RESOLUTION NO. 19-10

A RESOLUTION ADOPTING UPDATED CITY OF OREGON CITY PUBLIC WORKS WATER DISTRIBUTION SYSTEM DESIGN STANDARDS

WHEREAS, the City of Oregon City operates a water distribution system in order to provide water from the lower Clackamas River to the residents of the City; and

WHEREAS, the City's water system serves over 5,500 acres of developed property within the City limits and is comprised of over 140 miles of pipelines and other facilities including fire hydrants, valves, and service lines; and

WHEREAS, the City finds it is necessary to establish and implement uniform engineering design standards for all Public Works Water Distribution System projects in the interest of health, safety, and welfare of the residents of the City of Oregon City.

NOW, THEREFORE, OREGON CITY RESOLVES AS FOLLOWS:

Section 1. That the Commission, by this Resolution, adopts the Public Works Water Distribution System Design Standards, attached to this resolution as Exhibit "A", for application to all publicly-owned Water Distribution System improvements within the City.

Section 2. The effective date for the Public Works Water Distribution System Design Standards shall be the date this resolution is adopted and signed.

Section 3. The Public Works Water Distribution System Design Standards adopted by this resolution shall supersede the Public Works Water Distribution System Design Standards, as adopted June 16, 1993.

Section 4. That the Commission, by this Resolution, empowers the City Engineer to periodically update these Standards as needed to maintain currency with standard engineering practices and standards.

Approved and adopted at a regular meeting of the City Commission held on the 1st day of May 2019.

DAN HOLLADAY, Mayor

Attested to this 1st day of May 2019:

Katie Riggs
City Recorder

Approved as to legal sufficiency:

City Attorney

CITY OF OREGON CITY

PUBLIC WORKS
WATER DISTRIBUTION SYSTEM
DESIGN STANDARDS

RESOLUTION NO. 19-10

ADOPTED: May 1, 2019

PREPARED BY

Public Works Department

625 Center Street

Oregon City, Oregon 97045-0304

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WATER DISTRIBUTION SYSTEM DESIGN STANDARDS

Table of Contents

SECTION I - GENERAL

1.00 PURPOSE

The purpose of these Water Distribution System Design Standards is to provide a consistent policy under which certain physical aspects of the public water distribution design will be implemented. Most of the elements contained in this document are Public Works oriented and most are related to public improvements and City contract projects; however, it is intended that they apply to both public and private work designated herein.

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

The Standards are also not intended to unreasonably limit any innovative or creative effort that could result in better quality, cost savings, or both. Any proposed departure from the Standards will be judged on the likelihood that such variance will produce a compensating or comparable result, in every way adequate for the user and the City resident.

1.01 GOALS

Following from the above purpose, the Standards have the objective of developing a water distribution system, which will:

A. Be consistent with the Oregon City Comprehensive Plan, Oregon City Municipal Code, the Oregon City Water Distribution System Master Plan, the Oregon State Health Division Administrative Rules (Chapter 333), the State Plumbing Code, Clackamas Fire District #1 Oregon Fire Code Applications Guide, Oregon Fire Code – Appendix B, the most recent edition of the AWWA Standard Specifications, the most recent revision to the ODOT/APWA Standard Specifications for Construction, and City Code Chapter 13.04;

B. Provide sufficient capacity to maintain minimum pressure during periods of maximum use and to provide sufficient volumes of water at adequate pressures to provide the expected average daily consumption plus fire flows at a minimum energy loss;

C. Have sufficient structural strength to resist all expected loads, both internal and external, which may be imposed; and able to preserve the potability of the water supply;

D. Be economical and safe to build and maintain.

E. Be of materials resistant to both corrosion and erosion, and have a minimum design life of 75 years or the maximum industry standard, whichever is greater;

Alternative materials and methods will be considered for approval based on these objectives.

Whenever any conflict exists between the references in 1.01.A. and these standards, the references in 1.01.A. take precedent.

1.02 REVISIONS TO THESE STANDARDS

It is anticipated that revisions to these 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. The Standard Drawings referenced in Section III may be revised from time to time as deemed necessary without revision to this overall document.

1.03 SHORTENED DESIGNATION

These City of Oregon City Water Distribution System Design Standards shall be cited routinely in the text as the "Standards".

1.04 APPLICABILITY

These Standards shall govern all construction and upgrading of the facilities for public water distribution system in the City of Oregon City and/or applicable work within its service areas.

Some areas of Oregon City may be served by Clackamas River Water (CRW) when the City of Oregon City and CRW have executed an interagency agreement that provides the terms and provisions for CRW to provide water service to specific designated areas or properties with the City limits.

Whenever possible, the public water distribution pipelines shall be located within the public rights of way. Where pipelines are required to pass through private property, public water easements shall be obtained from the property owner.

The public distribution system shall include, but is not limited to, the distribution mains, fire hydrant assemblies, isolation valves, and the service lines including the water meter boxes in the public right-of-way or easement. The public distribution system is owned and maintained by the City of Oregon City unless otherwise noted.

The privately owned and maintained piping from the customer's property line, or the meter where provided, to the point of water use (the building supply line) is subject to the requirements of the Oregon Plumbing Specialty Code.

Fire suppression water lines are considered privately owned and maintained beyond the public isolation valve in the public right of way or public easement.

Permanent public water distribution systems shall be provided to all property within the City of Oregon City in accordance with these standards, including legal lots of record created by partitioning or subdivision of land as per City of Oregon City Municipal Code.

Where applicable, developing property shall provide public water distribution extension along their frontage or through their site for extension to undeveloped property.

The design of the following are considered special facilities and are not covered in detail in these Standards:

A. Water Distribution Pump Stations

B. Reservoirs

C. Relining of Existing Water Mains

D. Treatment Plants

E. Pressure Regulating Devices

F. Flow Measurement Devices

Review and approval of the above special facilities by the City Engineer shall be required. The City Engineer may designate a qualified State of Oregon licensed Civil Engineer to perform the review. When requested by the City, full design calculations shall be submitted for review prior to approval.

1.05 REFERENCES

The Standards are intended to be consistent with the most currently adopted provision of:

A. Oregon City Municipal Code

B. Oregon City Comprehensive Plan

C. Oregon City Water Distribution System Master Plan

D. Oregon Plumbing Specialty Code

E. Oregon Statewide Planning Goals and Guidelines

F. Oregon Administrative Rules, Chapter 333

G. Referenced National Trade Standards such as AWWA, ASTM, ANSI

H. Appendix B of the Oregon Fire Code

I. Clackamas Fire District #1 Oregon Fire Code Applications Guide

J. Local Trade Standards such as ODOT/APWA

1.06 STANDARD SPECIFICATIONS

The workmanship and materials shall be in accordance with the current edition of the "Standard Specifications for Public Works Construction" except where the Standards provide other design detail. These standards are prepared by the Oregon Chapter of APWA, as modified by the City of Oregon City.

1.07 DEFINITIONS AND TERMS

Air Gap Separation - A physical vertical separation (two times the diameter of the pipe) between the free-flowing discharge end of a potable water supply pipeline and an open or non-pressurized receiving vessel.

Approved Backflow Prevention Device - A device that has been investigated and approved by the regulatory agency having jurisdiction.

As-Built Plans/Record Drawing - Plans signed, stamped, and dated by the Consulting Engineer or approved Professional indicating that the plans have been reviewed and revised, if necessary, to accurately show all known construction details of a particular public works project.

Backflow - Backflow is the flow of water or other liquids, mixtures, or substances into the distribution pipes of a potable water supply from any sources other than its intended source. (See Back-Siphonage)

Backflow Preventer - A backflow preventer is a device or means to prevent backflow into the potable water system.

Back-Siphonage - Back-Siphonage is the flowing back of used, contaminated, or polluted water from a plumbing fixture or vessel into a water supply due to a negative pressure in such pipe.

Building Official - The Building Official of the City of Oregon City or his/her authorized representative.

Building Supply - The building supply is the pipe carrying potable water from the water meter or other source of water supply to a building or other point of use or distribution to the lot. Building supply shall also mean water service. (See Customer Line)

City - The City of Oregon City, Oregon.

City Engineer - The City Engineer of the City of Oregon City or his/her authorized representative.

Consulting Engineer - The engineer of record, licensed by the State of Oregon as a Civil Engineer, under whose direction construction plans, profiles, and details for the work are prepared and submitted to the City for review and approval.

Cross Connection - A cross connection is any connection or arrangement, physical or otherwise, between a potable water supply system and any plumbing fixture or any tank, receptacle, equipment, or device, through which it may be possible for non-potable, used, unclean, polluted, and contaminated water, or other substances, to enter into any part of such potable water system under any circumstance.

Customer Line - That piping connecting the meter to the building plumbing system. (See Building Supply)

Cut Sheets - Sheets of tabulated data, indicating stations, structures, fittings, angle points, beginning of curve, points on curve, end of curves, staking offset, various elevations, and offset cuts.

Definition of Words - Wherever, in these Standards, the words directed, required, permitted, ordered, designated, or words of like importance are used, they shall be understood to mean the direction, requirement, permission, order, or designation of the City Engineer. Similarly, the words approved, acceptable, and satisfactory shall mean by, acceptable to, or satisfactory to the City Engineer.

Distribution System - Distribution main pipelines, pumping stations, pressure reducing stations, valves, and ancillary equipment used to transmit water from the supply source to the service line.

Double Check Valve Assembly - An assembly composed of two single, independently acting, approved check valves, including tightly closing shut-off valves located at each end of the assembly and fitted with properly located test cocks.

Double Check - Detector Valve Assembly - A line-sized approved double check valve. The purpose of this assembly is to provide a telltale check of the fire system showing any system leakage or unauthorized use of water.

Dwelling Unit - A habitable living unit that provides basic living requirements including permanent cooking, and toilet facilities.

Easement - Easements are areas along the line of all public water mains and appurtenances that are outside of dedicated public rights-of-way and shall be prepared on approved forms granting rights along the public water line and appurtenances to the City.

Fire Flow - The flow rate of a water supply, measured at twenty (20) pounds per square inch (psi) residual pressure that is available for firefighting at fire hydrants.

Fire Hydrant Assembly - The fire hydrant head, bury, piping and attached auxiliary valve.

Fire Protection Service - A connection not metered to the public water main that is intended only to provide service to fire suppression systems that extinguish fires and the flushing necessary for the fire system's proper maintenance. The fire protection service shall not have any cross connections to any onsite domestic water and/or irrigation water systems that are metered from the public water system.

Fixture Unit Equivalents - The unit equivalent of plumbing fixtures as tabulated in the Oregon Plumbing Specialty Code.

Hydrant Lead - The line connecting the fire hydrant and bury to the auxiliary valve at the City public water main.

Irrigation Service - A separate metered connection from the domestic water metered connection intended for seasonal use and delivering irrigation water that is not discharged to the sanitary sewer system.

Multiple Family Dwelling - A building or portion designed thereof for occupancy by two or more families, living independently of each other.

Manufacturer's Name - Any manufacturer's name, specification, catalog number, or type used herein as specified by make and order to establish the standard requirements of the City. Other equivalent makes will be considered for approval, providing they are comparable with this established standard.

Owner - Any individual, partnership, firm, or corporation by whom the consulting engineer has been retained or who, as a property owner, is making arrangements with the City.

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

Plans - Construction plans, including system site plans, water system plans, profiles, cross sections, detail drawings, etc., or reproductions thereof, approved or to be approved by the City Engineer. These plans shall show the location, character, dimensions, and details for the work to be done, in which constitutes a supplement to these standards.

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

Premise - Any lot, parcel, or tract of land owned by a single entity.

Private or Private Use - In the classification of plumbing fixtures, "private" or "private use" applies to plumbing fixtures in residences and apartments, to private bathrooms in hotels and hospitals, to restrooms in commercial establishments containing restricted use, single fixtures, and to similar installations where the fixtures are intended for the use of a family or an individual.

Public or Public Use - In the classification of plumbing fixtures, "public" or "public use" applies to plumbing fixtures in commercial or industrial establishments, restaurants, bars, public buildings, comfort stations, schools, gymnasiums, and railroad stations. This use applies to fixtures placed where the public is invited or which are frequented by the public without special permission or special invitation. This use also applies to fixtures in other installations (whether pay or free) where fixtures are installed so that their use is similarly unrestricted.

Public 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 general public. Within this right-of-way, the City shall have the right to install or maintain waterlines and other public utilities.

Public Water Main - The water main (street main) is a water supply pipe for public or community use.

Residential User - The owner, lessee, or occupant of a single dwelling unit in one structure.

Roadway - The public right-of-way dedicated, granted, used, or to be used for transportation purposes by the general public.

Public Service Line - The line or pipe connecting the City water main to the water meter.

Single Family Dwelling - Any residential building designed to house one family.

Standard Drawings - The drawings of structures or devices commonly used for City public works infrastructure and referred to on the design plans. These standard drawings are included in Section III.

Streets or Roads - Any public highway, road, street, avenue, alley, way, easement, or public right-of-way used or to be used for a motor vehicle, bicycle, or other legal mode of transportation for the general public.

Traveled Way - That portion of the roadway for the movement of motor vehicles, bicycles, or other legal modes of transportation, exclusive of the shoulder and auxiliary lanes.

Uniform 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 Plumbing Specialty Code."

Water Supply System - For buildings or premises, consists of the building supply pipe, the water distribution pipes, and the necessary connecting pipes, fittings, control valves, and all appurtenances carrying or supplying potable water in or adjacent to the building premises.

1.08 ENGINEERING POLICY

The engineering policy of the City of Oregon City requires strict compliance with Oregon Revised Statute 672 for professional engineers.

All engineering plans, reports, or documents shall be prepared by a registered professional Civil Engineer licensed in the State of Oregon. These documents may also be prepared by a subordinate employee under his/her direction, and shall be signed by him/her and stamped with his/her seal to indicate his/her responsibility for them. It shall be the consulting engineer's responsibility to review any proposed system, extension, and/or existing system change with the City, before engineering or proposed design work, to determine any special requirements or whether the proposal is permissible. A City approval granted on the plans or other documents, for any job, does not in any way

relieve the consulting engineer of his/her responsibility to meet all requirements of the City. A City approval also does not relieve the consulting engineer of his/her obligation to protect the life, health, and property of the public. The plan for any job shall be revised or supplemented at any time if it is determined that the full requirements of the City have not been met.

The City will warn a consulting engineer in writing of their conduct for submitting false or inaccurate information of a material nature. The City will also advise the Oregon State Board of Engineering Examiners.

1.09 APPROVAL OF ALTERNATIVE MATERIALS OR METHODS

Any alternate material or method not explicitly approved herein will be considered for approval based on the objectives set forth in Section 1.00 PURPOSE. Persons seeking such approvals shall make the request in writing. Approval of any major deviation from these Standards will be in written form. Approval of minor matters will be made in writing if requested.

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

The written request is to 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.

1.10 ISSUANCE OF BUILDING PERMIT

Water improvements as well as all other public infrastructure improvements are required to be completed and be accepted by the City before any building permits for connection to new single family residential dwellings can be issued.

Building permits may be issued for commercial, industrial, and multi-family projects once city engineering approval has been provided for the plans.

Occupancy may not be granted to a building until all improvements are complete to the satisfaction of the City Engineer and Building Official; however, temporary occupancy may be provided if certain conditions are met as determined by the Building Official.

1.11 TRANSFER OF ENGINEERING RESPONSIBILITY

Project water plans shall always have an engineer of record performing the function of consulting engineer. If the consulting engineer is changed during the course of the work, the City shall be notified in writing and the work shall be stopped until the replacement

engineer has agreed to accept the responsibilities of the consulting engineer. The new consulting engineer shall provide written notice of accepting project responsibility to the City within seventy-two hours of accepting the position as consulting engineer.

SECTION II - DESIGN

2.00 GENERAL DESIGN CONSIDERATIONS

Within the limits of economic feasibility, the designed water system shall have sufficient capacity to keep variations in pressure to a minimum and provide minimum pressure of 35 pounds per square inch (psi) at the highest using fixture during periods of maximum use. The water system shall also provide sufficient volumes of water at adequate pressures to satisfy the expected daily consumption plus fire flows. Typically, the working service pressure range under average daily demand operating conditions if 40 to 100 psi. Where mainline distribution pressures exceed 80 psi, customer services shall be equipped with individual pressure reducing valves (PRVs) to protect water heaters per the Oregon Plumbing Specialty Code. The minimum pressure shall be 35 psi in the building at the highest distribution point (such as a showerhead).

In general, water distribution systems should be designed to provide for maximum development of the service area with recognition of possible urban renewal, industrial expansion, and so forth.

As a condition of water service, all developments will be required to provide public water mains of sufficient size for fire protection to adjacent parcels. This shall include the extension of water 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.

The acceptable velocities in mains under Maximum Daily Demand (MDD) conditions shall be less than four (4) feet per second (fps) and during fire flow conditions less than ten (10) fps. However, velocity criteria are secondary to pressure and fire flow requirements. A 20-psi residual pressure under fire flow conditions shall be maintained in the distribution system as required by Oregon Health Authority, Drinking Water Program, OAR Chapter 333 Division 61 regulations.

All materials shall be new and undamaged. No rebuilt, reconditioned, or used material shall be allowed unless approved by the City Engineer. The same manufacturer of each item shall be used throughout the project.

All work and materials shall conform to the most recent edition of the ODOT/APWA Oregon Standard Specifications for public works construction as adopted and modified by the City of Oregon City.

2.01 WATER SYSTEM CAPACITY

The Water Distribution System Master Plan has been in place for the City for several years as far back as the mid-1990s. Most recently a plan was readopted in 2004 and updated in 2012 and is currently undergoing a new update in 2019. The plan is subject to

periodic updates. A hydraulic analysis computer model was developed as part of the Water Master Plan effort to evaluate the performance of the existing distribution system and to aid in the development of future improvements. Hydraulic modeling performed provides the basis for development of capital improvement plans, financing plans, and technical memorandums aiding the City in understanding the deficiencies with the existing system, potential deficiencies caused by development, and solutions to correct or prevent those deficiencies.

On a case-by-case situation, the City may require a water model to analyze the operation of the existing distribution system given the required fire flow for a proposed development at the expense of the applicant. The fire flow requirement for a development shall be determined by the Clackamas Fire District #1 (Fire District) in compliance with the latest version of the Oregon Fire Code.

The following design criteria shall be used to determine system adequacy and recommend improvement to provide required fire flow:

Minimum Residual Pressure - 20 psi

Maximum Demand Fire Flow Velocity in Main - <10 fps

The minimum fire flow required:

Residential - 1,500 gpm (for 2 hours)

Office/Commercial - 3,500 gpm (for 3 hours)

Mixed Use/Schools - 3,500 gpm (for 3 hours)

Industrial - 5,000 gpm (for 4 hours)

Actual required fire flow:

Case-by-case determined by the Fire District.

For reference to the fire flow requirements for buildings, see the latest version of the Oregon Fire Code based on the International Fire Code, Appendix B and the latest version of the Clackamas Fire District #1 Oregon Fire Code Applications Guide.

2.02 MAIN CLASSIFICATION

A. Supply mains (Transmission Mains)

Mains that are used for transporting water from the source of supply and catchment reservoirs to the centralized point of distribution and distribution reservoirs.

B. Feeder Mains

Mains that transport water from centralized points of distribution and distribution reservoirs, to the various points of interconnection with the grid system of mains and centralized points of consumption.

1. Primary - Those feeder mains not supplying individual consumers, but their sole purpose being to transport water from centralized points of distribution to various points of interconnection with the grid system and centralized points of consumption.

2. Secondary - Those feeder mains which serve the same purpose as any other feeder mains except that individual consumers are served by this group because no other main is available or that the required supply to the consumer demands a large main.

C. Distribution Mains

Those mains that are used for supplying the individual consumer. As a rule, these are the small mains in the water supply system.

2.03 WATER SYSTEM CONSTRUCTION PLANS

A. General

Complete plans and specifications for all proposed water systems improvements, including any necessary dedications and easements, shall be submitted to the City. The City will review these documents for compliance with this Standard and issue approval when the documents meet City Standards. Plans must receive the required approval prior to construction permit issuance and beginning of construction. See Section 2.07 for required submittal information.

Improvements shall be constructed as shown on the City approved plans and in accordance with these Standards and the latest version of the Standard Drawings. Equipment and materials shall be installed in compliance with the manufacturer's recommendations, except where a higher quality of workmanship is required by the City Approved Plan, Specifications, and these Standards.

All materials and work shall be in strict accordance with any applicable regulations and requirements of Federal, State, and local authorities. The Contractor may be required to arrange for inspection by these agencies and submit evidence of their approval, when required or requested by the City.

Take care to prevent damage to pipe, fittings, and other materials (not including granular material) and equipment during transportation, unloading, and final placement for installation. Manufacturer recommended product handling shall be followed to protect coatings, linings, and structural integrity of materials used in

public water system construction. Under no circumstances shall materials be dropped or dumped into the trench.

All damaged materials and equipment during construction shall be replaced or repaired to the satisfaction of the City.

The Contractor shall maintain safe working conditions for employees, City staff, and the general public in and around trench excavations. Precautions shall be taken to avoid damage to franchise utilities, adjacent properties, existing water infrastructure, and public or private landscapes/hardscapes. If any underground utilities are damaged, report damage to the City and Utility Owner immediately.

B. Plan Preparation

Construction plans and specifications for public water main systems shall be prepared by a professional civil engineer licensed in the State of Oregon. Plans and specifications shall be prepared in accordance with the following requirements:

1. Dimensions - Construction plans shall be clearly and legibly drawn on a 24 inches by 36 inches wide format with a 1½ inch clear margin on the left side and one inch (1") margins on all other sides unless another format is approved by the City Engineer and using the latest version of the City's standard plan sheet template.

2. Scale - Horizontal scale shall be not smaller than 1" = 50'; vertical scale shall be not smaller than 1" - 5' or as approved by the City Engineer. 1" = 20' shall be required when more detail is needed.

3. Form - Title Sheet, Overall Utility Plan, Erosion/Sedimentation Control Plan, Grading Plan (if applicable), Plan and Profiles, and Details.

The water plans can be combined with the sanitary sewer plan if the water plans are part of a subdivision, commercial development, or City project where other public facilities are involved (sanitary sewer, storm, streets). However, the Consulting Engineer must ensure the notes for the sanitary sewer and water are drafted to distinguish a definite difference between the water and sanitary. For example: surround all water notes with a cloud symbol and all sewer notes with a box symbol.

Each utility will be required to be on its own page if required by the City.

2.04 TITLE SHEET

A. Plan view (Site Plan) of the entire project, showing street right-of-way and/or subdivision layout to a scale of 1" = 100'. A smaller scale may be used on large projects upon approval of the City Engineer. A project is too large when a minimum dimension of two inches (2") cannot be maintained between the title, system site plan, and vicinity map. A scale of 1" = 200' may be used in this case.

   The site plan shall be a composite plan showing all complete properties to be served by the water system improvements and properties adjacent to and within 250 feet of those served. The site plan shall also show existing and proposed water lines, tract names and numbers, addresses, and lot numbers or property owner's names and street names.

B. Index of sheets, including a graphical index if more than one (1) plan sheet.

C. Complete legend of symbols used.

D. Vicinity Map to a scale of not less 1" = 800' showing the project locations unless another scale is approved by the City Engineer.

E. Engineer Title Block - located in lower right-hand corner or right edge of paper with scale, north point, date, drawing number, the engineer's name, address and official stamp, and where applicable, the owner/developer's name and address as determined by current standards maintained by the City Engineer.

F. Space for City Approval Stamp, 3" X 3", preferably in the lower right-hand corner (to be provided on each sheet of the plan set) as determined by current standards maintained by the City Engineer.

G. Temporary and permanent benchmarks including their descriptions (see comment under profiles).

H. Current City Standard Construction Notes and other special notes relating to construction methods, or include the City Standard Construction Notes in the Contract Documents with a note on the drawings so indicated.

I. City Planning File No. or City Capital Improvement Project No.

J. City G.P.S. Control (see Section 2.22 As-Built Drawings/Digital Mapping Requirements).

   NOTE: If all the above items cannot be located on the title sheet, a different location within the plans may be used upon the approval by the City Engineer.

2.05 PLAN AND PROFILES

A. Plan

Plan view of water system shall be to a scale of not smaller than 1" = 50' (1" = 20' shall be required when more detail is needed) unless a different scale is approved by the City Engineer and shall contain the following information in addition to the above:

1. Adjacent street curbs and property lines, edge of pavement, right-of-way and utility easements referenced to property corners, property identification (Lot number or tax number), street intersection, or section lines. Adequate two foot (2') contour lines or property corner and curb elevations to help determine if existing basements or proposed daylight basements in new subdivisions can or should be served.

2. Location of water mains, service lines, meter boxes, fire hydrants, thrust block with bearing areas, and appurtenances with each fitting and branch line stationed to facilitate coordination in locating appurtenances. The stationing shall be tied to existing property corners or street monuments with the relationship of each valve and fitting shown to the property owners or street centerline. Each line with separate designation shall be stationed continuously from 0+00 at its point of connection to another line and each service line stationed.

3. Size, length, type of material, and class of pipe between fittings.

4. Location of existing water courses, geologic hazards, stream and railroad crossings, gas mains, culverts, sanitary and storm drains, underground and overhead power and other utilities (including but not limited to gas, electric, telephone, cable, fiber), and hydrants within 100 feet of the proposed extension. All water course crossings must show the 100-year flood plains and floodways.

5. Location of other proposed public improvements (including but not limited to sanitary sewer, storm sewer, curbs, traffic signals, street lighting, street signage).

6. Location of existing private facilities (including but not limited to driveways, retaining walls, mailboxes, trees)

7. Location of other public utilities (non-City owned)

8. Match lines with sheet number references.

9. Location and description of all known existing surveying monuments, including, but not limited to, section corners, quarter corners, donation land claim corners, and City control survey monuments. Any monuments removed or destroyed by construction shall be replaced per ORS 209.150. If a boundary control survey or plat is prepared in conjunction with the construction plans, a copy shall be

submitted with the construction plans for review. See Section 2.22 As-Built Drawing/Digital Mapping Requirements.

10. Location of existing water valves that would be necessary to isolate project during construction if required.

B. Profiles

Profiles for the individual water lines shall be to the same horizontal scale and preferably on the same sheet, drawn immediately below the corresponding plan view reading from 0+00 left to right. However; if spatial and clarity needs are met better by having plan and profiles on separate sheets, they may be on separate sheets. Profiles shall be required in the following instances:

1. Railroad and culvert crossings, geologic hazard areas, ditch or stream crossings with elevations of the ditch or streambed and the 100-year flood elevations profile and casing details. Horizontal scale 1" - 20', vertical scale 1" = 2'.

2. Utility crossings that conflict with the proposed water line installation. Same horizontal and vertical scale as (1) above.

3. Mains installed in easements across private property. Horizontal scale 1" = 50', vertical scale 1" = 5', or other standard scale.

4. Mains 12 inches in size or larger.

   Profiles shall be based on one of the following bench mark systems:

   a. City of Oregon City,

   b. ODOT, or

   c. U.S. Geodetic Survey.

Show the location and elevation of the reference benchmark and any temporary benchmarks set on the title sheet.

Profiles shall show proposed waterline appurtenances, all utility crossings, existing and proposed finished grade, line sizes, slopes, elevations at grade brakes stationing, and required minimum clearances. For mains 12 inches and larger, include backfill classification.

SPECIAL NOTE: If practicable, the consulting engineer shall field locate and verify the alignment, depth, and inverts of all existing facilities shown on the plans that will be crossed by proposed facilities. City as-built records are only to be used as an aid to the consulting engineers when verifying the existing facilities in the field.

2.06 WATER SYSTEM APPURTENANCES/CONSTRUCTION NOTES

A. Appurtenances

Detailed drawings shall be included for all water system appurtenances including fire hydrants, thrust blocks, valve boxes, blow offs, and service installations.

B. Construction Notes

Standard City General Construction Notes and Water Notes shall be included on the plans, or in the Construction Documents with a note on the drawing so indicating. These notes may be added to or revised, upon City Engineer approval, in order to accommodate specific projects.

2.07 PLAN SUBMITTAL, APPROVALS, INSPECTION REQUIREMENTS

A. Construction plans shall be submitted to the Public Works Department for checking to ensure compliance with these Standards, City of Oregon City Ordinances, and good engineering practice. Submitted plans shall include the following:

1. Engineer's Preliminary Cost Estimate (or Opinion of Probable Cost),
2. Engineering Review Checklist checked by consulting engineer, and
3. A tie to the City horizontal control system. Survey ties to include monuments tied and closure results.

B. Submitted plans shall also include (if applicable) the following:

1. Supplemental specifications,
2. Soils report and design recommendations,

3. Geotechnical report and design recommendations,

4. Natural Resource report and design recommendations,

5. Easement and right-of-way descriptions and sketches,

6, A tie to the City Bench Mark systems, including closure results,

7. Boundary control survey,

8. Final plat, and

9. Other material as requested by the City Engineer

C. A 2½ % plan check fee, (or the currently established fee, fee is a percentage of an approved engineer's cost estimate) will be levied at the time plans are submitted to the Engineering Division. This fee is a percentage of an approved engineer's cost estimate for all site improvements. Plans will not be checked until fee is paid.

D. Once the plans are approved and construction permit issued, the Consulting Engineer for private development projects shall be responsible for providing inspection and surveying services necessary to stake and construct the project. The Consulting Engineer shall prepare the as-built drawings when the project is complete.

E. The Consulting Engineer preparing the plans for a privately funded public improvement project shall execute a "City of Oregon City, Developer/Engineer Agreement for Public Works Improvements." This agreement provides for the following services from the Consulting Engineer:

1. Perform surveying sufficient to prepare construction plans.

2. Prepare construction plans and specifications, and obtain approvals.

3. Attend a preconstruction meeting.

4. Perform construction staking and inspection.

F. If the Consulting Engineer is not furnishing all of the above services, the specific arrangements, i.e., subcontracting, must be supplied to the City. The name, address and telephone number of Consulting Engineer, surveyor, and contact person shall be included.

G. Should the services of the Consulting Engineer be terminated or curtailed below the specific tasks, he/she shall correspond with the City so indicating.

H. The Consulting Engineer doing inspection for a privately funded public improvement project shall follow the City's "Minimum Guidelines for Inspection/Observation of Public Works Construction" or similar current policy.

I. It shall be the policy of the City of Oregon City to provide spot check inspection services for non-public-funded public improvements. A 2½ % inspection fee or currently established fee (the fee is a percentage of an engineer's cost estimate) will be collected at the time the plans are approved. This inspection fee is in addition to the plan check fee. A permit is issued for construction when the following items are provided:

1. Approved Engineering Plan,
2. Engineer's Final Cost Estimate (or Opinion of Probable Cost),
3. Accepted Geotechnical Report (if required),
4. Accepted Natural Resource Plan (if required),
5. Performance Bond,
6. Developer/Engineer Agreement,
7. Erosion Control Permit (if required),
8. Permits from other jurisdiction if working in their right-of-way,
9. Approval from State of Oregon Health Division (if City does not continue its program to approve plans on behalf of the State), and
10. Any other permits required from any other agencies having jurisdiction on the project.

J. A project becomes accepted by the City when construction is complete and the following have been completed or obtained:

1. Maintenance Bond,

2. Consulting Engineer's Certificate of Completion,

3. Completed Punchlist, and

4. Recorded Subdivision or Easement Document (when required).

K. A water main becomes fully owned and maintained by the City once the City has accepted the new improvement and released the performance bond. The City will provide all locates and supervise all new taps to that main once it has been connected to the public water distribution system. The contractor is responsible for a two-year period following release of the performance bond for warranty to that new water main and is required to make repairs if the line or appurtenances fail in any way as determined by the City. If repairs are not made, the City may use the maintenance bond for any repairs.

2.08 WATER MASTER PLAN REQUIREMENTS

The City uses the current adopted Water Distribution System Master Plan to recommend improvements to the existing and future distribution system. These recommendations shall be included in the design; however, they may be modified based on updating of the Water Distribution System Master Plan or updated computer model runs for specific fire flow requirements.

2.09 PIPE MATERIALS

Pipe materials shall conform to standards listed in this section. All water mains and services shall be designed for a cold water working pressure of 250 psi (refer to AWWA C 150 and DIPRA Technical Bulletin "Designing for Ductile Iron Pipe"). Fittings and valves shall be specified to have a working pressure of 250 psi unless an alternative is approved by the City Engineer.

Waterlines less than 30 inches shall be ductile iron pipes, cement mortar lined and seal coated, and shall conform to ASTM A536, ANSI/AWWA C151/A21.5, ANSI/AWWA C104/A21.4, and ANSI/AWWA C111/A21.11. Waterlines shall be thickness Class 52 with push-on joints. Joint and/or mechanical joint type conforming to ANSI A21.11 (AWWA C11). All joints shall be restrained unless approved by the City Engineer. Higher thickness class may be required where analysis indicates abnormal loading condition (see AWWA H-3).

All tees, bends, valves, and blow-off locations shall, unless otherwise noted and approved by the City Engineer, be restrained with a Mega-Lug follower, or approved equal.

Straddle blocks shall be provided on any dead end water mains.

Waterlines that are thirty inches (30") and larger or meet other Special Conditions shall be of acceptable alternate materials that include reinforced concrete water pipe, steel cylinder type, pre-tensioned conforming to AWWA C303 as approved by the City Engineer.

Acceptable abbreviations for showing existing types of pipe on the plans are as follows:

AC - Asbestos Cement
CI - Cast Iron
DI - Ductile Iron
CC - Concrete Steel Cylinder
PE - Polyethylene
PVC - Poly-Vinyl Chloride

A. General

Furnish the size, strength, and thickness classification; the type of joints; and type of materials as specified. Furnish catalog data for all materials and shop drawings for all fabricated items for approval prior to ordering or fabricating.

B. US Made Products

All materials shall be made in the United States of America unless approved by the City Engineer. Exceptions to US Made may only be approved by the City Engineer if the product is not available in the USA or if the City Engineer determines that the lead time required will negatively affect the general public.

C. Ductile Iron Pipe

Ductile iron pipe material shall conform to ASTM A536. Pipe shall be centrifugally cast, conforming to ANSI A 21.51 (AWWA C151), and shall be cement mortar lined and seal coated, conforming to ANSI A 21.4 (AWWA C 104). Pipe joints shall be mechanical, flanged, or push-on types. All joints shall be restrained. Furnish gaskets and joint lubricant conforming to ANSI A 21.11 (AWWA C 111), suitable for designated pipe joint, size, and pressure rating.

D. Concrete Cylinder Pipe

Concrete cylinder pipe shall conform to AWWA C 300. Steel cylinder thickness, reinforcing wire diameter and spacing, and cement mortar lining and coating shall be as specified. Design shall furnish flanged, welded, or Carnegie-type push-on joints as required.

E. Pipe Fittings and Specials

Pipe fittings and specials used with cast and ductile iron pipe shall conform to ANSI A 21.10 (AWWA C 110). Fittings shall be mortar lined, Class 250, and shall be mechanical, restrained, or flanged as required. The manufacturer's fittings and specials for concrete cylinder pipe shall be in accordance with AWWA C 300. Fittings may be furnished with plain ends for welding, flanged joints, or restrained joints, as specified.

Unless otherwise stated, manufacture fittings for steel pipe in accordance with AWWA C 200 and AWWA C 208. Furnish fittings for steel pipes that have plain ends, restrained joints as specified, or flanged ends. Protect steel pipefittings and accessories by applying coal-tar enamel as specified in AWWA C 203 or as otherwise specified.

All fittings shall be ductile iron conforming to ASTM A536, ANSI/AWWA C110/A21.10, ANSI/AWWA C104/A21.4, and ANSI/AWA C153/A21.53. Fittings shall have cast upon them the manufacturer's identification, pressure rating, nominal diameters or openings, and the number of degrees or fractions of a circle for all bends. Fittings shall be coated inside with cement mortar with an asphaltic seal-coat. When specified, fittings shall be ductile iron mechanical joint (MJ) or flange joint (FLG) conforming to AWWA C153 and C110.

The maximum allowable joint deflection shall not exceed twelve (12) inches per eighteen (18) feet of laying length.

F. Flanges and Gaskets

Provide flanges and gaskets conforming to the requirements of AWWA C 207, Class D unless otherwise specified, rated at 150 to 174 psi. Provide bolts and gaskets conforming to AWWA C 207.

G. Mechanical Couplings

Provide mechanical couplings where connecting pipes are made of cast or ductile iron. Provide steel mechanical couplings where connecting pipes are made of steel or concrete cylinder pipe. Couplings shall be capable of withstanding the designated internal hydrostatic test pressure without leakage or over stressing. Coupling diameter shall be compatible with the outside diameter of the pipe on which the coupling is installed. Steel couplings shall receive corrosion protection as specified in sub paragraph 501.3.06. Mechanical couplings shall have a minimum metal ring dimension as shown. Bolts shall be stainless steel or ductile iron compatible with the coupling used.

H. Restrained Joint

Restrained joints and gaskets shall be used on all projects involving City of Oregon City public water in place of other joints and thrust blocks unless approved by the

City Engineer. Achieve joint restraint using flanges, welded joint, joint harnesses, or other means as shown. Field welding of steel joints shall conform to AWWA C 206. Where joint harnesses are used, they shall consist of steel tie bolts extending across the pipe joints with lugs shop-welded to the pipe barrel as shown. Joint harness assemblies shall conform to AWWA Manual M 11. Sized as required to withstand the hydrostatic test pressure on the pipe. Components of joint harness shall be hot-dip galvanized after fabrication.

I. Material for Thrust Blocks

Furnish and place thrust blocks sized as shown using Portland Cement concrete conforming to ASTM C 94, developing a 28-day compressive strength of at least 4,000 psi, placed as shown on the Plans per the standard detail.

J. Material for Straddle Blocks

Where straddle blocks are required, they shall use Portland Cement concrete with a minimum 28 day compressive strength of 4,000 psi per standard detail.

K. Pipe Joining

1. Cleaning

Before joining, all pipe contact surfaces are to be thoroughly cleaned, wire brushed if necessary, and kept clean until joining is completed. Remove all lumps, blisters, and excess coal tar coating from the bell and spigot ends of each pipe and fitting.

2. Mechanical Joints

All mechanical joints shall be installed with joint restraints except on cast iron pipe.

Installation of mechanical joints shall be as recommended by the manufacturer and in accordance with ANSI/AWWA C111/A21.11 Appendix A. If effective sealing is not obtained, the joint shall be disassembled, thoroughly cleaned, and reassembled.

Bolts shall be uniformly tightened to the torque valves listed below or according to manufacturer's instructions, whichever is greater.

Joint Size (in.)	Bolt Size (in.)	Range of Torque (ft-lbs)
3	5/8	45-60
4-24	¾	75-90
30-36	1	100-120
42-48	1¼	120-150

The above torque loads may be applied with torque measuring or indicating wrenches.

If effective sealing is not attained by the maximum torque indicated above, disassemble the joint and reassemble after thorough cleaning. Overstressing of bolts to compensate for poor installation is not permitted.

3. Push-on Joints

   All push-on joints shall be restrained.

   Installation of push-on joints shall be according to manufacturer's recommendations and AWWA C600.

   All joint surfaces shall be lubricated immediately before joining of pipe with an NSF-approved joint lubricant, as recommended by the gasket manufacturer.

   The Contractor shall take precaution not to damage the pipe, gasket, or fittings when pushing pipe together. Pipe spigot is to be squared with pipe bell prior to the joining process. If deflection is needed at a push-on joint, deflection shall take place after pipe is shoved home in the bell.

4. Deflection

   Pipe deflection shall not exceed the values listed in the table below, or the manufacturer's maximum allowable pipe joint deflection, whichever is less.

(18-foot pipe length)		
Pipe Diameter (inches)	Push-On Joint Maximum Deflection	
	Angle (degrees)	Offset per 18-foot pipe length (in.)
4	5	18
6	5	18
8	5	18
12	5	18
18	3	15
24	2.5	9.5

5. Flange Joints

   Installation of flange joints shall be according to manufacturer's recommendations and ANSI/AWWA C111/A21.11 Appendix C.

   Flange faces shall be flat and perpendicular to the pipe center line. Flange faces must be cleaned with a wire wheel prior to installation of the valve. Flange bolts shall be tightened in a progressively crisscross pattern, such as by first tightening

the bottom bolt; then the top bolt; next the bolts on either side; finally, the remaining bolts. This process should be repeated until all bolts are sufficiently tightened. Bolts for flange fittings shall be long enough to tighten through the nut and have three threads exposed beyond the nut.

6. Thrust and Straddle Blocks

The Water Department will only accept concrete thrust blocking where shown on Standard Drawings or for applications where joint restraints are not feasible. Cost is not a determining factor in feasibility.

When permitted, install thrust blocking according to the Standard Drawings. Concrete shall have a slump of 2 to 4 inches and shall comply with ODOT Standard Specifications Section 2001.29 (Class 3000 – ¾-inch) "Commercial Grade Concrete." Any field mixing of concrete must be approved by the City staff.

Concrete blocking shall extend from the fitting to solid, undisturbed earth and installed so that all joints are accessible for repair. Prior to using high-early concrete for thrust blocking, the Contractor shall submit a mix design from the supplying concrete plant for City approval.

Concrete thrust restraint for vertical bends shall include embedded steel rebar hooks as shown in the Standard Drawings.

All pipe and fittings in contact with concrete shall be completely wrapped in two (2) layers of 4- mil polyethylene sheets or one (1) layer of 8-mil polyethylene prior to the placement of the concrete.

Straddle blocks installed on existing waterlines 8-inch and smaller require U.G. clamps or mid span restraint glands. Straddle blocks on waterlines 10 inches and larger require designed rebar reinforcement stamped by a registered professional engineer and approved by the Water Department.

2.10 MAIN SIZE

A. Grid System

The distribution system mains shall be looped at all possible locations to provide circulation and water quality.

B. Size of Pipe

1. 2-inch - shall not be used as part of the distribution system.

2. 3-inch - shall not be used as part of the distribution system as well as service lines and fire lines.

3. 6-inch - may only be used on dead-end streets not requiring a fire hydrant that is less than a center line distance of 200 feet in length. This 200 feet is measured from the center of the intersecting street to the radius point of the cul-de-sac of a dead-end street. This line may not serve more than 12 residences and shall be connected to a looped minimum six-inch (6") main.

4. 8-inch - the minimum size distribution water main in residential subdivisions for the grid (looped) system. Looping of the distribution grid shall be at least every 600 feet to 1,200-foot intervals, unless otherwise approved. Also, the minimum size for permanently dead-ended mains supplying fire hydrants with a fire flow less than 1,500 gpm and for secondary feeder mains in residential subdivisions. 6-inch may be used if approved by the City Engineer and this guideline is followed.

5. 12-inch - and larger, as required, for primary feeder mains in industrial subdivisions.

6. Full pipe sections shall be eighteen (18) feet in length unless industry standards change between updates of these standards, whereby the City Engineer can approve any changes.

7. Exceptions to this section may be requested with rationale to the City Engineer for decision.

2.11 MINIMUM DEPTH

The standard minimum cover over buried water mains within the street right-of-way shall be thirty-six inches (36") from finish grade to top of pipe.

The minimum cover for mains in easements across private property shall be thirty-six inches (36") from finish grade to top of pipe.

Where the main is located in the cut or fill side slope or where mains are located in easements, finish grade shall mean at the water main alignment. The intent is to provide a minimum cover over the pipe of 36 inches in the street right-of-way and 36 inches in easements.

Deviation from the above standards will be considered on a case-by-case basis when the following circumstance exists:

Underlying rock strata - required: a request in writing to the City Engineer together with submission of a soils report with a plan and profile certifying that bed rock exists less than three feet (3') below the undisturbed ground surface.

When deviating from the standard depth, a profile shall be required.

2.12 LOCATION

A. Water Mains Within Street Right-of-Way

The standard location for water mains within public streets and roads shall be four feet (4') from the face of curb for such streets and roads under the pavement section and preferably on the south and east sides of the street. Exceptions to these requirements may be made to avoid conflicts with other existing underground facilities and to permit sanitary sewers to be installed on the low sides of streets.

Mains should not be installed in alleys. As nearly as practical, mains shall be installed in a particular street with the distance from the curb line of the street varied as little as possible. On curved streets, the mains may be laid on a curve provided the following minimum radius are not exceeded (minimum radius was calculated using one half manufacturer allowable deflection):

PIPE SIZE - MINIMUM RADIUS	
6 inches through 12 inches	500 feet
14 inches through 16 inches	600 feet
18 inches through 24 inches	800 feet

On curved streets where mains are to be laid in straight lines, they shall be laid along the tangent between selected angle points to avoid conflicts with other utilities. The angle point of tangent section shall not be less than four feet (4') from curb face or pavement edge.

All new water pipelines under construction shall be physically disconnected from the City's existing distribution system and may only be connected after passing hydrostatic and bacteriological testing and the City's approval.

B. Within Easements

Mains laid in easements along property lines, with the easements centered on property line, shall have the main and easement centerline offset forty-two inches (42") from the property line. The installation of mains within easements across privately-owned property is to be done only when absolutely necessary, such as avoiding dead-end conditions. Such easements, when required, shall be a minimum of fifteen feet (15') in width except that the minimum width shall be twenty feet (20') or more for transmission water mains and 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. Typically, 15 feet is used for placement in private roadways or parking areas and 20 feet is used when vehicular access is not normally available. 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. The intent is to provide an unobstructed area in which to operate or repair equipment. Concrete pads, patios, walkways, and landscaping may be installed but is subject to removal at the property owner's expense. Trees shall only be allowed within 10 feet horizontally from the water main.

Easement locations for public mains serving a planned unit development, apartment complex, or commercial/industrial development shall be in parking lots, private driveways, or similar open areas which will permit an unobstructed vehicle access for maintenance by City forces, and shall be located at least twenty feet (20') from the edge of existing or proposed structures.

Easement widths shall vary from the fifteen foot (15') minimum in five foot (5') increments (i.e., 15, 20 feet).

All easements must be furnished to the City for review and approval prior to acceptance and recording. Standard City utility easement document forms and guidelines for preparation of descriptions and sketches shall be used.

The easement shall be exclusive for water mains and appurtenances and not shared with other utilities or structures (unless approved by Public Works).

C. Relation to Sewer Lines and Other Utilities

Whenever possible, mains shall be installed a minimum clear distance of ten feet (10') horizontally from sanitary sewers and shall go over the top of such sewers with a minimum of eighteen inches (18") of clearance at intersections of these pipes. A City approved design exception shall be obtained if these clearances cannot be met. In all instances in this section and the following sections, the distances shall be measured edge to edge. If the recommended spacing cannot be achieved, then construction standards, as outlined per the Oregon Administrative Rule Chapter 333-61-050, shall be followed. The minimum spacing between water mains and storm drains, gas lines, and other underground utilities, excepting sanitary sewers, shall be three feet (3') 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 separation shall be a minimum of twelve inches (12") 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 non-sanitary sewer utilities is required, the minimum vertical clearance shall be twelve inches (12"). A City approved design exception shall be obtained if these clearances cannot be met.

Sanitary sewers crossing a water main shall be made at approximately 90 degrees and have a minimum of eighteen (18) inches of vertical clearance. Otherwise, the sanitary sewer shall be constructed of ductile iron water pipe with watertight joints for a distance of nine (9) feet from both sides of the water line.

2.13 SURFACE WATER

Surface water crossings of mains shall be over or under water depending on the location and size of the pipe.

A. Above Water Crossings

The pipe shall be adequately supported and anchored, with care taken to protect from freezing and damage, yet be accessible for repair and maintenance. All above water crossings will require the approval of 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.

2. Where the watercourse is more than 15 feet wide, the pipe shall be of special construction with flexible watertight joints, valves shall be provided on both sides of the crossing so the section can be isolated for testing or repair, and test cocks shall be provided at the valves. The valves shall be easily accessible and not subject to flooding.

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

   a) Stream or drainage channel crossing for pipes twelve inch (12") inside diameter or greater.

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

4. The minimum cover from the top of pipe shall be thirty-six inches (36") to the bottom of the stream bed or drainage channel.

5. A scour pad centered on the water line will be required for mains less than twelve inch (12") inside diameter when the cover from the top of the pipe to the bottom of the stream bed or drainage channel is thirty inches (30") or less. The scour pad shall be six inches (6") thick and six feet (6') wide reinforced with (#4) bars twelve inches (12") on center both ways and shall extend to a point where a one-to-one slope, that begins at the top of the bank and slopes down from the bank away from the channel canter line intersects the top of the pipe.

2.14 VALVES

A. Description

1. General

This section covers furnishing and installing the valves listed herein. The type and location of other special valves not listed herein will be specified and shown in the Plans and Special Specifications, when required. Valves shall be the same size as the mains in which they are installed. Gate valves will be used for pipe eight inches (8") or less. Butterfly valves will be used for twelve inch (12") and larger pipe rated for 250 psi. No City of Oregon City valves shall be operated without authorization from the Public Works Department.

2. Certification

Furnish certification properly executed by the manufacturer showing compliance with the required specifications and results of test performance.

B. Materials

1. Gate Valves

Gate valves shall be ductile iron body, bronze mounted, non-rising stem valves with O-ring seals and shall be manufactured to open when the stem is rotated counterclockwise. Provide a two-inch (2") square operating nut. Valve ends and sizes shall be as shown. All gate valves shall have resilient seats and conform to the latest revision of AWWA C 509. All gate valves shall be UL listed and FM approved.

Joint materials for mechanical joints shall conform to AWWA C 111. Joint materials for flanged joints will consist of 1/8-inch thick, full face, one piece, cloth inserted, rubber gaskets conforming to Section 7 of AWWA C 207. Bolts and nuts shall conform to section 8 of AWWA C 207.

2. Butterfly Valves

Unless otherwise specified, butterfly valves shall have ductile iron body and conform in all respects to the physical and performance requirements of AWWA C 504, short body type having operators suitable for direct burial. Furnish Class 250 valves unless otherwise indicated. Valves shall have a two inch (2") square operating nut which shall rotate counterclockwise to open unless otherwise specified.

The valve stem for butterfly valves shall be located on the street centerline side of the waterline unless otherwise noted on the plans or directed in the field.

3. Valve Boxes

All valves shall have a valve box for access. The valve box shall be constructed per City of Oregon City Standard Drawing 410, sized as shown in the applicable Standard Drawings, having cast iron top section and cover. Valve box extensions shall be Schedule 40 or 3034 sewer pipe 6" diameter.

Valve lids located in roadways with high-volume traffic or speed limits 35 mph and greater shall have locking lids to prevent lid from being dislodged.

All lids shall contain the Oregon City design logo.

C. Location

Distribution system valves shall be located at the "T" or cross fitting as near as possible. Whenever a conflict exists with curbs or other physical obstructions, the valve shall be located at the intersection of the main with a property line. There shall be a sufficient number of valves located so that not more than four (4) and preferably three (3) valves must be operated to affect any one particular shutdown. Three (3) valves shall be required on a "T" intersection. The spacing of the valves shall be such that the length of any one shutdown in high value areas shall not exceed 500 feet nor 800 feet in other areas. The maximum distance between main line valves shall be 800 feet.

Generally, valves shall be installed at water main intersections in groups of three (3) for tee applications and four (4) for cross applications.

Valves shall be installed in areas adequate to allow for a 3-foot clear zone maintained around all water system valve boxes. Fencing, trees, large bushes, retaining walls, and anything else that may interfere with the operation of a water valve is prohibited within the clear zone.

Valves shall not be located within a curb, gutter, driveway, sidewalk surfaced area, or ADA ramp.

Transmission water mains shall have valves spaced at no more than 2,000 feet and preferably spaced at 1,300 feet. Hazardous crossings, such as creek, railroad, and freeway crossings, shall have valves on each side.

Distribution taps on transmission mains shall not be spaced less than 1,300 feet apart where practical and shall have valves and be plugged.

D. Phased Construction

Water mains installed by phased construction, which will be extended in the future, shall terminate with a valve and blow-off. Also, see Section 2.17 (B) Blow-offs.

All developments will be required to extend mains across existing or proposed streets for future extensions by the City or other developments. All terminations shall be planned and located such that new or existing pavement will not have to be cut in the future when the main is extended.

2.15 BACKFLOW PREVENTION

General

An approved backflow prevention assembly shall be required per the City's Standard Guidelines for the Installation, Testing, and Inspection of Backflow Prevention Devices and in compliance with the Oregon Plumbing Specialty Code. All plans should be routed to the water quality technician for review and comment regarding cross connection control requirements. Conditions as set forth in the City Cross Connection Control Ordinance will prevail in all cases.

The meter user or the owner of the property shall have the assembly tested by a certified tester at least once per year. The water user or the owner of the property is responsible for the operation and maintenance of all approved backflow-prevention assemblies.

2.16 FIRE HYDRANTS

A. Coverage

1. Distribution of hydrants shall be based upon the required fire flow and the area served. The Fire District shall determine the required fire hydrant distribution based on their judgment in applying adopted fire codes. See Section VII, Uniform Fire Code, Appendix III A & B, Fire Flow, Fire Hydrants.

2. Preferred coverage shall result in hydrant spacing of:

    a. 500 feet (when measured along a route accessible to vehicles) in residential areas,

    b. 200 to 500 feet in high-value districts including industrial subdivisions, and

    c. No further than 250 feet away from any dwelling, business, garage, or building.

    d. When new water mains are extended along streets where hydrants are not required for the protection of surrounding structures or other fire concerns, fire hydrants shall be provided at a spacing not exceeding 1,000 feet, for transportation hazards. When streets are provided with median dividers which cannot be crossed by fire fighters pulling hose lines, or where arterial streets are provided with four or more traffic lanes and have a traffic count of more than 30,000 vehicles per day, hydrant spacing shall average 500 feet on each side of the street and be arranged on an alternating basis up to a fire-flow requirement of 1,500 gallons per minute and 400 feet for higher fire-flow requirements.

B. Location

No fire hydrant shall be installed on a water main of less than eight-inch (8") inside diameter unless approved by the City Engineer and the Fire Marshall. The hydrant run shall be a minimum six-inch (6") inside diameter. Long eight-inch (8") dead-end lines to fire hydrants shall be avoided whenever possible to prevent water quality problems (stagnant water). When unavoidable, a fire hydrant shall be installed at the end of the line. Long dead-end lines over **30** feet shall be approved by the City Engineer. Hydrants shall be located as close to the mainline as possible and in no case shall be over 30 feet away.

Hydrant supply lines shall not exceed 30 feet in length. Hydrants shall be located:

a. As near as possible to the corner of street intersections (curb returns),

b. Within at least 200 feet from any cul-de-sac radius point, and

c. At property lines extended into the right-of-way to not interfere with driveways.

When possible, hydrants shall be provided on the street side closest to the water main to avoid long supply lines.

Hydrants shall be placed within the grass parkway area of the right-of-way except when curb tight sidewalk (or integral sidewalk and curb). Hydrants in the grass parkway shall be located 24 inches behind face of curb and hydrants with curb tight sidewalk shall be placed at the back of sidewalk within the right-of-way to allow proper ADA access along sidewalk.

When placed at mid-block locations, fire hydrants are to be installed at a common property line.

Hydrants shall not be installed closer than five feet (5') from an existing utility pole or guy wire nor shall a guy wire or utility pole be placed less than five feet (5') from an existing hydrant.

Hydrants shall not be installed closer than five feet (5') from any proposed or existing trees, shrubs, signs, benches, structures, etc. that would prevent access to the Fire Department.

Hydrants shall not be located adjacent to a parking space that would prevent access to the Fire Department.

Hydrants are to be installed in accordance with AWWA C600, AWWA Manual M17 and the manufacturer's recommendations. Hydrants shall be located as shown on the approved plans or as directed by the fire code official.

See 2.22 Mobile Home Parks and 2.23 Planned Unit Developments for locations under special conditions.

C. Hydrant

Approved hydrant type is Centurion as produced by Mueller Co., with a 5 ¼ inch opening, three (3) port nozzles, two (2) inch hose nozzles, and four (4) inch threaded pumper nozzle or alternatives as approved by the Public Works Department. Allowed alternatives with written approval from the Public Works Department are Clow Valve Company, Medallion Model NO. F-2545. All hydrants in a particular project shall be the same manufacture and model.

All fire hydrants shall be painted per the standard detail.

D. Auxiliary Valve

Each fire hydrant shall have an auxiliary valve and valve box which will permit repair of the hydrant without shutting down the main supplying the hydrant. Such auxiliary valves shall be gate valves conforming to Section 2.14 B.1. of this Design Standard. Refer to City Standard Details for illustration.

E. Bollards

Bollards shall be provided in parking lots and drives when the hydrant is exposed to vehicular traffic. Bollards shall be located no closer than five feet (5') to the hydrant to provide adequate room to operate the hydrant.

F. Private Fire Hydrants

The City Engineer may approve private fire hydrants in consultation with the Fire Marshall and Public Works Water Department. The owner of the private fire hydrant shall furnish the City a signed operations and maintenance agreement acceptable to the City Attorney. The owner shall pay the County recording fees for this document upon signature by the responsible City official. Backflow prevention shall be provided.

2.17 AIR RELEASE VALVES/BLOW OFFS

A. Air Release/Combination Air and Vacuum Release Valve

An air release valve or combination air and vacuum release valve shall be permanently installed at high points on all water mains twelve-inch (12") inside diameter and greater where air can accumulate. The combination air and vacuum release valve shall be used where directed by the City Engineer. In general, the combination air and vacuum release valves are used in hilly terrain rather than gentle, rolling terrain. The air release valve or combination air and vacuum release valves shall be installed in a manhole off the street where flooding of the manhole or chamber will not occur.

Mains less than twelve inch (12") diameter may make use of a service line system for release of air during construction.

The air release shall be installed per the standard detail.

B. Blow-Offs

Mains that can conceivably be extended later shall have a blow-off assembly preceded by a two inch (2") valve. The blow-off shall be located within the street unless approved by the City Engineer. Also see Section 2.14 (D), Valves, Phased Construction.

All low points shall be provided with adequate means for flushing, either by using a fire hydrant or blow-off hydrant.

Straddle Blocks are required at all blow-off locations.

C. Chamber Drainage

Chambers or manholes containing valves, blow-offs, meters, or other such appurtenances to a distribution system shall provide for drainage.

2.18 SERVICE LINES

The term "service lines" is meant to be used only for the water line extending from the distribution main to the meter, hydrant, backflow prevention device, or fire sprinkler system double check valve.

The City of Oregon City Public Works Department is responsible for serving and maintaining water pipes from the water main to the customer's side of the water meter. Maintaining the piping between the water meter and the property being served is the customer's responsibility.

A. Sizes

1. Public Service Lines - the sizes of service lines that may be used are:

   a. 1 inch,
   b. 2 inch,
   c. 4 inch,
   d. 6 inch,
   e. 8 inch,
   f. 10 inch, and
   g. 12 inch.

   Service lines will be reviewed for effects on the distribution system and shall not be greater in size than the distribution main.

A service line may be reused on public property if it is in good condition as determined or approved by the Public Works Department.

2. Building Service Lines

The minimum size water service is based on fixture counts as outlined in the current edition of the Oregon Plumbing Specialty Code as determined by the Building Official.

A service line may be reused on private property if it is in good condition on private property as approved by the Building Official.

B. Location

1. Domestic

The service lines shall be extended from the main to a point where the curb stop, meter, and meter box will be located. In new residential developments, the meter shall be located behind the curb within a distance of two feet (2'). In general, service connections shall terminate in front of the property to be served. The domestic service may come off alongside fire service (i.e., one that crosses the street) upstream (City side) from the backflow prevention device. Each lot shall be served by a one-inch (1") line reduced at the curb stop. ¾" service lines may be re-used if existing line is the City's current standards service material and in good condition as determined by the Public Works Department.

It is preferred to locate the meter within the grass parkway. If no grass parkway exists, then directly behind the back of sidewalk, and the least preferred location is within the sidewalk if there are no other alternatives. If construction and orientation of the structure ultimately requires the meter be placed within the driveway, the meter should be placed in the sidewalk portion of the driveway. At last resort, the meter may be placed in the driveway itself within the right-of-way. At no time may a meter be located in the 'wing' of the driveway. Any meter boxes placed in driveways shall be traffic rated.

2. Private Fire Service

The service line shall normally extend from the main to the property line with a valve located at the property line.

A backflow prevention device shall be placed at the property line unless an agreement signed by the City Engineer permits otherwise. Plans for such service shall include a vicinity map, adjoining street name, width, curb and property line, location of existing water line referenced to property line, and the distance to property pins where the service crosses the property line.

SPECIAL NOTE:

A pump shall not be used on a service line to provide adequate pressure to a subdivision lot or property located above the pressure level of the supply main.

C. Materials

Pipe materials shall be described on the plans and conform to requirements of this section.

1. Service Water Pipe and Fittings

All one-inch service pipelines with a 5/8"x3/4" or ¾" or 1" meter shall be seamless Type 'K' soft copper water tubing conforming to AWWA C 800 Type K and ASTM B88.

The piping for 2-inch service lines shall be 2" rigid copper tubing type L with 1-1/2" or 2" meters.

Each individual residential water service connection shall be equipped with a one-inch lock-wing meter stop at the inlet to the meter. MuellerB-24258N full ball style stop, Ford BA43444WQNL.

All 1½-inch and 2-inch meters shall be equipped with a Mueller H 1423-2-99000 meter/bypass setter or acceptable equivalent and other details as shown in the Standard Drawings.

All fittings, brass, and cast iron type fittings will be used with the aid of Teflon tape or Teflon paste.

If an active cathodic protection system is encountered, Schedule 40 PVC Shall be installed as shown in the Standard Drawings.

All meter boxes will be Hubbell Quartzite or Brooks meter boxes with reinforced concrete cover and cast iron reading lids. All meter boxes will be set to grade and in line. Refer to Section 2.21 for type of meter boxes and standard drawing.

All A.C., cast iron, plastic, and steel pipe shall be saddle tapped. All saddles will be iron pipe thread made of D.I. bodied with two (2) stainless steel straps, nuts, and washers.

Meter installations one and a half-inch (1.5") and larger shall have a fabricated bypass of adequate size and lockout capability. The City's standard drawings shall be used, and the design drawing shall be submitted showing the vault and fitting requirements, with the expected flow requirements and proposed water usage.

Corporation taps can be made on the following ductile iron pipe sizes. All other sizes shall be saddle tapped. (Y-yes, N-no)

D.I.	Class	1"	1 ½"	2"
4"	52	Y	N	N
6"	52	Y	N	N
8"	52	Y	N	N
10"	52	Y	N	N
12"	52	Y	Y	Y
14"	52	Y	Y	Y
16"	52	Y	Y	Y
20"	52	Y	Y	Y

*All cast iron pipes shall be saddle tapped.

2. Valves and Special Valves

Resilient-seated gate valves with square operating nut and a minimum rated working pressure of 200 psi shall be used for 2-inch service. All valves shall be hydro tested to 300 psi or air tested to 100 psi under water by manufacturer.

Galvanized pipe is not an approved material for underground service.

3. Service Taps

Service taps shall be a minimum of 18-inches from water main joints and fittings and minimum 18 inches from another tap. Multiple direct taps shall be staggered if installed closer than 2 feet apart.

All service wet taps must be installed by an approved tapping contractor and under the direction of a Public Works Department representative. Contact the Public Works Department for a list of approved contractors.

Service taps on 4-inch and smaller water main pipe shall be tapped through a tapping saddle. Service taps on 6-inch and larger ductile water main pipe can be directly tapped for 1-inch copper tubing and tapped with a tapping saddle or sleeve for 1½-inch and larger meter water services.

Special sleeved taps shall be used when tapping existing cast iron water main.

D. Existing Service

It is required to maintain continuous water service to existing water users at all times. The Contractor shall schedule construction work accordingly. When it becomes necessary to shut down service to make required inter-ties or repairs, the Contractor shall notify and get shut-off date approval from the Public Works Department so affected customers can be timely notified in advance.

If a fire system is affected, the Contractor is required to contact the approved Fire Code Official for alternate fire protection requirements.

Water main and service shut-offs are to be coordinated through a Public Works Department representative. Customers are required to be notified a minimum of 48-hours prior for residential properties and 72-hours for commercial or industrial properties. Weekends and holidays are not to be counted as part of notification time.

2.19 BEDDING AND BACKFILL

All backfilling under streets, parking lots, driveways, and sidewalks will be ¾-inch - minus crushed aggregate material.

Backfill for all other areas may consist of native materials providing that no rocks larger than three-inch (3") maximum dimension or clods of soil larger than six-inch (6") maximum dimension are included. No sharp objects or any other material is acceptable.

Provide imported base material under all pipe where, in the opinion of the Engineer, material satisfactory for fine upgrading and bedding the pipe is not available at the trench. Imported base material will be used principally where ground water or rock conditions make it impractical to use a lesser quality base.

All trench excavation shall be in conformance with Oregon City Standard Drawing for Pipe Bedding and Backfill and shall be classified as either rock or common excavation.

Disposal of all excavated materials shall be at an approved permitted dumpsite meeting all State and local requirements.

Pipe bedding and trench backfill may be Class A on all water lines outside public streets or outside paved areas. Trench backfill shall be Class B in all public streets or paved areas in the project as outlined in Oregon City Standard Drawing for Pipe Bedding and Backfill. The Class B backfill shall extend a minimum of three feet (3') beyond the edge of street or hard surfaced areas. CDF backfill may be required instead of Class B as applicable per Oregon City Pavement Cut Standard or as shown on plans or as directed in the field.

CDF backfill is required on all existing Arterial and Collector Streets per ODOT Standards, Section 00442 for all trench transverse or perpendicular crossings of vehicle travel lanes as well as City standard detail.

Trench backfill compaction shall be 95% of AASHTO T-180 Modified Proctor from top of pipe zone up to road base. Contract shall determine type of equipment and method to use to achieve required compaction. 95% compaction, AASHTO T-180, is required in public streets and paved areas. 85% compaction, AASHTO T-99, is required in non-paved or unimproved areas (except when future pavement or hard surface is anticipated).

Open trenches shall be strictly limited to a maximum of 100 feet within active street rights of way unless limited to a lesser amount by permit. No trenches will be allowed to remain open overnight. Use of steel plates overnight shall be kept to a minimum and can only be used in the following ways:

A. For Local Streets, cold or hot asphalt mix may be used with pins to firmly secure plates.

B. For Collector and Arterial Streets, plates must be level with the pavement with no ramping of asphalt and must be firmly secured.

Utility trenches 12 feet in depth and under, a minimum of one compaction and density test at approximately one half of the trench depth is required along with one test at or near the surface. For trenches over 12 feet in depth, tests shall be at approximately 4 feet above the pipe, at the surface, and one additional test halfway between the surface and the first test. Compaction density tests shall be performed at a minimum of every 100 feet.

2.20 CONNECTIONS AND TESTING

Connection to the City's existing distribution system shall be made after passing hydrostatic and bacteriological testing and acceptance by the City of Oregon City Public Works Department. Hydrostatic testing shall be monitored by City staff. Bacteriological test shall be taken by City staff who are certified Distribution Operators by Oregon Department of Human Services, Drinking Water Program. Connection of new pipelines to the existing system shall be observed by City staff.

Facilities shall be provided for the proper dewatering and disposal of all water removed from water mains and excavations to avoid damage to adjacent property.

Special care shall be taken to prevent contamination while dewatering, cutting into, and making connections with existing water pipe. Trench water, mud, or other contaminating substances shall not be permitted to enter the water pipes. The interior of all pipe, fittings, and valves installed in water connections shall be thoroughly cleaned and then swabbed, sprayed, or dipped in a 1% hypochlorite solution prior to assembly.

A. Hydrostatic Tests

The test shall conform with AWWA C600, with the exception that the test duration shall be 60 minutes with zero loss in pressure allowed. The test pressure shall be 150 psi at the highest point of elevation in any section or one and a half times the working pressure, as determined by the City. The duration and pressure shall be monitored by City staff.

B. Disinfection

Pipelines shall be flushed and disinfected before placing into service. Disinfection shall conform with the latest version of AWWA C651. Super-chlorinate the new pipeline for a minimum of 24 hours, but no more than 36 hours. After 24 hours, the chlorine concentration must be a minimum of 10 ppm, at which time the pipeline is flushed until residual chlorine level is met (nominal 1 ppm). Pipeline shall remain in static condition with distribution water (nominal 1 ppm chlorine residual) a minimum of 16 hours, then the City's Public Works Department shall take two (2) bacteriological samples 15 minutes apart while leaving the water running at the sample locations. Highly chlorinated water used for disinfection shall not be discharged into the City's municipal separate storm sewer system or surface waters. Compliance with all applicable federal, state, and local regulations concerning discharge of chlorinated water shall be followed. Granulated chlorine is not allowed without approval from the Public Works Department.

No chlorine shall be introduced to a new water main until the hydrostatic pressure test has been passed and accepted by City staff.

C. Wet Tapping

Connection to existing water pipe may be made by means of a wet tap. The cutting in of tees will not be permitted unless approved and signed off by the Public Works Department.

All wet taps shall be installed by a contractor approved by the Public Works Department and installed under the direction of a Public Works Department representative. Contact the Public Works Department for a list of approved tapping contractors.

Wet taps 12 inches and larger require a horizontally installed butterfly valve.

D. Connection to Existing Valves

Water improvements that include connection to the City water system by means of an older existing valve may require the replacement of said valve if the valve's condition is determined by the Public Works Department to be questionable in performing the necessary pressure testing and disinfection.

2.21 METERS

City Water Department personnel will furnish and install all water meters scheduled for services inside the City of Oregon City at the request and expense of the customer.

Meter size shall be equal to the service piping size, unless supporting calculations are supplied and approved. For four-inch (4") and greater service, the City's standard

drawings and the design drawing shall be submitted showing the vault and fitting requirements, with the expected flow requirements and proposed water usage.

All water meters 2 inches and smaller shall be installed by the Public Works Department; and 3 inches and larger water meters shall be furnished (at the Contractor's cost) to the Contractor by the Public Works Department and shall be the responsibility of the Contractor to install the larger water meters.

A. Meter Boxes

All meter boxes for residential service (5/8"x3/4" and 1") shall be Hubbell Quazite B03111812M with Hubbell Quazite Lid PG1118WAKM50. No other meter boxes are allowed as an approved equal unless this product is no longer manufactured and the City of Oregon City Water Division approves a different product.

Note: Brooks Style NO. 37 may be allowed if approved by the Public Works Department in cases where Hubbell is not available.

Unless otherwise approved, all meter boxes must be as shown:

1. 2-inch Brooks	Style No. 66
2. 4-inch and above	Pre-cast Vault from utility vault company as specified per City Standard drawings

B. Location

When a curb and sidewalk are provided by a development or in the existing condition, the meter shall be located in the planter strip between the curb and the sidewalk.

When the planter strip does not exist, the location shall be determined in the field by Public Works personnel.

The meter shall not be located in the same vault with a backflow prevention device.

Meters shall be located at the termination of the City service line in the public right-of-way.

1. 5/8"x3/4" through two-inch meters

   Installed in the right-of-way, as described in Section 2.18 B.1.

2. Three-inch and larger meters

   Near the curb and in the public right-of-way to allow for easy meter reading and maintenance without entering private property. If due to constraints the meter is located on private property, then City approval and a water line easement are required. The meter and vault shall also be accessible with a crane truck to be

within ten feet (10') of the installation. There shall be no obstructions within a ten-foot (10') vertical clearance from the top of the meter.

The meter, vault, and piping are to be protected from freezing, vandals, and vehicles. The area around the vault shall be sloped in such a manner to prevent storm water from ponding over the vault.

A minimum three-foot (3') clear space or more shall be provided around the vault to provide ample working space for maintenance.

C. Hydrant Meters

Water may be available for the contractor's use from approved fire hydrants upon deposit of a cash bond from the Public Works Department. Site-specific fire hydrants for Bulk Water usage may be allowed on a case-by-case basis, at the sole discretion of the Public Works Department. The contractor or developer shall request and obtain the hydrant meter and backflow assembly to use water from a specific fire hydrant at the Public Works Operations Center. All bulk water usage shall be metered and include an approved backflow assembly when required. All water usage shall be paid by the contractor or developer prior to returning the hydrant meter and receiving the cash bond back.

2.22 MOBILE HOME PARKS

General design considerations shall conform to requirements set forth by the State Department of Human Resources, Health Division, by the Oregon State Plumbing Specialty Code (Chapter 10 and Appendixes A and E), and these design standards.

Previously-introduced requirements for public water distribution mains or service lines shall apply in the design for mobile home parks subject to approval by the State Health Division.

A. Fire Protection

Previously introduced requirements for fire hydrants shall apply for fire protection within mobile home parks subject to the following special requirements:

1. Each mobile home must be within a 200-foot radius of a fire hydrant.

2. Maximum area coverage per fire hydrant shall not exceed 160,000 square feet.

3. Minimum fire flow from each hydrant shall be 1,000 gallons per minute at 20-psi residual pressure (see Section 2.00) and maximum velocity of ten feet (10') per second in the main or as required by Oregon Fire Code and Fire District whichever is the higher flow requirement.

4. The minimum main size supplying fire hydrants shall be eight inches (8") per City standard.

5. In mobile home developments requiring more than one fire hydrant, there shall be two (2) or more connections to the main distribution system for the mains supplying the fire hydrants.

2.23 PLANNED UNIT DEVELOPMENT (PUD)

General design consideration shall conform to requirements set forth in the Oregon Plumbing Specialty Code and these design standards.

Previously-introduced requirements in the City's Design Standard for capacity, materials, grids, valves, fire protection, service lines, and meters shall also be applicable to design within PUD areas.

2.24 ABANDONING FACILITIES

The Contactor shall fill abandoned pipes 6-inches and larger with a controlled density fill (CDF), seal the open ends of all pipes, fittings, etc. that are to be abandoned with an end cap, coupling, or a concrete plug with a thickness equal to the diameter of the pipe. The Public Works Department requires that all abandoned piping be severed as close to active piping as practical.

All service lines are required to be severed at the main and for the corporation stops to be capped if not required to be removed. A 4" diameter by 4" long piece of PVC pipe is to be installed over all capped corporation stops that remain as part of abandonment. All other parts of the service lines and other appurtenances are to be cut off and removed at 24 inches minimum below finish grade.

Structures (vaults, meter boxes, etc.) shall be removed completely to eliminate conflict with any future utility improvements. Abandonment of structures shall be completed only after piped systems have been properly abandoned.

Abandoned valve boxes in pavement areas shall be cut off 24 inches below grade, removed, gravel filled, and plugged with compacted asphalt. Valve boxes outside of pavement areas shall be cut off 24 inches below grade, removed, and filled with native backfill.

The Public Works Department has first claim to any removed or abandoned water materials (valves, hydrants, fittings, etc.). The contractor shall dispose of all unwanted materials in an approved manner.

2.25 AS-BUILT DRAWINGS/DIGITAL MAPPING REQUIREMENTS

A. As-built Drawings

For the purposes of this section, as-built drawings will also mean drawings of record, record drawings, or terms indicative of an attempt to record the as-constructed state of the improvement.

Following completion of construction, the Consulting Engineer shall submit as-built drawings in the form requested by the City Engineer. As-built drawings shall be the same size and format as the construction plans. As-built drawings shall describe all revisions to the previously-approved construction plans. The Consulting Engineer shall also certify that the public improvements have been completed in accordance with the City of Oregon City Public Works Standards and Specifications to the best of his/her knowledge. (This is completed with a Certificate of Completion.) The words "As-Built Drawing" or "Record Drawing" shall appear as the last entry in the revision block along with the month, day, and year the as-built drawing was prepared. Submission of as-built drawings shall be made within 90 days of acceptance by the City. The cost to produce these as-built drawings shall be included in the Consulting Engineer's cost estimate for establishing the surety amount for the performance surety. Failure to submit these as-built drawings shall be grounds for withholding final release of the surety amount.

The Consulting Engineer shall provide design calculations and complete test results to the City Engineer.

All as-builts shall follow the most recent version of the City of Oregon City's "As-Built Drawing and Post Construction Survey Requirements."

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

1. Generally, the location of cleanouts, vaults, fire hydrants, blowoff assemblies, water meters, and water valves shall be shown.

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

3. 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.

4. 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 value.

5. Identify types of fittings (i.e., MJ x MJ, FLG x MJ, etc.). Provide an inventory list on construction drawings for appurtenances including fire hydrants, thrust blocks,

valves, blow-offs, service installations, tees, bends, tapping sleeves, air releases, and so forth.

6. Any other change altering the approved plans.

7. Actual location and depth from finish grade of street of any other utilities encountered during construction.

Provide photographs of all installed valves and fittings in place before backfill. Photographs should be provided with daily inspection reports during the course of construction.

WATER DISTRIBUTION SYSTEM
DESIGN STANDARDS

SECTION III

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WATER DISTRIBUTION SYSTEM
DESIGN STANDARDS

SECTION IV

STANDARD CONSTRUCTION NOTES

CITY OF OREGON CITY - STANDARD NOTES

General Notes:

1. All work and materials shall conform to most recent edition of the ODOT/APWA Oregon Standard Specifications for public works construction as adopted and modified by the City of Oregon City.
2. Contractor shall obtain all required permits and licenses before starting construction. A City business license is required.
3. It shall be the responsibility of the contractor to verify all utility locations prior to construction and arrange for the relocation of any utilities in conflict with the proposed construction. The locations, depth and description of existing utilities shown were compiled from available records and/or field surveys. The engineer or utility companies do not guarantee the accuracy or the completeness of such records. Additional utilities may exist within the work area.
4. Oregon law requires that the rules adopted by Oregon Utility Notification Center be followed. Those rules are set forth in OAR 952-001-0090. You may obtain copies of the rules by calling the center or accessing via internet at www.callbeforeyoudig.org or call before you dig (800) 332-2344.
5. The contractor shall make provisions to keep all existing utilities in service and protect them during construction. Contractor shall immediately repair or replace any damaged utilities using materials and methods approved by the utility owner. No service interruptions shall be permitted without prior written agreement with the utility provider.
6. All water line crossings shall be in conformance with OAR Chapter 333. The City may require more stringent standards.
7. Contractor shall notify Project Engineer and City of Oregon City Public Works Construction Inspector Staff 48 hours in advance of starting construction and 24 hours before resuming work after shutdowns, except for normal resumption of work following Saturdays, Sundays, or holidays.
8. Contractor shall remove and depose of trees, stumps, brush, roots, topsoil, and other material in the roadway and where indicated on the plans. Material shall be disposed of in such a manner as to meet all applicable regulations. Contractor shall ensure recipients of fill materials removed offsite are permitted to receive said materials regardless of the receiving jurisdiction. City requires a grading permit per Oregon City Municipal Code Chapter 15.48 for a single site to receive over 10 cubic yards of material unless the grading work is already covered in another construction permit. Contractor is responsible for meeting other jurisdictions' grading/fill requirements when appropriate.

9. Construction vehicles including trailers shall park on the construction site or at a location(s) indicated on the approved plan. This includes all subcontractors' vehicles and trailers. Hours of construction shall be 7 AM to 6 PM, Monday through Friday; 9 AM to 6 PM Saturday. Construction is prohibited on Sunday. Construction activities include all field maintenance of equipment, refueling, and pick-up and delivery of equipment as well as the actual construction activity.

10. The contractor shall submit a 15% Maintenance Bond/Guarantee as required by the City of Oregon City. The amount of the guarantee is 15% of the public improvements cost.

11. The contractor shall keep an approved set of plans on the project site at all times.

12. Upon completion of construction, the contractor shall submit "redline drawings" to Project Engineer for preparation of record drawings. "Redline drawings" document all deviations and revisions to the approved plans; they also record a description of construction materials actually used (pipe material, etc.). From the information contained on these redline drawings, as well as any notes recorded by the Project Engineer, the Project Engineer shall prepare and submit record drawings to Public Works Engineering Development Services (paper copy first for city approval and then high-resolution electronic pdf file as directed by city staff). Record drawings are required for any public improvements, as well as for any (public or private) stormwater management quantity or quality control facility. City acceptance of any public improvements are tied to the submittal of these record drawings. CAD-generated plans shall also have electronic record drawings submitted to the City in compliance with the digital mapping requirements. Comply with latest City standard for As-Built Record Drawings and Survey.

13. Contractor shall erect and maintain temporary traffic control per the "Manual on Uniform Traffic Control Devices" (MUTCD), Part 6, and deviations to the MUTCD as adopted and modified by ODOT. Should work be in an existing public right of way that is open to traffic, the contractor shall submit a traffic control plan to appropriate City, County, and State personnel for approval. Approvals shall be obtained prior to start of work.

14. The contractor shall perform all work necessary to complete this project in accordance with the plans and specifications including such incidentals as may be necessary to meet the intent of the project contract documents, applicable agency requirements and other work as necessary to provide a complete project.

15. There shall be no alteration or variance from the approved plans. The minimum submittal requirements for plan revisions are as follows:

    - Plan revisions shall be submitted on an 8½" X 11" sheet (minimum) with a 2" by 2" block space for city approval; and
    - Plan revision shall be wet stamped and signed by Project Engineer, and
    - Any required engineering calculations, or other agency approvals, shall be included with the submitted revision.

- Upon approval of the submitted revisions, the City Engineer shall affix an approval stamp to the revised plan sketch and the plan shall be returned to the Project Engineer. It is the responsibility of the Project Engineer to distribute the approved plan revision to all parties to whom the original approved plans were issued. All approved revisions shall be affixed to the construction field prints (also known as the Contractor's "redline drawings").

16. Contractor shall provide effective erosion protection to include, but not limited to, grading, ditching, hay bales, silt fencing, and sediment barriers to minimize erosion and impact to adjacent property. See separate erosion and sediment control notes and approved plans.

17. Open trenches shall be strictly limited to a maximum of 100 linear feet within active street rights-of-way unless limited to a lesser amount by permit. No trenches will be allowed to remain open overnight. Use of steel plates overnight shall be kept to a minimum and if used shall be firmly secured with pins and cold or hot A/C mix.

18. Contractor shall maintain and coordinate access to all affected properties.

19. Any pavement distortion caused by the construction operations shall be temporarily repaired same day of occurrence (or in a time period agreed to with the City Inspector), using cold or hot A/C mix. Owner/contractor shall be required to maintain repaired areas until City final acceptance is granted.

20. If ground water springs are encountered during construction, the contractor shall immediately contact the Project Engineer. The Project Engineer shall direct the contractor to take measures to ensure that water is not conveyed through utility trenches and the natural flow path of the spring is altered as little as practicable. The Project Engineer shall submit a report summarizing the finding to the City. Impacts and mitigation shall be addressed for City approval.

21. It is the contractor's responsibility to visit the site and verify all existing conditions before the start of work. The contractor shall take all necessary field measurements and otherwise verify all dimensions and existing construction conditions indicated and/or shown on the plans. Should any error or inconsistency exist, the contractor shall not proceed with the work affected until reported to the Project Engineer for clarification or correction.

22. Any inspection by the City, County, State, Federal Agency or Project Engineer shall not, in any way, relieve the contractor from any obligation to perform the work in compliance with the applicable codes, regulations, city standards and project contract documents.

23. Project Plans shall always have an engineer-of-record performing the function of Project Engineer. If the project engineer is changed during the course of the work, the City shall be notified in writing and the work shall be stopped until the replacement engineer has agreed to accept the responsibilities of the Project Engineer. The new Project Engineer shall provide written notice of accepting project responsibility to the City within 72 hours of accepting the position as Project Engineer.

24. For utility trenches 12-feet in depth and under; complete a minimum of one compaction density test at approximately one half of the trench depth and an additional test at or near the surface. For trenches over 12-feet in depth; complete one compaction density test at approximately 4-feet above the pipe, one test at or near the surface and one additional test approximately half way in between. Compaction density tests shall be performed at a minimum every 100 feet.

Engineered Grading Notes:

1. Project grading limits shall be within the project's property boundary and/or street right-of-way, unless otherwise shown on plans. No grading shall be conducted in wetlands or other environmentally sensitive areas unless specifically shown on the approved plans.
2. The identification or removal of unsuitable material shall be done with consultation with the Project Engineer or Project's Geotechnical Engineer.
3. Remove and dispose of all organic and/or unsuitable materials, including trees, stumps, roots, brush, and grass in such a manner to meet all applicable regulations. On-site disposal shall be as determined by the Project Engineer or Project's Geotechnical Engineer.
4. Stockpile excess soil material on-site as directed by the Project Engineer, project's Geotechnical Engineer, or approved plans (unless approved plans identify excess excavation is to be removed from the site).
5. The Contractor shall protect all trees not specifically shown to be removed on approved plans.
6. Grade the site to the elevations shown on the drawing with the necessary adjustments to accommodate the finish grades as specified. Shape future paved areas per the plans to a subgrade elevation that will accommodate future base rock and paving.
7. Straight grades shall be run between finish grade and/or finish contour lines shown, unless otherwise noted. Finish grades are to drain as indicated on the plans. Rough grading shall be finished by blading and raking to reasonable smooth contours with gentle transitions.
8. All cut or fill slopes shall be constructed at no steeper than four (4) horizontal to one (1) vertical unless otherwise shown on approved plans.
9. Areas to receive fill materials shall be prepared by removing all organic and unsuitable materials and "proof rolled". Benching may be required. Material in soft spots within a proposed building envelope, paved area, or sidewalk area shall be removed to the depth required (as directed by the Project Engineer or the Project's Geotechnical Engineer) and shall be replaced with suitable backfill.
10. The construction of structural fills and/or excavations connected with any public improvements shall be in accordance with the written recommendations made by the Project's Geotechnical Engineer in an approved report.
11. Compaction Tests and Reports for each lot shall be conducted by an approved testing laboratory, test frequency shall be per the Project Engineer, or Project's Geotechnical Engineer. Testing to commence with fill activities and as a minimum, one test will be taken for every 500 cubic yards placed.

12. If dusty conditions exist, the permittee shall apply a fine spray of water on the surface to control the dust.

13. Engineered fill in the Building Envelope shall be certified by the Project Engineer. This certification shall be sent to the City Building Official upon submission of the building permit if it has not already been received by the City Building Official.

Storm Drain Notes:

1. Pipe Rules:

   a. Ten-inch diameter pipe or smaller shall be PVC storm drainpipe conforming to either ASTM D-3034, or seamless PVC pipe conforming to ASTM F794 unless otherwise noted on the approved plans. Concrete pipe conforming to ASTM C-14, Class 3 is also acceptable. Watertight gaskets are required on all pipe sizes.

   b. Twelve-inch through 48-inch diameter pipe (for storm drain pipe – but not for culverts) may be one of the following, unless otherwise noted on the approved plans:

      - Class V reinforced concrete pipe conforming to ASTM C-76. Water tight joints required. When used in public right-of-way there must be one-foot minimum cover from roadway subgrade.
      - Ductile Iron; Class 50 wall thickness for pipe sizes up to 12 inches; Class 51 wall thickness for 14 inch and larger; water tight gaskets required. When used in public right-of-way there must be two-foot minimum cover from roadway subgrade unless Class 52 is used allowing a one-foot minimum cover.
      - Corrugated high-density polyethylene pipe (HDPE) – smooth interior (ADS N- 12 or equivalent, maximum 30-inch diameter conforming to AASHTO M-294) (with watertight gaskets). When used in public right-of-way there must be two- foot minimum cover from roadway subgrade. Concrete headwalls/treatments are required for any exposed ends.
      - Polyvinyl chloride (PVC), seamless, sewer pipe: (SDR 35, meeting requirements of ASTM D3034 for pipes up to 15-inch), (ASTM F-679 for pipes 18 to 27 inches), (ASTM F- 794 for pipes up to 30 inches), (AWWA C-900 DR 18 for up to 12-inch), (AWWA C-905 DR 25 for pipes 14 to 30-inches). When used in public right-of-way, the minimum cover shall be two-foot minimum cover from roadway subgrade, except for C-900 and C-905, which requires one- foot minimum cover from roadway subgrade. Water tight gaskets required. Concrete headwalls/treatments are required for any exposed ends.

   c. Perforated pipe shall be HDPE pipe conforming to AASHTO M-294 or PVC pipe conforming to either ASTM D3034 or ASTM 2729, unless otherwise noted on the approved plans or standard drawings.

   d. Culvert pipe shall be Class V reinforced concrete pipe conforming to ASTM C-76, unless otherwise noted on the approved plans. When used in public right-of-way there must be one-foot minimum cover from roadway surface.

2. All trench excavation shall be in conformance with Oregon City Standard Drawing for Pipe Bedding and Backfill, and shall be classified as either rock or common excavation. All excess material from the trench excavation shall be disposed of to an approved site.

3. Pipe bedding and trench backfill may be Class A on all sewer lines outside public streets or outside of paved areas. Trench backfill shall be Class B in all public streets or paved areas in the project as outlined in Oregon City Standard Drawing for Pipe Bedding and Backfill. The Class B backfill shall extend a minimum of three feet (3') beyond the edge of street or hard surfaced areas. CDF Backfill may be required instead of Class B as applicable per Oregon City Pavement Cut Standard.

4. Trench backfill compaction shall be 95% of AASHTO T-180 Modified Proctor from top of pipe zone up to road base. Contractor to determine type of equipment and method to use to achieve the required compaction. 95% compaction, AASHTO T-180, is required in public streets and paved areas, 85% compaction of AASHTO T-99 in non- paved or unimproved areas.

5. Manhole walls shall be precast reinforced concrete manholes of the size required per manufacturer's recommendations for the pipe sizes and number of openings.

6. Box culvert shall be precast reinforced box culvert sections meeting the requirements of ASTM C-850, unless otherwise noted on the approved plans.

7. If drainage field tile is encountered during construction, the contractor shall notify the Project Engineer and the City's Inspector. The intent will be to connect any functioning drain tile system to the storm drain system in an appropriate manner. Such connection must be noted on the as-built drawings and must be approved by the Project Engineer as well as the City's Inspector.

8. All house service stubouts shall be a minimum of three feet (3') beyond easement or right- of-way line and shall be marked with a pressure treated 2" x 4" (painted white with the label of "STM") for future location. Service stubouts shall be a minimum of 6-inch diameter pipe at minimum slope of 1%. Curb shall be stamped above storm service with the label "ST". Tracer wire shall be installed with service stubouts.

9. All manholes located in unimproved easements and right of ways shall be provided with tamper proof lids, be installed two feet (2') above existing grade and marked with a marker post per Oregon City Standards unless otherwise noted.

10. All materials inspections and tests are to be in accordance with City of Oregon City and/or ODOT/APWA standard specifications. All sections failing to pass the required tests and inspections shall be located and repaired. After repair, these sections shall be retested and inspected until found acceptable by the City.

11. All storm piping shall be video inspected by the contractor per latest edition of ODOT/APWA Standard Specifications for Construction, and submitted to the City Inspector with a written report. Before acceptance by the City, stormwater pipe shall be shown clear of any debris, rocks, gravel, sand, silt and other foreign material as well as having the final course of AC pavement in place within the pipe's tributary drainage area.

Water System Notes:

1. All work and materials shall comply with the applicable sections of City of Oregon City Public Works Standards, Oregon State Health Division Administrative Rules, Chapter 333, recent edition of AWWA Standard Specifications and ODOT/APWA Standard Specifications for Construction.

2. Waterline shall be ductile iron pipe, factory cement-mortar lined and seal- coated, conform with latest revision of ANSI/AWWA C151/A21.5, ANSI/AWWA C104/A21.4, ANSI/AWWA C111/A21.11, and ASTM A536, and be Standard Thickness Class 52 unless specified otherwise. Full pipe sections shall be 18 feet in length. Restrained joints shall be used unless an alternative is approved by the City Engineer. Non-restrained joints shall be rubber gasket, push-on type joint, when approved unless specified otherwise.

3. All pipe shall have a minimum cover of 36 inches below the future finished grades in easements and street rights-of-way unless specified otherwise or other measures are approved by the City Engineer.

4. Gate valves shall be ductile iron body, conform to latest revision of AWWA C509, and shall be UL listed and FM approved. Butterfly valves shall ductile iron body and conform to AWWA C-504.

5. Copper tubing shall be Type "K" soft for 1" service lines with a 5/8x3/4" or 3/4" or 1" water meter. Copper shall be rigid for 2" service lines with either a 1-1/2" or 2" water meter.

6. All water meters to be installed by the City of Oregon City Water Department.

7. Fire hydrant assemblies shall be installed per City Standard Drawings. Fire hydrants shall be Centurion fire hydrant as produced by Mueller Co., with a five and 1/4-inch valve opening, three port nozzles, two 2-inch hose nozzles, and 4-inch threaded pumper nozzle. Alternative fire hydrant manufacturer's and models are: Clow Valve Company, Medallion Model No. F-2545. All fire hydrants installed for a particular project shall be the same manufacturer and model.

8. All fittings shall be ductile iron conforming to ASTM A536, ANSI/AWWA C110/A21.10, ANSI/AWWA C104/A21.4, and ANSI/AWWA C153/A21.53. Fittings shall have cast upon them the manufacturer's identification, pressure rating, nominal diameters of openings, and the number of degrees or fractions of a circle for all bends. Fittings shall be coated inside with cement mortar with an asphaltic seal-coat. When specified, fittings shall be ductile iron mechanical joint (MJ) or flange joint (FLG) conforming to AWWA C153 and C110.

9. All tees, bends, valves and blow-off locations shall, unless otherwise noted, have poured in place concrete thrust blocks conforming to the City Standard Drawings. All fittings shall be restrained with a Mega-Lug follower, or approved equal.

10. All trench excavation shall be in conformance with Oregon City Standard Drawing for Pipe Bedding and Backfill, and shall be classified as either rock or common excavation. All excess material from the trench excavation shall be disposed of to an approved site.

11. Pipe bedding and trench backfill may be Class A on all water lines outside public streets or outside of paved areas. Trench backfill shall be Class B in all public streets or paved areas in the project as outlined in Oregon City Standard Drawing for Pipe Bedding and Backfill. The Class B backfill shall extend a minimum of three feet (3') beyond the edge of street or hard surfaced areas. CDF Backfill may be required instead of Class B as applicable per Oregon City Pavement Cut Standard.

12. Trench backfill compaction shall be 95% of AASHTO T-180 Modified Proctor from top of pipe zone up to road base. Contractor to determine type of equipment and method to use to achieve the required compaction. 95% compaction, AASHTO T-180, is required in public streets and paved areas, 85% compaction of AASHTO T-99 in non-paved or unimproved area.

13. All sanitary sewer lines within ten (10) feet laterally or eighteen (18) inches vertically of a water main shall be encased in concrete or constructed of Ductile Iron Water Pipe with watertight joints.

14. Sanitary sewers crossing a water main shall be made at approximately 90 degrees and have eighteen (18) inches of vertical clearance. Otherwise, the sanitary sewer shall be constructed of ductile iron water pipe with watertight joints for a distance of nine (9) feet from both sides of the water line.

15. The maximum allowable joint deflection shall not exceed twelve (12) inches per eighteen (18) feet of laying length.

16. The valve stem for butterfly valve shall be located on the street centerline side of the waterline unless otherwise noted on the plans or directed in the field. All pipe twelve (12) inches or larger shall have butterfly valves.

17. All new water pipelines under construction shall be physically disconnected from the City's existing distribution system. Connection to the existing distribution system shall be made after passing hydrostatic and bacteriological testing and acceptance by City of Oregon City Public Works Department, Water Division. Hydrostatic testing shall be monitored by City staff. Bacteriological tests shall be taken by City staff certified as Distribution Operators by Oregon Department of Human Services, Drinking Water Program. Connection of new pipelines to the existing system shall be observed by City staff.

18. Hydrostatic Tests: The test shall conform with AWWA C600, with the exception that the test duration shall be 60 minutes with zero loss in pressure allowed. The test pressure shall be 150 psi at the highest point of elevation in any section or one and a half times the working pressure, as determined by the Engineer. The duration and pressure shall be monitored by City staff.

19. Disinfection: Pipelines shall be flushed and disinfected before placing into service. Disinfection shall conform with AWWA C651. Super-chlorinate the new pipeline for a minimum of 24 hours, no more than 36 hours. After 24 hours the chlorine concentration must be a minimum of 10 ppm, at which time the pipeline is flushed until residual chlorine level is met (nominal 1 ppm). Pipeline shall remain in static condition with distribution water (nominal 1 ppm chlorine residual) a minimum of 16 hours, then take two (2) bacteriological samples 15 minutes apart while leaving the water running at the sample locations. Highly chlorinated water used for disinfection shall not be discharged into the City's municipal separate storm sewer system or surface waters. Compliance with all applicable federal, state and local regulations concerning discharge of chlorinated water shall be followed.

Sanitary Sewer Notes:

1. All trench excavation shall be in conformance with Oregon City Standard Drawing for Pipe Bedding and Backfill, and shall be classified as either rock or common excavation. All excess material from the trench excavation shall be disposed of to an approved site.
2. Pipe bedding and trench backfill may be Class A on all sewer lines outside public streets or outside of paved areas. Trench backfill shall be Class B in all public streets or paved areas in the project as outlined in Oregon City Standard Drawing for Pipe Bedding and Backfill. The Class B backfill shall extend a minimum of three feet (3') beyond the edge of street or hard surfaced areas. CDF Backfill may be required instead of Class B as applicable per Oregon City Pavement Cut Standard.
3. Trench backfill compaction shall be 95% of AASHTO T-180 Modified Proctor from top of pipe zone up to road base. Contractor to determine type of equipment and method to use to achieve the required compaction. 95% compaction, AASHTO T-180, is required in public streets and paved areas, 85% compaction of AASHTO T-99 in non-paved or unimproved areas.
4. Subsequent settlement of the finished surface within the warranty period shall be considered to be a result of improper compaction and shall be promptly repaired by the contractor at no expense to the City of Oregon City.
5. All sewer lines shall be tested and video inspected by the contractor per latest edition of APWA/ODOT Oregon Standard Specifications for Construction with the exception that, all lines shall be video inspected downstream, with the flow.
6. All manholes shall be vacuum tested per APWA/ODOT Oregon Standard Specifications for Construction.
7. Pavement resurfacing, where required shall conform to Oregon City Pavement Cut Standards or the Contract Documents, whichever is greater.
8. Project Engineer of Record reserves the right to adjust grades or alignment to accommodate other utilities as required; such adjustments shall be reviewed by the City of Oregon City engineering staff, and approved by the City prior to commencing work.
9. All PVC sewer pipe shall conform to ASTM D3034, SDR35 specifications and shall be clearly marked as such unless, a minimum cover of 2' of cover from top of subgrade cannot be met, in which case the pipe material shall be changed to PVC C-900 SDR 25.
10. All manholes located in unimproved easements and right of ways shall be provided with tamper proof lids, be installed two feet (2') above existing grade and marked with a marker post per Oregon City Standards unless otherwise noted.
11. Sanitary sewer lines crossing less than 12 inches above or below another public utility shall be constructed with PVC C-900/C-905 or approved equal, with a complete stick of pipe, centered at the crossing.

12. Manhole Workmanship: All manholes shall be constructed in accordance with APWA/ODOT Oregon Standard Specifications for Construction and all applicable Oregon City Standard Drawings.

13. All sanitary sewer service laterals shall have a 2-Way Cleanout at the right-of-way line per Oregon City Standard Drawings.

14. Sanitary sewers crossing a water main shall be made at approximately 90 degrees to the waterline alignment, have eighteen (18) inches minimum vertical clearance crossing under waterline, and one full pipe length centered at waterline crossing.

Street System Notes:

1. Engineered fill shall be placed on areas stripped of all organic materials in lifts not to exceed 8-inches in depth and each layer shall be separately and thoroughly compacted. Fill materials shall be placed within 2% of the optimum moisture and no less than 95% compaction per AASHTO T 180. Contractor shall submit test results to the Engineer of Record and City Public Works Inspector.

2. Material in soft spots within the roadway shall be removed to the depth required to provide a firm foundation and shall be replaced with 1-1/2"-0" crushed rock. The entire subgrade shall be thoroughly compacted at the lowest moisture content at which a handful of soil can be molded by a firm closing of the hand. Minimum of 95% compaction AASHTO T 180 required.

3. The sub grade shall be compacted per ODOT/APWA Part 3, Section 00331. Contractor shall submit test results to the Engineer of Record and City Public Works Inspector. The required density of treated and untreated subgrade materials shall not be less than 95% of maximum density as determined by AASHTO T 180.

4. Contractor shall notify the engineer and City when subgrade is complete, 24 hours prior to placement of rock base material, and 24 hours prior to final paving for an inspection of the work. Failure to do so will make any subgrade failure or drainage problems the responsibility of the contractor.

5. The aggregate road base shall be compacted per ODOT/APWA Part 6, Section 00640 and 00641. With materials maintained within 2% of the optimum moisture content. Contractor shall begin compaction of each layer immediately after the material is spread and continue until a density of not less than 95% of the maximum density has been achieved using AASHTO T 180. Contractor shall submit test results to the Engineer of Record and City Public Works Inspector. Testing frequency shall be one test per every 100 linear feet minimum and more frequently at the discretion of the City Public Works Inspector if tests are not meeting a minimum of 95% Compaction per AASHTO T-180.

6. Asphalt concrete pavement mix shall be designed from a mix formula approved by ODOT for material used or as noted on these plans. Contractor to provide Engineer of Record and City with Certificate of Compliance from asphalt pavement plant unless otherwise indicated.

7. The asphalt concrete pavement mix shall be compacted per ODOT/APWA Part 7, Section 00744 with testing by nuclear gauge to at least 92% of theoretical maximum density (Rice Density) per AASHTO T 209 on all lifts. Contractor shall submit test results to the Engineer and City. Testing frequency shall be one test per every 100 linear feet minimum and more frequently at the discretion of the City Public Works Inspector if tests are not meeting a minimum of 92% Compaction per AASHTO T-209.

8. Excess excavation may be spread and compacted evenly on the site in depths of less than one foot per the site grading plan. Vegetation and topsoil to be stripped on fill areas prior to filling. Compaction of 95% of AASHTO T 180 is required in buildable areas. Contractor shall achieve 85% compaction in non-buildable areas. Proper City or County Fill Permit shall be obtained if excess excavation is hauled off site.

9. Monument box locations shall be placed at the beginning, end, centerline intersection, point of curvature and point of tangency for all streets, and in accordance with Clackamas County Surveyor Standards. Contact project surveyor for required locations. The contractor shall install the monument boxes in street areas where marked by the surveyor and in accordance with Clackamas County monument standards and City street standards.

10. All materials, inspections, and tests shall be in accordance with City of Oregon City Standard Specifications and the most recent edition of the Oregon ODOT/APWA Standard Specifications for Construction.

11. Monolithic curb and gutter is required unless otherwise noted.

12. Proof roll with a loaded water truck or 10-11 cubic yards loaded gravel truck is required prior to curb placement and prior to paving.

13. Contractor shall install ADA ramps and sidewalks as shown in accordance with City standard drawings.

14. ADA ramps and sidewalks shall be a minimum of 4-inch thick concrete with 4-inches of compacted ¾"—0"- crushed rock base course.

15. Driveway approaches shall be a minimum of 6-inch thick concrete with 6-inch by 6- inch - 10 gauge steel mesh on top of blocks over 4-inches of compacted ¾"—0"- crushed rock base course.

16. All concrete shall be air entrained, minimum 4.5%, with a minimum compressive breaking strength of 4,000 psi after 28 days.

17. Prior to installation of curb and gutter, ADA ramps or sidewalk, the project Engineer of Record and City Public Works Inspector shall be contacted to inspect string line, formwork, base compaction, and related items.

18. Existing private utilities shall be relocated if necessary. Contractor shall coordinate this work.

19. All utility crossings shall be placed prior to proof roll test for curb installation. The number of crossings, exact location, depth, conduit type, etc. shall be specified by the private utility carriers. Contractor shall coordinate.

20. Contractor shall contact City Public Works Inspector to schedule pre-paving conference prior to commencing paving operations.

21. Furnish a twelve-foot (12-foot) straightedge. Test with a twelve-foot (12-foot) straightedge parallel to and perpendicular to the centerline, as directed. The pavement surface shall not vary by more than one-quarter-inch (1/4 inch). Mark areas not meeting the surface tolerance. These tolerances shall apply when water valve boxes, manhole castings and other utility appurtenances can be adjusted before or during the paving operations.

WATER DISTRIBUTION SYSTEM
DESIGN STANDARDS

SECTION V

MINIMUM GUIDELINES FOR INSPECTION

CITY OF OREGON CITY

Minimum Guidelines For Inspection/Observation of Public Works Construction

PURPOSE:

These guidelines serve to document what is expected of the various participants involved in the process of constructing City of Oregon City public infrastructure. Proper inspection and observation of these construction projects is essential to:

- Ensure city material and construction standards are met,
- Document daily work progress and weather conditions,
- Establish a methodology for processing changes to approved plans, and
- Culminate in as-built Record Drawings being prepared and submitted to the City.

DEFINITIONS:

A. Registered Engineer – A registered engineer currently licensed by the State of Oregon to perform engineering work in Oregon.

B. Applicant – Entity responsible for obtaining the construction permit.

C. Inspecting/Observing Engineer – The State of Oregon-registered professional engineer or a qualified individual(s) under their supervision.

D. Contractor – Company responsible for performing the construction work for the public improvements approved in the city construction permit.

E. Engineer of Record – The registered Professional Engineer whose professional engineer's stamp is on the construction drawings.

F. City Inspector – City employee or contracted personnel responsible for spot-checking the construction of the public improvements approved in the construction permit.

GENERAL:

A. All public construction under a permit issued by the City of Oregon City shall be inspected/observed by Engineer of Record, who is a State of Oregon-registered engineer, or a qualified individual under the supervision of a State of Oregon-registered engineer. The City will not issue a construction permit to begin work on public improvements without designation of an Inspecting/Observing Engineer by the Applicant. In addition, both the Applicant and the engineer's authorized representative(s) must sign the City's Developer/Engineer Agreement form before construction can begin. Usually, this form is signed at the pre-construction meeting.

B. The City shall host a preconstruction meeting, attendees to include the Applicant, contractor, Engineer of Record, Inspecting/Observing Engineer, City representatives, and any interested utility companies.

C. The Applicant shall pay all inspection/observation costs, including any testing required to confirm that the public improvements comply with project requirements. Inspection/observation costs shall also be accounted for in the computation of the contract surety amount.

D. An engineer whose firm, or any member of the firm, has any form of real property interest in the development for which the improvements are required cannot be designated Inspecting/Observing Engineer. The inspection/observing engineer's relationship to the project must be solely that of a professional service nature.

E. City policy is to <u>not</u> provide full inspection/observation services for non-public funded public improvements. However, the City may perform limited inspection/observation services, for a fee upon request, if the project scale does not warrant the retention of a private Inspecting/Observing Engineer. This method does not relieve the Engineer of Record from any responsibilities they have with regard to their final certification of completion to the City.

F. The Contractor shall notify the City at least 48 hours (two full working days) before any "milestone" inspection required by the City. The Contractor shall not make connections between existing utilities and new utilities until successfully completing required inspection(s) and testing of the new work. This new work must conform in all respects to the requirements of the plans and specifications.

G. The Inspecting/Observing Engineer should visit the job site and make contact with the contractor's foreman each day to verify that materials and construction are meeting specifications. Amount of time spent at the job site depends on the size, complexity of project, and cooperation and reliability of contractor. If the City determines the Inspecting/Observing Engineer is not keeping adequate control of the job, or is not spending enough time at the job site, the City representative may issue a stop work order for the project until the Inspecting/Observing Engineer provides adequate inspection/observation. When the Engineer of Record is performing primary inspection/observation, it is their responsibility to monitor all construction and testing. However, the City Inspector has access to the foreman on the project and can require the contractor to meet job specifications.

CITY ACTIVITIES:

Inspecting services provided by the City shall include-

A. Acting as a liaison between the Inspecting/Observing Engineer and the City.

B. Attend and record notes at all project related meeting including the preconstruction meeting and any other regularly scheduled construction meeting.

C. Monitoring of work progress and performance testing as necessary to establish compliance with the plans and specifications and as deemed required by the City Engineer.

D. Assist in the performance of administrative and coordinating activities as required supporting the processing and completion of the project.

E. The issuance of stop work orders upon notifying the Contractor or Inspecting/Observing Engineer of the City's intention to do so. If the City representative cannot contact the Contractor or inspecting/observing engineer verbally, then the City representative shall send a written notification to the Applicant, Contractor, and Engineer of Record, preferably by facsimile and/or electronic mail.

F. Inform the City Development Services Division of all proposed plan changes, material changes, stop work orders, or errors or omissions in the approved plans or specifications as soon as practical. Any revision to approved plans must be under the direction of the Engineer of Record. The Engineer of Record shall submit seven (7) copies of the proposed revision for approval; no work affected by the revision shall be done until approved by the City Development Services Division. Ensure the approved changes are included on the as-builts.

INSPECTING/OBSERVING ENGINEER'S ACTIVITIES:

The following <u>minimum</u> activities are required of the designated Inspecting/Observing Engineer.

A. * Execute Developer/Engineer Agreement form to provide engineering services including construction staking, construction inspection/observation, and as-built/record drawing preparation. Refer to item A under GENERAL.

B. Maintain a project log that contains at least the following information.

1. Job number, City Planning File No., and name of Inspecting/Observing Engineer and designee(s);

2. Date and time of site visits, including arrival and departure times;

3. Daily weather conditions, including temperature, and precipitation;

4. A description of construction activities;

5. Statements of directions to change plans, specification, stop work, reject materials or other work quality actions;

6. Notation of public agency contacts and conversations;

7. Perceived problems and action taken;

8. General remarks related to construction activities;

9. Final and "milestone" inspections;

10. Record all project compliance testing; and

11. Citizen contact or complaints;

All active site development projects shall be required to turn in daily inspection/ observation reports to the City on a weekly basis containing information as outlined above. If the compiled reports become more than two (2) weeks overdue, the City representative may post a stop work order on the project site;

C. Obtain and use a copy of City-approved construction plans and specifications;

D. Review, inspect and certify that all pipe, aggregate, concrete, asphaltic concrete, and other construction materials comply with City or other pre-approved standards;

E. * Endorse all plan or specification changes in writing and obtain City approval (See City Activities above). All proposed changes shall be approved by the City Development Services Division before the commencement of work affected by the revision;

F. Monitor construction activities to ensure end products meet City specifications;

G. * Perform (or have performed) material, composition and other tests required to ensure City specifications are met;

H. Periodically check that curb, sanitary sewer work, storm sewer work, and pavement grades are in accordance with adopted plans;

I. In the event the Applicant requests a reduction in the contract surety amount, the Inspecting/Observing Engineer shall submit a written certification to the City certifying the amount of work completed to date. The City Inspector shall certify the amount of work completed to enable the City to justify release of monies or a reduction of contract surety amount;

J. Attend and record notes at a final project walk through meeting. File a completion report that contains:

1. A table containing all final project punch list items as well as the final status of all listed items

2. The original of the project completion certification;

3. A complete copy of the log, signed by the Inspecting/Observing Engineer, compiled from the contractor's, Engineer of Record's, and City Inspector's records;

4. A complete set of as-built/record drawing plans compiled from the contractor's, Engineer of Record's, and City inspector's records;

5. The results of materiel tests, compaction tests, and soil analysis as detailed in the log.

6. Equipment operation & maintenance manuals or product warrantee information.

7. A commitment letter signed by the Applicant, Contractor, and Engineer of Record acknowledging maintenance and warrantee responsibilities, that includes a maintenance schedule for any work to be completed during the required 2-year maintenance bond period.

K. Call to the City's attention, by the end of that workday, all plan changes, material changes, stop work orders, or errors or omissions in the approved plans or specifications.

L. Observe and record as-built/record drawing information on job site at time of construction. The inspector should observe, approve, and document any minor deviations from plans and specifications not requiring City approval. This could include minor changing of manhole elevations, correcting unforeseen field conditions, and so forth.

M. Ensure that contractor notifies police, fire, school bus, public transportation officials, and local affected residences and businesses of proposed utility outages, street closures, or traffic detouring or disruption.

N. Verify that traffic control signing is in place before the start of construction, and in compliance with City-approved traffic control plan and construction sign plan.

* The Inspecting Engineer of Record must be registered to practice engineering in the State of Oregon. They must personally perform all activities marked above by an (*) and must supervise all individuals performing delegated activities. A recognized testing firm or another registered engineer must accomplish material testing not performed by the Inspection Engineer.

MAJOR INSPECTION CHECKLIST.

(This is the responsibility of the Inspecting/Observing Engineer)

A. General –

1. Confirm that the Contractor has installed all erosion and sediment control measures in accordance with the approved erosion and sediment control permit.

2. Confirm that materials for construction are in compliance with the approved plans and City of Oregon City standard specifications.

B. Sanitary Sewers -

1. Be present at initial opening of trench to verify grade and alignment and answer any questions.

2. Verify grade and alignment of sewer a minimum of once for each run between manholes. If alignment and grade does not check, additional checks shall be made to ensure grade and alignment are achieved.

3. Verify pipe sizes, class of bedding, backfill, manholes, other materials, and construction meet specifications.

4. Be present at air test and supply City with copy of air test results.

5. Be present initially and intermittently thereafter to visually confirm that the Contractor's method of obtaining trench compaction is adequate to consistently meet or exceed the City of Oregon City compaction requirements.

6. Be present at compaction testing of trenches and asphalt, and supply City with a copy of compaction testing results.

7. Be present at pavement patching of trenches. Verify that tack coat has been applied before paving and that all trench joints are sand-sealed following paving.

8. Be present periodically when traffic is being detoured or streets are closed to monitor traffic control measures.

9. Notify City when line is ready for TV inspection. Monitor TV inspections.

10. Verify that manhole tops are at proper finish elevation with correct amount of grade rings.

11. Be present at manhole testing. Test manhole for acceptance only after completion of surface restoration including paving and final adjustment to grade. Manhole testing shall be either hydrostatic per Oregon Chapter APWA Standard Specifications for Public Works Construction, Section 306.3.03, or vacuum testing per latest industry standards. If vacuum testing is used, every manhole shall be tested. DEQ's manhole test record form or equivalent shall be used to record the test.

12. Attend the project final inspection meeting.

C. Water Lines -

1. Be present at initial opening of trench to verify line, grade, and connection to existing water line meet specifications.

2. Be present to witness all connections to existing City water lines.

3. Verify that a minimum of three feet (3') of cover from finish street grade is maintained. Grade stakes shall be required when water line is installed before coring of street. When water line varies from standard cover of three feet (3'), water line depths shall be recorded at grade breaks and every 100 lineal feet and referenced to final grade.

4. Verify pipe, valve, fitting, and blowoff installation as per plan and location. Inspect materials before installation for compliance with City Standard Specifications.

5. Verify that all joint restraint systems are installed as per specifications and manufacturer's recommendations.

6. Verify service lines are proper size and material, and meter stop is at correct horizontal and vertical location.

7. Verify fire hydrants meet City specifications at correct horizontal and vertical location.

8. Provide the City Inspector and Water Utility Provider notice that the system is ready to be witnessed for pressure and bacteriologic testing. Notice shall be a minimum of 48 hours prior to the desired test time. Monitor water line pressure and leakage test.

9. Monitor water line flushing and chlorination.

    a. Method of introducing chlorine to waterline must meet City and State requirements.

    b. City's Water Quality Specialist shall take two water samples for bacteriological test of water purity within 24 hours and report results to Project Engineer.

    c. The City's Water Quality Specialist shall ensure the bacteriological tests passed and obtain approval from the City Inspector before authorizing connection of the new water system to the existing water system.

    d. Discharging of the highly chlorinated water used for disinfection shall not be discharged into surface waters. The Project Engineer shall ensure Contractor disposes of flushed chlorinated water in accordance with applicable federal state and local regulations concerning said discharge.

10. Be present initially and intermittently thereafter to visually confirm that the Contractor's method of obtaining trench compaction is adequate to

consistently meet or exceed the City of Oregon City compaction requirements.

11. Be present at compaction testing of trenches and asphalt and supply City with a copy of compaction testing results.

12. Be present at pavement patching of trenches. Verify that tack coat has been applied prior to paving and that all trench joints are sand-sealed following paving.

13. Notify City Water Operations Office ((503) 657-8241) two (2) working days before any required public water shutdown.

14. Periodically be present to observe when traffic is being detoured or streets are closed to monitor traffic control measures.

15. Attend the project final inspection meeting.

D. Stormwater Sewers -

1. Be present at initial opening of trench to verify grade and alignment and answer any questions.

2. Verify grade and alignment of stormwater sewer a minimum of once for each run between manholes. Number of checks depends on quality of work being done by contractor.

3. Verify, pipe sizes, class of bedding, backfill, manholes, other materials, and construction meet specifications.

4. Be present initially and intermittently thereafter to visually confirm that the Contractor's method of obtaining trench and asphalt compaction is adequate to consistently meet or exceed the City of Oregon City compaction requirements.

5. Be present at compaction testing of trenches and asphalt, and supply City with copy of compaction testing results.

6. Be present at pavement patching of trenches. Verify that tack coat has been applied before paving and that all trench joints are sand-sealed following paving.

7. Periodically be present when traffic is being detoured or streets are closed to monitor traffic control measures.

8. Verify that manhole tops are at proper finish elevation with correct amount of grade rings.

9. Verify catch basin inlet installation per specifications at proper grade and location.

10. Attend the project final inspection meeting.

E. Storm Water Quality Facilites –

1. Verify that the grades, structures and horizontal locations are consistent with the plans and specifications.

2. Verify that all inlet and outlet structures are at the specified elevation and grade.

3. Verify that all pre-manufactured vaults, tanks, and other water quality structures are installed and constructed in accordance with the manufacture's recommendations.

4. Verify that all permanent and temporary irrigation systems are installed and operational.

5. Verify that the plant materials meet the planting requirements and that they are installed in accordance with the approved landscape plans.

F. Street Construction -

1. Monitor and document subgrade, grade elevation, and compaction testing. Observe subgrade for soft spots and unsuitable materials. Document corrective actions.

2. Verify subbase rock meets specifications and grade elevation. Monitor compaction testing.

3. Monitor curb alignment and elevation per the construction plans and the survey stakes. Verify curbs meet specification requirements and that drainage blockouts, wheelchair ramps, and driveway cuts (where required) are placed correctly.

4. Notify City Inspector so he may be present during proof rolling of subgrade, rock placement, and before paving.

5. Verify that all utility boxes and survey monument boxes have been raised to the appropriate grade.

6. Monitor asphalt placement:

   a. Submit ready-to-pave notice to City for approval.

   b. Apply tack coat and saw cut existing pavement.

   c. Tack-coat existing curbs, manholes, and pavement before paving.

   d. Test asphalt temperature against specifications.

e. Ensure depth of asphalt meets specifications.

f. Ensure class of asphalt meets specifications.

g. Ensure compaction and procedures meet specifications. Monitor compaction testing where required.

h. Provide supplier's certification showing rock gradation and asphalt content of materials.

7. Be present periodically when traffic is being detoured or streets are closed to monitor traffic control measures.

8. Attend the project final inspection meeting.

WATER DISTRIBUTION SYSTEM
DESIGN STANDARDS

SECTION VI

UNIFORM FIRE CODE, APPENDIX III – A & B

Oregon Fire Code Applications Guide

CLACKAMAS FIRE DISTRICT #1

Revised 5/12/16

Notes to Users

Local Development Codes

Check the local city or county development code to determine the applicability of roadway standards as it relates to conflicts with this guide and/or the adopted fire code.

ORS 368.039 Road standards adopted by local government supersede standards in fire codes: Consultation with fire agencies.

(1) When the governing body of a county or city adopts specifications and standards, including standards for width, for roads and streets under the jurisdiction of the governing body, such specifications and standards shall supersede and prevail over any specifications and standards for roads and streets that are set forth in a uniform fire code adopted by the State Fire Marshal, a municipal fire department or a county firefighting agency.

(2) This section applies to specifications and standards for roads and streets adopted by the governing body of a county or city in a charter, acknowledged comprehensive plan or ordinance adopted pursuant to ORS chapter 92, 203, 221 or 368.

(3) Before adopting or amending any comprehensive plan, land use regulation or ordinance that establishes specifications and standards for roads and streets, a governing body of a county or city shall consult with the municipal fire department or other local firefighting agency concerning the proposed specifications and standards. The county or city governing body shall consider the needs of the fire department or firefighting agency when adopting the final specifications and standards.

Dispute Resolution Process

The Office of State Fire Marshal's (OSFM), Dispute Resolution Process allows an aggrieved party to dispute inspection findings of the local fire marshal. This process allows the aggrieved party to ask for a "second opinion" but does not supersede the local or State Fire Marshal's appeal process. The local fire marshal, through the OSFM, arranges a conference call with the aggrieved party and on-call code experts from other jurisdictions and industry. The on-call group discusses the case and the local fire marshal takes the group's second opinion into consideration when rendering a decision in writing to the aggrieved party. The goal of the OSFM is to conduct the conference call within 48 hours (two business days) for new construction and no more than seven business days for maintenance issues of the notice of dispute. Aggrieved parties who are not satisfied with the findings can appeal the decision to a local appeals board, if available, otherwise to the OSFM.

Preamble/Authority and Scope

Clackamas Fire District #1 administers and enforces the Oregon Fire Code under the authority granted to them by ORS 476.030 or ORS 476.060. The Oregon Fire Code is the International Fire Code, 2014 Edition, as published and copyrighted by the International Code Council, which has been amended and adopted by the Oregon State Fire Marshal's Office.

This Applications Guide was created to provide good faith guidance to building officials, contractors, business owners, the public, and fire marshals on local interpretations and practices that are considered to be in compliance with the Oregon Fire Code. The intent is to clarify aspects of the code that are vague or non-specific by addressing selected issues under normal conditions. This Applications Guide does not create or replace code provisions, and is not an adopted policy of Clackamas Fire District #1. The reader is cautioned that the guidance detailed in this Applications Guide may or may not apply to their specific situation, and that the designated authority for each jurisdiction retains final authority to determine compliance.

Table of Contents

Fire Department Access and Water Supply Submittal Requirements

When required, include the following documents with submittal to the Engineering or Building Department and email digital copies to appropriate Fire District contact.

- Fire Access & Water Supply Plan
- Available Fire Flow
- Fire Flow/Hydrant Worksheet

Fire Access & Water Supply Plan shall contain the following:

The plan shall show fire apparatus access, fire lanes, fire hydrant locations within 600' of new building(s), available fire flow, fdc location if applicable, building square footage, height, and type of construction. See example on Clackamas Fire District #1 website.

Available Fire Flow:

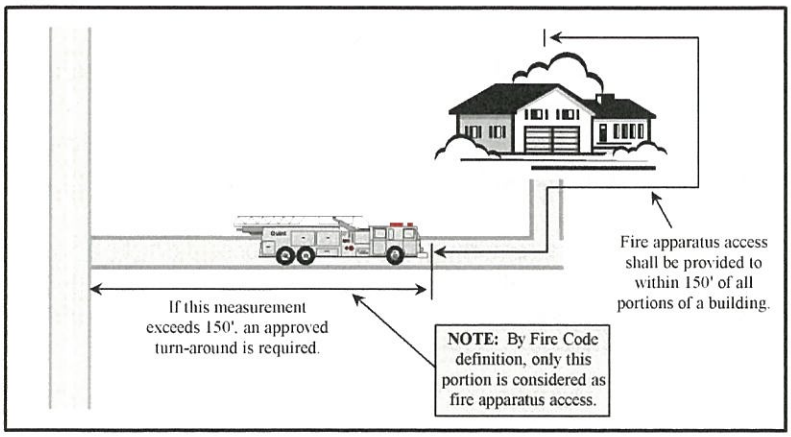
The applicant shall provide fire flow tests per NFPA 291 and shall be no older than 12 months. For review purposes, the available fire flow at 20 psi is required. Work to be completed by experienced and responsible persons and coordinated with the local water authority. *Hydraulic models may be available, contact water authority to verify.

Fire Flow/Hydrant Worksheet:

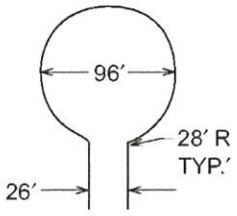
Excel spreadsheet shall be completed and included with submittal. Form location: http://www.clackamasfire.com/newconstruction.html

Fire Apparatus Access

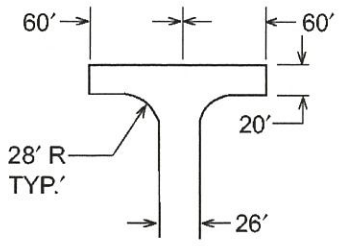
FIRE APPARATUS ACCESS ROAD DISTANCE FROM BUILDING AND TURNAROUNDS: Access roads shall be within 150 feet of all portions of the exterior wall of the first story of the building as measured by an approved route around the exterior of the building. An approved turnaround is required if the remaining distance to an approved intersecting roadway, as measured along the fire apparatus access road, is greater than 150 feet. (OFC 503.1.1)



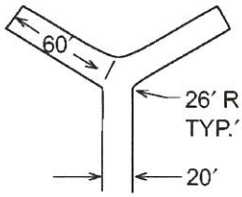
DEAD END ROADS: Dead end fire apparatus access roads in excess of 150 feet in length shall be provided with an approved turnaround. Dead end fire apparatus access roads in excess of 500 in length shall have a driving surface width of not less than 26 feet. Diagrams of approved turnarounds are shown below: (OFC 503.2.5)



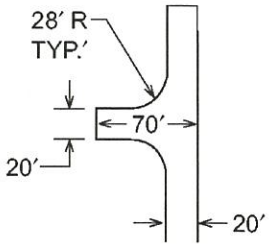
96′ DIAMETER CUL-DE-SAC



120′ HAMMERHEAD

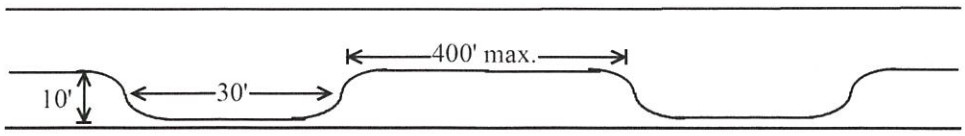


ACCEPTABLE ALTERNATIVE TO 120′ HAMMERHEAD



ACCEPTABLE ALTERNATIVE TO 120′ HAMMERHEAD

TURNOUTS: When any fire apparatus access road exceeds 400 feet in length, turnouts 10 feet wide and 30 feet long shall be provided in addition to the required road width and shall be placed no more than 400 feet apart, unless otherwise approved by the fire code official. These distances may be adjusted based on visibility and light distances.

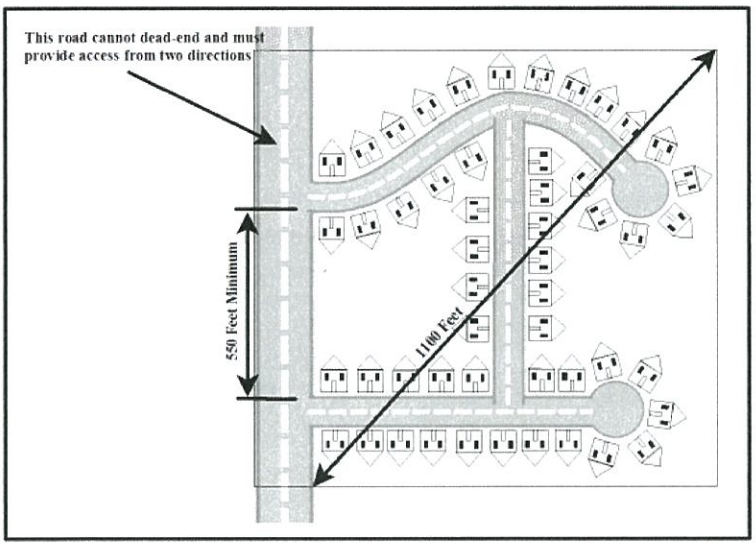


FIRE APPARATUS ACCESS ROAD EXCEPTION FOR AUTOMATIC SPRINKLER PROTECTION: When buildings are completely protected with an approved automatic fire sprinkler system, the requirements for fire apparatus access may be modified as approved by the fire code official. The approval of this alternate method of construction shall be accomplished in accordance with the provisions of OFC 503.1.1 Exception 1.

MULTIPLE ACCESS ROADS: Developments of one- and two-family dwellings where the number of dwelling units exceeds 30, multiple-family residential projects having more than 100 dwelling units and where vehicle congestion, adverse terrain conditions or other factors that could limit access, as determined by the fire code official, shall be provided with not less than two approved means of access. Exceptions may be allowed for approved automatic sprinkler system. The approval of fire sprinklers as an alternate shall be accomplished in accordance with the provisions of OFC D106 & D107.

GRADE: Fire apparatus access roadway grades shall not exceed 12 percent. Intersections and turnarounds shall be level (maximum 5%) with the exception of crowning for water run-off. When fire sprinklers are installed, a maximum grade of 15% may be allowed. Grades over 15% will not be approved. The approval of fire sprinklers as an alternate shall be accomplished in accordance with the provisions of OFC 503.1.1Exception (2).

MULTIPLE ACCESS ROADS SEPARATION: Where two access roads are required, they shall be placed a distance apart equal to not less than one half of the length of the maximum overall diagonal dimension of the property or area to be served, measured in a straight line between accesses. (OFC D104.3 & D107.1)



FIRE APPARATUS ACCESS ROAD WIDTH AND VERTICAL CLEARANCE: Fire apparatus access roads shall have an unobstructed driving surface width of not less than 20 feet (26 feet adjacent to fire hydrants (OFC D103.1)) and an unobstructed vertical clearance of not less than 13 feet 6 inches. (OFC 503.2.1 & D103.1)

> Note: When serving three or less dwelling units and accessory buildings, the driving surface may be reduced to 12 feet, although the unobstructed width shall be 20 feet. Turning radii for curves and turnarounds on 12' wide roads shall be not less than 44 feet and 56 feet respectively, measured from the same center point.

AERIAL FIRE APPARATUS ROAD WIDTH: Buildings more than 30 feet in height shall have fire apparatus access roads constructed for use by aerial apparatus with an unobstructed driving surface width of not less than 26 feet and comply with OFC D105.

SURFACE AND LOAD CAPACITIES: Fire apparatus access roads shall be of an all-weather surface that is easily distinguishable from the surrounding area and is capable of supporting not less than 13,500 pounds point load (wheel load) and 80,000 pounds live load (gross vehicle weight). Documentation from a registered engineer that the finished construction is in accordance with the approved plans or the requirements of the Fire Code may be requested.

BRIDGES: Private bridges shall be designed and constructed in accordance with the State of Oregon Department of Transportation and American Association of State Highway and Transportation Officials Standards *Standard Specification for Highway Bridges.* A building permit shall be obtained for the construction of the bridge if required by the building official of the jurisdiction where the bridge is to be built. The design engineer shall prepare a special inspection and structural observation program for approval by the building official. The design engineer shall give in writing final approval of the bridge to the fire district after construction is completed. Maintenance of the bridge shall be the responsibility of the party(ies) that use(s) the bridge for access to their property(ies). The fire district may at any time, for due cause, ask that a registered engineer inspect the bridge for structural stability and soundness at the expense of the property owner(s) the bridge serves. (OFC 503.2.6)

TURNING RADIUS: The inside turning radius and outside turning radius for a 20' wide road shall be not less than 28 feet and 48 feet respectively, measured from the same center point. (OFC 503.2.4 & Appendix D)

GATES: Gates securing fire apparatus roads shall comply with all of the following: (OFC D103.5)

- Minimum unobstructed width shall be 16 feet, or two 10 foot sections with a center post or island
- Gates serving one- or two-family dwellings shall be a minimum of 12 feet clear width
- Gates shall be set back at minimum of 30 feet from the intersecting roadway
- Gates shall be of the swinging or sliding type
- Manual operation shall be capable by one person
- Electric gates shall be equipped with a means for operation by fire department personnel
- Locking devices shall be submitted for approval

NO PARKING SIGNS: Where fire apparatus roadways are not of sufficient width to accommodate parked vehicles and 20 feet of unobstructed driving surface, "No Parking" signs shall be installed on one or both sides of the roadway and in turnarounds as needed. Roads 26 feet wide or less shall be posted on both sides as a fire lane. Roads more than 26 feet wide to 32 feet wide shall be posted on one side as a fire lane.

Signs shall read "NO PARKING - FIRE LANE" and shall be installed with a clear space above grade level of 7 feet. Signs shall be 12 inches wide by 18 inches high and shall have red letters on a white reflective background. (OFC D103.6)

PAINTED CURBS: Where required, fire apparatus access roadway curbs shall be painted red and marked "NO PARKING FIRE LANE" at approved intervals. Lettering shall have a stroke of not less than one inch wide by six inches high. Lettering shall be white on red background. (OFC 503.3)

Firefighting Water Supplies

COMMERCIAL BUILDINGS - FIRE FLOW: The minimum fire flow and flow duration for buildings other than one and two-family dwellings shall be determined according to OFC Appendix B. The required fire flow for a building shall not exceed the available GPM in the water delivery system at 20 psi.

SINGLE FAMILY DWELLINGS - REQUIRED FIRE FLOW: The minimum available fire flow for single family dwellings and duplexes served by a municipal water supply shall be 1,000 gallons per minute. If the structure(s) is (are) 3,600 square feet or larger, the required fire flow shall be determined according to OFC Appendix B. (OFC B105)

RURAL COMMERCIAL BUILDINGS - REQUIRED FIRE FLOW: Required fire flow for rural and suburban areas in which adequate and reliable water supply systems do not exist may be calculated in accordance with ISO "Guide for Determination of Needed Fire Flow," when approved by the fire code official. Please contact the Fire Marshal's Office for special assistance and other requirements that may apply.

RURAL ONE AND TWO FAMILY DWELLINGS-REQUIRED FLOW: Required fire flow for detached one and two family dwellings in areas in which adequate and reliable water supply systems do not exist shall be calculated in accordance with National Fire Protection Association Standard 1142, 2012 Edition. (OFC 107.1)

- Exception 1: One and two family dwelling structures where the total area of all floor levels within exterior walls are less than 3,600 square feet.
- Exception 2: When an Alternate Method and Material is approved, which provides a separation in accordance with one of the following methods, the square footage of the garage shall not count towards the 3,600 square foot exception above.
    - The garage/dwelling separation shall be per ORSC, except that construction material in Table R302.6 shall be two (2) layers of 5/8" Type X gypsum board in all design options. All other separation and penetration protection shall be per ORSC302.5; or
    - A listed 1-hour fire rated assembly. All other separation and penetration protection shall be per ORSC 302.5
- Exception 3: One and two family dwellings protected by an approved NFPA13D automatic sprinkler system are not required to have a water supply other than that required to supply the fire sprinkler system.

ACCESS AND FIRE FIGHTING WATER SUPPLY DURING CONSTRUCTION: Approved fire apparatus access roadways and fire fighting water supplies shall be installed and operational prior to any combustible construction or storage of combustible materials on the site. (OFC 501.4)

Fire Hydrants

FIRE HYDRANTS – COMMERCIAL BUILDINGS: Where a portion of the building is more than 400 feet from a hydrant on a fire apparatus access road, as measured in an approved route around the exterior of the building, on-site fire hydrants and mains shall be provided. (OFC 507.5.1)

Note: This distance may be increased to 600 feet for buildings equipped throughout with an approved automatic sprinkler system.

FIRE HYDRANTS – ONE- AND TWO-FAMILY DWELLINGS & ACCESSORY STRUCTURES: Where a portion of a structure is more than 600 feet from a hydrant on a fire apparatus access road, as measured in an approved route around the exterior of the structure(s), on-site fire hydrants and mains shall be provided. (OFC 507.5.1) Exception (1)

FIRE HYDRANT NUMBER AND DISTRIBUTION: The minimum number and distribution of fire hydrants available to a building shall not be less than that listed in Table C 105.1. See page 9 for hydrant proximity to FDC. (OFC Appendix C)

TABLE C105.1
NUMBER AND DISTRIBUTION OF FIRE HYDRANTS

FIRE-FLOW REQUIREMENT (gpm)	MINIMUM NUMBER OF HYDRANTS	AVERAGE SPACING BETWEEN HYDRANTS[abc] (feet)	MAXIMUM DISTANCE FROM ANY POINT ON STREET OR ROAD FRONTAGE TO A HYDRANT[d]
1,750 or less	1	500	250
2,000-2,250	2	450	225
2,500	3	450	225
3,000	3	400	225
3,500-4,000	4	350	210
4,500-5,000	5	300	180
5,500	6	300	180
6,000	6	250	150
6,500-7,000	7	250	150
7,500 or more	8 or more	200	120

For SI: 1 foot = 304.8 mm, 1 gallon per minute = 3.785 L/m.

a. Reduce by 100 feet for dead-end streets or roads.
b. Where streets are provided with median dividers which can be crossed by fire fighters pulling hose lines, or where arterial streets are provided with four or more traffic lanes and have a traffic count of more than 30,000 vehicles per day, hydrant spacing shall average 500 feet on each side of the street and be arranged on an alternating basis up to a fire-flow requirement of 7,000 gallons per minute and 400 feet for higher fire-flow requirements.
c. Where new water mains are extended along streets where hydrants are not needed for protection of structures or similar fire problems, fire hydrants shall be provided at spacing not to exceed 1,000 feet to provide for transportation hazards.
d. Reduce by 50 feet for dead-end streets or roads.
e. One hydrant for each 1,000 gallons per minute or fraction thereof.

CONSIDERATIONS FOR PLACING FIRE HYDRANTS MAY BE AS FOLLOWS: (OFC C104)

- Existing hydrants in the area may be used to meet the required number of hydrants as approved. Hydrants that are up to 600 feet away from the nearest point of a subject building that is protected with fire sprinklers may contribute to the required number of hydrants. (OFC C104.1)
- Hydrants that are separated from the subject building by railroad tracks shall not contribute to the required number of hydrants unless approved by the fire code official.
- Hydrants that are separated from the subject building by divided highways or freeways shall not contribute to the required number of hydrants. Heavily traveled collector streets only as approved by the fire code official.
- Hydrants that are accessible only by a bridge shall be acceptable to contribute to the required number of hydrants only if approved by the fire code official.
- When evaluating the placement of hydrants at apartment or industrial complexes the first hydrant(s) to be placed shall be at the primary access and any secondary access to the site. After these hydrants have been placed other hydrants shall be sited to meet the above requirements for spacing and minimum number of hydrants.

FIRE HYDRANT NON-THREADED QUICK CONNECTORS: Non-threaded quick connectors shall NOT be installed on newly installed fire hydrants Clackamas Fire District #1.

FIRE HYDRANT DISTANCE FROM AN ACCESS ROAD: Fire hydrants shall be located not more than 15 feet from an approved fire apparatus access roadway unless approved by the fire code official. (OFC C102.1)

REFLECTIVE HYDRANT MARKERS: Fire hydrant locations shall be identified by the installation of reflective markers. The markers shall be blue. They shall be located adjacent and to the side of the centerline of the access road way that the fire hydrant is located on. In case that there is no center line, then assume a centerline, and place the reflectors accordingly. (OFC 508.5.4)

FIRE HYDRANT/FIRE DEPARTMENT CONNECTION: A fire hydrant shall be located within 100 feet of a fire department connection (FDC). Fire hydrants and FDC's shall be located on the same side of the fire apparatus access roadway. (OFC C102.1 & NFPA 14)

FDCs shall normally be remote except when approved by the fire code official.

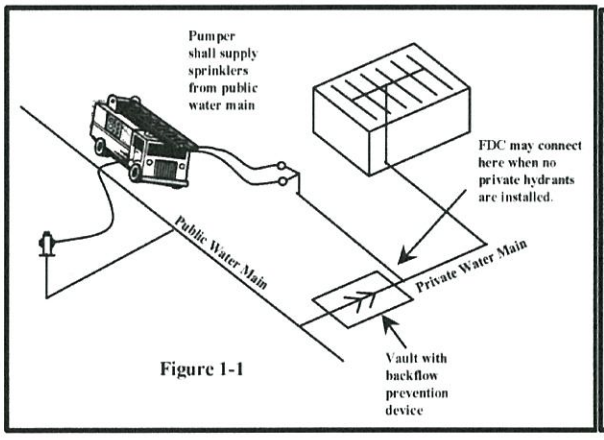


Figure 1-1

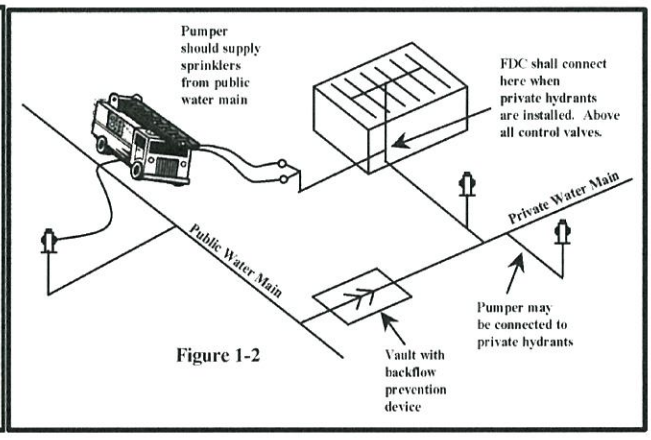


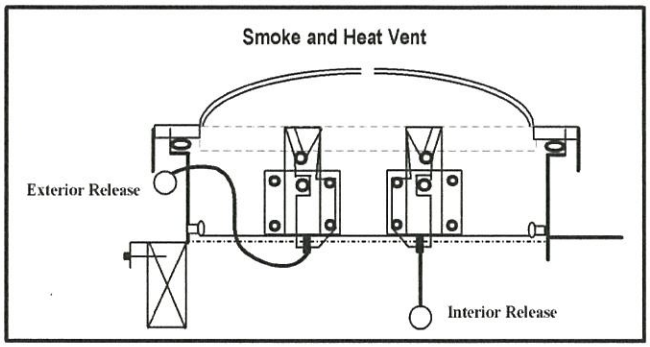
Figure 1-2

Key Boxes

KEY BOX: A key box for building access may be required. For details go to www.clackamasfire.com and find the lock box program in the Operations section.

Smoke and Heat Vents

MANUAL RELEASE: Manual releases shall be provided for use during fire suppression operations. Individual exterior release mechanisms shall be provided for each vent.



Fire Watch

FIRE WATCH: Whenever a *required* fire alarm, detection or suppression system is out-of-service and a life hazard and or distinct fire hazard is present, the fire code official and/or the property owner or manager shall initiate a fire watch. A fire watch is defined as a temporary measure intended to ensure continuous and systematic surveillance of a building or portion thereof by one or more qualified individuals for the purposes of identifying and controlling fire hazards, detecting early signs of unwanted fire, raising an alarm of fire and notifying the fire department. Each affected area or building must be patrolled hourly and documented on a written log. Individuals assigned to fire watch duty must be provided with a means of communication such as a cell phone or two-way radio and their only duties shall be to perform constant patrols. The watch must remain in effect until repairs are made and the system(s) are back in-service. *When in doubt if a system is required or if a fire watch is needed, contact the local Fire Marshal's Office for consultation and or response.* (OFC, Section 901.7, Section 202, and Appendix N)

EXAMPLES:

The automatic smoke detection system in the Family Birth Center at the local Hospital is taken off-line due to unwanted false alarms and an alarm technician has been dispatched to evaluate the system. This is a required detection system and the patients occupy the floor. A fire watch is required and could be conducted by nursing and or security personnel.

The manual fire alarm system at a local Elementary School is initiating false alarms and is taken off line by school district personnel; the automatic smoke detection and fire sprinkler system are operational. It's Saturday afternoon and the building is not occupied. Although this is a required system, a fire watch is not

required as the building is vacant.

The water main that serves a local apartment complex is damaged in a construction accident rendering the fire hydrants and residential fire sprinkler systems out-of-service. It's Sunday night and nearly all of the apartments are occupied. Both systems are required and a continuous fire watch is needed.

APPENDIX B

FIRE-FLOW REQUIREMENTS FOR BUILDINGS

The provisions contained in this appendix are not mandatory unless specifically referenced in the adopting ordinance.

SECTION B101 GENERAL

B101.1 Scope. The procedure for determining fire-flow requirements for buildings or portions of buildings hereafter constructed shall be in accordance with this appendix and as required by the *fire code official.* This appendix does not apply to structures other than buildings.

SECTION B102 DEFINITIONS

B102.1 Definitions. For the purpose of this appendix, certain terms are defined as follows:

FIRE-FLOW. The flow rate of a water supply, measured at 20 pounds per square inch (psi) (138 kPa) residual pressure, that is available for fire fighting.

FIRE-FLOW CALCULATION AREA. The floor area, in square feet (m^2), used to determine the required fire flow.

OCCUPANCY HAZARD. A classification system based on the classification of occupancies and commodities system specified in NFPA 13.

PROTECTED AREAS. Geographic areas where a service or an agency has been established for the purpose of providing fire suppression services for buildings and other structures. Examples of agencies typically include public fire departments, rural fire protection districts and private fire protection services.

UNPROTECTED AREAS. Geographic areas where no organized service or agency exists to provide fire suppression services for buildings and other structures. Examples of unprotected areas typically include areas where wildland fire protection is provided by federal (USFS, BLM, BIA, etc.) state (ODF), or regional (forest protection associations) organizations and other areas that are generally in remote or rural isolated areas where no structural fire protection service is present.

SECTION B103 MODIFICATIONS

B103.1 Decreases. The fire chief is authorized to reduce the fire-flow where the development of full fire-flow requirements is impractical based on, but not limited to, the following: type of occupancy, type of construction, location on property, floor area, height and number of stories, yards as defined by the *International Building Code*, fire walls, and the fire-fighting capabilities of the jurisdiction.

B103.2 Increases. The fire chief is authorized to increase the fire-flow requirements where conditions indicate an unusual susceptibility to group fires or conflagrations. An increase shall not be more than twice that required for the building under consideration.

B103.3 Limiting. The *fire code official* is authorized to limit the maximum required fire-flow based on, but not limited to, the fire-fighting capabilities of the jurisdiction. Fire-flow limitation shall be in accordance with Section B106 which are in addition to the fire-flow requirements as specified in Section B105.

SECTION B104 FIRE-FLOW CALCULATION AREA

B104.1 General. The fire-flow calculation area shall be the total floor area of all floor levels within the *exterior walls*, and under the horizontal projections of the roof of a building, except as modified in Section B104.2 or B104.3.

B104.2 Area separation. Portions of buildings which are separated by *fire walls*, constructed in accordance with the *International Building Code*, are allowed to be considered as separate fire-flow calculation areas.

B104.3 Type IA and Type IB construction. The fire-flow calculation area of buildings constructed of Type IA and Type IB construction shall be the area of the three largest successive floors.

Exception: Fire-flow calculation area for open parking garages shall be determined by the area of the largest floor.

SECTION B105 FIRE-FLOW REQUIREMENTS FOR BUILDINGS IN PROTECTED AREAS WITH ADEQUATE AND RELIABLE WATER SYSTEMS

B105.1 General. The provisions of Section B105 are intended for use by the *fire code official* in *protected areas* in which adequate and reliable water systems exist. Refer to Section B106 for additional alternative provisions regarding limiting fire-flows.

B105.2 One- and two-family dwellings. The minimum fire-flow and flow duration requirements for one- and two-family *dwellings* having a fire-flow calculation area that does not exceed 3,600 square feet (344.5 m^2) shall be 1,000 gallons per minute (3785.4 L/min) for 1 hour. Fire-flow and flow duration for *dwellings* having a fire-flow calculation area in excess of 3,600 square feet (344.5m^2) shall not be less than that specified in Table B105.2 as modified by Section B105.4.

Exceptions:

1. A reduction in required fire-flow of 50 percent is allowed when the building is provided with an *approved automatic sprinkler system* installed in

accordance with Appendix T of the *Oregon Residential Specialty Code*.

2. When there are not more than one each, Group R, Division 3 and Group U occupancies or agricultural buildings, as defined by Oregon Revised Statute (ORS) 455.315, on a single parcel of not less than 1 acre, the requirements of this section may be modified provided, the Group R, Division 3 occupancy does not require a fire-flow in excess of 1,500 gallons per minute (5678 L/min) and in the opinion of the *fire code official*, fire-fighting or rescue operations would not be impaired.

B105.3 Buildings other than one- and two-family dwellings. The minimum fire-flow and flow duration for buildings other than one- and two-family *dwellings* shall be as specified in Table B105.2 as modified by Sections B105.3 and B105.4.

B105.3.1 Fire-flow reductions. The total required fire-flow may be reduced by either Section B105.3.1.1 or B105.3.1.2 and Section B105.4, but in no case shall the resulting fire-flow be less than 1500 gallons per minute (5678 L/min) at 20 pounds per square inch (138 kPa) residual.

B105.3.1.1 Sprinkler systems. A reduction in required fire-flow of up to 75 percent, as approved, is allowed when the building is provided with an approved automatic sprinkler system installed in accordance with Section 903.3.1.1 (NFPA 13) or 903.3.1.2 (NFPA 13R).

B105.3.1.2 Fire alarm systems. A reduction in required fire-flow of 25 percent is allowed when the building is provided with an approved automatic and manual fire alarm system that is installed throughout the building and is monitored by an approved central receiving station. The systems shall meet all requirements of NFPA 72 as specified for a central station fire alarm system providing total (complete) coverage by detection devices.

TABLE B105.2
MINIMUM REQUIRED FIRE-FLOW AND FLOW DURATION FOR BUILDINGS

FIRE-FLOW CALCULATION AREA (square feet)					FIRE-FLOW (gallons per minute)[b]	FLOW DURATION (hours)
Type IA and IB[a]	Type IIA and IIIA[a]	Type IV and V-A[a]	Type IIB and IIIB[a]	Type V-B[a]		
0-22,700	0-12,700	0-8,200	0-5,900	0-3,600	1,500	2
22,701-30,200	12,701-17,000	8,201-10,900	5,901-7,900	3,601-4,800	1,750	
30,201-38,700	17,001-21,800	10,901-12,900	7,901-9,800	4,801-6,200	2,000	
38,701-48,300	21,801-24,200	12,901-17,400	9,801-12,600	6,201-7,700	2,250	
48,301-59,000	24,201-33,200	17,401-21,300	12,601-15,400	7,701-9,400	2,500	
59,001-70,900	33,201-39,700	21,301-25,500	15,401-18,400	9,401-11,300	2,750	
70,901-83,700	39,701-47,100	25,501-30,100	18,401-21,800	11,301-13,400	3,000	3
83,701-97,700	47,101-54,900	30,101-35,200	21,801-25,900	13,401-15,600	3,250	
97,701-112,700	54,901-63,400	35,201-40,600	25,901-29,300	15,601-18,000	3,500	
112,701-128,700	63,401-72,400	40,601-46,400	29,301-33,500	18,001-20,600	3,750	
128,701-145,900	72,401-82,100	46,401-52,500	33,501-37,900	20,601-23,300	4,000	4
145,901-164,200	82,101-92,400	52,501-59,100	37,901-42,700	23,301-26,300	4,250	
164,201-183,400	92,401-103,100	59,101-66,000	42,701-47,700	26,301-29,300	4,500	
183,401-203,700	103,101-114,600	66,001-73,300	47,701-53,000	29,301-32,600	4,750	
203,701-225,200	114,601-126,700	73,301-81,100	53,001-58,600	32,601-36,000	5,000	
225,201-247,700	126,701-139,400	81,101-89,200	58,601-65,400	36,001-39,600	5,250	
247,701-271,200	139,401-152,600	89,201-97,700	65,401-70,600	39,601-43,400	5,500	
271,201-295,900	152,601-166,500	97,701-106,500	70,601-77,000	43,401-47,400	5,750	
295,901-Greater	166,501-Greater	106,501-115,800	77,001-83,700	47,401-51,500	6,000	
—	—	115,801-125,500	83,701-90,600	51,501-55,700	6,250	
—	—	125,501-135,500	90,601-97,900	55,701-60,200	6,500	
—	—	135,501-145,800	97,901-106,800	60,201-64,800	6,750	
—	—	145,801-156,700	106,801-113,200	64,801-69,600	7,000	
—	—	156,701-167,900	113,201-121,300	69,601-74,600	7,250	
—	—	167,901-179,400	121,301-129,600	74,601-79,800	7,500	
—	—	179,401-191,400	129,601-138,300	79,801-85,100	7,750	
—	—	191,401-Greater	138,301-Greater	85,101-Greater	8,000	

For SI: 1 square foot = 0.0929 m^2, 1 gallon per minute = 3.785 L/m, 1 pound per square inch = 6.895 kPa.

a. Types of construction are based on the *International Building Code*.

b. Measured at 20 psi residual pressure.

B105.4 Occupancy hazard modifiers. Where a single occupancy classification, as defined by NFPA 13, or a single high-piled combustible storage commodity classification, as specified in Section 3203, is present in a building, the minimum fire-flow required by Table B105.2 shall be multiplied by the appropriate factor in Table B105.4 to determine the total required fire-flow, but in no case shall the resulting fire-flow be less than 1500 gallons per minute (5678 L/min) at 20 pounds per square inch (138 kPa) residual.

TABLE B105.4

Light hazard occupancies	0.75
Ordinary Hazard (Group 1)	0.85
Ordinary hazard (Group 2) and HPCS[a] Classes I & II	1.00
Extra hazard (Group 1) and HPCS Class III	1.15
Extra hazard (Group 2) and HPCS Classes IV & High Hazard	1.25

a. HPCS – High-piled combustible storage.

B105.4.1 Multiple occupancy hazards. Where more than one occupancy classification or commodity classification is present in a building, the minimum fire-flow required by Table B105.2 shall be proportioned by percentage of the floor area used for each hazard. The proportioned building fire-flow shall be multiplied by the factor, relating to that portion of the building, in Table B105.4 and totaled to determine the total required fire-flow, but in no case shall the resulting fire-flow be less than 1500 gallons per minute (5678 L/min) at 20 pounds per square inch (138 kPa) residual.

SECTION B106
LIMITING FIRE-FLOW REQUIREMENTS FOR BUILDINGS IN PROTECTED AREAS WITH ADEQUATE AND RELIABLE WATER SYSTEMS

B106.1 General. The provisions of Section B106 are intended for use by the *fire code official* in addition to the provisions specified in Section B105 as authorized by Section B103.3. This section is intended to apply in protected areas in which adequate and reliable water systems exist.

B106.2 Limiting required fire-flow. No building shall be constructed, altered, enlarged, moved, or repaired in a manner that by reason of size, type of construction, number of stories, occupancy, or any combination thereof creates a need for a fire-flow in excess of 3,000 gallons per minute (11 356 L/min) at 20 pounds per square inch (138 kPa) residual pressure as specified in Table 105.2, or exceeds the available fire-flow at the site of the structure.

Exception: Fire-flow requirements in excess of 3,000 gallons per minute (11 356 L/min) may be allowed if, in the opinion of the *fire code official*, all reasonable methods of reducing the fire-flow have been included within the development and no unusual hazard to life and property exists.

B106.3 Existing buildings. Existing buildings that require a fire-flow in excess of 3,000 gallons per minute (11 356 L/min) are not required to comply with the fire-flow requirements of this section. However, changes in occupancies or the character of occupancies, alterations, additions or repairs shall not further increase the required fire-flow for buildings.

SECTION B107
FIRE-FLOW REQUIREMENTS FOR BUILDINGS IN PROTECTED AREAS WITHOUT ADEQUATE AND RELIABLE WATER SYSTEMS

B107.1 Areas without water supply systems. The provisions of Section B107 are intended for use by the *fire code official* in protected areas in which adequate and reliable water supply systems do not exist. In determining the fire-flow for buildings, the *fire code official* is authorized to utilize the following nationally recognized standards: NFPA 1142, the *International Urban-Wildland Interface Code* or the *ISO Guide for Determining Needed Fire-Flow.*

SECTION B108
FIRE-FLOW REQUIREMENTS FOR BUILDINGS IN UNPROTECTED AREAS (RESERVED)

SECTION B109
REFERENCED STANDARDS

ICC	IBC—12	International Building Code	B103.1, B104.2, Table B105.1
ICC	IFC	International Fire Code	B105.3
ICC	IWUIC—12	International Wildland-Urban Interface Code	B107.1
ICC	IRC	International Residential Code	B105.2
NFPA	13—13	Installation of Sprinkler Systems	B105.3.1.1, B105.4
NFPA	13D—13	Installation of Sprinkler Systems In One- and Two-family Dwellings and Manufactured Homes	B105.3.1.2
NFPA	13R—13	Installation of Sprinkler Systems in Residential Occupancies up to and including Four Stories in Height	B105.3.1.1
NFPA	1142—12	Standard on Water Supplies for Suburban and Rural Fire Fighting	B107.1
ISO	05—2008	Guide for Determining Needed Fire-Flow	B107.1

SECTION VII

DEVELOPER/ENGINEER AGREEMENT

CITY OF OREGON CITY
DEVELOPER/ENGINEER AGREEMENT
FOR PUBLIC WORKS IMPROVEMENTS

By this agreement, required by the City of Oregon City, _____ agrees to provide the following professional engineering services for the public improvements associated with the private development project,_____ (City Planning File No. _____).

1) Prepare the necessary construction plans for the proposed private development project in accordance with the City of Oregon City standards. Submit plans to obtain approvals from the governing agencies. Attend a pre-construction meeting.

2) Provide field inspection for the project to ensure city material and construction standards are met and approve materials and workmanship as required by the plans and specifications. The Engineer may give written notice that all work be stopped until the Engineer is satisfied that materials and workmanship conform to the applicable specifications.

3) Process changes to approved plans and submit modification requests for approval by the city.

4) Prepare "As-Built"/"Record Drawings per the City of Oregon City Standards for the constructed public works improvements, including a Certificate of Completion, final record drawings in electronic file format and paper, copies of test results and inspection logs, and submit all to the City for their records.

5) The project engineer and owner agree to notify the City Engineer immediately if the above agreement is terminated, or if the engineer for any reason is unable to perform the above duties. The project engineer and the owner understand that a breach of this Agreement may be reason for the City to issue a "Stop Work" order. This agreement is not transferable.

Engineer: _____

Signed Stamp:

Date: _____

Owner/Developer: _____

Authorized Representative of Owner/Developer: _____

Signature: _____

Date: _____