Oceanside Water District (OWD)

PUBLIC WORKS DESIGN STANDARDS

October 1999

Last Updated October 1999

Oceanside Water District (OWD)
5390 Netarts Highway NW
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OCEANSIDE WATER DISTRICT (OWD)
PUBLIC WORKS DESIGN STANDARDS

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PREFACE

These design standards have been developed by the Oceanside Water District (OWD) to provide a uniform set of standards for public improvements. The intent of these standards is to provide guidelines for the construction of public facilities that will provide an adequate service level for the present as well as for future development. The format has been kept brief and no attempt has been made to cover all possible situations or to provide lengthy explanations.

These design standards are intended to be used in conjunction with the District's Public Works Construction Standards. The District is presently using the Standard Specifications of the Oregon Chapter American Public Works Association (APWA) with all amendments as its Public Works Construction Standards. In the event of discrepancies between these standards and the Public Works Construction Standards (PWCS) or between the text of these standards and the standard details, the more stringent requirements as determined by the Public Works Director shall apply.

Copies of these design standards can be obtained from Oceanside Water District (OWD), Oregon , 5390 Netarts Highway NW ,Tillamook, OR 97141 .

It is anticipated that revisions to the design standards will be made from time to time. The date appearing on the title page is the date of latest revision of the text portion of the standards. The date appearing on the details is the date of latest revision of that particular detail.

OCEANSIDE WATER DISTRICT (OWD)
Public Works Design Standards

Division 1

General Requirements

DIVISION 1
GENERAL REQUIREMENTS

1.1 GENERAL

a. These Public Works Design Standards will be cited routinely in the text as the "Standards."

b. Wherever specific supplementary standards are indicated (ie. ASTM C-150), it shall be understood to mean the latest revision thereof.

c. In interpreting these Standards, it is understood that: (1) if the context so requires: (a) the singular pronoun shall be taken to mean and include the plural pronoun; (b) the masculine pronoun shall be taken to mean the feminine and the neuter pronoun; and (2) all captions used therein are intended solely for the convenience of reference and shall in no way limit any of the provisions of these Standards.

d. These Standards shall apply to all improvements within existing and proposed public right-of-way and public utility easements, to all improvements to be maintained by the District, and to all improvements for which the Development Code requires approval by the District. These Standards are to be guidelines for designers and developers in preparing their drawings and for District staff in reviewing drawings. Where minimum values are stated, greater values should be used whenever practical; where maximum values are stated, lesser values should be used whenever practical.

e. Requests for variances to these Standards shall be based on topography, right-of-way, geography or existing physical conditions that impose an economic hardship on the applicant. Request must show that the variance meets the intent of the standards and will not compromise safety, impact other properties or cause an increase in maintenance.

f. The District currently has physical Standards for the construction of streets and related work, sanitary sewers, storm drains and structures and waterlines that cover the standard construction requirements for these facilities within the OWD. Standard Specifications are hereinafter referred to as Public Works Standards (PWS) and can be purchased at the OWD office.

g. In the case of conflicts between the text of these design standards and the standard details, or between the provisions of these design standards and the PWS, the more stringent as determined by the Director of Public Works shall apply. Acceptable materials shall be as outlined in these Design Standards.

h. All other utility improvements, including telephone, electrical power, gas and cable TV shall meet the current standards of the appropriate agency as well as District standards.

i. Traffic Control Devices shall meet the standards of the current Manual on Uniform Traffic Control Devices, including Oregon amendments.

j. All other work not covered by the above standards shall conform to the Oregon State Highway Division (OSHD) Standard Specifications for Highway Construction and Standard Drawings for Design and Construction.

1.2 PURPOSE

a. The purpose of these Standards is to provide a consistent policy under which certain physical aspects of public utility design will be implemented. Most of the elements contained in this document are Public Works oriented and most are related to the development or platting process. However, it is intended that they apply to both public and private work designated herein.

b. These Standards cannot provide for all situations. They are intended to assist but not to substitute for competent work by design professionals. The Standards are also not intended to limit unreasonably any innovative or creative effort that could result in better quality, better 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 District resident.

c. The objective is to develop Standards which will:

1) be consistent with current District Ordinances.

2) provide design guidance criteria to the private sector for the design of public improvements within the OWD.

3) provide public utility improvements designed in a manner to allow economical future maintenance.

4) Develop minimal private utility standards for systems that will impact or potentially impact public streets and/or public utility systems.

1.3 ENGINEERING POLICY

a. The engineering policy of the District requires strict compliance with Oregon Revised Statute 672 for professional engineers. The following requirements shall be applicable to the design of streets, grading plans, sanitary sewers, storm drain systems (including detention systems), and water distribution and storage facilities.

1) All engineering drawings, reports, or documents designated herein shall be prepared by a professional Civil Engineer registered in the State of Oregon, or by a subordinate employee under his direction, and shall be signed by him and stamped with his seal to indicate responsibility for them.

2) It shall be the Design Engineer's responsibility to review any proposed extension, modification or improvement of a public utility system with the District prior to final engineering and design work to determine any special requirements or whether the proposal is permissible. A preliminary review and/or approval of the drawings for construction for any project does not in any way relieve the Design Engineer of his responsibility to meet all requirements of the District or the obligation to protect life, health and property of the public. The drawings for any project shall be revised or supplemented at any time it is determined that the full requirements of the District have not been met.

3) Any engineer having submitted to the District false or inaccurate information of a material nature will be warned of their conduct, and the Oregon State Board of Engineering Examiners will also be advised.

1.4 DEFINITIONS AND TERMS

a. Unless otherwise defined in these Standards, the following definitions, terms and abbreviations shall apply whenever used.

1) As-built Drawings: Drawings prepared by the Design Engineer, signed and dated by the District representative indicating the drawings have been reviewed and revised, if necessary, to accurately show all as-built conditions and construction details.

2) Construction drawings: Drawings prepared by a registered professional engineer, including site plans, plan and profile views of utilities, cross sections, detailed drawings, etc., or reproductions thereof, approved by the District Engineer, which show the location, character, dimensions and details for the work to be done.

3) Cut Sheets: Sheets of tabulated data, indicating stationing, structures, fittings, angel points, beginning of curve, points on curve, end of curves, staking offset, various elevations and offset utility cuts.

4) 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 Director. Similarly, the words approved, acceptable, satisfactory, shall mean approved by, acceptable to, or satisfaction to the Director.

5) Design Engineer: The engineer licensed by the State of Oregon as a Civil Engineer under whose direction plans, profiles and details for work are prepared and submitted to the District for review and approval.

6) Director/Director of Public Works/Public Works Supervisor/District Superintendent: As used herein, these titles refer to the person(s) designated by

the District Board with responsible charge of the public infrastructure under District jurisdiction, or his/her authorized representative. For purposes of this document, the terms are considered to be interchangeable.

7) District: The Oceanside Water District, Oregon.

8) Dwelling Unit: A facility designed for permanent or semi-permanent occupancy and provided with minimum kitchen, sleeping and sanitary facilities for one family.

9) Easement: Areas along the line of public utilities that are outside of dedicated right-of-way. Easements shall be prepared on District forms granting rights along the public utility line to the District.

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

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

12) Owner: Any individual, partnership, firm or corporation by whom the Design Engineer has been retained or who, as a property owner, is making arrangements with the District.

13) Person: Individual, firm, corporation, association, agency or other entity.

14) Plans: See Construction Drawings.

15) Preliminary Review: Review of the construction drawings by the District as outlined in these standards. All District comments and provisions of these design standards must be addressed prior to final review and approval for construction.

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

17) 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 free of all encumbrances, within which the District shall have the unencumbered right to install and maintain public utilities.

18) Roadway: All of that portion of the right-of-way used, for vehicle movement, which exists between the curbs or proposed curbs or proposed curb lines.

19) Single Family Dwelling: Any residential building designed to house one family.

20) Standard Details: The drawings of structures or devices commonly used on District work and referred to on the construction drawings. Also called Standard Plans.

21) Street or Road: Any public highway, road, street, avenue, alley, way, easement or right-of-way to be used for vehicle movement.

22) Traveled Way: That portion of the roadway for the movement of vehicles, exclusive of shoulder and auxiliary lanes.

1.5 LOCATION OF UTILITIES WITHIN RIGHT-OF-WAY

a. The standard details indicate the general required location for each utility within the public right-of-way.

b. Installation of private utilities in a common trench with water, sanitary sewer or storm drain mainlines is prohibited. A minimum of 3 feet of horizontal separation must be maintained between public and private utilities except at crossings.

c. Utility service companies proposing to install major utility systems larger than typically required to serve local users and which cannot conveniently be relocated in the future will be required to prepare detailed drawings showing how the proposed system can be installed within the right-of-way without conflicting with existing or proposed District utilities. Drawing requirements may include but not be limited to plan and profile of proposed systems based on a detailed topographic survey.

1.6 PROVIDING FOR FUTURE DEVELOPMENT

a. All public improvements shall be designed as a logical part of the development of the surrounding area.

b. Water systems shall be sized to accommodate the entire service area that they will ultimately serve.

c. Utilities and street improvements shall be extended to the boundaries of the development to provide for future extensions to the adjoining areas and prevent adjoining properties from becoming landlocked.

d. The District may require over-sizing of utility lines to accommodate future growth of the District.

e. Where existing District utility lines do not adjoin the proposed development or the capacity of existing lines is inadequate, the developer will be required to extend new utility lines to the development as necessary.

f. Where existing roadway improvements do not extend to the proposed development or the existing roadways to the proposed development are not adequate to serve the

development, the developer may be required to improve the roadways to the development.

1.7 TIME LIMITS FROM DRAWING APPROVAL TO CONSTRUCTION

a. The Developer shall obtain a construction permit and begin construction within six (6) months from the time the construction drawings are approved by the District Engineer. If construction does not begin within this period, the approvals of the construction drawings shall be null and void. Renewal of the approval for the construction drawings may result in additional conditions to meet new standards, changed conditions or new information discovered since the original approval.

1.8 PHASED DEVELOPMENT

a. In the case of a development approved to be constructed in phases, the construction drawings for each phase shall be capable of standing alone.

b. Approval by the District of construction drawings for each phase of a phased development shall be independent of the approval for all other phases.

c. The intent of these requirements is that the time limits between approval of the construction drawings by the District and the time by which construction must begin shall apply to each phase independently.

1.9 REVIEW PROCEDURE

a. Pre-design Conference: The developer is encouraged to meet with the Director of Public Works and the District Engineer prior to final design of the proposed improvements. It shall be the developer's responsibility to provide the District Engineer with base maps showing existing utilities and proposed street improvement limits prior to the pre-design conference.

b. Three (3) sets of complete construction drawings shall be submitted to the District for preliminary review. Submittal requirements are as outlined herein, and shall include a unit price engineer's estimate acceptable to the District Engineer and any required review fees. Incomplete submittals will be returned without review.

c. Upon completion of the preliminary review, the District will return one (1) set of drawings outlining the required revisions. In order to be entitled to further review, the applicant's engineer must respond to each comment of the prior review. All submittals and responses to comments must appear throughout to be a bona fide attempt to result in complete drawings. Resubmittals shall consist of a minimum of three (3) sets of drawings.

d. Once the preliminary review has been completed and required revisions made, the Developer shall circulate the drawings to all utility service companies within the District and other agencies as required.

e. Prior to final approval of the construction drawings, all proposed drawings from utility service companies must be received and approved by the District. Approvals from other agencies with jurisdiction must also be received, including but not limited to the Oregon Health Division (OHD), Department of Environmental Quality (DEQ), Department of Transportation (ODOT) and Tillamook County wherein each has jurisdiction.

f. The applicant is responsible for the coordination with the various utilities and agencies during design and construction. The utilities and agencies may include those shown in the Appendix.

g. Upon final approval of the drawings, submit a minimum of ten (10) copies of the revised drawings to the District to be stamped as approved for construction. Additional sets may be submitted at the developer's option.

h. Prior to issuance of the public utility construction permits, the Developer shall provide the District with the following:

1) Copy of an approved (by District Attorney) Developer/District Construction Agreement signed and notarized by the Developer and the Developer's engineer.
2) Any required permit fees.
3) Recorded copies of all off-site easements. Executed and notarized copies of easements for all public utilities that are constructed prior to the recording of a final plat.
4) Proposed Construction Schedule.
5) Certificates of insurance, minimum limits as outlined in the Appendix. Oceanside Water District and District Engineer shall be named as additional insured.
6) Evidence of Workman's Compensation coverage from contractor performing the work.
7) Any required Waiver of Remonstrance agreements.
8) Signed certification that the Developer has copies of and will conform to requirements of the most current revision of the OWD Public Works Construction Standards (PWS).
9) Other submittals specific to this project.

1.10 SUBMITTAL REQUIREMENTS

a. Survey: All designs shall be based off of a complete topographic survey, including but not limited to the following:

1) Surface features.
2) Subsurface features.
3) Existing utilities (public and private).
4) Property lines/monuments.
5) Right-of-way lines & centerline monuments.

b. Drawing Submittal: The drawing submittal shall include the following as applicable unless otherwise approved by the District Engineer. The following is a general overview of drawing requirements, but is not intended to be exclusive. All requirements of the individual divisions of the standards shall be satisfied.

1) Construction drawings shall be submitted on 22" x 34" blueline or blackline sheets unless otherwise approved by the District Engineer.

2) District plan review fees as required.

3) Cover Sheet

4) Overall drainage, utility and street lighting plan.

5) Site grading plan where applicable.

6) Plan and profile for the following public utilities:

a) Streets
b) Water as specified
c) Sanitary sewers as required to show lack of conflict
d) Storm drains as required to show lack of conflict

7) Erosion control plan.

8) Standard details shall be included on the construction drawings.

9) Copies of all easements, including slope easements, for all utilities to be constructed. Easements shall be executed and notarized for all public utilities that are constructed prior to the recording of a final plat. Easements shall be worded such that no trees, permanent structures or improvements including parallel fences shall be placed or constructed on the easement. Easements shall be a constant width between manholes, valves or other in-line structures. Easement width shall be based on the deepest portion of the line between such structures. See the Appendix for standard easement forms.

10) Proposed private utility plans (final review).

11) Engineer's unit price construction cost estimate acceptable to the District Engineer or bid results (preliminary and final review). Cost estimates shall include a line item for street lighting.

12) The submittal may also be required to include a traffic study and a traffic control plan.

c. General

1) A title block shall appear on each sheet of the drawing set and shall be placed in the lower right-hand corner of the sheet, across the bottom edge of the sheet or across the right-hand edge of the sheet. The title block shall include the name of the project, the sheet title and number, the name of the engineering firm, engineer's stamp, date and revision blocks.

2) A north arrow shall be shown on each sheet containing plan views and adjacent to any other drawing which is not oriented the same as other drawings on the sheet.

3) The scale shall be 1"=10', 20', 40' or 50' horizontal and 1"=2', 4' or 5' vertical for all drawings except structural or mechanical drawings. The scale of corresponding plan views and profiles shall be the same.

4) **In cases where streets or public utilities exist or will be reconstructed, plan view scales shall not exceed 1" = 20'.**

5) Each plan, profile and detail shall be labeled under the drawing. The scale for the plan, profile, or detail shall be noted under the title. Details not drawn to scale shall be so noted.

6) All detail drawings, including standard detail drawings, shall be included on the drawing sheets.

7) A complete legend of all symbols used shall be provided at the front of each drawing set or on the appropriate pages. In general, existing utilities shall be shown with a lighter line weight than proposed utilities.

8) Letter size shall not be smaller than 0.10-inch high.

d. Cover Sheet

1) The first sheet (Cover Sheet) of all drawing sets shall include the following as a minimum:

a) Project name.
b) Design Engineer's name, address, telephone and fax number.
c) Developer's name, address and telephone number.

d) Vicinity Maps showing the location of the project in respect to the nearest major street intersection and a minimum of 500 feet around the site.

e) Legend including all symbols and line types used on the construction drawings.

f) General construction notes matching format and content of notes in the Appendix.

g) Sheet index located near lower right corner.

e. Overall Drainage, Utility and Street Lighting Plan.

1) The overall drainage and utility plan shall show the following as a minimum:

a) The location and elevation of a National Geodetic Survey, United States Geological Survey, State Highway, Tillamook County or OWD bench mark which the elevations shown are based shall be shown or noted. Temporary bench marks on or near the project site shall also be shown.

b) Right-of-way lines, property lines, easement lines including those outside the project but intersecting or within 150 feet of the project boundaries.

c) Existing and proposed streets, curbs, sidewalks, handicap ramps and driveways within the project and within 150 feet of the project boundaries.

d) Existing and proposed sanitary sewers, storm drains, waterlines and appurtenances within the project and within 150 feet of the project boundaries.

e) Existing private utilities within the project and within 150 feet of the project boundaries.

f) Lot or parcel numbers, street names and other identifying labels. New street names are subject to the approval of the District.

g) Location and description of existing survey monuments, including but not limited to section corners, quarter corners and donation land claim corners within the limits of the work area.

h) Public and private utilities and other facilities to be relocated.

i) Street light and area light pole locations.

j) Existing drainage patterns within the project and within 150 feet of the project boundaries.

k) Floodplain, floodway and wetland boundaries, including floodplain elevation with FEMA map reference.

f. Site Grading Plan

1) A site grading plan is required for subdivisions, major partitions or minor partitions involving street improvements with cuts or fills exceeding 2 feet.

2) A site grading plan is required for projects subject to site design review, including commercial, industrial, or multi-family developments.

3) The site grading plan shall show proposed finished grade and parcel corner elevations, with the existing and proposed contours shown at one (1) foot intervals and extended a minimum of 100 feet beyond the improvements.

4) The site grading plan shall show all drainage systems and proposed erosion control facilities.

g. Plan Views

1) General: Information required on the overall utility plan shall be shown on the plan views as applicable. In addition, the following shall be shown:

a) Utilities and vegetation in conflict with the construction or operation of the street and public utilities. Vegetation to include trees greater than 6 inches in diameter and landscape plantings within the right-of-way and easement areas.

b) Public and private utilities to be relocated.

c) Match lines with sheet number references.

d) Additional information as outlined below or as required by the District based on unique or unusual features of the project.

2) Streets

a) Except as otherwise specified, conform to requirements of Tillamook County or other agency with jurisdiction. The following information shall be shown for all streets within which sanitary sewer improvements are to be constructed, as well as utility access roadways required along easements.

b) Street stationing shall be tied to existing property corners, centerline of intersections, and/or existing street monuments.

c) Location, alignment and stationing of existing streets and proposed street centerline and curb faces. Location of all curbs, driveways, edge of

pavement, etc. shall be dimensioned from right-of-way centerline, easement boundary or other means so that its location is clearly defined.

d) Location of existing and proposed street centerline monuments.

e) Location of the low points of street grades and curb returns.

3) Storm Drains

a) Except as otherwise specified, conform to requirements of Tillamook County or other agency with jurisdiction.

b) Sufficient information must be provided to the District to determine potential conflicts with existing or proposed utilities.

4) Sanitary Sewer

a) Except as otherwise specified, conform to requirements of Netarts Oceanside Sanitary District (NOSD) or other agency with jurisdiction.

b) Sufficient information must be provided to the District to determine potential conflicts with existing or proposed utilities.

5) Water Distribution

a) Location, stationing and size of existing and proposed water mains and appurtenances.

b) Each valve and fire hydrant shall be identified and stationed to facilitate checking the plan views with the profile.

c) Location of all waterlines and hydrants shall be dimensioned from right-of-way centerline, easement boundary or other means so that its location is clearly defined.

d) Waterline stationing shall be independent of the street stationing.

h. Profile Views

1) General: Profile views shall conform to the requirements and show the information outlined under this section as applicable:

a) Profile views shall be to the same horizontal scale and on the same sheet as the corresponding plan view.

b) Match lines with sheet number references.

2) Streets

a) Except as otherwise specified, conform to requirements of Tillamook County or other agency with jurisdiction. The following information shall be shown for all utility access roadways required along easements.

b) Original ground profile along the centerline or roadway edge as appropriate. Ditch invert profiles shall be shown where waterlines are proposed under ditches.

c) Stationing, elevations and percent slopes for centerline or edge of roadway profiles.

d) Beginning point of all vertical curves, points of vertical intersection, end of vertical curve, length of vertical curve, K-value and design speed, and low point of vertical curve if a sag curve.

e) Projection of the profile of streets that may be extended or reconstructed in the future. The projected profile shall extend a minimum of 200 feet beyond the proposed work limits. The District may require profiles to be extended further where necessary due to topography or to demonstrate ability to tie to existing streets. Projected profiles shall be designed to be compatible with the restraints of the terrain.

3) Storm Drain

a) Except as otherwise specified, conform to requirements of Tillamook County or other agency with jurisdiction.

4) Sanitary Sewer

a) Except as otherwise specified, conform to requirements of Netarts Oceanside Sanitary District (NOSD) or other agency with jurisdiction.

5) Water Distribution

a) Waterline profiles shall be provided for all waterlines within existing right-of-ways or along alignments paralleled (within 15 feet) or crossed by existing public utilities. Waterline profiles will not be required for new waterlines within new right-of-ways unless required to prevent conflicts with proposed utilities.

b) Profile of existing and proposed ground surface along centerline of pipe, as well as existing and proposed pavement surface of adjacent streets (where applicable).

c) Location of valves, fittings, fire hydrants and other appurtenances with all valves and fire hydrants numbered and stationed to match the corresponding plan view.

d) Size, pipe material and class, depth of cover and class of backfill and surface restoration.

e) All existing public and private utilities crossing the profile and any existing utilities which potentially are in conflict with construction of the improvements.

i. Easements

1) Private utility easements a minimum of fifteen (15) feet wide shall be provided for all private water lines outside of public right-of-ways or the boundaries of the property being served.

1.11 VARIANCES TO DESIGN STANDARDS

a. Request for Variance to Specifications/Standards

1) Variances to specifications or standards may be requested as outlined below. It is to be noted that if the requested variance involves public safety, the District will rule in favor of safety.

b. Variance Process

1) Submittal

a) Requests for variance shall be submitted in writing to the District Engineer. This written request shall state the desired variance, the reason for the request and a comparison between the specification/standard and the variance as far as performance, etc.

b) Any variance of these Standards should be documented and referenced to a nationally accepted specification/standard. The use thereof shall not compromise public safety or intent of the District's Standards.

2) District's Review

a) The variance request shall be reviewed by the District Engineer who shall make one of the following decisions:

(1) Approve as is,

(2) Approve with changes, or

(3) Deny with an explanation.

b) Approval of a request shall not constitute a precedent.

3) Appeal

a) Applicant may appeal the District Engineer's decision to the District Board.

c. Criteria for Variance of Specification Standards

1) The District Engineer may grant a variance to the adopted specifications or Standards when all of the following conditions are met:

a) Topography, right-of-way or other geographic conditions impose an economic hardship on the applicant and an equivalent alternative that can accomplish the same intent is proposed. Variances to self-imposed hardships shall not be allowed. The variance requested shall be the minimum variance that alleviates the hardship.

b) A minor change to a specification or standard is required to address a specific design or construction problem which, if not enacted, will result in an undue hardship.

c) An alternative design is proposed which will provide a plan equal or superior to these Standards. In considering the alternative, the District Engineer shall consider appearance, durability, cost of maintenance, public safety and other appropriate factors.

1.12 PRECONSTRUCTION CONFERENCE

a. A preconstruction conference shall be scheduled before issuance of the public utility construction permits. The meeting is to include the developer's representative, developer's engineer and prime contractor, and all affected utility companies. The purpose of the conference is to discuss the construction schedule and times of the work which require special coordination.

b. The Developer shall be responsible for notifying the private utility companies of the time and location of the preconstruction conference, and requesting that a representative of each utility be present. The Developer may be required to submit proof of notification to the District prior to the preconstruction conference. Copies of notification letters sent to the utility companies by the Developer are acceptable.

1.13 CONSTRUCTION INSPECTION

a. General

1) All public construction shall be inspected by a professional engineer licensed in the State of Oregon or a qualified individual under his supervision as required in the Developer-District Agreement.

2) An engineer whose firm, or any member of the firm, has a corporate, partnership or any form of real property interest in the development for which the improvements are required cannot be designated inspecting engineer. The inspecting engineer's relationship to the project must be solely that of a professional nature.

3) It shall be the policy of the District not to provide full inspection services for non-public funded public improvements. It shall be the Developer's responsibility to provide an engineer to perform these services.

4) These inspection requirements are not applicable to individual sidewalk, driveway or service lateral permits for single residences. If the project scale is such that the retention of an independent inspecting engineer is not warranted, the Developer may request that the District provide these services. If the District agrees to provide these services, the Developer shall be responsible to reimburse the District for any costs incurred for these inspection services.

b. District Activities

1) Inspection services provided by the District shall include:

a) Liaison between the inspection engineer and the District;

b) Monitoring of work progress and performance testing as deemed desirable;

c) The performance of administrative and coordination activities as required to support the processing and completion of the project;

d) The issuance of stop work orders upon notifying the inspection engineer of the District's intention to do so.

e) Operate all valves, including fire hydrants, on existing waterlines.

2) In addition, the District shall be notified a minimum of 48 business hours (2 business days) prior to the following tests and inspections so that a District representative may be present to witness the inspections or tests.

a) Water Distribution System

(1) Pressure tests;

(2) Disinfection.

c. Developer's Inspecting Engineer's Activities

1) The inspecting engineer of record must be registered to practice engineering in the State of Oregon. Material testing not performed by the inspecting engineer must be accomplished by a recognized testing firm or another registered engineer.

2) ***The engineer must personally perform all activities marked by an (*) and must supervise all individuals performing other delegated activities.**

3) The following minimum activities are required of the designated inspecting engineer:

a) *Execute a form accepting responsibility:

b) *Attend preconstruction conference and distribute approved construction drawings to contractor, subcontractors and utility companies.

c) Obtain and use a copy of District-approved construction drawings and specifications;

d) Notify the District 48 business hours (2 business days) before the start of construction or resumption of work after shutdowns, except for normal resumption of work following Sundays or holidays.

e) Call to the District's attention within two (2) working days all drawing changes, material changes, stop work orders or errors or omissions in the approved drawings or specifications.

f) Maintain records which contain at least the following information and submit copies to the District on a weekly basis:

(1) Site Visits

(a) Date and time of site visits
(b) Weather conditions, including temperature

(c) A description of construction activities

(2) Statement of directions to change drawings, specifications, stop work, reject materials or other work quality actions;

(3) Public agency contacts which result in drawing changes or other significant actions;

(4) Perceived problems and action taken;

(5) Final and staged inspections;

(6) Records of all material, soil and compaction tests.

g) Provide all surveying services necessary to stake the project prior to and during construction.

h) Review and approve all aggregate, pipe and other materials to ensure their compliance with District Standards;

i) *Approve all drawing or specification changes in writing and obtain District approval prior to the performance of the work;

j) Monitor and concur in construction activities to ensure end products meet District specifications;

k) *Perform or have performed material, compaction and other tests required to ensure District specifications are met;

l) File a completion report which contains:

(1) The original of the project completion certification;

(2) A complete set of blue-line as-built drawings;

(3) The results of waterline tests, material tests, compaction tests.

m) Submit final reproducible as-built drawings conforming to the requirements outlined herein.

1.14 AS-BUILT DRAWINGS

a. As-built drawings prepared by the design engineer are required whenever the work results in new or modified public improvements and shall describe all revisions to the previously approved construction drawings.

b. Unless otherwise approved by the District Engineer, as-built drawings for sanitary sewer and storm drains shall be based off of an as-built survey conducted by a land surveyor registered to practice surveying in the State of Oregon.

c. Show all below grade private utility vaults and street crossing, as well as all above grade transformers, pedestals, etc.

d. The location of all utility stubs shall be shown on the as-builts based on distance ties from two permanent points. The tie points shall be immovable structures, such as property pins, street monuments or the center of manholes.

e. Legible blue-line or black-line copies of the as-built drawings shall be submitted to the District prior to the final walkthrough inspection and submittal of the mylar as-builts. Following the final walkthrough, submit approved as-built drawings on 3 mil minimum thickness mylar to the District Engineer.

Division 5

Water Distribution

DIVISION 5
WATER DISTRIBUTION

5.1 PURPOSE

a. In addition to the purposes outlined under Division 1 of these Design Standards, the purpose of these Standards is to ensure the development of a water distribution system which will:

1) be of adequate design to meet all expected domestic, commercial and industrial demands including fire flows within the design life;

2) have sufficient structural strength to withstand all external loads which may be imposed;

3) be of materials resistant to both corrosion and erosion with a minimum design life of 75 years;

4) be economical and safe to build and maintain;

5) meet all design requirements of the Oregon Health Division (OHD).

Alternate materials and methods will be considered for approval on the basis of these objectives.

b. These Standards cannot provide for all situations. They are intended to assist but not to substitute for competent work by professional design engineers.

5.2 APPLICABILITY

a. These Standards shall govern all construction and upgrading of all public water distribution facilities in the OWD and applicable work within its service areas.

b. Permanent water distribution facilities shall be provided to all properties within the OWD in accordance with these Standards. This shall generally be interpreted to mean that permanent water distribution facilities shall be provided for existing legal lots of record at the time development occurs, and for new legal lots of record created by a major or minor partitioning or subdivision of land at the time of partitioning or subdivision.

5.3 SPECIAL ITEMS

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

1) Water Distribution Pump Stations
2) Reservoirs
3) Wells
4) Treatment Plants
5) Pressure Regulating Devices
6) Flow Measurement Devices
7) Relining of the Existing Water Mains
8) Chemical Addition or pH Adjustment
9) Bridge Crossings
10) Creek or Stream Crossings

b. Review and approval of the above special items by the Director of Public Works shall be required. When requested by the District, full design calculations shall be submitted for review prior to approval. Special items may also require review and approval by the Oregon Health Division.

5.4 APPROVAL OF ALTERNATE MATERIALS AND METHODS

a. Any alternate material or method not explicitly approved herein will be considered for approval on the basis of the objectives set forth in Paragraph 5.1, Purpose. Persons seeking such approval shall make application in writing to the Director of Public Works. Approval of any major deviation from these Standards shall be in written form. Approval of minor matters will be made in writing, if requested.

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

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

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

5.5 CONSTRUCTION DRAWINGS

a. Construction drawings shall conform to the requirements of Division 1 of these Design Standards.

b. Detail drawings shall be included on the construction drawings for all water system appurtenances including valves, blowoffs, hydrants, service connections, couplings, etc.

5.6 STANDARD DETAILS

a. Standard details included in the appendix are supplemental to the text of these design standards and show the District's minimum requirements for the construction of standard structures and facilities.

b. In the case of conflicts between the text of these design standards and the standard details, the more stringent as determined by the Director of Public Works shall apply.

c. As required by Division 1 of these standards, all applicable standard details shall be included on the construction drawings.

5.7 DEFINITIONS AND TERMS

a. In addition to the definitions contained in Division 1 of these Standards, the following definitions may apply particularly to water distribution systems. Unless otherwise defined in these Design Standards, the following definitions and abbreviations shall apply whenever used. Other definitions as outlined in the Uniform Plumbing Code shall also apply.

1) Abbreviations: Acceptable abbreviations for showing types of new and existing pipe materials on the plans are as follows:

   a) CI - Cast Iron
   b) DI - Ductile Iron
   c) PVC - Polyvinyl Chloride
   d) STL - Steel
   e) AC - Asbestos Cement

2) Air Gap Separation: A physical vertical separation between the free-flowing discharge end of a potable water supply and the rim of any open, non-pressurized receiving vessel.

3) Approved Backflow Prevention Assembly: An assembly that has been investigated and approved by the Oregon Health Division for preventing backflow.

4) Backflow: The flow of water or other fluids in a direction opposite to the normal flow. (See Back-Siphonage.)

5) Back-Siphonage: The flowing back of used, contaminated, or polluted water from a plumbing fixture or vessel into a water supply pipe due to a negative or reduced pressure in such pipe.

6) Building Supply: 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 on the lot. Building supply shall also mean customer line.

7) Cross Connection: Any connection or arrangement, physical or otherwise, between a potable water supply system and any plumbing fixture or any tank, receptacle, equipment or devise, 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 condition.

8) Customer Water Supply System: The water supply system of a building, premises or private system consists of the all supply pipe from the customer side of the water meter, including water service pipes, and the necessary connecting fittings, control valves, pipe and all appurtenances carrying or supplying potable water in or adjacent to the building premises served.

9) Distribution Mains: All mains which are not designated as transmission mains, and which are used for supply the individual consumer. As a general rule these are the smaller mains in the water supply system.

10) Distribution System: Distribution main pipelines, pumping stations, valves and ancillary equipment used to transmit water from the supply source to the service line.

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

12) Double Detector Check Valve Assembly: A line-sized approved double check valve assembly with a parallel meter and meter-sized approved double check valve assembly. The purpose of this assembly is to provide double check valve protection for the distribution system and at the same time provide partial metering of the fire system showing any system leakage or unauthorized use of water.

13) Fire Hydrant Assembly: Fire hydrant, hydrant lead, mainline hydrant valve, mainline tee, and thrust restraint at the hydrant and the mainline tee.

14) Fire Protection Services: A connection to the public water main intended only for the extinguishment of fires and flushing necessary for its proper maintenance. All fire services connected to building sprinkler systems shall have a double detector check assembly.

15) Fixture Unit Equivalents: The unit flow or demand equivalent of plumbing fixtures as tabulated in the Uniform Plumbing Code.

16) Health Division: Oregon Department of Human Resources Health Division.

17) Hydrant Lead: The line connecting the fire hydrant to the District main or private fire line.

18) Irrigation Service: A metered connection intended for seasonal use and delivering water that is not discharged to the sanitary sewer.

19) ISO: Insurance Service Office.

20) Mainline Hydrant Valve: The isolation valve between the District water main or private fire line and the fire hydrant.

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

22) Private Distribution System: A privately owned and maintained water distribution system serving an industrial or commercial subdivision or a multi-building development on a single lot served through a master meter installed at the approved location. Private distribution systems must have a single entity responsible for the system. Resale of water without written approval of the District shall be prohibited.

23) Service Line: The waterline or pipe extending from the distribution main to the water meter, backflow prevention device, or private fire system double check valve.

24) Transmission Mains (Supply Lines): Mains that are used for transporting water from the source of supply and storage reservoirs to the centralized point of distribution and distribution reservoirs. Transmission mains may or may not supply individual consumers, but they are sized and located to transport water from centralized points of distribution to various points of interconnection with the grid system and centralized points of consumption.

25) 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 State Plumbing Specialty Code."

26) Water Main: A water-supply pipe for public or community use.

27) Water Master Plan: The Water System Master Plan for OWD, Oregon, most recent revisions.

5.8 MATERIALS

a. General

1) Unless otherwise approved by the District Engineer, materials shall conform to the minimum requirements outlined herein and as shown on the Standard Details. This listing is not intended to be complete nor designed to replace the District's Public Works Construction Standards (PWS).

2) In the case of conflicts between the provisions of these design standards and the PWS, the more stringent as determined by the Director of Public Works shall apply. Acceptable materials shall be as outlined in these Design Standards.

3) It is not intended that materials listed herein are to be considered acceptable for all applications. The design engineer shall determine the materials suitable for the project to the satisfaction of the District Engineer.

4) All materials or products which will come in contact with or which will be used on material or products which will come in contact with potable water shall conform to the requirements of OAR 333-61-087, Product Acceptability Criteria or the National Sanitation Foundation (NSF) Standard 61, Drinking Water System Components - Health Effects as approved by the Oregon Health Division.

b. Pipe

1) 4-inch Through 12-inch PVC (ASTM D-2241, Class 200)

a) PVC pressure pipe 4-inches through 12-inches in diameter shall conform to the requirements of ASTM D-2241, NSF approved. PVC pipe shall be Class 200 pipe with wall thickness equivalent to a standard dimension ratio (SDR) of 21.

2) 14-inch Through 24-inch PVC (AWWA C-905)

a) PVC pressure pipe 12-inches through 24-inches in diameter shall conform to the requirements of AWWA C-905 (design stress of 4000 psi), NSF approved, with cast iron pipe equivalent (CI) outside diameter dimensions. PVC pipe shall be Class 165 pipe with wall thickness equivalent to a standard dimension ratio (SDR) of 25.

3) Ductile Iron

a) Where ductile iron pipe is used for water distribution, pipe shall be Class 52 ductile iron pipe conforming to AWWA C-151, and cement-mortar lined and seal coated in accordance with AWWA C-104.

b) All ductile iron pipe and fittings buried underground shall be coated on the outside with a standard coating of black bituminous paint a minimum of 1 mil thick unless otherwise specified.

c. Fittings

1) Mechanical Joint Fittings

a) All MJ tees, crosses, elbows, reducers, adapters, combinations thereof, and other miscellaneous fittings 4-inches through 24-inches in diameter shall be ductile iron compact fittings in conformance with AWWA C-153.

b) The minimum working pressure for all MJ cast iron or ductile iron fittings 4-inches through 24-inch in diameter shall be 350 psi.

2) Flanged Fittings

a) All flanged tees, crosses, elbows, reducers, adapters, combinations thereof, and other miscellaneous fittings 4-inches through 48-inches in diameter shall be cast iron or ductile iron fittings in conformance with AWWA C-110.

b) The minimum working pressure for all flanged cast iron or ductile iron fittings shall be 250 psi.

d. Couplings

1) Couplings shall be limited in their application to connection of new pipe work to existing waterlines, temporary installations, and where specifically approved by the District Engineer.

2) Couplings shall be mechanical joint solid sleeve or mechanical joint split sleeve type couplings consisting of a ductile iron sleeve, ductile iron follower rings, rubber gaskets, and corrosion-resistant bolts and hex nuts.

3) Mechanical joint couplings shall have minimum pressure ratings that will accommodate maximum pressures that will be experienced during hydrostatic and leakage testing.

4) Solid sleeve couplings shall be Romac, Clow, Smith-Blair or approved equivalent.

5) Dresser type couplings are not an approved option unless specifically approved by the Director of Public Works. Applications shall be limited to transitions between pipe types for which mechanical joint couplings are not available.

e. Mainline Valves

1) General

a) All mainline valves and appurtenances shall have the name, monogram, or initials of the manufacturer cast thereon. They shall be built and equipped for the type of operation as specified herein or as shown on the drawings.

2) Valve Operators

a) All valve operators shall be totally enclosed traveling nut type manual operators, sealed and lubricated for underground service.

b) All buried valves shall be supplied with a 2-inch square operating nut. Nuts shall have a flanged base on which shall be cast an arrow at least 2-inch long with the word "OPEN" cast on the nut to clearly indicate the direction of opening.

c) Extension stems shall be provided for buried valves when the operating nut is four (4) feet or more below finished grade. Extension stem shall extend to within twelve (12) inches (maximum) of the finished ground surface and shall be provided with spacers that will center the stem in the valve box.

3) Valve Boxes (VB)

a) All buried valves shall be provided with valve boxes.

b) All buried valves shall be provided with valve boxes. Valve boxes shall be as shown on the Standard Details.

4) Gate Valves (GV)

a) For criteria regarding acceptable location for use of gate valves, see Section 5.16.

b) All gate valves shall be resilient wedge gate valves conforming to the requirements of AWWA C-509, except as herein modified.

c) Gate valves shall be epoxy coated iron-body, resilient wedge non-rising stem gate valves. The wedge shall be cast iron completely encapsulated in an elastomer covering with polymer guide bearing caps on each side. The valves shall have a full diameter waterway with no grooves or recesses at the valve seat location. Flanges, where required, shall be 125 pound, full faced, drilled per ANSI B16.1.

d) Valves shall be tested and certified by the manufacturer for shut-off at a working pressure of 200 psi and a minimum test pressure of 300 psi.

e) Gate valves shall be Mueller A-2360, Waterous Series 500 or approved equivalent.

5) Butterfly Valves (BFV)

a) For criteria regarding acceptable location for use of butterfly valves, see Section 5.16.

b) All butterfly valves shall conform to AWWA C-504, except as herein modified.

c) Butterfly valves shall be epoxy coated short body type AWWA Type-B valves. Flanges, where required, shall be 125 pound, full faced, drilled per ANSI B16.1.

d) Valve operators shall be enclosed traveling nut type manual operators, sealed and lubricated for underground service, and shall be rated for submerged operation up to 10 psi (±23 feet).

e) Valves shall be tested and certified by the manufacturer for shut-off at a working pressure of 150 psi and a minimum test pressure of 300 psi.

f) Butterfly valves shall be Pratt Groundhog series, or approved equivalent.

6) Shop Painting

a) All valves shall be furnished with a fusion-bonded epoxy coating inside and outside conforming to the requirements of AWWA C-550.

7) Toning Wire

a) A continuous insulated 12 gauge stranded copper toning wire shall be supplied with non-metallic pipe. Insulation shall be blue in color for potable water piping.

b) Additional wire shall be supplied as necessary to allow the toning wire to be looped up at all valve boxes on all lines.

f. Service Pipe and Fittings

1) For criteria regarding tapping requirements, see Section 5.19.

2) All services that are saddle tapped shall use ductile iron service saddles with stainless steel bolts and clamps. All ductile iron service saddles shall be furnished with a fusion-bonded epoxy coating conforming to the requirements of AWWA C-550.

3) Unless otherwise shown on the drawings, single residential service pipe shall be 1-inch diameter minimum. Double service lines to separate meters shall not be allowed.

4) 1-inch Services

a) Unless otherwise specified herein, water service lines shall be Driscopipe 5100 Ultra-Line (PE 3408) high density polyethylene pipe, iron pipe size OD, SDR 9 (200 psi working pressure rated) conforming to ASTM D-2737, 1-inch minimum diameter.

b) All corporation stops shall be brass ball valve corporation stops rated to 300 psi with iron pipe thread inlet and compression outlet to adapt copper pipe. Corporation stops shall be Ford FB-1100 or approved equivalent.

c) Each individual water service line shall be equipped with a locking ball valve meter stop assembly at the inlet to the meter. All meter stop assemblies shall be brass with copper pipe connector as appropriate and outlet for meter coupling.

d) Meter stops for 1-inch single meter stops shall be locking angle ball valves with CTS PAC joint inlet. 1-inch meter stops shall be Ford BA43-444W, or approved equivalent.

e) Service line couplings shall be CTS pack joint style couplings. Couplings shall be Ford C44 coupling or approved equivalent.

5) 1½-inch and Larger Services

a) 1½-inch and 2-inch water service lines shall be Driscopipe 5100 Ultra-Line (PE 3408) high density polyethylene pipe, iron pipe size OD, SDR 9 (200 psi working pressure rated) conforming to ASTM D-2737.

b) 1½-inch and 2-inch water services shall be provided with high bypass coppersetters for flanged meters, Ford 70 series or approved equivalent conforming to standard details.

(1) The coppersetter shall be provided with ball valves on the inlet and outlet, with inlet valve provided with a lockwing and the outlet valve provided with a handle.

(2) The bypass line shall be 1-inch diameter minimum, and shall be provided with a lockwing ball valve.

c) 2-inch and larger services shall have a mainline tee with flanged side outlet and flanged resilient wedge gate valve conforming to the requirements specified herein.

d) 3-inch and larger water service lines shall be reviewed on a case-by-case basis. Pipe and fittings shall be as required by the District Engineer and the Director of Public Works.

g. Water Meter Boxes

1) Unless otherwise approved by the Director of Public Works, all meter boxes must be as shown below:

WATER METER BOXES			
Service Line Size	Non-Traffic Area	Traffic Area	Inside Dimensions
1-inch	[1]Brooks 38-H	[1]Brooks 38-TR	13" x 24"
1½-inch	[1]Brooks 66-S(CI)	[1]Brooks 66-TR	17" x 30"
2-inch	[1]Brooks 66-S(CI)	[1]Brooks 66-TR	17" x 30"
3-Inch and larger	Vault built to Public Works requirements w/remote read head.		
[1] -or approved equivalent. All meter box and vault lids shall be provided with the touch-read knockout to allow the future installation of touch read sensors by the District.			

2) Meter boxes outside of traffic areas shall be reinforced concrete boxes with reinforced concrete covers and cast iron hinged reading lids.

3) Meter boxes within traffic areas shall be reinforced concrete boxes with steel covers and cast iron reading lids.

h. Fire Hydrants

1) Unless otherwise required by the Fire District, all fire hydrants shall conform to the following:

a) All fire hydrants shall be improved, dry barrel, 5-1/4-inch compression type valve, traffic model.

b) Fire hydrants shall be equipped with two 2-1/2-inch hose ports (NST), one 4-1/2-inch pumper port (NST), 1-1/2-inch pentagon nut, and barrel drains.

c) Fire hydrants shall be oriented so as to optimize access to ports, or as directed by the Engineer.

d) Fire hydrants shall be AVK Model 2780 or Waterous Model WB-67, and shall be factory painted yellow.

i. Mainline Blowoffs

1) Minimum allowable blowoff size shall be as outlined under Section 5.12. Blowoffs shall be sized to provide adequate flushing velocities as approved by the District Engineer.

2) Unless otherwise shown or authorized by the District Engineer, all blowoffs shall be provided with valve boxes and/or meter boxes as shown in the Standard Details.

j. Mainline Tapping Tees

1) Tapping tees used for making connections to existing, in-service lines shall have Class 125 outlet flanges. In all cases, the tapping tee shall be designed for use with the existing pipe materials and O.D. equivalent.

2) Any company performing mainline taps shall be prequalified with the District prior to performing any work on a project.

3) Contractors shall coordinate all taps with District Public Works and perform work with Public Works staff present.

k. Underground Warning Tape

1) Underground warning tape shall be detectable or non-detectable acid and alkali resistant safety warning tape. The tape shall consist of a minimum 4.0 mil (0.004") thick, virgin low density polyethylene plastic film formulated for extended use underground. The tape shall be in accordance with the APWA national color code and shall be permanently imprinted in lead free black pigments suitable for direct burial.

2) The tape shall be safety blue and shall be provided with the legend "CAUTION BURIED WATER LINE BELOW" or approved equivalent printed continuously down the length of the tape.

1. Bore Casings and Accessories

1) Carrier pipe used in bore casings shall meet the minimum specifications contained herein.

2) Casing shall be welded smooth steel pipe conforming to the requirements of ASTM A-53 or approved equal, with a minimum yield strength of 35,000 psi.

3) Minimum casing wall thickness shall as outlined below. Casing wall thickness shall conform to these requirements or the requirements of the agency having jurisdiction, whichever is more stringent.

CASING PIPE - MINIMUM THICKNESS		
Carrier Pipe Diameter (Inches)	**Minimum Casing Pipe Diameter (Inches)**	**Minimum Casing Wall Thickness (Inches)**
<6	10	0.188 (3/16)
6	12	0.281 (9/32)
8	14	0.281 (9/32)
10	16	0.313 (5/16)
12	18	0.344 (11/32)
14	20	0.375 (3/8)
16	22	0.406 (13/32)
18	24	0.438 (7/16)
20	26	0.469 (15/32)
>20	As required	0.50 (1/2)

4) The class of casing specified is based upon assumed superimposed loads and not upon the stresses resulting from jacking or boring operations. Any increase in casing strength to withstand jacking or boring operations shall be the responsibility of the Developer.

5) Casing Spacers and End Seals

a) Casing spacers (skids) shall be Model SSI as manufactured by Advanced Products and Systems, Inc. (APS) or approved equivalent.

b) End seals shall be Model AC or Model AW End Seals as manufactured by APS or approved equivalent.

5.9 GENERAL DESIGN CONSIDERATIONS

a. The water system shall have sufficient capacity to maintain 40 psi at the building entrance for one and two family dwellings. For other development, the system shall have sufficient capacity to provide minimum pressure of 35 psi at the building side of the meter during periods of maximum use, and to provide sufficient volumes of water at adequate pressures to satisfy the maximum expected daily consumption plus fire flows.

b. Normal working pressure in the distribution system should be approximately 70 psi with a range of 40 psi to 100 psi.

c. Head loss shall be determined by the Hazen-Williams equation based on the following coefficients.

Hazen-Williams Coefficients	
Pipe Diameter	C Value
8 Inches and Less	100
10 to 12 Inches	110
Greater than 12 Inches	120

d. Velocities in mains shall normally range from three (3) to six (6) feet per second for average demand to a maximum velocity of ten (10) feet per second for maximum day demand plus fire flow.

e. A 20 psi residual pressure under fire flow conditions shall be maintained at all points in the distribution system. Generally, a maximum velocity of ten (10) feet per second will govern for sizing mains at all other locations of the service level where this criteria does not govern.

f. Private systems shall limit velocities as required by the Oregon State Plumbing Specialty Code, Installation Standards.

g. Providing for Future Development

1) As a condition of water service, all developments will be required to provide public water mains of sufficient size for fire protection to adjacent parcel. 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.

2) In general, water distribution systems should be designed for maximum development of the service area with recognition of possible urban renewal, industrial expansion, etc.

5.10 WATER SYSTEM CAPACITY

a. General:

1) In areas not addressed in the Water Master Plan, design capacities shall be determined by consideration of the following factors and assumptions:

a) Area to be serviced, both immediate and adjacent.

b) Current and projected population within the areas to be served.

c) Current and projected land use within the areas to be served.

d) Commercial, industrial, or institutional users to be served.

e) Changes in any of the above factors that are likely to occur within a foreseeable time period.

2) In the absence of consumption data or other reliable information, the following factors may be assumed:

a) Peak hour demands as follows:

(1) 5 gpm per single family residential

(2) 2.5 gpm per dwelling unit for multiple family residential

(3) 5,000 gal/ac/day for commercial development

(4) 10,000 gal/ac/day for industrial development

b) Demand for unique commercial installations, industrial users, PUD's, multiple and institutional developments shall be calculated on an individual basis.

b. Fire Flow Requirements

1) Unless otherwise approved or required by the District Engineer and the local Fire Marshall, minimum fire flows shall be as follows:

MINIMUM FIRE FLOW REQUIREMENTS			
Land Use		**Fire Flows (gpm)**	**Duration (Hr.)**
Residential	Single Family/Duplex	1000	2
	Multi-Family, Apartments, etc.	1500	2
Commercial		1500	2

2) In all cases, all new fire hydrants shall be capable of delivering a minimum of 1,000 gpm at 20 psi residual system pressure.

5.11 LOOPING

a. The distribution system mains shall be looped at all possible locations.

b. All water lines shall be looped and valved such that the removal of any single line segment from service will not result in more than one fire hydrant being taken out of service.

c. The installation of permanent dead-end mains upon which fire protection depends and areas of large demands on single mains will not be permitted.

5.12 BLOWOFFS

a. All dead-end mains shall terminate with a blowoff assembly or a fire hydrant.

b. Permanent dead-ends shall have a permanent blow-off assembly and a permanent thrust restraint system. Permanent blowoffs in cul-de-sacs shall be located in front of the curb within five (5) feet from the curb face.

c. Mains that can conceivably be extended at some later date shall have a mainline valve in front of the blowoff assembly, and a thrust restraint system that allows the mainline valve to be connected to without taking the line out of service.

d. Blowoffs shall be sized to ensure that the water mains can be flushed at a minimum velocity of 2½ feet per second in accordance with AWWA C-650. The following table may be used as a minimum guideline assuming 40 psi minimum residual system pressure under flushing conditions.

MAINLINE BLOWOFF SIZES	
Water Main Diameter	Minimum Blowoff Diameter
6 and 8-inch	2-inch
10 and 12-inch	4-inch
>12	As required

e. The design engineer shall submit calculations showing that these flushing velocities can be satisfied.

f. Temporary blowoffs larger than 2-inches in diameter shall have a valve conforming to the requirements contained herein for mainline valves.

g. Temporary blowoffs, where required for cleaning new water mains, shall be located at the lower end of the line to be flushed whenever possible.

5.13 MINIMUM DEPTH

a. The standard minimum cover over buried water mains within the street right-of-way or easements shall be thirty six (36) inches from the finished grade, except that a minimum of 40 inches cover shall be required for waterlines in fill slopes.

b. Finish grade shall normally be determined as follows:

FINISH GRADE	
Mainline Location	Finish Grade
Waterline under sidewalk in right-of-way	Top of curb
Waterline in front of curb	Gutter
Waterline in cut slope behind sidewalk	Top of curb
Fill slopes	Perpendicular from pipe to surface
Easement	Finish grade at pipe centerline

c. Where the waterline is located in the cut side slope, in an undeveloped right-of-way, or along a roadway developed at less than ultimate width (including sidewalks), the waterline shall be placed at a depth sufficient to ensure that 36-inches of cover is maintained at the time of final construction of the roadway.

5.14 MINIMUM MAINLINE SIZE

a. Unless otherwise directed by the District Superintendent, minimum sizes for water mains shall be as follows:

MAINLINE SIZE REQUIREMENTS	
Minimum Diameter	Type of Mainline
4-inch	Public lines in cul-de-sacs which cannot be looped in the future and which are beyond the fire hydrant envelope of 250 feet to the furthest point on any existing or future structure. Private fire line supplying either a single fire hydrant or a building fire suppression system. Looping of private fire lines that supply hydrants will be required.
8-inch	Minimum size water main for the public water system. Looping back into the distribution grid shall be at intervals as required by the District, but shall generally not exceed ±600 feet.
8-inch	Public water distribution mains, and permanently dead-end mains supplying fire hydrants with a required fire flow of 1,500 gpm of less.
10-inch & Larger	As required for transmission mains, and fire lines supplying more than 1,500 gpm.

5.15 ALIGNMENT AND LOCATION

a. General

1) Water lines shall generally be parallel to the right-of-way or easement wherein they lie.

2) Unless otherwise required by the District Engineer, water lines shall generally be located on the uphill side of the right-of-way wherein they lie.

b. Location in Relation to Sanitary Sewer Lines and Other Utilities

1) Water mainlines shall be separated from all other utilities by a minimum of 5 feet.

2) Water mainlines shall generally be separated from sewer mainlines by a minimum of 10 feet. In no case shall the separation be less than 5 feet or as required by OAR 333.

3) Sanitary Sewer Main Crossings

a) Where a water mainline crosses below or within 18-inches vertical separation above a sanitary sewer main or lateral, one full length of waterline pipe shall be centered at point of crossing.

c. Location in Right-of-Ways

1) Unless otherwise approved by the Director, water mainlines shall generally be located in the street right-of-way between the curb and the right-of-way line, centered under the sidewalk.

2) The distance between the mainline and the curb shall vary as little as possible. On curved streets, mains may be laid on a curve concentric with the street centerline with deflections no greater than the manufacturer's specifications, or mains may be laid in straight lines along the tangent between selected angle points to avoid conflicts with other utilities. The angle point and tangent section shall not be closer than 5 feet from the right-of-way line, nor more than 3 feet in front of the curb face.

d. Location in Easements

1) Unless otherwise specified or authorized by the District, minimum easements widths for water mainlines shall be fifteen (15) feet for normal depth lines.

2) Mainlines in easements will be allowed only in cases where it is required in order to loop a mainline to avoid a permanent dead end condition, and only after all reasonable attempts to loop the mainlines in a right-of-way have been exhausted.

3) When water mainlines in easements are approved by the District, the easement shall be centered on the mainline, and the mainline shall be offset a minimum of 6 feet from any property line.

4) 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 mainline purposes. Under no circumstances shall a building or structure, trees, ornamental landscaping or fence be placed over a water mainline or easement. Prohibited structures shall include footings, decks and overhanging portions of structures located outside the easement.

5) Easement locations for public water mainlines serving a PUD, apartment complex or commercial/industrial development shall be in parking lots, private

drives or similar open areas which will permit an unobstructed vehicle access for maintenance by District forces.

6) Water mainlines with inside diameters larger than 12-inches will require wider easements.

7) Common placement in the easement of water and sewer or storm drain line may be allowed under certain conditions subject to approval by the Director. Easements wider than the minimum will be required.

8) Common easements will be reviewed on a case-by-case basis. Separation of utilities must meet Oregon State Health Division (OHD) requirements.

9) All easements must be furnished to the District for review and approval prior to recording.

e. Phased Construction

1) Water mains installed by phased construction, which will be extended in the future, shall terminate with a mainline valve, blow off and permanent thrust restraint system.

2) All developments will be required to extend mains across existing or proposed streets for future extensions by the District 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.

3) The construction plans for each phase shall be capable of standing alone, including provisions for looping and minimum fire flows.

f. Location in Relation to Ditches and Drainage Channels

1) Surface water crossings of mains shall be in accordance with OAR 333 and the requirements outlined herein.

2) Mains crossing ditches or drainage channels shall be designed to cross as nearly perpendicular to the channel as possible.

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

a) Ditch or drainage channel crossing for pipes of 12-inch diameter and greater.

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

4) The minimum cover from the bottom of the ditch or drainage channel to the top of pipe shall be a minimum of thirty-six (36) inches unless otherwise approved by the Director of Public Works and the Oregon Health Division.

5) A scour pad centered on the water line will be required for mains where the potential for erosion exists as determined by the Director of Public Works. The size and design of scour pads will be reviewed on a case-by-case basis by the Director.

5.16 VALVES

a. Sizes

1) In general, valves shall be the same size as the mains in which they are installed. Reducers for reconnection into existing water mains less than 8-inches in diameter shall be placed between the new valve and the existing line.

2) Unless otherwise approved or required by the Director of Public Works, valves shall conform to the following table.

Required Valves by Size and Operating Conditions

Valve Size	Static Pressure	Valve Style
10-inch and smaller	< 120 psi	Gate Valve
8-inch & 10-inch	≥ 120 psi	Butterfly Valve
12-inch & larger	All pressures	Butterfly Valve

3) Valve types and materials shall conform to the requirements of these Design Standards and the Standard Construction Specifications.

b. Location

1) Distribution system valves shall be located at the tee or cross fitting as nearly as possible.

2) There shall be a sufficient number of valves so located that not more than four (4) and preferable three (3) valves must be operated to effect any one particular shutdown. The spacing of 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.

3) A tee-intersection shall be valved on two branches and a cross-intersection shall be valved on three branches.

4) Hazardous crossings (ie. creek, railroad, freeway crossings, etc.) shall be valved on each side of the crossing.

5) Distribution branches on transmission mains shall be spaced not more than 800 feet apart where practical and shall be valved and plugged.

6) Transmission water mains shall have valves at spacings as required by the Director of Public Works.

c. Tapping Tees

1) Tapping tees to make connection to existing, in-service lines are only allowed in cases where the District determines that water service cannot be interrupted to cut in a tee or cross, and where the additional in-line valve required is not needed for system isolation as outlined above.

5.17 FIRE HYDRANTS

a. Coverage

1) Preferred coverage shall result in maximum hydrant spacing of 500 feet in residential areas, 300 feet in high-value districts including industrial subdivisions and no further than 250 feet from the furthest point of any dwelling, business, garage or building. Hydrant stubs with mainline valves will be required as a minimum in undeveloped areas.

b. Location

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

2) Hydrants shall be placed in locations approved by the local Fire Marshall.

3) In general, hydrants shall be located at corner of street intersections where possible. Hydrants located at points other than intersections shall be located at the extension of property lines.

4) Unless otherwise approved by the District, hydrants shall be placed between the sidewalk and the property line.

5) No hydrant shall be installed within five (5) feet of an existing utility pole or guy wire nor shall a utility or guy wire be placed within five (5) feet of an existing hydrant.

c. Hydrant Valves

1) Each fire hydrant shall have a hydrant valve and valve box at the mainline hydrant tee that will permit removal and repair of the hydrant without shutting down the water main supplying the hydrant.

2) Hydrant valves shall be resilient wedge gate valves.

3) The hydrant valve shall be connected directly to the mainline tee using a flange joint.

4) If the length of the hydrant lead is greater than 30 feet, an additional gate valve shall be provided within 3 feet of the hydrant.

d. Hydrant Bury & Exposure

1) Hydrant bury shall not be sufficient to provide a minimum of 36-inches of cover over the hydrant lead. In no case shall the bury be less than the depth of the waterline from which the hydrant is served.

2) The hydrant shall be set such that the base of bottom flange bolts are a minimum of 2-inches and a maximum of 6-inches above finish grade following all landscaping and surface restoration.

5.18 AIR RELEASE VALVES

a. General

1) Provisions for air relief shall be provided at all high points of waterlines. Where possible, location of service taps at high points in the line is preferable to the installation of an air relief valve. Fire hydrants may be used for air relief on lines 10-inches in diameter or less.

2) Where service taps cannot be used, an air release valve shall be permanently installed at high points on all water mains at all location where air can accumulate. An automatic air release valve shall be installed in a manhole off of the street where flooding of the manhole or chamber will not occur.

b. Air Release Valve Piping

1) The open end of an air release pipe from automatic valves shall extend to the top of the manhole at least twelve inches above grade and provided with a screened, downward facing elbow. Grade shall mean the existing ground elevation adjoining the manhole. An opening twice the size of the vent pipe shall exist at grade to prevent flooding of the vault.

5.19 SERVICE LINES

a. General

1) The use of pumps on a service line to provide adequate pressure to a subdivision lot or property located above the pressure level of the supply main shall be prohibited.

2) Each legal lot of record shall be connected by a separate water service line connected to the public or approved private water main. Combined water service lines will be permitted only when the property cannot legally be further divided. An example of this is a residential lot with a house and unattached garage or shop with plumbing fixtures.

3) Additional water service lines must be stubbed into the property lines sufficient to serve all residential parcels which can be further partitioned in the future where such future partition would require that the streets be cut to install such services.

b. Sizes

1) Standard service line sizes are 1-inch, 1½-inch, 2-inch, 3-inch, 4-inch, 6-inch and 8-inch. Service lines will be reviewed for effects on the distribution system and shall not be greater in size than the distribution main.

MINIMUM SERVICE SIZE	
Type of Service	Minimum Service Size
Single residential service	1-inch
Double residential service	1-inch
Triple residential service (triplexes only)	1½-inch
Commercial Service	1" minimum
Note: The next larger service size may be required for residential lots large enough to be partitioned into additional lots without a water main extension.	

2) The water service line on the private side of the meter may not be larger than one nominal pipe size larger than the service line size.

3) Commercial services shall not be smaller than 1-inch. For new streets or streets being cut for service installation, far side commercial services shall be installed in a 3-inch minimum size PVC sleeve.

4) Service piping shall be equal to or greater than the meter size.

5) For 3-inch and larger services, design drawings must be submitted showing the vault and fitting requirements, including a lockable bypass line, with the expected flow requirements and proposed usage.

c. Tapping requirements

1) Tapping requirements for water service lines shall be as outlined below.

WATER SERVICE TAPPING REQUIREMENTS		
Service Size	Mainline Type	Tapping Requirements
1"	All pipe types	Service Saddle
1½"	All pipe types	Service Saddle
2" & larger	All pipe types	Mainline tee with flanged valve

d. Location

1) Domestic

a) The service lines shall normally extend from the main to a point 6-inches behind the back of the sidewalk. A curb stop and meter box shall be located at the termination of the service line.

b) The meter stop shall be located such that the front of the meter box is 3-inches behind the sidewalk.

c) In general, individual service connections shall terminate in front of the property to be served. Double services shall be located on each side of a common side property line.

d) Domestic service lines shall not be connected to fire protection services, including hydrant leads.

2) Fire Service

a) A backflow prevention assembly shall be placed on fire service lines as required by the District.

b) Plans for fire service lines shall meet the requirements of outlined in Division 1 and shall be stamped by a licensed Civil Engineer.

c) Drawings for fire services shall include vicinity map, adjoining street name, width, curb and property line, location of existing water line referenced to the property line, existing hydrant locations and the distance to property pins where the service crosses the property line.

5.20 WATER METERS

a. General

1) All water meters within the service area of the District will be furnished and installed by District forces at the request and expense of the customer. The service line, meter box and all piping within the meter box must be installed by the developer.

b. Location

1) General

a) Meters shall be located at the termination of the District service line.

b) A public utility and access easement shall be provided to and around any meter boxes set on private property. The easement shall be sized to provide a minimum of five (5) foot clear around the meter box or vault on all sides.

2) 3/4-inch through 2-inch Meters

a) In the right-of-way in a location that allows for easy reading and maintenance, preferably 3-inches behind the back of sidewalk.

3) 3 Inch and Larger Meter:

a) On private property adjacent to the public right-of-way to allow reading and maintenance. It must be accessible with a crane truck to within ten feet of the installation with a ten foot vertical clearance.

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

c) A minimum three foot clear space must be provided around the vault to provide ample working space for maintenance.

d) All 3-inch and larger meters shall be provided with a remote readout head located such that it can be read without entering the meter vault.

4) The meter, with approval by the District, may be located in the same vault with a backflow prevention device, provided a completed dimensioned design is submitted with a request for variance.

c. Meter Boxes

1) Meter boxes shall be provided by the Developer for each water service and meter location. Double set meters (2 meters in 1 box) are not allowed.

2) Meter boxes shall be set level to finish grade. The Developer or builder shall be responsible for setting meter boxes and services to finish grade prior to installation of water meters by the District.

5.21 PRIVATE WATER SYSTEMS

a. General design considerations for private water systems shall conform to requirements set forth by the Oregon Health Division, by the Oregon State Plumbing Specialty Code (Chapter 10), and these Design Standards.

b. All public water mains within private developments shall be in public right-of-way or exclusive easements to the District and shall conform to these design standards. Each connection of the private water system to the District system shall be through an approved backflow prevention assembly and meter.

c. Requirements for capacity, materials, looping, valves, fire protection, service lines and meters shall also be applicable to design within PUD areas.

d. The resale of water without written approval of the District shall be prohibited. Written authorization from the District shall be required for each service connection and for any sale of water.

5.22 BACKFLOW PREVENTION

a. General

1) All backflow devices shall be testable and include provisions for testing by a certified backflow testing person or organization.

2) An approved backflow prevention assembly with an approved metering system shall be required for each use in the following instances:

a) When a private line must be extended from or looped between two (2) or more District mains in order to obtain the required flow and the resultant loop is no benefit to the District grid system.

b) When pipe materials other than those approved for potable water are installed on private fire services.

c) On all private water lines or distribution system attached to the District's distribution system.

d) On all private water lines or distribution systems attached to the District grid system at the master meter on the detector check assembly.

e) When an auxiliary water supply exists on the property being served.

f) As determined by the District Cross-connection Control Inspector and Oregon State Health Division requirements.

3) An approved reduced pressure backflow prevention assembly with an approved metering system shall be required for service connections in high hazard areas as determined by the Director of Public Works.

4) The backflow assemblies must meet the District approved assembly standards, which standards are taken from the current approved list of assemblies maintained by the Oregon Health Division.

b. Location

1) The approved backflow prevention assembly shall be installed on the property being served in place accessible for District inspector and testing and located as follows:

a) Before any branch, immediately downstream of the meter; or

b) If not meter, at the property line; or

c) If in the building, before the first branch or hazard being controlled or as determined by the District Cross-connection Control Inspector; or

2) If installed outside the building being served, it shall be placed at the property line or easement line in a vault or structure in accordance with the manufacturer's recommendations and as approved by the Director of Public Works. Vaults must have a sump and be watertight.

3) The distance from a fire hydrant to the fire department connection shall not exceed 40 feet unless otherwise approved in writing by the Fire Chief, but in no case shall a distance of greater than 60 feet be allowed.

5.23 UNDERGROUND WARNING TAPE

a. Detectable or non-detectable acid and alkali resistant safety warning tape shall be provided along all mainlines not located under sidewalks or paved portions of public streets.

b. Underground warning tape shall be placed a minimum of 12-inches and a maximum of 18-inches below the finish ground surface, and shall be continuous the entire length of the mainline as specified.

5.24 MAINLINE BORED CROSSINGS

a. Casing size shall adequate to permit proper construction of the carrier pipe to the required lines and grades. Carrier pipe used in bore casings shall be as specified herein.

b. All bore crossings shall be provided with casing spacers and end seals. Casing spacer configuration shall conform to the manufacturer's recommendations, but in no case shall less than 3 spacers per length of pipe be used.

c. In order to prevent over-belling of PVC or other flexible pipe while installing it through the casing, provide a method for restricting movement between the assembled bell and spigot conforming with the manufacturer's recommendations.

d. The design of the bore crossing shall include the following as a minimum:

1) Casing and carrier pipe materials and dimensions, including outside bell diameters of the carrier pipe.

2) Details for any part of the system that must be changed as a result of the boring operation (manhole, headwall, etc.).

3) Bore and receiving pit backfill material and compaction requirements.

OCEANSIDE WATER DISTRICT (OWD)
Public Works Design Standards

Division 1

General Requirements

i. Traffic Control Devices shall meet the standards of the current Manual on Uniform Traffic Control Devices, including Oregon amendments.

j. All other work not covered by the above standards shall conform to the Oregon State Highway Division (OSHD) Standard Specifications for Highway Construction and Standard Drawings for Design and Construction.

1.2 PURPOSE

a. The purpose of these Standards is to provide a consistent policy under which certain physical aspects of public utility design will be implemented. Most of the elements contained in this document are Public Works oriented and most are related to the development or platting process. However, it is intended that they apply to both public and private work designated herein.

b. These Standards cannot provide for all situations. They are intended to assist but not to substitute for competent work by design professionals. The Standards are also not intended to limit unreasonably any innovative or creative effort that could result in better quality, better 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 District resident.

c. The objective is to develop Standards which will:

1) be consistent with current District Ordinances.

2) provide design guidance criteria to the private sector for the design of public improvements within the OWD.

3) provide public utility improvements designed in a manner to allow economical future maintenance.

4) Develop minimal private utility standards for systems that will impact or potentially impact public streets and/or public utility systems.

1.3 ENGINEERING POLICY

a. The engineering policy of the District requires strict compliance with Oregon Revised Statute 672 for professional engineers. The following requirements shall be applicable to the design of streets, grading plans, sanitary sewers, storm drain systems (including detention systems), and water distribution and storage facilities.

1) All engineering drawings, reports, or documents designated herein shall be prepared by a professional Civil Engineer registered in the State of Oregon, or by a subordinate employee under his direction, and shall be signed by him and stamped with his seal to indicate responsibility for them.

2) It shall be the Design Engineer's responsibility to review any proposed extension, modification or improvement of a public utility system with the District prior to final engineering and design work to determine any special requirements or whether the proposal is permissible. A preliminary review and/or approval of the drawings for construction for any project does not in any way relieve the Design Engineer of his responsibility to meet all requirements of the District or the obligation to protect life, health and property of the public. The drawings for any project shall be revised or supplemented at any time it is determined that the full requirements of the District have not been met.

3) Any engineer having submitted to the District false or inaccurate information of a material nature will be warned of their conduct, and the Oregon State Board of Engineering Examiners will also be advised.

1.4 DEFINITIONS AND TERMS

a. Unless otherwise defined in these Standards, the following definitions, terms and abbreviations shall apply whenever used.

1) As-built Drawings: Drawings prepared by the Design Engineer, signed and dated by the District representative indicating the drawings have been reviewed and revised, if necessary, to accurately show all as-built conditions and construction details.

2) Construction drawings: Drawings prepared by a registered professional engineer, including site plans, plan and profile views of utilities, cross sections, detailed drawings, etc., or reproductions thereof, approved by the District Engineer, which show the location, character, dimensions and details for the work to be done.

3) Cut Sheets: Sheets of tabulated data, indicating stationing, structures, fittings, angel points, beginning of curve, points on curve, end of curves, staking offset, various elevations and offset utility cuts.

4) 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 Director. Similarly, the words approved, acceptable, satisfactory, shall mean approved by, acceptable to, or satisfaction to the Director.

5) Design Engineer: The engineer licensed by the State of Oregon as a Civil Engineer under whose direction plans, profiles and details for work are prepared and submitted to the District for review and approval.

6) Director/Director of Public Works/Public Works Supervisor/District Superintendent: As used herein, these titles refer to the person(s) designated by

the District Board with responsible charge of the public infrastructure under District jurisdiction, or his/her authorized representative. For purposes of this document, the terms are considered to be interchangeable.

7) District: The Oceanside Water District, Oregon.

8) Dwelling Unit: A facility designed for permanent or semi-permanent occupancy and provided with minimum kitchen, sleeping and sanitary facilities for one family.

9) Easement: Areas along the line of public utilities that are outside of dedicated right-of-way. Easements shall be prepared on District forms granting rights along the public utility line to the District.

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

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

12) Owner: Any individual, partnership, firm or corporation by whom the Design Engineer has been retained or who, as a property owner, is making arrangements with the District.

13) Person: Individual, firm, corporation, association, agency or other entity.

14) Plans: See Construction Drawings.

15) Preliminary Review: Review of the construction drawings by the District as outlined in these standards. All District comments and provisions of these design standards must be addressed prior to final review and approval for construction.

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

17) 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 free of all encumbrances, within which the District shall have the unencumbered right to install and maintain public utilities.

18) Roadway: All of that portion of the right-of-way used, for vehicle movement, which exists between the curbs or proposed curbs or proposed curb lines.

19) Single Family Dwelling: Any residential building designed to house one family.

20) Standard Details: The drawings of structures or devices commonly used on District work and referred to on the construction drawings. Also called Standard Plans.

21) Street or Road: Any public highway, road, street, avenue, alley, way, easement or right-of-way to be used for vehicle movement.

22) Traveled Way: That portion of the roadway for the movement of vehicles, exclusive of shoulder and auxiliary lanes.

1.5 LOCATION OF UTILITIES WITHIN RIGHT-OF-WAY

a. The standard details indicate the general required location for each utility within the public right-of-way.

b. Installation of private utilities in a common trench with water, sanitary sewer or storm drain mainlines is prohibited. A minimum of 3 feet of horizontal separation must be maintained between public and private utilities except at crossings.

c. Utility service companies proposing to install major utility systems larger than typically required to serve local users and which cannot conveniently be relocated in the future will be required to prepare detailed drawings showing how the proposed system can be installed within the right-of-way without conflicting with existing or proposed District utilities. Drawing requirements may include but not be limited to plan and profile of proposed systems based on a detailed topographic survey.

1.6 PROVIDING FOR FUTURE DEVELOPMENT

a. All public improvements shall be designed as a logical part of the development of the surrounding area.

b. Water systems shall be sized to accommodate the entire service area that they will ultimately serve.

c. Utilities and street improvements shall be extended to the boundaries of the development to provide for future extensions to the adjoining areas and prevent adjoining properties from becoming landlocked.

d. The District may require over-sizing of utility lines to accommodate future growth of the District.

e. Where existing District utility lines do not adjoin the proposed development or the capacity of existing lines is inadequate, the developer will be required to extend new utility lines to the development as necessary.

f. Where existing roadway improvements do not extend to the proposed development or the existing roadways to the proposed development are not adequate to serve the

development, the developer may be required to improve the roadways to the development.

1.7 TIME LIMITS FROM DRAWING APPROVAL TO CONSTRUCTION

a. The Developer shall obtain a construction permit and begin construction within six (6) months from the time the construction drawings are approved by the District Engineer. If construction does not begin within this period, the approvals of the construction drawings shall be null and void. Renewal of the approval for the construction drawings may result in additional conditions to meet new standards, changed conditions or new information discovered since the original approval.

1.8 PHASED DEVELOPMENT

a. In the case of a development approved to be constructed in phases, the construction drawings for each phase shall be capable of standing alone.

b. Approval by the District of construction drawings for each phase of a phased development shall be independent of the approval for all other phases.

c. The intent of these requirements is that the time limits between approval of the construction drawings by the District and the time by which construction must begin shall apply to each phase independently.

1.9 REVIEW PROCEDURE

a. Pre-design Conference: The developer is encouraged to meet with the Director of Public Works and the District Engineer prior to final design of the proposed improvements. It shall be the developer's responsibility to provide the District Engineer with base maps showing existing utilities and proposed street improvement limits prior to the pre-design conference.

b. Three (3) sets of complete construction drawings shall be submitted to the District for preliminary review. Submittal requirements are as outlined herein, and shall include a unit price engineer's estimate acceptable to the District Engineer and any required review fees. Incomplete submittals will be returned without review.

c. Upon completion of the preliminary review, the District will return one (1) set of drawings outlining the required revisions. In order to be entitled to further review, the applicant's engineer must respond to each comment of the prior review. All submittals and responses to comments must appear throughout to be a bona fide attempt to result in complete drawings. Resubmittals shall consist of a minimum of three (3) sets of drawings.

d. Once the preliminary review has been completed and required revisions made, the Developer shall circulate the drawings to all utility service companies within the District and other agencies as required.

e. Prior to final approval of the construction drawings, all proposed drawings from utility service companies must be received and approved by the District. Approvals from other agencies with jurisdiction must also be received, including but not limited to the Oregon Health Division (OHD), Department of Environmental Quality (DEQ), Department of Transportation (ODOT) and Tillamook County wherein each has jurisdiction.

f. The applicant is responsible for the coordination with the various utilities and agencies during design and construction. The utilities and agencies may include those shown in the Appendix.

g. Upon final approval of the drawings, submit a minimum of ten (10) copies of the revised drawings to the District to be stamped as approved for construction. Additional sets may be submitted at the developer's option.

h. Prior to issuance of the public utility construction permits, the Developer shall provide the District with the following:

1) Copy of an approved (by District Attorney) Developer/District Construction Agreement signed and notarized by the Developer and the Developer's engineer.
2) Any required permit fees.
3) Recorded copies of all off-site easements. Executed and notarized copies of easements for all public utilities that are constructed prior to the recording of a final plat.
4) Proposed Construction Schedule.
5) Certificates of insurance, minimum limits as outlined in the Appendix. Oceanside Water District and District Engineer shall be named as additional insured.
6) Evidence of Workman's Compensation coverage from contractor performing the work.
7) Any required Waiver of Remonstrance agreements.
8) Signed certification that the Developer has copies of and will conform to requirements of the most current revision of the OWD Public Works Construction Standards (PWS).
9) Other submittals specific to this project.

1.10 SUBMITTAL REQUIREMENTS

a. Survey: All designs shall be based off of a complete topographic survey, including but not limited to the following:

1) Surface features.
2) Subsurface features.
3) Existing utilities (public and private).
4) Property lines/monuments.
5) Right-of-way lines & centerline monuments.

b. Drawing Submittal: The drawing submittal shall include the following as applicable unless otherwise approved by the District Engineer. The following is a general overview of drawing requirements, but is not intended to be exclusive. All requirements of the individual divisions of the standards shall be satisfied.

1) Construction drawings shall be submitted on 22" x 34" blueline or blackline sheets unless otherwise approved by the District Engineer.

2) District plan review fees as required.

3) Cover Sheet

4) Overall drainage, utility and street lighting plan.

5) Site grading plan where applicable.

6) Plan and profile for the following public utilities:

a) Streets
b) Water as specified
c) Sanitary sewers as required to show lack of conflict
d) Storm drains as required to show lack of conflict

7) Erosion control plan.

8) Standard details shall be included on the construction drawings.

9) Copies of all easements, including slope easements, for all utilities to be constructed. Easements shall be executed and notarized for all public utilities that are constructed prior to the recording of a final plat. Easements shall be worded such that no trees, permanent structures or improvements including parallel fences shall be placed or constructed on the easement. Easements shall be a constant width between manholes, valves or other in-line structures. Easement width shall be based on the deepest portion of the line between such structures. See the Appendix for standard easement forms.

10) Proposed private utility plans (final review).

11) Engineer's unit price construction cost estimate acceptable to the District Engineer or bid results (preliminary and final review). Cost estimates shall include a line item for street lighting.

12) The submittal may also be required to include a traffic study and a traffic control plan.

c. General

1) A title block shall appear on each sheet of the drawing set and shall be placed in the lower right-hand corner of the sheet, across the bottom edge of the sheet or across the right-hand edge of the sheet. The title block shall include the name of the project, the sheet title and number, the name of the engineering firm, engineer's stamp, date and revision blocks.

2) A north arrow shall be shown on each sheet containing plan views and adjacent to any other drawing which is not oriented the same as other drawings on the sheet.

3) The scale shall be 1"=10', 20', 40' or 50' horizontal and 1"=2', 4' or 5' vertical for all drawings except structural or mechanical drawings. The scale of corresponding plan views and profiles shall be the same.

4) **In cases where streets or public utilities exist or will be reconstructed, plan view scales shall not exceed 1" = 20'.**

5) Each plan, profile and detail shall be labeled under the drawing. The scale for the plan, profile, or detail shall be noted under the title. Details not drawn to scale shall be so noted.

6) All detail drawings, including standard detail drawings, shall be included on the drawing sheets.

7) A complete legend of all symbols used shall be provided at the front of each drawing set or on the appropriate pages. In general, existing utilities shall be shown with a lighter line weight than proposed utilities.

8) Letter size shall not be smaller than 0.10-inch high.

d. Cover Sheet

1) The first sheet (Cover Sheet) of all drawing sets shall include the following as a minimum:

a) Project name.
b) Design Engineer's name, address, telephone and fax number.
c) Developer's name, address and telephone number.

d) Vicinity Maps showing the location of the project in respect to the nearest major street intersection and a minimum of 500 feet around the site.

e) Legend including all symbols and line types used on the construction drawings.

f) General construction notes matching format and content of notes in the Appendix.

g) Sheet index located near lower right corner.

e. Overall Drainage, Utility and Street Lighting Plan.

1) The overall drainage and utility plan shall show the following as a minimum:

a) The location and elevation of a National Geodetic Survey, United States Geological Survey, State Highway, Tillamook County or OWD bench mark which the elevations shown are based shall be shown or noted. Temporary bench marks on or near the project site shall also be shown.

b) Right-of-way lines, property lines, easement lines including those outside the project but intersecting or within 150 feet of the project boundaries.

c) Existing and proposed streets, curbs, sidewalks, handicap ramps and driveways within the project and within 150 feet of the project boundaries.

d) Existing and proposed sanitary sewers, storm drains, waterlines and appurtenances within the project and within 150 feet of the project boundaries.

e) Existing private utilities within the project and within 150 feet of the project boundaries.

f) Lot or parcel numbers, street names and other identifying labels. New street names are subject to the approval of the District.

g) Location and description of existing survey monuments, including but not limited to section corners, quarter corners and donation land claim corners within the limits of the work area.

h) Public and private utilities and other facilities to be relocated.

i) Street light and area light pole locations.

j) Existing drainage patterns within the project and within 150 feet of the project boundaries.

k) Floodplain, floodway and wetland boundaries, including floodplain elevation with FEMA map reference.

f. Site Grading Plan

1) A site grading plan is required for subdivisions, major partitions or minor partitions involving street improvements with cuts or fills exceeding 2 feet.

2) A site grading plan is required for projects subject to site design review, including commercial, industrial, or multi-family developments.

3) The site grading plan shall show proposed finished grade and parcel corner elevations, with the existing and proposed contours shown at one (1) foot intervals and extended a minimum of 100 feet beyond the improvements.

4) The site grading plan shall show all drainage systems and proposed erosion control facilities.

g. Plan Views

1) General: Information required on the overall utility plan shall be shown on the plan views as applicable. In addition, the following shall be shown:

a) Utilities and vegetation in conflict with the construction or operation of the street and public utilities. Vegetation to include trees greater than 6 inches in diameter and landscape plantings within the right-of-way and easement areas.

b) Public and private utilities to be relocated.

c) Match lines with sheet number references.

d) Additional information as outlined below or as required by the District based on unique or unusual features of the project.

2) Streets

a) Except as otherwise specified, conform to requirements of Tillamook County or other agency with jurisdiction. The following information shall be shown for all streets within which sanitary sewer improvements are to be constructed, as well as utility access roadways required along easements.

b) Street stationing shall be tied to existing property corners, centerline of intersections, and/or existing street monuments.

c) Location, alignment and stationing of existing streets and proposed street centerline and curb faces. Location of all curbs, driveways, edge of

pavement, etc. shall be dimensioned from right-of-way centerline, easement boundary or other means so that its location is clearly defined.

d) Location of existing and proposed street centerline monuments.

e) Location of the low points of street grades and curb returns.

3) Storm Drains

a) Except as otherwise specified, conform to requirements of Tillamook County or other agency with jurisdiction.

b) Sufficient information must be provided to the District to determine potential conflicts with existing or proposed utilities.

4) Sanitary Sewer

a) Except as otherwise specified, conform to requirements of Netarts Oceanside Sanitary District (NOSD) or other agency with jurisdiction.

b) Sufficient information must be provided to the District to determine potential conflicts with existing or proposed utilities.

5) Water Distribution

a) Location, stationing and size of existing and proposed water mains and appurtenances.

b) Each valve and fire hydrant shall be identified and stationed to facilitate checking the plan views with the profile.

c) Location of all waterlines and hydrants shall be dimensioned from right-of-way centerline, easement boundary or other means so that its location is clearly defined.

d) Waterline stationing shall be independent of the street stationing.

h. Profile Views

1) General: Profile views shall conform to the requirements and show the information outlined under this section as applicable:

a) Profile views shall be to the same horizontal scale and on the same sheet as the corresponding plan view.

b) Match lines with sheet number references.

2) Streets

a) Except as otherwise specified, conform to requirements of Tillamook County or other agency with jurisdiction. The following information shall be shown for all utility access roadways required along easements.

b) Original ground profile along the centerline or roadway edge as appropriate. Ditch invert profiles shall be shown where waterlines are proposed under ditches.

c) Stationing, elevations and percent slopes for centerline or edge of roadway profiles.

d) Beginning point of all vertical curves, points of vertical intersection, end of vertical curve, length of vertical curve, K-value and design speed, and low point of vertical curve if a sag curve.

e) Projection of the profile of streets that may be extended or reconstructed in the future. The projected profile shall extend a minimum of 200 feet beyond the proposed work limits. The District may require profiles to be extended further where necessary due to topography or to demonstrate ability to tie to existing streets. Projected profiles shall be designed to be compatible with the restraints of the terrain.

3) Storm Drain

a) Except as otherwise specified, conform to requirements of Tillamook County or other agency with jurisdiction.

4) Sanitary Sewer

a) Except as otherwise specified, conform to requirements of Netarts Oceanside Sanitary District (NOSD) or other agency with jurisdiction.

5) Water Distribution

a) Waterline profiles shall be provided for all waterlines within existing right-of-ways or along alignments paralleled (within 15 feet) or crossed by existing public utilities. Waterline profiles will not be required for new waterlines within new right-of-ways unless required to prevent conflicts with proposed utilities.

b) Profile of existing and proposed ground surface along centerline of pipe, as well as existing and proposed pavement surface of adjacent streets (where applicable).

c) Location of valves, fittings, fire hydrants and other appurtenances with all valves and fire hydrants numbered and stationed to match the corresponding plan view.

d) Size, pipe material and class, depth of cover and class of backfill and surface restoration.

e) All existing public and private utilities crossing the profile and any existing utilities which potentially are in conflict with construction of the improvements.

i. Easements

1) Private utility easements a minimum of fifteen (15) feet wide shall be provided for all private water lines outside of public right-of-ways or the boundaries of the property being served.

1.11 VARIANCES TO DESIGN STANDARDS

a. Request for Variance to Specifications/Standards

1) Variances to specifications or standards may be requested as outlined below. It is to be noted that if the requested variance involves public safety, the District will rule in favor of safety.

b. Variance Process

1) Submittal

a) Requests for variance shall be submitted in writing to the District Engineer. This written request shall state the desired variance, the reason for the request and a comparison between the specification/standard and the variance as far as performance, etc.

b) Any variance of these Standards should be documented and referenced to a nationally accepted specification/standard. The use thereof shall not compromise public safety or intent of the District's Standards.

2) District's Review

a) The variance request shall be reviewed by the District Engineer who shall make one of the following decisions:

(1) Approve as is,

(2) Approve with changes, or

(3) Deny with an explanation.

b) Approval of a request shall not constitute a precedent.

3) Appeal

a) Applicant may appeal the District Engineer's decision to the District Board.

c. Criteria for Variance of Specification Standards

1) The District Engineer may grant a variance to the adopted specifications or Standards when all of the following conditions are met:

a) Topography, right-of-way or other geographic conditions impose an economic hardship on the applicant and an equivalent alternative that can accomplish the same intent is proposed. Variances to self-imposed hardships shall not be allowed. The variance requested shall be the minimum variance that alleviates the hardship.

b) A minor change to a specification or standard is required to address a specific design or construction problem which, if not enacted, will result in an undue hardship.

c) An alternative design is proposed which will provide a plan equal or superior to these Standards. In considering the alternative, the District Engineer shall consider appearance, durability, cost of maintenance, public safety and other appropriate factors.

1.12 PRECONSTRUCTION CONFERENCE

a. A preconstruction conference shall be scheduled before issuance of the public utility construction permits. The meeting is to include the developer's representative, developer's engineer and prime contractor, and all affected utility companies. The purpose of the conference is to discuss the construction schedule and times of the work which require special coordination.

b. The Developer shall be responsible for notifying the private utility companies of the time and location of the preconstruction conference, and requesting that a representative of each utility be present. The Developer may be required to submit proof of notification to the District prior to the preconstruction conference. Copies of notification letters sent to the utility companies by the Developer are acceptable.

1.13 CONSTRUCTION INSPECTION

a. General

1) All public construction shall be inspected by a professional engineer licensed in the State of Oregon or a qualified individual under his supervision as required in the Developer-District Agreement.

2) An engineer whose firm, or any member of the firm, has a corporate, partnership or any form of real property interest in the development for which the improvements are required cannot be designated inspecting engineer. The inspecting engineer's relationship to the project must be solely that of a professional nature.

3) It shall be the policy of the District not to provide full inspection services for non-public funded public improvements. It shall be the Developer's responsibility to provide an engineer to perform these services.

4) These inspection requirements are not applicable to individual sidewalk, driveway or service lateral permits for single residences. If the project scale is such that the retention of an independent inspecting engineer is not warranted, the Developer may request that the District provide these services. If the District agrees to provide these services, the Developer shall be responsible to reimburse the District for any costs incurred for these inspection services.

b. District Activities

1) Inspection services provided by the District shall include:

a) Liaison between the inspection engineer and the District;

b) Monitoring of work progress and performance testing as deemed desirable;

c) The performance of administrative and coordination activities as required to support the processing and completion of the project;

d) The issuance of stop work orders upon notifying the inspection engineer of the District's intention to do so.

e) Operate all valves, including fire hydrants, on existing waterlines.

2) In addition, the District shall be notified a minimum of 48 business hours (2 business days) prior to the following tests and inspections so that a District representative may be present to witness the inspections or tests.

a) Water Distribution System

(1) Pressure tests;

(2) Disinfection.

c. Developer's Inspecting Engineer's Activities

1) The inspecting engineer of record must be registered to practice engineering in the State of Oregon. Material testing not performed by the inspecting engineer must be accomplished by a recognized testing firm or another registered engineer.

2) ***The engineer must personally perform all activities marked by an (*) and must supervise all individuals performing other delegated activities.**

3) The following minimum activities are required of the designated inspecting engineer:

a) *Execute a form accepting responsibility:

b) *Attend preconstruction conference and distribute approved construction drawings to contractor, subcontractors and utility companies.

c) Obtain and use a copy of District-approved construction drawings and specifications;

d) Notify the District 48 business hours (2 business days) before the start of construction or resumption of work after shutdowns, except for normal resumption of work following Sundays or holidays.

e) Call to the District's attention within two (2) working days all drawing changes, material changes, stop work orders or errors or omissions in the approved drawings or specifications.

f) Maintain records which contain at least the following information and submit copies to the District on a weekly basis:

(1) Site Visits

(a) Date and time of site visits
(b) Weather conditions, including temperature

(c) A description of construction activities

(2) Statement of directions to change drawings, specifications, stop work, reject materials or other work quality actions;

(3) Public agency contacts which result in drawing changes or other significant actions;

(4) Perceived problems and action taken;

(5) Final and staged inspections;

(6) Records of all material, soil and compaction tests.

g) Provide all surveying services necessary to stake the project prior to and during construction.

h) Review and approve all aggregate, pipe and other materials to ensure their compliance with District Standards;

i) *Approve all drawing or specification changes in writing and obtain District approval prior to the performance of the work;

j) Monitor and concur in construction activities to ensure end products meet District specifications;

k) *Perform or have performed material, compaction and other tests required to ensure District specifications are met;

l) File a completion report which contains:

(1) The original of the project completion certification;

(2) A complete set of blue-line as-built drawings;

(3) The results of waterline tests, material tests, compaction tests.

m) Submit final reproducible as-built drawings conforming to the requirements outlined herein.

1.14 AS-BUILT DRAWINGS

a. As-built drawings prepared by the design engineer are required whenever the work results in new or modified public improvements and shall describe all revisions to the previously approved construction drawings.

b. Unless otherwise approved by the District Engineer, as-built drawings for sanitary sewer and storm drains shall be based off of an as-built survey conducted by a land surveyor registered to practice surveying in the State of Oregon.

c. Show all below grade private utility vaults and street crossing, as well as all above grade transformers, pedestals, etc.

d. The location of all utility stubs shall be shown on the as-builts based on distance ties from two permanent points. The tie points shall be immovable structures, such as property pins, street monuments or the center of manholes.

e. Legible blue-line or black-line copies of the as-built drawings shall be submitted to the District prior to the final walkthrough inspection and submittal of the mylar as-builts. Following the final walkthrough, submit approved as-built drawings on 3 mil minimum thickness mylar to the District Engineer.

Division 5

Water Distribution

DIVISION 5
WATER DISTRIBUTION

5.1 PURPOSE

a. In addition to the purposes outlined under Division 1 of these Design Standards, the purpose of these Standards is to ensure the development of a water distribution system which will:

1) be of adequate design to meet all expected domestic, commercial and industrial demands including fire flows within the design life;

2) have sufficient structural strength to withstand all external loads which may be imposed;

3) be of materials resistant to both corrosion and erosion with a minimum design life of 75 years;

4) be economical and safe to build and maintain;

5) meet all design requirements of the Oregon Health Division (OHD).

Alternate materials and methods will be considered for approval on the basis of these objectives.

b. These Standards cannot provide for all situations. They are intended to assist but not to substitute for competent work by professional design engineers.

5.2 APPLICABILITY

a. These Standards shall govern all construction and upgrading of all public water distribution facilities in the OWD and applicable work within its service areas.

b. Permanent water distribution facilities shall be provided to all properties within the OWD in accordance with these Standards. This shall generally be interpreted to mean that permanent water distribution facilities shall be provided for existing legal lots of record at the time development occurs, and for new legal lots of record created by a major or minor partitioning or subdivision of land at the time of partitioning or subdivision.

5.3 SPECIAL ITEMS

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

1) Water Distribution Pump Stations
2) Reservoirs
3) Wells
4) Treatment Plants
5) Pressure Regulating Devices
6) Flow Measurement Devices
7) Relining of the Existing Water Mains
8) Chemical Addition or pH Adjustment
9) Bridge Crossings
10) Creek or Stream Crossings

b. Review and approval of the above special items by the Director of Public Works shall be required. When requested by the District, full design calculations shall be submitted for review prior to approval. Special items may also require review and approval by the Oregon Health Division.

5.4 APPROVAL OF ALTERNATE MATERIALS AND METHODS

a. Any alternate material or method not explicitly approved herein will be considered for approval on the basis of the objectives set forth in Paragraph 5.1, Purpose. Persons seeking such approval shall make application in writing to the Director of Public Works. Approval of any major deviation from these Standards shall be in written form. Approval of minor matters will be made in writing, if requested.

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

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

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

5.5 CONSTRUCTION DRAWINGS

a. Construction drawings shall conform to the requirements of Division 1 of these Design Standards.

b. Detail drawings shall be included on the construction drawings for all water system appurtenances including valves, blowoffs, hydrants, service connections, couplings, etc.

5.6 STANDARD DETAILS

a. Standard details included in the appendix are supplemental to the text of these design standards and show the District's minimum requirements for the construction of standard structures and facilities.

b. In the case of conflicts between the text of these design standards and the standard details, the more stringent as determined by the Director of Public Works shall apply.

c. As required by Division 1 of these standards, all applicable standard details shall be included on the construction drawings.

5.7 DEFINITIONS AND TERMS

a. In addition to the definitions contained in Division 1 of these Standards, the following definitions may apply particularly to water distribution systems. Unless otherwise defined in these Design Standards, the following definitions and abbreviations shall apply whenever used. Other definitions as outlined in the Uniform Plumbing Code shall also apply.

1) Abbreviations: Acceptable abbreviations for showing types of new and existing pipe materials on the plans are as follows:

   a) CI - Cast Iron
   b) DI - Ductile Iron
   c) PVC - Polyvinyl Chloride
   d) STL - Steel
   e) AC - Asbestos Cement

2) Air Gap Separation: A physical vertical separation between the free-flowing discharge end of a potable water supply and the rim of any open, non-pressurized receiving vessel.

3) Approved Backflow Prevention Assembly: An assembly that has been investigated and approved by the Oregon Health Division for preventing backflow.

4) Backflow: The flow of water or other fluids in a direction opposite to the normal flow. (See Back-Siphonage.)

5) Back-Siphonage: The flowing back of used, contaminated, or polluted water from a plumbing fixture or vessel into a water supply pipe due to a negative or reduced pressure in such pipe.

6) Building Supply: 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 on the lot. Building supply shall also mean customer line.

7) Cross Connection: Any connection or arrangement, physical or otherwise, between a potable water supply system and any plumbing fixture or any tank, receptacle, equipment or devise, 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 condition.

8) Customer Water Supply System: The water supply system of a building, premises or private system consists of the all supply pipe from the customer side of the water meter, including water service pipes, and the necessary connecting fittings, control valves, pipe and all appurtenances carrying or supplying potable water in or adjacent to the building premises served.

9) Distribution Mains: All mains which are not designated as transmission mains, and which are used for supply the individual consumer. As a general rule these are the smaller mains in the water supply system.

10) Distribution System: Distribution main pipelines, pumping stations, valves and ancillary equipment used to transmit water from the supply source to the service line.

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

12) Double Detector Check Valve Assembly: A line-sized approved double check valve assembly with a parallel meter and meter-sized approved double check valve assembly. The purpose of this assembly is to provide double check valve protection for the distribution system and at the same time provide partial metering of the fire system showing any system leakage or unauthorized use of water.

13) Fire Hydrant Assembly: Fire hydrant, hydrant lead, mainline hydrant valve, mainline tee, and thrust restraint at the hydrant and the mainline tee.

14) Fire Protection Services: A connection to the public water main intended only for the extinguishment of fires and flushing necessary for its proper maintenance. All fire services connected to building sprinkler systems shall have a double detector check assembly.

15) Fixture Unit Equivalents: The unit flow or demand equivalent of plumbing fixtures as tabulated in the Uniform Plumbing Code.

16) Health Division: Oregon Department of Human Resources Health Division.

17) Hydrant Lead: The line connecting the fire hydrant to the District main or private fire line.

18) Irrigation Service: A metered connection intended for seasonal use and delivering water that is not discharged to the sanitary sewer.

19) ISO: Insurance Service Office.

20) Mainline Hydrant Valve: The isolation valve between the District water main or private fire line and the fire hydrant.

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

22) Private Distribution System: A privately owned and maintained water distribution system serving an industrial or commercial subdivision or a multi-building development on a single lot served through a master meter installed at the approved location. Private distribution systems must have a single entity responsible for the system. Resale of water without written approval of the District shall be prohibited.

23) Service Line: The waterline or pipe extending from the distribution main to the water meter, backflow prevention device, or private fire system double check valve.

24) Transmission Mains (Supply Lines): Mains that are used for transporting water from the source of supply and storage reservoirs to the centralized point of distribution and distribution reservoirs. Transmission mains may or may not supply individual consumers, but they are sized and located to transport water from centralized points of distribution to various points of interconnection with the grid system and centralized points of consumption.

25) 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 State Plumbing Specialty Code."

26) Water Main: A water-supply pipe for public or community use.

27) Water Master Plan: The Water System Master Plan for OWD, Oregon, most recent revisions.

5.8 MATERIALS

a. General

1) Unless otherwise approved by the District Engineer, materials shall conform to the minimum requirements outlined herein and as shown on the Standard Details. This listing is not intended to be complete nor designed to replace the District's Public Works Construction Standards (PWS).

2) In the case of conflicts between the provisions of these design standards and the PWS, the more stringent as determined by the Director of Public Works shall apply. Acceptable materials shall be as outlined in these Design Standards.

3) It is not intended that materials listed herein are to be considered acceptable for all applications. The design engineer shall determine the materials suitable for the project to the satisfaction of the District Engineer.

4) All materials or products which will come in contact with or which will be used on material or products which will come in contact with potable water shall conform to the requirements of OAR 333-61-087, Product Acceptability Criteria or the National Sanitation Foundation (NSF) Standard 61, Drinking Water System Components - Health Effects as approved by the Oregon Health Division.

b. Pipe

1) 4-inch Through 12-inch PVC (ASTM D-2241, Class 200)

a) PVC pressure pipe 4-inches through 12-inches in diameter shall conform to the requirements of ASTM D-2241, NSF approved. PVC pipe shall be Class 200 pipe with wall thickness equivalent to a standard dimension ratio (SDR) of 21.

2) 14-inch Through 24-inch PVC (AWWA C-905)

a) PVC pressure pipe 12-inches through 24-inches in diameter shall conform to the requirements of AWWA C-905 (design stress of 4000 psi), NSF approved, with cast iron pipe equivalent (CI) outside diameter dimensions. PVC pipe shall be Class 165 pipe with wall thickness equivalent to a standard dimension ratio (SDR) of 25.

3) Ductile Iron

a) Where ductile iron pipe is used for water distribution, pipe shall be Class 52 ductile iron pipe conforming to AWWA C-151, and cement-mortar lined and seal coated in accordance with AWWA C-104.

b) All ductile iron pipe and fittings buried underground shall be coated on the outside with a standard coating of black bituminous paint a minimum of 1 mil thick unless otherwise specified.

c. Fittings

1) Mechanical Joint Fittings

a) All MJ tees, crosses, elbows, reducers, adapters, combinations thereof, and other miscellaneous fittings 4-inches through 24-inches in diameter shall be ductile iron compact fittings in conformance with AWWA C-153.

b) The minimum working pressure for all MJ cast iron or ductile iron fittings 4-inches through 24-inch in diameter shall be 350 psi.

2) Flanged Fittings

a) All flanged tees, crosses, elbows, reducers, adapters, combinations thereof, and other miscellaneous fittings 4-inches through 48-inches in diameter shall be cast iron or ductile iron fittings in conformance with AWWA C-110.

b) The minimum working pressure for all flanged cast iron or ductile iron fittings shall be 250 psi.

d. Couplings

1) Couplings shall be limited in their application to connection of new pipe work to existing waterlines, temporary installations, and where specifically approved by the District Engineer.

2) Couplings shall be mechanical joint solid sleeve or mechanical joint split sleeve type couplings consisting of a ductile iron sleeve, ductile iron follower rings, rubber gaskets, and corrosion-resistant bolts and hex nuts.

3) Mechanical joint couplings shall have minimum pressure ratings that will accommodate maximum pressures that will be experienced during hydrostatic and leakage testing.

4) Solid sleeve couplings shall be Romac, Clow, Smith-Blair or approved equivalent.

5) Dresser type couplings are not an approved option unless specifically approved by the Director of Public Works. Applications shall be limited to transitions between pipe types for which mechanical joint couplings are not available.

e. Mainline Valves

1) General

a) All mainline valves and appurtenances shall have the name, monogram, or initials of the manufacturer cast thereon. They shall be built and equipped for the type of operation as specified herein or as shown on the drawings.

2) Valve Operators

a) All valve operators shall be totally enclosed traveling nut type manual operators, sealed and lubricated for underground service.

b) All buried valves shall be supplied with a 2-inch square operating nut. Nuts shall have a flanged base on which shall be cast an arrow at least 2-inch long with the word "OPEN" cast on the nut to clearly indicate the direction of opening.

c) Extension stems shall be provided for buried valves when the operating nut is four (4) feet or more below finished grade. Extension stem shall extend to within twelve (12) inches (maximum) of the finished ground surface and shall be provided with spacers that will center the stem in the valve box.

3) Valve Boxes (VB)

a) All buried valves shall be provided with valve boxes.

b) All buried valves shall be provided with valve boxes. Valve boxes shall be as shown on the Standard Details.

4) Gate Valves (GV)

a) For criteria regarding acceptable location for use of gate valves, see Section 5.16.

b) All gate valves shall be resilient wedge gate valves conforming to the requirements of AWWA C-509, except as herein modified.

c) Gate valves shall be epoxy coated iron-body, resilient wedge non-rising stem gate valves. The wedge shall be cast iron completely encapsulated in an elastomer covering with polymer guide bearing caps on each side. The valves shall have a full diameter waterway with no grooves or recesses at the valve seat location. Flanges, where required, shall be 125 pound, full faced, drilled per ANSI B16.1.

d) Valves shall be tested and certified by the manufacturer for shut-off at a working pressure of 200 psi and a minimum test pressure of 300 psi.

e) Gate valves shall be Mueller A-2360, Waterous Series 500 or approved equivalent.

5) Butterfly Valves (BFV)

a) For criteria regarding acceptable location for use of butterfly valves, see Section 5.16.

b) All butterfly valves shall conform to AWWA C-504, except as herein modified.

c) Butterfly valves shall be epoxy coated short body type AWWA Type-B valves. Flanges, where required, shall be 125 pound, full faced, drilled per ANSI B16.1.

d) Valve operators shall be enclosed traveling nut type manual operators, sealed and lubricated for underground service, and shall be rated for submerged operation up to 10 psi (±23 feet).

e) Valves shall be tested and certified by the manufacturer for shut-off at a working pressure of 150 psi and a minimum test pressure of 300 psi.

f) Butterfly valves shall be Pratt Groundhog series, or approved equivalent.

6) Shop Painting

a) All valves shall be furnished with a fusion-bonded epoxy coating inside and outside conforming to the requirements of AWWA C-550.

7) Toning Wire

a) A continuous insulated 12 gauge stranded copper toning wire shall be supplied with non-metallic pipe. Insulation shall be blue in color for potable water piping.

b) Additional wire shall be supplied as necessary to allow the toning wire to be looped up at all valve boxes on all lines.

f. Service Pipe and Fittings

1) For criteria regarding tapping requirements, see Section 5.19.

2) All services that are saddle tapped shall use ductile iron service saddles with stainless steel bolts and clamps. All ductile iron service saddles shall be furnished with a fusion-bonded epoxy coating conforming to the requirements of AWWA C-550.

3) Unless otherwise shown on the drawings, single residential service pipe shall be 1-inch diameter minimum. Double service lines to separate meters shall not be allowed.

4) 1-inch Services

a) Unless otherwise specified herein, water service lines shall be Driscopipe 5100 Ultra-Line (PE 3408) high density polyethylene pipe, iron pipe size OD, SDR 9 (200 psi working pressure rated) conforming to ASTM D-2737, 1-inch minimum diameter.

b) All corporation stops shall be brass ball valve corporation stops rated to 300 psi with iron pipe thread inlet and compression outlet to adapt copper pipe. Corporation stops shall be Ford FB-1100 or approved equivalent.

c) Each individual water service line shall be equipped with a locking ball valve meter stop assembly at the inlet to the meter. All meter stop assemblies shall be brass with copper pipe connector as appropriate and outlet for meter coupling.

d) Meter stops for 1-inch single meter stops shall be locking angle ball valves with CTS PAC joint inlet. 1-inch meter stops shall be Ford BA43-444W, or approved equivalent.

e) Service line couplings shall be CTS pack joint style couplings. Couplings shall be Ford C44 coupling or approved equivalent.

5) 1½-inch and Larger Services

a) 1½-inch and 2-inch water service lines shall be Driscopipe 5100 Ultra-Line (PE 3408) high density polyethylene pipe, iron pipe size OD, SDR 9 (200 psi working pressure rated) conforming to ASTM D-2737.

b) 1½-inch and 2-inch water services shall be provided with high bypass coppersetters for flanged meters, Ford 70 series or approved equivalent conforming to standard details.

(1) The coppersetter shall be provided with ball valves on the inlet and outlet, with inlet valve provided with a lockwing and the outlet valve provided with a handle.

(2) The bypass line shall be 1-inch diameter minimum, and shall be provided with a lockwing ball valve.

c) 2-inch and larger services shall have a mainline tee with flanged side outlet and flanged resilient wedge gate valve conforming to the requirements specified herein.

d) 3-inch and larger water service lines shall be reviewed on a case-by-case basis. Pipe and fittings shall be as required by the District Engineer and the Director of Public Works.

g. Water Meter Boxes

1) Unless otherwise approved by the Director of Public Works, all meter boxes must be as shown below:

WATER METER BOXES			
Service Line Size	Non-Traffic Area	Traffic Area	Inside Dimensions
1-inch	[1]Brooks 38-H	[1]Brooks 38-TR	13" x 24"
1½-inch	[1]Brooks 66-S(CI)	[1]Brooks 66-TR	17" x 30"
2-inch	[1]Brooks 66-S(CI)	[1]Brooks 66-TR	17" x 30"
3-Inch and larger	Vault built to Public Works requirements w/remote read head.		
[1] -or approved equivalent. All meter box and vault lids shall be provided with the touch-read knockout to allow the future installation of touch read sensors by the District.			

2) Meter boxes outside of traffic areas shall be reinforced concrete boxes with reinforced concrete covers and cast iron hinged reading lids.

3) Meter boxes within traffic areas shall be reinforced concrete boxes with steel covers and cast iron reading lids.

h. Fire Hydrants

1) Unless otherwise required by the Fire District, all fire hydrants shall conform to the following:

a) All fire hydrants shall be improved, dry barrel, 5-1/4-inch compression type valve, traffic model.

b) Fire hydrants shall be equipped with two 2-1/2-inch hose ports (NST), one 4-1/2-inch pumper port (NST), 1-1/2-inch pentagon nut, and barrel drains.

c) Fire hydrants shall be oriented so as to optimize access to ports, or as directed by the Engineer.

d) Fire hydrants shall be AVK Model 2780 or Waterous Model WB-67, and shall be factory painted yellow.

i. Mainline Blowoffs

1) Minimum allowable blowoff size shall be as outlined under Section 5.12. Blowoffs shall be sized to provide adequate flushing velocities as approved by the District Engineer.

2) Unless otherwise shown or authorized by the District Engineer, all blowoffs shall be provided with valve boxes and/or meter boxes as shown in the Standard Details.

j. Mainline Tapping Tees

1) Tapping tees used for making connections to existing, in-service lines shall have Class 125 outlet flanges. In all cases, the tapping tee shall be designed for use with the existing pipe materials and O.D. equivalent.

2) Any company performing mainline taps shall be prequalified with the District prior to performing any work on a project.

3) Contractors shall coordinate all taps with District Public Works and perform work with Public Works staff present.

k. Underground Warning Tape

1) Underground warning tape shall be detectable or non-detectable acid and alkali resistant safety warning tape. The tape shall consist of a minimum 4.0 mil (0.004") thick, virgin low density polyethylene plastic film formulated for extended use underground. The tape shall be in accordance with the APWA national color code and shall be permanently imprinted in lead free black pigments suitable for direct burial.

2) The tape shall be safety blue and shall be provided with the legend "CAUTION BURIED WATER LINE BELOW" or approved equivalent printed continuously down the length of the tape.

1. Bore Casings and Accessories

1) Carrier pipe used in bore casings shall meet the minimum specifications contained herein.

2) Casing shall be welded smooth steel pipe conforming to the requirements of ASTM A-53 or approved equal, with a minimum yield strength of 35,000 psi.

3) Minimum casing wall thickness shall as outlined below. Casing wall thickness shall conform to these requirements or the requirements of the agency having jurisdiction, whichever is more stringent.

CASING PIPE - MINIMUM THICKNESS		
Carrier Pipe Diameter (Inches)	**Minimum Casing Pipe Diameter (Inches)**	**Minimum Casing Wall Thickness (Inches)**
<6	10	0.188 (3/16)
6	12	0.281 (9/32)
8	14	0.281 (9/32)
10	16	0.313 (5/16)
12	18	0.344 (11/32)
14	20	0.375 (3/8)
16	22	0.406 (13/32)
18	24	0.438 (7/16)
20	26	0.469 (15/32)
>20	As required	0.50 (1/2)

4) The class of casing specified is based upon assumed superimposed loads and not upon the stresses resulting from jacking or boring operations. Any increase in casing strength to withstand jacking or boring operations shall be the responsibility of the Developer.

5) Casing Spacers and End Seals

a) Casing spacers (skids) shall be Model SSI as manufactured by Advanced Products and Systems, Inc. (APS) or approved equivalent.

b) End seals shall be Model AC or Model AW End Seals as manufactured by APS or approved equivalent.

5.9 GENERAL DESIGN CONSIDERATIONS

a. The water system shall have sufficient capacity to maintain 40 psi at the building entrance for one and two family dwellings. For other development, the system shall have sufficient capacity to provide minimum pressure of 35 psi at the building side of the meter during periods of maximum use, and to provide sufficient volumes of water at adequate pressures to satisfy the maximum expected daily consumption plus fire flows.

b. Normal working pressure in the distribution system should be approximately 70 psi with a range of 40 psi to 100 psi.

c. Head loss shall be determined by the Hazen-Williams equation based on the following coefficients.

Hazen-Williams Coefficients	
Pipe Diameter	C Value
8 Inches and Less	100
10 to 12 Inches	110
Greater than 12 Inches	120

d. Velocities in mains shall normally range from three (3) to six (6) feet per second for average demand to a maximum velocity of ten (10) feet per second for maximum day demand plus fire flow.

e. A 20 psi residual pressure under fire flow conditions shall be maintained at all points in the distribution system. Generally, a maximum velocity of ten (10) feet per second will govern for sizing mains at all other locations of the service level where this criteria does not govern.

f. Private systems shall limit velocities as required by the Oregon State Plumbing Specialty Code, Installation Standards.

g. Providing for Future Development

1) As a condition of water service, all developments will be required to provide public water mains of sufficient size for fire protection to adjacent parcel. 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.

2) In general, water distribution systems should be designed for maximum development of the service area with recognition of possible urban renewal, industrial expansion, etc.

5.10 WATER SYSTEM CAPACITY

a. General:

1) In areas not addressed in the Water Master Plan, design capacities shall be determined by consideration of the following factors and assumptions:

a) Area to be serviced, both immediate and adjacent.

b) Current and projected population within the areas to be served.

c) Current and projected land use within the areas to be served.

d) Commercial, industrial, or institutional users to be served.

e) Changes in any of the above factors that are likely to occur within a foreseeable time period.

2) In the absence of consumption data or other reliable information, the following factors may be assumed:

a) Peak hour demands as follows:

(1) 5 gpm per single family residential

(2) 2.5 gpm per dwelling unit for multiple family residential

(3) 5,000 gal/ac/day for commercial development

(4) 10,000 gal/ac/day for industrial development

b) Demand for unique commercial installations, industrial users, PUD's, multiple and institutional developments shall be calculated on an individual basis.

b. Fire Flow Requirements

1) Unless otherwise approved or required by the District Engineer and the local Fire Marshall, minimum fire flows shall be as follows:

MINIMUM FIRE FLOW REQUIREMENTS			
Land Use		**Fire Flows (gpm)**	**Duration (Hr.)**
Residential	Single Family/Duplex	1000	2
	Multi-Family, Apartments, etc.	1500	2
Commercial		1500	2

2) In all cases, all new fire hydrants shall be capable of delivering a minimum of 1,000 gpm at 20 psi residual system pressure.

5.11 LOOPING

a. The distribution system mains shall be looped at all possible locations.

b. All water lines shall be looped and valved such that the removal of any single line segment from service will not result in more than one fire hydrant being taken out of service.

c. The installation of permanent dead-end mains upon which fire protection depends and areas of large demands on single mains will not be permitted.

5.12 BLOWOFFS

a. All dead-end mains shall terminate with a blowoff assembly or a fire hydrant.

b. Permanent dead-ends shall have a permanent blow-off assembly and a permanent thrust restraint system. Permanent blowoffs in cul-de-sacs shall be located in front of the curb within five (5) feet from the curb face.

c. Mains that can conceivably be extended at some later date shall have a mainline valve in front of the blowoff assembly, and a thrust restraint system that allows the mainline valve to be connected to without taking the line out of service.

d. Blowoffs shall be sized to ensure that the water mains can be flushed at a minimum velocity of 2½ feet per second in accordance with AWWA C-650. The following table may be used as a minimum guideline assuming 40 psi minimum residual system pressure under flushing conditions.

MAINLINE BLOWOFF SIZES	
Water Main Diameter	Minimum Blowoff Diameter
6 and 8-inch	2-inch
10 and 12-inch	4-inch
>12	As required

e. The design engineer shall submit calculations showing that these flushing velocities can be satisfied.

f. Temporary blowoffs larger than 2-inches in diameter shall have a valve conforming to the requirements contained herein for mainline valves.

g. Temporary blowoffs, where required for cleaning new water mains, shall be located at the lower end of the line to be flushed whenever possible.

5.13 MINIMUM DEPTH

a. The standard minimum cover over buried water mains within the street right-of-way or easements shall be thirty six (36) inches from the finished grade, except that a minimum of 40 inches cover shall be required for waterlines in fill slopes.

b. Finish grade shall normally be determined as follows:

FINISH GRADE	
Mainline Location	Finish Grade
Waterline under sidewalk in right-of-way	Top of curb
Waterline in front of curb	Gutter
Waterline in cut slope behind sidewalk	Top of curb
Fill slopes	Perpendicular from pipe to surface
Easement	Finish grade at pipe centerline

c. Where the waterline is located in the cut side slope, in an undeveloped right-of-way, or along a roadway developed at less than ultimate width (including sidewalks), the waterline shall be placed at a depth sufficient to ensure that 36-inches of cover is maintained at the time of final construction of the roadway.

5.14 MINIMUM MAINLINE SIZE

a. Unless otherwise directed by the District Superintendent, minimum sizes for water mains shall be as follows:

MAINLINE SIZE REQUIREMENTS	
Minimum Diameter	Type of Mainline
4-inch	Public lines in cul-de-sacs which cannot be looped in the future and which are beyond the fire hydrant envelope of 250 feet to the furthest point on any existing or future structure. Private fire line supplying either a single fire hydrant or a building fire suppression system. Looping of private fire lines that supply hydrants will be required.
8-inch	Minimum size water main for the public water system. Looping back into the distribution grid shall be at intervals as required by the District, but shall generally not exceed ±600 feet.
8-inch	Public water distribution mains, and permanently dead-end mains supplying fire hydrants with a required fire flow of 1,500 gpm of less.
10-inch & Larger	As required for transmission mains, and fire lines supplying more than 1,500 gpm.

5.15 ALIGNMENT AND LOCATION

a. General

1) Water lines shall generally be parallel to the right-of-way or easement wherein they lie.

2) Unless otherwise required by the District Engineer, water lines shall generally be located on the uphill side of the right-of-way wherein they lie.

b. Location in Relation to Sanitary Sewer Lines and Other Utilities

1) Water mainlines shall be separated from all other utilities by a minimum of 5 feet.

2) Water mainlines shall generally be separated from sewer mainlines by a minimum of 10 feet. In no case shall the separation be less than 5 feet or as required by OAR 333.

3) Sanitary Sewer Main Crossings

a) Where a water mainline crosses below or within 18-inches vertical separation above a sanitary sewer main or lateral, one full length of waterline pipe shall be centered at point of crossing.

c. Location in Right-of-Ways

1) Unless otherwise approved by the Director, water mainlines shall generally be located in the street right-of-way between the curb and the right-of-way line, centered under the sidewalk.

2) The distance between the mainline and the curb shall vary as little as possible. On curved streets, mains may be laid on a curve concentric with the street centerline with deflections no greater than the manufacturer's specifications, or mains may be laid in straight lines along the tangent between selected angle points to avoid conflicts with other utilities. The angle point and tangent section shall not be closer than 5 feet from the right-of-way line, nor more than 3 feet in front of the curb face.

d. Location in Easements

1) Unless otherwise specified or authorized by the District, minimum easements widths for water mainlines shall be fifteen (15) feet for normal depth lines.

2) Mainlines in easements will be allowed only in cases where it is required in order to loop a mainline to avoid a permanent dead end condition, and only after all reasonable attempts to loop the mainlines in a right-of-way have been exhausted.

3) When water mainlines in easements are approved by the District, the easement shall be centered on the mainline, and the mainline shall be offset a minimum of 6 feet from any property line.

4) 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 mainline purposes. Under no circumstances shall a building or structure, trees, ornamental landscaping or fence be placed over a water mainline or easement. Prohibited structures shall include footings, decks and overhanging portions of structures located outside the easement.

5) Easement locations for public water mainlines serving a PUD, apartment complex or commercial/industrial development shall be in parking lots, private

drives or similar open areas which will permit an unobstructed vehicle access for maintenance by District forces.

6) Water mainlines with inside diameters larger than 12-inches will require wider easements.

7) Common placement in the easement of water and sewer or storm drain line may be allowed under certain conditions subject to approval by the Director. Easements wider than the minimum will be required.

8) Common easements will be reviewed on a case-by-case basis. Separation of utilities must meet Oregon State Health Division (OHD) requirements.

9) All easements must be furnished to the District for review and approval prior to recording.

e. Phased Construction

1) Water mains installed by phased construction, which will be extended in the future, shall terminate with a mainline valve, blow off and permanent thrust restraint system.

2) All developments will be required to extend mains across existing or proposed streets for future extensions by the District 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.

3) The construction plans for each phase shall be capable of standing alone, including provisions for looping and minimum fire flows.

f. Location in Relation to Ditches and Drainage Channels

1) Surface water crossings of mains shall be in accordance with OAR 333 and the requirements outlined herein.

2) Mains crossing ditches or drainage channels shall be designed to cross as nearly perpendicular to the channel as possible.

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

a) Ditch or drainage channel crossing for pipes of 12-inch diameter and greater.

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

4) The minimum cover from the bottom of the ditch or drainage channel to the top of pipe shall be a minimum of thirty-six (36) inches unless otherwise approved by the Director of Public Works and the Oregon Health Division.

5) A scour pad centered on the water line will be required for mains where the potential for erosion exists as determined by the Director of Public Works. The size and design of scour pads will be reviewed on a case-by-case basis by the Director.

5.16 VALVES

a. Sizes

1) In general, valves shall be the same size as the mains in which they are installed. Reducers for reconnection into existing water mains less than 8-inches in diameter shall be placed between the new valve and the existing line.

2) Unless otherwise approved or required by the Director of Public Works, valves shall conform to the following table.

Required Valves by Size and Operating Conditions

Valve Size	Static Pressure	Valve Style
10-inch and smaller	< 120 psi	Gate Valve
8-inch & 10-inch	≥ 120 psi	Butterfly Valve
12-inch & larger	All pressures	Butterfly Valve

3) Valve types and materials shall conform to the requirements of these Design Standards and the Standard Construction Specifications.

b. Location

1) Distribution system valves shall be located at the tee or cross fitting as nearly as possible.

2) There shall be a sufficient number of valves so located that not more than four (4) and preferable three (3) valves must be operated to effect any one particular shutdown. The spacing of 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.

3) A tee-intersection shall be valved on two branches and a cross-intersection shall be valved on three branches.

4) Hazardous crossings (ie. creek, railroad, freeway crossings, etc.) shall be valved on each side of the crossing.

5) Distribution branches on transmission mains shall be spaced not more than 800 feet apart where practical and shall be valved and plugged.

6) Transmission water mains shall have valves at spacings as required by the Director of Public Works.

c. Tapping Tees

1) Tapping tees to make connection to existing, in-service lines are only allowed in cases where the District determines that water service cannot be interrupted to cut in a tee or cross, and where the additional in-line valve required is not needed for system isolation as outlined above.

5.17 FIRE HYDRANTS

a. Coverage

1) Preferred coverage shall result in maximum hydrant spacing of 500 feet in residential areas, 300 feet in high-value districts including industrial subdivisions and no further than 250 feet from the furthest point of any dwelling, business, garage or building. Hydrant stubs with mainline valves will be required as a minimum in undeveloped areas.

b. Location

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

2) Hydrants shall be placed in locations approved by the local Fire Marshall.

3) In general, hydrants shall be located at corner of street intersections where possible. Hydrants located at points other than intersections shall be located at the extension of property lines.

4) Unless otherwise approved by the District, hydrants shall be placed between the sidewalk and the property line.

5) No hydrant shall be installed within five (5) feet of an existing utility pole or guy wire nor shall a utility or guy wire be placed within five (5) feet of an existing hydrant.

c. Hydrant Valves

1) Each fire hydrant shall have a hydrant valve and valve box at the mainline hydrant tee that will permit removal and repair of the hydrant without shutting down the water main supplying the hydrant.

2) Hydrant valves shall be resilient wedge gate valves.

3) The hydrant valve shall be connected directly to the mainline tee using a flange joint.

4) If the length of the hydrant lead is greater than 30 feet, an additional gate valve shall be provided within 3 feet of the hydrant.

d. Hydrant Bury & Exposure

1) Hydrant bury shall not be sufficient to provide a minimum of 36-inches of cover over the hydrant lead. In no case shall the bury be less than the depth of the waterline from which the hydrant is served.

2) The hydrant shall be set such that the base of bottom flange bolts are a minimum of 2-inches and a maximum of 6-inches above finish grade following all landscaping and surface restoration.

5.18 AIR RELEASE VALVES

a. General

1) Provisions for air relief shall be provided at all high points of waterlines. Where possible, location of service taps at high points in the line is preferable to the installation of an air relief valve. Fire hydrants may be used for air relief on lines 10-inches in diameter or less.

2) Where service taps cannot be used, an air release valve shall be permanently installed at high points on all water mains at all location where air can accumulate. An automatic air release valve shall be installed in a manhole off of the street where flooding of the manhole or chamber will not occur.

b. Air Release Valve Piping

1) The open end of an air release pipe from automatic valves shall extend to the top of the manhole at least twelve inches above grade and provided with a screened, downward facing elbow. Grade shall mean the existing ground elevation adjoining the manhole. An opening twice the size of the vent pipe shall exist at grade to prevent flooding of the vault.

5.19 SERVICE LINES

a. General

1) The use of pumps on a service line to provide adequate pressure to a subdivision lot or property located above the pressure level of the supply main shall be prohibited.

2) Each legal lot of record shall be connected by a separate water service line connected to the public or approved private water main. Combined water service lines will be permitted only when the property cannot legally be further divided. An example of this is a residential lot with a house and unattached garage or shop with plumbing fixtures.

3) Additional water service lines must be stubbed into the property lines sufficient to serve all residential parcels which can be further partitioned in the future where such future partition would require that the streets be cut to install such services.

b. Sizes

1) Standard service line sizes are 1-inch, 1½-inch, 2-inch, 3-inch, 4-inch, 6-inch and 8-inch. Service lines will be reviewed for effects on the distribution system and shall not be greater in size than the distribution main.

MINIMUM SERVICE SIZE	
Type of Service	Minimum Service Size
Single residential service	1-inch
Double residential service	1-inch
Triple residential service (triplexes only)	1½-inch
Commercial Service	1" minimum
Note: The next larger service size may be required for residential lots large enough to be partitioned into additional lots without a water main extension.	

2) The water service line on the private side of the meter may not be larger than one nominal pipe size larger than the service line size.

3) Commercial services shall not be smaller than 1-inch. For new streets or streets being cut for service installation, far side commercial services shall be installed in a 3-inch minimum size PVC sleeve.

4) Service piping shall be equal to or greater than the meter size.

5) For 3-inch and larger services, design drawings must be submitted showing the vault and fitting requirements, including a lockable bypass line, with the expected flow requirements and proposed usage.

c. Tapping requirements

1) Tapping requirements for water service lines shall be as outlined below.

WATER SERVICE TAPPING REQUIREMENTS		
Service Size	Mainline Type	Tapping Requirements
1"	All pipe types	Service Saddle
1½"	All pipe types	Service Saddle
2" & larger	All pipe types	Mainline tee with flanged valve

d. Location

1) Domestic

a) The service lines shall normally extend from the main to a point 6-inches behind the back of the sidewalk. A curb stop and meter box shall be located at the termination of the service line.

b) The meter stop shall be located such that the front of the meter box is 3-inches behind the sidewalk.

c) In general, individual service connections shall terminate in front of the property to be served. Double services shall be located on each side of a common side property line.

d) Domestic service lines shall not be connected to fire protection services, including hydrant leads.

2) Fire Service

a) A backflow prevention assembly shall be placed on fire service lines as required by the District.

b) Plans for fire service lines shall meet the requirements of outlined in Division 1 and shall be stamped by a licensed Civil Engineer.

c) Drawings for fire services shall include vicinity map, adjoining street name, width, curb and property line, location of existing water line referenced to the property line, existing hydrant locations and the distance to property pins where the service crosses the property line.

5.20 WATER METERS

a. General

1) All water meters within the service area of the District will be furnished and installed by District forces at the request and expense of the customer. The service line, meter box and all piping within the meter box must be installed by the developer.

b. Location

1) General

a) Meters shall be located at the termination of the District service line.

b) A public utility and access easement shall be provided to and around any meter boxes set on private property. The easement shall be sized to provide a minimum of five (5) foot clear around the meter box or vault on all sides.

2) 3/4-inch through 2-inch Meters

a) In the right-of-way in a location that allows for easy reading and maintenance, preferably 3-inches behind the back of sidewalk.

3) 3 Inch and Larger Meter:

a) On private property adjacent to the public right-of-way to allow reading and maintenance. It must be accessible with a crane truck to within ten feet of the installation with a ten foot vertical clearance.

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

c) A minimum three foot clear space must be provided around the vault to provide ample working space for maintenance.

d) All 3-inch and larger meters shall be provided with a remote readout head located such that it can be read without entering the meter vault.

4) The meter, with approval by the District, may be located in the same vault with a backflow prevention device, provided a completed dimensioned design is submitted with a request for variance.

c. Meter Boxes

1) Meter boxes shall be provided by the Developer for each water service and meter location. Double set meters (2 meters in 1 box) are not allowed.

2) Meter boxes shall be set level to finish grade. The Developer or builder shall be responsible for setting meter boxes and services to finish grade prior to installation of water meters by the District.

5.21 PRIVATE WATER SYSTEMS

a. General design considerations for private water systems shall conform to requirements set forth by the Oregon Health Division, by the Oregon State Plumbing Specialty Code (Chapter 10), and these Design Standards.

b. All public water mains within private developments shall be in public right-of-way or exclusive easements to the District and shall conform to these design standards. Each connection of the private water system to the District system shall be through an approved backflow prevention assembly and meter.

c. Requirements for capacity, materials, looping, valves, fire protection, service lines and meters shall also be applicable to design within PUD areas.

d. The resale of water without written approval of the District shall be prohibited. Written authorization from the District shall be required for each service connection and for any sale of water.

5.22 BACKFLOW PREVENTION

a. General

1) All backflow devices shall be testable and include provisions for testing by a certified backflow testing person or organization.

2) An approved backflow prevention assembly with an approved metering system shall be required for each use in the following instances:

a) When a private line must be extended from or looped between two (2) or more District mains in order to obtain the required flow and the resultant loop is no benefit to the District grid system.

b) When pipe materials other than those approved for potable water are installed on private fire services.

c) On all private water lines or distribution system attached to the District's distribution system.

d) On all private water lines or distribution systems attached to the District grid system at the master meter on the detector check assembly.

e) When an auxiliary water supply exists on the property being served.

f) As determined by the District Cross-connection Control Inspector and Oregon State Health Division requirements.

3) An approved reduced pressure backflow prevention assembly with an approved metering system shall be required for service connections in high hazard areas as determined by the Director of Public Works.

4) The backflow assemblies must meet the District approved assembly standards, which standards are taken from the current approved list of assemblies maintained by the Oregon Health Division.

b. Location

1) The approved backflow prevention assembly shall be installed on the property being served in place accessible for District inspector and testing and located as follows:

a) Before any branch, immediately downstream of the meter; or

b) If not meter, at the property line; or

c) If in the building, before the first branch or hazard being controlled or as determined by the District Cross-connection Control Inspector; or

2) If installed outside the building being served, it shall be placed at the property line or easement line in a vault or structure in accordance with the manufacturer's recommendations and as approved by the Director of Public Works. Vaults must have a sump and be watertight.

3) The distance from a fire hydrant to the fire department connection shall not exceed 40 feet unless otherwise approved in writing by the Fire Chief, but in no case shall a distance of greater than 60 feet be allowed.

5.23 UNDERGROUND WARNING TAPE

a. Detectable or non-detectable acid and alkali resistant safety warning tape shall be provided along all mainlines not located under sidewalks or paved portions of public streets.

b. Underground warning tape shall be placed a minimum of 12-inches and a maximum of 18-inches below the finish ground surface, and shall be continuous the entire length of the mainline as specified.

5.24 MAINLINE BORED CROSSINGS

a. Casing size shall adequate to permit proper construction of the carrier pipe to the required lines and grades. Carrier pipe used in bore casings shall be as specified herein.

b. All bore crossings shall be provided with casing spacers and end seals. Casing spacer configuration shall conform to the manufacturer's recommendations, but in no case shall less than 3 spacers per length of pipe be used.

c. In order to prevent over-belling of PVC or other flexible pipe while installing it through the casing, provide a method for restricting movement between the assembled bell and spigot conforming with the manufacturer's recommendations.

d. The design of the bore crossing shall include the following as a minimum:

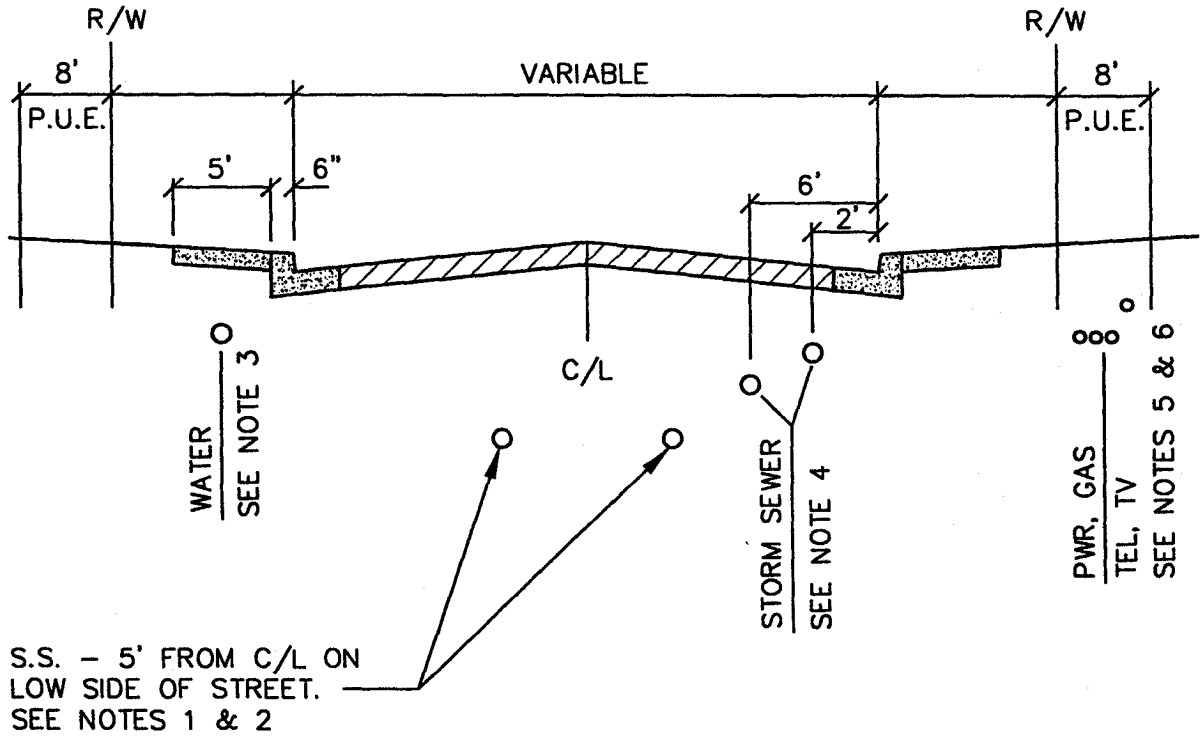
1) Casing and carrier pipe materials and dimensions, including outside bell diameters of the carrier pipe.

2) Details for any part of the system that must be changed as a result of the boring operation (manhole, headwall, etc.).

3) Bore and receiving pit backfill material and compaction requirements.

Standard Detail Drawings

Appendix A



CURBED STREETS

NTS

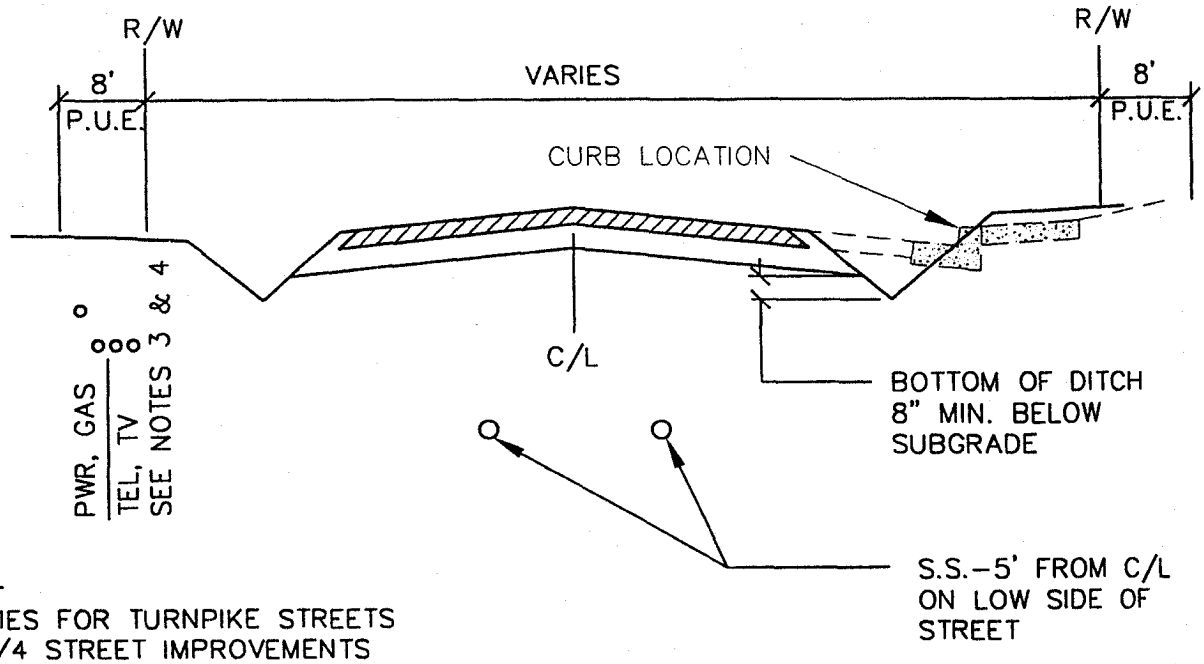
NOTES:

1. WATER TO BE INSTALLED 3' BEHIND FACE OF CURB ON HIGH SIDE OF STREET. 36" MIN. COVER ON ALL WATERLINES.

2. MAINTAIN MIN. 3' HORIZ. SEPARATION BETWEEN PUBLIC UTILITIES & PARALLEL PRIVATE UTILITIES. OTHER VERT. AND HORIZ. SEPARATION DISTANCES ARE CONTROLLED BY DEQ, OHD, AND OTHER PUBLIC/PRIVATE UTILITY COMPANIES.

3. UNITY TRENCH PER UTILITY COMPANY REQMTS. ON OPPOSITE SIDE OF STREET FROM WATER LINE.

LAST REVISION DATE: June 1999	
TYP. UTILITY LOCATIONS (CURBED STREETS)	
CITY: OWD, OR	DRAWING NO. 101



NOTE:

UTILITIES FOR TURNPIKE STREETS OR 3/4 STREET IMPROVEMENTS SHALL BE LOCATED TO ALLOW FUTURE CONSTRUCTION OF CURBED STREETS WITHOUT RELOCATING UTILITIES. SEE DETAIL 101.

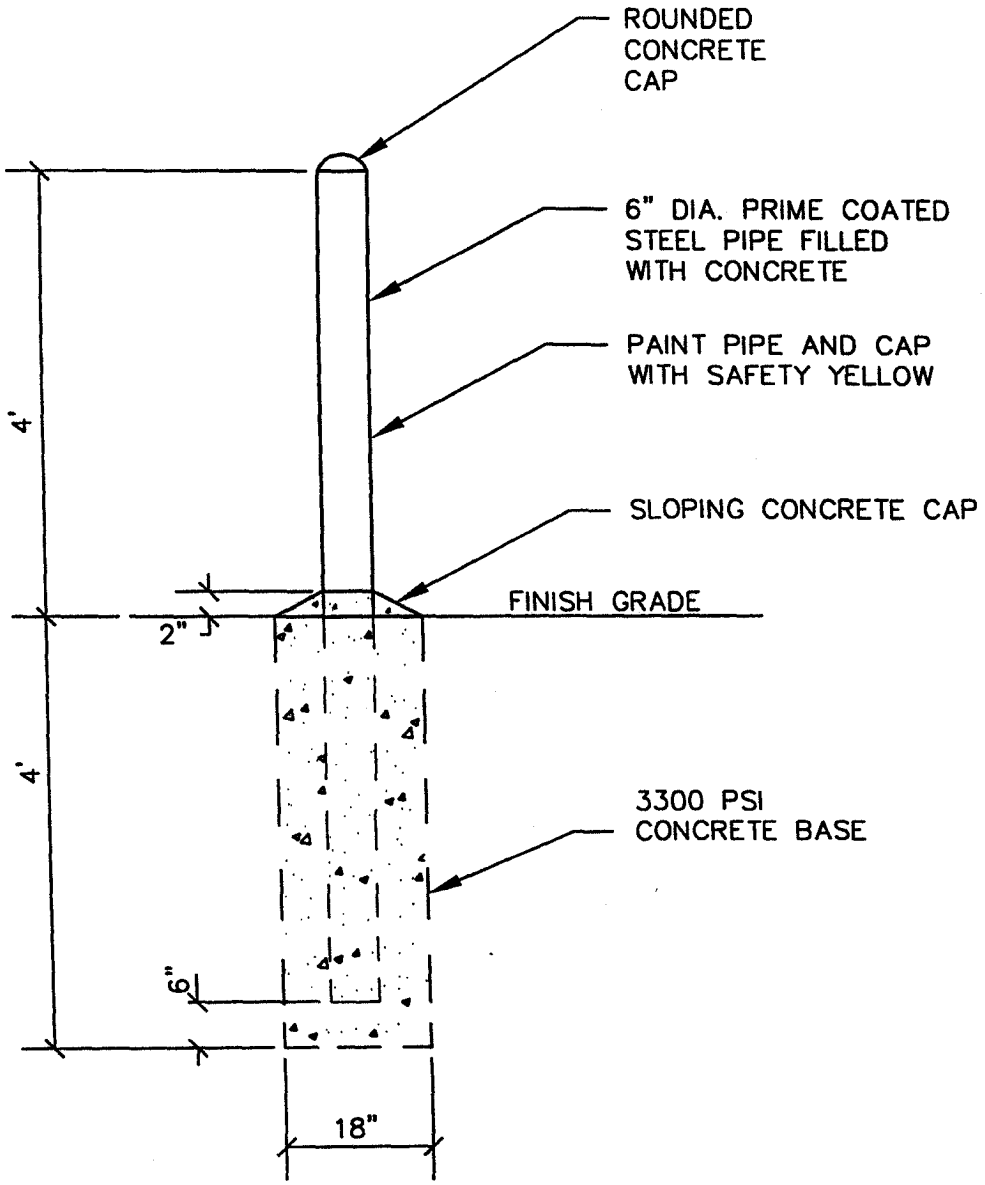
TURNPIKE STREETS

NTS

NOTES:

1. WATER TO BE INSTALLED 3' BEHIND FACE OF CURB ON IMPROVED SIDE OR 3' BEHIND FUTURE FACE OF CURB LOCATION AS DIRECTED BY THE CITY ENGINEER.

LAST REVISION DATE: June 1999	
TYP. UTILITY LOCATIONS (TURNPIKE & 3/4 STREETS)	
CITY: OWD, OR	DRAWING NO. 102

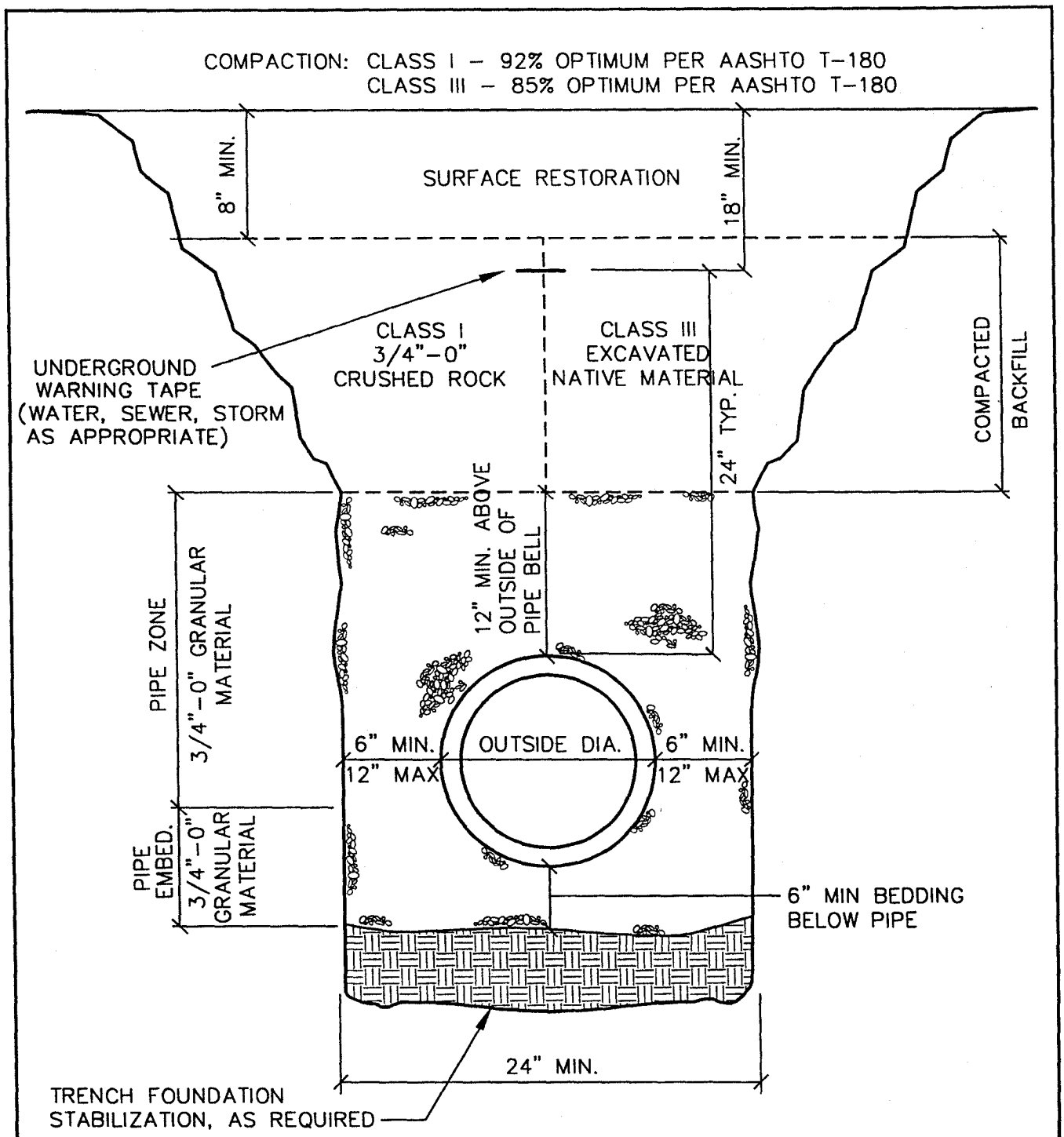


LAST REVISION DATE:
June 1999

BOLLARD
(GUARD POST)

CITY:
OWD, OR

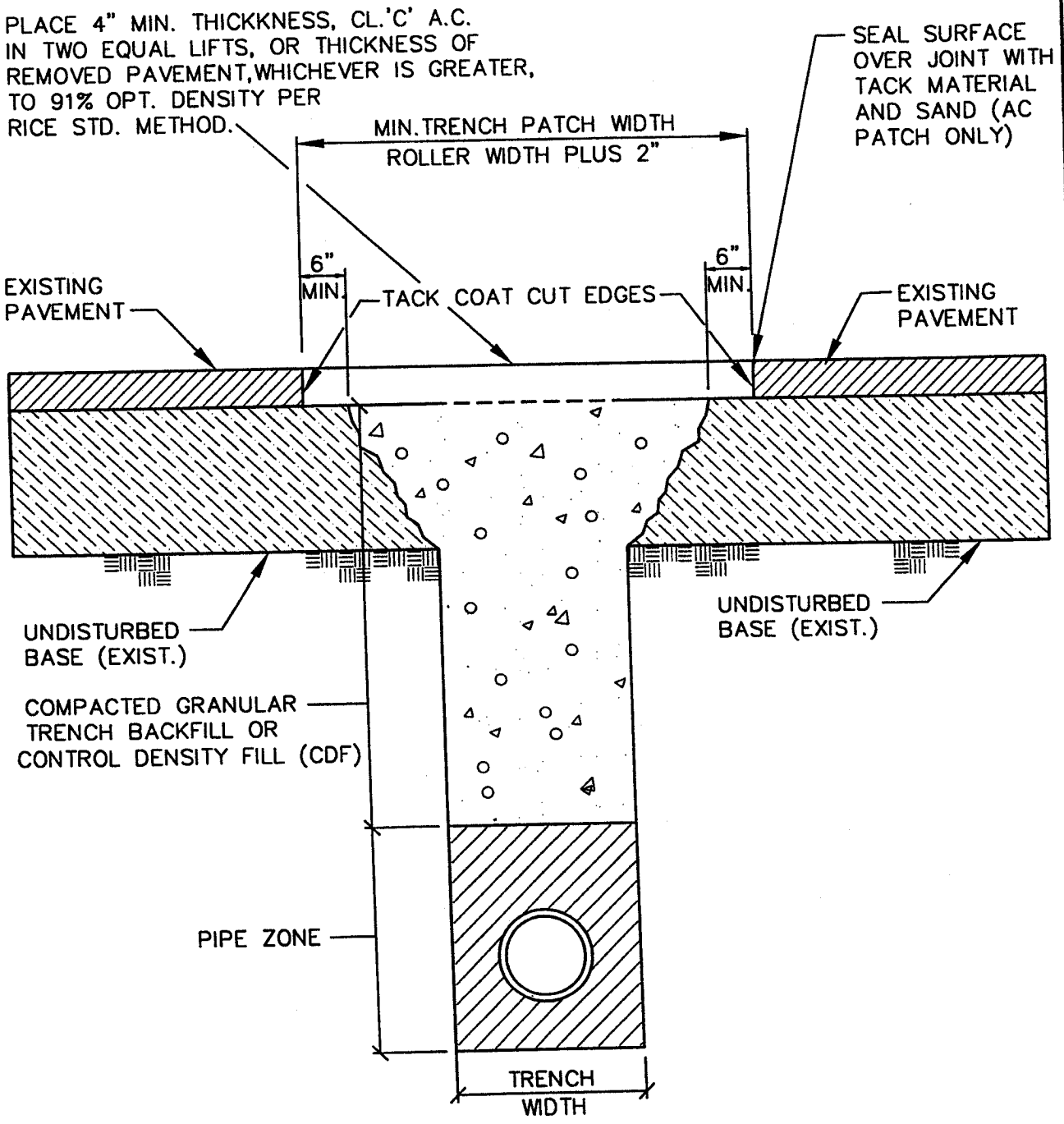
DRAWING NO.
226



NOTES:

1. CLASS I REQ'D. UNDER ALL EXIST. OR FUTURE IMPROVED AREAS INCLUDING SIDEWALKS.
2. WHERE NEW PIPING IS IN SAME ALIGNMENT AS EXIST. PIPING, THE PIPE EMBEDMENT SHALL EXTEND TO A MIN. OF 6" BELOW THE NEW PIPING OR 6" BELOW EXIST. PIPING, WHICHEVER IS DEEPER.

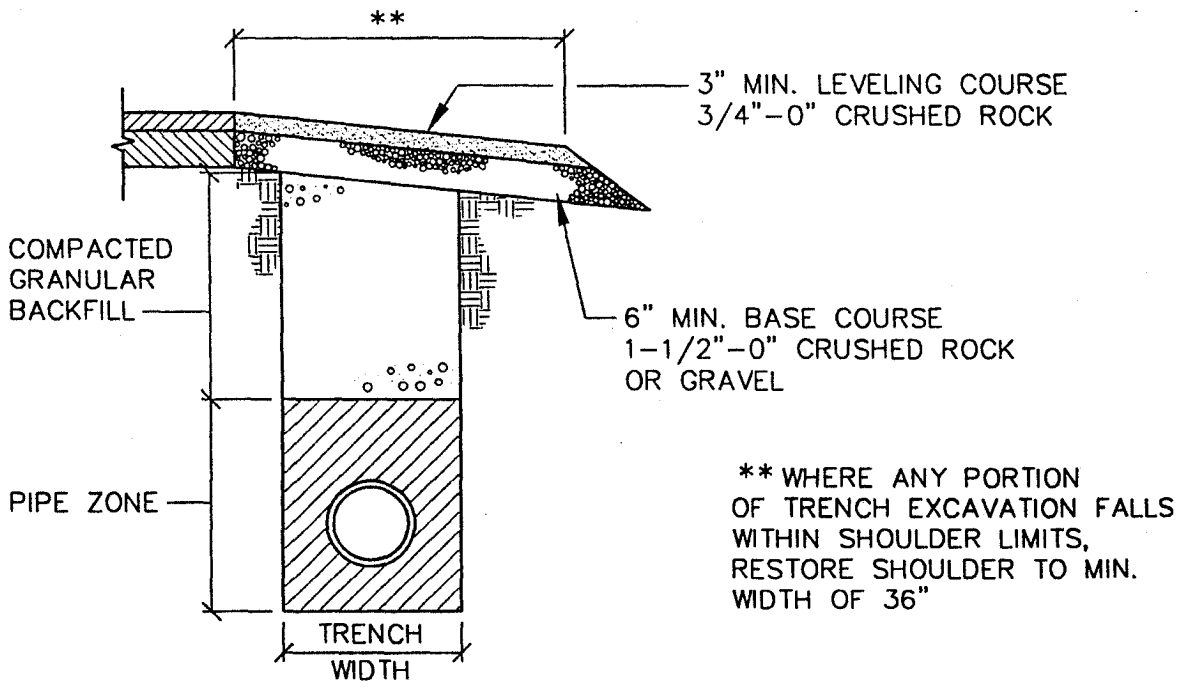
LAST REVISION DATE: JUNE 1999	
TRENCH BACKFILL, BEDDING, AND PIPE ZONE	
CITY: OWD, OR	DRAWING NO. 301



NOTES:

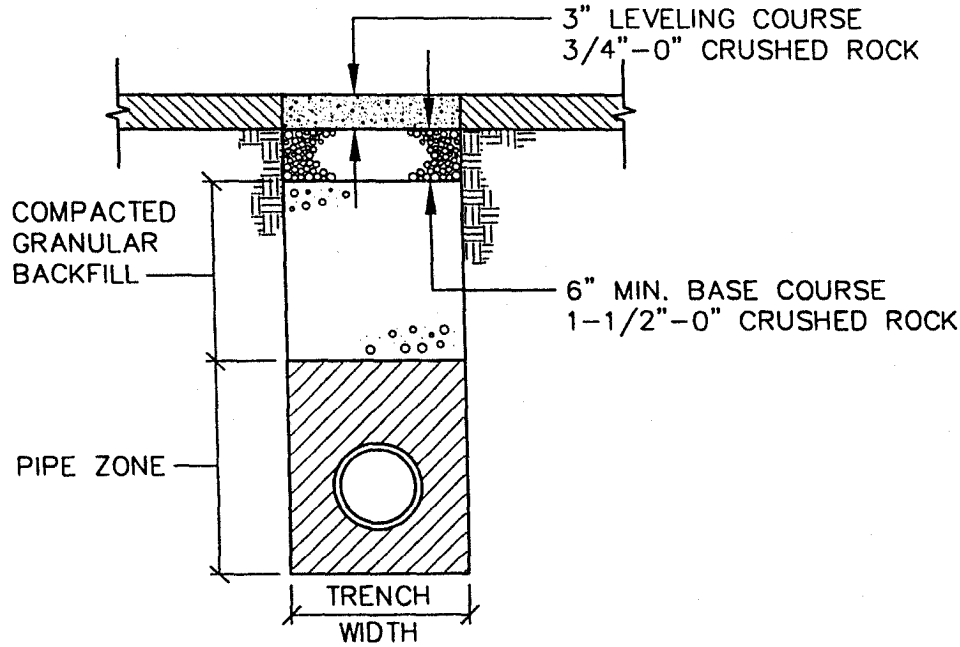
1. ALL EXISTING AC OR PCC PAVEMENT SHALL BE SAWCUT PRIOR TO REPAVING.
2. PCC CONCRETE PAVEMENT SHALL BE REPLACED WITH CONCRETE TO A MINIMUM THICKNESS OF 6" OR TO THE THICKNESS OF REMOVED CONCRETE, WHICHEVER IS GREATER.
3. FOR PAVED DRIVEWAYS, (EXCEPT COMMERCIAL OR INDUSTRIAL), PAVEMENT THICKNESS MAY BE REDUCED TO 3" IN 2 LIFTS, AND OVERCUT MAY BE REDUCED TO 3" EACH SIDE.

LAST REVISION DATE: June 1999	
STREET CUT SURFACE RESTORATION	
CITY: OWD, OR	DRAWING NO. 302



** WHERE ANY PORTION OF TRENCH EXCAVATION FALLS WITHIN SHOULDER LIMITS, RESTORE SHOULDER TO MIN. WIDTH OF 36"

CLASS 'C'
GRAVEL SHOULDER

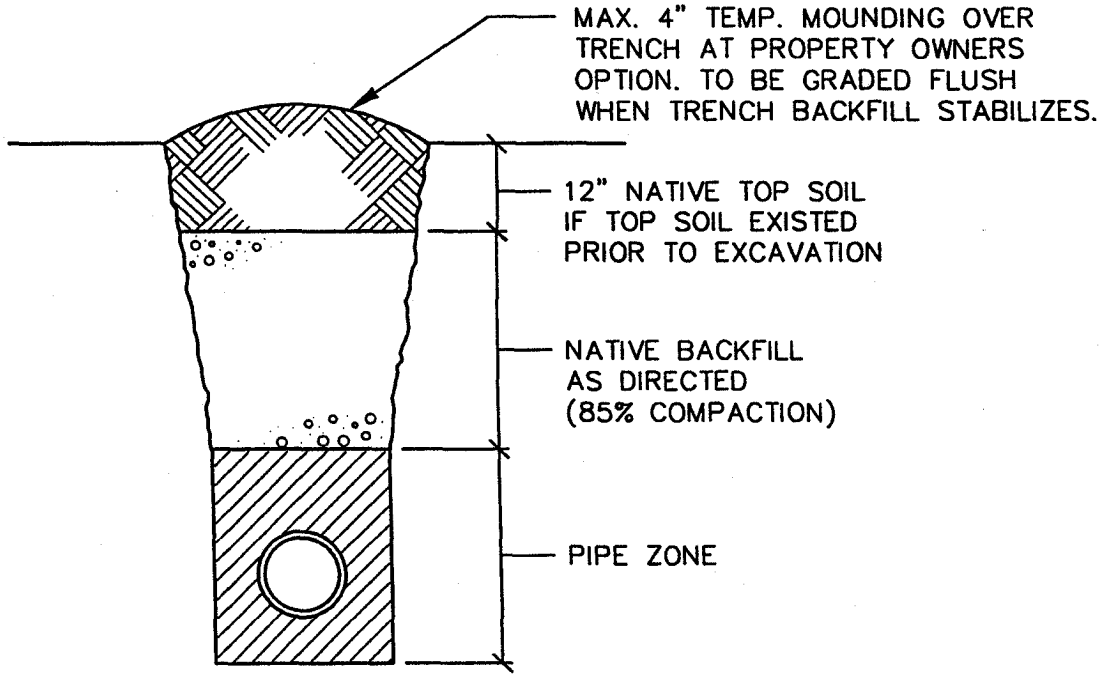


CLASS 'D'
GRAVEL ROAD OR STREET

NOTES:

1. COMPACTION STANDARD WILL BE 92% OPTIMUM PER AASHTO T-180

LAST REVISION DATE: June 1999	
GRAVEL SURFACE RESTORATION	
CITY: OWD, OR	DRAWING NO. 303



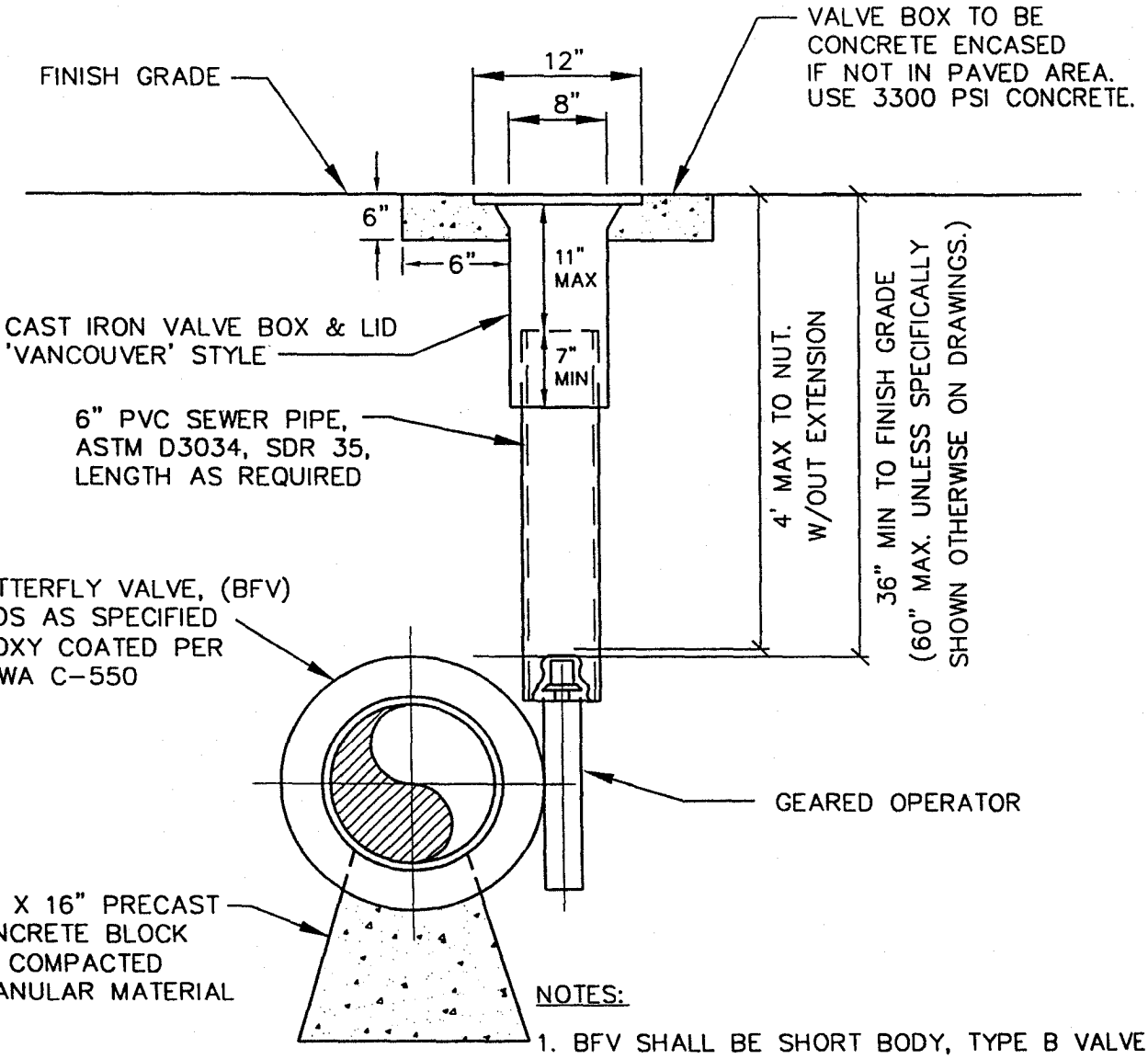
CLASS 'E'

UNIMPROVED & OPEN AREAS

NOTES:

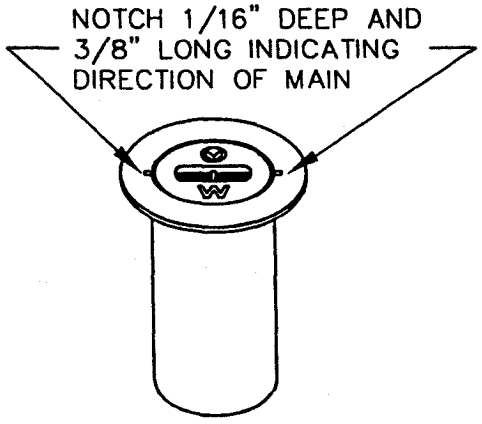
1. COMPACTION STANDARD WILL BE AASHTO T-180.

LAST REVISION DATE: June 1999	
NATIVE SURFACE RESTORATION	
CITY: OWD, OR	DRAWING NO. 304



NOTES:

1. BFV SHALL BE SHORT BODY, TYPE B VALVE PER AWWA C-504.
2. VALVE BOXES SHALL BE PLUMB AND CENTERED DIRECTLY OVER THE VALVE NUT.
3. VALVE BOX TOP SHALL BE ADJUSTED TO MEET FINISHED GRADE.
4. PVC SHALL BE ONE CONTINUOUS PIECE, NO BELLS OR COUPLERS.



'VANCOUVER'

18" TALL VALVE BOX

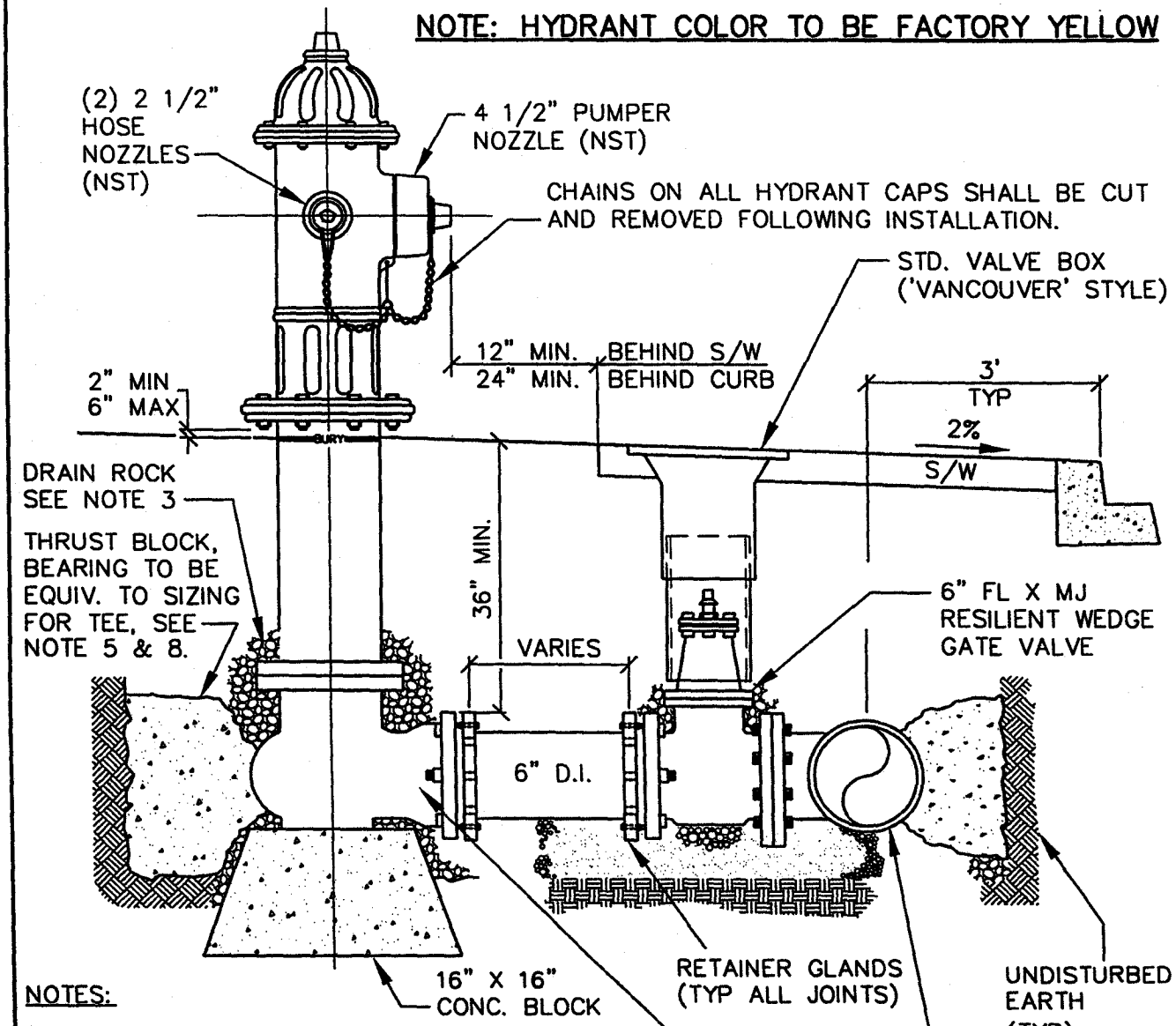
LAST REVISION DATE: June 1999

BUTTERFLY VALVE AND VALVE BOX DETAILS

CITY: OWD, OR

DRAWING NO. 502

NOTE: HYDRANT COLOR TO BE FACTORY YELLOW



NOTES:

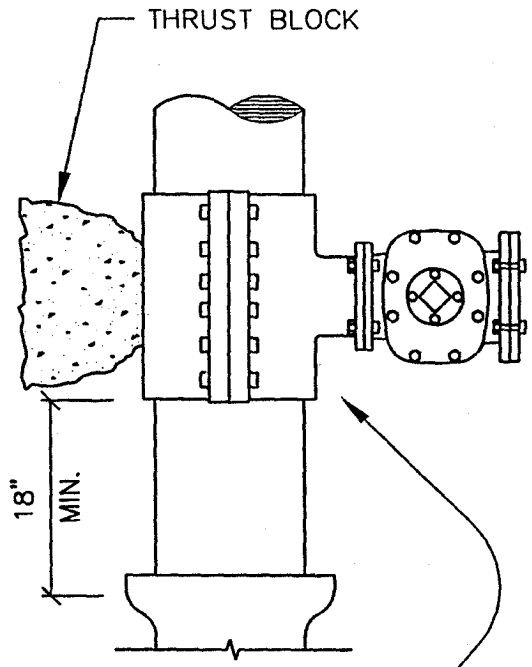
1. HYDRANTS TO BE AVK MODEL 2780 OR WATEROUS WB-67, TRAFFIC STYLE.
2. **ALL FITTINGS IN CONTACT WITH CONCRETE SHALL BE WRAPPED IN PLASTIC.** HYDRANT DRAIN HOLES TO REMAIN OPEN TO DRAIN ROCK AND OPERATIONAL.
3. 1-1/2" TO 3/4" CLEAN DRAIN ROCK SHALL BE PLACED A MIN. OF 6" ABOVE DRAIN OUTLET.
4. WHERE PLANTER STRIP EXISTS, HYDRANT SHALL BE PLACED SO FRONT PORT IS A MIN. OF 24" BEHIND FACE OF CURB.
5. THRUST BLOCK AT STANDARD 6" FIRE HYDRANT TEE SHALL HAVE MIN. 3.7 SQ. FT. BEARING AREA.
6. ALL HYDRANTS SHALL BE SET PLUMB.
7. FOR HYDRANT LEADS LONGER THAN 30', AN ADDITIONAL GATE VALVE SHALL BE PROVIDED WITHIN 3 FT. OF THE HYDRANT.
8. RETAINER GLANDS SHALL BE USED INSTEAD OF HYDRANT THRUST BLOCK ON NEAR SIDE HYDRANTS.

LAST REVISION DATE: OCTOBER 1999

STANDARD FIRE HYDRANT ASSEMBLY

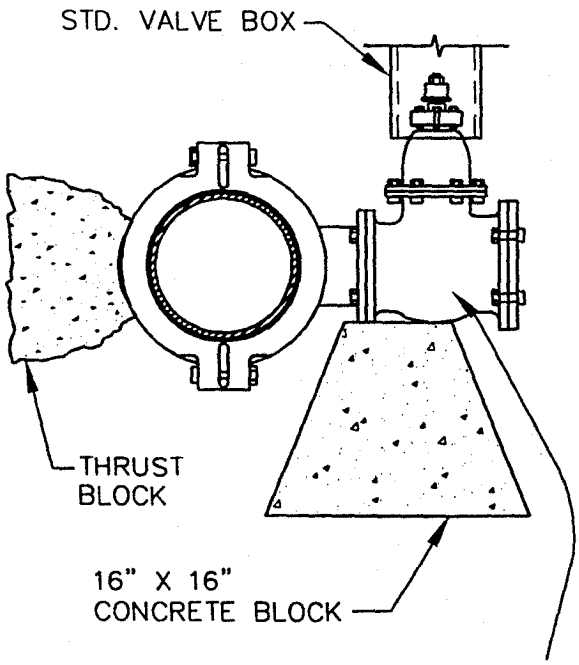
CITY: OWD, OR

DRAWING NO. 503



MUELLER MODEL H304,
JCM MODEL 432 OR APPROVED EQUAL

TOP VIEW



RESILIENT WEDGE GATE VALVE

SIDE VIEW

NOTES:

1. WATER MAIN SHALL BE CLEANED BEFORE ATTACHING SLEEVE.
2. TAPPING SLEEVE SHALL BE ALL STAINLESS STEEL WITH FULL PERIMETER GASKET.
2. TAPPING VALVE SHALL BE EPOXY COATED PER AWWA C-550.
3. SLEEVE AND VALVE SHALL BE PRESSURE TESTED BEFORE MAKING TAP. PRESSURE TEST AND TAP SHALL BE MADE IN THE PRESENCE OF AN AUTHORIZED CITY REPRESENTATIVE.
4. APPROVED TAPPING MACHINE SHALL BE USED TO MAKE TAP.
5. 3/4" GRANULAR BACKFILL SHALL BE PLACED AND COMPACTED TO 95% OF MAXIMUM DENSITY AS DETERMINED BY AASHTO T-180.
6. THRUST BLOCKING REQUIREMENTS SHALL BE DETERMINED BY THE ENGINEER.
7. TAP SHALL BE MADE NO CLOSER THAN 18" FROM THE NEAREST JOINT.
8. **SLEEVE AND VALVE SHALL BE WRAPPED WITH 8 MIL PLASTIC PRIOR TO CONCRETE PLACEMENT.**
9. CONCRETE BLOCK(S) SHALL COMPLETELY SUPPORT TAPPING TEE AND VALVE.
10. CONTRACTOR SHALL COORDINATE ALL TAPS WITH CITY AND PERFORM ALL TAPS WITH PUBLIC WORKS STAFF PRESENT.

LAST REVISION DATE: June 1999

TAPPING TEE AND VALVE

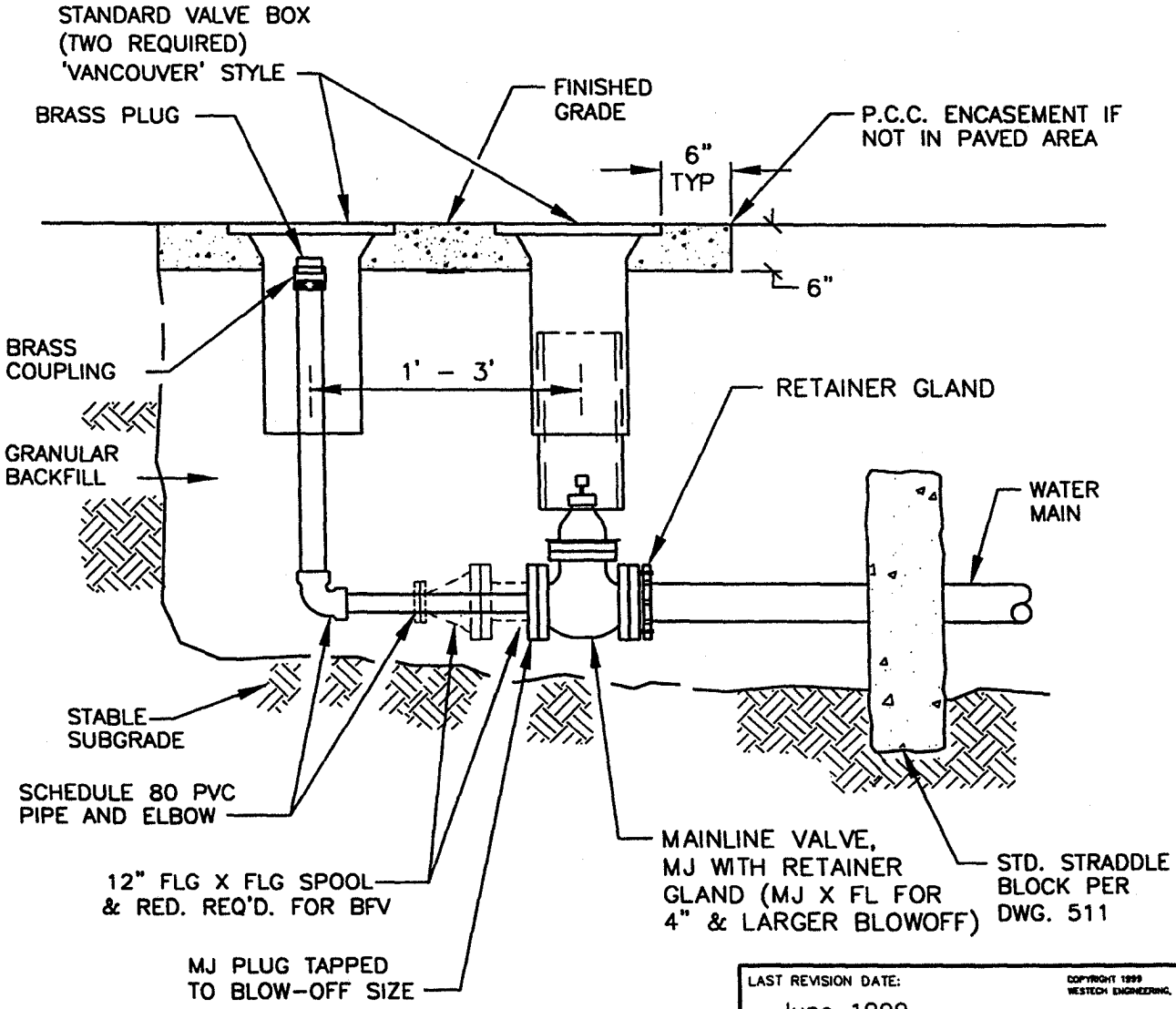
CITY: OWD, OR

DRAWING NO. 505

BLOW-OFF SIZES REQUIRED (ASSUMES 40 PSI RESIDUAL PRESS.)	
MAIN SIZE	BLOW-OFF SIZE
6" – 8"	2"
10" – 12"	4"
>12"	BY ENGR.

NOTES:

1. BACKFILL WITH GRANULAR BACKFILL.
2. REQUIRED ON ALL LINES WHICH MAY BE EXTENDED IN FUTURE OR AS DIRECTED BY CITY ENGINEER.
3. ALL CONCRETE TO BE 3300 PSI @ 28 DAYS.
4. FLANGED DUCTILE IRON PIPE AND FITTINGS MAY BE REQUIRED FOR 4" & LARGER BLOWOFFS.

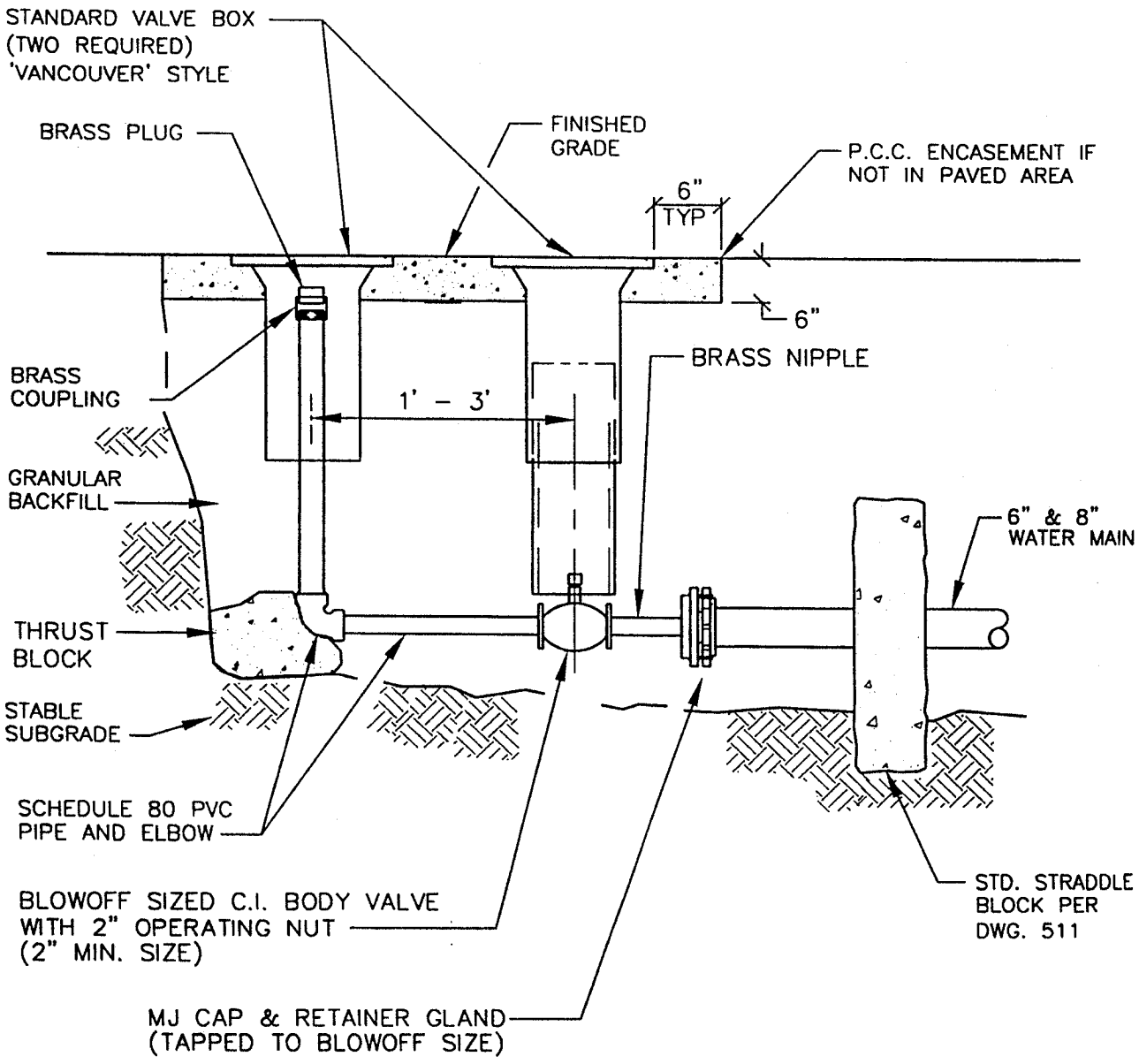


LAST REVISION DATE: June 1999

MAINLINE BLOWOFF ASSEMBLY

CITY: OWD, OR

DRAWING NO. 506



NOTES:

1. BACKFILL WITH GRANULAR BACKFILL.
2. ALLOWED ONLY ON PERMANENT DEAD END LINES IN CUL-DE-SACS WHICH CANNOT BE EXTENDED IN THE FUTURE.
3. ALL CONCRETE TO BE 3300 PSI @ 28 DAYS.
4. 2" BLOWOFF SIZE ASSUMES 40 PSI RESIDUAL PRESSURE.

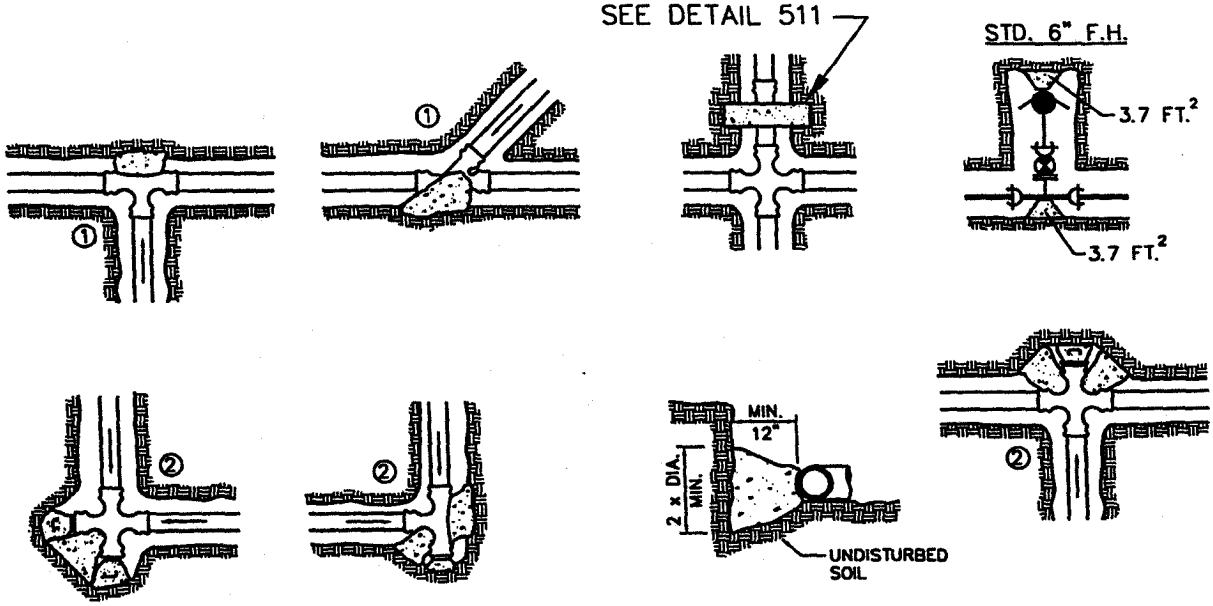
LAST REVISION DATE: June1999	
STANDARD BLOWOFF WITH PLUGGED END	
CITY: OWD, OR	DRAWING NO. 507

FITTING SIZE (Inches)	TEE, WYE, & ① HYDRANTS	90° BEND ② PLUGGED CROSS TEE PLUGGED–RUNS	45° BEND ③	22 1/2° BEND ③	11 1/4° BEND ③
2	*	*	*	*	*
4	1.7	2.4	1.3	*	*
6	3.7	5.3	2.9	1.5	*
8	6.7	9.5	5.1	2.7	1.3
10	10.5	14.8	8	4.1	2
12	15.1	21.3	11.6	5.9	2.9
16	26.8	37.9	20.5	10.4	5.2
18	33.9	47.9	25.9	12.8	6.7
LARGER	* *	* *	* *	* *	* *
	BEARING AREA OF THRUST BLOCKS (sq. ft.)				

1. ALL VALUES ARE BASED ON THE FOLLOWING ASSUMPTIONS: AVG. PRESSURE = 100 PSI x 2 (safety factor); 1500 PSF SOIL BEARING CAPACITY; NORMAL DISTRIBUTION DESIGN VELOCITY NOT TO EXCEED 5 FPS.
2. **ALL FITTINGS SHALL BE WRAPPED IN PLASTIC PRIOR TO PLACEMENT OF CONCRETE.**
3. BEARING SURFACE OF THRUST BLOCKING SHALL BE AGAINST UNDISTURBED SOIL.
4. ALL CONCRETE MIX SHALL HAVE A MIN. 28 DAY STRENGTH OF 3300 PSI.
5. ALL PIPE ZONES SHALL BE BACKFILLED WITH GRANULAR BACKFILL AND COMPACTED.
6. THRUST BLOCKS FOR PLUGGED CROSS AND PLUGGED TEE SHALL HAVE #4 REBAR LIFTING LOOPS INSTALLED AS SHOWN.
7. VERTICAL THRUST DETAILS–SEE DWG. 512.
8. STRADDLE BLOCK DETAILS–SEE DWG. 511.

* BLOCK TO UNDISTURBED TRENCH WALLS

* * THRUST BLOCKS FOR PIPES LARGER THAN 18" WILL BE INDIVIDUALLY DESIGNED BY THE ENGINEER.

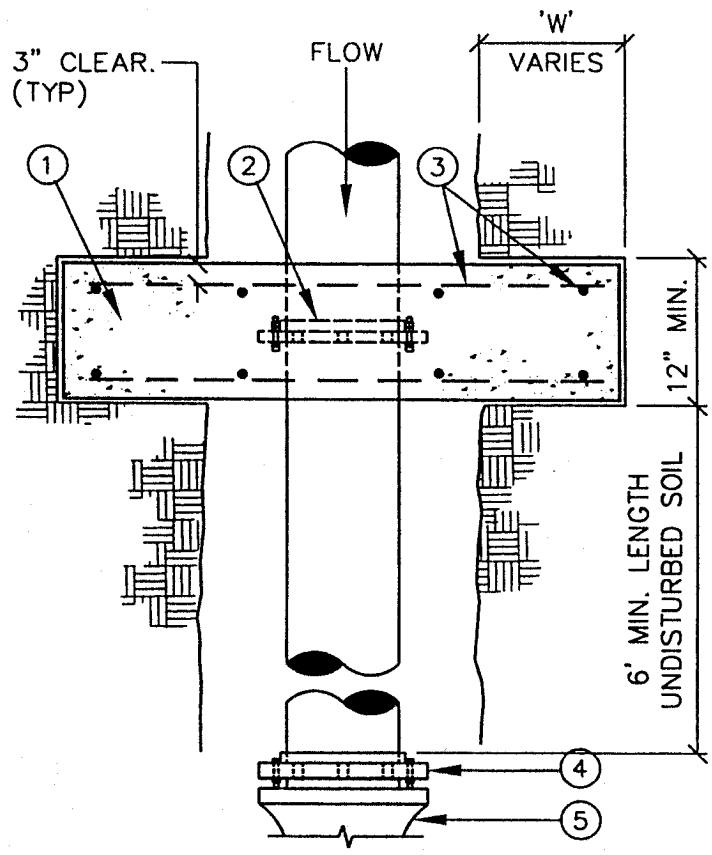


LAST REVISION DATE: June 1999

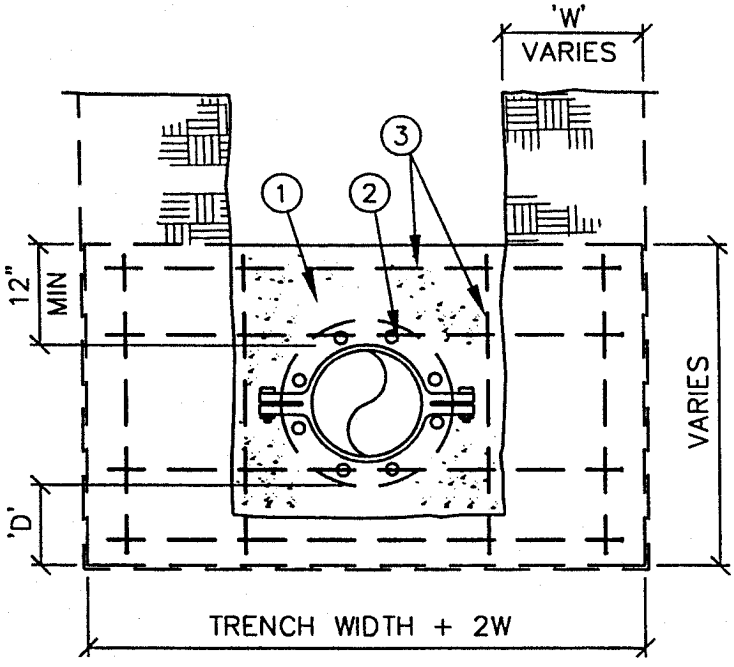
HORIZONTAL THRUST BLOCKING

CITY: OWD, OR

DRAWING NO. 510



TOP VIEW



FRONT VIEW

MATERIALS

1. CONCRETE STRADDLE BLOCK.
2. UNI-FLANGE, SERIES 900, CL.125
3. #4 REBAR EA. WAY, 12" O.C.
4. RETAINER GLAND.
5. MJ FITTING, VALVE OR BLOWOFF.

PIPE SIZE	'W'	'D'
6"	12"	8"
8"	16"	10"
10"	20"	12"
>10"	BY ENGINEER	

NOTES:

1. STRADDLE BLOCKS FOR >10" PIPE SHALL BE DESIGNED INDIVIDUALLY BY THE ENGINEER AND SHALL BE BASED ON THE FOLLOWING:
   a.) 200 PSI WATER PRESSURE.
   b.) SOIL BRG. CAPACITY, STEEL SIZE & SPACING BY THE ENGINEER.
2. BEARING AREA OF BLOCK SHALL BE AGAINST UNDISTURBED SOIL.
3. STRADDLE BLOCK SHALL HAVE A MINIMUM OF 18" COVER.
4. CONCRETE SHALL HAVE A MIN. 28 DAY STRENGTH OF 3300 PSI.

LAST REVISION DATE: June 1999

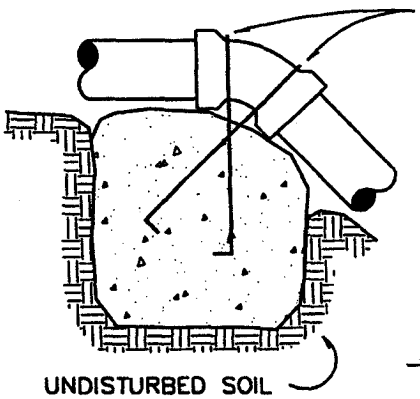
STRADDLE BLOCK FOR 10" AND SMALLER PIPE

CITY: OWD, OR

DRAWING NO. 511

NOTES:

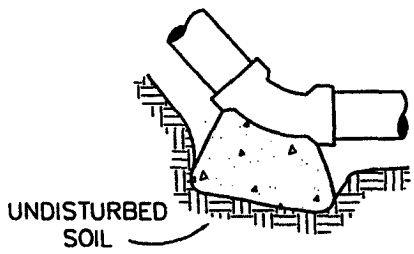
1. GRAVITY VERTICAL THRUST BLOCKS SHALL BE DESIGNED BY THE ENGINEER.
2. **KEEP CONCRETE CLEAR OF JOINT AND JOINT ACCESSORIES. FITTINGS SHALL BE WRAPPED IN PLASTIC PRIOR TO PLACEMENT OF CONCRETE.**
3. CONCRETE THRUST BLOCKING SHALL BE POURED AGAINST UNDISTURBED EARTH.
4. CONCRETE MIX SHALL HAVE A MIN. 28 DAY STRENGTH OF 3000 P.S.I.
5. THRUST BLOCK VOLUMES FOR VERTICAL BENDS HAVING UPWARD RESULTANT THRUSTS ARE BASED ON TEST PRESSURE OF 150 P.S.I.G. AND THE WEIGHT OF CONCRETE = 4050 LBS./CU.YD.
6. VERTICAL BENDS THAT REQUIRE A THRUST BLOCK VOLUME EXCEEDING 5 CUBIC YARDS REQUIRE SPECIAL BLOCKING DETAILS. SEE PLANS FOR VOLUMES SHOWN INSIDE HEAVY LINE IN TABLE.
7. ALL REBAR SHALL BE GALVANIZED IN ACCORDANCE WITH ASTM-123 (MIN. 3.4 MIL). REBAR SHALL BE BENT BEFORE GALVANIZATION, AND LAST 4" OF BAR SHALL BE BENT 90 DEGREES WITH A 1/2" RADIUS BEND. REBAR SHALL BE TIGHTLY FIT TO RESTRAINED FITTING.
8. FOR HORIZONTAL THRUST BLOCK DETAILS SEE DRAWING NO. 510.



PROFILE

GRAVITY VERTICAL THRUST BLOCK

SIZED LIKE HORIZONTAL THRUST BLOCKS



PROFILE

NORMAL VERTICAL THRUST BLOCK

VOLUME OF THRUST BLOCK IN CUBIC YARDS (VERTICAL BENDS)			
FITTING SIZE	BEND ANGLE		
	45°	22 1/2°	11 1/4°
4	1.1	0.4	0.2
6	2.7	1.0	0.4
8	4.0	1.5	0.6
10	6.0	2.3	0.9
12	8.5	3.2	1.3
14	11.5	4.3	1.8
16	14.8	5.6	2.3

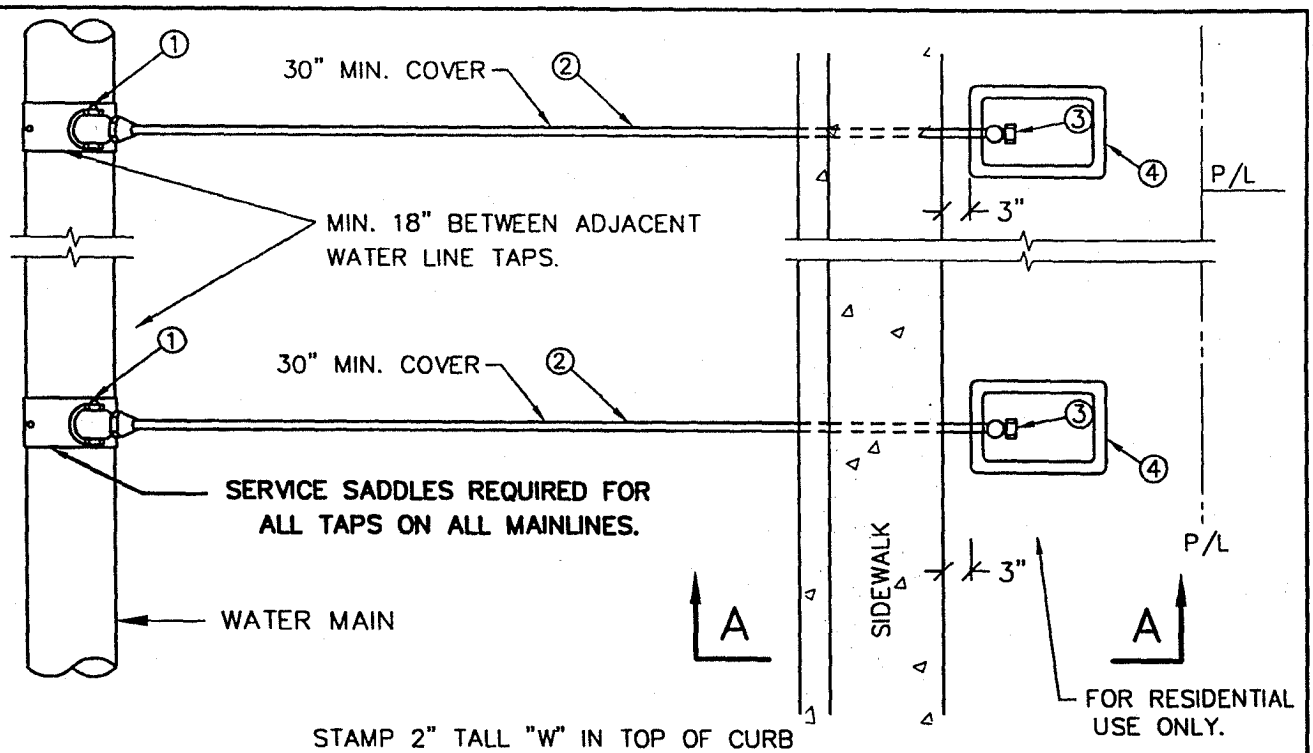
FITTING SIZE	ROD SIZE	EMBED-MENT
12" AND LESS	#6	30"
14" – 16"	#8	36"

LAST REVISION DATE: June 1999

VERTICAL THRUST BLOCKING

CITY: OWD, OR

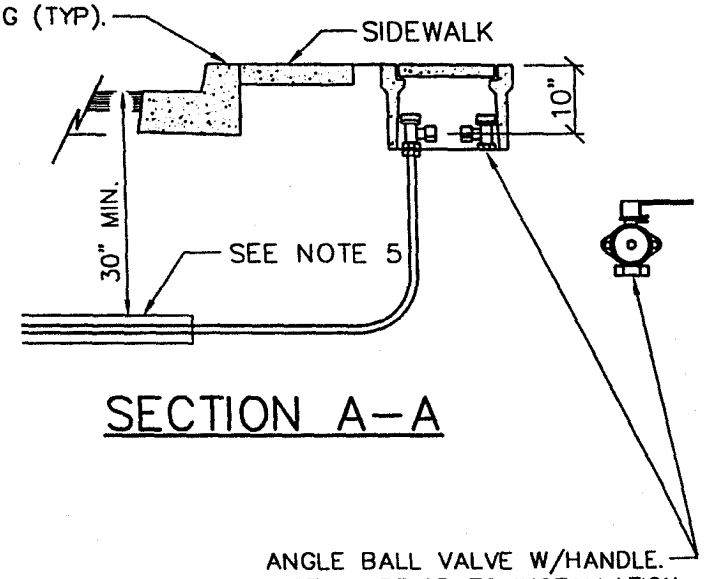
DRAWING NO. 512



STAMP 2" TALL "W" IN TOP OF CURB AT POINT OF CROSSING (TYP).

MATERIALS:

1. BALL STYLE CORPORATION STOP FORD FB-1100. SET AT 30° ANGLE UP FROM HORIZONTAL.
2. DRISCOPIPE 5100 ULTRA-LINE (PE 3408) IRON PIPE SIZE OD, SDR 9 (200 PSI) SINGLE RESIDENTIAL SERVICE: 1" (TYP)
3. BALL STYLE LOCKING ANGLE METER STOP, FORD BA43-232W.
4. BROOKS CONCRETE METER BOX:
   NO. 38-TR IN TRAFFIC AREAS.
   NO. 38-H ELSEWHERE.



SECTION A-A

NOTES:

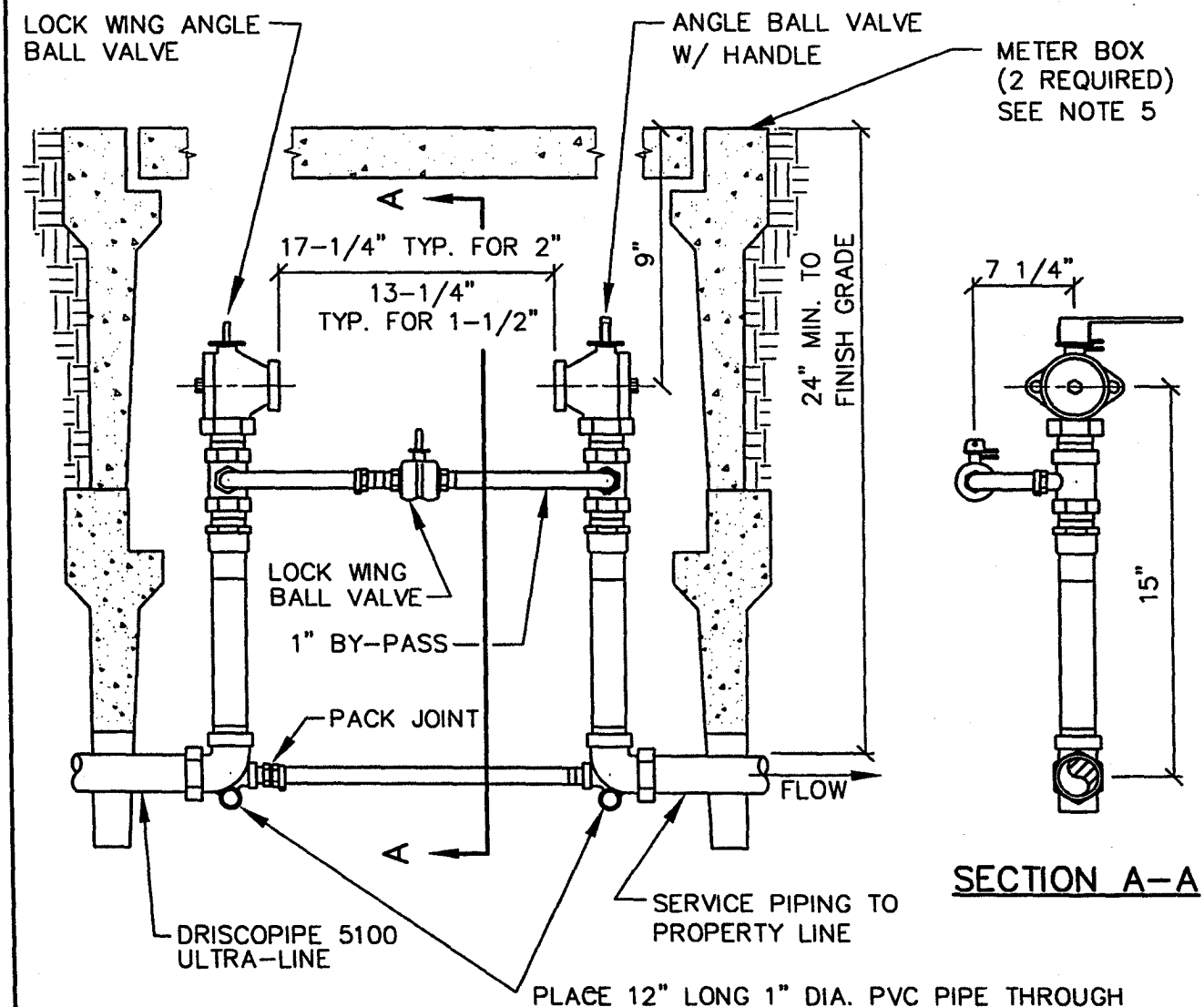
1. SUBSTITUTES FOR ANY MATERIALS SHOWN SHALL BE APPROVED BY THE DISTRICT ENGINEER.
2. ALL PIPE AND BACKFILL ZONES SHALL BE BACKFILLED USING 3/4" MINUS GRANULAR MATERIAL AND COMPACTED TO 92% MAX. DENSITY DETERMINED BY AASHTO T-180.
3. SET FRONT OF METER BOX 3-INCHES BEHIND BACK OF SIDEWALK LOCATION FOR CURBLINE WALKS.
4. METER BOX SHALL BE CENTERED OVER THE COMPLETED METER ASSEMBLY.
5. MIN. SIZE COMMERCIAL SERVICES SHALL BE 1-INCH. FOR NEW STREETS OR STREETS BEING CUT FOR SERVICE INSTALLATION, FAR SIDE COMMERCIAL SERVICES SHALL BE INSTALLED IN A 3" MIN. SCHED 40 PVC SLEEVE

LAST REVISION DATE: October 1999

1" WATER SERVICE

CITY: OWD, OR

DRAWING NO. 515



PLACE 12" LONG 1" DIA. PVC PIPE THROUGH RINGS TO STABILIZE BASE OF COPPERSETTER.

NOTES:

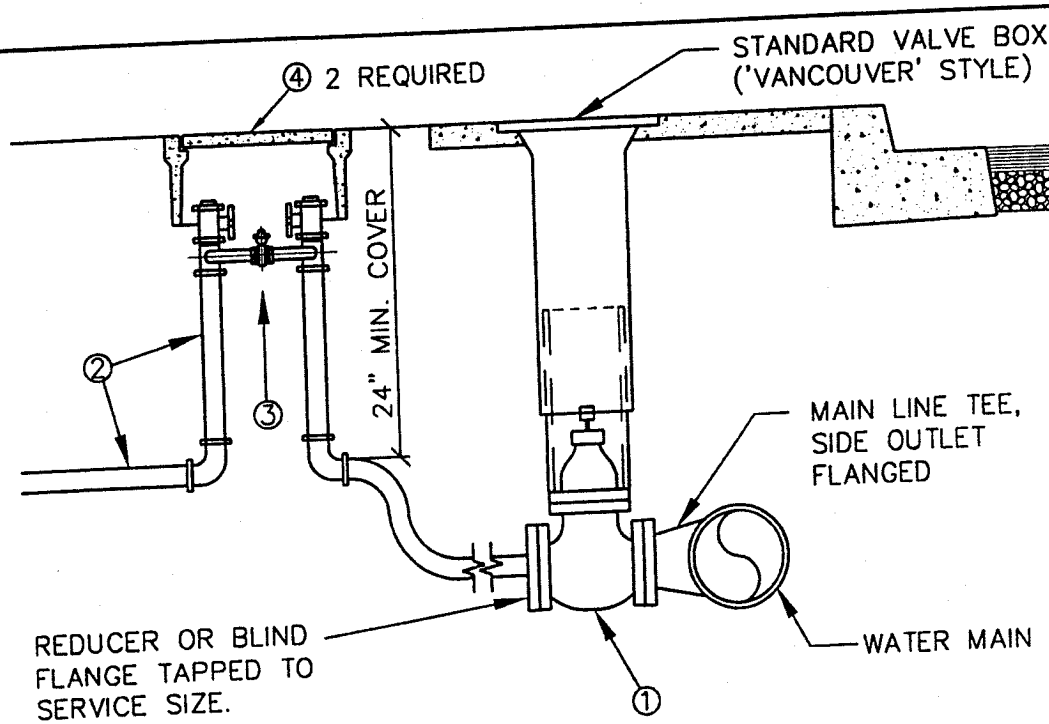
1. METERSET TO BE FORD COPPERSETTER #B-95082 WITH RAISED LOCKING BYPASS OR APPROVED EQUAL.
2. SUBSTITUTES FOR ANY MATERIALS SHOWN SHALL BE APPROVED BY THE DISTRICT ENGINEER.
3. ALL PIPE AND BACKFILL ZONES SHALL BE BACKFILLED USING 3/4" MINUS GRANULAR MATERIAL AND COMPACTED TO 92% OPTIMUM DENSITY PER AASHTO T-180.
4. SET FRONT OF METER BOX 3-INCHES BEHIND SIDEWALK (TYPICAL) FOR CURBLINE WALKS. NO METERS ON PRIVATE PROPERTY WITHOUT A RECORDED EASEMENT.
5. METER BOX SHALL BE CENTERED OVER THE COMPLETED METER ASSEMBLY. METER BOX TO BE BROOKS NO. 66-TR IN TRAFFIC AREAS, BROOKS NO. 66-H ELSEWHERE.
6. WATER METER SET BY DISTRICT FORCES. COPPERSETTER, METER BOX, & ALL FITTINGS PROVIDED BY DEVELOPER.
7. SEE DETAIL 517 FOR TAPPING REQUIREMENTS.

LAST REVISION DATE: June 1999

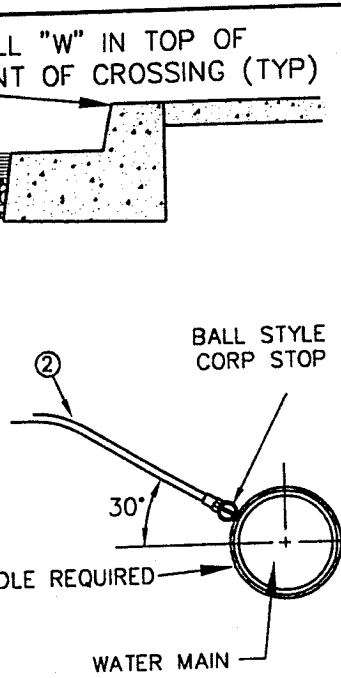
1 1/2" AND 2" METER SET W/ 1" HIGH BY-PASS

CITY: OWD, OR

DRAWING NO. 516



2" & LARGER SERVICE



1-1/2" SERVICE

MATERIALS

① FLG X FLG RESILIENT WEDGE GATE VALVE PER AWWA C-509. 4" DIA. OR SERVICE SIZE, WHICHEVER IS LARGER. EPOXY COATED PER AWWA C-550.

② DRISCOPIPE 5100 ULTRA-LINE (PE 3408) IRON PIPE SIZE OD, SDR 9 (200 PSI).

③ METER STOP ASSEMBLY W/BYPASS PER PUBLIC WORKS REQUIREMENTS. SEE DETAIL 516 FOR 1-1/2 & 2" SERVICES.

④ CONCRETE METER BOX FOR 1-1/2" AND 2" SERVICES SHALL BE:
BROOKS NO. 66TR IN TRAFFIC AREAS.
BROOKS NO. 66H ELSEWHERE.
METER VAULT FOR LARGER SERVICE PER PUBLIC WORKS REQUIREMENTS.

NOTES

1. SUBSTITUTES FOR ANY MATERIAL SHOWN SHALL BE APPROVED BY DISTRICT ENGINEER.
2. ALL PIPE AND STRUCTURE ZONES SHALL BE BACKFILLED USING 3/4" MINUS GRANULAR MATERIAL AND COMPACTED TO 95% MAX DENSITY AS DETERMINED BY ASHTO T-180.
3. METER BOX SHALL BE CENTERED OVER THE COMPLETED METER AND FITTING ASSEMBLY.
4. CUSTOMER SHALL INSTALL AN APPROVED BACKFLOW PREVENTION DEVICE ON PRIVATE PROPERTY IMMEDIATELY DOWNSTREAM OF WATER METER.

CITY: OWD, OR

TAPPING REQUIREMENTS, 1-1/2" & LARGER SERVIC

DRAWING NO. 517

LAST REVISION DATE: October 1999

WATERLINE PRESSURE TEST REPORT

Project Location: Maxwell Mnt	Project Name: Maxwell Utility	Date: 10/9/2012
Inspector: Jason Morgan, PE (Print) Alan Tuckey, OWD	**Waterline to be tested.** From Station: 3" EXTENSION	To Station:
Verify that all in-line valves, including hydrant mainline valves are open? (Yes) / No		
Verify that all corp stops are open? (Yes) / No		
Verify that pressure gauge is mounted at high point of line to be tested? (Yes) / No If no, correct for elevation difference *(ie. add 0.433 psi per foot elevation difference)*.		
System Static Pressure (psi):	Starting Pressure (psi): (greater of 150 psi or 1.5 times static) 26 psi	Ending Pressure (psi): 26 psi
Test Length: ~4 hrs (2 hours minimum)	Starting Time:	Ending Time: 130pm
Volume Required to Reach Initial Test Pressure (gal):	Allowable Leakage (gal): (2 times table value below) NONE	Measured Leakage (gal): NONE
TEST RESULTS: (Pass) / Fail		

ALLOWABLE LEAKAGE PER 1,000 FEET OF PIPELINE - *gph*

Test Pressure *psi*	NOMINAL PIPE DIAMETER - *in.*									
	3	4	6	8	10	12	14	16	18	20
200	0.32	0.43	0.64	0.85	1.06	1.28	1.48	1.70	1.91	2.12
175	0.30	0.40	0.59	0.80	0.99	1.19	1.39	1.59	1.79	1.98
150	0.28	0.37	0.55	0.74	0.92	1.10	1.29	1.47	1.66	1.84

If the pipeline under test contains various diameters, the allowable leakage shall be the sum of the allowable leakage for each size. No additional leakage allowance will be given for fire hydrant assemblies or valves.

Allowable leakage based on : $L = SD(P)^{1/2}/133{,}200$

Where:

L = allowable leakage, in gallons per hour
S = length of pipe tested, in feet
D = nominal diameter of the pipe, in inches
P = test pressure during the leakage test, in psig

Regardless of leakage, maximum pressure drop during test period shall not exceed 5 psi/hour.

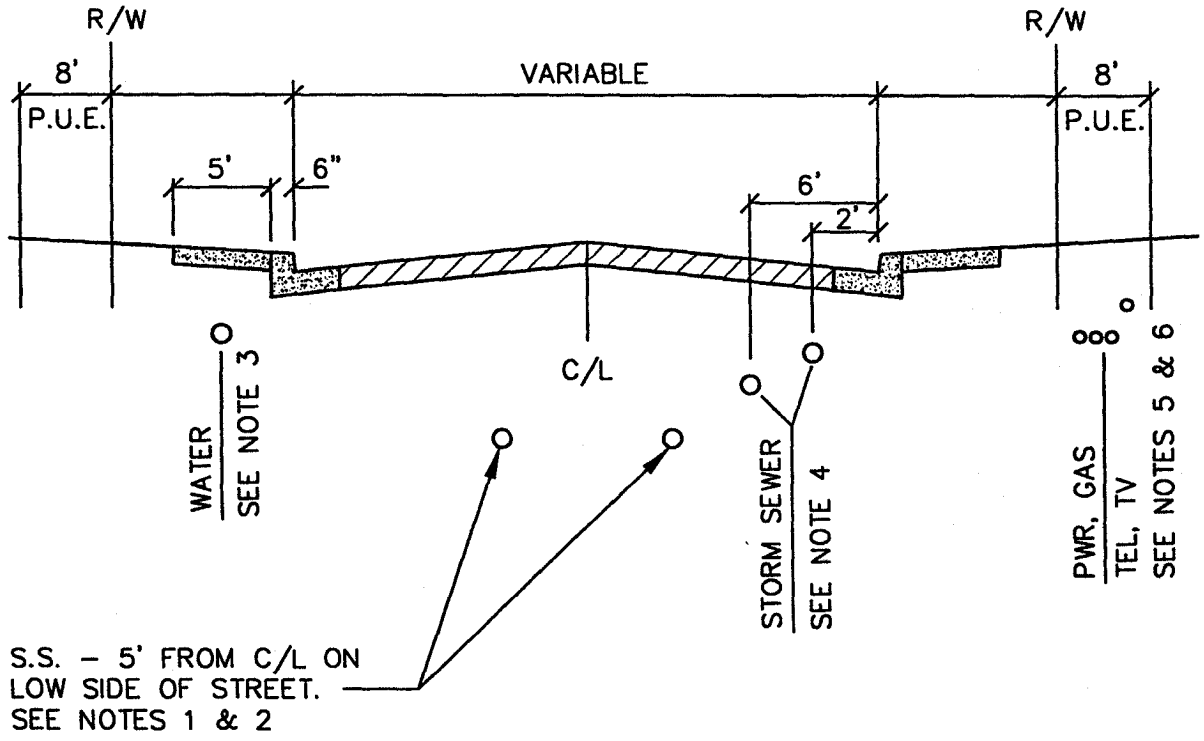
Test directed by
Alan Tuckey, OWD
Watermaster

TEST PROCEDURE

1. Apply hydrostatic pressure by pumping water from an auxiliary supply basin. Accurately determine the amount of water required to reach the initial test pressure by refilling the supply basin with a calibrated container following pressurization of pipeline.
2. Monitor test pressure for 2 hour period.
3. At the completion of the test period, re-pressurize the pipeline by pumping water from the auxiliary supply basin. Accurately determine the amount of water required to reach the test pressure by refilling the supply basin with a calibrated container following pressurization of pipeline. If the measured leakage is less than the allowable leakage, the test is successful.

Standard Detail Drawings

Appendix A



CURBED STREETS

NTS

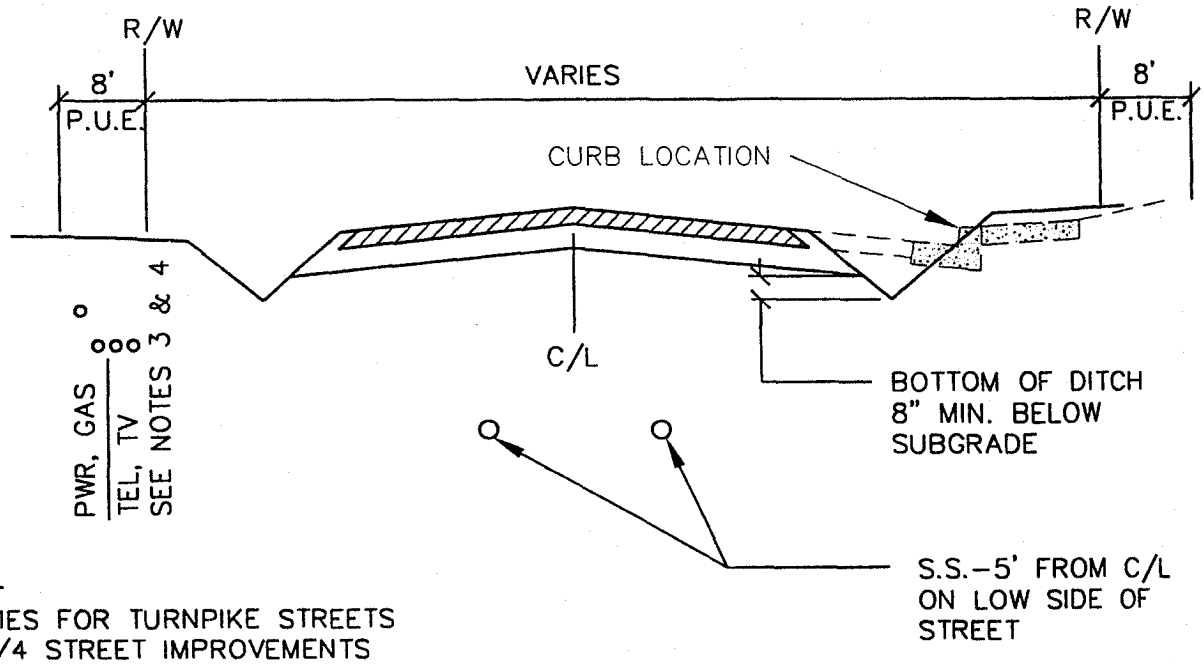
NOTES:

1. WATER TO BE INSTALLED 3' BEHIND FACE OF CURB ON HIGH SIDE OF STREET. 36" MIN. COVER ON ALL WATERLINES.

2. MAINTAIN MIN. 3' HORIZ. SEPARATION BETWEEN PUBLIC UTILITIES & PARALLEL PRIVATE UTILITIES. OTHER VERT. AND HORIZ. SEPARATION DISTANCES ARE CONTROLLED BY DEQ, OHD, AND OTHER PUBLIC/PRIVATE UTILITY COMPANIES.

3. UNITY TRENCH PER UTILITY COMPANY REQMTS. ON OPPOSITE SIDE OF STREET FROM WATER LINE.

LAST REVISION DATE: June 1999	
TYP. UTILITY LOCATIONS (CURBED STREETS)	
CITY: OWD, OR	DRAWING NO. 101



NOTE:

UTILITIES FOR TURNPIKE STREETS OR 3/4 STREET IMPROVEMENTS SHALL BE LOCATED TO ALLOW FUTURE CONSTRUCTION OF CURBED STREETS WITHOUT RELOCATING UTILITIES. SEE DETAIL 101.

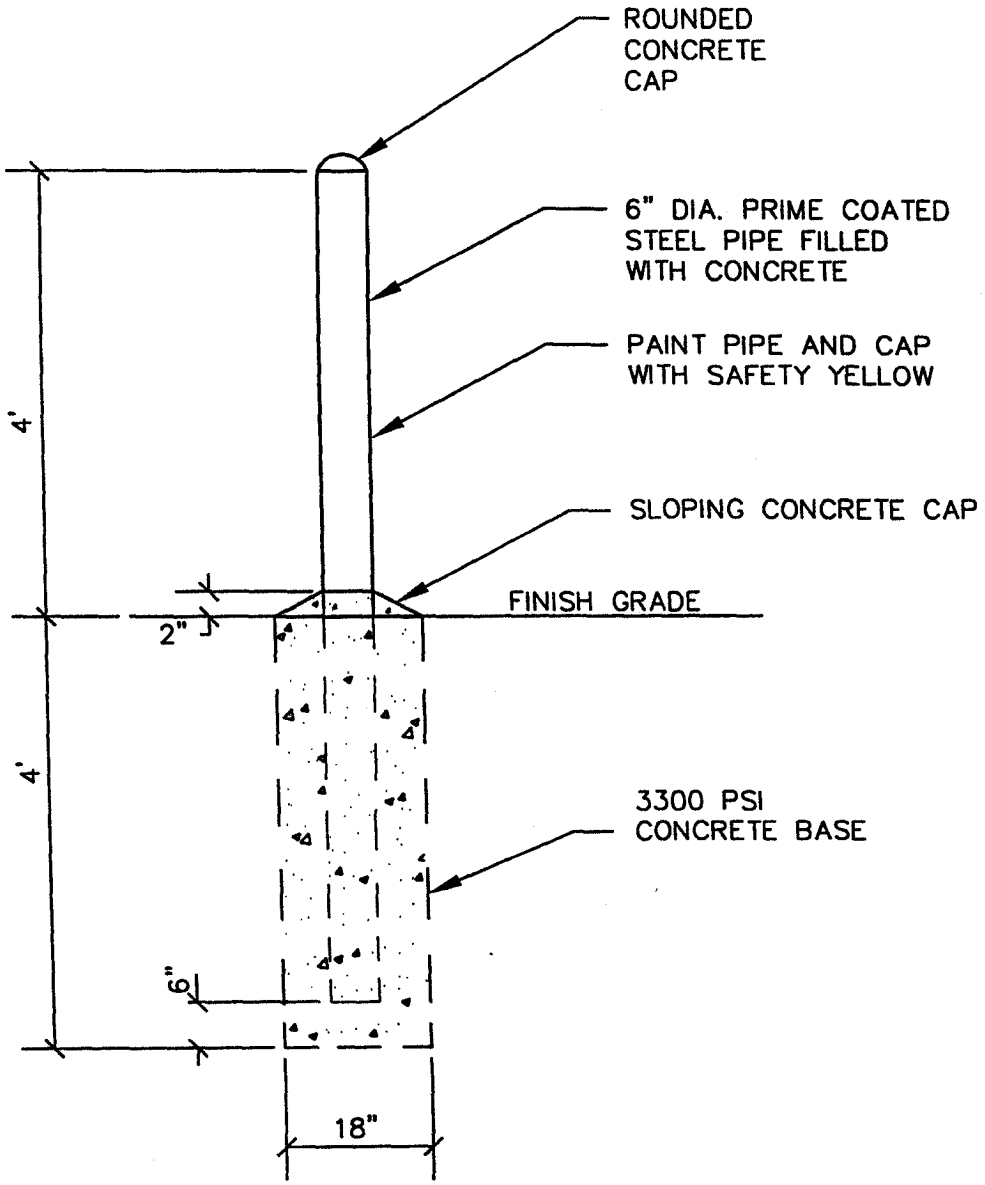
TURNPIKE STREETS

NTS

NOTES:

1. WATER TO BE INSTALLED 3' BEHIND FACE OF CURB ON IMPROVED SIDE OR 3' BEHIND FUTURE FACE OF CURB LOCATION AS DIRECTED BY THE CITY ENGINEER.

LAST REVISION DATE: June 1999	
TYP. UTILITY LOCATIONS (TURNPIKE & 3/4 STREETS)	
CITY: OWD, OR	DRAWING NO. 102

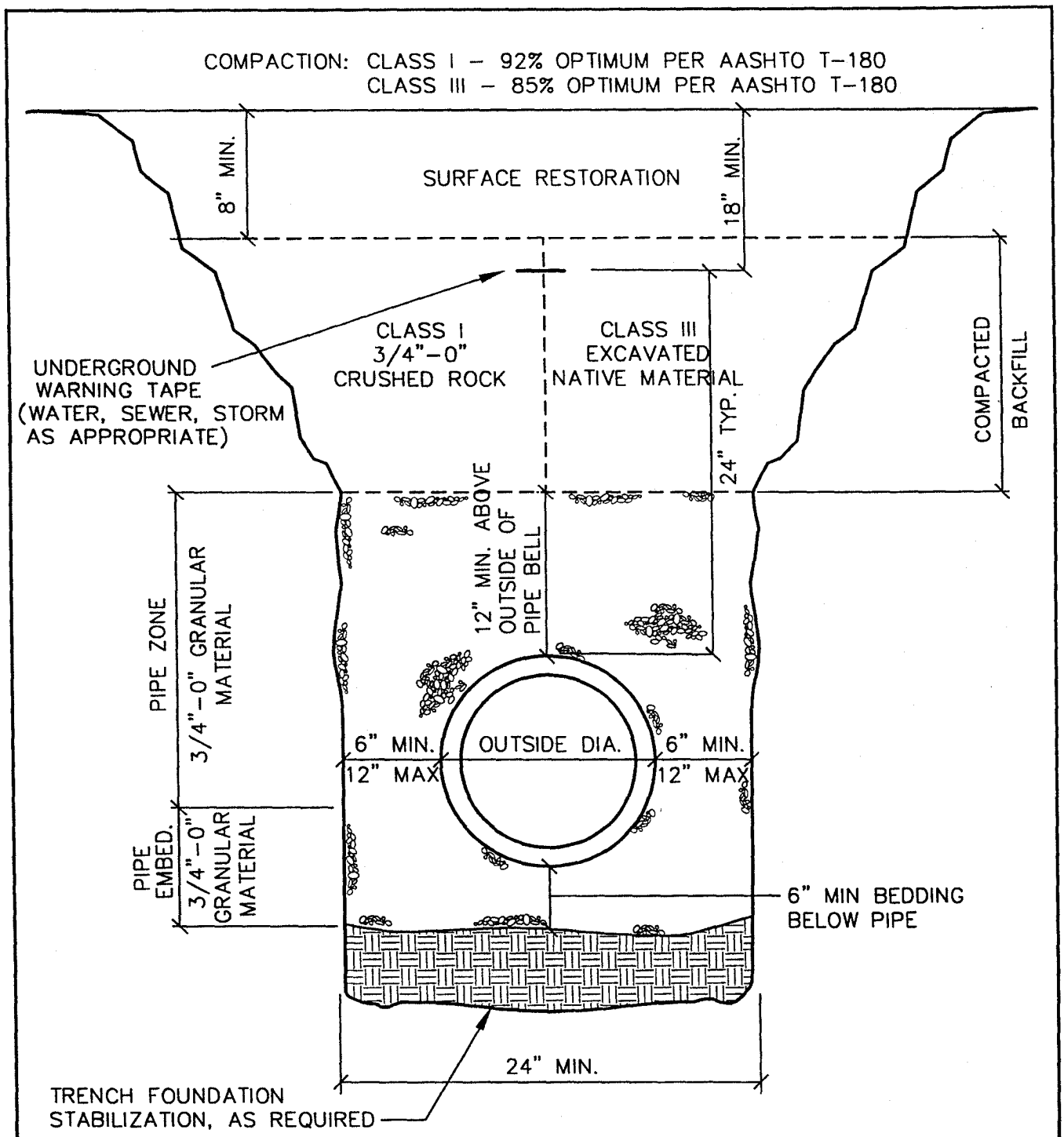


LAST REVISION DATE:
June 1999

BOLLARD
(GUARD POST)

CITY:
OWD, OR

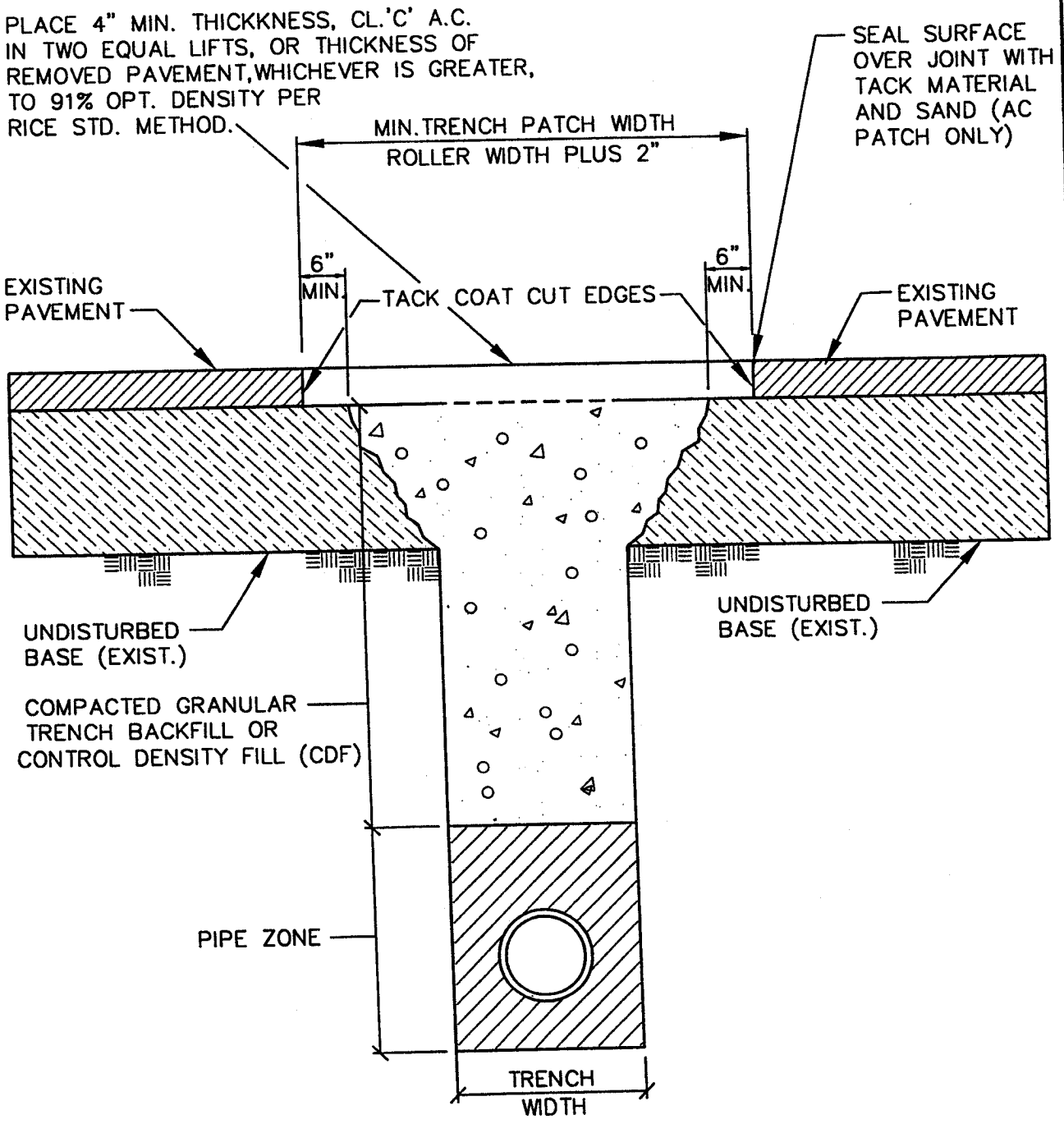
DRAWING NO.
226



NOTES:

1. CLASS I REQ'D. UNDER ALL EXIST. OR FUTURE IMPROVED AREAS INCLUDING SIDEWALKS.
2. WHERE NEW PIPING IS IN SAME ALIGNMENT AS EXIST. PIPING, THE PIPE EMBEDMENT SHALL EXTEND TO A MIN. OF 6" BELOW THE NEW PIPING OR 6" BELOW EXIST. PIPING, WHICHEVER IS DEEPER.

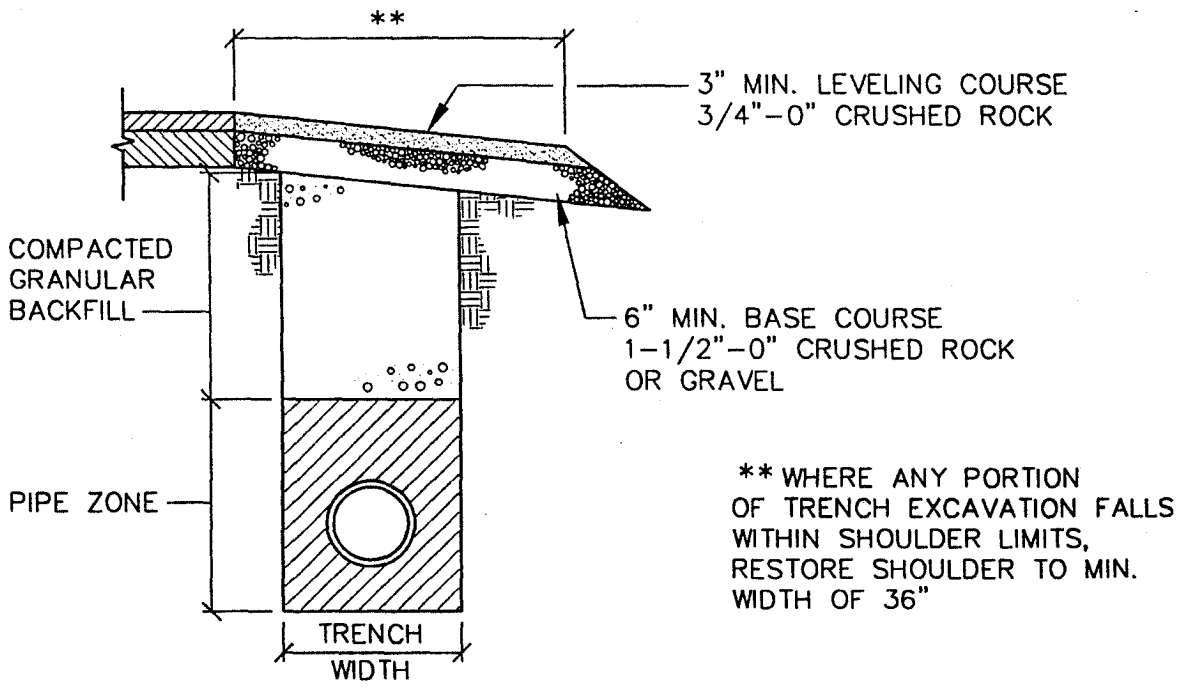
LAST REVISION DATE: JUNE 1999	
TRENCH BACKFILL, BEDDING, AND PIPE ZONE	
CITY: OWD, OR	DRAWING NO. 301



NOTES:

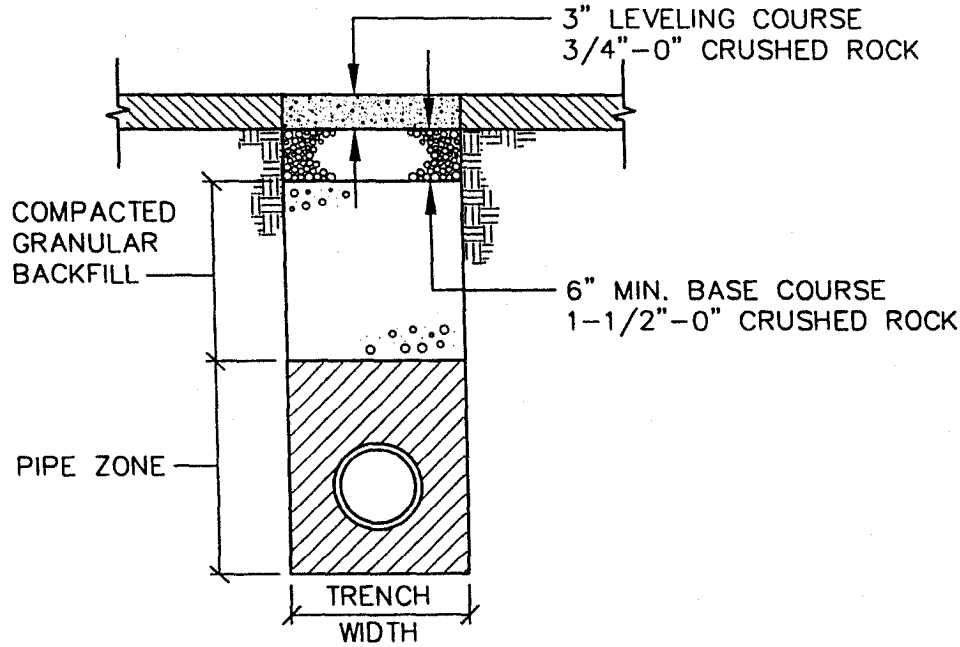
1. ALL EXISTING AC OR PCC PAVEMENT SHALL BE SAWCUT PRIOR TO REPAVING.
2. PCC CONCRETE PAVEMENT SHALL BE REPLACED WITH CONCRETE TO A MINIMUM THICKNESS OF 6" OR TO THE THICKNESS OF REMOVED CONCRETE, WHICHEVER IS GREATER.
3. FOR PAVED DRIVEWAYS, (EXCEPT COMMERCIAL OR INDUSTRIAL), PAVEMENT THICKNESS MAY BE REDUCED TO 3" IN 2 LIFTS, AND OVERCUT MAY BE REDUCED TO 3" EACH SIDE.

LAST REVISION DATE: June 1999	
STREET CUT SURFACE RESTORATION	
CITY: OWD, OR	DRAWING NO. 302



** WHERE ANY PORTION OF TRENCH EXCAVATION FALLS WITHIN SHOULDER LIMITS, RESTORE SHOULDER TO MIN. WIDTH OF 36"

CLASS 'C'
GRAVEL SHOULDER

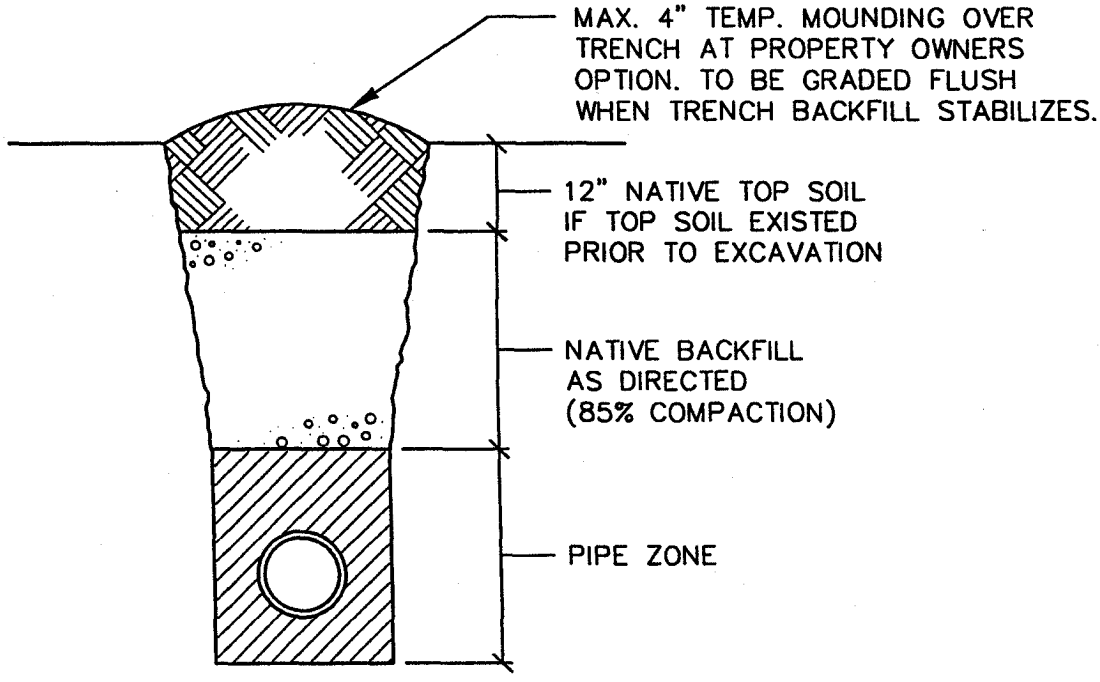


CLASS 'D'
GRAVEL ROAD OR STREET

NOTES:

1. COMPACTION STANDARD WILL BE 92% OPTIMUM PER AASHTO T-180

LAST REVISION DATE: June 1999	
GRAVEL SURFACE RESTORATION	
CITY: OWD, OR	DRAWING NO. 303



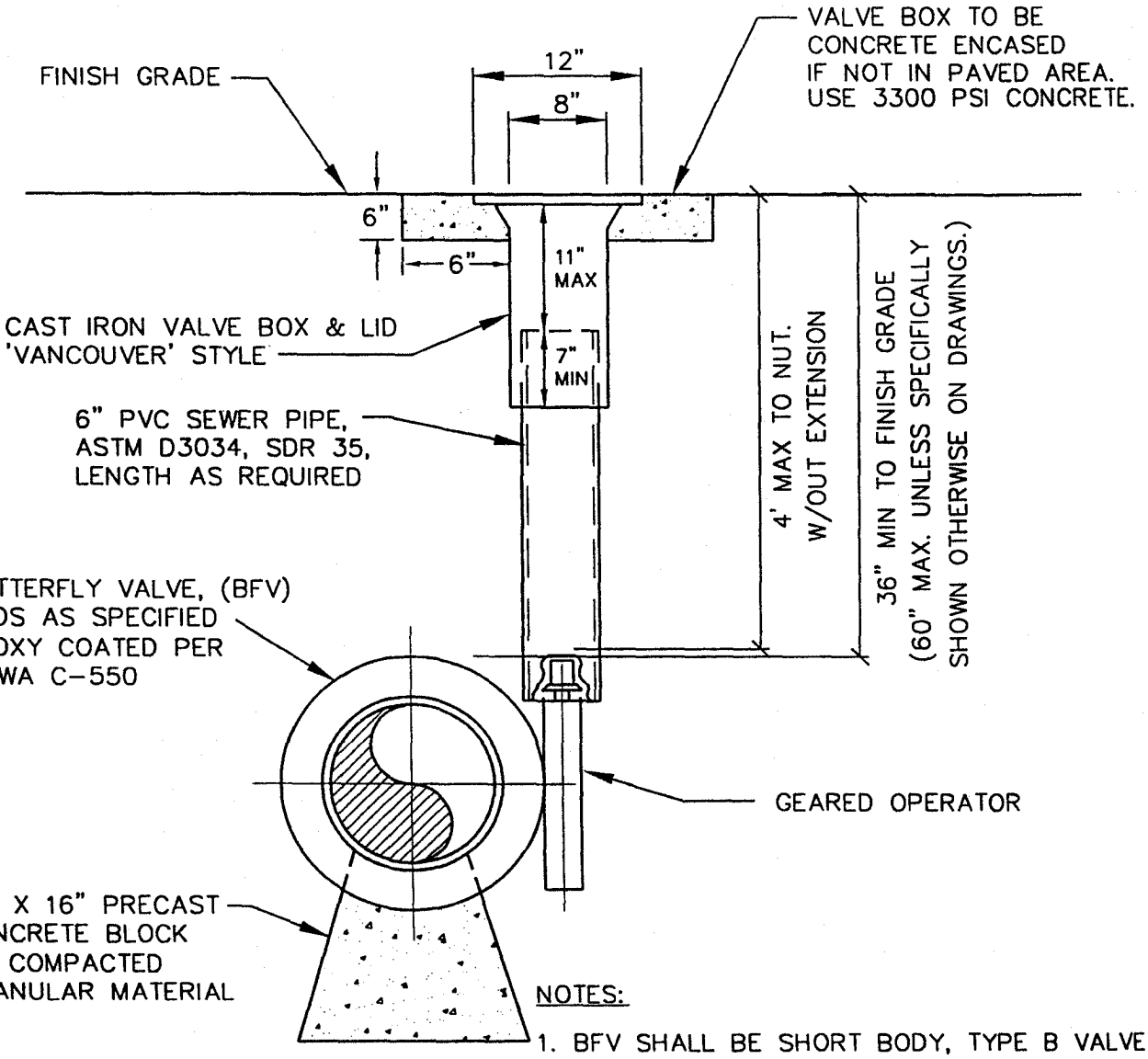
CLASS 'E'

UNIMPROVED & OPEN AREAS

NOTES:

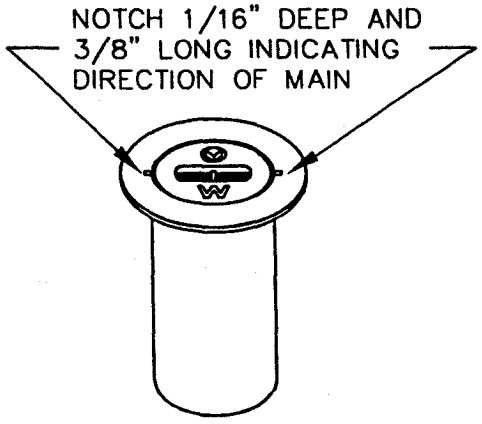
1. COMPACTION STANDARD WILL BE AASHTO T-180.

LAST REVISION DATE: June 1999	
NATIVE SURFACE RESTORATION	
CITY: OWD, OR	DRAWING NO. 304



NOTES:

1. BFV SHALL BE SHORT BODY, TYPE B VALVE PER AWWA C-504.
2. VALVE BOXES SHALL BE PLUMB AND CENTERED DIRECTLY OVER THE VALVE NUT.
3. VALVE BOX TOP SHALL BE ADJUSTED TO MEET FINISHED GRADE.
4. PVC SHALL BE ONE CONTINUOUS PIECE, NO BELLS OR COUPLERS.



'VANCOUVER'

18" TALL VALVE BOX

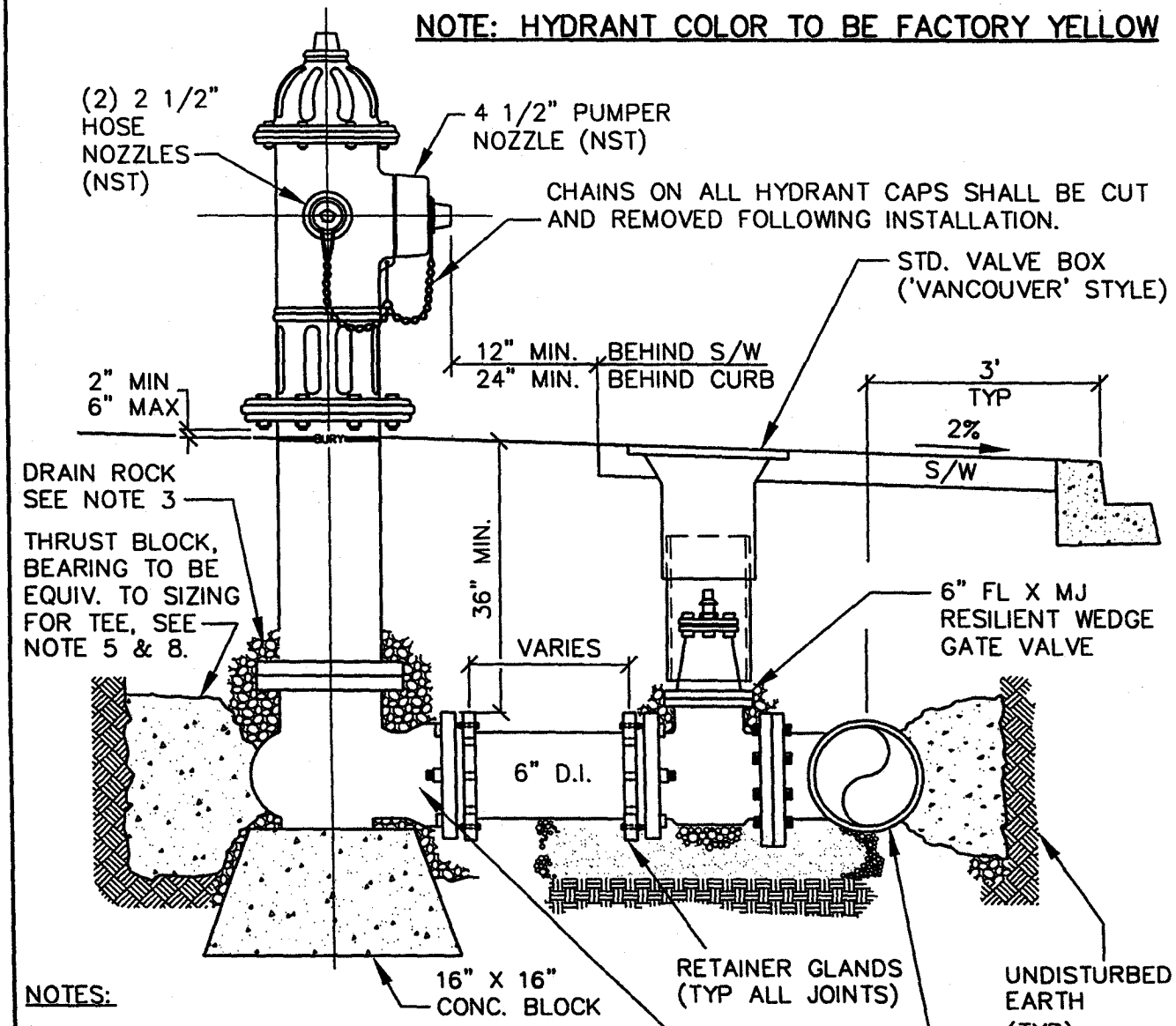
LAST REVISION DATE: June 1999

BUTTERFLY VALVE AND VALVE BOX DETAILS

CITY: OWD, OR

DRAWING NO. 502

NOTE: HYDRANT COLOR TO BE FACTORY YELLOW



NOTES:

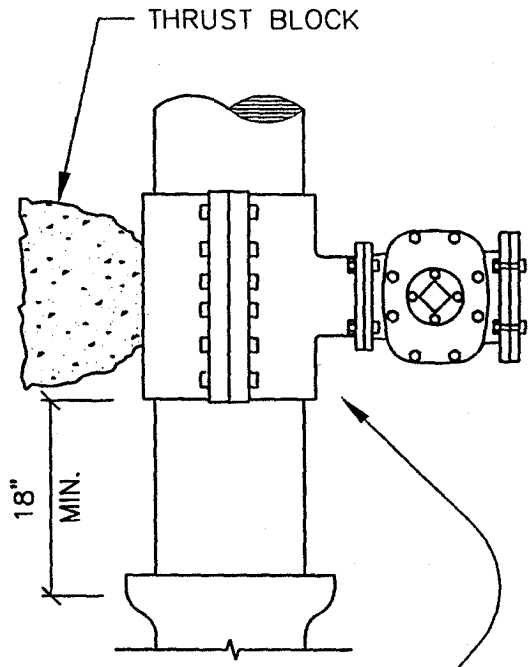
1. HYDRANTS TO BE AVK MODEL 2780 OR WATEROUS WB-67, TRAFFIC STYLE.
2. **ALL FITTINGS IN CONTACT WITH CONCRETE SHALL BE WRAPPED IN PLASTIC.** HYDRANT DRAIN HOLES TO REMAIN OPEN TO DRAIN ROCK AND OPERATIONAL.
3. 1-1/2" TO 3/4" CLEAN DRAIN ROCK SHALL BE PLACED A MIN. OF 6" ABOVE DRAIN OUTLET.
4. WHERE PLANTER STRIP EXISTS, HYDRANT SHALL BE PLACED SO FRONT PORT IS A MIN. OF 24" BEHIND FACE OF CURB.
5. THRUST BLOCK AT STANDARD 6" FIRE HYDRANT TEE SHALL HAVE MIN. 3.7 SQ. FT. BEARING AREA.
6. ALL HYDRANTS SHALL BE SET PLUMB.
7. FOR HYDRANT LEADS LONGER THAN 30', AN ADDITIONAL GATE VALVE SHALL BE PROVIDED WITHIN 3 FT. OF THE HYDRANT.
8. RETAINER GLANDS SHALL BE USED INSTEAD OF HYDRANT THRUST BLOCK ON NEAR SIDE HYDRANTS.

LAST REVISION DATE: OCTOBER 1999

STANDARD FIRE HYDRANT ASSEMBLY

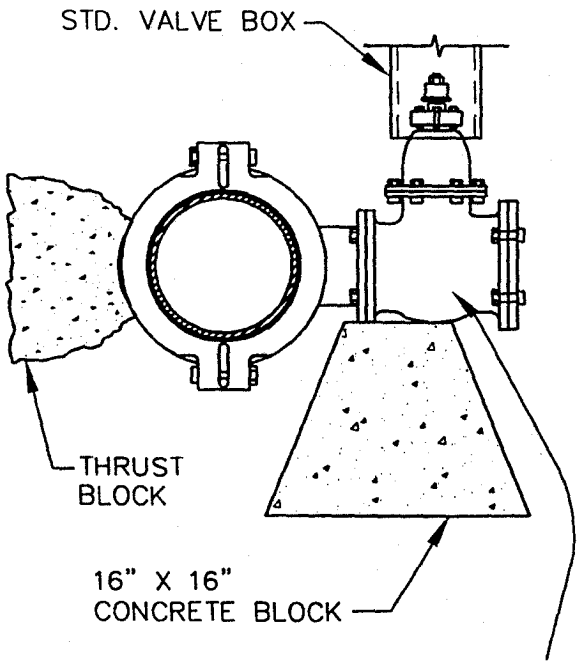
CITY: OWD, OR

DRAWING NO. 503



MUELLER MODEL H304,
JCM MODEL 432 OR APPROVED EQUAL

TOP VIEW



RESILIENT WEDGE GATE VALVE

SIDE VIEW

NOTES:

1. WATER MAIN SHALL BE CLEANED BEFORE ATTACHING SLEEVE.
2. TAPPING SLEEVE SHALL BE ALL STAINLESS STEEL WITH FULL PERIMETER GASKET.
2. TAPPING VALVE SHALL BE EPOXY COATED PER AWWA C-550.
3. SLEEVE AND VALVE SHALL BE PRESSURE TESTED BEFORE MAKING TAP. PRESSURE TEST AND TAP SHALL BE MADE IN THE PRESENCE OF AN AUTHORIZED CITY REPRESENTATIVE.
4. APPROVED TAPPING MACHINE SHALL BE USED TO MAKE TAP.
5. 3/4" GRANULAR BACKFILL SHALL BE PLACED AND COMPACTED TO 95% OF MAXIMUM DENSITY AS DETERMINED BY AASHTO T-180.
6. THRUST BLOCKING REQUIREMENTS SHALL BE DETERMINED BY THE ENGINEER.
7. TAP SHALL BE MADE NO CLOSER THAN 18" FROM THE NEAREST JOINT.
8. **SLEEVE AND VALVE SHALL BE WRAPPED WITH 8 MIL PLASTIC PRIOR TO CONCRETE PLACEMENT.**
9. CONCRETE BLOCK(S) SHALL COMPLETELY SUPPORT TAPPING TEE AND VALVE.
10. CONTRACTOR SHALL COORDINATE ALL TAPS WITH CITY AND PERFORM ALL TAPS WITH PUBLIC WORKS STAFF PRESENT.

LAST REVISION DATE: June 1999

TAPPING TEE AND VALVE

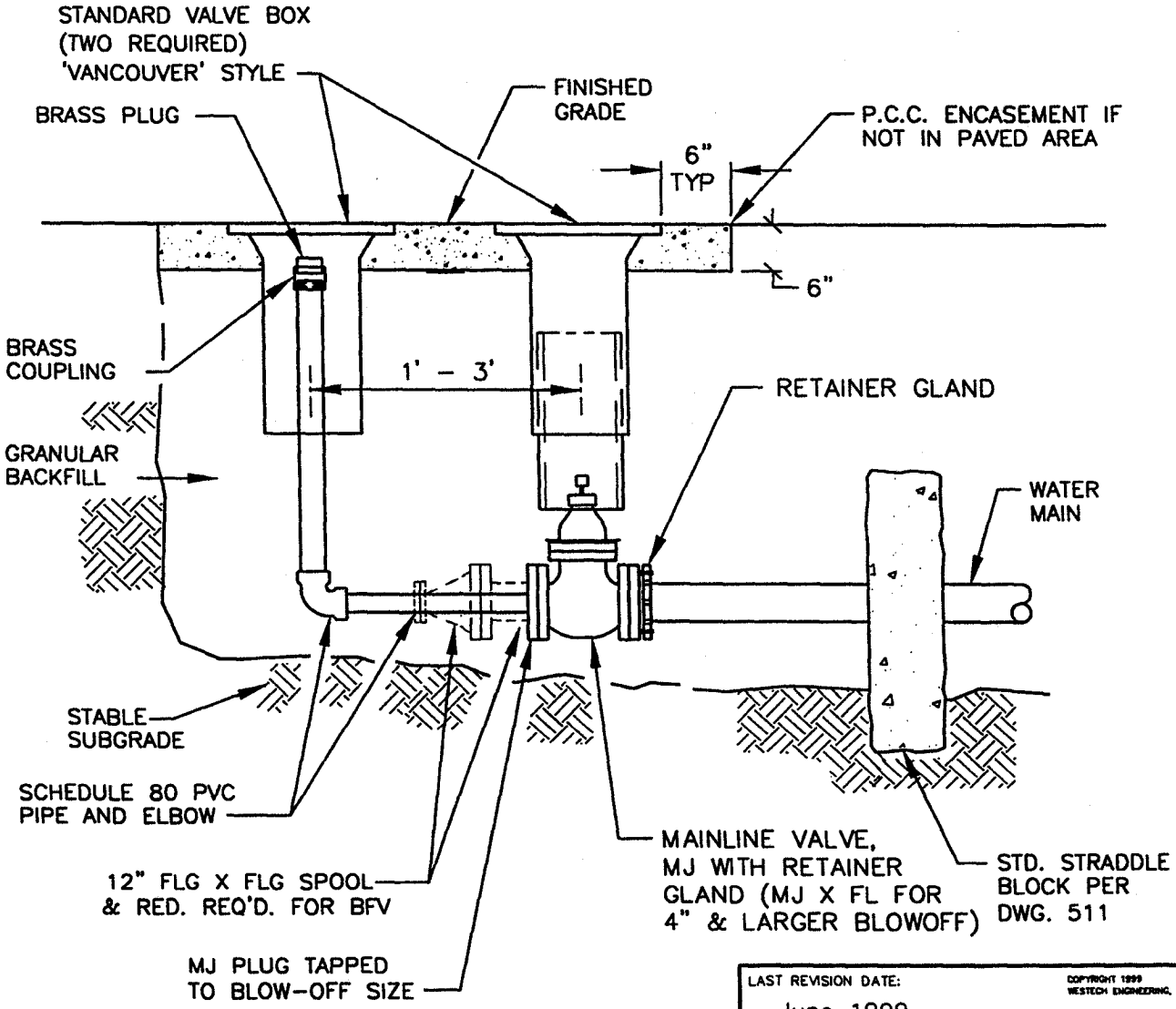
CITY: OWD, OR

DRAWING NO. 505

BLOW-OFF SIZES REQUIRED (ASSUMES 40 PSI RESIDUAL PRESS.)	
MAIN SIZE	BLOW-OFF SIZE
6" – 8"	2"
10" – 12"	4"
>12"	BY ENGR.

NOTES:

1. BACKFILL WITH GRANULAR BACKFILL.
2. REQUIRED ON ALL LINES WHICH MAY BE EXTENDED IN FUTURE OR AS DIRECTED BY CITY ENGINEER.
3. ALL CONCRETE TO BE 3300 PSI @ 28 DAYS.
4. FLANGED DUCTILE IRON PIPE AND FITTINGS MAY BE REQUIRED FOR 4" & LARGER BLOWOFFS.

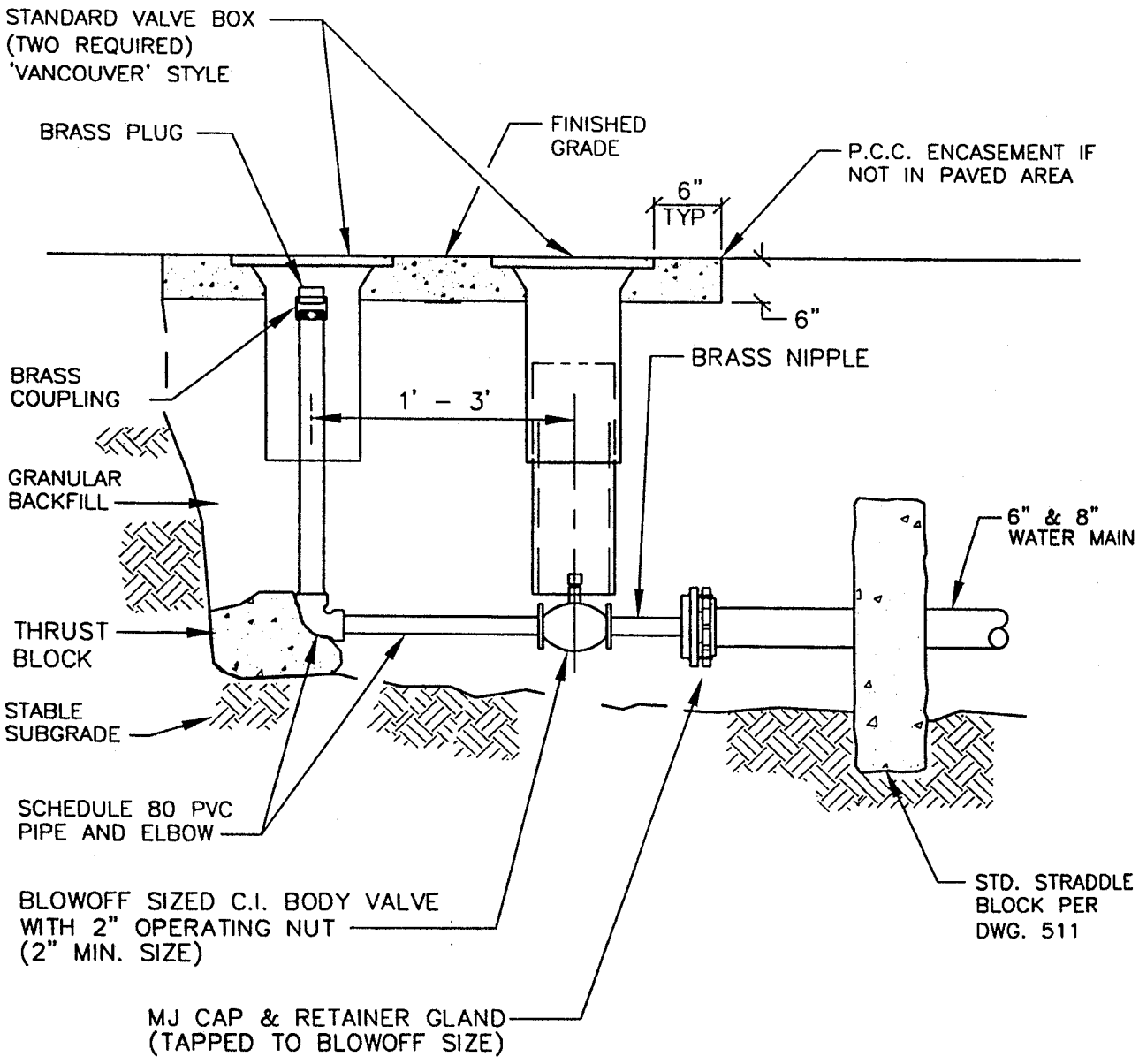


LAST REVISION DATE: June 1999

MAINLINE BLOWOFF ASSEMBLY

CITY: OWD, OR

DRAWING NO. 506



NOTES:

1. BACKFILL WITH GRANULAR BACKFILL.
2. ALLOWED ONLY ON PERMANENT DEAD END LINES IN CUL-DE-SACS WHICH CANNOT BE EXTENDED IN THE FUTURE.
3. ALL CONCRETE TO BE 3300 PSI @ 28 DAYS.
4. 2" BLOWOFF SIZE ASSUMES 40 PSI RESIDUAL PRESSURE.

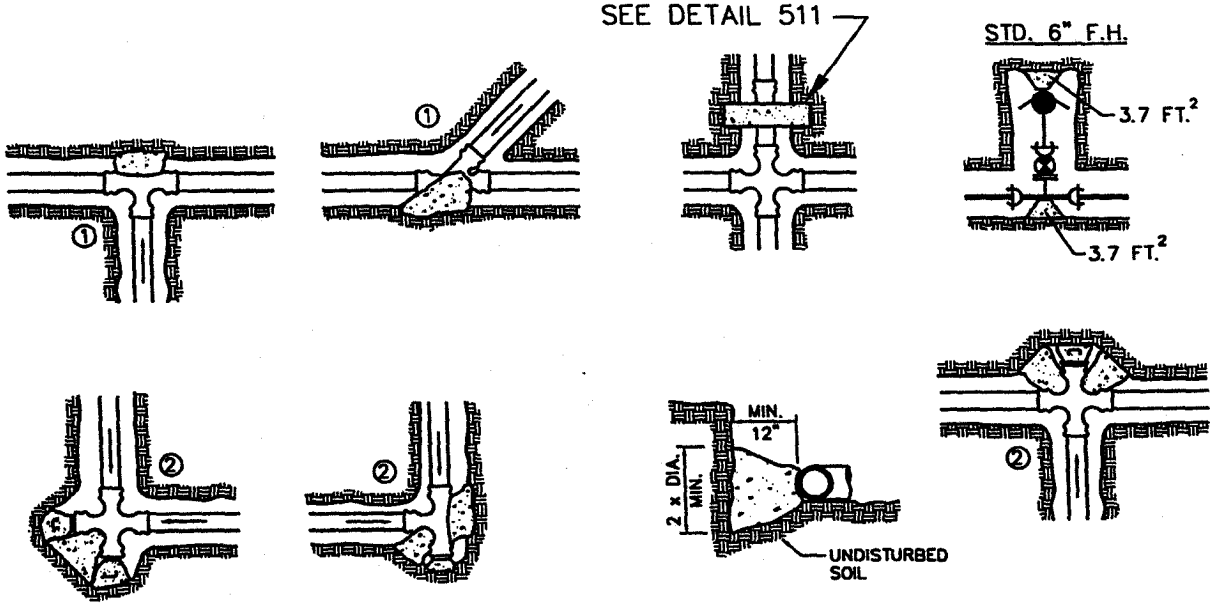
LAST REVISION DATE: June1999	
STANDARD BLOWOFF WITH PLUGGED END	
CITY: OWD, OR	DRAWING NO. 507

FITTING SIZE (Inches)	TEE, WYE, & ① HYDRANTS	90° BEND ② PLUGGED CROSS TEE PLUGGED–RUNS	45° BEND ③	22 1/2° BEND ③	11 1/4° BEND ③
2	*	*	*	*	*
4	1.7	2.4	1.3	*	*
6	3.7	5.3	2.9	1.5	*
8	6.7	9.5	5.1	2.7	1.3
10	10.5	14.8	8	4.1	2
12	15.1	21.3	11.6	5.9	2.9
16	26.8	37.9	20.5	10.4	5.2
18	33.9	47.9	25.9	12.8	6.7
LARGER	* *	* *	* *	* *	* *
	BEARING AREA OF THRUST BLOCKS (sq. ft.)				

1. ALL VALUES ARE BASED ON THE FOLLOWING ASSUMPTIONS: AVG. PRESSURE = 100 PSI x 2 (safety factor); 1500 PSF SOIL BEARING CAPACITY; NORMAL DISTRIBUTION DESIGN VELOCITY NOT TO EXCEED 5 FPS.
2. **ALL FITTINGS SHALL BE WRAPPED IN PLASTIC PRIOR TO PLACEMENT OF CONCRETE.**
3. BEARING SURFACE OF THRUST BLOCKING SHALL BE AGAINST UNDISTURBED SOIL.
4. ALL CONCRETE MIX SHALL HAVE A MIN. 28 DAY STRENGTH OF 3300 PSI.
5. ALL PIPE ZONES SHALL BE BACKFILLED WITH GRANULAR BACKFILL AND COMPACTED.
6. THRUST BLOCKS FOR PLUGGED CROSS AND PLUGGED TEE SHALL HAVE #4 REBAR LIFTING LOOPS INSTALLED AS SHOWN.
7. VERTICAL THRUST DETAILS–SEE DWG. 512.
8. STRADDLE BLOCK DETAILS–SEE DWG. 511.

* BLOCK TO UNDISTURBED TRENCH WALLS

* * THRUST BLOCKS FOR PIPES LARGER THAN 18" WILL BE INDIVIDUALLY DESIGNED BY THE ENGINEER.

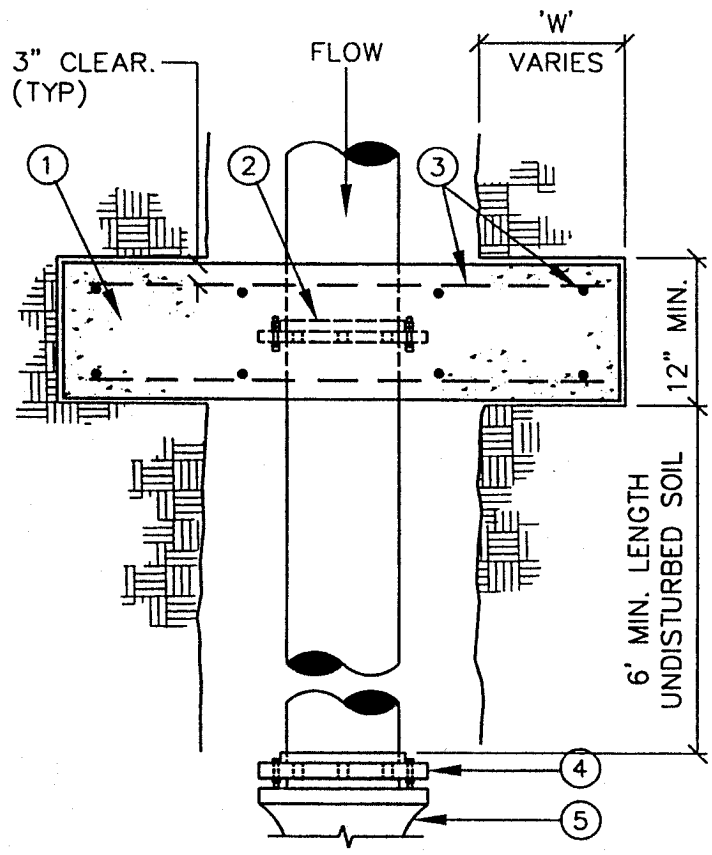


LAST REVISION DATE: June 1999

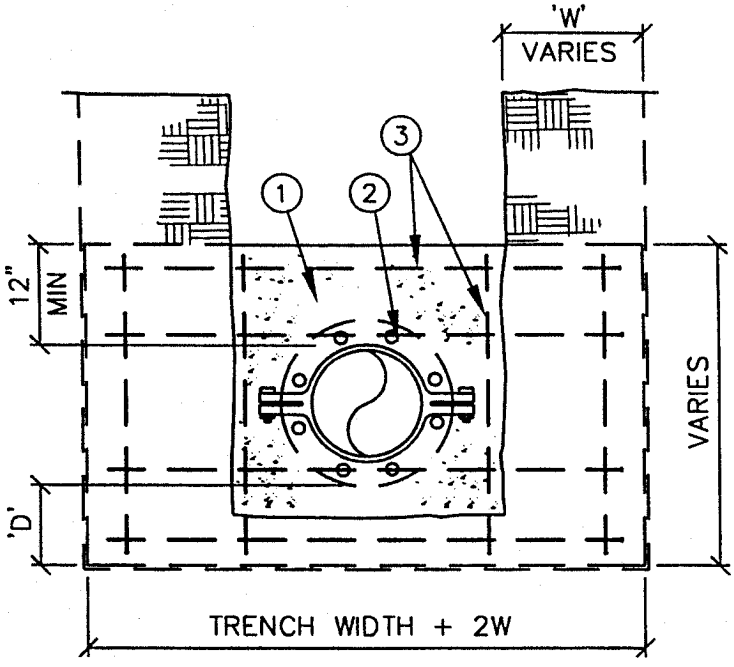
HORIZONTAL THRUST BLOCKING

CITY: OWD, OR

DRAWING NO. 510



TOP VIEW



FRONT VIEW

MATERIALS

1. CONCRETE STRADDLE BLOCK.
2. UNI-FLANGE, SERIES 900, CL.125
3. #4 REBAR EA. WAY, 12" O.C.
4. RETAINER GLAND.
5. MJ FITTING, VALVE OR BLOWOFF.

PIPE SIZE	'W'	'D'
6"	12"	8"
8"	16"	10"
10"	20"	12"
>10"	BY ENGINEER	

NOTES:

1. STRADDLE BLOCKS FOR >10" PIPE SHALL BE DESIGNED INDIVIDUALLY BY THE ENGINEER AND SHALL BE BASED ON THE FOLLOWING:
   a.) 200 PSI WATER PRESSURE.
   b.) SOIL BRG. CAPACITY, STEEL SIZE & SPACING BY THE ENGINEER.
2. BEARING AREA OF BLOCK SHALL BE AGAINST UNDISTURBED SOIL.
3. STRADDLE BLOCK SHALL HAVE A MINIMUM OF 18" COVER.
4. CONCRETE SHALL HAVE A MIN. 28 DAY STRENGTH OF 3300 PSI.

LAST REVISION DATE: June 1999

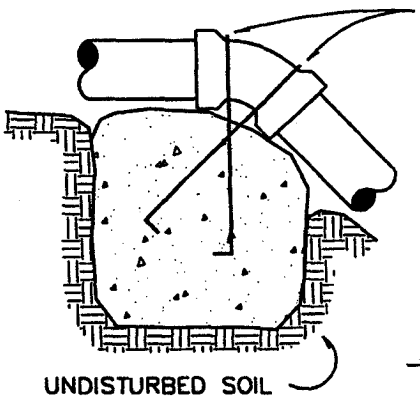
STRADDLE BLOCK FOR 10" AND SMALLER PIPE

CITY: OWD, OR

DRAWING NO. 511

NOTES:

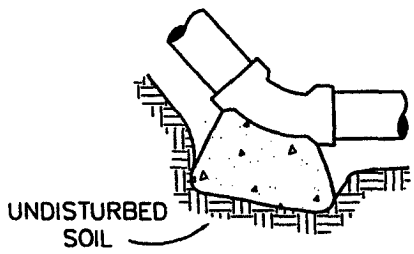
1. GRAVITY VERTICAL THRUST BLOCKS SHALL BE DESIGNED BY THE ENGINEER.
2. **KEEP CONCRETE CLEAR OF JOINT AND JOINT ACCESSORIES. FITTINGS SHALL BE WRAPPED IN PLASTIC PRIOR TO PLACEMENT OF CONCRETE.**
3. CONCRETE THRUST BLOCKING SHALL BE POURED AGAINST UNDISTURBED EARTH.
4. CONCRETE MIX SHALL HAVE A MIN. 28 DAY STRENGTH OF 3000 P.S.I.
5. THRUST BLOCK VOLUMES FOR VERTICAL BENDS HAVING UPWARD RESULTANT THRUSTS ARE BASED ON TEST PRESSURE OF 150 P.S.I.G. AND THE WEIGHT OF CONCRETE = 4050 LBS./CU.YD.
6. VERTICAL BENDS THAT REQUIRE A THRUST BLOCK VOLUME EXCEEDING 5 CUBIC YARDS REQUIRE SPECIAL BLOCKING DETAILS. SEE PLANS FOR VOLUMES SHOWN INSIDE HEAVY LINE IN TABLE.
7. ALL REBAR SHALL BE GALVANIZED IN ACCORDANCE WITH ASTM-123 (MIN. 3.4 MIL). REBAR SHALL BE BENT BEFORE GALVANIZATION, AND LAST 4" OF BAR SHALL BE BENT 90 DEGREES WITH A 1/2" RADIUS BEND. REBAR SHALL BE TIGHTLY FIT TO RESTRAINED FITTING.
8. FOR HORIZONTAL THRUST BLOCK DETAILS SEE DRAWING NO. 510.



PROFILE

GRAVITY VERTICAL THRUST BLOCK

SIZED LIKE HORIZONTAL THRUST BLOCKS



PROFILE

NORMAL VERTICAL THRUST BLOCK

VOLUME OF THRUST BLOCK IN CUBIC YARDS (VERTICAL BENDS)			
FITTING SIZE	BEND ANGLE		
	45°	22 1/2°	11 1/4°
4	1.1	0.4	0.2
6	2.7	1.0	0.4
8	4.0	1.5	0.6
10	6.0	2.3	0.9
12	8.5	3.2	1.3
14	11.5	4.3	1.8
16	14.8	5.6	2.3

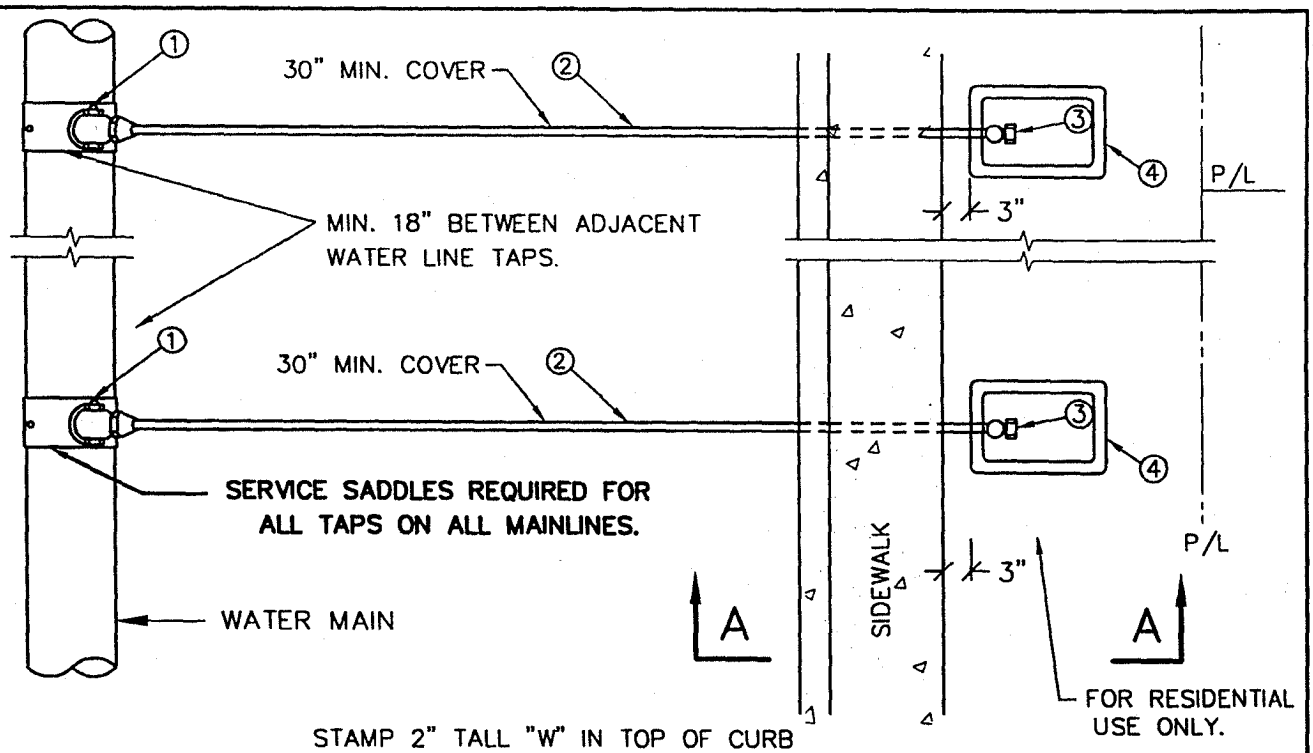
FITTING SIZE	ROD SIZE	EMBED-MENT
12" AND LESS	#6	30"
14" – 16"	#8	36"

LAST REVISION DATE: June 1999

VERTICAL THRUST BLOCKING

CITY: OWD, OR

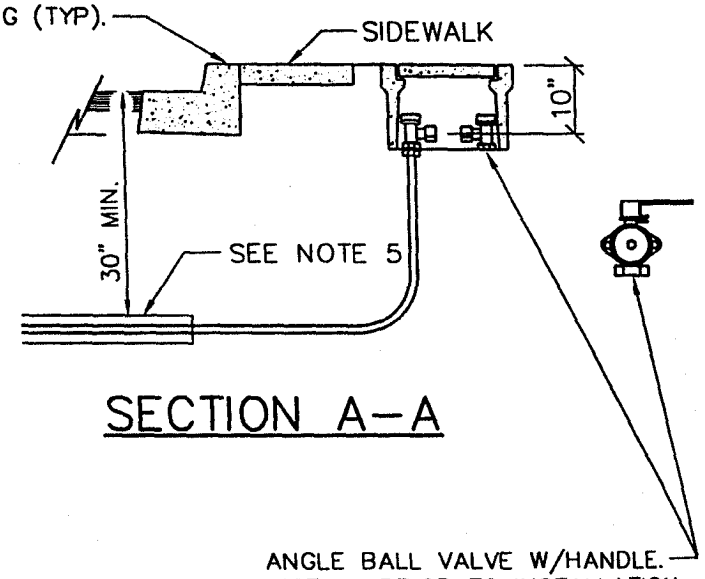
DRAWING NO. 512



STAMP 2" TALL "W" IN TOP OF CURB AT POINT OF CROSSING (TYP).

MATERIALS:

1. BALL STYLE CORPORATION STOP FORD FB-1100. SET AT 30° ANGLE UP FROM HORIZONTAL.
2. DRISCOPIPE 5100 ULTRA-LINE (PE 3408) IRON PIPE SIZE OD, SDR 9 (200 PSI) SINGLE RESIDENTIAL SERVICE: 1" (TYP)
3. BALL STYLE LOCKING ANGLE METER STOP, FORD BA43-232W.
4. BROOKS CONCRETE METER BOX:
   NO. 38-TR IN TRAFFIC AREAS.
   NO. 38-H ELSEWHERE.



SECTION A-A

NOTES:

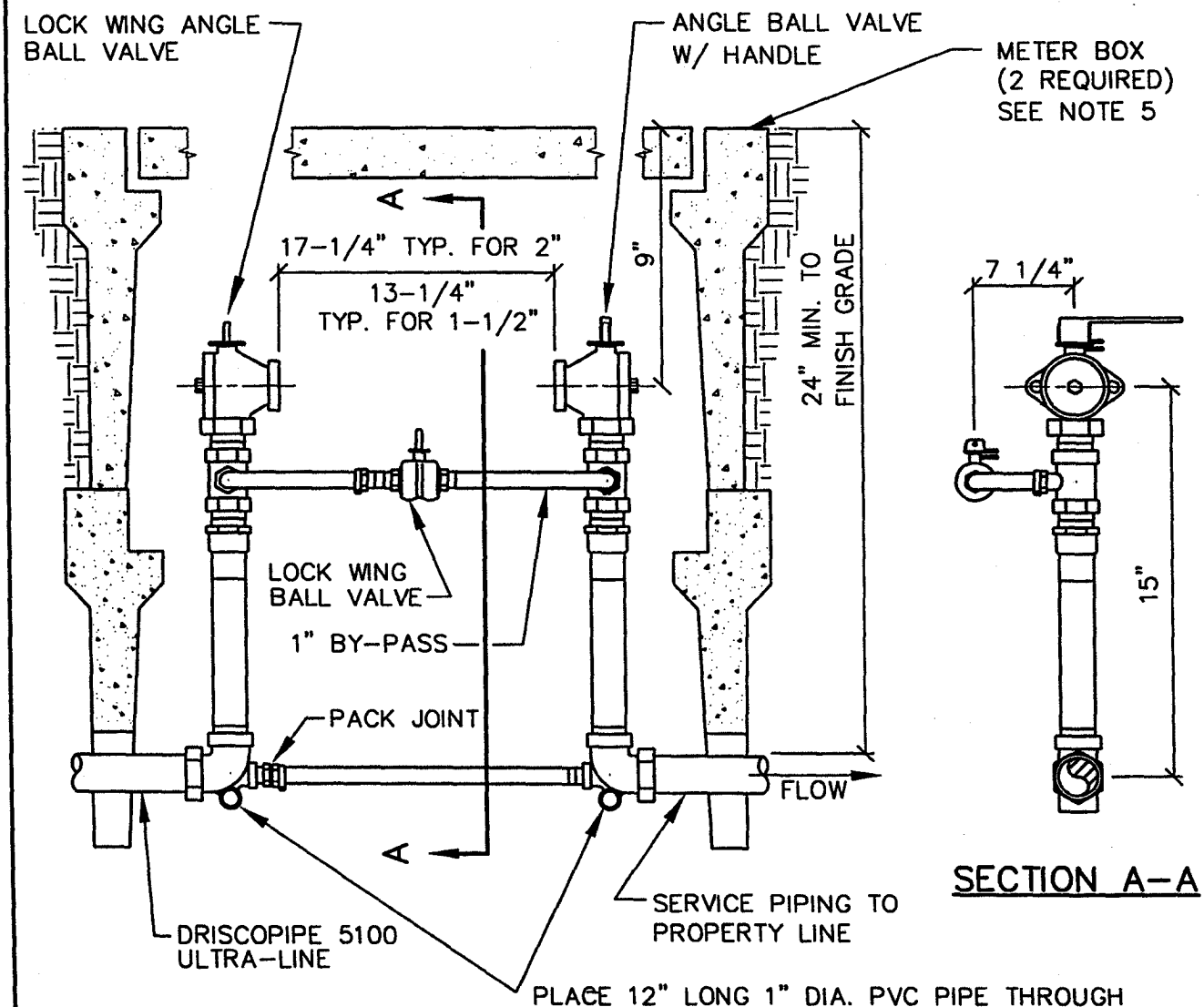
1. SUBSTITUTES FOR ANY MATERIALS SHOWN SHALL BE APPROVED BY THE DISTRICT ENGINEER.
2. ALL PIPE AND BACKFILL ZONES SHALL BE BACKFILLED USING 3/4" MINUS GRANULAR MATERIAL AND COMPACTED TO 92% MAX. DENSITY DETERMINED BY AASHTO T-180.
3. SET FRONT OF METER BOX 3-INCHES BEHIND BACK OF SIDEWALK LOCATION FOR CURBLINE WALKS.
4. METER BOX SHALL BE CENTERED OVER THE COMPLETED METER ASSEMBLY.
5. MIN. SIZE COMMERCIAL SERVICES SHALL BE 1-INCH. FOR NEW STREETS OR STREETS BEING CUT FOR SERVICE INSTALLATION, FAR SIDE COMMERCIAL SERVICES SHALL BE INSTALLED IN A 3" MIN. SCHED 40 PVC SLEEVE

LAST REVISION DATE: October 1999

1" WATER SERVICE

CITY: OWD, OR

DRAWING NO. 515



PLACE 12" LONG 1" DIA. PVC PIPE THROUGH RINGS TO STABILIZE BASE OF COPPERSETTER.

NOTES:

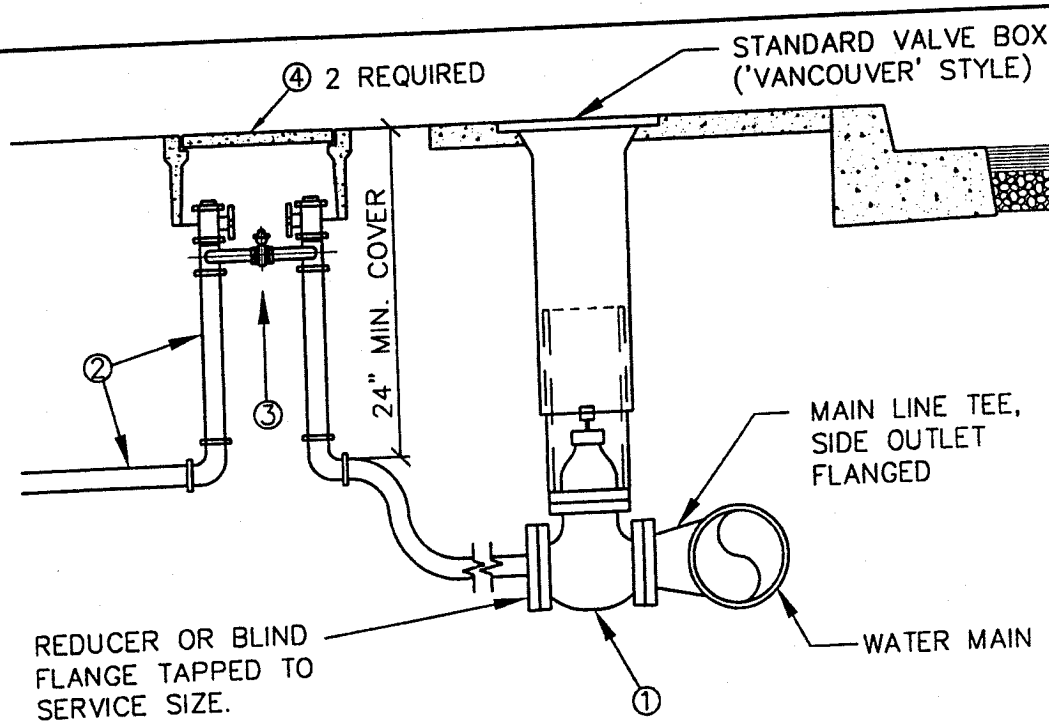
1. METERSET TO BE FORD COPPERSETTER #B-95082 WITH RAISED LOCKING BYPASS OR APPROVED EQUAL.
2. SUBSTITUTES FOR ANY MATERIALS SHOWN SHALL BE APPROVED BY THE DISTRICT ENGINEER.
3. ALL PIPE AND BACKFILL ZONES SHALL BE BACKFILLED USING 3/4" MINUS GRANULAR MATERIAL AND COMPACTED TO 92% OPTIMUM DENSITY PER AASHTO T-180.
4. SET FRONT OF METER BOX 3-INCHES BEHIND SIDEWALK (TYPICAL) FOR CURBLINE WALKS. NO METERS ON PRIVATE PROPERTY WITHOUT A RECORDED EASEMENT.
5. METER BOX SHALL BE CENTERED OVER THE COMPLETED METER ASSEMBLY. METER BOX TO BE BROOKS NO. 66-TR IN TRAFFIC AREAS, BROOKS NO. 66-H ELSEWHERE.
6. WATER METER SET BY DISTRICT FORCES. COPPERSETTER, METER BOX, & ALL FITTINGS PROVIDED BY DEVELOPER.
7. SEE DETAIL 517 FOR TAPPING REQUIREMENTS.

LAST REVISION DATE: June 1999

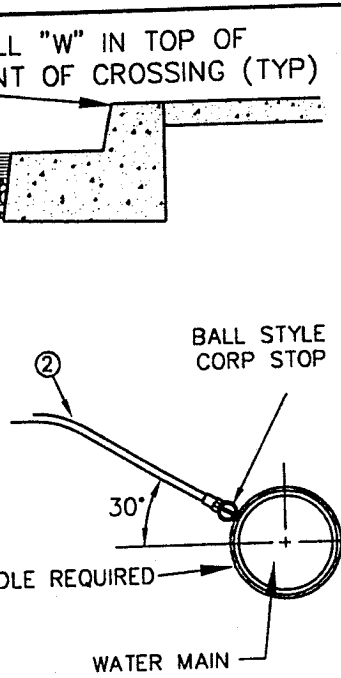
1 1/2" AND 2" METER SET W/ 1" HIGH BY-PASS

CITY: OWD, OR

DRAWING NO. 516



2" & LARGER SERVICE



1-1/2" SERVICE

MATERIALS

① FLG X FLG RESILIENT WEDGE GATE VALVE PER AWWA C-509. 4" DIA. OR SERVICE SIZE, WHICHEVER IS LARGER. EPOXY COATED PER AWWA C-550.

② DRISCOPIPE 5100 ULTRA-LINE (PE 3408) IRON PIPE SIZE OD, SDR 9 (200 PSI).

③ METER STOP ASSEMBLY W/BYPASS PER PUBLIC WORKS REQUIREMENTS. SEE DETAIL 516 FOR 1-1/2 & 2" SERVICES.

④ CONCRETE METER BOX FOR 1-1/2" AND 2" SERVICES SHALL BE:
BROOKS NO. 66TR IN TRAFFIC AREAS.
BROOKS NO. 66H ELSEWHERE.
METER VAULT FOR LARGER SERVICE PER PUBLIC WORKS REQUIREMENTS.

NOTES

1. SUBSTITUTES FOR ANY MATERIAL SHOWN SHALL BE APPROVED BY DISTRICT ENGINEER.
2. ALL PIPE AND STRUCTURE ZONES SHALL BE BACKFILLED USING 3/4" MINUS GRANULAR MATERIAL AND COMPACTED TO 95% MAX DENSITY AS DETERMINED BY ASHTO T-180.
3. METER BOX SHALL BE CENTERED OVER THE COMPLETED METER AND FITTING ASSEMBLY.
4. CUSTOMER SHALL INSTALL AN APPROVED BACKFLOW PREVENTION DEVICE ON PRIVATE PROPERTY IMMEDIATELY DOWNSTREAM OF WATER METER.

CITY: OWD, OR

TAPPING REQUIREMENTS, 1-1/2" & LARGER SERVIC

DRAWING NO. 517

LAST REVISION DATE: October 1999

WATERLINE PRESSURE TEST REPORT

Project Location: Maxwell Mnt	Project Name: Maxwell Utility	Date: 10/9/2012
Inspector: Jason Morgan, PE (Print) Alan Tuckey, OWD	**Waterline to be tested.** From Station: 3" EXTENSION	To Station:
Verify that all in-line valves, including hydrant mainline valves are open? (Yes) / No		
Verify that all corp stops are open? (Yes) / No		
Verify that pressure gauge is mounted at high point of line to be tested? (Yes) / No If no, correct for elevation difference *(ie. add 0.433 psi per foot elevation difference)*.		
System Static Pressure (psi):	Starting Pressure (psi): (greater of 150 psi or 1.5 times static) 26 psi	Ending Pressure (psi): 26 psi
Test Length: ~4 hrs (2 hours minimum)	Starting Time:	Ending Time: 130pm
Volume Required to Reach Initial Test Pressure (gal):	Allowable Leakage (gal): (2 times table value below) NONE	Measured Leakage (gal): NONE
TEST RESULTS: (Pass) / Fail		

ALLOWABLE LEAKAGE PER 1,000 FEET OF PIPELINE - *gph*

Test Pressure *psi*	NOMINAL PIPE DIAMETER - *in.*									
	3	4	6	8	10	12	14	16	18	20
200	0.32	0.43	0.64	0.85	1.06	1.28	1.48	1.70	1.91	2.12
175	0.30	0.40	0.59	0.80	0.99	1.19	1.39	1.59	1.79	1.98
150	0.28	0.37	0.55	0.74	0.92	1.10	1.29	1.47	1.66	1.84

If the pipeline under test contains various diameters, the allowable leakage shall be the sum of the allowable leakage for each size. No additional leakage allowance will be given for fire hydrant assemblies or valves.

Allowable leakage based on : $L = SD(P)^{1/2}/133{,}200$

Where:

L = allowable leakage, in gallons per hour
S = length of pipe tested, in feet
D = nominal diameter of the pipe, in inches
P = test pressure during the leakage test, in psig

Regardless of leakage, maximum pressure drop during test period shall not exceed 5 psi/hour.

Test directed by
Alan Tuckey, OWD
Watermaster

TEST PROCEDURE

1. Apply hydrostatic pressure by pumping water from an auxiliary supply basin. Accurately determine the amount of water required to reach the initial test pressure by refilling the supply basin with a calibrated container following pressurization of pipeline.
2. Monitor test pressure for 2 hour period.
3. At the completion of the test period, re-pressurize the pipeline by pumping water from the auxiliary supply basin. Accurately determine the amount of water required to reach the test pressure by refilling the supply basin with a calibrated container following pressurization of pipeline. If the measured leakage is less than the allowable leakage, the test is successful.

Standard Construction Notes

Appendix B

12. **Record Drawings**. The Contractor shall maintain one complete set of stamped approved drawings on the construction site at all times whereon he will record any approved deviations in construction from the approved drawings, as well as the station locations and depths of all existing utilities encountered. These field record drawings shall be kept up to date at all times and shall be available for inspection by the OWD upon request.

13. Upon completion of construction of public facilities, Contractor shall submit a clean set of field record drawings containing all as-built information to the Design Engineer for use in the preparation of As-Built drawings for submittal to OWD.

14. The Contractor shall submit a suitable maintenance bond prior to final payment where required by public and/or private agencies having jurisdiction.

15. Elevations shown on the drawings are based from _____(OWD; County, OSHD, etc) Bench Mark _____, Elevation _____(adjusted 19__), consisting of a _____(brass cap; monument, etc.) located at _____.

EXISTING UTILITIES & FACILITIES:

16. The location and descriptions of existing utilities shown on the drawings are compiled from available records and/or field surveys. The engineer or utility companies do not guarantee the accuracy or the completeness of such records. Contractor shall field verify locations of all existing utilities prior to construction.

17. The Contractor shall locate and mark all existing property and street monuments prior to construction. Any monuments disturbed during construction of the project shall be replaced by a Registered Land Surveyor at the Contractor's expense.

18. Contractor shall field verify location and depth of all existing utilities where new facilities cross. Contractor shall be responsible for exposing potential utility conflicts far enough ahead of construction to make necessary grade modifications without delaying the work. If grade modification is necessary, Contractor shall notify the Design Engineer, and the Design Engineer shall obtain approval from the OWD District Engineer prior to construction. All utility crossings shall be potholed as necessary prior to excavating or boring to allow the Contractor to prevent grade or alignment conflicts.

19. All existing facilities shall be maintained in-place by the Contractor unless otherwise shown or directed. Contractor shall take all precautions necessary to support, maintain, or otherwise protect existing utilities and other facilities at all times during construction. Contractor to leave existing facilities in an equal or better-than-original condition and to the satisfaction of the OWD District Engineer.

20. Utilities, or interfering portions of utilities, that are abandoned in place shall be removed by the Contractor to the extent necessary to accomplish the work. The Contractor shall

plug the remaining exposed ends of abandoned utilities. All piped utilities abandoned in place shall have all openings closed with concrete plugs with a minimum length equal to 2 times the diameter of the abandoned pipe.

21. Contractor shall remove all existing signs, mailboxes, fences, landscaping, etc., As required to avoid damage during construction and replace them to existing or better condition.

WATER UTILITIES:

22. Curbs shall be stamped with a 'W' at the point where each water service lateral crosses the curb. Letters shall be a minimum of 2-inches high.

23. Where trench excavation requires removal of PCC curbs and/or sidewalks, the curbs and/or sidewalks shall be sawcut and removed at a tooled joint unless otherwise authorized in writing by the OWD. The sawcut lines shown on the drawings are schematic and not intended to show the exact alignment of such cuts.

24. **Bedding and Backfill**. All pipes shall be bedded with minimum 6-inches of 3/4" minus crushed rock bedding and backfilled with compacted 3/4" minus crushed rock in the pipe zone (crushed rock shall extend a minimum of 12-inches over the top of the pipe in all cases). Crushed rock trench backfill shall be used under all improved areas, including sidewalks.

25. **Compaction Requirements.**

    a. Trench backfill in the pipe zone shall be achieved by mechanical means in horizontal lifts to ninety percent (90%) of the maximum dry density per AASHTO T-180 test method.

    b. Compaction in the backfill zone (more than 12" above the top of pipe) and within the street right of way shall be achieved by mechanical means in horizontal lifts to ninety-two percent (92%) of the maximum dry density per AASHTO T-180 test method unless a greater degree of compaction is required by another agency with jurisdiction.

    c. Compaction in the backfill zone (more than 12" above the top of pipe) and outside the street right of way shall be achieved by mechanical means in horizontal lifts to ninety percent (90%) of the maximum dry density per AASHTO T-180 test method unless a greater degree of compaction is required by another agency with jurisdiction.

26. Crushed rock shall conform to the requirements of Section 02630 (Base Aggregate) OSHD Standard Specifications.

27. Contractor shall provide all materials, equipment and facilities required for testing all utility piping in accordance with OWD construction specifications.

28. **Tracer Wire**. All non-metallic water piping shall have an electrically conductive insulated 12 gauge copper tracer wire the full length of the installed pipe using blue wire for water piping. Tracer wire shall be extended up into all valve boxes.

29. **Warning Tape.** Detectable or non-detectable acid and alkali resistant safety warning tape shall be provided along the full length of all water mainline segments not located under sidewalks or paved portions of public streets. Underground warning tape shall be continuous the entire length of service laterals installed from the mainline to the back of the PUE.

30. No trenches in roads or driveways shall be left in an open condition overnight. All such trenches shall be closed before the end of each work day and normal traffic flows restored.

31. OWD forces to operate all valves, including fire hydrants, on existing public mains.

32. All water mains shall be ASTM D-2241 Class 200, C-905 PVC (DR 25) or Class 52 ductile iron. All fittings 4-inches through 24-inches in diameter shall be ductile iron fittings in conformance with AWWA C-153 or AWWA C-110. The minimum working pressure for all MJ cast iron or ductile iron fittings 4-inches through 24-inch in diameter shall be 350 psi for MJ fittings and 250 psi for flanged fittings.

33. Unless otherwise approved by the OWD Engineer, all valves shall be flange connected to adjacent tees or crosses.

34. Water service pipe on the public side of the meter shall be Driscopipe 5100 Ultra-Line (PE 3408), copper tube size OD, SDR 9, conforming to ASTM D-2737.

35. Unless otherwise noted, water service pipe on the private side of the meter shall be Schedule 40 PVC.

36. Domestic and fire backflow prevention devices and vaults shall conform to requirements of public and/or private agencies having jurisdiction.

37. Contractor shall install temporary plug and blowoff as required at the end of waterline for flushing, testing and chlorination.

38. The work shall be performed in a manner designated to maintain water service to buildings supplied from the existing waterlines. In no case shall service to any main line or building be interrupted form more than four (4) hours in any one day. Contractor shall notify the OWD and all affected residents and businesses a minimum of 24 business hours (1 business day) prior to any interruption of service.

39. **Sanitary Sewer & Waterline Crossings**. Where sanitary sewer lines cross above or within 18-inches vertical separation below a waterline, sewer mains and/or laterals shall be replaced with C-900 PVC pipe (DR 18) at the crossing in conformance with OAR 333. Center one full length of AWWA C-900 PVC pipe at point of crossing. Connect to existing sewer lines with approved rubber couplings. *Note: For an 8-inch waterline with 36-inches cover, lateral inverts within 5.67-feet (68-inches) of finish grade must be C-900 PVC.*

Utility Companies & Agencies

Appendix C

UTILITY COMPANIES AND AGENCIES

The following is a summary list of utility companies with utilities within the District, as well as public agencies with jurisdiction within the District. This summary is not necessarily complete or up to date, and is included solely for benefit of the developer, and is not intended to indicate all utilities or agencies which must be contacted or from which approvals must be obtained.

Category	Utility/Agency	Phone #
Sanitary Sewer System	Netarts Oceanside Sanitary District	(503) 842-8231
Water System	Oceanside Water District	(503) 842-6462
Water System	Netarts Water District	(503) 842-9405
District Engineer	Westech Engineering	(503) 585-2474
Fire District	Oceanside Rural Fire Protection District	(503) 842-5316
Fire District	Netarts Rural Fire Protection District	(503) 842-5900
Gas	None	
Power	Tillamook PUD	(503) 842-2535
Telephone	United Telephone	1-800-788-0102
TV	Falcon Cable	(503) 842-6682
State Highway	ODOT District 1	(503) 325-7222
County Roads	Tillamook County Public Works	(503) 842-3419
Sanitary Sewer	Dept. of Environmental Quality (DEQ) Northwest Region	(503) 229-5552

Standard Easement Forms

Appendix D

After recording, return to:

Oceanside Water District
5390 Netarts Highway NW
Tillamook, OR 97141

PERMANENT EASEMENT

The undersigned, _____ Grantor, for the mutual consideration as outlined herein, the receipt of which is hereby acknowledged, do hereby grant to the Oceanside Water District, a duly organize sanitary district and municipal corporation, referred to herein as District, an exclusive and permanent right-of-way and easement to construct, reconstruct, operate and maintain water facilities and all necessary related facilities under and along the following described premises:

Legal Description here, or
'See "Exhibit A", incorporated herein by reference.'

TO HAVE AND TO HOLD said easement and right-of-way unto said District, its successors and assigns.

The permanent right-of-way or easement shall include the right, privilege, and authority of the District to excavate for, and to construct, install, lay, operate, maintain and remove underground pipelines and/or cables with all appurtenances incident thereto or necessary thereafter, for the purpose of supplying public utility service under and across the said premises, together with the right of District to place, install, maintain, inspect, add to the number of and relocate pipelines and/or cables and necessary appurtenances and make excavations therefore from time to time, in, under and through the above described premises within said right-of-way, and to cut and remove from said right-of-way any trees and other obstructions which may endanger the safety or interfere with the use of said pipelines and/or cables or appurtenances attached to or connect therewith; and the right of ingress and egress to and over said described premise at any and all times for the purpose of patrolling the pipelines and/or cables, or repairing, renewing or adding to the number of pipelines and/or cables and appurtenances and for doing anything necessary, useful or convenient for the enjoyment of the easement hereby granted.

Upon the final acceptance of the installed system by the District, the District shall be responsible for all further restorations of the premises if at any time the District causes the utilities to be repaired or maintained. No trees, permanent structures or improvements, including parallel fences shall be placed or constructed on the easement by the Grantor or the Grantor's heirs, assigns or successors in interest. The District, upon each and every occasion that the same be repaired, maintained or removed shall restore the premise of the Grantor, by removing all debris and leaving the ground surface in a neat and presentable condition. Grass and topsoil shall be restored as near as possible to as good a condition as the same were prior to any repair or maintenance by the District.

( ) Consideration for this grant consists wholly of value other than money.

( ) Consideration for this grant consists of _____ dollars and other valuable consideration to Grantor paid.

The only other persons, firms, or corporations known by Grantor to have any interest in the granted property are: _____

_____ (Grantor)

_____ (Grantor)

DATED this _____ day of _____, 199____.

STATE OF OREGON)
) ss.
County of _____)

On this _____ day of _____, 199___, personally appeared before me, the above named person(s), _____, known to be to be the person(s) whose signature is above subscribed, and acknowledged to me that this is a free act and deed, for the uses and purposes therein expressed.

In testimony whereof, I have hereunto set my hand and affixed by official seal on the day and year last above written.

_____
(Signature)
Notary Public for Oregon
My Commission Expires: _____

After recording, return to:

Oceanside Water District
5390 Netarts Highway West
Tillamook, OR 97141

Sample Insurance Certificates

Appendix E

ACORD. CERTIFICATE OF INSURANCE

DATE (MM/DD/YY)

PRODUCER

THIS CERTIFICATE IS ISSUED AS A MATTER OF INFORMATION ONLY AND CONFERS NO RIGHTS UPON THE CERTIFICATE HOLDER. THIS CERTIFICATE DOES NOT AMEND, EXTEND OR ALTER THE COVERAGE AFFORDED BY THE POLICIES BELOW.

INSURED

SAMPLE

1 OF 2

COMPANIES AFFORDING COVERAGE

COMPANY A

COMPANY B

COMPANY C

COMPANY D

COVERAGES

THIS IS TO CERTIFY THAT THE POLICIES OF INSURANCE LISTED BELOW HAVE BEEN ISSUED TO THE INSURED NAMED ABOVE FOR THE POLICY PERIOD INDICATED, NOTWITHSTANDING ANY REQUIREMENT, TERM OR CONDITION OF ANY CONTRACT OR OTHER DOCUMENT WITH RESPECT TO WHICH THIS CERTIFICATE MAY BE ISSUED OR MAY PERTAIN, THE INSURANCE AFFORDED BY THE POLICIES DESCRIBED HEREIN IS SUBJECT TO ALL THE TERMS, EXCLUSIONS AND CONDITIONS OF SUCH POLICIES. LIMITS SHOWN MAY HAVE BEEN REDUCED BY PAID CLAIMS.

CO LTR	TYPE OF INSURANCE	POLICY NUMBER	POLICY EFFECTIVE DATE (MM/DD/YY)	POLICY EXPIRATION DATE (MM/DD/YY)	LIMITS	
	GENERAL LIABILITY				GENERAL AGGREGATE	$ 1,000,000
X	COMMERCIAL GENERAL LIABILITY				PRODUCTS-COMP/OP AGG	$ 1,000,000
	CLAIMS MADE [X] OCCUR				PERSONAL & ADV INJURY	$ 1,000,000
X	OWNER'S & CONT PROT				EACH OCCURRENCE	$ 1,000,000
					FIRE DAMAGE (Any one fire)	$ 50,000
					MED EXP (Any one person)	$ 5,000
	AUTOMOBILE LIABILITY				COMBINED SINGLE LIMIT	$ 1,000,000
X	ANY AUTO					
X	ALL OWNED AUTOS				BODILY INJURY (Per person)	$
X	SCHEDULED AUTOS					
	HIRED AUTOS				BODILY INJURY (Per accident)	$
	NON-OWNED AUTOS					
					PROPERTY DAMAGE	$
	GARAGE LIABILITY				AUTO ONLY - EA ACCIDENT	$
	ANY AUTO				OTHER THAN AUTO ONLY:	
					EACH ACCIDENT	$
					AGGREGATE	$
	EXCESS LIABILITY				EACH OCCURRENCE	$
	UMBRELLA FORM				AGGREGATE	$
	OTHER THAN UMBRELLA FORM					$
	WORKERS COMPENSATION AND EMPLOYERS' LIABILITY				STATUTORY LIMITS	
	THE PROPRIETOR/ PARTNERS/EXECUTIVE OFFICERS ARE: [ ] INCL [ ] EXCL				EACH ACCIDENT	$ 100,000
					DISEASE - POLICY LIMIT	$ 500,000
					DISEASE - EACH EMPLOYEE	$ 100,000
	OTHER					

DESCRIPTION OF OPERATIONS/LOCATIONS/VEHICLES/SPECIAL ITEMS

CERTIFICATE HOLDER

Oceanside Water District (OWD), Oregon
5390 Netarts Highway NW
Tillamook, OR 97141

CANCELLATION

SHOULD ANY OF THE ABOVE DESCRIBED POLICIES BE CANCELLED BEFORE THE EXPIRATION DATE THEREOF, THE ISSUING COMPANY WILL ENDEAVOR TO MAIL 30 DAYS WRITTEN NOTICE TO THE CERTIFICATE HOLDER NAMED TO THE LEFT, BUT FAILURE TO MAIL SUCH NOTICE SHALL IMPOSE NO OBLIGATION OR LIABILITY OF ANY KIND UPON THE COMPANY, ITS AGENTS OR REPRESENTATIVES.

AUTHORIZED REPRESENTATIVE

THIS ENDORSEMENT CHANGES THE POLICY. PLEASE READ IT CAREFULLY.

ADDITIONAL INSURED - OWNERS, LESSEES OR CONTRACTORS (FORM B)

This endorsement modifies insurance provided under the following:

COMMERCIAL GENERAL LIABILITY COVERAGE PART.

SCHEDULE

Name of Person or Organization:

Oceanside Water District (OWD), Oregon
5390 Netarts Highway NW
Tillamook, OR 97141

Westech Engineering, Inc.
Oceanside District Engineer
3841 Fairview Industrial Drive SE
Salem, OR 97302

1. WHO IS AN INSURED (Section II) is amended to include as an insured the person or organization shown in the Schedule, but only with respect to liability arising out of "your work" for that insured by or for you.

2. With respect to 1. above the following additional provisions apply:

   4. Other Insurance.

      The insurance afforded by this Coverage Part is primary insurance and we will not seek contribution from any other insurance available to the insured unless the other insurance is provided by a contractor. Then we will share with that other insurance by the method described below.

      If all of the other insurance permits contribution by equal shares, we will follow this method also. Under this approach, each insurer contributes equal amounts until it has paid its applicable limit of insurance or none of the loss remains, whichever comes first.

      If any of the other insurance does not permit contribution by equal shares, we will contribute by limits. Under this method, each insurer's share is based on the ratio of its applicable limit of insurance to the total applicable limits of insurance of all insurers.

Oceanside Water District (OWD)

PUBLIC WORKS DESIGN STANDARDS

October 1999

Last Updated October 1999

Oceanside Water District (OWD)
5390 Netarts Highway NW
Tillamook, OR 97141
(503) 842-6462

PUBLIC WORKS DOCUMENTS ORDER FORM

Name: _____

Company/Organization: _____

Address: _____

City: _____ State: _____ Zip _____

Phone: _____ Fax: _____

____ Copies of Public Works Design Standards & Details @ $30.00 .....$_____

Postage & Shipping .....$_____

Total $_____

Make Checks Payable to the Oceanside Water District. **Prepaid Orders Only**
Add $5.00 postage/shipping for orders that must be shipped (standard U.S. mail or UPS ground service).

Mail Orders to: OWD
5390 Netarts Highway NW
Tillamook, OR 97141

Available at: OWD
5390 Netarts Highway NW
Tillamook, OR 97141

OCEANSIDE WATER DISTRICT (OWD)
PUBLIC WORKS DESIGN STANDARDS

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OCEANSIDE WATER DISTRICT (OWD)
PUBLIC WORKS DESIGN STANDARDS

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Section **Page**

APPENDICES

APPENDIX A – STANDARD DETAILS

• Division 1 - General Requirements

• Division 5 - Water Distribution

▸ For trench backfill and surface restoration, see Details 301 - 304

Test Reports

▸ Waterline Pressure Test Report

TABLE OF CONTENTS

Section **Page**

PREFACE

These design standards have been developed by the Oceanside Water District (OWD) to provide a uniform set of standards for public improvements. The intent of these standards is to provide guidelines for the construction of public facilities that will provide an adequate service level for the present as well as for future development. The format has been kept brief and no attempt has been made to cover all possible situations or to provide lengthy explanations.

These design standards are intended to be used in conjunction with the District's Public Works Construction Standards. The District is presently using the Standard Specifications of the Oregon Chapter American Public Works Association (APWA) with all amendments as its Public Works Construction Standards. In the event of discrepancies between these standards and the Public Works Construction Standards (PWCS) or between the text of these standards and the standard details, the more stringent requirements as determined by the Public Works Director shall apply.

Copies of these design standards can be obtained from Oceanside Water District (OWD), Oregon , 5390 Netarts Highway NW ,Tillamook, OR 97141 .

It is anticipated that revisions to the design standards will be made from time to time. The date appearing on the title page is the date of latest revision of the text portion of the standards. The date appearing on the details is the date of latest revision of that particular detail.

Standard Construction Notes

Appendix B

GENERAL NOTES:

1. All work and materials shall conform to the requirements of Tillamook County, the Oceanside Water District (OWD) and the 1990 APWA Standard Specifications for Public Works Construction including supplements. In the event of a conflict between OWD policies and regulations and the APWA Standard Specifications, the more stringent shall control unless otherwise directed by OWD.

2. Contractor shall notify OWD, County, ODOT and all utility companies a minimum of 72 business hours (3 business days) prior to the start of construction or resuming work after shutdowns except for normal resumption of work after Sundays or Holidays. Contractor shall comply with all requirements of ORS 757.541 to 757.571.

3. Contractor shall perform all work necessary to complete the project in accordance with the approved construction drawings including such incidentals as may be necessary to meet applicable agency requirements and provide a completed project.

4. Contractor shall procure a right-of-entry permit from ODOT State Highway Division for all work within the State right-of-way and conform to all conditions of the permit.

5. Contractor shall procure and conform to all construction permits and licenses prior to start of construction.

6. Contractor shall provide all bonds and insurance required by public and/or private agencies having jurisdiction, including OWD.

7. Unless otherwise approved by the District Superintendent, construction of all public facilities shall be done between 7:00 a.m. and 6:00 p.m., Monday through Saturday. Work outside these hours shall be approved in writing by OWD prior to the start of construction outside normal work hours.

8. Any inspection by OWD, County or other agencies shall not, in any way, relieve the Contractor from any obligation to perform the work in strict compliance with the applicable codes and agency requirements.

9. Contractor shall erect and maintain barricades, warning signs, traffic cones per OWD, County and ODOT requirements in accordance with the MUTCD (including Oregon amendments). Access to driveways shall be maintained at all times. All traffic control measures shall be approved and in place prior to any construction activity.

10. Proposed changes to the approved drawings shall be made only after such changes are submitted in writing to the OWD by the developer's engineer and approved in writing by OWD.

11. Submittals shall be provided by the Contractor to OWD for review and approval prior to construction in accordance with OWD requirements.

12. **Record Drawings**. The Contractor shall maintain one complete set of stamped approved drawings on the construction site at all times whereon he will record any approved deviations in construction from the approved drawings, as well as the station locations and depths of all existing utilities encountered. These field record drawings shall be kept up to date at all times and shall be available for inspection by the OWD upon request.

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the PUE.

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32. All water main
ductile iron. A
fittings in conf
pressure for all
shall be 350 ps

33. Unless otherwi
to adjacent tee

34. Water service
(PE 3408), cop

35. Unless otherw
Schedule 40 P

36. Domestic and
of public and/

37. Contractor sh
for flushing, t

38. The work sha
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or building be
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business hou

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UNITED PIPE & SUPPLY

TANK RPRS — M(ATN) RESERVOIR

AJ COAT TOP

Call Jason

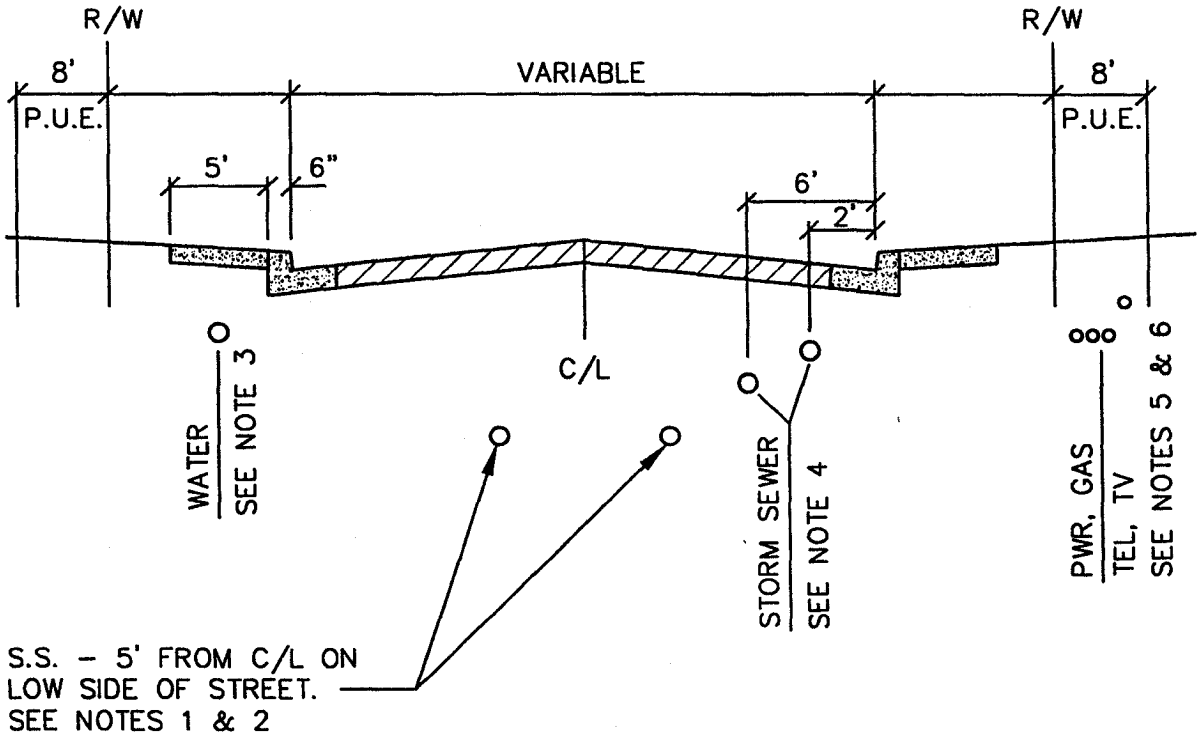
Jason Morgan

GREG McCarthy
LOT 2300
Cell 503-351-6600
FAX 662-9904

OCEANSIDE WATER DISTRICT (OWD)
Public Works Design Standards

Standard Detail Drawings

Appendix A



CURBED STREETS

NTS

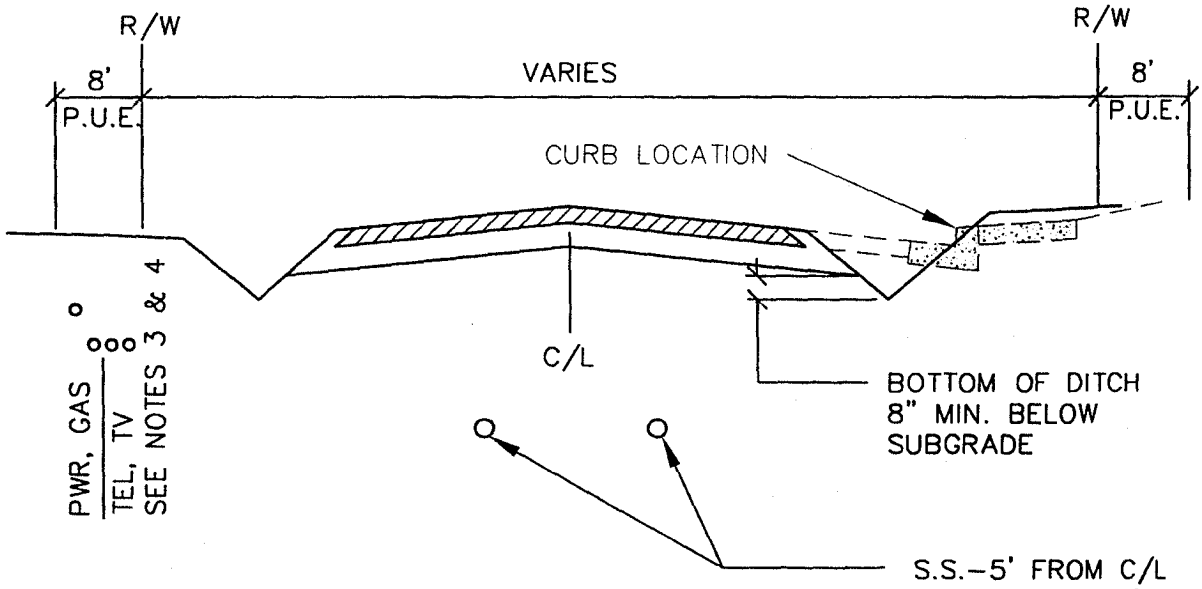
NOTES:

1. WATER TO BE INSTALLED 3' BEHIND FACE OF CURB ON HIGH SIDE OF STREET. 36" MIN. COVER ON ALL WATERLINES.

2. MAINTAIN MIN. 3' HORIZ. SEPARATION BETWEEN PUBLIC UTILITIES & PARALLEL PRIVATE UTILITIES. OTHER VERT. AND HORIZ. SEPARATION DISTANCES ARE CONTROLLED BY DEQ, OHD, AND OTHER PUBLIC/PRIVATE UTILITY COMPANIES.

3. UNITY TRENCH PER UTILITY COMPANY REQMTS. ON OPPOSITE SIDE OF STREET FROM WATER LINE.

LAST REVISION DATE: June 1999	
TYP. UTILITY LOCATIONS (CURBED STREETS)	
CITY: OWD, OR	DRAWING NO. 101



NOTE:

UTILITIES FOR TURNPIKE STREETS OR 3/4 STREET IMPROVEMENTS SHALL BE LOCATED TO ALLOW FUTURE CONSTRUCTION OF CURBED STREETS WITHOUT RELOCATING UTILITIES. SEE DETAIL 101.

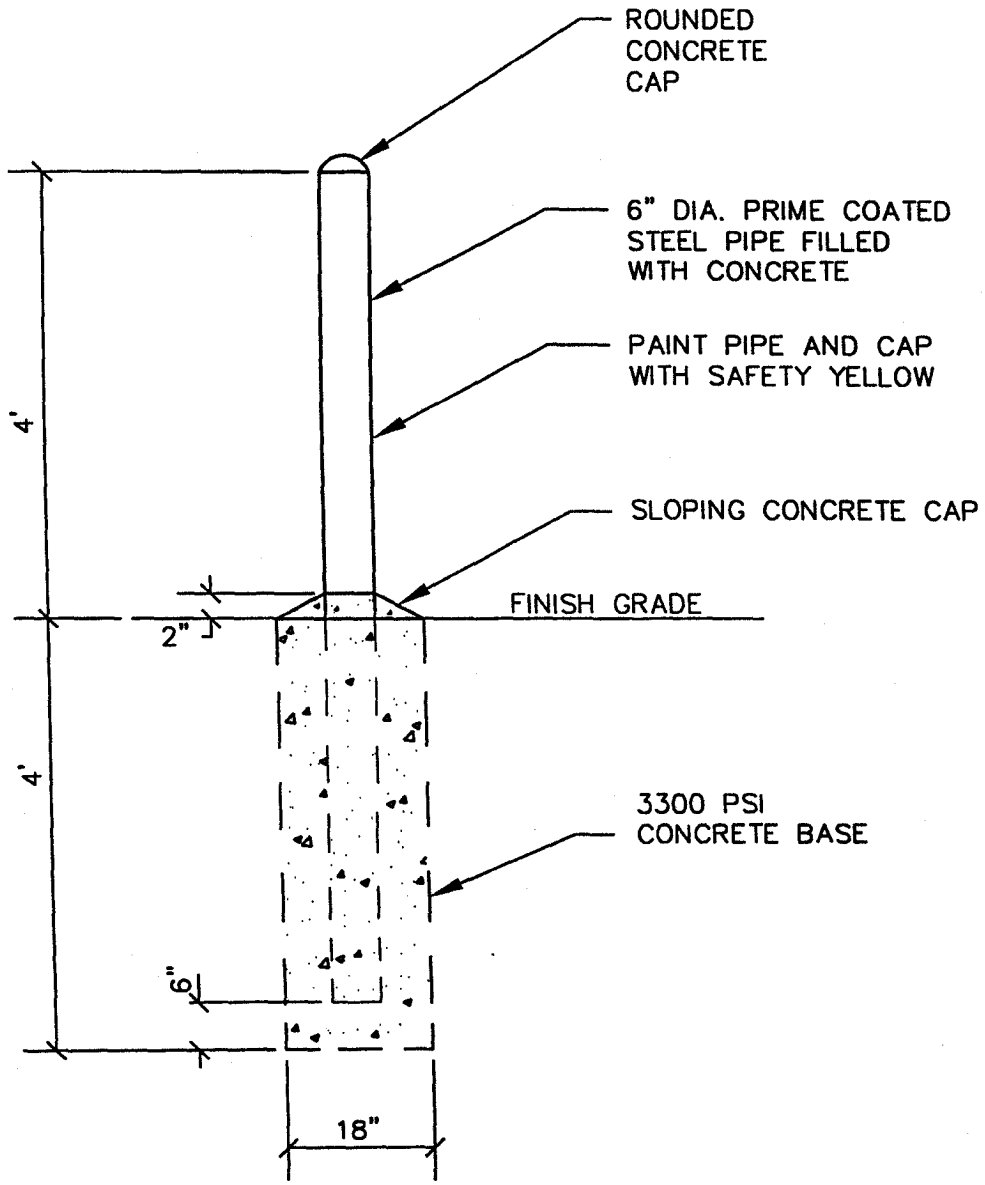
TURNPIKE STREETS

NTS

NOTES:

1. WATER TO BE INSTALLED 3' BEHIND FACE OF CURB ON IMPROVED SIDE OR 3' BEHIND FUTURE FACE OF CURB LOCATION AS DIRECTED BY THE CITY ENGINEER.

LAST REVISION DATE: June 1999	
TYP. UTILITY LOCATIONS (TURNPIKE & 3/4 STREETS)	
CITY: OWD, OR	DRAWING NO. 102

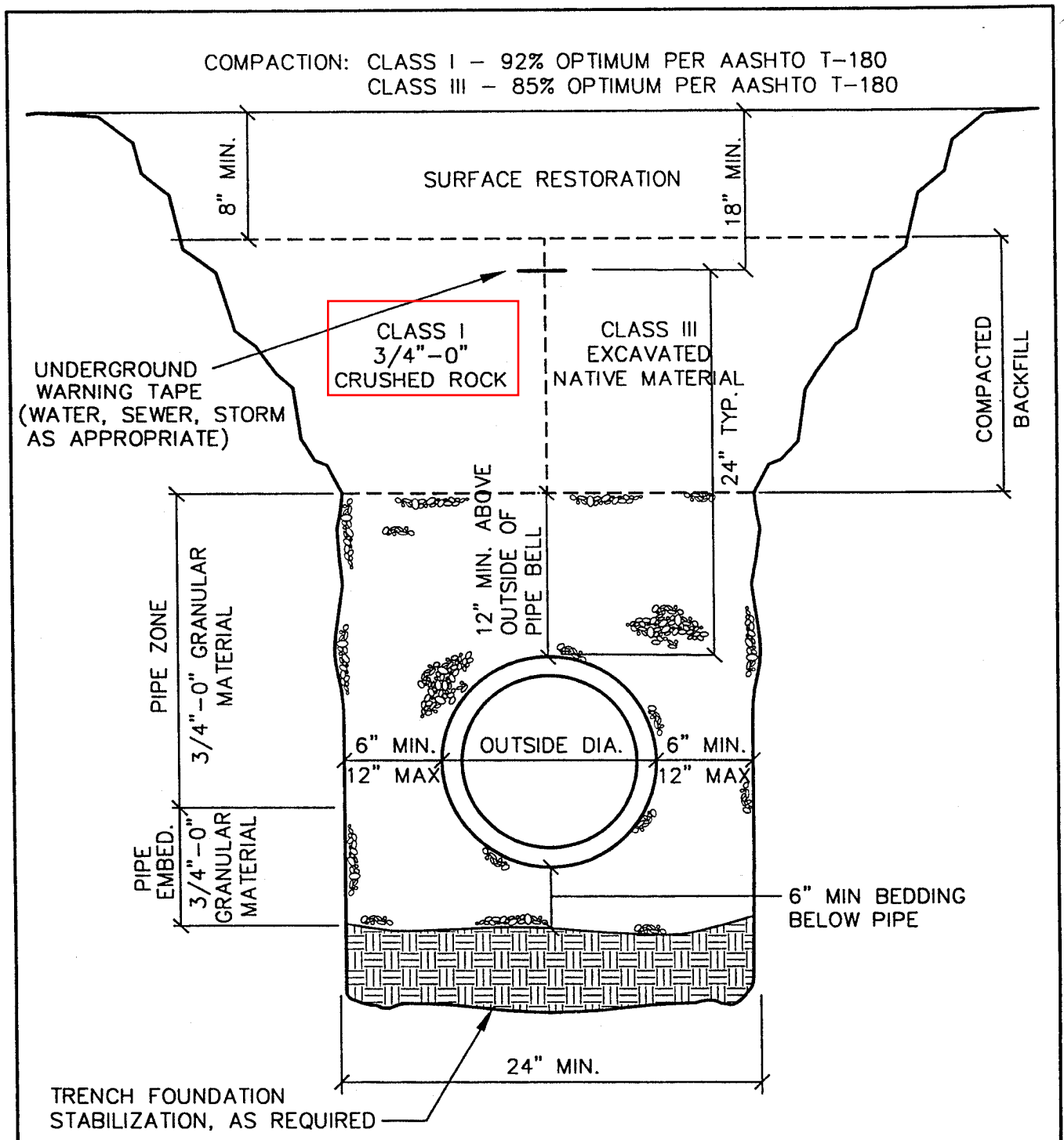


LAST REVISION DATE: June 1999

BOLLARD (GUARD POST)

CITY: OWD, OR

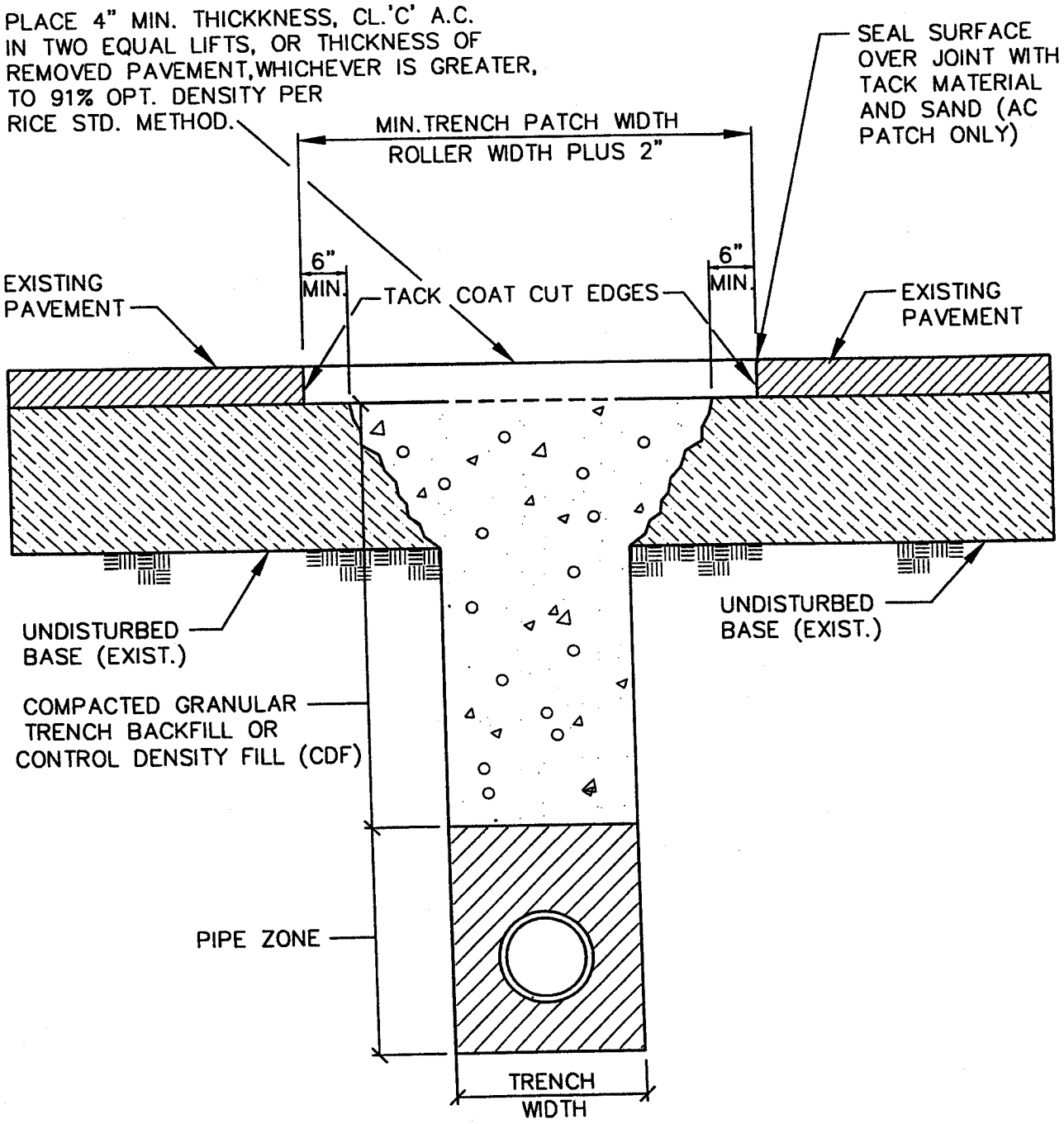
DRAWING NO. 226



NOTES:

1. CLASS I REQ'D. UNDER ALL EXIST. OR FUTURE IMPROVED AREAS INCLUDING SIDEWALKS.
2. WHERE NEW PIPING IS IN SAME ALIGNMENT AS EXIST. PIPING, THE PIPE EMBEDMENT SHALL EXTEND TO A MIN. OF 6" BELOW THE NEW PIPING OR 6" BELOW EXIST. PIPING, WHICHEVER IS DEEPER.

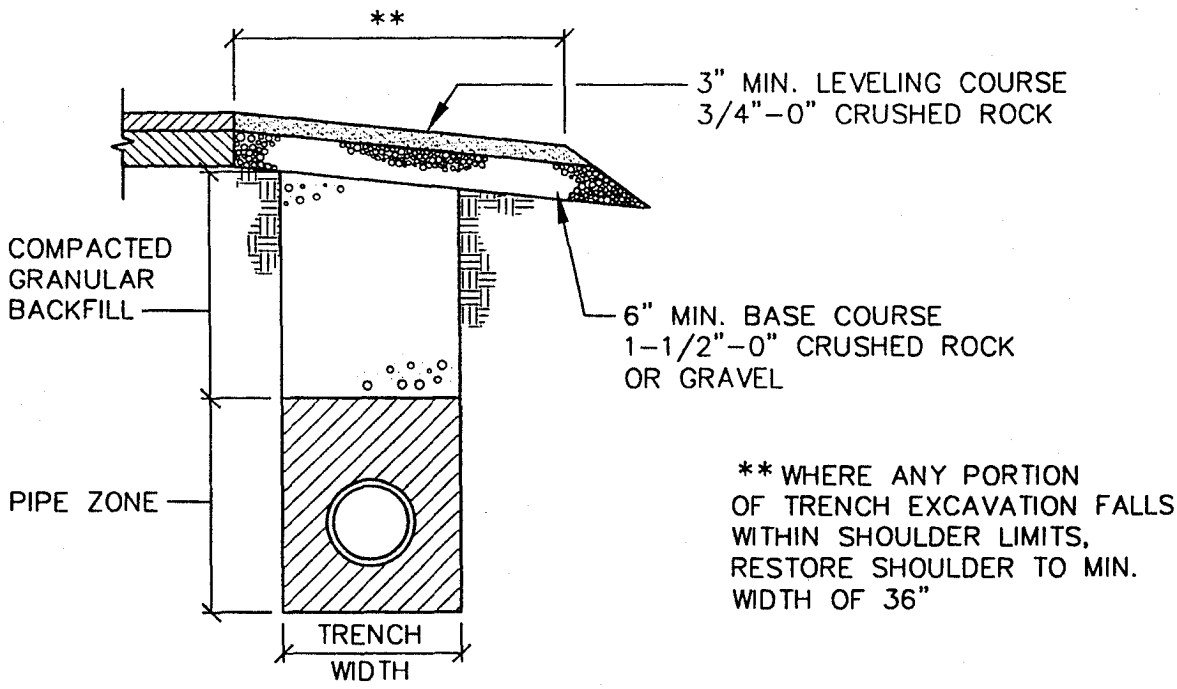
LAST REVISION DATE: JUNE 1999	
TRENCH BACKFILL, BEDDING, AND PIPE ZONE	
CITY: OWD, OR	DRAWING NO. 301



NOTES:

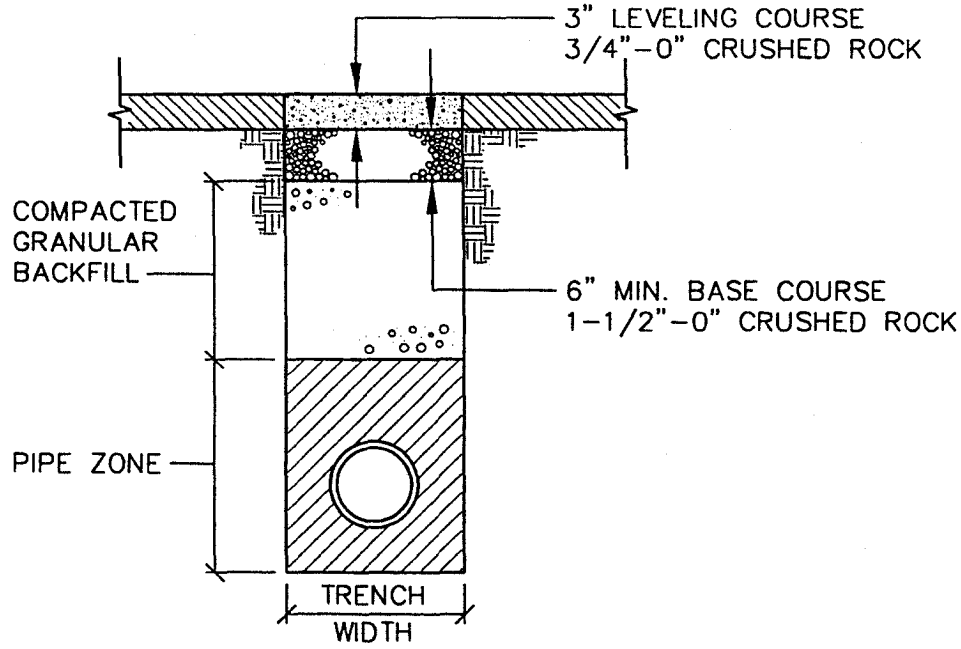
1. ALL EXISTING AC OR PCC PAVEMENT SHALL BE SAWCUT PRIOR TO REPAVING.
2. PCC CONCRETE PAVEMENT SHALL BE REPLACED WITH CONCRETE TO A MINIMUM THICKNESS OF 6" OR TO THE THICKNESS OF REMOVED CONCRETE, WHICHEVER IS GREATER.
3. FOR PAVED DRIVEWAYS, (EXCEPT COMMERCIAL OR INDUSTRIAL), PAVEMENT THICKNESS MAY BE REDUCED TO 3" IN 2 LIFTS, AND OVERCUT MAY BE REDUCED TO 3" EACH SIDE.

LAST REVISION DATE: June 1999	
STREET CUT SURFACE RESTORATION	
CITY: OWD, OR	DRAWING NO. 302



** WHERE ANY PORTION OF TRENCH EXCAVATION FALLS WITHIN SHOULDER LIMITS, RESTORE SHOULDER TO MIN. WIDTH OF 36"

CLASS 'C'
GRAVEL SHOULDER

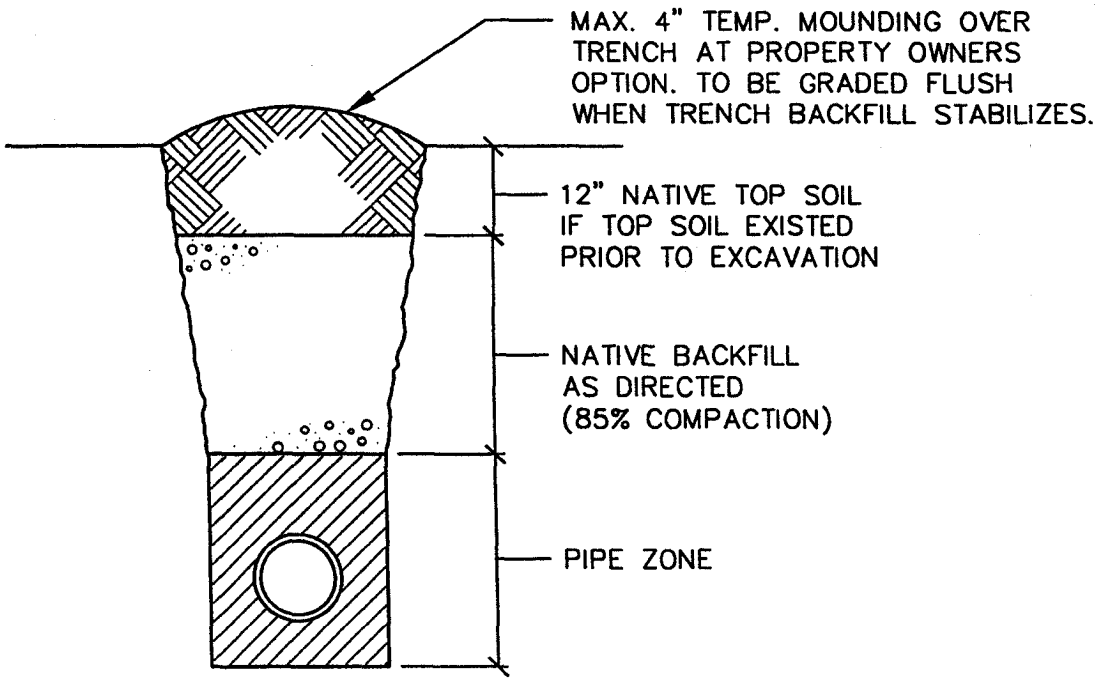


CLASS 'D'
GRAVEL ROAD OR STREET

NOTES:

1. COMPACTION STANDARD WILL BE 92% OPTIMUM PER AASHTO T-180

LAST REVISION DATE: June 1999	
GRAVEL SURFACE RESTORATION	
CITY: OWD, OR	DRAWING NO. 303



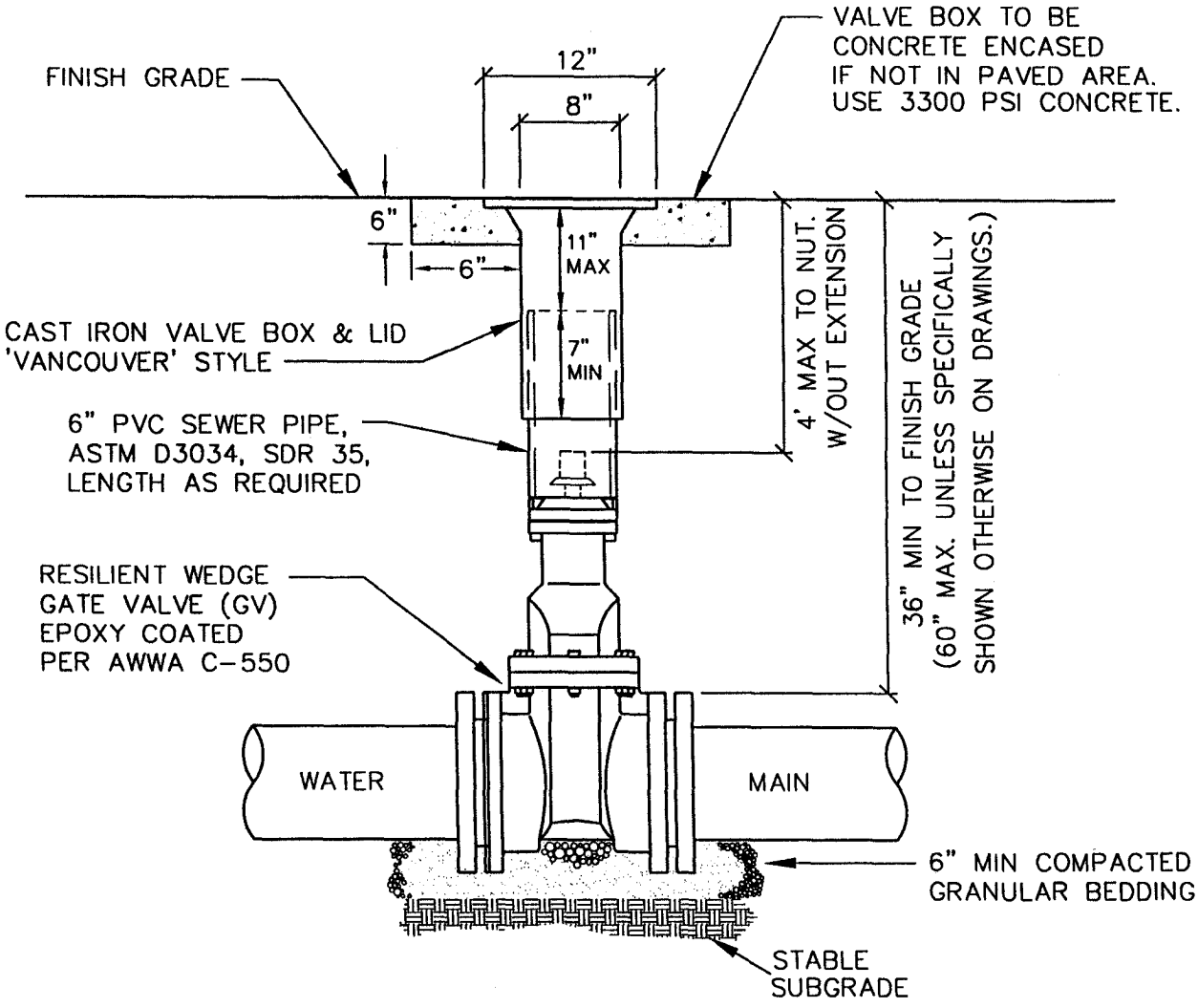
CLASS 'E'

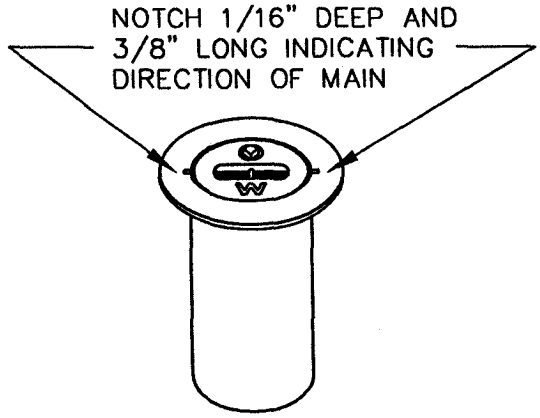
UNIMPROVED & OPEN AREAS

NOTES:

1. COMPACTION STANDARD WILL BE AASHTO T-180.

LAST REVISION DATE: June 1999	
NATIVE SURFACE RESTORATION	
CITY: OWD, OR	DRAWING NO. 304





'VANCOUVER'
18" TALL VALVE BOX

NOTES:

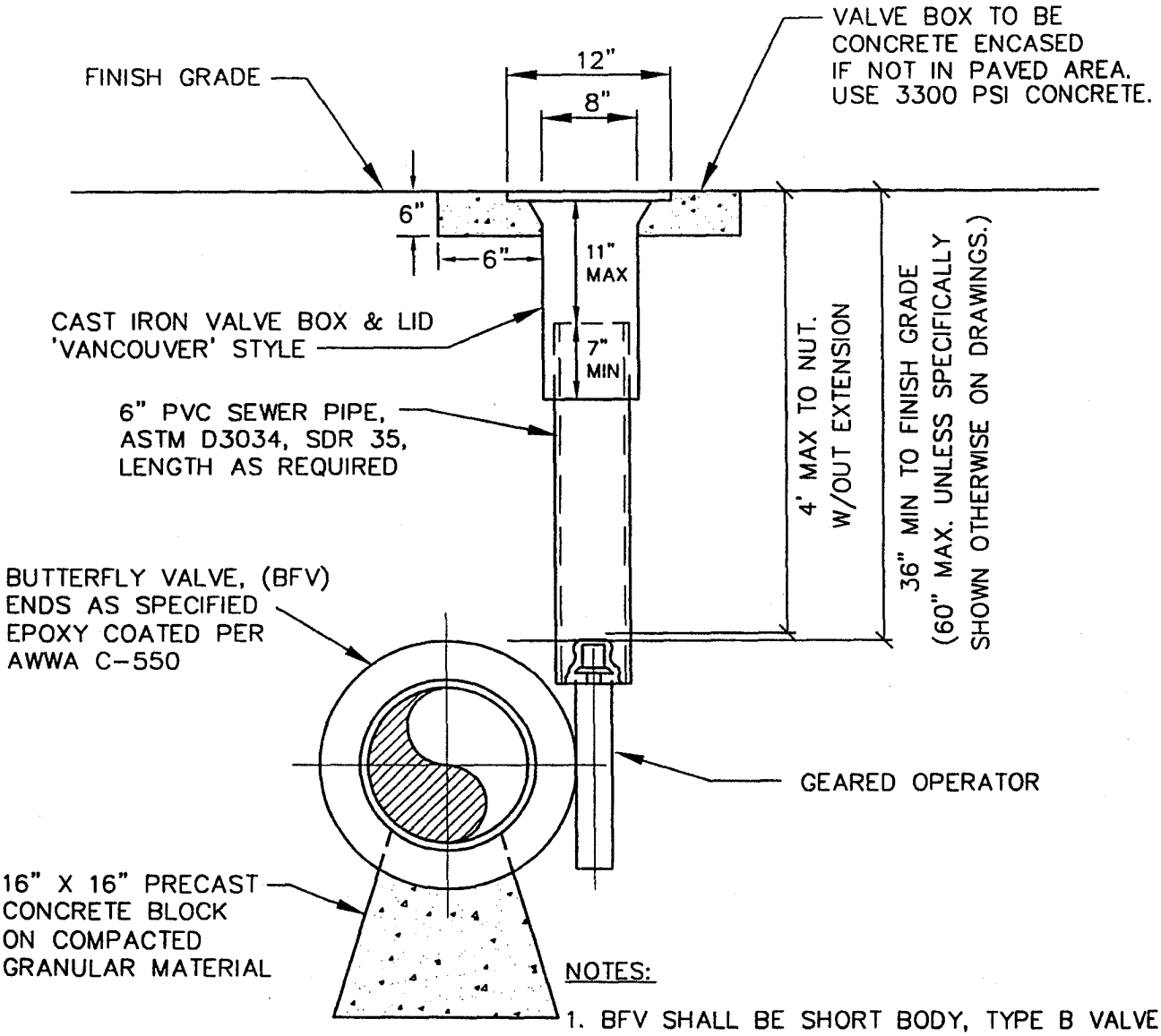
1. GV SHALL CONFORM TO AWWA C-509.
2. VALVE BOXES SHALL BE PLUMB AND CENTERED DIRECTLY OVER THE VALVE NUT.
3. VALVE BOX TOP SHALL BE ADJUSTED TO MEET FINISHED GRADE.
4. PVC SHALL BE ONE CONTINUOUS PIECE, NO BELLS OR COUPLERS.

LAST REVISION DATE: JUNE 1999

GATE VALVE AND VALVE BOX DETAIL

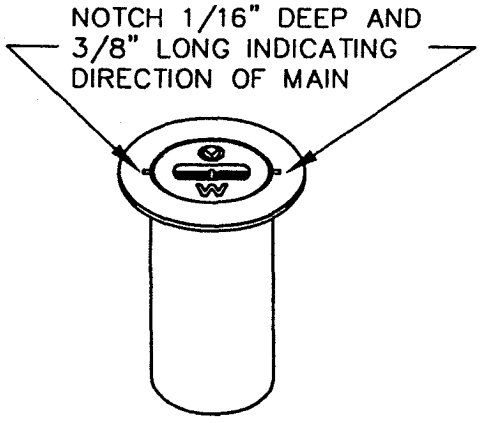
CITY: OWD, OR

DRAWING NO. 501



NOTES:

1. BFV SHALL BE SHORT BODY, TYPE B VALVE PER AWWA C-504.
2. VALVE BOXES SHALL BE PLUMB AND CENTERED DIRECTLY OVER THE VALVE NUT.
3. VALVE BOX TOP SHALL BE ADJUSTED TO MEET FINISHED GRADE.
4. PVC SHALL BE ONE CONTINUOUS PIECE, NO BELLS OR COUPLERS.



'VANCOUVER'

18" TALL VALVE BOX

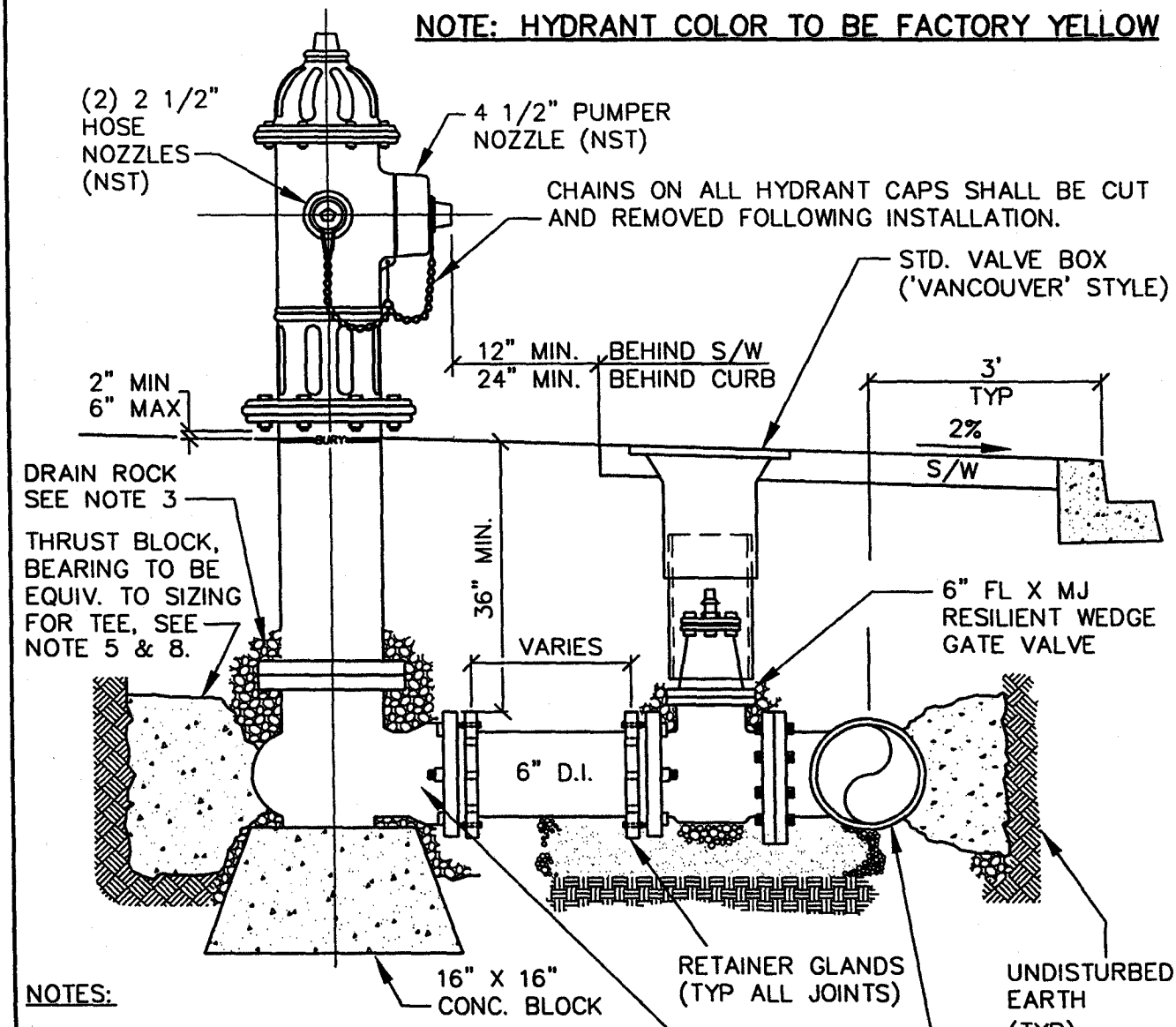
LAST REVISION DATE: June 1999

BUTTERFLY VALVE AND VALVE BOX DETAILS

CITY: OWD, OR

DRAWING NO. 502

NOTE: HYDRANT COLOR TO BE FACTORY YELLOW



NOTES:

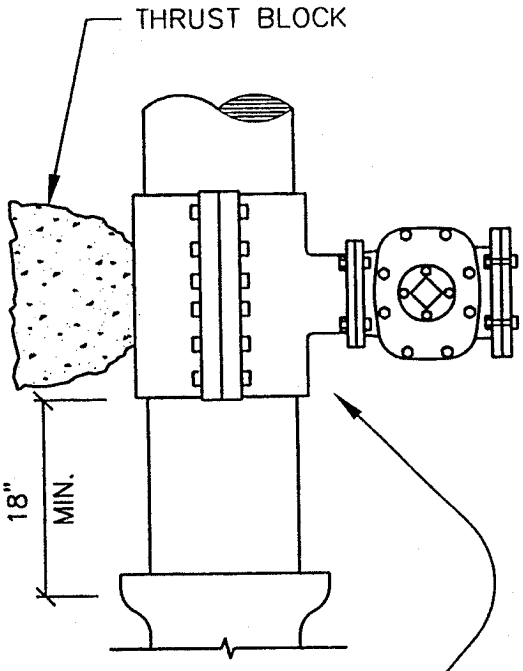
1. HYDRANTS TO BE AVK MODEL 2780 OR WATEROUS WB-67, TRAFFIC STYLE.
2. **ALL FITTINGS IN CONTACT WITH CONCRETE SHALL BE WRAPPED IN PLASTIC.** HYDRANT DRAIN HOLES TO REMAIN OPEN TO DRAIN ROCK AND OPERATIONAL.
3. 1-1/2" TO 3/4" CLEAN DRAIN ROCK SHALL BE PLACED A MIN. OF 6" ABOVE DRAIN OUTLET.
4. WHERE PLANTER STRIP EXISTS, HYDRANT SHALL BE PLACED SO FRONT PORT IS A MIN. OF 24" BEHIND FACE OF CURB.
5. THRUST BLOCK AT STANDARD 6" FIRE HYDRANT TEE SHALL HAVE MIN. 3.7 SQ. FT. BEARING AREA.
6. ALL HYDRANTS SHALL BE SET PLUMB.
7. FOR HYDRANT LEADS LONGER THAN 30', AN ADDITIONAL GATE VALVE SHALL BE PROVIDED WITHIN 3 FT. OF THE HYDRANT.
8. RETAINER GLANDS SHALL BE USED INSTEAD OF HYDRANT THRUST BLOCK ON NEAR SIDE HYDRANTS.

LAST REVISION DATE: OCTOBER 1999

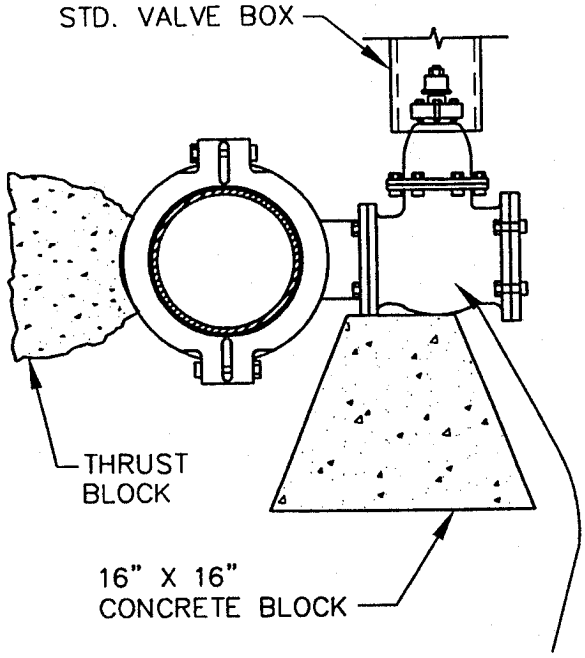
STANDARD FIRE HYDRANT ASSEMBLY

CITY: OWD, OR

DRAWING NO. 503



TOP VIEW



SIDE VIEW

NOTES:

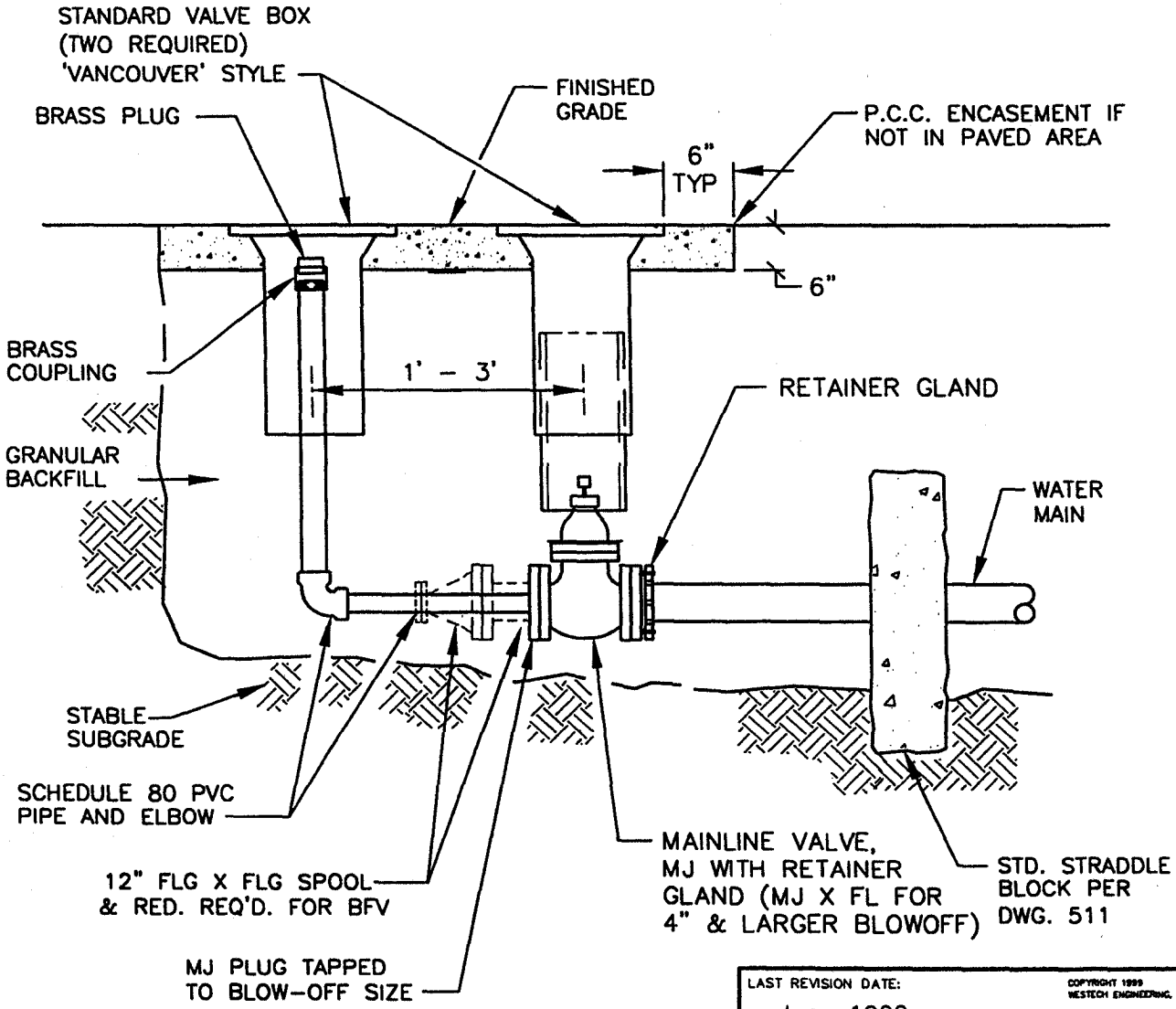
1. WATER MAIN SHALL BE CLEANED BEFORE ATTACHING SLEEVE.
2. TAPPING SLEEVE SHALL BE ALL STAINLESS STEEL WITH FULL PERIMETER GASKET.
2. TAPPING VALVE SHALL BE EPOXY COATED PER AWWA C-550.
3. SLEEVE AND VALVE SHALL BE PRESSURE TESTED BEFORE MAKING TAP. PRESSURE TEST AND TAP SHALL BE MADE IN THE PRESENCE OF AN AUTHORIZED CITY REPRESENTATIVE.
4. APPROVED TAPPING MACHINE SHALL BE USED TO MAKE TAP.
5. 3/4" GRANULAR BACKFILL SHALL BE PLACED AND COMPACTED TO 95% OF MAXIMUM DENSITY AS DETERMINED BY AASHTO T-180.
6. THRUST BLOCKING REQUIREMENTS SHALL BE DETERMINED BY THE ENGINEER.
7. TAP SHALL BE MADE NO CLOSER THAN 18" FROM THE NEAREST JOINT.
8. **SLEEVE AND VALVE SHALL BE WRAPPED WITH 8 MIL PLASTIC PRIOR TO CONCRETE PLACEMENT.**
9. CONCRETE BLOCK(S) SHALL COMPLETELY SUPPORT TAPPING TEE AND VALVE.
10. CONTRACTOR SHALL COORDINATE ALL TAPS WITH CITY AND PERFORM ALL TAPS WITH PUBLIC WORKS STAFF PRESENT.

LAST REVISION DATE: June 1999	
TAPPING TEE AND VALVE	
CITY: OWD, OR	DRAWING NO. 505

BLOW-OFF SIZES REQUIRED (ASSUMES 40 PSI RESIDUAL PRESS.)	
MAIN SIZE	BLOW-OFF SIZE
6" – 8"	2"
10" – 12"	4"
>12"	BY ENGR.

NOTES:

1. BACKFILL WITH GRANULAR BACKFILL.
2. REQUIRED ON ALL LINES WHICH MAY BE EXTENDED IN FUTURE OR AS DIRECTED BY CITY ENGINEER.
3. ALL CONCRETE TO BE 3300 PSI @ 28 DAYS.
4. FLANGED DUCTILE IRON PIPE AND FITTINGS MAY BE REQUIRED FOR 4" & LARGER BLOWOFFS.

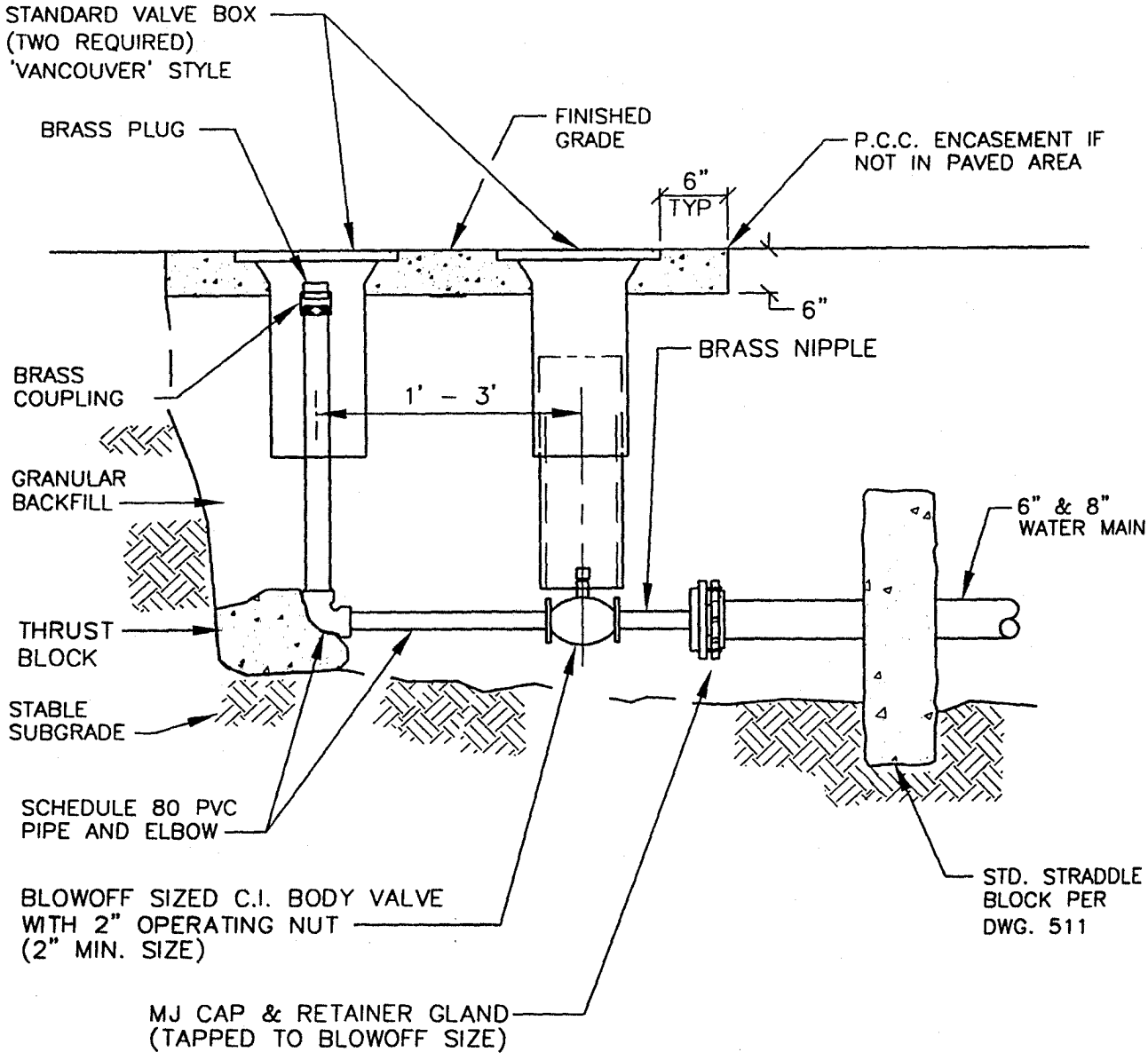


LAST REVISION DATE: June 1999

MAINLINE BLOWOFF ASSEMBLY

CITY: OWD, OR

DRAWING NO. 506



NOTES:

1. BACKFILL WITH GRANULAR BACKFILL.
2. ALLOWED ONLY ON PERMANENT DEAD END LINES IN CUL-DE-SACS WHICH CANNOT BE EXTENDED IN THE FUTURE.
3. ALL CONCRETE TO BE 3300 PSI @ 28 DAYS.
4. 2" BLOWOFF SIZE ASSUMES 40 PSI RESIDUAL PRESSURE.

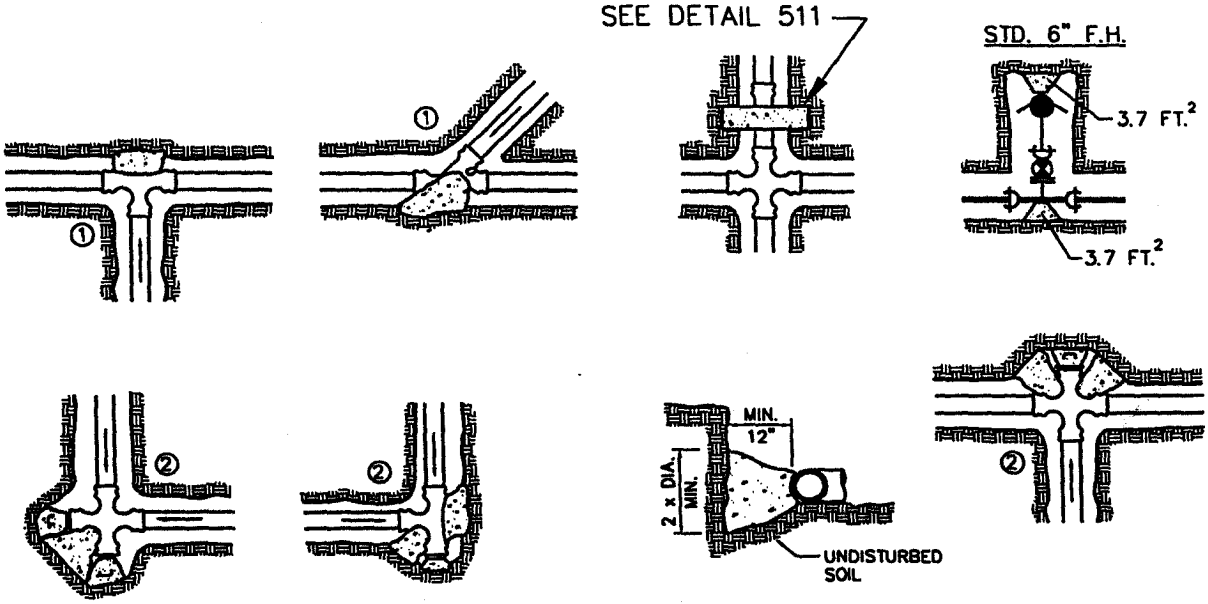
LAST REVISION DATE: June1999	
STANDARD BLOWOFF WITH PLUGGED END	
CITY: OWD, OR	DRAWING NO. 507

FITTING SIZE (Inches)	TEE, WYE, & ① HYDRANTS	90° BEND ② PLUGGED CROSS TEE PLUGGED–RUNS	45° BEND ③	22 1/2° BEND ③	11 1/4° BEND ③
2	*	*	*	*	*
4	1.7	2.4	1.3	*	*
6	3.7	5.3	2.9	1.5	*
8	6.7	9.5	5.1	2.7	1.3
10	10.5	14.8	8	4.1	2
12	15.1	21.3	11.6	5.9	2.9
16	26.8	37.9	20.5	10.4	5.2
18	33.9	47.9	25.9	12.8	6.7
LARGER	* *	* *	* *	* *	* *
	BEARING AREA OF THRUST BLOCKS (sq. ft.)				

1. ALL VALUES ARE BASED ON THE FOLLOWING ASSUMPTIONS: AVG. PRESSURE = 100 PSI x 2 (safety factor); 1500 PSF SOIL BEARING CAPACITY; NORMAL DISTRIBUTION DESIGN VELOCITY NOT TO EXCEED 5 FPS.
2. **ALL FITTINGS SHALL BE WRAPPED IN PLASTIC PRIOR TO PLACEMENT OF CONCRETE.**
3. BEARING SURFACE OF THRUST BLOCKING SHALL BE AGAINST UNDISTURBED SOIL.
4. ALL CONCRETE MIX SHALL HAVE A MIN. 28 DAY STRENGTH OF 3300 PSI.
5. ALL PIPE ZONES SHALL BE BACKFILLED WITH GRANULAR BACKFILL AND COMPACTED.
6. THRUST BLOCKS FOR PLUGGED CROSS AND PLUGGED TEE SHALL HAVE #4 REBAR LIFTING LOOPS INSTALLED AS SHOWN.
7. VERTICAL THRUST DETAILS–SEE DWG. 512.
8. STRADDLE BLOCK DETAILS–SEE DWG. 511.

* BLOCK TO UNDISTURBED TRENCH WALLS

* * THRUST BLOCKS FOR PIPES LARGER THAN 18" WILL BE INDIVIDUALLY DESIGNED BY THE ENGINEER.

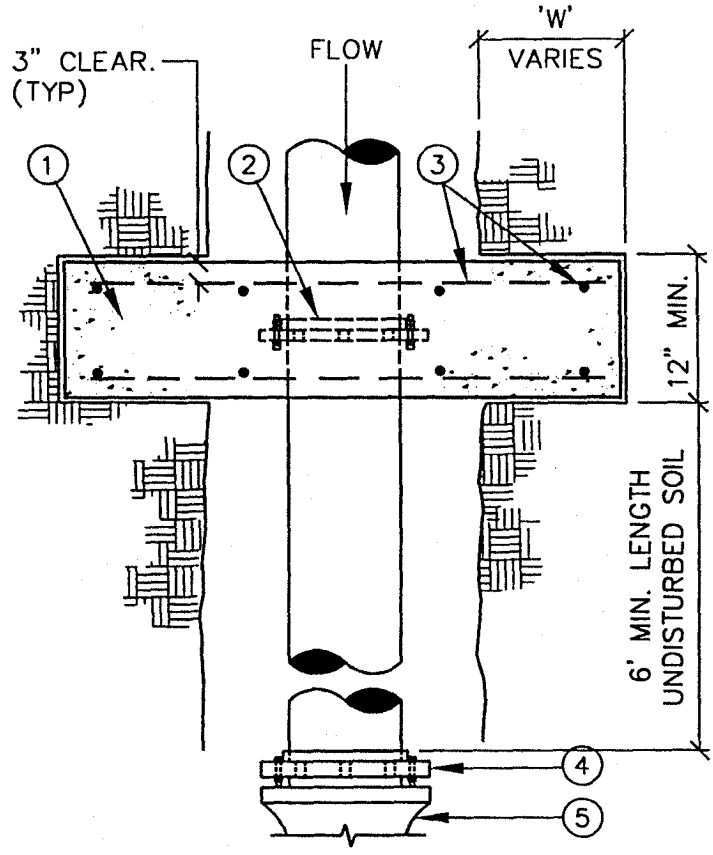


LAST REVISION DATE: June 1999

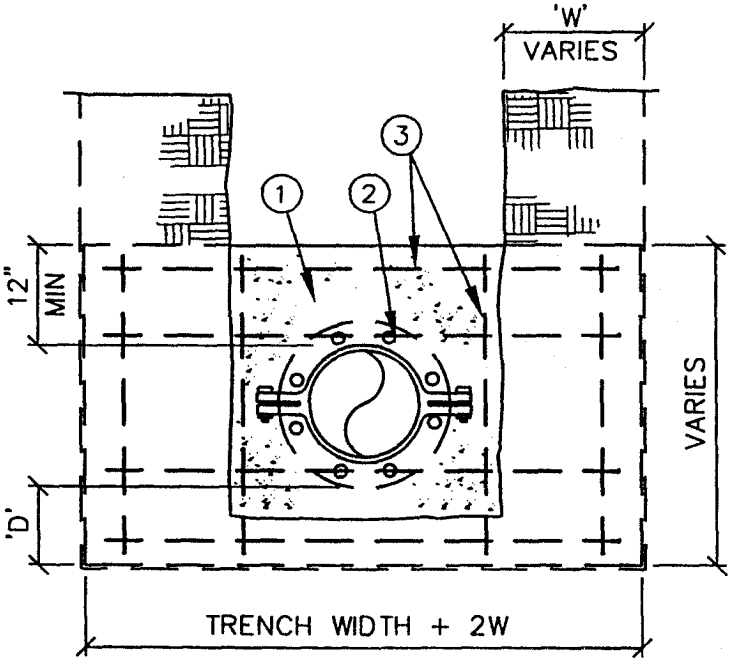
HORIZONTAL THRUST BLOCKING

CITY: OWD, OR

DRAWING NO. 510



TOP VIEW



FRONT VIEW

MATERIALS

1. CONCRETE STRADDLE BLOCK.
2. UNI-FLANGE, SERIES 900, CL.125
3. #4 REBAR EA. WAY, 12" O.C.
4. RETAINER GLAND.
5. MJ FITTING, VALVE OR BLOWOFF.

PIPE SIZE	'W'	'D'
6"	12"	8"
8"	16"	10"
10"	20"	12"
>10"	BY ENGINEER	

NOTES:

1. STRADDLE BLOCKS FOR >10" PIPE SHALL BE DESIGNED INDIVIDUALLY BY THE ENGINEER AND SHALL BE BASED ON THE FOLLOWING:
   a.) 200 PSI WATER PRESSURE.
   b.) SOIL BRG. CAPACITY, STEEL SIZE & SPACING BY THE ENGINEER.
2. BEARING AREA OF BLOCK SHALL BE AGAINST UNDISTURBED SOIL.
3. STRADDLE BLOCK SHALL HAVE A MINIMUM OF 18" COVER.
4. CONCRETE SHALL HAVE A MIN. 28 DAY STRENGTH OF 3300 PSI.

LAST REVISION DATE: June 1999

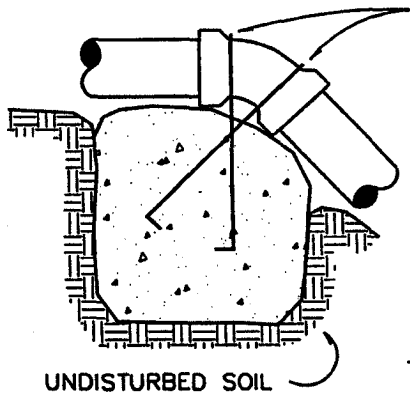
STRADDLE BLOCK FOR 10" AND SMALLER PIPE

CITY: OWD, OR

DRAWING NO. 511

NOTES:

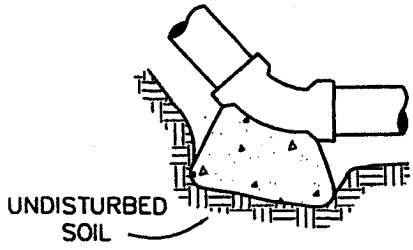
1. GRAVITY VERTICAL THRUST BLOCKS SHALL BE DESIGNED BY THE ENGINEER.
2. **KEEP CONCRETE CLEAR OF JOINT AND JOINT ACCESSORIES. FITTINGS SHALL BE WRAPPED IN PLASTIC PRIOR TO PLACEMENT OF CONCRETE.**
3. CONCRETE THRUST BLOCKING SHALL BE POURED AGAINST UNDISTURBED EARTH.
4. CONCRETE MIX SHALL HAVE A MIN. 28 DAY STRENGTH OF 3000 P.S.I.
5. THRUST BLOCK VOLUMES FOR VERTICAL BENDS HAVING UPWARD RESULTANT THRUSTS ARE BASED ON TEST PRESSURE OF 150 P.S.I.G. AND THE WEIGHT OF CONCRETE = 4050 LBS./CU.YD.
6. VERTICAL BENDS THAT REQUIRE A THRUST BLOCK VOLUME EXCEEDING 5 CUBIC YARDS REQUIRE SPECIAL BLOCKING DETAILS. SEE PLANS FOR VOLUMES SHOWN INSIDE HEAVY LINE IN TABLE.
7. ALL REBAR SHALL BE GALVANIZED IN ACCORDANCE WITH ASTM-123 (MIN. 3.4 MIL). REBAR SHALL BE BENT BEFORE GALVANIZATION, AND LAST 4" OF BAR SHALL BE BENT 90 DEGREES WITH A 1/2" RADIUS BEND. REBAR SHALL BE TIGHTLY FIT TO RESTRAINED FITTING.
8. FOR HORIZONTAL THRUST BLOCK DETAILS SEE DRAWING NO. 510.



PROFILE

GRAVITY VERTICAL THRUST BLOCK

SIZED LIKE HORIZONTAL THRUST BLOCKS



PROFILE

NORMAL VERTICAL THRUST BLOCK

VOLUME OF THRUST BLOCK IN CUBIC YARDS (VERTICAL BENDS)			
FITTING SIZE	BEND ANGLE		
	45°	22 1/2°	11 1/4°
4	1.1	0.4	0.2
6	2.7	1.0	0.4
8	4.0	1.5	0.6
10	6.0	2.3	0.9
12	8.5	3.2	1.3
14	11.5	4.3	1.8
16	14.8	5.6	2.3

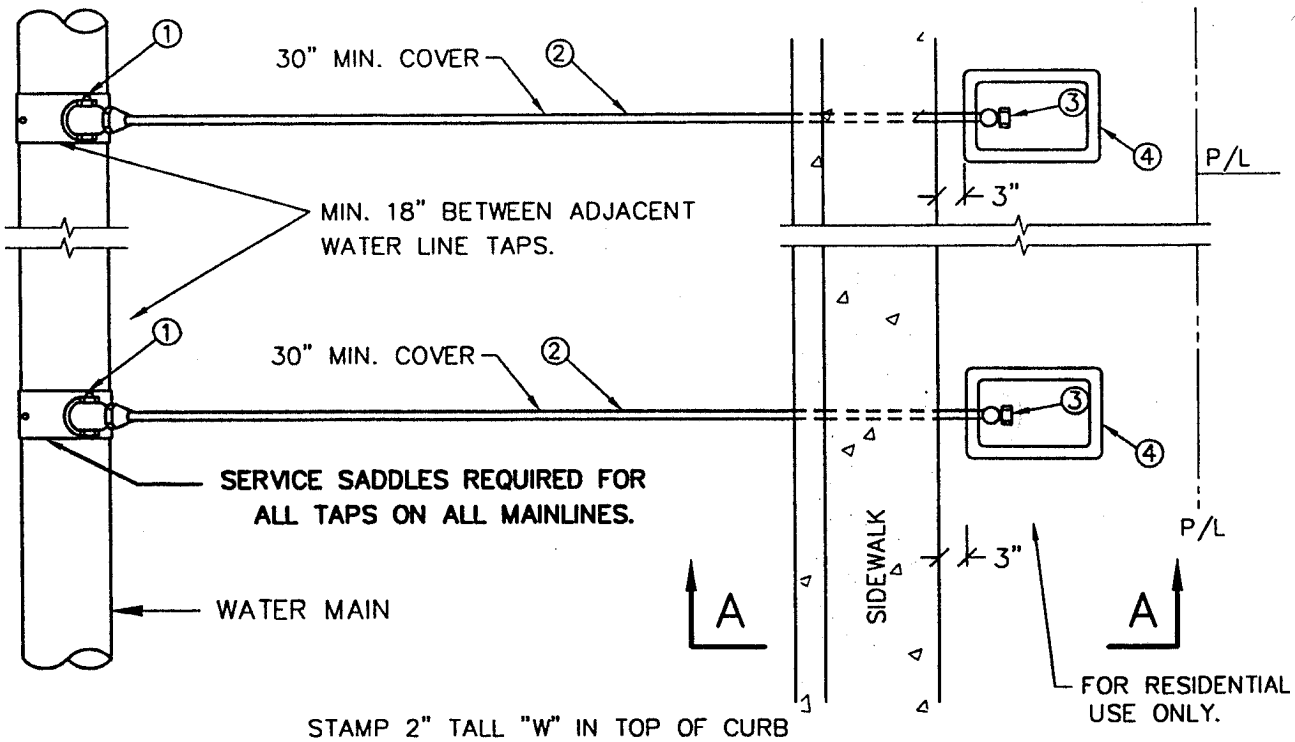
FITTING SIZE	ROD SIZE	EMBED-MENT
12" AND LESS	#6	30"
14" – 16"	#8	36"

LAST REVISION DATE: June 1999

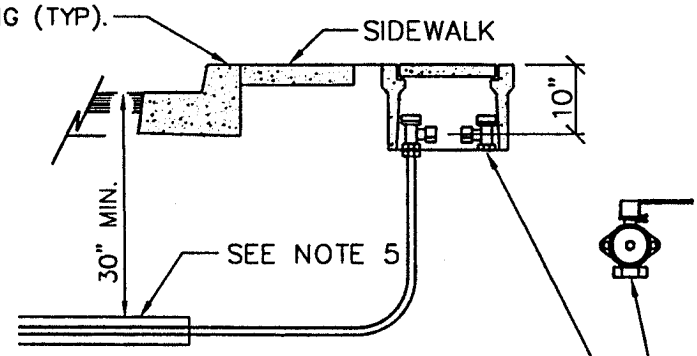
VERTICAL THRUST BLOCKING

CITY: OWD, OR

DRAWING NO. 512



STAMP 2" TALL "W" IN TOP OF CURB AT POINT OF CROSSING (TYP).



SECTION A-A

MATERIALS:

1. BALL STYLE CORPORATION STOP FORD FB-1100. SET AT 30° ANGLE UP FROM HORIZONTAL.
2. DRISCOPIPE 5100 ULTRA-LINE (PE 3408) IRON PIPE SIZE OD, SDR 9 (200 PSI) SINGLE RESIDENTIAL SERVICE: 1" (TYP)
3. BALL STYLE LOCKING ANGLE METER STOP, FORD BA43-232W.
4. BROOKS CONCRETE METER BOX:
   NO. 38-TR IN TRAFFIC AREAS.
   NO. 38-H ELSEWHERE.

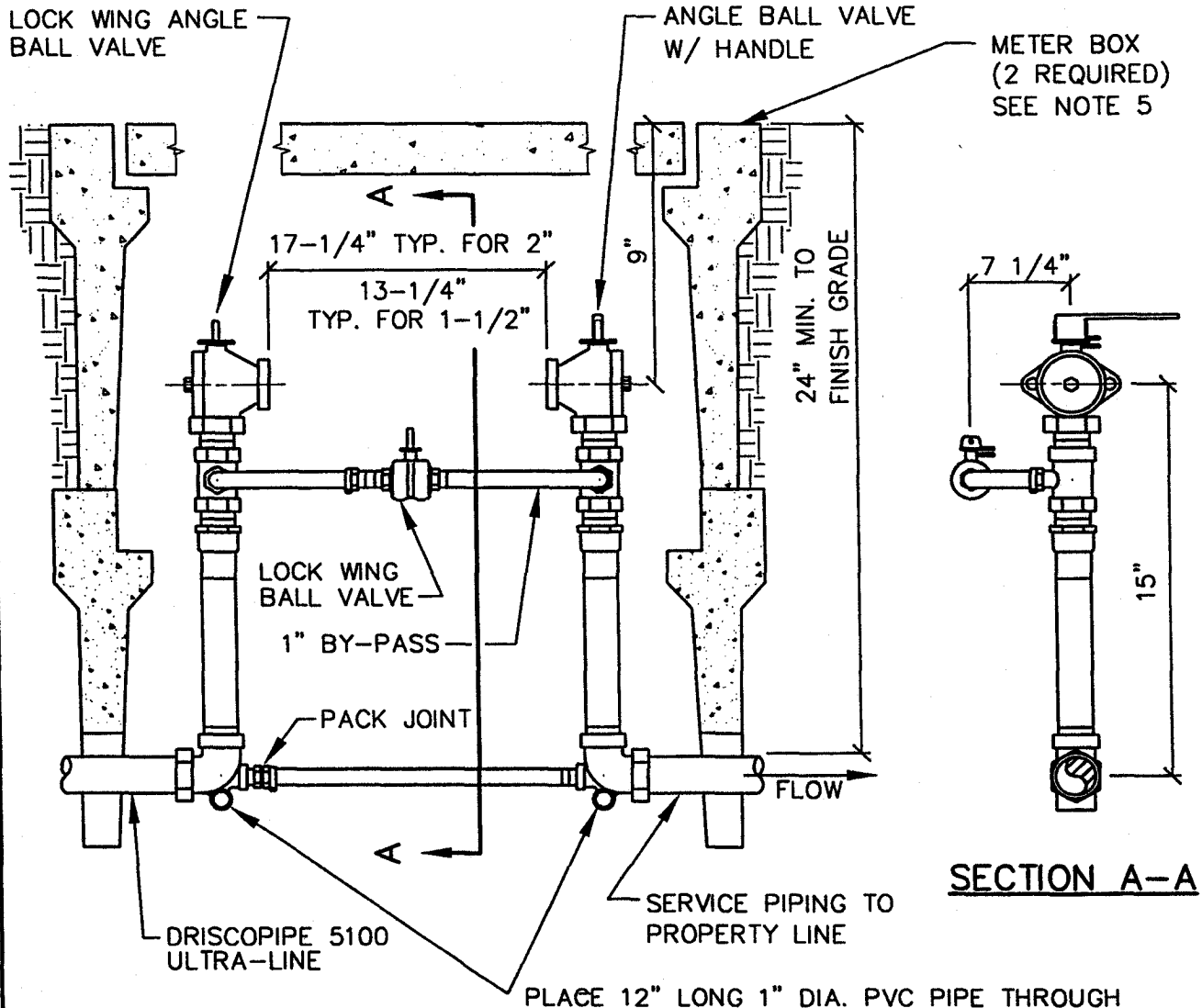
ANGLE BALL VALVE W/HANDLE. INSTALL PRIOR TO INSTALLATION OF WATER METER

NOTES:

1. SUBSTITUTES FOR ANY MATERIALS SHOWN SHALL BE APPROVED BY THE DISTRICT ENGINEER.
2. ALL PIPE AND BACKFILL ZONES SHALL BE BACKFILLED USING 3/4" MINUS GRANULAR MATERIAL AND COMPACTED TO 92% MAX. DENSITY DETERMINED BY AASHTO T-180.
3. SET FRONT OF METER BOX 3-INCHES BEHIND BACK OF SIDEWALK LOCATION FOR CURBLINE WALKS.
4. METER BOX SHALL BE CENTERED OVER THE COMPLETED METER ASSEMBLY.
5. MIN. SIZE COMMERCIAL SERVICES SHALL BE 1-INCH. FOR NEW STREETS OR STREETS BEING CUT FOR SERVICE INSTALLATION, FAR SIDE COMMERCIAL SERVICES SHALL BE INSTALLED IN A 3" MIN. SCHED 40 PVC SLEEVE.

Conflict w/ Art B #34

LAST REVISION DATE: October 1999	
1" WATER SERVICE	
CITY: OWD, OR	DRAWING NO. 515



PLACE 12" LONG 1" DIA. PVC PIPE THROUGH RINGS TO STABILIZE BASE OF COPPERSETTER.

NOTES:

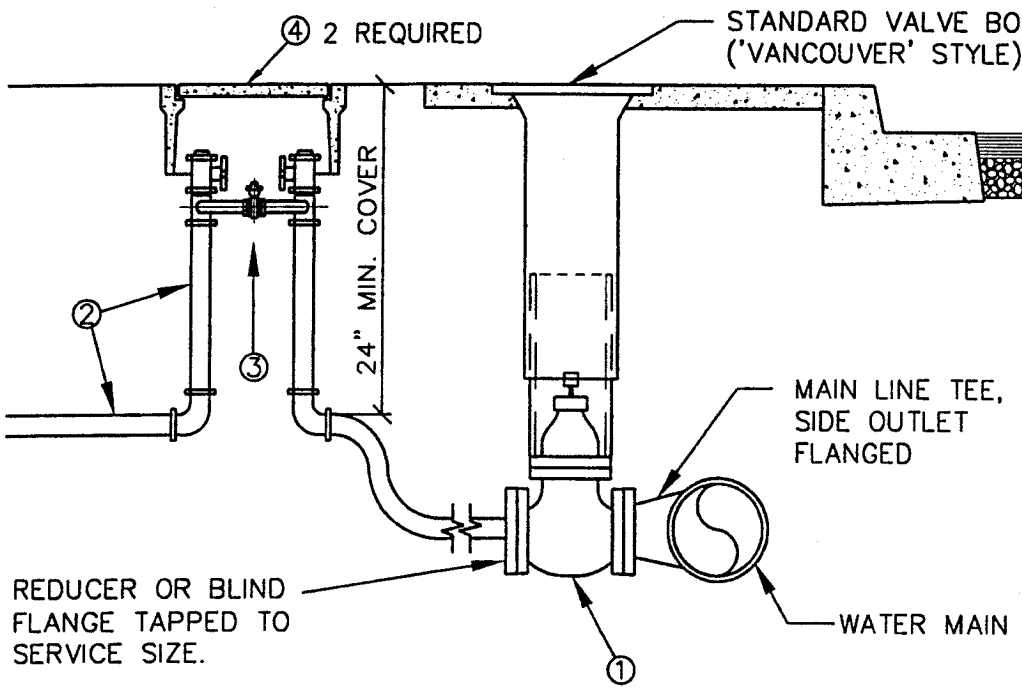
1. METERSET TO BE FORD COPPERSETTER #B-95082 WITH RAISED LOCKING BYPASS OR APPROVED EQUAL.
2. SUBSTITUTES FOR ANY MATERIALS SHOWN SHALL BE APPROVED BY THE DISTRICT ENGINEER.
3. ALL PIPE AND BACKFILL ZONES SHALL BE BACKFILLED USING 3/4" MINUS GRANULAR MATERIAL AND COMPACTED TO 92% OPTIMUM DENSITY PER AASHTO T-180.
4. SET FRONT OF METER BOX 3-INCHES BEHIND SIDEWALK (TYPICAL) FOR CURBLINE WALKS. NO METERS ON PRIVATE PROPERTY WITHOUT A RECORDED EASEMENT.
5. METER BOX SHALL BE CENTERED OVER THE COMPLETED METER ASSEMBLY. METER BOX TO BE BROOKS NO. 66-TR IN TRAFFIC AREAS, BROOKS NO. 66-H ELSEWHERE.
6. WATER METER SET BY DISTRICT FORCES. COPPERSETTER, METER BOX, & ALL FITTINGS PROVIDED BY DEVELOPER.
7. SEE DETAIL 517 FOR TAPPING REQUIREMENTS.

LAST REVISION DATE: June 1999

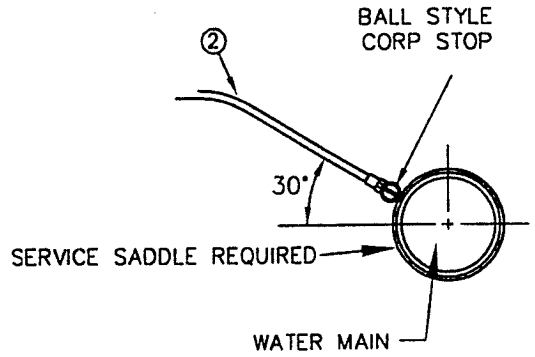
1 1/2" AND 2" METER SET W/ 1" HIGH BY-PASS

CITY: OWD, OR

DRAWING NO. 516



2" & LARGER SERVICE



1-1/2" SERVICE

MATERIALS

① FLG X FLG RESILIENT WEDGE GATE VALVE PER AWWA C-509. 4" DIA. OR SERVICE SIZE, WHICHEVER IS LARGER. EPOXY COATED PER AWWA C-550.

② DRISCOPIPE 5100 ULTRA-LINE (PE 3408) IRON PIPE SIZE OD, SDR 9 (200 PSI).

③ METER STOP ASSEMBLY W/BYPASS PER PUBLIC WORKS REQUIREMENTS. SEE DETAIL 516 FOR 1-1/2 & 2" SERVICES.

④ CONCRETE METER BOX FOR 1-1/2" AND 2" SERVICES SHALL BE:
BROOKS NO. 66TR IN TRAFFIC AREAS.
BROOKS NO. 66H ELSEWHERE.
METER VAULT FOR LARGER SERVICE PER PUBLIC WORKS REQUIREMENTS.

NOTES

1. SUBSTITUTES FOR ANY MATERIAL SHOWN SHALL BE APPROVED BY DISTRICT ENGINEER.
2. ALL PIPE AND STRUCTURE ZONES SHALL BE BACKFILLED USING 3/4" MINUS GRANULAR MATERIAL AND COMPACTED TO 95% MAX DENSITY AS DETERMINED BY ASHTO T-180.
3. METER BOX SHALL BE CENTERED OVER THE COMPLETED METER AND FITTING ASSEMBLY.
4. CUSTOMER SHALL INSTALL AN APPROVED BACKFLOW PREVENTION DEVICE ON PRIVATE PROPERTY IMMEDIATELY DOWNSTREAM OF WATER METER.

CITY: OWD, OR

TAPPING REQUIREMENTS, 1-1/2" & LARGER SERVICE

DRAWING NO. 517

LAST REVISION DATE: October 1999

WATERLINE PRESSURE TEST REPORT

Project Location:	Project Name:	Date:
Inspector: (Print)	**Waterline to be tested.** From Station:	To Station:
Verify that all in-line valves, including hydrant mainline valves, are open? Yes / No		
Verify that all corp stops are open? Yes / No		
Verify that pressure gauge is mounted at high point of line to be tested? Yes / No If no, correct for elevation difference *(ie. add 0.433 psi per foot elevation difference)*.		
System Static Pressure (psi):	Starting Pressure (psi): (greater of 150 psi or 1.5 times static)	Ending Pressure (psi):
Test Length: (2 hours minimum)	Starting Time:	Ending Time:
Volume Required to Reach Initial Test Pressure (gal):	Allowable Leakage (gal): (2 times table value below)	Measured Leakage (gal):
TEST RESULTS: Pass / Fail		

ALLOWABLE LEAKAGE PER 1,000 FEET OF PIPELINE - *gph*

Test Pressure *psi*	NOMINAL PIPE DIAMETER - *in.*									
	3	4	6	8	10	12	14	16	18	20
200	0.32	0.43	0.64	0.85	1.06	1.28	1.48	1.70	1.91	2.12
175	0.30	0.40	0.59	0.80	0.99	1.19	1.39	1.59	1.79	1.98
150	0.28	0.37	0.55	0.74	0.92	1.10	1.29	1.47	1.66	1.84

If the pipeline under test contains various diameters, the allowable leakage shall be the sum of the allowable leakage for each size. No additional leakage allowance will be given for fire hydrant assemblies or valves.

Allowable leakage based on : $L = SD(P)^{1/2}/133{,}200$

Where:

L = allowable leakage, in gallons per hour
S = length of pipe tested, in feet
D = nominal diameter of the pipe, in inches
P = test pressure during the leakage test, in psig

Regardless of leakage, maximum pressure drop during test period shall not exceed 5 psi/hour.

TEST PROCEDURE

1. Apply hydrostatic pressure by pumping water from an auxiliary supply basin. Accurately determine the amount of water required to reach the initial test pressure by refilling the supply basin with a calibrated container following pressurization of pipeline.
2. Monitor test pressure for 2 hour period.
3. At the completion of the test period, re-pressurize the pipeline by pumping water from the auxiliary supply basin. Accurately determine the amount of water required to reach the test pressure by refilling the supply basin with a calibrated container following pressurization of pipeline. If the measured leakage is less than the allowable leakage, the test is successful.