

CITY OF OREGON OHIO

SPECIFICATIONS FOR

WATER MAINS

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A. GENERAL

The Developer or the Developer's Engineer shall submit four (4) sets of plans to the City of Oregon for approval by the Director of Public Service. One set will be returned. Plans shall be submitted for all water lines 6-inches and larger, both private and public, and shall be prepared by an Engineer registered in the State of Ohio. Rules and Regulations of the City of Oregon, Ohio, Water Department shall govern the design and construction of the water mains.

All plans submitted for approval shall incorporate the following:

1. Specifications
2. Plan and profile of the proposed improvement.
3. Details, including:
 - a. Blocking for bends, tees and plugs, typical valve manhole and hydrant setting shall be as shown in this specification
 - b. Symbol index for existing and proposed facilities
4. Material list giving the following:
 - a. Number of valves and their sizes
 - b. Number of hydrants
 - c. Size and length of pipe
5. Intended water usages
6. Provide space for the City of Oregon Director of Public Service to signify approval.

Written approval must be obtained from the Ohio Environmental Protection Agency and same shall be the responsibility of the Developer or the Developer's Engineer. Prior to final approval of the plans by the City, copies of the maintenance and performance bond shall be submitted for approval. All work shall be in accordance with the plans as approved by the City. When inspection is provided by the City, same shall be paid for by the Contractor or Developer. The Developer or the Developer's Engineer shall furnish the City "as constructed" reproducible tracings at no cost to the City of Oregon.

The City of Oregon reserves the right to approve all subcontractors.

B. SPECIAL NOTICE

The City of Oregon has approximately 25 miles of existing prestressed reinforced concrete trunk water mains that circumvent the City. By their very nature, emergency repairs are expensive and time consuming. These concrete mains are located on the following roads: NORTH CURTICE - CEDAR POINT - LALLENDORF - SEAMAN - COY - NAVARRE AVENUE - WHEELING STREET. TRUNK ELEVATION VARIES FROM FOUR TO TEN FEET.

NO EXCAVATION WILL BE PERMITTED OVER, UNDER, OR IN THE IMMEDIATE VICINITY OF THE TRUNK MAINS WITHOUT PRIOR PERMISSION FROM THE DIRECTOR OF PUBLIC SERVICE OR HIS AUTHORIZED REPRESENTATIVE.

Contract the Oregon Division of Water (419-698-7039) to have the water lines marked. With regard to the various other utilities, they can be contracted through Ohio Utilities Protection Service at 800-362-2764.

C. CONCRETE AND CONCRETE WORK

C.1. CONCRETE - All concrete included in this contract shall be of two classes or qualities, namely Class I and Class II, made by the proper mixing of Portland cement, aggregates, water and required admixtures correctly proportioned to assure concrete of a dense, homogeneous structure which, when hardened and cured, will have the required strength and resistance to weathering. Class I Concrete in all areas subject to freezing and thawing shall have an air-entrainment admixture added as subsequently specified.

The testing, material and equipment specifications herein referred to are the specifications of the American Society for Testing and Materials (ASTM), unless otherwise noted, and shall be the latest specifications of the Society.

C.2. STRENGTH REQUIREMENTS - Class I Concrete, air-entrained or non-air-entrained, shall attain a minimum compressive strength of 3,750 pounds per square inch and Class II Concrete a minimum of 1,500 pounds per square inch in 28 days when tested in specimen cylinders made and cured in accordance with ASTM C31 and tested in accordance with ASTM C39.

Air-entrained concrete shall be required in all areas subject to freezing and thawing, with the air content maintained in accordance with Table 4.2.5 of American Concrete Institute (ACI) Standard 318.

C.3. SLUMP - Slump may vary from a minimum of 2-inches to a maximum of 5-inches but, within this range, shall be as directed by the City or their Engineer to provide the maximum workability and ease of placement consistent with satisfactory density, freedom from segregation and satisfactory surface texture.

C.4. CEMENT - Cement shall conform to ASTM C150, Type I, Portland Cement and must be approved by the City or their Engineer. Use of Type IA cement to obtain air-entrained concrete will not be permitted.

High Early Strength cement, C150, Type III, shall not be used without the approval of the City or their Engineer. If approval is given for the use of C150, Type III, such approval shall not entitle the Contractor to extra payment therefore. Preferably, one brand of cement shall be used.

The concrete supplier shall request certification from the cement manufacturer that the cement furnished meets the requirements of ASTM C150 and submit same to the City or their Engineer.

C.5. FINE AGGREGATE - Fine aggregate shall consist of natural sand or sand prepared from the product obtained by crushing stone or gravel and shall conform to the requirements of ASTM C33.

C.6. COARSE AGGREGATE - Coarse Aggregate shall consist of crushed stone or gravel having hard, strong, durable pieces free from adherent coatings and shall conform to the requirements of ASTM C33, except that local aggregates may be used if approved by the City or their Engineer. The maximum size of coarse aggregate should not be larger than ¾-inch or 100% of all coarse aggregate shall pass through a standard 1-inch laboratory sieve.

C.7. ADMIXTURES

A. Air-Entrainment Admixture - any air-entraining admixture used shall conform to ASTM C260. The entrained air content of Class I concrete, as required in all areas subject to freezing and thawing, shall be strictly controlled within the limits of six (6) to eight (8) percent entrained air. The air-entrainment admixture to be used shall be “DAREX AEA” as manufactured by W. R. Grace & Company. Use of Type IA cement will not be permitted to obtain air-entrainment.

B. Water Reducing Admixture - Any water reducing admixture used shall conform to ASTM C494-Type A. The water reducing admixture shall be free from alkali or fatty compound; shall be added in strict accordance with the manufacturer’s directions to all Class I concrete mixes to increase workability and to reduce the water-cement ratio; and shall be a non-air-entraining type. When added to an untreated mix having a slump of from 1-inch to 3-inches, the water-reducing agent shall increase the slump by not less than 100%. The water-reducing admixture shall result in concrete with: a) drying shrinkage of 200 days reduced at least 10%; b) relative durability factor (without air-entrainment) for freezing and thawing of not less than 90%; c) compressive strengths at 3, 7, 28 and 365 days increased at least 10%; d) flexural strength shall not be reduced at 7 and 28 days; and e) water content shall be decreased at least 5%.

The water reducing admixture shall be “Pozzolith 200-N” as manufactured by Master Builders or approved equal.

C. General Requirements - For any admixture used, the concrete supplier shall request certification from the manufacturer that the admixture furnished meets the requirements of the appropriate ASTM Specification and submit same to the City or their Engineer.

C.8. WATER - Water for concrete shall be clean and free from injurious amounts of oil, acid, alkali, organic matter, or other deleterious substances.

C.9. PROPORTIONING - The proportions of cement, aggregate, cement dispersing agent, water and, when required to permitted, admixtures necessary to produce concrete of the specified character, strength, and consistency shall meet the approval of the City of their Engineer.

All Class I concrete, air-entrained or non-air-entrained, shall have a minimum of six (6) sacks of Portland Cement per cubic yard of concrete and not more than six (6) gallons of water per sack of cement. All Class II concrete shall have a minimum of four (4) sacks of Portland Cement per cubic yard of concrete and not more than eight (8) gallons of water per sack of cement.

C.10. MIXING - All mixing of concrete, including the mixing equipment, shall conform to the requirements of ASTM C94.

C.11. FORMS - forms shall conform to the shape, lines, grades and dimensions of the concrete as called for on the plans. They may be of wood or of an approved type of metal form unit. They shall be properly braced or tied together to maintain position and shape during and after placing concrete and shall be sufficiently tight to prevent leakage of mortar.

Lumber used in forms for exposed surfaces shall be dressed to a uniform thickness and shall be free from loose knots or other defects. Lumber once used in forms shall have nails withdrawn and surfaces to be in contact with concrete thoroughly cleaned before being used again.

Joints in forms shall be horizontal or vertical where appearance of the finished surface is of importance. Bolts and rods shall preferably be used for internal ties and they shall be so arranged that when the forms are removed no metal shall be within 1-inch of any surface.

Unless otherwise specified, suitable moldings or bevels shall be placed in forms to provide at least a three-quarter inch bevel on exposed corners of walls, columns, beams and slabs. Unless otherwise indicated, all keyways shall be 2" x 4".

The inside of forms shall be coated with non-staining mineral oil or other approved material or, in the case of wood forms, they shall be kept thoroughly wetted for a period of 12 hours before any concrete is placed. Where oil is used, it shall be applied before the reinforcement is placed.

C.12. CONCRETE PLACING - Concrete shall be handled from the mixer to the place of final deposit as rapidly as practicable by methods which shall prevent the separation or loss of the ingredients. Under no circumstances shall concrete that has partially hardened be deposited in the work. Concrete shall be deposited in the forms as nearly as practicable in its final position to avoid re-handling. It shall be so deposited as to maintain a surface approximately horizontal and in layers not exceeding 18-inches in thickness.

Concrete shall not be dropped into the forms a distance of more than five feet. Drop chutes shall be used to limit free fall to five feet and the delivery ends shall be as nearly vertical as practicable.

Concrete during and immediately after depositing shall be thoroughly compacted by means of suitable tools. Special care shall be taken to work the coarser ingredients away from the face of the forms with a suitable sharp steel tool so as to leave the exposed surface of the concrete positively smooth and firm.

For pavements, driveways and sidewalks, concrete shall be consolidated by internal vibration and smoothed with the least amount of work necessary. A broom finish shall then be applied. Extreme care shall be taken not to destroy the entrained air in the surface of the concrete. As a general rule, the less finishing done the better.

When the temperature is below 40° F or is likely to fall below 40° F during the 24-hour period after placing, the concrete shall be protected from freezing in a manner acceptable to the City or their Engineer. For pavements and driveways placed between October 1 and April 1 of the succeeding year, should surface defects such as spalling and/or scaling occur as the result of freezing and thawing and/or exposure to calcium chloride, the concrete shall be subject to replacement at the discretion of the City or their Engineer and at the expense of the Contractor.

C.123. CURING - Protection against loss of moisture from the surface of the concrete shall be accomplished by keeping the surface continuously wet or protected by forms for a period of not less than seven days. When wood forms are left in place during the curing period, they shall be kept sufficiently damp at all times to prevent openings at the joints and drying of the concrete.

For pavements, driveways and sidewalks, concrete shall be cured with water for at least 72-hours or cured with an approved waterproof membrane. However, between October 1 and April 1 of the succeeding year, liquid membrane curing compounds shall not be used.

In addition, pavements and driveways placed between April 1 and October 1 shall be sealed not less than 30 days after placing and no later than November 1 of the same year with an approved chlorinated rubber or acrylic sealer.

C.14. FINISHING - Any unevenness in the surface of that portion of the concrete which will be exposed shall be rubbed to a uniformly smooth surface with carborundum blocks moistened with thin mortar as soon as the surface permits. The Contractor shall be required to power grind any uneven surfaces which will not response to rubbing.

R. REINFORCING STEEL

R.1. TYPES OF BARS - All reinforcing steel, unless noted otherwise on the plans, shall be Grade 60 as defined in the American Society for Testing and Materials “Specifications for Deformed Steel Bars for Concrete Reinforcement” (A615 or A617).

R.2. TYPE OF MESH - Reinforcing mesh shall meet the requirement of the “Standard Specifications for Welded Steel Wire Fabric for Concrete Reinforcement”, Designation A185, adopted by the American Society for Testing and Materials.

R.3. PLACING - Steel reinforcement shall be accurately positioned and secured against displacement by using annealed iron wire ties or suitable clips at intersections, and shall be supported by metal chairs, spacers or metal hangers. Reinforcing shall be free from loose mill scale and rust and from ice or other coatings that destroy or reduce the bond. Where necessary to splice bars, the bars shall be placed in contact with a lap of at least 36 diameters, but in no event shall lap be less than 12-inches, and securely wired. Slices in adjacent bars shall be staggered.

1. PIPE AND PIPE LAYING

1.1 GENERAL - Pipe shall be of ductile cast iron and shall be of a size as approved by the Division of Water or their Engineer. In no case shall the inside diameter be less than 8-inches, except for fire hydrant leads which shall be 6-inches.

1.2 DUCTILE CAST IRON PIPE AND FITTINGS - Ductile cast iron pipe shall be designed in accordance with AWWA C150 and manufactured in accordance with AWWA C151. The pipe shall be of the push-on joint type and shall be ANSI Thickness Class 52 with a polyethylene tube. All pipe shall be coated with a bituminous material on the outside and shall be cement mortar lined in accordance with AWWA C104.

Fittings shall be of ductile iron, shall conform to AWWA C110 and C153 latest revision and shall be coated and lined as specified for the pipe. Fittings shall be of the mechanical joint or push-on joint type.

Mechanical joints and push-on joints shall be in accordance with AWWA C111, incorporating rubber gaskets. With push-on joints, the surfaces to be in contact with the rubber gasket shall be wiped clean and dry just prior to making the joint and, when making the joint, a lubricant shall be used in accordance with the manufacturer's recommendations. With mechanical joints, the surfaces to be in contact with the rubber gasket shall be brushed with soapy water to remove all sand and grit just prior to making the joint.

Ductile iron Class 52 pipe shall be field wrapped with a minimum 8 mil thick polyethylene tube meeting the requirements of AWWA C105, with installation in accordance with Method A and the recommendations of the manufacturer. All overlaps and seams shall be completely taped. All rips, punctures and other damage to the polyethylene shall be acceptably repairs. Tape shall be 2-inch wide plastic baked adhesive tape which will bond securely to both metal surfaces and the polyethylene film. Fittings that require concrete thrust blocks shall be completely wrapped prior to placing the blocking. All valve, fire hydrants and other appurtenances shall also be properly wrapped to either the ground line or the underside of the operating nut or valve.

Whenever it is necessary to cut the pipe at fittings, valves, specials or elsewhere, the remaining portions may be used where possible to minimize the number of scrap pieces when the project is complete; however, scrap pieces less than 5-feet in length shall not be used.

1.3 INSPECTIONS AND REJECTIONS - All pipes, fittings, etc. shall be appropriately marked for purposes of identification.

The materials and methods of manufacture shall be subject to inspection at all times, and the completed pipes, fittings, etc. shall be subject to inspection at the factory, trench or other point of delivery. Further, all are subject to rejection when discovered

until the final completion and adjustment of the Contract. The City or their Engineer has the right to make said inspection.

1.4 MANUFACTURER'S AFFIDAVIT - The manufacturer shall furnish an affidavit indicating that the pipe, fittings and appurtenances have been manufactured and tested in accordance with all requirements of the applicable referenced standards. A copy of the affidavit, indicating the project on which the material is to be used, shall be forwarded to the City or their Engineer.

1.5 PIPE LAYING - Pipe sections shall be strung along the route of the mains so as to interfere least with pedestrian and vehicular traffic and to protect the pipe as fully as possible. Care shall be taken at all times in handling the pipe so as not to injure it in any way and at no time shall other pipes or material be placed in the pipes.

Rubber tired equipment shall be used on all paved surfaces during pipe laying and all related operations. Heavy equipment shall not be driven over streets, but shall be moved by trailer.

The mains shall be laid in the locations and at the grades shown on the plans, except as specifically permitted or ordered otherwise by the City or their Engineer in order to avoid existing or proposed utility lines or any other obstructions encountered in the progress of the work; to secure a more readily accessible position for trenching; or to facilitate the location of various appurtenances of the mains.

Existing utilities or other obstructions along the route of the mains shall be located and the elevation determined at least 200 feet in advance of pipe laying.

All utilities, when encountered, shall be adequately supported, shored up or otherwise protected whenever exposed in the excavation to the satisfaction of the City or their Engineer. Timber supports shall be a minimum of 6-inches square. Support of utilities perpendicular to the excavation shall be in accordance with Detail 1.

Plans shall indicate the location of existing utilities, in accordance with the best information presently available, but neither the City or their Engineer assumes any responsibility for the accuracy of their location or that all utilities are shown.

When abrupt changes in the grade of the main are necessary to avoid existing utilities or other obstructions, suitable fittings, usually 1/8 bends, shall be used, unless otherwise specified, so as to secure an easy flow of liquid and to provide sufficient cover below same. Pipe shall be so located with respect to other utilities as to allow for taps to be inserted. A minimum clearance of one foot in all directions shall be maintained.

All pipes shall be thoroughly cleaned inside and outside before being lowered into the trench; shall be kept clean during and after laying; and the end of the pipe shall be plugged to exclude water, animals or other matter when pipe laying is stopped for any reason.

1.6 TRENCHES - Except where otherwise specifically required or permitted by the City or their Engineer, the mains shall be laid in open trench excavated to a depth sufficient to provide not less than 4-feet of vertical cover, unless otherwise noted. However, pipes shall be installed at a greater depth when shown on the plans; when necessary to pass under other utilities or obstructions; or where necessary to prevent high points in the main. In addition to the minimum vertical cover, where any pipes parallel roadside ditches or streams, a lateral cover shall be provided at least equal to the specified vertical cover.

Sufficient space shall be provided in the trench for properly making the joints without raising the length of pipe above the solid bottom on the trench. Care shall be taken to detect and remove any stone, boulder or other debris that might be encountered in the bottom of the trench which would damage the pipe or be detrimental to the proper bedding of the pipe.

Where the pipe liens enter the paved limits of a street, alley, driveway or parking area, the pavement shall be nearly cut and the main installed in open trench, if permitted by the City, otherwise it shall be bored. Pavement crossings shall be constructed in accordance with the requirements for maintaining traffic as subsequently specified.

Where catch basins are in the line of construction, the Contractor shall tunnel under the basins to install the pipe.

On private lawns, outside of right-of-way, the sod over the trench shall first be removed and placed in a protected area adjacent to the trench.

1.7 ANCHORS AND SUPPORTS - Reinforced concrete anchors and supports (thrust blocks) shall be provided at all fittings, valves or changes in direction of the pipe. They shall be constructed of Class I concrete, as shown on Detail 2 and shall be placed against firm undisturbed soil. All plugs or caps shall be securely strapped or blocked.

1.8 PIPE EMBEDMENT - After the pipe has been laid and the joints made, the full length of each pipe shall be thoroughly bedded by tamping fine excavated material under, around and over the pipe for a distance of 6-inches above the top of the pipe barrel.

The material shall be placed in layers not exceeding 6-inches in thickness, loose measurement, and securely compacted by hand or mechanical taping to secure a good compaction while taking care not to displace or damage the pipe or joints.

1.9 BACKFILLING - Backfill shall include the material placed above a plant 6-inches above the top of the pipe barrel.

Trenches coming within existing paved or stoned streets, alleys, driveways and parking areas or within proposed pavements shall be backfilled with granular material meeting the requirements of ODOT Item 304. The material shall have a standard Proctor

density of at least 125 pounds per cubic foot, and shall be placed and compacted in a manner acceptable to the Engineer. The compacted backfill shall have a minimum density of 93% for material having a standard Proctor density greater than 130.

Where mains are installed along and across existing paved or stoned streets, alleys, driveways and parking areas or proposed pavements, compacted granular backfill material shall also be provided for all portions of the trenches falling within that area below a line drawn at 45 degrees to the horizontal from the surface at the edge of the pavement or back of curb and above the horizontal plane of the pipe embedment material.

When trenches are backfilled with granular material, the excess excavated material shall be disposed of in a manner acceptable to the City or their Engineer.

In all paved streets and highways immediately upon the completion of other backfilling operations, a temporary pavement meeting the requirements of ODOT Item 405 shall be provided and shall remain in place and be properly maintained until such time as the permanent pavement is placed. In asphalt concrete or surface treated macadem pavements, the temporary pavement shall be a minimum of 1-1/2-inches thick, but in no case shall it be less than that existing. In concrete pavements, the temporary wearing course shall be 3-inches thick.

The Contractor shall keep a supply of the bituminous cold mix (405) on hand along the route of construction for subsequent maintenance of the temporary pavement as required by the City or their Engineer.

For backfilling the remainder of the trenches, as much of the excavated material as possible shall be replaced. The materials shall be finely divided, free of stones larger than 3-inches, and other harmful debris, and may be placed by hand or machine to the satisfaction of the City or their Engineer.

After placement of the backfill material for the full depth of the trench, the material shall be thoroughly saturated with water by driving a pipe with a perforated nozzle into the trench (jetting) to a point 6-inches over the top of the pipe. Jetting shall not begin until pipe laying operations are far enough in advance so as not to be hindered by water in the trench. Jetting shall be done at intervals so as to obtain maximum settling as approved by the City or their Engineer.

After jetting, along undeveloped lawn or unsodded areas, the material shall be neatly graded to conform to the original ground profile. On private lawns, outside of any right-of-way, the sod which was removed shall be replaced in as nearly its original conditions as possible. In lawns or other areas where grass exists, topsoil shall be provided and the areas shall be seeded as subsequently specified in this item.

Special care shall be taken in backfilling any trenches under sidewalks to compact the backfill material such that it shall be equal to the degree of compaction of the adjacent undisturbed earth; however, in no case shall the compaction be less than 90%.

In all cases, the City or their Engineer may check the compaction of backfill at any time.

The Contractor shall be required to re-grade and reshape all road shoulders and all ditches or swales from existing high points to existing drainage structures or pipe outlets along the proposed improvement. The Contractor and the Owner or their Engineer shall mutually agree and establish all ditch grades to be restored prior to the installation of the water main. Ditches which are reshaped shall have reasonable side slopes and vertical or steep slopes will not be permitted.

1.10 CONNECTIONS TO EXISTING MAINS - New mains shall be connected to existing mains, using proper fittings. Connections shall be made in a manner acceptable to the City or their Engineer. No cut-ins or connections to existing mains shall be made unless at least 24 hours notice of such cut-ins or connections is given to the Director of Public Service and the related portion of the new main has been sterilized and all testing completed, a subsequently specified.

One day prior to shutting valves on existing lines, the Contractor shall notify all affected property owners and the Director of Public Service of such shut-off. The shut-off time shall be kept to a minimum and shall be made at off-peak hours. All shut-offs shall be done by or in the presence of a representative of the Oregon Water Department.

The City or their Engineer assume no responsibility for any delay occasioned by special requirements or conditions which must be met in making connections.

Extreme care shall be taken in making such connections to prevent contamination of the existing mains. Before making cut-ins or connections to existing mains, all fittings, valves and pipe shall be washed with clean water and then sterilized by washing with a chlorine solution having a residual chlorine strength of not less than 50 ppm.

All such work shall be planned so as to reduce the number of shut-offs and to keep the length of shut-offs to a minimum.

Plugs removed from the existing mains may be re-used within the project and those remaining after completion of construction shall remain the property of the City.

1.11 STEEL ENCASEMENT PIPE - Where required, the pipes shall be installed within welded steel encasement pipe. The encasement pipe shall be Armco welded steel pipe or City approved equal, and shall be asphalt coated on the outside. The minimum wall thickness for various sizes of encasement pipe is shown in the following table, with same based on steel pipe having a minimum tensile strength of 60,000 psi and a minimum yield strength of 35,000 psi. The wall thickness shall be adjusted as necessary for other grades of pipe.

MINIMUM WALL THICKNESS FOR STEEL ENCASEMENT PIPE

<u>Pipe Sewer I.D.</u>	<u>Encasement Pipe (O.D.)</u>	<u>Minimum Wall Thickness</u>
6"	12-3/4"	.250
8"	16"	.250
10"	18"	.312
12"	20"	.312

The encasement pipe shall be installed by boring and jacking, or as otherwise required, and in such a manner so as to allow the pipe to be laid at the proper grade. Upon completion of the pipe installation the area between the pipe and the encasement pipe shall be completely filled with a sand and cement mixture or grout as required by the governing authority. Care shall be taken to insure that the pipe does not shift within the encasement pipe. If required, the ends of the encasing pipe shall be sealed with 2-inch thick redwood bulkheads.

All necessary permits shall be obtained and all required inspection and insurance provided for. The Contractor shall be responsible for meeting all the requirements of the governing authority, which may include approval of equipment to be used for the installation of any encasement pipe and for providing same with any required notification prior to the start of such work. The City or their Engineer will not be responsible for any additional cost to the Contractor as a result of his failure to meet any of the governing authorities requirements.

1.12 STREAM CROSSINGS OR CULVERT CROSSINGS - Where any pipes cross watercourses or pass under culverts, they shall be encased in Class II concrete. The concrete encasement shall be square in cross-section and shall have a minimum thickness of 6-inches at the bells. The ends of the encasement shall extend to a point which is below the tops of the banks of the stream.

1.13 REMOVAL, REPLANTING OR REPLACEMENT, AND REPAIR OF TREES AND SHRUBS - All trees, deciduous shrubs and evergreens which are in the immediate vicinity of the route of construction shall be removed and replanted or replaced to permit installation of the pipe and appurtenances. In the locations where the trees are too large to replace, the Contractor shall tunnel under same to install the pipe.

Planting beds or pits for trees shall be provided with topsoil for a depth of at least 24-inches and have a diameter in feet equal to the diameter of the tree in inches, but not less than 3-feet in diameter nor less than 12-inches wider than the root spread in diameter. Pits for free standing specimen shrubs shall be provided with topsoil at least 15-inches deep and at least 6-inches beyond the root spread.

All plants shall be dug, moved and planted in a manner that will minimize damage to the roots. They shall be of symmetrical growth, and in the case of trees, shall

have a straight trunk throughout their height. No pruning shall be undertaken before planting. All nursery stock shall be free of insect pests and shall be secured from a certified nursery. All plant materials shall be subject to approval and all plants which are found unsuitable in growth or condition, or which are not true to name, shall be removed at the expense of the Contractor and replaced with acceptable plants.

All trees and specimen shrubs shall be furnished with roots properly balled and burlapped. Upon delivery to the site, all nursery stock shall be planted at once. If this is not feasible, however, they shall be healed in, i.e., all bundles opened at the top, the plants spread out without disturbing the roots into a spade dug trench, the roots fully covered with damp topsoil, and protected from the sun and wind. During planting operations, the nursery stock shall not be exposed to the sun, drying winds or winter freezing.

No planting shall be done in frozen soil, or during unfavorable weather conditions. Pits for trees shall be provided with topsoil as previously specified. After planting, a 3-inch mulch of well rotted manure or peat shall be applied over the disturbed ground about the tree. For free-standing specimen shrubs, topsoil shall be provided at least 15-inches wider than the root spread or root ball. All injured trees and shrub roots shall be pruned to make clean ends before planting. Trees and shrubs shall be set a little lower in their new location than where they stood in the nursery. Each plant shall be thoroughly watered when the hole is 2/3 filled with soil. After watering, the soil shall be well tamped into place and the surface of the ground shall be left at least 1-inch lower than the surrounding ground level, with a slight lip at the edge of the hole forming a shallow depression or "rain well".

A 3-inch mulch of old compost or well rotted manure shall be made on all planting beds and about all trees. All trees over 2-inches in diameter shall be property guyed by three wires, encased in water hose at the tree trunk and securely staked or otherwise supported with approved substitute materials. Watering shall be continued at frequent intervals until acceptance. Foliage, when exposed to hot sunlight, shall not be wet down or sprinkled.

Shrub beds and the areas around trees shall be kept cultivated, free of weeds and grass and properly watered until acceptance. Pruning shall be done as soon as dead branches appear. If any tree, shrub or plant settled more than 3-inches below the established grade, it shall be raised to the proper level and not merely filled in with additional topsoil.

All plant materials shall be guaranteed by the contractor to be true to name and size and in vigorous growing condition. Trees shall be guaranteed for at least one year and shrubs for at least one growing season. Replacements shall be made at the beginning of the first succeeding planting season.

Other trees, tree limbs, bushes, etc., that are so located that equipment of the Contractor will damage same during construction shall be carefully trimmed and shaped

by workmen skilled in tree trimming. All limbs and branches shall be flush cut. All exposed surfaces in excess of 1" diameter, deciduous shrub or evergreen destroyed or damaged to the extent that its continued life is impaired shall be replaced as herein specified. The Contractor shall employ a competent arborist to inspect all trees, shrubs, etc., along the line of the work and to properly trim, prune, repair and protect any that have been damaged, and to designate those which have been so damaged as to require replacement.

1.4 MAINTAINING TRAFFIC - The Contractor shall so conduct his work that inconvenience to residents and the traveling public is minimized. Pavement crossings shall be constructed so that one way traffic is maintained at all times on any street or highway.

Prior to the start of construction, the Contractor shall meet with and obtain the permission of the Director of Public Service for the closing of any street to traffic or for modifying traffic flow on any street and to establish requirements for signing, flashers, flagmen, etc. Work area protection and work area lighting both within and outside the work limits will be the responsibility of the Contractor involved.

Sections 4511.09 and 4511.11 of the Revised Code of Ohio and the "Ohio Manual of Uniform Traffic Control Devices for Streets and Highways", as prepared by the Ohio Department of Highways, Division of Operations, Bureau of Traffic, outline the requirements of standard traffic control devices and the establishment of standard arrangement patterns for typical roadway work projects. All signs shall be of substantial metal construction and shall be erected on steel posts or wood barricades, all as approved by the Director of Public Service. Barricades will not be furnished by the City.

During construction, subsequent notice of the closure of any street to traffic or of the modification of traffic flow on any street hours prior to same, with work area protection and lighting as earlier approved by the Director. As previously required in Section B, the Contractor shall file with the City or their Engineer a telephone number where he can be reached at any time in case of an emergency.

1.15 REMOVAL OF EXCAVATED MATERIAL AND STORAGE OF MATERIALS - All excess excavated material which has been stockpiled at the work site, and which will not be used for backfill or other fill purposes, must be removed from the project area within forty-eight (48) hours. In all cases, stock piles of all excavated material and all construction materials shall be of limited size and shall be neatly maintained in such a manner that they will not block existing drainage or be hazardous to pedestrian or vehicular traffic in any way. The limitation relative to the stockpiling of all excavated material as required above, or fails to satisfactorily modify his operations relative to the stockpiling of excavated or construction materials upon order of the City or their Engineer, all work except clean-up operations will be stopped, and remain stopped until the order of the City or their Engineer has been complied with.

The removal and disposal of surplus excavated material shall be the responsibility of the Contractor, but the location of the disposal areas shall be subject to the approval of the City or their Engineer. However, the Contractor shall be wholly responsible for any damage to public or private property in the disposal of waste materials even though the location of the site for such material may have been approved by the City or their Engineer.

1.16 PREVENTION OF AIR AND WATER POLLUTION THROUGH DUST AND DIRT CONTROL - It shall be the responsibility of the Contractor to prevent air and water pollution through dust and dirt control to the satisfaction of the City or their Engineer in the following areas:

1. In the streets, sidewalks and drives within the limits of the Contract.
2. Any haul roads leading to or away from the project that are used by the Contractor, his sub-contractors and his material suppliers.
3. Take all necessary steps to prevent soil from eroding onto all paved areas and into all natural watercourses, ditches and the public sewer systems.

The following methods of control shall be used:

1. The streets and haul roads shall be swept by an automatic self-contained mechanical sweeper meeting the requirements of Elgin-White Wing Model 475, Wayne Model 880 or City approved equal.
2. All excessive dirt that gets on the pavement shall be removed by means of hand shoveling or appropriate mechanical equipment and the area swept as in Method 1 above.
3. Sidewalks and driveways shall be cleaned by means of shovels and hand brooms or approved mechanical equipment.
4. If required by the City or their Engineer, any dust remaining shall be controlled in accordance with ODOT Item 616.

The Contractor shall comply with the above requirements on a daily basis. If the Contractor fails to perform the above work in a satisfactory manner, all work except clean-up operations will be stopped immediately until the Contractor has complied with the above requirement to the satisfaction of the City or their Engineer.

1.17 PROGRESS - The Contractor shall be required to complete backfilling operations and general clean-up within a reasonable distance of trenching and pipe laying operations and other excavations. The specific limitations of this paragraph shall be at the discretion of the City or their Engineer, but the general intent is to require the Contractor to minimize the inconvenience to nearby residents or businesses where the

mains are constructed in streets and alleys or in other locations where the construction produces an inconvenience to nearby residences or businesses. The City or their Engineer shall be permitted to require the Contractor to cease trenching and pipe laying operations at such time as he feels that back-filling and clean-up have not progressed satisfactorily.

1.18 MAINTENANCE OF TRENCHES AND EXCAVATIONS - At all times during the progress of the work and, unless otherwise noted, for a period of three (3) years after conditional acceptance of the work by the City, the Contractor shall maintain the backfilled trenches and other excavations. In particular, those trenches or excavations which are within 15-feet of the edge of the pavements or the edge of traveled roadways shall be kept filled up to the same level as the adjacent undisturbed ground. Any settlement which occurs during this period shall be immediately filled in to prevent the possibility of accidents.

1.19 MAINTENANCE OF FLOW - During construction, where existing sewers are encountered and are interfered with, flow shall be maintained in the existing sewers. Sewage or other liquid must be handled by the Contractor with the approval of the City or their Engineer by temporarily pumping to a satisfactory outlet; and shall not be pumped, bailed or flumed over the street or ground surface; or by providing a temporary conduit to maintain flow through the trench or other excavation. In addition, a reasonable supply of temporary conduit shall be kept on hand to be used as indicated or as directed by the City or their Engineer.

1.20 REPLACEMENTS - Where any pavements, driveways, parking areas, curbs, gutters, berm stone, sidewalks, water lines, gas lines, sewers, catch basins, drains, field tile, conduit pipes, cable or other existing facilities are removed or otherwise disturbed in carrying out this Contract, they shall be replaced in as good a condition as found at the expense of the Contractor and to the approval of the City. Any such material broken or disturbed to such an extent as to require replacement shall be replaced with new material at the expense of the Contractor.

Exception to the above shall be made in the case of pavements, sidewalks and sewers which shall be replaced in accordance with the requirements of the applicable items subsequently specified.

In any event, the Contractor shall be liable for any damage to streets or private property caused by movement of equipment or by other operations and he shall repair or replace, to a condition existent prior to his operations, any streets or private property damaged by his operations.

1.21 SEEDING - The Contractor will be required to seed all grassed areas disturbed by open trench construction or any other operations connected with work on the project. The Contractor shall take special care to insure that backfill of the trenches is well compacted prior to the application of topsoil, fertilizer and seed. If any backfilled trenches settle during the term of the Contract, after they have been seeded, the

Contractor shall fill the settled areas with approved topsoil; re-fertilize and re-seed in accordance with the original procedure; as follows:

- a. Surface Preparation - The backfilled trenches and cut areas shall be rough graded to within approximately two-inches of the original ground surface and shall be cleared of all rubble. Two inches of loose, friable, loamy topsoil, free of refuse or any foreign material, shall then be applied to all of the area to be seeded. Topsoil shall contain not less than five nor more than twenty percent organic matter. The area shall then be raked, rolled and graded smooth and level with surrounding areas; and made ready for fertilizing and seeding. All other areas disturbed in the performance of work shall be similarly carefully prepared for seeding and shall be loosened with a disc or harrow to a depth of 2-inches just prior to fertilizing.
- b. Fertilization - All areas to be seeded shall be given an application of an approved commercial fertilizer, applied at the rate of 20 pounds per 1,000 square feet. The fertilizer shall be obtained from a dealer or manufacturer whose brands and grades are registered or licensed by the State of Ohio, Department of Agriculture. Immediately prior to seeding, the area shall be raked sufficiently to thoroughly mix the fertilizer with the topsoil.
- c. Seed - Seed shall have the following mixture and shall be approved by the Engineer prior to seeding operations:

	<u>Percent By Weight</u>
Kentucky Blue Grass	40
Creeping Red Fescue	55
Red Top	5
Weed Content: Maximum 1%	

If certain undisturbed lawns are of better quality than the specified seed will produce, the Contractor shall furnish seed for these specific lawns that will produce a lawn of equal quality, as approved by the City or their Engineer.

The Seed shall be approved by the State of Ohio, Department of Agriculture, Division of Plant Industry. Only unmixed seeds shall be purchased unless certified as to quality and mixture. All mixing shall be done at the project site, from the original packages, in the presence of a representative of the City or their Engineer.

d. Sowing - The specified seed shall be uniformly sown, by means of mechanical distributors, at the rate of four pounds per 1,000 square feet. No seeding shall be done during windy weather or when the ground is frozen, muddy or otherwise non-tillable.

After seeding, the ground shall be raked so as to cover the seed to a depth of approximately ¼-inch and the area covered with a non-toxic mulching material such as wheat or oat straw. Mulching material shall be placed over all seeded areas at the rate of approximately 2 tons per acre for straw and 3 tons per acre for hay when seeding is performed between the dates of March 15 and October 15, and at the approximate rate of 3 tons per acre for straw and 4-1/2 tons per acre for hay when seeding is performed between the dates of October 15 and March 15 of the succeeding year. The mulching material shall be securely tied down or otherwise kept in place by a method approved by the City or their Engineer. In the event any mulching material is displaced, it shall be replaced, but only after seeding, and other work preceding the mulch, damaged because of the displacement of the mulching material has been acceptably repaired.

e. Maintenance - Regardless of the date of conditional acceptance of the Project by the Owner, the Contractor shall properly care for all lawn areas until the grass is a well established dense uniform growth at least 4-inches high. At that time all excess mulch shall be removed and the grass shall be mowed. The Contractor shall be responsible for the grass for two weeks after this mowing. If the grass shows good growth and a dense stand at this time, the Contractor’s obligations shall have been fulfilled except for the repairs of future settlement. All areas and spots that do not show a prompt “catch” shall be re-seeded at intervals of 21 days, which shall be continued until a good growth is established over the entire specified area. The methods utilized in the re-seeding of any area shall be as previously specified. Areas damaged due to acts of neglect by residents or vandalism shall be re-sown only at the request of and at the expense of the Owner.

1.22 DISINFECTION - As previously specified, all pipe interiors shall be cleaned before laying and shall be kept clean thereafter. After a main has been completed it shall be disinfected in accordance with AWWA C651-86, “Disinfecting Water Mains”, using the tablet or continuous feed method, and the following:

For the tablet method, an average chlorine dose of 25 mg/l shall be provided by placing calcium hypochlorite granules and tablets in the main as it is being installed. Granules shall be placed at the upstream end of the first section of pipe, at the upstream end of each branch main, and at 500 foot intervals in the following quantities, based on pipe diameter:

<u>PIPE DIAMETER</u> (inches)	<u>CALCIUM HYPOCHLORITE GRANULES</u> (ounces)
8	2.0
10	4.0

Tablets shall be placed in each section of pipe, with the number of tablets determined by the formula $0.0012dL$ rounded to the next highest integer, where d is the inside diameter of the pipe in inches and L is the length of the pipe section in feet, and also, one tablet shall be placed in each hydrant, hydrant branch, and other appurtenances. Tablets shall be attached using Permatex No. 1, or equal, adhesive on only the side attached and so that they are at the inside top of the pipe upon installation of the pipe, and

with approximately equal numbers of tablets at each end of a given pipe length. When installation of the pipe is complete, the main shall be filled with potable water at a rate such that water within the main will flow at a velocity no greater than 1 fps. Precautions shall be taken to assure that air pockets are eliminated. The water shall remain in the pipe for at least 24 hours, except if the water temperature is less than 40° F, the water shall remain in the pipe for at least 48 hours.

For the continuous feed method, the main shall be flushed as thoroughly as possible with the water pressure and outlets available and all air exhausted. If no hydrant is installed at the end of the main, a tap large enough to develop a velocity in the main of at least 2.5 fps shall be provided by the Contractor. Disinfection can be accomplished by injecting a 1% chlorine solution (10,000 mg/l), prepared by mixing one pound of calcium hypochlorite (approximately 65% available chlorine by weight) and 8 gallons of water, into the main at a point not more than 10 feet downstream from the beginning of the new main. Potable water for the injector for delivering the 1% chlorine solution shall be pumped from a cleaned and sterilized container. Water from the existing distribution system or other approved potable water source shall be controlled so as to flow slowly into the new main during chlorine application, with the rate of chlorine application in such proportion to the rate of water entering the main that the solution of clean water and chlorine in the main will have not less than 25 mg/l free chlorine. The solution shall remain in the main for 24 hours, at which time the treated water in all portions of the main shall have a residual of not less than 10 mg/l free chlorine.

For all methods, after the applicable retention period the main shall be thoroughly flushed out with potable water from the distribution system until the main has approximately the same chlorine content as water in the existing system.

Air shall be exhausted at fire hydrants, air release valves, and one inch corporation stops inserted at the extremities and high points of the main. The Contractor shall provide all corporation stops required for exhausting air, for samples for testing for chlorine residual, and for chlorine solution injection. In all cases, tests for chlorine residual will be performed by the Owner or the Engineer.

During all flushing and disinfection operations, existing valves shall be manipulated so that strong chlorine solution in the main being treated will not flow back into the line supplying the water, and new valves and hydrants shall be operated so as to disinfect appurtenances and pipe branches.

Bacteriological samples shall not be taken for testing until the main has been subjected to a successful pressure and leakage test.

Disinfection is a responsibility of the Contractor, who shall provide all materials, labor and equipment and, in addition, pay for the total volume of water used and dispose of all heavily chlorinated water.

1.23 PRESSURE AND LEAKAGE TEST - After a main has been disinfected and flushed out, it shall be subjected to a pressure and leakage test in accordance with AWWA C600 (latest revision) and the following:

The main shall be isolated from adjacent mains and pressure shall be applied by pumping clean water from a sterilized container into the main via 2-inch corporation stops. The test pressure shall be 150 pounds per square inch (psi), unless valves in existing mains are involved within the section of new main being tested, in which case the test pressure shall be 100 psi. The test pressure shall not vary by more than ± 5 psi.

The pressure test shall be started in an afternoon and the pressure shall be on for 18 hours, and then the test pressure shall be maintained for an additional two hours by pumping water from the container. At the end of the two hour period, the water used shall be measured and the loss by leakage shall not exceed that as determined by the following formula:

$$L = \frac{SD(P)^{1/2}}{133,200}$$

in which L is the allowable leakage in gallons per hour; S is the length of pipe tested in feet; D is the nominal diameter of the pipe in inches; and P is the average test pressure during the leakage test in pounds per square inch gauge.

When testing against closed metal-seated valves, an additional leakage per closed valve of 0.0078 gal/hr./in. of nominal valve size shall be allowed. When hydrants are in the test section, the test shall be made against the closed hydrant.

Pressure testing at each side of the intermediate valves shall be done at this time by shutting each valve and exhausting the pressure on one side and then applying the test pressure of 150 psi or more to the main on the opposite side of the valve. This procedure shall be repeated for each intermediate valve.

If the main and valves do not pass the leakage test, the leak or leaks shall be located and repaired and the testing procedure repeated by and at the expense of the Contractor. All visible leaks shall be repaired regardless of the amount of leakage.

Pressure and leakage testing is a responsibility of the Contractor, who shall provide all materials, labor and equipment and, in addition, pay for the total volume of water used.

1.24 BACTERIOLOGICAL TESTS - After a main has been disinfected and tested, and before it is placed in service, bacteriological tests shall be performed in accordance with Section 7 of AWWA C651, and the following:

Samples will be collected from the extremities and mid-point of the main by a representative of the Owner and bacteriological tests performed. Samples shall not be

taken by the Contractor. At least two samples taken at 24 hour intervals shall show the water to be safe.

Before a sample is taken, the water shall be allowed to flow from the sampling point for at least one minute. The outlet shall be thoroughly flamed in order to kill all bacteria. Nothing should be allowed to touch the lip or top of the sample bottle while the sample is being taken.

If bacteriological tests show the water to be safe, the main may be placed in service. If bacteriological tests shown the water to be unsafe, the main shall be completely disinfected again at the expense of the Contractor.

The Contractor shall be responsible for all costs of bacteriological tests.

1.25 COMPLETION OF TESTS - When all tests on the water main have been successfully completed, the main will be placed in service by a representative of the Oregon Water Department and no further work on the main or its valves will be permitted without full knowledge of the work by the Director of Public Service.

2. VALVES AND APPURTENANCES

2.1 GENERAL - This item covers gate valves and tapping sleeves and valves which may be required in connection with the installation of the water mains. All valves shall be provided with a valve box or shall be installed within a manhole as subsequently specified. Valves installed with Class 52 ductile pipe shall be wrapped as previously specified in Item 1.

2.2 GATE VALVES - Gate valves shall be iron body, bronze mounted, double disc, parallel seat type meeting the requirements of AWWA C500, or iron body resilient seat type meeting the requirements of AWWA C509. Valves shall be designed for a working water pressure of 200 psi and shall be of the non-rising stem type with a standard AWWA nut. The manufacturer shall furnish an affidavit indicating that all tests and provisions of the applicable standard have been met. Valves shall have mechanical joint ends. Stem seals shall consist of at least two "O" rings. Valves shall open by turning to the right (clockwise). If required, operators shall be provided with extension stems such that the operating nut terminates approximately 4 feet below grade. Extension stems shall be centered in the valve boxes by approved stem guides. Valves shall be set plumb, with the valve box accurately centered over the valve.

The following makes and models of valves will be permitted:

	<u>C500</u>	<u>C509</u>
American Flow Control	55	Series 500
Kennedy	C571	4571
Mueller	A2380-20	A2360

2.3 TAPPING SLEEVES AND TAPPING VALVES -

A. Installation Requirements - The existing water main into which a pressure connection is to be made cannot be shut down or taken out of service. The installation shall be made by personnel skilled and experienced in the making of pressure taps. The Contractor shall exercise extreme care in the selection and adjustment of drilling equipment as well as in the installation, inspection and cutting procedures. Prior to ordering any tapping sleeve assembly, the Contractor shall expose a section of the existing main and verify the circumference of the pipe.

The Contractor shall be responsible for inspection, proper assembly, alignment and fitting of the tapping sleeve and valve to the main. In the event of any mismatch of any purchased materials, it shall be the Contractor's responsibility to refit them in the field or to make the necessary arrangements with the manufacturer for factory refit.

The severed section of water mains shall be removed through the tapping valve and given to the City or their Engineer as proof of satisfactory execution of the operation. The Engineer, at his option, may retain the coupon for such analysis or tests as are

necessary to evaluate the condition of the existing water main, water treatment, deposits, etc.

The City of Oregon, Division of Water, has the necessary equipment and experienced personnel to make pressure taps and will perform same at the request and expense of the Contractor.

B. Tapping Sleeves - Tapping sleeves shall be made in two halves for assembly around the mains. Gaskets shall extend the entire length of the sleeves to form watertight joints when the side bolts are tightened in accordance with the manufacturers' recommendations. Branch flanges shall have female faces to accommodate male faces of tapping valves.

C. Tapping Valves - Tapping valves shall be gate valves as previously specified in Paragraph 2.2, except as modified by the following supplementary requirements:

Tapping valves shall be of the cast iron body, resilient seat type, meeting the requirements of AWWA C509-latest revision.

Valve outlets shall be mechanical joint in compliance with AWWA C111. The cylindrical section of the interior annular recess of the bell shall be machined with the bore through the seat rings to provide alignment for the drilling machine.

2.4 VALVE LOCATION AND SETTING - Main line valves shall be installed at intersections so as to be able to isolate the line and prevent back feet and at intervals as shown on the plans. A gate (watch) valve shall be installed with each fire hydrant as subsequently specified in Item 3.

Main line valves installed in existing or proposed paved areas or as otherwise required by the City shall be installed in manholes. Valves installed at all other locations shall be with a valve box as subsequently specified. Valves shall set plumb with the manhole accurately centered over the valve and with the top of the manhole cover flush with the surface of the ground or pavement.

Watch valves installed with fire hydrants and all other main line valves shall be installed with valve boxes. Valves shall be set plumb with valve box centered over the valve and with the top of the box flush with the surface of the ground or pavement.

2.5 VALVE BOXES - As shown on the plans, the gate valves shall be provided with valve boxes. Valve boxes shall be constructed of a good grade of cast iron; shall be coated; shall be of the three piece screw type; shall have a 5-1/4 inch shaft; and shall be provided with a heavy need fitting cover having the word "WATER" cast on the top. Bases shall cover the entire bonnet section of the valve. Boxes shall correctly set on valve body and shall extend to the ground elevation with sufficient length for each section to be properly engaged.

2.6 MANHOLES - Manholes shall be constructed with approved 6-inch thick solid concrete (circular) block walls or with approved pre-cast concrete pipe sections and shall have an inside diameter of 4'-0" for 10-inch diameter and smaller mains and 5'-0" for 12-inch diameter and larger mains. Walls shall rest on a Class I reinforced concrete foundation ring. The blocks or pipe sections shall be set in a full bed of, and all joints shall be filled with, mortar composed of one part, by volume, Portland cement and two parts clean hard sand. In addition, concrete block walls shall be plastered on the outside with the same mortar and trowelled to a smooth, hard, waterproof surface. Where the pipe passes through the manhole walls, provide ½-inch thick neoprene gasket material around the pipe.

The earth floor shall be well tamped and then the manhole shall be filled to the centerline of the pipe with No. 6 stone.

The manhole shall be provided with an 8-inch thick removable top slab constructed of Class I reinforced concrete. The top slab shall have 2-inch diameter lifting holes, filled with mastic to prevent the entry of dirt, or approved lifting rings as shown on the plans. Provide a cast iron manhole frame and cover. Frame and cover shall be East Jordan 1040 with Type A Solid Cover, Neenah R-1642 with Type "B" or type "C" Lid, or City approved equal. The frame and cover shall be coated and shall weight not less than 400 pounds. Frame shall have a clear opening of not less than 24-inch and shall have four 1-inch diameter holes in the base flange at quarter points for anchoring to the top slab. Cover shall be solid and shall have the word "WATER" cast thereon. Frames and covers shall have finished bearing surfaces to prevent rocking of the cover on its supporting surface. After installation, the top of the cover and the top of the frame shall be painted with one coat of asphaltum paint. The frame shall set in a full leveling bed of mortar on the top slab. Any elevation adjustment shall be accomplished using concrete brick set in mortar. Mortar shall be as specified herein. The frame shall be anchored to the top slab as approved by the City or their Engineer. Anchor bolts shall be of a length as required to be anchored in the top slab allowing for any elevation adjustment.

Manholes for gate valves shall be in accordance with Detail 3.

3. FIRE HYDRANTS AND APPURTENANCES

3. GENERAL - This item covers fire hydrants, watch valves and valve boxes, hydrant tees, anchoring fittings and anchoring pipe which may be required in connection with the installation of the water mains. Hydrants in new subdivisions shall be 4-foot unless otherwise specified and approved by the Director of Public Service. Fire hydrants and appurtenances when installed with Class 52 ductile pipe shall be wrapped as previously specified in Item 1.

3.2 FIRE HYDRANTS - Fire hydrants shall be of the compression type, opening against and closing with the water pressure in the main, having a 5-1/4 inch valve opening, two 2-1/2 inch hose nozzles (2-63/64 inches O.D., 8 threads per inch) and one 4-inch pumper nozzle (4-13/16 inches O.D., 6 threads per inch). Hydrants shall conform to AWWA C502, latest revision. The manufacturer shall furnish an affidavit indicating that all tests and provisions of AWWA C502 have been met.

The following makes and models of hydrants will be permitted:

American-Darling	B-84-B
Kennedy	K-81D
Mueller	A-423, Super Centurion 250

The hydrant barrel shall have an inside diameter of not less than 6 inches and shall be in two parts fastened together with a frangible section located just above ground line. The hydrant stem shall have a breakable coupling in the same plane as the frangible section. Stem shall terminate at the top in a standard pentagonal shaped nut, 1.3125 inches point to point and 1.50 inches point to flat. Seals shall be rubber O-rings. Hydrants shall be suitable for setting in trenches of the depths shown or as required. The hydrants shall be designed so that when properly operated water hammer will be prevented. Hydrants shall be furnished with a positive-operating drain valve and shall be installed with the drain valve open. Each hydrant shall be furnished with a 6-inch mechanical joint base. Hydrants shall open by turning to the left (counter-clockwise).

The Contractor shall verify that the hydrant furnished and that the hydrant pumper nozzle, operating nut, outlet nozzle cap nuts and hose threads conform to those in the system before new hydrants are shipped.

Each hydrant exterior, in addition to finishing as required by AWWA C502, shall be given one field coat of asphalt varnish after erection and before backfilling from ground level down. That part of the hydrant exterior above ground level shall be field painted with two coats of pain as required by the Owner after backfilling is complete.

Bonnet, 3 caps and chains - Black enamel, Glidden 4551, ICI 43089990, or City approved equal.
Barrel - Yellow enamel, Glidden 4560, ICI 43088600, or City approved equal.

3.3 WATCH VALVES AND VALVE BOXES - Each hydrant shall be controlled by a watch valve which shall be a 6-inch gate valve as previously specified in Paragraph 2.2, except the valves shall have mechanical joint ends for receiving the spigot ends of 6-inch anchoring fittings and/or anchoring pipe. Each valve shall be installed complete with a valve box as previously specified in Paragraph 2.5.

Valve boxes shall be constructed of a good grade of cast iron; shall be coated; shall be of the three piece screw type; shall have a 5-1/4 inch shaft; and shall be provided with a heavy neat fitting cover having the word "WATER" cast on the top.

3.4 ANCHORING PIPE AND ANCHORING FITTINGS - Each hydrant connection to the mains shall be made by means of anchoring pipe and anchoring fittings as shown on the details herein. All anchoring pipe and anchoring fittings shall be as manufactured by Clow Corporation or City approved equal.

3.5 INSTALLATION - Hydrants shall be set plumb and to the grade of the curb, street, alley, highway or right-of-way at the direction of the City or their Engineer and shall be of the over main type or offset type as subsequently specified. Pumper nozzle shall always be set toward the middle line of the street, highway or right-of-way. Excavation for hydrants shall first be backfilled with No. 6 stone to a minimum depth of two feet as shown on the plans. Remainder of excavation shall then be backfilled as previously specified for pipe laying.

For the over the main type, the hydrant base shall rest on a creosoted wood timber supported by two vertical blocks. The timber shall be the largest nominal size square timber which will fit between the hydrant base and the top of the main, with the blocks to be the same size. The horizontal timber shall be spiked to the vertical blocks to prevent the movement of same during subsequent backfilling operations. Each hydrant setting shall consist of a tee, Clow F-288 and an anchoring elbow Clow F-1218 or City approved equal, set vertical and tied securely to the watch valve and hydrant with one minimum three foot long piece of anchoring pipe, Clow F-1216 or City approved equal. See Detail 4.

For the offset type, the hydrant base shall be provided with a foundation slab of Class I concrete, 18-inche square and at least 6-inches thick. Each hydrant connection to the main shall be made by means of an anchoring tee, Clow F-1217 or approved equal, tied securely to the watch valve and hydrant with the required lengths of anchoring pipe, Clow F-1216 or City approved equal. See Detail 5.

4. EXISTING PAVEMENT, DRIVEWAY AND SIDEWALK REPLACEMENT

4.1 GENERAL - This item covers the replacement, except as noted, of brick, concrete, asphalt concrete or surface treated macadam pavements, driveways, sidewalks and parking areas which are damaged or removed during trenching, pipe laying or other operations. Gravel or stone roadways, driveways or parking areas are not classified as pavements and shall be replaced to a condition similar to that existing before construction on the previously specified backfill.

The State of Ohio, Department of Transportation Construction and Material Specifications shall be followed insofar as applicable. Driveways and parking areas shall be classified as pavements according to the types of materials of construction.

4.2 PREPARATION - Prior to the replacement of the permanent pavement, any temporary pavement placed under Item 1 shall be removed. Concrete pavements shall be removed to a neat straight edge to a point 12-inches beyond each side of the excavation, using care to preserve any reinforcement whenever possible so that it can be bent back into place. Asphalt concrete or surface treated macadam pavements shall be removed to a neat straight edge.

In all cases, any excess granular backfill material (304) placed under Item 1 shall be removed to allow for the placement of the permanent pavement in accordance with the thicknesses subsequently specified. If required, additional mechanically tamped granular backfill material (304) shall be provided to fill all depressions and bring the base to the proper elevation. If, in the opinion of the City or their Engineer, the aggregate base is not adequately compacted and keyed, the base shall be scarified to a sufficient depth and the aggregate worked in with mechanical tampers or vibratory devices to obtain maximum keying. The compacted aggregate shall have a firm, even surface ready for the placement of the permanent pavement.

4.3 CONCRETE PAVEMENT - Concrete pavement, including driveways, shall be replaced with Class I concrete with materials and workmanship as previously specified in Section C. All concrete materials shall be approved by the City or their Engineer. An approved ready-mix concrete may be used. The thickness of concrete shall be the same as that of the existing adjacent pavement, but in no case shall it be less than 6-inches.

Reinforcement shall be substantially the same as in the existing pavement. Reinforcing steel shall be as previously specified in Section R.

Brick pavements removed shall be replaced with Class I concrete. Bases of brick or concrete, having an asphalt wearing surface, shall be replaced with Class I concrete. The wearing surface shall be replaced with 1-1/2 inches of 404 asphalt concrete.

4.4 ASPHALT CONCRETE OR SURFACE TREATED MACADAM PAVEMENTS - The pavements shall be replaced as follows:

- a. Apply a bituminous prime coat of 408 at the rate of 0.35 gallons per square yard, to the 304 aggregate base.
- b. The surface course shall consist of a minimum of 1-1/2 inches of 402 asphalt concrete, but in no event shall the thickness be less than that removed. If the existing thickness is of sufficient depth to warrant more than one course, the material shall be placed in the proper number of courses necessary to provide an acceptable surface.
- c. Faces of existing pavement, curb, structures, etc., against which the mixture is to be placed and the mating surfaces where new pavement meets existing pavement shall be sealed with bituminous materials in accordance with 401.12, 401.15 and 702.01.

4.5 TEMPORARY PAVEMENT - No asphalt concrete pavement shall be placed after October 31st except by specific permission of the City or their Engineer. In event pavement replacement is not completed prior to this date, the temporary pavement provided under Item 1 shall remain in place and be properly maintained until the permanent pavement can be placed in the Spring, as soon as the weather permits.

4.6 CONCRETE SIDEWALKS - Existing concrete or brick sidewalks which must be removed during trenching, pipe laying or other operations, or which are damaged in connection with the work, shall be replaced upon conclusion of pipe laying and backfilling operations with new concrete sidewalks of the same width as the original. New sidewalks shall be 4-inches in thickness, except at driveways where they shall be 6-inches thick, and shall be laid to the established sidewalk grade. All concrete shall be Class I with materials and workmanship as previously specified in Section C. All materials shall be approved by the City or their Engineer. An approved ready-mix concrete may be used. Installation shall be in accordance with Item 608.03, with 1/2-inch mastic expansion strips provided at 25 foot intervals.

Sidewalks other than concrete or brick shall be classified as pavement and shall be replaced as previously specified for the appropriate type of pavement.

4.7 BERMS, CURBS, GUTTERS, ETC. - Any berm, curb, curb drain or curb and gutter on either side of the pavement which are damaged or removed must be replaced in their original condition as found. Materials shall be as approved by the City or their Engineer.

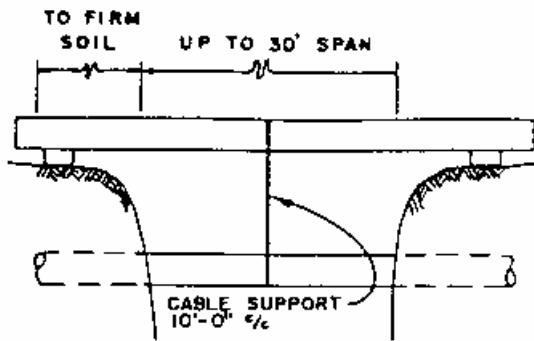
5. EXISTING SEWER REPLACEMENT

5.1 GENERAL - All existing sewers or field tile drains which must be removed during trenching, pipe laying or other operations shall be replaced to the satisfaction of the City or their Engineer. Existing sewer pipe or field tile which must be removed and which remain unbroken and in good condition may be relaid.

5.2 REQUIREMENTS - The Contractor is cautioned to use the greatest care in reporting to the City or their Engineer all existing sewer lines, tiles and drains of any type which are exposed in trenching for the new water lines. All such sewer lines, tiles and drains must be replaced, with the same material, in a workable conditions similar to that found. They must be replaced securely so as to withstand any future settlement either by thorough tamping of their foundation in the trench or by bridging by means of timber supports, a minimum of 6-inches square, or reinforced concrete. Where timber bridging cannot be supported by a firm foundation, the Contractor shall provide vertical support for the timber bridging, including any lateral bracing necessary to provide a firm and substantial support for the existing sewer, all at the direction of the City or their Engineer.

6. Details

NOTES

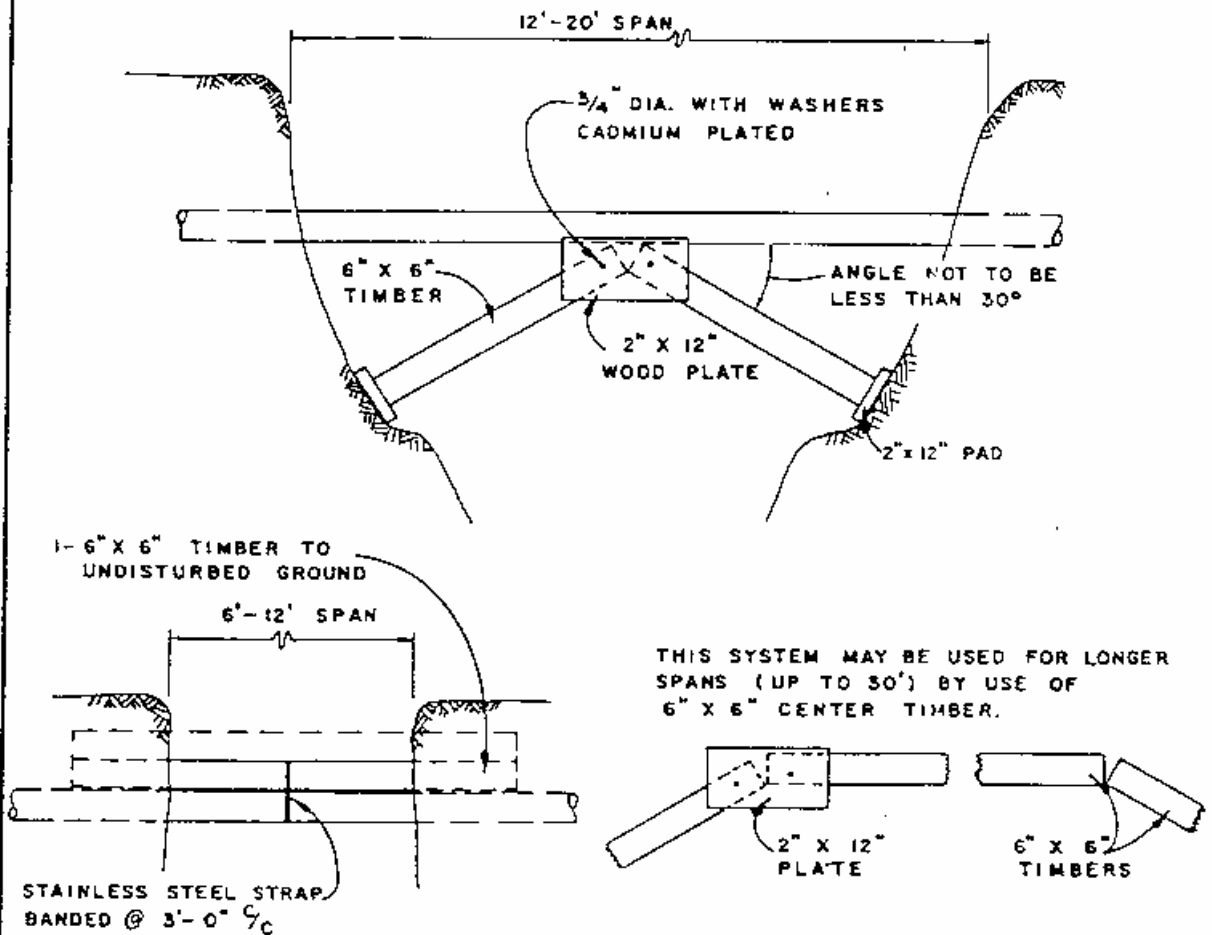


FOR SPANS UP TO 12' A 6" X 6" TIMBER MAY BE USED.

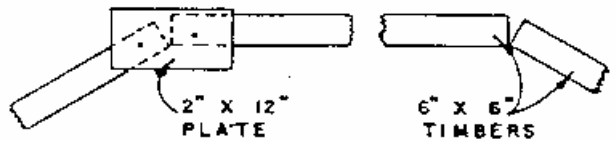
OVER 12' USE A CLASS 4 OR BETTER UTILITY POLE. (ACCEPTABLE ALTERNATES INCLUDE -6" .219" WALL PIPE OR 6" X 3 3/8" I-BEAM)

BACKFILL MUST BE COMPLETELY COMPACTED, OR PERMANENT SUPPORTS INSTALLED, OR NATURAL SETTLEMENT COMPLETE PRIOR TO REMOVING EXPOSED SUPPORTS.

THIS METHOD OF SUPPORT IS TO BE USED FOR 6" AND 8" WATER MAINS ONLY.



THIS SYSTEM MAY BE USED FOR LONGER SPANS (UP TO 30') BY USE OF 6" X 6" CENTER TIMBER.



1- 6" X 6" TIMBER SUPPORT UP TO 8' SPAN.
2- 6" X 6" TIMBER SUPPORTS UP TO 12' SPAN.

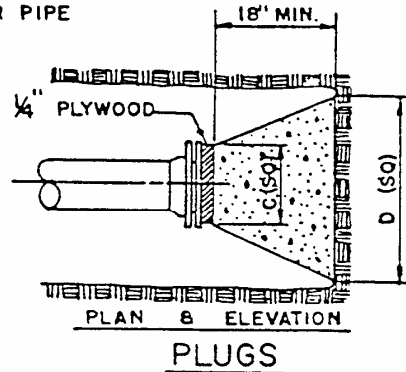
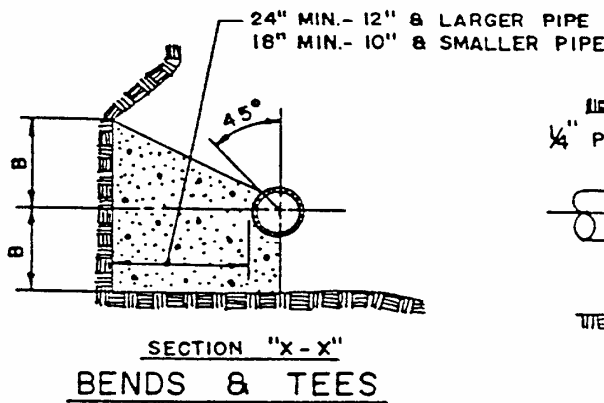
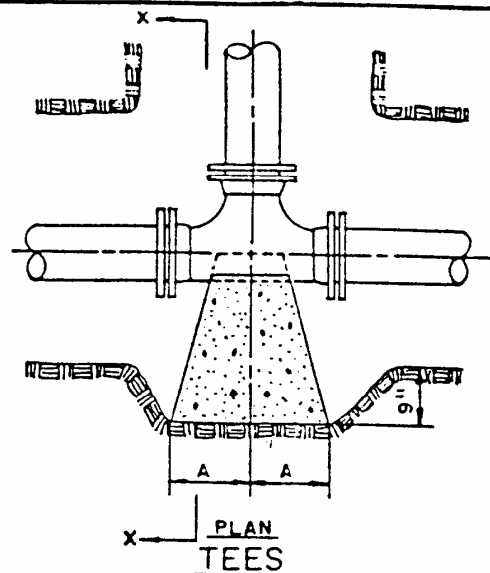
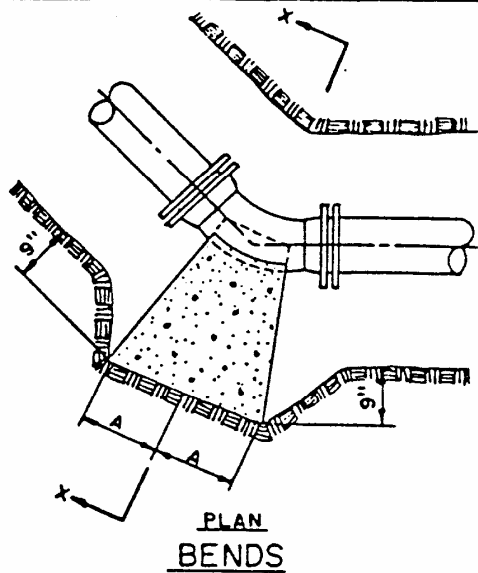
**SUPPORT OF UTILITIES
PERPENDICULAR TO EXCAVATION**

SCALE 3/8" = 1'-0"

DETAIL 1

CITY OF OREGON STANDARD

THRUST BLOCK DETAILS

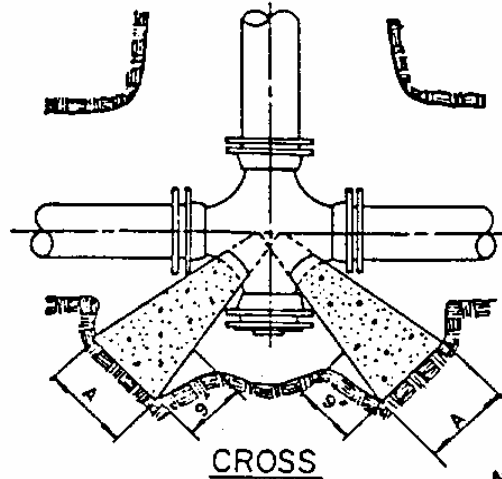


TYPE	SIZE	1/4 BENDS		1/8 BENDS		1/16 BENDS		TEES		PLUGS	
		A	B	A	B	A	B	A	B	C	D
2000 PSF SOIL	6"	18"	11"	10"	11"	6"	9"	11"	13"	10"	24"
	8"	25"	14"	14"	14"	9"	11"	15"	17"	12"	32"
	10"	27"	20"	16"	19"	10"	15"	18"	22"	14"	40"
	12"	33"	23"	18"	23"	12"	18"	21"	26"	16"	47"
	14"	39"	26"	22"	26"	13"	22"	24"	30"	18"	54"
	16"	43"	30"	24"	30"	14"	26"	28"	33"	20"	61"
	20"	50"	39"	27"	39"	17"	32"	33"	42"	24"	74"
	24"	60"	45"	33"	45"	20"	38"	40"	49"	28"	88"

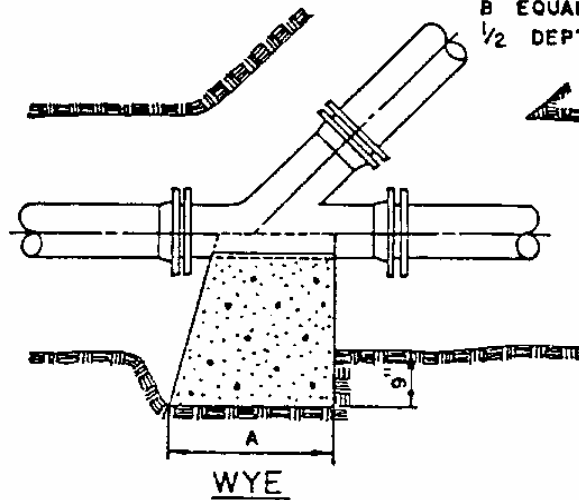
NOTE:
BASED ON 150 P.S.I. STATIC PRESSURE PLUS A.W.W.A. WATER HAMMER.
ALL BEARING SURFACES TO BE CARRIED TO UNDISTURBED GROUND.

FOR PIPING SMALLER THAN 6" USE BLOCKING DIMENSIONS FOR 6" PIPE.

THRUST BLOCK DETAILS



NOTE:
B EQUALS
1/2 DEPTH



TYPE	SIZE	CROSS		WYE	
		A	B	A	B
2000 P S F SOIL	6"	11"	13"	10"	12"
	8"	15"	17"	14"	14"
	10"	18"	22"	15"	20"
	12"	21"	26"	18"	23"
	14"	24"	30"	21"	27"
	16"	28"	33"	24"	30"
	20"	33"	42"	27"	43"
	24"	40"	49"	32"	50"

NOTE:
BASED ON 150 P.S.I. STATIC PRESSURE PLUS A.W.W.A. WATER
HAMMER.

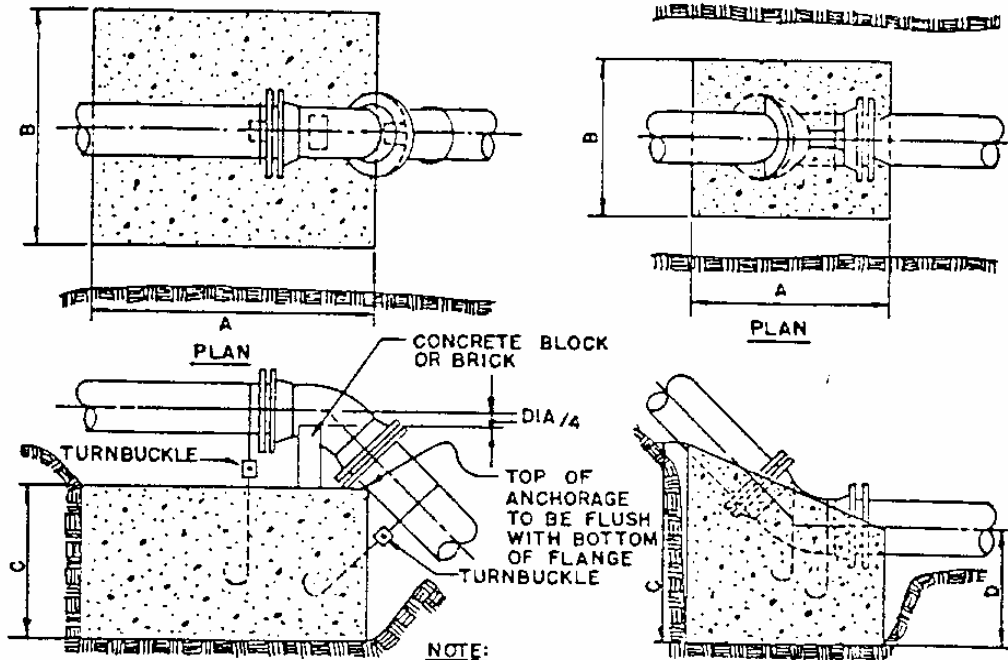
ALL BEARING SURFACES TO BE CARRIED TO UNDISTURBED
GROUND.

FOR PIPING SMALLER THAN 6" USE BLOCKING DIMENSIONS

Sheet 2 of 3 FOR 6" PIPE.

DETAIL 2
CITY OF OREGON STANDARD

THRUST BLOCK DETAILS



ELEVATION
TYPE A

NOTE:

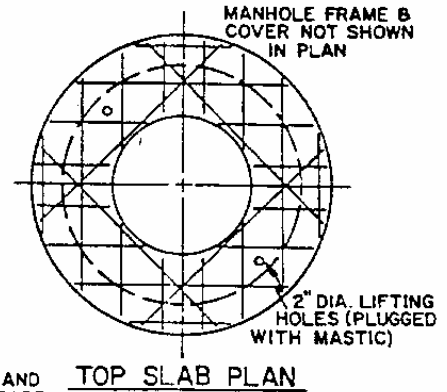
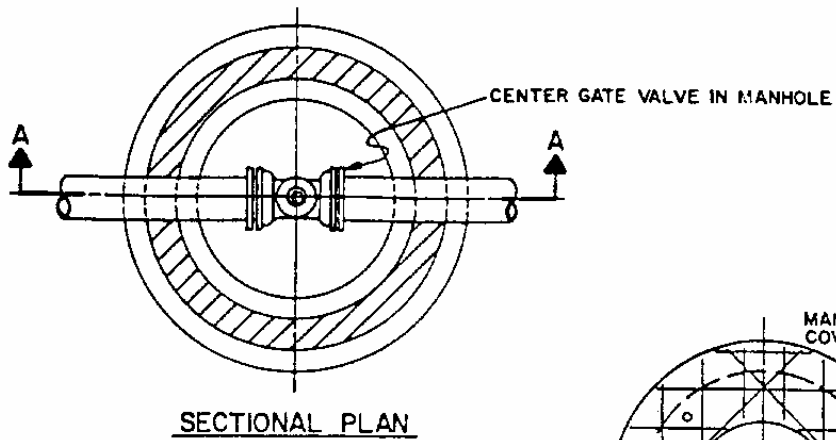
6" TO 8"	1- 1/4 x 1 1/8 STRAP
10" TO 12"	2- 1/4 x 1 1/4 "
14" TO 16"	2- 3/8 x 1 1/2 "
18" TO 20"	2- 1/2 x 1 3/4 "

ELEVATION
TYPE B

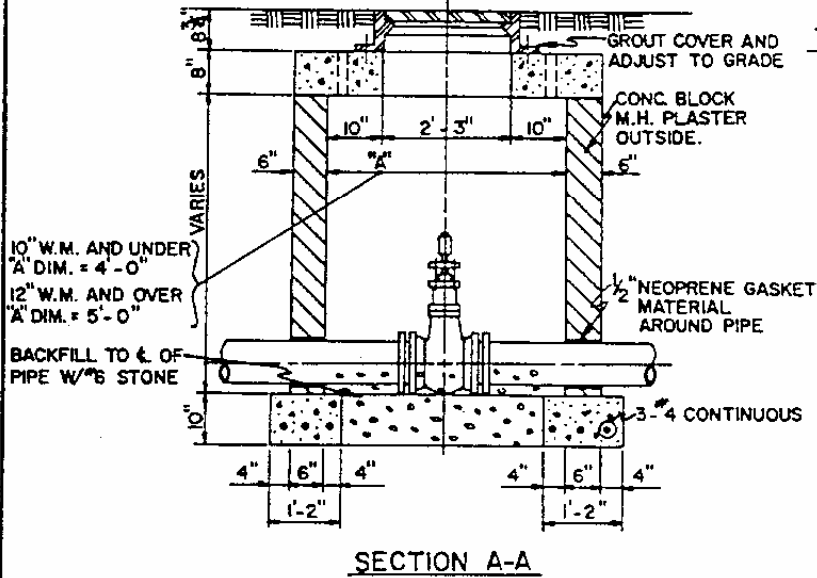
VERTICAL BENDS

TYPE	SIZE	TYPE A			TYPE B			
		A	B	C	A	B	C	D
2000 P.S.F SOIL	6"	38"	32"	27"	27"	27"	27"	16"
	8"	44"	38"	27"	30"	30"	30"	18"
	10"	50"	44"	34"	37"	37"	33"	18"
	12"	57"	51"	40"	41"	41"	40"	21"
	14"	57"	51"	67"	47"	47"	47"	24"
	16"	64"	57"	67"	54"	54"	49"	24"
	20"	78"	63"	80"	64"	64"	64"	30"
	24"	93"	75"	83"	78"	78"	78"	36"

NOTE:
 BASED ON 150 P.S.I. STATIC PRESSURE PLUS A.W.W.A. WATER HAMMER.
 ALL BEARING SURFACES TO BE CARRIED TO UNDISTURBED GROUND.
 FOR PIPING SMALLER THAN 6" USE BLOCKING DIMENSIONS FOR 6" PIPE.



MANHOLE FRAME & COVER-EAST JORDAN 1670
TYPE "A" SOLID COVER OR EQUAL
WITH THE WORD "WATER" THEREON

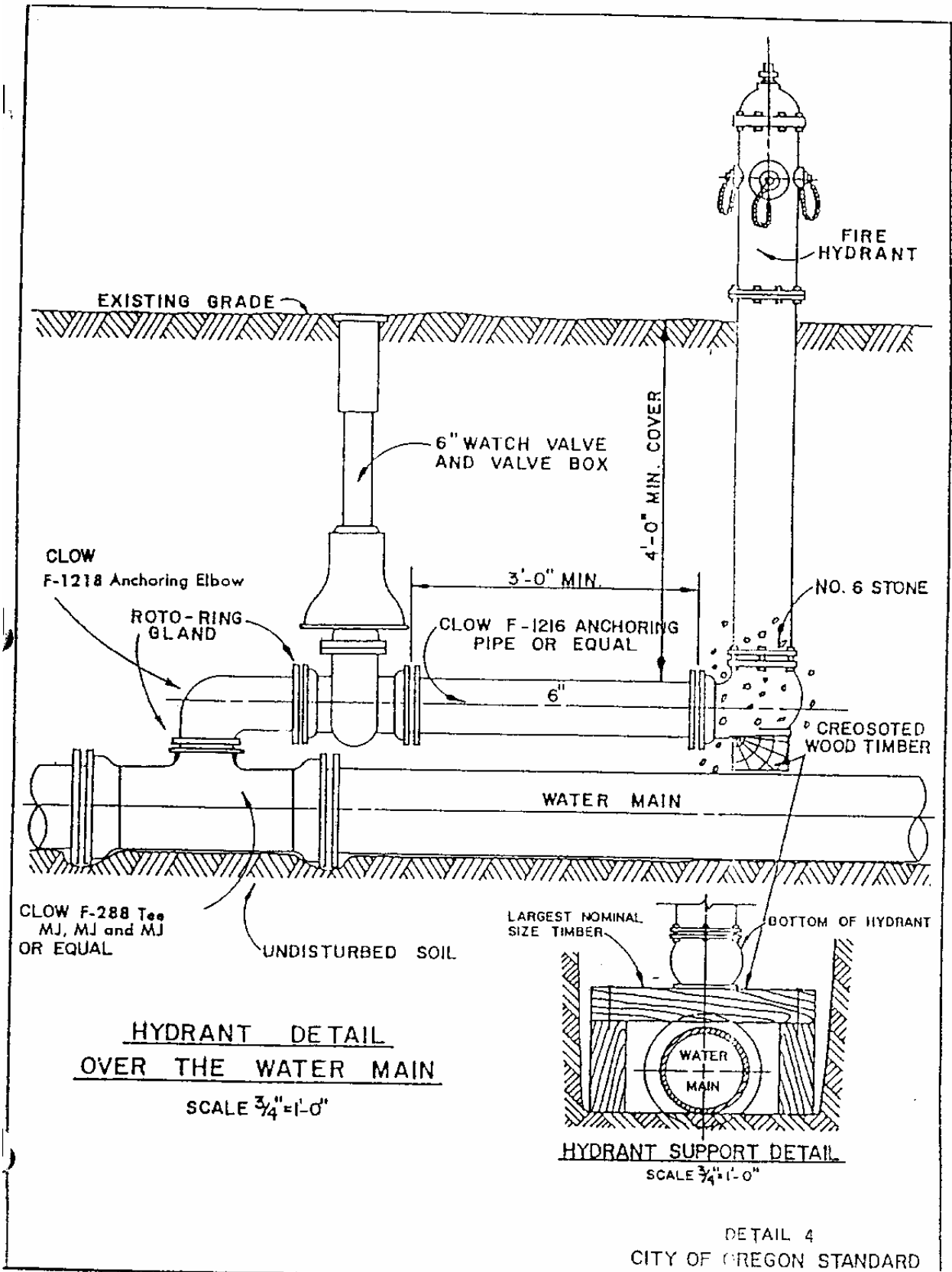


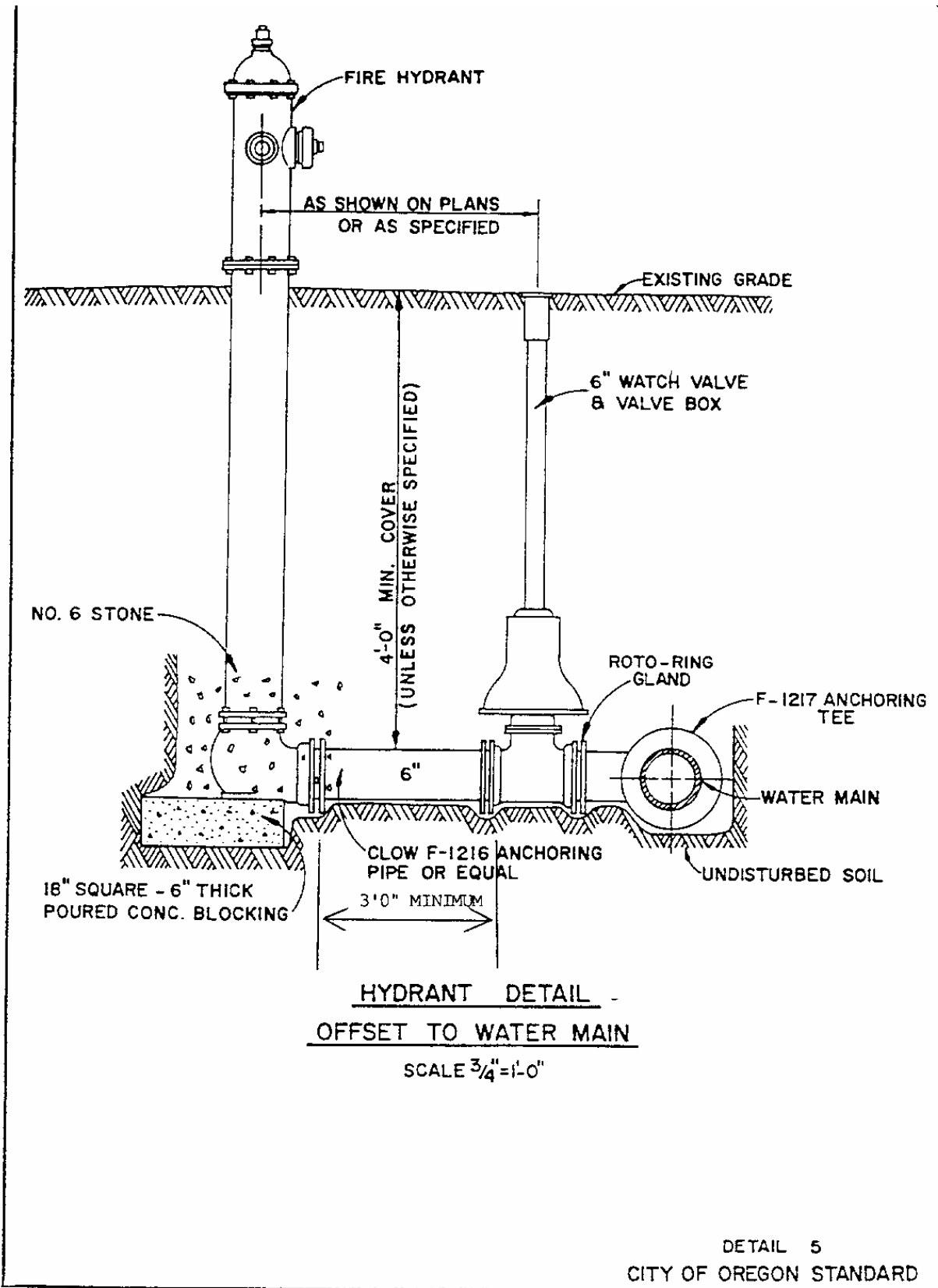
- REINFORCING STEEL
- FOR LOCATION IN ROADWAY
- * 6 DIAGONAL BARS IN BOTTOM
 - * 6 BARS 8" EA. WAY TOP & BOTT.
- FOR NORMAL LOCATION
- * 4 DIAGONAL BARS IN BOTTOM
 - * 4 BARS 8" EA. WAY TOP & BOTT.

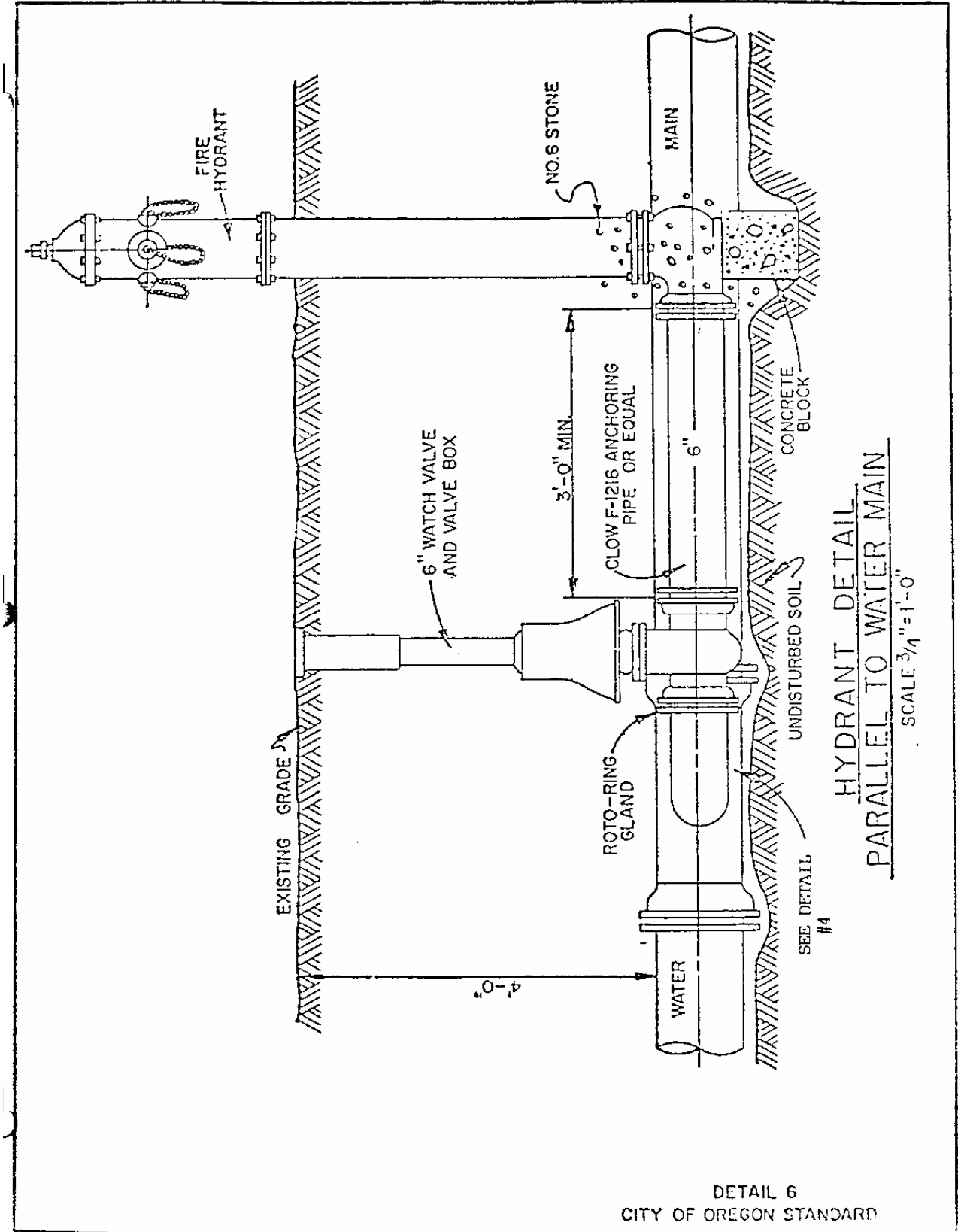
GATE VALVE IN MANHOLE

SCALE: $\frac{3}{8}$ " = 1'-0"

DETAIL 3
CITY OF OREGON STANDARD







HYDRANT DETAIL
 PARALLEL TO WATER MAIN
 SCALE 3/4" = 1'-0"

DETAIL 6
 CITY OF OREGON STANDARD

**CITY OF OREGON
DIVISION OF WATER**

Water Line Number _____ Public _____ Private _____
 Location _____ Between _____ And _____
 Subdivision _____

Total Footage of 8" Pipe _____ No. of Hydrants _____
 Total Footage of 10" Pipe _____
 Total Footage of _____ " Pipe _____ Main Line Valves _____

$SD(P)^2$ (L = The allowable leakage in gallons per hour; S = Length of pipe tested in feet; D = The nominal diameter of the pipe in inches; P = The average test pressure in PSI.) L = _____
 L= -----
 133,200 Prior to digging Contact Oregon Water Dept. 698-7038

Inspector _____
 Engineer _____
 Owner _____
 Contractor _____

PRESSURE TEST

Line originally Filled - Date _____
 Line pumped to 150 PSI for 18 hour Test Date _____ Time _____ AM/PM
 Line Refilled for Pressure Test Date _____ At _____ AM/PM to 150 PSI
 Minimum Test: Two hours at 150 PSI (minimum of 18 hours after filling for PSI test)
 Gallons required for two hours at 150 PSI Minimum.

Line Passed _____ Line Failed _____
 Attended By: _____

DISINFECTION / FLUSHING

Type of Disinfectant _____ Date Disinfected _____
 Concentration of Disinfectant _____ mg/LCl⁻ Date Flushed _____
 Chlorine concentration after Flushing _____ mg/L Gallons Flushed _____ gal
 Line Flowed at _____

LABORATORY RESULTS

Sample Location	Lab No.	Date Collect /Init.	Date Analyze	Time Collect	Time Analyze	Total Coli. NEG	Total Coli. POS	Anal-lyst

Approved: 1. _____ Date _____
Superintendent of Water Treatment
 2. _____ Date _____
Director of Public Service

Chemical - Bacteriological Results

First Samples taken on
Date _____

Location	PA	TA	TH	NCH	Turb	pH	CL ₂	Cl ₂	"F"	Total Coli	
							Free	Total		Neg	Pos
_____	_____	_____	_____	_____	_____	_____	_____	_____	_____	_____	_____
_____	_____	_____	_____	_____	_____	_____	_____	_____	_____	_____	_____
_____	_____	_____	_____	_____	_____	_____	_____	_____	_____	_____	_____

Second Samples taken on
Date _____

Location	PA	TA	TH	NCH	Turb	pH	CL ₂	Cl ₂	"F"	Total Coli	
							Free	Total		Neg	Pos
_____	_____	_____	_____	_____	_____	_____	_____	_____	_____	_____	_____
_____	_____	_____	_____	_____	_____	_____	_____	_____	_____	_____	_____
_____	_____	_____	_____	_____	_____	_____	_____	_____	_____	_____	_____

Comments: _____

Sampling Layout