

TECH. SPECS / MATERIALS

Revised March 2015

A-1 GENERAL

Developer/Contractor shall furnish all materials necessary for construction of the water system. North City Water District will provide and install all meters upon acceptance of the water system.

Any products used to coat, line, seal, or patch surfaces that contact water (i.e. paint, pipe liners, interior tank coatings, etc.) or any products that come in contact with water in the distribution system (i.e. pipes, fittings, valves, etc.) must comply with ANSI/NSF Standard 61 Drinking Water System Components.

In addition, all products used in the construction of the water system must be pre-approved by the District and shall be manufactured in the United States of America. The District reserves the right to approve or disapprove the use of foreign made materials.

Reference herein is made to standards, tests, methods and specifications of research and technical organizations as follows:

ASTM American Society for Testing Materials
AWWA American Water Works Association
ANSI American National Standards Institute

Reference to ASTM, AWWA or ANSI shall be understood to mean, in all cases, the standard or specification of latest revision unless otherwise stated in the Detail specifications.

A-2 DUCTILE-IRON PIPE

A-2.1 Mechanical Joint Pipe:

Mechanical joint ductile iron pipe shall conform to AWWA C151 and shall be thickness Class 52. The pipe shall be standard thickness cement-mortar lined conforming to the requirements of AWWA C104 and shall be as manufactured by US Pipe & Foundry Company, American Pipe, Griffin Pipe Products, Pacific States Cast Iron Pipe Company or approved equal. Each length shall be plainly marked with the manufacturer's identification, year cast, class of pipe, and weight. Joints shall conform to AWWA C111. Joint accessories shall be furnished with the pipe. Bolts and nuts shall be coated with TRI PAC 2000 Blue Coating System. Pipe with diameters of 12-inches and smaller shall have a wall thickness of Class 52. Pipe with diameters of 13-inches and larger shall have a wall thickness of Class 50.

A-2.2 Push-on Joint Pipe:

Push-on ductile iron pipe shall conform to AWWA C151 and shall be thickness Class 52. The pipe shall be cement-mortar lined conforming to the requirements of AWWA C104 and shall be as manufactured by US Pipe & Foundry Company, Griffin Pipe Products, American Pipe, Pacific States Cast Iron Pipe Company or approved equal. Joints shall conform to AWWA C111, and shall be "Tyton" joint as manufactured by US Pipe & Foundry Company and by Pacific States Cast Iron Pipe Company or approved equal. The rubber ring gasket shall be suitable for the specified pipe sizes and pressures, and shall be furnished with the pipe. A non-toxic vegetable soap lubricant shall be supplied in sufficient quantities for installing the pipe furnished. Fastite as manufactured by the American Pipe may be substituted for "Tyton" joint pipe. Pipe with diameters of 12-inches and smaller shall have a wall thickness of Class 52. Pipe with diameters of 13-inches and larger shall have a wall thickness of Class 50.

A-2.3 Flanged Joint Pipe:

Flanged ductile iron pipe shall conform to AWWA C115 and shall have a minimum thickness Class 52. The pipe shall be cement-mortar lined conforming to the requirements of AWWA C104 and shall be as manufactured by US Pipe & Foundry Company and by Pacific States Cast Iron Pipe Company or approved equal. Bolts, gaskets, and installation shall be in accordance with the Appendix of AWWA C115. Bolts and nuts shall be coated with TRI PAC 2000 Blue Coating System. Flanges shall be ductile iron. Pipe with diameters of 12-inches and smaller shall have a wall thickness of Class 52. Pipe with diameters of 13-inches and larger shall have a wall thickness of Class 50.

A-2.4 Restrained Joint Pipe:

Restrained joint ductile iron pipe shall conform to AWWA C151 and shall be thickness Class 52. The pipe shall be cement-mortar lined conforming to the requirements of AWWA C104 and shall be as manufactured by US Pipe & Foundry Company and by Pacific States Cast Iron Pipe Company or approved equal. The pipe shall be furnished with spigot ends and push-on joint bells suitable for transmitting the thrust created by a dead-end condition based on pipe diameter and a pressure of 150 psi. Restrained push-on joints shall be TR-Flex joint as manufactured by the US Pipe & Foundry Company, Thrust-Lock as manufactured by Pacific States Cast Iron Pipe Company, or approved equal. All restraint ears, locking rings, etc. shall be installed. Restrained mechanical joints shall use joint restraint glands as specified in Section A-5 of these Specifications.

The use of restrained joint gaskets will not be allowed by the District. Pipe with diameters of 12-inches and smaller shall have a wall thickness of Class 52. Pipe with diameters of 13-inches and larger shall have a wall thickness of Class 50.

A-3 DUCTILE-IRON FITTINGS

A-3.1 Flanged Fittings:

Flanged ductile iron fittings shall conform to AWWA C153 and C110. Flanges shall have bolt circles and bolt holes matching those of ANSI B16.1. Unless otherwise noted, the pressure rating of fittings shall be 250 psi. Flange thickness shall be uniform on full circumference of flange and thickness as specified in AWWA C153, Table 12. Bolts for joining cast iron flanges shall be carbon steel of at least Grade 5 with American Standard Regular unfinished hexagon heads and the nuts shall be of steel with American Standard Regular hexagon dimensions, all as specified in American Standard for Wrench Head Bolts and Nuts (ASME B18.1). Bolts and nuts shall be coated with TRI PAC 2000 Blue Coating System. All bolts and nuts shall be threaded in accordance with American Standard for Screw Threads (ASME B1.1.), Coarse Thread Series, Class 2A and 2B fit. Gaskets shall be rubber Flange-Tyte (Ring Style) as manufactured by the US Pipe & Foundry Company or approved equal. Cement-mortar lining is required on all fittings. Fittings shall be as manufactured by Tyler, US Pipe & Foundry Company, American, Griffin Pipe Products or an approved equal.

A-3.2 Mechanical Joint Fittings:

Mechanical joint ductile iron compact fittings shall conform to AWWA C153 and C110. Joints shall conform to AWWA C111. Joint accessories shall be furnished with the fittings. Bolts shall be low-alloy steel or ductile iron in accordance with AWWA C111. Fittings must be cement-mortar lined in accordance to AWWA C104. Fittings shall be as manufactured by Tyler, US Pipe, American, Griffin Pipe Products or an approved equal.

A-4 COUPLINGS

All couplings shall meet current AWWA Standards. Solid sleeve pipe couplings shall be long pattern sleeves constructed of ductile iron with a minimum pressure rating of 250 psi working pressure. All center and end rings shall be ductile iron on 4" and larger pipe and meet acceptable ASTM Standards except where specifically stated otherwise. Followers shall be ductile iron ASTM A536 and gaskets shall be made of materials compounded for water service. Nuts and bolts shall be corrosion resistant, high strength, low-alloy steel with heavy hex nuts, meeting requirements of AWWA C111 (ANSI-A21.11). Couplings shall be as manufactured by Smith Blair, Romac 501, Ford, or approved equal.

A-5 JOINT RESTRAINT GLANDS

Joint restraint glands used for thrust anchorage in place of regular cast iron mechanical joint glands shall be ductile iron mechanical joint Megalug, as manufactured by EBAA Iron, Roma Grip by Romac, Ford 1400 Series Restraint Gland, or approved equal. The minimum number of set screws by size of gland shall be as follows:

4-inch - 2	10-inch - 6	16-inch - 12	24-inch - 16
6-inch - 3	12-inch - 8	18-inch - 12	
8-inch - 4	14-inch - 10	20-inch - 14	

A-6 POLY PIGS

"Poly Pigs" shall be constructed of flexible open cell polyurethane foam. They shall be able to pass through reductions of up to 60% of cross sectional area of nominal pipe. They shall have the ability to negotiate short radius bends, 90° elbows, tees, crosses, wyes, gate valves, ball valves, multi-dimensional piping and reduced port valves. "Poly Pigs" shall be a municipal series, bare type, 5-7 lbs per cubic foot density, and generally be for a light cleaning or gauging application.

A-7 LOCATOR TAPE AND TRACER WIRE

A-7.1 Detectable Locator Tape:

Locator tape shall consist of a minimum 4.0 mil thickness, inert polyethylene plastic which is impervious to all known alkalis, acids, chemical reagents and solvents likely to be encountered in the soil, with a minimum 1/3-mil metallic foil. The tape shall be at least three inches (3-inch) in width and shall be solid blue with identifying print in black letters. The tape shall have printed thereon the following or similar as commercially available:

"CAUTION - BURIED WATERLINE BELOW"

The identifying lettering shall be minimum 1-inch high and repeated continuously the full length of the tap. In no instance shall the spacing of the individual segment of the identifying message be greater than eighteen inches (18-inch).

Detectable locator tape shall be installed 24-inches above the pipe it identifies. The backfill shall be sufficiently leveled so that the tape will be installed on a flat surface. The tape shall be centered in the trench and laid flat with printed side up. Caution shall be exercised to avoid displacement of tape and to ensure its integrity. The remainder of the trench is then backfilled in accordance with applicable specifications.

A-7.2 Tracer Wire:

All non-metallic water main and water services shall have tracer wire installed above the pipe. Tracer wire shall consist of jacketed 12 gauge solid copper wire. Tracer wire shall be continuous from valve box to valve box and along water services from the main to the meter box. Enough slack shall be provided in each valve box or meter box to allow the wire to be extended above the ground surface. All wires shall be tested for continuity following installation and backfill.

The District may require the use of Tracer wire in other situations such as the installation of transmission mains.

A-8 GATE VALVES & TAPPING VALVES

Gate valves shall be 4-inch to 12-inch and shall conform to AWWA C509. The valves shall be epoxy coated, ductile iron-bodied, resilient-seated with a full rubber encapsulated wedge and floating stem nut. Valves shall be non-rising stem with flanged ends or mechanical joint as shown. The operating stem shall be bronze with O-ring stem seals. The valve shall open when turned counter-clockwise and shall be equipped with a 2-inch-square operating nut. Valves installed above ground shall be equipped with a hand-wheel. All valves with mechanical joint connection shall be furnished with ductile iron nuts, bolts, glands and gaskets for mechanical joint connections. All valves shall have the manufacturer and date cast on the body. Resilient seated gate valves shall be Kennedy, Clow, M&H, Mueller, or equal.

A-9 BUTTERFLY VALVES

Butterfly valves shall be used for valves 14-inches and larger. Butterfly Valves shall be short bodied flanged or wafer type or mechanical joint ends when placed underground. They shall be epoxy coated and lined, rubber seated type and shall conform to AWWA C504, Class 150B, unless otherwise approved and noted. Butterfly valves shall be furnished with iron bodies. Flanges shall be drilled in accordance with ANSI-125 lb. standard. Mechanical joint ends shall conform to AWWA C111. Butterfly valves shall be suitable for direct burial and shall have direct burial, totally enclosed, integral manual operators which shall be fully gasketed and grease-packed and designed to withstand submersion in water to a pressure of 10 psi. The valves shall open with a counter-clockwise rotation of a 2-inch nut.

THE MINIMUM NUMBER OF TURNS FROM CLOSED TO OPEN POSITION SHALL BE NOT LESS THAN TWO TURNS PER INCH OF VALVE SIZE.

Only the following valves will be accepted: M & H, Kennedy, Pratt and Mueller

A-10 TAPPING SLEEVES

Tapping sleeves shall be used for all cast iron pipe and ductile iron pipe sizes 4-inch through 12-inch. Tapping saddles will not allowed. Sleeves shall be U.S. Pipe T-28 Dual compression seal, Kennedy Valve Manufacturing Co. MJ tapping sleeve, Mueller Tapping Sleeve, ROMAC FTS-420, Smith Blair 622, JCM 412, and Tyler. All tapping sleeves shall have a test plug.

When tapping an existing cast iron waterline, the tapping sleeve shall be mechanical joint type manufactured by the Mueller C., M&H, Clow, Smith Blair 623 or approved equal.

All connections to a cement-lined and coated pipe will be made by North City Water District with cooperation and assistance from the Developer/Contractor on excavation, backfill, temporary plating, and traffic control. See North City Water District Standard Detail No. 1.

Developer/Contractors making hot taps onto existing District lines shall hire a District approved Contractor to perform the tap.

The hot tapping Contractor shall;

- (1) Specialize in hot tapping as a core business and shall have been in business and providing hot taps for a minimum of ten (10) years.
- (2) Be fully experienced and properly qualified, licensed, equipped, organized and financed.
- (3) Have successfully completed at least ten (10) hot tapping projects on 8-inch and larger water mains within the last two years.

The following Contractors are approved by the District.

- (1) Superior Tapping, or approved equal.

In addition, the foreman supervising the work in the field shall have at least five (5) years experience with supervising this type of work, including operating hot tapping equipment.

Information verifying the hot tapping Contractor's qualifications and experience shall be submitted to the District prior to the commencement of the work.

A-11 VALVE BOXES

Valve boxes shall be the three-piece sliding adjustable type consisting of a lid, box section, and steel casing extension. Valve box and lid shall be made of ductile iron and shall be No. 931 as manufactured by Olympic Foundry. The valve box lid shall be labeled "Water" and shall fit the valve box snugly and shall not rock on its seat. The steel well casing shall be of 12-gauge wall thickness, with outside diameter of 6 inches WSP bare or approved equal. The steel well casing shall be within 6" of finished grade. See North City Water District Standard Detail No. 27.

A-12 VALVE STEM EXTENSIONS

Provide stem extension for all valves with operating nut more than 4-feet below grade to raise operating nut to within 36 to 24-inches of the ground surface. Stem extension shall be a minimum of 1 foot long with standard 2-inch square by 2-inch high operating nut and self centering rockplate support. See North City Water District Standard Detail No. 27.

A-13 FIRE HYDRANTS

A-13.1 Fire Hydrant Assemblies:

Fire hydrant assemblies shall include the fire hydrant, auxiliary gate valve, valve box, and materials for anchorage such as mechanical joint restraint glands, and shall be as follows or as otherwise specified in the North City Water District's Standard Details

A-13.2 Fire Hydrants:

Fire hydrants shall be of the compression type conforming to AWWA C502 and shall have 5-inch valve opening with 6-inch mechanical joint and connection. The hydrant shall have a 1¼-inch operating nut, shall open when turned counter-clockwise and shall have two 2½-inch hose nozzles and one pumper connection. The nozzles and operating nut shall be National Standard.

The pumper nozzle shall be 5¼-inch size with national standard thread and shall be equipped with a 5" Storz adapter for Shoreline or a 4-inch Storz adapter for Lake Forest Park. The Storz fitting shall be installed after pressure testing of the system. The two 2½-inch nozzles shall be fitted with cast iron threaded caps with operating nuts of the same design and proportions as the hydrant operating nut. Caps shall be threaded to fit the corresponding nozzles and shall be fitted with suitable neoprene gaskets for positive water tightness under test pressures

All hydrants shall have corrosion resistance protection on the interior of the hydrant shoe; coating shall conform to AWWA C550. The exterior of all hydrants shall be painted per the requirements of Item A-15. The depth of bury of the hydrants shall be such that when the hydrant is set at the grade indicated on the plans that the ground line marked on the hydrant shall be at the sidewalk or ground surface. Mechanical joint and flanged ends shall have full wall ductile iron thickness elbow that is equal to the AWWA C-509 flange standard.

Hydrants shall be manufactured by American Darling Manufacturing Company (B-62-B), Clow Corporation (Medallion), Mueller Company (A-423), and AVK (2780).

A-13.3 Fire Hydrants Auxiliary Valves:

The fire hydrant auxiliary valves shall have mechanical joint ends and shall be gate valves conforming to Item A-8. The auxiliary valve shall be located adjacent to the hydrant branch tee which shall have a swivel branch.

A-13.3 Valve Box for Fire Hydrant Auxiliary Valves:

The valve boxes for the fire hydrant auxiliary valves shall conform to Item A-11.

A-14 FIRE HYDRANT GUARD POSTS

When required, fire hydrant guard posts shall be precast reinforced concrete posts, 9-inches in diameter by six feet long constructed with concrete having a minimum strength of 3500 psi. Reinforcing shall consist of a minimum of five No. 3 deformed steel bars.

A-15 PAINT FOR FIRE HYDRANT AND POSTS

Fire hydrants, hydrant valve lids, and bollards shall be painted with (2) coats of Kelly Moore Safety Yellow Luxlite Q.D. Alkyd Gloss Enamel #5880-563 or Pitt-Tech 90-330 Safety Yellow.

A-16 AIR AND VACUUM RELIEF ASSEMBLIES

The materials for the air and vacuum relief assemblies shall be as illustrated in the North City Water District's Standard Details No. 21 and 22. Air relief valves shall be designed to operate with potable water under pressure to allow entrapped air to escape from the pipeline. Body and cover shall be cast iron conforming to ASTM A126, Class 30. Floats and internal parts shall be stainless steel conforming to ASTM A240 and designed to withstand 1,000 psi pressure. Seats shall be Buna N rubber and internal parts shall be stainless steel or bronze.

Valves shall be designed to withstand 300 psi pressure with normal operating pressure under 100 psi and shall be manufactured by Crispin A111145 UL10, Val-Matic 201C.2 SV or an Approved equivalent.

Vaults for air and vacuum relief valves shall be (2) Old Castle FL-30 meter boxes stacked with Old Castle FL-30 lid per the North City Water District's Standard Detail No. 21 and 22.

A-17 5/8 x 3/4-INCH CUSTOMER SERVICE CONNECTION

The materials for 5/8 x 3/4-inch service connection installations shall be as shown on the North City Water District's Standard Detail No. 7 and as further described herein. **All Brass shall be LOW LEAD.**

A-17.1 Copper Tubing:

Copper tubing shall be 1-inch Type "K" soft, domestic made with a minimum pressure rating of 150 psi and conform to AWWA C-800-05 Appendix A specifications.

A-17.2 Corporation Stop:

The corporation stop shall be 1-inch Corporation Stop (CCTH x C-Comp) as manufactured by Mueller (B-25008N) or Ford Quick Joint (FB1000-Q.)

A-17.3 Angle Meter Valve:

The meter valve shall be 5/8 x 3/4 x 1-inch (C-comp x Yoke) as manufactured by Mueller (B-24273-3N) with 360 Degree Rotation.

A-17.4 Meter Yoke:

Meter Yoke shall be 5/8 x 3/4-inch Yoke Bar as manufactured by A Y McDonald (14-2.)

A-17.5 Meter Yoke Expansion Connection:

Meter Yoke expansion connection shall be as manufactured by Ford (EC-23), Mueller (H-14234N) or A Y McDonald (14-2E.)

A-17.6 Customer Valve:

The customer valve shall be 3/4 x 1-inch (Yoke x FIP) as manufactured by Ford (B-91-324W / HH-34.)

A-17.7 Meter Box and Lid:

Meter boxes shall be as manufactured by Old Castle Products (FL12) with Old Castle (B-12GP) or (FL 12 GP) lid.

A-18 1-INCH CUSTOMER SERVICE CONNECTION

The materials for 1-inch service connection installations shall be as shown on the North City Water District's Standard Detail No. 8 and as further described herein. **All Brass shall be LOW LEAD.**

A-18.1 Copper Tubing:

Copper tubing shall be 1-inch Type "K" soft, domestic made with a minimum pressure rating of 150 psi and conform to AWWA C-800-05 Appendix A specifications.

A-18.2 Corporation Stop:

The corporation stop shall be 1-inch Corporation Stop (CCTH x C-Comp) as manufactured by Mueller (B-25008N) or Ford Quick Joint (FB1000-Q.)

A-18.3 Angle Meter Valve:

The meter valve shall be 1-inch (C-comp x Yoke) as manufactured by Mueller (B-24273-3N) with 360 Degree Rotation.

A-18.4 Meter Yoke:

Meter Yoke shall be 1-inch Yoke Bar as manufactured by A Y McDonald (14-4.)

A-18.5 Meter Yoke Expansion Connection:

Meter Yoke expansion connection shall be as manufactured by Ford (EC-4), Mueller (H-14234N) or A Y McDonald (14-2E.)

A-18.6 Customer Valve:

The customer valve shall be 1-inch (Yoke x FIP) as manufactured by Ford (B-91-344W / HH-34.)

A-18.7 Meter Box and Lid:

Meter boxes shall be as manufactured by Old Castle Products (FL30) with Old Castle (B-30Gp or FL-30GP) lid.

A-19 1 1/2-INCH CUSTOMER SERVICE CONNECTION

The materials for 1½ -inch service connection installations shall be as shown on the North City Water District's Standard Detail No. 9 and as further described herein. All Brass shall be LOW LEAD.

A-19.1 Copper Tubing:

Copper tubing shall be 2-inch Type "K" soft, domestic made with a minimum pressure rating of 150 psi and conform to AWWA C-800-05 Appendix A specifications. Fittings and couplings (if necessary) shall be as manufactured by Mueller.

A-19.2 Corporation Stop:

The corporation stop shall be 2 inch Ball Corporation Stop (MIP x C-Comp) as manufactured by Mueller (B-25028N.)

A-19.3 Service Saddle:

Service saddle for connection to main shall be as manufactured by Smith Blair or Romac Industries. Saddles shall be epoxy coated w/ stainless steel (SS) straps.

A-19.4 Angle Meter Valve:

Shall be per current District Standard

A-19.5 Customer Valve:

The customer valve shall be 2-inch gate valve with brass handle as manufactured by Nibco T-113.

A-19.6 Meter Box and Lid:

Meter boxes shall be as manufactured by Old Castle Products (FL36) with Old Castle (B-36GP or FL-36GP) lid

A-20 2-INCH CUSTOMER SERVICE CONNECTION

The materials for 2-inch service connection installations shall be as shown on the North City Water District's Standard Detail No. 10 and as further described herein. **All Brass shall be LOW LEAD.**

A-20.1 Copper Tubing:

Copper tubing shall be 2-inch Type "K" soft, domestic made with a minimum pressure rating of 150 psi and conform to AWWA C-800-05 Appendix A specifications. Fittings and couplings (if necessary) shall be as manufactured by Mueller.

A-20.2 Corporation Stop:

The corporation stop shall be 2-inch Ball Corporation Stop (MIP x C-Comp) Low Lead as manufactured by Mueller (B-25028N)

A-20.3 Service Saddle:

Service saddle for connection to main shall be as manufactured by Smith Blair or Romac Industries. Saddles shall be epoxy coated w/ stainless steel (SS) straps.

A-20.4 Angle Meter Valve:

The Angle Meter Valve Shall be 2-inch (C-Comp x Mtr Flange) Low Lead as manufactured by Mueller (B-24276-3N) with 360 Degree Rotation..

A-20.5 Customer Valve:

The customer valve shall be 2-inch gate valve with brass handle as manufactured by Nibco T-113.

A-20.6 Meter Box and Lid:

Meter boxes shall be as manufactured by Old Castle Products (FL36) with Old Castle (B-36GP or FL-36GP) lid.

A-21 FOUNDATION GRAVEL

Foundation gravel Class A shall be coarse graded gravel and shall comply with the requirements of Section 9-03.17 of the WSDOT Standard Specifications.

A-22 PIPE BEDDING

Pipe bedding materials shall be crushed surfacing top course meeting the requirements of Section 9-03.9(3) of the WSDOT Standard Specifications.

A-23 GRAVEL BACKFILL

Gravel backfill shall consist of naturally occurring or screened gravel. It shall be essentially free from wood, roots, bark, or other extraneous material. It shall have such characteristics of size and shape that it will compact readily to a firm, stable course.

Gravel backfill shall be crushed surfacing top course meeting the requirements of Section 9-03.9(3) of the WSDOT Standard Specifications.

A-24 CONTROLLED DENSITY FILL (CDF)

Controlled Density Fill (CDF) shall conform to the requirements of Section 2-09.3(1)E of the WSDOT Standard Specifications.

A-25 ASPHALT CONCRETE

Asphalt concrete shall conform to the requirements of the local agency having jurisdiction. At a minimum, asphalt concrete shall be Class B or Hot Mix Asphalt (HMA) asphalt concrete and shall conform to Section 5.04 of the Standard Specifications for Road, Bridge, and Municipal Construction.

CONSTRUCTION METHODS

CM-1 CONSTRUCTION PROGRESS

It is the intent that the progress of the work shall be in a systematic manner resulting in as little inconvenience as possible to the public throughout the course of construction. It is necessary, therefore, that the Developer/Contractor confine his operations to a length that is feasible for the given crew size. Except by written permission of the North City Water District, at no time shall the trenching equipment be farther than 200 feet ahead of each pipe laying crew. Backfill of the trench shall be accomplished so that no section of approved pipe shall be left open longer than 48-hours except by written permission of the North City Water District.

The Developer/Contractor shall complete the progression of backfill and clean-up as each section of pipe has been inspected and approved. The Developer/Contractor shall repair and regrade all existing drainage ditches, natural drainage courses and all other drainage facilities including culverts damaged or removed during the construction.

The Developer/Contractor shall reopen streets, roads and driveways to the public as soon as practical. No road-way shall be closed while work is suspended over weekends or holidays. Where private accesses are to be closed, the property owner shall be notified by the Developer/Contractor at least 24-hours in advance of the closure. Access for fire and emergency equipment shall be maintained at all times.

CM-2 TRENCH EXCAVATION AND BACKFILL

Trench excavation shall be unclassified. The terms earthwork or excavation shall include all materials excavated or removed regardless of material characteristics. The Developer/Contractor shall estimate the kind and extent of the materials which will be encountered in the excavation.

CM-2.1 Line and Grade:

All trenches shall be dug to true line and smooth bottom grades. Surface grading, including cut, fill and compaction, shall be accomplished prior to trench excavation. In pavement sections, grading to subgrade may be sufficient for areas to be newly paved. The trench width from the bottom of the trench to the crown of the pipe shall not exceed the following:

Maximum Trench Width

6-inch Pipe - 30-inches

Maximum Trench Width

8-inch Pipe	-	30-inches
10-inch Pipe	-	36-inches
12-inch Pipe	-	36-inches
16-inch Pipe	-	42-inches
18-inch Pipe	-	48-inches
24-inch Pipe	-	48-inches

When necessary for proper pipe bedding, or as directed by the District, the trench shall be extended below the pipeline grades to permit the placing of foundation gravel. All unsuitable material shall be removed and disposed of by the Developer/Contractor. All areas of over excavation, required to remove unsuitable material, or for any other reason, shall be brought to grade with approved foundation gravel, and compacted.

The trench bottom shall form a continuous and uniform bearing and support for the pipe on bedding material at every point between bell holes, except that for a maximum distance of 18" near the center of the pipe, the bedding may be disturbed for the removal of lifting tackle. Where the trench is excavated in rock it is especially important that a minimum of three (3) inches of bedding material be used to obtain uniform bearing and support for the pipe.

The root systems of all trees which are located within the right-of-way and/or on or near the easements shall not be cut or disturbed, but shall be tunneled or otherwise protected by the Developer/Contractor to ensure that no damage is done.

CM-2.2 Pavement Removal:

Unless otherwise noted, where trenches are to be dug through paved streets or driveways, the pavement shall be cut to a straight line on each side of the trench with a pavement saw or other approved equipment. The Developer/Contractor shall conduct the pavement removal operations as to cause the minimum damage possible to the adjacent pavement.

CM-2.2 Pipe Cover:

Minimum cover over all water lines shall be 36-inches over the top of the pipe for 10-inch mains and smaller; 48-inches over the top of mains greater than 10-inches. Maximum cover shall be 6 feet, unless otherwise authorized by the North City Water District. Deeper excavation may be required due to localized breaks in grade, or installing the new main under existing culverts and/or other utilities where necessary.

CM-2.2 Shoring, Sheeting and Bracing of Trenches:

The Developer/Contractor alone shall be responsible for worker safety, and the District assumes no responsibility.

All shoring sheet or bracing required to perform and protect the trench and to safeguard the employees, shall be designed and furnished by the Developer/Contractor. Where sheeting and bracing are used, trench widths shall be increased accordingly. All shoring, sheeting or bracing shall remain in place until the pipe has been placed and the backfill around the pipe compacted to a depth of four inches over the top of the pipe. No timber bracing, lagging, sheathing or other lumber shall be left in any excavation except with the permission of the District.

All shoring, sheeting and bracing of trenches shall be per current OSHA Standards, WSDOT Section 2-09.3(3)D and Part N of the Washington Administrative Code (WAC) 296-155.

CM-2.2 Pipe and Utility Crossings:

The Washington State Department of Health and the Washington State Department of Ecology require a 10-foot horizontal separation between all sanitary sewer lines, reclaimed water lines and potable water lines when laid horizontally, and an 18-inch separation, measured from outside pipe edge to outside pipe edge, for perpendicular and oblique crossings. Situations occurring with less than the minimum separation will require construction in accordance with Section C1-9.1 of the "Criteria for Sewage Works Design" as published by the Washington State Department of Ecology as revised August 2008.

Where it is necessary to cross sanitary sewer or storm sewer lines, trench backfill shall 100% imported Crushed Surfacing to provide uniform support for the pipe. This backfill shall extend a minimum of 3 feet each way from the centerline of the pipe which is being crossed.

A 5-foot minimum horizontal separation shall be maintained between water facilities and all other utilities such as underground power, gas and telephone facilities, unless otherwise approved.

CM-2.2 Removal of Water:

The Developer/Contractor shall furnish and maintain all equipment necessary to dewater the trench and dispose of all water entering the trench excavation during the time that the trench is being prepared for pipe laying, during the laying of pipe, and for such additional time as may be required for the setting or hardening of joint materials. In addition, the trench shall remain free of water during the

time that the backfill is being placed and at such other times as may be directed by the District. All water lines, new or existing, shall be protected at all times against the intrusion of any foreign material including groundwater. The Developer/Contractor shall dispose of water removed from the trench in a suitable manner without damage to adjacent property.

CM-2.2 Piling of Excavated Material:

All excavated material shall be piled in a manner that will not endanger the work and that will avoid obstructing sidewalks and driveways. Hydrants under pressure, valve boxes, meter boxes, or other utility controls shall be left unobstructed and accessible through the work period. Gutters and other drainage courses shall be left clear or other satisfactory provisions shall be made to divert street drainage. Natural water courses shall not be obstructed and erosion control measures shall be installed which adequately protect stockpiled material.

CM-2.2 Bedding:

Pipe bedding shall consist of 3-inches of material specified in Item M-22 hereof and shall be placed in the bottom of the trench to provide a means of uniform pipe support. At the location of each joint, bell (joint) holes shall be dug in the bedding as necessary to permit the joint to be made properly and to properly support the full length of the pipe in the bedding.

CM-2.2 Pipe Zone:

Pipe zone shall be defined as the area of the trench from the top of the bedding to 6-inches over the top of the pipe. Bedding material shall be as specified in Item M-23 hereof and shall be placed in the pipe zone of all trenches.

CM-2.2 Trench Backfill:

Pipe bedding and initial pipe-zone backfill up to 6-inches over the top of the pipe shall be completed before subsequent trench backfilling procedures are started. During backfilling operations, the Developer/Contractor shall take all necessary precautions to protect the pipe from any damage, movement or shifting.

The entire depth of the trench shall be backfilled with material as specified in Item M-23 hereof (5/8" minus Crushed Surfacing). Backfill material shall be compacted by mechanical compaction to 95% of maximum density, per ASTM D-698, to finished grade in all locations, and shall be in accordance with applicable City requirements in all City rights-of-way.

Backfill material shall be placed in layers not exceeding 12-inches in loose depth and each layer thoroughly compacted with a vibratory compactor that compacts

granular material by a combination of weight, vibration, and impact. The Developer/Contractor shall be responsible for providing the proper size and type of compaction equipment and selecting the proper method of utilizing said equipment to attain the required compaction density. In all cases, equipment shall be selected and used so as to not damage the pipe or other utilities and structures.

At a minimum, two passes over each layer shall be made with the vibratory compactor at a speed not exceeding 60 linear feet per minute. It shall, however, remain the Developer/Contractor's responsibility to determine the amount of compaction in excess of the minimum required to prevent subsequent settlement of the backfill.

Any subsequent settlement of the finished surfacing during the one (1) year warranty period shall be the Developer/Contractor's responsibility and shall be promptly repaired by the Developer/Contractor at no cost to the North City Water District.

The Developer/Contractor shall remove and dispose of all excess excavated material by at his expense.

CM-2.2 Compaction Testing:

Compaction testing will be required for all backfilled trenches. A minimum of one testing location shall be chosen for each 200 feet of water main installed. A separate test shall be performed for each two (2) feet of depth. The Developer, or the Contractor, shall contract the services of a qualified and District approved geotechnical consultant to perform the compaction testing. All testing (and retesting) shall be at the Developer/Contractor's expense. Testing locations shall be chosen by the District's field inspector. Compaction results shall be furnished to the District prior to paving. Recompaction and retesting will be required for any tests which do not pass the compaction testing. Satisfactory compaction tests do not relieve the Developer/Contractor of the responsibility to provide trenches which will not fail. Subsurface settlements within the warrantee period will remain the responsibility of the Developer/Contractor.

Materials excavated from trenches may be used as backfill outside of paved areas that are within private property. However the materials excavated from the trench are not guaranteed to be suitable to meet the standards for trench backfill. Where original excavated material is unsuitable for trench backfill, imported gravel backfill shall be placed. The unsuitable material shall be removed by the Developer/Contractor to a disposal area, in accordance with City requirements.

CM-3 MAINTAINING ROAD, STREET AND DRIVEWAY ACCESS

The Developer/Contractor shall obey all rules and regulations of the applicable City, County, and State authorities regarding the closing of public streets or highways to the use of public traffic.

The Developer/Contractor's work shall be carried out so as to cause minimum disruption to traffic flow. Traffic must be kept open on those roads and streets where no detour is possible. The Developer/Contractor shall provide, erect, and maintain at all times during the progress or temporary suspension of the work, suitable barricades, fences, signs, danger lights, signals or other adequate protection per City standards. All traffic control devices shall meet City and WSDOT standards.

CM-4 PERMITS AND EASEMENTS

Where the trench lies within a City right-of-way the Developer/Contractor shall secure the applicable right-of-way permits from the City. Where the trench is to be dug within private property, the Developer/Contractor shall secure the necessary clearing and grading permits and the necessary easements prior to the start of construction. Easements shall be obtained, prepared and presented to the District as specified in the District's Water Service Extension Agreement.

Whether working in the right-of-way or an easement, the Developer/Contractor shall acquaint himself with the requirements of the permit or easement. In addition, the Developer/Contractor shall confine his operations to the area denoted within the permit or easement. At the conclusion of work within the right-of-way the applicable City shall provide written approval of the Developer/Contractor's work as complete and accepted. At the conclusion of work within easements, the Developer/Contractor shall obtain from the easement grantor a written release indicating that the work, and restoration of the property, has been satisfactorily completed in accordance with the terms of the easement. The Developer/Contractor shall notify the owners of these properties 48 hours in advance of the time when construction will be started.

CM-5 PIPE LAYING

CM-5.1 Preparation of Trench

The pipe trench shall be excavated per District Standards to the depth required so as to provide a uniform and continuous bearing and support for the pipe on solid compacted or undisturbed ground at every point between bell holes, see Section CM-2.

CM-5.1 Materials Handling

Pipe and associated materials shall be distributed on the job no faster than can be used in a timely manner. In general, no more than one week's supply of material shall be distributed in advance of the laying.

The Developer/Contractor shall provide proper implements, tools and facilities, satisfactory to the District, to be used for the safe and convenient prosecution of the work. All pipe, fittings, valves, and hydrants shall be carefully lowered into the trench, piece by piece, by means of a crane or other suitable equipment, in such a manner as to prevent damage to the pipeline materials and protective coatings and linings. Under no circumstances shall pipeline materials be dropped or dumped into the trench.

CM-5.1 Cutting Pipe

The cutting of pipe for inserting valves, fittings or closure pieces shall be done in a neat and workmanlike manner without damage to the pipe or lining and so as to leave a smooth end at right angles to the axis of the pipe.

Acceptable methods of cutting cast iron pipe are sawing with a band or powered hack saw or with a portable, gasoline engine driven abrasive saw. When approved by the District, cast iron pipe may also be cut by breaking with the use of rolling pipe cutters, hydraulically actuated cutters such as "Wheeler" cutters or with the use of a sledge and cold cutter.

Acceptable methods of cutting ductile iron pipe are only those done by sawing or milling. The flame cutting of cast iron or ductile iron pipe by means of an oxyacetylene torch shall not be allowed.

When mechanical joint or push-on joint pipe is cut in the field, it shall be cut as recommended by the pipe manufacturer, and the cut end shall be reconditioned so that it may be used for the next joint. On push-on joint pipe, the outside of the cut shall be ground back or dressed as recommended by the pipe manufacturer and approved by the District.

CM-5.1 Cleaning Pipe and Fittings

All lumps, blisters and excess coating shall be removed from the bell and spigot ends of each pipe. The outside of the spigot and the inside of the bell shall be wiped clean and dry and free from dirt, grease and foreign matter before the pipe is laid.

CM-5.1 Placing Pipe in Trench

Every precaution shall be taken to prevent foreign material from entering the pipe while it is being placed in the trench. If the pipe laying crew cannot put the pipe into the trench and in place without getting earth into it, the District may require that, before lowering the pipe into the trench, a heavy, tightly woven canvas bag of suitable size shall be placed over each end and left there until the connection is to be made to the adjacent pipe. During the laying operations, no debris, tools, clothing or other materials shall be placed in the pipe.

Pipe shall be laid with bell ends facing in the direction of laying, unless otherwise directed by the District. On an appreciable slope, bells shall (at the direction of the District) face upgrade.

CM-5.1 Number of Pipes Laid Before Joining

Mechanical joint pipe and push-on joint pipe shall be connected as hereinafter specified as soon as the pipe is placed in the trench.

CM-5.1 Preventing Water From Entering Pipe:

At times when pipe laying is not in progress, the open ends of pipe shall be closed by a water-tight plug or other means approved by the District, and no trench water shall be permitted to enter the pipe. These provisions shall apply during the daytime operations as well as overnight. If water is in the trench, the seal shall remain in place until the trench is pumped completely dry.

CM-5.1 Permissible Pipe Deflection

Wherever it is necessary to deflect pipe from a straight line, either in the vertical or horizontal plane, to avoid obstructions or plumb stems or where long-radius curves are permitted, the amount of deflection allowed shall not exceed one half (1/2) of the manufactures allowable deflection.

CM-6 JOINTING OF PIPE

CM-6.1 Mechanical Joint Pipe

Mechanical joint ductile iron pipe shall be installed in accordance with manufacturer's recommendations and as approved by the District. In general, the procedure shall be as hereinafter specified. The ends of the pipe shall be cleaned of all dirt, mud, and foreign matter by washing with water and scrubbing vigorously with a wire brush, after which the gland and gasket shall be slipped on the plain end of the pipe. The ends of ductile iron pipes 16-inches and larger and all rubber gaskets shall be lubricated with gasket lubricant of the type used for

push-on joints. The end of the pipe shall then be guided carefully into the bell of the pipe previously laid. The spigot shall be centrally located in the bell, the gasket placed in position, and the bolts inserted in the holes.

When tightening bolts, the gland should be brought up toward the flange evenly, maintaining approximately the same distance between the gland and the face of the flange at all points around the socket. This shall be done by partially tightening the bottom bolt first, then the top bolt, next the bolts at either side, and last, the remaining bolts. If effective sealing is not attained at the maximum torque, the joint shall be disassembled and reassembled after thorough cleaning. Over stressing of bolts to compensate for poor installation practice will not be accepted.

CM-6.2 Push-on Joint Pipe, Tyton Joint and Restrained Joint Pipe

Ductile iron pipe with push-on type, mechanical joint-tyton joint and restrained type joints shall be laid and jointed in strict accordance with the manufacturer's recommendations as approved by the District. The Developer/Contractor shall provide all special tools and devices such as special jacks, chokers, and similar items required for the installation. Lubricant for the pipe gaskets shall be furnished by the pipe manufacturer, and no substitutes will be permitted under any circumstances.

CM-6.2 Flanged Pipe & Fittings

The jointing of flanged pipe and fittings shall be in accordance with Appendix A of AWWA C115. Care shall be taken to evenly tighten all bolts and to avoid overstressing the bolts or flanges.

At times when pipe laying is not in progress, the open ends of pipe shall be closed by a water-tight plug or other means approved by the District. If water is in the trench when work resumes, the seal shall remain in place until the trench is pumped completely dry.

CM-7 SETTING VALVES, FITTINGS AND COUPLINGS

CM-7.1 General

Valves, fittings, plugs, couplings, and caps shall be set and jointed to pipe in the manner hereinbefore specified for cleaning, laying, and jointing pipe. All valves shall be operated through a full closed and full open position. Valves shall be checked for proper direction of operation.

CM-7.2 Valve Location

Inline valves along water mains shall, where possible, be located at point within the right-of-way where the pipeline and an extension of a property line intersect, unless otherwise shown on the plans.

CM-7.2 Valve Boxes

A valve box shall be provided for every buried valve. Valve boxes shall be as illustrated in the District's Standard Details. The valve box steel casing extension shall be cut to proper length so that the valve box does not ride on the extension when set at finish grade. In addition, the top section of the valve box shall slide over the extension for a minimum distance of 8-inches. The top of the valve casing shall be within 8-inches of finished grade. The valve box shall be centered and plumb over the valve wrench nut with the box cover flush with the finish surface. When valve boxes are set in paved streets, particular care shall be given to the placing of asphaltic concrete around the box to assure compaction of the paving materials under the shoulder of the box. When the distance from the top of the valve operating nut to the top of the valve box exceeds 36 inches, an extension to the operating nut shall be furnished and installed. Extension shall be a minimum of 12-inches long.

CM-8 ANCHORAGE

CM-8.1 Limiting Pipe Diameter and Degree of Bend

On all pipelines 4 inches in diameter or larger, all tees, plugs, caps, bends and all other locations where unbalanced forces exist shall be securely anchored by the use of suitable restrained joint pipe and fittings, thrust blocking or a combination of the two. No vertical bend thrust blocking will be allowed. Vertical bends must be anchored with MJ pipe and restrained joints.

CM-8.2 Thrust Blocking

Reaction or thrust blocking shall consist of concrete blocking having a compressive strength of not less than 3,000 pounds per square inch. Thrust blocks shall not be backfilled for 12 hours unless authorized by the District Inspector and/or District Engineer. Blocking shall be placed between the undisturbed ground and the fittings to be anchored. Concrete blocking shall be formed with plywood and bear against solid undisturbed earth of the sides and bottom of the trench excavation. The minimum bearing area for the blocking shall be as determined in Tables 8.2 and 8.3. The blocking shall be so placed that, unless specifically shown otherwise on the plans, the pipe and fitting joints

will be accessible to repairs. Eight (8.0) mil plastic shall be placed between all concrete and fitting or pipe.

TABLE 8.2*

SIZE	TEST PRESSURE (PSI)	THRUST AT FITTINGS IN POUNDS				
		A	B	C	D	E
		TEE AND DEAD ENDS	90° BEND	45° BEND	22.5° BEND	11.25° BEND
4"	250	3,140	4,440	2,405	1,225	615
6"	250	7,070	9,995	5,410	2,760	1,385
8"	250	12,565	17,770	9,620	4,905	2,465
10"	250	19,635	27,770	15,030	7,660	3,850
12"	250	28,275	39,985	21,640	11,030	5,545
14"	250	38,485	54,425	29,455	15,015	7,545
16"	250	50,265	71,085	38,470	19,615	9,855

TABLE 8.3*

SOIL TYPE	SAFE BEARING LOAD (PSF)
MUCK, PEAT, ETC.	0
SOFT CLAY	1,000
SAND	2,000
SAND AND GRAVEL	3,000
SAND AND GRAVEL CEMENTED WITH CLAY	4,000
HARD SHALE	10,000

Table 8.2 and 8.3 Notes:

1. Contractor to provide blocking adequate to withstand full test pressure.
2. Divide thrust by safe bearing pressure to determine required.
3. Areas to be adjusted for other pressure conditions.

*Tables adapted from Washington State Department of Transportation Standard Plan B-90.40-00

CM-8.3 Mechanical Joint Restraint Glands

With suitable conditions, anchorage may be obtained with the use of ductile iron mechanical joint restraint glands with set screws, as specified in item A-3.2, in place of the follower glands normally furnished for pipe and fittings. The installation of the glands shall be in accordance with the manufacturer's recommendations. Care shall be taken to see that the mechanical joint bolts are completely tightened and that there will be no further deflection before tightening the set screws.

CM-8.4 Anchorage for Hydrants

Hydrants shall be anchored by means of mechanical joint restraint glands as specified in Item CM-8.3. above unless otherwise directed by the District.

CM-9 SETTING FIRE HYDRANTS

CM-9.1 General

Hydrants shall be inspected in the field upon arrival to determine proper working order prior to installation. Hydrants shall be set according to the District's standard details including set plumb and set to the established grade utilizing hydrant extensions if necessary. Hydrants shall also be set with the center of the nozzle being between 18 and 24 inches above final grade. Hydrants shall be backfilled with gravel under and around the barrel drain. The barrel shall be supported on a concrete bearing block. See District's Standard Details 2 through 5.

CM-9.2 Hydrant Locations

Hydrants shall be located as shown on the plans or as directed by the District. Where possible, hydrants shall be located at point within the right-of-way where the pipeline and an extension of a property line intersect, unless otherwise shown on the plans. Hydrant locations shall provide complete accessibility to the hydrant and shall minimize the possibility of damage from vehicles or injury to pedestrians.

CM-9.3 Hydrant Installation

All hydrants shall stand plumb and shall have the pumper nozzle facing the curb or the center of the street. Each hydrant shall be connected to the main with a 6-inch ductile iron branch controlled by an independent 6-inch gate valve. All hydrants shall be set with the ground line marked on the hydrant at finish grade

or as directed by the District Inspector. Hydrants shall be set on a concrete base 12 inches by 12 inches square and 4 inches deep and shall be backfilled to three (3) inches above the bottom hydrant flange with 1 cubic yard of 1 ½ inch washed drain rock. The remaining trench depth shall be backfilled with 5/8-inch minus crushed rock placed in 8-inch layers and compacted to 95% density. A 3 foot square by 6" deep concrete pad with #4 bar shall be poured around the base of the hydrant and shall be flush with the surface.

All chains shall be removed from hydrants. The hydrant shall be painted with two coats of paint as specified in the construction materials section.

Relocated fire hydrants shall meet the same requirements as new fire hydrants for grade, backfill, blocking and installation of a culvert. After relocation, the fire hydrant shall be painted like new. Relocated fire hydrants shall be subject to the same hydrostatic pressure and purity tests as new fire hydrants.

CM-10 INSTALLATION OF FIRE HYDRANT BOLLARDS

When directed by the District, fire hydrant bollards shall be set with the tops of the posts at the same elevation as the top of the operating nut. Hydrant bollards shall be set at a minimum distance of 3-feet 6-inches from the center of the hydrant. The exposed portion of the posts shall be painted with concrete primer and two coats of paint as specified in the construction materials section. See North City Water District's Standard Details 2 through 4.

CM-11 INSTALLATION OF AIR-RELIEF ASSEMBLIES

Vacuum and air-relief valve assemblies shall be installed as shown in the North City Water District's Standard Details 21 and 22. Taps for the valves shall be made on the top of the pipe and shall be located at the high point of the main line. Valves shall be located 90° to the tap location on the main. The line from the tap location to the valve shall be constructed with continuous positive slope between the two points.

CM-12 INSTALLATION OF BLOW-OFF ASSEMBLIES

The blow-off assemblies shall be installed as shown on plans approved by the District..

CM-13 INSTALLATION OF SERVICE LINES

The services shall be installed as shown on the standard details (#7-10). Services shall be installed in one piece with no splices, unless approved otherwise by The District for special conditions. Under no circumstances will splices be allowed for services.

CM-14 CONCRETE THRUST BLOCKING

Concrete thrust blocking shall be cast in place and have a minimum of 1/4-square-foot bearing against the fitting and 2 square feet of bearing against undisturbed soil and shall be clear of joints so as to permit taking up or dismantling joint. All poured in place blocking shall have a minimum measurement of 12 inches between the pipe and the undisturbed bank. All blocking configurations and sizes shall be per the standard detail. All blocking as shown on the standards are considered as minimums, and consideration should be given to unusual circumstances and topography. See Standard Detail #4

CM-15 AUGERED OR BORED CASINGS

Water mains installed in casing pipe shall be made by jacking, driving, or augering a steel casing pipe beneath the surface. No open excavation shall be made closer than six feet from the edge of pavement. The diameter of the casing shall be sufficient to allow installation of the water main and also to provide allowance for adjustment of the water main to proper line and grade. Wall thickness shall be sufficient to withstand installation force and highway loading and shall not be less than 3/8-inch. After installation of the water main, and with the approval of the inspector, sand shall be placed in the casing pipe to fill all voids. Casing ends shall be sealed using linkseal, mortar, or other approved method.

Restrained mechanical joint pipe shall be installed in all casings. Approved stainless steel casing insulators (Cascade Water Works Manufacturing, or equal) shall be used to protect the pipe and adjust it to proper grade. The water main may be pushed or pulled into the casing pipe, unless MEGALUGS are used for joint restraint, in which case the water main should be pulled into and through the casing pipe.

All bore pits or related excavations shall be closed at the end of each day. Ditches must be backfilled or covered with steel sheets and, within public or private rights-of-way, barricaded with minimum 5-foot high chain link fencing and flashing warning lights to prevent people or animals from falling into the trench.

The requirements of the roadway agency as contained in the construction permit, or as issued by oral instructions of the authorized representative of the roadway agency shall be followed by the Developer/Contractor.

CM-16 HYDROSTATIC TESTING DISINFECTING

All pipelines shall be tested and disinfected prior to acceptance of work. All pumps, gauges, plugs, saddles, corporation stops, miscellaneous hose and piping, and measuring equipment necessary for performing the test shall be furnished, installed, and operated by the North City Water District. Feed for the pump shall be from a barrel or other container so that the actual amount of "makeup" water can be measured periodically during the test period.

The pipeline shall be backfilled sufficiently to prevent movement of the pipe under pressure. All thrust blocks shall be in place and time allowed for the concrete to cure before testing. Where permanent blocking is not required, the Developer/Contractor shall furnish and install temporary blocking.

As soon as pipe is adequately secured against movement under pressure, it may be filled with water.

After the pipe is filled and all air expelled, it shall be pumped to a test pressure equal to 1.5 x Line Pressure or 150 psi whichever is greater, and this pressure shall be maintained for a period of 1 hour or what the District feels is suitable. In accordance with manufacturer's recommendation, all valves may be limited to a pressure differential equal to the rated pressure of the valve (200 psi minimum), but shall not restrict the test pressure of the main. Mainline testing shall be made with the hydrant auxiliary gate valves open and pressure against the hydrant valve. Hydrant ports shall also be tested to hold static pressure without any visible leaks. Hydrostatic tests shall be performed on every complete section of water main between two valves.

In addition to the hydrostatic pressure test, a leakage test shall be conducted on the pipeline. The leakage test shall be conducted at the same pressure as the hydrostatic pressure test for a period of not less than 1/2 hour. The quantity of water lost from the main shall not exceed the number of gallons per hour determined by the formula:

$$L = \frac{ND(P)^{0.5}}{7,400}$$

in which L = Allowable leakage, gallons/hour
 N = No. of joints in length of pipeline tested
 D = Nominal diameter of the pipe in inches
 P = Avg. test pressure during leakage test, psi

Defective materials or workmanship, discovered as a result of the tests, shall be replaced by the Developer/Contractor at the Developer/Contractor's expense. Whenever it is necessary to replace defective material or correct the workmanship, the tests shall be rerun at the Developer/Contractor's expense until a satisfactory test is obtained.

As sections of pipe are constructed and before pipelines are placed in service they shall be sterilized in conformance with the requirements of the State of Washington, Department of Health.

CM-17 DISINFECTING

Before being placed in service, all new water mains and repaired portions of, or extensions to, existing mains shall be chlorinated and a satisfactory bacteriological report obtained. Temporary or permanent physical connections shall not be allowed between the existing distribution system and non-disinfected pipelines constructed without a State Department of Health approved backflow preventer (double check valve assembly or better) temporarily installed in the connecting line

Chlorine shall be applied in one of the following manners, listed in order of preference, to secure a concentration in the pipe of at least 50 ppm:

- (1) Injection of chlorine-water mixture from chlorinating apparatus through corporation cock at beginning of section after pipe has been filled and with water exhausting at end of section at a rate controlled to produce the desired chlorine concentration.
- (2) Injection similarly of a hypochlorite solution.

After the desired chlorine concentration has been obtained throughout the section of line, the water in the line shall be left standing for at least 24 hours. Following this, the line shall be thoroughly flushed and a water sample collected. The line must not be placed in service until a satisfactory bacteriological report has been received. If the District feels the need to up the Chlorine dosage, the standing time can be lowered, This could take place if the North City Water District Operations Manager approves the method.

Discharge of hypo chlorinated water to surface waters is strictly prohibited. A reducing agent shall be applied to the water to be wasted to neutralize the chlorine residual remaining in the water. Federal, state, and local regulatory agencies should be contacted to determine special provisions for the disposal of

heavily chlorinated water. This is to include lakes, rivers, streams, and any and all other waters where fish or other natural water life can be expected. Hypo chlorinated water may be required to be trucked off site and disposed of at a sewer treatment plant or other approved location.

District representatives only shall be allowed to operate existing and new tie-in valves. Developer/Contractor's personnel are expressly forbidden to operate any valve on any section of line which has been accepted by the District.

CM-18 FLUSHING / Polly Pigs

Upon completion of pipe laying and installation of any service lines, Polly Pigs shall be flushed so that all dirt and foreign matter shall be removed by a thorough flushing through all hydrants, blow offs or other approved means. Each section of newly laid pipe between valves or dead ends shall be flushed independently, and fire hydrants or other dead end appurtenances shall be flushed simultaneously with the parent line. A minimum flushing velocity of 2.5 fps shall be developed in the main.

The Developer/Contractor shall be responsible for scheduling and organizing his work so as to use flushing water only during off-peak hours and in the most economical manner.

No flushing shall be performed without the North City Water District Personnel.

CM-19 CONNECTION TO EXISTING WATER MAIN

Wet tap connections shall be installed as shown on the Plans and the tapping valve shall remain closed.

Cut-in tees and crosses shall be installed as shown on the plans and the valves on the branches of the tee or cross shall remain closed.

At connections of new piping to existing piping all of the new piping, appurtenances and blocking shall have been installed, disinfected and tested. The Developer/Contractor is required to use a state approved backflow prevention device for filling, testing and flushing of the new water system prior to cutting into the existing line.

The District shall be notified three (3) working days in advance of all scheduled connections. No cut-in connections or connections of new piping to existing piping will be scheduled on Fridays or Mondays.

All equipment and material necessary to make the connections shall be delivered to the site prior to the start of work. Bolts, flanges, gaskets, couplings and all

accessories shall be checked and assembled where possible by the Developer/Contractor and verified by the District prior to shut down of the water system. Tapping tees and valves shall be air tested prior making tap.

Before connection or cut-in, the fittings, pipes, valves, and couplings shall be cleaned and sterilized with chlorine solution in the same manner as provided for the pipeline. The cleaning and sterilizing shall be done immediately prior to installation and in the presence of the District. Once the is started on this connection, it shall proceed continuously without interruption and as rapidly as possible until completed.

No shut-off of mains will be permitted overnight or over weekends or holidays. The Developer/Contractor may be required to perform the connection during times other than normal working hours

After connection to the existing system, the opening of valves shall be done with the authorization of, and in the presence of, the District's authorized representative.

CM-20 ASBESTOS/CEMENT WATER PIPE

As far as we know no AC Pipe exists in the District. But any work to be performed upon existing asbestos/cement water pipe if it does exist shall be in conformance with the latest edition of "Recommended Standard Asbestos/Cement (AC) Pipe Work Practice Procedures and Training Requirements," adopted and published by the Pacific Northwest Section of the American Water Works Association, which is included herein by reference, and Chapter 296-65 of WAC, except as revised herein. Any AC pipe which is removed from service and is not disturbed may be capped and abandoned in place. Any exposed and disturbed pipe to be removed from service shall be removed and disposed of at an appropriate waste site. The disturbed pipe may not be relocated in the trench or otherwise disposed of on site. No new or used AC pipe is to be installed in the North City Water District. Disposal of any removed materials shall be at an approved off-site facility, in accordance with the above publications. All materials, equipment and safety gear shall be on site prior to cutting, tapping or removing any AC pipe.

CM-21 RESTORATION OF DISTURBED AREAS

Restoration of public and private improvements shall be performed by experienced Contractors or by employees of the Developer who are qualified in this type of work.

The Developer/Contractor shall be responsible to maintain all roadway areas until the permanent repair is accomplished.

The Developer/Contractor shall limit construction time on each easement to the very minimum possible, including the time required for installation and testing. Restoration work shall follow immediately after pipe testing with due allowance for weather and season of year.

Asphalt Pavement

The existing asphalt concrete shall be cut on a neat line with a cutting disc or similar approved tool prior to excavation. Before the end of each day the trench shall be backfilled and compacted and a temporary cold mix patch shall be placed and maintained in good condition until replaced.

Immediately prior to permanent resurfacing of bituminous surfaced roads, the edges shall be re trimmed 18 inches wider than the excavation with straight vertical edges free from irregularities and the cold mix shall be removed. Edges of the trimmed surfacing shall be thoroughly tacked with an emulsified asphalt and asphalt concrete shall then be placed and compacted to the grade of the original surface. All asphalt joints shall be sealed with an approved sealer.

Crushed Surfacing

The existing gravel roadway shall be restored by grading the surface to a uniform grade to the width of the roadway prior to construction.

Where ditch sections are disturbed during construction, the ditch shall be restored to the same cross sections as existed prior to construction and shall be restored prior to placement of the crushed surfacing.

The Developer/Contractor shall spread the crushed surfacing as each load is placed and shall compact the crushed surfacing after the material has been spread.

Landscaped and Improved Areas

All improvements and landscaping within the construction area which are damaged, destroyed or the use thereof interfered with due to the operation of the Developer/Contractor shall be immediately restored to their former conditions by the Developer/Contractor at the Developer/Contractor's expense, using the services of a qualified nursery and/or sod installation company, except where noted otherwise. Notice should be given to the property owners along the route of construction by the Developer/Contractor advising them of the methods to be used to preserve and restore the improvements.

Unimproved Areas

All areas disturbed by this construction for which no other restoration is specified, and for which there were no private improvements existing prior to construction, shall be seeded for erosion control.

Seeding shall not be done during windy weather or when the ground is frozen, excessively wet, or otherwise untillable. Seed shall be placed at a minimum rate of 120 pounds per acre.

Seeding, fertilizing and mulching shall be installed using an approved type hydroseeder. If hand seeding is used with prior approval, evidence of vigorous growth, in the opinion of the District, will be required prior to final acceptance.

Fertilizer shall be applied in accordance with the procedures and requirements for seeding at a minimum rate of 500 pounds per acre.

Wood cellulose fiber mulch shall be applied in accordance with the procedures and requirements for seeding at a minimum rate of 2,000 pounds per acre.

CM-22 INSTALLATION OF PRESSURE-REDUCING STATION

Excavation shall be carried to the proper grade and to a dense undisturbed firm foundation. Grade shall be as shown on drawings, but in no case shall the top slab extend higher than adjoining road grades. The vault shall be carefully placed on a prepared foundation of foundation gravel. The excavation shall be kept free of ground and surface water during installation. The Developer/Contractor shall use caution at all times to prevent flotation of the vault.

Backfill around the structure shall be carefully placed in layers not over 12 inches thick and mechanically compacted. No brush, topsoil, organic material or asphalt shall be used in backfilling. Where original excavated material is unsuitable for backfill, as determined by the Engineer, imported gravel backfill shall be placed. The unsuitable material shall be removed by the Developer/Contractor to a disposal site, in accordance with County requirements. The backfill shall be compacted by mechanical compactors to 95% of maximum density, ASTM D-698, to finished grade.

The piping, vault and metal items shall be painted as described under MATERIALS. All surfaces shall be clean and dry. No painting shall be done before the prepared surfaces are approved by the Engineer. The pipe shall be empty and the surfaces shall be free of all moisture and condensation before application begins.

Upon completion of the installation the Developer/Contractor shall furnish the services of a technical manufacturer's representative for the pressure relief and pressure reducing valves. The technical representative shall check the installation, test the equipment, place it in operation and train the District's representative.