

Central Hooksett Water Precinct
Specifications For Water Works Construction

CHWP, Hooksett NH

9/2009

CONSTRUCTION OF WATER SYSTEM CHWP HOOKSETT, NEW HAMPSHIRE

TABLE OF CONTENTS

<u>DOCUMENTS</u>	<u>NUMBER OF PAGES</u>
 <u>TECHNICAL SPECIFICATIONS</u>	
Section 1 - WATER SYSTEM DESIGN	6
PART 1 GENERAL	
1.01 Design Guidelines	
1.02 Pressure	
1.03 Diameter	
1.04 Dead ends	
1.06 Hydrants	
1.07 Air Relief Valves	
1.08 Valve Chambers	
1.09 Installation Of Water Mains	
1.10 Water Service Connections And Meters	
Section 2 - WATER MAINS AND APPURTENANCES	15
PART 1 GENERAL	
1.01 Scope	
1.02 Product Delivery, Storage And Handling	
PART 2 MATERIALS	
2.01 Ductile Iron Pipe	
2.02 Restrained Joints	
2.03 Insulation	
2.04 Fittings	
2.05 Plugs And/Or Caps	
2.06 Solid Sleeve, Flexible And Transition Couplings	
2.07 Valve Boxes And Covers	
2.08 Valves	
2.09 Friction Clamps	
2.10 Hydrants	
2.11 Water Services And Permanent Blowoffs	
2.12 Tape	
2.13 Tapping Sleeves And Valves	
PART 3 EXECUTION	
3.01 Installing Water Mains And Appurtenances	
3.02 Insulation	
3.03 Mechanical Joints	
3.04 Cutting Of Pipe	
3.05 Hydrant Branches	
3.06 Connections To Existing Mains	
3.07 Concrete Thrust Blocks And Friction Clamps	
3.08 Pipe Blocking	
3.09 Valve Boxes	
3.10 Service Connections And Permanent Blow-Offs	

- 3.11 Flushing
- 3.12 Pressure Testing
- 3.13 Leakage Test
- 3.14 Chlorination Of New Mains

Section 3 – CHECK LIST4

Details

Water Trench Construction.....	A- 1
Water Service Connection	A- 2
Water Sewer Separation.....	A- 3
Typical Hydrant	A- 4
Thurst Block 1.....	A- 5
Trust Block 2.....	A- 5
Valve Detail	A- 7
Water Service Installation.....	A - 8
Backflow	A-10
Backflow	A-11

Other Details Available

END OF TABLE OF CONTENTS

WATER MAINS AND APPURTENANCES

PART 1 GENERAL

1.01 SCOPE

- A. The work of this section includes the furnishing of all labor, tools, equipment and materials and performing all operations necessary for the construction of water mains, fittings, valves, hydrants and other related items as specified herein and as shown on the drawings. All products and materials shall conform to the latest appropriate AWWA Standards, and as otherwise specified hereinafter.

1.02 PRODUCT DELIVERY, STORAGE AND HANDLING

- A. All pipe when shipped shall be packed and separated by wood separators such that pipe to pipe contact is prevented during transit or storage.
- B. The loading, trucking, unloading, and handling of pipe and appurtenant materials shall be done by the Contractor. Care shall be taken so as not to damage the pipe, appurtenant materials or the street surface. Dropping pipe, special castings, valves, hydrants, etc. directly from the trucks upon the ground will not be permitted. Suitable effective buffers or runners shall be provided. Metal chain shall not be used for lifting pipe materials. The Contractor shall be responsible for any damage done to the pipe or appurtenant materials until they are accepted in the completed work.
- C. Distribution of pipeline materials along the line of work will not be permitted, unless approved by the Engineer. The Contractor shall not obstruct driveways, sidewalks, walkways, etc., nor shall pipeline materials be placed on private property without the express written approval of the property owner.

PART 2 MATERIALS

2.01 DUCTILE IRON PIPE

- A. All ductile iron pipe shall have push-on joints, except as may be otherwise noted. Pipe shall be designed for the rated working pressure in pounds per square inch shown below and for laying condition type 2 (flat bottom trench, backfill consolidated to centerline of pipe) and for 8 feet of earth cover. Thickness shall be as specified hereinafter. The grade of iron from which the pipe is made shall be 60-42-10, having 60,000 psi minimum tensile strength, 42,000 psi minimum yield strength, and 10 percent minimum elongation. Pipe shall be Class 52. Minimum pipe size for residential streets and water main extensions beyond 500 feet shall be 8-inch. Water main with a maximum pressure of 100 psi shall be designed for a maximum velocity of five (5) feet per second under all conditions.
- B. The interior of all ductile iron pipe shall be cement lined to twice the thickness specified in ANSI A21.5 (AWWA C104) and asphalt seal coated twice. Asphalt seal-coat shall not impart taste or odor, or toxic or carcinogenic compounds to the water contained therein. Asphalt seal coat shall be a product acceptable to the National Sanitation Foundation (NSF) for use in potable water and shall be so listed in the most current NSF summary of approved products (ANSI/NSF Standard 61). The asphalt seal coat shall be applied and cured in strict conformance with the coating manufacturer's cautions and instructions. The seal coat shall be applied by the pipe manufacturer under controlled factory conditions and field application is strictly prohibited. Exterior surface of buried ductile

iron pipe shall be bituminous coated.

2.02 RESTRAINED JOINTS (12" Diameter and Smaller)

- A. Restrained joints shall be used at MJ pipe joints, fittings, valves, short pieces (less than 10 feet), etc., and where directed by the Engineer, and shall be Romac "Grip Ring", or approved equal.
- B. All joints with fittings are to be restrained. All restrained joints shall be assembled in strict accordance with manufacturer's instructions.
- C. Retainer glands, tie-rods or a combination of concrete thrust blocks and retainers must be used on all fittings. A durable flat rock may be substituted should it possess adequate bearing against undisturbed earth. If tie-rods are used they shall be coated with approved rust proofing agent. No 90 degree bends allowed.

2.03 INSULATION

- A. Insulation for shall be 2-inch (min) thick rigid polystyrene thermal insulation in 4'X8' sheets. Insulation shall be placed on water main if within 5 feet of any drainage or sewer

2.04 FITTINGS

- A. Furnish and install all required fittings shown on the drawings or as directed by the Engineer. Standard fittings allowed by the CHWP include tees, reducers, crosses, and bends. There shall be no 90 degree bends. Fittings shall be made in the USA.
- B. Fittings shall conform to AWWA C153. Class 350 minimum, ductile iron compact fitting with double cement lining and seal coated inside and out AWWA C104. Fittings shall be complete with accessories, tee bolts shall be either ductile iron or corten. Branch of tees for hydrants or stubs shall be mechanical joint anchoring tees.
- C. All tees, bends, plugs and hydrants shall be provided with mechanical restraint tie rods or joints designed to prevent movement.

2.05 PLUGS AND/OR CAPS

- A. Furnish and install permanent pipe plugs, caps or blank flanges as shown on the drawings and/or as directed by the Engineer. The wetted surfaces of all plugs, caps, and blank flanges shall be cement coated and asphalt seal coated as specified hereinbefore for ductile iron pipe.
- B. Furnish and maintain on the project site temporary watertight plugs in the various sizes required for the water mains to be installed.

2.06 SOLID SLEEVE, FLEXIBLE AND TRANSITION COUPLINGS

- A. Solid sleeves shall be furnished and installed where shown on the drawings or wherever the intent for their use is indicated or may be required by the Engineer. Sleeve shall be cast iron with mechanical joints and complete with all accessories. Solid sleeves shall be as manufactured by Clow Corporation, or equal and shall be cement lined and seal coated as specified hereinbefore for ductile iron pipe.

- B. Flexible couplings or transition couplings shall be furnished and installed where shown on the drawings or wherever the intent for their use is indicated or may be required by the Engineer. Flexible couplings shall be cast iron with rubber gaskets. Bolts shall be properly spaced to insure uniform gasket compression. Transition couplings shall be Ductile iron pipe coupling in conformance with ASTM A536-80 with SBR gasket in conformance with ASTM D2000 3 BA715 or approved equal. Flex couplings shall be as manufactured by Dresser Industries, Smith Blair, Romac or equal and shall be cement lined and seal coated as specified hereinbefore for ductile iron pipe.

2.07 VALVE BOXES AND COVERS

- A. Valves shall be provided every 500 feet and at all intersections. Valve boxes shall be furnished and installed for all valves. They shall be cast iron, tar coated, sliding type adjustable valve boxes, with cast iron covers. The word "WATER" shall be cast into the cover.
- B. The bell end of the lower sections shall in all cases be sufficiently large to fit over the stuffing boxes of the valves. (Operating nut shall be centered in the bell end of the valve boxes.) The smallest inside dimension of the shaft shall not be less than 5-1/4 inches. Upper section shall have a flange sufficiently strong to furnish the bearing for that section so that all weight or jolting from street traffic or the like shall not be transmitted to the valve. Each valve box, including cover shall weigh at least 100 pounds. Valve box extensions if required, shall be supplied at no additional cost to the Owner.

2.08 VALVES

- A. All gate valves shall be manufactured in full compliance with the content and intent of this specification. Gate valves shall be 200 psi working pressure, vertical, plain non-rising stem, nut operated, open left with mechanical joint end connections. Valves shall comply with AWWA C500 or C509. Valves shall be resilient seat.
- B. Valves shall also conform to the specifications of the AWWA as to size of stem, pitch of thread, etc. When mechanical joint ends are specified for use, the gasket seating area shall be fully machined to fixed dimensions and tolerances as per AWWA specifications. All valves shall be provided with "O" rings. The design of the valve shall be such that the seal plate can be fitted with new "O" rings while the valve is under pressure in a fully open position.
- C. Valve interiors and exterior shall have a 100% solids thermoset or fusion bonded epoxy protective coatings, holiday-free in the waterway, which shall meet all requirements of AWWA C550. The epoxy coating shall not impart taste or odor to the water. The coating shall be a product acceptable to the National Sanitation Foundation (NSF) for use in potable water and shall be so listed in the most current NSF summary of approved products ANSI/NSF Standard 61. The coating shall be applied and cured in strict conformance with the coating manufacturer's cautions and instructions. The coatings shall be applied by the valve manufacturer under controlled factory conditions and field application is strictly prohibited.
- D. Valves twelve inches and smaller shall be gate type, cast iron, resilient wedge and mechanical joints conforming to AWWA C509 latest revision as provided in the construction specifications. Valves shall be designed for a working pressure of not less than 200 psi, and each shall have the pressure rating cast into the body and manufacturer's name or initial cast into the body or bonnet. Valves sixteen inches (16") and larger shall be butterfly type, ductile iron with rubber seat and mechanical joint ends with side gear operator. Butterfly valves shall be used for all pipe 16-inch and larger. Butterfly valves shall comply with AWWA C 504. Butterfly valves shall be Henry Pratt "Groundhog", Dresser BF or Allis Chambers steamseal.

2.09 FRICTION CLAMPS

- A. Friction clamps shall be carbon steel and of a design to restrain pipe joints, caps, plugs, or valves as shown or specified. Thrust rods shall be 3/4-inch minimum diameter carbon steel and the clamps and rods shall be capable of withstanding a sustained pressure of 150 psi and an intermittent pressure of 300 psi. Clamps, rods and associated hardware shall be protective coated. All exposed rods shall be asphalt coated twice after installation.

2.10 HYDRANTS

- A. Hydrants shall be provided every 500 feet and at all intersections. Furnish break type flange, swivelhead 6-inch mechanical joint inlet nozzle with fusion bonded epoxy shoe. Hydrants of the following make and type:

Make and Model - Clow, Eddy 2640, Mueller Super Centurion 250 model A-423 or
Type of Thread - National Standard
No. Outlets two, 2-1/2" hose conn. one 4-1/2" steamer conn.
Diameter Valve Opening - 5-1/4 inches (minimum)
Diameter of Barrel - 7-1/4 inches (minimum)
Hub - mechanical joint
Direction of opening - open right
Depth of Bury - 5'-6" minimum or to suit trench conditions
Color - to match existing hydrants of the Owner.

- B. Hydrants shall be designed for 150 pounds per square inch working pressure and shall conform in every respect to the specifications adopted for hydrants by the AWWA. Hydrants shall be given two coats of quality paint before shipment.
- C. Hydrant barrel extensions shall be furnished and installed where directed by the Engineer on new hydrant installations. Extensions shall be as recommended by the manufacturer of the hydrant and shall include all couplings, pins, flanges, gaskets, nuts and bolts, etc., necessary to provide a complete and workable installation. If more than one type of extension is available, the Engineer shall direct the type to be provided.

2.11 WATER SERVICES AND PERMANENT BLOWOFFS

A. Service Pipe

1. Service pipe shall be copper tubing, Type K for buried service, and shall be American made, by a manufacturer approved by the Owner.
2. Service pipe 1" or less shall be copper tube type K or 3/4" service pipe shall be plastic service tubing manufactured from high molecular weight polyethylene and shall meet the extruded materials standard as defined by ASTM D-1248. Tubing shall be 3/4" or 1" CTS service tubing. Pipe and tubing shall be made from all virgin materials and conform to product standard ASTM D-2239. Tubing shall conform to ASTM D2737 and shall be NSF approved. Plastic tubing will not be allowed in areas where static pressure exceeds 100 psi. Plastic tube shall be 200 psi, PE3608 with tracer (12AWG, UL listed copper conductor securely attached to the tubing and shall meet requirements of AWWA C 901.
 - a. Piping shall have the specific use, class, size and manufacturer's name clearly printed at specific intervals. Service pipe shall be manufactured by Hastings

Inc., or approved equal.

- b. Pipe shall have a minimum working pressure of 160 PSI at 73.4 degrees F.
- c. Pipe and tubing must be capable of maintaining pressures of 340 PSI at 73.4 degrees F for 1000 hours when tested in accordance with ASTM D-1598 and must have a minimum quick burst of 630 PSI when tested in accordance with ASTM D-1599.
- d. Piping compound shall comply with the regulations of the Food Additives Regulations under the Federal Food, Drug and Cosmetic Act of the United States Government.
- e. Piping shall be covered by a minimum of 50-year guarantee against rot, rust and electrolytic corrosion and a 25-year cost-of-replacement warrantee.
- f. All connections with the polyethylene services tubing shall contain a stainless steel insert for stability.
- g. Plastic service tubing shall be buried with detectable tape. Tape shall be 4" polyethylene, suitable for burial and labeled "water". Tape shall be located at least 18" above the tubing.

B. Service Boxes

- 1. Service boxes shall be Erie pattern and shall be tar coated, cast iron, sliding type with inlaid covers. Covers shall have the word "WATER" cast in the top, and shall be held in place with bronze bolts. Shaft shall be 2-1/2 inches inside diameter with extension rods, and be the extension type extending from 4 feet to 5 feet, 6 inches. Service boxes shall be as manufactured by Caldwell, Pioneer Foundries, or equal.
- C. Required Brass Goods shall include Corporation Stops, Curb Stops, Misc. Couplings, and Fittings. Castings shall be sufficiently heavy to meet all service conditions without springing or leaking and be clean and free from roughness both inside and out. Waterways shall be smooth, full size and free from obstruction. All threads shall be cut sharp, clean and true.
- D. Washers shall be of cast bronze containing not less than 85 percent copper finished on both sides to true faces.
- E. Nuts shall be of commercial bronze containing not less than 89 percent copper and finished on both sides to true faces. Adjusting nuts shall also come to a true facing against bottom of the bronze washer, and proper adjustment shall be made to assure easy turning and freedom from leakage. Adjusting nuts shall be properly locked to the stop plug to avoid change in position in operation of stop.
- F. All plugs of corporations and curb stops shall be solid (except for waterway). Bronze in all plugs shall be of a composition harder than that of the body, such as ingot No. 245 Navy M metal, containing not less than 87 percent copper. All plugs shall be properly lubricated, and upon assembly bronze washers are to come to a true facing completely around bottom of curb stop body.
- G. All curb stops shall be subjected to a sustained hydraulic pressure of 200 pounds and tested in both the open and closed position. Curb and corporation stops shall be Mueller Mark II, Ford Ball Valve, or equal.
- H. All brass goods shall be individually wrapped to protect threads during shipment.

Corporation stops and curb stops shall open left, and shall be of the compression type.

- I. Compression fittings for joining copper tubing shall be Dresser Style 88, or equal.
- J. Y-Branch connections shall have two inlets and one outlet, and be suitable for use with copper tubing. End connections shall be of the style required to complete the work. Connections shall be as manufactured by Hays, Ford or equal.
- K. Couplings for connecting copper to cast iron pipe shall be as manufactured by Ford Meter Box Company, Hays, Mueller, or equal.
- L. All permanent blow-offs shall be comprised of a 1-inch corporation stop, a 1-inch curb stop, a 4-foot length of 1-inch type K copper tubing, two 1-inch elbows, a 4-1/2 foot length of 1-inch type K copper pipe, a 3/4-inch x 1-inch hose bib adapter, a 3/4-inch cap, and a cast iron gate box and cover (as specified previously).
- M. Service saddles shall be 304 stainless steel, suitable for use with ductile iron, cast iron and AC water mains and corporation stops specified. Saddles shells shall be 304 stainless steel, fully passivated. Bolts, washers, and nuts shall be 304 stainless steel, with NC threads, Teflon coated. Gasket shall be NBR compounded for water service. Tapped outlet shall be 304 stainless steel. Stainless steel saddles shall be double bolt, Model "306", as manufactured by Romac Industries, Inc., or approved equal by Ford Meter Box Co., Cascade Waterworks Mfg. Co., or Mueller Co. Saddles shall meet all applicable parts of AWWA C800. Service saddles required for all AC water mains. Service saddles required for services larger than 1" for ductile iron water main.

2.12 TAPE

- A. Tape shall be detectable polyethylene, suitable for burial and labeled "water" shall be provided over all pipes and service connections..

2.13 TAPPING SLEEVES AND VALVES

- A. Tapping sleeves and valves shall conform to the most current AWWA specifications for tapping sleeves and valves.
- B. Tapping sleeves shall be mechanical joint, sleeves for use with asbestos cement pipe 2-part castings, flanged on the vertical centerline, and come complete with all joint accessories. The surface area of each flange shall be thoroughly machined, and the sleeve flanges shall be fitted with lead gaskets. Each gasket shall cover the entire surface area of each joint for the full length of the sleeve. Bolts used to assemble the sleeves shall pass directly through each flange and through each gasket. Bolts shall be properly spaced to insure uniform gasket pressure and compression. As an alternative 304 stainless steel tapping sleeve with a fully circumferential seal and 304 ss nuts, 304 ss w/teflon coated bolts, shall be "SST" or approved equal.
- C. Prior to ordering the sleeve, the Contractor shall check the dimensions of the pipe on which the tapping sleeves are to be installed.

PART 3 EXECUTION

3.01 INSTALLING WATER MAINS AND APPURTENANCES

- A. Pipes shall be thoroughly cleaned before being laid. Particular attention shall be paid to the proper positioning of the rubber gaskets. Under no conditions will the Contractor be allowed to "pop" the pipe home. Only approved methods such as driving the pipe home with a bar and block, by using the bucket of the backhoe to push the pipe home (utilizing

a block in front of the bell to push against), or other methods as may be approved by the Engineer will be allowed. Special care shall be used in following the Manufacturer's instructions for pipe joint systems. Water mains shall be buried at a minimum depth of five feet six inches (5'-6") and a maximum depth of eight feet (8'-0"). In no case will the pipe depth be allowed in excess of 6-feet at water main valves. Water main shall be buried a minimum of 5'-0" with permission.

- B. Temporary watertight plugs shall be utilized at the end of each working day to prevent the intrusion of silt, debris and water into the mains. When working in areas with a high potential for flooding the main from groundwater, streams, storm drains, sewers or other water mains, or as directed by the Engineer, temporary plug shall be provided on each pipe length.
- C. In the event of flooding of the main, all pipe laying shall cease until the mains have been thoroughly cleaned and observed by the Engineer.
- D. When joined together, pipes shall form a smooth continuous line and grade on straight sections of the road and on curved sections (both vertical and horizontal) shall have uniform deflections within the required limits and conforming in general to the line and profile of the adjacent roads. Location of rubber rings shall be determined with a checking gauge before backfilling the pipe.
- E. Pipe shall be joined and laid in accordance with the manufacturer's latest published instructions and AWWA C600 for Gray and Ductile Cast Iron Water Mains and Appurtenances, (or ASTM-D2321 for PVC Pipe).
- F. The Contractor shall install two serrated silicon bronze wedges for 3-inch through 12-inch diameter pipe, and four wedges for larger diameter pipe, at each push-on joint.
- G. Pipe shall not be laid with deflection of more than one-half the maximum deflection as recommended by the manufacturer.
- H. Backfill shall be placed on both sides of the pipe and compacted simultaneously with approved tamping bars for the full length of pipe. Bell or coupling holes shall be excavated as necessary to ensure that the pipes and not the pipe bells or couplings are bearing the weight of backfill and the traffic load.
- I. Pipe shall not be laid in areas where excavation has been carried below trench grade, or where water conditions create unstable bottoms, until the trench is excavated, refilled and compacted to the satisfaction of the Engineer.
- J. Bells or other joints shall not be installed directly under existing utilities or structures. Use short or random lengths to avoid such conditions.
- K. Water marking tape shall be installed 24" over all newly installed pipe.
- L. Other utilities, including but not limited to natural gas, storm drainage, electric, telephone, steam and cable television shall not be installed within three feet of water-mains.

3.02 INSULATION

- A. Where pipe has less than 5 feet of cover, the pipe shall be insulated with materials as specified.
- B. Should water main be less than 2 feet separation from storm drain manhole or storm sewer then 2 " rigid polystyrene thermal insulation with an "R" value of 11 will be

required for a distance of a minimum of 8 feet.

3.03 MECHANICAL JOINTS

- A. Mechanical joints shall be an approved type with the required joint accessories, gaskets, cast iron follower glands with drilled bolt holes, cast iron tee head bolts, hexagonal nuts, etc. Torque wrenches shall be used to take up the joints. Wrenches shall be equipped with adjusting breakable tension gauge, set to break the tension at the tension loading recommended by the manufacturer.
- B. Mechanical joints shall be made to secure tight joints. Every means shall be taken to secure this result. Where required, joints shall have a deflection of not more than one-half the recommended maximum deflection allowed by the standards of CIPRA.
- C. Retainer glands tie rods or a combination of poured concrete thrust blocks and retainers must be used on all mechanical fittings. Tie rods (4) shall be coated with approved rust proofing agent.

3.04 CUTTING OF PIPE

- A. All cuts of ductile iron pipe shall be made with either an electric, pneumatic, or gasoline driven power saw. Blades shall be carbide tipped for cutting cement lined ductile iron pipe. Hydraulic cutters may be used for cutting cast iron pipe, provided the cement lining is not damaged by this method.
- B. When lengths of ductile iron pipe are field cut to provide for short lengths, the outside of the cut ends shall be tapered back about 1/8 inch at an angle of 30 degrees with the centerline of the pipe, before field cut pieces are used in the push-on type joints.

3.05 HYDRANT BRANCHES

- A. Furnish and install hydrants on hydrant branches where shown on the drawings or where directed by the Engineer. Each branch shall consist of a valve anchoring tee, 6-inch gate valve (mechanical joint) and one 6-inch ductile iron, mechanical joint nipple of the required length. The base of the hydrant shall be set on a concrete pad where required. Hydrants shall be restrained with bitumastic coated thrust rods. Hydrant barrel extensions shall be installed where necessary to provide a hydrant elevation acceptable to the Engineer. A 1/2 cubic yard hydrant drainage well shall be built at each hydrant location, using 2-inch stone placed in the excavation below and around the hydrant bottom. A concrete thrust block shall be placed between the hydrant and the undisturbed soil to overcome thrust where required by the Engineer.
- B. Following final project cleanup, all hydrants shall be given one field coat of paint, which shall be compatible with, and match the type and color given by the manufacturer (to match existing system hydrants).

3.06 CONNECTIONS TO EXISTING MAINS

- A. At least 24 hours prior to connecting to any existing water main, the Contractor shall notify the water department. At no time shall the contractor operate any existing system valve. All such operations shall be performed by water department personnel. Prior to connecting or disconnecting any fire sprinkler service line, the Contractor shall notify the fire department, water department and a responsible party at the building(s) being serviced by the line.
- B. Make all taps, (wet) into the various water pipes, and install the required sleeves, tees,

couplings, adapters, reducers, pipe nipples, jointing materials, and other fittings which may be required and make all joints watertight, as shown on the drawings or as specified herein, and do whatever work is shown or intended to be done in order to make complete and effective connections to existing water mains.

- C. The cutting, removal, plugging, and bracing of parts of the existing water mains made necessary by this work, and the shutdown of the existing water system, and subsequent pumping, hand excavating and whatever time that may be required by the Owner to notify customers of discontinuation of water service, time required to effect tight closures of existing valves, and any reasonable changes that may be required by the Engineer, or any other work done hereunder shall be considered as an obligation of the Contractor to complete the work. No additional compensation will be made for such work, other than that directly covered by the applicable bid items listed in the proposal.
- D. The work shall be coordinated with the Owner and such connections that may be required shall be made at such times and in such a manner as to cause as little interference in water service within the existing system as practicable.

3.07 CONCRETE THRUST BLOCKS AND FRICTION CLAMPS

- A. Furnish and place cement concrete in such locations and quantities as may be required by the Engineer.
- B. Concrete shall be of proportions, 1 part cement to 2 parts sand and 4 parts coarse aggregate, as approved by the Engineer.
- C. Care shall be taken to ensure that all concrete thrust blocks bear against undisturbed trench walls, and not to encase flanges and bolts on mechanical joint fittings.
- D. Thrust block bearing areas and volumes shall conform to the minimum dimensions found in the "Vertical and Horizontal Anchoring", Attached Plate for the various soil and fitting types noted. Where unsuitable bearing material is encountered, the Contractor shall excavate and place sufficient concrete ballast, to offset the anticipated thrusts.
- E. Precast thrust blocks may only be used for hydrant installations when authorization is obtained from the Engineer.
- F. Thrust rods shall be used in conjunction with concrete thrust blocks for each hydrant installation or as otherwise directed by the Engineer.
- G. Friction clamps and thrust rods shall be installed in accordance with the manufacturer's instructions, as directed by the Engineer. All exposed rods shall be coated twice with asphalt after installation.

3.08 PIPE BLOCKING

- A. Where required due to condition of the trench bottom, blocking shall be used as directed by the Engineer. Blocking furnished by the Contractor shall be new spruce plank 1 inch and 2 inches in thickness. Blocks shall be bedded firmly and level across the bottom of the trench. When any block has been sunk too deeply, additional blocking of suitable thickness shall be placed to bring the pipe to the required grade. Blocks shall be placed at a point 1/5th of the span from each joint. Each block shall be 2 inch x 4 inch, with a length of 4 inches larger than the diameter of the pipe. A sufficient quantity of wedges 12-inches long of 4 inch x 4 inch fir shall be furnished to properly hold gates and special castings in place; a new 4 inch x 4 inch timber shall be used to properly brace hydrant posts.

3.09 VALVE BOXES

- A. Valve boxes shall be cut with a wheel cutter, if it becomes necessary to cut them to adjust for height.
- B. Valve boxes shall be properly centered and plumbed over the operating nuts of valves and adjusted to the proper height to correspond to the finished street or ground surface.
- C. Valve boxes shall be installed with a cushion of sand between the valve and the valve box. In wet areas, washed stone is to be placed around valve box wrapped by geotextile fabric to separate stone from existing soil.
- D. Valves greater than 10" must be supported during installation.
- E. All main line valves at pipe intersections (including hydrant valves) must be placed within 2 feet of tees.

3.10 SERVICE CONNECTIONS AND PERMANENT BLOW-OFFS

- A. All services shall be connected to the new main as directed by the Owner, the Engineer, and as specified herein. Services shall be connected after the new main has been tested, chlorinated and approved for service. The work shall be scheduled and executed to result in a minimum disruption of service to water customers.
- B. Only "wet taps" shall be made into new water mains unless specifically authorized otherwise by the Engineer. Corporation stops, water service pipe, new curb stops (if required), new service boxes (if required), fittings, etc., shall be installed, and all joints shall be made water tight. Services shall be installed to the limits and at locations directed by the Engineer, utilizing to the fullest the existing materials.
- C. Prior to excavating for the service connections, all sod on established lawns shall be stacked. Shrubs, hedges, fences, trees, etc. that may require removal or are damaged by construction operations, shall be removed and replanted or replaced.
- D. The Contractor shall install Service pipe beneath paved surfaces and sidewalks wherever possible, by jacking, jacking, boring or pulling the existing service pipe. Breaking up of existing pavement will not be permitted if jacking, jacking, boring, or pulling the pipe is possible.
- E. Equipment with pneumatic tires shall be used to excavate and backfill within a paved road surface of an established lawn. Excavation, backfilling and disposal of materials shall be done in accordance with the provisions of Section 02200, Earthwork.
- F. Water mains shall be tapped in accordance with the manufacturer's latest published recommendations, i.e., depth of tap, number of threads exposed, allowable sizes, etc., and the Contractor shall adhere strictly to these recommendations. The Contractor shall be held responsible for all subsequent leaks or failure of the taps for one year from the date of final acceptance of the project and he shall make all necessary repairs that may be required during this period.
- G. Drills or taps shall be inspected frequently for signs of wear, and in general the Contractor shall not exceed the number of taps specified by the manufacturer before reconditioning or replacement. Service pipe shall be cut only with approved wheel cutters.
- H. Service pipe shall be laid to a minimum depth of 5-6", and laid in a straight line wherever practicable to the structure to be serviced or to the point of termination of existing

service.

- I. The Contractor shall excavate at the existing water main to confirm location prior to starting.
- J. Where required, the Contractor shall flush all new services before connecting to the existing water service. The Contractor shall also assist Water Department personnel in flushing service lines if sediment or debris from existing mains plugs piping or meters, as a result of the work under this contract.

3.11 FLUSHING

- A. All new water mains, and existing water mains that have been drained and cut-into for making connections, shall be thoroughly flushed prior to pressure or leakage testing or final chlorination. Each section of main shall be slowly filled with water. Flushing shall be accomplished by partially opening and closing valves, hydrants, and blowoffs, etc., several times, under expected line pressure, with flow velocities of not less than 2.5 feet per second, in the main(s)

3.12 ACCEPTABLE TESTS

- A. All testing will be performed in accordance with the ANSI/AWWA C600 or current revision. The contractor shall provide the Precinct with 48 hours notice prior to undertaking any tests. Note: Reinspection fees are charged for retesting when initial tests fail. Contact the Precinct for current rate schedules.
- B. Pressure Test
After the pipe has been laid, all newly laid pipe or any valved section thereof shall be subjected to a hydrostatic pressure of at least 200 psi.

Test Pressure Restrictions. Test pressures shall:

- (a) not exceed pipe or thrust restraint design pressure;
- (b) be of at least 2-hour duration;
- (c) not vary by more than +5 psi;
- (d) not exceed twice the rated pressure of the valves or hydrants when the pressure boundary of the test section includes closed gate valves or hydrants;
- (e) not exceed the rated pressure of the valve.

Pressurization. Each valved section of pipe shall be filled with water slowly and the specified test pressure shall be applied by means of a pump connected to the pipe in a manner satisfactory to the Precinct. The water and container used to pump up the line to be tested shall be properly disinfected. Air Removal. Before applying the specified test pressure, air shall be expelled completely from the pipe, valves, and hydrants.

Examination. All exposed pipe, fittings, valves, hydrants, and joints shall be examined carefully during the test. Any damaged or defective pipe, fittings, valves, or hydrants that are discovered following the pressure test shall be repaired or replaced with sound material and the test shall be repeated until it is satisfactory to the Authority.

- C. Leakage Test

1. leakage test shall be conducted concurrently with the pressure test.
2. Leakage defined. Leakage shall be defined as the quantity of water that must be supplied into the newly laid pipe, or any valved section thereof, to maintain pressure within 5 psi of the specified test pressure after the air in the pipeline has been expelled and the pipe has been filled with water.
3. Allowable leakage. No pipe installation will be accepted if the leakage is greater than that determined by the following formula:

$$L = \frac{SD\sqrt{P}}{133,200}$$

in which L is the allowable leakage, in gallons per hour;

S is 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.

4. 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.
5. When hydrants are in the test section, the test shall be made against the closed hydrant valve.
6. Acceptance of installation. Acceptance shall be determined on the basis of allowable leakage. If any test of pipe laid discloses leakage greater than the allowable amount, the contractor shall, at his own expense, locate and repair the defective material until the leakage is within the specified allowance.
7. All visible leaks are to be repaired regardless of the amount of leakage.

D. DISINFECTION

1. Precautions shall be taken to protect pipe interior, fittings and valves against contamination. When pipe laying is not in progress, all openings in the pipeline shall be closed with watertight plugs. If water accumulates in the trench, plugs shall remain in place until the trench is dry. All pipe and fittings shall be kept free of dirt or any foreign material likely to cause contamination.
2. Mains shall be disinfected by the continuous feed method or the tablet method in accordance with AWWA C-651 current revision, except as specified otherwise or approved in writing by the Precinct.

(a). Continuous Feed Method

Potable water shall be introduced into the pipe line at a constant flow rate protected by an approved backflow prevention device. Chlorine shall be added at a constant rate to this flow so that the chlorine concentration in the water in the pipe is at least 50 mg/l. The chlorinated water shall remain in the pipe line at least 24 hours, after which, the chlorine concentration in the water shall be at least 10 mg/l.

3. The cost of all such testing will be the responsibility of the Contractor. All valves and appurtenances shall be operated while chlorinated water is in the pipe line. After the retention period, the main shall be flushed of the high chlorine water until the water leaving the system shows a chlorine concentration of less than 1 mg/l or no higher than that prevailing in the water used for flushing. After final flushing, two (2) water samples shall be collected 24 hours apart for bacteriological tests. The samples shall be collected at regular intervals not to exceed 1,000 feet throughout the length of the pipe. All bacteriological samples collected following disinfection shall be analyzed by a lab certified by the new Hampshire Department of Environmental Services. The results of these samples must indicate the absence of coliform contamination.
4. Disinfection shall include hydrants and other special pipe, taps and fittings used at connections to existing piping. These shall be thoroughly disinfected before installation. Excavation for such connections shall be kept free from water until the connection is completed and great care shall be exercised to prevent contamination of the pipe and connection fittings. The inside of the existing pipe within three (3) feet of point of connection shall be disinfected by spraying with a solution containing not less than 200 mg/l of chlorine immediately before connection is made. On completion of disinfection the piping shall be flushed thoroughly, and samples shall be taken and tested by a recognized testing laboratory. The water shall be proven safe for human consumption before acceptance of disinfection. Should the samples show the water is unsafe, the piping shall be disinfected until satisfactory tests are obtained.

DRAWINGS ATTACHED:

- A-1 Water trench Detail
- A-2 Water Service Connection
- A-3 Water Sewer Separation
- A-4 Typical Hydrant
- A-5 Thrust Block Detail 1
- A-6 Thrust Block Detail 2
- A-7 Valve Detail
- A-8 Water Service Installation