

WATER MAIN SPECIFICATIONS

DERRY, NEW HAMPSHIRE

APRIL 1993

**Including Amendments and Revisions to
February 1998
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DEPARTMENT OF PUBLIC WORKS

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SECTION 100

DEFINITIONS AND TERMS

1.01 - Meaning of Terms:

Wherever in these specifications the following terms or pronouns in place of them, are used, the intent and meaning shall be interpreted as follows:

TOWN OR OWNER: The Town of Derry, New Hampshire

DEPARTMENT: The Department of Public Works of the Town of Derry New Hampshire acting for the Town.

DIRECTOR: The Director of the Department of Public Works acting directly or through an authorized representative, such representative acting within the scope of the particular duties entrusted to him.

ENGINEER: The Engineering Technician in charge of New Construction for the Town of Derry, New Hampshire or authorized agent or officer.

CONTRACTOR: Any individual, firm or corporation employed by a developer to complete work in a subdivision or contracted by the Town of Derry, New Hampshire.

MATERIAL: Any substances proposed to be used in connection with the construction of any integral part and/or any appurtenant part and/or any incidental part of the proposed project.

SPECIFICATIONS: The directions, provisions and requirements contained herein, designated as the water main specifications together with all written agreements made or to be made pertaining to the method and manner or performing the work, or the quantities and qualities or materials to be furnished under these provisions.

WORK: All performance, including the furnishing of materials, labor, tools equipment and incidentals, required of the Contractor under the terms of these provisions.

THE WORD: "As directed", "as required" or words of like effect shall mean that the direction, permission or requirement of the Director is intended, and similarly the words "approved", "acceptable", "satisfactory", or words of like import shall mean approved by or acceptable or satisfactory to the Director unless otherwise provided herein. The words "necessary", "suitable", or words of like import shall mean necessary, suitable or equal in the opinion of the Director. The words "complete in place" shall mean the inclusion of all works, including incidentals, mentioned or implied in the Specifications and on the plans, or work that may reasonably be inferred as necessary to the proper execution of the item, unless payment for any portion of the work is otherwise specifically provided for.

1.02 - Abbreviations: Whenever the following abbreviations are used in these specifications or on the plans, they are to be construed the same as the respective expressions represented:

AAN - American Association of Nurserymen

AAR - Association of American Railroads

AASHTO - American Association of State Highway and Transportation Officials

ACI - American Concrete Institute

AGC - Association General Contractors of America

AIA - American Institute of Architects

AISC - American Institute of Steel Construction

ANSI - American national Standards Institute

ARA - American Railway Association

AREA - American Railway Engineering Association

ASCE - American Society of Civil Engineering

ASLA - American Society of Landscape Architects

ASME - American Society of Mechanical Engineers

ASTM - American Society for Testing and Materials

AWPA - American Wood Preservers Association

AWWA - American Water Works Association

AWS - American Welding Society

DOT/FHWA - Department of Transportation, Federal Highway Administration

FSS - Federal Specifications and Standards, General Services Administration

MUTCD - Manual on Uniform Traffic Control Devices

NEMA - National Electrical Manufacturers Association

NH/DOT - The State of New Hampshire Department of Transportation

RSA - The New Hampshire Revised Statutes Annotated, 1955 together with all revisions amending same to date of invitation of bids

SAE - Society of Automotive Engineers

SSPC - Steel Structures Painting Council

SECTION 200

MAINTENANCE OF TRAFFIC

2.01 General

A. This work shall include all operations necessary to maintain traffic flow, and to maintain access to all properties adjacent to the work. This work shall include, but not limited to; use of **Uniform Traffic Control and Flaggers**, furnishing, erecting, moving, and dismantling barricades, signs, and temporary lighting, to inform the general public of hazards existing near the site of work.

B. The **CONTRACTOR** shall facilitate the passage of school buses and provide safe access to all school bus stops, and notify the Police chief, Fire chief, and School Superintendent at least 72 hours in advance where the **CONTRACTOR** intends to work and the location of all detours.

2.02 Materials

A. Road construction approach signs shall be built, erected, and located in accordance with New Hampshire Department of Public Works and Highway Standards. Cost for all sign packages and barricades required shall be borne by the **CONTRACTOR**.

B. Traffic paddles and Flagger's equipment shall conform to those described in the MUTCD of New Hampshire Traffic Control HandBook, as appropriate.

C. Traffic Control personnel shall use two-way radio communication at all times, when two Traffic control people are used.

2.03 Personnel

A. 1) Uniformed Officers shall be attired with regulation duty uniforms, headgear, reflective vests, and an exposed badge. Flaggers shall be attired with blaze orange caps and vests.

2) Uniformed Officers and flaggers shall possess the following qualifications: at least average intelligence and alertness, good sight and hearing, courteous but firm manner, neat and presentable appearance, pleasing personality, and a sense of responsibility.

3) Uniformed Officers and flaggers shall have been given specific instructions by the **CONTRACTOR** as to their duties and responsibilities, both to the public and to their fellow workers on the job. They shall direct traffic in accordance with Section 618 of the NHDPW&H Standard Specification entitled "Uniform Officers and Flagmen."

4) Uniformed Officers and flaggers shall not be paid under a separate pay item but shall be absorbed under various pay items.

2.04 Execution

- A. At the preconstruction meeting, the **CONTRACTOR** shall submit a traffic control plan to the Town for approval. The Traffic Control Plan shall be approved prior to any construction.
- B. Except where permitted by the **TOWN** as part of an approved detour plan, all streets where work is being performed shall be left in a passable condition at night.
- C. No open trenches shall be left open overnight. Excavations shall be backfilled and compacted, as specified for temporary trench pavement, including all roadway base course gravels.
- D. The **CONTRACTOR** shall spread water or calcium chloride for Dust Control as directed by the Engineer. Cost for this procedure shall be absorbed under various pay items
- E. The **CONTRACTOR** shall provide a field supervisor or equivalent to rectify problems within traveled ways; if they develop. The field supervisor or equivalent shall be available 24 hours per day, seven days per week during the time of the contract. The field supervisor or equivalent shall have the appropriate equipment, tools and materials available to immediately resolve any problems which represent a safety hazard to the residents of the **TOWN**. The **CONTRACTOR** shall provide the Town a means of reaching the field supervisor during non-business hours. (such as a paging service, etc)
- F. The Director of Public Works and the Chief of Police shall retain the authority to suspend all or part of the **CONTRACTOR'S** operation, as he may deem necessary in the interest of public safety. The **CONTRACTOR** shall make no claim for additional compensation or time on account of such suspension.

SECTION 300

DUCTILE IRON PIPE AND FITTINGS

3.01 General

A. Furnish all labor, materials, equipment and incidentals required, and install ductile iron pipe and fittings complete as shown on the Drawings and as specified herein.

3.02 Materials

A. Ductile Iron Pipe: shall conform to ANSI/AWWA C151, class 52. The pipe shall be supplied in lengths not in excess of 20 feet. All proposed water mains shall be a minimum 8" in diameter unless otherwise approved by the Director. The pipe shall be subject to rejection at any time on account of failure to meet any of the specification requirements, even though pipes may have been accepted as satisfactory at the place of manufacture. Pipe rejected after delivery shall be marked for identification and shall immediately be removed from the job.

B. Non-restrained Joint Pipe: shall conform to ANSI/AWWA Type push-on joint, as manufactured by the American Cast Iron Pipe Company, U.S. Pipe and Foundry Company, or Lok-Fast Joint by American Cast Iron Pipe Company.

C. Restrained Joint Pipe: shall be wedge action retainer glands or grip rings or equivalent and be manufactured of ductile iron conforming to ASTM A536-80. They shall have a working pressure of at least 350 psi in sizes 3" through 16" and 250 psi in sizes 18" through 48" with a minimum safety factor of 2:1. Tee head bolts shall conform to the requirements of ANSI/AWWA A21.11/C111 and ANSI/AWWA.A21.53/C153 of latest revision. Twist off nuts on wedge action retainer glands shall be used to insure proper actuating of the restraining devices. **Under no circumstances shall the use of set screw retainer glands be used during installation.**

3.03 Execution

A. All pipe or fittings shall be examined before laying, and no piece shall be installed which is found to be defective. Pipe or fittings shall not be dropped. Any damage to the pipe lining or coatings shall be cause for rejection of pipe. All rejected pipe shall be promptly removed from the site and replaced with sound pipe at the **CONTRACTOR'S** expense. Hauling and laying of pipe and fittings shall be in accordance with the manufacturer's instruction.

B. All pipe and fittings shall be thoroughly cleaned before laying and shall be kept clean until they are used in work, and when laid, shall conform to the lines and grades required. A firm, even bearing throughout the length of the pipe placed in not less than 3 separate lifts shall be constructed by tamping selected material at the sides of the pipe up to 1 ft. over the top of the pipe. Blocking will not be permitted. If any defective pipe is discovered after it has been laid, it shall be removed and replaced with a sound pipe in a satisfactory manner by the Contractor at his own expense.

C. The Pipe Embodiment Zone shall consist of sand as that stipulated by Section 6.05 here in unless otherwise requested by the Town's Engineer.

D. When pipe laying is not in progress, the open ends of the pipe shall be closed by watertight plugs or other approved means.

E. Good alignment shall be preserved in laying. The deflection at joints shall not exceed that recommended by the manufacturer.

F. Pipe and fittings shall be laid with a minimum of 5 feet of cover over the top of the pipe.

G. Wedge Action Retainer Glands and or Grip ring mechanical joint pipe restraints or equal, along with concrete thrust blocks shall be installed at all fittings and other locations as indicated on the Contract Drawings or as directed by the Engineer. Minimum bearing area for thrust blocks shall be as shown on the drawings. Joints shall be protected by felt roofing or polyethylene sheet paper prior to placing concrete. Concrete shall be placed against undisturbed material, and shall not cover joints, bolts, or nuts, or interfere with the removal of any joint. Wooden side forms or sandbags shall be provided for thrust blocks.

H. Warning tape: shall have a minimum thickness of 4 mils with a solid aluminum core to ensure continuity. It shall have a minimum width of 4" and be installed directly over the pipe with an approximate 2' vertical separation.

3.04 Testing

A. The **CONTRACTOR** shall furnish a test pump, gauges, and any other equipment required in conjunction with carrying out the hydrostatic test. All labor and taps associated with testing shall be included under the bid item for testing.

B. All pipelines shall be subjected to a hydrostatic pressure of **200 psi**. This pressure shall be maintained for a **minimum of one hour**. Any loss of pressure will be unacceptable. Before testing begins, the **CONTRACTOR** shall notify the **ENGINEER**. The **ENGINEER** shall follow closely the progress of the pressure test.

3.05 Chlorinating of Pipelines

A. Before being placed in service, all new water mains shall be chlorinated using the continuous feed method specified in AWWA C601. The procedure shall be approved by the Engineer in advance.

B. 1) The location of the chlorinating and sampling points will be determined by the Engineer in the field. Taps for chlorination and sampling shall be installed by the contractor.

2) Any materials such as corporations and copper pipe will be provided by the Contractor and be paid under the lump sum item for testing and chlorination. The **CONTRACTOR** shall excavate, remove testing lines and backfill taps following approval by the Engineer.

C. The general procedure for Chlorination shall be first to flush all dirty or discolored water from the lines, and then introduce chlorine in approved dosages through a tap at one end, while

water is being withdrawn at the other end of the line. The chlorine solution shall remain in the pipeline at **50 parts per million (PPM) for 24 hours**. The chlorine solution must be purged from the pipeline no later than 36 hours following initial injection.

D. Following the chlorination period, all treated water shall be flushed from the lines at their extremities, and replaced with water from the distribution system. All treated water flushed from the lines shall be disposed of by discharging to the nearest sanitary sewer or by other approved means. No discharge to any natural watercourse will be allowed. The **CONTRACTOR** shall obtain samples of replacement water for bacteriological analysis by an approved laboratory in full accordance with AWWA Specification C601. The **CONTRACTOR** will be required to rechlorinate, if necessary, and the line shall not be placed in service until the requirements of the New Hampshire Department of Environmental Services, Water Supply and Pollution Control Division are met, and the **ENGINEER** is provided with a copy of the results from the approved laboratory.

E. All costs associated with the disinfection of water mains, including all lab analysis shall be borne by the **CONTRACTOR**.

SECTION 300-A

POLYETHYLENE ENCASEMENT FOR DUCTILE IRON PIPE AND FITTINGS

3.01-A General

A. Furnish all labor, materials, equipment and incidentals required, to encase ductile iron pipe and fittings with polyethylene material complete as shown on the Drawings and as specified herein.

3.02-A Materials

A. Polyethylene film: shall conform to ANSI/AWWA C105/A21.5-99 section 4.1.2 for High-density, cross-laminated polyethylene film. The polyethylene shall be tubular with a minimum thickness of 4 mil. Tube size shall be according to table 1 of the above mentioned standard.

B. Marking of the polyethylene film shall be at a minimum of every 2-ft along its length, containing the following information:

- a. Manufacturer's name or trademark.
- b. Year of manufacture
- c. ANSI/AWWA C105/A21.5
- d. Minimum film thickness and material type (HDCLPE).
- e. Applicable range of nominal pipe diameter size(s).
- f. Warning—Corrosion Protection—Repair Any Damage

3.03-A Execution

A. The polyethylene encasement shall prevent contact between the pipe and the surrounding backfill and bedding material, but it is not intended to be a completely airtight or watertight enclosure. During installation, soil or embedment material shall not be trapped between the pipe and the polyethylene. The polyethylene film shall be fitted to the contour of the pipe creating a snug but not tight, encasement with minimum space between the polyethylene and the pipe. Sufficient slack shall be provided in contouring to prevent stretching the polyethylene where it bridges irregular surfaces, such as bell-spigot interfaces, bolted joints, or fittings and to prevent damage to the polyethylene caused by backfilling operations. Overlaps and ends shall be secured with adhesive tape, or plastic tie straps. Also, circumferential wraps of tape should be placed at 2 ft intervals along the barrel of the pipe to minimize the space between the polyethylene and the pipe.

B. 1) Specific installation of the polyethylene film shall be according to ANSI/AWWA C105/A21.5-99 section 4.4.2.1 Method A.

2) Cut polyethylene tube to a length approximately 2 ft longer than the pipe section. Slip the tube around the pipe, centering it to provide a 1-ft overlap on each adjacent pipe section and bunching it accordion-fashion lengthwise until it clears the pipe ends.

- 3) Lower the pipe into the trench and make up the pipe joint with the preceding section of pipe. A shallow bell hole must be made at the joints to facilitate installation of the polyethylene tube.
- 4) After assembling the pipe joint, make the overlap of the polyethylene tube. Pull the bunched polyethylene from the preceding length of pipe, slip it over the end of the new length of pipe, and secure it in place. Then slip the end of the polyethylene from the new pipe section over the end of the first wrap until it overlaps the joint at the end of the preceding length of pipe. Secure the overlap in place. Take up the slack width at the top of the pipe to make a snug but not tight fit along the barrel of the pipe, securing the fold at quarter points.
- 5) When it is not practical to wrap valves, tees, crosses, and other odd shaped pieces in a tube, wrap with a split the length of the polyethylene tube by passing the sheet under the appurtenance and bringing the sheet around the body. Make seams by bringing the edges of the polyethylene sheet together, folding them over twice, and taping them. Tape the polyethylene securely in place at the valve stem and other penetrations.
- 6) Repair cuts, tears, punctures, or damage to polyethylene with adhesive tape or with a short length of polyethylene tube cut open, wrapped around the pipe to cover the damaged area, and secured in place.
- 7) Provide openings for branches, service taps, blowoffs, air valves, and similar appurtenances by cutting an X in the polyethylene and temporarily folding back the film. After the appurtenance is installed, tape the slack securely to the appurtenance, and repair the cut and any other damaged areas in the polyethylene with tape. Direct service taps may also be made through the polyethylene, with any resulting damaged areas being repaired as described previously. To make direct service taps, apply two or three wraps of adhesive tape completely around the polyethylene encased pipe to cover the area where the tapping machine and chain will be mounted. This method minimizes possible damage to the polyethylene during the direct tapping procedure. After the tapping machine is mounted, the corporation stop is installed directly through the tape and polyethylene.
- 8) Where polyethylene wrapped pipe joins an adjacent pipe that is not wrapped, extend the wrap to cover the adjacent pipe for a distance of at least 3 ft. Service lines of dissimilar metals shall be wrapped with polyethylene for a minimum clear distance of 3 ft away from the ductile iron pipe.

SECTION 400

VALVES AND APPURTENANCES

4.01 General

A. Furnish and install gate valves, valve boxes, tapping sleeves and valves, hydrants, and appurtenances complete as shown on the Drawings and/or specified herein.

4.02 Materials

A. 1. Gate valves 4" to 12" shall conform to Standard Specification AWWA AC-509 for resilient wedge gate valves in so far as applicable. The body shall be completely manufactured of lightweight, high-strength ductile iron with a wall thickness, which meets or exceeds the requirements of AWWA C-153. Wedge shall be constructed of ductile iron, fully encapsulated in synthetic rubber per AWWA C-509. Valve body and bonnet shall be fusion bonded epoxy coated inside and out per AWWA C-550.

Gate valves larger than 12" shall conform to Standard Specification AWWA C-504 for Butterfly Valves, in so far as applicable. The Valve body shall be ASTM-A48; Class 40 or A126, Class B Cast Iron. The Butterfly valve disc, shall be of the "offset" design to provide a full 360° seating surface, uninterrupted by shaft holes. Disc shall be constructed of ASTM A56, Grade 65-45-12 ductile iron. Valve shafts shall be single piece "through" type and shall be of round 18-8 stainless steel, type, 304 material. All internal and external surfaces of valve body shall be shop painted with two coats of asphalt varnish (Federal Specification TT-V-51C). Valve actuators shall be furnished with standard 2" AWWA operating nuts. Each valve shall be tested per AWWA C-504, including hydrostatic, performance, and leakage tests.

All valves shall have mechanical joint ends and shall open left (**counter clockwise**).

2. Each gate valve shall be accompanied by a valve box of the two section, adjustable type of heavy pattern, constructed of cast iron and provided with cast iron cover. Boxes shall be of lengths consistent with pipe depths.

B. Tapping valves shall meet the requirements of AWWA C500. The valves shall all be flanged by mechanical joint outlet with non-rising stem, designed for vertical burial and shall open left or counterclockwise. Stuffing boxes shall be the "O-Ring" type. Operating nut shall be AWWA Standard 2-inches square. The valve shall be provided with an overloaded seat to permit the use of full size cutters. Gaskets shall cover the entire area of flange surfaces.

C. Tapping sleeves shall be manufactured of 18-8 stainless steel with minimum 5/8" 18-8 stainless steel nuts and bolts coated with fluorocarbon. The flange shall conform to AWWA C207 Class D-ANSI 150 lb. drilling. A 3/4" 18-8 stainless steel testing plug shall be provided so that the sleeve may be tested for a positive seal before tapping. The gasket shall be made of virgin GPR compounded for water service meeting the requirements of ASTM D2000.80M 4AA607. Tapping sleeves shall be rated for 200 PSI minimum working pressure.

D. Hydrants shall be American Darling B-84-B conforming to AWWA C-502. Standard depth of bury shall be 5'0". All hydrants shall be open left and weep holes plugged. The **ENGINEER** shall determine whether or not that the plugs be removed based on ground water conditions.

E. All hydrant laterals shall be 6" ductile iron pipe and conform to ANSI/AWWA C-151, Class 52. **(No domestic taps shall be permitted on fire hydrant laterals.)** Need confetti

4.03 Execution

A. Gate valves shall be set vertically aligned on a firm foundation and supported by tamping selected excavated material under and at the sides of the valve. Gaskets shall be properly tightened around the flange to create an adequate seal. All gate valves should be closed prior to installation.

B. Valve boxes shall be installed vertically, centered over the operating nut, and the elevation of the top shall be adjusted to conform to the finished surface of roadway or other surface at the completion of the contract. Boxes shall be adequately supported during backfilling to maintain vertical alignment.

C. Hydrants, as detailed on the Drawings shall be set at the location designated by the **ENGINEER** and shall be bedded on a firm foundation. A drainage pit 3 ft. in diameter and to the limits shown on the Drawings shall be filled with 3/4" crushed stone and satisfactorily compacted. Each hydrant shall be set in true vertical alignment and shall be properly braced. Concrete thrust blocks shall be placed between the back of the hydrant inlet and undisturbed soil at the end of the trench providing at least the minimum bearing as shown on the Contracted Drawings. The hydrant shall be tied to the pipe with suitable stainless steel rods or clamps. Wedge action retainer glands or grip ring mechanical joint restraints must be used to join all pipes and fittings, from the tee at the main, to the hydrant.

D. Reconnecting existing hydrants to new water mains as indicated on the drawings shall include all new pipe and fittings up to the hydrant base. The use of grip couplings shall not be permitted. The contractor shall adjust the location of the existing hydrant for proper alignment with the new lateral. (No bell joints shall be permitted along hydrant laterals less than 20 feet from the hydrant.)

- E.
1. The tapping operation shall be conducted by workmen thoroughly experienced in the installation of tapping sleeves and valves, and under supervision of qualified personnel furnished by the manufacturer. The tapping machine shall be furnished by the Contractor.
 2. Installation shall be made under pressure and the flow of water through the existing main shall be maintained at all times. The tapping valves and sleeves shall be tested through the sleeve plug at **200 psi for 15 minutes using water or 100 psi for 15 minutes using air** prior to tapping the existing main.
 3. The **CONTRACTOR** shall determine the location of the existing main to be tapped to confirm the fact that the proposed position for the tapping sleeves will be satisfactory and no interference will be encountered such as the occurrence of existing utilities or of a

joint or fitting at the location proposed for the connection. **No tap will be made closer than 3 ft from the pipe joint.**

4. Tapping sleeves and valves with boxes shall be set vertically and squarely centered on the main to be tapped. Adequate support shall be provided under the sleeve and valve during the tapping operation. Thrust blocks shall be provided behind all tapping sleeves. Proper tamping of supporting earth around and under the valve and sleeves is mandatory.

SECTION 500

WATER SERVICES

5.01 General

A. Furnish all labor, materials, equipment and incidentals required to install copper pipe and fittings complete as shown on the drawings and as specified herein.

5.02 Materials

A. All Water services must be at least 3/4" - Type K copper tubing with compression type fittings. All proposed water services greater than 100 feet in length shall be a minimum 1" – type K Copper tubing.

B. Corporation stops shall be tapered AWWA thread (CC) inlets with compression pack joint (CPPJ) outlet. They must meet or exceed AWWA specification C-800 and possess a working pressure of 300 psi.

C. Curb stops must be of a ball curb type (brass ball with Teflon coating) without drain. They must meet or exceed AWWA specification C-800 and possess a working pressure of 300 psi.

D. The water service curb box is made up of three basic components: the cover, the service box, and the rod.

1. The plug type cover must have a brass pentagon plug with coarse "rope" thread to enable quick and easy removal.

2. The service box shall be adjusted to 1' - 0" within its height range. It must be adjusted to final grade flush with either pavement or grass surface.

3. The rod must offset for centering in the pipe and be provided with a heavy ductile iron end yoke with brass cotter pin. The pin assembly must be attached to the curb stop prior to backfill.

E. Three-piece coupling shall be of compression type pack-joint (CPPJ) on both ends to connect lengths of copper service piping. The CPPJ coupling must be of a type with a split clamp device.

F. Saddles must be of Ductile Iron meeting ASTM A-536-80 Grade 65-45-12 (Threads shall be CC). The finish shall be 10 mils of fusion applied nylon. Straps, bolts, nuts and washers shall be Mayari-R (Corten) high tensile strength, type 304 (18-8) stainless steel. Threads must be Teflon coated and GMAW welds must be passivated for resistance to corrosion. The gasket shall be virgin NBR compounded for water.

5.03 Execution

A. All materials shall be inspected prior to installation. Water service connections shall be extended to the Right of Way as shown on the drawings or as directed by the Engineer.

B. 1. Sand bedding must be placed and completed to **provide cover a minimum of 6" below and 12" above the service connection pipe.**

2. Copper tubing, available in **100' rolls shall be used** to minimize the use of unions during installation.

3. Extra care shall be taken in bending the tubing. Any tubing **having irregularities such as kinks shall be replaced at the Contractor's expense.**

C. Corporation stops must be installed only after the water main is tested and chlorinated, and must be installed under full service pressure by threading the corporation directly into the main. The corporations must be installed at an angle of 66 degrees away from top of the pipe by an approved type of **"Tapping Machine"**. Tapping new mains or old by a makeshift hand drill shall not be allowed.

D. After the water service connection to the main is completed the water service line is laid up to the property line of the homeowner and the curb stop is installed. This line will be laid without bends whenever possible.

E. Curb boxes must be set vertically level and must be cleaned and "Blown-out" prior to acceptance by the Town of Derry.

F. Taps into ductile or cast iron mains shall be made without tapping saddles, by an approved type of "Tapping Machine". If a saddle is required due to a leaky direct tap, then all materials and labor expenses associated with the repair shall be borne by the **CONTRACTOR**. All other pipe materials such as transite and PVC shall require the use of a saddle.

G. When reconnecting existing water services to new water mains, caution shall be exercised to ensure proper alignment of the new service tap in relation to the existing water service. Any extra pipe and fittings required to complete this work, shall be included within the bid item.

H. Service connections shall be installed with a **minimum six feet of cover.**

I. Trench excavation and backfill shall be the same as that stipulated by section 600 herein.

J. Trench repair shall be the same as that stipulated in Section 700 herein.

K. Sewer and Water services shall maintain a minimum horizontal separation of 10 feet.

L. Duplexes or other multi-unit dwellings shall have separate connections to the main as well as separate shut-offs and be installed as outlined herein.

SECTION 600

TRENCH EXCAVATION AND BACKFILL

6.01 General

A. Furnish all labor, materials, equipment and incidentals necessary for trenching of utilities and appurtenances, including back-filling, test pits, and disposal of surplus materials.

6.02 Location of Utilities

A. Once the Contractor is awarded it shall be the Contractor's sole responsibility to contact Dig Safe prior to construction.

B. Prior to construction, the Town shall mark out location of existing water, sewer and drainage utilities based on best available information. This shall not in any way relieve the contractor from damages to the existing utilities. The **CONTRACTOR** shall be responsible for maintaining and recording all utility locations during construction. The **CONTRACTOR** shall be charged by the Town for any relocating of existing utilities.

6.03 Trench Excavating

- A
1. The Contractor shall make excavations in such manner and to such widths as will give suitable room for laying, jointing, and bedding the pipe, furnish and place sheeting, as necessary, and for de-watering and maintaining the trench in a dry condition.
 2. It is the **CONTRACTOR'S** responsibility to satisfy all Federal, State, and local regulations such as those of OSHA.
- B.
1. The top of the trench shall be the ground elevation as determined by the Engineer prior to excavation. In general trenches for pipelines are calculated to give such depth as will provide 5.5 feet of earthen cover.
 2. The allowable trench width shall be 2.0 feet greater than the normal pipe size or a minimum of 3 feet, whichever is greater.
- C.
1. All pavement is to be cut prior to excavation. The **CONTRACTOR** shall at all times exercise care not to excavate outside the trench limiting lines as shown on the drawings. No extra allowance will be given for back filling, rock removal, paving, or other work resulting from excavation beyond these lines.
 2. If the **CONTRACTOR** excavates below grade through error or his own convenience, or through failure to properly de-water the trench, or disturbs the sub-grade before de-watering is sufficiently complete, may be directed by the **ENGINEER** to excavate below grade, in which case the work of excavating below grade and furnishing

and placing the refill shall be performed at his own expense.

- D.
1. If in the opinion of the Engineer, the material at or below the normal grade of the bottom of the trench is unsuitable for foundation, it shall be removed to the depth directed by the **ENGINEER** and replaced by an approved second gravel.
 2. Surplus material excavated from trench and abandoned pipe and utilities, broken pavement, masonry, reinforced concrete, and other materials encountered in the excavation and not suitable for landfill, becomes the property of the **CONTRACTOR** and must be disposed of appropriately.
- E. The **CONTRACTOR** shall furnish all labor, materials, equipment, and incidentals required to repair any existing utilities damaged during construction. Any assistance rendered to the **CONTRACTOR** by the **TOWN** in isolating or repairing damaged utilities, shall be appropriately deducted from the contract bid price.

6.04 Trench Ledge Excavation and Disposal

- A.
1. Rock excavation shall consist of all solid rock which cannot be removed without blasting or ripping. It shall consist of boulders and parts of masonry structures when found to measure 1 cubic yard or more.
 2. Material which can be loosened and removed such as loose or fractured rock, frozen materials, shale, hardpan, and the like which is outside of the limits of measurements allowed shall not be measured or classified as rock excavation.
 3. Where rock is encountered, it shall be uncovered but not excavated until measurements have been made by the **ENGINEER**. All ledges within the trench limitations will be removed and disposed of off the site by the **CONTRACTOR**. All ledge excavated from the trench will be replaced with suitable material approved by the **ENGINEER**.
- B.
1. All blasting operations shall be conducted in full compliance with all the laws of the State, all local ordinances, and with all possible care so as to avoid injury to persons and property.
 2. The **CONTRACTOR** shall perform a pre-blast survey of the area where blasting is required. He shall record existing conditions in written form, sketches, photographs, videotapes, or any other form. All nearby buildings, foundations, driveways, roadways, and other existing structures shall be inspected for cracks, loose masonry, and any other conditions which might be attributable to blasting at a later date. A copy of said survey shall be provided to the **ENGINEER** before blasting commences.
 3. The **CONTRACTOR** shall record the location, depth, and size of each hole. A copy of the said blasting record shall be provided to the **ENGINEER** at the conclusion of blasting rock.
 4. No blasting will be permitted under or adjacent to any street, roads, or highway

unless permission has been received in writing from the authority having jurisdiction.

5. Conform to all Municipal, State, Federal, and other ordinances and codes relating to the storage and handling of explosives. Particular attention is called adherence to requirements of the electric, gas, and other utilities which may be located in the project area.

6. Damages and costs of whatever nature resulting from the work specified herein shall be borne solely by the **CONTRACTOR**.

6.05 Select Materials for Pipe Embedment

A. From the bottom of the trench to a minimum of 12 inches above the pipe crown, shall referred to as the pipe embedment zone. Select material shall be specified elsewhere or as indicated on the drawings. The select material shall be hand tamped around the pipe so that each section shall have a firm bearing through out its entire length.

B. Select materials shall conform to the following standards:

1. Sand - shall be free from stone or any organic matter.

<u>Sieve Size</u>	<u>Percent Passing By Weight</u>
3"	100
#4	70- 100
#200	0- 12

2. Bank Run Gravel - shall be graded such that the maximum size of stone particles shall not exceed 3/4 of the compacted depth of the layer being placed. In no case shall the stone size be larger than 6 inches.

<u>Sieve Size</u>	<u>Percent Passing By Weight</u>
6"	100
#4	25 - 70
#200	0 - 12

3. Crushed Gravel - at least 50 percent of the material retained on the 1 inch sieve shall have a fractured face.

<u>Sieve Size</u>	<u>Percent Passing By Weight</u>
3"	100
2"	95 - 100
1"	55 - 85
#4	27 - 52
#200	0 - 12

4. Crushed Stone - shall consist of clean durable ledge and rock. It shall be free from thin elongated pieces.

<u>Sieve Size</u>	<u>Percent Passing By Weight</u>
1"	100
3/4"	85 - 100
1/2"	15 - 45
#4	0 - 5
#3	0 - 5
#50	0 - 5
#200	0 - 5

6.06 Backfill

A. The material above the pipe embedment zone shall be selected backfill or common fill as specified on the plans. All trenches within the limits of a roadway, shoulder, sidewalk, or other paved areas shall be thoroughly compacted by hand or mechanical means in layers not to exceed twelve (12) inches. Each backfill layer shall be at 95% of its optimum.

B. All backfill material shall be free from all organic matter and debris. No stone or rock fragments larger than 6" shall be deposited in the backfill.

C. Any trench areas improperly backfilled or having excessive settlement, shall be reopened to the depth required, then refilled, compacted, restored to the required grade, mounded over and smoothed or repaved as necessary.

D. All digging up, protecting, and replacing of hedges, shrubs, trees, and plants, along with stripping and stockpiling of all topsoil where it exists, and replacement of the original earth cover including regrading and clean-up shall be the sole responsibility of the **CONTRACTOR**.

SECTION 700

TRENCH REPAIR

7.01 General

A. Furnish all labor, material, equipment, and incidentals required to replace all pavement removed over trenches or otherwise disturbed by the **CONTRACTOR'S** operation.

B. Streets, driveways, parking areas or sidewalk pavement, damaged or disturbed by, the **CONTRACTOR'S** operation shall be repaired, replaced, or restored, by the **CONTRACTOR** in accordance with the requirements specified herein, and as directed by the **ENGINEER**, at no additional expense of the owner.

C. Except as otherwise specified herein, the material and construction shall be in accordance with the "Standard Specifications for Road and Bridge Construction", New Hampshire Department of Transportation (NHDOT), latest edition, including all addendum.

7.02 Materials

A. Bank Run Gravel shall meet the requirements of Section 600 herein.

B. Crushed Gravel shall meet the requirements of Section 600 herein.

C. 1. Base course pavement shall be 3/4" Type B as specified in the NHDPW & H "Standard Specifications for Road and Bridge Construction.

2. Wearing course shall be 1/2" Type E as specified in the Standard specifications referenced above.

3. Temporary pavement shall be 1/2" Type C as specified in the Standard specification referenced above.

7.03 Temporary Pavement

A. All trenches shall be paved immediately following construction unless otherwise noted on the plans or directed by the Engineer.

B. The **CONTRACTOR** shall provide a mechanical sweeper and shall "sweep" roads used or in the construction areas as requested by the **ENGINEER**. This shall be done as construction progresses to further control the dust nuisance caused by unpaved trenches in roadways and other areas. Upon completion of all road work, the **CONTRACTOR** shall sweep clean the final work.

C. 1. Trenches shall be backfilled to within 22 inches of final grades as specified herein.

2. The **CONTRACTOR** shall place **12" of Bank run gravel, 8" crushed gravel, and 2" of Temporary pavement**. Gravel materials shall be thoroughly compacted by hand or

mechanical means in layers not to exceed six (6) inches. Each backfill layer shall be 95% of its optimum density.

3. Temporary patches shall remain in place for a minimum of **60 days** but not more than **120 days**. The **CONTRACTOR** shall have the responsibility to periodically inspect temporary pavement areas and repair as necessary, especially during the winter months when the temporary pavement remains in place for an extended period.

4. Use of Cold Patch materials is specifically prohibited for Temporary Patch.

7.04 Permanent Trench Pavement Repair

A. At the end of the stabilization period the temporary patch will be cut out and the trench trimmed with neat straight and square corners a minimum distance of (12) inches beyond the limits of temporary patch or areas of observed settlement, whichever, is greater. The **CONTRACTOR** will insure this requirement is adhered too.

B. The **CONTRACTOR** shall remove the temporary asphalt and crushed gravel as needed to obtain the 4" of permanent pavement required. A tack coat shall be applied along all joints.

C. Supply and place (2 1/2) inches of 3/4" Type B Base course asphalt and (1 1/2) inches of 1/2" Type E Finish course asphalt. Paving shall be allowed if the air temperature is at least 45 degrees F and rising, and the area is exposed to the sun.

D. Rolling shall be done with a self-propelled roller weighing not less than 8 tons and shall continue until a firm even surface true to the lines and grades is obtained.

E. Newly paved trenches shall be either bonded to the existing pavements by an approval means of infra-red heat sealing, or overlaid by 1" of Type F pavement over the entire area.

F. All trenches shall be overlaid the entire width of roadway and 50 ft beyond the edges of the trench along the length of the roadway. The new pavement shall be keyed into the existing pavement as directed by the **ENGINEER**. Finish course paving shall be placed by machine method in accordance with the Derry Roadway Construction Specifications.

7.05 Sidewalks

A. All sidewalks, whether bituminous concrete or cement concrete, interfered with during the construction of sanitary sewer and/or water service connections shall be rebuilt by the **CONTRACTOR** in accordance with the following specifications:

1. Cement Concrete: The foundation shall be at least six (6) inches of well - compacted bank run gravel. The concrete shall be 3000 lb. strength, 4 inches in thickness, reinforced with No 4, 4" X 6" mesh and wood flat finished. Expansion joints (3/4" open) shall be scored into walk every 4 feet. Base gravel material shall be of an approved type. It shall be compacted to 95% of its optimum density.

2. Bituminous Concrete: The foundation shall be twelve (12) inches of bank run gravel as specified above, and the wearing surface shall be laid in two courses, a 1 1/2 inch bottom course and a 1 inch top course, thickness measured after compaction. The material and application shall conform to the Specifications outlined for roadway surfacing. All edges of the walks shall be formed with wood screeds which are securely anchored and left in place. The sidewalk shall meet existing sidewalk widths and have a slope of 1/4 inch per foot from back edge of sidewalk towards roadway.

SECTION 800

AS-BUILTS

8.01 General

A. The CONTRACTOR must submit all asbuilts for Water/Sewer mains and Water/Sewer services. All cost for as-built drawings shall be included with pipeline installation bid prices.

8.02 Requirements

A. The below list is the minimum requirement which must be provided:

- 1) House location
- 2) Installed sewer and/or water service location
- 3) Driveway location
- 4) Water main location
- 5) Sewer main location
- 6) Drain location (if any)
- 7) Catch basin location (if any)
- 8) Sewer Manhole location (if any)
- 9) Retaining wall location (if any)
- 10) Other Public Utilities (Electric, Telephone, etc)
- 11) Existing trees within 12 feet of proposed Service (if any)
(Figure 1 illustrates an example of a typical as-built site.)

B. Original site plans may be used in drawing as-builts for sewer and water mains. The actual pipeline installed shall be drawn in red pencil or red ink, as will notes and swing ties.

C. All newly installed water main gate boxes and hydrant gate boxes must be accurately located and “tied off” from permanent building structures only. Ties taken from poles, catch basins, manholes, other gate boxes, trees and property boundaries are not acceptable. The above requirement may be modified if one “tie” distance is greater than one hundred feet (100’).

D. 1) Service “as built” must show the exact location and depths of new water/sewer services in relation to the building that it serves. All depths between the top of the services and existing ground must be noted.

2) Water service connection “as-builts” must include “tie” from the building corners to the corporation, the service box, unions, and any points at which the service changes direction. In addition, distances from corporations to curb stops, curb stops to unions, and the point at which the service enters the foundation.

3) Sewer service connection “as-builts” must include “ties” from the building corners to the tap or wye, and to the clean out. In addition, distances from the “tap or wye” to the clean out and from the clean out to point at which “tap or wye” to the upstream sewer manhole in the public sewer main shall also be noted.

E. Distances must be accurate to the nearest length of a foot (plus or minus 0.10 foot). Accurate “as-built” plans are dependent on good location and measurements prior to backfill.

F. Before the Town releases final monies from bid items or escrow accounts, complete “as-built” plans must be submitted to the Department of Public Works, 14 Manning Street, Derry, New Hampshire.

SECTION 900

TEMPORARY WATER MAINS AND SERVICES

9.01 General

A. Furnish all labor, materials, equipment and incidentals required to install, maintain, and remove temporary water service as shown on the drawings and as specified herein.

9.02 Materials

A. Restrained Joint PVC Pressure Pipe: shall be certainities Yelomine PVC Pipe or equivalent and be made from Polyvinyl Chloride, Type I, Grade 1, 2,000 psi design stress material, class 12454B in accordance with ASTM D-1784. It shall be pressure rated for 200 psi according to ASTM D-2241 and impact strength shall meet the requirements of ASTM Standard 10-2444.

B. Restrained PVC Joints: shall be certainities Yelomine certa-Lok or equivalent and meet ASTM D-3139. Rubber O rings shall meet ASTM F-477, standard specification for Elastomeric seals for joining PVC pipe.

C. Restrained Joint PVC fittings; shall meet or exceed all specifications for certainities Yelomine PVC Pipe or equivalent.

D. Polyethylene Pressure Pipe: shall be made from high density, extra high molecular weight compound equaling a PE 3408 designation and shall conform to ASTM-1248 and ASTM-3350; with a cell classification of 345434C. All pipe and fittings shall be pressure rated for a minimum of 200 psi.

E. Ball valves: shall meet or exceed AWWA Specification C-800 and possess a working pressure of 300 psi.

9.03 Execution

A. Handling and laying of pipe and fittings shall be in accordance with the manufacturer's instruction. All pipe and fittings shall be kept clean and free from debris during installation.

B. All temporary pipe shall be laid on top of the ground unless otherwise noted on the plans. When the pipe crosses driveways and walkways, stone dust shall be placed and properly ramped to maintain access during construction. The pipe shall be installed a minimum of 12 inches below pavement when crossing roadways.

C. The Contractor shall be responsible for shutting appropriate valves within buildings to ensure that water does not back feed into existing water main or leak out through any draining curb stops that may exist, as well as shutting off the curb stops themselves.

D. The Contractor shall attempt to blow off service lines through temporary connections prior to reconnection of services to new watermain. (Note: This requirement may be waived if a backflow device prevents water from flowing in reverse direction.)

E. If any special modifications are required due to absence of sill cocks or sill cocks with built in backflow preventers, the contractor shall perform the work and bear all the costs required to make connections and appropriate repairs during disconnections.

9.04 Chlorination of Pipelines

A. All temporary water mains shall be disinfected as specified in Section 3.05 herein.

Section 1000

Easement Construction

10.01 General

A. Furnish all Labor, materials, equipment, and incidentals required to construct easements that will allow access to maintenance and construction equipment.

10.02 Materials

A. 1) Woven Geotextile shall be a woven polypropylene product. It shall meet or exceed the following physical requirements.

<u>Geotextile Property</u>	<u>Test Method</u>	<u>Minimum Property Requirements</u>
Apparent Opening Size (US Standard Sieve Size)	ASTM D4751-87	No. 30 Sieve
Permittivity (1/second)	ASTM D4491-85	0.02
Grab Tensile Strength (Pounds)	ASTM D4632-86	270
Puncture Strength (Pounds)	ASTM D4833	100
Mullen Burst (psi)	ASTM D3786	550
Trapezoid Tear (pounds)	ASTM D4533-85	100

2) To prevent damaging the fabric, the Contractor shall exercise necessary care while transporting, storing and installing the fabric. Prior to installation, the fabric shall be protected from weather, direct sunlight or other ultra-violet exposure, and from dust, mud, dirt, debris and other elements which may affect its performance. Fabric which is torn, punctured or otherwise damaged shall not be placed. After placement, fabric shall be covered within 5 days. Traffic or construction equipment will not be permitted directly on the geotextile.

B. Bank Run Gravel: shall meet the requirements of Section 600 herein.

C. Crushed Gravel: shall meet the requirements of Section 600 herein.

10.03 Construction Easement

A. A 50' wide construction easement shall be cleared and grubbed according to Plans or as specified by the Town's Engineer. Caution shall be exercised by the Contractor so as not to disturb areas outside the limits of work.

B. All loam shall be stripped within the limits of the 20' permanent utility easement and stock piled for future use in an authorized area.

10.04 Access Drive

A. All utility lines and structures shall be installed and tested as outlined herein.

B. 1) A 12 foot wide access drive shall be constructed directly over the center of the utility main installed within the 20 foot permanent easement. Drainage culverts shall be installed according to plans or as directed by the Town's Engineer.

2) The access drive shall be cut to subgrade at a minimum of 18 inches from finished grade or as specified on the Plans. The geotextile shall be placed in accordance with the plans and manufacturer's requirements. Prior to placement of the fabric, the site shall be prepared to provide a smooth surface which is free from debris, obstruction, and depressions which could result in gaps, tears or punctures in the fabric during cover operations. The fabric shall be unrolled loosely and positioned as evenly as possible on the surface to eliminate wrinkles and folds. Pins or staples may be used to anchor the fabric as directed by the Engineer. The fabric should be pinned in a loose condition so that it easily conforms to the ground surface and will give to the inward movement of the overlying material. Fabric which is damaged after placement shall be replaced, repaired by stitching or patched. Patches shall be of the same material as the placed geotextile. The patch shall be joined to the existing fabric using overlapped seams as directed by the Engineer.

3) 12 inches of Bank run gravel shall be placed over the fabric in accordance with the plans. Fabric which is damaged as a result of careless or improper placement of gravel, grading techniques or equipment traffic above the fabric shall be repaired or replaced at the expense of the Contractor. 6 inches of crushed gravel shall be placed over the Bank run gravel and be graded to match the surrounding topography or as directed by the Town's Engineers.

4) Screened loam at an average depth of 2 inches shall be placed over the access drive and shall be seeded to discourage use by unauthorized vehicles.

/jmt 7/9/96

/smt revised 1/20/98

/mrl revised 3/29/01

/mrl revised 4/12/05