

WATER SUPPLY SYSTEM

PART 1 - GENERAL

1.01 SUMMARY

- A. Section includes:
1. Pipe Materials
2. Hydrants
3. Valves
4. Fittings
5. All other appurtenances necessary to complete the water main system as shown on the Contract Plans.

1.02 SUBMITTALS

- A. Product Data: Submit published data from manufacturers of products and accessories specified, indicating compliance with requirements to the Engineer and local municipality.

1.03 QUALITY ASSURANCE

- A. All materials and the installation procedure shall be in accordance with the Department of Environmental Conservation, Water Supply Division and the applicable construction ordinances of the local municipality.

PART 2 - PRODUCTS

2.01 GENERAL

- A. Furnish ells, tees, reducing tees, wyes, couplings, increasers, crosses, transitions and end caps of the same type and class of material as the conduit, or of material having equal or superior physical and chemical properties as acceptable to the Engineer as necessary to complete the water system.

2.02 DUCTILE IRON WATER PIPE

- A. Pipe shall be Ductile Iron Class 52 (sizes as shown on the plans) conforming to current ANSI/AWWA C115/A21.5 (latest revision). Larger size mains will be required if necessary to allow withdrawal of the required fire flow while maintaining the minimum pressure specified in the VT Water Supply Rule, Chapter 21, 8.1.1. Any proposed departure from minimum requirements shall be justified by hydraulic analysis and future water use assessment, and will be considered only in special circumstances (VT Water Supply Rule, Chapter 21, 8.1.4). Push-on joint pipe shall be minimum thickness Class 52. Push-on joint accessories shall conform to applicable requirements of ANSI/AWWA C115/A21.5. All ductile iron pipes shall have polyethylene encasement in accordance with ANSI/AWWA C105/A21.5.
B. Pipe shall be cement mortar lined on the inside in accordance with ANSI Specification A21.4 except that the cement lining thickness shall not be less than 1/8 inch. A plus tolerance of 1/8 inch will be permitted.
C. Pipe shall be given an exterior petroleum asphaltic coating in accordance with ANSI AWWA C151/ANSI A21.51.
D. When a pipe material is specifically noted on the contract drawings, the contractor/developer shall not have the option of utilizing any other pipe material. Galvanized pipe or fittings shall not be used in any water system owned or maintained by the Town of Shelburne.
The Town of Shelburne reserves the option to use pvc waterline meeting the requirements of AWWA C-900 (DR-14).

2.03 FITTINGS

- A. Ductile iron fittings shall conform to ANSI/AWWA C110/A21.10, 350 PSI working pressure. Ductile iron fittings larger than twelve inches (12") shall have a standard body length equal to Class 250 Cast Iron fittings. Cast Iron Class 250 fittings will be allowed in lieu of ductile iron fittings larger than twelve inches (12"). Ductile iron fittings shall be rated for 250 p.s.i. However, two inch (2") and smaller may be rated for 350 p.s.i. with the use of special gaskets. All ductile iron compact fittings shall conforming to AWWA/ANSI C153/A21.53 standards.
B. Anchor tees shall be standard mechanical joint tees except that the branch is plain Class 250 cast iron or Class 350 ductile iron, cement lined, conforming to ANSI/AWWA C110/A21.10, C111/A21.11, and C104/A21.4. Anchor tees shall be Class F-1217, U.S. Pipe U-92 or equal.
C. Mechanical joint restraints shall be incorporated into the design of the follower gland and shall include a restraining mechanism which, when activated, imparts multiple wedging action against the pipe increasing its resistance as the pressure increases. Flexibility of the joint shall be maintained after burial. Glands shall be manufactured of ductile iron, and have a minimum working pressure of 350 psi. List of nuts (i.e. mega-lug) or equal shall be used to ensure proper actuating of the restraining devices. Contractors may also use approved grip ring (or equal) retainer glands.
D. Bolts shall conform to ANSI Specification A21.10.
E. Pipeline couplings shall conform to AWWA Standards C110 and ANSI A21.10. Mechanical joint couplings shall be of proper diameter shall be installed in accordance with the manufacturer recommendations and at locations directed by the plans or the Town of Shelburne.
F. All fittings shall be wrapped in plastic and have concrete thrust blocks poured in place.

2.04 TAPPING SLEEVES AND VALVES

- A. The Town of Shelburne shall be notified whenever a proposed tap is to be made on any Town of Shelburne water line.

2.05 TAPPING SLEEVES

- A. Tapping sleeves shall be of the split sleeve design, constructed with two solid half-sleeves bolted together. Sleeves shall be constructed of ductile iron, shall have a working pressure of at least 200 psi, and shall have mechanical joint ends with end and side gasket seats.
B. All iron body tapping sleeves shall be provided with a 3/4" NPT test plug, or other provisions must be made for air testing the valve and sleeve at maximum working pressure, prior to tapping.
C. All bolts and nuts for mechanical joints of tapping sleeves shall be of high-strength cast iron or high-strength, low-alloy steel conforming to ANSI/AWWA C111/A21.11.
D. All bolts and nuts for flanged joints of tapping sleeves shall be AISC Type 304 stainless steel.
E. All bolts and nuts shall be sound, clean, and coated with a rust-resistant lubricant; their surfaces shall be free of objectionable protrusions that would interfere with their fit in the made-up mechanical or flanged joint.

2.06 TAPPING VALVES

- A. Tapping valves shall conform to ANSI/AWWA C509 Standard for Resilient-Seated Gate Valves for Water and Sewage Systems, except as modified herein. Valves shall open counterclockwise and shall have a minimum working pressure of 200 psi. Inlet flanges shall be Class 125 conforming to ANSI Specification B16.1 or ANSI/AWWA C110/A21.10, and outlet connection shall be Standardized Mechanical Joint unless specified otherwise on the drawings for the type of pipe required for the branch or lateral pipeline.
B. Tapping valves over sixteen inches (16") diameter shall be installed with their stems horizontal, shall be equipped with rollers, tracks and scrapers, and shall be provided with bypass valves unless otherwise specified.
C. Buried tapping valves shall be provided with a two inch (2") square wrench nut and shall be installed with a cast iron valve box as required to allow positive access to the valve operating nut at all times. In installations where the depth from grade to top of valve operating nut is greater than 6'0", a valve stem riser shall be provided and installed such that the depth from valve stem riser nut to grade is from four feet to six feet (4'-6"). (Minimum length of valve stem riser is two feet (2')). Valve stem riser shall be of high strength steel and of welded construction.
D. All bolts and nuts used with all pipe sleeves shall, upon final tightening and testing, be brushed coated heavily with bituminous cold-applied mastic to thoroughly cover all exposed surfaces of the bolts and nuts.

2.07 GATE VALVES-RESILIENT SEAT

- A. Valves shall be manufactured to meet all requirements of AWWA Specification C509. Valves twelve inches (12") and smaller shall be bubble tight, zero leakage, and shall be working pressure. Valves shall have non-rising stems, open counter clockwise, and provide a two inch (2") square operating nut with arrow cast in the metal indicating direction of opening. Each valve shall have manufacturer's name, pressure rating and year in which manufactured cast on the body. Prior to shipment from the factory, each valve shall be tested by hydrostatic pressure equal to twice the specified working pressure. Gate valves shall be Mueller, Dresser, Kennedy, or approved equal.
B. Buried valves shall be installed with a gate valve box.
C. Gate valves shall normally be placed a maximum of five hundred feet (500') apart. Tee intersections shall have a minimum of three (3) gate valves. Cross sections (four way intersections) shall have a minimum of four (4) gate valves.
D. The Town of Shelburne may require all bolts, studs and nuts and nuts made from a corrosion resistant-material such as low-zinc, nickel-copper alloy or stainless steel in known or suspected corrosive soil conditions.

2.08 VALVE BOXES

- A. Valve boxes shall be of the three-piece Cast Iron slide-type with a minimum inside shaft diameter of five and one quarter inches (5 1/4") and a six foot (6') trench depth. Valve boxes shall not transfer loads onto the valve.
B. Valve boxes shall have a cast iron cover, marked "WATER". The boxes shall be dirt tight with the top of the cover flush with the top of the box rim.

2.09 FIRE HYDRANTS AND HYDRANT BRANCHES

- A. Fire hydrants shall be Mueller Super Centurion 250, Figure A-423, Kennedy K-81 D, shall conform to AWWA C502 with the following specific specifications:
1. Main Valve Inches: 5 1/4 inches
2. Nozzle Arrangement: Two 2 1/2 inch Hose Nozzles with National Standard Thread (NST)
3. One 1 1/2 inch Pumper Nozzle with National Standard Thread (NST)
4. Inlet Connection: 6 inch Mechanical Joint, "Mega-Lug" or equivalent retaining gland and concrete thrust block
5. Operating Nut: Standard 1 1/2 inch Pentagon
6. Direction of Opening: Counterclockwise
7. Depth of Bury: Six-foot cover. The hydrant shall have at least 15 inches and no more than 21 inches between the bottom of the steamer cap and the ground.
8. Drain: The hydrant shall be non-draining or have the drains permanently plugged.
9. Color: Red enamel
10. Other: Hydrant nuts shall be compression type closing with the steamer. Hose and pumper nozzles shall be 1/4 turn type secured by stainless steel or corrosion resistant pins or screws. Pressure seals behind the nozzle flanges shall be "O" rings. A breakable coupling retained in place by stainless steel or corrosion resistant pins shall make the union between the upper and lower stems. The two-piece traffic flange shall be held in place by nuts and bolts. The upper barrel shall be able to rotate 360 degrees without rotating any bolts. Hydrant flags shall be required and supplied for each hydrant. Whenever a traffic hazard appears to exist, curbing and/or bollards shall protect the hydrant.
B. For single-family house subdivisions, there will be at least one hydrant at each intersection and a maximum of five hundred feet (500') between hydrants with a minimum water flow of 500 gallons per minute (gpm) at the flow hydrant with a 20-psi residual pressure at the residual hydrant. Hydrants shall be located immediately adjacent to street property lines. A 20' x 20' placement will be required around all hydrants. No structures or enclosures are to be placed within a 20' x 20' area of any hydrant.

2.10 HYDRANT ASSEMBLIES

- A. Hydrant assemblies shall consist of an anchor tee, a six inch (6") mechanical joint gate valve conforming to the above specifications, the appropriate length of six inch (6") Ductile Iron Lined, Class 52 pipe, all necessary anchor couplings and approved restraining glands, the fire hydrant and appropriate thrust block.
B. Care shall be taken to prevent damage to hydrants and appurtenances during handling and installation. All materials shall be carefully inspected for defects in workmanship and materials; all debris and foreign material cleaned out of the hydrant bowl; all operating mechanisms operated to check their proper functioning, and all nuts and bolts checked for tightness. All hydrants shall be carefully incorporated in the water main and supported in their respective positions free from distortion and strain. Hydrants shall be set plumb. All hydrants shall be oriented to most efficiently allow fire truck access and connection for emergency purposes. They shall be installed away from the curb line at sufficient distance to avoid damage from or to vehicles. Traffic model hydrants shall be installed so the breakaway flange is not less than two inches (2"), nor more than six inches (6") above the established grade, according to manufacturer recommendations. Hydrant locations are subject to the approval of the Town of Shelburne and the Town of Shelburne appropriate municipality's fire department. Installation for fire hydrants can be found in AWWA Standard C600.

2.11 BLOW-OFF ASSEMBLIES

- A. Blow-off assemblies will be constructed as detailed in the drawings. They shall consist of an anchor tee, a six inch (6") mechanical joint gate valve conforming to these Specifications, the appropriate length of six inch (6") Ductile Iron Cement Lined, Class 52 pipe, all necessary anchor couplings, approved restraining glands, MJ and flanged fittings, and approved screen. Smaller blow-off assemblies may be allowed with approval of the Town of Shelburne.
B. Blow-offs shall not be connected to any sewer, submerged in any stream or ditch, or installed in any manner that will permit back siphonage into the distribution system. The open end of the blow-off must be capped and terminate at least eighteen inches (18") above grade (VT Water Supply Rule, A-5.1.7).

2.12 SERVICE CONNECTIONS

- A. Service lines shall be installed so as to run perpendicular, in a straight line from the water main to the curb stop.
B. Each service shall consist of a corporation, curb stop, copper tubing and a curb box with a cast iron or stainless steel service rod. Service lines from three-quarter to two inches (3/4" to 2") shall be copper tubing from the corporation stop to the curb stop. Copper tubing shall be type "K", soft temper, conforming to ASTM B88. The name or trademark of the manufacturer and type shall be stamped at regular intervals along the pipe. Copper service pipe shall be one piece from the curb stop to the curb stop. The minimum service for a single-family residence shall be three-quarter inch (3/4"). The minimum service for a duplex shall be one inch (1").
C. Corporations shall be Mueller 110 (brass) and manufactured in accordance with specifications shall have a minimum of Mueller threads, adopted as AWWA Figure 1, at the inlet and a compression type fitting at the outlet. Both inlet and outlet shall be the same size. Three-quarter inch and one-inch corporations shall be directly tapped into ductile iron pipe six inches (6") and larger in diameter. Larger size corporations up to two inches (2") shall use a tapping saddle. Pipe less than six inches (6") shall require the use of a tapping saddle and corporation. Corporations shall be used for all taps up to two inches (2"). In no instance, except when a tapping sleeve and valve are used, shall a tap be made without a corporation. Corporations shall be Mueller H-1500B (3/4" - 1"), or Mueller H 15013 (1 1/2" - 2"). A connection made to a pipe that requires a tapping saddle or is not ductile iron will have a 28 day cure time. The tapping saddle and suitable means for attachment to the main. The body shall be made to conform to the outside configuration of the main. The service saddle shall be designed to provide a drip tight connection. The body shall be made of ductile iron and shall be stainless steel strap(s), bolts, nuts, and mechanism for attaching to the pipe barrel.
D. Curb stops shall be a quarter turn plug type valve with an o-ring type seal and manufactured in accordance with AWWA C800. The curb stop shall open left, have a minimum 28 day cure time, and a tee design or flat design. No curb stop shall have the ability to drain the service line. Both the inlet and outlet of the curb stop shall have compression type fittings. The tee head of the curb stop shall have the provision for the connection of a service rod. Curb stops shall be Mueller Orisel III. The curb stop shall rest on a four inch by eight inch by sixteen-inch (4" x 8" x 16") concrete block for support. Curb stops shall be installed just inside the municipality or AOT R.O.W.
E. Curb boxes shall be of sliding adjustable type Erie style with capable of adjusting from five feet to six feet (5' - 6'). The base of the box shall be arch type so as to prevent the box from resting on the curb stop. The adjustable upper section shall be one inch (1") diameter for use with 3/4" and 1" curb stops. For larger curb stops, the upper section shall be 1 1/4" in diameter. Stationary rods shall be used for the curb stop. The curb stop shall be thirty inches (30") in length for 3/4" and 1" curb stops and twenty-four inches (24") for large curb stops. Curb box rods may be stainless steel.
The word "WATER" shall be inscribed on the cover of the box. The cover of the box shall have countersunk brass pentagon plug for paved or concrete areas, and standard two holes for grass areas. Curb box couplings and extensions will be the same material as the pipe. Bolt cover and upper section of the box shall be able to be located with an aqua type metal locator.
F. All service connections shall be installed to the curb stop for all building lots before the street is paved.

2.13 BACKFLOW PREVENTION DEVICES

- A. A water service connection shall be approved or maintained by the Town of Shelburne unless the water supply is protected as required by State laws, regulations and ordinances. The type of protective device shall depend on the degree of hazard that exists. In general, backflow devices designed to protect potable water supplies in accordance with the International Plumbing Code - non-health hazard cross connections and continuous pressure applications shall be used, i.e. Watts Series 007 or approved equal. Watts Series 709 Double Check Valve Assembly or approved equal shall be used on all sprinkler systems. A shop drawing detail assembly showing backflow devices and meter placements shall be required by the Town of Shelburne.
B. Rock excavation and suspected ledge may require subsurface investigation to determine its extent prior to job commencement, at the contractor's expense. A pre-blast survey shall be required prior to blasting.
C. Rock shall be excavated, when encountered, to the lines and grades indicated on the drawings or as directed by the Town of Shelburne. Excavated material shall be disposed of and acceptable material shall be furnished for backfill in the space voided by the excavated rock.
D. Rock in pipe trenches shall be excavated to a depth not less than six inches (6") lower than the bottom of the installed pipe. When so specified or indicated, or when laying the pipe in an excavated rock area, the trench shall be backfilled with satisfactory material listed and approved under Pipe Bedding.
E. Blasting shall be in full compliance with all State and Federal laws and local ordinances. Take all possible care to avoid injury to persons and damage to property. The rock to be well covered with blasting mats and sufficient warning given to all persons in the vicinity of the work before blasting. Care shall be taken to avoid damages to utilities or other structures above and below ground.
F. No blasting will be permitted under or adjacent to any street, road, or highway unless permission has been received in writing by the authority having jurisdiction.
G. Conform to all municipal, State, Federal and other ordinances and codes relating to the storage and handling of explosives. Particular attention is called to the use of results of tests of the electric, gas and other utilities that may be located in the project area.
H. Damages and cost of whatever nature resulting from blasting operations shall be borne solely by the contractor.
I. If rock below grade is shattered by blasting, caused by holes drilled too deep, or too heavy charges of explosives, or any other circumstance due to blasting, and if such shattered rock does not provide suitable foundation, the rock shall be removed and the excavation refilled with acceptable material by and at the expense of the contractor.

2.15 PIPE BEDDING

- A. Water lines shall be laid and maintained on lines and grades established by the plans for the project. Pipeline trenches shall be excavated to the width and depths shown on the plan typicals. Pipeline trenches in which pipe is to be installed shall be excavated to a depth not less than six inches (6") below the bottom shall not be excavated entirely by machinery, but shall be finally excavated by hand tools such that the trench shall have a bottom shaped to support the pipe throughout its entire length by firm and undisturbed material. Where bedding is required, may be excavated to the required depths using machinery. No pipe shall be laid directly on ledge, hard shale or a very compact glacial till. When an unstable trench bottom is encountered, the contractor shall be notified. It determines that it cannot support the pipe adequately, an additional depth shall be excavated and refilled to the pipe invert with approved material at the contractor's expense. Pipeline trenches shall be dry during the laying of pipe. Blow supports under pipe shall be removed prior to backfilling. Pipeline installation procedures can be found in AWWA Standard C600.

- B. Bedding material shall consist of crushed or natural stone conforming to ASTM D2321.
Sieve Percent Passing
1" Screen 100%
3/4" Screen 100%
1/2" 90 - 100%
3/8" Screen 40 - 70%
No. 4 Sieve 0 - 15%

2.16 PIPELINE INSULATION

- A. Approved waterlines with less than five feet (5') of cover over the crown, that cross a storm sewer or whose depth is indicated on the plans, shall be protected against freezing by the installation of four inch (4") thick highest available density extruded polystyrene insulating sheets or equivalent. Sheets shall be the total width of the trench, for a typical four foot (4') trench. The sheets shall be placed six inches (6") above the crown after placement of four to six inches (4" - 6") of clean medium or coarse sand below the pipe bottom and four to six inches (4" - 6") above the crown. Joints shall be overlapped so there is no gap that will allow frost to penetrate. Care shall be exercised during backfill and compaction over the polystyrene sheets to prevent damage to the sheets. The polystyrene sheets shall meet the comprehensive strength requirements of ASTM D1821-73. In no cases shall the waterline have less than four feet (4') of cover over the top of the pipe.

2.17 POLYETHYLENE PIPE ENCASEMENT

- A. Polyethylene pipe encasement may be required in areas of corrosive soils and shall conform to current ANSI/AWWA C105/A21.5 Specifications. Minimum material requirements for the polyethylene film shall be high density, cross laminated virgin polyethylene 4 mil film. The Town of Shelburne reserves the right to specify Polyethylene pipe, C-900, in areas of corrosive soils.
B. The polyethylene encasement shall prevent contact between the pipe or fittings and the surrounding backfill and bedding material and shall be installed as outlined in Section 4.1 of the above ANSI/AWWA standard.
C. Concrete for Thrust Blocks
1. Concrete shall be Portland Cement concrete of 2,500 psi minimum 28 day compressive strength. The mix design and specification for transit mixed concrete shall control the concrete quality. A maximum water cement ratio of 6 gallons per sack and a maximum slump of four inches (4") will be allowed.

2.19 INSTALLATION

- A. Contractors shall notify the Town of Shelburne and Dig Safe at least seven days prior to any work on the water system.
B. Skilled workers experienced in such work shall install all items. Tools shall be adequate for the work and in good condition so as to produce good, clean cut threads of the correct size, pitch, and lead.
C. Installation of all water lines shall be in accordance with the latest version of AWWA C600.
D. Connection to an existing water main shall be done under the supervision of and with the approval of the Town of Shelburne. It is the applicant's, developer's, or owner of record's responsibility to obtain all necessary connection permits and pay ALL applicable fees to make the connection, and to coordinate all parties involved in the process. The engineer and the Town of Shelburne shall be notified at least 14 days in advance of the proposed work to allow for a site visit. No existing valves, hydrants, curb stops, etc. shall be operated without prior approval of the Town of Shelburne. The Town of Shelburne shall operate all valves initially to ensure the integrity of the valve. The Town of Shelburne may then authorize the contractor to operate those valves. Any damage occurring after the use of any valve operated by the contractor shall be the contractor's responsibility.
E. Care shall be taken to prevent damage to valves and other appurtenances during handling and installation. All materials shall be carefully inspected for defects in workmanship and materials; all debris and foreign matter cleaned out of valve openings, etc.; all operating mechanisms operated to check their proper functioning, and all other nuts and bolts checked for tightness. Valves and other equipment, which do not operate easily, or are otherwise defective, shall be replaced. All valves shall be carefully incorporated into the water main and supported at their respective positions free from distortion and strain. Valves and valve boxes shall be set plumb. Valve boxes, besides being plumb, shall be centered directly over the valves.
F. All pipes showing cracks shall be rejected. If cracks occur in the pipe, the contractor may, at his own expense and after approval of the Town of Shelburne, cut off cracked portions at a point of least twelve inches (12") from the visible limits of the crack and use the sound portion of the pipe.
G. All water mains shall have no less than six feet (6') of cover unless waived by the Town of Shelburne. The pipe shall be laid to conform to the lines and grades indicated on the drawings or given by the Engineer. Each pipe shall be laid so as to form a close joint with the next adjoining pipe and to bring the inverts continuously to the required grade. In no cases shall the waterline have less than four feet (4') of cover over the top of the pipe.
H. Temporary support, adequate protection, and maintenance of all underground structures, drains, sewers and other obstructions encountered in the progress of the work shall be provided at all times. If utility service is interrupted as a result of work for the project, the contractor shall immediately restore service by repairing the damaged utility at the contractor's expense.
I. At all times, when pipe laying is not actually in progress, the open ends of the pipe shall be closed by temporary watertight plugs or by other approved means. If water is in the trench when work is resumed, the plug shall not be removed until all danger of water entering the pipe has passed. During construction, the contractor shall conduct operations so as to prevent the accumulation of water, ice, and snow in the vicinity of excavations or in the vicinity of excavated areas, and to prevent water from interfering with the progress and quality of the work.
J. Under no conditions shall water be allowed to rise in open trenches after pipe has been laid.
K. Accumulated water, ice, and snow shall be promptly removed and disposed of by pumping or other approved means. Disposal shall be carried out in a manner that will not create a hazard to public health, safety or cause injury to persons or property. No work completed or in progress, or public streets. Disposal shall not cause any interference in the use of streets and roads by the public. Pipes under construction shall be used for drainage of excavations.
L. Any deflection of joints in pipe up to twelve-inch (12") diameter shall be within the limits specified by the manufacturer, but not to exceed five degrees or nineteen inches (19") per eighteen feet (18') of pipe length.
M. Concrete thrust blocks shall be installed on all hydrants, plugs, tees, and bends deflecting 1 1/4 degrees or more. Concrete thrust blocks shall be used in conjunction with "Mega-Lug" restraining glands or equivalent. Care shall be taken to ensure that concrete will not come into contact with flanges, joints, or bolts. The required area of thrust blocks shall be indicated on plan typicals and approved by the Town of Shelburne. Concrete shall be placed against undisturbed soil. Wooden side forms or equal shall be provided for thrust blocks. No backfilling shall be allowed until concrete masonry has set sufficiently. Where directed by the Town of Shelburne or engineer, concrete encasement of the waterline may be made for strength of the pipe. The Town of Shelburne or his engineer shall inspect the concrete encasement. Where required, all trenching safety standards shall be in conformance with all applicable State and Federal guidelines. The contractor shall be solely responsible for any safety citations by State or Federal inspectors.

- O. There shall be no physical connection between the distribution system and any pipes, pumps, hydrants, or tanks that are supplied with water that is, or may be, contaminated.
P. As necessary, temporary PVC markers shall be supplied at all gate valves, curb boxes, and at the end of water lines to a minimum of twelve inches (12") above finish grade until lined. Class 52 pipe, all necessary anchor couplings, approved restraining glands, MJ and flanged fittings, and approved screen.
Q. All surplus material and debris shall be removed as the project progresses, leaving all areas clean and presentable.
R. Unless otherwise required, all paving and sidewalks that may be damaged during construction shall be replaced with the same kind of material that previously existed.
S. The contractor shall be responsible for proper protection of persons and property on the project. The contractor shall barricade open holes and depressions occurring as part of the work, and post warning lights on adjacent property to or with public access.
T. Warning lights shall be operated during hours from dusk to dawn and as otherwise requested.
U. The contractor shall protect structures, utilities, sidewalks, pavements, and other facilities from damage caused by settlement, lateral movement, washout, and other hazards created by construction operations.
V. No water lines shall be installed after November 15 or before April 1 without prior approval of the Town of Shelburne. The Town of Shelburne may restrict work before November 15 and after April 1 during adverse weather conditions. The Town of Shelburne may not allow excavating for water mains during the winter months except by special permission for emergencies.

2.20 BACKFILLING

- A. Trenches shall be backfilled to subgrade with, wherever possible, material excavated from the trench, and shall be done only after the approval of the Town of Shelburne. Backfilling shall be free of roots, stumps, and frost. Backfill shall not be placed on frozen material. Materials used for backfilling trenches shall be free of stones weighing more than thirty (30) pounds. No stones heavier than three inches (3") in the longest dimension shall be placed within one foot (1') of the pipeline being backfilled. Stones found in the trench shall be removed for a depth of at least six inches (6") below the bottom of the pipe. In general, use of blasted rock as trench backfill will not be permitted.
B. Backfill material shall be tamped in layers around the pipe to a sufficient height above the pipe to adequately support and protect the pipe. Backfill for pipelines shall be placed in twelve inch (12") lifts, each lift being compacted to not less than 95% of maximum dry density as determined by the AASHTO-T-99 Standard Proctor. If conditions warrant, the backfilling of trenches may be done with mechanical equipment. Particular care shall be taken to ensure that the backfilling material of the backfill material in order not to damage the pipe, pipe coating or structure. The backfill shall be brought up evenly. Around valve boxes, the backfill shall be tamped to a distance of four feet (4') on all sides of the box, or to the undisturbed trench face, if less than four feet (4'). Backfilling in all public roadways shall be so compacted as to leave no depression in the road. Additional backfill requirements may apply within State Highway Right-of-Ways. All public road surfaces shall be regraded to a condition at least equal to that which existed prior to the start of construction. Precautions shall be taken against undue damage to existing surface materials.
C. No compacting shall be done when the material is too wet to be compacted. Distortion of the work shall be suspended until the previously placed and new materials have dried out sufficiently to permit proper compaction, or such other precautions are taken as may be necessary to obtain proper compaction.
D. Surplus excavated materials shall be disposed of in a satisfactory manner. Surplus material or spoil shall be removed promptly and disposed of so as not to be objectionable to abutters or the general public.
E. Trenches that have been improperly backfilled, enclosed or covered before inspection of fittings and joints shall be reopened and re-backfilled at the contractor's expense.

2.21 WATER/SEWER SEPARATION

- A. Water mains crossing sewers shall be laid to provide minimum vertical distance of eighteen inches (18") between the outside of the water main and the outside of the sewer line. This shall be done in such a manner that the water main is above the sewer. At crossings, one full length of pipe shall be located so both joints will be as far from the sewer as possible. This vertical separation shall be maintained for that portion of the water main located within ten feet (10') horizontally of any sewer it crosses. Water mains must be laid at least five feet (5') horizontally from any existing or proposed storm sewer and ten feet (10') from any existing or proposed sanitary sewer.
B. When it is impossible to obtain horizontal and vertical separation in both the water main and sewer main shall be constructed of waterworks material with watertight joints and shall be pressure tested before backfilling. A PVC sleeve may be required for one or both mains in addition to the waterworks material. Lines may also be encased in concrete as required by the Retail Superintendent. The water main shall be above the sewer. If in contact with any part of a sewer manhole.
C. Distribution lines shall not be placed closer than fifty feet (50') horizontal distance from any septic tank or leach field unless approved by the VT Water Supply Rule Provisions under Chapter 21.8.6.4 or by the Town of Shelburne.
D. Sewer and water separation shall be arranged so that at least one full length of sewer pipe is centered above or below the water line, with the sewer joints as far as possible from the water joints. The new force main line shall be constructed to water main standards for a minimum of twenty feet (20') on either side of the crossing. The section of water main above the sewer shall be pressure tested to maintain 50 psi for fifteen (15) minutes without leakage prior to backfilling. In those areas that proper cover cannot be provided, proper insulation shall be installed.
E. Sewer and waterline separation shall conform to all VT Water Supply Rule requirements, and installed in accordance with the latest edition of the "Ten States Standards - Recommended Standards for Water".

2.22 TESTING AND DISENTEGRATION

- A. All water mains shall be constructed, tested and disinfected in accordance with AWWA Standards C-600, C-601, C-900 and the Vermont Water Supply Rule. Minimum testing pressure shall be 1.5 times the working pressure of the installed line or 200 psi, whichever is greater, and will be monitored at the lowest elevation in the length of the pipeline being tested. Maximum allowable leakage will be:
L = (SD / E) \* 133,200 as outlined in AWWA Standards
Where: L = allowable leakage, in gallons per hour
S = length of pipe tested, in feet
D = nominal diameter of the pipe, in inches
P = average test pressure during the leakage test, in pounds per square inch (gauge).
1. Testing: All tests shall be conducted by and at the expense of the Contractor. The Engineer will give direction pertaining to the test methods and the time of testing.
2. Hydrostatic Test of Pipeline: The pipeline, including trench laterals, shall be tested in accordance with AWWA Standard C-600-87 Section 4.
3. Disinfection: Disinfection of the pipeline shall be directed by the Engineer and at the Contractor's expense. AWWA

Standard C-651 shall be used as a basis for the disinfection process.

- B. The Engineer or Town of Shelburne will require as minimum:
1. Complete flushing of the pipeline to wash out all dirt, debris, etc. which may have accumulated in the pipeline during construction. A reducing agent shall be used at the point of flushing to eliminate the free chlorine residual per the direction of the Town of Shelburne.
2. Following flushing to clean clear water, the Contractor will add chlorine to the entire drinking volume of water such that the water will have not less than 25 mg/L free chlorine, and let the mixture set for at least 24 hours.
3. After the 24-hour duration, the water in the pipeline shall be tested for residual free chlorine and must contain a minimum of 10 mg/L chlorine. If less than 10 mg/L are found, then the disinfection procedure shall be repeated until at least 10 mg/L chlorine residual is indicated by test.
4. Upon successful completion of step 3 above, the pipeline shall be flushed again until the chlorine concentration in the pipeline is no higher than that prevailing in the supply system. A reducing agent shall be used to eliminate the free chlorine residual in the flushing process per the direction of the Town of Shelburne.
C. After final flushing and before the new water main is connected to the distribution system, two consecutive sets of acceptable samples taken over the 24 hours apart, shall be collected from the new main, and submitted to the Vermont Health Department for analysis. At least one set of samples shall be collected from every 1,200 feet of the new water main, plus one set from the end of the line and the first most one set from the end of the line. All samples shall show the absence of coliform organisms and, if required, the presence of a chlorine residual (AWWA C651-99). If the initial disinfection fails to produce samples which pass the VS. Health Department's requirements, the new water main shall be refushed and shall be resampled until satisfactory test results are obtained.
D. Upon satisfactory results by the Vermont State Health Department, the pipeline may be placed in service. All costs for water, materials, equipment and labor to perform the required testing, disinfection, and flushing of the pipeline shall be paid by the Contractor.

- 2.23 SUBMITTAL OF TEST RESULTS
A. The Applicant or Project Engineer shall be responsible for submittal of test results to the Town of Shelburne. The Applicant or Project Engineer shall submit a letter to the Town of Shelburne certifying that the water system has passed all tests, is constructed in accordance with the approved plans, except as may have been modified by approved Change Order, and is in condition to be placed in service.
2.24 FINAL INSPECTION
A. For one year from the date the new system is placed into service, the applicant's developer/contractor will be responsible for any necessary repairs or corrections as part of the project warranty. At the end of a one-year period, an inspection will be performed by the Town of Shelburne prior to the system owner assuming ownership of any of the lines and appurtenances. The contractor shall correct any punch list items calculated during the inspection after receipt of this list. Incomplete work on the system shall not be included in the initial inspection, but shall be inspected as the project continues. The contractor shall repair, replace, or reset promptly as directed by the Town of Shelburne and without further charges, all work equipment, materials or parts, which may fall during the one year warranty period.
B. A final walk-through inspection shall be conducted by the Town of Shelburne prior to the water system being accepted for ownership by the system owner. This inspection shall include but not be limited to:
1. Valves, hydrants, and curb stops operating properly.
2. Valve boxes and covers set plumb and at proper elevations.
3. Proper operation of the water meter and nozzle height above the curb.
4. Proper hydrant opening direction, nozzle thread, and barrel color.
5. Proper distance from the face of the curb of hydrant nozzles.
6. Static and residual hydrant pressures and flow rates.
7. Curb boxes inside ROW, set to grade, containing operating rod, and plumb.
8. The information and record drawings complete and submitted.
9. Material testing results, lab reports, manufacturers' certificates, and leakage test results complete and on file.
10. General appearance and restoration of the water system.
11. Submittal of As-Builts in hard copy format and Auto-CAD/DWG Version 14 format or newer.

- 2.25 GENERAL INFORMATION
A. All persons taking water must keep the fixtures and service pipe clean, free from dirt, and fully protected and fully protected from frost, and must prevent unnecessary leakage of water. The Town of Shelburne shall not be liable for leakage of hydrants, pipes or fixtures upon the premises of any consumer, nor for obstructions therein by freezing or otherwise, nor for damages resulting from any of the foregoing causes. All leaks that are on the building side of the curb stop will be the owner's responsibility and repaired at the owner's expense.
B. Water rates shall be collected for all water used until the water is metered. Fines for unauthorized use of any hydrant or abatement of water rates will be allowed by reason of disuse, diminished use, or vacancy of premises without proper notice to the Town of Shelburne.
C. The Town of Shelburne or system owner shall not be liable for any injury, loss, damage or cost of water meter occasioned by the failure to maintain a constant or uniform pressure in the water mains, or for damages occasioned by or growing out of a stoppage of said water by frost or other cause, or for damage occasioned by or growing out of an insufficient supply of the same, or for accident or damage of any kind caused by or growing out of the use or failure of said water.
D. No person shall open any hydrant or draw water there from except the Town of Shelburne personnel or persons under their direction, or the officers or designees of the municipal fire department and members of the fire companies under their direction for fire purposes, or those individuals who have been granted approval on a hydrant use application by the Town of Shelburne, in which case, all such usage shall be metered. Fines for unauthorized use of any hydrant or connection may be incurred, according to the Rules and Regulations of the Town of Shelburne.
E. One curb stop and one water meter shall be installed for each individual dwelling unit, condominium unit, apartment unit, public health, or office building. The water meter shall be installed in cases where a condominium association signs a binding agreement to be responsible for all collection of water bills. In cases where condominiums are converted into separate apartments, separate curb stops and water meters shall be installed for each unit. Town of Shelburne employees shall install all water meters. Under no circumstances are plumbers or persons other than those authorized by the Town of Shelburne permitted to turn water on or off at a curb stop. The water will not in any instance be turned on to any premise for use until the Town of Shelburne has suitably attached a meter.
F. The owner of the premises shall be responsible for all water payments. A change of ownership of premises will not relieve the owners from payment of a back bill.

Table with 4 columns: Date, Ch'kd, Revision, and Project No. 96111. Includes a signature line for the Project Engineer.

TOWN OF SHELBURNE WATER LINE RELOCATION (AOT WORK) SPECIFICATIONS SHEET C-28 CIVIL ENGINEERING ASSOCIATES, INC. SHELBURNE, VERMONT

