TEMPORARY WATER MAIN

**From Stowe BRF 0235(11)

xx. DESCRIPTION. This work shall consist of the installation, testing, maintenance, and removal of a temporary water main; and transferring from existing service to the temporary water main within the limits indicated on the Plans.

The work under this Section shall be performed in accordance with these provisions, the Plans, and Section 629 of the Standard Specifications.

xx. REFERENCE STANDARDS. Information and requirements contained in these provisions are based on the most recent version of the following standards:

(a) AWWA Standard C906 – For sizes 4" – 56"

(b) ASTM D3350 Cell Classification of 345434C

(c) ASTM D2737 and ASTM 1248

(d) AWWA/ANSI Standard C110/A21.10 for Ductile Iron Fittings.

(e) AWWA/ANSI Standard C111/A21.11 for Rubber Gasket Joints for Ductile Iron Pipe and Fittings.

(f) AWWA/ANSI Standard C150/A21.50 for the Thickness Design of Ductile Iron Pipe.

(g) AWWA/ANSI Standard C153/A21.53 for Ductile Iron Compact Fittings.

(h) AWWA Standard C651 for Disinfecting Water Mains.

(i) NSF standards for all materials used in the production of potable water pipe.

xx. SUBMITTALS. The Contractor shall submit the following information prior to beginning the work:

(a) Manufacturer's certified data for each pipe type to be used on the project, including dimensions, specifications of pipe material, gasket material, pipe class/pressure rating, coatings, and linings.

(b) Manufacturer's certified data for each type of fitting to be used on the project, including dimensions, specifications of fitting material, gasket material, class/pressure rating, coatings, linings, joint restraints, and appurtenances.

(c) Manufacturer's certified data for tapping sleeves and valve assemblies, and appurtenances.

(d) Manufacturer's certified data for the temporary bridge,

temporary bridge support piers, bridge mounted pipe supports, and appurtenances.

xx. QUALITY ASSURANCE. The Contractor shall be thoroughly trained and experienced in the skills and equipment required for installation and testing of water piping and appurtenances.

The Contractor shall protect water piping materials before, during and after installation. In the event of damage, the Contractor shall immediately make all repairs and replacements necessary to the approval of the Engineer and Owner at no additional cost to the Owner.

Upon direction of the Engineer, the Contractor shall remove, replace and/or rework all water piping and appurtenances that do not meet the requirements of this Section. The Contractor shall perform all remedial measures at no additional cost to the Owner.

(a) Water System Pressure and Leakage Testing. Water system pressure and leakage testing shall be subject to the following requirements:

(1) Engineer and Owner shall witness all testing.

(2) Flush all piping prior to performing pressure testing.

(3) Provide proper thrust restraint for all fittings and valves.

(4) Test equipment shall have pressure relief valves so that water system components are not over-pressurized.

(5) The pressure and leakage test shall include all services. The Contractor shall provide temporary “tails” as necessary to allow air to be bled from each service to above grade. After the system has passed the necessary tests and prior to weather below freezing temperatures, the Contractor shall dig up each service, and as appropriate for the project, either connect the new service to the existing service, or turn off the curb stop and install a short stub of service piping out of the curb stop with a compression cap, a minimum of 5½ feet below grade.

(6) The pressure and leakage tests shall be performed as a combined hydrostatic test with a duration of two hours at 150% of the normal operating pressure in the piping at the lowest elevation or 200 psi, whichever is greater. The test pressure shall not exceed manufacturer recommendations for any portion of the system.

(7) No water system components will be accepted if the test pressure cannot be maintained within 5 psi of

the required pressure for the entire test period.

(8) Leakage is defined as the quantity of water that must be supplied into the piping to maintain the test pressure after the pipe has been filled with water and the air expelled.

(9) No water system components will be accepted if the leakage is greater than that determined by the following formula:

L = (SD/P)/(144,800) where

L = the allowable leakage in gallons per hour;
S = the length of pipe being tested;
D = the nominal diameter of the pipe in inches;
P = the average test pressure in psi (gauge).

(10) The Contractor shall make all repairs or replacements necessary to obtain passing test results, at no additional expense to the Owner.

(11) The maximum length of pipe to be pressure and leakage tested at one time shall not exceed 1,200 feet. The Contractor shall provide all necessary temporary connections, valves, and piping to allow proper expulsion of air and connection of test equipment, at no additional cost to the Owner.

xx. MATERIALS.

(a) Water Piping.

(1) Refer to Plans for locations and sizes of various pipe types required.

(2) High-Density Polyethylene (HDPE) Water Pipe shall meet the referenced standards and the following requirements, as applicable:

a. Pipe shall be SDR 9 (200 psi) DIPS.

b. Materials used for manufacturing of polyethylene pipe and fittings shall be PE 3608(formerly PE 3408) High Density Polyethylene (HDPE) meeting the ASTM D3350 cell classification 345444C or 34564C.

c. Material shall have a minimum Hydrostatic Design Basis (HDB) of 1600 psi at 73 degrees F when tested in accordance with PPI TR-3 and shall be listed in the name of the pipe and fitting manufacturer in PPI TR-4.

e. Pipe shall be furnished in 18 to 20 foot laying lengths.

f. HDPE pipe shall be manufactured by Performance Pipe, JM Eagle, or approved equivalent.

(3) Each pipe length shall have permanent identification of piping service provided by co-extruding longitudinal stripes into the pipe's outside surface. The striping material shall be the same material as the pipe material except for color. Stripes printed or painted on the pipe outside surface shall not be acceptable. Stripe color for portable waterlines shall be blue.

(b) Fittings.

(1) Ductile Iron fittings shall be flexible grooved coupling style joints with stainless steel bolts as recommended by the manufacturer. Fittings, and gaskets shall be of appropriate style and size for the pipes being connected.

(2) Fittings shall be coated on the outside with bituminous coating.

(3) All mechanical joint fittings for DI pipe shall be accompanied by a grooved flange adapter, 341 Vic-flange adapter as manufactured by Victaulic or approved equivalent Dresser, Grinnell or equal and mechanical joint restraints as manufactured by EBAA Iron Sales, Inc., or "Uni-Flange Wedge Action" mechanical joint restraints as manufactured by Ford Meter Box Co., of the proper style for the pipe type being restrained.

(4) All couplings shall be restrained mechanical joint solid sleeves with ductile iron long body and ductile iron glands. Sleeves, glands, and gaskets shall be of appropriate style and size for the pipes being connected.

(5) Polyethylene fittings shall be made from material meeting the same requirements as the pipe. Polyethylene fittings shall be molded or fabricated by the manufacturer of the pipe. Where applicable, fittings shall meet the requirements of AWWA C906. Molded fittings shall be manufactured in accordance with either ASTM D2683 (socket fused) or ASTM D3261 (butt fused) and shall be so marked.

(c) Tapping Sleeve and Valve.

(1) The tapping sleeves shall meet AWWA C500 (latest revision) and AWWA C207, Class D, maximum working pressure of 200 psi.

(2) Tapping sleeves shall be approved for exterior underground use.

(3) Tapping sleeves shall be stainless steel with mechanical joint by mechanical joint run on the branch end of the sleeve. Tapping sleeve shall have a rubber-steel backed gasket and 316 stainless steel or silicone bronze flanged bolts.

(4) Valves shall meet AWWA C500 (latest revision) and be approved for exterior underground use.

(5) Valves shall be a resilient wedge type valve with a non-rising stem, double o-ring stem seals, parallel seat, C.I. resilient wedge with synthetic elastomer coating, ASTM A307 cadmium plated bonnet with 18-18 stainless steel bonnet bolts (type 304), and MJxMJ end connections. Valves shall be Kennedy, Mueller, Dresser or approved equivalent.

(d) Temporary Waterline Bridging System.

(1) The Contractor shall furnish and install a modular steel bridge as described herein and as shown in the Plans. The modular steel bridge shall be supplied by Mabey Inc., or approved equivalent.

(2) The superstructure shall be comprised of interchangeable, modular steel truss panel units, pinned together, designed specifically for rapid installation and capable of disassembly and reuse.

(3) The bridge shall be designed to accommodate the appropriate loading for the temporary water line utility. The loading must be applied in such a way that it produces the worst effects from eccentricity and impact. The bridge shall be designed in accordance with the manufacturer’s published figures for allowable shear forces and bending moments.

(4) The published truss properties shall be based upon Full Scale Testing of the modular bridge system. The Full Scale Testing must be carried out by the bridge manufacturer on the version of the bridge that will be supplied under this Contract.

(5) The bridge manufacturer shall provide proof calculations and drawings specific to the project for review by the OWNER. Generic drawings and calculations or cut-sheets will not be accepted. This submittal shall be sealed by a Professional Engineer registered in the State of Vermont.

(6) All main structural members shall be Grade 50 steel or greater.

(7) All structural components shall be hot-dipped galvanized.

(8) All nuts and bolts shall be spun galvanized. Pins

shall be electroplated using a zinc coating or suitable equivalent. All bolts and pins shall act in shear only.

(9) All truss members should be of a design such that all surface areas of the member can be easily inspected and maintained. Tube sections shall not be used in the truss members.

(10) No field welding will be allowed on the superstructure.

(11) The foundation system shall be designed to carry the applied loads and accommodate anticipated fluctuations in length due to temperature changes.

(12) Fixed bridge supports and bracing shall be provided to secure the temporary waterline to the temporary bridge.

(13) A qualified representative of the bridge manufacturer shall be available to provide technical assistance during the installation.

(d) Material Storage and Handling. Material storage and handling shall be performed in accordance with the following requirements:

(1) Handle and transport pipe and fittings to insure they are in sound, undamaged condition and to prevent damage to coating and lining, in accordance with manufacturer's instructions.

Furnish slings, straps, and other devices to support pipe and fittings when lifted. Do not drop or drag pipe or fittings from trucks onto the ground or into the trench.

(2) Examine all pipe and fittings before installing. Defective or damaged materials shall be rejected.

(3) Pipe or fittings with damaged coatings and/or linings shall be rejected.

(4) Cracked or chipped pipe or fittings shall be rejected.

(5) If defective pipe or fittings are discovered after installation, the Contractor shall remove and replace the defective piece(s) at no additional cost to the Owner.

xx. GENERAL CONSTRUCTION REQUIREMENTS.

(a) Installation. Installation shall be performed in accordance with the following requirements:

(1) Water mains and appurtenances shall be installed according to the Plans.

(2) Pipe shall be laid accurately to the lines and grades indicated on the Plans.

(3) All field cut pipe ends shall be chamfered to avoid damage to the gasket and facilitate assembly. When cutting of pipe is required, the cutting shall be done with power saws. Cut ends shall be smooth and at right angles to the pipe. Cut pipe ends shall be beveled and de-burred on interior and exterior.

(4) HDPE pipe shall be installed per the manufacturer' recommendations.

(5) Grooved pipe joints shall be assembled per the manufacturer's recommendations.

(6) Deflection of grooved joint pipe shall not exceed manufacturer's recommended limits.

(7) Restrained Grooved Joints shall be assembled per the manufacturer's recommendations.

(8) All fittings shall be adequately supported to prevent undo strain on the pipe, fittings, gaskets, and bolts.

(9) Plant batched, poured in place, concrete thrust blocks shall be provided at all directional changes of the main, when restrained pipe joints cannot be used (i.e. connections to existing systems) in compliance with the Plans. Thrust blocks shall not be backfilled within ½ hour of being poured to allow sufficient time for setting of the concrete. Onsite mixed concrete is <u>not</u> acceptable.

(10) When pipe laying is not in progress, the open ends of the pipe shall be closed with a water tight plug.

(11) Where water mains cross within 2 feet of drainage pipe or site conditions do not allow the minimum 5½ foot cover, the Contractor shall install 2 inch thick by 2 foot wide rigid insulation, suitable for direct burial, for frost protection.

(12) Cover of less than 5½ feet shall be approved by the Engineer prior to pipe installation. Under no circumstances shall water mains have less than 4 feet of cover over the top of the pipe, except where indicated on the Plans. Insulation shall be installed 6 inches above the pipe on compacted envelope material with care taken to not damage the sheets during trench backfill and compaction.

(13) Where water mains are required to cross wastewater

piping, the installation shall comply with the following requirements:

a. Water and sewer pipes shall have a minimum vertical clearance of 18 inches.

b. Water and sewer pipe joints shall be located as far apart as possible.

c. The Contractor shall provide structural support for exposed water and sewer lines.

(14) The minimum horizontal clearance between water and sanitary sewer piping is 10 feet, and the minimum horizontal clearance to storm sewers is 5 feet.

(15) In the event that the minimum vertical or horizontal clearances between water and sewer piping cannot be maintained, the sewer piping must be upgraded and tested to water pipe standards.

(16) Temporary bridge, piers, and fixed bridge supports and bracing for the temporary waterline.

(b) Flushing. Flushing shall be performed in accordance with the following requirements:

(1) All water piping shall be flushed at a minimum velocity of 2.5 feet per second. All pipes shall be flushed prior to leakage and pressure testing, disinfection, and bacteriological testing.

(2) Care shall be taken to protect property from erosion or other damage during flushing operations.

(3) The flushing operation shall include all services.

(c) Disinfection. Disinfection shall be performed in accordance with the following requirements:

(1) At a point not more than 10 feet downstream from the beginning of a new main, water entering the main shall be dosed with chlorine, fed at a constant rate, such that the entire volume of water will have a concentration of not less than 25 mg/l free chlorine. Chlorine levels shall be confirmed with a test kit; however, the following table is provided as a general guide to estimate the volume of chlorine required.

PIPE SIZE (INCHES)	1% CHLORINE SOLUTION (GALLONS)
4	0.16
6	0.36
8	0.65
12	1.44

Chlorine required to produce 25 mg/l concentration in 100 feet of pipe, by pipe diameter.

(2) Disinfection operations shall not cease until the entire main is filled with heavily chlorinated water.

(3) The chlorinated water shall be retained for a minimum of 24 hours, during which all curb stops, valves, and hydrants in the treated section shall be operated to ensure disinfection of appurtenances. The water in all portions of the main shall have a minimum residual of 10 mg/l of free chlorine after 24 hours.

(4) The Contractor shall prevent the introduction of heavily chlorinated water into any active portions of the water distribution system.

(5) At the end of the 24 hour period, the main shall be flushed with water from the distribution system until the discharge chlorine concentration is equal to that of the system or 1 mg/l free chlorine.

(6) The Contractor shall comply with all laws relevant to the discharge of chlorinated water. Water discharged directly or indirectly to water bodies shall not have a chlorine level greater than 0.1 ppm. Water bodies shall include all rivers, streams, creeks, brooks, reservoirs, ponds, lakes, springs, wetlands, and any body of surface water, artificial or natural.

(7) The Contractor shall supply all necessary de-chlorination equipment, materials, chemicals, and labor necessary to reduce the chlorine level prior to discharge.

(8) Any required permits for the discharge of chlorinated water (local or State) are the responsibility of the Contractor.

xx. METHOD OF MEASUREMENT. The quantity of Special Provision (Temporary Water Main)of the size and type specified to be measured for payment will be on a lump sum basis in the complete and accepted work.

xx. BASIS OF PAYMENT. The accepted quantity of Special Provision (Temporary Water Main) of the size and type specified will be paid for at the Contract lump sum price. Payment will be full compensation for furnishing, transporting, handling, and installing the materials specified; all appurtenant work and materials necessary for a complete installation, including but not limited to excavation, bedding, backfill, pipe, fittings, joint restraints, expansion joints, tapping sleeves and valves, and pipe supports; initial and final testing, flushing, and disinfecting of the water main system as specified in the Contract Documents; temporary bridge rental and installation including abutments, abutment construction, disassembly, and removal; for making all necessary connections; and for furnishing

all labor, tools, equipment, and incidentals necessary to complete the work.

Payment for transfer from existing service to temporary water main service will be included in the unit price bid for Special Provision (Temporary Water Main).

Payment will be made under:

Pay Item		Pay Unit
900.645	Special Provision (Temporary Water Main) (X" HDPE)	Lump Sum