

WS 12-1211



APPROVAL DATE
JAN 08 2016
TENN DEPT OF ENVIRONMENT & CONSERVATION
DIVISION OF WATER SUPPLY

APPROVED FOR CONSTRUCTION
THE ORIGINAL SETTING THIS STAMP HAS BEEN RECEIVED AND REVIEWED BY THE
TENNESSEE DEPARTMENT OF ENVIRONMENT AND CONSERVATION
DIVISION OF WATER SUPPLY
AND IS LOANED TO YOU BY THE DIVISION CHIEF ENGINEER
JAN 08 2016
THIS APPROVAL SHALL NOT BE CONSIDERED AS CREATING A PRESUMPTION OF CORRECT
CONSTRUCTION OR WARRANTY BY THE COMMISSIONER. THAT THE APPROVED FACILITY
WILL MEET THE DESIGN DRAWN
BY _____
FOR THE COMMISSIONER
TITLE _____

Gatlinburg Utilities Department
Standard Specifications
Water Main Installation Requirements

November 2012



**GATLINBURG UTILITIES DEPARTMENT
STANDARD SPECIFICATIONS
WATER MAIN INSTALLATION**



NOVEMBER 2012

1. MATERIAL:

All materials shall be new and unused and shall be suitable for installation and operation under the conditions for which they are to be used.

1.1 PIPE:

All pipe used for potable water mains larger than 2" in diameter shall be cement lined and seal coated in accordance with ANSI Spec. A21.4 Ductile Iron with rubber gasket "Push-On" joints, except where mechanical or flanged joints are indicated on the plans.

Ductile Iron Pipe provided shall be manufactured and tested in accordance with ANSI Spec. A21.51 for grade 60-42-10 ductile iron, laying condition "B", depth of cover up to 8 ft. and 350 P.S.I. working pressure. Minimum wall thickness shall be:

<u>Size</u>	<u>Class</u>	<u>Thickness</u>
6"	50	0.25"
8"	50	0.27"
10"	50	0.29"
12"	50	0.31"

1.2 FITTINGS:

All fittings shall be cement lined (standard thickness) and seal coated in accordance with ANSI Spec. A21.4. Joints shall be mechanical, except where flanged joints are shown on the plans.

- A. Cast Iron Fittings: Shall comply with ANSI Spec. 21.10 and shall be rated for 250 psi working pressure.
- B. Ductile Iron Fittings: Shall comply with ANSI Spec. 21.10 and shall be rated for 350 psi working pressure.

1.3 GATE VALVES: Shall comply with AWWA C500. The valves shall be iron-body, bronze mounted, inside-screw, double disk type with parallel seats, non-rising stems, and shall be equipped with rubber o-ring seals at the top of the stems, and shall be equipped

with turn left (counter-clockwise) to open this valve. Valve ends shall be standard mechanical joints except where other type joints are shown on the plans.

1.4 VALVE BOXES:

- A. All underground valves shall be provided with a cast iron valve box. Valve boxes shall be adjustable sliding or screw type with a shaft diameter of 5.25 inches. Boxes shall be installed true vertical and flush with finish grade.

1.5 FIRE HYDRANTS:

- A. Fire Hydrants shall comply with AWWA C502 for dry-barrel hydrants and shall have 4 ½ inch valve openings, two 2-1/4 inch hose connections, and one 4 inch diameter pumper connection (National Standard Threads). (Must be M & H or Mueller only). Hydrants color to be *Safety Yellow*.
- B. The operating nut shall be a National Standard Pentagon measuring 1.5 inches from point to flat: and shall be turned to the left (counter clockwise) to open the hydrant. The operating nut shall be sealed with O-Ring seals.
- C. Fire hydrants shall have 6-inch inlets and mechanical joint connections.
- D. The length of each hydrant shall be suitable for proper operation at the required depth of bury. Barrel extension sections shall be installed where required. Hydrant barrels and stems shall be provided with breakaway bolts and couplings.

1.6 WATER SERVICE CONNECTIONS:

All service lines shall be connected to water mains as shown on the plans.

- A. Copper tubing shall be utilized for all service lines 2" and smaller and shall be "Type-K" soft, annealed complying with Federal Specification WW-T-799, (stamped "American Made" only)
- B. Corporation Stops shall be installed using double strap-clamps with neoprene gaskets.
- C. Water Meters: Shall be the frost proof, positive displacement type, nutating disk meters; and shall comply with AWWA Specification C-700. The main case shall be one piece, cast bronze. Registers shall be hermetically sealed and shall have integral transmission gearing. Registers shall be straight reading and shall record in U.S. Gallons. Serial numbers shall be stamped or molded on the register lid. Meters 1" in size and smaller shall be set in an angle yoke complete with inverted

key valve. All meters to be Sensus and be approved by the Department prior to installation.

- D. Meter Boxes: Shall be cast iron and shall be non-locking for 1-inch and smaller meters.

1.7 PVC PIPE:

- A. All water mains 2" and smaller shall be white ASTM D2241 IPS Gasketed polyvinyl chloride pipe (PVC) SDR-17, 250 psi rated. Fittings used shall match the pipe.
- B. All PVC water mains shall be installed with detection tape and tracer wire. Tracer wire shall be 10 gauge copper wire with blue polyethylene jacket.

1.8 RELATION TO SEWER MAINS

- A. All water mains shall be laid with a minimum ten foot (10') horizontal separation, measured edge to edge, from any sewer main.
- B. If conditions physically prohibit a ten foot separation, the water main may, upon the approval of the Engineer, be laid in a separate trench with the elevation of the top (crown) of the sewer pipe a minimum of 18" below the bottom (invert) of the water main.
- C. Where sewer and water mains cross, the invert of the water main shall be separated from the crown of the sewer main by 18". The water main shall be installed above the sewer main.
- D. If conditions physically prohibit an 18" separation, the sewer main shall be constructed of ductile iron pipe with mechanical joints for a distance of ten feet (10') either side of the crossing.

1.9 SUBMITTALS

Samples, specifications, brochures, etc. for all material shall be submitted to the Utility Manager and approved before delivery to the job site. Any material not approved in advance or any material not in accordance with the approved submittal or any material which is damaged, deformed or otherwise, in the opinion of the Inspector, unsuitable for use shall be immediately removed from the job site.

2 - EXECUTION

2.1 EXCAVATION

- A. The water mains shall be installed in open trenches, except where boring is specifically authorized. Trenches shall be excavated true to the line and grades shown on the plans, and with vertical, parallel banks, trench widths shall be as follows:

<u>Pipe Size</u>	<u>Trench Width</u>
6"	24"
8"	28"
10"	30"
12"	30"

- B. Bell holes shall be excavated at proper intervals so that the pipe shall rest for its entire length upon the bottom of the trench.
- C. Pipe trenches shall not be excavated more than 100 feet in advance of pipe laying.
- D. All excavation is "Unclassified".
- E. Surplus excavated material is to be disposed of under an "Excavation (Fill) Permit" obtained and issued and inspected by the Department of Building Inspections of the City of Gatlinburg. All disposal is to be in accord with the Excavation Code of the City of Gatlinburg. This provision does not apply to disposal sites outside of the city limits. The city does not provide, offer or arrange for disposal sites outside of the city limits. The city does not provide, offer or arrange for disposal sites.
- F. Trench walls shall be sufficiently sheeted, shored, and braced, when required, to prevent slides, cave-ins, settlements or movement of the banks.
- G. Depth of cover over installed water lines is a minimum 30 inches and shall not exceed 5 feet unless otherwise authorized.

2.2 UNDERWATER EXCAVATION

- A. Where the excavation area shown on the plans falls under the water surface or near the banks of a flowing stream or other body of water, the Contractor may adopt and carry out any method he may deem feasible for the performance of the

excavation work and for the protection of the work thereafter; provided the method and equipment to be used have received prior approval to the City. In such cases, the excavation area shall be effectively protected from damage during the excavation period and until all contemplated construction work therein has been completed to the satisfaction of the City.

2.3 MATERIAL PLACEMENT

- A. Backfilling shall commence immediately after the pipe work has been inspected and approved by the City. Backfill material shall consist of fine loose earth, free of large clods, stones, vegetable matter, debris and/or other objectionable materials.

It shall be carefully deposited in 6-inch layers (before Compaction) on each side of the pipe and then thoroughly and carefully tamped or rammed around the pipe with approved power tools until enough material has been placed and compacted and provide a cover of not less 6-inches over the top of the pipe. If the trench extends along or across a paved street, or sidewalk, the remainder of the trench shall be backfilled and tamped to its full depth in the manner specified above; otherwise it may be filled with loose material without compaction. From a height of one (1) foot above the water main upward, backfill material shall be as herein, before specified except that a broken stone content of not more than fifty (50) percent of volume will be allowed stones not exceeding twelve inches maximum dimension and thoroughly mixed with the earth.

- B. Earth materials which are to be used for backfilling under paved areas but are (in the opinion of the City) too dry to permit proper compaction, shall be sprinkled with sufficient water to permit proper compaction. Earth materials that have excessive water content shall not be placed in the trench.
- C. Where water mains are constructed along and across major streets, trenches shall be backfilled to their full depth with crushed stone or other approved granular material where shown on the plans.
- D. Where excavation has been made with the limits of easement across private, developed property, the top one (1) foot of backfill materials shall consist of fine loose earth free from large clods, vegetable matter, debris stones, and/or other objectionable materials.
- E. Where pipe trenches are cut across or along improved streets or roadways, the Contractor shall construct a temporary surface over the cut by filling and tamping the upper 6-inches of the cut with crushed stone which will not disintegrate under traffic and which shall be maintained in good condition under traffic until the

temporary or permanent pavement has been accepted by the City. In streets that are paved, this aggregate surface shall be immediately covered with an approved temporary plant mix bituminous pavement one inch thick. This temporary pavement shall be spread and rolled to accurately conform to the grade of the existing street surface.

- F. The Contractor shall replace all surface material and shall restore paving, curbing, sidewalks, gutters, fences, grassing, and other surfaces disturbed, to a condition equal to that before the work began, furnishing all labor and materials incident thereto.

2.5 CRUSHED STONE CUSHION

- A. A cushion of crushed stone shall be required in locations where unsatisfactory foundation conditions exist, or for bedding pipe in rock excavation. All cushion material shall pass a 1-inch screen and 90 percent shall be retained on a 20 mesh screen.
- B. Where crushed stone cushion is used in rock excavation it shall be placed to the specified width of trench with a thickness of 6-inches below the stone cushion used to replace unsatisfactory sub-grade material will be placed in the location and to the depth as directed by the City. Cushion materials shall be compacted in place by tamping with suitable tools and shaped to receive the pipe and support the full length of the barrel of the pipe at exact line and grade.

2.6 HYDROSTATIC TEST

- A. All newly laid water mains shall be slowly filled with clean water for a period of at least 2 hours. The test pressure shall be determined by the Utility Manager.
- B. Each valved section of pipe shall be slowly filled with clean water and the specified test pressure, measured at the point of lowest elevation, shall be applied by means of a pump connected to the pipe. The pump, connecting piping, gages, metering equipment, and other apparatus required for the test shall be furnished by the contractor and shall be subject to approval by the Utilities Manager.
- C. Taps shall be made at all high points in the main and all air expelled from the pipe before the test pressure is applied.
- D. All leakage that can be located shall be completely stopped, no matter how small it might seem. Any cracked or defective pipe, fittings, or valves shall be removed and replaced by the contractor with new, sound material and the test shall be

repeated until it is satisfactory. A test will be considered unsatisfactory if the leakage exceeds the amounts shown below:

ALLOWABLE LEAKAGE
(Gallons per Hour per 1,000 feet of pipe)

<u>Pipe Size</u>	<u>Test Pressure</u>	
	150 PSI	200 PSI
3" and 4"	0.33	0.39
6"	0.50	0.58
8"	0.67	0.76
10"	0.83	0.95
12"	1.00	1.15

2.7 FLUSHING AND DISINFECTING

- A. After successful completion of the pressure test, each new water main shall be thoroughly flushed through hydrants, or by other approved means, to remove all dirt and foreign matter.
- B. The main shall then be disinfected by pumping a solution of hypochlorite (HTH) into the main in an amount sufficient to produce a concentration of at least 25 parts per million throughout the main. This treated water shall be kept in the main for at least 24 hours. A longer disinfection period will be required if after 24 hours the chlorine residual at the pipe extremities is less than 10 parts per million.
- C. All valves shall be operated while the chlorine solution is in the main.
- D. Following disinfection, the treated water shall be thoroughly flushed from the main until the replacement water throughout its length shall, upon test, both chemically and bacteriologically, be proven to be safe for human consumption. Water samples shall be submitted (by the contractor) to the State Health Department or the water plant lab for bacteriological examination. If the initial treatment was not completely effective, the chlorination procedure shall be repeated until confirmed test show that the water sampled from the new main is free of bacteria.

2.8 MAINTENANCE

- A. The contractor shall maintain all road surfaces, trench backfill, and completed sections of water mains in good condition until final acceptance of all work by the owner.

- B. The Owner may elect to use completed sections of water mains without relieving the contractor of his responsibility for maintaining or replacing defective work.

2.9 PAVEMENT REMOVAL AND REPLACEMENT

- A. Removal - All pavement shall be neatly cut prior to any attempt that is made to remove it or begin excavation. (Note disposal provision of 2.1e)
- B. Replacement - All pavement shall be replaced as before. The contractor is encouraged to photograph the existing conditions. Replacement shall be true to the existing line and grade in such a manner to assure that there is no perceptible difference in grade (i.e., not discernible “bump”). Any grade differential or any settlement which is discernible to the motorist inspector, shall be restored. (Note: Warranty Provisions in 6.)

3. - MAINTAINING TRAFFIC

Local traffic shall be maintained at all times. Signs and detours as necessary or as required by the Inspector shall be provided. All detours necessary for through traffic shall be arranged for by the contractor and coordinated with the Gatlinburg Police Department.

4. - RETURN OF STREETS TO SERVICE

With due reference to paragraphs 2.9 (b) (replacement of paving), 3. (Maintaining Traffic) and 2.6 (testing), it is specifically required that the work be installed, tested and the street repaired and placed back into full service at intervals not exceeding 1000 ft. All pavement marking, drainage and other roadway incidentals shall be restored and all surplus materials removed from each 1000' increment.

5. - STANDARDS

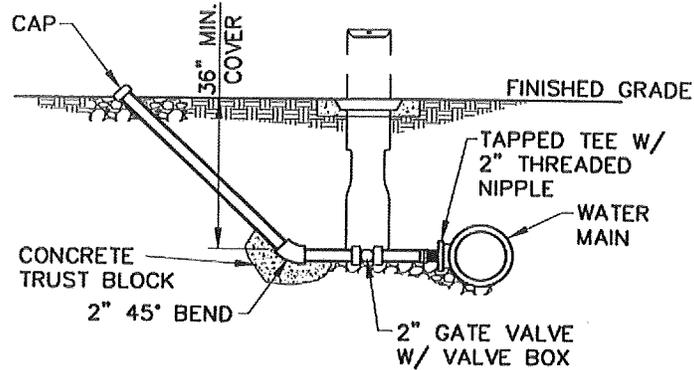
In addition to the drawings and these specifications, all work shall comply with the minimum design criteria of the State of Tennessee and the applicable Plumbing Code.

6. - WARRANTY

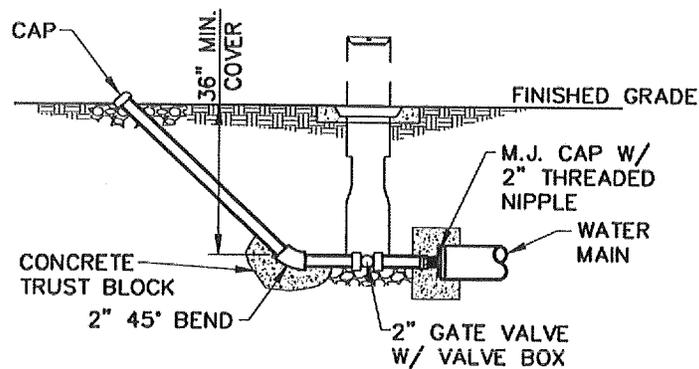
All work shall function in the manner intended and shall be free from defects in material and/or workmanship for a period of twelve (12) months from its acceptance by the City of Gatlinburg. Any work found to not be so, including the replacement of paving, shall re-repaired or replaced at no cost to the City of Gatlinburg.

7. - INSPECTION

All work shall be inspected by the Utilities Manager or his designee and shall be performed in a manner that is acceptable to him.



MANUAL IN-LINE BLOW-OFF DETAIL



MANUAL END OF LINE BLOW-OFF DETAIL

NOTES:

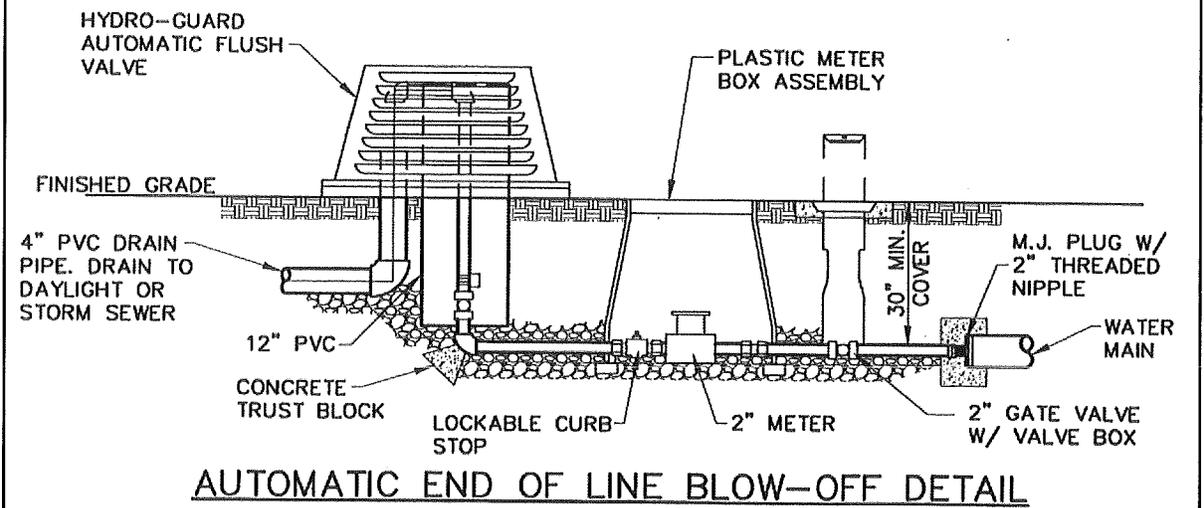
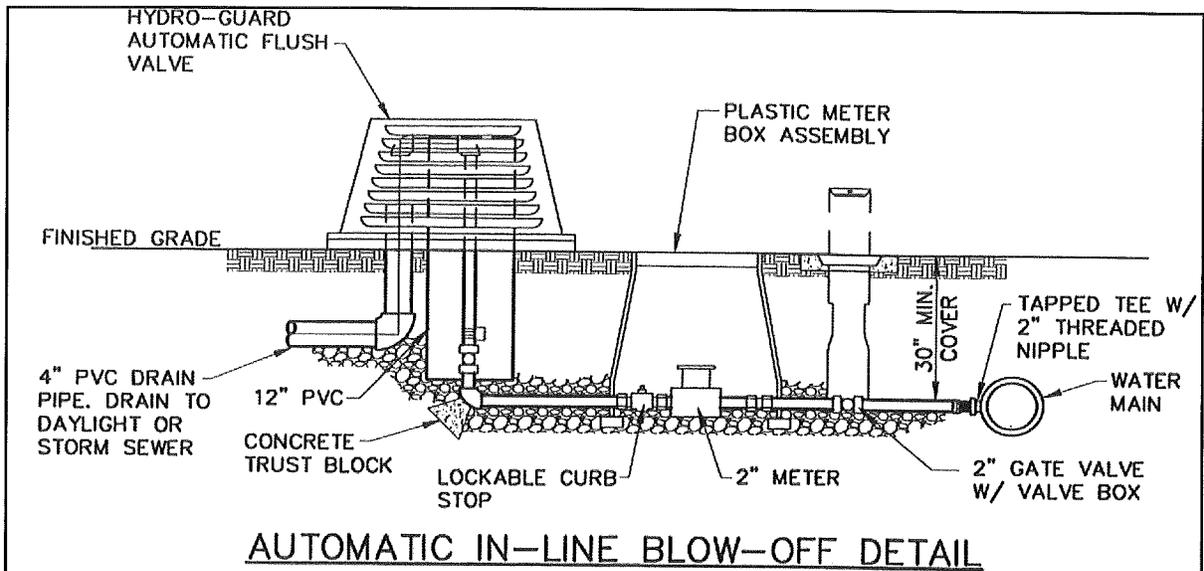
1. CONCRETE BLOCKING AT WATER MAIN PLUG SHALL BE A MINIMUM OF 1'-6" THICK AND BE OUT A MINIMUM OF 1'-0" INTO UNDISTURBED SOIL ON EACH SIDE AND BELOW TRENCH
2. ALL THREADED PIPE SHALL BE JOINED WITH HEAVY DUTY TEFLON TAPE OR APPROPRIATE THREAD SEALANT

WATER MAIN BLOW-OFF DETAIL



Gatlinburg Utilities Department
 Standard Details - Typical Construction
 November 2012
not to scale





NOTES:

1. CONCRETE BLOCKING AT WATER MAIN PLUG SHALL BE A MINIMUM OF 1'-6" THICK AND BE OUT A MINIMUM OF 1'-0" INTO UNDISTURBED SOIL ON EACH SIDE AND BELOW TRENCH
2. ALL THREADED PIPE SHALL BE JOINED WITH HEAVY DUTY TEFLON TAPE OR APPROPRIATE THREAD SEALANT

WATER MAIN BLOW-OFF DETAIL



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