



Town of Holbrook
Department of Public Works
Construction Standards



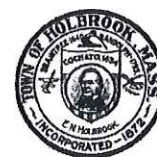
This page intentionally left blank.



	Page
Glossary	v
1 General	1-1
1.1 Preamble	1-1
1.2 Regulatory Framework	1-1
1.2.1 Application/Plan Review	1-2
1.2.2 Construction.....	1-2
1.2.3 As-Built/Record Documents	1-2
1.3 General Requirements.....	1-2
1.3.1 Brand Name or Equal	1-2
1.3.2 FEMA Regulations	1-2
1.3.3 Easements	1-3
1.3.4 Roadway Bounds and Monumentation	1-3
1.3.5 Traffic Management Plans.....	1-3
1.3.6 Construction Site Maintenance	1-3
1.4 Erosion Control.....	1-3
1.4.1 Stormwater Management During Construction	1-3
1.4.2 Stormwater Management Post Construction.....	1-5
1.5 Tree Planting and Protection.....	1-5
1.6 Asbestos Cement Pipe Encountered during Construction	1-7
1.7 Conditions for Street Acceptance	1-7
1.8 Items Not Covered in This Document	1-8
1.9 References.....	1-8
2 Water Construction Standards.....	2-1
2.1 General.....	2-1
2.1.1 Description.....	2-1
2.1.2 Submittals	2-1
2.1.3 Inspection.....	2-2
2.1.4 Delivery, Storage and Handling.....	2-2
2.2 Materials	2-3
2.2.1 Lead Free	2-3
2.2.2 Pipe.....	2-3
2.2.3 Piping Connections	2-4
2.2.4 Hydrants.....	2-5
2.3 Execution	2-6
2.3.1 Piping.....	2-6
2.3.2 Valves	2-8
2.3.3 Tapping.....	2-8
2.3.4 Thrust Restraint	2-8
2.3.5 Electrical Grounding.....	2-9
2.3.6 Fire Suppression	2-9
2.3.7 Pipe, Valve and Structure Abandonment / Removal	2-9
2.4 References.....	2-10
3 Sewer Construction Standards	3-1
3.1 General.....	3-1
3.1.1 Description.....	3-1
3.1.2 Submittals	3-1
3.1.3 Inspection.....	3-2
3.1.4 Delivery, Storage and Handling.....	3-2



3.2	Materials – Gravity Sewer Systems.....	3-3
3.2.1	Polyvinyl Chloride Pipe (PVC) (Gravity).....	3-3
3.2.2	Couplings.....	3-3
3.2.3	Ductile Iron Pipe (Gravity) – where required by Town	3-3
3.2.4	Cast Iron Pipe (Gravity) (For Plumbing Code Areas Only).....	3-3
3.2.5	Cleanouts	3-4
3.2.6	Manholes	3-4
3.2.7	Manholes & Sewer Structures – Bitumastic Coatings	3-5
3.2.8	Sewer Piping Connections	3-5
3.3	Execution – Gravity Sewer Systems.....	3-6
3.3.1	Piping.....	3-6
3.3.2	Testing of Public Sewer	3-12
3.4	General – Pressure Sewers.....	3-14
3.5	Materials – Pressure Sewers	3-15
3.5.1	Pressure Sewer Pipe and Fittings.....	3-15
3.5.2	Couplings and Connectors	3-16
3.5.3	Air Release Valves.....	3-16
3.5.4	SDR 21 PVC Force Main, Flange Adapter and Thrust Blocks.....	3-17
3.6	Execution – Pressure Sewers	3-17
3.6.1	Sleeve Couplings	3-17
3.6.2	Piping.....	3-17
3.6.3	Testing Pressure Sewer Pipe.....	3-18
3.6.4	Pipe and Structure Abandonment	3-19
3.7	Grease Traps	3-19
3.7.1	Exterior Grease Traps	3-19
3.7.2	Interior Grease Traps	3-20
3.8	References.....	3-20
4	Drainage Construction Standards	4-1
4.1	General.....	4-1
4.2	Private Connections to Town Drainage System	4-2
4.3	Materials	4-2
4.3.1	Bedding Material	4-2
4.3.2	Pipe	4-2
4.3.3	Drainage Structures.....	4-4
4.3.4	Frames and Covers.....	4-5
4.3.5	Granite Curb Inlets (Throat Stones).....	4-5
4.3.6	Box Culverts, Headwalls, Wing Walls, and Endwalls.....	4-6
4.3.7	Perforated Drain Pipe Trenches (Subdrain)	4-6
4.3.8	Dry Wells.....	4-6
4.3.9	Subsurface Infiltration	4-7
4.3.10	Drainage Swales	4-8
4.4	Execution	4-8
4.4.1	Pipe Laying	4-8
4.4.2	Manholes, Catch Basins, and Leaching Basins.....	4-10
4.4.3	Box Culverts, Headwalls, Wingwalls, and Endwalls.....	4-11
4.4.4	Perforated Drain Pipe Trenches (Subdrain)	4-11
4.4.5	Dry Wells.....	4-12
4.4.6	Drainage Swales	4-12
4.4.7	Separation of Storm Drains and Water or Sewer Mains	4-12
4.5	Maintenance	4-13
4.5.1	Maintenance of Drainage Systems on Private Property	4-13



4.5.2	Access for Maintenance of Drainage within Easements.....	4-13
4.6	Definitions	4-13
4.7	References.....	4-13
5	Roadway Construction Standards	5-1
5.1	Roadway Design	5-1
5.1.1	General.....	5-1
5.1.2	Streets and Roadways	5-1
5.1.3	Curbing	5-2
5.1.4	Sidewalks.....	5-2
5.1.5	Walls or Slopes	5-2
5.1.6	Driveways.....	5-2
5.1.7	Protection of Utilities.....	5-2
5.2	Roadway Materials	5-3
5.2.1	Special Borrow	5-3
5.2.2	Processed Gravel for Subbase.....	5-3
5.2.3	Gravel Borrow	5-3
5.2.4	Crushed Stone for Subbase	5-3
5.2.5	Dense Graded Crushed Stone for Subbase	5-3
5.2.6	Loam Borrow.....	5-3
5.2.7	Fertilizer.....	5-3
5.2.8	Grass Seed	5-3
5.2.9	Hot Mix Asphalt	5-3
5.2.10	A. Hot Mix Asphalt (HMA) shall conform to MassDOT Standard Section M 3.11.00.Superpave...	5-3
5.2.11	Portland Cement Concrete for Sidewalks	5-3
5.2.12	Granite Curbing	5-4
5.2.13	Granite Curb Inlets.....	5-4
5.2.14	HMA Berm and Curb	5-4
5.2.15	Retaining Walls	5-4
5.2.16	Granite Bounds	5-4
5.2.17	Guard Rail.....	5-4
5.2.18	Pavement Markings	5-4
5.2.19	Street Signs	5-4
5.2.20	Traffic Signs	5-5
5.2.21	Dust Control.....	5-5
5.2.22	Handholes	5-5
5.2.23	Handhole Frame and Covers.....	5-5
5.2.24	Manhole Frame and Covers.....	5-5
5.3	Roadway Execution	5-6
5.3.1	General Conditions	5-6
5.3.2	Procedure	5-6
5.3.3	Clearing (including excavating or stripping poor material)	5-7
5.3.4	Preparation of Subgrade.....	5-7
5.3.5	Gravel Sub-base.....	5-8
5.3.6	Dense Graded Crushed Stone	5-8
5.3.7	Hot Mix Asphalt Roadways.....	5-8
5.3.8	Sidewalks and Driveway Aprons.....	5-8
5.3.9	Granite Curbing	5-9
5.3.10	Retaining Walls	5-9
5.3.11	Slopes.....	5-9
5.3.12	Granite Bounds	5-9
5.3.13	Guard Rail.....	5-10
5.3.14	Pavement Markings	5-10



5.3.15	Traffic Signs	5-10
5.3.16	Street Signs	5-10
5.3.17	Inspections	5-10
5.3.18	Handhole Installation	5-11
5.4	References.....	5-11
6	Existing Road Openings.....	6-1
6.1	General.....	6-1
6.2	Traffic Management.....	6-2
6.3	Excavation	6-2
6.3.1	Backfill	6-3
6.3.2	Temporary Pavement.....	6-4
6.3.3	Permanent Pavement.....	6-6
6.3.4	Material Specification – Trenches	6-7
6.4	Special Condition(s).....	6-8
6.5	References.....	6-9

Appendices

- Appendix A** Plan Content and As Built Plan Requirements
Appendix B Construction Details



Glossary

AAB	Architectural Access Board
AASHTO	American Association of State Highway and Transportation Officials
AC	Asbestos Cement
ACM	Asbestos containing material
ADA	Americans with Disabilities Act
ADAAG	Americans with Disabilities Act Accessibility Guidelines
ANSI	American National Standards Institute
ASTM	American Society for Testing and Materials. Note: ASTM International is originally known as the American Society for Testing and Materials, is an international standards organization that develops and publishes voluntary technical standards for a wide range of materials, products, systems, and services
AWWA	American Water Works Association
ATSSA	American Traffic Safety Services Association
BMP	Best Management Practice
CDF	Controlled Density Fill
CLOMR	Conditional Letter of Map Revisions
CMR	Code of Massachusetts Regulations
DBH	Diameter at Breast Height (the diameter of a tree trunk at 4.5 feet above ground)
DI	Ductile Iron
DPW	Holbrook Department of Public Works
Engineer	A member of the Holbrook Department of Public Works Engineering & Transportation Division or an authorized representative thereof
FEMA	Federal Emergency Management Agency
HDPE	High Density Polyethylene
HMA	Hot Mix Asphalt
ID	Inner Diameter
LOMR	Letter of Map Revisions



Mandrel Test	The roundness of a pipeline is tested by moving a slightly smaller steel shank, called a mandrel, through the inside of the pipeline. If the pipeline is out of round, the mandrel will be held and kept from moving forward.
MGL30 §39M	Massachusetts General Law "General Provisions Relative to State Departments, Commissions, Officers and Employees: Contracts for Construction and Materials; Manner of Awarding"
mg/l	milligrams per liter
MassDEP	Massachusetts Department of Environmental Protection
Mass DLS	Massachusetts Department Labor and Standards
MassDOT	Massachusetts Department of Transportation (formerly Massachusetts Highway Department)
MUTCD	Manual on Uniform Traffic Control Devices
NPDES	National Pollutant Discharge Elimination System
OD	Outer Diameter
OSHA	Occupational Safety and Health Administration
PE	Polyethylene
PP	Polypropylene
PVC	Polyvinyl Chloride
ppm	Parts per million
psi, psig	Pounds per square inch, pounds per square inch (gauge)
RCP	Reinforced Concrete Pipe
SOP	Street Opening Permit
SDR	Standard Diameter Ratio
US DOT	U.S. Department of Transportation
US EPA	U.S. Environmental Protection Agency

Section 1



1 General

1.1 Preamble

- A. These Construction Standards are hereby established by the Town of Holbrook Department of Public Works (DPW). Their purpose is to provide a consistent policy under which the controlling requirements for construction of physical aspects of infrastructure system improvements within the Town limits will be implemented. These aspects include streets, sidewalks, storm drains, water supply and sewer lines.
- B. These Design and Construction Standards and Construction Details are herein after referred to as the Standards. The Design and Construction Standards are provided as specifications in the materials and methods for performing work relative to the Town of Holbrook's infrastructure systems. The Construction Details are provided to graphically depict and to help illustrate key elements outlined within the written portion of these Standards.
- C. Most of the elements contained in this document are related to public improvements and Town of Holbrook contract projects; however, it is intended that they apply to both public and private work designated herein. For private work that does not fall within the regulatory jurisdiction of Town By-Laws or regulations, DPW strongly recommends that these standards be used as a basis for construction. These Standards address the more typical infrastructure components. Accordingly, these Standards are intended to assist but not to substitute for competent work by design professionals by providing basic information. It is expected that engineers will bring to each project the best of skills from their respective disciplines, and design professionals shall contact the DPW for clarification and direction regarding designs not covered by these Standards.
- D. These Standards are also not intended to unreasonably limit any innovative or creative effort which could result in better quality, cost savings, or both. However, any proposed departure from the Standards will be judged on the likelihood that such variance will produce a long-term compensating or comparable result, in every way adequate for the user and Town resident. Any variances from these Standards must be approved by the DPW. Further, these Standards are not intended to restrict the DPW in its effort to obtain the maximum benefits for the Town in any construction project.
- E. These Standards are supplemented by regulations and fee structures. Reference to the pertinent regulations and fee structures is provided within each section of this document. In some cases, the regulations, fee structures, and forms are provided as Appendices to these Standards.

1.2 Regulatory Framework

- A. These Standards are provided to outline the DPW minimum criteria for construction of infrastructure within Town limits. It is the responsibility of the property owner to verify and obtain all applicable permits.
- B. These standards are supplemental to the standards in the *Town of Holbrook Zoning By-Law* regulations for erosion and sediment control during and after construction and the *Rules and Regulations Governing Subdivision of Land in the Town of Holbrook*, which provides general design standards. Please refer to these documents for design requirements. All work shall conform to the current versions of the Town of Holbrook Water and Sewer regulations.
- C. All construction materials and methods shall conform to the requirements contained in the latest version of the Massachusetts Department of Transportation (MassDOT) Standard Specifications for Highways and Bridges as amended, unless otherwise specified herein or approved by the Town of Holbrook DPW.



1.2.1 Application/Plan Review

- A. Proposed construction must be approved by the DPW. The approval must be by the Town Engineer, or designee. Proposed work shall be submitted as an Engineering Plan stamped by a Professional Engineer registered in the Commonwealth of Massachusetts. The DPW will provide the Applicant with written correspondence indicating approval of the plan, or required changes. See Appendix A for Plan content requirements.
- B. In addition to plan review approval, it is the responsibility of the property owner to verify and obtain all written permits from appropriate agencies and pay all permit fees before construction begins.

1.2.2 Construction

- A. DPW Inspector of Construction and Utilities may approve field changes, or allowances, that differ from submitted plans or Town standards. No changes are allowed without prior approval by the Inspector.

1.2.3 As-Built/Record Documents

- A. The Contractor shall be responsible for the preparation and submittal of record drawings to the DPW when construction is complete. Record drawings shall be a full set of drawings showing all details of the construction, along with any specifications or design reports. This plan shall include all drain lines and structures with rim and invert elevations; all water lines, gates and dwelling service shut offs; all sewer lines and structures with rim and invert elevations; all service wyes with distances to the nearest structures and all relevant easements. Record drawings and reports shall be certified (signed and stamped) true and correct by a Professional Engineer registered in the Commonwealth of Massachusetts and/or Professional Land Surveyor registered in the Commonwealth of Massachusetts, as applicable. Drawings shall be submitted in both electronic and hard copy formats. Contact the DPW to determine the current acceptable electronic format. See Appendix A for As-built Plan content requirements
- B. Certificates of Occupancy will not be signed until payments of the required fees are confirmed and a final site inspection is concluded to validate completeness and accuracy of the submitted as-built plan documents. The DPW requires a minimum of five business days following the delivery of as-built documents package (turnaround time subject to document package completeness) to provide Occupancy Certificate Sign-off.

1.3 General Requirements

1.3.1 Brand Name or Equal

- A. If an item in these Standards is identified as “brand name or an approved equal,” the product will reflect the characteristics and level of quality that will satisfy the Town’s needs. The Town will evaluate “equal” products on the basis of information furnished by the Applicant or Contractor. All “or Equal” submissions must be approved during the Plan review process and will be judged consistent with MGL 30 §39M. All technical information submitted must be as provided by the manufacturer. The Town is not responsible for locating or obtaining any information not identified.

1.3.2 FEMA Regulations

- A. The developer or owner is required to meet all Federal Emergency Management Agency (FEMA) regulations and the Town’s Zoning By-Law. When a submittal to FEMA is required to adjust the FEMA Flood Boundary and Floodway Maps, the submittal must be submitted to and approved



by the Town Engineer prior to submitting to FEMA. Conditional Letter of Map Revisions (CLOMRs) and Letter of Map Revisions (LOMRs) are required for any modifications to a floodplain or floodway.

1.3.3 Easements

- A. Easements for Water, Sewer, or Drainage on or across lots or centered on rear lot lines or side lines shall be provided where necessary and shall be at least thirty feet (30 feet) wide. Major easements (i.e., over three hundred feet (300 feet) long) for sewer, water and drainage must be at least forty feet (40 feet) wide. Signed copies of easements and agreements affecting land not within a subdivision, but necessary for provision of utilities shall be submitted to the DPW before a plan can be approved. Where a subdivision is traversed by a water course, drainage way, channel, or stream, the DPW may require a storm water easement or drainage right of way be provided of adequate width to conform substantially to the lines of such water course, drainage way, channel, or stream and the necessary width for access. The DPW may further require the subdivider to provide construction of such improvements as they consider essential for public safety and for the adequate control of a one hundred (100) year storm.

1.3.4 Roadway Bounds and Monumentation

- A. All existing roadway monumentation shall be inventoried and protected. Any and all proposed impacts shall be brought to the attention of the Engineering Division immediately.
- B. The Engineering Division shall be notified immediately if any survey monuments are uncovered, exposed or damaged.
- C. Any damage to roadway or other survey monuments prior to acceptance by the Town shall be repaired in a manner satisfactory to the DPW and the full cost of such repair shall be paid by the Contractor. Any material used which does not meet the standards of the DPW shall be replaced by the Contractor at no cost to the Town.

1.3.5 Traffic Management Plans

- A. All traffic management plans shall be approved by the Engineering Division before construction may begin.
- B. Traffic management plans shall meet the requirements and guidance set forth in the MassDOT Work Zone Safety Guidelines, the ATSSA Guide to Temporary Traffic Control, and the MUTCD guidelines.
- B. Specific requirements are provided in Section 6 of these Construction Standards.

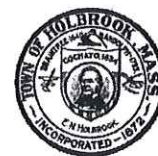
1.3.6 Construction Site Maintenance

- A. At the completion of each working day, all areas affected by work shall be brought to a reasonably clean, safe, and usable condition as determined by the Town or its designee.

1.4 Erosion Control

1.4.1 Stormwater Management During Construction

- A. All construction shall comply with the Town's Zoning By-Laws and Subdivision Regulations for land disturbance including clearing, erosion control, and stormwater management. In addition, construction shall comply with any applicable federal and state requirements, including but not



limited to National Pollutant Discharge Elimination System (NPDES) stormwater discharge requirements.

- B. Every person seeking to construct, repair, or modify a property's infrastructure that is either in the right of way or is subject to applicable Town requirements (e.g., Planning Board or Conservation Commission) shall be required by the Town to prepare and implement an Erosion and Sedimentation Control Plan to prevent the introduction of sediments into the Town's drainage system. The person initiating such modification will be held accountable as the "Responsible Party" with the obligation to:
1. Secure the design of any facilities required pursuant to this section;
 2. Submit the design to DPW for review and approval;
 3. Be responsible for the full expense of installation and maintenance of such facilities; and
 4. Notify the DPW prior to the start of any work to arrange and coordinate Town Inspection of the installation.
- C. Silt fencing shall be used as one of the primary erosion control measures. Silt fence shall consist of a sheet of synthetic fabric such as polypropylene, nylon, polyester, or polyethylene yarn. Silt fence shall be erected in a continuous fashion from a single roll of fabric. The bottom of the fabric fence shall be buried sufficiently below the ground surface to prevent gaps from forming, usually 4 to 6 inches below ground surface. The fabric shall be installed on the upstream side of the stakes. Stakes shall be strong enough and tall enough to securely anchor the fabric to the ground. Stake spacing shall be no more than 10 feet apart for extra-strength fabric and 6 feet apart for standard strength fabric. Maintenance of the fence is required during construction. Material shall be based on the synthetic fabric requirements as follows:
1. Filtering efficiency: 75% (minimum)
 2. Tensile strength: Standard strength: 30 lb./linear inch (minimum), Extra strength: 50 lb./linear inch (minimum)
 3. Elongation: 20% (maximum)
 4. Ultraviolet radiation: 90% (minimum)
 5. Slurry flow rate: 0.3 gal/ft²/min (minimum)
- D. Fiber rolls or an approved equal shall be used as another primary erosion control measures. Fiber rolls shall be used in conjunction with silt fences except when used for hillside erosion control, where they may be used alone.
1. Fiber rolls shall be trenched between 3 and 5 inches into the ground, depending on the size of the fiber roll.
 2. Fiber rolls shall be staked securely into the ground using wood stakes. A minimum of 3 inches of the stake shall stick out above the roll.
 3. Stakes shall be spaced 3 to 4 feet apart unless otherwise approved by the DPW.
 4. Fiber rolls placed around drain inlets shall be placed a minimum of one (1) foot back from the inlet.
 5. For slope stabilization, fiber rolls shall be placed perpendicular to the expected flow of stormwater runoff, with the following separation:
1:1 slopes = 10 feet apart
2:1 slopes = 20 feet apart



3:1 slopes = 30 feet apart

4:1 slopes = 40 feet apart

- E. Gravel aprons shall be installed at the entrance of construction sites where disturbance is over 4,000 square feet to prevent sediment from the construction site entering the roadway. Aprons shall be a minimum of 15 feet in length, and extend the width of the entrance.
- F. Silt sacks (or equivalent) shall be placed in down gradient catch basins to prevent sediment from entering the drainage system. Silt sacks shall be periodically cleaned while in use and must be cleaned prior to and after precipitation events. Applicants are advised they may be required to respond immediately for repair and maintenance at the request of the Town within two hours of notification.
- G. All erosion and sediment controls shall remain in effective operating condition during construction activities. Inspect all erosion and sediment controls regularly and make the necessary repairs or modifications to ensure effectiveness or as directed by the Town Inspector.
- H. Initiate soil stabilization measures immediately whenever earth-disturbing activities have permanently or temporarily ceased on any portion of the site. Complete soil stabilization measures as soon as practicable, but no later than 14 calendar days after the initiation of soil stabilization measures.
- I. All soil stockpiles to be in place for more than 14 days shall have erosion controls (e.g., fiber rolls) installed on the downgradient side to prevent migration of soils.

1.4.2 Stormwater Management Post Construction

- A. Every person shall be required to prepare and implement a stormwater management operations and maintenance plan as required by Town review requirements (e.g., Planning Board or Conservation Commission).
- B. Such a plan shall include non-structural and structural measures to manage stormwater during and after construction of the new or expanded facility. The design of such facilities shall be subject to the approval of the DPW. The costs for the design, installation and maintenance of the aforementioned stormwater management systems shall be the responsibility of the facility owner. The DPW shall receive advance notice prior to the start of said work to coordinate Inspectional coverage of the installation.
- C. For subdivisions regulated by the Town's Subdivision By-Laws, the DPW may require that major components of stormwater management systems be placed on the property rather than within the Town right-of-way limits. In such cases, the owner or homeowners' association shall be responsible for the ongoing maintenance of said components, and the approved stormwater management plan shall include management of these components. This management plan shall be recorded with the deed at the Massachusetts Registry of Deeds.

1.5 Tree Planting and Protection

- A. All tree work shall be completed in accordance with the requirements of the Tree Warden and/or planning board as appropriate.
- B. When specifying trees to be planted on or near the roadways in Town, specifications shall identify species and cultivar. The more disease resistant cultivars shall be recommended.



-
- C. Trees shall be tagged with identification as to location of origin, species, and cultivar. Notification shall be provided to the Tree Warden to provide time for inspection and verification of tree species and cultivar.
- D. When planted, an area around the trees shall be mulched for a minimum of 3 feet from the tree or twice the size of the root ball, whichever is greater. The area immediately around the tree trunk (within 2 inches of the trunk) shall remain un-mulched.
1. The planting hole shall be at least 2 times the width of the rootball, up to 5 times the rootball.
 2. Burlap, twine, and wire baskets shall be entirely removed after planting.
 3. Place the tree in the hole at both the appropriate upright angle and depth.
 4. Replace the soil so that there is no excessive coverage to roots or contact above the root flare at the stem.
 5. Add a two- to three-inch layer of mulch, not contacting the bark of the tree.
 6. Immediately water the tree, with a plan for regular follow-up watering.
 7. Provide a final quality-control check, where depth of the structural roots is verified, with the use of a chaining pin or other measuring implement.
- E. Tree protection shall include the following.
1. Notification shall be provided to Tree Warden during the planning and specification development of projects where tree protection may be required. The Tree Warden may require that a Town-approved certified arborist oversee construction activities related to tree protection.
 2. A pre-construction meeting with the Tree Warden shall be conducted at least two weeks prior to construction to review tree protection procedures.
 3. Tree protection shall be provided for each tree within the work area.
 4. The tree protection zone shall extend out from the center of the trunk to a radius of 1.5 feet per inch of DBH (DBH = diameter of trunk at 4.5 feet above ground).
 5. Primary tree protection shall include 2" x 4" boards in 8-foot lengths vertically strapped around the trunk, at a maximum of 8 inches apart, on center. No penetration of the tree trunk shall be allowed except as approved by a certified arborist or the Tree Warden.
 6. Secondary tree protection shall include fencing around the tree protection zone.
 7. No storage of any materials or equipment shall be allowed within the tree protection zone.
 8. No parking shall be allowed within the tree protection zone.
 9. No roots greater than 2 inches shall be cut during construction activities.
 10. Any pruning of tree limbs shall be done under the direction of a certified arborist.
 11. During excavation, major roots as determined by the Tree Warden shall be exposed using an air spade and flagged for protection.
 12. Vertical mulching shall be required if soil compaction levels exceeds 75% or more than 3 passes by heavy equipment are expected.
 13. If travel is required within the tree protection area, a layer of at least 6 inches of wood chips, mulch, or other matting as approved by the Tree Warden shall be laid down to protect the



roots. The matting shall be removed and the area restored to pre-construction conditions upon completion of the work.

14. For construction where trees roots may be damaged, only root pruning methods may be used for removal. The Tree Warden shall be notified and a plan submitted to the Tree Warden for approval.
 15. Curb cuts should not be closer than five (5) feet from the trunk of any adjacent tree.
- F. Trees that, in the judgment of the Engineer or the Tree Warden, have been irreparably damaged by the Contractor shall be replaced in kind and in size, or with a quantity of 2-inch caliper replacement trees (the quantity of which shall be determined by the Engineer) such that the cumulative caliper of the replacement trees will be up to the equivalent diameter of the lost tree at breast height. Cost of removal of a destroyed tree, including roots and stumps, as well as the cost of replacement trees, shall be paid for by the Contractor.
- G. A written guarantee shall be provided to the Town that trees planted in Town as per the contract will thrive for a minimum of two (2) years. The guarantee shall include replacement of trees that the Tree Warden has determined are not thriving. Replacements shall be required to have the same guarantees as the original trees.

1.6 Waste Management

Disposal of removed pavement, concrete, soil, or other construction materials shall comply with the DPW's Waste Management and Soil Management specifications. The disposal location and management plan shall be pre-approved by the DPW, prior to the start of any work.

1.7 Asbestos Cement Pipe Encountered during Construction

- A. If either asbestos cement (AC) pipe or asbestos cement material in soil is encountered, notification shall be immediately provided to the DPW Engineering and Transportation Division.
- B. Handling of any AC Pipe or AC material shall be according to federal and state regulations, specifically but not limited to EPA's *National Emission Standards for Hazardous Air Pollutants* (NESHAP) Title 40, Part 61; EPA's *Guide to Respiratory Protection for the Asbestos Abatement Industry* OSHA 29 CFR part 1926.1101; OSHA 29 CFR 1010.1001; USDOT 49 CFR 100-185; Massachusetts Division of Labor Standards 453 CMR 6; MassDEP 310 CMR 7.00, 7.09, 7.15; and MassDEP *Asbestos Cement Pipe Guidance Document* (June 2011).
- C. Handling, management, storage and disposal of any AC pipe or AC contaminated material shall comply with Holbrook's Standard Operating procedures for asbestos containing materials.

1.8 Conditions for Street Acceptance

- A. The following shall be required as applicable as conditions for acceptance of streets. Any listed reports shall be signed and stamped by a registered professional engineer or land surveyor with applicable qualifications.
 1. Conditions & confirmation conditions achieved
 2. Order letter of conditions
 3. Identified condition exceptions
 4. Homeowner association document
 5. As-built subdivision or plot plan
 6. Roadway layout plan



7. Copies of deeded easements
8. Inspection reports of plantings and other items in the right of way
9. Street light inspection report
10. Fire pull box inspection report
11. Highway sign and/or striping inspection report
12. Layout /bound/ easement inspection report
13. Roadway/sidewalk/curbing base & finish inspection report
14. Utilities inspection (water, sewer, drainage) reports, including water quality testing for all water systems
15. CCTV drain/ sewer systems reports
16. Hydrant inspection reports including test data
17. Drainage/retention pond inspection report
18. Easement or proof of ownership and Operations and Maintenance plans for drainage detention/retention basins.

1.9 Items Not Covered in This Document

- A. Items not covered in this document include the following:
1. Complex and specialty items such as bridges, culverts, siphons, pump stations, and backflow prevention. Plans for these items are to be provided for individual review by the DPW.
 2. Drainage that is completely operating within the boundaries of private property, with no discharge to waterways or the Town's drainage system.
 3. Street Opening Permit (SOP) requirements for any facility installation that may occur within the Town Right of Way limits. For SOP policy details please refer to Town of Holbrook Web site link as follows:
https://www.holbrookma.gov/sites/g/files/vyh1if3261/f/uploads/street_opening_permit_sop.pdf
 4. Trench Opening Permit requirements for any excavation that meets the definition of a trench as per MGL Chapter 82A Unattended Open Trenches Safety Hazards Rules, Regulations and Fines, and regulated under 520 CMR 14.00 Excavation and Trench Safety Regulations.

1.10 References

<u>Standards</u>	<u>Title/Subject</u>
ATSSA	Guide to Temporary Traffic Control in Work Zones
Mass DLS	453 CMR 6. Current Asbestos Regulations
MassDEP	310 CMR 7.00. Air Pollution Control Regulations. Includes Section 7.09 <i>Dust Odor, Construction and Demolitions</i> and 7.15: <i>Asbestos</i>
MassDEP	Asbestos Cement Pipe Guidance Document (June 2011).
MassDOT	Work Zone Safety Guidelines for Massachusetts Municipalities and Contractors
US DOT	Manual on Uniform Traffic Control Devices
OSHA	29 CFR part 1926.1101. Safety and Health Regulations for Construction, Sub Part Z, Toxic and Hazardous Substances: Asbestos



OSHA	29 CFR 1010.1001. Occupational Safety and Health Standards, Subpart Z, Toxic and Hazardous Substances: Asbestos
US DOT	49 CFR 100-185. Hazardous Materials Transportation
US EPA	National Emission Standards for Hazardous Air Pollutants (NESHAPS) Title 40, Part 61
US EPA	Guide to Respiratory Protection for the Asbestos Abatement Industry

Section 2



2 Water Construction Standards

2.1 General

2.1.1 Description

- A. The work includes furnishing and installing all pipe, fittings, valves, structures and appurtenances required for the proposed system to supply water to users of the Town's Water System.
- B. Work and materials shall be performed in accordance with the State Plumbing Code when work is within ten (10) feet of buildings.
- C. Only one domestic water service shall be installed per parcel.
- D. All water connections shall be to Town owned distribution mains.

2.1.2 Submittals

- A. Materials List and Shop Drawings
 - 1. Materials list of materials proposed shall be submitted to the Town.
 - 2. Approved shop drawings for all materials and structures shall be submitted to the Town.
 - 3. Plans for chlorination, dechlorination, pressure test, bypass construction shall be submitted to the Town. All pressure testing shall be performed by a qualified third party approved by the Town. All pressure testing must be in conformance to a written plan submitted to, and approved by, the Town
- B. As-Built Drawings
 - 1. Submit one (1) copies of As-Built Drawings to the DPW upon completion and acceptance of work as wells as an electronic version of the drawings in both AutoCAD and Acrobat (PDF) format.
 - 2. As-Built Drawings shall be complete and shall indicate the true measurement and location, horizontal and vertical, of all new construction. As-Built Drawings shall include a minimum of three (3) ties to each valve cover and curb stop from fixed permanent objects. Three (3) ties shall also be provided for each bend or other unanticipated field change. As-Built drawings shall also contain any additional information required by the municipality and shall be stamped with the seal of a Professional Land Surveyor or Licensed Professional Engineer. The Town may, at its discretion, require that as-built plans be submitted on electronic form (e.g., AutoCAD release 2008 or higher).
 - 3. As-Built Drawings shall be filed or stored on property and available for use by DPW for all commercial, industrial, and institutional properties and large residential properties, such as apartment or condominium complexes and assisted or congregate living facilities.
- C. Temporary Bypass Plans shall be prepared by a registered professional engineer and submitted to DPW for review and approval prior to installation when required by the Town. Bypass plans shall include and consider the following:
 - 1. Proposed schedule for installing, testing, disinfecting, operating, and removing the temporary bypass.



2. All components of the bypass shall be for potable water transmission and distribution with a minimum service pressure of 150 psi. Piping and hose shall be galvanized steel, high density polyethylene (HDPE) or polyvinylchloride (PVC) pipe. All plastic pipe or hose shall bear the imprint of the National Sanitary Foundation (NSF) approval for potable water NSF-PW or shall be capable of meeting the standards established by the NSF for this use.
3. Details of the materials, size, and location of temporary facilities including bypass mains, valves, connections, laterals, services, and fire hydrants.
4. Bypass mains shall be supplied by at least two connections to the existing system either via an existing hydrant or a direct connection to an underground main.
5. Bypass mains shall be a minimum of 6-inches in diameter when supplying water for fire protection to temporary hydrants. Temporary hydrants shall be located in the same approximate location as existing hydrants that have been placed out of service and bagged. The number of hydrants on the temporary bypass shall be greater than or equal to the number of existing hydrants that are placed out of service.
6. Minimum size of bypass mains that do not supply water for fire protection is 2-inches. All temporary services shall be greater than or equal to the diameter of the existing service.
7. Bypass mains shall be laid outside of the traveled and access ways whenever possible and trenched when crossing roadways. All services shall be ramped or trenched.
8. Where possible, services shall be connected to the user's sill cock using a wye fitting with valves to accommodate connections of garden hoses by the user.
9. Need to add language about containment – i.e., dentist offices
10. All plans shall include provision of twenty-four/seven contact information for operation and maintenance of the bypass system.
11. Pressure testing shall comply with the requirements of Section 2.3.1.1 and disinfection testing shall comply with the requirements Section 2.3.1.2.
12. All work shall be coordinated with DPW and the Fire Department and no construction activity shall commence without a minimum of 48 hours advance notice to each department.

2.1.3 Inspection

- A. The Applicant is responsible for the provisions and all test requirements specified herein. In addition, all pipe and appurtenances shall be inspected at the plant for compliance with these specifications by an independent testing laboratory.
- B. Inspection of the pipe and appurtenances shall also be made after delivery. The pipe and appurtenances shall be subject to rejection at any time on account of failure to meet any of the specification requirements, even though samples may have been accepted as satisfactory at the place of manufacture. Pipe and appurtenances rejected after delivery shall be marked for identification and shall be removed from the site at once.
- C. All bypass plans must be submitted to DPW for review and approval prior to installation.
- D. All work shall be inspected by the Town's Inspector of Construction and Utilities or designated representative prior to backfill.

2.1.4 Delivery, Storage and Handling

- A. All materials shall be adequately protected from damage during transit. Pipes shall not be dropped.



- B. All pipe and other appurtenances shall be inspected before placement in the work and any found to be defective from any cause, including damage caused by handling, and determined by the Town to be unrepairable.
- C. Storage and handling of pipes and other appurtenances shall be in accordance with the manufacturer's recommendations, subject to the approval of the Town.

2.2 Materials

- A. The Materials section summarizes the Town's standards to be used in public or private components that affect the Town's water system. All materials should conform to the applicable AWWA standards unless otherwise noted.

2.2.1 Lead Free

- A. All materials used in public or private water systems within the Town of Holbrook's water system must be certified "lead free."

2.2.2 Pipe

- A. All water mains shall be minimum Ductile Iron Class 52, single gasket, double sealing pipe with cement mortar lining. All ductile iron water main pipe shall be rated for a minimum operating pressure of 350 psi. All water mains shall be encased in polyethylene film when the trench is backfilled with control density fill.
- B. All water mains shall be minimum 8-inch diameter. All hydrant branches shall be minimum 6-inch diameter.
- C. Push-on type joints are recommended on straight runs of pipe. Gaskets must be standard for pipe used and be acceptable to the DPW.
- D. Mechanical joint restraints shall consist of individually actuated wedges that increase their resistance to pull out as pressure or external forces increase. The device shall be capable of full mechanical joint deflection during assembly and the flexibility of the joint shall be maintained after burial. They shall have a rated work pressure of 350 psi in sizes 16-inch and smaller and 250 psi on in sizes greater than 16 inches.
- E. The Town has standardized on the Series 1100 MEGA-LUG restraint as produced by EBAA Iron, Inc. or approved equal.
- F. Where petroleum contamination is known or suspected to be in the soil and/or groundwater, nitrile gaskets shall be required.

2.2.2.1 Fittings

- A. Ductile iron fittings shall be used and shall be cement lined. Fittings shall be equipped with a mechanical joint restraint, unless otherwise specified by the DPW. Mechanical joint fittings in sizes 4 inch through 12 inch shall be ductile iron compact fittings and rated for 350 psi working pressure. All nuts and bolts shall be of a type equal to ductile iron or KOR-10 steel T-bolts and nuts or an approved equal.

2.2.2.2 Couplings

- A. Couplings shall be provided with AWWA approved plain, Grade 27, rubber gaskets and track-head bolts with nuts. Couplings shall be Smith Blair, Style 441 or Dress, Style 153; 360 or an approved equal. If the outer diameter of the pipe permits, a Dresser coupling is preferred.



- B. Where petroleum contamination is known or suspected to be in the soil and/or groundwater, nitrile gaskets shall be required.

2.2.2.3 Resilient Seat Gate Valves

- A. Resilient seat gate valve bodies shall be manufactured of ductile iron. Gate valves shall be open left (counter clockwise). All valves shall be designed for minimum 250 psi working water pressure.
- B. The Town has standardized on Mueller resilient seal, open right.

2.2.2.4 Valve Boxes

- A. Valve boxes shall be heavy duty, adjustable style with the lower part manufactured of cast iron and the upper part of steel or cast iron. All valve boxes shall be designed and constructed to prevent direct transmission of traffic loads to the pipe or valve, and shall have the lower part manufactured of cast iron and the upper part of steel or cast iron. The top of the cover shall be flush with the finish grade. Boxes shall be as manufactured by Bibby Ste-Croix or approved equal.
- B. Box covers shall be round frame and cover manufactured by the Bibby Ste-Croix or approved equal. The boxes shall be labeled to differentiate between division valves ("DIV"), Blow-Off ("B.O.") and generic valves as indicated in the Construction Details. Box covers shall have a minimum height of four (4) inches.

2.2.2.5 Tapping Sleeves and Valves

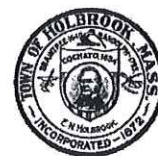
- A. Tapping sleeves shall be of the mechanical joint type. The valves shall be flanged by mechanical joint outlet with non-rising stem and designed for vertical burial. Tapping valves shall be rated at 200 psi working pressure and shop tested at 300 psi. Bolts on bonnet and stuffing box shall be stainless steel (316 stainless steel), stuffing boxes shall be "O" ring type. The operating nut shall be 2 inches square. Gaskets shall cover the entire flange surface. Valves shall open left, (counter clockwise).
- B. The Town has standardized on American Darling 1004 or an approved equal.
- C. Tapping sleeves shall be no greater than one-half of the diameter of the main being tapped.

2.2.3 Piping Connections

2.2.3.1 Service Connections

- A. All service pipe shall be type "K" copper tubing.
- B. Plastic services are allowed on a case-by-case basis. In such circumstances, the Town will require that the applicant verify that no petroleum constituents are present in subsurface soil in the vicinity of the service. Plastic water services shall be NSW-PW, listed, High Density Polyethylene (HDPE) blue plastic and shall conform to the following:
 1. Copper Tube Size (CTS) – ASTM 2737, 200 psi, PE 3608 or PE 3710, SDR9
 2. Iron Pipe Size (IPS) – ASTM 2239, 200 psi, PE 3608 or PE 3710, SIDR7

Plastic pipe shall be as manufactured by Silver Line Plastics or approved equal. Dimensional and performance characteristics shall conform to the requirements of AWWA C901. The use of



HDPE pipe and tubing may be allowed for water service - two (2) inches or under in diameter (4-inch and larger diameter water services shall use cement lined ductile iron water pipe). HDPE pipe shall be installed with enough slack to compensate for settlement and compaction and shall be laid on a bed of fine grained material.

- C. Curb valves shall not include a drain.
- D. The Town has standardized on lead-free service connections manufactured by McDonald, Mueller, Ford or an approved equal. Copper tubing shall be of the type commercially known as type "K" soft and conforms to ASTM Specifications B-88-49.
- E. Curb boxes shall be Erie box style for 1-inch services and Buffalo box style (no rod) for 1-1/2-inch and larger services.

2.2.3.2 Corporations

- A. Corporations for 1 inch installations shall be heavy pattern, solid plug, easy turning. The inlet shall be an AWWA (CC) thread. The 1 inch, 1-1/2 inch and 2 inch corporations shall be of a tee head ball valve type which incorporates Teflon seats to assure self-centering of Teflon coated bronze ball. The corporation shall be easy turning and non-binding. The inlet shall be an AWWA (CC) thread. Corporations shall be subject to a sustained hydraulic pressure of 200 psi. All 1½ and 2-inch saddles shall have stainless steel straps.

2.2.4 Hydrants

- A. Hydrants shall have a 5-1/4-inch valve opened by turning the operating unit in the counter clockwise direction. The hydrant shall have one 4-1/2- inch steamer and two 2-1/2- inch hose connections. The hose and steamer connections shall have National Standard Thread. The operating nuts shall be pentagonal in shape, 1-1/2- inch from point to opposite flat and shall open left (counter clockwise). The hydrant shall be the hub or mechanical-joint type having a 6-inch pipe connection to an 8-inch or larger diameter main.
- B. The hydrant valve shall consist of a cast iron valve and valve bottom and hydrant valve rubber. The rod threads shall be permanently sealed from contact with water. The hydrant valve shall seal against the bronze hydrant seat. The upper barrel shall be ductile iron with markings identifying size, model and year of manufacture. The lower barrel shall be ductile iron.
- C. The upper barrel shall connect to the lower barrel with a breakable traffic flange and 8 bolts and nuts. This connection shall allow 360 degree rotation of the upper nozzle section.
- D. The hydrant shall have a bronze drain ring securely held between the barrel and base flange. It shall provide bronze to bronze threaded connection for hydrant seal. The bronze drain ring shall serve as a non-corrosive multi-port drain channel.
Hydrant anchor tees shall be located at the main.
- E. The hydrant shall have a minimum working pressure of 200 psi. Hydrant design shall be of positive automatic drain type to prevent freezing.
- F. All hydrants that will not be Town owned shall be painted red. Hydrants that are Town owned, or will be Town owned, shall be factory painted to the Town's paint scheme:
Hydrant body: Red
Caps: Red



- G. The Town has standardized on Mueller "Super Centurion 250", open right.

2.3 Execution

- A. This section summarizes the Town's standardized methods for the installation and maintenance of certain aspects of the water system. All procedures shall be performed consistent with AWWA standards.

2.3.1 Piping

- A. The sizing of water mains shall be based on sound engineering principals. All water mains shall be minimum 8-inch nominal diameter. All hydrant connections shall be minimum 6-inch diameter.
- B. All piping shall be installed with a minimum 5-foot cover. In such cases where 5-foot cover is not possible, the piping shall be appropriately insulated. Water pipe shall be installed with minimum distance from sewer and septic pipe as summarized in Section 3.3.1.2 H.
- C. Pipe shall be laid accurately to line and grade in sand bedding conforming to MassDOT Standard Spec. M1.04.0 Sand Borrow and AWWA guidelines. The depth of the sand bedding shall be one half (1/2) the diameter of the pipe under the main and one half (1/2) the diameter of the pipe over the main or 6 inches both under and over the pipe, whichever is greater. Bedding shall be placed in layers not over six inches thick, and each layer shall be thoroughly compacted by tamping and chinking on each side of pipe to provide uniform support.
- D. Backfill material placed above the bedding material and below the roadway foundation shall conform to W-2.3.0. Roadway foundation and surface restoration shall conform to Section 5, Roadway Construction Standards, and Section 6, Existing Road Openings, as applicable.
- E. Push-on pipe gaskets shall be clean and thoroughly coated with lubricant specified by the manufacturer during installation.

2.3.1.1 Pressure Tests

- A. The pipelines shall be tested (in sections if required by the Town) for strength and for leakage at a pressure of 200 pounds per square inch. In certain circumstances, the Town may require higher pressure tests. The tests for leakage shall last for two hours although the Town may allow a one hour test subject to advanced approval. No more than 1,000 feet of water main shall be tested in a single test.
- B. The additional water needed to maintain the required pressure shall be accurately measured in a manner approved by the Town. The container shall be clearly labeled with its capacity in gallons. Allowable leakage amounts will be determined by the AWWA standards for pressure testing Ductile Iron pipe (AWWA C600 latest revision).
- C. Tests shall be made for all newly installed pipe and when required by the Town. A 24-hour notice shall be given to the Town prior to all tests. The Contractor shall pay for and make all necessary arrangements for securing the water for test purposes. For projects where water is collected straight from an un-metered source, the Contractor shall meter the water. The Town will subsequently bill the contractor on a private job for that water usage. For DPW projects, the Contractor will not be billed, but water usage shall be documented.



- D. During this test all hydrant laterals shall be in the open position. Methods of testing and plans showing sections to be tested shall be submitted to the Town for approval as requested. The Contractor will not perform a pressure test against existing valves unless authorized by the Town.
- E. The Contractor shall submit a written report to the DPW summarizing the results. The Contractor shall repair all leaks discovered under any of the required tests and retest the pipe. The Town will not accept any installation where a final test has not been passed.

2.3.1.2 Chlorination of the Pipeline

- A. Prior to disinfection, the Contractor shall submit a detailed disinfection plan to the DPW. The plan shall be prepared consistent with AWWA standards and federal and state regulations, and it shall outline and describe the disinfection procedures. At minimum, the plan shall include the following components:
- General: All water mains, water services, attached appurtenances and connections shall be disinfected in accordance with AWWA Standard C651.
 - Disinfection of new mains, including all chlorination, chlorine residual measurements, collection of samples, and certification shall be conducted by a third party testing agency approved by the DPW.
 - All pipe, fittings, and appurtenances shall be kept free from dirt and foreign matter at all times. During construction all open pipe ends and fittings shall be fitted with a water tight plug. At the end of the work day the open pipe in the trench shall be plugged in an equally suitable manner.
 - The interior surfaces of new valves, pipe and appurtenances shall be swabbed, as well as the interior surfaces of existing main, both upstream and downstream of the new pipe section, with a minimum five percent concentration of hypochlorite disinfection solution before installation. During the chlorination or chlorinating process, all valves shall be operated, and the chlorine solution shall be drawn through all laterals and appurtenances. Disinfection of mains and appurtenances, hydrostatic testing, and chlorine retention may run concurrently for the required minimum 24- hour period only if prior approval is obtained from DPW.
 - In the event of leakage or where repairs are necessary, added disinfection shall be made only by injecting chlorine into the line whereby adequate mixing is assured. If the test results are not satisfactory, additional disinfection shall be required.
 - Chlorine Dosage and Injection shall be performed in accordance with the continuous feed method as described in AWWA C651. The Disinfection Plan shall summarize the intended chlorine dosage and the method for establishing that dosage. The disinfection may be accomplished by introducing into all the various parts of the new water mains a liquid solution containing one percent available chlorine in such volume that the rate of dosage to the water mains shall be at least 25 parts per million of available chlorine. The Disinfection Plan shall document the locations and methods for applying the chlorine into the pipeline. Disinfection Period and Flushing – The contact period for this disinfection shall be at least twenty-four hours, and a longer period will be required if tests of residual chlorine show it to be less than the required minimum of 10 mg/l. The pipeline shall be adequately flushed with potable water and the Disinfection Plan shall document the method for de-chlorinating and discharging the residual water. All discharges must comply with local, state and federal requirements
 - Water shall be flushed from the line at its extremities and at all outlets until the chlorine residual of the water system being flushed is equal or less than the distribution system level.
 - Sampling – Sampling shall be performed by an independent certified laboratory according to AWWA C651 – Disinfecting Water Mains. B. The Contractor shall not proceed with the



disinfection procedures until the Disinfection Plan has been approved by the DPW. All sampling results shall be submitted to the DPW prior to activation of the water main.

- C. Connections at cuttings shall be swabbed with a 5% solution of chlorine at locations when other methods are not applicable.
- D. All water used to disinfect pipe shall be discharged and managed consistent with the appropriate state and local regulations. These shall include the Town of Holbrook Conservation Commission permitting and the *Illicit Discharges to Municipal Separate Storm Sewer System* bylaw. Discharge to the sanitary sewer system is not allowed.
- E. Water mains and appurtenances must be completely installed, flushed, disinfected, and satisfactory bacteriological sample results received prior to connections being made to the active distribution system.

2.3.2 Valves

- A. All material shall be inspected for defects prior to installation. Defective materials shall be immediately removed from the site. All foreign matter shall be removed from valve openings and seat faces. All nuts and bolts shall be checked for tightness.
- B. For any T-connections that may be considered a lateral connection, the valve for the lateral line shall be attached with an anchor-T or tapping sleeve if approved by DPW (See Detail W-2.4.1). The valves on the main line shall be installed in line with the curb (see Detail W-2.4.3).

2.3.3 Tapping

- A. Where there is more than one public water main in a street, the Town shall determine which main the owner may tap for water service pipe connection. Water mains designated as transmission mains shall not be tapped for water service, except when approved by the Town.
- B. Service taps to the distribution main shall be separated by a minimum of 18-inches in all directions.
- C. Temporary taps installed for filling and testing a pipe shall be abandoned prior to Town acceptance. Abandonment shall include cut pipe no more than 3" from the corporation stop and corporation stop shall be in the closed position.

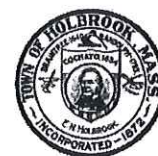
2.3.4 Thrust Restraint

2.3.4.1 Thrust Blocks

- A. Thrust blocks may only be used against undisturbed soil. They shall be designed in accordance with the Design Standards using the appropriate concrete and pressures as specified in the Construction Details and the AWWA standards and guidelines.

2.3.4.2 Tie Rods

- A. Tie rod systems may be used where approved by the Town. All materials shall be steel and coated with an approved bituminous coating or other approved corrosion resistant coatings. Unless otherwise required or approved by the Engineer, the Contractor shall install tie rods in accordance with the following schedule for all fittings:



Minimum Tie Rod Design		
Pipe Size (inches)	Number of Rods	Tie Rod Diameter (inches)
4"-12"	2	3/4"
16"	4	3/4"
20" - 24"	4	1 1/2"

2.3.4.3 Wedge Action Retaining Joints

- A. Wedge Action Retaining Joints may be used wherever approved by the Town and shall be manufactured of ductile iron conforming to ASTM A536. The mechanical joint restraint shall be Megalug Series 1100 or equal approved by DPW.

2.3.5 Electrical Grounding

- A. No electrical grounds shall be made on water service pipes where a driven ground rod can provide the needed grounding service. Electrical grounding shall be provided in accordance with the Massachusetts Electric Code.

2.3.6 Fire Suppression

- A. All new fire suppression (i.e. sprinkler) connections shall be coordinated with and approved by the Town's fire department.
- B. Fire suppression connections shall be coordinated with the property owner. Sprinkler valves shall only be operated by a certified sprinkler operator. The certified sprinkler operator shall bleed air from the sprinkler system upon completion of installation.
- C. Single-family detached dwellings (i.e. single-family homes) may tap a single fire suppression service connection from their domestic water line if all of the following conditions are met:
1. The connection is made after the water meter
 2. A testable backflow preventer is installed on the fire service line next to the connection
 3. All pipes used in the fire suppression system be approved to carry potable water
 4. Fire suppression system does not contain anti-freeze or any substance other than potable water
- D. No fire service connection may be tapped off a domestic service (and vice-versa) for all commercial and multi-family properties. Separate domestic and fire services shall be installed from the building serviced to the public water main.

2.3.7 Pipe, Valve and Structure Abandonment / Removal

- A. Pipes left in place that are greater than 6 inches in diameter shall be filled with CDF regardless of material (e.g., DI, PVC).
- B. Pipes left in place that are equal to or less than 6 inches in diameter may be left unfilled.
- C. Structures left in place shall be demolished down to five feet below ground surface, the bottom shall be cracked and compacted, and the remaining structure filled with CDF. Demolition debris shall be removed, and the area regraded and compacted over the filled structure.



- D. When abandoning asbestos cement pipe, care shall be used to follow DPW's Standard Operating Procedures for ACM.

2.4 References

- A. All materials and execution shall conform to the highest applicable standards. If there is a conflict between other standards, or between other standards and these Design standards, then the most stringent criteria shall be used.
- B. The Town commonly references AWWA standards as guidance for the materials and execution of work performed on the Town's water infrastructure. The following summarizes select AWWA standards applicable to the sections in these Design Standards. This list is not exclusive as other standards may apply. The latest revision of each standard shall be referenced.

<u>Standards</u>	<u>Title/Subject</u>
ASTM A536	Standard Specification for Ductile Iron Castings
ASTM D3350.	Standard Specification for Polyethylene Plastic Pipe and Fittings Materials
AWWA C104/ANSI 21.4.	American National Standard for Cement-Mortar Lining for Ductile-Iron Pipe and Fittings for Water
AWWA C105/ANSI A21.5.	American Standard for Polyethylene Encasement for Ductile-Iron Pipe Systems
AWWA C110/ANSI A21.10.	American National Standard for Ductile-Iron and Grey-Iron Fittings, 3 Inch Through 48 Inch for Water
AWWA C111/ANSI A21.11.	American National Standard for Rubber-Gasket Joints for Ductile-Iron Pressure Pipe and Fittings
AWWA C150/ANSI A21.50.	American National Standard for the Thickness Design of Ductile-Iron Pipe
AWWA C151/ANSI A21.51.	American National Standard for Ductile-Iron Pipe, Centrifugally Cast, for Water or Other Liquids
AWWA C153/ANSI A21.53.	American National Standard for Ductile-Iron Compact Fittings, 3 In. Through 64 In.
AWWA C502.	AWWA Standards for Dry-Barrel Fire Hydrants
AWWA C504	AWWA Standard for Rubber-Seated Butterfly Valves
AWWA C509.	AWWA Standard for Resilient-Seated Gate Valves for Water Supply Service
AWWA C515.	AWWA Standard for Reduced-Wall Resilient-Seated Gate Valves for Water Supply Service
AWWA C600.	AWWA Standard for the Installation of Ductile-Iron Water Mains and Their Appurtenances
AWWA C651.	AWWA Standard for Disinfecting Water Mains



AWWA C901.

Polyethylene (PE) Pressure Pipe and Tubing, ½ Inch – 3
Inch, for Water Service

MassDEP

Guidelines for Public Water Systems (April 2014)

US EPA

In a Guidance Letter dated July 17, 1991, identified as
Control # C99 within the Agency Applicability
Determination Index, the U.S. EPA determined that “the
pumping of grout into buried lines is not a process
which, in and of itself, would cause asbestos cement
pipe to become regulated asbestos containing material.”

Section 3



3 Sewer Construction Standards

3.1 General

3.1.1 Description

- A. This Section specifies requirements for a gravity flow sewerage system and pressure sewer system.
- B. The work includes furnishing and installing all pipe, fittings, manholes, structures and appurtenances required for the proposed system to convey sewage by gravity flow conditions. Work when applicable will include furnishing and installing all pipe, fittings, valves and structures for a pressure sewer system.
- C. Work and materials shall be performed in accordance with the State Plumbing Code when work is within ten (10) feet of buildings.

3.1.2 Submittals

- A. Materials List and Shop Drawings
 - 1. The list of materials proposed shall be submitted to the Town.
 - 2. Approved shop drawings for all materials (including bricks and mortar) and structures shall be submitted to the Town.
- B. As-Built Drawings
 - 1. Submit one (1) copy of As-Built Drawings to the DPW upon completion and acceptance of work.
 - 2. As-Built Drawings shall be complete and shall indicate the true measurement and location, horizontal and vertical, of all new construction. As-Built Drawings shall include a minimum of three (3) ties to each manhole from fixed permanent objects. As-Built drawings shall also contain any additional information required by the municipality and shall be stamped with the seal of a Professional Land Surveyor or Licensed Professional Engineer. The Town may, at its discretion, require that as-built plans be submitted on electronic form (e.g., AutoCAD release 2008 or higher).
 - 3. As-Built Drawings shall be filed or stored on property and available for use by DPW for all commercial, industrial, and institutional properties and large residential properties, such as apartment or condominium complexes and assisted or congregate living facilities.
- C. Abandonment Plan
 - 1. Pipes abandoned in place that are greater than 6 inches in diameter shall be abandoned using control density fill and shall be subject to prior DPW approval of an abandonment plan.
 - 2. Pipes abandoned in place that are equal to or less than 6 inches in diameter may be left unfilled.
 - 3. When abandoning asbestos cement pipe care shall be used to prevent pipe material from becoming friable, thereby rendering it as regulated asbestos containing material (US EPA).



- D. Temporary wastewater bypass plans shall be prepared by a registered professional engineer and submitted to DPW for review and approval prior to installation. Bypass plans shall include and consider the following:
1. Proposed schedule for installing, testing, operating, restoring flows to normal conditions, and removing the temporary bypass.
 2. Details of the materials, size, number, and location of temporary facilities including upstream suction manhole and downstream discharge manhole locations, piping layout, bypass pumps, mains, valves, connections, laterals, services, and primary and standby power.
 3. Sewer plugging location(s) and method, type, and quantity of plugs. Spare plugs of the proper size and material shall be stored on site and available at all times of bypass operation.
 4. Primary and backup bypass pump sizes, capacity, and number to be on site, power requirements, and power supply. Pumps shall be either submersible or self-priming type.
 5. All bypass piping and system components shall be watertight and pressure rated for the proposed bypass system operating conditions.
 6. Calculations of flow rate, static head, friction losses, total dynamic head, flow velocity, and pump curves indicating operating range.
 7. Method of noise control for pumps and generators.
 8. Surcharging of upstream flows during bypass shall be minimized at all times. The pumping system may not surcharge the upstream sewer more than 18-inches in the vertical direction as measured from the invert of the existing suction manhole from which bypass pumps are withdrawing wastewater. The suction and discharge manholes shall be frequently monitored by the Contractor to observe flow rate and flow depth conditions in the existing system during bypass operations.
 9. Flow turbulence in the downstream discharge manhole shall be minimized at all times.
 10. All work shall be coordinated with DPW and no construction activity shall commence without a minimum of 48 hours advance notice.
- E. Temporary stone sump systems are not allowed as a temporary wastewater disposal method for service connection flows

3.1.3 Inspection

- A. The Applicant is responsible for the provisions and all test requirements specified in ASTM D3034 for SDR 35 gravity pipe and ASTM D2241 for polyvinyl chloride (PVC) pressure rated sewer pipe. In addition, all PVC pipe may be inspected at the plant for compliance with these specifications by an independent testing laboratory.
- B. Inspection of the pipe may also be made after delivery. The pipe shall be subject to rejection at any time on account of failure to meet any of the specification requirements, even though pipe samples may have been accepted as satisfactory at the place of manufacture. Pipe rejected after delivery shall be marked for identification and shall be removed from the site at once.

3.1.4 Delivery, Storage and Handling

- A. All materials shall be adequately protected from damage during transit. Pipes shall not be dropped.



- B. All pipe and other appurtenances shall be inspected before placement in the work and any found to be defective from any cause, including damage caused by handling, and determined by the Town to be unrepairable, shall be replaced at no cost to the Town.
- C. Storage and handling of pipes, manholes and other sewer system appurtenances shall be in accordance with the manufacturer's recommendations, subject to the approval of the Town.

3.2 Materials - Gravity Sewer Systems

- A. The Materials section summarizes the Town's standardized components to be used in public and private components that affect the Town's sewer system. All materials should conform to the applicable ASTM standards.

3.2.1 Polyvinyl Chloride Pipe (PVC) (Gravity)

- A. Pipe and Fittings: Polyvinyl chloride pipe and fittings (PVC) shall be minimum SDR 35 with full diameter dimensions conforming to the specifications for Type PSM Polyvinyl Chloride (PVC) Sewer Pipe and Fittings, ASTM Designation D-3034, latest revision, for sizes 3 inches to 15 inches. For sizes 18 inches to 48 inches, the pipe shall comply with ASTM F679, latest record.
- B. Pipe color shall be in accordance with Uniform Color Code as established by the American Public Works Association Utility Location and Coordination Council (adopted September 2000).

3.2.2 Couplings

- A. Fittings, couplings, and adaptors for use with the gravity sewer system shall be Romac Industries, Inc. or an approved equal. Saddles for low-pressure sewers shall be bolt-on premier units. They shall have polypropylene bodies, stainless steel fasteners, stainless steel reinforced outlets.
- B. Joints: PVC pipe shall have an integral wall bell and spigot push-on joint with elastomeric gaskets secured in place in the bell of the pipe. The bell shall consist of an integral wall section with a solid cross section elastomeric gasket, factory assembled, securely locked in place to prevent displacement during assembly. Elastomeric gaskets shall conform to ASTM D3212.
- C. Spigot pipe ends shall be supplied with bevels from the manufacturer to ensure proper insertion. Each spigot end shall have an "assembly stripe" imprinted thereon to which the bell end of the mated pipe will extend upon proper joining of the two pipes.
- D. Where petroleum contamination is known or suspected to be in the soil and/or groundwater, nitrile gaskets shall be required.

3.2.3 Ductile Iron Pipe (Gravity) - where required by Town

- A. Ductile Iron Pipe: ASTM A746, Extra Heavy type, bell and spigot end, with Inderon Protecto 401 ceramic epoxy lining or equivalent applied per manufacturer's recommendation.
- B. Ductile Iron Pipe Joint: ANSI A21.11, rubber gasket joint.
- C. Where petroleum contamination is known or suspected to be in the soil and/or groundwater, nitrile gaskets shall be required.

3.2.4 Cast Iron Pipe (Gravity) (For Plumbing Code Areas Only)

- A. Cast Iron Soil Pipe: ANSI/ASTM A74, Extra Heavy type, bell and spigot end, inside to be asphalt coated per manufacturer standard.
- B. Cast Iron Pipe Joint: ASTM C564, rubber gasket joint devices.



- C. Transitions between different gravity pipe sizes shall be accomplished by using Femco or approved equal flexible eccentric reducing couplings with stainless steel bands. Completed pipelines shall be free of deviations from grade. Visible leaks, broken pipes, etc., shall be repaired or replaced.
- D. Fittings for pressure sewer pipe shall be of similar style and material to match the force main material (PVC or DI). Bells shall be gasketed joint conforming to ASTM D3139 with gaskets conforming to ASTM F477. Gasket material shall be equal to that specified for pipe.

3.2.5 Cleanouts

- A. The sewer cleanouts shall be minimum 6-inch diameter or sized to match the service pipe, whichever is greater. The cleanouts shall be either stubbed 6 inches above surface grade, or completed at finish grade if contained within a hand hole clearly marked "SEWER" per Standard Detail S-3.2.0. Cleanouts shall include a water-tight cap.

3.2.6 Manholes

- A. All precast concrete manholes shall conform to the ASTM "Specifications for Precast Reinforced Concrete Manhole Sections," Designation D478. The barrel shall be 4-foot or 5-foot diameter at the Town's discretion. The precast structures shall be manufactured with 4,000 psi minimum compressive strength concrete, with eccentric cone section tapering to 30-inch diameter, or flat top, and one pour monolithic base section conforming to ASTM C478. All units to be designed for HS-20 loading.
- B. Precast Unit Joint: Butyl rubber section joint conforming to ASTM C443.
- C. The date of manufacture and the name or trademark of the manufacturer shall be clearly marked on the inside of each precast section.
- D. Manhole frames and covers shall be minimum Class 25 conforming to ASTM "Standard Specification for Gray Iron Castings," Designation: A48. Manhole frame shall have a clear opening of 24 inches and be a minimum of 6 inches in height. The surface of the covers for manholes that will not become the property of the Town of Holbrook shall have a diamond pattern with the word "SEWER" cast thereon for sanitary sewers. For sewer systems that will become the property of the Town, the sewer manholes shall include the word "SEWER." Watertight manhole covers shall be secured with six (6) stainless steel bolts and have a watertight gasket. The frame and cover shall be watertight up to 15 psig external pressure.
- E. All manholes frames and covers shall be manufactured by East Jordan Iron Works (formerly LeBaron Foundry Co.) or an approved equal.
- F. The top of cone shall be constructed of red brick or reinforced concrete grading rings for adjusting frame to match finished surface. Manhole frame shall be flush with grade using a minimum of two (2) and a maximum of five (5) brick courses. Elevations greater than 6 inches vertical may include riser rings designed for that purpose. Brick shall conform to sewer bricks (made from clay) ASTM designation C32, Grade MS.
- G. Curve side inverts and layout main inverts (where direction changes) shall be constructed with smooth curves of longest possible radius tangent to adjoining pipelines centerline. All inverts shall be constructed with 4,000 psi concrete in void areas and with sewer brick. Brick shall conform to sewer bricks (made from clay) ASTM designation C32, Grade SS.

All sewer inverts are to be constructed once the manhole is installed. Manhole inverts built above ground will not be accepted.



- H. Mortar shall be in conformance with ASTM C270, Type M. The mortar shall be composed of Portland cement hydrated lime, and sand, in the proportions of 1 part cement to ¼ part hydrated lime to 3 ½ parts sand, by volume.
- I. Cement shall be Type I or II Portland cement conforming to ASTM C150, Standard Specification for Portland Cement. Where masonry is exposed to salt water, Type II shall be used.
- J. Hydrated lime shall be Type S conforming to ASTM D207.
- K. Sand for masonry mortar shall conform to the gradation requirements of ASTM C144.
- L. All drop manholes will be of the external type. The drop pipe shall be constructed of minimum SDR 35 PVC. The drop piping and horizontal cleanout sections will be sized the same as the sewer main piping and shall enter the manhole at invert elevation. The drop portion of the piping shall be secured with anchor straps. The drop piping shall be encased with control density fill.
- M. Manhole Pipe Connections: Flexible sleeve or rubber gaskets shall be Lock Joint, Kor-n-Seal, A-Lok, or approved equivalent.
- N. Manhole covers shall be watertight when placed in the 100-year flood plain areas or as determined by DPW, and as specified in federal, state and local regulations.

3.2.7 Manholes & Sewer Structures - Bitumastic Coatings

- A. The entire exterior surface of all masonry and concrete (whether precast or cast-in-place) structures associated with sewerage systems, such as: manholes, grease traps, holding tanks, tight tanks, septic tanks, aeration tanks, pump stations, valve pits, etc., shall receive two coats of waterproofing such as Carboline Bitumastic 300M as manufactured by SOMAY Products, Inc., Miami, FL; Sonnoshield HLM 5000 as manufactured by Sonneborn, Shakopee, MN or approved equal at a minimum thickness of 7 mils per coat and a total thickness of 14 mils; however, in no case shall the thickness per coat be less than that recommended by the manufacturer.

3.2.8 Sewer Piping Connections

3.2.8.1 Service Connections

- A. Gravity service connections shall be minimum 6 inch PVC. All connections into sewers shall be by wyes, T-wyes, or a Romac saddle, and couplings manufactured for use with the same type of pipe. Service connections made using saddles and tapping sleeves shall be allowed only when authorized by the DPW. All service connections shall have a slope between 2 and 6 percent. Service connections that have a vertical drop of 4 feet to 12 feet between the house sewer invert at the street and the main sewer invert shall be by sloped line using 22-degree or 45-degree angle connectors to allow snakes and rods to clean the line between the house and the main sewer.
- B. For grinder pump to gravity sewer connections, the service connections shall be minimum 2-inch DI or SDR 21 PVC. Check valves shall be Y-pattern commercial bronze valves.
- C. On private projects, portions of existing service piping to remain shall be video inspected prior to verify pipe condition, ensure integrity, and limit infiltration. Service piping video shall be provided to DPW for review prior to approval of existing piping reuse.
- D. Use of Inserta Tee service connectors may be allowed upon specific approval by DPW.



3.3 Execution - Gravity Sewer Systems

- A. This section summarizes the DPW's standardized methods for the installation and maintenance of certain aspects of the sewer system. All procedures should be performed consistent with ASTM standards.

3.3.1 Piping

- A. The minimum pipe diameters for gravity building sewers and public sewers shall be six and eight inches, respectively. All pipes shall be designed based on the standards established in the Water Environment Federation/American Society of Civil Engineers *Manual of Practice No. FD-5, Gravity Sanitary Sewer Design and Construction*, latest edition, and New England Interstate Water Pollution Control Commission, *Guides for the Design of Wastewater Treatment Works, Technical Report # 16*, latest edition, and sound engineering principals.
- B. Pipe shall be handled in an approved manner, using slings or other approved devices. No pipe shall be dropped from trucks or into trenches.
- C. Pipe shall be laid accurately to line and grade in three-quarter (3/4") crushed stone. The depth of the crushed stone shall be one half (1/2) the diameter of the pipe under the main and one half (1/2) the diameter of the pipe over the main or 6 inches both under and over the pipe, whichever is greater. Stone shall be placed in layers not over six inches thick, and each layer shall be thoroughly compacted by tamping and chinking on each side of pipe to provide uniform support.
- D. Backfill material placed above the bedding material and below the roadway foundation shall conform to 6.3.1. Roadway foundation and surface restoration shall conform to Section 5, Roadway Construction Standards, and Section 6, Existing Road Openings, as applicable.
- E. Impervious material may be required on service connections for a distance 10 feet from the inside wall of the foundation to where crushed stone can start. Pipe shall be laid with the spigot end pointing in the direction of the flow.
- F. Sewer pipe shall be laid at a minimum of ten feet from the water main. Should local conditions prevent a lateral separation of ten feet, a sewer may be laid closer than ten feet from a water main if:
- Approved by DPW
 - It is laid in a separate trench.
 - The sewer is encased in concrete, unless otherwise approved by DPW.
 - The elevation of the top (crown) of the sewer is at least 18 inches below the bottom (invert) of the water main. The sewer pipe shall be laid such that the pipe joints are equidistant and located as far as possible from the water main crossing. See Section 3.3.1.2.H for additional requirements.
- G. Sewer pipe shall be laid at a minimum of 5 feet horizontally from a drainage main and 18 inches vertically from a drainage main (see 4.3.7)
- H. Sewer pipe shall have a minimum cover of 3 feet unless otherwise approved by DPW.

3.3.1.1 Gravity Main

- A. The connection of the building sewer to the public sewer shall be made at the "Y" branch, if such branch is available at a suitable location. Lateral stubs or stubs for future sewer extensions shall be capped watertight until permanent connections are completed. All lateral stubs shall be approved by the Town prior to installation. If no branch is available, a connection may be made by tapping the public sewer by an approved method, then inserting an approved cast iron, ductile iron,



stainless steel or PVC “Y” or “T” saddle with stainless steel mounting bands or other approved connection device. Cutting a hole in the public sewer by hand is prohibited.

- B. All sewer mains shall be laid with a straight alignment between manholes. When tying into an existing manhole, the manhole wall shall be cored and an insert installed for water-tightness.

3.3.1.2 Pipe Installation

- A. All sewer pipes shall be laid accurately to the lines and grades shown in the Drawings and in conformance with pipe manufacturer’s recommended procedures.
- B. Notch under pipe bells and joints, where applicable, to provide for uniform bearing under entire length of pipe.
- C. Laying Pipe: Each length of pipe shall be laid with firm, full and even bearing throughout its entire length, in a prepared trench. Pipe shall be laid with bells upgrade unless otherwise approved by the Engineer. Do not permanently support pipes on bells.
Every length of pipe shall be inspected and cleaned of all dirt and debris before being laid. The interior of the pipe and the jointing seal shall be free from sand, dirt and trash. Extreme care shall be taken to keep the bells of the pipe free from dirt and rocks so that joints may be properly lubricated and assembled. No pipe shall be trimmed or chipped to fit.
No length of pipe shall be laid until the proceeding lengths of pipe have been thoroughly embedded in place, to prevent movement or disturbance of the pipe alignment.
All piping shall be laid in the dry with the spigot ends pointing in the direction of flow. Installation shall proceed from the downstream to upstream in all cases.
- D. Pipe Extension: Where an existing pipe is to be extended, the same type of pipe shall be used, unless otherwise approved by the Inspector.
- E. Full Lengths of Pipe: Only full lengths of pipe shall be used in the installation except that partial lengths of pipe may be used at the entrance to structures, and to accommodate the required locations of service connection fittings.
- F. Pipe Entrances to Structures: All pipe entering structures shall be cut flush with the inside face of the structure, and cut ends of the pipe surface within the structure shall be properly rounded and finished so that there will be no protrusion, ragged edges or imperfections that will impede or affect the hydraulic characteristics of the sewage flow. The method of cutting and finishing shall be subject to the approval of the Inspector.
- G. Protection During Construction: The Applicant shall protect the installation at all times during construction, and movement of construction equipment, vehicles and loads over and adjacent to any pipe shall be performed at the Applicant’s risk.
At all times when pipe laying is not in progress, all open ends of pipes shall be closed by approved temporary water-tight plugs. If water is in the trench when work is resumed, the plug shall not be removed until the trench has been dewatered and all danger of water entering the pipe eliminated.
- H. Water Pipe – Sewer Pipe Separation: When a sewer pipe crosses above or below a water pipe, the following procedures shall be utilized. The Applicant shall comply with the following procedures: reference detail S 3.5.0

- 1. Relation to Water Mains:



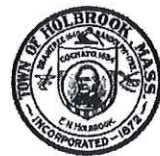
- a. *Horizontal Separation:* Whenever possible, sewers shall be laid at a minimum at least 10 feet horizontally from any existing or proposed water main. Should local conditions prevent a lateral separation of 10 feet, a sewer may be laid closer than 10 feet to a water main, if:
 - i. It is laid in a separate trench, or if
 - ii. It is laid in the same trench with the water mains located at one side on a bench of undistributed earth, and if
 - iii. In either case, the elevation of the top (crown) of the sewer is at least 18 inches below the bottom (invert) of the water main.
 - b. *Vertical Separation:* Whenever sewers must cross under water mains, the sewer shall be laid at such an elevation that the top of the sewer is at least 18 inches below the bottom of the water main. When the elevation of the sewer cannot be varied to meet the above requirements, the water main shall be relocated to provide this separation or reconstructed with mechanical-joint pipe for a distance of 10 feet on each side of the sewer. One full length of the water main should be centered over the sewer so that both joints will be as far from the sewer as possible.
 - c. When it is impossible to obtain horizontal and/or vertical separation as stipulated above, pipes shall be pressure tested by an approved method as described in Section 3.3.2 to assure watertightness or both pipes shall be encased in control density fill (CDF). Further, any ductile or cast iron shall be double wrapped in 6 mil polyethylene plastic.
- I. Sewer Pipes-Laser Installation: Sewer pipes shall be laid to required grades by use of a laser and target system, unless otherwise specifically approved in writing by engineer.

3.3.1.3 Pipe Joints

- A. All joints shall be made water-tight.
- B. Pipe shall be jointed in strict accordance with the Pipe manufacturer's instruction. Jointing of all pipe shall be done entirely in the trench.
- C.
 - 1. Lubricant for jointing of PVC pipe shall be applied as specified by the pipe manufacturer. Use only lubricant supplied by the pipe manufacturer.
 - 2. PVC Pipe shall be pushed home by hand or with the use of bar and block. The use of power equipment, such as a backhoe bucket, shall only be used at the direction of the manufacturer.
 - 3. Field-cut pipe ends shall be cut square and the pipe surface beveled to the size and shape of a factory-finished beveled end. All sharp edges shall be rounded off.
- D. Jointing of Ductile Iron and Cast Iron Pipe shall be in accordance with Section 2, Water Construction Standards.
- E. Bentonite collars shall be placed every 500 feet on sewer lines placed in the groundwater table that are more than 1200 feet in length. Collars shall extend to the width and height of the stone bed.

3.3.1.4 Manholes

- A. General Requirements: All manholes shall be built in accordance with the Details and in the locations shown on the Town of Holbrook Details.
- B. Structures shall be constructed of precast concrete.
- C. All masonry shall be installed by personnel experienced and skilled in this work, and any person not deemed to be such by the Engineer shall be removed and replaced by a person so qualified.



- D. Manholes shall be constructed as soon as the pipe laying reaches the location of the manhole. Should the Applicant continue pipe laying without making provision for completion of the manhole, the Engineer shall have the authority to stop the pipe laying operations until the manhole is completed.
- E. The Applicant shall accurately locate each manhole and set accurate templates to conform to the required line and grade. Any manhole which is mislocated or oriented improperly shall be removed and rebuilt in its proper location, alignment and orientation at no additional cost to the Owner.
- F. Foundations: All manholes shall be constructed on a 12-inch layer of compacted bedding material. The excavation shall be dewatered to provide a dry condition while placing bedding material and setting the base.
- G. Inverts: Brick invert channels shall be constructed in all manholes to provide a smooth channel for sewage flow through the structure, and shall correspond in shape to the lower half of the pipe. At changes in directions, the inverts shall be laid out in curves of the longest possible radii tangent to the centerline of the sewer pipes at the manhole side. Brick shelves shall be constructed to the elevation of the highest pipe crown and sloped to drain toward the flow channel. Only red sewer brick shall be used for any invert, brick shelves and manhole frame adjustments. Brick shall comply with ASTM Standard Specification for Sewer Brick (made from clay or shale), Designation C32, for Grade SA, hard brick.
Special care shall be taken in laying brick inverts. Joints shall not exceed three-sixteenth inch in thickness and each brick shall be carefully laid in full cement mortar joints on bottom, side and end in one operation. No grouting or working in of mortar after laying of the brick will be permitted. Bricks forming the shaped inverts in manholes shall be laid on edge.
Invert channels shall be built for future extensions where shown on the Drawings and where directed by the Engineer.
Inverts shall not be built above ground. All inverts shall be built with the manhole in place (i.e. at the design elevation) and with all pipes installed.
- H. Precast Manholes: Precast manholes shall be installed only after Shop Drawings have been approved.
- I. The top grade of the precast concrete cone section shall be set sufficiently below finished grade to permit a maximum of five and a minimum of two courses (laid in the flat position) of eight inch brick to be used as risers to adjust the grade of the manhole frame. Manhole frames shall be set on a grout pad to make a water-tight fit.
- J. Grout fill lifting holes on all manhole sections.

3.3.1.5 Connections to Existing Facilities

- A. General Requirements: The Applicant shall make all required connections of the proposed sewer into existing sewer system, where and as shown on the Drawings and as required by the Engineer.
- B. Applicant to verify the location, size, invert and type of existing pipes at all points of connection prior to ordering new utility materials.
- C. Compliance with Requirements of Owner of Facility: Connections into existing sewer facilities shall be performed in accordance with the requirements of the Owner of the facility. The Applicant shall comply with all such requirements, including securing of all required permits, and paying the costs thereof.



3.3.1.6 Manhole Connections

- A. Manhole pipe connections for precast manhole bases may be accomplished by any method described below. The Applicant shall make sure that the outside diameter of the pipe is compatible with the particular pipe connection used.
1. A tapered hole filled with non-shrink waterproof grout after the pipe is inserted. This connection method will not be allowed when connecting PVC pipe to manholes.
 2. The LOCK JOINT Flexible Manhole Sleeve cast in the wall of the manhole base. The stainless steel strap and exposed sleeve shall be protected from corrosion with a bitumastic coating.
 3. PRESS WEDGE II gasket cast into the wall on the manhole base. The rubber wedge shall only be driven into the V slot from the outside of the manhole.
 4. The RES-SEAL, a cast iron compression ring which compresses a rubber "O" ring gasket into a tapered hole in the wall of the manhole base. Exposed metal shall be protected from corrosion with a bitumastic coating.
 5. KOR-N-SEAL neoprene boot cast into the manhole wall. The stainless steel clamp shall be protected from corrosion with a bitumastic coating.
- B. Sewer manholes shall be constructed with drop connections when the proposed invert of the connection is at least 2 feet above the manhole invert. Drop connections for differences of less than 2 feet shall also be provided if required by the Town.

3.3.1.7 Service Connections

- A. General Requirements: The Applicant shall make all required connections of the building sewer service pipes into the sewer system. Work shall include making the service pipe connections into the sewer system pipes or into the manholes located ten (10) feet outside of the proposed building lines. If stubs are constructed for later connection to the building pipes, the ends shall be sealed with watertight plugs.
- B. Coordination with Building Applicant: The Applicant shall coordinate the work with the work of the Building Applicant to determine the exact location and elevation of the point of entry into the building.
- C. Connection into Sewer System: Sewer service pipe connections to the pipe of the sewer system shall be made with fittings supplied by the pipe manufacturer.
- The Applicant shall install 45 degree wye branch or 90 degree tee fittings in the sewer pipes at all locations where building sewer service pipe connections are shown on the Drawings. Connections of the sewer service pipes shall be made into the wye branches or tees by means of 45 degree bends. The connections shall be made thoroughly watertight and concrete shall be placed under each connection to bear on undisturbed earth and firmly support the connection. Sewer chimneys shall be encased in concrete unless directed otherwise by the Town.
- D. Any sewer lateral that contains a 45-degree (45°) bend or greater shall require a manhole. Alternative connections shall be allowed only if reviewed and approved by DPW.

- 3.3.1.8 E. Chimney drop sewer services shall only be allowed where the depth of the mainline sewer crown is more than 12-feet from the ground surface. Installation of chimney when the mainline crown is less than 12-feet deep will not be allowed without the prior review by DPW. Service connections shall preferably be installed utilizing the most direct (shortest) route from building to**



main. Services should be laid out to run perpendicular to the main. Refer to standard installation details for materials and requirements? Rehabilitation of Sewers with Cured-In-Place Pipeliners

- A. Pipeline rehabilitation using cured in place pipeliners (CIPP) may be approved by DPW for existing public sewers 8-inches in diameter and greater. CIPP rehabilitation of public sewers less than 8-inches in diameter is not permitted.
- B. The CIPP shall conform to the provisions and all test requirements specified in ASTM D790 – Test Methods for Flexural Properties of Un-reinforced and Reinforced Plastics and Insulating Materials, ASTM F1216 – Rehabilitation of Existing Pipelines and Conduits by the Inversion and Curing of a Resin-Impregnated Tube, and ASTM F2561-11 Standard Practice for Rehabilitation of a Sewer Service Lateral and Its Connection to the Main Using a One Piece Main and Lateral Cured-in-Place Liner.
- C. The CIPP shall be designed based on a fully deteriorated condition of the existing host pipe in which it is assumed that the existing host pipe provides no structural support. The CIPP shall be designed to carry soil, groundwater, and other superimposed loads.
- D. The CIPP shall be designed in accordance with ASTM F1216 under the following conditions:
 - 1. Fully deteriorated host pipe
 - 2. Height of groundwater above pipe invert = Ground surface elevation
 - 3. Height of soil above pipe = Final design ground surface elevation
 - 4. Life Load = AASHTO HS-20
 - 5. Soil density = 120 lbs. / cubic foot
 - 6. Ovality = 2% to 8%
- E. The applicant shall prepare and submit a design submittal prepared and stamped by a registered professional engineer that includes the following:
 - 1. Description of materials and product samples
 - 2. Design parameters
 - 3. Installation process
 - 4. Long term creep data, testing duration 10,000 hours minimum
 - 5. Proposed flexural modulus and flexural strength
 - 6. Proposed wall thickness supported by design calculations
 - 7. Bypass pumping plan
 - 8. Installer's qualifications and relevant experience
- F. The existing sewer shall be cleaned and closed circuit television inspected prior to the CIPP installation to prepare the host pipe and locate the existing service connections.
- G. Installation, curing, cool down, finish, and sealing at manhole and service connections shall conform to CIPP manufacturer's requirements. Curing shall be performed using steam unless otherwise approved by DPW and MWRA.
- H. All service connections shall be reinstated after the CIPP is installed to no less than 95% of the existing service connection diameter and ground or brushed as required to form a neat lateral



opening free of any jagged edges, lips, or protuberances. All service connections shall be grouted to prevent infiltration from the edge of lined sewer main to a minimum distance of 3 feet up the service connection.

- I. Post construction acceptance testing of the rehabilitated sewer shall conform to manufacturers requirements, ASTM D5813-04 (2012 or latest edition) - Standard Specification for Cured-In-Place Thermosetting Resin Sewer Piping Systems, and the requirements of Section 3.3.2.
- J. For each separate manhole to manhole segment of CIPP installed, at least one sample shall be prepared and tested in accordance with ASTM F1216 and ASTM D790. A “restrained” sample shall be taken for pipes 18-inches or less in diameter. A “flat plate” sample shall be taken for pipes more than 18-inches in diameter. The proposed testing laboratory shall be submitted for approval to DPW. Samples shall be tested to verify that the flexural modulus, flexural strength, and wall thickness of the CIPP are at least equal to the parameters proposed in the approved design submittal.

3.3.2 Testing of Public Sewer

- A. If the visual inspection of the completed sewer or any part thereof shows any pipe, manhole or joint which allows infiltration of water, the defective work or material shall be replaced or repaired as directed. After completing installation and backfill of sewer pipe to the satisfaction of the DPW, the applicant shall conduct a line acceptance test under the following procedures.

3.3.2.1 Gravity Main

- A. All gravity sewers that will become the property of the Town of Holbrook shall undergo mandrel testing, televised inspection and, as directed by the Town, pressure testing. All televised inspections shall be recorded and provided to the Town in digital format.
- B. Pressure Testing Gravity Sewers – After a manhole to manhole reach of pipe has been backfilled and cleaned, pneumatic plugs shall be placed in the line at each manhole and inflated to 25 psig. Low pressure air shall be introduced into this sealed line until the internal air pressure reaches four psig greater than the average back pressure of any groundwater that may be over the pipe. A minimum two minutes shall be allowed for the air pressure to stabilize. After the stabilization period (3.5 psig minimum pressure in the pipe), the air hose from the control panel to the air supply shall be disconnected. The portion of line being tested shall be termed “Acceptable” if the time required in minutes for the pressure to decrease from 3.5 to 2.5 psig (greater than the average back pressure of any groundwater that may be over the pipe), shall not be less than the time shown for the given diameters as indicated in the Uni-Bell PVC Pipe Association’s, Handbook of PVC Pipe, current edition.

If testing is not feasible between manholes due to live sewer service connections the contractor shall conduct low pressure air testing at each pipe joint.



Pipe Diameter (inches)	Minimum Time (min:sec)	Allowable Maximum Length (L = ft) for Minimum Time	Time for Longer Length (sec)
8	<u>3:46</u>	<u>597</u>	0.380L
10	<u>5:40</u>	<u>398</u>	0.854L
12	<u>7:34</u>	<u>298</u>	1.520L
15	<u>14:10</u>	<u>159</u>	5.342L
18	<u>17:00</u>	<u>133</u>	7.692L
24	<u>22:40</u>	<u>99</u>	13.674L
30	<u>28:20</u>	<u>80</u>	21.366L
36	<u>34:00</u>	<u>66</u>	30.768L
42	<u>39:48</u>	<u>57</u>	41.883L
48	<u>45:34</u>	<u>50</u>	54.705L

Vacuum testing of service connections may be required as directed by the Town.

- C. Deflection testing shall be performed on all flexible pipes. The tests shall be conducted after the final backfill has been in place for at least 30 days to allow for stabilization. Pipe shall be installed so there is no more than a maximum deflection of five (5.0) percent. Deflection testing shall be performed using a specially designed gauge assembly (mandrel) pulled through the complete section. The gauge assembly shall have a diameter of not less than 95 percent of the base inside diameter or the average inside diameter as specified by ASTM. The pipe shall comply with ASTM D2122, Standard Test Method of Determining Dimensions of Thermoplastic Pipe and Fittings. The deflection test shall be performed without mechanical pulling devices. Other testing methods such as electronic deflectometers, calibrated video cameras, or laser profilers must be submitted for review and approval by DPW prior to use.

3.3.2.2 Manholes

- A. All tests shall be observed by a representative of the DPW and the Applicant on each manhole. Manholes shall be tested by vacuum methods [see below].
- B. Vacuum Testing of Manholes – Leakage tests for four and five foot diameter manholes may be made using vacuum testing equipment. This type of test may be used only immediately after assembly of the manhole and only prior to backfilling. The manhole to pipe connection should only be a flexible connector. All lift holes shall be plugged with a non-shrinking mortar. For this test, each four or five foot diameter manhole shall be tested under 10 inches of Hg vacuum. Manholes shall be vacuum tested per ASTM C1244 – 11. Manholes shall be prepared by plugging all lift holes and pipes entering the manhole. Care shall be taken to securely brace the pipes and plugs to prevent them from being drawn into the manhole. The test head shall be placed at the top of the manhole in accordance with manufacturer's recommendations and a vacuum of 10 inches of mercury shall be drawn on the manhole, the valve on the vacuum line of the test head closed, and the vacuum pump shut off. The time shall be measured for the vacuum to drop to 9 in. of mercury. The manhole shall pass if the time for the vacuum reading to drop from 10 in. of mercury to 9 in. of mercury



meets or exceeds the values indicated in the table below. If the manhole fails the initial test, necessary repairs shall be made by an approved method. The manhole shall then be retested until a passing test is obtained.

Depth (feet)	Testing Time (seconds) for 48 and 60-Inch Diameter Manhole (inches)	
	48-Inch	60-Inch
8 (and less)	20	26
10	25	33
12	30	39
14	35	46
16	40	52
18	45	59
20	50	65
22	55	72
24	59	78
26	64	85
28	69	91
30	74	98

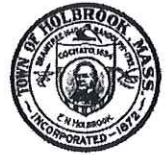
All excess material including dirt, loose concrete, bricks, grit, stones and any other material, shall be removed from all manholes prior to final acceptance by DPW.

3.3.2.3 Pipe and Structure Abandonment

- A Pipes left in place that are greater than 6 inches in diameter shall be filled with CDF regardless of material (e.g., DI, PVC).
- B Pipes left in place that are equal to or less than 6 inches in diameter may be left unfilled.
- C Structures left in place shall be demolished down to five feet below ground surface, the bottom shall be cracked and compacted, and the remaining structure filled with CDF. Demolition debris shall be removed, and the area regraded and compacted over the filled structure.

3.4 General - Pressure Sewers

- A Whenever possible, the force main will be designed on a continuous slope so that no "high points" exist, which may result in entrapment of gases and so that no "low points" exist which may induce settlement of solids. If unavoidable, all "high points" will have an air/vacuum release valve, and "low points" will have a cleanout. Details for these appurtenances will be provided and they will be accessible for maintenance without the need for excavation. During backfill, a polyethylene warning tape will be buried two feet below the ground surface along the entire length of the force main. Restrained joints on the force main should be used in place of thrust blocks.
- C The Work of this section includes the installation of a new sewage pump station and pressure sewer as shown on the Drawings and specified herein.
- D Work under this section shall comply with federal, state, and local requirements for the design, installation, testing, and certification of an operational sewage pump station and pressure sewer



system. The Applicant shall be required to submit Shop Drawings, and Equipment cut sheets for items specified and required in this Section.

- E. Work shall comply with local, state and federal electrical codes to provide watertight and corrosion resistant installations. Electrical junctions of any kind are prohibited within the confines of the wet well.
- F. Work shall comply with the Commonwealth of Massachusetts Plumbing Code.
- G. Pipe color shall be in accordance with Uniform Color Code as established by the American Public Works Association Utility Location and Coordination Council (adopted September 2000).
- H. All pressure sewers and force mains shall be constructed of DI or SRD 21 (pressure rated) PVC. Reference the appropriate AWWA standards latest version for tightness testing. At minimum, all force mains shall be pressure tested with minimum pressure of 150 psi for minimum two hours.

3.5 Materials - Pressure Sewers

3.5.1 Pressure Sewer Pipe and Fittings

- A. Polyvinyl Chloride (PVC) Plastic Pipe and Fittings:
 - 1. Size 2 inch to 12 inch diameter, SDR 21, ASTM D-2241, with material per ASTM D-1784, Grade 1, Type 1.
 - 2. Push on joint, bell and spigot type with pressure rating of 200 psi.
 - 3. Joints to meet ASTM F477 and tested to ASTM D-3139 standard.
 - 4. Install at locations and sizes indicated on drawings.
- B. Ductile Iron Pipe and Fittings:
 - 1. Pipe size 4 to 12 inches diameter, push-on joint, pressure Class 350, ANSI/AWWA C150/A21.50, inside epoxy coating per manufacturer standard.
 - 2. Pipe size 12 to 24 inches diameter, push-on joint, pressure Class 250, ANSI/AWWA C150/A21.50, inside epoxy coating per manufacturer standard.
 - 3. Fittings, size 4 to 12 inches diameter, pressure Class 350, ANSI/AWWA C153/A21.53, push-on joints per ANSI/AWWA C111/A21.11.
 - 4. Gaskets shall conform to ANSI/AWWA C111/A21.11. Restrained joints shall be provided by a field lock gasket supplied by the manufacturer of the pipe for that purpose. (U.S. Pipe – “FIELDLOK”, Clow – “SUPER-LOCK,” or U.S. Pipe – “TRFLEX”).
 - 5. Pipe and fittings to have an outside coating of asphaltic material per ANSI/AWWA C153/A21.53 and ANSI/AWWA C110/A21.10.
 - 6. Valves and fittings to have an inside coating of epoxy lining applied in accordance with AWWA C550.
- C. Flanged Ductile Iron Pipe and Fittings:
 - 1. Pipe and fitting sizes 3 inches to 24 inches, pressure Class 250 psi, per ANSI/AWWA C115 A21.15 with asphaltic coating outside and epoxy coated inside.
 - 2. Flange bolt circle and holes per ANSI/AWWA/C115/A21.15.
 - 3. Gaskets per ANSI/AWWA C111/A21.11.



4. Flange adapters to push-on joint pipe sections shall be supplied by the manufacturer of the pipe.

3.5.2 Couplings and Connectors

- A. Sleeve Type, Buried:
 1. Cast iron or epoxy coated steel, middle rings, ASTM A513
 2. Reducer type where required
 3. Followers, two steel rings epoxy coated
 4. Bolts ANSI 21.11/AWWA C111, galvanized
 5. Two wedge section compressible gaskets
 6. Dresser Manufacturing Co. – Style 38, 162, or 128 as appropriate
- B. Sleeve Type, Exposed:
 1. Steel middle ring, shop prime.
 2. Reducer type for different pipe sizes.
 3. Two steel follower rings.
 4. Two wedge section compressible gaskets.
 5. Steel bolts.
 6. Dresser Manufacturing Co., Style 38.
- C. Flexible Connectors:
 1. Do not use rubber or elastomeric PVC type flexible couplings to connect pressure sewers.
 2. Material shall be compatible with pipes being joined.
 3. Maximum allowable deflection per joint shall be 15 degrees or per manufacturer's recommendation, whichever is less.
 4. Stainless steel metal retaining rings.
 5. Use suitable retaining control rods.
- D. Air Release and Drain Manholes:
 1. Precast concrete sections with a one-pour monolithic base in accordance with ASTM C478.
 2. Air Release and Air and Vacuum Release Valves of size and type specified herein are to be able to fit into structure with ample room for access and maintenance of these units.

3.5.3 Air Release Valves

- A. Air Release and Vacuum Valve shall be similar to a Clow F 3077, Valmatic VM-49BW.3 or approved equivalent, threaded joint end, valve with cast iron body and bronze body seat, all in accord with APCO 400 Sewage Valves with a working pressure of 150 psi. ASTM A48, Class 30 and ASTM B62.

Air Release and Vacuum Valve shall be installed in the Air Release chamber as shown along the pressure pipe and at any high points constructed due to changes in the pressure pipe route or elevations.



3.5.4 SDR 21 PVC Force Main, Flange Adapter and Thrust Blocks

A. Joints

1. All joints are to be made water-tight in accordance with the requirements specified herein.
2. Pipe shall be jointed in strict accordance with the pipe manufacturer's instruction. Jointing of all pipe shall be done entirely in the trench.
3. Lubricant for jointing of ball and spigot PVC pipe shall be applied as specified by the pipe manufacturer. Use only lubricant supplied by the pipe manufacturer.
4. Ball and spigot PVC Pipe shall be pushed home by hand or use of bar and block. The use of power equipment such as a backhoe bucket is not recommended and shall only be used at the direction of the manufacturer.
5. To join field-cut pipe, pipe shall be cut square. The cut end of the pipe surface shall be properly beveled to the size and shape of a factory-finished beveled end. All sharp edges shall be rounded off.

3.6 Execution - Pressure Sewers

3.6.1 Sleeve Couplings

- A. Thoroughly clean pipe ends for a distance of 8 inches from the ends prior to installing couplings, and use soapy water as a gasket lubricant.
- B. Slip a follower ring and gasket (in that order) over each pipe and place the middle ring centered over the joint.
- C. Insert the other pipe length into the middle ring the proper distance.
- D. Press the gaskets and followers evenly and firmly into the middle ring flares.
- E. Insert the bolts, finger tighten and progressively tighten diametrically opposite nuts uniformly around the adapter with a torque wrench applying the torque recommended by the manufacturer.
- F. Insert and tighten the tapered threaded lock pins.
- G. Insert the nuts and bolts for the flange, finger tighten and progressively tighten diametrically opposite bolts uniformly around the flange applying the torque recommended by the manufacturer.

3.6.2 Piping

- A. The minimum pipe diameters for pressure building sewers shall be two inches. All pipe should be sized based on sound engineering principals.
- B. Pipe shall be handled in an approved manner, using slings or other approved devices. No pipe shall be dropped from trucks or into trenches.
- C. Pipe shall be laid accurately to line and grade in three-quarter (3/4") crushed stone. The depth of the crushed stone shall be one half (1/2) the diameter of the pipe under the main and one half (1/2) the diameter of the pipe over the main or 6 inches both under and over the pipe, whichever is greater. Stone shall be placed in layers not over six inches thick, and each layer shall be thoroughly compacted by tamping and chinking on each side of pipe to provide uniform support. Impervious material may be required on service connections for a distance 10 feet from the inside wall of the foundation to where crushed stone can start. Pipe shall be laid with the spigot end pointing in the direction of the flow.



- D. Sewer pipe shall be laid at a minimum of ten feet from the water main. Should local conditions prevent a lateral separation of ten feet, a sewer may be laid closer than ten feet from a water main if:
- Approved by DPW
 - It is laid in a separate trench.
 - The elevation of the top (crown) of the sewer will be at least 18 inches lower than the bottom (invert) of the water main.
- E. Sewer pipe shall be laid at a minimum of 5 feet horizontally from a drainage main and 18 inches vertically from a drainage main (see 4.3.7)

3.6.3 Testing Pressure Sewer Pipe

- A. Except as otherwise directed, pressure sewers (force mains) shall be given combined pressure and leakage tests in sections of approved length. The Applicant shall furnish and install suitable temporary testing plugs or caps; necessary pressure pumps, pipe connections, meters, gauges, gates, and other necessary equipment; and required labor. The Owner and Engineer shall have the option of using their own gauges.
- B. Subject to approval and provided that the tests are made within a reasonable time considering the progress of the project as a whole, and the need to put the section into service, the Applicant may make the tests when he desires. However, pipelines in excavation or embedded in concrete shall be tested after the backfilling of the excavation or curing of the concrete and exposed piping shall be tested prior to field painting.
- C. The section of pipe to be tested shall be filled with water of approved quality, and air shall be expelled from the pipe. If blow offs are not available at high points for releasing air, the Applicant shall make the necessary excavations and do the necessary backfilling and make the necessary taps at such points and shall plug said holes after completion of the test.
- D. The section under test shall be maintained full of water for a period of 24 hours prior to the combined pressure and leakage test being applied.
- E. The pressure and leakage test shall consist of first raising the water pressure (based on the elevation of the lowest point of the section under test corrected to the gage location) to the pressure rating of the pipe or alternately, to two times the maximum calculated operating pressure of the pipe, as approved by the Engineer. If the Applicant cannot achieve the specified pressure and maintain it for a period of one hour, the section shall be considered as having failed the test.
- F. Following or during the pressure test, the Applicant shall make a leakage test by metering the flow of water into the pipe while maintaining in the section being tested a pressure equal to the pressure rating of the pipe. If the average leakage during the two-hour period exceeds a rate of leakage indicated in AWWA Section C600 per 24 hours per mile of pipeline, the section shall be considered as having failed the leakage test.
- G. If the section fails to pass the pressure and leakage test, the Applicant shall do everything necessary to locate, uncover, and repair or replace the defective pipe, fitting, or joint, all at his own expense and without extension of time for completion of the work. Additional tests and repairs shall be made until the section passes the specified test.
- H. If, in the judgment of the Town of Holbrook, it is impracticable to follow the foregoing procedure exactly for any reason, modifications in the procedure shall be made as approved, but in any event the Applicant shall be responsible for the ultimate tightness of the line within the above leakage and pressure requirements. Passing the test does not absolve the Applicant from his responsibility if leaks develop later within the period of warranty.



- I. The sewer lines shall be inspected via closed-circuit television (CCTV) after completion with a 2 gpm flow of water to reveal pipe bellies. The remote camera shall also pan to view up the service connections to the Fernco fitting.

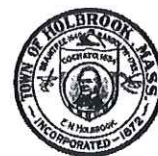
3.6.4 Pipe and Structure Abandonment

- A. Pipes left in place that are greater than 6 inches in diameter shall be filled with CDF regardless of material (e.g., DI, PVC), except for AC pipe. Pipes left in place that are equal to or less than 6 inches in diameter may be left unfilled.
- C. Structures left in place shall be demolished down to five feet below ground surface, the bottom shall be cracked and compacted, and the remaining structure filled with CDF. Demolition debris shall be removed, and the area regraded and compacted over the filled structure.
- D. In a guidance letter dated July 17, 1991, Identified as Control # C99 within the Agency Applicability Determination Index, the U.S. EPA determined that "the pumping of grout into buried lines is not a process which, in and of itself, would cause asbestos cement pipe to become regulated asbestos containing material." Therefore when abandoning asbestos cement pipe, care shall be used to prevent pipe material from becoming friable, thereby rendering it as regulated asbestos containing material.

3.7 Grease Traps

3.7.1 Exterior Grease Traps

- A. Exterior grease traps shall be designed by a registered Professional Engineer. The plans shall be stamped and include the design criteria and calculations used to size the grease trap.
- B. Grease traps shall be sized in accordance with Massachusetts Uniform State Plumbing Code 248 CMR 10.00 and shall have a minimum capacity of 1,000 gallons. The grease trap shall be sized to provide a minimum of 24 hours of detention time for the design flow.
- C. The discharge concentration for grease trap effluent fats, oils, and grease (FOG) shall not exceed 100 mg/l.
- D. The grease trap shall be located a minimum of 10 feet from buildings, property lines, water services, and in compliance with all applicable building and zoning codes. The grease trap shall be located where it is accessible for inspection and cleaning.
- E. Piping to and from the grease trap shall be in accordance with the *Sewer Construction Standards*. Inlet and outlet piping shall be 6-inch minimum diameter PVC (SDR 35), with allowable slopes between 2% and 6%.
- F. Sanitary wastewater flow into the grease trap is strictly prohibited. Sanitary flow from the building shall connect to a manhole located downstream of the grease trap. A manhole shall be provided upstream and downstream of the grease trap to facilitate bypass and treatment of flows if the grease trap must be temporarily taken out of service.
- G. The grease trap shall be constructed of reinforced concrete and shall be designed for AASHTO HS-20 loading at a minimum. A 1-inch thick butyl rubber gasket shall be provided between precast sections of tank. Buoyancy calculations shall be provided by the applicant, and if necessary, sufficient ballast (such as a buoyancy slab) shall be provided to counteract buoyancy forces when the grease trap is empty, assuming the groundwater table is at the ground surface.



Interior baffles shall be provided to retain collected grease and other materials and prevent the discharge of these materials into the Town's sewer system.

- H. The grease trap shall have inlet and outlet tees constructed of ductile iron or Schedule 40 PVC pipe. The inlet tee shall extend down a minimum of 12-inches below the normal operating fluid depth in the tank. The outlet tee shall extend down to within 12-inches of the floor of the tank. The outlet invert shall be 2 inches lower than the inlet invert. A minimum of 2 access openings with a minimum diameter of 24-inches shall be provided, and shall be located directly over the inlet and outlet tees. Access openings shall be raised to grade with brick or concrete risers and frames and covers that conform to the Town's *Sewer Construction Standards*.
- I. Water cooled grease traps are prohibited.
- J. The grease trap shall be tested to demonstrate watertightness prior to acceptance and use. Testing shall consist of a water infiltration / exfiltration test. The grease trap shall be filled to 4 inches below the outlet invert. Leakage into or out of the tank shall not exceed 10 gallons per 1,000 gallons of tank volume in a 72-hour period. Test shall be performed before backfilling, and shall be witnessed by the Department.
- K. The grease trap shall be filled to its normal fluid operating depth with clean water prior to its first use.
- L. Unless otherwise required by a schedule established by the DPW, owners or operators shall clean grease traps of accumulated grease and oil in accordance with all applicable local, state and federal laws, and no less frequently than a minimum of once every three months or whenever one quarter of the liquid depth of the trap consists of grease or oil, whichever occurs first. Grease traps shall be cleaned by physically removing accumulated grease, scum, oil or other floating substances and solids. Chemical, biological, or physical means (including flushing with water) shall not be used to release fats, wax, oil, or grease into the sewer, bypass the trap, or otherwise make the trap operate less effectively.

3.7.2 Interior Grease Traps

- A. At locations where Exterior Grease Traps cannot be constructed to serve a building, an interior grease trap shall be provided. Interior grease traps shall be the automatic grease and oil removal type and sized and installed in accordance with Massachusetts Uniform State Plumbing Code 248 CMR 10.00. The grease trap shall be sized using a one (1) minute draindown period. The grease trap shall be cleaned of accumulated grease and oil based on the manufacturer's recommendations, applicable local, state, and federal laws, or at a minimum monthly, or on a more frequent basis at the discretion of the DPW.

3.8 References

- A. All materials and execution shall conform to the highest applicable standards. If there is a conflict between other standards, or between other standards and these Design standards, then the most stringent criteria shall be used.
- B. The Town commonly references ASTM standards as guidance for the materials and execution of work performed on the Town's Infrastructure. The following summarizes select ASTM standards applicable to the sections in these Design Standards. This list is not exclusive as other standards may apply. The latest revision of each standard shall be referenced.

Standards

Title/Subject



248 CMR 10.00	Massachusetts Uniform State Plumbing Code 248 CMR 10.00
ANSI/AWWA C110/A21.10	Ductile-Iron and Gray-Iron Fittings for Water
ANSI/AWWA C111/A21.11-07	Rubber-Gasket Joints for Ductile-Iron Pressure Pipe and Fittings
ANSI/AWWA C115/A21.15	Standard for Flanged Ductile-Iron Pipe With Threaded Flanges
ANSI/AWWA C150/A21.50-08	Thickness Design of Ductile-Iron Pipe
ANSI/AWWA C153/A21.53-06	Ductile-Iron Compact Fittings for Water Service
ASTM A48	Standard Specification for Gray Iron Castings
ASTM A513	Standard Specification for Electric-Resistance-Welded Carbon and Alloy Steel Mechanical Tubing
ASTM A74	Standard Specification for Cast Iron Soil Pipe and Fittings
ASTM A746	Standard Specification for Ductile Iron Gravity Sewer Pipe
ASTM B62	Standard Specification for Composition Bronze or Ounce Metal Castings
ASTM C1244	Standard Test Method for Concrete Sewer Manholes by the Negative Air Pressure (Vacuum) Test Prior to Backfill
ASTM C144	Standard Specification for Aggregate for Masonry Mortar
ASTM C150	Standard Specification for Portland Cement
ASTM C270	Standard Specification for Mortar for Unit Masonry
ASTM C32	Standard Specification for Sewer and Manhole Brick (Made From Clay or Shale)
ASTM C443	Standard Specification for Joints for Concrete Pipe and Manholes, Using Rubber Gaskets
ASTM C478	Standard Specification for Precast Reinforced Concrete Manhole Sections
ASTM C564	Standard Specification for Rubber Gaskets for Cast Iron Soil Pipe and Fittings
ASTM D-1784	Standard Specification for Rigid Poly(Vinyl Chloride) (PVC) Compounds and Chlorinated Poly(Vinyl Chloride) (CPVC) Compounds
ASTM D207	Standard Specification for Shellac Varnishes
ASTM D2241	Standard Specification for Poly(Vinyl Chloride) (PVC) Pressure-Rated Pipe (SDR Series)
ASTM D3034	Standard Specification for Type PSM Poly(Vinyl Chloride) (PVC)
ASTM D3139	Standard Specification for Joints for Plastic Pressure Pipes Using Flexible Elastomeric Seals
ASTM D3212	Standard Specification for Joints for Drain and Sewer Plastic Pipes Using Flexible Elastomeric Seals
ASTM D478	Standard Specification for Zinc Yellow (Zinc Chromate) Pigments
ASTM D5813-04	Standard Specification for Cured-In-Place Thermosetting Resin Sewer Piping Systems
ASTM D790	Test Methods for Flexural Properties of Un-reinforced and Reinforced Plastics and Insulating Materials
ASTM F1216	Rehabilitation of Existing Pipelines and Conduits by the Inversion and Curing of a Resin-Impregnated Tube



ASTM F2561-11	Standard Practice for Rehabilitation of a Sewer Service Lateral and Its Connection to the Main Using a One Piece Main and Lateral Cured-In-Place Liner
ASTM F477	Standard Specification for Elastomeric Seals (Gaskets) for Joining Plastic Pipe
ASTM F679	Standard Specification for Poly(Vinyl Chloride) (PVC) Large-Diameter Plastic Gravity Sewer Pipe and Fittings