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700 MINIMUM DESIGN CRITERIA

700.01 General

1. Within the Town of Frederick's Town Limits there are three jurisdictions for public water supply. Left Hand water district generally supplies all public potable water demand on the west side of Interstate 25 (I-25). Central Weld Water District and the Town of Frederick supply potable water on the east side of I-25. Please contact the Town of Frederick to determine which jurisdiction a project is in. Each jurisdiction has their own design standards.

2. All water distribution systems will comply with the requirements of the Standards and Specifications for water main and service line construction and may include criteria established by the Engineer for the overall hydraulics of the water utility system. Additional criteria shall be outlined during public improvement plan review as determined necessary by the Town Engineer or Town Representative.

3. These Standards and Specifications apply to pipe sizes up to and including 12-inch diameter. Standards for pipe sizes larger than 12-inches shall be as determined by the Town Engineer on a project by project basis.

4. The maximum length of a dead-end line shall not be greater than 500-feet without the approval of the Town Engineer.

700.02 Water System Utility Study Requirements

The Utility Study shall include the following information and shall be bound in an 8-1/2" x 11" folder:

1. Certification statement - shall be included at the beginning of the report and shall read as follows: "This Utility Report for the design of the _____ development was repared by me or under my direct supervision in accordance with the Town of Frederick's Standards and Specifications and acceptable professional practices of the industry. We acknowledge that the Town of Frederick's review of this Utility Study is only for general conformance with submittal requirements, current design criteria and standard engineering principles and practices. We are also aware of the provisions of the Code of the Town of Frederick." The seal and signature of the professional engineer responsible for preparing the report shall follow this statement.

2. Report text for the water system design shall include at a minimum:

    a. Project location and Description – a description of the boundary streets, project area and type of development proposed or anticipated use. Include a vicinity map.

b. System layout – a description of the existing and proposed water infrastructure in conformance with the Town's latest master plan shall be provided and reference shall be made to a figure in the back of the report illustrating these improvements. The description shall include the sizes and types of existing and proposed pipes and the influence of the improvements on the project and surrounding area.

c. Design flow requirements – Complete design flow calculations and a discussion explaining the calculations and assumptions shall be provided. Items shall include types of facilities to be served, fire flow calculations based on building construction type and floor area, developed land area, number of units based on land use, and population densities. Calculations for Average Day, Max Day and Peak Hour demands shall be presented. Max Day plus Fire Flow and Peak Hour demand scenarios shall be evaluated for worst case and all include domestic demands, building sprinkler flows and domestic irrigation flows. Data shall be presented in table format, if possible, for ease of reading. The report shall acknowledge that the Public Works Department/Engineering Department/Fire Department has provided the required fire flows and that they approve of the proposed fire hydrant locations.

d. Hydraulic Analysis – A detailed description of modeling assumptions and rationale shall be provided in the report text such that the analysis is clear and can be confirmed. Results of the analysis at a minimum shall include: minimum and maximum system pressures for the various scenarios modeled, corresponding node locations, distribution of fire flows among hydrants, and maximum pipe velocities. Data should be presented in table format. Reference shall be made to modeling data in the appendix and a figure of the pipe and node network provided.

e. Conclusions – a description of the results and how they follow the Town criteria shall be provided. Any deviations from the Town criteria shall be described and applicable variances requested.

f. Appendices - Printed data output from the modeling results shall be provided in the appendix and shall correspond with a figure of the pipe and node network. The appendix shall also include hydrant flow test results, hand calculations and any other pertinent data. A large size figure (24" x 36") illustrating the existing and proposed utility improvements shall be provided and shall conform to the Town's latest master plan. The drawing shall include pressure zone boundaries, building finished floor elevations, elevation contours and locations of proposed and existing utility easements and right-of-way.

700.03 Design Guidelines

Table 700-01 - Design Guidelines

	SINGLE FAMILY	MULTIFAMILY	COMMERCIAL/INDUSTRIAL
MINIMUM FIRE FLOW (GPM)*	1500	3500	3500
MAX MAIN PIPE VELOCITY (ft/sec)	8	8	8
MAX SERVICE LINE VELOCITY (ft/sec)**	8	8	8
MINIMUM STATIC PRESSURE (psi)	60	60	60
MAX STATIC (psi)	90	90	90
PEAK DAY MIN (psi)***	55	55	55
PEAK HOUR MIN PRESSURE (psi)***	40	40	40
MAXIMUM SYSTEM PRESSURE FLUCTUATION (psi)	40	40	40

* In accordance with the current Frederick-Firestone Protection District standards, however, the required fire flow for some projects may be greater. Refer to the adopted IFC code for specific requirements. Minimum residual pressure during fire flow is 20–psi.

** In accordance with the current IBC.

*** This pressure may not be possible for all situations. Quality of Life Benchmark.

700.04 Pipe Sizes

Minimum main line size shall be 8-inch, except for fire hydrant lines. Dead end water mains with less than the equivalent of ten 5/8-inch domestic taps on the line may be 6- inch diameter as long as fire flows are achieved per the Frederick-Firestone Fire Protection District. For pipe sizes larger than 12-inches, the Engineer will determine the Specifications.

700.05 Service Lines

Service lines shall be of a size which is adequate to supply the requirements of the property being served. The minimum size allowable for a service line shall be 3/4-inch. A 1-inch domestic tap may be installed in areas where a residential fire sprinkler system may be installed. The requirements of the property being served shall be defined as peak demand, as calculated in the IPC, latest edition.

700.06 Depth

All water lines shall have at least 5-feet of ground cover from the top of the pipe to the finished ground surface.

700.07 Location

All water lines shall be laid, when possible, generally 10-feet north or west of the center line of the street. If the curves exceed the Town's maximum allowed deflections (half of the manufacturers recommendation) then fittings shall be used. All utilities shall be installed with a minimum ten feet (10') horizontal separation (edge to edge distance) and a minimum vertical separation of eighteen inches (18") unless otherwise authorized by the Town Engineer. All weather vehicular access shall be provided to manholes and valve boxes installed in areas outside of the public roadway. No water mains shall be installed within 15-feet of any existing building, retaining wall, or structure, unless approved by the Town Engineer. No building, retaining wall, or structure shall be constructed within 15-feet from any water main, unless approved by the Town Engineer.

700.08 Alignment

The vertical alignment of water mains shall be designed such that unnecessary high points are avoided. If a high point in the main cannot be avoided, a controlled high point shall be located at a fire hydrant tee where trapped air in the system can be bled. For controlled high points in transmission mains (16-inch and larger), combination air valves shall be provided. High points at a water main lowering should be avoided by deflecting the main on both sides of the lowering such that positive pipe grades are maintained to controlled high points in the system. To maintain positive pipe grades to controlled high points, the maximum depth of cover to the main can increase to 8-feet, if approved in writing by the Town.

700.09 Waterline Crossings

1. Waterline Crossing Over a Sanitary Sewer Line

   When there is less than 18-inches of vertical clearance between the water main and the sanitary sewer, the sanitary sewer shall be encased in concrete a minimum of nine feet on each side of the centerline of the crossing or polyvinyl chloride pressure pipe in accordance with American Water Works Association C900, pressure class 305-psi may be used for the sanitary sewer.

2. Sanitary Sewer Line Crossing Over a Waterline

   In all cases, regardless of vertical clearance, the sanitary sewer shall be encased in concrete a minimum of nine feet on each side of the centerline of the crossing or polyvinyl chloride pressure pipe in accordance with American Water Works Association C900, pressure class 305-psi may be used.

3. Waterline Crossing Over a Storm Sewer Line

When there is less than 18-inches of vertical clearance between the water main and the storm sewer, each joint of the storm sewer within nine feet of the centerline of the crossing shall be encased in concrete.

Freeze potential of a water main shall be evaluated when crossing storm sewers or other exposures to the elements. If a water main crosses a storm sewer with 3-feet or less of vertical clearance, a 12-inch thick layer of extruded polystyrene insulating foam, also referred to as "XPS" shall be provided all around the water main for a minimum of 5-feet on each side of the storm sewer. The sheets of "XPS" shall be thick enough to allow shaping of the material so it fits snugly around all sides of the pipe leaving a minimum 12-inch thickness around all sides of the pipe. The sheets of "XPS" shall be bonded together using "3M 78 Polystyrene Foam Insulation Spray Adhesive" or approved equal. Crossings of dead end water mains and storm sewer with less than 18-inches of vertical clearance shall be prohibited.

4. Storm Sewer Line Crossing Over a Waterline

In all cases, regardless of vertical clearance, the joints of the storm sewer shall be encased in concrete a minimum of 9- feet on each side of the centerline of the crossing.

Freeze potential of a water main shall be evaluated when crossing storm sewers or other exposures to the elements. If a water main crosses a storm sewer with 3-feet or less of vertical clearance, a 12–inch thick layer of extruded polystyrene insulating foam, also referred to as "XPS" shall be provided all around the water main for a minimum of 5 feet on each side of the storm sewer. The sheets of "XPS" shall be thick enough to allow shaping of the material so it fits snugly around all sides of the pipe leaving a minimum 12-inch thickness around all sides of the pipe. The sheets of "XPS" shall be bonded together using "3M 78 Polystyrene Foam Insulation Spray Adhesive" or approved equal. Crossings of dead end water mains and storm sewer with less than 18-inches of vertical clearance shall be prohibited.

700.10 Grade

1 All pipe shall be installed to the lines, grades, and depths specified in the approved plans. Fittings, valves, and hydrants shall be installed at the specified locations with joints centered, and all valve and hydrant stems plumb. No deviation shall be made from the required line or grade except with the written consent of the Town Engineer.

2. Air and vacuum valves may be required at extreme high points on water lines 12-inches and larger. The Town Engineer may require installation on smaller lines as deemed necessary.

700.11 Future Connections

1. Water mains shall be designed such that they extend the entire frontage of the property to be served or as otherwise approved in writing by the Town.

2. When future main extensions are possible, the main which will be extended must be valved such that only one valve will have to be closed when the main is extended. The valve must be restrained so that when the one valve is closed and the line to be extended is exposed, the valve will remain safely in place. Restraint may be made by the use of a swivel or flange joint or the following minimum lengths of pipe installed on the extension side of the valve:

4-inch Pipe	--	29-feet
6-inch Pipe	--	41-feet
8-inch Pipe	--	53-feet
10-inch Pipe	--	64-feet
12-inch Pipe	--	76-feet

3. These are minimum lengths and the design engineer shall be responsible for determining if these are acceptable or if greater lengths are needed to develop sufficient friction.

700.12 Valve Spacing

1. Valves shall be placed at locations to minimize water outages in case of a line break or repair. In general, valves will be placed on lines of 12-inch or smaller diameter no more than 500-feet apart. Each fire hydrant shall have a hydrant valve. For lines larger than 12-inch the valve location and spacing will be determined by the Town Engineer.

2. The valving of the mainlines between hydrants must be accomplished to prevent more than one hydrant from being out of service in the event of a mainline break or shutdown, unless otherwise approved by the Town Engineer.

3. A minimum of two valves shall be installed at every tee and three valves installed at every cross, unless otherwise approved by the Town Engineer.

700.13 Fire Hydrant Locations

1. The Developer shall provide fire hydrants which conform to the requirements of these Specifications. Fire hydrant location and spacing shall be determined by the Frederick-Firestone Fire Protection District in accordance with the adopted International Fire Code. Generally, the number of fire hydrants, their location and spacing shall be as follows:

   a. Residential Areas - 500-feet between hydrants starting at street intersections.

   b. Multiple Dwellings - 500-feet between hydrants and not more than 200-feet from the end of required emergency access.

c. Commercial, Industrial, Storage - 500-feet between hydrants and not more than 200-feet from the end of required emergency access.

d. No fire hydrant line shall be connected to less than an 8-inch water main or to a "dead end" water main unless the hydrant can deliver 1500-GPM with minimum of a 20-psi residual, or specifically approved by the Engineer.

2. Variances from the above requirements shall be coordinated with and approved by the Frederick-Firestone Fire Protection District.

700.14 Fire Lines and Fire Hydrant Lines

1. A fire hydrant line shall extend from the hydrant tee and valve on the water main to the fire hydrant.

2. A private fire service line for use on an internal fire suppression system shall require a valve at the mainline and a valve on the fire service line and the valves will be owned and maintained by the Town. The valves shall open left. The property owner shall own and maintain the fire service line from the fire service line valve to the building or structure.

3. Private fire service lines shall be six inch (6") minimum diameter.

4. Domestic and irrigation taps shall not be allowed on the fire service line or fire hydrant line.

5. All fire sprinkler taps shall be installed with an approved backflow prevention device and a flow switch which will indicate when water has flowed through the line.

6. Plans for the installation of either of the above-mentioned fire service lines must be submitted to the Town for approval and must be stamped by a Professional Engineer.

7. Fire hydrant lines shall be ductile iron pipe with swivel tees. Any fittings used shall be class 250 (minimum) ductile iron.

8. Fire line valves shall have a flange connection and shall bolt directly to a mechanical joint anchoring tee (swivel tee) at the main.

9. The use of any private fire service line to supply more than one lot is not allowed.

10. Fire service lines shall be electrically insulated from the public mainline if the main line is cast or ductile pipe.

11. The property owner shall maintain the fire service line from the fire service valve to the building or structure.

701 MATERIALS

See the Approved Materials List in the Appendix.

702 DUCTILE IRON PIPE

702.01 Description of Pipe

1. Pipe class shall be in accordance with the table below with thickness designed in accordance with A.N.S.I. A21.50 (A.W.W.A. C150), and manufactured in accordance with A.N.S.I. A21.51 (A.W.W.A. C151). The pipe shall conform to pressure class 350. Alternate thickness designs, when appropriate, may be approved by the Town Engineer.

2. All buried joints for ductile iron pipe shall generally be mechanical joint or push-on conforming to A.N.S.I. A21.11 (A.W.W.A. C 111).

Table - 700-02 - Class of Pipe

TYPE OF PIPE	MINIMUM THICKNESS CLASS OF PIPE
Fire hydrant lines	52
Fire service lines	52
4-inch	51
6-inch	50
8-inch	50
10-inch	50
12-inch	50

702.02 Coating of Pipe

Pipe and fittings shall be coated on the outside with a bituminous coating, in accordance with A.N.S.I. A21.51 (A.W.W.A. C l5l).

702.03 Cement Lining

Pipe and fittings shall be cement lined in accordance with A.N.S.I. A21.4 (A.W.W.A. C l04).

702.04 Tapping

Taps larger than 2-inches in size shall be made only with approved tapping saddles or sleeves as determined by the Engineer. Refer to the Appendix for the Approved Material List.

702.05 Corrosion Protection

1. Whenever the installation of metallic mainline pipe is proposed, a soil resistivity survey of the Construction area must be performed. The survey data and calculations shall be submitted to the Town. Joints of metallic pipe shall be bonded to provide electrical continuity and test stations installed at intervals approved by the Town Engineer. See Details at the end of this section.

2. Where soils adjacent to Construction areas are determined to have a resistivity of less than 1000 Ohm-Cm, or where stray current corrosion is, in the opinion of the Town, expected to be severe, an approved non-metallic or cathodic protection system shall be installed with the approval of the Town Engineer. Additional measures may be required to insure protection from corrosion.

3. All metallic pipe, fittings, valves, and other appurtenances shall be wrapped in polyethylene or an approved coating. The polyethylene encasement shall prevent contact between the pipe and surrounding material.

4. The polyethylene shall have a minimum wall thickness of 8-mils and be manufactured in accordance with A.W.W.A. Standard C105, “Polyethylene Encasement for Gray and Ductile Cast-Iron Piping for Water and Other Liquids”.

5. All Ductile Iron pipe shall be wrapped in Polyethylene. A 2-inch wide 10-mil thickness polyethylene pressure-sensitive tape shall be used to close seams or hold overlaps.

6. Pipes of dissimilar metallic materials shall be insulated from each other using insulated flanges or fittings with test stations as approved by Engineer.

703 POLYVINYL CHLORIDE PIPE

703.01 Description of Pipe

All Polyvinyl Chloride (P.V.C.) pipe shall be manufactured according to A.W.W.A. Standard C 900, "Polyvinyl Chloride (P.V.C.) Pressure Pipe, 4-inch through 12-inch, for Water. No P.V.C. over 12-inches in diameter will be installed without approval of the Town Engineer. Following are additional requirements or exceptions.

703.02 Joint Type

Pipe joints shall be made using an integral bell with an elastomeric gasket push-on type joint or using machined couplings of a sleeve type with rubber ring gaskets and machined pipe ends to form a push-on type joint. Solvent cement joints are strictly prohibited.

703.03 Class and Type

All pipe up to and including 12-inches shall be Pressure Class 305 psi, dimension ratio 14 (DR 14) minimum. Larger pipe sizes must be designed by the Engineer.

703.04 Tapping

1. Tapping of P.V.C. and ductile up to and including 2-inch shall be done only with approved tapping saddles.

2. Taps larger than 2-inches in size shall be made only with approved tapping saddles or sleeves as determined by the Town Engineer.

3. Tapping mains may require digging out bedding material and cutting or removing part of the corrosion protective wrapping. After the taps are made, the wrap shall be repaired or replaced by the contractor to protect both the service line and the main.

4. Service taps shall have a minimum separation of 24-inches and be no closer than 24-inches to a main line joint.

5. All taps into the water main shall be at an angle of not more than 45-degrees from the horizontal, and corporation stops shall be installed.

6. Taps to PVC mains shall be accomplished with the mainline valves either side of the tap in the closed position.

7. Taps to PVC mains shall only be made when the air temperature is 32-degrees Fahrenheit or higher.

8. All service taps shall be performed by the Contractor. All necessary materials for said taps, including corporations stops, copper line, meter pits, copper setters, curb stops, etc., shall be supplied by the Contractor. Said materials shall conform to these Standards and Specifications. The Town will inspect each tap prior to backfilling.

703.05 Tracing Wire

1. All PVC pipe shall be installed with tracing wire taped securely to the top of the pipe and shall extend along the entire length of the pipe installed. The tracing wire shall be a minimum 12-AWG direct bury solid copper wire (see Detail 700-17). The tracing wire shall be tested prior to and as a condition of construction acceptance.

2. Tracing wire shall be brought to grade at all fire hydrants or test stations. The tracing wire shall be securely affixed to the barrel section of the fire hydrant and brought to grade as described in Section 712.04.

704 ASBESTOS CEMENT PIPE

704.01 Use

The installation of Asbestos Cement Pipe is not permitted.

704.02 Tapping of Existing Lines

Existing Asbestos Cement Pipe shall be tapped up to and including 2-inches with an approved stainless steel tapped repair clamp. The make and model of the clamp shall be approved by the Engineer. When taps are larger than two inches the Town Engineer may require that a full section of pipe be removed and replaced with a non-asbestos material.

705 CAST AND DUCTILE IRON WATER WORKS FITTINGS

1. All cast iron fittings shall be manufactured in accordance with the following A.W.W.A. Standards: C104 “Cement-Mortar Lining for Ductile-Iron Pipe and Fittings for Water”, C110 “Ductile-Iron and Gray-Iron Fittings, 3-inch. – 48-inch (76-mm – 1,219-mm), for Water”, C153 “Ductile-Iron Compact Fittings for Water Service”, or C111 “Rubber-Gasket Joints for Ductile-Iron Pressure Pipe and Fittings” with the following additional requirements or exceptions.

2. All fittings shall be furnished with mechanical joint ends conforming to referenced specifications, and in addition the tee-head bolts and hexagon nuts shall be fabricated from a high-strength, low alloy steel known in the industry as "Cor-Ten," "Usalloy" or equal. Accessories for the mechanical joint consisting of the gasket, gland and fasteners shall be furnished and packaged separately from the fittings. Each package shall be labeled in such a manner as to provide for proper identification and the number of units per package or bundle. All hydrant tees shall be mechanical by flanged joint or swivel tees.

3. All fittings shall be a minimum of 250–psi pressure rating and shall conform to the dimensions and weights shown in the tables of above referenced specifications. All fittings shall be made from gray-iron or ductile-iron.

4. All fittings shall be wrapped in polyethylene encasement.

706 VALVES

706.01 General

1. All valve operating wrench nuts shall be installed no deeper than 4-feet below finished grade. Stainless steel pins or a minimum of two (2) set screws may be used if any extension is necessary to meet this requirement.

2. Mainline valve placement shall be no greater than 24-inches from any fitting. In the event that a valve is located in a lowering, the location of the valve should be coordinated with the Town Engineer. In-line tee connections shall have no less than two (2) valves, in-line cross fittings shall have no less than three (3) valves. This does not apply to fire hydrant tees.

3. All valves larger than 12-inches shall be installed in a vault in accordance with the detail drawings at the end of this section. All valve vaults shall be capable of withstanding AASHTO H-20 highway loading. The vault shall also have lift hooks in the roof for valve removal inside the vault.

4. Vaults shall be made water proof after construction by use of sealants, epoxy or other approved methods. All vaults shall be designed with wall sleeves and link seal and be capable of handling thrusts caused by removing valves. All vent pipes for vaults shall be installed in conformance with the detail drawings at the end of this section.

706.02 Gate Valves

Gate valves shall be used on all lines up to and including 12-inch and shall be resilient seated gate valves with non-rising stem, compression seating, double "0" ring stem seals, with 2-inch square operating nut, conforming to AWWA C509. Valves shall be the same size as the line which they serve and shall open left (counterclockwise). Valve ends shall be mechanical-joint, except for hydrant valves, which shall have one flanged or swivel valve end.

706.03 Butterfly Valves

All valves having a nominal inside diameter of greater than 12-inches will be geared butterfly valves designed for direct burial and they shall conform to A.W.W.A. C504, Class 150B. Valves will be tight closing rubber seat type with the seats bonded to the body. No metal to metal surfaces will be permitted. All valves will open left (counterclockwise) with a 2-inch square nut conforming to A.W.W.A. C509. The Engineer may require Butterfly valves to be installed in a vault.

706.04 Tapping Valves

1. Tapping valves shall conform to the above standards and any additional requirements requested by the Town Engineer. Wet taps are allowed only with written approval of the Town Engineer.

2. Wet taps must be at least one nominal pipe size less than the diameter of the pipe being tapped. Same size taps will not be permitted.

706.05 Blow-Off Valve Assembly

1. In all installations where the main will be permanently dead-ended, such as a cul-de-sac, a permanent blow-off assembly or fire hydrant shall be installed. Where the main will be temporarily dead-ended, for example the boundary of a subdivision filing, a temporary blow-off may be installed, unless a fire hydrant, which can serve additionally as a blow-off, is located at the main's temporary end. All plugs and caps unless otherwise specified, shall be provided with a concrete thrust block, or thrust shall be restrained by attaching suitable metal tie rods and clamps or joint restraints as specified (see Details 700-02, and 700-02A). The blow-off shall be installed at a right angle to the main.

2. Blow-off assembly sizing shall be dependant upon the size of line it is to be attached and will be sized to provide a flushing velocity in the main of at least 2-feet per second.

3. Temporary blow-offs shall be approved in writing by the Town Engineer.

706.06 Pressure Reducing Valves

1. Pressure-reducing valve (PRV) installations are used to control pressure between distribution system pressure zones. When main extension plans are submitted for review, the need for a pressure-regulating valve installation shall be determined jointly by the developer's engineer and the Town. Plans shall be submitted as part of the utility study indicating size, type, and location of the PRV installation. All calculations shall be submitted to the Town for review.

2. For individual water services to buildings, water pressure regulators will be required if system pressures exceed 80-psi or at the discretion of the Building Division.

706.07 Manholes

Manholes shall be installed on all pressure regulating valves, permanent blow-off installations, and air release valves in accordance with the detail drawing at the end of this section.

707 VALVE BOXES

All valve box sections shall be cast iron, screw type with lid. Bases shall be suitable for the valves furnished and for the depth of cover specified. The box shall have a circular base for support around the valve (see Detail 700-01).

708 CURB STOP BOXES

1. The approved list of curb stop boxes is located in Appendix A APPROVED MATERIALS LIST.

2. Curb stops installed must conform to A.W.W.A. C800 up to 2-inches in size. Beyond 2-inches, a gate valve must be used.

709 FIRE HYDRANTS

709.01 Approved Types

See Detail 700-06 for the Standard Fire Hydrant Installation and Appendix for the manufacturer of approved Fire Hydrants.

709.02 Requirements

1. All fire hydrants used in the Town of Frederick Water System shall meet the following Specifications:

   a. 5-inch minimum hydrant valve opening, 5-1/4-inch main valve opening.

   b. Two (2) hose nozzles, 2-1/2-inch National Standard thread.

   c. One (1) pumper nozzle, 4-1/2-inch National Standard thread.

   d. Six (6) inch M.J. Shoe Connection inlet.

   e. Operating nut, l-l/4 inch points to flat National Standard pentagon.

   f. Open left.

   g. Color - red.

   h. 5-foot bury depth.

   i. Nozzles shall be a minimum of 18-inches above finished grade.

   j. 200-psi. working pressure.

   k. Hydrants shall have weep drain holes in the hydrant shoe and shall be surrounded with 1-1/2-inch washed rock. A sheet of 8-mil polyethylene shall be placed over the washed rock to prevent dirt from filling the rock.

   l. Must comply with A.W.W.A. C502.

m. The fire hydrant bottom flange shall be adjusted to not more than 8-inches or less than 2-inches above the approved finished grade.

n. All extension sections must be class 52 ductile or cast iron and installed per the manufacturers recommendations.

o. The lateral line, hydrant and fittings shall be wrapped in polyethylene

p. All hydrants shall be set on an 18-inch by 18-inch and 6-inch thick concrete foundation.

q. Each hydrant shall be blocked against the end of the trench with a concrete thrust block. If the trench is unstable then the hydrant shall be mechanically restrained from the tee at the main to the hydrant in addition to the thrust block.

r. All fire hydrants shall be of breakaway Construction.

s. All hydrants shall be NEW, unless an existing hydrant is in good operating condition and meets or exceeds the above standards. The use of an existing hydrant shall be approved by the Town Engineer.

2. Prior to installation the contractor must:

a. Inspect the hydrant thoroughly for any defects or damage.

b. Toughly clean the hydrant interior.

c. Open and close as many times as necessary to determine that all parts are in proper working order, valves are seating properly and the drain valve is operating freely.

d. Align the hydrant so that the nozzles are rotated to face the accessible route by the Fire Department.

e. Verify the hydrant bury depth from the shoe to the finished grade and the appropriate hydrant installed. Extension kits will not be allowed on new hydrant installations without the prior written approval of the Public Works Director/Town Engineer.

3. Following installation, the contractor must ensure the following:

a. The nozzle caps are removed, cleaned and greased with a food grade anti-seize compound such as those manufactured by Loctite, CRC, Assured Flow or USA Bluebook

b. Reservoir oil is checked and filled as required.

c. The operating nut is in new condition.

d. The hydrant is re-painted in accordance with the requirements of these STANDARDS and SPECIFICATIONS.

710 GENERAL INFORMATION

710.01 Operation of Valves

When connecting to the existing water system, mainline valves on the existing system and connecting valves shall be operated by the Town of Frederick personnel ONLY. The Contractor shall notify the Engineer and Inspector at least 48- hours prior to needing any valve operated, except in the case of emergencies.

710.02 Connection to Existing System

1. At locations where connections to existing water mains are to be installed, the Contractor shall locate the existing mains both vertically and horizontally and verify their exact size and material in advance of the time scheduled for making the connections.

2. Prior to connecting to existing water mains, the Contractor shall have all personnel, materials, and equipment ready to connect the fitting to the existing main, so as to keep the shutoff time to a minimum. As soon as possible after making the connections, the Contractor shall flush the connection so as to prevent contamination of the existing facilities. The Contractor shall take every precaution necessary to prevent dirt or debris from entering the main.

3. Connections to the existing water system shall be completed in a neat and workmanlike manner. The Inspector shall be notified at least 48- hours in advance and be present at all times during the Construction of the connection. The connection is subject to approval by the Engineer and the Inspector. Under NO circumstances shall a non-disinfected main, which cannot be isolated, be connected to an existing disinfected main.

4. The Town does not guarantee the water tightness of its valves on existing facilities. If existing valves leak, the Town shall assist in reducing the influx of water, but the Contractor must use methods at their own disposal to dewater the trench and complete any required testing or disinfection of the water line.

5. All connections shall be valved to separate new Construction from the existing system. Valves shall be kept closed until acceptance of the new system.

710.03 Abandonment of Existing Water Lines or "Stubs"

All water and water service lines that were installed and will not be used (such as a replat or a change in building configurations) shall be abandoned at the main line. This shall include

excavating the main and removing any mainline valves on the line to be abandoned and replacing them with a plug. However, if the street was paved within the previous 3-years and no street asphalt overlay is planned for the next five years, then the developer shall place in cash escrow with the Town, sufficient funds for the Town to abandon the service line in the future.

711 TAPPING

711.01 Tapping Authorization

The Contractor is authorized to tap existing water mains within the Town of Frederick only when a Town Inspector is present. The Town should be notified 48-hours before the main is scheduled to be tapped. All appropriate fees shall be paid prior to any tapping.

712 GENERAL PIPE INSTALLATION

712.01 General

The Town shall be notified at least 48 hours in advance of any pipe installation. No pipes shall be backfilled until they have been inspected by the Town. Alignment and grade of the pipe and the location of fittings, valves, and hydrants shall be staked in accordance with the approved construction plans under the supervision of a professional surveyor registered in the State of Colorado.

712.02 Lowering of Pipe and Accessories into Trench

Implements, tools and facilities satisfactory to the Engineer shall be provided and used by the Contractor for the safe and efficient execution of the work. All pipe, fittings, valves, hydrants and accessories shall be carefully lowered into the trench with suitable equipment in a manner that will prevent damage to pipe and fittings. Under no circumstances shall pipe or accessories be dropped or dumped into the trench. Pipe and accessories shall be inspected for defects prior to their being lowered into the trench. Any defective, damaged or unsound material shall be repaired or replaced as directed by the Town Engineer or Town Representative. All foreign matter or dirt shall be removed from the interior and machined ends of pipe and accessories before it is lowered into position in the trench. Pipe shall be kept clean by means approved by the Town Engineer during and after laying.

712.03 Drainage of Mains

Mains shall be drained through drainage branches or blowoffs. Drainage branches, blowoffs, air vents, and appurtenances shall be provided with valves and shall be located and installed as shown on the plans. The Town may require dechlorination.

712.04 Laying of Pipe

1. Trenching, backfilling and compaction shall be done in accordance with Section 200 of these STANDARDS AND SPECIFICATIONS.

2. In the event unstable trench conditions are found at pipeline grade, a minimum of one and one-half inch uniformly graded, washed rock shall be used for trench stabilization. Depth of the stabilization shall be as approved in writing by the Town.

3. Granular bedding material shall meet the requirements of Section 200 of these STANDARDS AND SPECIFICATIONS. Bedding shall be placed to six inches below the bottom of the pipe and shall be placed around the sides of the pipe and to a minimum of 12-inches above the top of the pipe and in accordance with the detail drawing at the end of this section.

4. Every precaution shall be taken to prevent foreign material from entering the pipe while it is being placed in line. If that is not possible, the Town Engineer or Inspector may require that before lowering the pipe into the trench, a heavy, tightly woven canvas bag be placed over each end and left there until the connection is to be made. The end of the pipe will be plugged or capped with approved materials when work stops. Pipe shall be laid with bell ends facing in the direction of laying, unless directed otherwise by the Engineer. Where pipe is laid on a grade of 10% or greater, the laying shall start at the bottom and shall proceed upward with the bell ends of the pipe up-grade. No pipe shall be laid when, in the opinion of the Engineer or the Inspector, trench conditions are unsuitable.

5. A minimum 12 gage, direct bury, solid copper wire shall be buried directly above all pipe. The copper wire shall be attached to the top of the pipe and surface at each fire hydrant. The wire shall be taped to the front of the hydrant barrel and coiled around the barrel just below the top flange with an excess length of approximately 16-inches (see Detail 700-6). The tracing wire shall be installed in a continuous run between fire hydrants and the ends of the tracer wire shall be brought to the surface in a cathodic protection box next to the fire hydrant. If there is no fire hydrant where the tracing wire can be brought up, the wire may be brought up in a valve box as directed in the field.

6. For pipe outside the roadway there shall also be a warning tape installed 18-inches directly above the pipe in addition to the tracing wire described above.

712.05 Cutting of Pipe

The cutting of pipe for inserting valves, or fittings, shall be done in a neat and workmanlike manner without damage to the pipe or lining and so as to leave a smooth end at right angles to the axis of the pipe. Pipe ends shall be smooth and beveled with a file or other tools according to the pipe manufacturer's recommendations. Flame cutting of ductile pipe shall not be allowed. Asbestos cement pipe shall not be cut, but the entire section of pipe shall be removed to the nearest joint and replaced with a non-asbestos type pipe.

712.06 Dissimilar Materials

1. Cathodic protection and insulation shall be installed as required by the Town Engineer. Particular care shall be taken to insulate between dissimilar materials. Damage to the polyethylene wrap prior to or during backfilling shall be repaired by the Contractor. All damage to the polyethylene wrap caused by tapping the pipe shall also be repaired by Contractor.

2. Whenever it is necessary to join pipe of dissimilar metal, an approved insulated joint shall be installed. The Contractor with a Town inspector shall conduct a resistivity test across the joint. If the resistance test fails, the insulated joint shall be removed and repaired. The joint shall then be reinstalled and retested. This procedure shall continue until a successful test result is obtained. A test station shall then be installed near the joint for future testing of continuity.

3. Test stations for metallic mainlines shall be located in vehicular accessible areas no more than 500 feet apart or less as determined by the Town Engineer. Cathodic protection systems shall be designed by a qualified, licensed engineer, who regularly designs corrosion protection systems of this type.

4. Following backfill and compaction of the water mains, cathodic protection test stations, shall be tested for effectiveness by the contractor and the results of the continuity test shall be submitted to the Town. If cathodic protection of the pipe is determined not to meet industry standards, then corrections shall be made until it meets industry standards and is accepted by the Town.

712.07 Joining of Pipe

1. Immediately before joining two lengths of pipe, the inside of the bell and the outside of the spigot end and the gasket shall be thoroughly cleaned. Caution shall be exercised to ensure that the correct type of gasket is used. A thin film of gasket lubricant shall be applied to the inside face of the gasket and the spigot end of the pipe. The spigot end of the pipe shall be placed in the bell with care to prevent the joint from contacting the ground. The joint shall be completed by pushing the pipe home with a slow steady pressure, without jerky or jolting movements. Pipe furnished without a depth mark shall be marked before assembly to ensure insertion to the full depth of the joint. The pipe shall then be properly set and brought to correct line and grade. After installation of the polyethylene protective wrap, if required, the pipe shall be secured in place by installation of bedding material and backfill, in accordance with Section 200 and the detailed drawings at the end of this section.

2. Push on joints shall be accomplished in accordance with A.W.W.A. C600 “Installation of Ductile-Iron Water Mains and Their Appurtenances”, A.W.W.A. M23 “PVC Pipe - Design and Installation”. Longitudinal bending of PVC is not allowed. All deflection shall be through fittings or allowable deflection at joints if allowed by manufacturer’s written literature. Pipe shall not be deflected either vertically or horizontally more than one percent or one half of the limits recommended by the manufacturer, whichever is less.

3. Mechanical joints shall be accomplished in accordance with A.W.W.A. C600 “Installation of Ductile Iron Water Mains and Their Appurtenances”.

4. Flanged (or swivel) joints shall be accomplished in accordance with A.W.W.A. C115 "Flanged Ductile Iron and Grey Iron Pipe with Threaded Flanges", and A.W.W.A. C110 "Ductile Iron and Grey Iron Fittings 3-inch Through 48-inch., For Water and Other Liquids".

5. All requirements for the joining of different types of pipe with an inside diameter greater than 8-inches shall be done with an approved sleeve or transition piece. Type and style to be determined by the Town Engineer on a case by case basis.

712.08 Permissible Pipe Deflection

Pipe shall not be deflected either vertically or horizontally more than one percent or one half of the limits recommended by the manufacturer, whichever is less.

712.09 Backfilling

During the backfilling of all PVC waterline trenches, a continuous 2-inch wide metallic-coated, detectable tape labeled "Waterline Buried Below" shall be placed in the trench backfill 2-feet above and directly over the pipe. Detectable tape shall be manufactured by Pro-Line, or Town approved equal.

713 RESTRAINT

713.01 Thrust Blocks

All bends, tees, plugs, dead-ends, wet taps (in certain cases), hydrants, and blow-offs shall be designed and constructed with concrete thrust blocks. Concrete thrust blocks shall be designed for the internal pipe pressure, surge pressure and the soil bearing capacity. If the soil-bearing strength is unknown, the soil-bearing capacity used in design shall be 2,000-pounds per square foot. Refer to the detail drawings at the end of this section. Thrust blocks shall be placed between solid ground and the fitting to be anchored; the area of bearing on the pipe and on the ground in each instance shall be approved by the Engineer. The contractor shall excavate as required to ensure that the thrust blocks are placed against undisturbed soil and shall form the sides of the thrust block to provide the size and shape as required in the detail drawing at the end of this Section. When it is impossible, because of over excavation or other causes, to pour a thrust block against undisturbed earth, harness rods shall be used to anchor the fittings to the main in addition to the thrust block and as required by the Town. The thrust blocks shall be so placed that the pipe and fitting joints will be accessible for repair. All fittings and piping shall be protected with a suitable bond breaker prior to pouring a concrete thrust block (the concrete shall have a minimum 28-day compressive strength of 3000-psi). Refer to Details 700-04 and 700-05 for typical thrust block installations and sizing. Forms for thrust blocks may be required by the Town

Engineer. After the concrete has been placed and has set, the contractor shall remove all forming materials prior to backfilling around the thrust block. Backfill may be placed over the thrust blocks once the surface has set sufficiently to resist the weight of the backfill. However, no tamping or compacting shall be allowed above the thrust block for a minimum of 24-hours after placement. Concrete must set a minimum of 48-hours prior to the initial filling of the line.

713.02 Joint Restraint Devices

1 Joint restraint devices of adequate strength to prevent movement may be used instead of concrete blocking, as directed by the Engineer. Steel rods or clamps shall be coated and polywrapped, under no circumstance shall steel harness rods be allowed to be in contact with soils. Use of tie rods is only as approved by the Town Engineer in writing. Joint restraint devices shall be used on both sides of valves and fittings for pipe sizes 12-inches in diameter and smaller and in addition to thrust blocks. For transmission mains, 16-inches in diameter and larger, joint restraints shall be used for a specified distance as recommended using the latest edition of the pipe restraint calculator provided by EBAA Iron, or equivalent (rcp.ebaa.com).

2. Kick blocks will be required to be used in addition to joint restraint devices on transmission mains. Vertical bends in all pipe sizes shall be restrained using joint restraint devices and shall be restrained for a specified distance as recommended using the latest edition of the pipe restraint calculator provided by EBAA Iron, or equivalent (www.rcp.ebaa.com).

3. Harness rods, or “rodding”, are not an acceptable means for restraining pipe and fittings unless it is specified inside vaults as shown on the detail drawings at the end of this section.

4. Pipes shall be connected to valves and fittings by mechanical joints unless specified differently in the approved drawings. For approved slip-on joints, the joint shall be assembled with a ratchet jack or other approved method in a manner that does not cause any damage to the pipe. Both the spigot and bell must be thoroughly clean and free from tar or other coatings and rust.

5. For mechanical joint pipe, the last 8-inches of the outside of the spigot end of the pipe and the inside of the bell of all fittings and gate valves shall be thoroughly cleaned to remove oil, grit, tar (other than standard coating), and other foreign matter from the joint and then a thin film of gasket lubricant shall be applied. The cast iron gland shall then be slipped on the spigot end of the pipe with the lip extension of the gland toward the bell of the fitting. Gasket lubricant shall be applied to the rubber gasket and placed on the spigot end of the pipe with the thick edge towards the gland.

6. After the spigot end of the pipe is placed into the bell and fully inserted the gasket shall be pressed into place within the bell so it is even around the entire joint. After the gland is positioned behind the gasket, the contractor shall install all bolts and nuts and tighten them with a torque wrench in accordance with manufacturer’s

recommendations. Nuts spaced 180-degrees apart shall be tightened alternately to produce equal pressure on all parts of the gland.

7. Jointing shall be done in accordance with AWWA Specification C-111-07, Rubber Gasket Joints for Ductile Iron Pressure Pipe and Fittings, for all mechanical joint fittings.

713.03 Restraint for Fire Hydrants

The shoe of each hydrant shall be well braced against unexcavated earth at the end of the trench with concrete backing, and it shall be tied to the pipe with suitable metal tie rods or clamps, as directed by the Town Engineer.

714 SERVICE LINES

714.01 General

1. Each subdivided lot shall be served by a separate service line and meter except as provided for in the municipal code. Refer to detail 700-08 for a typical service line installation for more information.

2. The meter pit shall be located within 6-inches behind the back of an attached walk. Where no walks or detached walks are to be installed, the location of the meter pit shall be subject to the approval of the Town Engineer.

3. The owner of the premises shall maintain the curb stop box or meter pit so that it will always be conveniently accessible and in good working order, properly capped and clean of debris and other foreign matter.

4. All corporation stops shall have Corporation Cock (C.C.) threads.

5. All service lines supplying water from the Town's system shall conform to one of the following types of pipe:

    a. Seamless copper tube, "Type K, soft", for service lines 3/4-inch through and including 2-inches.

    b. Ductile Iron Pipe conforming to these Standards for service lines 3-inches or larger.

    c. PVC pipe conforming to these Standards for service lines 4-inches and larger.

    d. No other type of pipe shall be allowed without the written approval of the Town Engineer.

6. All service lines shall have a curb stop and meter box installed within the Town's right-of-way (ROW).

7. Service lines shall not be installed in trenches containing conduits which carry any substances other than potable water without written permission of the Town, service lines shall be separated laterally from conduits which contain a potential health hazard by a minimum of 10-feet.

   Exception: If it is not possible to achieve a 10-foot separation of the water and sewer services due to the size, location or other physical restraints of the lot, the lines may be installed in the same trench with the approval of the Town Engineer and under the following conditions:

   a. The water service must be installed 18-inches above the sewer service on a separately excavated shelf of undisturbed soil in the common trench.

   b. 4-1/2-feet of cover must be maintained as a minimum over the water service.

8. All service lines will be inspected by the Inspector. It is the responsibility of the Contractor or Developer to submit as-built drawings indicating the actual locations of all service stub-outs, prior to issuance of a final acceptance.

9. See Detail 700-08 for a typical service line installation.

10. The installation of pumps directly fed by the Town water system in service lines is prohibited.

11. All taps shall be at least 18-inches from any joint, fitting, valve or other tap unless approved otherwise by Engineer.

12. Location of all service lines shall be marked with a "W" chiseled in the sidewalk or curb closest to the property line.

714.02 Ownership

The Town shall maintain the water service line from the mainline to the curb stop, excluding the curb stop valve, box and stem, where a curb stop exists. In instances where no curb stop or outside meter exists, the Town will maintain the service line from the main to the right-of-way line. In instances where an outside meter exists without a separate curb stop, the Town will maintain the service line from the main to the meter, provided the meter is within fifteen feet of the right-of-way line. All remaining portions of the service line are to be maintained by the property owner, excluding the meter and backflow devices. Domestic water services shall not be tapped into fire service lines.

715 SETTING OF VALVES AND FITTINGS

Valves, fittings, plugs, and caps shall be set and joined to pipe in the manner specified above in laying and joining of pipe. Valves in water mains shall be located as shown on the plans.

716 SETTING OF VALVE BOXES

716.01 Valve Boxes

1. Gear cases shall be tightened and the valve shall be inspected in opened and closed positions to ensure that all parts are in working condition prior to installation. The cases shall be supported by concrete blocks to prevent any shock or stress being transmitted to the valve.

2. A valve box shall be provided for every valve that has no gearing or operating mechanism, or in which the gearing or operating mechanism is fully protected with a cast-iron grease case. The valve box shall be centered and plumb over the operating nut of the valve, with the box cover at most 1/4-inch below the surface of the surrounding pavement or such other level as may be directed by the Town Engineer. Refer to Detail 700-01 for valve and valve box installation.

3. Extensions to within 4-feet of the finished grade shall be provided for valves installed with more than 5-feet of cover. All extensions shall be pinned to the valve operating nut. Earth fill shall be carefully tamped around each valve box to a minimum distance of 4-feet on all sides of the box, or to the undisturbed trench face if less than 4-feet.

4. Valves shall have the interiors cleaned of all foreign matter before and after installation.

717 SETTING HYDRANTS

717.01 Location

1. Hydrants shall be located at least 1-foot inside the right-of-way or water utility easement and 5-feet from the side lot line and shall conform to one of the following conditions.

2. When placed behind the curb, the hydrant barrel shall be set so that no portion of the pumper or hose nozzle cap will be less than 24-inches or more than 30-inches horizontal distance from the gutter face of the curb.

3. When set in the lawn space between the curb and the sidewalk, or between the sidewalk and the property line, the hydrant or nozzle cap shall be a minimum 6-

inches and a maximum of 18-inches off of the sidewalk. No portion of the hydrant or nozzle cap shall be over the sidewalk.

717.02 Position

All hydrants shall stand plumb and shall have their nozzles parallel with, or at right angles to, the appropriate curb, with the pumper nozzle facing the fire access. Hydrants shall be set to the established grade, with the safety flange approximately 4 to 6-inches, or as per the manufacturers recommendations, vertically above the ground.

717.03 Connection to Main

Each hydrant shall be connected to the main with a 6-inch swivel tee controlled by an independent 6-inch flanged by M.J. gate valve, unless otherwise specified. Dependent upon the soil conditions and the length of the hydrant run, the fittings and pipe lengths may require rodding as determined by the Engineer.

717.04 Hydrant Drainage in High Permeability Soil

Wherever a hydrant is set in soil that is pervious, drainage shall be provided at the base of the hydrant by placing 1-inch washed rock, from the bottom of the trench to at least 6-inches above the waste opening in the hydrant and to a distance of 1-foot around the elbow.

717.05 Hydrant Drainage in Low Permeability Soil

Wherever a hydrant is set in clay or other impervious soil, a drainage pit shall be excavated below each hydrant and filled with 1- inch washed rock and under and around the elbow of the hydrant and to a level of 6-inches above the waste opening. The drain pit shall be covered with polywrap prior to backfill.

717.06 Usage and Operation of Hydrants

Water usage from a fire hydrant is strictly prohibited unless a special use permit is issued by the Town of Frederick.

717.07 Filling the Waterline

The new pipeline shall be filled slowly, filling at a rate which will not cause surges or exceed the rate at which air can be released. All air in the line shall be purged. Where blow-offs or hydrants are not available or effective in purging air from the line, the Town Engineer shall require a tap to purge the line. The location and the size of the tap shall be at the Town Engineer's discretion. All costs related to make the tap shall be the Contractor/Developers responsibility. Tapping fees do not apply.

718 DISINFECTION AND FLUSHING

1. The chlorination of finished water mains shall be done prior to the hydrostatic testing. Before filling the main with water, the main shall be clean and free from debris to the satisfaction of the Engineer.

2. Disinfection by chlorination of the main shall be performed prior to acceptance by the Town. The chlorinating agent and method of application shall be approved by the Engineer in accordance with A.W.W.A. C651.

3. If chlorine tablets are used for disinfection, the tablets shall be attached to the top of the pipe with A.W.W.A. and FDA approved adhesive specific for this purpose just prior to the installation of the pipe in the trench.

4. After the water main is filled with water and chlorine, the chlorinated water shall be held in contact with the main for 48-hours. At the end of the 48-hours, the water in the main shall be tested by the Town, to ensure a residual chlorine content of not less than 30-mg/l (ppm) and not more than 200-mg/l (ppm) under 2-mg/l (ppm) or equal to system level. The main shall then be thoroughly flushed to remove the heavily chlorinated water. Care shall be taken in flushing the main to prevent damage or danger to the public and the environment. The Town Engineer may require Contractor to dechlorinate the flushed water.

5. After final flushing and before the new water main is opened to the distribution system, two consecutive sets of acceptable samples, taken at every hydrant, shall be collected from the new main. The first set of samples shall be collected from every 1,200-feet of the new water main and all fire hydrants, plus one set from the end of the line and at least one set from each branch more than 100-feet long. The first set of samples shall be taken of water that has stood in the new main for at least 24-hours after final flushing. The second set of samples shall be taken after completion of the hydrostatic testing at the locations(s) used for hydrostatic testing. All samples shall be collected and tested in accordance with Standard Methods for the Examination of Water and Wastewater, and shall show the absence of coliform organisms, and, if required, the presence of a chlorine residual. Sampling and testing of residual chlorine and coli form organisms will be done by the Town.

6. If the initial disinfection fails to produce satisfactory bacteriological results or if tests indicate that other water quality parameters do not meet Town potable water standards, the new main may be re-flushed and shall be resampled. If check samples also fail to produce acceptable results, the main shall be re-chlorinated by the continuous-feed or slug method of chlorination in accordance with A.W.W.A. C651 until satisfactory results are obtained.

719 HYDROSTATIC TESTS

1. No hydrostatic tests shall be made on any portion of the pipeline until all field placed concrete has had adequate curing time. Sufficient backfill shall be placed between joints and fittings to stabilize the constructed pipeline, however joints, fittings, valves,

etc., may be required by the Inspector to remain uncovered so that visual inspection may be made at the time of testing. Tests shall include testing of service lines to and including the curb stop on new waterline installation.

2. All pipe shall be field tested to a minimum of 150-psi at all points in the line and 200-psi in private fire service mains.

3. The Town of Frederick shall be notified at least 24-hours in advance of any testing. All testing shall be done in the presence of the Town.

4. The Contractor shall furnish the necessary equipment to do the pressure test including a calibrated meter. The pipeline shall be in a state of readiness for testing, having been filled, flushed of high chlorine, and purged of air.

5. While the test pressure is maintained continuously for 2-hours, the allowable leakage from the pipe shall not exceed the formula listed below. An examination may be made of the pipeline in general during testing, and any leaks shall be repaired. Any pipe or fitting found to be cracked shall be removed and replaced. Cutting and replacing of pavement, excavating and backfilling are a necessary part of locating and repairing leaks discovered by pressure testing of pipe and the costs of these activities shall be borne by the Contractor.

6. No leakage is allowed through the bonnet of any valve. Any valve that leaks through the bonnet will be removed and replaced.

   The hydrostatic pressure test shall be performed against each valve within the new piping system.

   Allowable Leakage for PVC Pipe (per AWWA C605):

$$L = \frac{ND\sqrt{P}}{7{,}400}$$

   Where:

   L = allowable leakage, in gallons per hour
   N = number of joints in the length of pipeline tested
   D = nominal diameter of the pipe, in inches
   P = average test pressure during the leakage test, in pounds per square inch (gauge)

Allowable leakage at various pressures in shown in the following table. The values in the table are calculated on the basis of the above equation.

Allowable leakage per 50 joints of PVC pipe* (gph)

Avg. Test Pressure (psi)	Nominal Pipe Diameter (in)				
	4	6	8	10	12
200	0.38	0.57	0.76	0.96	1.15

175	0.36	0.54	0.72	0.89	1.07
150	0.33	0.50	0.66	0.83	0.99
125	0.30	0.45	0.60	0.76	0.91
100	0.27	0.41	0.54	0.68	0.81

*If the pipeline under test contains sections of various diameters, the allowable leakage will be the sum of the computed leakage for each size.

Allowable Leakage for Ductile Iron Pipe (per AWWA C600):

$$L = \frac{SD\sqrt{P}}{133{,}200}$$

Where:

L = allowable leakage, in gallons per hour
S = length of pipe tested, in feet
D = nominal diameter of the pipe, in inches
P = average test pressure during the leakage test, in pounds per square inch (gauge)

Allowable leakage at various pressures in shown in the following table. The values in the table are calculated on the basis of the above equation.

Allowable Leakage per 1,000-feet of pipeline* (gph)

Avg. Test Pressure (psi)	Nominal Pipe Diameter (in)					
	3	4	6	8	10	12
200	0.32	0.43	0.64	0.85	1.06	1.28
175	0.30	0.40	0.59	0.80	0.99	1.19
150	0.28	0.37	0.55	0.74	0.92	1.10
125	0.25	0.34	0.50	0.67	0.84	1.01
100	0.23	0.30	0.45	0.60	0.75	0.90

*If the pipeline under test contains sections of various diameters, the testing allowance will be the sum of the testing allowance for each size.

7. Operational Inspection

At the completion of the project and in the presence of the Inspector, the Contractor shall operate all valves, hydrants, and water services to ascertain that the entire facility is in good working order; that all valve boxes are centered and valves are opened; that all hydrants operate and drain properly; that all curb boxes are plumb centered; and that water is available at all curb stops.

720 WATER METERS

720.01 General

1. All work and materials must be acceptable to the Town Engineer or Town Representative.

2. All work and materials are subject to inspection by the Town of Frederick at all times.

3. There shall be only one Town water meter per service tap purchased. Multi-unit structures require tap fees to be paid for each unit.

4. The tap, water service line between the main and the meter, and water meter may all be the same nominal size. Where the meter size is smaller or larger than the service line size, the water service size shall be considered equal to the water meter size. There shall be installed upstream and downstream of said meter a pipe of the same diameter and 20 (twenty) times that diameter in length. Variation between service line and meter size must be approved by the Town Engineer in writing.

5. The Town reserves unto itself sole responsibility for testing and certifying the accuracy of Town water meters. No one shall in any way attempt to test, certify, or calibrate a Town owned water meter without the written approval of the Town.

6. Modification, alteration or relocation of metering equipment must be approved by the Town in writing.

7. Water meter and offsite reading equipment costs, fees, and repair costs shall be determined by the Town of Frederick.

8. The Town shall have the sole right to determine the rated size, kind, type, make, and component configuration of water meters and offsite reading equipment.

720.02 Ownership

1. Water meters and off-site reading equipment shall be obtained from the Town of Frederick, upon payment of fees, and shall remain in the Town's ownership.

2. Town ownership of water meters includes the entire meter. All water meters connected to the Town of Frederick’s utility system shall be the property of the Town. Under no circumstances shall anyone other than Town personnel remove a water meter once the pit or vault has been inspected and approved. No connections shall be made in the meter pit, for irrigation or otherwise, by anyone other than authorized Town personnel. Irrigation system connections shall be made downstream from the meter and a minimum of five feet from the meter pit or vault.

3. Water meters installed at a premise shall remain with that premise and are not transferable.

720.03 Materials

1. Setter, pit, dome, meter and AMI; 5/8-inch to 1-inch shall be obtained from the Town of Frederick.

2. The user/customer has the sole responsibility to determine the potential loads a meter pit and meter vault will require and shall provide the structural strength required. The Town may require AASHTO HS-20 loading at its option.

3. No solder containing lead shall be used. All soldering fluxes, plumbing pastes, pipe dopes, sealants, coatings, gaskets, and similar material which may come into contact with potable water must be non-toxic and approved for general plumbing use.

720.04 Installation

1. Whenever possible, the installation of water meter vaults in streets, roadways, driveways, alleys, or parking lots will not be allowed. Meters for residences shall be placed in a pit (for 5/8-inch or 1-inch services) outside of the structure as indicated in the detail drawings. Meters for commercial/industrial buildings may be placed inside the building as approved by the Town Engineer. Meters for larger services (greater than 1-inch) may be placed in minimum 4-foot diameter vault. The vault must be within 300-feet of the structure. Meters for all Parks & Forestry maintained areas (parks, arterial streets and primary greenways) must be placed in a minimum 72-inch diameter vault for service lines 3-inches and less.

2. The water meter shall be situated such that it is protected from freezing and frost damage.

3. The meter pit shall be installed within the right-of-way or public Utility Easements. Water meter pit locations and installations must be acceptable and meet the approval of the Town Engineer. The meter pit shall be located within 6-inches behind the back of an attached walk, within the tree lawn but no closer than 18-inches from the front edge of the walk to the edge of the meter lid of a detached sidewalk, and no more than 6-feet behind the back of curb if there is no sidewalk. See Detail 700-08. Water meter pits shall not be installed with the construction of the water service line until such time as the electric service lines, or other adjacent utilities, have been installed unless otherwise approved by the Town Engineer. For installation outside the Town limit, the meter pit shall be installed immediately adjacent to right-of-way (ROW).

4. All meter settings must be inspected before backfilling.

5. If the street or ground is not to final grade at the time of installation of the meter, the owner must raise or lower the meter vault when the final grade is established. Top of pit lid must be a minimum of 2-inches above dirt level if no sod or other landscape covering is in place at the time of final inspection.

6. Galvanized piping is not allowed.

7. The service line through and on both sides of the meter pit must be of the same material.

8. No branch connections shall be made in the meter pit. Connections must be made more than 5-feet from the meter pit on the downstream side.

9. Valves 4-inch diameter and larger shall be supported by adjustable steel supports, and 1-1/2-inch diameter and larger meters shall be supported by concrete blocks with steel shims if needed.

10. Manhole rings and covers shall be in conformance with the wastewater section of these Standards, except "WATER" shall be cast in the cover.

11. Meter manholes for meters 1-1/2-inch and larger shall use a 24-inch aluminum ring and cover and the outside of the aluminum ring shall have 8-mils of tar applied. A 24-inch by 36-inch aluminum cover adaptor and ring shall be used to enlarge the access opening if required. Once the tar is set then a 12-inch wide by 6-inch thick concrete collar shall be placed around the manhole ring. The manhole cover shall have a 2-inch diameter hole in the center of the cover for the transponder and the cover shall have the lettering “Water Meter” cast into the lid. Meter manholes in traffic areas are only allowed at the discretion of the Town. If allowed, the manhole shall use a 24-inch cast iron ring and cover and shall be designed to accommodate and protect the transponder. Approval by the Town of this design will be on a project specific basis.

12. Settings of meters other than shown and detailed herein shall be considered as non-standard and shall require prior approval of proposed piping layout, meter setting and structural design of vault for each separate installation.

13. Backflow prevention devices will be required in accordance with the Municipal Code.

14. Customers/users and contractors shall be responsible for obtaining all locates for underground utilities and services prior to excavation.

15. The following apply to 2-feet in diameter water meter pit installation (meters </= 1-inch).

    a. The pit shall rest upon brick supports or concrete block.

    b. The installed pit shall have its top locking lid at the same elevations as the grade of the adjacent landscaping. Care shall be taken that drainage of surface waters be directed away from the pit lid and do not puddle over the pit.

    c. Both the inner frost lid and the top locking lid shall be installed on the pit. The locking mechanism shall be fully functional.

    d. When installed, the water meter shall not be touching or resting against the pit barrel or pit cone assembly. The water meter shall lie horizontal and be essentially level.

e. Water meter pits shall not contain any plumbing fixture, fitting, valve, or pipe not directly a part of the pit assembly, the water meter set, or the water meter itself. Lawn irrigation tees, valves, and winterizing fittings shall not be allowed inside a water meter pit.

f. The meter must be within 18-inches below the top lid.

16. The following apply to 4-feet and larger water meter vault installation (meters >1-inch).

a. Water meter vaults proposed for water meters larger than 2- inches, manifold water meter sets, fire line rated water meters, or specifically constructed water meter sets shall have site and design plans approved by the Town Engineer prior to the start of Construction.

b. Vaults are to be of water tight construction with a sump pit.

c. To the extent possible, the top of the water meter register head shall be visible from the opened access lid.

d. Bypasses for 1-1/2-inchand larger meters are required for commercial, industrial and multi-family users (see Details). Bypass sizes are to be determined by the Town.

e. A list of approve meter setters can found in the Appendix.

17. The following apply to inside installations.

a. Bypasses for 1-1/2-inch and larger meters are required for commercial, industrial and multi-family users. Bypass sizes are to be determined by the Town.

18. The Property Owner is required to bear the costs of relocating a meter and/or remote when their actions limit existing free and easy access for the meter readers or introduces a safety hazard. This would include remodeling, additions, fences, new landscaping, pets, etc.

19. When installing 1-1/2-inchand larger water meters/backflow devices inside commercial buildings and inside of a locked room, a lock box, locked with an approved lock with a key to the room, must be provided for access by the Town and installed just outside of the locked door.

720.05 Access - Water Meters

1. Free, easy, and ready access for the purposes of testing, certification, repair, maintenance, or replacement shall be provided to water meters at any reasonable hour.

2. All water meters have to be periodically tested and certified. The customer/user shall take whatever measures are necessary for providing this periodic access.

3. There shall be a clear line of access to the water meter. This access line shall be free of any impediment, including safety hazards, to the movement of personnel and necessary tools, equipment, or material.

4. Lines of access and openings governing access to the water meter set shall be large enough to accommodate the passage of the water meter without the water meter having to be dismantled in any way. It is the responsibility of the customer/ user to move belongings, material, or property to insure reasonable conditions of access.

5. There shall be no obstruction of any sort which would necessitate the reaching around, through, behind, under, or over in order to perform usual and necessary work. Nor shall there be any obstruction which would impair the clear viewing of the water meter. The area around the water meter shall be fully sufficient for a person to place their body squarely before and in close proximity to the water meter, have a clear view of the meter, and have room to operate customary tools without hindrance.

6. Whenever security considerations necessitate that access to a water meter be controlled through the use of a lock, alarm, or other such device, the customer/user shall make known to the Town the procedures to be followed for ready access through such locks, alarms, or other security arrangements.

721 BACKFLOW CONTROL

721.01 General

1. All work and materials must be acceptable to the Town Engineer.

2. All work and materials are subject to inspection by the Town of Frederick at all times.

3. Modification, alteration or relocation in backflow device equipment must be approved by the Town.

4. All work necessary to achieve installation of a backflow prevention device or assembly shall be inspected. Inspections will be required as follows:

   a. Any work on a water service line, including all piping and valve work, and underground vaults shall be approved by a Town Inspector prior to any backfilling.

   b. Backflow prevention device sets, device installation, and discharge piping where appropriate, shall be approved by Town of Frederick prior to device installation.

c. For commercial and multi-family properties, no Certificate of Occupancy will be issued without an approved inspection and device test result submitted to the Town of Frederick.

5. Backflow prevention devices shall be required on the domestic line for commercial, industrial, and multi-family units where 4 (four) or more units are connected by a common meter and tap.

6. The specific make, model, and manufacturer shall be found in the most recent listing published by The Foundation for Cross-Connection Control and Hydraulic Research of the University of Southern California's (FCCC&HR) "List of Approved Backflow Prevention Assemblies." In the cases of single family residences, the assemblies shall bear the approval of the American Society of Sanitary Engineers (ASSE).

721.02 Backflow Prevention Devices

1. An approved backflow prevention device or assembly used for protection by containment is required on any water service line whenever there is an actual or potential situation when backflow due to backpressure and/or backsiphonage can occur.

2. The Town of Frederick staff shall make an inventory of water use in any facility or location which is supplied potable water from the Town's water distribution system to determine the degree of hazard which might exist.

3. On remodels or retrofit situations, subsequent to the hazard inspection, the Town staff will notify the customer of the type of backflow prevention device required.

4. Where hazards are largely unknown or hazard inspections cannot be conducted for whatever reason the highest degree of protection may be required.

721.03 Ownership

1. Backflow prevention devices shall be privately owned and maintained by the property owner.

2. Backflow prevention devices used for protection by containment remain with a premise and are not transferable to another premise, property, area, or street address.

3. Only properly trained and certified cross-connection control personnel are permitted to install, repair, replace, relocate, maintain, test, certify, modify, or otherwise affect the internal workings of a backflow prevention device.

721.04 Design Requirements

1. Definitions

   AIR GAP: The unobstructed vertical distance through the free atmosphere between the lowest opening from any pipe or faucet supplying water to a tank, plumbing fixture, pool, or other device and the flood level rim of said vessel or container. An approved air-gap shall be at least double the diameter of the supply pipe, measured vertically, above the flood level rim of the vessel or container; and, in no case less than 1-inch.

2. Location requirements

   a. Backflow prevention devices or assemblies used for protection by containment shall be located on the building side of Town owned water meters.

   b. A reduced pressure zone backflow prevention device shall be used for all non-residential irrigation services. This shall be required for both domestic and reclaimed water sources. The assembly shall be located a minimum of five feet downstream of the water meter and installed per Colorado Department of Public Health and Environment guidelines and Town of Frederick Municipal Code to allow for proper operation and easy access for annual testing and maintenance.

   c. Backflow prevention devices or assemblies used for protection by containment shall be located such that all water entering the premise or property through the water service line shall pass through the device or assembly prior to any use by the customer/user. There shall be no fitting, fixture, or other means capable of diverting water form the service line before the device. The exceptions are as follows:

   d. There may be closed loop bypass around the backflow prevention device or assembly, provided the bypass itself has in it a similar type approved backflow prevention device or assembly. The purpose shall only be to insure continuous water delivery while one device or assembly is undergoing testing, maintenance, repair, or replacement.

   e. Landscape irrigation systems may be tested before the backflow prevention device used for containment, provided such systems are themselves properly equipped with an approved backflow prevention device or assembly.

   f. The Town may authorize more than one approved backflow prevention device or assembly when physical conditions in a retro-fit situation pose unusual problems to the installation of a single device or assembly.

3. Underground vaults

   a. The user/customer has the sole responsibility to determine the potential loads an underground vault will require and shall provide the structural strength required.

b. Site plans and Construction details for proposed installation of underground vaults which will be subjected to the loads of motor vehicles shall be submitted to and receive the approval of the Town Engineer prior to the commencement of Construction. Whenever possible, the siting of underground vaults in streets, roadways, driveways, alleys, or parking lots will not be allowed. The location of underground vaults on any premise where there is any routine handling of petroleum products, chemicals, hazardous, or toxic materials shall be such that spillage, flow, or runoff of those materials will be away from the underground vault. Care shall be taken that ground slope, landscaping, and other provisions for runoff will not cause any accumulation of such materials inside, over, or adjacent to the vault.

4. Pressure Increases

a. Most backflow prevention devices and assemblies, by the very nature of their design, do not allow any release of pressure which may build up on the customer/user's side of the piping or plumbing system to escape back to the Town's water distribution system. Customer/users must insure that there is adequate protection from increases in water pressure on the downstream or user's side of a backflow prevention device or assembly.

THE TOWN DOES NOT ACCEPT NOR TAKE ANY RESPONSIBILITY OR LIABILITY FOR DAMAGES OF WHATEVER KIND WHICH MAY BE OCCASIONED BY OR RELATED TO AN INCREASE OR DECREASE IN PRESSURE IN THE PIPING OR PLUMBING SYSTEM DUE TO THE INSTALLATION OR OPERATION OF AN APPROVED BACKFLOW PREVENTION DEVICE OR ASSEMBLY.

b. The customer/user shall maintain in good working order pressure relief valves on their hot water tanks, boilers, and hot water heating systems. Further, the customer/ user shall install and maintain whatever additional pressure relief valves, water hammer arrests, pressure expansion tanks, or other means deemed prudent and wise.

5. Shutoff valves

a. The customer/user shall install and shall maintain in good operating order a curb stop and at least one (1) other valve in the service line before the backflow prevention device or assembly used for protection by containment. Both the curb stop and additional valve shall be capable of fully stopping all water flows into the device or assembly. The curb stop is required on the service line between the back of curb and the edge of meter lid. The isolating valves on the backflow prevention devices or assemblies are not to be considered in lieu of these valves. The isolating valves are to be used only for testing and certifying the device, not for the control of water flow through any piping or plumbing system.

6. Drainage

a. Certain types of approved backflow prevention devices and assemblies are specifically designed to dump or vent water to the atmosphere as an expected

part of their operation. The customer/user shall be responsible for providing whatever drainage work may be needed to control and carry away water which may be dumped or vented by such devices or assemblies.

b. The Town accepts no responsibility nor liability for damages or injury caused or related to the dumping or venting of water, or water mixed with other materials.

c. Reduced pressure principle devices (RP devices) may dump or vent large quantities of water under pressure. These devices or assemblies are equipped with an air gap funnel to catch the dumped or vented water. The customer/user shall provide whatever piping is necessary from the outlet side of the air gap funnel to effectively and safely carry away and dispose of any dumped or vented water or water mixed with other substances.

7. Stop and Waste Valves

a. Stop and waste valves on the upstream side of a backflow control device will be allowed only if the valves can vent to daylight. No upstream stop and waste valve may be buried nor be situated such that it is, or potential can be, submerged by the water it vents or dumps, any other water, or any other liquids.

721.05 Materials

No solder containing lead shall be used. All soldering fluxes, plumbing pastes, pipe dopes, sealants, coatings, gaskets, and similar materials which may come into contact with potable water must be non-toxic and approved for general plumbing use.

721.06 Access - Backflow Prevention

1. Free, easy, and ready access for the purposes of testing, certification, repair, maintenance, or replacement shall be provided to backflow prevention devices or assemblies used for protection by containment at any reasonable hour.

2. All backflow prevention devices have to be periodically tested and certified, most of them annually. The customer/user shall take whatever measures are necessary for providing this periodic access to the device or assembly for the purposes of testing and certification.

3. There shall be a clear line of access to the backflow prevention device or assembly. This access line shall be free of any impediment, including safety hazards, to the movement of personnel and necessary tools, equipment, or material.

4. Lines of access and openings governing access to the device set shall be large enough to accommodate the passage of the backflow prevention device or assembly without the device or assembly having to be dismantled in any way. It is the responsibility of the customer/ user to move belongings, material, or property to insure reasonable conditions of access.

5. There shall be no obstruction of any sort which would necessitate the reaching around, through, behind, under, or over in order to perform usual and necessary work. Nor shall there be any obstruction which would impair the clear vision of the device set. The area around the device set shall be fully sufficient for a person to place their body squarely before and in close proximity to the device set, have a clear view of the set, and have room to operate customary tools without hindrance.

6. Whenever security considerations necessitate that access to a backflow prevention device or assembly be controlled through the use of a lock, alarm, or other such device, the customer/user shall make known to the Town the procedures to be followed for ready access through such locks, alarms, or other security arrangements.

721.07 Space and Location Requirements

1. The following requirements shall apply to backflow prevention device or assembly sets in all newly constructed structures or facilities and, where reasonable, in all retro-fit situations:

   a. A minimum vertical distance of 12-inches shall exist between the ground or floor and the lowest point on the device or assembly, including the air gap funnel on reduced pressure principle (RP) devices.

   b. The lowest point on the device or assembly shall not exceed 30-inches above the floor, ground, or a firm, permanent footing surface.

   c. The closest side of the device or assembly sized 2-inch and smaller shall not be less than 2- inches from any wall or obstruction and shall be at least 4-inches from any surface which is subjected to freezing temperatures on its other side. Larger devices or assemblies which require companion flanges for installation shall have a minimum clearance of 12-inches from the closest wall or obstruction.

   d. At least one side of the device or assembly shall be open to ready and easy access.

   e. The piping side of all unions and companion flanges shall allow sufficient room to introduce bolts, nuts, and use usual tools. In no case shall the piping side of a union or companion flange be closer than 4-inches to a wall, floor, or other obstruction.

   f. There shall be at least 12-inches of clearance between the test cocks and any adjacent wall, fixture, or ceiling.

   g. No device or assembly set shall be installed in or above a ceiling.

   h. No device or assembly shall be located such that any vented or dumped water cannot be safely carried away without damaging property.

i. No device or assembly, including any air gap funnel, shall be located such that it is likely to be submerged in the water it vents or dumps, in ground water, or in other water or liquids which may be present.

j. No device or assembly shall be located either above or below a hazardous location, such as a chemical mixing tank, electrical apparatus, electronic equipment, or a storage site for chemicals or other hazardous materials.

k. All devices or assemblies shall be located such that they are protected against vandalism, mischief, and deterioration due to atmospheric conditions. Customers/users who are retro-fitting the backflow prevention device set may request a variance to the above requirements when they deem them to be unduly burdensome. Such request should be directed to the Town which will make an investigation and render a decision.

721.08 Installation Requirements for Air Gaps

1. Properly constructed and located air gaps are approved for protection by containment for all degrees of hazard. Air gaps used for protection by containment are most commonly used for applications on tank loading stations, pools used for swimming, wading, or therapy, chemical processing tanks, and sumps or tanks which provide water for pumping. Air gaps shall conform to the following:

a. They shall be located downstream of the Town water meter.

b. They shall be constructed such that no hose, piping arrangement, or other fixture may be attached to defeat the air gap separation. This includes any solid funnel arrangement installed to prevent splashing.

c. They shall be constructed such that the potable water supply line is at a vertical distance of not less than two inside pipe diameters (of the potable supply line) above the flood level of the receiving vessel, and in no case shall the air gap between the potable line and the receiving vessel be less than 1-inch.

d. When the potable supply line discharge is within two (2) inside pipe diameters of any wall or protrusion, the required vertical air gap between the potable supply discharge and receiving vessel shall be extended to a minimum of three (3) inside pipe diameters of the potable supply line, or 2-inches, whichever is greater.

e. There shall be adequate drainage arrangements to handle full volume overflows of the receiving vessel.

f. The water supply or service line shall be protected from freezing.

g. Stop and waste type valves are not allowed.

h. Air gaps used for protection by containment shall be considered approved backflow prevention devices and shall be inspected at least annually.

721.09 Installation Requirements for Reduced Pressure Principle (RP) or Reduced Pressure Detector Check (RPDC) Devices or Assemblies

1. A reduced pressure principle (RP/RPDC) device or assembly shall be installed for protection by containment whenever the degree of hazard is high and there is a potential risk of contamination to the Town's water distribution system. RP/RPDC devices or assemblies shall be installed at any premises or location where toxic or hazardous materials are routinely handled or present. RP/RPDC devices or assemblies shall meet the following:

   a. When installed horizontally, they shall be in an upright position, essentially plumb, and with the relief valve pointed down. RP/RPDC devices or assemblies larger than 2-inches in size must be installed horizontally.

   b. RP devices 2-inches and smaller may be installed in a vertical position provided the water flow will be in an upward direction through the device or assembly. Such installations require the addition of a vent elbow such that the outlet of the air gap funnel will be pointing down.

   c. RP devices 2-inches and smaller shall be equipped with full port/quarter turn ball isolating valves.

   d. RP/RPDC devices sized 2-1/2-inch and larger are normally provided with resilient seat butterfly type isolating valves. OS & Y type gate valves can be substituted for the butterfly valves when the device or assembly is to be used in a fire suppression water line.

   e. RP/RPDC devices shall be protected against frost and freeze damage.

   f. RP/RPDC devices shall not be installed in underground vaults unless such vaults have a drain to daylight which is capable of carrying the maximum possible discharge from the device. The drain shall be provided with a 24-inch mesh non-corrodible screen at the discharge to prevent any material from entering the waste line and creating a plug. A sump pump shall not be utilized in lieu of a drain to daylight.

   g. Installation of an RP/RPDC device above ground in a small enclosure is acceptable provided that the enclosure has non-corrodible screened opening(s) which will provide the necessary drainage without the air gap funnel being submerged in the vented or dumped water.

   h. RP/RPDC devices installed inside structures may have a drainage line through an exterior wall to daylight provided any dumped or vented water exiting the drain line will not pose a hazard to the public. Such drain line shall be equipped with a non-corrodible screen at the discharge opening.

   i. The Town may elect to remove the operators or handles from the isolating valves or to chain them together to prevent unauthorized operation of the isolating valves.

721.10 Installation Requirements for Double Check Valve (DCV) Devices or Assemblies

1. A double check valve (DCV) device or assembly shall be installed if the degree of hazard is low, with little or no risk of bodily harm should the device or assembly fail. Customers/users or contractors have the option of substituting a reduced pressure principle device or air gap for a DCV. DCV devices shall conform to the following:

    a. When installed horizontally, DCV devices or assemblies shall be in an upright position and essentially plumb.

    b. DCV devices may be installed vertically, provided, the water flow is in an upward direction through the device.

    c. DCV devices 2-inches and smaller shall be equipped with full port/quarter turn ball isolating valves.

    d. DCV devices sized 2-1/2-inches and larger are normally provided with resilient seat butterfly type isolating valves. OS & Y type gate valves can be substituted for the butterfly valves when the device or assembly is to be used in a fire suppression water line.

    e. DCV devices shall be protected against frost and freeze damage.

    f. DCV devices may be installed in underground vaults, either alone or in conjunction with water meters. The following provisions shall be met:

        i. Vaults must be a minimum of 4-feet in diameter for DCV devices sized 2-inches and smaller.

        ii. Vaults for larger DCV devices shall conform to the minimum space requirements on the appropriate Engineer's approved detail drawing.

        iii. Standard water meter pits cannot be used for DCV installations.

        iv. Vaults containing both water meters and DCV devices must provide sufficient working room to perform usual maintenance, repair, or replacement of both the water meter and the DCV device.

        v. Vaults must satisfy all access and siting requirements.

        vi. Vaults must provide that the DCV not be submerged due to high water tables, infiltration of ground waters, or infiltration by surface runoff. Properly screened drains to daylight, sump pumps, or water proof construction may be required to ensure the DCV is not subjected to submersion.

g. Installation of a DCV device above ground in a small enclosure is acceptable, provided that the enclosure provides the necessary frost protection and conditions of access.

h. The Town may elect to remove the operators or handles from the isolating valves or to chain them together to prevent unauthorized operation of the isolating valve.

721.11 Installation Requirements for Pressure Vacuum Breaker (PVB) Devices or Assemblies

1. Pressure vacuum breaker (PVB) devices or assemblies shall only be used for protection by containment for water service lines supplying landscaping irrigation systems. PVB devices cannot be used in lieu of reduced pressure principle or double check valve devices or assemblies. PVB devices shall conform to the following:

   a. PVB devices shall be installed in an upright position and essentially plumb.

   b. PVB devices shall be installed with the critical level mark, or bottom of the device if it has no critical level mark, a minimum of 12-inches above the highest point of downstream usage.

   c. PVB devices shall not be installed where they are, or where they will be subjected to backpressure. However, they can be subjected to continuous line pressure, provided it is not greater than the water pressure on the supply side of the device.

   d. PVB devices used for protection by containment of a landscaping irrigation system shall be equipped with full port/quarter turn isolating ball valves.

   e. PVB devices can have valves, including "stop and waste" type, on their downstream side.

   f. PVB devices shall be protected against frost and freeze damage. Air ports for winterizing the device by means of blowing out water are acceptable upstream of the PVB device provided the air port is not, nor is likely to be, submerged.

   g. Installation of a PVB device above ground in a small enclosure is acceptable provided that the enclosure provides the necessary conditions of access and adequate drainage.

721.12 Installation Requirements for Atmospheric Vacuum Breaker (AVB) Devices or Assemblies

1. Atmospheric vacuum breaker (AVB) devices or assemblies shall only be used for protection by containment for water service lines supplying landscaping irrigation systems. AVB devices cannot be used in lieu of pressure vacuum breaker, reduced

pressure principle, or double check valve devices or assemblies. AVB devices shall conform to the following:

a. AVB devices shall be installed in an upright position and essentially plumb.

b. AVB devices shall be installed with the critical level mark, or the bottom of the device if it has no critical level mark, a minimum of 6-inches above the highest point of downstream usage.

c. AVB devices shall not be installed where they are, or where they will be, subjected to backpressure from any cause. There cannot be any valves of any type downstream of the AVB device, nor can AVB devices be used in situations where the floating check disk or poppit will be in a closed position for more than 12-hours continuously.

e. AVB devices used for protection by containment of a landscaping irrigation system shall be installed in each zone of the irrigation system, downstream of all solenoid or zone control valves, such that when the water supply to each zone is shut-off, the float check disk, or poppit, will immediately drop.

f. AVB devices shall be protected against frost and freeze damage. Air ports for winterizing the device by means of blowing out water are acceptable upstream of the AVB device provided the air port is not, nor is likely to be, submerged.

721.13 Installation Requirements for In-Line Dual Check (IDC) Devices or Assemblies

1. In-line dual check (IDC) devices or assemblies are approved for residential and commercial locations where potable water use is limited to drinking, family cooking, bathing, and washing. The IDC device or assembly can only be installed when the lowest degree of backflow hazard exists. The IDC device or assembly shall not be subjected to any backpressure condition. IDC devices or assemblies shall conform to the following:

   a. IDC devices or assemblies shall be considered for protection by containment only when they are configured with a water meter setter or resetter. By themselves, dual in-line checks are not approved for containment unless the application has been specifically authorized by the Superintendent.

   b. IDC devices or assemblies offer the least amount of protection against backflow. The Town reserves the right to require all IDC devices or assemblies to be upgraded to devices or assemblies offering higher degrees of protection at any time it is considered wise or prudent. Customers/users are strongly urged to treat IDC devices or assemblies as a temporary compliance of having a backflow prevention device installed.

   c. IDC devices or assemblies shall not be considered in lieu of any other required backflow prevention device or assembly.

d. The Town reserves the right to require that previously installed IDC devices or assemblies not so equipped to be retro-fitted with venting or pressure relief ports, testing ports, and/or other means which would increase their effectiveness as a backflow preventer.

e. All IDC devices shall meet the appropriate standard of the ASSE.

721.14 Backflow Prevention Device Sets

1. The backflow prevention device set and connected piping or plumbing shall be firmly supported so that there is no centerline misalignment in the device set when the device or assembly is not in place. The backflow prevention device or assembly is not to be used to support nor bear the weight of other components in plumbing or piping system.

2. No part or component of the device set is to be used for any purpose other than holding and securing the backflow prevention device or assembly in place.

3. In no case shall the backflow prevention device set allow the device or assembly to rest directly upon a lower weight bearing surface. Removable blocking or approved jacks shall be used between the device or assembly and the bearing surface to provide needed support to the device or its set. Such blocking shall be of cement block, brick, or similar non-biodegradable materials.

4. Only bottom support as provided by movable blocking or approved jacks shall be in contact with the backflow prevention device or assembly. No strapping, pipe hangers, or similar supporting devices shall be attached or connected to the device or assembly itself.

5. All backflow prevention device sets shall be thoroughly flushed to remove all Construction debris and foreign matter from them and the service line or plumbing system piping prior to device installation.

721.15 Testing and Certification of Backflow Control Devices or Assemblies

1. Testing of Backflow Control Devices is the responsibility of the property owner. Devices must be tested by a Certified Cross-Connection Control Technician prior to the issuance of a Certificate of Occupancy. The successful test results must be provided to the Town before a Certificate of Occupancy will be issued.

2. Each year after the first test, the property owner will be notified in writing by the Town of the need to recertify the Backflow Control Devices at each property. The property owner will have 60-days to have all Backflow Control Devices on the referenced property tested by a Certified Cross-Connection Control Technician. If the testing is not completed in the 60-days, the Town may terminate water service to the property.

3. The inspections, tests, and replacement of Backflow Control Devices shall be the expense of the property owner.

4. Testable backflow assemblies for lawn sprinkler system of single family residences where there is no injection or mixing of fertilizer or any other foreign substances shall be tested by the owner on a schedule determined by the Town.

5. Repair Parts

   a. Only replacement parts produced by or specifically recommended by the Backflow Control Device manufacturer shall be used in the repair of the Backflow Control Devices.

   b. The reuse of parts from check valves by reversing the part will not be allowed.

6. All testing gauges used by Certified Cross-Connection Control Technicians shall be check for accuracy at least yearly, and proof of testing shall be provided to the Town upon request.

721.16 Records and Reports

1. Within 10-days of the completion of inspections, tests, or maintenance, a completed form must be submitted to the Town and to the property owner.

2. A Certified Cross-Connection Control Technician shall attach a tag to the backflow preventer or other tested devices.

721.17 Backflow Prevention Devices on Irrigation Systems

1. Per the requirements of the International Plumbing Code, all landscaping irrigation systems which use potable water shall be equipped with a proper backflow prevention device. The Town will inspect all backflow preventers upon installation. Testing of all devices will be done by a Certified Cross-Connection Control Technician, or properly trained personnel.

2. Water service lines which are dedicated solely to supplying irrigation water shall conform to all appropriate procedures and conditions based upon a hazard inspection and a determination of the necessary type of device and its installation as required for protection by containment.

3. Landscaping irrigation systems which are supplied with potable water by means of a tee in a water service line which also supplies water for other uses shall conform to the following:

   a. Air gap separations and reduced pressure principle (RP) devices or assemblies shall be acceptable in all situations.

b. All irrigation systems which have pumps, or other means of producing backpressure, chemical injection of any kind or type, or are capable of using water from another source, shall be equipped with air gap separation or reduced pressure principle (RP) devices or assemblies.

c. All irrigation systems which do not produce any backpressure and utilize only potable water from the Town's distribution system may be equipped with a reduced pressure principle valve (RP), pressure vacuum breaker (PVB), or atmospheric vacuum breaker (AVB) devices or assemblies, provided, each type of device is installed in conformance with its appropriate installation requirements.

d. Each and every pipe, water line, or other means used to provide potable water to an irrigation system shall have an approved backflow prevention device or assembly installed in it.

721.18 Backflow Prevention Devices on Fire Suppression Lines

1. Unless otherwise required by ordinance, all newly constructed or modified fire suppression systems using potable water from the Town's water distribution system shall be required to have an approved backflow prevention device or assembly installed. Modified shall mean any expansion, piping alteration or realignment, rebuilding, or piping replacement in an existing system. Such fire suppression systems shall conform to the following:

   a. Reduced pressure principle (RP) devices or assembles shall be installed whenever any chemical additive, pump, injection, or other means of producing backpressure, except for a “Siamese” type connection, is present. RP devices or assemblies shall also be installed in any situation where a second source of water is utilized, or may be utilized. All other fire suppression lines shall be protected with a double check backflow prevention device.

   b. All backflow prevention devices or assemblies shall conform to their appropriate installation requirements.

722 TEMPORARY WATER USE PERMIT REQUIRED

Temporary use of potable water from the Town's water distribution system by means of a temporary water tap, a temporary service line, a fire hydrant, or other devices shall require a permit from the Town, subject to availability. Said permit shall include provisions for payment of water used, installation of a meter, installation of an appropriate backflow prevention device, deposit and daily rental charge. The Town will require a minimum of two (2) working days advance notice prior to the issuance of any temporary water use permit. The Contractor may use their own meter after paying a deposit to the Town for the fire hydrant. At its sole discretion, the Town may suspend temporary water use permits at any time.

723 REFERENCES

Standards Referenced in Section 700:	
Number	**Title**
AWWA C104	Cement-Mortar Lining for Ductile-Iron Pipe and Fittings for Water
AWWA C105	Standard for Polyethylene Encasement for Ductile-Iron Pipe Systems
AWWA C110	Ductile-Iron and Gray-Iron Fittings, 3-inch through 48-inch, for Water and Other Liquids
AWWA C111	Rubber-Gasket Joints for Ductile-Iron Pressure Pipe and Fittings
AWWA C115	Flanged Ductile-Iron Pipe with Ductile-Iron or Gray-Iron Threaded Flanges
AWWA C150	Thickness Design of Ductile-Iron Pipe
AWWA C153	Ductile-Iron Compact Fittings for Water Service
AWWA C502	Dry-Barrel Fire Hydrants
AWWA C504	Rubber-Sealed Butterfly Valves
AWWA C509	Resilient-Seated Gate Valves for Water-Supply Service
AWWA C605	Underground Installation of Polyvinyl Chloride (PVC) Pressure Pipe and Fittings for Water
AWWA C651	Disinfecting Water Mains
AWWA C800	Underground Service Line Valves and Fittings
AWWA M23	PVC Pipe - Design and Installation