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3.1. PURPOSE

3.1.1. The purpose of this Section is to outline requirements for design, construction, inspection, and final acceptance of potable water mains and appurtenances, water service connections, and fire protection systems.

3.2. DESIGN REQUIREMENTS

3.2.1. Water system improvements shall be installed in public rights-of-way or, upon approval from the City of Lebanon, in a utility easement granted to the City of Lebanon. A utility easement shall be provided when a water main is located on private property. The utility easement width shall be no less than twenty feet (20') and shall be located over the center of the water main. Using the water main as the centerline, there shall be at least ten feet (10') of open space from the center of the water main for maintenance purposes. Water mains shall not run between residential or commercial structures unless authorized, in writing, by the City of Lebanon.

3.2.2. Each lot in a development shall be provided with a connection to the public water supply.

3.2.3. In cases where water is not available to a site, it shall be the Owner/Developer's sole responsibility and cost to extend the water main to the site.

3.2.4. It shall be the Owner/Developer's responsibility to determine if existing water mains will have the capacity to feed the development. If water main upsizing is needed it shall be the responsibility of the Owner/Developer. Copies of all sizing calculations shall be provided to the office of the City Engineer.

3.2.5. Dead end water mains shall be minimized by looping water mains with multiple feed points. Where dead ends occur, they shall terminate with a tee and plug and fire hydrant, tee and plug and flushing hydrant, water sampling station with a resilient wedge gate valve or any combination of the three devices herein described. This configuration shall be approved by the City Engineer.

3.2.6. To ensure future looping of the water system, the Owner/Developer shall install the proposed water main along the entire road frontage (including existing roadways) of the development and to all of the property boundary lines of the development. Final determination of the water extension shall be at the discretion of the City Engineer.

3.3. AMERICAN MADE PRODUCTS

3.3.1. All water main, service lines, fittings, valves, fire hydrants, and all appurtenances shall be manufactured in the United States of America.

3.4. WATER MAINS

3.4.1. Water mains are those pipes used to distribute water to service connections and public fire hydrants and are owned or under the control of the City of Lebanon. Water mains must be sized to meet present water consumption and projected average and maximum daily demands, including fire flow demand. The Owner/Developer shall provide design criteria and calculations, to establish water usage demands. A complete set of hydraulic computations, in a tabular form, shall be provided to the City of Lebanon which documents average and peak flows, ground elevations, elevations of hydraulic grade line and system operating pressures. All calculations shall be signed and stamped by a Professional Engineer registered in the State of Ohio.

3.4.2. Peak design flows shall be the greater of the following:

3.4.2.1. Flow determined by the Design Engineer as the instantaneous demand placed upon the system by the development; or

3.4.2.2. Flow required for fire protection by Insurance Services Offices of Ohio guidelines; or

3.4.2.3. Computed peak flow if development is commercial or industrial; or

3.4.2.4. As directed by the City of Lebanon under extenuating circumstances or circumstances not covered by these regulations.

3.4.3. All water mains, including those not designed to provide fire protection, shall be designed to maintain a minimum pressure of 35 psi at ground level for all flow conditions. A minimum flow of 1000 GPM at a residual pressure of 20 PSI at the highest ground elevation shall be required by the City of Lebanon for all new construction.

3.4.4. Water mains shall be the size specified by the most current City of Lebanon Water Master Plan for the water system expansion. In no case shall the size of the water main be less than eight inches (8") in diameter, unless approved, in writing, by the City Engineer.

3.4.5. The required depth of cover over the top of a water main and all fire hydrant branches shall be no less than four feet (48"). Any water main installed in a trench over five feet (60") in depth must first have the approval of the City Engineer.

3.4.6. Fire hydrant branch lines shall be the size specified by the City of Lebanon. In no case shall branch lines for fire hydrants be less than six inches (6") in diameter.

3.4.7. Water mains not designed nor intended to carry fire flows shall not have fire hydrants connected.

3.5. WATER SERVICE LINES

3.5.1. Water service lines are those water lines that tap off the water main and provide potable water service to a specific property or water user. All water service lines shall be connected to a designated City of Lebanon water main.

3.5.2. The Owner/Developer shall install the corporation stop, service line with appropriate gooseneck application, curb stop, and curb box in an approved manner from the water main to the Right-of-Way. Where applicable, a minimum of ten-foot (10') extension of the water service shall be provided to avoid conflicts with future sidewalks and utilities.

3.5.2.1. Curb stop boxes shall be the responsibility of the Developer. The developer may install the curb stop boxes at the time of utility installation, or the Developer may elect to have the curb stop boxes installed at the time of home construction. In either case bonds will not be released until properly installed curb stop boxes are in place.

3.5.3. The water service line and curb stop and box shall run in a perpendicular manner from the water main to the Public Right-of-Way line, or an area approved by the City of Lebanon in writing. A ten-foot (10') horizontal distance between water service lines and sewer laterals shall be maintained at all times. The intent is for the water service line and the sewer lateral to run parallel from the main connections to the residential or commercial buildings in a perpendicular manner.

3.5.4. All curb stops and boxes shall be placed within the Right-of-Way.

3.5.5. The City of Lebanon maintenance responsibility for the water service line shall be as described herein:

3.5.5.1. Where the water meter is located outside of the building and within the right of way the City of Lebanon will be responsible for the maintenance of the water service from the tap to the water meter, not including the outlet connection. The owner of premises served shall be responsible for the operation, maintenance, repair and reconstruction of the building water service line from the building to the point of connection with the water meter, including the outlet connection.

3.5.5.2. Where the water meter is located outside of the building and outside of the right of way the City of Lebanon shall be responsible for repairs from the public water main to the curb stop, including the curb stop. The owner of premises served shall be responsible for the operation, maintenance, repair and reconstruction of the building water service line from the building to the point of connection with the curb stop, including the outlet connection. The owner of the premise will also be responsible for the operation, maintenance, repair and reconstruction of the building water service line from the water meter to the curb stop.

3.5.5.3. Where the water meter is located inside the building the City of Lebanon shall be responsible for repairs from the public water main to the curb stop, including the curb stop. The owner of premises served shall be responsible for the operation, maintenance, repair and reconstruction of the building water service line from the inlet of the water meter to the curb stop located at the right of way.

3.5.5.4. In all cases, the water meter and the inlet coupling is the responsibility of the City of Lebanon.

3.5.6. Water service lines shall comply with the following:

3.5.6.1. From the water main to the curb stop, the minimum diameter of water service lines shall be one inch.

3.5.6.2. From the curb stop to the structure, the minimum diameter of water service lines shall be as determined by the current plumbing code.

3.5.6.3. Only the following materials are acceptable for water service lines:

3.5.6.3.1. All service lines less than three inches (< 3”) shall be Type K Copper tubing.

3.5.6.3.1.1. In certain cases where the service line will be in a length in excess of 100’, plastic water service may be used with written approval of the City Engineer.

3.5.6.3.1.1.1. If a plastic water service is installed, a trace wire shall be installed. The trace wire shall be terminated and made accessible in the curb stop box to allow future location of the water service.

3.5.6.3.1.1.2. If a plastic water line is installed, the plastic water line shall not protrude through the foundation/footer. The penetration shall only be made with Type K copper pipe. A minimum of 25 feet of buried Type K copper shall be provided between the point of foundation/footer penetration and the plastic water service material.

3.5.6.3.2. All service lines 3 inches and larger (≥ 3”) shall be Class 53 ductile iron pipe. All ductile iron pipe, bends, and fittings shall comply with the standards set forth for water mains.

3.5.7. All water service lines, from the water main to the structure, shall be covered with a minimum of forty-eight inches (48") and a maximum of sixty inches (60") of backfill material, measured from the top of the water service pipe to the final finished ground level.

3.5.8. All reasonable efforts to avoid placing a water service under driveways or walkways shall be made.

3.6. WATER PUMPING FACILITIES

3.6.1. General

3.6.1.1. All water pumping facilities shall be designed in accordance with the Recommended Standards for Water Works (10 States Standards) and shall be subject to the approval of the Director of Water and Wastewater and the City Engineer.

3.6.2. Pumps

3.6.2.1. All pumps shall be Gorman Rupp Pumps.

3.6.2.2. At least two pumping units shall be provided. With any pump out of service, the remaining pump or pumps shall be capable of providing the maximum pumping demand of the system. The pumping units shall:

3.6.2.2.1. Have ample capacity to supply the peak demand against the required distribution system pressure without dangerous overloading.

3.6.2.2.2. Be driven by prime movers able to meet the maximum horsepower condition of the pumps,

3.6.2.2.3. Be provided with readily available spare parts and tools,

3.6.2.2.4. Be served by control equipment that has proper heater and overload protection for air temperature encountered.

3.6.2.3. Duplicate Pumps

3.6.2.3.1. Each booster pumping station shall contain not less than two pumps with capacities such that peak demand can be satisfied with the largest pump out of service.

3.6.2.4. Metering

3.6.2.4.1. All booster pumping stations shall be fitted with a flow rate indicating and totalizer meter.

3.6.2.5. Inline Booster Pumps

3.6.2.5.1. In addition to the other requirements of this section, inline booster pumps shall be accessible for servicing and repairs.

3.6.3. Automatic and Remote Controlled Stations

3.6.3.1. All automatic stations shall be provided with automatic signaling apparatus which will report when the station is out of service. All remote controlled stations shall be electrically operated and controlled and shall have signaling apparatus of proven performance. Installation of electrical equipment shall conform with the applicable state and local electrical codes and the National Electrical Code.

3.6.3.2. SCADA Integration

3.6.3.2.1. All equipment related to the pump station shall be provided with all items necessary to be integrated into the City of Lebanon's SCADA system.

3.6.3.3. Standby Power

3.6.3.3.1. To ensure continuous service when the primary power has been interrupted, a power supply shall be provided from at least two independent sources or a standby or an auxiliary source shall be provided. If standby power is provided by onsite generators or engines, the fuel storage and fuel line must be designed to protect the water supply from contamination. See section 4.20.4. for generator set requirements.

3.6.3.3.2. Carbon monoxide detectors shall be provided when generators are housed within pump stations.

3.6.3.4. Water Pre-Lubrication

3.6.3.4.1. When automatic pre-lubrication of pump bearings is necessary and an auxiliary direct drive power supply is provided, the pre-lubrication line shall be provided with a valved bypass around the automatic control so that the bearings can, if necessary, be lubricated manually before the pump is started or the pre-lubrication controls shall be wired to the auxiliary power supply.

3.7. FIRE PROTECTION

3.7.1. Fire suppression systems may utilize a City of Lebanon standard fire meter pit. If a fire meter pit is utilized, separate taps for fire suppression systems shall not be permitted. A detail of the City of Lebanon Standard Fire Meter Pit is included in the Appendix.

3.7.2. If a fire meter pit is not utilized, a separate tap for the fire suppression system and for the domestic water service may be provided. All required fire line valves (gate valves and double check valves) shall be located at the point of entry of the fire suppression line to the structure.

3.7.2.1. A remote Fire Department Connection (FDC) shall be provided. The location of the FDC shall be determined by the City of Lebanon Fire Department.

3.7.3. Fire lines shall be located in a separate trench from the domestic water service lines. The separation shall be no less than four feet from pipe edge to pipe edge, unless approved in writing by the City of Lebanon.

3.7.4. Water lines designed or constructed to carry water for fire protection shall comply, as a minimum, with the material and construction method requirements for water mains.

3.7.5. All fire protection lines shall be constructed of Class 53 ductile iron unless otherwise approved by the City of Lebanon, in writing. Joints and fittings shall comply with the standards set forth for water mains.

3.7.6. All water lines constructed for the purpose of fire lines shall have, at the point of entry (POE), an OEPA approved backflow device and shall conform to and abide by all rules and regulations contained in the City of Lebanon's Backflow/Cross Connection Control Program.

3.7.6.1. An ASSE 1015 Double Check Detector Check may be allowed upon condition of a written document stating no chemicals will be added to this fire line.

3.7.7. Fire hydrants and their drainage systems shall not be connected to or located within ten feet (10') of sanitary sewers or storm drain systems, unless approved in writing by the City of Lebanon.

3.8. SEPARATION OF WATER AND SEWER LINES

3.8.1. Water mains shall be laid at least ten feet (10') horizontally from any existing or proposed sewer. The distance shall be measured edge to edge. In cases where it is not practical to maintain a ten-foot (10') separation, the City of Lebanon may allow deviation on a case-by-case basis, if supported by data from the Design Engineer. Such deviation may allow installation of the water main closer to a sewer, provided that the water main is laid in a separate trench or on an undisturbed earth shelf located on one side of the sewer at such an elevation that the bottom of the water main is at least eighteen inches (18") above the top of the sewer.

3.8.2. Water mains crossing sewers shall be laid to provide a minimum vertical distance of eighteen inches (18") between the outside of the water main and the outside of the sewer. This shall be the case where the water main is either above or below the sewer. At crossings, one full length of water main shall be located so both joints will be as far from the sewer as possible. Special structural support for the water and sewer pipes may be required. Any deviations from these standards will first be submitted in writing from the Design Engineer to the City of Lebanon for final determination. The City of Lebanon shall have final determination on all exceptions, and place such determinations in writing.

3.8.3. No water main or service shall pass through or come in contact with any part of a sewer manhole, sewer main, sewer lateral, or any other sewer appurtenance.

3.8.4. Design engineers shall exercise caution when locating water mains at or near certain sites such as sewage treatment plants or industrial complexes. Individual septic tanks shall be located and avoided. The Design Engineer must contact the City of Lebanon to establish specific design requirements for locating water mains near any source of contamination.

3.8.5. Surface water crossings present special problems. The City of Lebanon shall be consulted before any plans are prepared.

3.8.6. Aerial water main crossings are discouraged. If situations arise that require aerial crossings, they shall be adequately supported and anchored, protected from damage and freezing, and accessible for repair or replacement.

3.8.7. Underwater main crossings shall have a minimum cover of four five (5') over the pipe. Open cut installations shall be encased in concrete. Installations that are bored and jacked shall be installed within a casing pipe.

3.8.7.1. When crossing water courses which exceed fifteen feet (15') in width, the following shall be provided on both sides:

3.8.7.1.1. The pipe shall be of special construction, for the purpose of underwater construction;

3.8.7.1.2. Valves shall be provided on both sides of the water crossing so that the section can be easily isolated for testing or repair;

3.8.7.1.3. The valves shall be easily accessible, and not subject to flooding;

3.8.7.1.4. Both valves shall be in a manhole with a one inch (1") corporation stop tapped into the top of the water main approximately one foot (1') on each side of the valves for the purpose of disinfection and testing.

3.9. DUCTILE IRON PIPE, FITTINGS AND JOINTS

3.9.1. Water mains shall be constructed of Class 53 ductile iron unless otherwise approved by the City of Lebanon, in writing.

3.9.2. Ductile iron pipe shall be designed in accordance with the latest revision of ANSI/AWWA C150/A21.50 for a minimum 150 psi (or project requirements, whichever is greater) rated working pressure plus a 100 psi minimum surge allowance; a 2 to 1 factor of safety on the sum of working pressure plus surge pressure.

3.9.3. Ductile iron pipe shall be manufactured in the U.S.A. in accordance with the latest revision of ANSI/AWWAC151/A21.51. Each pipe shall be subjected to a hydrostatic pressure test of at least 500 psi at the point of manufacture.

3.9.4. Pipe shall have standard asphaltic coating on the exterior with a cement mortar lining on the interior in accordance with the most current revision of ANSI/AWWA C104/A21.4.

3.9.5. The class or nominal thickness, net weight without lining, and casting period shall be clearly marked on each length of pipe. Additionally, the manufacturer's mark, country where cast, year in which the pipe was produced, and the letters "DI" or "Ductile" shall be cast or stamped on the pipe.

3.9.6. All pipe shall be furnished with push-on type joints, such as "Tyton" or "Fastite" unless mechanical joints with Mega-Lugs are required by the City of Lebanon. Joints shall be in accordance with ANSI/AWWA C111/A21.11, of latest revision, and be furnished complete with all necessary accessories. Field-LOK gaskets or approved equal may be required by the City of Lebanon where designated by the City of Lebanon Engineer. In all cases, Field-LOK gaskets or approved equal shall be required by the City of Lebanon for the first three (3) joints upstream and/or downstream of all bends, tees, reducers, and plugs/caps.

3.9.7. Fittings shall be manufactured in the U.S.A. and be either ductile iron or gray iron. Ductile iron fittings shall conform to the latest revisions of either ANSI/AWWA C110/A21.10 or ANSI/AWWA C153/A21.53. Gray iron fittings shall be in accordance with ANSI/AWWA C110/A21.10, or latest revision. Fittings shall have a standard asphaltic coating on the exterior and a cement mortar lining on the interior in accordance with ANSI/AWWA C104/A21.4, of latest revision.

3.9.8. All mechanical joints shall be restrained by the use of Mega-Lugs.

3.9.9. Fittings and accessories shall be furnished with either mechanical or push-on type joints in accordance with ANSI/AWWA C111/A21.11, or latest revision.

3.9.10. All pipe, fittings, and accessories shall be installed and tested in accordance with the latest revision of AWWA Standard C600. Newly installed ductile iron water mains shall be disinfected in accordance with the latest revision of AWWA Standard C651 prior to placing in service.

3.9.11. Mechanical joints, as well as plain and bell ends of fittings, shall conform to the dimensions set forth in AWWA C111-90 (ANSI A 21.11). The cleaning and assembly of pipe and fitting joints shall be in accordance with the manufacturer's recommendations.

3.9.12. Care is to be taken when loading and unloading ductile iron pipe and its appurtenances. Improper handling may result in damage. Damaged material will not be accepted by the City of Lebanon.

3.10. POLYETHYLENE ENCASEMENT

3.10.1. All ductile iron pipe and ductile or gray iron fittings shall be protected by an eight-mil thick polyethylene encasement meeting the requirements of ANSI A21.5.

3.10.2. Polyethylene Encasement will not be required if a geotechnical investigation performed by a Professional Engineer registered in the State of Ohio indicates that the soils in the project area are not subject to corrosivity or conductivity and therefore will not be detrimental to the pipe material. Copies of all boring logs, a map indicating the location of the bores and a written report shall be provided to the Office of the City Engineer.

3.11. ENCASEMENT PIPE

3.11.1. Encasement pipe shall be steel, plain end, uncoated, unwrapped, have a minimum yield point strength of 35,000 PSI, and conform to ASTM A252 Grade 2 of ASTM Al30 Grade B without hydrostatic test. The steel pipe shall have welded joints and be in at least 18-foot lengths.

3.11.2. Wall thickness and encasement pipe diameter shall comply with all applicable ODOT and railroad authority requirements.

3.11.3. Stainless steel casing spacers (Cascade Waterworks, Mfg.) or their approved equal will be installed on the water main in the encasement pipe per the manufacturer's recommendations. After the water main has been installed, inspected, and tested as specified, both ends of the cover pipe shall be closed with brick or concrete block masonry and the encasement pipe shall be filled completely with sand in a manner acceptable to the City of Lebanon.

3.12. WATER MAIN APPURTENANCES

3.12.1. Valves

3.12.1.1. Sufficient valves shall be provided on water mains so that inconvenience and sanitary hazards will be minimized during repairs. Valves shall be located at all intersections and not more than 500-foot intervals in commercial/industrial districts and not more than one block or 800 feet in other districts. The final determination for the location, amount, and style of valves shall rest with the City of Lebanon.

3.12.1.2. Valves required in valve vaults shall have one-inch (1") corporation stops tapped into the top of the water main approximately one foot (1') on both sides of the resilient wedge gate valve. This one-inch (1") corporation stop will be utilized to inject disinfectant for new main construction and serve as a future disinfection or testing station.

3.12.1.3. All water valves sixteen inches (16") in diameter and larger shall be flanged butterfly valves unless otherwise approved by the City Engineer. All flanged butterfly valves shall have a gear operated closing mechanism.

3.12.1.4. All gate and butterfly valves shall open by turning left (close clockwise).

3.12.2. Gate Valves

3.12.2.1. Gate valves shall be of resilient wedge type.

3.12.2.2. Standards: Unless otherwise stated, the valves shall conform to the latest revisions of the following American Water Works Standards:

3.12.2.2.1. AWWA C515 Standard for Resilient-Seated Gate Valves for Water Supply Service

3.12.2.2.2. AWWA C111 American National Standard for Rubber-Gasket Joints for Ductile-Iron Pressure Pipe and Fittings

3.12.2.2.3. AWWA C550 Standard for Protective Epoxy Interior Coatings for valves and Hydrants

3.12.2.2.4. AWWA C600 Installation of Ductile Iron Water Mains and Their Appurtenances

3.12.2.3. Gate valves shall be rated at 200 psi water working pressure with 400 psi hydrostatic test for structural soundness for 3" through 12". Testing shall be conducted in accordance with AWWA C515.

3.12.2.4. Valve Design: Resilient wedge gate valves and tapping valves shall be designed in accordance with the following requirements:

3.12.2.4.1. M.J. bolts and nuts. Glands shall be full body gray iron or ductile iron. Mechanical joint bells, glands and rubber gaskets shall be in accordance with AWWA C111.

3.12.2.4.2. Valve Ends

3.12.2.4.2.1. Flange ends shall conform to Section 4.4.1.4.1 of AWWA C515.

3.12.2.4.2.2. Push-on joints shall conform to AWWA C111 and shall be furnished with suitable gaskets and sufficient lubricant.

3.12.2.4.2.3. Tapping valve inlet end shall conform to Sec. 4.4.1.4.4 of AWWA C515 with the face finished in accordance with MSS SP-60, and shall be furnished with a suitable gasket. Tapping valve shall be furnished with bolts and nuts of 300 series 18-8 stainless steel, low zinc bronze, or approved equal for the inlet end.

3.12.2.4.2.4. Tapping valve outlet end shall have mechanical joint and shall be capable of accommodating a Mueller Machine for tapping the pipe. Accessories shall be furnished in accordance with the above paragraph.

3.12.2.4.3. Exterior Fasteners – All exterior fasteners, including all bonnet and seal plate bolts and nuts, plugs and external accessories shall be made from low zinc bronze or 300 series 18-8 stainless steel or approved equal corrosion resistant material.

3.12.2.4.4. All ductile iron (DI) shall conform to A536 Gr. 65-45-12. Castings shall be clean and sound without defects that will impair their service. No plugging or welding of such defects will be allowed.

3.12.2.4.5. Stem Seal – The valve stem seal shall be O-rings in conformance with AWWA C515 and shall be so designed that the O-ring above the stem collar can be replaced while the valve is under pressure and in the fully open or fully closed position.

3.12.2.4.6. Valve Stem – Valve stem, stem nut and stem collar shall be made of low zinc bronze or approved equal material and shall be designed in accordance with Section 4.4.5 of AWWA C515. Stems shall have a minimum tensile strength of 60,000 psi, a minimum yield of 20,000 psi for a 20” valve. Valves 3” and 4” in diameter shall be designed for an input torque of 300 foot pounds at the fully opened or fully closed positions, without distortion of any kind to the valve or its components. Valves 6” thru 12” in diameter shall be designed for an input torque of 450 foot pounds at the fully opened or fully closed positions, without distortion of any kind to the valve or its components.

3.12.2.4.7. Direction to open – The valves shall open by turning the operating nut to the Left (counter-clockwise)

3.12.2.4.8. Gate and Valve Seats – Gate material may be gray iron, ductile iron or bronze. The valve gate shall be fully encapsulated in rubber, which shall be bonded or vulcanized to the gate in compliance with Section 4.4.2.1.1 of AWWA C515. Mechanical means of attaching the valve seat to the gate are not permitted. The gate and the rubber encapsulation shall be so designed as to provide a positive stop, without damaging rubber encapsulation or the epoxy.

3.12.2.4.9. Guides – Valve shall have guides in compliance with Section 4.4.3 of AWWA C515. Guide ‘Inserts’ made of suitable material, are optional.

3.12.2.4.10. Throttling Service - Valve shall be capable of being used for throttling without chatter, vibration or wear to the valve or to the water main.

3.12.2.4.11. Coating - Both inside and outside of the valve shall receive at least 5 mil thick fusion bonded epoxy coating in compliance with AWWA C 550.

3.12.3. Butterfly Valves

3.12.3.1. All butterfly valves shall be of the rubber-sealed, tight-closing type designated, manufactured and tested in conformance to AWWA Standard C504, latest revision. All valves shall be M&H style 4500 Class 250 butterfly valves, or approved equal by the City of Lebanon. All valves shall be National Standard Foundation (NSF) approved.

3.12.3.2. Valve Ends

3.12.3.2.1. Both ends shall be AWWA C111 mechanical joint or per flanged ANSI B16.1 (or as otherwise noted on plans and specs) per AWWA Standard C111.

3.12.3.3. Valve Shaft

3.12.3.3.1. Valve shafts shall be 18-8 Type 304 stainless steel. Each valve shaft shall be of a one piece design for valves 12" and smaller and a two piece design for valves 14" and larger. Valve shafts shall have a minimum diameter extending through the valve bearings and into the valve disc as specified in AWWA C504, Table 3. As well, all valve shafts must meet or exceed the minimum connection torque requirement set forth in AWWA C504, Section 4.5.3.2.

3.12.3.4. Valve Body and Disc

3.12.3.4.1. For valve sizes 3" - 16", valve body and disc shall be high strength cast iron to ASTM A 126, Class B or high strength ductile iron to ASTM A536 with ASTM A276 Type 304 stainless steel body seats.

3.12.3.4.2. Valves 18" and larger, Valve body shall be of high strength ductile iron to ASTM A536, Grade 65-45-12 with ASTM A276 Type 304 stainless steel body seat. Valve disc shall be high strength cast iron to ASTM A 126, Class B.

3.12.3.5. Valve Seat

3.12.3.5.1. Rubber valve seats shall be a full-circle 360-degree seat not penetrated by the valve shaft. Valve seat may be Buna-N or Buna-S for cold water applications and EPDM for high temperature applications.

3.12.3.5.2. The valve seat will be attached to the valve disc by ASTM A276 Type 304 stainless steel self-locking fasteners. The valve seat must be easily field adjustable and replaceable without any special tools or lengthy curing time.

3.12.3.6. Shaft Seals

3.12.3.6.1. Valve shaft seals shall be of the O-ring type and utilize the same elastomer as specified for the valve seats and for the intended service. Valves using self-compensating split V-type packing will not be accepted. All valve shaft seals must be easily field replaceable.

3.12.3.7. Valve Operator

3.12.3.7.1. Valve operators shall be of the traveling nut type, sealed , gasketed and lubricated for underground or in-plant service. Operator shall be capable of withstanding an overload input torque of 450 ft-Ibs. at full-open or full-closed position without damage to the valve operator. Operators for valves 14" and larger must have a 304 stainless steel external stop limiting device and travel adjustment. The travel adjustments must be able to be operated without removing the valve from the line or removing the actuator cover. No internal travel adjustment devices will be acceptable. All valve actuators must be sized per AWWA C504, Latest edition torque requirements. Certification of proof of design and torque requirements shall be submitted to the owner during shipment.

3.12.3.7.2. All manual operators for service other than underground shall have a position indicator and shall be totally enclosed and permanently lubricated. In any event, a maximum pull of 80 pounds on the crank or wheel shall produce full C50A Table 1 output torque throughout entire travel. Operators shall be of the "Traveling Nut" type.

3.12.3.8. Coatings

3.12.3.8.1. The valve interior and exterior surfaces shall be coated in accordance with the latest revisions of AWWA C504 and must be NSF 61 certified.

3.12.3.9. Miscellaneous Requirements

3.12.3.9.1. All valves shall close by turning the operator nut or handwheel in a clock-wise direction (open left). The operator shall be capable of meeting the torque requirements for opening and closing the valve against the pressure and flow rate specified.

3.12.3.9.2. All valves shall be tested for leakage at rated pressure, and tested hydrostatically at two times rated pressure-all in conformance with AWWA Standard C504, latest revision.

3.12.4. Tapping Sleeves and Valves

3.12.4.1. Tapping sleeves for connecting to existing water mains shall either be of the flanged type suitable for working pressures of 250 psi and shall be Mueller No. H - 615, American-Darling No. 1004, or approved equal, or stainless steel tapping sleeves with removable bolts and 360 degree gasket and shall be Ford Style FTSS, FST or equal approved by the City of Lebanon.

3.12.4.2. Resilient Wedge Tapping valves shall be of the flanged type suitable for working pressures of 250 psi and shall conform with the latest revision of AWWA Standard for Gate Valves for Ordinary Water Works Service, AWWA C515. Valves shall be manufactured by Clow, Darling, Kennedy, Waterous, or equal approved by the City of Lebanon.

3.12.5. Valve Boxes

3.12.5.1. Standard valve boxes shall be manufactured in the U.S.A. and shall be of 5.25-inch standard cast iron three-piece, screw type valve box with drop cover marked "WATER".

3.12.5.2. Valve Boxes shall be of the following type:

3.12.5.2.1. Tyler Union 6860 or approved equal by the City of Lebanon.

3.12.5.3. Valve boxes shall be accurately centered over the valve-operating nut, and backfill shall be compacted thoroughly about them. Valve box bases shall not rest on the valves but shall be supported on crushed stone fill, concrete block or brick for stabilization. The box shall be set vertically and properly cut and/or adjusted so that the tops of boxes will be at grade in any paving, walk, yard or road surface.

3.12.5.4. All valve boxes not placed in paved areas shall have a circular concrete collar surrounding the top of the valve box. The collar shall extend a minimum of six inches (6”) past the outside of the valve box and shall be a minimum of six inches (6”) thick. The concrete collar and valve box shall be flush with final grade.

3.12.6. Corporation Stops

3.12.6.1. All corporation stops 2” and under shall be Ford Model FB1000 or an equal approved by the City of Lebanon.

3.12.6.2. All corporation stops shall have an AWWA/CC Taper thread inlet.

3.12.6.3. All corporation stops shall have a pack joint outlet.

3.12.6.4. All corporation stops shall be capable of withstanding 300 PSI working pressure.

3.12.7. Curb Stops

3.12.7.1. All curb stops 2” and under shall be Ford Model B44 or an equal approved by the City of Lebanon.

3.12.7.2. All curb stops shall have pack joint ends on both the inlet and outlet side.

3.12.7.3. All curb stops shall be capable of withstanding 300 PSI working pressure.

3.12.8. Curb Stop Boxes

3.12.8.1. All curb stop boxes shall be manufactured in the U.S.A. and shall be standard cast iron two-piece, screw type valve box with screw lock cover marked "WATER". The inside diameter shall be 2-1/2".

3.12.8.2. The curb stop box shall be properly centered over the curb stop as to allow operation of the curb stop via a standard key.

3.12.9. Fire Hydrants

3.12.9.1. Fire hydrants installed within the City of Lebanon shall comply with the latest published specifications of the City of Lebanon as to material type, performance and placement.

3.12.9.2. Hydrants shall be provided at each street intersection and at intermediate points between intersections as recommended by the Insurance Services Office of Ohio and the City of Lebanon. Fire hydrant spacing shall not exceed 400 feet in residential areas, and shall not exceed 250 feet in commercial and industrial areas.

3.12.9.3. Fire hydrants installed outside of the City of Lebanon, but connected to the City of Lebanon water system shall comply with the requirements specified herein and be spaced as follows:

3.12.9.3.1. In commercial/industrial zones, fire hydrants shall be spaced or located not more than 250 feet apart.

3.12.9.3.2. In residential zones, fire hydrants shall be spaced or located not more than 400 feet apart.

3.12.9.4. The Contractor shall furnish and install fire hydrants where shown on the plans. Hydrant barrels shall have a safety breakage feature (traffic model) above the ground line. All hydrants shall have a six-inch (6") flanged shoe connection, two, two and one half inch (2.5") discharge nozzles national standard thread (NST) and one five inch (5") inside diameter (I.D.) Storz compatible pumper nozzle with caps fitted with cap chains. Connection threads and operation nuts shall conform to the National Standard Specifications as adopted by the National Board of Fire Underwriters.

3.12.9.5. The operation nut shall be pentagonal in shape and shall open by turning to the right (clockwise) (close left) with National Standard threads on the hydrant caps.

3.12.9.6. The main valve closure shall be of the compression type, opening against the pressure and closing with the pressure. Traffic feature shall be designed so that the nozzle section of the hydrant can be rotated (by degree) through a full 360-degree circle during field installations, if necessary.

3.12.9.7. The main valve opening shall not be less than five and one quarter inch (5.25") and be designed so that the seat, drain valve mechanism, internal rod and all working parts can be removed through the top of the hydrant. These parts shall be removable without disturbing the ground line joint or the nozzle section of the hydrant. The bronze seat shall be threaded into mating threads of bronze for easy field removal. The lower barrel section shall be made of ductile iron.

3.12.9.8. The draining system of the hydrant shall be bronze and shall be activated by the main stem without the use of an auxiliary rod, toggles, pins, etc. The drain mechanism shall be completely closed after no more than three turns of the operating nut in the opening direction. There shall be a minimum of two (2) inside ports and four (4) drain port outlets to the exterior of the hydrant. Drain shut-off shall be by direct compression closure. Sliding drain seals are not acceptable.

3.12.9.9. The operating nut, main stem, coupling, and main valve assembly shall be capable of withstanding input torque of 200 ft/lbs, in opening or closing directions. There shall be an internal top housing with triple O-Rings to seal operating threads from the waterway and accommodate an anti-friction washer.

3.12.9.10. Hydrant bonnet assembly shall be provided with a grease reservoir and lubrication system that automatically circulates lubricant to all operating stem threads and bearing surfaces each time the hydrant is operated. Downward stem travel shall be limited by a travel stop located in the upper housing of the hydrant.

3.12.9.11. Nozzle sections of the hydrant shall be designed to permit field replacement of damaged threads without special tools, excavation, or disturbance of the ground line joint. Bronze nozzles are to be locked into hydrant barrel with locking lugs and be sealed by a heavy duty O-Ring. The threading of nozzles and the shape of operating nuts are to be of National Standard.

3.12.9.12. Fire Hydrants shall be located not more than six feet (6') nor less than two feet (2') from the back side of the curb or from the edge of existing or proposed edge of pavement unless otherwise approved by the City Engineer. Hydrants shall be installed with a vertical distance from the center of the pumper nozzle to the ground of sixteen to eighteen inches (16" - 18"). All fire hydrants shall be provided with no less than a six-inch (6") resilient wedge gate valve attached to no less than a six-inch (6") ductile iron hydrant branch connected to the water main. No water service or water testing line shall be permitted between the fire hydrant watch valve and the fire hydrant. Fire Hydrant set-backs shall be determined by the City Engineer at the time when improvement plans are submitted by the Owner/Developer, and are reviewed by the City of Lebanon.

3.12.9.13. The fire hydrant watch valve shall be attached directly to an anchor tee, unless approved otherwise, in writing, by the City of Lebanon.

3.12.9.14. Fire hydrants shall be secured to the shut off valve by AWWA approved restraint joints, rodding with four (4) equally spaced all thread rods and Mega-Lugs or another method approved by the City of Lebanon. Where fire hydrant branches exceed one (1) pipe length, Field-LOK gaskets shall be required.

3.12.9.15. Hydrants shall be American Darling B-62-B and shall be painted white with green caps.

3.12.9.16. Fire hydrant watch valve boxes shall be of 5.25 inch standard cast iron, three-piece, screw type valve box with a drop cover marked “water”, East Jordan Iron Works Series 6860 or approved equal by the City of Lebanon. Valve boxes shall be accurately centered over valve operating nut, with backfill thoroughly compacted around them. The valve box base shall not rest on the valves but shall be supported on crushed stone fill or block footers. Valve boxes shall be set vertically and properly cut and/or adjusted so that the top of the boxes will be at grade in any paving, walk, or road surface.

3.12.10. Air Release Valves and Boxes

3.12.10.1. Air release valves shall be the combined vacuum and air release type and shall be equipped with cast iron body and cover, stainless steel float, Buna-N seat and bronze linkage. Valve shall have one inch threaded inlet and be suitable for 150 psi working pressure. Valve shall be APCO No. 200-A or equal approved by the City of Lebanon.

3.12.10.2. Air release valves shall be installed at the high point on the water main as shown on the approved plans. They shall be connected to the main by a corporation stop with inside IPS threaded outlet. The inlet pipe to the air release valve shall be ASTM B43 extra strong seamless red brass pipe with IPS male threaded ends and isolation valve.

3.12.10.3. Outside of the Right-of-Way, the air release valve box shall be 24 inch reinforced concrete pipe conforming to ASTM C76, Class II, Wall B, and shall be set on a round, washed, crushed stone or gravel base. The cover shall be cast iron, heavy duty, perforated and of the size to fit the bell of the pipe.

3.12.10.4. Inside of the Right-of-Way, the air release valve shall be housed in a City of Lebanon Standard Valve Vault. A detail of this vault can be found in the Appendix.

3.12.11. Blow offs

3.12.11.1. Blow-offs shall only be installed at the direction of the City of Lebanon. Approved fire hydrants shall be used in place of blow-offs wherever possible. The City Engineer shall have the final determination for the application of blow-offs and the substitution of blow-offs with approved fire hydrants.

3.12.12. Fire Protection Lines

3.12.12.1. All fire suppression systems shall utilize a standard City of Lebanon fire meter pit or a Domestic/Fire Line split located within the structure. Separate taps for the domestic and fire service lines shall not be permitted. A copy of the Fire Meter Pit and Domestic/Fire Line standard drawings are included in the Appendix.

3.12.12.2. water service lines to be used for private fire protection systems (i.e., sprinkler systems) shall have an OEPA approved backflow preventer installed at the point of entry (POE) to the building.

3.12.12.2.1. An ASSE 1015 Double Check Detector Check is acceptable with written guarantee that no chemicals will be added to the fire line.

3.12.12.3. All fire protection service lines shall be constructed of Class 53 ductile iron pipe and ductile iron fittings to the structure.

3.12.12.4. Fire suppression systems are to be tested and installed by licensed fire protection system contractors.

3.12.13. Sampling Stations

3.12.13.1. Permanent water quality sampling stations shall be installed with each section of a development at a location determined by the City Engineer.

3.13. TRENCH EXCAVATION

3.13.1. Unless specifically directed otherwise by the City Engineer, not more than 500 feet of trench shall be opened ahead of the pipe laying work of any one crew and not more than 500 feet of trench shall be allowed to remain open behind the work.

3.13.2. All backfilled ditches shall be maintained in such a manner that they will offer no hazard to the passage of traffic. The convenience of the traveling public and property owners abutting shall be taken into consideration. All public or private drives shall be taken into consideration and shall be promptly backfilled or bridged. Excavated materials shall be disposed of so as to cause the least interference.

3.13.3. Trenches in which pipes are to be laid shall be excavated via open cut to the depths shown on the approved plans. The minimum allowable trench width shall not be less than the outside diameter of the pipe plus eight inches (8”). Where rock is encountered, it shall be removed to a minimum depth of four inches below the pipe bells.

3.13.4. Unless specifically authorized by the City Engineer, trenches shall in no case be excavated or permitted to become wider than two feet six inches (2' - 6 "), plus the nominal diameter of the pipe at the level of or below the top of the pipe.

3.13.5. All excavated materials shall be placed a minimum of two feet (2’) back from the edge of the trench.

3.13.6. Where conditions exist that may be conducive to slides or cave-ins, proper and adequate sheeting, shoring and bracing shall be installed to provide safe working conditions and to prevent damage of work.

3.13.7. It is the Contractor’s sole responsibility to maintain safe working conditions on the job site and to conform to "Specific Safety Requirements Relating to Construction of the Industrial Commission

of Ohio", "Construction Safety and Health Regulations, Part 1926, Subpart P "Occupational Safety and Health Administration", U. S. Department of Labor, and all local laws, ordinances, and regulations.

3.13.8. Trenches shall be kept free of water during the laying of pipe until the pipeline has been backfilled.

3.14. OBSTRUCTIONS

3.14.1. In cases where storm sewers, sanitary sewers, gas lines, water lines, telephone lines, and other utilities, or other underground structures are encountered, they shall not be displaced or disturbed unless necessary, in which case, they shall be replaced as approved by the City of Lebanon, as quickly as possible.

3.15. SHORING, SHEETING, AND BRACING

3.15.1. The shoring, sheeting, and bracing of excavations shall be performed by the Contractor in compliance with applicable safety codes and OSHA requirements.

3.15.2. Where unstable material is encountered or where the depth of excavation in earth exceeds five feet (5'), the sides of the trench or excavation shall be supported by substantial sheeting, bracing and shoring, or the sides shall be sloped to the angle of repose. Sloping the sides of the ditch to the angle of repose will not be permitted in streets, roads, narrow rights-of-way or other constricted areas unless otherwise specified. The design and installation of all sheeting, sheet piling, bracing and shoring shall be based on computations of pressure exerted by the materials to be retained under construction conditions. Adequate and proper shoring of all excavations shall be the entire responsibility of the Contractor; however, the City Engineer may require the submission of shoring plans (accompanied by supporting computations) for review prior to the Contractor undertaking any portion of the work. All submitted calculations shall be performed by, and signed and stamped by a professional Engineer registered in the State of Ohio.

3.15.3. Excavations to be made below the depth of an existing foundation shall be supported by shoring, bracing or underpinning as long as the excavation shall remain open, or thereafter, if required to insure the stability of the structure supported by the foundation. The Contractor shall be held strictly responsible for any damage to said foundation.

3.15.4. Solid sheeting will be required for wet or unstable material.

3.15.5. Care shall be taken to avoid excessive backfill loads on the completed pipelines. The requirements that the width of the ditch at the level of the crown of the pipe be no more than two feet six inches (2'-6") plus the nominal diameter of the pipe shall be strictly observed.

3.15.6. Trench sheeting shall not be removed until sufficient backfill has been placed to protect the pipe.

3.15.7. All sheeting, planking, timbering, bracing and bridging shall be placed, renewed and maintained as long as necessary.

3.16. PIPE BEDDING

3.16.1. In all cases, the foundation for pipes shall be prepared so that the entire load of the backfill on top of the pipe will be carried on the barrel of the pipe and so that none of the load will be carried on the bells.

3.16.2. Where undercutting and granular bedding are involved, the depth at the bottom of the bells of the pipe will be at least four inches (4") above the bottom of the trench as excavated.

3.16.3. Supporting of pipe shall be as set out herein before, and in no case shall the supporting of pipe on blocks be permitted.

3.16.3.1. Bedding shall be in accordance with the current City of Lebanon standard drawings.

3.16.3.2. Special Bedding - In wet, yielding, mucky locations, where pipe is in danger of sinking below grade or floating out of line or grade, or where backfill materials are of such a fluid nature that the movements of the pipe might take place during the placing of the backfill, the pipe must be weighted or secured permanently in place by such means as will prove effective. When ordered by the City Engineer, yielding and mucky material in sub-grades shall be removed below ordinary trench depth in order to prepare a proper bed for the pipe. Approved granular material shall be used to replace poor sub-grade material and shall be classified as "Special Pipe Bedding".

3.17. LAYING PIPE

3.17.1. All pipe shall be laid with ends abutting true to line and grade as shown on the plans. Supporting of pipe shall be as specified under "Pipe Bedding" specified herein and in no case shall be supported on blocks.

3.17.2. Fittings for the water mains shall be provided and placed as shown on the plans. All open ends of pipes and branches shall be sealed or plugged at the end of each working day.

3.17.3. Before each piece of pipe is lowered into the trench, it shall be thoroughly cleaned and inspected for defects. Any piece of pipe or fitting which is known to be defective shall not be laid or placed. Any defective pipe or fitting discovered after the pipe is laid shall be removed and replaced with a satisfactory pipe or fitting. In case a length of pipe is cut to fit in a line, it shall be so cut as to leave a smooth edge at right angles to the horizontal axis of the pipe.

3.17.4. Granular bedding material as specified herein, shall be used to correct irregularities in the earth trench sub-grade.

3.17.5. The interior of the pipe shall be maintained clean. When the laying of any pipe is stopped for any reason, the exposed end of such pipe shall be closed with an appropriate AWWA approved plug device fitted into the pipe bell, so as to exclude earth or other material.

3.17.6. No backfilling (except for securing pipe in place) over pipe will be allowed until the City of Lebanon has made an inspection of the joints, alignment and grade in the section laid.

3.17.6.1. Inspections shall not relieve the Contractor of further liability in case of defective joints, misalignment caused by backfilling and other such deficiencies that are identified later.

3.17.7. The Contractor shall install a four inch by four inch (4"x 4") wood location post at the ends of all water lines, including water mains and water service connections, so as to identify the termination point of the line. The location posts shall be painted blue and marked so as to identify the line as a water pipe and be extended a minimum of 4’ above existing grade. The curb shall be stamped with a “W” to mark the location of the water service line.

3.17.8. When a water main will be extended in the future, pipe shall be laid for a minimum of three pipe lengths beyond the last valve and capped. This additional pipe will be utilized for the future water main extension and will reduce the amount of disturbance the line in service will experience. Field-LOK gaskets shall be used.

3.18. JOINTING PIPE

3.18.1. Pipe joints described herein shall be installed in accordance with the manufacturer's recommendations.

3.19. BACKFILLING PIPELINE TRENCHES

3.19.1. All backfilling shall be accomplished in accordance with the details shown on the Standard Drawings and the requirements of this Section. Any variances must be approved in writing by the City Engineer.

3.19.2. When directed by the City of Lebanon, the Contractor shall add water to the backfill material or dry out the material when needed to attain a condition near optimum moisture content for a

maximum density of the material when it is compacted. The Contractor shall obtain a compaction of the backfill of at least 95 percent of standard Proctor density (ASTM D698) where mechanical compaction of backfill is required. Compaction testing may be required by the City of Lebanon. Such testing shall be performed by a professional geotechnical firm. Copies of all testing reports shall be provided to the City.

3.19.3. In all cases, walking or working on the completed pipelines, except as may be necessary in compaction procedures or backfilling, will not be permitted until the trench has been backfilled to a point one foot (1') above the top of the pipe. The filling of the trench and the compaction of the backfill shall be carried on simultaneously on both sides of the pipe in such a manner that the completed pipeline will not be disturbed and injurious side pressures do not occur.

3.20. SETTLEMENT OF TRENCHES

3.20.1. The Contractor shall be responsible for any trench settlement and subsequent damage as a result of such settlement. The Contractor shall restore all settled areas as directed by the City of Lebanon.

3.21. CONCRETE CRADLE, ANCHORS OR ENCASEMENT

3.21.1. Concrete cradle anchors or encasement of water mains and fittings shall be placed where shown on the plans. Concrete shall be Lebanon Standard Concrete and shall be mixed sufficiently wet to permit it to flow under the pipe to form a continuous bed. While placing concrete, care shall be taken not to disturb the grade or line of the pipe or injure the joints.

3.21.2. Water mains shall have concrete thrust or "kicker" blocks at all pipe intersections and changes of direction to resist forces acting on the pipeline.

3.21.3. In places where concrete will be poured at a flanged fitting, polyethylene (plastic) sheets having a minimum thickness of 8-10 mils, shall be wrapped around the fitting to prevent the concrete from coming in contact with the fitting's bolts and nuts. The accessibility of mechanical joints shall be maintained for future maintenance and/or repair.

3.22. HIGHWAY AND RAILROAD CROSSINGS

3.22.1. Steel encasement pipe for road and railroad crossing shall be bored and/or jacked in place to the elevations shown on the plans. All joints between lengths shall be solidly welded with a smooth non-obstructing joint inside. The encasement pipe shall be installed without bends. The water main pipeline shall be installed after the encasement pipe is in place.

3.22.2. Stainless steel casing spacers (Cascade Waterworks, Mfg.) or their approved equal will be installed on the water main in the encasement pipe per the manufacturer's recommendations. After the water main has been installed, inspected, and tested as specified, both ends of the cover pipe shall be closed with brick or concrete block masonry and the encasement pipe shall be filled completely with sand in a manner acceptable to the City of Lebanon.

3.22.3. All street cutting, street boring, highway boring, or railroad boring permits will be the responsibility of the Contractor.

3.23. HYDROSTATIC/LEAKAGE TESTING OF MAINS

3.23.1. Upon completion of the construction of water mains and the connection of customer service connections, but prior to Final Inspection, all water mains and appurtenances shall be tested for leaks as specified herein. The City of Lebanon shall be notified at least 48 hours in advance of the scheduled test time and, at its own discretion, will have an inspector present during the performance of the test.

3.23.2. Where practicable, pipelines shall be tested between main valves or plugs in lengths of not more than 1,500 feet.

3.23.3. The City of Lebanon or its designee shall be the only person(s) allowed to open or close a water valve to the Public Water Supply.

3.23.4. The City of Lebanon or its designee shall slowly fill the completed water main until all air has been expelled through the water main and all its appurtenances.

3.23.5. The Contractor shall perform both a hydrostatic pressure test and a leakage test on the installed water main under the supervision of the City of Lebanon. The tests shall be a minimum of two hours.

3.23.6. The two tests shall be conducted after the trench has been backfilled, but must be completed before replacement of pavement and final restoration.

3.23.7. The Contractor shall use an approved supply of water and furnish the pump, pipe connection corporation stops in the pipe, and water meters used for leakage measurement.

3.23.8. The Contractor shall furnish the pressure gauges and meters for the test. Pressure gage accuracy certification reports shall be provided to the City upon request.

3.23.9. The Contractor shall be responsible for all labor and equipment necessary to conduct the tests including excavating and backfilling the test pit at the locations selected by the City of Lebanon.

3.23.10. When taps for testing are required on an installed main they shall be made by the Contractor at Contractor's sole expense.

3.23.11. The test pressure for the hydrostatic pressure test shall be 200 psi, or 1.5 times the operating pressure, whichever is greater, based on the elevation of the lowest point in the section under test and corrected to the elevation of the test gauge unless otherwise directed by the City of Lebanon.

3.23.12. The allowable leakage rate is given in Table 1:

Table 1 – Allowable Leakage

Allowable Leakage per 1000 ft. of pipeline (gallons per hour)									
Average Test Pressure (PSIG)	**Nominal Pipe Diameter (inches)**								
	6	**8**	**10**	**12**	**16**	**20**	**24**	**30**	**36**
200	0.64	0.85	1.06	1.28	1.70	2.12	2.55	3.19	3.82
175	0.59	0.80	0.99	1.19	1.59	1.98	2.38	2.98	3.58
150	0.55	0.74	0.92	1.10	1.47	1.84	2.21	2.76	3.31
100	0.45	0.60	0.75	0.90	1.20	1.50	1.80	2.25	2.70

3.23.13. The exposed pipe and/or the top of the trench shall be carefully inspected after the pressure test for any signs of leakage.

3.23.14. Any cracked or defective pipe, fittings, valves or hydrants discovered in consequence of the pressure test shall be removed and replaced by the Contractor with sound material and the test shall be repeated until satisfactory results are obtained.

3.23.15. The Contractor is responsible for locating, excavating and backfilling the water main trench in addition to replacing the defective material at his expense.

3.23.16. Measurement of the leakage shall be conducted in conjunction with the pressure test.

3.23.17. The Contractor shall maintain the required hydrostatic pressure at all times during the leakage test through his test pump.

3.23.18. Leakage shall be defined as the quantity of water that must be supplied into the newly laid pipe, or any valved section thereof, to maintain the specified leakage test pressure after the air has been expelled and the pipe has been filled with water.

3.23.19. No pipe installation will be accepted if the amount of leakage is greater than specified in Table 1.

3.24. DISINFECTION OF WATER MAINS

3.24.1. New potable water mains shall not be placed into service, either temporarily or permanently, until they have been thoroughly disinfected in accordance with the following requirements and to the satisfaction of the City of Lebanon.

3.24.2. Disinfection shall be carried out prior to connecting the newly constructed water main to the existing water distribution system.

3.24.3. Disinfection shall be done by the Contractor under the direction of the City of Lebanon.

3.24.4. The practices and procedures for disinfecting the water mains and the chemicals to be used shall be in accordance with the requirements of AWWA C 651 (latest edition).

3.24.5. The City of Lebanon preferred method for disinfection is as follows:

3.24.5.1. Liquid Chlorine

3.24.5.1.1. Water from the existing distribution system shall be controlled so as to flow slowly into the newly laid pipeline during the application of chlorine. At the point of entry (POE) of the new water line into the distribution system, there shall be installed a valve chamber assembly for the purpose of feeding a chlorine solution. There shall be an approved RPZ backflow device installed on the water feed line. The cost of the water for the disinfection will be the responsibility of the Contractor.

3.24.5.1.2. There shall be a positive displacement pump and water meter for pumping and maintaining an accurate control of the chemical feed ratio for the chlorine mixture.

3.24.5.2. Solid Chlorine

3.24.5.2.1. Water shall be introduced into the water main in a slow, controlled manner to prevent washing the solid chlorine-bearing material down the water main. Air shall be released at the downstream end of the main to allow for the main to be completely filled.

3.24.5.3. An application of 25 PPM (mg/L) is required for proper disinfection to produce a minimum chlorine residual of 10 ppm (mg/L) after 24 hours.

3.24.5.4. A mixture of water and a chlorine-bearing compound of known chlorine content shall be used.

3.24.5.4.1. Approved types are calcium hypochlorite or sodium hypochlorite.

3.24.5.4.2. Commercial types of calcium hypochlorite are known as HTH, Perchloron and Pittchlor.

3.24.5.4.3. Sodium hypochlorite (12%-15%) is known commercially as liquid laundry bleach (3%-5%).

3.24.5.5. Following the disinfection of the main, the strong chlorine solution shall be flushed until the chlorine residual is consistent with the standard residuals of the Public Water System. Two consecutive sets of tests (each set of test consists of a total coliform and a chlorine residual test), taken 24-hours apart shall be collected and analyzed in accordance with the requirements of the EPA Standards. Sets of tests shall be taken at maximum distances of 1,200 feet apart, and separate tests shall be performed on all branch lines. When the samples have been tested and reported safe from contamination, the tested water main may be connected to the system. The City of Lebanon shall keep on record written documentation that the water sample passed the bacteriological test and is safe. The cost for the initial purity testing shall be paid by the City of Lebanon. If a retest is required, the cost of the retest and any subsequent tests shall be at the cost of the Contractor.

3.25. CONNECTING TO THE WATER SYSTEM

3.25.1. Unless otherwise directed by the City Engineer, the Contractor shall be responsible for providing the connection of the new water main to the existing water system. Unless otherwise approved by the City Engineer, all connections between a new water main and the existing water distribution system shall be made via wet tap. The Contractor shall notify the City of Lebanon when the connection is to be made so that representatives of the City of Lebanon may operate existing valves and witness the connection. A minimum notice of 24 hours in advance of the connection shall be given to the City of Lebanon.

3.25.2. In all cases where a wet tap is to be made to connect to the existing system, the tapping sleeve, resilient wedge gate valve and box, valve chamber, and all other necessary material and labor shall be provided and performed by the Contractor at the Contractor's expense.

3.26. CUSTOMER SERVICE CONNECTIONS

3.26.1. Services up to one inches (1") to be installed outside of new developments shall be installed by the City of Lebanon.

3.26.2. The City of Lebanon shall install the service connection tap on the water main, service line from the water main to a curb stop and curb box, water meter pit assembly, and a ten foot tail piece (where applicable), upon application for water service and payment of the appropriate tap fee.

3.26.2.1. New developments, subdivisions, or expansions by Developers will require the customer service connections to be part of the development and are required to be installed by the Contractor. The Contractor shall be required to install the corporation stop, copper service line, curb stop, curb box, and the water meter pit assembly (where applicable) with a 4"x 4" painted blue wooden stake marking the service with minimum height above existing grade of four feet (4'). If curb and gutter exists or is installed, a stamped "W" must be incorporated into the face of the curb.

3.26.3. Sleeving of customer service connection lines by use of PVC or any other material shall only be done with the approval and specifications of the City Engineer.

3.26.4. All customer service connections shall be installed prior to the hydrostatic and leakage testing of the water main.

3.27. CROSS CONNECTION CONTROL

3.27.1. There shall be no connection between the water distribution system and any pipes, pumps, hydrants, or other material that may be discharged or drawn into the public water system.

3.28. LAWN SPRINKLER SYSTEMS

3.28.1. Lawn sprinkler systems and/or equipment shall not be installed within the Public Right-of-Way or easements without a permit.

3.28.2. No lawn sprinkler system shall be installed without a permit from the City of Lebanon. An application for a lawn sprinkler system permit shall be submitted to the Office of the City Engineer and shall contain the following information:

3.28.2.1. A completed Comprehensive Permit form.

3.28.2.2. A site plan drawing at a scale of not less than one inch to 30 feet, showing the following information:

3.28.2.2.1. The location of every existing and proposed building or structure, including dimensions.

3.28.2.2.2. All property lines, including the shape and dimensions of the lot.

3.28.2.2.3. Locations and dimensions of all easements and building setback lines.

3.28.2.2.4. Location and dimensions of all access points, driveways, off-street parking spaces.

3.28.2.2.5. Location of all existing and proposed streets, including rights-of-way and pavement widths.

3.28.2.2.6. All sidewalks, walkways and open spaces.

3.28.2.2.7. All water, sanitary, and storm sewer facilities to serve the lot, indicating all pipe sizes, types, and grades.

3.28.2.2.8. The locations of all sprinkler system components, sprinkler heads, and piping.

3.29. RESPONSIBILITY FOR MAINTENANCE

3.29.1. Prior to formal acceptance of the Improvements by the City of Lebanon, the Contractor and/or Owner/Developer shall be responsible for the maintenance and repair of the Improvements in compliance with these specifications for a period of two years after construction completion and acceptance by the City of Lebanon.

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