1 General

1.1 The potable water distribution system is supplied by a 1.5-million-gallon water tower and nine onsite wells with a pumping capacity of approximately 7,000 GPM. Operating pressures range from 20 to 100 psi with the norm being approximately 75 psi.

1.2 Potable water lines are direct buried in clean sand, with the preferred piping material being cement-lined ductile iron or high density polyethylene (HDPE).

1.3 System valves are resilient seat gate valves per Division 33 Utilities 1101 Potable Water Valves.

1.4 All pipe joints are to be mechanically restrained and, in certain circumstances, double restrained. Thrust blocks are not permitted.

1.5 Materials and installations shall be in accordance with the following industry and association standards. In the event new editions supersede any of the herein mentioned Standards, the latest edition shall apply.

- ANSI / AWWA C104 Cement Mortar Lining for Ductile Iron Pipe and Fittings for Water
- ANSI / AWWA C110 Ductile Iron and Gray Iron Pipe Fittings
- ANSI / AWWA C111 Rubber Gasket Joints for Ductile Iron Pressure Pipe and Fittings
- ANSI / AWWA C115 Flanged Ductile Iron Pipe with Ductile Iron or Gray Iron Threaded Flanges
- ANSI / AWWA C150 Thickness Design of Ductile Iron Pipe
- ANSI / AWWA C151 Ductile Iron Pipe, Centrifugally Cast
- ANSI / AWWA C153 Ductile Iron Compact Fittings 3 in. thru 24 in. for Water Service
- ANSI / AWWA C600 Installation of Ductile Iron Mains and Their Appurtenances
- ANSI / AWWA C605 Underground Installation of Polyvinyl Chloride (PVC) Pressure Pipe and Fittings
- ANSI / AWWA C651 Disinfecting Water Mains
- Indiana Department of Environmental Management (IDEM) Regulations in Indiana Administrative Code, Title 327 – Water Pollution Control Division
- Indiana Plumbing Code
- Indiana Fire Code
- National Sanitation Foundation Standards 60 and 61.
- All IDEM, AWWA, and 10 State standards

2 Design Parameters

2.1 150 psig design pressure
2.2 100°F design temperature
2.3 150 psig hydrostatic test pressure for a 2-hour duration. Plus or minus 5 psig differential.
2.4 Maximum 6 feet per second (fps) water velocities
2.5 All pipe, fittings, and pipe joining materials used for potable water systems shall be lead-, copper-, arsenic-, zinc-, synthetic organic compound-, and volatile organic compound-free.
2.6 New distribution main line materials shall be determined with Utilities Engineering for each project.
2.7 Straight piping runs shall consist of push-joints with gripper gaskets.
2.8 Thrust and momentum control devices shall consist of a double restraint as follows:
   2.8.1 Mechanical Joints with Lug Style Restraining Glands and additional clamps with rods
   2.8.2 Mechanical Joints with Dual Lug Style Restraining Glands
2.9 Dual thrust and momentum control devices are required for all 11.5° or greater changes of direction, tees, fittings, changes of diameter, valves, hydrants and dead ends.
2.10 Thrust blocks are not allowed
2.11 The Owners representative shall approve all restraining and anchoring methods.
2.12 Separation of water mains and sewers shall meet the requirements of IAC 327.
2.13 Consult Utilities Engineering if an application is believed to be outside of these conditions.

3 Ductile Iron Pipe Materials and Equipment

3.1 Piping
   3.1.1 Ductile Iron shall be made in accordance with AWWA C150 and C151. Control of the chemical constituents shall insure that the pipe produced is suitable for satisfactory drilling and cutting in the field.
   3.1.2 The pipe shall be AWWA pressure class 350 and shall have a thin bituminous coated
cement lining, complying with AWWA C104.

3.2 Fittings

3.2.1 All fittings for use with ductile iron pipe shall be AWWA pressure class 350 with mechanical joints, and shall meet the requirements of AWWA C110 and/or C153.

3.3 Mechanical Joints

3.3.1 Mechanical joints on pipe and fittings shall comply with AWWA C110 and C115.

3.4 Gaskets

3.4.1 Gripper Gaskets: Push-joint gaskets shall be EPDM rubber with stainless steel grip inserts complying with AWWA C111.

3.4.2 Mechanical Joint gaskets shall be EPDM rubber complying with AWWA C111.

3.5 Connecting Hardware

3.5.1 All connecting hardware material shall consist of 304-grade stainless steel machine bolts and nuts complying with ASTM A108.

3.5.2 All bolts shall be furnished with full sized, semi-finished, hexagon stainless steel nuts. Stainless T-bolts are permitted for use on mechanical joints.

4 High Density Polyethylene Pipe (HDPE) Materials & Equipment

4.1 HDPE pipe shall meet the requirements of ASTM D3035, D3350 and/or F714, and AWWA C901 and/or C906.

4.2 HDPE pipe shall be DR-11 or DR-13.5 with a working pressure rating of 160 psig at a water temperature of 73°F.

4.3 HDPE pipe size shall be determined for each specific application. HDPE pipe has significantly smaller inside diameter than ductile iron pipe, therefore it is sometimes oversized to achieve the desired inside diameter. However, consideration must be given to connecting the larger HDPE pipe to flanges and fittings of ductile iron pipe.

4.4 HDPE fittings shall be selected to provide a working pressure rating of 160 psig. This may require fittings of the next numerically lower size with a thicker wall. Consider the effect of the reduction in inside diameter on fluid velocity and pressure loss if multiple fittings will be required for an installation.

4.5 HDPE pipe shall be limited to nominal 12” diameter without approval from Utilities Engineering.

4.6 HDPE pipe shall be joined by thermal butt-fusion in accordance with the manufacturer’s recommendations.

4.7 Transitions from ductile iron to HDPE pipe shall be done with a valve. Follow the manufacturer’s recommendations for connecting HDPE to mechanical joint valves. Where lug style fittings are used, a stainless steel sleeve shall be provided.

4.8 HDPE pipe shall be DIPS sizes and have three BLUE horizontal color stripes equally spaced around pipe.

4.9 HDPE pipe shall be laid with a trace wire to facilitate future locating.

4.9.1 Trace wire shall be #12 THHN solid copper.

4.9.2 Trace wire shall be affixed to outside of pipe to resist backfill.

4.9.3 Trace wire color code shall follow piping color code.

4.9.4 Trace wire shall be brought into a building junction box and labeled.

4.9.5 An additional valve box shall be installed at the origin of the HDPE piping run to house trace wires. No wire terminations shall be in the valve box. Simply coil the trace wire in the box.

5 Installation Guidelines

5.1 Pipe Restraints

5.1.1 Repair couplings and dresser couplings used for connecting to sections of existing piping shall be protected with thrust and momentum control devices.

5.1.2 Thrust and momentum control devices shall be installed so as to allow the use of trench boxes and other similar confined space entry safety devices.

5.1.3 Thrust and momentum control devices shall be installed to allow for maintenance of strainers, water meters, backflow prevention devices, instrumentation and other ancillary devices. In this case, maintenance includes disassembly and removal of devices.

5.1.4 Terminate the pipe entering the building with an ANSI Class 125 flange and a resilient seat gate valve. The piping shall be
restrained by means of retaining rods tied back into the concrete wall.

5.1.5 Restraining rods and fastener threads shall be fully brush-coated with an approved anti-seizing compound just prior to use. Unused threads shall remain coated with anti-seizing compound when construction is complete.

5.1.6 Washers and nuts shall be used on both sides of all connections. Bolt and rod threads shall extend 1” beyond nuts.

5.2 Piping

5.2.1 At all times and in all places, a minimum depth of 5 feet of cover over the top of the pipe must be maintained, per Indiana Administrative Code 327 IAC 8-3.2-17, to prevent thermal influences and protect the pipe from light surface loads. As-built drawings of the pipe system must be produced by the Contractor showing the elevation of the pipe, the depth to the surface, and shall be submitted to the Owner’s Representative at the completion of the works.

5.2.2 Foreign material shall not be allowed to enter the pipes, fittings, or other items while they are stored, lowered into the trench, and connected to the system. The pipes and fittings shall be lowered in such a manner as to prevent damage to the materials and protective coatings and linings. After each segment of pipe is lowered into the trench, it shall be immediately assembled and connected into the pipeline network at the correct line and grade. Any open ends of pipe shall be closed by a watertight plug or by an alternative but equally secure method at the end of each working day.

5.2.3 All buried lines shall be spaced 30” apart with clear side-spacing to facilitate future repairs or expansion.

5.2.4 Cathodic protection shall be discussed with Energy and Utilities Engineering for each project.

5.2.5 Branch lines shall take-off at horizontal centerline of main or above.

5.3 Flanges

5.3.1 When flanges are used to connect HDPE pipe to ductile iron pipe or valves, verify bolt pattern and dimensions, and verify that all components will provide a minimum of 160 psig design pressure for the joint.

6 Irrigation Connections

6.1 Irrigation taps to water mains shall be made with a mechanical joint tee or a ductile iron mechanical joint tapping sleeve. Band clamps are not acceptable. The irrigation branch shall include a minimum 4” resilient seat gate valve connected to the tee with a Foster adapter. The valve shall be operable from the finished grade through a 5¼” valve box set with a Valve Box Adapter II.

7 Hydrostatic Testing New Sections of Exterior Pipe

7.1 Visual Test

7.1.1 After completion of the sterilization and testing process, new piping may be filled with potable water. As new or repaired sections are filled with potable water all joints, fittings and attached equipment shall be visibly inspected for leaks. All visible leaks are to be repaired regardless of the amount of leakage.

7.2 Pressure Test

7.2.1 The new and repaired main and fittings shall be pressure tested at 150 PSIG for a 2-hour duration. Plus or minus 5 PSIG differential.

7.2.2 Test Restrictions:

7.2.2.1 Valves shall not be operated in either direction at a differential pressure exceeding the rated working pressure.

7.2.2.2 The test pressure shall not exceed the rated pressure of the valves.

7.2.3 Pressurization:

7.2.3.1 After the pipe has been laid, all newly laid pipe or any valved section thereof shall be subjected to a hydrostatic pressure as stated in 7.2.1. Each valved section of pipe shall be slowly filled with water, and the specified test pressure (based on the elevation of the lowest point of the line or section under test and corrected to the elevation of test gauge) shall be applied by means of a pump connected to the pipe.

7.2.3.2 It is good practice to allow the system to stabilize at the test pressure before conducting the leakage test.

7.2.4 Air Removal

7.2.4.1 Before applying the specified test pressure, air shall be expelled completely from the section of piping under test. If permanent air vents are not located at all high points, corporation stops shall be installed at such
points so that the air can be expelled as the line is filled with water. After all the air has been expelled, corporation stops shall be closed and the test pressure applied. At the conclusion of the pressure test, the corporation stops shall be plugged.

7.2.5 Examination

7.2.5.1 All exposed pipe, fittings, valves, hydrants and joints shall be examined carefully during the test. Any damage or defective pipe, fittings, valves, hydrants or joints that are discovered following the pressure test shall be repaired or replaced with sound material, and the test shall be repeated until satisfactory results are obtained.

7.3 Return the Repaired Main and Fittings to Service

7.3.1 Operation of the potable water distribution system shall only be by an Authorized University Water Works Employee.