

# ENGINEERING DESIGN STANDARDS

## SECTION 3 – WATER MAIN

### 3.0 GENERAL

This standard establishes the minimum requirements for the design of water mains in Commerce Township.

Prior to starting any water main design, the design engineer is encouraged to make use of maps and information available at the Township offices and at the Oakland County Water Resources Commissioner's office. It shall be the responsibility of the design engineer to verify utility locations provided by the Township and the Oakland County Water Resources Commissioner.

### 3.1 DESIGN CONSIDERATIONS

#### A. GENERAL

1. The current Oakland County Water Resources Commissioner Water Main Standard Detail Sheets with related Commerce Township standard water main notes shall be considered a part of the Engineering Design Standards and must be included with the water main plans.
2. All water main and appurtenances shall conform to the current standards of the Charter Township of Commerce and the Oakland County Water Resources Commissioner.
3. Water mains shall be looped whenever possible.
4. Water mains in new developments shall be installed from boundary to boundary, in abutting roads and interior streets, and at other locations as may be deemed necessary by the Township for future extensions.
5. All water mains shall be installed with a minimum cover of 5-1/2 feet below finish grade. Whenever water mains must dip to pass under a sewer or other obstruction, the sections, which are deeper than normal, shall be kept to a minimum length by the use of vertical bends properly anchored.
6. A 5½ - foot minimum vertical clearance at all open drain crossings is required between the bottom of the drain and the top of the water main.
7. Note the top of pipe elevation for staking on the plan where a water main crosses another pipe. Show where the water main will dip at crossings with the limits of special backfill. The information shall be shown in the plan and profile views or as a crossing table.
8. Water main materials shall be as indicated:
  - a. Ductile Iron Class 54 double cement lined.
  - b. High Density Polyethylene SDR11
  - c. Other material approved by Township Engineer.
9. All water mains shall be designed for 150 psi minimum working pressure.
10. Concrete thrust blocks and/or other approved restraint systems shall be provided at all bends, tees, hydrant shoes, at plugs and caps and at any locations where necessary to prevent lateral movement of the pipe. Thrust blocks shall bear against undisturbed earth and shall have sufficient bearing area to develop the full resultant axial thrust of the pipe at test pressure.

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11. No house or hydrant leads shall be made to a transmission main 20" inside diameter or larger without approval of the Township.
12. Where transitioning from plastic pipe to ductile iron pipe, adapters and joint restraints shall be required to properly resist Poisson Effect forces to prevent joint pull outs.

## B. DESIGN FLOWS

The Design Engineer shall arrange a meeting with the Township Engineer and the Fire Department to discuss specific fire protection needs.

1. Single Family Residential- Water mains shall have the ability to provide at least 1,200 gallons per minute at a minimum pressure of 20 PSI. Design calculations shall be furnished upon request to the Engineer.
2. Multiple Family and Institutional- Water mains shall have the ability to provide at least 2,000 gallons per minute at a minimum pressure of 20 psi in multiple family, institutional, and school areas. Design calculations shall be furnished upon request to the Engineer.
3. Commercial & Industrial- Water mains shall have the ability to provide at least 3,000 gallons per minute at a minimum pressure of 20 psi in commercial, industrial, office and shopping center developments. Design calculations shall be furnished upon request to the Township Engineer.

## C. MINIMUM SIZE

1. Single Family Residential-Water mains within new single-family residential developments shall be eight (8) inches minimum inside diameter .
2. Major Roads- Water mains within major roads shall be minimum 12 inches inside diameter. Larger mains will be required as indicated on the Township's Water Main Master Plan.
3. Commercial & Industrial- Within commercial, office, industrial and multiple family residential developments, 12 inches inside diameter water main is considered to be the minimum, except in a looped system of 1,500' or less where 8 inches in inside diameter mains may be permitted.

## D. LOCATION OF WATER MAINS

1. In Street Right-of-Way - Water mains shall generally be located on opposite sides of streets from sanitary and storm sewers. Water mains shall be located seven (7) feet inside the public right-of-way line in existing subdivisions where the ROW is under 60 feet wide. Other developments shall follow the guidelines of the Utility Ordinance.
2. In Easements - All water main, fire hydrants, valves, service valve boxes and other appurtenances shall be located in a 12' foot wide easement, centered on the water main. The easement shall extend six (6) feet beyond a hydrant. Such easement shall be dedicated to the Township.
  - a. A written description and drawing of the easement shall be prepared by the Design Engineer and be presented to the Township for examination before recording.
  - b. Easements for possible extensions shall be provided to the property lines at locations designated by the Township Engineer.
  - c. Water mains shall preferably be constructed outside of paved parking areas, streets, drives, and rear-yards.

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- d. Within unplatted projects, water mains shall be installed parallel to the property lines or building lines.
  3. Relation to Other Utilities - The minimum separation (barrel to barrel) of water main to sewers shall be ten (10) feet horizontal and eighteen (18) inches vertical.
- E. VALVES AND GATE WELLS
1. General
    - a. When connecting to an existing water main, a tapping sleeve, gate valve and well will be required unless connection to the existing water main can be made without interrupting service. Only mechanical joint tapping sleeves shall be used.
    - b. All valves 3" and greater, except hydrant shut-off valve, shall be installed in a gate well.
  2. Location
    - a. In single family residential areas, valves shall be arranged so that no single water main failure will require more than 1,000 feet of water main, not more than 26 homes and not more than two (2) hydrants to be out of service.
    - b. In multiple housing, commercial and industrial areas, valves shall be so arranged that no single water main failure will require more than 800 feet of water main or more than one (1) hydrant to be out of service.
    - c. Valves shall be so arranged that closing not more than four (4) valves can isolate any section.
    - d. Valves shall generally be located at street intersections, and such that the gate well structure will clear sidewalks, five (5) feet from the intersecting street right-of-way line.
- F. HYDRANTS
1. General
    - a. Existing hydrants on public streets may be considered as available to meet the fire protection requirements. Existing fire hydrants on adjacent properties may be considered as available provided that a fire apparatus access extends between the properties and that an easement is established to prevent obstruction of such access.
    - b. Hydrant nozzle shall be fitted with 5" Storz nozzles and shall face the road.
    - c. Hydrant leads shall be six (6) inch diameter minimum with a maximum length of 20 feet (one pipe length to stop box). Hydrant leads longer than 20 feet in length must be eight (8) inches inside diameter and have an eight (8) inch gate valve and well installed at the tee and a reducer and stop box installed near the hydrant.
    - d. Hydrants shall be plumb and set to grade before final acceptance.
    - e. No service leads are allowed to extend from a 6" hydrant lead.
    - f. Flagging of hydrants may be required upon review by the Fire Marshal
  2. Location
    - a. Spacing of hydrants around multiple family, institutional, commercial, and industrial areas shall be considered as individual cases and the design engineer is encouraged to arrange

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a meeting with the Township Engineer and Fire Department to review specific fire protection requirements. The Fire Department shall have final approval for number and arrangement of hydrants. The spacing shall meet the requirements of the current Fire Code as outlined below (or per the most current version):

Fire Flow Requirement (gpm)	Minimum Number of Hydrants	Maximum Spacing (feet)	Maximum distance to a hydrant <sup>a, b, c</sup> (feet)
1,750 or less	1	500	250
2,000 – 2,500	2	450	225
3,000	3	400	225

<sup>a</sup> Reduce by 50 feet for dead-end streets

<sup>b</sup> A 50% spacing increased may be permitted where the building is equipped throughout with an approved automatic sprinkler system in accordance with Section 903.3.1.1 of the International Fire Code.

<sup>c</sup> A 25% spacing increased may be permitted where the building is equipped throughout with an approved automatic sprinkler system in accordance with Section 903.3.1.2 or 903.3.1.3 of the International Fire Code.

- b. In single-family residential areas, hydrants shall be located at the center of the lot or at lot lines.
- c. When near a street intersection, hydrants shall be located 15 feet from the intersecting street right-of way.
- d. Hydrants shall be located at least 25 feet from any exterior wall of a masonry building and at least 50 feet from any exterior wall of frame or equivalent construction including brick and stone veneer.
- e. Hydrants located in parking areas shall be protected with a six (6) inches (minimum) concrete curb or standard guard posts. Locate hydrant a minimum 5' from the back of curb.
- f. All dead-end water mains shall end with a gate valve and a hydrant.

## B. PRESSURE REDUCING VALVES

- 1. In systems where two or more pressure districts are to be interconnected, the plans shall include a pressure-reducing valve near the point of connection to the higher-pressure district to balance pressures across the new water system. The PRV shall conform to the Township's Standards for such facilities.
- 2. A line gate valve shall be installed both upstream and downstream of each pressure reducing valve to permit isolation of the pressure reducing valve for maintenance and repair. A bypass line of equivalent size pipe as the water main and an additional bypass gate valve and well shall be provided.

## C. SPECIAL BACKFILL REQUIREMENTS

- 1. Sand meeting the requirements for MDOT Granular Material, Class II shall be required for full depth backfill of trenches, above pipe bedding, where the pipe is under or within a one-on-one influence of, or the trench is within three feet of, existing or proposed roads, pavements, curbs, driveways, parking areas, and sidewalks.

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2. Compacted granular backfill shall be provided between all utility crossings to the top of the higher utility.
3. Leads shall have compacted granular backfill within the entire street right-of-way where sidewalks are required.
4. Special backfill shall be placed in maximum lifts of twelve (12) inches and compacted to 95% of maximum dry density. Compaction results will be determined by Modified Proctor Test, ASTM Designation D-1557. An independent laboratory shall perform compaction testing.

### 3.2 FINAL ACCEPTANCE

- A. Water mains shall be flushed and cleaned and followed by chlorination and bacteria testing. Water main sterilization shall be in accordance with the Oakland County Water Resources Commissioner's recommendations.
- B. Water mains shall be pressure tested in accordance with the Oakland County Water Resources Commissioner's requirements. A preliminary test shall be witnessed by the Township prior to scheduling a final test with the Oakland County Water Resources Commissioner's Office.
- C. All punch list items shall be completed and approved prior to final acceptance.
- D. A set of approved Record Drawings, an approved Bill of Sale, and a copy of any recorded easement that was required for construction, shall be submitted to the Township prior to final acceptance of the water main.