

## PART I – DESIGN STANDARDS

### 1.0 WATER MAINS

#### 1.01 *Water Distribution System Basis of Design*

- a) All publicly owned and operated system components require construction plan review and permitting, as outlined in Section 3 of the Connection Manual for Systems Operated by the MHOG Utility Department (Connection Manual). All 8-inch and greater water main, fire hydrants, system valves, and booster stations are considered publically owned. Fire suppression lines can be private if there are no hydrants connected to them. All water main shall be shown in both plan and profile view on the construction plans with a maximum scale of 1" = 50'.
- b) A water distribution system basis of design shall be submitted with construction plans for approval by the Authority's Engineer. The basis of design shall include an area map indicating the areas and zoning district for each area to be served, including any off-site areas. The basis of design will reflect proposed developmental phasing. Developments with proposed usage larger than 100 residential units shall go through the Impact Determination requirements in Section 3 of the Connection Manual.
- c) In general, water distribution systems shall be designed in accordance with the *Recommended Standards for Water Works* by the Great Lakes-Upper Mississippi River Board of State Public Health and Environmental Managers ("Ten States Standards").
- d) Residential developments shall consider a design population of at least 2.6 persons per dwelling unit, with an annual average daily water demand of 100 gallons per capita per day (gpcd).

In non-residential developments, flow estimates shall be based on water use records from similar facilities, as may be provided by petitioner and approved by the Authority's Engineer, or an estimate of proposed water demand in accordance with the residential equivalent user (REU) schedule.

- e) For the purpose of network analysis and water main design, maximum daily demands will be computed as no less than twice the average daily demand. Peak hourly flows will be computed as no less than four times the average daily demand.

- f) Water main shall be designed to provide fire protection (rates and durations) based on the recommendations of the Insurance Services Office (ISO) for projected land use and building types.
- g) Water main shall be sized to meet peak hourly demands and to meet maximum daily demands plus fire flow. The Authority Engineer shall model the distribution network. The petitioner is responsible for providing the onsite size, layout and necessary information for model development.
- h) All municipal water distribution mains shall be a minimum of 8-inch in diameter. Transmission mains of greater diameter may be required if future area development plans or the impact determination process dictate such sizing.
- g) Where improvement or grading is to be done over existing utilities a profile of existing utilities should be included in the construction plans.

#### *1.02 Water Main Layout*

- a) All sites developing an on-site water main network shall be serviced by two sources of water or shall be planned for service from an adjacent site by extending the water main to one or more property lines. The impact determination process will determine if looping of the water main is required. Looping of the water main may be required to increase the pressure or fire flow. Looping also provides the benefit of redundancy and for end users in which water is critical to operation looping may be required for redundancy.
- b) All water mains shall be carried to the limits of the development for future extension by neighboring properties. Water main in excess of 1,600 lineal feet between interconnections may be required to be oversized at the developer's expense. The Township and/or Authority may also require water main oversizing or additional water main improvements based on the impact determination process.
- c) Dead-end mains may not exceed 600 feet in a single-family, residential neighborhood, nor 500 feet in a multiple-family, residential neighborhood. Valves shall not be left on a dead-end line, unless there are plans for a subsequent phase, as outlined in subsection (t) below. Dead-ends shall be terminated with a hydrant at the end of the water main for adequate flushing and maintenance of the main.

- d) Hydrants shall be a maximum of 500 feet on center along the water main on a dedicated street or approved fire lane. Additional hydrants may be required at locations selected by the Fire Marshal. A reduction in this standard must be approved by the Authority Engineer or Utility Director.
- e) Hydrant assemblies less than 25 feet from the main may be connected to the water main with 6-inch pipe. Hydrant assemblies greater than 25 feet from the main shall be connected with 8-inch pipe. This 8-inch pipe may be reduced down to a 6-inch pipe within 25 feet from the hydrant.
- f) Buildings shall be covered within a 250-foot radius of a hydrant. No hydrant shall be placed within 40 feet of a building/structure. In single-family, residential areas, the hydrant coverage may be increased to 350-foot radius with the approval of the Fire Marshal and Authority Engineer. The radii of coverage may be reduced in industrial areas at the discretion of the Fire Marshal.
- g) Fire hydrants and valves shall be placed in such a way that no more than two hydrants and valves in total have to be put out of service when isolating a section of water main.
- h) Valves shall be placed at each junction of water main, and in such a way that no more than three valves have to be closed to isolate a branch of water main. Water mains 16-inch and greater shall use butterfly valves, rather than gate valves. Butterfly valves shall be placed in gate wells. Gate valves located outside of paved areas shall be installed with concrete aprons. The maximum distance between valves shall be 800 feet. This distance can be exceeded for transmission lines or rural areas with the approval of the Utility Director and/or Engineer.
- i) Service lead locations shall be approved by MHOG during the construction plan review process. All curb stops shall be adjusted to final grade. Curb stops within any driveways, walkways or cement sidewalks shall be placed in a valve box as outlined in 22 11 13. Curb stops shall be placed no closer than 10 feet from a building footing. Stainless steel riser rods affixed with stainless steel cotter pins shall be installed on all curb stops, regardless of size.
- j) All unnecessary utility crossings shall be avoided. A minimum 10-foot horizontal and 18-inch vertical clearance shall be maintained from sanitary and storm sewers. If less than 18-inches of clearance is requested, contractor shall install a full length of pipe centered on the crossing to ensure the joints are as far from the crossing as possible.

- k) Water main shall be placed in the right-of-way and outside the roadway surface where possible, in general accordance with approved typical street cross-sections (see Details). Water main may be placed in easements if approved by the Authority Engineer. Where placement in easements is approved, a minimum 25-foot-wide permanent easement is required. The petitioner should work with the Township to secure the necessary easements.
- l) All water main shall be profiled in the construction drawings. Top of pipe elevations, rim elevations, final grade elevations, utility crossings, stationing, and backfill requirements shall be shown in the profile view.
- m) Building footings must be a minimum of 20-feet from all water mains.
- n) Water main shall be ductile iron pipe. HDPE or PVC pipe may be installed in special situations when approved by the Authority Engineer or Utility Director. Special applications may include:
- Surface water crossings
  - Highway crossings
  - Wetlands
  - Unstable soil areas
  - Areas that would require high restoration costs due to conventional construction
  - Corrosive soils or anode beds.
- o) A valve shall be provided on each side of all critical crossings, such as surface water crossings. Critical crossings may also require additional monitoring, such as pressure gauges.
- p) Where HDPE pipe is used in conjunction with ductile iron pipe, the inside diameter of the HDPE pipe shall be equal or greater than the inside diameter of the ductile iron pipe. HDPE pipe shall be ductile iron pipe sizes (DIPS). HDPE pipe shall be manufactured from high density PE 3408 polyethylene resin, having a dimension ratio (DR) of 11 or less, the DR rating shall be specified on the plans. The DR is calculated as the outside diameter of the pipe divided by the minimum wall thickness.
- q) Tracer wire shall be included on all water main distribution lines. Refer to Section 22 11 13, Water Distribution Piping for details.

- r) Tracing wire systems shall terminate in Rhino TriView Tracing Wire Stations or a tracer wire box located at a hydrant, not a valve. The tracer wire box shall have a concrete housekeeping pad in developed areas.
- s) Valves shall be located a minimum of 5 feet from roadway.
- t) When a residential development is constructed in phases, a valve must be installed between each phase to ensure the subsequent phases can be installed tested during construction without disturbing water service to the existing phases.

#### *1.03 Depth of Water Main*

- a) Water main shall be buried with a minimum of 5.5 feet of cover over the pipe, and maximum 8.5 feet of cover. Where water main is installed in undeveloped areas, or areas subject to future grading, probable finished grades will be considered.
- b) Water main shall be buried with a minimum 5.5 feet of cover under roadway.
- c) If water main is constructed in areas where pavement will be constructed in the future, granular backfill shall be used.

#### *1.04 Joint Restraint*

- a) All water main or process piping shall be designed with mechanical restraint of joints in accordance with Section 22 11 13 of the Standard Technical Specifications and Details.
- b) Concrete thrust blocks are not permissible.

#### *1.05 Meters*

- a) All buildings using Authority water shall be metered. In general, water meters shall be placed in a dedicated closet or room for water meter installation, access and maintenance. Area shall be specifically designated on design drawings and shall be oriented to coincide with water lead locations. Water meters must be in a heated area that is accessible always.
- b) For multiple tenant occupied buildings a dedicated meter area with a meter manifold should be constructed to meter each tenant space individually.
- c) Fire lines (4-inch diameter or greater) may bypass the meter, provided the fire system is alarmed in accordance with applicable building and fire codes.