

**UNIFORM DESIGN AND CONSTRUCTION
STANDARDS FOR EXTENDING WATER
DISTRIBUTION SYSTEMS**

SECTION 2

DESIGN STANDARDS

Revised: October 2023

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SECTION 2

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DESIGN STANDARDS

2.01 General Statement

- A. Include in the design of new water systems, projections for present and future demands based on population projections, per capita consumption, area population densities and fire requirements. Utilize parameters above when sizing system extensions; factoring in available sources of supply, available pressures, project phasing and water quality regulations.
- B. Include measures designed to achieve sufficient pressure and flow in the water main(s), and to mitigate the effect of soil corrosiveness on water mains and appurtenances. Provide water main location references to property lines, easement boundaries, and other utilities on plans. Calculate the size of service lines, and site valves and hydrants for proper system operation. Also note any special valve, pump, and water storage requirements.
- C. Design measures to maintain water quality in accordance with existing and proposed regulations, including minimizing water age.
- D. Submit water system designs prepared by, or under the direction of, a Licensed Professional Engineer that is registered in the State of New York.
- E. Any deviation from these design standards requires written approval from Monroe County Water Authority (Authority).
- F. Reference Standards:
 - 1. AWWA D100 – Standard for Welded Steel Tanks for Water Storage
 - 2. AWWA D107 Composite Elevated Tanks for Water Storage.
 - 3. AWWA D110 Wire- and Strand-Wound, Circular, Prestressed Concrete Water Tanks
 - 4. AWWA C153 – Ductile Iron Compact Fittings for Water Service
 - 5. AWWA C207 – Steel Pipe Flanges for Water Service, Size 4" to 144"
 - 6. AWWA C208 – Dimensions for Fabricated Steel Water Pipe Fittings
 - 7. AWWA C651 – Disinfecting Water Mains
 - 8. AWWA C906 – Polyethylene Pressure Pipe and Fittings
 - 9. AWWA M14 – Backflow Prevention and Cross-Connection Control Recommended Practices

10. AWWA M31 - Distribution System Requirements for Fire Protection
11. AWWA M42 – Steel Water-Storage Tanks
12. GLUMRB (Great Lakes – Upper Mississippi River Board) - 10 States Standards – Recommended Standards for Water Works
13. Insurance Services Office (ISO) Guide for Determination of Needed Fire Flow
14. Building Code of New York State
15. Fire Code of New York State
16. Plumbing Code of New York State
17. National Fire Protection Association (NFPA)
18. ASTM F1962 – Use of Maxi-Horizontal Directional Drilling for Placement of Polyethylene Pipe or Conduit Under Obstacles, Including River Crossings.
19. Hydraulic Institute
20. Guidelines for Designing Backflow Prevention Assembly Installations - Supplement to the 1981 Cross Connection Control Manual - January 1992

2.02 Water Distribution System Pressure

- A. Protect services in areas where the static pressure exceeds 70 psi under any demand condition with individual pressure reducing valves on each domestic service. Individual pressure reducing valves will be maintained by the Owner or Developer in accordance with all applicable plumbing codes. Submit plans identifying all domestic services that will require individual pressure reducing valves.
- B. Protect areas where the static pressure will exceed 130 psi, under any demand condition, by placing a pressure reducing valve or valves on the public water system. Pressure reducing valves will be maintained by the Authority.
- C. Provide a design that meets the following minimum parameters for water pressure:
 1. Design water system so that each building with 2 or less stories, will have at least 35 psi at first floor level with a flow rate of 15 gpm (or calculated maximum domestic flow for the building, whichever is greater), with a domestic demand at all other units in the system proposed flowing at a rate of:

<u>Number of Units</u>	<u>Demand/Unit</u>
0 to 50	5 gpm
51 to 100	4 gpm
101 to 150	3 gpm
151 and greater	2 gpm

2. Design water system so that buildings with 3 or more stories meet or exceed New York State Plumbing Code Standards.
 3. Design water system to maintain a minimum pressure of 20 psi under fire flow demand at all points. Note location and grade of highest and lowest elevation points of the water mains and services, and calculate flow and pressure available at each.
 4. Adequately size water mains and services to make sure that the standards listed above are met for each section and for all future phases of construction.
- D. Services which will have water pressure between 20 and 40 psi under any conditions of demand, except fire flows, are termed “Low Pressure Water Services”. If a property can be served by extending a water main from an adjacent higher pressure zone, then a low pressure water service will generally not be permitted. Individual house pumps may be required to meet New York State Plumbing Code Standards. Indicate where house pump systems will be required with initial design submission if applicable. Local Department of Health approval is required for all house pump installations. The Authority reserves the right to not approve a Low Pressure Water Service and/or require written acknowledgement of these conditions from the affected property Owner(s).

2.03 Water Distribution Main Sizes

A. General Design Requirements

1. Size all water mains based on flow demands and pressure requirements listed herein.
 - a. Design water systems using 8-inches as the minimum diameter water main size unless a hydraulic network analysis is performed and the Authority approves of the smaller diameter water main. A departure from the minimum size requirements will be considered if there is no potential for future water main extension and all flow and pressure requirements are met.

B. Fire Protection Design

1. Design fire protection in accordance with recommendations of the Fire Department having jurisdiction and the “Fire Suppression Rating Schedule” as published by Insurance Services Office (ISO). Design a system that will maintain a residual water main pressure on the customer’s side of the meter and backflow device of at least 20 psi under fire flow conditions at all points of the water system measured at ground level over the water main and during all phases of the proposed project. Any departure from ISO’s schedule will only be considered with written approval from the Fire Department or Fire Marshall.
2. List all required and calculated fire flows on the Proposed Project Data Sheet (Appendix E).

3. Design fire protection so that maximum water velocity does not exceed 20 feet/second under any emergency condition.
4. Design fire suppression sprinkler systems in accordance with requirements of the Fire Department having jurisdiction and the “Fire Suppression Rating Schedule” as published by ISO. The Authority will provide water supply data, at the point of connection, for all projects that have fire sprinkler systems. Design shall take into consideration all pressure losses associated with the service line, meter, backflow assembly and appurtenances. Design pump assisted fire suppression sprinkler systems so that the public water main system is not drawn down below 20 psi.

2.04 Hydraulic Network Analysis

A. Water Supply Capacity

1. Requests for water supply curves should be made by the Developer’s Engineer prior to starting the initial design. Provide the following information for each connection point to the existing water main with the request:
 - a. Location, type of development and number of units proposed within the development.
 - b. Anticipated fire flow requirements.
 - c. Anticipated flushing requirements necessary to meet AWWA C651 standards.
 - d. Location and elevation of the proposed tie-in point(s) to the existing water system.

B. Hydraulic Network Analysis Submittal

1. Supply hydraulic network analysis (HNA) calculations that are certified by a New York State Licensed Professional Engineer. Utilize the same elevation datum for the hydraulic network analysis as used on the grading plan. If the final grading plan deviates significantly from the elevations used in the analysis, then a revised analysis will be required.
2. Supply a HNA with the project’s initial design application for review. However, for larger projects, such as a major subdivision, water district or industrial complex with large water demands, submit HNA prior to the initial design application for review. The Developer’s Engineer is encouraged to contact the Authority for guidance, especially if more than one feed is required.
3. Provide the following items with the HNA submittal for each scenario:
 - a. Supply a visual layout drawing of the pipe network, showing all model components (pipes, junction nodes, pumps, reservoirs, etc.). Label special control valves, such as PRV’s, flow control valves and check valves; standard isolation valves need not

- be shown. Also, label all nodes (with ID, elevation and pressure), pipes (with ID diameter and flow rate), hydrants (with ID and elevation), pumps (with ID and discharge hydraulic grade), reservoirs (with ID and elevation), tanks (with ID and water level elevation), and PRV's (with ID, upstream pressure and downstream pressure).
- b. Supply result tables that include a pipe table (complete with pipe ID, pipe material, C factor, length, flow rate, head loss/1000 feet and total head loss), junction node table (complete with node ID, demand, elevation, hydraulic grade and pressure), pump table (complete with pump ID, elevation, flow rate, discharge hydraulic grade, and the flow and head points used to describe the pump curve), reservoir table (complete with reservoir ID and elevation), tank table if applicable (complete with diameter and the following elevations: base, minimum level, maximum level and initial level for model run), and a PRV table if applicable (complete with diameter, minor loss factor {K factor}, flow rate, upstream hydraulic grade and pressure, downstream hydraulic grade and pressure).
 - c. Supply a copy of the Authority's field flow test, email or other communication showing the basis for the connection point hydraulics.
 - d. Supply information about the development (type of development, number of acres, number of units, fire flow requirements, etc.).
 - e. Note location of all fire hydrants.
 - f. Note the name and version of software used for the analysis.
 - g. Note staging or phasing of development.
 - h. Supply service sizing results. Note the size and material of the water service (public and private) and finished floor elevations of units supplied. Note units located at the highest and lowest elevations separately.
 - i. Note the appropriate off-site demands.
 - j. Identify the weakest fire flows available in the hydraulic analysis. Identify the hydrants that will be located at the highest and lowest points and flows available.
 - k. Supply water quality modeling if requested by the Authority.
4. Use the following roughness factors when performing any hydraulic analysis:
- a. Unlined Cast Iron Pipe: C - 35
 - b. Lined Cast Iron Pipe: C - 70
 - c. Ductile Iron and AC Pipe: C - 110

- d. High Density Polyethylene (HDPE) and Polyvinyl Chloride (PVC) Pipe: C - 130
- e. All other existing pipe: C – 100
- f. All service tubing use the following Copper: C-130, and HDPE: C-140

2.05 Water Quality

- A. Calculate the turnover rate within the proposed system and submit calculations to the Authority for review. Utilize the typical consumption rates of the proposed system when calculating the turnover rate. Contact the Authority for the allowable water age to be used for the proposed system.
- B. If the Authority determines that water quality cannot be maintained in a reasonable manner, the Authority reserves the right to request changes to the proposed distribution layout and removal of sections that can't comply.
- C. Provide a water quality plan that is designed, approved and stamped by a New York State Licensed Professional Engineer.
- D. Design mitigation measures, if applicable, to maintain water quality. Typical mitigation measures include, but are not limited to, changing water main size, limiting project scope, looping mains, providing bleeder valve assemblies at pressure zone boundary valves, and as a last resort, providing portable flushing units. Additional means and methods to maintain water quality will be considered by the Authority and can be submitted with applicable engineering data for the Authority's review and approval.
- E. Design flushing units, if applicable, to safely convey water away from the discharge point to prevent damage, directly or indirectly, to any structures or property on a year round basis if required. Provide water retention and detention areas as required.
- F. Provide permanent cold climate year round sampling station if required by the Authority.
- G. For Water Districts and as directed by the Authority, the following submissions will be required:
 - 1. Conceptual Submission
 - a. Submit preliminary water quality calculations with the conceptual submission of the Preliminary Engineering Report for the Authority's review. Provide the following information on the preliminary water quality calculations:
 - i. Identify the proposed water main size, length and volume of water within each section.
 - ii. Identify the number of users, typical daily consumption rate per user and total demand within each water main section. Contact the Authority for typical

daily consumption rates and allowable water age to be utilized for the proposed area.

- iii. Calculate the water turnover rate within each section and for services that will be located at the furthest points in the system. Label areas that exceed the Authority's water age limits.
- iv. Calculate the required additional usage required to reduce the turnover rate to the allowable water age within the proposed system.

2. Design Submission

- a. Design and submit a proposed flushing schedule, if applicable, for the Authority's review and approval which includes the following:
 - i. Identify the location and type of flushing to be utilized.
 - ii. Identify the proposed water main size, length and volume of water within each section.
 - iii. Identify the number of users, typical daily consumption rate per user and total demand within each water main section.
 - iv. Identify the proposed flushing rate, duration, volume and operating times that meet the Authority's requirements.
 - v. Calculate the water turnover rate utilizing the total demand and proposed flushing volume.
- b. Design and submit engineering data for other proposed water quality designs for the Authority's review and approval.

2.06 Pump Stations

- A. Design pumping capacity in accordance with Recommended Standards for Water Works and the Authority's input. Pumping capacity shall be coupled with tank size and location. Locate Pump Stations (PS) to minimize suction draw down impact. Prove design with HNA using extended model runs. Submit hydraulic calculations with the basis of design report indicating both upstream and downstream conditions for the Authority's review and approval.
- B. Provide PS that are designed, approved and stamped by a New York State Licensed Professional Engineer and complies with all New York State Building Codes and current Hydraulic Institute Standards
- C. Provide the proposed pump, motor, frame and motor control equipment dimensions with the basis of design submission.

D. Design PS with the following features and appurtenances:

1. Provide building style and architectural consistent with the surrounding buildings with features approved by the Authority. Below-grade and package skid-mounted stations are not permitted. Acceptable building types include the following:
 - a. Above-grade with brick exterior walls, CMU interior walls, metal roofing and stick-built roof framing.
 - b. Above-grade architectural insulated precast buildings where acceptable to the Authority.
2. Provide PS with enough floor area and correct riser pipe sizing to accommodate a future increase in pump and motor sizes. Include future piping for an additional pump at next horse power increment or higher as design projections dictate. Future planning of pump capacity shall be as approved by the Authority.
3. Coat piping exterior surfaces with Authority approved coatings both in PS and vaults.
4. Provide piping with coated interior surfaces with either a cement mortar lining or other NSF 61 approved potable water coating.
5. Determine type and capacity of electrical supply when considering sites. Stations with pumps driven by motors of 5 hp or less can have a 200 amp 220v single phase electric service. Stations with pumps driven by motors greater than 5 hp shall have 480v three phase electric services. Design motor control cabinets and electrical conduits to accommodate larger pumps as design projections dictate.
6. Provide 120v house power.
7. Provide natural gas based heat where available and electric heat in areas not served by natural gas.
8. Provide instrumentation for suction and discharge pressure, power monitoring, flow monitoring, security measures, temperature alarm, control valve (if used) to indicate when open and closed. All instrument and control equipment shall meet current Authority standards.
9. Provide telemetry equipment complying with the Authority's standards. Coordinate the type of telemetry communication means with the Authority.
10. Provide adequate building ventilation.
11. Provide security measures meeting the Authority's requirements for PS. This includes, but is not limited to, door locks, vault hatch locks and internal security sensors. Coordinate the type of security measures required with the Authority.

12. Provide a doorway large enough to install and remove all components.
 13. Provide all necessary clear floor space and ceiling height to allow items to be removed using either an overhead crane or other approved means.
 14. Provide Authority approved motors, (s.f. 1.15) motor drives and programmable logic controls.
 15. Provide Authority approved pumps and appurtenances.
 16. Provide Authority approved surge relief valve.
 17. Provide a vault with a magnetic flow meter on the suction piping.
 18. Provide water service to the building with a New York State Department of Health Approved Backflow Prevention Device.
 19. Coat PS interior walls with Authority approved coatings.
 20. Provide sound attenuation measures when required by the Authority.
 21. Provide an emergency generator to power pump(s) capable of providing average day demand.
 22. Provide an emergency bypass pump connection capable of providing the average day demand of the pump station. Location to be accessible by a trailer mounted pump.
 23. Provide hypo-chlorite booster injection if required by the Authority.
 24. Provide chlorine residual monitoring if required by the Authority.
 25. Provide ADA compliant restroom facilities.
 26. Provide signage in accordance with the Authority, OSHA, National Fire Protection Association and NYS Building Code regulations.
- E. Design PS site to meet the following requirements:
1. Provide a parcel with a minimum of 30 feet of clearance around PS and that can accommodate the parking requirements noted herein.
 2. Provide chain link fencing meeting the Authority's security standards if required by the Authority.
 3. Provide site grades that are mowable.

4. Provide sufficient slope away from building to facilitate proper drainage. Drainage shall not impact existing or future properties or roadside drainage.
5. Provide a paved driveway with a maximum of 8% slope, capable of handling three 1-ton trucks at a time with a turnaround sized to the turning radius of an F-450 with 12 foot stake bed.
6. Provide sidewalks from all entries/exits to the paved driveway.

2.07 Water Storage Tanks

- A. Acceptable types of water storage tanks are limited to the following:
 1. ANSI/AWWA D100 Welded Carbon Steel Tanks for Water Storage (Use of Section 14 is not permitted).
 2. ANSI/AWWA D107 Composite Elevated Tanks for Water Storage.
 3. ANSI/AWWA D110 Wire- and Strand-Wound, Circular, Prestressed Concrete Water Tanks, Type III only.
- B. Provide a water storage tank and foundation that is designed, approved and stamped by a New York State Licensed Professional Engineer and complies with all New York State Building Codes.
- C. Document that FAA Structural Notification is made and determination given.
- D. Design tank capacity in accordance with Recommended Standards for Water Works, AWWA Manual of Water Supply Practices M31 – Distribution System Requirements for Fire Protection, and the Authority's input. Submit hydraulic calculations with the basis of design report.
- E. Design tank with a configuration that stores 80% of usable capacity required within normal system operating ranges, minimizes water age, promotes mixing, optimizes water turnover, limits ice formation and has a self-supporting roof.
- F. Design tank features using internal pressure that is calculated at maximum overflow level, and with minimum design loads conforming to NYS Building Code applicable to site location and ANSI/AWWA standards for type of tank chosen.
- G. Design shall include current Authority approved interior and exterior coating systems. Provide a NACE Level I inspector to oversee all coating work.
- H. Design venting for maximum inflow (total output of pumps feeding into the system with no demand) and outflow (total flow if outlet pipe failed completely at tank foundation edge).

- I. Design water storage tanks with the following features and appurtenances:
 1. Provide passive cathodic protection for under the floor and impressed current cathodic protection for all interior submerged surfaces.
 2. Provide individual inlet, outlet and drain piping.
 3. Provide a mixing system designed to prevent stratification and submit the associated design calculations.
 4. Provide clog-resistant, freeze proof venting that meets current Authority tank design specifications.
 5. Provide twin 30" shell hatchways that close against pressure and have a greasable hinge. Place hatchways 180° apart.
 6. Provide a single, lockable 30" roof hatchway near roof access points.
 7. Provide shell ladders and roof access on south face meeting OSHA standards with round rungs, anti-climb shielding, and the Authority's standard fall prevention system.
 8. Provide roof railings and roof fall prevention features meeting OSHA standards from shell wall to roof center with a tie-off fixture near roof center.
 9. Provide an overflow system capable of handling total output of pumps feeding into the system with no demand.
 10. Provide anchor chairs that leave room to coat around anchor bolts.
 11. Provide foundation with a protective coating on all exposed surfaces.
- J. Design water storage tank site to meet the following requirements:
 1. Provide a parcel with a minimum of 75 feet of clearance around the water storage tank and that can accommodate the parking requirements noted herein.
 2. Provide chain link fencing meeting the Authority's current security standards.
 3. Provide a minimum of 10 feet of clearance between outside of fencing and any trees or shrubs.
 4. Provide site grades that are mowable.
 5. Provide a minimum of 20 feet of usable ground clearance around the water storage tank and a 25' x 60' level and hard surfaced permanent staging area.
 6. Provide 12 feet of paved driveway surface around the water storage tank.

7. Provide on-site and off-site drainage facilities capable of handling overflow water or any site water generated by a 25-year storm event, whichever is greater.
8. Provide drainage and overflow discharge locations to an area that will not impact existing or future properties or roadside drainage.
9. Provide a 220v single phase 100 amp electrical service at tank for telemetry and cathodic protection systems.
10. Provide a valve control vault, complete with gravity sump and an Authority approved pressure transmitter.
11. Provide a telemetry and electrical control box to the Authority's standards. Verify type of telemetry communication means to be used with the Authority. Provide telemetry conduit, cable, and antenna complete with attachment brackets on the tank. Provide security measures as required by the Authority.
12. Provide a paved driveway with a maximum of 8% slope, capable of handling a tractor with a 45 foot trailer.
13. Provide a lockable gate across the driveway if tank fence is more than 100 feet from edge-of-pavement.
14. Provide any additional security measures as required by the Authority.

2.08 Transmission Mains

- A. Design transmission mains in accordance with Recommended Standards for Water Works and the Authority's input. Prove design with HNA using extended model runs. Submit hydraulic calculations with the basis of design report. The Authority will determine the maximum allowable headloss on a case by case basis.
- B. Provide transmission mains that are designed, approved and stamped by a New York State Licensed Professional Engineer.
- C. Incorporate redundancy into the design with the Authority's input. This may include, but is not limited to, redundant crossings, parallel transmission mains, interconnections with existing transmission mains and/or additional valves.
- D. Design air relief/air vacuum relief valves on high points and other changes in grade.
- E. Design flushing hydrants at low points and areas to safely convey water away from the discharge point to prevent damage, directly or indirectly, to any structures or property. Provide water retention and detention areas as required.
- F. Design surge relief measures, if applicable.

- G. No water service connections are allowed on transmission mains unless otherwise approved by the Authority. Additional design requirements may be required for transmission mains used for distribution.

2.09 Vaults

- A. Design vaults to withstand floatation forces, handle traffic loading, allow access to equipment inside for maintenance and replacement, drain properly, prevent intrusion of ground and surface water, minimize settlement, OSHA standards, and in accordance with the Material and Performance Specifications contained in Section 4.
- B. Design vault piping so that isolation valves are restrained against movement when closed. Use of mechanical joint restraint glands and gaskets are not allowed to restrain isolation valves.
- C. Provide supports under pipe and components.
- D. Provide a ladder with a bottom rung no more than 12 inches above the floor and a top rung no more than 6 inches lower than top of access hatch. Provide a ladder-up safety post to assist with entering and exiting the vault. Design ladder and vault to meet OSHA standards for ladder clearance.
- E. Coat piping and appurtenances inside vault to the Authority's standards. Order factory applied primers that are compatible with the Authority's approved coating systems.
- F. Design access hatchways to be installed over valves for easier removal and replacement.
- G. Depending on the vault location of installation and specific use (i.e. Meter, PRV, or Chemical injection, etc.) the Authority may require that the top section be exposed 6" above final grade.
- H. All vaults shall be reinforced concrete, fabricated by a specialty company, having controlled environmental conditions for curing to meet the required concrete design strength.

2.10 HDPE Horizontal Directional Drills

- A. Design horizontal directional drill in accordance with ASTM F1962 – Use of Maxi-Horizontal Directional Drilling for Placement of Polyethylene Pipe or Conduit Under Obstacles, Including River Crossings.
- B. Provide a horizontal directional drill plan that is designed, approved and stamped by a New York State Licensed Professional Engineer. Use of HDPE water main for horizontal directional drills will be approved by the Authority on a case by case basis.
- C. Provide a copy of the Geotechnical Investigation stamped by a New York State Licensed Professional Engineer. Soil borings are required to be taken adjacent to and a minimum of

5 feet below the bottom of the proposed horizontal directional drill. The Authority reserves the right to request additional geotechnical information from the Developer's Engineer.

- D. Submit design calculations along with a plan and profile of the proposed horizontal directional drill for the Authority's review and approval. The Authority reserves the right to request additional engineering calculations.
- E. Design horizontal directional drill to meet the following requirements:
 - 1. Flow capacity.
 - 2. Working pressure.
 - 3. Radius of curvature.
 - 4. Operational and installation collapse pressures.
 - 5. Pipe deflection limit.
 - 6. Pullback force.
- F. Design anchor blocks to withstand pullout forces at HDPE transition points.
- G. Design bore path to be as direct as possible.
- H. Provide a minimum depth of cover of 5 feet in non-paved areas and 6 feet in paved areas.
- I. Provide a maximum depth of cover of 8 feet.
- J. No water service connections are allowed on HDPE water main.
- K. Provide metered test connections on all HDPE horizontal directional drills that cross a body of water.

2.11 Water Main Location

- A. Locate water main extension within a dedicated public right-of-way. If a dedicated public right-of-way is not available, then the water main may be located elsewhere, with the Authority's approval, and upon the granting of an appropriately sized easement to the Authority.
- B. Locate water mains a minimum of 6 feet from the edge of pavement, 15 feet from any building or structure and 10 feet from headwalls.
- C. Maintain at least 10 feet of horizontal separation from storm and sanitary sewers and at least 6 feet of horizontal separation from all other utilities.

- D. Maintain a minimum vertical separation of 18 inches when water main crosses above storm or sanitary sewers. Maintain a minimum vertical separation of 18 inches with one full length of water main centered on crossing when water main crosses under storm or sanitary sewers.
- E. Provide a minimum depth of cover of 5 feet in non-paved areas and 6 feet in paved areas.
- F. Provide a maximum depth of cover of 8 feet.
- G. Minimize the creation of dead-end water mains by looping them whenever practical.
- H. Locate water mains in cul-de-sacs so that they run the full street length, ending with a hydrant, unless the water main is looped.

2.12 Valves

- A. Provide a sufficient number of valves to minimize inconvenience and sanitary hazards during repairs. Locate valves to meet requirements listed below:
 - 1. Arrange so that no more than 2 fire hydrants can be isolated at any time.
 - 2. Space at minimum intervals of 500 feet in industrial or commercially zoned areas. Space at minimum intervals of 1000 feet, including no more than 20 services in residential areas. In rural or sparsely developed areas, the Authority reserves the right to increase the spacing limits. Obtain the Authority's approval for valve spacing on transmission mains and other situations not mentioned above.
 - 3. Locate at intersections of 2 or more water mains to provide full control over each water main segment.
 - 4. Arrange so that no more than 5 valves are necessary to isolate any area.
 - 5. Locate for proper operation and maintenance of the system in the opinion of the Authority.
 - 6. Locate outside of ditches, pavement, gutters, sidewalks and driveways.
 - 7. Locate downstream of the last service and a minimum of 40 feet upstream of a blow-off on all temporarily dead-ended water mains.
 - 8. Locate on both sides of service lines used to supply schools, hospitals, dialysis treatment centers, nursing homes (or other critical care facilities), convention centers, hotels and motels.
 - 9. Use anchor tees whenever applicable to hold valves in place.

- B. Install air relief or air vacuum relief valves if required by the Authority on pipeline high points and other changes in grade, depending on water main size and terrain.
- C. Install pressure reducing valves (PRV) if required by the Authority where necessary to reduce water pressure to less than maximum value allowed. Install an iHydrant to monitor downstream pressure at each PRV and a mainline valve just downstream of the iHydrant.
- D. Provide gradient control mats when located within 100 feet of overhead high voltage transmission lines.

2.13 Hydrants

- A. Hydrant Locations: Locate public hydrants using the following criteria:
 - 1. Locate within the dedicated public right-of-way or on an easement dedicated to the Authority.
 - 2. Locate at property line intersections where such lines exist and near road intersections.
 - 3. Locate so that there is a minimum space of 3 feet from pavement and sidewalks and 10 feet from driveways.
 - 4. Locate to allow for the proper operation and maintenance of the hydrant in the opinion of the Authority.
 - 5. Space at minimum intervals of 500 feet in residential areas. In rural or sparsely developed areas, the Authority reserves the right to increase the spacing limits. The Authority may require narrower spacing in congested business and residential areas. Obtain the Authority's approval for hydrant spacing on transmission mains and other situations not mentioned above.
 - 6. Locate as required by the Authority at high points and low points for air-release and blow-off purposes.
 - 7. Install dead-end hydrants at the end of all permanently dead-ended water mains.
 - 8. Provide gradient control mats when located within 100 feet of overhead high voltage transmission lines.
- B. Hydrant Branch Limitations
 - 1. Definitions:
 - a. Branch: Consists of all pipe, fittings and valves installed between tee connection at water main and hydrant for all perpendicular and parallel hydrant assemblies, or the reducer and the hydrant for dead-end hydrant assemblies.

- i. Branch Length: Distance as measured from center of tee or reducer to center of hydrant.
 - ii. Branch Size: Minimum of 6-inches in diameter.
 - b. Combined Service Branch: Section of a public hydrant branch that supplies water to a service. Section begins at the water main and ends at the service connection point.
 - c. Private Hydrant: A hydrant located on private property that is privately owned.
 - d. Public Hydrant: A hydrant connected directly to a publically dedicated water main that is located within the dedicated public right-of-way or an easement dedicated to the Authority.
 - e. Reduced Pressure Zone Detector Assembly (RPDA): A valve assembly designed to prevent a backflow event from occurring using dual reduced pressure zone valves with a water meter to detect system leaks and unauthorized use of water.
- 2. Public Hydrants:
 - a. Design hydrant branches to be less than 75 feet in length unless branch line is used as a combined service. If used as a combined service branch, then the Authority reserves the right to limit the branch length to maintain water quality.
 - b. If an existing hydrant branch is used as a combined service, then a valve will be required at the connection point to the water main, a second at the service connection to the branch and a third on the branch downstream of the service to isolate the hydrant for repair.
 - c. Install a Dead-End Perpendicular Hydrant Assembly at the end of all hydrant branches that are constructed of unrestrained pipe and in locations where the end of the water main will not be extended.
 - d. Coat public hydrants yellow in accordance with the Material and Performance Specifications.
- 3. Private Hydrants
 - a. Protect all private hydrants with a RPDA backflow prevention device. Submit an application for each RPDA device installation for review by the Authority and approval by the Department of Health having jurisdiction.
 - b. Coat private hydrants red in accordance with the Material and Performance Specifications.
 - c. Use of private hydrants is restricted to extinguishing fires and periodic testing.

2.14 Water Services

- A. Eligibility requirements for water service are stated in the Authority's Rules and Regulations. Parcels are eligible for water service if they meet the following conditions:
 - 1. Parcel must have frontage on a water main.
 - 2. Water main must extend across the entire length of the structure to be served (applicants shall be required to extend the water main at their own cost to meet this requirement).
 - 3. Both the water main and proposed service must be adequate to meet the needs of the parcel.
- B. Install water services perpendicular to water main.
- C. Design water services not to exceed 8 fps based upon the maximum domestic demand.
- D. Install meter housings outside of the structure being served as required in the Authority's Rules and Regulations.
- E. Locate curb stops/control valves to allow for the proper operation of the valve in the opinion of the Authority. Additional easements may be required.
- F. Installation of water services off proposed water mains shall be outlined in the Main Extension Agreement (MEA), Water District Main Extension Agreement (WDMEA) or Private Main Extension Agreement (PMEA) agreement.
- G. Lots that are proposed to receive service off existing water mains will be noted on the approved plans as "MCWA Exception Lots". Application for service for these lots shall be made separately by the Developer to the Authority at the time of building construction. Only the Authority can install the public portion of Exception Lot services, unless otherwise approved by the Authority.
- H. Advance taps, in general, will not be allowed. Developers of single family residential subdivisions may seek approval for advance services. Approval shall be given on a case by case basis. Locations of all advance taps shall be shown on plans. Developer shall install only those advance taps which are shown on the Approved Plans.
- I. No advance taps will be approved in non-residential developments.
- J. Payment for advance service installations shall be made at the time of execution of the MEA or PWME agreement.
- K. The Developer shall pay all costs for the Authority to abandon any unneeded advance taps.

2.15 Cross Connection Control

- A. Design cross connection control in accordance with AWWA M14 – Backflow Prevention and Cross-Connection Control Recommended Practices, Guidelines for Designing Backflow Prevention Assembly Installations - Supplement to the 1981 Cross Connection Control Manual - January 1992 and the Authority's input.
- B. Provide a cross connection control plan that is designed, approved and stamped by a New York State Licensed Professional Engineer.
- C. Provide cross connection control protection, using either a New York State Department of Health Approved Backflow Prevention Device or an air gap, on every service to a commercial property, residential building with more than two single-family units and single or dual residential property where a potential hazard exists or could exist as determined solely by the Authority. Utilize containment methods as required by New York State Department of Health regulations and the Authority's standards, to protect the public water supply from a backflow event. Match type of containment to the degree of hazard posed at each facility served.
- D. Approval of all private water service connections is dependent on protecting the public water supply. No proposed water service connections will be approved without a proper cross connection control application submitted. All backflow prevention systems shall be approved by the Authority and Department of Health with jurisdiction prior to installation.
- E. Design backflow prevention systems that consider pressure loss across the device and maintenance requirements for critical services. Install a parallel assembly when service interruptions are a concern as backflow devices are shut off for annual testing and periodic maintenance.

2.16 Corrosive Soils

- A. Submit certified results of the Ductile Iron Pipe Research Association's (DIPRA) Ten Point Soil Test prior to commencing construction. Testing shall be conducted by a qualified soil testing laboratory, and the results shall be submitted to the Authority. Soil test samples, if performed, shall be:
 - 1. Taken along the route of the proposed water main.
 - 2. Taken at a maximum spacing of 500 feet with a minimum of one test in developments less than 500 feet long.
 - 3. Taken in all wetlands, fill areas and railroad beds (existing or abandoned) that the water main route crosses or occupies.
 - 4. Taken at the elevation of the top of the proposed water main.

5. Taken at all Hazmat Spill sites, gas stations (existing or abandoned), and areas with contaminated soil. Provide test results for volatile organic compounds and hydrocarbons in addition to DIPRA results. Additional protective measures (e.g., nitrile gaskets, use of copper water service material, etc.) may be required at the Authority's discretion.
 6. Reference sample sites on the report by the project's station number.
- B. Certify that the samples tested are from the site referenced on the form and were taken along the pipe route at the appropriate depth. Certification may be done on the form or in a separate letter from the Developer's Engineer.
 - C. Upon submission of a satisfactory soil testing report, the Engineer will make the determination as to whether or not a water main will require polyethylene encasement, and the limits of such encasement. Water mains installed in soils with DIPRA Point Totals of 10 or greater shall be wrapped in polyethylene. Polyethylene encasement shall be installed in accordance with the Authority's Materials and Performance Specifications.

2.17 Easements

- A. Provide easements around water mains, when required, that are 30 feet or greater in width for operation, maintenance and replacement. Water mains are to be located 10 feet from the property line or easement edge or as specified by the Authority for the entire water main length.
- B. Provide easements around public hydrants, when required, that are 20 feet wide and extend 10 feet beyond the hydrant and 10 feet on either side of the hydrant, connecting back to the right of way or existing easement.
- C. The Authority may request additional easement widths on transmission mains and other situations not mentioned above.
- D. Provide frontage easements with each application in accordance with the Authority's Rules and Regulations.
- E. Supply the information outlined below whenever easements are to be granted to the Authority. Final Plans will not be signed until all easements are ready to be recorded at the County Clerk's Office.
 1. Provide Owner's exact name and address. If the Owner is not an individual, then also provide the name and title of the person who will be executing the easement document.
 2. Provide the name and address that the easement should be sent to for execution arrangements (e.g. Attorney, Developer's Engineer, or Owner.)

3. Provide a copy of the most current deeds (including the recording pages) for all properties through which the easements run.
 4. Certify ownership to the Authority; either in a letter or other suitable form (no abstracts or title insurance documents). A title company or an attorney can do this work. In the body of the letter include the following for each deed:
 - a. Liber and page numbers.
 - b. Recording date.
 - c. Tax account numbers.
 - d. Property addresses.
 5. Provide tax maps highlighting each parcel involved and the approximate locations of the easements.
 6. Provide point of beginning anchors to intersections of two dedicated roads or a filed map.
 7. Provide easement descriptions in Microsoft Word format.
- F. After all of the above items are provided, reviewed and approved, the Authority will prepare the easement document(s) and send it to the appropriate recipient to arrange for execution, or, the easement document can be picked up at the Authority's General Offices. When the easement document is returned to the Authority and is properly executed it can be recorded at the County Clerk's Office, and the easement process is complete.

2.18 Submission Requirements

- A. Partial submissions will not be reviewed by the Authority. A cursory review of the proposed layout and water main routing may be completed by the Authority prior to the submission of the design documents.
- B. Submit a complete set of water supply plans for review, and make all the required changes as requested by the Authority. Project fees, applications, and agreements are not required at this time. Final project approval must be obtained before construction is initiated.
- C. Resubmit one set of revised water supply plans if the drawings or other information change from the initial submission with respect to the water main installation. Revised plans must be submitted with responses to all Authority review comments and note any additional changes to the plans.
- D. Approval of Plans shall be granted after all easements are granted to the Authority, all of the Authority's concerns and comments are addressed, all plans are signed and stamped by an Professional Engineer that is registered by the State of New York, and one set of

original mylar plans are supplied. Allow a minimum period of one week to review the final mylar plans.

- E. Issuance of approval is for the proposed water system only and does not include cross connection control review. Cross connection control requires a separate application, which must also be approved by the Department of Health having jurisdiction.
- F. Construction must commence within 2 years of the approval date shown on the plans, and must be diligently pursued to completion or the project may be subject to cancellation and must then be resubmitted for review and approval in accordance with the Authority's Rules and Regulations currently in effect. If construction has not started within this period, the approval shall be void, and the Developer shall be required to resubmit the necessary plans and information for approval by the Authority.
- G. The Authority reserves the right to request additional information and engineering calculations during the review process in addition to those outlined in Article 2.18.
- H. Provide design drawings that follow the requirements stated below:
 - 1. General Plan:
 - a. Label project name.
 - b. Provide Developer's name, address and phone number.
 - c. Provide Developer's Engineer name, address and phone number.
 - d. Provide Professional Engineer's stamp and signature on final drawings and required calculations.
 - e. Provide a legend.
 - f. Provide a north arrow.
 - g. Label scale(s) (horizontal and vertical).
 - h. Label horizontal scale; scale shall be between 1" = 10' and 1" = 40'.
 - i. Draw all proposed water mains true to scale with no break lines.
 - j. Provide benchmark data and identification of a tie between existing or proposed survey monuments and submitted easement documents.
 - 2. Utility Plan:
 - a. Provide plans that indicate all water details up to, and for, the property to be served.

- b. Provide street names and dedicated public right-of-way dimensions.
 - c. Show all dedicated public right-of-way and easement lines (all easement lines to include bearings and lengths).
 - d. Show all existing water mains, laterals, valves, hydrants, etc. Locate all existing and proposed obstructions, such as utility vaults, catch basins, traffic islands, etc.
 - e. Show all proposed water mains, laterals, stubs, valves, bends, reducers, hydrants, meter housings and appurtenances, dimensioned from existing stationary markers (street light, sign, hydrant, etc.) and surveyed controls (street intersections, centerlines, property lines, etc.)
 - f. Show adjacent areas and their relationship between the proposed facilities and all existing facilities, (i.e. surface grading, etc.)
 - g. Show all driveway, sidewalk, curb, gutter and structure footprint locations.
 - h. Provide all of the Authority's standard notes and details as required by these standards.
 - i. Provide all curve data on deflected water mains.
 - j. Show all proposed abandonments of existing water mains, hydrants, laterals, valves, etc.
 - k. Provide a signature block for the Authority's approval.
3. Subdivision (Plat) Plan
- a. Show all dedicated public rights-of-way and easement lines (all easement lines to include bearings and lengths).
 - b. Provide all Tax Account Numbers for on-site and adjoining properties.
4. Grading Plan
- a. Show all dedicated public rights-of-way and easement lines (all easement lines to include bearings and lengths).
 - b. Show all existing water mains, laterals, valves, hydrants, etc.
 - c. Show all proposed water mains, laterals, stubs, valves, bends, reducers, hydrants, meter housings and appurtenances.
 - d. Show all driveway, sidewalk, curb, gutter and structure footprint locations.

- e. Show all existing and proposed grade lines in the vicinity of all existing and proposed water main facilities.
5. Profiles
- a. Provide profiles for all water mains proposed.
 - b. Identify all other utilities, existing and proposed (i.e. gas, sewer, etc.). Locate all existing or proposed obstructions such as utility vaults, catch basins, traffic islands, etc.
 - c. Show casing length, restrained joint pipe length, and depth of all existing and proposed utilities at road and rail road bore crosses.
 - d. Provide all necessary Authority standard notes and details as required by these standards.
6. Provide additional plan submittals, as required by the Authority. These may include, but are not limited to, site plan, landscaping plan and an erosion control plan.
- I. Provide the following information with each water main extension submittal:
- 1. A completed Proposed Project Data Sheet (Appendix E).
 - 2. One copy of an overall master plan showing the area to be served (total build-out of the project) and any other adjoining proposed developments.
 - 3. A complete set of design drawings.
 - 4. A hydraulic network analysis or system analysis for flow and pressure in the form prescribed by in Article 2.04 above.
 - 5. A vicinity map showing adjacent area and the relationship between proposed facilities and existing facilities.
 - 6. A written statement detailing the completion of the environmental assessment process under the State Environmental Quality Review Act.
 - 7. A complete set of thrust block calculations signed and sealed by the Developer's Engineer, complete with the safety factor, design pressure, soil type, source of soil determination and soil bearing strength used.
 - 8. All calculations determining the minimum laying length of pipe required between the end of the water main and the last (upstream) valve such that when the valve is closed, and the pressure released from the water main, and the thrust block removed from the end of the water main to extend it, the water main and valve will not move. These laying length calculations are required when the proposed water main will be a

temporary dead-end water main that will be extended at a future date and when proposing to connect to an existing temporary dead-end water main.

9. A written statement detailing utility crossings of a special nature (high pressure gas lines, high voltage power conduits, petroleum pipe lines, etc..) that may require special notifications, inspections, protection from impressed current cathodic protection systems or depth of cover requirements.
 10. A written statement of potential impacts to water quality, including remedial measures if necessary.
 11. A completed DOH-348 form ready for signature, if applicable.
 12. All easement information, if applicable.
- J. Provide the following information with each cross connection control submittal:
1. A completed DOH-347 form for the Authority's signature.
 2. A completed Engineering Report for Approval of a Backflow Prevention Design (Appendix G).
 3. Elevation and Plan of the proposed backflow prevention device.
 4. Site Plan, if applicable.
 5. Specification sheets for all proposed devices.
- K. Provide the following information with each project that involves installation of a PS, water storage tank or transmission main:
1. Submit a basis of design report that is designed, approved and stamped by a New York State Licensed Professional Engineer for the Authority's review and approval. Design documents will not be reviewed until the basis of design report has been approved by the Authority.
 2. After the Authority has reviewed and approved the basis of design report provide the following information:
 - a. A complete set of design drawings.
 - b. A complete set of design specifications.
 - c. A completed DOH-348 form for the Authority's signature, if applicable.
 - d. A completed building permit application for the Authority's signature and submission, if applicable.

- e. A copy of the Geotechnical Investigation stamped by a New York State Licensed Professional Engineer.
 - f. A written statement detailing the completion of the environmental assessment process under the State Environmental Quality Review Act.
 - g. A complete set of thrust block and/or restrained joint pipe calculations signed and sealed by the Developer's Engineer, complete with the safety factor, design pressure, soil type, source of soil determination and soil bearing strength used.
 - h. All calculations determining the minimum laying length of pipe required between the end of the water main and the last (upstream) valve such that when the valve is closed, and the pressure released from the water main, and the thrust block removed from the end of the water main to extend it, the water main and valve will not move. These laying length calculations are required when the proposed water main will be a temporary dead-end water main that will be extended at a future date and when proposing to connect to an existing temporary dead-end water main.
 - i. A written statement detailing utility crossings of a special nature (high pressure gas lines, high voltage power conduits, petroleum pipe lines, etc..) that may require special notifications, inspections, protection from impressed current cathodic protection systems or depth of cover requirements.
 - j. All easement information, if applicable.
- L. Provide the following information with each water district submittal:
- 1. Submit a Preliminary Engineering Report prior to the design documents for the Authority's review. The Preliminary Engineering Report must include:
 - a. Project location map.
 - b. Hydraulic Network Analysis.
 - c. Water Quality Calculations as outlined in section 2.05.G.
 - d. Consumption Rates.
 - e. A written statement detailing the completion of the environmental assessment process under the State Environmental Quality Review Act.
 - f. A map indicating the proposed water district boundaries. Map shall clearly indicate the limits that can be adequately served from the proposed improvements based upon the existing topography.

2. After the Authority has reviewed and approved the preliminary engineering report provide the following information:
 - a. A complete set of design drawings.
 - b. A complete set of design specifications.
 - c. A completed DOH-348 form for the Authority's signature.
 - d. Service Sizing Calculations.
 - e. Water Quality Calculations as outlined in section 2.05.G.
 - f. A written statement detailing the completion of the environmental assessment process under the State Environmental Quality Review Act.
 - g. A complete set of thrust block calculations signed and sealed by the Developer's Engineer, complete with the safety factor, design pressure, soil type, source of soil determination and soil bearing strength used.
 - h. All calculations determining the minimum laying length of pipe required between the end of the water main and the last (upstream) valve such that when the valve is closed, and the pressure released from the water main, and the thrust block removed from the end of the water main to extend it, the water main and valve will not move. These laying length calculations are required when the proposed water main will be a temporary dead-end water main that will be extended at a future date and when proposing to connect to an existing temporary dead-end water main.
 - i. A written statement detailing utility crossings of a special nature (high pressure gas lines, high voltage power conduits, petroleum pipe lines, etc.) that may require special notifications, inspections, protection from impressed current cathodic protection systems or depth of cover requirements.
 - j. All easement information, if applicable, to be filed by the District.

~ END OF SECTION ~