FLBOA
ANNUAL CONFERENCE 2024

Water Supply and Distribution

MONROE COUNTY WATER AUTHORITY

Course Information

This course has been approved by the Department of State for In-Service Training credit as follows:

- 2 hours, Topic 2 – Uniform Code

Course number: T02-07-3243

Department of State
Building Standards and Codes

Attendees must scan or sign the Class Registration List to receive credit

- Scanning In – Between 30 minutes before the scheduled start time to 15 minutes after the scheduled start time.
- Scanning Out – Between the scheduled end time to 30 minutes after the scheduled end time.

Scans or signatures outside of the above time frames will prohibit attendees from receiving course credit.

Department of State
Building Standards and Codes

Course Attendance Issues

The Division of Building Standards and Codes cannot give course attendees credit for a course without the required scans or signatures.

NEW YORK STATE | Department of State Building Standards and Codes

Stephen Savage, P.E.
Director of Engineering for Monroe County Water Authority (MCWA) since 2008

Former
Project Engineer with the MCWA 2 years
10 years as a Municipal Consulting Engineer and Project Manager

Certifications or Licenses
Licensed Professional Engineer in NYS
Licensed NYS Code Enforcement Official
Water System Operator – Class D

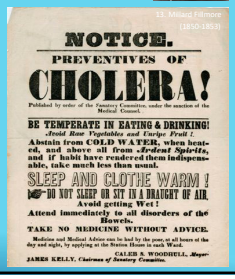
Serve
Board of Advisors for the Civil Engineering Technology Program at Rochester Institute of Technology
Board of Advisors for the Environmental Engineering Program for the US Military Academy at West Point
Former Town of Greece Planning Board Member (2006-2010)

AGENDA

- History of Water in Monroe County
- Codes and Standards
  - Monroe County Water Authority Uniform Design And Construction Standards for Extending Water Distribution Systems
  - Residential Code Chapter 29 Water Supply and Distribution – Residential Backflow
  - 10 NYCRR Part 5 of the New York State Sanitary Code
- Materials
- Public and private hydrants
- Flow tests and hydraulic modeling

- Cholera epidemics in Rochester
  - 1832: 121 persons died (1% of population) & 388 sickened
  - 1852: 420 – 469 reported dead
- Several water companies formed, none succeeded

13. Millard Fillmore (1850-1853)



NOTICE.

PREVENTIVES OF

CHOLERA!

Published by order of the Sanitary Committee, under the sanction of the Medical Council.

BE TEMPERATE IN EATING & DRINKING!

Avoid Raw Vegetables and Unripe Fruit!

Abstain from COLD WATER, when heated, and above all from *Ardent Spirits*, and if habit have rendered them indispensable, take much less than usual.

SLEEP AND CLOTHE WARM!

DO NOT SLEEP OR SIT IN A DRAUGHT OF AIR.

Avoid getting Wet!

Attend immediately to all disorders of the Bowels.

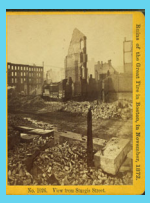
TAKE NO MEDICINE WITHOUT ADVICE.

Medicine and Medical Advice can be had by the poor, at all hours of the day and night, by applying at the Station House in each Ward.

CALEB S. WOODRUFF, *Mayor.*

JAMES KELLY, *Chairman of Sanitary Committee.*

GREAT FIRES OF CHICAGO (1871) AND BOSTON (1872)



- $222 M in property
- 3.3 square miles
- 17,500 Buildings
- 300 Fatalities

- Property loss $73 M = ~$1.6B (2022)
- 65 acres
- 776 Buildings
- 30 Fatalities

START OF ROCHESTER PUBLIC WATER SYSTEMS

18. Ulysses S. Grant (1869-1877)

- 1872
  - Board of Water Commissioners established by NYS
- 1873 – 74
  - Holley System constructed
- 1873-76
  - Conduit I supply
    - Hemlock
    - Rush & Highland reservoirs
  - 58 miles of distribution

Highland Park Reservoir and Gate House, Rochester, N. Y.

NEW YORK WATER SERVICE CORPORATION - 1904

26. Theodore Roosevelt (1901-1909)

- Charlotte WTP constructed
  - Sedimentation
- Transmission:
  - 20": Charlotte to Fairport
  - Pump Stations: Ridge – Burrows – Culver Rd – Linden Rd
  - Cobbs Tank I

CROSS CONNECTION CRISIS - 1940

- A waterworks worker opened a valve connecting the Holly and domestic systems, allowing river water into the domestic system.
  - 34,000 cases of dysentery and diarrhea
  - State issued boil-water order
  - City severed interconnections
  - River source to Holly eliminated – fed with Hemlock supply or filtered water from Kodak

MCWA FORMATIVE YEARS

34. Dwight D. Eisenhower (1953-1961)

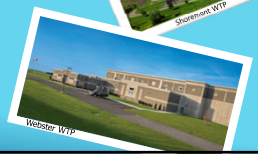
- 1950
  - MCWA Formed by NYS
- 1954
  - First customers served (Honeoye Falls)
- 1959
  - Acquisition, by EDPL, of NY Water Service Corp.
- 1962
  - SWTP constructed

CROSS CONNECTION DÉJÀ VU ?

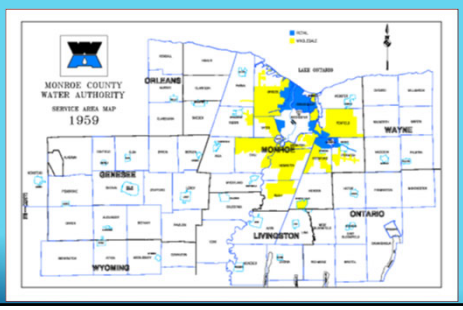
Caledonia October 2014

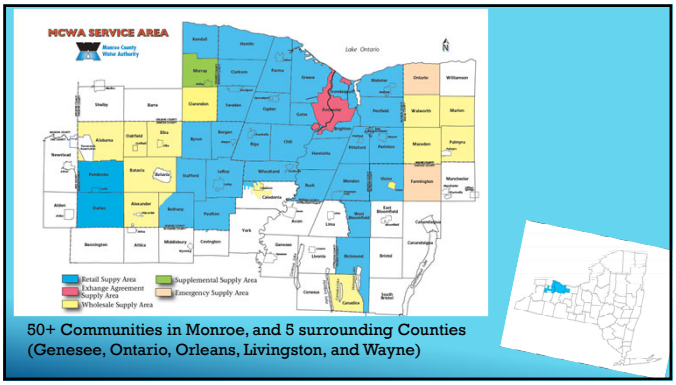
MONROE COUNTY WATER AUTHORITY (MCWA)

- Created by statute in 1950 under the Public Authorities Law of New York State
- Not-for-Profit Public Benefit Corporation
- Monroe County Legislature appoints Water Authority Board Members
- Began operation in 1959 after taking over private Rochester Branch of the NYS Water Service Corporation



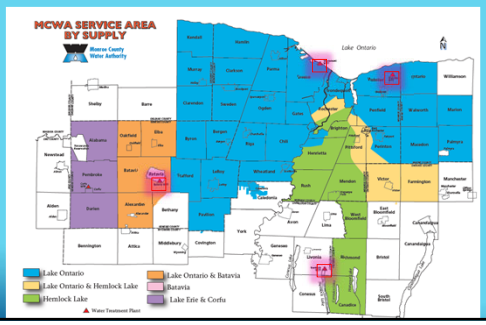
MCWA'S ORIGINAL SERVICE AREA





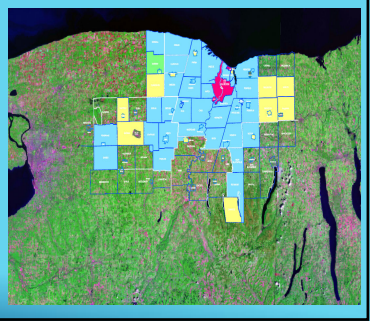
50+ Communities in Monroe, and 5 surrounding Counties (Genesee, Ontario, Orleans, Livingston, and Wayne)

WHERE DOES THE WATER COME FROM…



MCWA – BY THE NUMBERS

- 786,000 Population served
- 55 Communities Served
  - 190,000 Retail Customer Accounts
  - 27,000 Wholesale Customers
- Treat 20 Billion gallons /year
- 56 Storage Facilities (153 mg)
- 48 Pumping Stations
  - 42,000 horsepower connected load
- 3,435 miles of Water Mains
  - 27,350 fire hydrants & 38,000 valves

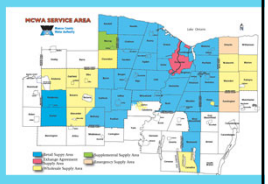


RETAIL LEASE AGREEMENT

- Water Authority is responsible for:
  - Supply, Treatment, Pumping, Transmission & Storage facilities
    - Construction, O&M, CIP's and R&R
  - Distribution Maintenance & Repairs
  - All Water Quality & Testing
  - Billing / Customer Service
  - Infrastructure Replacements
  - New Installations Review and Approvals
- Municipality is responsible for:
  - New distribution mains on existing streets currently unserved
  - Additional Fire Hydrants

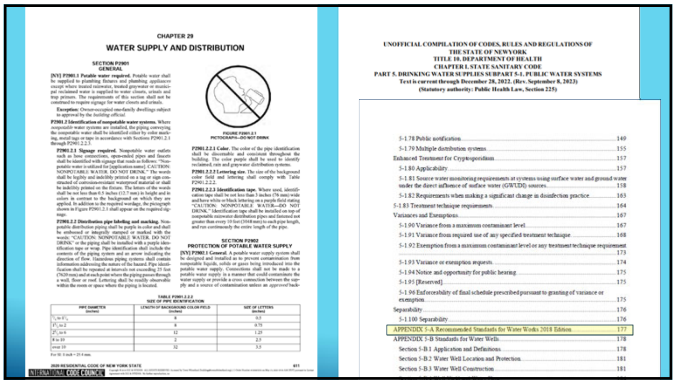
WHOLESALE AGREEMENT

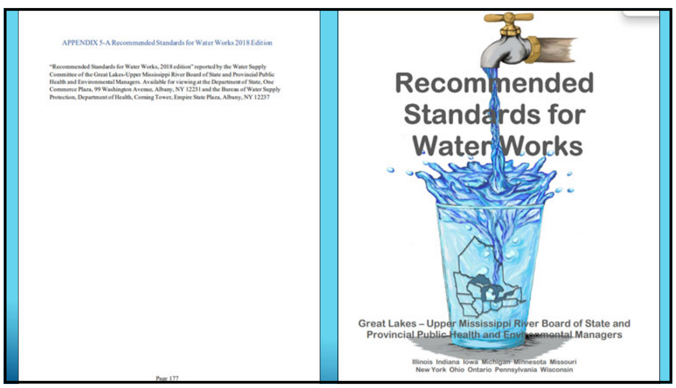
- Water Authority is responsible for:
  - Selling water at boundary points through meters.
  - Supply, Treatment, Pumping, Transmission & Storage facilities
    - Construction, O&M, CIP's and R&R
  - Reviewing & assisting with district extensions including hydraulic planning.
- Municipality is responsible for:
  - New Water District Extensions.
  - Main replacements and distribution system improvements.
  - Distribution maintenance.
  - Customer billing.
  - New service installation.
  - Water quality and testing.

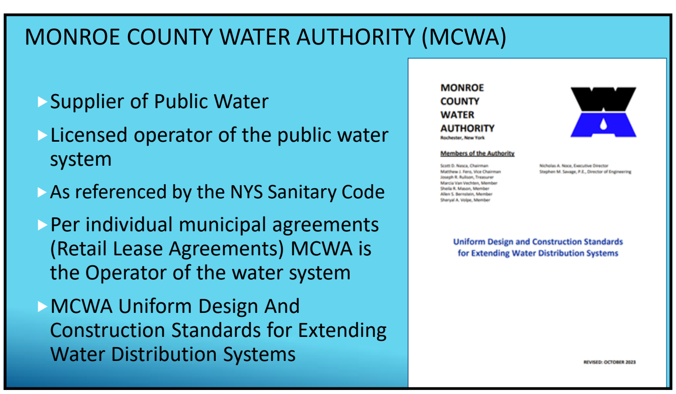


EXTENSIONS TO NEW SERVICE AREAS

- Water Districts
  - Initiated & constructed by Town / Village
  - Constructed to MCWA Design Standards
  - Operated & Maintained under the Retail Lease Agreement
- New Developments
  - Town / Village subdivision approval
  - Constructed to MCWA Design Standards
  - Dedicated to MCWA


CHAPTER 29
WATER SUPPLY AND DISTRIBUTION
UNOFFICIAL COMPILATION OF CODES, RULES AND REGULATIONS OF
THE STATE OF NEWYORK
TITLE 10. DEPARTMENT OF HEALTH
CHAPTER I. STATE SANITARY CODE
PART 5. DRINKING WATER SUPPLIES SUBPART 5-1. PUBLIC WATER SYSTEMS
Text is current through December 28, 2022. (Rev. September 8, 2023)
(Statutory authority: Public Health Law, Section 225)
5-1.78 Public notification 149
5-1.79 Multiple distribution systems 155
Enhanced Treatment for Cryptosporidium 157
5-1.80 Applicability 157
5-1.81 Source water monitoring requirements at systems using surface water and ground water under the direct influence of surface water (GWUDI) sources 158
5-1.82 Requirements when making a significant change in disinfection practice 163
APPENDIX 5-A Recommended Standards for Water Works 2018 Edition 177


APPENDIX 5-A Recommended Standards for Water Works 2018 Edition
"Recommended Standards for Water Works, 2018 edition" reported by the Water Supply Committee of the Great Lakes-Upper Mississippi River Board of State and Provincial Public Health and Environmental Managers. Available for viewing at the Department of State, One Commerce Plaza, 99 Washington Avenue, Albany, NY 12231 and the Bureau of Water Supply Protection, Department of Health, Corning Tower, Empire State Plaza, Albany, NY 12237
Recommended Standards for Water Works
Great Lakes – Upper Mississippi River Board of State and Provincial Public Health and Environmental Managers
Illinois Indiana Iowa Michigan Minnesota Missouri
New York Ohio Ontario Pennsylvania Wisconsin


MONROE COUNTY WATER AUTHORITY (MCWA)
Supplier of Public Water
Licensed operator of the public water system
As referenced by the NYS Sanitary Code
Per individual municipal agreements (Retail Lease Agreements) MCWA is the Operator of the water system
MCWA Uniform Design And Construction Standards for Extending Water Distribution Systems
MONROE COUNTY WATER AUTHORITY
Uniform Design and Construction Standards for Extending Water Distribution Systems

BACKFLOW FOR RESIDENTIAL PROPERTIES

SECTION P2902
PROTECTION OF POTABLE WATER SUPPLY

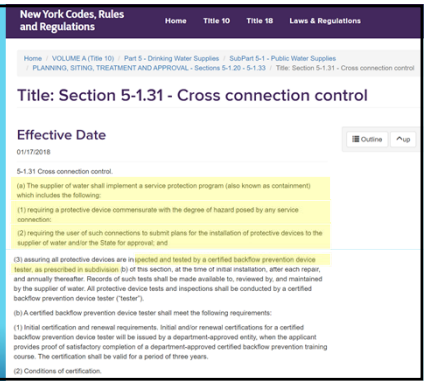
[NY] P2902.1 General. A potable water supply system shall be designed and installed as to prevent contamination from nonpotable liquids, solids or gases being introduced into the potable water supply. Connections shall not be made to a potable water supply in a manner that could contaminate the water supply or provide a cross connection between the supply and a source of contamination unless an *approved* backflow prevention device is provided. Cross connections between an individual water supply and a potable public water supply shall be prohibited, except where an appropriate cross control connection device is installed in accordance with Subpart 5-1.31 of the New York State Sanitary Code (10 NYCRR 5-1).

[NY] P2902.3 Backflow protection. A means of protection against backflow shall be provided in accordance with Sections P2902.3.1 through P2902.3.7. Backflow prevention applications shall conform to Table P2902.3, except as specifically stated in Sections P2902.4 through P2902.5.5. On-site containment is regulated by Subpart 5-1.31 of the New York State Sanitary Code (10 NYCRR) and may be required by the provider of public water, depending on the degree of hazard, to protect public water systems through the use of appropriate backflow prevention device installations.

- Auxiliary water supply (i.e. wells)
  - Approved backflow device
  - Physically separate plumbing
    - Inspections by Water Supplier as required by DOH (5 years)
- Water driven sump pumps
- House pumps
- Lawn irrigation systems
- Other hazards
- Water Supplier may not allow other devices allowed through code. i.e. Any of the situations above require testable device as approved by the Health Department.

SUBPART 5-1.31 OF NYS SANITARY CODE (10 NYCRR 5-1)

- Backflow Program
- Engineers report and plan
  - Approved by water supplier
  - Approved by State
- Inspection by Design Professional and Certification of installation per approved plans
- Inspected and tested by NYS certified backflow prevention device tester.
- Annual inspection and test by NYSDOH certified backflow device tester submitted to water supplier



New York Codes, Rules and Regulations — Home | Title 10 | Title 18 | Laws & Regulations

Home / VOLUME A (Title 10) / Part 5 - Drinking Water Supplies / SubPart 5-1 - Public Water Supplies / PLANNING, SITING, TREATMENT AND APPROVAL - Sections 5-1.20 - 5-1.33 / Title: Section 5-1.31 - Cross connection control

Title: Section 5-1.31 - Cross connection control

Effective Date

01/17/2018

Outline | up

5-1.31 Cross connection control.

(a) The supplier of water shall implement a service protection program (also known as containment) which includes the following:

(1) requiring a protective device commensurate with the degree of hazard posed by any service connection;

(2) requiring the user of such connections to submit plans for the installation of protective devices to the supplier of water and/or the State for approval; and

(3) assuring all protective devices are inspected and tested by a certified backflow prevention device tester, as prescribed in subdivision (b) of this section, at the time of initial installation, after each repair, and annually thereafter. Records of such tests shall be made available to, reviewed by, and maintained by the supplier of water. All protective device tests and inspections shall be conducted by a certified backflow prevention device tester ("tester").

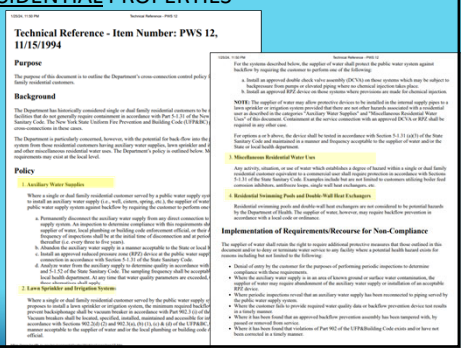
(b) A certified backflow prevention device tester shall meet the following requirements:

(1) Initial certification and renewal requirements. Initial and/or renewal certifications for a certified backflow prevention device tester will be issued by a department-approved entity, when the applicant provides proof of satisfactory completion of a department-approved certified backflow prevention training course. The certification shall be valid for a period of three years.

(2) Conditions of certification.

BACKFLOW FOR RESIDENTIAL PROPERTIES

- Auxiliary water supplies
- Lawn sprinkler and irrigation systems
- Water driven sump pumps – Miscellaneous Residential Water Use
- Other hazards



Technical Reference - Item Number: PWS 12, 11/15/1994

Purpose

Background

Policy

1. Auxiliary Water Supplies

2. Lawn Sprinkler and Irrigation System

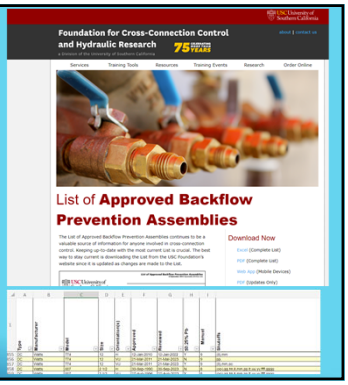
3. Miscellaneous Residential Water Uses

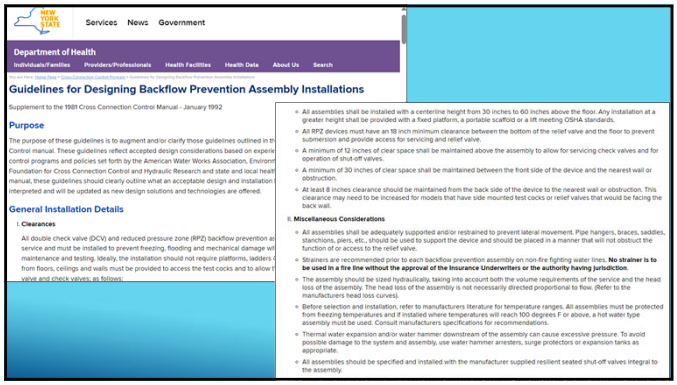
4. Residential Swimming Pools and Double-Wall Heat Exchangers

Implementation of Requirements/Recourse for Non-Compliance

APPROVED BACKFLOW DEVICES PER DOH

- NYS Follows University of Southern California (USC) Foundation for Cross – Connection Control and Hydraulic Research
- Over 4,200 approved devices





DESIGNING BACKFLOW PREVENTION ASSEMBLY INSTALLATION

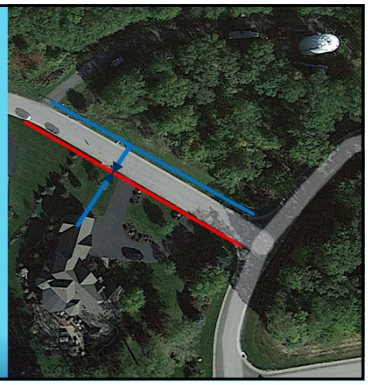
Guidelines for Designing Backflow Prevention Assembly Installations
Supplement to the 1981 Cross Connection Control Manual - January 1992

I. Clearances
II. Miscellaneous Considerations
III. Drainage
IV. Pit Installations
V. Above Grade Installations – Protective Enclosures
VI. Installation Within a Building
VII. Submission and Approval of Plans
VIII. Engineer's Report
IX. Certified Testing and Completed Works Approvals

Guidelines for Designing Backflow Prevention Assembly Installations (ny.gov)
https://www.health.ny.gov/environmental/water/drinking/cross/guide.htm

- House is over 4,000 SF
- Only 3 bedrooms, 4 bathrooms
- Constructed in 2014
- Subdivision approved by DOH

- Lawn irrigation system



- Tank Constructed in 1999

- Height - 90'
- Diameter - 25'
- Capacity – 325,000 Gal.
- Base elevation - 880'
- Overflow elevation - 981.5'
- High Operating level - 979'
- Low Operating level - 956'

- Elevation at house - 877'
- Static Pressure at house (FF) - 35 psi to 44 psi
- Water Level fluctuates = 23'

TEN STATES STANDARDS

FINISHED WATER STORAGE PART 7

7.3.1 Pressures

The maximum variation between high and low levels in storage structures providing pressure to a distribution system should not exceed 30 feet. The minimum working pressure in the distribution system should be 35 psi (240 kPa) and the normal working pressure should be approximately 60 to 80 psi (410 - 550 kPa). When static pressures exceed 100 psi (690 kPa), pressure reducing devices shall be provided on mains or as part of the meter setting on individual service lines in the distribution system.

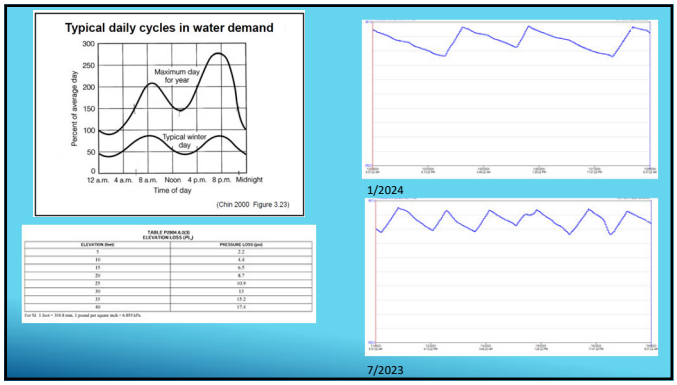
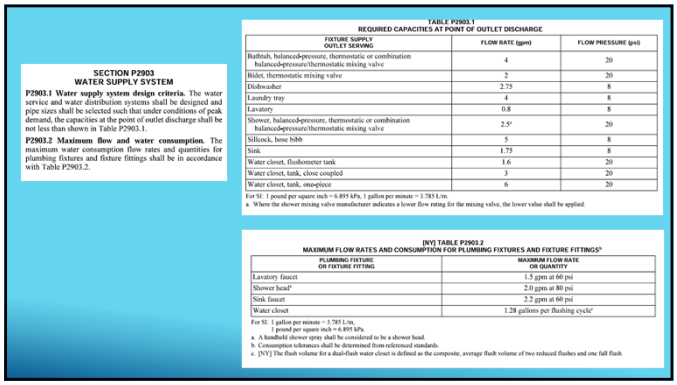


TABLE P0904.6.1(3)
ELEVATION LOSS (PL)

ELEVATION (feet)	PRESSURE LOSS (psi)
5	2.2
10	4.4
15	6.5
20	8.7
25	10.9
30	13
35	15.2
40	17.4

For SI: 1 foot = 304.8 mm, 1 pound per square inch = 6.895 kPa.



SECTION P2903
WATER SUPPLY SYSTEM

P2903.1 Water supply system design criteria. The water service and water distribution systems shall be designed and pipe sizes shall be selected such that under conditions of peak demand, the capacities at the point of outlet discharge shall be not less than shown in Table P2903.1.

P2903.2 Maximum flow and water consumption. The maximum water consumption flow rates and quantities for plumbing fixtures and fixture fittings shall be in accordance with Table P2903.2.

TABLE P2903.1
REQUIRED CAPACITIES AT POINT OF OUTLET DISCHARGE

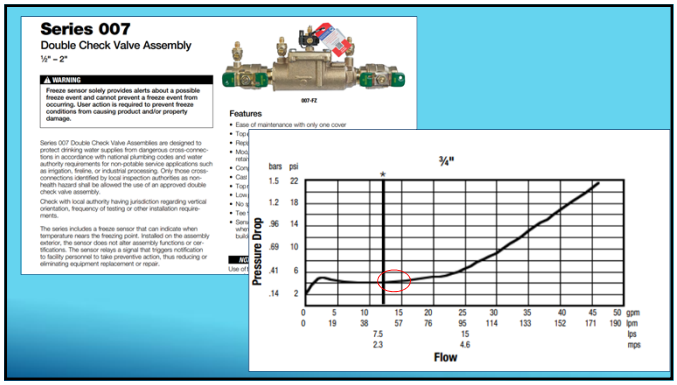
FIXTURE SUPPLY OUTLET SERVING	FLOW RATE (gpm)	FLOW PRESSURE (psi)
Bathtub, balanced-pressure, thermostatic or combination balanced-pressure/thermostatic mixing valve	4	20
Bidet, thermostatic mixing valve	2	20
Dishwasher	2.75	8
Laundry tray	4	8
Lavatory	0.8	8
Shower, balanced-pressure, thermostatic or combination balanced-pressure/thermostatic mixing valve	2.5[a]	20
Sillcock, hose bibb	5	8
Sink	1.75	8
Water closet, flushometer tank	1.6	20
Water closet, tank, close coupled	3	20
Water closet, tank, one-piece	6	20

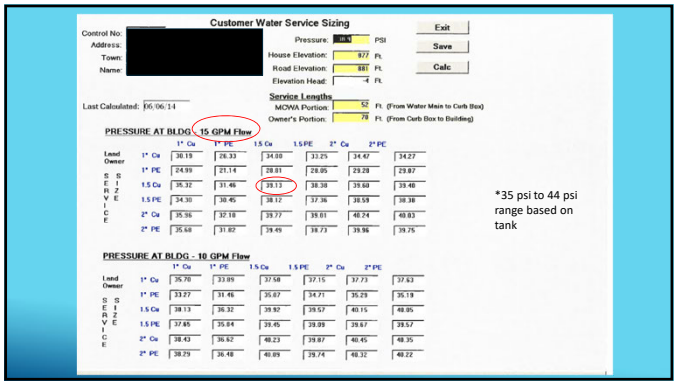
For SI: 1 pound per square inch = 6.895 kPa, 1 gallon per minute = 3.785 L/m.
a. Where the shower mixing valve manufacturer indicates a lower flow rating for the mixing valve, the lower value shall be applied.

[NY] TABLE P2903.2
MAXIMUM FLOW RATES AND CONSUMPTION FOR PLUMBING FIXTURES AND FIXTURE FITTINGS[a]

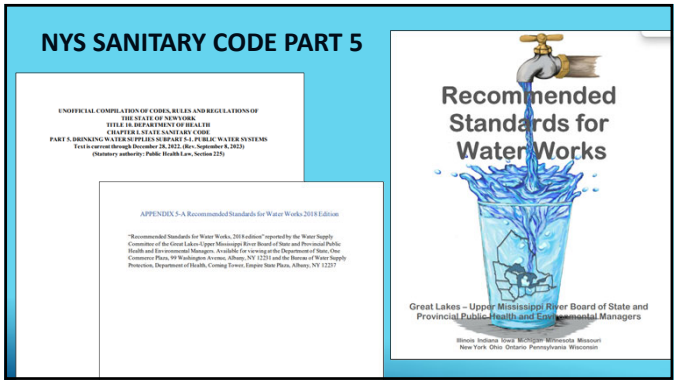
PLUMBING FIXTURE OR FIXTURE FITTING	MAXIMUM FLOW RATE OR QUANTITY
Lavatory faucet	1.5 gpm at 60 psi
Shower head[a]	2.0 gpm at 80 psi
Sink faucet	2.2 gpm at 60 psi
Water closet	1.28 gallons per flushing cycle[c]

For SI: 1 gallon per minute = 3.785 L/m,
1 pound per square inch = 6.895 kPa.
a. A handheld shower spray shall be considered to be a shower head.
b. Consumption tolerances shall be determined from referenced standards.
c. [NY] The flush volume for a dual-flush water closet is defined as the composite, average flush volume of two reduced flushes and one full flush.





*35 psi to 44 psi range based on tank



6.4 BOOSTER PUMPS

Booster pumps shall be located or controlled so that:

a. they will not produce negative pressure in their suction lines;

b. pumps installed in the distribution system shall maintain inlet pressure as required in Section 8.2.1 under all operating conditions. Pumps taking suction from storage tanks shall be provided adequate net positive suction head;

c. automatic shutoff or low pressure controller shall maintain at least 20 psi (140 kPa) in the suction line under all operating conditions, unless otherwise acceptable to the reviewing authority. Pumps taking suction from ground storage tanks shall be equipped with automatic shutoffs or low pressure controllers as recommended by the pump manufacturer;

d. automatic or remote control devices shall have a range between the start and cutoff pressure which will prevent excessive cycling;

e. a bypass is available.

6.4.1 Duplicate pumps

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

6.4.2 Metering

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

6.4.3 Inline booster pumps

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

6.4.4 Individual residential booster pumps

Private booster pumps shall not be allowed for any individual residential service from the public water supply main.

6.5 AUTOMATIC AND REMOTE CONTROLLED STATIONS

All automatic stations should be provided with automatic signaling apparatus which will report when the station is out of service. All remote controlled stations shall be electrically operated and controlled and shall have signaling apparatus of proven performance.

TABLE P2904.6.2(1)
WATER SERVICE PRESSURE LOSS (PL_{ss})[a, b]

FLOW RATE[c] (gpm)	¾-INCH WATER SERVICE PRESSURE LOSS (psi)				1-INCH WATER SERVICE PRESSURE LOSS (psi)				1¼-INCH WATER SERVICE PRESSURE LOSS (psi)			
	Length of water service pipe (feet)				Length of water service pipe (feet)				Length of water service pipe (feet)			
	40 or less	41 to 75	76 to 100	101 to 150	40 or less	41 to 75	76 to 100	101 to 150	40 or less	41 to 75	76 to 100	101 to 150
8	5.1	8.7	11.8	17.4	1.5	2.5	3.4	5.1	0.6	1.0	1.3	1.9
10	7.7	13.1	17.8	26.3	2.3	3.8	5.2	7.7	0.8	1.4	2.0	2.9
12	10.8	18.4	24.9	NP	3.2	5.4	7.3	10.7	1.2	2.0	2.7	4.0
14	14.4	24.5	NP	NP	4.2	7.1	9.6	14.3	1.6	2.7	3.6	5.4
16	18.4	NP	NP	NP	5.4	9.1	12.4	18.3	2.0	3.4	4.7	6.9
18	22.9	NP	NP	NP	6.7	11.4	15.4	22.7	2.5	4.3	5.8	8.6
20	27.8	NP	NP	NP	8.1	13.8	18.7	27.6	3.1	5.2	7.0	10.4
22	NP	NP	NP	NP	9.7	16.5	22.3	NP	3.7	6.2	8.4	12.4
24	NP	NP	NP	NP	11.4	19.3	26.2	NP	4.3	7.3	9.9	14.6
26	NP	NP	NP	NP	13.2	22.4	NP	NP	5.0	8.5	11.4	16.9
28	NP	NP	NP	NP	15.1	25.7	NP	NP	5.7	9.7	13.1	19.4
30	NP	NP	NP	NP	17.2	NP	NP	NP	6.5	11.0	14.9	22.0
32	NP	NP	NP	NP	19.4	NP	NP	NP	7.3	12.4	16.8	24.8
34	NP	NP	NP	NP	21.7	NP	NP	NP	8.2	13.9	18.8	NP
36	NP	NP	NP	NP	24.1	NP	NP	NP	9.1	15.4	20.9	NP

For SI: 1 inch = 25.4 mm, 1 foot = 304.8 mm, 1 gallon per minute = 0.063 L/s, 1 pound per square inch = 6.895 kPa.
NP = Not Permitted. Pressure loss exceeds reasonable limits.
a. Values are applicable for underground piping materials listed in Table P2905.4 and are based on an SDR of 11 and a Hazen Williams C Factor of 150.
b. Values include the following length allowances for fittings: 25% length increase for actual lengths up to 100 feet and 15% length increase for actual lengths over 100 feet.
c. Flow rate from Section P2904.4.2. Add 5 gpm to the flow rate required by Section P2904.4.2 where the water service pipe supplies more than one dwelling.

MCWA DESIGN STANDARDS

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:

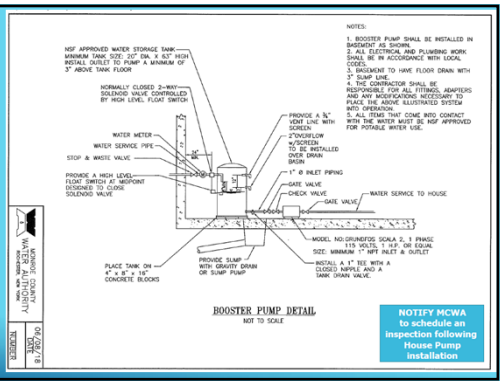
1. Design water system so that each building with 2 or less stories, will have at least 35 psi at first floor level with a flow rate of 15 gpm (or calculated maximum domestic flow for the building, whichever is greater), with a domestic demand at all other units in the system proposed flowing at a rate of:

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

2-2

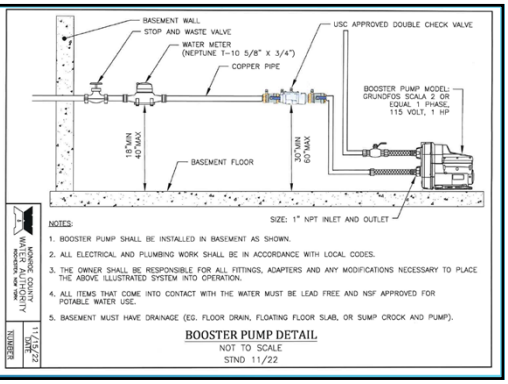
D. Services which will have water pressure between 20 and 40 psi under any conditions of demand, except fire flows, are termed "Low Pressure Water Services". If a property can be served by extending a water main from an adjacent higher pressure zone, then a low pressure water service will generally not 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 form the affected property Owner(s).

MCWA OLD RESIDENTIAL BOOSTER PUMP DETAIL



NOTIFY MCWA to schedule an inspection following House Pump installation

MCWA CURRENT RESIDENTIAL BOOSTER PUMP DETAIL



- Secondary backflow requirements
- If a hazard per PWS-12, MCWA will require an approved backflow device.
- Lawn Irrigation systems very common.

P2902.5 Protection of potable water connections. Connections to the potable water shall conform to Sections P2902.5.1 through P2902.5.5.

P2902.5.1 Connections to boilers. Where chemicals will not be introduced into a boiler, the potable water supply to the boiler shall be protected from the boiler by a backflow preventer with an intermediate atmospheric vent complying with ASSE 1012 or CSA B64.3. Where chemicals will be introduced into a boiler, the potable water supply to the boiler shall be protected from the boiler by an *air gap* or a reduced pressure principle backflow prevention assembly complying with ASSE 1013, CSA B64.4 or AWWA C511.

P2902.5.2 Heat exchangers. Heat exchangers using an essentially toxic transfer fluid shall be separated from the potable water by double-wall construction. An *air gap* open to the atmosphere shall be provided between the two walls. Single-wall construction heat exchangers shall be used only where an *essentially nontoxic transfer fluid* is utilized.

P2902.5.3 Lawn irrigation systems. The potable water supply to lawn irrigation systems shall be protected against backflow by an atmospheric vacuum breaker, a pressure vacuum-breaker assembly or a reduced pressure principle backflow prevention assembly. Valves shall not be installed downstream from an atmospheric vacuum breaker. Where chemicals are introduced into the system, the potable water supply shall be protected against backflow by a reduced pressure principle backflow prevention assembly.

P2902.5.4 Connections to automatic fire sprinkler systems. The potable water supply to automatic fire sprinkler systems shall be protected against backflow by a double-check backflow prevention assembly, a double-check fire protection backflow prevention assembly, a reduced pressure principle backflow prevention assembly or a reduced pressure principle fire protection backflow prevention assembly.

Exception: Where sprinkler systems are installed in accordance with Section P2904.1, backflow protection for the water supply system shall not be required.

P2902.5.4.1 Additives or nonpotable source. Where systems contain chemical additives or antifreeze, or where systems are connected to a nonpotable secondary water supply, the potable water supply shall be protected against backflow by a reduced pressure principle backflow prevention assembly or a reduced pressure principle fire protection backflow prevention assembly. Where chemical additives or antifreeze is added to only a portion of an automatic fire sprinkler or standpipe system, the reduced pressure principle fire protection backflow preventer shall be permitted to be located so as to isolate that portion of the system.

SECTION P2904
DWELLING UNIT FIRE SPRINKLER SYSTEMS

P2904.1 General. The design and installation of residential fire sprinkler systems shall be in accordance with NFPA 13D or Section P2904, which shall be considered to be equivalent to NFPA 13D. Partial residential sprinkler systems shall be permitted to be installed only in buildings not required to be equipped with a residential sprinkler system. Section P2904 shall apply to stand-alone and multipurpose wet-pipe sprinkler systems that do not include the use of antifreeze. A multipurpose fire sprinkler system shall provide domestic water to both fire sprinklers and plumbing fixtures. A stand-alone sprinkler system shall be separate and independent from the water distribution system. A backflow preventer shall not be required to separate a sprinkler system from the water distribution system, provided that the sprinkler system complies with all of the following:

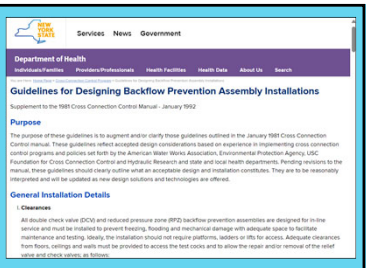
1. The system complies with NFPA 13D or Section P2904.
2. The piping material complies with Section P2906.
3. The system does not contain antifreeze.
4. The system does not have a fire department connection.

P2902.6 Location of backflow preventers. Access shall be provided to backflow preventers as specified by the manufacturer's installation instructions.

P2902.6.1 Outdoor enclosures for backflow prevention devices. Outdoor enclosures for backflow prevention devices shall comply with ASSE 1060.

P2902.6.2 Protection of backflow preventers. Backflow preventers shall not be located in areas subject to freezing except where they can be removed by means of unions, or are protected by heat, insulation or both.

P2902.6.3 Relief port piping. The termination of the piping from the relief port or air gap fitting of the backflow preventer shall discharge to an *approved* indirect waste receptor or to the outdoors where it will not cause damage or create a nuisance.



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Guidelines for Designing Backflow Prevention Assembly Installations

Supplement to the 1981 Cross Connection Control Manual - January 1992

Purpose

The purpose of these guidelines is to augment and/or clarify those guidelines outlined in the January 1981 Cross Connection Control manual. These guidelines reflect accepted design considerations based on experience in implementing cross connection control programs and policies set forth by the American Water Works Association, Environmental Protection Agency, USC Foundation for Cross Connection Control and Hydraulic Research and state and local health departments. Pending revisions to the manual, these guidelines should clearly outline what an acceptable design and installation constitutes. They are to be reasonably interpreted and will be updated as new design solutions and technologies are offered.

General Installation Details

I. Clearances

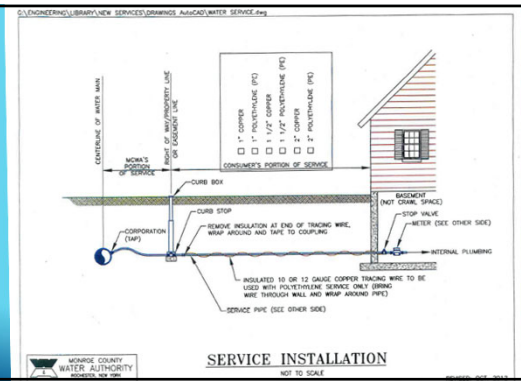
All double check valve (DCV) and reduced pressure zone (RPZ) backflow prevention assemblies are designed for in-line service and must be installed to prevent freezing, flooding and mechanical damage with adequate space to facilitate maintenance and testing. Ideally, the installation should not require platforms, ladders or lifts for access. Adequate clearances from floors, ceilings and walls must be provided to access the test cocks and to allow the repair and/or removal of the relief valve and check valves, as follows:

MCWA STANDARDS REGARDING PIPE MATERIALS

SECTION P2906
MATERIALS, JOINTS AND CONNECTIONS

P2906.1 Soil and groundwater. The installation of water service pipe, water distribution pipe, fittings, valves, appurtenances and gaskets shall be prohibited in soil and groundwater that is contaminated with solvents, fuels, organic compounds or other detrimental materials that cause permeation, corrosion, degradation or structural failure of the water service or water distribution piping material.

P2906.1.1 Investigation required. Where detrimental conditions are suspected by or brought to the attention of the *building official*, a chemical analysis of the soil and groundwater conditions shall be required to ascertain the acceptability of the water service material for the specific installation.



P2906.4 Water service pipe. Water service pipe shall conform to NSF 61 and shall conform to one of the standards indicated in Table P2906.4. Water service pipe or tubing, installed underground and outside of the structure, shall have a working pressure rating of not less than 160 pounds per square inch at 73°F (1103 kPa at 23°C). Where the water pressure exceeds 160 pounds per square inch (1103 kPa), piping material shall have a rated working pressure equal to or greater than the highest available pressure. Water service piping materials not third-party certified for water distribution shall terminate at or before the full open valve located at the entrance to the structure. Ductile iron water service piping shall be cement mortar lined in accordance with AWWA C104/A21.4.

P2906.4.1 Separation of water service and building sewer. Trenching, pipe installation and backfilling shall be in accordance with Section P2604. Where water service piping is located in the same trench with the building sewer, such sewer shall be constructed of materials listed in Table P3002.1(2). Where the building sewer piping is not constructed of materials indicated in Table P3002.1(2), the water service pipe and the building sewer shall be horizontally separated by not less than 5 feet (1524 mm) of undisturbed or compacted earth. The required separation distance shall not apply where a water service pipe crosses a sewer pipe, provided that the water service is sleeved to a point not less than 5 feet (1524 mm) horizontally from the sewer pipe centerline on both sides of such crossing. The sleeve shall be of pipe materials indicated in Table P2906.4, P3002.1(2) or P3002.2. The required separation distance shall not apply where the bottom of the water service pipe that is located within 5 feet (1524 mm) of the sewer is not less than 12 inches (305 mm) above the highest point of the top of the building sewer.

TEN STATES STANDARDS

DISTRIBUTION SYSTEM PIPING AND APPURTENANCES — PART 8

8.8 SEPARATION DISTANCES FROM CONTAMINATION SOURCES

8.8.1 General

The following factors should be considered in providing adequate separation:

a. materials and type of joints for water and sewer pipes,

b. soil conditions,

c. service and branch connections into the water main and sewer line,

d. compensating variations in the horizontal and vertical separations,

e. space for repair and alterations of water and sewer pipes,

f. off-setting of pipes around manholes.

g. Sanitary sewer shall be defined as a gravity pipe carrying untreated wastewater. Storm sewer shall be defined as gravity pipe carrying surface water runoff to a point of discharge

8.8.2 Parallel installation

a. Water mains shall be laid at least 10 feet horizontally from any existing or proposed gravity sanitary or storm sewer, septic tank, or subsoil treatment system. The distance shall be measured edge to edge.

b. In cases where it is not practical to maintain a 10 foot separation, the reviewing authority may allow deviation on a case-by-case basis, if supported by data from the design engineer.

8.8.3 Crossings

a. Water mains crossing sanitary or storm sewers shall be laid to provide a minimum vertical distance of 18 inches between the outside of the water main and the outside of the sewer. This shall be the case where the water main is either above or below the sewer with preference to the water main located above the sewer.

b. At crossings, one full length of water pipe shall be located so both joints will be as far from the sewer as possible. Special structural support for the water and sewer pipes may be required.

8.8.4 Exception

When it is impossible to obtain the minimum specified separation distances, the reviewing authority must specifically approve any deviation from the requirements of Sections 8.8.2 and 8.8.3. Where sanitary or storm sewers are being installed and Section 8.8.2 and 8.8.3 cannot be met, the following methods of installation may be used:

a. Such deviation may allow installation of the water main closer to a sewer, provided that the water main is laid in a separate trench or on an undisturbed earth shelf located on one side of the sewer at such an elevation that the bottom of the water main is at least 18 inches above the top of the gravity sewer.

-134-

DISTRIBUTION SYSTEM PIPING AND APPURTENANCES — PART 8

b. The sanitary sewer pipe materials and installation shall meet the requirements of Sections 8.1 and 8.7, or otherwise approved by the reviewing authority. Pipe shall be pressure tested to ensure water tightness.

c. The storm sewer materials shall be as approved by the reviewing authority and shall be pressure tested to ensure water tightness.

8.8.5 Force mains

There shall be at least a 10 foot horizontal separation between water mains and sanitary or storm sewer force mains. There shall be an 18 inch vertical separation at crossings as required in Section 8.8.3. Any deviation from these requirements must be approved by the reviewing authority.

8.8.6 Sewer manholes, inlets, and structures

No water pipe shall pass through or come in contact with any part of a sanitary or storm sewer manhole, inlet, or structure. Water main shall be located at least 10 feet from sewer manholes, inlets, and structures; any deviation from this requirement must be approved by the reviewing authority.

8.8.7 Separation of water mains from other sources of contamination

Design engineers should exercise caution when locating water mains at or near certain sites such as sewage treatment plants or industrial complexes. On site waste disposal facilities including absorption fields must be located and avoided. The engineer must contact the reviewing authority to establish specific design requirements for locating water mains near any source of contamination.

8.9 SURFACE WATER CROSSINGS

Surface water crossings, whether over or under water, present special problems. The reviewing authority should be consulted before final plans are prepared.

8.9.1 Above-water crossings

The pipe shall be adequately supported and anchored, protected from vandalism, damage and freezing, and accessible for repair or replacement.

8.9.2 Underwater crossings

A minimum cover of five feet shall be provided over the pipe unless otherwise approved by the reviewing authority. When crossing water courses which are greater than 15 feet in width, the following shall be provided:

a. the pipe shall be of special construction, having flexible, restrained or welded watertight joints,

b. valves shall be provided at both ends of water crossings so that the section can be isolated for testing or repair; the valves shall be easily accessible, and not subject to flooding,

c. permanent taps or other provisions to allow insertion of a small meter to determine leakage and obtain water samples on each side of the valve closest to the supply source.

-135-

Fire Code of NYS 2020 (FCNYS 2020)
Section 102.6 spells out applicability of the Fire Code to 1 and 2 Family structures

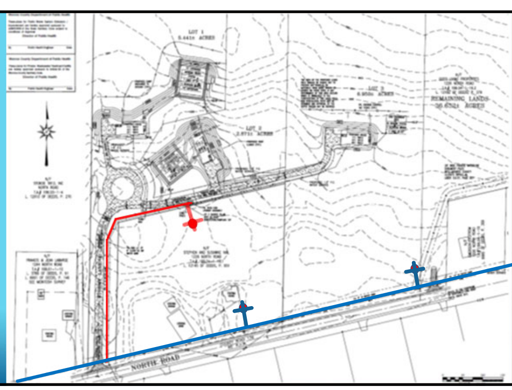
[NY] 102.6 Application of the Residential Code of New York State. Where *structures* are designed and constructed in accordance with the *Residential Code of New York State*, the construction and design provisions of this code pertaining to the exterior of the structure shall apply including, but not limited to, premises identification, fire apparatus access, and water supplies.

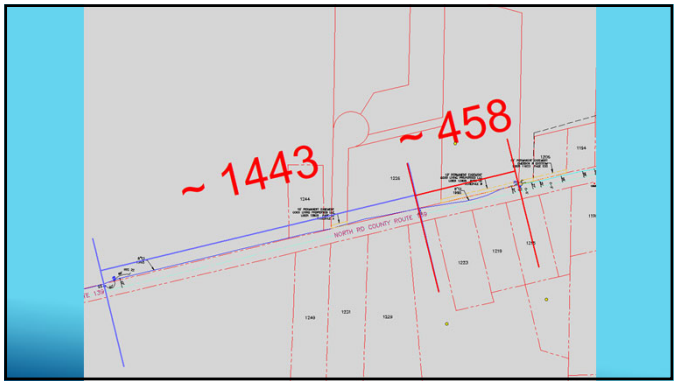
507.5 Fire hydrant systems. Fire hydrant systems shall comply with Sections 507.5.1 through 507.5.6.

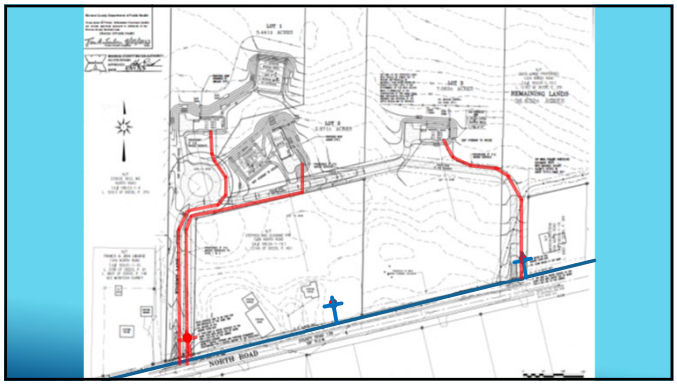
507.5.1 Where required. Where a portion of the facility or building hereafter constructed or moved into or within the jurisdiction is more than 400 feet (122 m) from a hydrant on a fire apparatus access road, as measured by an *approved* route around the exterior of the facility or building, on-site fire hydrants and mains shall be provided where required by the *fire code official*.

Exceptions:

1. For Group R-3 and Group U occupancies, the distance requirement shall be 600 feet (183 m).
2. For buildings equipped throughout with an *approved automatic sprinkler system* installed in accordance with Section 903.3.1.1 or 903.3.1.2, the distance requirement shall be 600 feet (183 m).







FIRE HYDRANT REQUIREMENTS

- Public vs Private
  - Public Hydrants
    - Installed on public distribution mains
    - MCWA Agreements
    - 10 States Recommended Standards for Water Works.
  - Private Hydrants
    - Installed on private water mains or water services
    - Additional hydrants as required by: Fire Marshall, Fire Chief, Building Code, or others

MCWA RETAIL LEASE AGREEMENT

IV. HYDRANTS

4.1 When replacing existing water mains in accordance with Section 4.3 hereof, the Authority will pay the costs thereof.

4.2 Upon the receipt of a certified copy of a resolution of the Village of Fairport requesting installation of hydrants and specifying the locations where the same are to be placed upon the mains of the Village, the Authority will, at its initial cost and expense, but subject to reimbursement by the Village as hereinafter provided, place and install the hydrants and hydrant connections in accordance with Section 4.3 hereof.

4.3 Hydrants shall only be installed on six-inch or larger diameter water mains at a minimum spacing interval of 500 feet. When hydrants are installed as part of a water main replacement project the Authority will, to the extent practicable and desirable for the Village and the Authority, locate new hydrants reasonably close to existing hydrant locations.

4.4 Hydrants installed at the sole request of the Village less than 500 feet apart shall be considered "Additional Hydrants" installed for the purposes of private fire protection, as such term is defined in the Authority's Rules. Hydrants installed by the Authority in its sole discretion and for its water supply purposes less than 500 feet apart shall not be considered as private fire protection.

4.5 The Authority will bill the Village for hydrants and hydrant connections at the actual installed cost thereof to the Authority, and the Village will reimburse the Authority in the amount billed therefor within thirty (30) days of the invoice date. Legal title to such hydrants and hydrant connections shall be and remain in the Authority.

4.6 Hydrants installed as part of main extensions for real estate developments shall be installed by and at the expense of the real estate developer, and shall be owned by the Authority.

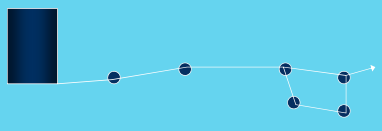
TEN STATES STANDARDS

8.4 HYDRANTS

8.4.1 Location and spacing

a. Fire hydrants should be provided at each street intersection and at intermediate points between intersections as recommended by the State Insurance Services Office. Generally, fire hydrant spacing ranges from 350 to 600 feet depending on the area being served.
b. Water mains not designed to carry fire-flows shall not have fire hydrants connected to them. It is recommended that flushing hydrants be provided on these systems. Flushing devices should be sized to provide flows which will give a velocity of at least 2.5 feet per second in the water main being flushed. No flushing device shall be directly connected to any sewer.

HYDRAULIC MODELING OF FIRE FLOWS



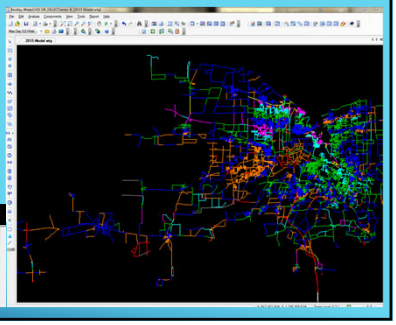
- Create hydraulic model
- Calibrate model with flow test data
- Set demand, pumps and tanks (i.e. max day)
- Run model
- Calculates fire flow at selected nodes

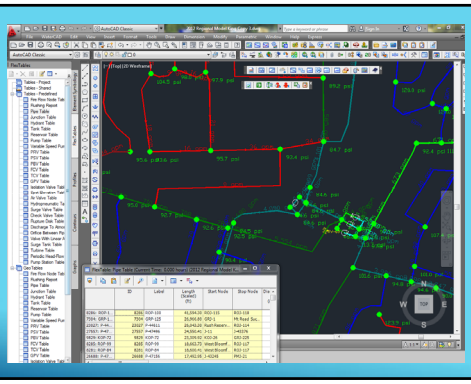
AVAILABLE FIRE FLOW IS IMPACTED BY…

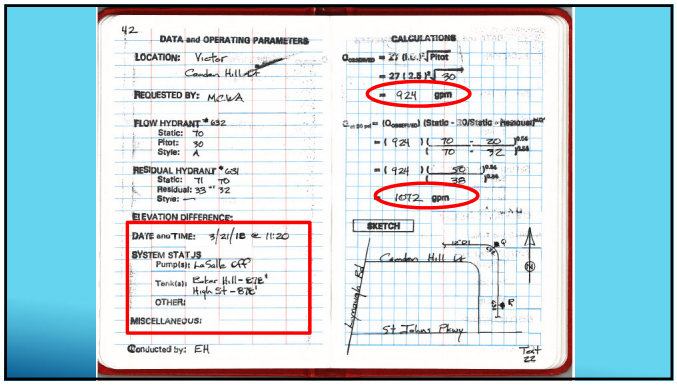
- System Demand
  - Domestic / Commercial / Industrial demand
  - Time of day
  - Weather
- Network configuration
- Water Mains
  - Size
  - Internal "roughness" (C-factor)
- Pumping status
- Storage levels
- Control valves
- ~~Phase of the moon~~

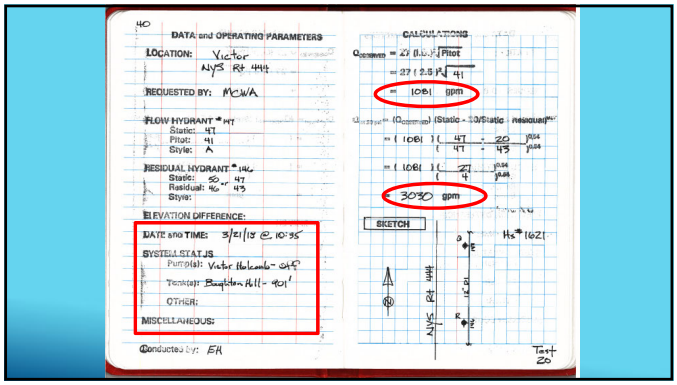
HYDRAULIC MODELING

- Model used to simulate how water is moved through the system, from the various treatment plants to all of the pump stations and water storage tanks
- Modeled for water quality
- Fire flow
- Pressures, and
- Energy efficiencies
- Pre-planning



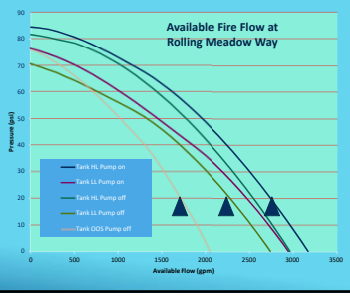






The distribution flows and pressures are constantly changing

Flows are all from the same location, changes to the water level in the High Street Tank and turning the LaSalle BPS pumps on and off, in addition, these are all with average day demands, during the summer (max day) there would be 5 more curves.

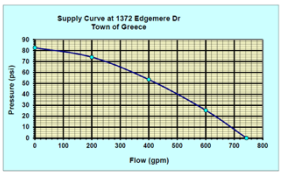


Computer Simulated Fire Flow Test/Supply Curve

Location: 1372 Edgemere Dr
Town of Greece
Main: 8"
Elevation: 420
Pressure Zone: 570

Supply Curve

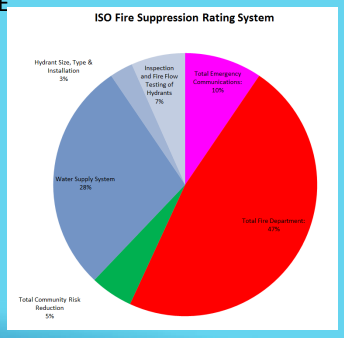
Q	PSI	H
0	82.6	190.8
200	74	170.9
400	53.5	123.6
600	25.4	58.7
743	0	0.0



The pressure and flow data provided herein represents a computer simulated average estimated value at this location in the distribution system from known and/or estimated system variables. The flow values indicated by the supply curve may vary greatly depending on demands, operational parameters, system configurations, subsequent modifications and other related criteria.

INSURANCE SERVICES OFFICE (ISO)

- MCWA works directly with ISO for Water Supply portion of rating
- Fire Ratings given by ISO



THANK YOU!

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