

CHAPTER VII TRANSMISSION AND DISTRIBUTION SYSTEMS

VII.A MATERIALS

- *Installation of Vinyl-Lined Pipe Restricted*

CGS 25-39b

Report by commissioner. From May 27, 1980, to July 1, 1981, no person, firm, corporation or municipality may install any vinyl-lined pipe containing tetrachloroethylene or other solvents deemed toxic by the Commissioner of Public Health in any water supply system in the state. On or before February 15, 1981, the Commissioner of Public Health shall report to the General Assembly his recommendations concerning the future installation of such vinyl-lined pipe and any public health hazards associated with its use.

- *Installation of Asbestos Cement Pipe Restricted*

CGS 25-39c

Determination by commissioner health hazard. On and after October 1, 1980, no person, firm, corporation or municipality may install any asbestos cement pipe in any water supply system until the Commissioner of Public Health determines that the use of such pipe in water supply systems does not create a public health hazard.

- *Restriction on Use of Lead Solder in Potable Water Systems*

CGS 25-39e

Sale of lead solder. (a) No solder containing more than 0.2 per cent lead shall be used in making joints and fittings in any public or private potable water supply system or any water user's pipelines. (b) On and after December 31, 1986, no solder containing more than 0.2 per cent lead shall be sold in Connecticut unless it contains a warning label which states in capital letters: "CONTAINS LEAD. CONNECTICUT LAW PROHIBITS THE USE OF THIS SOLDER IN MAKING JOINTS AND FITTINGS IN ANY PUBLIC OR PRIVATE POTABLE WATER SUPPLY SYSTEM OR ANY WATER USER'S PIPELINES."

- *Lead Service Line Replacement*

PHC 19-13-B102(j)(10)

(A) Water systems that fail to meet the lead action level in tap samples taken pursuant to subsection (e)(8)(D)(ii) of this section, after installing corrosion control or source water treatment, whichever sampling occurs later, shall replace lead service lines in accordance with the requirements of this subdivision. If a water system is in violation of subdivision (7) of (9) of this subsection for failure to install source water or corrosion control treatment, the department may require the water system to commence lead service line replacement under this subdivision after the date by which the water system was required to conduct monitoring under subsection (e)(8)(D)(ii) of this section has passed.

- (B) A water system shall annually replace at least seven percent (7%) of the initial number of lead service lines in its distribution system.. The initial number of lead service liens is the number of lead lines in place at the time the replacement program begins. The water system shall identify the initial number of lead service lines in its distribution system based upon a materials evaluation, including the evaluation required under subsection (e)(8)(A) of this section. The first year of lead service line replacement shall begin on the date the action level has exceeded in tap sampling referenced in subparagraph (A) of this subdivision.
- (C) A water system is not required to replace an individual lead service line if the lead concentration is all service line samples from that line, taken pursuant to subsection (e)(8)(B)(iii) of this section, is less than or equal to 0.015 mg/l.
- (D) A water system shall replace the entire service line (up to the building inlet) unless it demonstrates to the satisfaction of the department under subparagraph (E) of this subdivision that it controls less than the entire service line. In such cases, the water system shall replace the portion of the line which the department determines is under the other system's control. The water system shall notify the user served by the line that the water system will replace the portion of the service line under it's control and shall offer to replace the building owner's portion of the line, but is not required to bear the cost of replacing the building owner's portion of the line. For buildings where only a portion of the lead service line is replaced, the water system shall inform the residents that the system will collect a first flush tap water sample after partial replacement of the service line is completed if the residents so desire. In cases where the residents accept the offer, the system shall collect the samples and report the results to the residents within fourteen (14) days following partial lead service line replacement.
- (E) A water system is presumed to control the entire lead service line up to the building inlets unless the water system demonstrates to the satisfaction of the department, in a letter submitted under subsection (h)(5)(E)(iv) of this section, that it does not have any of the following forms of control over the entire line as defined by State Statute, municipal ordinances, public service contracts or other applicable legal authority: authority to set standards for construction, repair, or maintenance of the line, authority to replace, repair, or maintain the service line; or ownership of the service line. The department shall review the information supplied by the system and determine whether the system controls less than the entire service line and, in such cases, shall determine the extent of the water system's control. The department's determination shall be in writing and explain the basis for its decision.
- (F) The department shall require a system to replace lead service lines on a shorter schedule than that required by this subdivision, taking into account the number of lead service lines in the water system, where such a shorter replacement schedule is feasible. The department shall make this determination in writing and notify the system of its finding within six (6) months after the system is triggered into lead service line replacement based on monitoring referenced in subparagraph (A) of this

- subdivision.
- (G) Any system may cease replacing lead service lines whenever first-draw samples collected pursuant to subsection (e)(8)(D)(iii) of this section meet the lead action level during each of two (2) consecutive monitoring periods and the system submits the results to the department. If first-draw tap samples in any such water system thereafter exceed the lead action level, the system shall recommence replacing lead service lines, pursuant to subparagraph (B) in this subdivision.
- (H) To demonstrate compliance with subparagraphs (A) through (D) of this subdivision, a system shall report to the department the information specified in subsection (h)(5)(E) of this section.

PHC 19-13-B102(j)(10)
(continued)

- *Material*

DPUC 16-262m-8(j)

- (1) Metallic and non-metallic materials may be used to construct component parts of a water system including, but not limited to , conduits, pipes, couplings, caulking material, protective linings and coatings, services, valves, hydrants, pumps, tanks and reservoirs; provided:
- (A) The materials shall have a reasonable useful service life;
 - (B) The material shall be capable of withstanding the internal and external forces to which it may be subjected while in service;
 - (C) The material shall not cause the water to become impure, unwholesome, nonpotable or unhealthful;
 - (D) Materials and equipment shall be designed and selected with factors of safety included and installed as to mitigate corrosion, electrolysis and deterioration. When the possibility of a near future interconnection with another utility exists, some components such as pressure tanks and compressors may be designed for limited service life;
 - (E) Use of non-metallic pipe shall require a suitable tracer wire for pipe location;
 - (F) No material shall be allowed which does not meet standards established by the AWWA or other comparable standards;
- (2) Specification for material, equipment, and testing shall be in accordance with all applicable AWWA standards, the specified water utility which will eventually own the system, and the requirements of the Department of Health Services and the Department of Public Utility Control. Such Specifications shall include the following:
- (A) Proper protection shall be given to metal surfaces by paints or other protective coatings;
 - (B) All paints, liners or coatings proposed for use in a water supply system that will come in contact with the potable water must be approved by the Department of Health Services. Following final curing, disinfection and dissipation of the chlorine residual, water samples must be collected and tested in accordance with Section 19-13-B102 of the Regulation of Connecticut State Agencies. for

19-13-B102 of the Regulation of Connecticut State Agencies, for hydrocarbon, organohalide, inorganic chemical, physical, and total coliform analysis from a sampling point approved by the Department of Health Services. The results of these analyses must be reviewed and approved by the Department of Health Services both at the time of initial drilling of the wells and after the design and construction stages but before using the facility;

DPUC 16-262m-8(j)
(continued)

(C) Cathodic protection, when required, must be designed and installed by competent technically qualified personnel.

(3) Upon completion of the construction of the community water supply system, the well(s), storage tank(s), and appurtenances must be disinfected, in accordance with procedures established by the Department of Health Services;

(4) Prior to acceptance and use, the design engineer shall supervise appropriate pressure testing of all piping and tanks for leakage to assure specified standards are met.

- *Standards, Materials Selections*

RSWW 8.0.1

Pipe, fittings, valves and fire hydrants shall conform to the latest standards issued by the AWWA and/or NSF, if such standards exist, and be acceptable to the Department. In the absence of such standards, material meeting applicable Product Standards and acceptable to the Department may be selected. Special attention shall be given to selecting pipe material which will protect against both internal and external pipe corrosion. Pipes and pipe fittings containing more than 8% lead shall not be used. All products shall comply with ANSI/NSF standards

- *Permeation of System by Organic Compounds*

RSWW 8.0.2

Where distribution systems are installed in areas of groundwater contaminated by organic compounds:

- a. pipe and joint materials which are not subject to permeation of the organic compounds shall be used.
- b. non-permeable materials shall be used for all portions of the system including water main, service connections and hydrant leads.

- *Used Materials*

RSWW 8.0.3

Water mains which have been used previously for conveying potable water may be reused provided they meet the above standards and have been restored practically to their original condition.

- *Joints*

Packing and jointing material used in the joints of pipe shall meet the standards of the AWWA and the Department. Pipe having mechanical joints or slip-on joints with rubber gaskets is preferred. Lead-tip gaskets shall not be used. Repairs to lead-joint pipe shall be made using alternative methods.

RSWW 8.0.4

VII.B WATER MAIN DESIGN

VII.B.1 Minimum Size

- Sources of supply, treatment, pumping, transmission and storage facilities of sufficient capacity shall be maintained to provide flows in excess of the maximum flows experienced in the community water system, and in individual service zones within integrated systems. Whenever peak period consumption interrupts water service to consumers under normal condition, conservation measures that effectively reduce consumption shall be promptly instituted for the community water supply, and a program to provide sufficient supply, treatment, pumping, transmission, and storage capacity to meet existing and projected peak period consumption shall be implemented.

PHC 19-13-B102(p)

- *Transmission and Distribution System*

The distribution system shall be of adequate size and design to maintain minimum normal operation pressures. Minimum distribution pipe diameter shall be 6 inches except in cul-de-sacs where the mains are not subject to being extended or as otherwise approved by the Department of Public Utility Control. If fire protection is to be provided, minimum distribution pipe diameter shall be 8 inches. All mains shall be installed in the rights-of-way of paved roadways to allow all weather access and to facilitate repairs;

DPUC 16-262m-8(i)(2)

- *Diameter*

The minimum size of water main for providing fire protection and serving fire hydrants shall be six-inch diameter. Larger size mains will be required if necessary to allow the withdrawal of the required fire flow while maintaining the minimum residual pressure specified in Section VII.B.2 of this document.

RSWW 8.1.2

- *Small Mains for Domestic Service*

The minimum size of water main in the distribution system where fire protection is not to be provided should be a minimum of three (3) inches in diameter. Any departure from minimum requirements shall be justified by hydraulic analysis and future water use, and can be considered only in special circumstances.

RSWW 8.1.4

VII.B.2 Water Pressure

- (1) All service connections shall have a water pressure at the main of at least 25 psi under normal conditions. Where pressure is normally less than 25 psi, special provisions shall be made to furnish adequate service to the user.
- (3) Normal operating pressures, including peak demand conditions in the distribution main shall be between 35 psi and 125 psi at the service connection;
(4) Where static pressures would exceed 125 psi, pressure reducing devices shall be provided on distribution mains;

PHC 19-13-B102(f)(1)

DPUC 16-262m-8(i)(3,4)

VII.B.3 Dead Ends

- Insofar as practicable, the distribution system shall be designed so as to avoid dead ends in the mains. Suitable right-of-way easement control shall be provided to the proposed owner and operator and his assigns to permit future such extensions. Where a dead end line is to be used, an adequately sized blow-off shall be installed at the end of the line;
- (a) In order to provide increased reliability of service and reduce head loss, dead ends shall be minimized by making appropriate tie-ins whenever practical.
(b) Where dead-end mains occur, they shall be provided with a fire hydrant if flow and pressure are sufficient, or with an approved flushing hydrant or blow-off for flushing purposes. 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.

DPUC 16-262m-8(i)(5)

RSWW 8.1.6

VII.B.4 Fire Protection

When fire protection is to be provided, system design should be such that fire flows and facilities are in accordance with the requirements of the State Insurance Services Office.

RSWW 8.1.3

VII.C DISTRIBUTION SYSTEM APPURTENANCES

VII.C.1 Valves

- Essential water supply valves shall be maintained in operating conditions.
- Sufficient isolation valves shall be provided on water mains so that inconvenience to customers and sanitary hazards will be minimized during repairs and flushing. At intersections, valves shall be installed on all connecting mains.

PHC 19-13-B102(q)

DPUC 16-262m-8(i)(6)

- Sufficient valves shall be provided on water mains so that inconvenience and sanitary hazards will be minimized during repairs. Valves should be located at not more than 500 foot intervals in commercial districts and at not more than one block or 800 foot intervals in other districts. Where systems serve widely scattered customers and where future development is not expected, the valve spacing should not exceed one mile.

RSWW 8.2

VII.C.2 Hydrants

- Whenever fire protection is required the water system shall be designed and constructed in accordance with recommendations of the Fire Underwriter’s Insurance Services Office, the Department of Public Utility Control and the specified water utility that will eventually own the water system. No fire hydrants shall be permitted unless the community water system has at least 150,000 gallons of water in atmospheric storage.
- Hydrants should be maintained in accordance with NFPA 25 Section 4.4.2.

DPUC 16-262m-8(k)

NFPA

VII.C.2.a *Location and Spacing*

Hydrants should be provided at each street intersection and at intermediate points between intersections as recommended by the State Insurance Services Office. Generally, hydrant spacing may range from 350 to 600 feet depending on the area being served.

RSWW 8.3.1

VII.C.2.b *Valves and Nozzles*

Fire hydrants should have a bottom valve size of at least five inches, one 4-1/2 inch pumper nozzle and two 2-1/2 inch nozzles.

RSWW 8.3.2

VII.C.2.c *Hydrant Leads*

The hydrant lead shall be a minimum of six inch in diameter. Auxiliary valves shall be installed in all hydrant leads.

RSWW 8.3.3

VII.C.2.d *Drainage*

Hydrant drains should be plugged. When the drains are plugged the barrels must be pumped dry after use during freezing weather. Where hydrant drains are not plugged, a gravel pocket or dry well shall be provided unless the natural soils will provide adequate drainage. Hydrant drains shall not be connected to or located within 10 feet of sanitary sewers or storm drains.

RSWW 8.3.4

VII.C.3 Air Release

- (8) Air relief valves: At high points in water mains where air can accumulate, provisions shall be made to remove the air by means of hydrants or air relief valves. Suitable protection measures shall be included in the design to cover situations where flooding of the manhole or chamber may occur;
- (9) Air relief valve piping: The open end of an air relief pipe from automatic valves shall be extended to at least one foot above grade and provided with a screened, downward-facing elbow. The pipe from a manually operated valve should be extended to the top of the pit;
- (10) Chamber drainage: Chambers, pits or manholes containing valves, blow-offs, meters, or other such appurtenances to a distribution system, shall not be connected directly to any sewer. Such chambers or pits shall be drained to the surface of the ground where they are not subject to flooding by surface water, or to absorption pits underground;

DPUC 16-262m-8(i)(8,9,10)

VII.C.3.a Air Relief Valves

At high points in water mains where air can accumulate, provisions shall be made to remove the air by means of air relief valves. Automatic air relief valves shall not be used in situations where flooding of the manhole or chamber may occur.

RSWW 8.4.1

VII.C.3.b Air Relief Valve Piping

The open end of an air relief pipe from automatic valves shall be extended to at least one foot above grade and provided with a screened, downwater-facing elbow. The pipe from a manually operated valve should be extended to the top of the pit. Use of manual air relief valves is recommended wherever possible.

RSWW 8.4.2

VII.C.3.c Chamber Drainage

Chambers, pits or manholes containing valves, blow-offs, meters , or other such appurtenances to a distribution system, shall not be connected directly to any storm drain or sanitary sewer, nor shall blow-offs or air relief valves be connected directly to any sewer.

RSWW 8.4.3

Such chambers or pits shall be drained to the surface of the ground where they are not subjected to flooding by surface water, or to absorption pits underground.

VII.D INSTALLATION OF MAINS

VII.D.1 Trench Details

- (11) When installing pipe, care must be taken to keep the pipe clean. Trenches shall be kept as free of water as is possible;
- (12) When laying of pipe is interrupted overnight or for any longer period of time, the open end of the pipe shall be plugged tightly and the open

DPUC 16-262m-8(i)(11-15)

DPUC 16-262m-8(i)(11-15)
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- trench covered with wood or steel covers;
- (13) Installation and pressure testing shall incorporate the provisions of the AWWA Standards and/or corresponding installation procedures;
 - (14) A continuous and uniform bedding shall be provided in the trench for all buried pipe. Backfill material, free of detrimental substances, shall be used. That backfill material shall be tamped in layers around the pipe and to a sufficient height above the pipe to adequately support and protect the pipe. During pipe laying, stones, boulders and any other significantly detrimental materials found in the trench shall be removed for a depth of at least six inches below the bottom of the pipe;
 - (15) All pipe shall be provided with a minimum earth cover of 4.5 feet. When rock blasting is necessary, ample excess depth shall be provided to allow for a suitable depth of bedding material between the pipe bottom and the rock base. Where frost can be expected to occur deeper than 4.5 feet, additional pipe cover shall be provided to suit. The mains should have adequate cover over the top of the pipe, using suitable backfill material, for protection against surface loads. For river or stream crossings where the water main may be exposed to the air, the water main shall be protected against freezing by an alternate means;

VII.D.1.a Standards

Specifications shall incorporate the provisions of the AWWA standards and/or manufacturer's recommended installation procedures.

RSWW 8.5.1

VII.D.1.b Cover

All water mains shall be covered with sufficient earth or other insulation to prevent freezing.

RSWW 8.5.3

VII.D.1.c Blocking

All tees, bends, plugs and hydrants shall be provided with reaction blocking, tie rods or joints designed to prevent movement.

RSWW 8.5.4

VII.D.1.d Pressure and Leakage Testing

All types of installed pipe shall be pressure tested and leakage tested in accordance with the latest edition of AWWA Standard C600.

RSWW 8.5.5

VII.D.1.e Disinfection

All new, cleaned or repaired water mains shall be disinfected in accordance with AWWA Standard C651. The specifications shall include detailed procedures for the adequate flushing, disinfection ,and microbiological testing of all water mains, In an emergency or unusual situation, disinfection procedure shall be discussed with the Department.

RSWW 8.5.6

VII.D.1.f External Corrosion

- a. Provide for a system of records by which the nature and frequency of corrosion problems are recorded. On a plat map of the distribution system, show the location of each problem so that follow-up investigations and improvements can be made when a cluster of problems is identified.
- b. If needed, perform a survey to determine the existence of facilities or installations that would provide the potential for stray, direct electric currents. Also, determine whether problems are caused by the users of water pipes as grounds for the electrical system.
- c. In previously unexplored areas where aggressive soil condition are suspect, or in areas where there are known aggressive soil conditions, perform analyses to determine the actual aggressiveness of the soil.
- d. If soils are found to be aggressive, take necessary action to protect the water main, such as by encasement of the water main in polyethylene, provision of cathodic protection (in very severe instances), or using corrosion resistant water main materials.

RSWW 8.5

VII.D.2 Provisions for Sanitary and Storm Sewers

- (16) Whenever possible, water and sewer lines (sanitary and storm) shall be located in separate trenches at least 10 feet apart. Where laid in the same trench, the water pipe shall be laid on a shelf at least 18 inches above the sewer pipe and at least 12 inches, but preferably 18 inches, horizontally from the side of the sewer pipe. The horizontal separating distance between a sanitary sewer manhole and a water line shall be 10 feet.
- (17) Where water and sewer inches cross, a minimum vertical distance of 18 inches shall be maintained between the water and sewer line with the sewer at the lower elevation. At crossings, pipe joints shall be spaced as far from the crossing as possible;
- (18) For force sewer lines there shall be no deviation from the 10 foot horizontal separation and the 18 inch vertical separation distances;
- (19) When it is not possible to satisfy the requirements in paragraph (17) of this subsection above one or more of the following precautions may be approved by the Department of Health Services as acceptable alternatives:
 - (A) Sleeving of the sewer;
 - (B) Concrete encasement of the sewer;
 - (C) The use of a thicker-walled sewer pipe (pressure testing will be required);
 - (D) Concrete encasement of the water pipe;
 - (E) The use of thicker-walled water pipe;
 - (F) The design engineer may also propose other precautionary measures which will be subject to review and approval;

DPUC 16-262m-8(i)(16-19)

VII.D.2.a General

The following factors should be considered in providing adequate separation:

RSWW 8.6.1

- a. material and type of joints for water and sewer pipes,
- b. soil conditions,

RSWW 8.6.1
(continued)

- 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.

VII.D.2.b *Parallel Installation*

Water mains shall be laid at least 10 feet horizontally from any existing or proposed sewer/septic tank absorption field trench. The distance shall be measured edge to edge. In cases where it is not practical to maintain a ten foot separation, the Department may allow deviation on a case-by-case basis, if supported by data from the design engineer. 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 sewer.

RSWW 8.6.2

VII.D.2.c *Crossings*

Water mains crossing 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. 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.

RSWW 8.6.3

VII.D.2.d *Exception*

The Department must specifically approve any variance from the requirements of Sections VII.D.2.b and VII.D.2.c of this report when it is impossible to obtain the specified separation distances. Where sewers are being installed and Section VII.D.2.b and c cannot be met, the sewer material shall be water works grade 150 psi (1.0 Mpa) pressure rated pipe or equivalent and shall be pressure tested to ensure water tightness.

RSWW 8.6.4

VII.D.2.e *Force Mains*

There shall be at least a 10 foot horizontal separation between water mains and sanitary sewer force mains. There shall be an 18 inch vertical separation at crossings as required in Section VII.D.2.c of this report.

RSWW 8.6.5

VII.D.2.f *Sewer Manholes*

No water pipe shall pass through or come in contact with any part of a sewer manhole.

RSWW 8.6.6

VII.D.2.g *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 Department to establish specific design requirements for locating water mains near any source of contamination.

RSWW 8.6.7

VII.D.3 Surface Water Crossings

- For river or stream crossings where the water main may be exposed to the air, the water main shall be protected against freezing by an alternate means;
- Surface water crossings, whether over or under water, present special problems. The Department should be consulted before final plans are prepared.

DPUC 16-262-8(i)(15)

RSWW 8.7

VII.D.3.a *Above-water Crossings*

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

RSWW 8.7.1

VII.D.3.b *Underwater Crossings*

A minimum cover of two feet shall be provided over the pipe. When crossing water courses which are greater than 15 feet in width, the following shall be provided:

RSWW 8.7.2

- 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; and the valve closest to the supply source shall be in a manhole,
- c. permanent taps shall be made on each side of the valve within the manhole to allow insertion of a small meter to determine leakage and for sampling purposes.

VII.E CROSS-CONNECTIONS/INTERCONNECTIONS

VII.E.1 Cross-connections

- *Permissible Arrangements for Connections to Public Water Supply Lines*

PHC 19-13-B38a

(a) Definitions.

- (1) “Air Gap” means the unobstructed vertical distance through the free atmosphere between the lowest opening from any pipe or outlet supplying water to a tank plumbing fixture, or other device, and the flood level rim of the receptacle. The vertical physical separation shall

PHC 19-13-B38a
(continued)

- be at least two times the inside diameter of the water inlet pipe above the flood rim level but shall not be less than one inch.
- (2) "Air Vent Type Backflow Preventer" means a device containing two independently operating check valves separated by a chamber which can automatically vent to the atmosphere if backflow occurs.
 - (3) "Atmospheric Vacuum Breaker" means a mechanical device which automatically airvents a pipeline to prevent backsiphonage.
 - (4) "Auxiliary Source" means (a) a water supply which is not approved for potable use such as a pond, river, open storage tank, or large swimming pool; (b) potable water which has become unpotable such as by the addition of chemicals or from contamination while the water is being stored or held in reserve.
 - (5) "Double Check Valve Assembly" (DVCA) means a device which contains two independently acting check valves located between two tightly closing shut-off valves and fitted with properly located test cocks. This device is installed on existing fire sprinkler systems pursuant to section 19-13-B38a(c)(2)(I) of the Regulations of Connecticut State Agencies.
 - (6) "Existing Fire Sprinkler System" means a sprinkler system installed prior to October 1, 1992 and not having undergone substantial renovations, alterations or additions representing more than 50% of the replacement cost of the existing system at the time of renovation, alteration or addition after July 1, 1993.
 - (7) "Fire Sprinkler System" for fire protection purposes means an integrated system of underground and overhead piping designed to provide fire protection for a building or structure. The installation includes one or more automatic water supplies. The portion of the sprinkler system aboveground is a network of specially sized or hydraulically designed piping installed in a building, structure, or area generally overhead, and to which sprinklers are attached in a systematic pattern. The valve controlling each system riser is located in the sprinkler riser or its supply piping. Each sprinkler system riser includes a device for actuating an alarm when the system is in operation. The system is usually activated by heat from a fire and discharges water over the fire area.
 - (8) "Hose Bibb Vacuum Breaker" means an atmospheric vacuum breaker designed to be attached to an outlet having a hose connection thread.
 - (9) "New Fire Sprinkler System" means a sprinkler system installed after October 1, 1992 or a sprinkler system which has undergone substantial renovations, alterations or additions representing more than 50% of the replacement cost of the existing system at the time of renovation, alteration or addition after July 1, 1993.
 - (10) "Owner" means the customer of a water utility.
 - (11) "Pressure Vacuum Breaker" means a device which contains a spring loaded check valve and a spring loaded atmospheric vent which opens when the pressure approaches atmospheric. The unit shall include two tightly closing shut-off valves located at each end of the device and two test cocks properly located for testing the device.
 - (12) "Reduced Pressure Principle Backflow Preventer" (RPD) means a device containing within its structure a minimum of two independently

PHC 19-13-B38a
(continued)

acting, approved check valves, together with an automatically operating pressure differential relief valve located between the two check valves. The first check valve reduces the supply pressure a predetermined amount so that during normal flow and cessation of normal flow the pressure between the checks shall be less than the supply pressure. In case of leakage of either check valve, the differential relief valve, by discharging to atmosphere, shall operate to maintain the pressure between the checks less than the supply pressure. The unit shall include tightly closing shut-off valves located at each end of the device and each device shall be fitted with properly located test cocks.

(13) "Siamese Connection" means an inlet equipped with one or more couplings to which a fire hose can be attached and through which water can be delivered by a fire department pumper to a sprinkler system.

(14) "Toxic or Objectionable Substance" means any compound which could affect the public health, the potability or the aesthetic quality of the water.

(b) **Air Gap.** An air gap is required between all potable water lines and equipment or systems which may be subject to contamination.

(c) **Reduced Pressure Principle Backflow Preventer**

(1) A reduced pressure principle backflow preventer (RPD) is required on a line to all facilities where toxic or objectionable substances are used in addition to the required air gap, vacuum breaker or RPD on individual pieces of equipment. Where such substances are used in a specific area, and RPD on the line to that area may be used in place of the RPD on the line to the facility.

(2) Unless otherwise required by Sections 19-13-B38a(b) and 19-13-B38a(c) of the Regulations of Connecticut State Agencies, the owner shall install a reduced pressure principle backflow preventer (RPD) or an air gap in the following instances:

(A) On a line to fire sprinkler systems (including tanks) where chemicals are added or to foam fire fighting systems;

(B) On a line to pressurized water systems on ships;

(C) On a line used to supply car wash facilities where pressure is boosted;

(D) On a line to irrigation or lawn sprinkler systems where chemicals are added;

(E) On a line to all boiler systems where chemicals are added;

(F) On a line to heat exchangers where chemicals are added;

(G) On a line to solar heating systems where chemicals are added;

(H) On a line to new fire sprinkler systems with any siamese connections;

(I) Effective January 1, 1999, on a line to all existing fire sprinkler systems with any siamese connections unless such systems are

PHC 19-13-B38a
(continued)

systems with any siamese connections, unless such systems are equipped with a DCVA. The owner shall have in place either an RPD or a DCVA or an air gap on such systems. Where chemicals are added to such systems, the owner shall install an RPD pursuant to subparagraph (A) of this subdivision of the Regulations of Connecticut State Agencies.

- (J) On a line to plating tanks or areas. No potable water use will be allowed downstream of the device pursuant to Section 19-13-B38a(e)(2) of the Regulations of Connecticut State Agencies.
- (3) Unless otherwise required by Sections 19-13-B38a(b) or 19-13-B38a(c) of the Regulations of Connecticut State Agencies, the owner shall install either an RPD or an air vent type backflow preventer or an air gap in the following instances:
 - (A) Water supply lines to all boiler systems where chemicals are not added;
 - (B) Water supply lines to carbonators for beverage machines, water conditioning systems, and commercial ice making equipment;
 - (C) Water supply lines connected to solar heating systems where chemicals are not added and heat exchangers where chemicals are not added;
 - (D) Water supply lines to storage tanks used for fire protection where chemicals are not added.
- (d) **Vacuum Breaker.** The owner shall install either an atmospheric vacuum breaker or a pressure vacuum breaker or an air gap in the following instances:
 - (1) Irrigation or lawn sprinkler systems where chemicals are not added;
 - (2) Flush valve toilets;
 - (3) Inlets which are or may become submerged, except where an RPD is required pursuant to Sections 19-13-B38a(c)(2) of the Regulations of Connecticut State Agencies;
 - (4) Hemodialysis units;
 - (5) At marinas and docks on all hose bibbs or other outlets to which a hose may be connected.
- (e) **Installation and Maintenance.** The devices required by Section 19-13-B38a of the Regulations of Connecticut State Agencies shall be purchased, owned, installed, and maintained by the owner in compliance with the following conditions:
 - (1) New devices shall conform to the revision of American Water Works Association Standard C510, C511 or the revision of the applicable standard of the American Society of Sanitary Engineering in effect at the time of building permit application.
 - (2) There shall be no connection made for potable water use downstream of an RPD and upstream of the equipment or systems subject to contamination except where the device is installed on the service line and the required air gap, vacuum breaker, or RPD is provided on all individual pieces of equipment.
 - (3) Each RPD shall be located in a room or structure that is well lighted, properly drained, and not subject to flooding. Each RPD shall be easily accessible for repair, testing, and inspection.
 - (4) Each DCVA shall be accessible for testing and inspection.

PHC 19-13-B38a

- (5) If an RPD or DCVA cannot be removed from service for maintenance and testing during normal working hours, than a second device of the same type shall be installed in parallel so as to permit inspection and repair of either unit.
- (6) The public water utility shall test annually each RPD, DCVA and pressure vacuum breaker and maintain records of the test. Any malfunctioning device shall be promptly restored to proper operating condition by the owner. A copy of the results shall be forwarded to the State Department of Health Services as a part of the annual cross connection survey report. All tests must be performed by a backflow preventer tester who has passed a written and laboratory examination administered by the State Department of Health Services.
- (7) Atmospheric vacuum breakers shall be located beyond the last control valve prior to the first outlet. All vacuum breakers shall be installed at an elevation higher than any outlet according to manufacturer's instructions.
- (8) An atmospheric vacuum breaker shall be installed so that it is not subject to backpressure or continuous operating pressure of more than twelve (12) hours duration. Where vacuum breakers are to be installed under Section 19-13-B38a(d) of the Regulations of Connecticut State Agencies and a continuous operating pressure exists, a pressure vacuum breaker shall be used.
- (9) An atmospheric vacuum breaker shall be installed in such a fashion that it will not be subject to corrosion which will render it inoperative.
- (10) Any time a device is required to be installed on a fire sprinkler line, the customer shall submit to the water utility written approval of the proposed installation and device from the Fire Marshal and the customer's insurance underwriter.

(continued)

- *Protection of Distribution System*

PHC 19-13-B102(f)(2)

Each supplier of water to a community public water supply system shall report the following information to the state health department by March 1 of each year covering the preceding calendar year.

(A) A list of all consumer premises where:

- (1) A private source of water supply is known to exist.
- (2) Toxic or objectionable chemical or biological substances are used in water solution on public commercial, or industrial premises.
- (3) Water pressure is raised by pumping on other than residential premises above that furnished by the supplier.
- (4) There is a water storage tank for other than residential use, commercial swimming pool or commercial water filter.
- (5) There is known to be a sprinkler system for either fire protection or irrigation.

(B) Date of last inspection of each consumer premises listed in item (A). Also the number of violation detected of the PHC Regulations, relation

PHC 19-13-B102(f)(2)
(continued)

Also, the number of violation detected of the PHC Regulations, relation to water distribution systems, and the status of corrections of these violation. Listings under item (A)(2) shall be inspected at least once each year and the remaining items shall be inspected at least once every five years.

- *Cross-Connection*

RSWW 8.8.1

There shall be no connection between the distribution system and any pipes, pumps, hydrants, or tanks whereby unsafe water or other contaminating materials may be discharged or drawn into the system. Each water utility shall have a program conforming to state requirements to detect and eliminate cross connections.

VII.E.2 Interconnections

- *Cross-Connections Between Water Supplies Prohibited*

PHC 19-13-B37

- (a) No physical connection between the distribution system of a public potable water supply and that of any other water supply shall be permitted, unless such other water supply is of safe sanitary quality and the interconnection of both supplies is approved by the State Department of Health Services. No officer, board, corporation, or other person or group of persons, owning or having the management or control of any potable water supply furnished to any municipality or water district, shall supply water to any person, firm, or corporation who maintains such connection.
- (b) Effective December 31, 1989, the State Department of Health Services shall prohibit the use of double check valve assemblies except those assemblies allowed pursuant to section 19-13-B38a(c)(2)(1) of the Regulations of Connecticut State Agencies.

- *Connections with Other Water Sources*

PHC 19-13-B51c

No physical connection between piping carrying water from a public water supply and piping carrying water from any other source shall be permitted unless such other water supply is of safe, sanitary quality and the interconnection is approved by the commissioner of health.

- *Service Pipes*

DPUC 16-262m-8(l)(6)

No physical connection between the distribution system of a public water supply and any non-public water supply is permitted except as provided for in Section 19-13-B37 of the Regulations of Connecticut State Agencies;

- *Interconnections*

RSWW 8.8.3

The approval of the Department shall be obtained for interconnections between potable water supplies

VII.E.3 Cooling Water

Neither steam condensate, cooling water from engineer jackets, nor water used in conjunction with heat exchange devices shall be returned to the potable water supply.

RSWW 8.8.2

VII.E.4 Water Loading Stations

Water loading stations present special problems since the fill line may be used for filling both potable water vessels and other tanks or contaminated vessels. To prevent contamination of both the public supply and potable water vessels being filled, the following principles shall be met in the design of water loading stations:

RSWW 8.11

- a. there shall be no backflow to the public water supply,
- b. the piping arrangement shall prevent contaminant being transferred from a hauling vessel to others subsequently using the station,
- c. hoses shall not be contaminated by contact with the ground.

VII.F WATER SERVICES AND PLUMBING

VII.F.1 Plumbing

- *Service Pipes*

DPUC 16-262m-8(l)(1-7)

- (1) The size, design, material, and installation of the service pipe shall conform to the reasonable requirements of the utility that will eventually own the water system; provided, however, that the minimum size of the pipe shall be not less than ¾ inch and that the use of non-metallic pipe shall include a suitable tracer wire for pipe location;
- (2) All service pipes shall be installed below the frost line to prevent freezing;
- (3) Service pipes shall not be connected to hydrant branch lines, and they shall not cross intervening properties even with the protection of easements. If fire protection to the customer's property is required, there shall be a separate service connection and separate service pipe paralleling the domestic service pipe to the customer's place of consumption;
- (4) The service pipe shall be connected to a single-service corporation at the main, installed with a suitable gooseneck and be sufficiently flexible to prevent fracture from expansion or contraction. It shall be run perpendicular from the water main to the customer premises and be free from any tee, branch connection, irregularity or defect;
- (5) The service pipe shall be installed with a suitable shutoff valve and curb box at the property line. There shall also be a suitable shutoff valve at the interior of the premises. In the case of service pipes dedicated for fire protection, there shall be a detector check meter installed on the pipe;
- (6) No physical connection between the distribution system of a public water supply and any non-public water supply is permitted except as provided for in Section 19-13-B37 of the Regulation of Connecticut State Agencies;

(7) A separate service connection shall be required for any dwelling unit or office unit that is adaptive to individual ownership. Thus, an application for a Certificate of Public Convenience and Necessity for the following types of projects must include provisions for installing a separate service connection for each dwelling or commercial unit: residential subdivisions, including homeowners associations and municipal tax districts; cluster housing projects; duplexes; townhouses; residential and office condominiums; industrial parks; shopping centers or malls; trailer or mobile home parks; elderly housing projects and garden apartment complexes. Projects that may or may not require individual service connections, and subject to the Department of Public Utility Control's judgment, include high rise apartment complexes, multi-storied homes, commercial buildings and high rise condominiums;

DPUC 16-262m-8(l)(1-7)

- *Plumbing*

RSWW 8.9.1

Water services and plumbing shall conform to relevant local and/or state plumbing codes, or the applicable National Plumbing Code. Solders and flux containing more than 0.2% lead and pipe and pipe fittings containing more than 8% lead shall not be used.

VII.F.2 Service Meters

- *Service Pipes*

DPUC 16-262m-8(l)(8)

Each service connection shall be separately metered. The service line in each dwelling or office unit shall contain two ball valves and an AWWA certified meter adaptive to a remote reading device setting. The water utility which will eventually own the water system shall be responsible for providing the water meters to each customer premise at its own expense.

- Each service connection should be individually metered.

RSWW 8.10

VII.G MAINTENANCE PLAN FOR SYSTEM

VII.G.1 Flushing

Protection of Distribution System

The distribution system shall be flushed as required to maintain it free from excessive accumulation of sediment, organic growths, products of corrosion and erosion, and other extraneous matter.

PHC 19-13-B102(f)(5)

VII.G.2 Record Keeping

- (1) Any owner or operator of a public water system subject to the provisions of this section shall retain on its premises or at a convenient location near its premises the following records,

PHC 19-13-B102(l)(1)(E)

- (E) Accurate and up-to-date maps and records showing the location of all mains, valves, hydrants, service connections, and other facilities including pumps, tanks and treatment plants shall be maintained for each community water system. An integrated map of the system showing supply, treatment, pumping and storage facilities and major mains shall be filed with the department and updated at least every five (5) years.

PHC 19-13-B102(1)(1)(E)
(continued)

VII.G.3 Program to Reduce Unaccounted Water

A program to reduce the amount of water which cannot be accounted for shall be established and filed with the department of health for review and approval. Such program shall include a schedule of implementation and consideration of the following elements:

PHC 19-13-B102(s)

1. Calibration of supply and main line meters.
2. Calibration of consumers meters.
3. Pipeline flow measurements.
4. Leakage surveys.
5. Inspection of bleeders.

VII.G.5 Certified Operators

Classification of Water Distribution Systems

CGS 25-32-10

- (a) Each water distribution system shall be classified according to the population served. The classifications are as follows:

Class I	1,000-5,000 persons served.
Class II	5,001-50,000 persons served.
Class III	Over 50,000 persons served.

Qualifications for Certified Distribution System Operators

CGS 25-32-11

- (a) Except as provided in subsection (g) of this section, every community water supply distribution system which serves 1,000 or more persons shall have at least one operator who is certified at the system's class or higher and who shall be designated by the utility as the chief operator. The chief operator shall have direct responsible charge of the system. In the event that the chief operator is not available, the utility shall place an operator, who is certified at the system's class or higher, to serve in the interim. All operators in direct responsible charge shall be certified at the system's class or higher.
- (b) To become certified as a distribution system operator, a person must demonstrate the ability to responsibly operate the system of the given classification applied for (I, II, III) by completing a written application to the Department of Public Health attesting to the education, experience and written test requirements required by subsection (c) of this section.
- (c) Minimum education and experience requirements to qualify for the written examination:

<u>Class</u>	<u>Education (yrs.)</u>	<u>Experience (yrs.)</u>
I	12	1
II	12	2
III	12	4

One year of education beyond high school (12 years) in a field of study applicable to water distribution may be suitable for one year of the experience requirement to qualify for the written examination for a Class III certification. The minimum education requirements shall be met by either a high school diploma or a high school equivalency diploma. A minimum of one year of experience in operating a distribution system is required for all classes. Any amount of educational training beyond 12 years may be substituted for an amount of additional years of required experience in class.

- (d) **Examination Requirement for Certification.** A written examination administered by the Department of Public Health will be given to qualifying system operator candidates. The examination will test the candidate's ability to understand written instructions, keep records of operation, inspection and testing for cross-connections and an understanding of the overall operation of the distribution system classification applied for.
- (e) Every community water supply distribution system which serves 1,000 or more persons shall employ at least one person who has completed and passed a course on testing of backflow preventers administered or approved by the Department of Public Health.
- (f) **Existing Operators.** If an operator having direct responsible charge of a system as of the effective date of these regulations is not certified, the Department of Public Health will designate that operator as a limited operator upon presentation of an application by the utility within one year of the effective date of these regulations. This designation is only granted for a specific system and cannot be designated as a chief operator but can serve in direct responsible charge.
- (g) **Provisional Operators.** If a utility does not have a qualified operator as outlined in Section 25-32-11(a) and if the Department of Public Health determines that this is due to reasons beyond the utility's control, the Department of Public Health may grant a provisional operator status to an operator. The utility must submit a request in writing which indicates the reasons for not having a qualified operator and include an application. The provisional operator status would only be granted for a given system and only be given to an operator who could qualify to take the appropriate class exam within 2 years.
- (h) On or after January 1, 1989, every community water supply distribution system which serves 1,000 or more persons shall employ at least one person who has completed and passed a course on cross-connection inspections administered or approved by the Department of Public Health.
- (i) **Operator-In-Training.** A person who has received a certificate of achievement in water management from a Connecticut Technical College, or its equivalent as determined by the Department of Public

Health may apply to take any examination. After successful completion of the examination, the person will be an operator-in-training. After the operator-in-training has completed the education and experience requirements of the appropriate class, he may apply to become a certified operator.

CGS 25-32-11
(continued)

Reciprocity

CGS 25-32-12

The Department of Public Health may waive the examination requirements specified in Section 25-32-9(d) and Section 25-32-11(d) above in the event that the applicant has passed an examination given by another State or ABC and the Department of Public Health has entered into a reciprocity agreement with that state or ABC. A reciprocity agreement can only be established if the requirements of the other state or ABC are at least as stringent as those of the Department of Public Health.

Revocation of Certification

CGS 25-32-13

The commissioner of the Department of Public Health may revoke the certificate of an operator, or issue other appropriate orders when it is determined that the operator obtained a certificate through fraud, deceit, or the submission of inaccurate data on qualifications; has practiced fraud or deception in the performance of his or her duties; that reasonable care, judgement or the application of his or her knowledge or ability was not used in the performance of his or her duties; or that the operator is incompetent or unable to properly perform his or her duties. The Department of Public Health shall conduct such revocation in accordance with the Rules of Practice and Procedure for the Department of Public Health, Sections 19-2a-1 through 19-2a-41 of the Regulations of Connecticut State Agencies.

Renewal

CGS 25-32-14

Certificates issued pursuant to Section 25-32-9 and 25-32-11 above must be renewed every 3 years by the operator to remain valid. The renewal form shall be provided by the Department of Public Health and must be completed by the operator. Any certificates issued pursuant to Sections 25-32-9 and 25-32-11 and having a date of issuance more than 3 years prior to the effective date of the regulations must be renewed within one year of the effective date of these regulations. This section does not apply to certificates for Provisional Operators issued pursuant to Section 25-32-9(f) and 25-32-11(g).