

**Sec. 16-262m-8. Design criteria**

All community water systems proposed for construction or expansion in accordance with Section 16-262m of the General Statutes of Connecticut shall be designed substantially in accordance with the technical standards enumerated herein.

(a) For the purposes of this Section and Sections 16-262m-5, 16-262m-6 and 16-262m-7 inclusive, the following definitions shall apply:

(1) “Anticipated Average Daily Demand” shall mean the estimated normal water usage of the system as determined for the most representative 24 hour period of record not affected by unusual demand conditions such as drought or a significant temporary increase in demand;

(2) “Peak Hour Demand” shall mean largest hourly volume of water consumed and shall be considered  $\frac{1}{3}$  of the average daily demand;

(3) “Design Population” shall mean the estimated number of people per service connection, calculated as follows, unless specific circumstances dictate otherwise:

<i>Type of service</i>	<i>Design Population Per Service Connection</i>
Single family dwelling	4
(Over 3 bedrooms add 1 person per additional bedroom)	
Multi-dwelling (i.e. apartments, elderly housing duplexes, townhouses and, residential condominiums)	
One bedroom unit	2
Two bedroom unit	3
Three bedroom unit	4
(over 3 bedrooms add 1 person per additional bedroom)	
Mobile Homes or Trailers	2.5
Convalescent Homes	Use Number of Beds
All other components described in 16-262m-1(a)	Use Estimated Population

(4) “Safe Daily Yield of a Water Supply System” shall mean the amount of water which can be delivered to the system from all the system sources at the safe yield rate simultaneously in an 18 hour period expressed in gallons per day;

(5) “Safe Yield of a Well” shall be calculated as follows: (A) Unconsolidated aquifer ground water sources. The safe yield shall be based on an analysis of the impact of minimum water table elevations projected in a dry period on the yield of the well(s) and an analysis of critical impacts such as decreased stream flow or induction of pollutants. (B) Confined and bedrock aquifer ground water sources. Safe yield shall be equal to 90% of the hourly yield of the well multiplied by 18 hours of pumping per day except that the safe yield may be less when utilization of this yield will have unacceptable impacts or when historical reports or other information indicates that the safe yield is less. Hourly well yield shall be based on a pump test during which the cone of depression caused by the pumping of the

well shall be stabilized for at least 24 hours;

(6) "Source" shall mean any Department of Health Services approved well, spring, reservoir or other location where water is siphoned, pumped, channeled or drawn for use in a potable water supply;

(7) "Source of Pollution" shall mean any place from which stems or condition which may cause pollution of a ground or surface water supply. It may include but not be restricted to a watercourse including any stream, pond, lake or river; privy; subsurface sewage disposal system; cemeteries; sanitary landfill; sewage lagoon; industrial waste disposal location; sanitary or storm sewers; or a buried oil or gasoline storage tank;

(8) "Well Pump Capacity" shall mean the maximum quantity of water the well pump can supply under normal operating conditions. The pump capacity shall not exceed the safe yield of the well;

(9) "Yield of a Well" shall mean the amount of groundwater which can be withdrawn from a well as determined by the yield test. The yield of a well is expressed as gallons per minute (gpm);

(10) "Service Pipe," as used herein shall mean the pipe that runs between the curb stop, at or adjacent to the street line or the customer's property line, and the customer's place of consumption.

(b) **Facility location.** These include such items as, but not limited to, treatment plants, pumping stations, storage tanks, etc., but do not include water intakes and connecting pipelines.

New facilities are to be located: (1) Above the level of the one hundred year flood and not within the floodway boundary as established on flood boundary and floodway mapping prepared pursuant to the federal flood insurance program; (2) Where chlorine gas will not be stored or used within three hundred feet of any residence; and (3) Where the facility is not likely to be subject to fires or other natural or manmade disasters.

(c) The following equations are to be used when determining the design population and water demand of the community water system. Where unusual circumstances exist, the Department of Public Utility Control and Department of Health Services will determine the appropriateness of these equations.

(1) Design Population Served = number of service connections  $\times$  number of people per service;

(2) Average Daily Demand = population served  $\times$  75 gallons per person per day;

(3) Peak Hour Demand = average daily demand  $\times$   $\frac{1}{3}$ .

(d) **Water Supply requirements:**

(1) Each community water system shall be designed to furnish and maintain sufficient facilities to provide a continuous and adequate supply of water; and there shall be at least a 15% margin of safety maintained between the system's safe daily yield and anticipated average daily demand. Unless other acceptable provisions are made to assure continuous service, the community water system should be able to meet the anticipated average daily demand with its largest well and/or pump out of service;

(2) For a system utilizing only groundwater supplies, a minimum of 2 well sources shall be provided;

(3) All wells shall be subjected to a minimum 72-hour yield test, by a qualified well

yield tester, such that at a constant pumped discharge rate, the drawdown level has stabilized for at least a 24-hour period. The pump must run continuously during the yield test for the entire 72 hour period irregardless of the anticipated well yield. The following items must be recorded and measured during the test:

- (A) Static water level before pumping;
- (B) Date, time, pump rate and drawdown (at least hourly);
- (C) Time and water levels after pump has been shut down until well has recovered;
- (D) Each well shall have a drawdown curve plotted from the results of the yield test, with the tester's established safe daily yield at its stabilized drawdown certified and printed thereon. Suitable provisions shall be made in cases of wells that are located in close proximity to each other and subject to "interference." In such cases a simultaneous pumping of each well shall be required;
- (E) Whenever possible, the pump test shall be performed during the summer months and should be conducted during a time period absent of precipitation or as reasonably close to non-precipitation as possible;
- (F) Suitable provisions including data from observation wells shall be made in cases of wells located in close proximity to wetlands, drainage ways, or watercourses in order to quantify the effect of induced recharge on flows in such wetlands, drainage ways or watercourses;
- (4) All wells, especially deep drilled rock wells, are subject to diminution of their yields after a period of time. Therefore, they should be periodically monitored for possible loss of yield, and scheduled for an appropriate maintenance program when conditions dictate. When new wells are added at a future date, especially in the vicinity of existing wells, suitable measures shall be taken to ascertain potential loss of yield from the adjacent wells simultaneously with the yield testing of the new wells;
- (5) Reserve well site property is required and must be shown on the final map;
- (6) There shall be a safe yield capacity sufficient to supply 75 gallons per person per day and at least 15% additional supply to maintain an adequate margin of safety and be able to accommodate adjacent growth in the future.

**(e) Source Protection:**

(1) The following *minimum* separating distances are required by Public Health Code Sections 19-13-B51 and 19-13-B103 (Technical Standards).

<u>Item</u>	<u>Minimum Distances*</u>		
	<u>Under 10 gpm</u>	<u>10-50 gpm</u>	<u>Over 50 gpm</u>
(A) Septic system, buried oil tanks or other sources of pollution	75'	150'	200'
(B) Cast iron sewer pipe or equivalent	25'	75'	100'
(C) Surface water body or drain	25'	50'	50'

\* Greater separating distances are required for gravel wells with pumping capacities

greater than 50 gpm where ledge is found at less than 10 feet and/or the soil percolation rate is faster than 1 inch per minute at surrounding septic systems.

(D) Sanitary conditions within the radial separating distance required shall be under the control of the water supply owner by direct ownership, easement, or other arrangement approved by the Department of Health Services and detailed on the as-built map.

**(f) Well Construction and Water Quality:**

(1) Wells shall be constructed in accordance with Public Health Code Regulation 19-13-B51 and the Regulations of Connecticut State Agencies Sections 25-128-1 through 25-128-64, inclusive (Regulations of the Well Drilling Industry);

(2) The bacterial, physical, inorganic chemical, organic chemical and radiological quality of the source must satisfy the requirements of Public Health Code Regulation 19-13-B102 and the Connecticut Department of Health Services action levels for organic compounds. Suitable treatment may be required by the Department of Health Services;

(3) Each well shall be equipped with a water level probe for periodic drawdown measurement; and there shall be provided suitable low water level well pump shutoff and lightning protection devices in accordance with Section 19-13-B102 (n) of the Regulations of Connecticut State Agencies.

**(g) Atmospheric Storage Tank:**

(1) The atmospheric storage tank shall be equipped with a properly bolted entry hatch to allow access for cleaning and painting of the tank and a filler pipe to provide for water to be trucked in. The filler pipe must be capped and locked. The tank shall also be equipped with a sight glass gauge, a screened vent pipe and a high and low water level signal system. There shall be a drain valve at the bottom of the accessible face of the tank. Drain lines must discharge to the ground. No direct connection to a sanitary sewer will be permitted;

(2) Atmospheric storage tank capacity shall be at least 200 gallons per residential customer or equal to the average daily demand of the system, whichever is the greater number. If commercial or industrial customers are included, additional storage shall be provided based on reasonable average day estimated water usage thereof;

(3) Hydropneumatic tank and transfer pumps:

(A) A hydropneumatic tank and transfer pump arrangement, used in tandem with the atmospheric tank, shall be sized to accommodate the peak hour demand. A minimum of two (2) transfer pumps shall be installed to operate alternately, each capable of providing water to the system at the peak hour demand rate; (B) The transfer pumps shall be installed between the atmospheric tank and the hydropneumatic tank; (C) The required gross volume of the hydropneumatic storage tank shall be calculated using the following equations:

$$\text{Usable Volume} = 5 \text{ minutes} \times \text{largest transfer pump capacity (gpm)}$$

$$\text{Gross Volume} = \frac{100\% \text{ Usable Volume}}{\% \text{ usable volume}}$$

(D) Transfer pumps shall be protected by low water level shutoff controls in the storage tank.

(4) All waterworks equipment shall be designed and installed so as to assure safe and

easy access to the equipment for normal service and for repairs or replacement work.

**(h) On-site Standby Power:**

(1) Wherever possible, there shall be included on-site a permanently installed gasoline, propane-fueled, diesel, natural gas or oil fired generator capable of supporting at least the largest well pump, one transfer pump, any high service booster stations and all treatment systems simultaneously in the event of an electrical outage. Portable generators may be considered acceptable as an alternate to an on-site generator;

(2) Fuel storage shall be above ground, and provided with a containment area capable of holding the full volume of the fuel tank.

**(i) Transmission and Distribution System:**

(1) The transmission pipelines, (i.e. that pipe from the source of supply to the pumphouse or treatment facility or from the source of supply to the distribution system) from sources of supply shall be designed to deliver, in combination with related storage facilities and to the limits of the capacity of those sources of supply, the maximum requirements of that portion of the system which is dependent upon such transmission pipelines;

(2) The distribution system shall be of adequate size and design to maintain minimum normal operating 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;

(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;

(5) 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;

(6) 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;

(7) Customer Booster Pumps: No community water system shall be designed to furnish water service to any customer who must utilize a booster pump to pump water from the utility's water main into the customer's plumbing facilities in order to maintain a minimum 35 psi pressure service, except in extreme circumstances and when authorized by the Department of Public Utility Control. The system's gradient shall be designed to preclude this need under reasonable foreseeable conditions for the ultimate service area. Consideration shall be given both to deteriorating pipe conditions leading to increases in pressure losses in the mains and also to any potential hazard which might be created if contamination should be introduced into the system through a cross-connection when a negative pressure is induced in the water main by a customer's booster pump;

(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;

(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 trench covered with wood or steel covers;

(13) Installation and pressure testing shall incorporate the provisions of the American Water Works Association Standards and/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;

(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 lines 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;

(20) The layout plan should provide for suitable ownership or easement control of the water supply operator to permit further extension of the piping, particularly where dead ends may occur and/or where expansion of the water system can be readily foreseen.

**(j) Materials:**

(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 materials, 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 American Water Works Association or other comparable standards;

(2) Specifications for materials, equipment, and testing shall be in accordance with all applicable American Water Works Association 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 Regulations 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;

(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.

**(k) Fire protection:**

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.

**(l) Service Pipes:**

(1) The size, design, material, and installations 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 Regulations 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;



(8) Each service connection shall be separately metered. The service line in each dwelling or office unit shall contain two ball valves and an American Water Works Association-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.

**(m) Pumphouse requirements:**

(1) Well pit and/or pumphouse construction shall be designed to prevent the entrance of rodents and other small animals. All facilities shall be locked and fenced and otherwise protected and secured to prevent entrance of unauthorized persons;

(2) Adequate drainage of all well houses and pits including the use of floor drains shall be provided as required in Public Health Code Regulation 19-13-B51h;

(3) Necessary electrical controls shall be installed to enable both manual and automatic operation of all pumps, motors and accessory equipment. All controls must be clearly labeled as to their function. All electrical wiring, controls and appurtenances shall be installed in conformance with the National Electrical Code;

(4) Flow meters capable of measuring totalized and instantaneous flow shall be installed to accurately measure independently each source of supply and their installation shall provide for ease of meter reading, repair and/or removal. Additional meters may be required where water treatment and/or other conditions dictate;

(5) Water treatment, when required, shall be installed in accordance with procedures established by the Department of Health Services;

(6) Smooth end (e.g. threadless chrome) sampling taps shall be installed on the discharge line of each well and at a representative point(s) off the discharge pipe(s) coming from the storage tank(s). Where treatment is used, taps before and after treatment facilities shall also be installed. Taps shall be at least 12 inches above the finished floor and any possible high water level. Taps must point downward;

(7) Suitable over and under voltage protection shall be provided on the various electrical equipment;

(8) The waterworks facilities shall be provided with suitable lighting, heat and ventilation. If necessary, a dehumidifier shall be used during summer operations;

(9) The pumphouse, wells and other plant facilities should be accessible to the various maintenance vehicles.

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