Chapter 8
Finished Water Storage

Acronyms used in this section:

ACI – American Concrete Institute
ANSI – American National Standards Institute
ASME – American Society for Mechanical Engineers
AWWA – American Water Works Association
CT – contact time
FAA – Federal Aviation Administration
MassDEP – MA Department of Environmental Protection
NFPA – National Fire Protection Association
NSF – National Sanitation Foundation
OSHA – Occupational Safety and Health Administration
PSI – pounds per square inch

Editor's Note: For questions on updates, please call the MassDEP Drinking Water Program in Boston, MA at 617-292- 5770, or e-mail the MassDEP Drinking Water Program Director at Program.Director-DWP@state.ma.us Attn: Guidelines.

Chapter 8
Finished Water Storage

8.0 General

1. The material and designs used for finished water storage structures shall provide stability and durability as well as protect the quality of the stored water. All finished water storage tanks and structures shall be designed to meet the current standards and manuals wherever they are applicable:

    a. ANSI/AWWA D100 Welded Carbon Steel Tanks for Water Storage

    b. ANNSI/AWWA D102 Coating Steel Water Storage Tanks

    c. ANSI/AWWA D103 Factory-Coated Bolted Steel Tanks for Water Storage

    d. ANSI/AWWA D104 Automatically Controlled, Impressed-Current Cathodic Protection for the Interior of Steel Water Tanks

    e. ANSI/AWWA Standard D110 Wire and Strand-Wound, Circular, Prestressed Concrete Storage Tanks

    f. ANSI/AWWA D115 Tendon-Prestressed Concrete Water Tanks

    g. ANSI/AWWA D120 Thermosetting Fiberglass-Reinforced Plastic Tanks

    h. ANSI/AWWA D130 Flexible-Membrane Materials for Potable Water Storage

    i. AWWA Manual M-42 Steel Water-Storage Tanks

    j. American Concrete Institute (ACI) 350 Code Requirements for Environmental Engineering Concrete Structures and Commentary

    k. Other materials of construction are acceptable when properly designed to meet the requirements of this section.

2. Concrete, either mild reinforced or prestressed, and fiberglass reinforced plastic shall meet the applicable codes and standards.

8.1 Design and Maintenance Standards

8.1.1 Sizing

Storage facilities should have sufficient capacity, as determined from engineering studies, to meet domestic demands, and fire flow demands where fire protection is provided.

1. Fire flow requirements established by the National Fire Protection Association (NFPA) should be satisfied where fire protection is provided.

2. The minimum storage capacity (or equivalent capacity) for systems not providing fire protection shall be equal to the average daily consumption. This requirement may be reduced when the source and treatment facilities have sufficient capacity with standby power to supplement peak demands of the system.

Excessive storage capacity should be avoided to prevent potential water quality deterioration problems.

8.1.2 Location of Ground-Level Finished Water Storage

1. The bottom of finished water storage and standpipes should be placed at the normal ground surface and shall be above maximum flood level or 100 Year Flood.

2. When the bottom must be below normal ground surface, it shall be placed above the water table unless otherwise approved in writing by MassDEP. At least 50 percent of the water depth should be above grade. Sewers, drains, standing water, and similar potential sources of contamination must be kept at least 50 feet from the finished water storage. Water main pipe, pressure tested in place to 50 psi without leakage, may be used for gravity sewers at distances greater than 20 feet and less than 50 feet.

3. The top of finished water storage shall not be less than 2 feet above normal ground surface. Clearwells and concrete storage tanks may be excepted from this requirement when the total design gives the same protection.

8.1.3 Protection from Contamination

All finished water storage structures shall have suitable watertight roofs that exclude birds, animals, insects, and excessive dust. The installation of appurtenances, such as antennae, shall be done in a manner that ensures no damage to the tank, coatings or water quality. See section 8.4.4 *Antennae and/or Other Appurtenances*.

All finished water storage structures shall be designed to prevent infiltration from groundwater and surface waters.

8.1.4 Protection from Trespassers

Minimum six feet high fencing, locks on access manholes, and/ or other necessary precautions as required by MassDEP in writing shall be provided to prevent trespassing, vandalism, and sabotage. Consideration should be given to the installation of high strength, cut resistant locks or lock covers to prevent direct cutting of a lock, and alarms against trespassers.

8.1.5 Drains

No drains on a water storage structure may have a direct connection to a sewer or storm drain. Drainage shall be directed to an area where flooding and erosion will not occur. The design shall allow draining the storage facility for cleaning or maintenance without causing loss of pressure in the distribution system.

8.1.6 Stored Water Turnover

The system shall be designed to facilitate turnover of water in the finished water storage. Excessive water age is an important factor related to water quality deterioration. It is recommended that a 3-5 day complete water turnover as a starting point, and each finished water storage facility be evaluated individually and given its own turnover goal. Consideration should be given to separate inlet and outlet pipes, turbulent jets, baffle walls or other acceptable means to avoid stagnation, nitrification, and allow complete mixing.

8.1.7 Overflow

All water storage structures shall be provided with an overflow that is brought down to an elevation between 12 and 24 inches above the ground surface, and discharges over a drainage inlet structure or a splash plate. No overflow may be connected directly to a sewer or storm drain. All overflow pipes shall be located so that any discharge is visible. The design of the overflow outlet shall include consideration of frost and debris clogging.

1. When an internal overflow pipe is used on elevated tanks, it should be located in the access tube. For vertical drops on other types of storage facilities, the overflow pipe should be located on the outside of the structure.

2. The overflow of a ground-level structure shall open downward and be screened with 24-mesh non-corrodible screen installed within the pipe at a location least susceptible to

damage by vandalism. The twenty-four mesh screened outlet shall be designed as a swing-away device or by other means to allow normal function of the overflow in all operating conditions. In addition, a 4 mesh non corrodible screen is recommended upstream of 24 mesh non-corrodible screen.

3. The overflow for an elevated tank shall open downward and be screened with a twenty-four mesh non-corrodible swing-away type screen. In addition, a 4 mesh non corrodible screen is recommended upstream of 24 mesh non-corrodible screen. The screen shall be installed within the overflow pipe at a location least susceptible to damage by vandalism.

4. The overflow pipe shall be of sufficient diameter to permit waste in excess of the filling rate.

5. Use of a flap or flapper valve should be considered to minimize air movement and hence ice formation in the tank. When a flapper valve is utilized, provisions must be included to prevent the flapper from freezing shut. If a flapper valve is used, a screen shall be provided inside the valve.

8.1.8 Access

Finished water storage structures shall be designed with reasonably convenient access to the interior for cleaning and maintenance. At least two manholes shall be provided above the waterline at each water compartment where space permits.

8.1.8.1 Elevated Storage Structures

1. At least one of the access manholes shall be framed at least four inches above the surface of the roof at the opening. They shall be fitted with solid water tight cover which overlaps the framed opening and extends down around the frame at least two inches, shall be hinged on one side, and shall have a locking device.

2. All other manholes or access ways shall be bolted and gasketed, or shall meet the requirements of (a).

8.1.8.2 Ground Level Structures

1. Each manhole shall be elevated at least 24 inches above the top of the tank or covering sod, whichever is higher.

2. Each manhole shall be fitted with a solid water tight cover which overlaps a framed opening and extends down around the frame at least two inches. The frame shall be at least four inches high. Each cover shall be hinged on one side, and shall have a locking device.

3. When walled manholes are provided, they shall include a locking device, open-in, and shall be kept in place by water pressure within the tank.

8.1.9 Valve Pit and Sampling

A valve pit with necessary valves and gauges shall be installed. Samples shall be taken from a separate representative sample tap, such as a freeze-proof yard hydrant, or other location approved in writing by MassDEP. A completed chemical injection point into a pipeline using an injection nozzle with a corporation stop, ball check (to prevent back flow), and safety chain/cable between tank and valve to allow the injection of emergency chlorine shall be installed.

8.1.10 Vents

Finished water storage structures shall be vented. Overflows shall not be considered as vents. Open construction between the sidewall and roof is not permissible. Vents:

1. Shall prevent the entrance of surface water and rainwater

2. Shall exclude birds and animals

3. Should exclude insects and dust, as much as this function can be made compatible with effective venting

4. Shall, on ground-level structures, open downward with the opening at least 24 inches above the roof or sod and covered with twenty-four mesh non-corrodible screen. The screen shall be installed within the pipe at a location least susceptible to vandalism.

5. Shall, on elevated tanks and standpipes, open downward, and be fitted with either four mesh non-corrodible screen, or with finer mesh non-corrodible screen in combination with an automatically resetting pressure-vacuum relief or release mechanism, as required by MassDEP. If a vacuum release mechanism is utilized, a four mesh screen must surround this mechanism in order to prevent contaminants from entering the tank when the relief mechanism is activated and to assure that objects do not prevent the mechanism from reseating properly.

8.1.11 Roof and Sidewall

The roof and sidewalls of all structures must be watertight with no openings except properly constructed vents, manholes, overflows, risers, drains, pump mountings, control ports, or piping for inflow and outflow. Particular attention shall be given to the sealing of roof structures which are not integral to the tank body.

1. Any pipes running through the roof or sidewall of a finished water storage structure must be welded or properly gasketed in metal tanks. In concrete tanks, these pipes shall be connected to standard wall castings which were poured in place during the forming of the concrete. These wall castings should have seepage rings imbedded in the concrete.

2. Openings in a storage structure roof or top, designed to accommodate control apparatus or pump columns, shall be curbed and sleeved with proper additional shielding to prevent the access of surface or floor drainage water into the structure.

3. Valves and controls should be located outside the storage structure so that the valve stems and similar projections will not pass through the roof or top of the finished water storage.

4. The roof of concrete finished water storage with earthen cover shall be sloped to facilitate drainage. Consideration should be given to installation of an impermeable membrane roof covering.

5. Finished water storage with pre-cast concrete roof structures must be made watertight with the use of a waterproof membrane or similar product.

8.1.12 Roof Drainage

The roof of the storage structure shall be well drained. Downspout pipes shall not enter or pass through the finished water storage. Parapets, or similar construction which would tend to hold water and snow on the roof, will not be approved unless adequate waterproofing and drainage are provided.

8.1.13 Construction Materials

1. The material used in construction of finished water storage structures shall be acceptable to MassDEP. Porous material, including wood, brick, and concrete block, are not suitable for potable water contact applications.

2. For field constructed concrete structures, where locally available, all cement, admixtures, form release agents, and curing compounds in contact with the finished water shall meet latest edition of NSF Standard 61.

8.1.14 Safety and Tank Access

The safety of employees, authorized third party employees, and inspectors must be considered in the design of a new storage structure. As a minimum, such matters shall conform to pertinent laws and regulations of the area where the finished water storage is constructed. There are a number of major hazards involved in water tank access-1) climbing the ladder 2) walking on roof

surface of tank 3) slip hazards and 4) confined space entry hazards. AWWA design standards incorporate some safety and access elements into the design, but additional design elements may be needed, based on site specific inspection and access issues and state, federal and local requirements.

1. Ladders, ladder guards, ladder cages, balcony railings, guardrails, and safely located entrance hatches shall be provided where applicable. Refer to Federal Occupational Safety and Health Administration (OSHA) 1910.27 *Fixed Ladders* http://www.osha.gov/pls/oshaweb/owadisp.show_document?p_table=STANDARDS&p_id=9719 OSHA requires fixed ladders to have either cages or devices for safe climbing. When a fixed ladder is used, the bottom shall be located at least 12 feet above grade to prevent access by an unauthorized person.

2. Roof ladder. Access to roof hatches and vents shall be provided. Such access shall be from the outside tank ladder for standpipes and multicolumn tanks, and from the access tube ladder for single-pedestal and single column supported tanks.

3. Elevated tanks with riser pipes over 8 inches in diameter shall have protective bars over the riser openings inside the tank.

4. Railings or handholds shall be provided on elevated tanks where persons must transfer from the access tube to the water compartment.

5. Rooftop Inspections

    a. Regardless of the slope of the roof, workers must be protected from falls greater than 6 feet at all times.

    b. This can be done by the use of a standard guardrail, a fall restraint system or a fall protection system. Fall arrest systems are designed to limit the free fall of a worker over the edge to no more than 6 feet. Fall restraint systems are designed to prevent the worker from stepping over the roof/tank edge.

6. Roof anchor bolt devices with steel swivel shackle brackets are required for all tanks (regardless of material) over 6 feet high measured at highest point above grade when a worker is required to walk on roof for any reason unless standard guardrails are installed around entire perimeter of tank

7. Confined Space Entry

    a. Consider the requirements for confined space entry in design of all water tanks. A confined space is defined as a space that is large enough for a person to enter, has limited means of entry or egress and is not designed for continuous human occupancy.

b. Water tank “entry” includes placing the head into a tank for visual inspection.

8. Aerial Lift/Bucket Truck Rooftop Inspections

   Some PWS may decide to inspect the tank rooftop using an aerial lift, bucket truck, fire department truck ladder, electric/light department aerial lift, or other lift apparatus.

9. Further information on public sector worker health and safety including confined space entry, roof anchor bolt devices, guardrails, and fall protection can be found at www.mass.gov/dos or by contacting the MA Division of Occupational Safety at 617-969-7177.

Additional information on OSHA requirements which are referenced for all public and required for all private sector workers can be found at www.osha.gov.

8.1.15 Freezing

Finished water storage structures and their appurtenances, especially the riser pipes, overflows, and vents, shall be designed to prevent freezing and ice damage which will interfere with proper functioning. Equipment used for freeze protection that will come into contact with the potable water shall meet ANSI/NSF Standard 61. If a water circulation system is used, it is recommended that the circulation pipe be located separately from the riser pipe.

8.1.16 Internal Catwalk

Every catwalk over finished water in a storage structure shall have a solid floor with sealed raised edges and designed so that shoe scrapings and dirt will not contaminate the water.

8.1.17 Silt Stop

The discharge pipes from all finished water storage structures shall be located in a manner that will prevent the flow of sediment into the distribution system. Removable silt stops should be provided where feasible.

8.1.18 Grading

The area surrounding a ground-level structure shall be graded in a manner that will prevent surface water from standing within 50 feet of the structure.

8.1.19 Painting and/or Cathodic Protection

Proper protection shall be given to metal surfaces using paints or other protective coatings and/or, by cathodic protective devices.

1. Paint systems shall meet appropriate AWWA specification and ANSI/NSF Standard 61. Interior paint must be applied, cured, and used in a manner consistent with ANSI/NSF 61 approval. After proper curing, the coating shall not transfer any substances to the water that will be toxic or cause tastes or odors. Consideration should be given to 100% solids coating. Refer to AWWA Standard D-102 *Coating Steel Water-Storage Tanks* and AWWA Standard D-103 *Factory-Coated Bolted Steel Tanks for Water Storage* latest issues for more information. The tank shall be flushed, disinfected, filled with water, and sampled for coliform and volatile organic compounds prior to going back into service.

2. Cathodic protection should be designed and installed by competent technical personnel, and a maintenance contract should be provided. When properly designed and maintained a cathodic protection system will help arrest corrosion and coating flaws in the submerged coated surface of steel finished water storage facilities. Without proper maintenance, a cathodic protection system may accelerate corrosion and coating degradation and result in water quality problems.

    a. The cathodic protection system should be controlled automatically rather than manually.

    b. The cathodic protection system should be deactivated as a safety precaution whenever personnel are working inside or on the tank.

    c. Rectifier meter readings should be recorded.

8.1.20 Disinfection

1. Finished water storage structures shall be disinfected in accordance with latest issue of ANSI/AWWA Standard C652 *Standard for Disinfection of Water-Storage Facilities*. One or more successive sets of coliform bacteria samples as required by MassDEP in writing shall indicate microbiologically satisfactory water before the facility is placed into operation.

2. The final water should also be tested to insure that no offensive odor exists because of chlorine reactions or excess chlorine residual.

3. Chlorinated Discharge - In accordance with latest edition of AWWA Standard C-652 thorough consideration should be given to the impact of discharge of highly chlorinated

water to the environment. If there is any possibility that chlorinated discharge will cause damage to the environment, a neutralizing chemical, as listed in AWWA standard C-652, shall be applied to the water to be wasted to neutralize thoroughly the chlorine residual remaining in the water. Where necessary, federal, state, and local regulatory agencies should be contacted to determine special provisions for the disposal of heavily chlorinated water.

4. The disinfection procedure specified in latest issue AWWA Standard C652 chlorination method 3, section 4.3 which allows use of the highly chlorinated water held in the storage tank for disinfection purposes, should only be used with care. The chlorinated water may contain various disinfection by-products which should be kept out of the distribution system. If this procedure is used, it is recommended that the initial heavily chlorinated water be properly disposed. Water that enters the distribution system shall comply with MassDEP water quality standards.

8.1.21 Provisions for Sampling

Smooth-nosed sampling tap(s) shall be provided to facilitate collection of water samples for both bacteriological and chemical analyses. The labeled sample tap(s) shall be easily accessible. Sampling taps shall be provided for both separate inlet and outlet pipes as applicable. Refer to section 8.1.9 Valve Pit and Sampling.

8.1.22 Maintenance

1. The exterior and interior of every finished water atmospheric storage tank shall be inspected as specified below. A thorough interior and exterior structural and coating inspection shall be conducted every 3-5 years by qualified and experienced personnel. . Such individuals will be experienced in tank climbing safety, coating and corrosion assessment and concrete assessment. Interior inspections could be accomplished by a diver with necessary vacuuming equipment, robotic equipment, or by draining the tank if possible to remove any accumulated bottom sediment. Emptied tanks require disinfection.

2. As a minimum unless otherwise approved in writing by MassDEP, monthly ground level exterior inspections of the tank and surrounding grounds shall be done, and a written dated log kept available for MassDEP inspection at any time checking for:

    a. Forced entry

    b. Fence damage

    c. Leaks

d. Overflows

e. Vandalism

f. Blocked overflow pipe(s) and box cover

g. Clean and in-place roof vent screen (if visible from ground level)

h. Ground level overflow screen condition and in place

i. Closed roof covers or hatches (if visible from ground level)

j. Acceptable cathodic protection meter readings (if used)

k. Evidence of trees or bushes encroaching upon tank

l. Working exterior sampling station, and accessible and dry valve pit

m. Intrusion alarm (if used)

n. Foundation problems, such as settlement, deep cracking, anchor bolt corrosion, etc.

o. Ladder and cage damage and corrosion

p. Exterior tank corrosion

q. Wind or earthquake damage

r. Minimum 12-inch air gap at bottom of overflow pipe

Use of binoculars and photographs are encouraged.

3. All finished water atmospheric storage tanks in the distribution system shall be visually inspected annually including the roof or top. The inspections shall include manhole hatches, vent caps, screens, screen condition, watertight seals, signs of vandalism, locks and other sanitary defects. A written dated log of the inspection shall be kept and available for MassDEP inspection at any time. Photographs of all inspections are strongly encouraged.

4. All storage tank inspections shall be performed by personnel determined by the PWS to be competent to perform such inspections

5. All tank inspections shall be kept on file for MassDEP inspection at any time for a minimum of 5 years. PWS shall use inspection reports provided by MassDEP where provided or checklist formats shown in AWWA Manuals.

6. For detailed maintenance and inspection checklists, refer to AWWA M42 *Manual of Water Supply Practices Steel Water-Storage Tanks* and MassDEP checklist titled: *PWS Monthly Finished Water Storage Tank Inspection Log*. Refer to http://www.mass.gov/dep/water/approvals/dwsforms.htm

8.2 Plant Storage

The applicable design standards of Section 8.1 shall be followed for plant storage.

8.2.1 Washwater Tanks

Washwater tanks shall be sized, in conjunction with available pump units and finished water storage, to provide the backwash waters required by Chapter 5.3.2.6 *Surface Wash Facilities* and Chapter 5.3.2.9 *Backwash*. Consideration must be given to the backwashing of several filters in rapid succession.

8.2.2 Clearwell

Clearwell storage should be sized, in conjunction with distribution system storage, to relieve the filters from having to follow fluctuations in water use.

1. When finished water storage is used to provide disinfectant contact time (see Chapter 5.4.1.2 *Contact Time* (CT)), special attention must be given to tank size and baffling.

2. To ensure adequate disinfectant contact time, sizing of the clearwell should include extra volume to accommodate depletion of storage during the nighttime for intermittently operated filtration plants with automatic high service pumping from the clearwell during non-treatment hours.

3. An overflow and vent shall be provided.

4. A minimum of two clearwell compartments shall be provided.

7. Refer to Chapter 5.3.12 *Treated Water Storage – Clearwell* for more design requirements.

8.2.3 Adjacent Compartments

Finished water shall not be stored or conveyed in a compartment adjacent to unsafe or partially treated water when the two compartments are separated by a single wall.

8.2.4 Other Basins and Wet-Wells

Receiving basins and pump wet-wells for finished water shall be designed as finished water storage structures.

8.3 Hydropneumatic or Pressure Tanks

Hydropneumatic (pressure) tanks, when provided as the only storage facility, are acceptable only in very small water systems. Hydropneumatic storage is considered primarily as an electrical pump control mechanism and not as true water storage. If a community public water system has a design average day flow of 7,500 gallons per day or greater or serves more than 150 living units, ground or elevated storage designed in accordance with Sections 8.2 or 8.4 should be provided. Pressure tank storage is not considered for fire protection purposes. Pressure tanks shall meet latest American Society of Mechanical Engineer's (ASME) code requirements or an equivalent requirement of state and local laws and regulations for the construction and installation of unfired pressure vessels.

8.3.1 Location

The tank shall be located above normal ground or floor surface and be completely housed and heated for protection from both physical damage and freezing. Earth mounding over the tank is not recommended.

8.3.2 System Sizing

1. The capacity of the wells and pumps in a hydropneumatic system should be at least 10 times the average daily consumption rate.

2. The capacity of wells and pumps in a non-community system should be sized to meet the peak instantaneous design demand in gallons per minute.

3. The gross volume of a hydropneumatic tank, in gallons, should be at least ten times the capacity of the largest pump, rated in gallons per minute. For example, a 250 gpm pump should have a 2,500 gallon pressure tank. Delivery volume in gallons of water from bladder type hydropneumatic tank(s) should be at least three times the capacity (in GPM) of the largest supplying pump (typical for non-community systems).

4. Sizing of hydropneumatic storage tanks must consider the need for chlorine detention time.

8.3.3 Piping

The tank(s) shall have bypass piping to permit operation of the system while it is being repaired or painted. If more than one tank is utilized, each tank should be able to be isolated separately. Provisions should be provided to maintain system pressure while the tank is out of service.

8.3.4 Appurtenances

1. All pressure tanks (including bladder type) shall provide a:

    a. Drain

    b. Pressure gauge

    c. Automatic or manual air blow-off

    d. Means of adding air

    e. Pressure-activated off/on switch to control the supply pump

    f. Thermal overload or low water cut-off switch for pump protection

    g. Pressure relief valve capable of handling full pumpage rate at the pressure vessel design limit

2. Hydropneumatic tanks shall provide:

    a. An access manhole, if size of tank permits

    b. A water sight glass

    c. That the size of the access manhole should be 24 inches in diameter, where practical.

8.4 Distribution System Storage

The applicable design and maintenance standards of Section 8.1 shall be followed for distribution system storage.

8.4.1 Pressures

1. All service connections shall have a minimum residual water pressure at street level of at least 20 psi under all design conditions of flow (310 CMR 22.19 (1) under *Distribution System Requirements)*.

2. The maximum variation between high and low levels in storage structures providing pressure to a distribution system should not exceed 30 feet.

3. The minimum working pressure in the distribution system should be 35 psi and the normal working pressure should be approximately 60-80 psi.

4. When static pressures exceed 100 psi, pressure reducing devices shall be provided on mains or as part of the meter setting on individual service lines in the distribution system.

8.4.2 Drainage

Finished water storage structures which provide pressure directly to the distribution system shall be designed so they can be isolated from the distribution system and drained for cleaning or maintenance without necessitating loss of pressure in the distribution system. The storage structure drain shall discharge to the ground surface with no direct connection to a sewer or storm drain. Refer to section 8.1.5 *Drains*.

8.4.3 Level Controls

Adequate controls shall be provided to maintain levels in distribution system storage structures. Level indicating devices should be provided at a central location.

1. Pumps should be controlled from tank levels with the signal transmitted by telemetering equipment when any appreciable head loss occurs in the distribution system between the source and the storage structure.

2. Altitude valves or equivalent controls may be required for second and subsequent structures on the system.

3. Overflow and low-level warnings or alarms should be located at places in the community where they will be under responsible surveillance 24 hours a day.

8.4.4 Antennae and/or Other Appurtenances

Adequate controls shall be provided such that antennas and/or other appurtenances attached to water storage tanks or on water supply land will not affect or interfere with the water supply or ladder access to top of tank.

1. Such installation shall meet the requirements of latest MassDEP Policy # DWP98-01 titled: *Policy on Antennae and/or Other Appurtenances Proposed to be Attached to Public Drinking Water Storage Tanks or on Water Supply Land* http://www.mass.gov/dep/water/laws/9801.doc

2. Grounded aviation warning lights if required by applicable FAA (Federal Aviation Administration) determination shall be constructed and installed in accordance with FAA standards, and maintained so they will provide adequate warning to aircraft and to ensure that the lighting unit(s) has not decreased in light output per FAA requirements.

3. If antenna or communication cables or cell towers are planned on new or existing tanks, it is recommended:

    a. To install a false overflow pipe as a conduit on the side of tank least visible to keep cables away from the side and roof ladders and allow easier future painting

    b. To install communication cables mounted upon fabricated wireways, supported off brackets, cable ladders or other commercially available cable support systems properly secured to tank walls.

4. Antenna cables should be supported at regular intervals every 4.5 feet in exposed locations. Antennas and related equipment must not interfere with vent and hatch access. Cables shall not be attached to ladders or obstruct manholes and platforms.

5. All antennae mountings should be done in a manner that does not damage protective coatings system where possible and the mountings should not compromise any components of the tank. Damaged protective coatings should be prepared and recoated in a manner satisfactory to the tank owner. All mounting equipment should be fabricated from corrosion resistant materials or protected by corrosion preventative coatings.