22.02(2) Definitions as Related to Cross Connections. As used in 310 CMR 22.22, unless the context indicates otherwise, the following words shall have the following meanings:

Air Gap Separation means the method of preventing backflow through the use of an unobstructed vertical distance through the free atmosphere between the lowest opening from any pipe or faucet supplying water to a tank, plumbing fixture, or other device and the flood level rim of the receptacle. The air gap separation shall be at least twice the internal diameter of the supply pipe discharge line but in no case less than one inch.

Approved Backflow Prevention Device or Device means a testable or non-testable cross connection control device that is approved by the Department for use in Massachusetts.

Approved Examiner means an individual authorized in writing by the Department to administer written and practical certification examinations at a recognized training institution.

Atmospheric Vacuum Breaker means an approved backflow device used to prevent back siphonage which is not designed for use under static line pressure.

Audit means a review of a Public Water System's implementation of its cross connection program to evaluate its effectiveness in distributing safe drinking water.

Back Pressure means pressure created by mechanical means or other means which causes water or other liquids or substances to flow or move in a direction opposite to that which is intended.

Back Siphonage means a form of backflow due to reduced or sub-atmospheric pressure within a water system.

Backflow means the flow of water or other liquids, mixtures or substances into the distribution pipes of a potable water supply from any source other than the intended source.

Backflow Preventer with Intermediate Atmospheric Vent means a non testable device having two independently operating check valves separated by an intermediate chamber with a means for automatically venting it to the atmosphere, in which the check valves are force loaded to a normally closed position and the venting means is forced loaded to a normally open position.

Barometric Loop means a loop of pipe rising at least 35 feet, at its topmost point, above the highest fixture it supplies for the protection of back siphonage.

Certification Examination means an examination approved by the Department for the purpose of testing competency in all areas of cross connection control and backflow prevention device testing.

Certified Backflow Prevention Device Tester means an individual who holds a valid Massachusetts Backflow Prevention Device Tester's Certificate issued by the Department.

Contaminant means any physical, chemical, biological or radiological substance or matter in water.

Cross Connection means any actual or potential physical connection or arrangement between a pipe conveying potable water from a public water system and any non-potable water supply, piping arrangement or equipment including, but not limited to, waste pipe, soil pipe, sewer, drain, other unapproved sources.

22.02(2) Definitions as Related to Cross Connections (continued)

Cross Connection Program Plan means a plan submitted to the Department by the water supplier describing the current and proposed cross connection program and including information on staffing, training, testing, surveying, fee structure, etc.

Cross Connection Violation Form means a violation form which is sent to the owner by the water supplier with copies to the plumbing inspectors and Board of Health delineating cross connection violations found on the owner's premises and a procedure for corrective action.

Department's Designee or Designee means any water supplier to whom, upon written request of said water supplier, the Department delegates any portion of its authority to act under 310 CMR 22.22.

Design Data Sheet means a report form submitted to the Department or its Designee along with plans for each installation of a reduced pressure backflow preventer or double check valve assembly, or for each change to any such device already installed, describing and showing the details of the specific installation.

Double Check Valve Assembly means a Department approved testable backflow prevention device that incorporates an assembly of check valves, with shut-off valves at each end and appurtenances for testing.

Health Hazard means an actual or potential threat of contamination to the potable water in a public water system, which, in the opinion of the Department or its Designee would endanger health.

In-Plant Protection means the location of approved backflow prevention devices in a manner, which provides protection of the consumers of water and the potable water system within the premises.

Inspection means an on-site inspection and survey by a qualified individual to determine the existence and location of cross connections and/or the physical examination and testing of an installed backflow prevention device to verify that the backflow prevention device is functioning properly.

Inspection and Maintenance Report Form means a report form, designated by the Department, which is to be used by certified testers to record all pertinent testing information.

Owner means any person maintaining a cross connection installation or owning or occupying premises on which cross connections can or do exist.

Owner's Agent means any person or body designated by the owner to act as his or her representative.

Potable Water means water from any source that has been approved by the Department for human consumption.

Pressure Vacuum Breaker means an approved backflow prevention device designed to prevent only back siphonage and which is designed for use under static line pressure.

Reduced Pressure Backflow Preventer means an approved testable backflow prevention device incorporating:

(a) two or more check valves,
(b) an automatically operating differential relief valve located between the two checks,
(c) two shut-off valves, and
(d) necessary appurtenances for testing; and which is designed to operate so that:
    1. the pressure in the zone between the two check valves is maintained at a value less than the pressure on the public water system side of the device and

22.02(2) Reduced Pressure Backflow Preventer (continued)

2. at cessation of normal flow, the pressure in the zone between the two check valves is maintained at a value less than the pressure on the public water system side of the device, and

3. in the case of leakage of either check valve, the differential relief valve shall operate to maintain reduced pressure in the zone by discharging to the atmosphere.

Reviewing Authority means the Department, its Designee, or the local plumbing inspector, authorized by M.G.L. c. 142 and licensed by the Board of State Examiners of Plumbers and Gas Fitters, whichever is responsible for the review and approval of the installation of an approved backflow prevention device.

Supplier of Public Water means any person who owns or operates a public water supply system.

Unapproved Source means the source or distribution system for any water or other liquid or substance which has not been approved by the Department as being of safe and sanitary quality for human consumption, including but not limited to any waste pipe, soil pipe, sewer, drain, or non-acceptable potable water system material.

22.22: Cross Connections Distribution System Protection

(1) Purpose. The Department's purpose in establishing a comprehensive distribution protection program is to prevent the contamination of drinking water to the last free flowing outlets or consumer's tap. For this reason, the Department strongly advocates the elimination of all cross connections. The installation of backflow prevention devices does not eliminate a cross connection. The installation of backflow prevention devices is a protection solution when re-plumbing or re-piping is not feasible. All cross connection protection devices shall be approved and permitted in accordance with 310 CMR 22.22.

(2) Maintenance of a Cross Connection

(a) No physical cross connection shall be maintained between the distribution system of a public water system, the water of which is being used for drinking, domestic, or culinary purposes, and the distribution system of any water source not approved by the Department, as being of safe sanitary quality, or any plumbing, fixture, or device whereby non-potable water or other substances might flow into the potable water system, unless said connection has been protected by a backflow prevention device approved, in accordance with 310 CMR 22.22 or 248 CMR 2.00, as applicable.

(b) Backflow prevention devices shall be installed, based on the degree of hazard involved, at all fixtures and equipment where backflow and/or back siphonage may occur and whenever a minimum air gap cannot be provided between the public water system outlets to the fixture or equipment and its flood level rim. All fixtures that have a threaded hose type connection shall, at a minimum, have the required air gap separation and be equipped with a vacuum breaker in accordance with 248 CMR 2.14,

(c) Where a water connection is not subject to back pressure, a non-pressure type vacuum breaker shall be installed on the discharge side of the last valve on the line serving the fixture or equipment,

(d) Cross connections maintained or created on fire protection system shall comply with 310 CMR 22.22(9)(d).

(e) All cross connection requiring the installation of a double check valve assembly or a reduced pressure backflow preventer shall be approved by the Department, its designee or the public water system in accordance with 310 CMR 22.22.

(f) Cross connections protected by a device other than a double check valve assembly or a reduced pressure backflow preventer, approved and permitted by the inspector of plumbing in accordance with 248 CMR 2.00 do not require the approval of the Department, its designee or the public water system.

(g) Except for the installation of backflow prevention devices on fire protection systems, no double check valve assembly or reduced pressure backflow preventors shall be installed on a cross connection until the application for a plumbing permit is accompanied by a letter of approval from the Department, its designee or public water system pursuant to 248 CMR 2.14(c).

22.02 Maintenance of a Cross Connection (continued)

(h) Subject to applicable laws and regulations, public water systems shall have the authority to terminate any water service connection to any facility where cross connections are found to be in non-compliance with 310 CMR 22.22. The supplier shall deny water service to any premises where cross connections exist until corrective action is taken. If necessary, water service shall be disconnected for failure to test or maintain backflow prevention devices in a manner acceptable to the supplier. If it is found that the backflow prevention device has been removed or by-passed or otherwise rendered ineffective, water service shall be discontinued unless corrections are made immediately.

(i) The public water system shall establish a time for completion of necessary corrections or removal of actual or potential cross connections, taking into consideration the degree of hazard involved and the time required to obtain and to install the needed equipment. The public water system shall use every means at its disposal to obtain voluntary compliance. However, if proper protection has not been provided after a reasonable period of time (following legal notification and subject to applicable laws and regulations), the public water system shall physically separate the public water supply from the on-site piping system in such a manner that the two systems cannot again be connected by an unauthorized person.

(j) Cross connections between a public water system and a private well or individual water source serving residential dwellings used for potable or non-potable purposes are prohibited.

(k) All backflow prevention devices shall be installed and repaired by a Massachusetts licensed plumber, except for backflow prevention devices installed on fire protection systems. A Massachusetts licensed fire sprinkler contractor is responsible for all work conducted on a fire protection system, including the installation, maintenance and repair of backflow prevention devices.

(l) An anti-siphon or back pressure device shall be installed on any apparatus that pumps any chemical into a potable water supply to prevent back siphonage.

(3) Public Water System Responsibilities. Every public water system shall be responsible for:

(a) Controlling cross connections to the last free flowing outlet of the consumer and for the safety of the public water system under its jurisdiction.

(b) Having a cross connection control distribution system protection program plan (the "cross connection program plan") approved by the Department as specified at 310 CMR 22.22(3)(b).

1. Every public water system is required to have its cross connection program plan approved by the Department by June 1, 1994.
2. Each plan must be prepared in accordance with departmental guidance and shall include, at a minimum, the following information: description of current program (i.e. staffing, tracking, surveying, testing, training and fee requirements) and evaluation of the current program, proposed changes and implementation plans. The plan shall also include an explanation of how the public water system will satisfy 310 CMR 22.22(3)(c) through (s).
3. The plan shall be fully implemented and operational by January 1, 1999. A public water system may use a contractor, subcontractor, or consultant to assist in the program implementation except as specified at 310 CMR 22.22(3)(r). However, every public water system shall continue to be responsible for compliance with 310 CMR 22.22 and subject to enforcement by the Department.
4. The public water system shall obtain the Department's written approval prior to modifying its approved cross connection plan.

(c) Inspecting and surveying of all industrial, commercial, and institutional premises served by the public water system to determine if cross connections exist and that all cross connections are properly protected by an appropriate device or eliminated.

(d) Maintaining on the public water system premises the following documentation:

1. a schedule of all facilities inspected and surveyed;
2. records of all device locations;
3. related correspondence, including notices of violation; and
4. list of devices and inspections of approved backflow prevention devices.

22.03 Public Water System Responsibilities (continued)

(e) Ensuring that all backflow prevention device inspections are conducted by a Massachusetts Certified Backflow Prevention Device Tester and surveys for cross connections are conducted by a person who is certified by the Department as a Massachusetts Certified Cross Connection Surveyor.

(f) Establishing and maintaining a cross connection control program for residential users, which shall include an educational component.

(g) Not allowing any cross connection at any point within its system unless said cross connection is approved pursuant to 310 CMR 22.22 or 248 CMR 2.00.

(h) Ensuring that all double check valve assemblies and reduced pressure backflow preventer devices are inspected and tested in accordance with the public water system program plan as approved by the Department and as specified at 310 CMR 22.22(13). The public water system has the option of testing the devices itself, having the device tested by the device owner, or having the testing conducted by a contractor.

(i) Establishing a program for auditing for devices not tested by public water system staff.

(j) Submitting a report to the Department annually on a form specified by the Department that shall include the following minimum information:

1. a list of all cross connections protected by an approved double check valve assembly or approved reduced pressure backflow preventer devices;
2. the numbers and types of facilities surveyed yearly; and
3. the number type and location of violations found.

(k) Assisting Department personnel in any cross connection related inspections and backflow device installations;

(l) Taking appropriate action to eliminate cross connections and hazardous conditions, strongly promote compliance, and take the appropriate enforcement action when necessary;

(m) Notifying the cross connection owner of any violations of 310 CMR 22.22 by sending a Notice of Violation to owner;

(n) Notifying all device owners of their responsibilities relative to cross connection control and 310 CMR 22.00.

(o) Annually notify consumers of water and local public officials of the requirements of the distribution system cross connection control program, including Mayors, Town Managers, city and town councilors or selectmen, water commissioners, fire chiefs, local boards of health, plumbing inspectors, building inspectors, local state representatives, unless waived in writing by the Department.

(q) Generating all necessary correspondence relative to the administration and operations of the cross connection control program. The public water system will be responsible for all correspondence to device owners. All correspondence relating to the cross connection control program must be signed by the public water system.

(r) Reviewing and approving design data sheets and plans for proposed new installations of reduced pressure backflow preventers, and double check valve assemblies. . All design data sheets and plans shall be reviewed by a Massachusetts Certified Cross Connection Surveyor, effective January 1, 1999 as specified at 310 CMR 22.22(7)(a)4.. The public water system may not delegate, or sub-delegate, contract, or subcontract this responsibility to any other entity, unless otherwise authorized in writing by the Department. The Department will require that all recommendations or findings made by the contracted certified surveyor, when reviewing and approving data sheets and plans, be submitted on the public water system letterhead and signed by an authorized person of the public water system.

(s) Ensuring, upon completion of installation that backflow prevention devices are installed according to the approved design data sheet and plans and tested for proper operation, effective January 1, 1999.

(4) Owners' Responsibilities. The owner of any cross connection protected by a double check valve assembly or reduced pressure backflow preventer shall:

(a) Notify the public water system of all cross connections protected by a double check valve assembly or reduced pressure backflow preventer and comply with all necessary approvals and permits from the public water system and/or the Department for the maintenance of cross connections, as specified at 310 CMR 22.22;

22.04 Owners' Responsibilities (continued)

(b) Have suitable arrangements made so that inspections of backflow prevention devices and cross connection surveys can be made during regular business hours;

(c) Maintain a spare parts kit and any special tools required for the removal and reassemble of backflow prevention devices;

(d) Provide the necessary labor for inspection and testing by the Certified Backflow Prevention Device Testers or Certified Cross Connection Surveyor;

(e) Overhaul, repair, or replace within 14 days of the initial inspection date and retest pursuant to 310 CMR 22.22(13)(f), any device which fails a test or is found defective;

(f) Submit copies of the Inspection and Maintenance Report Form as required by the public water system.

(g) Maintain on the premises complete records on all devices for the life of said devices including as-built plans and design data sheets; maintain for seven years the Inspection and Maintenance Report Forms for tests conducted by the certified.

(h) Make certain that the cross connection protection device is tested as specified at 310 CMR 22.22(13) or as required by the public water system.

(5) Certified Backflow Prevention Device Tester's Responsibilities. Certified Backflow Prevention Device Testers have the following responsibilities relative to cross connections:

(a) Having a backflow preventer test kit that is maintained in proper working order and calibrated annually;

(b) Recording the test results for each inspection conducted;

(c) Submitting copies of inspection reports to the water supplier, and the owner within 30 days of the inspection; and

(d) Maintaining records of all test results for a minimum of seven years.

(6) Local Plumbing Inspector Responsibilities. Local Plumbing Inspectors, authorized by M.G.L. c. 142 to administer and to enforce 248 CMR 2.00 (the State Plumbing Code), have the following responsibilities relative to cross connections:

(a) As required by 248 CMR 2.14(6), the Inspector of Plumbing will ensure that potable water supply systems are designed, installed and maintained in a manner as to prevent contamination from non-potable liquids, solids or gases which may be introduced to a potable water supply system through cross connections;

(b) After reviewing the plans and specifications for plumbing work under 248 CMR 2.04(5), and before issuing a permit, the Plumbing Inspector, as required by 248 CMR 2.14, shall require the installation of appropriate devices in accordance with 310 CMR 22.00; and

(c) No plumbing permit shall be issued for cross connection installations requiring Reduced Pressure Zone Backflow Preventors or Double Check Valve Assemblies until the application for such permit is accompanied by a letter of approval from the Department, its Designee or public water system.

(7) Installation Approval and Permit Requirements.

(a) Installation Approval.

1. No person shall install or remove or contract with another person for the installation or removal of any reduced pressure backflow preventer or double check valve assembly required by 310 CMR 22.22 unless a design data sheet with plans showing the method of protection of the public water distribution system has been approved by the Department, its Designee or the public water system for the installation of such device.

2. All persons shall obtain approval from the local plumbing inspector or the head of the local fire department, to the extent required by the State Plumbing Code, 248 CMR 2.04(3), or M.G.L. c.148, §27A, for the initial installation or retrofit for any change in the installation of any air gap separation with tank and pump arrangement, reduced pressure backflow preventer, or double check valve assembly.

22.07(a) Installation Approval (continued)

3. Prior to the installation of any pressure or atmospheric vacuum breaker, backflow preventer with intermediate atmospheric vent, or barometric loop, the plans and specifications for the plumbing work must receive a permit issued pursuant to 248 CMR 2.04(3) by the local Plumbing Inspector. For these devices, a plumbing permit issued under 248 CMR 2.04(3) shall constitute installation approval pursuant to 310 CMR 22.22.

4. All design data sheets and plans for the installation of backflow prevention devices shall be reviewed by a certified cross connection surveyor as of December 31, 1998.

5. Design data sheets and plans for the installation of a backflow prevention device on fire protection systems shall not be approved by the public water system until a building permit has been issued by the Building Official who has jurisdiction over such system in accordance with 780 CMR Chapter 1 and 9 and approval by the head of the local fire department.

(b) Permit Requirement.

1. Any person owning or maintaining a cross connection protected by a double check valve assembly or a reduced pressure backflow prevention device that was approved by the Department, its designee or public water system shall register such protected cross connection device(s)with the public water system in accordance with 310 CMR 22.22(2). The Department will issue one annual permit to the public water system covering only those registered cross connection devices identified by the public water system in its annual statistical report to the Department.

2. The Department reserves the right to revoke or suspend any conditional approval and/or permit for cause.

(c) The Department may revoke any approval or permit for any installation or change in installation of any backflow prevention device, which is found to be in noncompliance with 310 CMR 22.22.

(8) Location of Devices.

(a) The location of each approved backflow prevention device, with respect to the plumbing on the premises and the service connection to the premises, shall be based upon the degree of existing or potentially existing health hazard, and shall conform to the following specific requirements:

1. Approved backflow prevention devices shall be located so that protection of all cross connections is achieved with a minimum number of devices;

2. Approved backflow prevention devices shall be located so as to provide in-plant protection;

3. The following types of facilities have been determined to present high health hazard conditions and in-plant protection shall be supplemented by installation of a reduced pressure backflow preventer or an air gap separation at the meter or property line unless an approved device is installed on a dedicated or process line, or if protection of the in-plant cross connection(s) is achieved to the satisfaction of the Department, its Designee or the public water system at:

a. Nuclear reactors or other facilities where radioactive materials are used;
b. Sewage treatment plants and sewage pumping stations;
c. Piers, docks, marinas, shipyards;
d. Chemical plants;
e. Metal plating industries;
f. Hospitals, mortuaries, medical clinics, dental offices and clinics;
g. Laboratories, except when the Department or its Designee has made a specific determination that no health hazard exists on the premises;
h. Other types of facilities as determined in writing by the Department or its Designee.

(b) If, upon request by the owner of the premises or upon its own initiative, the Department or its Designee or the public water system determines that it is unreasonable to locate all cross connections within the premises, or the Department or its Designee determines that protection of all cross connections is unreasonable for economic reasons, then (1) the public water supply distribution system shall be protected by installation of a reduced pressure backflow preventer or an air gap separation at the meter or property line, and (2) the owner of the premises shall provide a safe, alternative supply of potable water, well marked and labeled, to all domestic water fixtures on the premises.

(9) Types of Backflow Prevention Devices Required.

(a) Subject to the provisions of 310 CMR 22.22(10), Table 310 CMR 22-1 shall serve as the guide for the type of protection required.

TABLE 22-1

AG - Air Gap
RPBP - Reduced Pressure Backflow Preventer
DCVA - Double Check Valve Assembly
AVB - Atmospheric Vacuum Breaker
PVB - Pressure Vacuum Breaker
BPIAV - Backflow Preventer with Intermediate Atmospheric Vent

	Acceptable Types of Backflow Preventers						
Types of Hazard on Premises	**AG**	**RPBP**	**DCVA**	**AVB**	**PVB**	**BPIAV**	**Comments***
1. Sewage Treatment Plant	X	X					
2. Sewage Pumping Station	X	X					
3. Food Processing	X	X	X*				*If no health hazard exists
4. Laboratories	X	X	X*				*If no health hazard exists
5. Fixtures with hose threads on inlets	X	X	X	X			In addition to an air gap separation, all fixtures that have a threaded hose type connection shall at a minimum, be equipped with a AVB in accordance with 248 CMR 2.14
6. Hospitals, Mortuaries, Clinics	X	X					
7. Plating Facilities	X	X					
8. Irrigation Systems	X	X		X*	X**		Each case should be evaluated individually. *An AVB can be used if no backpressure is possible and no health hazard exists. **Pressure Vacuum Breakers can be installed if. back pressure is not possible
9. Systems or Equipment Using Radioactive Material	X	X					
10. Submerged Inlets	X	X		X*			*If no health hazard exists and no back pressure is possible
11. Dockside Facilities	X	X					
12. Valved outlets or fixtures with hose attachments	X	X		X*			Each case should be evaluated individually *If no health hazard exists and no back pressure is possible
13. Commercial Laundries and Dry Cleaners	X	X					
14. Commercial Dishwashing Machines	X	X		X*			*If no health hazard exists
15. High and Low Pressure Boilers	X	X*					*If chemicals are added
16. Low Pressure Heating Boilers						X	Residential and small commercial, having no chemicals added
17. Photo Processing Equipment	X	X					
18. Reservoirs – Cooling Tower Re-circulating Systems	X	X					
19. Fire Protection Systems: For cross connection control, fire protection systems may be classified on the basis of water source and arrangement of supplies as follows:							

19. Fire Protection Systems (continued) a. Class 1: Direct connection from public water system mains only; no pumps, tanks, or reservoirs; no physical connection from other water supplies; no antifreeze or other additives of any kind; all sprinkler drains discharge to atmosphere, dry wells, or other safe outlets. These systems may or may not have fire department connections. Refer to 310 CMR 22.22(9)(d)1.	X	X	X				A backflow prevention assembly does not have to be installed on existing fire protection systems installed prior to March 21, 1997, provided that the fire protection system is registered with the public water system, equipped with a UL listed alarm check valve that is properly maintained in accordance with NFPA 25 and has not undergone substantial modification defined within 310 CMR 22.22(9)(d)3. Alarm check maintenance records must be available for inspection by the Department, its designee or the public water system
b. Class 2: Same as Class 1 except that booster pumps may be installed in the connections from the street mains. These systems may or may not have fire department connections. Refer to 310 CMR 22.22(9)(a).	X	X	X				A backflow prevention assembly does not have to be installed on existing fire protection system installed prior to March 21, 1997, provided that the fire protection system is registered with the public water system and equipped with a UL listed alarm check valve that is properly maintained in accordance with NFPA 25. Alarm check maintenance records must be available for inspection by the Department, its designee or the public water system
c. Class 3: Direct connection from public water system mains, plus one or more of the following: elevated storage tanks; fire pumps taking suction from aboveground covered reservoirs, or tanks; and pressure tanks.	X	X*	X*				*RPBP or DCVA contingent on evaluation of auxiliary supply and on-site system in accordance with 310 CMR 22.22(9)(d)1.
d. Class 4: Directly supplied from public water system mains, similar to Class 1 and Class 2 with an auxiliary water supply dedicated to fire department use and available to the premises, such as an non-potable water source located within 1700 feet of the fire department connection, (FDC).	X	X*					*RPBP on evaluation of auxiliary supply and on-site system in accordance with 310 CMR 22.22(9)(d)1.
e. Class 5: Directly supplied from public water system mains, and interconnected with auxiliary supplies, such as pumps taking suction from reservoirs exposed to contamination, or rivers and ponds; driven wells; mills or other industrial water systems; or where antifreeze or other additives are used.	X*	X*					*RPBP or air gap contingent on evaluation of auxiliary supply and on-site system. Refer to 310 CMR 22.22(9)(d)1.
f. Class 6: Combined industrial and fire protection systems supplied from the public water mains only, with or without gravity storage or pump suction tanks.	X	X*			X	X	*RPBP contingent on evaluation of on-site water system Refer to 310 CMR22.22 (9)(d)1.
g. Residential fire protection systems for one and two family detached dwellings and manufactured homes only. Fire protection systems in three family dwellings meeting NFPA 13D requirements as provided in 780 CMR, Chapter 9, are included in this section.	X	X	X				Non testable devices and flow through systems should be used whenever possible. Systems are typically designed and installed in accordance with NFPA 13D: "Installation of Sprinkler systems in One and Two Family Dwellings and manufactured homes." These systems are authorized to use food grade antifreeze with no additional requirements when potable piping (PB, CPVC, and copper tube) is employed. If non-grade antifreeze is utilized, the system may be classified as a class 5. If a fire department connection is used, the requirements for a class 1 or 2 apply.
h. Residential fire protection systems for other than those described in Table 22-1-19.g.	X	X	X				Fire protection system in this category shall comply with the requirements set forth in class 1 through 4 as appropriate.
20. Solar Energy Systems	X	X				X*	Residential and small commercial having no chemicals or only USP Glycenne added to water
21. Single Jacketed Heat Exchangers	X	X					Each case should evaluated individually

22.09 Types of Backflow Prevention Devices Required (continued)

(b) Subject to the authority of the Department, its Designee, or public water system to issue the final determination of what type of device is required and the location of the device for each cross connection in individual cases, depending upon the degree of health hazard and type of backflow involved, the acceptable devices for backflow prevention include air gap separation, reduced pressure backflow preventers, double check valves assemblies, atmospheric or pressure vacuum breakers, backflow preventers with intermediate atmospheric vents, and barometric loops.

(c) There shall be no by-pass around any approved backflow prevention device unless the same type of approved backflow prevention device is installed on the by-pass.

(d) Fire Protection Systems.

1. Any new, existing or substantially modified fire protection system, including residential fire protection systems, shall be evaluated by the Department, its Designee or public water system to determine if a cross connection exists. If it is determined that a cross connection does exist, 310 CMR 22.22(9)(a) Table 22-1 shall serve as a guide in determining the type of protection device required. In evaluating the type of protection device required, the degree of hazard associated with the fire protection system, and the potability of the water pumped into the fire department connection, shall be considered, and the head of the local fire department shall be consulted.

2. All existing cross connections between public water systems and fire protection systems, as described in Table 22-1, 310 CMR 22.22(9)(a)19.a. and b., and installed prior to March 21, 1997, shall be equipped with a UL listed alarm check valve with the standard alarm pressure switch trim package. The device shall comply with the applicable requirements stated in 310CMR 22.22(9)(d)6.: Fire protection systems installed on or after March 21, 1997, shall be equipped with a protection device specified in 310 CMR 22.22(9)(d)1. When backflow prevention devices are to be retroactively installed on exiting fire protection system, a thorough hydraulic analysis, including revised hydraulic calculations, new fire flow data, and all necessary system modification to accommodate the additional friction loss, shall be completed as part of the installation in accordance with NFPA-13. The installation of a backflow prevention device only does not constitute a substantial modification of an existing fire protection system.

3. The owner of a cross connection subject to 310 CMR 22.22(9)(d)2 shall register the connection(s) with the public water system . a copy of which shall be retained by the public water system as specified at 310 CMR 22.22.

4. Any owner of existing cross connection(s) who decides to install a protection device specified at 310 CMR 22.22(9)(a), Table 22-1, when the Department has not determined that such a protection device is necessary, shall obtain the prior written approval of the Department or its Designee of the design data sheets for the proposed protection device as specified at 310 CMR 22.22(9)(d)6.

5. Notwithstanding the provisions of 310 CMR 22.22(9)(d)3. and 4., by providing written notification to the owner of a cross connection between a public water system and a fire protection system, the Department or its Designee may, whenever the Department or its designee determines that the cross connection constitutes a threat to the public health, at any time require the installation of a protection device, modify or revoke the approval of a cross connection, or require water quality monitoring.

6. In addition to the requirements set forth in 310 CMR 22.22, the installation and testing of a backflow protection device on a fire protection system may be subject to the requirements of the following:

a. 780 CMR, Massachusetts State Building Code-Fire Protection Systems, Design, Installation, Testing and Maintenance Requirements.

b. 527 CMR, Massachusetts Fire Prevention Regulations, Installation Permits.

c. 250 CMR, board of Registration of Professional Engineers and Land Surveyors, Practice of Engineering and Preparation of Plans and Specifications.

d. 528 CMR, Bureau of Pipe fitters, Refrigeration, and Sprinkler Fitters, Qualification and Licensing of Installers.

22.09(d) Fire Protection Systems (continued)

e. M.G.L. c. 148, § 27A, Shutting Off of Existing Fire Protection systems and Permitting

f. 248 CMR, State Plumbing and Fuel Gas Code, Permits and Installation.

(10) Approval of Devices for Use in Massachusetts.

(a) Types and models of atmospheric breakers, pressure vacuum breakers/anti-siphon vacuum breakers, backflow preventers with intermediate atmospheric vent, dual check valve preventers, and hose connection vacuum breakers may be used in Massachusetts for certain low hazard applications referred to in the State Plumbing Code shall be those meeting the requirements of, and approved by, the Board of State Examiners of Plumbers and Gas Fitters.

(b) All reduced pressure backflow preventers, double check valve assemblies, and double check detector assemblies used in Massachusetts for the protection of a cross connection in accordance with 310 CMR 22.00 shall meet the standards established by at least one of the following organizations: American Society of Sanitary Engineering (ASSE), American Water Works Association or University of Southern California (USC) Specifications;

(c) Devices and valves installed on fire protection systems including dual check backflow preventer for residential fire sprinkler systems shall be listed by Underwriters Laboratory (UL) or approved by Factory Mutual Research in accordance with Appendix I of 780 CMR (the State Building Code), unless otherwise approved by the head of the local fire department.

(d) The Department reserves the right to prohibit the use of any cross connection protection devices in Massachusetts if the Department determines that such device is found, after subsequent review, to be defective or to have performed inadequately in the field.

(11) Installation Requirements.

(a) Reduced Pressure Backflow Preventers: Reduced pressure backflow preventers may be used to protect against backflow caused by back pressure or back siphonage and to protect a public water supply system from substances which are hazardous to health only when they are installed in the following manner:

1. For devices installed as in-plant protection, the reduced pressure backflow preventer shall be installed on the owner's side of the water meter on the potable water supply line.

2. Before installing a reduced pressure backflow preventer, all pipelines shall be thoroughly flushed to remove foreign material.

3. Drinking and domestic water lines, lines for safety showers, and lines for eye wash units must be taken off the upstream side of reduced pressure backflow preventers for devices installed as in-plant protection.

4. The reduced pressure backflow preventer shall be located so as to permit easy access and provide adequate and convenient space for maintenance, inspection, and testing.

5. The owner of the device shall be able to shut down water lines after reasonable notice during normal business hours to permit necessary testing and maintenance of the device, provided that if it is not possible to meet this requirement a by-pass line equipped with an approved type reduced pressure backflow preventer shall be installed.

6. The reduced pressure backflow preventer and shut-off valves must be installed in a horizontal alignment between three and four feet from the floor to the bottom of the device and a minimum of 12 inches from any wall. Vertical installation of devices shall be determined by the public water system.

7. Tightly closing valves must be installed at each end of the device and be immediately accessible unless otherwise approved by the Department or its Designee or public water system.

8. The device must be protected from freezing, flooding, and mechanical damage.

9. If the device is to be installed on a hot water line, a device approved for use at the elevated temperature must be used.

22.11 Installation Requirements (continued)

10. If a drain is to be provided for the relief valve port, there must be an approved air gap separation between the port and drain line. To be approved, the air gap must be at least twice the internal diameter of the discharge line.

11. Pit installation shall be approved only as provided in 310 CMR 22.22(11)(f).

12. All water lines shall be color coded according to the state plumbing code, except that water filtration plants, pumping stations, sewage treatment plants and sewage pumping stations shall label all water lines in lieu of color coding.

(b) Double Check Valve Assemblies: Double check valve assemblies may be used to protect against backflow caused by back pressure or back siphonage and to protect a public water supply system from substances which may be objectionable, but not hazardous to health, only if they are installed in the following manner:

1. Drinking and domestic water lines, lines for safety showers, and lines for eye wash units must be taken off the upstream side of the double check valve assembly for devices installed as in-plant protection.

2. The double check valve assembly shall be installed with adequate space to facilitate maintenance, inspection, and testing.

3. The double check valve must be installed horizontally and the top of the double check valve assembly must be between 12 inches and 48 inches from the floor to the bottom of the device and a minimum of 12 inches from any wall. Vertical installation of devices shall be determined by the public water system.

4. If a water meter is not provided on the upstream side of an approved swing-type double check valve assembly, a three to five foot spacer must be installed between the check valves.

5. Tightly closing valves must be installed at each end of the device and be immediately accessible unless otherwise approved by the Department or its Designee.

6. Double check valve assemblies must be readily accessible for testing and service and provided with suitable connections and appurtenances for testing.

7. The device must be protected against flooding, freezing and mechanical damage.

8. Pit installation will be approved only as provided in 310 CMR 22.22(11)(f).

(c) Vacuum Breakers: Vacuum breakers shall not be used to protect against backflow due to back pressure and shall not be installed as protection for high hazard conditions as determined by the Department, its Designee or public water system. Vacuum breakers may be used for low health hazards only if they are installed in the following manner:

1. Vacuum breakers must be installed at least six inches above the flood level rim of the fixture they serve.

2. Atmospheric vacuum breakers must be installed downstream of the last shut off servicing the fixture or equipment.

3. Vacuum breakers must not be installed in locations where the device is subject to corrosive fumes, dust or grit.

4. Vacuum breakers must be protected against flooding, freezing and mechanical damage.

5. Atmospheric vacuum breakers shall not be used under conditions of static line pressure. Pressure vacuum breakers may be used under conditions of static line pressure.

6. Vacuum breakers shall be installed on all fixtures that have a threaded hose type connection as required in 248 CMR 2.14, in addition to an air gap separation.

(d) Barometric Loops: Barometric Loops may be used only to protect against back siphonage, shall be approved for use only when no health hazard exists and when back pressure is not possible.

(e) Air Gap Separation: Air gap separation may be used to protect against backflow caused by back pressure or back siphonage and to protect a public water supply system from substances which are hazardous to health and shall be approved for use only when installed in accordance with Uniform State Plumbing Code, 248 CMR 2.00.

22.11 Installation Requirements (continued)

(f) Pit Installation: No devices shall be installed in pits except as specifically approved by the Department, its Designee or public water system in cases of unique circumstances, and must comply with 29 CFR 1910.196, OSHA regulations where applicable for work in confined spaces then only as follows:

1. The pit interior shall be a minimum of ten feet long, six feet wide, and must have a clear height 6½ feet high;
2. The pit must be watertight;
3. The pit opening and manhole cover must be at least 30 inches in diameter;
4. The foothold inserts must be of steel, aluminum, or other material approved by the Department, must be a maximum of 12 inches apart, and must be installed so that the top foothold is within 12 inches of the manhole cover and the bottom foothold is within 12 inches of the pit floor;
5. An adequate drain must be installed and the drain line shall not be connected to a sewer;
6. The pit floor shall be pitched to the drain;
7. If built in a roadway, the top of the pit must be adequately reinforced.

(12) Cross Connection Certification

(a) Cross Connection Backflow Prevention Device Tester. Any person seeking Department certifications as a Backflow Prevention Device Tester in the Commonwealth of Massachusetts shall meet all of the following requirements:

1. pass a written and practical certification examination which is approved by the Department for "Backflow Prevention Device Tester".
2. apply to the Department for certification on the form provided by the Department. This submittal must include payment of the certification fee established by the Department.
3. Application for certification must be submitted to the Department no later than 12 moths after the date the applicant received notice of passing a Department approved examination.

(b) Cross Connection Control Surveyor. Any person seeking Department certification as a Cross-Connection Surveyor in the Commonwealth of Massachusetts shall meet all of the following requirements:

1. Pass a written examination approved by the Department for Cross Connection Control Surveyor".
2. Apply to the Department for certification on the form provided by the Department. This submittal must include payment of the certification fee established by the Department.
3. Application for certification must be submitted to the Department no later than 12 months after the date the applicant received notice of passing a Department approved examination.

(c) Any person, upon satisfying the requirements of 310 CMR 22.22(13)(a), shall receive from the Department a certificate which indicates that he or she is a:

1. Certified Backflow Prevention Device Tester; or
2. Certified Cross Connection Surveyor; or
3. Combination Certified Backflow Prevention Device Tester/Certified Cross Connection Surveyor.

(d) All certificates will remain valid for three years from the date of issuance.

(e) Renewal of Certification. Any Certified Backflow Prevention Device Tester, Cross Connection Surveyor or person holding a valid Combination Certificate who desires to renew his or her certification must submit a renewal application including any renewal fee and prerequisites, no later than one month prior to the expiration date of his or her certificate.

1. Backflow Prevention Device Testers: Persons applying for renewal shall complete at least 24 inspections/tests of backflow prevention devices and obtain a least three training contact hours (TCH) in the past three years. Proof of inspections and TCH shall accompany the application.

22.12(e) Renewal of Certification (continued)

2. Cross Connection Surveyor. Persons applying for renewal shall complete at least three cross connection surveys and obtain a least three training contact hours (TCH) in the past three years. Proof of surveys and TCH shall accompany the application.

(f) Persons failing to meet the certification renewal requirements at 310CMR 22.22(13)(e)1. and/or 2. within three years from the date that the certification expired must retake an examination approved by the Department for renewal.

(g) Re-certification Requirements. Persons failing to renew their certification within three years from the date that the certificate expired must retake an examination approved by the Department for re-certification.

(h) Persons holding both a valid Backflow Prevention Device Testers certificate and a valid Cross Connection Surveyor certificate shall be issued a Combination Certificate.

(i) Persons holding a combination certification shall satisfy all the renewal requirements stated at 310 CMR 22.22(12)(e), except for the TCH requirements. Only three TCH will be required for a combination certificate.

(13) Inspection Surveying, Testing and Overhauling of Devices.

(a) All cross connection surveys shall be conducted by a person who is a Massachusetts Certified Cross-Connection Surveyor. All backflow prevention device tests shall be conducted by a certified Backflow Prevention Device Tester in accordance with 310 CMR 22.22. A person holding a Combination Certification may conduct a cross connection survey and/or backflow prevention test.

(b) Within 14 calendar days after the installation of devices in accordance with plans reviewed and approved by the reviewing authority, the owner or owner's agent shall notify the public water system to arrange for the inspection of the installation.

(c) Reduced pressure backflow preventers, double check valve assemblies, may be inspected and tested by the Department, its designee or the public water system at any time.

(d) The public water system is responsible to ensure that each reduced pressure backflow preventer will be inspected semiannually in accordance with the public water system's approved cross connection program plan, as provided for in 310 CMR 22.22(3)(b) . If the supply is used less than six months of the year, these devices shall be inspected and tested once each year. Each double check valve assembly shall be tested annually. Pressure type vacuum breakers should be tested at least annually by the owner of the device. Each test shall be conducted by a Certified Backflow Prevention Device Tester.

(e) Devices, which fail the test or are found to be defective shall be overhauled, repaired, or replaced and re-tested within 14 calendar days of the failure or from the discovery of the defect. The repair work must be done by a plumber licensed by the Commonwealth of Massachusetts to the extent required by 248 CMR 2.04(3). No person shall overhaul, repair, replace a device on a fire system without approval from the head of the local fire department pursuant to M.G.L. c.148, §27A.

(f) No two routine tests for reduced pressure backflow preventers required by 310 CMR 22.22 shall be conducted within five months of each other without the written approval of the Department, its designee or the public water system.

(g) The owner or owner's agent must maintain on the premises a spare parts kit and any special tools required for removal and re-assembly of devices which are to be tested. The presence of these materials must be recorded on the Inspection and Maintenance Report Form.

(h) The owner or owner's agent must provide labor on the premises as necessary to allow inspection and testing of devices by the Department, the supplier of water, or Certified Backflow Prevention Device Testers.

(i) The owner or owner's agent shall notify the public water system in writing, no later than 30 days

(j) Prior to the removal from service of any permitted device and such notification shall include the reason for removal and must indicate if the cross connection has been eliminated.

22.13 Inspection Surveying, Testing and Overhauling of Devices (continued)

(k) The owner or owner's agent shall notify the public water system in writing no later than 30 days prior to a change in ownership. Notification must include, at a minimum, the name and address of the new owner as well as documentation with proof of change in ownership.

(l) If the public water system deems necessary, it may test a device more frequently to ensure proper cross connection control.

(14) Right of Entry. All owners or operators of commercial, industrial or institutional premises served by a public water supply system shall authorize agents and employees of the Commonwealth, upon presentation of their credentials, to enter their premises without a warrant for the purpose of inspecting and surveying their water systems for cross connections and assuring compliance with 310 CMR 22.22, whether or not the Commonwealth has evidence that the system is in violation of an applicable legal requirement.

(15) Fees.

(a) The certification fees for Backflow Prevention Device Testers and Cross Connection Control Surveyors are established by the Department as stated in 310 CMR 4.00.

(b) A person holding either a Testers or Surveyors certificate will not be charged an additional fee for a combination certification provided that all the requirement of 310 CMR 22.08 have been met.

(c) Permit fees as specified at 310 CMR 22.22(7)(b) are established by the Department in accordance with 310 CMR 4.00.

(16) Enforcement.

(a) Whoever maintains a cross connection in violation of M.G.L. c. 111, § 160A, shall be:

1. Punished by a fine of not more than $25,000 for each day such violation occurs or continues, or by imprisonment for not more than one year, or both such fine and imprisonment, or
2. Subject to a civil penalty not to exceed $25,000 per day for each day that such violation occurs or continues.

(b) Any violation of 310 CMR 22.22 shall be subject to the administrative penalty provisions of 310 CMR 5.00.

(c) Upon due notice to the person maintaining the connection the Department may revoke any permit whenever, in the opinion of the Department, the cross connection or the maintenance thereof no longer complies with 310 CMR 22.00.

(d) After notice and opportunity for a hearing, the Department may suspend or revoke the certification of any Backflow Prevention Device Tester or Cross Connection Control Surveyor for cause. A certified backflow prevention device tester or certified cross connection control surveyor whose certification has been suspended or revoked by the Department may not test devices or conduct any surveys pending the outcome of the hearing, if any.

(e) Audit: The Department may perform audits of a Public Water System's distribution system protection cross connection control program to ascertain whether the PWS is in compliance with 310 CMR 22.22, and to ascertain the fitness and purity of the water for domestic use and to secure the sanitary protection of such waters, pursuant to MGL c. 111, §160. The Department may issue a written order, pursuant to M.G.L. c. 111, § 160A, requiring a supplier of public water to perform any action necessary to assure the delivery of fit and pure water through its distribution system, including the actions required under 310 CMR 22.22(13).

(f) In order to ensure the delivery of a fit and pure water supply, the Department may issue a written order, pursuant to M.G.L. c. 111, § 160, requiring a supplier of public water to cease supplying water to any premises if one or more cross connections are maintained in violation of the requirements of 310 CMR 22.22, or requiring any person to take such actions as are reasonable and necessary to prevent or to eliminate cross connections.