

SECTION N - PLUMBING AND CROSS CONNECTION CONTROL¹

REFERENCES (Chapter 511-6-1)

.01 Definitions. Amended. (vvvv) "Plumbing system"
.06 Sanitary Facilities and Controls. Amended. (2) Plumbing System (a) (b) (d) (e) (f) (j) (k) (m) (n) (p) (q) (r)
.06 Sanitary Facilities and Controls. Amended. (4) Sewage, Other Liquid Waste... (b)(c)(e)
This Manual – Part-II, Appendix R – Plumbing and Cross-Connection Control by FDA Division of Human Resources Development

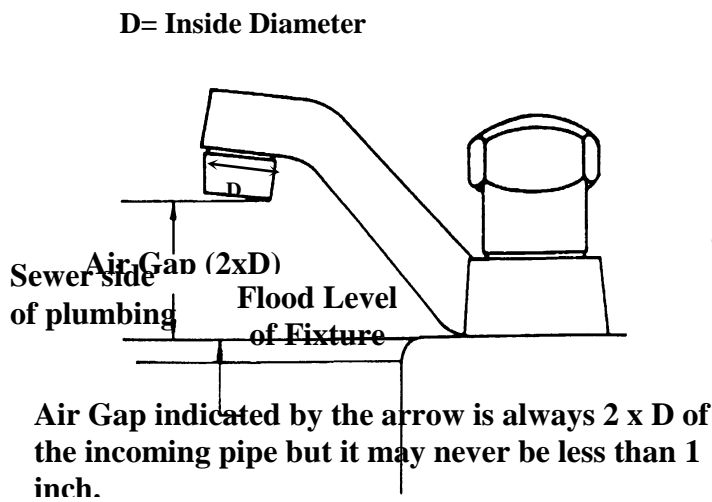
- I. General:** Plumbing shall be sized and installed according to State or local codes whichever is applicable. There shall be no cross-connections between the potable water supply and any non-potable or questionable water supply. Where non-potable water systems are permitted for purposes such as air conditioning and fire protection, the non-potable water must not contact directly or indirectly: food, potable water or equipment that contacts food or utensils. The piping of any non-potable water system shall be durably identified (most are colored pipe or have color coded stripes on the pipe) so that it is readily distinguishable from piping that carries potable water.
- II. Submerged Inlet Protection:**
1. A connection to a sewer line may be *direct* or *indirect*:
 - A. A *direct connection* is a solid physical connection between a potable and non-potable plumbing system;
 - B. An *indirect connection* is a potential connection between a potable and non-potable plumbing system and it comprises two types:
 - a. An *air gap* means the unobstructed vertical distance through the free atmosphere between the lowest opening from any pipe or outlet supplying fixture, or other device, and the flood level rim of the receptacle. The vertical physical separation shall be at least two times the inside diameter of the water inlet pipe above the flood rim level, but shall not be less than one inch. See *Illustrations N-1, N-2, N-3, and N-4* for examples of air gaps indirect connections.
 - b. There shall be no cross-connections between the potable water supply and any non-potable water supply. The potable water system shall be installed to preclude the possibility of backflow and back siphonage. Devices shall be installed to protect against backflow and back siphonage at all fixtures and equipment unless an air gap is provided. The air gap must be at least twice the diameter of the water supply inlet, but not less than 1 inch, between the water

¹ Source: Subsection entitled, "Plumbing And Cross Connection Control" starting Section 5 – Water And Sewage Disposal in the 2008 FDA Plan Review for Food Establishments guidance document.

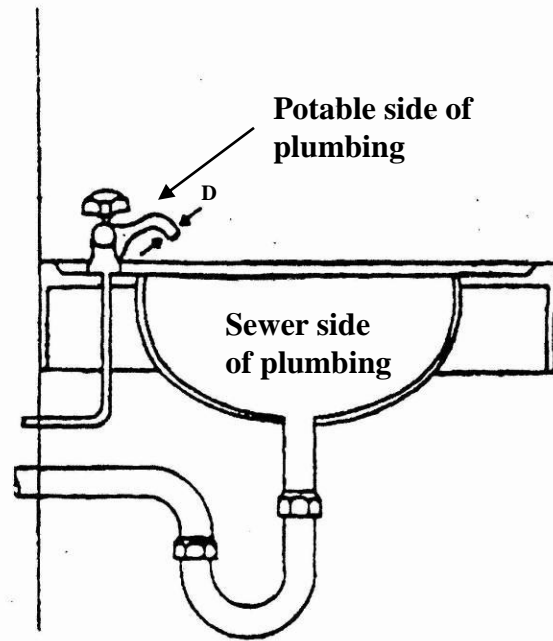
supply inlet and the fixture's flood level rim. *See Illustration N-2.*

- c. An *air Break* is a piping arrangement in which a drain from a fixture, appliance, or device discharges indirectly into another fixture, receptacle or interception at a point below the flood level rim. The connection does not provide an unobstructed vertical distance through the free atmosphere and is not solidly connected, but precludes the possibility of backflow to a potable water source into a sink or dishwasher/or fixture being drained. *See Illustration N-5.*

ILLUSTRATION N-1



Air Gap on Lavatory



Air Gap and Effective Opening

ILLUSTRATION N-2

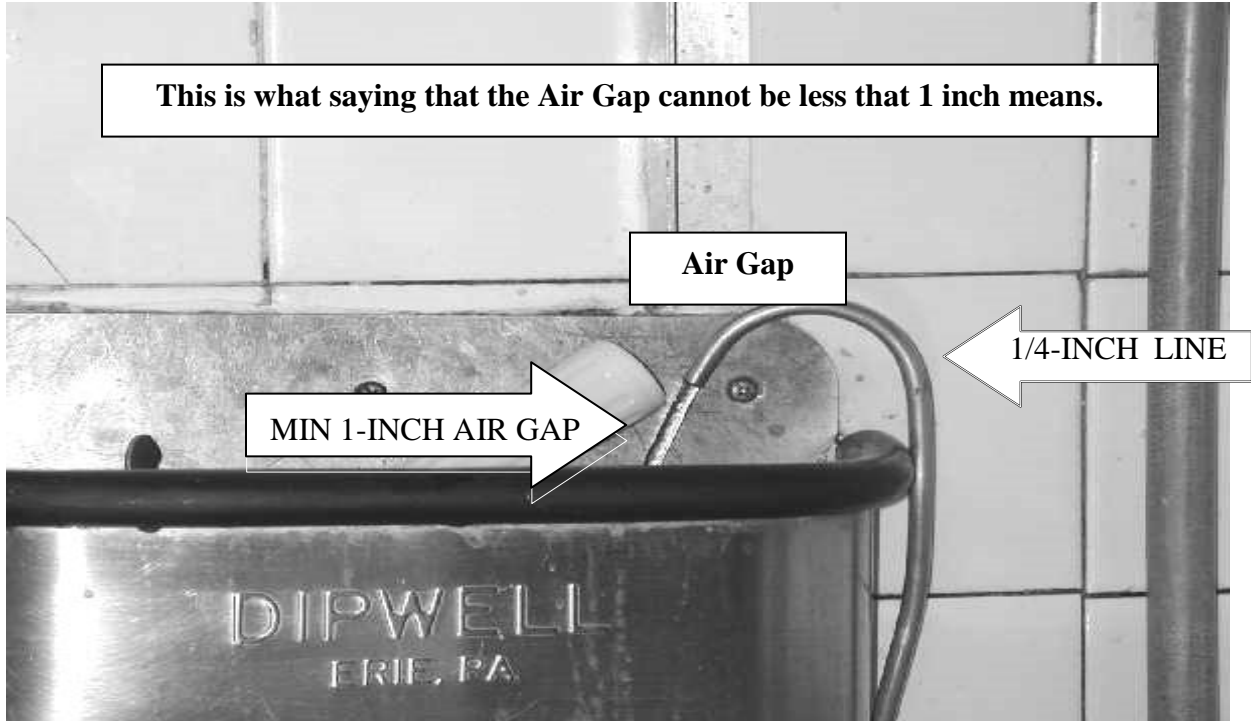


ILLUSTRATION N-3



ILLUSTRATION N-4

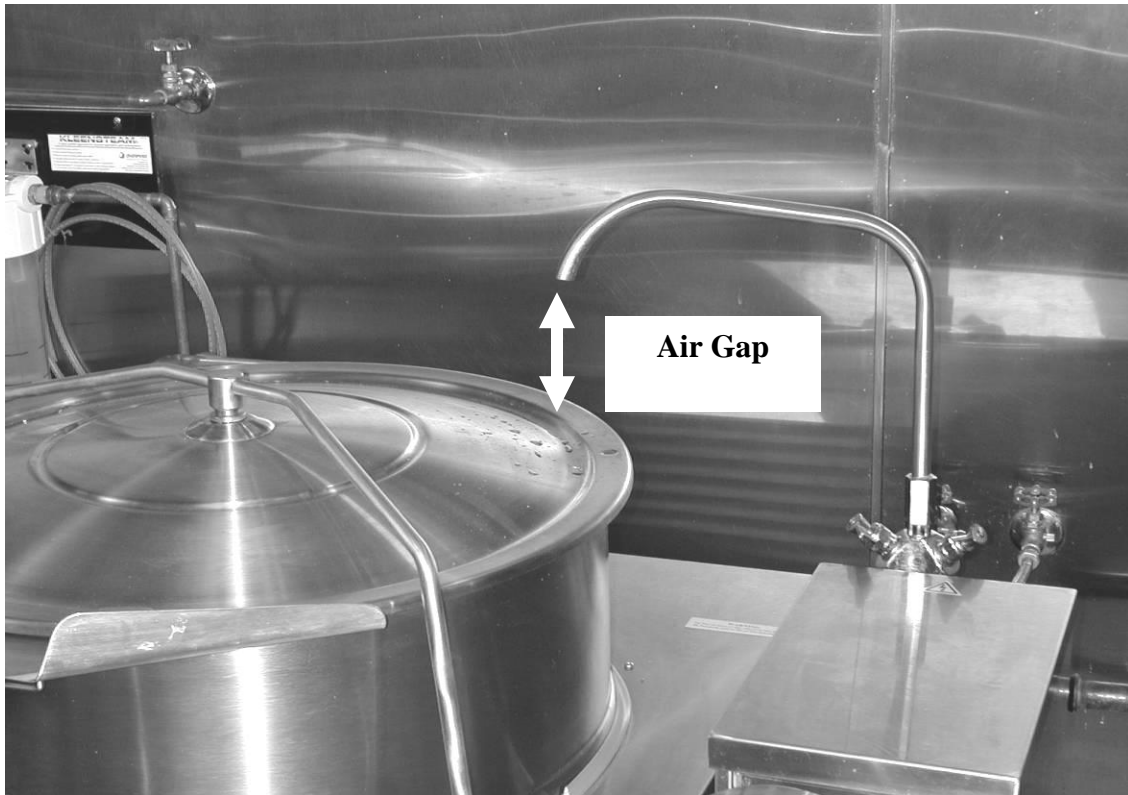
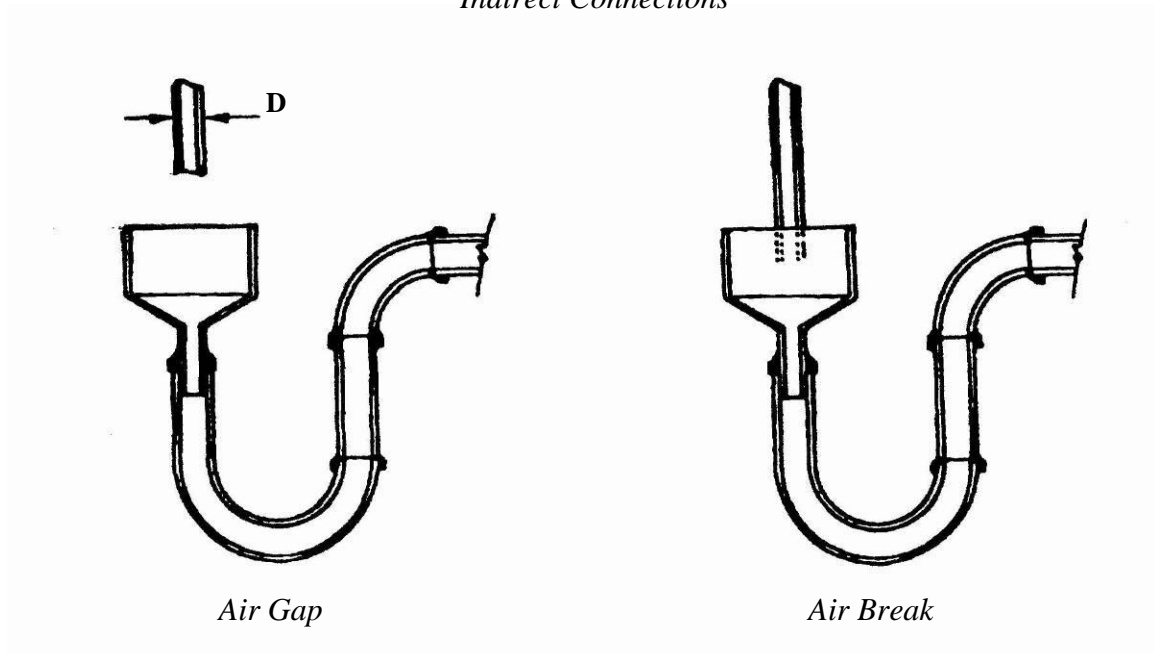


ILLUSTRATION N-5

Indirect Connections



- A. Types of Backflow/Back Siphonage Protection: The following *List N-1* provides examples of some of the types of equipment with potentially submerged inlets and required backflow/back siphonage protection:

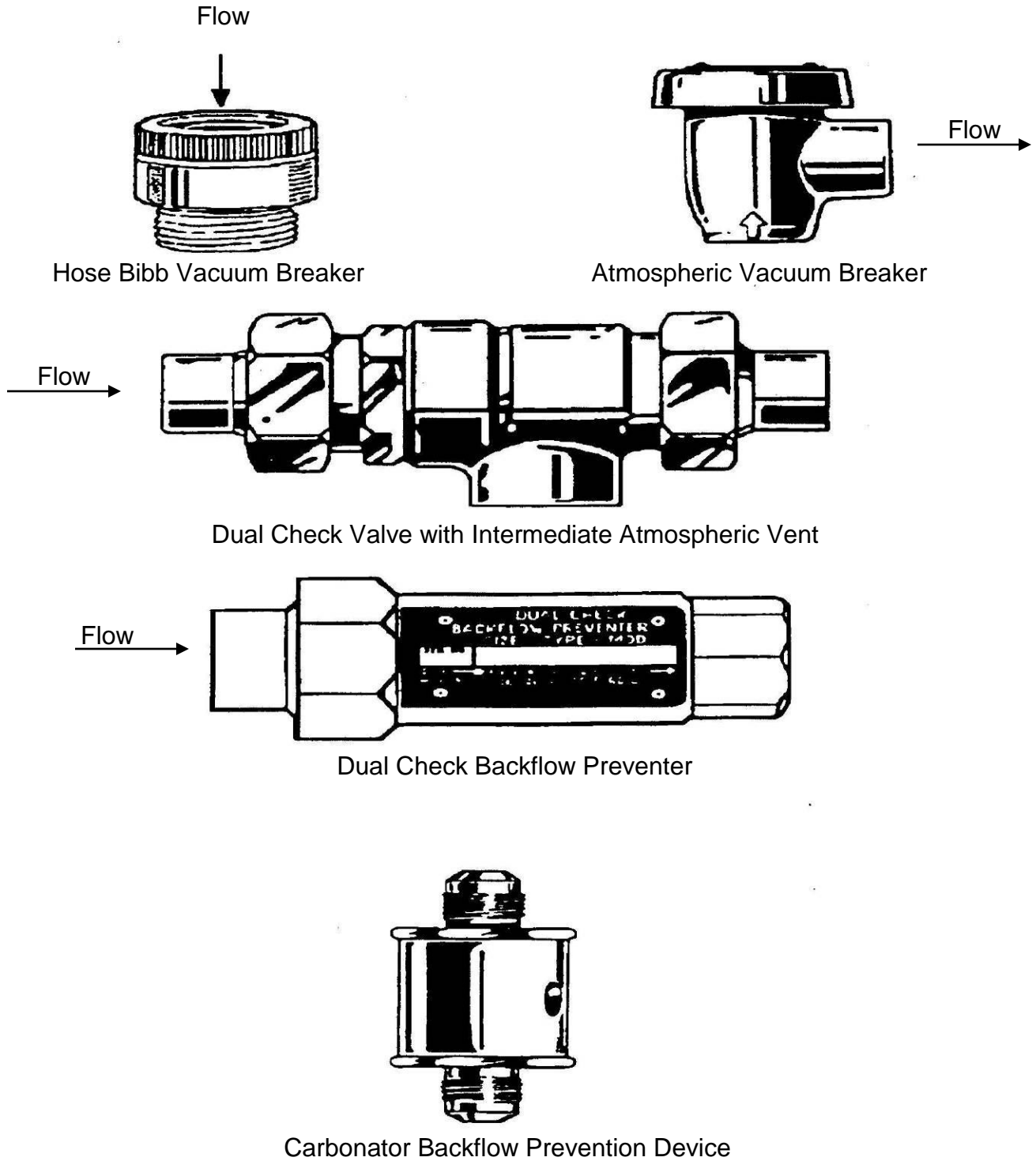
LIST N-1

<u>Backflow/Back siphonage Preventer Equipment</u>	<u>Required in Lieu of Air Gap</u>
1. Boiler with chemicals added	Reduced pressure device
2. Boiler with no chemicals added	Air vent type backflow preventer
3. Carbonators for beverage dispensers	Approved backflow preventer (in agreement with local plumbing codes)
4. Lawn sprinkler system with no chemicals added	Atmospheric or pressure vacuum breaker
5. Flush valve toilets	Atmospheric or pressure vacuum breaker
6. All hose bibs inside & outside of establishments	Hose bib-type vacuum breaker
7. Pre-flush hose with a nozzle head that may be submerged	Pressure vacuum breaker
8. Perforated pipe to oriental Wok cookers	Atmospheric vacuum breaker
9. Inlets which are or may become submerged:	
a. Supply inlet to garbage grinder	Atmospheric vacuum break
b. Supply inlet to dish table trough	Atmospheric vacuum breaker

LIST N-1
(Continued)

- | | |
|---|--|
| c. Fill line for steam kettle | Atmospheric vacuum breaker* |
| d. Supply line for mechanical warewashing machine | <u>Backflow/Backsiphonage Preventer Required in Lieu of Air Gap</u> |
| e. Supply line to all soap and chemical dispensing units on mechanical warewashing machine. | <u>Backflow/Backsiphonage Preventer Required in Lieu of Air Gap</u> |
| f. Garbage can washer | <u>Backflow/Backsiphonage Preventer Required in Lieu of Air Gap</u> |
| g. Soap portioner on faucet | Soap portioner must contain an internal air gap |
| h. Water wash system for exhaust hood | Air-vent type backflow preventer (RPZ or Reduced Pressure Zone may be required if toxic chemicals are added) |
- A. *An atmospheric vacuum breaker means a mechanical device that automatically air vents a pipeline to prevent back siphonage. The device shall be located beyond the last control valve prior to the first outlet and at an elevation 6 inches higher than any source of contamination. Atmospheric vacuum breakers shall be installed so that they are not subject to backpressure or continuous operating pressure of more than 12 hours duration. *See Illustrations N-8, N-9, N-10*
- B. *See Illustration N-6* for examples of backflow/backsiphonage prevention devices.

ILLUSTRATION N-6



- C. ** A Pressure vacuum breaker is a mechanical device that *automatically vents a pipeline to prevent backsiphonage even with a pressure nozzle attached to the end of the attached hose*. The device must be installed at least 12 inches above the highest elevated inlet or fixture on its downstream side. The unit must have a shut-off valve on each side and two test cocks for testing. The device must be located in such a manner to be accessible for testing and servicing. The Pressure vacuum breaker is *approved* for high hazard, continuous pressure, and no backpressure potential. Valves may be located on the downstream side. *See Illustration N-7* for an example of a pressure vacuum breaker.

ILLUSTRATION N-7

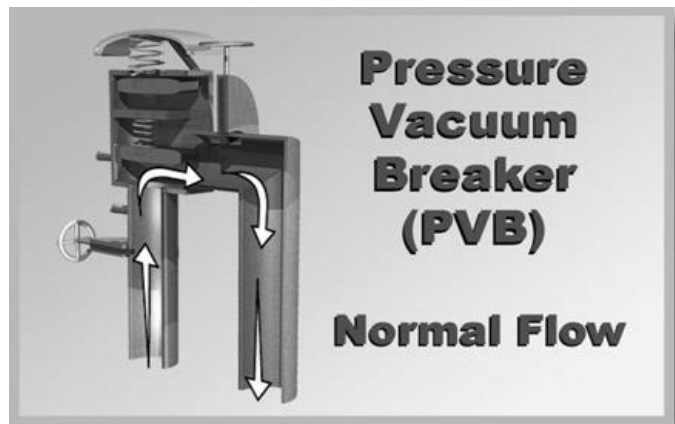
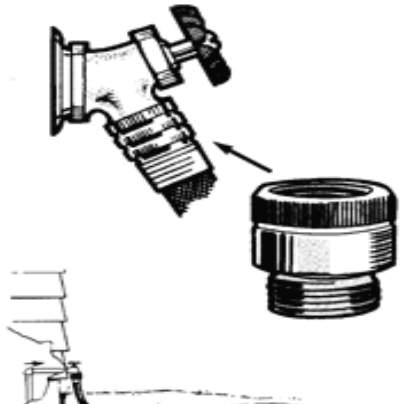


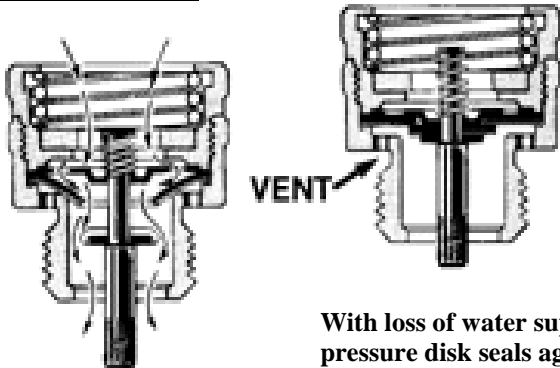
ILLUSTRATION N-8

Hose-Bibb Vacuum Breaker

Atmospheric Vacuum Breaker



How It Operates:



Opened Completely

With loss of water supply, pressure disk seals against diaphragm, checking backflow and opening vent ports.

How It Operates:

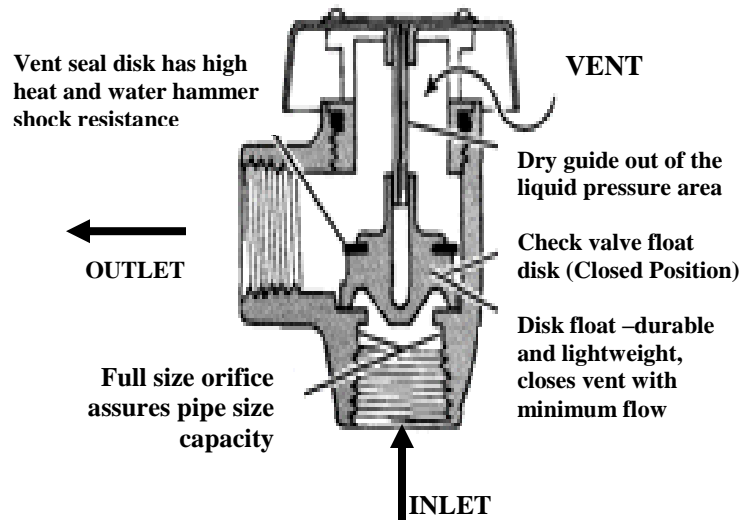


ILLUSTRATION N-9

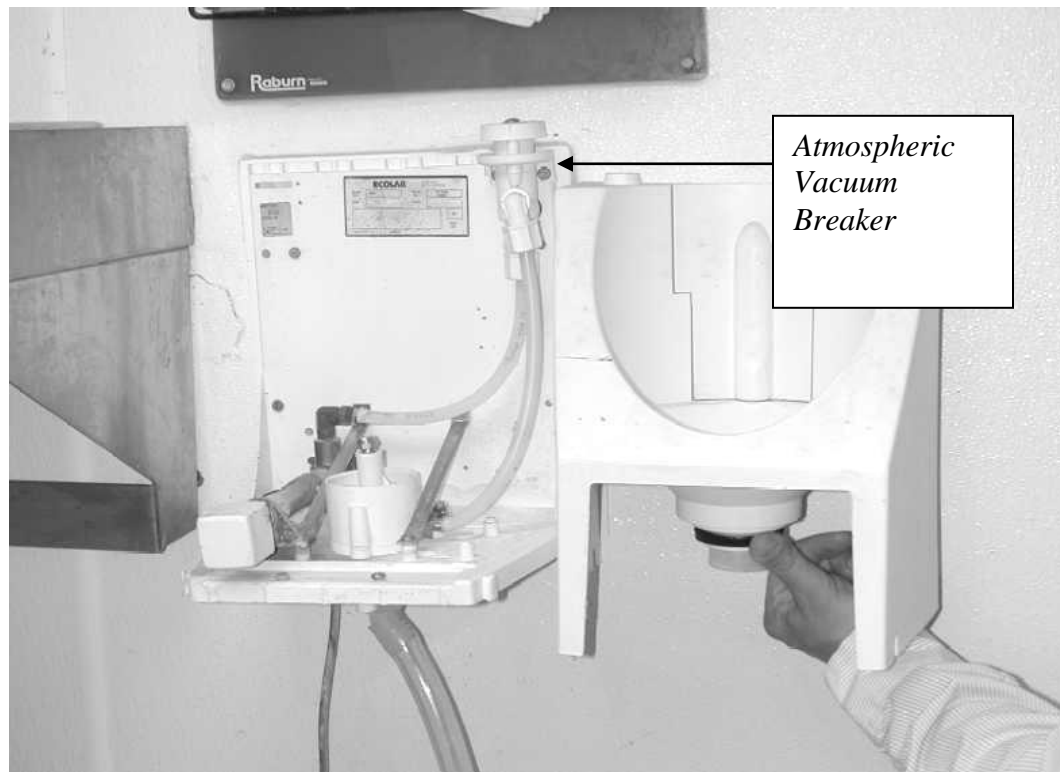
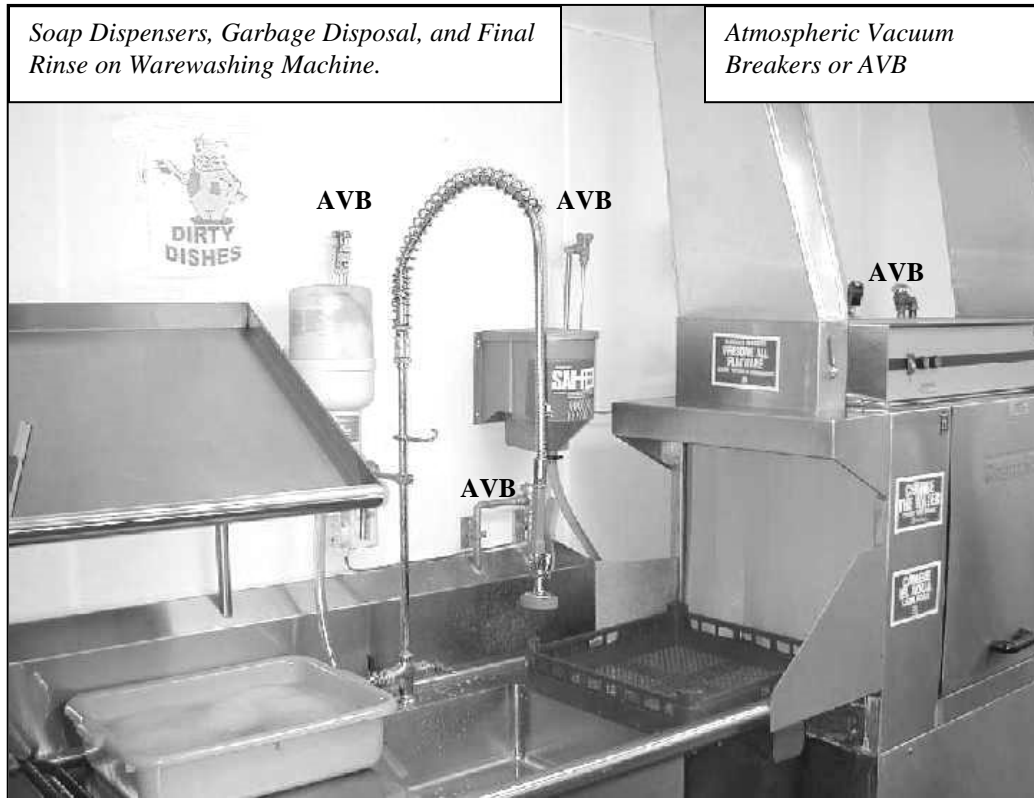


ILLUSTRATION N-10



D. Dual Check Valve with Intermediate Atmospheric Vent:

- a. These units consist of two identically loaded, independent check valves and an atmospheric vent.
 - b. This device is suitable for constant pressure, backpressure and back siphonage applications.
 - c. Watts Regulator Model #9D is the most common seen in plans; however, other manufacturers make similar devices.
 - d. *See Illustrations N-11 through N-14* for more information.
- E. *See Table N-1* for general installation information for backflow/back siphonage devices.

ILLUSTRATION N-11
Dual Check Valve with Intermediate Atmospheric Vent

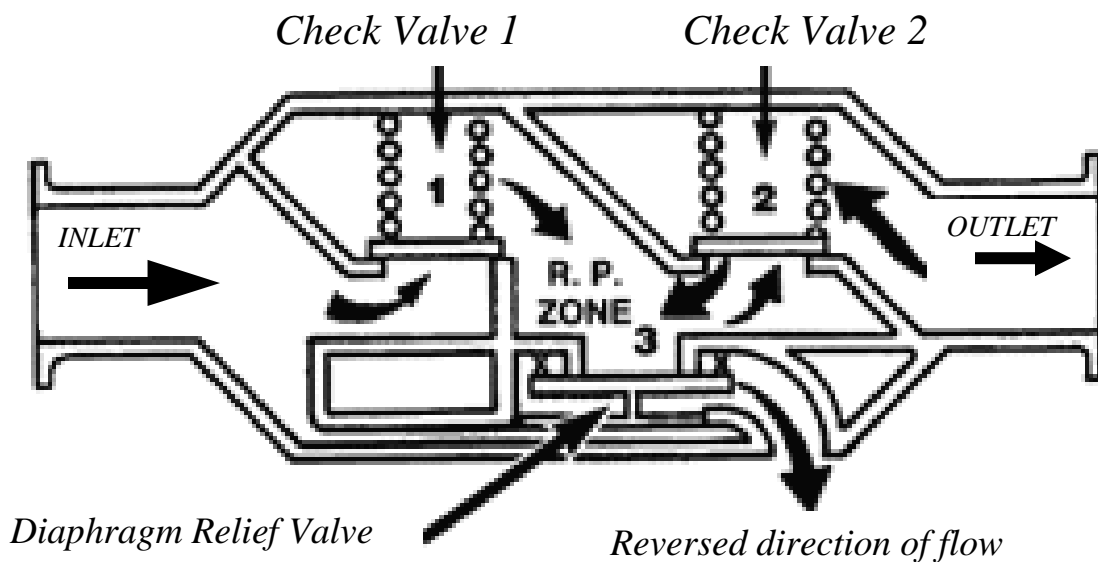
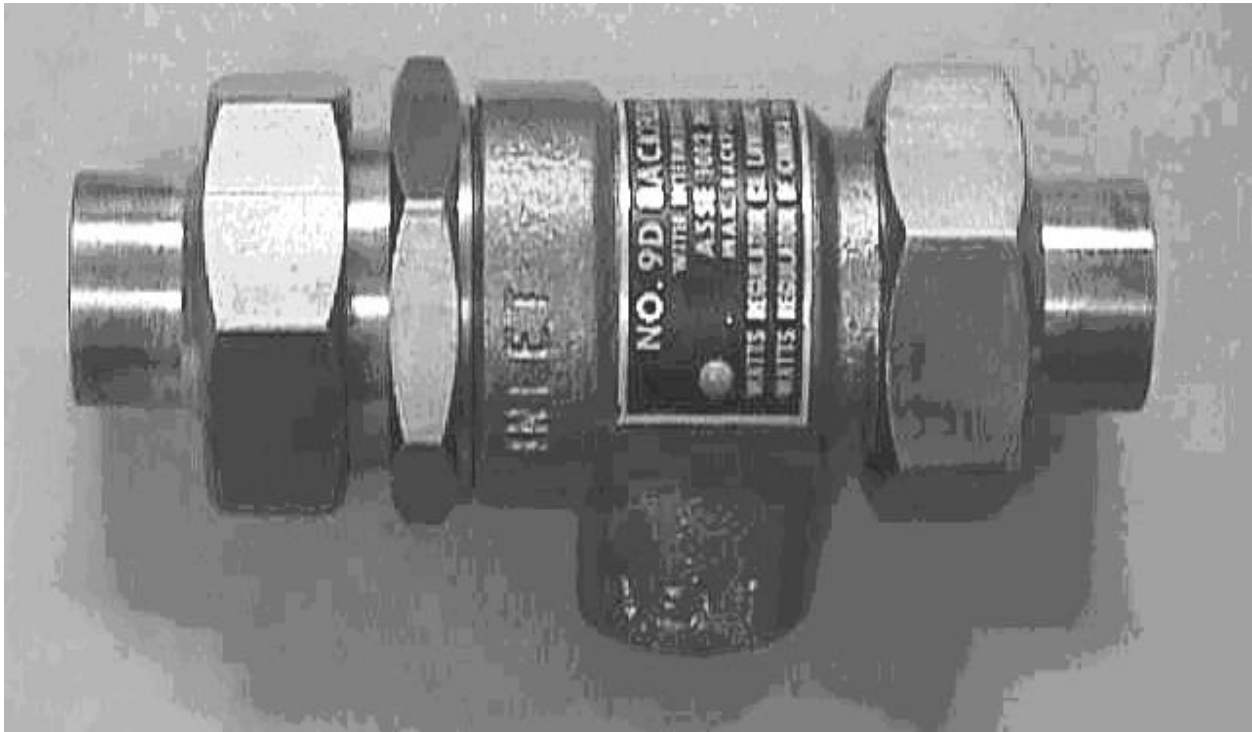
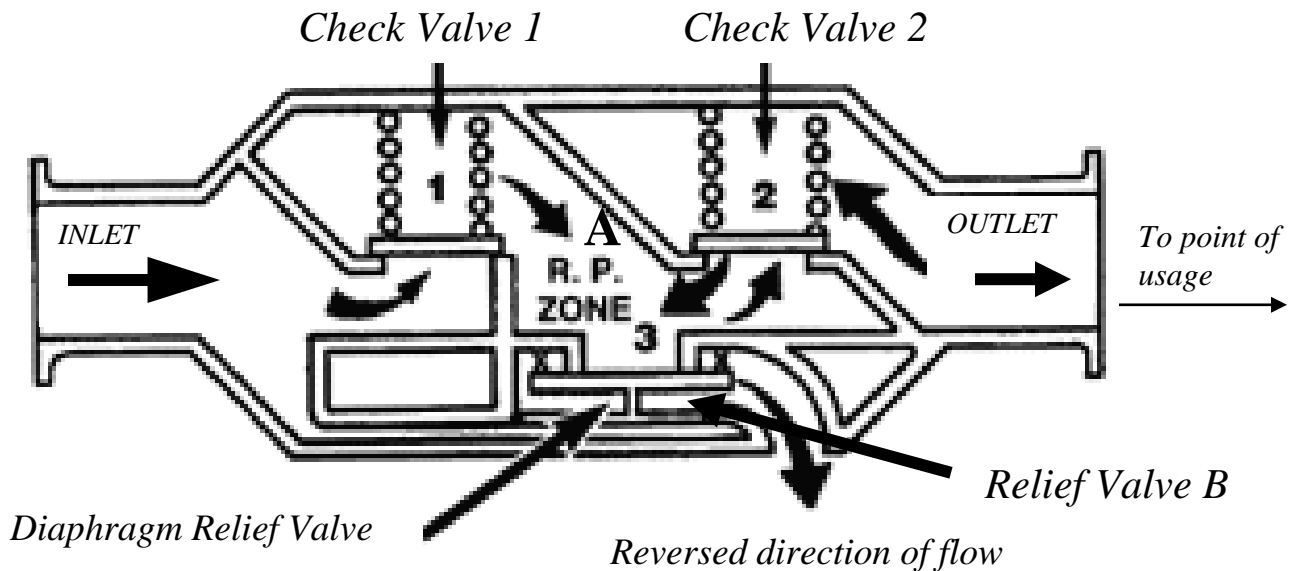


ILLUSTRATION N-12
 “How It Works”



- “A” represents the reduced pressure zone.
- Construction of the RPZ consists of two very sensitive, independent, spring loaded check valves with a reduced pressure zone “between them – at least 2 psi pressure differential between the supply and the “Reduced” pressure zone.
- As water passes through check valve #1, the water pressure drops (predetermined by friction loss/resistance) at least 2 psi in the RPZ under normal conditions water continues through check valve #2 (requires only 1 psi to open) to the point of usage.
- RPZ consists of a relief valve located at “B”. This valve has supply water pressure on one side and a RPZ pressure on the other.
- To keep the relief valve “B” closed, the supply pressure must exceed the RPZ pressure. It will open under any condition that causes pressure in the RPZ to approach or exceed supply pressure – for example, Backpressure.
- If backsiphonage occurs, the relief valve opens since there is no supply pressure to keep it closed.

ILLUSTRATION N-13
Beverage Carbonator



A dual check valve with an intermediate vent preceded by a screen of not less than 100 mesh to 1 inch shall be installed upstream from a carbonating device and downstream from any copper in the water supply line. This requirement in DPH Chapter 511-6-1 is more stringent than ASSE 1022 for use on a carbonator. The 100 mesh screen is not part of the ASSE standard for carbonator protection.

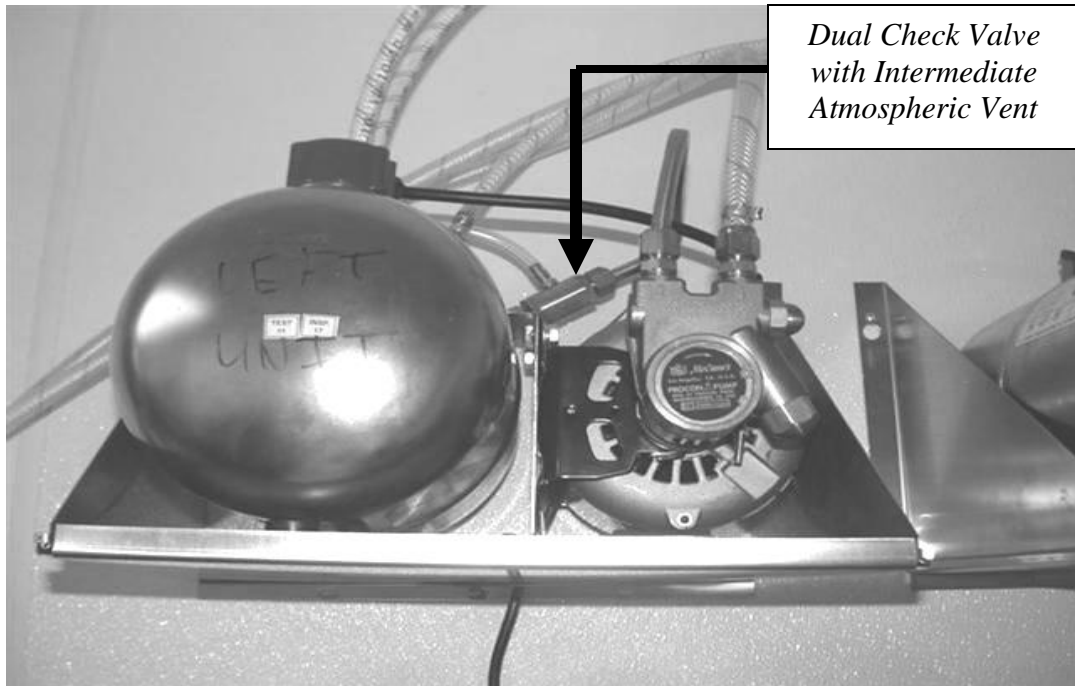
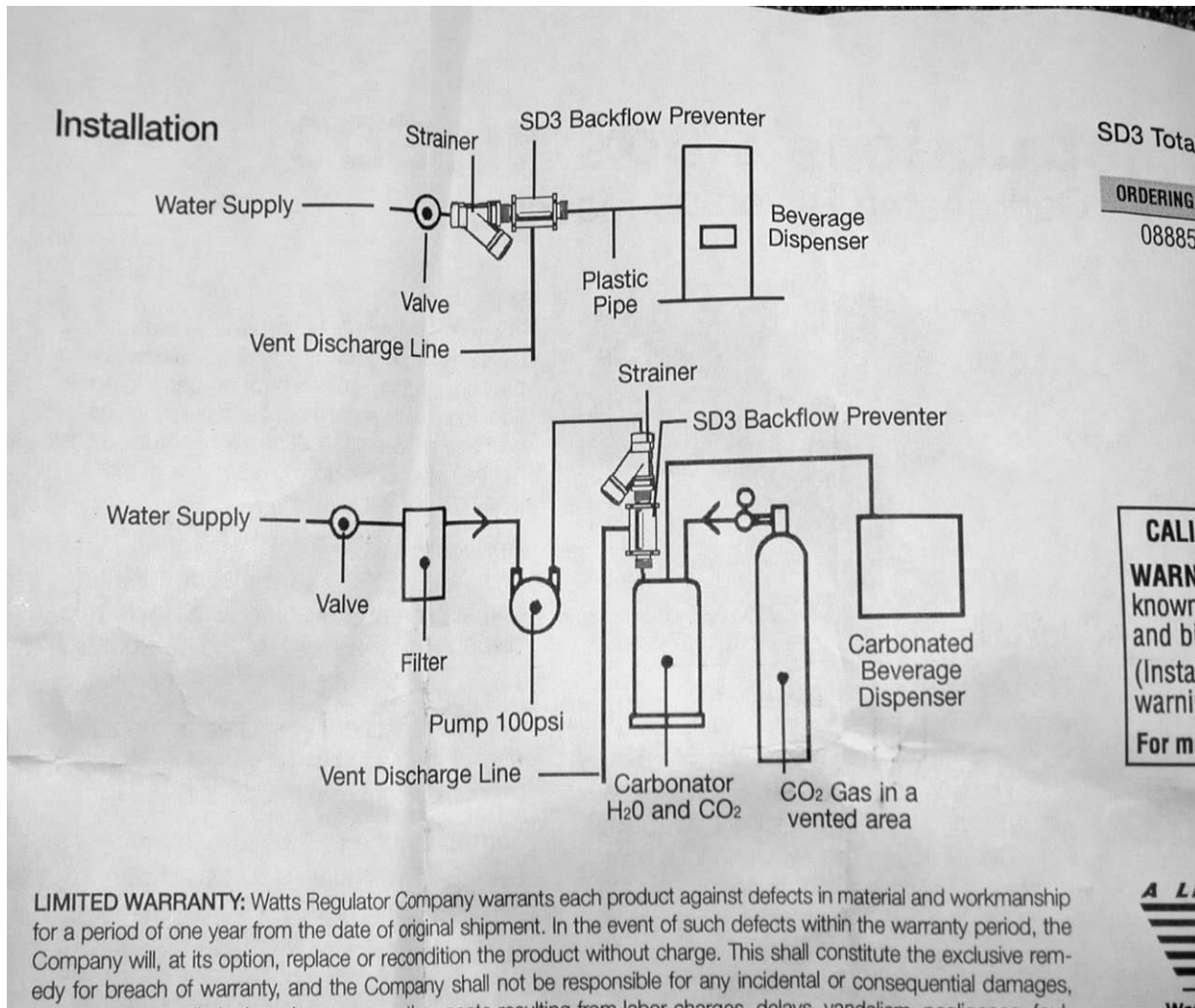


ILLUSTRATION N-14
Typical Beverage Carbonator Installation Schematic



This is a typical beverage carbonator installation schematic. It shows how the “Dual Check Valve with Intermediate Atmospheric Vent” listed here, as SD3 Backflow Preventer, is installed to prevent any carbonated water (acidic) from contacting any copper plumbing. Should the acidic carbonated water come in contact with copper plumbing, copper will be leached into solution and could cause foodborne illness should the beverage be consumed. This backflow preventer will be under constant backpressure created by the pump.

TABLE N-1

Type of Control	Rules of Installation
Air Gap	The air gap must be the greater of the two - <u>A MINIMUM OF ONE INCH OR TWICE THE INSIDE DIAMETER OF THE PIPE.</u> For a supply line, this distance is measured from the supply pipe to the flood level rim (the point of over flow) of the receptacle or fixture. For a drain line, the distance is measured from the pipe from which the wastewater is being discharged.
Atmospheric Vacuum Breaker	1. Must be installed 6 inches higher than the outlet.
	2. Must be installed in the vertical position only
	3. Is not for continuous water pressure
	4. Must only be installed where it is not subject to backpressure
	5. Must be installed after the last shut off valve
Dual Check Valve with an Intermediate Atmospheric Vent	1. Can be installed horizontally or vertically.
	2. Must not be located in a pit or a location subject to standing water.
	3. Relief port or vent must not be plugged.
	4. Approved for low hazard, continuous pressure and backpressure or back-siphonage.
Dual Check Valve with an Intermediate Atmospheric Vent and 100 mesh screen	Must be used for water line to soda carbonation systems.
Pressure Type Vacuum Breaker	1. Must be installed at least 12 inches above the outlet.
	2. Must have a shut off valve on each side and two test cocks for testing.
	3. Must be located in an accessible area for testing and servicing.
	4. Not acceptable in a backpressure application
	5. Can be used for continuous pressure applications
Reduced Pressure Zone Device (RPZ)	1. Must be accessible for testing and service.
	2. Must be located above grade (not subject to flooding).
	3. Must be installed at least 12 inches from any wall and between 12 to 30 inches above the floor.
	4. Approved for high hazard, continuous pressure, backpressure or back-siphonage.
Hose Bibb Vacuum Breaker	Cannot be used for continuous pressure. Cannot have a shut off valve downstream of the device.

III. Water Filters and Conditioning Devices:

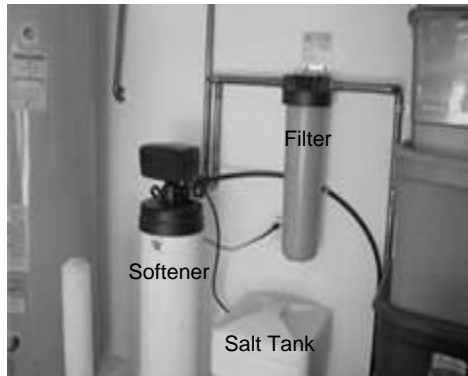
1. *Materials:* Water filter shall be made of safe materials and it must meet NSF certification for potable water.
2. *Design:* Water filters, screens, and other water conditioning devices installed on water lines shall be located to facilitate disassembly for periodic servicing and cleaning. Water filter elements shall be of the replaceable type.
3. *See Illustration N-14* below for examples of water filter and water conditioning devices.

ILLUSTRATION N-14

Typical Water Filter and Water Conditioning Devices



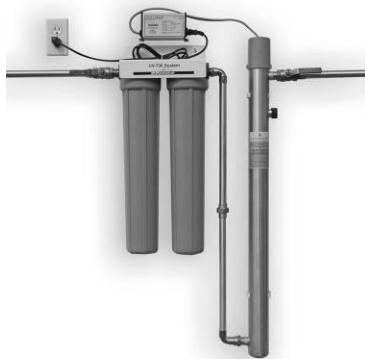
*Water Filter Assembly
(Wall Mount)*



Water Softener and Filter Installation



*Water Filters must be
easily to disassemble and
filters must be
changeable.*



*Typical Water Filter/Softener Unit
Installation*

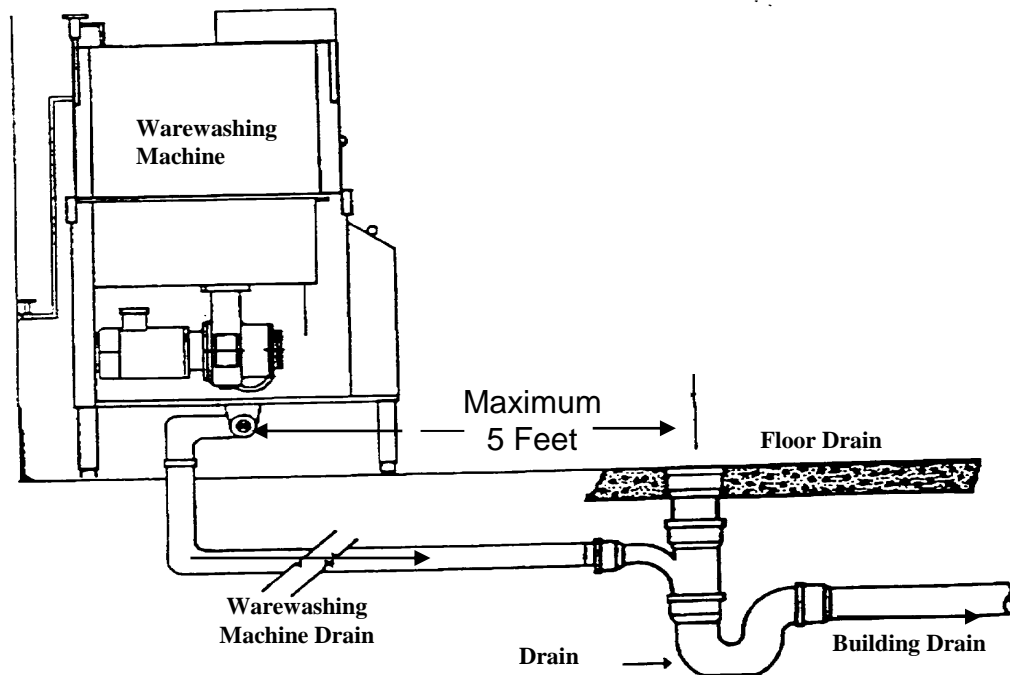


Accessible Installation

IV. Drains:

1. *A direct connection may not exist between the sewerage system and any drains originating from equipment in which food, portable equipment, or utensils are placed, except if otherwise required by state plumbing codes. DPH Rule 511-6-1-.06(4) (c) 3 states that, if allowed by applicable plumbing code (state or local), "...a warewashing machine may have a direct connection between its waste outlet and a floor drain when the machine is located within 5 feet (1.5 m) of a trapped floor drain and the machine outlet is connected to the inlet side of a properly vented floor drain trap."*
2. *Illustration N-15 below illustrates this connection.*

ILLUSTRATION N-15
Warewashing Machine with a Direct Waste Connection



3. Other examples of required indirect drain line connections are:

<u>Equipment</u>	<u>Required Indirect Drain Line Connection to Sewer Line</u>
1. Water-cooled condenser for ice machine or other refrigeration system	Air gap
2. Air-cooled condenser for ice machine or other refrigeration system	Air break
3. Ice bin	Air break

4. Sewage Disposal: All sewage including liquid waste shall be disposed into a public sewage system or an on-site sewage management system constructed and operated according to law. Where on-site sewage management systems are utilized, the location shall be noted on the plans and certification of compliance with applicable Rules and Regulations shall be provided. See *Part-I, Section G* of this Manual for more information.

5. Grease Traps/Interceptors:

A. A grease trap/interceptor is a chamber designed for wastewater to pass through and allow any grease to float to the top for retention as the remainder of the wastewater passes through. If used, a grease trap shall be located to be easily accessible for cleaning. Food solids entering the grease trap/interceptor should be minimized.

B. Waste water from fixtures or drains that would allow fats, oils, and grease to be discharged must be directed to a grease trap/interceptor.

C. See *Part-I, Section G* within this Manual for more information.

III. Additional Information:

1. For more information concerning plumbing and cross-connection control, see *Appendix R² entitled, “Plumbing and Cross-Connection Control” in Part-II of this Manual.*

² Source of guidance document, “Plumbing and Cross-Connection Control” – FDA, Food and Drug Administration, Division of Human Resource Development, Rockville, Maryland 20857