PLUMBING & CROSS-CONNECTION CONTROL

MODULE 4

.

VII. Typical Retail Food Service Cross-Connections

VIII. Air Gaps and Air Breaks for Drains and Waste

IX. Grease Interceptors

VII. TYPICAL RETAIL FOOD SERVICE CROSS-CONNECTIONS

NOTE: When evaluating the potential plumbing hazards for each fixture, there may be more than one type of backflow assembly or device that can be installed to protect a cross-connection (even if it exceeds minimum requirements to meet the hazard). In lieu of an air gap, is a cross-connection subject to backpressure and continuous or non-continuous pressure (all are subject to back- siphonage)? All inlets and cross-connections attached to the water supply are subject to back- siphonage, but not all are subject to backpressure. For specifications on proper installation and use for each device, review the previous pages.

The following are "typical" examples of equipment and backflow prevention devices required in lieu of an air gap. Remember, sometimes plumbing installations can be construed in a "nontypical" fashion; this does not mean that is necessarily wrong, but it will take more effort to evaluate the cross- connection control design.

1. **Prerinse or preflush hose**: (typically located at garbage grinders/disposals, prerinse or flushing stations prior to mechanical warewashing machines, or vegetable/prep sinks)

Units that are not equipped with a proper retainer spring (so an air gap above the flood level rim can be maintained when allowed to hang freely) must be provided with an appropriate backflow assembly or device. The type installed is dependent on the shut off valve location:

a. Hand valve on spray nozzle:

Since the entire supply line is subject to continuous pressure, the backflow device must be acceptable for use with continuous pressure and back-siphonage application. Backpressure is not an issue for a potential indirect cross-connection. An in-line double check valve assembly with an intermediate atmospheric vent or pressure vacuum breaker (PVB) can meet the minimum requirements for continuous pressure.

b. No valve on the spray nozzle or end of hose:

The supply line from the shut off valve to the end of the nozzle is not subject to continuous pressure or backpressure. An atmospheric vacuum breaker (AVB) can meet the minimum requirements for non-continuous pressure and potential back-siphonage.

2. **Hose bibbs, threaded faucets** (inside & outside of establishment, fairgrounds, special events, festival, etc.):

When a hose is attached directly to the faucet, a potential indirect cross-connection exists. Protected will depend on whether or not a shut-off device (pistol grip, etc.) is installed on the end of the hose.

a. No shut off device on the end of the hose:

The hose is not subject to continuous pressure or backpressure. A hose bibb vacuum breaker (HBVB) or atmospheric vacuum breaker (AVB) can meet the minimum requirements for non-continuous pressure and potential back-siphonage.

b. A shut off device on the end of a hose:

The backflow device is subject to continuous pressure and no backpressure. An in-line backflow prevention device with an intermediate atmospheric vent or a pressure vacuum breaker (PVB) can meet the minimum requirements for protection. (Note, the PVB must be installed at least 12 inches above the maximum expected height that the hose end will be utilized.)

3. **Inlets which are or may become submerged**:

A. Supply line for a mechanical warewashing machine and dish conveyor belt.

B. Supply inlet to a dish table trough or silverware and dish soak tanks.

C. Supply line to a soap dispenser (detergent feeder) and/or drying agent for mechanical warewashing machines:

The dispenser discharges the solution on the down stream side of AVB for the warewashing machine's supply line.

D. Supply inlet to a garbage disposal with flushing rim:

The submerged inlet is controlled by an electronic solenoid that supplies water to the waste being ground to form a slurry whenever the disposer is turned on.

E. Garbage can washer. (If a jet rinse type, the inlet through the floor must be at least six inches above the flood level rim of the depressed area/sink).

F. Perforated pipe to an oriental wok cooker.

G. Supply inlet or fill line for equipment such as steam kettles, steam tables, dipper wells and coffee urns.

Backflow prevention for items A - G: Typically the atmospheric vacuum breaker is utilized on a submerged inlet for non-continuous pressure and potential back-siphonage. For continuous pressure and potential back-siphonage (no backpressure), a pressure vacuum breaker (PVB) can meet the minimum requirements for protection.

Inlets which are or may become submerged, Continued:

H. Soap portioner on a faucet:

The soap portioner must contain an internal air gap.

I. Water wash system for an exhaust hood (self cleaning):
Detergent feeder must discharge on the down stream side of the backflow prevention device and have an AVB for non-continuous pressure, PVB for continuous pressure or an in-line backflow prevention device with an intermediate atmospheric vent for continuous pressure and potential backpressure. A reduced pressure zone (RPZ) backflow prevention device may be required if toxic chemicals are added.

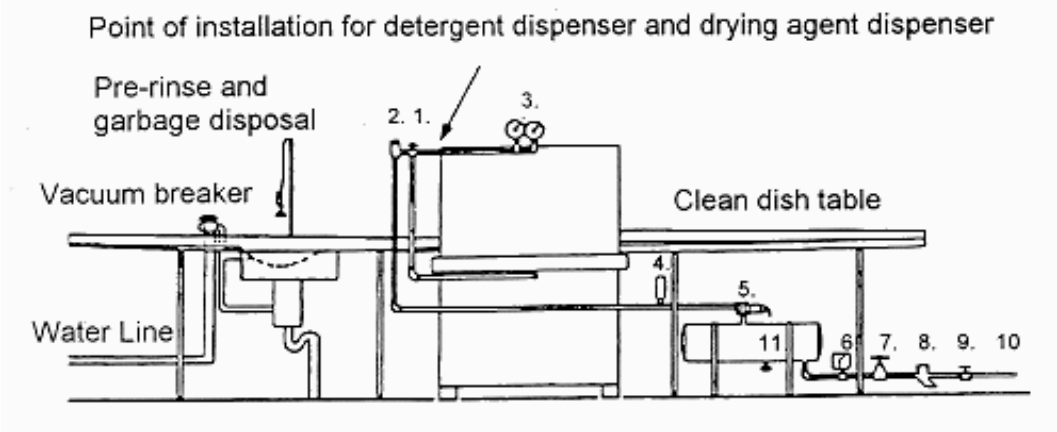
4. **Carbonators for beverage dispensers**: Carbon dioxide (CO_2) from the carbonator that comes into contact with water will form carbonic acid (weak acid). If carbonic acid comes into contact with copper piping, copper will dissolve into the water and may result in copper poisoning (vomiting). Typically, the hazard exists for those consuming the first few softdrinks of the day. To prevent the backpressure of CO_2, an in-line backflow prevention device with an intermediate atmospheric vent meeting ASSE Standard #1022 **must be installed between the carbonator and any copper supply line.**

5. **Boiler**:
a. with no chemicals added:
An in-line backflow prevention device with an intermediate atmospheric vent for continuous pressure and potential backpressure.

b. with chemicals added (high hazard):
A reduced pressure zone (RPZ) backflow prevention device would be required for toxic chemicals with potential backpressure and continuous pressure. The water supply line for the chemical additive reservoir must also be adequately protected.

6. **Water softening equipment**: with a continuous feed to a brine tank requires at least an in-line backflow prevention device with an intermediate atmospheric vent to meet the minimum protection for continuous pressure.

7. **Lawn sprinkler system** with no potential backpressure: An AVB for non-continuous pressure and a PVB for continuous pressure would meet minimum requirements for backflow protection. If chemicals are added, a RPZ may be required.



TYPICAL MECHANICAL WAREWASHING INSTALLATION

1. Gauge cock for tests
2. Vacuum breaker
3. Wash and final rinse
4. Shock arrestor (recommended)
5. Pressure – temperature relief valve
6. Pressure – temperature gauge
7. Pressure reducing valve (set at 15-25 psi)
8. Strainer
9. Cut-off valve
10. 140 degree water supply
11. Booster heater

VIII. AIR GAPS & AIR BREAKS FOR DRAINS & WASTE

An indirect connection between the water supply or food service equipment and the facility's drainage or wastewater disposal system is necessary to prevent wastewater from backflowing (back-siphonage or backpressure) into the supply or into equipment where food, kitchenware or utensils are retained.

DIRECT CONNECTION: A waste line or pipe from a fixture, receptacle or device that discharges used water, waste materials or sewage directly into the facility's drainage system.

INDIRECT CONNECTION: A waste line or pipe from a fixture, receptacle or device that discharges used water, waste materials or sewage into the facility's drainage system through an "air gap" or "air break." Thus, there is no direct connection between the two systems.

> **AIR GAP**: is the unobstructed, vertical air space that separates the end of a supply line and the flood level rim of a receptacle. This receptacle may be a sink, coffee urn, steam kettle, floor drain, floor sink, etc. The air gap must be the greater of the two - a minimum of one inch or twice the inside diameter of the supply pipe.
>
> **AIR BREAK**: is a waste line or pipe from a fixture that discharges used water or liquid waste into another fixture or receptacle at a point below the flood level rim, i.e., the waste line from a vegetable preparation sink that drains into a floor drain. (Restated: an air break is an indirect connection that does not have an "air gap.") *(Note: some jurisdictions do require the waste line to terminate above the flood level rim of the floor, sink or drain.)*

1. **Booster heater for warewashing machine**:
   Provide an air gap between the relief valve vent pipe and the floor drain or floor sink.

2. **Water-cooled condenser** for an ice machine or other refrigeration system:
   Provide an air gap between the end of the supply line and the floor drain or floor sink. (The supply line water still remains as part of the supply system as it cools. The cooling water is not exposed to potential outside contamination until it exits the unit.)

3. **Drain lines for food service equipment** such as salad cooler table or salad bar, ice machine or ice bin, soda fountain/dispenser, steam kettle and steam table:
   Provide an air break.

4. **Condensate drain lines** for refrigeration equipment:
   Provide an air break.

5. **Water softening equipment**:

   a. Brine tank drains through a hose bibb (potential indirect cross-connection with a drain hose): a hose bibb vacuum breaker (HBVB) can meet the minimum requirements for non-continuous pressure and potential back-siphonage.

   b. Brine tank with a gate or ball valve: drain line must be air gapped.

6. **Exceptions to indirect wastes**:

   a. Warewashing machines located within five feet of a trapped floor drain may have a direct waste connection to inlet side of a properly vented floor drain trap.

   b. Garbage disposals require a direct connection to prevent the solids from separating out from the waste slurry.

   c. Other exceptions as provided by law or regulation.

IX. GREASE INTERCEPTORS

Oil and grease entering a facility's drainage waste system will eventually solidify somewhere down stream and eventually clog the sewer line and/or cause potential problems for the onsite or public sewage system. The oil and grease from foods and cooking liquefy at high water temperatures primarily originating from the three compartment sink, warewashing machine or some pieces of equipment such as an oriental wok cooker.

Oil and grease can occur in a combination of four forms:

1. Dissolved oil is oil that has dissolved in the water via a degreasing compound and will not separate from the water.

2. Chemically emulsified oil is oil that has been broken down into very small particles via a detergent and will not float to the surface.

3. Free oil, which is the majority of the oil produced in a food service facility, is not dissolved or chemically emulsified but is in a liquid form that is available to float to the water surface when it is allowed to coalesce (consolidate or congeal on the water surface).

4. Mechanically emulsified oil is free oil that has been agitated in water to form small droplets. These droplets will congeal, as free oil does, provided enough time is allowed for the process.

HOW GREASE INTERCEPTORS WORK

A grease interceptor is a chamber designed for wastewater to pass through and allow any free or mechanically emulsified oil to float to the top for retention as the remainder of the effluent passes through. (This concept is similar to a septic tank, but remember that a septic tank is designed to collect solids on the bottom and scum on the top of the tank.) The terms ***interceptor*** and ***trap*** may sometimes be used interchangeably as the only technical difference is location and size. Grease ***interceptors*** are usually installed inside the establishment; grease ***traps*** are outside the establishment and must be a minimum of 1,000 gallon capacity. There is no minimum capacity for grease interceptors.

For the oil to float to the top, it is necessary to calm the water as turbulence only perplexes the separation. To assist in the ponding or calming process, the waste water enters through an inlet baffle and may pass through additional baffles before exiting through the outlet baffle. Flow rate (volume of water per unit of time, i.e. 7 gallons per minute [GPM]) affects time and turbulence in the interceptor. Too fast a flow rate does not allow the "time" necessary for separation and creates turbulence. Thus, many of these installations are equipped with a flow control valve prior to the inlet baffle.

Only the facility's grease laden waste should be plumbed to the grease trap, otherwise suspended solids would fill the unit and a larger tank would be needed for the higher volume of waste water. Also, some installations are designed with a solids strainer prior to the interceptor, to prevent solids from interfering with grease separation.

SIZING THE INTERCEPTOR

Installations are designed and sized based on anticipated flow rates and organic load for maximum efficiency. Specific gravity (density) of the grease filtrates affects the time necessary for separation. For example, the specific gravity of water is 1.0, thus the lower the specific gravity of the oil, the less time it takes to separate and float to the top of the tank. Also, the higher the flow rate, ratio of grease to water, suspended solids, and total grease volume to be retained between cleaning/emptying, the larger the grease interceptor must be. Local plumbing codes should be consulted for specific requirements for interceptors and traps.

INTERCEPTOR LOCATION

Grease interceptors range in size from 5 gallon units located inside the kitchen area to 1,000 gallon or greater in- ground installations outside the facility (again, these are usually called grease traps) . Installation should be properly vented and as close to the source as possible but in a manner that facilitates the ease of cleaning and service without creating a nuisance.