

Condensate Drains

As plumbing engineers, we must coordinate our systems with the heating and air-conditioning systems in a building, allowing for the needs of other trades. One issue that plumbing engineers must constantly deal with is condensate drainage. In an air-conditioning system, when the air is cooled, water is removed from the air. All cooling coils in an air-conditioning system must have a drain pan under the cooling coil to collect the condensed water (condensate). A path is required to allow this condensed water to discharge to the drainage system. The 2006 International Plumbing Code (IPC) has extensive requirements for collecting and discharging this condensed water. The 2006 Uniform Plumbing Code (UPC) has one simple requirement. Where do they differ?

ABOUT CONDENSATE DRAINAGE

Condensate drainage from air-conditioning equipment is extremely important. In humid climates, a lot of moisture is in the air. When the air is cooled through an air-conditioning process, this water is condensed out of the air. In dryer climates, only a little amount of water is condensed out of the air. In many jurisdictions located in dry climates, the condensate drain from rooftop air-conditioning equipment is discharged on the roof. However, I know of several jurisdictions where the condensate must be piped to the drainage system because algae tends to grow on the wet areas of the roof where the condensate drips, creating unhealthy conditions.

Because the condensate drain piping is typically an indirect drain line, both the IPC and the UPC require the condensate piping from the air-conditioning unit to be trapped. In reality, the reason for the trap at air-conditioning equipment is a mechanical issue. The condensate drain pan, located under the cooling coil in the air-conditioning equipment, is under either positive pressure or negative pressure depending on the location of the cooling coil. On the outlet side of the fan, the drain pan is under positive pressure. On the suction pressure side of the fan, the drain pan is under negative pressure. The trap on the condensate drain from the air-conditioning unit prevents air from passing through the indirect piping. The trap seal of this trap is sized based on the negative or positive pressure of the fan.

Typically, the trap seal is sized at 1½ times the inlet or outlet pressure of the fan, whichever is greater. On large fan systems, the trap seal could be up to 12 inches deep. As a plumbing designer, you must coordinate the depth of the trap with the mechanical designer to ensure adequate space to install the trap. The downstream side of the trap should be vented to equalize the pressure in the piping, allowing the condensate water to flow from the trap.

THE CODE REQUIREMENTS

The piping from the condensate drain pan is an indirect waste pipe and must be sized and designed as an indirect waste pipe. The IPC requires indirect waste lines more than 4 feet total length or 2 feet horizontal length to be trapped. The UPC requires indirect waste lines more than 5 feet long to be trapped. The trap

required on the condensate drain from the air-conditioning unit meets these requirements. An additional trap is not necessary.

Table 8-2 of the UPC specifies the minimum pipe sizes for the condensate drain pipe. Section 314.2.2 of the IPC states that the minimum size of the pipe shall be ¾ inch, and where multiple units are connected, the piping shall be sized by an approved method. The IPC also requires horizontal sections of the drainpipe to be installed in a uniform alignment and at a uniform slope. Table 8-2 of the UPC shows that a ¾-inch pipe can handle up to 20 tons of refrigeration. It is my experience that many manufacturers of air-conditioning equipment provide condensate drain connections that are larger than the ¾-inch pipe size. It is my recommendation that the condensate drain line be the same size as the outlet connection on the air-conditioning equipment.

The IPC specifies that the piping material for the condensate drainpipe should be cast iron, galvanized steel, copper, cross-linked polyethylene, polybutylene, polyethylene, ABS, CPVC, or PVC pipe or tubing. All components shall be selected for the pressure and temperature rating of the installation. The UPC specifies that the condensate drain piping shall be constructed of material specified in Chapter 7, which deals with sanitary drainage. Therefore, all condensate drainage piping shall be the same as that for sanitary drainage. One problem with this is that the smallest drainage pipe is 1¼ inch, and many times the condensate drain pipe is ¾ inch or 1 inch. If this is the case, water tubing or pipe must be used.

The IPC has some additional requirements for condensate drain pans that are not included in the UPC. Section 314 of the IPC is taken directly from the International Mechanical Code. Section 314 of the IPC requires that additional protection be provided in case the drain line gets plugged, and the condensed water overflows the drain pan and damages building components.

The IPC also requires that an auxiliary or secondary drain system be provided. There are four different methods for compliance. The first method is to provide a secondary drain connection on the primary drain pan. This secondary drain must drain to a place where occupants would notice if a stoppage existed in the main drainage system. The second method is to provide a condensate drainpipe from an auxiliary or secondary drain pan. The third and four methods listed in the IPC require a water level detector and shuts of the air-conditioning equipment to be provided so additional condensed water is not produced. Typically, this water level detector is a sensor or float switch.

As plumbing engineers, we need to work with the mechanical engineers in the design of the heating and air-conditioning systems to provide condensate drains from the air-conditioning equipment. **PSD**



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