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**TO:** All Concerned

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**SUBJECT:** Vacuum Relief Valves

The 2006 UPC includes language in Section 608.7 that requires installation of a vacuum relief valve “Where a hot-water storage tank or an indirect water heater is located at an elevation above the fixture outlets in the *hot water system* . . . . .” [italics added]. In reality, either the cold *or* hot water piping associated with a storage tank and water heating source could result in a loss of stored water if there should be a loss of water pressure in the piping system. An open valve located at an elevation below the bottom of the storage tank would likely create a siphon if it were open during loss of water pressure at the water heater or at the water meter. This same event could occur with a bottom-fed self-contained water heater. **NOTE:** Siphonage occurs when the short leg of a piping circuit is dipped into a liquid (water) reservoir, and the long leg of that circuit is filled with water and open at the outlet end, thus creating a siphon. A bottom-fed tank will have both the long *and* the short leg external to the tank.

A bottom-feed water heater or hot water storage tank [indirect-fired] that is being supplied with heated water from a gas-fired heat exchanger could also result in both the tank and the heat exchanger being drained down from the “make-up” water opening into the storage vessel. The cold water make-up supply and circulating water are typically fed into the bottom of an unfired storage tank *below* the tap where heated (circulating) water *from* the heat exchanger is fed into the storage tank. Whether a storage tank is located overhead in a horizontal position, or stands in a vertical upright position, the cold water supply is normally fed into or near the bottom of the storage tank. A circulating system typically collects both the cold make-up water and the warm water return from a tee-branch near the bottom of the storage tank. Siphonic action can result in total or partial loss of water in both the storage tank and the heat source, ultimately resulting in heating elements failing, or steam being generated in a fuel fired heat exchanger (boiler).

The installation of a vacuum relief valve is intended to prevent siphonage from occurring when the piping configuration and storage tank location would make siphonage possible. However, if the vacuum relief valve is not installed in a

location above the highest stored water level a vacuum relief valve will not prevent siphonage from occurring. Whether cold water is supplied from overhead piping or piping located below the boiler/storage tank combination, the piping configuration shall be designed to allow installation of the vacuum relief valve at a location above both the boiler and the storage tank. The primary life-safety aspect of this Code requirement is prevention of a possible steam-generated explosion. Either a bottom feed water heater *or* a hot water storage tank located above water system valve outlets on the floor below will require installation of a vacuum relief valve. There is no other anti-siphon means available when the piping system configuration creates a potential siphon leg.

Roof mounted boiler/storage tank installations and solar panel heating systems are all subject to siphonage under conditions similar to those described above. Section 608.7 of the UPC provides little in the way of specific guidance, but its objectives are relatively clear. A combination of piping configuration, equipment location, and valve outlets located below the boiler/storage tank elevation with the potential for creating siphonage (during zero water pressure conditions) will require installation of a vacuum relief valve at a high point in the water system (on either the cold or hot water supply [or both]) as piped to the equipment served).