



Coffee Break Training - Fire Protection Series

Building Construction: Water-Cooling Towers

No. FP-2011-13 March 29, 2011

Learning Objective: The student shall be able to identify fire hazards associated with industrial cooling towers.

Water-cooling towers are heat removal devices used to transfer waste heat from various sources such as machinery or heated process material to the atmosphere. Common applications include cooling the circulating water used in oil refineries, chemical plants, power plants, and building cooling. Smaller towers are normally factory-built, while larger ones are constructed on site.

The water-cooling tower in today's illustration is an "induced draft" device that pulls air through the tower. The fan **induces** hot moist air out the discharge. This produces low entering and high exiting air velocities, reducing the possibility of recirculation in which discharged air flows back into the air intake, but also affects potential fire behavior.



This industrial water-cooling tower should be evaluated for potential fire hazards.

Cooling towers that are constructed in whole or in part of combustible materials can support internal fires, resulting in damage severe enough to require the replacement of the entire cell or tower structure. For this reason, some codes and standards recommend combustible cooling towers be provided with an automatic fire sprinkler system. Fires can propagate internally within the tower structure during maintenance when the cell is not in operation (such as for maintenance or construction), and even when the tower is in operation, especially those of the induced-draft type because of the existence of relatively dry areas within the towers.

According to National Fire Protection Association (NFPA) 214, *Standard on Water-Cooling Towers*, "a significant percentage of fires in water-cooling towers of combustible construction are caused by ignition from outside sources such as incinerators, smokestacks, or exposure fires. Fires in water-cooling towers can create an exposure hazard to adjacent buildings and processing units. Ignition within these structures can be caused by welding or cutting operations, smoking, overheated bearings, electrical failures, and other heat- or spark-producing sources."

Although rarer, another potential hazard exists where cooling water is supplied to heat exchangers that are used for cooling flammable gases or liquids or combustible liquids. If the cooling water pressure is less than that of the material being cooled, flammables or combustibles can be returned to the cooling tower water distribution system, thereby increasing the fire potential.

For additional information, refer to NFPA 214, and NFPA 13, *Standard for the Installation of Automatic Sprinkler Systems*.



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