

CHAPTER 7



Prevent Hackers from Destroying a Cooling Tower

A cooling tower is used to dispose of unwanted heat from a chiller. Water-cooled chillers operating on the principle of evaporative cooling are normally more energy-efficient than air-cooled chillers. To achieve better performance (more cooling), they are designed to increase the surface area and the time of contact between the air and water flow. A “collection basin” is used to collect and contain the cooled water after its interaction with the airflow. Make-up water is added to the system to compensate for water lost due to evaporation.

Cooling tower water is filtered to remove particulates and treated with biocides and algaecides to prevent growths that could interfere with the continuous flow of the water and prevent the growth of *Legionella*, including species that cause legionellosis or Legionnaires’ disease, most notably *L. pneumophila*, or *Mycobacterium avium*. Cooling towers are fitted with electrical immersion heaters, steam coils, or hot-water coils in the collection basin to prevent freezing. Obviously, the basin heater should not be operating in the summer, because that would contribute to growth of opportunistic pathogens.

Modern cooling towers are designed with a drift eliminator that provides multiple directional changes of airflow to prevent the escape of water droplets. They are designed to prevent excessively high water levels and possible overflow of the cold-water basin due to over pumping, clogged strainers, or makeup valve malfunction.

A hacker wishing to disrupt a building HVAC may decide to flood the cooling tower collection basin, turn off the fans and heat the water in the basin. Turning off the pumps or intermittent fan reversal would also cause damage to the cooling tower, chillers, or both. Another hack would be to search the installation files to determine the resonant operation speed of the unit that may result in vibrations, which could damage the components or structure, and/or create objectionable noise. The resonant speed ranges are identified at start-up and typically locked out to prevent the variable frequency drive to operate the motor at these resonant speeds. A hacker may also interfere with the chemical “pot” feeder that injects diluted liquid biocides directly to the collection water basin.

Another possible hack would be to spoof the *vibration cutout switch* (VCOS) to shut down the cooling tower. A VCOS is designed to cause a trip condition when it detects any vibration after a time delay. A VCOS can be mechanical or electronic, with a single setpoint containing one trip limit for alarm or shut down.

Troubleshooting Cooling Towers

Building maintenance personnel should disassemble screens and access panels for inspection; inspect the tower fill, support structure, sump and spray nozzles, fill valve, gear box, drive coupling, fan blades, and motor bearings; inspect wiring; check motor starter contacts for proper operation; megger test the motor and check the condition of the sump heater and contactor.