



Data Center Walkway

Using Heat to Keep Data Centers Cool

By Bill Keyes, Delta-Therm Corporation

Mission Critical is not a new concept. From military supply lines to space travel, we've seen how the simplest detail can change history. Data centers especially feel the weight of responsibility for business continuity in today's hyperconnected landscape. They are the guardians of the world's information. Outages can cost over \$1M each. Like a transatlantic liner, any disaster affects not only the data center, but all those on board.

The insatiable demand for data storage and retrieval feeds the need for more storage space and faster processing speed. To ensure optimal performance of processors, hardware accelerators, and storage components, reliable cooling systems must be added. Without thermal stability, the potential exists for catastrophic failure. And without reliable cooling, there is no thermal stability.

Wherever water and condensate from cooling or precipitation are vulnerable to freezing from low temperatures, pipe freeze protection and deicing become mission critical for data centers. One of the most practical and efficient safeguards against cooling failure is the strategic installation of electric heating cable on pipes, gutters, drains, ducts and vents.

Self-Regulating electric heating cables are commonly used for freeze protection because they automatically adjust heat output based on need created by the surrounding temperature. The cable is easily mounted on pipes, drains and gutters to ensure uninhibited water flow and drainage.

Due to the mission critical nature of the heat trace systems, robust and reliable control systems are used. This ensures the operation of the heating cable when needed, and provides the required ground fault protection and system monitoring.

Data Centers vary widely in design, structure and location. That's why cooling solutions also vary to meet the needs and criteria of each center. Cooling towers and ventilation fans are generally a part of any data center cooling system. Here are some of the basics.

Cooling Towers /Chillers

Cooling towers remove the immense heat generated by servers in data centers by cooling the chilled water loop that was heated by the densely packed processing equipment. The challenge is keeping cold weather temperatures from freezing chilled water in the pipes that cool the data center. Maintenance or chiller shutdown can leave the system at risk of freezing and failure. Without a cooling system, data center operations can experience catastrophic failure. To protect servers from overheating and prevent water damage Data Centers can install heating cable on pipes that are vulnerable to



freezing temperatures. Cooling Towers rely on several critical lines that hold or carry water for efficient operation. Freezing of water in any of these lines can compromise the cooling system, the building structure and the entire data center operation.

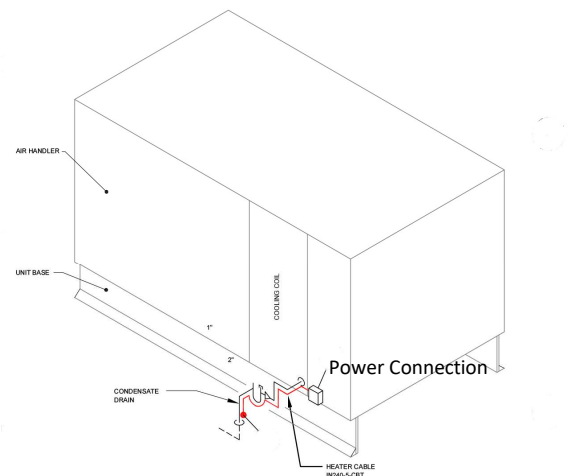
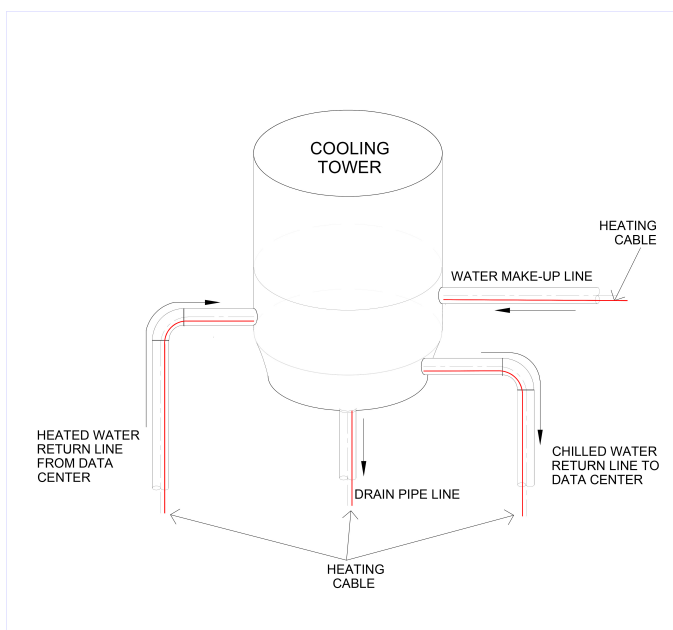
Chilled water supply lines carry cooled water to the data center equipment; **chilled water return lines** carry heated water back to the tower to be cooled and recirculated.

Equalizer lines connect cooling tower basins so that water levels are balanced equally.

Condensate lines remove water collected by the evaporator coil as warm, moist air passes over it.

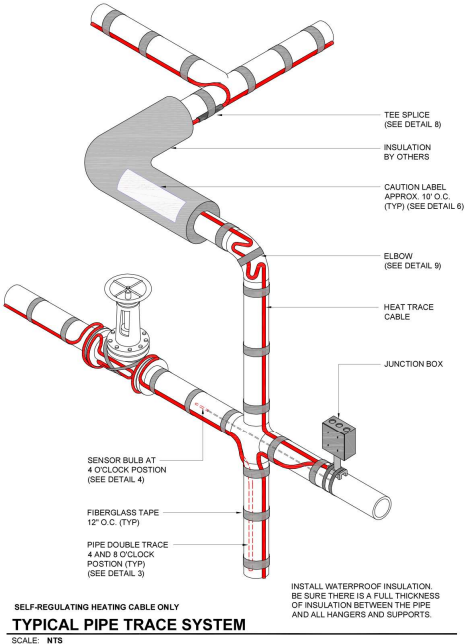
Water make-up or evaporation lines are used to replenish water loss from evaporation during cooling.

Drain lines remove excess water from tower to grade to or through a gutter and drain pipe system.



AIR HANDLING UNIT, CONDENSATE DRAIN & HEATER CABLE

Pipe Tracing replaces the heat lost through the pipe insulation. Freeze protection systems maintain the pipe temperature at or above 40° F by supplying more heat than is lost at that temperature.

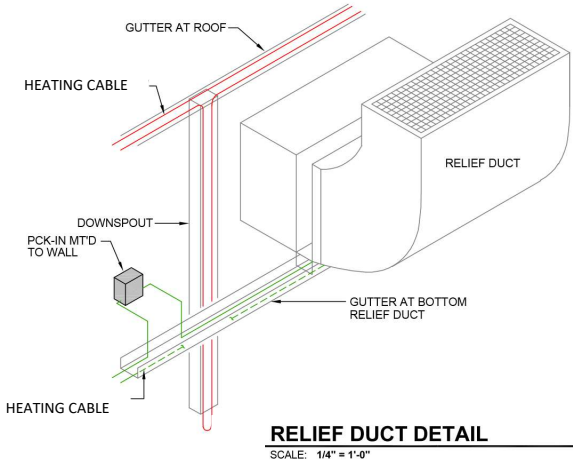


Relief Ducts and Ventilation Fans

As ventilation fans push warm air from servers out of the structure, it may naturally form condensation. To keep the moisture from remaining in the building, it is sent to a relief duct collection pan where it can drain outside the building. Ice blockage at any point in this system could prevent the removal of moisture and compromise an optimum environment for crucial equipment. Installing electric heating cable on all applicable drain lines and gutter systems will always maintain a clear drainage path to grade.

Electric heat tracing protects

- Condensation pans
- Drain and gutter systems



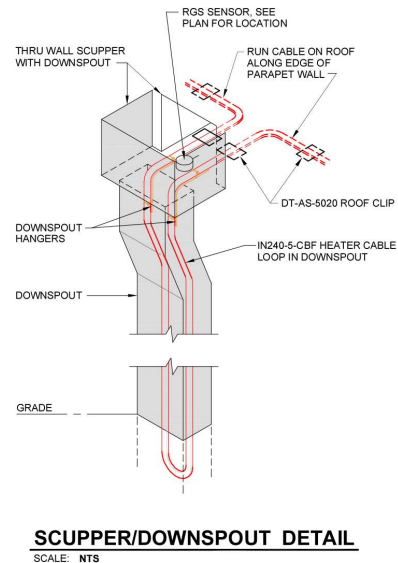
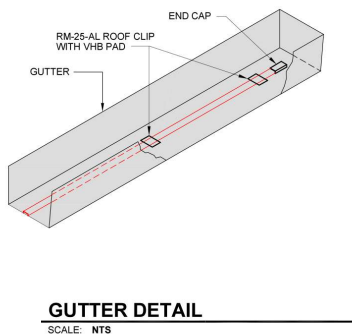
Back-up Generators

Back-up generators may also rely on water cooling lines for cool operation. In cold weather supply lines are vulnerable to freezing. Applying electric heat tracing cable to both supply and return water lines ensures the cooling system for the back-up generator is operational in case of power failure when temperatures are at the freezing point.

Like the cooling tower, the back-up generator may rely on **chilled water supply** and **chilled return lines** to keep from overheating during operation. **Exhaust condensate lines** channel water created during operation.

Roof and Gutter Deicing Systems

Freezing rain, snow and ice can cripple gutters and downspouts, cause structural damage, and create a safety hazard for pedestrians below. And if cooling tower lines empty into the same system, the problem is multiplied. A reliable electric roof and gutter deicing system incorporates self-regulating cable and control system sensing both ambient temperature and moisture to keep gutters and drains moving regardless of the temperature.



Melt water from the heating cable requires a complete path of heating cable to grade to avoid areas of potential freeze up.

A matter of control

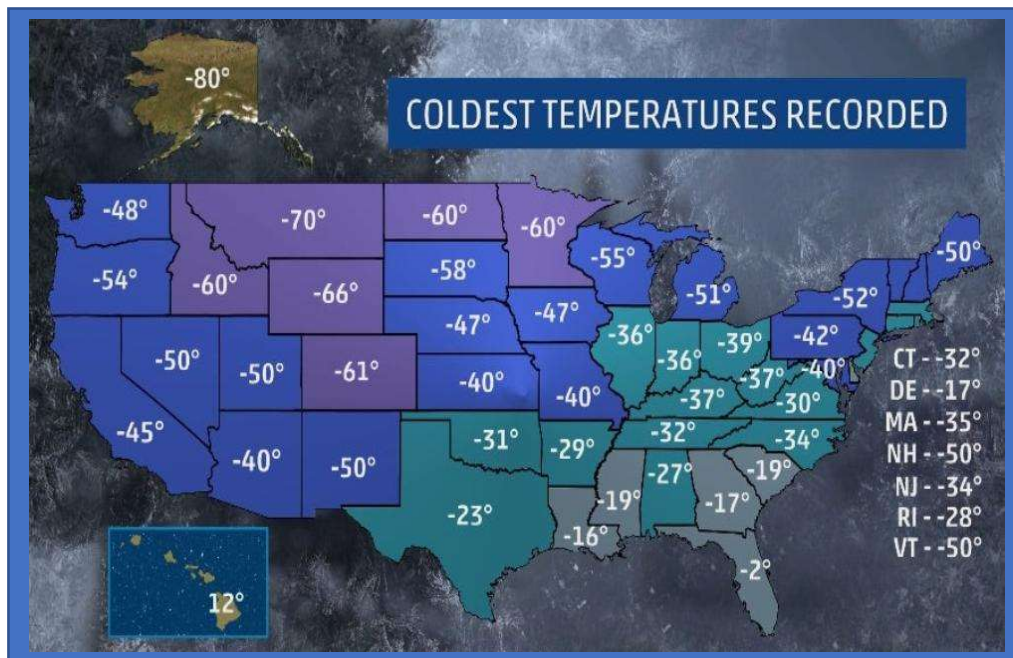
With so much at stake, data centers must consider every detail that will deliver not just cooling but reliable cooling to its servers, processors and accelerators. All that comes down to the system controllers that constantly monitor the performance of the entire system.

System Controllers typically provide

- 30mA Ground Fault Protection
- Ground Fault Alarms
- Low Temperature Alarms
- Electrical Power Switching to the cable
- Electrical Current Sensing
- Low Current or No Current Alarms
- Loss of Control Power Alarm

Does every data Center need freeze protection? What about the warmer states?

Every state gets snow. If your operation is or will be located in a more temperate zone like Florida, Louisiana or Hawaii, it is vulnerable to wintry weather and sub-zero temperatures. Even Southern California reported a barometric pressure drop of 24 millibars in November 2019 that brought the bomb cyclone that dropped over a foot of snow on Lake Tahoe. Across the globe we see lots of examples of climate instability.



Map courtesy of The Weather Channel.

Northern states attract many new data centers that want to use outside air to cool their servers. Using vents and fans they let the cooler environment provide cooling without a cooling tower. However, the warm air removed from the servers has to be expelled through vents with the help of fans. Condensation will still occur as the warm, moist air comes in contact with a cooler surface.

In sub-zero temps, the drain path for the condensation is in jeopardy of being blocked by ice. That means water that cannot drain can end up back in the server room. The same is true for roof drains and gutters. Without a clear path to grade, the center could suffer structural damage from ice and snow that accumulates on the roof. Water can damage the servers and activate a leak detection alarm system.

There are no shortcuts when it comes to mission critical operations like data centers. Fortunately, there are very practical, efficient and easily maintained solutions for keeping data centers cool, dry and performing their best year around.

Delta-Therm Corporation engineers and manufactures commercial and industrial electrical heat tracing solutions for snow and ice management, radiant heating, freeze protection and process temperature maintenance. Est. 1968.