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How to control snow and ice melting systems

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THREE BASIC CONTROL requirements are needed for an exterior surface heating, or snow melting, system:

1. System activation and shut down.
2. Maximum system supply water temperature protection; and
3. Minimum return water temperature protection.

Automatic snow and ice detection controls can vary from simple temperature/moisture detection to sophisticated microprocessors.

Temperature/moisture detectors are relatively inexpensive. The combination air temperature/moisture sensing unit is usually installed near the area to be heated. This type of detector can only react to ambient air temperature and moisture, and activates the system only if both conditions are met at the same time. More critical commercial applications, however, such as loading docks, underground garage ramps, or helipads, require an ice detection control. Ice detection in this case can only be accomplished with moisture and temperature sensors embedded directly in the pavement. This type of control is more expensive ($1,500 to $2,000) but can be justified for commercial systems.

Most system activation controls have small, built-in heaters in the sensor to detect dry powder snow by melting the snow on the sensor surface and thereby detecting moisture. A post-running cycle of 20 minutes to two hours is usually a standard feature after the sensor is dry, to make sure the snow melt area is completely dry.

A maximum supply water temperature of 140°F has to be assured to protect an ice cold slab from being thermally-shocked during a cold start. This is usually controlled with a three-way or four-way mixing valve, actuator and temperature modulation control, which works with a system supply temperature sensor.

The control gradually increases the glycol solution temperature up to 140°F maximum (if there's enough boiler horsepower). A maximum temperature set point adjustment is provided on the mixing valve control.

The minimum system return water temperature protection depends solely on the type of boiler being used.

Conventional cast iron and steel boilers require a minimum of 130°F to 140°F system return temperature to prevent thermal shock and condensation. Copper boilers and some European low temperature units are capable of receiving return temperatures as low as 80°F to 90°F, without any long-term damage to the boiler.

A typical hydronic snow melting glycol system, however, will deliver system return temperatures of 0°F to 40°F during a cold start, and 100°F to 120°F during continuous operation.

Under these extreme conditions even a low-temperature boiler will fall to its knees.

If a 4-way mixing valve is controlling system supply temperature, you should add a sensor at the boiler return leg between the 4-way and the boiler return tapping and an appropriate control with minimum boiler return set-point adjustment and priority.

Set the control to recirculate just enough hot boiler water back into the system return to hold the adjusted minimum return temperature at all times. The rest of the Btuh output of the boiler is released into the slab without exceeding the maximum of 140°F. The control has to be capable of performing this balancing act between the two mixing valve sensors.

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