

CSI SPECIFICATION: BACnet Snow/Ice Sensor Interface 681

SECTION: 230913 Instrumentation and Control Devices for HVAC

PART 1 GENERAL

1.1 SECTION INCLUDES

- A. BACnet Snow/Ice sensor interface control for under slab hydronic heating systems.

1.2 REFERENCES

- A. American National Standards Institute (ANSI) and American Society of Heating, Refrigerating and Air-Conditioning Engineers, Inc. (ASHRAE)
 - 1. ANSI/ASHRAE Standard 135 – “BACnet – A Data Communication Protocol for Building Automation and Control Networks”

1.3 REGULATORY APPROVALS

- A. BACnet Testing Laboratories (BTL)
 - 1. The interface control must be BACnet Testing Laboratories tested and certified to meet BACnet protocol specifications.

1.4 CONTROL OPERATION

- A. **Description:** The interface control shall operate on 24 V (ac) Class 2 circuits, with a maximum power of 17 VA. The Snow/Ice sensor and interface control shall be pre-engineered and configurable exclusively for interfacing to a BAS system for operation of under slab snow and ice melting systems. The interface control shall communicate with Building Automation Systems using BACnet MS/TP for snow melt start and stop operation, alert notification, remote monitoring, and adjustment capability. It shall incorporate the following integrated functions: Warm Weather Shut Down, Cold Weather Cut Off, Melting Setpoint, Slab Outdoor Reset and error messages.
- B. **Snow Melting Operating Concept:** Using an outdoor air sensor or the outdoor temperature BACnet object supplied by BAS system, an in-slab temperature and moisture detection sensor, the interface control monitors the slab temperatures while measuring for the presence of moisture. If moisture is detected and the outdoor and slab temperatures are sufficient for frozen precipitation, the BAS system is notified that the heating system needs to activate to melt and drain/evaporate the moisture.

- C. **Sequence of Operation:** If moisture is detected while the outdoor temperature is between Warm Weather Shut Down and Cold Weather Cut Off, the interface control shall signal to BAS system that Snow Detected is True. In this state the interface control shall determine a slab target temperature, based on the melting setpoint and the current outdoor temperature, and signal to BAS system to regulate the heat source and/or operate the mixing device to maintain this target. It shall remain in this state until moisture is no longer detected, and any additional melt time (if programmed in BAS system) has expired. During operation, should the outdoor temperature drop below the Cold Weather Cut Off setpoint, the interface control shall signal to the BAS system to shut down the heating system to conserve energy; the interface control shall enter a "melt pending" state and will resume the melting signal to BAS system when the outdoor temperature rises above the Cold Weather Cut Off setpoint.
- D. **Features:**
1. **Warm Weather Shut Down Setpoint:** The interface control shall incorporate an adjustable Warm Weather Shut Down setpoint. When the outdoor temperature rises above the WWSD, the control interface will signal the BAS system to deactivate the snow melting system, thereby conserving energy.
 2. **Cold Weather Cut Off Setpoint:** The interface control shall incorporate an adjustable Cold Weather Cut Off setpoint. When the outdoor temperature falls below this setting, the interface control will signal the BAS system to deactivate the system, thereby conserving energy. If a melt is in progress when the temperature falls below this setpoint, the interface control shall enter a Snow Melt pending state until the outdoor temperature rises above the Cold Weather Cut Off. The interface control will resume melting until moisture is no longer detected.
 3. **Snow Detected:** The interface control when connected to a snow/ice sensor installed in the slab, provides a signal to the BAS system indicating when snow is detected.
 4. **Snow/Ice Sensitivity:** The interface control when connected to a snow/ice sensor installed in the slab, provides adjustment of the sensor sensitivity.
 5. **Wet Detected:** The interface control when connected to a snow/ice sensor installed in the slab, provides a signal to the BAS system indicating when moisture is detected.
 6. **Outdoor Temperature:** The interface control includes an input for an outdoor air temperature sensor. When an outdoor air sensor is connected, outdoor air temperature is measured. Outdoor temperature may be measured from this sensor or from the BAS BACnet object.
 7. **Melting Setpoint:** The interface control shall incorporate an adjustable Melting Setpoint. This is the desired temperature of the slab surface accounting for outdoor temperature while the control is in the Melt state.
 8. **Snow Melt Pending:** The Interface control signals the BAS system when it is melting pending, as Cold Weather Cut Off has occurred. Once outdoor temperature increases above CWCO, melt will continue in Melting mode.
 9. **Slab Outdoor Reset (Slab Temperature Target):** The interface control shall recommend a setpoint slab surface temperature by signaling to BAS system to adjust target water temperatures in proportion to the current outdoor temperature. Efficiency is maximized by accounting for changes in heat loss that result with changes in outdoor temperature.

10. **Error Codes:** The interface control shall be able to provide error codes to the BAS system. These codes are used to indicate improper operation of the control interface and Snow / Ice sensor.
11. **Memory:** The interface control shall store all configuration and settings in non-volatile memory. In case of power failure, the control should be able to retrieve all its latest settings.
12. **Display:** The interface control shall have a color touchscreen display to clearly display the current system operation with a color-coded illuminated status message.
13. **BACnet MS/TP:** The interface control shall be capable of communicating over BACnet MS/TP. The communication shall allow for viewing of all sensor values and shall allow for modification of all system status settings and all setpoint values.

E. Inputs:

1. **In-Slab Sensor:** The interface control shall be capable of accepting an in-slab temperature and moisture sensor to measure the current slab temperature and detect precipitation. It shall be installed level with the slab. It shall facilitate easy replacement without the need for slab repair.
 1. Operating Range -30 to 170°F
 2. Cable Material 5 conductor stranded wire with polyethylene jacket
 3. Manufacturer tekmar Controls
 4. Model Snow/Ice Sensor 090 (65 ft cable) or 094 (208 ft cable)
2. **Aerial Sensor:** The interface control shall be capable of accepting an aerial mounted snow detector sensor. It shall be installed on a ½ inch metal or PVC plastic conduit.
 1. Operating Range -40 to 122°F
 2. Manufacturer tekmar Controls
 3. Model Snow Sensor 095
3. **Outdoor Air Sensor:** The interface Control shall be capable of accepting up an outdoor air sensor to measure the outdoor air temperature.
 1. Operating Range -60 to 140°F
 2. Manufacturer tekmar Controls
 3. Model Outdoor Air Sensor 070
4. **BACnet MS/TP:** The interface control shall be capable of accepting and transmitting communications with BACnet MS/TP via an RS 485 connection.

1.6 BMS Communication (BACnet MS/TP)

- A. **BACnet Communication:** The interface control shall be BACnet MS/TP. The interface control shall be designed to be BACnet Application Specific Controller (B-ASC). The MS/TP communication shall allow for viewing / adjusting of BACnet Objects as defined in tekmar Integration Manual, IST-T681-BAS Integration.