

## Pipe Freeze Protection

### GENERAL



All insulated pipes exposed to risk of freezing shall be fitted with an energy efficient self-regulating trace heating system, known as nVent RAYCHEM XL-Trace, manufactured by nVent..

The system shall be complete with low smoke zero halogen self-regulating heating cables, advanced energy efficient controller and cold applied components, CE marked and certified according to IEC (EN) codes by VDE.

The manufacturer shall have a minimum 40 year experience in producing self-regulating heating cables and offer an extended warranty of 10 years for heating cables/connection components, 2 years for controllers and make available the following documents for submittal: data sheets (for heating cables, interconnection & termination components and controller), system design guide, typical schematic drawings, controller wiring diagrams and system installation/operation manual, along with approval certificates on request.

The manufacturer shall provide BIM solutions, including BIM families and add-in tools for Autodesk Revit. The add-in tools shall automatically pull information from the Revit model (such as pipe material, sizes, thermal insulation and lengths); provide a bill of materials, along with electrical circuit and load details; use a Cloud based pipe design engine. The BIM families shall include Revit .RFA and .Txt files, along with product specifications.

### SELF-REGULATING HEATING CABLES

The self-regulating heating cables shall be tested and compliant with IEC 61034-2, IEC 60754-1, 62395:2013, IEC 60068-2-5 and 2-9 (for low smoke emission, zero halogen, self-extinguishing properties, UV resistance and colour fastness under UV exposure), qualified for a useful lifetime in excess of 25 years, highly flexible with a bend radius of 10mm and suitable for use with 20A circuit breakers.

The self-regulating heating cables shall include a conductive polymer core, modified low smoke zero halogen electrical insulation (radiation cross-linked to ensure long life expectancy), tinned copper braid and modified low smoke zero halogen over jacket printed with cable model, batch number and metre marks for ease of installation within maximum circuit lengths.

All insulated pipework exposed to risk of freezing shall be fitted with self-regulating heating cables, with 10XL2-ZH on cold water services or sprinklers (or 15/26XL2-ZH on larger pipes) and 31XL2-ZH on low pressure hot water services, all installed to a maximum circuit length of 215m at 5°C switch on for 10XL2-ZH (or 160/135/118m for 15/26/31XL2-ZH respectively).

### INTERCONNECTION AND TERMINATION COMPONENTS

Interconnection and termination shall be with cold applied insulation displacement connectors and gel type end seals that are UV resistant, IP68 and 65°C rated, suitable for 2500Vdc insulation resistance test, with Torx head fittings and both audible and visual installation confirmation, known as RayClic, manufactured by nVent.

### THERMAL INSULATION

Insulation selection and thickness shall be strictly in accordance with the XL-Trace design guide.

## **ENERGY EFFICIENT, CONTROL SYSTEM [SELECT ONE OR MORE OPTIONS]**

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### **[1] Cold Water Services -Single Circuit, Single ApplicationController-AMBIENT SENSING**

All cold water pipe freeze protection circuits shall be controlled using a programmable, energy-efficient thermostat complete with proportional ambient sensing (PASC) mode, LED touch interface, high and low temperature alarm, hysteresis), selectable set temperatures, offsite programming without external power supply, USB connectivity (for pre-set up in power off mode or firmware upgrades), password protection, non-volatile memory, remote alarm capability, single pole double throw volt-free alarm relay, 25A output relay switching capacity, selectable fail safe mode, wall or din rail mounting, IP65 rated enclosure, known as nVent RAYCHEM RAYSTAT V5.

### **[2] LPHW Services -Single Circuit, Single Application Controller-LINE SENSING**

All LPHW water pipe freeze protection circuits shall be controlled using a programmable, energy-efficient thermostat complete with line sensing mode, LED touch interface, high and low temperature alarm, hysteresis), selectable set temperatures, offsite programming without external power supply, USB connectivity (for pre-set up in power off mode or firmware upgrades), password protection, non-volatile memory, remote alarm capability, single pole double throw volt-free alarm relay, 25A output relay switching capacity, selectable fail safe mode, wall or din rail mounting, IP65 rated enclosure, known as nVent RAYCHEM RAYSTAT V5.

### **[3] Cold Water or LPHW Services -Multi Circuit Panel, With Integrated Controller And Electrical Protection**

All cold water or LPHW pipe freeze protection circuits shall be controlled and monitored by a multi-circuit, electrically protected control panel that is EN60204-1/EN61439-1 compliant with RAL7035 (light grey) coated metal housing (IP65 rated), with type C circuit protection and 30mA RCD per circuit. The integrated programmable controller shall be complete with dual zone heat-tracing (to simultaneously maintain two separate heating circuits at different temperature settings), proportional ambient sensing (PASC)and line temperature sensing control, large touch screen LCD colourdisplay, selectable set temperatures, offsite programming without external power supply, USB connectivity, diagnostic monitoring of system performance (with each parameter input and event logged), password protection, non-volatile memory and remote alarm capability. The control panel shall be nVent RAYCHEM SBS-FP-xx, complete with integrated nVent RAYCHEM Elexant450c controller and available as standard in the following formats SBS-FP-3X16A (up to 3 circuits), SBS-FP-6X16A (up to 6 circuits), SBS-FP-9X16A (up to 9 circuits), SBS-FP-12X16A (up to 12 circuits)

### **[4] Sprinklers -Multi Circuit Panel, With Integrated Control And Electrical Protectio**

All sprinkler pipe freeze protection circuits shall be controlled and monitored by an integrated, multi-circuit, multi-sensor, electrically protected control panel that is EN60204-1/EN61439-1 compliant with RAL7035 (light grey) coated metal housing (IP54 rated), complete with automatic redundant circuit switching (compliant with BS EN12845), individual sprinkler pipe circuit monitoring(ambient and pipe sensing), automatic switching to redundant circuit (in the event of heating circuit failure) with audible alarm, digital display of ambient temperature and sprinkler line temperature per circuit, audible alarms (to indicate loss of power or low voltage to the panel or loss of an electrical phase or redundant circuit activation or RCD/circuit breaker failure), manual over-ride switch (to allow system override or testing (main heating circuit on, redundant circuit on/main heating circuit off, automatic mode controlledvia sensor inputs), system reset button and audible alarm reset button, lights to indicate when circuits are on (green) and when redundant circuit has been powered (yellow). The control panel shall be RAYCHEM SBS-xx-SNR as manufactured by nVent, available as standard in the following formats: SBS-02-SNR (1 sprinkler line control and monitoring with redundant circuit); SBS-04-SNR (2 sprinkler lines control and monitoring with redundant circuits); SBS-06-SNR (3 sprinkler lines control and monitoring with redundant circuits); SBS-08-SNR (4 sprinkler lines control and monitoring with redundant circuits); SBS-10-SNR (5 sprinkler lines controland monitoring with redundant circuits); SBS-12-SNR (6 sprinkler lines control and monitoring with redundant circuits).

### **[5] Cold Water or LPHW Services -Multi-Circuit, Distributed Digital Control System, Single orMulti-Application**

All pipe freeze protection circuits shall be controlled and monitored using a centralisedcontrol system with distributed power and control modules, complete with colourLCD touch screen, password protected user interface terminal (UIT) for central programming; power connection modules (PCM) to provide distributed power, circuit protection, control & monitoring; remote monitoring modules (RMM)for additional temperature measurement; integrated energy saving programmable controller with proportional ambient sensing (PASC)and line temperature sensing control; BMS interface using ProtoNodehigh performance multi-protocol gateway, to allow translation from native ModBusto BacNetprotocols; pre-programmed parameters, to deliver concurrent control for heating cables used for pipe freeze protection, hot water temperature maintenance, flow maintenance, surface snow melting, roof/gutter de-icing and floor heating applications. One UIT shall be included in the system, along with at least 1 PCM (to maximum 52), each PCM shall control up to 5circuits. The UIT shall accept up to 16 RMM, each having up to 8 temperature inputs. The control system shall be RAYCHEM ACS-30 as manufactured by nVent, complete with integrated nVent RAYCHEM Elexant450c controller.

## **EXECUTION**

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### **Design, Installation, Electrical Connectionand SystemCommissioning**

The manufacturer shall be able to provide all design calculations, including heat loss and corresponding selection of heatingcables; electrical schedules providing cable lengths, circuit breakers, circuit start up currents, operating currents and loads, linelist summary and single line details; system layout and schematic drawings indicating power connections, tees and end seals; controller configuration listing and wiring diagrams. The manufacturer shall provide a BIM add-in for Autodesk Revit MEP to automate the design process within a BIM model.

All pipe freeze protection cables shall be installed in accordance with the design plans, within the defined maximum circuit lengths, tested and commissioned strictly in accordance with the manufacturer's instructions (IM-CDE1547) using a 2500Vdc megger. Installation of thermal insulation shall be closely coordinated with the responsible sub-contractors. ATE-180 shall be used on plastic pipes.

Connections between the electrical supply, control panel and pipe freeze protection circuits shall be installed by an approved electrical contractor and protected by MCB (BS EN 60898 type C or D) and RCD (30 mA sensitivity, tripping within 100ms)..

**[Select One Option]**

- [1]** The system shall be installed, tested and commissioned by the manufacturer.
- [2]** The system shall be installed/tested by trained installers certified by the manufacturer, commissioned by the manufacturer.
- [3]** The system shall be installed, tested and commissioned by installers trained and certified by the manufacturer.
- [4]** The system shall be installed, tested and commissioned under periodic supervision by the manufacturer..

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