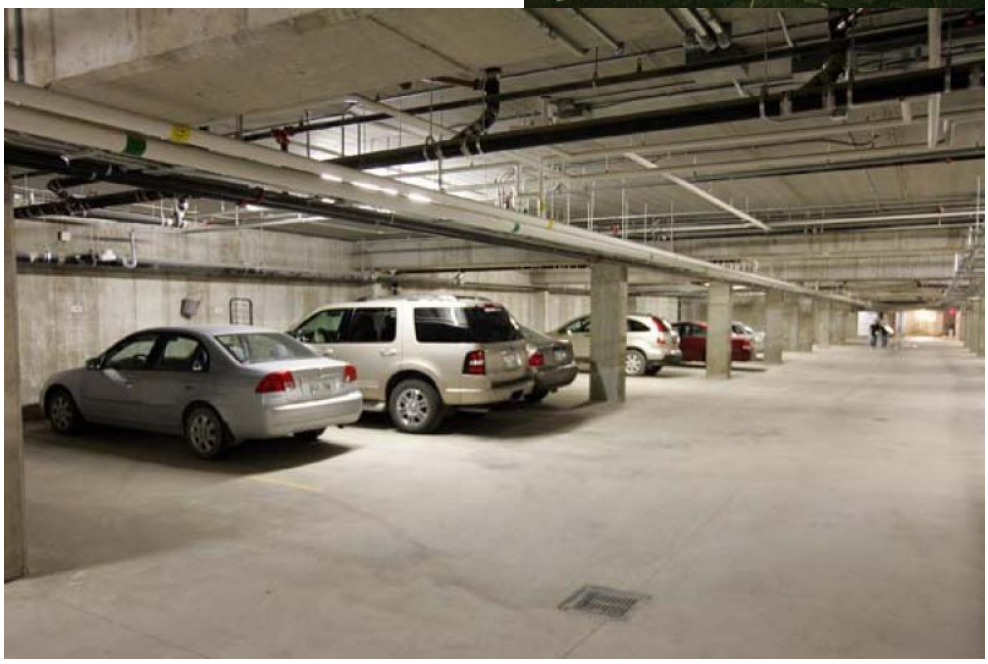
Fire Sprinkler Freeze Protection Design / Install Guide



Fire Sprinkler System Freeze Protection Design / Install Guide

CONTENTS

INTRODUCTION

This design guide and installation manual from Drexan HeatTracer provides recommendations for designing a pipe freeze protection system for fire sprinkler piping, using Drexan HeatTracer MultiTrace® cables. It provides system design and performance data, information on heat tracing monitoring and control, electrical sizing information, and various configuration recommendations. This design guide assumes the fire protection system has been designed by others qualified in the art.

MultiTrace is certified to all CSA / UL (CUS) standards for use throughout North America, as well as ATEX 2014/34/EU for global applications and is suitable for both metal and non-metal pipes, tanks and vessels. (see p.17).

This guide does not cover the following applications:

- Hazardous locations as defined in the National / Canadian Electric Code
- Supply voltages other than 100-130V or 208-277V

For assistance with application requirements that differ from those addressed in this document, contact your Drexan representative or Drexan directly at 1-800-663-6873.

The following instructions will provide you with a step-by-step procedure for determining the best solution for your fire sprinkler system freeze protection applications. An improperly designed and installed heat tracing system could result in cable failure and possible physical injury.

The installation manual provides general guidance for installing the heating cable and components on fire sprinkler piping. Additional installation instructions are included with the connection kits, controllers, and accessories. If you are missing any required documents, you can download them from the on-line document library at www.drexan.com.

SYSTEM OVERVIEW

Drexan HeatTracer MultiTrace self-regulating cable is designed for freeze protection of above ground and buried supply pipes, fire standpipes, branch lines and branch lines containing sprinklers when run in areas potentially exposed to freezing temperatures.

Drexan offers 4 MultiTrace nominal cable power output options for fire sprinkler systems: 3W, 5W, 8W and 10W per foot[1] for applications using 100-130V and 208-277V power. Selection of the correct power output for a given line size will ensure sprinkler systems do not overheat and that electrical energy is efficiently used, while providing the required, reliable freeze protection.

A correctly designed and specified system will comprise the following:

- Heating cable correctly selected for the line size at design minimum ambient temperatures
- Power connections, tees and end seals based on piping configuration
- Monitoring and control system
- Power distribution panels complete with appropriate ground fault equipment protection
- Accessories including attachment tapes and warning labels
- Tools necessary for a complete installation and commissioning tests

Approvals

Drexan HeatTracer MultiTrace is CSA / UL (CUS) certified for use on fire suppression systems in North America. The system covered in this manual includes supply lines, stand pipes, branch lines and sprinkler heads.

[1] at 50 degrees F

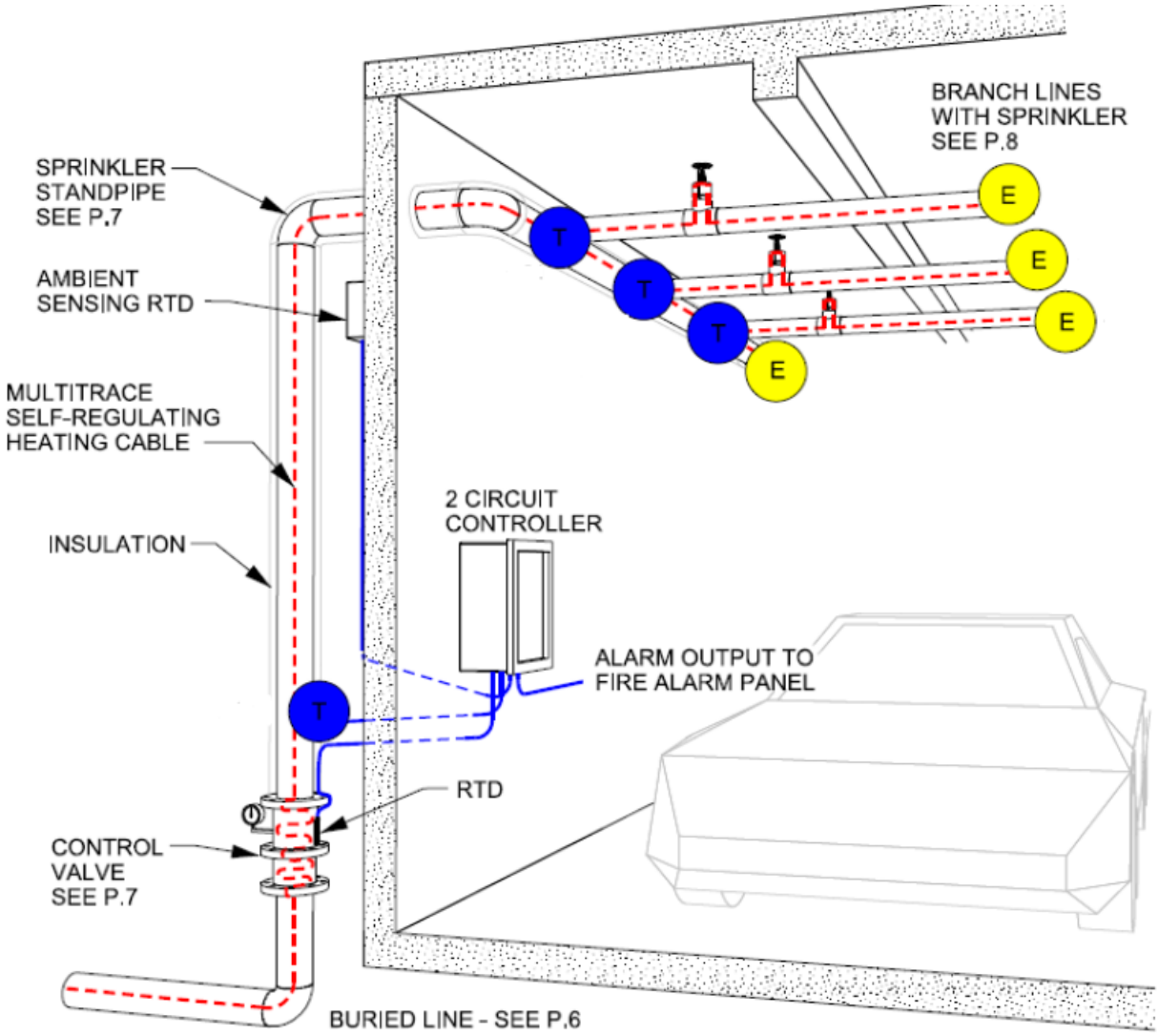
FIRE SUPPRESSION SYSTEM FREEZE PROTECTION APPLICATIONS

Properly designed freeze protection systems maintain water temperature at a minimum of 40°F/4°C to prevent fire suppression piping from freezing.

Fire Suppression System Freeze Protection Applications

A typical freeze protection system includes the heating cables, connection kits, cable monitoring and temperature control, and power distribution.

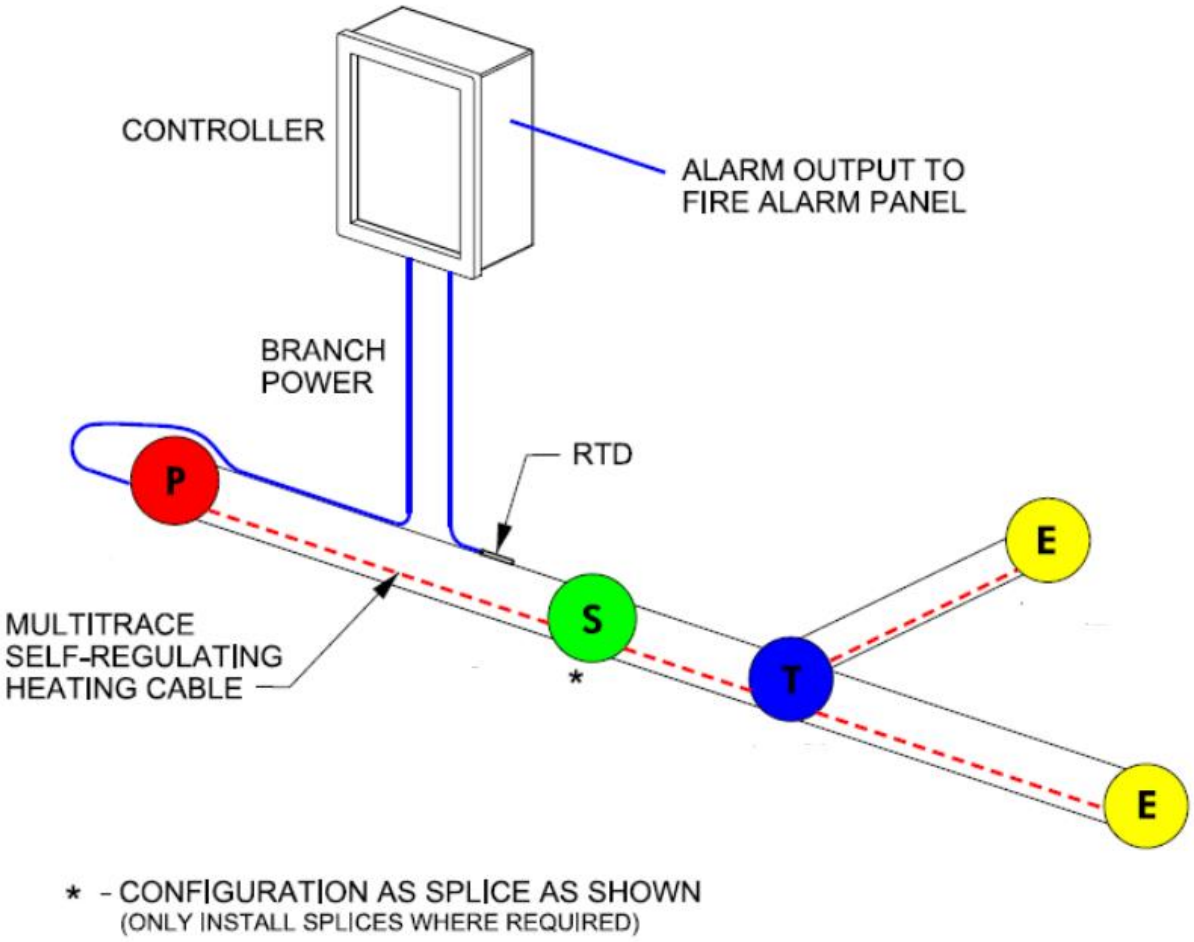
FIG. 1 – TYPICAL FIRE / FREEZE PROTECTION SYSTEM



Fire Supply Lines

MultiTrace is designed to maintain fire supply lines at 40°F/4°C in areas subject to freezing.

FIG. 2 – ABOVE GROUND SUPPLY PIPING



Application Requirements

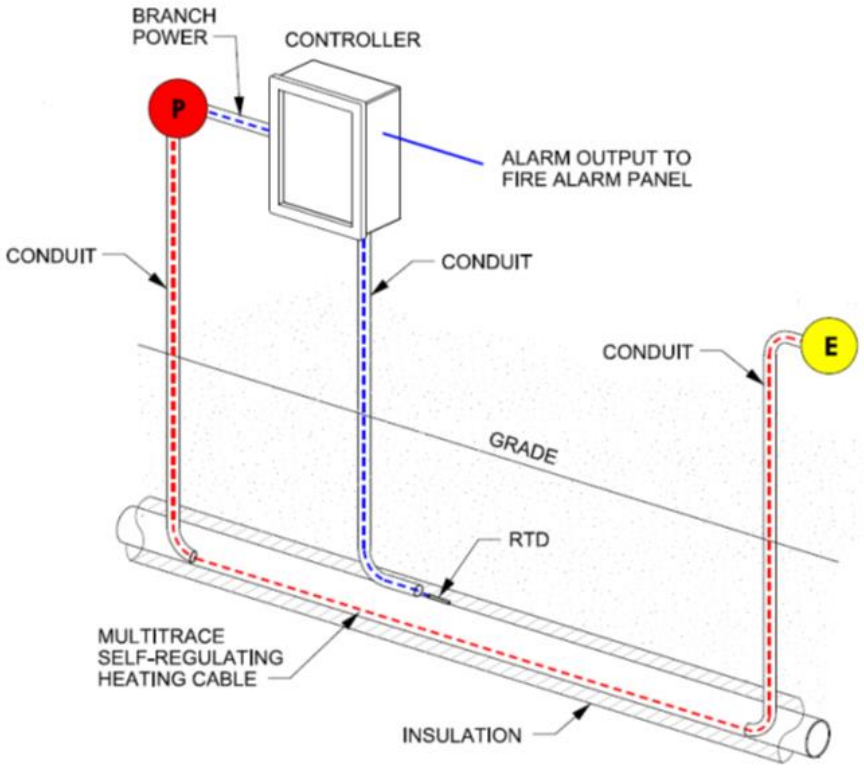
The system complies with Drexan HeatTracer design and installation requirements for above ground general water piping given the following conditions are met:

- Heating cable is permanently secured to insulated metal pipes using TAPE-GCR-HT glass tape or to plastic pipes using TAPE-AL aluminum tape
- The system is controlled by a Controller with integrated ground fault protection with alarm contacts connected to a fire control panel
- Heating cable is installed per manufacturer's instructions with approved connection kits.

Approvals

CSA / UL (CUS) certified for non-hazardous locations.

FIG. 3 – TYPICAL BURIED PIPING SYSTEM



Application Requirements

The system complies with Drexan HeatTracer design and installation requirements for buried piping given the following conditions are met:

- The line is buried at least 2 feet/0.7 m deep
- All heating cable connections are made above ground
- The power connection and end seal connections are made above grade in Drexan HeatTracer connection kits
- Heating cable is protected from the pipe to the power connection box in CSA certified water-sealed conduit with a minimum diameter of ¾" suitable for the location
- The system is controlled by a Controller with integrated ground fault protection with alarm contacts connected to a fire control panel
- Closed cell waterproof thermal insulation with fire retardant waterproof covering approved for direct burial is used over the cable and pipe
- Heating cable is installed per manufacturer's instructions with approved connection kits

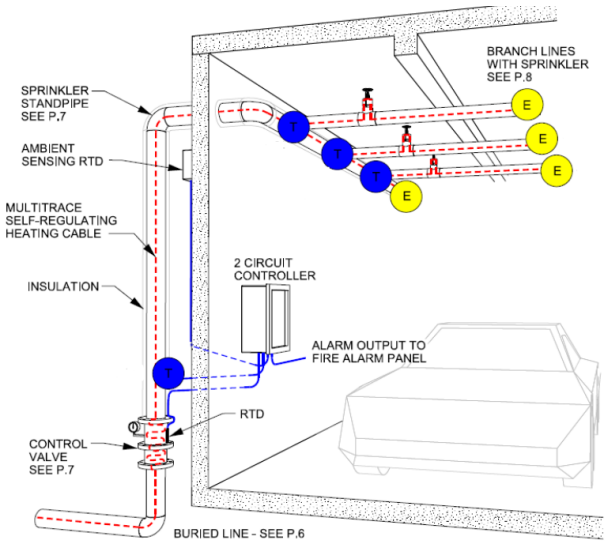
Approvals

CSA / UL (CUS) certified for non-hazardous locations.

Sprinkler Standpipes

MultiTrace is designed to maintain fire suppression system standpipes at 40°F/4°C in areas subject to freezing.

FIG. 4 – STANDARD SPRINKLER STANDPIPE – Heating System Layout



Application Requirements

The system complies with Drexan HeatTracer design and installation requirements for freeze protection of sprinkler system piping given the following conditions are met:

- Schedule 5, 10, 20 or 40 steel sprinkler standpipe up to and including 20” diameter is used
- UL listed fiberglass or closed cell flame-retardant insulation with weatherproof cladding is used
- The system is controlled by a Controller with integrated ground fault protection with alarm contacts connected to a fire control panel
- Control valve may be traced but requires removable insulation to allow inspection, and requires a dedicated controller with RTD mounted on valve body and alarm contact for low temperature alarm connected to a fire control panel
- Heating cable is installed per manufacturer’s instructions with approved connection kits.

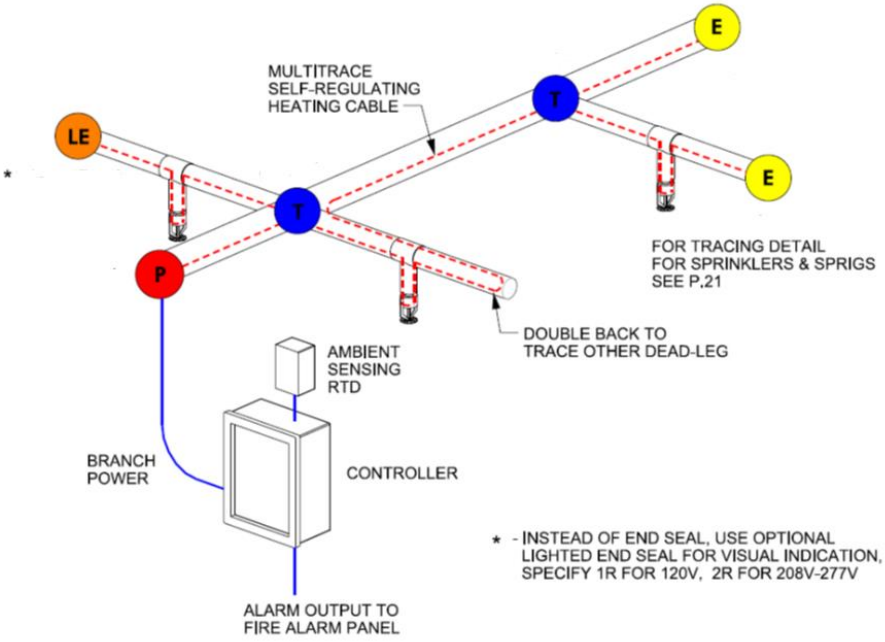
Approvals

CSA / UL (CUS) certified for non-hazardous locations.

Branch Lines with Sprinklers

MultiTrace is designed to maintain branch lines containing sprinklers at 40°F/4°C in areas subject to freezing.

FIG. 5 – TYPICAL FIRE SUPPRESSION SYSTEM FOR BRANCH LINES WITH SPRINKLERS



Application Requirements

The system complies with Drexan HeatTracer design and installation requirements for freeze protection of fire suppression branch lines with sprinklers given the following conditions are met:

- The heating cable is permanently secured to insulated metal pipes using TAPE-GCR-HT glass tape or to plastic pipes using TAPE-AL aluminum tape
- Temperature controller alarm contacts must be connected to the fire control panel
- The system is controlled by a Controller with integrated ground fault protection with alarm contacts connected to a fire control panel
- The sprinkler design must account for the sprinkler shadow created by the outer diameter of the thermal pipe insulation
- Closed cell waterproof thermal insulation with flame-retardant waterproof covering is used
- Heating cable is installed per manufacturer's instructions with approved connection kits
- Additional heating cable is run to compensate for sprinkler heads, sprigs, valves and pipe supports as detailed in these design guidelines and installation instructions

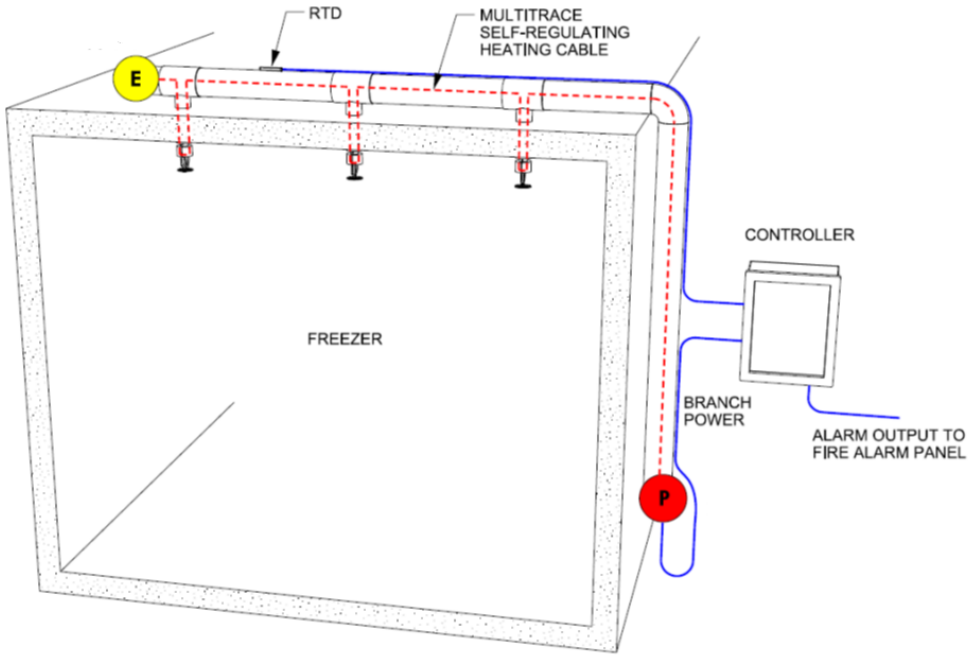
Approvals

CSA /UL (CUS) certified for non-hazardous locations.

Freezer Applications

MultiTrace is designed to keep condensate in dry sprinklers from freezing and may be installed in freezers located in areas subject to freezing.

FIG. 6 – TYPICAL FIRE SUPPRESSION SYSTEM FOR FREEZER APPLICATIONS



Application Requirements

The system complies with Drexan HeatTracer design and installation requirements for fire suppression systems for freezer applications given the following conditions are met:

- The heating cable is permanently secured to insulated metal pipes using TAPE-GCR-HT glass tape or to plastic pipes using TAPE-AL aluminum tape
- The system is controlled by a Controller with integrated ground fault protection with alarm contacts connected to a fire control panel
- Closed cell waterproof thermal insulation with flame-retardant waterproof covering is used
- The sprinkler design must account for the sprinkler shadow created by the outer diameter of the thermal pipe insulation
- Heating cable is installed per manufacturer's instructions with approved connection kits
- Additional heating cable is run to compensate for sprinkler heads, sprigs, valves and pipe supports as detailed in these design guidelines and installation instructions

Approvals

CSA / UL (CUS) certified for non-hazardous locations.

FIRE SUPPRESSION SYSTEM FREEZE PROTECTION DESIGN GUIDE

This section provides step-by-step instructions to design a fire suppression freeze protection system. While the steps shown here allow for manual design, Drexan HeatTracer recommends the use of the ProTrace Design Software to provide a compliant design complete with estimates of power loads and detailed bills of material for the project.

STEP 1 – COLLECT THE REQUIRED INFORMATION FOR EACH LINE

- **Pipe diameter**
- **Pipe length**
- **Minimum ambient temperature**
  This is the minimum temperature expected (worst case) throughout the winter months[2].
- **Maintain temperature**
  For freeze protection a typical maintain temperature of 4˚C/40˚F is sufficient.
- **Start-up temperature**
  This temperature will have a direct effect on the maximum circuit length and the breaker size required. You should select the temperature at which the cable will normally become energized, not necessarily the coldest temperature.
- **Metal or non-metallic Pipe**
  Some materials have superior heat transfer compared to others. For example, metal will conduct heat better than a polymeric material. For this reason, we require the use of aluminum foil tape (part# TAPE-AL) on polymeric pipes applied over the pipe under the cable.
- **Pipe hardware (valves, shoes, flanges etc.)**
  When measuring the total length of the pipe to be heat traced remember to allow extra cable for the pipe hardware.
- **Thermal Insulation type & thickness**
  All pipes, equipment and pipe hardware must be thermally insulated as specified in the previous section.

Measurement: Metric? Imperial? **Temperature:** Celsius? Fahrenheit?

Voltage: (include if 3 phase) _____

APPLICATIONS

Pipe Tracing: Metal? Other? (specify) _____

Pipe Length: _____ **Diameter:** _____ **Insulation Type:** _____

Insulation Thickness: _____ **Not Yet Determined** _____

Low Ambient Temp: _____ **Max. Pipe Temp:** _____ **Maintain Temp:** _____

Number of Supports _____ **Valves** _____ **Hangers** _____

[2] If in doubt, refer to historical data at: http://climate.weather.gc.ca/index_e.html

STEP 2 – DESIGN CONSIDERATIONS

- When a pipe enters the heated area of a building it is important that the cable extends into the building approximately 12" to ensure the pipe temperature is maintained above freezing.
- When a pipe enters the ground to below the frost line it is important to run the cable well below the frost line (a minimum of 2 feet) to ensure the pipe temperature is maintained above freezing.
- When a main pipe has a short branch line connected to it, the branch line may be double-traced (down & back) to eliminate the need for a Tee Splice Kit. Refer to detail in **Figure 5**.
- Heating cable should not pass through the air. When crossing from one pipe to another, the cable should run through a Flexible Extension (FLEX-E).
- Select the cable wattage output to suit the application. A conservative design will specify a slightly higher wattage output per foot of cable than required. However, this will consume more electrical power over time and is not required with a correctly designed system.
- A lower wattage cable has a longer circuit length. On projects with long runs, this reduces the number of circuits, thereby lowering component and circuit costs and increasing reliability by reducing the number of potential failure points in each connection. Always design to use the lowest wattage heater for the given design conditions – it is bad practice to use higher wattage cables than necessary.
- Insulate all heat sinks (pipe hangars, pipe shoes, valves) in the heat tracing system. Allow sufficient cable to trace additional heat sinks. **Refer to Table 2.**
- DO NOT expose heating cables to temperatures higher than their temperature ratings.
- For valves, install the heating cable so that the valves can be conveniently removed for servicing.
- The type and thickness of thermal insulation will have a direct effect on the amount of heat required. Longer circuit lengths may be achieved by increasing the insulating thermal value to lower the cable wattage output required. **Refer to Table 1.**
- Multiple runs of cable may be required on larger pipes with high heat loss.

STEP 3 – ELECTRICAL REQUIREMENTS

Design the heat tracing system using the most commonly expected start-up temperature.

Be practical. If you choose the most extreme (coldest possible) start-up temperature, for example -40 degrees, you may unnecessarily shorten the circuit lengths, or require larger breaker sizes or additional panels and power cable. However, keep in mind that if the heating system starts up at a lower temperature than it was designed for, you may experience breaker tripping. Since fire sprinkler systems are controlled to power on at 4°C/40°F, this temperature may be used for start-up design.

To determine maximum circuit length and breaker size required, refer to tables found on the cable data sheets available at www.drexan.com/

For voltages other than 120/240V refer to cable data sheets at www.drexan.com/

All heating cable systems require ground fault protection (27 or 30 mA trip level) as per the National and Canadian Electrical Codes. This protection is provided in Drexan's recommended Controllers.

STEP 4 – SELECTING CABLE POWER OUTPUT

When determining the minimum ambient temperature for your location, always consider the worst case or lowest temperature. Selecting a low ambient design temperature will provide an increased safety factor.

From the following tables you can determine the amount of heat (watts/ft pipe) required to maintain your pipe @ 40°F/4°C. MultiTrace is available in 4 nominal power outputs: 3W, 5W, 8W and 10W per foot. If higher watt densities per foot are required, run multiple tracers on the line. E.g. if 20W per foot is required, run 2 lengths of 10W cable.

For example: An ambient temperature of minus -20°F/-29°C and a 2" pipe with 1" of Glass Fiber thermal insulation will require 3.8 Watts/foot of pipe.

Note: The charts used in this guide are based on Glass Fiber Thermal Insulation. These charts may also be used with polyisocyanurate and Mineral Wool insulations of the same thickness.

Note: refer to the MultiTrace cable data sheet located on the Drexan HeatTracer Website: www.drexan.com/

Table 1

WATTS PER FOOT PIPE REQUIRED									
Pipe Dia.	Ambient Temp.		Insulation Thickness						
Inch	°F	°C	½"	1"	1 ½"	2"	2 ½"	3"	4"
½	0	-18	2.0	1.3	1.0	1.0	1.0	0.8	0.7
	-10	-23	2.5	1.6	1.3	1.2	1.0	1.0	0.8
	-20	-29	2.9	2.0	1.6	1.4	1.2	1.0	1.0
	-40	-40	3.9	2.5	2.0	1.8	1.6	1.5	1.3
¾	0	-18	2.3	1.5	1.2	1.0	1.0	0.8	0.7
	-10	-23	2.9	1.9	1.5	1.3	1.0	1.0	0.9
	-20	-29	3.5	2.2	1.8	1.5	1.4	1.3	1.0
	-40	-40	4.5	2.9	2.3	2.0	1.8	1.6	1.4
1	0	-18	2.8	1.7	1.4	1.2	1.0	1.0	0.8
	-10	-23	3.4	2.1	1.7	1.4	1.3	1.2	1.0
	-20	-29	4.1	2.5	2.0	1.7	1.5	1.4	1.2
	-40	-40	5.3	3.3	2.6	2.2	2.0	1.8	1.6
1 ¼	0	-18	3.3	2.0	1.6	1.3	1.0	1.1	0.9
	-10	-23	4.1	2.5	2.0	1.6	1.4	1.3	1.1
	-20	-29	4.9	3.0	2.3	1.9	1.7	1.6	1.3
	-40	-40	6.4	3.9	3.0	2.5	2.2	2.0	1.8
1 ½	0	-18	3.7	2.2	1.7	1.4	1.3	1.1	1.0
	-10	-23	4.5	2.7	2.1	1.8	1.5	1.4	1.2
	-20	-29	5.4	3.3	2.5	2.0	1.8	1.7	1.4
	-40	-40	7.1	4.3	3.3	2.7	2.4	2.2	1.9
2	0	-18	4.4	2.6	2.0	1.6	1.4	1.3	1.1
	-10	-23	5.5	3.2	2.4	2.0	1.8	1.6	1.4
	-20	-29	6.5	3.8	2.9	2.4	2.1	1.9	1.6
	-40	-40	8.6	5.0	3.8	3.1	2.7	2.5	2.1
2 ½	0	-18	5.2	3.0	2.3	1.8	1.6	1.4	1.2
	-10	-23	6.4	3.7	2.8	2.3	2.0	1.8	1.5
	-20	-29	7.6	4.4	3.3	2.7	2.4	2.1	1.8
	-40	-40	10.0	5.8	4.3	3.6	3.0	2.8	2.3
3	0	-18	6.1	3.5	2.6	2.1	1.8	1.6	1.4
	-10	-23	7.6	4.3	3.2	2.6	2.3	2.0	1.7
	-20	-29	9.0	5.2	3.8	3.0	2.7	2.4	2.0
	-40	-40	11.9	6.8	5.0	4.0	3.5	3.1	2.6
4	0	-18	7.6	4.3	3.1	2.5	2.2	1.9	1.6
	-10	-23	9.5	5.3	3.9	3.1	2.7	2.3	1.9
	-20	-29	11.3	6.3	4.6	3.7	3.2	2.8	2.3
	-40	-40	14.9	8.3	6.0	4.9	4.1	3.7	3.0

Table 1 cont.

WATTS PER FOOT PIPE REQUIRED									
Pipe Dia.	Ambient Temp.		Insulation Thickness						
Inch	°F	°C	½"	1"	1 ½"	2"	2 ½"	3"	4"
6	0	-18	11.0	6.0	4.6	3.4	2.8	2.5	2.0
	-10	-23	13.5	7.4	5.3	4.2	3.5	3.1	2.5
	-20	-29	16.0	8.8	6.3	5.0	4.2	3.7	3.0
	-40	-40	21.1	11.6	8.2	6.5	5.5	4.8	3.9
8	0	-18	14.0	7.5	5.3	4.2	3.5	3.0	2.4
	-10	-23	17.2	9.3	6.6	5.2	4.3	3.8	3.0
	-20	-29	20.5	11.0	7.8	6.2	5.2	4.5	3.6
	-40	-40	27.0	14.6	10.3	8.1	6.8	5.9	4.7
10	0	-18	17.0	9.2	6.4	5.0	4.2	4.0	3.0
	-10	-23	21.0	11.4	8.0	6.2	5.2	5.0	4.0
	-20	-29	26.0	13.6	10.0	7.4	6.2	5.3	4.2
	-40	-40	34.0	18.0	13.0	10.0	8.1	7.0	6.0
12	0	-18	20.0	11.0	8.0	6.0	5.0	4.2	3.3
	-10	-23	25.0	13.3	9.3	7.2	6.0	5.1	4.1
	-20	-29	30.0	16.0	11.0	9.0	7.0	6.1	5.0
	-40	-40	39.0	21.0	15.0	11.3	9.3	8.0	6.4
14	0	-18	22.0	12.0	8.0	6.3	5.2	5.0	4.0
	-10	-23	27.2	15.0	10.0	8.0	7.0	6.0	4.4
	-20	-29	33.0	17.3	12.0	9.3	8.0	7.0	5.2
	-40	-40	43.0	23.0	16.0	12.2	10.1	9.0	7.0
16	0	-18	25.0	13.2	9.2	7.1	6.0	5.0	4.0
	-10	-23	31.0	17.0	11.4	9.0	7.3	6.2	5.0
	-20	-29	37.0	20.0	14.0	11.0	9.0	7.4	6.0
	-40	-40	48.5	26.0	18.0	14.0	11.3	10.0	8.0
18	0	-18	28.0	15.0	10.2	8.0	7.0	6.0	4.3
	-10	-23	35.0	19.0	13.0	10.0	8.0	7.0	5.4
	-20	-29	42.0	22.0	15.0	12.0	10.0	8.2	6.4
	-40	-40	54.3	29.0	20.0	15.3	13.0	11.0	8.4
20	0	-18	31.0	17.0	11.3	9.0	7.0	6.1	5.0
	-10	-23	38.0	21.0	14.0	11.0	9.0	8.0	6.0
	-20	-29	46.0	24.0	17.0	13.0	11.0	9.0	7.0
	-40	-40	60.2	32.0	22.0	17.0	14.0	12.0	9.2
24	0	-18	37.0	20.0	14.0	11.0	9.0	7.1	6.0
	-10	-23	46.0	24.0	17.0	13.0	11.0	9.0	7.0
	-20	-29	55.0	29.0	20.0	15.0	13.0	11.0	8.0
	-40	-40	72.0	38.0	26.0	20.0	16.3	14.0	11.0

The following **Table 2** shows the amount of extra cable required to heat trace pipe hardware such as valves and supports.

Allow an extra 4 feet of cable per cable circuit run for the power and end seal terminations. Example: 3 feet for the power termination and 1 foot for the end termination.

Table 2

HEAT LOSS ADDERS (CABLE PER FOOT) Pipe Hardware Types					
Pipe Size Inches	**Flange Per Pair**	**Vent Drain**	**Pipe Support**	**Globe, Ball & Butterfly**	**Gate Valve**
½	0.3	1	1	1	1
¾	0.3	1	1.5	1	1.5
1	0.3	1	1.5	1	2
1 ¼	0.3	1	2	1.5	2.5
1 ½	0.3	1	2	1.5	2.5
2	0.3	1	2	2	2.5
2 ½	0.3	1	2	2.5	3
3	0.3	1	2	2.5	3
4	0.5	1	2.5	3	4
6	0.8	1	2.5	3.5	5
8	0.8	1	2.5	4	7
10	0.8	1	3	4.5	8
12	0.8	1	3	5	9
14	1	1	3	5.5	10
16	1	1	3.5	6	11
18	1	1	3.5	7	12
20	1	1	3.5	7.5	13
24	1	1	4	8	15

STEP 5 – CABLE COMPONENTS

A typical heat tracing system will include cable, cable components and controls, as required. Drexan offers 3 families of connection components. For most installations, AMIGA components are recommended as they can connect up to three heaters to power or be used as an inline splice (no power) or inline tee (no power). HeatShrink® kits are economical and familiar to most contractors.

*AMIGA Power / Tee / Splice

AMIGA is an advanced connection system designed for use with the Drexan HeatTracer family of Self-Regulating PipeGuard cables. AMIGA can connect up to three heaters to power or be used as an inline splice (no power) or inline tee (no power).

AMIGA consists of a pipe-mounted stanchion and an enclosure (junction box) with terminal blocks mounted on DIN rail. The AMIGA stanchion provides ample room in which installers can manipulate heating cables, has excellent mechanical protection for cables installed on a pipe, and permits application of up to 4 inches (102 mm) of thermal insulation.

AMIGA is CSA/UL (CUS) certified for both non-hazardous and hazardous locations up to Class I Division 2 (Zone 2).

HeatShrink Components

***†HS-PC**
Power Connection
(Junction box not included)

***†HS-TSPLICE**
Splice Kit

***†HS-ESK**
End Seal Kit

HS-JB
Junction Box

APPROVALS

231572

Class I, Div. 2, Groups A, B, C, D
Class II, Div. 2, Groups E, F, G
Class III

E484945*/E480818†

STEP 6 – POWER DISTRIBUTION

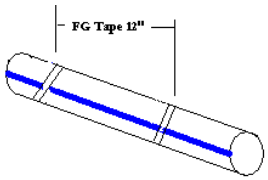
Power to the heating cables can be provided directly or through external contactors. For large jobs where power distribution panels are desired, contact Drexan HeatTracer for design and delivery.

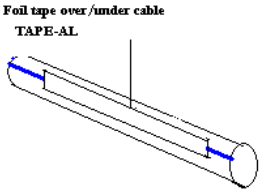
Single circuit control: Heating cable circuits that do not exceed the current rating of the selected Controllers can be switched directly.

Group control: If current draw of the system exceeds the switch rating, or if the controller will activate more than one circuit in group control, an external contactor must be used.

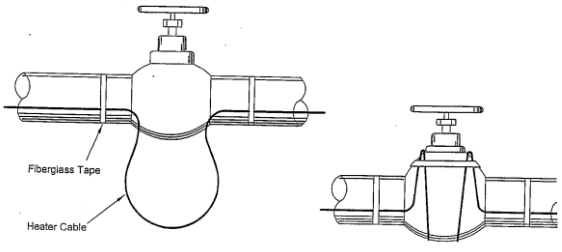
INSTALLING SELF REGULATING CABLE

- Install heating cable on the bottom half of the pipe between 4 & 8 o'clock. Install cable straight along the pipe. In some instances, it may be necessary to install more than one run or spiral the cable around the pipe. Example: pipe heat loss requires 12 W/ft., cable output is 8 W/ft., therefore apply 1.5 feet cable per foot of pipe.
- For typical installations the heating cable should be fastened with fiberglass tape.
  Note: Do not use metal strapping or tie wire to fasten cable to pipe.





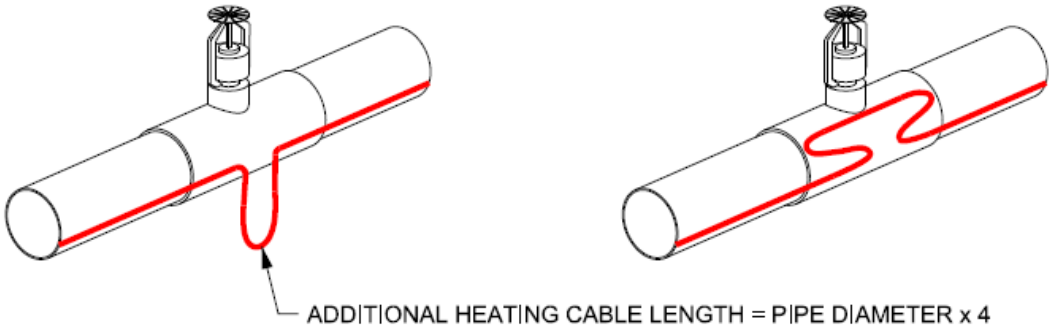
- Aluminum foil tape (TAPE-AL) is typically used when installing heating cable on plastic pipes. Applying a layer of foil tape on the pipe under the cable provides more efficient heat transfer. An additional layer of foil tape fastening the cable to the pipe also assists in the heat transfer and can prevent the cable from being embedded in the insulation.
- Do not cut the cable until it is fastened to the pipe. This ensures you will have a sufficient amount of cable for terminations and heat sinks such as valves, flanges, pipe supports and any other piping equipment.
- Install the heating cable in such a way as to allow for easy removal of valves and other equipment.



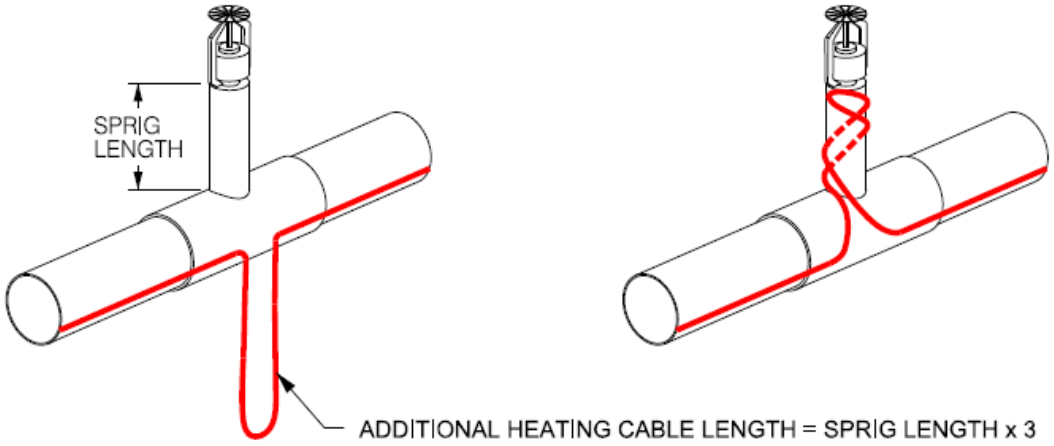
- Heating cable ends must be kept dry at all times. Until the cable is terminated, all ends should be sealed from the environment with a moisture proof tape.
- When pipe is buried, ensure the power and end of circuit terminations are above grade.
- After insulation has been applied to the pipe, over the cable, visually inspect to ensure there are no gaps in the seams or damage to the insulation.
  Note: An improperly insulated pipe will result in a cold pipe.

FIG. 7

- **TRACING A SPRINKLER HEAD WITHOUT SPRIG:**



- **TRACING A SPRINKLER HEAD WITH SPRIG:**



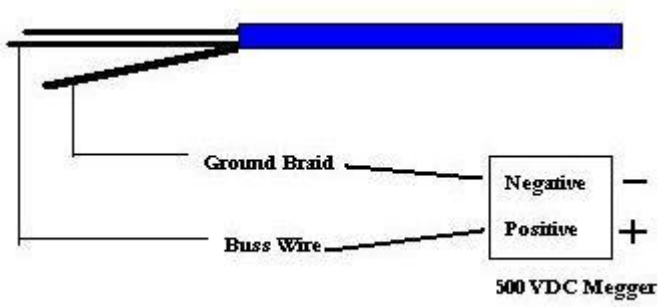
TESTING SELF-REGULATING CABLE

A test should be performed when the heating cable is received, prior to installation and after installation using a 500 VDC megger.

Note: Do not use a megger in excess of 2500 VCD.

Detecting cable damage prior to the application of insulation can prevent additional labor costs.

Minimum readings of 20 Megohms for each circuit is an acceptable level to test for.



A record should be kept of the reading after the cable has been installed. This reading can be used as a reference point when taking future readings during regular maintenance.

A history of resistance readings can be useful in spotting moisture ingression into the cable from either junction boxes or physical damage to the cable.

See the following page for a “Test Report” template.

HEATING CABLE TESTING REPORT

Customer_____ Contractor_____

Phone No._____ Phone No. _____

Site Location_____ Project Ref. _____

Readings Prior to Installation:

Cable Reference No. _____ Heater Length

Insulation Resistance (M Ohms) _____

Tested By _____ Date_____

Witnessed By _____ Date_____

Readings after Installation:

Insulation Resistance (M Ohms)_____

Tested By _____ Date_____

Witnessed By _____ Date _____

Final Readings:

Insulation Resistance (M Ohms)_____

Panel No. _____ Breaker No._____

Ambient Temp_____Volts _____ Amps _____

Tested By _____ Date _____

Witnessed By_____Date _____

TROUBLESHOOTING SELF-REGULATING HEATING CABLE

Symptom	Probable Cause	Remedy
Circuit Breaker Trips	Breaker undersized for the length of the cable on that circuit	Revisit the current loads and resize breakers or shorten the cable run lengths Note: Check Feeder wire size to confirm a larger breaker may be used
	Start-up temperature too low	Start-up cables at a higher temperature by adding a thermostat
	Physical damage to cable causing a short	Locate and repair
	Bus wires touching at the end seal	Locate and repair
	Heating cable connections or feeder wire may be shorting out either by contamination, moisture, or contact between wires in the connection	Locate and repair
Zero power output	Low or no input voltage	Repair electrical supply
	Connections not properly made	Repair connections
	Pipe is at elevated temperature	Check pipe temperature and recalculate the output wattage
	Heating cable has been exposed to excessive temperature	Replace the heating cable with appropriate temperature rated cable
Power output is correct but pipe temperature is below design values	Insulation is wet or open exposing the pipe to the ambient air.	Remove and replace with dry insulation
	Insufficient cable was installed on pipe shoes, valves or other heat sinks	Splice in additional cable BUT do not exceed the maximum circuit length for the breaker size
	Thermostat setting is incorrect	Adjust thermostat to correct setting.
	Incorrectly designed.	Revisit the design conditions and criteria

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