TRM
Heating Cables

Mineral Insulated Heating Elements
For Ordinary Location Applications

Installation Guide

"The Heating Cable Guys"

Phone: (905) 940-4737

Fax: (905) 940-4731

www.trmheatingcables.com

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Section 1:

General Information

- The heating portion of the cable set shall not touch, cross over, nor overlap itself.
- The heating portion of the cable set shall be spaced at least 13mm from any combustible surface.
- The minimum bending radius of the cable and cold lead, MI type, is 6 X O.D. of the cable.
- Do not repeatedly bend and straighten the cable
- Do not install the cables if the temperature is below -20 Degrees C (-4 Degrees F)
- Do not energize the cable until the final topping material has cured (e.g. asphalt, concrete)
- Heating cables can only be installed in materials that are designed to bear the expected load (e.g. cars) and environmental conditions (e.g. rain) over time
- Test the cable insulation and continuity before, during and after installation. (SEE SECTION 8)
- Position junction boxes above ground level to prevent moisture damaging the cold lead connections
- Cable terminations should be kept dry before, during and after installation
- If a cable termination becomes damaged at any time, please contact TRM immediately for assistance. Damaged cables can cause electrical arcing or fire.

- Heating elements are supplied ready to terminate with standard cold lead lengths (7' type 'A' element and 15' type 'B' element.) Cold leads are fitted with ½" NPT glands as standard and 12" solid copper tails.

As such, MI cable sets should not be altered in the field

- Cables shall be connected to branch wiring /circuits in accordance with local codes and standards – for specific wiring connections or assistance, please contact TRM.

- After installation, the minimum IR insulation resistance should be 20 MΩ. Apply 500 Volts with an IR tester, between the sheath of the cable set and its conductor, with the cable set de-energized and isolated from ground. (See SECTION 8)

- Metal structures or materials used for the support or on which cable sets are installed, shall be grounded in accordance with CSA standard C22.1, section 10.

- TRM MI heating cable sets must be installed according to instructions, to prevent fire and shock. A ground fault protection device must be used with a heating element, per local and national codes.

- All installations must be in compliance with the following electrical code regulations:

Articles 426 & 500 of the National Electric Code (NEC)
Sections 18 & 62 of the Canadian Electrical Code (CEC)

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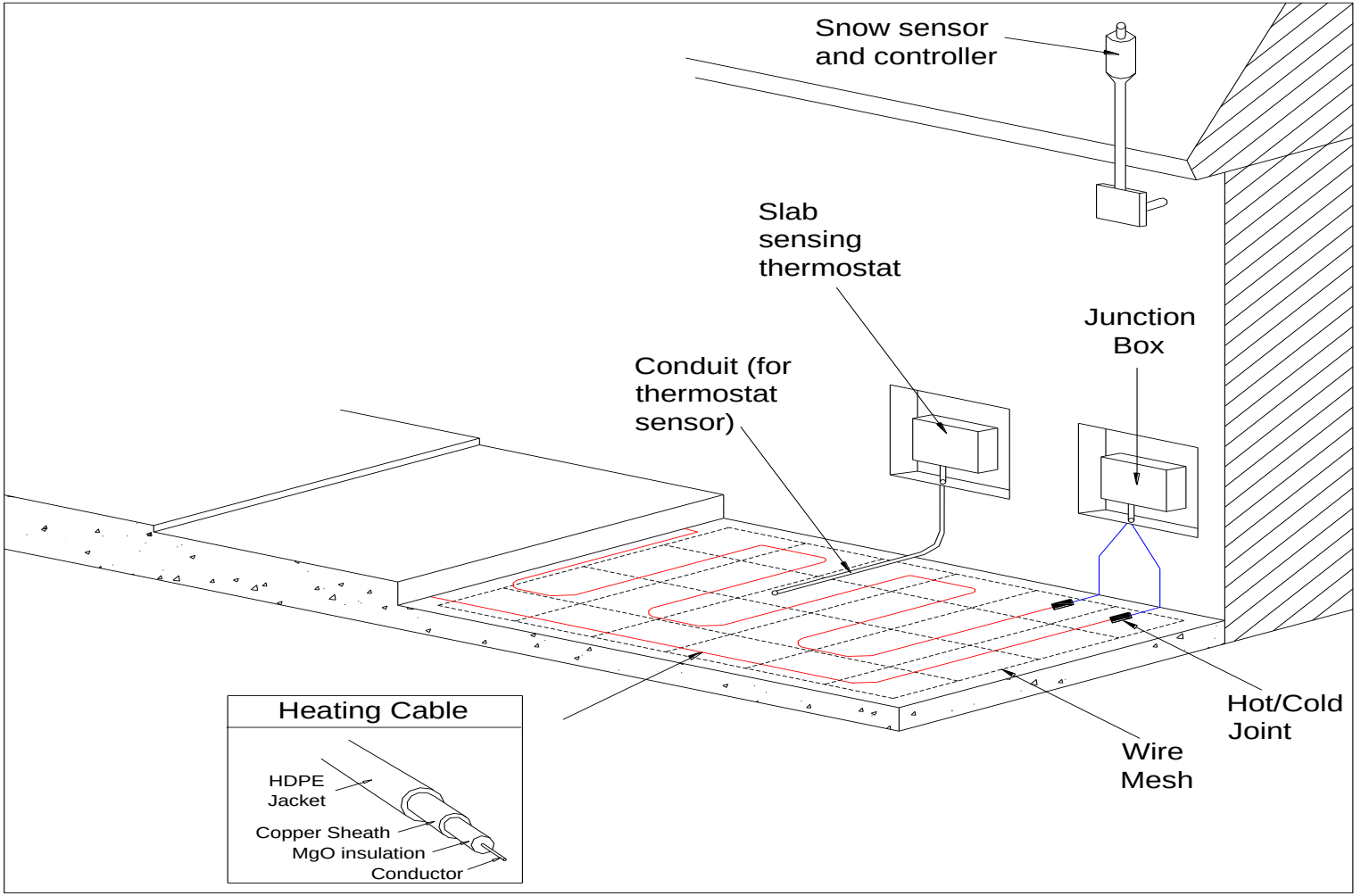
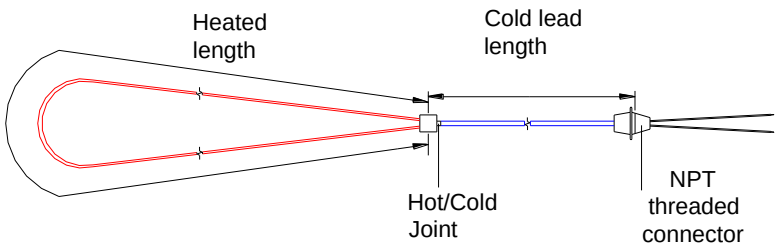
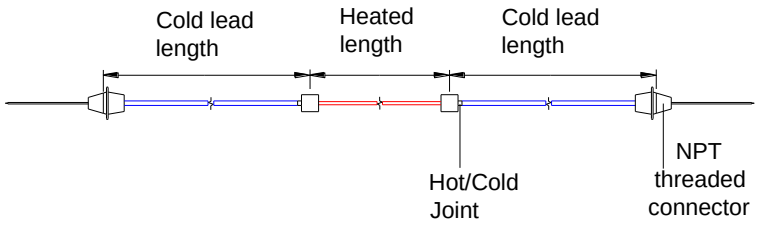
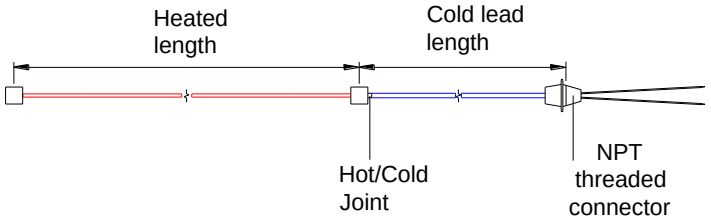
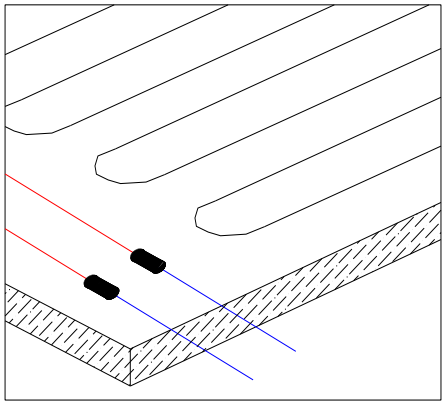


Typical Snow Melting System

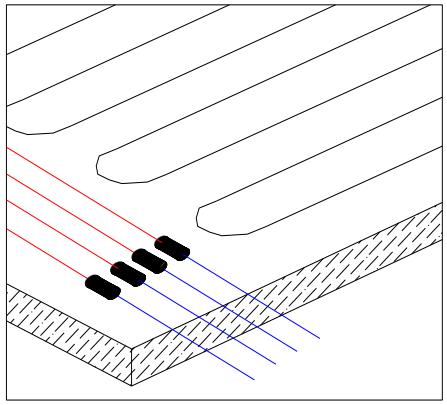
MI Cable Design	Configuration	Number of Conductors
A		Single conductor
B		Single conductor
D		Dual Conductor

MI Heating Cable Configurations



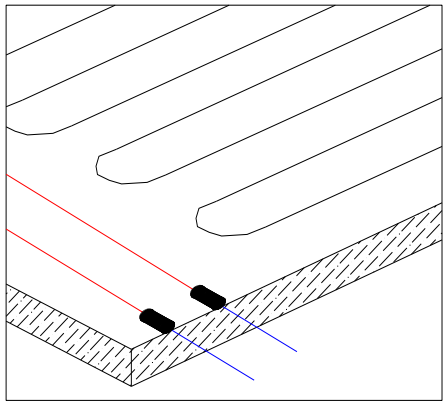
Correct

Hot/Cold joints 6" apart and 6" in from slab edge



Incorrect

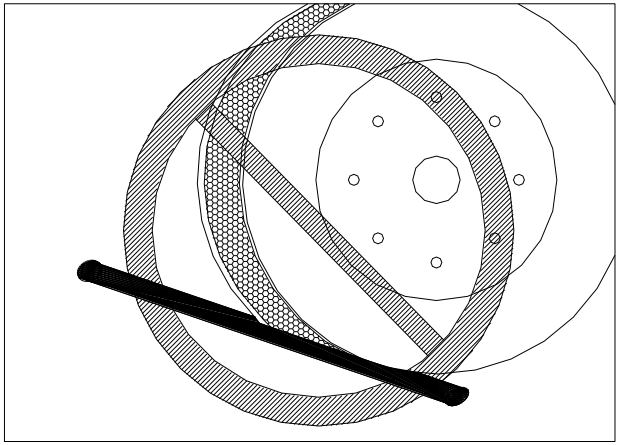
Hot/Cold joints bunched



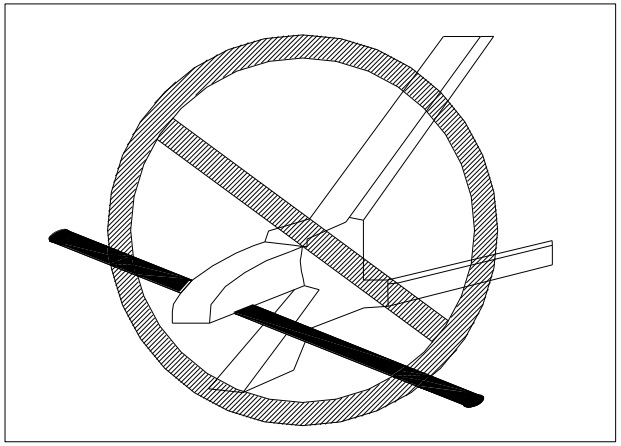
Incorrect

Hot/Cold joints installed on slab edge

Positioning of the hot/cold joint



DO NOT CRUSH OR PUT UNDUE PRESSURE ON THE CABLE



DO NOT CUT OR MARK THE CABLE

Avoid damaging the cable

Section 2:

Pre-Installation Checks

- Understand the area that will be heated.

- Confirm the topping and method of topping installation – refer to the drawing options (SECTION 4) in this manual.

- Assemble your tools and accessories that are required:
    - Heating cable sets
    - Design and layout notes
    - Method to pay the heating cables off, i.e. cable payoff reel
    - Method to attach cables down, refer to drawings, such as steel strapping, tie wraps
    - 500 Vdc Insulation Resistance tester
    - Multimeter
    - Junction boxes, ground bushings, as needed, depending on the connections required

- Unpack and inspect each heating cable set for any visible damage

- Test each heating cable set:
    - Insulation resistance test – 500Vdc tester – minimum 20M ohms IR value
    - Continuity/ohms check – compare vs. information on the cable set tags
    - Record above values

Section 3:

Design Calculations and Layout

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Basic design and layout calculations

- Spacing between heated runs:

$$\frac{\text{(Area in Square Feet) x 12}}{\text{Total heating cable length in feet}} = \text{Spacing in Inches}$$

- Wattage per square foot = total heating cable wattage / area in square feet
- Quantity of rolls of 75 foot steel strapping = Area in square feet X 0.006
- Ensure that all heating cables are spaced as per the above calculation – this includes the spacing between the heated loops, and the spacing between the loops and straight runs of heating cable.

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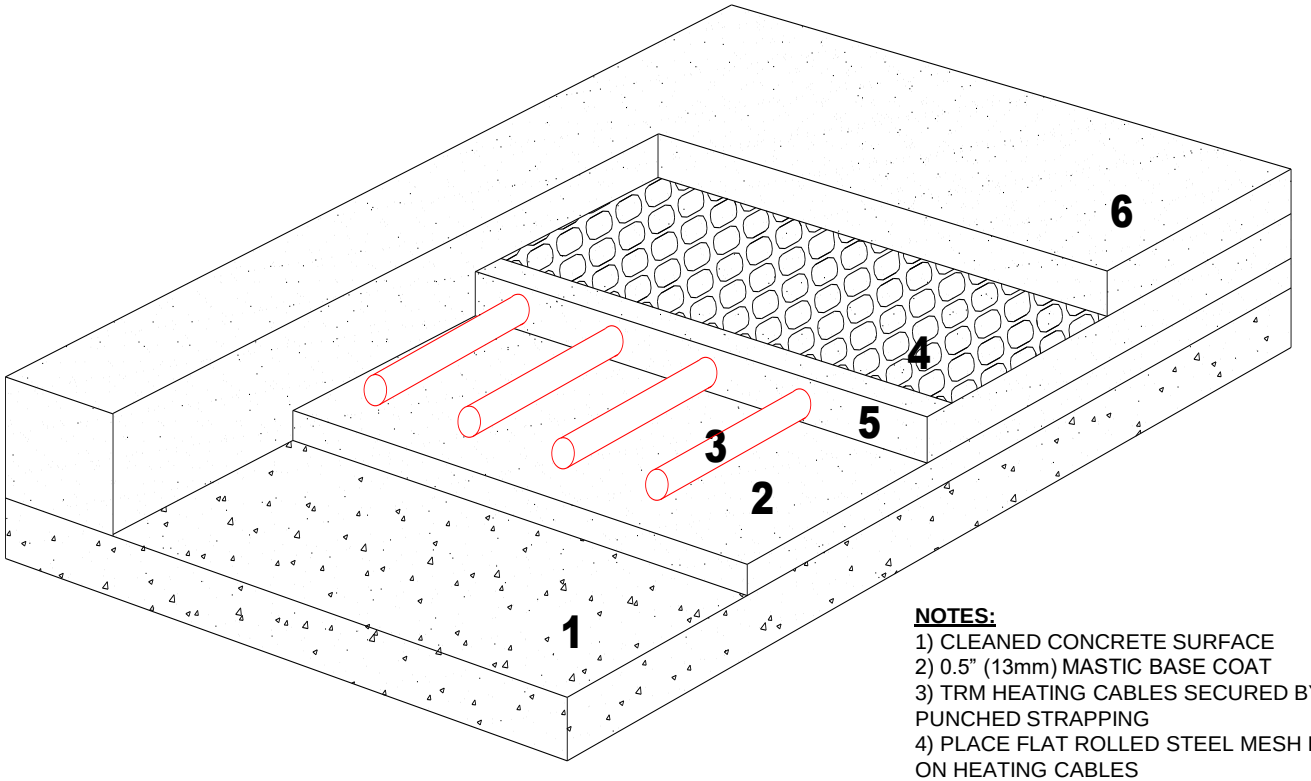
Section 4:

Installation Drawings



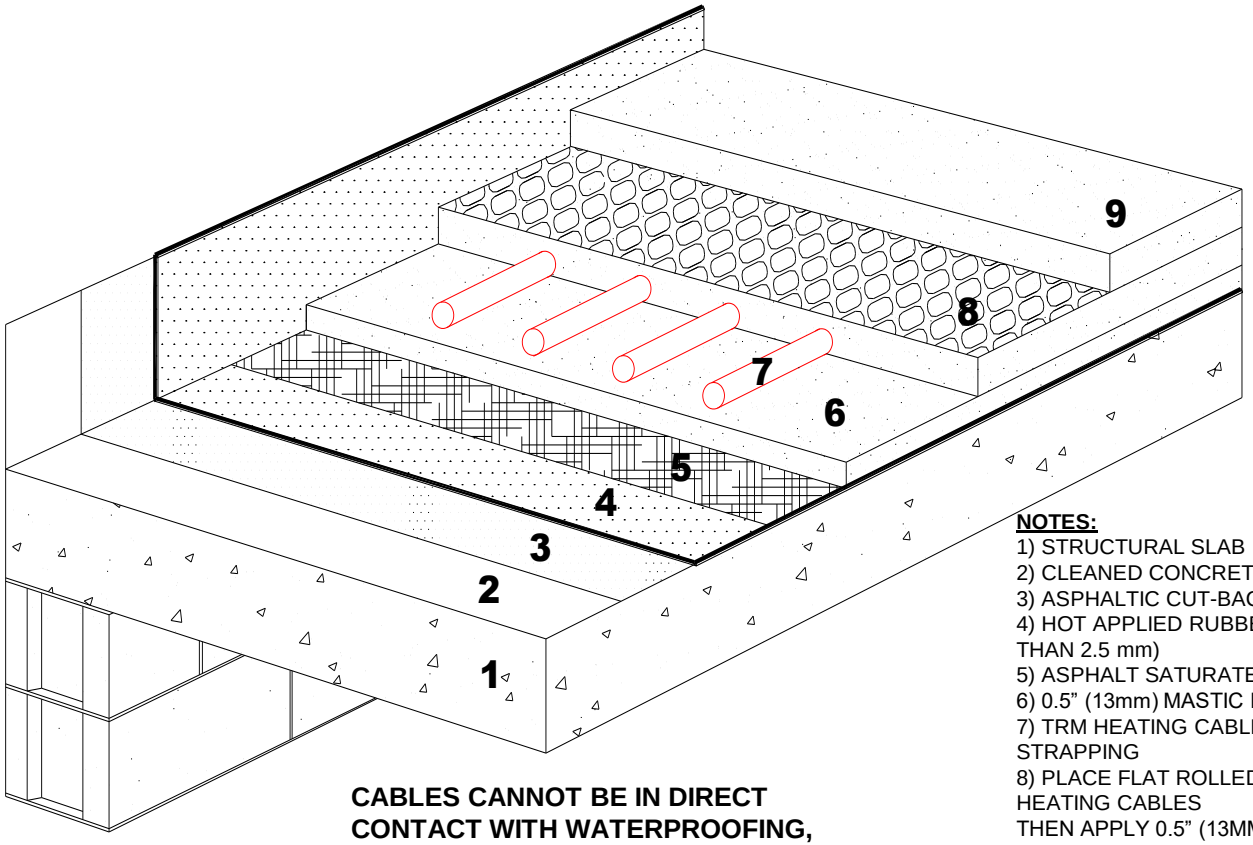
NOTES:

1) CLEANED CONCRETE SURFACE
2) 0.5” (13mm) MASTIC BASE COAT
3) TRM HEATING CABLES SECURED BY PRE-PUNCHED STRAPPING
4) PLACE FLAT ROLLED STEEL MESH DIRECTLY ON HEATING CABLES
5) 0.5” (13MM) MASTIC BEDDING COAT
6) 0.5” (13MM) TOP COAT OF MASTIC ASPHALT TRAFFIC-WEARING SURFACE
EITHER A MECHANICALLY EMBOSSED FINISH OR A ROLL PRESSED TRAP ROCK FINISH

Mastic on Concrete

Mastic on Concrete Notes

1. Install a 0.5” mastic layer over the top of the concrete base
2. Fasten the pre-punched strapping at 3 ft intervals to the base layer of mastic using anchors/screws
3. Serpentine the cable across the area using the pre-punched strapping to secure it in position
4. If using a slab sensing thermostat, install a 0.5” metal conduit between two runs of heating cable and away from high concentrations of heating cable. *Do not install the thermostat at this time*
5. Lay reinforced steel diamond mesh over the top of the cables
6. Apply a 0.5” thick mastic bedding coat whilst being careful not to damage the cables
7. Apply a 0.5” thick mastic traffic coat once the previous coat has set
8. Once the mastic traffic coat has set, install the thermostat sensing bulb in the conduit



CABLES CANNOT BE IN DIRECT CONTACT WITH WATERPROOFING, THE CABLES WILL BURNOUT, AND THE MEMBRANE WILL MELT.

NOTES:

1) STRUCTURAL SLAB
2) CLEANED CONCRETE SURFACE
3) ASPHALTIC CUT-BACK PRIMER
4) HOT APPLIED RUBBERIZED MEMBRANE (NOT MORE THAN 2.5 mm)
5) ASPHALT SATURATED SPUN FIBERGLASS SHEET
6) 0.5" (13mm) MASTIC BASE COAT
7) TRM HEATING CABLES SECURED BY PRE-PUNCHED STRAPPING
8) PLACE FLAT ROLLED STEEL MESH DIRECTLY ON HEATING CABLES
THEN APPLY 0.5" (13MM) MASTIC BEDDING COAT
9) 0.5" (13MM) TOP COAT OF MASTIC ASPHALT TRAFFIC-WEARING SURFACE
EITHER A MECHANICALLY EMBOSSED FINISH OR A ROLL PRESSED TRAP ROCK FINISH

Mastic on Concrete Base with Waterproofing

Mastic on Concrete Base with Waterproofing Notes

1. Install a 0.5” mastic layer over the top of the concrete base and waterproofing layers

2. Fasten the pre-punched strapping at 3 ft intervals to the base layer of mastic using anchors/screws. Ensure the screws do not penetrate into the waterproofing membrane below

3. Serpentine the cable across the area using the pre-punched strapping to secure it in position

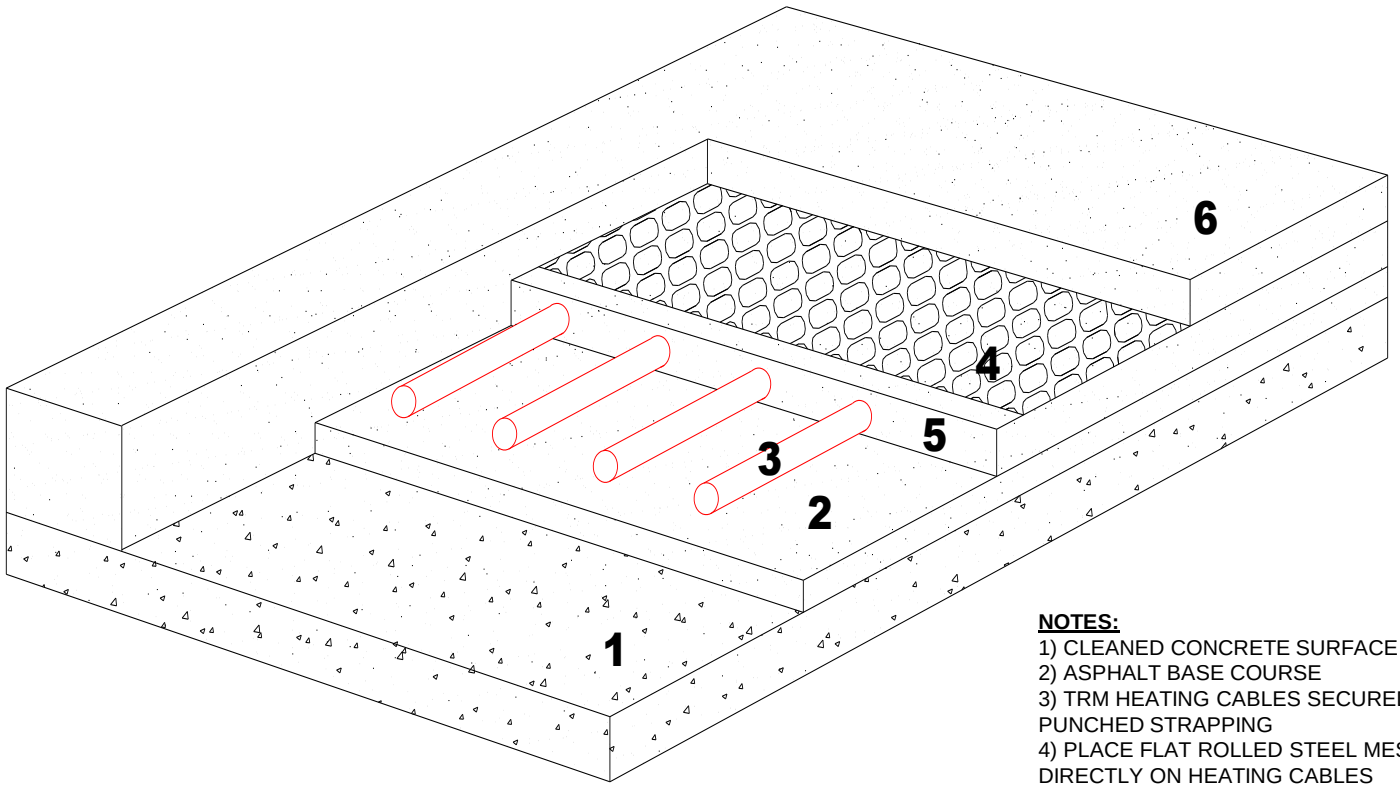
4. If using a slab sensing thermostat, install a 0.5” metal conduit between two runs of heating cable and away from high concentrations of heating cable. *Do not install the thermostat at this time*

5. Lay reinforced steel diamond mesh over the top of the cables

6. Apply a 0.5” thick mastic bedding coat whilst being careful not to damage the cables

7. Apply a 0.5” thick mastic traffic coat once the previous coat has set

8. Once the mastic traffic coat has set, install the thermostat sensing bulb in the conduit



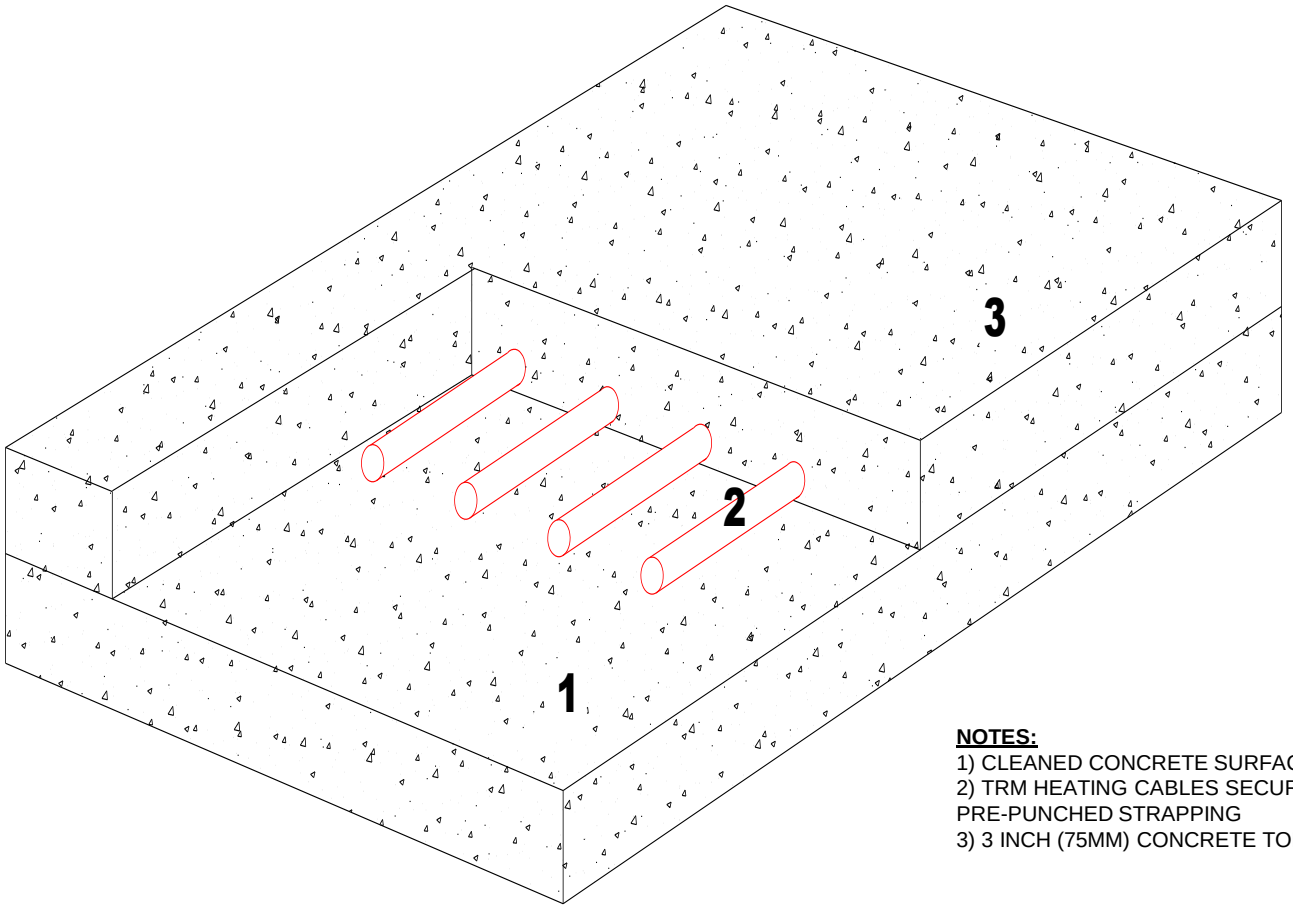
NOTES:

1) CLEANED CONCRETE SURFACE
2) ASPHALT BASE COURSE
3) TRM HEATING CABLES SECURED BY PRE-PUNCHED STRAPPING
4) PLACE FLAT ROLLED STEEL MESH DIRECTLY ON HEATING CABLES
5) 0.5” (13MM) MASTIC BEDDING COAT
6) 0.5” (13MM) TOP COAT OF MASTIC ASPHALT TRAFFIC-WEARING SURFACE EITHER A MECHANICALLY EMBOSSED FINISH OR A ROLL PRESSED TRAP ROCK FINISH

Mastic on Asphalt

Mastic on Asphalt Notes

1. Install a 0.5” asphalt layer over the top of the concrete base (or use the existing asphalt layer)
2. Secure the pre-punched strapping at 3 ft intervals to the base layer of asphalt using anchors/screws.
3. Serpentine the cable across the area using the pre-punched strapping to secure it in position
4. If using a slab sensing thermostat, install a 0.5” metal conduit between two runs of heating cable and away from high concentrations of heating cable. *Do not install the thermostat at this time*
5. Lay reinforced steel diamond mesh over the top of the cables
6. Apply a 0.5” thick mastic bedding coat whilst being careful not to damage the cables
7. Apply a 0.5” thick mastic traffic coat once the previous coat has set
8. Once the mastic traffic coat has set, install the thermostat sensing bulb in the conduit



NOTES:
1) CLEANED CONCRETE SURFACE
2) TRM HEATING CABLES SECURED BY PRE-PUNCHED STRAPPING
3) 3 INCH (75MM) CONCRETE TOPPING

Concrete on Concrete

Concrete on Concrete Notes

1. Secure the pre-punched strapping at 3 ft intervals to the base layer of concrete

2. Serpentine the cable across the area using the pre-punched strapping to secure it in position

3. If using a slab sensing thermostat, install a 0.5” metal conduit between two runs of heating cable and away from high concentrations of heating cable. *You may install the thermostat at this time.*

4. Ensure the heating cable is covered with a minimum of 2.5” of concrete

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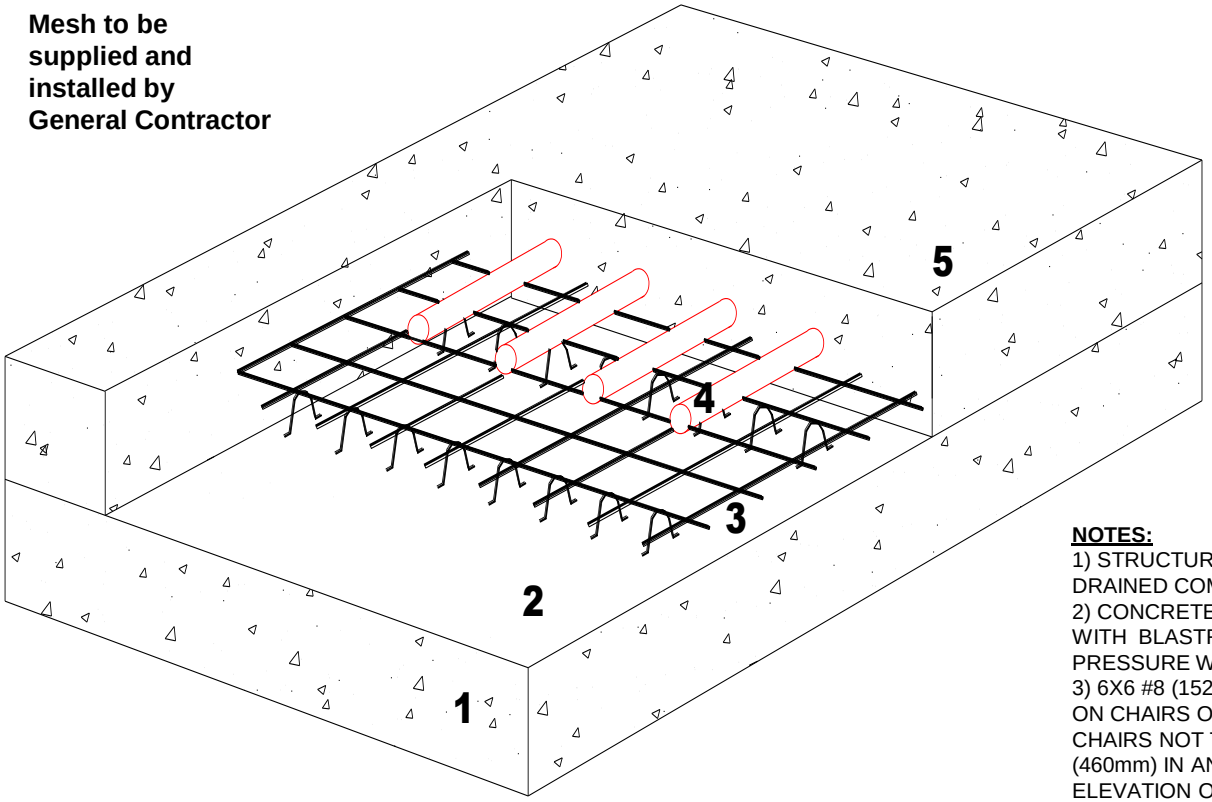
Mesh to be supplied and installed by General Contractor



NOTES:

1) STRUCTURALLY SOUND SLAB ON WELL DRAINED COMPACTED BASE
2) CONCRETE BASE SLAB TO BE CLEANED WITH BLASTRAC MACHINE OR HIGH PRESSURE WATER
3) 6X6 #8 (152 X 152mm) MESH SUPPORTED ON CHAIRS OR 10mm REBAR. SPACING OF CHAIRS NOT TO EXCEED 18 INCHES (460mm) IN ANY DIRECTION. FINAL ELEVATION OF CABLES TO BE WITHIN 2 TO 3 INCHES (50 TO 75 mm) FROM THE COMPLETED SURFACE.
4) TY-WRAP TRM HEATING CABLES ON 6X6 (152 X 152) MESH
5) CONCRETE TOPPING

Concrete 1 Pour - Cables on Mesh

Concrete 1 Pour – Cables on Mesh Notes

1. Use chairs or rebar to raise the cable up so that the final elevation of the cable is within 2-3” of the completed surface

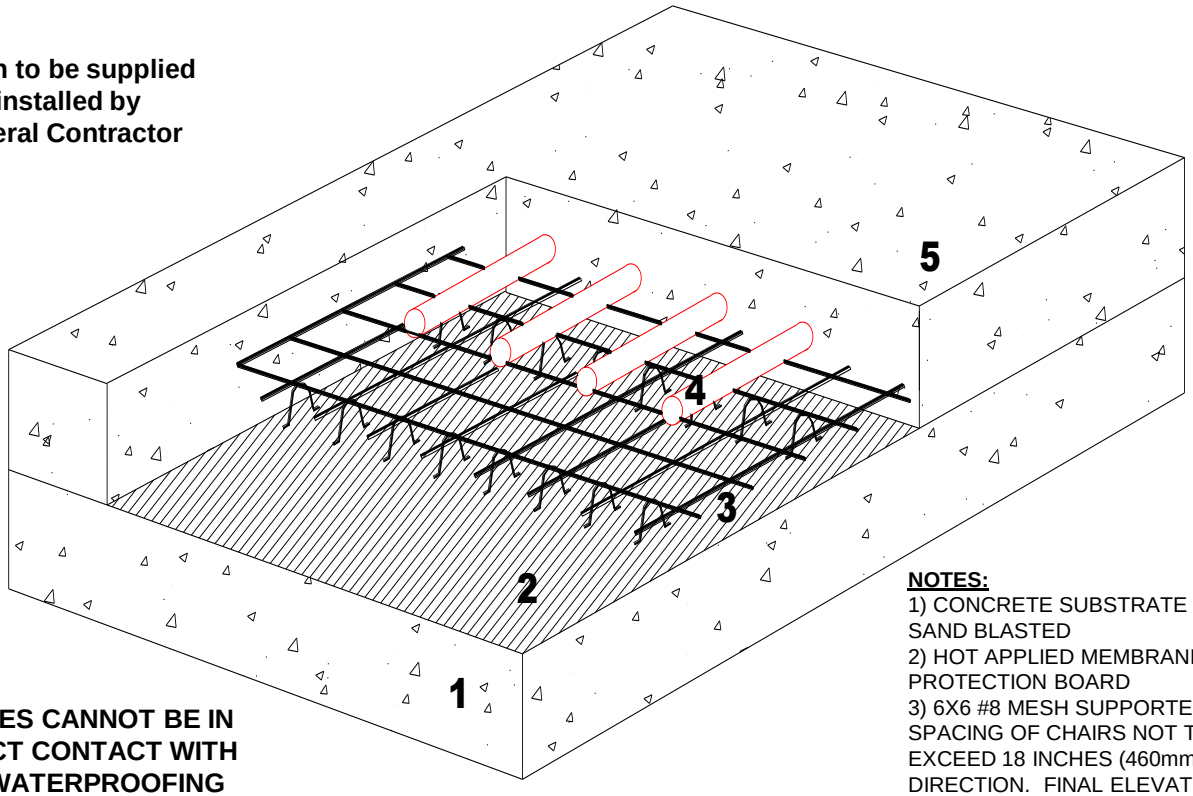
2. Lay a 6” x 6” mesh on top the chairs and strap the heating cable to this mesh using ty-wraps

3. If using a slab sensing thermostat, install a 0.5” metal conduit between two runs of heating cable and away from high concentrations of heating cable. *You may install the thermostat at this time.*

4. Ensure the heating cable is covered with a minimum of 2.5” of concrete

TRM Heating Cables

Mesh to be supplied and installed by General Contractor



CABLES CANNOT BE IN DIRECT CONTACT WITH THE WATERPROOFING MEMBRANE. THE CABLES WILL BURNOUT, AND THE MEMBRANE WILL MELT.

NOTES:

1) CONCRETE SUBSTRATE BLAS-TRACKED OR SAND BLASTED
2) HOT APPLIED MEMBRANE WITH ASPHALTIC PROTECTION BOARD
3) 6X6 #8 MESH SUPPORTED ON CHAIRS. SPACING OF CHAIRS NOT TO EXCEED 18 INCHES (460mm) IN ANY DIRECTION. FINAL ELEVATION OF CABLES TO BE WITHIN 2 TO 3 INCHES (50 TO 75 mm) FROM THE COMPLETED SURFACE.
4) TY-WRAP TRM HEATING CABLES ON 6X6 MESH
5) CONCRETE TOPPING

Concrete 1 Pour - Cables on Mesh – with Waterproofing

Concrete 1 Pour – Cables on Mesh with Waterproofing Notes

1. Apply the hot waterproof membrane over a pre sand-blasted concrete base slab

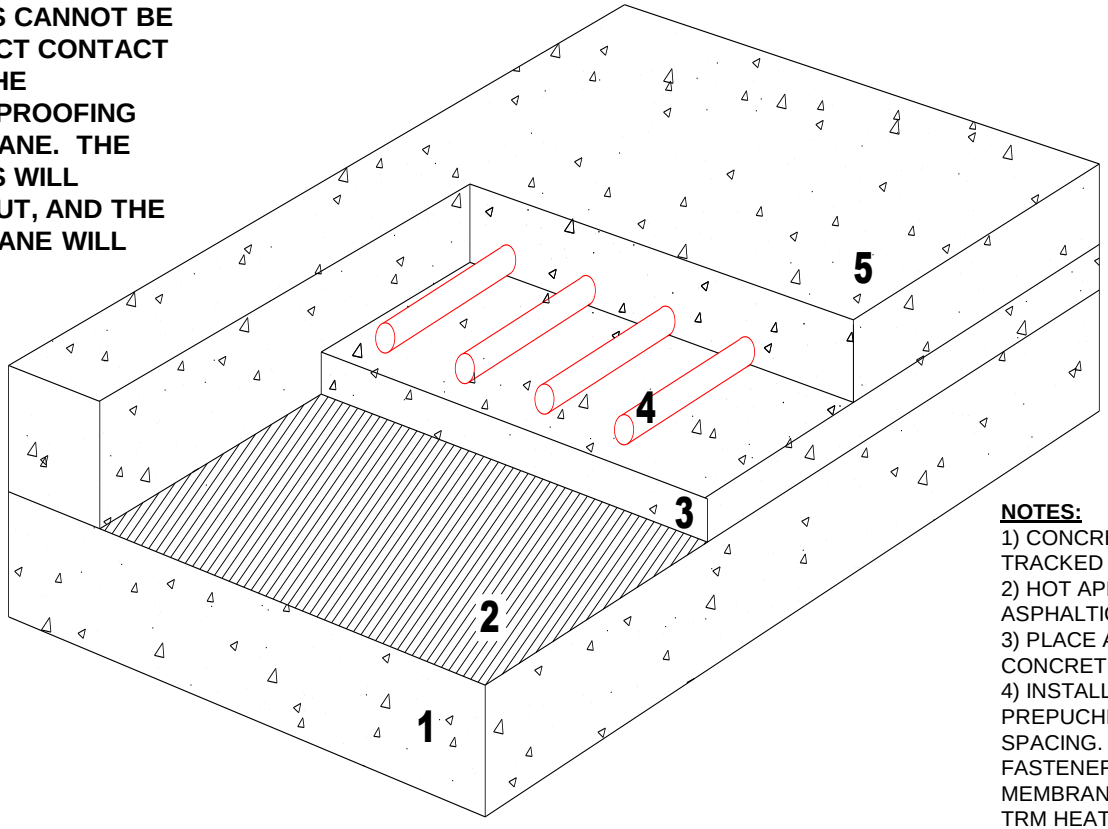
2. Use chairs or rebar to raise the cable up so that the final elevation of the cable is within 2-3” of the completed surface

3. Lay a 6” x 6” mesh on top the chairs and strap the heating cable to this mesh using ty-wraps

4. If using a slab sensing thermostat, install a 0.5” metal conduit between two runs of heating cable and away from high concentrations of heating cable. *You may install the thermostat at this time.*

5. Ensure the heating cable is covered with a minimum of 2.5” of concrete

CABLES CANNOT BE IN DIRECT CONTACT WITH THE WATERPROOFING MEMBRANE. THE CABLES WILL BURNOUT, AND THE MEMBRANE WILL MELT.



NOTES:

1) CONCRETE SUBSTRATE BLAS-TRACKED OR SAND BLASTED
2) HOT APPLIED MEMBRANE WITH ASPHALTIC PROTECTION BOARD
3) PLACE A 1.25 TO 1.5 INCH CONCRETE BASE
4) INSTALL STAINLESS STEEL PREPUCHED STRAPPING AT 3 FT SPACING. ENSURE THAT FASTENERS DO NOT PENETRATE MEMBRANE..
TRM HEATING CABLES SECURED BY PREPUNCHED STRAPPING.
5) PLACE A THREE INCH CONCRETE TOPPING
CONCRETE MIX - 32 MPA, 20MM CRUSHED, 75MM SLUMP 6% AIR

Concrete 2 Pour with Waterproofing

Concrete 2 Pour with Waterproofing Notes

1. Apply the hot waterproof membrane over a pre sand-blasted concrete base slab

2. Lay a 1.25” - 1.5” concrete base over the waterproofing membrane

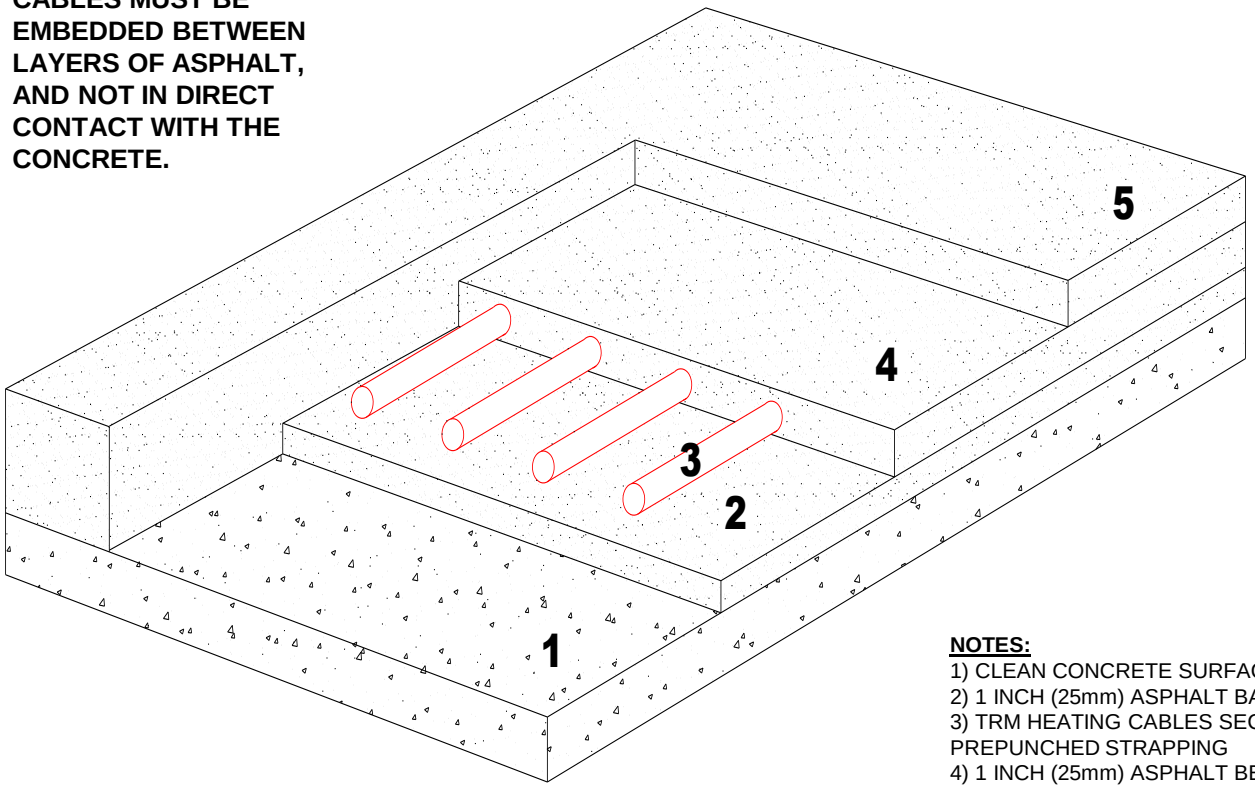
3. Secure the pre-punched strapping at 3 ft intervals to the base layer of concrete using anchors/screws. Ensure the screws do not penetrate into the waterproofing membrane below

4. Serpentine the cable across the area using the pre-punched strapping to secure it in position

5. If using a slab sensing thermostat, install a 0.5” metal conduit between two runs of heating cable and away from high concentrations of heating cable. *You may install the thermostat at this time.*

6. Ensure the heating cable is covered with a minimum of 2.5” of concrete

CABLES MUST BE EMBEDDED BETWEEN LAYERS OF ASPHALT, AND NOT IN DIRECT CONTACT WITH THE CONCRETE.



NOTES:

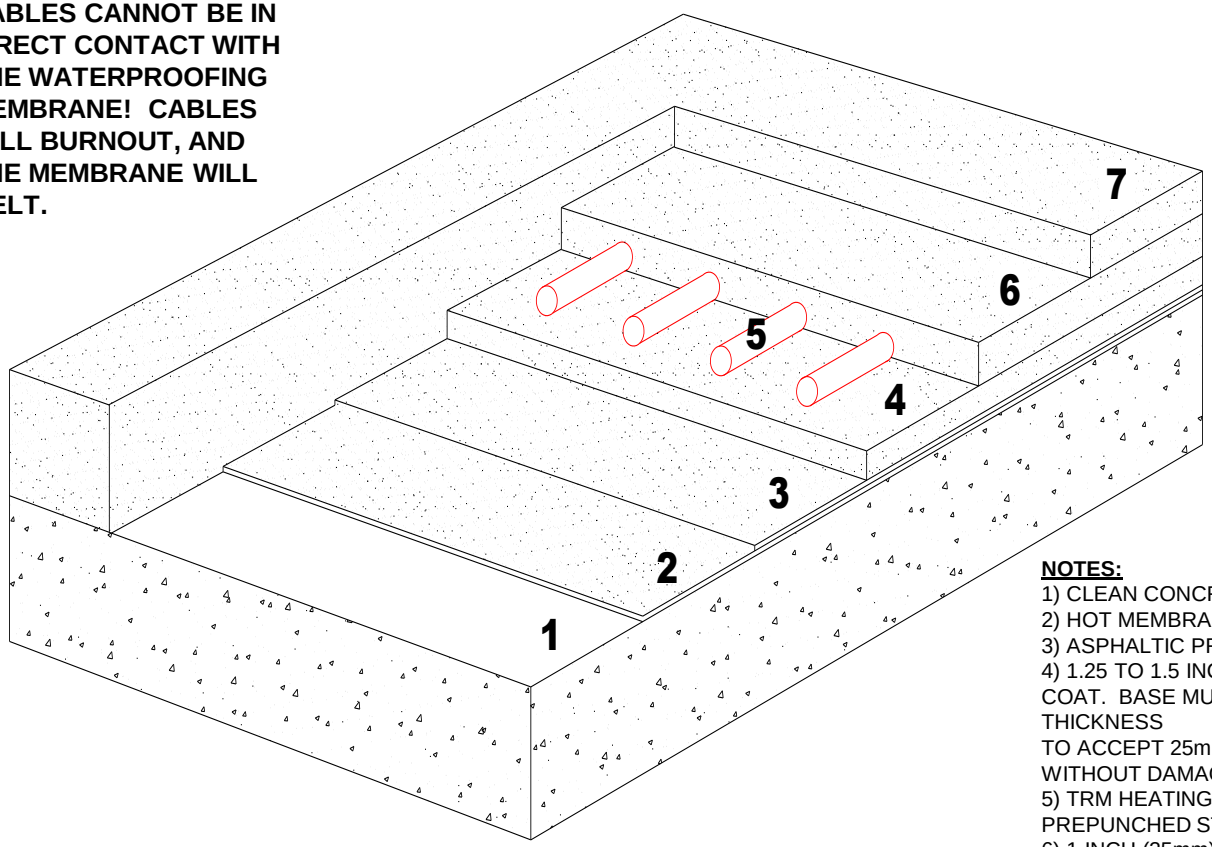
1) CLEAN CONCRETE SURFACE
2) 1 INCH (25mm) ASPHALT BASE COAT (HL3-HL8)
3) TRM HEATING CABLES SECURED BY PREPUNCHED STRAPPING
4) 1 INCH (25mm) ASPHALT BEDDING COAT (HL3A - COMPACTED WITH ONE TON ROLLER AFTER PLACEMENT)
5) 1 INCH (25mm) ASPHALT TRAFFIC COAT (HL3)

Asphalt on Concrete Base

Asphalt on Concrete Notes

1. Install a 1” asphalt layer over the top of the concrete base
2. Secure the pre-punched strapping at 2 ft intervals to the base layer of asphalt using anchors/screws.
3. Serpentine the cable across the area using the pre-punched strapping to secure it in position
4. If using a slab sensing thermostat, install a 0.5” metal conduit between two runs of heating cable and away from high concentrations of heating cable. *Do not install the thermostat at this time*
5. Lay a 1” bedding coat of HL3A asphalt and compact to 1” thickness
6. Lay a traffic coat of HL3 Asphalt 1” thick
7. Once the traffic coat has set, install the thermostat sensing bulb in the conduit

CABLES CANNOT BE IN DIRECT CONTACT WITH THE WATERPROOFING MEMBRANE! CABLES WILL BURNOUT, AND THE MEMBRANE WILL MELT.



NOTES:

1) CLEAN CONCRETE SURFACE
2) HOT MEMBRANE WATERPROOFING
3) ASPHALTIC PROTECTION BOARD
4) 1.25 TO 1.5 INCH (32mm TO 38mm) BASE COAT. BASE MUST HAVE A COMPACTED THICKNESS
TO ACCEPT 25mm CONCRETE NAILS WITHOUT DAMAGING THE MEMBRANE
5) TRM HEATING CABLES SECURED BY PREPUNCHED STRAPPING
6) 1 INCH (25mm) ASPHALT BEDDING COAT (HL3A - COMPACT WITH ONE TON ROLLER AFTER PLACEMENT)
7) 1 INCH (25mm) ASPHALT TRAFFIC COAT (HL3)

Asphalt on Concrete Base with Waterproofing Membrane

Asphalt on Concrete Base with Waterproofing Membrane Notes

1. Apply the hot waterproof membrane over a clean concrete base slab
2. Lay a 1.25” - 1.5” asphalt base over the waterproofing membrane
3. Secure the pre-punched strapping at 2 ft intervals to the base layer of concrete using anchors/screws. Ensure the screws do not penetrate into the waterproofing membrane below
4. Serpentine the cable across the area using the pre-punched strapping to secure it in position
5. If using a slab sensing thermostat, install a 0.5” metal conduit between two runs of heating cable and away from high concentrations of heating cable. *Do not install the thermostat at this time*
6. Lay a 1” bedding coat of HL3A asphalt and compact to 1” thickness
7. Lay a traffic coat of HL3 Asphalt 1” thick
8. Once the traffic coat has set, install the thermostat sensing bulb in the conduit

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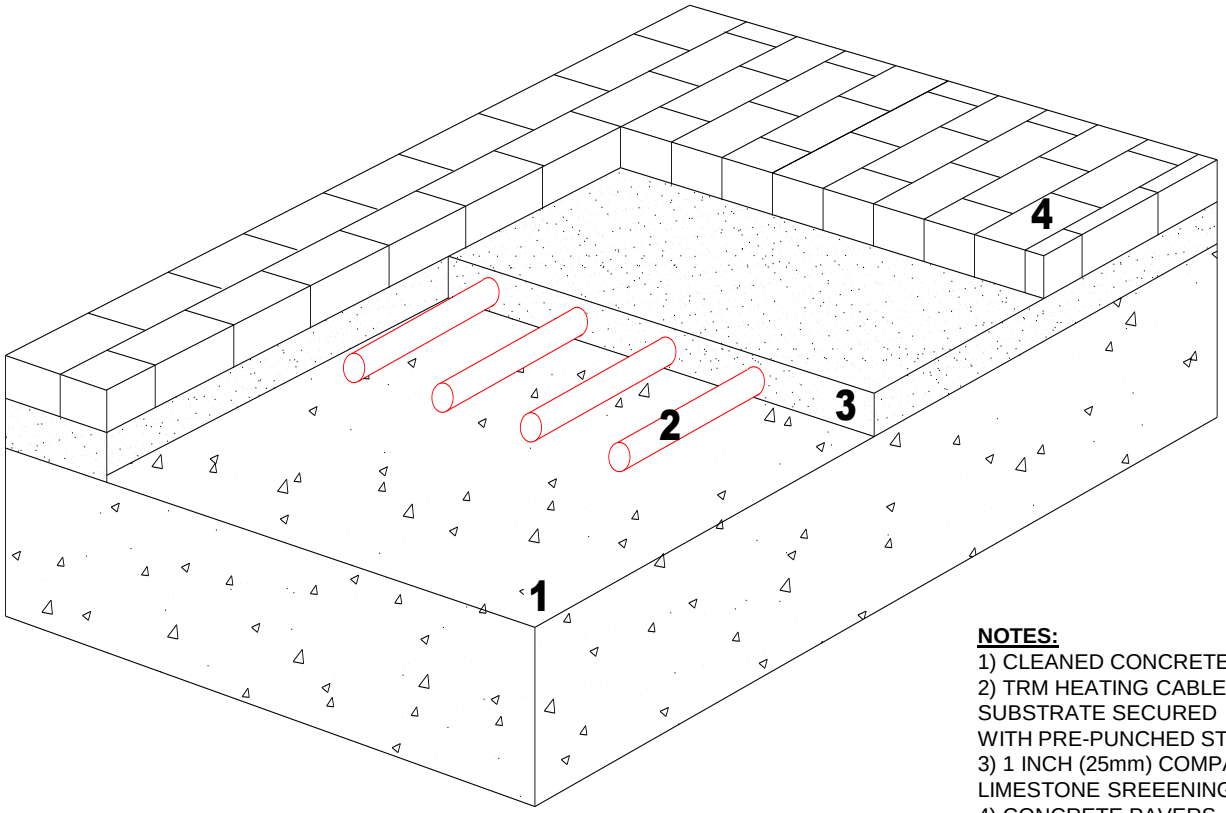


NOTES:
1) CLEANED CONCRETE SURFACE
2) TRM HEATING CABLES ON CONCRETE SUBSTRATE SECURED WITH PRE-PUNCHED STRAPPING
3) 1 INCH (25mm) COMPACTED LIMESTONE SREEENINGS OR SAND
4) CONCRETE PAVERS

Pavers on Concrete Base

Pavers on Concrete Notes

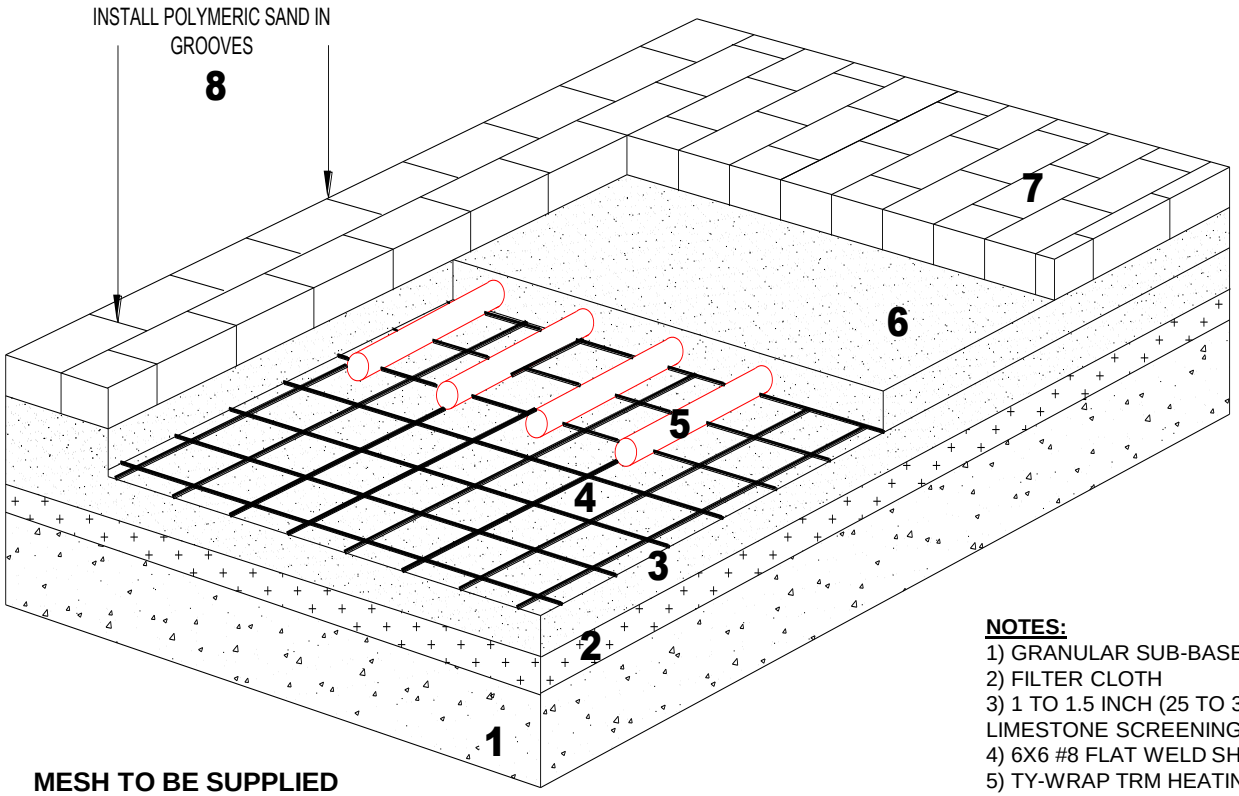
1. Secure the pre-punched strapping at 2 ft intervals to the base layer of concrete using anchors/screws

2. Serpentine the cable across the area using the pre-punched strapping to secure it in position

3. If using a slab sensing thermostat, install a 0.5” metal conduit between two runs of heating cable and away from high concentrations of heating cable. *You may install the thermostat at this time.*

4. Compact a 1” layer of sand or screenings above the heating cables

5. Lay the concrete pavers on top



MESH TO BE SUPPLIED AND INSTALLED BY GENERAL CONTRACTOR

NOTES:

1) GRANULAR SUB-BASE MATERIAL
2) FILTER CLOTH
3) 1 TO 1.5 INCH (25 TO 38 mm) OF COMPACTED LIMESTONE SCREENINGS OR SAND
4) 6X6 #8 FLAT WELD SHEET MESH
5) TY-WRAP TRM HEATING CABLES ON 6X6 MESH
6) 1 INCH (25mm) (ABOVE CABLES) LIMESTONE SREEENINGS OR SAND COMPACTED
7) CONCRETE PAVERS
8) INSTALL POLYMERIC SAND IN GROOVES

Pavers on Sand with Mesh

Pavers on Sand with Mesh Notes

1. For sloped areas, do not use sand as it may be washed away thus exposing and damaging the heating cables

2. Above the sub base material lay a filter cloth and compact 1” - 1.5” of limestone screening or sand

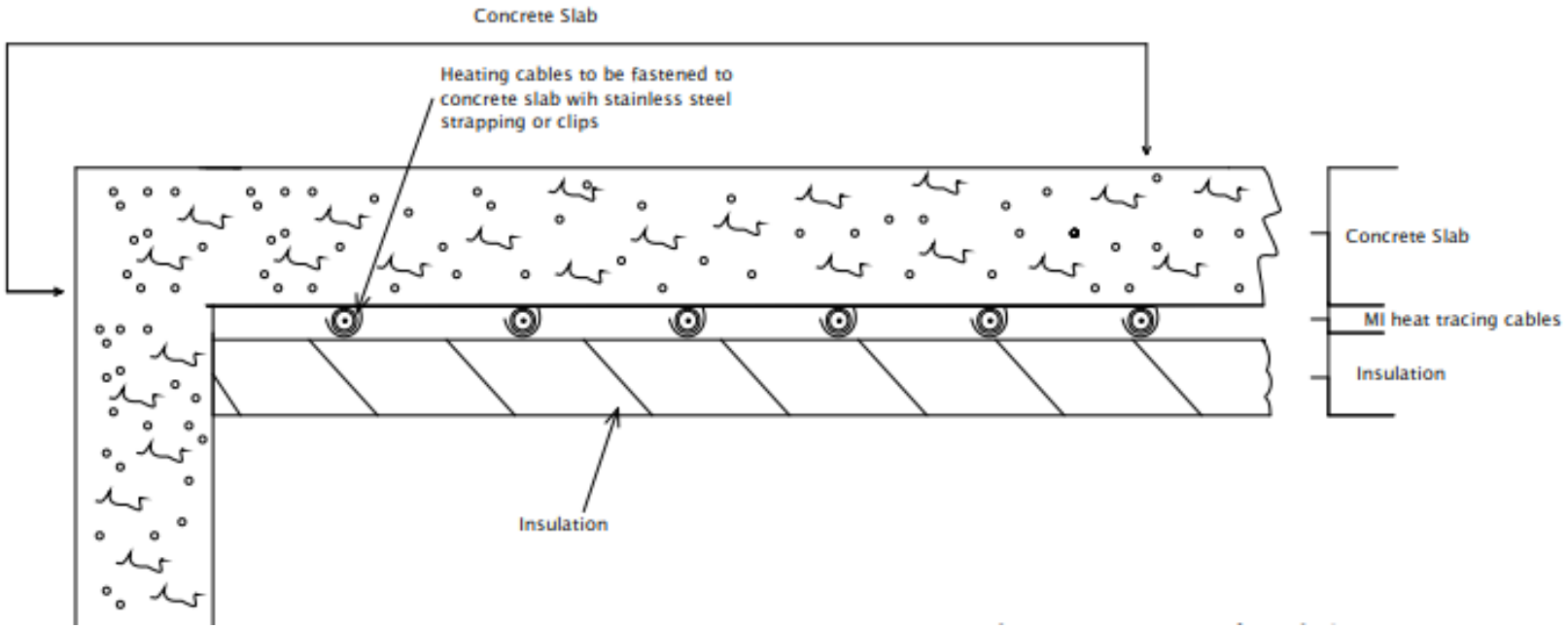
3. Lay a 6” x 6” mesh over the previous layer and secure the heating cable to this mesh using ty-wraps

4. If using a slab sensing thermostat, install a 0.5” metal conduit between two runs of heating cable and away from high concentrations of heating cable. *You may install the thermostat at this time.*

5. Compact a 1” layer of sand or screenings above the heating cables

6. Lay the concrete pavers on top

7. Install polymeric sand in the paving grooves



Heat Loss Replacement - Underslab Heating

Heat Loss Replacement - Underslab Heating Notes

1. Each zone/ area to be site measured and confirmed before cable installation

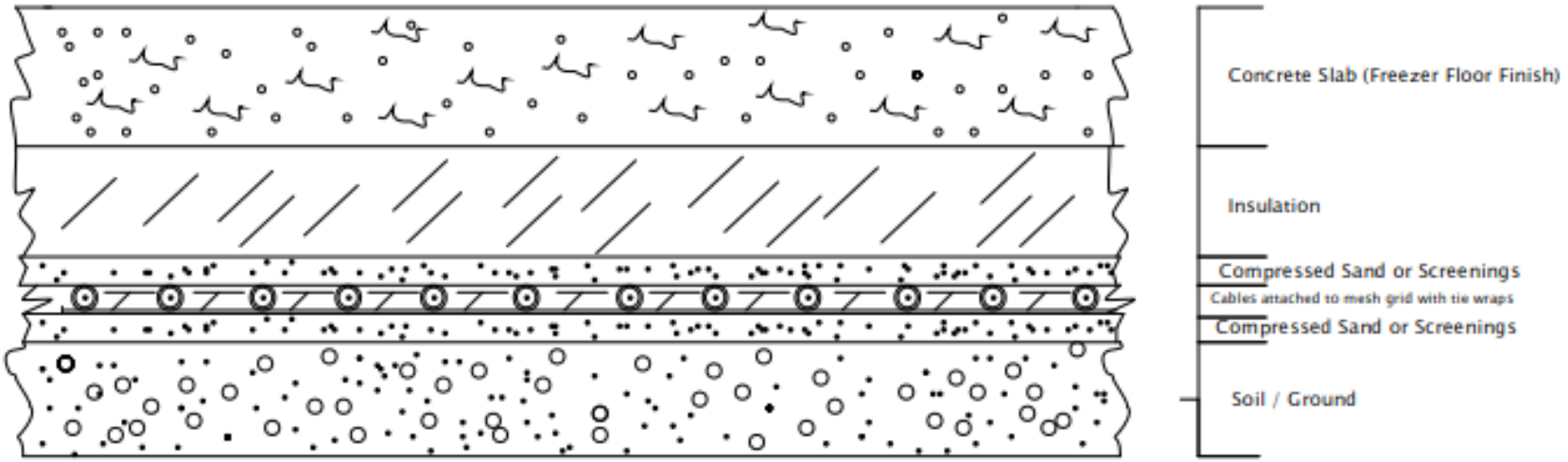
2. Control to be at a minimum, a basic mechanical t/stat per zone

3. Spacing per zone = Square footage x 12 / cable length in feet = spacing in inches.
   Typical cable spacing for HLR: 12” – 16”

4. Wattage per square foot = cable watts / square foot of area to be heated.
   Typical watts per square foot = 5 - 8

5. Cable type to be SR (Self regulating) or MI (Mineral insulated) type.

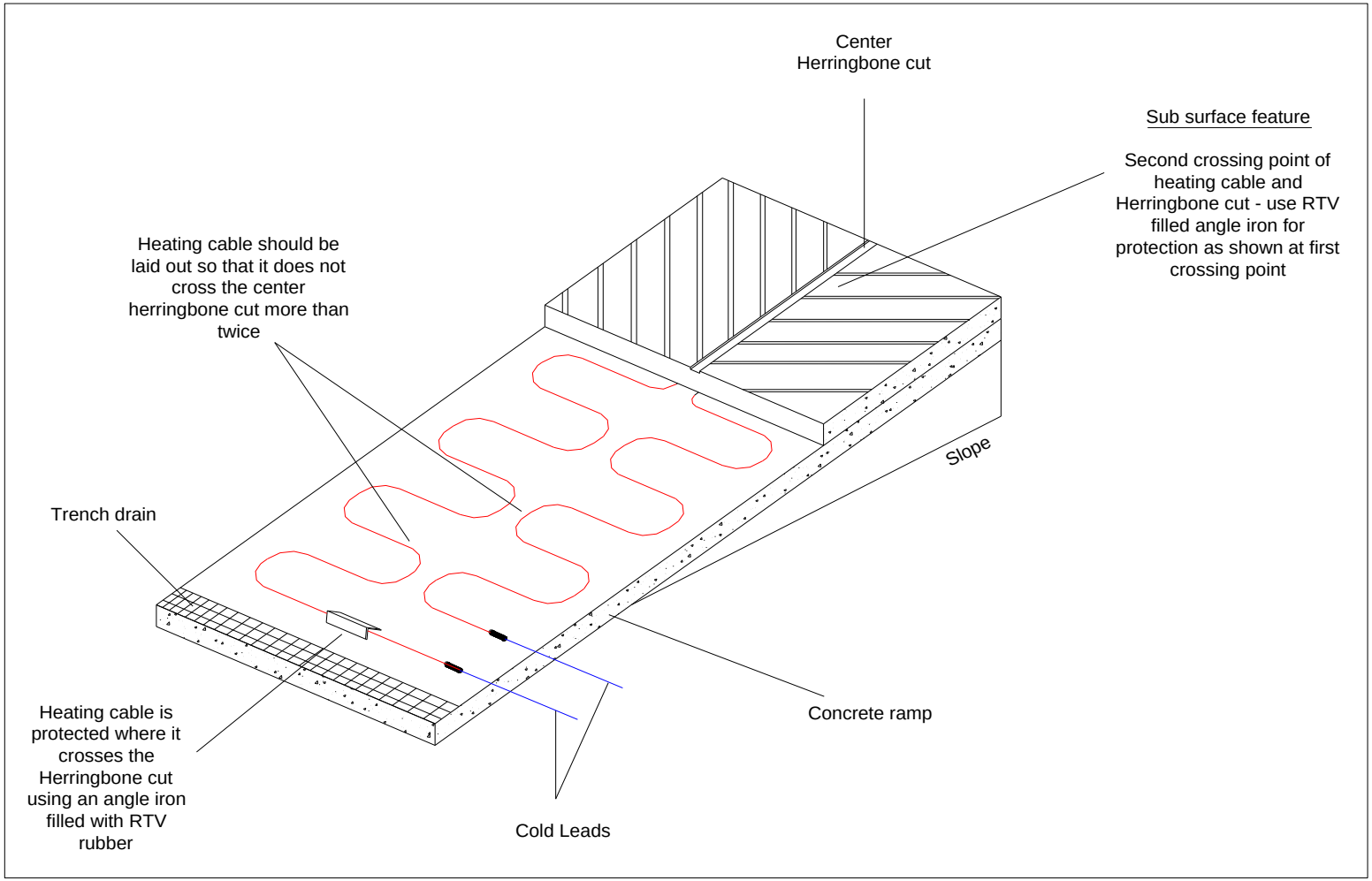
TRM Heating Cables



Frost Heave Prevention

Frost Heave Prevention Notes

1. Each zone/ area to be site measured and confirmed before cable installation
2. Cables to be entirely embedded well compacted sand or limestone screenings
3. Heated lengths of cables must be completely embedded in sand
4. Insulation to be installed above sand
5. TRM Brand MI Cables to be utilized
6. Aim for an application watt density of 4-5 watts per square foot
7. Maximum acceptable spacing: 48”



Herringbone Cut Cable Layout

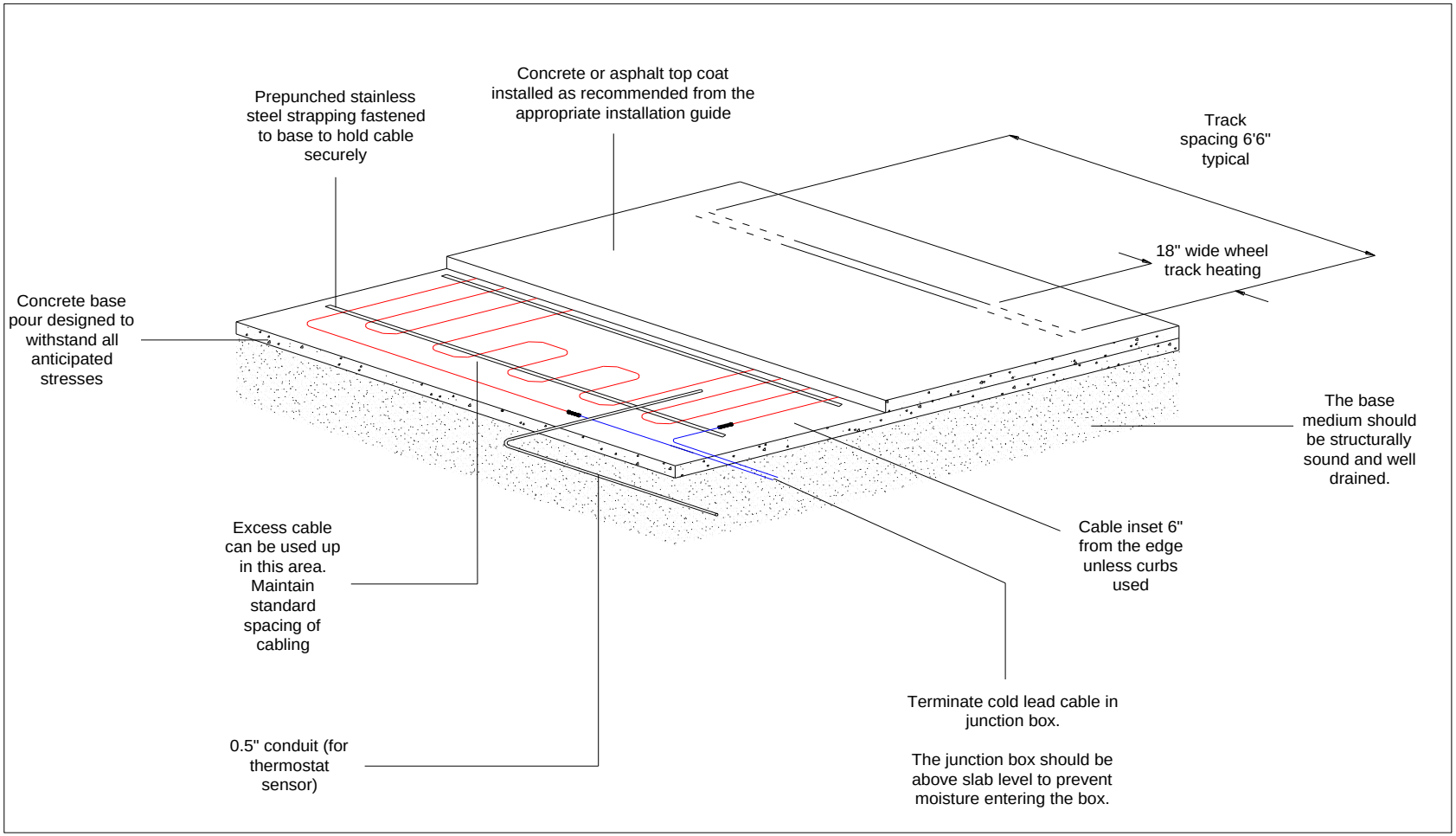
Herringbone Pattern Notes

1. Ensure that the heating cable layout does not cross the center herringbone cut more than twice

2. At these crossing points use an angle iron filled with RTV rubber to protect the cable

3. Ensure the minimum concrete cover is maintained, even when measured from the bottom of the herringbone cut to the cables. (minimum 2”)

4. Refer to the notes on pages 22-29 for more details on concrete installations



Wheel Track Cable Layout

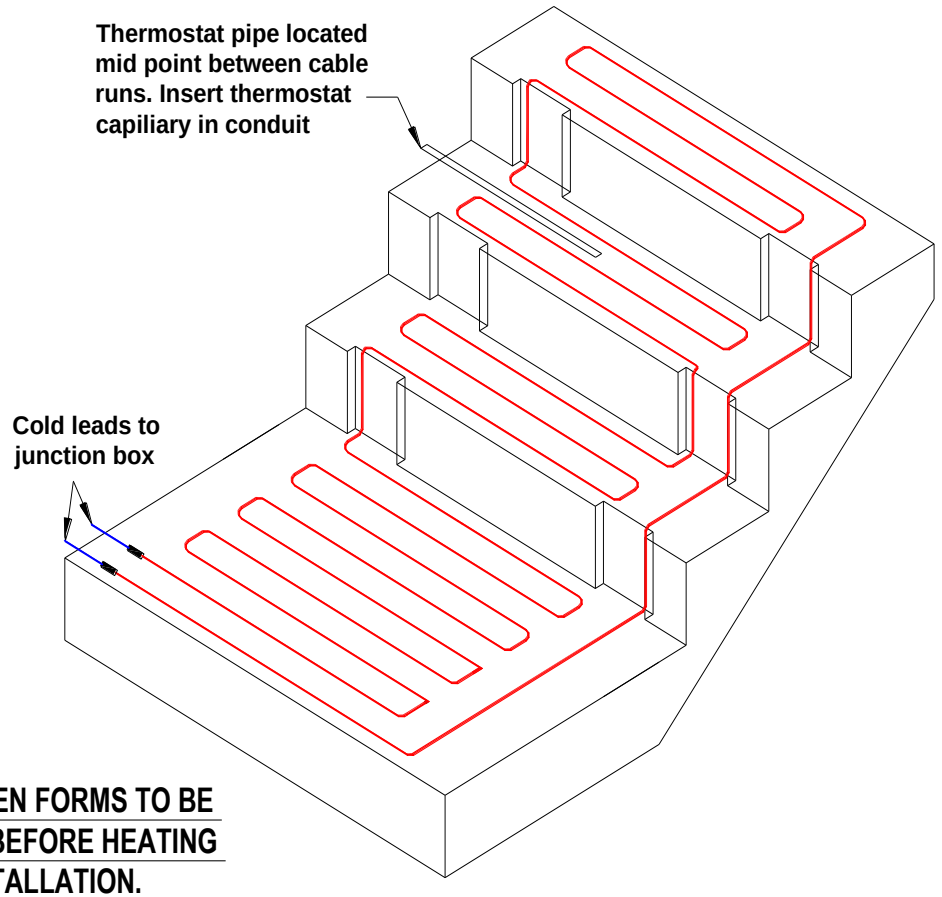
Wheel Track Notes

1. Only applicable for concrete and asphalt surfaced driveways

2. Check the track spacing is equal to the wheel spacing for the vehicle which will use the driveway

3. Typically use 4 runs of heating cable – spaced at 6” - for each wheel track

TRM
Heating Cables



ALL WOODEN FORMS TO BE REMOVED BEFORE HEATING CABLE INSTALLATION.

STAIR SNOW MELTING - CONCRETE TO BE POURED IN TWO POURS - HEATING CABLES TO BE ATTACHED TO BASE CONCRETE, THEN COVERED WITH 2-3" OF CONCRETE TOPPING.

HEATING CABLES

EACH HEATED AREA HAS A TRM HEATING CABLE. CABLE DESIGN AND PARAMETERS TO BE DETERMINED BASED ON SPECS AND STAIR DIMENSIONS.

CONTROL SYSTEM

CABLES TO BE CONTROLLED BY INDIVIDUAL THERMOSTATS, OR BY THE RAMP SNOW MELTING CONTROLLER/SNOW MELTING SENSOR SYSTEM.

Typical Stair Installation

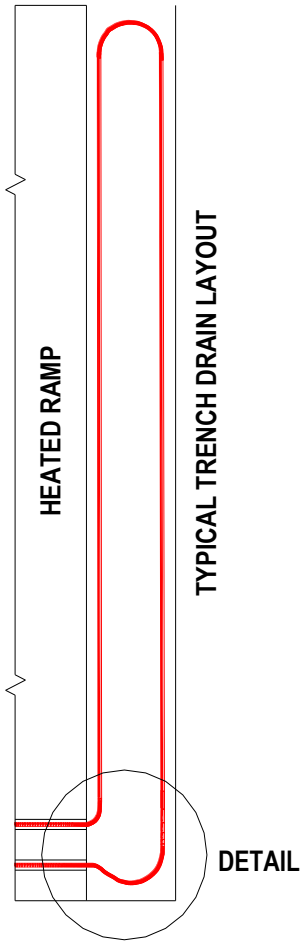
Stair Installation Notes

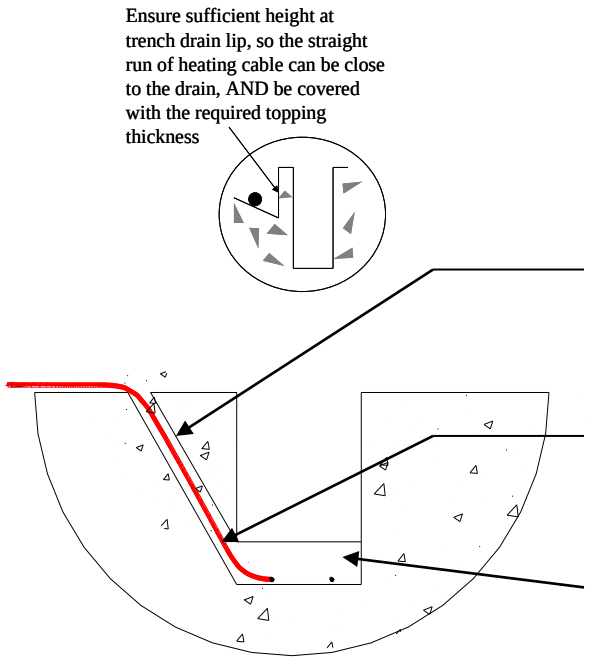
1. If rail posts are to be installed, mark their locations. Heating cable must be installed at least 4” away from rail posts.

2. If installation is 2 pour, round off the sharp outside edges of the steps where the heating cable will transition from the vertical to horizontal surface

3. Ensure the heating cable is covered with at least 2” of concrete

4. Cables to be secured to concrete by pre-punched strapping





STRUCTURAL DRAIN

1) DIAMOND CORE OR FORM TWO 2 INCH HOLES INTO THE CATCH BASIN. SPACE HOLES A MINIMUM OF 6 INCHES APART. INSTALL THE HEATING CABLE ENSURING THE COPPER IS NOT EXCESSIVELY WORK HARDENED

2) DRY PACK THE LOWER END OF THE HOLE WITH HYDRAULIC CEMENT. WHEN SET, MIX A VERY SLOPPY MIXTURE OF HYDRAULIC CEMENT AND FILL THE CAVITY

3) THE HEATING CABLE SHOULD BE EMBEDDED USING THE SAME METHOD AS THE RAMP CROSS-SECTION

4) WATERPROOF THE TRENCH DRAIN

POWER LOADING

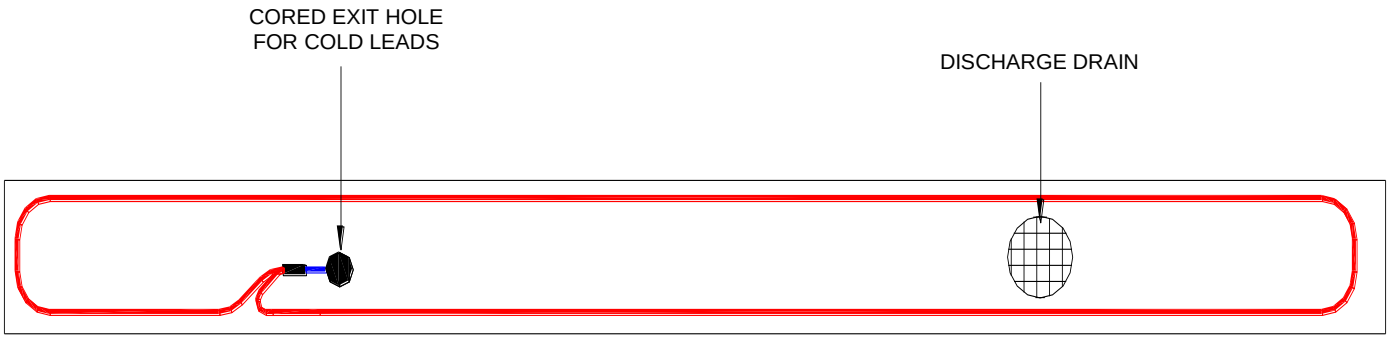
Provide a minimum of 35 Watts per Sq. Ft. of trench drain

Trench Drain Details

Trench Drain Notes

1. The Hole/Cavity MUST be completely filled with cement, to avoid air pockets around the heating cable. Failure to do this will result in early burnout of the heating cable. This is EXTREMELY IMPORTANT.

2. If the trench drain heating cable replacement is part of a ramp reconstruction – first remove the existing topping and heating cables



DRAIN HEATING CABLE

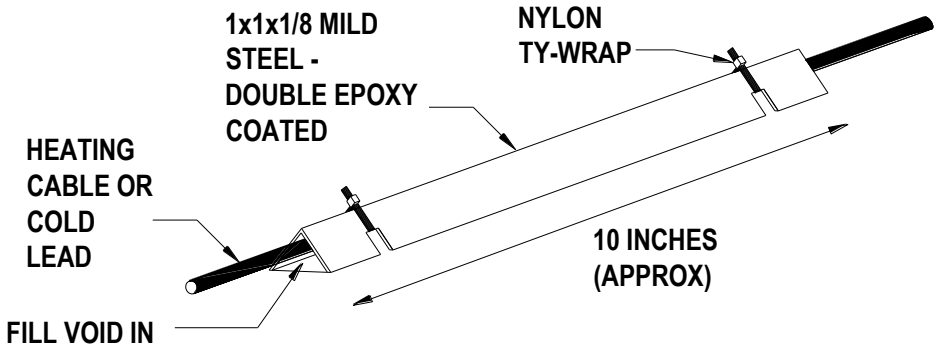
HEATED AREA HAS ONE HEATING CABLE

TYPICAL DESIGN OF HEATING CABLE (CONFIRM AGAINST ACTUAL TRENCH LENGTH/WIDTH) TO PROVIDE MINIMUM 35 WATTS / SQ.Ft.

CONTROL SYSTEM

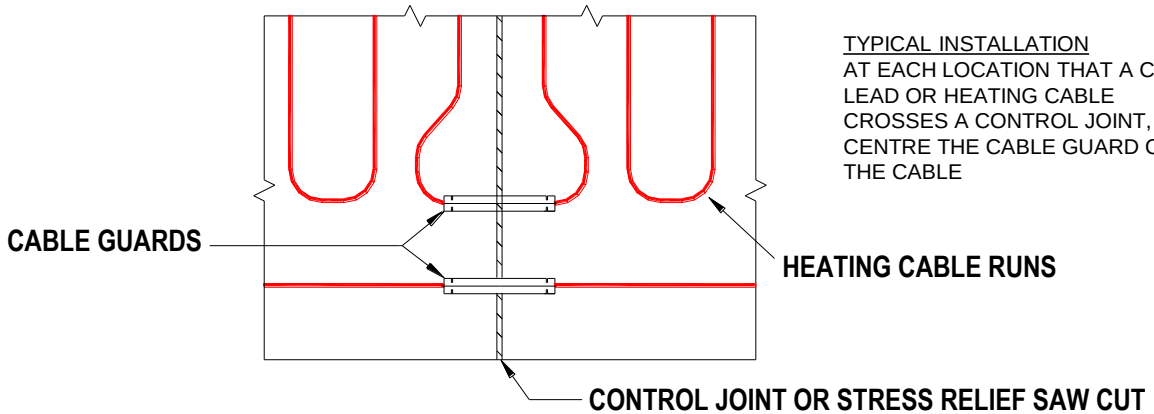
THE HEATING CABLES ARE CONTROLED BY INDIVIDUAL THERMOSTATS, OR BY THE RAMP SNOW MELTING CONTROLLER / SNOW SENSOR SYSTEM.

Trench Drain Only Installation - Plan View



CABLE GUARDS FOR CROSSING CONTROL JOINTS

THE FUNCTION OF THE CABLE GUARD IS TO USE THE STRUCTURAL STRENGTH OF THE ANGLE IRON TO MINIMIZE THE DIFFERENTIAL MOVEMENT OF THE CONCRETE ACROSS THE CONTROL JOINT WHILE THE SILICONE RUBBER CONDUCTS THE HEAT AWAY FROM THE HEATING CABLE.



TYPICAL INSTALLATION
AT EACH LOCATION THAT A COLD LEAD OR HEATING CABLE CROSSES A CONTROL JOINT, CENTRE THE CABLE GUARD OVER THE CABLE

Cable Guards

Cable Guard Notes

Manufacturing

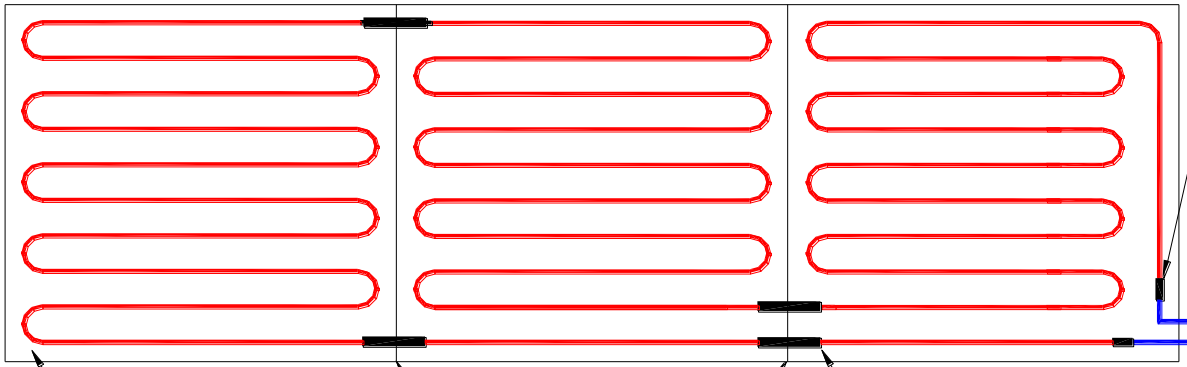
1. Cable guard manufactured from 1 x 1 x 1/8 inch mild steel
2. Double – epoxy coated for chemical resistance

Field installation for heating cable laid directly on a surface

1. Place a heavy bead of silicone rubber at the bottom of the "v"
2. Nylon ty-wrap the heating cable or cold lead in place
3. Fill the balance of the "v" with silicone rubber
4. Place the flat (open) part of the angle on the heated surface with the cable guard bisecting the control joint at right angles

Field installation for heating cable installed on a wire mesh

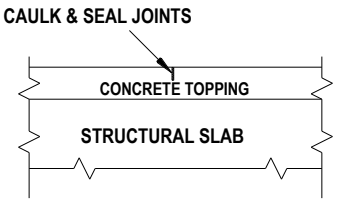
1. Items 1 through 3 same as above
2. Place the flat (open) part of the angle facing up on the wire mesh (this prevents the silicone rubber from flowing out) with the cable guard bisecting the control joint at right angles.
3. If the concrete topping is to be saw cut, ensure that the cable guard will not be cut. if the depth is not sufficient, locally cut the steel mesh to lower the cable guard in the location on the saw cut control joint.



TYPICAL CABLE LAYOUT

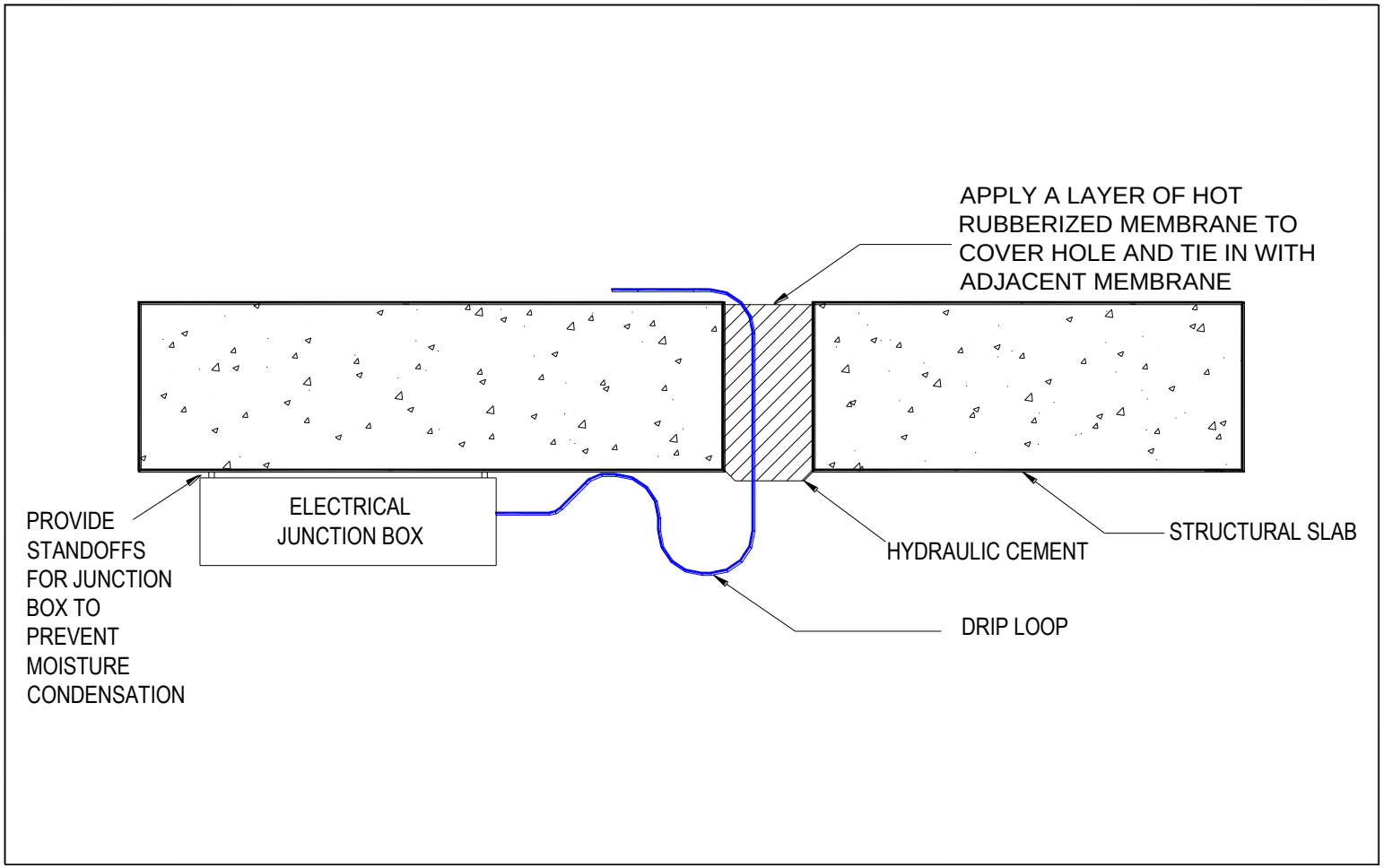
CONTROL JOINTS

1) IF SLAB ON GRADE - SAW CUT BASE SLAB TO 1/3 DEPTH OF SLAB
2) CAULK AND SEAL JOINT
3) ACCURATELY MARK THE LOCATION OF THE CONTROL JOINTS
4) PLACE CONCRETE TOPPING
5) PLACE TOPPING SAW CUT DIRECTLY OVER BASE SAW CUTS. MAXIMUM DEPT OF SAW CUT - 25mm



TYPICAL CONTROL JOINT DETAIL

Control Joint Layout



Cold Lead Slab Waterproofing

Cold Lead Slab Notes

1. Diamond core hole(s) through the structural slab.
2. Mount the electrical junction(s) on standoffs (min 0.375 inch) leaving enough distance from the cored hole to form the drip loops.
3. Install the cold leads into the junction box, then form the drip loops in the cold leads.
4. When all the cold leads have been installed space the cold leads in the hole.
5. Dry pack the lower end of the hole with hydraulic cement. When set mix a sloppy batch of hydraulic cement and fill the hole from the top.
6. When dry apply hot rubberized membrane to the top of the hole and tie in with the structural slab waterproofing.

TRM Heating Cables

Section 5:

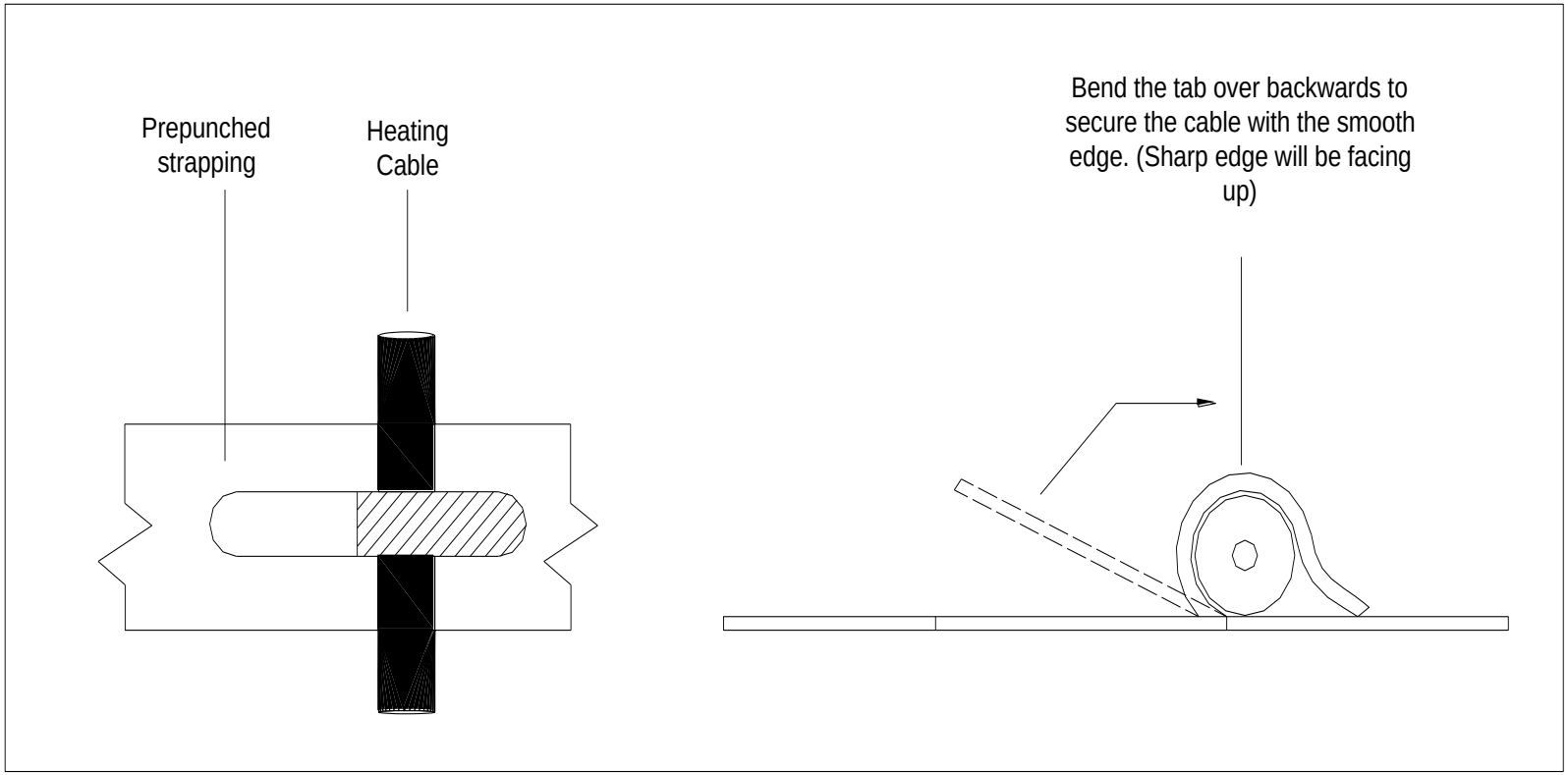
Installation Procedures

Put cable unit onto the payoff reel

Take first cold lead end from payoff reel

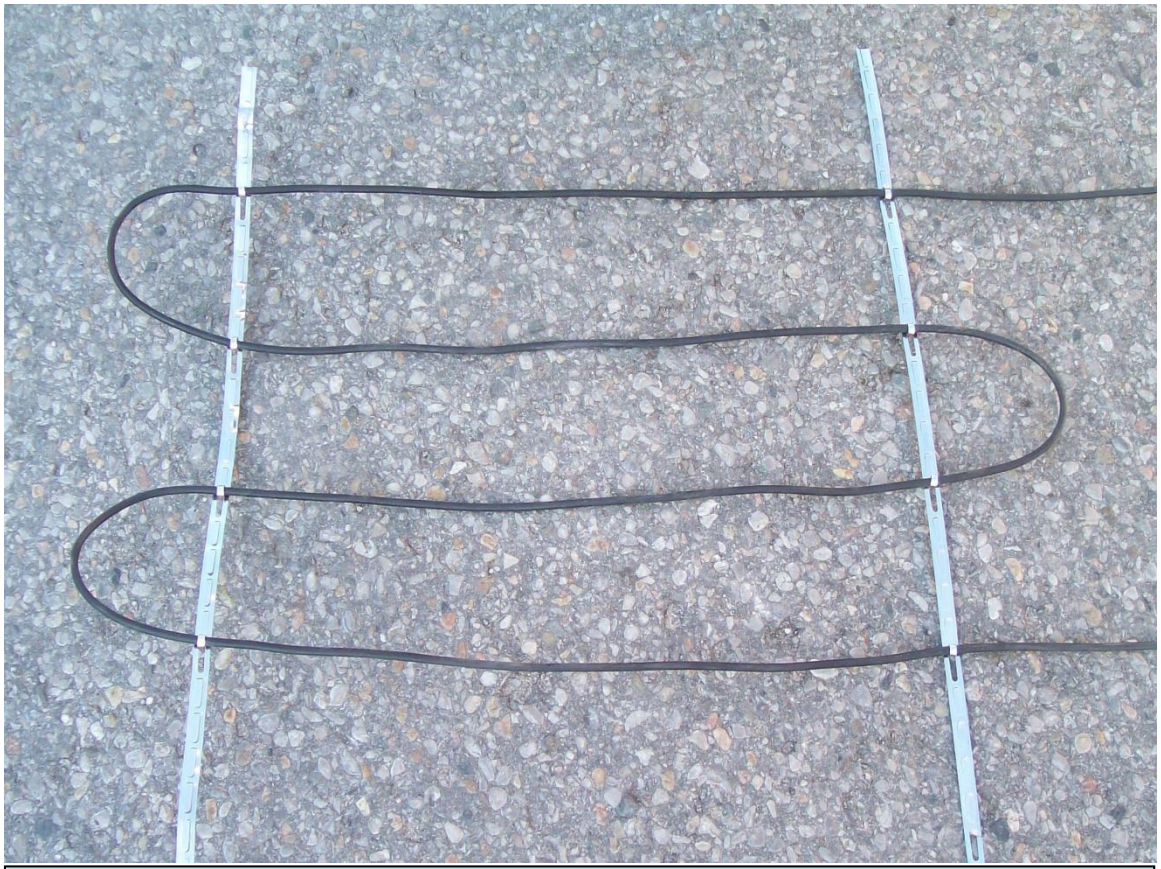
Secure hot/cold joint and keep the joint straight

Bend tabs back to accept the cable. WEAR SAFETY GLOVES



Bending tabs on pre-punched strapping

Tabs in the bent back position



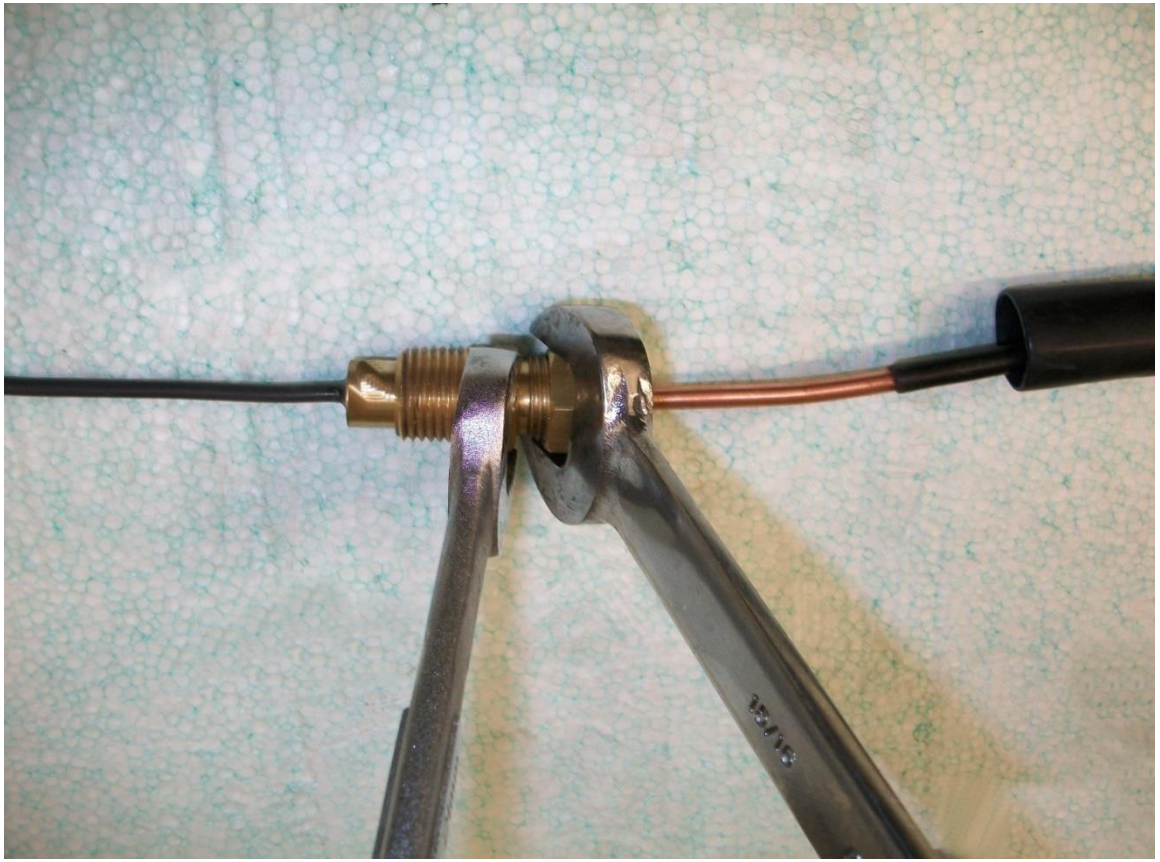
Serpentine the cable on the strapping. Ensure equal spacing throughout

The next procedure instructions deal with the installation of cold leads to the junction box

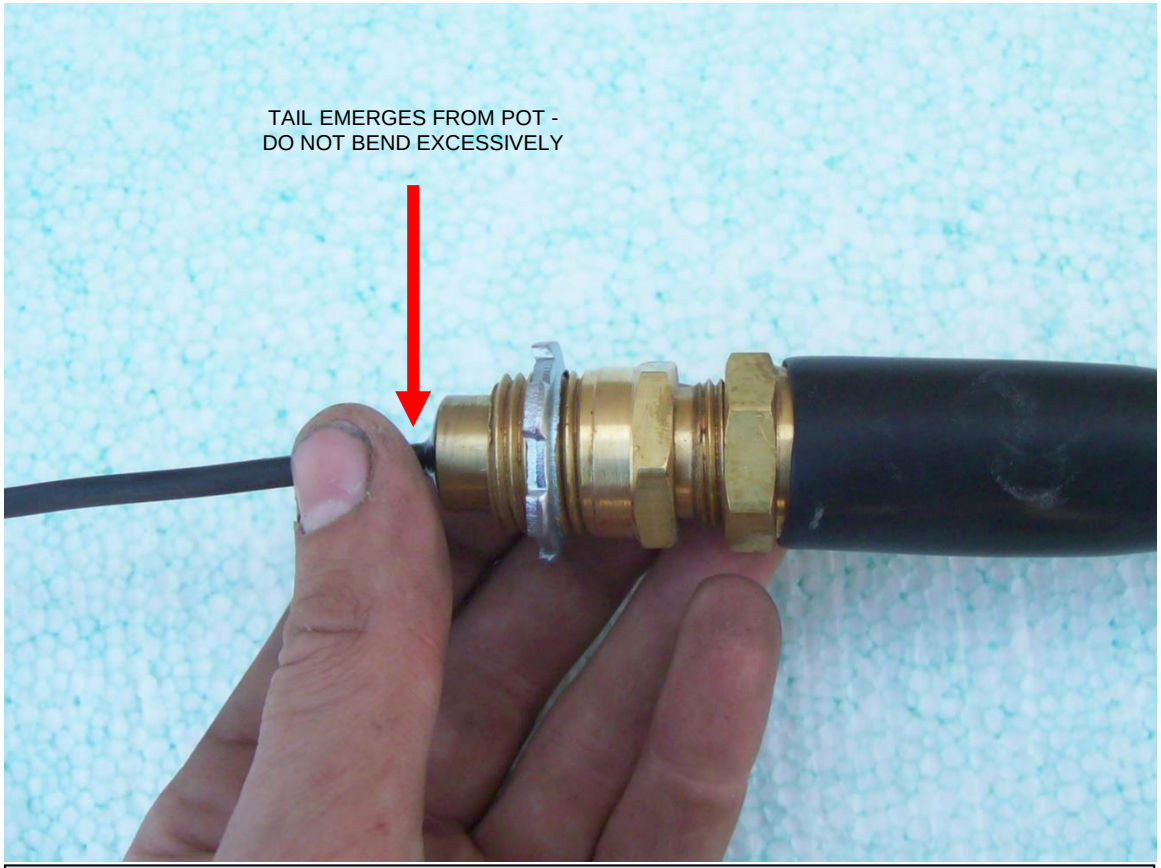
Procedures differ depending on whether the junction box is *metallic* or *nonmetallic*

Continue to the next page for installation details on metallic junction boxes

If the junction box is nonmetallic (e.g. PVC), skip to page 71

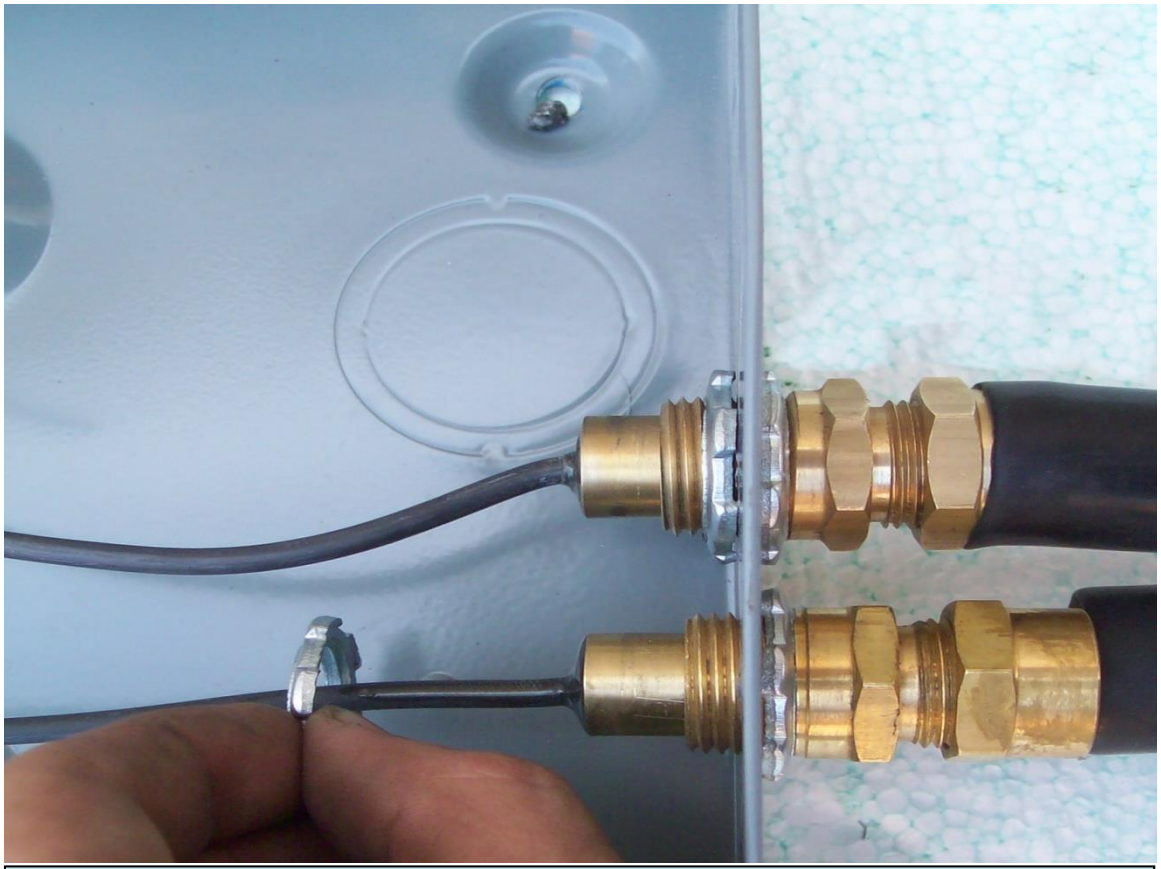


Metallic Junction Box – First tighten the gland connection making sure it is pushed up against the pot



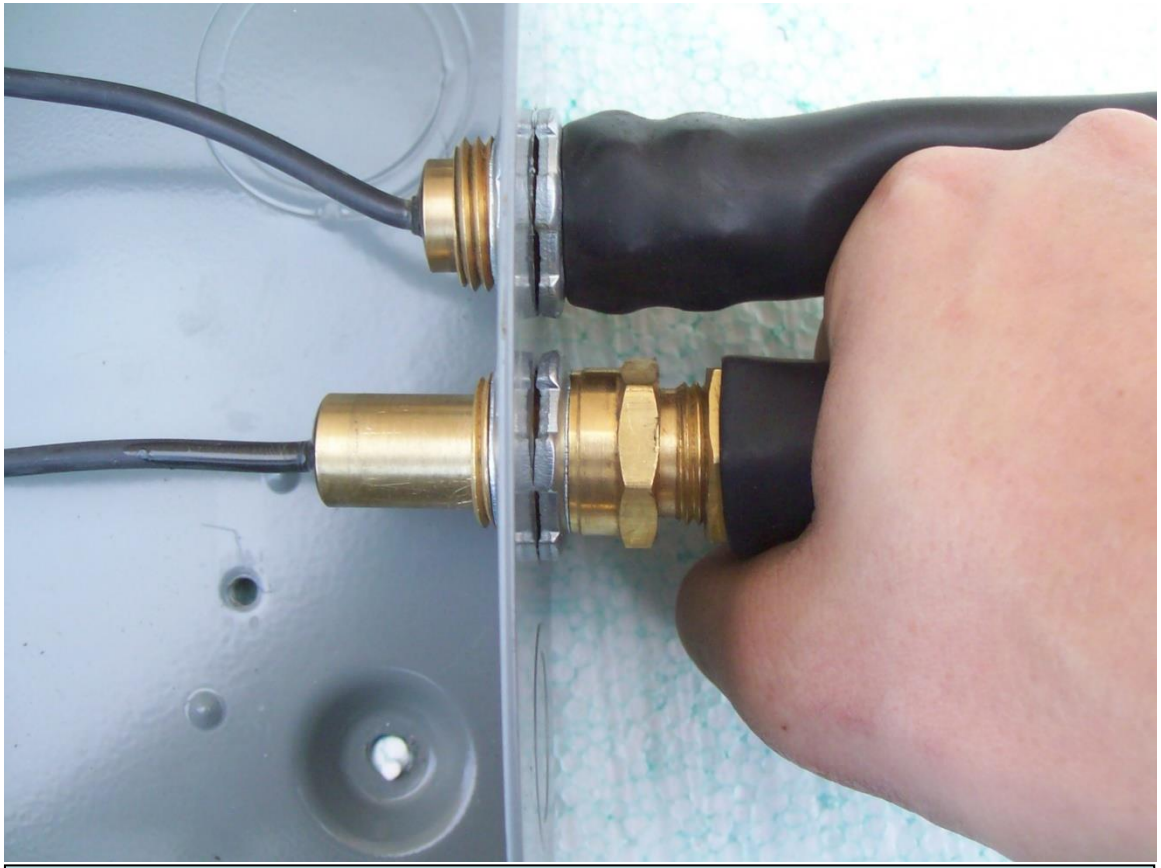
Metallic Junction Box - Screw the first lock nut onto the cable gland

NOTE - Throughout installation refrain from excessive bending of the cable tails, especially where they emerge from the pot



Metallic Junction Box - Push the glands into the electrical box and secure with the second lock nut on the inside of the box

Metallic Junction Box - How a properly secured gland will look



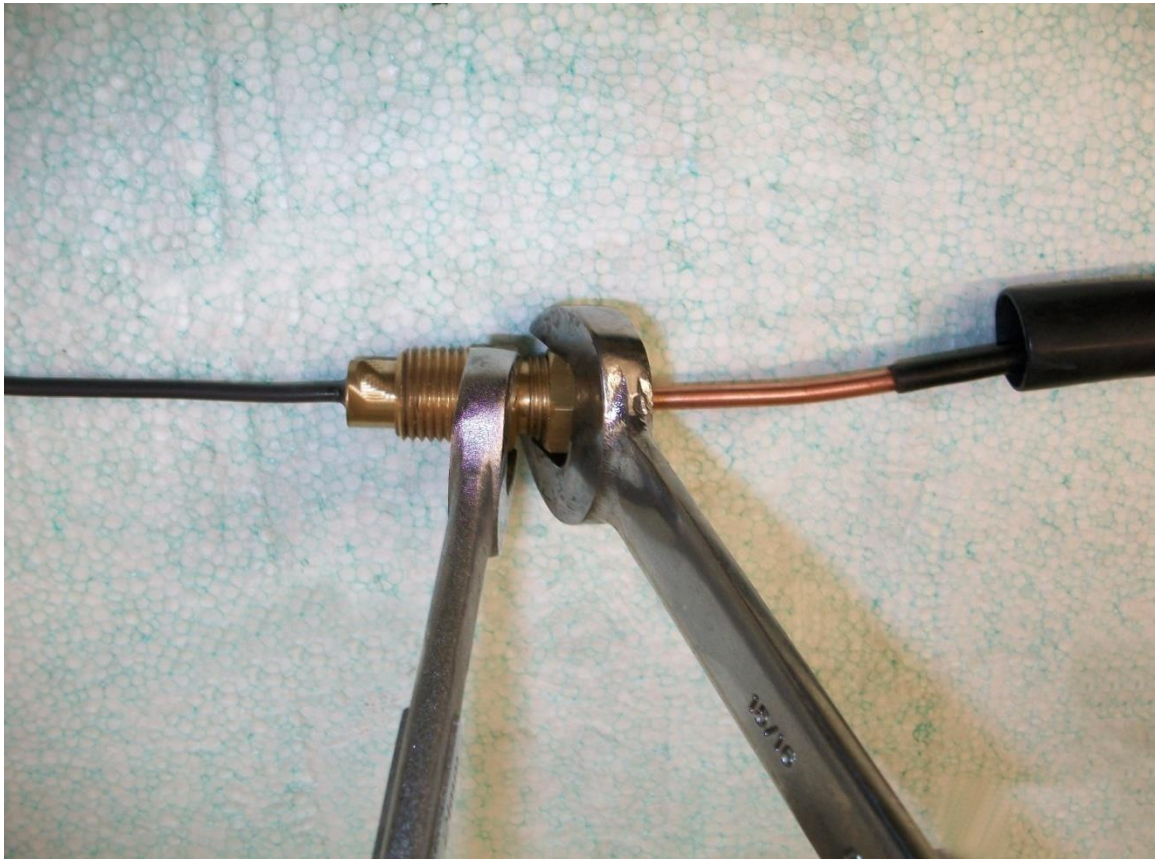
Metallic Junction Box - Push the shroud up and over the bottom of the gland

Metallic Junction Box - The shroud should now fully encapsulate the bottom of the gland

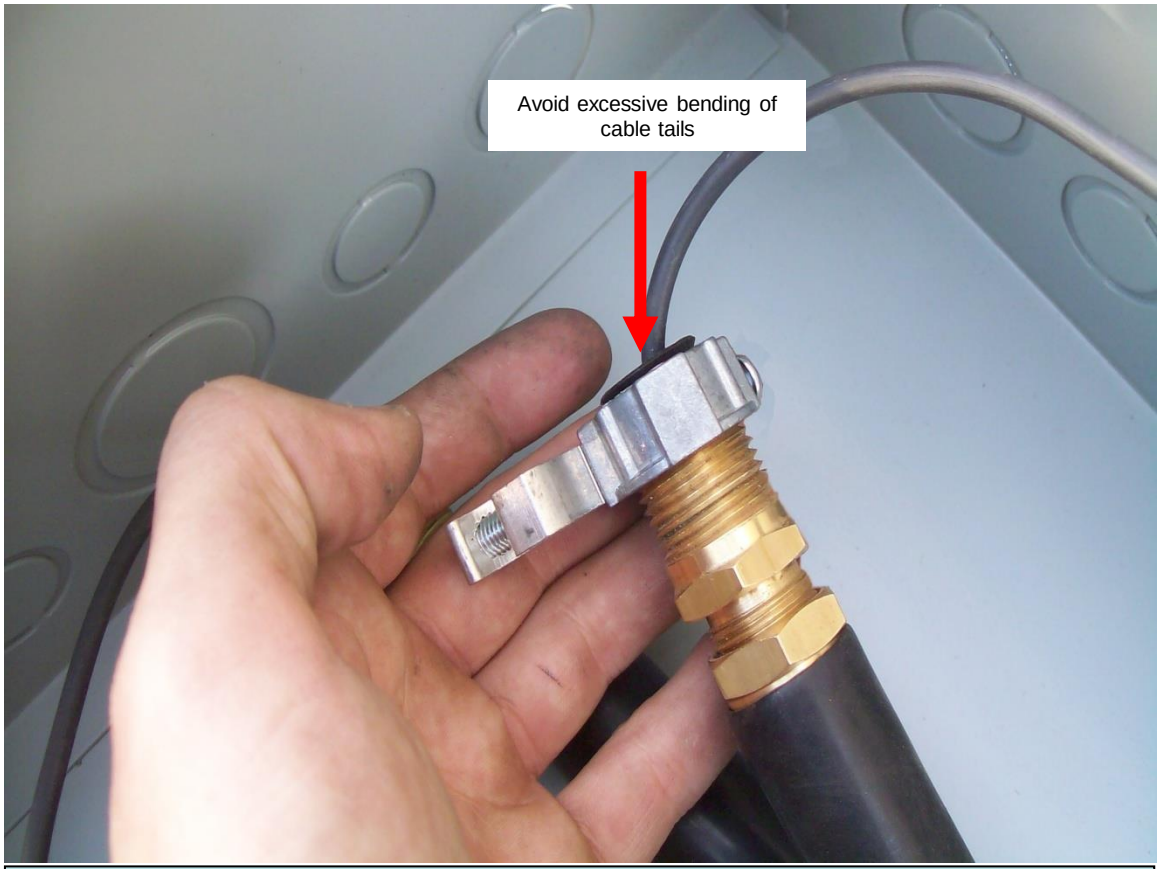
For instructions on how to wire a metallic junction box, please refer to the electrical connections chapter. (SECTION 6)

The following procedures refer to nonmetallic junction boxes

If using a *nonmetallic junction box*, you will need ground bushings for each cable



Nonmetallic junction box – First tighten the gland connection making sure it is pushed up against the pot



Nonmetallic junction box - Feed the cables in the box FIRST, then screw on the ground bushings to the gland

NOTE - Throughout installation refrain from excessive bending of the cable tails, especially where they emerge from the pot

Nonmetallic junction box - How the ground bushings will look when installed on the cables

Refer to the electrical connections chapter (SECTION 6) for instructions on how to wire a nonmetallic junction box

TRM Heating Cables

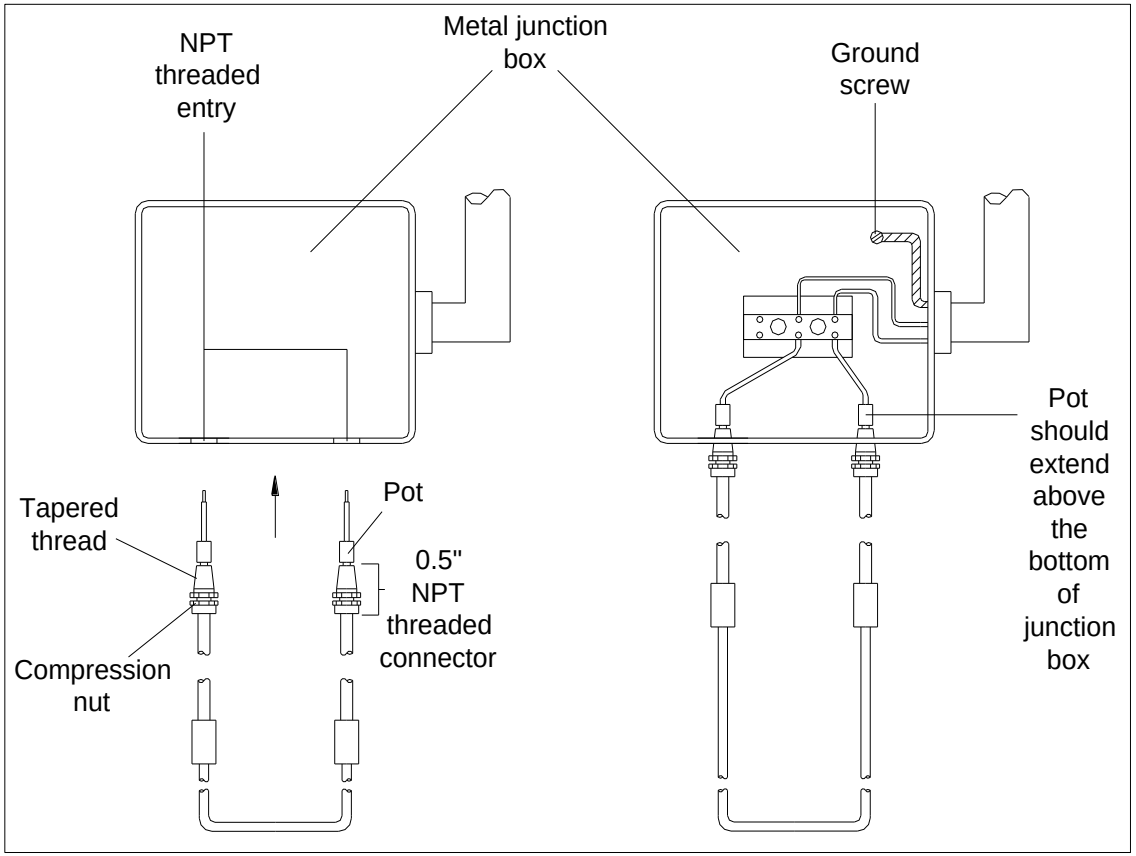
Section 6:

Electrical Connections

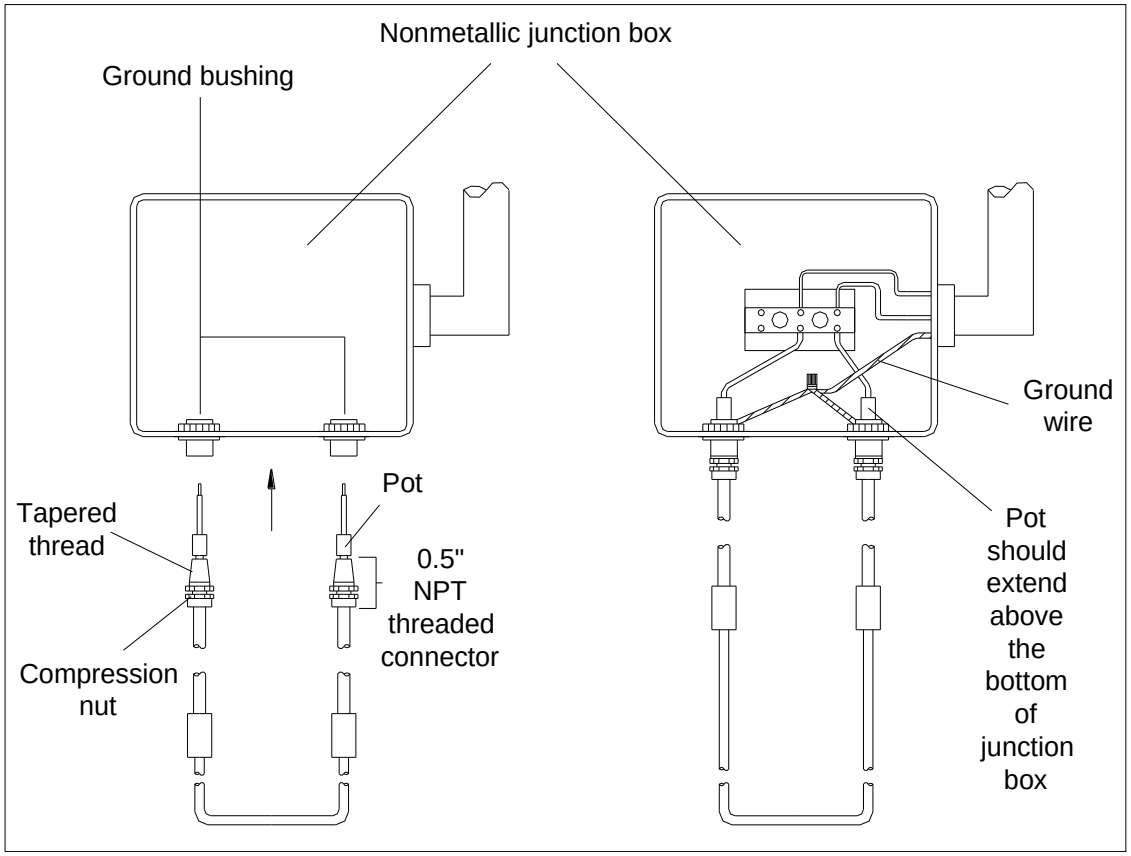
Making the Cold Lead Connections

Wire schematics are provided on the next two pages for metallic and nonmetallic junction boxes

When installing the cold lead pot, make sure the pot extends above the bottom of the junction box as shown in the following diagrams



Metallic junction box wiring instructions



Nonmetallic junction box wiring instructions

TRM Heating Cables

Section 7:

Control Methods

Control of Snow Melting Systems

Snow melting systems need to be controlled so that the system turns on when snow is imminent and turns off when conditions become milder. This ensures that the system runs as efficiently possible saving both energy and money.

There are three main methods of control:

1.Manual On/Off Control

2.Slab Sensing Thermostat

3.Automatic Snow Controller

Manual On/Off Control

- Recommended only for small areas
- Cheaper initial cost
- Less energy efficient than slab sensing thermostats / automatic snow controllers
- Requires manual monitoring
- Prone to being left on accidentally

Slab Sensing Thermostat

- Used to energize the system when slab temperature drops below freezing
- Recommended for all installations
- Not very energy efficient when used as the sole means of control
- ***More*** energy efficient when used in conjunction with an automatic snow controller
- Required for all Asphalt and Mastic installations to prevent the surface overheating

Automatic Snow Controller

• Energizes the system when both precipitation and low temperature are detected

• System remains “on hold” once precipitation or low temperatures have ceased, allowing the surface to completely dry. Then the system will de-energize itself

• When combined with a slab sensing thermostat, the system will de-energize once the slab has reached the thermostat set point which will not allow snow to settle, even when falling snow is still present

• Using an automatic snow controller in conjunction with a slab sensing thermostat offers the most energy efficient control solution

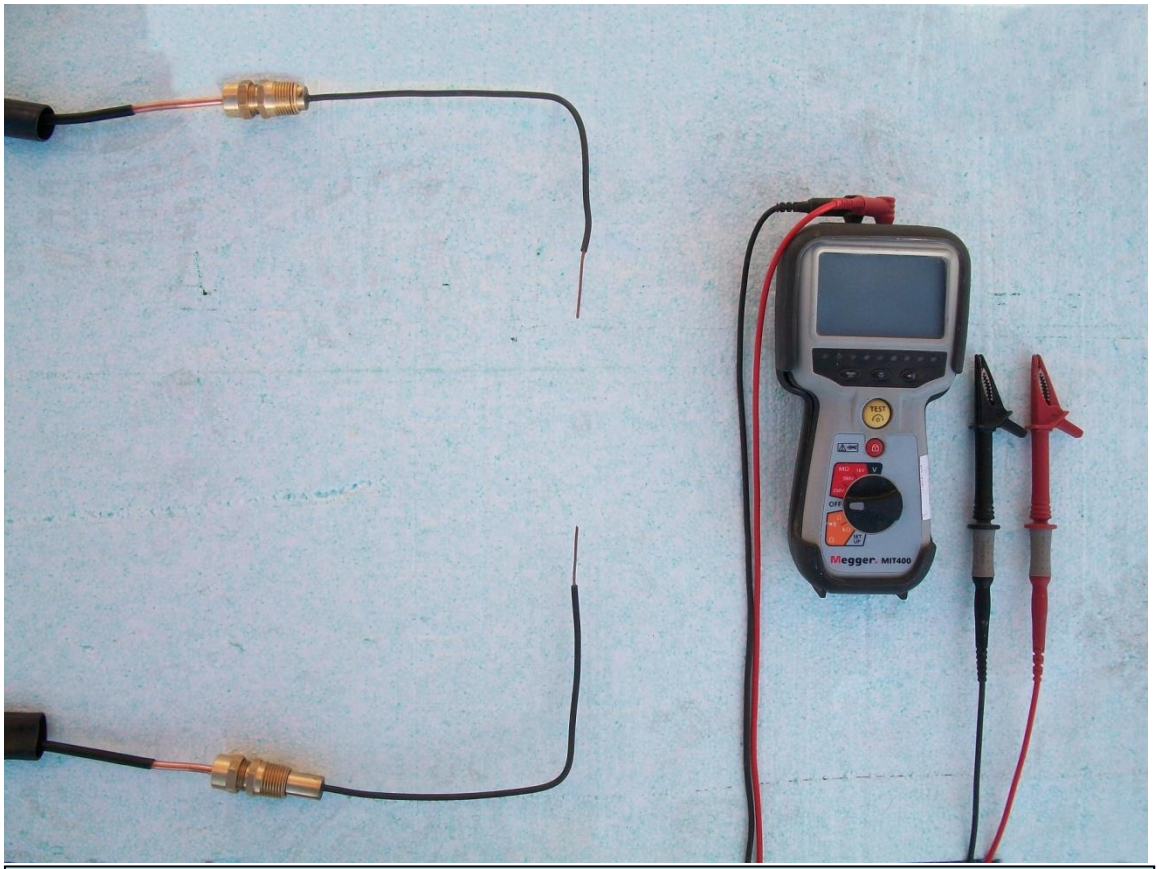
TRM Heating Cables

Section 8:

Test Procedures

Insulation Resistance Test

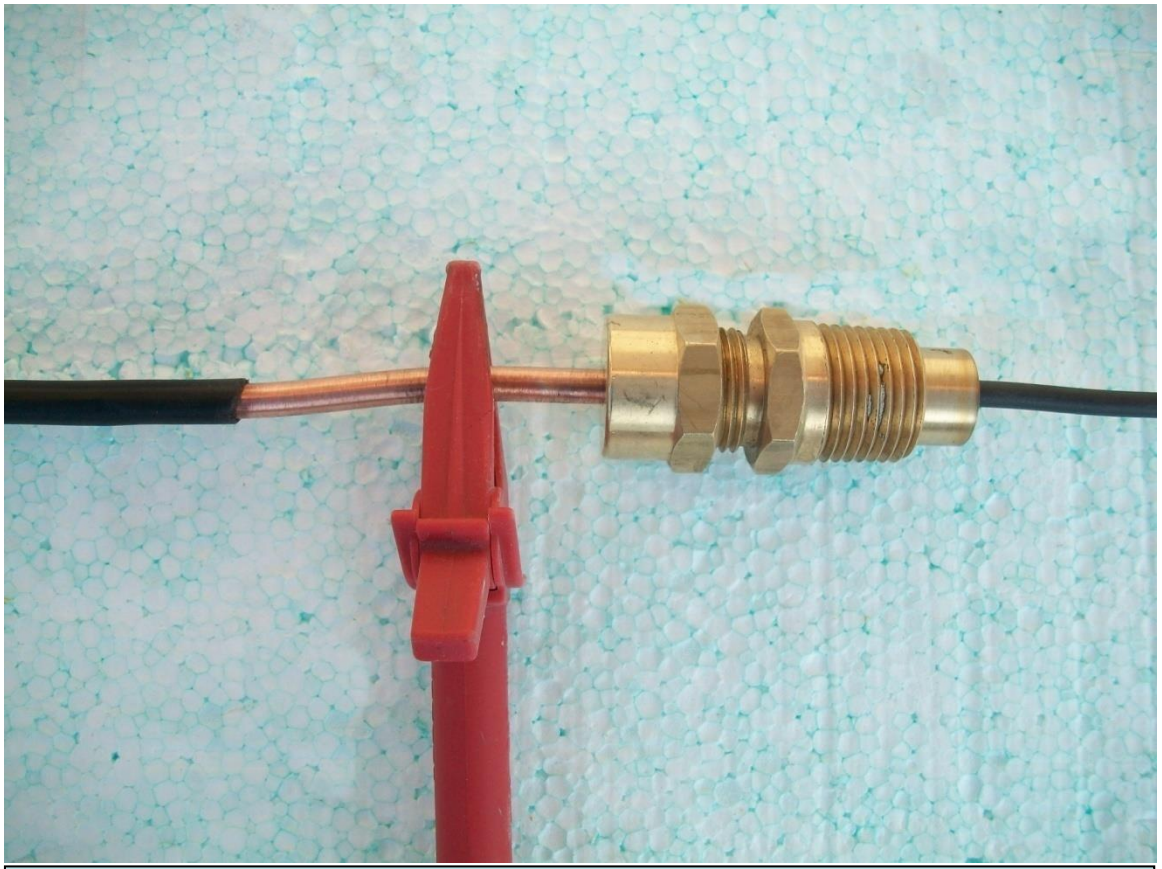
- Make sure the cable is clean and dry before testing
- Cable should be insulation tested **before**, **during** and **after** installation
- Results of the testing should be noted for future reference in the tables included within this section



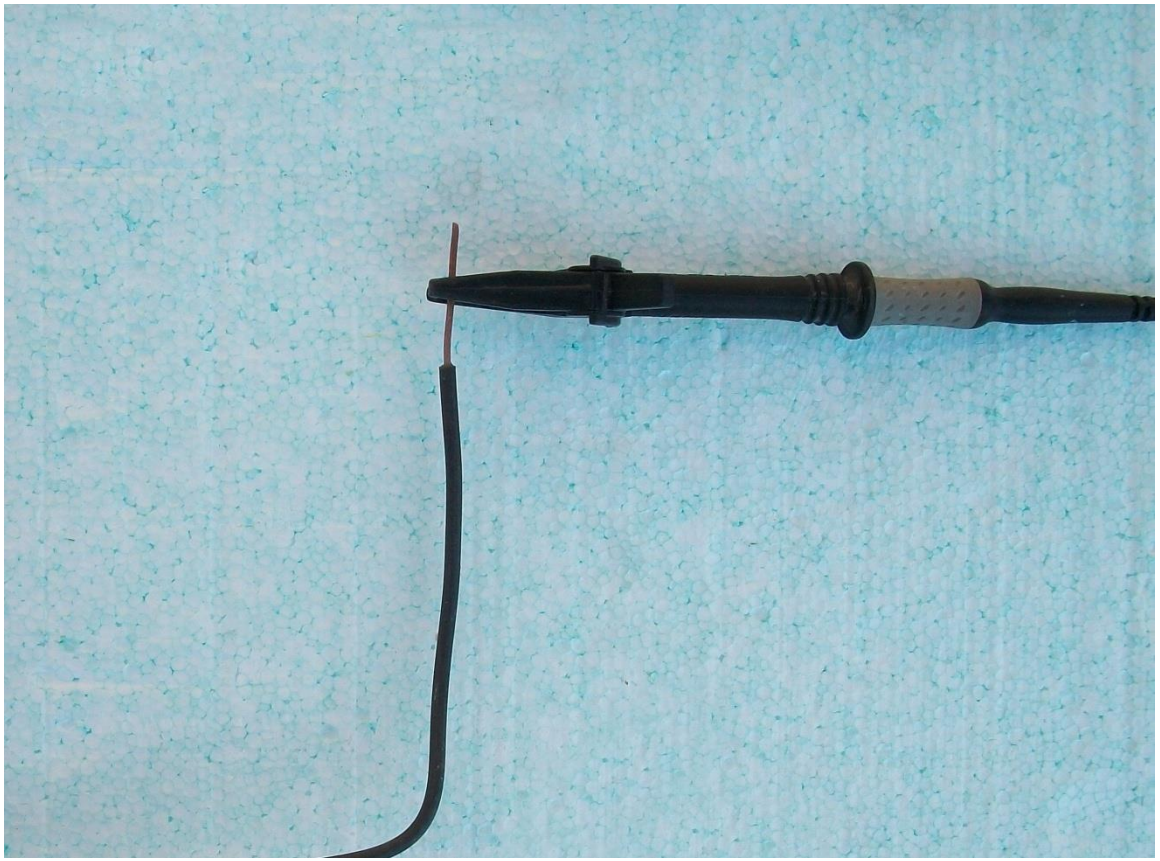
Apparatus Required

- Megohmmeter capable of supplying 500 Vdc
- Heating cable with both tail ends accessible for testing

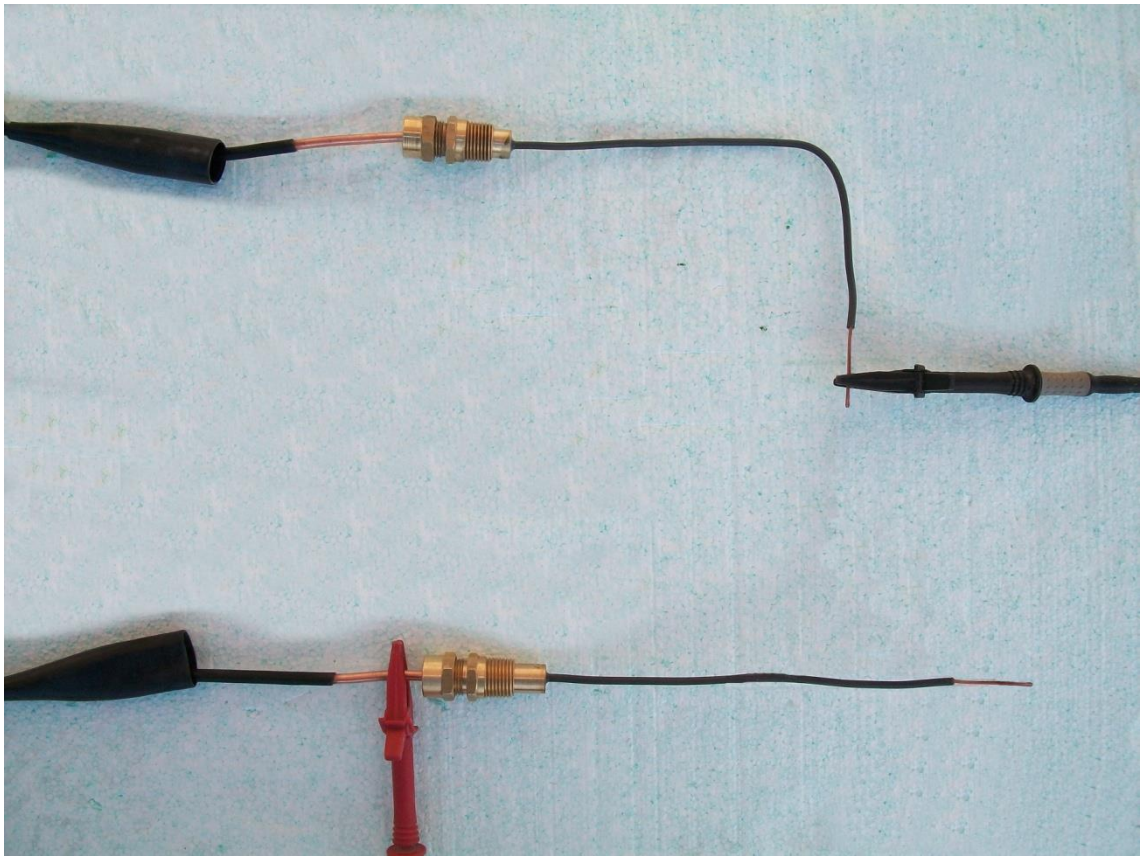
Set the megohmmeter voltage to 0 Vdc



Connect the positive lead to the copper sheath of the heating cable



Connect the negative lead to one of the heating cable tails



How the completed circuit should look before testing

Turn on the megohmmeter and set the voltage to 500Vdc

Apply voltage to the cable and allow time for the reading to settle

A good cable will have greater than 200 MΩ of insulation resistance at all stages of testing

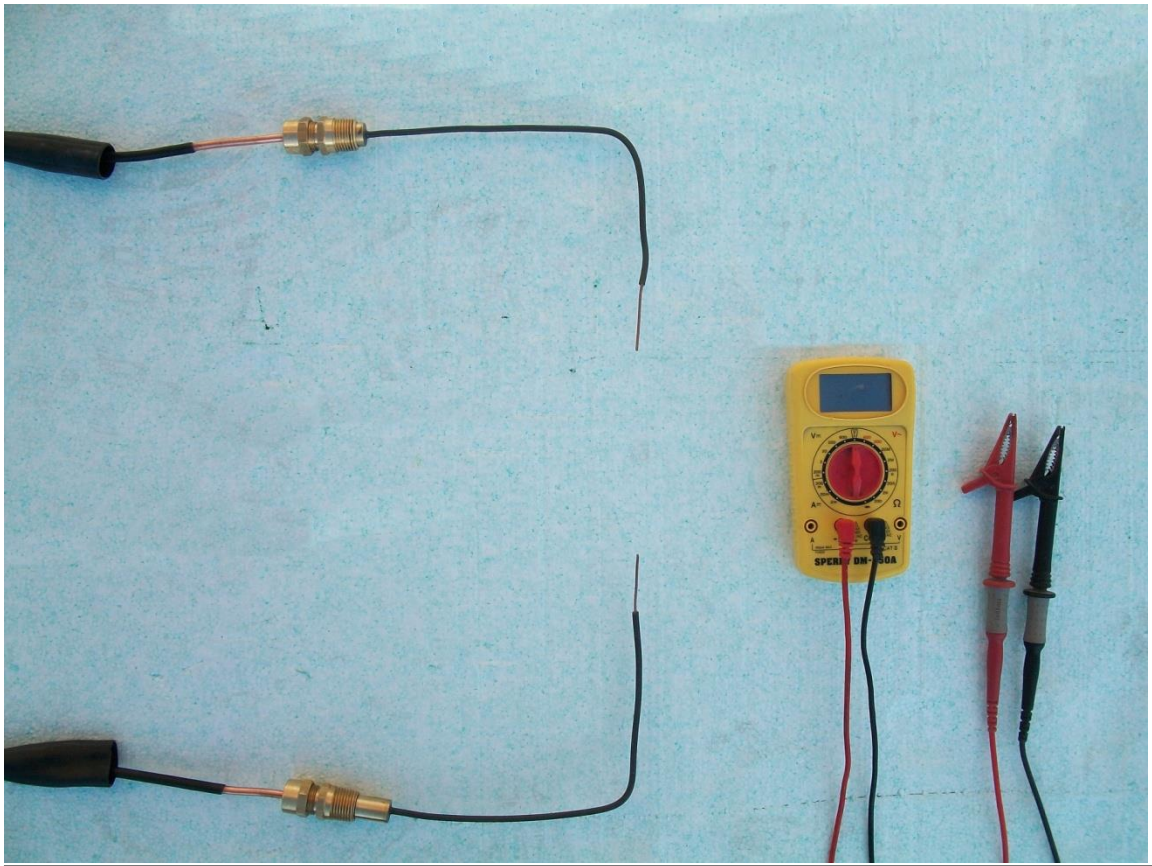
If the insulation resistance rating is lower than 200 Mohms cable may have been damaged. If the cable ends are wet, and / or the atmosphere is wet/humid, the IR readings can be lower - If so, dry the ends of the cable and the leads of the megger completely, and retest.

	Insulation Resistance Reading (Ohms)
Before installation	
During installation	
Post installation	

Record the insulation resistance value in the table

Continuity Resistance Test

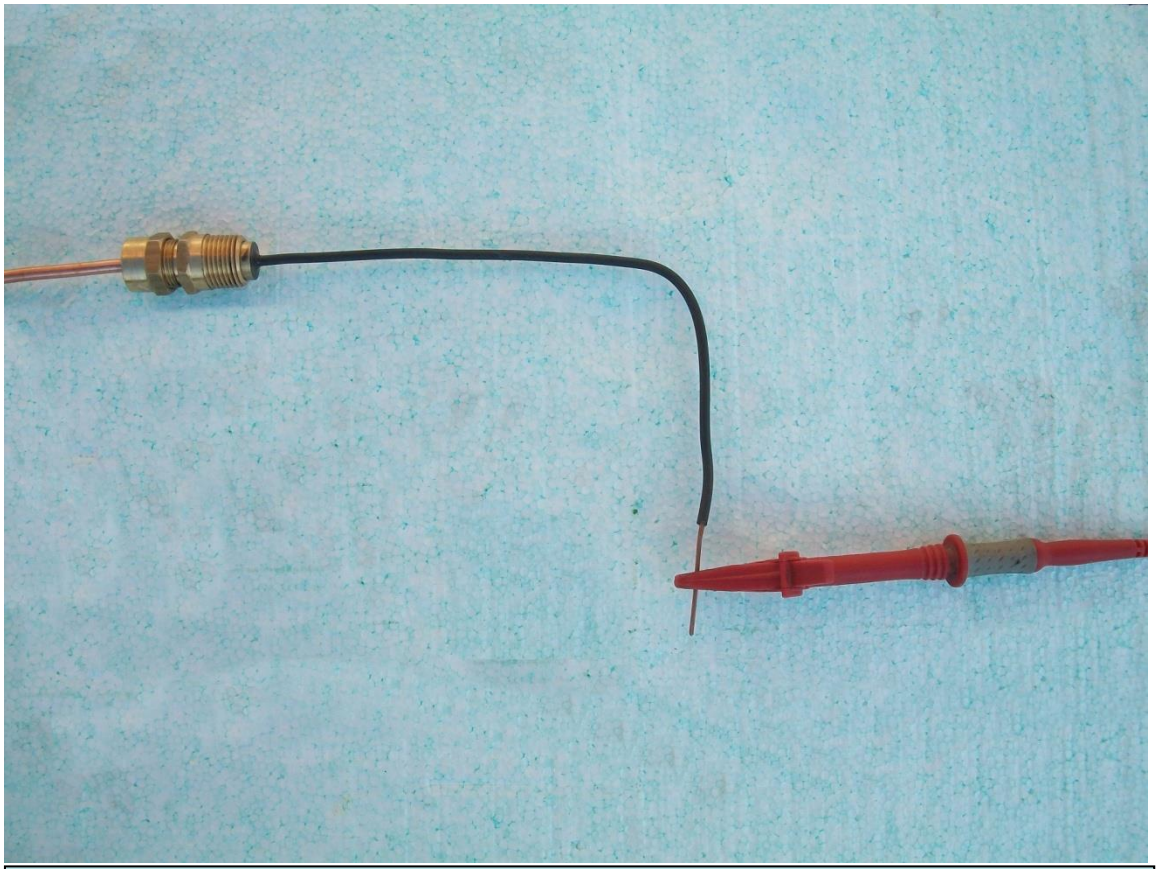
- Make sure the cable is clean and dry before testing
- Cable should be insulation tested **before**, **during** and **after** installation
- Results of the testing should be noted for future reference in the table at the end of this section



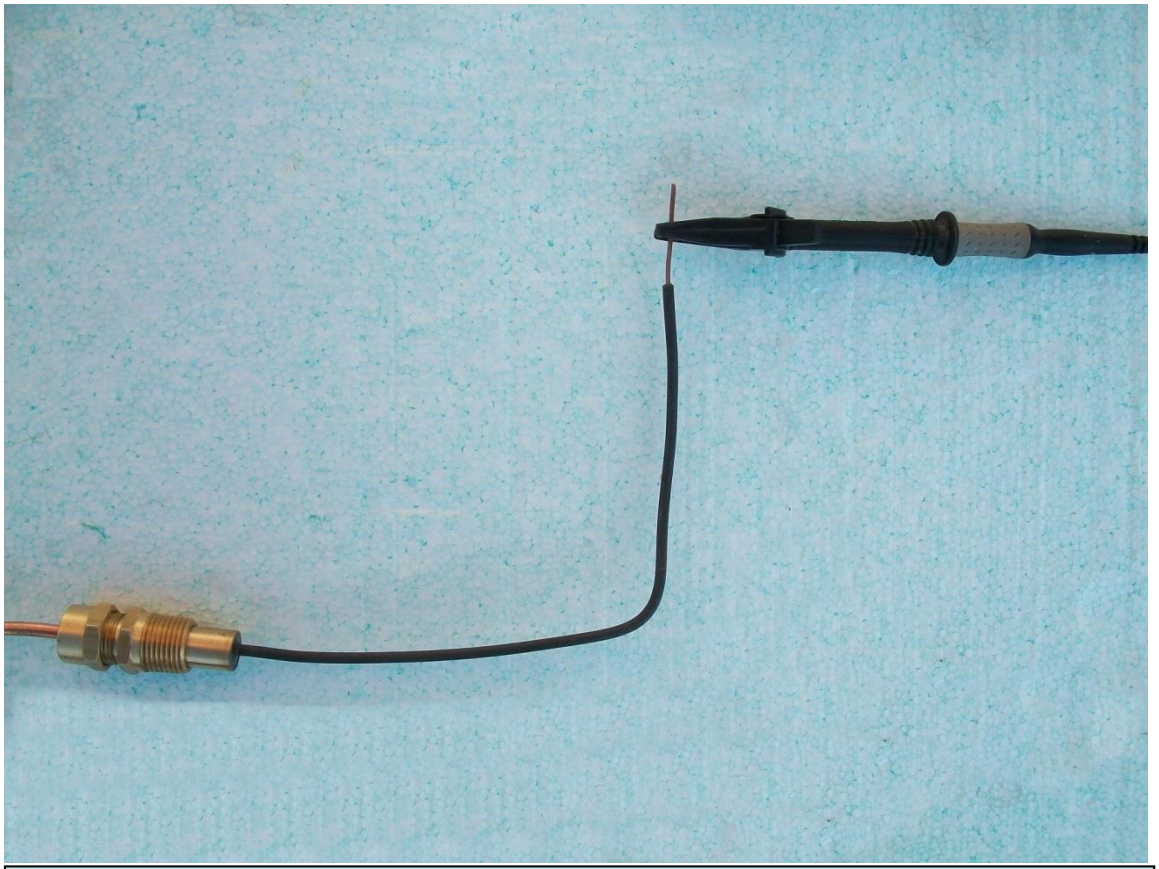
Apparatus Required

- Multimeter
- Heating cable with both tail ends accessible for testing

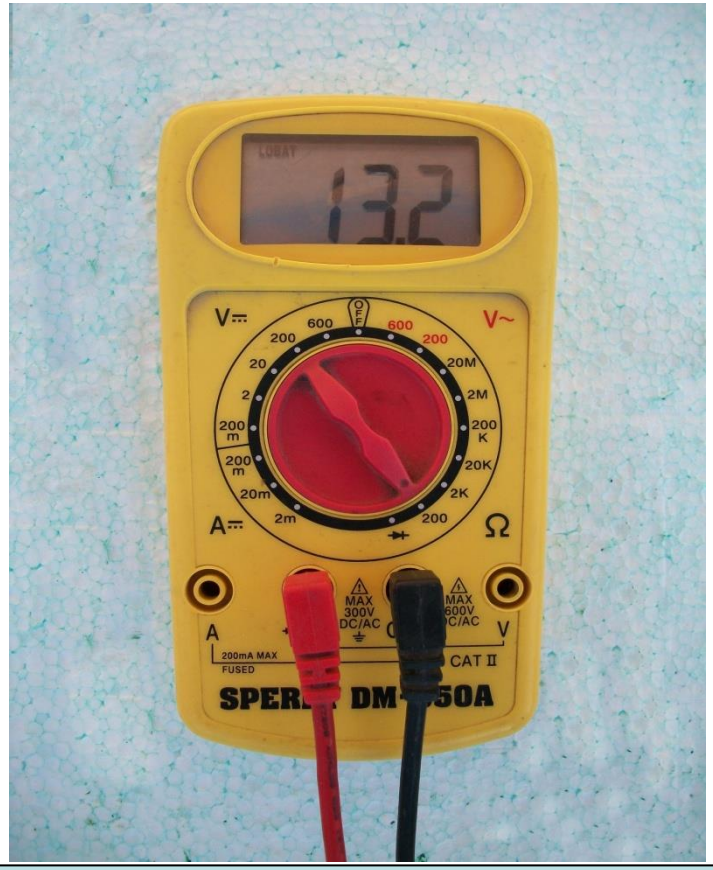
Turn on the multimeter for resistance measurement



Connect the positive lead to one of the heating cable tails

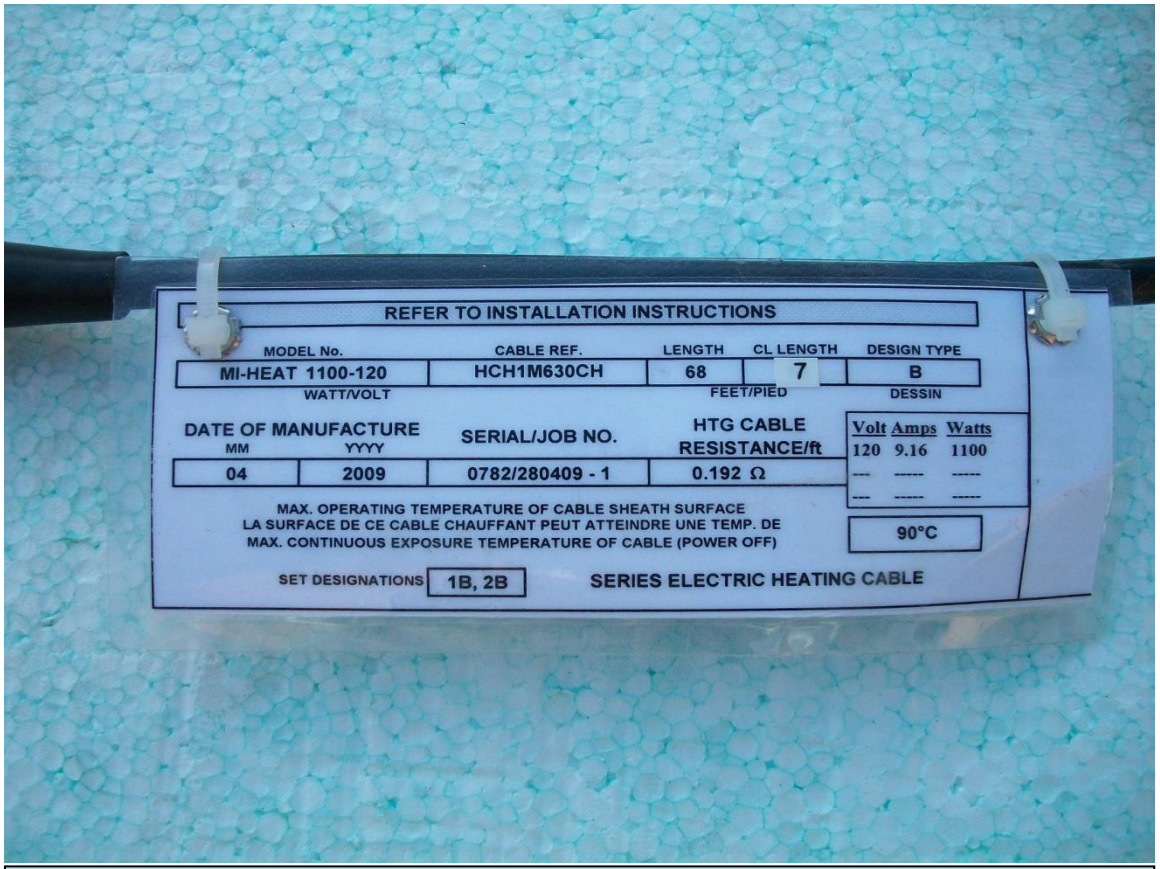


Connect the negative lead to the other heating cable tail

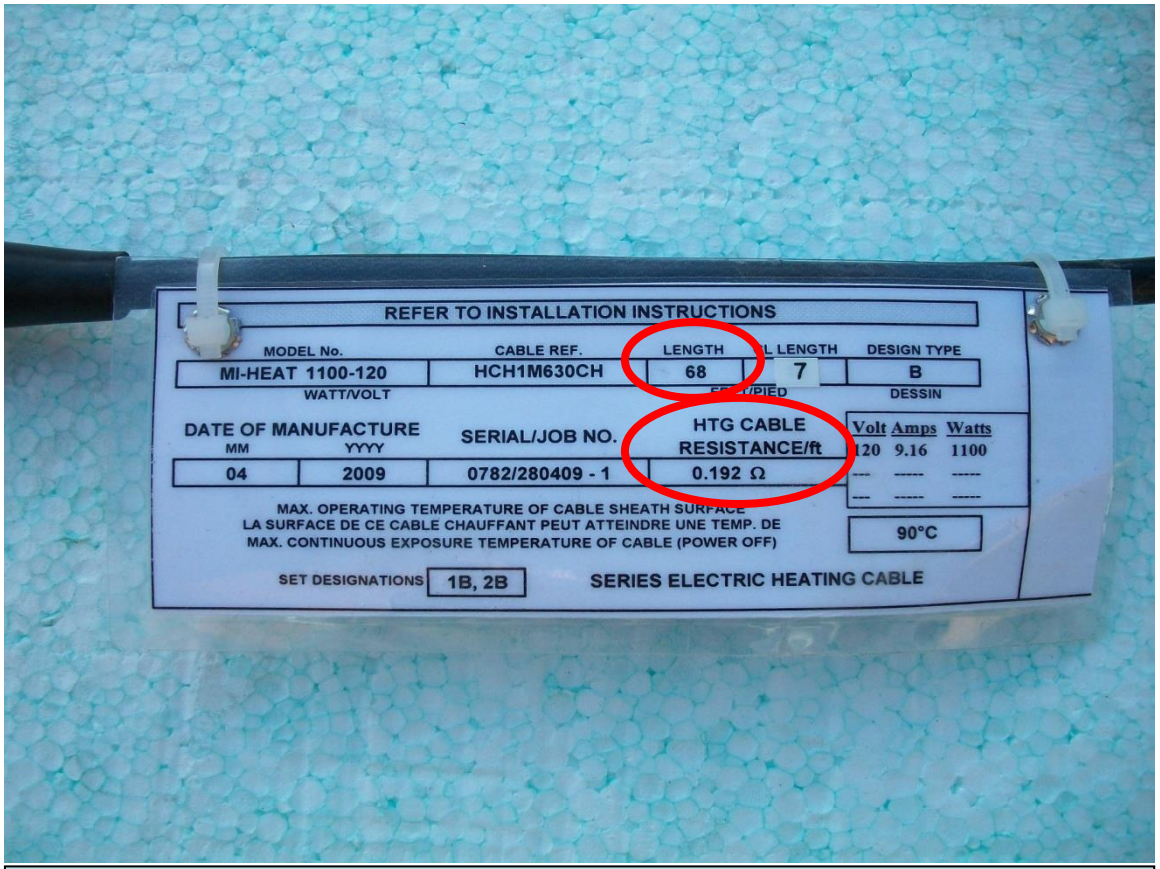


Note continuity between the two cable ends.

(Recorded Value)



To check if the resistance you have measured is correct for this cable, refer to the cable information tag.



By multiplying the cable length by the Resistance/ft you can calculate the expected total cable resistance.

TRM Heating Cables

EXAMPLE

(from previous page)

0.192 x 68 = 13.06Ω (Calculated Value)

Note that there will normally be a slight differential between the calculated and recorded values. The value recorded from the multimeter should lie within +/- 10% of the calculated value

A close similarity in resistance values confirms the cable is functioning properly

A damaged cable will read a low resistance. A broken cable would show an open circuit reading

	Continuity Resistance Reading (Ohms)
Before installation	
During installation	
Post installation	

Record the continuity resistance value in the table