# **MI, Mineral Insulated**
# Snow Melting & De-Icing, Installation & Maintenance Manual

# TABLE OF CONTENTS

# GENERAL INFORMATION

## General Information:

This installation manual is for use with Trasor Mineral Insulated (MI) snow melting and de-icing heaters. Since 1969, Trasor has been building safe and dependable snow melting and de-icing systems. A safe and reliable snow melting and de-icing system requires quality products, proper design, installation and maintenance.

Read this instruction sheet and those enclosed with the accessories to familiarize yourself with the products. Do not hesitate to contact the factory or your local representative.


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## Electric Snow Melting & De-Icing Systems:

An electric snow melting and de-icing system consist of Mineral Insulated (MI) heating cables embedded in a slab to remove snow or freezing moisture plus controls and sensors to control the heaters. The heaters are buried 2" below the surface of the slab on 4" to 9" centers depending on the application and slab material. Snow melting and de-icing systems will typically generate 40 to 60 watts per square foot and the heating cables will generate about 15 to 30 watts per cable foot.

## Electrical Codes:

Article 426 of the National Electrical Code governs the installation of fixed outdoor electric de-icing and snow melting equipment. Installation of snow melting system must comply will all national and local codes. Ground fault protection of equipment shall be provided for all outdoor electric de-icing and snow melting equipment.

## Important:

All information contained in this manual is believed to be accurate and reliable. Users should independently evaluate this information for suitability for their particular application. Trasor Corporation makes no warranties as to the accuracy or completeness of the information, and disclaims any liability regarding its use. Trasor Corporation's only obligations are those such expressed in the sale of the particular product. In no case will Trasor Corporation be liable for any incidental, indirect, or consequential damages arising from the sale, resale, use or misuse of the product.

## Receiving and Storage:

Compare all received materials against the packing list. Verify that no items have been damaged. It is important to field test all MI heaters as shown on page 21 and complete the heater installation and inspection record on page 22. Do not remove any tagging information. Store all materials in a clean dry area protected from weather and mechanical abuse.

## Tools Required for Installation:

500 or 1000 Volt DC Megger
Clamp on Amp meter
Multi meter
Lineman pliers
Two adjustable wrenches

## Controls and Accessories:

All related controls and associated components must be properly rated and approved for the area and application. Controls should carry UL XAPX certification.

## Maintenance:

Heater, control system and slab should be inspected annually. Follow the procedures noted in Heater Maintenance & Inspection Log on page 23.

# HEATER CONSTRUCTION AND OPERATION

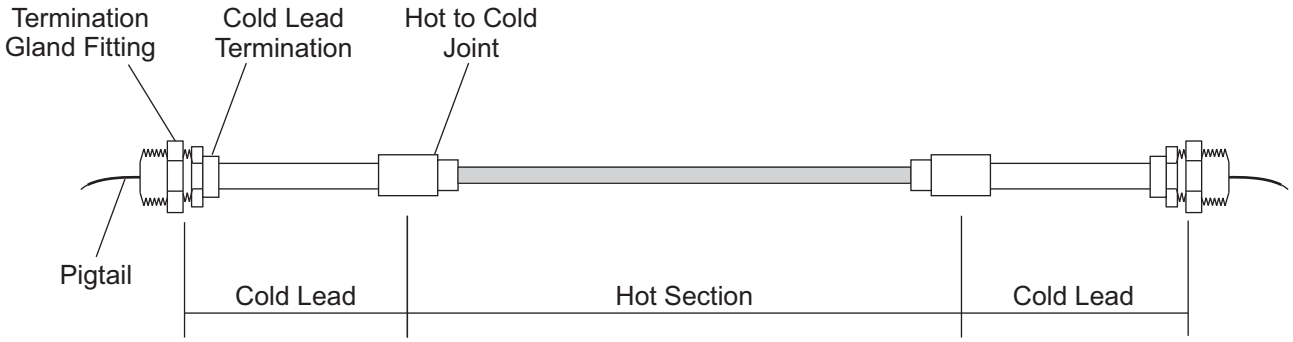



Figure 1

**General Heater Construction**

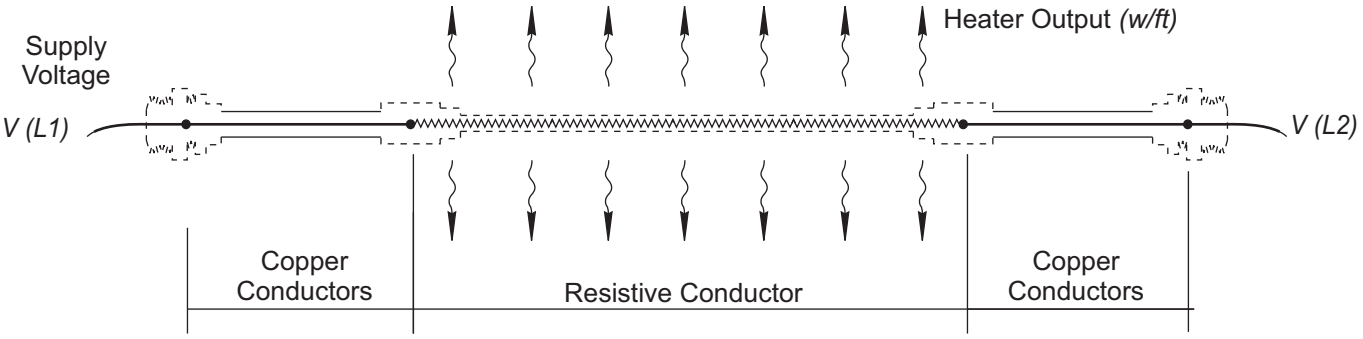



Figure 2

**Internal View**

## General Operation:

MI heating cable is a series resistance heater that has a constant output along the entire length of the heater. It's operation is consistent with Ohm's Law.

## Variables and Formulas:

| | |
|---|---|
| *V* | Voltage = $I * R$ |
| *I* | Current = $V \div R$ |
| *W* | Wattage = $V * I = I^2 * R = V^2 \div R$ |
| *w/ft* | Watts per foot = $W \div L = I^2 * \Omega/ft$ |
| *R* | Resistance = $L * \Omega/ft = V \div I$ |
| *L* | Heater length = $R \div \Omega/ft$ |
| *Ω/ft* | Published cable resistance ≈ $R \div L$ |

Note, Form "B" one conductor heater is shown in the above figures. Form "B" is the most common form used in snow melting applications. It offers a comprehensive selection of resistances. There is also a one conductor form "C" and a two conductor form "A". See page 6.

# HEATER PART NUMBER SYSTEM & HEATER FORMS

## Heater Part Number System:

**MIE - R21EH - B - 200 - 07 - 07 - X**

- Special feature, see datasheets for details
- Cold section #2 length (FT.), if applicable
- Cold section length (FT.)
- Hot section length (FT.)
- Heater unit form, see figures 3 & 4 for details
- Heater unit hot section size, see datasheets for details
- Heating cable type, see datasheets for details

## Heater Forms:

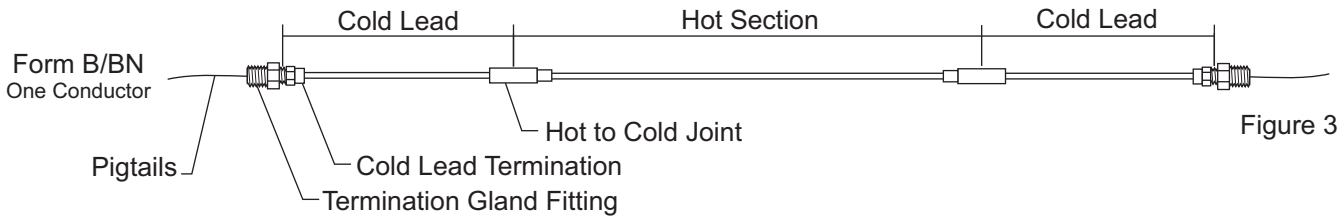



Figure 3

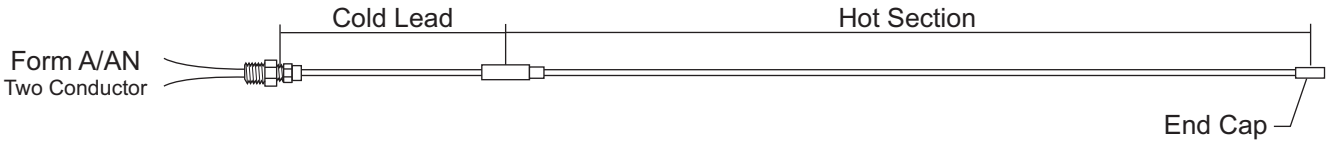



Figure 4

# GENERAL HEATER LAYOUT & CABLE SPACING

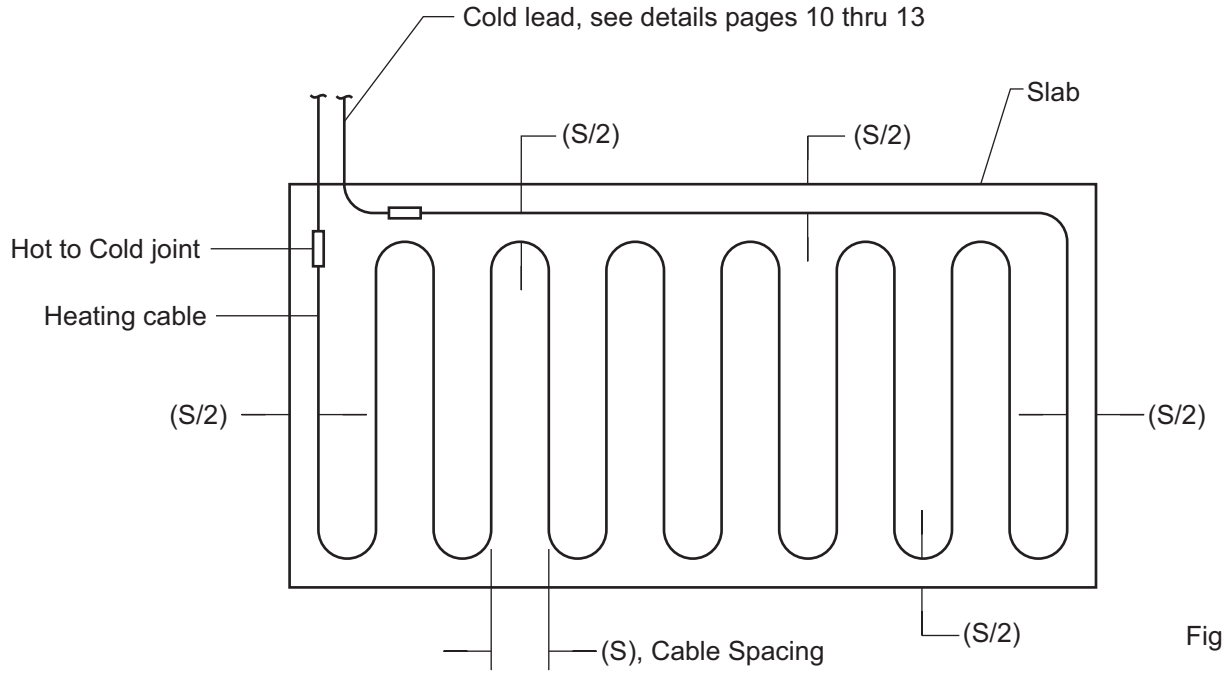



Figure 5

## General Cable Layout

Layout heating cable as shown in Figure 5 or layout drawings. When installation and layout drawings are provided, verify heated areas match what are shown on the drawings and confirm all dimensions. Follow pattern and cable spacing (S) on drawings. If drawings are not provided calculate cable spacing using equation 1.

$$\text{Spacing (S)} = \frac{\text{Heated Area (ft}^2\text{)}}{\text{Heater Length (ft)}} \times 12 \text{ (in/ft)} \qquad \text{Equation 1}$$

Example:
Heated Area = 120 $ft^2$
Heater Length = 180 ft

$$\text{Spacing (S)} = \frac{120 \text{ ft}^2}{180 \text{ ft}} \times 12 \text{ (in/ft)} = 8\text{” spacing}$$

# INSTALLATION GUIDELINES

## Project Coordination Meeting:

Before the project begins, a project coordination meeting should be held with all trades that will be involved with the installation of the heating cable, pouring of the slab and cutting or drilling into the slab. Coordination of these trades is extremely important. It can be catastrophic for a heater to be cut through with a saw or drilled into for a rail post. The following topics should be covered:

1. Review of all layout drawings and instructions.
2. Review slab construction and support media for cable. Confirm cable depth and cable spacing.
3. Confirm all expansion and construction joint locations and mark in the field on the slab forms so they are apparent to all crafts.
4. Confirm all locations of rail supports, doorstops, signs or drains.
5. Confirm heating termination method to be used. See pages 10 thru 13.
6. Confirm junction box and control locations.
7. Confirm locations and make provisions for slab sensors or warning markers.
8. Coordinate testing and record keeping between installation procedures. See pages 21 and 22.

## General Installation Notes:

1. Follow all installation and layout drawings. Verify heated areas match what are shown on layout drawings and confirm that all dimensions on drawings match field dimensions.
2. Unpack and test all heaters to verify there was no damage from shipping. Reference testing procedures on page 21 and record values in table 1 on page 22. Make copies of table 1 for each heater. Test heaters again before installation, after they are secured to the reinforcement media, while the heaters are being embedded in slab and after slab is complete.
3. The heater, cold lead termination and pigtails must be kept dry, protected from weather and mechanical abuse before, during and after installation.
4. Protect heating cable from being walked on, driven on, sharp materials, weld slag or being cut.
5. Verify proper heater is selected for area shown on drawing. Heaters cannot be randomly switched. All heaters are provided with a stainless nameplate. The nameplate will have tagging information and electrical ratings.
6. Confirm proper slab reinforcement is in place and at proper depth. Heating cable must be secured at a minimum depth of two inches from slab surface. It is not recommended to exceed a depth more than three inches. This will extend the heat up time and reduce heat getting to the surface.
7. Prepare area for heating cable. Follow layout drawings for proper cable spacing and routing path. Mark cable paths with chalk or spray paint. Do not locate heating cable within six inches any future slab penetrations, such as handrails, drill holes or drains.
8. If layout drawings are not provided calculate cable spacing using equation 1 on page 7.
9. Uncoil or roll out the heater. Do not pull cable from center of coil into a spiral.
10. Minimum bending radius of heating cable is 6 x the cable diameter.
11. Do not bend the cable within 3” on any hot to cold joint, termination or splice joint. Almost all heaters that are broken during installation occur at the hot to cold joint due to mishandling.
12. Do not repeatedly bend and straighten the cable.
13. Do not install cable so that it may touch or be within 3” of another cable pass.
14. Do not pass heating cable through expansion, control or construction joints unless using methods shown in detail 9, 10 or 11 on pages & 10 on page 18.
15. If any cable is damaged or broken, stop installation and seal break with silicone and contact the factory.
16. Start heater installation with the first cold lead. Secure with nylon ties three inches from each side of the hot to cold joint.
17. Handle hot to cold joint carefully. Support both sides when moving and positioning cold lead.
18. Secure heating cable to rebar or reinforcement mesh every 12 to 18 inches with nylon ties. Do not use steel ties.
19. When approaching the end of a heater installation, adjust the last few passes as need so the end of the heater is at the point specified in the layout drawing.
20. Note any variations of cable routing or termination locations on project drawings and return to owner and factory. This is valuable information if repairs or trouble shooting is required in the future.
21. Terminate heaters to junction box as shown on pages 10 or 12.
22. IMPORTANT: The termination gland fitting is the grounding mechanism for the heater. This must be connect by an NEC approved grounding method.
23. Junction boxes and enclosures for electrical connections to the heating cable must be listed and approved for the environment in which they are installed.

# INSTALLATION GUIDELINES

## Slab & Paving Construction Guidelines:

Proper slab design is essential to a successful system. The size, thickness, reinforcing media, and general design must be such that the slab will not crack, causing damage to the heating cable.

The slab base should be smooth and adequately compacted to prevent settlement, and care should be taken to make certain that tree roots will not cause future heaving.

Proper design should include provisions for water runoff. This water could cause the slab to heave if it accumulated in the base, or it could cause a dangerous ice condition at the foot of a sloping drive. If adequate natural drainage is not available it may be necessary to install a drain. In some instances the drain may have to be heated to prevent freezing.

## Installing Cable in Concrete:

Rebar is the preferred reinforcement material for embedded heating cable in concrete. It provides maximum strength and is more apt to keep heating cable at a consistent depth. The spacing of the rebar is often wider than reinforcement mesh. This makes it easer for the installer to step into the area while securing the cable. See detail 1 on page 14.

It is recommended that a ground-supported slab be no larger than 20 feet by 20 feet, with a minimum thickness of 4 inches for walkways or 6 inches for areas supporting motor vehicles.

Cable depth should be 2 to 3 inches below the finished surface of the slab. The cable should be secured to rebar or reinforcement mesh with nylon ties. Do not use steel tie wire. Secure cable every 12 to 18 inches.

When installing cable on an existing slab or using a two pour method, secure the cable to the first slab using spacer strip. See detail 2 on page 14.

If heater is damaged while concrete is being pored, box off 24” square area around damaged cable and clear out concrete. Seal break with silicon and contact the factory.

## Installing Cable in Asphalt:

The base or foundation course must be designed so that the heater unit will not be damaged due to movement. The heated area of an asphalt slab must be held well in from the edges unless there is adequate provision made to prevent the possible collapse of the edges.

The top course of asphalt should have a minimum thickness of 2 inches after compaction.

The heater should be installed into a uniform pattern as specified and held in position on the base slab using spacer strip. For added security, reinforcement mesh should secured over the cable and spacer strip. See detail 3 on page 15.

After the cables are in position, place a layer of asphalt about 1” thick over the cable by hand. Roll this with a small roller. This will protect the cable from tools or paving equipment during placement of top course.

Do not dump piles of asphalt in small area of cable and spread out. This may damage jacketed heating cable from the concentrated heat of the asphalt.

## Installing Cable under Pavers and Bricks:

Secure the cable to masonry reinforcing over a concrete base or 1 inch of well compacted sand or lime stone screenings. Cover the heating cable with 1” of compacted sand or lime stone screenings. See detail 4 on page 15. Use caution when setting pavers not to damage heating cable.

Note: Cable spacing is typically tighter under pavers (4 to 6 inches) due to the poor conductivity of brick and pavers.

## Heater Cold Lead and Pigtail Lengths:

Each heater has cold leads and pigtails. The lengths of these components can vary per system design and requirements.
Heaters with standard 11” pigtails are used when the junction box locations are local and close to the slab. The locations are specified and will not vary in the field. Typically these heaters will have 7' to 15' cold leads to reach the junction box. See pages 10 and 11.

Heaters with extended pigtails are used when the junction box locations are remote. The locations are field located and may be 20 to 50 feet from slab. Typically these heaters will have 2' cold leads with long pigtails to reach the junction box. See pages 12 and 13.

# INSTALLATION STEPS FOR HEATERS WITH STANDARD PIGTAILS

## Terminating Heaters with Standard Pigtails:

The cold leads for heaters with standard 11” pigtails will extend out of the slab and terminate directly into a local junction box. The cold leads are typically 7 to 15 feet or longer. This method is used when the junction box locations are specified and will not vary in the field. **Note, cold lead lengths cannot be modified in the field.**

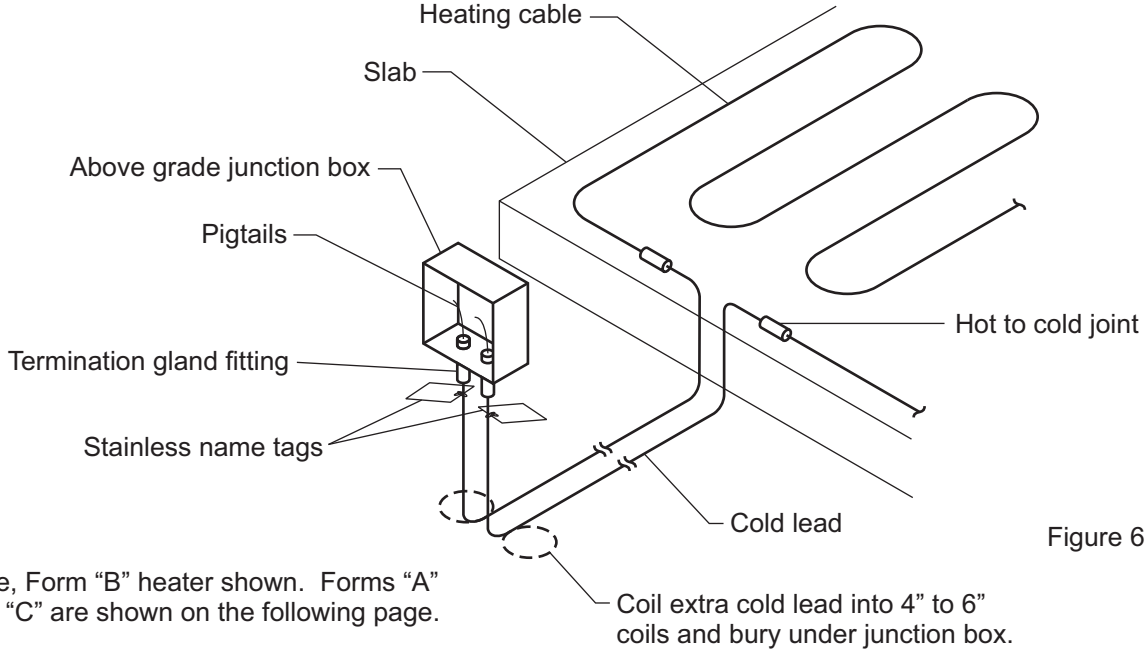



Figure 6

Note, Form “B” heater shown. Forms “A” and “C” are shown on the following page.

## Installation Steps for Heaters with Standard 11” Pigtails:

1. Secure the hot to cold joint of the first cold lead to the reinforcement media. Place ties 3 inches from each side of the hot to cold joint.
2. When possible pass the cold lead out through the bottom of the slab.
3. Install heating cable as described in the previous sections.
4. Secure the second cold lead to the reinforcement media as describe in step one. Note, heater forms “A” and “C” will not have a second cold lead.
5. Route the cold leads back to the junction box. Bury any extra cold lead in small 4”+ coil underneath the junction box. Note, cold lead lengths cannot be modified in the field.
6. Secure termination gland fitting to junction box or controller.
7. Pass pigtails through termination gland fitting.
8. Push cold lead termination midway into termination gland fitting. Tighten ferrule side of the gland fitting. Use care not to twist termination or cold lead cable.
9. Test insulation resistance (Megger) and heater continuity and record values. See pages 21 and 22.
10. Note: Termination gland fitting provides ground connection for heater. NEC approved grounding method must be used at junction box.
11. Junction boxes and enclosures for electrical connections to the heating cable must be listed and approved for the environment in which they are installed.

# INSTALLATION STEPS FOR HEATERS WITH STANDARD PIGTAILS

### Form “B” Heater:

Termination of form “B” heater with standard pigtails.

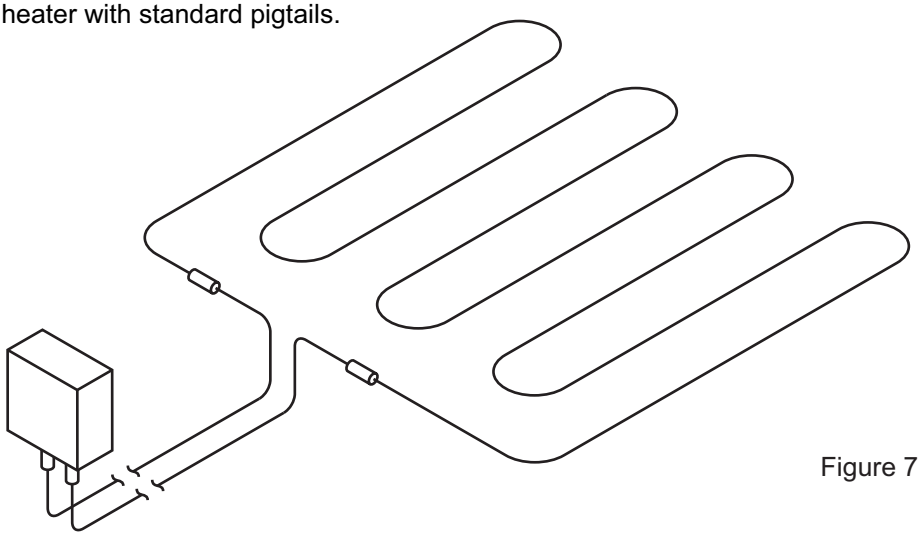


Figure 7

### Form “A” Heater:

Termination of form “A” heater with standard pigtails.

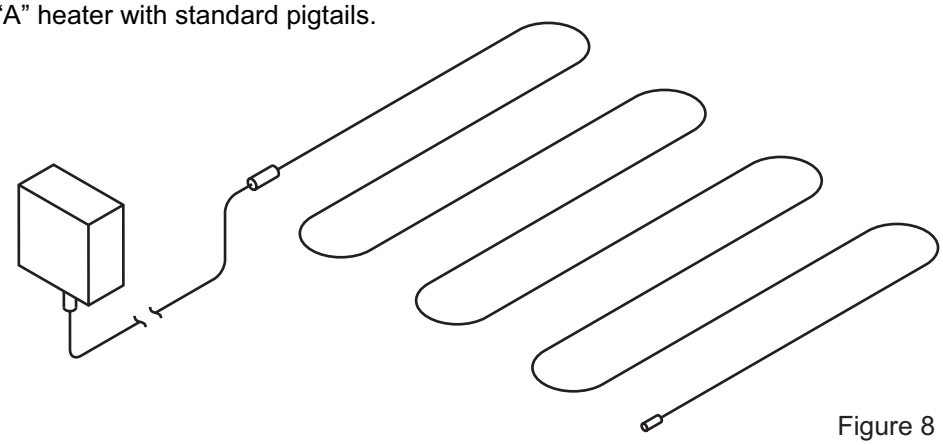


Figure 8

# INSTALLATION STEPS FOR HEATERS WITH EXTENDED PIGTAILS

## Terminating Heaters with Extended Pigtails:

The cold leads for heaters with extend pigtails will terminate into a conduit body located within the slab. The pigtails will be pulled through field routed conduit and terminate into a remote junction box. The cold leads will typically be 2' long and have stranded pigtails that may be 20 to 50 feet in length. This method is used when there is a long distance between the heater and the junction box.

Heaters with pigtails longer than 1 foot are noted as having extended pigtails. The part numbers for thess heaters will have a special feature suffix “T**”. The ** will indicate the pigtail length in feet.

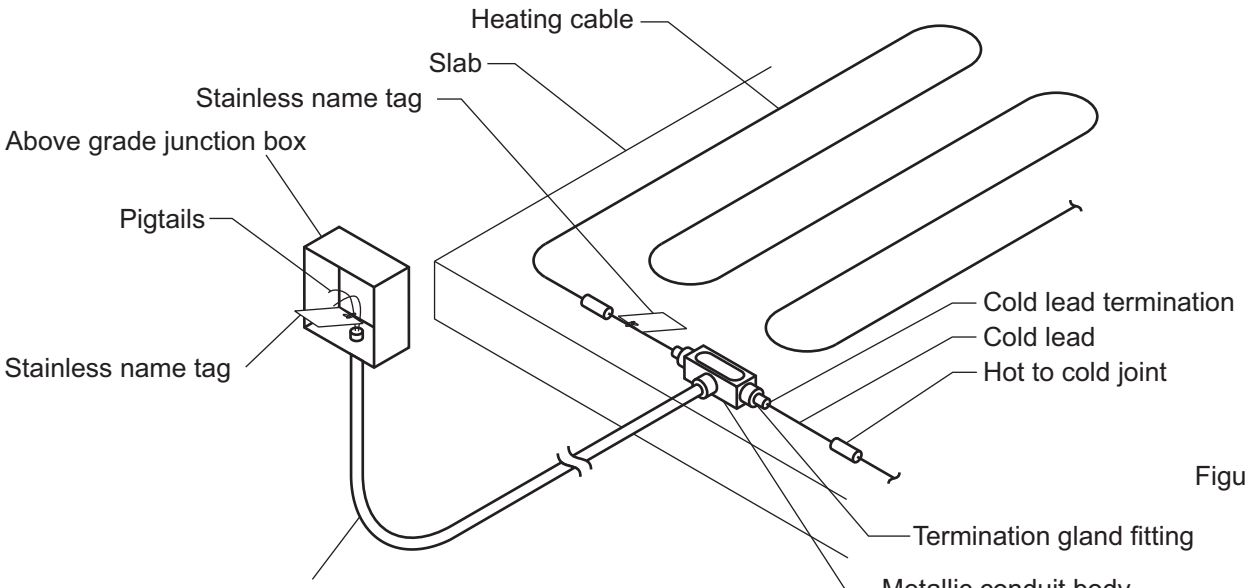



Figure 9

Note, Form “B” heater shown. Forms “A” and “C” are shown on the following page.

## Installation Steps for Heaters with Extended Pigtails:

1. Uncap conduit body and verify it is dry and free of moisture.
2. Install conduit body so that opening is facing up.
3. Secure termination gland fitting into conduit body.
4. Carefully pass the pigtails from the first cold lead through the termination gland fitting.
5. Push cold lead termination midway into the termination gland fitting. Tighten ferrule side of the gland fitting and use care not to twist termination or cold lead cable.
6. Install and secure heating cable as described in previous sections.
7. Using the pigtails from the second cold lead, follow step 3,4 & 5. Note, heater forms “A” and “C” do not have a second cold lead.
8. Pull pigtails and ground wire, if required, through conduit to the junction box or controller. Ground wire must be provided when using plastic piping. See detail 13, page 20.
9. Remove one of the stainless nameplates from a cold lead and secure it to a one of the pigtails at the junction box. This tags has important electrical ratings and part number information.
10. NEC approved grounding method must be used at junction box.
11. Test insulation resistance (Megger) and heater continuity and record values. See pages 21 and 22.
12. Apply duct seal between conduit body and conduit. IMPORTANT, Fill conduit body with 3M Scotch Cast 8882. See details 12 and 13, page 20.
13. Junction boxes and enclosures for electrical connections to the heating cable must be listed and approved for the environment in which they are installed.

# INSTALLATION STEPS FOR HEATERS WITH EXTENDED PIGTAILS

### Form “B” Heater:

Termination of form “B” heater with extended pigtails.

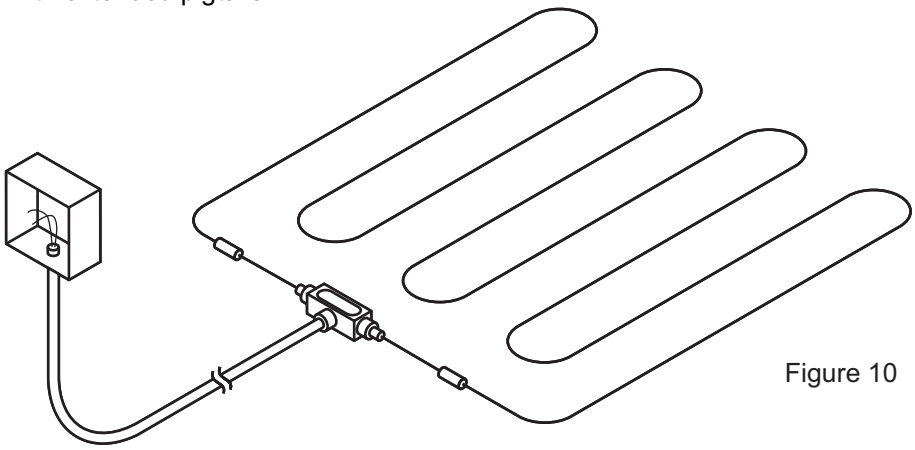


Figure 10

### Form “A” Heater:

Termination of form “A” heater with extended pigtails.

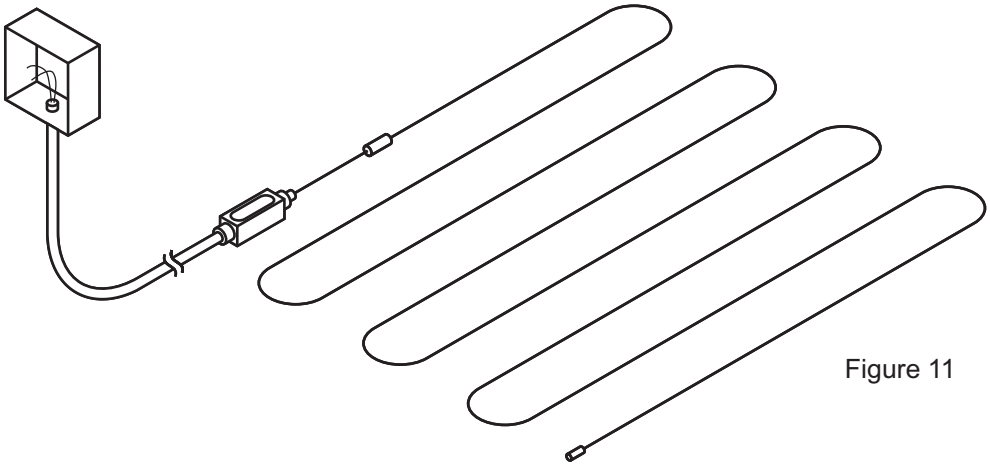
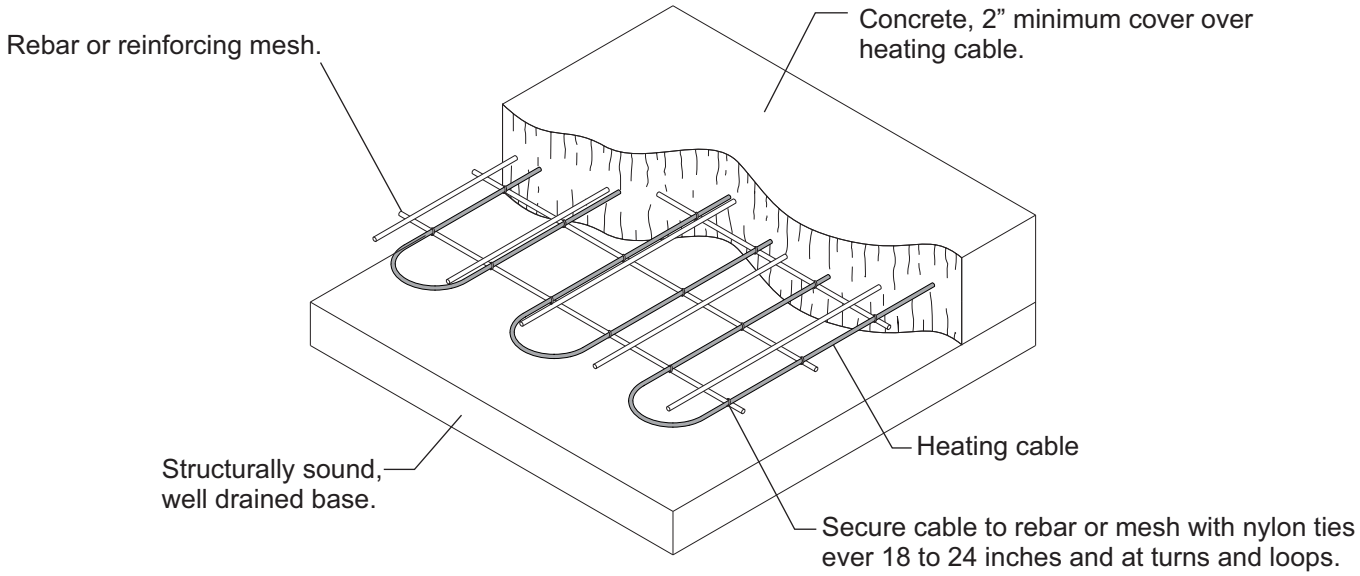


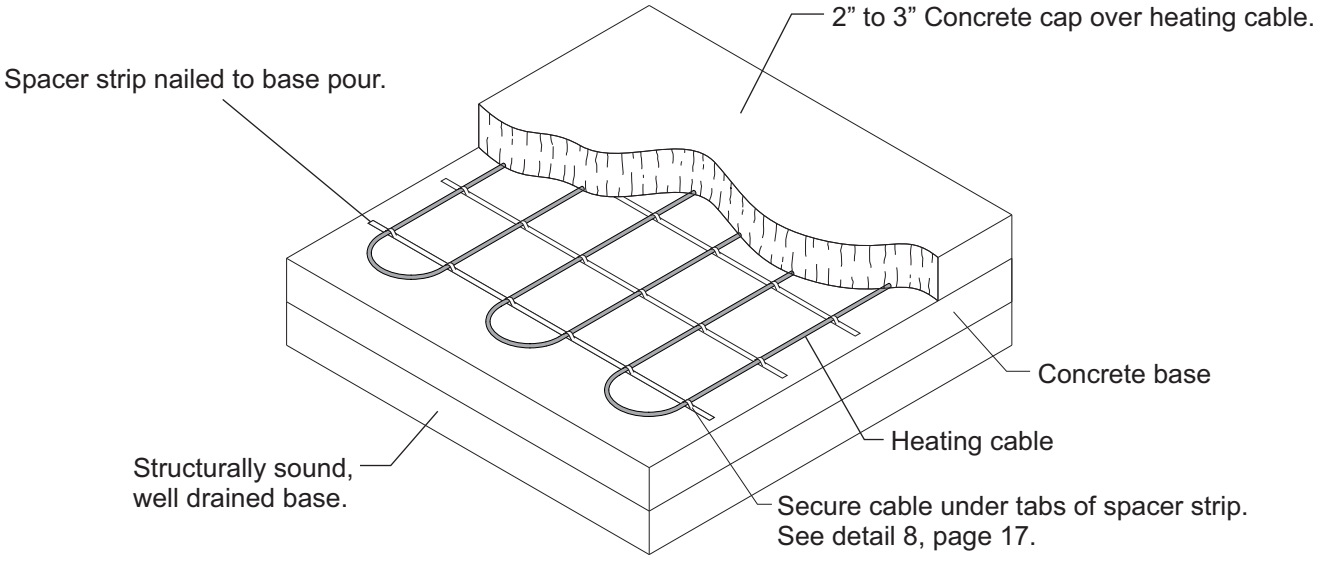
Figure 11

# SLAB INSTALLATION DETAILS




Detail 1

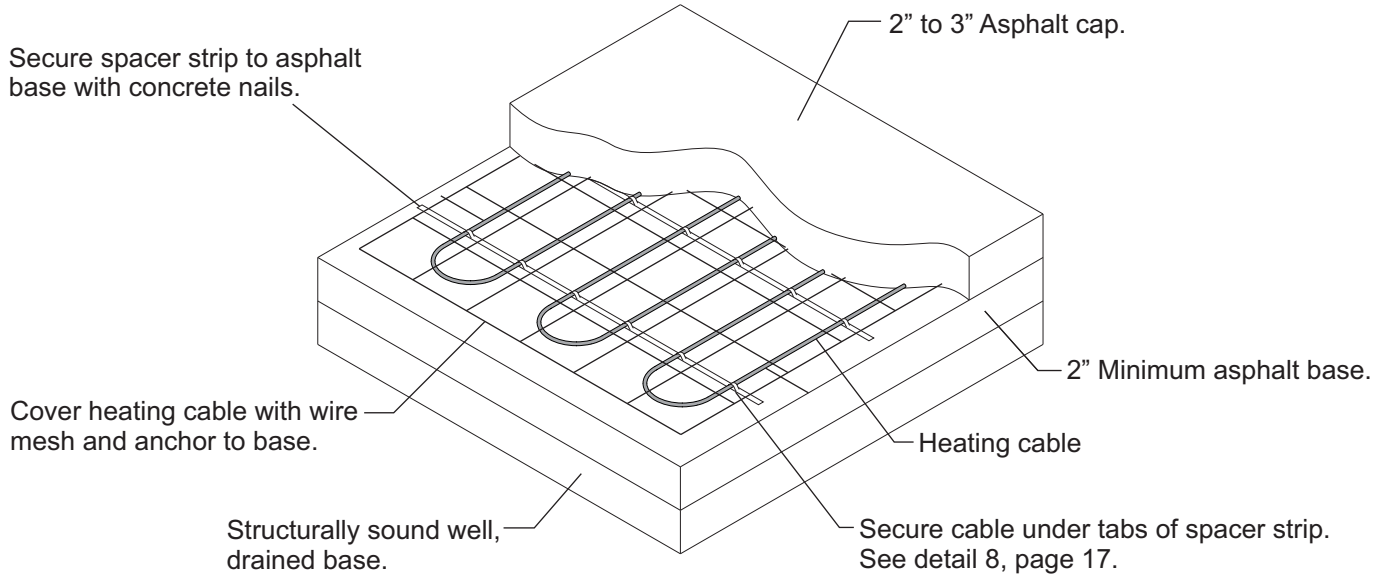
**Installing in Concrete, Single Pour Slab**
(Heating cable secured to rebar or wire mesh)




Detail 2

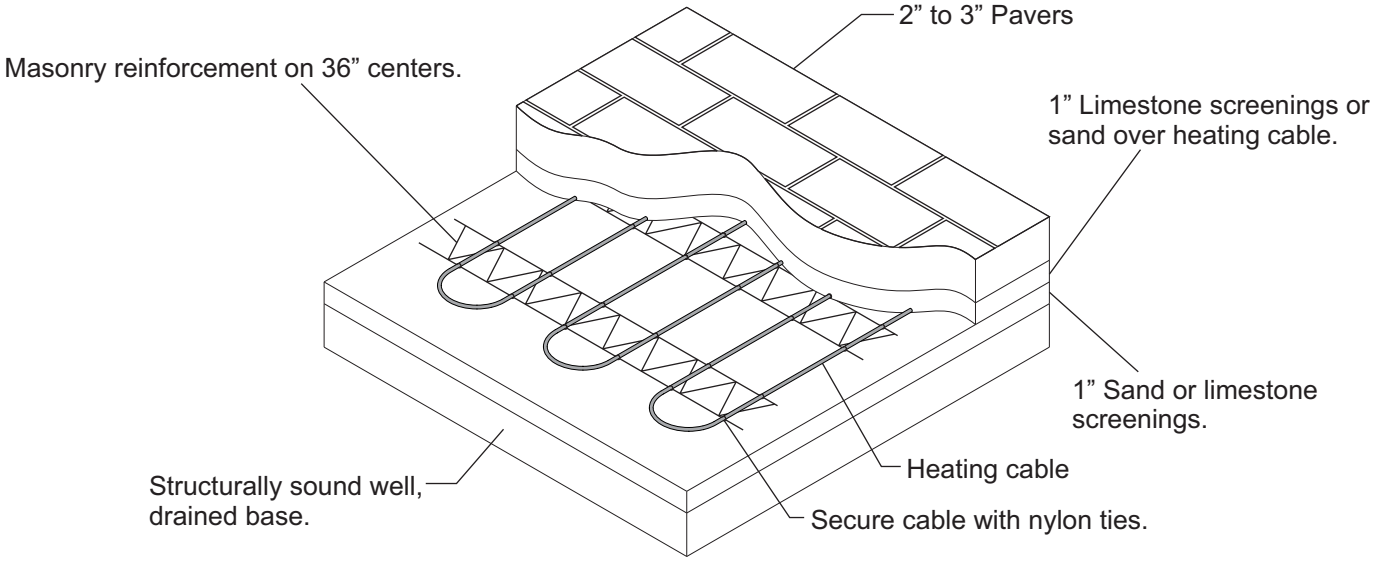
**Installing in Concrete, Two Pour Slab**
(Heating cable secured with spacer strip)

# SLAB INSTALLATION DETAILS




Detail 3

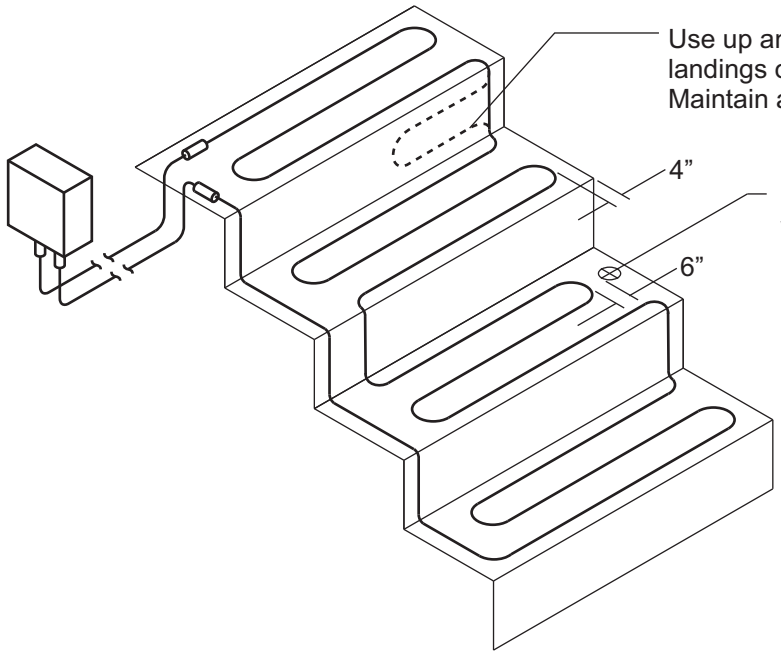
**Installing in Asphalt**
(Heating cable secured with spacer strip & covered with wire mesh)




Detail 4

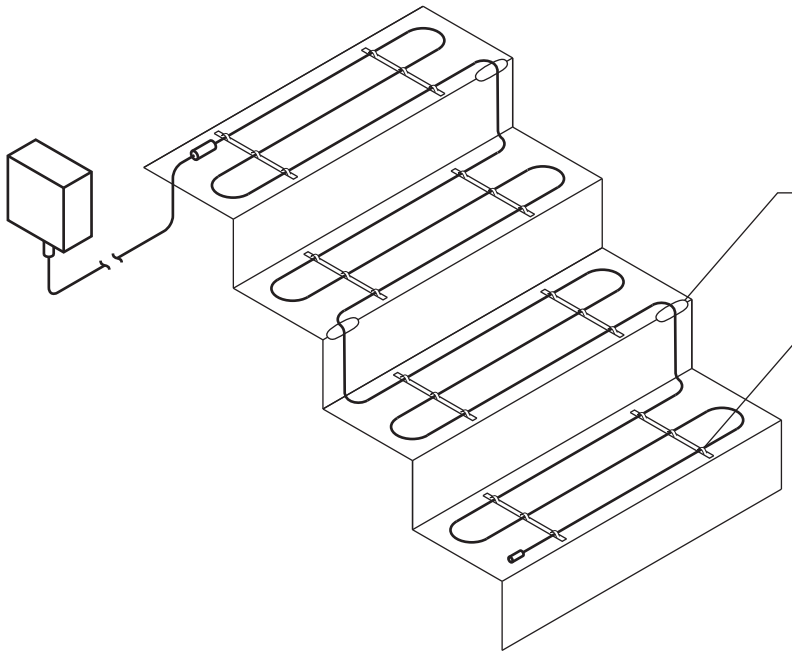
**Installing under Pavers**
(Heating cable secured with masonry reinforcement)

# INSTALLATION IN STAIRS




Detail 5

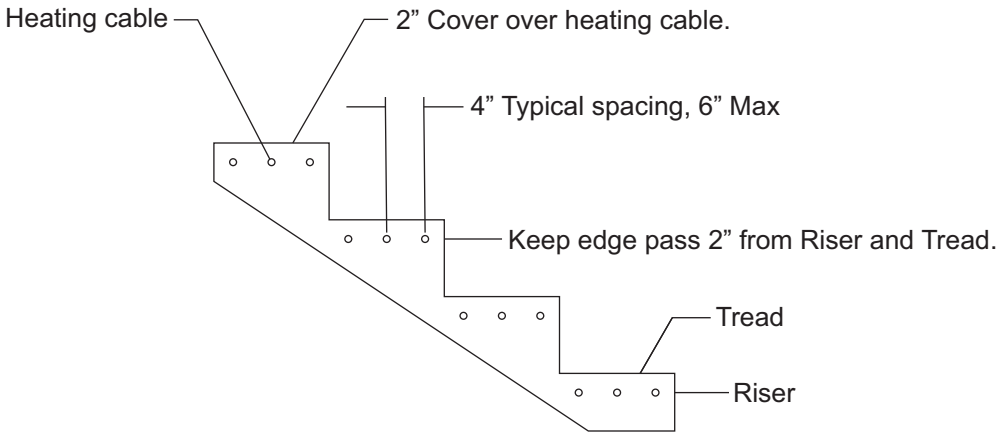
**Installing in Stairs, Single Pour Method**
(Heating cable secured with rebar. See detail 1, page 14.)
Form “B” heater shown




Detail 6

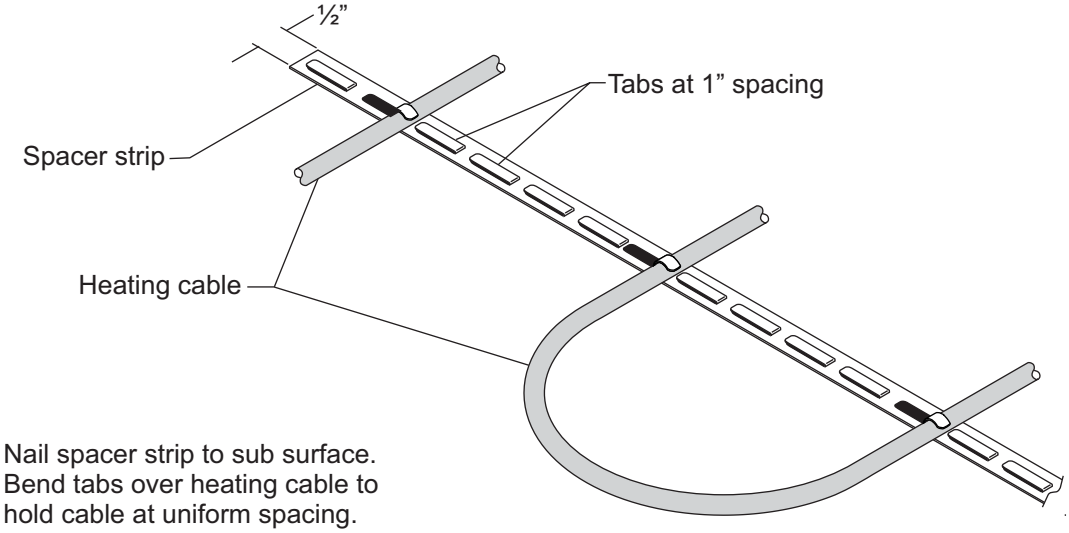
**Installing in Stairs, Two Pour Slab**
(Heating cable secured with spacer strip. See detail 2, page 14 & detail 8, page 17.)
Form “A” heater shown

# STAIR INSTALLATION DETAIL




Detail 7

**Side View, Heating Cable in Stairs**
(Secure cable to rebar with single pour method. See detail 1, page 14.)
Secure cable with spacer strip with two pour method. See detail 2, page 14.



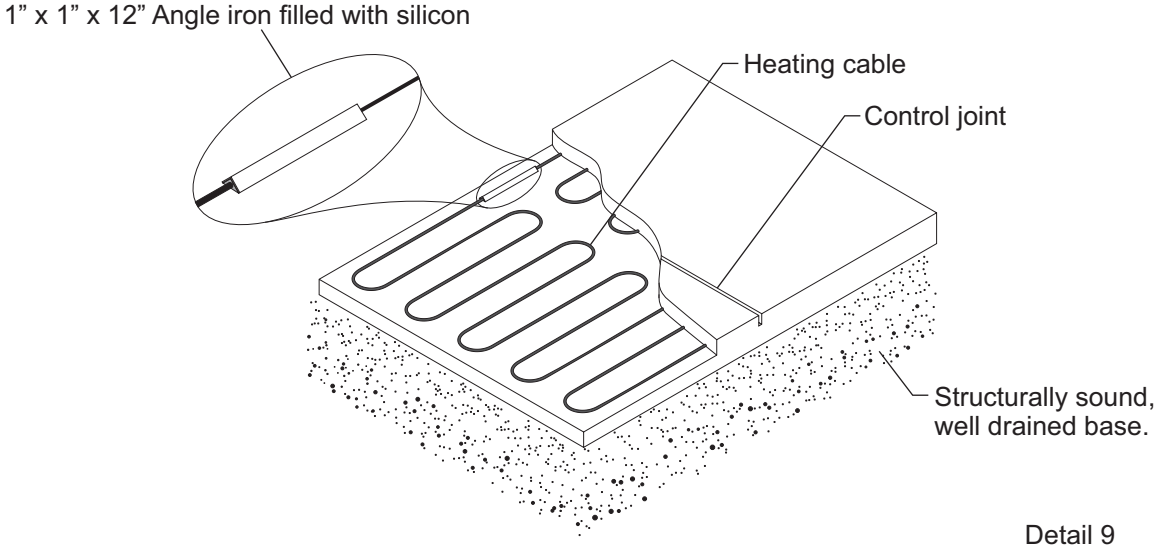

Detail 8

**Spacer Strip Detail**
(Securing heating cable with spacer strip)

## Crossing Control or Construction Joints:

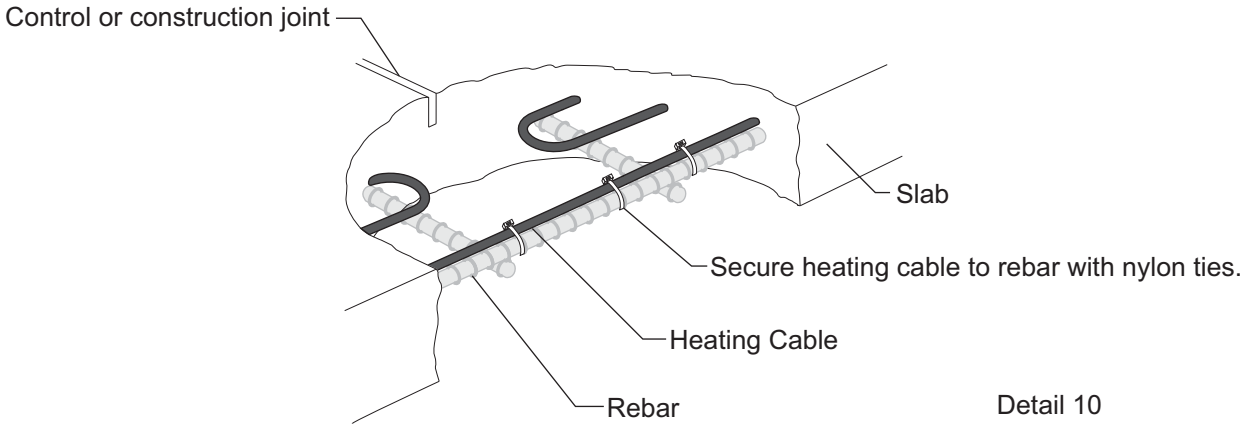
Control joints are intended to control where that slab will crack. It is important that the locations of these joints are specified before the cable is installed or slab is poured. Because of the reinforcement in the slab, there is rarely a shearing action caused by differential vertical movement between the concrete on either side of the crack. As a precautionary measure, use either of the two methods of crossing as shown in detail 9 or 10. When possible minimize the number of times the joint is crossed as shown in detail 9. When installing cables using the two pour method, control joint must be placed in the base slab and the surface slab.

Construction joints are joints that occur when the concrete pour is going to stop but will resume at a later date. The reinforcement should be left protruding out of the first pour so that it enters the next pour and therefore shearing action rarely occurs. Use either of the two methods of crossing as shown in detail 9 or 10.




Detail 9

**Crossing Control or Construction Joint**
(Two pour or single pour slab)

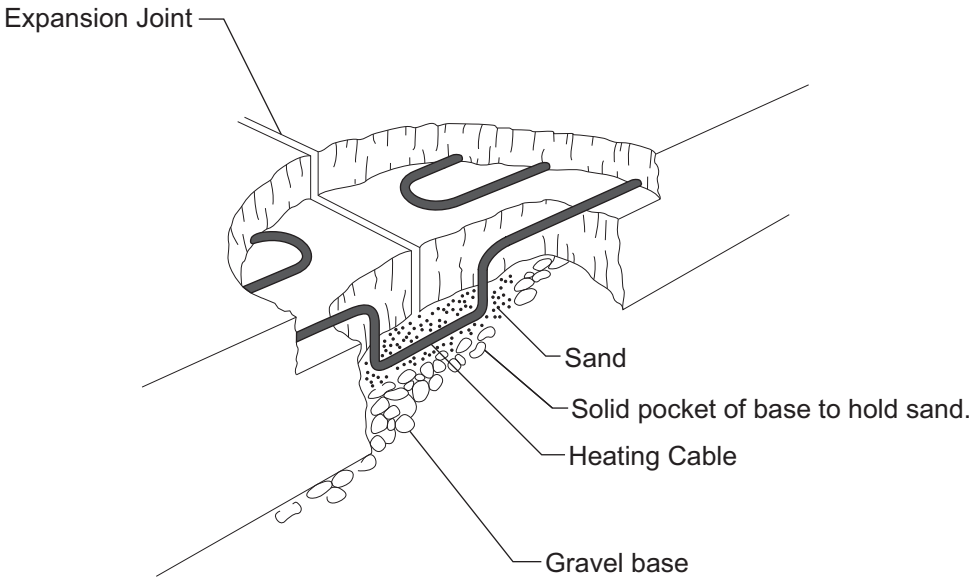



Detail 10

**Crossing Control or Construction Joint**
(Single pour slab)

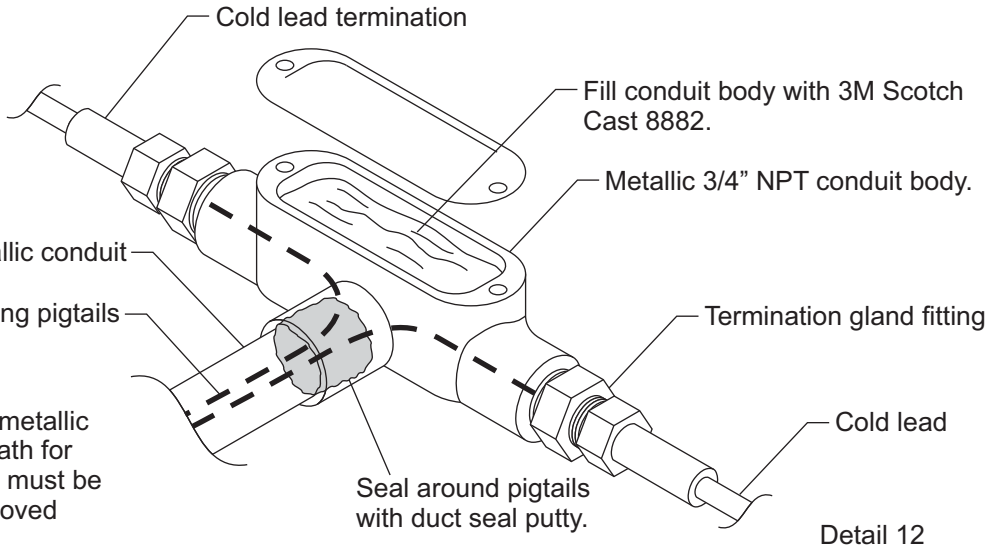
## Cable Crossing Expansion Joints:

Expansion joints are placed where a concrete slab abuts some structure, such as a building, slab, or a foundation. Because the reinforcement does not cross expansion joints, differential movement will occur between the slab and the adjoining structure. Avoid crossing expansion joints with the heating cable. If this is not possible, expansion joints can be crossed using method shown in detail 11.




Detail 11

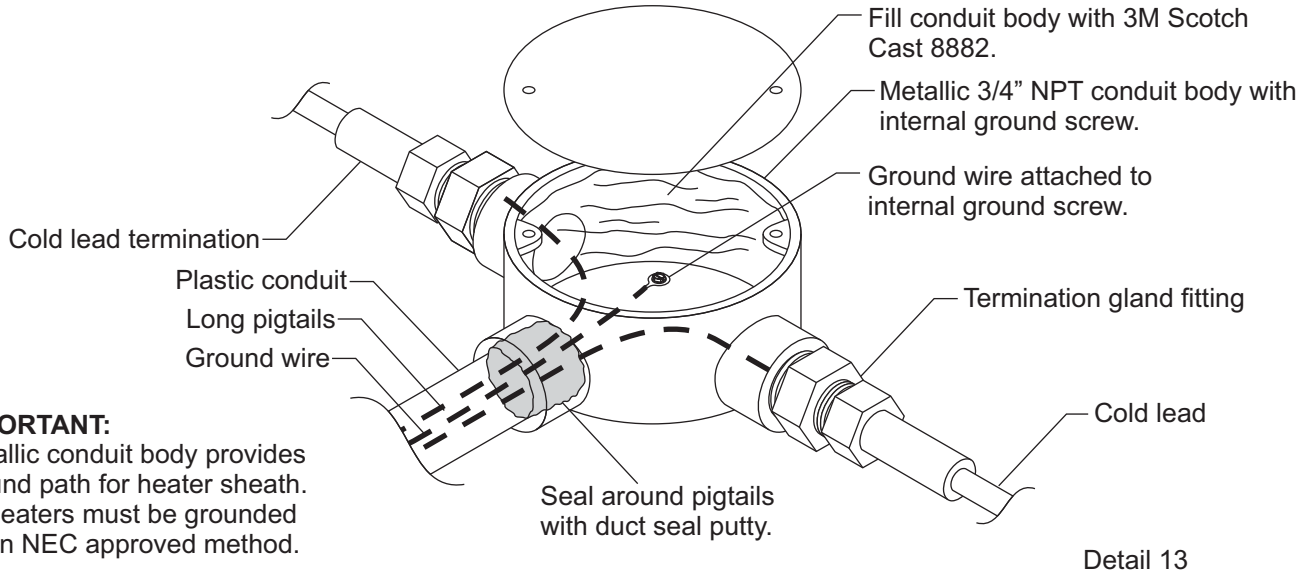
**Expansion Joint Detail**
(Heating cable passed under joint)




**IMPORTANT:**
Metallic conduit body and metallic conduit provides ground path for heater sheath. All heaters must be grounded by an NEC approved method.

Detail 12

**Conduit Body Detail - Metallic Conduit**
(Heater termination with long pigtails. See pages 12 & 13.)




**IMPORTANT:**
Metallic conduit body provides ground path for heater sheath. All heaters must be grounded by an NEC approved method.

Detail 13

**Conduit Body Detail - Plastic Conduit**
(Heater termination with long pigtails. See pages 12 & 13.)

# HEATER TESTING

The following tests are important to verify the integrity of the heater throughout the installation. Use copies of the Inspection Log on page 22 to record these values for each heater. Completed log sheets are essential for factory warranties. Copies must be sent to the factory. An annual inspection and maintenance log is provided on page 23.

**IMPORTANT:**
Tests should be conducted with all power disconnected to the heater. Test must be conducted with pigtails removed from terminal blocks or feed wiring.

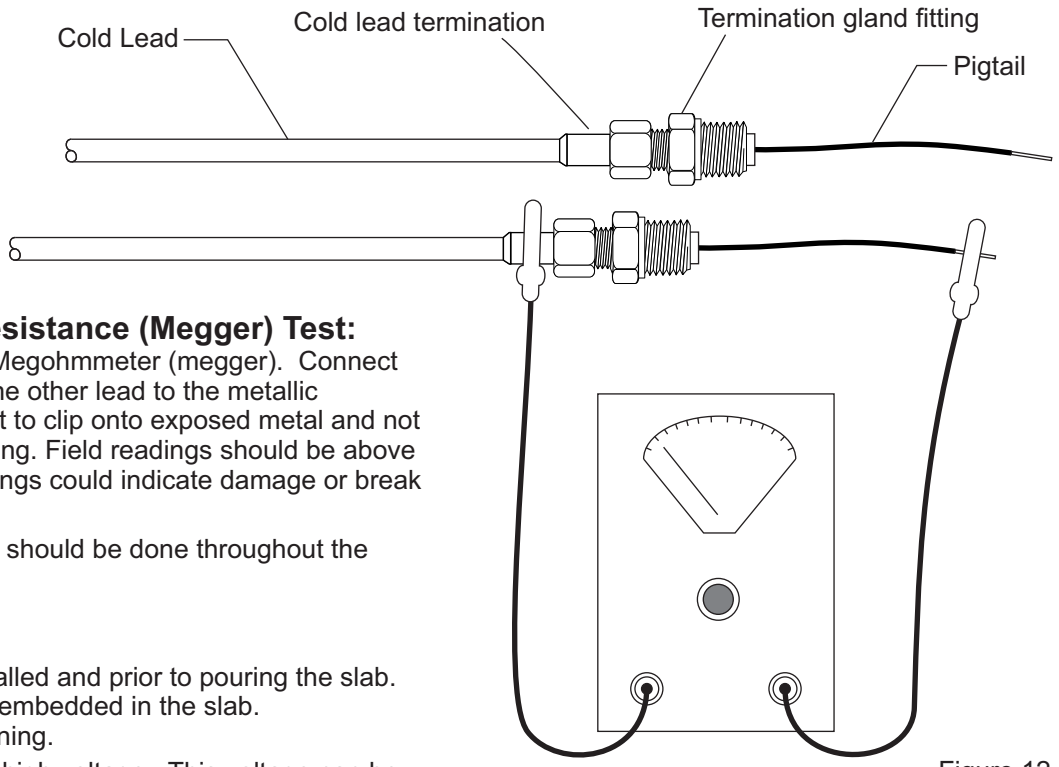



Figure 12

## Heater Insulation Resistance (Megger) Test:

Use 500Vdc or 1000Vdc Megohmmeter (megger). Connect one lead to a pigtail and the other lead to the metallic termination. It is important to clip onto exposed metal and not onto any protective jacketing. Field readings should be above 200 Megohms. Low readings could indicate damage or break in the sheath.

Insulation resistance tests should be done throughout the installation as follows:

1) When it is received.
2) Prior to installing.
3) After it has been installed and prior to pouring the slab.
4) During and after it is embedded in the slab.
5) At time of commissioning.

Note: Meggers operate at high voltage. This voltage can be hazardous. Read and follow all instructions included with the instrument.

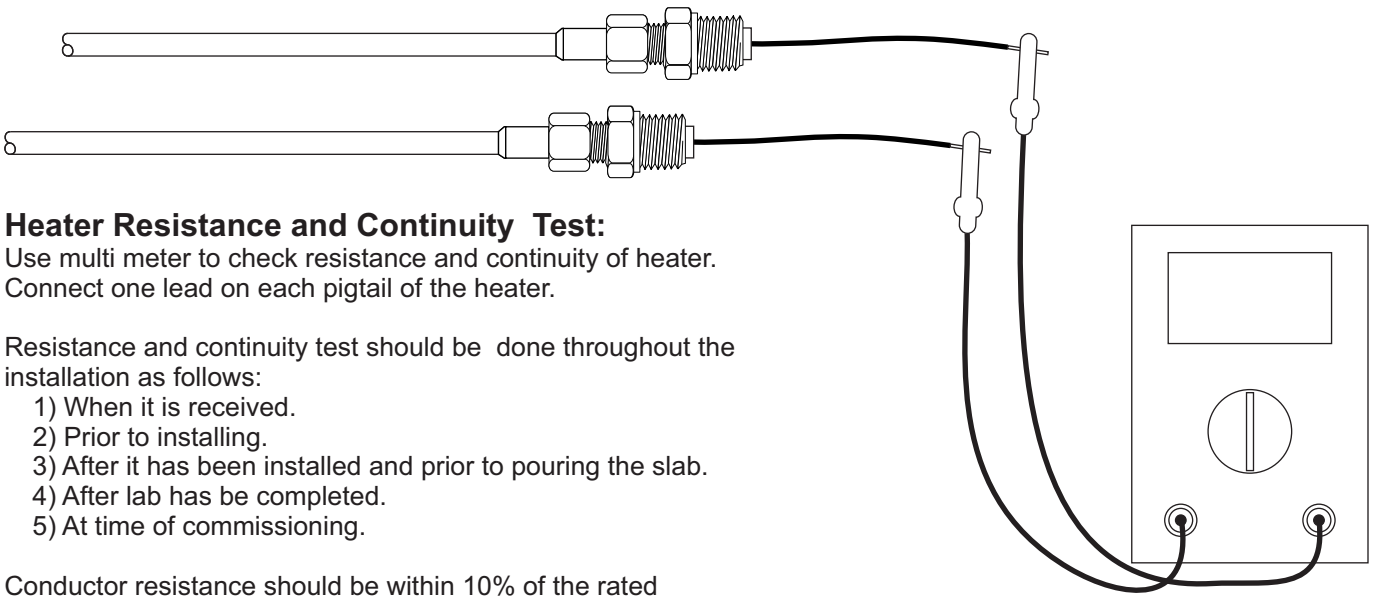


Figure 13

## Heater Resistance and Continuity Test:

Use multi meter to check resistance and continuity of heater. Connect one lead on each pigtail of the heater.

Resistance and continuity test should be done throughout the installation as follows:

1) When it is received.
2) Prior to installing.
3) After it has been installed and prior to pouring the slab.
4) After lab has be completed.
5) At time of commissioning.

Conductor resistance should be within 10% of the rated value.

# HEATER INSTALLATION & INSPECTION LOG

This document is used to record individual heater test values throughout installation.

Heater Catalog #: _____ Heater Design Resistance: _____ Ohms
Tag or Circuit #: _____ Rating: ____Volts ____ Amps _____Watts
Serial #: _____ Trasor Order Number, B- _____
Breaker / Panel #: _____

Table 1

| **Testing at time heaters received:** | Values / Remarks | Date | Initial |
|---|---|---|---|
| 1. Inspect heater for physical damage. | | | |
| 2. Heater resistance between conductors. ① | | | |
| 3. Insulation resistance between conductors and sheath. ② | | | |

**Pre Installation Testing:**

| | | | |
|---|---|---|---|
| 1. Inspect heater for physical damage. | | | |
| 2. Heater resistance between conductors. ① | | | |
| 3. Insulation resistance between conductors and sheath. ② | | | |

**After forming and secured to reinforcement media:**

| | | | |
|---|---|---|---|
| 1. Inspect heater for physical damage. | | | |
| 2. Continuity between conductors. ③ | | | |
| 3. Insulation resistance between conductors and sheath. ② | | | |
| 4. Cable routing and layout matches drawings. | | | |
| 5. Cable properly secured to reinforcement media. | | | |
| 6. Cold lead or pigtails properly routed to junction box. | | | |

**After heater is embedded and slab is complete :**

| | | | |
|---|---|---|---|
| 1. Continuity between conductors. ③ | | | |
| 2. Insulation resistance between conductors and sheath. ② | | | |

**Final Testing and Commissioning:**

| | | | |
|---|---|---|---|
| 1. Installation is complete and slab is completely cured. | | | |
| 2. Insulation resistance between conductors and sheath. ② | | | |
| 3. Energized testing, Heater voltage. | | | |
| 4. Energized testing, Heater current after 10 minutes. | | | |

**Circuit Approval (Heater tested, documented and approved for service):**

| | | |
|---|---|---|
| Contractor: | | |
| Client: | | |
| Comments: | | |

① Resistance should be within 10% of design value. See page 21, Figure 13.
② Use 500VDC megger, 200 megohms minimum. See page 21, Figure 12.
③ Use megger or ohm meter to verify continuity. See page 21, Figure 13.

# HEATER MAINTENANCE & INSPECTION LOG

This document is used to record annual inspection values.

Heater Catalog #: _____ Heater Design Resistance: _____ Ohms
Tag or Circuit #: _____ Rating: ____Volts ____ Amps _____Watts
Serial #: _____ Trasor Order Number, B- _____
Breaker / Panel #: _____

Table 2

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| Heated slab areas are free of damage and cracks. | Initial | | | | | | |
| | Date | | | | | | |
| Snow sensor's are cleaned and free of any dirt or residue. | Initial | | | | | | |
| | Date | | | | | | |
| Inside connection box is clear of moisture and corrosion. | Initial | | | | | | |
| | Date | | | | | | |
| Heater is properly connected and grounded at power connection. | Initial | | | | | | |
| | Date | | | | | | |
| Test ground fault device for circuit. | Initial | | | | | | |
| | Date | | | | | | |
| Controller checked for moisture, corrosion, set point and switch operation. | Set Pt. | | | | | | |
| | Initial | | | | | | |
| | Date | | | | | | |
| Megger test between heater conductors and sheath with lead wires disconnected. (Megohms)① | Value | | | | | | |
| | Initial | | | | | | |
| | Date | | | | | | |
| Energized testing, Heater voltage. | Value | | | | | | |
| | Initial | | | | | | |
| | Date | | | | | | |
| Energized testing, Heater current after 10 minutes. | Value | | | | | | |
| | Initial | | | | | | |
| | Date | | | | | | |
| All connection boxes and controllers have been properly sealed. | Initial | | | | | | |
| | Date | | | | | | |

① Use 500VDC megger, 200 megohms minimum. See page 21, Figure 12.

Comments: