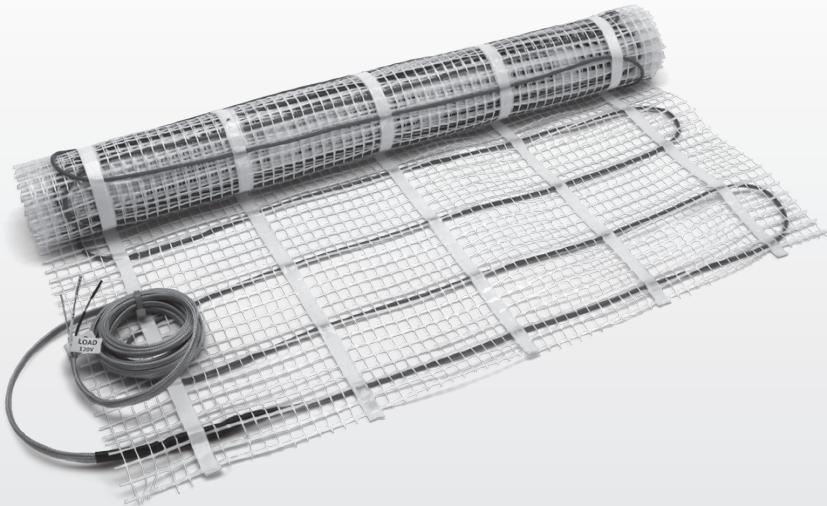


# DIY TapeMat

## Installation Manual



Series D12



### ⚠ WARNING

Please be aware local codes may require this product and/or the thermostatic control to be installed or connected by an electrician. Please leave this manual with the end user.

## **⚠ WARNING**



**THINK  
SAFETY  
FIRST**

Read this Manual BEFORE using this equipment.

Failure to read and follow all safety and use information can result in death, serious personal injury, property damage, or damage to the equipment.

Keep this Manual for future reference.

Floor heating mats are a simple way to heat an indoor space. This instruction manual is provided as a guide to installing TapeMats, including design considerations, installation steps, limitations, precautions, and floor covering guidelines.

## **Specifications for TapeMat:**

**TapeMat** is a complete heating mat consisting of a series heating wire and a power lead for connection to the electric power supply. **The heating wire length cannot be cut to fit.**

**Controls:** TapeMats must be controlled by a SunStat® floor sensing thermostat. (Listed separately)

**Voltage:** 120 VAC, 240 VAC, 1-phase (see Table 2)

**Watts:** 12 W/ft<sup>2</sup> (41 Btu/h/ft<sup>2</sup>)

**Maximum circuit load:** 15 A

**Maximum circuit overload protection:** 20 A breaker

**GFCI:** (Ground Fault Circuit Interrupter) required for each circuit (included in the SunStat control)

**Listing:** UL Listed for U.S. and Canada under UL 1693 and CAN/CSA C22.2 No. 130.2-93, File No. E185866

**Application:** Indoor floor heating only (-X on the nameplate label indicates CUL Listing for this application). Suitable for installation in a shower area (see Step 3.10 for restrictions). (-W on the nameplate label indicates CUL Listing for Wet Location in Canada per Canadian Electrical Code, Part I (CEC). Embedded in polymer-modified cement based mortar only (see Phase 4). May be installed under masonry or non-masonry surfaces as indicated in this manual.

**Minimum bend radius:** 1 inch

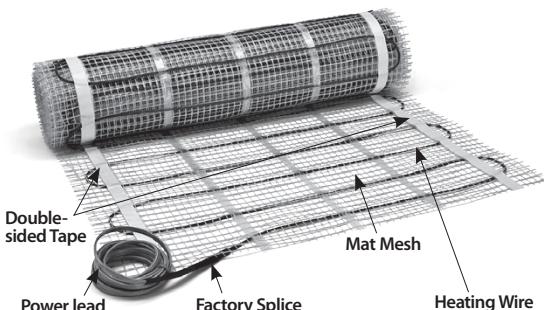
**Maximum exposure temperature:**

(Continuous and storage)

194°F (90°C)

**Minimum installation**

**temperature:** 50°F (10°C)



## **⚠ WARNING**

Installation must be performed by qualified persons, in accordance with local codes, ANSI/NFPA 70 (NEC Article 424) and CEC Part 1 Section 62 where applicable. Prior to installation, please consult the local codes in order to understand what is acceptable. To the extent this information is not consistent with local codes, the local codes should be followed. However, electrical wiring is required from a circuit breaker or other electrical circuit to the control. It is recommended that an electrician perform these installation steps. Please be aware local codes may require this product and/or the control to be installed by an electrician.

## **Expected floor temperature**

Heating performance is never guaranteed. The floor temperature attainable is dependent on how well the floor is insulated, the temperature of the floor before start up, and the overall thermal drain of the floor mass. Insulation is required for best performance. Refer to Phase 4 for important design considerations.

### **These are the three most common installations:**

- Wood framing:** With the mat installed on a well-insulated wood subfloor, and thin-set mortar and tile on top, most floors can be heated up to 20°F warmer than they would otherwise be.
- Insulated concrete slab:** With the mat installed on an insulated concrete slab, and thin-set mortar and tile on top, most floors can be heated up to perhaps 15°F warmer than they would otherwise be.
- Uninsulated concrete slab:** With the mat installed on an uninsulated concrete slab, and thin-set mortar and tile on top, most floors can be heated up to perhaps 10°–15°F warmer than they would otherwise be.

### **NOTICE**

Please consult a designer or the factory if questions remain about the surface temperature that can be expected from the cables in any particular construction.

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### **Important Safety Information**



This is a safety-alert symbol. The safety alert symbol is shown alone or used with a signal word (DANGER, WARNING, or CAUTION), a pictorial and/or a safety message to identify hazards.

When you see this symbol alone or with a signal word on your equipment or in this Manual, be alert to the potential for death or serious personal injury.



This pictorial alerts you to electricity, electrocution, and shock hazards.

#### **⚠ WARNING**

This symbol identifies hazards which, if not avoided, could result in death or serious injury.

#### **⚠ CAUTION**

This symbol identifies hazards which, if not avoided, could result in minor or moderate injury.

#### **NOTICE**

This symbol identifies practices, actions, or failure to act which could result in property damage or damage to the equipment.

**Table 1****⚠ WARNING**

As with any electrical product, care should be taken to guard against the potential risk of fire, electric shock, and injury to persons. The following cautions must be observed:

**⚠ WARNING**

Local building or electrical codes may require modifications to the information provided. You are required to consult the local building and electrical codes prior to installation. If this information is not consistent with local building or electrical codes, the local codes should be followed.

- NEVER** install TapeMat under carpet, wood, vinyl, or other non-masonry flooring without embedding it in thin-set, thick-set, or self-leveling mortar.
  - NEVER** install TapeMat in adhesives or glues intended for vinyl tile or other laminate flooring, or in pre-mix mortars. It must be embedded in polymer-modified, cement based mortar.
  - NEVER** cut the heating wire. Doing so will cause dangerous overheating and will void the warranty. The power lead may be cut shorter if necessary, but never remove completely from the heating wire.
  - NEVER** bang a trowel or other tool on the heating wire. Be careful not to nick, cut, or pinch the wire causing it to be damaged.
  - NEVER** use nails, staples, or similar to fasten the heating wire to the floor.
  - NEVER** attempt to repair a damaged heating wire, splice, or power lead using unauthorized parts. Use only factory authorized repair parts and methods.
  - NEVER** attempt to repair a damaged shower mat. It must be replaced.
  - NEVER** splice one mat heating wire to another mat heating wire to make a longer mat. Multiple mat power leads must be connected in parallel in a junction box or to the thermostat.
  - NEVER** install one mat on top of another or overlap the heating wire on itself. This will cause dangerous overheating.
  - NEVER** forget to install the floor sensor included with the thermostat.
  - NEVER** install TapeMat in any walls, or over walls or partitions that extend to the ceiling.
  - NEVER** install mats under cabinets or other built-ins having no floor clearance, or in small closets. Excessive heat will build up in these confined spaces, and the mat can be damaged by fasteners (nails, screws, etc.) used to install built-ins.
  - NEVER** remove the nameplate label from the power leads. Make sure it is viewable for inspection later.
  - NEVER** extend the heating wire beyond the room or area in which it originates.
  - NEVER** allow a power lead or sensor wire to cross over or under a heating cable. Damage could result.
  - NEVER** put the system into full operation until the tile or flooring installer verifies all cement materials are fully cured (typically two to four weeks).
- 
- ALWAYS** completely embed the heating wire and factory splices in the floor mortar.
  - ALWAYS** maintain a minimum of 2.5" spacing between heating wires.

**ALWAYS** pay close attention to voltage and amperage requirements of the breaker, the thermostat, and the TapeMat. For instance, do not supply 240 VAC power to 120 VAC TapeMat as damage will result.

**ALWAYS** make sure all electrical work is done by qualified persons in accordance with local building and electrical codes, Section 62 of the Canadian Electrical Code (CEC) Part I, and the National Electrical Code (NEC), especially Article 424.

**ALWAYS** use copper only as supply conductors to the thermostat. **Do not use aluminum.**

**ALWAYS** seek help if a problem arises. If ever in doubt about the correct installation procedure to follow, or if the product appears to be damaged, the factory must be called before proceeding with the installation.

## **⚠ WARNING**

Installation must be performed by qualified personnel, in accordance with local codes and standards. A licensed electrician is recommended.

## **Phase 1 - Preparations**

Before installing TapeMat, make sure to fully inspect the products and carefully plan the site.

## **Items Needed**

### **Materials:**

- SunStat thermostat control with floor sensor.
- Control electrical box (UL Listed, extra deep, see control instructions for size and type required)
- Junction electric box (if required, see Step 2.2)
- Wire nuts (Must be UL Listed and proper size)
- Flexible or rigid conduit (if required, see Step 2.4, must be UL Listed and proper size)
- 12-gauge or 14-gauge electrical wiring cable (consult local code)
- Nail plate (see Step 3.8)

### **Tools:**

- Digital multi-meter for ohms testing; must read up to 20,000 ohms to measure sensor
- Drill with 1/2" & 3/4" bits
- Hammer and chisel
- Hot glue gun and hot glue (craft grade)
- Wire strippers
- Phillips screwdriver
- Fish tape
- Hole saw
- Floor covering installation tools

**Floor sensor is included in the SunStat thermostat packaging. This must be installed in the floor with the mat.**



## Table 2 - Mat Sizes

Please check the product label for exact ratings. This table is for reference only.

240 VAC					120 VAC				
2.5 ft Wide	Mat Square Footage	Mat Size (W x L)	Amp Draw	Ohms	2.5 ft Wide	Mat Square Footage	Mat Size (W x L)	Amp Draw	Ohms
	20	2.5' x 8'	1	218 - 268		10	2.5' x 4'	1	107 - 132
	30	2.5' x 12'	1.5	144 - 177		15	2.5' x 6'	1.5	71 - 88
	40	2.5' x 16'	2	107 - 132		20	2.5' x 8'	2	53 - 66
	50	2.5' x 20'	2.5	85 - 105		25	2.5' x 10'	2.5	42 - 52
	60	2.5' x 24'	3	68 - 84		30	2.5' x 12'	3	34 - 42
	70	2.5' x 28'	3.5	59 - 74		35	2.5' x 14'	3.5	29 - 37
	80	2.5' x 32'	4	51 - 63		40	2.5' x 16'	4	25 - 32
	90	2.5' x 36'	4.5	45 - 56		45	2.5' x 18'	4.5	22 - 28
	100	2.5' x 40'	5	41 - 51		50	2.5' x 20'	5	20 - 26
	120	2.5' x 48'	6	34 - 42		60	2.5' x 24'	6	17 - 21
	140	2.5' x 56'	7	29 - 37		70	2.5' x 28'	7	14 - 19
	160	2.5' x 64'	8	25 - 31		80	2.5' x 32'	8	12 - 16

### NOTICE

It is important to select the proper size mat for the given area. Mats cannot be cut shorter in order to fit a given area. Doing so will damage the heating wire and prevent the system from working.

## Inspect mat, control, and sensor

### ⚠ WARNING



To prevent the risk of personal injury and/or death, make sure power is not applied to the product until it is fully installed and ready for final testing. All work must be done with power turned off to the circuit being worked on.

### STEP 1.1

Remove the TapeMat, SunStat Control, and sensor from their packages. Inspect them for any visible damage and verify everything is the correct size and type according to the plan and the order. Do not attempt to install a damaged product.

### STEP 1.2

Record the product information in **Table 4**. Give this information to the homeowner to keep in a safe place.

The Mat model number, serial number, voltage, and resistance range are shown on a nameplate label attached to the power leads.

## NOTICE

Do not remove this nameplate label. The electrical inspector will need to see this.

### STEP 1.3

Use a digital multi-meter set to the  $200\Omega$  or  $2000\Omega$  ( $2k\Omega$ ) range to measure the resistance between the conductors of the mat power leads. Record these resistances in **Table 4** under "Out of the box before installation".

The resistance should measure within the resistance range on the nameplate label. If it is a little low, it may be due to low air temperatures or meter calibration. Consult the factory if in doubt.

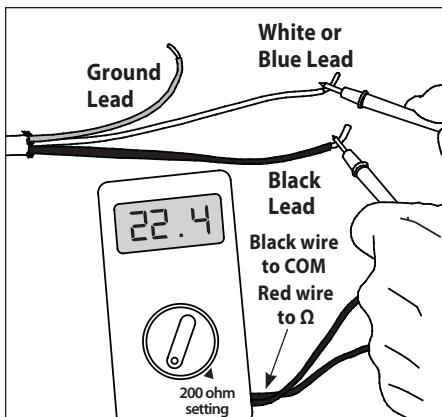
Measure the resistance between either of the white or black leads and ground lead. This measurement should be "open", usually indicated by an "OL" or a "I". This is the same as displayed when the test leads are not touching anything.

If there is any change in the reading, record this information and contact the factory before continuing. This could indicate damage, test lead problems, or a number of other issues. Try "pinning" the test leads to the cable lead wires against a hard non-metal surface if the readings continue to fluctuate.

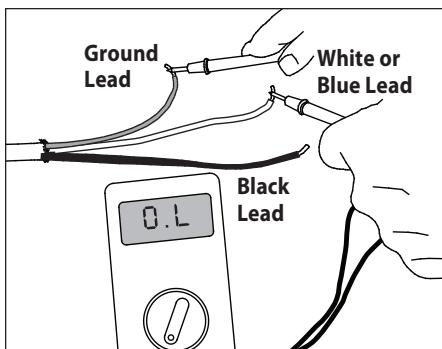
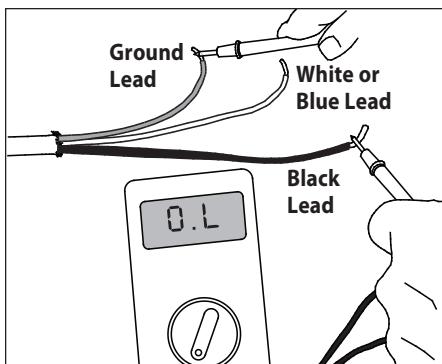
Change the meter to the  $20,000$  ohms ( $20 k\Omega$ ) range. Measure between the lead wires of the control sensor. This resistance varies according to the temperature sensed. **Table 3** provides approximate resistance-to-temperature values for reference.

**Table 3 - Floor Sensor Resistance Values**

Temperature	Typical Values
55°F (13°C)	17,000 ohms
65°F (18°C)	13,000 ohms
75°F (24°C)	10,000 ohms
85°F (29°C)	8,000 ohms



Press the test lead tips to the Black and White (or Blue for 240 VAC) power lead wires. This reading should correspond to the factory resistance range on the nameplate label attached to the Power lead.



Readings between the Black and Ground and the White (or Blue for 240 VAC) and Ground power lead wires should measure "open", or "OL", or the same as displayed when the test leads are not touching anything.

**Table 4 - Mat and Sensor Resistance Log**

	Mat 1	Mat 2	Mat 3
Mat serial number			
Mat model			
Mat voltage			
Factory mat resistance range			
<b>OUT OF THE BOX BEFORE INSTALLATION (OHMS)</b>			
Mat black to white (black to blue for 240VAC)			
Mat black to ground			
Mat white to ground (blue to ground for 240VAC)			
Sensor wire			
<b>AFTER MAT AND SENSOR ARE FASTENED TO FLOOR (OHMS)</b>			
Mat black to white (black to blue for 240VAC)			
Mat black to ground			
Mat white to ground (blue to ground for 240VAC)			
Sensor wire			
<b>AFTER FLOOR COVERINGS ARE INSTALLED (OHMS)</b>			
Mat black to white (black to blue for 240VAC)			
Mat black to ground			
Mat white to ground (blue to ground for 240VAC)			
Sensor wire			
<b>Retain this log to retain the warranty! Do not discard!</b>			

**INSTALLATION NOTES**

## Phase 2 - Electrical Rough-in

### ⚠ WARNING



To prevent the risk of personal injury and/or death, make sure power is not applied to the product until it is fully installed and ready for final testing. All work must be done with power turned off to the circuit being worked on.

### STEP 2.1:

#### Circuit Breaker (Overcurrent Protection)

TapeMat(s) must be protected against overload by a circuit breaker. GFCI type (ground fault circuit interrupter) or AFCI type (arc-fault circuit interrupter) breakers may be used if desired, but are not necessary when using SunStat controls with integral GFCI.

The rating of the breaker (see **Table 5**) is determined by the amp draw of the heating mats. Add the amp ratings of all mats to be connected to the SunStat control (see Table 2 or the Nameplate Label on the mat). If the total is less than 12 amps, use a 15 or 20 A breaker (preference is 15 A). If the total is between 12 and 15 amps, use a 20 A breaker. If the total is over 15 A, another circuit will be required with its own breaker and SunStat control.

It may be possible to tap into an existing circuit as long as there is adequate capacity for the mat(s) and any additional appliance, such as a hair dryer or vacuum cleaner. Avoid circuits which have lighting, motors, exhaust fans, or hot tub pumps due to possible interference.

### STEP 2.2:

#### Install Electrical Boxes

##### **SunStat Thermostat:**

Install an extra-deep electrical box for the SunStat thermostat. Follow the instructions included with the SunStat for complete information on location and wiring. The thermostat must be located at least 4 feet (1.2 meters) away from shower openings to avoid being exposed to water or touched by a person while in the shower area.

##### **Junction Boxes:**

If a mat is to be located so its Power lead is not long enough to reach the SunStat Control directly, a junction box must be installed. Do not attempt to make a connection to other wiring without a junction box. Use a standard junction box with a cover, mounting it below the subfloor, in the attic, in the wall, or in another location easily accessible after all coverings are complete. If the SunStat sensor wire is not long enough to reach the SunStat Control directly, it may be extended. A junction box may be required by local code to make this connection. Follow the installation instructions included with the SunStat Control for details.

For construction with an existing wall or where the wall is covered, cut the necessary openings to mount the electrical boxes listed above. Wait to install the boxes until all wiring is fed into these locations to make it easier to pull the wire.

**Table 5**

Circuit Breakers and Supply Wire					
Mat(s)		Supply Wire	Breaker		
VAC	total amps	(AWG)*	qty	type**	rating
120	up to 12 amps	14	1	SP	15 or 20 A
120	up to 15 amps	12	1	SP	20 A
240	up to 12 amps	14	1	DP	15 or 20 A
240	up to 15 amps	12	1	DP	20 A

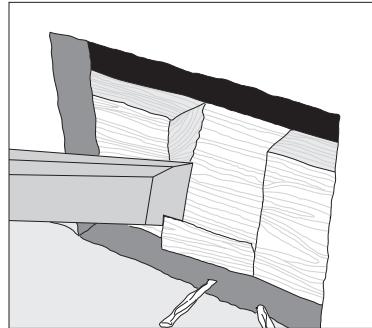
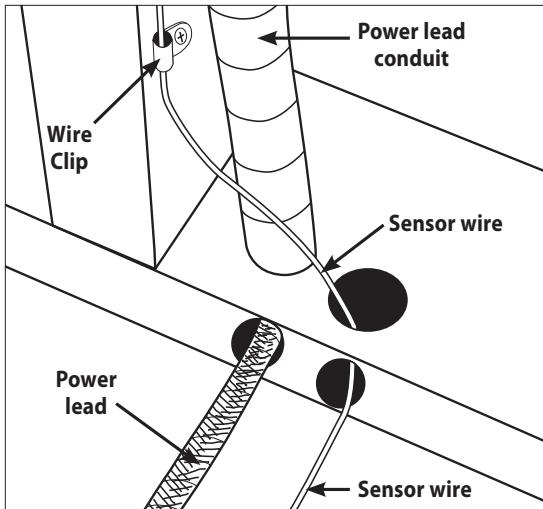
\* Recommended only. Follow local codes for wire gauge size.

\*\* SP= single-pole, DP=double-pole

## STEP 2.3:

### Bottom Plate Work

Drill or chisel holes at the bottom plate as indicated. One hole is for routing the power lead conduit and the other is for the thermostat sensor. These holes should be directly below the electrical box(es).



If going in to an existing wall, cut out dry wall and chisel out bottom plate to route wires to control.

## STEP 2.4:

### Install Power Lead Conduit and Thermostat Sensor

#### **Power Lead Conduit:**

The shielded power lead can be installed with or without electrical conduit (recommended for added protection against nails or screws) depending on code requirements. Remove one of the knock-outs in the electrical box to route the power lead. If electrical conduit is not required by code, install a wire collar to secure the power leads where they enter the box. If conduit is required by code, install 1/2" (minimum) conduit from the bottom plate up to the electrical box. For multiple power leads (multiple mats) install 3/4" conduit.

#### **Thermostat Sensor:**

The SunStat Control sensor can be installed with or without electrical conduit depending on code requirements. Conduit is recommended for added protection against nails or screws. Do not place the sensor in the same conduit as the power leads to avoid possible interference. Open a separate knock-out in the bottom of the thermostat box. Feed the sensor (and conduit, if used) through the knock-out, down through the cut-out in the bottom plate, and out into the floor where the heating mat will be installed. If the sensor wire needs to be secured to the wall stud, wait until after the mat and sensor are completely installed on the floor.

## STEP 2.5:

### Rough-in Wiring:

Install appropriate 12 or 14 AWG electrical wire from the circuit breaker or branch circuit source to the SunStat Control electrical box following all codes, see **Table 5**.

## Phase 3 - Mat Installation

### STEP 3.1:

#### Floor Cleaning

The floor must be completely swept of all debris including all nails, dirt, wood, and other construction debris. Make absolutely sure there are no objects on the floor which might damage the TapeMat wire.

Wet mop the floor at least twice to ensure there is no dirt or dust. This will allow proper bonding of the mortar.

### STEP 3.2:

#### Position the Power Leads

Carefully cut the tie binding the power lead coil. Do not nick the braid covering the power lead.

Place the mat on the floor to ensure the power lead will reach the control electrical box or junction box location.

If the power lead will need to cross a long distance to reach the control location, it may be possible to cut the mat mesh and pull loose the length of heating wire needed.

It is acceptable to run the power lead several feet in the floor area and embed in mortar, but this may require making a shallow channel in the floor to ensure it lays flat with the rest of the mat. See Step 3.8.

**Make sure the power lead factory splice is to be completely flat and in the floor mortar, not in the wall.**

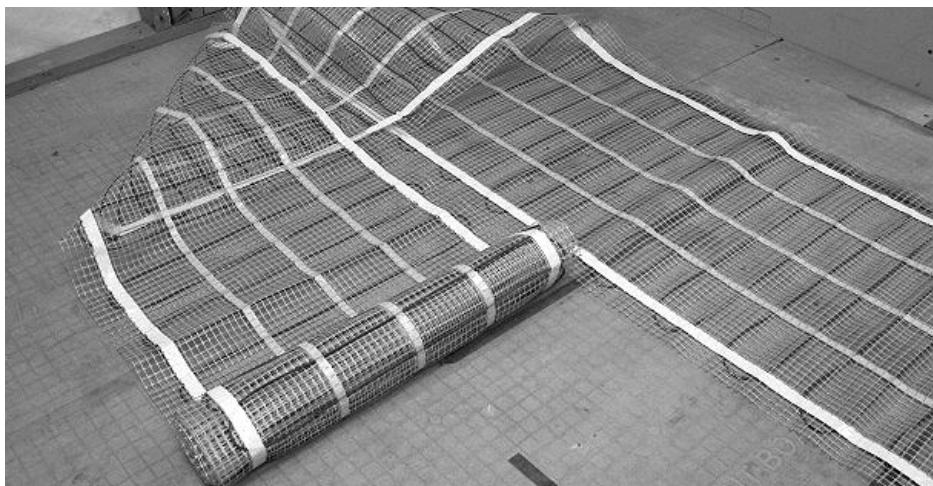
### STEP 3.3:

#### Connect a LoudMouth™

If a LoudMouth is being used, connect it to the power lead wires. Refer to the instructions provided with the LoudMouth for details and proper connections.

#### ⚠ CAUTION

Do not cut the heating wire to make it fit the area. Doing so will cause dangerous overheating and will void the warranty.



Test fit the mat by rolling it out, flipping it on itself as needed.  
Make sure it fits before cutting the mesh.

## STEP 3.4

### Test Fit the Mat

Roll out the mat, flipping it as needed to cover the intended area. This is very important to ensure proper fit before proceeding. If there is too much mat for the area it cannot be cut shorter and heating wire cannot be routed into a wall, under baseboards, or other similar areas. All heating wire must be embedded in the floor mortar.

## STEP 3.5

### Shape the Mat

If the mat must be shaped to fit the floor area, see **Table 6** for technique examples and see the Appendix for additional layouts, techniques, and Cautions.

Install the mat approximately 4"-6" away from walls, showers, tubs, drains, etc. and 6" from a toilet wax ring. It may be installed closer to walls if necessary, but make sure the heating wire will not be located underneath finish trim. Install in-line with vanity and counter areas. Install roughly 20" from back wall in toilet area.

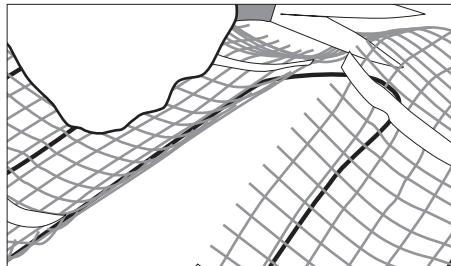
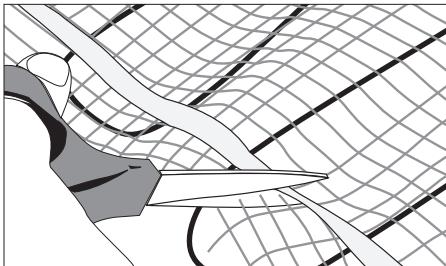
#### NOTICE

**DO NOT** leave gaps between the mats. The heat will conduct only about 1-1/2" from the heating wire. Mat should be installed continuously across the floor. Never install mats in a fashion causing the heating wires to be any closer than 2" from each other or to overlap.

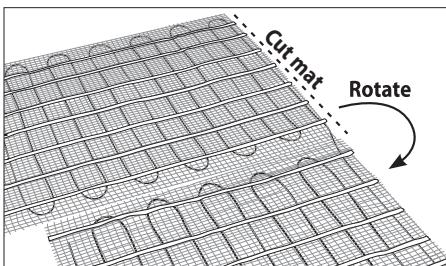
**Table 6**

#### *Mat Turns and "Fill-in" Techniques*

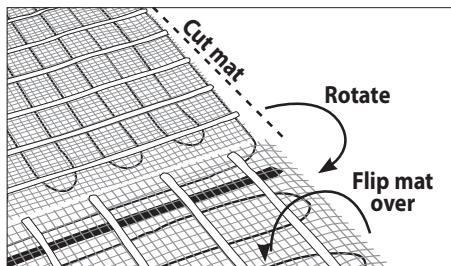
This table contains some of the common turns and techniques used to layout around corners, angles, and built-ins.



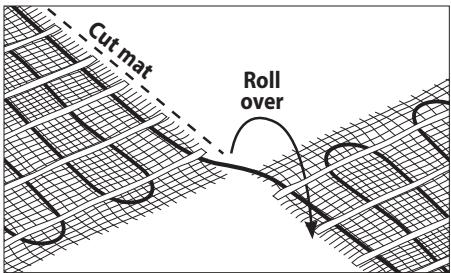
Carefully cut the orange mesh to make turns. Never cut, nick, or otherwise damage the heating wire.



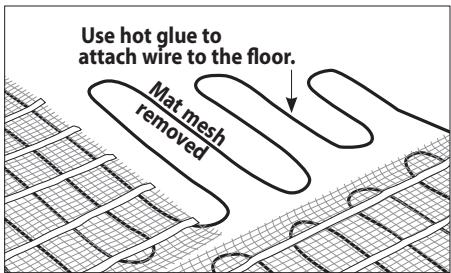
180° or Back-to-Back Turn.



90° or Flip Turn.

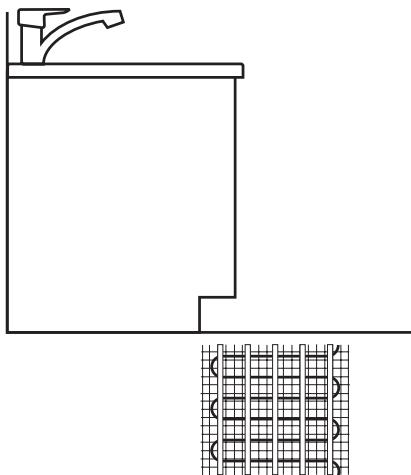


Roll-over Turn.

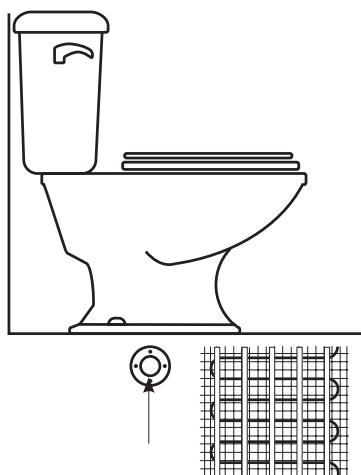


Fill-in Technique.

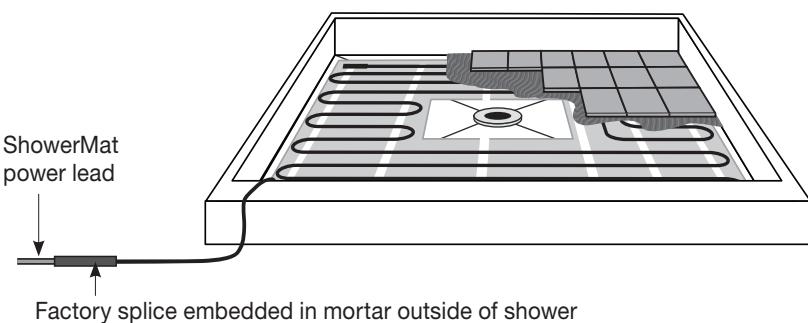
**Installing in front of cabinets and toilets:**



Install mat right up to the face of the cabinet as shown above.



Mat can be installed under tile to within 6" from the wax ring, and can slightly underlay the foot of the toilet if need be (approximately 20" from wall).



Factory splice embedded in mortar outside of shower

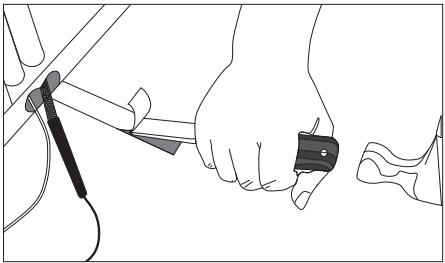
## STEP 3.6

### Secure the Mat to the Floor

Lay the mat down flat. Ensure it fits well and has no folds or large ripples.

#### NOTICE

Securing the mat as flat as possible will help make a smooth surface for spreading mortar.



Chisel a path for the power lead and factory splice.

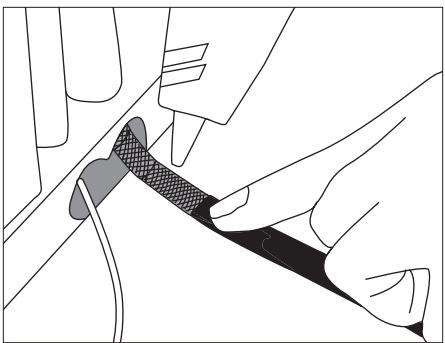
If the mat comes with double-sided tape already attached, remove the liner along one edge and press the tape down. Remove the liner along the other edge and press the tape down, pulling lightly on the mat to keep it flat.

Ensure all edges of the mat are secured to the floor using double-sided tape or hot glue. Secure as needed across the middle of the mat to ensure it stays flat during floor mortar application later. Do not use staples or anything else that will cause damage to any waterproofing membrane.

#### NOTICE

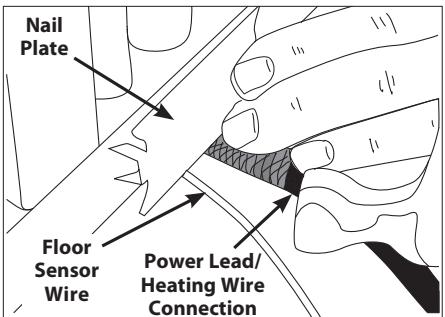
**DO NOT** staple or apply tape over the heating wire. Damage can result.

**DO NOT** use nails, duct tape, other types of tape, or other unapproved fasteners to hold the heating wire or mesh in place. Damage can result.



Use hot glue to secure to the floor.

It may be necessary to use a metal nail plate to protect the power lead and sensor wire as they transition into the wall. This will help prevent nail penetrations from drywall and baseboards trim.



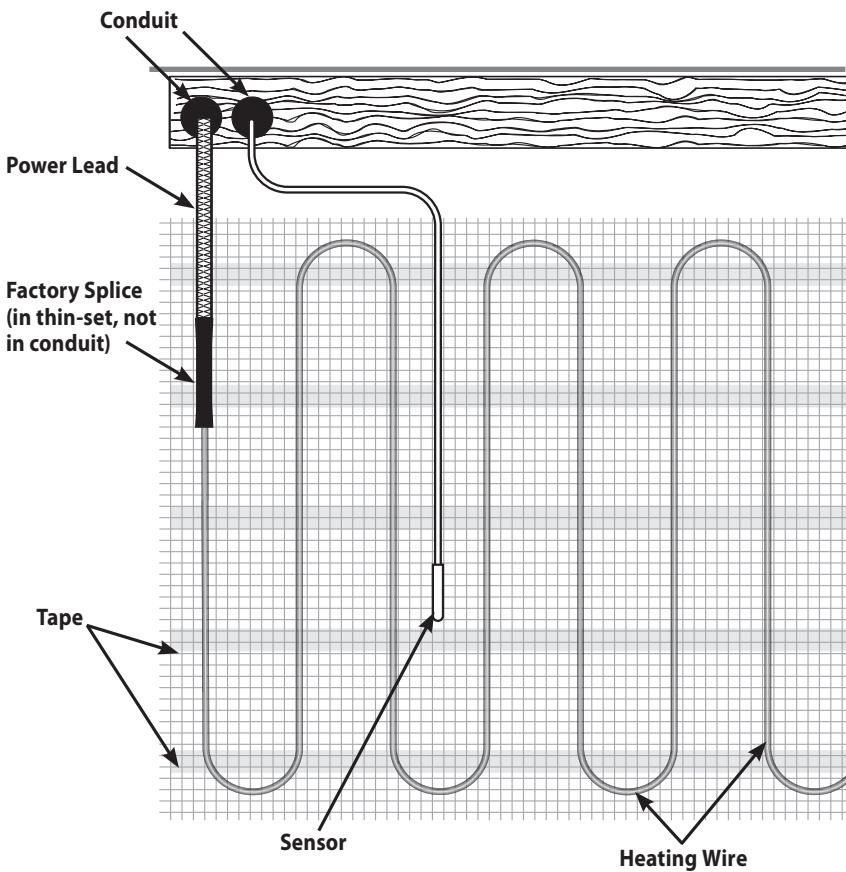
Place a metal nail plate over the transition point to protect the power lead and sensor wire.

## STEP 3.7

Use a digital multi-meter to measure the resistance between the conductors of the power leads again. Record these resistances in **Table 4** under “After mat is secured in place”.

## STEP 3.8

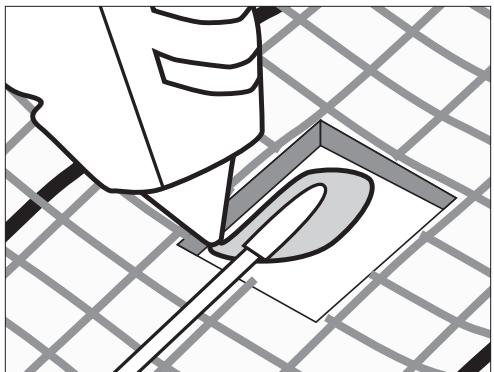
Feed the power leads through the conduit to the control electrical box, leaving at least 6"-8" of free power lead. Chisel a slot in the floor to recess the factory splice level with the heating wire. Secure the factory splice with hot glue so it cannot be pulled into the conduit.



Top-Down view of Mat and the sensor entering wall.

### STEP 3.9

Feed the sensor wire to the SunStat thermostat electrical box leaving at least 6"-8" of free lead length in the box. Weave the sensor at least 1' into the mat area, halfway between the heating wires, and secure it using hot glue. Do not cross the heating wires. It may be necessary to chisel a small section of the subfloor to accommodate the sensor, depending on the thin-set thickness being used.

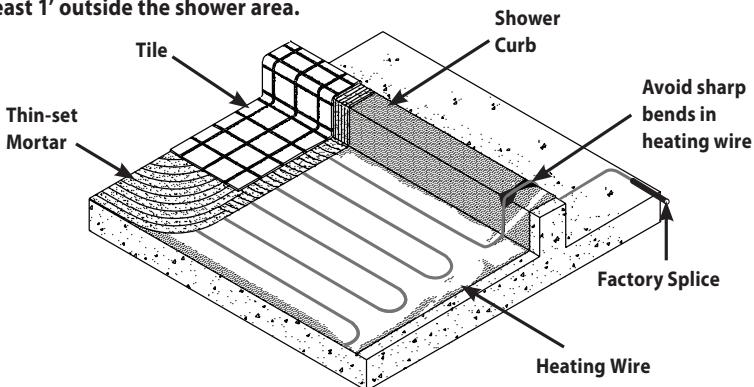


## STEP 3.10: Shower Application

### NOTICE

Acceptance of this application must be verified by the local inspector or authority having jurisdiction (AHJ).

#### Locate power lead and factory connection to heating wire at least 1' outside the shower area.



1. Refer to diagrams in the Appendix, especially pages 26 & 27.
2. Never install TapeMat or ShowerMat in shower walls (or any other wall).
3. Never make a field splice to mats installed in a shower.
4. It is recommended that a dedicated mat be installed in the shower area, separate from the mat in the rest of the floor. In case there is ever a problem with the shower installation, this mat could be disconnected without loss of heat to the rest of the floor.
5. Use the double-sided tape or hot-glue to secure the ShowerMat. Do not use staples or anything that will damage any waterproofing membrane.
6. If the heating wire must enter the shower area over a curb, secure the wire at the edges in an "s-shaped" curve to ensure the wire is not bent sharply or pinched when surface coverings are installed. Do not damage any waterproofing components, and do not run the heating wire through a non-masonry curb, causing it to overheat.
7. Embed mats in mortar and install only under tile, stone, brick, or other masonry surface, per this instruction manual.
8. Never begin the mat in a shower. The connection between the power lead and the heating wire must be fully embedded in mortar and located at least 1' (304.8 mm) away from shower openings and other areas normally exposed to water.
9. Mat controls must be located at least 4' away from shower openings. Controls cannot be exposed to water or touched by a person while in the shower area.
10. If covering a bench seat in the shower, carefully trim away mesh to release some heating wire. Use hot glue to secure a single run of wire up the side of the bench riser. Fill in the seat with mat. Then secure a single run of wire down the riser if needed. Use an "s-shaped" curve to avoid sharp bends at corners and help the wire to lay flat.
11. All grout seams should be sealed after the mortar and grout has completely cured.

**Take photographs of the mat installation. This can be very useful later during remodel work to help avoid possible wire damage. Keep the photos with this installation manual and provide to end user upon completion.**

## Phase 4 - Floor Coverings / General Recommendations

### NOTICE

Please note, this installation manual is not a structural or a floor covering installation manual and is intended only for general guidance as it applies to the TapeMat product.

It is recommended to consult with professional flooring installers to make sure proper materials are used and proper installation techniques are followed.

When installing tile or stone, the Tile Council of North America (TCNA) guidelines, National Tile Contractors Association (NTCA), or ANSI specifications should be followed as a minimum standard.

A polymer-modified thin-set cement-based mortar and grout is recommended instead of water-based multi-purpose materials when installing a radiant product.

### NOTICE

Do not use solvent based adhesives or pre-mix mortars because they are not as heat resistant and do not conduct heat well.

Select the proper size trowel for the installation of tile or stone. We recommend a minimum 3/8" x 1/4" trowel. This trowel works well for most ceramic tile. A thicker thin-set can be used if required. Select the thin-set thickness in accordance with the floor covering requirements.

For additional information on tile installation, please contact TCNA at 864-646-8453 or visit their web site at [www.tileusa.com](http://www.tileusa.com), or contact NTCA at 601-939-2071 or see their web site at [www.tile-assn.com](http://www.tile-assn.com)

When installing floor coverings other than tile or stone, follow industry and/or manufacturer's recommendations. Ensure the mat is first covered with a layer of self-leveling cement based mortar, letting it cure fully before applying any surface underlayment, floating wood or laminate flooring, carpet, etc. The combined R-values of all floor coverings over the mat should not exceed R-3. Higher R-values will diminish performance. Consult the floor covering manufacturer to verify compatibility with radiant electric heat.

### NOTICE

Make sure nails, screws, or other fasteners do not penetrate the floor in the TapeMat area. The wire can easily be damaged by fasteners penetrating the floor.

All floor coverings must be in direct contact with the cement-based mortar encasing the mat. Do not elevate the floor above the mortar mass. Do not install 2" x 4" wooden nailers (sleepers) on top of a slab for the purpose of attaching hardwood. Any air gap between the heating mat and the finished floor covering will drastically reduce the overall output of the heated floor.

Care should be taken when laying area rugs, throw rugs, and other surface products on the floor. Most products are okay to use, but if in doubt, consult the product manufacturer for compatibility. Do not use rubber backed products that may degrade or very heavy rugs that will trap heat. Be careful not to place a rug over the area where the sensor tip was placed, causing false thermostat readings.

When placing furniture make sure an air clearance of at least 1-1/2" is available. Furniture able to trap heat can damage the heating system, the flooring, and the furniture over time.

**Use a digital multi-meter to measure the resistance between the conductors of the power leads again. Record these resistances in Table 4 under "After floor coverings are installed".**

## Type of Construction

### Mortar Applications:

Thin-set and thick-set (self-leveling) mortar applications are illustrated below and to the right.

- a. If a backer board or plywood sheeting is used to strengthen the floor, or if the mat will be placed directly onto the slab, install TapeMat in the thin-set mortar bond coat above these materials.
- b. If a thicker mortar bed, or self-leveling concrete, is used to strengthen the floor, TapeMat can be installed in either the mortar bed (dry-set) or in the mortar bond coat directly below the tile or stone.

TapeMat is generally installed above the self-leveling mortar in a thin-set bond coat. Use plastic lath instead of the typical metal lath when installing in a self-leveling layer.

### Self-leveling Mortar Applications:

These are appropriate applications if installing engineered wood, vinyl, laminate, or carpet floor coverings. Attach the TapeMat to the subfloor or slab, then pour self-leveling mortar 1/4" to 1/2" thick according to manufacturer's specifications. Fully embed the heating wire and splices so that no portion of these show. Install floor covering after the mortar has cured.

### Special Precautions

**Isolation Membrane:** Install the TapeMat above the membrane, whenever possible, unless recommended otherwise by the membrane manufacturer.

**Insulation:** Insulation dramatically enhances the performance and efficiency of floor-warming systems. Do not install rigid insulation directly above or below backer board or mortar.

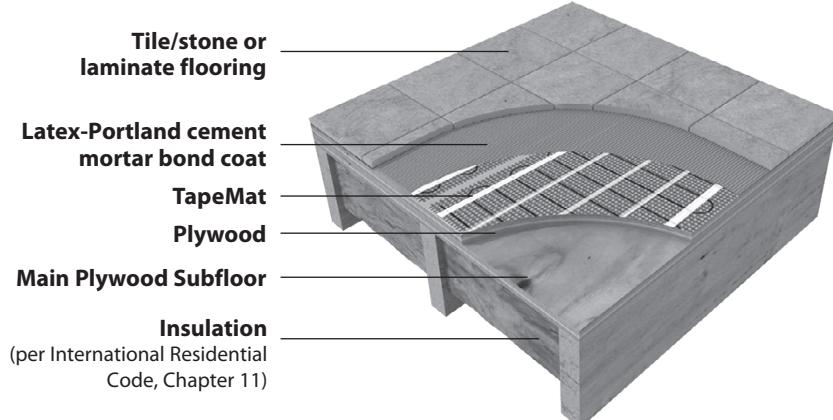
**Mosaic Tile:** When installing mosaic tile, it is recommended to apply a two-step process. First, embed the Mat in a thin self-level mortar bed (1/4"-3/8"), then thin-set the mosaic tile according to typical practice.

**Expansion Joints:** Do not install heating mats through an expansion joint. Install mats right up to the joint, if necessary, but not through the joint.

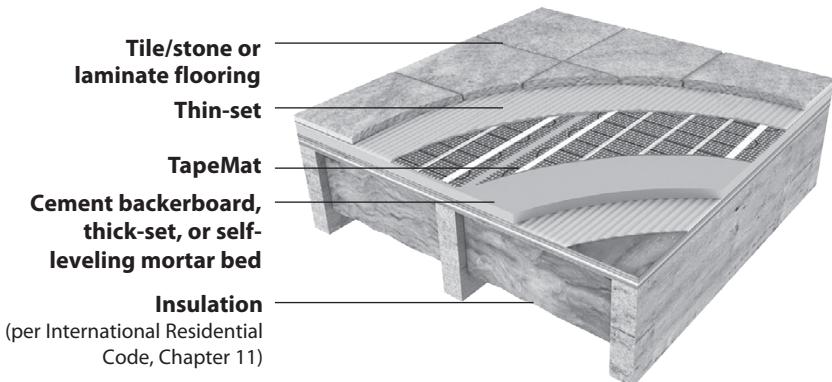
### ⚠ CAUTION

Never bang a trowel on the Heating Wire to remove excess mortar from the trowel. This could damage the heating wire.

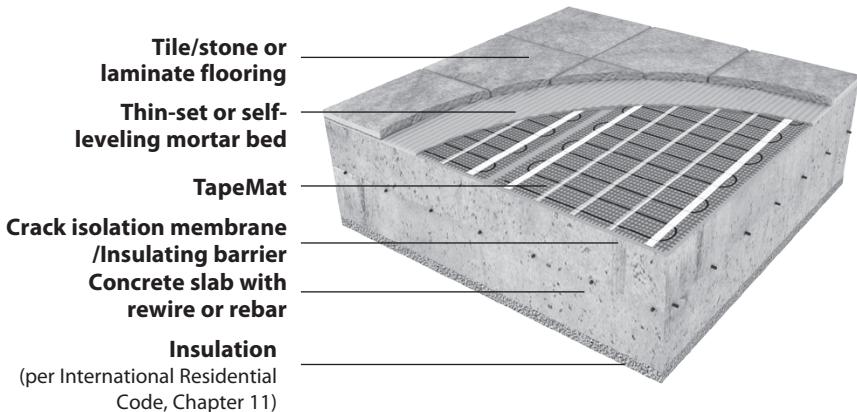
## DOUBLE-PLYWOOD OVER FRAME FLOOR



## CEMENT BACKERBOARD OVER FRAME FLOOR



## THIN-SET OVER SLAB ON GRADE



## Phase 5 - Control Installation

### STEP 5.1:

#### **Install the Controls**

If it has not already been done, install an electrical box for the SunStat thermostat. See Step 2.2 for details.

### STEP 5.2

Read and follow the instructions included with the SunStat thermostat for complete connection instructions, requirements, and mounting.

### STEP 5.3

Make any final connections to the circuit breaker or branch circuit source.

#### **⚠ WARNING**

Make sure 120 VAC is supplied to 120 VAC mats and 240 VAC is supplied to 240 VAC mats. Otherwise, dangerous overheating and possible fire hazard can result.

### STEP 5.4

#### **System Start Up**

After all controls are installed, do not energize the system, except to briefly test operation of all components (no longer than 10 minutes). **Do not put the system into full operation until the tile or flooring installer verifies all cement materials are fully cured (typically two to four weeks).** See mortar manufacturer's instructions for recommended curing time.

#### **NOTICE**

Most laminate and wood floor manufacturers specify their flooring should not be subjected to temperatures over 82° to 84°F (27° to 28°C). Check with the flooring dealer or manufacturer and set the thermostat Floor Limit temperature appropriately.

#### **NOTICE**

Refer to the installation sheets provided with the controls for proper setting. The system should now operate as designed. **Please leave this instruction manual, SunStat Control instructions, and copies of photos of the installed heating system with the end user.**

#### **NOTICE**

Place this warning label (provided with the product) on the electrical panel and indicate the circuit breaker number that supplies the radiant heating. Also, place the label indicating "Radiant Floor Heating" on the control.

*Place this label at the room heating control.*

Radiant Floor Heating

Nappe de chauffage de sol

Tapete radiante para calefacción de pisos

*Place this label on the circuit breaker panel.*

#### **Warning - Risk of electric shock**

Electric wiring and heating panels contained below the floor.

Do not penetrate floor with nails, screws, or similar devices.

CKT# \_\_\_\_\_ / \_\_\_\_\_

#### **Avertissement: Risque de choc électrique**

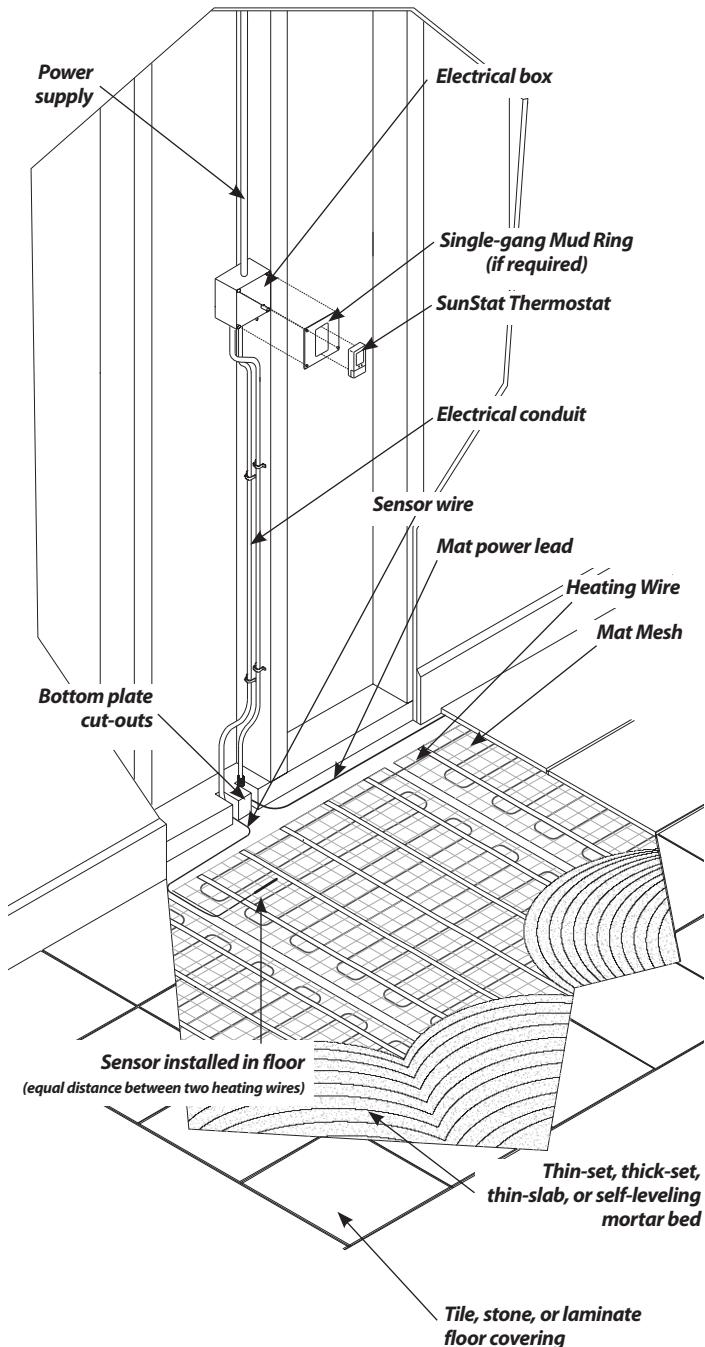
Câblage électrique et nappes de chauffage dans le sol. Ne pas enfoncez de clous, vis ou autres éléments d'assemblage similaires.

CKT# \_\_\_\_\_ / \_\_\_\_\_

#### **Precaución: Riesgo de electrocución**

El piso contiene cables eléctricos y paneles calefactores. No insertar clavos, tornillos ni dispositivos similares.

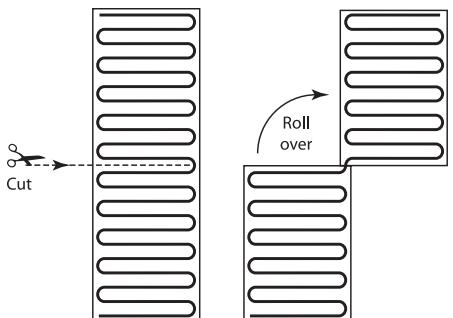
CKT# \_\_\_\_\_ / \_\_\_\_\_



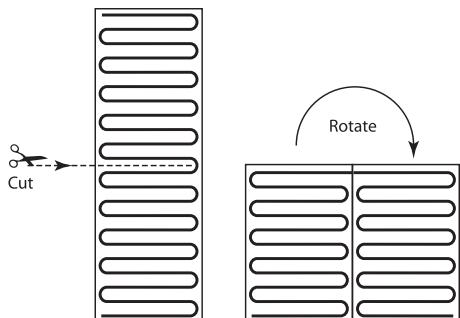
*General layout of the TapeMat installation*

### Types of turns

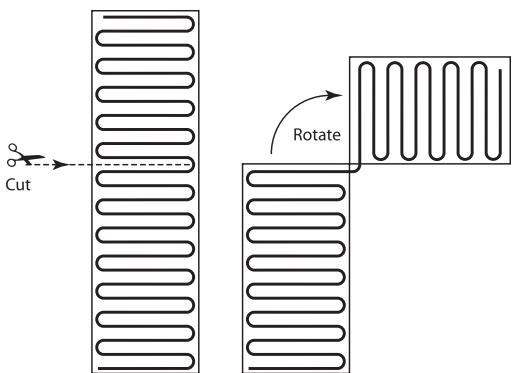
#### Roll-over Turn



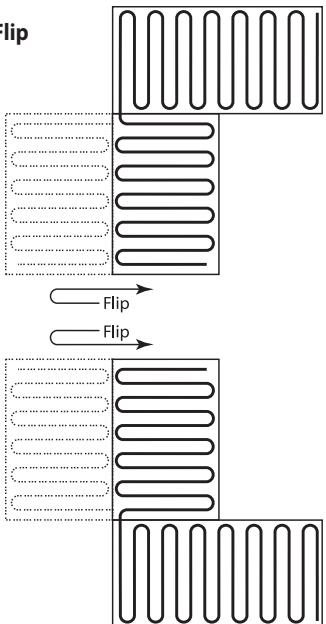
#### 180° or Back-to-Back Turn



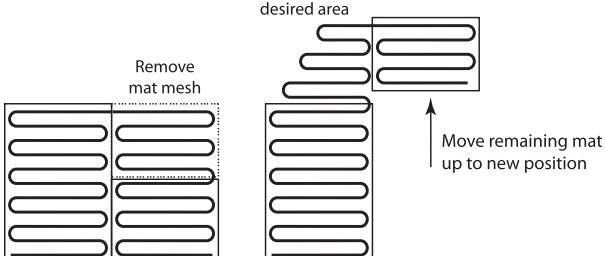
#### 90° Turn



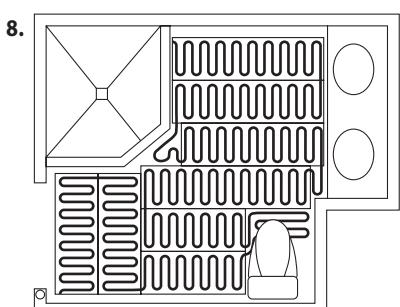
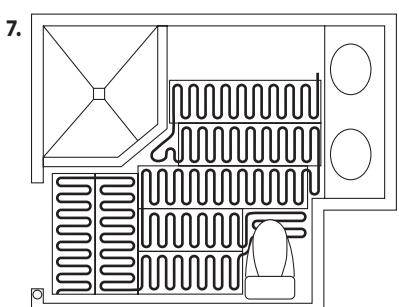
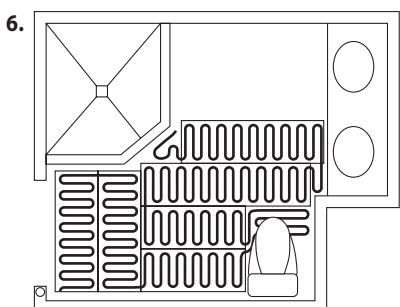
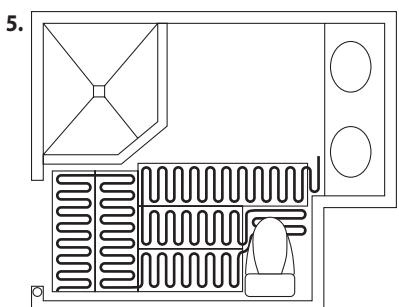
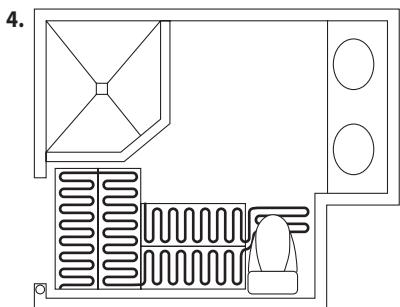
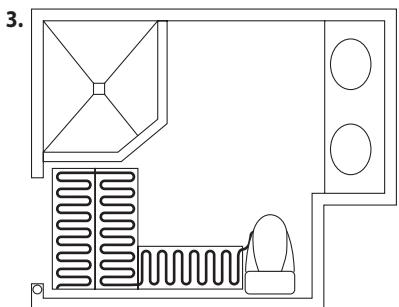
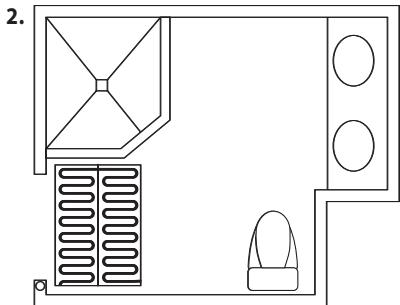
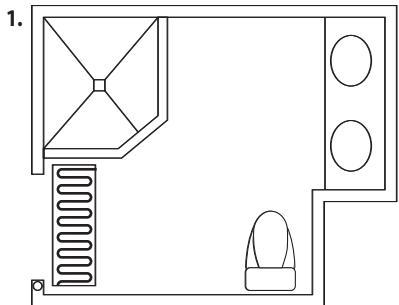
#### 90° Flip



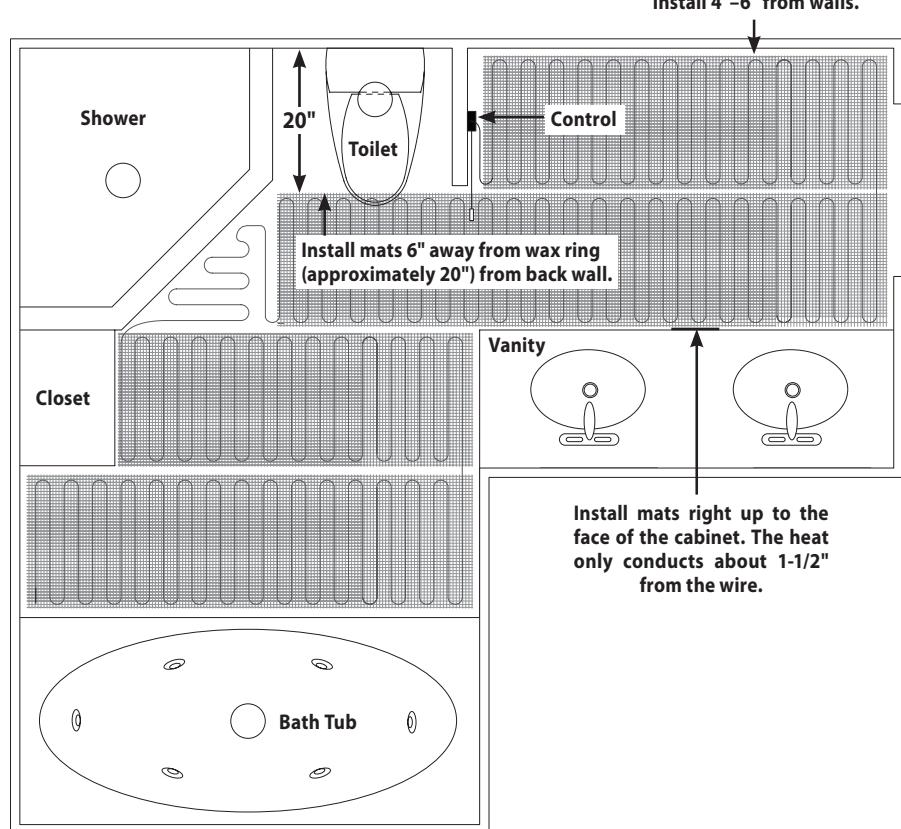
#### Fill-in Technique



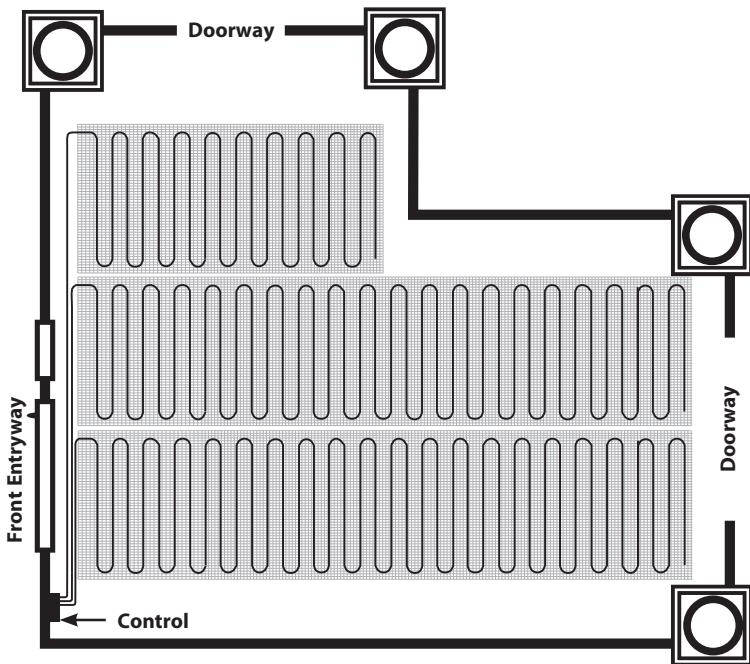
## Step-by-step layout for a typical bathroom



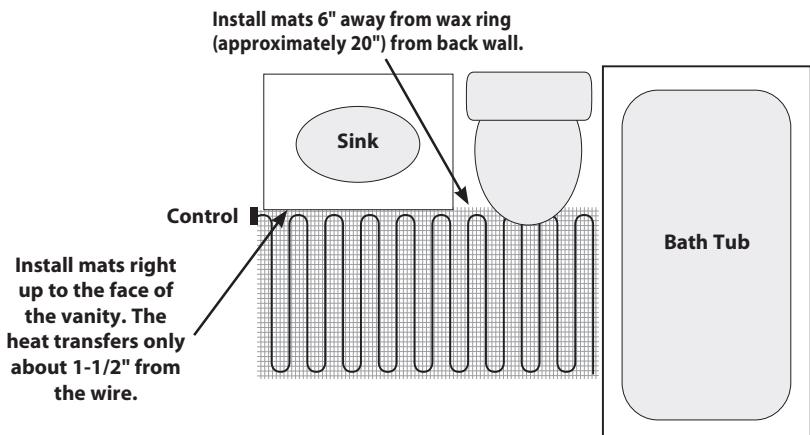
## Bathroom layout: One mat



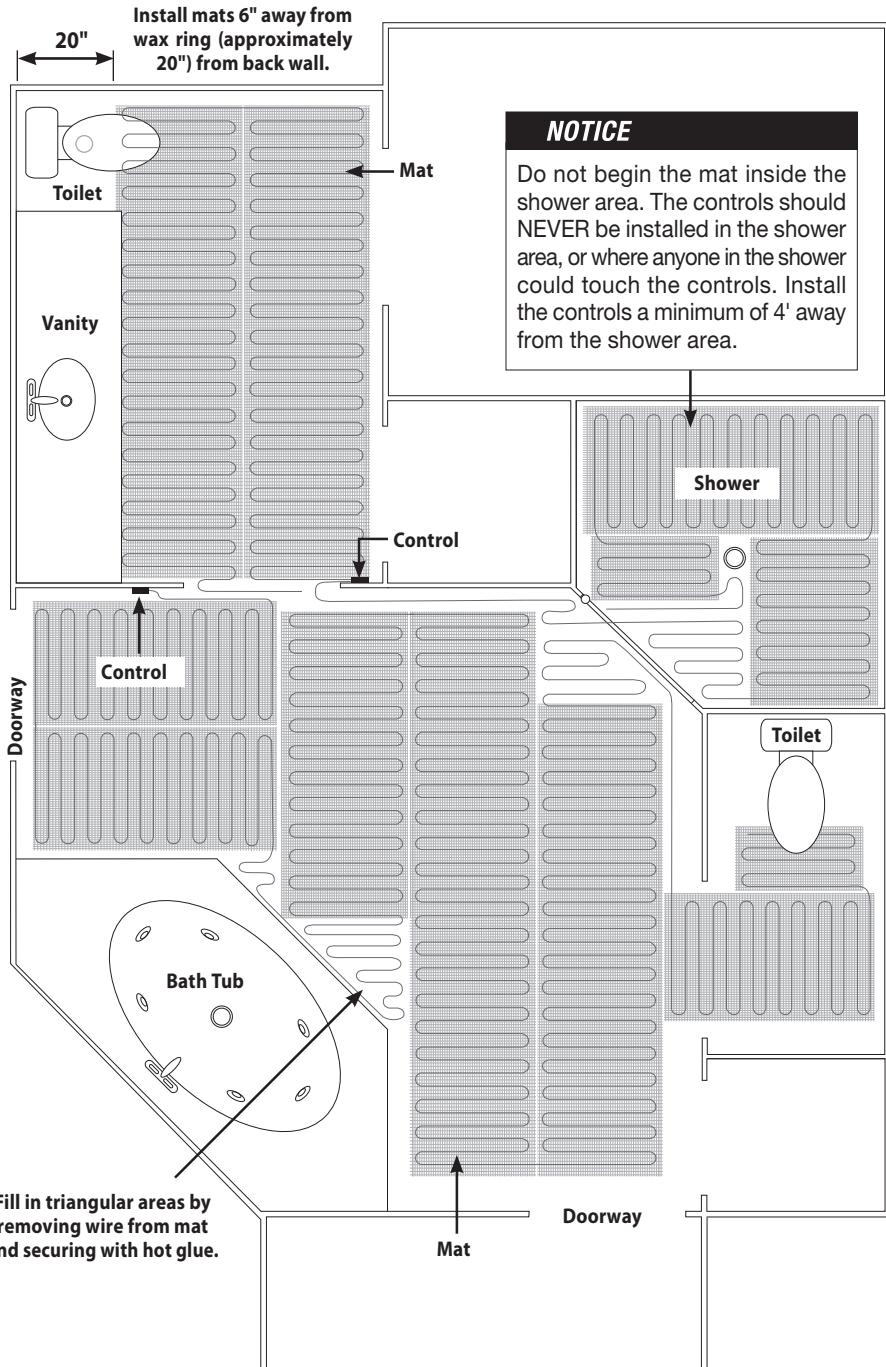
## Front entryway layout: Three mats



## Small bath layout: One mat



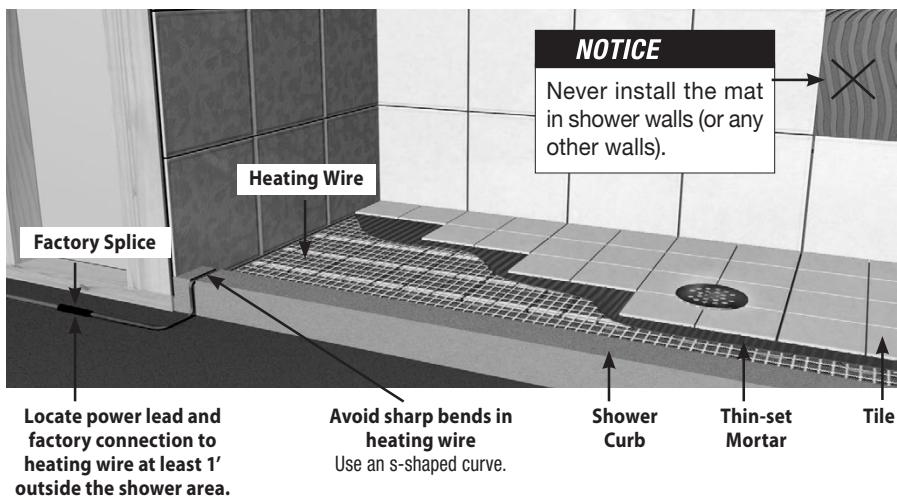
## Bathroom layout: Three mats



## **NOTICE**

See Phase 3 for complete details and Cautions. This application into a shower area must be verified by the local inspector or the authority having jurisdiction.

### **Shower installation detail**

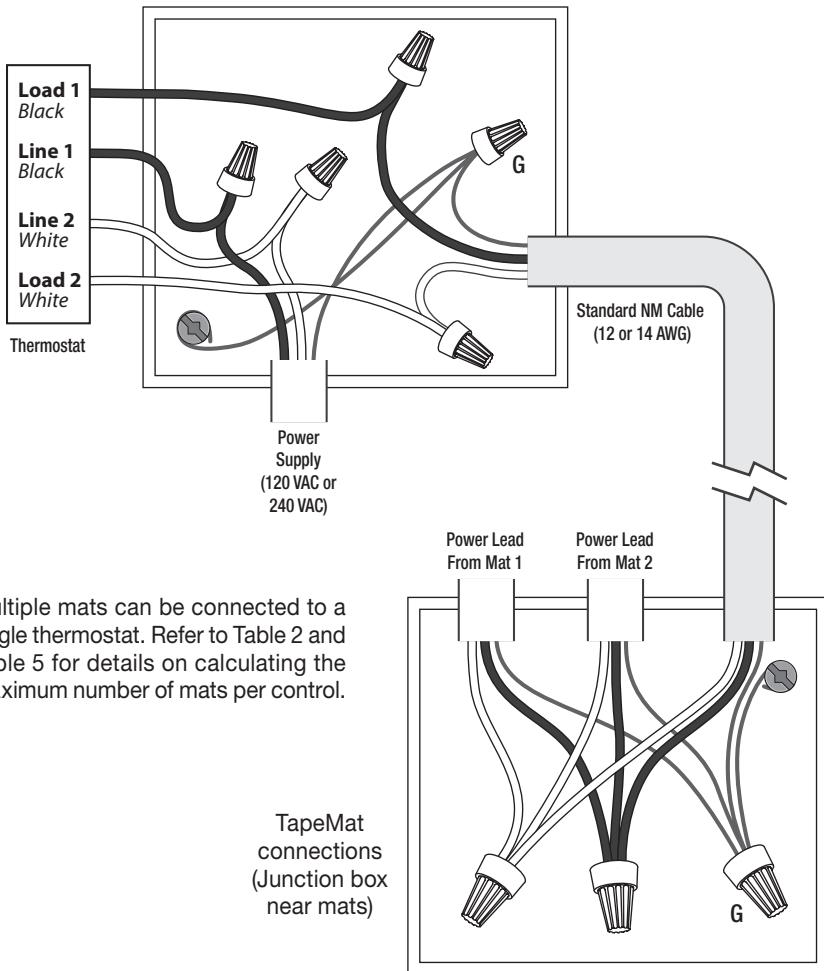


## Connecting Multiple Mats

### ⚠ WARNING

To prevent the risk of personal injury and/or death, do not perform any electrical work unless qualified to do so. Work should be done with great care and with power turned off to the circuit being worked on. Follow all local building and electrical codes.

Thermostat Connections



Multiple mats can be connected to a single thermostat. Refer to Table 2 and Table 5 for details on calculating the maximum number of mats per control.

### ⚠ WARNING

The thermostat is not fully illustrated in these diagrams in order to simplify them. These diagrams are given only as examples of how to properly connect multiple mats. Care must be taken not to overfill a box. Be sure to use wire nuts that are the correct size for the connections being made. Follow all codes for wiring.

All electrical work must be done by a qualified licensed electrician in accordance with local building and electrical codes, and the National Electrical Code (NEC), especially Article 424 of the NEC, ANSI/NFPA70 and Section 62 of CEC Part 1.

## Troubleshooting Guide

If problems arise with the TapeMat or its related electrical components, please consult this troubleshooting guide. If not qualified to perform electrical work, it is highly recommended that a qualified, licensed electrician be hired.

### **WARNING**

**Any electrical troubleshooting work should be performed with the power removed from the circuit, unless otherwise noted.**

Although this troubleshooting guide is provided to assist with problems experienced with a TapeMat system, results are never guaranteed. TapeMat does not assume any liability or responsibility for damage or injury that may occur from using this guide. If problems with the system persist, call the manufacturer.

Problem	Possible Cause	Solution
Mat resistance measurement is outside the range printed on the nameplate label.	An analog meter (using a moving needle) was used to take the reading.	Obtain a digital multi-meter and re-measure the resistance.
	If measurement shows an open or short circuit, the Heating Wire has been damaged.	Record resistance between all wires and contact the manufacturer.
	If measurement is just a little low or high, room temperature has affected the resistance.	Make the room temperature 65° – 75°F (18°-24°C), or contact the manufacturer.
	The resistance measurement could be from more than one mat wired in series, or wired in parallel. Either will provide false resistance readings.	Make sure resistance measurements are for only one mat at a time.
	The multi-meter may be set to the wrong scale.	The multi-meter should typically be set to the 200 ohms (200Ω) scale. For mats with resistance range higher than 200 ohms on the nameplate label, set the meter to the 2000 ohm (2kΩ) scale.
Floor is not getting warm.	Mat has been damaged.	Measure mat resistance. Check for both "open circuit" and "short circuit" as detailed earlier in this manual. If damaged, record resistances between all wires and contact the manufacturer.
	GFCI has tripped, indicated by a light or "GFCI TRIP" on the control.	Check for loose wire connections. Reset the GFCI on the control or circuit breaker. If it trips again, check for a short circuit in the mat as detailed earlier in this manual. If mat is damaged, record resistance between all wires and contact the manufacturer. If mat is not damaged, replace the GFCI control. Also see "GFCI conflicts" below.
	Incorrect voltage supplied, or mismatched electrical components used.	Measure "line" voltage, then measure "load" voltage. 120 VAC mats have black and white power leads. 240 VAC mats have black and blue power leads.
	Uninsulated concrete slab floor.	Surface temperatures rise slowly an uninsulated slab and heat is lost to the ground below.. If, after 5 to 8 hours of heating, the floor is not warmer to the touch, check for mat damage (see "Mat has been damaged" above). A clamp-on ammeter may be used to verify the amps are correct to each mat.
	Mats are wired in "series" or "daisy chained" (end-to-end).	Multiple mats must be connected in "parallel" (or black-to-black, white-to-white).

<b>Problem</b>	<b>Possible Cause</b>	<b>Solution</b>
Floor heats continuously.	Incorrect wiring. The control was "bypassed" when it was wired to the power supply.	Make sure wiring connections are correct. Consult the wiring diagram on the back of the control the instructions that came with the control, or the wiring diagram in this manual.
	Defective control.	Return control to dealer for replacement.
Control is not working correctly.	If a programmable control, the programming may be incorrect.	Carefully read and follow control programming instructions.
	Incorrect voltage supplied, or mismatched components used.	Test voltage, verify parts. See "Incorrect voltage supplied" above.
	Floor sensor is not wired properly, or is not working properly.	Make sure only one floor sensor is connected to the control. Also see "Sensor is loose or broken" above.
	Loose connection(s) on line side and/or load side of control.	Remove and reinstall the wire nuts at each connection. Make sure the wire nuts are tight. Check all connections back to the breaker.
	Defective control.	Return control to dealer for replacement.
Control is not working at all.	No power is supplied.	Check circuit breaker. Measure voltage at the control. Check all connections between breaker and control.
	Defective control.	Return control to dealer for replacement.
GFCI conflicts and false-trips	An electric motor or a ballasted light source is sharing the circuit with the mat.	Electric motors and other electrical devices can cause a GFCI to false-trip. Run a dedicated circuit to the floor-warming system or select a different branch circuit.

**WARNING:** This product contains chemicals known to the State of California to cause cancer and birth defects or other reproductive harm. For more information: [www.watts.com/prop65](http://www.watts.com/prop65)

## **Electric Floor-warming Products 25-year Limited Warranty**

SunTouch and Watts Radiant (the Companies) warrant their respective electric floor heating mats and cables (the Products) to be free from defects in materials and workmanship for twenty-five (25) years from the date of manufacture. Thermostats and controls sold by the Companies are warranted, parts and materials, for two (2) years from the date of purchase. The sole remedy for controls is product replacement. This warranty is only provided to customers who purchase the Products from authorized resellers, and is transferable to subsequent owners of properties where the Products are initially installed.

### **Under this Limited Warranty, the Companies will provide the following:**

If the Product is determined by the Companies to be defective in materials and workmanship, and has not been damaged as a result of abuse, misapplication or modification, the Companies will refund all or part of the manufacturer's published list price of the Product at the time of purchase in accordance with the following: 100% for the first ten (10) years, then prorated on a diminishing 25-year scale for the remaining warranty period.

#### **For example:**

- (1) Product found defective in the 5th year will receive the full manufacturer's published list price of the Product at the time of purchase;
- (2) Product found defective in the 15th year, with 10 years remaining in the warranty period, will receive 10/25ths of the manufacturer's published list price of the Product at the time of purchase.

#### **In order to make a claim, you must:**

- (a) Provide the Company with sufficient details relating to the nature of the defect, the installation, the history of operation, and any repairs that may have been made.
- (b) At the Company's discretion and at the owner's expense, ship the Product to the Company or the Company's local representative or distributor.
- (c) Provide proof that the Product was installed in accordance with the applicable Product Installation Manual and any special written design or installation guidelines by the Companies for this project.
- (d) Provide proof that the Product was installed in accordance with the National Electrical Code (NEC) or the Canadian Electrical Code (CEC), and all applicable local building and electrical codes.
- (e) Provide a retail sales receipt or proof of purchase.

#### **The following are not covered by this Limited Warranty:**

- (a) Any incidental or consequential damage, including inconvenience, loss of time or loss of income.
- (b) Any labor or materials required to repair or replace the Product or control, not authorized in writing by the Company.
- (c) Any labor or materials required to remove, repair or replace flooring materials.
- (d) Any freight or delivery costs related to the Product, the control, or any related flooring or electrical products.

The Companies assume no responsibility under this warranty for any damage to the Product caused by any trades people, visitors on the job site, or damage caused as a result of post-installation work. The staff at the Company is available to answer any questions regarding the proper installation or application of the Product at this toll-free phone number: 800-276-2419. If you are ever in doubt about the correct installation procedure to follow, or if the Product appears to be damaged, you must call us before proceeding with the installation, or proposed repair.

THE COMPANIES DISCLAIM ANY WARRANTY NOT PROVIDED HEREIN, INCLUDING ANY IMPLIED WARRANTY OF MERCHANTABILITY OR IMPLIED WARRANTY OF FITNESS FOR A PARTICULAR PURPOSE. THE COMPANIES FURTHER DISCLAIM ANY RESPONSIBILITY FOR SPECIAL, INDIRECT, SECONDARY, INCIDENTAL, OR CONSEQUENTIAL DAMAGES ARISING FROM OWNERSHIP OR USE OF THIS PRODUCT, INCLUDING INCONVENIENCE OR LOSS OF USE. THERE ARE NO WARRANTIES WHICH EXTEND BEYOND THE FACE OF THIS DOCUMENT. NO AGENT OR REPRESENTATIVE OF THE COMPANIES HAS ANY AUTHORITY TO EXTEND OR MODIFY THIS WARRANTY UNLESS SUCH EXTENSION OR MODIFICATION IS MADE IN WRITING BY A CORPORATE OFFICER.

DUE TO DIFFERENCES IN BUILDING AND FLOOR INSULATION, CLIMATE, AND FLOOR COVERINGS, THE COMPANIES MAKE NO REPRESENTATION THAT THE FLOOR TEMPERATURE WILL ACHIEVE ANY PARTICULAR TEMPERATURE, OR TEMPERATURE RISE. UL® STANDARD LISTING REQUIREMENTS LIMIT THE HEAT OUTPUT OF REGULAR MATS AND CABLES TO 15 WATTS PER SQUARE FOOT DEPENDING ON CABLE INSTALL SPACING, AND UNDERFLOOR MATS TO 10 WATTS PER SQUARE FOOT, AND AS SUCH, USERS MAY OR MAY NOT BE SATISFIED WITH THE FLOOR WARMTH THAT IS PRODUCED. THE COMPANIES DO WARRANT THAT ALL PRODUCTS WILL PRODUCE THE RATED OUTPUT LISTED ON THE PRODUCT NAMEPLATE, WHEN OPERATED AT THE RATED VOLTAGE.

Some states do not allow the exclusion or limitation of incidental or consequential damages and some states do not allow limitations on how long implied warranties may last. Therefore, the above limitations or exclusions may not apply to you. This warranty gives you specific legal rights and you may also have other rights, which vary from state to state. SO FAR AS IS CONSISTENT WITH APPLICABLE STATE LAW, ANY IMPLIED WARRANTIES THAT MAY NOT BE DISCLAIMED, INCLUDING IMPLIED WARRANTIES OF MERCHANTABILITY OR FITNESS FOR A PARTICULAR PURPOSE ARE LIMITED IN DURATION TO TWENTY-FIVE YEARS FROM THE DATE OF MANUFACTURE.

#### **Terms and Conditions**

**Shipping Discrepancies:** Incoming materials should be inventoried for completeness and for possible shipping damage. Any visible damages or shortages must be noted prior to accepting the material. Once the receiving personnel accept the material on their dock, they have relieved the freight company of any responsibility. Any discrepancy concerning type or quantity of material shipped, must be brought to the attention of the Companies within 15 days of the shipping date entered on the packing slip for the order.

**Return Policy:** The Companies items may be returned within one year from the date of purchase, if they are not damaged or used. There will be a 15% restock charge applied to items returned due to overstock or customer order error. All returned items must be in new condition. Products, controls or other parts that have a quality defect will be replaced (not credited) at no charge to the customer. If an item is shipped in error, there will be no restocking charge. All items returned, for replacement, credit or repair, must have a Returned Goods Authorization (RGA) number, or they will not be accepted. Please call our order desk for an RGA number. Products older than one year are excluded from these terms and conditions and may not be returned. No returns will be accepted for the Custom TapeMat product. Products that have been damaged, or Products that have been cut, may not be returned. This includes Products that have had mortar or concrete materials applied to them. These Products cannot be repaired and cannot be resold; therefore, we cannot accept them.

**Effective:** APRIL 1, 2006. This warranty applies to all Products purchased after this date.

## Affiliations:



**Member of**  
TCNA  
TITLE COUNCIL OF NORTH AMERICA, INC.



*Success By Association®*



The SunTouch and Watts Radiant manufacturing facility's Quality System is an ISO 9001:2008 registered facility through LRQA.

### SunTouch Customer Support

USA Toll-free: (888) 432-8932

USA Fax: (417) 831-4067

Canada Toll-free: (888) 208-8927

Canada Fax: (905) 332-7068

Latin America Tel: (52) 81-1001-8600

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