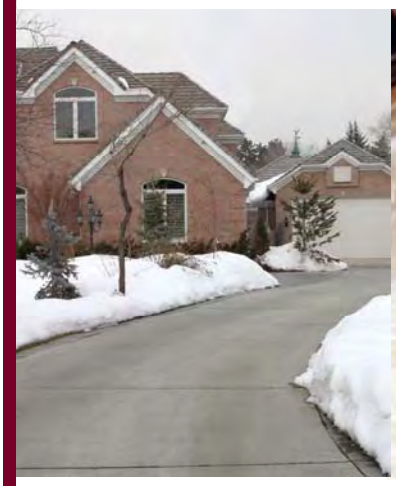
HEATIZON SYSTEMS

RADIANT HEATING AND SNOW MELTING SYSTEMS

Design and Installation Manual

SLC500 Control Unit

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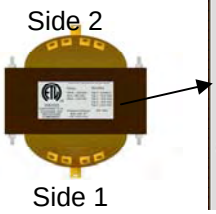
IMPORTANT!
This Information Must Be Completed During Installation

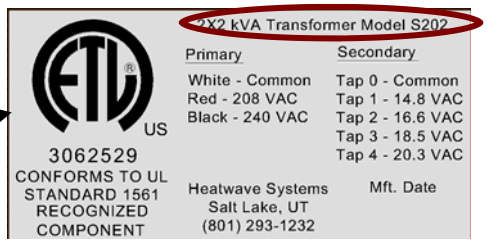
HEATIZON SYSTEMS

During the installation process, it will be necessary to document certain information which will be entered during the start up and calibration of your Heatizon Systems Control Unit. This information will be required for the "After Element Installation Tests" which are performed periodically throughout the installation process. Heatizon Systems recommends that you make note of the information which is needed *for each zone* installed, and record the appropriate information below throughout the installation process.

Transformer Size (Model Number)

S __ __ __





Primary Power Voltage _____ VAC

Heating Element Type and Length

Side 1

9" ZMesh _____ Ft.
Number of Feet Installed

or

12" ZMesh _____ Ft.
Number of Feet Installed

ZMesh _____ Folds
(Enter number of 90º folds made during element installation)

Tuff Cable _____Ft.
Number of Feet Installed

Cold Lead Length

Cold Lead _____ Ft.
Number of Feet Installed

Application or Load Type:

Interior Space Heating	Interior Floor Warming	Exterior Snow Melting	Exterior Roof Deicing

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Heatizon Systems
4137 South 500 West
Murray, UT 84123

801-293-1232 Phone
801-293-3077 Fax
Www.heatizon.com

COMMENTS AND SUGGESTIONS

Dear Installer:

Heatizon Systems welcomes and appreciates any and all comments and suggestions that you may have regarding our products, installation instructions and techniques, and applications. Please take a few minutes to share your comments and suggestions with us.

Thank you in advance for the time you will spend in helping us improve our products in the future.

Warm Regards,

Heatizon Systems
4137 South 500 West
Murray, UT 84123
Phone: (801) 293-1232
Fax: (801) 293-0137
Email: info@heatizon.com

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Name: _____

Address: _____

City: _____ **State:** _____ **Zip Code:** _____

Telephone: _____ **Fax:** _____

Email Address: _____

The Heating Element: *Tuff Cable* (Heatizon Part Number E101) is a durable 10 gauge coated copper cable, Tuff Cable comes labeled with footage marks and Heatizon's name on it. *ZMesh* (Heatizon Part Number E102) is a durable 9" or 12" wide, woven 1/32" thickbronze screen. The ZMesh element is approximately the same thickness as the fabric in a screen door. Specific uses of each heating element vary based on application and installation conditions.

Tuff Cable Kit

ZMesh Kit

The Transformer. Both heating elements can produce up to 12 watts of heat per lineal foot. ZMesh and Tuff Cable systems are sized with transformers from 1/2 to 1 kVA. Transformers operate on 120 volt power as shown on 1-5.

The SLC500 Control Unit. This component houses the appropriate sized Transformer and the other electronic components necessary to provide low-voltage electricity to the heating element. The Control Unit continually monitors the system's operation and is self-testing and problem diagnosing. It is engineered to provide simple and problem free operation. One Control Unit can energize one area or multiple areas that have been "jumpered" (connected in series) together on the same system. The Control Unit operation is controlled by the "Activation Device". Dimensions for the Control Unit are: 12" wide 12" high and 6" deep. The SLC500 Control Unit Kit includes Control Box, PC Board, Sheet Metal Enclosure, 50' Thermostat Wire, 25' #2 Cold Lead and the Hardware Kit.

Transformer

Control Unit

Activation Device. Activation Devices available for Heatizon's Control Unit include many options for its varied applications. Devices include:

- Programmable Thermostats
- Mechanical Timers
- Temperature/Moisture Sensors
- Remote Temperature Sensors

Most Heatizon Activation Devices include a system indicator light (LED) to notify the owner of the system status.

Space Heating

Heatizon Systems products are plenty robust to provide total space heating. Like all other space-heating products, heat-loss calculations should be performed prior to selecting the appropriate Heatizon Systems product. Heat-loss calculations define the amount of heat which must be delivered in order to heat the given space. Heatizon Systems Tuff Cable and ZMesh products are suitable for installation under most floor coverings.

Floor Warming

Heatizon Systems products may be used in conjunction with a primary heat source to provide warm floors or supplemental heat. Floor warming applications typically require 7 to 15 Watts per square foot. Heatizon Systems Tuff Cable and ZMesh products are suitable for installation under most floor coverings.

Snow Melting

Rate of snow-fall, moisture content of the snow, ambient air temperature, ground temperature, wind velocity, orientation of exposure to the sun and installed heat density of the snow-melting system all affect the performance of snow-melting systems. Heatizon Systems has proven products with long track records for all of your snow-melting needs.

Roof Snow & Ice Melting

“Out of sight” and “Permanent Installation” are phrases that describe Heatizon Systems’ Invizimelt roof snow and ice melting products. ZMesh is designed to be installed under non-conductive roof covering materials like asphalt, composite or shake shingles and single and double membranes. Tuff Cable in a Heatizon Heatsink Kit (US Patent # 7,071.446B1) is designed to be installed under conductive materials like metal roof coverings, valley metal, and flashing. All of Heatizon Systems’ roof snow and ice melting products are designed to provide complete removal of the snow and ice from eaves, valleys, and crickets and not just provide a path for water.

System Sizing

Performance specifications for each size transformer, each type of heating element, lengths of heating element and for various heating element spacings are located in the **“System Operating Tables”** section of this manual. System Operating Tables can be used to select the proper size system as well as the length and type of heating element needed and the spacing between heating element runs necessary to achieve a given heat density.

Insulation

Properly installed insulation is always recommended by Heatizon to enhance the efficiency and improve the performance of all Heatizon Systems products.

WARNINGS

Check contents of all boxes immediately upon receipt of your Heatizon shipment and notify Heatizon within 24 hours of any discrepancy or missing part.

Read this Installation Manual in its entirety before attempting to install any Heatizon Systems Products.

Installation of Heatizon Systems products and associated work must be performed by qualified persons and conform to local building codes, ordinances, trade practices, and in accordance with all applicable sections of the National Electric Code (NEC) or the Canadian Electrical Code (CEC).

Risk of fire! Risk of fire possible if installation of system is not completed according to all of the installation instructions contained within this Installation Manual, including but not limited to the warnings and notes throughout. Risk of fire possible if metal or any other conductive material is allowed to come into contact with the Cold Leads and Tuff Cable or ZMesh Heating Element. Risk of fire possible if connections/joints between Cold Leads and Tuff Cable, Colds Leads and ZMesh, Tuff Cable and Tuff Cable, and or ZMesh and ZMesh are not crimped and/or soldered correctly. Risk of fire possible if loose strands of ZMesh or Tuff Cable Heating Element or cuts or other damage to ZMesh or Tuff Cable are not repaired correctly. Note: The safety features incorporated into Heatizon Systems products cannot detect cuts in Cold Leads and ZMesh or Tuff Cable Heating Elements. Do not allow ZMesh to cross itself—maintain a minimum of 2" distance between adjacent runs of ZMesh Heating Element. Do not allow Tuff Cable to touch or cross itself.

Risk of shock! Make sure all power to your Heatizon Systems product and thermostat is shut off at the electric distribution panel before installing, removing covers, servicing, or working on any of the components of any Heatizon System product.

All connections/joints between Colds Leads and Tuff Cable heating element must be embedded into mortar, asphalt, or other acceptable cementitious Heatsink.

Knockout openings shall not be used except with devices that are designed to fill such openings.

Obtain written approval from Heatizon Systems for applications and installations that are different from those described herein.

In order for your Heatizon Systems product to operate correctly, the transformer portion of the Control Unit must be installed so that it can dissipate the heat that it generates

Like all electric products, Heatizon Systems products create a magnetic field that may interfere with certain brands of televisions, computer monitors, etc. Unlike Cathode Ray Tubes ("CRT"), Plasma Display Panels ("PDP") and Liquid Crystal Displays ("LCD") do not seem to be affected by magnetic fields. In the event magnetic field interference is a concern for you please consult Heatizon Systems or your sales representative prior to making your purchase.

Mattresses, Bean Bag Chairs, LoveSacs, Futons, and all other items which have high insulating values should never be placed directly on any surface which has a radiant heating product under it.

Never install Heatizon Systems products in space heating or floor warming applications to deliver more than the15 watts per square foot (or 160 watts/m^2) recommended by the Radiant Panel Association.

"Field installed wiring is to be in compliance with the National Electrical Code (NFPA-70) and/or ordinances," or the Canadian Electrical Code, or equivalent, as applicable to installation location.

Never install heating element near a wax toilet ring.

Please call Heatizon Systems Technical Support Department at (801) 293-1232 with any questions you have regarding these Design and Installation Instructions and The Customer Information Sheet, or the installation, operation, and maintenance of Heatizon Systems products.

Roofing Requirements

Element Selection and Applications

Roofing Material	*ZMesh Requirements*	*Tuff Cable Requirements*
Shake Shingles	Self-adhesive waterproof underlayment over and, if desired, under ZMesh	Tuff Cable not recommended
Composite or Asphalt Shingles	Self-adhesive waterproof underlayment over and, if desired, under ZMesh	Tuff Cable not recommended
Slate or Tile Shingles without Lattice/patterns	Self-adhesive waterproof underlayment over and, if desired, under ZMesh	Tuff Cable not recommended
Metal Roof, Valley Metal, Metal Flashing	DO NOT use ZMesh	Tuff Cable in a Heatsink Kit or Invizimelt with self-adhesive waterproof underlayment over it. And if desired under tuff cable in a heatsink kit of invizimelt.
Membrane or Other Roofs	Self-adhesive waterproof underlayment, Dens-deck, Cement Board or similar over ZMesh.	Call Heatizon at (801) 293-1232

Flooring Requirements

Element Selection and Applications

Sub Floor Material and Floor Covering	*ZMesh Requirements*	*Tuff Cable Requirements*
Carpet on Concrete or Wood Subfloor	1/8" Particle Board, Plywood, or EHV Underlayment, or 1/4" Cement Board over ZMesh Recommended	Tuff Cable must be imbedded in a heatsink, such as concrete, thin set mortar, self-leveling concrete or mortar, light-weight concrete, heatizon heatsink kit or invizimelt.
Hardwood on Wood or Concrete Subfloor	No Overlayment Required	
Laminate Flooring on Wood or Concrete Subfloor	Slip Sheet or Foam Underlayment over ZMesh Required	
Tile on Wood or Concrete Subfloor	Cement Board or Other Non-Metallic Product over ZMesh Required. Do not use metal lath or other electrically conductive material	
Sheet Vinyl or Vinyl tile on Concrete or Wood Subfloor	1/8" Particle Board or Plywood, or 1/4" Cement Board over ZMesh Required	

Snow Melting Requirements

Element Selection and Applications

Snow Melting Application	*ZMesh Requirements*	*Tuff Cable Requirements*
Concrete or Asphalt, New Pour	ZMesh Not Appropriate	Tuff Cable attached to welded wire fabric which is set on chairs or dobies. Insulation recommended.
Concrete, Retrofit	ZMesh Not Appropriate	Tuff Cable inserted in 1/4" x 1" sawcut grooves; Cuts filled with backer rod and sealant.
Asphalt, Retrofit	ZMesh Not Appropriate	Tuff Cable inserted in 1/4" x 1" sawcut grooves; Cuts filled with sealant.
Asphalt, Concrete, Pavers or Stone on a Sand Bed	ZMesh Not Appropriate	Tuff Cable imbedded in 1" of sand under asphalt*, concrete*, or under pavers or stone using PAVERKIT. Insulation recommended
Deck	ZMesh sandwiched between water tight barrier; Insulation recommended.	Tuff Cable must be imbedded in a heat sink, such as concrete, thin set mortar, self-leveling concrete or mortar, light weight concrete or a Heatizon Heatsink Kit. Insulation is required.

*Response time will be longer for these applications

HEATIZON SYSTEMS LIMITED WARRANTY

Twenty-five Year Limited Warranty for
Heatizon Systems
"Tuff Cable" Element (E101), "Z Mesh" Screen Element (E102) and
Specified Radiant Panel Heating Components

Heatizon Systems warrants to the original purchaser/end user of the following products that for the periods noted such products shall be free from defects in material and workmanship: Tuff Cable (E101) Heating Element and ZMesh (E102) Heating Element for a period of twenty-five (25) years, the Control Unit for a period of one (1) year, and power Transformer for a period of five (5) years. Such warranty periods shall commence on the date of shipment by Heatizon Systems. If any parts are found to be defective in manufacture during such time period, Heatizon Systems will, at its sole option, replace or repair defective parts.

This Limited Warranty applies only if articles sold hereunder (a) are selected, designed, and installed according to instruction and operation manuals furnished by Heatizon Systems and installed in a "workmanlike manner" according to the building association standards adopted by Heatizon Systems, (b) remain in their originally installed location, (c) are connected to proper power supplies, (d) are not misused or abused, (e) show no evidence of tampering, mishandling, neglect, damage (accidental or otherwise), modifications or repair without the approval of Heatizon Systems, or damage done to the product by anyone other than Heatizon Systems, and (f) are installed in accordance with applicable code requirements. Any warranty claims must be made in writing, no later than one (1) month following expiration of the warranty period, and must be accompanied by the warranted part or component. Any claim not made in such manner shall not be honored by Heatizon Systems.

This Limited Warranty does not cover:

1. The workmanship of any installer of Heatizon Systems radiant panel heating products.
2. Any Heatizon Systems radiant heating products that have a failure or malfunction resulting from improper or negligent operation, accident, abuse, misuse, unauthorized alteration or improper repair or maintenance.
3. Any Heatizon Systems radiant heating products that have had components not purchased from Heatizon Systems integrated into or connected to them.
4. Any labor costs for removal of alleged defective part(s) and/or reinstallation of replacement part(s), transportation to and from Heatizon Systems (if necessary) and any other material necessary to perform the exchange or repair.
5. Any Heatizon Systems heating products that have not been properly registered by completion and return of the Warranty Registration Card attached hereto.

DISCLAIMER OF WARRANTIES:

This warranty described above is in lieu of all other warranties, express or implied, including but not limited to any implied warranties of fitness for a particular purpose and merchantability. Heatizon Systems expressly disclaims and excludes any liability for losses, expenses, inconveniences, consequential, incidental, indirect, or punitive damages for breach of any express or implied warranty. By installing and/or purchasing Heatizon Systems products, you accept the terms of this limited warranty.

Some states do not allow the exclusion or limitation of incidental or consequential damages, or limitations on how long an implied warranty lasts, so the above limitations and exclusions may not apply to you. This Limited Warranty gives you specific legal rights, and you may also have other rights which may vary from state to state.

Determine the Location of the SLC500 Control Unit

1.1 Determining the placement location of the SLC500 Control Unit is the first step in the electrical rough-in process. Placement of this the SCL500 Control Unit must allow for easy future access, good air flow, and protection from moisture. Acceptable locations include garages, basements, utility rooms, or mechanical rooms.

Note: The SLC500 comes with 25' of Cold Lead.

Use the following guidelines for locating the SLC500 Control Unit:

Location must be easily accessible for installation, service and maintenance.

Maintain a minimum of 6 inches of clearance between the SLC500 Control Unit and any ceiling, wall, floor or adjacent SLC500 Control Unit.

Do not locate SLC500 Control Unit in an area where it will be covered.

Maintain 36 inches of clear space in front of every SLC500 Control Unit.

Placement outdoors is acceptable only if enclosed in a Heatizon Systems Enclosure Kit (ENCLKIT), which measures 12"X18"X12" with a customized back plate.

Do not place in an area where high humidity is present, or where Control Unit may be exposed to water.

Consideration for sound and vibration of transformer is advised. Proper sound attenuation insulation or vibration isolation is recommended.

Note: Knockout opening in all Heatizon Systems products should never be used except with devices that are designed to fill those openings.

Note: When installing Heatizon Systems products, strict compliance with the National Electrical Code, Canadian Electric code, local Building Codes, and Heatizon Systems Design and Installation Manual is essential.

SLC500 Kit

Enclosure Kit (ENCLKIT)

1.2 Determine whether the SLC500 Control Unit will be installed on studs, on a concrete or other non framed surface or if an Enclosure Kit will be used.

- SLC500 Control Unit on studs. If SLC500 Control Unit will be mounted on a studed wall, anchors must be capable of supporting shear and lateral loads of at least 100 pounds per SLC500 Control Unit.

- SLC500 Control Unit on block or concrete. If the SLC500 Control Unit mounting area is to be a block, concrete or non-framed surface it should be installed at this point using adequate anchoring devices to accept shear loads and lateral loading of Control Unit and Transformer (weight may equal 100 lbs for larger systems).

- Enclosure Kit. If the SLC500 Control Unit will be exposed to water or high humidity, or if it will be mounted outdoors, a Heatizon Systems Enclosure Kit with a customized SLC500 Control Unit should be used.

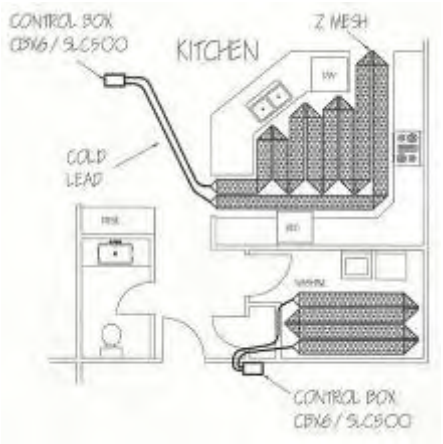
Plan the Cold Lead

1.4 The Cold Leads will be run the total horizontal and vertical distance from the selected SLC500 Control Unit to the location where the Tuff Cable or ZMesh will eventually begin and end. Once the SLC500 Control Unit (s) has been installed, plan the Cold Lead runs by walking through the building.
Note: The SLC500 comes with 25' of Cold Lead. Do not add additional Cold Lead to an SLC500 Control Unit without approval from Heatizon Systems.

Generally there are three possible configurations for running the Cold Lead. Make sure you know the type of

Sample Layout 1

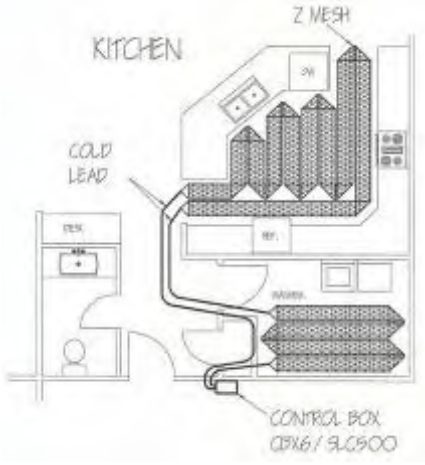
Each full sized heated area is connected to one standard Control Unit. Each heated zone is connected to its own Control Unit.



ZMesh and Cold Lead Sample Layout for two separate zones connected to two separate Control Units.

Sample Layout 2

Two smaller heated areas are jumpered together and connected to one standard Control Unit.



ZMesh and Cold Lead Sample Layout for two separate areas connected in series by "jumpering" the areas together with Cold Lead.

Note: SLC500 Control Unit systems require one pair of Cold Leads for the beginning and ending points of the Tuff Cable or ZMesh heating element.

Note: All connections between Cold Leads and Tuff Cable must be imbedded in mortar, asphalt, concrete, a Heatizon Heatsink Kit, Invizimelt or other acceptable heat sink material.

IMPORTANT! A red plastic "STOP! DANGER!" sign indicating the presence of electric deicing, snow melting, or warming equipment has been included with your Heatizon product packaging. This caution notice must be posted at the fuse or circuit breaker panel and be clearly labeled.

Install the Cold Lead

1.5 Run Cold Leads the total horizontal and vertical distance from the selected SLC500 Control Unit or Rough-In Box placement location, to the location where the heating element will eventually begin and end. Pull the wire through holes drilled in the studs or through conduit, and secure both ends of the Cold Lead.

Install the Cold Lead through the back of the SLC500 Control Unit, leaving approximately 14 inches protruding through the front of the SLC500 Control Unit, and approximately 10 inches where the Cold Lead will connect to the heating element. If Cold Leads are shortened, the required markings must be retained.

Note: All Heatizon Systems Transformers require one pair of Cold Leads (except for S202 -- 2X2kVA and S203--2X3kVA Transformers which require *two sets of Cold Lead pairs*). One of the Cold Leads from any given pair connect to the common tap located at the back of the Transformer and the other Cold Lead connects to one of the voltage taps at the front of the Transformer.

IMPORTANT! Record the number of feet of Cold Lead that you have installed for each system here:

The following guidelines will help insure a proper and safe installation:

a. Cold Lead runs should be planned from the Tuff Cable or ZMesh heating element connection points to the SLC500 Control Unit. Leave approximately 14 inches of Cold Lead protruding through the SLC500 Control Unit, and 10 inches of extra Cold Lead wherever the connection between the Cold Lead and heating element will be made.
b. Do not kink the Cold Leads.
c. To minimize the size of the flux lines or lines of force of any magnetic field given off by the Cold Leads, always run Cold Leads in pairs and have those pairs as close to one another as possible. In order to minimize the potential for problems caused by any magnetic field given off by the Cold Leads, always avoid running Cold Leads in areas over, under, behind, or otherwise near the place where televisions and or computer monitors using Cathode Ray Tube technology will be located. Keep Cold Lead off of and out of metal ducts.
d. Place the pair of Cold Leads on the same stud, or put both Cold Leads in the same conduit. When using conduit, always run Cold Leads in pairs in the same conduit. Never run individual Cold Leads in conduit.
e. Magnetic and non-magnetic metal studs require special consideration. Refer to a current edition of NEC/CEC for installation considerations.
f. The Cold Lead length and element length affect the Watts per square foot your system will deliver to the area where the Tuff Cable or ZMesh heating element is installed. If you have a question or concern, or if you are considering adding to the Cold Lead or heating element provided to you by Heatizon, contact Heatizon Systems or your Heatizon Distributor for more information.
g. Cold Leads are conductors; As a result grouping or banding of Cold Leads must be in accordance with NEC/CEC.

COLD LEAD TO ELEMENT CONNECTIONS—

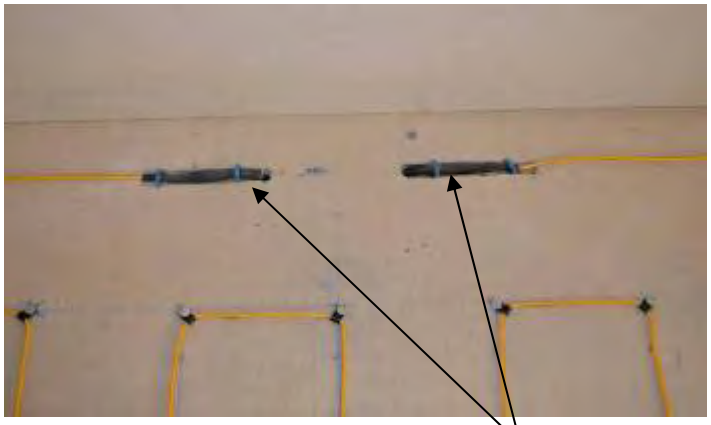
Eventually, you'll make connection from the Cold Leads to your chosen heating element. Make sure the Cold Lead has been properly installed to insure it can be connected to the ZMesh or Tuff Cable element later in the install process. See Section 7, "Making the Connection," for specific connection instructions.

ROUGH-IN THROUGH SUB-FLOOR OR SUB-ROOF—FLOOR HEATING OR ROOF MELTING: When installing transition plates in floor heating installations and roof snow melting installations, extend Cold Lead up through sub-floor or sub-roof, leaving 10", and anchor in place. Cold Leads should be spaced to accommodate the specific heating element to be used:

12" ZMesh = 14" apart
9" ZMesh = 11" apart
Tuff Cable = 6" apart

ROUGH-IN THROUGH WALL—FLOOR HEATING OR ROOF MELTING: For wall installations of Transition Plates, anchor Cold Lead to sill plate and extend beyond face of finished material 10". Cold Leads should be placed such that Transition Plates will never touch one another, and the tips of the Transition Plates should not be closer than 2" apart at the nearest point. Cold Leads should be spaced to accommodate the specific heating element to be used:

12" ZMesh = 14" apart
9" ZMesh = 11" apart
Tuff Cable = 6" apart



ROUGH IN FOR TUFF CABLE SYSTEMS—SNOW MELTING OR INTERIOR SPACE HEATING: When installing Cold Lead in Tuff Cable heating or snow melt systems, Cold Leads should be placed such that connection points of E210BS Butt Splices are a minimum of 4" apart. Extend Cold Lead by 10" and secure Cold Lead in place.

Note: All connections between Cold Leads and Tuff Cable must be imbedded in a mortar, asphalt, concrete, Heatizon Heatsink Kit, Invizimelt or other acceptable cementitious heatsink material.

Cold Lead Rough-In in standard wood frame wall. Local building codes may require conduit.

Install the Thermostat Wire

1.6 Before you begin, read the specific wiring instructions and installation instructions provided for the activator selected. See the “Activation Devices” section of this manual and the instructions included in the activation device packaging for further details.

a. Run the Thermostat Wire (M316) the total horizontal and vertical distance from the SLC500 Control Unit placement location to the location selected for the Activation Device.

b. Determine and provide the appropriate power if needed to the chosen Activation Device.

c. Install sensors, if any, at this point, such as remote bulb sensors, floor sensors, or temperature moisture sensors..

Install the Electrical Service Requirements for the Control Unit

1.7 Run the appropriate line voltage wires the total horizontal and vertical distance from the Distribution Panel to the SLC500 Control Unit in accordance with the NEC/CEC. All Heatizon Systems products require a dedicated circuit. Never exceed the maximum rating of the Transformer.

Electrical Service Requirements:

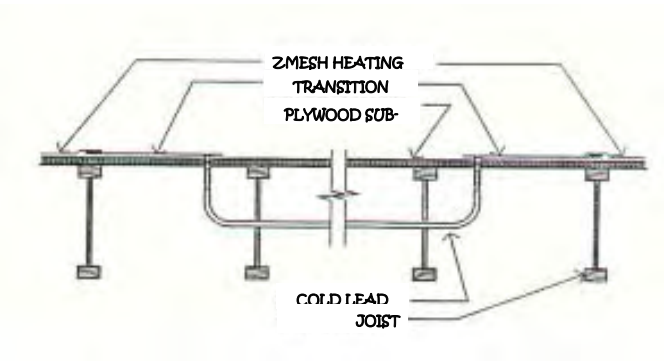
- ½ and 1 kVA systems - operate on 120 volt power supply and require a single pole, 15-amp minimum breaker.

Jumpering

1.8 At this point, it is necessary to plan out any jumpers that may need to be installed. A jumper is necessary **whenever two adjacent detached areas are connected to one another**, or whenever heating element will pass through any joint. Never install Cold Lead, Tuff Cable or ZMesh element where they bridge or extend through any joint, or mark, unless provision is made for expansion and contraction with a jumper. See Section 7, "Making the Connection," for specific connection instructions.

a. Area to Area Jumper.

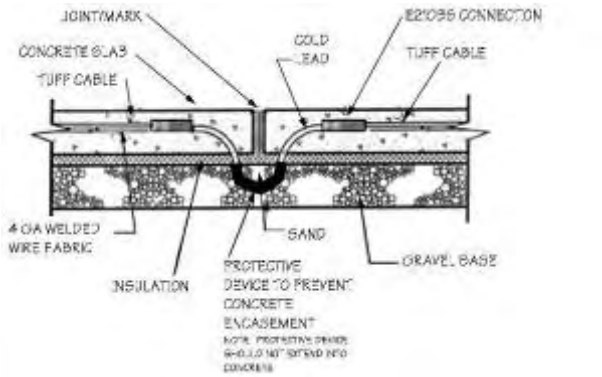
It is not necessary that all heated areas be adjacent to one another. Jumpering between different areas can be accomplished by using an adequate amount of Cold Lead (E210) and two Transition Plates (E217) for ZMesh systems, or two Butt Splices (E210BS) for Tuff Cable systems.



ZMesh heating element can be jumpered by using an adequate length of Cold Lead and two E217 Transition Plates. All jumpering of element is to be done using Heatizon Cold Lead (E210) only.

b. Joint/Mark Jumper.

Always jumper through every kind of joint/mark in all types of mortar, asphalt, mud bed, concrete or any other heatsink except Heatizon Heatsink Kit (CABSINKKIT) and Invizimelt (INVORKIT).



Tuff Cable heating element can be jumpered by using a Heatizon Jumper Kit. All jumpering of element is to be done using Heatizon Cold Lead (E210) only. All Butt Splices (E210BS) must be imbedded in a heat sink.

Note: Remember that all Tuff Cable or ZMesh heating element to be energized by a single Transformer (S050, S101 must be a continuous loop connected in series.

Note: Always determine the total length of Cold Lead and heating element attached to each Control Unit and Transformer, and make certain that the watts per square foot generated will meet your needs. See Section 8 of this manual , *System Operating Tables* and *Useful Information,* for additional information.

CAUTION: THIS IS AN ENTIRE COPPER SYSTEM. UNDER NO CIRCUMSTANCES ARE COMPONENTS MADE OF OTHER METALS SUCH AS ALUMINUM TO BE SUBSTITUTED FOR HEATIZON SYSTEM COMPONENTS. THE ADDITION OF ANY NON-HEATIZON SYSTEMS COMPONENT OR MATERIAL TO ANY HEATIZON SYSTEMS PRODUCT WILL VOID THE WARRANTY AND LISTING.

Congratulations! You are now ready to install heating element!

Determine the Type of Heating Element

2.1 You have purchased a Heatizon System that utilizes either Tuff Cable heating element, a 10 guage coated copper cable that is chemical and gasoline resistant, or ZMesh heating element, a 9" or 12" wide woven bronze screen.

Remember: "After Installation Element Test" #1 should be conducted after the heating element has been installed, and "After Installation Element Test" #2 should be conducted following the covering of the heating element and immediately prior to installing the Control Unit.

Tuff Cable

Heatizon Systems Tuff Cable is a low-voltage electric radiant heating element that must always be installed in an acceptable heatsink. For this manual, a heat sink means asphalt, concrete, mortar, mud bed, sand or a Heatizon Heatsink Kit. Tuff Cable is designed to be spaced at specific intervals and lengths to produce a specified amount of heat per square foot.

Installations for Tuff Cable include:

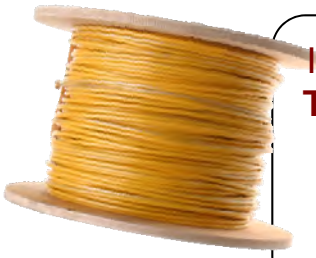
- concrete or asphalt
- light-weight concrete or mortar bed
- Heatizon Heatsink Kit under metal roof covering*
- existing concrete slab or asphalt
- sand under pavers or concrete

Spacing between element runs for various applications are:

- snow melting — 4 " to 6"
- roof de-icing under metal roof coverings — 6" *
- floor warming under hard surfaces — 6"
- floor warming under other surfaces — 6" to 8"
- space heating (Must be determined by heat-loss calculations)

Heat Density: The density per square foot of the Tuff Cable Heating Element is dependent on the spacing between adjacent runs of Tuff Cable, the total length of the Tuff Cable Heating Element, and the size of the transformer. More details about system sizing can be found in the "System Operating Tables" section of this manual.

***Requires special procedures for installation. Please see specific installation procedures.**



If your project uses **Tuff Cable heating element,** go to **Page 2-3.**

ZMesh

Heatizon Systems ZMesh is a low-voltage electric radiant heating element that is designed to go on a wood or concrete subfloor or subroof, and under any non-conductive floor or roof covering.

Installation for ZMesh include:

- under carpet over concrete or wood subfloor
- under hardwood flooring
- under tile or marble over wood subfloor or concrete
- under linoleum/vinyl flooring over concrete or wood subfloor*
- under non-metallic roofing systems *

Spacing between element runs for various applications are:

- roof de-icing —2"
- floor warming under hard surfaces — 2"
- floor warming for other surfaces — 2" to 6"
- space-heating

Heat Density: The density per square foot of the ZMesh Heating Element is dependent on the spacing between adjacent runs of the ZMesh, the total length of the ZMesh Heating Element, and the size of the transformer. More details about system sizing can be found in the "System Operating Tables" section of this manual.

***Requires special procedures for installation. Please see specific installation procedures.**

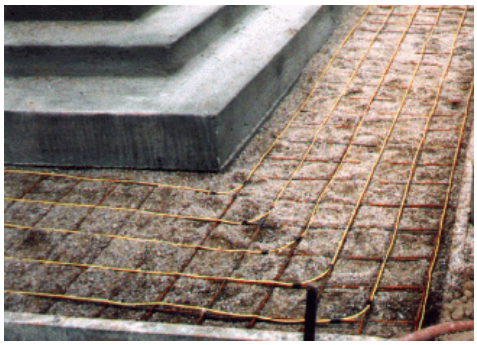
If your project uses **ZMesh heating element,** skip to **Page 2-24.**

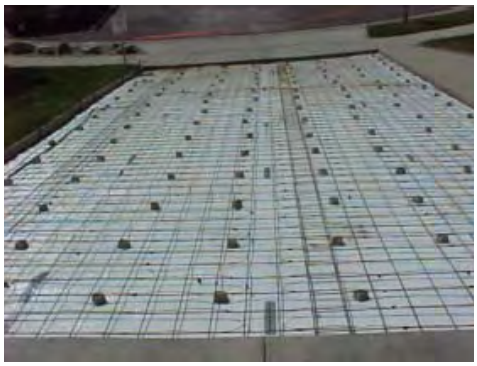
Tuff Cable Heating Element

Note: Tuff Cable AND the connection between Tuff Cable and Cold Lead must always be installed in an acceptable heatsink—a heatsink means asphalt, concrete, mortar, mud bed, sand or a Heatizon Heatsink Kit. Failure to do so may burn the insulation off of the Tuff Cable, which may result in risk of fire.

Note: To minimize the size of the flux lines or lines of force of any magnetic field given off by the Tuff Cable heating element, always run an even number of lengths of heating element and begin and end the heating element at approximately the same place.

2.2 General Tuff Cable Installation Instructions:





All applications using Tuff Cable heating element will utilize similar procedures for installing the element. You should also review your specific application installation procedures and jumpering instructions before completing the element installation.

a. Beginning at the point where the Cold Lead and Tuff Cable element will be spliced together (see “Rough-In” section of this manual), plan the element layout for each zone. Proper element spacing is determined by heat-loss calculations or heat density requirements and watts per square foot desired.

b. Connect Tuff Cable to one Cold Lead. Lay out the Tuff Cable element in a continuous loop. Make sure the Tuff Cable element never crosses or touches itself, and will never be outside of an approved heat sink. For ease of installation, an even number of Tuff Cable runs are recommended. Allow enough Tuff Cable Heating Element at each end of the run to make the connection to the Cold Lead.

c. Firmly anchor the Tuff Cable element to the subfloor, subroof, or welded wire fabric in three places on 180 degree turns, and two places on 90-degree turns by using an adhesive or anchoring system designed for your specific use. See the specific anchoring method instructions for the Tuff Cable application you have selected.

d. Continue with each zone until all zones have been laid out and anchored. Insure that the Tuff Cable element and its insulation are not crimped, cut, or severed. If the Tuff Cable or its insulation is compromised or damaged in any way, the copper wire core will deteriorate over time, and the Tuff Cable element will require repair. Immediately repair all damage to Tuff Cable with an approved Cable Repair Kit (Heatizon Part # CABREPKIT).

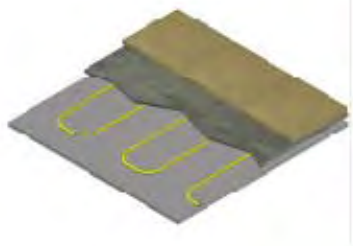
e. Connect the end of the Tuff Cable heating element to the Cold Leads with the Heatizon E210BS butt splice connector. See Section 7, “Making the Connection,” for details on how to make this connection.

f. If a temperature/moisture sensor such as the Heatizon M331 or M336 is to be installed in the concrete, mud bed, mortar, or sand bed, it must be in place prior to covering. See the sensor installation instructions for details.

CAUTIONS:

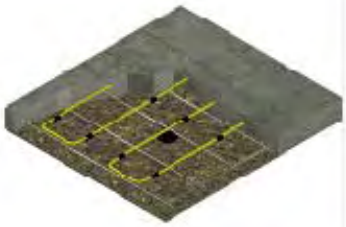
- **TUFF CABLE ELEMENT MUST NEVER COME INTO CONTACT WITH FLAME.**
- **TUFF CABLE ELEMENT MUST BE ENCASED IN CONCRETE, ASPHALT, SAND BED, MORTAR BED OR A HEATIZON HEATSINK KIT, AND MUST NEVER BE EXPOSED TO AIR.**
- **TUFF CABLE MUST NEVER TOUCH OR CROSS ITSELF**
- **DAMAGED TUFF CABLE ELEMENT OR ITS INSULATION MUST BE REPAIRED IMMEDIATELY USING A HEATIZON CABLE REPAIR KIT (PART # CABREPKIT).**

Tuff Cable Specific Application Guide



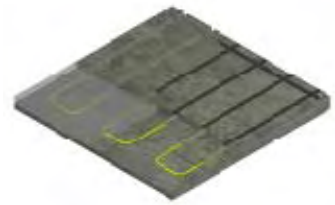
Section 2.2
General Tuff Cable Installation Instructions

Section 2.6
Tuff Cable in a Sand Bed under Asphalt, 4” (or less) Concrete, Pavers or Stone



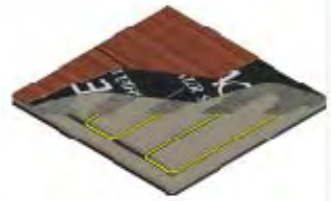
Section 2.3
Tuff Cable In and Under New Pour Concrete

Section 2.4
Tuff Cable Jumpers



Section 2.7
Tuff Cable Retrofit Installation in Concrete or Asphalt

Section 2.5
Tuff Cable in a Mortar Bed or Lightweight Concrete



Section 2.8
Tuff Cable in Heatizon Heatsink Kit

Your Tuff Cable application may require some of these Heatizon supplies and parts:

NI101	3M Skotchkote
NI102	3M23 Plastic Electrical Tape, 30' roll
NI104	Acrylic Paint, Clear 12 oz. Can
NI137	Backer Rod, 3/8" - 100 Feet
NI146	Chairs, Castle, bag of 96
NI112	Chairs, Dobies - bag of 96
NI105	Chalk String, 100 ' in Steel Case
NI109	Chalk, 8 oz. Red
NI138	Concrete Sealant Gun for Sika Flex Cartridge
NI139	Blacktop Sealant, 8 Tubes (100 Feet)
NI114	Ice & Water Shield
NI117	Insulation - Concrete Barrier Foil - 500 sf.
NI118	Insulation - Rigid - 4' x 8' x 1" sheet
NI119	Insulation - Slab Shield - 252 sf.
NI120	Remesh - 4" x 4" - 4 ga. - 140 sf.
NI121	Remesh - 6" x 6" - 4 ga. - 140 sf
NI122	Remesh - 6" x 6" - 6 ga. - 140 sf
NI127	Sikaflex Caulking, 1A - 10.5 oz tube
NI128	Sikaflex Caulking, 1CSL - 30 oz tube
NI129	Solder, 40/60
NI133	Weather Bond - 100 sf.
NI136	Wire Ties, 8" - 100 count

Your Tuff Cable application may require some of these Heatizon System Kits:

ANCHPLUGKIT	Tuff Cable Anchoring Plug Kit
CABCENKIT	Tuff Cable Heatsink Kit
CABREPKIT	Tuff Cable Repair Kit
CABSPLKIT	Tuff Cable Splice Kit
JUMPERKIT	Joint Jumper Kit
PAVERKIT	Paver Kit
PLASCLIPKIT	Plastic Clip Kit
CLDEXTKIT	Cold Lead Extension Kit

Your Tuff Cable application may require some of these tools and equipment:

Hammer
Tape measure
Marking pencil and chalk line
Crimpers
Appropriate drill with 1/4" diameter cement bit
Wire Strippers and Cutters and/or Remesh Cutters
Razor Blade or Box Cutter
True RMS Clamp On Meter
Heatizon Roof Alarm (Part Number NI126)
Propane Torch
Saw cutter
Power Washer

2.3 Tuff Cable In and Under New Pour Concrete

Tuff Cable is the heating element designed to be used in poured concrete installations. It is recommended that Tuff Cable element be installed just prior to pouring the concrete in order to reduce the potential for damage to the Tuff Cable. The precise location of any and all types of joints, walls, cabinets, bathroom fixtures, hand rails, and equipment to be permanently installed must be known prior to the installation of the Tuff Cable in order to avoid damage to the Tuff Cable heating element or heating unnecessary or unwanted areas. Running Tuff Cable under an area where a wall, rail, joint etc. will be installed allows for possible severing of the Tuff Cable by anchoring devices or other penetrations into concrete or by movement of the concrete.

Pre-installation considerations. Tuff Cable element is installed just prior to pouring the concrete. Concrete must be a minimum of 3 ½" in thickness. Heatizon recommends 5" thick concrete (see "A Few Concrete Facts" in the **Useful Information Section** of this manual. Tuff Cable's maximum efficiency occurs when it is raised 1 ½" to 2" from the slab surface.

If the element is not within 2" from the slab surface, the Heatizon System will either: (1) not heat evenly, or (2) have slower response time and less efficiency. The use of "chairs" under welded wire fabric will raise the Tuff Cable to the desired height prior to and during the concrete pour.

You should refer to and become familiar with Section 2 of this manual, "Tuff Cable Heating Element," including Section 2.4, "Tuff Cable Jumpers and Connections," and Section 2.2, "General Tuff Cable Installation Instructions."

Note: Heatizon Systems recommends a meeting between the general contractor, the concrete contractor and the installer of your Heatizon System take place prior to any work commencing. The purpose of this meeting is to insure that the Tuff Cable and its insulation will not be cut, crimped, nicked, or otherwise damaged or severed in any way, and to review the installation process during the meeting. The precise location of all joints (cold joints, expansion joints, etc) or concrete penetrations must be identified so that "Jumper Connections" may be planned and problem areas avoided. See Section 2.4, "Tuff Cable Jumpers and Connections".

1. Cut the insulation to size and lay it between the concrete forms. For the most efficient use of the Heatizon System use minimum of R-5 insulation below the concrete on grade and to provide perimeter insulation. Review all local and national building codes for recommendation of insulation practices.

2. Cut the welded wire fabric to size and lay it between the concrete forms.

3. Install the "Chairs" (Heatizon Systems Part NI112) under the 4 gauge welded wire fabric (2X2, 4X4 or 6X6). **Note:** During the concrete pour, constantly monitor the welded wire fabric and Tuff Cable to insure that the element is within 2" from the slab surface.

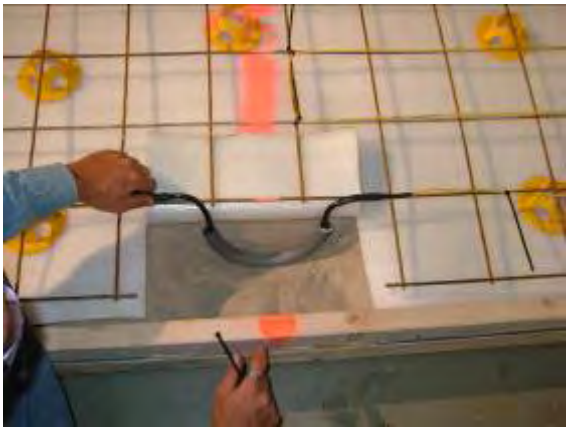
4. Once the area is ready for concrete, use spray paint to mark the location of all joints. Cut welded wire fabric and insulation, then dig the holes for Cold Lead jumpers wherever Tuff Cable will cross through a joint of any kind. Line the hole with gravel.

5. Connect one end of the Tuff Cable element to one Cold Lead. See Section 7, "Making the Connection," for details on how to make this connection. Lay out the element, anchoring it to the welded wire fabric in three places on 180-degree turns and two places on 90-degree turns

6. Attach the Tuff Cable heating element to the welded wire fabric every 12 to 18 inches. Attach the Tuff Cable to the welded wire fabric with plastic electrician's tape or plastic wire ties (available from Heatizon Systems). When beginning and ending a zone**,** leave enough extra element to allow for connection to the Cold Leads. **DO NOT INSTALL ANY LENGTH OF TUFF CABLE ELEMENT THAT WILL CAUSE YOUR HEATIZON PRODUCT TO OPERATE AT A SECONDARY AMPERAGE GREATER THAN 96. DO NOT EXCEED THE MAXIMUM LENGTH OF TUFF CABLE ELEMENT REQUIRED TO ACHIEVE THE DESIRED WATTS PER LINEAR FOOT FOR A ZONE.**

7. The Tuff Cable heating element is then connected to the Cold Lead with the Heatizon E210BS butt splice connector. The E210BS butt splice connection must be inside the concrete so that the concrete acts as a heatsink. This connection is to be made in the concrete; no junction box is to be used. When necessary, the Cold Lead can run under the concrete slab for some distance before exiting. It is recommended that the Cold Lead always be encased in PVC conduit and ran in pairs as much as possible.

8. Complete the jumpers under all joints by connecting the ends of the Tuff Cable to Cold Lead jumpers using Heatizon Joint/Mark Jumper Kit (Heatizon Part # JUMPERKIT) . Tuff Cable element should never pass through a concrete expansion joint or any other type of joint or control mark. After the connection is made, fill the hole with sand, and replace the insulation. See complete jumpering instructions and photos in Section 2.4.



9. If a temperature/moisture sensor such as the M331 or temperature sensor such as the M336 is to be installed in the concrete slab, it must be in place prior to the concrete being poured (See the sensor installation instruction for details).

10. Continue with the next zone until all zones are laid out and anchored to the welded wire fabric.

CAUTIONS: Do not use metal wire ties, or other conductive material to connect the Tuff Cable to the welded wire fabric. Always use electrical tape or plastic wire ties to attach the Tuff Cable to the welded wire fabric. Damaged Tuff Cable element or Tuff Cable element insulation must be repaired IMMEDIATELY. Tuff Cable element must never touch or cross itself.

IMPORTANT! A red plastic "STOP! DANGER!" sign indicating the presence of electric deicing, snow melting or warming equipment has been included with your Heatizon product packaging. This caution notice must be posted at the fuse or circuit breaker panel and be clearly visible.

IMPORTANT! Record the number of feet of Tuff Cable Element that you have installed for each zone here:

HEATIZON SYSTEMS

A FEW CONCRETE SUGGESTIONS

Heatizon Systems is not an asphalt, concrete or pavers expert, but we have a few suggestions that you may wish to discuss with your contractor. We make these suggestions in an effort to increase the likelihood that Heatizon Systems' high quality Tuff Cable will be surrounded by products that are equal to it in both quality and expected longevity. In addition, we make these suggestions in an effort to reduce the possibility that your Tuff Cable heating element will get damaged or broken by the vertical or horizontal movement of asphalt, concrete, or pavers.

Dry Base: Make certain that the ground below where the new asphalt, concrete or pavers will be located is as dry as possible. It is recommended that it be covered whenever there is a risk of a storm for one to two weeks prior to the pour.

Excavation: Be sure that your excavation is deep enough to accommodate the thickness of the concrete, the thickness of the insulation, the depth of the aggregate base you will have below the concrete and a 1" sand bed if you elect to install the Tuff Cable below the concrete.

Compaction: Once the excavation is complete, it is highly recommended that a great deal of care be given to completely and properly compact the entire area where the asphalt, concrete or pavers will be located.

Drainage: In order to have proper drainage and to reduce the likelihood of vertical shifting of your asphalt, concrete, or pavers Heatizon Systems recommends that a minimum of 6 inches of high quality aggregate be laid over the entire area where the asphalt, concrete, or pavers are to be installed, plus one foot around all edges.

Reinforcement: In order to enhance the integrity of your asphalt, concrete or pavers, Heatizon Systems recommends that reinforcement be considered. Most of the time concrete can be reinforced with number 4 gauge welded wire fabric or ½ inch re-bar placed at least 2 inches from the top and bottom surfaces of the concrete.

Insulation: Insulation is a two edged sword. On the one hand, it acts as a good moisture barrier, reduces the response time of your snow melt or heating system, and saves money by reducing operating time. On the other hand ,insulation does not allow the heat from the ground to get into the asphalt, concrete, or pavers.

Maximum Area: Heatizon Systems recommends that concrete be poured in square sections no larger than 9.5 feet X 9.5 feet. Pouring other geometric shapes without additional joints almost always results in cracking. Each square must always have a joint on each of its four sides.

Jumpers: It does not matter what kind of joint is in the asphalt or concrete, Tuff Cable should never be allowed to run through it. Always use a Heatizon Systems jumper under any and all joints. Remember, if it is a joint of any kind it must be jumpered under with a Joint/Mark Jumper Kit (Heatizon Part # JUMPERKIT)..

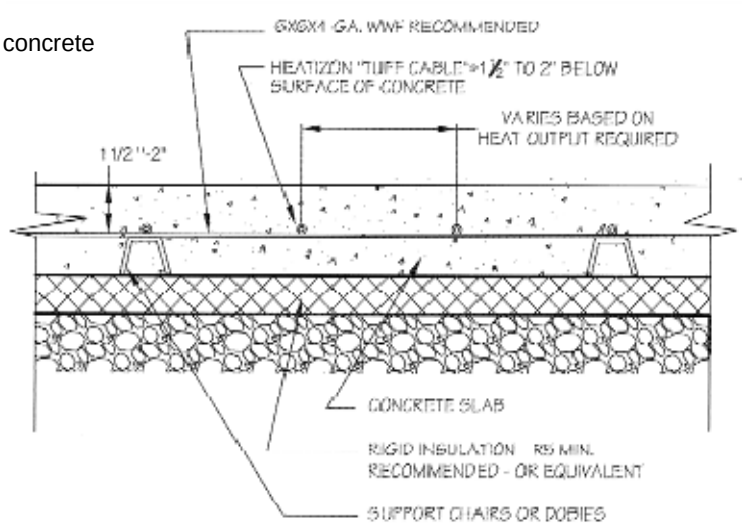
Thickness: Heatizon Systems always recommends the following thickness be observed:

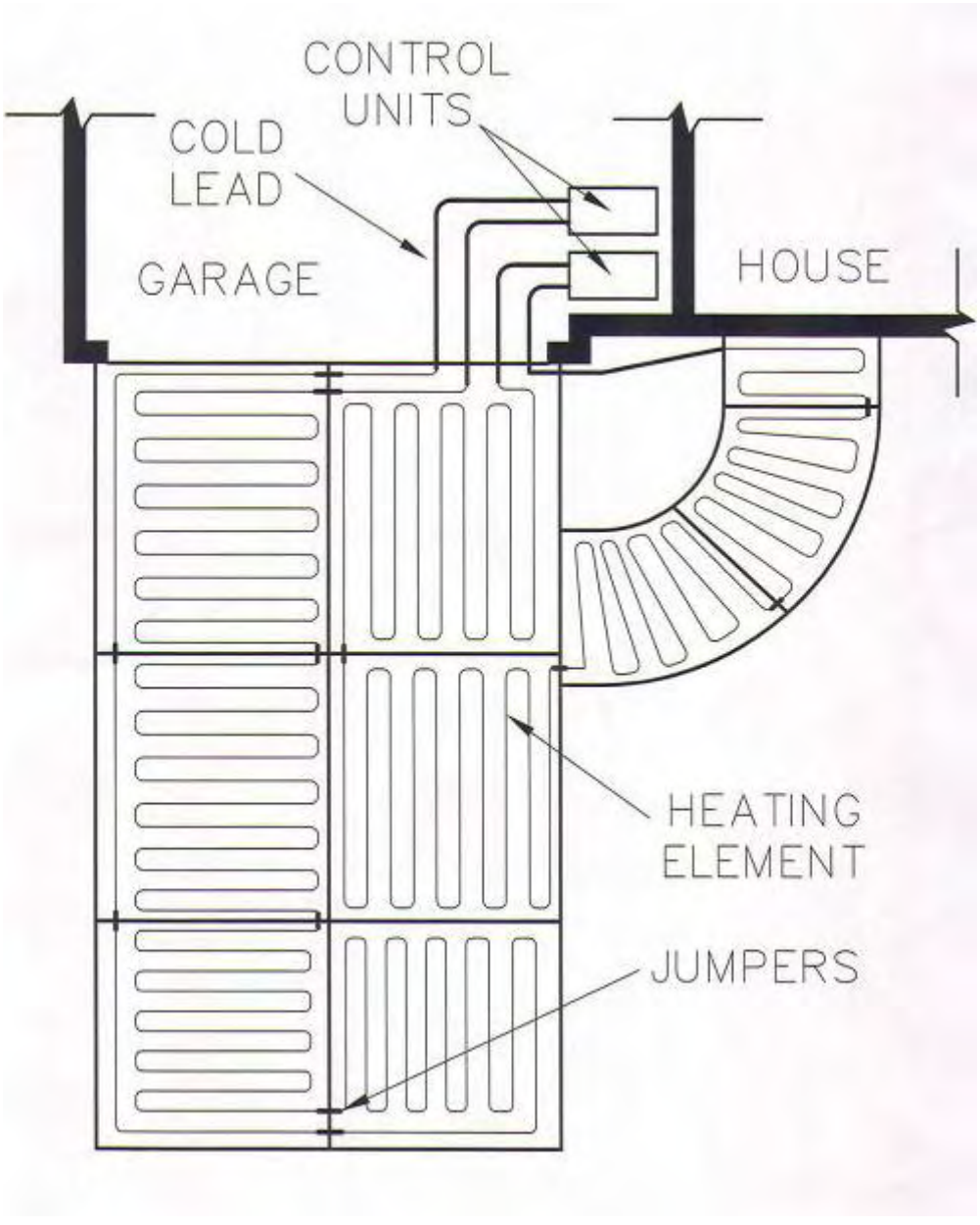
Concrete	5 or more inches
Asphalt	4 or more inches
Pavers	4 or less inches

Suggested Mix: Heatizon Systems recommends that a six-bag mix with fiber or steel fibers always be used when pouring concrete.

TUFF CABLE

Tuff Cable in new pour concrete



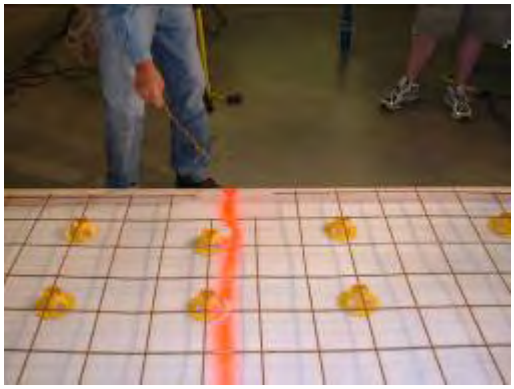


Sample Driveway and sidewalk layout for two zones of Tuff Cable snow melting systems. Note that jumpers extend the Tuff Cable heating element through all joints and marks.

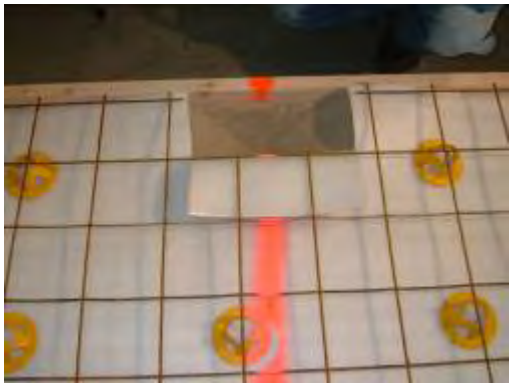
2.4 Tuff Cable Jumpers and Connections

In order to plan and install Tuff Cable Jumpers, the precise location of all walls, any and all kinds of joints (expansion, crack control, strike, etc,) and future floor penetrations must be known in order to avoid damage to Tuff Cable and/or Cold Lead.

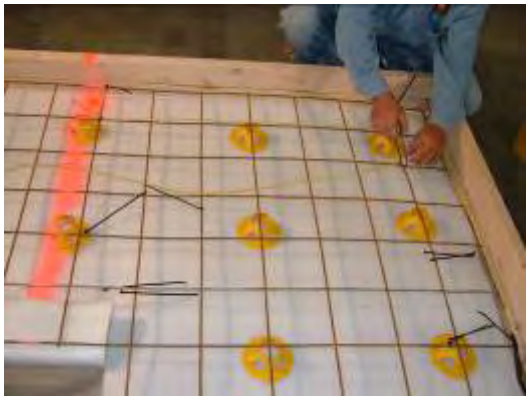
The example below demonstrates the steps necessary to install Tuff Cable jumpers in new-pour concrete.



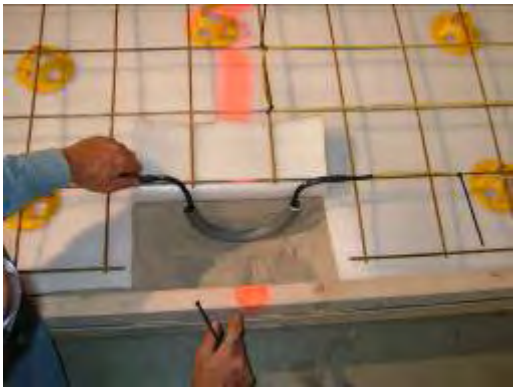
1. After insulation, castle chairs and welded wire fabric have been installed, use spray paint to indicate where any joint (expansion, mark, strike, etc) will be located.



2. Trim welded wire fabric away from area. Cut insulation to expose area where jumpers will be installed; fold back to expose sand or gravel sub material.



3. Attach Tuff Cable element to welded wire fabric with wire ties, as shown in the following section, making sure Tuff Cable NEVER crosses through the indicated joint.

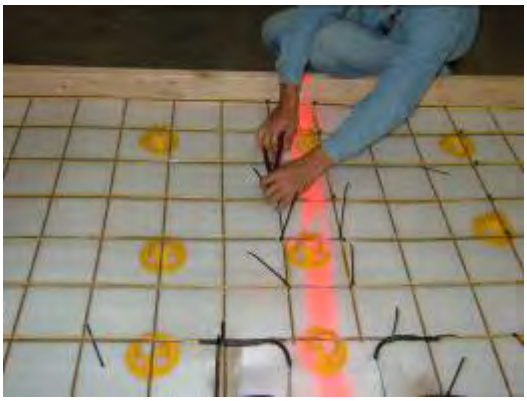


4. Use a Heatizon Tuff Cable Joint/Mark Jumper Kit (Heatizon Part # JUMPERKIT) to extend Tuff Cable through any joint. Note that the Tuff Cable does not cross the indicated joint at any point.

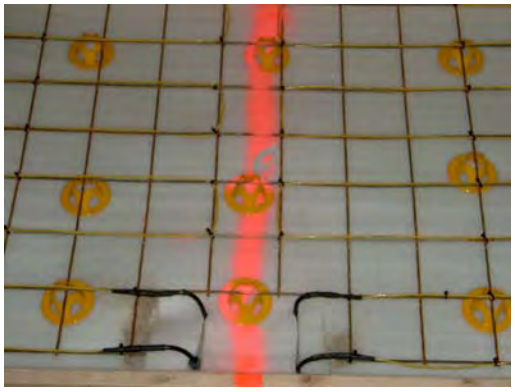
5. Follow Tuff Cable Jumper Kit instructions to complete the proper jumper connections. The Tuff Cable starting and ending points are also connected to the Cold Lead in a similar manner.

6. Once the jumper is complete, fill in the exposed area with sand so that conduit is completely covered.

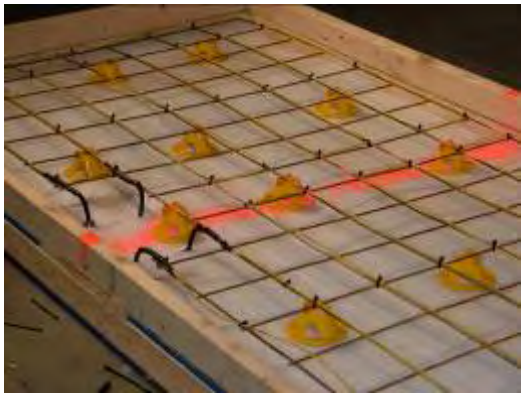
7. Replace the insulation over the top of the sand.



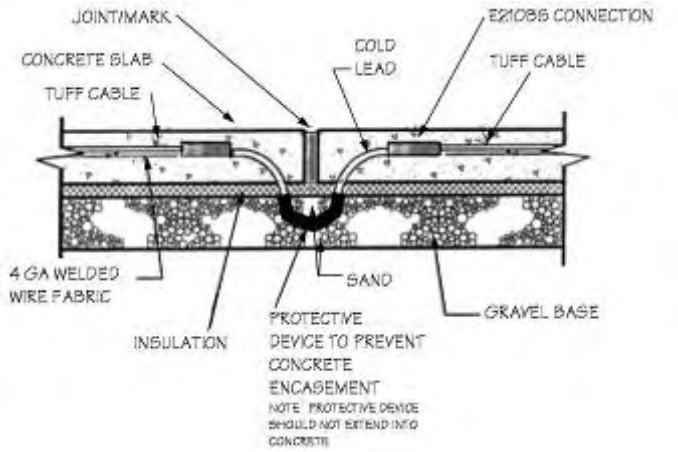
8. Complete tying of any Tuff Cable, and trim any un-trimmed wire ties.

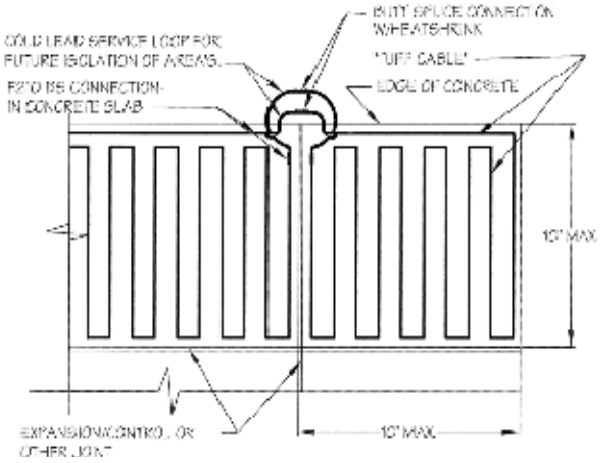


9. Make certain that the painted lines are clear and visible for the concrete contractor so that joints are installed only in the indicated areas.



10. You are ready for concrete!





See Section 7, “Making the Connections” for more details on how to make this connection..

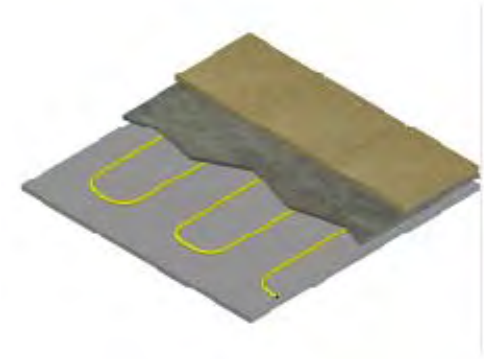
2.5 Tuff Cable in a Mortar Bed or Lightweight Concrete

Typical Tuff Cable installations for Interior Space Heating and Floor Warming include:

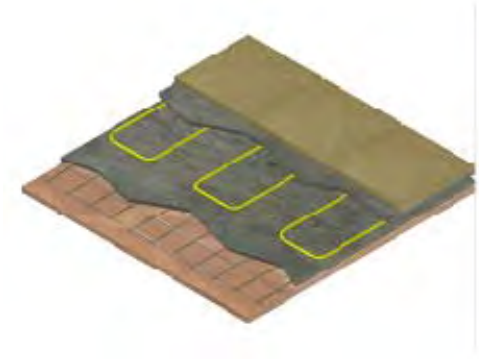
- in a mortar bed on a wood or concrete sub floor
- in lightweight concrete on a wood or concrete subfloor
- in thin set on a wood or concrete sub floor
- in a Heatizon Systems Heatsink Kit

You should refer to and become familiar with Section 2 of this manual, "Tuff Cable Heating Element," as well as reviewing Section 7, "Making the Connection."

Note: For each application Tuff Cable must be completely embedded in mortar, lightweight concrete, Gypcrete, a Heatizon Systems Heatsink Kit, or other acceptable heat sink. Warning: Never design and install Heatizon Systems Tuff Cable products for space heating or floor warming applications in a manner that will result in the delivery of more than 15 watts per square foot.



CAUTION: Take extreme caution not to damage the insulation of the Tuff Cable. If the insulation is nicked or damaged in any way, the Tuff Cable must be immediately repaired using Heatizon Tuff Cable Repair Kit (Part Number CABREPKIT) before the mortar bed or lightweight concrete are installed.



Note: There is a minimum and maximum length of Tuff Cable that must be installed for your specific installation. See "System Operating Tables" section of this manual.

Note: Tuff cable needs to make a complete loop from one Cold Lead to the other when installed without crossing over or touching itself.

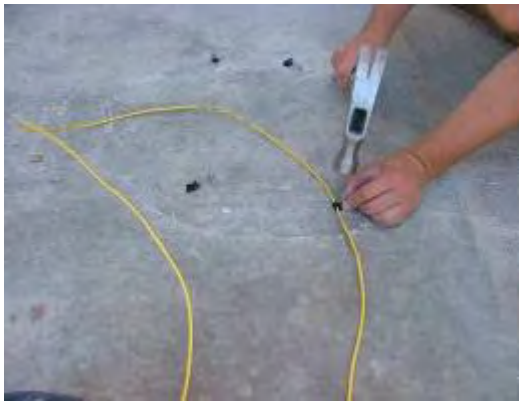
1. Follow design and layout procedures found in Section 2.1.

2. Transfer element design layout to floor using tape measure, marking pencil, and chalk line. Lay out perimeter of area to be heated first, keeping a minimum of 3 inches from walls and or cabinets and first run of element. Verify that you have enough Tuff Cable to heat area you have selected.

3. If Tuff Cable is being installed on wood subfloor, mark adjacent runs of element on the floor with appropriate spacing, usually 6 to 8 inches (but in some cases, may be 4, 10 or 12 inches). Verify specific spacing requirements for your installation with those in your heat loss calculation for space heating.

Anchor the Tuff Cable using a Heatizon Plastic Clip Kit (Part # PLASCLIPKIT) to hold Tuff Cable to wood subfloors. Never use any attachment that will compromise the Tuff Cable or its insulation in any way. Each 90Ebend and each 180E turn requires two Heatizon Plastic Clips. Heatizon Plastic Clips should be spaced approximately every 18 or 24 inches apart along the length of the Tuff Cable heating element.

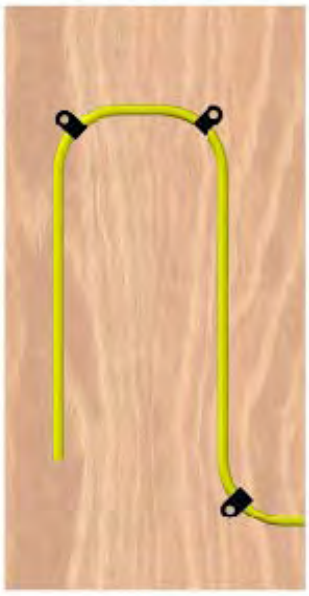
4. If Tuff Cable is being installed directly on existing concrete, use 1/4" cement drill bit to drill holes 1" deep in every location where a Heatizon Plastic Clip will be located. Install one Tuff Cable Anchoring Plug into each pre-drilled hole by tapping plugs until they are flush with the surface of the concrete. Tuff Cable Anchoring Plugs should fit tightly in pre-drilled holes.



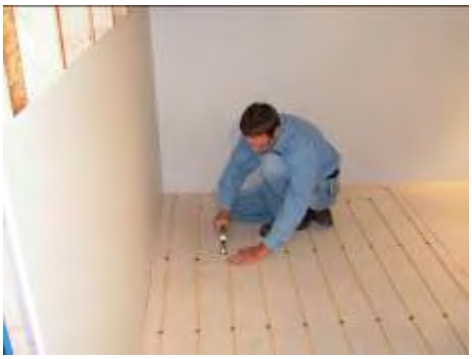
5. Make the first connection between one Cold Lead and Tuff Cable by following directions in Section 7, "Making the Connection." You may need to notch out the floor to accommodate the connection.

6. Lay out Tuff Cable on designated chalk lines as planned in the layout. Secure Tuff Cable with Heatizon Plastic Clips by using the following procedures:

If Tuff Cable is being installed **directly on a wood sub floor or on top of a mortar bed**, Heatizon Plastic Clips can be inserted around Tuff Cable element, and secured to sub floor by hammering nail through anchor ends until both plastic tails are flat against sub floor surface. Repeat with each Heatizon Plastic Clip until all clips are secure.



If Tuff Cable is being installed **directly on existing concrete**, you should have already completed Step 4. If you have not completed Step 4, do so now. Insert Heatizon Plastic Clips around Tuff Cable element and secure by hammering nail through anchor ends directly into Tuff Cable Plug, until both plastic tails of the clip are flat against and concrete and plug. Repeat with each Heatizon Plastic Clip until all clips are secure.

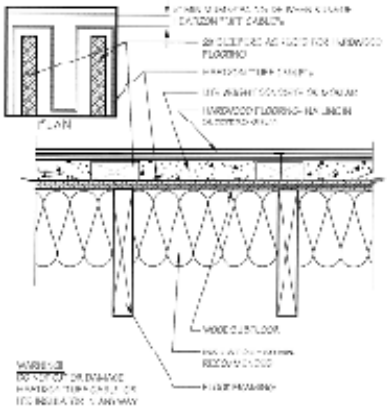


Step 7: Continue laying out and anchoring Tuff Cable until complete. Make sure end of Tuff Cable returns to the second Cold Lead location to make final connection between Tuff Cable and Cold Lead. Make the connection between the second Cold Lead and end of Tuff Cable by following directions in Section 7, "Making the Connection."

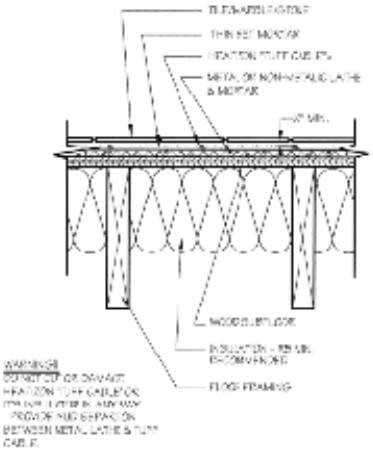
Step 8: Make note below of how much Tuff Cable was installed for future reference and trouble shooting. Length of element is printed in one-foot increments on the Tuff Cable.

Step 9: Install the temporary paper "Stop! Danger!" signs to advise others not to damage or disturb the Tuff Cable. Remove the temporary signs prior to covering the Tuff Cable with cementitious material.

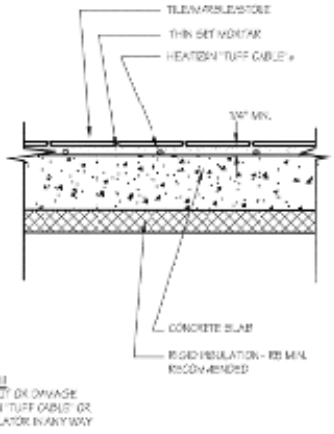
Tuff Cable under hardwood in lightweight concrete.



Tuff Cable under tile on a wood subfloor



Tuff Cable under tile on a concrete slab



CAUTIONS: Damaged Tuff Cable element or Tuff Cable element insulation must be repaired IMMEDIATELY. Tuff Cable element must never touch or cross itself.

IMPORTANT! Record the number of feet of Tuff Cable Element that you have installed for each zone here:

IMPORTANT! A red plastic "STOP! DANGER!" sign indicating the presence of electric deicing, snow melting or warming equipment has been included with your Heatizon product packaging. This caution notice must be posted at the fuse or circuit breaker panel and be clearly visible.

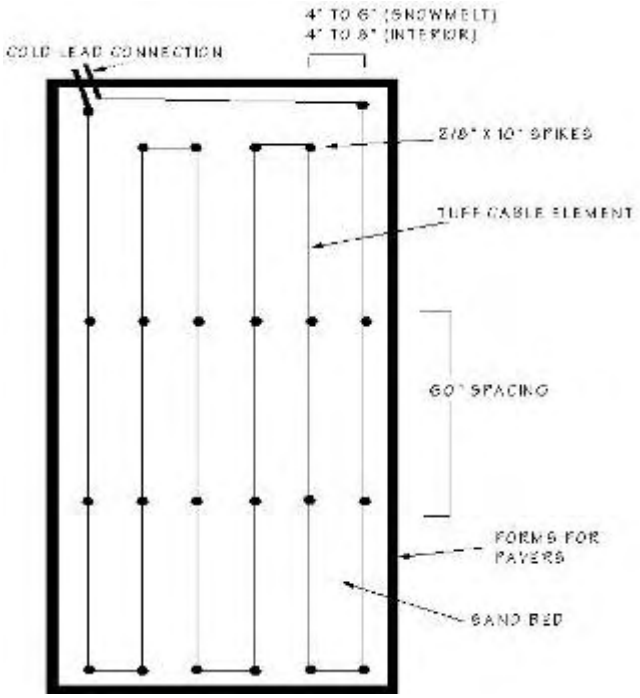
2.5 Tuff Cable in Sand Bed Under Asphalt, Concrete, Pavers, Stone, or Concrete (4” Maximum Thickness)

Heatizon Tuff Cable must be embedded in a 1" sand bed and should have approximately 1/2” of sand over and under it. Tuff Cable should never be installed in open air applications, nor directly on top of the rigid insulation. Heatizon recommends insulating where Tuff Cable is being installed to get maximum heat transfer. Rigid insulation that is at least one inch (1") thick R-5 minimum is recommended.

Step 1. Cover entire area to be heated with rigid 1" thick insulation, and then ½" of sand.

Step 2. Create a layout by determining which direction to run the Tuff Cable. Remember that Tuff Cable must be installed in lines that are parallel to one another. Make sure that both the beginning and end of the Tuff Cable element runs are in the same area as the Cold Leads.

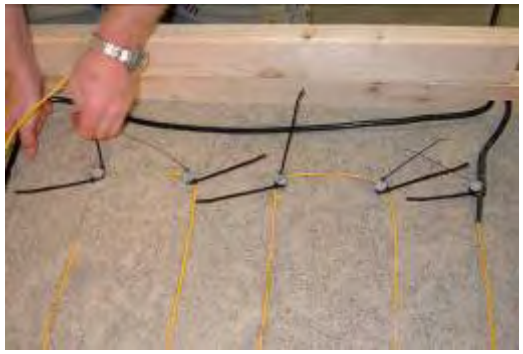
Step 3. Beginning on the edge of area where Tuff Cable beginning and end are located, drive spikes into ground to establish widths between the Tuff Cable runs.



Sample Layout of Tuff Cable Under Pavers

Step 4. Place rows of spikes, driving a spike in every 60 inches on each row. Make sure the last spike in each row is at the very end of the area to be heated. Each spike head should remain ½" above the sand.

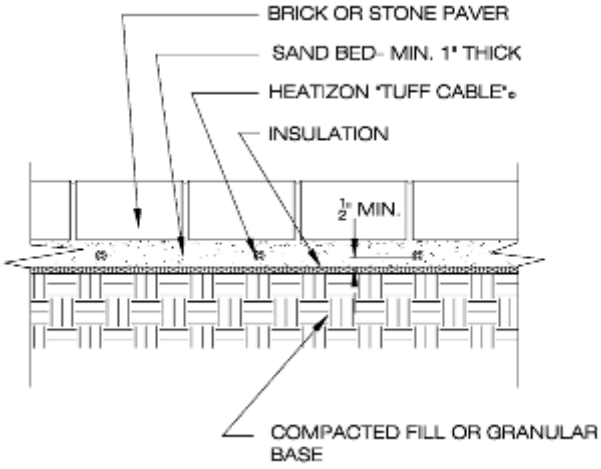
Step 5. Connect one Cold Lead to Tuff Cable, then round the spikes with the Tuff Cable at each end and tie the Tuff Cable to the spikes using plastic wire ties. Make a continual loop of the Tuff Cable, making sure the end of the Tuff Cable returns to the Cold Lead location. Leave an extra 12" of Tuff Cable at the start and finish to make eventual connection to the Cold Leads.



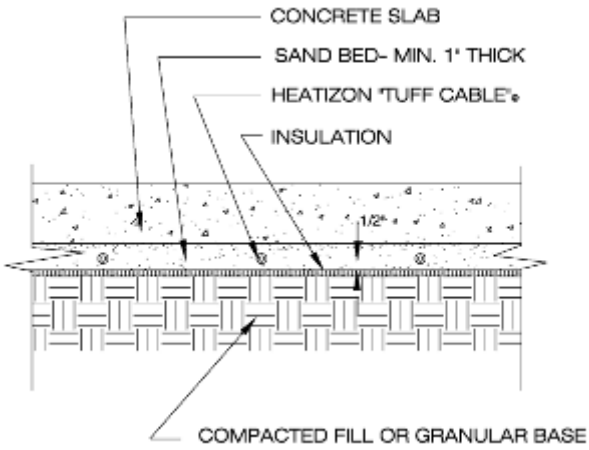
Step 6. Make the connections between the two Cold Leads and the beginning and end of the Tuff Cable by following directions in Section 7, “Making the Connection. ” Secure the Cold Leads to the spikes with plastic wire ties.

Step 7. Cover Tuff Cable with ½" of sand. Make certain that the Tuff Cable is surrounded by sand. Never allow Tuff Cable to directly touch itself or the insulation. Always make certain that some sand gets between the bottom of the Tuff Cable and the insulation. Great care must be taken to avoid damage to the Tuff Cable.

Step 8: Install asphalt, pavers, stone or concrete (4" maximum).



Tuff Cable in a Sand Bed
Under Brick, Stone or Concrete Pavers



Tuff Cable in a Sand Bed
Under a Concrete or Asphalt Slab

CAUTIONS: Do not use metal wire ties, or other conductive material to connect the Tuff Cable to the welded wire fabric. Always use electrical tape or plastic wire ties or plastic clips to attach the Tuff Cable to the stakes. Damaged Tuff Cable element or Tuff Cable element insulation must be repaired IMMEDIATELY. Tuff Cable element must never touch or cross itself.

IMPORTANT! A red plastic "STOP! DANGER!" sign indicating the presence of electric deicing, snow melting or warming equipment hase been included with your Heatizon product packaging. This caution notice must be posted at the fuse or circuit breaker panel and be clearly visible.

IMPORTANT! Record the number of feet of Tuff Cable Element that you have installed for each zone here:

2.7 Tuff Cable Retrofit Installation

Tuff Cable element can be installed in existing concrete, asphalt, and/or pavers. This is accomplished by saw-cutting the concrete, asphalt or pavers with grooves that are ¼ - inch wide by 1 - inch deep spaced on appropriate centers, inserting the Tuff Cable (and backer rod for concrete and pavers only) into the grooves and then filling the grooves.

1. Determine the desired element spacing (usually 4 to 6-inch centers for exterior snow/ice melting, depending on elevation and weather patterns of your area, and 6 to 12-inch centers for interior heat and floor warming) and the dimensions of the area to be melted. NOTE: The combination of heated area desired, heat density, and Tuff Cable element spacing will determine the number of Heatizon Tuff Cable zones you will need.

2. Lay out the pattern of the Tuff Cable element such that it creates a continuous loop that never crosses or touches itself. Turns may be made by over cutting the lines at various angles. For example, two 90 degree cuts will create parallel paths.

3. Mark the determined Tuff Cable locations on the top of the asphalt or concrete with a chalk line.

4. Spray the chalk lines with clear lacquer to Prevent the chalk line from washing away.

5. Saw cut each chalk line ¼" wide by 1" deep for the Tuff Cable element and ½" wide by 1½" deep for Cold Leads. Round outside corners of cuts and remove any sharp edges to avoid damage to Tuff Cable.

6. Thoroughly clean the sawcut cracks with a high power pressure washer to remove all dust and debris from the grooves. Allow to dry.

7. Make one connection between the Cold Lead and Tuff Cable. Lay the Heatizon Tuff Cable element in the bottom of the saw cuts leaving an extra 12" of element at the end for eventual connection to the Cold Lead.

8. The Cold Lead to Tuff Cable element connection is made by following directions in Section 7, "Making the Connection." This connection must be embedded in the concrete, asphalt or pavers.

9. Fill all cuts with sealant for asphalt retrofits, or backer rod and sealant for concrete and paver retrofits, in accordance with filler manufacturers recommended procedures.

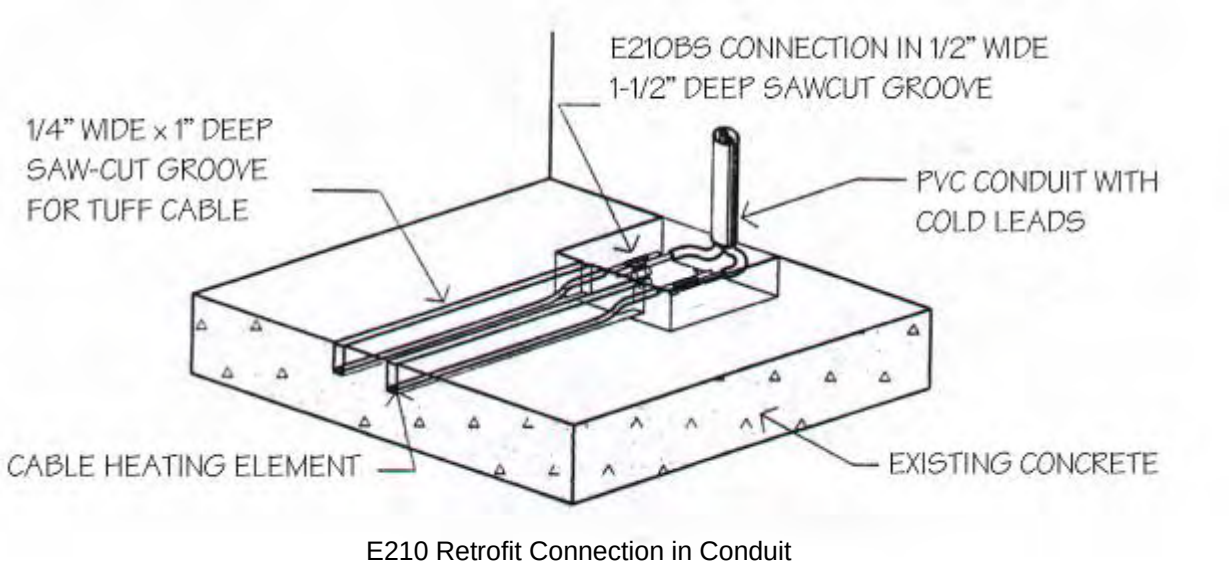
Note: To maximize performance, element should be installed in lines that are parallel to one another.

Note: All cuts will need to be slightly over cut to insure that the intersection of two cuts still result in a depth of one inch where the Tuff Cable element will lay.

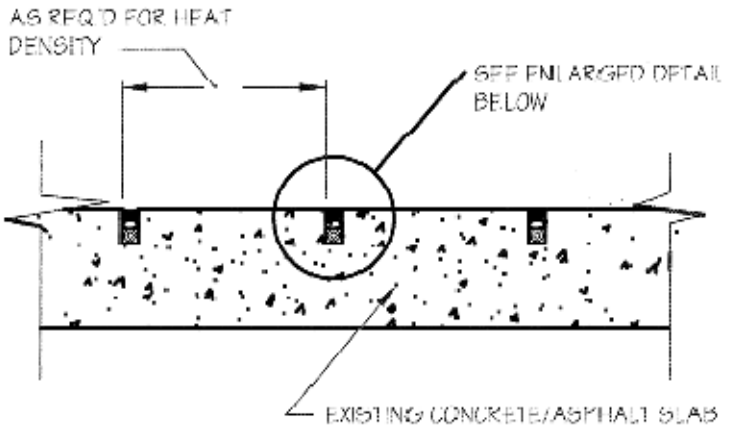
CAUTIONS: Damaged Tuff Cable element or Tuff Cable element insulation must be repaired IMMEDIATELY. Tuff Cable element must never touch or cross itself.

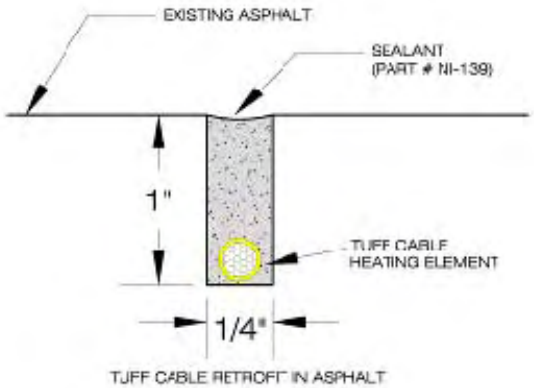
IMPORTANT! A red plastic "STOP! DANGER!" sign indicating the presence of electric deicing, snow melting or warming equipment has been included with your Heatizon product packaging. This caution notice must be posted at the fuse or circuit breaker panel and be clearly visible.

IMPORTANT! Record the number of feet of Tuff Cable Element that you have installed for each zone here:

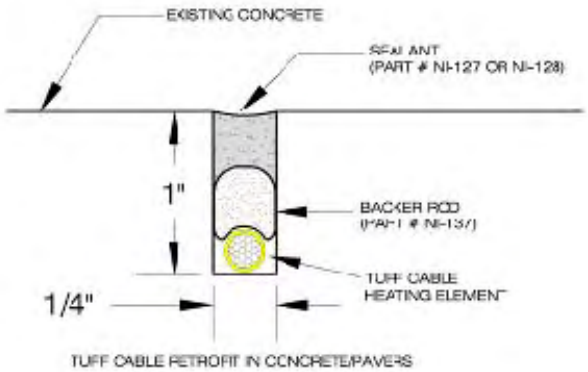


E210 Retrofit Connection in Conduit





TUFF CABLE RETROFIT IN ASPHALT

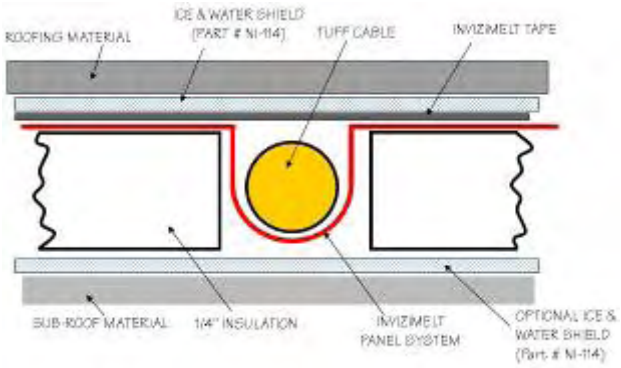


TUFF CABLE RETROFIT IN CONCRETE/PAVERS

2.8 Tuff Cable in Invizimelt Panels Installation for Roofs, Steps, Decks, & Subfloor

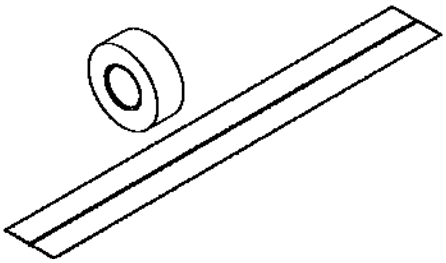
The Invizimelt Panel System uses Tuff Cable Heating Element to provide unparalleled roof deicing and roof snow melting. Heatizon Systems Tuff Cable is a low-voltage electric radiant heating element that must always be installed in an acceptable heat sink. For this manual, a heat sink means asphalt, a cementitious material like concrete or mortar, a mud bed, sand, Invizimelt Panel System or a Heatizon Heat Sink Kit. Tuff Cable is designed to be spaced at specific intervals and lengths to produce a specified amount of heat per square foot.

Heatizon's Invizimelt Panel System can be installed in a variety of configurations to conform to project dimensions and roof deicing and snow melting needs. By connecting panels in a series of configurations, virtually any shaped area can be covered.



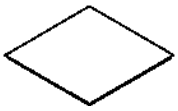
INV6KIT: Heatizon Systems Invizimelt 6 Panel Kit Contains

25 INV648 6" x 48" Invizimelt Panels
1 INVTAP 150' Roll of Invizimelt Z-Tape



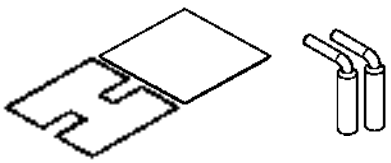
INVGAPKIT: Heatizon Systems Invizimelt Gap Kit Contains

16 INV66GAP 6" x 6" Invizimelt Gap Plates (with foam insulation, not attached)



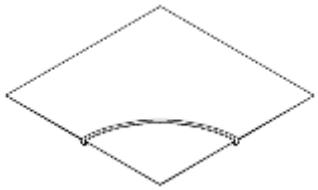
INVORKIT: Heatizon Systems Invizimelt Origination Kit Contains

1 P331 6" x 6" Invizimelt Origination "H" Plate (with insulated backing)
1 INV66BAS 6" x 6" Cover Plate without insulated Backing
2 E210BS90 Butt Splice with 90º Turn
2 Heatshrink Tubes



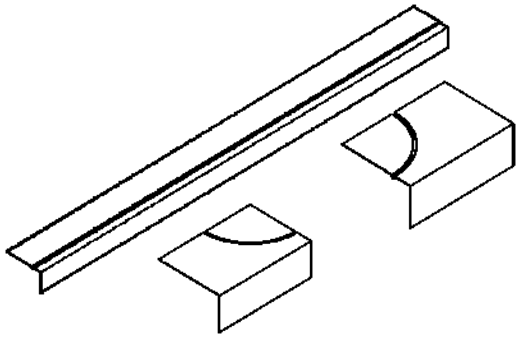
INVTRNKIT: Heatizon Systems Invizimelt 6 Turn Kit Contains

8 INV66TURN 6" x 6" 90 Degree Turn plates



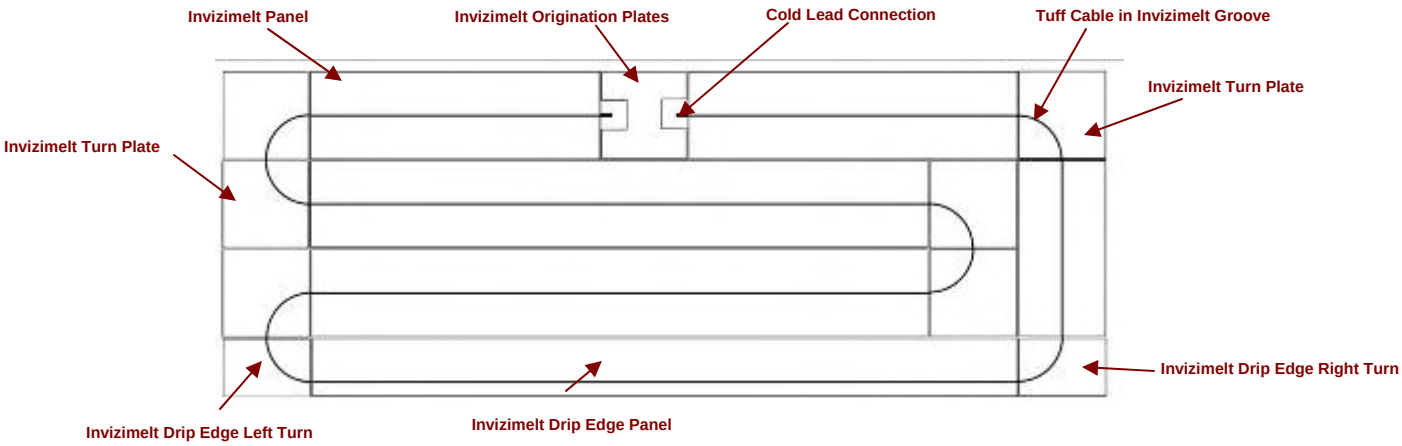
INVDEKIT: Heatizon Systems Invizimelt Drip Edge Kit Contains

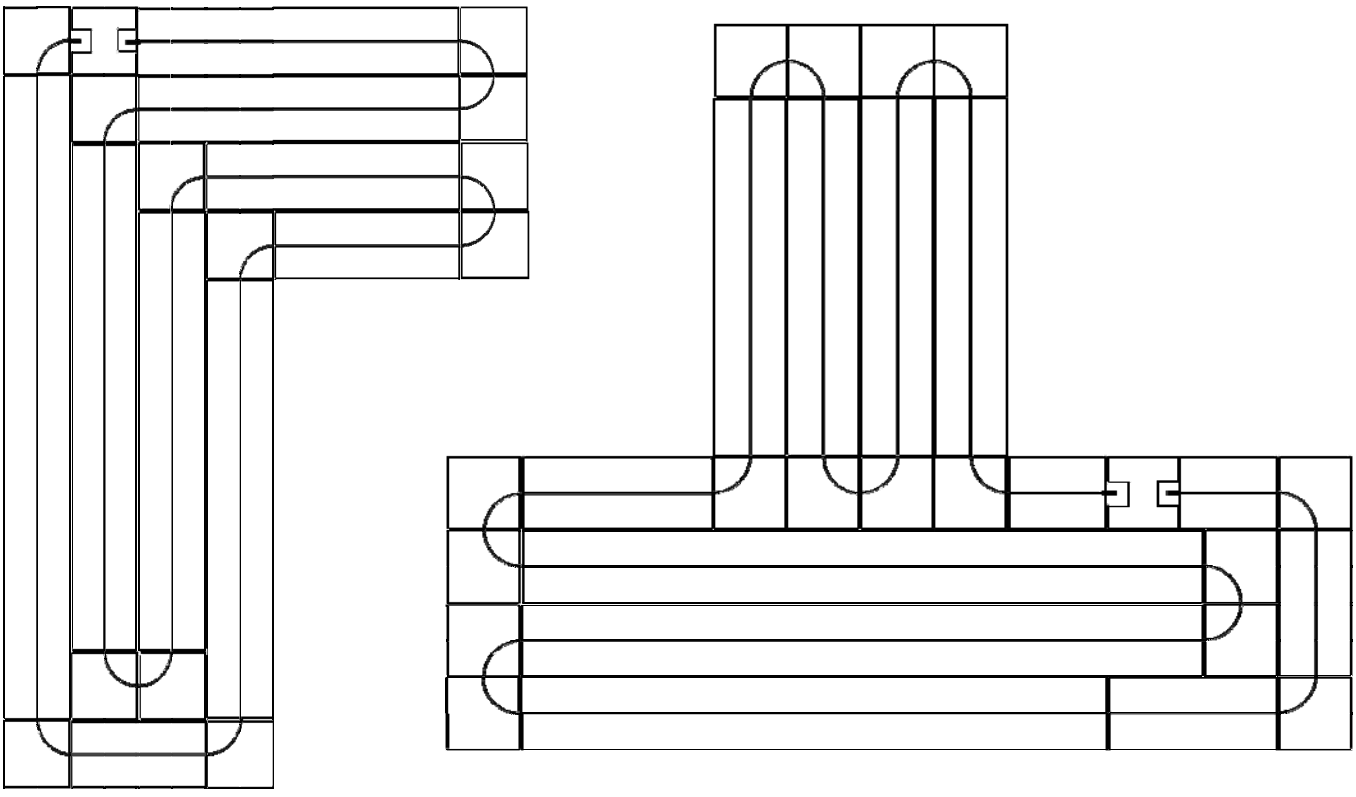
5 INV648DE 6" x 48" Drip Edge Panels
1 INV66DEL 6" x 6" Left Drip Edge Turn
1 INV66DER 6" x 6" Right Drip Edge Turn



DESIGN THE SYSTEM. Determine the area to be covered by Invizimelt. Use the sample layouts below for ideas on how Invizimelt can be configured to meet the needs of your project. Note: Make certain that you have enough Invizimelt Panels to cover the entire area and for the amount of heating element to be installed.

Tip: Ensure that an even number of runs is planned so that the heating element begins and ends in the same location.

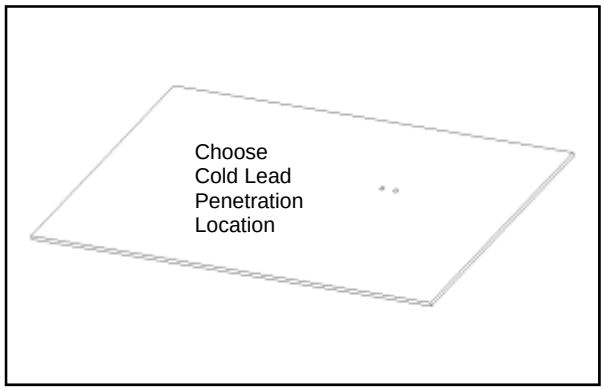




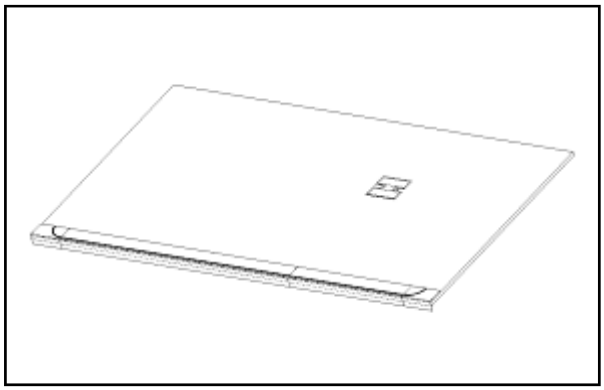
INVIZIMELT PANEL INSTALLATION:

Once the layout design has been finalized and the starting place chosen on the sub-roof, begin the installation of the Heatizon Systems Invizimelt System as follows:

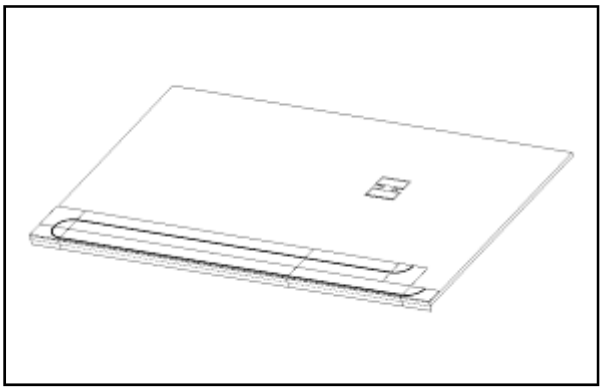
Step One: Determine where the Cold Leads will penetrate the sub-roof or sub-deck and connect with L-shaped Butt Splices (Heatizon Part Number E210BS90) to the origination and termination of the Tuff Cable heating element. At the Tuff Cable origination/termination location, leave a 6" wide gap in the Invizimelt Panels for the Invizimelt H-Plate (Heatizon Part Number P331) and Invizimelt Cover Plate (INV66BAS) at the origination/termination location. (Once all of the Invizimelt Panels and Turn Plates are installed, ensure that the Invizimelt System allows for a continuous loop of Tuff Cable and provides an even number of Tuff Cable runs from the origination to the termination point.)



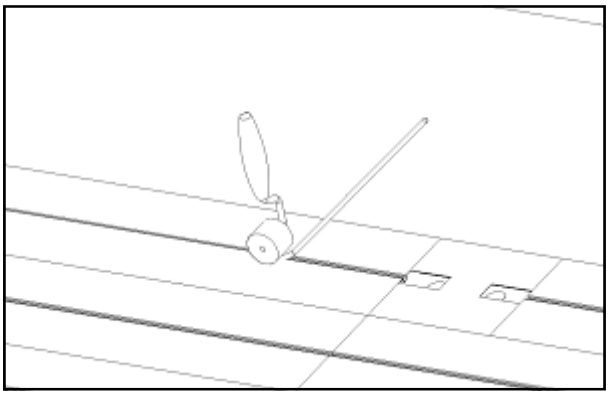
Step Two: Drill two holes in the sub-roof large enough for each Cold Lead to pass through in the center of the Origination/Termination Area. The holes should be approximately 3/4 " diameter and 4" apart, and in line with the Invizimelt Panel recessed Tuff Cable groove.



Step Three: If using the Optional Invizimelt Drip Edge Kit along the eaves or around the open perimeter of a deck, begin by installing the L-shaped Drip Edge Panel (Heatizon Part Number INV648DE) along the entire edge of the roof or deck. Install a Drip Edge Left Turn Plate (Heatizon Part Number INV66DEL) and a Drip Edge Right Turn Plate (Heatizon Part Number INV66DER) at the appropriate ends of the Drip Edge Panels.

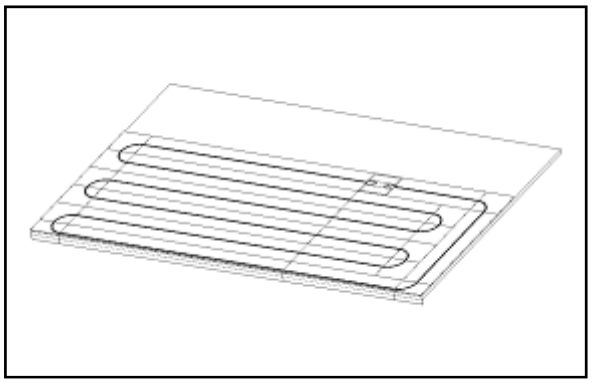


Step Four: Lay one row of Invizimelt Panels in place directly above the Drip Edge Panels (Heatizon part Number INV648), or along a straight chalk line designed to establish the starting point. Leave 1/8" between long edges of the Invizimelt Panels to allow for expansion and contractions. Tack the Invizimelt Panels and Plates in place using roofing nails, screws, or other recommended fasteners. Use several Invizimelt Turn Plates (Heatizon Part Number INV66TRN) to connect the Tuff Cable grooves between each row of Invizimelt Panels. Continue adding Invizimelt Panels and Turn Plates one row at a time until desired coverage is achieved. Be sure all turns line up to the proper spacing between the panels.



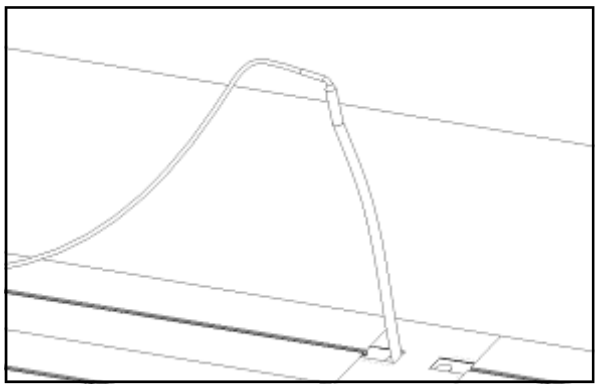
Step Five: Run the Tuff Cable into the grooves in the Invizimelt Panels and Invizimelt Turn Plates. Begin at the origination leaving approximately 6 inches of Tuff Cable to make a connection to the Cold Lead. Ensure that the Tuff Cable is completely inserted into the Invizimelt Panel groove. Aluminum Invizimelt Z-Tape (Heatizon Part INVTAP) must be used to hold cable into grooves.

Step Six: Secure the Tuff Cable in the grooves of the Invizimelt Panels and Plates by covering with Aluminum Invizimelt Z-Tape. Be sure to leave approximately 6 inches of Tuff Cable exposed at the origination and termination points.

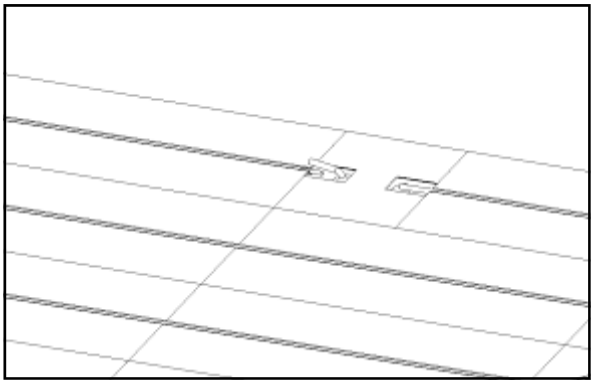


Step Seven: Completely secure the Invizimelt Panels and Plates with screws, nails, or other acceptable fasteners. Do not damage or penetrate the Tuff Cable.

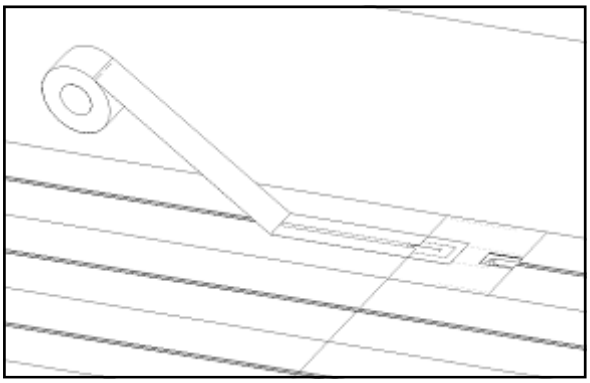
Warning: Never damage or penetrate Tuff Cable Heating Element. If Tuff Cable is damaged or penetrated, it must be properly repaired or replaced. Call Heatizon Systems at 801-293-1232 for details.



Step Eight: After all of the Tuff Cable has been inserted into the Invizimelt Panels, cut the Tuff Cable approximately 1" to 1 ½" away from the edge of the Invizimelt Panel on both the Origination and Termination sides of the Tuff Cable. Strip approximately ½" of the Tuff Cable and insert a heat shrink tube on both ends of Tuff Cable. Continue making the connection between the Tuff Cable and Cold Lead using the instructions provided in the "Making the Connection" section of this manual. Make certain there is no gap between the Tuff Cable connection and the end of the Invizimelt Panel.



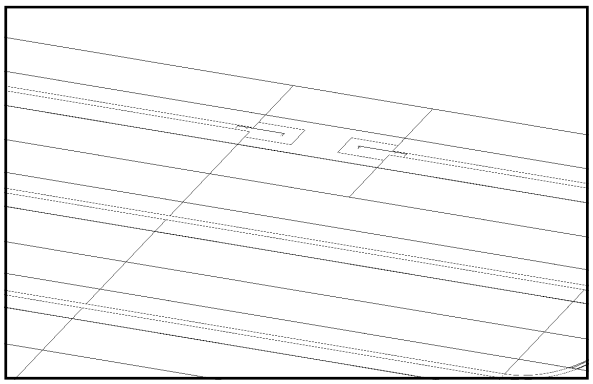
Step Nine: Cover the remaining Tuff Cable and heat shrinked Cold Lead connection with Aluminum Invizimelt Z-Tape. Tape over the connections and any remaining Tuff Cable in Invizimelt Panels that has not yet been covered.



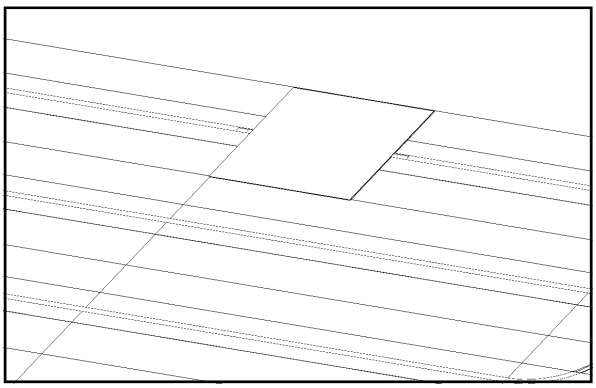
Warning: All Tuff Cable Heating Element must be in a groove in an Invizimelt Panel or Turn. A risk of fire exists any time Tuff Cable is not surrounded by something to pull the heat away from it, like a Heat sink Kit, Invizimelt Panel, etc.

Step Ten: Place the Origination Cover Plate (Heatizon Part Number INV66BAS) over the top of the connections and press down firmly to make a flat surface. Note and document the location of all Tuff Cable runs so that their location may be marked in Step Twelve below.

Note: Heatizon Systems suggests that a drawing with dimensions be made at this time, and that several photographs be taken for future reference.



Step Eleven: Do not allow the Invizimelt to get wet. Completely cover the Invizimelt and Tuff Cable with a high temperature rated roof water proofing underlayment. . Keep the Invizimelt Panels dry so the Aluminum Invizimelt Z-Tape will stick. Do not cover Invizimelt system with the water proofing underlayment while wet.



Step Twelve: Using a chalk line and the Tuff Cable run locations noted above, mark the location of all Tuff Cable on the top of the Ice and Water Shield, EPM, or other water-proofing product so that nails, screws, or other devices will NOT penetrate or damage the Tuff Cable element. Spray the chalk line with clear lacquer to protect the chalk lines and reduce the potential that they may be removed by moisture.

Warning: All electric products, including Tuff Cable, produce an electro-magnetic field which can cause ferrous metals (or metals which are magnetic because they contain iron) to vibrate. Two or more layers or pieces of vibrating ferrous metal in contact with one another may result in a hum or noise. Separating contact between ferrous metals with Heatizon Drip Edge Protector (Heatizon Part # NI144) may reduce the audible effects of the vibration. In order to minimize the size of the flux lines or lines of force of any magnetic field given off by the Tuff Cable heating element, always run an even number of lengths of heating element and begin and end the heating element at approximately the same place.

Warnings:

- Do not penetrate or otherwise damage the Tuff Cable. Damaged or penetrated Tuff Cable heating rlement must be repaired or replaced prior to covering.
- Leave 1/8” between long edges of the Invizimelt Panels to allow for expansion and contractions.
- Make certain that all of the Tuff Cable heating element is secured in an Invizimelt Panel, Turn Plate, or Gap Plate, and covered with Invizimelt Z-Tape.
- Examine and eliminate any and all sharp edges in the Invizimelt Panels and Plates.

2.9 Tuff Cable Heatsink Kit Installation for Roofs, Steps, Decks, & Subfloor

Heatizon Heatsink Kit

1	1.5” X 60” X ¼” Heatsink Starting Strip
5	5.0” X 60” X ¼” Heatsink Middle Strips
2	2.5” X 60” X ¼” Heatsink Ending Strip
100	Heatsink Screws
30	Black Tube Clamps
30	Roofing Nails
13 lbs	Premixed Heatizon Filler
1	5” Trowel
1	12” Trowel
1	Heatizon Filler Bag
1	5 Gallon Plastic Bucket and Lid
1	Filler Mixer Drill Attachment

Optional Heatsink Center Cable Protector Kit

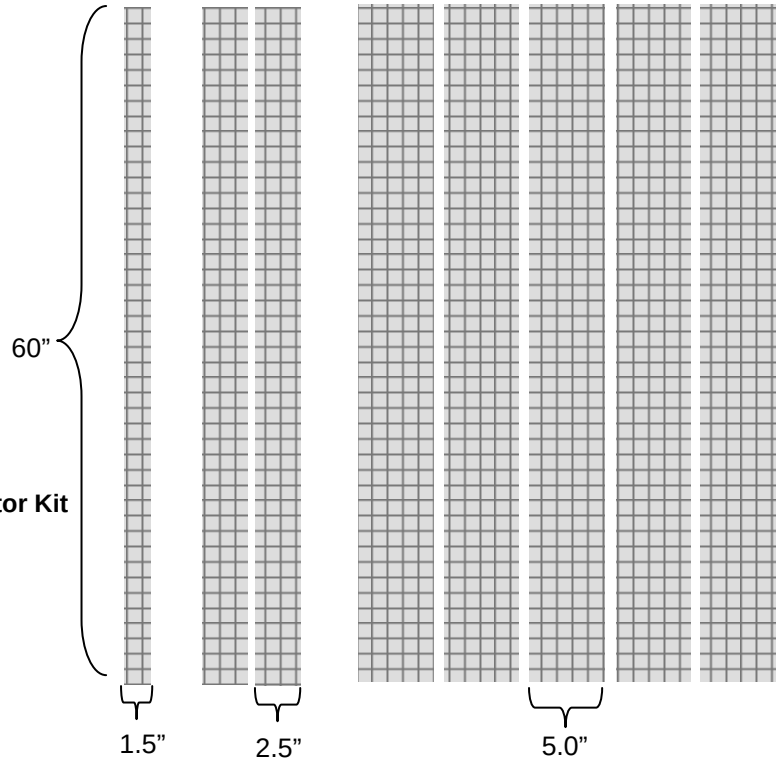
6	1.5” X 60” Tuff Cable Protector
30	Heatsink Screws

Optional Heatsink Origination/End Cable Protector Kit

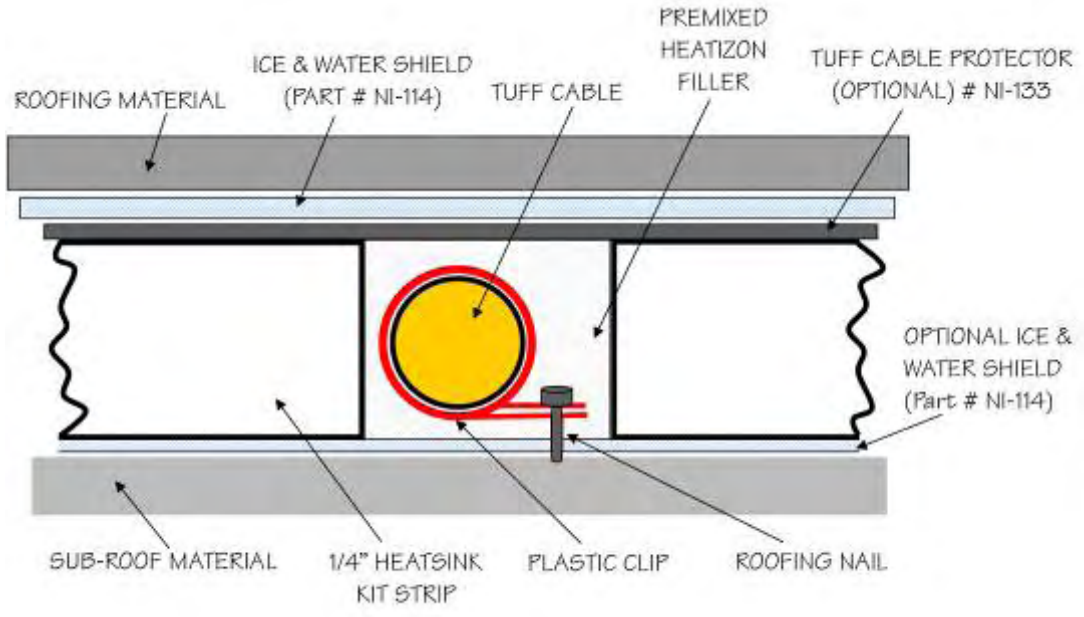
3	1.5” X 35” Tuff Cable End Protector
10	Heatsink Screws

US Patent 7,071,446B1

HEATIZON HEATSINK KIT PIECES



Note: Always allow for the space for one 2.5” Field-Cut Heatsink Return Cap plus a 1” gap and one 2.5" Field-Cut Origination Cap plus 1" for each Heatizon Tuff Cable (see Illustration above). Also, do not forget to always leave a 1” gap for the Tuff Cable between all Heatsink Strips.



HEATIZON SYSTEMS

ROOF INFORMATION

FOR ROOFING CONTRACTOR AND OTHER TRADES

The roofing contractor is responsible for insuring the Heating Element is not damaged during the installation of roofing materials.

Please communicate this information directly to anyone who will come into contact with the Heatizon Systems ZMesh or Tuff Cable heating element after it has been installed. Prior to beginning the installation of any Heatizon Systems product, read the applicable sections of the installation manual in their entirety. In order for Heatizon Systems installation instructions to be followed completely, **Heatizon Systems requires that a copy of this page be given to the Roofing Contractor**, and additional copies be stapled on top of the ZMesh and near the Tuff Cable immediately after its installation. The copies and staples should be removed prior to installing the roof covering.

A Heatizon roof deicing system has been installed on this project. Here are the steps you need to take to insure that the system is installed correctly and is not damaged:

Waterproof underlayment. A self-adhesive waterproof underlayment must be placed over Heatizon ZMesh and/or Heatizon Tuff Cable Heating Element in a Heatizon Heatsink Kit or in an Invizmelt Kit. If underlayment has not yet been installed over the Heatizon ZMesh and/or Heatizon Tuff Cable Heating Element, do not apply roofing material directly on top of the Heating Element. For membrane roofs, contact Heatizon Systems.

Electrically Conductive Materials. Heatizon ZMesh and Tuff Cable Heating Elements must not come in direct contact with any other electrically conductive materials on the roof structure or elsewhere. The roofing contractor is responsible for insuring the element is not cut, or damaged in any way and does not come into contact with any conductive material. If the Tuff Cable Heating Element is penetrated during installation of roofing materials, the damaged Tuff Cable must be immediately repaired with a Heatizon Tuff Cable Splice Kit (Part # CABSPLKIT).

- Drip edge, flashing or any other conductive material on the roof structure must not connect to or come in contact with ZMesh or Tuff Cable Heating Element.
- Screws, nails, attachments or any other connectors securing the conductive shingles, drip edge, flashing, valley metal, skylights, etc or any other conductive material must not penetrate, connect to, or come in contact with ZMesh or Tuff Cable Heating Element.
- Do not cut, fold, twist, or alter the installed ZMesh or Tuff Cable Heating Element.
- All metal used over, under and/or on the roof must be kept away from ZMesh, or must be completely electrically insulated from it.

Continuity Check. Immediately following installation, ZMesh or Tuff Cable Heating Element has been tested for continuity and correct readings have been recorded. The Roofing Contractor is responsible for any penetration, cutting or other damage done to Tuff Cable Heating Element, and for cutting or other damage done to ZMesh Heating Element. ZMesh may be penetrated as long as such penetration does not provide a path for electrical current to other electrically conductive materials. The Heating Elements should have a continuous continuity check performed during the installation of all conductive roofing materials. A Roof Alarm is available for rental or purchase from Heatizon Systems to assist the roofing contractor in performing this continuity check. The circuit must always be open. See Roof Alarm instructions for more detail.

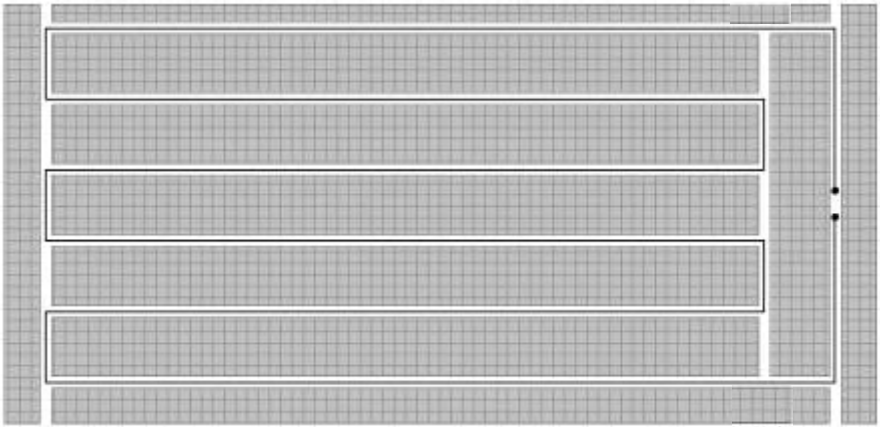
After the Installation. Immediately following installation, the ZMesh or Tuff Cable Heating Element is to be visually inspected and electronically tested for continuity and the correct readings recorded in the Design and Installation Manual (See After Element Installation Tests). The Roofing Contractor is responsible for any penetration, cutting, or other damage done to the ZMesh or Tuff Cable Heating Element.

Electrical Codes. The Cold Leads of the Heatizon Roof Deicing System is considered part of a listed snow melt/deicing system. However, local electrical codes may require Cold Leads to be run in conduit between the Control Unit and the heated section. Consult with a local electrical inspector or other relevant authority prior to installation.

Warnings. Heed all warnings in the Heatizon Systems Design and Installation Manual, the product packaging, and attached to or affixed to the product.

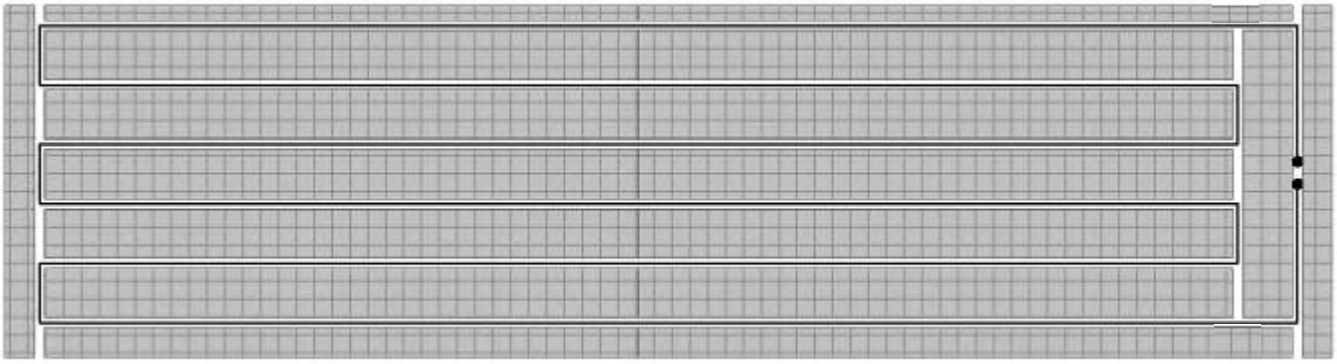
Sample Tuff Cable in a Heatsink Kit Designs

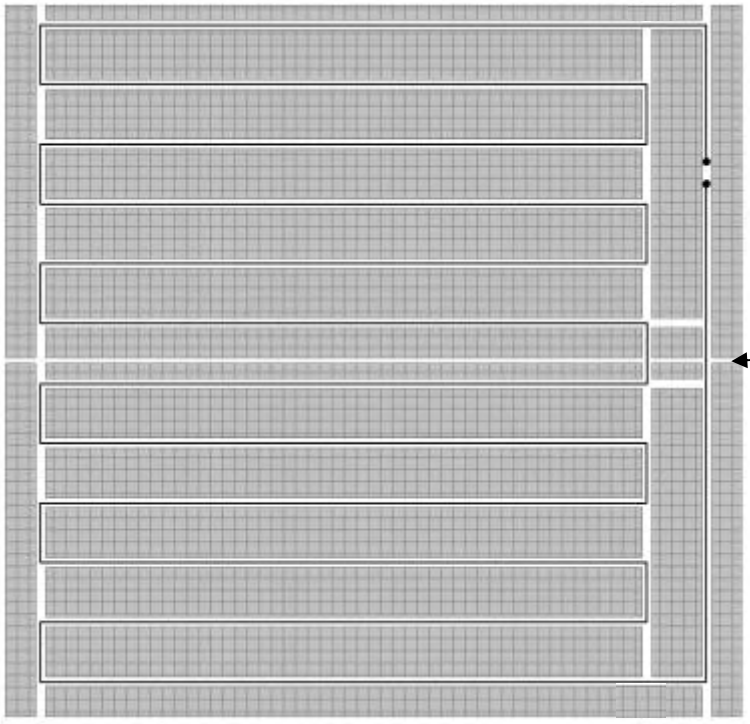
Use these diagrams to assist you in connecting multiple Heatsink Kits to accommodate the specific design and square footage of the project.



Note: The connection between Tuff Cable and Cold Lead must always be embedded in the Heatsink Kit.

SINGLE
Standard Heatizon Heatsink Kit





ADD LENGTH
A Standard Heatizon Heatsink Kit can be extended to any length by simply inserting additional Heatsink Starting, Middle, and Ending Strips (end to end) from additional Heatsink Kits in between the Field-Cut Origination Strip and End Caps. Run Heatizon Systems Tuff Cable through the 1” spaces as shown.

ADD WIDTH
A Standard Heatizon Heatsink Kit can be extended to any width by simply inserting additional Heatsink Kits (or portions) next to it. Be sure to leave a 1/2” gap in between each additional kit, and run Heatizon Systems Tuff Cable through the 1” spaces as shown.

Once the layout design has been finalized and the starting place chosen on the eaves, valleys, steps, deck or floor, begin the installation of the Heatizon Systems Heatsink Kit as follows:

Step One: Install one 1.5" X 60" Heatsink Starting Strip to the sub-roof, sub-step, or sub-deck, with enough of the provided wood screws or construction adhesive to secure in place; For floors, discard all 1.5" x 60" Heatsink Starting Strips and begin with a Field-Cut 2.5" Heatsink Starting Strip along one wall, or 5" x 60" Heatsink Middle Strips in the center of the room.

Step Two: After leaving a 1" gap for the Tuff Cable install one 5" X 60" Heatsink Middle Strip with enough of the provided wood screws or optional construction adhesive to secure in place.

Step Three: After leaving a 1" gap for the Tuff Cable, install a second 5" X 60" Heatsink Middle Strip. Repeat as necessary to cover the entire area to be warmed or snow and ice melted.

Step Four: After leaving a 1" gap for the Tuff Cable install one Field-Cut 2.5" Heatsink Ending Strip.

Step Five: At the end of the Heatsink or the point where the Tuff Cable will make two 90 degree turns and return back toward the point of beginning, leave a 1" gap for the Tuff Cable then install one Field-Cut 2.5" Heatsink Origination Strip.

Step Six: At the beginning of the Heatsink, or the point where the Cold Leads will connect to the Tuff Cable, leave a 1" gap for the Tuff Cable and install one Field-Cut 5" Heatsink Origination Cap, one Field-Cut 1.5" Heatsink Starting Strip, and one 2.5" Heatsink Large Ending Strip.

Step Seven: Connect one Cold Leads to one end of the Tuff Cable as shown in Section 7, "Making the Connection." Install the Tuff Cable into the 1" gaps following the instructions in this manual. Secure the Tuff Cable to the roof deck or subfloor with the plastic clips and screws provided. Plastic clips should be used to hold the Tuff Cable below the surface of the Heatsink strips.

Note: Leave 1" space between all Heatsink Origination Caps and the Heatsink Origination Strip for the Cold Lead/Tuff Cable beginning and ending connections.

Step Eight: Connect the second Cold Lead to the Tuff Cable as shown in Section 7, "Making the Connection."

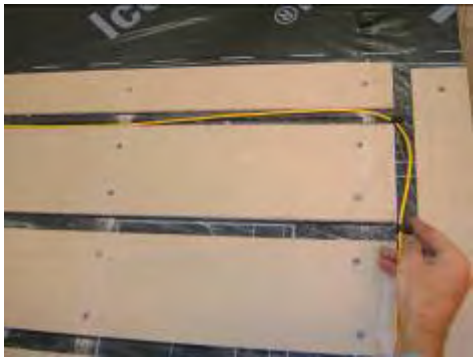
Step Nine: Once the Tuff Cable has been installed into the gaps and the Tuff Cable connections are completed and in the 1" gaps, completely fill all 1" gaps with the provided Heatizon filler so that they are level with the top of the Heatsink Strips. Make certain that all Tuff Cable and all splices between the Cold Leads and the Tuff Cable are completely covered by the provided Heatizon filler.

Step Ten: Install the optional Tuff Cable Protectors over the Tuff Cable using the provided screws. **Caution: Do not allow the provided screws or anything else to damage the Tuff Cable or Cold Leads.**

Step Eleven: Note and document the location of all Tuff Cable runs so that its location may be marked in Step Thirteen below.

Step Twelve: Do not allow the Heatsink to get wet. Completely cover the Heatsink and Tuff Cable with the appropriate self adhesive waterproof underlayment for your roof covering, such as Ice and Water Shield (Heatizon Part Number NI1214 or EPDM Heatizon part Number NI133) when using on roofs. A similar waterproofing is required for exterior stairs and decks.

Step Thirteen: Using a chalk line and the Tuff Cable run locations noted in Step Eleven above, mark the location of all Tuff Cable on the top of the Ice and Water Shield, EPDM, or other waterproofing product so that nails, screws, or other attachment devices will NOT penetrate or damage the Tuff Cable element. Spray the chalk lines with clear lacquer to protect the chalk lines and reduce the potential that they may be removed by moisture.



Tuff Cable in a Heatizon Heatsink Kit should use only the following Transformers: 1kVA, 2kVA, 3kVA, 2x2kVA, or 2x3kVA.

Note: In order to have the Tuff Cable connect to both Cold Leads at approximately the same point, an odd number of Heatsink Strips must be installed. Installing an odd number of Heatsink Strips will result in an even number of 1" gaps for Tuff Cable.

Note: When planning the layout of the Heatsink Strips, allow enough space to install one 2.5" Heatsink Ending Strip (plus a 1" gap for Tuff Cable), at the end of the Heatsink so the Tuff Cable can be looped back toward the point of beginning. In addition, plan the layout of the Heatsink Strips to accommodate the 5" Heatsink Origination Cap, the 2.5" (Large) and 1.5" (Small) End Caps, plus the 2.5" Field-Cut Heatsink Origination Strip at the end of the Heatsink where you plan to connect the Tuff Cable to the Cold Leads.

Note: All of the Tuff Cable, and the connection of the Cold Lead and the Tuff Cable, must be embedded into the Heatsink and entirely covered with the provided filler in order to embed the connection of the Cold Lead and the Tuff Cable.

Damaged Tuff Cable element or Tuff Cable element insulation must be repaired IMMEDIATELY. Tuff Cable element must never touch or cross itself.

IMPORTANT! A red plastic "STOP! DANGER!" sign indicating the presence of electric deicing, snow melting or warming equipment has been included with your Heatizon product packaging. This caution notice must be posted at the fuse or circuit breaker panel and be clearly visible.

IMPORTANT! Record the number of feet of Tuff Cable Element that you have installed for each zone here:

ZMesh Heating Element

Note: Always inspect the ZMesh for hairy edges or loose strands, cuts or other damage prior to and after installation; repair as required. Always conduct a continuity test between ZMesh and any metal in the area of the ZMesh and the Cold Leads. Complete the form "Heatizon Systems After Installation Element Test" immediately following the installation of the ZMesh, and immediately following any work that has been performed on the project which may affect the heating element. See the "Heatizon Systems After Installation Element Test" section of this Design and Installation Manual.

Note: Properly installed insulation is always recommended by Heatizon to enhance the efficiency and improve the performance of all Heatizon Systems products.

Note: Preparing a detailed layout of the element installation results in a superior installation. Preparing this layout on paper will save time and provide for a permanent record of the layout.

Note: To minimize the size of the flux lines or lines of force of any magnetic field given off by the ZMesh heating element, always run an even number of lengths of heating element and begin and end the heating element at approximately the same place.

3.1 General ZMesh Installation Instructions:

The function of the Transition Plate is to connect the bronze ZMesh heating element to the Cold Leads. Transition Plates may be terminated in the floor, in the wall, on the roof, on a deck surface, or in a joist space. Placement of the Transition Plates are done as follows:

Maintain 2" of space or more between Transition Plates. The location of the Transition Plates should be determined at the time the Cold Lead is installed. The spacing between Transition Plate's butt splices is dictated by the spacing between the ZMesh and the direction that the ZMesh runs from each Transition Plate**.**

Install the Transition Plate(s) at the time the ZMesh element is installed. If it is necessary to install the Transition Plates at the same time as the Cold Lead, make certain that they are protected so that they will not get damaged, dirty, or painted.

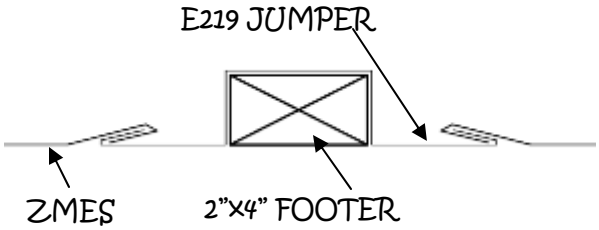
Note: Non repaired cuts and loose strands of ZMesh will get red hot if energized, and will result in fire danger. Eliminate all loose strands of ZMesh prior to energizing your Heatizon product and repair all cuts. If ZMesh is cut, it must be repaired by using Heatizon Systems ZMesh Cut Out Kit (part # CUTOUTKIT) which must be properly installed.

Remember: "After Installation Element Test" #1 should be conducted after the heating element has been installed, and "After Installation Element Test" #2 should be conducted following the covering of the heating element and immediately prior to installing the Control Unit.

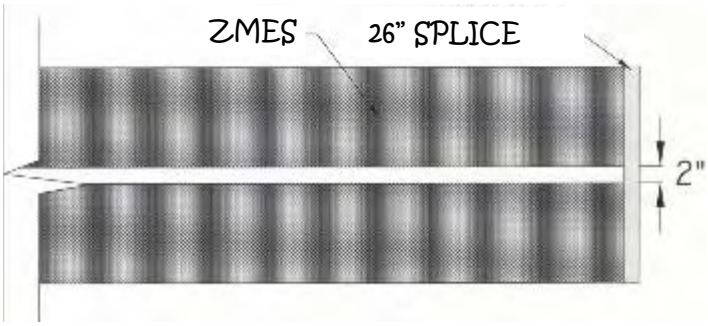
TIPS FOR WORKING WITH ZMESH

Splice Plate. On rare occasion, it may be necessary to splice the ZMesh element. Use a splice plate (Heatizon Part # E220). Follow the instructions in Section 7, “Making the Connection.”

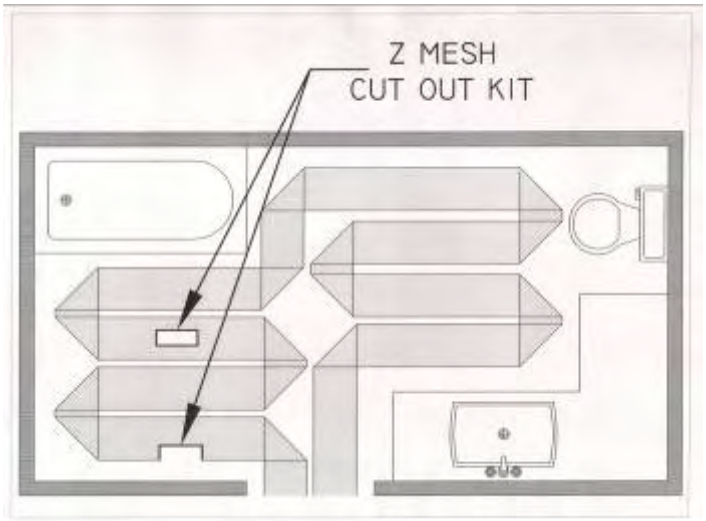
Jumper Plate. When two adjacent areas are being jumpered together, or connected in series, a Wall Plate or Jumper Plate (Heatizon Part # E219) is used to extend the ZMesh through a 2” x 4” wood studded wall, by installing the jumper over a wood 2” x 4” footer stud. Follow the instructions in Section 7, “Making the Connection.”



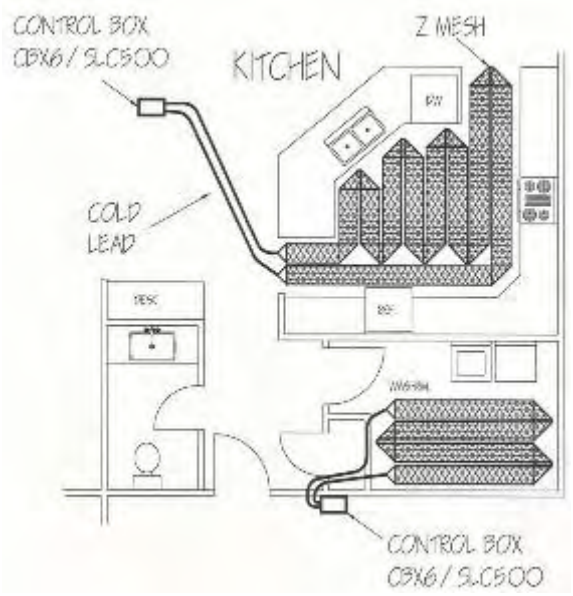
End Plate. Wherever a need exists to avoid having turns in the ZMesh, Heatizon 26" Splice Plate or End Plate (Heatizon Part # P1402) may be used. Follow the splicing instructions in Section 7, “Making the Connection.”



ZMesh Cut Repair. Always use a ZMesh Cut Out Kit whenever the ZMesh has been cut or damaged, or whenever a portion of the ZMesh must be cut away to avoid an object. Never cut away more than 4" of 12" ZMesh nor more than 3" of 9" ZMesh. Use Heatizon Systems ZMesh Cut Out Kit (Heatizon Part # CUTOUTKIT).



Planning the Layout — Two Sample Configurations of ZMesh Element

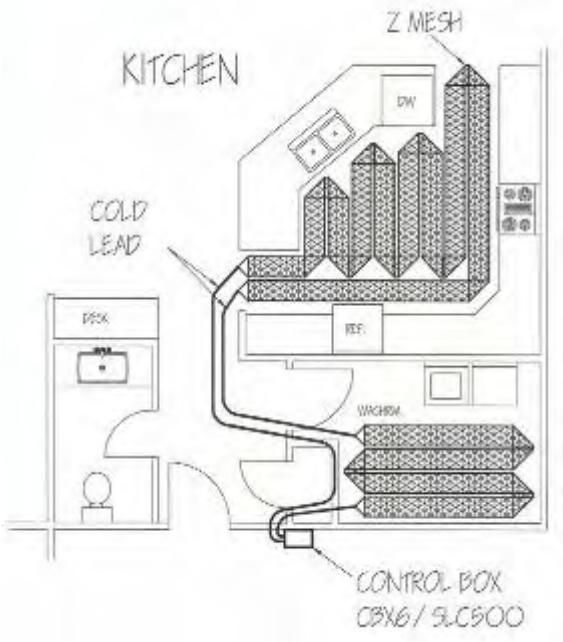


1.

ZMesh and Cold Lead for two separate zones, connected to two separate Control Units. One pair of Cold Leads has already been installed prior to ZMesh element installation. Each full sized heated area is connected to one standard CBX6 or SLC500 series Control Unit.

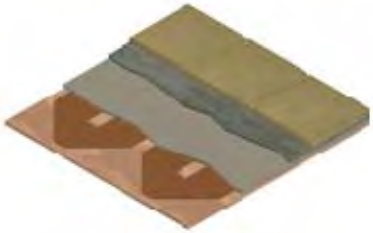
2,

ZMesh and Cold Lead for two separate areas, which are connected in series by "jumpering" the areas together with Cold Lead (right) or with a wall plate (above). One pair of Cold Leads must have already been installed prior to ZMesh element installation. The two smaller areas are jumpered together and connected to one standard CBX6, or SLC500 series Control Unit.

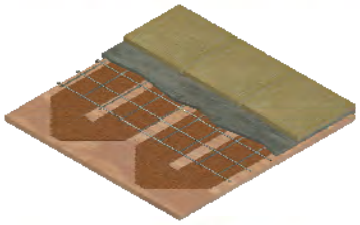


ZMesh Specific Application Guide

All applications using ZMesh heating element will utilize similar procedures for installing the element. Review your specific application installation procedures on the following pages before completing the element installation.



Section 3.1
General ZMesh Installation Instructions



Section 3.2
ZMesh Interior Installation

Section 3.3
ZMesh on Decks for Snowmelt Installation

Section 3.4
ZMesh Retrofit/ Staple-Up Installation

Section 3.5
ZMesh Roof De-Icing Installation

Your ZMesh application may require some of these Heatizon supplies and parts:

NI101	3M Skotchkote
NI102	3M23 Tape, 30' roll
NI103	3M33 Tape, 66' roll
NI110	Clamp Meter, Fluke 333
NI111	Crimper
NI113	Element Tester
NI147	Hammer Style Crimper
NI114	Ice & Water Shield
NI115	Infared Thermometer, Raytec MT2
NI116	Infared Thermometer, Westward
NI117	Insulation - Concrete Barrier Foil - 500 sf.
NI118	Insulation - Rigid - 4' x 8' x 1" sheet
NI119	Insulation - Slab Shield - 252 sf.
NI129	Solder, 40/60
NI130	Stapler, Screen
NI131	Staples, 3/8" - 5000 count
NI133	Weather Bond - 100 sf.
NI136	Wire Ties, 8" - 100 count
NI144	Drip Edge Protector
E217	Transition Plate with #2 Butt Splice
E218	Splice Plate, 12"
P1402	Splice Plate, 26"

Your ZMesh application may require some of these Heatizon System Kits:

JUMPERKIT	Joint Jumper Kit
CLDEXTKIT	Cold Lead Extension Kit
CUTOUTKIT	Z Mesh Cut Out Kit
JSTSCRKIT100	Joist Screen Kit - 100'
JSTSCRKIT250	Joist Screen Kit - 250'
JSTSCRKIT350	Joist Screen Kit - 350'
ENCLKIT	Enclosure Kit w/Back Plate

Your ZMesh application may require some of these tools and equipment:

Hammer
Tape measure
Marking pencil and chalk line
Crimpers
Wire Strippers and Cutters and/or Remesh Cutters
Razor Blade or Box Cutter
True RMS Clamp On Meter
Heatizon Roof Alarm (Part Number NI126)
Propane Torch

3.2 ZMesh Interior Installation

NOTE: Make certain that the surface area to be covered with ZMesh is smooth and flat. Prior to installing the ZMesh element, clean the areas to be covered of all dirt, nails, drywall, mud, etc.

Inspect the ZMesh element for loose strands as you go and be sure to cut them off and discard them. In the unlikely event blemishes are spotted in the ZMesh, return the entire roll to Heatizon Systems for replacement.

A. Beginning at the point where the Cold Lead penetrates the floor, wall, or roof, plan the element run for each zone. Proper element spacing is based upon the results of the heat loss calculations or heat density requirements that were performed to size the heating system. Maintain a minimum of 2" distance between adjacent runs of ZMesh element, and do not allow ZMesh to cross itself.

B. Once the location of runs of ZMesh has been determined, connect one end of the ZMesh to one Transition Plate, by following the instructions in Section 7, “Making the Connection.”

If installation of ZMesh is on concrete use a flooring adhesive to hold the ZMesh in place. With a 3" wide putty knife place 3" wide swaths of adhesive perpendicular to the length of the ZMesh approximately every 18". Duct tape may be used to temporarily hold the ZMesh in place until adhesive dries. Follow directions of flooring adhesive manufacturer for application of floor adhesive. Once the adhesive is dry, remove and dispose of all duct tape.

If installation is over a wood sub-floor or sub roof, begin stapling the ZMesh to the sub-floor or sub-roof, pushing loose ZMesh ahead of you while pulling ZMesh tight and stapling it every approximately 18" on opposite sides and center. The first staple should be 12" away from the Transition Plate connector, to allow for making the connection between the Transition Plate connector and the ZMesh comfortably. “Bubbling up” of the ZMesh must be avoided. Staple folded areas around the outside edge of the fold.

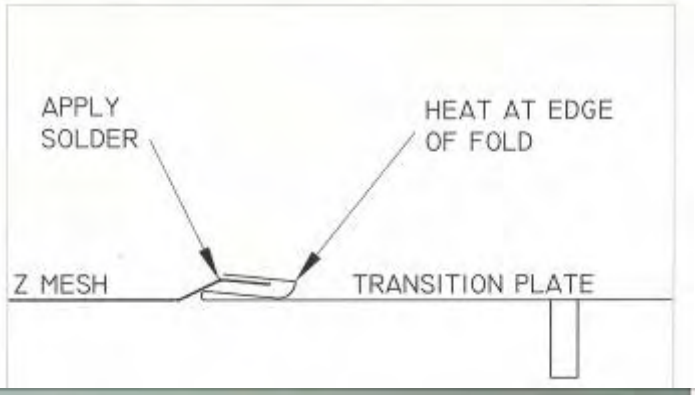
If installation of ZMesh is over a concrete slab that has elevated sleepers for hardwood flooring, the folds of the ZMesh element must occur over the concrete areas, not over the sleepers.

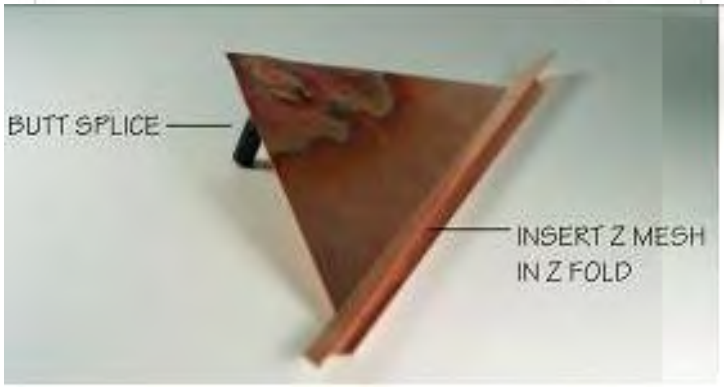
C. Begin to roll out the ZMesh starting at one of the Transition Plates. Fold the ZMesh element with two 90º folds to make parallel return runs and lesser degree turns to make non-parallel runs.

D. Once all of the required Z Mesh has been rolled out and the layout is finalized, crease each fold firmly (a scrap of 2" x 4" lumber can be used to create a crisp fold).

E. Connect the second end of the ZMesh to the second Transition Plate, by following the instructions in Section 7, "Making the Connection."

F. Once the ZMesh element has been installed, the covering (acceptable coverings and applications are noted in table at the beginning of this Design and Installation Manual section) must be installed immediately to prevent damage to the element and to prevent shorting of adjacent runs of element.

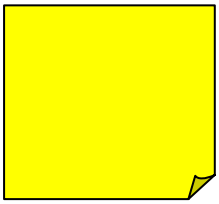




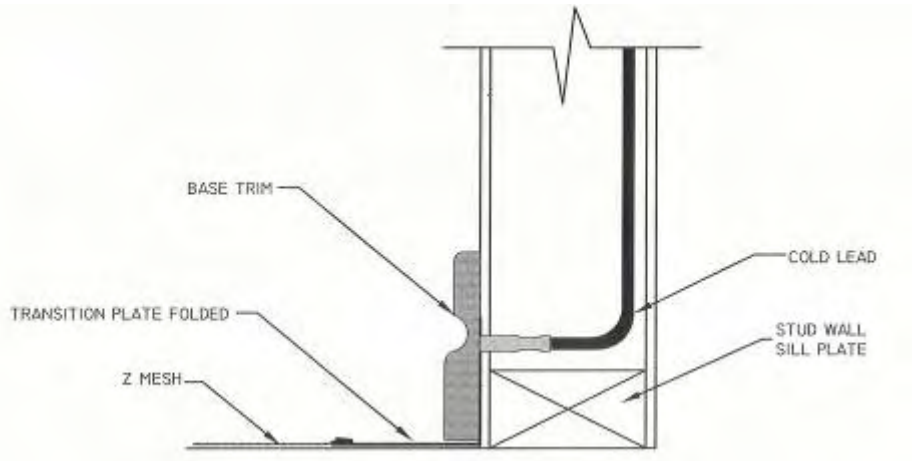
Note: The Heatizon Systems Solder (Heatizon Part Number NI129) is the only Solder to be used. Warning: Note precautionary measures for use of solder containing lead included in solder packet.

CAUTION: ZMesh element must never touch or cross any other ZMesh element or other metal or electrically conductive objects. Nails, staples or screws may penetrate the ZMesh element as long as they DO NOT contact any electrically conductive material or metal other than the ZMesh element. ZMesh element should never be installed over/under a mudbed with metal lath.

IMPORTANT! Record the number of feet of ZMesh Element that you have installed for each zone here:



IMPORTANT! One or more "STOP! DANGER!" paper warning signs indicating the presence of electric deicing, snow melting or warming equipment have been included with your Heatizon product packaging. These notices must be attached to approximately every 50 feet of the ZMesh Heating Element. Remove the notices prior to installing the floor covering etc.



Wall Section at Floor

IMPORTANT! A red plastic "STOP! DANGER!" sign indicating the presence of electric deicing, snow melting or warming equipment has been included with your Heatizon product packaging. This caution notice must be posted at the fuse or circuit breaker panel and be clearly visible.

3.3 ZMESH ELEMENT ON DECK INSTALLATION

ZMesh may be installed on wood or concrete decks in the same manner it is installed on wood subfloor and wood sub-roofs.

Note that elevated decks must always have either heated living space or insulation below the surface where the ZMesh heating element is installed.

ZMesh must always be protected from moisture by a waterproof membrane when used on exterior decks.

CAUTION: ZMesh element must never touch or cross any other ZMesh element or other metal or electrically conductive objects. Nails, staples or screws may penetrate the ZMesh element as long as they DO NOT contact any electrically conductive material or metal other than the ZMesh element. ZMesh element should never be installed over/under a mudbed with metal lath.

IMPORTANT! A red plastic "STOP! DANGER!" sign indicating the presence of electric deicing, snow melting or warming equipment has been included with your Heatizon product packaging. This caution notice must be posted at the fuse or circuit breaker panel and be clearly visible.

IMPORTANT! One or more "STOP! DANGER!" paper warning signs indicating the presence of electric deicing, snow melting or warming equipment have been included with your Heatizon product packaging. These notices must be attached to approximately every 50 feet of the ZMesh Heating Element. Remove the notices prior to installing the floor covering etc.

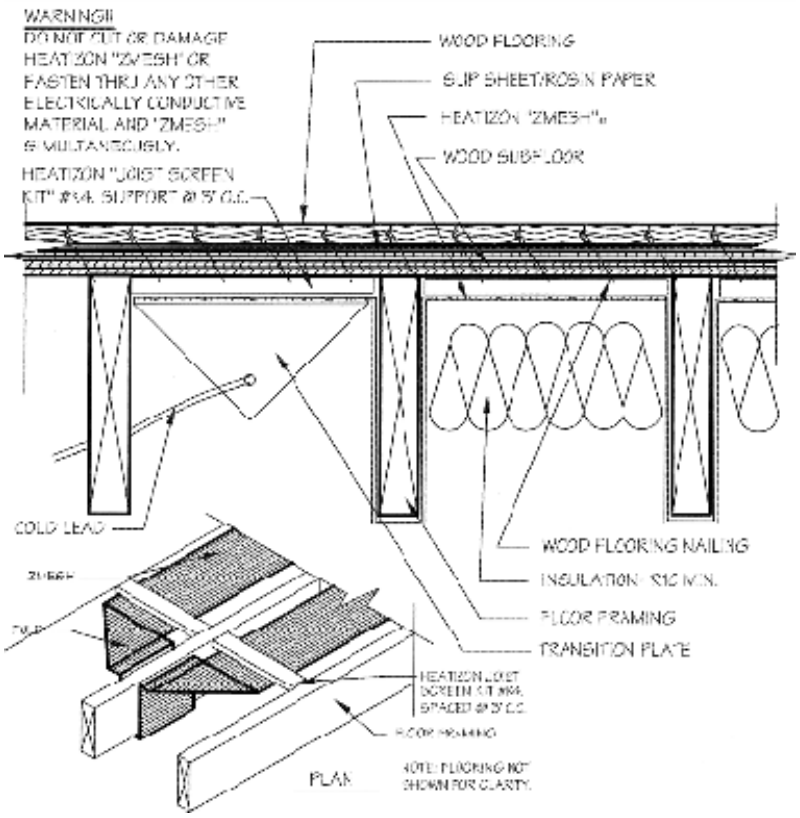
CAUTION: Risk of fire will occur if ZMesh is shorted to anything metal or electrically conductive. In order to reduce the risk, always use an Element Alarm (Part Number NI113) or amp meter with an alarm to check for continuity between the ZMesh and all metal or electrically conductive material.

IMPORTANT! Record the number of feet of ZMesh Element that you have installed for each zone here:

3.4 ZMESH RETROFIT/STAPLE-UP INSTALLATION

ZMesh element can be retrofit by stapling the ZMesh element beneath the sub-floor in the joist space by using a Heatizon Systems Joist Screen Kit (JSTSCRKIT). The ZMesh element is then stapled to the Joist Screen Kit spacers, which maintains approximately 3/4-inch space between the sub-floor and the ZMesh. Insulation is then installed below the ZMesh heating element leaving a minimum of 2-inches of dead air space.

Review the directions for ZMesh Interior Installation and use similar procedures.



IMPORTANT!
Record the number of feet of ZMesh Element that you have installed for each zone here:

3.5 ZMESH ELEMENT ROOF DEICING INSTALLATION

ZMesh Heating Element can be used for de-icing in valleys and on eaves as well as other trouble areas on roofs. The ZMesh must be covered with Ice and Water Shield (Part Number NI114) or EPDM (Part Number NI133). These products may also be used under the ZMesh element if desired. Great care must be taken to make sure that the element is shielded from moisture. Always install KwikWrap Drip Edge Protector (Heatizon Part # NI144) prior to installing the ZMesh on top of the drip edge.

Fasteners (screws, nails, etc.) must never penetrate simultaneously through the ZMesh element and any metal. Valley metal, metal drip edge, metal flashings or other electrically conductive or metal roofing material or their attachments must never be allowed to come into contact with ZMesh. Unlike Tuff Cable in a Heatsink Kit, ZMesh is not recommended for use under metal roofs, valley metal, metal drip edge, or metal flashing etc.

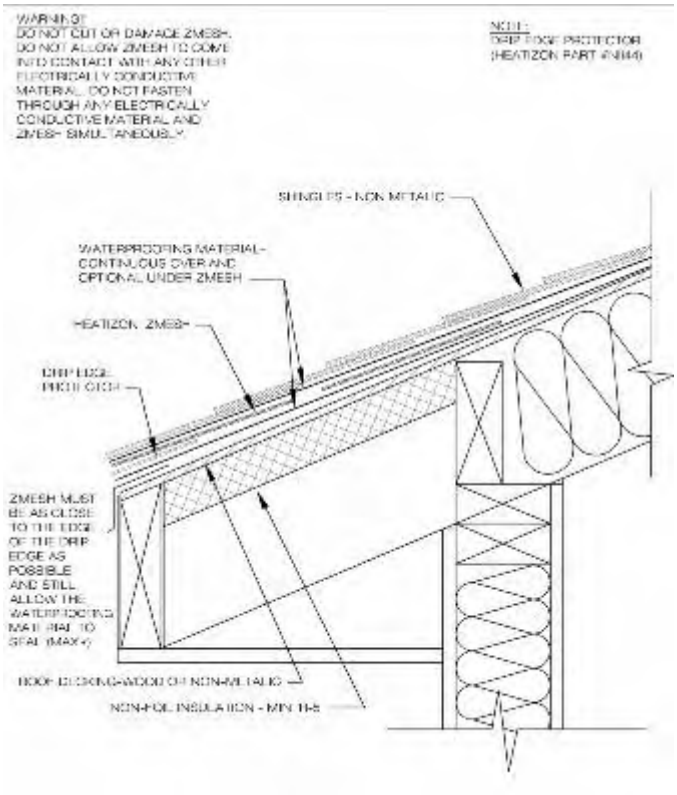
Review the directions for ZMesh Interior Installation and use similar procedures. Begin stapling the ZMesh to the sub-roof, pushing loose ZMesh ahead of you while pulling ZMesh tight and stapling it every approximately 18" on opposite sides and center. The first staple should be 12" away from the Transition Plate connector. “Bubbling up” of the ZMesh must be avoided. Staple folded areas around the outside edge of the fold.

IMPORTANT! ZMesh must be installed as close to the drip edge as possible in order to reduce the risk of icicle formation.

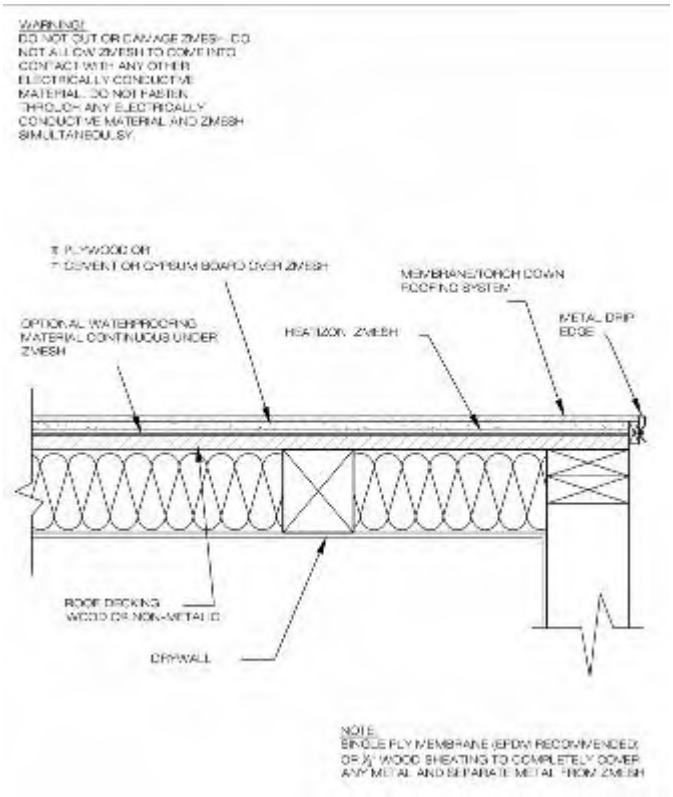
IMPORTANT! Always conduct a continuity check between ZMesh and any and all metal and ground before covering with Ice and Water Shield or EPDM.

IMPORTANT! A red plastic “STOP! DANGER!” sign indicating the presence of electric deicing, snow melting or warming equipment has been included with your Heatizon product packaging. This caution notice must be posted at the fuse or circuit breaker panel and be clearly visible.

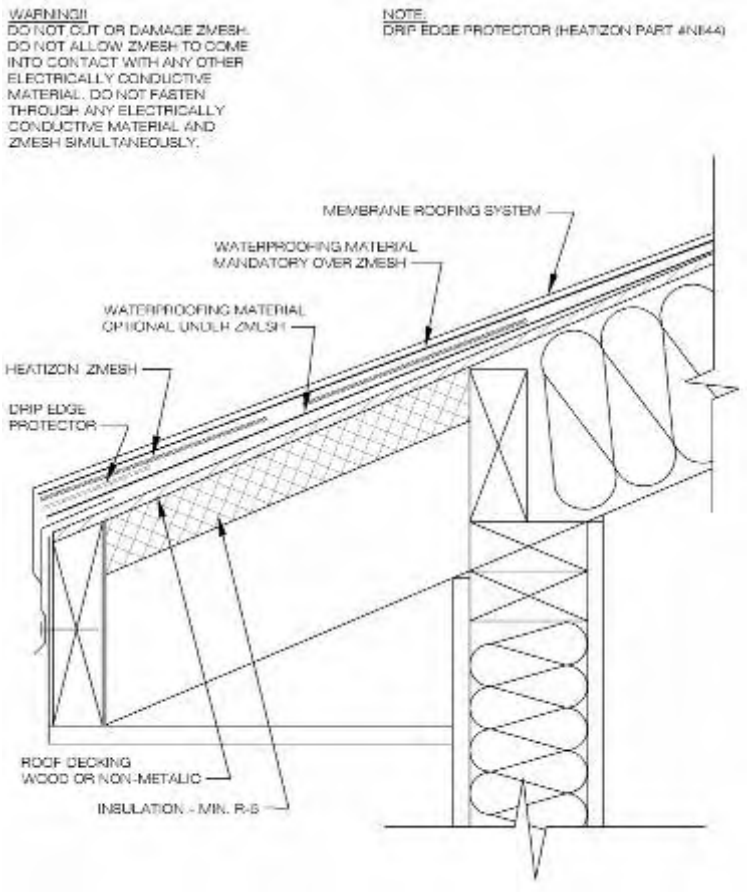
IMPORTANT! One or more “STOP! DANGER!” paper warning signs indicating the presence of electric deicing, snow melting or warming equipment have been included with your Heatizon product packaging. These notices must be attached to approximately every 50 feet of the ZMesh Heating Element. Remove the notices prior to installing the floor covering etc.



Eave Detail — ZMesh Under Asphalt Shingles



ZMesh Under Single Ply Membrane



Eave Detail — ZMesh Under Single Ply Membrane

CAUTION: Risk of fire will occur if ZMesh is cut and not repaired, or shorted to anything metal or electrically conductive. In order to reduce the risk, always use an Element Alarm (Part Number NI113) or amp meter with an alarm to check for continuity between the ZMesh and all metal or electrically conductive material, and never cut anything in areas whedre ZMesh is located. Read Customer Information regarding additional information and warnings for Heatizon Roof Deicing Systems. See Roof Warning Information Sheet in this Design and Installation Manual.

Note: Always conduct a Heating Element Test and complete the form "Heatizon Systems After Installation Element Test" immediately following the installation of the ZMesh . See Section 10, "Heatizon Systems After Installation Element Test."

IMPORTANT!
Record the number of feet of ZMesh Element that you have installed for each zone here:

HEATIZON SYSTEMS

ROOF INFORMATION

FOR ROOFING CONTRACTOR AND OTHER TRADES

The roofing contractor is responsible for insuring the Heating Element is not damaged during the installation of roofing materials.

Please communicate this information directly to anyone who will come into contact with the Heatizon Systems ZMesh or Tuff Cable heating element after it has been installed. Prior to beginning the installation of any Heatizon Systems product, read the applicable sections of the installation manual in their entirety. In order for Heatizon Systems installation instructions to be followed completely, **Heatizon Systems requires that a copy of this page be given to the Roofing Contractor**, and additional copies be stapled on top of the ZMesh and near the Tuff Cable immediately after its installation. The copies and staples should be removed prior to installing the roof covering.

A Heatizon roof deicing system has been installed on this project. Here are the steps you need to take to insure that the system is installed correctly and is not damaged:

Waterproof underlayment. A self-adhesive waterproof underlayment must be placed over Heatizon ZMesh and/or Heatizon Tuff Cable Heating Element in a Heatizon Heatsink Kit or in an Invizmelt Kit. If underlayment has not yet been installed over the Heatizon ZMesh and/or Heatizon Tuff Cable Heating Element, do not apply roofing material directly on top of the Heating Element. For membrane roofs, contact Heatizon Systems.

Electrically Conductive Materials. Heatizon ZMesh and Tuff Cable Heating Elements must not come in direct contact with any other electrically conductive materials on the roof structure or elsewhere. The roofing contractor is responsible for insuring the element is not cut, or damaged in any way and does not come into contact with any conductive material. If the Tuff Cable Heating Element is penetrated during installation of roofing materials, the damaged Tuff Cable must be immediately repaired with a Heatizon Tuff Cable Splice Kit (Part # CABSPLKIT).

- Drip edge, flashing or any other conductive material on the roof structure must not connect to or come in contact with ZMesh or Tuff Cable Heating Element.
- Screws, nails, attachments or any other connectors securing the conductive shingles, drip edge, flashing, valley metal, skylights, etc or any other conductive material must not penetrate, connect to, or come in contact with ZMesh or Tuff Cable Heating Element.
- Do not cut, fold, twist, or alter the installed ZMesh or Tuff Cable Heating Element.
- All metal used over, under and/or on the roof must be kept away from ZMesh, or must be completely electrically insulated from it.

Continuity Check. Immediately following installation, ZMesh or Tuff Cable Heating Element has been tested for continuity and correct readings have been recorded. The Roofing Contractor is responsible for any penetration, cutting or other damage done to the Tuff Cable Element. Tuff Cable Heating Elements should have a continuous continuity check performed during the installation of all conductive roofing materials. A Roof Alarm is available for rental or purchase from Heatizon Systems to assist the roofing contractor in performing this continuity check. The circuit must always be open. See Roof Alarm instructions for more detail.

After the Installation. Immediately following installation, the ZMesh or Tuff Cable Heating Element is to be visually inspected and electronically tested for continuity and the correct readings recorded in the Design and Installation Manual. The Roofing Contractor is responsible for any penetration, cutting, or other damage done to the ZMesh or Tuff Cable Heating Element.

Electrical Codes. The Cold Leads of the Heatizon Roof Deicing System is considered part of a listed snow melt/deicing system. However, local electrical codes may require Cold Leads to be run in conduit between the Control Unit and the heated section. Consult with a local electrical inspector or other relevant authority prior to installation.

Warnings. Heed all warnings in the Heatizon Systems Design and Installation Manual, the product packaging, and attached to or affixed to the product.

Installing the Transformer

Note: The length of the Tuff Cable or ZMesh and Cold Lead you received are compatible with the Transformer Heatizon Systems shipped. Prior to installing the Transformer, Heatizon Systems recommends that you make certain the Transformer you have is the proper size given the actual length of Cold Lead and either Tuff Cable or ZMesh heating element that you have installed. The sizing of the Transformer can be accomplished using either the System Operating Tables or formulas in the "Useful Information" section of this manual.

Note: The second "Heatizon Systems After Installation Element Test" must be performed immediately following the covering of the heating element. See the Heatizon Systems After Installation Test portion of the Installation Manual for details.

Note: Visually inspect the installed Heating Element and Cold Leads for cuts, shorts, and other damage; repair as necessary. Check for continuity to any conductive material, including but not limited to metal; eliminate as necessary. Conduct After-installation Element Tests per manufacturer's installation instructions. Test system in presence of Architect, Contractor and Owner's Representative, to be certain system functions in accordance with design intent.

Installation of Transformer

The Transformer is the powerhouse that allows Tuff Cable or ZMesh to produce up to 12 watts of heat per lineal foot.

All Single Transformers
S050 to S101

All single Heatizon Systems Transformers require one pair of Cold Leads (SLC 500 systems require one pair of Cold Leads for the beginning and ending points of the Tuff Cable or ZMesh heating element). One of the Cold Leads from any given pair connect to the common tap located at the back of the Transformer and the other Cold Lead connects to one of the voltage taps at the front of the transformer.

Installation Instructions for all Transformers

Note: Make certain power supply is off before proceeding with installation of Transformer and Control Unit.

Install Transformer Support Screws. Install two 1/4-20 x 3/4" slotted round head Transformer mounting screws provided in the hardware kit into the pemnuts attached to the upper right hand portion of the SLC500 Control Unit. DO NOT FULLY INSTALL TRANSFORMER SCREWS AT THIS TIME. Leave a gap between screw head and back of the SLC500 Control Unit large enough to accommodate the Transformer mounting bracket.

Hang Transformer. Slip the Transformer on to the support screws. Lower the Transformer until it rests on the screws. With the Transformer supported by the screws, tighten the two transformer support screws.

Prepare Cold Leads. Cut each Cold Lead to the proper length. One Cold Lead should be long enough to reach the common tap on the back of the Transformer, and the other should be able to reach all of the front voltage taps on the Transformer. Then, using appropriate strippers, strip 1/2” of insulation from each Cold Lead, and install provided crimp lugs with appropriate crimping tool.

Installation Instructions for all Transformers

Install Torroid Take the provided torroid and slide it around the Cold Lead connecting to the common tap. The other end of the torroid will slide through the opening in the Control Unit side plate, and eventually connect to the P3 terminal on the Mother Board.

Single Torroid

Make Cold Lead to Common Tap Connections. Make the connection between the common tap and Cold Lead using the provided 1/4" hex bolt, nut and lock washer. Tighten the connection securely.

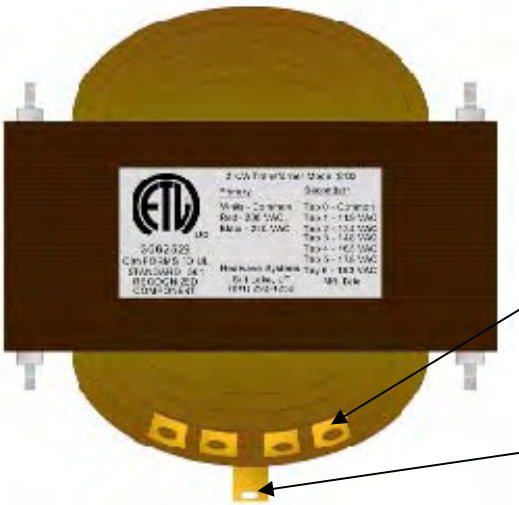
Make Cold Lead to Secondary Voltage Tap Connection.
In order to select which secondary voltage tap to connect Cold Lead to, refer to the System Operating Tables in the back of the Heatizon Design and Installation Manual. When the proper tap has been selected, attach the Cold Lead using the provided 1/4" hex bolt, nut and lock washer. Tighten the connection securely.

Make Transformer Primary Power Connection. Select proper Transformer primary power wires.

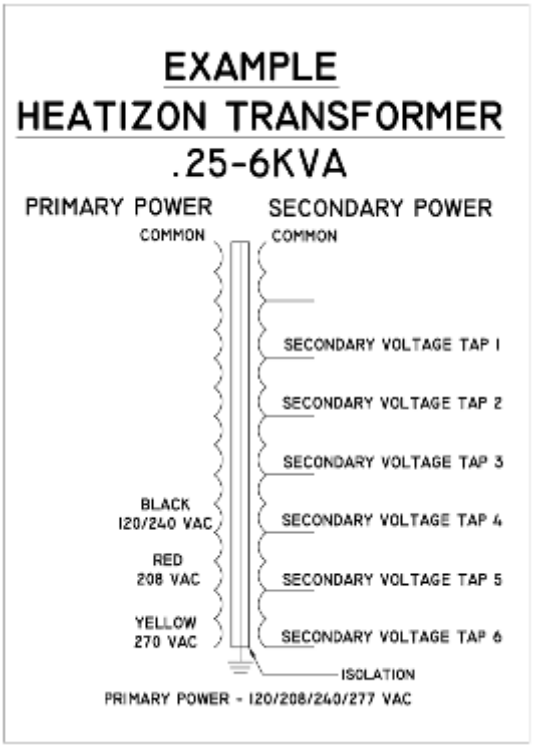
Note: Most Heatizon Transformers are designed to be powered by more than one primary input voltage. Run the selected wires through the top opening in the Control Unit board mount. Cap off all unused Transformers wires using one wire nut per wire.

Note: Refer to the diagram on the Transformer to connect primary wiring. Wiring configuration will change with Transformer size and supply voltage.

NOTE: In order to avoid Transformer damage, do not attach Cold Leads without using a lock washer and tightening the nut completely.



Single Sided Transformer



STEP 4 — Installation of the SLC500 Control Unit

- The Control Unit is the brains of the Heatizon System, and contains all of the system safeties and provides for a soft start to the Transformer. Make sure the primary power to the Control Unit is still off before proceeding with Control Unit Installation.

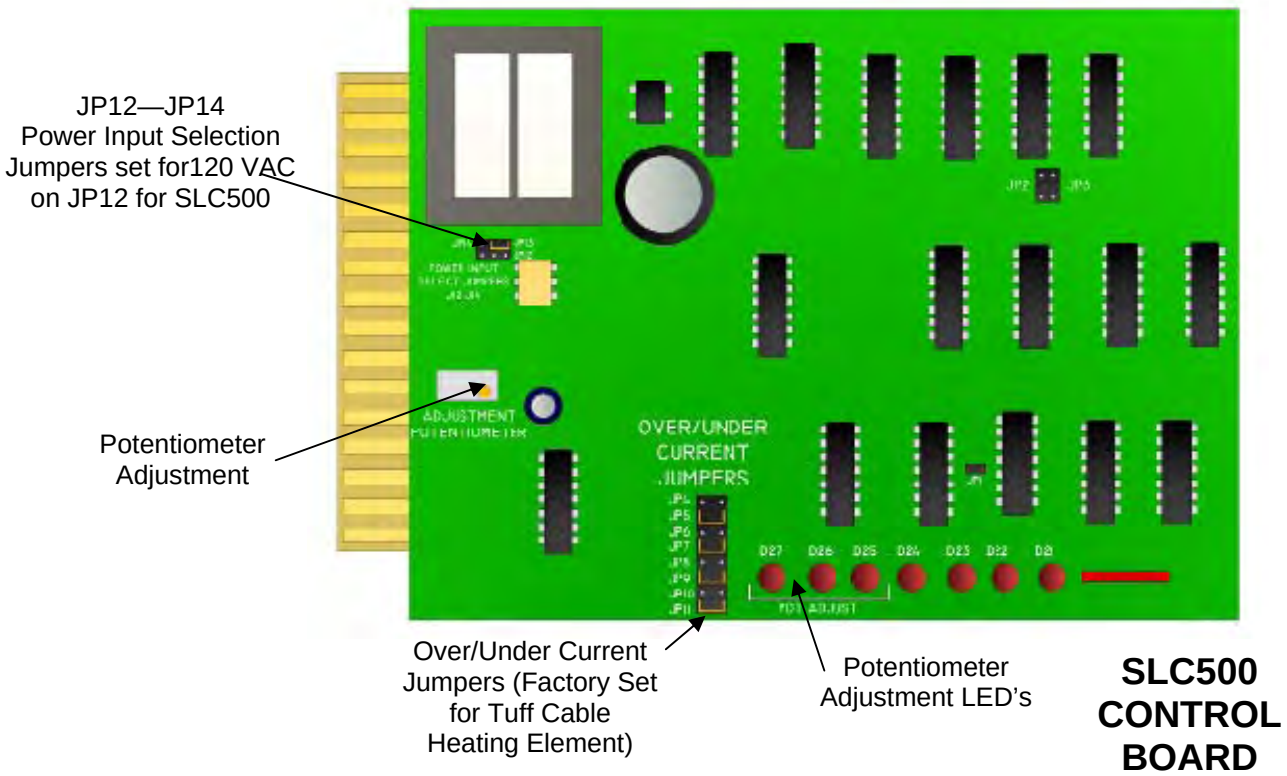
- **Locate Power Supply and Thermostat Wire**. Run the power supply conductor through the round hole or knock-out in the upper right side or back of the Control Unit. Strip the insulation form the power supply conductor and connect it to TB2 “Live Voltage In” Terminal. Run the Thermostat Wire through the round hole in the upper right back or center right side of the Control Unit. Strip the insulation from the green, white and red wires and connect them to the Green, white and red terminals of TB5 on the motherboard.

- Run the primary wires for the Transformer through the bushing in the divider plate, Connect into the TB1 terminal on the motherboard. It is not necessary to observe polarity when making this connection.

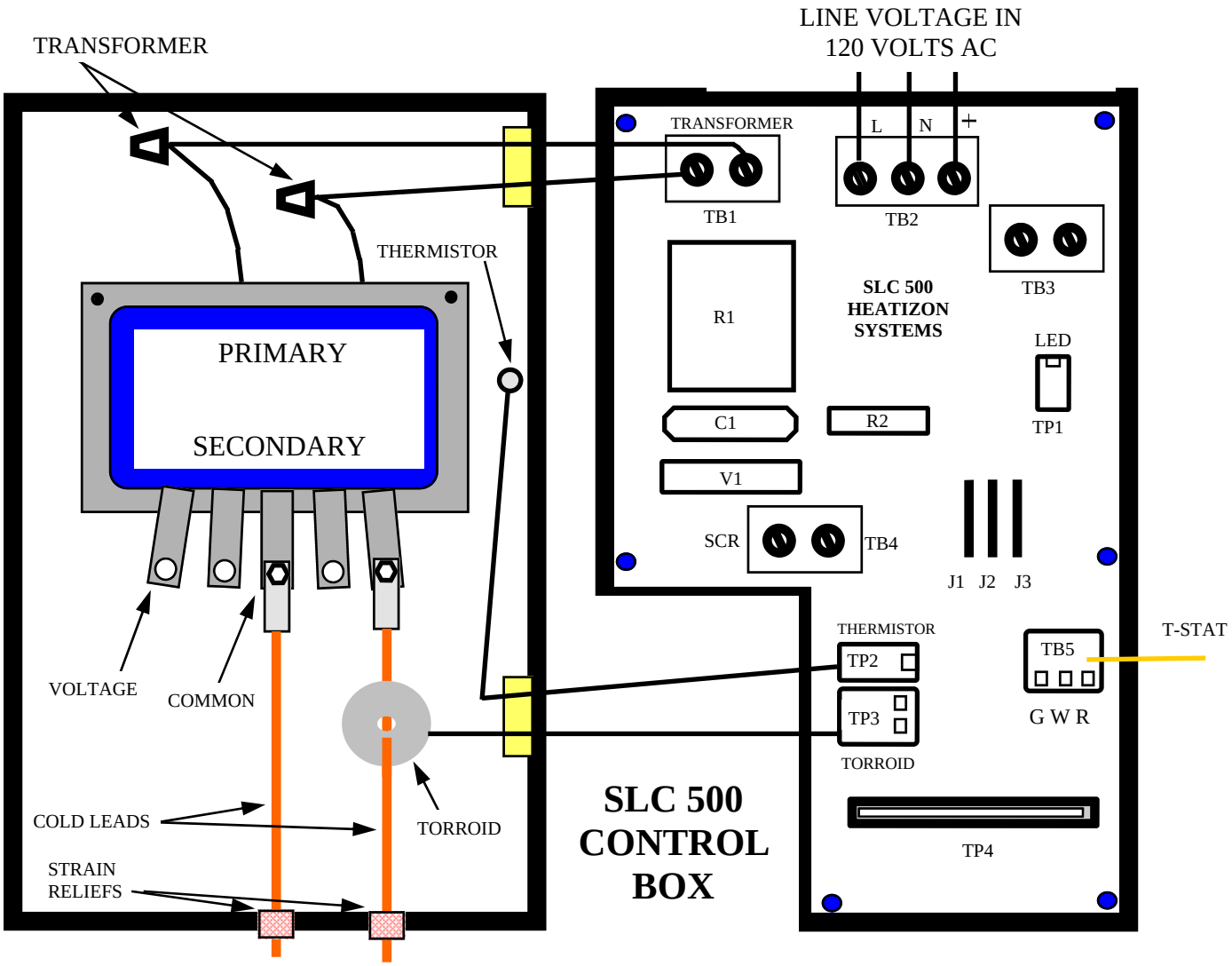
- **Connect Thermistor.** The Overtemp Sensor, also known as a thermistor, senses the Transformer operating temperature and will turn off the system if the temperature exceeds the Transformer’s rating. Connect the end of the thermistor to the TP2 terminal on the Mother Board and then pass the black bulb of the thermistor through the bushing in side of divider plate and into the Transformer cavity. Insert the black bulb of the thermistor into the space between the laminations and the belly of the Transformer.

- **Connect Torroid.** Pass the end of the torroid through the bottom opening in the divider plate and connect it to the TP3 terminal on the Mother Board.

- **Check all Connections.** Check all connections at this time for proper location and tightness. Check all wire nuts, and check all screws on the SCR; tighten as needed.



SLC500 Control Unit Mother Board



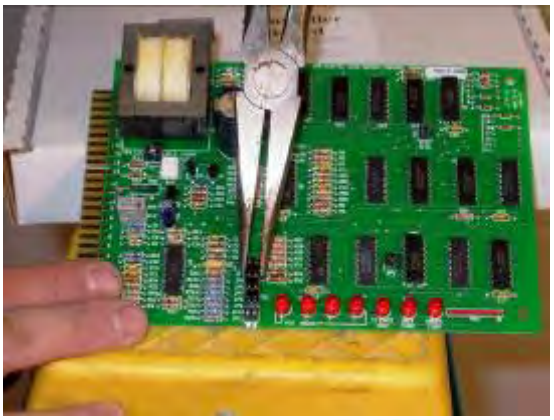
SET UP THE SLC500 CONTROL BOARD

• Set the JP12, JP13, and JP14 jumpers on the Control Board before installing Control Board into the Mother Board using the tables below. Refer to Input Voltage Select Table below for jumper locations on the Control Board.

• Verify that all jumpers are installed on the appropriate settings for your specific application before inserting Control Board into the Mother Board of the Control Unit.

• **Control Boards have been preset at the factory on the JP12 120V incoming power setting, and the JP5, JP7, JP9, and JP11 have been preset for Tuff Cable Heating Element or for ZMesh Heating Element when being used for snow melt and roof deicing applications.** If your application uses ZMesh Heating Element for interior applications, the jumpers will need to be repositioned to correspond to the following table:

• Verify that there is a jumper on JP1.

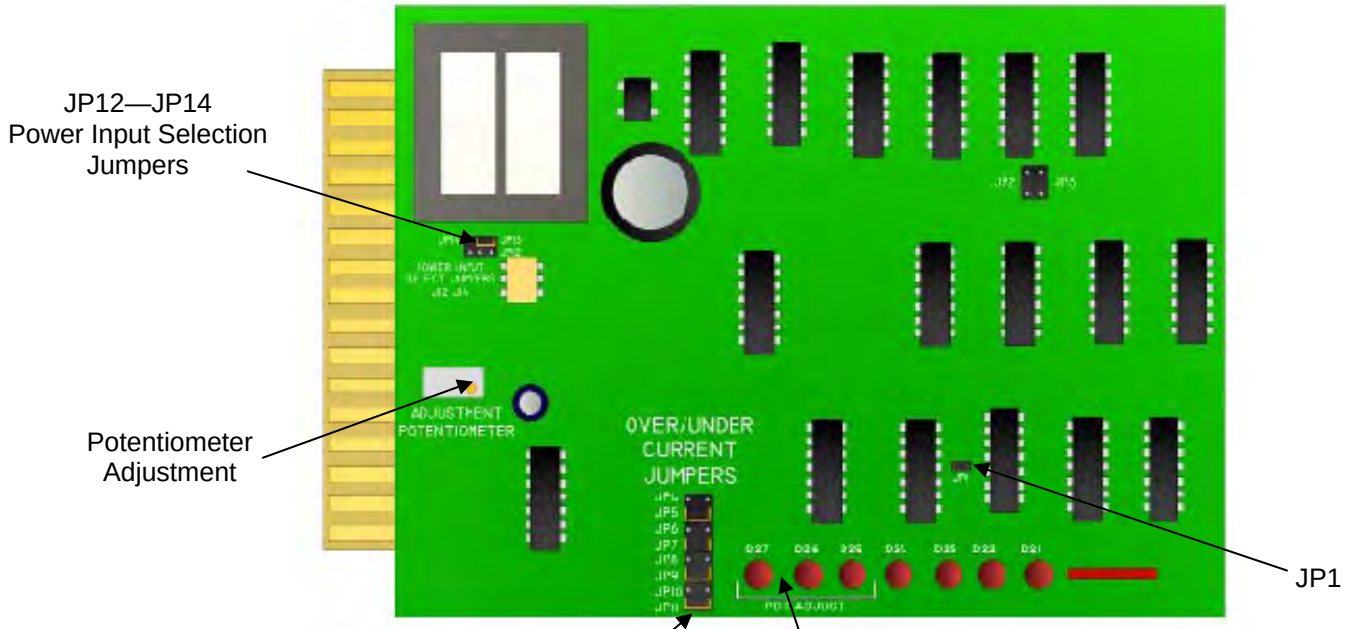


Over/Under Current Settings

ZMesh Interior	**(5%/10%)**	**JP4**	**JP6**	**JP8**	**JP10**
Tuff Cable	**(10%/20%)**	**JP5**	**JP7**	**JP9**	**JP11**
ZMesh Exterior	**(10%/20%)**	**JP5**	**JP7**	**JP9**	**JP11**

Input Voltage Select Table

120VAC	**JP12**



SLC500 CONTROL BOARD

INSTALL THE CONTROL BOARD

Make certain that the primary power to the Control Unit is off, and then insert the Control Board fully into the edge connector, making certain that the components on the Control Board are facing toward you.

STEP 5 — ACTIVATION DEVICE

Many different types of Heatizon Systems activation devices are currently available through Heatizon Systems' Distributors and dealers. Heatizon Systems offers activation devices that range from simple switches to temperature/moisture sensors and telephone or computer activators.

Power requirements for specific devices vary based upon the device selected. Some devices are battery operated or mechanical, and require no line power at all. Other activation devices operate on 120/240VAC line power, or on 24VAC delivered from Heatizon Part # M360.

Each activation device is shipped complete with customized wiring instructions for proper installation. To avoid damaging Heatizon products, make certain to use the Heatizon customized wiring instructions and schematics to connect the device to the Heatizon System. The wiring diagram is also available online at www.heatizon.com. Your activation device also includes operating and programming instructions, if applicable.

When energized, Heatizon Systems Control Units turn the primary power on and off to a step-down, low-voltage Transformer that provides power to the Heatizon Tuff Cable or ZMesh. If there is a problem, the primary power to the Control Unit must shut OFF.

Heatizon System's SLC500 Control Units employ "soft turn" circuits that turn the Transformer on without a high in-rush current from the power source. **The following safety circuits monitor the SLC Control Unit to contribute to safe operation:**

A. Shorting and Arcing: Monitors for loose connections between the Cold Leads and both the Transformer and the Tuff Cable or ZMesh heating element. In addition, this circuit monitors shorts and arcing on the Tuff Cable or ZMesh heating element.

B. Overtemp Sensors: Monitors the temperature of the Transformer; in the event of the Transformer overheating, it will shut off the Transformer until it cools down, then turn it back on.

C. Over current: If the secondary current is increased by more than 5% on ZMesh interior application systems and more than 10% on Tuff Cable systems and ZMesh snow melt and roof deicing applications, the Control Unit should shut off.

D. Under current: If the current decreases by more than 10% on ZMesh interior application systems, and 20% on Tuff Cable systems or ZMesh snowmelt and roof deicing applications, the Control Unit should shut off.

E. Automatic Check. The Control Unit automatically shut off every 30 minutes to check the power circuit for problems. If the Control Unit detects a power problems, it should shut off and keep it off.

F. SCR Failure. The SLC500 Control Unit has an SCR fault that opens a relay and turns the system off if the SCR fails, or if the activation device is off and the system attempts to stay on.

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STARTING UP A SLC500 SYSTEM

After all Heatizon System's components have been installed and electrical connections have been made the system is ready to energize and test.

The adjustment potentiometer on the Control Board for the high and low current fault circuits must be set for the exact length of Tuff Cable or Z Mesh heating element, the length of Cold Lead and the Transformer voltage.

Before proceeding, make certain that all shorts have been corrected and cleared, all damaged or cut heating element and/or Cold Lead has been appropriately repaired, and any and all joints have been crimped, soldered, and tightened where appropriate,

Step 1: Attach a Clamp on Amp Meter around one of the Cold Leads and set the amp meter for AC Amps with a range of at least 200 Amps. Turn on the circuit breaker and switch on the activation device. System will turn on and transformer will hum upon activation, this is normal.

Step 2: Using the Amp Meter verify that the system is running at less than 96 Amps. System will shut down in approximately 5 seconds, this will be long enough to get an Amperage reading from the system. The LEDs will indicate either under or over current prior to system shut down—this is normal. If the system is not running at the expected amperage, turn the circuit breaker and activation device off, and select a different transformer tap to achieve the proper operating amperage, and connect the Cold Lead to the newly selected tap. Repeat steps 1and 2 above until the system is operating at the amps expected given the length of heating element and Cold Lead connected to it.

Step 3: After readjusting the Transformer tap, switch the breaker and activation device on. System will run for another 5 seconds allowing you to re check the Amperage measurement. Repeat this procedure until the proper operating Amperage is achieved. After the proper operating Amperage has been achieved, refer to the System Operating Tables in this Design and Installation Manual to see if Amper-

WARNING: If the proper operating amps cannot be achieved, this could indicate a fault in the installation of the heating element or other problem with the system. Consult your Heatizon dealer or Heatizon Systems for further assistance.

Step 4: Once the proper amperage readings have been verified you may adjust the Control Board adjustment potentiometer.

Set the activation device to the **OFF** position (no call for heat).

Switch the panel circuit breaker that feeds Control Unit to the **ON** position.

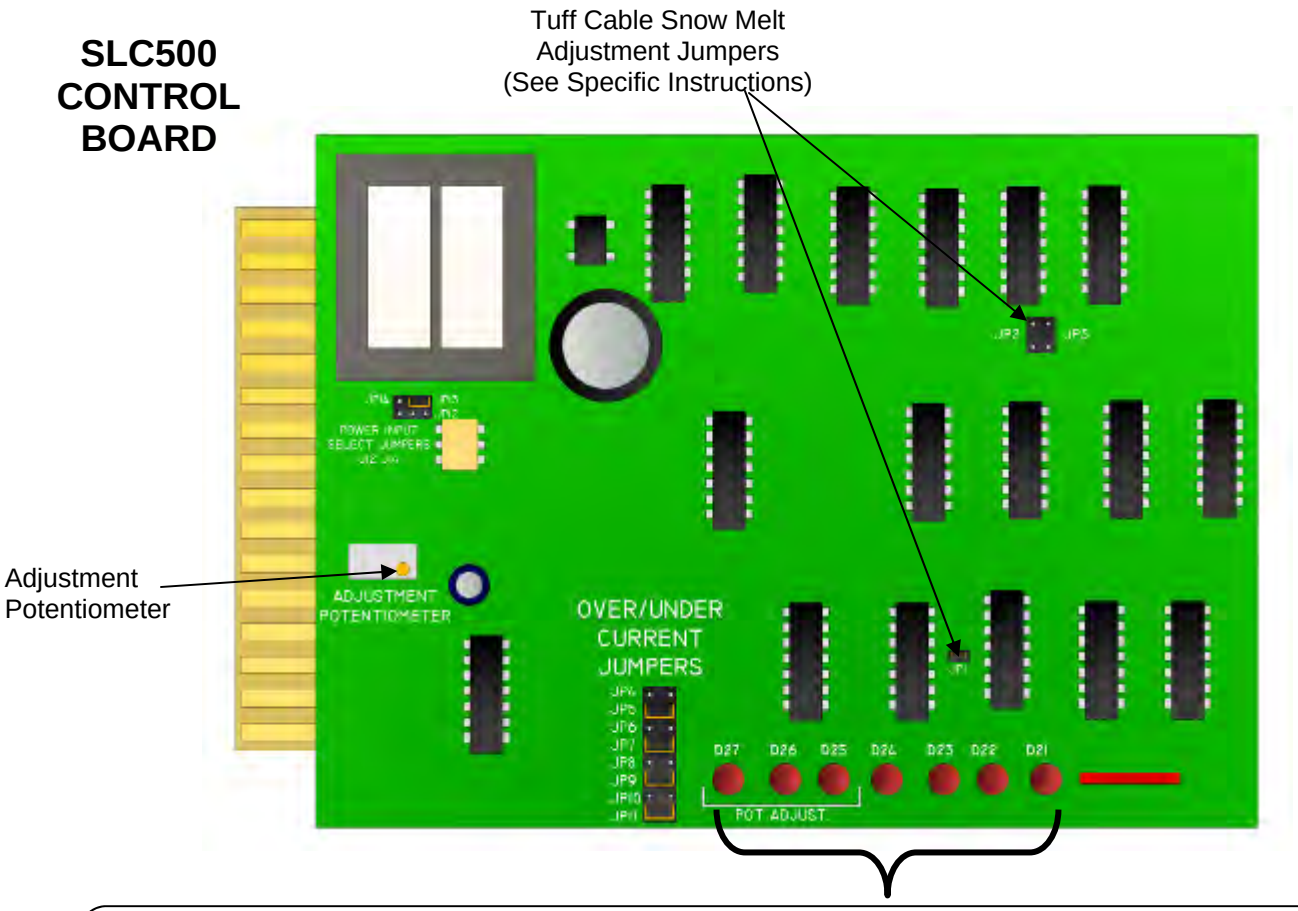
Switch the breaker in the front of the Control Unit to the **ON** position.

LED's D24 and D25 should be illuminated; this indicates line power is on with no call for heat.

NOTE: The Control Unit will not stay running until the Control Board is properly adjusted. Adjustment of the potentiometer must be done with the system turned on and calling for heat. The Control Unit will operate for approximately 5 seconds if not properly adjusted. When the Control Unit shuts down, it may be reset by switching the activation device and the Control Unit switch circuit breaker off and then on, then the adjustment procedure can resume.

Step 5: Follow the correct procedure for each specific application as described in the next few pages. There are a few additional adjustments and instructions that are unique to each application. Please locate the appropriate section for the type of system which has been installed. Refer to the Control Board diagram below to locate the adjustment potentiometer, jumpers, and LED indicators.

SLC500 CONTROL BOARD



NOTE: LED's are designated as D21 through D27 (under current indication is D21, D23 is Trasformer Overtemp, D24 indicates the activator is not calling for heat and D25-D27 indicate proper potentiometer adjustment). Also a status indicator is located on the front cover door of the SLC500 Control Unit. This indicator mimics the function of the status indicator LED on the activation device.

SLC500 POTENTIOMETER AND JUMPER ADJUSTMENTS FOR SPECIFIC APPLICATIONS:

5A. TUFF CABLE RETROFITS IN ASPHALT OR CONCRETE:

When doing a start-up for Tuff Cable Retrofit Systems in existing asphalt or concrete, move Jumper JP1 to JP3 on the Control Board. Movement of Jumper JP1 to JP3 will cause the Control Unit to operate for approximately 120 seconds when not properly adjusted, rather than 5 seconds, to allow a longer delay before the system shuts down.

If D24 and/or D25 are on when the system is activated, turn adjustment potentiometer counter-clockwise until only D26 is lit. If LED D27 and/or D26 come on when system is activated, turn adjustment potentiometer clockwise until only D26 is lit. Let Control Unit run approximately 30 minutes for a Tuff Cable Retrofit System. After 30 minutes, the cable has warmed up and the current lowers, LED 27 should go off if the system is properly adjusted. If LED's D25 and/or D26 are lit, the Control Unit is adjusted correctly, otherwise, perform a FINAL adjustment to the potentiometer while the Tuff Cable heating element is warm. If the Control Board cannot be adjusted correctly after several attempts, turn the power off and refer to the troubleshooting section of the install manual.

5B. INTERIOR ZMESH SYSTEMS AND INTERIOR TUFF CABLE SYSTEMS

If LED's D27 and/or D26 come on when system is activated, turn adjustment potentiometer clockwise until D25 and D26 are equally lit. If D24 and D25 are lit turn the potentiometer counter clockwise until D25 and D26 are equally lit.

With the initial adjustment made let the Control Unit run for approximately 10 minutes then perform a final adjustment to the potentiometer while the heating element is warm. If the Control board cannot be adjusted correctly after several attempts, turn the power off and refer to the troubleshooting sections of the Heatizon installation manual.

NOTE: On cold startup of all systems, the system will be slightly out of adjustment and will drift into its proper adjustment as it reaches operating temperature. Amperage will lower slightly during this warm up period; this is a normal function of the system.

5C. ZMESH SNOW MELT AND ROOF DEICING SYSTEMS

The temperature rise of ZMesh is less than that of Tuff Cable, primarily because of the area of the ZMesh verses the area of the Tuff Cable. As a result, while the concept is the same as with Tuff Cable, the solution is different. When installing ZMesh on a roof deicing or snow melting project the final adjustment of the potentiometer many need to be performed when the ambient temperature closely approximates the ambient temperature that will exist when the system will be energized and operating (at a temperature lower than the freezing point of 32° F and preferably when snow is on the roof, deck or other surface to be deiced or snow melted).

It is possible to compensate for the difference between the ambient temperature at the time of installation and the ambient temperature expected at the time of operation be setting the secondary amperage down by one (1) amp for each ten (10) degrees F of expected ambient temperature decrease. For example: If the ambient temperature at the time of installation is 90° F and 30° F is the ambient temperature expected at the time of operation then the amps would be set 6 amps lower than the amps desired at the expected ambient operating temperature.

5D. TUFF CABLE SNOW MELT AND ROOF DEICING SYSTEMS INSTALLED DURING THE SUMMER MONTHS.

Once all shorts have been corrected and cleared, all damaged or cut Tuff Cable and/or Cold Lead has been appropriately repaired, and any and all joints have been crimped, soldered, and tightened where appropriate, the following steps must be taken:

a) Move the black jumper currently on the pins marked JP1 to the pins marked JP3 in order to change the time out period from approximately 5 seconds to approximately 120 seconds.

b) Use the following formula to calculate the appropriate amperage setting needed to compensate for the difference between the temperature of the surface into which the Tuff Cable is embedded at the time of installation and the anticipated temperature at the time of operation.

Note: In all of our examples, we use 30° F as the anticipated temperature at the time of operation for snow melting and roof deicing projects. You may choose to use a different anticipated temperature degree number in the formulas below.

OPA= Desired Operating Amps at 30°F
TA= Target Amps to set for at the surface temperature
ST= Surface Temperature of the project at the time of installation
30°F= Desired or anticipated operating temperature
NT= Number of Turns on the potentiometer to compensate for the change in amps due to temperature
STA= Surface Temperature Amps or the secondary recorded at the time of installation

OPA – (ST – 30) / 3.5 = TA

c) Energize the Control Unit by turning the input power on.

d) Set the Activator so that it is calling for the Control Unit to power the Tuff Cable hearting element.

e) Check the output amps on the secondary side of the Transformer.

f) Set the secondary amps by changing the power tap to which the Cold Lead is connected until the amps equal the value of STA calculated in the above formula.

g) Next use the following formula to determine the number of clockwise turns that must be made to the potentiometer in order to tune the Control Unit in for operation at the desired or anticipated operating temperature.

(OPA – STA) / 6 = NT

h) Adjust the potentiometer of the Control unit for the desired or anticipated operating temperature by turning the potentiometer clockwise the number of times calculated in the above formula.

Note: After the potentiometer of the Control Unit has been adjusted for the desired or anticipated operating temperature the system will probably turn off with an undercurrent indication (LED's Number 24 and Number 25 lit). Once this happens the system is tuned in and should operate at the desired or anticipated operating temperature.

WARNING: ONCE THE CORRECT FINAL ADJUSTMENT OF THE POTENTIOMETER HAS BEEN MADE, THE POTENTIOMETER SHOULD NEVER NEED RE-ADJUSTMENT.

WARNING: NEVER READJUST THE POTENTIOMETER FOR ANY HEATIZON SYSTEM PRODUCT WITHOUT FIRST CHECKING THE OUTPUT SECONDARY CURRENT AND VERIFYING THAT IT IS THE SAME AS IT WHAS WHEN THE SYSTEM WAS INITIALLY SET UP AND ENERGIZED. IN THE EVENT THE OUTPUT SECONDARY CURRENT IS EVER DIFFERENT THAN IT WAS WHEN THE POTENTIOMETER WAS SET AND THAT DIFFERENCE CANNOT BE EXPLAINED BY EITHER A COORESPONDING CHANGE IN THE PRIMARY INPUT POWER OR A CHANGE IN THE AMBIENT TEMPERATURE, A PROBLEM EXISTS AND ALL POWER TO THE SYSTEM SHOULD BE TURNED OFF UNTIL THE PROBLEM IS IDENTIFIED AND CORRECTED.

WARNING: Danger of shock, extreme care should be used to position Transformer taps so that they are clear of the cover or other taps on the transformer. Carefully bend copper taps as needed to ensure proper clearance on both used and unused taps.

Step 6: Visually inspect the Heating Element and Cold Leads for cuts, shorts, and other damage; repair as necessary. Check for continuity to any conductive material, including but not limited to metal; eliminate as necessary. Record system information in the spaces provided on the on the Control Unit front cover. Also fill out the third Heatizon Systems *"After Installation Element Test"* form found in the Heatizon Systems After Installation element test section of the manual. Test system in presence of Architect, Contractor and Owner's Representative, to be certain system functions in accordance with design intent.

Step 7: After the system has been properly adjusted and is running normally, the cover door is secured using the two provided screws. Make sure to turn the system power off first, to reduce the risk of electrical shock, anytime the cover door is open.

Step 8: Energize and activate the system using the selected activation device. System should operate normally. If not refer to trouble shooting section of the Heatizon Design and Installation manual. Check status indicator on front of the SLC500 Control Unit or activation device for solid red condition. If status LED indicates other than solid red, refer to the trouble shooting section of this manual.

Step 9: Air flow around the Control Unit and transformer is critical and must be maintained. If the transformer overheats the Control Unit will shut the system down until the transformer cools.

Step 10: The owner of the system should be given a copy of the Owner's Manual and the warranty card to be completed and returned to Heatizon Systems upon completion of the installation.

Cold Lead to Cold Lead

Step 1: Strip wires. The Cold Lead splice is made using a Heatizon E211 butt splice connector. This connection is accomplished by stripping back the insulation on both Cold lead wires to be spliced one inch.

Step 2: Crimp connection. Slide the heat shrink tubing and sleeve over one Cold Lead to a point at least 8" beyond the splice. Insert the Cold Leads into the E211 butt splice connector. Crimp the connection in two locations on each side of the lug.

Step 3: Solder connection. Solder all exposed copper strands of Cold Lead with the solder provided. Make certain that heat is sufficient to draw solder completely into the splice. Never scorch the insulator on the Cold Lead.

Step 4: Heat shrink connection. When the splice has completely cooled slide the heat shrink and center it over the splice. Use a broad soft flame torch or hot air gun to heat around the diameter of the tube to warm and shrink it. Do not scorch the tube. The shrink is complete when adhesive oozes from between the tube and the Cold Lead.

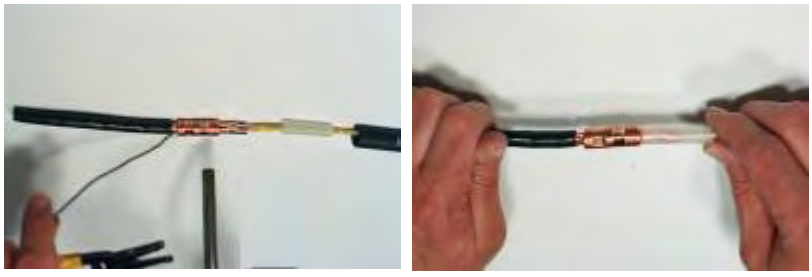
Tuff Cable to Cold Lead using E210BS

For each connection from Tuff Cable to Cold Lead, you have been provided the following items in your Tuff Cable Heating Element Kit: E210BS Butt Splice, plastic sleeve and a heat shrink length. You will also need wire strippers, a crimping tool, and a broad soft flame torch or hot air gun.

Step 1: Strip wires. The Tuff Cable element is connected to the Cold Lead with the Heatizon E210BS butt splice connector. This connection is accomplished by stripping back the insulation on the Tuff Cable and Cold Lead wires to be spliced seven eights of an inch.

Step 2: Crimp connection. Slide the heat shrink tubing and sleeve over the Tuff Cable to a point at least 8" beyond the splice. Insert the Tuff Cable and the Cold Lead into the E210BS butt splice connector. Crimp the connection in two locations on each side of the lug.

Step 3: Solder connection. Solder all exposed copper strands of Tuff Cable and Cold Lead with the solder provided. Make certain that heat is sufficient to draw solder completely into the splice. Never heat the small end of the E210BS butt splice or scorch the insulator on the Tuff Cable or Cold Lead. While connection is cooling carefully slide the sleeve over Tuff Cable end of the E210BS butt splice.

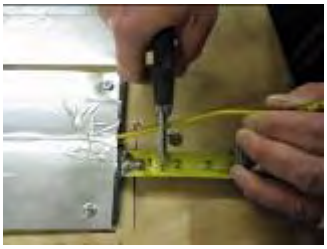


Step 4: Heat shrink connection. When the splice has completely cooled slide the heat shrink and center it over the splice. Use a broad soft flame torch or hot air gun to heat around the diameter of the tube to warm and shrink it. Do not scorch the tube. The shrink is complete when adhesive oozes from between the tube and the Tuff Cable and Cold Lead.

Invizimelt — Tuff Cable to Cold Lead using E210BS90

For each connection from Tuff Cable to Cold Lead, you have been provided the following items in your Invizimelt Panel Kit or Invizimelt Origination Kit: 2-E210BS90 Butt Splice, 2-Heat Shrink, and 2-self adhesive protector. You will need wire strippers, a crimping tool, and a broad soft flame torch or hot air gun.

Step 1: Cut Tuff Cable. Cut the Tuff Cable element 2" beyond the end of the last Invizimelt Panel.



Step 2: Strip wires. The Tuff Cable element is connected to the Cold Lead with the Heatizon E210BS90 butt splice connector. This connection is accomplished by stripping back 7/8" of the insulation on the Tuff Cable and Cold Lead wires to be spliced .

Step 3: Crimp Cold Lead and Tuff Cable connection. Insert the Cold Lead into the E210BS90 butt splice connector. Crimp the connection in two locations on each side of the lug.

Slide the heat shrink tubing over the Tuff Cable with the sliced end of the heat shrink towards the stripped end of the Tuff Cable. Insert the Tuff Cable into the E210BS butt splice connector. Crimp the connection in two locations on each side of the lug.

Step 4: Solder Tuff Cable connection. Solder all exposed copper strands of Cold Lead and Tuff Cable with the solder provided. Make certain that heat is sufficient to draw solder completely into the splice. Never heat the small end of the E210BS butt splice or scorch the insulator on the Tuff Cable or Cold Lead.

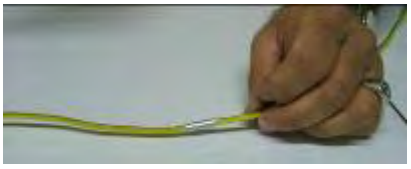
Step 5: Heat shrink connection. When the splice has completely cooled slide the heat shrink over the splice so that the sliced end of the heatshrink extends beyond the 90 degree bend in the butt splice. Use a broad soft flame torch or hot air gun to heat around the diameter of the tube to warm and shrink it. Do not scorch the tube. The shrink is complete when adhesive oozes from between the tube and the Tuff Cable.

Follow origination plate installation instructions in "Tuff Cable in Invizimelt" section of the manual.

Tuff Cable to Tuff Cable Splice

Step 1: Strip connection. Tuff Cable splicing is accomplished by sliding the provided heat shrink at least 8" beyond the splice and then stripping back one inch (1") of insulation on the end of both wires to be spliced.

Step 2: Crimp connection. Insert stripped wires from one end of the Tuff Cable into number 10 butt splice connector provided in splice kit and crimp the connection well. Repeat this procedure for the other end of the Tuff Cable.



Step 3: Solder connection. Solder the splice with provided solder being careful not to burn the insulation on the wire.

Step 4: Heat shrink connection. When the splice cools slide and center the heat shrink over the butt splice. Warm the diameter of the heat shrink until adhesive oozes from between the Tuff Cable and the Heat shrink.

Step 5. Secure the repaired Tuff Cable in place.

Always use a Tuff Cable Splice Kit whenever the Tuff Cable has been cut or damaged in any way. A Cable Repair Kit (CABREPKIT) should be used whenever repairing Tuff Cable in existing concrete or asphalt.

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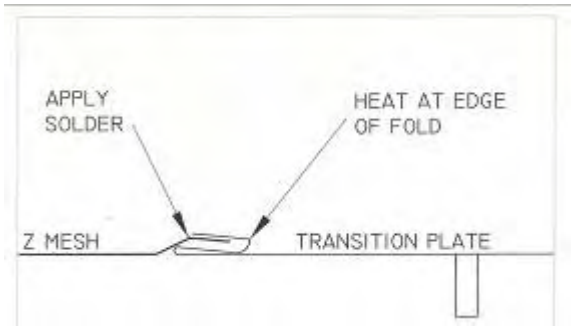
ZMesh to Cold Lead and Transition Plate



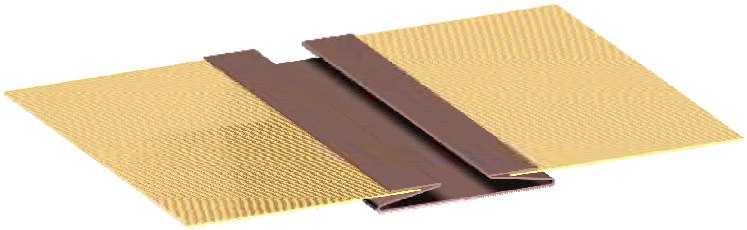
Step 1: Connect Cold Lead to Transition Plate. Connect the transition plate to Cold Lead by stripping back 1 inch of insulation from the Cold Lead. Insert the exposed Cold Lead into the butt splice connector on transition plate and crimp twice.

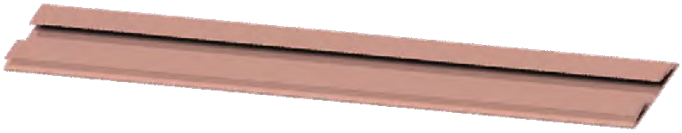
Step 2: Solder Cold Lead Connection. Solder all exposed copper strands of Cold Lead with provided solder, heating the butt splice sufficient to draw solder back into the splice.

Step 3: Install ZMesh in Transition plate fold. If necessary cut the ZMesh so that it can extend the full depth of the fold on the transition plate. The ZMesh can easily be cut using scissors. Place the ZMesh in the fold of the plate and hammer down the fold as flat as possible using a length of 2 by 4 or a hammer. Caution should be used when hammering the fold to avoid hitting ZMesh on the tip of the transition plate.

Step 4: Solder ZMesh connection. Apply heat to the Transition plate only and never to the ZMesh. Be extremely careful not to burn holes in the ZMesh. Apply the provided solder to the ZMesh. The solder will be drawn back into the fold and create a permanent bond between the Z Mesh and the Transition plate.

ZMesh to ZMesh with Z-Splice Plate

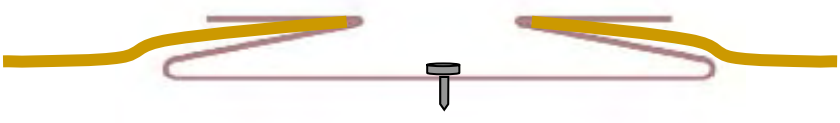




Step 1: Cut both runs of ZMesh to be spliced, leaving the cut straight and flat. Remove any loose strands. Insert first section of ZMesh into one side of the Z splice plate. Gently crimp or compress Z fold; ensure that ZMesh stays fully inserted in the fold. Repeat this procedure with second length of ZMesh.

Step 2: Flatten the connection by crimping or compressing the splice plate down on top of both pieces of ZMesh using a short length of 2x4 stud or by tapping gently with a hammer or rubber mallet.

Step 3: Solder Splice connection. Apply heat to the splice plate using a propane torch. Place the tip of the solder ahead of the flame until solder flows into the fold. The entire length of the connection between Z Mesh element and Transition Plate must be soldered. Be careful not to scorch or burn holes in the Z Mesh or to ignite or damage the subsurface.



HEATIZON SYSTEMS

SYSTEM OPERATING TABLES AND OTHER USEFUL INFORMATION

The following tables list Transformer sizes and the amperage/wattage values that they will operate at using varying lengths of Tuff Cable or ZMesh element. These tables may be used as a general guide in selecting the proper voltage tap for use with the specific length of heating element that your particular installation requires. It is important to note that the System Operating Tables DO NOT include any resistance for Cold Leads. As a result, it is recommended by Heatizon Systems that the helpful formulas (on the "Useful Information" page) be used to more accurately estimate the total resistance you have, the Transformer tap you should use, and the amperage and watts you will experience.

NOTE: YOUR HEATIZON SYSTEM MAY BE PRE-DESIGNED BY HEATIZON OR ONE OF ITS DEALERS TO MATCH YOUR HEATING REQUIREMENTS WITH THE PROPER LENGTH OF ELEMENT & TRANSFORMER SIZE / VOLTAGE. PROPER DESIGN OF THE SYSTEM BEFORE INSTALLATION WILL GREATLY REDUCE THE NEED FOR MODIFICATIONS OF SYSTEM COMPONENTS. CONTACT HEATIZON SYSTEMS OR ONE OF ITS DEALERS FOR ADDITIONAL INFORMATION.

NOTE: THE LENGTH OF THE COLD LEAD MAY DECREASE THE LENGTH OF THE ZMESH OR TUFF CABLE THAT IS ACCEPTABLE TO USE.

NOTE: THE LENGTH OF THE COLD LEAD HAS A MORE SIGNIFICANT IMPACT ON SMALLER SIZED TRANSFORMERS.

HEATIZON SYSTEMS

SYSTEM OPERATING TABLES

12" ZMesh

Length of Element: 50 Feet or Less
(SCRKIT50)

Transformer Size	Tap	Tap Voltage	15 feet		20 feet		25 feet		30 feet		33 feet		36 feet		39 feet		42 feet		45 feet		48 feet	
			Amps	Watts	Amps	Watts	Amps	Watts	Amps	Watts	Amps	Watts	Amps	Watts	Amps	Watts	Amps	Watts	Amps	Watts	Amps	Watts
.25kVA	1	1.68	89	10	67	6																
.25kVA	2	2.51					80	8	66	6												
.50kVA	1	3.40							90	10	82	8	75	7	69	6	64	5	60	5		
.50kVA	2	4.10											90	10	83	9	77	7	72	7	68	6
.50kVA	3	5.00															94	11	88	10	83	9

Length of Element: 55 to 100 Feet
(SCRKIT75 or SCRKIT100)

Transformer Size	Tap	Tap Voltage	55 feet		60 feet		65 feet		70 feet		75 feet		80 feet		85 feet		90 feet		95 feet		100 feet	
			Amps	Watts	Amps	Watts	Amps	Watts	Amps	Watts	Amps	Watts	Amps	Watts	Amps	Watts	Amps	Watts	Amps	Watts	Amps	Watts
.50kVA	3	5.00	72	7	66	6	61	5														
1kVA	1	6.60	95	11	87	10	80	8	75	7	70	6	65	5	62	5						
1kVA	2	7.70					94	11	87	10	81	8	76	7	72	7	68	6	64	5	61	5
1kVA	3	8.80									93	11	87	10	82	8	77	8	73	7	70	6
1kVA	4	10.00													93	11	88	10	83	9	79	8

Length of Element: 110 to 200 Feet
(SCRKIT150 or SCRKIT200)

Transformer Size	Tap	Tap Voltage	110 feet		120 feet		130 feet		140 feet		150 feet		160 feet		170 feet		180 feet		190 feet		200 feet	
			Amps	Watts	Amps	Watts	Amps	Watts	Amps	Watts	Amps	Watts	Amps	Watts	Amps	Watts	Amps	Watts	Amps	Watts	Amps	Watts
1kVA	4	10.00	75	7	71	6	66	5														

Note: Wattage values are given in watts per linear foot of element.
To calculate watts per square foot, multiply watts per linear foot by the following factors:
2" spacing x .857; 4" spacing x .750; 6" spacing x .666

Wattage on these System Operating Tables are calculated using 0 feet of Cold Lead and 120 or 240 VAC.
Please use formulas in “Useful Information” section to determine exact wattage.

HEATIZON SYSTEMS

SYSTEM OPERATING TABLES

9" ZMesh

Length of Element: 15 to 60 Feet
(SCRKIT50-9, SCRKIT 100-9)

Transformer Size	Tap	Tap Voltage	15 feet		20 feet		25 feet		30 feet		35 feet		40 feet		45 feet		50 feet		55 feet		60 feet	
			Amps	Watts	Amps	Watts	Amps	Watts	Amps	Watts	Amps	Watts	Amps	Watts	Amps	Watts	Amps	Watts	Amps	Watts	Amps	Watts
.25kVA	1	1.68	82	9	61	5																
.25kVA	2	2.51			92	12	79	7	61	5												
.50kVA	1	3.40							83	9	71	7	62	5								
.50kVA	2	4.10									86	10	75	8	67	6	60	5				
.50kVA	3	5.00											91	11	81	9	73	7	66	6	61	5
1kVA	1	6.60																	88	11	80	9
1kVA	2	7.70																			94	12

Length of Element: 65 to 100 Feet
(SCRKIT100-9, SCRKIT 250-9)

Transformer Size	Tap	Tap Voltage	65 feet		70 feet		75 feet		80 feet		85 feet		90 feet		95 feet		100 feet		105 feet		110 feet	
			Amps	Watts	Amps	Watts	Amps	Watts	Amps	Watts	Amps	Watts	Amps	Watts	Amps	Watts	Amps	Watts	Amps	Watts	Amps	Watts
1kVA	1	6.60	74	8	69	7	64	6	60	5												
1kVA	2	7.70	87	10	80	9	75	8	70	7	66	6	63	5	59	5						
1kVA	3	8.80			92	12	86	10	80	9	76	8	72	7	68	6	64	6	61	6	58	5
1kVA	4	10.00							91	11	86	10	81	9	77	8	73	7	70	7	66	6

Length of Element: 120 to 210 Feet
(SCRKIT250-9)

Transformer Size	Tap	Tap Voltage	120 feet		130 feet		140 feet		150 feet		160 feet		170 feet		180 feet		190 feet		200 feet		210 feet	
			Amps	Watts	Amps	Watts	Amps	Watts	Amps	Watts	Amps	Watts	Amps	Watts	Amps	Watts	Amps	Watts	Amps	Watts	Amps	Watts
1kVA	4	10.00	60	5																		

Note: Wattage values are given in watts per linear foot of element. To calculate watts per square foot, multiply watts per linear foot by the following factors: 2" spacing x 1.09; 4" spacing x .923; 6" spacing x .800

Wattage on these System Operating Tables are calculated using 0 feet of Cold Lead and 120 or 240 VAC. Please use formulas in “Useful Information” section to determine exact wattage.

HEATIZON SYSTEMS

SYSTEM OPERATING TABLES

Tuff Cable

Length of Element: 15 to 60 Feet
(CABKIT100)

Transformer Size	Tap	Tap Voltage	15 feet		20 feet		25 feet		30 feet		35 feet		40 feet		45 feet		50 feet		55 feet		60 feet	
			Amps	Watts	Amps	Watts	Amps	Watts	Amps	Watts	Amps	Watts	Amps	Watts	Amps	Watts	Amps	Watts	Amps	Watts	Amps	Watts
.25kVA	1	1.68	95	11	71	6	57	4	47	3												
.25kVA	2	2.51					85	9	71	6	61	4	53	3	47	3	43	2				
.50kVA	1	3.40							96	11	82	8	72	6	64	5	58	4	52	3	48	3
.50kVA	2	4.10											87	9	77	7	69	6	63	5	58	4
.50kVA	3	5.00													94	10	85	8	77	7	71	6

Length of Element: 65 to 110 Feet
(CABKIT100, CABKIT200)

Transformer Size	Tap	Tap Voltage	65 feet		70 feet		75 feet		80 feet		85 feet		90 feet		95 feet		100 feet		105 feet		110 feet	
			Amps	Watts	Amps	Watts	Amps	Watts	Amps	Watts	Amps	Watts	Amps	Watts	Amps	Watts	Amps	Watts	Amps	Watts	Amps	Watts
.50kVA	3	5.00	65	5																		
1kVA	1	6.60	86	9	80	8	75	7	70	6	66	5	62	5	59	4	56	4	53	3		
1kVA	2	7.70			93	10	87	9	82	8	77	7	73	6	69	6	65	5	62	5	59	5
1kVA	3	8.80							93	10	88	9	83	8	79	7	75	7	71	6	68	5
1kVA	4	10.00											94	10	89	9	85	8	81	8	77	7

Note: Wattage values are given in watts per linear foot of element.
To calculate watts per square foot, multiply watts per linear foot by the following factors:
2" spacing x 6; 4" spacing x 3; 6" spacing x 2;

Wattage on these System Operating Tables are calculated using 0 feet of Cold Lead and 120 or 240 VAC.
Please use formulas in “Useful Information” section to determine exact wattage.

Resistance of Heating Element

9" Z Mesh Resistance = 0.001367 ohms / l.f.

12" Z Mesh Resistance = 0.001262 ohms / l.f.
Tuff Cable Resistance = 0.00118 ohms/ l.f.
Cold Lead Resistance = 0.000129 ohms / l.f.

Helpful Formulas

V = Volts C = Cold Lead, Total Feet
I = Amps Z = ZMesh Element, Total Feet
T = Tuff Cable Element, Total Feet
R = Resistance - (C x 0.000129)
RZ = Resistance of Z Mesh
RT = Resistance of Tuff Cable

TR = Total Resistance = (Heating Element x ohms/l.f.) + (Cold lead x ohms/l.f.)

V = I x R: Volts (V) = Amps (I) x Resistance (R)
W = V x I: Watts (W) = Volts(V) x Amps (I)
I = V ÷ R: Amps (I) = Volts(V) ÷ Resistance (R)
R = V ÷ I: Resistance (R) = Volts(V) ÷ Amps (I)

Determining Length of 12" Z Mesh Used:
(When Volts and Amps are known)

Total Resistance (TR) = Volts (V) ÷ Amps (I)
RZ = R - (C x 0.000129)
Z = RZ ÷ 0.001262

Example: 3kVA Transformer on Tap #6
V = 30.3
I = 94
C = 50 feet
R = 30.3 ÷ 94
RZ = 0.32234 - (50 x 0.000129)
Z = 0.31589 ÷ 0.001262 = 250 l.f. 12" Z Mesh

Determining Operating Amperage of ZMesh or Tuff Cable Heating Element:
(When Volts and lineal footage of Heating Element are known)

Amps (I) = Volts (V) ÷ Resistance (R)
R = Z or T x R per linear foot of ZMesh or Tuff Cable element

Example: 3kVA Transformer on Tap #6, 12" ZMesh
V = 30.3
Z = 250 l.f. of 12" ZMesh
C = 50 feet
I = 30.3 ÷ (250 x 0.001262 + 50 x 0.000129)
I = 94

Determining Operating Costs

Watts = Volts (V) x Amps (I)
Kilowatts/hour (KWH) = W ÷ 1000
Operating Cost/hour = KWH x Cost per KWH

Example: 3kVA Transformer on tap #6

V = 30.3
I = 94
Cost Per Kilowatt Hour = $0.06

W = 30.3 x 94
KWH = 2848 ÷ 1000
Operating Cost/hour = 2.85 x $0.06 =
$0.17 per continuous hour of operation

Determining Length of Tuff Cable Used:
(When Volts and Amps are known)

RT = R - (C x 0.000129)
T = RT ÷ 0.00118

Example: 6kVA Transformer on Tap #3
V = 59.1
I = 90
C = 50 feet
R = 59.1 ÷ 90
RT = 0.656666 - (50 x 0.000129) = 0.65021
T = 0.65021 ÷ 0.00118 = 551 l.f. Tuff Cable

Determining Watts Per Square Foot
(When Volts and Amps are known)

W = V x I
Watts/ft^2 **=** Watts ÷ Square feet

Example: 6kVA Transformer on Tap #3
V = 59.1
I = 90
Feet^2 = 278
W = 59.1 x 90
Watts/ft^2 **=** 5319 ÷ 278
Watts per Square Foot = 19.13

Conversions
BTU's = Watts x 3.412
Calorie/hour = BTU/hour x 252
Degree F = Degree C x 1.8 + 32
Degree C = (Degree F - 32) x 0.556
Meters = Feet x 3.281
Feet = Meters x 0.3048

Note: Volts and amps readings should be taken on secondary taps on the transformer

WARNING: HIGH VOLTAGE PRESENT! TROUBLE- SHOOTING PROCEDURES AND MEASUREMENTS MUST BE PERFORMED WITH THE SYSTEM ENERGIZED AND THE COVERS REMOVED. ALWAYS MAKE CERTAIN THAT THE PERSON PERFORMING THESE PROCEDURES IS FAMILIAR WITH SAFE PRACTICES REQUIRED FOR WORKING WITH HIGH VOLTAGE EQUIPMENT. A QUALIFIED TECHNICIAN OR ELECTRICIAN SHOULD PERFORM THE FOLLOWING PROCEDURES!

NOTE: Always turn power off prior to opening and closing the cover.

NOTE: Never install or reinstall the Control Board with the primary power in the "ON" position.

NOTE: Prior to trouble-shooting the system, check for obvious problems such as loose connections, cut or broken wires, etc. Check the jumpers on the printed circuit board for proper settings.

STATUS INDICATOR LIGHTS—WHAT DO THEY MEAN?

The **SLC500** series Control Unit is equipped with a status indicator LED on most activation devices and the Control Unit itself. This indicator monitors whether the unit is heating or not heating and gives other vital diagnostic information.

Indication	Status
-On -Solid	System heating - normal heating mode
-Off	System not heating - no call for heat
-Slow Blink	Under/Over Current
-2 Blinks - Pause	Transformer over temperature
-3 Blinks - Pause	Arcing or Shorting of Heating Element
-Rapid Blink	SCR Failure--Actions required when a diagnostic signal is given by the status indicator are listed in the troubleshooting section below.

TROUBLESHOOTING PROCEDURES FOR SLC500

The following procedures cover most problems that can be encountered when installing or servicing Heatizon Systems products with SLC500 Control Units. If your Heatizon Systems product cannot be re-paired using the following procedures, contact Heatizon Systems for further assistance.

Problem: **The system shuts off every 30 minutes for one minute.**
Solution: It is normal for the Control Unit to shut the system off every 30 minutes to perform a diagnostic test of the system's safety features.

Problem: **There is no power to control unit (no LED indication on control board)**
Solution:
1. Test for input power.
2. Check panel circuit breaker, reset or turn on as necessary.
3. Check controller circuit breaker, reset or turn on as necessary.
4. If power is measured at the input but the Control Board indicates no power is pre sent, the problem could be within the Control Unit itself. Contact Heatizon for technical assistance.

Problem: **The system is "Hard starting" or a breaker trips when the thermostat is activated.** Under normal conditions the controller incrementally powers up the transformer during the first one second of operation. Failure of the controller to do this properly will result in a "hard start." Hard starting is characterized by a noticeable "bang" or shaking in the transformer and/or conduits upon start-up).
Solution:
1. Check for proper wiring of the transformer primary for the supply voltage you are using. Improper wiring of the primary will possibly trip circuit breaker. Improper primary wiring can also damage the transformer if allowed to run for any length of time.
2. Check for continuity of the heating element. Heating element may be damaged, broken or shorted out to something metal or electrically conductive.

Problem: **The Control Unit has power, but the system will not activate**
Solution:
1. LED indicators #D24 and #D25 on the Control Board should be lit when system is energized (but not activated). Check voltage select jumpers on control board, (JP12 - JP13 - JP14). Jumper settings must be set for the supply voltage. Control Board will not operate properly if voltage is set incorrectly and **will be damaged if set for a value lower than the supply voltage.**
2. Test the Control Unit by jumpering Red and White terminals for the activation device, Control Unit should start. If system starts, fault is in the activation device or Thermostat Wire.
3. Check the installation and wiring of the Activation Device. To test Activation Device, connect an ohm meter to the Thermostat Wire terminals (the "R" & "W" terminals) of the Control Unit. The ohm meter should read continuity when the device is adjusted to call for heat, and should read open when the device is set for no heat. Repair or replace Activation Device or Thermostat Wire as necessary.
4. Check to see if LED #D23 ("Overtemp") is illuminated. Check connection and placement of thermistor on the Control Board. If thermistor is missing or not in stalled properly, system will not operate.

Problem: **System starts when power is turned on, but will not turn off via activation device.**
Solution: Remove red or white wire from Control Unit at activation terminals. If Control Unit shuts off, test activation device as described above.

Problem: **System starts, but won't stay running; LED's #D24 through #D27 won't change status when potentiometer is adjusted.**
Solution:
1. Check that the torroid is properly installed over one of the Cold Leads and plugged into the proper connector in the Control Unit.

2. Attach clamp-on amp meter around a Cold Lead and activate the system. Check for the presence of current in the secondary circuit during the 5-second period prior to system shut down (current should be 40 to 100 amps). If there is no cur rent present in the secondary, check the Transformer for voltage on the taps you are connected to 1.6 to 66 VAC depending on Transformer size). The presence of voltage on the Transformer taps but no current on the Cold Leads indicates no continuity in the heating element or Cold Lead. To check for continuity in the heating element and Cold Lead, remove one of the Cold Leads from the Trans former and place an ohm meter across the Cold Leads. Normal resistance should be less than 1 ohm.

3. If there is current present and the unit will not adjust, check for a feedback volt age using a voltage meter connected to TP3 and TP4 while system is running. Normal volts should be approximately 3 to 4 volts. If none is detected, replace the torroid.

Problem: **System starts, but will not stay running. LED # D21 (undercurrent) or #D22 (overcurrent) turns on and status LED blinks slowly.**
Solution:
1. Check that the torroid (for single-sided transformers) or both torroids (for dual sided transformers) are properly installed over one (or both) of the Cold Leads and plugged into the proper connector(s) in the Control Unit.

2. Verify secondary voltage and amperage is the same as those taken when heating element was originally installed. If they are the same, return the Control Unit to Heatizon Systems. If they are different, then call Heatizon Systems Technical Support Department at (801) 293-1232.

3. Open heating element. Test for continuity as described in previous section.

Problem: **System starts and runs, but Transformer is operating at greater than 200EF.**
Solution: Check thermistor for proper location and connection.

Problem: **System may start and run, but shuts down after a period of time. LED # 23 (overtemp) lights and status indicator flashes a pattern of two blinks and a pause. This is transformer overtemp fault.**
Solution:
1. Check to see if the Transformer is operating at a temperature less than 200EF.

WARNING. An out of adjustment potentiometer may be caused by shorted or damaged heating ele-ment or Cold Lead which may result in a danger of fire and risk to property or life. Shorted or dam-aged heating element or Cold Lead must be repaired prior to energizing the Control Unit and/or any adjustment to the potentiometer.

If it is operating at less than 200EF, then:

2. Check Cold Lead operating amperage. If higher than original Amperage measured when the Control Unit was originally installed, see Trouble Shooting Guide, “System starts, but won’t stay running.”

3. Check for restricted air flow to the transformer. Correct as necessary.

4. Check for air temperature where the Control Unit is mounted. Make certain it is 72EF or less. Correct as necessary.

5. Check that thermistor is properly installed on the controller, (if thermistor is missing or not installed properly system will not operate).

Problem: **System may or may not start, but shuts down and status LED blinks three times then pauses, LED #D21 & D22 will light. This is an arcing or shorting fault**.

Solution:

1. Turn primary power off. Check for loose connections at the transformer. Correct as necessary.

2. Check for loose connections at the Control Unit, (power input and transformer primary). Correct as necessary.

3. If Control Unit connections are found to be good, the problem could be in the Cold Leads or heating element, or the connections between them at the transition plate or butt splice. Check for poor solder or crimp connections. Repair as necessary.

4. Check for anything that could be shorting between adjacent runs of heating element or cold leads, such as nails that pass through the heating element into air ducts below the floor, metal carpet strips or thresholds, a frayed wire from the screen element, a foil candy wrapper, etc. Correct as necessary.

5. An erratic power source may also cause an erroneous arcing detection in the system. Check for defective panel circuit breakers or loose connections at these breakers. Correct as necessary. If primary power to the breaker panel is the source of the problem, contact your electrician or your power company for technical assistance.

Problem: **System shuts down immediately upon call for heat, status LED flashes rapidly. This indicates SCR has failed.**

Solution: Turn the power to the Control Unit OFF. Contact Heatizon Systems.

Problem: **System will stay in adjustment. After running a given period of time, an Over current or undercurrent fault occurs. (Note: Make certain that the Tuff Cable or ZMesh heating element has not been shorted to electrically conductive material, or cut or otherwise damaged and not repaired.)**

Solution:

1. Check jumpers on control board for proper over/under current tolerance settings. If the system is using Tuff Cable heating element or ZMesh in an outdoor application, set it for 10% tolerance on over current and 20% tolerance on undercurrent (JP5, JP7, JP9 and JP11). If the system is using ZMesh screen element for indoor applications, set it for 5% tolerance on over current and 10% tolerance on under current (JP4, JP6, JP8, and JP10). These adjustments are made on the Control Board.

2. Check for poor connections, burnt or damaged heating element. Correct as necessary.

Problem: **Television Screen or Computer Monitor interference occurs only when Heatizon System is on.**

Solution:

1. Change the distance from the Heatizon heating element and the television or computer monitor, and/or change the location of the television or computer monitor in the room.

2. Turn the Heatizon system thermostat to the off position when watching the affected television or when using the affected computer monitor.

3. Replace the affected television or computer monitor with one that utilizes Plasma Display Panel or Liquid Crystal Display technology.

Note: Prior to returning anything to Heatizon Systems, 4137 South 500 West, Murray, UT 84123, call (801) 293-1232 for a Return Materials Authorization form.

HEATIZON SYSTEMS

LOCATING A SHORT IN ZMESH HEATING ELEMENT

A short means that contact has been made between the heating element and ground and/or some electrically conductive material, such as valley metal, flashing, drip edge, door thresholds, metal lathe etc. If you suspect you may have a short, DO NOT OPERATE ANY HEATIZON SYSTEMS PRODUCT.

Always check for continuity between ZMesh Heating Element and ground, and between ZMesh Heating Element and any electrically conductive material including metal. If continuity to ground and/or any electrically conductive material is present then the ZMesh Heating Element has one or more shorts. The following procedure may be helpful in locating the general area where the short(s) are located, but it must be performed with extreme caution because of the risk of fire!

SHORT LOCATION PROCEDURE

Conducting this procedure will cause the area(s) where the short(s) is located to get extremely hot. Do not leave the primary power to the ZMesh Heating Element on for extended periods of time. Always carefully watch for hot spots in all areas where ZMesh Heating Element is present. If a hot spot and/or smoke is observed, immediately turn the primary power off, expose the area where the hot spot and/or smoke are observed, and make certain the any risk of fire is eliminated.

1. Connect the end of one Cold Lead to Tap #1 (the lowest voltage tap) of the Transformer, and the end of the other Cold Lead to the Common Tap of the Transformer.

2. Connect the 240VAC primary leads of the Transformer to a 120VAC primary power supply.

3. Read and record the secondary voltage across the Cold Leads.

4. Divide the number of feet of installed ZMesh Heating Element into the recorded secondary voltage. The result will be the volts per foot across the ZMesh.

   EXAMPLE:

   15VAC/250 Feet of ZMesh) = .06VAC per Foot

5. Measure the voltage from each Cold Lead to ground and/or the electrically conductive material to which the ZMesh heating element is shorted. Divide the measured voltage by the volts per foot determined in Step 4 above. The result is the approximate number of feet the short is away from the point where the ZMesh connects to the Cold Lead.

   EXAMPLE:

   One Cold Lead = 5VAC
   Other Cold Lead = 10VAC
   5VAC/0.06VAC Per Foot = approximately 83.3 feet from one end of the ZMesh;
   10VAC/0.06VAC Per Foot = approximately 166.6 feet from the other end of the ZMesh

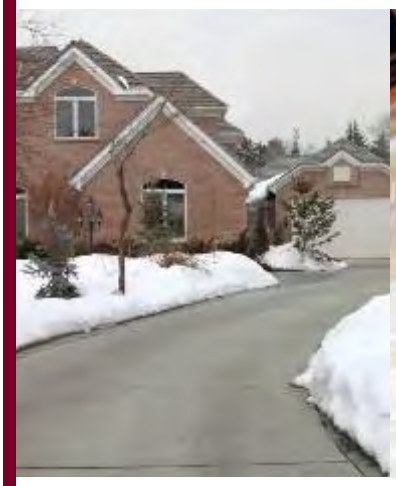
6. To locate the short, connect one lead from a voltmeter to ground and/or the electrically conductive material and probe the ZMesh heating element with the other voltmeter lead. Probe along the length of the ZMesh heating element runs and record the voltage reading. Keep probing, moving the direction that the volts are decreasing. When the voltage reads “Zero,” that is where the short is located.

HEATIZON SYSTEMS

RADIANT HEATING AND SNOW MELTING SYSTEMS

Design and Installation Manual

SLC500 Control Unit




02/12

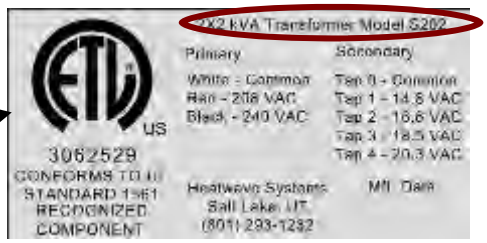
IMPORTANT!
This Information Must Be Completed During Installation

HEATIZON SYSTEMS

During the installation process, it will be necessary to document certain information which will be entered during the start up and calibration of your Heatizon Systems Control Unit. This information will be required for the "After Element Installation Tests" which are performed periodically throughout the installation process. Heatizon Systems recommends that you make note of the information which is needed *for each zone* installed, and record the appropriate information below throughout the installation process.

Transformer Size (Model Number)

S ___ ___ ___



Primary Power Voltage _____ VAC

Heating Element Type and Length

Side 1

9" ZMesh _____ Ft.
Number of Feet Installed

or

12" ZMesh _____ Ft.
Number of Feet Installed

ZMesh _____ Folds
(Enter number of 90º folds made during element installation)

Tuff Cable _____Ft.
Number of Feet Installed

Cold Lead Length

Cold Lead _____ Ft.
Number of Feet Installed

Application or Load Type:

Interior Space Heating	Interior Floor Warming	Exterior Snow Melting	Exterior Roof Deicing

Heatizon Systems
4137 South 500 West
Murray, UT 84123

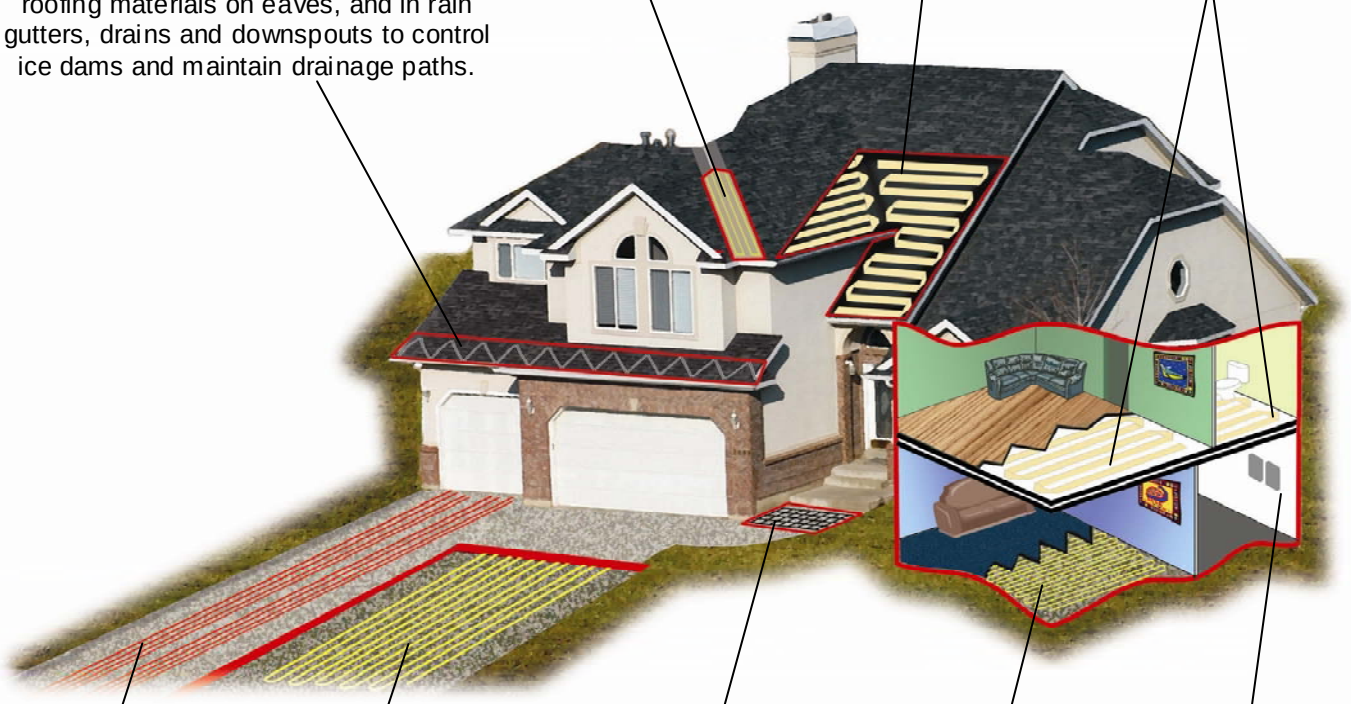
Phone: 801-293-1232
Fax: 801-293-3077

Roof Deicing—Non Metal Roofing
ZMesh Heating Element is easily installed under most non-metallic roof coverings, including asphalt, shake, or tile shingles to provide "invisible" eave and valley ice melting and prevention of snow build up and ice dams.

Roof De-icing—Metal Roofing
Tuff Cable Heating Element is installed in a Heatizon Heatsink Kit or Heatizon Invizimelt Kit when metal roofing materials are used.

Floor Warming/Space Heating
ZMesh Heating Element is installed on a wood or concrete subfloor under carpet, laminate flooring, hardwood, or tile. Two or more smaller rooms can easily be "jumpered" together to heat multiple areas with one system.

Roof and Gutter Deicing
Heatizon GutterMelt is installed on top of roofing materials on eaves, and in rain gutters, drains and downspouts to control ice dams and maintain drainage paths.



Floor Warming/Total Space Heating
Tuff Cable or Cozy Heat is installed in concrete of basement (or on a concrete or wood subfloor encased in mortar) directly under carpet, tile, hardwood, and laminate floorings.

Snow Melting—New Pour
Tuff Cable or Hott-Wire Heating Element is installed in concrete, asphalt, or under pavers for safe and convenient snow melting solutions.

The Control Unit
The Heatizon Control Unit is the "brains" of the system, and houses the necessary electrical components to provide low voltage electricity to the heating elements. Because the largest Control Unit is only 17" x 12" x 9", it can be mounted easily on a garage, utility room or mechanical room wall.

Snow Melting—Retrofit
Tuff Cable or Hott-Wire Heating Element is installed in saw cuts in existing concrete or asphalt; cuts are then filled with sealant.

Snow Melting—Stairs & Sidewalks
Tuff Cable or Hott-Wire Heating Element is installed in sidewalks and stairs, access ramp, in concrete, asphalt, or under pavers.