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Date: 2017/10/06
Subscriber: 100567550
PartySite: 664868
File No: E348282
Project No: 17SR4362512
PD No: 17M38690
Type: R
PO Number:

Subject: **Procedure And/Or Report Material**

The following material resulting from the investigation under the above numbers is enclosed.

Issue

<u>Date</u>	<u>Vol</u>	<u>Sec</u>	<u>Pages</u>	<u>Revised Date</u>
2013/08/02	1		Revised Authorization Page(s) Add New Manufacturer	2107/10/06

Manufacturer Party Site 664868 has been added.

KIM BROOKS, UL INSPECTION CENTER CENTRAL MIDWEST AREA OFFICE, UL LLC, 333 PFINGSTEN RD, NORTHBROOK, IL, United States, 60062., PHONE: 847-664-3220, FAX: 847-313-3220, EMAIL: Kim.E.Brooks@ul.com
Marks as needed may be obtained from UL LABEL CENTER USA, UL LLC, 333 PFINGSTEN RD, NORTHBROOK, IL, United States, 60062. PHONE: 847-664-3030, TOLL FREE: 877-854-3577 EXT 43030, FAX: 847-509-6201, EMAIL: LABELCENTER.USA@UL.COM.

Please file revised pages and illustrations in place of material of like identity. New material should be filed in its proper numerical order.

NOTE: Follow-Up Service Procedure revisions DO NOT include Cover Pages, Test Records and Conclusion Pages. Report revisions DO NOT include Authorization Pages, Indices, Section General Pages and Appendixes.

Please review this material and report any inaccuracies to UL's Customer Service Professionals. Contact information for all of UL's global offices can be found at <http://ul.com/aboutul/locations>.

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CAM File

UL INSPECTION CENTER 610

Follow-Up Service Procedure

DO NOT DISCARD THIS PAGE

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PAGES (in content order)	FUNCTION	HOW TO UPDATE
Authorization Page	Displays the Product Category, the type of Follow-Up Service (Type R=Reexamination / Type L=Label), the File Number and the Volume Number associated with each Applicant's, Manufacturer's and Listee's company name and address.	Replace existing page by matching the UL File Number and Volume Number. Discard the older page (refer to "Issued" or "Revised" date).
Addendum to Authorization Page*	Lists the additional names and addresses of manufacturing locations, when multiple locations exist	Replace existing page by matching the UL File Number and Volume Number. Discard the older page (refer to "Issued" or "Revised" date).
Listing Mark Data (LMD), Classification Mark Data (CMD) or Recognized Component Mark Data (RCMD) Pages* #	Used only for products covered under Type R Service. Displays the correct LMD, CMD, or RCMD Mark, the Control Number for Listed and Classified categories and additional information regarding minimum size, application, procurement, and any other optional markings, in addition to the UL Mark.	Replace existing page by matching the UL File Number and Volume Number. Discard the older page (refer to "Issued" or "Revised" date).
Multiple Listing (ML) Correlation Sheet	Correlates product model numbers between those products made by a Manufacturer for the Basic Applicant and those supplied to another company, the Multiple Listee.	Replace, add or delete page(s) with most current "Issued" or "Revised" date.
Index*	Catalogs the contents of the Procedure by some logical means, i.e. Section Number, Report Reference Number, or Issue Date.	Replace present page by matching the UL File Number, Volume Number, Page Number and most current "Revised" date.
Appendices* # (App.)	Contains instructions for the Manufacturer and UL Representative concerning specific responsibilities and required periodic tests. May also outline tests to be conducted on samples to be forwarded to UL's facilities.	Replace present page by matching the UL File Number, Volume Number, Appendix letter (eg. App. A), Page Number and most current "Revised" date.
	Standardized Appendix Pages are the same for all manufacturers within a particular product category.	Replace present page by matching the Appendix letter (eg. App. A), Page Number and most current "Revised" date.
Follow-Up Inspection Instructions (FUII) Pages*	Contains information similar to that in the Appendices. FUII Pages are issued as part of the Procedure when a UL Standard is used in conjunction with the Procedure, and are the same for all manufacturers within a particular category.	Replace present pages by matching the Page Number and most current "Issued" or "Revised" date.
Section General* # (Sec. Gen.)	Contains description, requirements, identifications and/or specifications that are common to all products covered by the entire volume and supplements the information provided in the Description Section.	Replace present page by matching the UL File Number, Volume Number, Page Number and most current "Revised" date.
Description, or Section (Sec.)	Contains the specific description of one or more products or systems. This includes written text supplemented by photographs, drawings, etc., as necessary, to define features that affect compliance with the applicable requirements.	Replace present page by matching the UL File Number, Volume Number, Section Number, Page Number and most current "Issued" date.

* The above page(s) may not appear in all UL Follow-Up Service Procedures; UL's Conformity Assessment Services staff determines their inclusion.

These pages are combined in the **Generic Inspection Instructions** for International Style Reports, identified, as example by Vol. X1, X2, etc.

PLEASE NOTIFY YOUR LOCAL UL OFFICE OF ANY CHANGES IN CONTACT NAME, COMPANY NAME OR ADDRESS, SO THIS MATERIAL AND IMPORTANT INFORMATION CONTINUES TO BE DELIVERED TO YOUR FACILITY WITHOUT INTERRUPTION.



File E348282

Vol 1

Auth. Page 1

Issued: 2013-08-05

Revised: 2017-10-06

FOLLOW-UP SERVICE PROCEDURE
(TYPE R)

RADIANT HEATING EQUIPMENT
(KQYZ)

Manufacturer: SEE ADDENDUM FOR MANUFACTURER LOCATIONS

Applicant: 664868 (Party Site)
Warm Waves L L C
(100567-550) 27850 Irma Lee Circle, Suite 102
LAKE FOREST IL 60045

Listee/Classified Co.: 664868 (Party Site)
SAME AS APPLICANT
(100567-550)

This Follow-Up Service Procedure authorizes the above Manufacturer(s) to use the marking specified by UL LLC, or any authorized licensee of UL LLC, including the UL Contracting Party, only on products when constructed, tested and found to be in compliance with the requirements of this Follow-Up Service Procedure and in accordance with the terms of the applicable service agreement with UL Contracting Party and any applicable Service Terms. The UL Contracting Party for Follow-Up Services is listed on addendum to this Follow-Up Service Procedure ("UL Contracting Party"). UL Contracting Party and UL LLC are referred to jointly herein as "UL."

UL further defines responsibilities, duties and requirements for both Manufacturers and UL representatives in the document titled, "UL Mark Surveillance Requirements" that can be located at the following web-site: <http://www.ul.com/fus> and in the document titled "UL and Subscriber Responsibilities" that can be located at the following website: <http://www.ul.com/responsibilities>. Manufacturers without Internet access may obtain the current version of these documents from their local UL customer service representative or UL field representative. For assistance, or to obtain a paper copy of these documents or the applicable Service Terms, please contact UL's Customer Service at <http://ul.com/aboutul/locations/>, select a location and enter your request, or call the number listed for that location.

The Applicant, the specified Manufacturer(s) and any Listee/Classified Co. in this Follow-Up Service Procedure must agree to receive Follow-Up Services from UL Contracting Party. If your applicable agreement is a Global Services Agreement ("GSA") with an effective date of January 1, 2012 or later and this Follow-Up Service Procedure is issued on or after that effective date, the Applicant, the specified Manufacturer(s) and any Listee/Classified Co. will be bound to a Service Agreement for Follow-Up Services upon the earliest by any Subscriber of use of the prescribed UL Mark, acceptance of the factory inspection, or payment of the Follow-Up Service fees which will incorporate such GSA, this Follow-Up Service Procedure and the Follow-Up Service Terms which can be accessed by clicking here: <http://www.ul.com/contracts/Terms-After-12-31-2011>. In all other events, Follow-Up Services will be governed by and incorporate the terms of your applicable service agreement and this Follow-Up Service Procedure.

It is the responsibility of the Listee/Classified Co. to make sure that only the products meeting the aforementioned requirements bear the authorized Marks of UL LLC, or any authorized licensee of UL LLC.

This Follow-Up Service Procedure contains information for the use of the above Manufacturer(s) and representatives of UL and is not to be used for any other purpose. It is provided to the Manufacturer with the understanding that it will be returned upon request and is not to be copied in whole or in part.

This Follow-Up Service Procedure, and any subsequent revisions, is the property of UL and is not transferable. This Follow-Up Service Procedure contains confidential information for use only by the above named Manufacturer(s) and representatives of UL and is not to be used for any other purpose. It is provided to the Subscribers with the understanding that it is not to be copied, either wholly or in part unless specifically allowed, and that it will be returned to UL, upon request.

Capitalized terms used but not defined herein have the meanings set forth in the GSA and the applicable Service Terms or any other applicable UL service agreement.

UL shall not incur any obligation or liability for any loss, expense or damages, including incidental, consequential or punitive damages arising out of or in connection with the use or reliance upon this Follow-Up Service Procedure to anyone other than the above Manufacturer(s) as provided in the agreement between UL LLC or an authorized licensee of UL LLC, including UL Contracting Party, and the Manufacturer(s).

UL LLC has signed below solely in its capacity as the accredited entity to indicate that this Follow-Up Service Procedure is in compliance with the accreditation requirements.

Bruce A. Mahrenholz
Director
North American Certification Program

LOCATION

1454699 (Party Site)
Lane Technical Sales Inc
6501 N Avondale Ave
Chicago IL 60631
Factory ID: None
UL Contracting Party for above site is: UL LLC

(100567-550) 664868 (Party Site)
Warm Waves L L C
27850 Irma Lee Circle, Suite 102
LAKE FOREST IL 60045
Factory ID: W
UL Contracting Party for above site is: UL LLC

(100586-044) 765734 (Party Site)
ONDOLIA CO LTD
74 Saneop-Ro 116Beon-Gil
Gyeolseong-Myeon
Hongseong-Gun Chungcheongnam-Do 350-872 KOREA
Factory ID: None
UL Contracting Party for above site is: UL AG

(FILE IMMEDIATELY AFTER AUTHORIZATION PAGE)

LISTING MARK

The Listing Mark consists of four elements placed in close proximity and shall appear on Listed products only. Minimum size is not specified, as long as the Listing Mark is legible. The following is suggested.



XXXX = The control number assigned by UL, 4UH6.

The minimum height of the registered trademark symbol ® shall be 3/64 of an inch. When the overall diameter of the UL Mark is less than 3/8 of an inch, the trademark symbol may be omitted if it is not legible to the naked eye.

The product identity is: "RADIANT HEATING CABLE", "RADIANT HEATING PANEL UNIT", "RADIANT HEATING EMBEDDED UNIT", or other appropriate product identities. The words "RADIANT HEATING" must appear in addition to the individual product identity.

The product identity may be omitted if the Mark is directly and permanently applied to the product by stamping, molding, ink-stamping, silk screening or similar process. The product identity may appear elsewhere on the product if the other three elements are part of the nameplate which includes the rating or the catalog or model designation.

Separable Listing Mark (not part of a nameplate and in the form of decals, stickers or labels) will always include the four elements.

The manufacturer may reproduce the Mark or obtain it from a UL authorized supplier.

THIS PAGE IS TO BE REVISED BY FUS DEPARTMENT ONLY

INDEX

Product	Section	UL	CUL
Radiant Heating Mat Systems, WWF13NW and WWF13GNW Series.	1	X	-

Radiant Heating Equipment (KQYZ)

A P P E N D I X A

INSTRUCTIONS TO INSPECTOR FOR
EXAMINATION OF PRODUCT

INSPECTOR:

At each inspection, select representative samples of the model(s) available from production and stock and inspect them for compliance with the description contained in the individual sections of the Procedure, paying particular attention to:

- A. Electrical spacing requirements.
- B. (1) Wiring - conductor; material and size.
(2) Insulation - material; thickness, color, voltage and temperature rating.
- C. Field wiring connections means, including equipment grounding.
- D. Installation instructions, if included in the Procedure, to ensure that they are in accordance with those in the Procedure.
- E. All required markings (e.g., cautionary) to confirm that they are on the unit, the letters are the correct size and the material is as stated (if Recognized Marking and Labeling System is required, it shall bear the marking as described in the Recognized Component Directory).
- F. Dimensions:
 - (1) Those specified without tolerances are nominal design dimensions, practical manufacturing tolerances are permitted. Variations resulting from change in design or manufacturing methods are not permitted.

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STANDARD APPENDIX PAGE (SAP). TO BE REVISED BY CONTROLLING OFFICE ONLY.

Radiant Heating Equipment (KQYZ)

- (2) Where tolerances are specified, the dimensions are critical and no changes are permitted. If a minimum value is stated, no minus tolerances is allowed.
- G. Integral spacings and dimensions of internal baffles and radiation shields.
- H. Where corrosion protection is specified, this is to include all surfaces, unless otherwise stated.
- I. Manufacturer's name, designation and temperature setting on all electrical controls.
- J. General workmanship, such as no "pinched" wires, routing wires clear of components, no sharp edges or metal shavings, and connections are both electrically and mechanically secure.
- K. If the appliance or part of the appliance is made at more than one factory, each component or subassembly shall have the appropriate factory identification. (Covered under "Marking" in each section.)
- L. The appliance is to be completely assembled for shipment unless otherwise specified in the Procedure.

INTERNAL WIRING:

Protection of Wiring - All wire and wire insulation in the product shall be protected from damage. This is commonly achieved by securement, segregation, and routing to keep the wire away from parts of assemblies which can damage the wire or insulation. Internal wiring which might make contact with metal parts shall be protected from sharp metal edges. This may be accomplished by rounding or deburring the metal, use of a Recognized Component bushing, or other construction described in the Procedure.

If the wiring is located where it may be in proximity to combustible material, it shall be protected by the method(s) described in the individual Procedure section.

Conductors shall be examined for evidence of damage. Faulty practices which can cause damage to conductors and/or insulation include:

Radiant Heating Equipment (KQYZ)

- A. Improper application of crimped connectors.
- B. Improper insulation removal.
- C. Overheating of conductor insulation because of routing or contact with hot surfaces during or after installation.
- D. Use of wire in which the insulation has been cut, cracked, crushed, abraded, etc.

SECUREMENT OF PARTS:

In the mounting or supporting of small, insulating parts, screw or other fastening should not cause cracking or breaking of these parts with expansion and contraction.

Uninsulated live parts, components which support live parts, and dead metal parts, shall be prevented from rotating or shifting if movement will result in twisting or stress of internal wiring or connections, or spacings being reduced below that specified in the Procedure.

MARKING OF HEATING CABLES AND PANELS:

Each unit shall be marked with the identifying name or identification symbol, catalog number, ratings in volts and watts, or in volts and amperes.

- A. Heating Cables - Each unit length of heating cable shall have a per-manent legible markings on each nonheating lead located within 3 in. (76 mm) of the terminal end. The lead wire shall have the following color identification to indicate the circuit-voltage on which it is to be used: 120-V nominal, yellow; 208-V nominal, blue; 240-V nominal, red; and 277-V nominal, brown.
- B. Heating Panels - Heating panels shall be permanently marked in a location that is readily visible prior to application of panel finish.
 - (1) On the front surface for panels intended for ceiling surface mounting,

Radiant Heating Equipment (KQYZ)

- (2) On the back of those panels intended for T-bar (dropped-ceiling installation) or framed surface mount with hinged panels, and
- (3) Both front and back for panels intended for installation as either ceiling surface or T-bar installed units.

The UL Listing Mark shall be placed adjacent to the other markings except that it may be located on the front surface only for subitem (3) of item B, above.

TESTS AND INSPECTIONS TO BE WITNESSED BY INSPECTOR:

At each inspection verify that the manufacturer is performing the following on each appliance, percentage of production, or parts, and witness representative sets of tests:

A. Tests:

- (1) Input Test (applies to all products).
- (2) Supply Lead Pullout Test (applies to heaters which do not have a strain relief means).
- (3) Rupture Test (applies only to panels of standard gypsum board which have resistance wire inserted in grooves routed in the back).
- (4) Dielectric Voltage-Withstand Test on 100 percent of production of all appliances employing high voltage electrical circuits.
- (5) Uniformity of Resistance Test (applies only to those flat, sheet type heating elements where the resistance medium is applied as a sheet along a plane).
- (6) Insulation Resistance Test (applies to radiant heating cable).

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B. Inspections and checks:

- (1) Inspection of all incoming raw materials and components.

EQUIPMENT CALIBRATION:

Annually review the manufacturer's documentation of equipment calibrations to determine that his test equipment is calibrated at least once per year to a standard which is traceable to the National Bureau of Standards, or National Standard of the country of manufacture of the appliance.

TEST RECORDS:

At each inspection, review the manufacturer's required test records for tests specified in App. D.

Test records need not be kept when the tests are performed on 100 percent of production, e.g., Dielectric Voltage-Withstand.

PROCEDURE IN CASE OF NONCONFORMANCE:

The UL inspector shall record each item of nonconformance on a UL "Variation Notice," a copy of which shall be given to the manufacturer. The UL inspector shall:

- A. Record any deviation of the appliance or its parts from the physical and/or material specifications in the individual sections of this Procedure.
- B. Record any nonconforming test results observed, the cause of the problem, and the corrective action taken by the manufacturer.
- C. Record if the manufacturer's test equipment has not been calibrated at the specified intervals.
- D. Record if the manufacturer's required test records are not being maintained as specified in the Procedure.

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The test methods are described in App. D. If more than one model is manufactured, vary those selected at each visit so that each basic series is inspected and tested at least once every 2 years. The inspector shall keep records of the models inspected.

If any of the tests yield nonconforming results, the entire lot of appliances represented by the samples tested shall be rejected.

If the lot is rejected, the manufacturer may:

- A. Remove the Listing Marks.
- B. Cull the stock and resubmit the lot to the inspector.
- C. Rework defective units, retest and resubmit to the inspector.

In the case of a resubmittal, the inspector shall select an additional set of samples equal in number to twice the original set. If any of the second set of samples yield nonconforming results, the lot is rejected and the Listing Marks removed.

The UL inspector shall also indicate on the Variation Notice action taken with respect to the removal of UL Listing Marks or the withholding from shipment (in lieu of the removal of Listing Marks) of appliances which do not comply with requirements of this Procedure.

At each inspection determine that the manufacturer is conducting the production line tests described in App. D. If the tests are not being correctly performed, bring it to the attention of the manufacturer's representative for corrective action and request that the tests be conducted on all untested or improperly tested appliances. This shall be reported on a Variation Notice.

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A P P E N D I X B

INSTRUCTIONS TO THE INSPECTOR

FOR SAMPLE PICK UP

INSPECTOR:

Once each year select representative samples of each component in the quantity specified on Page 2.

The sample shall be appropriately identified, tagged to indicate materials, manufacturer, and type designation, and unless otherwise noted, forwarded to the Follow-Up Services Department, Northbrook office.

GENERAL:

Components subject to follow-up test:

- A. Splices (applies only to the splices joining the nonheating leads to the heating leads of a radiant heating cable).
- B. Mineral Insulated Cable
 - (1) Outside diameter measurement.
 - (2) Sheath thickness measurement.
 - (3) Flexibility of cable.
- C. Radiant Heating Cable
 - (1) Specific-Inductive-Capacity Test (SIC)

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A P P E N D I X C

INSTRUCTIONS FOR
FOLLOW-UP TESTS AT UL

GENERAL:

The samples shall be subjected only to the tests which are specified under "Index to Testing" as being appropriate to the product.

A. SPLICE TEST

Apparatus

A salt water solution bath with a heater and an ohmmeter.

Method

Six samples of the splice are to be placed in a salt water solution maintained at a temperature of 75°C for a period of 1 h. At the end of the 1 h period, the insulation resistance at 240 V dc shall be measured between conductors and the solution.

Results

The insulation resistance, as measured between the conductors and the solution, shall not be less than 0.1 megohms.

B. MINERAL INSULATED CABLE TESTS

1. Outside Diameter Measurement

Apparatus

A micrometer caliper having flat measuring faces for the anvil and spindle.

Method

The average of at least three readings in different planes at any one point along the length of the cable shall be made.

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Results

The maximum variation at any point shall be ± 10 mils of the nominal diameter given in the Procedure.

2. Sheath Thickness Measurement

Apparatus

A micrometer caliper having a flat measuring face for a spindle and a round nose measuring face for the anvil.

Results

The minimum at any point shall be not more than 2 mils less than the nominal thickness of 0.020 in.

3. Flexibility of Cable Test

Apparatus

A mandrel having a diameter equal to five times the diameter of the cable and a Dielectric Voltage Withstand tester capable of producing at least 1500 V ac.

Method

The cable shall be wrapped for three complete turns around the mandrel. With the cable in a helical coil, a potential, gradually increased from 0 to 1500 V, shall be applied between the conductors and between the conductors and the sheath.

Results

The cable shall withstand the applied potential for 1 min. without failure. The cable shall show no evidence of damage when examined with the unaided eye.

C. RADIANT HEATING CABLE TEST

1. Specific-Inductive-Capacity (SIC)

Apparatus

A capacitance bridge and a heated water bath.

Radiant Heating Equipment (KQYZ)

Method

This test shall be conducted as described in the Standard for Thermoplastic-Insulated Wires and Cables, UL 83, paragraph 51.

Results

The following limits shall apply:

SIC for 1 day	8.2
Percent change in SIC -- 1-14 day	2.8
Percent change in SIC -- 7-14 day	2.0

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A P P E N D I X D

INSTRUCTIONS FOR TESTS AND/OR
INSPECTION AT THE FACTORY

GENERAL:

The following covers the manufacturer's required program of inspection and tests to assure that the products comply with the requirements of this Procedure. The construction details and materials used shall conform to those described in the numbered sections of the Procedure. The inspection program shall be such that poor workmanship is eliminated; some of the areas where particular attention is needed, are listed in App. A, Pages 1 and 2 under "INSPECTOR."

RESPONSIBILITY OF THE MANUFACTURER:

Once every shift, the manufacturer shall determine that the test equipment is functioning properly.

CALIBRATION OF TEST EQUIPMENT

The instruments used for these tests shall be calibrated at regular intervals (at least once annually) and at any time when the accuracy of the test equipment appears questionable for reasons including, but not limited to, mechanical abuse. Calibration may be done by the manufacturer or an outside laboratory. In either case, it shall be by comparison with a standard that is traceable to the National Bureau of Standards or the National Standard of the country of manufacture. Certification of calibration shall be maintained by the manufacturer until the next succeeding certification is provided.

TEST RECORDS

The manufacturer shall maintain records of test performance. (Exception: Records of test performance for 100 percent production line test need not be maintained.) The required test performance records (if any) shall include, but are not limited to: date(s) of production; results of each test (even though no unacceptable results occurred); number of units tested, number of units rejected; and corrective action taken. All records shall be readily available to UL personnel, and shall be maintained for a period of at least 6 months.

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INSPECTION OF MATERIALS:

Inspect representative samples of all raw materials and incoming components; if UL Recognized Components, to confirm that they bear the Marking as designated in the Recognized Component Directory.

Examine representative samples of all devices to assure that they are free from defects.

TESTS TO BE CONDUCTED AT THE FACTORY:

DIELECTRIC VOLTAGE-WITHSTAND TEST

Equipment

The Dielectric Voltage-Withstand Test Equipment on Page 7 has been investigated and found acceptable for use in conducting this test.

Method

Each assembled sample shall withstand for 1 min, without breakdown, an alternating-current potential applied between high voltage live parts and the dead metal parts. The connection to the dead metal parts shall not be impeded by paint or other nonconductive coating. The test potential is to be at the rated frequency of the sample and is to be 1000 V for all units except the test potential is to be 1000 V plus twice the rated voltage for appliances rated at more than 250 V. If no supply frequency is marked on the unit, a 60 Hz test supply shall be used.

The test time may be reduced from 1 min to 1 s if the required test potential is increased to 120 percent of the value specified above.

Basis for Acceptability

Each sample shall withstand the applied potential without electrical breakdown.

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INPUT TEST

METHOD

Three coils of different ratings of radiant heating cable shall be selected and their respective lengths measured. Each coil shall be immersed in a water-filled tank maintained at 57°C. The ends of the samples used in the test are to be brought well away from the tank. At the end of 45 min., with coils still immersed, the resistance of each coil shall be measured by means of a Wheatstone Bridge, or other resistance measuring instrument with the same accuracy. Additional measurements shall be made every 15 min. thereafter until two successive measurements show no significant change in resistance.

BASIS FOR ACCEPTABILITY

$R \times W/\text{ft} \times L$ shall be equal to or greater than

$$\frac{V^2}{1.05}$$

R = measured coil resistance

W/ft = watts per foot rating of the heating cable wire

L = measured length of the coil

V = rated voltage of the unit

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SUPPLY LEAD PULLOUT TEST

Equipment

Supporting means such that the sample unit shall be supported so as to have the supply lead entrance into the unit in the center of a span equivalent to a span of a 16 in. center space ceiling joist, and a set of weights up to 60 lb.

Method

A sample unit shall be supported in such a manner so as to have the supply lead entrance into the unit in the center of a span equivalent to a span of a 16 in. center space ceiling joist. A direct pull shall be applied to the lead in such a manner as to be at right angles to the plasterboard. Increase the force until 60 lb is reached and maintained for 5 min.

Basis for Acceptability

The supply leads shall not pull out.

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RUPTURE TEST

Equipment

Knife edges, 2 ft apart, and a set of weights up to 190 lb.

Method

A samples of a heating panel shall be supported, front face down, at each end 2 ft apart on knife edges and shall be loaded in the center until it breaks.

Basis for Acceptability

The sample shall withstand a force of at least 190 lb without breaking.

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INSULATION RESISTANCE TEST

Equipment

A heated water bath and a megohm bridge accurate to 10 percent or less of the value indicated by the meter, having a 125 V or higher open-circuit potential.

Method

In preparing the coil or reel for the test, each end of the wire or cable is to be brought out well above the water level in the tank. It is acceptable to dip the insulation at the ends in melted paraffin to keep moisture from forming a conductive path from the conductor metal across the surface of the insulation to the water. The coil or reel is then to remain immersed in water for 24 h before the test potential is applied.

The temperature of the water shall be maintained at 75°C.

Basis for Acceptability

The insulation resistance shall be at least 0.1 megohm per 1000 ft.

S P E C I A L A P P E N D I X A

SPLIT INSTRUCTIONS TO THE INSPECTOR

Components described in Volume 1, Section 1 are to be split inspected at Manufacturer A and Manufacturer B as follows:

Instructions for Field Representative at Manufacturer A:

ONDOLIA CO LTD
74 SANEOP-RO 116BEON-GIL
GYEOLSEONG-MYEON
HONGSEONG-GUN
CHUNGCHONGNAM-DO 350-872 KOREA

Subscriber Number - 100586-044

Party Site - 745817

Components:

- Volume 1, Section 1, Page 5, Heating Mat. Note the Heating Mat may not bare the UL Certification Marking.

Appendix Testing Requirements:

- See Appendix.

Split Inspection Marking:

- Blue adhesive label to be applied to the packaging.

Additional Instructions:

These components are only made and inspected at Manufacturer A. Inspector should verify compliance as described within this Report. If the product is found to comply, split inspection marking is to be applied and sent to Manufacturer B. The presence of this marking indicates that these parts have been inspected at Manufacturer A and have been verified for compliance with the description in the Procedure and can be shipped to Manufacturer B. However, if these components are not produced according to the Procedure description, then the split inspection marking shall be removed or destroyed.

Instructions for Field Representative at Manufacturer B:

Lane Technical Sales Inc
6501 N Avondale Ave
Chicago IL 60631

Party Site - **1454699**

Components:

- Volume 1, Section 1, Page 5, Heating Mat - Verify split inspection marking only (from Manufacturer A); confirm blue adhesive label applied to the packaging.
- Volume 1, Section 1 - all items.

Additional Instructions:

Final assembly, packaging, verification of the UL Listing Mark and final shipment take place at this location. The components indicated above that are described in this Volume have been assembled at Manufacturer A and are marked with the markings indicated above, as well as the remaining components manufactured at Manufacturer B. The presence of the marking split inspection marking from Manufacturer A indicates that these parts have been inspected and have been verified for compliance with the description in the Procedure. If the split inspection marking is not present or is destroyed on the components from Manufacturer A or any variations when compared to the report are found on components at Manufacturer B, then the component is not suitable for use for final shipment and the Listing Marking shall be held.

Radiant Heating Equipment (KQYZ)

SAMPLE SELECTION GUIDE

A. SPLICES:

Component	Used in Model	Proc. Sec. or Date	Quantity

B. MINERAL INSULATED CABLE:

Used in Model	Proc. Sec. or Date	Quantity

C. RADIANT HEATING CABLE:

Used in Model	Proc. Sec. or Date	Quantity

Radiant Heating Equipment (KQYZ)

APPENDIX B, PART 2

ADDITIONAL INSTRUCTIONS FOR UL SAMPLE PICK-UP

GENERAL

In reference to the following sample selection guides, the information is to be completed by the certification organization during the initial investigation. These guides are not to be completed by the field representative.

I. THERMOPLASTIC ENCLOSURES:

Certain products contained in this Procedure employ thermoplastic enclosures which may require Follow-Up Testing. Samples shall be selected in accordance with the "Sample Selection Guide for (Recognized or Unrecognized) Thermoplastic Enclosures."

When required by the "Sample Selection Guide for (Unrecognized) Thermoplastic Enclosures", a sample for Follow-Up ID Tests shall consist of a portion of the molded enclosure weighing 49.90 g (1.76 oz.).

When required by the "Sample Selection Guide for (Recognized or Unrecognized) Thermoplastic Enclosures", a sample for Flame Tests shall consist of the complete enclosure.

The sample shall be picked up in a manner such that one enclosure material shall be selected during each regular visit, and each enclosure material shall be represented by tests no less than once over a two year period.

An enclosure material that is not Recognized shall be represented by tests no less than twice over a two year period.

Radiant Heating Equipment (KQYZ)

A sample that is picked up for Follow-Up testing shall be tagged with the following information and forwarded to the Conformity Assessment Services Department at the Reviewing Office.

- a) Material,
- b) Manufacturer,
- c) Model or catalog number, and
- d) Phrase "Thermoplastic ID Test", "Flame Test", or Both

II. THERMOPLASTIC PARTS

Once each year, select the number of samples specified in the "Sample Selection Guide for Unrecognized Thermoplastic Parts." The selection of one model from each group is sufficient to represent the entire group.

A sample that is picked up for Follow-Up testing shall be tagged with the following information and forwarded to the Conformity Assessment Services Department at the Reviewing Office.

- a) Material,
- b) Manufacturer,
- c) Model or catalog number, and
- d) Phrase "Infrared Test"

- 1 - Manufacturer and Type Designation
- 2 - Rating under Material Recognition
- 3 - $\frac{3}{4}$ or 5 inch.
- 4 - If Required.

Radiant Heating Equipment (KQYZ)

*Sample Selection Guide for Un-Recognized **Materials**

Group No. (7)	*Material (1)	Flame Test (2)	IR Date (3)	DSC Date (4)	TGA Date (5)	Flame Test Conditioning Temp. (6)	Model Nos. Employ-ing Material	Enclosure Description			
								Vol.	Sec.	Page	Item
1	Hanyoung Industry Co. Ltd., FINON C3020 NW (Pick up at ONDOLIA CO LTD, 100586-044)	-	C07-26-13	C07-27-13	C07-26-13	-	WWF13NW and WWF13GNW	1	1	5	8.A
NA	JAEGER, Type DP-99729 (Pick up at Warm Waves L L C, 100567-550)	-	C11-06-15	C11-08-15	C11-06-15	-	WWF13NW and WWF13GNW	1	1	4A	4A
NA	JAEGER, Type 28753 (Pick up at Warm Waves L L C, 100567-550)	-	C11-04-15	C11-05-15	C11-04-15	-	WWF13NW and WWF13GNW	1	1	4A	4B

1 - Manufacturer and Type Designation

2 - 12 mm, ¾ or 5 in.

3 - IR - Infrared Analysis - Reference date provided in the description line of the original test results

4 - DSC - Differential Scanning Calorimetry - Reference date provided in the comment line and data-file extension of the original test results.

5 - TGA - Thermogravimetry Analysis - Reference date provided in the comment line and data-file extension of the original test results.

6 - If Required

7 - All parts molded of the same thermoplastic material shall be grouped together

Sample Selection Guide for Thermoplastic Parts

NA - Reserved for future use:

Group No. ₁	Part Description	Model Designation	Location of Description				IR Date ₂	Comments
			Vol.	Sec.	Page	Item		

1 - All parts molded of the same thermoplastic material shall be grouped together

2 - IR - Infrared Analysis - Reference date provided in the description line of the original test results

Specimen Parameters: **See App. B, Page 1**

*

Group No.	Minimum Quantity	Color	Sample Type, inches	Thickness

Radiant Heating Equipment (KQYZ)

S P E C I A L A P P E N D I X B

INSTRUCTIONS TO THE INSPECTOR
FOR SAMPLE PICK UP

INSPECTOR:

Pick up Location 1:

ONDOLIA CO LTD
74 SANEOP-RO 116BEON-GIL
GYEOLSEONG-MYEON
HONGSEONG-GUN
CHUNGCHONGNAM-DO 350-872 KOREA

Subscriber Number - 100586-044
Party Site - 745817

*

Twice each year select one representative sample of the following:

Section	Model	Sample Size	Special Instruction to Factory
1, Item 8A	Non-Woven Fabric (150), Hanyoung Industry Co. Ltd., FINON C3020 NW	6 inches by 20 inches	Pick up Location 1 Mark sample: IR, DSC, TGA Test Samples (App. C, Test I) SAMPLES
*			

The samples shall be appropriately identified, tagged to indicate manufacturer name, model number, and rated watt density, and unless otherwise noted, forwarded to the Follow-Up Services Department, Northbrook office.

GENERAL:

Samples subject to follow-up test:

See above table.

INSPECTOR:

Pick up Location 2:

Warm Waves L L C
1454699 (Party Site)
Lane Technical Sales Inc
6501 N Avondale Ave
Chicago IL 60631

Subscriber Number - 100567-550
Party Site - 1454699

Twice each year select one representative sample of the following:

Section	Model	Sample Size	Special Instruction to Factory
1, Item 4Ba	Tape JAEGER, Type DP-99729	6 inches long	Pick up Location 2 Mark sample: IR, DSC, TGA Test Samples (App. C, Test I) SAMPLES
1, Item 4Ba	Tape JAEGER, Type 28753	6 inches long	Pick up Location 2 Mark sample: IR, DSC, TGA Test Samples (App. C, Test I) SAMPLES

The samples shall be appropriately identified, tagged to indicate manufacturer name, model number, and rated watt density, and unless otherwise noted, forwarded to the Follow-Up Services Department, Northbrook office.

GENERAL:

Samples subject to follow-up test:

See above table.

[illegible]

Radiant Heating Equipment (KQYZ)

APPENDIX C, PART 2

INSTRUCTIONS FOR FOLLOW-UP TESTS AT UL

GENERAL:

The sample enclosures, parts of enclosures, fans, motors or polymeric ball-joint hangers forwarded by the UL Representative shall be subjected to the appropriate tests described below.

I. THERMOPLASTIC ENCLOSURE TESTS:

The Qualitative Infrared Analysis (IR), Differential Scanning Calorimetry (DSC), and Thermogravimetry Analysis (TGA) Tests are to be conducted in accordance with the current Standard for Polymeric Materials Short Term Property Evaluations (UL 746A).

A. QUALITATIVE INFRARED ANALYSIS:

Method

An infrared spectrum of the material is to be obtained by means of an infrared spectrophotometer. Instrument settings used in obtaining the spectrum are to be identical to those used in obtaining the original spectrum of the material referenced in this Procedure.

Basis For Acceptability

The spectrum obtained shall indicate the same composition as that recorded in the spectrum obtained under the original investigation date specified in Appendix B.

B. DIFFERENTIAL SCANNING CALORIMETRY:

Method

A thermogram of the material is to be obtained by means of a thermal analyzer with a DSC (Differential Scanning Calorimeter) module. Instrument settings used in obtaining the thermogram are to be identical to those used in the original thermogram of the material referenced in this Procedure.

Basis For Acceptability

The thermogram obtained shall indicate the same general thermal response over the programmed temperature range as that recorded in the thermogram obtained under the original investigation date specified in Appendix B.

Radiant Heating Equipment (KQYZ)

C. THERMOGRAVIMETRY:

Method

A thermogram of the material is to be obtained by means of a thermal analyzer with a thermogravimetric module. Instrument settings used in obtaining the thermogram are to be identical to those used in obtaining the original thermogram of the material referenced in this Procedure.

Basis For Acceptability

The thermogram obtained shall indicate the same characteristic weight loss over the programmed temperature range as that recorded in the thermogram obtained under the original investigation date specified in Appendix B.

D. 3/4 INCH (12 mm) FLAME TEST:

Method

The sample of the enclosure shall be subjected to the 3/4 Inch Flame Test as described in UL 746C Polymeric Materials - Use in Electrical Equipment Evaluations. The samples shall be aged at 70°C, or at a higher temperature if specified in Appendix B.

Basis For Acceptability

The enclosure shall not flame for more than one minute after two 30 second applications of the test flame. There shall be an interval of one minute between applications. The results are not acceptable if the sample is completely consumed.

E. 5 INCH (127 mm) FLAME TEST (FIXED EQUIPMENT):

Method

The sample of the enclosure shall be subjected to the 5 Inch Flame Test as described in UL 746C Polymeric Materials - Use in Electrical Equipment Evaluations. The samples shall be conditioned in a forced draft air-circulating oven for a period of seven days at a temperature of 70°C, or at a higher temperature if specified in Appendix B. Following the seven day conditioning, samples shall be conditioned for a period of 40 hours at a temperature of 23 ± 2°C in a relative humidity of 45 to 55 percent.

Radiant Heating Equipment (KQYZ)

Basis For Acceptability

The enclosure shall not continue to burn for more than one minute after fifth five-second application of the test flame and shall not be destroyed in the area of test flame to such an extent that the integrity of the enclosure is affected or accessibility to live parts is afforded. Also, flaming drops or flaming or glowing particles shall not be emitted by the enclosure at any time during the test.

II. THERMOPLASTIC PARTS TEST:

A. QUALITATIVE INFRARED ANALYSIS:

Method

The test shall be conducted in accordance with the method described in Sec. I of Appendix C.

Basis For Acceptability

The basis for acceptability is stated in Sec. I of Appendix C.

Radiant Heating Equipment (KQYZ)

S P E C I A L A P P E N D I X C

INSTRUCTIONS FOR
FOLLOW-UP TESTS AT UL

GENERAL:

The samples shall be subjected only to the tests which are specified under "Index to Testing" as being appropriate to the product.

A. STABILIZED RESISTANCE
UL 1683, Issue No. 1, Section 19.5

Method

One flexible radiant heating panel sample was prepared for thermal conditioning in an air circulating environmental chamber at $20^{\circ}\text{C} \pm 2^{\circ}\text{C}$ until stabilization. The resistance of the flexible sample was measured following the initial temperature stabilization period. The conditioning sequence for one thermal cycle was as follows:

1. Chamber air temperature was raised to $85^{\circ}\text{C} \pm 5^{\circ}\text{C}$ in approximately 20 minutes and held for 10 minutes.
2. Chamber cooled to $30^{\circ}\text{C} \pm 2^{\circ}\text{C}$ in approximately 20 minutes; forced cooling is permitted, and held for 10 minutes.

The resistance of the flexible sample was measured following the 25th cycle.

Note: The humidity setting during the conditioning is not specified and shall be at any convenient level for the testing.

Results

The measured resistance between the conductors shall not be less than the following:

Model	Minimum Resistance after 25 th cycle, ohms	Engineering Note - Not for Lab Usage
*		

Radiant Heating Equipment (KQYZ)

INSTRUCTIONS TO THE INSPECTOR

INSPECTOR:

All required factory tests are to be done at the following location.

Location:

ONDOLIA CO LTD
74 SANEOP-RO 116BEON-GIL
GYEOLSEONG-MYEON
HONGSEONG-GUN
CHUNGCHONGNAM-DO 350-872 KOREA

Subscriber Number - 100586-044

Party Site - 745817

MANUFACTURER'S DIELECTRIC VOLTAGE-WITHSTAND EQUIPMENT:

The equipment specified below has been evaluated and found to be acceptable for conducting the production line Dielectric Voltage-Withstand Test.

Manufacturer	Model No.
Instek	PGI-825

Radiant Heating Equipment (KQYZ)

EXCEPTIONS TO 100 PERCENT DIELECTRIC VOLTAGE-WITHSTAND TEST:

Based on engineering judgement, the production line Dielectric Voltage-Withstand Test is not required to be performed on the models tabulated below.

Product	Model Designation	Proc. Sec. or Date

Radiant Heating Equipment (KQYZ)

RESERVED FOR FUTURE USE

Radiant Heating Equipment (KQYZ)

INDEX TO TESTING				
Dielectric Voltage- Withstand Test	Input Test	Supply Lead Pullout Test	Rupture Test	Insulation Resistance Test
√	NA	NA	NA	NA

SECTION GENERAL**PRODUCT COVERED:****ELECTRIC SPACE HEATING PRODUCTS****MARKINGS:****UL CERTIFICATION MARKINGS:**

See online KQYZ and KQYZ7 Category General Information for Radiant Heating Equipment.

METHOD OF MARKING THE UL LISTING MARK:

See online KQYZ Category General Information for Radiant Heating Equipment.

The UL Certification Mark can be separate from nameplate label, ratings label, or any other required labels.

NAMEPLATE/RATINGS LABEL - METHOD OF MARKING

Products are to be marked at the factory, or provided with a label or tag that is intended for the installer to apply to the non-heating leads during installation. This applies to the nameplate markings, and the UL Certification Mark. For products that have non-heating leads of fixed length which are not intended to be shortened in the field, the marking shall be affixed at the factory.

The marking above shall be on a tag made of substantial material (cardboard, cloth, plastic, or the equal) to provide mechanical strength and to resist easy removal. All exposed surfaces of the tag shall have a clear plastic overlay or other protection for the markings. The tag shall be in either:

1) A flat tag having a hole to facilitate securing of the tag to the non-heating leads by a means such as a plastic strap which is not removable without cutting. Or;

2) A flag-type label with an adhesive back, intended to be wrapped tightly once around and adhere to the non-heating lead. The ends of the tag are intended to adhere to one another and project out as a flag.

Instructions are to be provided with the product indicating that the above marking shall be applied in accordance with applicable jurisdictional electrical codes.

*

DATE CODE:

The lot number or date code of manufacture may be abbreviated or may be in a nationally accepted conventional code or in a code affirmed by the manufacturer, provided that the code:

- a) Does not repeat in less than 20 years, and
- b) Does not require reference to the production records of the manufacturer to determine when the product was manufactured.

Lot Number WWFNW-13 1106

Where WWFNW - Type of panel
13 - Wattage Density
11 - Year of manufacturer
06 - Month of manufacturer

MARKINGS:

Each product must be permanently marked with the following. The following markings shall be visible during installation prior to application of panel finish on the outside of all heating products. The markings specified in (h), (i) and (j) shall be in letters not less than 2.4 mm (3/32 inch) high.

- a) The manufacturer's name, trade name, trademark, or other descriptive marking by which the organization responsible for the product may be identified;
- b) The product identification such as a catalog, style, model, or type designation;
- c) The rated voltage of the product;
- d) The letters "ac" after the voltage, or the symbol "~";
- e) For heating products of fixed dimension, the input in amperes or watts;
- f) For a heating product of dimensions determined during installation, the input (current or power) per unit area, based on the active area;
- g) For a heating product of dimensions determined during installation, the maximum heating panel length;
- h) The statement: "SEE INSTALLATION INSTRUCTIONS";
- i) As applicable, the following or equivalent statement, "RADIANT CEILING HEATING PANEL", "RADIANT FLOOR HEATING PANEL", or " RADIANT CONCRETE HEATING PANEL";

j) For products intended to be installed in a common joist space with a complementary radiant heating product, the following or equivalent statement, "INTENDED FOR INSTALLATION IN A COMMON JOIST SPACE WITH COMPLEMENTARY RADIANT HEATING PRODUCT RATED ____ MAXIMUM". The blank shall be filled in with the maximum heating density of the intended complementary heating product;

k) For each associate part required for installation of the heating product (connectors, insulating covers, crimping tools, insulating tape, etc.), a part number marked on the part or the part's smallest unit packaging; and

m) For products intended to be installed in or beneath concrete, the following or equivalent statement, "INTENDED FOR CONCRETE INSTALLATION ONLY".

WARNING LABELS:

The following labels shall be on R/C (PGDQ2), adhesive backed labels, that are suitable and rated for application.

The manufacturer of a heating product shall provide labels with provision for the installer to indicate which branch circuits supply the space heating installations and instructions that the labels, including the following warnings, shall be affixed to the panelboards.

Exception: A heating product installation that is visible and distinguishable after installation need not be provided with labels.

For ceiling products: A warning label shall be supplied by the manufacturer of a ceiling heating product, marked with the word "WARNING", and the following or equivalent statement, "RISK OF ELECTRIC SHOCK - ELECTRIC WIRING AND HEATING PANELS CONTAINED IN CEILING. DO NOT PENETRATE CEILING WITH NAILS, SCREWS OR SIMILAR DEVICES".

For floor products: A warning label shall be supplied by the manufacturer of a below floor heating product, marked with the word "WARNING", and the following or equivalent statement, "RISK OF ELECTRIC SHOCK - ELECTRIC WIRING AND HEATING PANELS CONTAINED BELOW THE FLOOR. DO NOT PENETRATE FLOOR WITH NAILS, SCREWS, OR SIMILAR DEVICES".

For ceiling products: A warning label shall be supplied with a ceiling heating product, marked with the word "WARNING", and the following or equivalent statement, "RISK OF FIRE. DO NOT INSTALL ADDITIONAL CEILING FACING MATERIALS ON EXISTING CEILING".

*

The manufacturer of a heating product shall provide labels that are intended to be affixed adjacent to points of access to concealed areas in which installed heating products are accessible. They shall be marked with the word "CAUTION", and the following or equivalent statement, "RADIANT HEATING PRODUCTS INSTALLED IN THIS AREA. AVOID ACTIONS WHICH MAY RESULT IN MECHANICAL DAMAGE TO THE PRODUCT." Each heating panel and each 100 m (328 ft) of heating panel sets shall be provided with one label. See 36.2(k).

Exception: A heating product installation that is visible and distinguishable after installation need not be provided with labels.

All of the above markings shall be in letters not less than 1.6 mm (1/16 inch) high except that the signal words "WARNING" and "CAUTION" shall be in letters not less than 2.4 mm (3/32 inch) high.

The manufacturer of a heating product shall provide labels that are intended to be affixed to individual room heating controls. They shall be marked with the following or equivalent term, "RADIANT CEILING HEATING" or "RADIANT FLOOR HEATING" as appropriate. The letter height is not specified. Each heating panel shall be provided with one label. Each 100 m (328 ft) of heating panel sets shall be provided with a minimum of five labels.

Exception: A heating product installation that is visible and distinguishable after installation need not be provided with labels.

DESCRIPTIONPRODUCT COVERED:

USL - Radiant Heating Mat Systems, Carbon Film-Type Heating Product, WWF13NW and WWF13GNW Series.

ELECTRICAL RATINGS:

Ratings for single panel:

Model	Minimum Size&	(Half Width) Overall Maximum Size&	(Full Width) Overall Maximum Size&	Voltage, Vac	Mininum Ohm/ft ²	Maximum A/ft ²	Maximum Density, W/ft ²	Maximum Wattage	Maximum Length
WWF13NW	8in. x 20in.	1.7ft x 32ft	3.35ft x 32ft	120	1107	0.108	13	1400	32
WWF13NW	8in. x 20in.	1.7ft x 64ft	3.35ft x 64ft	240	4430	0.054	13	2800	64
WWF13GNW	8in. x 20in.	1.7ft x 32ft	3.35ft x 32ft	120	1107	0.108	13	1400	32
WWF13GNW	8in. x 20in.	1.7ft x 64ft	3.35ft x 64ft	240	4430	0.054	13	2800	64

& = Not For Field Representative Use

Ratings for whole system of panels:

Model	Voltage, Vac	Maximum A	Maximum W	Maximum Size, ft ²
WWF13NW	120	15	1800	138
WWF13NW	240	15	3600	277
WWF13GNW	120	15	1800	138
WWF13GNW	240	15	3600	277

GENERAL:

These products are electric space heating systems made up of a flexible carbon mat and connectors that are all field connected.

The products are intended for indoor use and installed as follows:

- Location - Dry, floor.
- Floorcovering Material - Engineered wood, tile, and laminate floor coverings.
- Thinset Location and Thickness - Fully embedded in thinset with 3/8 inch thickness above and 3/8 inch thickness below.
- Vapor Barrier - Not applicable.
- Maximum Thermal Resistance = R-1
- Minimum Installation Temperature = 32°F
- Minimum Bend Radius - Not applicable.

The radiant floor heating mats covered by this report are intended space heating and to be installed in accordance with Article 424, as applicable of the National Electrical Code (NEC). After installation these mats become an integral part of the finished building construction.

The Listing of these products does not cover any other performance features claimed by the manufacturer, such as, waterproofing, sound control, radon gas blocking, surface crack suppression, and anti-fracture.

Plywood or other combustible building materials are not suitable for direct contact with the heating panel. The unit is not intended to be installed in walls, or ceilings, nor is carpeting or other combustible material to be installed directly over the unit. Any increase in watt density is considered to cause a corresponding increase in temperature on the facing material. Inclusion of additional facing materials (or thickness or framing method) in the instructions shall be done only after consideration of the need for additional testing by UL.

As an integral part of the finished building, it is necessary that the installation instructions be followed exactly as described.

The inclusion of any additional building materials in the installation instructions shall be done only after consideration of their similarity to the materials permitted to be used.

The radiant floor heating mats are rated for maximum current-rated branch-circuit overcurrent-protective device of 20A.

The radiant heating mats are provided with an internal "ground plane", however this 'ground' was not considered a 'safety ground' where it would need to be connected to a wire with insulation colored green or green with one or more yellow strips.

TECHNICAL CONSIDERATIONS (Not For Field Representative Use):

USL indicated investigation to the Outline of Investigation for Electric Heating Products For Installation Under Floor Covers, UL 1683, Issue Number 1.

NOMENCLATURE:Mats:

WWF13NW - Six voltage copper strips are embedded, without two ground-planes.
WWF13GNW - Six voltage copper strips are embedded, with two ground-planes (two ground copper strips are visible).

APPLICATIONS:

- Embedded in thinset.
- Field or factory assembled or a combination of both.

MARKINGS: See Section General.

WARNING LABELS: See Section General.

INSTALLATION INSTRUCTIONS: Provided by manufacturer with each product.

See ILL. 1. Diagrams and wording can change, however, must be equivalent.

Alternate - Installation of 3M # 69 tape system (ILL. 1, Pages 19 and 20) is optional when Alternate WW End Tape System (Item 4, Page 4A) is used and described.

Alternate - Same as above, except see ILL. 1A. Instruction manual may be marked "Tec" by HB Fuller.

Alternate - Glass cloth tape (ILL. 1A, Pages 14 and 15) is optional when Alternate WW End Tape System (Item 4, Page 4A) is used and described.

Alternate - Same as above, except see ILL. 1B. Instruction manual may be marked "Peel and Heat Cutting Edge" by Protecto Wrap Company. This version is for factory assembly only.

SHIPPING ASSEMBLY: The Heating Mat may be placed in a separate box from the other components, but must be shipped together.

SPLIT INSPECTION INSTRUCTIONS: See Appendix.

Electric Space Heating Mats

Model WWF13NW, FIG. 1

Model WWF13GNW, FIG. 2

Connection Kit, FIG. 3

1. Wall Thermostat with Integral Ground Fault Circuit Interrupter - Optional and not shown. Listed, any rated 120/240Vac, 60 Hz, minimum 15 A, maximum 20 A, GFCI Type Class A.
2. Slave Power Module with Integral Ground Fault Circuit Interrupters - Optional and not shown. Listed, any rated 120/240Vac, 60 Hz, minimum 15 A, maximum 20 A, GFCI Type Class A.
3. Non-Heating Leads - Optional and not shown. Listed. Type THWN, or THWN-2, 14 AWG, stranded, rated minimum 90°C, 600 V.

Alternate - R/C (AVLV2). 14 AWG, stranded, rated minimum 600 V, 105°C.

Alternate - R/C (AVLV2). 16 AWG, stranded, rated minimum 600 V, 105°C for use only with factory assembled models rated less than 10 A with Connectors soldered.

4. WW End Tape System - Consists of the following:
 - A. Larger "Non-Heating Lead" Section - EternaBond, Designated WebSeal. Measures minimum 6 in wide, minimum 30 mil. A roll to be provided and cut to length. Provided with own adhesive and two removable, peel off films. Covers Non-Heating Leads and Connectors covered with Crimp Taping.

*Alternate - Same as above, except Jaeger, Type 28753, minimum 0.6 mm thick (polypropylene / polyethylene / butyl).
 - B. Smaller "Bottom Connection" Sections - Consists of the two following layers:
 - a. Inner Electrical Tape - R/C (OANZ2), 3M Company Electrical Markets DIV. (EMD), (E17385), Glass Cloth Insulated Tape, Cat. No. 69, (rated 600V, 200°C), 0.7 inch wide. A roll to be provided and cut to length. Covers Bottom Connection end of Heating Mat. (Provides electrical insulation).

Alternate - Same as above except, any Listed or R/C (OANZ2), glass cloth insulated tape, rated minimum 300V, 130°C.
 - b. Outer Seal Layer - EternaBond, Designated WebSeal. Measures minimum 3 in. wide, minimum 30 mil. A roll to be provided and cut to length. Provided with own adhesive and two removable, peel off films. Covers Inner Electrical Tape.

Alternate - Same as above, except Gebrüder Jaeger GmbH, Type 28753, minimum 0.6 mm thick (polypropylene / polyethylene / butyl).

WW End Tape System - Alternate WW End Tape System:

- A. Larger "Non-Heating Lead" Section - JAEGER, Type DP-99729. Measures minimum 6 in. wide, minimum 0.5 mm thick. A roll to be provided and cut to length. Provided with own adhesive peel off film. (Polypropylene, fibrous glass. White; contacts live parts; FUS tested).

Alternate - Same as above, except JAEGER, Type 28753, minimum 0.6 mm thick. (Polypropylene, polyethylene, butyl). (White; contacts live parts; FUS tested).
- B. Smaller "Bottom Connection" Sections - Same as above except 3 in. wide.

5. Crimp Taping - R/C (OANZ2), 3M Company Electrical Markets DIV. (EMD), (E17385), Glass Cloth Insulated Tape, Cat. No. 69, (rated 600 V, 200°C), 0.7 inch wide. Two pieces are wrapped around each Connector in an "X"-shape as shown in ILL. 1, Page 19. (Provides electrical insulation).

Alternate - Same as above except, any Listed or R/C (OANZ2), glass cloth insulated tape, rated minimum 300V, 130°C.

6. Crimp Tool - Harbin Sanzing Heating Company Ltd., Model Number FTC-104, rated for 14 AWG, one or two conductors. (Instructions for tool use and calibration are in ILL. 1).

Alternate - Same as above except, Harbin Sanzing Heating Company Ltd., Model Number LS-01, rated for 14 AWG, one or two conductors. (Same as FTC-104 above).

7. Connectors - USU (ZMVV3), Warm Waves LLC., (E348282), Cat. No. 330716. Minimum 3 provided with each shipment. (Maximum 15 A at barrel and 11.58 A at foil buss connection).

Alternate - For factory installation only. Manufactured by AMP Inc., Tin or Nickel Plated Copper. See ILL. 4 for dimensions. One Non-Heating Leads or two butted Non-Heating Leads installed and soldered. (End product tested. 15 A maximum).

8. Heating Mat - Consists of the following materials (side view). See ILL. 2 and ILL. 3 for organizations of layers. (Secured together by combination of heat, pressure, and adhesive (Sinsung Chemical Co., Type DL-2090). See Appendix for split inspection instructions.

A. Non-Woven Fabric (150) - Hanyoung Industry Co. Ltd., Designated Finon C3020 NW, minimum 0.1 mm thick. (IR on file).

B. PET 0.05 mm (130) - R/C (QMFZ2), Toray Advanced Materials Korea Inc., (E90724), PET, Designated XB 30, rated 105°C, VTM-2, minimum 0.05 mm thick.

C. Copper Ground Buss (Model WWF13GNW only) (112/116) - Copper. Measures 15.0±0.1 mm wide and 0.060±0.005 mm thick. (Not consider a protective ground).

D. Carbon Ground Honeycomb (Model WWF13GNW only) (111) - Sinsung Chemical Co. Ltd., Designated SEG-603A.

E. PET 0.075 mm (113) - R/C (QMFZ2), Toray Advanced Materials Korea Inc., (E90724), PET, Designated XG 200, rated 105°C, VTM-2, minimum 0.075 mm thick.

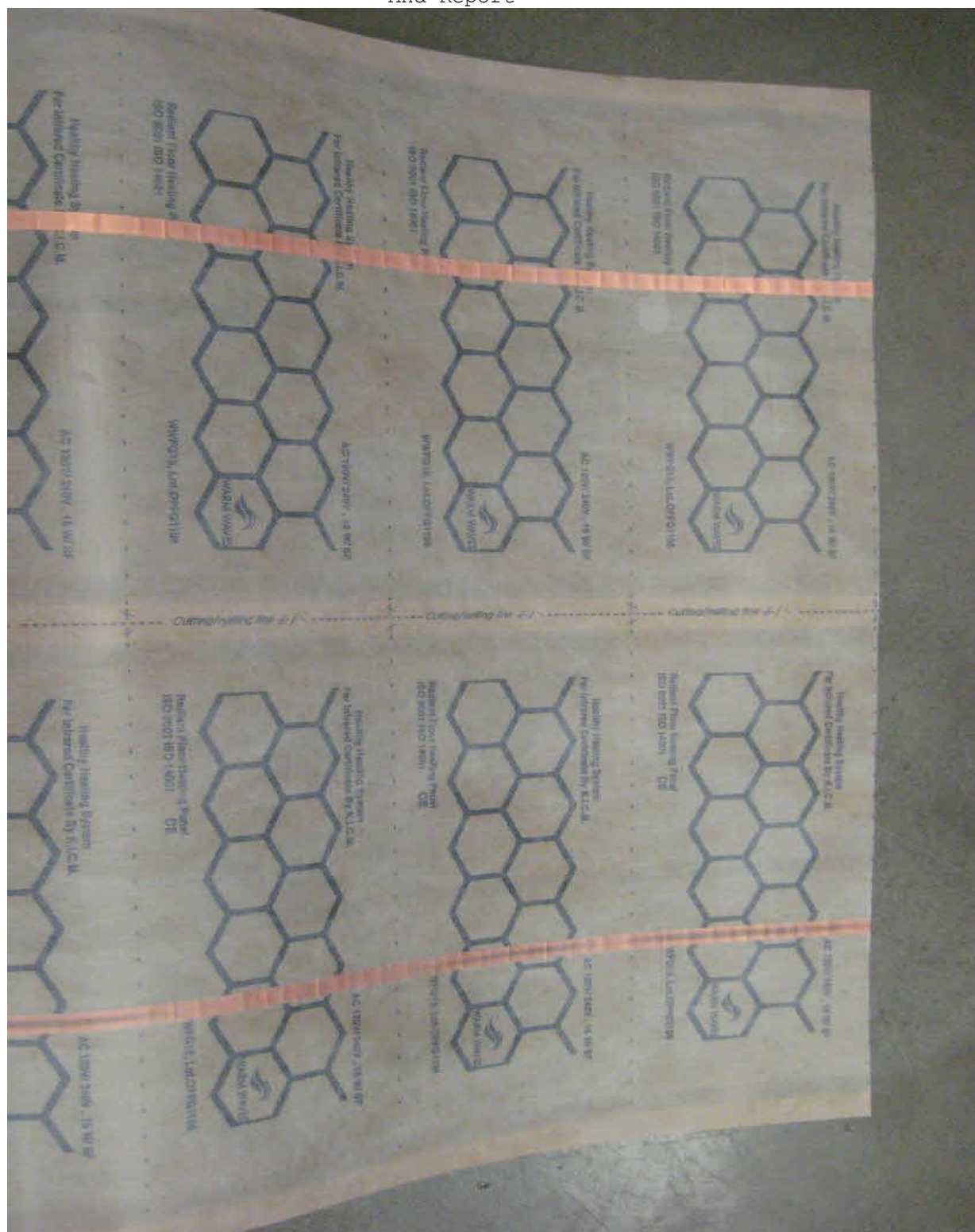
F. Carbon Conductive Honeycomb (111) - Sinsung Chemical Co. Ltd., Designated SEG-603A. Minimum 1107 Ohm per square foot when measured in a 120Vac wiring configuration and minimum 4430 ohm per square foot when measured in a 240Vac wiring configuration.

G. Copper Buss (112) - Two or three provided. Two located on either edge and third located in the center, all in parallel. Copper. Measures 15.0±0.1 mm wide and 0.060±0.005 mm thick. A 1.6 mm or greater inert border is provided between the Copper Buss and the edges.

H. **Adhesive - Optional. May be applied to bottom of Heating Mat.**



C131450807



C131450808



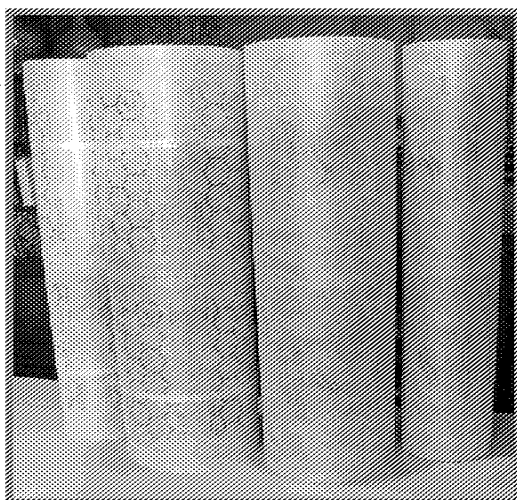
C131450809



Certified Underwriters
Laboratories Inc & UL 1683



WARM WAVES



**Design,
Assembly and
Installation Manual
Stone and Tile
WWF13NW 120/240 V
WWF13GNW 120/240 V**

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This document is for
UL Underwriters
Laboratory Review.
There are no
representations or
warranties. This is not
an approved
Installation Manual.

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For additional information regarding any aspect of installation, please contact us at:

www.warmwaves.com

Phone: 877-309-WARM (9276)

E-mail: ilnfo@warmwaves.com

All information in this manual may be updated without notice.

Cautions and Warnings



This symbol indicates safety cautions and warnings. This symbol alerts you to potential hazards that can hurt you and others in serious personal injuries or damage to property. You must read and follow the cautions and warnings for safety.



This symbol indicates that a electric hazard and shock may exist if a particular action is not followed.



This symbol indicates that an electrical hazard may cause a fire if a particular action is not followed



The Warm Waves Heating System shall be installed only by qualified personnel who are familiar with the construction and operation of the apparatus and the risks involved. The requirement that the installation shall be made in accordance with Article 424, of the National Electrical Code, ANSI/NFPA 70.



If the Warm Waves Heating System is not installed properly, fire or shock could occur resulting in serious personal injuries or damage to property. You must follow the instructions, warnings and cautions contained in this manual.



Make sure that the work area is always neat and clean prior to any installation of Warm Waves. Nails, screws, and other sharp debris can damage the panels. Any and all panels that are torn or penetrated must be discarded. Be sure the subfloor is clean, rigid, flat, level, and free of cracks

The installation of this heating product shall be in accordance with the manufacturer's instructions and regulations of the authority having jurisdiction.



Before installation, check the electrical capacity of the area. It should be enough for the total output of the film. All wiring, fuse, and /or circuit breaker must conform to National Electric Codes. Appointed thermostat must be used and it must have a ground fault circuit interrupter (GFCI) to prevent electrical hazards. Do not allow any electrical cable to cross themselves or each other.



Do not install over expansion joints. Follow the manufacturer's instructions. Heating Mats should never be installed at or below 32 Degrees F.

Never install one mat on top of another or overlap the mat on itself. This will cause dangerous overheating. Don't forget to install the floor sensor. Do not install Warm Waves in any walls. Do not install mats under cabinets or other built-ins. Excessive heat will build up in these small spaces, and the mat can be damaged by fasteners (nails, screws, etc.) used to install built-ins



Always refer to the TCNA Handbook recommendations and ANSI references for proper substrate needed for thin-set tile installations and for recommendations on proper Movement Joints within the plane of the tile per Detail EJ-171.

Cautions and Warnings

Product Description

The Warm Waves under floor heating system is designed to be embedded in thin-set mortar. It will create warm comfortable floors. It is possible to use Warm Waves for primary heat when properly designed for the specific space and environment.

Warm Waves is a low density group of heating panels. It is recommended to cover the majority of open floor space to create optimal comfort.

Warm Waves Heating mats draw 13 watts per Sq/ft providing even heating throughout the mat. The system can be wired in 120v or 240v. Floor temperature is controlled by a programmable thermostat (refer to the controller specifications section). The maximum shipping size of the product is 40 inches in width and 328 feet in length. The maximum usable size per panel is 32 feet long for a 120v wired panel and 64 Feet for a 240v wired panel.

Warm Wave panels are designed for thin-set applications only. Any finished flooring surface cannot exceed R-1. The Warm Waves Heating panels are designed to be imbedded underneath the following surfaces.

- A. High Density floors
- B. Engineered Wood floors
- C. Natural Stone Floors
- D. Ceramic Tiles

Always refer to the TCNA Handbook recommendations and ANSI references for proper substrate needed for thin-set installations and for recommendations on proper movement joints within the plane of the tile per detail EJ-171.



10 Year Limited Warranty

The Warm Waves heating system standard warranty is 10 years for the film from the date of purchase. This warranty is for the film only from the date of purchase. The warranty system is activated when Manufacturer returns a warranty card. The warranty card is mailed to the address of the installation only after the system registration card is received by the manufacturer, who is not responsible for lost or misdirected mail.



Documentation

The Check List and Registration defines in detail the installation just performed. All information must be filled out. There are three copies. One should be left with the homeowner and one retained by the installer and the final submitted to the Manufacturer.



The manual must be attached to the service panel and must be easily recognizable and accessible. This can help the homeowner or contractor define any problems and solutions.

Important Notes to Assemblers and Installers

This manual contains the information required to design, assemble and install the Warm Waves radiant heating panel product being described. **Completely Read This Manual Before Installing the Product.** This manual serves as the document and information of record for installation. No other information or representations, including verbal, supersede or replace the information in this manual.



- ALL REQUIRED INSPECTIONS MUST BE COMPLETED BEFORE COVERING THE WARM WAVES FILM INSTALLATION.

- The installation of this heating product must be in accordance with the manufacturer's Instructions and the regulations of the authority having jurisdiction.



- Only personnel licensed for and familiar with the local and national electrical codes should be conducting the electrical installation.



- The installation of this heating product shall be in accordance with article 424, of the National Electrical Code, ANSI/NFPA 70.



- Thin-set used in the installation must be cured for 28 days before energizing mats. It is the responsibility of the installer to ensure that the thin-set has cured to prevent residual conductivity that would trip the thermostat GFCI.



- The product must not be used in any way other than described in this manual. The Warm Waves must be connected to a **dedicated 20 amp** electrical circuit.



- DO NOT overlap the film.



- 240 VAC power is connected to the 2 outer embedded copper strips. 120 VAC power is connected to all 3 embedded copper strips.



- Indicate and label on the electrical panel which circuit is used for the electric floor heating system.



- It is mandatory to install a Class "A" GFCI or GFCI circuit breaker with each Warm Waves Installation. DO NOT have multiple GFCI's on a single circuit as this can cause inadvertent tripping.



- DO NOT USE sharp tools or power tools to clean grout lines. Cleaning grout lines with sharp tools or power tools may damage the film and will void the warranty.



- Subfloor must be prepared in accordance to ANSI specifications.



- The ambient air temperature must be above 0° C or 32° F when the Warm Waves film is being installed.




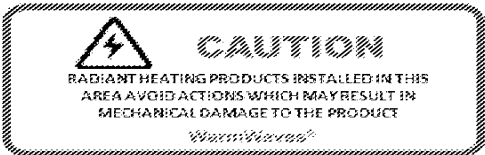

- The maximum R value of all floor coverings is R-1

Product Description

- Warm Waves film can be field cut and configured, eliminating the necessity to be wired and sized in the factory.
- The Warm Waves film is supplied in a roll. It can be cut to length, as well as cut from its 40 inch width to 20 inches, in order to accommodate the layout of a given installation.
- Virtually any size room and installation can be accommodated.
- A Warm Waves layout can be “changed on the fly” if there is a change or unanticipated condition at the point of installation. This is a significant advantage over factory-built systems.
- The product can be wired for either 120 VAC or 240 VAC power.
- Warm Waves is rated for 13 watts per square foot of film, which produces 42 BTU per square foot.
- Warm Waves heating panels temperature can be limited to a specific set point if the flooring material requires it.
- An installation uses a Dual Input Thermostat, which provides control from both a floor sensor and from the ambient air temperature. Floor temperature can be limited in this fashion. Room temperature can be controlled at a comfortable setting. “A/F Mode” controls the floor temperature and room temperature together.
- Warm Waves comes with a 10 year limited warranty.
- This manual covers the use of Warm Waves film specifically for installations that require fully embedded in thin-set installations
- Warm Waves can be covered with carpet, vinyl or hardwood if the mat is installed in a minimum of 3/8” cement- based or gypsum-based material to provide a rigid surface which to install the material
- Use of anti-fracture membranes and underlayment for stone and tile is allowed. Warm Waves should be installed above the membrane.

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There are no representations or warranties. This is not an
approved Installation Manual.

Warm Waves Components

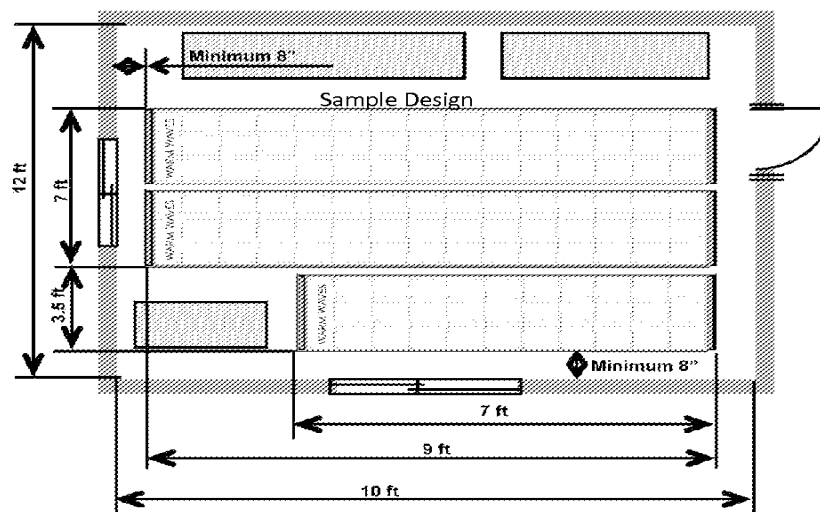
Product	Description
Warm Waves Heating panels	Warm Waves Heating Panels cut to the specific size you determine.
Thermostat and or controller	UL Listed thermostat. The capacity of the thermostat must be 20% greater then the installed heating load. If relays are used, a low voltage control thermostat may be used.
Junction Boxes	Use junction boxes to house relays and the thermostat. Size the boxes to the specific use required.
Multi-Meter or OHM Meter	An ohm meter is required to measure the resistance prior to heating to panels. A digital meter is recommended.
This instruction and operating manual	A full review and understanding of this document is required prior to starting an installation
Warning Labels	WW13WAR
Affix to the electrical panel. Record the number of systems installed. Along with a amp, watts and ohm reading.	
Affix to other points of access where the wiring or heating panels are accessible.	WW13CAU
	
Affix to the device that is controlling the Warm Waves heating panel system.	WW13JUN
	

Section 1 Designing System

Step 1 Designing the Warm Waves Panel system

Design the Warm Waves Heating System

- Measure and design the installation area. (Net: film area and gross: total space area)
- Determine the total output of the system based on the next section



Sample Design

Total area	Gross Area	120 ft ²	In total
	Net area	87.5 ft ²	WWF13GNW 240V
	Total Amp	Amp 4.7	0.054A/ ft ² *87.5 ft ²
	Total Watt	WATT 1140	13W / ft ² *87.5 ft ²

Your Design

Total area	Gross Area	ft ²	in total
	Net area	ft ²	Warm waves Heating system
	Total Amp	Amp	
	Total Watt	WATT	

Section 1 Designing System

Step 2 Choosing the Correct Panels and Power

Recommended for this Use	WWF13 NW 120v	WWF13N W 240V	WWF13G NW 120V	WWF13GNW 240V
Heating a tile room	Good	Great	Good	Great
Heating over an non insulated space	OK	Great	OK	Great
Heating a kitchen floor	Good	Great	Good	Great
Heating more than 138 SF	NO	Great	NO	Great
Heating a basement floor	OK	Great	OK	Great
Heating a room over a garage	OK	Great	OK	Great
Misc large installations	OK	Great	OK	Great

Choosing a Heating Panel

Review the chart above and decide the panel for your intended use. As a rule if 240V is available we recommend it.

Assuming you plan to heat a tile room like the prior drawings. You will need to assemble three individual mats. In this case we will use the WWF13GNW 120V Heating Panel.

The first thing you want to do is unroll the panel on a clean flat surface. Make sure its free and clear of anything that might damage it. It might be easiest to put it on a work table if available.

Second measure the exact length and the exact width of the panel. For quick reference the panels are roughly 8 inches apart and they can be cut down to 20 inches in width.

After you determine the exact length you can prepare to cut the panel to size. We advise sharp quality scissors for this phase.

Section 1 Designing System

Step 3 Calculating The Power Requirements

Power requirements and size of a single panel

Model	Overall Minimum Size	(Half Width) Overall Maximum section size	(Full Width) Overall Maximum Section size	Voltage, Vac.	Ohm/FT Squared	Amps/ft squared	Maximum Density W/ft squared	Maximum Length
WWF13NW	8in x 20in	1.7 ft x 32ft	3.35 ft x 32ft	120	1107	0.108	13	32
WWF13NW	8in x 20in	1.7 ft x 64ft	3.35 ft x 64ft	240	4430	0.054	13	64
WWF13GNW	8in x 20in	1.7 ft x 32 ft	3.35 ft x 32ft	120	1107	0.108	13	32
WWF13GNW	8in x 20in	1.7 ft x 64ft	3.35 ft x 64ft	240	4430	0.054	13	64

Power requirements and size of a system of panels

Model	Maximum Watts per individual panel	Maximum Amps per circuit	Maximum watts per system of panels	Voltage, Vac.	Maximum system of panels/SF
WWF13NW	1400	15	1800	120	138
WWF13NW	2800	15	3600	240	277
WWF13GNW	1400	15	1800	120	138
WWF13GNW	2800	15	3600	240	277

Model Name	WWF13GNW+ WWF13NW 240V	WWF13GNW+ WWF13NW 120V
Rated Voltage	240V-60Hz	120V-60Hz
Rated Amp	0.054~0.06 /ft ² ± 5%	0.105~0.115A /ft ² ± 5%
Power Output	~13 W /ft ² ± 5%	~13 W /ft ² ± 5%

Power requirements for example(Model WWF13GNW 240V)

Total area	Gross Area	120 ft ²	In total
	Net area	87.5 ft ²	WWF13GNW 240V
	Total Amp	Amp 4.725	0.054A/ ft ² *87.5 ft ²
	Total Watt	WATT 1137	13W / ft ² *87.5 ft ²

Watts per foot x sf =
total Watt
(13 x 87.5 =1137)
Net Sf x amp per
foot = total amp
(87.5 x.054 =4.725)



If the installation area exceeds the maximum installation area with 1 thermostat, install a relay slave in accordance with the capacity of recommended thermostat.



Do not design a system to exceed the above standard (Amp. & Watt):
Maximum output with 1 thermostat or Slave

Section 2 Assembling the Mat

Step 1 Materials and Tools Required

Product	Materials for Assembly
Warm Waves Heating panels	Warm Waves Heating Panels cut to the specific size you determine.
Electrical Wire	Listed. 14 AWG, Stranded, Type THWN or THWN-2g
Terminal connector	Tyco Amp 330716. This is the clip to be used to terminate the 14 gauge wires to the Warm Waves Heating panels.
Thin-set	Multi purpose and polymer. It must be mixed on site. Product should not be premixed.
This instruction and operating manual	A full review and understanding of this document is required prior to starting an installation
WW End Tape system For covering cold lead section	Eterna Bond Webseal or and 3m # 69 electrical tape. Or Glass cloth 600v tape.
WW End Tape system For covering bottom section	Eterna Bond Webseal or and 3m # 69 electrical tape. Or Glass cloth 600v tape.

Product	Tools for Assembly
Tape Measure	25 ft.
Crimp	LS-01.
Knife/ Scissors	Heavy gauge scissors or utility knife
Wire stripper	Stripper and cutter
thermometer	Infrared Thermometer
Multi-meter	Amp. W. Ω



After you assemble the materials and tools required you can begin assembling the mat. Take your design and calculations and prepare a clean working area. It is advisable to assemble the mats on a clean sturdy table and then move the assembled mats into the installation area.

Section 2 Assembling the Mat

Step 2 Cutting The heating panels

Working With the Film – Cutting Film

Warm Waves film can be cut and wired in the field.

Precautions:



Only cut on the dashed cut lines that are clearly marked on the film



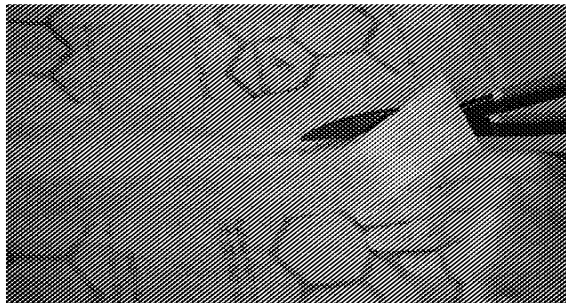
The film can only be divided in half at the center cut line only.



Care should be taken on the WWF13GNW film **to never cut the honeycomb pattern**. Cut the film only on the dotted cut lines. Refer to section "Working with the film" for further instruction

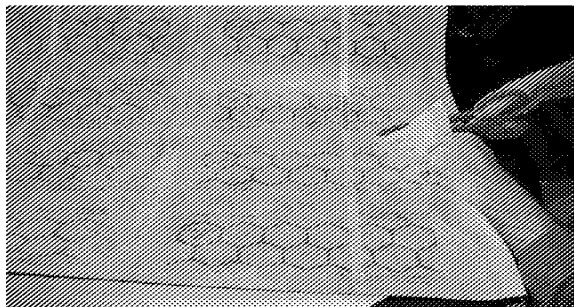


Insulate the cut edge of film WW end tape system as noted in the materials list.



Assembling WWF13GNW for 120 VOLTS application

Cut film in half only on
the center cut line

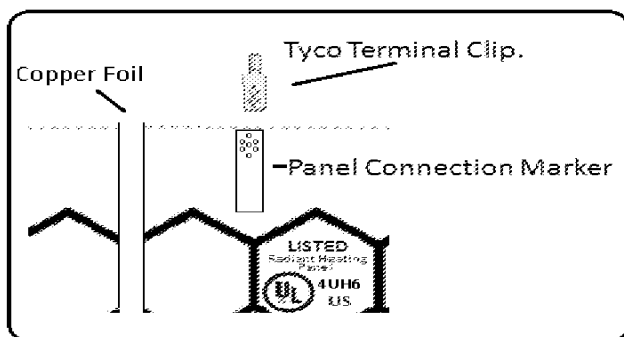
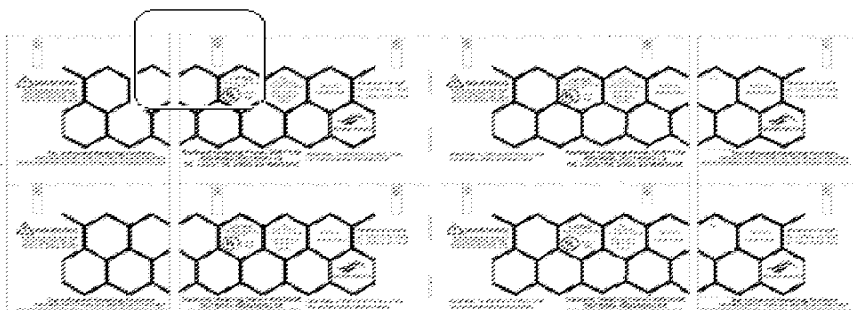


Cut to length in the
field only
on the cut lines
marked every
8 inches

Section 2 Assembling the Mat

Step 3 Identify Panel Connection Markers and Tune Crimping Tool

Notice there are three Connection Markers on each panel. You can also notice a visible copper foil wire running vertically to the left or right of center. These markers are the connection points to the power source. The wiring is simple but different for 120V versions and 240V versions. A simple way to think about it is 240V has more power and sf. Potential. 120V has less power and less square foot potential.



Find the 3 copper "Panel Connection Markers" Shown on the panel. If you are assembling a full 40" width panel there will be 6 "Panel Connection Markers" and two copper foils.

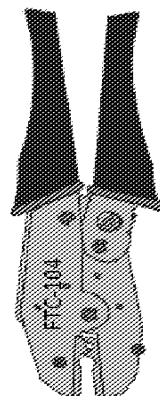
NOTE: The "Copper Foil Wire" can be clearly seen. The 3 Conductor electrical copper foils are located directly under the "Panel Connection Marker"

Checking the Crimping Tool

Before fixing the crimp connectors check that the LS- 01 crimping tool is correctly adjusted to the required 1.25-1.40mm (50-55 thou.) gap when fully closed.

If adjustment is required:

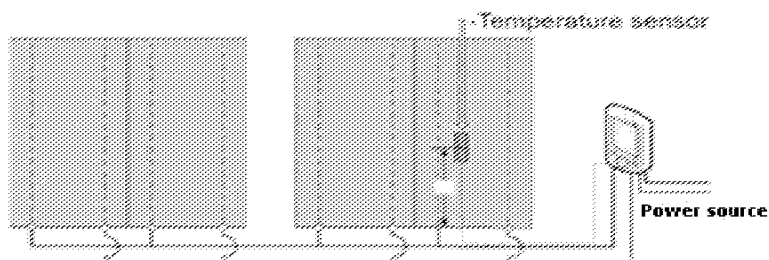
1. Remove the retaining ring or the locking screw from the eccentric axle.
2. Where fitted, remove the toothed lock washer and turn the axle to loosen or tighten the tool adjustment.
3. Alternatively, move the toothed washer in the direction indicated to loosen or tighten the tool adjustment.
4. Replace lock washer with retainer ring/bolt or the locking screw.
5. Recheck the flat parallel jaw gap with a feeler gauge.



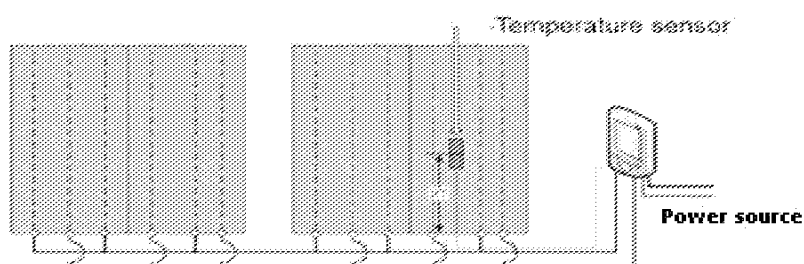
Section 2 Assembling the Mat

Step 4 Identify Wiring Pattern for Use

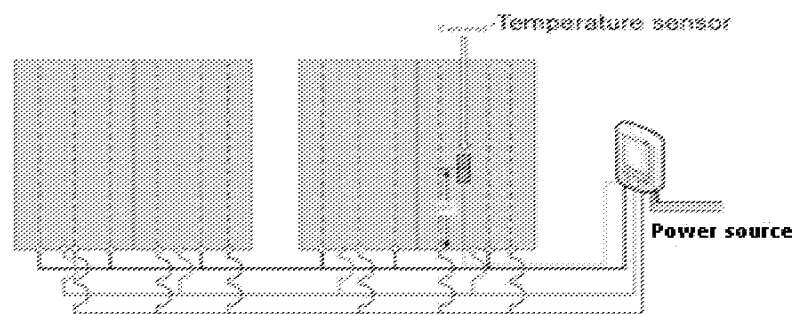
Follow the circuit diagram for each model.



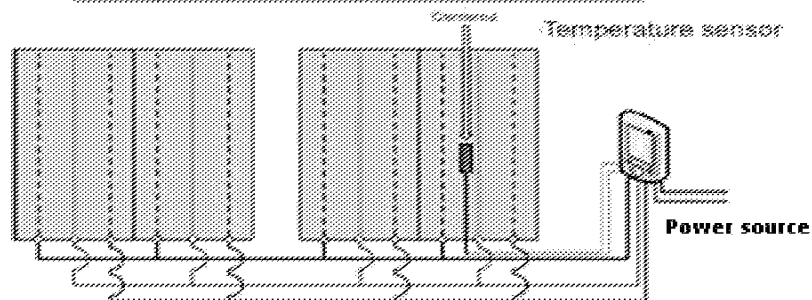
A. Wiring diagram for Model no. WWF13NW Wired for a 240VAC application



B. Wiring diagram for Model no. WWF13NW for 120VAC application



C. Wiring diagram for Model no. WWF13GNW for A 120VAC application



D. Wiring diagram for Model no. WWF13GNW for A 240VAC application

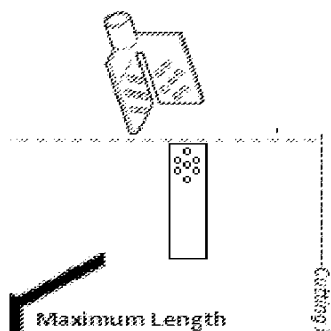
Section 2 Assembling the Mat

Step 5 Connecting the Terminal to the Mats

Use only the IS-01 crimping pliers supplied. Attach metal clip connectors to all copper conductors at one end of the element. Locate the crimp centrally on the end of the copper strip, then fold shut between thumb and forefinger.

The crimping pliers are now utilized with 2 diagonal applications (firstly from the hinge side of the crimp, and then from the open side) to ensure that the whole area of the crimp in contact with the element is pressed flat. The ratchet mechanism on these pliers prevents the jaws being opened until the correct pressure has been applied.

NOTE: First crimp clip to copper strip then connect wire to clip.



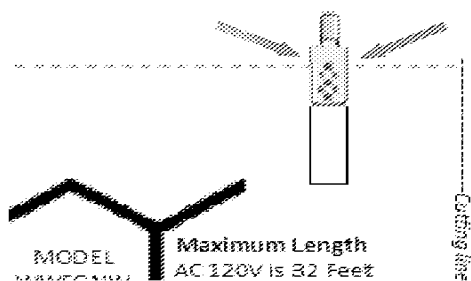
Use one of the Tyco amp terminal connectors.

Line up the dotted holes of the Tyco terminal with the dots on the "Panel Connection Marker."

Fold the Tyco Terminal over the edge of the heating panel. Use your thumb and forefinger.

Make sure the Tyco terminal is seated on the "Panel Connection Marker" and covers all of the dots.

Close up View
Tyco Terminal Clip.
Panel Connection Marker



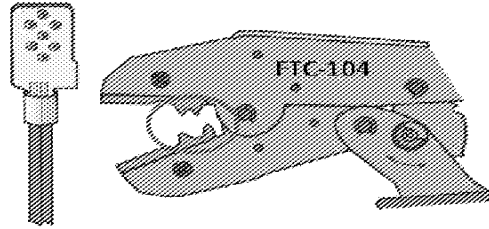
The crimping pliers are now utilized with 2 diagonal applications (first, from the hinge side of the crimp, and then from the open side) to ensure that the whole area of the crimp in contact with the element is pressed flat. The ratchet mechanism on these pliers prevents the jaws being opened until the correct pressure has been applied.

NOTE: First crimp clip to "Panel Connection Marker" then connect wires to Terminal connector.

Section 2 Assembling the Mat

Step 6 Crimping terminal to the mat.

Attaching Tyco Amp 330716 Clips To the cold Leads



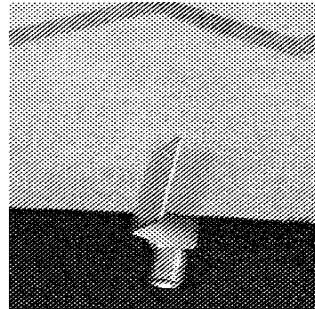
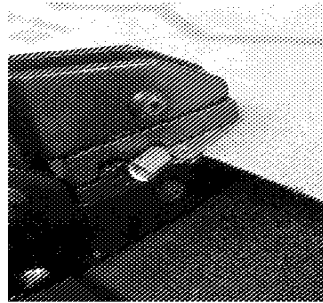
Strip wires and insert
Singly or in pairs into the
cylindrical ferrule of the crimp
connector. Hold back wires from
heating panels.



2 wires may be attached to the clip. Use the recommended tool so that the "W" form of the tool is to the seamed side of the cylindrical female of the crimp.

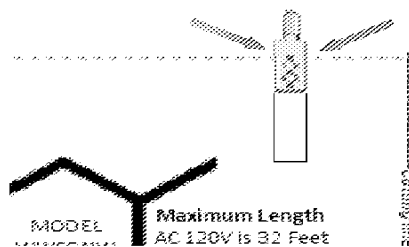


Standard pliers must not be used for this operation as crimps fitted incorrectly, may overheat due to high contact resistance






Crimp Clip twice, 45 degrees on
both sides

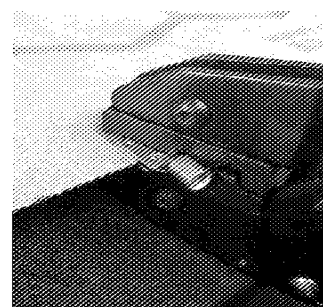
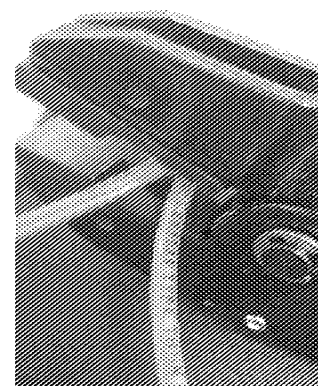
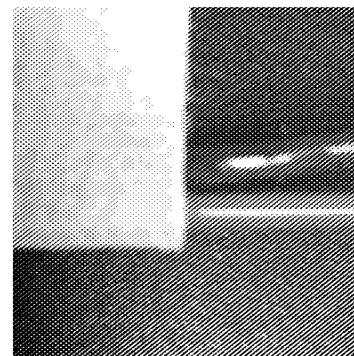
Crimp Wire/s



Section 2 Preparing for Cold Leads

Step 7 Defining Cold Leads

Action	Description
Define Cold lead	The wires that start at the heating panel and are to be run to the conduit system are called cold leads. They are attached to the terminal amp connectors..
Length	Cold leads should be installed so that the entire cold lead can reach the junction box or reach the thermostat connection. Small connecting cold leads encapsulated in the mat should be trimmed to size.
Purpose	The cold leads are the power wires to the amp terminals installed to the heating panels. The wires inside of the end tape are cold lead components of the mat. The wires outside of the end tape are cold leads, These need to be long enough to reach the thermostat or junction box.
Organize wires 	Connect the cold leads and cold lead components by strictly following the wiring layout in section 2 step 4. Make sure to wire the mats exactly as shown and to connect to the terminals exactly as shown in section 2 step 6.
Caution 	Cold leads must never pass over heating panels.
Smoothing out 	Make sure all connections are calibrated, firm and wired correctly. Make sure that your final home run cold leads are long enough to reach the thermostat or junction box.



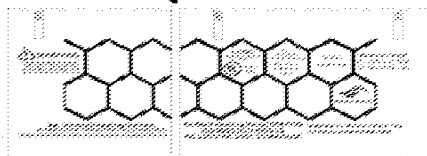
Section 2 Assembling the Mat

Step 8 Capacitance Wire

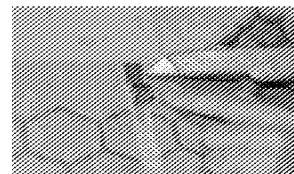
Working With the Film – Capacitance Collection wire Only on The WWF13GNW. 120V and 240V Panels.

Locate the flat visible copper foil wire, which is the only easily visible copper foil wire. With a utility knife, carefully cut the PET covering the copper foil wire making sure not to cut into PET below this wire. Peel back 2 inches on both the wired side on the top of the panel and the bottom of the panel. On the wired end, attach the clip to the copper foil wire and secure with Tyco AMP 330716. Seal with Electrical tape. On the dead end, fold the copper strip back from the cut end and secure with WW end tape system.

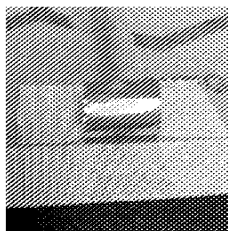
Copper Foil



Locate the flat visible copper foil wire. It is the only easily visible copper foil wire.

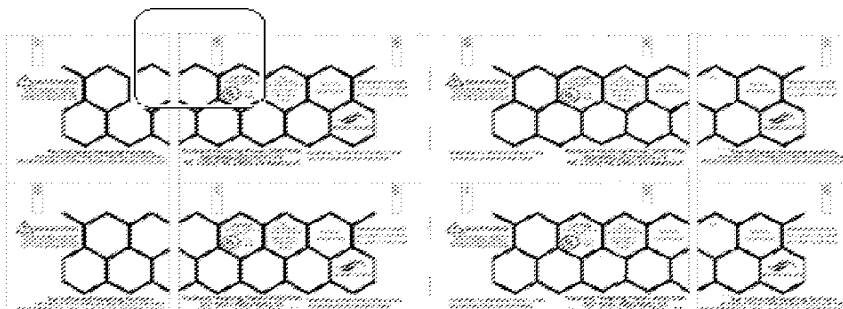
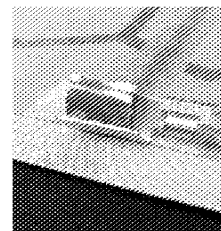


With a utility knife, carefully cut the PET covering the copper foil wire making sure not to cut into PET below the foil wire.




Carefully separate the copper foil wire. Fold this wire back. Don't cut PET below. Fold back 1 inch on the top of the heating panel. If your panel is cut to the desired length, strip the bottom of the panel back the same 1 inch.

You must make sure the bottom of the panel is striped back and taped. If it is not it has the potential to become conductive. Peel it back and fold it over and tape it flat to the panel

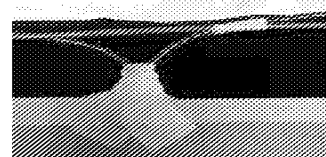
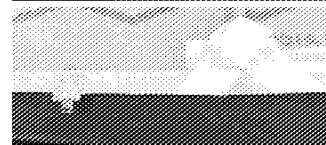
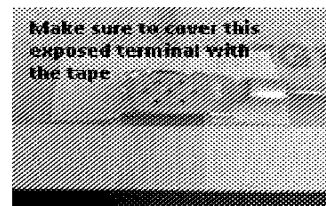


Section 2 Assembling the Mat

Step 9 Installing the 3M #69 tape system Section with terminals

Make sure the tape system completely covers the AMP clips. 

Action	Description
Preparing end tape for the top of the film that protects the connections	Lay the film on a flat clean surface. From one end to the other tape over all AMP connectors. This should leave a 1/4" extension over the edge of the film. Carefully cut tape on the sides of the clips and fold tape under the film.
Capacitance connection	If the film Chosen has a capacitance connection. Connect it now and fold the connection over the small piece of protective tape.
Completely cover all terminal connections	After all connectors are secured to the panel tape over any exposed connector areas and exposed wires. Crisscross 2 pieces of tape and mirror the taping on the back side of the film. IF for any reason there is bare metal or wires exposed continue to add tape until completely covered.
Capacitance connector	Cover the capacitance connector in the same manner as the other connectors with a crisscross pattern.
Organize wires	It is a good idea to organize the wires using the tape to keep them together. This will help when installing the end tape cover.
Sealing the top	Before you go to the next step. Flip the film over and mark one inch below the tape fold over. Draw a parallel line one inch down.
Smoothing out	Take a piece of the discarded tape cover or smooth cardboard and rub it over the wires and tape to assure a good bond.



Section 2 Assembling the Mat

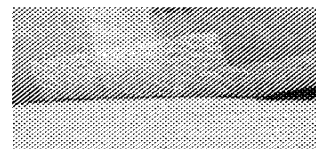
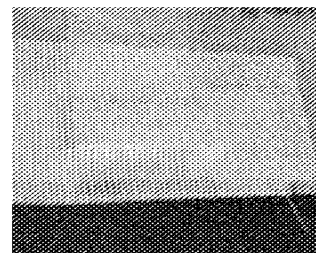
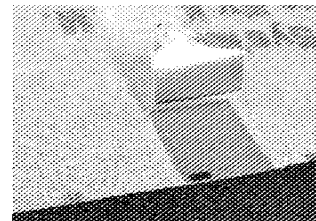
Step 9.1 Installing the 3M #69 tape system Bottom section of Film with no terminals



Warning:

Make sure that the copper foil ON THE NON WIRED END has been folded over and is not touching the end of the heating panel. This can make the copper foil conductive.

Action	Description
Preparing end tape for the Bottom of the film Section with no wires	Peel back the copper strip. If there is a capacitance wire on the panel.
Capacitance coverage	Fold the wire back on its self. Make sure the fold is at least ½ inch from the edge of the film.. Place a small strip of tape and wrap it to the back side.
Completely cover the folded over copper tab	Place another piece of tape large enough to cover the fold and to securely adhere to the film .
Capacitance connector. I	Take a full strip of tape and place it under the film. Fold the entire length to the front. Make sure there is equal coverage on both sides of the film.
Smooth out tape	Cover this entire end of the film with the end tape cover and smooth the end with left over release paper.



Section 2 Assembling the Mat.

Step 10 Cover the top and bottom of panel with Eterna Bond end tape.

Eterna bond 6" and 2" width.

Release ½ of the liner of the 6 inch wide Eterna bond. Place the Eterna bond on the back side of the film. The tape should line up with the 1 inch marking you did in the last section

Rout the wires (from the front side) in the sticky part created by putting the Eterna bond from the back side installation

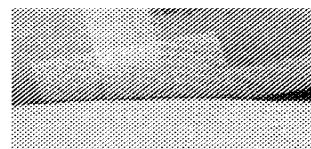
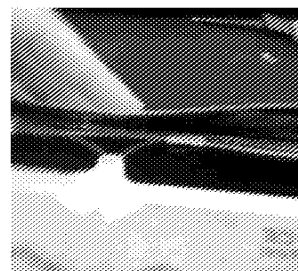
Run the final connections out of the mat. These wires are the cold leads that will be connected to the thermostat and the power source.

When you are satisfied with the wire locations slowly peel off the front section of liner and cover the front side.

Take a waste piece of the release liner and use it to smooth out the Eterna bond cover.

Trim the over lap of the Eterna bond cover on an angle back to the film.

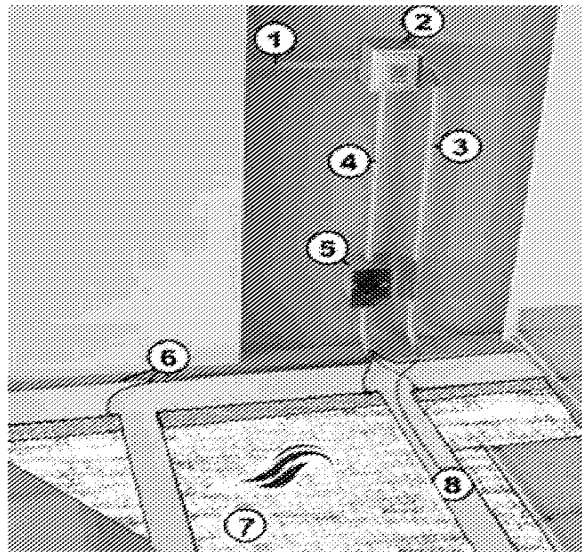
Repeat this process with the 2 inch Eterna bond for the bottom side of the panel (area with no wires)



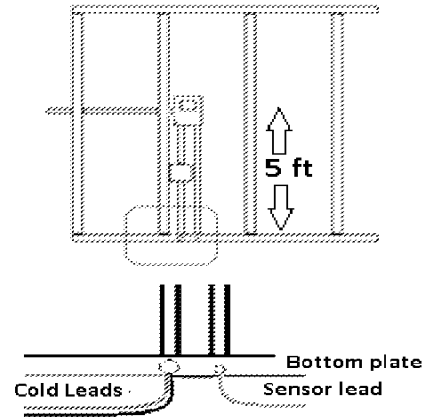
Section 3 Wiring

Step 1 Roughing in the cold leads

Roughing in the cold leads to the power source and thermostat.



For clarity, the framing members have been removed. Note the line drawing to show standard framing and the bottom plate



1. Power source
2. Thermostat 4 " square
3. Conduit for the sensor line
4. Conduit for the cold leads
5. Junction box if needed
6. Cold leads
7. Warm Waves Heating panels
8. Sensor



Type NM and NMC non-metallic sheathed cable is not suitable for installing the product. UL797, UL1242, UL6, BS4568, BS31 UL listed conduit is required for all installations.



The cold leads of the heating products shall be suitable for the applied voltage and the temperature to which they are subjected under normal and abnormal operating conditions and shall be the following.



The installation of this heating product shall be in accordance with article 424, of the National Electrical Code, ANSI/NFPA 70.



Caution: Use copper only as supply conductor.

Section 3 Wiring

Step 2 Preparation Before Installation



Confirm the electric capacity of the installation location. It should be enough to accommodate the total output of the heating panels. The circuit breaker should be rated for a maximum of 20 amps (no greater than a 15 amp load). Determine how many thermostats should be needed and the location of each thermostat and /or relay. Drill or cut hole for electrical junction box. Make groove for the path of wires (power & sensor). Never install one mat on top of another or overlap the mat on itself. This will cause dangerous overheating. Do not forget to install the floor sensor.



Be sure the subfloor is clean, rigid, flat, level, free of cracks and objects that can damage the film. **DO NOT INSTALL FILM OVER EXPANSION JOINT.**



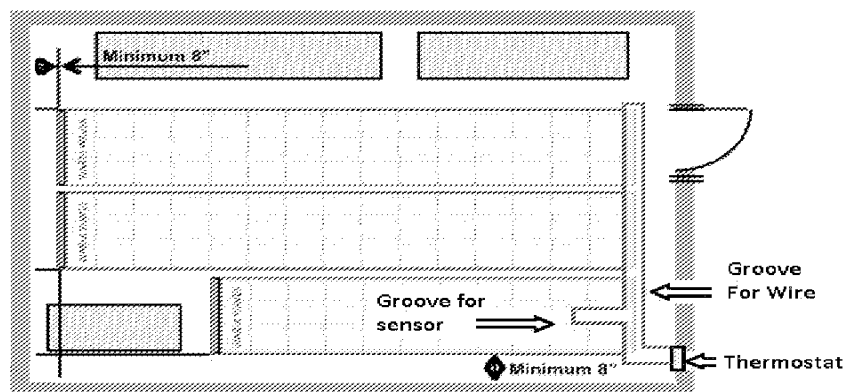
Heating Mats should never be installed at or below 32 degrees. Make sure that the work area is always neat and clean prior to any installation of Warm Waves. Nails, screws, and other sharp debris can damage the panels. Any and all panels that are torn or penetrated must be discarded.



Never install mats under cabinets or other built-ins. Excessive heat will build up in these small spaces, and the mat can be damaged by fasteners (nails, screws, etc.) used to install built-ins.



Always refer to the TCNA Handbook recommendations and ANSI references for proper substrate needed for thin-set tile installations and for recommendations on proper movement joints within the plane of the tile per Detail EJ-171.



Section 3 Wiring

Step 3 Wiring Resistance Inspection

A. Visual Inspection



Before finishing the floor, check carefully for damage or scratches that might have occurred during installation on the heating film. If any damage or scratches are found, you must replace the heating film.

B. Electrical Inspection without electric power input.

Check the resistance in total. The results must be

$$R(\text{Ohms}) = \frac{W}{I^2} \pm 10\%$$

I: Designed Amp.
(voltage factor X Sq Ft)
Voltage Factor - 120V = .108
- 240V = .054
W: Designed output

OHM test example-

- 20 Sq Ft
- 13 watts per ft
- 120 volt - Amps = .108 x Sq Ft

$$55 \text{ OHMs} = \frac{260 \text{ watts } (20 \text{ sq ft} \times 13 \text{ watt})}{4.66 \text{ Amp} = (20 \text{ sq ft} \times .108)^2}$$



Check all electric connection points and the path of electric wires. If all connections and wires are securely assembled proceed.



Result is Zero (0) System circuit is shorted. Check all electric connection points and the path of all electric wires. If damaged sections are found on the film or electrical parts, replace the entire panel. The terminal clips are designed to be used once. Then perform a recheck.



If the resistance is not matched with the limits, you should check all heating panel sections and the wiring. Fix the problems, then move to next step.

C. Electrical Inspection with Electric Power Input



After passing inspection "B," supply the rated power and check whether the heating panels work properly by using an infrared thermometer on the surface of the heating panels. (Check the heat on all panels.) If the surface temperature does not increase by 3 degrees F in one minute, repeat inspection A and B.

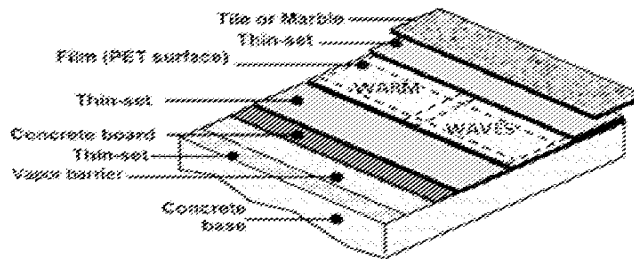


Route and secure wires between heating panels and the power source or junction box using code mandated wiring practices.

Section 4 Installation of System

Step 1-A Installing System in a Concrete Base

Installing Warm Waves in a Concrete Base for Stone and Tile Option



	Spec	Thickness	How to Install
Tile or Marble	-	Per supplier	Refer to Manufacturer's guide
Thin-set	-	3/8"	
Warm Waves	Non Woven Surface	1/32 "	
Thin-set	-	3/8"	Refer to Manufacturer's guide
Concrete Board optional	Concrete Board	3/8"	Refer to Manufacturer's guide
Vapor Barrier	-	1/32"	
Base	Concrete	-	



NOTE: Do not apply mats to floors where hydrostatic or moisture vapor rate emissions exist above 4 lbs per 1,000 sq in 24 hours per the Calcium Chloride test method.



Refer to the TCNA Handbook recommendations and ANSI references for proper substrate needed for thin-set tile installations and for recommendations on proper Movement Joints within the plane of the tile per Detail EJ-171.

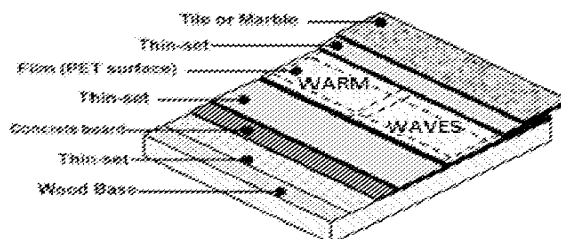


ALWAYS: Completely embed the heating mats and connection in mortar (tile and stone) or self-leveling underlayment (lamine and non-masonry) materials.

Section 4 Installation of System

Step 1-B Installing System in a Wood Base

Installing Warm Waves in a Wood Base for Stone and Tile Option



	Spec	Thickness	How to Install
Tile or Marble	-	Per supplier	Refer to Manufacturer's guide
Thin-set	-	3/8"	
Warm Waves	Non Woven Surface	1/32"	
Thin-set	-	3/8"	Refer to Manufacturer's guide
Concrete Board	Concrete Board	3/8"	Refer to Manufacturer's guide
Thin-set	-	3/8"	
Base	Wood	-	



NOTE: Do not apply mats to floors where hydrostatic or moisture vapor rate emissions exist above 4 lbs per 1,000 sq in 24 hours per the Calcium Chloride test method.



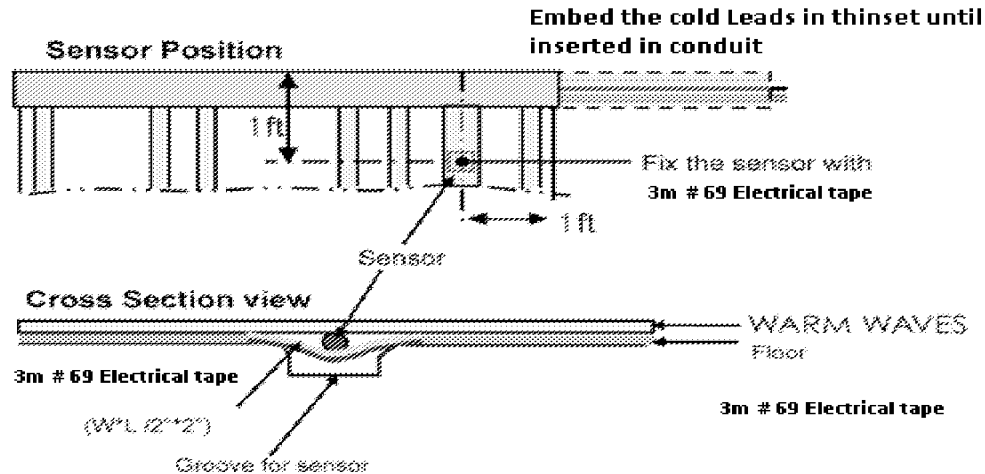
Refer to the TCNA Handbook recommendations and ANSI references for proper substrate needed for thin-set tile installations and for recommendations on proper Movement Joints within the plane of the tile per Detail EJ-171.



ALWAYS: Completely embed the heating mats and connection in mortar (tile and stone) or self-leveling underlayment (lamine and non-masonry) materials.

Section 4 Installation of System

Step 2 Installing Sensor and Thermostat



Thermostat and Sensor Requirements



A line Voltage thermostat that measures ambient air temperature and floor temperature through a sensor must be installed. A low voltage controller can be used if it controls slave relays that are required if the heating panels are larger than the maximum power requirements.



The thermostat is required to have a built in GFCI and must be rated to handle the required voltage.



The installation of this heating product shall be in accordance with article 424, of the National Electrical Code, ANSI/NFPA 70.



Affix to the device that is controlling the Warm Waves heating panel system.

WW13JUN

RADIANT FLOOR HEATING DEVICE

WarmWaves®

Section 4 Installation of System

Step 3 Connecting Sensor, Thermostat and Labels

Complete the installation.



With the flooring in place and cured to the manufacture's specifications, you can now complete the final hook up to the power and sensor system.



Install the control device thermostat and any required relays according the manufacturer's instructions to the junction box and the thermostat box.



Refer to the wiring section 3 step 1-6 for additional information regarding proper wiring and testing.

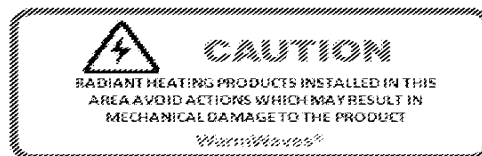


Make sure 28 days has passed prior to testing the heating output of the system.

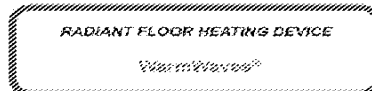
WW13WAR



WW13CAU



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Refer to the TCNA Handbook recommendations and ANSI references for proper substrate needed for thin-set tile installations and for recommendations on proper movement joints within the plane of the tile per detail EJ-171.

System Record (Information Card)**Customer Information**

Name			
Address			
Tel. Mobile Fax			
Installation Address			

Name			
Address			
Tel. Mobile Fax			
Installation Address			

**System Information
Designed Specification**

Location	Model name	Sq.ft	V	A	W

Inspection Data

Location	Model name	Sq.ft	V	A	W

**System Record
Sketch of the System***Diagram of circuit*

Location	Sq.ft	W	A	Model

This document is for UL Underwriters Laboratory Review. There are no representations or warranties. This is not an approved Installation Manual.

Diagram of circuit

Location	Sq.ft	W	A	Model

**System Record
Sketch of the System**



Certified Underwriters
Laboratories Inc & UL 1683



TEC™ Skill Set™ Heating Panel System



Design, Assembly and Installation Manual Stone and Tile

WWF13NW

15 Square Foot mat

26 Square Foot mat

50 Square Foot mat

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TEC™ Skill Set™ IN-FLOOR HEAT

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For additional information regarding any aspect of installation, please contact us at:

www.tecskillset.com

Phone: 800-832-9023

tecskillset.com

All information in this manual may be updated without notice.

Cautions and Warnings



This symbol indicates safety cautions and warnings. This symbol alerts you to potential hazards that can hurt you and others and result in serious personal injuries or damage to property. You must read and follow the cautions and warnings for safety.



This symbol indicates that an electric hazard and shock may exist if a particular action is not followed.



This symbol indicates that an electrical hazard may cause a fire if a particular action is not followed.



The TEC™ Skill Set™ heating system may only be installed by qualified personnel who are familiar with the construction and operation of the heating panels and the risks involved. The installation must be made in accordance with Article 424, of the National Electrical Code, ANSI/NFPA 70.



If the TEC™ Skill Set™ heating system is not installed properly, fire or shock could occur resulting in serious personal injuries or damage to property. You must follow the instructions, warnings and cautions contained in this manual.



Make sure that the work area is always neat and clean prior to any installation. Nails, screws, and other sharp objects and debris can damage the panels. Any and all panels that are torn or penetrated must be discarded. Be sure the subfloor is clean, rigid, flat, level, and free of cracks.



This heating product shall installed in accordance with the manufacturer's instructions and the regulations of any authority having jurisdiction over installation and use.



Do not install over expansion joints. Follow the manufacturer's instructions. Heating panels should never be installed at or below 32 Degrees F.



Before installation, check your available electrical capacity. It should be enough for the total output of your layout. All wiring, fuses, and/or circuit breakers must conform to National Electric Codes. A thermostat with a floor sensor must be used and it must have a ground fault circuit interrupter (GFCI) to prevent electrical hazards. Don't forget to install the floor sensor.



Never install one mat on top of another or overlap the mat on itself. Do not allow any electrical cables to cross themselves or each other. This will cause dangerous overheating. Do not install heating panels in any walls. Never install heating panels under cabinets or other built-ins. Excessive heat will build up in these small spaces, and the heating panels can be damaged by fasteners (nails, screws, etc.) used to install built-ins



Always refer to the TCNA Handbook recommendations and ANSI references for proper substrate needed for thin-set tile installations and for recommendations on proper movement of joints within the plane of the tile per Detail EJ-171.

General Information and Features

Product Description

TEC™ Skill Set™ IN-FLOOR HEAT is a low density heating device. It is recommended to cover the majority of open floor space to create optimal comfort.

The heating panels draw 13 watts per ft², providing even heating throughout each heating panel. Floor temperature is controlled by a programmable thermostat (refer to the controller specifications section).

The heating panels are designed for thin-set applications only. Any finished flooring surface cannot exceed R-1. The heating panels are designed to be imbedded underneath the following surfaces.

Natural Stone Floors
Ceramic Tile Floors

- 40" x 54" – 15 sq ft
- 40" x 90" – 26 sq ft
- 40" x 180" – 50 sq ft

Features

The heating panels are factory assembled, but can be cut to fit job requirements in the field.

A layout can be "changed on the fly" if there is a change or unanticipated condition at the point of installation. This is a significant advantage over other radiant heat systems.

Virtually any size room and installation can be accommodated.

The heating panels are rated for 13 watts/ft², which produces 42 BTU per square foot.

The temperature of the heating panels can be limited to a specific set point if the flooring material requires it.

TEC™ Skill Set™ IN-FLOOR HEAT uses a TEC™ Thermostat, which provides control from both a floor sensor and from ambient air temperature. Floor temperature can be limited in this fashion. Room temperature can be controlled at a comfortable setting. Ambient air temperature and floor temperature controls the floor temperature and room temperature together.

It is possible to use the heating panels for primary heat when properly designed for the specific space and environment.

This manual covers the use of the heating panels specifically for installations that require installations fully embedded in thinset.

Use of crack isolation membranes and underlayment for stone and tile is allowed. Heating panels should be installed above the membrane.



Always refer to the TCNA Handbook recommendations and ANSI references for proper substrate needed for thin-set installations and for recommendations on proper movement joints within the plane of the tile per detail EJ-171.



10 Year Limited Warranty and Activation

See tecskillset.com



Manual Availability

The manual must be attached to the service panel and must be easily recognizable and accessible. This can help the homeowner or contractor troubleshoot any problems and solutions.

Important Notes to Assemblers and Installers

This manual contains the information required to design, assemble and install the radiant heating panel product. **Completely Read This Manual Before Installing the product.** This manual serves as the document and information of record for installation. No other information or representations, including verbal, supersede or replace the information in this manual.



ALL REQUIRED INSPECTIONS MUST BE COMPLETED BEFORE COVERING THE HEATING PANEL INSTALLATION.



The installation of this heating product must be in accordance with the manufacturer's instructions and the regulations of any authority having jurisdiction over installation and use.



Only personnel licensed for and familiar with the local and national electrical codes should be conducting the electrical installation.



The installation of this heating product shall be in accordance with article 424, of the National Electrical Code, ANSI/NFPA 70.



Thinset used in the installation must be cured for 28 days before energizing mats. It is the responsibility of the installer to ensure that the thinset has cured to prevent residual conductivity that would trip the thermostat GFCI.



The product must not be used in any way other than described in this manual. The heating panels must be connected to a **dedicated 20 amp** electrical circuit.



DO NOT overlap the film.



Indicate and label on the electrical panel which circuit is used for the electric floor heating system.



It is mandatory to install a Class "A" GFCI or GFCI circuit breaker with each installation. DO NOT have multiple GFCI's on a single circuit as this can cause inadvertent tripping.



DO NOT USE sharp tools or power tools to clean grout lines. Cleaning grout lines with sharp tools or power tools may damage the film and will void the warranty.



Subfloor must be prepared in accordance to ANSI specifications.



The ambient air temperature must be above 50°F or 10°C when the heating panels are installed.



The maximum R value of all floor coverings is R-1

Components For Assembly and Installation

Product

Heating System
Boxed Product

Description

Heating panel, scissors to cut panel to fit job requirements, composite end tape to apply to cut end, Warning Labels and this Design, Assembly and Installation Manual.

TEC™ Thermostat and/or controller

UL Listed thermostat. The capacity of the TEC™ Thermostat must be 20% greater than the installed heating load. If relays are used, a low voltage control thermostat may be used.

Junction Boxes

Use junction boxes to house relays and the TEC™ Thermostat. Size the boxes to the specific use.

Thinset

Use latex modified thinset mortar to install panel. To set tile use latex modified mortar appropriate for tile size and type. Thinset must be mixed on-site. Product should not be premixed.

This instruction and operating manual

A full review and understanding of this document is required prior to starting installation.

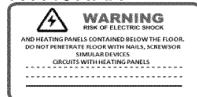
Warning Labels

WW13JUN



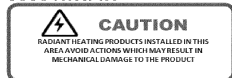
Affix to the device that is controlling the heating panel system.

WW13WAR



Affix to the electrical panel. Record the number of systems installed, along with amp, watt and ohm readings.

WW13CAU



Affix to other points of access where the wiring or heating panels are accessible.

Tools

Description

Tape Measure

25 ft.

Wire Stripper

Stripper and Cutter

Thermometer

Infrared Thermometer

Multi-Meter

Amp, Watts, Ohms. An Ohm meter is required to measure the resistance prior to energizing the heating panels. A digital meter is recommended

Scissors

Cutting utensil



After the materials and tools are assembled you can begin assembly and installation.

Section 1 Designing System

Step 1 Choosing the Correct Panels and Power

Review the chart below and choose the heating panel for your intended use.

Recommended for this Use	120v
Heating a tile room	Great
Heating over an non insulated space	Good
Heating a kitchen floor	Great
Heating more than 100 SF See Section 1, Step 3, Page 10	NO
Heating a basement floor	Good
Heating a room over a garage	Good
Misc large installations	Good

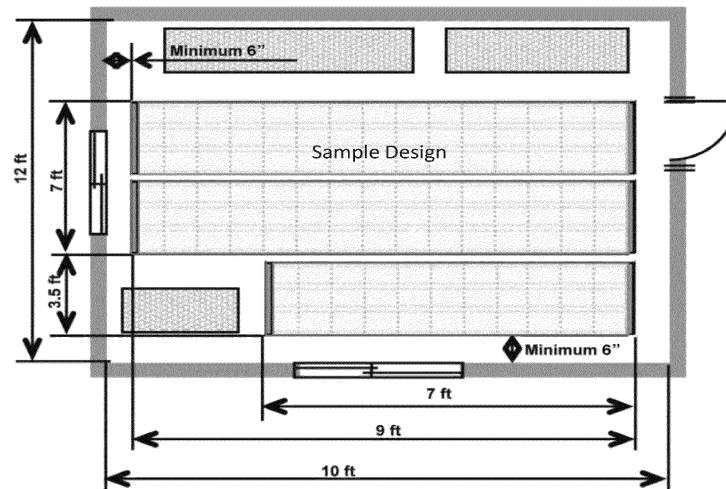


Never mix heating panels of different voltage ratings. Never use a different input voltage than rated for the heating panel

Section 1 Designing System

Step 2 Designing the Heating Panel System

Measure and design the installation area. Calculate the gross floor area of the room to be heated. In the example below it is 120 sq.ft. Calculate the "net area" which is the aggregate surface area of the heating panels to be installed. In this example it is 87.5 sq. ft.



Section 1 Designing System

Step 3 Calculating Power Requirements

Power requirements and size of a single panel

Minimum Panel Size	Voltage AC	40" Wide Panel Maximum Panel Size	Ohm/ft ²	Amps/ft ²	Maximum Density W/ft ²	Maximum Length
40 in x 8 in	120	40 in x 15 ft	22.65	0.108	13	15

Power requirements and size of a system of panels

Voltage AC	Maximum Watts per individual panel	Maximum Amps per circuit	Maximum watts per system of panels	Maximum system of panels/ft ²
120	650	12	1300	100

Power Calculation Formulas

Panel Type	120V AC
Rated Voltage	120V-60Hz
Rated Amp	0.105~0.115A /ft ² +5 or -10%
Power Output	~13 W /ft ² +5 or -10%

Power requirements for example (120V)

120V	Formula	Calculation
Net Area	87.5 ft ²	
Total Amp	0.105A/ ft ² x 87.5 ft ²	9.2 Total Amps
Total Watt	13W / ft ² x 87.5 ft ²	1137 Total Watts



If the installation area exceeds the maximum installation area with 1 TEC™ Thermostat, install a relay slave in accordance with the capacity of recommended TEC™ Thermostat.



Do not design a system to exceed the above maximum amp and watt output with 1 TEC™ Thermostat.

Section 1 Designing System

Step 4 Calculating Power Requirements for Your Design

Calculate your power requirements by completing the gray boxes in the following table. Be sure to perform the calculations only for the row that applies to the voltage of your system. .

120V AC	Formula			Calculation	
Net Area	Calculated in Step 2 above				
Total Amp	$0.105A / ft^2 \times$		$ft^2 =$		Total Amps
Total Watt	$13W / ft^2 \times$		$ft^2 =$		Total Watts

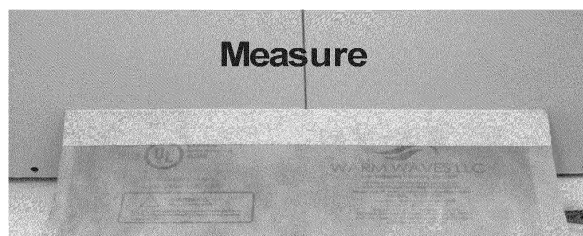
Section 1 Designing System

Step 5 Assembling Your Heating Panel

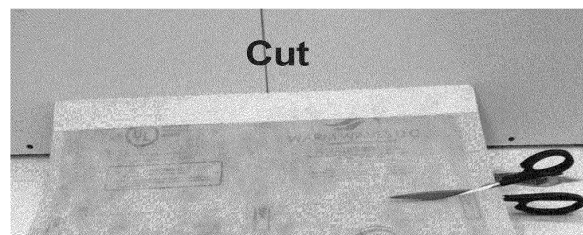
Using the floor layout example in Step 2, select two 40 inch by 10 foot heating panels, and one 40 inch by 8 foot heating panel. If there is no need to shorten the heating panel, continue with Installation under Section 2 Wiring. (The heating panels described in this section are for illustration purposes only. The actual product lengths may be different.)

Unroll each of the panels on a clean flat surface. Make sure each panel is free and clear of anything that might damage it. It is easiest to put them on a work table one at a time, if available.

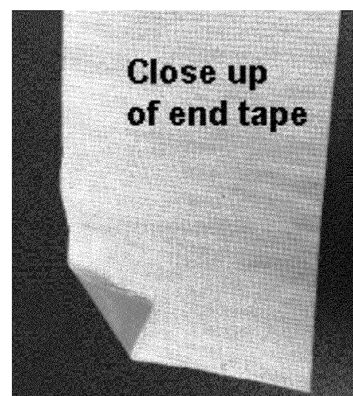
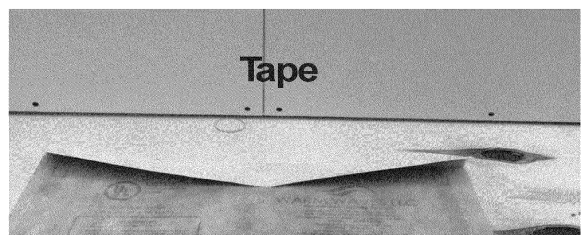
Measure how much of the panel has to be removed by jobsite measurement or simply placing the panel on the floor



Using the scissors supplied with the heat panels, cut the length of the two 10 foot panels at the cut line closest to the desired length, in this case, 9' (+). Similarly cut the 8' roll to 7' (+).



Apply the Cutting Edge End Tape to the cut end.



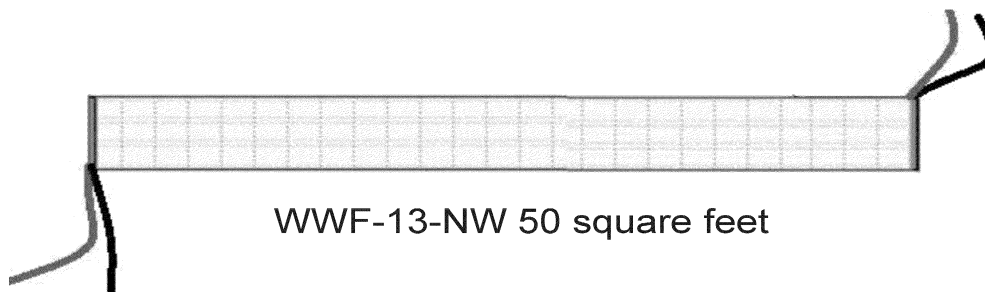
Special Procedures for Heating Panel # WWF-13-NW 50 square foot mat

Heating panel # TSS-13NW-50 must be cut into two segments along horizontal dashed cut lines printed on the panel. This panel is easily recognizable because it has power wires on both ends. Each segment may be individually connected to a power source after using the same power calculation, testing and installation methods described in other sections of this manual for each segment.

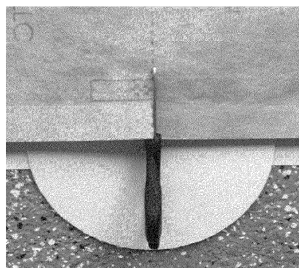


Do not connect either end of this film to a power source unless the panel has been completely cut into two segments, each having only one wired end. See the illustration below. Failure to cut the panel into two segments before connecting either or both ends to a power source will result in damaged panels, and may cause a fire or death by electric shock.

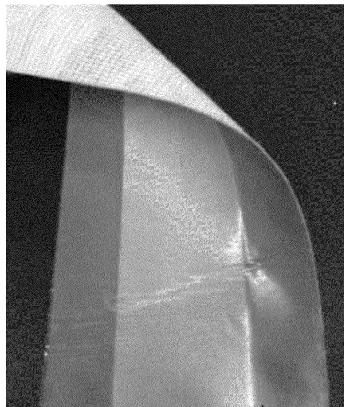
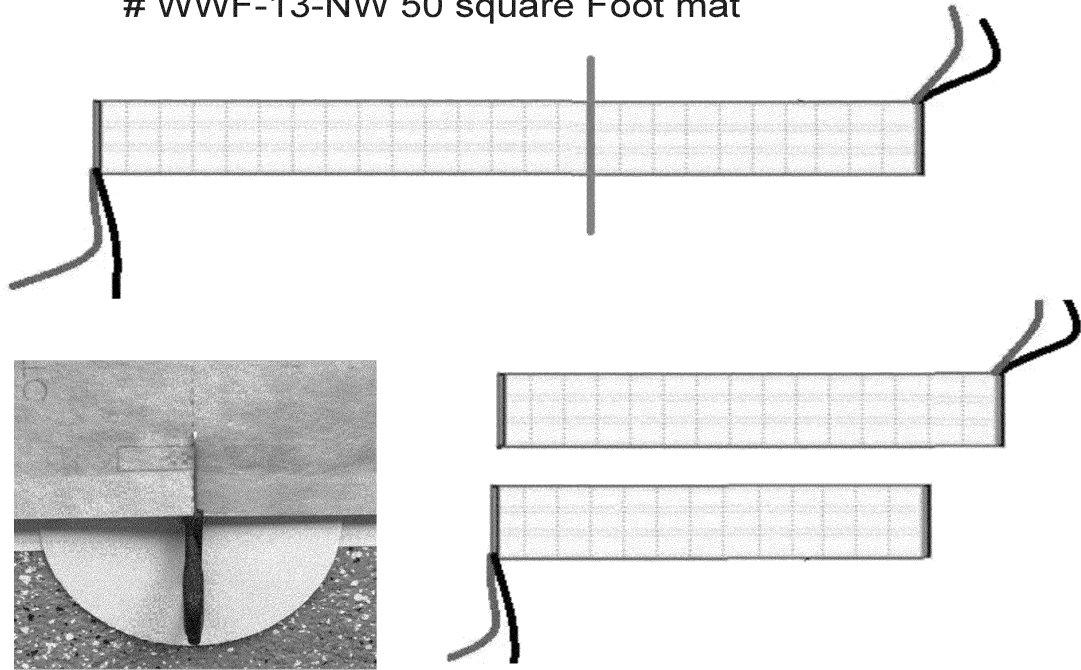
Panels must be cut only on the horizontal cut lines. No panel may be shorter than the distance between two cut lines, i.e. 8" or 20 cm



Roll mat on a flat clean surface. The mat must be cut into two pieces to form two individual mats. Choose the length of each segment and cut the film along a chosen cut line using heavy duty scissors completely separating the panels into two wired segments



Special Procedures for Heating Panel # WWF-13-NW 50 square Foot mat



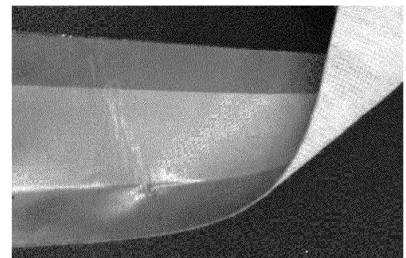
Prepare to seal the cut edge of the two Heating mats that were just created.

It is best to lay both mats on a clean flat Surface It is advisable to use two people when Covering the cut edge with the end Tape.

Picture of End tape with the electrical Glass cloth insulator.

Special Procedures for Heating Panel # WWf-13-NW 50 Square Foot mat

Action	Description
Prepare surface . Clean of all debris and locate the end tape.	Unroll the end tape embedded with glass cloth tape on a clean dry surface. Smooth out tape as flat as possible without removing the release liner.
Completely cover the glass cloth with the supplied end tape	The end tape has an extremely aggressive adhesive. It is recommended to have two people involved with this assembly. Peel the release liner off and completely cover both sides.
Smooth out the end tape	Take a small waste piece of the scrap liner. Smooth out the edge by hand. Make sure the end tape is fully covering the cut end.



End tape showing
Glass cloth electrical insulator



Finished edge of mat

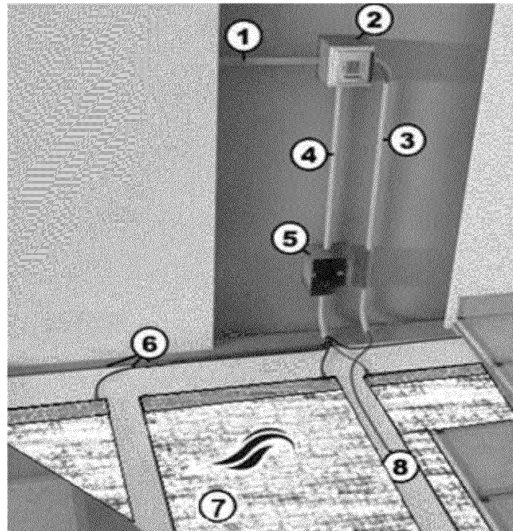


Section 2 Wiring

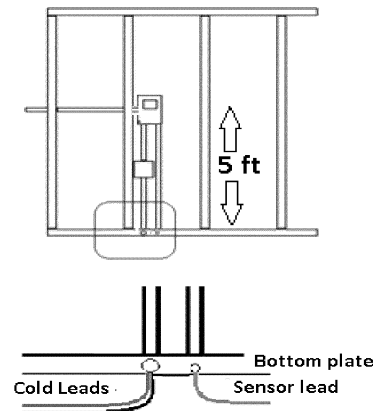
Step 1 Roughing in the cold leads to the power source and thermostat



Cold Leads are the pre-installed wires that exit the bottom of the heating panels to be run through the conduit system to the TEC™ Thermostat. Panels with longer cold leads can be acquired from the manufacturer. Do not cut cold leads prior to the thermostat.



For clarity, the framing members have been removed.



1. Power source
2. Thermostat 4 " square
3. Conduit for the sensor line
4. Conduit for the cold leads
5. Junction box if needed
6. Cold leads
7. Heating panels
8. Sensor



Type NM and NMC non-metallic sheathed cable is not suitable for installing the product. UL797, UL1242, UL6, BS4568, BS31 UL listed conduit is required for all installations.



The cold leads of the heating products shall be suitable for the applied voltage and the temperature to which they are subjected under normal and abnormal operating conditions.



The installation of this heating product shall be in accordance with article 424, of the National Electrical Code, ANSI/NFPA 70.



Caution: Use copper only as supply conductor.

Section 2 Wiring

Step 2 Preparation Before Installation



Confirm the electric capacity of the installation location. It should be enough to accommodate the total output of the heating panels. The circuit breaker should be rated for a maximum of 20 amps (with no greater than a 15 amp load). Determine how many thermostats should be needed and the location of each thermostat and/or relay. Drill or cut a hole for the electrical junction box. Make a groove in the substrate for the path of wires (power & sensor).



Be sure the subfloor is clean, rigid, flat, level, free of cracks and objects that can damage the heating panels. **DO NOT INSTALL FILM OVER EXPANSION JOINT.** Nails, screws, and other sharp debris can damage the panels. Any and all panels that are torn or penetrated must be discarded.



Heating panels should never be installed at or below 50°F



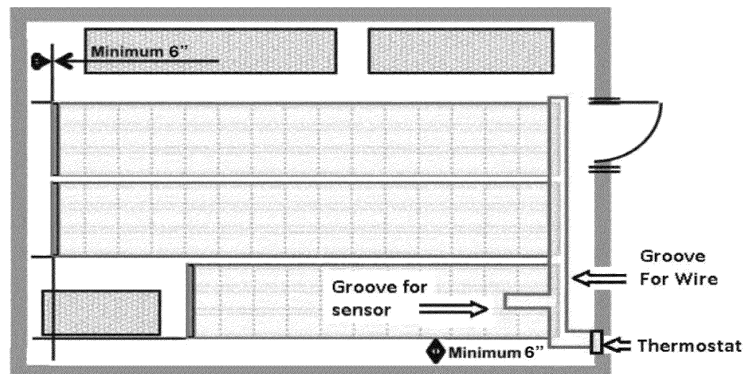
Never install one mat on top of another or overlap the mat on itself. This will cause dangerous overheating. Do not forget to install the floor sensor. Never install mats under cabinets or other built-ins. Excessive heat will build up in these small spaces, and the mat can be damaged by fasteners (nails, screws, etc.) used to install built-ins.



Always refer to the TCNA Handbook recommendations and ANSI references for proper substrate needed for thin-set tile installations and for recommendations on proper movement joints within the plane of the tile per Detail EJ-171.



RISK OF ELECTRIC SHOCK AND FIRE. DAMAGE TO SUPPLY CONDUCTOR INSULATION MAY OCCUR IF CONDUCTORS ARE ROUTED LESS THAN 2 INCHES (51 MM) FROM THIS HEATING PRODUCT. REFER TO INSTALLATION INSTRUCTIONS FOR RECOMMENDED MEANS OF ROUTING SUPPLY CONDUCTORS



Section 2 Wiring

Step 3 Calculating Resistance

The formula to calculate resistance is: $\Omega = W/I^2 \pm 10\%$

Ω = resistance in Ohms

W = total watts in the system (13 w/ft² X the number of ft² of the combined heating panels)

I = total amps in the system (0.105 A/ft² x the ft² of the combined heating panels for 120V panels.

This manual will use the more descriptive symbol "A" for amps.

For simplicity, this manual will use the formula $\Omega = W / A^2 \pm 10\%$

Resistance in sample design (Section 1 Step 2)

Panel Type	System Area	Total System Watts	Total System Amps	Total System Resistance (Ω)
120V	87.5 ft ²	1137 (87.5 x 13 = 1137W)	9.2 (87.5 x .105 = 9.2A)	
		1137 W	84.64 A² (9.2A x 9.2A)	13.43 Ω (1137/84.64)

Resistance in your design

Copy your calculations from page 11 into the gray boxes in the appropriate line for your system voltage. **Calculate your resistance by completing the remainder of the gray boxes in the table.**

Panel Type	System Area		Watts (area x 13)		Amps (area x 0.105) (area x 0.054)		Amps ² (amps x amps)		Resistance Watts/Amps ²	
120V		ft ²		W		A		A ²		Ω



Then check the resistance in your system to see if it matches your resistance calculation



If the result is Zero (0) Ω , the system circuit is shorted. Check all electric connection points and the path of all electric wires. If damaged sections are found on the film or electrical parts, replace the entire panel. Then measure the resistance in your system to verify that it is correct.



If the resistance is not matched within the limits, you should check the resistance of each heating panel section individually to isolate the problem.



If this does not identify the problem, check all electrical connection points and the path of electric wires.

Electrical Inspection with Electric Power Input



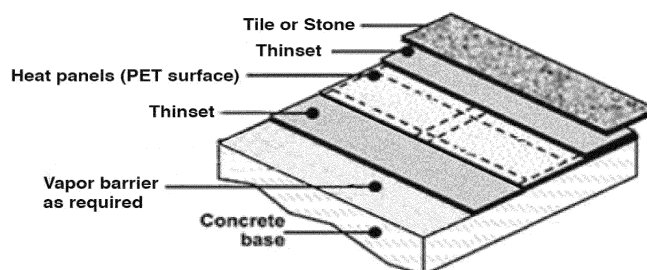
After verifying that the calculated "Resistance in your design above" matches your measured resistance to a tolerance of +5% or -10%, supply the rated power and check whether the heating panels work properly by using an infrared thermometer on the surface of the heating panels. (Check the heat on all panels.) If the surface temperature does not increase by 3°F in one minute, repeat all wiring inspections and calculations. Do not use the heating panel if calculated and actual values do not match within the proper tolerance or the panel does not warm properly.



Route and secure wires between heating panels and the power source or junction box using code mandated wiring practices.

Section 3 Installation of System

Step 1 -A Installing Heating Panels in a Concrete Base for Stone and Tile Option



	Spec		How to Install
Tile or Stone	-	Per supplier	Refer to Manufacturer's guide
Thinset	-	3/8"	Refer to Manufacturer's guide
Heat Panel	Non Woven Surface	1/32 "	Refer to Manufacturer's guide
Thinset	-	3/8"	Refer to Manufacturer's guide
Vapor Barrier	-	1/32"	Refer to Manufacturer's guide
Base	Concrete	-	Refer to current TNCA Handbook



NOTE: Do not apply heating panels to floors where hydrostatic or moisture vapor rate emissions exist above 4 lbs/1,000 ft² in 24 hours per the Calcium Chloride test method.



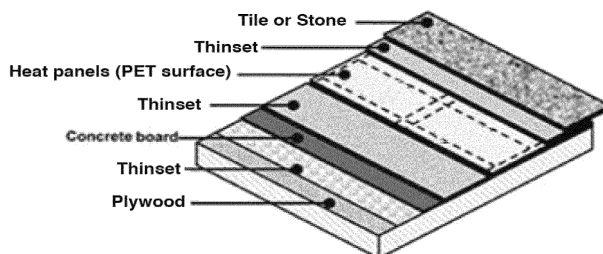
Refer to the TCNA Handbook recommendations and ANSI references for proper substrate needed for thin-set tile installations and for recommendations on proper Movement Joints within the plane of the tile per Detail EJ-171.



ALWAYS: Completely embed the heating panels and connections in mortar (tile and stone) or self-leveling underlayment (lamine and non-masonry) materials.

Section 3 Installation of System

Step 1 -B Installing Heating Panels in Plywood for Stone and Tile Option



	Spec		How to Install
Tile or Stone	-	Per supplier	Refer to Manufacturer's guide
Thinset	-	3/8"	Refer to Manufacturer's guide
Heat Panels	Non Woven Surface	1/32"	Refer to Manufacturer's guide
Thinset	—	3/8"	Refer to Manufacturer's guide
Concrete Board	Concrete Board	3/8"	Refer to Manufacturer's guide
Thinset	—	3/8"	Refer to Manufacturer's guide
Base	Plywood	-	Refer to current TCNA Handbook



NOTE: Do not apply heating panels to floors where hydrostatic or moisture vapor rate emissions exist above 4 lbs/ft² in 24 hours per the Calcium Chloride test method.



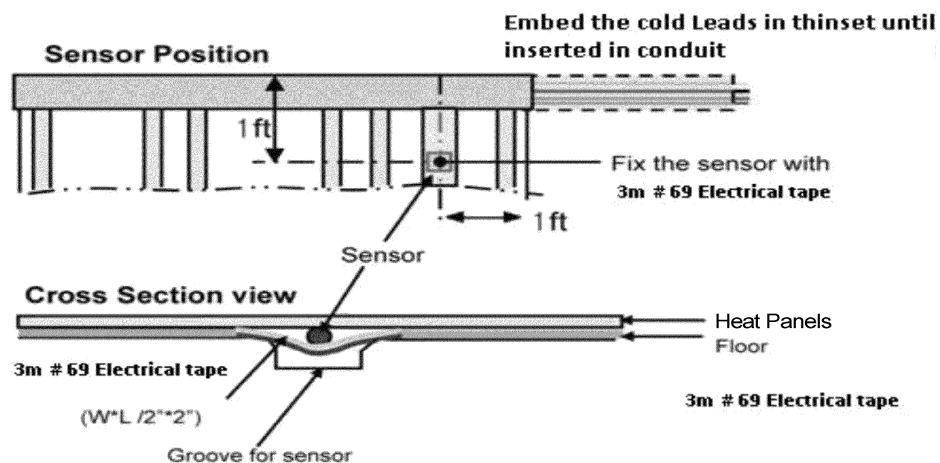
Refer to the TCNA Handbook recommendations and ANSI references for proper substrate needed for thin-set tile installations and for recommendations on proper Movement Joints within the plane of the tile per Detail EJ-171.



ALWAYS: Completely embed the heating mats and connection in mortar (tile and stone) or self-leveling underlayment (lamine and non-masonry) materials.

Section 3 Installation of System

Step 2 Installing Sensor and TEC™ Thermostat



TEC™ Thermostat and Sensor Requirements



A line voltage thermostat that measures ambient air temperature and floor temperature through a sensor is included with the TEC™ Thermostat (sold separately.)



Any substituted thermostat is required to have a built in GFCI and must be rated to handle the required voltage.



The installation of this heating product shall be in accordance with article 424, of the National Electrical Code, ANSI/NFPA 70.

Section 3 Installation of System

Step 3 Connecting Sensor and TEC™ Thermostat and applying Warning Labels



With the flooring in place and cured to the manufacture's specifications, you can now complete the final hook up to the power and sensor system.



Install the control device thermostat and any required relays according the manufacturer's instructions in the junction box and the thermostat box.



Refer to the wiring Section 3 Step 1 for additional information regarding proper wiring and testing.



Make sure 28 days has passed prior to testing the heating output of the system.



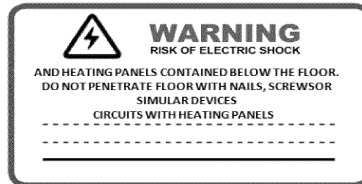
The Warning Labels are found in the box with the scissors and end tape. Affix the Warning Labels as follows.

WW13JUN



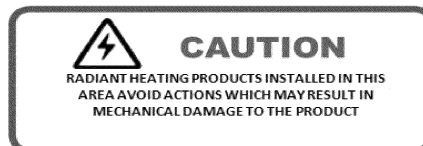
Affix to the device that is controlling the heating panel system.

WW13WAR



Affix to the electrical panel. Record the number of systems installed, along with amp, watt and ohm readings.

WW13CAU



Affix to other points of access where the wiring or heating panels are accessible.

System Record (Information Card)**Customer Information**

Name			
Address			
Tel.			
Mobile			
Fax			
Installation Address			

Name			
Address			
Tel.			
Mobile			
Fax			
Installation Address			

System Information**Designed Specification**

Location	Model name	Sq.ft	V	A	W

Inspection Data

Location	Model name	Sq.ft	V	A	W

**System Record
Sketch of the System*****Diagram of circuit***

Location	Sq.ft	W	A	Model

***Diagram of circuit***

Location	Sq.ft	W	A	Model



Notes



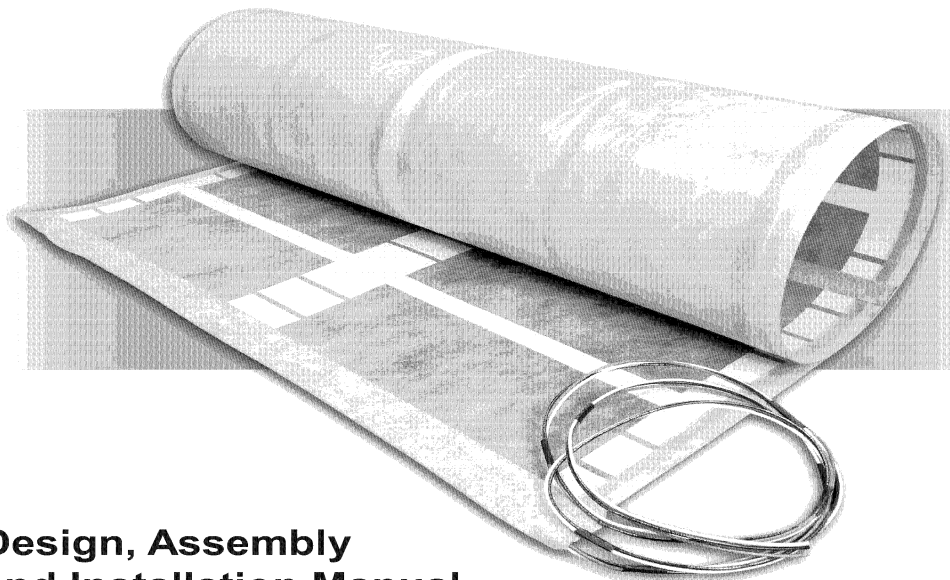
LISTED
Radiant Heating Panel
4UH6

Certified Underwriters
Laboratories Inc & UL 1683



PEEL AND HEAT CUTTING EDGE™ Heating Panel System

by Protecto Wrap Company



**Design, Assembly
and Installation Manual
Stone and Tile
WWF13GNW**

20" x 64", 20" x 127", 40" x 64" and 40" x 127" mat sizes

Custom sizes available

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For additional information regarding any aspect of installation, please contact us at:

www.protectowrap.com

Phone: **800-759-9727** E-mail: **info@protectowrap.com**
All information in this manual may be updated without notice.

Cautions and Warnings



This symbol indicates safety cautions and warnings. This symbol alerts you to potential hazards that can hurt you and others and result in serious personal injuries or damage to property. You must read and follow the cautions and warnings for safety.



This symbol indicates that an electric hazard and shock may exist if a particular action is not followed.



This symbol indicates that an electrical hazard may cause a fire if a particular action is not followed.



The Peel and Heat Cutting Edge heating system may only be installed by qualified personnel who are familiar with the construction and operation of the heating panels and the risks involved. The installation must be made in accordance with Article 424, of the National Electrical Code, ANSI/NFPA 70.



If the Peel and Heat Cutting Edge heating system is not installed properly, fire or shock could occur resulting in serious personal injuries or damage to property. You must follow the instructions, warnings and cautions contained in this manual.



Make sure that the work area is always neat and clean prior to any installation. Nails, screws, and other sharp objects and debris can damage the panels. Any and all panels that are torn or penetrated must be discarded. Be sure the subfloor is clean, rigid, flat, level, and free of cracks.



This heating product shall be installed in accordance with the manufacturer's instructions and the regulations of any authority having jurisdiction over installation and use.



Do not install over expansion joints. Follow the manufacturer's instructions. Heating panels should never be installed at or below 32 Degrees F.



Before installation, check your available electrical capacity. It should be enough for the total output of your layout. All wiring, fuses, and/or UL Listed or Recognized circuit breakers must conform to National Electric Codes. A UL Listed or Recognized Thermostat with a floor sensor must be used and it must have a UL Listed and Recognized Ground Fault Circuit Interrupter (GFCI) to prevent electrical hazards. Don't forget to install the floor sensor.



Never install one mat on top of another or overlap the mat on itself. Do not allow any electrical cables to cross themselves or each other. This will cause dangerous overheating. Do not install heating panels in any walls. Never install heating panels under cabinets or other built-ins. Excessive heat will build up in these small spaces, and the heating panels can be damaged by fasteners (nails, screws, etc.) used to install built-ins.



Always refer to the TCNA Handbook recommendations and ANSI references for proper substrate needed for thinset tile installations and for recommendations on proper movement of joints within the plane of the tile per Detail EJ-171.

General Information and Features

Product Description

Peel and Heat Cutting Edge is a low density heating device that utilizes a high tack pressure sensitive adhesive (PSA) the easily secures the heat mats to the substrate. It is recommended to cover the majority of open floor space to create optimal comfort.

The Peel and Heat Cutting Edge heating panels draw 13 watts per ft², providing even heating throughout each heating panel. Floor temperature is controlled by a programmable UL Listed or Recognized Thermostat (refer to the controller specifications section).

Peel and Heat Cutting Edge heating panels are designed for thinset applications only. Any finished flooring surface cannot exceed R-1. The heating panels are designed to be imbedded in mortar underneath ceramic, porcelain, natural stone and tile.

Features

Peel and Heat Cutting Edge heating panels are factory assembled, but can be cut to fit job requirements in the field.

A Peel and Heat Cutting Edge layout can be "changed on the fly" if there is a change or unanticipated condition at the point of installation. This is a significant advantage over other radiant heat systems.

Peel and Heat Cutting Edge is available in 120 volt.

- 20" X 64" (8.9 square feet)
- 20" X 127" (17.67 square feet)
- 40" X 64" (17.74 square feet)
- 40" 127" (35.23 square feet)
- Custom sizes available

Heating panels come pre-wired from the factory with 12' long leads.

Virtually any size room and installation can be accommodated.

Peel and Heat Cutting Edge heating panels are rated for 13 watts/ft², which produces 44 BTU per square foot.

The temperature of Peel and Heat Cutting Edge heating panels can be limited to a specific set point if the flooring material requires it.

Peel and Heat Cutting Edge is operated by an electronic on/off programmable UL Listed or Recognized Thermostat for controlling temperature by means of a sensor positioned next to the heat mat and built into the thermostat. The thermostat can be configured for control of floor temperature, room temperature or room temperature with a limit switch.

(UL Listed or Recognized Thermostat sold separately)

It is possible to use Peel and Heat Cutting Edge heating panels for primary heat when properly designed for the specific space and environment. See Section 1, Step 2.

This manual covers the use of Peel and Heat Cutting Edge heating panels specifically for installations that require installations fully embedded in thinset mortar.

Peel and Heat Cutting Edge heating panels can be covered with carpet, vinyl or hardwood if the heating panel is installed in a minimum of 3/8" cement-based or gypsum-based mortar to provide a rigid surface in which to install the heating film.

Protecto Wrap's Whisper Mat® CS Membrane can be installed under Peel and Heat Cutting Edge heating panels to provide a thermal break and improve system performance and efficiency.



Always refer to the TCNA Handbook recommendations and ANSI references for proper substrate needed for thinset installations and for recommendations on proper movement joints within the plane of the tile per detail EJ-171.

10 Year Limited Warranty and Activation



The heating element for Peel and Heat Cutting Edge heating panels have a 10 year limited warranty from the date of purchase as more fully described on the warranty. Warranty does not apply until the customer completes online warranty registration at www.protectowrap.com/peelandheatcuttingedge/warranty.com

Manual Availability



The manual must be attached to the service panel and must be easily recognizable and accessible. This can help the homeowner or contractor troubleshoot any problems and solutions.

Important Notes to Assemblers and Installers

This manual contains the information required to design, assemble and install the Peel and Heat Cutting Edge radiant heating panel product. **Read This Manual Completely Before Installing the product.** This manual serves as the document and information of record for installation. No other information or representations, including verbal, supersede or replace the information in this manual.



ALL REQUIRED INSPECTIONS MUST BE COMPLETED BEFORE COVERING THE Peel and Heat Cutting Edge HEATING PANEL INSTALLATION.



The installation of this heating product must be in accordance with the manufacturer's instructions and the regulations of any authority having jurisdiction over installation and use.



Only personnel licensed for and familiar with the local and national electrical codes should be conducting the electrical installation.



The installation of this heating product shall be in accordance with article 424, of the National Electrical Code, ANSI/NFPA 70.



Thinset mortar used in the installation must be cured for 28 days before energizing mats. It is the responsibility of the installer to ensure that the thin-set has cured to prevent residual conductivity that would trip the UL Listed or Recognized Thermostat GFCI.



The product must not be used in any way other than described in this manual. Peel and Heat Cutting Edge heating panels must be connected to a **dedicated 20 amp** electrical circuit.



DO NOT overlap the film.



Indicate and label on the electrical panel which circuit is used for the electric floor heating system.



It is mandatory to install a Class "A" GFCI or GFCI Listed circuit breaker with each Peel and Heat Cutting Edge Installation. DO NOT have multiple GFCI's on a single circuit as this can cause inadvertent tripping.



DO NOT USE sharp tools or power tools to clean grout lines. Cleaning grout lines with sharp tools or power tools may damage the film and will void the warranty.



Subfloor must be prepared in accordance to ANSI specifications.



The ambient air temperature must be above 0° C or 32° F when Peel and Heat Cutting Edge heating panels are installed.



The maximum R value of all floor coverings is R-1.



DO NOT install heat mat under large appliances, built-in cabinetry, solid base fixtures or food pantries or in walls, ceiling or between floor joists.



RISK OF ELECTRICAL SHOCK AND FIRE. DAMAGE TO SUPPLY CONDUCTOR INSULATION MAY OCCUR IF CONDUCTORS ARE ROUTED LESS THAN 2 INCHES (51 MM) FROM THIS HEATING PRODUCT. REFER TO INSTALLATION INSTRUCTIONS FOR RECOMMENDED MEANS OF ROUTING SUPPLY CONDUCTORS.

PHCE Components for Assembly and Installation

Product

Description

Peel and Heat Cutting Edge Heating System Boxed Product

Peel and Heat Cutting Edge heating panel, composite end tape to apply to cut end, Warning Labels and this Design, Assembly and Installation Manual.

Sold Separately

UL Listed or Recognized Thermostat and/or controller

UL Listed or Recognized Thermostat. The capacity of the thermostat must be 20% greater than the installed heating load. If relays are used, a low voltage control UL Listed or Recognized Relay may be used.

Junction Boxes

Use UL Listed or Recognized Junction Boxes to house relays and the UL Listed or Recognized Thermostat. Size the boxes to the specific use.

Thin-set

Multi-purpose and polymer. Thinset must be mixed on-site. Product should not be premixed.

This instruction and operating manual

A full review and understanding of this document is required prior to starting installation.

Tools

Description

Tape Measure

25 ft.

Wire Stripper

Stripper and Cutter

Thermometer

Infrared Thermometer

Multi-Meter

Amp, Watts, Ohms. An Ohm meter is required to measure the resistance prior to energizing the heating panels. A digital meter is recommended.



After the materials and tools are assembled, you can begin assembly and installation.

Section 1: Designing the System

Step 1 Choosing the Correct Panels and Power

Review the chart below and choose the heating panel for your intended use.

Note. 240 volt heating panels can be special ordered through authorized dealers.

Recommended for this Use	120v
Heating a tile room	<i>Great</i>
Heating over an non-insulated space	<i>Good</i>
Heating a kitchen floor	<i>Great</i>
Heating more than 120 SF See Section 1, Step 3, Page 10	<i>NO</i>
Heating a basement floor	<i>Good</i>
Heating a room over a garage	<i>Good</i>
Misc large installations	<i>Good</i>

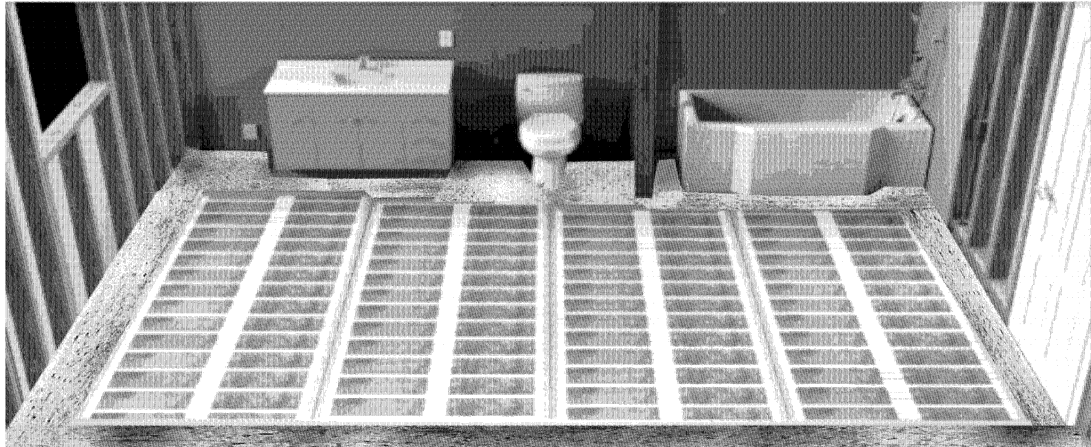


Never mix heating panels of different voltage ratings.
Never use a different input voltage than rated for the heating panel.

Section 1: Designing the System

Step 2 Designing the Peel and Heat Cutting Edge Heating Panel System

Measure and design the installation area. Calculate the gross floor area of the room to be heated. In the example below it is 120 square feet. Calculate the "net area" which is the aggregate surface area of the heating panels to be installed. In this example, it is 87.5 square feet.



The Peel and Heat Cutting Edge (PHCE) panel system works very well as primary heat. When calculating your heating needs be aware that the better insulated the structure, the better the performance. PHCE produces 44 BTU per square foot. This should be more than enough to heat a properly designed primary heat system.

PHCE should be installed on a properly prepared stable sub-floor. For wood subfloors, 3/8 inch backer board or a self-leveling system of at least 3/8 inch should be present or applied. Cover the entire panel system with thinset or self leveling compound to embed the PHCE.

If a laminate or other surface than stone or tile is chosen as the finished floor, 3/8 inch backer board or self-leveling compound may replace stone or tile as the top layer of the system. This protective surface acts as a non-decorative tile. Check with the flooring manufacturer to determine if the floor covering is radiant heat compliant.

If a synthetic underlayment is desired (flexible antifracture), make sure that at least 3/8 inch of thinset is applied prior to installing the PHCE.

Section 1: Designing the System

Step 3 Calculating Power Requirements

Power requirements and size of a **single panel**

Minimum Panel Size	Voltage AC	20" wide Panel Maximum Panel Size	40" Wide Panel Maximum Panel Size	Ohm/ft ²	Amps/ft ²	Maximum Density W/ft ²	Maximum Length
8in x 20in	120	1.7ft x 10ft	3.35 ft x 10ft	1107	0.108	13	10

Power requirements and size of a **system of panels**

Voltage AC	Maximum Watts per individual panel	Maximum Amps per circuit	Maximum watts per system of panels	Maximum system of panels/ft ²
120	433.29	15	1560	120

Power Calculation Formulas

Panel Type	120V AC
Rated Voltage	120V-60Hz
Rated Amp	+10 or -10
Power Output	+10 or -10

Power requirements **example (120V)**

120V	Formula	Calculation
Net Area	87.5 ft ²	
Total Amp	0.108A/ ft ² x 87.5 ft ²	9.45 Total Amps
Total Watt	13W / ft ² x 87.5 ft ²	1137 Total Watts



If the installation area exceeds the maximum installation area with one UL Listed or Recognized Thermostat, install a UL Listed or Recognized Relay Slave Unit in accordance with the capacity of recommended thermostat.



Do not design a system to exceed the above maximum amp and watt output with one UL Listed or Recognized Thermostat or Slave Unit.

Section 1: Designing the System

Step 4 Calculating Power Requirements for Your Design

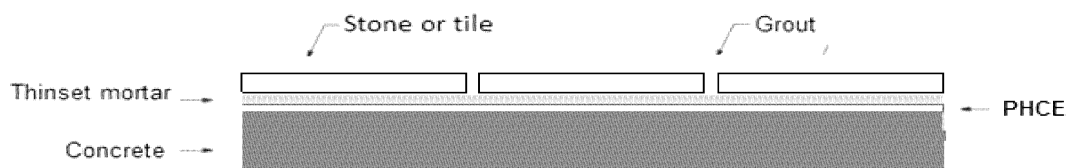
Calculate your power requirements by completing the gray boxes in the following table. Be sure to perform the calculations only for the row that applies to the voltage of your system. There is one table for 120V and one table for 240V.

120V AC	Formula			Calculation	
Net Area	Calculated in Step 2 above				
Total Amp	$0.108A / ft^2 \times$		$ft^2 =$		Total Amps
Total Watt	$13W / ft^2 \times$		$ft^2 =$		Total Watts

240V AC	Formula			Calculation	
Net Area	Calculated in Step 2 above				
Total Amp	$0.054A / ft^2 \times$		$ft^2 =$		Total Amps
Total Watt	$13W / ft^2 \times$		$ft^2 =$		Total Watts

Section 1: Designing the System

Step 5-A Installing Peel and Heat Cutting Edge Heating Panels in a Concrete Base for Stone and Tile Option



	Spec	Thickness	How to Install
Tile or Marble	-	Per supplier	Refer to Manufacturer's guide
Thinset	-	3/8"	Refer to Manufacturer's guide
Base	Concrete	-	



NOTE: Do not apply heating panels to floors where hydrostatic or moisture vapor rate emissions exist above 4 lbs./1,000 ft² in 24 hours per the Calcium Chloride test method.



Refer to the TCNA Handbook recommendations and ANSI references for proper substrate needed for thinset tile installations and for recommendations on proper movement joints within the plane of the tile per Detail EJ-171.

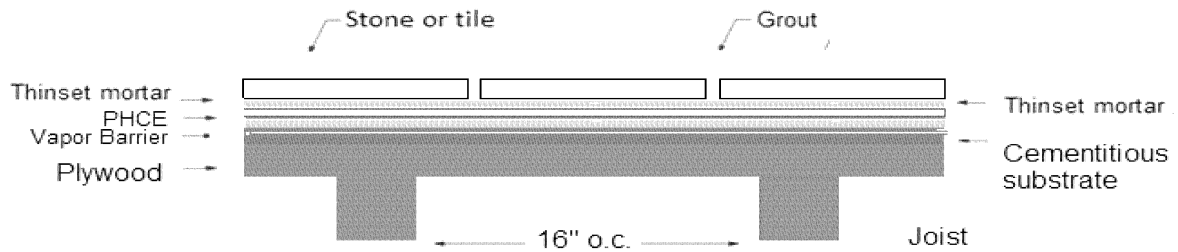


ALWAYS: Completely embed the heating panels and connections in mortar (tile and stone) or self-leveling underlayment (lamine and non-masonry) materials.

Section 1: Designing the System

Step 5-B Installing Peel and Heat Cutting Edge Heating Panels in a Wood Base for Stone and Tile Option

Radiant Heat over a Plywood Subfloor



	Spec	Thickness	How to Install
Tile or Marble	-	Per supplier	Refer to Manufacturer's guide
Thinset	-	3/8"	
PHCE	Non Woven Surface	1/32 "	
Thinset	-	3/8"	Refer to Manufacturer's guide
Cementitious Substrate	Backer board-self leveling compound	3/8"	Refer to Manufacturer's guide
Vapor Barrier (optional)	-	1/32"	Refer to Manufacturer's guide
Base	Wood	-	



NOTE: Do not apply heating panels to floors where hydrostatic or moisture vapor rate emissions exist above 4 lbs./ft² in 24 hours per the Calcium Chloride test method.



Refer to the TCNA Handbook recommendations and ANSI references for proper substrate needed for thin-set tile installations and for recommendations on proper Movement Joints within the plane of the tile per Detail EJ-171.



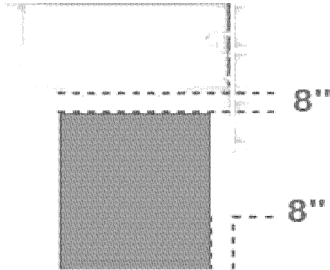
ALWAYS: Completely embed the heating mats and connection in mortar (tile and stone) or self-leveling underlayment (lamine and non-masonry) materials.

Section 2: Assembling Heating Panel

Step 1. Select heat panels

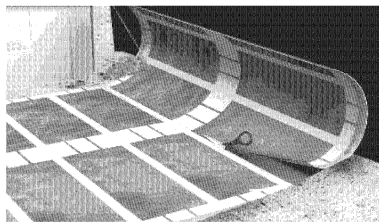
Select the heating panel sizes needed for your room. If there is no need to shorten the heating panel, continue with installation under Section 4 Wiring.

Unroll each of the panels on a clean flat surface. Make sure each panel is free and clear of anything that might damage it. It is easiest to put them on a work table one at a time, if available.



Step 2. Measure

Measure how much of the panel has to be removed by jobsite measurement or simply placing the panel on the floor. Make sure to have the mat 8 inches away from the outside walls or permanent obstructions such as a cabinet.

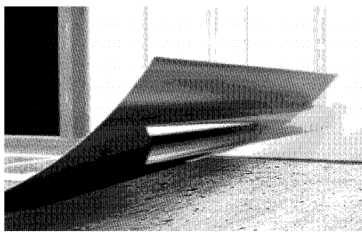


Step 3. Cut

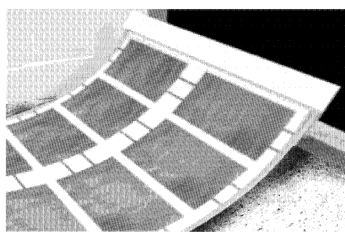
Only using scissors, cut the heat mat at the cut line closest to the desired length.

Apply the Peel and Heat Cutting Edge End Tape to the cut end.

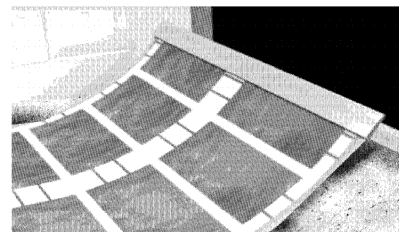
Step 4. Tape



Peel back film from back side of mat from end that was cut.



Apply piece of end tape onto bottom of mat, underneath the pulled back film.



Wrap tape around end and adhere to top side of mat. Make sure the release liner of the tape facing the floor.

Section 3: Installing Peel and Heat Cutting Edge

Preparation Before Installation



Confirm the electric capacity of the installation location. It should be enough to accommodate the total output of the heating panels. The UL Listed or Recognized Circuit Breaker should be rated for a maximum of 20 amps (with no greater than a 15 amp load). Determine how many UL Listed or Recognized Thermostats should be needed and the location of each thermostat and/or relay. Drill or cut a hole for many UL Listed or Recognized Electrical Junction Box. Make a groove in the substrate for the path of wires (power and sensor).



Be sure the subfloor is clean, rigid, flat, level, free of cracks and objects that can damage the heating panels. **DO NOT INSTALL FILM OVER EXPANSION JOINT.** Nails, screws and other sharp debris can damage the panels. Any and all panels that are torn or penetrated must be discarded.



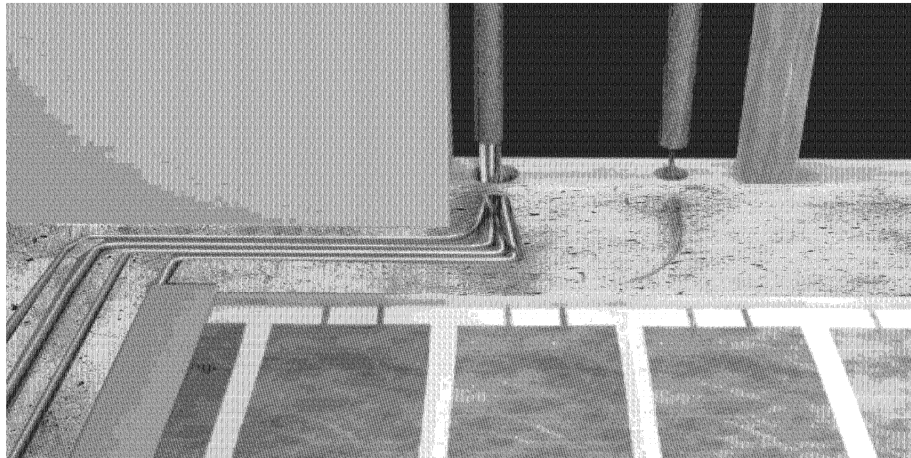
Heating panels should never be installed at or below 32 F°.



Never install one mat on top of another or overlap the mat on itself. This will cause dangerous overheating. Do not forget to install the floor sensor. Never install mats under cabinets or other built-ins. Excessive heat will build up in these small spaces, and the mat can be damaged by fasteners (nails, screws, etc.) used to install built-ins.



Always refer to the TCNA Handbook recommendations and ANSI references for proper substrate needed for thinset tile installations and for recommendations on proper movement joints within the plane of the tile per Detail EJ-171.



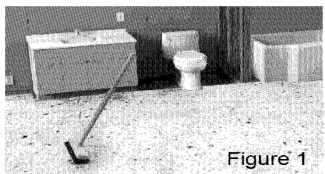


Figure 1

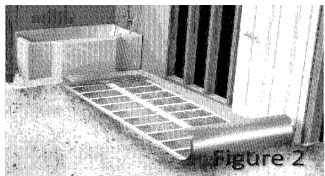


Figure 2

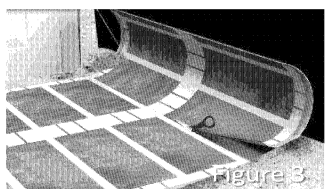


Figure 3

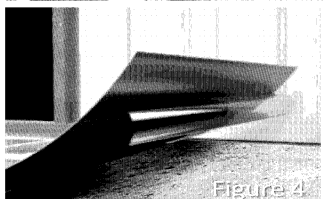


Figure 4

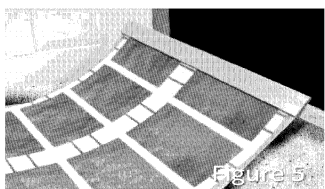


Figure 5

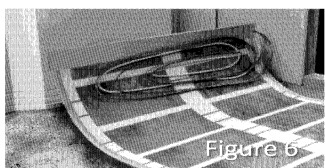


Figure 6

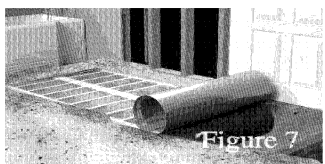


Figure 7

Section 3: Installing Peel and Heat Cutting Edge Mat

Step 1

Completely prepare and clean the subfloor of all obstructions including nail heads and debris. See "subfloor inspection and preparation" below. Wipe down the subfloor with a wet sponge and let dry completely. (Figure 1)

Subfloor inspection and preparation

Prior to installing a PHCE system make sure the subfloor is properly prepared. Inspect that there are not any nails, screws or other protrusions in the floor. Determine that at least $\frac{1}{4}$ of cementitious substrate such as self-leveling compound is present or applied. A properly prepared subfloor is required to fully embed and encapsulate the PHCE system.

If this is a direct concrete floor installation make sure the concrete is clean and ready for a properly embedded installation.

The PHCE system should be fully embedded as described in this manual.

Step 2

With the release paper still on, practice fit the mat into place allowing 8" clearance around walls, drains and fixtures. (Figure 2)

Step 3

Make sure the leads are within reach of the junction box and that there are no obstructions or floor penetrations in the way.

Step 4

When mat is in proper position, roll the end with the power lead connections back far enough to trim off approximately 12" of the release paper to expose a portion of the adhesive surface. (Figures 3-5)

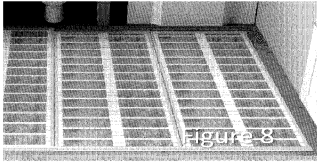
Step 5

Press this exposed section of the mat onto the clean substrate and then roll the other end back to the point where the release paper was removed. (Figure 6)

Step 6

Begin pulling the release paper off and hand smooth the mat into position as it unrolls to achieve a positive bond while avoiding trapping air bubbles. (Figure 7)

Section 3: Installing Peel and Heat Cutting Edge Mat (continued)



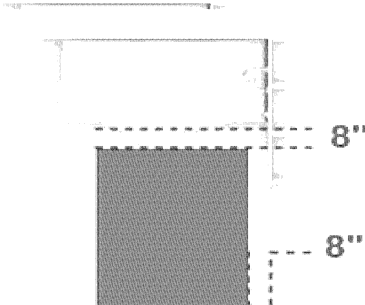
For adjacent mats, follow the same procedure starting with alignment of side-by-side mats. (Figure 8)

The heat mat can be installed with up to 3" of space between panels. "Cold spots" can form if spaced farther apart.

Do not overlap mats, which can cause the system to overheat and fail. (Figure 8)

Step 7

As you set mat(s) in place leave, clearance to walls or partitions at the connector end for wiring and final connections. It is important to take care in the placement of the heating mats, as once the adhesive side of the heating mat comes in contact with the surface, it will provide a tenacious bond. (Figure 9)



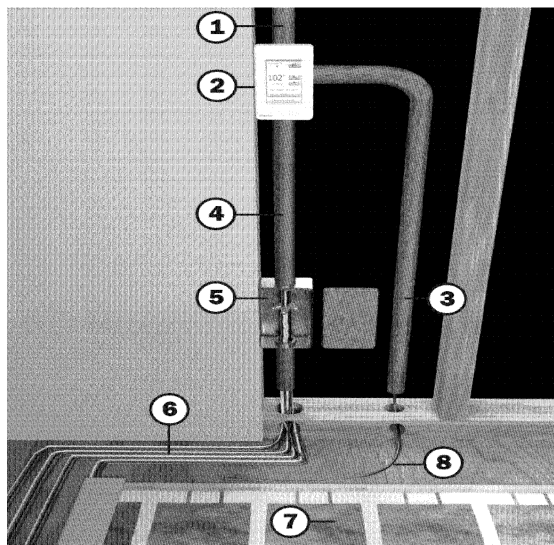
"RISK OF ELECTRIC SHOCK AND FIRE. DAMAGE TO SUPPLY CONDUCTOR INSULATION MAY OCCUR IF CONDUCTORS ARE ROUTED LESS THAN 2 INCHES (51 MM) FROM THIS HEATING PRODUCT. REFER TO INSTALLATION INSTRUCTIONS FOR RECOMMENDED MEANS OF ROUTING SUPPLY CONDUCTORS."

Section 4: Wiring

Step 1 Roughing in the cold leads to the power source and UL Listed or Recognized Thermostat



Cold leads are the pre-installed wires that exit the bottom of the heating panels to be run through the conduit system to the UL Listed or Recognized Thermostat. Panels with longer cold leads can be acquired from the manufacturer. Do not cut cold leads prior to the thermostat.



1. Power source
2. UL Listed or Recognized
Thermostat 4" square
3. Conduit for the sensor line
4. Conduit for the cold leads
5. Junction box if needed
6. Cold leads
7. Peel and Heat Cutting
Edge heating panels
8. Sensor

For clarity, the framing members have been removed. See the line drawing to show standard framing and the bottom plate.



Type NM and NMC non-metallic sheathed cable is not suitable for installing the product. UL797,UL1242,UL6,BS4568,BS31 UL listed conduit is required for all installations.



The cold leads of the heating products shall be suitable for the applied voltage and the temperature to which they are subjected under normal and abnormal operating conditions.



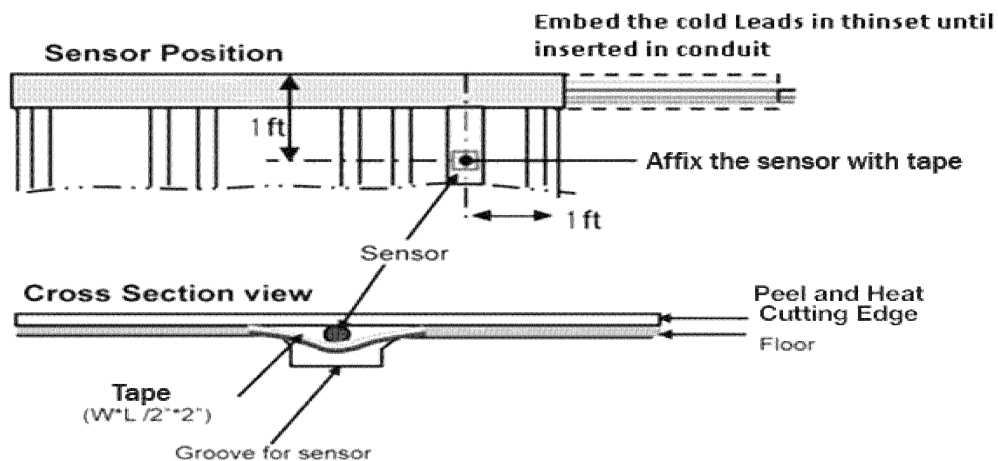
The installation of this heating product shall be in accordance with article 424, of the National Electrical Code, ANSI/NFPA 70.



Caution: Use copper only as supply conductor.

Section 4: Wiring

Step 2 Installing Sensor and Thermostat



UL Listed or Recognized Thermostat and Sensor Requirements



A line voltage UL Listed or Recognized Thermostat that measures ambient air temperature and floor temperature through a sensor is included with specifically marked Peel and Heat Cutting Edge products. A low voltage controller can be used if it controls slave relays that are required if the heating panels are larger than the maximum power requirements.



Any substituted UL Listed or Recognized Thermostat is required to have a built in UL Listed or Recognized GFCI and must be rated to handle the required voltage.



The installation of this heating product shall be in accordance with article 424 of the National Electrical Code, ANSI/NFPA 70.

Section 5: Inspection and Testing of Heat Mats

Step 1 Calculating Resistance

The formula to calculate resistance is: $\Omega = W/I^2 \pm 10\%$

Ω = resistance in Ohms

W = total watts in the system (13 w/ft² X the number of ft² of the combined heating panels)

I = total amps in the system (0.105 A/ft² x the ft² of the combined heating panels for 120V panels and 0.054 A/ft² of the combined heating panels for 240V). This manual will use the more descriptive symbol "A" for amps

For simplicity, this manual will use the formula **$\Omega = W / A^2 \pm 10\%$**

Resistance in sample design (Section 1 Step 2)

Panel Type	System Area	Total System Watts	Total System Amps	Total System Resistance (Ω)
120V	87.5 ft ²	1137 (87.5 x 13 = 1137W)	9.45 (87.5 x .108 = 9.2A)	
		1137 W	9.45	13.43 Ω (1137/84.64)

Resistance in your design

Copy your calculations from page 11 into the gray boxes in the appropriate line for your system voltage. **Calculate your resistance by completing the remainder of the gray boxes in the table, OR use the pre-calculated values on the next page where you are using a whole panel (NOT cut) for the product size purchased.** You must perform the calculations if you cut the panel.

Panel Type	System Area		Watts (area x 13)		Amps (area x 0.105) (area x 0.054)		Amps ² (amps x amps)		Resistance Watts/Amps ²	
120V		ft ²		W		A		A ²		Ω

120 V Heating Panel	Ohms
20" wide x 5' long	133 Ω
20" wide x 10' long	66 Ω
40" wide x 5' long	66 Ω
40" wide x 10' long	33 Ω

Step 2 Test Electrical Resistance



Then check the resistance in your system to see if it matches your resistance calculation.



If the result is Zero (0) Ω , the system circuit is shorted. Check all electric connection points and the path of all electric wires. If damaged sections are found on the film or electrical parts, replace the entire panel. Then measure the resistance in your system to verify that it is correct.



If the resistance is not matched within the limits, you should check the resistance of each heating panel section individually to isolate the problem.



After verifying that the resistance matches your measured resistance to a tolerance of $\pm 10\%$, connect the control device UL Listed or Recognized Thermostat and any required UL Listed or Recognized Relays according to the manufacturer's instructions in the junction box and the thermostat box.



Step 3 Testing for Heat

Turn on power supply and check whether the heating panels work properly by using an infrared thermometer on the surface of the heating panels. (Check the heat on all panels.) If the surface temperature does not increase by $3F^{\circ}$ in one minute, repeat all wiring inspections and calculations. Do not use the heating panel if calculated and actual values do not match within the proper tolerance or the panel does not warm properly.



Step 4 Turning Off Power Supply

Once the floor has been tested for heat, turn off power to the UL Listed or Recognized Thermostat at the breaker in the panel.

Section 6: Installing Finished Floor Topping



Tile, Stone & Marble Installation

Install tile using a 3/8" layer of Latex-Portland Cement Mortar, take care during the troweling process to not nick or cut into the mat. When installing tile or stone over Peel and Heat Cutting Edge, follow the TCNA guidelines and ANSI specifications as a minimum standard of installation. Use a Latex-Portland Cement Mortar that meets ANSI 118.4.



Warning: Never bang a trowel on the mat to remove excess mortar from the trowel. This could damage the mat. Make sure 28 days has passed prior to operating system.



Floating Floor and Other Floor Coverings Installation

Warm Wave panels are designed for thin-set applications only. Any finished flooring surface cannot exceed R-1. The Warm Waves Heating panels are designed to be imbedded underneath the following surfaces.

- A. High Density floors
- B. Engineered Wood floors
- C. Natural Stone Floors
- D. Ceramic Tiles



• Warm Waves can be covered with carpet, vinyl or hardwood if the mat is installed in a minimum of 3/8" cement-based or gypsum-based material to provide a rigid surface which to install the material



• Use of anti-fracture membranes and underlayment for stone and tile is allowed. Warm Waves should be installed above the membrane

Flooring materials must be rated for use with electric floor warming systems.



Install laminate/engineered wood per manufacturer's instructions. After installation, make sure 28 days has passed prior to operating system.

RADIANT FLOOR HEATING DEVICE

WARMWAVES CUTTING EDGE



WARNING

RISK OF ELECTRIC SHOCK

HEATING PANELS BELOW THE FLOORING.
DO NOT PENETRATE THE FLOOR WITH NAILS
STAPLES TOOLS OR ANY OTHER OBJECT

PANELS: _____ AMPS: _____ WATTS: _____ OHMS: _____



CAUTION

RISK OF ELECTRIC SHOCK

RADIANT HEATING PRODUCTS INSTALLED IN THIS
AREA. AVOID ACTIONS WHICH MAY RESULT IN
MECHANICAL DAMAGE TO THE PRODUCT

Affix to the device that is controlling the Peel and Heat Cutting Edge heating panel system.

Affix to the electrical panel. Record the number of systems installed, along with amp, watt and ohm readings.

Affix to other points of access where the wiring or heating panels are accessible.

System Record (Information Card)**Customer Information**

Name			
Address			
Tel.			
Mobile			
Fax			
Installation Address			

Name			
Address			
Tel.			
Mobile			
Fax			
Installation Address			

**System Information
Designed Specification**

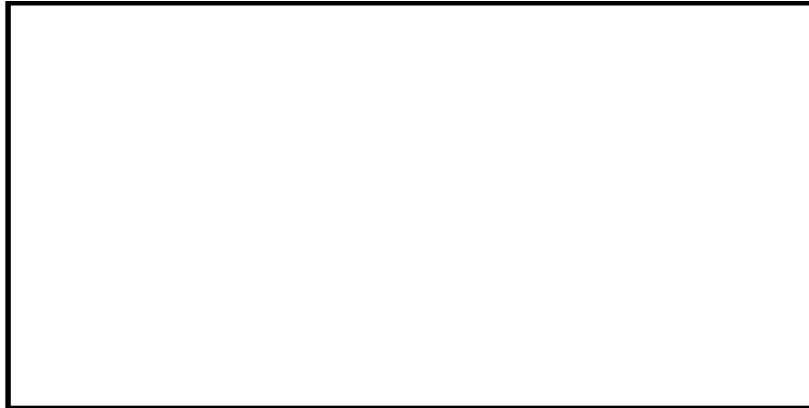
Location	Model name	Sq.ft	V	A	W

Inspection Data

Location	Model name	Sq.ft	V	A	W

System Record
Sketch of the System*Diagram of circuit*

Location	Sq.ft	W	A	Model

*Diagram of circuit*

Location	Sq.ft	W	A	Model



Notes

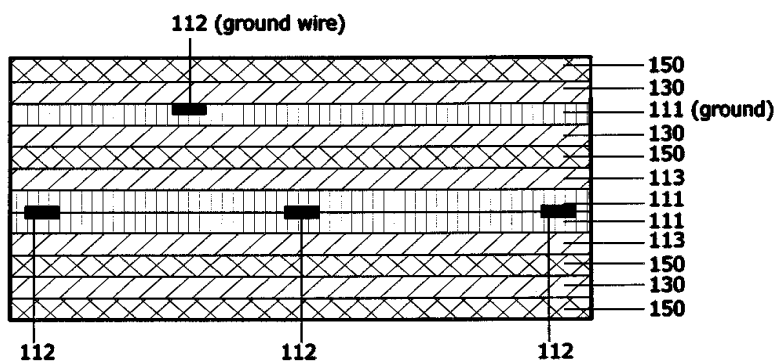


FIG. 3
OPFG 110/220
($\frac{1}{2}$ a full sheet width)

WWG

150- Non-woven fabric
130- Pet .05mm
112- Copper (ground wire)
111- Carbon (Honey comb ground)
130- Pet .05mm
150- Non-woven fabric
113- Pet .05mm
111- Carbon
112- Copper
111- Carbon
113- Pet .075mm
150- Non-woven fabric
130- Pet .05mm
150- Non-woven fabric

WW

150- Non-woven fabric
130- Pet .05mm
150- Non-woven fabric
113- Pet .075mm
111- Carbon
112- Copper
111- Carbon
113- Pet .075mm
150- Non-woven fabric
130- Pet .05mm
150- Non-woven fabric

MSDS Sheets

111- Carbon - SEG- 603A
130- PET EXCELL XB30
113- PET - EXCELL XG 200
150 - Non Woven Fabric- Hanyoung- FINON C302 NW
116- Copper- Green Industries - C1100
Adhesive - Sinsung Chemical DL-2090

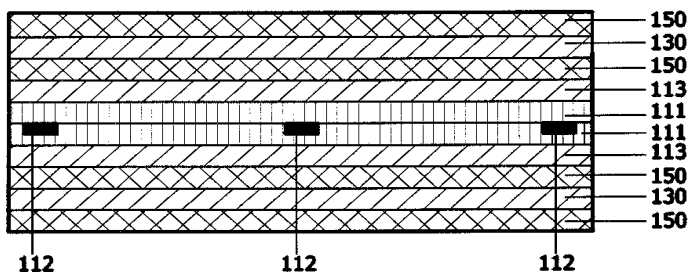
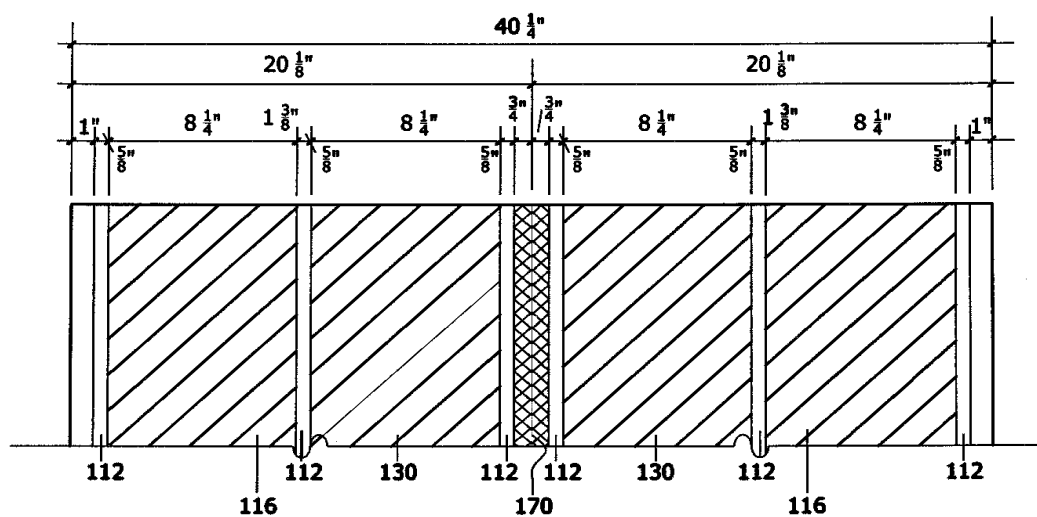
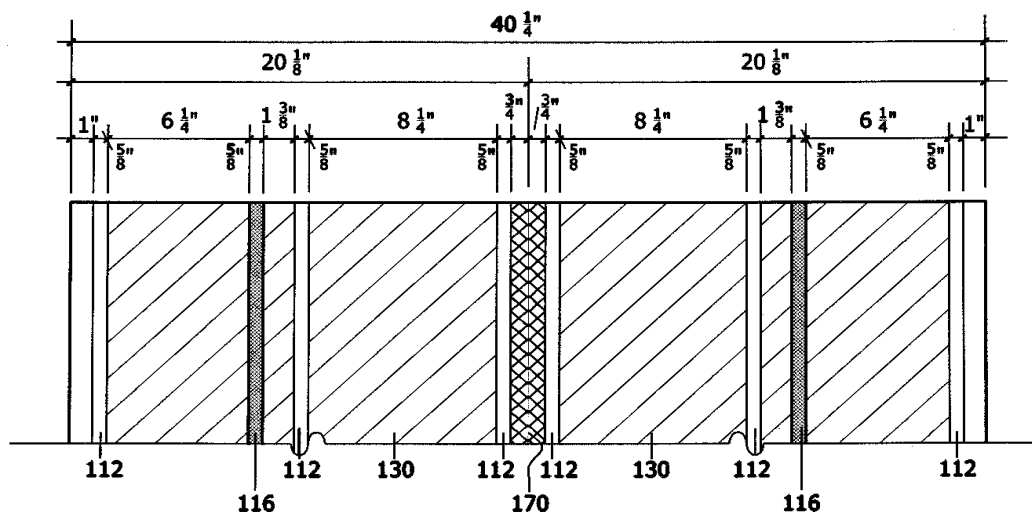


FIG. 4
OPF 110/220
($\frac{1}{2}$ a full sheet width)



4 3 2 1

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REV G 86
DESCRIPTION: F
DATE: 0208097
DWG NO: 53264-2

1 0.75[.030] MAX ALUMINUM FOIL THK

11 LANCES

2.62
[.103]
MIN DIA

4.06
[.160]
MAX DIA

8.41
[.331]
MAX

SERRATIONS

LOCKING TAB

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[.760]
MAX

11 TABS

9.30
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MAX

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[1.000]

0.64±0.05
[.025±.002]

0.25±0.25
-0.00
[.010 ±.010]
-0.000

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1-800-732-1111
1-800-526-5142

RECOMMENDED OPERATING TEMPERATURE:
150°C MAX
VOLTAGE RATING:
NOT APPLICABLE
WIRE CROSS SECTIONAL AREA RANGE:
1.65-2.62mm² (.3, .26-5, .180) CIR MILS
SOLID OR STRANDED

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SYMBOLS
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DATE: 0208097
BY: J. SCHULM
FOR: NJ SPICER
PRODUCT SPEC: 53264-2
APPLICATION SPEC: -
TIN PLATE: -
WEIGHT: -
CUSTOMER DRAWING: -

DATE: 0208097
BY: J. SCHULM
FOR: NJ SPICER
PRODUCT SPEC: 53264-2
APPLICATION SPEC: -
TIN PLATE: -
WEIGHT: -
CUSTOMER DRAWING: -

AMP Incorporated
Horsham, PA 17105-3608
W/ BARREL, TAP,
DOUBLE FACE, TERM-FOIL™,
WIRE SIZE: 18-12 AWG
SHEET 1 OF 1
REV F

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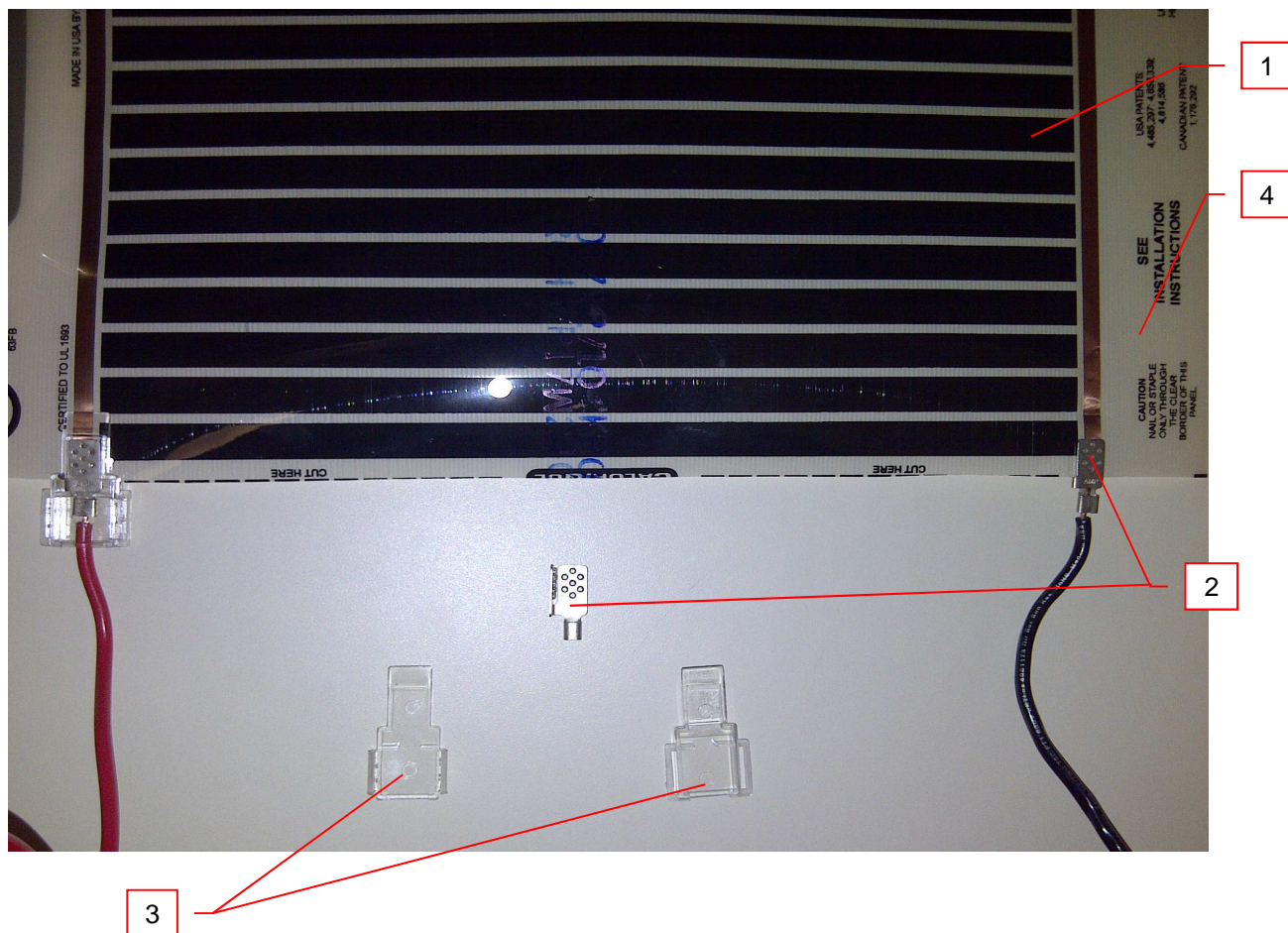
N151356295

1.0 Reference and Address			
Report Number	100457357CRT-003	Original Issued: 12-Oct-2012	Revised: 2-Jan-2019
Standard(s)	Electric Heating Appliances [UL 499:2014 Ed.14+R:23Feb2017]		
Applicant	Calorique LLC	Manufacturer 1	Calorique LLC
Address	2380 Cranberry Highway West Wareham, MA 02576	Address	2380 Cranberry Highway West Wareham, MA 02576
Country	USA	Country	USA
Contact	Jim O'Dowd	Contact	Jim O'Dowd
Phone	508 291 2000	Phone	508 291 2000
FAX	508 291 2299	FAX	508 291 2299
Email	jim.odowd@calorique.com	Email	jim.odowd@calorique.com

2.0 Product Description	
Product	Under-Floor Heating Radiant Sheet Heating Elements
Brand name	Calorique, Floor Heat, Perfectly Warm, Quiet Warmth
Description	The product covered by this report consist of a series of narrow heating element strips interconnected by a pair of parallel flat conductors that run along the end of the strips, all embedded between two sheets of plastic film (Mylar). A 1/4 inch or greater inert border is provided along the edges.
Models	<p>FLR10P8W120V, FLR10P8W240V, FLR14P10W120V, FLR14P10W240V, FLR22P17W120V, FLR22P17W240V, FLR12P12F120V, FLR12P12F240V, FLR24P12F120V, FLR24P12F240V, FLR48P12F120V, FLR48P12F240V, FLR13P8W120V, FLR13P8W240V, FLR17P10W120V, FLR17P10W240V, FLR24-22W120V, FLR24-22W240V, FLR25P17W120V, FLR25P17W240V, FLR36-35W120V, FLR36-35W240V, FLR48P38W120V, FLR48P38W240V</p> <p>FH/FF 36-3, FH/FF 36-5, FH/FF 36-7, FH/FF 36-10.</p> <p>PWF18-16W120V, PWF18-31W120V, PWF18-47W120V, PWF18-62W120V, PWF18-78W120V, PWF18-94W120V, PWF18-109W120V, PWF18-125W120V, PWF18-140W120V, PWF18-156W120V, PWF36-33W120V, PWF36-67W120V, PWF36-100W120V, PWF36-134W120V, PWF36-167W120V, PWF36-200W120V, PWF36-234W120V, PWF36-267W120V, PWF36-300W120V, PWF36-334W120V, PWF18-16W240V, PWF18-31W240V, PWF18-47W240V, PWF18-62W240V, PWF18-78W240V, PWF18-94W240V, PWF18-109W240V, PWF18-125W240V, PWF18-140W240V, PWF18-156W240V, PWF36-33W240V, PWF36-67W240V, PWF36-100W240V, PWF36-134W240V, PWF36-167W240V, PWF36-200W240V, PWF36-234W240V, PWF36-267W240V, PWF36-300W240V, PWF36-334W240V.</p> <p>QWF18-16W120V, QWF18-31W120V, QWF18-47W120V, QWF18-62W120V, QWF18-78W120V, QWF18-94W120V, QWF18-109W120V, QWF18-125W120V, QWF18-140W120V, QWF18-156W120V, QWF36-33W120V, QWF36-67W120V, QWF36-100W120V, QWF36-134W120V, QWF36-167W120V, QWF36-200W120V, QWF36-234W120V, QWF36-267W120V, QWF36-300W120V, QWF36-334W120V, QWF18-16W240V, QWF18-31W240V, QWF18-47W240V, QWF18-62W240V, QWF18-78W240V, QWF18-94W240V, QWF18-109W240V, QWF18-125W240V, QWF18-140W240V, QWF18-156W240V, QWF36-33W240V, QWF36-67W240V, QWF36-100W240V, QWF36-134W240V, QWF36-167W240V, QWF18-200W240V, QWF36-234W240V, QWF36-267W240V, QWF36-300W240V, QWF36-334W240V.</p>
Model Similarity	Refer to UL Report E108850 Vol. 1 Sec. 1, pages 2, 2A, 2B, and Illustrations 6 for Model Similarity
Ratings	Refer to UL Report E108850 Vol. 1 Sec. 1, page 1C and Illustration 7, 7a.
Other Ratings	NA
Conditions of Acceptability	<p>The products covered in this Report are incomplete in construction features or limited in performance capabilities and are intended for use and evaluation in other products. Consideration should be given to the following when the component is used in or with another product.</p> <p>1. Refer to UL Report E108850 Vol. 1 Sec. 1, page 2B for details.</p>

3.0 Product Photographs

Photo 1 - Overall Product (photo callouts correspond to items in UL Report E108850 Vol. 1 Sec. 1, page 3 for component descriptions.)



4.0 Critical Components						
Photo #	Item no. ¹	Name	Manufacturer/ trademark ²	Type / model ²	Technical data and securement means	Mark(s) of conformity ³
1	1	Main Product Components	Various	Various	Refer to UL Report E108850 Vol. 1 Sec. 1, page 3 for component descriptions.	NR
<p>NOTES:</p> <p>1) Not all item numbers are indicated (called out) in the photos, as their location is obvious.</p> <p>2) "Various" means any type, from any manufacturer that complies with the "Technical data and securement means" and meets the "Mark(s) of conformity" can be used.</p> <p>3) Indicates specific marks to be verified, which assures the agreed level of surveillance for the component. "NR" - indicates Unlisted and only visual examination is necessary. "See 5.0" indicates Unlisted components or assemblies to be evaluated periodically refer to section 5.0 for details.</p>						

5.0 Critical Unlisted CEC Components

No Unlisted CEC components are used in this report.

6.0 Critical Features

Recognized Component - A component part, which has been previously evaluated by an accredited certification body with restrictions and must be evaluated as part of the basic product considering the restrictions as specified by the Conditions of Acceptability.

Listed Component - A component part, which has been previously Listed or Certified by an accredited Certification Organization with no restrictions and is used in the intended application within its ratings.

Unlisted Component - A part that has not been previously evaluated to the appropriate designated component standard. It may also be a Listed or Recognized component that is being used outside of its evaluated Listing or component recognition.

Critical Features/Components - An essential part, material, subassembly, system, software, or accessory of a product that has a direct bearing on the product's conformance to applicable requirements of the product standard.

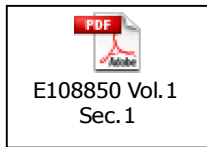
Construction Details - For specific construction details, reference should be made to the photographs and descriptions. All dimensions are approximate unless specified as exact or within a tolerance. In addition to the specific construction details described in this Report, the following general requirements also apply.

1. Spacing - In primary circuits, 3.2 mm minimum spacing are maintained through air and over surfaces of insulating material between current-carrying parts of opposite polarity and 6.4 mm minimum between such current-carrying parts and dead-metal parts or low voltage isolated circuits.
2. Mechanical Assembly - Components such as switches, fuseholders, connectors, wiring terminals and display lamps are mounted and prevented from shifting or rotating by the use of lockwashers, starwashers, or other mounting format that prevents turning of the component.
3. Corrosion Protection - All ferrous metal parts are protected against corrosion by painting, plating or the equivalent.
4. Accessibility of Live Parts - Refer to UL Report E108850, Vol. 1, Sec. 1, Page 2B.
5. Grounding - This product is not provided with a means of grounding.
6. Polarized Connection - NA
7. Internal Wiring - NA
8. Schematics - NA
9. Markings - Refer to UL Report E108850, Vol. 1, Sec. 1, Page 2B.

The following markings in French are required: NA
10. Cautionary Markings - The following are required: Refer to UL Report E108850, Vol. 1, Sec. 1, Page 2B
11. Installation, Operating and Safety Instructions - Instructions for installation and use of this product are provided by the manufacturer. See III. 2, 3, 3a, 3b, 3c, 3d, 4, 4a, 4b, 4c, 4d, 4e, 4f, 5, 5a, 5b, 5c, 5d, 5e, &5f.

7.0 Illustrations

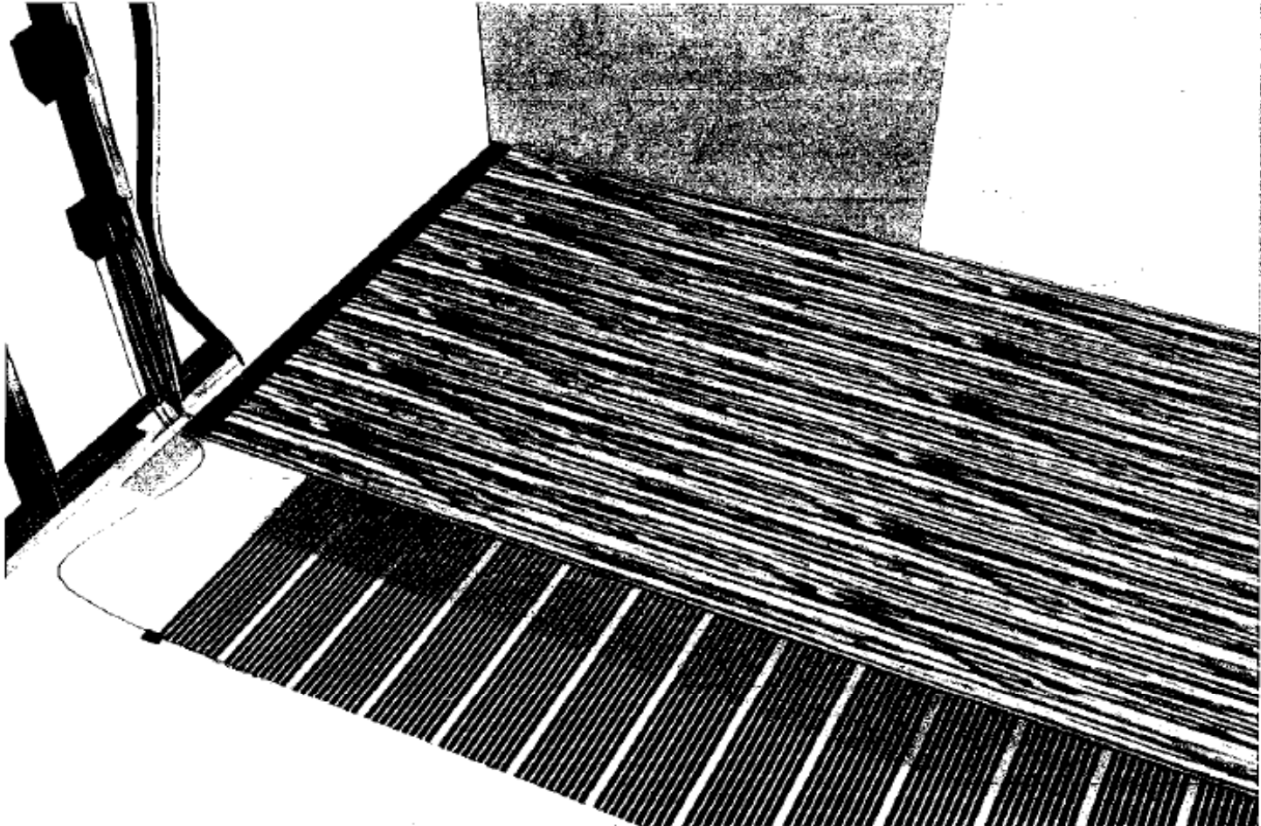
Illustration 1 - UL Report E108850 Vol. 1 Sec. 1



7.0 Illustrations

Illustration 2 - Installation Instructions for Series FLR Panels

CALORIQUE **LAMINATE WARMING SYSTEM**



Installation Manual

CM1024 — LIMITED EDITION — 2008-02-08

7.0 Illustrations

Illustration 3 - Installation Instructions for Series FH/FF Panels



7.0 Illustrations

Illustration 3a - Installation Instructions for Series FH/FF Panels (continued)

FloorHeat™

RADIANT HEAT FILM FOR FLOATING FLOORS

INSTALLATION AND OPERATION

The FloorHeat™ Radiant Heat for Floating Floors system works just like the sun. When the thermostat calls for power, the heating element warms the floating floor or laminate finished flooring surface by providing radiant heat, the same type of heat that warms you on a cool spring day. Although the air is cool, the radiant heat from the sun keeps you warm.

The radiant heat warms your floor, and provides clean even heat throughout the room by uniformly warming the objects while providing thermal comfort. There is no need to directly over-heat the air. This is the opposite of how a conventional forced hot air or baseboard heating systems works. In other types of heating systems, the large mass of air in a home is heated while the objects and especially the outside walls remain relatively cool.



CAUTION:

Read and follow all the installation instructions in this manual before attempting to install the FloorHeat™ Radiant Heat for Floating Floors. Improper installation procedures or techniques can cause potentially unsafe conditions, including overheating and shock hazards. Failure to comply with the instructions in this manual can void the manufacturer's warranty. Electrical connections should only be made by licensed contractors.



NOTE:

Upon removing the heating mats from the box, it is important to check and record the resistance of each mat using a digital ohmmeter, and compare those readings with the baseline resistance indicated on the stickers attached to the mats. If any mat shows a resistance reading that varies from the baseline value, call the technical support hotline at 888-265-5455.

7.0 Illustrations

Illustration 3b - Installation Instructions for Series FH/FF Panels (continued)

SAFETY INFORMATION

Throughout the manual you will see Cautions and Notes. These notices highlight conditions, procedures, or other information that require special attention to prevent damage to the mats, to your flooring, or possible injury. For a safe and functional installation of FloorHeat™ Radiant Heat for Floating Floors, read and follow these important safety precautions. Failure to comply with these items may result in injury or damage to the mats.

This information must be read and understood by all technicians who will be working in the area of an installed FloorHeat™ Radiant Heat for Floating Floors or main electrical systems. Failure to follow these guidelines may result in a risk of electric shock or fire hazard.



Indicates precautions or procedures that should be followed to prevent the possibility of fire.



Indicates precautions or procedures that should be followed to prevent the possibility of electrical shock.



Indicates an item that you should pay special attention to. For example, notes are used to highlight installation tips.



CAUTION: *Make sure that the jobsite is neat and clean before working with the mats. Nails, screws, and other sharp debris can damage the mats creating a potential shock hazard. Any mats which become torn or otherwise damaged must be discarded.*

Ensure that the breaker supplying power to the heating mats has been turned off before making electrical connections.

When installing any other materials on or near a heated floor, ensure that no heating mats are punctured by nails, screws, etc.

Not for use in wet areas, such as showers. This system is only for use in areas considered dry locations by National Electrical Code.

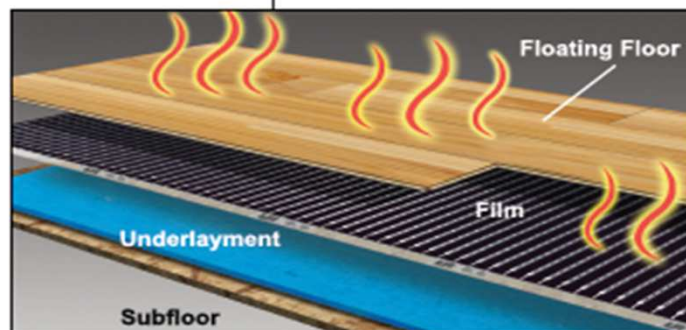
Do not install mats in walls, under walls or partitions, or in locations where they will be covered by floor hugging furniture or fixtures.



CAUTION: *Flooring materials must be rated for use with electric floor warming system.*

Do not fold or alter the heating mats.

Do not place futons, beanbag chairs, or similar furniture on heated floors.



7.0 Illustrations

Illustration 3c - Installation Instructions for Series FH/FF Panels (continued)

SECTION 3. Installation

Preparing the Job Site

Make sure that the job site is neat and clean before working with the FloorHeat™ Radiant Heat for Floating Floors. Nails, screws, and other sharp debris can damage the mats. Any mats which become torn or otherwise damaged must be discarded.

NOTES:

The installation of this heating product shall be in accordance with the manufacturer's instructions. Improper installation can result in mats that do not work, poor heating, and can void the manufacturer's warranty.

Heating mats should not be installed at or below 32°F (0°C).

This equipment shall be installed only by qualified personnel who are familiar with the construction and operation of the apparatus and the risks involved.

The installation of this product shall be in accordance with Article 424, of the National Electrical Code, ANSI/NFPA 70. ETL listed to UL499.

Note that installations over non-insulated concrete subfloors may require a longer period of time to adjust to your desired temperature.

What You Will Need

- FloorHeat™ mats
- Kapton Discs and Warning Labels (included in kits)
- Thermostat: A recommended floor-sensing thermostat (go to www.getFloorHeat.com for recommended thermostats)
- GFCI Breaker (if not part of the thermostat)
- Junction Boxes: Minimum of two required for each room or area. One box (3") required for thermostat, one box (4") required for electrical connections
- Vapor Barrier (6 mil) (only for concrete slabs when using underlayment without an attached vapor barrier)
- Underlayment
- Duct tape
- Tools: Digital Ohm Meter (multi-meter), wire stripper, screw driver, wood chisel, knife and scissors to cut underlayment
- 12/2 Romex Wire

7.0 Illustrations

Illustration 3d - Installation Instructions for Series FH/FF Panels (continued)

4. Inspection and Testing Continued

Complete the Installation

1. Install the finished flooring according to the manufacturer's instructions.
2. Retest the mats to ensure that the mats have not been damaged during the installation process. If they have been damaged, follow guidelines noted to remedy the situation.




NOTE:

Install baseboards or trim around the perimeter of the room. This ensures that the floor will not lift, exposing the mats. The flooring manufacturer's instructions will have information about installing the baseboard or trim to allow the floor to float properly.

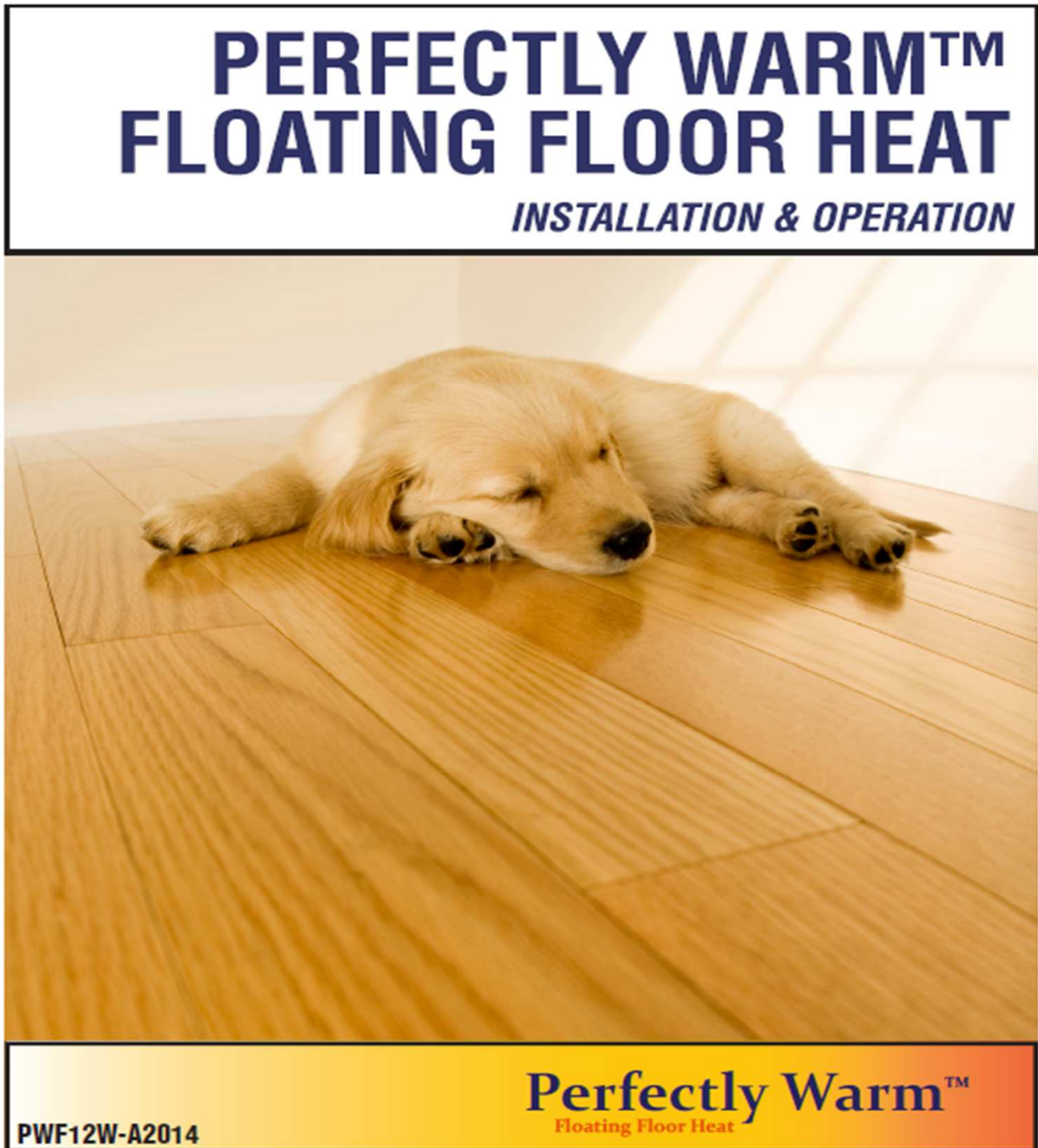
Place Caution Stickers

Apply warning stickers provided with mats in appropriate locations, as shown below. these labels are an integral part of this heating system and must be installed for warranty to be in force.

<p>Affix to the electrical panel box. In the space provided, record the numbers of all circuits to which floor heating mats are attached.</p> <div>WARNING RISK OF ELECTRIC SHOCK ELECTRIC WIRING AND HEATING PANELS CONTAINED WITHIN THE FLOOR. DO NOT PENETRATE FLOOR WITH NAILS, SCREWS OR SIMILAR DEVICES. CIRCUITS WITH HEATING MATS: _____ _____ _____ _____ FloorHeat[®]</div>	<p>Affix adjacent to points of access to all concealed areas in which installed heating products are accessible.</p> <div>CAUTION RADIANT HEATING PRODUCTS INSTALLED IN THIS AREA. AVOID ACTIONS WHICH MAY RESULT IN MECHANICAL DAMAGE TO THE PRODUCT. FloorHeat[®]</div>	<p>Affix adjacent to the thermostat.</p> <div>FloorHeat[®] RADIANT FLOOR HEATING</div>
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7.0 Illustrations

Illustration 4 - Installation Instructions for Series PWF Panels



7.0 Illustrations

Illustration 4a - Installation Instructions for Series PWF Panels (continued)

PERFECTLY WARM™ FLOATING FLOOR HEAT

INSTALLATION & OPERATION

The Perfectly Warm™ Floating Floor Heat system works just like the sun. When the thermostat calls for power, the heating element warms the floating floor or laminate finished flooring surface by providing radiant heat, the same type of heat that warms you on a cool spring day. Although the air is cool, the radiant heat from the sun keeps you warm.

The radiant heat warms your floor, and provides clean even heat throughout the room by uniformly warming the objects while providing thermal comfort. There is no need to directly over-heat the air. This is the opposite of how a conventional forced hot air or baseboard heating systems works. In other types of heating systems, the large mass of air in a home is heated while the objects and especially the outside walls remain relatively cool.

CAUTION



Read and follow all the installation instructions in this manual before attempting to install the Perfectly Warm™ Floating Floor Heat. Improper installation procedures or techniques can cause potentially unsafe conditions, including overheating and shock hazards.

Failure to comply with the instructions in this manual can void the manufacturer's warranty.

Electrical connections should only be made by licensed contractors.

NOTE



Upon removing the heating mats from the box, it is important to check and record the resistance of each mat using a digital ohmmeter, and compare those readings with the baseline resistance indicated on the stickers attached to the mats. If any mat shows a resistance reading that varies from the baseline value, call the technical support hotline at 1-888-WARM PAD.

7.0 Illustrations

Illustration 4b - Installation Instructions for Series PWF Panels (continued)

Safety Information

Throughout the manual you will see Cautions and Notes. These notices highlight conditions, procedures, or other information that require special attention to prevent damage to the mats, to your flooring, or possible injury. For a safe and functional installation of Perfectly Warm™ Floating Floor Heat, read and follow these important safety precautions. Failure to comply

with these items may result in injury or damage to the mats. This information must be read and understood by all technicians who will be working in the area of an installed Perfectly Warm™ Floating Floor Heat or main electrical systems. Failure to follow these guidelines may result in a risk of electric shock or fire hazard.



Indicates precautions or procedures that should be followed to prevent the possibility of fire.



Indicates precautions or procedures that should be followed to prevent the possibility of electrical shock.



Indicates an item that you should pay special attention to. For example, notes are used to highlight installation tips.

CAUTION



Make sure that the jobsite is neat and clean before working with the mats. Nails, screws, and other sharp debris can damage the mats creating a potential shock hazard. Any mats which become torn or otherwise damaged must be discarded.

CAUTION



Ensure that the breaker supplying power to the heating mats has been turned off before making electrical connections.



Flooring materials must be rated for use with electric floor warming system.



When installing any other materials on or near a heated floor, ensure that no heating mats are punctured by nails, screws, etc.

7.0 Illustrations

Illustration 4c - Installation Instructions for Series PWF Panels (continued)

Safety Information - Continued



CAUTION

Not for use in wet areas, such as showers. This system is only for use in areas considered dry locations by National Electrical Code.

CAUTION

Do not install mats in walls, under walls or partitions, or in locations where they will be covered by floor hugging furniture or fixtures.



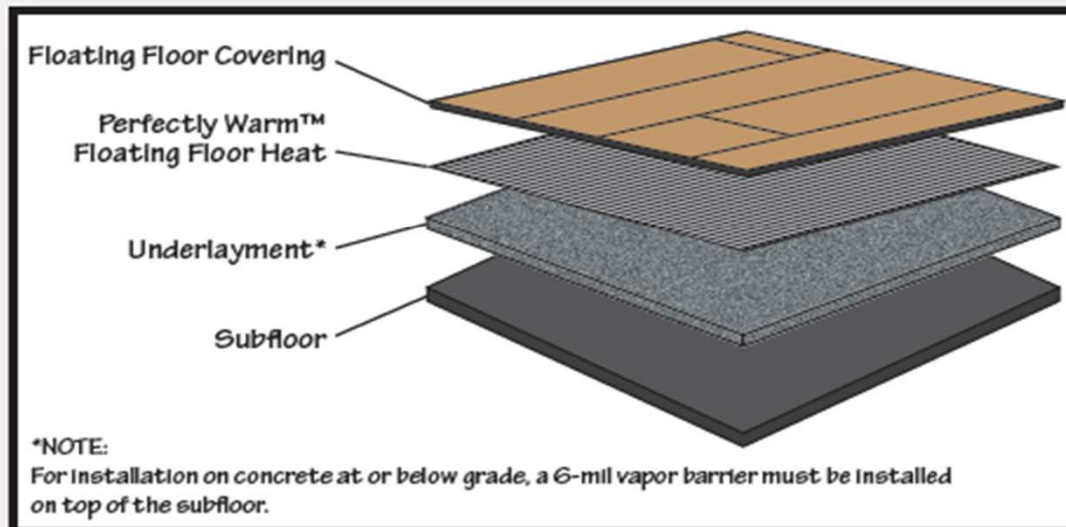
CAUTION

Do not fold or alter the heating mats.



CAUTION

Do not place futons, beanbag chairs, or similar furniture on heated floors.



7.0 Illustrations

Illustration 4d - Installation Instructions for Series PWF Panels (continued)

2. Designing the Installation - Continued

Control Devices



NOTE

The installation of this heating product and listed components shall be in accordance with Article 424, of the National Electric Code, ANSI/NFPA 70. All electrical connections should be made by a licensed electrician.

All heated areas must be protected by a GFCI in either the thermostat or at the service panel. The fuse or circuit breaker used to protect the circuit supplying power to the Perfectly Warm™ Floating Floor Heat system must be rated for a maximum of 20 amperes (no greater than 16 amp load). If a lower rated fuse or circuit breaker is used, it must be rated at least 25% greater than the heating system load attached to it. If an area requires more than the 16 amperes allowed, additional branch circuits may be used, each having its own overcurrent protection. These branch circuits may all be controlled by a single thermostat if it is used with a system of electric relays or power modules.

Thermostat Requirements



NOTE

The system must be installed using a thermostat approved by the manufacturer. Use of any other thermostat will void the manufacturer's warranty. For a list of approved thermostat devices, refer to www.perfectly-warm.com.

Locating the Thermostat

Thermostats are usually located near the power leads. However, they can be located almost anywhere, because the power leads and the sensor wire can be routed to

electrical junction boxes and extended to a location outside the heated room (such as a utility room or basement).

Location of the thermostat should be approximately 60" (152 cm) above the floor on an inside wall, near the center of the room to allow the connection leads to reach. A 3" deep box is recommended for the thermostat.

Floor Construction

The Perfectly Warm™ Floating Floor Heat can be installed on any standard sub-floor, so long as it is flat, smooth, and free from protrusions such as nails, screws, etc.

Design Clearances

When designing the heating system, care must be taken to ensure that proper clearance is maintained from fixtures which may be part of the floor.

- For best results, there should be a 6 inch (15 cm) clearance between the edge of the mats and the perimeter of the room or the walls. Clearance may be greater than 6 inches.
- Decorative trim: Mats must be installed so that they will not be covered, even in part, by decorative trim, baseboards or other structures on the floor. Heating mats which are covered by other structures may overheat.
- Wiring: Electrical wiring in the floor, other than that for the heating system, must be at least 2 inches (5 cm) away from the heating mats and/or separated from the heating mats by insulation or the building structure.
- Heat Sources: At least 8 inches (20 cm) of clearance must be maintained between heat sources and the Perfectly Warm™ Floating Floor Heat mats. Heat sources include hot water pipes, stoves, fireplaces, wood stoves, hot air vents, etc.

7.0 Illustrations

Illustration 4e - Installation Instructions for Series PWF Panels (continued)

Section 3. Installation

3.1 Preparation

CAUTION



Make sure that the jobsite is neat and clean before working with the mats. Nails, screws and other sharp debris can damage the mats. Any mats which become torn or otherwise damaged must be discarded.

NOTE



The installation of this product shall be in accordance with Article 424, of the National Electrical Code, ANSI/NFPA 70. ETL listed to UL499.

NOTE



The installation of this heating product shall be in accordance with the manufacturer's instructions. Improper installation can result in mats that do not work, poor heating, and can void the manufacturer's warranty.

NOTE



This equipment shall be installed only by qualified personnel familiar with the construction and operation of the apparatus and the risks involved.

NOTE



Heating mats should not be installed at or below 32°F (0°C).

Preparing the Job Site

Make sure that the job site is neat and clean before working with the Perfectly Warm™ Floating Floor Heat. Nails, screws and other sharp debris can damage the mats. Any mats which become torn or otherwise damaged must be discarded.

What You Will Need

- Perfectly Warm™ Floating Floor Heat mats
- Kapton Discs and Warning Labels (included in kits)
- Thermostat: A recommended floor-sensing thermostat (go to www.perfectly-warm.com for recommended thermostats)
- GFCI Breaker (if not part of the thermostat)
- Junction Boxes: Minimum of two required for each room or area. One box (3") required for thermostat, one box (4") required for electrical connections
- Vapor Barrier (6 mil) (only for concrete slabs when using underlayment without an attached vapor barrier)
- Underlayment
- Duct tape
- Tools: Digital Ohm Meter (multi-meter), wire stripper, screw driver, wood chisel, knife and scissors to cut underlayment
- 12/2 Romex Wire

7.0 Illustrations

Illustration 4f - Installation Instructions for Series PWF Panels (continued)

4. Inspection and Testing - Continued

Complete the Installation



NOTE

Install baseboards or trim around the perimeter of the room. This will ensure that the floor will not lift, exposing the mats. The laminate manufacturer's instructions will have information about installing the baseboard or trim to allow the floor to float properly.

1. Install the finished flooring according to the manufacturer's instructions.
2. Retest the mats to ensure that the mats have not been damaged during installation process. If they have been damaged, follow guidelines noted to remedy the situation.

Place Warning Labels

Apply warning labels provided with mats in appropriate locations, as shown below. These labels are an integral part of this heating system and must be installed for warranty to be in force.

Affix to the electrical panel box. In the space provided, record the numbers of all circuits to which floor heating mats are attached.

	WARNING RISK OF ELECTRIC SHOCK ELECTRIC WIRING AND HEATING PANELS CONTAINED WITHIN THE FLOOR. DO NOT PENETRATE FLOOR WITH NAILS, SCREWS OR SIMILAR DEVICES. CIRCUITS WITH HEATING MATS : _____ _____ _____ _____ _____ _____ Perfectly Warm™ PWF015
--	--

Affix adjacent to points of access to all concealed areas in which installed heating products are accessible.

CAUTION RADIANT HEATING PRODUCTS INSTALLED IN THIS AREA. AVOID ACTIONS WHICH MAY RESULT IN MECHANICAL DAMAGE TO THE PRODUCT. Perfectly Warm™ PWF009
--

Affix adjacent to the thermostat.

Perfectly Warm™ RADIANT FLOOR HEATING PWF011
--

7.0 Illustrations

Illustration 5 - Installation Instructions for Series QWF Panels



7.0 Illustrations

Illustration 5a - Installation Instructions for Series QWF Panels (continued)

QuietWarmth®

Radiant Heat Film for Floating Floors

INSTALLATION & OPERATION

The QuietWarmth® Radiant Heat Film for Floating Floors system works just like the sun. When the thermostat calls for power, the heating element warms the floating floor or laminate finished flooring surface by providing radiant heat, the same type of heat that warms you on a cool spring day. Although the air is cool, the radiant heat from the sun keeps you warm.

The radiant heat warms your floor, and provides clean even heat throughout the room by uniformly warming the objects while providing thermal comfort. There is no need to directly over-heat the air. This is the opposite of how a conventional forced hot air or baseboard heating systems works. In other types of heating systems, the large mass of air in a home is heated while the objects and especially the outside walls remain relatively cool.

CAUTION



Read and follow all the installation instructions in this manual before attempting to install the QuietWarmth® Radiant Heat Film for Floating Floors. Improper installation procedures or techniques can cause potentially unsafe conditions, including overheating and shock hazards.

Failure to comply with the instructions in this manual can void the manufacturer's warranty.

Electrical connections should only be made by licensed contractors.

NOTE



Upon removing the heating mats from the box, it is important to check and record the resistance of each mat using a digital ohmmeter, and compare those readings with the baseline resistance indicated on the stickers attached to the mats. If any mat shows a resistance reading that varies from the baseline value, call the technical support hotline at 1-888-WARM PAD.

7.0 Illustrations

Illustration 5b - Installation Instructions for Series QWF Panels (continued)

Safety Information

Throughout the manual you will see Cautions and Notes. These notices highlight conditions, procedures, or other information that require special attention to prevent damage to the mats, to your flooring, or possible injury. For a safe and functional installation of QuietWarmth® Radiant Heat Film for Floating Floors, read and follow these important safety precautions.

Failure to comply with these items may result in injury or damage to the mats. This information must be read and understood by all technicians who will be working in the area of an installed QuietWarmth® Radiant Heat Film for Floating Floors or main electrical systems. Failure to follow these guidelines may result in a risk of electric shock or fire hazard.



Indicates precautions or procedures that should be followed to prevent the possibility of fire.



Indicates precautions or procedures that should be followed to prevent the possibility of electrical shock.



Indicates an item that you should pay special attention to. For example, notes are used to highlight installation tips.

CAUTION



Make sure that the jobsite is neat and clean before working with the mats. Nails, screws, and other sharp debris can damage the mats creating a potential shock hazard. Any mats which become torn or otherwise damaged must be discarded.

CAUTION



Ensure that the breaker supplying power to the heating mats has been turned off before making electrical connections.



Flooring materials must be rated for use with electric floor warming system.



When installing any other materials on or near a heated floor, ensure that no heating mats are punctured by nails, screws, etc.

7.0 Illustrations

Illustration 5c - Installation Instructions for Series QWF Panels (continued)

Safety Information - Continued



CAUTION

Not for use in wet areas, such as showers. This system only for use in areas considered dry locations by the National Electrical Code.

CAUTION

Do not install mats in walls, under walls or partitions, or in locations where they will be covered by floor hugging furniture or fixtures.



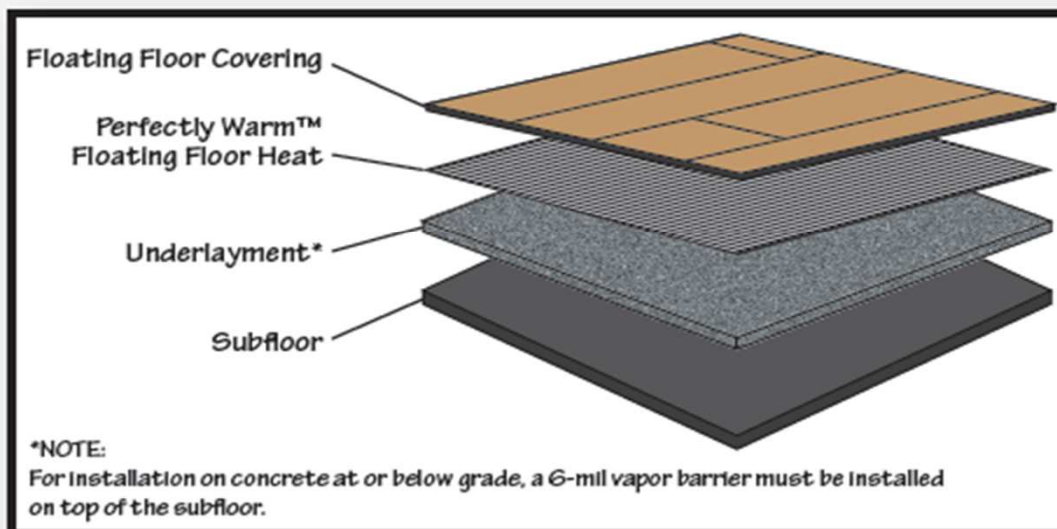
CAUTION

Do not fold or alter the heating mats.



CAUTION

Do not place futons, beanbag chairs, or similar furniture on heated floors.



7.0 Illustrations

Illustration 5d - Installation Instructions for Series QWF Panels (continued)

2. Designing the Installation - Continued

Control Devices



NOTE

The installation of this heating product and listed components shall be in accordance with Article 424, of the National Electric Code, ANSI/NFPA 70. All electrical connections should be made by a licensed electrician.

All heated areas must be protected by a GFCI in either the thermostat or at the service panel. The fuse or circuit breaker used to protect the circuit supplying power to the QuietWarmth® Radiant Heat Film for Floating Floors system must be rated for a maximum of 20 amperes (no greater than 16 amp load). If a lower rated fuse or circuit breaker is used, it must be rated at least 25% greater than the heating system load attached to it. If an area requires more than the 16 amperes allowed, additional branch circuits may be used, each having its own overcurrent protection. These branch circuits may all be controlled by a single thermostat if it is used with a system of electric relays or power modules.

Thermostat Requirements



NOTE

The system must be installed using a thermostat approved by the manufacturer. Use of any other thermostat will void the manufacturer's warranty. For a list of approved thermostat devices, refer to www.quietwarmth.com.

Locating the Thermostat

Thermostats are usually located near the power leads. However, they can be located almost anywhere, because the power leads and the sensor wire can be routed to

electrical junction boxes and extended to a location outside the heated room (such as a utility room or basement).

Location of the thermostat should be approximately 60" (152 cm) above the floor on an inside wall, near the center of the room to allow the connection leads to reach. A 3" deep box is recommended for the thermostat.

Floor Construction

The QuietWarmth® Radiant Heat Film for Floating Floors can be installed on any standard sub-floor, so long as it is flat, smooth, and free from protrusions such as nails, screws, etc.

Design Clearances

When designing the heating system, care must be taken to ensure that proper clearance is maintained from fixtures which may be part of the floor.

- For best results, there should be a 6 inch (15 cm) clearance between the edge of the mats and the perimeter of the room or the walls. Clearance may be greater than 6 inches.
- Decorative trim: Mats must be installed so that they will not be covered, even in part, by decorative trim, baseboards or other structures on the floor. Heating mats which are covered by other structures may overheat.
- Wiring: Electrical wiring in the floor, other than that for the heating system, must be at least 2 inches (5 cm) away from the heating mats and/or separated from the heating mats by insulation or the building structure.
- Heat Sources: At least 8 inches (20 cm) of clearance must be maintained between heat sources and the QuietWarmth® Radiant Heat Film for Floating Floors mats. Heat sources include hot water pipes, stoves, fireplaces, wood stoves, hot air vents, etc.

7.0 Illustrations

Illustration 5e - Installation Instructions for Series QWF Panels (continued)

Section 3. Installation

3.1 Preparation

CAUTION



Make sure that the jobsite is neat and clean before working with the mats. Nails, screws and other sharp debris can damage the mats. Any mats which become torn or otherwise damaged must be discarded.

NOTE



The installation of this heating product shall be in accordance with the manufacturer's instructions. Improper installation can result in mats that do not work, poor heating, and can void the manufacturer's warranty.

NOTE



This equipment shall be installed only by qualified personnel familiar with the construction and operation of the apparatus. The installation of this product shall be in accordance with Article 424, of the National Electrical Code, ANSI/NFPA 70. ETL listed to UL499.

NOTE



Heating mats should not be installed at or below 32°F (0°C).

Preparing the Job Site

Make sure that the job site is neat and clean before working with the QuietWarmth® Radiant Heat Film for Floating Floors. Nails, screws and other sharp debris can damage the mats. Any mats which become torn or otherwise damaged must be discarded.

What You Will Need

- QuietWarmth® Radiant Heat Film for Floating Floors mats
- Kapton Discs and Warning Labels (included in kits)
- Thermostat: A recommended floor-sensing thermostat (go to www.quietwarmth.com for recommended thermostats)
- GFCI Breaker (if not part of the thermostat)
- Junction Boxes: Minimum of two required for each room or area. One box (3") required for thermostat, one box (4") required for electrical connections
- Vapor Barrier (6 mil) (only for concrete slabs when using underlayment without an attached vapor barrier)
- Underlayment
- Duct tape
- Tools: Digital Ohm Meter (multi-meter), wire stripper, screw driver, wood chisel, knife and scissors to cut underlayment
- 12/2 Romex Wire

7.0 Illustrations

Illustration 6 - Model Similarities

FH/FF SERIES:

NEW PRODUCT	SIMILAR PRODUCT #	DESCRIPTION
FIH36-12F120V	FLR25P17W120V	36in, 33 Watts/Foot @ 120 Volt 12W/SqFt

PWF & QWF SERIES:

NEW PRODUCT	SIMILAR PRODUCT #	DESCRIPTION
MPG36-12F120V	FLR36-35W120V	36in, 33 Watts/Foot @ 120 Volt 12W/SqFt
MPG36-12F240V	FLR36-35W240V	36in, 33 Watts/Foot @ 240 Volt 12W/SqFt
MPG18-12F120V	FLR17P10W120V	18in, 15 Watts/Foot @ 120 Volt 12W/SqFt
MPG18-12F240V	FLR17P10W240V	18in, 15 Watts/Foot @ 240 Volt 12W/SqFt

KEY

The first three letters correspond to the brand name of the panel.
The First number refers to the width of the panel.
The second number corresponds with the panels power per square foot.
The Last number is the incoming Voltage for the panel.

7.0 Illustrations

Illustration 7 - Ratings

Model	Rated Voltage	Max Watts (sq ft)	Element Width (inches)	Element Length (feet)
FH/FF 36-3	120V	12	36	3
FH/FF 36-5	120V	12	36	5
FH/FF 36-7	120V	12	36	7
FH/FF 36-10	120V	12	36	10
PWF18-16W120V	120V	12	18	1
PWF18-31W120V	120V	12	18	2
PWF18-47W120V	120V	12	18	3
PWF18-62W120V	120V	12	18	4
PWF18-78W120V	120V	12	18	5
PWF18-94W120V	120V	12	18	6
PWF18-109W120V	120V	12	18	7
PWF18-125W120V	120V	12	18	8
PWF18-140W120V	120V	12	18	9
PWF18-156W120V	120V	12	18	10
PWF36-33W120V	120V	12	36	1
PWF36-67W120V	120V	12	36	2
PWF36-100W120V	120V	12	36	3
PWF36-134W120V	120V	12	36	4
PWF36-167W120V	120V	12	36	5
PWF36-200W120V	120V	12	36	6
PWF36-234W120V	120V	12	36	7
PWF36-267W120V	120V	12	36	8
PWF36-300W120V	120V	12	36	9
PWF36-334W120V	120V	12	36	10
PWF18-16W240V	240V	12	18	1
PWF18-31W240V	240V	12	18	2
PWF18-47W240V	240V	12	18	3
PWF18-62W240V	240V	12	18	4
PWF18-78W240V	240V	12	18	5
PWF18-94W240V	240V	12	18	6
PWF18-109W240V	240V	12	18	7
PWF18-125W240V	240V	12	18	8
PWF18-140W240V	240V	12	18	9
PWF18-156W240V	240V	12	18	10
PWF36-33W240V	240V	12	36	1
PWF36-67W240V	240V	12	36	2
PWF36-100W240V	240V	12	36	3
PWF36-134W240V	240V	12	36	4
PWF36-167W240V	240V	12	36	5
PWF36-200W240V	240V	12	36	6
PWF36-234W240V	240V	12	36	7
PWF36-267W240V	240V	12	36	8

7.0 Illustrations

Illustration 7a - Ratings (continued)

PWF36-300W240V	240V	12	36	9
PWF36-334W240V	240V	12	36	10
QWF18-16W120V	120V	12	18	1
QWF18-31W120V	120V	12	18	2
QWF18-47W120V	120V	12	18	3
QWF18-62W120V	120V	12	18	4
QWF18-78W120V	120V	12	18	5
QWF18-94W120V	120V	12	18	6
QWF18-109W120V	120V	12	18	7
QWF18-125W120V	120V	12	18	8
QWF18-140W120V	120V	12	18	9
QWF18-156W120V	120V	12	18	10
QWF36-33W120V	120V	12	36	1
QWF36-67W120V	120V	12	36	2
QWF36-100W120V	120V	12	36	3
QWF36-134W120V	120V	12	36	4
QWF36-167W120V	120V	12	36	5
QWF36-200W120V	120V	12	36	6
QWF36-234W120V	120V	12	36	7
QWF36-267W120V	120V	12	36	8
QWF36-300W120V	120V	12	36	9
QWF36-334W120V	120V	12	36	10
QWF18-16W240V	240V	12	18	1
QWF18-31W240V	240V	12	18	2
QWF18-47W240V	240V	12	18	3
QWF18-62W240V	240V	12	18	4
QWF18-78W240V	240V	12	18	5
QWF18-94W240V	240V	12	18	6
QWF18-109W240V	240V	12	18	7
QWF18-125W240V	240V	12	18	8
QWF18-140W240V	240V	12	18	9
QWF18-156W240V	240V	12	18	10
QWF36-33W240V	240V	12	36	1
QWF36-67W240V	240V	12	36	2
QWF36-100W240V	240V	12	36	3
QWF36-134W240V	240V	12	36	4
QWF36-167W240V	240V	12	36	5
QWF36-200W240V	240V	12	36	6
QWF36-234W240V	240V	12	36	7
QWF36-267W240V	240V	12	36	8
QWF36-300W240V	240V	12	36	9
QWF36-334W240V	240V	12	36	10

8.0 Test Summary			
Evaluation Period	8/22/2011 - 9/25/2012	Project No.	G100457357
Due to the previous testing performed under UL Report E108850 Vol. 1, Sec. 1 no additional testing was necessary.			
Evaluation Period	12/8/2015	Project No.	G102393981SVN
Due to previous testing performed and reported above no additional testing was necessary for UL 499 Issued: 2014/11/07 Ed: 14 Electric Heating Appliances.			
Evaluation Period	11/14/2017	Project No.	G103258816SVN
Due to previous testing performed and reported above no additional testing was necessary for Electric Heating Appliances [UL 499:2014 Ed.14+R:23Feb2017].			
8.1 Signatures			
A representative sample of the product covered by this report has been evaluated and found to comply with the applicable requirements of the standards indicated in Section 1.0.			
Completed by:	D. Robb	Reviewed by:	D. Tesfaye
Title:	Engineer	Title:	Reviewer
Signature:	Signature on file	Signature:	Signature on file

9.0 Correlation Page For Multiple Listings

The following products, which are identical to those identified in this report except for model number and Listee name, are authorized to bear the ETL label under provisions of the Intertek Multiple Listing Program.

BASIC LISTEE	Calorique LLC
Address	2380 Cranberry Highway West Wareham, MA 02576
Country	USA
Product	Under-Floor Heating Radiant Sheet Heating Elements

MULTIPLE LISTEE 1	None
Address	
Country	
Brand Name	
ASSOCIATED MANUFACTURER	
Address	
Country	
MULTIPLE LISTEE 1 MODELS	BASIC LISTEE MODELS

MULTIPLE LISTEE 2	None
Address	
Country	
Brand Name	
ASSOCIATED MANUFACTURER	
Address	
Country	
MULTIPLE LISTEE 2 MODELS	BASIC LISTEE MODELS

MULTIPLE LISTEE 3	None
Address	
Country	
Brand Name	
ASSOCIATED MANUFACTURER	
Address	
Country	
MULTIPLE LISTEE 3 MODELS	BASIC LISTEE MODELS

10.0 General Information

The Applicant and Manufacturer have agreed to produce, test and label ETL Listed products in accordance with the requirements of this Report. The Manufacturer has also agreed to notify Intertek and to request authorization prior to using alternate parts, components or materials.

COMPONENTS

Components used shall be those itemized in this Intertek report covering the product, including any amendments and/or revisions.

LISTING MARK

The ETL Listing mark applied to the products shall either be separable in form, such as labels purchased from Intertek, or on a product nameplate or other media only as specifically authorized by Intertek. Use of the mark is subject to the control of Intertek.

The mark must include the following four items:

- 1) applicable country identifiers "US" and/or "C" or "US", "C" and "EU"
- 2) the word "Listed" or "Classified" or "Recognized Component" (whichever is appropriate)
- 3) a control number issued by Intertek
- 4) a product descriptor that identifies the standards used for certification. Example:

For US standards, the words, "Conforms to" shall appear with the standard number along with the word, "Standard" or "Std." Example: "Conforms to ANSI/UL Std. XX."

For Canadian standards, the words "Certified to CAN/CSA Standard CXX No. XX." shall be used, or abbreviated, "Cert. to CAN/CSA Std. CXX No. XX."

Can be used together when both standards are used.

Note: A facsimile must be submitted to Intertek, Attn: Follow-up Services for approval prior to use.

The facsimile need not have a control number. A control number will be issued **after signed Certification Agreements** have been received by the Follow-up Services office, approval of the facsimile of your proposed Listing Mark, satisfactory completion of the Listing Report, and scheduling of a factory assessment in your facility.

MANUFACTURING AND PRODUCTION TESTS

Manufacturing and Production Tests shall be performed as required in this Report.

FOLLOW-UP SERVICE

Periodic unannounced audits of the manufacturing facility (and any locations authorized to apply the mark) shall be scheduled by Intertek. An audit report shall be issued after each visit. Special attention will be given to the following:

1. Conformance of the manufactured product to the descriptions in this Report.
2. Conformance of the use of the ETL mark with the requirements of this Report and the Certification Agreement.
3. Manufacturing changes.
4. Performance of specified Manufacturing and Production Tests.

In the event that the Intertek representative identifies non-conformance(s) to any provision of this Report, the Applicant shall take one or more of the following actions:

1. Correct the non-conformance.
2. Remove the ETL Mark from non-conforming product.
3. Contact the issuing product safety evaluation center for instructions.

10.1 Evaluation of Unlisted Components

Because Unlisted Components are uncontrolled, and they do not fall under a third party follow up program, Intertek may require these components to be tested and/or evaluated at least once annually, more often for certain components, as part of the independent certification process. The Unlisted Components in Section 5.0 require testing and/or evaluation as indicated.

Note to Intertek Follow Up Inspector: The Component Evaluation Center, CEC, will notify you in writing when these components must be selected and sent to the CEC for re-evaluation

Ship the samples to:

Intertek Testing Services NA Inc.

ETL Component Evaluation Center

45000 Helm Street, Suite 150

Plymouth Twp., MI 48170 USA

Attn: Component Evaluation Center

Sample Disposition: Due to the destructive nature of the testing, all samples will be discarded at the conclusion of testing unless, the manufacturer specifically requests the return of the samples. The request for return must accompany the initial component shipment.

11.0 Manufacturing and Production Tests

The manufacturer agrees to conduct the following Manufacturing and Production Tests as specified:

Required Tests

Dielectric Voltage Withstand Test

11.1 Dielectric Voltage Withstand Test

Method

One hundred percent of production of the products covered by this Report shall be subjected to a routine production line dielectric withstand test.

The test shall be conducted on products, which are fully assembled. Prior to applying the test potential, all switches, contactors, relays, etc., should be closed so that all primary circuits are energized by the test potential. If all primary circuits cannot be tested at one time, then separate applications of the test potential shall be made.

The test voltage specified below shall be applied between primary circuits and accessible dead-metal parts. The test voltage may be gradually increased to the specified value but must be maintained at the specified value for one second or one minute as required.

Test Equipment

The test equipment shall incorporate a transformer with an essentially sinusoidal output, a means to indicate the applied test potential, and an audible and/or visual indicator of dielectric breakdown.

The test equipment shall incorporate a voltmeter in the output circuit to indicate directly the applied test potential if the rated output of the test equipment is less than 500VA.

If the rated output of the test equipment is 500VA or more, the applied test potential may be indicated by either:

- 1 - a voltmeter in the primary circuit;
- 2 - a selector switch marked to indicate the test potential; or
- 3 - a marking in a readily visible location to indicate the test potential for test equipment having a single test potential output.

In cases 2 and 3, the test equipment shall include a lamp or other visual means to indicate that the test potential is present at the test equipment output. All test equipment shall be maintained in current calibration.

Products Requiring Dielectric Voltage Withstand Test:

<u>Product</u>	<u>Test Voltage</u>	<u>Test Time</u>
All 120Vac rated products covered by this Report.	1000V	60 s
	or 1200V	1 s
All 240Vac rated products covered by this Report.	1480V	60 s
	or 1776V	1 s

12.0 Revision Summary				
The following changes are in compliance with the declaration of Section 8.1:				
Date/ Proj # Site ID	Project Handler/ Reviewer	Section	Item	Description of Change
8-Dec-2015	D. Robb	1	--	Technical change to update standard UL 499 From: UL 499, Electric Heating Appliances, Dated Nov 17, 2005, 13th Edition, including revisions through March 28, 2011 To: UL 499 Issued: 2014/11/07 Ed: 14 Electric Heating Appliances. Product listed is not affected.
G102393981SVN	J. Pierce	1	--	Updated the Applicant and Manufacturer 1 name From: Calorique To: Calorique LLC.
		8	--	Added new test block.
		8.1	--	Added new signatures.
		10.1	--	Updated the CEC address.
14-Nov-2017	D. Robb	1	-	Technical change to update standard UL 499 From: UL 499 Issued: 2014/11/07 Ed: 14 Electric Heating Appliances. To: Electric Heating Appliances [UL 499:2014 Ed.14+R:23Feb2017]. Product listed is not affected.
G103258816SVN	D. Tesfaye	8	-	Added new test block.
		8.1	-	Added new signatures.

12.0 Revision Summary				
The following changes are in compliance with the declaration of Section 8.1:				
Date/ Proj # Site ID	Project Handler/ Reviewer	Section	Item	Description of Change
2-Jan-2019	J.Dean	1	-	Removed Mfg 2 . Protecto Wrap Co. 1955 S. Cherokee St. Denver, CO 80223 USA
				<p>Updated Models from: "Series FLR: FLR10P8W120V, FLR10P8W240V, FLR14P10W120V, FLR14P10W240V, FLR22P17W120V, FLR22P17W240V, FLR12P12F120V, FLR12P12F240V, FLR24P12F120V, FLR24P12F240V, FLR48P12F120V, FLR48P12F240V, FLR13P8W120V, FLR13P8W240V, FLR17P10W120V, FLR17P10W240V, FLR24-22W120V, FLR24-22W240V, FLR25P17W120V, FLR25P17W240V, FLR36-35W120V, FLR36-35W240V, FLR48P38W120V, FLR48P38W240V."</p> <p>to: "Series FLR: FLR10P8W120V, FLR10P8W240V, FLR14P10W120V, FLR14P10W240V, FLR22P17W120V, FLR22P17W240V, FLR12P12F120V, FLR12P12F240V, FLR24P12F120V, FLR24P12F240V, FLR48P12F120V, FLR48P12F240V, FLR13P8W120V, FLR13P8W240V, FLR17P10W120V, FLR17P10W240V, FLR24-22W120V, FLR24-22W240V, FLR25P17W120V, FLR25P17W240V, FLR36-35W120V, FLR36-35W240V, FLR48P38W120V, FLR48P38W240V."</p> <p>Series FH/FF: FH/FF 36-3, FH/FF 36-5, FH/FF 36-7, FH/FF 36-10.</p>

12.0 Revision Summary				
The following changes are in compliance with the declaration of Section 8.1:				
Date/ Proj # Site ID	Project Handler/ Reviewer	Section	Item	Description of Change
		2	--	<p>Series PWF: PWF18-16W120V, PWF18-31W120V, PWF18-47W120V, PWF18-62W120V, PWF18-78W120V, PWF18-94W120V, PWF18-109W120V, PWF18-125W120V, PWF18-140W120V, PWF18-156W120V, PWF36-33W120V, PWF36-67W120V, PWF36-100W120V, PWF36-134W120V, PWF36-167W120V, PWF36-200W120V, PWF36-234W120V, PWF36-267W120V, PWF36-300W120V, PWF36-334W120V, PWF18-16W240V, PWF18-31W240V, PWF18-47W240V, PWF18-62W240V, PWF18-78W240V, PWF18-94W240V, PWF18-109W240V, PWF18-125W240V, PWF18-140W240V, PWF18-156W240V, PWF36-33W240V, PWF36-67W240V, PWF36-100W240V, PWF36-134W240V, PWF36-167W240V, PWF36-200W240V, PWF36-234W240V, PWF36-267W240V, PWF36-300W240V, PWF36-334W240V.</p> <p>Series QWF: QWF18-16W120V, QWF18-31W120V, QWF18-47W120V, QWF18-62W120V, QWF18-78W120V, QWF18-94W120V, QWF18-109W120V, QWF18-125W120V, QWF18-140W120V, QWF18-156W120V, QWF36-33W120V, QWF36-67W120V, QWF36-100W120V, QWF36-134W120V, QWF36-167W120V, QWF36-200W120V, QWF36-234W120V, QWF36-267W120V, QWF36-300W120V, QWF36-334W120V, QWF18-16W240V, QWF18-31W240V, QWF18-47W240V, QWF18-62W240V, QWF18-78W240V, QWF18-94W240V, QWF18-109W240V, QWF18-125W240V, QWF18-140W240V, QWF18-156W240V, QWF36-33W240V, QWF36-67W240V, QWF36-100W240V, QWF36-134W240V, QWF36-167W240V, QWF18-200W240V, QWF36-234W240V, QWF36-267W240V, QWF36-300W240V, QWF36-334W240V."</p>
G103776712CRT	R. Ransom <i>RR</i>	2	--	Updated Brand name from: "NA" to: "Calorique, Floor Heat, Perfectly Warm, Quiet Warmth"

12.0 Revision Summary				
The following changes are in compliance with the declaration of Section 8.1:				
Date/ Proj # Site ID	Project Handler/ Reviewer	Section	Item	Description of Change
		2	--	Updated Model Similarity from: "Refer to UL Report E108850 Vol. 1 Sec. 1, pages 2, 2A, 2B" to: "Refer to UL Report E108850 Vol. 1 Sec. 1, pages 2, 2A, 2B, and Illustration 6 for Model Similarity" Added reference to illustration 7, 7a to Ratings section.
		6	11	Updated Instruction from: "See III. 2. Verify instructions are CM1024, 8/2/2008." to: " See III. 2, 3, 3a, 3b, 3c, 3d, 4, 4a, 4b, 4c, 4d, 4e, 4f, 5, 5a, 5b, 5c, 5d, 5e, &5f. "
		7	3, 3a, 3b, 3c, 3d	Added "Installation Instructions for Series FH/FF Panels"
		7	4, 4a, 4b, 4c, 4d, 4e, 4f	Added "Installation Instructions for Series PWF Panels"
		7	5, 5a, 5b, 5c, 5d, 5e, 5f	Added "Installation Instructions for Series QWF Panels"
		7	6	Added "Illustration 6 - Model Similarities"
		7	7, 7a,	Added Ratings



the standard in safety

Underwriters
Laboratories

MR. J WILLNER
CALORIQUE LTD
2380 CRANBERRY HWY
WEST WAREHAM MA 02576

Date: 2009/12/22
Subscriber: 290827001
PartySite: 41331
File No: E108850
Project No: 09SR5136164
PD No: 09M73693
Type: R
PO Number:

Subject: Procedure And/Or Report Material

The following material resulting from the investigation under the above numbers is enclosed.

Issue

Date	Vol	Sec	Pages
1987/01/30	1	1	Revised Description Page(s) 2B
1987/01/30	1	1	New Test Record 10

Revised Date

2009/12/21
2009/12/21

Inspections at your plant will be conducted under the supervision of PAMELA BLANCHETTE, AREA MANAGER, UL INSPECTION CENTER NEW ENGLAND, UNDERWRITERS LABORATORIES INC, BOX 333, 215 S BROADWAY, SALEM, NH, United States, 03079., PHONE: 978-250-7411, FAX: 978-250-5093, EMAIL: PAMELA.S.BLANCHETTE@US.UL.COM

Please file revised pages and illustrations in place of material of like identity. New material should be filed in its proper numerical order.

NOTE: Follow-Up Service Procedure revisions DO NOT include Cover Pages, Test Records and Conclusion Pages. Report revisions DO NOT include Authorization Pages, Indices, Section General Pages and Appendixes.

Please review this material and report any inaccuracies to our Customer Service Professional, PHONE: 1-877-UL Helps (877-854-3577), FAX: 1-360-817-6000, E-MAIL: CEC@us.ul.com, referring to the above Project and/or PD Numbers.

This material is provided on behalf of Underwriters Laboratories Inc.(UL) or any authorized licensee of UL.

MEL File

UL INSPECTION CENTER 14

INDEX

<u>Product</u>	<u>Section</u>	<u>Report Date</u>
*Component Sheet Heating Elements, A F H, J, O, X, Y, AGR, CHE, CPE, FLR, FHC, HBN, HST, IND, JPN, KFH, MIR, MST, RCH, RHP, RRT, SLB, THP, UDH, UTL, UTH, or US, followed by two numbers, followed by P or -, followed by numbers 3 number (max 149), may be followed by W, F, or M, followed by 3 numbers (max 240), followed by V or DV, may be followed by H or F.	1	1-30-87

*

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Revised: 2009-07-30

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Page 3

Issued: 1990-08-01
Revised: 2009-07-30

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DESCRIPTION

PRODUCT COVERED:

Component - Sheet Heating Elements. Refer to following chart for model numbers.

ELECTRICAL RATINGS:

<u>Model</u>	<u>Rated Voltage</u>	<u>Max Watts Per Sq Ft.</u>	<u>Element Width - In (Overall)</u>
AGR11-20W120V	120	25	11
AGR3-6W120V	24	34	3
AGR9-18W24V	24	34	9
AGR9P13W24V	24	20	9
AGR5P6W120V	120	12	5
AGR10P11W120V	120	20	10
AGR11P8W120V	120	8	11
AGR20P30W120V	120	10	20
AGR21P20W120V	120	20	21
AGR22P15W120V	120	15	22
AGR22P30W120V	120	30	21
CHE10.5-113WDV	120	149	9
CPE7P40F120VF	120	40	7
CPE7P40F240VF	240	40	7
CPE7P40FDVF	120/240	40	7
CPE12P40F120VF	120	40	12
CPE12P40F240VF	240	40	12
CPE12P40FDVF	120/240	40	12
CPE24P40F120VF	120	40	24
CPE24P40F240VF	240	40	24
CPE24P40FVDF	120/240	40	24
IND11P20W120V	120	25	11
IND11P20W240V	240	23	11
IND11P40W120V	120	47	11
IND11P25W120V	120	29	11
IND11P8W230V	230	9	11
IND11P70W120V	120	87	11
IND3-10W120V	120	56	3
IND3-6W120V	120	36	3
IND3-6W24V	24	39	3
IND3-6W12V	12	39	3
IND4-15W120V	120	58	4.5
IND4-3W120V	120	11.5	4.5
IND4-9W24V	24	33	4.5
IND-116	120	18	21
IND21-58W120V	120	35	21
IND15-45W120V	120	40	15
IND15-60W120V	120	53	15
IND15-60W240V	240	53	15
IND15-157W120V	120	15	15
IND15-40W120V	120	35	15
IND15-86W120V	120	76.2	15
IND5-15W120V	120	45	5
IND7P38W120V	240	87.6	7
IND7P39W240V	240	89.9	7
IND7P8.5W230V	230	20.4	7
IND17P288W120V	120	104	17
IND17P360W120V	120	130	17

ELECTRICAL RATINGS:

<u>Model</u>	<u>Rated Voltage</u>	<u>Max Watts Per Sq Ft.</u>	<u>Element Width - In (Overall)</u>
IND11-20W120V	120	25	11
IND11P20W120VF	120	27	11
IND11P20W240VF	240	27	11
IND11P40W120VF	120	54	11
IND11P40W240VF	240	54	11
IND12P20W120V	120	27	12
IND16-50WDV	120/240	41	16
IND17P10W120V	120	9	17
IND17P30W120V	120	27	17
IND21P40W120V	120	29	21
IND4-5W120V	120	20	4

<u>Model</u>	<u>Rated Voltage</u>	<u>Max Watts Per Sq Ft.</u>	<u>Element Width - In (Overall)</u>
THP8P40F120VF	120	40	8
THP8P40F240VF	240	40	8
THP13P40F120VF	120	40	13
THP13P40F240VF	240	40	13
THP25P40F120VF	120	40	25
THP25P40F240VF	240	40	25
THP25P40FDVF	120/240	40	25
THP36P40F120VF	120	40	36
THP36P40F240VF	240	40	36
THP48P40F120VF	120	40	48
THP48P40F240VF	240	40	48

<u>Model</u>	<u>Rated voltage</u>	<u>Max watts per lin. ft</u>	<u>Element width</u>
HTM11-22WDV	120/240	22	11 in
HTM11-32WDV	120/240	31	16 in
HTM25-40WDV	120/240	40	25 in
IND12P20W120VF	120	20	12 in
IND17P30W120VF	120	30	17 in
IND21P40W120VF	120	40	21 in
IND25P50W120VF	120	50	25 in
UDH13-60F115V	120	60	13.3 in
UDH13-60F115V	115	60	13 in
UTL26P7F48VH	48	7	26 in

<u>Model</u>	<u>Rated voltage</u>	<u>Max watts per Sq. ft</u>	<u>Element width</u>
IND11P40W240V	240	40	11 in
IND11P10W120V	120	10	11 in
IND13-11W240V	240	11	13.33 in
IND13-22W240V	240	22	13.33 in
IND4-8W120V	120	4	4 in
IND24-10F120V	120	10	24 in

<u>Model</u>	<u>Rated Voltage</u>	<u>Watts/Panel</u>	<u>Element width</u>
ATC204P8W120V	120	8	204 mm
ATC204P8W100V	100	8	204 mm
ATC172P8W120V	120	8	172 mm
ATC172P5W120V	120	5.5	172 mm
ATC172P5W230V	230	5.5	172 mm
ATC165P12W120V	120	12	165 mm
ATC205P12W230V	230	12	205 mm
ATC205P13W100V	100	13	205 mm

*

<u>Model</u>	<u>Rated Voltage</u>	<u>Max watts per Sq. ft</u>	<u>Element width</u>
CHE13P47W110V	110	47	34 cm
CHE13P47W220V	220	46	34 cm

<u>Model</u>	<u>Rated Voltage</u>	<u>Max watts per Sq. ft</u>	<u>Element width</u>
HTE20-40F120VF	120	40	20 in
HTE32-40F120VF	120	40	32 in
HTE32-40F240VF	240	40	32 in

<u>Model</u>	<u>Rated Voltage</u>	<u>Max watts per Sq. ft</u>	<u>Element width</u>
J65P180M220V8A	220	16	650 mm
KFH60P250M220V	220	23	600 mm
KFH60P290M220V	220	27	600 mm
KFH80P250M220V	220	23	800 mm
KFH80P290M220V	220	27	800 mm
Y65P180M220V	220	17	650 mm
Y65P200M220V	220	11	650 mm
Y65P300M220V	220	28	650 mm

<u>Model</u>	<u>Rated Voltage</u>	<u>Max watts per Sq. ft</u>	<u>Element width</u>
MIR18P75W120V	120	24	18 in
MIR18P75W230V	230	24	18 in
MIR13P60W120V	120	34	13 in
MIR13P60W120V	230	34	13 in
RPT7P4W120V	120	11	7 in
RPT7P8W120V	120	23	7 in
RPT11P7W120V	120	7	11 in
RPT11-10W120V	120	10	11 in
RPT11P15W120V	120	19	11 in
RPT17P11W120V	120	9.3	17 in
RPT17P24W120V	120	20	17 in
RPT18-15W120V	120	10	18 in
RPT24-20W120V	120	10	24 in
SLB32-48F220V	220	48	32 in
US10-430W220V	230	40	8 in
US18P22W220V	220	25	18 in
US30P270M220V	220	18.2	11.82 in
US43P215M220V	220	20	43 cm
US43P226M220V	220	21	43 cm
US30P270M220V	220	18.2	11.82 in
US60P150M220V	220	14	60 cm
US60P215M220V	220	20	60 cm
US60P235M220V	220	21	60 cm
US65P250M220V	220	23.25	26
US65P300M220V	220	28.61	26

Series ULw-xx.x-y-z - Refer to Nomenclature System.

Model	Rated Voltage	Max watts per Sq. ft	Element width
FHC44P110LM230V	230	25.64	17.52 in
FHC44P150LM230V	230	34.83	17.52 in
FHC44P75LM230V	230	17.41	17.52 in
FHC44P75LM230V8	230	17.41	17.52 in
FHC55P116LM230V	230	21.55	21.65 in
FHC55P150LM230V	230	27.86	21.65 in
FLR10P8W120V	120	10	10 in
FLR10P8W240V	240	10	10 in
FLR14P10W120V	120	10	14 in
FLR14P10W240V	240	10	14 in
FLR22P17W120V	120	12	22 in
FLR22P17W240V	240	12	22 in
FLR12P12F120V	120	12	12 in
FLR12P12F240V	240	12	12 in
FLR24P12F120V	120	12	24 in
FLR24P12F240V	240	12	24 in
FLR48P12F120V	120	12	48 in
FLR48P12F240V	240	12	48 in
FLR13P8W120V	120	10	13 in
FLR13P8W240V	240	10	13 in
FLR17P10W120V	120	10	17 in
FLR17P10W240V	240	10	17 in
FLR24-22W120V	120	12	24 in
FLR24-22W240V	240	12	24 in
FLR25P17W120V	120	10	24 in
FLR25P17W240V	240	10	24 in
FLR36-35W120V	120	12	36 in
FLR36-35W240V	240	12	36 in
FLR48P38W120V	120	10	48 in
FLR48P38W240V	240	10	48 in
HST24P40F240V	240	40	24 in
HST7-26W120V	120	67	7 in
HST7-26W220V	220	67	7 in
HST9-35W120V	120	53	9 in
HST9-35W220V	220	53	9 in
HTE20-40FDV	115/230	40	20 in
HTE32-40FDV	115/230	40	32 in
HTE44-40FDV	115/230	40	44 in
HTE6-40F120V	120	40	6 in
HTE6-40F240V	240	40	6 in
HTE8-40F240V	240	73	8 in

Series ULw-xx.x-y-z - Refer to Nomenclature System.

[illegible]

NOMENCLATURE SYSTEM:

Example:

1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
U	T	L	2	6	P	1	2	F	1	2	5	V	H	

- Columns 1,2,3 Three letter prefix to identify usage or customer;
such as: RCH - radiant ceiling heater
 FLR - under-floor heater
 RHP - Radiant Heating Products, Inc.
List of prefixes follows below.
- Columns 4, 5 Overall width of the finished element (in inches if ≤ 26 or in centimeters if ≥ 28), width is rounded off to a whole number, rounded down if less than .5.
- Column 6 Indication of whether the element is panelized or continuous
"-" (dash) indicates that the element is continuous (not panelized); "P" indicates that the element is panelized.
- Columns 7,8,9 Heat output in watts (columns 7,8) per panel or per unit length or per unit area.
- If the element is continuous;
 If width is in inches "W" indicates watts per lineal foot.
 If width is in centimeters "W" indicates watts per lineal foot.
 "F" indicates watts per square foot.
 "M" indicates watts per square meter.
- If the element is panelized;
 "W" indicates watts per panel.
 "F" indicates watts per square foot.
 "M" indicates watts per square meter.
- Columns 10,11,12 Maximum nominal voltage in volts,
Column 13 Letters "V" or "DV" indicating volts or dual voltage respectively.
- Columns 14,15 Suffixes indicating if punched with holes "H" or with aluminum foil "F". List of suffixes follows below.

PREFIXES FOR CalorIQ PRODUCT NUMBERING

RCH Radiant Ceiling Heater
FLR Under-Floor Radiant Heater
UDH Under Desk Heater
UTL Under Tile Floor Heater; low voltage
UTH Under Tile Floor Heater, line voltage, with grounding foil
SLB In-Slab Heater
JPN Products manufactured for Trans Global Inc. in Japan
HBN Products manufactured for Harbin Flex Heating in PRC
RHP Products manufactured for Radiant Heat Products Inc. in Lakeville, MA
MST Products manufactured for Mastex Engineering in Virginia
IND CalorIQ standard industrial heating elements
CHE Custom Heating Elements for various customers
CPE Clear Path Elements
THP Thermo Heat Products
AGR AGRI Tape for Green Houses
HTE Snow Melting
KFH Floor Heating for Korean company
RPT Reptile Heaters
J Floor Heating for company in Japan
MIR Mirror Defogger
US Floor Heating for company in China
Y Floor Heating for company in Korea

SUFFIXES FOR CalorIQ PRODUCT NUMBERING

H Holes are punched in unheated portions of the element to allow cement mortar or adhesive to bond through the element.
F Aluminum foil is laminated onto one side of the element to act as a grounding shield.
A Pressure Sensitive Adhesive is applied to one side of the element.
X Solid coverage of carbon ink with clear crosses for laminate bonding.
O Solid coverage of carbon ink with clear circles for laminate bonding.
FHC Floor Heat in Concrete
HST Heated Stair Tread

VARIATIONS BETWEEN MODELS:

All models covered by this report employ the same basic construction described. Models vary in element width, watt density and input voltage as described in the Electrical Ratings section of this report.

MARKINGS:

Each heating element shall be marked with the following: The manufacturer's name, model number, and electrical rating in volts, watts per panel, or watts per linear foot, (or section).

ENGINEERING CONSIDERATIONS (NOT FOR UL REPRESENTATIVE USE):

These products consist of a series of narrow heating element strips interconnected by a pair of parallel flat conductors that run along the end of the strips, all embedded between two sheets of plastic film (Mylar). A 1/4 in or greater inert border is provided along the edges.

CONDITIONS OF ACCEPTABILITY

In determining the acceptability of this heater in the end-use product, particular attention should be given to the following items:

1. Complete enclosure for and protection from physical damage should be provided in the end-use product.
2. Suitable means of support and mounting for proper heat transfer should be investigated in the end-use product.
3. The suitability of the terminals and their connection to any lead wires should be investigated in the end-use product.
4. Electrical spacings should comply with the end-use product requirements.
5. Suitability of the lamination employed should be determined by the end-use product.
6. Since this is a construction report only, acceptability of the performance of this component should be evaluated in the end-use product requirements.
7. Each heating element shall be marked "CAUTION: DO NOT PIERCE ELEMENT CLOSER THAN 1/4 IN TO HEATING PORTION;" if the securement in the end-product employs tacking, nailing, or the like.

AND REPORT

SEC. 1

FIG. 1

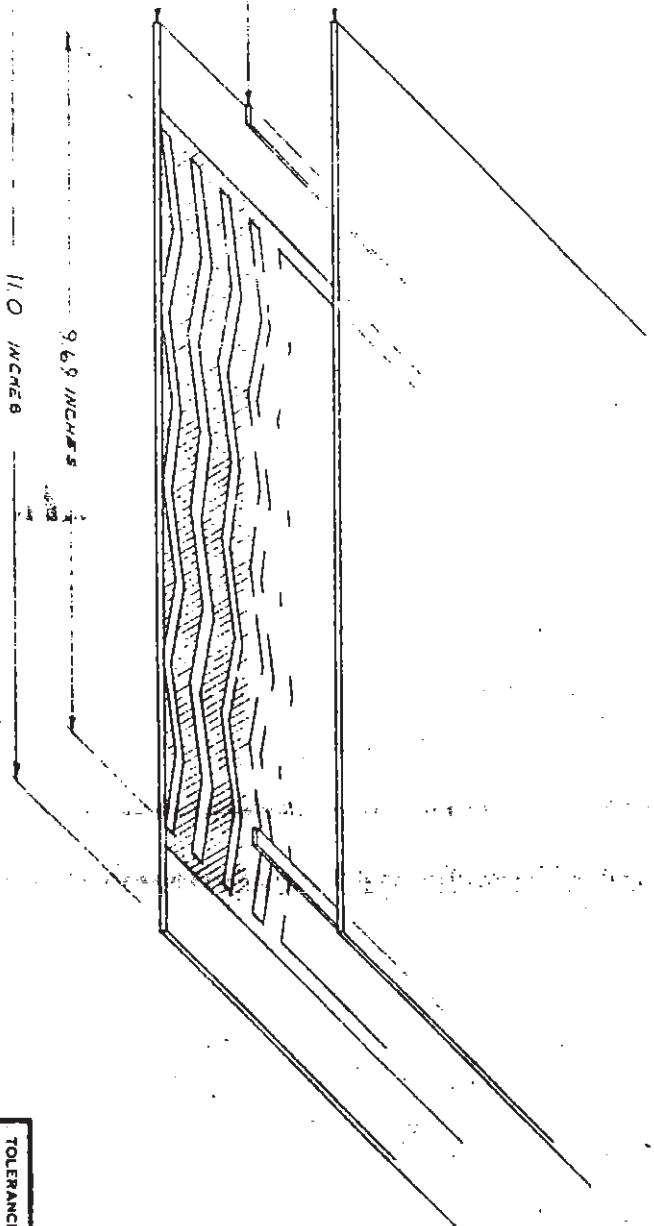
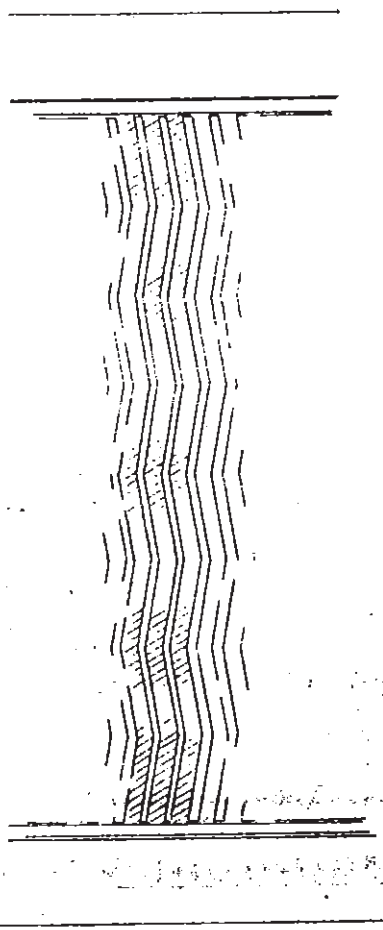
8791 3mm
TICKET

4

2

3

MEG 4874



NO.	REVISION
1.	REPLACES AGR-101 (11/7/84) - 1/4" CU
2.	
3.	
4.	
5.	

File **E108850**
Vol. **1**
Sec. **1**
and Report
Iss. **1-30-87**

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PRODUCE WITH SCREEN	119-AGR-101
MAXIMUM LENGTH (4 AMP)	24 FEET
RESISTANCE PER 31 BARS	732 OHMS
RESISTANCE PER BAR	22609 OHMS
RESISTANCE PER SQUARE	OHMS
VOLTAGE	120 VOLTS
WATTAGE PER SQUARE FOOT	25 WATTS
WATTAGE PER LINEAR FOOT	20 WATTS

B COVER LAYER	81 26" SLIT WIDTH	132 SQ INCHES
C CONDUCTOR	43 (1/4" CW SINGLE)	24 LIN INCH
A SUBSTRATE	A1 26" SLIT WIDTH	132 SQ INCH

MATERIAL LISTED FOR ONE LINEAR FOOT PRODUCT
NUMBER OF BARS PER LINEAR FOOT: 31.5
CALCULATED BARS PER LINEAR FOOT: 31

REVISIONS
NO. DATE BY
1 4B
2
3
4
5

FLEWAT CORPORATION 611 NEPONSET ST
CANTON MA 02026

TOLERANCES UNLESS AS NOTED	NO.	DATE	BY
DECIMAL	1		4B
FRACTIONAL	2		
ANGULAR	3		
	4		
	5		

DRAWN BY	9B	SCALE	NONE	MATERIAL
CHKD		DATE	9/20/86	DRAWING NO.
TRACED		APP'D		AGR-101

SHEET HEATING ELEMENT
REPRESENTS ALL MODELS

FIG. 1 (M84-04874)

General - This figure illustrates an overall view of the heating element.

1. Heating Element - Consists of conductive paths laminated between two sheets of PETP film, with a copper bus bar located along each edge which connects the conductive paths.
 - A. Conductive Paths - Carbon impregnated ink, arranged as shown. Each strip approx 0.250 in wide, applied in a thickness typically less than 0.001 in. Path areas arranged in 12.625 in modular lengths, with a 1 in unheated area separating each individual element section.
 - * Alternate - Silver printed applied under the copper path. The silver is composed of a silver screen ink typically applied from .0002 to .0005 in thick widths varying from .125 to .005 in.
 - B. Bus Bars - Two provided, one along each edge. Each consists of two copper strips, each 0.003 in thick, 1.8 in wide (total thickness 0.006 in) with a total cross sectional area of 750 sq mils for the two copper strips. May be tin coated.
 - Alternate - Two provided, one along each edge. Each consists of one copper strip with a min cross sectional area of 750 sq mils (0.003 in by 1/4 in or 0.0015 in by 1/2 in). Three bus bars may be provided for operation at 120 V or 240 V on Model CHE-120.
2. Terminals - Part No. FC-1001 manufactured by Flexwatt. "Termi-Foil" Cat. No. 1-330716-3 manufactured by AMP, applied with crimping tools, Part No. 58230-1. Field wire connected to barrel of connector by barrel crimping tool, Part No. 49935Y. Constructed of silver or tin plated copper, 0.030 in thick, forming two "flags", each 0.415 in wide, 11/16 in long, with 7-pierced point which puncture and lock onto bus bar when terminal is staked in place.
3. Terminal Insulators - Not provided.
4. Envelope - Two sheets of PETP film, overall 17 in wide. Laminated over conductive paths and bus bars. One sheet has conductive paths printed in place before lamination, min 0.003 in thick, and the other has hot-melt adhesive (GDC-111) applied, min 0.002 in thick. Film constructed of Recognized Component plastic (QMFZ2), PETP film (Mylar), rated min 90°C.

M.C.
D.S.

Heaters, Miscellaneous (KSOT, KSOT2)

A P P E N D I X A

INSTRUCTIONS TO THE INSPECTOR FOR EXAMINATION OF PRODUCT

INSPECTOR:

The products selected for inspection shall be examined for the applicable features of Appendix A and for the features in the specific description.

INTERNAL WIRING

Protection of Wiring - Conductors shall be examined for evidence of damage. All conductor and conductor insulation in the product shall be protected from damage which can result from contact with heat sources, (including lamps, heating elements, etc.) and with any rough, sharp or moving part. Protection may be achieved by securing, segregating or routing the wire away from such parts or assemblies. Assemblies which clamp or squeeze wire insulation shall not be used unless described in the Procedure.

Internal wiring which might make contact with metal parts shall be protected from sharp metal edges. This may be accomplished by rounding or deburring the metal, use of a Recognized Component bushing, or other construction described in the Procedure.

Faulty practices which can cause damage to conductors and/or conductor insulation include:

- A. Improper application of crimped connectors.
- B. Improper insulation removal.
- C. Overheating of conductor insulation because of routing or contact with hot surfaces during or after installation.
- D. Use of wire in which the insulation has been cut, cracked, crushed, abraded, etc.

Loose Strands - Ends of stranded conductors shall have all strands contained to prevent contacting of, or reduction of spacing to, other live parts or dead metal.

Typically, this can be accomplished by:

- A. Tinning.
- B. Inserting properly into suitable wire connectors.

Heaters, Miscellaneous (KSOT, KSOT2)

- C. Crimped connectors and/or eyelets with the crimp containing all strands.
- D. Solder lugs.

Solder Connections - All solder connections shall be made mechanically secure before soldering.

Some typical examples of mechanical securement are:

- A. Twisting wire around a solder post which has a change in dimension or restriction so unsoldered wire will not slip off post.
- B. Inserting wire through an opening.

SECUREMENT OF PARTS

In the mounting or supporting of fragile insulating parts, screw or other fastenings should not be tight enough to cause cracking or breaking of these parts with expansion and contraction. Generally, the fastening of such parts should be snug.

Uninsulated live parts, components which support live parts, and dead metal parts, shall be prevented from rotating, or shifting if movement will result in twisting or stress of internal wiring or connections, or spacings being reduced below that specified in the Procedure.

A switch, a lampholder, an attachment plug receptacle, a motor attachment plug cap, or other component subject to handling by the user shall be mounted securely and prevented from rotating.

Exception: Based on engineering considerations certain constructions of securely mounted push button or plunger type switches, and lampholders of the type in which the lamp cannot be replaced (such as a neon pilot or indicator light in which the lamp is sealed in a non-removable jewel) may be excepted from the above. These constructions are described in the Procedure. However, in no case will unacceptable spacings be allowed.

Heaters, Miscellaneous (KSOT, KSOT2)

Some means commonly used to prevent movement are:

- A. Lockwasher.
- B. Matched keying of the component and its mounting.
- C. Two or more fasteners (screws, rivets, pins, etc.)
- D. Strap, clip, or pin fitted into an adjacent part.
- E. Physical barrier (molder boss, side of enclosure, adjacent component, etc.) which bears against the component.

Heating Elements - A heating element shall be supported in the manner described in the individual Procedure section.

CASUALTY CONSIDERATION

Except as described, an appliance shall have no sharp edges, burrs, points, or spikes which may cause injury during use or during cleaning operations.

LAMPHOLDER CONNECTION

All screwshells of lampholders shall be connected to the same conductor of the supply circuit. (Also see "Polarized Appliances" if applicable.)

POLARIZED APPLIANCES

An appliance intended for permanent connection to the source of supply and having an identified terminal or lead; and an appliance employing a power supply cord with a polarized attachment plug cap (excluding 250 volt, 2-pole and 250 volt, 3-pole, 3-phase), utilizing the components indicated, shall have the components wired as follows:

Lampholders and Receptacles - The screw shell (identified) terminal or lead of a lampholder, and the identified terminal or lead of a receptacle, shall be connected to the identified (grounded) conductor or terminal within the product.

Switches (Single Pole) - Unless otherwise specified in the Procedure, a manual single pole switch, and an automatic control with a marked "off" position, shall not be connected to the identified grounded conductor.

Heaters, Miscellaneous (KSOT, KSOT2)

GROUNDING

Cord Connected Appliance - The equipment-grounding conductor of the flexible cord:

- A. Shall be finished to show a green color or green with one or more yellow stripes;
- B. Shall be connected to the grounding member of the attachment-plug cap; and
- C. Shall be conductively connected to (1) all exposed dead metal parts of the product and to (2) all dead metal parts within the enclosure that are specified in the description as being connected to the grounding conductor.

The grounding-conductor shall be connected by a screw or other reliable means if described in the Procedure, which serves no other purpose and which is not liable to be removed during any servicing operation. Solder alone shall not be used for securing this conductor.

NOTE:

- 1. The grounding member of the attachment-plug cap mentioned in Item B of the preceding paragraph shall be fixed in position with respect to the cap.
- 2. The screw mentioned in Item C of the preceding paragraph shall be of a corrosion-resistant metal or shall be protected against corrosion.

Permanently-Connected Appliance - In a permanently-connected appliance (1) all exposed metal parts, and (2) all dead metal parts within the enclosure which are specified in the description as being connected to the grounding conductor, shall be conductively connected to:

- A. The point of the enclosure at which the metal raceway of the power supply circuit will be connected, and
- B. The equipment-grounding field-wiring terminal or lead. (Only necessary in an appliance intended for permanent connection to the power supply by means other than a metal-enclosed wiring system such as nonmetallic-sheathed cable.)

Heaters, Miscellaneous (KSOT, KSOT2)

The equipment-grounding terminal or grounding lead shall be connected to the frame or enclosure by a positive means, such as by a bolted or screwed connection. The grounding connection shall reliably penetrate nonconductive coatings, such as paint or vitreous enamel. The grounding point shall be so located that it is unlikely that the grounding means will be removed during normal servicing.

A wire-binding screw intended for the connection of an equipment-grounding conductor shall have a green-colored head that is hexagonal shaped, slotted, or both.

A pressure wire connector intended for connection of an equipment grounding conductor shall be green colored, or be identified by the marking "G", "GR", "GND", "Ground", "Grounding", or the like. Or, if authorized in the Procedure, it may be identified by a suitable marking on a wiring diagram on the appliance.

The surface of an insulated lead intended solely for the connection of an equipment-grounding conductor shall be green or shall be green with or without one or more yellow stripes.

BONDING

Except where specifically noted in the Procedure, bonding of internal dead metal parts to the enclosure for grounding purposes shall be accomplished by a positive means such as clamping, riveting, bolting or screwed connection. The bonding connection shall reliably penetrate any nonconductive coatings such as paint or vitreous enamel.

MARKING

The appliance shall be plainly marked where it will be readily visible after it has been installed as intended, and shall include the name of the Listee (or recognizable portion thereof, or trade name or trademark if authorized in the Procedure), a distinctive catalog number or equivalent designation, and the electrical rating.

A portable appliance may have the marking located anywhere on the product provided that tools are not needed to gain access to the nameplate.

Special markings (other than those described above) when required shall be as specified in the Procedure.

Heaters, Miscellaneous (KSOT, KSOT2)

INSTRUCTIONS TO THE INSPECTOR
FOR EXAMINATION OF PRINTED WIRING BOARDS
PRINTED WIRING BOARD ASSEMBLIES

As part of the inspection of the products covered by this Procedure, inspect the printed wiring boards and/or the printed wiring board assemblies employed in the product as indicated below.

I. Printed Wiring Boards - When printed wiring boards are received at the factory without the components mounted and soldered in place, an inspection as outlined below shall be conducted as follows:

- A. The printed wiring board shall be as specified in this Procedure.
- B. If the soldering operation is performed at the factory and the soldering temperature and dwell time are given in the Procedure, the temperature and dwell time shall also be checked to determine that they do not exceed the limits specified.

II. Printed Wiring Board Assemblies - If the printed wiring boards are received at the factory with the components already mounted and soldered in place, ("Assemblies") an inspection shall be conducted as follows:

- A. The printed wiring board shall be as specified in the Procedure.
- B. A visual examination shall be made for mechanical damage or evidence of exposure to excessive temperatures that may have occurred during the soldering operation. The base material and the conductors shall be examined for unacceptable features as indicated below.
 - 1. Conductors, Terminal Pads, and Tabs.

- (a) Reduction in cross-section, such as scratches, nicks, pin holes, tearing.

Heaters, Miscellaneous (KSOT, KSOT2)

(b) Loosening or lifting of printed wiring conductor, pad, or tab from the base material.

(c) Sections missing or damaged

(d) Blistering

(e) Breaks

2. Base Material

(a) Warping

(b) Cracking

(c) Charring, blistering, or other heat damage due to solder process

(d) Delamination

III. Sample Selection - Samples of printed wiring boards and/or printed wiring board assemblies shall be selected at random as shown under "First Selection" in the following table.

The lot is to be rejected when any one of the unacceptable features is noted.

Size of Incoming Lot+ For Each Type++	No. of Board Samples To Be Examined	
	<u>First Selection</u>	<u>Reselection</u>
1 - 500	8	13
501 - 3,200	13	20
3,201 - 35,000	20	32
Above 35,000	32	50

+ - A lot comprises all printed wiring board assemblies of the same type++ at the manufacturer's factory at the time of the inspector's visit, which have not been previously checked by the inspector. A lot may also comprise all of the same type++ since the inspector's previous visit or inspection.

++ - A type is a printed wiring board assembly meeting all the following:

1. Same vendor who mounts and solders the components
2. Same board manufacturer and type or catalog number
3. Same size
4. Same pattern
5. Same components

Heaters, Miscellaneous (KSOT, KSOT2)

IV. Resubmittal of Rejected Lots - The manufacturer may want to screen out all printed wiring boards or printed wiring board assemblies in the rejected lot and resubmit it. The inspector shall then select samples for inspection in accordance with the subcolumn headed "Reselection", based on the number in the original lot size. When any one of the boards of the resubmitted lot is noted to be unacceptable in accordance with the criteria stated above, the lot shall be rejected and may not be used in the Listed or Recognized product.

Heaters, Miscellaneous (KSOT, KSOT2)

A P P E N D I X B

INSTRUCTIONS TO THE INSPECTOR
FOR SAMPLE PICKUP

RESERVED FOR FUTURE USE

File

Vol.

App. C

Page 1

Issued: 12-28-73

Heaters, Miscellaneous (KSOT, KSOT2)

A P P E N D I X C

INSTRUCTIONS FOR
FOLLOW-UP TESTS AT UL

RESERVED FOR FUTURE USE

This authorizes the application of the Certification Mark(s) shown below to the models described in the Product(s) Covered section when made in accordance with the conditions set forth in the Certification Agreement and Listing Report. This authorization also applies to multiple listee model(s) identified on the correlation page of the Listing Report.

This document is the property of Intertek Testing Services and is not transferable. The certification mark(s) may be applied only at the location of the Party Authorized To Apply Mark.

Applicant: Calorique
Address: 2380 Cranberry Highway
 West Wareham, MA 02576
Country: USA
Contact: Jim O'Dowd
Phone: 508 291 2000
FAX: 508 291 2299
Email: jim.odowd@calorique.com

Manufacturer: Calorique
Address: 2380 Cranberry Highway
 West Wareham, MA 02576
Country: USA
Contact: Jim O'Dowd
Phone: 508 291 2000
FAX: 508 291 2299
Email: jim.odowd@calorique.com

Party Authorized To Apply Mark: Same as Manufacturer
Report Issuing Office: Cortland, NY

Control Number: 117977

Authorized by:



for William T. Starr, Certification Manager



This document supersedes all previous Authorizations to Mark for the noted Report Number.

This Authorization to Mark is for the exclusive use of Intertek's Client and is provided pursuant to the Certification agreement between Intertek and its Client. Intertek's responsibility and liability are limited to the terms and conditions of the agreement. Intertek assumes no liability to any party, other than to the Client in accordance with the agreement, for any loss, expense or damage occasioned by the use of this Authorization to Mark. Only the Client is authorized to permit copying or distribution of this Authorization to Mark and then only in its entirety. Use of Intertek's Certification mark is restricted to the conditions laid out in the agreement and in this Authorization to Mark. Any further use of the Intertek name for the sale or advertisement of the tested material, product or service must first be approved in writing by Intertek. Initial Factory Assessments and Follow up Services are for the purpose of assuring appropriate usage of the Certification mark in accordance with the agreement, they are not for the purposes of production quality control and do not relieve the Client of their obligations in this respect.

Intertek Testing Services NA Inc.
 165 Main Street, Cortland, NY 13045
 Telephone 800-345-3851 or 607-753-6711 Fax 607-756-6699

Standard(s):	Electrical Resistance Heating Cables and Heating Device Sets, CSA C22.2 No. 130, 3rd Ed., Dated April 2003, revised January 2008.
Product:	Under-Floor Heating Radiant Sheet Heating Elements
Models:	Series FLR: FLR10P8W120V, FLR10P8W240V, FLR14P10W120V, FLR14P10W240V, FLR22P17W120V, FLR22P17W240V, FLR12P12F120V, FLR12P12F240V, FLR24P12F120V, FLR24P12F240V, FLR48P12F120V, FLR48P12F240V, FLR13P8W120V, FLR13P8W240V, FLR17P10W120V, FLR17P10W240V, FLR24-22W120V, FLR24-22W240V, FLR25P17W120V, FLR25P17W240V, FLR36-35W120V, FLR36-35W240V, FLR48P38W120V, FLR48P38W240V.

CB TEST CERTIFICATE CERTIFICAT D'ESSAI OC

Product
ProduitName and address of the applicant
Nom et adresse du demandeurName and address of the manufacturer
Nom et adresse du fabricantName and address of the factory
Nom et adresse de l'usineNote: When more than one factory, please report on page 2
Note: Lorsque il y plus d'une usine, veuillez utiliser la deuxième pageRatings and principal characteristics
Valeurs nominales et caractéristiques principalesTrademark (if any)
Marque de fabrique (si elle existe)Type of Manufacturer's Testing Laboratories used
Type de programme du laboratoire d'essais constructeurModel / Type Ref.
Ref. De typeAdditional information (if necessary may also be reported on page 2)
Les informations complémentaires (si nécessaire, peuvent être indiqués sur la deuxième pageA sample of the product was tested and found to be in conformity with
Un échantillon de ce produit a été essayé et a été considéré conforme à laAs shown in the Test Report Ref. No. which forms part of this Certificate
Comme indiqué dans le Rapport d'essais numéro de référence qui constitue partie de ce CertificatThis CB Test Certificate is issued by the National Certification Body
Ce Certificat d'essai OC est établi par l'Organisme National de Certification

Flexible sheet heating element for building in

Calorique LLC.
2380 Cranberry Highway
West Wareham, MA 02576
USACalorique LLC.
2380 Cranberry Highway
West Wareham, MA 02576
USACalorique LLC.
2380 Cranberry Highway
West Wareham, MA 02576
USA☐ Additional information on page 2Max. 150W/m² 230V Max. 10A
IPX1, IPX4 or IPX7. Installation in ceiling.
CaloriQue

CHT.P.LM230V

The first dot in the model name indicates width of heating element in cm.
The second dot in the model name indicates power pr square meter in W/m². See test report for explanation.☐ Additional information on page 2IEC 60335-1:2010
IEC 60335-2-96:2002, IEC 60335-2-96:2002/AMD1:2003, IEC
60335-2-96:2002/AMD2:2008
277322Gaustadalléen 30
NO-0373 Oslo, Norway

Date: 16-01-2017

Signature: Nastaran Vadoodi
Certification Department

CB TEST CERTIFICATE CERTIFICAT D'ESSAI OC

Product
ProduitName and address of the applicant
Nom et adresse du demandeurName and address of the manufacturer
Nom et adresse du fabricantName and address of the factory
Nom et adresse de l'usineNote: When more than one factory, please report on page 2
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Ce Certificat de test OC est établi par l'Organisme National de Certification

Flexible sheet heating element for building in

Calorique LLC.
2380 Cranberry Highway
West Wareham, MA 02576
USACalorique LLC.
2380 Cranberry Highway
West Wareham, MA 02576
USACalorique LLC.
2380 Cranberry Highway
West Wareham, MA 02576
USA☐ Additional information on page 2Max. 90W/m² 230V Max. 10A
IPX1, IPX4 or IPX7. Installation in wooden floor.
CaloriQue

FHT.P.LM230V

The first dot in the model name indicates width of heating element in cm.
The second dot in the model name indicates power per square meter in W/m². See test report for explanation☐ Additional information on page 2IEC 60335-1:2010
IEC 60335-2-96:2002, IEC 60335-2-96:2002/AMD1:2003, IEC
60335-2-96:2002/AMD2:2008
277322Gaustadalléen 30
NO-0373 Oslo, Norway

Date: 16-01-2017

Nastaran Vadoodi

Signature: Nastaran Vadoodi
Certification Department

CB TEST CERTIFICATE CERTIFICAT D'ESSAI OC

Product
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Nom et adresse du fabricantName and address of the factory
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Flexible sheet heating element for building in

Calorique LLC.
2380 Cranberry Highway
West Wareham, MA 02576
USACalorique LLC.
2380 Cranberry Highway
West Wareham, MA 02576
USACalorique LLC.
2380 Cranberry Highway
West Wareham, MA 02576
USA☐ Additional information on page 2Max. 300W/m² 230V Max. 10A
IPX1, IPX4 or IPX7. Installation in concrete floor.
Model FHC44P75LM230V: Cl. II when double insulated.
CaloriQue

FHC.P.LM230V

The first dot in the model name indicates width of heating element in cm.
The second dot in the model name indicates power per square meter in W/m². See test report for explanation.☐ Additional information on page 2IEC 60335-1:2010
IEC 60335-2-96:2002, IEC 60335-2-96:2002/AMD1:2003, IEC
60335-2-96:2002/AMD2:2008

277322

Gaustadalléen 30
NO-0373 Oslo, Norway

Date: 16-01-2017

Signature: Nastaran Vadoodi
Certification Department

CB TEST CERTIFICATE CERTIFICAT D'ESSAI OC

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ProduitName and address of the applicant
Nom et adresse du demandeurName and address of the manufacturer
Nom et adresse du fabricantName and address of the factory
Nom et adresse de l'usineNote: When more than one factory, please report on page 2
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Un échantillon de ce produit a été essayé et a été considéré conforme à laAs shown in the Test Report Ref. No. which forms part of this Certificate
Comme indiqué dans le Rapport des essais numéro de référence qui constitue partie de ce CertificatThis CB Test Certificate is issued by the National Certification Body
Ce Certificat d'essai OC est établi par l'Organisme National de Certification

Flexible sheet heating element for building in

Calorique LLC.
2380 Cranberry Highway
West Wareham, MA 02576
USACalorique LLC.
2380 Cranberry Highway
West Wareham, MA 02576
USACalorique LLC.
2380 Cranberry Highway
West Wareham, MA 02576
USA☐ Additional information on page 2Max. 90W/m² 230V Max. 10A
IPX1, IPX4 or IPX7. Installation between ceiling and floor.
CaloriQue

CFH.P.LM230V

The first dot in the model name indicates width of heating element in cm.
The second dot in the model name indicates power pr square meter in W/m². See test report for explanation☐ Additional information on page 2IEC 60335-1:2010
IEC 60335-2-96:2002, IEC 60335-2-96:2002/AMD1:2003, IEC
60335-2-96:2002/AMD2:2008
277322Gaustadalléen 30
NO-0373 Oslo, Norway

Date: 16-01-2017

Nastaran Vadoodi

Signature: Nastaran Vadoodi
Certification Department



www.nemko.com

TEST REPORT IEC / EN 60335-2-96	
Safety of household and similar electrical appliances	
Part II : Particular requirements for flexible sheet heating elements for room heating	
Report Reference No.	: 76149
Tested by (+ signature)	: Gunnar Aanstad
Approved by (+ signature)	: Magne Løvaas
Date of issue	: 2007-05-18
Number of pages	: 62
Testing Laboratory Name	: Nemko A/S
Address	: P.O. Box 73 Blindern, N-0314 Oslo, Norway
Testing location/ procedure	: CBTL <input checked="" type="checkbox"/> TMP <input type="checkbox"/> WMT <input type="checkbox"/> SMT <input type="checkbox"/>
Testing location/ address	: As above
Applicant's name	: Calorique Ltd
Address	: 2380 Cranberry Hwy West Wareham MA 02546 USA
Test specification:	
Standard	: IEC 60335-2-96:2002 (1. edition), incl. A1:2003 and IEC 60335-1:2001 (4. edition), incl. A1:2004 EN 60335-2-96:2002, incl. A1:2004 and EN 60335-1:2002, incl. A11:2004, A1:2004 and A12:2004
Test procedure	: CB Scheme
Non-standard test method	: N/A
Test Report Form No.	: IEC60335_2_96A (modified)
TRF Originator	: KEMA
Master TRF	: Dated 2004-07
Copyright © 2004 IEC System for Conformity Testing and Certification of Electrical Equipment (IECEE), Geneva, Switzerland. All rights reserved.	
This publication may be reproduced in whole or in part for non-commercial purposes as long as the IECEE is acknowledged as copyright owner and source of the material. IECEE takes no responsibility for and will not assume liability for damages resulting from the reader's interpretation of the reproduced material due to its placement and context.	
Test item description	: Flexible sheet heating elements for room heating, for building in
Trade Mark	: CaloriQue
Model/Type reference	: CHT, CFH, FHT and FHC series
Ratings	: Max. 300W/m ² 230V Max. 10A IPX1/IPX7
Manufacturer	: Calorique Ltd
Factory location(s)	: Same as applicant

This Test Report, when bearing the Nemko name and logo is only valid when issued by a Nemko laboratory, or by a laboratory having special agreement with Nemko.



Report No. 76149

Name and address of production-sites (Factories):

Calorique Ltd
2380 Cranberry Hwy
West Wareham
MA 02546 USA

Copy of marking plate and summary of test results (samples of additional IP ratings in red):



Report No. 76149

Information on models, specifications and intended use – covered by this report:

For use in floor: Models FHT... max. 90W/m^2
Models FHC... max. 300W/m^2 (in concrete only)

For use in ceiling: Models CHT... max. 150W/m^2

For use in space between ceiling and floor: Models CFH... max. 90W/m^2

Common code details on model designations:

FHTxPyM230V10A, where the width x can be up to 120 (cm) and y can be up to 90 (W/m^2),
FHCxPyM230V10A, where the width x can be up to 120 (cm) and y can be up to 300 (W/m^2),
CHTxPyM230V10A, where the width x can be up to 60 (cm) and y can be up to 150 (W/m^2),
CFHxPyM230V10A, where the width x can be up to 60 (cm) and y can be up to 90 (W/m^2)

All flexible heating elements share the same construction, materials and terminations.

List of attachments:

Annex 1 : Pictures



Report No. 76149

IEC 60335-2-96			
Clause	Requirement - Test	Result - Remark	Verdict

Test item particulars.....:	
Classification of installation and use	Fixed installation, unattended use
Supply Connection	Fixed wiring (with supply leads)
.....:	
.....:	
Possible test case verdicts:	
- test case does not apply to the test object..... : N/A	
- test object does meet the requirement..... : P (Pass)	
- test object does not meet the requirement : F (Fail)	
Testing	
Date of receipt of test item	2006-10-31
Date (s) of performance of tests	2006-11-06 to 2007-02-28
General remarks:	
<p>This report is not valid as a CB Test Report unless signed by an approved CB Testing Laboratory and appended to a CB Test Certificate issued by an NCB in accordance with IEC 60335-2-96.</p> <p>The test results presented in this report relate only to the object tested.</p> <p>This report shall not be reproduced, except in full, without the written approval of the Issuing testing laboratory.</p> <p>"(see Enclosure #)" refers to additional information appended to the report.</p> <p>"(see appended table)" refers to a table appended to the report.</p> <p>Throughout this report a comma (point) is used as the decimal separator.</p>	

<p>General product information:</p> <p>Construction of heating element:</p> <p>Base film: 4 mil* polyester substrate</p> <p>Printed conductive carbon ink, with tinned copper bus bars along both edges</p> <p>Top film : 3 mil* polyethylene and 2 mil* polyester</p> <p>Connection by piercing Tyco/AMP terminals to supply leads – by authorised person using listed crimping tool</p> <p>Covering of terminations by thermoplastic covers or mastic tape (giving IPX1 and IPX7 respectively)</p> <p>* Minimum values, can be increased if required by client / circumstances</p>



Report No. 76149

IEC 60335-2-96			
Clause	Requirement - Test	Result - Remark	Verdict
5	GENERAL CONDITIONS FOR THE TESTS		
	Tests performed according to cl. 5, e.g. nature of supply, sequence of testing, etc.		P
5.2	The test of clause 22.105 is carried out on the same sample as that for the test of clause 13.2 (IEC 60335-2-96, A1)		P
5.3	The test of clause 22.105 is carried out after the test of clause 13.2 (IEC 60335-2-96, A1)		P
5.6	Thermostats sensitive to room air temperature or outdoor air temperature are short-circuited (IEC 60335-2-96)		P
5.101	Heating units to be installed in walls above 2,3 m are to be tested for installation in ceilings (IEC 60335-2-96, A1)		N/A
6	CLASSIFICATION		-
6.1	Protection against electric shock: Class 0, 0I, I, II, III :	Not classified	N/A
6.2	Protection against harmful ingress of water - heating units for use in a floor of concrete or similar are at least IP X7 - other heating units are at least IP X1 (IEC 60335-2-96)	IPX1 or IPX7, depending on installation requirements	P
7	MARKING AND INSTRUCTIONS		-
7.1	Rated voltage or voltage range (V):	230V	P
	Nature of supply:		N/A
	Rated frequency (Hz):		N/A
	Rated power input (W)::	Max. 300W/m ²	P
	Rated current (A) :	Max. 10A per element	P
	Manufacturer's or responsible vendor's name, trademark or identification mark:	CaloriQue	P
	Model or type reference:	FHT, FHC, CHT or CFH...	P
	Symbol 5172 of IEC 60417, for Class II appliances		N/A
	IP number, other than IPX0:	IPX1 or IPX7	P
	Flexible sheet heating elements are marked with and placed at least once every 0,5 m : (IEC 60335-2-96)		P
	- indication of orientation		N/A



Report No. 76149

IEC 60335-2-96			
Clause	Requirement - Test	Result - Remark	Verdict
	- intended installation	Direct floor heating or direct ceiling heating	P
	- heating mode	See above	P
7.2	Warning for stationary appliances for multiple supply		N/A
	Warning placed in vicinity of terminal cover		N/A
7.3	Range of rated values marked with the lower and upper limits separated by a hyphen		N/A
	Different rated values marked with the values separated by an oblique stroke		N/A
7.4	Appliances adjustable for different rated voltages, the voltage setting is clearly discernible		N/A
7.5	Appliances with more than one rated voltage or one or more rated voltage ranges, marked with rated input or rated current for each rated voltage or range, unless		N/A
	the power input is related to the mean value of the rated voltage range		N/A
	Relation between marking for upper and lower limits of rated power input or rated current and voltage is clear		N/A
7.6	Correct symbols used		P
7.7	Connection diagram fixed to appliances to be connected to more than two supply conductors and appliances for multiple supply		N/A
7.8	Except for type Z attachment, terminals for connection to the supply mains indicated as follows:		N/A
	- marking of terminals exclusively for the neutral conductor (N)		N/A
	- marking of protective earthing terminals (symbol 5019 of IEC 60417)		N/A
	- marking not placed on removable parts		N/A
7.9	Marking or placing of switches which may cause a hazard		N/A
7.10	Indications of switches on stationary appliances and controls on all appliances by use of figures, letters or other visual means:		N/A
	The figure 0 indicates only OFF position, unless no confusion with the OFF position		N/A
7.11	Indication for direction of adjustment of controls		N/A



Report No. 76149

IEC 60335-2-96			
Clause	Requirement - Test	Result - Remark	Verdict
7.12	Instructions for safe use provided		P
7.12.1	Sufficient details for installation supplied		P
7.12.2	Stationary appliances not fitted with means for disconnection from the supply mains having a contact separation in all poles that provide full disconnection under over-voltage category III, the instructions state that means for disconnection must be incorporated in the fixed wiring in accordance with the wiring rules		P
7.12.3	Insulation of the fixed wiring in contact with parts exceeding 50 K during clause 11; instructions stating that the fixed wiring must be protected		N/A
7.12.4	Instructions for built-in appliances:		-
	- dimensions of space		P
	- dimensions and position of supporting means		P
	- distances between parts and surrounding structure		P
	- dimensions of ventilation openings and arrangement		N/A
	- connection to supply mains and interconnection of separate components		P
	- plug accessible after installation, unless		N/A
	a switch complying with 24.3		P
7.12.5	Replacement cord instructions, type X attachment with a specially prepared cord		N/A
	Replacement cord instructions, type Y attachment		N/A
	Replacement cord instructions, type Z attachment		N/A
7.12.6	Instructions for heating appliances incorporating a non-self-resetting thermal cut-out that is reset by disconnection the supply mains contains the warning (IEC 60335-1, A1)		N/A
7.12.7	The instructions for fixed appliances shall state how the appliance is to be fixed to its support (IEC 60335-1, A1)		N/A
7.12.8	The instructions for appliances connected to the water mains shall state: - max.inlet water pressure - min. inlet water pressure (if necessary for correct operation) (IEC 60335-1, A1)		N/A
	The instructions shall give sufficient information about detachable hose-sets and old hose-sets shall		N/A



Report No. 76149

IEC 60335-2-96			
Clause	Requirement - Test	Result - Remark	Verdict
	not be reused (IEC 60335-1, A1)		
7.12.101	Instructions for applications in floors of concrete or similar (IEC 60335-2-96) (IEC 60335-2-96, A1)		P
7.12.102	Instructions for applications in metallic ceilings or metallic floors (IEC 60335-2-96)		N/A
7.12.103	Instructions for applications on floors where heating units can be covered by tiles (IEC 60335-2-96)		N/A
7.12.104	Instructions that work has to carried out by authorized persons (IEC 60335-2-96)		P
7.12.105	Instructions for storage heating applications (IEC 60335-2-96)		N/A
7.13	Instructions and other texts in an official language	English version checked	P
7.14	Marking clearly legible and durable and if used relating to the intended installation or heating mode, the superimposed rectangle shall have a height of at least 15 mm (IEC 60335-2-96, A1)		P
7.15	Marking on a main part		P
	Marking clearly discernible from the outside, if necessary after removal of a cover		P
	For portable appliances, cover can be removed or opened without a tool		N/A
	For stationary appliances, name, trademark or identification mark and model or type reference visible after installation	For building-in	N/A
	For fixed appliances, name, trademark or identification mark and model or type reference visible after installation according to the instructions		N/A
	Indications for switches and controls placed on or near the components. Marking not on parts which can be positioned or repositioned in such a way that the marking is misleading		N/A
7.16	Marking of a possible replaceable thermal link or fuse link clearly visible with regard to replacing link		N/A
7.101	Label with sufficient space provided (IEC 60335-2-96)		P
8	PROTECTION AGAINST ACCESS TO LIVE PARTS		-
8.1	Adequate protection against accidental contact with live parts		P
8.1.1	Requirement applies for all positions, detachable		P



Report No. 76149

IEC 60335-2-96			
Clause	Requirement - Test	Result - Remark	Verdict
	parts removed		
	Insertion or removal of lamps, protection against contact with live parts of the lamp cap		N/A
	Use of test probe B of IEC 61032: no contact with live parts		P
8.1.2	Use of test probe 13 of IEC 61032 through openings in class 0 appliances and class II appliances/ constructions: no contact with live parts		N/A
	Test probe 13 also applied through openings in earthed metal enclosures having a non-conductive coating: no contact with live parts		N/A
8.1.3	For appliances other than class II, use of test probe 41 of IEC 61032: no contact with live parts of visible glowing heating elements		N/A
8.1.4	Accessible part not considered live if:		N/A
	- safety extra-low a.c. voltage: peak value not exceeding 42.4 V		N/A
	- safety extra-low d.c. voltage: not exceeding 42.4 V		N/A
	- or separated from live parts by protective impedance		N/A
	If protective impedance: d.c. current not exceeding 2 mA, and		N/A
	a.c. peak value not exceeding 0.7 mA		N/A
	- for peak values over 42.4 V up to and including 450 V, capacitance not exceeding 0,1 μ F		N/A
	- for peak values over 450 V up to and including 15 kV, discharge not exceeding 45 μ C		N/A
8.1.5	Live parts protected at least by basic insulation before installation or assembly:		-
	- built-in appliances		P
	- fixed appliances		N/A
	- appliances delivered in separate units		N/A
8.2	Class II appliances and constructions constructed so that there is adequate protection against accidental contact with basic insulation and metal parts separated from live parts by basic insulation only		N/A
	Only possible to touch parts separated from live parts by double or reinforced insulation		N/A
9	STARTING OF MOTOR-OPERATED APPLIANCES		-
	Requirements and tests are specified in part 2	Not applicable	N/A



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Clause	Requirement - Test	Result - Remark	Verdict

	when necessary	(IEC 60335-2-96)	
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10	POWER INPUT AND CURRENT		-
10.1	Power input at normal operating temperature, rated voltage and normal operation not deviating from rated power input by more than shown in table 1	(see appended table)	P
10.2	Current at normal operating temperature, rated voltage and normal operation not deviating from rated current by more than shown in table 2	(see appended table)	N/A

11	HEATING		-
11.1	No excessive temperatures in normal use		P
11.2	Placing and mounting of appliance as described		P
11.2.103	Installation of heating units in timber floor, concrete or similar material in framework as shown in Figure 103 or 104 (IEC 60335-2-96, A1)	Timber floor/ceiling Concrete floor	P
11.3	Temperature rises, other than of windings, determined by thermocouples		P
	Temperature rises of windings determined by resistance method, unless		N/A
	the windings makes it difficult to make the necessary connections		N/A
11.4	Heating appliances operated under normal operation at 1.15 times rated power input:		P
11.5	Motor-operated appliances operated under normal operation at most unfavourable voltage between 0.94 and 1.06 times rated voltage:		N/A
11.6	Combined appliances operated under normal operation at most unfavourable voltage between 0.94 and 1.06 times rated voltage:		N/A
11.7	Operation duration until steady conditions are established (IEC 60335-2-96)		P
11.8	Temperature rises not exceeding values in table 3	(see appended tables)	P
	Protective devices do not operate		N/A
	Sealing compound does not flow out		P

13	LEAKAGE CURRENT AND ELECTRIC STRENGTH AT OPERATING TEMPERATURE		-
13.1	Leakage current not excessive and electric strength adequate		P



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	Heating appliances operated at 1.15 times rated power input:		P
	Motor-operated appliances and combined appliances supplied at 1.06 times rated voltage:		N/A
	Protective impedance and radio interference filters disconnected before carrying out the tests		N/A
13.2	Leakage current measured by means of the circuit described in figure 4 of IEC 60990		P
	Leakage current measurements	(see appended table)	P
13.3	Electric strength tests according to table 4	(see appended table)	P
	No breakdown during the tests		P

14	TRANSIENT OVERVOLTAGES		-
	Appliances withstand the transient over-voltages to which they may be subjected		N/A
	Clearances having a value less than specified in table 16 subjected to an impulse voltage test, the test voltage specified in table 6	(see appended table)	N/A
	No flashover during the test, unless of functional insulation		N/A
	In case of flashover of functional insulation, the appliance complies with clause 19 with the clearance short circuited		N/A

15	MOISTURE RESISTANCE		-
15.1	Enclosure provides the degree of moisture protection according to classification of the appliance		P
	Compliance checked as specified in 15.1.1, taking into account 15.1.2, followed by the electric strength test of 16.3		P
	No trace of water on insulation, which can result in a reduction of clearances and creepage distances below values specified in clause 29		P
15.1.1	Appliances, other than IPX0, subjected to tests as specified in IEC 60529:	IPX1 and IPX7	P
	Water valves containing live parts are subjected to the tests for IPX7 appliances (IEC 60335-1, A1)		N/A
15.1.2	Hand-held appliance turned continuously through the most unfavourable positions during the test		N/A
	Built-in appliances installed according to the instructions		P



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Clause	Requirement - Test	Result - Remark	Verdict
	Appliances placed or used on the floor or table placed on a horizontal un-perforated support		N/A
	Appliances normally fixed to a wall and appliances with pins for insertion into socket-outlets are mounted on a wooden board		N/A
	For IPX3 appliances, the base of wall mounted appliances is placed at the same level as the pivot axis of the oscillating tube		N/A
	For IPX4 appliances, the horizontal centre line of the appliance is aligned with the pivot axis of the oscillating tube		N/A
	For IPX4 appliances normally fixed to a ceiling are mounted underneath a horizontal un-perforated support that prevents water spraying onto the top surface (IEC 60335-1, A1)		N/A
	However, for appliances normally used on the floor or table, the movement is limited to two times 90° for a period of 5 min, the support being placed at the level of the pivot axis of the oscillating tube		N/A
	Wall-mounted appliances, take into account the distance to the floor stated in the instructions		N/A
	Appliances with type X attachment fitted with a flexible cord as described		N/A
	Detachable parts tested as specified		N/A
15.2	Spillage of liquid does not affect the electrical insulation		N/A
	Appliances with type X attachment fitted with a flexible cord as described		N/A
	Appliances incorporating an appliance inlet tested with or without an connector, whichever is most unfavourable		N/A
	Detachable parts removed		N/A
	Overfilling test with additional amount of water, over a period of 1 min (I):		N/A
	The appliance withstands the electric strength test of 16.3		N/A
	No trace of water on insulation that can result in a reduction of clearances and creepage distances below values specified in clause 29		N/A
15.3	Appliances proof against humid conditions		P
	Humidity test for 48 h in a humidity cabinet		P



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Clause	Requirement - Test	Result - Remark	Verdict

	The appliance withstands the tests of clause 16		P
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16	LEAKAGE CURRENT AND ELECTRIC STRENGTH		-
16.1	Leakage current not excessive and electric strength adequate		P
	Protective impedance disconnected from live parts before carrying out the tests		N/A
16.2	Single-phase appliances: test voltage 1.06 times rated voltage:		P
	Three-phase appliances: test voltage 1.06 times rated voltage divided by $\sqrt{3}$:		N/A
	Leakage current measurements	(see appended table)	P
16.3	Electric strength tests according to table 7	(see appended table)	P
	No breakdown during the tests		P

17	OVERLOAD PROTECTION OF TRANSFORMERS AND ASSOCIATED CIRCUITS		-
	No excessive temperatures in transformer or associated circuits in event of short-circuits likely to occur in normal use	(see appended table)	N/A
	Appliance supplied with 1.06 or 0.94 times rated voltage and the most unfavourable short-circuit or overload likely to occur in normal use applied:		N/A
	Temperature rise of insulation of the conductors of safety extra-low voltage circuits not exceeding the relevant value specified in table 3 by more than 15 K		N/A
	Temperature of the winding not exceeding the value specified in table 8,		N/A
	however limits do not apply to fail-safe transformer complying with sub-clause 15.5 of IEC 61558-1		N/A

18	ENDURANCE		-
18.101	Connections from the heating element to the supply leads and interconnection lead are reliable. Test is carried out 400 cycles (IEC 60335-2-96)		P
18.102	Electrical connections between the resistance material and electrodes are reliable. No contact degradation or damage to the electrodes (IEC 60335-2-96)		P
18.102.1	Test with heating unit wound on a cylindrical mandrel (IEC 60335-2-96)		P



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Clause	Requirement - Test	Result - Remark	Verdict
18.102.2	Test with heating element fully covered (IEC 60335-2-96)		P
18.102.3	Test for 1 000 cycles with heating unit in humidity cabinet (IEC 60335-2-96)		P
18.102.4	Test as 18.102.1 but for 2.000 cycles (IEC 60335-2-96)		P
18.102 5	Test with needle inserted into the resistance material (IEC 60335-2-96)		P
18.103	The resistance of the heating unit shall not decrease significantly during use (IEC 60335-2-96)		P

19	ABNORMAL OPERATION		-
19.1	The risk of fire or mechanical damage under abnormal or careless operation obviated		P
	Electronic circuits so designed and applied that a fault will not render the appliance unsafe		N/A
19.2	Test of appliance with heating elements with restricted heat dissipation; test voltage (V): power input of 0.85 times rated power input:	See 19.13 Table for temperatures	P
19.3	Test of 19.2 repeated; test voltage (V): power input of 1.24 times rated power input:		P
19.4	Test conditions as in cl.11, any control limiting the temperature during tests of cl.11 short-circuited		P
19.5	Test of 19.4 repeated on Class 0I and I appliances with tubular sheathed or embedded heating elements. No short-circuiting, but one end of element connected to element's sheath		N/A
	The test repeated with reversed polarity and the other end of the heating element connected to the sheath		N/A
	The test is not carried out on appliances intended to be permanently connected to fixed wiring and on appliances where an all-pole disconnection occurs during the test of 19.4		N/A
19.6	Appliances with PTC heating elements tested at rated voltage, establishing steady conditions		N/A
	The working voltage of the PTC heating element is increased by 5% and the appliance is operated until steady conditions are re-established. The voltage is then increased in similar steps until 1.5 times working voltage or until the PTC heating element ruptures		N/A



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Clause	Requirement - Test	Result - Remark	Verdict
19.7	Stalling test by locking the rotor if the locked rotor torque is smaller than the full load torque or locking moving parts of other appliances		N/A
	Locked rotor, motor capacitors open-circuited or short-circuited, if required		N/A
	Locked rotor, capacitors open-circuited one at a time		N/A
	Test repeated with capacitors short-circuited one at a time, if required		N/A
	Appliances with timer or programmer supplied with rated voltage for each of the tests, for a period equal to the maximum period allowed		N/A
	Other appliances supplied with rated voltage for a period as specified		N/A
	Winding temperatures not exceeding values specified in table 8	(see appended table)	N/A
19.8	Three-phase motors operated at rated voltage with one phase disconnected		N/A
19.9	Running overload test on appliances incorporating motors intended to be remotely or automatically controlled or liable to be operated continuously		N/A
	Winding temperatures not exceeding values as specified	(see appended table)	N/A
19.10	Series motor operated at 1.3 times rated voltage for 1 min:		N/A
	During the test, parts not being ejected from the appliance		N/A
19.11	Electronic circuits, compliance checked by evaluation of the fault conditions specified in 19.11.2 for all circuits or parts of circuits, unless they comply with the conditions specified in 19.11.1		N/A
	Protective electronic circuits are subjected to the tests of 19.11.3 and 19.11.4 (IEC 60335-1, A1)		N/A
19.11.1	Before applying the fault conditions a) to f) in 19.11.2, it is checked if circuits or parts of circuit meet both of the following conditions:		N/A
	- the electronic circuit is a low-power circuit, that is, the maximum power at low-power points does not exceed 15 W according to the tests specified		N/A
	- the protection against electric shock, fire hazard, mechanical hazard or dangerous malfunction in other parts of the appliance does not rely on the correct functioning of the electronic circuit		N/A



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Clause	Requirement - Test	Result - Remark	Verdict
19.11.2	Fault conditions applied one at a time, the appliance operated under conditions specified in cl. 11, but supplied at rated voltage, the duration of the tests as specified:		N/A
	a) short circuit of functional insulation if clearances or creepage distances are less than the values specified in 29		N/A
	b) open circuit at the terminals of any component		N/A
	c) short circuit of capacitors, unless they comply with IEC 60384-14		N/A
	d) short circuit of any two terminals of an electronic component, other than integrated circuits. This fault condition is not applied between the two circuits of an optocoupler		N/A
	e) failure of triacs in the diode mode		N/A
	f) failure of an integrated circuit. The possible hazardous situations of the appliance are assessed to ensure that safety does not rely on the correct functioning of such a component		N/A
19.11.3	If the appliance incorporates a protective electronic circuit which operates to ensure compliance with clause 19, relevant test is repeated with a single fault simulated, as indicated in a) to f) of 19.11.2		N/A
	During and after each test the following is checked:		N/A
	- the temperature rise of the windings do not exceed the values specified in table 8		N/A
	- the appliance complies with the conditions specified in 19.13		N/A
	- any current flowing through protective impedance not exceeding the limits specified in 8.1.4		N/A
	If a conductor of a printed board becomes open-circuited, the appliance is considered to have withstood the particular test, provided all three of the following conditions are met:		N/A
	- the material of the printed circuit board withstands the burning test of annex E		N/A
	- any loosened conductor does not reduce the clearances or creepage distances between live parts and accessible metal parts below the values specified in cl. 29		N/A
	- the appliance withstands the tests of 19.11.2 with open-circuited conductor bridged		N/A
19.11.4	Protective electronic circuits are subjected to the tests of clause 19.11.4.1 to 19.11.4.7		N/A



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Clause	Requirement - Test	Result - Remark	Verdict
	(IEC 60335-1, A1)		
	Appliances with a switch with an off position obtaining by electronic disconnection or that can be placed in a stand-by mode, are subjected to the tests of clause 19.11/4.1 to 19.11.4.7 (IEC 60335-1, A1)		N/A
19.11.4.1	The appliance is subjected to electrostatic discharges in accordance with IEC 61000-4-2, test level 4 (IEC 60335-1, A1)		N/A
19.11.4.2	The appliance is subjected to radiated fields in accordance with IEC 61000-4-3, test level 3 (IEC 60335-1, A1)		N/A
19.11.4.3	The appliance is subjected to fast transient bursts in accordance with IEC 61000-4-4, test level 3 (IEC 60335-1, A1)		N/A
19.11.4.4	The power supply terminals of the appliance are subjected to voltage surges in accordance with IEC 61000-4-5, test level 3 (IEC 60335-1, A1)		N/A
19.11.4.5	The appliance is subjected to injected currents in accordance with IEC 61000-4-6, test level 3 (IEC 60335-1, A1)		N/A
19.11.4.6	The appliance is subjected to voltage dips and interruptions in accordance with IEC 61000-4-11 (IEC 60335-1, A1)		N/A
19.11.4.7	The appliance is subjected to mains signals in accordance with IEC 61000-4-13, test level class 2 (IEC 60335-1, A1)		N/A
19.12	If the safety of the appliance for any of the fault conditions specified in 19.11.2 depends on the operation of a miniature fuse-link complying with IEC 60127, the test is repeated, measuring the current flowing through the fuse-link; measured current (A); rated current of the fuse-link (A):		N/A
19.13	During the tests the appliance does not emit flames, molten metal, poisonous or ignitable gas in hazardous amounts		P
	Temperature rises not exceeding the values shown in table 9	(see appended table)	P
	Enclosures not deformed to such an extent that compliance with cl.8 is impaired		P
	If the appliance can still be operated it complies with 20.2		P
	Insulation, other than of class III appliance, withstand the electric strength test of 16.3, the test voltage specified in table 4:		P



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Clause	Requirement - Test	Result - Remark	Verdict
	- basic insulation:		P
	- supplementary insulation:		N/A
	- reinforced insulation:		N/A
	The appliance shall not undergo a dangerous malfunction and there shall be no failure of protective electronic circuits if the appliance is still operable (IEC 60335-1, A1)		N/A
	Appliances with an electronic switch in the off position or in the stand-by mode shall not become operable (IEC 60335-1, A1)		N/A
19.101	Heating unit installed as in clause 11 and supplied at 1,1 times nominal voltage of the installation (IEC 60335-2-96)	To be deleted. (IEC 60335-2-96, A1)	N/A

20	STABILITY AND MECHANICAL HAZARDS		-
20.1	Adequate stability	Not applicable (IEC 60335-2-96)	N/A

21	MECHANICAL STRENGTH		-
	Appliance has adequate mechanical strength and is constructed as to withstand rough handling		P
	No damage after three blows applied to various parts of the enclosure, impact energy $0,5 \pm 0,04$ J		P
	If necessary, supplementary or reinforced insulation subjected to the electric strength test of 16.3		N/A
	If necessary, repetition of groups of three blows on a new sample		N/A
21.2	Accessible parts of solid insulation shall have sufficient strength to prevent penetration by sharp implements. The parts are scratched with a hardened steel pin. After the test there shall be no damage and the insulation shall withstand the tests of clause 16.3 (IEC 60335-1, A1)		P
21.101	Fully covering the width of the heating element. Bending test through angle of 180° in both directions for three times. The heating unit shall withstand clause 16.3 and no damaging (IEC 60335-2-96)		P
21.102	Two heating units are subjected to the scratch test with a hardened steel pin. After the test the appliances shall withstand the tests of clause 16.3 (IEC 60335-2-96)		P



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Clause	Requirement - Test	Result - Remark	Verdict
21.103	The part of the heating unit containing an insulated heating wire is tested with steel rod for 30 sec with a force of: - 600 N : heating units for application in floor of concrete - 300 N : heating units for other floor application There shall be no penetration of the sheath (IEC 60335-2-96, A1)	600N	P
21.104	A sample of the additional layer of material is scratched with a hardened steel pin for three times. There shall be no penetration of the material (IEC 60335-2-96, A1)		P

22	CONSTRUCTION		
22.1	Appliance marked with the first numeral of the IP system, relevant requirements of IEC 60529 are fulfilled	IPX1 or IPX7	P
22.2	Stationary appliance: means to provide all-pole disconnection from the supply provided, the following means being available:		P
	- a supply cord fitted with a plug		N/A
	- a switch complying with 24.3		N/A
	- a statement in the instruction sheet that a disconnection incorporated in the fixed wiring is to be provided		P
	- an appliance inlet		N/A
	Single-pole switches and single-pole protective devices for the disconnection of heating elements in single-phase permanently connected class I appliances, connected in the phase conductor		N/A
22.3	Appliance provided with pins: no undue strain on socket-outlets		N/A
	Applied torque not exceeding 0.25 Nm		N/A
	Pull force of 50N to each pin after the appliance has being placed in the heating cabinet; when cooled to room temperature the pins are not displaced by more than 1mm		N/A
	Each pin subjected to a torque of 0.4Nm; the pins are not rotating unless rotating does not impair compliance with the standard		N/A
22.4	Appliance for heating liquids and appliance causing undue vibration not provided with pins for insertion into socket-outlets		N/A
22.5	No risk of electric shock when touching the pins of		N/A



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Clause	Requirement - Test	Result - Remark	Verdict
	the plug		
22.6	Electrical insulation not affected by condensing water or leaking liquid		N/A
	Electrical insulation of Class II appliances not affected in case of a hose rupture or seal leak		N/A
22.7	Adequate safeguards against the risk of excessive pressure in appliances provided with steam-producing devices		N/A
22.8	Electrical connections not subject to pulling during cleaning of compartments to which access can be gained without the aid of a tool, and that are likely to be cleaned in normal use		N/A
22.9	Insulation, internal wiring, windings, commutators and slip rings not exposed to oil, grease or similar substances		N/A
	Adequate insulating properties of oil or grease to which insulation is exposed		N/A
22.10	Location or protection of reset buttons of non-self-resetting controls is so that accidental resetting is unlikely		N/A
	It shall not be possible to reset voltage-maintained non-self-resetting thermal cut-outs by the operation of an automatic switching device (IEC 60335-1, A1)		N/A
22.11	Reliable fixing of non-detachable parts that provide the necessary degree of protection against electric shock, moisture or contact with moving parts		P
	Obvious locked position of snap-in devices used for fixing such parts		P
	No deterioration of the fixing properties of snap-in devices used in parts that are likely to be removed during installation or servicing		P
	Tests as described		P
22.12	Handles, knobs etc. fixed in a reliable manner		N/A
	Fixing in wrong position of handles, knobs etc. indicating position of switches or similar components not possible		N/A
	Axial force 15 N applied to parts, the shape being so that an axial pull is unlikely to be applied		N/A
	Axial force 30 N applied to parts, the shape being so that an axial pull is likely to be applied		N/A
22.13	Unlikely that handles, when gripped as in normal use, make the operators hand touch parts having a		N/A



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Clause	Requirement - Test	Result - Remark	Verdict
	temperature rise exceeding the value specified for handles which are held for short periods only		
22.14	No ragged or sharp edges creating a hazard for the user in normal use, or during user maintenance		N/A
	No exposed pointed ends of self tapping screws etc., liable to be touched by the user in normal use or during user maintenance		N/A
22.15	Storage hooks and the like for flexible cords smooth and well rounded		N/A
22.16	Automatic cord reels cause no undue abrasion or damage to the sheath of the flexible cord, no breakage of conductors strands, no undue wear of contacts		N/A
	Cord reel tested with 6000 operations, as specified		N/A
	Electric strength test of 16.3, voltage of 1000 V applied		N/A
22.17	Spacers not removable from the outside by hand or by means of a screwdriver or a spanner		N/A
22.18	Current-carrying parts and other metal parts resistant to corrosion under normal conditions of use		P
22.19	Driving belts not used as electrical insulation		N/A
22.20	Direct contact between live parts and thermal insulation effectively prevented, unless material used is non-corrosive, non-hygroscopic and non-combustible		P
	Compliance is checked by inspection and, if necessary, by appropriate test		P
22.21	Wood, cotton, silk, ordinary paper and fibrous or hygroscopic material not used as insulation, unless impregnated		P
22.22	Appliances not containing asbestos		P
22.23	Oils containing polychlorinated biphenyl (PCB) not used		P
22.24	Bare heating elements adequately supported		N/A
	In case of rupture, the heating conductor is unlikely to come in contact with accessible metal parts		N/A
22.25	Sagging heating conductors cannot come into contact with accessible metal parts		N/A
22.26	The insulation between parts operating at safety extra-low voltage and other live parts complies with the requirements for double or reinforced insulation		N/A



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Clause	Requirement - Test	Result - Remark	Verdict
22.27	Parts connected by protective impedance separated by double or reinforced insulation		N/A
22.28	Metal parts of Class II appliances conductively connected to gas pipes or in contact with water: separated from live parts by double or reinforced insulation		N/A
22.29	Class II appliances permanently connected to fixed wiring so constructed that the required degree of access to live parts is maintained after installation		N/A
22.30	Parts serving as supplementary or reinforced insulation fixed so that they cannot be removed without being seriously damaged, or		N/A
	so constructed that they cannot be replaced in an incorrect position, and so that if they are omitted, the appliance is rendered inoperable or manifestly incomplete		N/A
22.31	Clearances and creepage distances over supplementary and reinforced insulation not reduced below values specified for supplementary insulation		N/A
	Creepage distances and clearances over supplementary or reinforced insulation not reduced to less than 50% of values specified in 29 if wires, screws etc. becomes loose		N/A
22.32	Supplementary and reinforced insulation designed or protected against deposition of dirt or dust		N/A
	Supplementary insulation of natural or synthetic rubber resistant to ageing, or arranged and dimensioned so that creepage distances are not reduced below values specified in 29.2		N/A
	Ceramic material not tightly sintered, similar material or beads alone not used as supplementary or reinforced insulation		N/A
	Oxygen bomb test at 70 °C for 96 h and 16 h at room temperature		N/A
22.33	Conductive liquids that are or may become accessible in normal use are not in direct contact with live parts		N/A
	Electrodes not used for heating liquids		N/A
	For class II constructions, conductive liquids that are or may become accessible in normal use, not in direct contact with basic or reinforced insulation		N/A
	For class II constructions, conductive liquids which are in contact with live parts, not in direct contact		N/A



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Clause	Requirement - Test	Result - Remark	Verdict
	with reinforced insulation		
22.34	Shafts of operating knobs, handles, levers etc. not live, unless the shaft is not accessible when the part is removed		N/A
22.35	Handles, levers and knobs, held or actuated in normal use, not becoming live in the event of an insulation fault		N/A
	Such parts being of metal, and their shafts or fixings are likely to become live in the event of an insulation fault, they are either adequately covered by insulation material, or their accessible parts are separated from their shafts or fixings by supplementary insulation		N/A
	This requirement does not apply to handles, levers and knobs on stationary appliances other than those of electrical components, provided they are either reliably connected to an earthing terminal or earthing contact, or separated from live parts by earthed metal		N/A
22.36	Handles continuously held in the hand in normal use are so constructed that when gripped as in normal use, the operators hand is not likely to touch metal parts, unless they are separated from live parts by double or reinforced insulation		N/A
22.37	Capacitors in Class II appliances not connected to accessible metal parts, unless complying with 22.42		N/A
	Metal casings of capacitors in Class II appliances separated from accessible metal parts by supplementary insulation, unless complying with 22.42		N/A
22.38	Capacitors not connected between the contacts of a thermal cut-out		N/A
22.39	Lamp holders used only for the connection of lamps		N/A
22.40	Motor-operated appliances and combined appliances intended to be moved while in operation, or having accessible moving parts, fitted with a switch to control the motor. The actuating member of the switch being easily visible and accessible		N/A
22.41	No components, other than lamps, containing mercury		P
22.42	Protective impedance consisting of at least two separate components		N/A
	Values specified in 8.1.4 not exceeded if any one of the components are short-circuited or open-circuited		N/A



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Clause	Requirement - Test	Result - Remark	Verdict
22.43	Appliances adjustable for different voltages, accidental changing of the setting of the voltage unlikely to occur		N/A
22.44	Appliances are not allowed to have an enclosure that is shaped and decorated so that the appliance is likely to be treated as a toy by children		P
22.45	When air is used as reinforced insulation, clearances not reduced below the values specified in 29.1.4 due to deformation as a result of an external force applied to the enclosure		N/A
22.46	Software used in protective electronic circuits shall be software class B or software class C (IEC 60335-1, A1)		N/A
22.47	Appliances intended to be connected to the water mains shall withstand the water pressure expected in normal use (IEC 60335-1, A1)		N/A
22.48	Appliances intended to be connected to the water mains shall be constructed to prevent back-siphonage of non-potable water into the water mains (IEC 60335-1, A1)		N/A
22.101	The means of connection to the supply shall be securely fixed to the heating element. A force of 60 N is applied to each supply lead for one min. There shall be no damage to the leads, connections or heating element and the heating unit shall comply with clause 16.3 (IEC 60335-2-96)		P
22.102	The insulation covering the connections and the edges of the heating element shall not affect the material of the heating element. After the test the heating unit shall withstand clause 16.3 (IEC 60335-2-96)		P
22.103	The sheets of electrical insulation of laminated flexible sheet heating elements shall be reliable bonded together (IEC 60335-2-96)		P
22.104	Connecting devices fitted to supply leads and interconnection leads are of class II construction and possible to separate them without the aid of a tool (IEC 60335-2-96)		N/A
22.105	Heating units of class II constructions to be installed under floors in damp locations shall not subject the user to excessive capacitive currents. The capacitive current shall not exceed 0,25 mA (IEC 60335-2-96, A1)		N/A



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IEC 60335-2-96			
Clause	Requirement - Test	Result - Remark	Verdict
23	INTERNAL WIRING		-
23.1	Wire-ways smooth and free from sharp edges		N/A
	Wires protected against contact with burrs, cooling fins etc.		N/A
	Wire holes in metal well rounded or provided with bushings		N/A
	Wiring effectively prevented from coming into contact with moving parts		N/A
23.2	Beads etc. on live wires cannot change their position, and are not resting on sharp edges or corners		N/A
	Beads inside flexible metal conduits contained within an insulating sleeve		N/A
23.3	Electrical connections and internal conductors movable relatively to each other not exposed to undue stress		N/A
	Flexible metallic tubes not causing damage to insulation of conductors		N/A
	Open-coil springs not used		N/A
	Adequate insulating lining provided inside a coiled spring, the turns of which touch one another		N/A
	No damage after 10 000 flexings for conductors flexed during normal use or 100 flexings for conductors flexed during user maintenance		N/A
	Electric strength test, 1000 V between live parts and accessible metal parts		N/A
23.4	Bare internal wiring sufficiently rigid and fixed		N/A
23.5	The insulation of internal wiring withstanding the electrical stress likely to occur in normal use		N/A
	No breakdown when a voltage of 2000 V is applied for 15 min between the conductor and metal foil wrapped around the insulation		N/A
23.6	Sleeving used as supplementary insulation on internal wiring retained in position by positive means		N/A
23.7	The colour combination green/yellow used only for earthing conductors		N/A
23.8	Aluminium wires not used for internal wiring		N/A
23.9	No lead-tin soldering of stranded conductors where they are subject to contact pressure, unless		N/A
	clamping means so constructed that there is no risk of bad contact due to cold flow of the solder		N/A



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IEC 60335-2-96			
Clause	Requirement - Test	Result - Remark	Verdict
23.10	The insulation and sheath of internal wiring, in external hoses for the connection of appliances to the water mains, shall be at least equivalent to that of light polyvinyl chloride sheathed flexible cords, code designation 60227 IEC 52 (IEC 60335-1, A1)		N/A
24	COMPONENTS		-
24.1	Components comply with safety requirements in relevant IEC standards		P
	List of components	(see appended table)	P
	Components not tested and found to comply with relevant IEC standard for the number of cycles specified are tested in accordance with 24.1.1 to 24.1.6		P
	Components not tested and found to comply with relevant IEC standard, components not marked or not used in accordance with its marking, tested under the conditions occurring in the appliance		P
24.1.1	Capacitors likely to be permanently subjected to the supply voltage and used for radio interference suppression or for voltage dividing, complying with IEC 60384-14, or		N/A
	tested according to annex F		N/A
24.1.2	Safety isolating transformers complying with IEC 61558-2-6, or		N/A
	tested according to annex G		N/A
24.1.3	Switches complying with IEC 61058-1, number of cycles of operation being at least 10 000, or		N/A
	tested according to annex H		N/A
24.1.4	Automatic controls complying with IEC 60730-1 with relevant part 2. The number of cycles of operation being:		-
	- thermostats:	10 000	N/A
	- temperature limiters:	1 000	N/A
	- self-resetting thermal cut-outs:	300	N/A
	- non-self-resetting thermal cut-outs:	30	N/A
	- timers:	3 000	N/A
	- energy regulators:	10 000	N/A
	- voltage maintain non-self-resetting thermal cut-outs (IEC 60335-1, A1)	1 000	N/A
	- other non-self-resetting thermal cut-	30	N/A



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IEC 60335-2-96			
Clause	Requirement - Test	Result - Remark	Verdict
	outs (IEC 60335-1, A1)		
24.1.5	Appliance couplers complying with IEC 60320-1		N/A
	However, appliances classified higher than IPX0, appliance couplers complying with IEC 60320-2-3		N/A
24.1.6	Small lamp holders similar to E10 lamp holders complying with IEC 60238, the requirements for E10 lamp holders being applicable		N/A
24.2	No switches or automatic controls in flexible cords		N/A
	No devices causing the protective device in the fixed wiring to operate in the event of a fault in the appliance		N/A
	No thermal cut-outs that can be reset by soldering		N/A
24.3	Switches intended for all-pole disconnection of stationary appliances are directly connected to the supply terminals and having a contact separation in all poles, providing full disconnection under over-voltage category III conditions	To be installed in the electrical supply	N/A
24.4	Plugs and socket-outlets for extra-low voltage circuits and heating elements, not interchangeable with plugs and socket-outlets listed in IEC 60083 or IEC 60906-1 or with connectors and appliance inlets complying with the standard sheets of IEC 60320-1		N/A
24.5	Capacitors in auxiliary windings of motors marked with their rated voltage and capacitance and used accordingly		N/A
	Capacitors in appliances for which 30.2.3 is applicable and that are permanently connected in series with a motor winding, are of class P1 or P2 of IEC 60252		N/A
	Voltage across capacitors in series with a motor winding does not exceed 1,1 times rated voltage, when the appliance is supplied at 1,1 times rated voltage under minimum load		N/A
24.6	Working voltage of motors connected to the supply mains and having basic insulation that is inadequate for the rated voltage of the appliance, not exceeding 42V.		N/A
	In addition, the motors are complying with the requirements of Annex I		N/A
24.7	Hose-sets for the connection of appliances to the water mains shall comply with IEC 61770 and supplied with the appliances (IEC 60335-1, A1)		N/A



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IEC 60335-2-96			
Clause	Requirement - Test	Result - Remark	Verdict
24.101	Thermal cut-outs necessary for compliance with clause 19 are non self resetting with a trip-free mechanism (IEC 60335-2-96)		N/A
24.102	Controls and other components necessary for compliance with this standard are supplied with flexible sheet heating element (IEC 60335-2-96) or sufficiently specified in the instructions for installation (IEC 60335-2-96, A1)		N/A
25	SUPPLY CONNECTION AND EXTERNAL FLEXIBLE CORDS		-
25.1	Appliance not intended for permanent connection to fixed wiring, means for connection to the supply:		N/A
	- supply cord fitted with a plug		N/A
	- an appliance inlet having at least the same degree of protection against moisture as required for the appliance		N/A
	- pins for insertion into socket-outlets		N/A
25.2	Appliance not provided with more than one means of connection to the supply mains		P
	Stationary appliance for multiple supply may be provided with more than one means of connection, provided electric strength test of 1250 V for 1 min between each means of connection causes no breakdown		N/A
25.3	Appliance provided with a set of terminals for the connection to fixed wiring (IEC 60335-2-96)		N/A
	Appliance provided with a set of supply leads to fixed wiring (IEC 60335-2-96)		N/A
	Appliance provided with a supply cord to fixed wiring (IEC 60335-2-96)		N/A
	Heating units that can be cut on side shall be supplied with a suitable means for connection to the supply mains. Supply leads shall be double insulated or fitted with insulating sleeves of at least 300 mm long and thickness corresponding to 60245 IEC 53 (IEC 60335-2-96)		P
25.4	Cable and conduit entries, rated current of appliance not exceeding 16 A, dimensions according to table 10		N/A
	Introduction of conduit or cable does not reduce clearances or creepage distances below values specified in 29		N/A



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Clause	Requirement - Test	Result - Remark	Verdict
25.5	Method for assemble supply cord with the appliance:		N/A
	- type X attachment		N/A
	- type Y attachment		N/A
	- type Z attachment is allowed (IEC 60335-2-96)		N/A
	Type X attachment, other than those with a specially prepared cord, not used for flat twin tinsel cords		N/A
25.6	Plugs fitted with only one flexible cord		N/A
25.7	Supply cord not lighter than:		N/A
	- braided cord (60245 IEC 51)		N/A
	- ordinary tough rubber sheathed cord (60245 IEC 53)		N/A
	- flat twin tinsel cord (60227 IEC 41)		N/A
	- light polyvinyl chloride sheathed cord (60227 IEC 52), appliance not exceeding 3 kg		N/A
	- ordinary polyvinyl chloride sheathed cord (60227 IEC 53), appliance exceeding 3 kg		N/A
	Temperature rise of external metal parts exceeding 75 K, PVC cord not used, unless		N/A
	appliance so constructed that the supply cord is not likely to touch external metal parts in normal use, or		N/A
	the supply cord is appropriate for higher temperatures, type Y or type Z attachment used		N/A
25.8	Nominal cross-sectional area of supply cords according to table 11; rated current (A); cross-sectional area (mm ²):		N/A
25.9	Supply cord not in contact with sharp points or edges		N/A
25.10	Green/yellow core for earthing purposes in Class I appliance		N/A
25.11	Conductors of supply cords not consolidated by lead-tin soldering where they are subject to contact pressure, unless		N/A
	clamping means so constructed that there is no risk of bad contacts due to cold flow of the solder		N/A
25.12	Moulding the cord to part of the enclosure does not damage the insulation of the supply cord		N/A
25.13	Inlet opening so shaped as to prevent damage to the supply cord		N/A



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Clause	Requirement - Test	Result - Remark	Verdict
	Unless the enclosure at the inlet opening is of insulation material, a non-detachable lining or bushing complying with 29.3 for supplementary insulation provided		N/A
	If unsheathed supply cord, a similar additional bushing or lining is required, unless		N/A
	the appliance is class 0		N/A
25.14	Supply cords adequately protected against excessive flexing		N/A
	Flexing test:		N/A
	- applied force (N):		N/A
	- number of flexings:		N/A
	The test does not result in:		N/A
	- short circuit between the conductors		N/A
	- breakage of more than 10% of the strands of any conductor		N/A
	- separation of the conductor from its terminal		N/A
	- loosening of any cord guard		N/A
	- damage, within the meaning of the standard, to the cord or the cord guard		N/A
	- broken strands piercing the insulation and becoming accessible		N/A
25.15	Conductors of the supply cord relieved from strain, twisting and abrasion by use of cord anchorage		N/A
	The cord cannot be pushed into the appliance to such an extent that the cord or internal parts of the appliance can be damaged		N/A
	Pull and torque test of supply cord, values shown in table 10: pull (N); torque (not on automatic cord reel) (Nm):		N/A
	Max. 2 mm displacement of the cord, and conductors not moved more than 1 mm in the terminals		N/A
	Creepage distances and clearances not reduced below values specified in 29.1		N/A
25.16	Cord anchorages for type X attachments constructed and located so that:		N/A
	- replacement of the cord is easily possible		N/A
	- it is clear how the relief from strain and the prevention of twisting are obtained		N/A
	- they are suitable for different types of cord		N/A



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Clause	Requirement - Test	Result - Remark	Verdict
	- cord cannot touch the clamping screws of cord anchorage if these screws are accessible, unless separated from accessible metal parts by supplementary insulation		N/A
	- the cord is not clamped by a metal screw which bears directly on the cord		N/A
	- at least one part of the cord anchorage securely fixed to the appliance, unless part of a specially prepared cord		N/A
	- screws which have to be operated when replacing the cord do not fix any other component, if applicable		N/A
	- if labyrinths can be bypassed the test of 25.15 is nevertheless withstood		N/A
	- for Class 0, 0I and I appliances: they are of insulating material or are provided with an insulating lining, unless a failure of the insulation of the cord does not make accessible metal parts live		N/A
	- for Class II appliances: they are of insulating material, or if of metal, they are insulated from accessible metal parts by supplementary insulation		N/A
25.17	Adequate cord anchorages for type Y and Z attachment		N/A
25.18	Cord anchorages only accessible with the aid of a tool, or		N/A
	so constructed that the cord can only be fitted with the aid of a tool		N/A
25.19	Type X attachment, glands not used as cord anchorage in portable appliances		N/A
	Tying the cord into a knot or tying the cord with string not used		N/A
25.20	Conductors of the supply cord for type Y and Z attachment adequately additionally insulated		N/A
25.21	Space for supply cord for type X attachment or for connection of fixed wiring constructed to permit checking of conductors with respect to correct positioning and connection before fitting any cover, no risk of damage to the conductors when fitting the cover, no contact with accessible metal parts if a conductor becomes loose, etc.		N/A
	For portable appliances, the uninsulated end of a conductor prevented from any contact with accessible metal parts, unless the end of the cord is such		N/A



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Clause	Requirement - Test	Result - Remark	Verdict

	that the conductors are unlikely to slip free		
25.22	Appliance inlet:		N/A
	- live parts not accessible during insertion or removal		N/A
	- connector can be inserted without difficulty		N/A
	- the appliance is not supported by the connector		N/A
	- is not for cold conditions if temp. rise of external metal parts exceeds 75 K, unless the supply cord is not likely to touch such metal parts		N/A
25.23	Interconnection cords comply with requirements for the supply cord, except as specified		N/A
	If necessary, electric strength test of 16.3		N/A
25.24	Interconnection cords not detachable without the aid of a tool if compliance with the standard is impaired when they are disconnected		N/A
25.25	Dimensions of pins compatible with the dimensions of the relevant socket-outlet. Dimensions of pins and engagement face in accordance with the relevant plug in IEC 60083		N/A

26	TERMINALS FOR EXTERNAL CONDUCTORS		-
26.1	Appliances provided with terminals or equally effective devices for connection of external conductors		P
	Terminals only accessible after removal of a non-detachable cover		P
	Only the earthing terminal may be accessible if a tool is required to make the connections and means to provide to clamp the wire independently from its connection (IEC 60335-1, A1)		N/A
	Heating units shall not incorporate screw-type terminals (IEC 60335-2-96)		P
26.2	Appliances with type X attachment and appliances for connection to fixed wiring provided with terminals in which connections are made by means of screws, nuts or similar devices, unless the connections are soldered	Crimped terminals	P
	Screws and nuts serve only to clamp supply conductors, except		N/A
	internal conductors, if so arranged that they are unlikely to be displaced when fitting the supply conductors		N/A



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Clause	Requirement - Test	Result - Remark	Verdict
	If soldered connections used, the conductor so positioned or fixed that reliance is not placed on soldering alone		N/A
	Soldering alone used, barriers provided, clearances and creepage distances satisfactory if the conductor becomes free at the soldered joint		N/A
26.3	Terminals for type X attachment and for connection to fixed wiring so constructed that the conductor is clamped between metal surfaces with sufficient contact pressure and without damaging the conductor	Refer to clause 18 for endurance tests for connection	P
	Terminals for type X attachment and those for connection to fixed wiring so fixed that when tightening or loosening the clamping means:		P
	- the terminal does not loosen		P
	- internal wiring is not subjected to stress		P
	- clearances and creepage distances are not reduced below the values in 29		P
	Compliance checked by inspection and by the test of sub-clause 8.6 of IEC 60999-1, torque applied being equal to two-thirds of the torque specified. Nominal diameter of thread (mm); screw category; torque (Nm):		N/A
26.4	Terminals for type X attachment, except those with a specially prepared cord, and those for connection to fixed wiring, no special preparation of conductors required, and so constructed or placed that conductors prevented from slipping out		N/A
26.5	Terminals for type X attachment so located or shielded that if a wire of a stranded conductor escapes, no risk of accidental connection to other parts that result in a hazard		N/A
	Stranded conductor test, 8 mm insulation removed		N/A
	No contact between live parts and accessible metal parts and, for class II constructions, between live parts and metal parts separated from accessible metal parts by supplementary insulation only		N/A
26.6	Terminals for type X attachment and for connection to fixed wiring suitable for connection of conductors with required cross-sectional area according to table 13; rated current (A); nominal cross-sectional area (mm ²):		N/A
	Terminals only suitable for a specially prepared cord		N/A



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Clause	Requirement - Test	Result - Remark	Verdict
26.7	Terminals for type X attachment accessible after removal of a cover or part of the enclosure		N/A
26.8	Terminals for the connection to fixed wiring, including the earthing terminal, located close to each other		N/A
26.9	Terminals of the pillar type constructed and located as specified		N/A
26.10	Terminals with screw clamping and screw-less terminals not used for flat twin tinsel cords, unless conductors ends fitted with a device suitable for screw terminals		N/A
	Pull test of 5 N to the connection		N/A
26.11	For type Y and Z attachment: soldered, welded, crimped and similar connections may be used		N/A
	For Class II appliances: the conductor so positioned or fixed that reliance is not placed on soldering, welding or crimping alone		N/A
	For Class II appliances: soldering, welding or crimping alone used, barriers provided, clearances and creepage distances satisfactory if the conductor becomes free		N/A
27	PROVISION FOR EARTHING		N/A
27.1	Accessible metal parts of class 0I and I appliances, permanently and reliably connected to an earthing terminal or contact of appliance inlet		N/A
	Earthing terminals not connected to neutral terminal		N/A
	Class 0, II and III appliance have no provision for earthing		N/A
	Safety extra-low voltage circuits not earthed, unless protective extra-low voltage circuits		N/A
27.2	Clamping means adequately secured against accidental loosening		N/A
	Terminals used for the connection of external equipotential bonding conductors allow connection of conductors of 2.5 to 6 mm ² , and		N/A
	do not provide earthing continuity between different parts of the appliance		N/A
	Conductors cannot be loosened without the aid of a tool		N/A
27.3	For appliances with supply cord, current-carrying conductors become taut before earthing conductor,		N/A



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Clause	Requirement - Test	Result - Remark	Verdict
	if the cord slips out of the cord anchorage		
	If a detachable part having an earth connection is plugged into another part of the appliance, the earth connection shall be made before the current-carrying connections are established and the current carrying connections shall be separated before the earth connection when removing the part (IEC 60335-1, A1)		N/A
27.4	No risk of corrosion resulting from contact between metal of earthing terminal and other metal		N/A
	Adequate resistance to corrosion of coated or uncoated parts providing earthing continuity, other than parts of a metal frame or enclosure		N/A
	Parts of steel providing earthing continuity provided at the essential areas with an electroplated coating, thickness at least 5 µm		N/A
	Adequate protection against rusting of parts of coated or uncoated steel, only intended to provide or transmit contact pressure		N/A
	In case of aluminium alloys precautions taken to avoid risk of corrosion		N/A
27.5	Low resistance of connection between earthing terminal and earthed metal parts		N/A
	This requirement does not apply to connections providing earthing continuity in the protective extra-low voltage circuit, provided that clearances of basic insulation are based on the rated voltage of the appliance		N/A
	Resistance not exceeding 0,1 Ω at the specified low-resistance test		N/A
27.6	The printed conductors of printed circuit boards not used to provide earthing continuity in hand held appliances		N/A
	They may be used in other appliances if:		N/A
	- at least two tracks are used with independent soldering points and the appliance complies with requirements of 27.5 for each circuit		N/A
	- the material of the printed circuit board complies with IEC 60249-2-4 or IEC 60249-2-5		N/A
28	SCREWS AND CONNECTIONS		N/A
28.1	Fixings, electrical connections and connections providing earthing continuity withstand mechanical		N/A



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Clause	Requirement - Test	Result - Remark	Verdict
	stresses		
	Screws not of soft metal liable to creep, such as zinc or aluminium		N/A
	Diameter of screws of insulating material min. 3 mm		N/A
	Screws of insulating material not used for any electrical connection or connections providing earthing continuity		N/A
	Screws used for electrical connections or connections providing earthing continuity screw into metal		N/A
	Screws not of insulating material if their replacement by a metal screw can impair supplementary or reinforced insulation		N/A
	Type X attachment, screws to be removed for replacement of supply cord or for user maintenance, not of insulating material if their replacement by a metal screw can impair basic insulation		N/A
	For screws and nuts; test as specified	(see appended table)	N/A
28.2	Electrical connections and connections providing earthing continuity constructed so that contact pressure not transmitted through insulating material liable to shrink or distort, unless shrinkage or distortion compensated		N/A
	This requirement does not apply to electrical connections in circuits carrying a current not exceeding 0.5A		N/A
28.3	Space-threaded (sheet metal) screws only used for electrical connections if they clamp the parts together		N/A
	Thread-cutting (self-tapping) screws only used for electrical connections if they generate a full form standard machine screw thread		N/A
	Such screws not used if they are likely to be operated by the user or installer unless the thread is formed by a swaging action		N/A
	Thread-cutting and space-threaded screws may be used in connections providing earthing continuity, provided unnecessary to disturb the connection and at least two screws are used for each connection		N/A
28.4	Screws and nuts that make mechanical connection secured against loosening if they also make electrical connections or connections providing earthing continuity		N/A



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Clause	Requirement - Test	Result - Remark	Verdict

	Rivets for electrical connections or connections providing earthing continuity secured against loosening if subjected to torsion		N/A
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29	CLEARANCES, CREEPAGE DISTANCES AND SOLID INSULATION		-
	Clearances, creepage distances and solid insulation withstand electrical stress		P
	For coatings used on printed circuits boards to protect the microenvironment or to provide basic insulation, annex J applies		N/A
29.1	Clearances not less than the values specified in table 16, taking into account the rated impulse voltage for over-voltage categories of table 15		P
	The values specified may be smaller for basic insulation and functional insulation if clearance meets the impulse voltage test of clause 14		N/A
	Appliances are in over-voltage category II		P
	Clearances less than specified in table 16 not allowed for basic insulation of class 0 and class 0I appliances,		P
	or if pollution degree 3 is applicable		N/A
	Compliance is checked by inspection and measurements as specified		P
29.1.1	Clearances of basic insulation withstand the over-voltages, taking into account the rated impulse voltage		P
	Clearance at the terminals of tubular sheathed heating elements may be reduced to 1mm if the microenvironment is pollution degree 1		N/A
	Lacquered conductors of windings assumed to be bare conductors, but the clearances specified in table 16 are reduced by 0.5mm for rated impulse voltages of at least 1500V		N/A
29.1.2	Clearances of supplementary insulation not less than those specified for basic insulation in table 16		N/A
29.1.3	Clearances of reinforced insulation not less than those specified for basic insulation in table 16, but using the next higher step for rated impulse voltage		N/A
29.1.4	For functional insulation, the values of table 16 are applicable, unless		P
	the appliance complies with clause 19 with the functional insulation short-circuited		N/A



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Clause	Requirement - Test	Result - Remark	Verdict
	Clearances at crossover points of lacquered conductors not measured		N/A
	Clearance between surfaces of PTC heating elements may be reduced to 1mm		N/A
	Lacquered conductors of windings assumed to be bare conductors, but the clearances specified in table 16 are reduced by 0.5mm for rated impulse voltages of at least 1500V		N/A
29.1.5	Appliances having higher working voltage than rated voltage, the voltage used for determining clearances from table 16 is the sum of the rated impulse voltage and the difference between the peak value of the working voltage and the peak value of the rated voltage		N/A
	If the secondary winding of a step-down transformer is earthed, or if there is an earthed screen between the primary and secondary windings, clearances of basic insulation on the secondary side not less than those specified in table 16, but using the next lower step for rated impulse voltage		N/A
	Circuits supplied with a voltage lower than rated voltage, clearances of functional insulation based on the working voltage used as the rated voltage in table 15		N/A
29.2	Creepage distances not less than those appropriate for the working voltage, taking into account the material group and the pollution degree		P
	Pollution degree 2 applies, unless		P
	precautions taken to protect the insulation; pollution degree 1		N/A
	insulation subjected to conductive pollution; pollution degree 3		N/A
	Compliance is checked by inspection and measurements as specified		P
29.2.1	Creepage distances of basic insulation not less than specified in table 17		P
	For pollution degree 1, creepage distance not less than the minimum specified for the clearance in table 16, if the clearance has been checked according to the test of clause 14		N/A
29.2.2	Creepage distances of supplementary insulation at least as specified for basic insulation in table 17		N/A
29.2.3	Creepage distances of reinforced insulation at least		N/A



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Clause	Requirement - Test	Result - Remark	Verdict
	double as specified for basic insulation in table 17		
29.2.4	Creepage distances of functional insulation not less than specified in table 18		P
	Creepage distances may be reduced if appliance complies with clause 19 with the functional insulation short-circuited		N/A
29.3	Solid insulation having a minimum thickness of 1mm for supplementary insulation,		N/A
	and 2mm for reinforced insulation		N/A
	This requirement does not apply if the supplementary insulation, other than mica or similar scaly material, consists of at least two layers, each of the layers withstands the electric strength test of 16.3		N/A
	This requirement does not apply if the reinforced insulation, other than mica or similar scaly material, consists of at least three layers, any two layers together withstand the electric strength test of 16.3		N/A
	This requirement also does not apply to inaccessible insulation and does not exceed the maximum permissible temperature values, or		N/A
	if the insulation, after conditioning as specified, withstands the electric strength test of 16.3		N/A
29.3.1	The thickness of the insulation shall be at least - 1 mm for supplementary insulation - 2 mm for reinforced insulation (IEC 60335-1, A1)		N/A
29.3.2	Each layer of material shall withstand the tests of clause 16.3. Supplementary insulation shall consist of at least 2 layer and reinforced insulation at least 3 layers (IEC 60335-1, A1)		N/A
29.3.3	The insulation is subjected to the dry heat test Bb of IEC 60068-2-2 for 48 hours at a temperature of 50K in excess of the maximum temperature rise during clause 19 and withstand the tests of clause 16.3 (IEC 60335-1, A1)		N/A
30	RESISTANCE TO HEAT AND FIRE		-
30.1	External parts of non-metallic material,		N/A
	parts supporting live parts, and		N/A
	thermoplastic material providing supplementary or reinforced insulation,		N/A
	sufficiently resistant to heat		N/A
	Ball-pressure test according to IEC 60695-10-2		N/A



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Clause	Requirement - Test	Result - Remark	Verdict
	External parts: at 40 °C plus the maximum temperature rise determined during the test of clause 11, or at 75 °C, whichever is the higher; temperature (°C):		N/A
	Parts supporting live parts: at 40°C plus maximum temperature rise determined during the test of clause 11, or at 125°C, whichever is the higher; temperature (°C):		N/A
	Parts of thermoplastic material providing supplementary or reinforced insulation, 25°C plus the maximum temperature rise determined during clause 19, if higher; temperature (°C):		N/A
	The test is not applicable to flexible sheet heating elements. The test of clause 25.1 and 25.4 of IEC 60884-1 are applicable (IEC 60335-2-96)		N/A
30.2	Relevant parts of non-metallic material adequately resistant to ignition and spread of fire		N/A
30.2.1	Glow-wire test of IEC 60695-2-11 at 550 °C, unless		N/A
	the material is classified at least HB40 according to IEC 60695-11-10		N/A
	Parts for which the glow-wire test cannot be carried out meet the requirements in ISO9772 for category FH3 material		N/A
30.2.2	Appliances operated while attended, parts of insulating material supporting current-carrying connections and parts within a distance of 3mm subjected to the glow-wire test of IEC 60695-2-11 at a temperature of:		N/A
	-750°C, for connections carrying a current exceeding 0,5A during normal operation		N/A
	-650°C, for other connections		N/A
	Test not applicable to conditions as specified		N/A
30.2.3	Appliances operated while unattended, tested as specified in 30.2.3.1 and 30.2.3.2		N/A
	Test not applicable to conditions as specified		N/A
30.2.3.1	Parts of insulating material supporting connections carrying a current exceeding 0.2A during normal operation, and		N/A
	parts of insulating material within a distance of 3mm		N/A
	having a glow-wire flammability index of at least 850°C according to IEC 60695-2-12		N/A
30.2.3.2	Parts of insulating material supporting current-carrying connections, and		N/A



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Clause	Requirement - Test	Result - Remark	Verdict
	parts of insulating material within a distance of 3mm		N/A
	subjected to glow-wire test of IEC 60695-2-11		P
	Test not carried out on material having a glow-wire ignition temperature according to IEC 60695-2-13 as specified		N/A
	Glow-wire test of IEC 60695-2-11, the temperature being:		N/A
	-750°C, for connections carrying a current exceeding 0,2A during normal operation		N/A
	-650°C, for other connections		N/A
	Parts that during the test produce a flame persisting longer than 2 s, tested as specified		N/A
	If a flame persists longer than 2 s during the test, parts above the connection, as specified, subjected to the needle-flame test of annex E, unless		N/A
	the material is classified as V-0 or V-1 according to IEC 60695-11-10		N/A
30.2.4	Base material of printed circuit boards subjected to needle-flame test of annex E		N/A
	Test not applicable to conditions as specified		N/A
31	RESISTANCE TO RUSTING		-
	Relevant ferrous parts adequately protected against rusting		N/A
32	RADIATION, TOXICITY AND SIMILAR HAZARDS		-
	Appliance does not emit harmful radiation		P
	Appliance does not present a toxic or similar hazard		P
A	ANNEX A (INFORMATIVE) ROUTINE TESTS		-
	Description of routine tests to be carried out by the manufacturer		P
B	ANNEX B (NORMATIVE) APPLIANCES POWERED BY RECHARGEABLE BATTERIES		N/A
	The following modifications to this standard are applicable for appliances powered by batteries that are recharged in the appliance		N/A
	This annex does not apply to battery chargers		N/A



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Clause	Requirement - Test	Result - Remark	Verdict
3.1.9	Appliance operated under the following conditions:		N/A
	-the appliance, supplied by its fully charged battery, operated as specified in relevant part 2		N/A
	-the battery is charged, the battery being initially discharged to such an extent that the appliance cannot operate		N/A
	-if possible, the appliance is supplied from the supply mains through its battery charger, the battery being initially discharged to such an extent that the appliance cannot operate. The appliance is operated as specified in relevant part 2		N/A
	If the appliance incorporates inductive coupling between two parts that are detachable from each other, the appliance is supplied from the supply mains with the detachable part removed		N/A
3.6.2	Part to be removed in order to discard the battery is not considered to be detachable		N/A
5.101	Appliances supplied from the supply mains tested as specified for motor-operated appliances		N/A
7.1	Battery compartment for batteries intended to be replaced by the user, marked with battery voltage and polarity of the terminals		N/A
7.12	The instructions for appliances incorporating batteries intended to be replaced by the user includes required information		N/A
	Details about how to remove batteries containing materials hazardous to the environment given		N/A
7.15	Markings placed on the part of the appliance connected to the supply mains		N/A
8.2	Appliances having batteries that according to the instruction may be replaced by the user need only have basic insulation between live parts and the inner surface of the battery compartment		N/A
	If the appliance can be operated without batteries, double or reinforced insulation required		N/A
11.7	The battery is charged for the period described		N/A
19.1	Appliances subjected to tests of 19.101, 19.102 and 19.103		N/A
19.101	Appliances supplied at rated voltage for 168 h, the battery being continually charged		N/A
19.102	Short-circuiting of the terminals of the battery, being fully charged, for appliances having batteries that		N/A



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Clause	Requirement - Test	Result - Remark	Verdict
	can be removed without the aid of a tool		
19.103	Appliances having batteries replaceable by the user supplied at rated voltage under normal operation with the battery removed or in any position allowed by the construction		N/A
21.101	Appliances having pins for insertion into socket-outlets have adequate mechanical strength, checked according to procedure 2 of IEC 68-2-32		N/A
	Part of the appliance incorporating the pins subjected to the free fall test, procedure 2, of IEC 60068-2-32, the number of falls being:		N/A
	- 100, the mass of part does not exceed 250 g		N/A
	- 50, the mass of part exceeds 250 g		N/A
	After the test, the requirements of 8.1, 15.1.1, 16.3 and clause 29 are met		N/A
22.3	Appliances having pins for insertion into socket-outlets tested as fully assembled as possible		N/A
25.13	An additional lining or bushing not required for interconnection cords operating at safety extra-low voltage		N/A
30.2	For parts of the appliance connected to the supply mains during the charging period, 30.2.3 applies		N/A
	For other parts, 30.2.2 applies		N/A
C	ANNEX C (NORMATIVE) AGEING TEST ON MOTORS		-
	Tests, as described, carried out when doubt with regard to the temperature classification of the insulation of a motor winding		N/A
D	ANNEX D (NORMATIVE) ALTERNATIVE REQUIREMENTS FOR PROTECTED MOTORS		-
	Applicable to motors that incorporate thermal motor protectors (IEC 60335-1, A1)		N/A
	- self-resetting thermal motor protectors for 300 cycles or for 72 hours		N/A
	- non-self-resetting thermal motor protectors for 30 cycles		N/A
	During the test temperatures shall not exceed the values specified in 19.7 and the appliance shall comply with 19.13		N/A



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Clause	Requirement - Test	Result - Remark	Verdict

E	ANNEX E (NORMATIVE) NEEDLE-FLAME TEST		-
	Needle-flame test carried out in accordance with IEC 60695-2-2, with the following modifications:		N/A
5	Severities		N/A
	The duration of application of the test flame is 30 s ± 1 s		N/A
8	Test procedure		N/A
8.2	The specimen so arranged that the flame can be applied to a vertical or horizontal edge as shown in the examples of figure 1		N/A
8.4	The first paragraph does not apply		N/A
	If possible, the flame is applied at least 10 mm from a corner		N/A
8.5	The test is carried out on one specimen		N/A
	If the specimen does not withstand the test, the test may be repeated on two further specimens, both withstanding the test		N/A
10	Evaluation of test results		N/A
	The duration of burning not exceeding 30s		N/A
	However, for printed circuit boards, the duration of burning not exceeding 15s		N/A

F	ANNEX F (NORMATIVE) CAPACITORS		-
	Capacitors likely to be permanently subjected to the supply voltage, and used for radio interference suppression or voltage dividing, comply with the following clauses of IEC 60384-14, with the following modifications:		N/A
1.5	Terminology		N/A
1.5.3	Class X capacitors tested according to subclass X2		N/A
1.5.4	This sub-clause is applicable		N/A
1.6	Marking		N/A
	Items a) and b) are applicable		N/A
3.4	Approval testing		N/A
3.4.3.2	Table II is applicable as described		N/A
4.1	Visual examination and check of dimensions		N/A



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Clause	Requirement - Test	Result - Remark	Verdict
	This sub-clause is applicable		N/A
4.2	Electrical tests		N/A
4.2.1	This sub-clause is applicable		N/A
4.2.5	This sub-clause is applicable		N/A
4.2.5.2	Only table IX is applicable		N/A
	Values for test A apply		N/A
	However, for capacitors in heating appliances the values for test B or C apply		N/A
4.12	Damp heat, steady state		N/A
	This sub-clause is applicable		N/A
	Only insulation resistance and voltage proof are checked		N/A
4.13	Impulse voltage		N/A
	This sub-clause is applicable		N/A
4.14	Endurance		N/A
	Sub-clauses 4.14.1, 4.14.3, 4.14.4 and 4.14.7 applicable		N/A
4.14.7	Only insulation resistance and voltage proof are checked		N/A
	Visual examination, no visible damage		N/A
4.17	Passive flammability test		N/A
	This sub-clause is applicable		N/A
4.18	Active flammability test		N/A
	This sub-clause is applicable		N/A
G	ANNEX G (NORMATIVE) SAFETY ISOLATING TRANSFORMERS		-
	The following modifications to this standard are applicable for safety isolating transformers:		N/A
7	Marking and instructions		N/A
7.1	Transformers for specific use marked with:		N/A
	-name, trademark or identification mark of the manufacturer or responsible vendor		N/A
	-model or type reference		N/A
17	Overload protection of transformers and associated circuits		N/A
	Fail-safe transformers comply with sub-clause 15.5 of IEC 61558-1		N/A



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Clause	Requirement - Test	Result - Remark	Verdict
22	Construction		N/A
	Sub-clauses 19.1 and 19.1.2 of IEC 61558-2-6 are applicable		N/A
29	Clearances, creepage distances and solid insulation		N/A
29.1 and 29.2	The distances specified in items 2a, 2c and 3 in table 13 of IEC 61558-1 apply		N/A
H	ANNEX H (NORMATIVE) SWITCHES		-
	Switches comply with the following clauses of IEC 61058-1, as modified:		N/A
	-The tests of IEC 61058-1 carried out under the conditions occurring in the appliance		N/A
	-Before being tested, switches are operated 20 times without load		N/A
8	Marking and documentation		N/A
	Switches are not required to be marked		N/A
	However, switches that can be tested separately from the appliance marked with the manufacturer's name or trade mark and the type reference		N/A
13	Mechanism		N/A
	The tests may be carried out on a separate sample		N/A
15	Insulation resistance and dielectric strength		N/A
15.1	Not applicable		N/A
15.2	Not applicable		N/A
15.3	Applicable for full disconnection and micro-disconnection		N/A
17	Endurance		N/A
	Compliance is checked on three separate appliances or switches		N/A
	For 17.2.4.4, the number of cycles is 10 000, unless otherwise specified in 24.1.3 of the relevant part 2 of IEC 60335		N/A
	Switches for operation under no load and which can be operated only by a tool and switches operated by hand that are interlocked so that they cannot be operated under load, are not subjected to the tests		N/A
	Sub-clause 17.2.5.2 is not applicable		N/A
	Temperature rise of the terminals not more than 30 K above the temperature rise measured in clause		N/A



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Clause	Requirement - Test	Result - Remark	Verdict

	11 of IEC 60335-1		
20	Clearances, creepage distances, solid insulation and coatings of rigid printed board assemblies		N/A
	This clause is applicable to clearances and creepage distances for functional insulation, across full disconnection and micro-disconnection, as stated in table 24		N/A

I	ANNEX I (NORMATIVE) MOTORS HAVING BASIC INSULATION THAT IS INADEQUATE FOR THE RATED VOLTAGE OF THE APPLIANCE		-
	The following modifications to this standard are applicable for motors having basic insulation that is inadequate for the rated voltage of appliance:		N/A
8	Protection against access to live parts		N/A
8.1	Metal parts of the motor are considered to be bare live parts		N/A
11	Heating		N/A
11.3	Temperature rise of the body of the motor is determined instead of the temperature rise of the windings		N/A
11.8	Temperature rise of the body of the motor, where in contact with insulating material, not exceeding values in table 3 for the relevant insulating material		N/A
16	Leakage current and electric strength		N/A
16.3	Insulation between live parts of the motor and its other metal parts not subjected to the test		N/A
19	Abnormal operation		N/A
19.1	The tests of 19.7 to 19.9 not carried out		N/A
19.101	Appliance operated at rated voltage with each of the following fault conditions:		N/A
	- short circuit of the terminals of the motor, including any capacitor incorporated in the motor circuit		N/A
	- short circuit of each diode of the rectifier		N/A
	- open circuit of the supply to the motor		N/A
	- open circuit of any parallel resistor, the motor being in operation		N/A
	Only one fault simulated at a time, the tests carried out consecutively		N/A
22	Construction		N/A
22.101	For class I appliances incorporating a motor		N/A



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Clause	Requirement - Test	Result - Remark	Verdict

	supplied by a rectifier circuit, the d.c. circuit being insulated from accessible parts of the appliance by double or reinforced insulation		
	Compliance checked by the tests specified for double and reinforced insulation		N/A

J	ANNEX J (NORMATIVE) COATED PRINTED CIRCUIT BOARDS		-
	Testing of protective coatings of printed circuit boards carried out in accordance with IEC 60664-3 with the following modifications:		N/A
6.6	Climatic sequence		N/A
	When production samples are used, three samples of the printed circuit board are tested		N/A
6.6.1	Cold		N/A
	The test is carried out at -25°C		N/A
6.6.3	Rapid change of temperature		N/A
	Severity 1 is specified		N/A
6.8.6	Partial discharge extinction voltage		N/A
	Type A coatings not subjected to a partial discharge test		N/A
6.9	Additional tests		N/A
	This sub-clause is not applicable		N/A

K	ANNEX K (NORMATIVE) OVERVOLTAGE CATEGORIES		-
	The information on over-voltage categories is extracted from IEC 60664-1		P
	Over-voltage category is a numeral defining a transient over-voltage condition		P
	Equipment of over-voltage category IV is for use at the origin of the installation		N/A
	Equipment of over-voltage category III is equipment in fixed installations and for cases where the reliability and the availability of the equipment is subject to special requirements		N/A
	Equipment of over-voltage category II is energy consuming equipment to be supplied from the fixed installation		P
	If such equipment is subjected to special require-		N/A



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Clause	Requirement - Test	Result - Remark	Verdict
	ments with regard to reliability and availability, over-voltage category III applies		
	Equipment of over-voltage category I is equipment for connection to circuits in which measures are taken to limit transient over-voltages to an appropriate low level		N/A
L	ANNEX L (INFORMATIVE) GUIDANCE FOR THE MEASUREMENT OF CLEARANCES AND CREEPAGE DISTANCES		-
	Sequences for the determination of clearances and creepage distances		P
M	ANNEX M (NORMATIVE) POLLUTION DEGREE		-
	The information on pollution degrees is extracted from IEC 60664-1		P
	Pollution		P
	The microenvironment determines the effect of pollution on the insulation, taking into account the microenvironment		P
	Means may be provided to reduce pollution at the insulation by effective enclosures or similar		P
	Minimum clearances specified where pollution may be present in the microenvironment		P
	Degrees of pollution in the microenvironment		P
	For evaluating creepage distances, the following degrees of pollution in the microenvironment are established:		P
	- pollution degree 1: no pollution or only dry, non-conductive pollution occurs. The pollution has no influence		N/A
	- pollution degree 2: only non-conductive pollution occurs, except that occasionally a temporary conductivity caused by condensation is to be expected		P
	- pollution degree 3: conductive pollution occurs or dry non-conductive pollution occurs that becomes conductive due to condensation that is to be expected		N/A
	- pollution degree 4: the pollution generates persistent conductivity caused by conductive dust or by rain or snow		N/A



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Clause	Requirement - Test	Result - Remark	Verdict
N	ANNEX N (NORMATIVE) PROOF TRACKING TEST		-
	The proof tracking test is carried out in accordance with IEC 60112 with the following modifications:		N/A
5	Test apparatus		N/A
5.1	Electrodes		N/A
	The note does not apply		N/A
5.4	Test solutions		N/A
	Test solution A is used		N/A
6	Procedure		N/A
6.3	Proof tracking test		N/A
	Voltage is 100V, 175V, 400V or 600V:		N/A
	Note 3 of clause 3 applies		N/A
	The test is carried out on five specimens		N/A
	In case of doubt, additional test with voltage reduced by 25V, the number of drops increased to 100		N/A
7	Report		N/A
	The report stating if the PTI value was based on a test using 100 drops with test voltage of (PTI-25) V		N/A
10.1	The proof voltage is 100 V, 175 V, 400 V or 600 V		N/A
10.2	The report shall state if the PTI value was based on a test using 100 drops with a test voltage of (PTI-25) V (IEC 60335-1, A1)		N/A
O	ANNEX O (INFORMATIVE) SELECTION AND SEQUENCE OF THE TESTS OF CLAUSE 30		-
	Description of tests for determination of resistance to heat and fire		P
P	ANNEX P (INFORMATIVE) GUIDANCE FOR THE APPLICATION OF THIS STANDARD TO APPLIANCES USED IN WARM DAMP EQUABLE CLIMATES		-
5.7	Ambient temperature during tests of clause 11 and 13 is 40 +/- 3 °C (IEC 60335-1, A1)		N/A
7.1	The appliance shall be marked with the letters WDaE (IEC 60335-1, A1)		N/A
7.12	The instructions shall state that the appliance is to be supplied through a residual current device (RCD)		N/A



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Clause	Requirement - Test	Result - Remark	Verdict
	not exceeding 30 mA (IEC 60335-1, A1)		
15.3	The value of t is 37 °C (IEC 60335-1, A1)		N/A
19.13	The leakage current test of clause 16.2 is applied (IEC 60335-1, A1)		N/A
R	ANNEX R (INFORMATIVE) SOFTWARE EVALUATION ACCORDING TO IEC 607301		-
H.2	Only definitions H.2.16 to H.2.20 are applicable (IEC 60335-1, A1)		N/A
H.11.12	All the sub-clauses of H.11.12 as modified are applicable (IEC 60335-1, A1)		N/A
H.11.12.7.1	For appliances using software class C having a single channel with self-test monitoring structure, the manufacturer shall provide measures (IEC 60335-1, A1)		N/A
H.11.12.8	Software fault/error detection shall occur before compliance with clause 19.13 is impaired (IEC 60335-1, A1)		N/A
H.11.12.13	Software and safety related hardware under its control shall initialize and terminate before compliance with clause 19.13 is impaired (IEC 60335-1, A1)		N/A
AA	ANNEX AA (INFORMATIVE)		-
	Summary of installation instructions		P



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Clause	Requirement - Test	Result - Remark	Verdict

COMMON EN MODIFICATIONS to IEC 60335-1			
6.1	Appliances shall be one of the following classes with respect to protection against electric shock : Class I, Class II, Class III	Refer to 60335-2-96	N/A
7.1	Single-phase appliances to be connected to the supply mains: 230 V covered (EN)		P
	Multi-phase appliances to be connected to the supply mains: 400 V covered (EN)		N/A
25.6	Supply cords of single-phase portable appliances having a rated current not exceeding 16 A, fitted with a plug complying with the following standard sheets of IEC 60083:1975: (EN)		N/A
	- for Class I appliances: standard sheet C2b, C3b or C4 (EN)		N/A
	- for Class II appliances: standard sheet C5 or C6 (EN)		N/A
25.7	Add -ordinary poly-chloroprene sheathed flexible cord (code designation 60245 IEC 57) (H05RN-F)		N/A
	When supply cords having high flexibility are used, they shall not be lighter than :		—
	- rubber insulated and sheathed cord (code designation 60245 IEC 86) (H03RR-H);		N/A
	- rubber insulated, cross-linked PVC sheathed cord (code designation 60245 IEC 87) (H03RV4-H);		N/A
	- cross-linked PVC insulated and sheathed cord (code designation 60245 IEC 88) (H03V4V4-H).		N/A
	NOTE Z1 The harmonized code designations corresponding to the IEC cord types are given in Annex ZD.		N/A

ZA	ANNEX ZA, SPECIAL NATIONAL CONDITIONS (EN 60335-1 :2002)	—
7.12	DENMARK: requirements regarding marking tag of power supply cord and connecting of earthing wire	N/A
19.5	NORWAY: the test is also applicable to appliances intended to be permanently connected to fixed wiring	P
22.2	FRANCE, NORWAY: The second paragraph of this subclause dealing with single-phase Class I permanently connected appliances with heating elements is not applicable due to the supply system	P
25.6	FRANCE, Fixed room heaters shall be appliances intended to be permanently connected to fixed wiring	P



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Clause	Requirement - Test	Result - Remark	Verdict
25.6	BELGIUM, FRANCE, SPAIN , UNITED KINGDOM: plugs according to Standard Sheet C2b not allowed		N/A
	AUSTRIA, FINLAND, GERMANY, ICELAND, IRELAND, ITALY, LUXEMBOURG, NETHER- LANDS, NORWAY, PORTUGAL, SPAIN, SWEDEN, SWITZERLAND, UNITED KINGDOM: plugs according to Standard C3b not allowed		N/A
	DENMARK: Supply cords of single-phase portable appliances having a rated current not exceeding 13 A provided with a plug according to the following:		—
	- Class I appliances: Section 107-2-D1 Standard Sheet DK2-1a		N/A
	For appliances covered by a Part 2 of EN 60 335, also plugs in accordance with Section 107-2-D1 Standard Sheet C2b, C3b or C4 are allowed		N/A
	- Class II appliances: Section 107-2-D1, Standard Sheet C1b ,C5, C6, DKA2-1a and DKA2-1b		N/A
	Stationary single-phase appliances, having a rated current not exceeding 13 A, and provided with a plug, the plug is in accordance with the requirements above		N/A
	Multi-phase appliances and single-phase appliances having a rated current exceeding 13 A, and provided with a plug, the plug is in accordance with the requirements below:		—
	- Class I appliances: Section 107-2-D1, Standard Sheet DK6-1a/EN 60 309-2, Standard Sheet 2-II,-IV		N/A
	- Class II appliances: Section 107-2-D1, Standard Sheet DK6-1a*/2-II, 2-IV*		N/A
	For max. allowed current values see EN 60335-1		N/A
	IRELAND: plug is in accordance with Standard Sheets B2 and C2b (see annex ZB as well)		N/A
	ITALY: Only plugs listed in CENELEC Report ROBT- 005:2001 are allowed		N/A
	SPAIN: For household appliances the following plugs only are allowed:		—
	- UNE 20315 :ESC 10-1b, C2b, C4, C6, or ESB 25- 5b ;		N/A
	- UNE-EN 50075		N/A



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Clause	Requirement - Test	Result - Remark	Verdict
	SWITZERLAND: supply cords of portable household and similar electrical appliances, rated current not exceeding 10 A, provided with a plug complying with SEV 1011 or IEC 60884-1 and one of the following dimension sheets:		—
	SEV 6532-2:1991 plug type 15 3P+N+PE 250/400 V, 10 A		N/A
	SEV 6533-2:1991 plug type 11 L+N 250V, 10 A		N/A
	SEV 6534-2:1991 plug type 12 L+N+PE 250 V, 10 A		N
	UNITED KINGDOM: plug according to Standard Sheet B2 or C5 used (refer to Annex ZB)		N/A
25.8	IRELAND, UNITED KINGDOM: replacement of figures (rated current/cross-sectional area) in the table		N/A

ZB	ANNEX ZB, A-DEVIATIONS	(EN 60335-1 :2002)	—
4	SWITZERLAND: information about batteries		N/A
7.1	ITALY: the voltage is 220 V/380 V	Not checked	-
	SPAIN: the voltages are 127/220 V and 220/380 V	Not checked	-
11.8	FRANCE: For fixed heaters, other than those for mounting at high level, the limit is 115 K for metallic air-outlet grilles and their immediate surrounds.		N/A
25.6	IRELAND / UNITED KINGDOM: regulations concerning plugs to be fitted to domestic appliances		N/A

COMMON EN MODIFICATIONS to IEC 60335-2-96	
No modifications	
No special national conditions	



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Clause	Requirement - Test	Result - Remark	Verdict

10.1 TABLE: Power input deviation					P
Input deviation of/at:	P _{rated} (W)	P _{measured} (W)	dP	Required dP	Remark
230V	145	132	- 9.1%	- 10%	

10.2 TABLE: Current deviation					N/A
Current deviation of/at:	I _{rated} (A)	I _{measured} (A)	dI	Required dI	Remark

11.8					TABLE: Heating test, thermocouples – concrete floor (embedded) (300W/m ²)					P	
		Test voltage (V):			245		—				
		Ambient (°C):			25		—				
Thermocouple locations				dT(K)				Max. dT (K)			
Surface of floor covering, 5cm from thermal block				14				22			
Heating element				25				--			
Floor construction: Thermal insulation, heating element, concrete											

11.8				TABLE: Heating test, thermocouples – wooden floor (90W/m ²)		P
	Test voltage (V):			245	—	
	Ambient (°C):			25	—	
Thermocouple locations			dT(K)		Max. dT (K)	
Surface of floor covering, 5cm from thermal block			9		22	
Bottom of sub-floor			24		60	
Wooden materials in floor framework			11		60	
Heating element			36		-	
Floor construction: Thermal insulation, heating element, 80mm airgap, 17mm chip board (matt black)						



Report No. 76149

IEC 60335-2-96			
Clause	Requirement - Test	Result - Remark	Verdict

11.8 TABLE: Heating test, thermocouples – ceiling (150W/m ²)				P
	Test voltage (V):	245	—	
	Ambient (°C):	25	—	
Thermocouple locations		dT (K)	Max. dT (K)	
Wooden materials in ceiling framework		8	60	
Accessible surface of gypsum board		20	No limit	
Heating element		39	No limit	
Ceiling construction: Thermal insulation (R30), heating element, 12 mm gypsum board (matt black)				

11.8				TABLE: Heating test, floor / ceiling (laminated) (90W/m ²)		P
	Test voltage (V):		245	—		
	Ambient (°C):		25	—		
Thermocouple locations		dT (K)		Max. dT (K)		
Accessible surface of wooden board		6		22		
Heating element		11		No limit		
Construction, between ceiling and floor: Thermal insulation, heating element, 15 mm laminate board (matt black)						

11.8 TABLE: Heating test, resistance method							N/A
	Test voltage (V):						—
	Ambient, t ₁ (°C):						—
	Ambient, t ₂ (°C):						—
Temperature rise of winding	R ₁ (Ω)	R ₂ (Ω)	dT (K)	Max. dT (K)	Insulation class		

13.2 TABLE: Leakage current				P
	Heating appliances: 1.15 x rated input:			—
	Motor-operated and combined appliances: 1.06 x rated voltage:			—
Leakage current between		I (mA)	Max. allowed I (mA)	
Live parts and surface of heating elements		0.05	0.5	



Report No. 76149

IEC 60335-2-96			
Clause	Requirement - Test	Result - Remark	Verdict

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13.3 TABLE: Electric strength			P
Test voltage applied between:		Voltage (V)	Breakdown (Yes/No)
Live parts and accessible parts		1000	No

14 TABLE: Transient over-voltages						N/A
Clearance between:	CI (mm)	Required CI (mm)	Rated impulse voltage (V)	Impulse test voltage (V)	Flashover (Yes/No)	

16.2 TABLE: Leakage current				P
Single phase appliances: 1.06 x rated voltage:				—
Three phase appliances 1.06 x rated voltage divided by $\sqrt{3}$:				—
Leakage current between		I (mA)	Max. allowed I (mA)	
Live parts and accessible parts		0.06	0.5	

16.3 TABLE: Electric strength			P
Test voltage applied between:		Voltage (V)	Breakdown (Yes/No)
Live parts and accessible parts		1250	No

17 TABLE: Overload protection, temperature rise			N/A
Temperature rise of part/at:	dT (K)	Max. dT (K)	



Report No. 76149

IEC 60335-2-96			
Clause	Requirement - Test	Result - Remark	Verdict

19.7		TABLE: Abnormal operation, locked rotor/moving parts		N/A	
	Test voltage (V):				—
	Ambient, t_1 (°C):				—
	Ambient, t_2 (°C):				—
Temperature of winding	R_1 (O)	R_2 (O)	dT (K)	T (°C)	Max. T (°C)

19.9		TABLE: Abnormal operation, running overload		N/A	
	Test voltage (V):				—
	Ambient, t_1 (°C):				—
	Ambient, t_2 (°C):				—
Temperature of winding	R_1 (O)	R_2 (O)	dT (K)	T (°C)	Max. T (°C)

19.13		TABLE: Abnormal operation, temperature rises		P	
Thermocouple locations	dT (K)		Max. dT (K)		
Tests of 19.4:					
Installation in Concrete floor:					
Surface of floor	16		150		
Installation in Wooden floor:					
Surface of floor	18		150		
Wooden parts	32		150		
Installation in Ceiling:					
Wooden framework	9		150		
Surface of ceiling (Gypsum board)	20		150		
Installation between ceiling and floor:					
Surface of floor	16		150		



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Clause	Requirement - Test	Result - Remark	Verdict

24.1 TABLE: Components						P
Object / part No.	Manufacturer/ trademark	Type / model	Technical data	Standard	Mark(s) of conformity	
Terminals	AMP	Termifoil 330716	—	EN 60335-1	Tested in appliance	
Supply leads	Cold Cable	AV		EN 60335-1	Tested in appliance	
Crimping tool	Quickcrimper	—	—	—	Tested in appliance	
Terminal covers (IPX1)		FB-1001	Macrolon 6555, UL 94 V-0, 55x22mm	EN 60335-1	Tested in appliance	
Tape for terminations (IPX7)	Scotch	2228 Rubber Mastic Tape	1.65mm thickness	EN 60335-1	Tested in appliance	
Tape for end of copper bus bar	Various	Various	90°C	EN 60335-1	Tested in appliance	
¹⁾ An asterisk indicates a mark which assures the agreed level of surveillance						

28.1 TABLE: Threaded part torque test				N/A
Threaded part identification	Diameter of thread (mm)	Column number (I, II, or III)	Applied torque (Nm)	

29.1 TABLE: Clearances						
Over-voltage category:		II		—		
		Type of insulation:				
Rated impulse voltage (V):	Min. cl (mm)	Basic	Functional	Supplementary	Reinforced	Verdict / Remark
330	0,5					
500	0,5					
800	0,5					
1 500	1,0					
2 500	2,0	>2.0	> 2.0			P
4 000	3,5					



Report No. 76149

IEC 60335-2-96			
Clause	Requirement - Test	Result - Remark	Verdict

6 000	6,0					
8 000	8,5					
10 000	11,5					

29.2 TABLE: Creepage distances, basic, supplementary and reinforced insulation											P
Working voltage (V)	Creepage distance (mm)										
	Pollution degree										
	1	2			3			Type of insulation			
		Material group			Material group						
		I	II	IIIa/IIIb	I	II	IIIa/IIIb	B ^{*)}	S ^{*)}	R ^{*)}	Verdict
>50	0,2	0,6	0,9	1,2	1,5	1,7	1,9		—	—	
>50	0,2	0,6	0,9	1,2	1,5	1,7	1,9	—		—	
>50	0,4	1,2	1,8	2,4	3,0	3,4	3,8	—	—		
>50 and ≤125	0,3	0,8	1,1	1,5	1,9	2,1	2,4		—	—	
>50 and ≤125	0,3	0,8	1,1	1,5	1,9	2,1	2,4	—		—	
>50 and ≤125	0,6	1,6	2,2	3,0	3,8	4,2	4,8	—	—		
>125 and ≤250	0,6	1,3	1,8	2,5	3,2	3,6	4,0	>2,5	—	—	P
>125 and ≤250	0,6	1,3	1,8	2,5	3,2	3,6	4,0	—		—	
>125 and ≤250	1,2	2,6	3,6	5,0	6,4	7,2	8,0	—	—		
>250 and ≤400	1,0	2,0	2,8	4,0	5,0	5,6	6,3		—	—	
>250 and ≤400	1,0	2,0	2,8	4,0	5,0	5,6	6,3	—		—	
>250 and ≤400	2,0	4,0	5,6	8,0	10,0	11,2	12,6	—	—		
>400 and ≤500	1,3	2,5	3,6	5,0	6,3	7,1	8,0		—	—	
>400 and ≤500	1,3	2,5	3,6	5,0	6,3	7,1	8,0	—		—	
>400 and ≤500	2,6	5,0	7,2	10,0	12,6	14,2	16,0	—	—		
>500 and ≤800	1,8	3,2	4,5	6,3	8,0	9,0	10,0		—	—	
>500 and ≤800	1,8	3,2	4,5	6,3	8,0	9,0	10,0	—		—	
>500 and ≤800	3,6	6,4	9,0	12,6	16,0	18,0	20,0	—	—		
>800 and ≤1000	2,4	4,0	5,6	8,0	10,0	11,0	12,5		—	—	
>800 and ≤1000	2,4	4,0	5,6	8,0	10,0	11,0	12,5	—		—	
>800 and ≤1000	4,8	8,0	11,2	16,0	20,0	22,0	25,0	—	—		

*) B=Basic, S=Supplementary and R=Reinforced



Report No. 76149

IEC 60335-2-96			
Clause	Requirement - Test	Result - Remark	Verdict

29.2 TABLE: Creepage distances, functional insulation								P
Working voltage (V)	Creepage distance (mm) Pollution degree							
	1	2			3			
		Material group			Material group			
		I	II	IIIa/IIIb	I	II	IIIa/IIIb	Verdict / Remark
>50	0,2	0,6	0,8	1,1	1,4	1,6	1,8	
>50 and ≤125	0,3	0,7	1,0	1,4	1,8	2,0	2,2	
>125 and ≤250	0,4	1,0	1,4	2,0	2,5	2,8	3,2	P
>250 and ≤400	0,8	1,6	2,2	3,2	4,0	4,5	5,0	
>400 and ≤500	1,0	2,0	2,8	4,0	5,0	5,6	6,3	
>500 and ≤800	1,8	3,2	4,5	6,3	8,0	9,0	10,0	
>800 and ≤1000	2,4	4,0	5,6	8,0	10,0	11,0	12,5	

30.1 TABLE: Ball pressure				N/A
Part	Test temperature (°C)	Impression diameter (mm)	Allowed impression diameter (mm)	

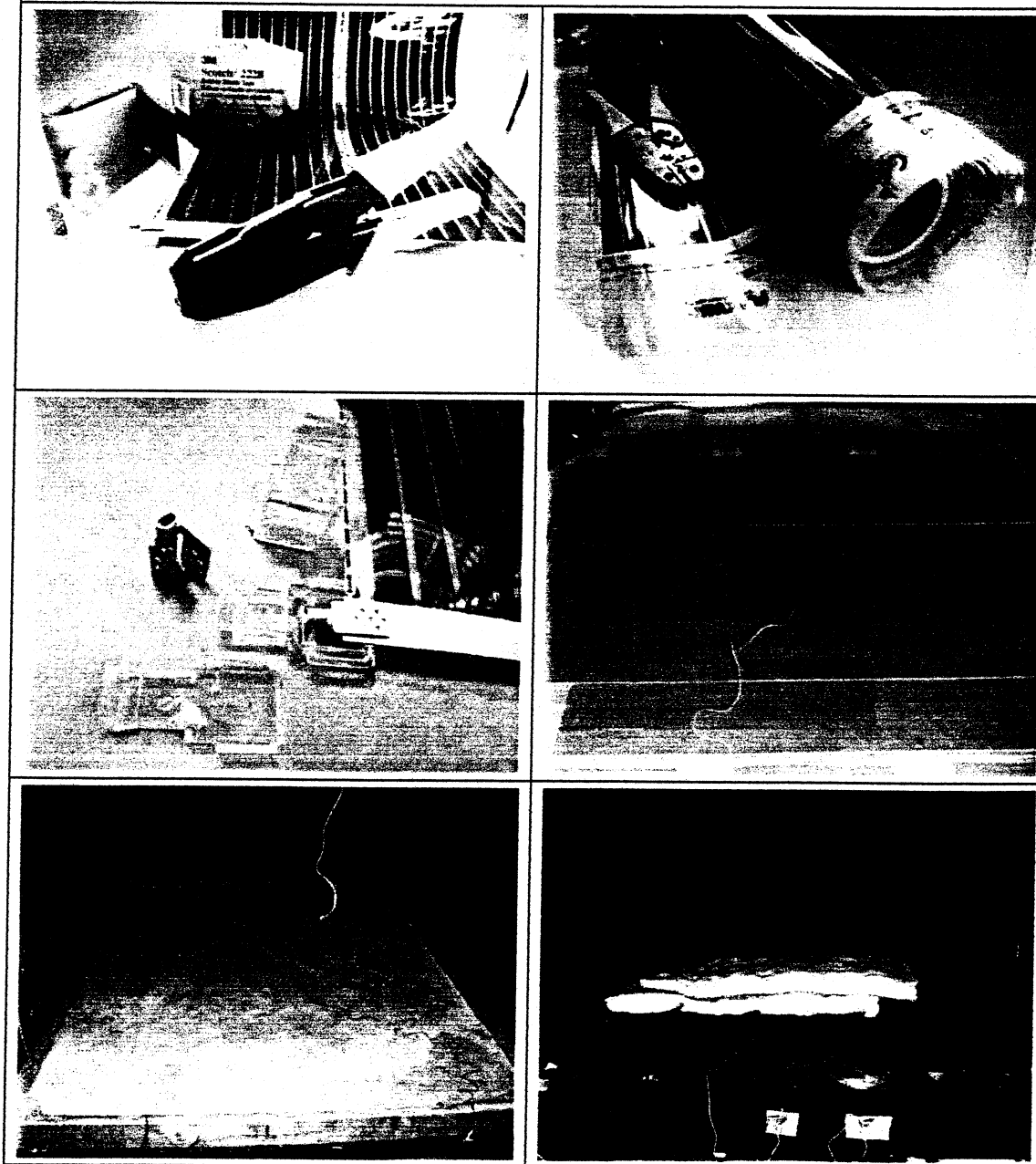
30.2 TABLE: Glow-wire				N/A
Part	Test temperature (°C)	Observation	Result	



Report No. 76149

IEC 60335-2-96			
Clause	Requirement - Test	Result - Remark	Verdict

ANNEX 1: Pictures of listed components and typical floor installations



NOTICE OF COMPLETION
AND
AUTHORIZATION TO APPLY THE UL MARK



2014-11-07

Calorique Ltd
KAPIL KULKARNI
2380 Cranberry Hwy
West Wareham Ma 02576-1229, Us

Our Reference: File E230827, Vol. 1 Project Number 4786582587
Your Reference: 12517
Project Scope: US Product Safety Evaluation - Electric Heating Film for Installation Under Floor Coverings, 'Perfectly Warm', Model Series PWT18-XXWYYYV, PWT24-XXWYYYV, PWT36-XXWYYYV, and PWT48-XXWYYYV, where XX is the wattage and YYY is the voltage.

Dear KAPIL KULKARNI:

Congratulations! UL's investigation of your product(s) has been completed under the above Reference Number and the product was determined to comply with the applicable requirements. This letter temporarily supplements the UL Follow-Up Services Procedure and serves as authorization to apply the UL Mark at authorized factories under UL's Follow-Up Service Program. To provide your manufacturer(s) with the intended authorization to use the UL Mark, you must send a copy of this notice to each manufacturing location currently authorized under File E230827, Vol. 1.

Records in the Follow-Up Services Procedure covering the product are now being prepared and will be sent in the near future. Until then, this letter authorizes application of the UL Mark for 90 days from the date indicated above.

Additional requirements related to your responsibilities as the Applicant can be found in the document "Applicant responsibilities related to Early Authorizations" that can be found at the following web-site:
<http://www.ul.com/EAResponsibilities>

Any information and documentation provided to you involving UL Mark services are provided on behalf of UL LLC (UL) or any authorized licensee of UL.

We are excited you are now able to apply the UL Mark to your products and appreciate your business. Feel free to contact me or any of our Customer Service representatives if you have any questions.

Very truly yours,

Timothy Lassila
360-817-5735
Staff Engineering Associate
Timothy.Lassila@ul.com

Reviewed by:

William R. Carney
847/664-1088
Chief Engineer Director I
William.R.Carney@ul.com

NWT290B-2159C9



File E514043

Vol 1

Auth. Page 1

Issued: 2020-02-23

Revised: 2020-02-23

FOLLOW-UP SERVICE PROCEDURE
(TYPE R)

HEATERS, SPECIALTY
(KSOT2, KSOT8)

Manufacturer: SEE ADDENDUM FOR MANUFACTURER LOCATIONS

Applicant: 664868 (Party Site)
Warm Waves L L C
(100567-550) 27850 Irma Lee Circle, Suite 102
LAKE FOREST IL 60045

Recognized Co.: 664868 (Party Site)
SAME AS APPLICANT
(100567-550)

Use of the Mark

This Follow-Up Service Procedure authorizes the above Manufacturer(s) to use the marking specified by UL LLC, or any authorized licensee of UL LLC, including the UL Contracting Party, only on products when constructed, tested and found to be in compliance with the requirements of this Follow-Up Service Procedure and in accordance with the terms of the applicable service agreement with UL Contracting Party. The UL Contracting Party for Follow-Up Services is listed in the addendum to this Follow-Up Service Procedure ("UL Contracting Party"). UL Contracting Party and UL LLC are referred to jointly herein as "UL."

It is the responsibility of the Applicant, Manufacturer(s), and Recognized Company to make sure that only the products meeting the aforementioned requirements bear the authorized Marks of UL LLC, or any authorized licensee of UL LLC.

Additional Responsibilities

Additional responsibilities, duties and requirements for the Applicant and Manufacturers are defined under Additional Resources at the following web-site: <http://www.ul.com/fus>. Manufacturers without Internet access may obtain the current version of these documents from their local UL customer service representative or UL field representative. For assistance, or to obtain a paper copy of these documents or the Follow-Up Service Terms referenced below, please contact UL's Customer Service at <http://www.ul.com/aboutul/locations/>, select a location and enter your request, or call the number listed for that location.

Acceptance of Follow-Up Services

The Applicant and the specified Manufacturer(s) and any Recognized Company in this Follow-Up Service Procedure must agree to receive Follow-Up Services from UL Contracting Party. If your applicable service agreement is a Global Services Agreement ("GSA"), the Applicant, the specified Manufacturer(s) and any Recognized Company will be bound to a Service Agreement for Follow-Up Services upon the earliest by any Subscriber of a) use of the prescribed UL Mark, b) acceptance of the factory inspection, or c) payment of the Follow-Up Service fees. The Service Agreement incorporates such GSA, this Follow-Up Service Procedure and the Follow-Up Service Terms which can be accessed by clicking the following link: <http://services.ul.com/fus-service-terms>. In all other events, Follow-Up Services will be governed by and incorporate the terms of your applicable service agreement and this Follow-Up Service Procedure.

Use and Ownership of the Follow-Up Service Procedure

This Follow-Up Service Procedure, and any subsequent revisions, is the property of UL and is not transferable. This Follow-Up Service Procedure contains confidential information for use only by the Applicant, the specified Manufacturer(s), and representatives of UL and is not to be used for any other purpose. It is provided to the Subscribers with the understanding that it is not to be copied, either wholly or in part unless specifically allowed, and that it will be returned to UL, upon request.

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Capitalized terms used but not defined herein have the meanings set forth in the GSA and the applicable Service Terms or any other applicable UL service agreement.

No Third Party Liability

UL shall not incur any obligation or liability for any loss, expense or damages, including incidental, consequential or punitive damages arising out of or in connection with the use or reliance upon this Follow-Up Service Procedure to anyone other than the above Manufacturer(s) as provided in the agreement between UL LLC or an authorized licensee of UL LLC, including UL Contracting Party, and the Manufacturer(s).

Certification Body

UL LLC has signed below solely in its capacity as the certification body to indicate that this Follow-Up Service Procedure fulfills the requirements for certification documentation issued by the certification body.

Bruce A. Mahrenholz
Director
Conformity Assessment Programs (CPO)
UL LLC

File E514043 Vol 1 Addendum To Page 1
Authorization Page

Issued: 2020-02-23
Revised: 2020-02-23

LOCATION

(100234-143) 637405 (Party Site)
Warm Waves LLC
35 Geomsan-Ro 173Beon-Gil
Paju-Si Gyeonggi-Do 413-050 KOREA
Factory ID: None
UL Contracting Party for above site is: UL GmbH

CERTIFICATE OF COMPLIANCE

Certificate Number UL-CA-2119650-0
Report Reference E514043-20080807
Date 10-May-2021

This is to certify that representative samples of the product as specified on this certificate were tested according to the current UL requirements

Model	Category Description
4789385687, PTC305	Heating Elements - Component
4789385687, PTC306	Heating Elements - Component
4789385687, PTC308	Heating Elements - Component
4789385687, PTC310	Heating Elements - Component
WWR10PEZ-120-17	Heating Elements - Component
4789385687, WWR12PEZ-120-18	Heating Elements - Component
4789385687, WWR12PEZ-120-36	Heating Elements - Component
4789385687, WWR12PEZ-240-18	Heating Elements - Component
4789385687, WWR12PEZ-240-36	Heating Elements - Component
4789385687, XM308	Heating Elements - Component
4789385687, XMx0411	Heating Elements - Component
4789385687, XMx0511	Heating Elements - Component
4789385687, XMx0522	Heating Elements - Component
4789385687, XMx0611	Heating Elements - Component
4789385687, XMx0622	Heating Elements - Component
4789385687, XMx0822	Heating Elements - Component
4789385687, XMx1022	Heating Elements - Component
4789385687, XMxa0511	Heating Elements - Component
4789385687, XT305	Heating Elements - Component
4789385687, XT308	Heating Elements - Component
4789385687, XT310	Heating Elements - Component



Bruce Mahrenholz, Director North American Certification Program

UL LLC

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Safety. Science. Transformation.

UL Solutions customer Warm Waves L L C
27850 Irma Lee Circle, Suite 102
LAKE FOREST, IL 60045 United States

UL Solutions customer E348282
file number and category Radiant Heating Equipment | KQYZ

January 10, 2024

As of the above date, UL Solutions confirms that Warm Waves L L C is the party associated with UL Solutions file number E348282 that appears in the UL Product iQ platform. Public information contained in UL Solutions file number E348282 can be viewed using the following link:

<https://iq.ulprospector.com/en/profile?e=1189011>

The appearance of a company's name or a specific product/component designation in the UL Product iQ platform does not in itself mean that the product or component so specified or identified is subject to the UL Solutions surveillance program.

The manufacturer's products are covered by the UL Solutions surveillance program only when they bear the authorized UL Mark. Therefore, only those products bearing the appropriate authorized UL Mark or UL Recognized Component Mark, the authorized company name, tradename, trademark and product designation shall be considered as being covered by the UL Solutions Listing, Classification, or Recognition service.

If you have questions regarding this letter, please contact the UL Solutions customer care team at <http://www.ul.com/contact-us>.

Sincerely,

UL Solutions

UL Solutions
333 Pfingsten Road
Northbrook, IL 60062

T: +1.847.272.8800

UL.com/Solutions

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Safety. Science. Transformation.

UL Solutions customer

Warm Waves L L C
27850 Irma Lee Circle, Suite 102
LAKE FOREST, IL 60045 United States

**UL Solutions customer
file number and category**

E514043
Heaters, Specialty Certified for Canada - Component | KSOT8

January 10, 2024

As of the above date, UL Solutions confirms that Warm Waves L L C is the party associated with UL Solutions file number E514043 that appears in the UL Product iQ platform. Public information contained in UL Solutions file number E514043 can be viewed using the following link:

<https://iq.ulprospector.com/en/profile?e=3817380>

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Sincerely,

UL Solutions

UL Solutions
333 Pfingsten Road
Northbrook, IL 60062

T: +1.847.272.8800
UL.com/Solutions

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File E514043

Vol 1

Auth. Page 1

Issued: 2020-02-23

Revised: 2020-02-23

FOLLOW-UP SERVICE PROCEDURE
(TYPE R)

HEATERS, SPECIALTY
(KSOT2,KSOT8)

Manufacturer: SEE ADDENDUM FOR MANUFACTURER LOCATIONS

Applicant: 664868 (Party Site)
Warm Waves L L C
(100567-550) 27850 Irma Lee Circle, Suite 102
LAKE FOREST IL 60045

Recognized Co.: 664868 (Party Site)
SAME AS APPLICANT
(100567-550)

Use of the Mark

This Follow-Up Service Procedure authorizes the above Manufacturer(s) to use the marking specified by UL LLC, or any authorized licensee of UL LLC, including the UL Contracting Party, only on products when constructed, tested and found to be in compliance with the requirements of this Follow-Up Service Procedure and in accordance with the terms of the applicable service agreement with UL Contracting Party. The UL Contracting Party for Follow-Up Services is listed in the addendum to this Follow-Up Service Procedure ("UL Contracting Party"). UL Contracting Party and UL LLC are referred to jointly herein as "UL."

It is the responsibility of the Applicant, Manufacturer(s), and Recognized Company to make sure that only the products meeting the aforementioned requirements bear the authorized Marks of UL LLC, or any authorized licensee of UL LLC.

Additional Responsibilities

Additional responsibilities, duties and requirements for the Applicant and Manufacturers are defined under Additional Resources at the following web-site: <http://www.ul.com/fus>. Manufacturers without Internet access may obtain the current version of these documents from their local UL customer service representative or UL field representative. For assistance, or to obtain a paper copy of these documents or the Follow-Up Service Terms referenced below, please contact UL's Customer Service at <http://www.ul.com/aboutul/locations/>, select a location and enter your request, or call the number listed for that location.

Acceptance of Follow-Up Services

The Applicant and the specified Manufacturer(s) and any Recognized Company in this Follow-Up Service Procedure must agree to receive Follow-Up Services from UL Contracting Party. If your applicable service agreement is a Global Services Agreement ("GSA"), the Applicant, the specified Manufacturer(s) and any Recognized Company will be bound to a Service Agreement for Follow-Up Services upon the earliest by any Subscriber of a) use of the prescribed UL Mark, b) acceptance of the factory inspection, or c) payment of the Follow-Up Service fees. The Service Agreement incorporates such GSA, this Follow-Up Service Procedure and the Follow-Up Service Terms which can be accessed by clicking the following link: <http://services.ul.com/fus-service-terms>. In all other events, Follow-Up Services will be governed by and incorporate the terms of your applicable service agreement and this Follow-Up Service Procedure.

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Definition of Terms

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No Third Party Liability

UL shall not incur any obligation or liability for any loss, expense or damages, including incidental, consequential or punitive damages arising out of or in connection with the use or reliance upon this Follow-Up Service Procedure to anyone other than the above Manufacturer(s) as provided in the agreement between UL LLC or an authorized licensee of UL LLC, including UL Contracting Party, and the Manufacturer(s).

Certification Body

UL LLC has signed below solely in its capacity as the certification body to indicate that this Follow-Up Service Procedure fulfills the requirements for certification documentation issued by the certification body.

Bruce A. Mahrenholz
Director
Conformity Assessment Programs (CPO)
UL LLC

CERTIFICATE OF COMPLIANCE

Certificate Number UL-CA-2119650-0
Report Reference E514043-20080807
Date 10-May-2021

This is to certify that representative samples of the product as specified on this certificate were tested according to the current UL requirements

Model	Category Description
4789385687, PTC305	Heating Elements - Component
4789385687, PTC306	Heating Elements - Component
4789385687, PTC308	Heating Elements - Component
4789385687, PTC310	Heating Elements - Component
WWR10PEZ-120-17	Heating Elements - Component
4789385687, WWR12PEZ-120-18	Heating Elements - Component
4789385687, WWR12PEZ-120-36	Heating Elements - Component
4789385687, WWR12PEZ-240-18	Heating Elements - Component
4789385687, WWR12PEZ-240-36	Heating Elements - Component
4789385687, XM308	Heating Elements - Component
4789385687, XMx0411	Heating Elements - Component
4789385687, XMx0511	Heating Elements - Component
4789385687, XMx0522	Heating Elements - Component
4789385687, XMx0611	Heating Elements - Component
4789385687, XMx0622	Heating Elements - Component
4789385687, XMx0822	Heating Elements - Component
4789385687, XMx1022	Heating Elements - Component
4789385687, XMxa0511	Heating Elements - Component
4789385687, XT305	Heating Elements - Component
4789385687, XT308	Heating Elements - Component
4789385687, XT310	Heating Elements - Component



Bruce Mahrenholz, Director North American Certification Program

UL LLC

Any information and documentation involving UL Mark services are provided on behalf of UL LLC (UL) or any authorized licensee of UL. For questions, please contact a local UL Customer Service Representative at <http://ul.com/about/locations/>



Possible sticker plan. Quiet warmth has the ability to sell these these combinations.

Sticker 1

Safety Certifications UL File Numbers. E514043 E348282

WWF13NW

WWR-12-120/240

WWF13GNW



You will see at least one of these logos on each Quiet warmth product or system component. Each logo is a certification from a reputable source for safety. Quiet warmth takes every precaution for safety by testing each product and running it through strict processes, ensuring functionality and reliability. You can rest assured when choosing Quiet warmth, a company that refuses to cut corners or compromise on quality.

Then Write this in French

Sticker 2

The exact same Quiet warmth sticker used now,

"Floor Heat Technical Specifications. "

This setup defines the different logos for different uses in different locations and in different geographic areas.

Intertek ETL SEMKO

AUTHORIZATION TO MARK

This authorizes the application of the Certification Marks shown below to the models described in the Products(s) Covered section when made in accordance with the conditions set forth in the Certification Agreement and Listing Report. This authorization also applies to the multiple listee model(s) identified on the correlation page of the Listing Report.

Applicant: MP Global Products LLC.
2500 Old Hadar Road
PO Box 2283
Norfolk, NE 68702, USA

Contact: Name: Mr. Bob Pratt

Phone: (402) 379-9695

Manufacturer: Thermo Soft
310 Lexington Drive
Buffalo Grove, IL 60089, USA

Party Authorized To Apply Mark: Same as Manufacturer

Report Issuing Office: Intertek, Arlington Heights, IL 60005 USA

Report No.: 3044025-001

Product Covered: Floor Heating Pad, model Quiet Warmth

Description: The product covered is a floor heating pad intended to be installed below tile, laminate and wood flooring only. The product is sold in sizes of 3' x 5' and 3' x 10' with a 10W/ft² power density. The product is provided with leads for permanent connection to the electrical supply. Additional sizes of 1.5' x 5' and 1.5' x 10' were added. These models have a 10W/ft² power density.

Standard(s): Standard for Safety for Electric-Radiant Heating Panels and Heating Panel Sets (UL 1693, 2nd Edition, dated 07/19/02)

This document is the property of Intertek Testing Services and is not transferable. Only the Applicant may reproduce this document. The certification mark(s) may be applied only at the above noted location of the Party Authorized To Apply Mark.



Authorized by: Michelle Lake
for William T. Starr, Certification Manager

Date: Sept. 18, 2006

Control Number: 3050800

This document supersedes all previous Authorizations to Mark for the noted Report number.

Intertek Testing Services NA Inc.
165 Main Street, Cortland, NY 13045
Telephone 800-345-3851 or 607-753-6711, Fax 607-756-6699

LISTING REPORT

INTERTEK TESTING SERVICES NA INC.

545 EAST ALGONQUIN RD., SUITE F ARLINGTON HEIGHTS, IL 60005

Job No. 3044025

Issued: October 14, 2003

Revised: 04/07/09

Page 1 of 37

REPORT NO. 3044025.001

INSPECTION, TESTS AND EVALUATION
OF A
FLOOR HEATING PAD

RENDERED TO

MP Global Products LLC.
NORFOLK, NE 68702

GENERAL: This Report gives the results of the inspection, tests and evaluation of a Floor Heating Pad for compliance with applicable requirements of the Standard for Safety for Electric-Radiant Heating Panels and Heating Panel Sets (UL 1693, 2nd Edition, dated 07/19/02). This investigation was authorized by Purchase Order No.4250, dated 02/26/03. The investigation was begun on April 13, 2003 and completed on October 10, 2003. A prototype sample in good condition was provided by the client on 04/13/03 and on 09/02/03 and tested at the Intertek Des Plaines facility.

ELECTRIC-RADIANT HEATING PANELS AND HEATING PANEL SETS
(UL 1693, 2nd Edition, dated 07/19/02)

Applicant: MP Global Products LLC.
2500 Old Hadar Road, PO Box 2283
Norfolk, NE 68702, USA

Contact: Mr. Bob Pratt
Phone: 402/379-9695
Fax: 402/379-9737


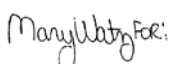
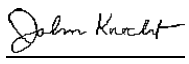
Manufacturer: Thermo Soft International Corporation
310 Lexington Drive
Buffalo Grove, IL 60089, USA

Contact: Mr. Russ Dunn
Phone: 847/279-3800
Fax: 847/279-8845

This report is for the exclusive use of Intertek's Client and is provided pursuant to the agreement between Intertek and its Client. Intertek's responsibility and liability are limited to the terms and conditions of the agreement. Intertek assumes no liability to any party, other than to the Client in accordance with the agreement, for any loss, expense or damage occasioned by the use of this report. Only the Client is authorized to copy or distribute this report and then only in its entirety. Any use of the Intertek name or one of its marks for the sale or advertisement of the tested material, product or service must first be approved in writing by Intertek. The observations and test results in this report are relevant only to the sample tested. This report by itself does not imply that the material, product, or service is or has ever been under an Intertek certification program.

<u>Report Composition:</u>	<u>Numbering</u>
Cover	1
Revisions	2
Main Report	1-2, 2A, 3-4, 4A, 4B, 4C, 5 – 12, 12A, 13
Illustrations	14 – 34, 15A-15I, 34A
Markings	35
Components Requiring Yearly Testing	36 – 37
Total Number of Pages	52

REVISION SUMMARY - The following changes have been made to this Report:

<u>Date / Project #</u>	<u>Project Handler</u>	<u>Reviewer</u>	<u>Page</u>	<u>Item</u>	<u>Description of Change</u>
11/04/03 non-bill	CAB	CAB	Cover, 9	Manuf.	Changed manufacturer from "Same as Applicant" to Thermowarm in Northbrook, IL 60062
			4	Test	Changed Overvoltage test from 3.7 to 3.8
			13	1	Changed "Unlisted Component" to "Recognized"
				4	Added "Z07-03 58 WW ... adhesive"
				5	Added "This adhesive ... adhesive."
			37	1, 2	Removed Photo 1-3 Item 1 from the list
04/26/06 3096096	 S. Rizvi	K. Abu-Hashim	All	Applicant and Manuf.	Changed applicant name from Midwest Padding to "MP Global Products LLC". Also changed manufacturer from Thermowarm in Northbrook IL to "Thermo Soft, Buffalo Grove, IL 60089, USA".
08/31/06 3099926 CHI	 C. Bloomfield	 J. Knecht	3	ProdDesc	Added "Additional sizes of 1.5 ... density"
				Ratings	Added ratings for sizes 1.5'x5' and 1.5'x10'
			4A		Added performance page 2
			13	3	Changed conductor size from 14 to 16 AWG
				8	Added buttsplice as an alternate method.
			15A,B		Added new illustrations 2A and 2B
01/31/07 3113792 -CHI	<u>SR</u> S. Rizvi	C. Bloomfield	2	Revision	Added new page 4B and 12A in index. Also changed total number of pages from 39 to 43. Added new revision
			4B 9	All Manufact urer	Added new test performance page Corrected manufacturer address
			12A	All	Added photo of original strain relief arrangement and alternate strain relief arrangement
			13	1	The heating cable definition is changed from sewn into the padding fabric to laminated onto the padding
			13	3	Changed supply lead Type from THHN to TFFN
			13	4	Added part number for polyester fabric
			13	7	Changed part number from EVA to CB-DWT 125°C
			13	8	Changed splice connector size from 14AWG to 16AWG

<u>Date /</u> <u>Project #</u>	<u>Project</u> <u>Handler</u>	<u>Reviewer</u>	<u>Page</u>	<u>Item</u>	<u>Description of Change</u>
04/07/09	<i>John Knecht</i>	<i>B.A.</i>	1		Removed disclaimer header
3158734 -CHI	J. Knecht	B. Alsop	2		Update numbering table
			2A		Overflow of latest revisions to next page
			3	Ele rat	Add padding size and electrical ratings for 240 V units.
			4C	Perf 4	Add performance page
			7	1	Added the field rep is not required to measure spacings.
				7	Added use at 240 V
			9		Added Thermo Soft International M/L
			13	1	Added (rated 120 VAC) and -2B to existing; added (rated 240 VAC) and description.
				3	Added (rated 120 VAC) and (one black and one white lead); added (rated 240 VAC) and description.
			14	ILL 1	Update 3x5-120 V heater drawing
			15	ILL 2	Update 3x10-120 V heater drawing
			15A	ILL 2A	Update 1.5x10-120 V heater drawing
			15B	ILL 2B	Update 1.5x5-120 V heater drawing
			15C	ILL 2C	Add 1.5x10-240 V heater drawing
			15D	ILL 2D	Add 1.5x15-240 V heater drawing
			15E	ILL 2E	Add 1.5x20-240 V heater drawing
			15F	ILL 2F	Add 3x5-240 V heater drawing
			15G	ILL 2G	Add 3x10-240 V heater drawing
			15H	ILL 2H	Add 3x15-240 V heater drawing
			15I	ILL 2I	Add 3x20-240 V heater drawing
			34A	ILL 22	Add ILL 22 (240 V instructions)
			36		Updated CEC address from Cortland,NY to Livonia, MI.

PRODUCT DESCRIPTION

PRODUCT COVERED

Floor Heating Pad, model Quiet Warmth.

PRODUCT DESCRIPTION

The product covered is a floor heating pad intended to be installed below tile, laminate, and wood flooring only. The product is sold in various sizes with a 10W/ft² power density. The product is provided with leads for permanent connection to the electrical supply.

ELECTRICAL RATINGS

Quiet Warmth Padding Size	Padding Sq. ft.	Watts/ft²	AC Voltage	Amp
1.5' x 5'	7.5	10	120	0.5
1.5' x 10'	15	10	120	1.0
1.5' x 10'	15	10	240	0.5
1.5' x 15'	22.5	10	240	0.8
1.5' x 20'	30	10	240	1.0
3' x 5'	15	10	120	1.1
3' x 10'	30	10	120	2.2
3' x 5'	15	10	240	0.5
3' x 10'	30	10	240	1.1
3' x 15'	45	10	240	1.7
3' x 20'	60	10	240	2.2

TEST PERFORMANCE

A representative sample of the product was tested in accordance with the Standard for Safety for Electric-Radiant Heating Panels and Heating Panel Sets (UL 1693, 2nd Edition, dated 07/19/02).

The following tests were performed:

<u>Test Description</u>	<u>Standard / Clause</u>
Power Input	17
Normal Temperature	19
Dielectric Voltage Withstand (Dry)	22
Dielectric Voltage Withstand (Wet)	23
Cold Bend	24
Mechanical Abuse	25
Scratch	26

The following tests were performed from CSA TIL-13

<u>Test Description</u>	<u>Standard / Clause</u>
Temperature	3.3
Dielectric Voltage Withstand	3.4
Overvoltage	3.8

Results of the tests indicate the specimens conform to applicable test criteria.

TEST PERFORMANCE

A representative sample of the product was tested in accordance with the Standard for Safety for Electric-Radiant Heating Panels and Heating Panel Sets (UL 1693, 2nd Edition, dated 07/19/02).

The following tests were performed:

<u>Test Description</u>
Input

<u>Standard / Clause</u>
17

TEST PERFORMANCE No. 3

A representative sample of the product was tested in accordance with the Standard for Safety for Electric-Radiant Heating Panels and Heating Panel Sets (UL 1693, 2nd Edition, dated 07/19/02).

The following tests were performed:

<u>Test Description</u>	<u>Standard / Clause</u>
Cold Bend	24

Results of the tests indicate the specimens conform to applicable test criteria.

TEST PERFORMANCE No. 4

A representative sample of the product was tested in accordance with the Standard for Safety for Electric-Radiant Heating Panels and Heating Panel Sets (UL 1693, 2nd Edition, dated 07/19/02).

The following tests were performed:

<u>Test Description</u>	<u>Standard / Clause</u>
Input	17

Results of the tests indicate the specimens conform to applicable test criteria.

CONCLUSION

A representative sample of the product covered by this report has been evaluated to the applicable requirements of the Standard for Safety for Electric-Radiant Heating Panels and Heating Panel Sets (UL 1693, 2nd Edition, dated 07/19/02).

Report prepared by:

Signature on file

Carl A. Bloomfield
Engineering Manager

Report approved by:

Signature on file

John Knecht P.E.
Senior Staff Engineer

Report revised by:



Syed Rizvi
Senior Project Engineer

Revision approved by:

Signature on file

Karim Abu-Hashim
Operations Manager – Intertek Cleveland

GENERAL INFORMATION

The Applicant and Manufacturer have agreed to produce, test and label ETL Listed products in accordance with the requirements of this Report. The Manufacturer has also agreed to notify Intertek and to request authorization prior to using alternate parts, components or materials.

COMPONENTS

Components used shall be those itemized in this Intertek report covering the product, including any amendments and/or revisions.

LISTING MARK

The ETL Listing mark applied to the products shall either be separable in form, such as labels purchased from Intertek, or on a product nameplate or other media only as specifically authorized by Intertek. Use of the mark is subject to the control of Intertek.

MANUFACTURING AND PRODUCTION TESTS

Manufacturing and Production Tests shall be performed as required in this Report.

FOLLOW-UP SERVICE

Periodic unannounced audits of the manufacturing facility shall be scheduled by Intertek. An audit report shall be issued after each visit. Special attention will be given to the following:

1. Conformance of the manufactured product to the descriptions in this Report.
2. Conformance of the use of the ETL mark with the requirements of this Report and the Certification Agreement.
3. Manufacturing changes.
4. Performance of specified Manufacturing and Production Tests.

In the event that the Intertek representative identifies non-conformance(s) to any provision of this Report, the Applicant shall take one or more of the following actions:

1. Correct the non-conformance.
2. Remove the ETL Mark from non-conforming product.
3. Contact the issuing product safety evaluation center for instructions.

GENERAL REQUIREMENTS AND DEFINITIONS

Recognized Component - Identifies any component, part or subassembly covered under the recognition service of an NRTL (US) or a CO (Canada) and intended for use in ETL Listed, ETL Classified, or ETL Recognized products.

Listed Component - Identifies any product covered under the Listing or Certification service of an NRTL (US) or a CO (Canada).

Unlisted Component - A part that has not been previously evaluated to the appropriate designated component standard by a certification body and is not subject to follow-up inspections. Or, it may also be a listed or recognized component part that is being used outside of its evaluated listing or component recognition.

Construction Details - For specific construction details, reference should be made to the following photographs and descriptions. All dimensions are approximate unless specified as exact or within a tolerance. In addition to the specific construction details described in this Report, the following general requirements may also apply as applicable.

1. **Spacing** - In primary circuits, minimum Fiber Optic Spacing are maintained through air and over surfaces of insulating material between current-carrying parts of opposite polarity and between current-carrying parts and dead-metal parts.

Parts involved	Potential involved, volts	Millimeters	(Inch)
Between uninsulated live parts of opposite polarity; and between a rigidly mounted uninsulated live part and a noncurrent-carrying metal part that either is exposed for persons to contact or may be grounded	0 – 250	1.6	(1/16)

The Field Representative is not required to measure spacings.

2. **Mechanical Assembly** - Components such as switches, fuseholders, connectors, wiring terminals and display lamps are mounted and prevented from shifting or rotating by the use of lockwashers, starwashers, or other mounting format that prevents turning of the component.
3. **Corrosion Protection** - All ferrous metal parts are protected against corrosion by painting, plating or other means specifically identified in the specific construction details.
4. **Internal Wiring** - Internal wiring is routed away from sharp or moving parts. Internal wiring leads terminating in soldered connections are made mechanically secure prior to soldering. Recognized separable (quick disconnect) connectors of the positive detent type, closed loop connectors, or other types specifically described in the text of this report are also acceptable as internal wiring terminals. At points where internal wiring passes through metal walls or partitions, the wiring insulation is protected against abrasion or damage by plastic bushings or grommets. All wiring is minimum 18 AWG, with a minimum rating of 300V, 90°C.
5. **Accessibility of Live Parts** - All uninsulated live parts in primary circuitry are housed within the flooring material or listed raceway per the NEC.
6. **Markings** – The product is marked on a component labeling system as follows: see marking page.
7. **Use at 240 V** – The use of two pads of the same size wired in series produces the same current as a single pad when subjected to 240 VAC. Refer to Illustration no. 22 for wiring instructions.

MANUFACTURING AND PRODUCTION TESTS

The manufacturer agrees to conduct the following Manufacturing and Production Tests as specified:

Required Tests

NONE

CORRELATION PAGE FOR MULTIPLE LISTINGS

The following products, which are identical to those identified in the Product Description except for model number and Listee name, are authorized to bear the ETL label under provisions of the Intertek Multiple Listing Program.

MULTIPLE LISTING

The following products which are identical to those identified in the index except for model number and participant name are authorized to bear the ETL label under provisions of the Intertek Multiple Listing Program

MULTIPLE LISTEE

Thermo Soft International Corporation
310 Lexington Drive
Buffalo Grove, IL 60089, USA
Contact Mr. Russ Dunn
Phone: 847/279-3800
Fax: 847/279-8845

BASIC LISTEE

MP Global Products LLC.
2500 Old Hadar Road, PO Box 2283
Norfolk, NE 68702
Contact Bob Pratt, 402/379-9695 phone 402/379-9737 fax

MANUFACTURER

Thermo Soft International Corporation
310 Lexington Drive
Buffalo Grove, IL 60089, USA
Contact Mr. Russ Dunn
Phone: 847/279-3800
Fax: 847/279-8845

PRODUCT

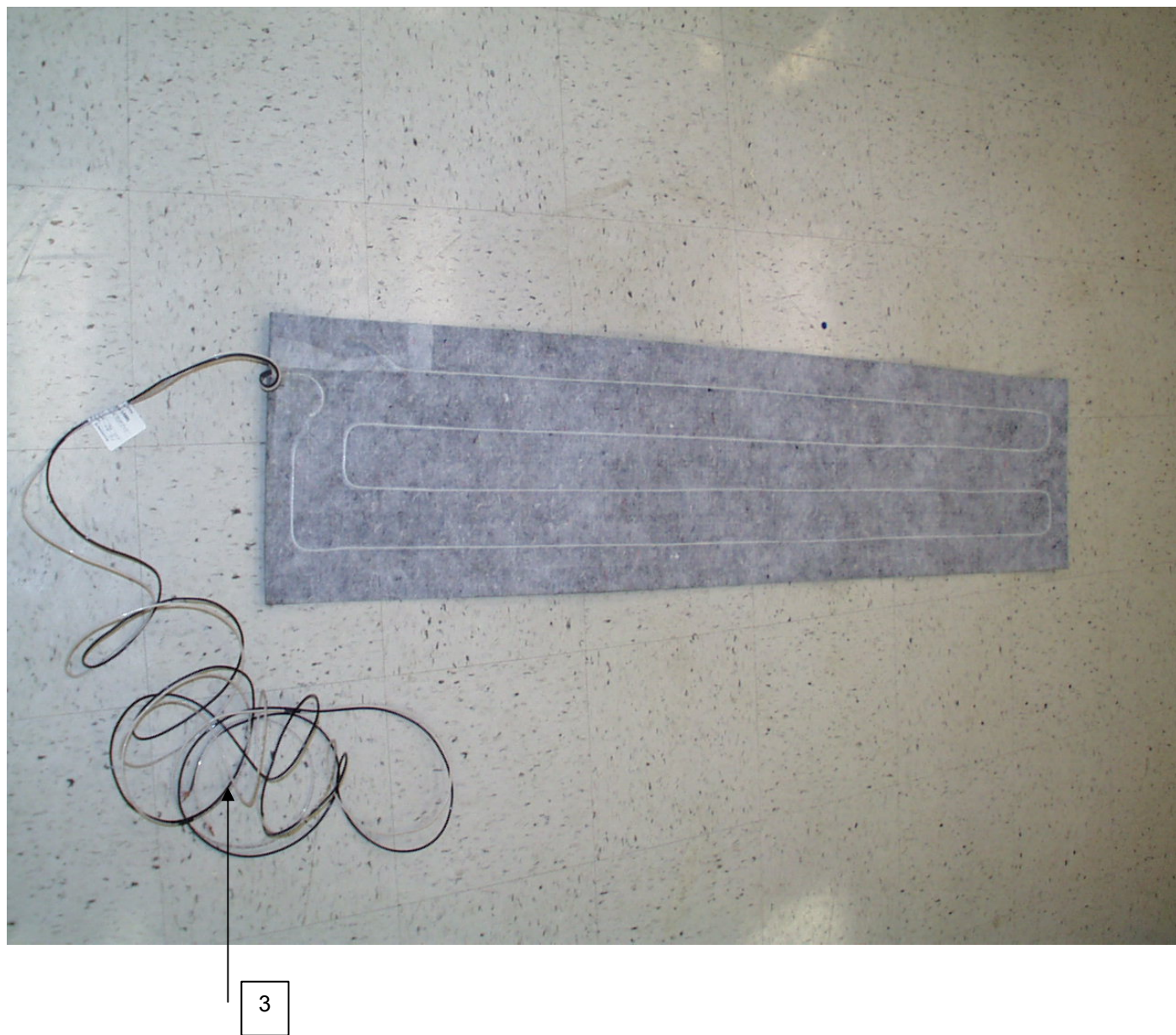
Floor Heating Pad, model Quiet Warmth

<u>MULTIPLE LISTEE MODEL NO.</u>	<u>BASIC LISTEE MODEL NO.</u>	<u>BASIC LISTEE ORDER NO.</u>
TF1505-120	1.5' x 5' – 120	
TF1510-120	1.5' x 10' – 120	
TF1510-240	1.5' x 10' – 240	
TF1515-240	1.5' x 15' – 240	
TF1520-240	1.5' x 20' – 240	
TF3005-120	3' x 5' – 120	
TF3010-120	3' x 10' – 120	
TF3005-240	3' x 5' – 240	
TF3010-240	3' x 10' – 240	
TF3015-240	3' x 15' – 240	
TF3020-240	3' x 20' – 240	

FLOOR HEATING PAD

PHOTO NO. 1

OVERALL TOP VIEW



FLOOR HEATING PAD

PHOTO NO. 2

OVERALL REAR VIEW

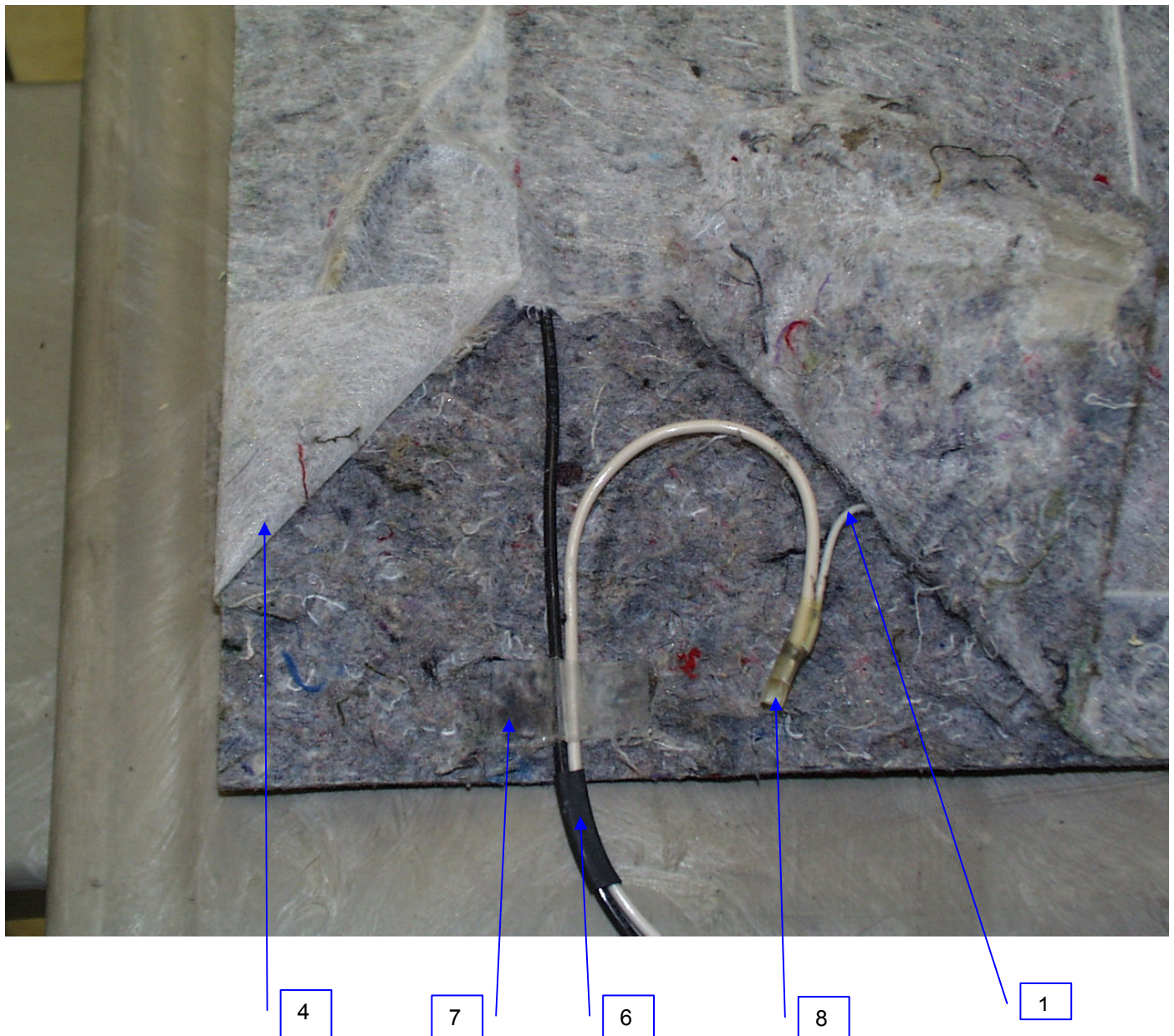


2

FLOOR HEATING PAD

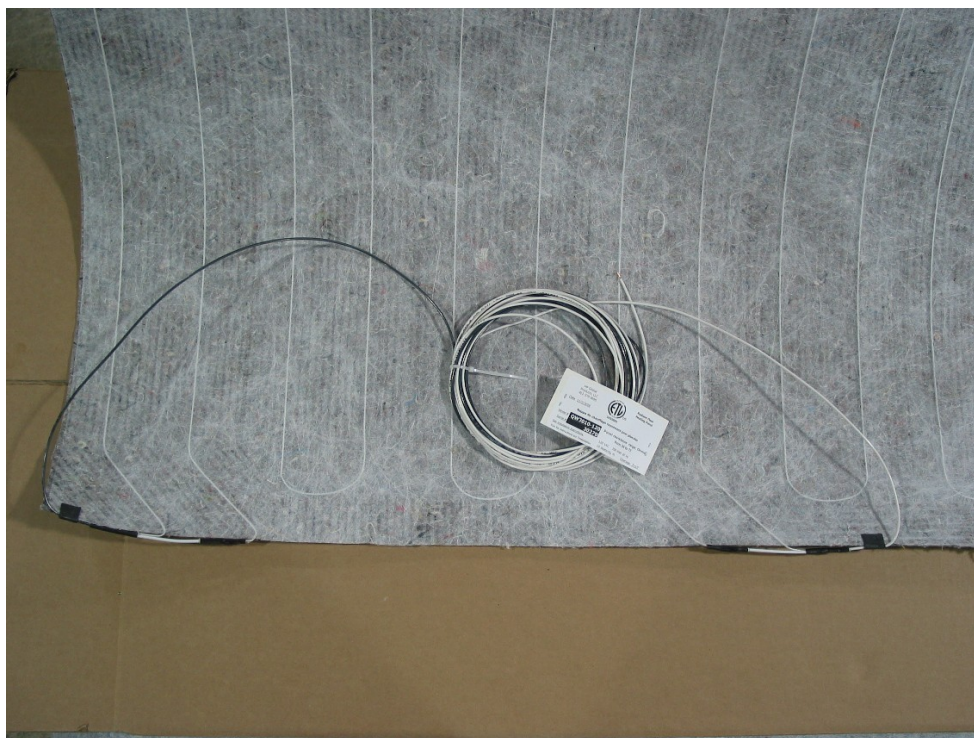
PHOTO NO. 3

CLOSE UP VIEW OF SUPPLY LEAD TERMINATION



FLOOR HEATING PAD

PHOTO NO. 4



FLOOR HEATING PAD

PHOTO NO. 5



FLOOR HEATING PAD

PHOTO NOS. 1 - 5

General - Photo nos. 1 – 3 shows an overall view of model Quiet Warmth. Photo 4 shows the original strain relief arrangement. Photo 5 shows the alternate strain relief arrangement.

Item

1. Heating Cable – (rated 120 VAC) **Recognized**. Thermosoft p/n Thermosoft® Fiber Thermics™. See Illustration Nos. 1 – 2B for bedding sizes. Cable is laminated onto padding.

(rated 240 VAC) Same except refer to Illustration No. 2C-2I for bedding sizes.
2. Padding Material – **Unlisted Component**. MP Global Products LLC., p/n INSULAYMENT. Material is constructed from Blended Synthetic Fibers, with a weight of 25 oz/yd², 0.11" thickness. See Illustrations 5 -8 for detailed specifications.
3. Supply Leads – (rated 120 VAC) (one black and one white lead) **Listed**. Any manufacturer with leads rated Type TFFN, 600V, 105°C minimum, 16AWG, 5 ft long minimum.

(rated 240 VAC) (one black and one red lead) Same as above.
4. Polyester Fabric – **Unlisted Component**. Freudenberg p/n 5019795, Lutradur® Type 070 or comparable material from any manufacturer. See Illustration No. 3 for specifications.
5. Adhesive – **Unlisted Component**. Spunfab Ltd. p/n Spunfab® FOX010314. See Illustration No. 4 for specifications. This adhesive is not used when polyester fabric, Item 4 above, includes pre-applied adhesive.
6. Heat Shrink – **Recognized**. Any manufacturer rated 250VAC, 90°C.
7. Tape – **Recognized**. Sheenzhen Changbao p/n CB-DWT 125°C. Overall dimensions of 3 cm x 1.5 cm minimum. Secures non-heating leads to padding material.
8. Splice Connector – **Recognized**. Any manufacturer suitable for two #16 AWG leads. Rated 150VAC, 15A minimum.

Alternate – **Critical**. Metal butt splice suitable for two # 16AWG, covered with **Recognized** shrink tubing rated 150VAC minimum.

FLOOR HEATING PAD

ILLUSTRATION NO. 1

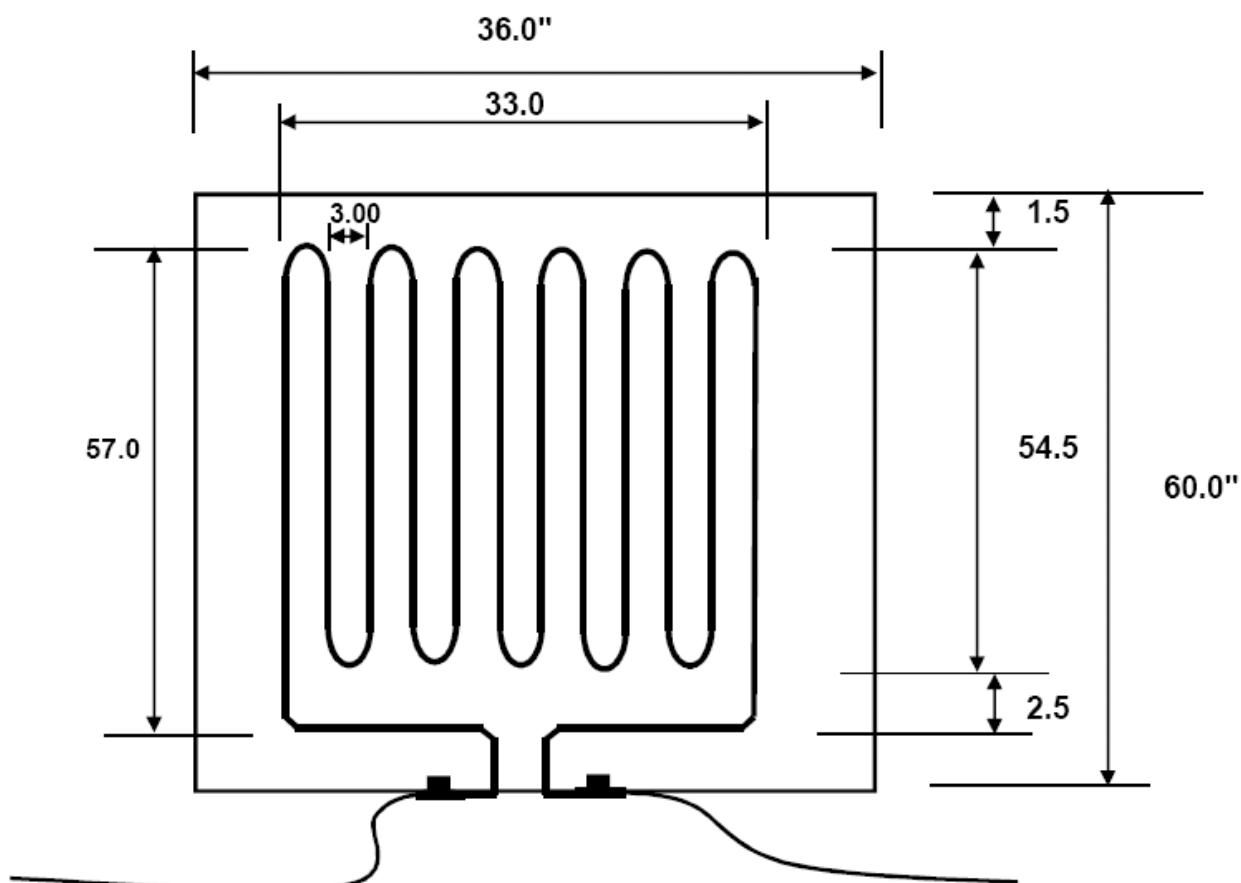
QuietWarmth™ / ThermoFloor™ Heater -120V

Type of
Product: 3' x 5' Single Unit Heater.

Date: 06/29/07 (revision of :7/23/2003)

Channels: 12

QW3005-120
TF3005-120



Length,ft :	60.8
Power Density, Wt/ft2:	10.0
Total Power , Wt:	131
Total Res., Ohm:	110
Res. per ft, Ohm:	1.81
Voltage, V:	120
Amperage, A	1.1

Do not scale
drawing

Note: All electrical parameters
represent maximum power

FLOOR HEATING PAD

ILLUSTRATION NO. 2

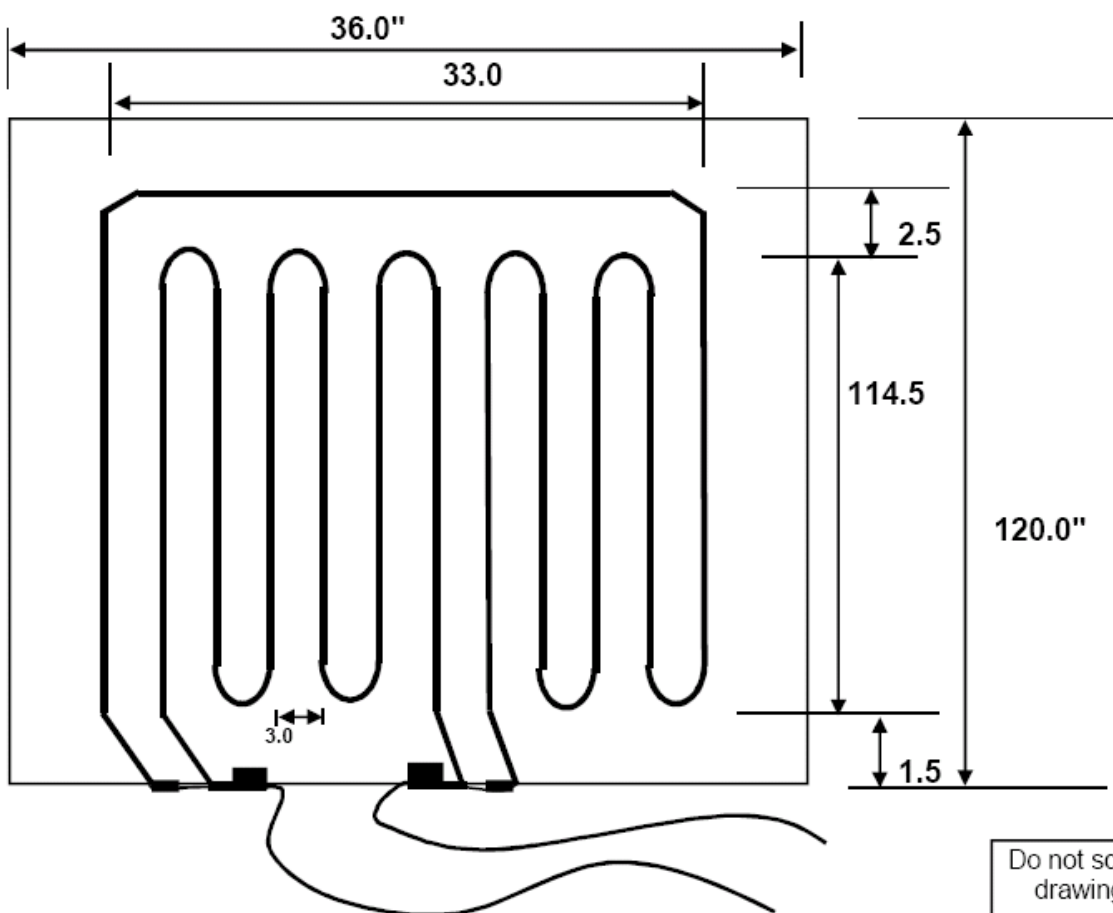
QuietWarmth™ / ThermoFloor™ Heater -120V

Product: 3' x 10' Dual Large heater.

Date: 07/07/07 (revision of: 07/23/03)

Total Channels (two heaters) :	12
---------------------------------------	-----------

QW3010-120
TF3010-120



	First Heater (Middle)	Second Heater (Side)	Combined (two heaters)
Length,ft :	57.8	60.9	118.7
Power Density, Wt/ft2:	10.0	10.0	10.0
Total Power , Wt:	135	133	269
Total Res., Ohm:	107	108	54
Res. per ft, Ohm:	1.8	1.78	1.81 (average)
Voltage, V:	120	120	120.0
Amperage, A	1.13	1.11	2.2

Note: ALL electrical parameters represent maximum power

FLOOR HEATING PAD

ILLUSTRATION NO. 2A

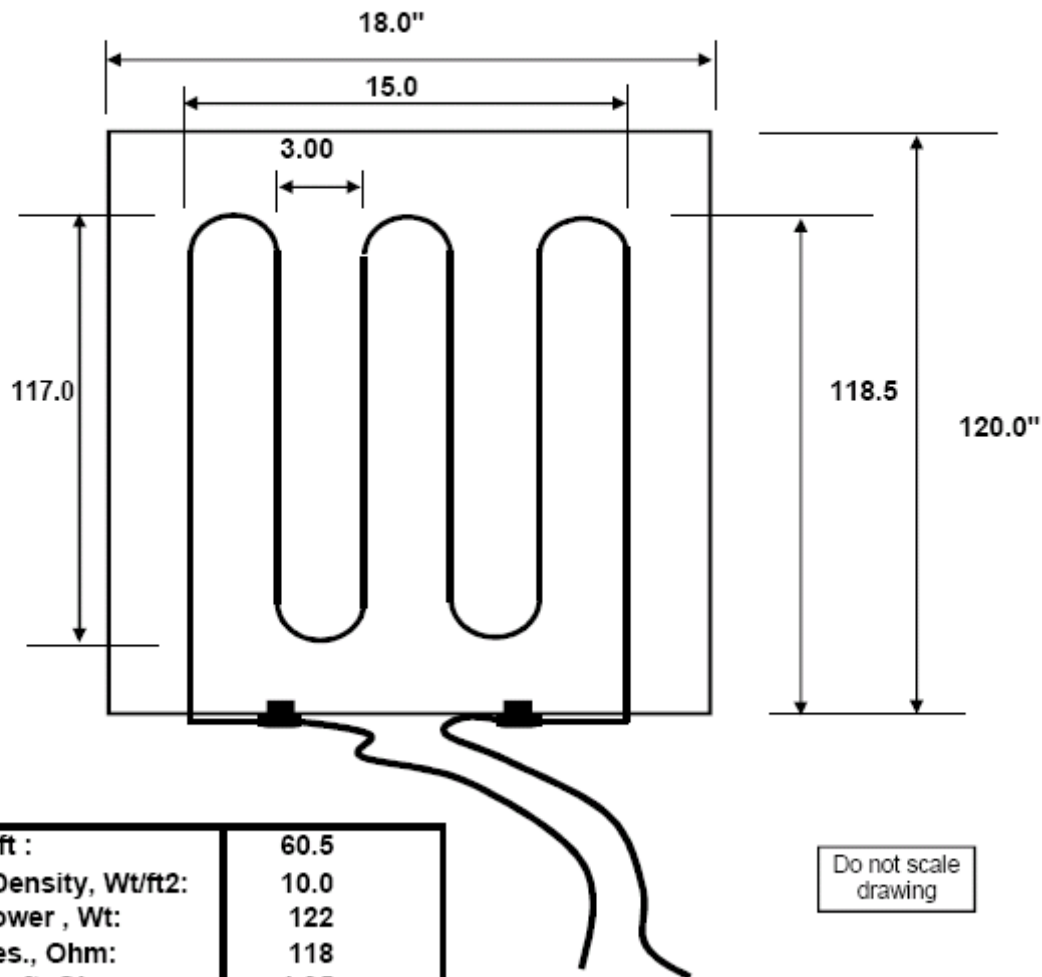
QuietWarmth™ / ThermoFloor™ Heater -120V

Type of
Product: 1.5' x 10' Single Unit Heater.

QW1510-120
TF1510-120

Channels: 6

Date: 6/27/2007



Length,ft :	60.5
Power Density, Wt/ft2:	10.0
Total Power , Wt:	122
Total Res., Ohm:	118
Res. per ft, Ohm:	1.95
Voltage, V:	120
Amperage, A	1.0

All electrical parameters represent
the maximum power.

FLOOR HEATING PAD

ILLUSTRATION NO. 2B

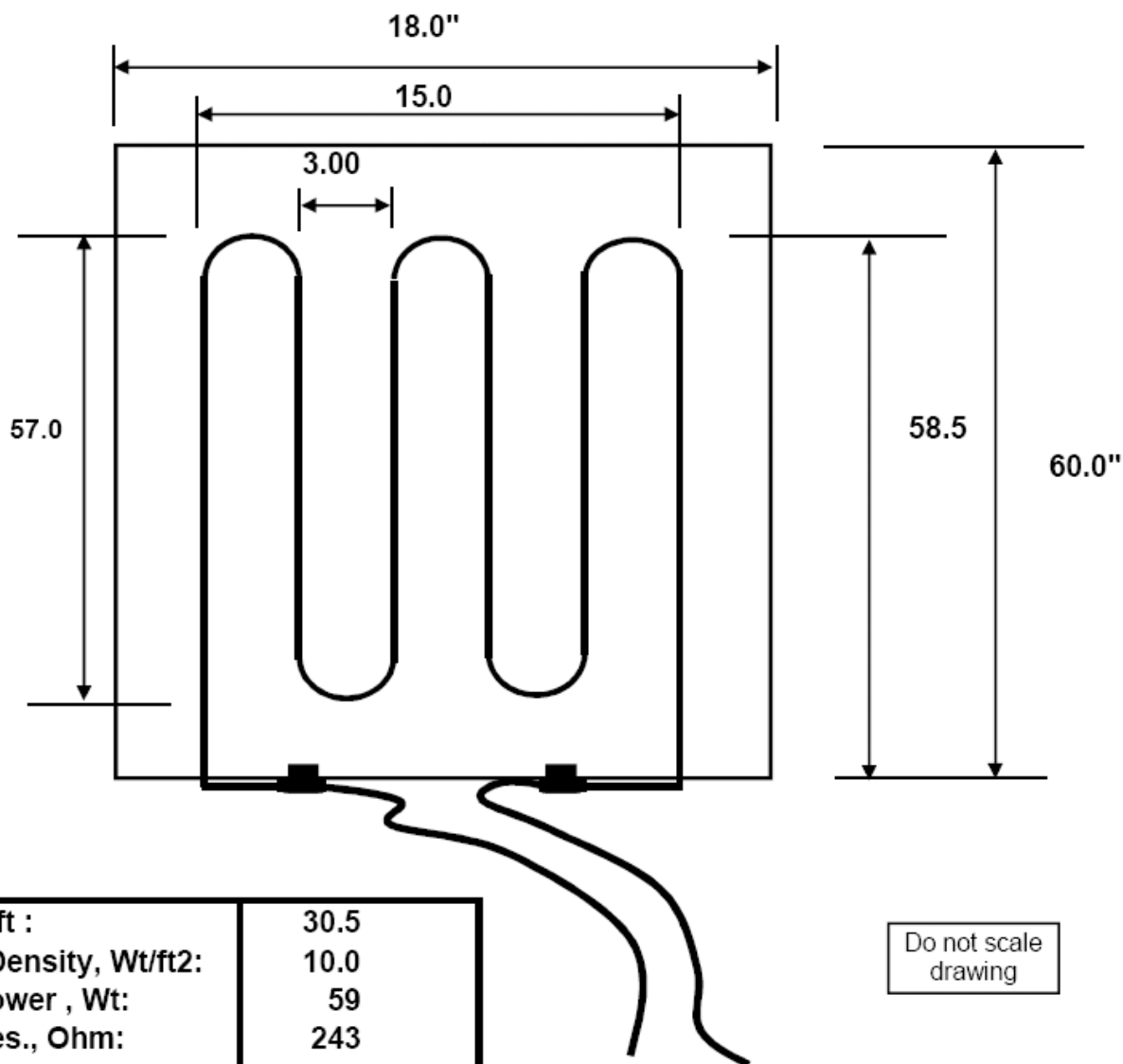
QuietWarmth™ / ThermoFloor™ Heater -120V

Type of
Product: 1.5' x 5' Single Unit Heater.

QW1505-120
TF1505-120

Channels: 6

Date: 6/27/2007



Length,ft :	30.5
Power Density, Wt/ft2:	10.0
Total Power , Wt:	59
Total Res., Ohm:	243
Res. per ft, Ohm:	7.95
Voltage, V:	120
Amperage, A	0.5

All electrical parameters represent
the maximum power.

FLOOR HEATING PAD

ILLUSTRATION NO. 2C

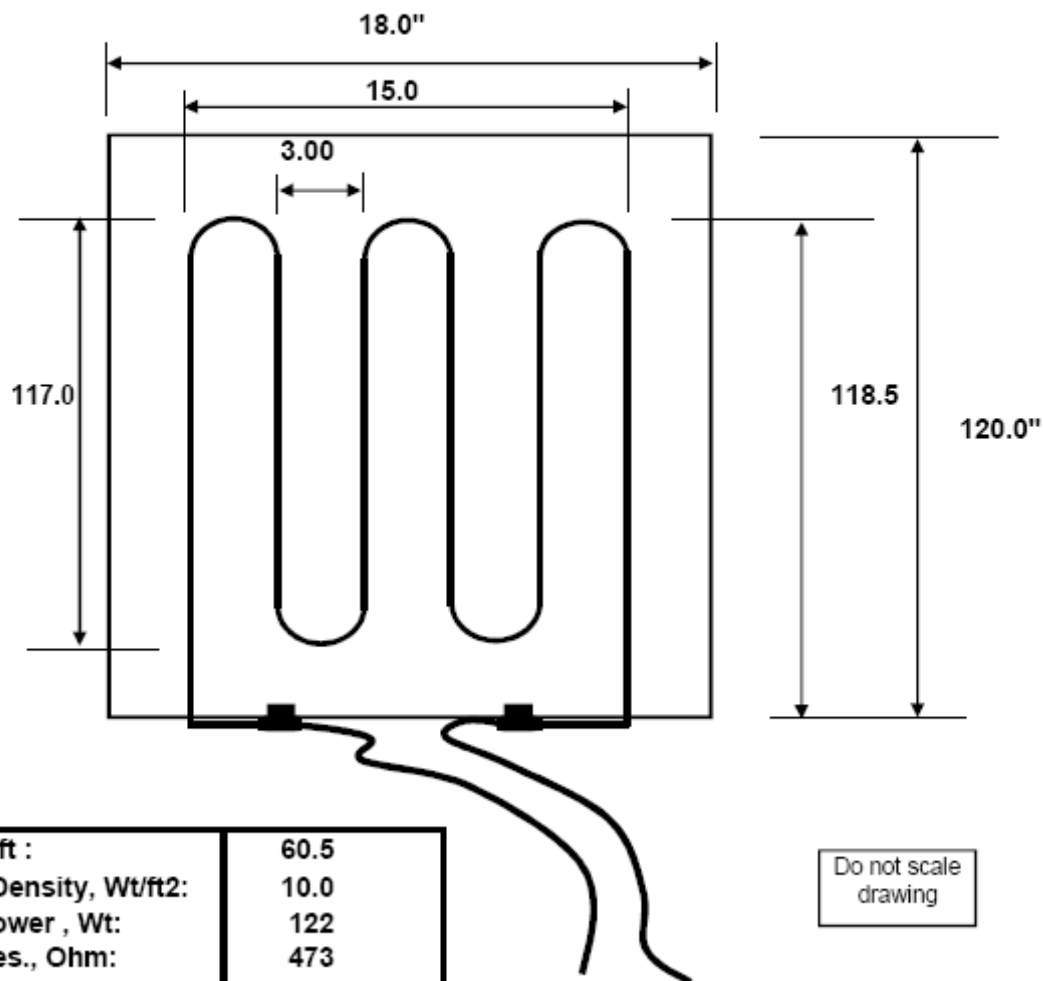
QuietWarmth™ / ThermoFloor™ Heater -240V

Type of
Product: 1.5' x 10' Single Unit Heater -240V.

QW1510-240
TF1510-240

Channels: 6

Date: 7/2/2008



Length, ft :	60.5
Power Density, Wt/ft2:	10.0
Total Power , Wt:	122
Total Res., Ohm:	473
Res. per ft, Ohm:	7.81
Voltage, V:	240
Amperage, A	0.5

FLOOR HEATING PAD

ILLUSTRATION NO. 2D

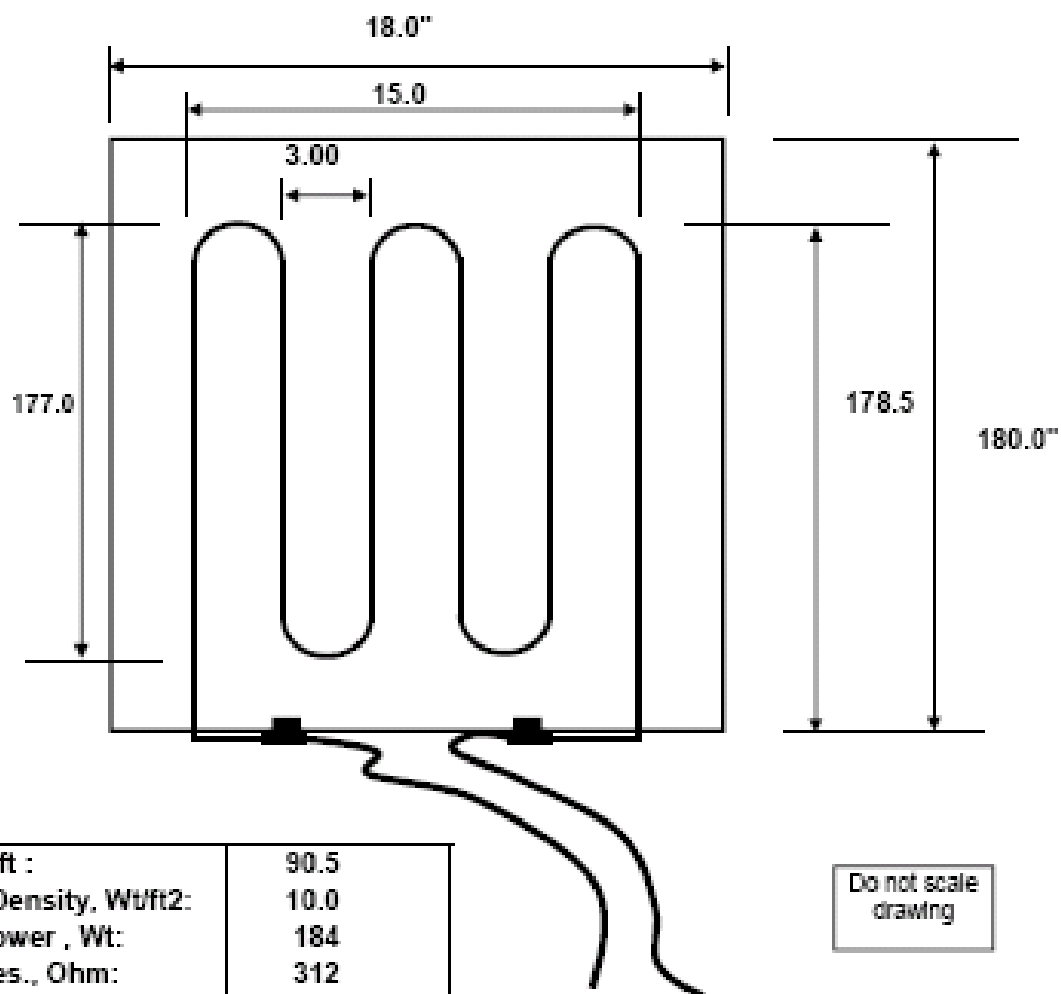
QuietWarmth™ /ThermoFloor™ Heater -240V

Type of
Product: 1.5' x 15' Single Unit Heater -240V.

QW1515-240
TF1515-240

Channels: 6

Date: 7/2/2008



Length, ft :	90.5
Power Density, Wt/ft ² :	10.0
Total Power , Wt:	184
Total Res., Ohm:	312
Res. per ft, Ohm:	3.5
Voltage, V:	240
Amperage, A	0.8

Do not scale
drawing

All electrical parameters represent
the maximum power.

FLOOR HEATING PAD

ILLUSTRATION NO. 2E

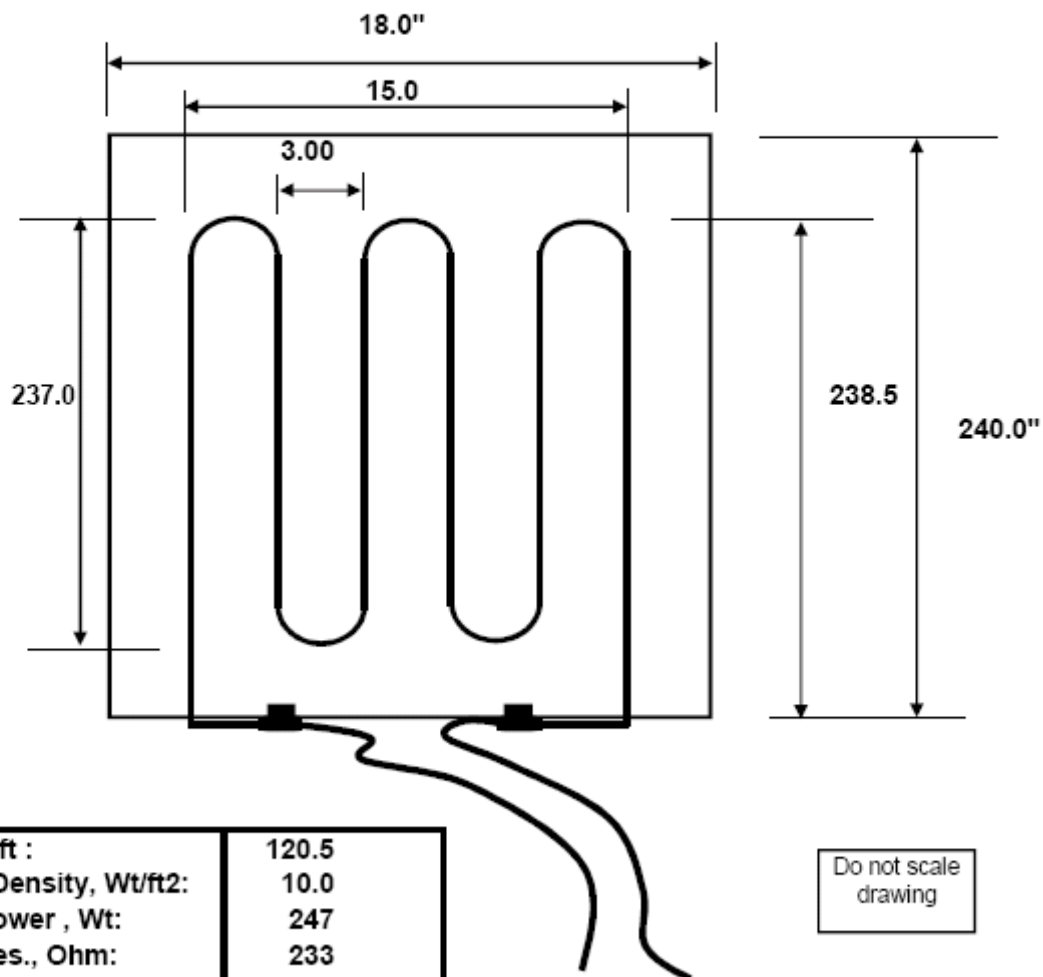
QuietWarmth™ /ThermoFloor™ Heater -240V

Type of
Product: 1.5' x 20' Single Unit Heater -240V.

QW1520-240
TF1520-240

Channels: 6

Date: 7/2/2008



Length,ft :	120.5
Power Density, Wt/ft2:	10.0
Total Power , Wt:	247
Total Res., Ohm:	233
Res. per ft, Ohm:	1.9
Voltage, V:	240
Amperage, A	1.0

All electrical parameters represent
the maximum power.

FLOOR HEATING PAD

ILLUSTRATION NO. 2F

QuietWarmth™ / ThermoFloor™ Heater -240V

Type of

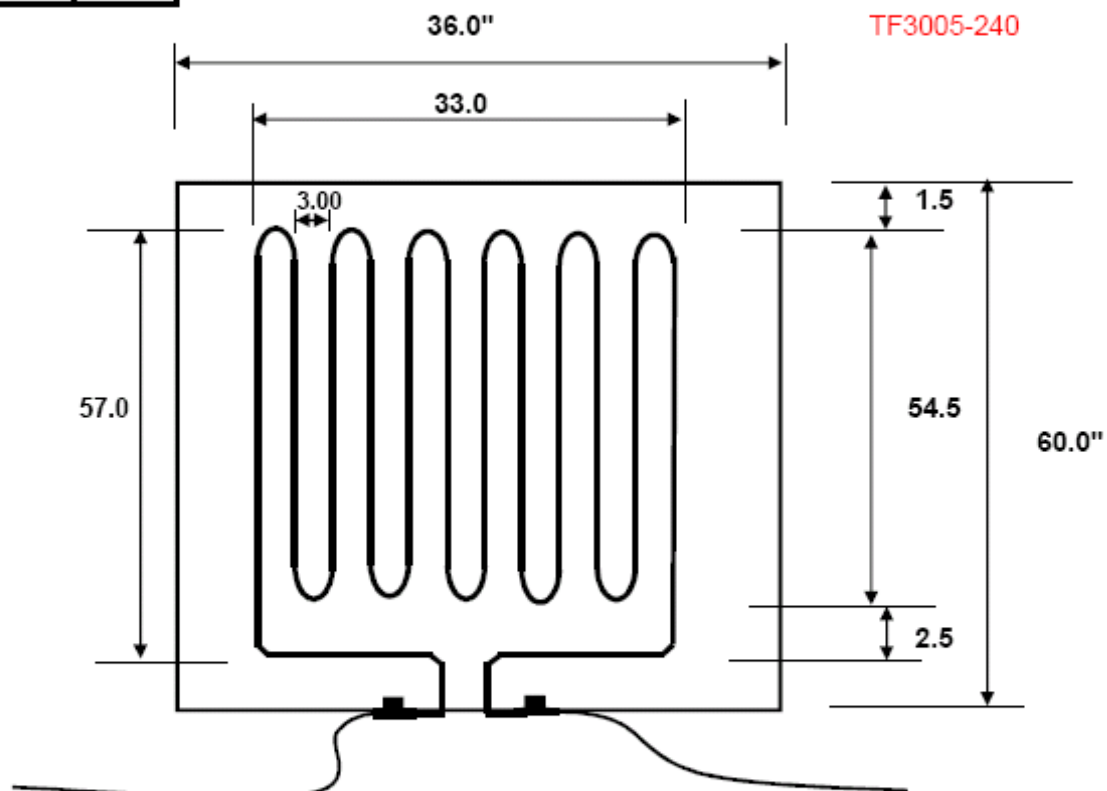
Product: 3' x 5' Single Unit Heater- 240V

Date: 7/2/2001

Channels: 12

QW3005-240

TF3005-240



Length,ft :	60.8
Power Density, Wt/ft2:	10.0
Total Power , Wt:	131
Total Res., Ohm:	441
Res. per ft, Ohm:	7.25
Voltage, V:	240
Amperage, A	0.5

Do not scale
drawing

Note: All electrical parameters
represent maximum power

FLOOR HEATING PAD

ILLUSTRATION NO. 2G

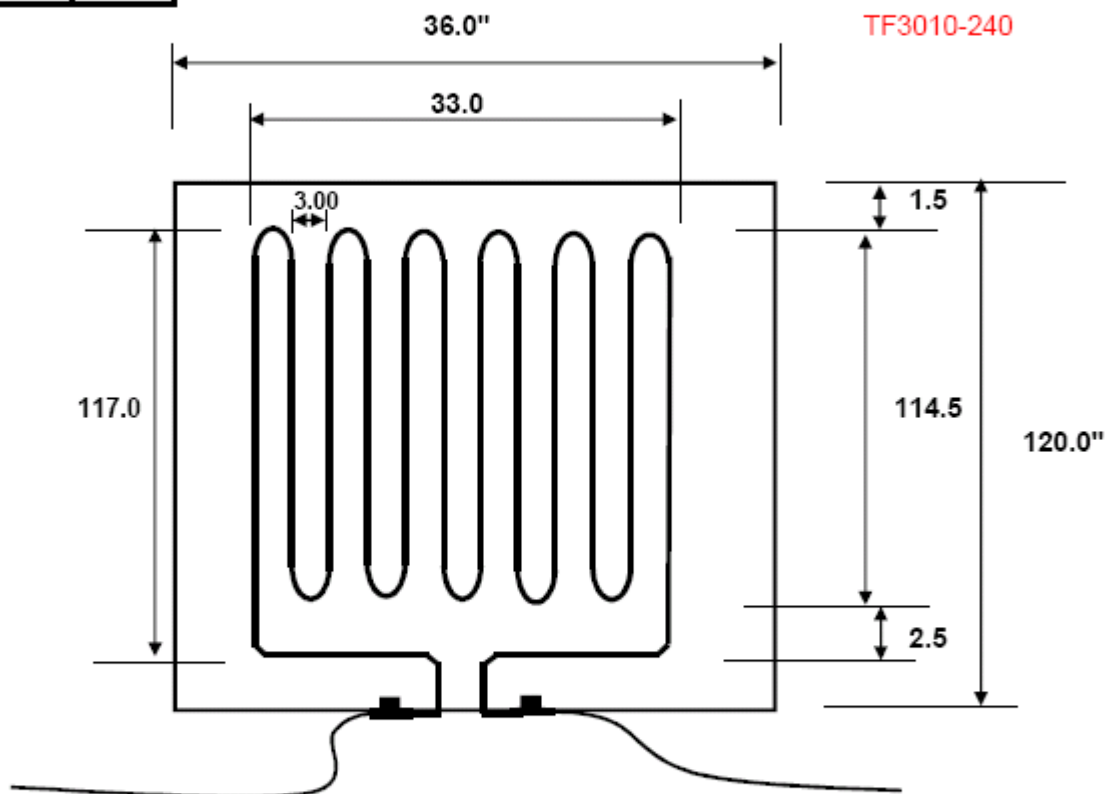
QuietWarmth™ / ThermoFloor™ Heater -240V

Type of
Product: 3' x 10' Single Unit Heater- 240V

Date: 7/2/2008

Channels: 12

QW3010-240
TF3010-240



Length,ft :	120.8
Power Density, Wt/ft2:	10.0
Total Power , Wt:	268
Total Res., Ohm:	215
Res. per ft, Ohm:	1.78
Voltage, V:	240
Amperage, A	1.1

Do not scale
drawing

Note: All electrical parameters
represent maximum power

FLOOR HEATING PAD

ILLUSTRATION NO. 2H

QuietWarmth™/ThermoFloor™ Heater -240V

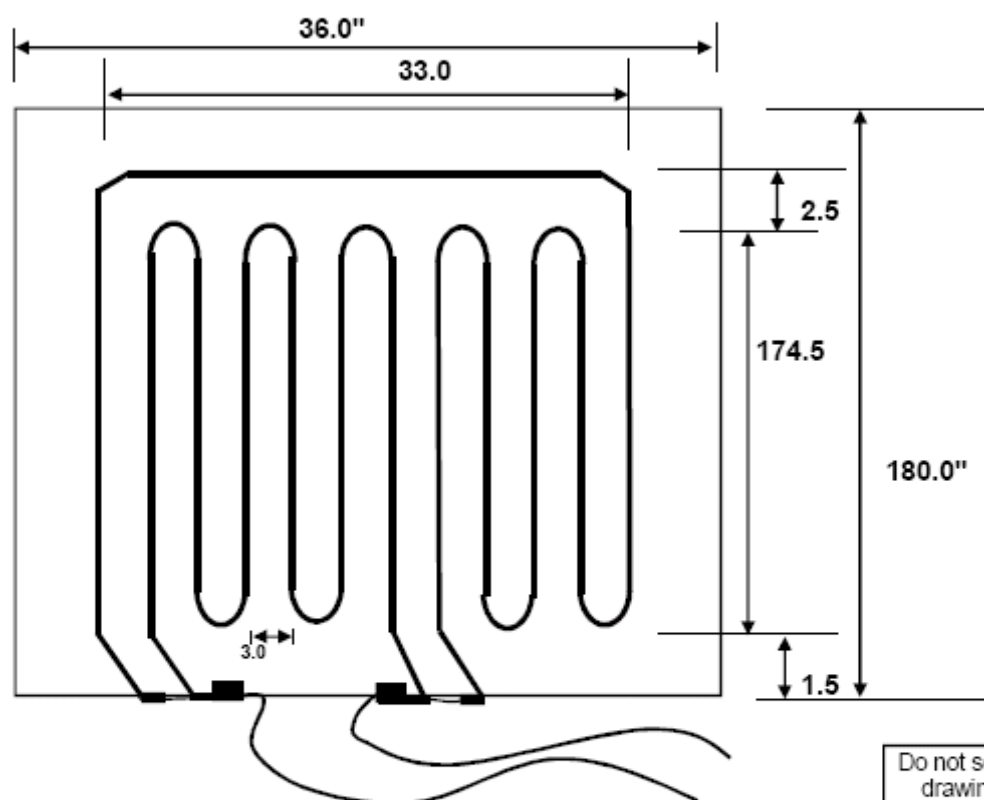
Product: 3' x 15' Dual Large heater.

QW3015-240

TF3015-240

Total Channels (two heaters) : **12**

Date: 7/2/2008



Do not scale drawing

	First Heater (Middle)	Second Heater (Side)	Combined (two heaters)
Length, ft :	87.8	90.9	178.7
Power Density, Wt/ft2:	10.0	10.0	10.0
Total Power , Wt:	206	200	269
Total Res., Ohm:	280	289	142
Res. per ft, Ohm:	3.2	3.2	3.2 (average)
Voltage, V:	240	240	240.0
Amperage, A	0.86	0.83	1.7

Note: ALL electrical parameters represent maximum power

FLOOR HEATING PAD

ILLUSTRATION NO. 2l

QuietWarmth™/ThermoFloor™ Heater -240V

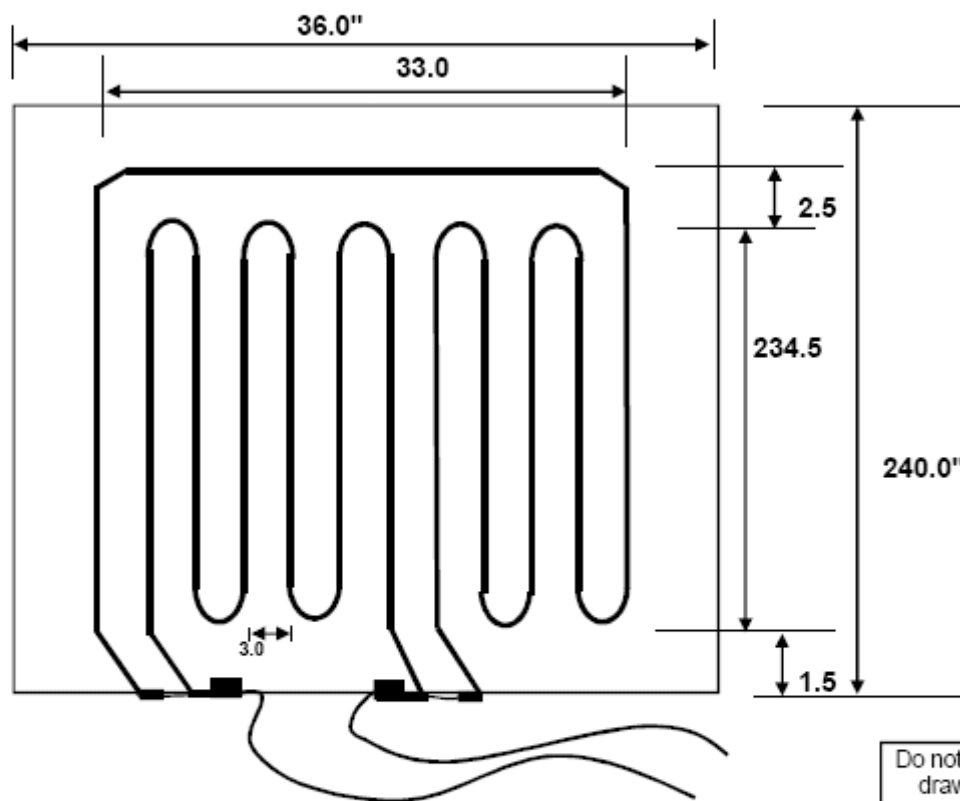
Product: 3' x 20' Dual Large heater.

QW3020-240

TF3020-240

Total Channels (two heaters) : 12

Date: 7/2/2008



	First Heater (Middle)	Second Heater (Side)	Combined (two heaters)
Length, ft :	117.8	120.9	238.7
Power Density, Wt/ft2:	10.0	10.0	10.0
Total Power , Wt:	277	266	269
Total Res., Ohm:	208	216	106
Res. per ft, Ohm:	1.8	1.8	1.8 (average)
Voltage, V:	240.0	240.0	240.0
Amperage, A	1.1	1.11	2.2

Note: ALL electrical parameters represent maximum power

FLOOR HEATING PAD

ILLUSTRATION NO. 3

Polyester Specifications

**The Freudenberg
Nonwovens Group**

Lutratur[®]

**Polyester Spunbond
Nonwoven Fabrics**

CONVERTER PART# 158185

Type 070 40 g/m²

Lutratur[®]

Typical Physical Properties

Basis Weight	:	1.18 40	oz/yd ² g/m ²
Grab Tensile Strength (MD/TD)	:	31/30 140/135	lbf N
Grab Elongation (MD/TD)	:	45/50	%
Trapezoidal Tear Strength (MD/TD)	:	13/13 60/60	lbf N
Thickness	:	8.0 .20	mils mm
Air Permeability	:	1000	CFM

Note: ASTM Tested

Characteristics

- Thermally bonded
- High strength to weight ratio
- Excellent dimensional stability
- Rot and mildew resistant
- Excellent moldability
- Structural rigidity
- Meets automotive flammability standard FMVSS 302

Primary Applications

- Secondary backing for molded automotive carpets
- Reinforcement for molded trim & trunk parts
- Automotive seat construction
- Filtration media
- Seam tape substrate

Other Applications

- Furniture & bedding construction
- Fiberglass replacement
- Coating, laminating, composites

FLOOR HEATING PAD

ILLUSTRATION NO. 4

Spunfab FOX010314 Specifications



Spunfab® FOX010314 Specification Sheet

Type	Stick Point °C	Heat Resistance 20g load °C	Plasticizer Migration Resistance	Wash Resistance °C	High Frequency Weldable
Polyolefin	96	88	low	N/A.	N/A.

Spunfab FOX010314 is our

Test Fab	PU-Foam	PVC-soft	LD-Foam
++++	++++	-	++++

- (-) peels, no bond (+) some bond {++++} Excellent, Substrate failure
- * estimate, to be determined
N/A. non-applicable

This information is derived from reference material and test data that is believed to be reliable. NOTHING HEREIN SHALL BE DEEMED A WARRANTY OR REPRESENTATION, EXPRESSED OR IMPLIED, WITH RESPECT TO THE USE OF SUCH INFORMATION OR GOODS DESCRIBED FOR ANY PARTICULAR PURPOSE ALONE OR IN COMBINATION WITH OTHER GOODS AND OR PROCESSES, OR THAT THEIR USE DOES NOT CONFLICT WITH EXISTING PATENT RIGHTS. No license is granted to practice any patented invention. It is offered solely for your consideration, investigation and verification.

Keuchel Associates Inc. / Spunfab Ltd. Certified to ISO 9001:2000, with design
175 Muffin Lane, Cuyahoga Falls, Ohio, 44223 ph. (330) 945-9455 fax. (330) 945-7588 www.spunfab.com

SS-C00314 Rev 1/20/03

FLOOR HEATING PAD

ILLUSTRATION NO. 5

Padding Material (1 of 4)



"A Sound Choice"

**Specifications &
Test Results for
INSULAYMENT**

10/17/2001

Materials

Blended synthetic fibers

Weight

25oz/sqyd (2.78 oz/sqft)

Thickness

0.11"

Density

18.9 lbs/ft³

R-Value

@0.11" = 0.46 hr-ft²-degF/Btu (4.19/inch)

Flammability

Meets or exceeds Federal Flammability Standard: CPSC FF 1-70 (Pill Test)

Sound

Field Impact Insulation Class (FIIC)

- 3/8" Engineered wood flooring over Insulayment, over 8" concrete sub-floor with no ceiling assembly (double glued). FIIC = 60
- Ceramic tile over Insulayment (latex modified thin set and grout), over 8" concrete sub-floor with no ceiling assembly. FIIC = 60.

Impact Insulation Class (IIC)

- Ceramic tile over Insulayment (latex modified thin set and grout), over wood floor structure with 1 1/2" of Gypcrete. IIC=52

Sound Transmission Class (STC)

- Ceramic tile over Insulayment (latex modified thin set and grout), over wood floor structure with 1 1/2" of Gypcrete. STC=53

Performance Level

Rated as "Extra Heavy" for "extra heavy and high impact use in food plants, dairies, breweries, and kitchens" when installed using porcelain tile & epoxy grout. (ASTM C627 – Robinson Floor Test)

Rated as "Light Commercial" for "office space, reception areas, kitchens, and bathrooms" when installed using residential tile and latex modified thin set and grout. (ASTM C627 – Robinson Floor Test)

Physical Properties

Compression Resistance @ 25%	23.2psi
Compression Resistance @ 30%	37.0psi
Compression Resistance @ 50%	219.6psi
Compression Set @ 25%	18.8%
Tensile Strength	Length 78.4lbs Width 63.3lbs

Weight and Density +/- 10% tolerance. Thickness +/- 5% tolerance.

2500 Old Hadar Rd.
P.O. Box 228
Norfolk, Nebraska 68702-228
402-379-885
1-888-379-969
Fax 402-379-973

FLOOR HEATING PAD

ILLUSTRATION NO. 6

Padding Material (2 of 4)

Material Safety Data Sheet

U.S. Department of Labor

May be used to comply with

OSHA's Hazard Communication Standard,
29 CFR 1910.1200. Standard must be
consulted for specific requirements.

Occupational Safety and Health
Administration

(Non-Mandatory Form)

Form Approved

OMB No. 1218-0072

IDENTITY (As Used on Label and List)
Insulayment

Note: Blank spaces are not permitted. If any item is
not applicable, or no information is available, the
space must be marked to indicate that.

Section I

Manufacturer's Name Midwest Padding L.L.C.	Emergency Telephone Number (402) 379-9695
Address (Number, Street, City, State, and ZIP Code) 2500 Old Hadar Road	Telephone Number for Information (402) 379-9695
Norfolk, NE 68701	Date Prepared 10/10/01
Signature of Preparer (optional)	

Section II - Hazard Ingredients/Identity Information

Hazardous Components (Specific Chemical Identity; Common Name(s))	OSHA PEL	ACGIH TLV	Other Limits Recommended	% (optional)
No hazardous materials used in this product. All new textile clippings processed through a web forming operation. Resulting fiber web is thermally bonded with a copolyolefin bicomponent binder fiber to maintain specific specifications.				

Section III - Physical/Chemical Characteristics

Boiling Point	N/A	Specific Gravity (H ₂ O = 1)	N/A
Vapor Pressure (mm Hg.)	N/A	Melting Point	425deg F
Vapor Density (AIR = 1)	N/A	Evaporation Rate (Butyl Acetate = 1)	N/A
Solubility in Water Insoluable			

FLOOR HEATING PAD

ILLUSTRATION NO. 7

Padding Material (3 of 4)

Appearance and Odor New textile fiber has no unusual odor in normal conditions.

Section IV - Fire and Explosion Hazard Data

Flash Point (Method Used) N/A	Flammable Limits N/A	LEL N/A	UEL N/A
Extinguishing Media Class "A" fires ordinary combustibles.			
Special Fire Fighting Procedures Routine for class "A" fire, synthetic content may produce irritating smell in smoldering fire.			
Unusual Fire and Explosion Hazards None			

(Reproduce locally)

OSHA 174, Sept. 1985

Section V - Reactivity Data

Stability	Unstable		Conditions to Avoid N/A
	Stable	X	
Incompatibility (Materials to Avoid) None			
Hazardous Decomposition or Byproducts N/A			
Hazardous Polymerization	May Occur		Conditions to Avoid N/A
	Will Not Occur	X	

Section VI - Health Hazard Data

Route(s) of Entry:	Inhalation? No	Skin? No	Ingestion? No
Health Hazards (Acute and Chronic)			
Carcinogenicity: No	NTP? No	IARC Monographs? No	OSHA Regulated? No
Signs and Symptoms of Exposure None			
Medical Conditions Generally Aggravated by Exposure			

FLOOR HEATING PAD

ILLUSTRATION NO. 8

Padding Material (4 of 4)

N/A
Emergency and First Aid Procedures
N/A

Section VII - Precautions for Safe Handling and Use

Steps to Be Taken in Case Material is Released or Spilled
None
Waste Disposal Method
No special procedures. Discard with other plant solid waste.
Precautions to Be taken in Handling and Storing
None
Other Precautions
None

Section VIII - Control Measures

Respiratory Protection (<i>Specify Type</i>)		
None		
Ventilation	Local Exhaust	Special
None	None	None
	Mechanical (<i>General</i>)	Other
	None	None
Protective Gloves		Eye Protection
None		None
Other Protective Clothing or Equipment		
None		
Work/Hygienic Practices		
No		

FLOOR HEATING PAD

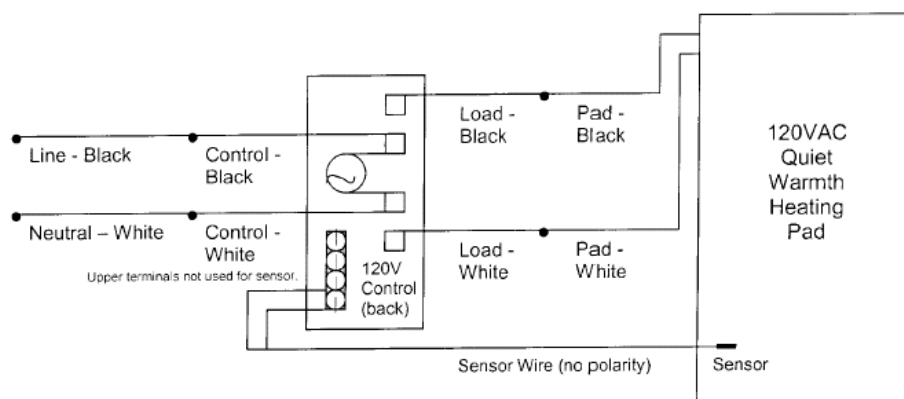
ILLUSTRATION NO. 9

Typical Installation Wiring Diagram

Figure 3

Quiet Warmth™ Installation Guidelines
Control Wiring Diagrams

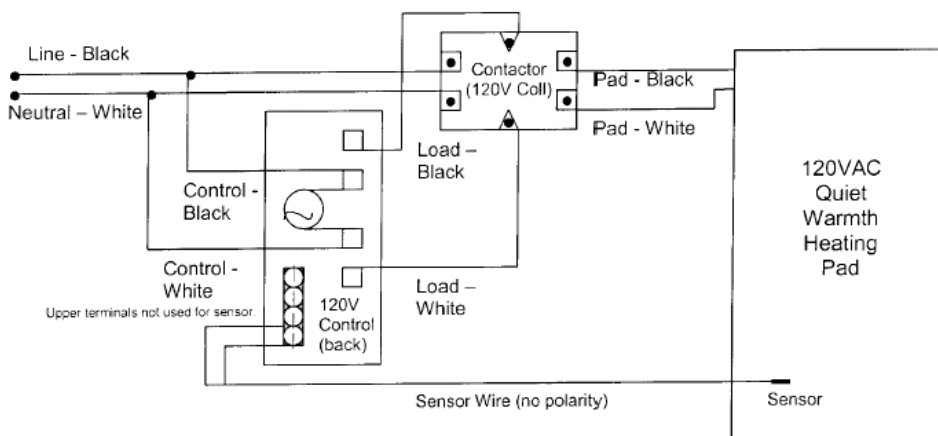
Typical Electrical Wiring Diagram w/thermostat controller (120V)



All electrical work must be done by a qualified, licensed electrician in accordance with local building and electrical codes, and the National Electrical Code (NEC), especially Article 424, Part J of the NEC, ANSI/NFPA 70 and Section 62 of CEC Part I.

Note: if installing a programmable control, do not install an external timer. The timer will disrupt the programming. If interfacing with a building energy management system, use a non-programmable control.

Typical Electrical Wiring Diagram w/contactor & thermostat controller (120V)



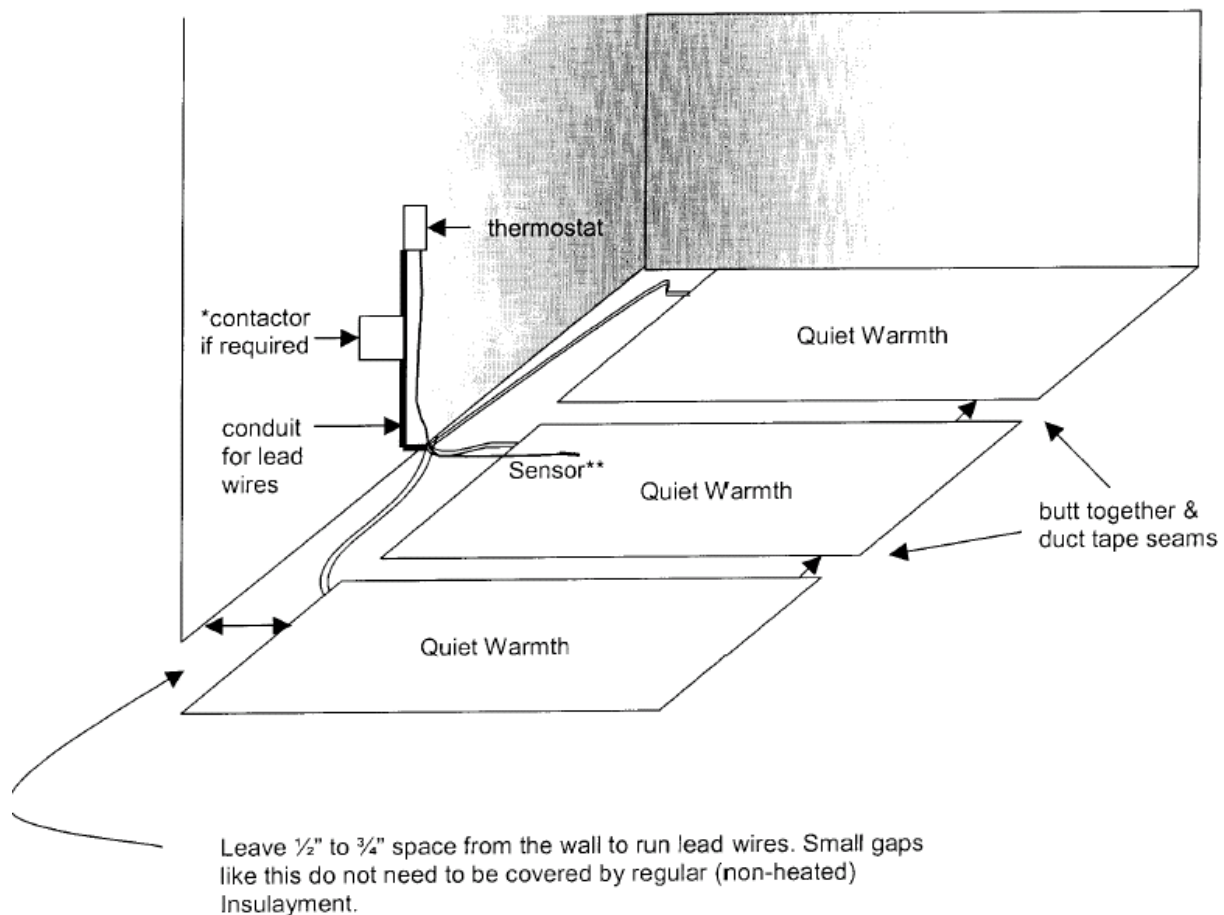
FLOOR HEATING PAD

ILLUSTRATION NO. 10

INSTRUCTIONS (1 of 12)

Figure 1

Quiet Warmth™ Installation Guidelines



* A contactor may be required for large installations. Consult an electrician.

** Sensor can be run down the wall or in a separate conduit from the power leads.

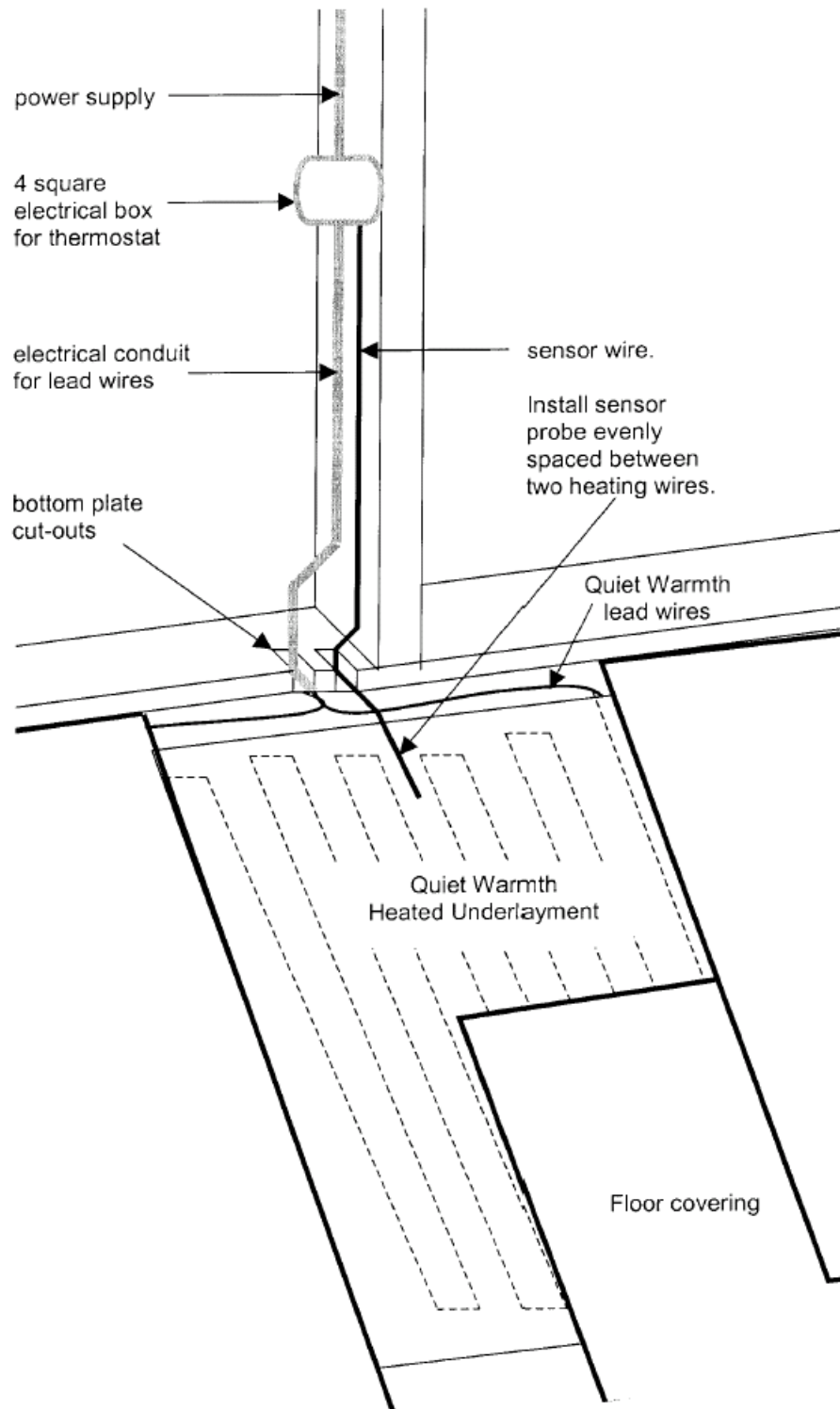
FLOOR HEATING PAD

ILLUSTRATION NO. 11

INSTRUCTIONS (2 of 12)

Figure 2

Quiet Warmth™ Installation Guidelines



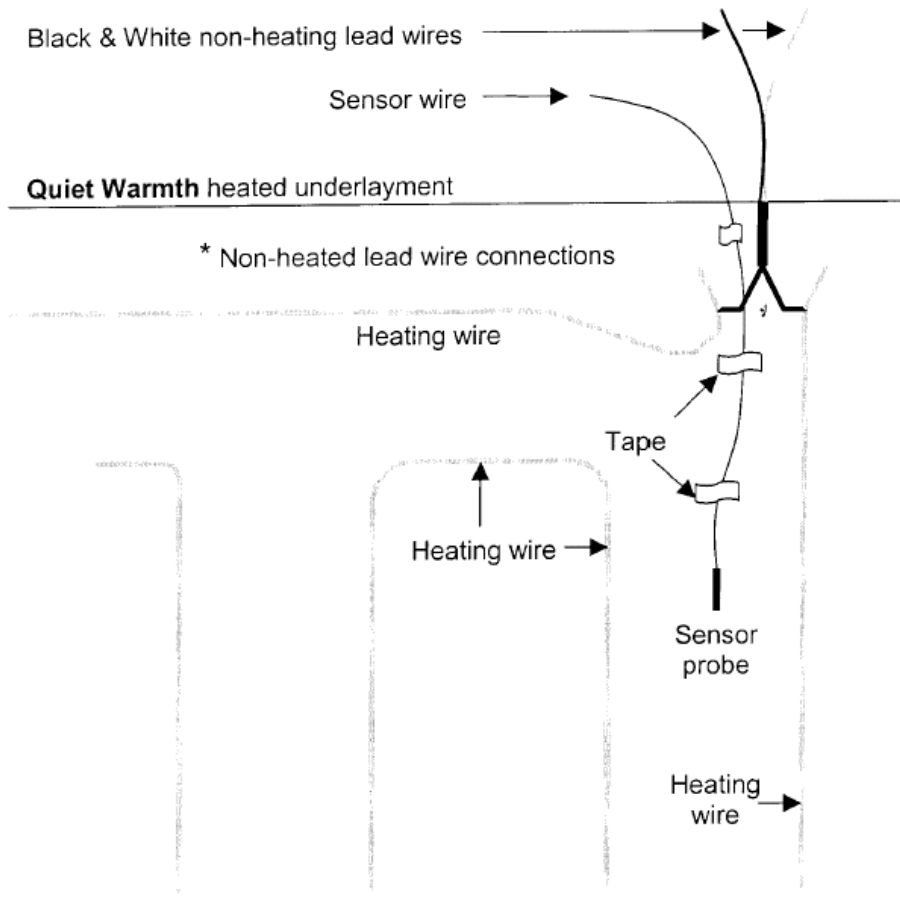
FLOOR HEATING PAD

ILLUSTRATION NO. 12

INSTRUCTIONS (3 of 12)

Figure 4

Quiet Warmth™ Installation Guidelines
Sensor Wire Location



Locate thermostat sensor probe equally spaced between two heating wires.

Tape wire in place but do not tape over sensor.

To avoid crossing over a heating wire with the sensor wire, run the sensor wire over the area where the non-heating lead wire connections are located. See *.

FLOOR HEATING PAD

ILLUSTRATION NO. 13

INSTRUCTIONS (4 of 12)

QuietWarmth™

Heated Underlayment with  ThermoSoft™ inside.

Installation Guidelines

Revolutionary **Quiet Warmth™** heated underlayment now combines the luxury of safe and soothing warmth with all the advantages of our original **Insulayment™** underlayment.

- There is no easier way to heat your floor than with **Quiet Warmth™**
- Made with ThermoSoft® FiberThermics™ heating elements
- No metal heating wires provide safe, soothing warmth to cold floors
- Complements home heating system making rooms more comfortable
- Allows for reducing the central heating thermostat saving on heat bills
- Can be used as a sole room heating source**
- Smooths out little subfloor imperfections
- Quiets impact sound and floor to ceiling noise
- Dampens ambient sound in the room it's installed in
- Inhibits sound from traveling into the room below
- An upgrade to poly foam for laminate floors
- Outperforms cork and rubber in head-to-head sound tests
- Certified field sound tests performed over a standard concrete subfloor received an FIIC score of "60"
- Increases R-value to help keep floors warm in winter and cool in summer

Quiet Warmth™ is available in two do-it-yourself size pads:

Padding Size	Padding Sq. Ft.	Watts /S.Ft.*	AC Voltage	Amp. Draw
3' x 5'	15	10	120	1.1
3' x 10'	30	10	120	2.2

* Watts per square ft. calculated over the heated area of padding.



Listing
in progress

To use **Quiet Warmth as the sole room heating source, make sure your BTU requirements are met by the total Watts of **Quiet Warmth** installed. 1,000 Watts = 3,413 BTU's/hour.

Midwest Padding • 2500 Old Hadar Road • PO Box 2283 • Norfolk, Nebraska 68702-2283
Telephone 402-379-9695 • Toll Free 888-379-9695
www.midwestpadding.com

FLOOR HEATING PAD

ILLUSTRATION NO. 14

INSTRUCTIONS (5 of 12)

Quiet Warmth™ Installation Guidelines

Heated Underlayment

Cautions

THIS EQUIPMENT SHALL BE INSTALLED ONLY BY QUALIFIED PERSONNEL WHO ARE FAMILIAR WITH THE CONSTRUCTION AND OPERATION OF THE APPARATUS AND THE RISKS INVOLVED.

THE INSTALLATION OF THIS HEATING PRODUCT SHALL BE IN ACCORDANCE WITH THE MANUFACTURER'S INSTRUCTIONS AND LOCAL AND NATIONAL CODES.

WARNING - as described in these instructions, lead wires are not to be routed over pads or come into contact with the heating elements as DAMAGE TO SUPPLY CONDUCTOR INSULATION MAY OCCUR IF CONDUCTORS ARE ROUTED to contact heating elements. REFER TO INSTALLATION INSTRUCTIONS FOR RECOMMENDED MEANS OF ROUTING SUPPLY CONDUCTORS.

INSTRUCTIONS (6 of 12)

Quiet Warmth™ Installation Guidelines

Heated Underlayment

Overview

There are four main sections to installing **Quiet Warmth** heated underlayment:

- Electrical rough-in.....Applies to all approved floor types.....Section 1
- **Quiet Warmth** Installation.....Applies to all approved floor types.....Section 2
- Floor Covering Installation.....Section 3

Floating laminate and floating wood floors.....Section 3A

Simply use **Quiet Warmth** in place of poly foams commonly used under floating floors.

Ceramic tile, marble, porcelain, slate, natural stone floors...Section 3B

When used with tile, the elasticity of **Quiet Warmth** resists the transferring of concrete subfloor cracks through to the tile or grout above. It also provides excellent bond strength with adhesives and thin-set mortars. Use latex modified thin-set mortar both below and above the **Quiet Warmth** heated underlayment. **Quiet Warmth** is recommended for Type II tile installations only. Do not use in shower pan applications or areas exposed to excessive moisture.

Glued-down engineered and solid wood floors.....Section 3C

For glued-down hardwood or engineered wood floors, simply glue **Quiet Warmth** to a structurally solid concrete or wood sub-floor, and then adhere the planks directly to the **Quiet Warmth** heated underlayment.

- Final wiring and connections.....Applies to all approved floor types.....Section 4

FLOOR HEATING PAD

ILLUSTRATION NO. 16

INSTRUCTIONS (7 of 12)

Sec. 1. Electrical Rough-In.....Applies to all approved floor types

Install GFCI Breaker – (Over-current Protection)

1. If you are not using a control which has an internal ground fault circuit interrupter (GFCI) already built-in, then install a dedicated, indicating-type GFCI. This GFCI serves as a local disconnect.
 - Note: Follow all local building and electrical codes.
 - It is possible to branch from an existing circuit, but this is not recommended. Please consult with a qualified electrician to determine if the circuit can handle the load and if the circuit is GFCI-protected.

The size of the breaker is determined by the total square footage of heated padding. (Depending on local codes, you may need multiple breakers for systems larger than 20 Amps).

Install Electrical Boxes

2. Thermostats are usually located near the power leads. However, they can be located almost anywhere, because the power leads and the sensor wire can be routed to electrical junction boxes and extended to a location outside the heated room (such as a utility room).
3. For the thermostat, install a 4" electrical box with a 1-gang mud ring. Electrical boxes should be located on interior walls typically 60" from the floor, according to NEC or other local code requirements.
4. The floor sensor wire can be extended up to 50' (maximum) if necessary.

Bottom Plate Work

5. Drill or saw holes at the bottom plate (See Fig 2.) One hole is for routing the power leads and the other hole is for routing the thermostat sensor wire. These holes should be directly below the electrical box(es).
6. Power lead conduit: Remove one of the knock-outs in the 4" box to route the lead.
7. Install ½" minimum conduit from the bottom plate up to the electrical box. Install ¾" conduit if necessary to make room for more lead wires when using multiple **Quiet Warmth** heated underlayment pads. See Figure 2. Close one end of conduit to junction box enclosure with appropriate fitting/locknut. Close bottom end of the

FLOOR HEATING PAD

ILLUSTRATION NO. 17

INSTRUCTIONS (8 of 12)

conduit flush with the wall and fit with insulated bushings to prevent chafing of wire on exposed edge.

8. A floor sensor comes with the thermostat control. It can be installed in a conduit separate from the power lead wire conduit although this is not necessary. If a conduit is installed, the tip of the conduit should be metallic in order for the sensor to give a true temperature reading.
9. Open a second knock-out in the bottom of the thermostat box. Feed the sensor and conduit through the knock-out down through the cut-out in the bottom plate, and out into the floor area where the **Quiet Warmth** heated underlayment will be installed.
10. If you have the thermostat and sensor, install the sensor now, but wait to install the thermostat until after **Quiet Warmth** is installed.
 - Note: the sensor is located in the thermostat box.

Rough-in Wiring

11. Install appropriate electrical wire (conductor) from the power source and GFCI protection to the thermostat and timer following all codes. Leave 6-8" extra wire at the thermostat box and optional timer box. Refer to the Typical Wiring Diagrams at the end of these installation guidelines for help.

Install External Contactor

12. Depending on the Amperage requirements of multiple **Quiet Warmth** heated underlayment, an external contactor may be required. Consult with an electrician to determine the type and size of contactor required.

INSTRUCTIONS (9 of 12)

Sec. 2. Quiet Warmth Installation.....Applies to all approved floor types

Planning

1. Plan the heated area of the floor so that the desired area of the floor can be heated with a combination of the two available mat sizes. When planning your heated floor area, keep the following important points in mind:
 - Non-heated areas of the floor must be covered with **Insulayment™** underlayment that can be cut to fit the areas of the floor that can not be covered by **Quiet Warmth** heated underlayment. This will keep your floor level.
 - Do not cut **Quiet Warmth** heated underlayment.
 - Do not cut or pierce **Quiet Warmth's** heating wires.
 - Do not overlap **Quiet Warmth** heated underlayment.
 - Do not duct tape over **Quiet Warmth's** heating wires.
 - Lead wires should run from the end of the mats to the nearest wall and electrical junction box. Lead wires must be run through conduit according to local and national electric codes. A licensed electrician must make all electrical connections.
 - Do not run lead wires over or under mats.
 - Do not install **Quiet Warmth** heaters under cabinets, built-ins or furniture with a solid surface base. Excessive heat will accumulate under these items and may damage **Quiet Warmth's** heating elements.
 - Consider the room plan. Where possible, do not position **Quiet Warmth** heaters under furniture, as some of the benefit of the heaters will be lost.

Preparation

2. See **Section 3** for surface preparation steps specific to different approved floor types. With all approved floor types, be sure the subfloor surface is clean and dry*. The floor must be completely swept of all debris including all nails, dirt, wood and other construction debris. Make absolutely sure there are no objects on the floor that might damage the **Quiet Warmth** wires.

*In geographic areas where concrete slabs are subject to excessive moisture, a calcium chloride moisture test is recommended. Vapor emission readings in excess of 3 lbs. per 1,000 square feet in 24 hours may require additional protection such as a concrete sealant or polyethylene sheeting.

FLOOR HEATING PAD

ILLUSTRATION NO. 19

INSTRUCTIONS (10 of 12)

3. Before starting, remove the **Quiet Warmth** heated underlayment from the box. Attach both lead wires to a high quality digital ohmmeter to measure the resistance. Compare the resistance you measured to the resistance recorded by the factory on the label attached to the padding. If the resistance is not within $\pm 10\%$ of the factory recorded resistance, call our customer service number for assistance. Damage may have occurred during shipping. Do not proceed with the installation. Keep a record of resistance measures as they will be needed for warranty purposes (see Sec. 5).
4. Leave the factory labels attached to the padding and the lead wires for later inspection. Save warning label #1, it must be placed near or on the face of the control (see Section 4, Step #4.)

Layout

5. Lay **Quiet Warmth** underlayment over the subfloor with the heating wires facing up.
6. Layout lead wires so they run to the nearest wall with an electrical box. See Fig. 1. Connections will be made later.
7. Allow approximately 1" of floor space between the wall and **Quiet Warmth** to run the lead wires to the conduit. Use thin strips of duct tape to hold lead wires in place – **DO NOT STAPLE**.
8. Padding should be completely flat, butted together flush, do not overlap the pad.
9. Tape the seams with duct tape or other water and tear resistant, utility-grade, poly-coated cloth backed tape that has a very aggressive adhesive. See Fig.1.
 - Do not tape over **Quiet Warmth's** heating wires.
10. Before installing your floor, use the ohmmeter to record the resistance measurement of the **Quiet Warmth** heated underlayment. The resistance must be within $\pm 10\%$ of the factory recorded resistance. If not, call our customer service number for assistance. Damage may have occurred during installation. Do not proceed with the installation. Keep a record of resistance measures for warranty (see Section 5).
11. The thermostat sensor wire should be installed on top of the **Quiet Warmth** heated underlayment and routed up the wall to the thermostat electrical box. Place the sensor wire evenly spaced between two **Quiet Warmth** heating wires extending about 6"-12" into the **Quiet Warmth** heated underlayment. You can tape the sensor wire in place but do not tape over the sensor probe as this will cause heat to build up causing the control to reduce power to **Quiet Warmth**. Do not tape over **Quiet Warmth** heating wires.

INSTRUCTIONS (11 of 12)

Sec.3. Floor Covering Installation – General Information

Quiet Warmth™ is suitable for use under:

- (Section 3A) Floating laminate and floating wood floors,
- (Section 3B) Ceramic tile*, marble, porcelain, slate, stone installations,
- (Section 3C) Glued-down engineered and solid wood floors.

***Quiet Warmth** is approved for Type II tile applications. Do not use in shower pan applications or areas exposed to excessive moisture.

Do not install **Quiet Warmth** under carpet, vinyl or nailed hardwood.

Do not install **Quiet Warmth** in walls.

For Installations not covered in these directions, consult Midwest Padding, L.L.C. before installation. Installations not performed within the stated manner may void all warranties.

When installing the floor, be careful not to damage **Quiet Warmth's** heating wires. If the floor covering is not immediately installed, protect **Quiet Warmth** heated underlayment with corrugated box material or plywood.

- Keep traffic to a minimum on installed **Quiet Warmth** heated underlayment.
- Avoid dropping, rolling or dragging objects or tools over the heating wires.
- Be careful that nails, screws or other fasteners do not penetrate the floor in the area of **Quiet Warmth**. **Quiet Warmth's** heating wires can be damaged by fasteners penetrating the floor.
- Do not attempt to repair damaged heating wires.

Final Resistance Measure

After installing your floor, use the ohmmeter to record the final resistance measurement of the **Quiet Warmth** heated underlayment. The resistance must be within $\pm 10\%$ of the factory recorded resistance. If not, call our customer service number for assistance. Damage may have occurred during floor installation. Keep a record of all three resistance measures as they will be needed for warranty purposes (see Section 5).

FLOOR HEATING PAD

ILLUSTRATION NO. 21

INSTRUCTIONS (12 of 12)

3A. FLOATING LAMINATE & FLOATING WOOD FLOORS

1. Plan your layout as discussed in Section 2.
2. Prepare your surface as discussed in Section 2.
3. Lay out Quiet Warmth as discussed in Section 2.
4. Protect **Quiet Warmth** prior to floor installation as discussed in Section 3 – General Information.
5. Install floating floors according to the manufacturer's installation instructions.
6. Record final resistance as discussed in Section 3 - General information.

ILLUSTRATION NO. 22

ED 16.3.13 (8/23/04)

FLOOR HEATING PAD

MARKING NO. 1

The product should be provided with markings that comply with the Standard for Marking and Labeling Systems (UL 969). The following minimum markings shall be provided:

- 1) Manufacturer's name, trademark, or other descriptive marking;
- 2) The catalog number or the equivalent;
- 3) The electrical ratings, including voltage (must have the letters ac" after the voltage or the symbol "~", frequency, and input in amperes or watts;
- 4) The maximum heating panel length (as specified on Page 3 of the report);
- 5) The Statement: " SEE INSTALLATION INSTRUCTIONS";
- 6) The words "RADIANT FLOOR HEATING PANEL";
- 7) The date of manufacturer should also be provided on the product (this date can be in coded into a serial number).
- 8) A warning label that is intended to be affixed by the installer to the panelboard; marked with the word "WARNING", and the following or equivalent statement "RISK OF ELECTRIC SHOCK – ELECTRIC WIRING AND HEATING PANELS CONTAINED BELOW THE FLOOR. DO NOT PENETRATE FLOOR WITH NAILS, SCREWS, OR SIMILAR DEVICES";
- 9) The manufacturer shall provide labels that are intended to be affixed adjacent to points of access to concealed areas in which installed heating products are accessible. They shall be marked with the word "CAUTION", and the following or equivalent statement, "RADIANT HEATING PRODUCTS INSTALLED IN THIS AREA. AVOID ACTIONS WHICH MAY RESULT IN MECHANICAL DAMAGE TO THE PRODUCT."

Note: The markings above should be in letters not less than 1.6 mm (1/16 inch) high except that the signal words "WARNING" and "CAUTION" shall be in letters not less than 2.4 mm (3/32 inch) high.

FLOOR HEATING PAD

Evaluation of Unlisted Components

Because unlisted components are uncontrolled, and they do not fall under a third party follow up program, Intertek may require these components to be tested and/or evaluated at least once annually, more often for certain components, as part of the independent certification process. The unlisted components in the table below require testing and/or evaluation as indicated.

Note to Intertek Follow Up Inspector: The Component Evaluation Center, CEC, will notify you in writing when these components must be selected and sent to the CEC for re-evaluation

Ship the samples to: Intertek
Component Evaluation Center
13200 Levan Road
Livonia, MI 48150
USA

Sample Disposition: Due to the destructive nature of the testing, all samples will be discarded at the conclusion of testing unless, the manufacturer specifically requests the return of the samples. The request for return **must** accompany the initial component shipment.

The Unlisted Components covered by this report are shown in the following Table:

Photo No.	Item No.	Component Description	Manufacturer	Catalog No.	Frequency*	Qty	Send to CEC (YES or NO)	Required Action***
1-3	2	Padding Material	MP Global Products LLC.	Insulayment	Quarterly	NA	NO	See Illustration No. 5 – 8 for construction
1-3	4	Polyester Fabric	Freudenberg	Lutradur	Quarterly	NA	NO	See Illustration No. 3 for construction
1-3	5	Adhesive	Spunfab	Spunfab	Quarterly	NA	NO	See Illustration No. 4 for specifications

* Quarterly, semi-annual, annual.

** note: Indicate any samples not available and provide the anticipated date that the component will be available.

*** Required Action (select one of the three):

Visual
Partial
Full Evaluation

Note:

Visual means the quarterly verification of the description of the unlisted component in the report is sufficient for Certification.