Section 23 83 23.16

radiant-heating electric Mats

NVENT nuheat MAT Floor Heating system FOR PERIMETER HEATING APPLICATIONS

This specification is dated 01/03/2020 and supersedes all previous versions.

Any text with yellow highlights indicates language specific to the nVent NUHEAT heating system described in this document. Any text with pink highlights is specific to perimeter heating applications. Un-highlighted text is common to all nVent NUHEAT specifications. For detailed design information, please contact your local representative, visit www.nuheat.com, or contact nVent Thermal Technical Support 800-545-6258.

1. General
	1. Summary
		1. Section includes UL Listed and CSA Certified floor heating systems.
		2. Related Requirements
			1. Section 23 83 13 – Radiant-Heating Electric Cables
			2. Section 23 83 23 – Radiant-Heating Electric Panels
			3. Section 25 09 33 – Electric and Electronic Control System for HVAC
			4. Section 09 34 13 – Waterproofing-Membrane Ceramic Tiling
	2. References
		1. Reference Standards
			1. UL515 – Electrical Resistance Heat Tracing for Commercial Applications
			2. IEEE 515.1-2012 Standard for the Testing, Design, Installation & Maintenance of Electric Resistance Trace Heating for Commercial Applications.
			3. CSA Standard C22.2 No. 130-03 Requirements for Electrical Resistance Heating Cables & Heating Device Sets
			4. NFPA 70 - National Electrical Code
			5. CSA Standard C22.1 – Canadian Electrical Code
			6. AMERICAN NATIONAL STANDARDS INSTITUTE (ANSI—current edition)
			7. UL 1693, Second Edition
			8. UL 1683, Issue No. 2
			9. NEC Article 424 Floor Warming Systems
			10. AMERICAN SOCIETY for TESTING & MATERIALS (ASTM—current edition)
	3. System description
		1. System Description: Electric radiant floor heating system consisting of a resistance heating wire bonded in a pre-configured pattern between two porous layers of fabric and thermostat(s) with built-in Class A GFCI protection.
			1. The pre-formed electric floor heating product is custom-manufactured to trace curtain wall(s) for the purposes of perimeter heating, providing heat loss replacement, mitigating window condensation, and providing other required benefits of a perimeter heating system.
			2. The system is custom-designed with the specific Watt density and dimensions to provide the required heat output for the perimeter heating system.
			3. Once installed, the system must take up no physical space within the finished room, be invisible, and operate silently apart from opening and closing of replay(s) in the control circuit(s). It must be maintenance-free apart from periodic replacement of control device(s) as required.
			4. Heating product thickness shall not exceed 1/8 inch (3.2 mm).
			5. The heating products must be protected by a minimum, non-pro-rated, 25-year warranty.
			6. This system must be approved for use under ceramic tile, marble, other natural stone, laminate, engineered wood, and luxury vinyl floor coverings.
			7. Thermostat must have built-in class A GFCI protection, floor sensing and ambient air sensing capabilities.
			8. Thermostat must work with Amazon Alexa, Google Assistant, Google Nest, IFTTT, Control4, and/or other custom integrations using thermostat manufacturer’s Open API.
	4. Action Submittals / informational submittals
		1. Product Data
			1. Floor heating data sheet
			2. UL Listed certificates for floor heating
			3. System installation and operation instructions
			4. System installation details
			5. Thermostat data sheet
			6. Thermostat wiring diagram
		2. Shop Drawings
			1. Detailed engineered drawings showing layout(s) of the floor.
	5. Quality assurance
		1. Source Limitations
			1. All system components (heating products, thermostats, and any other accessories) shall be sourced from a single manufacturer and under no circumstances shall components be installed other than those supplied by the system manufacturer to ensure system integrity and meet warranty requirements.
		2. Qualifications
			1. Manufacturers
				1. Manufacturer must have a minimum of thirty (30) years of experience in manufacturing floor heating systems.
				2. Manufacturer must be ISO-9001 registered.
				3. Manufacturer must provide floor heating product that meets IEEE 515.1, CSA 22.2 No 130-03, and UL1683 requirements.
			2. Installers
				1. System installer shall have a complete understanding of all relevant products and product literature directly from the manufacturer or from an authorized representative of the manufacturer prior to installation. Electrical connections shall be performed by a licensed electrician or otherwise appropriately qualified electrical contractor.
			3. Labelling of Electrical Components, Devices, and Accessories
				1. All system components (heating products, thermostats, and any other accessories) must be listed and labelled as defined in NFPA 70, Article 100, by a Nationally Recognized Testing Laboratory (NRTL), and marked for intended use.
		3. Certifications
			* 1. All system components (heating products, thermostats, and any other accessories) shall be UL Listed and CSA Certified for floor heating.
	6. Delivery, storage, and handling
		1. Delivery And Acceptance Requirements
			1. All system components must be delivered, stored, and handled in such a way as to prevent their deterioration or damage due to moisture, temperature changes, contaminates, or other causes.
			2. All system components must be delivered to the site in original unopened containers or packages with intact and legible manufacturer’s labels and must include the following information:
				1. Product and Manufacturer
				2. Size and Quantity
				3. Lot Number
				4. Installation and Operation Instructions
				5. MSDS (if applicable)
		2. Storage And Handling Requirements
			1. All system components must be stored in a clean, dry location with a temperature range not below -40°F (-40°C) and not exceeding 140°F (60°C).
			2. All system components must be protected from mechanical damage.
	7. Warranty
		1. Manufacturer Warranty
			1. The manufacturer must warranty all heating products and membranes with a comprehensive, non-prorated written twenty-five (25) year warranty against product defects which covers replacement materials and applies when installed under ceramic tile, marble, other natural stone, laminate, engineered wood, and luxury vinyl floor coverings.
			2. The manufacturer must warranty all thermostats with a comprehensive, non-prorated written three (3) year warranty against product defects which covers replacement materials.
		2. Installer Warranty
			1. This special warranty extends the period of limitations contained in the General Conditions. The installer warranty will be countersigned by the installer and the manufacturer. The installer warrants the work of this section to be in accordance with the Contract Documents and free from faults and defects in materials and workmanship for a period of one (1) year.
2. Products
	1. FLOOR HEATING SYSTEM
		1. Manufacturer
			1. Basis of Design Manufacturer: Subject to the compliance with requirements, provide nVent NUHEAT floor heating products courtesy of **nVent Thermal Management, LLC Richmond, BC**

Phone: 800-778-9276

Email: RES.customercare@nvent.com

Website: [**www.nuheat.com**](http://www.nuheat.com)

* + - 1. Provide specified product; Owner will not consider substitution requests.
		1. Materials
			1. Floor Heating Mat(s)
				1. Floor Heating Mat(s) should be shown in the drawings, carefully defining required locations, dimensions, heights, and heat output required to deliver the appropriate amount of perimeter heating.
				2. Thermostat(s) should be shown in the drawings, carefully defining required location(s).
				3. Where indicated on the drawings and elsewhere as required, provide a heating mat using one of those listed on the “Tested Materials“ list of the Underwriter’s Laboratory (UL) or the Canadian Standards Association (CSA) or provide a similar system approved in advance by the Architect.
				4. Basis-of-Design Products:

nVent NUHEAT Mat

Electric radiant floor heating system consisting of a resistance heating wire bonded in a pre-configured pattern between two porous layers of fabric.

The pre-formed electric floor heating product is manufactured to fit the shape of the heated floor area, without the need for on-site alterations or configuration, to ensure evenly distributed warmth throughout the floor.

Heating product thickness shall not exceed 1/8 inch (3.2 mm).

The system must be protected by a minimum, non-prorated, 25-year warranty.

The system must be approved for use under ceramic tile, marble, other natural stone, laminate, engineered wood, and luxury vinyl floor coverings.

nVent NUHEAT Signature Thermostat

Technical details:

Dual voltage: 120/240 Volts AC at 60 Hz.

15 A maximum (resistive load)

1800 W at 120 V, 3600 W at 240 V

Class A GFCI (5 mA trip level)

UL C/US Approved/Listed

Wi-Fi Enabled: 802.11 b/g/n

7-day programmability

10K Ω floor sensing probe

Built-in ambient air temperature sensor

Provision to allow user to limit floor temperature to 82 deg F (28 deg C) for laminate, engineered wood, or luxury vinyl floor coverings

Remotely operable via free iOS and Android apps or a web portal that offers control multiple thermostats for different zones/rooms/homes

Control integrations for smart home products including Amazon Alexa, Google Assistant, Google Nest, IFTTT, Control4, and custom integration using Open API

Tracks and displays hourly, weekly, and monthly energy usage.

Compatible with any electric floor heating system using 10K Ω floor sensor

English/French/Spanish display language options

12-hour and 24-hour clock display options

Fahrenheit and Celsius temperature display options

Adjustable screen brightness

The thermostat must be protected by a minimum, non-prorated, 3-year warranty

* + - 1. Approval
				1. All system components shall be UL Listed and CSA Certified for floor heating.
				2. All system components shall come with an installation and operation instructions.
1. Execution
	1. Examination
		1. Substrate Examination
			1. Verify that subfloor structures to be covered with floor heating product(s) and floor covering materials are sound, conform to accepted design/engineering practices, and are sufficiently rigid with maximum deflection of L/360 distributed uniformly over the span.
			2. Concrete shall be cured a minimum of twenty-eight (28) days at 70°F with a saturated surface dry (SSD) condition, including an initial seven (7) day period of wet curing prior to installation of the floor heating system.
			3. Concrete slab(s) to have steel trowel or light broom finish when floor heating system is to be installed using thin-set mortar.
			4. Substrate must be clean and free of dirt, oil, grease, sealers, curing compounds, form oil, loose plaster, paint, and scale in order to install the floor heating system.
	2. Preparation
		1. Examine the areas and conditions under which work described in this section will be performed. Correct conditions detrimental to timely and proper completion of the work. Do not proceed until unsatisfactory conditions are corrected.
		2. Coordinate with other trades as needed to assure that proper substrata are provided to receive the work of this section.
			1. Horizontal surfaces shall be level within one quarter of an inch (1/4”) for every ten feet (10’) in all directions.
		3. Condition of surfaces to receive floor heating (product(s):
			1. Verify that surfaces to receive mortar setting bed and floor heating product(s) are firm, dry, clean, and free from dust, wax, grease, sealers, and all other contamination which may reduce or prevent adhesion.
			2. Verify that the concrete has been heavily scarified if curing compounds have been used.
			3. Verify that grounds, anchors, plugs, recess frames, bucks, electrical work, mechanical work, and similar items under the floor heating product(s) have been installed before proceeding with the installation of the floor heating product(s).
			4. Advise General Contractor and Architect of any surface or substrate conditions requiring correction before tile work commences. Beginning of work constitutes acceptance of substrate or surface conditions.
	3. Installers
		1. Acceptable Installers
			1. Subject to compliance with requirements of Contract Documents, installer shall have minimum one (1) year documented experience with installations of similar scope, materials, and design.
	4. Installation
		1. General
			1. Comply with pertinent provisions of the referenced standards, except as otherwise directed by the architect or specified herein.
			2. Maintain minimum temperature limits and installation practices recommended by materials manufacturers.
		2. Do not begin installation of the floor heating product(s) until it has been tested and accepted.
			1. To confirm the proper power consumption of the floor heating product(s) and to confirm that there is no short to ground, perform the insulation and resistance test on the ground braid and each conductor wire as per installation instructions provided. Ensure that the resistance reading is within the range of plus 10% to minus 5% of the resistance rating listed on the product tag(s) as per installation instructions provided with the floor heating product(s). Mark the test results on the warranty card provided and ensure they match manufacturer’s recorded information on the floor heating product tag(s) as per installation instructions provided with the floor heating product(s). If system does not pass insulation and resistance testing, contact nVent NUHEAT technical services at (800) 778-9276.
		3. Install according to TCNA installation methods and written instructions
			1. TCNA #RH 130 EGP (Exterior Glue Plywood) Latex-Portland Cement Mortar
			2. TCNA #RH 135 Cementitious Backer Units/Fibre Cement Underlayment
			3. Floor Warming Systems UL 1693; CSA-C22.2 No.130-03; NEC Article 424
		4. Subfloor – 19/32” exterior-glue plywood on joists every 16” on center. Gaps between plywood sheets to be treated per setting material manufacturer’s recommendations.
		5. Electrical connections shall be performed by a licensed electrician or otherwise appropriately qualified electrical contractor.
		6. Apply coat of polymer-modified thinset mortar to the subfloor using a quarter-inch (1/4”) square notched trowel. Roll the floor heating mat(s) into the thinset material. Using a grout float, smooth out all air bubbles or folds. Ensure bond between floor heating mat(s) and thinset conforms to at least 80% coverage.
		7. Perform a second resistance and insulation test on the floor heating product(s) prior to installation of floor covering products as described above in 3.4 (B) (1). If system does not pass insulation and resistance testing, contact nVent NUHEAT technical services at (800) 778-9276.
		8. Route the cold lead wires to the thermostat location and install the thermostat sensor probe wire as described in the installation instructions provided with the floor heating system.
		9. Install compatible floor covering materials according to architectural specifications sections.
	5. Connections
		1. Ground equipment in accordance with Section 260526 "Grounding and Bonding for Electrical Systems."
		2. Connect wiring in accordance with Section 260519 "Low-Voltage Electrical Power Conductors and Cables."
	6. PROTECTION
		1. Protect finished installation. Close areas to other trades and traffic until floor covering materials has set and/or cured correctly. Keep traffic off horizontal Portland cement thick bed mortar installations for at least seventy-two (72) hours at 70°F (21°C).
		2. Replace or restore work of other trades damaged or soiled by work under this section.

End of Section