SECTION 22 0535

Electric Heat Tracing SYSTEMS

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LANL MASTER SPECIFICATION SECTION

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| Rev. 1 Summary of changes Added Articles *Related Sections* and *References*, and minor editorial updates. |

Word file at <http://engstandards.lanl.gov>

This template must be edited for each project. In doing so, specifier must add job-specific requirements. Brackets are used in the text to indicate designer choices or locations where text must be supplied by the designer. Once the choice is made or text supplied, remove the brackets. The specification section must also be edited to delete requirements for processes, items, or designs that are not included in the project -- and specifier’s notes such as these. To seek a variance from requirements in this section that are applicable, contact the Engineering Standards Manual Mechanical[POC](http://engstandards.lanl.gov/POCs.shtml#mech). Please contact POC with suggestions for improvement as well.

When assembling a specification package, include applicable specifications from all Divisions, especially Division 1, General Requirements.

This template was developed for ML-4 projects. For ML-1, 2, and 3 applications, additional requirements and independent reviews should be added if increased confidence in procurement or execution is desired; see ESM Chapter 1 Section Z10 Specifications and Quality Sections.

For additional guidance and information on freeze protection, refer to LANL Engineering Standards Manual Chapter 6, Mechanical Section D20, Plumbing/Piping/Vessels.

This section is not adequate for fire water or other critical systems because it lacks supervisory controls (see specifier note at Article *Temperature Control*)

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1. GENERAL
	1. SECTION INCLUDES
		1. Electric heat tracing systems for the freeze protection of [potable, non-potable, hydronic and process] piping.
	2. RELATED SECTIONS
		1. Section 01 2500*, Substitution Procedures.*
		2. Section 01 3300*, Submittal Procedures.*
		3. Section 22 0554*, Identification for Plumbing, HVAC, and Fire Piping and Equipment.*
		4. Section 22 0713, *Plumbing and HVAC Insulation.*
		5. Section 22 1100, *Facility Water Distribution.*
		6. Section 23 2113, *Hydronic Piping.*
		7. Section 26 0519, *Low Voltage Electrical Power Conductors and Cables*.
		8. Section 26 0526, *Grounding and Bonding for Electrical Systems*.
	3. REFERENCES
		1. ASME A13.1, *Scheme for the Identification of Piping Systems*
		2. NECA 1, *Standard for Good Workmanship in Electrical Construction*
		3. NECA 202, *Standard for Installing and Maintaining Industrial Heat Tracing Systems*
		4. NFPA 70, *National Electric Code*
	4. ACTION SUBMITTALS
		1. Submit the following in accordance with Section 01 3300, *Submittal Procedures*:
			1. Catalog Data: Submit catalog data for heater cable, thermostat, controls, fittings, indicator light, and pipe markers.

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Edit the following subparagraph to match project requirements; delete if not needed. Shop Drawings are usually not warranted for simple, single-circuit electric heat tracing installations on piping systems smaller than 2 inches. Shop Drawings are always warranted for heat tracing systems with multiple circuits, or with piping 2 inches and larger, or with complicated layouts (e.g., cooling towers).

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* + - 1. [Shop Drawings: Submit composite wiring and/or schematic diagrams of the complete system as proposed to be installed (standard diagrams will not be acceptable). Include the following:
				1. Actual location, length, routing, and rating of each heating cable.
				2. Pipe size for each pipe.
				3. Location of branch circuit connections, including conductor size and overcurrent rating recommended for each branch circuit.
				4. Location of terminations, thermostats, pipe markers, etc.
				5. Expected current draw of each heating cable (Data to be used in conjunction with system acceptance test).
				6. Bill of materials.]
	1. INFORMATIONAL SUBMITTALS
		1. Submit the following in accordance with Section 01 3300, *Submittal Procedures*:
			1. Installation Instructions: Indicate application conditions and limitations of use stipulated by Product testing agency specified under Article [1.6] *Quality Assurance*. Include instructions for storage, handling, protection, examination, installation, and starting of Product.
			2. Operation and Maintenance Instructions: Submit operation and maintenance instructions.
			3. Warranty: Provide a 3-year parts warranty, on materials and workmanship, and 1-year labor warranty beginning on the date of acceptance by LANL. This warranty is in addition to, and not a limitation of, other rights and remedies LANL may have under the Subcontract Documents.
			4. Submit records of inspections, tests, and adjustments described in Article [3.5] *Field Quality Control*.
	2. QUALITY ASSURANCE
		1. Comply with the NFPA 70 for components and installation.
		2. Provide products that are listed and labeled by a Nationally Recognized Testing Laboratory (NRTL) for the application and environment in which installed.
	3. RECEIVING, STORING AND PROTECTING
		1. Receive, store, and protect, and handle products according to NECA 1 and NECA 202
1. PRODUCTS
	1. PRODUCT OPTIONS AND SUBSTITUTIONS
		1. Alternate products may be accepted; follow [Section 01 2500](http://www.lanl.gov/f6stds/pubf6stds/conspec/htmls/csindex.htm#Div1), *Substitution Procedures.*
	2. GENERAL
		1. Furnish electric heat tracing system(s) as shown on the drawings with all components, controls, and accessories required for a complete and operating system.
	3. HEATER CABLE
		1. Furnish NRTL-listed self-regulating heater cable that will vary its power output relative to the temperature of the surface of the protected pipe. The cable shall be designed such that it can be crossed over itself and cut to length in the field.
		2. Furnish heater cable that is capable of operating at [120] [ ] volts, or as shown on the drawings, without the use of special transformers.
		3. Furnish heater cable with nominal power output [ 3 ] [ ] watts per foot at 50 degrees F or not less than that indicated on the drawings.
		4. The heating cable shall consist of two 16 AWG or larger stranded, [nickel] plated copper bus wires, embedded in a polymeric conductive core that controls heat output.
		5. An inner thermoplastic jacket shall be extruded over the core and bonded to the heating core to prevent moisture penetration and wicking along the core.
		6. A second electrical dielectric thermoplastic jacket shall be extruded over the inner jacket.
		7. A tinned copper braid shall be applied over the second dielectric jacket.
		8. The braid shall be protected by a flame-retardant fluoropolymer outer jacket.
		9. Manufacturer: Nelson Heat Tracing Systems Type LT-J.

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Edit the following article to match project requirements; complex electric heat tracing systems or heat tracing that protects critical piping systems may warrant more sophisticated control, monitoring, and alarm systems than the following. Discuss with the LANL ESM Chapter 6 POC.

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* 1. TEMPERATURE CONTROL
		1. Furnish NRTL-listed mechanical, bulb and capillary thermostats as indicated on the drawings that are suitable for the location, voltage, and load.
		2. Thermostat enclosure shall be NEMA 4X.
		3. Capillary shall be not less than 3 feet.
		4. Thermostat contacts shall be rated for not less than 22 A at 250 VAC.
		5. Manufacturer: Nelson Heat Tracing Systems, Type [TF4X40] [ ].
	2. CONNECTION KITS
		1. Furnish non-metallic connection kits that are suitable for interfacing the building wiring with the heater cables, connecting two heater cables in an in-line configuration, or connecting three heater cables in a tee splice configuration.
		2. Furnish an end-of circuit indicating light assembly at the end of each heater cable. Assembly shall contain low-temperature LEDs and be suitable for operation on [120] [ ] VAC systems.
		3. Manufacturer: Nelson Heat Tracing Systems, PLT Series.
	3. PIPE MARKERS
		1. Furnish pipe markers with the words “ELECTRIC TRACED” printed with UV-stable black ink on a durable yellow background. Meet the requirements of ASME A13.1. Provide materials and styles that meet the project requirements and that are suitable for indoor and outdoor environments.
		2. Manufacturers:
			1. Labelmaster
			2. Nelson Heat Tracing Systems
			3. Compliance Signs.
1. EXECUTION
	1. EXISTING WORK
		1. Remove exposed abandoned electric heat tracing material. Patch surfaces where materials are removed.
		2. Disconnect abandoned electric heat tracing systems and remove.
	2. EXAMINATION
		1. Verify that work of other trades likely to damage heater cable has been completed.
		2. Verify that field measurements are as shown on the drawings.
	3. PREPARATION
		1. Examine equipment and building finishes that are to receive grounding and bonding material for compliance with installation tolerances and other conditions. Do not proceed with installation until unsatisfactory conditions have been corrected.
		2. Do not install heater cable before piping system has been pressure tested and accepted by LANL.
	4. INSTALLATION
		1. Comply with the requirements of NFPA 70, Article 427, this Section, and the drawings.
		2. Install electric heat tracing system according to manufacturer's instructions. Ensure the manufacturer’s installation instructions are available at the construction site.
		3. Install electric heat tracing system in accordance with NECA 202.
		4. Install electric heating cables after piping has been pressure tested and before insulation is installed.
		5. Install heater cable to allow easy removal of maintenance items such as pumps, valves, strainers, or filters.
		6. Waterproof all terminations and electrical connections.
		7. Attach heater cable directly to the pipe using the heating cable manufacturer’s adhesive backed glass fiber tape at one foot intervals.
		8. Attach thermostat bulb directly to the pipe using the heating cable manufacturer’s adhesive backed glass fiber tape. Set thermostat to 40 degrees F.
		9. Protect electric heat tracing systems with “ground-fault equipment protection” (GFEP) circuit breakers or relays that are sensitive to leakage currents at a 30 milliampere level.
		10. Connect wiring in accordance with Section 26 0519, *Low Voltage Electrical Power Conductors and Cables*.
		11. Ground equipment in accordance with Section 26 0526, *Grounding and Bonding for Electrical Systems*.
		12. Install insulation over piping with electric heating cables in accordance with Section 22 0713, *Plumbing and HVAC Insulation*.
		13. Label Piping in accordance with Section 22 0554, *Identification for Plumbing, HVAC, and Fire Piping and Equipment*.
		14. Install signs at maximum 20 foot intervals along pipe insulation reading: “ELECTRIC TRACED.” Install labels so they will be visible during normal operations.
	5. FIELD QUALITY CONTROL
		1. Inspect, test, and adjust electric heat tracing system in accordance with NECA 202.
			1. Notify the LANL Subcontract Technical Representative (STR) ten (10) working days in advance of the expected completion of the system installation. Verification and testing can be scheduled in parts or by area depending on the system and construction schedule.
			2. In addition to standard acceptance tests, perform insulation resistance testing in accordance with NECA 202.
		2. Remove and replace defective, incorrect, or improperly installed heat tracing system components. Re-inspect and re-test replacement components.
		3. For each electric heat tracing system, keep a record of inspections, tests and adjustments using the “Heater Commissioning Record” in NECA 202. Submit test and inspection records to the LANL STR.

END OF SECTION

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Do not delete the following reference information:

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THE FOLLOWING STATEMENT IS FOR LANL USE ONLY

This project specification is based on LANL Master Specification Section 22 0535 Rev. 1, dated October 21, 2024.