SECTION 22 05 33 – domestic hot water heat maintenance tracing

1. GENERAL
	* + 1. RELATED DOCUMENTS
				1. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.
				2. Specifications throughout all Divisions of the Project Manual are directly applicable to this Section, and this Section is directly applicable to them.
			2. SUMMARY
				1. Furnish and Install a UL Listed, CSA Certified and FM Approved system of electric self-regulating heating cable, connection kits and electronic controller for maintaining the domestic hot water distribution temperature as indicated on the Contract Drawings.
			3. REFERENCE STANDARDS
				1. The latest published edition of a reference shall be applicable to this Project unless identified by a specific edition date.
				2. All reference amendments adopted prior to the effective date of this Contract shall be applicable to this Project.
				3. All materials, installation and workmanship shall comply with the applicable requirements and standards addressed within the following references:

2009 Edition of the International Plumbing Code.

Underwriters Laboratories Listings.

2008 Edition of the National Electric Code

* + - 1. QUALITY ASSURANCE
				1. Heat maintenance cable system components shall be specifically designed, manufactured and UL Listed, CSA Certified and FM Approved for hot water temperature maintenance.
				2. Manufacturer’s name, product name, temperature classification and voltage rating shall be permanently marked on outer jacket of cable.
				3. All materials shall be new and undamaged.
				4. Manufacturer Qualifications: Company shall have minimum five years documented experience specializing in manufacturing the products specified in this section.
				5. Installer Qualifications: Company shall have minimum three years documented experience specializing in performing the work of this section.
				6. Provide for the service of a trained representative for the manufacturer to provide installation instructions, inspect and test the completed installation, and acquaint the operators with the operation and maintenance of the system.
			2. SUBMITTALS
				1. Product Data:

Provide Code and Standards compliance, manufacturer’s Installation instructions, manufacturer's data showing materials and performance data for all products included within this specification section.

* + - * 1. Record Documents:

Record actual circuit lengths and locations of power connections, splice tees and end terminations.

Provide full written description of manufacturer’s warranty.

Copy of UL, CSA and FM file indicating the heating cable is specifically intended to provide supplementary heating to hot water service supply systems utilizing thermally insulated metal pipe.

Submit test reports and inspection certification for all systems listed herein. Provide completed warranty form to the Owner.

Submit floor plans, prepared by the heat maintenance tracing manufacturer, indicating location of required power connections, breaker sizes, splice tees, end terminations, insulation thicknesses and circuit lengths.

Installing Contractor shall submit list of at least three projects, installed with at least 500 feet of heating cable in each project.

* + - * 1. Operation and Maintenance Data:

Operation and Maintenance Data: Include components of system, servicing requirements, Record Drawings, inspection data, test reports, installation instructions, replacement part numbers and availability, location and contact numbers of service depot.

* + - 1. DELIVERY, STORAGE and HANDLING
				1. Accept products on Site in shipping containers and maintain in place until installation.
				2. Provide temporary protection for components not packaged within containers. Maintain in place until installation.
				3. Protect materials from damage during installation, completing sections of the work and isolating parts of completed system.
				4. Protect all materials that are to be installed within this project from exposure to rain, freezing temperatures and direct sunlight.
1. PRODUCTS
	* + 1. GENERAL
				1. All materials shall meet or exceed all applicable referenced standards, federal, state and local requirements, and conform to codes and ordinances of authorities having jurisdiction. Provide materials as specified herein and where indicated on Contract Drawings.
				2. Temperature and electrical ratings of cable, power connections, splice tees, end terminations, and all other appurtenances shall be suitable for the anticipated system temperatures and voltages in which they are installed.
				3. All cable, splice tees, end terminations and associated system components shall be Raychem, “HWAT” manufactured by Tyco Thermal Controls.
			2. CABLE
				1. The self-regulating heating cable shall consist of two 16 AWG nickel-coated copper bus wires embedded in a radiation-crosslinked conductive polymer core covered by a radiation-crosslinked, polyolefin, dielectric jacket surrounded by a polymer-coated aluminum wrap, and enclosed in a tinned copper braid of 14 AWG equivalent wire size. The braid shall be covered with a (nominal) 40 mil (1 mm) polyolefin outer jacket, color coded for easy identification.
				2. The cable shall have a minimum cut-through resistance of 100 lb (445 N) per the IEEE 515.1 (4.3.3) and CSA 130-03 (6.28) Resistance to Cutting Tests.
				3. The cable shall have a minimum impact resistance of 10 ft-lbs per the IEEE 515.1 (4.2.9) and CSA 130-03 (6.2.10.2) Impact Tests.
				4. The cable shall have a minimum abrasion resistance of 2500 cycles per the IEEE 515.1 (4.3.4) Abrasion Test.
				5. The cable shall withstand a crush resistance of 225 lbs per the IEEE 515.1 (4.2.8) Deformation Test, and withstand a crush resistance of 345 lbs (1500 N) per the CSA 130-03 (6.2.7) Crush Resistance Test.
			3. CONNECTION KITS
				1. Component enclosures shall be rated NEMA 4X to prevent water ingress and corrosion.
				2. Installation shall not require the installing Contractor to cut into the heating cable core to expose the bus wires. Connection systems requiring the installing Contractor to strip the bus wires, or which use crimps or terminal blocks, shall not be acceptable.
				3. The end seal shall use silicone gel.
			4. CONTROLLER
				1. Each installed system shall include at least one approved electronic controller. The controller shall not be of line sensing over-limit design.
				2. The controller shall be capable of setting different pipe temperatures based on ambient and voltage with 24 hour, 7 day/week programmable options.
				3. The controller shall have the energy savings feature of lowering pipe temperature during low use periods and the ability to raise the temperature of the pipes for a programmed interval.
				4. The controller shall have BMS interface capabilities to set pipe temperatures and provide alarm relays in loss of power, incorrect water heater temperature and communication failure.
				5. The controller shall have flexible wiring configurations to operate individually or control up to eight additional controllers.
			5. warranty
				1. Self-regulating heating cables and components shall have a 10-year warranty extension from the date of installation. Installing Contractor shall properly complete manufacturer's required warranty form within 30 days from the date of installation.
2. EXECUTION
	* + 1. ExaminATION
				1. Verify that piping is clean and dry prior to attaching cable. Do not install cable when piping surface exceeds ambient temperature.
			2. INSTALLATION
				1. Installation shall meet or exceed all applicable federal, state and local requirements, referenced standards and conform to codes and ordinances of authorities having jurisdiction.
				2. All installation shall be in accordance with manufacturer’s published recommendations.
				3. Plumber shall purchase all material, and is responsible for entire system, including testing before and after insulation. Installation, including all splices, tees and end terminations, shall be performed by plumbing Contractor, with the exception of any power connections, which shall be installed and connected to power by the Project's Electrical Contractor. The Plumbing Contractor may sub-Contract the services of the Project's Electrical Contractor to perform cable installation, including all splices, tees and end terminations and power connections.
				4. All materials and products shall be installed in accordance with manufacturer’s published recommendations. Use tools manufactured for the installation of the specific material or product.
				5. Secure the heater cable to piping with in accordance with manufacturer’s recommendations.
				6. Do not install heat maintenance cable until domestic water piping has been tested and approved.
				7. Heat generated by soldering procedures shall not be transmitted to cable, splices, tees, end terminations or any other components installed within the system that may be damaged due to high temperatures. Contractor shall take all precautions necessary and allow heated piping to cool to ambient temperature before attachment.
				8. All connection kits except for the power connection shall be installed under the piping thermal insulation.
				9. Each circuit shall be protected with a 30-MA ground fault protection device and be supplied and power with the electrical service. Circuit lengths shall not exceed manufacturer's recommendations.
				10. Cable system components shall not interfere with operation of or access to valves, air vents, drains, unions, etc.
				11. Apply a permanent "Electric Heat Tracing-Caution" label every 10 to 15 feet to indicate the presence of electrically traced piping after the insulation and moisture barrier have been applied.
			3. TESTING
				1. Tests shall be performed in accordance with manufacturer’s published recommendations.
				2. Test heat maintenance cable systems after the pipe insulation has been installed and prior to the installation of wall or ceiling panels.
				3. Each and every test shall be witnessed by the Resident Construction Manager and the manufacturer’s authorized representative.
				4. Measure the heater circuit continuity and the insulation resistance between the braid and the bus wires with a 2500 Vdc megohmmeter (megger).
				5. The heater circuit shall be continuous and megger readings shall be at least 1000 megohm regardless of the heater length. Circuits yielding unacceptable readings must be repaired or replaced.
				6. Prepare testing reports. All tests shall be recorded, describing date, persons involved and results. If testing is performed in segments, submit separate report for each segment, complete with diagram or clear description of applicable portion of piping. After inspection has been approved or portions thereof, certify in writing the time, date, name and title of the persons reviewing the test. This shall also include the description of what portion of the system has been approved. Obtain approval signature by Owner’s Representative. A complete record shall be maintained of all testing that has been approved, and shall be made available at the job Site. Upon completion of the work, all records and certifications approving testing requirements shall be submitted to the Owner’s Representative before final payment is made.
				7. Verify systems are complete. Where any portion of system must be concealed before completion of entire system, the portion shall be tested separately as specified for the entire system prior to concealment.
				8. Defective work or material shall be reworked and replaced, and inspection and test repeated. Repairs shall be made with new materials. Electrical tape shall not be used to correct deficiencies.
				9. Should the completion of these tests leave any reasonable question of a doubt relative to the integrity of the installation, additional tests or measures shall be performed to demonstrate the reliability of these systems to the complete satisfaction of the Owner’s Representative.

END OF SECTION 22 05 33