

SECTION 235523.13 - LOW-INTENSITY, GAS-FIRED, RADIANT HEATERS

TIPS:

To view non-printing **Editor's Notes** that provide guidance for editing, click on Masterworks/Single-File Formatting/Toggle/Editor's Notes.

To read **detailed research, technical information about products and materials, and coordination checklists**, click on Masterworks/Supporting Information.

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

- A. Section includes low-intensity, gas-fired, **[forced-draft]** **[draft-induced]** **[multiple-burner]** radiant heaters.

1.3 ACTION SUBMITTALS

- A. Product Data: For each type of product.
 - 1. Include rated capacities, operating characteristics, electrical characteristics, and furnished specialties and accessories.
- B. Shop Drawings:
 - 1. Signed, sealed, and prepared by or under the supervision of a qualified professional engineer.
 - 2. Include plans, elevations, sections, and **[mounting]** **[attachment]** details.
 - 3. Include details of equipment assemblies. Indicate dimensions, weights, loads, required clearances, method of field assembly, components, and location and size of each field connection.
 - 4. Detail fabrication and assembly of high-intensity, gas-fired, radiant heaters, as well as procedures and diagrams.
 - 5. Include diagrams for power[, **signal, and control**] wiring.

1.4 INFORMATIONAL SUBMITTALS

- A. Coordination Drawings: Plans, elevations, and other details, drawn to scale, on which the following items are shown and coordinated with each other, using input from installers of the items involved:
 - 1. Structural members to which equipment will be attached.
 - 2. Gas piping to heater installations
 - 3. Thermostats and wiring to heaters.
 - 4. Heater locations and clearance requirements.
 - 5. Other suspended ceiling components including the following:
 - a. Lighting fixtures.
 - b. Air outlets and inlets.
 - c. Sprinklers.
 - d. **<Insert item>**.
- B. Field quality-control reports.
- C. Sample Warranty: For manufacturer's special warranties.

1.5 CLOSEOUT SUBMITTALS

- A. Operation and Maintenance Data: For gas-fired, radiant heaters to include in emergency, operation, and maintenance manuals.

1.6 MAINTENANCE MATERIAL SUBMITTALS

- A. Furnish extra materials that match products installed and that are packaged with protective covering for storage and identified with labels describing contents.
 - 1. Igniter: **[One]** **<Insert number>** hot-surface burner igniter(s) for each style of high-intensity, gas-fired, radiant heater furnished.

1.7 WARRANTY

- A. Manufacturer's Special Warranty: Manufacturer agrees to repair or replace components of radiant heaters that fail in materials or workmanship within specified warranty period.
 - 1. Warranty Period: All warranty periods listed below are from date of Substantial Completion.
 - a. Burner Assembly: **[Three]** **[Five]** **[10]** **<Insert number>** years.
 - b. Combustion and Emitter Tubes: **[Two]** **[Three]** **[Five]** **<Insert number>** years.
 - c. Heater Controls: One **<Insert number>** year(s).

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

- A. CSA certified, with CSA Seal and certification number clearly visible on units indicating compliance with ANSI Z83.20/CSA 2.34.
- B. UL listed and labeled, with UL label clearly visible on units indicating compliance with ANSI Z83.20/CSA 2.34.
- C. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.

2.2 FORCED-DRAFT HEATERS

- A. [<Double click here to find, evaluate, and insert list of manufacturers and products.>](#)
- B. Description: Factory-assembled, [**indoor**] [**outdoor**], overhead-mounted, electrically controlled, low-intensity, infrared radiant heating units using gas combustion. Heater to have all necessary factory-installed wiring and piping required prior to field installation and startup.
- C. Fuel Type: Design burner for [**natural**] [**propane**] gas having characteristics same as those of gas available at Project site.
- D. Burner Assembly:
 - 1. Combustion-Air Inlet: Non-ducted, unvented.
 - 2. Combustion-Air Inlet: Ducted horizontal to outdoors through sidewall with vent caps.
 - 3. Combustion-Air Inlet: Ducted vertical to outdoors through roof with vent caps.
 - 4. Burner Control Housing: [**Stainless steel**] [**Corrosion-resistant, aluminized steel**] [**Steel**].
 - a. Totally enclosed with [**stainless-steel**] [**steel**] access cover.
 - b. Sight glass for visual inspection of burner.
 - c. Finish: [**Enameled finish**] [**or**] [**powder-coated finish**].
 - 5. Burner: [**Stainless steel**] [**One-piece cast iron**].
 - 6. Ignition System: [**Silicon carbide hot-surface igniter**] [**Direct spark**] [**24/25-V ac**] [**115/120-V ac**] with flame rod sensing capabilities[**and self-diagnostic control module**].
 - 7. Combustion Blower Fan: Dynamically balanced, direct-driven, forward-curved fan with [**cast-aluminum-alloy**] [**stainless-steel**] **<Insert material>** impeller and [**aluminized-steel**] housing, with a minimum temperature rating of **450 deg F (232 deg C)**.
 - 8. Motors: General requirements for motors are specified in Section 230513 "Common Motor Requirements for HVAC Equipment."
 - a. Motor: Resilient-mounted, capacitor-start-capacitor-run type with sealed ball bearings; totally enclosed, nonventilated type with internal thermal protection.

- b. Motor Sizes: Minimum size as indicated. If not indicated, large enough so driven load will not require motor to operate in service factor range above 1.0.
- E. Combustion Chamber: ~~4-inch-~~ (100-mm-) diameter, [12] [16]-gage, [aluminized] [titanium-coated aluminized] [stainless] [hot-rolled]-steel tubing with high-emissivity, high-temperature, corrosion-resistant external finish. Chambers shall be equipped with sight glass for burner and pilot flame observation.
- F. Emitter Tube: [~~4-inch-~~ (100-mm-)] [~~3-inch-~~ (76-mm-)] diameter, [12] [16]-gage, [aluminized] [hot-rolled] [stainless] [titanium-coated aluminized]-steel tubing with high-emissivity, high-temperature, corrosion-resistant external finish. [Emitter tubing shall be equipped with baffles to maximize heating efficiency.]
 - 1. Tubing Connections: [Stainless-steel threaded couplings] [Interlocking flare joints with stainless-steel draw bolts] [Compression couplings made from aluminized or stainless steel].
 - 2. [90] [180]-degree-bend emitter steel tubing with high-emissivity, high-temperature, corrosion-resistant external finish.
 - 3. Exhaust Vent Termination: [Vertical through roof] [Horizontal through side wall] with vent caps.
- G. Reflector: [Polished aluminum] [Polished stainless steel] [High-grade steel with a heat- and corrosion-resistant, hot-bonded, aluminum-silicon alloy coating], with end caps. Shape to control radiation from tubing for uniform intensity at floor level with 100 percent cutoff above centerline of tubing. Reflectors or entire heater shall accommodate rotational adjustment from horizontal to a minimum 30-degree tilt from vertical.
- H. Accessories:
 - 1. Reflector Extension Shields: Same material as reflectors, arranged for fixed connection to lower reflector lip and rigid support to provide 100 percent cutoff of direct radiation from tubing at angles greater than 30 degrees from vertical.
 - 2. Protective grilles mounted to reflectors to protect emitter tubing.
 - 3. Stainless-steel flexible connector with manual valve for gas supply.
 - 4. Hanger chain with "S" hooks.
 - 5. ~~3/16-inch-~~ (5-mm-) diameter, [galvanized][aluminized]-steel wire tubing hangers and reflector supports.
 - 6. Rigid mounting kits.
 - 7. Outdoor use conversion kit.
 - 8. Clearance warning plaque.
- I. Capacities and Characteristics:
 - 1. Gas Input: <Insert Btu/h (kW)>.
 - 2. Gas Output: <Insert Btu/h (kW)>.
 - 3. Fuel-Supply Connection: <Insert inches (mm)>.
 - 4. Combustion-Air Fan Motor Size: <Insert value> hp.
 - a. Volts: [120] [208] [230] <Insert value> V.
 - b. Phase: [Single] [Three].
 - c. Hertz: 60.

- d. Full-Load Amperes: **<Insert value>**.
- e. Minimum Circuit Ampacity: **<Insert value>**.
- f. Maximum Overcurrent Protection: **<Insert amperage>**.

2.3 DRAFT-INDUCED HEATERS

- A. [<Double click here to find, evaluate, and insert list of manufacturers and products.>](#)
- B. Description: Factory-assembled, [**indoor**] [**outdoor**], overhead-mounted, electrically controlled, low-intensity, infrared radiant heating units using gas combustion. Heater to have all necessary factory-installed wiring and piping required prior to field installation and startup.
- C. Fuel Type: Design burner for [**natural**] [**propane**] gas having characteristics same as those of gas available at Project site.
- D. Burner Assembly:
 - 1. Combustion-Air Inlet: Non-ducted, unvented.
 - 2. Combustion-Air Inlet: Ducted horizontal to outdoors through sidewall with vent caps.
 - 3. Combustion-Air Inlet: Ducted vertical to outdoors through roof with vent caps.
 - 4. Burner Control Housing: [**Stainless steel**] [**Corrosion-resistant, aluminized steel**] [**Steel**].
 - a. Totally enclosed with [**stainless-steel**] [**steel**] access cover.
 - b. Sight glass for visual inspection of burner.
 - c. Finish: [**Enameled finish**] [**or**] [**powder-coated finish**].
 - 5. Burner: [**Stainless steel**] [**One-piece cast iron**].
 - 6. Ignition System: [**Silicon carbide hot-surface igniter**] [**Direct spark**] [**24/25-V ac**] [**115/120-V ac**] with flame rod sensing capabilities[**and self-diagnostic control module**].
 - 7. Combustion Blower Fan: Dynamically balanced, direct-driven, forward-curved fan with [**cast-aluminum-alloy**] [**stainless-steel**] **<Insert material>** impeller and [**aluminized-steel**] housing, with a minimum temperature rating of **450 deg F (232 deg C)**.
 - 8. Motors: General requirements for motors are specified in Section 230513 "Common Motor Requirements for HVAC Equipment."
 - a. Motor: Resilient-mounted, capacitor-start-capacitor-run type with sealed ball bearings; totally enclosed, nonventilated type with internal thermal protection.
 - b. Motor Sizes: Minimum size as indicated. If not indicated, large enough so driven load will not require motor to operate in service factor range above 1.0.
- E. Combustion Chamber: **4-inch- (100-mm-)** diameter, [**12**] [**16**]-gage, [**aluminized**] [**titanium-coated aluminized**] [**stainless**] [**hot-rolled**]-steel tubing with high-emissivity, high-temperature, corrosion-resistant external finish. Chambers shall be equipped with sight glass for burner and pilot flame observation.
- F. Emitter Tube: [**4-inch- (100-mm-)**] [**3-inch- (76-mm-)**] diameter, [**12**] [**16**]-gage, [**aluminized**] [**hot-rolled**] [**stainless**] [**titanium-coated aluminized**]-steel tubing with high-emissivity, high-

temperature, corrosion-resistant external finish. [**Emitter tubing shall be equipped with baffles to maximize heating efficiency.**]

1. Tubing Connections: [**Stainless-steel threaded couplings**] [**Interlocking flare joints with stainless-steel draw bolts**] [**Compression couplings made from aluminized or stainless steel**].
 2. [**90**] [**180**]-degree-bend emitter steel tubing with high-emissivity, high-temperature, corrosion-resistant external finish.
- G. Vacuum Exhaust Fan: Dynamically balanced, direct-driven, [**cast-aluminum-alloy**] [**stainless-steel**] impeller in aluminized-steel housing, isolated from emitter tubing exhaust system by high-temperature flexible vibration isolation connector. Fan and connector to have a minimum temperature rating of **450 deg F** (**232 deg C**).
1. Motors: General requirements for motors are specified in Section 230513 "Common Motor Requirements for HVAC Equipment."
 - a. Motor: Resilient-mounted, capacitor-start-capacitor-run type with sealed ball bearings; totally enclosed, nonventilated type with internal thermal protection.
 - b. Motor Sizes: Minimum size as indicated. If not indicated, large enough so driven load will not require motor to operate in service factor range above 1.0.
 2. Balancing Dampers: Plate type, mounted in cast, double-flange fitting with vacuum test plug.
 3. Filter: Cartridge type for mounting on burner housing.
 4. Exhaust Vent Termination: [**Vertical through roof**] [**Horizontal through side-wall**] with vent caps.
- H. Reflector: [**Polished aluminum**] [**Polished stainless steel**] [**High-grade steel with a heat- and corrosion-resistant, hot-bonded, aluminum-silicon alloy coating**], with end caps. Shape to control radiation from tubing for uniform intensity at floor level with 100 percent cutoff above centerline of tubing. Reflectors or entire heater shall accommodate rotational adjustment from horizontal to a minimum 30-degree tilt from vertical.
- I. Accessories:
1. Reflector Extension Shields: Same material as reflectors, arranged for fixed connection to lower reflector lip and rigid support to provide 100 percent cutoff of direct radiation from tubing at angles greater than 30 degrees from vertical.
 2. Protective grilles mounted to reflectors to protect emitter tubing.
 3. Stainless-steel flexible connector with manual valve for gas supply.
 4. Hanger chain with "S" hooks.
 5. **3/16-inch- (5-mm-)** diameter, [**galvanized**] [**aluminized**]-steel wire tubing hangers and reflector supports.
 6. Rigid mounting kits.
 7. Outdoor use conversion kit.
 8. Clearance warning plaque.
- J. Capacities and Characteristics:
1. Gas Input: < **Insert Btu/h (kW)** >.

2. Gas Output: <Insert **Btu/h (kW)**>.
3. Fuel-Supply Connection: <Insert **inches (mm)**>.
4. Combustion-Air Fan Motor Size: <Insert value> hp.
 - a. Volts: [**120**] [**208**] [**230**] <Insert value> V.
 - b. Phase: [**Single**] [**Three**].
 - c. Hertz: 60.
 - d. Full-Load Amperes: <Insert value>.
 - e. Minimum Circuit Ampacity: <Insert value>.
 - f. Maximum Overcurrent Protection: <Insert amperage>.
5. Vacuum Exhaust Fan Motor Size: <Insert value> hp.
 - a. Volts: [**120**] [**208**] [**230**] <Insert value> V.
 - b. Phase: [**Single**] [**Three**].
 - c. Hertz: 60.
 - d. Full-Load Amperes: <Insert value>.
 - e. Minimum Circuit Ampacity: <Insert value>.
 - f. Maximum Overcurrent Protection: <Insert amperage>.

2.4 MULTIPLE-BURNER HEATERS

- A. [<Double click here to find, evaluate, and insert list of manufacturers and products.>](#)
- B. Description: Factory-assembled, [**indoor**] [**outdoor**], overhead-mounted, electrically controlled, low-intensity, infrared radiant heating units using gas combustion. Heater to have all necessary factory-installed wiring and piping required prior to field installation and startup.
- C. Fuel Type: Design burner for [**natural**] [**propane**] gas having characteristics same as those of gas available at Project site.
- D. Burner Assembly: <Insert drawing designation>.
 1. Combustion-Air Inlet: Non-ducted, unvented.
 2. Combustion-Air Inlet: Ducted horizontal to outdoors through sidewall with vent caps.
 3. Combustion-Air Inlet: Ducted vertical to outdoors through roof with vent caps.
 4. Burner Control Housing: [**Stainless steel**] [**Corrosion-resistant, aluminized steel**] [**Steel**].
 - a. Totally enclosed with [**stainless-steel**] [**steel**] access cover.
 - b. Sight glass for visual inspection of burner.
 - c. Finish: [**Enameled finish**] [**or**] [**powder-coated finish**].
 5. Burner: [**Stainless steel**] [**One-piece cast iron**].
 6. Ignition System: [**Silicon carbide hot-surface igniter**] [**Direct spark**] [**24/25-V ac**] [**115/120-V ac**] with flame rod sensing capabilities[**and self-diagnostic control module**].
 7. Combustion Blower Fan: Dynamically balanced, direct-driven, forward-curved fan with [**cast-aluminum-alloy**] [**stainless-steel**] <Insert material> impeller and [**aluminized-**]steel housing, with a minimum temperature rating of **450 deg F (232 deg C)**.

8. Motors: General requirements for motors are specified in Section 230513 "Common Motor Requirements for HVAC Equipment."
 - a. Motor: Resilient-mounted, capacitor-start-capacitor-run type with sealed ball bearings; totally enclosed, nonventilated type with internal thermal protection.
 - b. Motor Sizes: Minimum size as indicated. If not indicated, large enough so driven load will not require motor to operate in service factor range above 1.0.

- E. Combustion Chamber: ~~4-inch-~~ (100-mm-) diameter, [12] [16]-gage, [~~aluminized~~] [~~titanium-coated aluminized~~] [~~stainless~~] [~~hot-rolled~~]-steel tubing with high-emissivity, high-temperature, corrosion-resistant external finish. Chambers shall be equipped with sight glass for burner and pilot flame observation.

- F. Emitter Tube: [~~4-inch-~~ (100-mm-)] [~~3-inch-~~ (76-mm-)] diameter, [12] [16]-gage, [~~aluminized~~] [~~hot-rolled~~] [~~stainless~~] [~~porcelain-lined~~] [~~titanium-coated aluminized~~]-steel tubing with high-emissivity, high-temperature, corrosion-resistant external finish. [Emitter tubing shall be equipped with baffles to maximize heating efficiency.]
 1. Tubing Connections: [~~Stainless-steel threaded couplings~~] [~~Interlocking flare joints with stainless-steel draw bolts~~] [~~Compression couplings made from aluminized or stainless steel~~].
 2. [~~90-degree bends~~] [~~180-degree bends~~] [~~Tee fittings~~] [~~Cross fittings~~] made from [~~stainless steel~~] with corrosion-resistant, high-temperature black coating.
 3. Condensing Tubing: ~~4-inch-~~ (100-mm-) diameter, stainless-steel tubing with high-emissivity, high-temperature, corrosion-resistant external finish.

- G. Vacuum Exhaust Fan: Dynamically balanced, direct-driven, [~~cast-aluminum-alloy~~] [~~stainless-steel~~] impeller in aluminized-steel housing, isolated from emitter tubing exhaust system by high-temperature flexible vibration isolation connector. Fan and connector to have a minimum temperature rating of ~~450 deg F~~ (232 deg C).
 1. See [~~Section 230548 "Vibration and Seismic Controls for HVAC"~~] [~~Section 230548.13 "Vibration Controls for HVAC"~~] for mounting vacuum exhaust fan.
 2. Motors: General requirements for motors are specified in Section 230513 "Common Motor Requirements for HVAC Equipment."
 - a. Motor: Resilient-mounted, capacitor-start-capacitor-run type with sealed ball bearings; totally enclosed, nonventilated type with internal thermal protection.
 - b. Motor Sizes: Minimum size as indicated. If not indicated, large enough so driven load will not require motor to operate in service factor range above 1.0.
 3. Balancing Dampers: Plate type, mounted in cast, double-flange fitting with vacuum test plug.
 4. Filter: Cartridge type for mounting on burner housing.
 5. Exhaust Vent Termination: [~~Vertical through roof~~] [~~Horizontal though side wall~~] with vent caps.

- H. Reflector: [~~Polished aluminum~~] [~~Polished stainless steel~~] [~~High-grade steel with a heat- and corrosion-resistant, hot-bonded, aluminum-silicon alloy coating~~], with end caps. Shape to control radiation from tubing for uniform intensity at floor level with 100 percent cutoff above

centerline of tubing. Reflectors shall accommodate rotational adjustment from horizontal to a minimum 30-degree tilt from vertical.

I. Accessories:

1. Reflector Extension Shields: Same material as reflectors, arranged for fixed connection to lower reflector lip and rigid support to provide 100 percent cutoff of direct radiation from tubing at angles greater than 30 degrees from vertical.
2. Protective grilles mounted to reflectors to protect emitter tubing.
3. Stainless-steel flexible connector with manual valve for gas supply.
4. Hanger chain with "S" hooks.
5. ~~3/16-inch-~~ (5-mm-) diameter, [galvanized][aluminized]-steel wire tubing hangers and reflector supports.
6. Rigid mounting kits.
7. Outdoor use conversion kit.
8. Clearance warning plaque.

J. Capacities and Characteristics:

1. Gas Input: <Insert Btu/h (kW)>.
2. Gas Output: <Insert Btu/h (kW)>.
3. Fuel-Supply Connection: <Insert inches (mm)>.
4. Combustion-Air Fan Motor Size: <Insert value> hp.
 - a. Volts: [120] [208] [230] <Insert value> V.
 - b. Phase: [Single] [Three].
 - c. Hertz: 60.
 - d. Full-Load Amperes: <Insert value>.
 - e. Minimum Circuit Ampacity: <Insert value>.
 - f. Maximum Overcurrent Protection: <Insert amperage>.
5. Vacuum Exhaust Fan Motor Size: <Insert value> hp.
 - a. Volts: [120] [208] [230] <Insert value> V.
 - b. Phase: [Single] [Three].
 - c. Hertz: 60.
 - d. Full-Load Amperes: <Insert value>.
 - e. Minimum Circuit Ampacity: <Insert value>.
 - f. Maximum Overcurrent Protection: <Insert amperage>.

2.5 CONTROLS AND SAFETIES

- A. Gas Control Valve: [Single] [Two]-stage, regulated redundant 24-V ac gas valve that contains pilot solenoid valve, electric gas valve, pilot filter, pressure regulator, pilot shutoff, and manual shutoff all in one body.
- B. Failure Safeguards: 100 percent shutoff of gas flow in the event of flame or power failure.
- C. Prepurge of [15] [30] [45] seconds of air control system prior to burner ignition.

- D. Safety lockout of burner after [**three consecutive ignition failures**] [**flame is not reestablished within trial ignition period**].
- E. Blocked Vent Safety: Differential pressure switch in burner safety circuit to stop burner operation with high discharge or suction pressure.
- F. Control Panel Interlock: Stops burner if panel is open.
- G. Indicator Lights: ["**Airflow-on**"] [**and**] ["**burner-on**"] indicator lights.
- H. Thermostat: Devices and wiring are specified in Section 230923.27 "Temperature Instruments."
- I. Thermostat: Single-stage, wall-mounted type with 50 to 90 deg F (10 to 32 deg C) operating range and fan on switch.
 - 1. Control Transformer: Integrally mounted.
- J. Thermostat: Two-stage, wall-mounted type with 50 to 90 deg F (10 to 32 deg C) operating range and fan on switch.
 - 1. Control Transformer: Integrally mounted.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine structures, substrates, areas and conditions, with Installer present, for compliance with requirements for installation tolerances, required clearances, and other conditions affecting performance of the Work.
- B. Examine roughing-in for fuel-gas piping to verify actual locations of piping connections before equipment installation.
- C. Prepare written report, endorsed by Installer, listing conditions detrimental to performance of the Work.
- D. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 INSTALLATION

- A. Equipment Installation: Install gas-fired, radiant heaters and associated gas features and systems according to [**NFPA 54**] [**CSA B149.1**].
- B. Suspended Units: [**Suspend from substrate using chain hanger kits and building attachments**] [**Mount to substrate using manufacturer's rigid mounting kits or custom fabricated brackets**].

1. Restrain the unit to resist seismic acceleration. Comply with requirements for seismic-restraint devices specified in Section 230548 "Vibration and Seismic Controls for HVAC."
 2. Comply with requirements for hangers and supports specified in Section 230529 "Hangers and Supports for HVAC Piping and Equipment."
- C. Maintain manufacturers' recommended clearances for combustibles.

3.3 CONNECTIONS

- A. Gas Piping: Comply with [Section 231123 "Facility Natural-Gas Piping."] [Section 231126 "Facility Liquefied-Petroleum Gas Piping."] Connect gas piping to gas train inlet; provide union with enough clearance for burner removal and service.
1. Gas Connections: Connect gas piping to radiant heaters according to [NFPA 54] [CSA B149.1].
- B. Where installing piping adjacent to gas-fired, radiant heaters, allow space for service and maintenance.
- C. Vent Connections: Comply with Section 233113 "Metal Ducts" and with Section 235123 "Gas Vents."
- D. Electrical Connections: Comply with applicable requirements in Section 260519 "Low-Voltage Electrical Power Conductors and Cables."
1. Install electrical devices furnished with heaters but not specified to be factory mounted.

3.4 FIELD QUALITY CONTROL

- A. Manufacturer's Field Service: Engage a factory-authorized service representative to test and inspect components, assemblies, and equipment installations, including connections.
- B. Perform the following tests and inspections[**with the assistance of a factory-authorized service representative**]:
1. Test and adjust controls and safeties. Replace damaged and malfunctioning controls and equipment.
 2. Verify bearing lubrication.
 3. Verify proper motor rotation.
 4. Test Reports: Prepare a written report to record the following:
 - a. Test procedures used.
 - b. Test results that comply with requirements.
 - c. Test results that do not comply with requirements and corrective action taken to achieve compliance with requirements.
- C. Gas-fired, radiant heaters will be considered defective if they do not pass tests and inspections.
- D. Prepare test and inspection reports.

3.5 ADJUSTING

- A. Adjust initial-temperature set points.
- B. Adjust burner and other unit components for optimum heating performance and efficiency.

3.6 DEMONSTRATION

- A. **[Engage a factory-authorized service representative to train] [Train]** Owner's maintenance personnel to adjust, operate, and maintain gas-fired, radiant heaters.

END OF SECTION 235523.13