



GUIDE SPECIFICATION SRP SERIES VS, VSVH HIGH EFFICIENCY CONTINUOUS INFRARED SYSTEMS

SECTION 15540 – FUEL- FIRED HEATERS

(Alternate - SECTION 235523 - GAS-FIRED RADIANT HEATERS)

This section is based on the products of Superior Radiant Products, located at:

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| <ul style="list-style-type: none">• <u>Canadian Location:</u>
563 Barton St.
Stoney Creek, ON, Canada L8E 5S1 | <ul style="list-style-type: none">• <u>United States Location:</u>
980 Cobb Place Blvd. NW Unit 100
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Superior Radiant Products manufactures a full range of gas fired, high and low intensity infrared space heating equipment.

PART 1 GENERAL

1.1 SECTION INCLUDES

- A. Continuous radiant systems.

1.2 RELATED SECTIONS

- A. Section 15050 – Basic Mechanical Materials and Methods: Fuel service, safety valves and connections.
- B. Section 16050 – Basic Electrical Materials and Methods: Power service and connections.

1.3 REFERENCES

- A. CSA – CSA Group. Canadian Standards Association (CSA).

1.4 SUBMITTALS

- A. Submit under provisions of Section 01300.
- B. Product Data: Manufacturer's data sheets on each product to be used, including:
- C. Rated capacities, operating characteristics and accessories for each type of gas-fired radiant heater.
- D. Preparation instructions and recommendations.
- E. Storage and handling requirements and recommendations.

- F. Installation methods.
- G. Shop Drawings: Submit complete shop drawings indicating system components, control diagrams and load calculations.
- H. Field quality-control test reports.
- I. Installation, Operation and Maintenance Data: Provide copy of Installation, Operation and Maintenance Manual.
- J. Warranty: Provide copy of manufacturer's warranty statement.

1.5 QUALITY ASSURANCE

- A. Assemblies: Assemblies shall be CSA approved.
- B. Low intensity heaters to ANSI Z83.20 (latest revision) and CSA 2.34 (latest revision) for use in commercial and industrial applications.
- C. Approval shall include components of the complete heater, including burners, hangers, reflectors, reflector supports, thermostats and associated controls, and/or other accessories as noted in Contract Document plans and specifications.
- D. Code Compliance: Installations of units shall comply with local building codes, or in their absence, the latest edition of the national regulations and procedures listed below:
- E. Electrical: Heaters shall be electrically grounded in accordance with the National Electric Code, ANSI/NFPA 70 in the US, and the Canadian Electric Code, CSA C22.1 in Canada, and shall comply with all local requirements.
- F. General Installation and Gas Codes: Heaters shall be installed only for use with the type of gas appearing on the rating plate, and the installation shall conform to the National Fuel Gas Code, ANSI Z223.1 (NFPA 54) in the US and the Natural Gas and Propane Installation Code, CAN/CGA B 149.1 & B149.2 in Canada.
- G. Aircraft Hangar Installation: Installation in aircraft hangars shall conform to the Standard for Aircraft Hangars, ANSI/NFPA 409 in the US and CAN/CGA B149.1 & B149.2 in Canada.
- H. Public Garage Installation: Installation in public garages shall conform to the Standard for Parking Structures, NFPA-88A or Standard for Repair Garages, NFPA 88B, in the US and CAN/CGA B149.1 & B149.2 in Canada.
- I. Parking Structures: Technical requirements are outlined in the Standard for Parking Structures, ANSI/NFPA 88a, in the US and CAN/CGA B149.1 & B149.2 in Canada.
- J. Gas Supply Lines:
 - 1. Gas supply pipe sizing shall be in accordance with the National Fuel Gas Code, ANSI Z223.1 (NFPA 54) in the US and the Natural Gas and Propane Installation Code, CAN/CGA B149.1 & B149.2 in Canada.
 - 2. A 1/8 inch (3 mm) NPT plugged tap shall be installed in the gas line connection immediately upstream of the burner farthest from the gas supply meter to allow checking of system gas pressure.

- K. Venting: Refer to the National Fuel Gas Code, ANSI Z223.1 (NFPA 54) in the US and the Natural Gas and Propane Installation Code, CAN/CGA B149.1 and B149.2 in Canada for proper location, sizing and installation of vents as well as information on termination clearance requirements when penetrating combustible walls for venting purposes.
- L. Manufacturer Qualifications: Successfully completed and passed the auditing requirements for ISO 9001 - Quality Management System (QMS).
- M. Installer Qualifications: Authorized distributor of products and systems.

1.6 DELIVERY, STORAGE, AND HANDLING ®

- A. Store products in manufacturer's unopened packaging until ready for installation.

1.7 PROJECT CONDITIONS

- A. Maintain environmental conditions (temperature, humidity, and ventilation) within limits recommended by manufacturer for optimum results. Do not install products under environmental conditions outside manufacturer's recommended limits.

1.8 WARRANTY

- A. Manufacturer's standard warranty agrees to provide parts to repair or replace components of gas-fired radiant system that fails in materials or workmanship within specified warranty period.
- B. Warranty Period: 1-year for control panel and other controls.
- C. Warranty Period: 10 year for ceramic burner head.
- D. Warranty Period: 3 years for parts.

PART 2 PRODUCTS

2.1 MANUFACTURERS

- A. Acceptable Manufacturer: Superior Radiant Products

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- B. Substitutions: Not permitted.

2.2 CONTINUOUS RADIANT SYSTEMS

- A. Design and Performance:

1. Reflector Design: Reflector shall be 10-sided reflector design reflecting virtually 100% of the infrared energy out and away from the emitter tubes. Reflector shall be “Deep Dish: design with emitter tubes fully recessed within reflector.. Reflectors shall have a minimum 10 reflective surfaces. Reflectors with fewer surfaces allow energy to bounce back to the main heat exchanger tubing, and shall not be allowed. Reflector end caps shall be factory provided as standard and shall be fitted to the end of each reflector run to minimize convective heat loss. Reflectors shall provide a distribution pattern of 90 degrees inclusive beneath the heater. When called for in the Contract Documents and specifications, directing of radiant pattern outside the standard distribution patter shall be accomplished through use of side shields or bottom shields only. Tipped reflectors increase the convective loss of the heater and shall not be allowed, unless called for in the Contract documents.
2. Heat Uniformity: Burner shall distribute hot gases evenly along the length of the emitter tubes.
3. Serviceability: Burner shall be located outside of the air stream. Service and diagnostic control checks shall be possible with the blower fan running. Controls shall be proven name brand supported manufacturer.
4. Certified by Canadian Standards Association (CSA) for both US and Canadian applications.
5. Construction:
 - a. Control Box: Heavy-duty powder coated galvanized steel.
 - b. Emitter Tube: Shall be 4 inch (102 mm) diameter, minimum 16 gauge thickness and shall be one of, or a combination of, the following allowed materials as called for in the Contract documents.
 - 1) Hot rolled steel tube
 - 2) Heat-treated Type 1 aluminized steel tube (Required on Model UXR).
 - 3) Type 409 Stainless steel tube.
 - 4) High temperature epoxy coated steel tube.
 - c. Combustion Tube: 4 inches (102 mm) diameter, 16 gauge, heat treated type 1 aluminized steel tubing with sight glass for burner flame observation shall be required for all firing rates. Hot rolled steel shall not be allowed. Combustion tube shall be 10 feet (3048 mm) in length to prevent tube coupling disruption of internal flame.
 - d. Burners with firing rate at or above 150,000 BTU/H shall have an additional 10 feet (3048 mm) length of combustion tubing installed downstream of the combustion tube.
 - e. Couplings: Shall be 16 gauge aluminized steel, minimum 12 inches in length and be of heavy duty design incorporating two 1-inch wide draw bands.
 - f. Reflector: Deep dish, 100% efficient, mill-finished aluminum, ASTM 1100, .024 inch thickness aluminum sheet metal with two reflector support brackets for



each 10 feet (3048 mm) reflector section. Reflectors shall extend below the lowest position of the tubing at all times, and include standard end caps. Reflector shall be optional on tailpipe sections and fittings (such as elbows and u tubes) when called for in the Contract documents.

- g. Reflector Extension Shields: When called for in the contract documents, reflector extensions shall be the same material as reflectors, arranged for fixed connection to lower reflector lip and incorporate rigid support to provide 100 percent cutoff of direct radiation from tubing at angles greater than 30 degrees from vertical.
- h. Reflector end caps: Shall be fitted to the end of each reflector run to reduce convective heat loss, and shall be standard equipment.
- i. Hangers: Heavy duty (minimum 0.3125 inch), chrome plated, wire-formed hangers shall be included as standard. Stainless steel hangers shall be an approved alternate. Hangers shall allow for tipping the reflector up to 45 degrees from horizontal centerline of the heat exchanger.
- j. Fuel: Burners shall be factory designed to operate on natural gas (NG) or Liquid propane gas (LPG -Model VS only).

B. Products.

1. Basis of Design: Superior Radiant Products Premier Vacuum Systems provide the HVAC industry with a “greener choice”. The Premier Vacuum Systems provide improved comfort conditions with even heat distribution while reducing energy costs by up to 50% over conventional heating methods. With the Premier VS and Premier VS-VH, designs can be custom engineered to best suit the project with long or short, condensing or non-condensing system options. Unlike competition, Premier vacuum system burners are position-tuned to provide maximum radiant output from each section of radiant tubing, and do not utilize large amounts of end vent air. This feature improves vacuum pump capacity and allows up to 1.2 million BTUH to be vented from the space through a single vent Vacuum System.
2. Product shall be Premier Vacuum System Model VS or Model VSVH as manufactured by Superior Radiant Products. System shall be capable of operating in fully condensing (high efficiency) or non-condensing (mid efficiency) mode as called for in the Contract documents. Firing rates shall be as called for in the contract documents within the range of 20 MBH to 250 MBH.
 - a. Model VS individual burner rates shall be in the range 80,000 to 250,000 BTU/H.
 - b. Model VSVH individual burner rates shall be in the range 20,000 to 120,000 BTU/H.
3. Radiant Tube Lengths shall be as specified on the contract documents, according to the design criteria approved by the manufacturer.



4. Burners shall be position-tuned, and shall be factory designed to operate in a specific in-line position in the radiant branch to ensure equal firing rates for each burner in the branch. Burners shall be identified accordingly. Except for the first burner, subsequent burners in a leg shall have firing rates within + 2% of each other.
5. Radiant branches shall contain up to 4 burners in line as specified on the contract documents. Burners of different firing rates are allowed on a single branch.
6. End vent flow rates shall be kept to a minimum, according to the manufacturer's design criteria, as necessary to maximize radiant output from the system. Systems which utilize end vent flows of 200%, or more, of the end vent burner air requirement shall not be allowed, as they add extra mass flow which decreases radiant output.
7. Burners shall be capable of modulating from 60% to 100% of nominal firing rate when installed with variable controls.
8. Burners shall be factory assembled, piped, and wired, and complying with ANSI Z83.20/CSA 2.34.
9. Equipment Components:
 - a. Burners shall be cast iron and have high flow capability.
 - b. Ignition shall be direct spark.
 - c. Ignition control shall:
 - 1) Make 3 ignition attempts before lockout, with purge before each attempt.
 - 2) Recycle again in one hour with 3 ignition attempts.
 - 3) Have a lighted diagnostic capability.
 - 4) Have openly accessible sense current contacts within the housing.
 - 5) Have integral timing capability to allow for sequenced start-up operation.
10. Vacuum pump motor shall be TEFC.
11. Radiant heat exchanger tubing shall be seamless welded 16ga thick either hot rolled steel, heat-treated aluminized steel, stainless steel or high temperature epoxy coated (Silkote).
12. System shall incorporate a vacuum proving switch capable of shutting off gas flow in the event of flue blockage, or failure of vacuum pump.
13. Burner Safety Controls:
 - a. Zero Pressure gas regulator: Burner shall operate only when negative pressure is present in the combustion tubing, and the zero regulator shall maintain the correct air fuel ratio as required by the burner through its entire range of operation.
14. Gas Control Valve: Single-stage regulated redundant 24-V AC electric gas valve, pressure regulator and manual shutoff all in one body.

- a. Control Panel Interlock: Burner capable of being serviced while system is running with no requirements for interlock.
 - b. Indicator Lights: Burner-on indicator light.
15. Vacuum Pumps:
- a. Vacuum pumps shall be cast aluminum construction connected to the system by means of a high temperature flexible connector.
 - b. Vacuum pump motor shall be TEFC sealed ball bearings.
 - c. Vacuum pump shall be equipped with a steel fabricated wheel mounted by means of a taper lock bushing.
16. Burner and Emitter Type: Vacuum-vented burner, with the following features:
- a. Venting: Burner exhaust tubing connected at exit end to vacuum-fan inlet.
 - b. Integral balancing damper at exit end of burner branch exhaust tubing and at connection to manifold tube shall be factory supplied as standard.
17. The heater unit shall operate at a minimum gas inlet pressure of:
- a. Model VS: 5 inches W.C. for Natural Gas (11 inches W.C. for LPG).
 - b. Model VS-VH: 5 inches W.C. Natural Gas.
18. System shall operate under negative pressure.
19. Vacuum Fan: Dynamically balanced, direct-driven, steel impeller in a cast-aluminum housing, isolated from system by flexible connector with a minimum temperature rating of 450 degree F (232 degree C).
20. Controllers, Electrical Motors, Devices, and Wiring: Electrical devices and connections are specified in Division 16.
21. Motor: Resilient-mounted, capacitor-start-capacitor-run (except 3-phase motors) type with sealed ball bearings; totally enclosed, nonventilated type with internal thermal protection.
22. Motor Sizes: Minimum size as indicated in the Contract documents. If not indicated, large enough so driven load will not require motor to operate in service factor range above 1.0.
23. Balancing Dampers: Plate type, sheet metal dampers incorporated into a standard coupling.
24. Filter: Rectangular metal frame with dual elements. Filter shall be serviceable without disconnection of outside air supply ductwork.
25. Combustion-Air Connection: Duct connection to burner for combustion air to be drawn directly from outside or inside shall be factory supplied if required by the Contract documents.
26. Burner Commissioning:

- a. VS Burner firing rate to be set by means of system vacuum only with no orifice change or fuel/air adjustment.
 - b. VS-VH burner firing rate depends on orifice selected, and shall be factory tested and supplied for rate specified.
27. VS-VH Radiant output of the first burner shall be the same as subsequent burners in that branch.
28. Outdoor-Air Connection: Dynamically balanced, direct-driven, forward-curved fan with duct connection to each burner when required. [®]
- a. Motor: Resilient-mounted, capacitor-start-capacitor-run type, thermally protected with sealed ball bearings.
 - 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.
 - c. Controllers, Motors, Electrical Devices, and Wiring: Electrical devices and connections are specified in Division 16.
29. Controls:
- a. A control panel incorporating pre-purge and post purge functions shall be provided with provision for up to 4 zone(s) of burners controlled by low voltage thermostats when called for in the Contract documents.
 - b. Control panel shall be approved as part of the Premier System.
 - c. The Vacuum System shall be capable of interfacing with SRP AccuRate[®] Modulating Controls having the following features:
 - 1) General:
 - (a) The 4 zones may or may not be ON at the same time.
 - (b) The controls shall modulate up to 2 zones independently using motorized dampers.
 - (c) System shall also be capable of modulating the entire system as a single zone if desired.
 - (d) Shall have switching relays for zone-power and pump/fresh air motors.
 - (e) Shall have option of VFD to set initial vacuum.
 - 2) On-board indicators on control panel when used shall show the following status:
 - (a) Pump power ON / OFF indication.
 - (b) Zone power indication.
 - 3) When called for in the Contract documents, communication to the system controls shall be established on BACnet protocol without the use of a separate control panel.

PART 3 EXECUTION

3.1 EXAMINATION

- A. Do not begin installation until services and supports have been properly prepared.
- B. If substrate preparation is the responsibility of another installer, notify Architect of unsatisfactory preparation before proceeding.

3.2 INSTALLATION

- A. Installation shall comply with manufacturer supplied Instruction manual, approved drawings and applicable local codes and/or gas utility requirements. In the absence of any of the former, reference should be made to CAN 1-B149.1 and B149.2 Installation Codes and/or National Fuel Gas Code ANSI Z223.1 (NFPA54). Comply with manufacturer's recommendations including the following:
 - B. Clearance to combustibles shall comply with those in the Installation and Operations manual for the firing rate specified.
 - C. Provide approved 36 inch (918 mm) length flexible connectors.
 - D. Wire heaters in accordance with the National Electrical Code ANSI/NFPA 70 and local ordinances and/or Canadian Electrical Code.
 - E. Suspend heater units in accordance with manufacturer's instruction with chain and turnbuckles exceeding 540 lb (245 kg) pull test. 4 inch (102 mm) turnbuckles and 2/0 chain.
 - F. Install and connect gas-fired radiant heaters and associated fuel and vent features and systems according to either NFPA 54 or CAN/CSA B149.1 as applicable for local codes and regulations.
 - G. Install products in accordance to manufacturer's written installation instructions.
 - H. Hang suspended units from substrate using chain hanger kits and building attachments as required for safe installation and to meet all seismic requirements for specific building location.
 - I. Connections: Provide all electrical connections required for complete installation including installation of electrical devices furnished with heaters but not specified to be factory mounted.
 - J. Install piping to gas-fired radiant heaters to allow service and maintenance as required.
 - K. Connect gas piping to gas train inlet; provide union with enough clearance for burner removal and service.
 - L. Connect vent connections as required.

3.3 FIELD QUALITY CONTROL

- A. Manufacturer's Field Service: Manufacturer's Field Service: Engage a factory-authorized service representative to inspect, test and adjust components, assemblies, and equipment installations, including connections, and to assist in testing. Testing shall include the following:

- B. Test and adjust controls and safeties. Replace damaged and malfunctioning controls and equipment.
- C. Verify proper motor rotation.
- D. Test Reports: Prepare a written report to record the following:
 - 1. Test procedures used.
 - 2. Test results that comply with requirements.
 - 3. Test results that do not comply with requirements and corrective action taken to achieve compliance with requirements.
- E. Remove and replace malfunctioning units and retest until satisfactory results are obtained.

3.4 DEMONSTRATION

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

3.5 PROTECTION

- A. Protect installed products until completion of project.
- B. Touch-up, repair or replace damaged products before Substantial Completion.

END OF SECTION