

# ROBERTS GORDON<sup>®</sup>

## INFRARED HEATING

### COMPLETE™ MODULATING INFRARED RADIANT HEATERS

#### PRODUCT SPECIFICATIONS

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#### SYSTEM

##### A. General

###### 1. Mechanical General Requirements

##### B. Codes and Standards

1. American National Standard / CSA Standard Gas-Fired Low Intensity Infrared Heaters: Construct and certify gas-fired infrared heaters in accordance with latest edition ANSI Z83.20 / CSA 2.34 "Gas-Fired Low-Intensity Infrared Heaters" including all current supplements.

2. Installation Compliance: United States: Refer to National Fuel Gas Code NFPA 54/ANSI Z223.1 - latest revision.

Canada: Refer to Natural Gas and Propane Installation Code CSA B149.1 - latest revision.

3. CSA Compliance: Provide CSA Seal affixed to each burner name plate and provide CSA Certification of heater design as vented or unvented infrared heater for indoor installation.

4. National Standard Gas Piping Compliance: Install and connect gas piping to gas fired infrared heaters in accordance with United States: Refer to National Fuel Gas Code NFPA 54/ANSI Z223.1 - latest revision. Canada: Refer to Natural Gas and Propane Installation Code CSA B149.1 - latest revision.

5. National Electrical Code Compliance: Install and connect electrical wiring to gas fired infrared heaters in accordance with: 1.) United States: Refer to National Electrical Code®, NFPA 70 - latest revision. Wiring must conform to the most current National Electrical Code®, local ordinances and any special diagrams furnisCTH3. 2.) Canada: Refer to Canadian Electrical Code, CSA C22.1 Part 1 - latest revision.

6. National Performance Rating for Gas Fired Infrared Heaters Standard: Radiant output of gas fired infrared heaters shall be rated in accordance with AHRI Standard 1330. Refer to Performance Rating for Radiant Output of Gas Fired Infrared Heaters Standard CAN/ANSI/AHRI 1330-2015.

#### EQUIPMENT

##### A. Burner Box

1. **(Natural Gas) (Propane)** model, enclosed and sealed box design with silicone gasketed doors and internally mounted blower, nickel plated steel burner cup, outside air adapter, hot surface ignition outside air adapter, four-try ignition, door interlock safety switch, all components easily accessed, durable spot welded construction, mica flame observation window, balanced air rotor, gas and electric controls are separated from the combustion air stream, and CSA approved. Burner box paint shall be epoxy-polyester powder coat for corrosion resistance. Stainless steel flexible gas line and high-pressure gas cock assembly included, for U.S. models only.

2. Heater shall be equipped with permanently lubricated combustion blower with thermal overload protection enclosed inside burner compartment.

##### B. Burner Controls

1. Factory Wired: All burners shall be factory wired for 120 volts AC operation, Hot Surface Ignition operation, modulating gas valve, and variable speed combustion air blower and control for burner operation sequencing and modulation.

2. Fail-Safe Controls: To assure a high degree of fail-safe operation, the design shall include an air proving safety pressure switch to verify blower operation before gas valve opens. Combustion air pressure shall be continuously monitored

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and measured by a pressure sensor. A sensed reduction in pressure shall result in corresponding modulated reduction in gas input for maximum safety and combustion quality.

3. Ignition Controls: All units shall be equipped with a fully automatic Hot Surface Ignition (HSI). The ignition control shall have a pre-purge and timed trial for ignition with 4 ignition trials before lockout occurs. Heater shall have blower post-purge after burner shutdown. Burner shall have a 1 hour automatic reset from lockout.
4. Burner Modulation Controls: All units shall be equipped with a control to modulate both gas input and combustion air simultaneously to maintain proper combustion and continuously modulate burner input smoothly (not staged or stepped) throughout input range from minimum rated input to maximum rated input. Control shall be configurable for modulating burner input by the following methods: 24 volts AC thermostat; zone sensor input; programmable modulating thermostat; remote analog signal (0-10V or 4-20mA) from building management controls; or potentiometer.
5. Zone Control: All units shall be equipped with a control configurable to allow multiple heaters to be connected to a single heat demand control device. No user programming shall be required. Heat demand control device shall be connected to heater configured as a "central" unit. Remaining units in the zone shall be configured as "satellite" units and controlled by the "central" unit via low voltage control wiring between heaters.

#### C. Reflectors – High Efficiency

Provide high radiant reflective aluminum reflectors installed over all heat exchanger tube. Provide wide parabolic design reflector with 12 reflective surfaces and additional ribbing formed into reflector sides for added rigidity. Reflector shall be capable of producing an Infrared Factor (IF) as high as 15 when tested in accordance to AHRI standard 1330 for Radiant Output of Gas Fired Infrared Heaters. Reflector shall reflect 100% of the infrared energy that it receives from the heat exchanger tube directly to the floor. Reflectors with less than 12 reflective surfaces shall not be allowed. In order to maximize radiant output and reduce convective heat losses, reflectors are to extend below the bottom of the heat exchanger tube. Provide continuous reflector over all tube and fitting heat exchanger surfaces. Provide reflector end caps as necessary to reduce convective heat losses.

#### C. Reflectors - Standard

Provide high radiant reflective aluminum reflectors installed over all heat exchangers. Provide reflector joint pieces over heat exchanger fittings such as elbows so reflector covers heat exchanger continuously. In order to maximize radiant output and reduce convective heat losses, reflectors are to extend below the bottom of the heat exchanger tube.

1. Over all fittings: All reflectors at termination of the heat exchanger pipe and any elbows shall have end caps to prevent convective heat from escaping.
2. Side Reflectors: System to have aluminum perimeter side extension reflector in certain areas of layout as shown on plan where specified. Side reflectors permanently attach to side to top reflector and are secured to the pipe by side reflector supports and two "Z" clips for each 8' (2.44 m) section of side reflector. To prevent convection losses, tilting of reflectors will not be acceptable.

#### D. Outside Air

Provide fresh outside air to supply each burner for the support of combustion air.

#### E. Thermostats/Sensors

Provide where indicated Mount thermostat 5 ft. - 6 ft. (1.5 - 2 m) above finish floor or otherwise as noted on the drawing.

#### F. Radiant Piping - Heat Exchanger

1. Radiant Tube: Shall be new 4 in. (10 cm) O.D. Heat Treated Aluminized steel tube X 16 gauge wall with an emissivity factor of 0.80 or greater. ALUMITHERM® steel (aluminized steel/titanium alloy) tubing will be supplied on the first 10 ft. of each radiant heater.
2. Fittings: Shall be 4 in. (10 cm) O.D. Aluminized steel X 16 gauge wall. Tubes shall be as described in the installation, operation and service manual.

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3. Hanging Materials: All system's tube must be supported in accordance with acceptable practices, local codes, seismic requirements, and applicable standards and as shown on plans. Heat exchanger tube shall pitch down at least .5 in. per 20' (1.27 cm per 6.1 m) away from burner box.

#### G. Heat Demand Control Devices

All units shall be equipped with control configurable to allow a variety of heat demand control options. Control options shall include 24 volts AC thermostat, programmable modulating thermostat, zone temperature sensor, 0-10Vdc, 4-20mA and manual potentiometer. Provide where indicated, low voltage type heat demand control device for each "central" radiant heater. One of the five options below shall be specified by the engineer.

1. 24 volts AC Electronic Thermostat: 24 volts AC electronic thermostat shall be wired to one heater per zone designated as the "central" heater. Communication wiring shall be wired in series from "central" heater to each "satellite" heater in the zone via control wiring. Separate ON/OFF switch optional for "satellite" heaters (not supplied by manufacturer). Mechanical thermostats shall not be used.
2. Zone Temperature Sensor: Shall include 40-75°F setpoint adjustability and low voltage ON/OFF switch as available from radiant heater manufacturer. Suitable for mounting on a standard 2 x 4 junction box. Zone sensor shall control modulation of heater(s) according to the actual space temperature and desired setpoint. Temperature sensor shall be wired to one heater per zone designated as the "central" heater. Modulation control signal shall be wired in series from "central" heater to each "satellite" heater in the zone via control wiring. Separate ON/OFF switch optional for "satellite" heaters (not supplied by manufacturer).
3. 24 volts AC Programmable Modulating Thermostat: 24 volts AC electronic modulating thermostat with 7 day time clock and setback features shall be wired to one heater per zone designated as the "central" heater. Communication wiring shall be wired in series from "central" heater to each "satellite" heater in the zone via control wiring. Separate ON/OFF switch optional for "satellite" heaters (not supplied by manufacturer). Thermostat shall control modulation of heater(s) according to the actual space temperature and desired setpoint. Zone averaging and outdoor sensors may be added per the engineer's specification.
4. 0-10Vdc Signal: Shall be provided by an external controller, not supplied by radiant heater manufacturer. Signal will provide direct control of heater input rate. Signal shall be wired to one heater per zone designated as the "central" heater. Radiant heater manufacturer shall supply signal value vs. heater input details. Installer shall provide low voltage ON/OFF switch at user level for each "central" heater. Modulation control signal shall be wired in series from "central" heater to each "satellite" heater in the zone via control wiring. Separate ON/OFF switch optional for "satellite" heaters (not supplied by manufacturer).
5. Manual Potentiometer (10k Ohm) Control: Must be linear taper 10,000 Ohm (three-wire control) potentiometer. Potentiometer dial position shall dictate heater input rate. Shall provide "MIN to MAX" burner input adjustability. Installer shall provide low voltage ON/OFF switch at user level, at or near potentiometer unit. Potentiometer shall be wired to one heater per zone designated as the "central" heater. Modulation control signal shall be wired in series from "central" heater to each "satellite" heater in the zone via control wiring. Separate ON/OFF switch optional for "satellite" heaters (not supplied by manufacturer).

### INSTALLATION OF GAS FIRED RADIANT HEATERS

#### A. General

Install gas fired infrared heaters as indicated, in accordance with manufacturer's installation operation and service manual and in compliance with applicable codes and approvals. Allow adequate space for servicing or removal of the unit without disturbing other piping or equipment.

#### B. Support

Suspend heat exchanger, burner, gas piping, conduit, and reflectors from building substrate as indicated, or if not indicated, in manner to provide durable and safe installation; and in accordance with manufacturer's installation operation

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and service manual. Mounting height to be a minimum \_\_\_\_ feet (\_\_\_\_ m) from floor level.

C. Clearance to Combustibles

Always maintain clearance to combustibles as outlined and printed on burner nameplate and in manufacturer's product data. Measure clearance distance from surface of heat exchanger or as indicated by approval agency's listing.

D. Venting

Install vent piping as indicated on plans. Terminate where indicated on the drawings with a vent terminal assembly as supplied by the manufacturer. The venting must be installed in accordance with the requirements within the installation operation and service manual and the following codes: United States: Refer to National Fuel Gas Code NFPA 54/ANSI Z223.1 - latest revision. Canada: Refer to Natural Gas and Propane Installation Code CSA B149.1 - latest revision.

E. Gas Piping

Install gas piping as indicated and in accordance and in compliance with applicable codes and approval: United States: Refer to National Fuel Gas Code NFPA 54/ANSI Z223.1 - latest revision. Canada: Refer to Natural Gas and Propane Installation Code CSA B149.1 - latest revision.

1. Required Gas Supply Inlet Pressures:

<b>Natural Gas Units</b>	<b>Required Minimum Gas Pressure</b>	<b>Maximum Gas Pressure</b>
80,000-150,000 Btu/h	5.5" wc	14" wc
200,000 Btu/h	6.0" wc	14" wc
<b>Propane Gas Units</b>	<b>Required Minimum Gas Pressure</b>	<b>Maximum Gas Pressure</b>
80,000-150,000 Btu/h	12" wc	14" wc

2. Local Codes: Gas supply piping must meet local requirements and be sized in accordance with Btu/h demand, available pressure and total length of supply line required for the installation. Connection from supply line to burner unit must be made in accordance with installation operation and service manual. Gas shut-off cock, as supplied with unit, and controls in unit must not be subjected to more than 1/2 lb. or 14" wc pressure.

3. Drip Legs: Provide drip legs at all gas risers.

F. Electrical Wiring

Install electrical wiring as indicated. Connect power wiring to burners and control wiring between burners and thermostats in accordance with manufacturer's wiring diagrams.

G. Thermostats/Sensors

Mount thermostats 5 ft. - 6 ft. above finish floor, if not otherwise indicated.

H. Thermostat/Sensor Guards

All thermostats to be covered with a locking thermostat cover.

**FIELD QUALITY CONTROL**

A. Start-Up

Start-up, test, and adjust gas fired infrared heaters in accordance with manufacturer's start-up instructions in the installation operation and service manual, and Utility Company's requirements. Check and calibrate controls, adjust burners if applicable according to manufacturer's installation operation and service manual instructions for maximum efficiency.

**CLOSEOUT PROCEDURES**

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A. Training

Provide services of manufacturer's technical representative to instruct operating personnel in operation and maintenance of gas fired radiant heaters.

1. Schedule instruction with operating building owner, provide at least 7 days notice.

**WARRANTY**

Provide written warranty, by manufacturer, agreeing to replace/repair, within warranty period, components of gas fired infrared systems furnished by manufacturer, which are defective in either material or workmanship, provided manufacturer's instructions for handling, installing, protecting, and maintaining units have been adhered to during warranty periods follows:

- A. Three (3) year warranty on the burner system from the date of final acceptance of the infrared heaters

**QUALITY ASSURANCE**

A. Approved Manufacturers

Infrared heating system shall be COMPLETE™ MODULATING radiant heaters as manufactured by Roberts Gordon LLC., Buffalo, New York.

B. Manufacturer's Qualifications

Firms regularly engaged in manufacture of gas fired radiant systems with characteristics, sizes, and capacities required, whose products have been in satisfactory use in similar service for not less than 15 years.

C. Alternate Manufacturers

1. Other low intensity infrared heaters (of equal or greater thermal efficiency) (of an Infrared Factory (IF) as high as 15 when tested in accordance to AHRI standard 1330 for Radiant Output of Gas Fired Infrared Heaters,) and with the same or lower burner firing rate capacity, and with the infrared distribution pattern shown on drawing may be acceptable provided they meet the intent of these specifications and prior approval in writing is obtained from the engineer at least twenty (20) days before the bid date. If such systems are approved, the contractor assumes responsibility for the design, performance and expense of same. The redesigned system, gas piping, and electric wiring shall be done by a registered mechanical engineer. Shop drawings of the entire new system shall be provided by this contractor. The contractor should state the amount to be credited to the owner due to this substitution.

2. Where approved substitutes are used, the contractor assumes all responsibility for physical dimensions and all other resulting changes. This responsibility extends to cover all extra work as necessitated by other trades as a result of the substitutions.

3. The engineer reserves the right to require the contractor to remove and replace any material or equipment which does not meet specifications or does not have any prior approval as a substitute item. Work shall be completed immediately without cost or inconvenience to the owner.

**PERFORMANCE SCCTH3ULE**

A. Equipment

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1. Provide modulating gas fired low-intensity infrared radiant heaters to deliver the following performance capacities. Each heater shall be fueled by either natural gas or propane; electric rating: 120 volts AC 60Hz., 1.0 A (run), 5.0 A (start).

**A. Straight Tube:**

Manufacturer	Model	Gas	Input Btu/h			Overall Length
			Min.	Thru	Max.	<u>Minimum</u> (Ft. – In.)
Roberts-Gordon	CTH3-80	NG	52,000	-	80,000	21'-6"
Roberts-Gordon	CTH3-80	LP	55,000	-	80,000	21'-6"
Roberts-Gordon	CTH3-115	NG	75,000	-	115,000	31'-6"
Roberts-Gordon	CTH3-115	LP	78,000	-	115,000	31'-6"
Roberts-Gordon	CTH3-150	NG	100,000	-	150,000	41'-6"
Roberts-Gordon	CTH3-150	LP	105,000	-	150,000	41'-6"
Roberts-Gordon	CTH3-200	NG	130,000	-	200,000	51'-6"

**B. U-Tube:**

Manufacturer	Model	Gas	Input Btu/h			Overall Length
			Min.	Thru	Max.	<u>Minimum</u> (Ft. – In.)
Roberts-Gordon	CTH3-80	NG	52,000	-	80,000	13'-1"
Roberts-Gordon	CTH3-80	LP	55,000	-	80,000	13'-1"
Roberts-Gordon	CTH3-115	NG	75,000	-	115,000	18'-1"
Roberts-Gordon	CTH3-115	LP	78,000	-	115,000	18'-1"
Roberts-Gordon	CTH3-150	NG	100,000	-	150,000	23'-1"
Roberts-Gordon	CTH3-150	LP	105,000	-	150,000	23'-1"
Roberts-Gordon	CTH3-200	NG	130,000	-	200,000	28'-1"

NOTE: U-Tube equipment requires a U-Tube Package to be supplied by manufacturer. CTH3-200 N/A in LP.

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