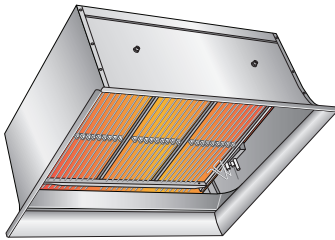

Operating Principles of High Intensity Infrared Heaters

Gas-fired high intensity heaters are direct-fired and pass a gas-air mixture through a porous matrix refractory material which ignites evenly across the surface. This surface is heated to temperatures of 1350°F or above, emitting a large concentration of infrared radiation that may be directed anywhere heat is desired.

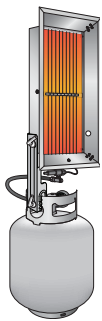
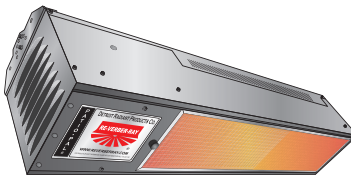
High intensity heaters typically operate unvented. Proper ventilation is necessary to dissipate combustion gases released into the space.

The Types of High Intensity Infrared Heaters



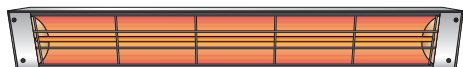
Infrared Space Heaters - Infrared space heaters are best applied in buildings with high ceilings and areas where there is a high demand for a heat load, such as loading docks or bay areas.

Infrared Patio Heaters - Patio heaters are used to provide indoor and outdoor spot heating to applications such as restaurant patios, decks and vestibules.



Portable Construction Infrared Heaters - Portable heaters are generally mounted to a 20 lb., 10-inch base LP tank and are designed for outdoor or inside areas under construction. They are ideal when temporary heat is required or where a permanent energy source is not available.

Electric Infrared Heaters - Electric infrared heaters produce heat by running an electric current through a high-resistance element. They are commonly used in areas where gas is impractical or unavailable.



Did You Know?

High intensity heaters are also referred to as spot heaters, box heaters, ceramic heaters, and as luminous heaters in Europe.

Operating at temperatures of 1350°F or above, high intensity heaters emit energy at a higher amplitude than low intensity. High intensity energy is in wavelengths from 1 to 6 microns and is close to the visible light spectrum. This closeness to the visible light spectrum is why some energy is released as visible light.

NFPA 54, section 9.18.3.1 requires that where unvented infrared heaters are used, natural or mechanical means shall be provided to supply and exhaust at least 4 CFM/1,000 BTU/hr (0.38 m³/min/kW) input of installed heaters.

Most high intensity heaters are an open flame type. Thousands of tiny flames pass through a perforated refractory; blanketing the surface of the emitter.

Product Certifications/ Standards

High Intensity: ANSI Z83.19
CSA 2.35

Patio Heaters: ANSI Z83.26

Portable Heaters: ANSI Z83.7

Electric Infrared: C22.2

Definitions

Atmospheric:

A unit that receives fresh air for combustion under normal atmospheric pressures without the use of a blower or fan.

Emitter Surface:

A material that is heat and corrosion resistant, and has a porous matrix which allows for the flow of the gas and air mixture. It emits the majority of the infrared heat.

Flashback:

Occurs when the fuel mixture burns within the rayhead assembly (behind ceramic surface) not allowing the flame to anchor properly on the ceramic surface during operation. Cracked or loose ceramics, missing gasket material or other physical abuses can attribute to flashback.

Rayhead:

An assembly that allows an air/gas mixture to pass through the perforated emitter surface, and usually houses the venturi and mixing tube.

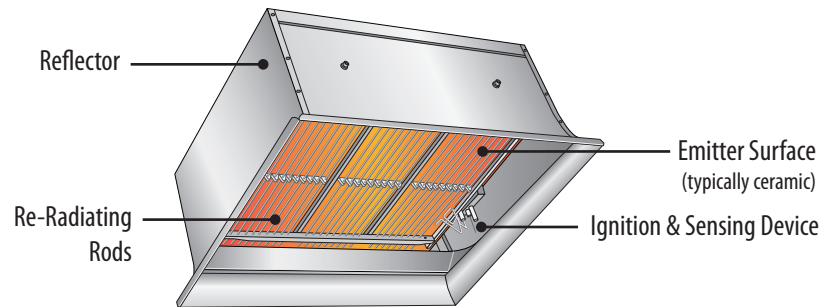
Reflector:

A device configured to direct radiant energy to the point of use in the space while absorbing minimal energy.

Secondary Emitter:

A device designed to re-radiate some of the energy back to the emitter surface, increasing the temperature and thus increasing the radiant output.

Key Components of High Intensity Infrared Heaters



High intensity infrared heaters are typically enclosed, except for the emitting surface. This exposed portion of the heater is intended to be oriented to the load.

Operating Characteristics of High Intensity Heaters

| | |
|-----------------------------------|-----------------------------------|
| Input Range | 30,000 to 160,000 BTU/h |
| Clearances to Combustibles | High |
| Combustion Air | Atmospheric |
| Heat Distribution | Concentrated, intense, focused |
| Operating Voltage | 24VAC, 120VAC or millivolt |
| Installation | Flexible |
| Mounting Heights | 12 ft. to 50 ft. typical |
| Surface Temperature | 1350°F or above |
| Venting | Non-vented - indirect |
| Response Time | Less than a minute |
| Other Considerations | Wind, contact hazards, clearances |

Common Uses of High Intensity

High intensity heaters are a cost effective solution for heating a variety of application types.

Effective in **high bay areas** due to the intensity and ease of installation.

Cost effective and simple to install in **retrofit** applications.

High output per square foot makes these units excellent for **spot heating**.

Millivolt units provide **freeze protection** in the event of a power outage.

Their simplicity makes them an option for **total building heating**.

Operating Principles of Low Intensity Tube Heaters

Gas-fired infrared heaters are an indirectly fired appliance, and have a radiating surface between the combustion and the intended load. When there is a call for heat, a flame is ignited within an exchanger. The exchanger is then heated to temperatures up to 1350°F, emitting infrared energy. This energy is directed to the floor level via reflectors and is absorbed by people and objects in its path.

A heat differential exists along the length of the heat exchanger because more heat is produced in the first half of the tube at the burner/combustion end, than the second half of the tube at the exhaust end. A well designed unit minimizes this temperature differential.

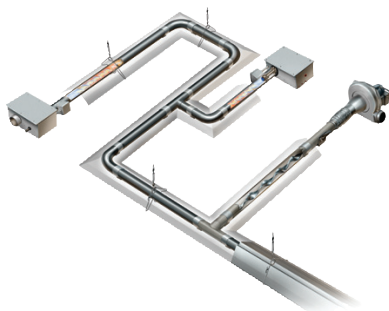
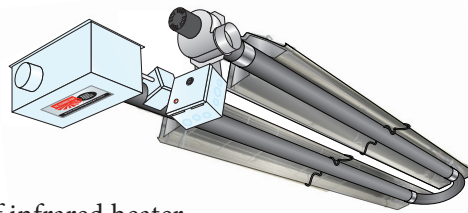
The Types of Low Intensity Tube Heaters



Forced Draft Systems (Push) - A forced draft system operates under a positive pressure, pushing the products of combustion through the length of the exchanger tubes. This type of infrared heater is easy to service and install because all of the components are housed in one compartment. When compared to other tube heater types, push tube heaters offer a variety of production, installation and operating benefits.

Draft Induced Systems (Pull) -

A draft induced tube heater operates under negative pressure pulling the products of combustion through the length of the exchanger tubes. This type of infrared heater offers reliable performance in high-wind applications and sometimes can allow for extended vent runs.



Multiple Burner Vacuum System - Multiple burner systems operate under negative pressure pulling the products of combustion through various runs of radiant exchanger tubing via a powerful vacuum exhauster pump. This type of infrared heater is used when minimal building penetrations are required, or if extended vent runs are necessary.

Did You Know?

Low intensity tube heaters are also known as radiant tube heaters, push tubes, tube brooders or stick heaters.

Low intensity heaters have a radiating surface that typically operates at temperatures below 1350°F with wavelengths of 2 to 10 microns. This is farther away from the visible light spectrum; therefore no light (glow) is emitted.

Tube heaters have the ability to be direct vented or can vent into the space as long as 4 CFM/1,000 BTU/hr (0.38 m³/min/kW) of ventilation is provided.

Fresh air for combustion can be drawn into the system and is recommended in harsh environments or where negative pressures exist in the space.

Low intensity tube heaters can be configured in a U or L shape in order to accommodate different applications.

Product Certifications/Standards

Low intensity tube heaters are Design Certified to ANSI Z83.20.

Select models are Design Certified under CSA requirements for residential use (No. 7-89).

Definitions

Burner Control Box:

An assembly that houses the various control components of a tube heater such as the gas valve, burner, ignition system, pressure switch, etc.

Combustion Chamber:

The section of radiant emitter tubing where the combustion occurs. Pending surface temperatures, the combustion chamber is typically constructed of a higher grade material than downstream radiant emitter tubes.

Radiant Emitter Tube:

The section of radiant emitter tubing following the combustion chamber, downstream of the burner control box. This section of tubing is typically constructed of aluminized or hot-rolled steel.

Reflector:

A hood-like device configured to direct radiant energy to the point of use in the space while absorbing minimal energy.

Burner:

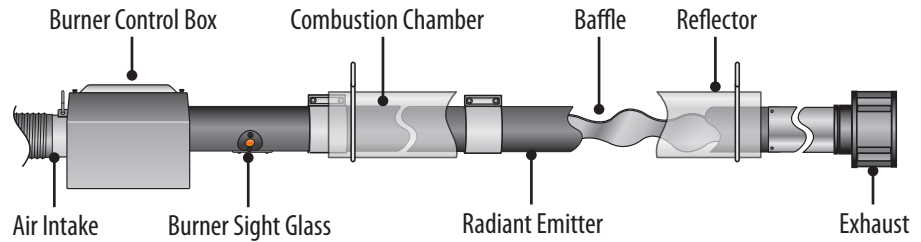
A device for the final conveyance of the gas and air to the combustion zone.

Baffle:

A device installed in the vent end of the emitter tube designed to "wring out" the most optimal heat energy from the products of combustion prior to venting it from the appliance.

Key Components of a Low Intensity Tube Heater

An infrared heater consists of three main components - the burner, reflector and radiant emitter. The burner control box on a low intensity heater typically houses all of the control components, including the burner.



The first 10 foot section of the tube, directly downstream of the burner control box, is referred to as the combustion chamber. This section of emitter tube houses the flame and is typically constructed of materials having the capability to handle high temperatures.

Operating Characteristics of Low Intensity Tube Heaters

| | |
|----------------------------|---------------------------------|
| Input Range | 25,000 to 200,000 BTU/h |
| Clearances to Combustibles | Reduced (versus high intensity) |
| Combustion Air | Atmospheric or vented |
| Heat Distribution | Large area, heat differential |
| Operating Voltage | 24VAC or 120VAC |
| Installation | Flexible |
| Mounting Heights | 9 ft. to 50 ft. typical |
| Surface Temperature | Up to 1350°F |
| Venting | Vented or non-vented |
| Response Time | 2 to 5 minutes |

Common Uses for Low Intensity Tube Heaters

Low intensity heaters are a cost effective and energy efficient solution for heating a variety of application types.

Effective in **low bay areas** and often used for total building heat.

Cost effective and simple to install in **retrofit** applications.

Durable and reliable, they are an excellent choice for **car washes**.

Patios and **vestibules** are a common application for low intensity infrared.

The soft heat patterns have proven well in **agricultural** applications.

Fresh air **intake** and **exhaust** options provide versatility.