

# Understanding Infrared Heaters

**T**he ultimate infrared heater is the sun, which generates infrared heat through combustion of gases. This infrared energy passes directly through space to warm the surface of the earth. So even on a cold day, objects and people are warmed by the heat radiated by the sun even though the surrounding air may be cold.

Similarly, infrared heaters act like mini suns because they burn a fuel to generate heat. The heat produced radiates downward warming objects such as the floor, machinery, tools and building components, as well as people in the room. These warmed objects then release some of their heat to the people and objects that come in contact with them and into the air, making it warmer. So, for example, a floor that absorbs infrared heat will warm a person who walks on it.

## How does it work?

Most infrared heaters are fueled using propane or natural gas, and sometimes oil. The hot temperatures generated by burning fuel inside the unit, heat either a steel tube (tube heater)

or ceramic surface (luminous heater) within the heater. The heat from this surface is then emitted in the form of infrared radiant energy. Reflectors direct the infrared radiant energy downward to ultimately warm the floor and objects below it.



From auto installation garages to swimming pools to greenhouses to manufacturing plants...infrared heaters can save building owners up to 30-50% when compared to forced air systems.

## Types of Infrared Heaters

### Low-Intensity Tube Heaters

Sometimes referred to as positive/negative pressure heaters, tube heaters, radiant tube heaters, or tube brooders.

- ▶ Hot exhaust gases travel through the inside of the tube resulting in tube surface temperatures up to 1100°F, which is considered low-intensity.
- ▶ Generally these heaters are vented and have the capability to use fresh air for combustion.
- ▶ Low intensity tube heaters are a popular choice for total building heat.



### Patio Heaters

Sometimes referred to as suspended, radiant, mushroom style, free-standing, or floor-mounted patio heaters.

- ▶ Ceramic or stainless steel radiant emitters.
- ▶ Designed to heat a concentrated outdoor area.
- ▶ Permanent or portable products that may be deck mounted or suspended.



### High-Intensity Ceramic Heaters

Sometimes referred to as luminous heaters, radiant ceramic heaters, or plaque heaters.

- ▶ Combustion takes place on a ceramic tile surface with surface temperatures of approximately 1800°F. Higher temperatures produced by this equipment means they must have a higher clearance to combustibles.

- ▶ Direct-fired operation releases products of combustion into a properly ventilated heated space.
- ▶ Often used in high air change applications.
- ▶ Affords great flexibility for total building heating, area heating, or spot heating applications.



### Construction Heaters

Sometimes referred to as spot heaters, portable construction heaters and tank top heaters. Heat turns a ceramic or stainless steel emitter red hot.

- ▶ Used in spot heat applications and/or as warm up stations.
- ▶ While commonly used in outdoor applications, units may also be used in industrial applications or temporarily used inside buildings under construction or repair. At no time shall construction heaters be used in residential applications.



### Maintenance

Infrared heaters are durable and can be easily maintained and cleaned. Since these heaters are used seasonally and often in industrial or commercial spaces that might produce dust and debris, regular maintenance by an experienced service professional is essential to the equipment's safe use and reliability. Like all gas burning products, infrared heaters have installation, operation and service procedures that must be followed to help ensure safety and reliable performance.

Visit the Infrared Heater Safety Council website at [www.irsafetycouncil.org](http://www.irsafetycouncil.org) to download a safety and maintenance checklist.

## Infrared Heater Efficiency

The American Society of Heating, Refrigerating, and Air-Conditioning Engineers has found infrared heaters can reduce the required heat needed to maintain a comfortable temperature in a building (heat load), by at least 15 percent.

These heaters can achieve these savings by

where doors are opened and closed often, like a loading dock. In these types of spaces, the warm air in the space will quickly escape to the outside, but a radiant heater will continue to provide comfort heating. The reason is that the floor absorbs and stores the radiant heat directed down from a heater above, and loses little of it when a door is opened.

Infrared Heater Type	Applications			
	Total Building Heat	Zone Heating	Area Heating	Spot Heating
Low Intensity Tube Heaters	★	★	★	★
High Intensity Ceramic Heaters	★	★	★	★
Patio Heaters			★	★
Construction Heaters			★	★

providing focused warmth where it is needed most, which helps to reduce the need to warm the air in the entire space.

Infrared heaters warm objects, machinery and people in its path, which in turn reradiates the absorbed warmth to provide a comfortable environment. This “spot heating” quality makes this equipment an energy-efficient heating option, particularly in situations where the air in a space does not need to be warmed or would be inefficient to warm. For example, in a large warehouse, an infrared heater can efficiently provide comfortable warmth to workers concentrated in an area, when it would be inefficient to heat the air in an entire building.

Radiant heaters can also work efficiently to heat areas

## Whole-Building Heat

A whole building also can be efficiently warmed by low intensity infrared heat, but the heating system must be designed effectively, properly installed, used and maintained. A common

mistake made is to install one large infrared heater to warm a space, which is neither effective nor efficient.

One large heater can create an intensive hot zone, which can have the unintended consequence of drawing the cold air from other areas of the building causing individuals under the infrared heater to feel intense heat from above, but a cold draft below making for an uncomfortable situation. A more effective design practice is to develop a balanced system that uses two or more burners

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— ASHRAE HVAC Systems & Equipment Handbook

<sup>1</sup> 2008 ASHRAE® HANDBOOK: Heating, Ventilating, and Air-Conditioning SYSTEMS AND EQUIPMENT, Inch-Pound Edition, Chapter 15, pg. 15.1, “Energy Conservation,” 2008, American Society of Heating, Refrigerating, and Air-Conditioning Engineers, Inc., 1791 Tullie Circle N.E., Atlanta, GA 30329, U.S.A.

Full ¶ Buckley and Seel (1987) compared energy savings of infrared heating with those of other types of heating systems. Recognizing the reduced fuel requirement for these applications, Buckley and Seel (1988) noted that is desirable for manufacturers of radiant heaters to recommend installation of equipment with a rated output that is 80 to 85% of the heat loss calculated by methods described in Chapters 29 and 30 of the 2005 ASHRAE Handbook—Fundamental.

spread throughout a large space to deliver lower-intensity comfort heating to more areas within the space.

## Zone Heating

When designing an infrared heating system, it's also important to note that these systems can be zoned to maximize their efficiency. With infrared heaters, it is possible to divide any area into separate smaller zones and maintain a different comfort level in each zone. For example, one zone with a high concentration of people could maintain a 65° Fahrenheit comfort level while at the same time another zone, a storage area, could be kept at 50° Fahrenheit or at a lower temperature. To obtain a balanced infrared heating system that maximizes its benefits by delivering comfortable heat efficiently, manufacturers recommend working with an experienced professional who is familiar with designing these systems. To find an experienced infrared heating manufacturer, go to [www.ahrinet.org](http://www.ahrinet.org).



Workstations heated with infrared heaters.

“ *More than 50% of the required heat load can be saved with an efficient layout and intelligent control of the infrared heating system.* ”

— ASHRAE HVAC Systems & Equipment Handbook



Low intensity tube heaters are widely used at fire stations where the doors can be frequently opened and closed.