STERLING HVAC PRODUCTS

Unit Heaters vs Infrared Units

Picking the right type of heating for your building!

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Did you ever wonder why there are so many different types of heaters? Why not just purchase the most efficient one regardless of type? The answer is because while buildings may look similar from the outside, internally they can be very different. It doesn't matter how efficient the unit is if the heat isn't getting to where you need it, or worse, escaping to the outside. Every building has its own specific needs and this paper will help you pick the best method to meet those needs. This paper will focus on the difference between unit heaters and infrared units.

Delivery Method

The main factor to consider when selecting a heating method is how the heat is going to be delivered to the space. If the space is a series of small storage rooms it will require a much different method than a wide open factory floor. The three main methods of delivering heat into the space are:

- Free Discharge – The outlet of the unit is located in the space and blows conditioned air directly into the space. This method can minimize first cost since it does not require additional ductwork. However, the air will be unable to reach multiple areas which may require multiple units to be installed.
- Ductwork – The ductwork is sized to deliver a specific amount of CFM to a given area. A main ductwork trunk will come out of the unit and then branch off to provide the conditioned air to multiple areas. This method allows one large unit to service multiple spaces, minimizing the number of units required. However, if the different spaces have different heating needs, this method will result in some spaces getting too much or not enough heat. This may result in occupancy comfort issues.
- Radiant – Radiant is similar to Free Discharge in that the unit is located in the space it is conditioning. However, radiant does not rely on convection (air) to heat the space. The unit has no fan to force the heat through the space. Rather it uses a hot surface to radiate the heating to the area below. The advantage of this method is that since it does not heat the air, you don't have to worry about the leakage rate of the building envelope.

Free Discharge or Ductwork condition the air that will then "billow" out into the space. As air continues to travel away from the unit it will cover a larger area within the space. In addition, the air will flow around factory equipment, stacks of boxes and other objects that may be in space. As the air leaves the manufacturer's recommend coverage area, the air will continue to the surrounding area just at reduced effectiveness. However, if you have an old drafty building or a warehouse where the loading bay doors are always open, some of the conditioned air will be escaping to the outside. If the building has significant leakage, the equipment would need to be substantially oversized to account for this heating loss.

Radiant on the other hand, does not condition the air. Instead it radiates heat like a camp fire making it ideal for spaces with large air leakage rates. However, radiant equipment only heats the objects within the affected area with direct line of sight to the unit. Unlike conditioned air, as soon as you leave the covered area, you will no longer feel the heat. This is also true if anything blocks your line of sight to the unit. So anyone working beneath a piece of factory equipment or behind a stack of boxes will not feel the effects of the unit.

Types of Infrared Units

If a large amount of the air inside the building is escaping to the outside through the building envelope either due to leakage or a large amount of doors and windows being open, then infrared is the best choice. Since it does not heat the air, you do not have to waste energy conditioning air that isn't going to stay in the space. Also since it does not heat the air, these units can be installed at higher mounting heights than unit heaters.

When calculating the heating input required of a traditional hot air system, you would take the calculated heating output required divided by the unit's heating efficiency. However, since infrared is radiant heat and does not heat the air, to calculate the required heating input you multiply the calculated heating output required by the Infrared Heat Loss Compensation Factor. The Infrared Heat Loss Compensation Factor will vary based on unit mounting height. They will also vary slightly from one manufacturer to another. Typical compensation factors would range from

0.80 for a mounting height of 16 feet to 0.90 for a mounting height of 36 feet, all the way up to 1.15 for a mounting height of 65 feet. For example: if the heating load was 100 MBH and the unit heater was 80% efficient then you would need: 100/0.80 = 125 MBH input. For the same 100 MBH heating load, if you mounted the infrared unit at a mounting height of 16 feet, you will only need 80 MBH input (100*0.80=80).

The two main types of infrared units are high intensity and low intensity. Low intensity infrared is used to distribute the heat over large areas. Tube lengths vary from as short as 10 feet for the small size units to as long as 70 feet for the larger sizes. A common application for infrared is a factory production line where the loading bay doors are frequently open or the factory is drafty. These units can also be installed in outdoor applications since there is no concern about the conditioned air blowing away. A common outdoor application for radiant heat is covered outdoor restaurant dining areas and residential patios.

Low intensity units are also available in separated combustion. If the air in the space is unfit to be used for combustion, then a combustion air inlet pipe can be connected to the unit. This will allow the unit to take air from the outside instead of from the space. This would be required if the air in the space is contaminated with dust, dirt or other debris, or if the environment has a high humidity, is mildly corrosive or has other chemicals in the air.

High intensity infrared is used for spot heat to focus the heat in a smaller area. It is traditionally used when a large portion of the building is unheated and there is just a small area requiring heat. For example a large portion of a warehouse may be unheated since it is unoccupied. However, there would just be one or two high intensity infrared units in the shipping department to keep those employees warm. High intensity is also available in a “millivolt” option. Traditional high intensity requires a 24 volt or 120-1-60 power supply. Millivolt infrared units do not require an electrical connection and are selfpowered. The units have a standing pilot and convert some of the heat from the pilot into electricity to power the main gas valve. These units are ideal for applications with no available electricity nearby. High intensity should not be used in an outdoor application since the unit has an open flame that will be effected by wind. These units are not available in separated combustion.

Types of Unit Heaters

While infrared units are ideal for buildings with a high leakage rate, they must run continuously for the occupants to feel the heat. If the building envelope has a low leakage rate, unit heaters would be a better choice. Once the space thermostat is satisfied, the unit heater can run at a lower firing rate or even turn off until the space has dropped below the set point. For buildings with good insulation and low heat loss, this means the unit can be off for substantial portion of the day resulting a lower operating cost.

Unlike infrared, you do not have to be in the affected area or in line of sight to the unit to feel the heat from unit heaters. The air will flow around any objects in the space, such as warehouse shelves, to provide heat throughout the space. Unit heaters have the additional advantage that they can be run in fan only mode to provide some cooling to the space in summer. They are ideal for residential garages, warehouses and other commercial and industrial spaces.

The two main types of unit heaters are propeller or blower style units. Both styles will have a similar throw and efficiency. Propeller units are not designed to handle any additional static pressure (except the accessories specifically designed for use with the unit) but are substantially cheaper than blower units. Propeller units come standard with horizontal louvers but have several accessories to distribute the air in different directions. Vertical louvers will allow the air to be aimed at specific areas of the space. A “Y-splitter” will allow the air to be aimed at two areas of the space. For higher mounting height, these units can be installed with a 30, 60 or 90 degree nozzle. Each nozzle type allows the unit to be mounted at a higher installation height but will cover a smaller area with heat. Blower units are specifically designed to handle additional external static pressure. While they are available with vertical louvers, Y-splitter and nozzles, they are typically connected to ductwork. The ductwork is then used to focus the heat onto specific areas or to multiple spaces.

Like infrared units, both propeller and blower unit heaters are also available in separated combustion models. Separated combustion units should be used whenever the air in the space is unsuitable for combustion.