



# Property Risk Consulting Guidelines

## SPACE HEATERS

### INTRODUCTION

Space heaters are self-contained, gas or oil fired, or electric heated, automatically controlled appliances used for circulating heated air in a designated area. Space heaters could be used for heating rooms or buildings, or for process heat. Space heaters may consist of several separate unit heaters in a single area, or of multiple sections assembled together as a single heater with a common or connected combustion chamber.

The types of heaters addressed in this section are:

- Duct furnaces, indirect gas- and oil-fired.
- Unit heaters, floor mounted or suspended indirect gas- and oil-fired.
- Infrared radiant space heaters, vented and unvented gas-fired.
- Make-up air heaters, direct and indirect fired gas- and oil-fired.

Conventional gas-fired space heaters can be classed as either direct or indirect fired units depending upon the path the products of combustion follow. Oil-fired space heaters are indirect fired units, where the products of combustion heats a medium, (metal tubes, etc.) then heats the air that is forced through the medium.

Infrared space heaters utilize the radiant principle of heating. An object (solid or liquid) that is in line-of-sight of the heaters absorbs the energy produced by the heaters radiating surfaces. The object then heats the surrounding air by means of convection. An infrared heater normally can be identified by the presence of a bright-surfaced metal reflector. The infrared generating surface will be found in many shapes and materials ranging from perforated ceramics to standard steel pipe.

### POSITION

In accordance with NFPA 54 all pre-engineered direct gas-fired space heaters used in industrial and commercial are to be listed by a nationally recognized testing laboratory, such as Underwriters Laboratories, Inc. (UL) that conduct periodic inspections of the production of the listed equipment or materials.

Install heaters with the minimum clearances from combustible materials as shown on the plate attached to the heater. These are clearances that have been established by the testing laboratories. Normally, the clearance to the roof or ceiling is always to be observed even though the roof or ceiling is noncombustible.

For units not listed by a nationally recognized laboratory, design the unit with the controls indicated in Table 1. Use safety shutoff valves with proof of closure. Provide a manual shut-off valve downstream

of the last safety shut-off valve to allow leak testing of the safety shut-off valves. In addition arrange all heaters for 100% shutoff.

Building ventilation is necessary where unvented gas- or oil-fired heaters are installed. The primary hazard is to personnel rather than to the property. It is incumbent upon the installer and property owner to ascertain that there is adequate ventilation at all times to protect against the toxicity hazard.

Install high temperature sprinklers in the 7 ft (2.1 m) radius areas above these heaters as specified in NFPA 13.

Rigidly support gas and oil fired heaters from the building structure. They should not be free-swinging using nonrigid type supports such as chains. A free-swinging heater is subject to vibration that could be transmitted to the flexible connectors. The listed connectors are intended to compensate for misalignment between fuel supply and appliance, and are not tested for the continual vibration and flexing to which they would be subjected to on a nonrigid suspension.

The major concern is the location of the infrared heaters in the facilities. Do not install infrared heaters in the following occupancy areas:

- In Class I, Class II or Class III areas as identified by the *National Electrical Code*<sup>®</sup> (*NEC*) unless specifically listed for use in such areas.
- In warehouses used for storage of combustible materials. The exception, which should be avoided whenever possible, is that the heaters may be installed over clearly defined main aisles which are at least 10 ft (3.1 m) wide, with the understanding that the heaters will have to be relocated if the aisles are subsequently used for storage of combustible materials. The heaters may be installed in the receiving and shipping areas of the warehouse where stock is stored no higher than one pallet load high and is constantly moving.
- Where the heater, particularly on the back surface, is subject to deposits of combustible residue from production equipment in the area. Examples of occupancies where residue from production equipment is normally not included in the *National Electrical Code*<sup>®</sup> Class I, Class II, or Class III are an automatic screw machine department and a rubber mixing department. One way to check this is to observe building members for combustible residue.
- Confined building areas where the room volume is insufficient to maintain proper combustion, or where the ventilation is insufficient to prevent an accumulation of heater combustion products in excess of 20 parts per million.

**TABLE 1**  
**Requirements For Nonlisted Space Heaters**

Classification Burner Input (Btu/h) \ Controls	Electronic Flame Supervision	Single Safety Shutoff Valve	Double Safety Shutoff Valve	Air Flow Switch	Prepurge And Air Changes	Excess Temperature Switch	Mechanical Exhaust	Motor Start Interlock	Low Fire Start	Atomizing Media Interlock	Fuel Pressure Switch <sup>7</sup>	Proven Ignition Source Main Burner
<b>Gas Fired</b>												
Direct												
Less than 150,000	X	X									X	
150,000 – 400,000	X	X		X <sup>5</sup>	X <sup>1</sup>	X					X	
400,001 – 1,000,000	X			X <sup>5</sup>	X <sup>1</sup>	X					X	
Greater than 1,000,000	X		X <sup>6</sup>	X <sup>5</sup>	X <sup>1</sup>	X			X		X	
Indirect – Single Units												
Less than 150,000												
150,000 – 400,000							X	X				
400,001 – 1,000,000	X	X		X	X	X	X	X	X		X	
Greater than 1,000,000	X		X <sup>6</sup>	X	X	X	X	X	X		X	
Indirect – Multi. Units <sup>2</sup>												
Less than 1,000,000 <sup>3</sup>												
Great than 1,000,000 <sup>4</sup>	X		X <sup>6</sup>	X	X	X	X	X	X	X	X	
<b>Oil Fired</b>												
Indirect – Single Units												
Less than 150,000												
150,000 – 400,000			X									
400,001 – 1,000,000	X		X	X	X	X	X	X		X	X	X
Greater than 1,000,000	X		X	X	X	X	X	X	X	X	X	X
Indirect – Multi. Units												
Less than 1,000,000 <sup>3</sup>												
Great than 1,000,000 <sup>4</sup>	X		X	X	X	X	X	X	X	X	X	X

SI Units: 1 Btu/h = 0.29 W

**NOTES:**

1. With exhaust fans a 4 air change purge period, without exhaust fans an “ENFORCED” waiting period.
2. These assemblies will normally have a manifolded exhaust system, if the combustion chamber is also manifolded into a common volume, treat as a single unit.
3. Where individual units are assembled together, provide the controls indicated for the appropriate size classification above.
4. Controls indicated are for the “assembly” and are in addition to the controls required for the individual units of assembly.
5. If a fan is provided, provide these controls.
6. Also provide a vent line to a safe location.
7. For gas fired units, provide high and low gas pressure, for oil fired units, low oil pressure.