

Fig. 7 .... Propeller Fan Unit Heater—Horizontal-Blow Type

Classification

The various types of unit heaters in present use can usually be classified according to one or more methods.

1. *By heating medium:* Under this classification there are five heating media to be considered: (*a*) steam, (*b*) hot water, (*c*) gas, (*d*) oil, (*e*) electric.

2. *By type of fan:* Under this classification there are two types of fans to be considered: (*a*) *propeller* and (*b*) *centrifugal.* Propeller fan units may be of the *horizontal-blow* or *down-blow* type. Centrifugal fan units may be of the smaller *cabinet* type or larger *industrial* type. Either may be arranged for the delivery of air horizontally, or vertically up or down.

3. *By arrangement of elements:* Under this classification there are two types of units to be considered: (*a*) the *draw-through type,* in which the fan draws air through, and (*b*) the *blow-through type,* in which the fan blows air through the heating element. Direct-fired unit heaters are always of the blow-through type.

Application

Unit heaters have three principal characteristics, as distinguished from gravity heating units: (1) relatively large heating capacities in compact casings, (2) the ability to project heated air in a controlled manner over a considerable distance, and (3) a relatively low installed cost per Btu output. They are, therefore, usually employed in applications where the heating capacity requirements, or the physical volume of the heated space, or both, are larger than those that can be adequately or economically handled by gravity heating units.

Where the heating capacity requirement is large, the installation of a small number of unit heaters will usually prove more economical than will the use of a multiplicity of gravity heating units of the same total capacity. Where the volume of the space is large, and especially where ceilings are high, unit heaters can provide comfort through uniform heat distribution, and can provide economy of operation by confining the heat to the occupied zone and eliminating stratification in a manner which is difficult to attain with gravity radiation.

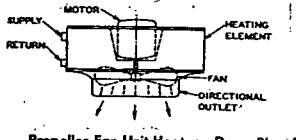

Fig. 8 .... Propeller Fan Unit Heater—Down-Blow Type

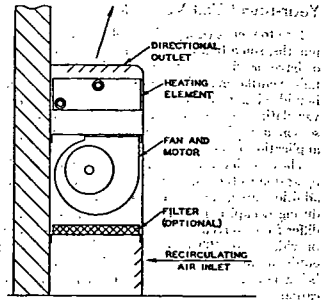

Fig. 9 .... Floor-Mounted Centrifugal Unit Heater—Cabinet Type

Unit heaters located overhead permit 100 percent utilization of floor space. They may often be used to advantage in specialized applications requiring spot or intermittent heating, such as the blanketing of outside doors in industrial plants or in corridors and vestibules. Unit heaters are also employed where filtration of the heated air is required, and they may be modified to provide ventilation where the introduction of outdoor air is required.

Unit heaters are principally used for heating commercial and industrial structures such as garages, factories, warehouses, showrooms, stores, and laboratories, and for heating corridors, lobbies, vestibules, and similar auxiliary spaces in all types of buildings.

Unit heaters may be applied to a number of industrial processes, such as drying and curing, in which the use of heated air in rapid circulation with uniform distribution is of particular advantage. They may be used for moisture absorption applications, such as fog removal in dye houses, or for the prevention of condensation on ceilings or other cold surfaces of buildings in which process moisture is released. When such conditions are severe, it is necessary that the units be equipped to draw air from outdoors in sufficient volume to provide a rapid air change, and that they operate in conjunction with exhaust ventilators or fans for exhausting the moisture-laden air. (See discussion of condensation in Chapter 23.)

Factors Affecting Application

There are five major factors to be considered in the application of unit heaters: (1) the heating medium to be employed, (2) the type of unit, (3) the location of the unit for proper heat distribution, (4) the permissible sound level, and (5) the degree of filtration required for the air circulated.

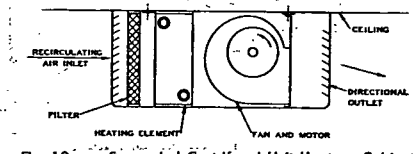

Fig. 10 .... Suspended Centrifugal Unit Heater—Cabinet Type

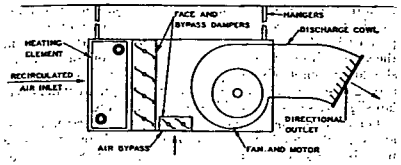

Fig. 11 .... Suspended Centrifugal Unit Heater—Industrial Type—Bypass Controlled

Heating Medium

The selection of the proper heating medium is usually determined on an economic basis and requires an examination of the first cost, the operating cost, and the conditions of use. Steam and hot water unit heaters are relatively inexpensive, but require a boiler plant and piping system, the per-unit cost of which generally decreases as the number of units installed increases. Gas- and oil-fired units are more costly, but the fuel lines and vent flues required are comparatively inexpensive, and the overall installation cost will usually be lower when a small number of units is used. Electric units are relatively inexpensive to purchase and install, but are usually associated with a high operating cost per Btu output, unless electric rates are very favorable.

Steam or hot water units are most frequently used in new installations in which the number of units is large enough to justify the expense of a new boiler and piping system, and in existing installations or additions, in which the system is of sufficient capacity to handle the additional load. *High-pressure steam* or *high-temperature hot water* units are usually employed in larger installations or, where a high temperature medium is also required, for process work. Low-pressure steam and conventional hot water units are usually installed in smaller installations and in those primarily concerned with comfort heating.

Gas-fired and oil-fired unit heaters are usually preferred in installations in which the number of units required does not justify the expense of a new boiler and piping system, where the space or the time required to construct a new boiler plant is not available, or where individual metering

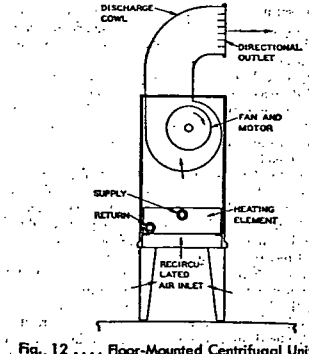

Fig. 12 .... Floor-Mounted Centrifugal Unit Heater—Industrial Type—Valve Controlled

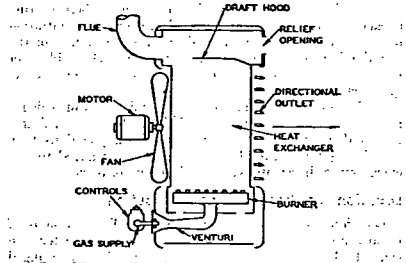

Fig. 13 .... Gas-Fired Propeller Fan Unit Heater

of the fuel supply is required, as in a shopping center. Gas-fired units are usually of the horizontal propeller type or the industrial centrifugal type. Oil-fired units are largely of the industrial centrifugal type. Some codes limit the use of direct-fired unit heaters in certain applications.

Electric unit heaters are used where low cost electric power is available, or for isolated locations, intermittent use, supplementary heating, or temporary service requirements. Typical applications are ticket booths, watchmen's offices, factory offices, locker rooms, and other isolated rooms scattered over large areas. Electric units are particularly useful in isolated and untended pumping stations or pits, where they may be thermostatically controlled to prevent freezing temperatures.

Type of Unit

Propeller fan units are usually used in free-delivery applications where the heating capacity and distribution requirements can best be met by units of moderate output, used singly or in multiples, and where filtration of the heated air is not required. *Horizontal-blow* units are usually associated with low to moderate ceiling heights. *Down-blow* units are employed in high-ceiling spaces and where floor and wall space limitations dictate an out-of-the-way location for the heating equipment.

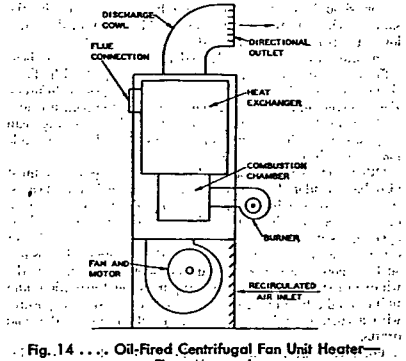

Fig. 14 .... Oil-Fired Centrifugal Fan Unit Heater—Floor Mounted