

Unit equipment as described previously justifies its existence due to the following features:

1. Lower cost per unit capacity.

Standardized design and volume production makes possible low cost factory assembly thereby eliminating individual design and handling of every part for each installation.

2. Flexibility and mobility of equipment.

Unitary equipment can be readily located in existing buildings without the necessity of running large ducts through floors and many partitions. Such equipment can be shifted to meet changing requirements. Tenants may obtain the advantages of conditioning when the entire building is not equipped with a conditioning system. In industrial process work, the flexibility of unitary equipment is of great advantage.

3. Lower installation costs.

The fact that the equipment arrives on the job in an assembled condition, coupled with the lesser problems of duct work and connecting piping, materially reduces installation costs.

4. Small capacities.

The small capacities available in unitary equipment have brought the advantages of controlled air conditions to a number of small offices, stores, shops, and individual rooms where specially designed and built central system equipment would have been uneconomic.

This chapter will limit itself in general to a description and discussion of the functions and construction of the units themselves indicating the accessory features necessary to complete unitary systems.

SUB-DIVISION OF UNITARY EQUIPMENT

While for descriptive purposes, it would be better to sub-divide unitary equipment on a purely functional basis, such as heating, cooling, ventilating, etc., there has grown up very definite branches of this industry in which the engineering and application of the equipment vary quite widely. Thus common acceptance in the industry recognizes the following sub-divisions:

1. *Unit heaters* consisting of an encased heating surface through which air is forced by means of a fan or blower, located either in or closely adjacent to the heated space, and normally employed only for industrial and commercial applications.

2. *Unit Ventilators* which are similar in principle to unit heaters but are designed to use outside air with or without provision for recirculation of the air. While unit heaters are largely used for commercial and industrial applications, unit ventilators are intended primarily for school, offices and semi-commercial applications.

3. *Unit Coolers* which are similar to unit heaters except that a cooling medium is used in place of a heating medium and provision is made to catch and remove the condensate. A distinction is made here between unit-coolers, normally applied to the cooling of products for their preservation or processing and unit conditioners used for cooling for comfort.

4. *Unit Conditioners* which consist of equipment to provide control of heating with humidifying, or cooling with dehumidifying, coupled with air circulation; all compactly housed in a single casing.

5. *Miscellaneous Unit Equipment and Accessories* such as filtering equipment, attic fans, humidifying units and special controls.

These sub-divisions will be discussed in detail.

UNIT HEATERS

A *unit heater* consists of the combination of a heating element and fan or blower having a common enclosure and placed within or adjacent to the space to be heated. Generally no ducts are attached to inlets or outlets, although it is common practice with many unit heaters to equip them with directional outlets or adjustable louvers. While unit heaters were first applied to industrial heating, the constant development and improvement of this equipment both as to appearance and quietness has broadened its field of application until today unit heaters are available for fields extending from large factory spaces to recreation rooms, churches, and offices.

While unit heaters are designed primarily to handle all recirculated air, they may be installed to handle either partial or total out-door air. Compared with the older method of heating by means of radiation, properly designed and applied unit heaters should:

1. Circulate air in the building at a rapid rate but without objectionable draft.
2. Reduce the temperature differential between the floor and ceiling.
3. Direct the heated air so that uniform temperature distribution be obtained throughout the heated space.
4. Prevent or remove the cold stratum of air commonly found at the floor level.
5. Reduce the number of heating elements required and thereby decrease the cost and extent of the piping necessary.
6. Maintain a closer control of room temperature either manually or by means of simple thermostats.
7. Produce an economy in heating costs resulting from the sum total of the above advantages.

TYPES OF UNITS

A wide variety of types of unit heaters is available. They all employ some form of convector, supplied with either steam or hot water, although occasionally equipped for gas or electric heat. Air is always forced over these convectors by a fan of either the propeller or centrifugal type. Heating surfaces may be in the form of steel pipe coils, non-ferrous tubes or pipes with extended surfaces, cast iron, and pressed or built up sections of the cartridge or automotive type.

Two major sub-divisions of design are commonly recognized. Floor mounted units which withdraw the cold air from the floor and discharge the heated air above the working zone and the suspended type where the unit is located in an elevated position withdrawing the air from this level and discharging the heated air down into the working zone. In closely occupied spaces where direct air drafts into the working zone are not permitted, the floor mounted unit will give more uniform temperature distribution. On the other hand if opportunity is provided to deliver the heated air from suspended units down into the working zone excellent temperature distribution is possible.

Housed fan, high velocity discharge units with outlets adjustable to deliver air in several directions are able to project their heating effect over distances of from 30 ft to as much as 200 ft from the unit. This makes possible the location of these units at considerable distances from each