

Fig. 1 . . . . Horizontal Remote Type Unit Air Conditioner

generally prove inadvisable except by the most experienced engineering personnel. The basic design considerations of unitary equipment are discussed in the following paragraphs.

Remote Units

Remote units can be obtained in two general classes, horizontal as shown in Fig. 1 and vertical as in Fig. 2. The construction of both is essentially the same, except for the drain pan and filter locations.

Casings. Casings are generally constructed of sheet metal with angle iron frames and with removable panels for access to coil connections, blower bearings, filters, and drain. Casings should be airtight. Panels should be tight-fitting with cam or similar fastenings for easy opening. Panel openings at coils for heavy units should be large enough to receive coils after the casing is suspended. Frames should be fitted with lugs strong enough to suspend horizontal units. Nonmetallic casings are of advantage in small remote units for reducing sound, particularly when propeller-type fans are used.

Insulation. Remote units are available with waterproof and verminproof, sound and heat barrier insulation on the inside of the casing. They are also available with flanges and flanged access doors to permit insulation after installation.

Drain Pans. Because of the corrosive effect of mild picric, carbonic, and sulfurous acids absorbed by condensate, drain pans are usually made of 14 gage or heavier metal. They should be hot dipped galvanized after fabrication, or otherwise treated to resist corrosion. Some manufacturers extend the drain pan under the entire unit, but in any case it should extend far enough to catch any condensate carried over from the coils. The drain connection should be readily accessible for cleaning and, in air-conditioning work, should be generously sized and trapped. Some municipal codes require a minimum size of 1¼ IPS.

Blowers. The usual practice among manufacturers is to use blowers having external resistance capacity in keeping with the size and type of application for which the unit is designed. *For example, the larger self-contained air conditioners* have blower and motor arrangements for delivering the design air quantities against the larger external static pressures that are encountered when applying these units for use with supply and return-air duct systems. In a well designed unit, the relation of the blower and the coil surface is arranged, through testing, to assure adequate uniformity of air distribution over the heat-transfer surface.

Some of the smaller suspended-type units, Fig. 3, use propeller fans with a trailing edge blade in order to obtain required pressure characteristics with quiet operation. Since most of the motors driving these fans are direct-connected and use brushes for starting, adequate access should be provided for maintenance and inspection.

Cooling Coils. The cooling and dehumidifying coils used in unit air conditioners are essentially the same as those used in central station units. A proper balance of coil capacity with the other components of the packaged air conditioner is an essential of good design and performance. Ample coil capacity is a requirement for good operation at light loads and low air quantities.

Where multiple circuits are used in the larger coils, equal distribution of the cooling medium to the various circuits is vital in order to develop full capacity of the coil. The cooling coils also perform the function of dehumidification. To prevent carryover of condensate, some coil designs require eliminator sections even at the normal face velocities of 400 to 600 fpm.

In addition to condensing the moisture out of the air, the design and arrangement of the cooling coil should provide for quick and effective draining of the condensate into the pan. Proper manufacturing practices to provide for uniform fin spacing and laboratory development to determine coil-surface arrangements are among the requirements for good drainage from the cooling and dehumidifying coils of self-contained air conditioners.

Heating Coils. Heating coils of unit air conditioners are usually conventional blast coils, and can be obtained with or without non-freeze steam distribution features. They usually match the cooling coils in face area, and are one or two rows deep depending on the heating requirements. Where coils are selected for hot water and have more than two rows of tubes, the air resistance and the space requirements of the cooling and heating coils should be carefully checked.

Humidification. Spray-type humidifiers are usually used in remote systems, but in some cases pan-type humidifiers or steam humidifiers are also used. Some condensation on the inside of the unit casing may occur with possible water damage if the unit is located in a cold space without adequate insulation. Spray-type humidifiers should be located so that no carryover of moisture occurs.

Filters. It is almost axiomatic that all units should have filters. Some small suspended units of 1 ton capacity or less, with low coil-face velocities and propeller fans, are equipped

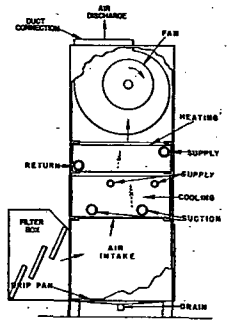

Fig. 2 . . . . Vertical Remote Type Unit Air Conditioner

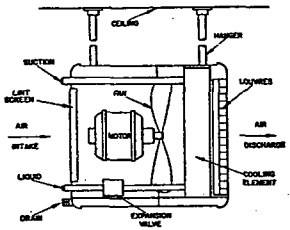

Fig. 3 . . . . Suspended Propeller Fan Type Unit Air Conditioner

only with lint screens or operate without filters, but in them the coils must be periodically cleaned and there is constant danger of clogging of the drain, with the possibility of water damage. Filters used are usually of the throw-away type, although cleanable filters are available for most of the larger units. Care should be taken to insure adequate filter surface, since the cross-sectional area of the unit is seldom adequate for filter area. V-shaped or staggered filter arrangements are quite commonly used to increase filter area.

Motors. In some units where the motor is mounted inside, adequate access for maintenance and clearance for tightening belts are imperative. When motors are mounted in this manner, the heat equivalent of the motor input must be added to the heat load to be absorbed by the system, and this requires a lower exit air temperature at the coils. Usually, however, the motor is located outside of the casing where it is readily accessible for service. In this case, only the brake horsepower required by the fan is transformed into heat to be included in the load calculations.

In either application, motors should be selected with adequate horsepower to handle the design volume of air against the resistance of the system when the coils are wet, and then checked against the possible horsepower requirements for the increased volume of air obtained when the coils are dry.

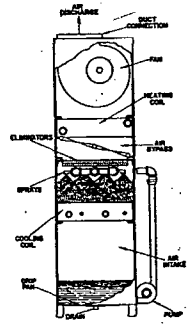

Fig. 4 . . . . Spray-Type Remote Unit Air Conditioner

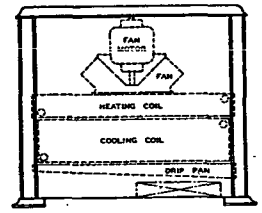

Fig. 5 . . . . Remote Floor Type Room Unit Air Conditioner

Other Types of Remote Units

Features of various other types of remote air conditioners are given in the following paragraphs.

Spray-Type Unit. Fig. 4 shows a spray-type unit used by designers who prefer air-washing and coil-wetting features. These units are equipped with a pump that sprays water or brine over the coils. Due to the direct mixing of the condensate and the spray, provision must be made for overflow in summer and replacement of water evaporated in winter.

Dehumidifying Units. In a further modification of spray-type units, absorbent brine solutions such as lithium chloride are used to remove moisture from the air. As explained in Chapter 42, the latent heat of the moisture removed is changed to sensible heat, so that coils must be used as aftercoolers to obtain the right dry-bulb temperatures. Factory-produced units are also available for use with solid adsorbents such as silica gel.

Another recent development as a manufactured item is the small refrigeration-type dehumidifying unit for control of moisture in residential basements.

Remote Room Units. For individual rooms, with cooling load requirements of ½ to 1½ tons, remote units are available in attractive casings for installation within the room. A suspended type is shown in Fig. 3 and a floor type, such as is

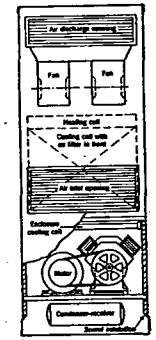

Fig. 6 . . . . Self-Contained Water-Cooled Air Conditioner