of high-side equipment in condensing units, the fan-coil units are factory made in various types as indicated by the preceding definitions.

If the condensing unit and cooling and heating coil surfaces are carefully selected, and if proper consideration is given to reduction of piping losses, the performance of the combined system will compare favorably with field assembled apparatus. A system in which the air handling unit is separated from the condensing unit, is called a remote system. The conditioning unit is designated as a remote unit. The usual capacities of remote units usually range from 2 to 100 tons.

The self-contained air conditioning or cooling units are widely used in capacities through 15 tons, and are available in larger sizes. Each model is designed for a specific cooling capacity and range of air delivery. Experience has demonstrated that well designed and properly applied equipment of this type produces excellent results in commercial comfort installations. In most designs of the larger self-contained units, the equipment can be adjusted to approximate the load calculations through a selection of the air quantity. An increase of air quantity in this type of equipment increases the sensible heat proportion, and a decrease of air quantity tends to provide a lower leaving dew point and a high proportion of moisture removal. However, the usual field practice is to adjust the fan speed for quietness and air distribution rather than for ratio of latent to sensible loads as indicated by a load estimate.

To meet the requirements of individual comfort in small rooms and offices, self-contained units, called room coolers, find extensive and economical application. These units are usually restricted to summer and intermediate season operation, and range from $\frac{1}{3}$ to $1\frac{1}{2}$ tons of refrigeration capacity.

A special application of remote units is found in the unit air cooler which is used extensively in refrigeration work. Its primary function is to reduce temperatures in insulated and sealed storage spaces, and humidity control is a secondary consideration. Because of the small temperature differences between the coil and room temperatures, unit coolers handle three to five times as much air per ton as remote units used in air conditioning.

The attic fan or exhaust fan is sometimes referred to as a cooling unit, but since it contains no element of heat transfer, it is treated in Chapter 33, Fans.

COMPONENT PARTS OF UNIT TYPE EQUIPMENT

The unitary equipment is designed for the air conditioning loads of most common occurrence. Highly special projects and projects of infrequent occurrence may require field-assembled equipment for best results. Field modifications generally prove inadvisable except by the most experienced engineering personnel. The basic design considerations of unitary equipment are discussed in the next 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. Their construction 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 air tight. 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. Non-metallic 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 vermin-proof, 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 $1\frac{1}{4}$ 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 to 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