

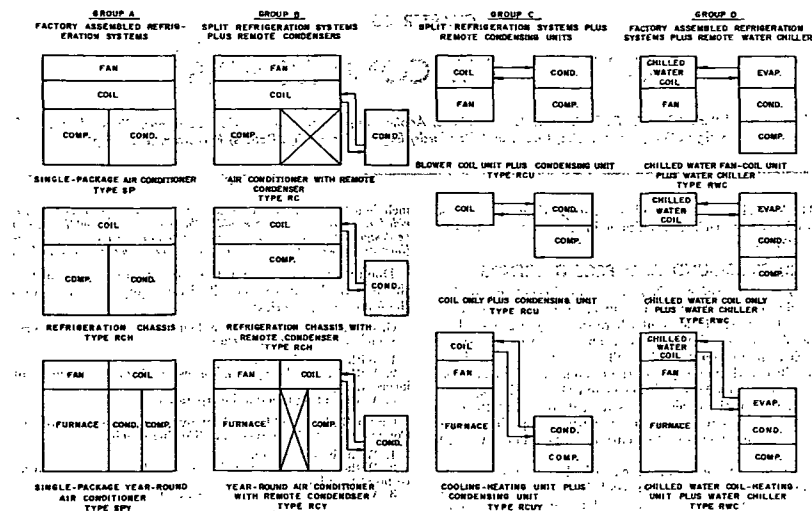


Fig. 1 Schematic Representation of ARI Classification of Unitary Air Conditioners

filtration, heating, humidifying, and circulation. Some of these functions are optional, depending on whether the unit must provide heating as well as cooling.

For the original water-cooled, one-piece unit, equipment location could be very simply described. Now that the types include air-cooled, water-cooled, and evaporatively-cooled multi-piece systems up to 100 tons, equipment may be located in the conditioned space or outside the conditioned space, with or without ducts. In the conditioned space, units may be either floor-mounted, wall-mounted, ceiling-mounted, or window- or transom-mounted. Outside the conditioned space, equipment may be located in a special equipment room, on the roof top, in an attic, in the basement, yard, garage, or in a crawl space.

A recent trend is to the use of year-round unitary equipment for multi-room apartments. Air-cooled condensing sections for such application are mounted through the wall and designed for complete service access from indoors.

GENERAL DESIGN CONSIDERATIONS

Sizes

Capacities of units presently extend up to 100 tons, with the top limit subject to upward pressure in recent years. The industry has not standardized on capacity steps within this limit, and therefore, no series of standard sizes is available for design purposes. Certified capacity ratings in accordance with the ARI unitary air conditioner certification program must be stated in increments of 1,000 Btuh.^{1,2}

Participation in the certification program is voluntary, and the program is limited to units of a maximum capacity of 135,000 Btuh.

In sizes up to 7½ tons, the industry presently builds equipment having capacity ratings at almost every step of the

1000 Btuh increment. From 7½ tons up, the steps are generally in the range of 2½ to 5 tons increments.

In addition to the certified capacity ratings published by the ARI,³ the *Air Conditioning Heating and Refrigeration News* publishes a yearly summary of unitary air-conditioning equipment offered by the industry.⁴

Shapes and Configurations

No particular pattern has been established in the industry for either the shape or arrangement of components for unitary air-conditioning equipment. Thus, the designer has a relatively free choice within the scope of equipment classifications with regard to shape, size, and general arrangement. Equipment is offered in both vertical and horizontal groupings of components for floor, wall-hung, or ceiling suspension. Units are also designed for matching use with auxiliary heating equipment, such as forced warm air furnaces, which in turn are offered in vertical upflow, vertical downflow, and horizontal models. Figs. 2 to 9 illustrate typical arrangements.⁴

Appearance

Unitary air conditioners can be separated into two classifications based on appearance and depending upon the location of the equipment. When designed for use within the conditioned space, cabinets and grilles are attractively styled to match the general surroundings. When used outside the conditioned space, styling is less important. When used outdoors, the units must be weather-proofed.

Codes and Standards

In the design of unitary equipment, a large number of codes and standards covering construction, performance testing, and application must be considered. A few of these

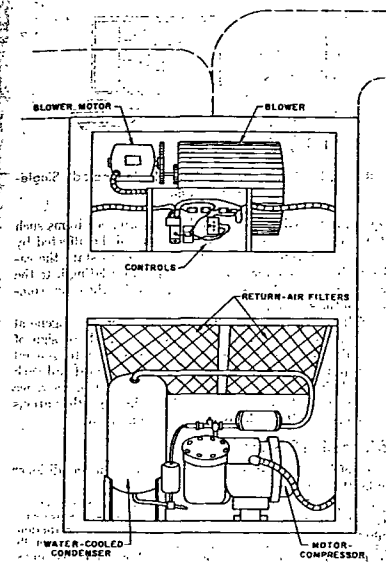


Fig. 2 Typical Vertical Water-Cooled Single-Package Unit

are of minor importance and in some instances, the requirements are in conflict. In most localities, city or state building codes require compliance with some of these standards.

Listed below are most of the significant codes and standards which concern the design, testing, and rating of unitary equipment. These are all national in scope. No effort has been made to indicate their relative importance which would

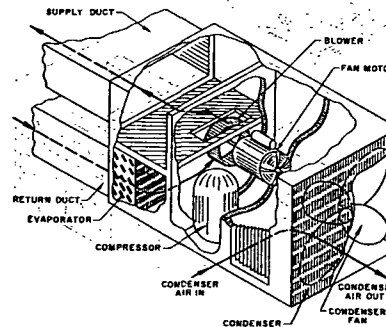


Fig. 3 Typical Horizontal Air-Cooled Single-Package Unit

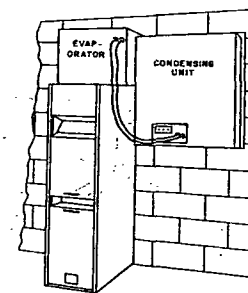


Fig. 4 Pre-Charged Split System with Through-the-Wall Condensing Unit

be determined by the type of unit, its marketing area, and compliance requirements of local codes.

1. ARI 210-64
 2. ASHRAE 37-60
 3. UL 465
 4. ASA-B9.1
 5. FHA-300
 6. CSA
 7. AGA
 8. NFPA-70
 9. NBFA
 10. NFPA
 11. NFBU
 12. ASA B31.5
- Unitary Air-Conditioning Equipment
Methods of Testing For Rating Unitary
Air Conditioners
Air Conditioners, Central Cooling
Safety Code for Mechanical Refrigeration
FHA Minimum Property Standards
Standards for Air-Conditioning and Re-
frigeration Equipment
Standards for Applicable Gas-Fired
Equipment Used as Components of Unitary
Air Conditioners
National Electrical Code
National Building Code
Uniform Building Code
Fire Prevention Code
Pamphlet 90B
Code for Pressure Piping

ENGINEERING DESIGN DETAILS

Table 1 summarizes current practice with respect to engineering design details for unitary air conditioners. In general, the values indicated represent the maximum and minimum design values for current units. Many have become industry design standards as established through the ARI.

The design of a complete refrigeration system to produce a

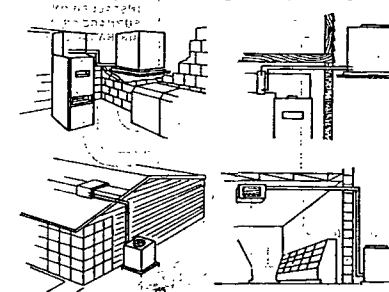


Fig. 5 Typical Split System Installations of Remote Air-Cooled Condensing Unit with Cooling Coil or Coil-Blowers