ards Publication No. CN-1-1964 establishes test procedures and contains minimum standards for room air conditioners which have been adopted by nearly all manufacturers. The various requirements of these standards have already been discussed in the paragraph Performance Data.

The NEMA Standards also give a simplified calculation form for determining the heat gain for a given space so that a room air conditioner with the correct cooling capacity can be selected to match this heat gain.

INSTALLATION AND SERVICE

Installation procedures vary widely because units can be mounted in various ways. Therefore, it is important to consider the most suitable mounting for the installation and also that it will satisfy the user and comply with existing building codes.

Common mounting methods are:

Inside flush mounting: Interior face of conditioner is approximately flush with inside edge of window sill.

Balance mounting: Unit is installed approximately half inside and half outside of window.

Outside flush mounting: Outer face of unit is flush or slightly beyond outside wall.

All-in-mounting: Unit is completely inside the room, so that the window can be closed.

Upper sash mounting: Unit is in the top of the window.

Special mounting: For casement windows, for office windows with swinging units, or swinging windows, to permit window washing, and for transom windows over doorways.

Built-in mounts or *sleeves* are used for installing window-type chassis or complete units, or consoles in walls of apartment buildings, hotels, motels and residences.

Room air conditioners are becoming increasingly compact in physical size because of consumer preference for minimum projection both inside and outside the structure, and a minimum loss of window light. This has generally been accomplished in capacity sizes up to 15,000 Btuh, and has permitted the design of installation mounts which are simpler to apply and more attractive in appearance. Several types of expandable mounts are now available for quick and dependable installation into single and double hung windows.

An increasing percentage of units are being applied through-the-wall and this would indicate an advantage in cabinets without side louvres. Coupled with this is the fact that single- and double-hung windows no longer constitute a majority on new home and apartment construction, and improved designs on most awning, slider, and casement window installation mounts should be forthcoming.

Some mountings depend on the window sash to take some of the load. In such cases, the window must be blocked in place. Otherwise, the unit might fall out if the window is inadvertently raised. Installation kits provide all structural parts needed for mounting; also gaskets, panels, and seals, for weather-tight assembly. The instructions must be carefully followed.

Adequate wiring with proper fuses must be provided for the service outlet. The necessary information is usually given on the instruction sheets or stamped on the conditioner near the service cord.

All room air conditioners regardless of voltage or amperage are required to be grounded. All units are equipped with grounding type plug caps from the manufacturer. Receptacle with ground conductors should be used when units are installed.

Through-the-wall units with steam or hot water coils must be wired in or connected with armored cable or conduit. When the cooling unit can be removed without disturbing the heating system, however, it has been customary to provide adequate plug-in wire in order to facilitate installation and servicing of the cooling unit.

The servicing aspect is related to the type of unit (slide out vs integral chassis) and the component which becomes defective. The integral chassis designs permit servicing of most electrical components (except compressor and fan motor) by partially dismantling the front (while the installation remains intact). The slide-out types have the advantage of maintaining window closure while repairs are made on the chassis element.

FUTURE DEVELOPMENTS

The trend toward smaller size is continuing because of the space, handling, and cost advantages to the owner. However, to accomplish this successfully, the performance of the unit (capacity, noise, airflow, condensate disposal, etc.) cannot be penalized. This requires more efficient air system designs and intensive testing of the aspects which are less critical on the more roomy arrangements. The advent of cooling capacity certification, with most manufacturers participating in the program, is expected to influence future developments because of the need for tighter control of those components which affect performance.

Noise reduction (both inside and outside) is becoming increasingly important. Where inside noise can be displeasing to the owner, excessive outside noise (condenser fan and compressor) can be irritating to his neighbor, and local ordinances are being effected in some areas to establish a maximum intensity. No universally accepted standard for noise ratings (either for design or application) has been approved, but active effort is being exerted to accomplish such a standard.

As a first step towards a standard for noise ratings, ASHRAE Standard 36A-63, giving a method of determining sound power levels of Room Air Conditioners, has been published.

Room air conditioners (primarily through-the-wall applications) can provide year-round comfort with steam, hot water, or resistance heat. A recent development is a combination gas heater and electric powered air conditioner.

Year-round room air conditioners of a long-low type have been developed for high-rise apartment applications primarily, and appear to be fulfilling special architectural needs relative to shape, projection, and structural variation. Such equipment competes with fan-coil systems, and is most acceptable with low noise levels and reliable long life construction.

Individual room controls provide different temperatures in different rooms and permit shutting off rooms as desired. The heating and cooling thermostats for these units are usually built into the conditioner, but sensitive wall-type thermostats operating on low voltage circuits give even better control. Another new development produces improved temperature and humidity conditions by using room air conditioners which reheat the air when the humidity is high and the dry-bulb temperature is relatively low.

Room air conditioners with cooling capacities up to 32,000 Btuh appear to be gaining a much larger share of the market. These units are generally applied in small business establishments, halls, and houses with a minimum of partitioning. Reverse cycle units of this type are being used successfully for heating and cooling of moderate size homes in some areas.

Small high-speed compressors driven by two-pole motors are coming into use. Improvement in noise level is to be expected as a result of current developments. Furthermore, thermoelectric cooling and heating are now being investigated intensively, and some experimental air-conditioning equipment using thermoelectric principles has been built. However, more efficient and lower cost thermoelectric materials are needed, before practical and economically feasible equipment can be produced.

DEHUMIDIFIERS

This section refers to domestic type dehumidifier units which are self-contained, electrically operated, and mechanically refrigerated.

A dehumidifier is a device which reduces the relative humidity of the surrounding atmosphere. It provides comfort by dehumidifying and reducing the relative humidity of circulating room air, and prevents rust, rot, mold and mildew in equipment. A dehumidifier consists of a motor-compressor unit, an air-circulating fan, a refrigerated surface (evaporator), a condenser, and a cabinet to house these components.

Fig. 2 shows a typical electric dehumidifier refrigeration system. The fan draws the moist room air through the cold coil. The air is cooled below its dew point, thus giving up moisture which drains off into the condensate receptacle or into the sewer. The cooled air of decreased moisture passes through the hot condenser, where it is reheated. Then, with the addition of other unit radiation heat, the air is discharged into the room at somewhat higher temperature, but much lower relative humidity.

Continuous recirculation of room air through this system gradually reduces the relative humidity of the room air. The addition of humidity control to cycle the system automatically maintains a preselected relative humidity. Controls are normally supplied in the adjustable range of 20 to 80 percent relative humidity.

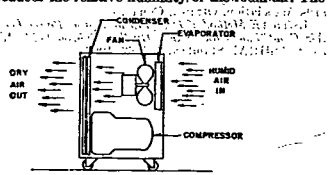

Fig. 2 .... Typical Dehumidifying Refrigeration Unit

SIZES

Domestic dehumidifiers range from ¼ to ½ hp. Their input varies from 200 to 600 watt at 115 volt, single-phase 60-cycle power, and they can be plugged into ordinary house outlets. Domestic dehumidifiers remove from 5 to 15 quarts of water from the air in 24 hours, and are tested under standard NEMA conditions by most manufacturers. (National Electrical Manufacturers Association, Publication No. DH1-1963. *Dehumidifiers (Self Contained, Electrically Operated, Mechanically Refrigerated).*

Removable water receptacles used with dehumidifiers hold 8 to 11 quarts, and are usually made of plastic or porcelanized steel to withstand corrosion. Ease of removal and handling without spilling is important. On most units, a flexible hose leads to the unit drain or receptacle for gravity drainage to a sewer outlet.

Overall sizes and weights of dehumidifiers vary as follows:

Width, inches—12 to 14.5	Height, inches—12 to 23.5
Depth, inches—10 to 20.5	Weight, lbs—45 to 75

Table 2 .... Typical Dehumidifier Performance Data

Room ambient—Dry Bulb 80 F, Wet Bulb 69.5 F, Relative Humidity 60%

Compressor HP*	⅓–½	½–½	½–½	½–½
Electrical Input				
Volts	115	115	115	115
Watts	320	350	440	550
Amps	3.5	3.7	5.3	6.4
Electric energy kwhr/24 hr	6.4	6.9	10.5	13.0
Air Circulation	140	170	180	190

* Optional

Depending on the cost, dehumidifiers are either plain or more decorative. More expensive models have higher capacity, are better styled, and are equipped with a humidistat. These humidistats control the relative humidity of the circulating air within ± 3 percent. They may include an off-on unit line switch. As an added safety feature for automatic dehumidifiers, accessory kits are available to automatically turn off the dehumidifier when the water receptacle is full and requires emptying. This device may or may not include an indicating light. Deluxe dehumidifiers are usually equipped with casters so that they can easily be moved from place to place.

Less expensive models usually are smaller, have lower capacity, and are not as decorative as more expensive types.

CAPACITY AND PERFORMANCE RATING

Dehumidifier rated capacity is expressed by the number of pounds of water removed from the atmosphere in a 24-hour period at standard NEMA rating conditions. For comparison, performance may be evaluated in terms of pounds of condensate per kilowatt hour.

Table 2 lists performance data for typical dehumidifiers.

DESIGN FEATURES

Evaporator surface may be in the form of bare-tube coils and finned-tube coils in both vertical and horizontal tube arrangements. Vertical tubes collect smaller drops and promote quicker run-off than horizontal tubes; the latter tubes, therefore, obtain more re-evaporation. With multiple horizontal tubes, the drops fall on the tubes below. This causes more re-evaporation which is detrimental to performance. Because of high construction costs involved in header connections of closely spaced multiple vertical tubes, spiral evaporator tubes appear to be a good current design compromise. This design has most of the advantages of the vertical-tube evaporator.

Finned tubing with relatively small fin extension aids performance if the entire surface remains below the dew-point temperature. Otherwise re-evaporation of the condensate occurs. However, finned coils are difficult to keep clean.

Evaporators are protected against corrosion by finishes, such as paint, wax, and anodizing (on aluminum). Waxing reduces the *wetting* effect needed for condensate formation. However, tests on waxed evaporator surfaces vs non-waxed surfaces indicate a negligible loss in capacity. Thin paint films do not appreciably affect capacity either.

The air circulated by dehumidifiers in the ¼ to ½ hp range varies from 125 cfm to 250 cfm. In general, capacity of a dehumidifier increases with increase in air flow. Large air flows, however, may cause objectionable noise.

Domestic dehumidifiers handle 0.75 to 1 air change per