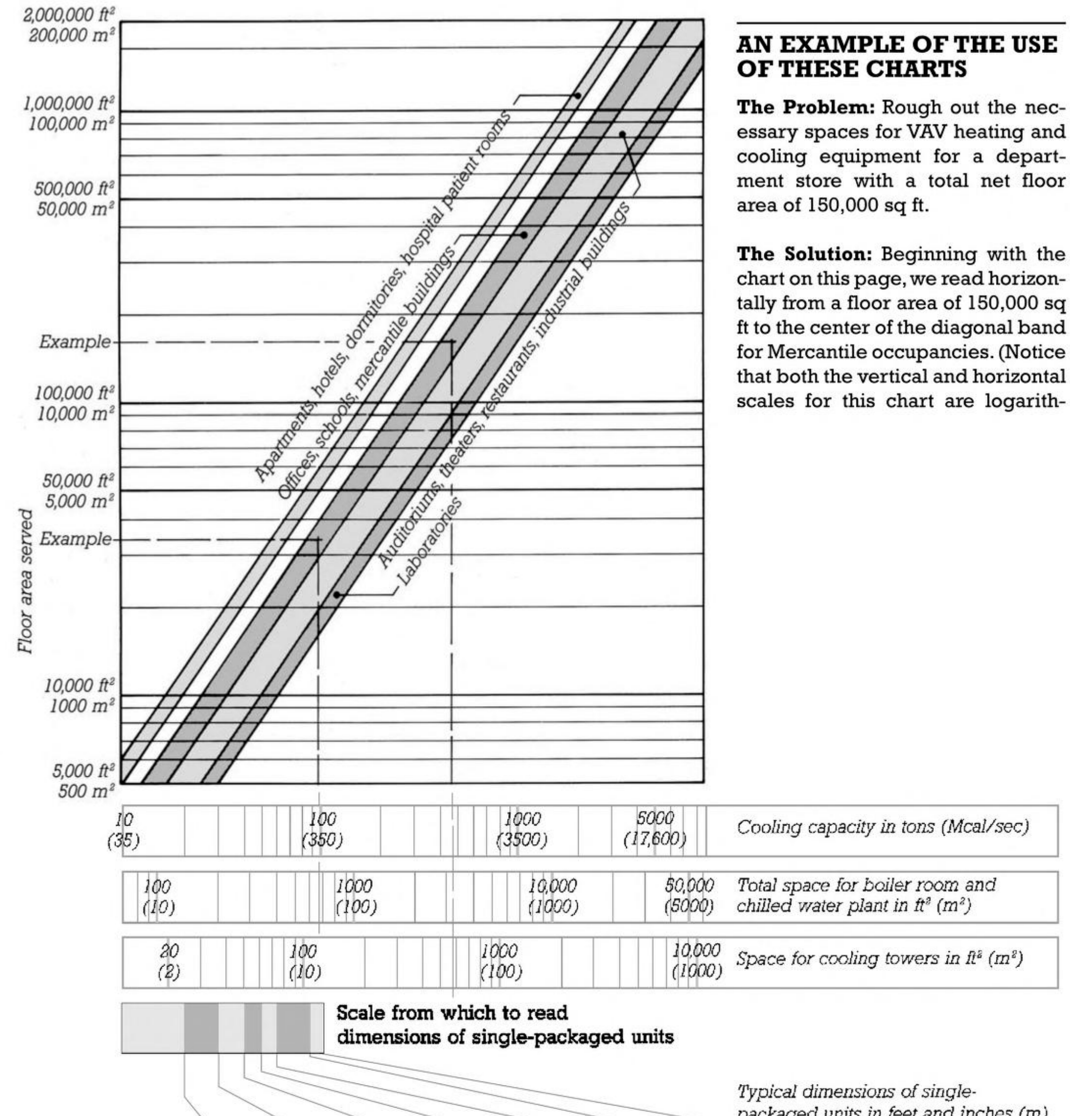
Mechanical Space Allocations: Methodology used in Admin BFR Generator for overall mechanical space requirements. Calculations estimate central (primary) mechanical space and distributed (secondary) fan rooms. Logarithmic charts below for office buildings were reverse engineered into equations.

SIZING SPACES FOR MAJOR HEATING AND COOLING EQUIPMENT



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Typical dimensions of single-packaged units in feet and inches (m)

10′-10″ (3.30)	17′-1″ (5.21)	20′-6″ (6.25)	25′-0″ (7.62)	25′-0″ (7.62)	36′-3″ (11.05)	39′-3″ (11.96)	Length
7′-3″ (2.21)	7′-3″ (2.21)	7′-3″ (2.21)	7′-3″ (2.21)	7′-3″ (2.21)	7′-8″ (2.34)	7′-8″ (2.34)	Width
4′-11″ (1.50)	4′-11″ (1.50)	4′-11″ (1.50)	4′-11″ (1.50)	4′-11″ (1.50)	7′-9″ (2.36)	7′-9″ (2.36)	Height

AN EXAMPLE OF THE USE OF THESE CHARTS

The Problem: Rough out the necessary spaces for VAV heating and cooling equipment for a department store with a total net floor area of 150,000 sq ft.

The Solution: Beginning with the chart on this page, we read horizontally from a floor area of 150,000 sq ft to the center of the diagonal band for Mercantile occupancies. (Notice that both the vertical and horizontal scales for this chart are logarith-

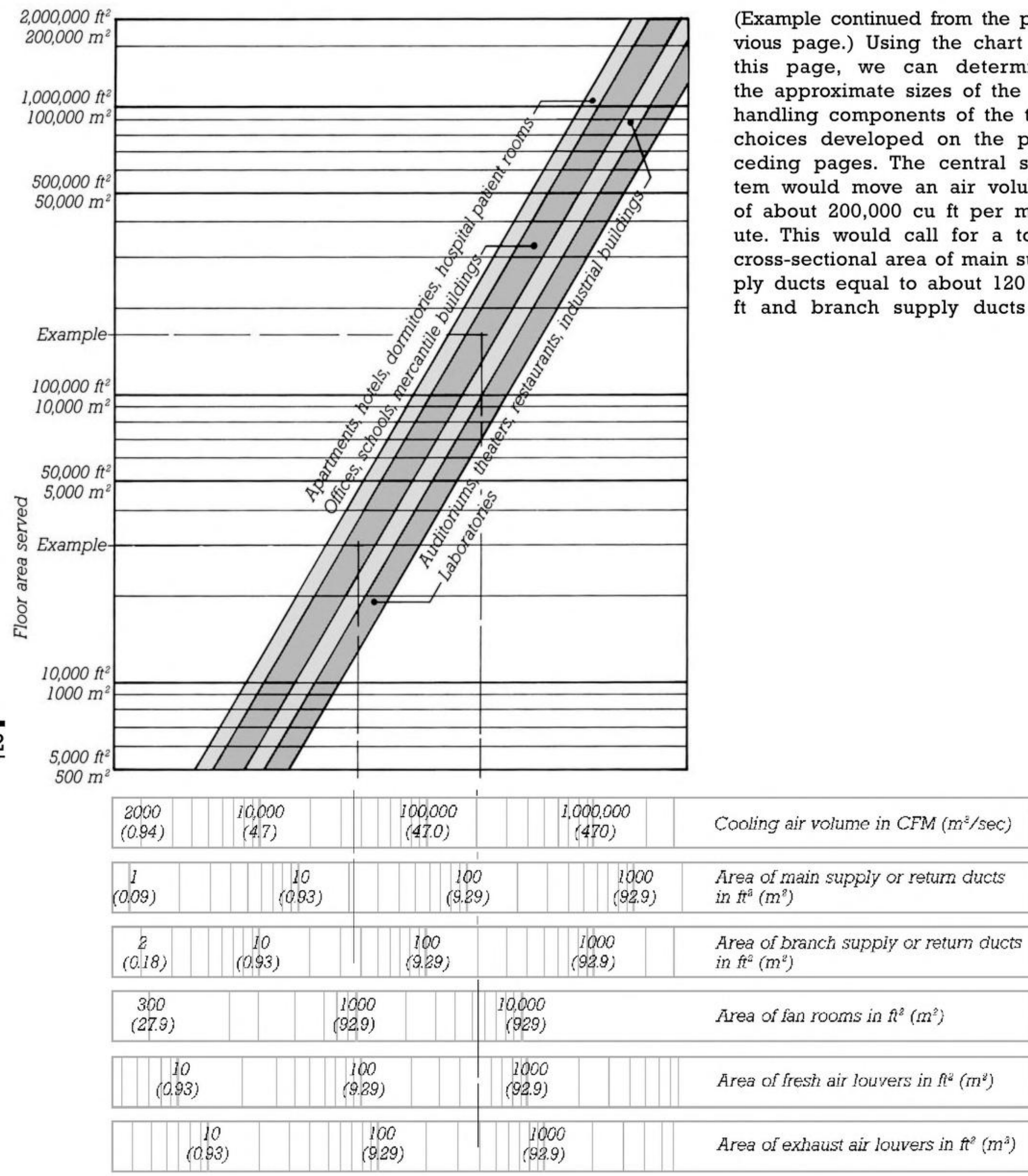
The following equation estimates the central mechanical room area for an office building: $x=(y/69.2)^{1.053}$, where x = size of mechanical room (in NSF) and y = Net Building Area (in NSF).

mic; 150,000 lies much closer to 200,000 than to 100,000.) Reading down, we find that the required cooling capacity for this building is approximately 450 tons, requiring a chilled water plant and a boiler room that together will occupy an area of approximately 3200 sq ft. Cooling towers will occupy about 560 sq ft on the roof or alongside the building. The width of the diagonal band from which we have read gives us a range of 400 to 520 tons for the cooling requirement, so we know that these space requirements may grow somewhat smaller or larger as the system is designed in detail.

These values assume a central plant for heating and cooling. Could rooftop single-packaged units be used instead? We see at the bottom of the chart that no single-packaged unit is large enough to handle the entire load. Starting from the largest available packaged unit and reading up, we intersect the diagonal band and read to the left to find that the unit could serve about 33,000 sq ft of this building. Five such units could be distributed about the roof to furnish heating and air conditioning for the entire building, each serving about 30,000 sq ft. Each unit would need a capacity of about 90 tons and would measure 39 ft 3 in. long, 7 ft 8 in. wide, and 7 ft 9 in. high. A larger number of smaller units could also be used.

For more detailed information on boiler rooms, see page 180. Chilled water plants and cooling towers are explained on page 181 and single-packaged units on page 186.

Move to the following page to continue this example.



(Example continued from the previous page.) Using the chart on this page, we can determine the approximate sizes of the air handling components of the two choices developed on the preceding pages. The central system would move an air volume of about 200,000 cu ft per minute. This would call for a total cross-sectional area of main supply ducts equal to about 120 sq ft and branch supply ducts of about 200 sq ft total. If the branch supply ducts were 2 ft deep, for example, their aggregate width would be about 100 ft. Similar areas of return ducting would also be needed. Reading from the last three scales, we further determine that fan rooms totaling about 5200 sq ft are needed, served by fresh air louvers adding up to about 500 sq ft in area and exhaust air louvers totaling nearly 400 sq ft. The location and distribution of this louver area on the outside surfaces of the building are of obvious architectural importance.

Each of the rooftop single-packaged units would need about 21 sq ft of main duct for supply air and the same for return, with a total area of 35 sq ft for branch ducts. Fans and louvers are incorporated into the units and do not need to be provided separately.

For further information on fan rooms and louvers, see page 185.

The following equation estimates the area for all fan rooms:
$x=(y/58)^{1.087}$, where x = size of fan rooms (in NSF) and y = Net Building Area (in NSF).

Adding the two equations together provides a rough estimate of the total mechanical space required for an office building.

Source: Architect's Studio Companion.