

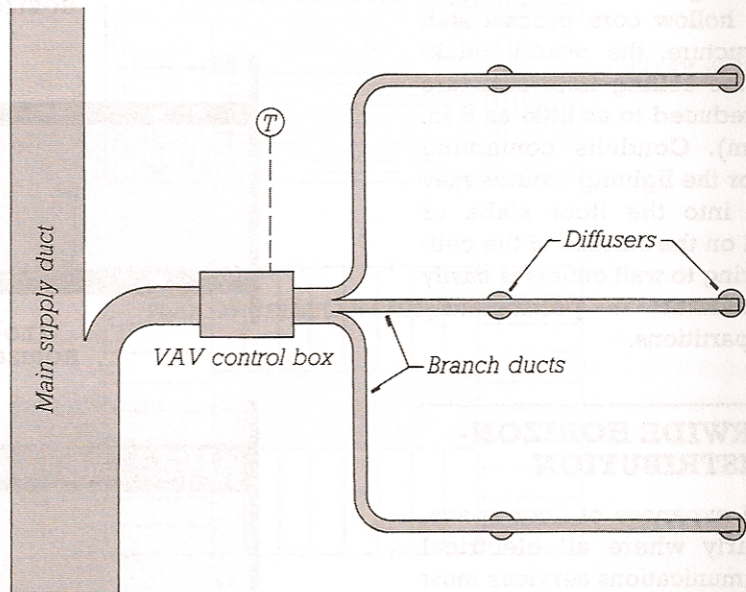
The horizontal distribution system for mechanical and electrical services in a large building should be planned simultaneously with the structural frame and the interior finish systems, because the three are strongly interrelated. The floor-to-floor height of a building is determined in part by the vertical dimension needed at each story for horizontal runs of ductwork and piping. The selection of finish ceiling, partition, and floor systems is often based in part on their ability to contain the necessary electrical and mechanical services and to adjust to future changes in these services. All these strategies involve close cooperation among the architect and the structural and mechanical engineers.

plumbing walls, they will not interfere with other services. Sprinkler heads, which have next highest priority in the layout of horizontal services, are served from the fire standpipe by horizontal piping that seldom exceeds 4 in. (100 mm) in outside diameter. The spacing of the heads is coordinated with the placement of walls and partitions; the maximum coverage per head is about 200 sq ft (18.6 m²) in light-hazard buildings such as churches, schools, hospitals, office buildings, museums, apartment houses, hotels, theaters, and auditoriums. Coverage in industrial and storage buildings ranges from 130 to 90 sq ft (12.1 to 8.4 m²) per head, depending on the substances handled in the building.

Air conditioning ducts, the next priority, branch out from a local fan room or from vertical ducts in supply and return shafts. Return ducts are often very short and confined to the interior areas of the building. Supply ducts extend from the main ducts through VAV or mixing boxes, then through low-velocity secondary ducts to air diffusers throughout the occupied area of the floor, with special emphasis on the perimeter, which may be on an independent, separately zoned set of ducts. Diffusers are generally required at the rate of four to seven diffusers per 1000 sq ft (100 m²). For some typical diffuser designs, see the illustration on page 215.

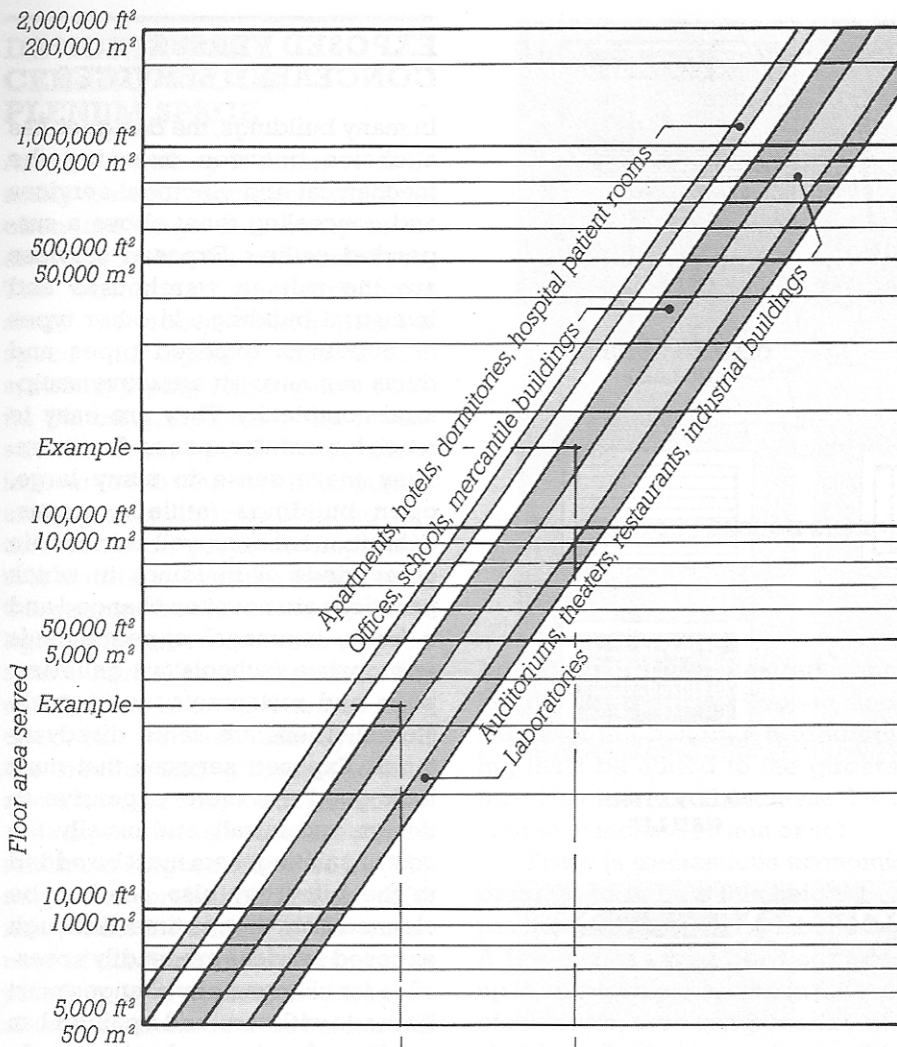
CONNECTING HORIZONTAL AND VERTICAL DISTRIBUTION LINES

Horizontal mechanical and electrical lines must be fed by vertical lines through smooth, functional connections. Plumbing waste lines, which must be sloped to drain by gravity, have top priority in the planning of horizontal service lines; if they are confined to vertical



PLAN OF VAV DUCTING

SIZING SPACES FOR MAJOR HEATING AND COOLING EQUIPMENT



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.

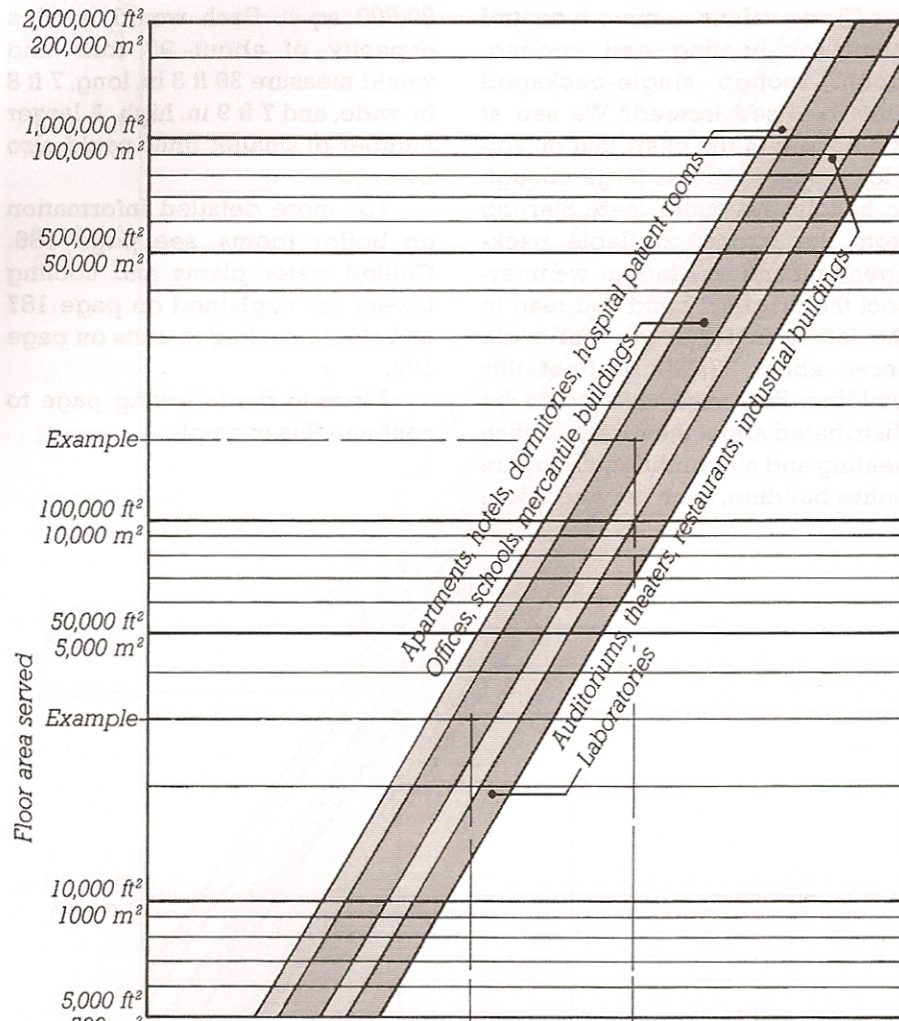
The Solution: Beginning with the chart on this page, we read horizontally from a floor area of 150,000 sq ft to the center of the diagonal band for Mercantile occupancies. (Notice that both the vertical and horizontal scales for this chart are logarithmic; 150,000 lies much closer to 200,000 than to 100,000.)

10 (35)	100 (350)	1000 (3500)	5000 (17,600)	Cooling capacity in tons (Mcal/sec)
100 (10)	1000 (100)	10,000 (1000)	50,000 (5000)	Total space for boiler room and chilled water plant in ft² (m²)
20 (2)	100 (10)	1000 (100)	10,000 (1000)	Space for cooling towers in ft² (m²)

Scale from which to read dimensions of single-packaged units

Scale from which to read dimensions of single-packaged units							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

SIZING SPACES FOR AIR HANDLING



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,

2000 (0.94)	10,000 (4.7)	100,000 (47.0)	1,000,000 (470)	Cooling air volume in CFM (m ³ /sec)
1 (0.09)	10 (0.93)	100 (9.29)	1000 (92.9)	Area of main supply or return ducts in ft ² (m ²)
2 (0.18)	10 (0.93)	100 (9.29)	1000 (92.9)	Area of branch supply or return ducts in ft ² (m ²)
300 (27.9)		1000 (92.9)	10,000 (929)	Area of fan rooms in ft ² (m ²)
10 (0.93)		100 (9.29)	1000 (92.9)	Area of fresh air louvers in ft ² (m ²)
	10 (0.93)	100 (9.29)	1000 (92.9)	Area of exhaust air louvers in ft ² (m ²)