

Table 9 Rapid Selection for +35 F Storage Room

Based on 9 ft outside height, 4 in. cork or equal insulation, 95 F outside temperature, no sun effect. Usage loads based on Table 8. Do not use this table for unusual loading.

Outside dimension	Btu/hr for 16-hr operation		Outside dimension	Btu/hr for 16-hr operation	
	Average service	Heavy service		Average service	Heavy service
6X6	2,580	3,180	14X10	8,640	10,900
6X6	2,960	3,540	14X12	9,720	12,300
7X6	2,330	3,540	14X14	10,800	13,700
7X7	3,790	4,080	16X8	8,140	10,000
8X5	3,240	3,920	16X10	9,340	12,000
8X6	3,710	4,530	16X12	10,700	13,450
8X7	4,200	5,170	18X14	12,000	15,000
8X8	4,680	5,680	18X16	13,100	16,600
9X6	4,080	4,960	18X18	10,300	13,000
9X7	4,600	5,640	18X12	11,700	14,800
9X8	5,080	6,260	18X14	13,100	16,400
9X9	5,630	6,920	18X16	14,400	17,400
10X6	4,450	5,450	18X18	15,800	19,600
10X7	5,010	6,200	20X10	11,300	13,700
10X8	5,520	6,880	20X12	12,800	15,700
10X9	6,080	7,520	20X14	14,300	17,600
10X10	6,630	8,150	20X16	15,600	19,400
11X6	4,820	5,910	20X18	17,000	21,100
11X7	5,380	6,630	20X20	18,700	22,700
11X8	6,000	7,350	22X12	13,700	17,100
11X9	6,620	8,050	22X14	15,300	18,900
11X10	7,100	8,800	22X16	16,800	20,800
12X6	5,150	6,350	22X18	18,300	22,000
12X8	6,400	7,700	24X12	14,700	18,200
12X10	7,590	9,380	24X14	16,200	20,300
12X12	8,800	10,800	24X16	17,300	22,100
14X8	7,300	9,050	24X18	19,300	24,000

15 X 10 X 8 ft (outside dimensions) with 3-in. cork insulation. The ambient temperature is 95 F and the storage temperature is 65 F. The product, 8000 lb of bananas, to be stored, enters the room at 65 F. The electrical load is 300 watts.

Solution: The outside surface area is 700 sq ft. From Table 1, the heat gain factor is 2.4 Btu per (sq ft) (F deg) (24 hr). The wall heat gain is $700 \times 30 \times 2.4 = 50,400$ Btu per 24 hr.

The internal volume of the room is $14 \times 9 \times 7 = 882$ cu ft. From Table 4, 19 air changes will occur in 24 hr. The heat required to cool air from 95 F to 65 F is 1.54 Btu per cu ft. Thus, the air change load is $882 \times 19 \times 1.54 = 25,500$ Btu per 24 hr.

The heat of respiration of bananas, from Table 4 of Chapter 69, is 8,360 Btu per (24 hr) (ton). The product load, therefore, is $8,360 \times 8000/2000 = 33,400$ Btu per 24 hr.

The electrical load is $300 \times 3.41 \times 24 = 24,600$ Btu per 24 hr.

Item	Btu per 24 Hr
Wall gain	50,400
Air change	25,500
Product	33,400
Electrical	24,600
10% Safety Factor	133,900
Total Load	147,300

CHAPTER 29

SPACE AIR DISTRIBUTION

Definitions, Standards for Satisfactory Conditions, Principles of Air Distribution, Isothermal Axial Flow Jets, Isothermal Radial Flow Jets, Nonisothermal Axial Flow Jets, Vertically Projected Heated and Chilled Jets, Duct Arrangements, Return and Exhaust Intakes, Balancing the System

CORRECT air distribution is essential in warm air heating, ventilating, and air-conditioning systems. Even though a system delivers the required quantity of conditioned air to a room, unsatisfactory conditions result if the air is poorly distributed.

This chapter deals with room air distribution only, and discusses: (1) standards for satisfactory conditions; (2) principles of air distribution; (3) outlet performance and selection; and (4) return and exhaust intakes. The transmission of air through ducts is treated in Chapter 31, Air Duct Design. Chapter 30 deals with Air Diffusing Equipment.

Further pertinent information on air distribution will be found in Chapter 7, Physiological Principles; Chapter 14, Sound Control; Chapter 16, Measurement and Instruments; Chapter 64, Unit Ventilators and Unit Heaters; and Chapter 65, Unitary Air Conditioners.

DEFINITIONS

The following definitions referring to air distribution equipment have gained general acceptance.

- Aspect Ratio:** The ratio of length to width of an opening or core of a grille.
- Coefficient of Discharge:** Ratio of area at vena contracta to area of opening.
- Core Area:** The total plane area of that portion of a grille included within lines tangent to the outer edges of the outer opening through which air can pass.
- Damper:** A device used to vary the volume of air passing through a confined cross-section by varying the cross-sectional area.
- Diffuser:** An outlet discharging supply air in various directions and planes.
- Diffusion:** Distribution of air within a space by an outlet discharging supply air in various directions and planes.
- Drop:** The vertical distance, the lower edge of a horizontally projected air stream drops between the outlet and the end of its throw.
- Effective Area:** The net area of an outlet or inlet device through which air can pass and is equal to the free area times the coefficient of discharge.

The general responsibility for this chapter is assigned to TC 4.1, Duct Design and Room Air Distribution.

9. **Entrainment:** The entrainment of room air by the air stream discharged from the outlet (commonly called secondary air motion).

10. **Entrainment Ratio:** The total air divided by the discharged air.

11. **Envelope:** The outer boundary of an air stream moving at a perceptible velocity.

12. **Exhaust Opening or Intake:** Any opening through which air is removed from a space which is being heated, cooled, humidified, dehumidified, or ventilated.

13. **Free Area:** The total minimum area of the openings in the air outlet or inlet through which air can pass.

14. **Grille:** A covering for any opening and through which air passes.

15. **Induction:** The induction of room air drawn into an outlet by the primary air stream (commonly called aspiration).

16. **Outlet Velocity:** The average velocity of air emerging from the outlet, measured in the plane of the opening.

17. **Plaque:** A ceiling outlet in which the supply air impinges against a plate or series of parallel plates, and is deflected horizontally in all directions.

18. **Primary Air:** The air delivered to the outlet by the supply duct.

19. **Radius of Diffusion:** The horizontal distance from the diffuser outlet to the perimeter of the space, within which air motion in the occupied zone is reduced to 50 fpm maximum.

20. **Register:** A grille equipped with a damper or control valve.

21. **Rise:** The converse of drop.

22. **Room Velocity:** The residual air velocity level in the occupied zone of the conditioned space, i.e., 65, 50, 35 fpm.

23. **Spread:** The divergence of the air stream in a horizontal or vertical plane after it leaves the outlet.

24. **Supply Opening or Outlet:** Any opening through which air is delivered into a space which is being heated, cooled, humidified, dehumidified, or ventilated.

25. **Temperature Differential:** Temperature difference between primary and room air.

26. **Temperature Variation:** Temperature difference between points of the same space.

27. **Terminal Velocity:** The average air stream velocity at the end of the throw.

28. **Throw (Blow):** The horizontal or vertical axial distance an air stream travels on leaving the outlet (grille) before the maximum velocity is reduced to 50 fpm.

29. **Total Air:** The mixture of discharged air and entrained air.