

Class "E" equipment capable of attaining from 75 to 80 per cent on the Synthetic Air Chart.

1. Mechanical air supply with gravity exhaust but without air cleaning device, humidifying apparatus, temperature or humidity control.
2. Direct-indirect systems with either mechanical or gravity exhaust.
3. Open window and other so-called natural systems of ventilation.

The recommended percentages of ventilation perfection based on the Synthetic Air Chart, for various types of buildings are given in Table 1.

TABLE 1. RECOMMENDED PERCENTAGES OF VENTILATION PERFECTION BASED ON THE SYNTHETIC AIR CHART

TYPE OF BUILDING	PART OF BUILDING	RECOMMENDED PERCENTAGE
SCHOOLS	Class Rooms.....	92
	Normal Training Rooms.....	90
	Domestic Science Rooms.....	90
	Auditoriums.....	90
	Corridors.....	85
CHURCHES		85
HOSPITALS	Wards.....	90
	Operating Rooms.....	95
	Other Rooms.....	90
THEATERS	Auditoriums.....	85
	Dressing Rooms.....	85
DANCE, LODGE AND ASSEMBLY HALLS		85
OFFICE BUILDINGS	Offices in buildings where persons are continuously employed.....	90
DEPARTMENT STORES		88
OTHER STORES		88
INDUSTRIAL BUILDINGS	The percentage desirable for industrial buildings will vary over a considerable range, depending upon the character of the work and the processes employed, modified to a considerable degree by the dust content of the air and the possibility of maintaining it free from objectionable dust and fumes. This requires careful study for each installation.	

CHAPTER 5

HEATING WITH WARM AIR FURNACES BY GRAVITY

Data on Furnaces; Leader Sizes; Stack Sizes; Air Temperatures; Register Sizes and Locations; Recirculation; Layouts; Standard Installation Code.

THERE are several typical systems of warm-air heating in common use today. An analysis of the systems mentioned in the following list will show that warm air may be employed as the heating medium in almost all types of heating requirements: (1) Gravity warm-air furnace systems, with or without booster fans for forced circulation and combination air and water systems for isolated rooms; (2) Fan furnace heating systems (see Chapter 6); (3) Fan-coil and unit heating systems (see Chapter 9); (4) Indirect radiating systems (see Chapter 16).

Each system has its particular application: No. 1 is intended particularly for residences and small structures; No. 2 for large residences, small theatres, churches, schools and stores; No. 3 for large buildings, theatres, schools, churches and factories; No. 4 for homes, hotels, schools, etc.

In this chapter of THE GUIDE, consideration will be given to the design of gravity circulating warm-air heating systems. For fan circulating systems see Chapters 4, 6, 7, 9, and 27. Complete engineering data, including the procedure to be followed in designing a typical system, are presented in the first part of this chapter, while the last part of the chapter presents a Standard Code Regulating the Installation of Gravity Warm Air Heating Systems in Residences, approved by the *National Warm Air Heating Association*, AMERICAN SOCIETY OF HEATING AND VENTILATING ENGINEERS and the *National Association Sheet Metal Contractors*, as a workable Code for furnace men.

DEFINITIONS

In general, warm-air furnace heating plants consist of a fuel-burning furnace or heater enclosed in a casing of sheet metal or brick, which is placed in the basement of the building. The heated air, taken from the top or sides near the top of the furnace casing, is distributed to the various rooms of the building through sheet-metal warm-air pipes. The warm-air pipes in the basement are known as leaders, and the vertical warm-air pipes which are run in the inside partitions of the building are

All figures and much of the engineering data which follow are from Bulletin No. 141, Warm Air Furnaces and Heating Systems, Part II, by Professors A. C. Willard and A. P. Kratz, Engineering Experiment Station, University of Illinois.