

PROVISION FOR COOLING SYSTEM

If the system is to be used for cooling, the following provisions should be made:

1. Where cooling is to be secured through air circulation only:
 - a. Provide for an increase of 25 to 50 per cent in fan capacity through multi-speed pulleys or other means.
 - b. If basement air or outside night air is to be used, provide suitable basement opening in duct system, or outdoor air intake.
2. Where water below 55 F or artificial refrigeration or ice is to be used:
 - a. Provide outside air duct for circulation of cool night air for economy.
 - b. Make provision in return duct system for cooling unit.
 - c. Make provision for reduction of fan speed.

HEAVY DUTY FAN FURNACES

Fan furnaces for large commercial and industrial buildings are available in sizes ranging from 400,000 to 1,800,000 Btu per hour per unit. Heavy duty heaters may be arranged in combinations of one or more units in a battery. A few possible arrangements are shown in Figs. 6 to 13, inclusive.

Control of temperature is secured through (1) controlling the quantity of heated air entering room, (2) using mixing dampers, or (3) regulating the fuel supply.

The design of heavy duty fan furnace heating systems is in many respects similar to that of the central fan heating systems described in Chapter 22. Ducts are designed by the method outlined in Chapter 19.

Chapter 24

GRAVITY WARM AIR SYSTEMS

Procedure for Design, Estimating Heating Requirements, Sizes of Leader Pipes, Proportioning Wall Stacks, Register Sizes, Recirculating Ducts and Grilles, Return Connection to Furnace, Furnace Capacity, Examples, Booster Fans

WARM air heating systems of the gravity type are described in this chapter¹, and those of the mechanical type are described in Chapter 23. In the gravity type, the motive head producing flow depends upon the difference in weight between the heated air leaving the top of the casing and the cooled air entering the bottom of the casing while in the mechanical type, a fan may supply all or part of the motive head. Booster fans are often used in conjunction with gravity-designed systems to increase air circulation.

In general, a warm-air furnace heating plant consists 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 called stacks. The heated air is finally discharged into the rooms through registers which are set in register boxes placed either in the floor or in the side wall, usually at or near the baseboard.

The air supply to the furnace may be taken (1) entirely from inside the building through one or more recirculating ducts, (2) entirely from outside the building, in which case no air is recirculated, or (3) through a combination of the inside and the outside air supply systems.

PROCEDURE FOR DESIGN

The design of a furnace heating system involves the determination of the following items:

1. Heat loss in Btu from each room in the building.
2. Area and diameter in inches of warm-air pipes in basement (known as leaders).
3. Area and dimensions in inches of vertical pipes (known as wall stacks).
4. Free and gross area and dimensions in inches of warm-air registers.
5. Area and dimensions of recirculating or outside air ducts, in inches.
6. Free and gross area and dimensions in inches of recirculating registers.

¹All figures and much of the engineering data which follow are from *Bulletins Nos. 141, 188 and 189, Warm Air Furnaces and Heating Systems, Part II*, by Professor A. C. Willard, A. P. Kratz, and V. S. Day, Engineering Experiment Station, University of Illinois.