

8. CONSTRUCTION:

Walls—Wood siding, building paper, wood sheathing, studding, wood lath and plaster.

Roof—Wood shingles on 1 x 4 strips spaced 2 in.

Attic Ceiling—Wood lath and plaster on roof rafters.

First Floor (over basement)—Maple flooring on rough flooring on floor joists

Doors (outside)—Three, 3 ft. x 7 ft. x 1 3/4 in.; one, 2 ft. 8 in. x 7 ft. x 1 3/4 in. No weatherstripping

Windows—Double-hung, single glass, weatherstripped.

9. TRANSMISSION COEFFICIENTS:

Walls—(Table 21, Chapter 3)..... $U = 0.262$

Roof (including attic ceiling)—(Table 31, Chapter 3)..... $U = 0.288$

Floor (over basement)—(Table 26, Chapter 3)..... $U = 0.339$

Doors—(Table 33B, Chapter 3)..... $U = 0.421$

Windows—(Table 33A, Chapter 3)..... $U = 1.13$

10. INFILTRATION COEFFICIENTS:

Windows—The leakage per foot of crack for weatherstripped, double-hung, wood sash windows is 27.7 cu. ft. per hour for a 17-mile wind velocity. (By interpolation from Table 2, Chapter 4). The heat equivalent is

$$27.7 \times 0.075 \times 0.24 = 0.5 \text{ B.t.u. per hour per foot of crack.}$$

Doors—Assume 1/8 in. crack. Leakage = 139 cu. ft. per hour. (Table 2, Chapter 4). The heat equivalent is

$$139 \times 0.075 \times 0.24 = 2.50 \text{ B.t.u. per hour per foot of crack.}$$

11. CALCULATIONS:

See summary of heat loss calculations, Table 7-A, and heat loss calculation sheet for living room, Table 7-B.

Chapter 6

GRAVITY WARM AIR HEATING

Design Rules; Calculating Heat Losses; Leader Pipe Sizes; Wall Stacks; Register Area; Recirculating Ducts and Grilles; Size of Furnace; Application of Data; Forced or Booster Circulation.

WARM air furnace systems may be of the *gravity type* described in this chapter, in which the motive head producing flow depends upon the difference in weight between the heated air leaving the casing and the cooler air entering the bottom of the casing, or of the *fan-circulating type* in which a fan may supply all or part of the motive head. The fan-circulating type may consist merely of a booster fan operated in conjunction with a gravity designed system (see p. 108) or it may consist of the fan-furnace type described in Chapter 7. The majority of residence warm-air installations are of the gravity type.

DESCRIPTION OF GRAVITY WARM AIR HEATING SYSTEM

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.

Furnace heating plants may be: (1) of the gravity circulating type in which the motive-head-producing flow depends upon the difference in weight between the heated air leaving the casing and pipes and the cooler air entering the bottom of the casing, or (2) of the fan circulating type in which a fan may supply all or part of the motive-head producing flow. In most house installations, the former type of system is in general use.

All 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 Professors A. C. Willard, A. P. Kratz, and V. S. Day, Engineering Experiment Station, University of Illinois.