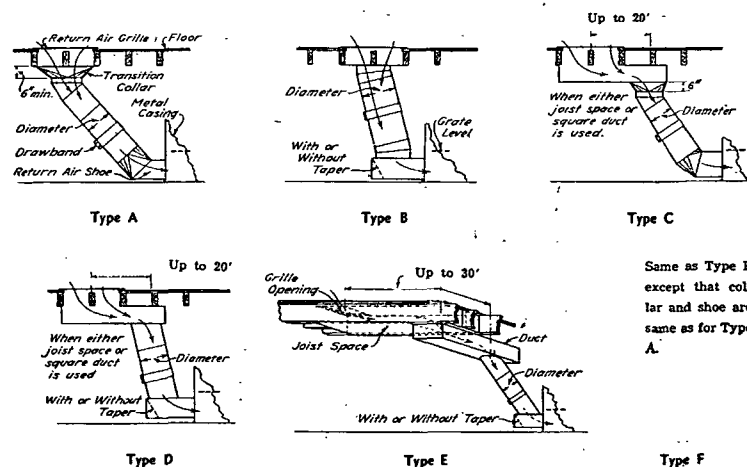


necessary in spaces which are closed off from the rest of the house or which have much outdoor exposure. Return grilles on different floor levels should not be connected to the same vertical return duct.

Ducts returning air to the furnace should avoid heat sources which tend to reheat the return air. If the duct must be run over the top of the furnace, or above the vent pipe from the furnace, insulation should be interposed between the heat source and the duct.

Circulation of air is facilitated if the air can slide down a pipe inclined at approximately 45 deg and into a furnace shoe connection having a cross-sectional area equal to that of the pipe. The top of the return shoe should enter the casing below the level of the grate in the case of a coal



Note: For Types C, D, E, and F return-air duct systems, reduce the carrying capacities shown in Table 8 by 1 per cent for each 4 ft additional length in the horizontal run.

FIG. 3. TYPICAL ARRANGEMENTS OF RETURN-AIR DUCT SYSTEMS

furnace, and not more than 14 in. above the floor in the case of oil or gas furnaces. In order to accomplish this the shoe is made wide.

OUTLINE OF DESIGN PROCEDURE

The data underlying the design procedure are given in detail in a circular² issued by the University of Illinois. In this procedure the design of the warm-air duct system is considered as an entire unit, so that for a given heat loss the sizes of leaders, stacks, boots, stackheads, and registers are all correlated. Similarly in the case of return ducts, the selection specifies a complete unit consisting of return grille, return duct, and shoe connection.

Recommended Standard Sizes

For the purpose of simplification and standardization, selected combinations of commercial sizes of warm air pipes, return air pipes, ducts, grilles, fittings, and registers are designated as Combination Numbers. The numbers assigned and the combinations selected as standard are listed in the following tables³.

Table 1—Combination Numbers 1 to 5—First Story Warm Air Ducts and Registers.

Table 2—Combination Numbers 11 to 16—Second Story Warm Air Ducts, Single Wall Stacks, Fittings, and Registers.

Table 3—Combination Numbers 21 to 24—Second Story Warm Air Ducts, Double Wall Stacks, Fittings, and Registers.

Table 4—Combination Numbers 31 to 38—Return Air Ducts, Fittings, and Grilles.

The selected types of boots are shown in Fig. 2 and their resistances expressed in equivalent elbows are shown in Table 5. It is essential that free areas be maintained throughout fittings.

The selected types of return air ducts and fittings are shown in Fig. 3.

TABLE 1. FIRST STORY WARM-AIR DUCTS^a

COMBINATION NO.	LEADER PIPE DIAMETER, IN.	REGISTER SIZE, IN.		
		Floor	Baseboard	
			Size	Extension
1	8	8 x 10	10 x 8	2 1/4
2	9	9 x 12	12 x 8	2 1/4
3	10	10 x 12	12 x 9	3 1/4
4	12	12 x 14	13 x 11	5 1/4
5	14	14 x 16	-----	-----

^aWhen the calculations indicate a requirement for a given room greater than Combination No. 4, two or more smaller units totalling the required capacity are recommended.

TABLE 2. SECOND STORY WARM-AIR DUCTS—SINGLE WALL STACKS AND FITTINGS

COMBINATION NO.	LEADER PIPE DIAMETER, IN.	STACK SIZE, IN.	REGISTER SIZE, IN.			
			Floor	Baseboard		Sidewall
				Size	Extension	
11	8	10 x 3 1/4	8 x 10	10 x 8	2 1/4	10 x 8
12	9	12 x 3 1/4	9 x 12	12 x 8	2 1/4	12 x 8
14	10	14 x 3 1/4	10 x 12	12 x 8	2 1/4	12 x 8
15	12	12 x 5 1/4	-----	12 x 9	3 1/4	-----
16	12	14 x 5 1/4	-----	13 x 11	5 1/4	-----

^bRecommended stack sizes. Tables may also be applied to 3 in. and 3 1/4 in. stack depths.

TABLE 3. SECOND STORY WARM-AIR DUCTS—DOUBLE WALL STACKS AND FITTINGS

COMBINATION NO.	LEADER PIPE DIAMETER, IN.	STACK SIZE, IN.		REGISTER SIZE, IN.			
		Internal	External	Floor	Baseboard		Sidewall
					Size	Extension	
21	8	2 1/8" x 10	3 1/8" x 10 5/8"	8 x 10	10 x 8	2 1/4	10 x 8
22	8	3" x 10	3 5/8" x 10 5/8"	8 x 10	10 x 8	2 1/4	10 x 8
23	9	2 1/8" x 12	3 1/8" x 12 5/8"	9 x 12	12 x 8	2 1/4	12 x 8
24	9	3" x 12	3 5/8" x 12 5/8"	9 x 12	12 x 8	2 1/4	12 x 8

^cCommercial sizes vary 1/8 in. from values shown.