

feeder ducts of the radial system extend directly from the subfloor plenum to the perimeter diffusers, and there is no loop duct around the perimeter of the floor. The feeders do provide floor-warming, but not to the same degree provided by the feeder and loop ducts of a perimeter-loop system. The same considerations of slab construction and edge insulation apply to both systems.

A simplified design procedure⁵ using 6-in. diameter duct and subject to limitations of: 1,000 to 1,200 sq ft maximum area, not more than approximately 15 ft along perimeter between diffusers, and no radial duct substantially longer than 20 ft, is the following:

1. Calculate the heat loss of each room or area using the method explained in Chapter 12. For subfloor and edge losses, see⁶ Manual 3 of the *National Warm Air Heating and Air Conditioning Association*.

2. Determine the required furnace-bonnet capacity from the heat loss of the building.

3. Locate the diffusers on the plan. Allow at least one diffuser for each exposed wall in each room or area of the building and preferably beneath window areas. For

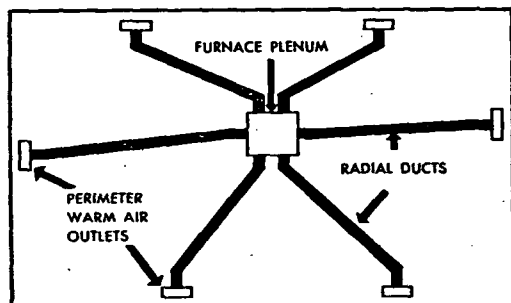


FIG. 6. PERIMETER RADIAL SYSTEM WITH FEEDER DUCTS IN CONCRETE SLAB OR CRAWL SPACE

residential installations, limit each diffuser to a maximum of 7,000 Btuh. This is a preliminary estimate of the number of diffusers needed.

4. Measure the length and count the number of elbows in each feeder duct. Determine Btuh capacity of each feeder duct from Table 3. Use Table 3 (Section A) for sidewall and floor diffusers and Table 3 (Section B) for baseboard diffusers.

5. If the total Btuh capacity of all feeders to each room or area equals or exceeds the heat loss of that room or area, the number of feeders initially chosen is satisfactory. If the heat loss exceeds the Btuh capacity of the feeders, use and locate additional diffusers and feeder ducts.

6. The cfm values in Table 3 are used for designing the return-duct system.

Perimeter-Radial System in Crawl Space or Basement Construction

The perimeter concept of warm air heating has been applied to crawl-space and basement homes by locating the diffusers in the perimeter location and by warming the area underneath the floor of such structures. Although the construction of the crawl space and the foundation wall is the responsibility of the architect and the general contractor, it is important that the engineer check the construction to make certain that it will not adversely affect the performance of the heating system. Details on crawl-space construction are shown⁶ in Manual 4 of the *National Warm*

TABLE 3. BTUH CAPACITIES AND CFM OF 6-INCH FEEDER DUCTS IN PERIMETER-RADIAL SYSTEMS IN CONCRETE SLAB FLOORS

SECTION A. FOR SIDEWALL AND FLOOR DIFFUSERS		ACTUAL LENGTH OF PIPE FROM BONNET TO DIFFUSER—FEET															
		5	10	15	20	25	30	35	40	45	50	55	60	65	70	75	80
0	Btuh										8700	8060	7460	6920	6430	5960	5550
	Cfm										127.7	124.8	122.3	119.7	117.4	115.0	113.0
1	Btuh									8620	8000	7430	6900	6400	5930	5500	5100
	Cfm									122.8	120.0	117.6	115.3	113.0	111.0	109.0	107.3
2	Btuh									8600	7960	7390	6860	6380	5940	5530	5160
	Cfm									118.5	116.2	114.0	112.0	110.0	107.8	105.6	103.0
3	Btuh									8640	8020	7450	6950	6460	6020	5600	5200
	Cfm									114.0	112.0	110.0	108.2	106.5	104.7	103.0	101.4
4	Btuh									8760	8160	7580	7050	6540	6080	5640	5250
	Cfm									110.2	108.4	106.6	105.0	103.0	101.5	99.0	97.5
5	Btuh									8850	8250	7670	7140	6640	6170	5740	5340
	Cfm									106.8	105.0	103.5	102.0	100.5	99.0	97.5	96.0
6	Btuh									9050	8420	7840	7280	6750	6300	5850	5440
	Cfm									104.0	102.5	100.7	99.2	97.8	96.5	95.2	94.0

The Equivalent Length Values used and included in calculating this table are: Diffuser and Boot = 40 ft; Plenum Takeoff = 20 ft; Each Elbow = 14 ft. For each additional 14 ft equivalent length of boot and diffuser, count one additional elbow.

All cfm values are based on standard air.

SECTION B. FOR BASEBOARD DIFFUSERS ONLY

SECTION B. FOR BASEBOARD DIFFUSERS ONLY		ACTUAL LENGTH OF PIPE FROM BONNET TO DIFFUSER—FEET															
		5	10	15	20	25	30	35	40	45	50	55	60	65	70	75	80
0	Btuh						8570	8000	7450	6910	6420	5960	5560	5150	4800	4450	4160
	Cfm						109.0	107.2	105.5	103.7	102.0	100.4	98.8	97.5	96.1	94.8	93.5
1	Btuh						8700	8100	7550	7000	6520	6060	5630	5250	4860	4530	4220
	Cfm						105.5	104.0	102.3	100.7	99.2	97.6	96.2	95.0	93.6	92.3	91.1
2	Btuh						8890	8270	7700	7160	6660	6200	5750	5350	4980	4620	4300
	Cfm						102.8	101.3	99.8	98.2	96.7	95.3	94.0	92.7	91.5	90.2	89.0
3	Btuh						8440	7870	7320	6820	6350	5880	5460	5070	4700	4350	4020
	Cfm						98.4	96.8	95.3	93.9	92.5	91.3	90.0	88.0	86.9	85.8	84.7
4	Btuh						8690	8090	7500	6980	6500	6030	5580	5180	4800	4450	4120
	Cfm						95.8	94.4	93.0	91.6	90.3	89.0	87.8	86.7	85.7	84.6	83.7
5	Btuh						8940	8320	7740	7200	6680	6190	5720	5320	4920	4550	4220
	Cfm						93.4	92.2	91.0	89.8	88.5	87.3	86.2	85.1	84.0	83.0	82.0
6	Btuh						8580	7960	7380	6850	6350	5880	5440	5040	4660	4320	4000
	Cfm						90.0	89.8	87.6	86.5	85.5	84.2	83.1	82.0	80.9	80.0	79.0

The Equivalent Length Values used and included in calculating this table are: Diffuser and Boot = 100 ft; Plenum Takeoff = 20 ft; Each Elbow = 14 ft. For each additional 14 ft equivalent length of boot and diffuser count one additional elbow.

All cfm values are based on standard air.

Air Heating and Air Conditioning Association. The crawl space or basement should be heated to provide warm floors.

A simplified design procedure⁵ for an individual duct system is summarized as follows:

1. Calculate the heat loss of each room or area using the method explained in Chapter 12. Consider the basement or crawl space as a part of the structure and