NOTES FOR TABLE 7.

[a] The inside-outside temperature difference is 70− (−10) or 80 F except where otherwise noted.

[b] Volume of infiltration, cfh = (no. air changes) x (floor or ceiling area) x (ceiling height).

[c] From Equation 5a.

[d] The ceiling heat losses are calculated by estimating the attic temperature and then calculating the loss through the ceiling using the proper temperature difference. This unheated attic is not ventilated during winter months. The attic temperature is estimated from Equation 1 to be 30.2 F when the outside temperature is −10 F and room temperature is 70 F. The temperature difference is then 70−30.2 or 39.8 deg. For the insulated residence, attic temperature becomes 4.6 F and temperature difference 70−4.6 = 65.4 deg.

[e] Temperature in garage assumed to be 35 F.

[f] Coefficient for wall adjoining garage calculated on basis of metal lath and plaster on both sides of studs (U = 0.39).

[g] One half of value from Table 4, Chapter 11, for storm windows or weatherstripping.

[h] Exposed on two sides, weatherstripped windows offset by fire-place. Use 1½.

[i] Window on one side weatherstripped but double-doors are hard to close tightly. Hence, conservative value of 1½.

[j] Assuming kitchen vent, door to vestibule usually open, allow full table value of 1½.

[k] One-half value in Table 4, Chapter 11, increased to 1½ by nearby outside door in vestibule.

[l] Full value in Table 4, Chapter 11, to allow for frequent opening of outside door.

[m] Two sides exposed, large doors but large volume. Use value 1½ as given in Table 4, Chapter 11.

[n] Two small unweatherstripped windows in protected location, but fireplace, indicate 1 change.

[p] Heat losses from these rooms into garage are heat gains for garage.

[q] Neglect heat loss to basement, as losses from boiler, piping, etc., will probably keep basement near, if not above, 70 F.

[r] Upstairs hall ceiling figures with downstairs. Heat should be provided downstairs for both.

[s] Linear feet of exposed edge.

TABLE 8. SUMMARY OF HEAT LOSSES OF UNINSULATED RESIDENCE (*Btu Per Hour*)

ROOM OR SPACE	WALLS	CEILING AND ROOF	FLOOR	GLASS AND DOOR	INFILTRATION	TOTALS
Bedroom A	5330	6910	....	1440	2180	15,860
Bedroom B	3490	4660	...	1440	1470	11,060
Bedroom C	2560	3540	...	970	1260	8,330
Bedroom D	2650	3020	960	720	950	8,300
Bathroom 1	670	1510	...	500	630	3,310
Bathroom 2	1640	960	310	320	400	3,630
Lving Room	7260	...	...	1800	5400	14,460
Dining Room	3720	...	...	3100	3080	9,900
Kitchen	2850	...	...	950	2300	6,100
Lavette	3000	...	...	1100	550	4,650
Entrance Hall	870	2390	....	640	1600	5,500
Garage	−1030[a]	−1270[b]	1060	3710	1910	4,380
Recreation	840	...	570	720	2890	5,020
Design Totals	33,850	21,720	2,900	17,410	24,620	100,500
Operating Totals[c]	*33,850*	*21,720*	*2,900*	*17,410*	*12,310*	*88,190*
Percentages[d]	38.4	24.6	3.3	19.7	14.0	100.0

[a] Wall heat loss of 2110 Btuh minus wall heat gains of 1280, 700 and 1160 Btuh. [b] Heat gains of 960 and 310 Btuh. [c] Based on ½ computed infiltration. [d] Based on operating totals.

TABLE 9. SUMMARY OF HEAT LOSSES OF INSULATED RESIDENCE (*Btu Per Hour*)

ROOM OR SPACE	WALLS	CEILING AND ROOF	FLOOR	GLASS AND DOOR	INFILTRATION	TOTALS
Bedroom A	2480	2460	...	1440	2180	8,560
Bedroom B	1620	1660	...	1440	1470	6,190
Bedroom C	1190	1260	...	970	1260	4,680
Bedroom D	1230	1080	690	720	950	4,670
Bathroom 1	310	540	...	500	630	1,980
Bathroom 2	760	250	220	320	400	1,950
Living Room	3370	...	...	1800	5400	10,570
Dining Room	1730	...	...	3100	3080	7,910
Kitchen	1320	...	...	950	2300	4,570
Lavette	1390	...	...	1100	550	3,040
Entrance Hall	410	850	....	640	1600	3,500
Garage	−470[a]	−910[b]	1060	3710	1910	5,300
Recreation	840	...	570	720	2890	5,020
Design Totals	16,180	7,190	2,540	17,410	24,620	67,940
Operating Totals[c]	16,180	7,190	2,540	17,410	12,310	55,630
Percentages[d]	29.1	12.9	4.6	31.3	22.1	100.0

[a] Wall heat loss of 980 Btuh minus wall heat gains of 590, 320 and 540 Btuh. [b] Heat gains 690 and 220 Btuh. [c] Based on ½ computed infiltration. [d] Based on operating totals.

actual heating installation (exclusive of heat sources) be reduced below that required to maintain at least 40 F in the building.

Electric Motors and Machinery

Motors and the machinery which they drive, if both are located in the room, convert all of the electrical energy supplied into heat. This heat is retained in the room if the product manufactured is not removed until its temperature is the same as the room temperature.

If power is transmitted to the machinery from the outside, then only the heat equivalent of the brake horsepower supplied is used. In some mills this is the chief source of heating, and it is frequently sufficient to overheat the building even in zero weather, thus requiring cooling by ventilation the year 'round. Table 6 shows the heat output equivalent of various sources of heat in a factory. For information concerning the heat supplied by persons, refer to data given in Chapter 6, and also Table 25, Chapter 13. For appliances see Table 26, Chapter 13.

INTERMITTENTLY HEATED BUILDINGS

In the case of intermittently heated buildings additional heat is required for raising the temperature of the air, the building materials and the material contents of the building to the specified inside temperature. The rate at which this additional heat must be supplied depends upon the heat capacity of the structure and its material contents, and upon the time in which these are to be heated.[15]

This additional heat may be computed and allowed for as conditions require, but inasmuch as the heating system proportioned for taking care of the heat losses will usually have a capacity about 100 percent greater than that required for average winter weather, and inasmuch as most buildings may either be continuously heated or have more time allowed for heating up during the few minimum temperature days, no allowance usually is made, except in the size of boilers or furnaces. For churches, auditoriums and other intermittently heated buildings, additional capacity should be provided.

RESIDENCE HEAT LOSS PROBLEMS

Example 6: Calculate the heat loss of the residence shown in Fig 3 located in the vicinity of Chicago. From Table 1, design outdoor conditions are −10 F and 12 mph wind velocity. Inside temperature from Table 2 is assumed to be 70 F. The attic is unheated. Assume ground temperature to be 50 F (see Fig. 3, Chapter 35) under basement and garage floors and 32 F adjoining basement walls. Estimate infiltration losses by the air change method. No wall, ceiling or roof insulation is to be considered in this problem, but all first and second floor windows, except in the garage, are to have storm sash. The building is constructed as follows (heat transmission coefficients *U* are parentheses):

Walls: Brick veneer, building paper, wood sheathing, studding, metal lath and plaster (0.28). Walls of dormer over garage, same except wood siding in place of brick veneer (0.26).

Attic Walls: Brick veneer, building paper, wood sheathing on studding (0.42).

Basement Walls: 10 in. concrete (0.10).

Roof: Asphalt shingles on wood sheathing on rafters (0.53).

Ceiling (Second floor): Metal lath and plaster (0.69).

Windows: Double-hung wood windows averaging 70 percent glass (0.45; from Chapter 9, Table 19, Section D, the U value for wood windows with storm sash is 0.53 x application factor; by interpolation this factor is 0.85). Steel casement sash in garage and basement (1.13; from Chapter 9, Table 19, U is 1.13 for all glass and the