TABLE 5. HEAT LOSS CALCULATION SHEET FOR UNINSULATED RESIDENCE (FIG. 2)

A	B	C	D	E	F	G
ROOM OR SPACE	PART OF STRUCTURE OR INFILTRATION AIR CHANGES	NET AREA OR AIR VOLUME	COEFFICIENT	TEMP. DIFF.[a]	HEAT LOSS (Btu per hour)	TOTALS (Btu per hour)
Bedroom A and Closet	Walls	238 sq ft	0.28	80	5330	
	Glass	40 sq ft	0.45	80	1440	
	Ceiling	252 sq ft	0.69	39.8[d]	6910	
	Infiltration (¾)[e]	1510 cfh[b]	0.018[c]	80	2180	15,860
Bedroom B and Closet	Walls	156 sq ft	0.28	80	3490	
	Glass	40 sq ft	0.45	80	1440	
	Ceiling	170 sq ft	0.69	39.8[d]	4660	
	Infiltration (¾)[e]	1020 cfh[b]	0.018	80	1470	11,060
Bedroom C and Closet	Walls	114 sq ft	0.28	80	2560	
	Glass	27 sq ft	0.45	80	970	
	Ceiling	129 sq ft	0.69	39.8[d]	3540	
	Infiltration (¾)[e]	874 cfh[b]	0.018[c]	80	1260	8,330
Bedroom D and Closet	Walls	118 sq ft	0.28	80	2650	
	Glass	20 sq ft	0.45	80	720	
	Ceiling	110 sq ft	0.69	39.8[d]	3020	
	Floor over garage	110 sq ft	0.25	35[e]	960[p]	
	Infiltration (¾)[e]	660 cfh[b]	0.018[c]	80	950	8,300
Bathroom 1	Walls	30 sq ft	0.28	80	670	
	Glass	14 sq ft	0.45	80	500	
	Ceiling	55 sq ft	0.69	39.8[d]	1510	
	Infiltration (1)[e]	440 cfh[b]	0.018[c]	80	630	3,310
Bathroom 2	Walls	79 sq ft	0.26	80	1640	
	Glass	9 sq ft	0.45	80	320	
	Ceiling	35 sq ft	0.69	39.8[d]	960	
	Floor over garage	35 sq ft	0.25	35[e]	310[p]	
	Infiltration (1)[e]	280 cfh[b]	0.018[c]	80	400	3,630
Living Room	Walls	267 sq ft	0.28	80	5980	
	Walls (adjoining garage)	94 sq ft	0.39[f]	35[e]	1280[p]	
	Glass	50 sq ft	0.45	80	1800	
	Floor	294 sq ft				
	Infiltration (1½)[h]	3745 cfh[b]	0.018	80	5400	14,460
Dining Room	Walls	166 sq ft	0.28	80	3720	
	Glass (doors)	35 sq ft	1.13	80	3160	
	Glass (windows)	20 sq ft	0.45	80	720	
	Floor	168 sq ft				
	Infiltration (1½)[i]	2140 cfh[b]	0.018[c]	80	3080	10,680
Kitchen and Entrance to Garage	Walls	96 sq ft	0.28	80	2150	
	Walls (adjoining garage)	51 sq ft	0.39[f]	35[e]	700[p]	
	Glass	18 sq ft	0.45	80	650	
	Door	17 sq ft	0.51	35	300	
	Floor	125 sq ft				
	Infiltration (1½)[j]	1595 cfh[b]	0.018[c]	80	2300	6,100
Lavette and Vestibule	Walls	82 sq ft	0.28	80	1840	
	Walls (adjoining garage)	85 sq ft	0.39[f]	35[e]	1160[p]	
	Glass	9 sq ft	0.45	80	320	
	Door	19 sq ft	0.51	80	780	
	Floor	30 sq ft				
	Infiltration (1½)[k]	383 cfh[b]	0.018[c]	80	550	4,650
Entrance Hall	Walls	39 sq ft	0.28	80	870	
	Door	21 sq ft	0.38	80	640	
	Ceiling[g]	87 sq ft	0.69	39.8[d]	2390	
	Infiltration (2)[l]	1110 cfh[b]	0.018[c]	80	1600	5,500
Garage	Walls	167 sq ft	0.28	45[e]	2110	
	Glass	53 sq ft	1.13	45	2700	
	Doors	44 sq ft	0.51	45	1010	
	Infiltration (1½)[m]	2360 cfh[b]	0.018[c]	45	1910	
	Floor (heat gain)	185 sq ft	0.10	−15	−280[e]	
	Gain adjoining rooms				−4410[p]	3,040
Recreation Room[q]	Walls	220 sq ft	0.10	38	840	
	Glass	8 sq ft	1.13	80	720	
	Floor	287 sq ft	0.10	20	570	
	Infiltration (1)[n]	2010 cfh[b]	0.018[c]	80	2890	5,020
					TOTAL	99,940

TABLE 6. 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
Living Room	7260	.....	.....	1800	5400	14,460
Dining Room	3720	.....	.....	3880	3080	10,680
Kitchen	2850	.....	.....	950	2300	6,100
Lavette	3000	.....	.....	1100	550	4,650
Entrance Hall	370	2390	.....	640	1600	5,500
Garage	−1030[a]	−1270[b]	−280[c]	3710	1910	3,040
Recreation	840	.....	570	720	2890	5,020
Design Totals	33,850	21,720	1,560	18,190	24,620	99,940
Operating Totals[d]	33,850	21,720	1,560	18,190	12,310	87,630
Percentages[e]	38.6	24.8	1.8	20.7	14.1	100.0

[a] Wall heat loss of 2110 Btuh minus wall heat gains of 1290, 700 and 1160 Btuh. [b] Heat gains of 980,310 Btuh. [c] Heat gain. [d] Based on ½ computed infiltration. [e] Based on Operating Totals.

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 37) 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 in 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 with storm sash (0.45). Steel casement sash in basement (1.13).

Floor (Bedroom D): Maple finish flooring on yellow pine sub-flooring; metal lath and plaster ceiling below (0.25).

Floor (Basement and Garage): 4 in. stone concrete on 3 in. cinder concrete (0.10).

Solution: The calculations for this problem are given in Table 5, and a summary of the results in Table 6. The values in column F of Table 5 were obtained by multiplying together the figures in columns C, D, and E. The heat losses are calculated to the nearest 10 Btu. See reference notes for Table 5 for further explanation of data.

Attention is called to the summary of heat losses (Table 6) for the uninsulated residence. As storm windows are used in this instance the *glass* and *door transmission* heat losses of 20.7 per cent are relatively small. The infiltration losses of 14.1 per cent are also comparatively small because the storm windows are equivalent to weatherstripping. In this problem, the wall, ceiling and floor transmission losses comprise 65.2 per cent of the total.

Example 6. Calculate the heat loss of residence shown in Fig. 2 based on the same conditions as in *Example 5* but having construction improved or insulated to obtain coefficients as follows:

Walls, 0.13; *Walls of Dormer over Garage*, 0.12; *Attic Walls*, 0.28; *Walls Adjoining Garage*, 0.18; *Basement Walls (Recreation Room)*, 0.10.

Roof, 0.53.

Ceiling (Second Floor), 0.15.

Windows (Same as in *Example 5*).

Floor (Bedroom D), 0.18.

Solution: The procedure for calculating the heat losses is similar to that for *Example 5*. A summary of the results is given in Table 7.