Table 9 . . . . Heat Loss Calculation Sheet for Uninsulated Residence (Fig. 1)

A Room or Space	B Part of Structure or Infiltration Air Changes	C Net Area or Air Volume	D Coefficient	E Temp. Diff.[a]	F Heat Loss (Btu per hour)	G Totals (Btu per hour)
Bedroom A and Closet	Walls	238 sq ft	0.29	80	5520	
	Glass	40 sq ft	0.45	80	1440	
	Ceiling	252 sq ft	0.74	39.8[d]	7410	
	Infiltration (¾)[e]	1510 cfh[b]	0.018[c]	80	2180	16,550
Bedroom B and Closet	Walls	156 sq ft	0.29	80	3620	
	Glass	40 sq ft	0.45	80	1440	
	Ceiling	170 sq ft	0.74	39.8[d]	5000	
	Infiltration (¾)[e]	1020 cfh[b]	0.018[c]	80	1470	11,530
Bedroom C and Closet	Walls	114 sq ft	0.29	80	2650	
	Glass	27 sq ft	0.45	80	970	
	Ceiling	129 sq ft	0.74	39.8[d]	3800	
	Infiltration (¾)[e]	874 cfh[b]	0.018[c]	80	1260	8,680
Bedroom D and Closet	Walls	118 sq ft	0.29	80	2740	
	Glass	20 sq ft	0.45	80	720	
	Ceiling	110 sq ft	0.74	39.8[d]	3240	
	Floor over garage	110 sq ft	0.26	35[o]	960[p]	
	Infiltration (¾)[e]	660 cfh[b]	0.018[c]	80	950	8,610
Bathroom 1	Walls	30 sq ft	0.29	80	690	
	Glass	14 sq ft	0.45	80	500	
	Ceiling	55 sq ft	0.74	39.8[d]	1620	
	Infiltration (1)[e]	440 cfh[b]	0.018[c]	80	630	3,440
Bathroom 2	Walls	79 sq ft	0.26	80	1640	
	Glass	9 sq ft	0.45	80	320	
	Ceiling	35 sq ft	0.74	39.8[d]	1060	
	Floor over garage	35 sq ft	0.26	35[o]	320[p]	
	Infiltration (1)[e]	280 cfh[b]	0.018[c]	80	400	3,740
Living Room	Walls	267 sq ft	0.29	80	6200	
	Walls (adjoining garage)	94 sq ft	0.39[f]	35[o]	1280[p]	
	Glass	50 sq ft	0.45	80	1800	
	Floor	294 sq ft				
	Infiltration (1½)[h]	3745 cfh[b]	0.018[c]	80	5400	14,680
Dining Room	Walls	166 sq ft	0.29	80	3850	
	Glass (doors)	35 sq ft	0.85	80	2380	
	Glass (windows)	20 sq ft	0.45	80	720	
	Floor	168 sq ft				
	Infiltration (1½)[i]	2140 cfh[b]	0.018[c]	80	3080	10,030
Kitchen and Entrance to Garage	Walls	96 sq ft	0.29	80	2220	
	Walls (adjoining garage)	51 sq ft	0.39[f]	35[o]	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	6,170
Lavette and Vestibule	Walls	82 sq ft	0.29	80	1900	
	Walls (adjoining garage)	85 sq ft	0.39[f]	35[o]	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	4,710
Entrance Hall	Walls	39 sq ft	0.29	80	900	
	Door	21 sq ft	0.38	80	640	
	Ceiling[r]	87 sq ft	0.74	39.8[d]	2560	
	Infiltration (2)[l]	1110 cfh[b]	0.018[c]	80	1600	5,700
Garage	Walls	167 sq ft	0.29	45[e]	2180	
	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	29 ft[s]	0.81	45	1060	
	Gain adjoining rooms				−4420[p]	4,450
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	103,310

Notes for Table 9. . . Heat Loss Calculation for Uninsulated Residence (Fig. 1).

[a] The indoor-outdoor 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 outdoor 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 fireplace. 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.

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

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

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

[r] Linear feet of exposed edge.

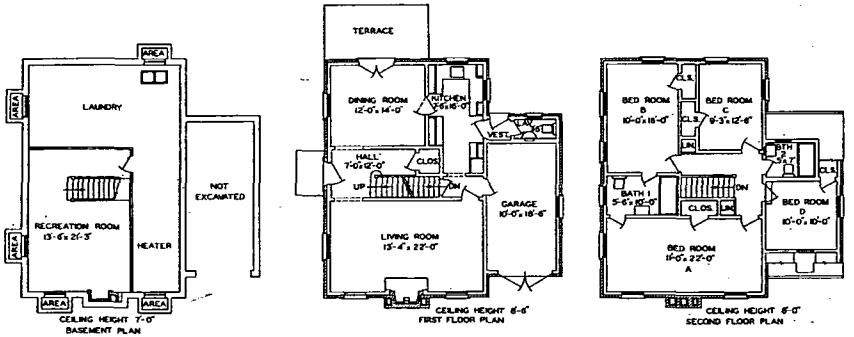


Fig. 1 . . . . Floor Plans of Residence

rage and basement (1.13; from Chapter 9, Table 18, U is 1.13 for all glass and the application factor is 1.00). French doors in dining room 50 percent glass, no storm doors (0.85; from Chapter 9, Table 18, U is 1.13 for all glass; by interpolation the application factor is 0.75).

Floor (Bedroom D): Maple finish flooring on yellow pine subflooring; metal lath and plaster ceiling below (0.26).

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 9, and a summary of the results in Table 10. The values in column F of Table 9 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 8 for further explanation of data.

Attention is called to the summary of heat losses (Table 10) for the uninsulated residence. As storm windows are used in this instance the *glass* and *door* transmission heat losses of 19.8 percent are relatively small. The infiltration losses of 14.0 percent are also comparatively small because the storm windows are equivalent to weatherstripping. In this problem, the wall, ceiling, and floor transmission losses comprise 66.2 percent of the total.

Example 7: Calculate the heat loss of residence shown in Fig. 1 based on the same conditions as in *Example 6* 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 6*).

Floor (Bedroom D), 0.18.

Solution: The procedure for calculating the heat losses is similar to that for *Example 6*. A summary of the results is given in Table 11.