tures of the various parts of a wall are controlled by the type and amount of insulation used and the vapor densities in the corresponding sections are controlled by the type of vapor barriers installed. The transmission of heat and vapor through a wall should be considered together, and in most cases the proper combination of insulation and vapor barriers will eliminate the possibilities of condensation within walls. A consideration often overlooked in problems of condensation within walls is that a vapor barrier should be placed on the warm side and not on the cold side of a wall.

HEAT LOSS COMPUTATION EXAMPLE

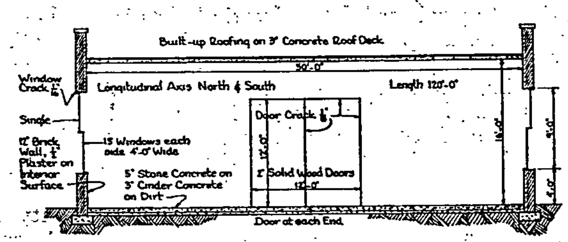

FIG. 1. ELEVATION OF FACTORY BUILDING

1. LOCATION............Philadelphia, Pa.

2. LOWEST OUTSIDE TEMPERATURE. (Table 2)............−6 F

3. BASE TEMPERATURE: *In this example* a design temperature 10 F above lowest on record instead of 15 F is used. Hence the base temperature =

$$(-6 + 10) = +4\text{ F}.$$

4. DIRECTION OF PREVAILING WIND (during Dec., Jan., Feb.)............Northwest

5. BREATHING-LINE TEMPERATURE (5 ft from floor)............60 F

6. INSIDE AIR TEMPERATURE AT ROOF:

   The air temperature just below *roof* is higher than at the breathing line. Height of roof is 16 ft, or it is 16 − 5 = 11 ft above breathing line. Allowing 2 per cent per foot above 5 ft, or 2 × 11 = 22 per cent, makes the temperature of the air under the roof = 1.22 × 60 = 73.2 F.

7. INSIDE TEMPERATURE AT WALLS:

   The air temperature at the mean height of the *walls* is greater than at the breathing line. The mean height of the walls is 8 ft and allowing 2 per cent per foot above 5 ft, the average mean temperature of the walls is 1.06 × 60 = 63.6 F. By similar assumptions and calculations, the mean temperature of the *glass* will be found to be 64.2 F and that of the *doors* 61.2 F.

8. AVERAGE WIND VELOCITY (Table 2)............11.0 mph

9. OVER-ALL DIMENSIONS (See Fig. 1)............120 x 50 x 16 ft

10. CONSTRUCTION:

    Walls—12-in. brick, with ½-in. plaster applied directly to inside surface.
    Roof—3-in. stone concrete and built-up roofing.

    Floor—5-in. stone concrete on 3-in. cinder concrete on dirt.
    Doors—One 12 ft x 12 ft wood door (2 in. thick) at each end.
    Windows—Fifteen, 9 ft x 4 ft single glass double-hung windows on each side.

11. TRANSMISSION COEFFICIENTS:

    Walls—(Table 3, Chapter 5, Wall 2B)............$U = 0.34$
    Roof—(Table 11, Chapter 5, Roofs 2A and 3A)............$U = 0.77$
    Floor—(Table 10, Chapter 5, Floors 5A and 6A)............$U = 0.63$
    Doors—(Table 13B, Chapter 5)............$U = 0.46$
    Windows—(Table 13A, Chapter 5)............$U = 1.13$

12. INFILTRATION COEFFICIENTS:

    Windows—Average windows, non-weatherstripped, 1/16-in. crack and 3/64-in. clearance. The leakage per foot of crack for an 11-mile wind velocity is 25.0 cfh. (Determined by interpolation of Table 2, Chapter 6.) The heat equivalent per hour per degree per foot of crack is taken from Chapter 6.

    25.0 × 0.018 = 0.45 Btu per deg Fahrenheit per foot of crack.

    Doors—Assume infiltration loss through door crack twice that of windows or 2 × 0.45 = 0.90 Btu per deg Fahrenheit per foot of crack.

    Walls—As shown by Table 1, Chapter 6, a plastered wall allows so little infiltration that in this problem it may be neglected.

13. CALCULATIONS: See calculation sheet, Table 3.

TABLE 3. CALCULATION SHEET SHOWING METHOD OF ESTIMATING HEAT LOSSES OF BUILDING SHOWN IN FIG. 1

PART OF BUILDING	WIDTH IN FEET	HEIGHT IN FEET	NET SURFACE AREA OR CRACK LENGTH	COEFFICIENT	TEMP. DIFF.	TOTAL BTU
North Wall:						
Brick, ½-in. plaster	50	16	656	0.34	59.6	13,293
Doors (2-in. wood)	12	12	144	0.46	57.2	3,789
⅛ in. Crack	1 pair doors		60	0.90	57.2	1,544[a]
West Wall:						
Brick, ½-in. plaster	120	16	1380	0.34	59.6	27,964
Glass (Single)	15 x 4	9	540	1.13	60.2	36,734
1/16 in. Crack	Double Hung Windows (15)		450	0.45	60.2	6,095[a]
South Wall	Same as North Wall					18,626
East Wall	Same as West Wall					70,793
Roof, 3-in. concrete and slag-surfaced built-up roofing	50	120	6000	0.77	69.2	319,704
Floor, 5-in. stone concrete on 3-in. cinder concrete	50	120	6000	0.63	5[b]	18,900
GRAND TOTAL of heat required for building in Btu per hour						517,442

[a]This building has no partitions and whatever air enters through the cracks on the windward side must leave through the cracks on the leeward side. Therefore, only one-half of the total crack will be used in computing infiltration for each side and each end of building.

[b]A 5 F temperature differential is commonly assumed to exist between the air on one side of a large floor laid on the ground and the ground.