eral case. Mechanical ventilating systems are frequently designed to produce positive or negative pressures in an enclosure, which are greater or lower than prevalent wind pressures. In such designs, if the specified rate at which air is to be supplied to, or removed from, the enclosure by positive means, exceeds the infiltration rate, it is common practice to use the greater value in determining the heating capacity to warm the outside air.

Infiltration Through Walls

Data on infiltration through brick and frame walls are given in Table 1.[1] The brick walls listed in this table are walls which show poor workmanship, and which are constructed of porous brick and lime mortar. For good workmanship, the leakage through hard brick walls with cement-lime mortar does not exceed one-third the values given. These tests indicate that plastering reduces the leakage by about 96 percent; a heavy

TABLE 1. INFILTRATION THROUGH WALLS[a]

Expressed in cubic feet per square foot per hour

TYPE OF WALL	WIND VELOCITY, MILES PER HOUR					
	5	10	15	20	25	30
8½ in. Brick Wall[b] Plain	2	4	8	12	19	23
8½ in. Brick Wall[b] Plastered[c]	0.02	0.04	0.07	0.11	0.16	0.24
13 in. Brick Wall[b] Plain	1	4	7	12	16	21
13 in. Brick Wall[b] Plastered[c]	0.01	0.01	0.03	0.04	0.07	0.10
13 in. Brick Wall[b] Plastered[d]	0.03	0.10	0.21	0.36	0.53	0.72
Frame Wall, with lath and plaster[e]	0.03	0.07	0.13	0.18	0.23	0.26

[a] The values given in this table are 20 percent less than test values to allow for building up of pressure in rooms, and are based on test data reported in the papers listed in chapter footnotes.

[b] Constructed of porous brick and lime mortar—workmanship poor.

[c] Two coats prepared gypsum plaster on brick.

[d] Furring, lath, and two coats prepared gypsum plaster on brick.

[e] Wall construction: Bevel siding painted or cedar shingles, sheathing, building paper, wood lath and three coats gypsum plaster.

coat of cold water paint, 50 percent; and three coats of oil paint carefully applied, 28 percent. The infiltration through walls ranges from 6 to 25 percent of that through windows and doors in a 10-story office building, with imperfect sealing of plaster at the baseboards of the rooms. With perfect sealing the range is from 0.5 to 2.7 percent; or a practically negligible quantity, which indicates the importance of good workmanship in proper sealing at the baseboard. It will be noted from Table 1 that the infiltration through properly plastered walls can be neglected.

The value of building paper, when applied between sheathing and shingles, is indicated by Fig. 1, which represents the effect on outside construction only, without lath and plaster. The effectiveness of plaster properly applied is no justification for the use of low grade building paper, or of the poor construction of the wall containing it. Not only is it difficult to secure and maintain the full effectiveness of the plaster, but also it is highly desirable to have two points of high resistance to air flow with an

air space between them. The infiltration indicated in Fig. 1 is that determined in the laboratory, and should be multiplied by the factor 0.80 to give proper working values.

Window and Door Leakage

There are two methods of estimating air leakage through window and door cracks, namely, (1) the crack method, and (2) the air change method. The crack method is generally regarded as being more accurate than the air change method, provided the variables, such as crack width and clearance, can be properly evaluated.

Crack Method

The crack method is based on known air leakage factors for various types of windows, and widths of crack and clearance. The wind velocity

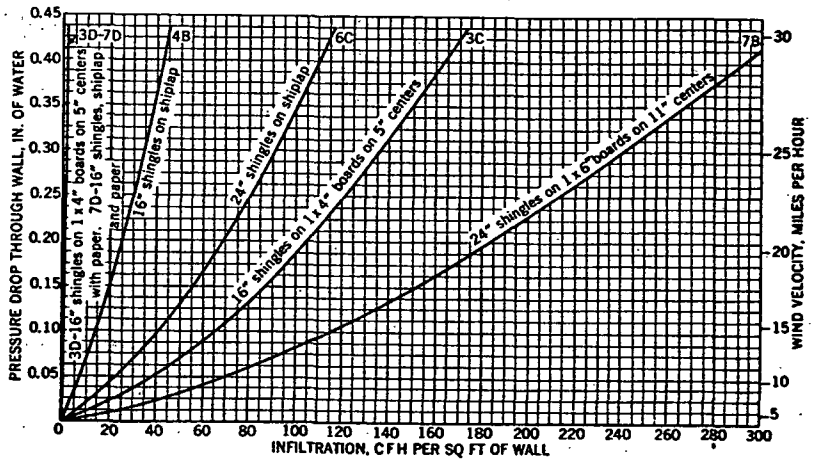

FIG 1. INFILTRATION THROUGH VARIOUS TYPES OF SHINGLE CONSTRUCTION

and length of crack are also considered when the crack method is employed. The amount of infiltration for various types of windows is given in Table 2.[2] The fit of double-hung wood windows is determined by crack and clearance. Crack thickness is equivalent to one-half the difference between the inside window frame dimension and the outside sash width. The difference between the width of the window frame guide and the sash thickness is considered as the clearance. The length of the perimeter opening or crack for a double-hung window is equal to three times the width, plus two times the height, or in other words, it is the outer sash perimeter length, plus the meeting rail length. All of the window crack in any given room is not necessarily used in estimating the infiltration heat loss by the crack method. The length of crack to be selected in any given case depends on the number of exposed sides, as explained in Chapter 11.

Values of leakage shown in Table 2 for the average double-hung wood window were determined by using, on nine windows tested in the laboratory, the average measured crack and clearance of a large number of windows found in a field survey. In addition, the table gives figures for a