the pipe transmission losses may be considerable. Where the heating plant is located within the building to be heated, the *house* or *building* efficiencies for coal, oil and gas may be substantially higher than those specified, although it is even possible that the efficiencies may be lower than these values under varying conditions of operation.

Radiation Saving: The installation of a given thickness of insulation in the walls and/or roof of a building will reduce the amount of direct radiation required to maintain the desired temperature, and in many cases this may be an item of considerable importance; in fact, in the case of certain uninsulated constructions having a high rate of heat transmission, the monetary value of the saving in radiation due to the application of the insulation, may be sufficient to offset the cost of the insulation. The amount of radiation that can be saved is of course determined from the difference in the radiation requirements of the uninsulated and insulated buildings. The radiation saving can also be estimated by means of the following formula, if a steam heating system is to be installed:

$$R_s = \frac{(U - U_i) \times (t - t_o) \times A}{240} \qquad (15)$$

where

R_s = saving in square of equivalent radiation based on a steam heating system.

t_o = the outside temperature on which the design of the system is based.

If in the example on page 32, the temperature t_o is 0 deg. fahr., the saving in radiation for a steam heating system will be:

$$R_s = \frac{(0.25 - 0.15) \times (75 - 0) \times 10{,}000}{240}$$

= 312 sq. ft. of equivalent direct radiation.

If the allowance on the reduction in the radiation required for this building on the above basis is $1.00 per square foot, the monetary value of the radiation saving will be $312.00, which if credited to the insulation, will leave a net cost of the insulation of $0.11 × 10,000 or $1,100.00 minus $312.00 or $788.00, and the annual return on the investment, taking both the fuel and radiation savings into consideration, will be $100 \times \frac{\$10.00 \times 14.3}{\$788.00}$ of 18.1 per cent, neglecting insurance and depreciation.

The radiation saving for a hot water or vapor system can be estimated by substituting the proper heat emission factor in the denominator of equation (15) for the value of 240 for steam. This heat emission factor varies with the heat dissipation coefficient of the radiator and the temperature difference between the medium in the radiator and the air surrounding it and is about 160 for hot water. However, it is obvious that the same factor should be used for estimating the radiation saving with insulation as was used for designing the heating system.

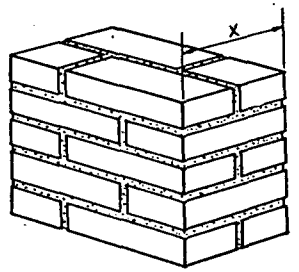
TABLE 12. COEFFICIENTS OF TRANSMISSION (U) OF SOLID BRICK WALLS[b]

Note.—THESE COEFFICIENTS ARE EXPRESSED IN B.T.U. PER HOUR PER SQUARE FOOT PER 1 DEG. FAHR. DIFFERENCE IN TEMPERATURE BETWEEN THE AIR ON THE TWO SIDES AND ARE BASED ON AN OUTSIDE WIND EXPOSURE OF 15 MILES PER HOUR.

The values of U in this Table are based on the following Internal Conductivities or Conductances which are expressed in B.t.u. per Hr. per Sq. Ft. per 1°F

Brick	5.00 per 1"
Cement Mortar	8.00 per 1"
Plasterboard	3.73 per ⅜"
Plaster (Gypsum)	2.32 per 1"
Wood Lath & Plaster	2.00 as applied
Corkboard	0.30 per 1"
Rigid Insulation (Board form)	0.33 per 1"
Cellular Gypsum (18#)	0.59 per 1"
Flaked Gypsum, Dry (24#)	0.48 per 1"
Split Furring Tile	1½" = 1.40 2" = 1.25

Y = Thickness of Insulation where specified



Number	Interior Construction	Y	Thickness of Brick – X		
			8"	12"	16"
			A	B	C
1	Plain Walls – No Interior Finish		0.385	0.295	0.238
2	½" Plaster on Brick		0.356	0.277	0.227
3	¾" Plaster on Metal Lath – Furred		0.261	0.216	0.184
4	½" Plaster on Wood Lath – Furred		0.250	0.208	0.178
5	½" Plaster on ⅜" Plasterboard – Furred		0.251	0.209	0.179
6	½" Plaster on Wood Lath on 2" Furring Strips – Cellular Gypsum Fill[c]	1⅜"[a]	0.171	0.151	0.135
7	½" Plaster on Wood Lath on 2" Furring Strips – Flaked Gypsum Fill	1⅜"[a]	0.154	0.137	0.124
8	½" Plaster on Rigid Insulation (Board form) Furred	½"	0.191	0.166	0.146
9		1"	0.148	0.132	0.120
10	½" Plaster on Corkboard set in ½" Cement Mortar	1½"	0.127	0.115	0.104
11		2"	0.105	0.097	0.090
12	½" Plaster on 1½" Split Furring Tile set against Wall		0.284	0.231	0.195
13	½" Plaster on 2" Split Furring Tile set against Wall		0.277	0.227	0.192

[a] Based on 1⅝ in., the actual thickness of 2 in. furring strips.
[b] The coefficients on this page can also be used with sufficient accuracy for the Ideal Rolok-Bak Wall.
[c] The coefficient used for cellular gypsum, 0.59 is for 18 lb. weight—weights as low as 12 lb. may be used.