

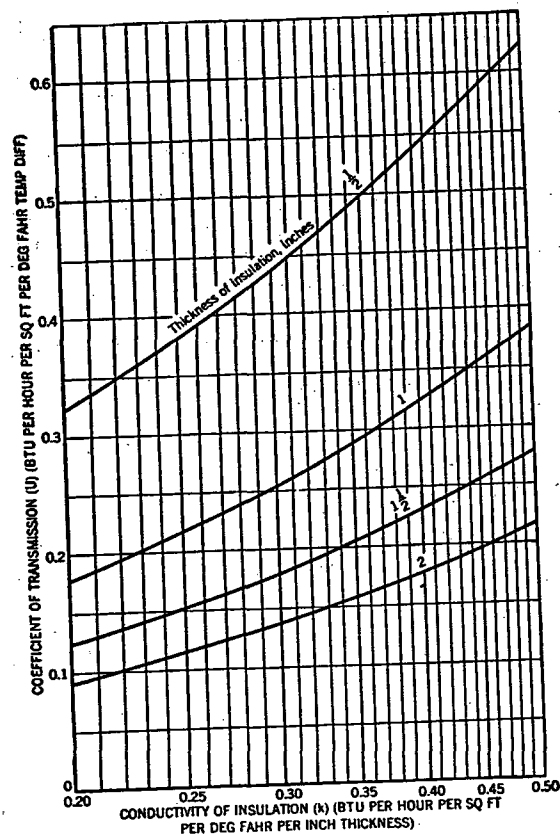


FIG. 16. HEAT LOSS COEFFICIENTS FOR INSULATED DUCTS*

* For round ducts less than 30 in. diameter, increase heat transmission values by the percentages shown below.

THICKNESS OF INSULATION (Inches)	$\frac{1}{4}$	1	1½	2
12 to 21 in. Duct Diameter.....	3%	5%	7%	9%
21 to 30 in. Duct Diameter.....	1%	2%	3%	4%

36 in. cross section and 70 ft in length, insulated with $\frac{1}{4}$ in. of a material having a conductivity of 0.35 Btu at 86 F mean temperature, carrying air at a velocity of 1200 fpm, measured at 70 F, to deliver air at 120 F with air surrounding the duct at 40 F.

Solution: Referring to Fig. 16, the overall heat transmission coefficient is found to be 0.49 Btu. From Table 1, Chapter 3 the density of air at 70 F and 29.921 in Hg. is found to be $1/13.348 = 0.0749$ lb per cu ft. Substituting these and the other given values in Equation 16, y and t_1 will be as follows:

$$y = \frac{28.8 \times 6 \times 1200 \times 0.0749}{0.49 \times 10 \times 70} = 45.3$$

$$t_1 = \frac{120(45.3 + 1) - 80}{45.3 - 1} = 123.7 \text{ F}$$

Substituting in Equation 14:

$$Q_w = 0.49 \times 10 \times 70 \left[\left(\frac{123.7 + 120}{2} \right) - 40 \right] = 28,100 \text{ Btu per hr.}$$

For special considerations which apply to insulation of ducts in marine installations see Chapter 48.

REFERENCES

- ¹ A.S.H.V.E. RESEARCH PAPER No. 1280—A New Friction Chart for Round Ducts, by D. K. Wright, Jr. (A.S.H.V.E. TRANSACTIONS, Vol. 51, 1945, p. 303).
- ² Friction Factors for Pipe Flow, by L. F. Moody (A.S.M.E. Transactions, Vol. 66, 1944, p. 671).
- ³ Friction Charts for Gases Including Correction for Temperature, Viscosity and Pipe Roughness, by R. D. Madison and W. R. Elliot (A.S.H.V.E. JOURNAL SECTION, Heating, Piping and Air Conditioning, October, 1946).
- ⁴ A.S.H.V.E. Research Report No. 1469—Friction Losses in Round Aluminum Ducts, by F. W. Hutchinson (A.S.H.V.E. TRANSACTIONS, Vol. 59, 1953, p. 127).
- ⁵ Friction Equivalents for Round, Square and Rectangular Ducts, by R. G. Huebscher (A.S.H.V.E. TRANSACTIONS, Vol. 54, 1948, p. 101).
- ⁶ A.S.H.V.E. RESEARCH REPORT No. 1405—Energy Losses in 90-Degree Duct Elbows: A Survey and Analysis of Available Information, by D. W. Locklin (A.S.H.V.E. TRANSACTIONS, Vol. 56, 1950, p. 479).
- ⁷ Pressure Loss in Ducts with Compound Elbows, by J. R. Weske (National Advisory Committee for Aeronautics, Advance Restricted Report W-39, February 1943).
- ⁸ Pressure Losses in Rectangular Elbows, by R. D. Madison and J. R. Parker (Heating, Piping and Air Conditioning, July, p. 365, August, p. 427, September, p. 483, 1936).
- ⁹ Modern Air Conditioning, Heating and Ventilating, by W. H. Carrier, R. E. Cherne and W. A. Grant, 2nd edition, 1950, p. 248 (Pitman Publishing Corp.).
- ¹⁰ A.S.H.V.E. RESEARCH REPORT No. 1216—Effect of Vanes in Reducing Loss in Elbows in Seven-Inch Square Ventilating Duct, by M. C. Stuart, C. F. Warner, and W. C. Roberts (A.S.H.V.E. TRANSACTIONS, Vol. 48, 1942, pp. 409-424).
- ¹¹ Pressure Losses of Divided-Flow Fittings, by S. F. Gilman (A.S.H.A.E. TRANSACTIONS, Vol. 61, 1955, p. 281).
- ¹² Pressure Losses Due to Bends and Area Changes in Mine Airways, by G. E. McElroy (U. S. Bureau of Mines, Information Circular I.C. 6663, p. 4).
- ¹³ Pressure Losses Resulting from Changes in Cross-Sectional Area in Air Ducts, by A. P. Kratz and J. R. Fellows (University of Illinois Engineering Experiment Station, Bulletin No. 300).
- ¹⁴ Fan Engineering, (R. D. Madison, Editor) 5th ed., 1948, p. 124 (Buffalo Forge Company).
- ¹⁵ Design of Power Plant Installations: Pressure-Loss Characteristics of Duct Components, by J. R. Henry (National Advisory Committee for Aeronautics, Advance Restricted Report LAF26, June 1944, L-208).
- ¹⁶ Installing Ducts for Higher Pressures and Why Higher Duct Velocities?, by L. O. Paul (Heating, Piping and Air Conditioning, April 1953, p. 98 and Feb. 1954, p. 109).
- ¹⁷ Modern Trends in Air Distribution, by R. D. Tutt (Refrigerating Engineering, May 1953, p. 509).
- ¹⁸ Design Factors in High Velocity Air Distribution, by W. W. Kennedy (Heating and Ventilating, January 1954, p. 83).
- ¹⁹ Can Air Conditioning be Simplified in Large Buildings?, by J. W. Kreuttnner (Heating, Piping and Air Conditioning, August 1954, p. 94).
- ²⁰ Air Conditioning an Operating Hotel, by Gardner Savage (Heating & Ventilating, September 1954, p. 100).
- ²¹ Handbook on High Velocity Air Distribution, by C. M. Wilson (Heating, Piping and Air Conditioning, November 1954, p. 94 and discussions Dec. 1954, p. 73. Feb. 1955, p. 69, March 1955, p. 99, June 1955, p. 82).