ECONOMIC THICKNESS OF PIPE INSULATION

Table 6 shows the thicknesses of insulation which ordinarily are used for various temperature conditions. Where a thorough analysis of economic thickness is desired, this may be accomplished through the use of the chart, Fig. 9.

The dotted line on the chart illustrates its use in solving a typical example. In order to use the chart, start at the lower left hand corner and proceed to the right to a point representing the given number of hours of operation per year; then proceed vertically to the line representing the given value of heat; thence horizontally, to the right, to the line representing the given temperature difference; thence vertically to the line representing the conductivity of the given material; thence horizontally, to the left, to the line representing the given discount on that material; thence vertically to the curve representing the required per cent return on the investment; thence horizontally, to the left, to the curve representing the given pipe size; thence vertically to the scale at the top of the sheet where the economical thickness may be read off directly. The dotted line on the chart illustrates its use in solving a typical example.

It is impossible to determine accurately the economic thickness of insulation to use for an underground installation owing to the many variables which are present such as depth of line, conductivity of ground, moisture conditions, etc. However, it is considered good practice to insulate underground lines with approximately ½ in. less thickness of insulation than for above ground installations under similar operating conditions.

It is necessary to keep the insulation absolutely dry if the efficiency is to be maintained, therefore, precautions should be taken thoroughly to weather-proof the insulation and to provide a drainage system for the water which may get into the conduit.

HEAT LOSSES FROM BARE FITTINGS

Very often, even where pipes are thoroughly insulated, flanges and fittings are left bare due to the belief that the losses from these parts are not large. However, the fact that a pair of 10 in. standard flanges having an area of 3.43 sq. ft. would lose, at 100 lb. steam pressure, an amount of heat equivalent to more than a ton of coal per year shows the necessity for insulating such surfaces. Table 3 shows the areas of both standard and extra heavy flanged fittings including the accompanying flanges bolted to the fittings.

CHAPTER 25

DISTRICT HEATING

Typical Service Connections; Control Devices; Underground Distribution Systems; Expansion and Contraction; Conduits and Tunnels; Insulation; Steam Requirements for Different Types of Buildings.

A GREAT deal of the information in this section will apply not only to the public utilities generally classed as district heating systems, but also to those institutional groups supplied from a central source, and perhaps better classified as central heating systems.

SERVICE CONNECTION METHODS

The practice of two companies in connecting the customer's premises with the street system are shown in accompanying sketches. Figs. 1 and 2 show the methods employed by a Boston utility for cooling condensate of customer's steam systems before discharging the condensate to the meter. Similar requirements hold where customers purchase steam by flow meter. In the latter case, however, the company does not insist that the customer meet the requirements completely as any loss in metering is borne by the customer. A vacuum or condensation return pump may be attached to these systems.

Fig. 3 shows a typical installation for service from the system of a New York utility. The practice followed by utilities in other localities may be found in the Handbook or the Proceedings of the *National District Heating Association.*

CONTROL OF STEAM SUPPLY

Because radiation for a building must provide for maximum load conditions, variable weather in many localities brings the problem of variable steam demand from the various heating elements in the building. This condition may be controlled by hand method or by any one of the systems of automatic heat control described in Chapter 17. Another form of regulation, known as the time-limit control, is sometimes employed for regulating the steam supply from the central station main to the building.

Such a control provides an intermittent supply of steam to the radiation either throughout the 24 hours of the day or during the daytime hours only. The setting of a switch may provide no service, continuous service, or periodic service. For the latter, by means of several intermittent settings, steam will be supplied during each period in increments of a certain number of minutes for each successive setting of the switch, steam being shut off during the balance of the period. These settings