

HEATING TUNNELS

Where steam heating lines are installed in tunnels large enough to provide walking space, the pipes are supported by means of hangers or roller frames on brackets or frame racks at the side or sides of the tunnel. The pipes are insulated with sectional pipe insulation over which is placed a sewed on painted canvas jacket or a jacket of asphalt saturated asbestos water-proofing felt. The tunnel itself is usually built of concrete and water-proofed on the outside with membrane water-proofing. Tile drains are installed at each side or in the center below the level of the tunnel floor to prevent the building up of static water pressure on the outside of the construction.

On account of their relatively high first cost as compared with smaller conduits, walking tunnels are sometimes not installed where provision for the heating lines is the only consideration, but only where required to accommodate miscellaneous other services, such as for underground passage between buildings.

STEAM USED PER SQUARE FOOT OF RADIATION PER SEASON

The following factors are used in New York City for the different classes of buildings listed. The factors are based on maintaining for certain hours 70 deg. inside temperature with a minimum of 0 deg. outside and an average of 43 deg. for the heating season, eight months, October 1 to June 1. In this group are six types of buildings:

For manufacturing or commercial loft type, where steam is used to heat the premises during the day hours to maintain 65 to 68 deg. from 9 A.M. to 5 P.M. No Sunday or holiday use and no night use. Factor: 325 lb. per square foot of radiation per season.

For office buildings using steam during daylight hours only to maintain 70 deg. from 9 A.M. to 6 P.M. for approximately 240 days (heating season). No night use. Factor: 400 lb. per square foot of radiation per season.

For office buildings using steam during day hours and at night when required to 7, 8 and 9 P.M. (customary where there are stock brokers or banking offices (204 days. Factor: 500 lb. per square foot of radiation per season.

For residences of the block type (not detached) where high class heating service is required somewhat similar to apartment buildings. Factor: 550 lb. per square foot of radiation per season.

For apartment houses where high class heating service is required. (Steam off at midnight). Factor: 650 lb. per square foot of radiation per season.

For hotels (commercial type) where very high class service is required—24-hour service. Factor: 800 lb. per square foot of radiation per season.

By assuming 1 sq. ft. of direct low-pressure steam radiation equivalent or required for each 100 cu. ft. of space heated, which seems a fair ratio in New York City, it is possible to roughly estimate the steam required per cubic foot of space which is often more easily obtained than the radiation.

Considerable additional data on the heating requirements of various types of buildings in a number of cities may be found in the section on Utilization in the Handbook of the *National District Heating Association*.

CHAPTER XII

GREENHOUSE HEATING SYSTEMS

Temperatures Required, Steam Heating Systems, Hot Water Radiation, Location of Radiation, Air Circulation.

A GLASS structure for horticultural purposes owing to the manner of its construction and the materials employed, offers less resistance to the penetration of frost and cold winds, than many other kinds of buildings and necessarily requires a proportionally greater amount and a more even distribution of heat.

The heating apparatus must be so arranged as to diffuse an even heat throughout every part of the house, and must be of sufficient heating power to increase the heat quickly in case of sudden changes in the weather, and so maintain the desired temperature during the night.

The temperatures usually required depends on the class of vegetation to be grown and are given in Table 1.

Although the same tables, formulae and other data that are used to estimate the heating requirements of systems in the usual types of buildings are also applicable to greenhouse heating and although the same pumps, traps, regulators, valves and other devices and fittings are used in greenhouses as in other systems, there are many differences that must be kept in mind so that due allowances may be made in the specification of a heating plant.

For instance—the highest temperatures in greenhouses are required at night, whereas with most other systems the maximum temperatures are required in the day time.

Greenhouse fires are banked almost always during the day throughout the firing season, even in mid-winter when the sun is shining; this in marked contrast to practically all other types of heating systems where the fires are banked at night.

Greenhouse radiation is almost exclusively made up of piping. The temperature demands are almost always below 70 deg. and horizontal piping carries a higher coefficient of emission than the radiating surfaces used in other systems. Special care must, therefore, be given to the selection of the boiler; the demands on it will be higher than with other forms of radiation.

Long runs of pipe are used and expansion and contraction require more consideration than in house-heating work; piping must be tied up, anchored, installations must be flexible. Although expansion joints are no more desirable in greenhouse heating than elsewhere, expansion must be compensated for by "spring" of pipe and by swivel fitted joints,

Material for this Chapter prepared for THE GUIDE by G. T. Cornwall.