REFERENCES

Panel Warming, by L. J. Fowler (A.S.H.V.E. TRANSACTIONS, Vol. 36, 1930, p. 287).

Room Warming by Radiation, by A. H. Barker (A.S.H.V.E. TRANSACTIONS, Vol. 38, 1932, p. 331).

What Will be the Future Development of Heating and Air Conditioning, by W. H. Carrier (*Heating, Piping and Air Conditioning*, January, 1933, p. 16).

American Practice in Panel Heating, by L. L. Munier (*Heating, Piping and Air Conditioning*, June, 1937, p. 424).

Radiant Heating and Cooling, by F. E. Giesecke (*Heating, Piping and Air Conditioning*, June, July, August, September and October, 1940).

Panel Heating in the British Embassy, by Alfred L. Jaros, Jr. and Richard A. Wolff (*Heating and Ventilating*, May and June, 1930).

Calculations for Radiant Heating, by T. Napier Adlam (*Heating and Ventilating*, October, 1931).

Notes on Electric Warming with Special Reference to Low Temperature Panel Systems, by R. Grierson (*Proceedings of The Institution of Heating and Ventilating Engineers*, London, Vol. 28, 1929).

Notes on the Theory of Radiant Heating, by C. G. Heys Hallett (*Proceedings of The Institution of Heating and Ventilating Engineers*, London, Vol. 29, 1930).

Radiant Heat, by A. F. Dufton (*Proceedings of The Institution of Heating and Ventilating Engineers*, London, Vol. 30, 1931).

Panel Heating, by C. M. Oates (*Proceedings of The Institution of Heating and Ventilating Engineers*, London, Vol. 30, 1931).

Principles of Calculation of Low Temperature Radiant Heating, by A. H. Barker (*Proceedings of The Institution of Heating and Ventilating Engineers*, London, Vol. 30, 1931).

Radiant Heat, by A. F. Dufton (*Proceedings of The Institution of Heating and Ventilating Engineers*, London, Vol. 31, 1932).

Chapter 46

WATER SUPPLY PIPING AND WATER HEATING

Maximum Flow, Factor of Usage, Water Pressure, Pipe Material, Allowance for Fittings, Sizing Up-Feed Systems, Sizing Down-Feed Systems, Hot Water Supply, Storage Capacity and Heating Load, Methods of Heating Water, Computing Grate and Coil Surface Area, Controls

THIS chapter deals only with problems of providing adequate facilities for delivering cold and heated water for domestic purposes in buildings.

The intensity of occupation and the amount of water used or wasted per occupant in buildings are subject to wide variation and present a complicated problem despite the rather exact knowledge available concerning hydraulic behavior as to friction, incrustation, heat transfer, etc. The designer's most serious problem is to provide the piping and the water heating and storage facilities of sufficient capacity to meet the peak demand without wasteful excess in investment or radiation costs.

For example, in two office buildings of similar type the metered water consumption has shown as much as 300 per cent difference per outlet. The rate of use in such buildings fluctuates tremendously with the hour of day, and therefore the design must be the result of adequate consideration of this and of the number of occupants, the number of water outlets, and the type of building occupancy.

Residences present a comparatively easy problem since long established custom has evolved reliable factors for water consumption per installed fixture. Tests have been made repeatedly of the amount of water required by standard fixtures in normal use with water at ordinary pressures so that this information gives a fairly correct basis of design.

For the purpose of this chapter the following terms will be used and should be clearly distinguished from one another:

Maximum Flow: The flow which would occur if the outlets on all fixtures were opened simultaneously. This condition is seldom obtained in actual practice except in cases of gang showers controlled from one common valve.

Probable Flow: The maximum flow which any pipe is likely to carry under the peak conditions. This is the most important amount to be considered in pipe sizing.

Average Flow: The flow likely to be required through the line under normal conditions.