

Homes are almost universally supplied with lighting current of 115 volts, which can only be used economically for small heaters. Usually the service lines will not permit more than plug-in devices. The Underwriters permit approved heaters of 1320 watts or less to be plugged into approved baseboard receptacles, but such heaters cannot be served on a circuit supplying much other load without overloading the fuses. There is an increasing trend toward supplying homes with three wire 115/230 volt service. Where homes have such service, larger heaters can be installed. For industrial purposes, heaters should be designed to use polyphase power, which is usually supplied at 220, 440 or 550 volts. All polyphase heaters should be balanced between phases.

REFERENCES

- Electric Elements Well Adapted to the Air Conditioning Heating Cycle, by L. P. Hynes (*Heating, Piping and Air Conditioning*, January, 1940, p. 29).
- Electric Air Heating Market (*Electrical West* 82:113; June, 1939).
- Seven Jobs for Electric Heat (*Factory Management* 97:80-1; September, 1939).
- Electric Heat for the Bathroom Floor (*Heating and Ventilating* 36:41; December, 1939).
- Electric Heat Spreads in Sunny Climes (*Barron's National Financial Weekly* 20:5; January 8, 1940).
- Electric Heating for Los Angeles Building (*Heating and Ventilating* 37:50-1; June, 1940).
- Dracker Apartments, West Los Angeles, Calif. (*Heating and Ventilating* 37:32; July, 1940).
- Electric Heat in California Homes, by P. F. Offerman, W. J. Walsh and H. H. Skilling (*Electrical West*; March, 1941, pp. 37-39).
- Radiant Heat, by F. W. Hutchinson (*Electrical West*, January, 1941, pp. 29-31).
- Electric Radiant Heat vs. Steam Convection, by Douglas Dow (*Electrical World*, August 10, 1940, pp. 61-62).
- Results of Electric Heating at Mason City (*Electrical West*, May, 1936, pp. 17-18).
- Electrically Heated Homes at Mason City, by H. G. Bender (*Electrical World*, December 21, 1935, pp. 36-37).
- Practical Aspects of Heating Residences by Electricity, by F. L. Lawton and P. Tellier et al (*Electrical News & Engineering* (Canada) July 1, 1934, pp. 32-33 and 40; July 15, 1934, pp. 29-32; August 1, 1934, p. 17; July 1, 1933, pp. 16-20; July 15, 1933, pp. 21-22; August 1, 1933, pp. 23-25).
- School Heating on a Degree Day Basis, by Ward H. Austin (*Electrical West*, September 1, 1931, pp. 137-139).
- Comparing Electric and Other School Heating Methods, by Ward H. Austin (*Electrical West*, November 1, 1931, pp. 244-246).
- Off-Peak System of Electric Heating for Buildings, by Elliott Harrington (A.S.H.V.E. TRANSACTIONS, Vol. 37, 1931, p. 323).
- One Answer to Off-Peak House Heating, by Delton T. Waby (*Electrical World*, May 3, 1930, pp. 878-881).
- Off-Peak Electric Heating of Buildings (*Electrical World*, June 1, 1929, pp. 1105-1107).
- Electrically Heated Houses, by E. B. Dawson and J. F. Lamb (*Electrical World*, January 12, 1929, pp. 91-95; February 23, 1929, pp. 389-395).
- Electric Heating of Residences, by Edgar Allan Loew (University of Washington, *Engineering Experiment Station*, Part I, *Bulletin* No. 15, December, 1921; Part II, *Bulletin* No. 20, November 15, 1923).
- Reversed-cycle Refrigeration for Air Conditioning Work, by Regis D. Heitchue (*Refrigerating Engineering*, May, 1941, pp. 317-321).
- South American Way on This Buenos Aires Job Was to Use a Heat Pump, Melvin A. Ramsey (*Heating, Piping and Air Conditioning*, March, 1941, pp. 167-170).

CHAPTER 45

Radiant Heating

Physical and Physiological Factors, Control of Heat Losses, Rate of Heat Production, Equivalent Temperature, Application Methods, Calculation Principles, Mean Radiant Temperature, Measurement and Control of Radiant Heating

FOR health and comfort, it is necessary for the rate of heat loss from the human body to be controlled by the aggregate effect of the conditions surrounding the body, so that the physiological reactions result in a feeling of comfort. No heating system serves the purpose of adding heat to the individual, but only controls the net rate at which the body loses heat in cold weather by radiation, convection and evaporation. In convection methods of heating, the medium serves to maintain such an air temperature as will give comfort under existing conditions of humidity and of surrounding surface temperatures. The object of heating by radiant methods is to produce a feeling of comfort by surrounding the occupant with surfaces heated to a mean temperature which will permit a normal radiant heat loss from the human body.

On a cold day, with no wind blowing, while standing in the sunshine, one may feel perfectly comfortable but, when a cloud passes over the sun, one will instantly feel much cooler. The cloud acts as a shield to interrupt the radiant heat from the sun. The change in feeling of comfort is due to the instant change in rate of radiant heat loss from the body caused by the shielding effect of the cloud. A shielded thermometer under the same condition would register no change in temperature.

An ordinary thermometer registering the temperature of the air is not a criterion of comfort conditions. Healthful comfort requires that heat shall escape from the body at the same rate as it is generated by the oxidation occurring in the body, and in a manner suitable to physiological requirements.

Furthermore, the ambient conditions will often cause changes both in the rate of heat generation in the body, and in the operation of the several methods by which the body loses heat. The feeling of heat or cold results not only from the rate at which the body loses heat, but also from the manner in which the heat is abstracted from the body, and the ease with which the body's heat regulating mechanisms can operate. If the conditions of the environment and the state of the body are not perfectly