

- Methods Developed for Built-In Radiant Heat (*Electrical West*, December 1948).
 House Heating Experience, by C. E. Simpson (*Electrical World*, October 9, 1948).
 Heating by Electricity in Tennessee Valley Area, by B. H. Martin and T. W. Newberry (*Heating and Ventilating*, May 1948).
 Low-Voltage High-Current Radiant Heat, by R. S. Tice (*Electrical West*, December 1947).
 House Heating Load Characteristics as They Affect Wiring Costs, by J. B. Cochran (*Electrical World*, April 12, 1947).
 Radiant Heating by Electricity, by L. N. Roberson (*Heating and Ventilating*, September 1946, p. 89).
 Longview House Heating Data, by H. G. Kelsey (*Electrical West*, September 1945).
 Heat Factor Formula to Calculate Electric House Heating, by H. C. Bender (*Electrical World*, May 12, 1945).
 American Standard—Household Automatic Electric Storage-Type Water Heaters, ASA C72.1-1949 (*National Electrical Manufacturers Association Publication No. WHI-1949*).
 Federal Specification for Domestic Electric Storage Water Heaters, W-H-196, amended May 1949.
 Application of Electric Water Heaters to Domestic Service, by C. G. Hillier (*Heating, Piping and Air Conditioning*, November 1946).
 Applications of Radiant Energy (*Lighting Handbook, Illuminating Engineering Society*, 1952, Section 18).
 Industrial Electric Resistance Heating, by Lee P. Hynes (*American Institute of Electrical Engineers*, Paper No. 48-247).
 Induction and Dielectric Heating, by Kennard Pinder (*Electrical Engineering*, February 1947).
 EEL-NEMA Preferred Voltage Ratings for A-C Systems and Equipment (*Edison Electric Institute Publication No. R-6*, May 1949, also *National Electrical Manufacturers Association Publication No. 11*, May 1949).
 Standard Handbook for Electrical Engineers (McGraw-Hill Book Co., 1952).
 Radiant Glass Heating Panels, by P. R. Achenbach (*Heating and Ventilating*, January 1953, p. 83).

CHAPTER 43

CORROSION AND WATER FORMED DEPOSITS,
CAUSES AND PREVENTION

Definitions, Classification and Characteristics of Water, Causes and Prevention of Scales and Sludges, Causes and Prevention of Slimes, Under-Water Corrosion, Atmospheric Corrosion, Buried Pipe Lines, Handling Water Treating Chemicals, Legal Regulations

THE surfaces of heating and ventilating equipment that are in intimate contact with water sometimes are affected by the chemical characteristics of contacting waters to such an extent that prohibitive amounts of insoluble materials are formed or corrosion ensues at an insufferable rate. To avoid or to correct such troubles, it is desirable that heating and ventilating engineers have a general appreciation of industrial water chemistry. The principal purpose of this chapter is to provide those criteria by which the average engineer may judge whether a problem is one that will yield to rather simple remedies, or will require the skill of an experienced water technologist.

DEFINITIONS

The following definitions for water-formed deposits, corrosion, and closely allied terms have been proposed:

Water-Formed Deposits. A water-formed deposit¹ is any accumulation of insoluble material derived from water or formed by the reaction of water upon surfaces in contact with water.

Deposits formed from or by water in all of its phases may be further classified as scale, sludge, corrosion products, or biological deposits.

Scale. Scale¹ is a deposit formed from solution directly in place upon a confining surface. It is a deposit which will retain its physical shape when mechanical means are used to remove it from the surface on which it is deposited. Scale, which may or may not adhere to the underlying surface, is usually crystalline and dense, frequently laminated, and occasionally columnar in structure.

Sludge. Sludge¹ is a water-formed sedimentary deposit. It usually does not cohere sufficiently to retain its physical shape when mechanical means are used to remove it from the surface upon which it deposits. Sludge is not always found at the place where it is formed. It may be hard and adherent, and baked to the surface on which it has been deposited.

Biological Deposits. Biological deposits¹ are water-formed deposits of biological organisms or the products of their life processes. Biological deposits may be microscopic in nature, such as slimes, or macroscopic, such as barnacles or mussels. Slimes are usually composed of deposits of a gelatinous or filamentous nature.

Corrosion. Corrosion² is destruction of a metal by chemical or electrochemical reaction with its environment. In the corrosion process, the reaction products formed may be soluble or insoluble in the contacting environment. Insoluble corrosion products may deposit at or near the attacked area, or be carried along and deposited at a considerable distance from the attacked area.

Corrosivity. Corrosivity¹ is the capacity of an environment to bring about destruction of a metal by the process of corrosion. Corrosivity is a property of the environment, but it has no significance until the metal in question is specified.