
CHAPTER 1

BASICS OF BRAZING



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CHAPTER 1

BASICS OF BRAZING

INTRODUCTION

The process of brazing that we know today began as an ancient art. Through our increased understanding of the nature and behavior of materials, this art evolved into technology and science. In a very general sense, brazing is a joining process that relies on the melting, flow, and solidification of a brazing filler metal to form a leak-tight seal, a strong structural bond, or both between materials. The process is unique in that this metallurgical bond is formed by melting the brazing filler metal only; the components being joined undergo no melting.

Brazing is a well-established commercial process capable of producing strong joints. It is widely used in industry because, in large part, it is capable of joining most metallic and ceramic materials. It is a versatile process that can be performed using manual techniques as well as automated production modes. Brazing lends itself to the production of large assemblies and assemblies composed of dissimilar metals. Brazing produces a tiny, clean fillet in contrast to the irregular bead made by welding, an advantage when appearance is critical. One of the main advantages of brazing is usually associated with cost savings. High production processes adapt well to today's improved processes. Brazing especially adapts to large production quantities as well as single individual quantities.

The term *brazing* refers, in fact, to a group of processes. The American Welding Society (AWS) defines *brazing (B)* as a group of joining processes that produce the coalescence of materials by heating them to the brazing temperature in the presence of a brazing filler metal that has a liquidus temperature above 840°F (450°C) and below the solidus temperature of the base materials. The brazing filler metal is distributed between the closely fitted faying surfaces of the

joint by capillary action.^{1,2} The term *brazing temperature* refers to the temperature to which a material is heated to enable the brazing filler metal to spread and adhere to, or wet, the base metal and form a brazed joint.³

This definition serves to distinguish brazing from the other joining processes of soldering and welding. Brazing and soldering share many important features, but the term *brazing* is used to refer to the joining processes performed above 840°F (450°C), while *soldering* refers to the joining processes performed below this temperature. Brazing differs from welding in that in brazing the intention is to melt the brazing filler metal, not the base materials. In welding, both the brazing filler metals and the base metals are melted to effect the coalescence of materials.

Several factors influence the quality of the brazed joint. To achieve a good joint using any of the brazing processes, the components to be joined must be properly cleaned and protected from excessive oxidation by fluxing or the use of a controlled atmosphere. The assembly must be designed so that when the components are properly aligned a capillary is

1. American Welding Society (AWS) Committee on Definitions, 2001, *Standard Welding Terms and Definitions, Including Terms for Adhesive Bonding, Brazing, Soldering, and Thermal Spraying*, AWS A3.0:2001, Miami: American Welding Society, p. 5.

2. At the time of the preparation of this chapter, the referenced standards were valid. If a standard is cited without a date of publication, it is understood that the latest edition of the document referred to applies. If a standard is cited with the date of publication, the citation refers to that edition only, and it is understood that any future revisions or amendments to the code or standard are not included; however, as standards undergo frequent revision, the reader is encouraged to consult the most recent edition.

3. American Welding Society (AWS) Committee on Definitions, 2001, *Standard Welding Terms and Definitions, Including Terms for Adhesive Bonding, Brazing, Soldering, and Thermal Spraying*, AWS A3.0:2001, Miami: American Welding Society, p. 6.