CHAPTER 23

CAST IRON

INTRODUCTION

The processes used for the brazing of cast irons are the same as those used for the brazing of steel—furnace, torch, induction, and dip brazing. Like for other metals, the selection of a brazing process for cast iron largely depends on the size and shape of the assembly, the quantity of assemblies to be brazed, and the equipment available. Many applications require that gray, malleable, and ductile cast irons be brazed either to themselves or to other metals. White cast irons are seldom brazed.

The brazing of gray, ductile, and malleable cast irons differs from the brazing of steel in two principal respects. First, a special precleaning method is necessary to remove graphite from the surface of the iron. Second, the brazing temperature should be kept as low as feasible to avoid a reduction in the hardness and strength of the iron.

APPLICABLE BRAZING PROCESSES

All of the processes described in Part 2 of this volume are applicable to the brazing of cast irons. The choice of brazing process depends upon the (1) metals being joined, (2) the brazing filler metals used, (3) the design of the joint, and (4) the relative masses of the assemblies to be jointed. Processes that can be used with automatic temperature control are desired, and overheating should be avoided.

Furnace brazing is particularly suited for the production of high-volume assemblies and the brazing of dissimilar metals. Copper and nickel brazing filler metals are generally used for these applications. Normalizing following brazing is sometimes performed to restore the original properties of the cast iron.

For applications in which little or no decrease in strength can be tolerated, it is mandatory to use a brazing filler metal with the lowest possible flow temperature. The brazing temperature and cycle time need to be minimized to limit the impact on the structure and properties of the cast iron.

PREPARATION OF CAST IRON FOR BRAZING

The machining of cast iron smears the cut surfaces with graphite, making it difficult to wet the surfaces with the brazing filler metal. During brazing, silver and copper brazing filler metals fail to wet the graphite flakes or nodules. Thus, the graphite must be removed from the surfaces prior to brazing. Brazing filler metals that contain chromium, titanium, or other carbide formers will wet and bond to the graphite. Brazing filler metals such as AWS BNi-2 can be used without the normal cleaning process to remove the graphite.

Some high-silicon cast irons may have silicon oxide on the surface of the casting, which also prevents wetting by the brazing filler metal. These surfaces must be cleaned using one of the methods described below. When using metals that do not contain carbide formers, smeared graphite and graphite flakes must be removed from the surfaces to be brazed. Several processes may be used, depending on the brazement’s application and the cost.

TREATMENT BY FLAME

An oxidizing oxyacetylene flame is normally applied to heat the surface and oxidize the surface