Lesson 16A

# Brazing and Braze Welding Principles

Name _____ Date _____

Class _____ Instructor _____

## Learning Objective

- You will be able to describe the principles of brazing and braze welding. You will also be able to choose the correct flux and brazing filler metal for a given job.

## Instructions

*Carefully read the introduction to Chapter 16 and Headings 16.1 through 16.5.1 of the text. Also study Figures 16-1 through 16-22 in the text. Then answer the following questions.*

1. Which of the following statements is *true* of brazing?
   A. It is done at a temperature below 840°F (450°C).
   B. Very thick layers of filler metal are used.
   C. The filler metal is distributed by capillary action.
   D. It is generally done on thick metal sections.

   1. C

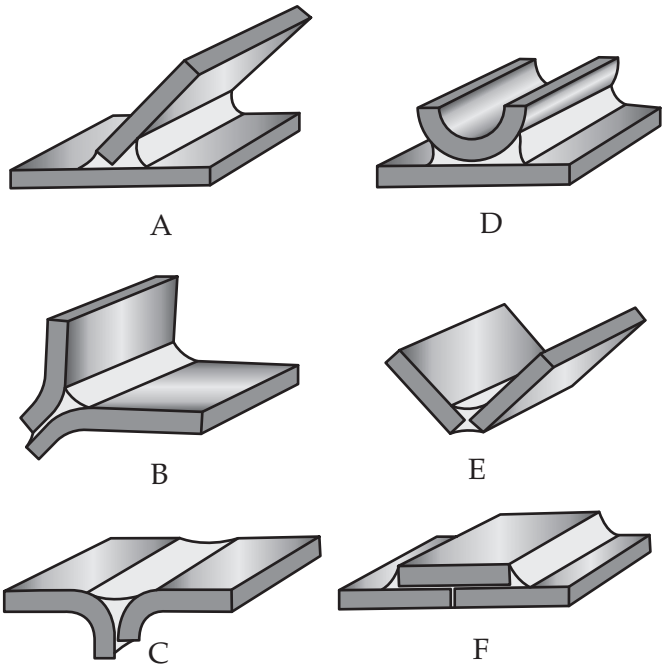
2. List three advantages of performing brazing or braze welding rather than welding.
   Brazing and braze welding will warp the base metal less than welding. Dissimilar metals can be brazed or braze welded. Base metal heat treatment is generally not affected by brazing or braze welding.

3. The most important thing to do before applying flux prior to braze welding or brazing is to _____ the metal surfaces.

   3. clean

4. List six of the ingredients typically found in a brazing flux.
   Any six of the following: Chlorides, fluorides, borax, borates, fluoborates, boric acid, elemental boron, alkalines, wetting agents, and water.

5. Name the six braze welded joints shown.
   A. Angle tee
   B. Flanged corner
   C. Flanged butt
   D. Line contact
   E. Corner
   F. Single strap butt




6. What AWS brazing flux type number is used for brazing a nickel or nickel-based alloy?
   FB3-A or FB3-C

7. What form of flux is used when brazing magnesium alloys?
   powder

8. Brazing can be used to combine two different metals. List the three brazing filler metals that can be used when brazing cast iron and copper?
   BAg (silver base), BAu (gold base), and RBCuZn (copper zinc)

9. List eight criteria that should be considered when choosing a brazing flux.
   Any order: base metal or metals to be joined, filler metal used, heat source, ease of flux residue removal, possible corrosive action, health hazards, electrical conductivity (for resistance brazing, the flux should conduct electricity), water content (fluxes containing water must not be used when dip brazing).

10. *True or False?* Braze welding fluxes must withstand higher temperatures for longer periods than brazing fluxes. 10. True

## Job 16A-1

# Braze Welding a Butt Joint, a Lap Joint, and a T-Joint in the Flat Welding Position

**Name** _____ **Date** _____

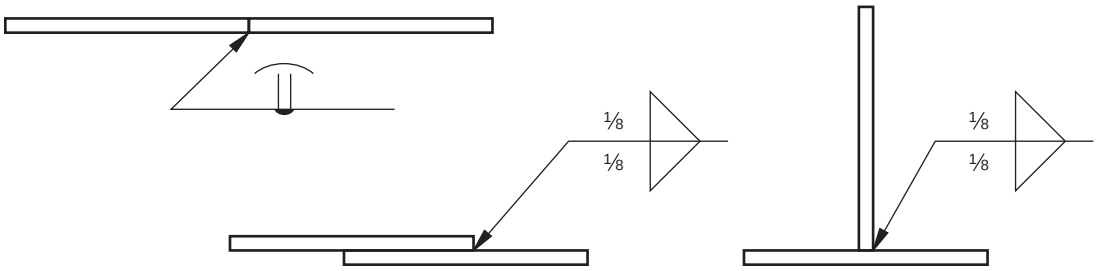
**Class** _____ **Instructor** _____

### Learning Objective

- In this job, you will braze weld butt joints, lap joints, and T-joints in the flat welding position.

1. Obtain six pieces of mild steel that measure 1/8″ × 1 1/2″ × 5″ (3.2mm × 40mm × 125mm).
2. Clean the joint areas of all pieces at least 1/2″ (12.5mm) back from the joint.
3. What flux is recommended? (Refer to Figure 16-10 in the text.)
   FB3-A, FB3-C, FB3-D
4. Braze weld two of each of the following joints.

   **Note:** Tack braze each joint at three points to hold the joint in position.




### Inspection

The braze-welded beads should be straight, with an even bead width.

Instructor's initials: _____

Lesson 16B

# Brazing and Braze Welding Processes

Name _____ Date _____

Class _____ Instructor _____

## Learning Objective

- You will be able to braze stainless steel, cast iron, and some nonferrous metals. You will also be able to determine which flux to use for each metal.

## Instructions

*Carefully read Headings 16.6 through 16.8 of the text. Also study Figures 16-23 through 16-41 in the text. Then answer the following questions.*

1. List five sources of heat for brazing.
A molten bath of brazing metal alloy, torch heating with an oxyfuel gas or air-fuel gas torch, a controlled atmosphere furnace, electric resistance heating, and induction heating.

2. List three factors that you should consider when selecting a brazing filler metal.
The brazing and service temperatures required, compatibility with the base metal(s), and the method of heating.

3. List the four brazing alloys suggested for brazing copper to copper. (See Figure 16-15 in the text.)
BAg (silver base) BAu (gold base), BCuP (copper phosphorus), and RBCuZn (copper zinc).

4. *True or False?* Brazing molybdenum (Mo) to nickel (Ni) is *not* recommended. 4. False

5. List the five brazing filler metals recommended for joining tool steel to carbon steel.
BAg (silver base), BAu (gold base), BNi (nickel base), BCu (copper base), RBCuZn (copper zinc base)

6. A silver-brazed joint is strongest when the thickness of the silver brazing filler metal in the joint is _____.
   A. .002″
   B. .006″
   C. .009″
   D. .012″

   6. A

7. Brazing filler metal will not flow over the base metal surface unless the base metal surface is heated to the brazing filler metal _____ temperature.

   7. flow

8. In silver brazing, the filler metal should be added when the flux appears _____.
   A. clear
   B. milky
   C. dry
   D. The flux appearance does not indicate when filler metal should be added.

   8. A

9. Which of the following is *not* a method used to clean magnesium after brazing is done?
   A. Cleaning in hot running water.
   B. Scrubbing with an alkaline solution.
   C. Mechanical scrubbing.
   D. Dipping into a chrome pickling solution.

   9. B

10. For brazing cast iron, _____ is recommended.
    A. a preheating temperature of 400°F to 600°F (204°C to 316°C)
    B. tinning of the surfaces to be brazed
    C. a tip that provides high heat with high gas pressures
    D. Both A and B.

    10. D

## Job 16B-1

# Braze Welding a V-Groove on an Outside Corner in the Flat and Horizontal Welding Positions

**Name** _____ **Date** _____

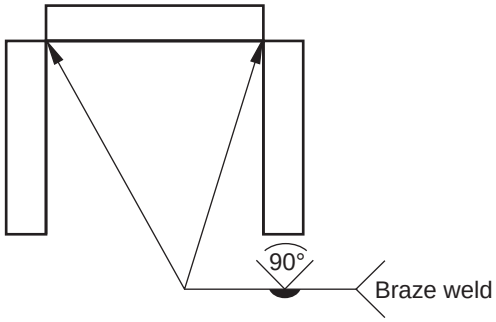
**Class** _____ **Instructor** _____

### Learning Objective

- In this job, you will braze weld a V-groove on an outside corner joint in the flat and horizontal welding positions.

1. Obtain three pieces of carbon steel that measure 1/4″ × 1 1/2″ × 5″ (6.4mm × 40mm × 125mm).

2. Braze weld the pieces into the shape shown in the following drawing.
   - Begin by braze welding a V-groove outside corner joint on the first two pieces in the flat position.
   - Next, tack weld the third piece in place so the weldment looks like the shape shown below.
   - Braze weld the second V-groove outside corner joint in the horizontal position.




3. If no silver-, gold-, nickel-, or zinc-based filler metal is available, what filler metal would you use? (See Figure 16-15 in the text.)
   BCu (copper)

### Inspection

The braze welding bead should be convex. The bead should not go beyond the edges of the groove more than about 1/16″ (1.6mm). The ripples in the bead should be evenly spaced, and the bead should have a constant width. There should be complete penetration over the entire length of the joint.

Instructor's initials: _____