

## FG-02: Apply Hard Surface

### SAFETY FIRST

- Follow all Caterpillar facility safety standards when performing this task.
- An explosive hazard exists if acetylene or oxygen leaks when working in a confined space or if working around explosive material.
- Be sure to have adequate ventilation when heating materials.
- Heat hazard exists up to approximately 2000°F.

### EQUIPMENT

- basic Maintenance Mechanic hand tools
- oxygen and acetylene tanks
- shaded glasses or a welding mask and welding hat
- long sleeves or a welding jacket
- piece part
- hardening material
- grinder
- torch/tip(s)

### RESOURCES

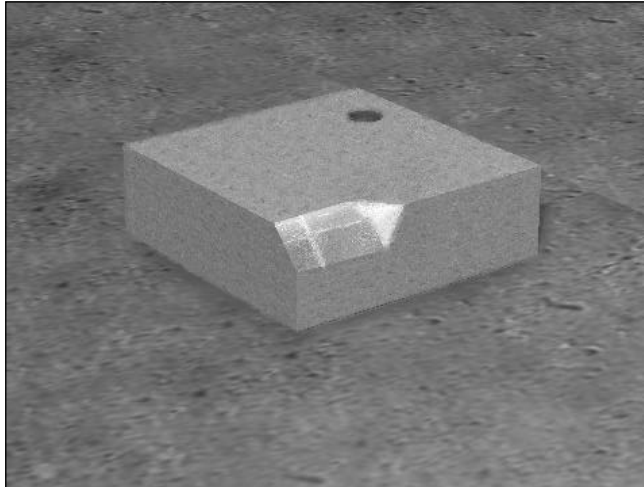
- Job ticket and Journeymen requesting work
- Print
- stock manufacturer's manual
- MetLab



## Heat Treat with Oxygen Acetylene (Apply Hard Surface)

Note: This task is performed with an oxygen acetylene torch. Applying a hardened surface can be performed with a TIG welder.

1. Lockout/tagout machine, if applicable.
  - Make sure the area you are working in is free of any moving equipment or power surge.
2. Identify the piece part material.
  - If necessary, have MetLab identify the material.



Sample Material

3. Select the hardening material.
  - Use the manufacturer's recommended hardening material that matches the piece part.

4. Clean the piece part.
  - Grind, air arc, or use a gouge rod to remove debris, oil, grease, rust, scale, and fatigued metal from the piece part.



Clean Surface  
for Hardening

#### Grinding the Piece Part

- Degrease the piece part with steam, high pressure wash, or all purpose cleaner and rags.

5. Prepare the work area.

**Warning:** When working with metals in confined areas, be sure to provide adequate ventilation to avoid hazardous conditions.

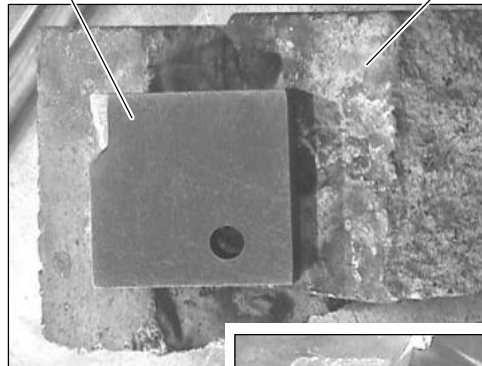
- Obtain any needed work permits (i.e., fire watch permit) when working on a machine.
- Wear Caterpillar recommended safety equipment.

## 6. Secure the piece part.

- Set the piece part in a vise, if possible.
- Use brick to position the part according to your needs and to help maintain an even temperature in the piece.

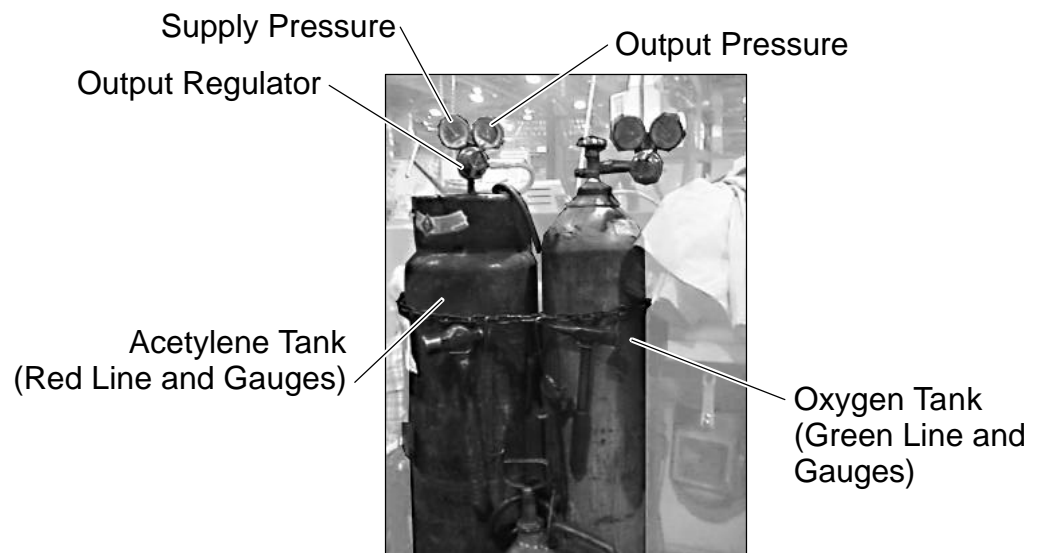
Part Setup for  
Optimal Access

Brick



Top and Side View of Setup

## 7. Set up the oxygen and acetylene tanks.

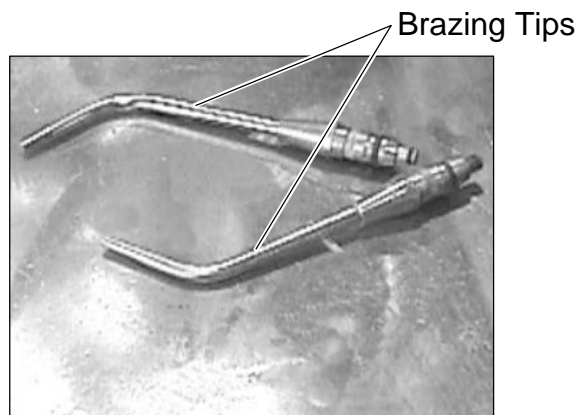


Note: The acetylene connections have left hand connecting nuts and the oxygen tank connections have right hand connecting nuts.

- Open the supply valve for the acetylene tank no more than 1/2 turn, permitting an adequate gas supply to complete the job.
- Adjust the acetylene regulator until the gage reads between 3-5 psig.
- Open the supply valve for the oxygen tank to permit an adequate gas supply for the job.
- Adjust the oxygen regulator until the gage reads approximately 25 psig.
- Pull the hose to the work area.

8. Set up the brazing torch.

- Select three brazing tips, one appropriate for heating the area you are working on, one that is too big for the job, and one that is too small for the job.



- Remove all debris from the brazing tips.

9. Light the torch.

- Open the acetylene valve (red line) on the brazing torch.



- Ignite the torch.
- Open the oxygen valve (green line) on the brazing torch.
- Adjust the torch, using the oxygen valve, so there is a neutral flame.

10. Preheat the piece part.

- Hold the torch over the piece part where you plan to add material.
- Allow the flame to warm up the surface until it just begins to turn red.



11. Apply hardening material.

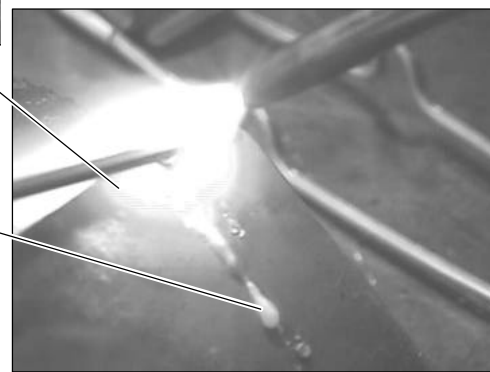
- Hold the flame approximately 3/8" to 1/2" from the piece part.
- Allow the material to begin dripping onto the piece part.
- Move the torch along the damaged area, and slowly and steadily apply the material.



Brazing Alloy

Built-up Surface

Excess Brazing to be Removed by Grinding



**Warning:** Do not over tighten the valves when shutting off the torch. Damage to the valves could result in leaking gases and the risk of explosion.

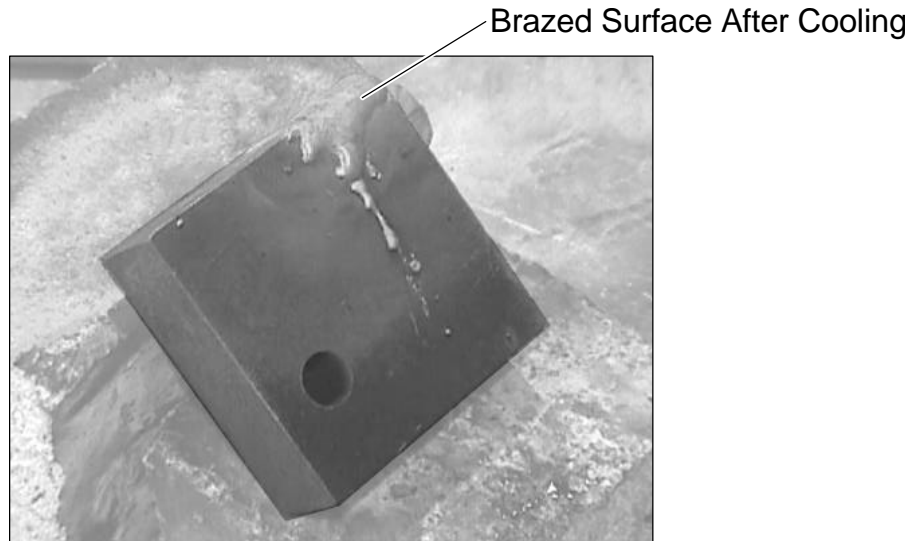
12. Shut off the torch.

**Caution:** Acetylene must be turned off first to avoid a possible ventilation problem.

- Turn off the acetylene first, then the oxygen.

13. Allow the repaired piece part to cool.

- Let the piece part return to room temperature without quenching.



14. Grind the piece part surface.

- Grind the piece part until the hardened surface is square or even with the piece part surface.

Brazed Surface After Grinding







15. Turn off the oxygen and acetylene tanks.
  - Open the valves at the torch and bleed the pressure from the lines.
  - Back out the regulator screws.
16. Clean up the work area.
  - Put away the torch, hand tools, and extra material.
17. Apply a cushion to the piece part if the hardened material continues to chip away.
  - Consult a Journeyman for help in applying the cushion.