

DA-02: Repair/Replace Guard

SAFETY FIRST

- Follow all Caterpillar facility safety standards when performing this task.
- Sheet metal often has sharp edges, is heavy and tends to drop on toes. Wear gloves and safety shoes.
- Beating on sheet metal is loud. Use hearing protection.
- Before removing a guard or cover from a machine, lock out and tag the machine.

EQUIPMENT

- manual and power brake
- manual and power shear
- tube roll
- band saw
- anvils, dollies, vises
- sander
- drills, countersinks
- spray bluing
- saber saw
- torch
- T-bevel square
- tape measure
- grease pencil
- cleaner
- towels
- combination square
- scribe, center punch, hammers (steel, rubber-faced, plastic-faced), deburring tool, file, and other hand tools



RESOURCES


- Machine Operator
- sketches and notes documenting original fabrication of guard or other sheet metal component
- machine manufacturer's documentation, parts lists, prints
- welding personnel and facilities

Repair/Replace Guard

1. Retrieve the damaged guard (shield, hood, door, or other sheet metal component).
2. Analyze the causes of the damage.
3. Determine if the repaired or replaced component could be improved to prevent the damage from recurring.
4. Determine the probable difficulty of repairing the damaged component.
 - Can the bent sheet metal be straightened?
 - Can the broken welds be redone?
 - Can damaged sections be cut out and replaced with welded-in patches?
5. Determine the probable difficulty of replacing the entire damaged component.
 - Is the damaged component usable as a pattern for a replacement?
 - Do dimensioned sketches of the component exist?
 - Are resources (documentation, stock, tools and equipment) available to fabricate a replacement?
6. Consider the probable costs and the time required to repair or replace the damaged component.
 - How much time is required to repair the part, and to fabricate a replacement?
 - What is the cost of the stock required for repair and replacement?

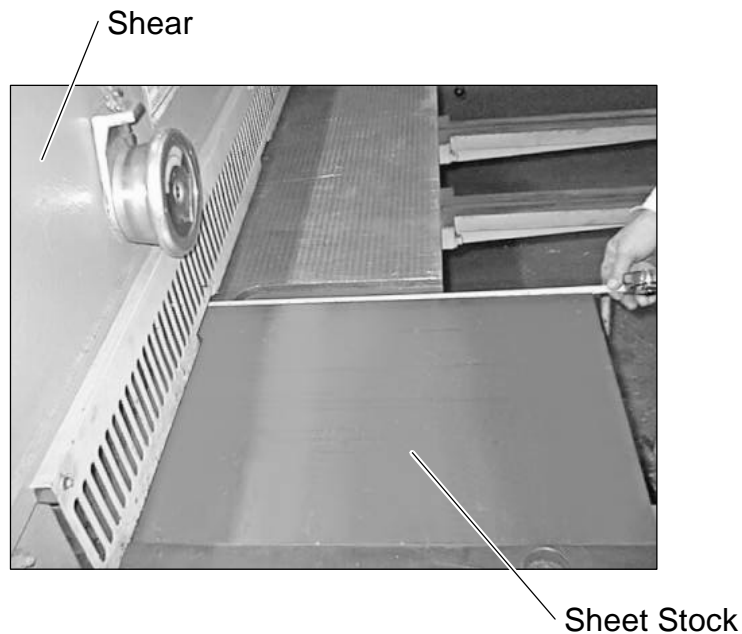


To Repair a Component:

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7. Straighten bent sheet metal.
 - Take the dings out of the straight first. Hammer both sides.
 - Use a soft (plastic or rubber) hammer and/or a brake to reshape large dents and distortions.
 - Use a steel hammer and dolly to remove dimples, ripples, and dings.
 - Minimize hammering that thins and expands the metal.
 - If possible, shrink expanded metal by hammering on the bulged side.
 - After the dents are pounded out, use the manual “break box” to reform the material.
 - Check the bend with the T-bevel square. If necessary, use the “power break.” The power break is detailed in step 24.
 8. Cut out sections that are worn, torn, or stretched and cannot be restored by straightening.
 - Use a saw or torch.
 9. Fabricate replacement sections and fit them to the component. If the replaced section is large or complex, see steps 16 through 25.
 10. Weld replacement sections in place and/or restore broken welds.
 11. Grind the welds flush.
 12. Measure, mark, drill and countersink or deburr the required mounting holes.
 13. If necessary, paint the repaired component.
 14. Re-install the repaired component.
 15. Check the component for fit and function.

To Fabricate a Replacement Component or Section:

16. Retrieve any notes, sketches, or prints that describe the damaged component.
17. If necessary, make a working sketch for fabricating the component.
18. Select or obtain the necessary stock.
19. Carefully figure the necessary pre-formed dimensions.
20. Carefully measure and shear the stock to size.
 - Start the machine.
 - Run back stop out (if applicable).
 - Slide the metal all the way to the left and back.
 - To have square edges for measuring, cut two sides.
 - Turn the piece over and take measurements to cut from this side. See the figure below.



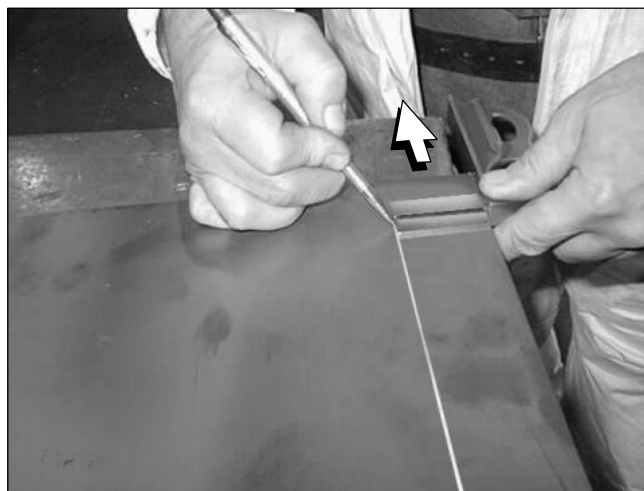
Measuring Shear Position

21. Deburr and dull sheared edges, as shown below.



Dulling a Sheared Edge

22. Lay out the component on the stock.
- Carefully figure the break lines necessary to form the component.
 - Carefully figure the necessary sequence for breaking and forming.
 - Prepare the stock with bluing.
 - Pull a scribe as shown below to mark cutouts, break lines, and other forming features.
 - Take the scribe line slightly past the point measured. See the figure below.



Scribing Lines

- Mark corners, break lines, and other features with a center punch, as shown below.



Center Punching

23. Saw cutouts.

Note: Band saw has a blade guide and a height adjustment.

- Deburr the edges with a hand file.

24. Form the component.

Note: For small projects and up to 16 gauge metal, use manual “box break.”

- If using a power break, select the correct anvil for the stock and angle, and adjust the ram stops and alignment with the controls shown below.

Fine Tilt Ram Alignment
Adjuster for Left End



Ram Stops - Depth of Break

Power Break Controls

- Set the centerpunch marks directly under the power break ram, as shown below.

Center Punch Marks



Break on Center Punch Marks

- Carefully monitor the angle as it forms and stop the brake when the angle is correct.



25. Weld corners, seams, and attachments.
26. Grind the welds flush.
27. Measure, mark, drill and countersink the required mounting holes.
28. If necessary, paint the repaired component.
29. Re-install the repaired component.
30. Check the component for fit and function.