Lab 18: Shear Testing Round Rod

Introduction

A single-shear test is performed on 1/8 inch diameter metal rods. The maximum force needed to shear the rod is measured, and this is used to calculate the Shear Strength of the material. Tested materials include 1018 steel, 360 brass, and 2024-T4 aluminum.

The Materials Shear Accessory consists of two hardened metal blocks, held together permanently by two screws. The back piece (with the label) fastens directly to the load cell, and the front piece slides vertically to provide the shearing action. The shearing force is applied by the cross-head, which is in direct contact with the front block. Note that the knurled cap nut is not needed for this experiment.

Equipment

<table>
<thead>
<tr>
<th>Qty</th>
<th>Items</th>
<th>Part #</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Materials Testing</td>
<td>ME-8236</td>
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<tr>
<td>1</td>
<td>Materials Shear Access</td>
<td>ME-8239</td>
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<td>1</td>
<td>Materials Shear Samples</td>
<td>ME-8240</td>
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<tr>
<td>1</td>
<td>Calipers</td>
<td>SE-871C</td>
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</tbody>
</table>

Written by Jon Hanks
**Setup**

1. Use calipers (or a micrometer) to measure the diameter of the rod. Edit the value for diameter in line #2 of the calculator.

2. Fasten the Shear Accessory to the load cell using the two silver cap screws as shown in Figure 2.

3. Lift the front block to the top of its travel as shown in Figure 3.

4. Slide the rod into the appropriately sized hole as shown in Figure 4. You may have to slightly lower the shear block for the holes to line up.

5. Slide the rod completely through, leaving only a small amount sticking out the front, as shown in Figure 1. The small tab sticking out makes it easier to remove once it is sheared, but you don't want to use any more material than you have too!

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**Figure 2. Shear Accessory**

**Figure 3. Lift Shear**

**Figure 4. Insert Rod**

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Note. When the rod is properly inserted, the front shear block will be higher than the back. When the cross-head is lowered, it should press on the front block that is free to move, NOT the back block that is fastened to the load cell.
Taking Data

Note: Your data will look better if you use the normal procedure to "seat" the test sample. A Compliance Calibration on position is NOT needed for this experiment. Only the force data is used.

1. Make sure the plastic Safety Shield is in place on the front of the tester.
2. Turn the crank counter-clockwise moving the cross-head downward until it is just touching the front sheath block.
3. Click on Record, and turn the crank counter-clockwise.
4. Continue cranking until the rod shears, then click on Stop.
5. Repeat the procedure for the other rods.
6. Open the Data Summary (at left) and re-name your runs.
7. The vertical axis of the graph is now Stress. Confirm that the equation for Stress in the calculator is correct. What are the units?

8. Measure the Shear Strength (max stress for each of your materials, and record below.

9. How do your values compare to those listed in reference data tables for the materials?

Results:

Steel:
Shear Strength from graph = 520 MPa
ref table 500-600 MPa

Brass:
Shear Strength from graph = 310 MPa
ref table 300-350 MPa

Aluminum:
Shear Strength from graph = 290 MPa
ref table 250-300 MPa