RECOMMENDATIONS FOR THE REPORT FOR THE MECHANICAL PROPERTIES EXPERIMENT

This experiment gave you the opportunity to learn first-hand how the basic mechanical properties of typical engineering alloys are measured. This should help you better understand the data in materials properties handbooks and data published by the producers of materials. It should also help provide you with better insight into these properties as they may apply to structures and parts you design.

During this experiment the a number of mechanical properties of alloys, including hardness, strength and ductility and energy capacity were measured. The recommendations given in this document should help you sort out this data, validate the data and make the comparisons, and to write a good report.

Stress-Strain Curves

Your engineering stress-strain curves can, at a glance, tell a person a lot about your material. The yield and tensile strengths and the ductility are easy to read off the graph while the areas under the curves, which are equal to the modulus of toughness, are easy to compare for each material. Even the initial linear region can tell the reader how stiff your testing machine was and whether or not an extensometer was used to measure the strain accurately. Obviously, these graphs can really help the reader understand your results. Here are a few suggestions to help you with your stress-strain graphs:

- If you plan to use the stress-strain curves printed out by the Instron's software you'll want to put them at the end of the report. If your report does not direct the reader to these graphs then they

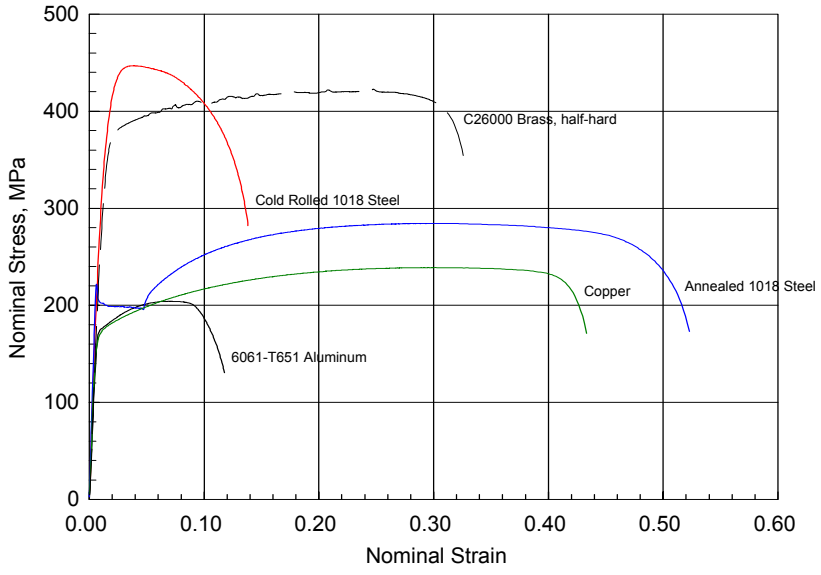

Figure 1 Examples of stress-strain curves for the types of materials tested in this laboratory.

should go in the appendix.
- The most effective way to present the stress-strain data from the four materials tested is to put them all on the same graph. This can be done using the Instron software or you can import each data file into a spreadsheet and create the graph yourself. This graph can be easily cut and pasted into your report. See figure 1 for an example.
- If you use separate graphs for each material then be sure to use the same scaling for each. This will be very helpful to your reader who will probably want to lay the graphs side-by-side to compare them.

Tables

While the stress-strain curves can convey a lot of information quickly, the reader is probably expecting you to report the actual numbers for the various properties. The best way to do this is to put them all in a single table. This table will probably look a lot like those in your worksheets, but with a little resourcefulness more can be done with it, saving you and the reader some work in the process. For instance, including the reference values, in parentheses under the experimental values or in a column next to them, can help the reader see how the results compare to the reference values without you having to create a second table. (Make sure the significance of the parentheses is clear to the reader.) Here are a few suggestions for creating your tables:

- Create the table in a spreadsheet first, then copy-paste it into your report. With the data in a spreadsheet you can easily create a bar chart (below) and perform other calculations such as the differences between the measured and reference values.
- Use standard table captions. These are located above the table and start out with "Table 1..." and then describe the table's contents.
- Use notes at the bottom of the table to explain anything unusual.
- Don't forget to include the units for each property.

Charts

Since one of the major issues in this experiment is the comparisons of the properties of several materials, a bar chart or two can be a very effective way to make these comparisons, and since that data is already organized in a table, creating these charts should be quick and easy. Here are a few suggestions for the bar charts:

- Consider using a single bar chart that groups the four materials together to compare each property. You'll have to use a second y-axis for this type of chart.
- Optionally, use a series of bar charts, one for each property. You'll have to cut and paste each of these graphs to get them into your report. If you go with this option use one color for each material in all the charts.
- Do not include the standard graph titles that Excel and other spreadsheets employ. Use standard figure captions to tell the reader what each graph is about.

Errors and Comparisons to Reference Data

Obviously you will want to compare your measurements to those in your text and laboratory manual. When doing so consider the following:

- The values reported in the references are average values. There is always a distribution in these values. Precise agreement, like that expected when determining the melting point of an element, for instance, is not expected in this case.

- Processing can alter a material's properties considerably. If you don't know the exact processing history of your material you might be able to make a reasonable guess at what it was by finding a similar set of properties in the references.
- The heat treatment of your material may not be quite the same as those in the references.