

**ZIP Engineering**  
**236 Shiley Hall, University of Portland**  
**Portland, OR 97203**

February 1, 2016

Students  
Materials Science Laboratory  
5000 N. Willamette Blvd.  
Portland, OR 97203

Dear Students,

I request your assistance in evaluating the performance of the enclosed test specimens. I would like to understand their basic mechanical properties. Please test the enclosed specimens per ASTM E 8<sup>1</sup>. I have tested additional materials (AISI 1018CF, 1045CF and 4140CF) and the force-strain data from the tests are on the course web page. For all five of the metallic specimens, determine mechanical properties of yield strength (0.2% offset or lower yield point, whichever is appropriate), tensile strength, and stiffness (Young's modulus). Additionally, determine the reduction of area (%RA) and elongation (%EL) for AISI 1045HR and 2024-T351 specimens tested in lab. Unless otherwise noted, assume the original diameter was 0.505 inch and the gage length was 2 inches.

You do not need to determine properties of the polymers. You are to test them to observe their behavior only. For your information, Young's modulus is typically not used to characterize stiffness of polymers since many are non-linear. A method referred to as the *secant method* is often used, but you do not need to be concerned with this for now.

For lab class next week, please submit a technical letter to discuss this testing. Please include all stress-strain data (graphs only) from the five metallic specimen tests as well as the properties discussed above. Additionally, for AISI 4140 (which is considered to be a "carbon steel"), provide information about composition specification (how much of various elements are allowed per specification/standard). You may use ASM handbooks as your reference information or reliable web based sources (be sure to cite it appropriately). Be sure to attach to the front of the letter the *check lists* for both the letter itself and the graphs (see web page).

Thank you for help in this matter. If you have any questions, do not hesitate to contact me (943-7432, lulay@up.edu, SH236). Please note, I've provided a blank data sheet on the reverse side of this letter.

Sincerely,  
(*electronic*)  
Kenneth Lulay

Enclosed: four (4) test specimens (1 each: 1045HR, 2024-T351, Acrylic, UHMW-PE).

<sup>1</sup>ASTM E8 / E8M - 09 Standard Test Methods for Tension Testing of Metallic Materials