

Marten's Welding and μ structure, LLC

236 Shiley Hall

March 14, 2016

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

Dear Students,

During the past few weeks you have been conducting a number of laboratory exercises including heat treating of 2024 aluminum alloy, Jominy end-quench testing of various steels, welding and microscopy. I am requesting that you write a technical letter regarding these laboratories. Specifically, you will need to discuss the general metallurgical effects of welding and discuss three photomicrographs (not necessarily related to welding). The following describes specifically what is expected.

Please discuss the effects of welding on the microstructure and mechanical properties (strength and ductility) in the Heat Affected Zone (HAZ) as well as the weld itself (the area that was melted). The Heat Affected Zone is the area next to the weld. By definition, the HAZ is not melted during welding, but is heated sufficiently to alter the microstructure. Your discussion should include steel (both plain carbon and hardenable steels) and heat treatable aluminum alloys (alloys that can be precipitation hardened). Also discuss what can be done to a welded 2024 aluminum or a steel part to partially or completely restore its pre-welding properties. Of course conciseness is important, so you will not be able to describe details in any great depth (no more than six sentences for the discussion of welding).

Things to consider when writing the letter: how does heating and cooling that occurs in welding affect the microstructure and hence the properties? Welding is localized heating, does the surrounding non-heated metal help quench the heat affected zone quicker than pure air quenching? Since we did not measure strength or toughness in any of these labs, your discussions will need to be based to great extent on literature search (be sure to cite your sources properly in the body of the letter).

The course web page contains three photomicrographs showing the microstructure of plain carbon steel. Also, the links provide the hardness of the respective photomicrographs (note various hardness scales used). You will need to determine what the various microstructures are (morphology and composition) based off the photos and hardness data (all specimens are plain carbon steel – either AISI 1018 or 1045). **Please consider these to be your data for this lab and discuss them in your letter (and include the data in the results attachment).** To answer the questions professionally,

you will need to search your textbook (or internet) to find charts that correlate hardness data, carbon content and steel microstructures.

The technical letter will be due next week. If you have any questions, please contact me at (503) 943-7432 or lulay@up.edu. I appreciate your effort in this matter.

Sincerely,
(electronic)

Ken Lulay, Engineering Vice President