

Lab Assignment 1 – Deformation

Description

This assignment is designed to clarify the concepts of **elastic** deformation and **plastic** deformation as well as the concepts of **strength**, **stiffness** and **ductility**. The content is taught by doing a tensile test of a ductile material that undergoes plastic deformation. After this assignment, the student can independently prepare, conduct, and interpret tensile test results and is able to form a link between deformation theory and practical test data.

You will form five teams (max. 6 persons/team) with a team leader (who will be selected during first laboratory exercise). The team needs to prepare, conduct, and report the results from a test series which compares the deformation behavior of two different materials.

Preparation

The first task for the teams is to familiarize themselves with the behavior of metallic materials and think about what factors can be and are reasonable to measure using a tensile test. For this study, the purpose is to compare the deformation behavior of two different materials and identify them. The focus of the study is to conduct a uniaxial tensile test in accordance with the *SFS-EN ISO 6892-1 Metallic materials. Tensile testing. Part 1: Method of test at room temperature* standard and properly analyze the results attained from the test. The standard is available online via Aalto library services. You must read almost all of it before the test. It is not as long and boring as one might think.

Execution

Each group has a one-hour time slot. Be prepared to explain what a tensile test is, what is measured and how, how is that measurement used, how reliable is it etc. The experiment is conducted with the help of a lab technician. You are responsible of recording all necessary data needed for reporting (read the standard, so you know what you need. Also, bring a USB flash drive so you can get the data with you).

TIME: A timeslot for the practical work is reserved during the first lecture in MyCourses.

PLACE: K2-Building @ Puumiehenkuja 3. The course assistant will meet you at the lobby.

Report

The recorded data from the tensile test will be analyzed in accordance with the standard. A report will be written explaining to the reader why, how and what was done. The structure follows the typical scientific paper: IMRaD (Introduction, Methods, Results and Discussion).

List of references is included last as well as any possible appendices. The introduction describes why this

type testing is done and what can be achieved. The methods section includes a detailed description of the methods used. The level of detail should be such that someone else could repeat your experiments and get the same results. Typically, this means that EVERY detail must be mentioned or referred to. The results section simply presents the data. Of high importance is the way the results are presented as it should be clear and rational. Tables and graphs are good options. The results section should include ALL applicable details mentioned in standard in sections “Symbols” and “Test report”. There’s about 50 of them, but it’s not laborious. The discussion section contains the verbal analysis of the results. Guess what the tested material is and motivate the answer with the measured numbers.

DEADLINE: The report should be uploaded to MyCourses in PDF format within a week of the laboratory session by the team leader. Write the names of every student in the group on the cover page.

Grading

Following the standard and reporting everything that is mentioned there will give a grade 3 out of 5. Describing **WHY** the tested materials behave the way they did and addressing uncertainties in the measurement methodology will result in a higher grade. Critical thinking is important, and the standard is not perfect. Simply obtaining some number is not the answer sought here. A precise list of requirements for grade 5 is not provided, because masters level students are expected to write a comprehensive report independently and without strict guidelines. The students will be given feedback and an opportunity to improve the report.

Contact

If you have any questions regarding the assignment, you can contact the course assistant via e-mail (patrik.sahiluoma@aalto.fi) or phone +358442722557. MyCourses will be used for uploading files and sending messages to the course participants. The team leader is by default responsible for correspondence with course staff.