Uniaxial Compression Testing of Concrete Cylinder

Purpose
In this laboratory we will conduct compression test on a concrete cylinder according to EN 12390-3:2009 European Standard.

This material has unique characteristics, including ultimate strength, modulus of elasticity and elongation properties. These properties will be measured by conducting compression test with precision data acquisition equipment using the loading frame in the Concrete Materials and Structures Laboratory. The data acquisition equipment will collect data on Force, Stroke (displacement of the loading frame), Axial deformation of the specimen, and transverse deformation of the specimen and store them for later use in a text file.

Experimental Procedure
1) Measure the Diameter and the Height of the specimen as well as gauge length Lo. These values will be used to calculate stresses and strains from measured deformation data.

2) After each specimen has been tested, note the peak load.

3) Observe each sample's failure mode/surface.

4) After the lab is complete, download the data from the Web for later use in Excel.

Analysis
1) Using Excel, convert force to stress using a formula and the measured initial diameter and gauge length. Plot the pair of stress-strain curves.

2) Calculate the peak stress and total elongation in terms of strain, as well as the Poisson's ratio of the material.

3) Find the elastic modulus, E, in kPa, for each specimen.

4) Work done is defined as force•distance, usually given in terms of kN•m. This value can be found for the various samples tested in this experiment by taking the area under the force vs. displacement curve, which is linearly related to the stress vs. strain curves already plotted. Calculate the work done to fracture for each sample. Please list some applications where the ability to adsorb energy would be a critical design consideration.

Report Requirements

Your report should provide an introduction, an explanation of the experimental procedures, the results of these experiments including a tabulation of the central results (such as strength), and conclusions and observations, including answers to the various questions asked in the analysis section above.

Please include in the appendix any sample computations needed to provide backup for your spreadsheet calculations. Make sure to clearly mention all appendix contents in the body of the report and to label all appendix items clearly. It is never appropriate to include items in the appendix which are not mentioned in the report.