

LABORATORY #3

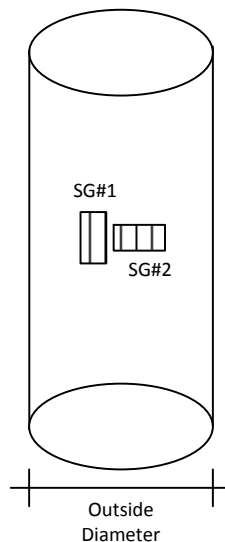
Internal Pressure of an EΨA can

Purpose

This is dual-purpose laboratory a) to become familiar with the basic principles of modern measuring systems involving strain gages, b) to apply elementary solid mechanics and structural analysis principles to convert measurements of strain to load.

Lab

Please install two strain gages on an EΨA lemonade can. One should be installed in such a way to measure longitudinal strain and the other to measure strain in the transverse direction. Pop the top of the can to relieve the pressure and from the strain measurements please calculate the internal pressure of the can. Can you get an estimate of the Poisson's ratio?



To complete this lab you need to utilize knowledge of your engineering mechanics courses (Mechanics II and Mechanics III). The aluminum can is a thin walled cylinder where the longitudinal stress and hoop stress can be written in terms of the pressure p from:

$$\sigma_h = p r / t \quad \text{and} \quad \sigma_l = p r / 2t$$

Where r =radius of the cylinder and t =thickness of the wall. Ignoring the air pressure write the stress equations for the biaxial state of stress and derive the pressure from both the hoop and the longitudinal stress equations. Note the longitudinal and hoop stresses are principal stresses.

Please comment on the results. Can you identify potential sources of uncertainty/error?