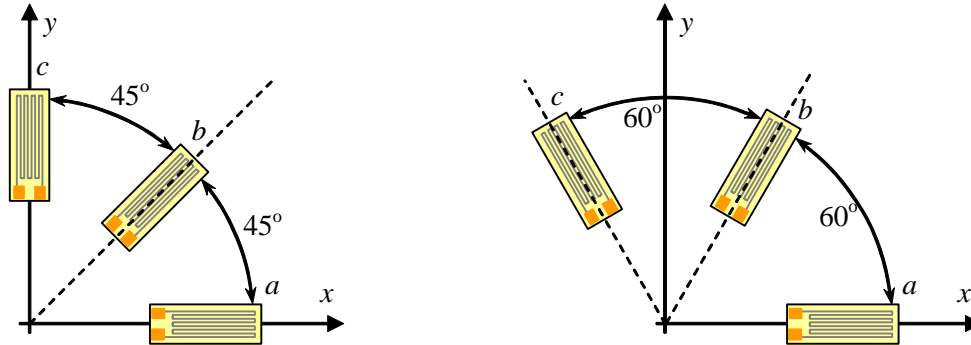


Strain Gage Rosettes

Author: John M. Cimbala, Penn State University
Latest revision: 24 March 2009

Introduction

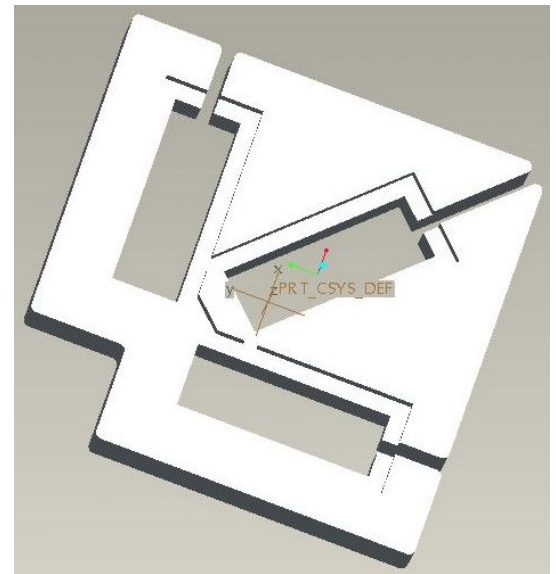
- So far we have discussed strain gages applied individually to a surface – to measure strain in one direction. There are many applications, however, in which multiple strain gages are applied to a surface in order to obtain strain rates in the plane – the *strain tensor*.
- It turns out that we need three closely mounted strain gages (with three independent Wheatstone bridges) to generate the strain tensor on a surface. Such a device is called a *strain gage rosette*.



- Typically, the three strain gages (*a*, *b*, and *c*) are mounted at either a 45° spacing or a 60° spacing, as sketched above, although technically the spacing can be any angle provided that the trigonometry is performed carefully.
- You should recall learning about Mohr's circle and the analysis of strain tensors. Those techniques are useful here to calculate the principal strains from the three strain measurements.

Strain gage rosette mounts

- For custom applications, a strain gage rosette can be constructed by gluing three strain gages on the surface. Typically, a template or mount is used so that the strain gages are properly aligned.
- Shown here is a strain gauge rosette mount designed by a student in M E 345, Jonathan Bednar (Spring 2009). It allows the engineer/technician to place three strain gages at perfect 45 degree angles, and hold them there while the epoxy dries.
- Notice also the channel at one end of each strain gage – this is for the wires.



Etched metal foil strain gage rosettes

- As mentioned previously, standard strain gages are made by etching a metal foil onto a plastic substrate.
- Some manufacturers also etch *three* strain gages on a single substrate to form a ready-made strain gage rosette.
- A picture of a commercially available 45° strain gage rosette is shown to the right; two wires are soldered to each of the three strain gages, and each strain gage is connected to its own Wheatstone bridge.

