06P: DCB Work of Fracture

The work of fracture can be measured with the DCB (double cantilever beam) geometry in two ways,

(i) Using the equations for the displacement as a function of the load, the length of the crack, the width and the thickness of the beams. Derive the equation for $2\gamma_F$ in term of the geometrical parameters of the DCB and the load to fracture. Check the units.

(ii) The second method, as we discussed just now, is to measure the change in compliance with crack length by cutting cracks of different lengths and measuring the force displacement curves for each of them. In this way the chance in compliance with crack length can be measured entirely by experiment which can then be substituted along with the critical load to fracture to obtain a value fo $2\gamma_F$.

In class we assumed the width of the cantilever beam to be unity. Repeat the analysis takin the width to be equal to w, and compare your answer to what we have derived. You should find that P per unit length will be replaced by (P/w). Check it out if this statement is current.