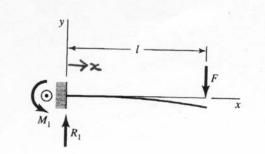ME 120 Experimental Methods

Procedure for Static Deflection Measurement Experiment Using LVDT Gage

1. Measure the cross section dimensions of the beam and calculate its area moment of inertia. Assume the Modulus of Elasticity of steel beam is 30 x 10^6 psi.
2. Move the LVDT mounting block on the beam and its support stand on the base to the designated position per lab instructor's direction. Tighten the setscrews and record the LVDT position with respect to the fixed end of the beam.
3. Move the weight support disk to the designated position on the beam per lab instructor's direction. Record the distance from the disk center to the fixed end of the beam.
4. Set up the static test system as described above with the LVDT located underneath the beam at the designated location. Turn on the power and record the digital readout from the TIC-9000 Indicator and use this as the datum point. The Indicator can display from +0.200 to -0.200 digital readout in inches.
5. Applied a known weight slowly onto the disk located near the end of the beam. Record the readout from the Indicator.
6. Based on the applied weight and its location along the beam, compute the vertical deflection of the beam at the LVDT location using a strength of material approach. Compare the vertical deflection of the beam with the result computed from the analytical prediction.
7. Discuss the accuracy of the LVDT sensor and possible reasons for error if any in your report.

Strength Of Material Approach For Calculating Vertical Displacement Of A Beam

1 Cantilever—end load

$$R_1 = V = F \qquad M_1 = -Fl$$
$$M = F(x - l)$$
$$y = \frac{Fx^2}{6EI}(x - 3l)$$
$$y_{max} = -\frac{Fl^3}{3EI}$$