Extra Credit for Beam Bending Lab

Using the steel and aluminum beams, place one beam on top of the other. Load the beams as you did when a single (aluminum and/or steel) beam was used. Try to predict the deflection of the "composite" beam.

Hint: the deflection equation presented in lab is

$$\delta = \frac{Fs^2}{6EI}(3L - s)$$

At the end of the beam $s = L$ and the equation above (for the deflection at the end of the beam) becomes

$$\delta = \frac{FL^3}{3EI}$$

Provided we do not load the beam beyond its elastic limit (cause permanent deformation), we can treat a beam as a spring that follows the linear relationship $F = k\delta$, where k is the spring constant. Using the relation above, we can express the spring constant (sometimes termed the spring rate) as

$$k = \frac{F}{\delta} = \frac{3(EI)_{eff}}{L^3}$$

where $(EI)_{eff}$ is the effective EI of the "composite" beam.