

75. (a) $C' = \varepsilon_0 A / (d - b)$, the same as part (a) in problem 74.

(b) Now,

$$\frac{U}{U'} = \frac{\frac{1}{2}CV^2}{\frac{1}{2}C'V^2} = \frac{C}{C'} = \frac{\varepsilon_0 A / d}{\varepsilon_0 A / (d - b)} = \frac{d - b}{d} .$$

(c) The work done is

$$W = \Delta U = U' - U = \frac{1}{2}(C' - C)V^2 = \frac{\varepsilon_0 A}{2} \left(\frac{1}{d - b} - \frac{1}{d} \right) V^2 = \frac{\varepsilon_0 A b V^2}{2d(d - b)} .$$

Since $W > 0$ the slab must be pushed in.