EQUILIBRIO ALLA TRASLAZIONE VERTICALE

$$F + \frac{6EI}{(l/3)^2}\varphi - \frac{6EI}{(2l/3)^2}\varphi - \frac{12EI}{(l/3)^3}\delta - \frac{12EI}{(2l/3)^3}\delta - \frac{24EI}{(l/2)^3}\delta = 0$$

$$F + \frac{54EI}{l^2}\varphi - \frac{27EI}{2l^2}\varphi - \frac{324EI}{l^3}\delta - \frac{81EI}{l^3}\delta - \frac{192EI}{l^3}\delta = 0$$

$$\frac{Fl^2}{EI} + 54EI\,\varphi - \frac{27EI}{2}\varphi - \frac{324}{l}\delta - \frac{81}{l}\delta - \frac{192}{l}\delta = 0$$

$$\frac{Fl^2}{EI} + \frac{81}{2}\varphi - \frac{\delta}{l}\left(516 + \frac{81}{2}\right) = 0$$

$$\frac{Fl^2}{EI} + \frac{81}{2}\varphi - \frac{\delta}{l}\,\frac{1113}{2} = 0$$

EQUILIBRIO ALLA ROTAZIONE

$$\frac{4EI}{(l/3)}\varphi + \frac{4EI}{(2l/3)}\varphi - \frac{6EI}{(l/3)^2}\delta + \frac{6EI}{(2l/3)^2}\delta + \frac{2GI_t}{l/2}\varphi = 0$$

$$\varphi\left(\frac{12EI}{l} + \frac{4GI_t}{l} + \frac{6EI}{l}\right) + \delta\left(-\frac{54EI}{l^2} + \frac{27EI}{2l^2}\right) = 0$$

$$\varphi\left(\frac{18EI}{l} + \frac{4GI_t}{l}\right) + \frac{\delta EI}{l^2}\left(-54 + \frac{27}{2}\right) = 0$$

$$\frac{EI}{l}\left[\varphi\left(18 + \frac{4GI_t}{EI}\right)\frac{\delta}{l}\left(-\frac{81}{2}\right)\right] = 0 \qquad \alpha = \frac{GI_t}{EI}$$

$$\varphi\left(18 + 4\alpha\right) - \frac{81}{2}\,\frac{\delta}{l} = 0$$

$$\frac{\delta}{l} = \frac{2}{81}\left(18 + 4\alpha\right)\varphi$$

$$\frac{\delta}{l} = \left(\frac{36 + 8\alpha}{81}\right)\varphi$$

Sostituisco il valore trovato nell'equazione precedente.