Remarks: See §2.6, pages 34 till 42

Answers:

a. $q = 50$ kN/m
b. $\Delta\ell = -20,8$ mm

Explanation:

$EA = 2,25\times10^{6}$ kN

a. $q = \dfrac{(2550\text{ kN}) - (1350\text{ kN})}{24\text{ m}} = 50\text{ kN/m}$

b. $\Delta\ell = \displaystyle\int_0^{\ell} \frac{N(x)\mathrm{d}x}{EA}$ where $N(x) = -F_1 + qx$

Working out this equation analytically gives the answer.

b. Alternative: Draw the N-diagram. The slope of the diagram is linear going from $N = -F_1 = -2550$ kN at the top of the pile to $N = -F_2 = -1350$ kN at the bottom.

$$\Delta\ell = \frac{1}{EA}\int_0^{\ell} N(x)\mathrm{d}x = \frac{\text{Area under } N\text{-diagram}}{EA} =$$

$$= \frac{\frac{1}{2}\times\{(-2550\text{ kN}) + (-1350\text{ kN})\}(24\text{ m})}{2,25\times10^{6}\text{ kN}} = -20,8\times10^{-3}\text{ m}$$