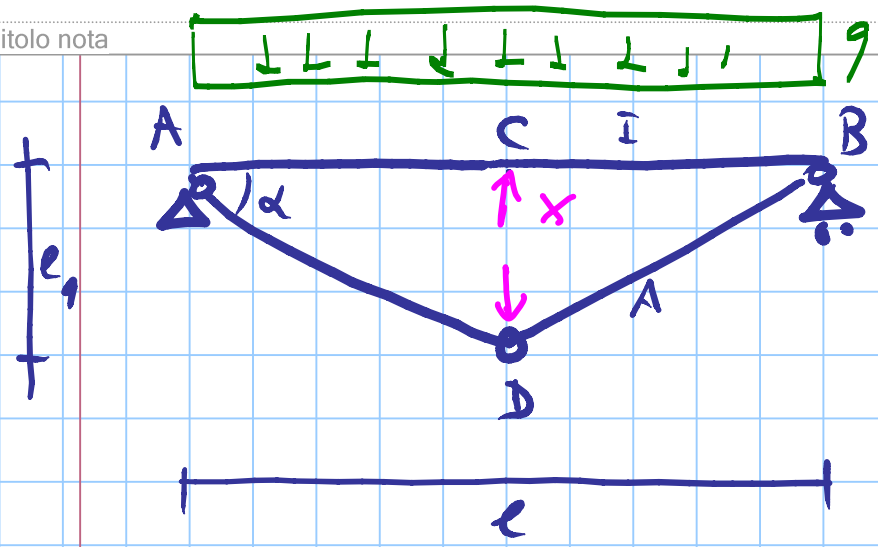
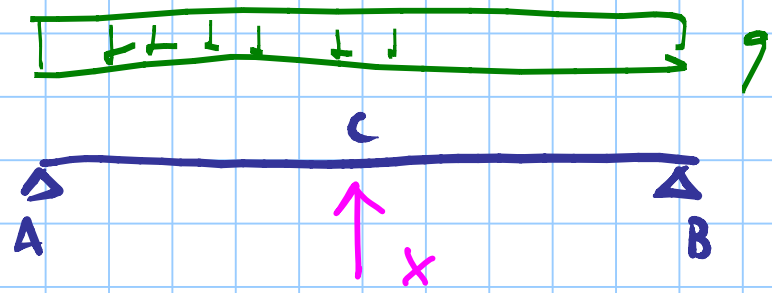
Titolo nota 06/12/2012

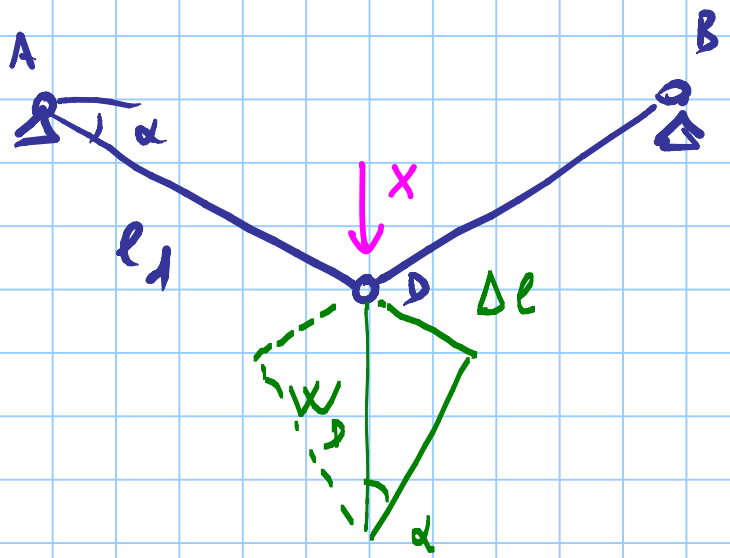


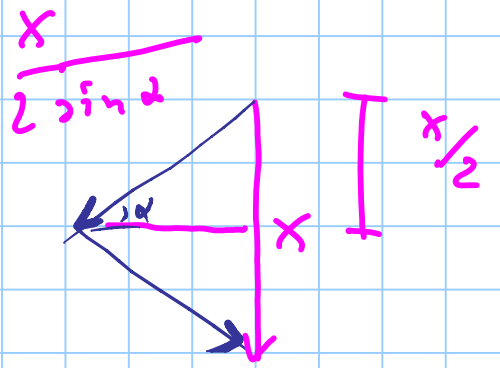
$$w_C = w_D$$

$$l_1 = \frac{l}{2} \operatorname{tg} \alpha \qquad \operatorname{tg} \alpha = \frac{2 l_1}{l}$$



$$w_c = \frac{5}{384}\frac{q l^4}{EI} - \frac{X l^3}{48 EI}$$





$$l_1 = \frac{l/2}{\cos\alpha}$$

$$\Delta l_1 = \frac{X/2\sin\alpha \; l_1}{EA}$$

$$w_D = \frac{\Delta l}{\sin\alpha} = \frac{X l_1}{2\sin^2\alpha \, EA}$$

$$\frac{5}{384}\frac{q\ell^4}{EI} - \frac{X\ell^3}{48EI} = \frac{X\ell_1}{2\sin^2\alpha\, EA}$$

$$\frac{48\,I}{\ell^3} \qquad\qquad \frac{48\,I}{\ell^3}$$

$$\frac{5}{8}q\ell - X = \frac{4X\ell_1 I}{\sin^2\alpha\, A\ell^3}$$

$$\frac{5}{8}q\ell = X\left[1 + \frac{24\ell_1 I}{\sin^2\alpha\, A\ell^3}\right] = X\left[1 + \frac{12\,I}{\sin^2\alpha\cos\alpha\, A\ell^2}\right]$$

$$X = \frac{5}{8} q\ell \; \frac{1}{1 + \frac{12\, I}{A \ell^2 \sin^2 \alpha \cos \alpha}}$$

(50% Simone Liffredo
Ivano Salemo
Elisabetta Bianchetti)

$$\Downarrow$$

$$N_1 = \frac{X}{2 \sin \alpha}$$

$$M_C = \frac{q\ell^2}{8} - \frac{X\ell}{4}$$

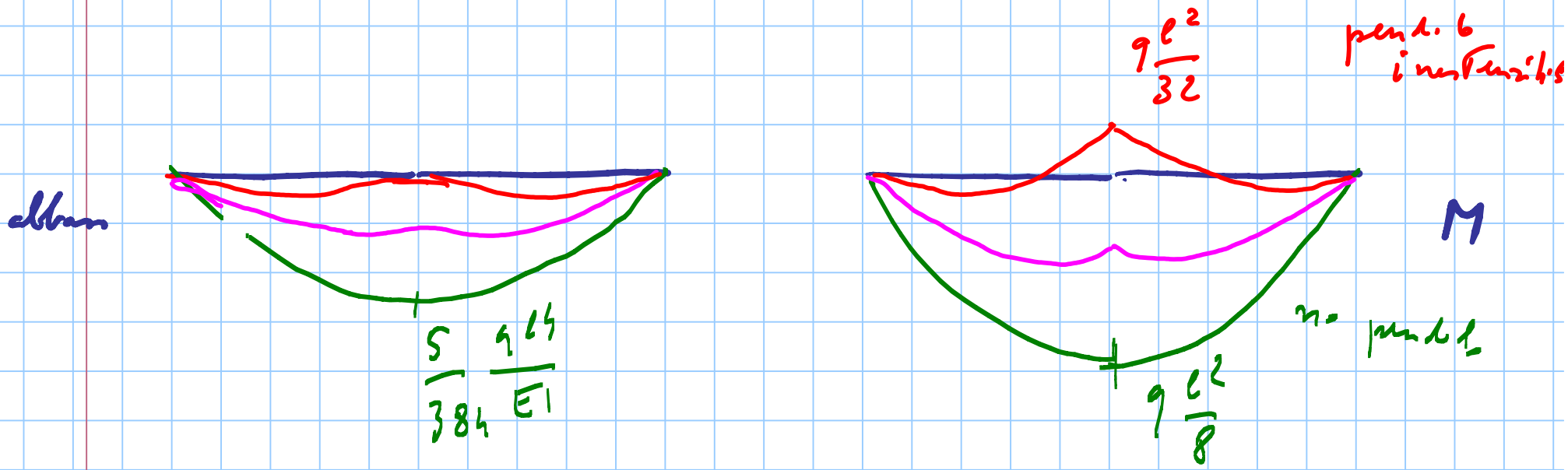
$$N_{ABC} = \frac{X}{2 \operatorname{tg} \alpha}$$

$\alpha \; A = \infty$
(appoggio fisso)

$$X = \frac{5}{8} q\ell$$

$$M_C = \frac{q\ell^2}{8} - \frac{5}{8}\frac{q\ell^2}{4} =$$

$$= -\frac{q\ell^2}{32} = -\frac{q\left(\frac{\ell}{2}\right)^2}{8}$$



$$X \le \frac{5}{8} q l \qquad N_1 \le \frac{5 q l}{16 \sin\alpha}$$

$$w_3 = \frac{X l}{4 \sin^2\alpha \cos\alpha \, EA} \le \frac{5 q l^2}{32 \sin^2\alpha \cos\alpha \, EA}$$

$$w_d < \frac{l}{200} \quad m\,g+q \qquad w_d \leq \frac{l}{250}\, m\,q$$

$$\frac{5}{32}\frac{q\,l^2}{\sin^2\alpha\cos\alpha\, E A} \leq \frac{l}{200} \Rightarrow A \geq \frac{1000\,q\,l}{32\sin^2\alpha\cos\alpha\, E}$$

$$N_{Ed} < N_{Rd} \Rightarrow \frac{5\,q\,l}{16\sin\alpha} \leq A\,\frac{f_y}{\gamma_{M0}}$$

$$A \geq \frac{5\,q\,l\,\gamma_{M0}}{16\sin\alpha\, f_y}$$

$$M_{ed} = \alpha \, g \, l^2$$

$$\alpha = \frac{1}{32} \div \frac{1}{16}$$

$$M_{ed} \leq W_{pl} \frac{f_y}{\gamma_{m0}}$$

$$W_{pl} \geq \frac{\alpha \, g \, l^2 \, \gamma_{m0}}{f_y}$$

$l = 8.00$ m

$l_1 = 1.00$ m

$g_k = 0.6$ kN/m $\quad q_k = 1.7$ kN/m

$g_k + q_k = 2.3$ kN/m

$g_d + q_d = 0.6 \times 1.3 + 1.7 \times 1.5 = 3.33$ kN/m

$$\operatorname{tg}\alpha = \frac{2 l_1}{l} = \frac{2 \times 1.00}{8.00} = 0.25$$

$\alpha = 14.0^\circ = 0.245$ rad

$\sin\alpha = 0.243 \quad \cos\alpha = 0.970$

≤ 235

perché, per resistenza

$$A \geq \frac{5\, q\, l^2\, \gamma_{M0}}{16 \sin\alpha\, f_y} = \frac{5 \times 3.33 \times 8.00^2 \times 1.05}{16 \times 0.243 \times 235} \times 10^3 = 153 \text{ mm}^2$$

per deformazione

$$A \geq \frac{1000\, q\, l}{32 \sin^2\alpha \cos\alpha\, E} = \frac{1000 \times 2.3 \times 8.0 \times 10^3}{32 \times 0.243^2 \times 0.970 \times 206000} = 48.7\ mm^2$$

trave

$$M = \alpha\, q\, l^2 = \frac{1}{20} q\, l^2 = \frac{1}{20} \times 3.33 \times 8.00^2 = 10.7\ kNm$$

$$W_{pl} \geq \frac{10.7 \times 1.05}{235} \times 10^6 = 47.8 \times 10^3\ mm^3$$

HE 100 A $\quad W_{pl} = 83.01 \times 10^3\ mm^3$

$I = 349.2 \times 10^4\ mm^4$

con un prof. 40 x 5 $A = 200\ mm^2$

profilo HE 100 A

con $g_k + q_k$

$X = 15.75\ kN$ $\quad \frac{5}{8} q\ell = 16.65\ kN$

$M_c = -4.85\ kNm$

$M^+_{max} = 4.45\ kNm$

RESISTENZA

con $g_k + q_k$

$X = 10.88\ kN$ $\quad w_c = 9.08\ mm$

$\frac{\ell}{200} = \frac{8000}{200} = 40\ mm$ $\quad w_{max} = 10.72\ mm < \frac{\ell}{200}$

$$M_{Ed} = \frac{q l^2}{8} = \frac{3.33 \times 8.00^2}{8} = 26.6 \text{ kN m}$$

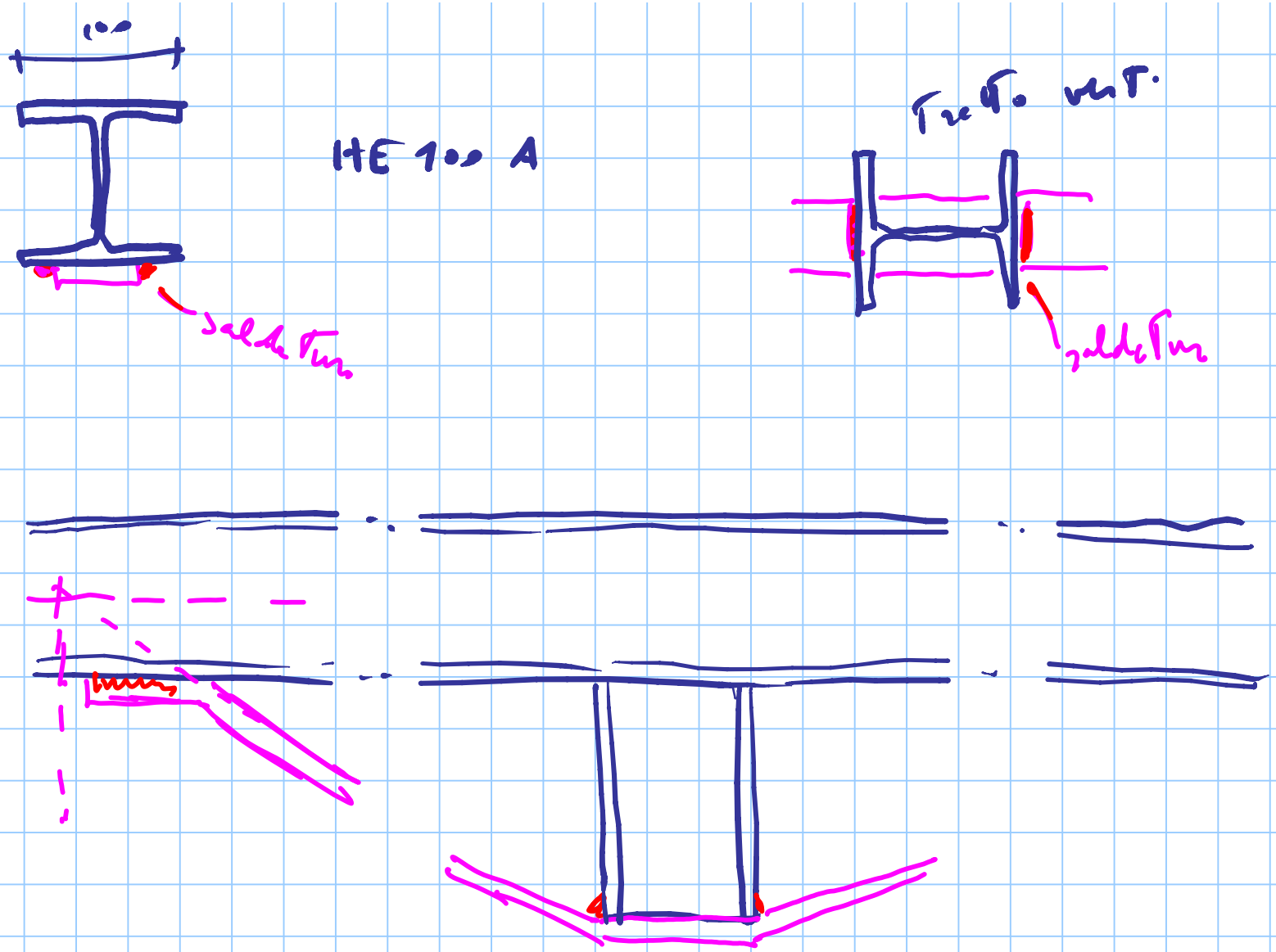
$$W_{pl} = \frac{26.6 \times 1.05}{235} \times 10^6 = 118.9 \times 10^3 \text{ mm}^3$$

min. T. IPE 180 • 160

$$\frac{5}{384} \frac{q l^4}{EI} < \frac{1}{200} l$$

$$I > \frac{1000}{384} \frac{q l^3}{E} = \frac{1000 \times 2.3 \times 8.00^3 \times 10^9}{384 \times 206 \cdots} = 1489 \times 10^4 \text{ mm}^4$$

IPE 200


HE 100 A