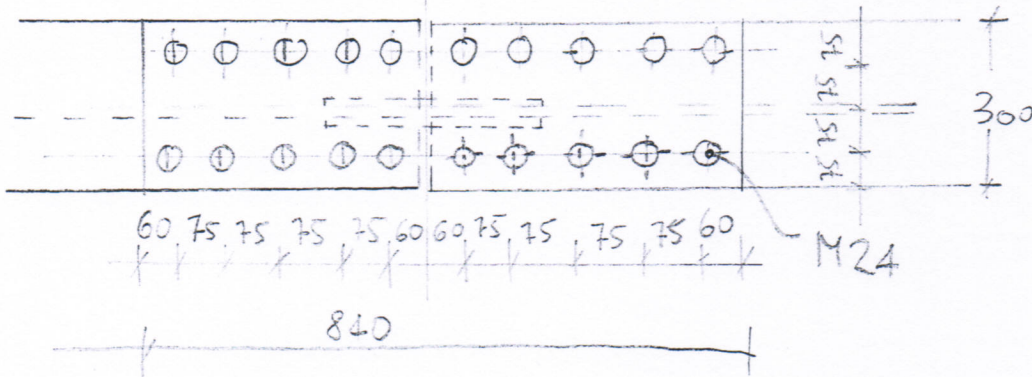
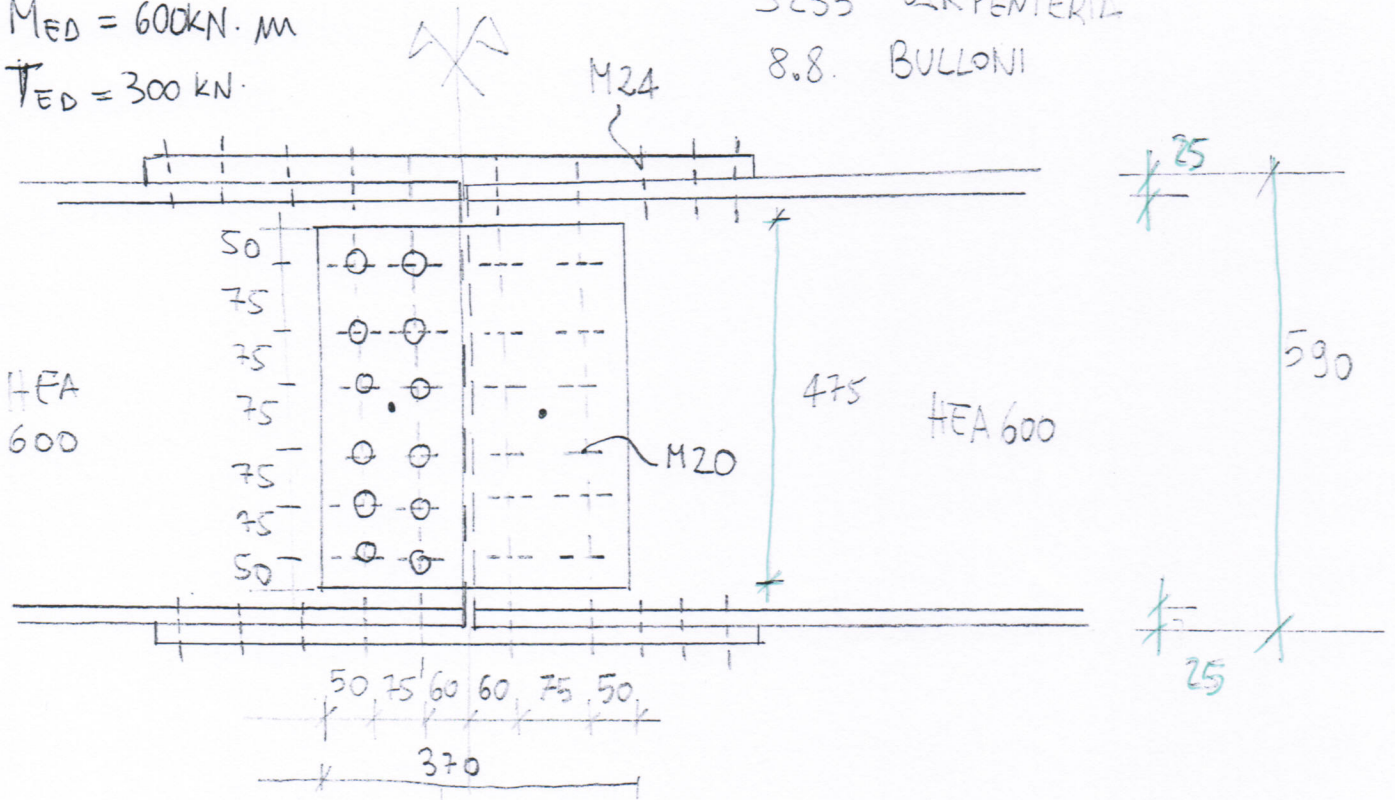


$$M_{ED} = 600 \text{ kN} \cdot \text{m}$$

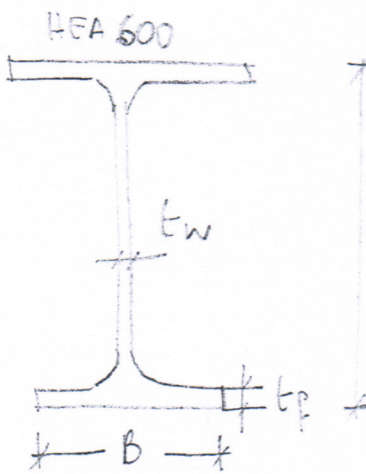
$$T_{ED} = 300 \text{ kN}$$

S235 CARPENTERIA

8.8. BULLONI



giunto di
continuità
trave-trave



$$B = 300$$

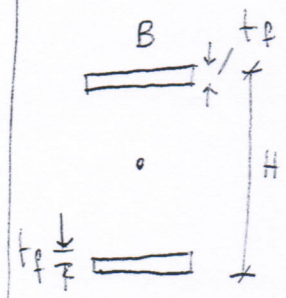
$$h = 590$$

$$t_f = 25$$

$$t_w = 12 \text{ mm}$$

$$I_y = 141208 \text{ cm}^4$$

$$M_{ED} = M_{ALI} + M_{ANIMA}$$



$$I_{ALI} \approx (2B \cdot t_f) \left(\frac{H - t_f}{2} \right)^2$$

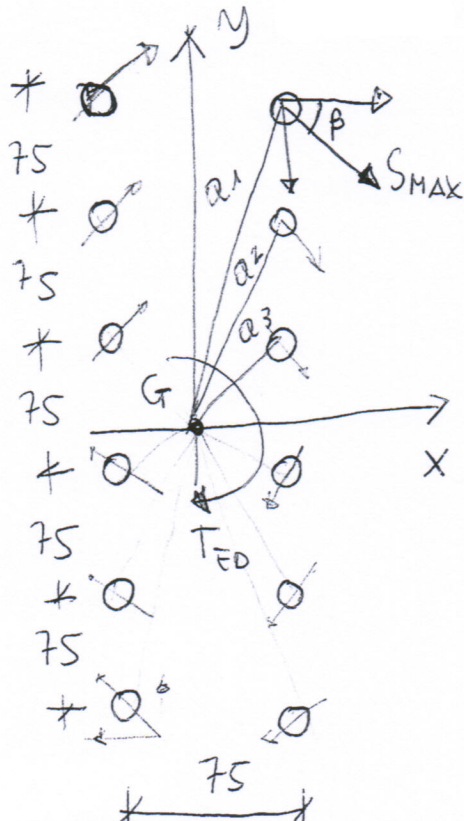
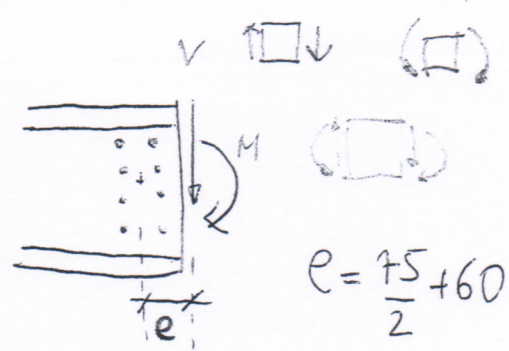
$$= (2 \cdot 30 \cdot 2,5) \cdot 28,25^2$$

$$= 119703 \text{ cm}^4$$

$$M_{ALI} = \frac{I_{ALI}}{I_{y_{TOT}}} M_{ED} = 0,85 M_{ED} \approx 510 \text{ kN} \cdot \text{m}$$

$$M_{ANIMA} = \left(1 - \frac{I_{ALI}}{I_{y_{TOT}}} \right) M_{ED} \approx 90 \text{ kN} \cdot \text{m}$$

CALCOLO BULLONATURA ANIMA (T_{ED}, V_{ED})



$$T_{ED} = M_{ANIMA} + V_{ED}(e)$$

$$= 90 + 29,25^M = 120 \text{ kN} \cdot \text{m}$$

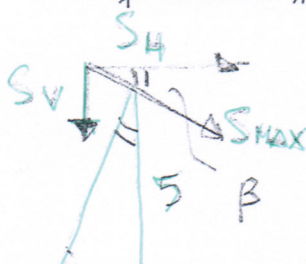
$$e = \frac{75}{2} + 60$$

$$S_{MAX} = \frac{T_{ED} \cdot a_1}{M_f \sum_{i=1}^{12} a_i^2} = \frac{T_{ED} \cdot 191,21}{2 \cdot 213738,6} = 53,67 \text{ kN}$$

$$\sum_{i=1}^{12} a_i^2 = 4 [a_1^2 + a_2^2 + a_3^2] = 213750$$

$$a_1 = 191,21 \quad a_2 = 118,58 \quad a_3 = 53,03$$

$$M_f = 2$$



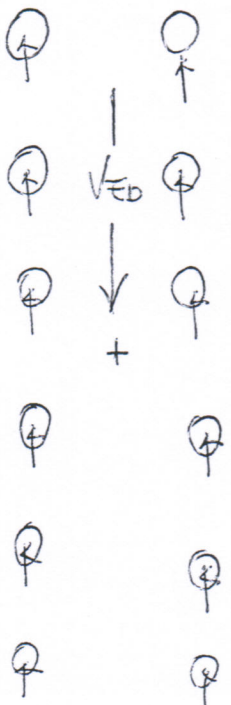
$$F_{V,ED,H}^{(T)} \quad S_H = S_{MAX} \cos(\beta) = 53,67 \cdot 0,98 = 52,62 \text{ kN}$$

$$F_{V,ED,V}^{(T)} \quad S_V = S_{MAX} \sin(\beta) = 10,52 \text{ kN}$$

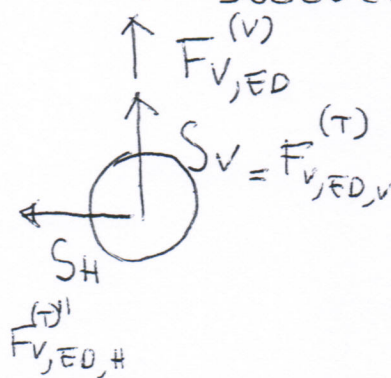
$$\beta = 11^\circ,31$$

Contributo dovuto al taglio agente V_{ED}

$$F_{V,ED}^{(V)} = \frac{V_{ED}}{M_f} = \frac{300}{12 \cdot 2} = 12,5 \text{ kN}$$



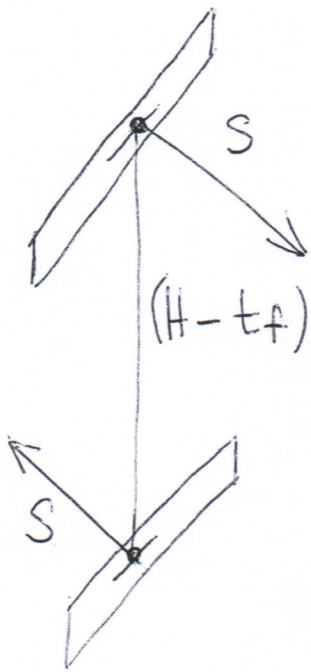
TAGLIO MASSIMO AGENTE SUL BULLONE PIU' SOLLECITATO



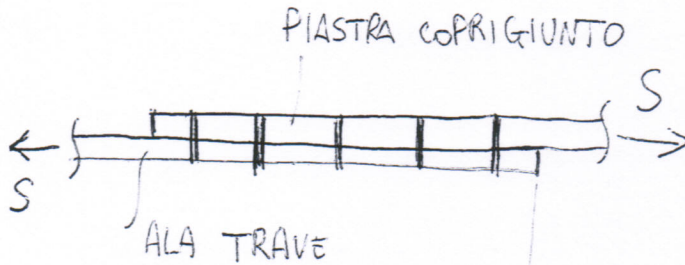
$$F_{V,ED} = \sqrt{(F_{V,ED,V}^{(T)} + F_{V,ED}^{(V)})^2 + (F_{V,ED,H}^{(T)})^2} = 57,44 \text{ kN}$$

BULLONI ALI

$$M_{ALI} = 510 \text{ KN}\cdot\text{m}$$



$$S = \frac{M_{ALI}}{(H - t_f)} \approx 903 \text{ KN}$$



$$\underline{\underline{F_{V,ED} = \frac{S}{m \cdot m_f} = \frac{903}{10 \cdot 1} = 90,3 \text{ KN}}}}$$

VERIFICA BULLONI ANIMA

$$M20 \text{ CL } 8.8 \quad f_{tbk} = 800 \frac{\text{N}}{\text{mm}^2}$$

$$F_{V,RD} = \frac{0,6 f_{tbk} \cdot A_{res}}{\gamma_{M2}} = 245$$

$$= 94 \text{ KN}$$

$$57,44 \text{ m} \quad \checkmark$$

VERIFICA BULLONI ALI

$$M24 \text{ CL } 8.8$$

$$F_{V,RD} = \frac{0,6 f_{tbk} A_{res}^{353}}{\gamma_{M2}}$$

$$= 116,35 \text{ KN}$$

$$> 90,3 \text{ KN} \quad \checkmark$$