

①  $M_K = 100 \text{ KN.m}$        $\alpha_s = 50 \text{ A}$        $\epsilon = 2$        $f_{yd} = 434,783$       ①  
 $b = 15 \text{ cm}$        $A_s = 2$        $d' = 3$   
 $f_{ck} = 20 \text{ MPa}$        $h = 2$

DIM

$$M_K = 100 \cdot \text{KN} \cdot 10^3 \text{ cm} \Rightarrow M_K = 10000 \text{ KN.cm}$$

$$M_d = 1,4 \cdot 10000 \text{ KN.cm} \Rightarrow M_d = 14000 \text{ KN.cm} //$$

$$\mu_d = \frac{M_d}{f_{cd} \cdot b \cdot d^2} \Rightarrow \mu_d = \mu_{d,lim} \Rightarrow \mu_{d,lim}(50 \text{ A}) = 0,32$$

$$d = \sqrt{\frac{M_d}{f_{cd} \cdot b \cdot \mu_d}} \Rightarrow d = \sqrt{\frac{14000}{\frac{2}{1,4} \cdot 15 \cdot 0,32}} \Rightarrow d = \sqrt{2043,667} \Rightarrow d = 45,185 \text{ cm} //$$

$$h = d + d' \Rightarrow d' = 4 \text{ cm} \Rightarrow h = 45,185 + 4 \Rightarrow h = 49,185 \text{ cm} \Rightarrow \boxed{h = 50 \text{ cm}} //$$

$$d = 50 - 4 \Rightarrow d = 46 \text{ cm} //$$

$$\mu_d = \frac{14000}{\frac{2}{1,4} \cdot 15 \cdot 46^2} \Rightarrow \boxed{\mu_d = 0,309}$$

$$\omega = 0,05 - \sqrt{0,7225 - 1,7 \cdot 0,309} \Rightarrow \boxed{\omega = 0,409}$$

$$K_x = \frac{0,409}{0,68} \Rightarrow \boxed{K_x = 0,596} \Rightarrow K_{x,lim}(50 \text{ A}) = 0,6283 \Rightarrow$$

$K_x < K_{x,lim} \Rightarrow \text{OK!} \Rightarrow \text{armadura está escoando.}$

$$\epsilon = 0,596 \cdot 46 \Rightarrow \boxed{\epsilon = 27,397 \text{ cm}} //$$

$$A_s = \frac{\omega \cdot b \cdot d \cdot f_{cd}}{f_{yd}} \Rightarrow A_s = \frac{0,409 \cdot 15 \cdot 46 \cdot 1429}{434,783} \Rightarrow \boxed{A_s = 9,185 \text{ cm}^2} //$$

