OTPORNOST MATERIJALA

VEŽBE BR. 4

SMICANJE

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FORMULE

- Ako se predpostavi da su tangencijalni naponi jednoliko raspoređeni po poprečnom preseku, onda se dimenzionisanje vrši po obrascu:

$$\tau_s = \frac{F}{A} \leq \tau_{doz}$$

$$A \geq \frac{F}{\tau_{doz}}$$

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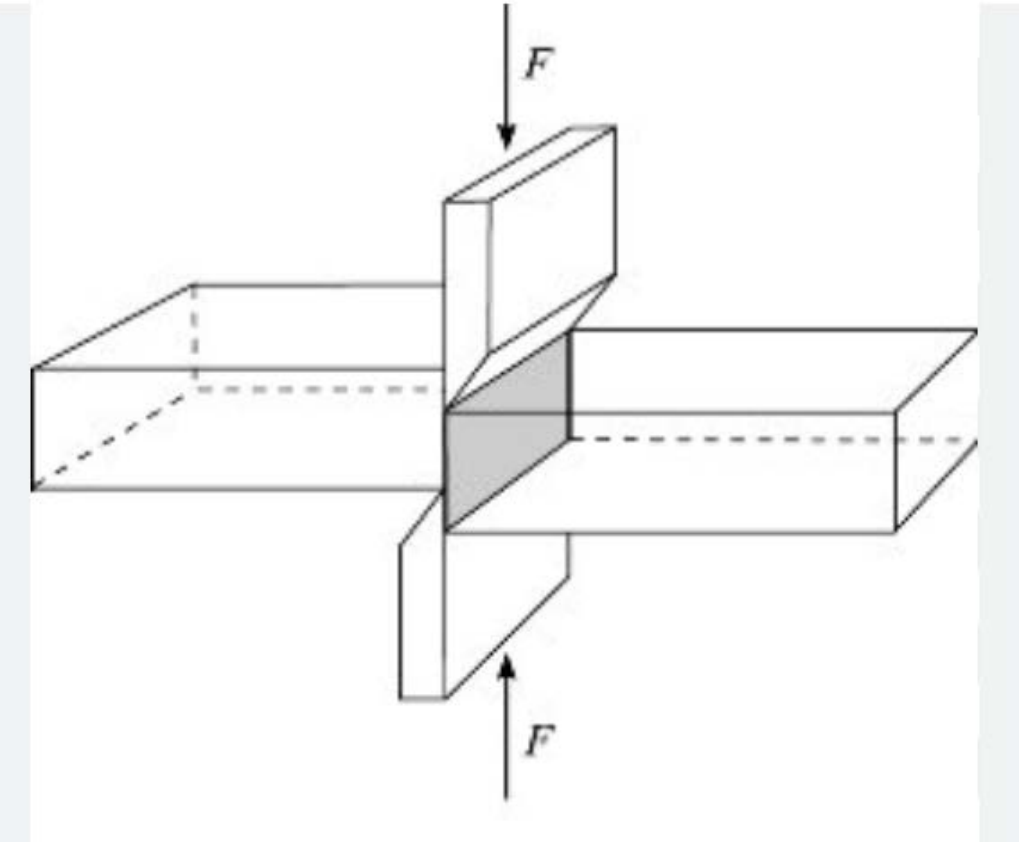
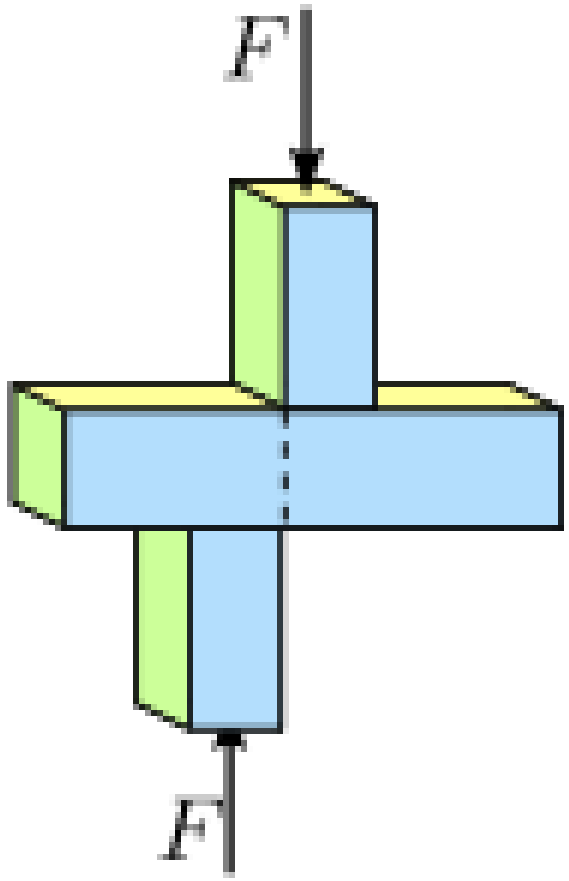


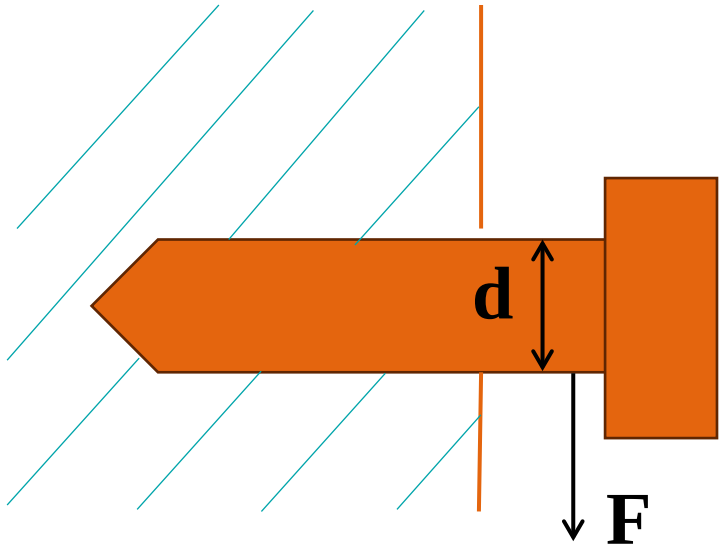


ZADACI

ZADATAK 1.

U klin kružnog poprečnog preseka obešen je teret 300 N.

Koliki je prečnik klina ako je dozvoljeni napon na smicanje $8 * 10^7\ Pa$.

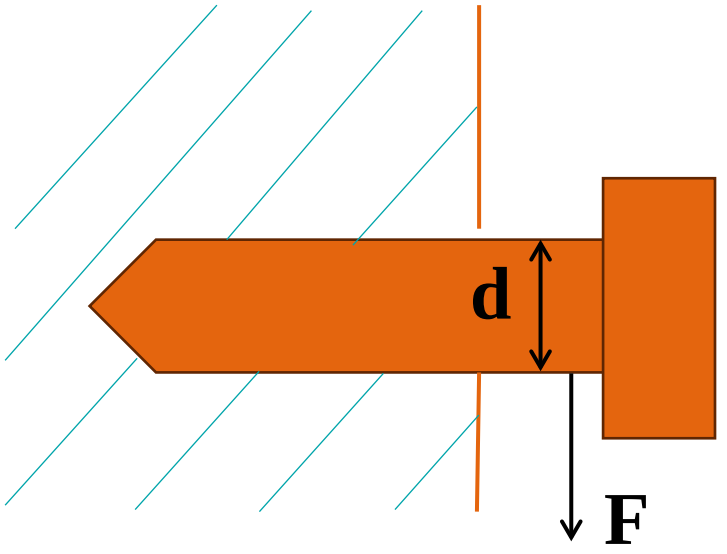


ZADATAK 1.

Podaci:

$F = 300N$

$\tau_{doz} = 8 * 10^7\ Pa$ → $80\ \frac{N}{mm^2} = MPa$



d =?

$$\tau_s = \frac{F_t}{A} \leq \tau_{doz}$$

$$A = \frac{d^2\pi}{4}$$

$$A \geq \frac{F}{\tau_{doz}} = \frac{300}{80} = 3.75\ mm^2$$

$$3.75 = \frac{d^2\pi}{4}$$

$$d^2 = \frac{4 * 3.75}{\pi}$$

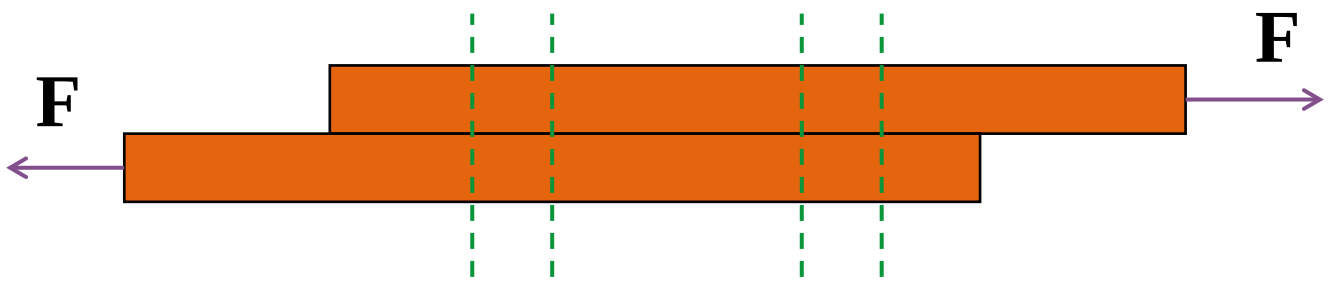
$$d = \sqrt{\frac{4 * 3.75}{\pi}}$$

$$d \geq 2.186\ mm$$

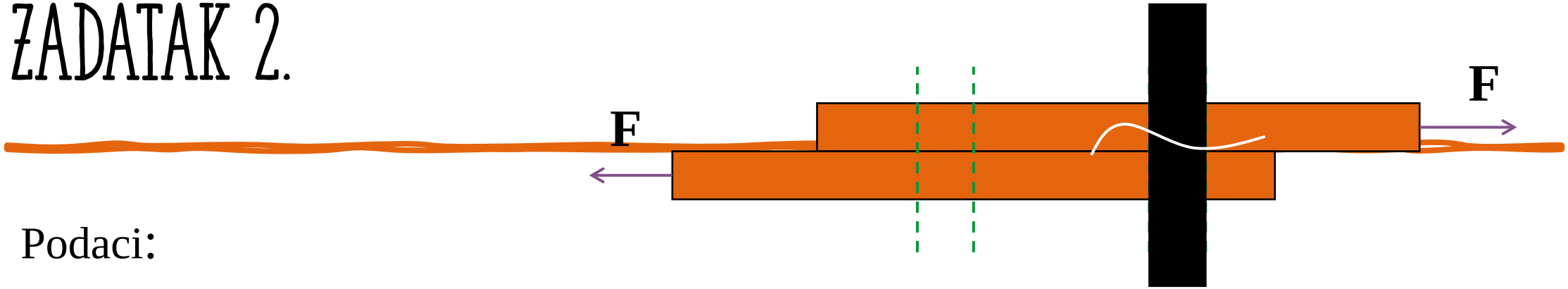
$$d = 3\ mm$$

ZADATAK 2.

Dva pljosnata štapa treba spojiti zakivcima da bi preneli silu $F = 150kN$. Odrediti potreban broj zakivaka, ako je prečnik zakivka $d = 19\,mm$, a izrađeni su od materijala sa dozvoljenim naprezanjem $\tau_{doz} = 12\ \frac{kN}{cm^2}$.



ZADATAK 2.



Podaci:

$F = 150\ kN$

$\tau_{doz} = 12\ \frac{kN}{cm^2}$

$d = 19mm$

$n = ?$

$A_S = A_1 * n * k$

$A_1 = \frac{d^2\pi}{4} = \frac{19^2 * 3.14}{4} = 2.83\ cm^2$

$k = 1$ → *broj smičućih površina*

$\tau_s = \frac{F_t}{A} \leq \tau_{doz}$

$12.5 \leq 2.83 * n * 1$

$A \geq \frac{F}{\tau_{doz}} = \frac{150}{12} = 12.5\ cm^2$

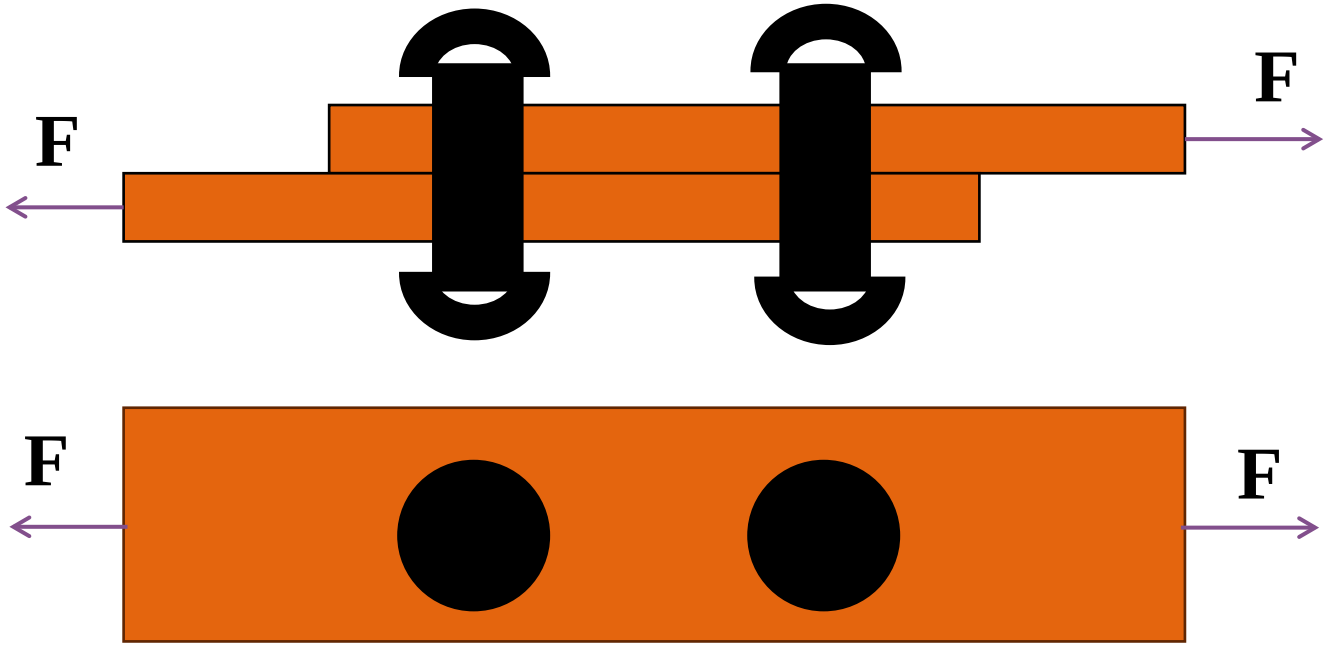
$n \geq \frac{12.5}{2.83}$

$n \geq 4.41$

$n = 5$

ZADATAK 3.

Dve limene ploče debljine $\delta = 8mm$ treba spojiti pomoću dva zakivka. Ploče su opterećene silom $F = 25\ kN$. Odrediti prečnik zakivka i širinu ploče b, ako je dozvoljeni napon smicanja $\tau_{doz} = 9\ \frac{kN}{cm^2}$, a dozvoljeni napon zatezanja $\sigma_{doz} = 10\ \frac{kN}{cm^2}$.



ZADATAK 3.

Podaci:

$\sigma_{doz} = 10 \frac{kN}{cm^2}$

$\tau_{doz} = 9 \frac{kN}{cm^2}$

$F = 25\ kN$

$\delta = 8\ mm$

$d =?$

$b =?$

$$\tau_s = \frac{F_t}{A} \leq \tau_{doz}$$

$$A \geq \frac{F}{\tau_{doz}}$$

$$A_S = A_1 * n * k$$

$$A_S = \frac{d^2\pi}{4} * n * k$$

$k = 1 \qquad n = 2$

$$A_S = \frac{d^2\pi}{4} * 2 * 1$$

$$\frac{d^2\pi}{4} * 2 \geq \frac{F}{\tau_{doz}}$$

$$d^2 = \frac{2 * F}{\pi * \tau_{doz}}$$

$$d = \sqrt{\frac{2 * 25}{\pi * 9}}$$

$d = 1.33\ cm$

$d = 14\ mm$

ZADATAK 3.

$$\sigma_s = \frac{F}{A} \leq \sigma_{doz}$$

$$A \geq \frac{F}{\sigma_{doz}}$$

$$A = b * \delta - d * \delta$$

$$A = (b - d) * \delta$$

$$\frac{F}{\sigma_{doz}} = (b - d) * \delta$$

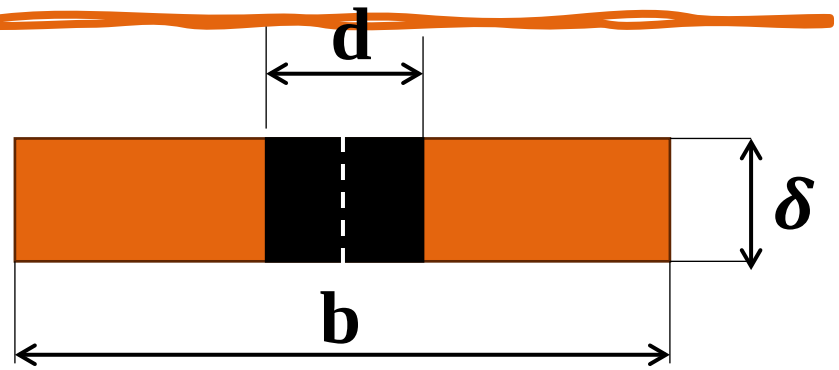
$$\frac{F}{\sigma_{doz}} = b\delta - d\delta$$

$$b\delta = \frac{F}{\sigma_{doz}} + d\delta$$

$$b = \frac{\frac{F}{\sigma_{doz}} + d\delta}{\delta}$$

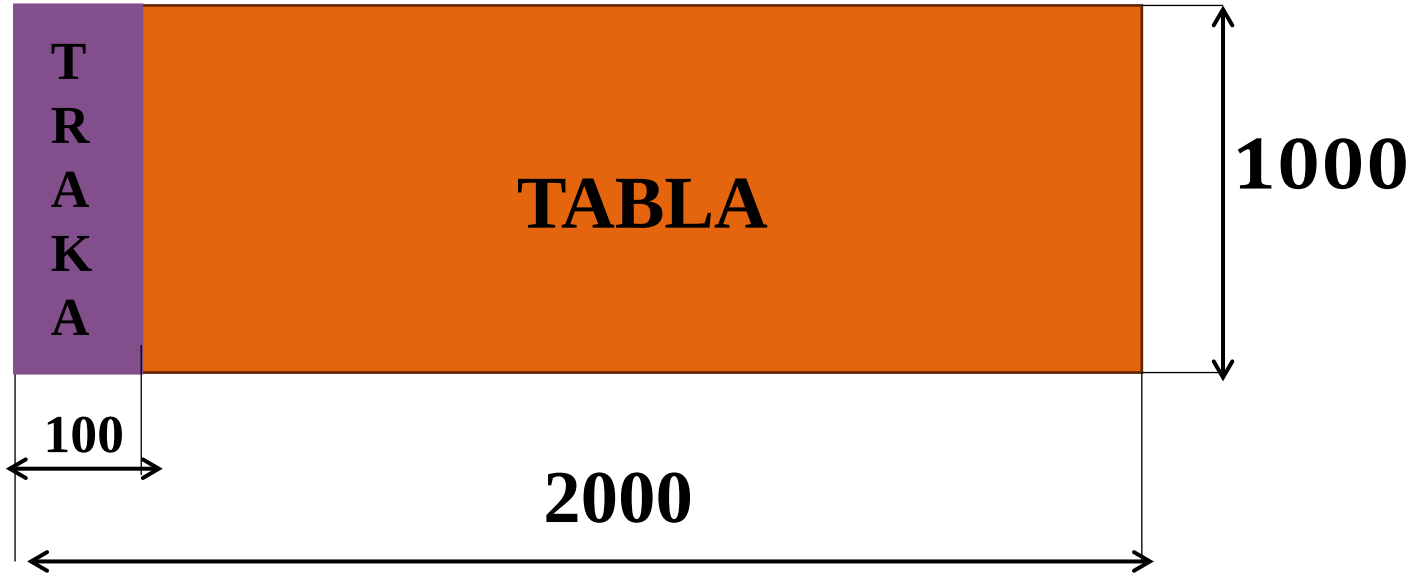
$$b = 4.53\ cm$$

$$b = 46\ mm$$



ZADATAK 4.

- Iz table lima od Č ($\tau_{doz} = 400\ \frac{N}{mm^2}$) veličine 2000x1000x2mm odseca se makazama sa ravnim i paralelnim noževima traka veličine 1000x100x2m. Odrediti silu odsecanja?



ZADATAK 4.

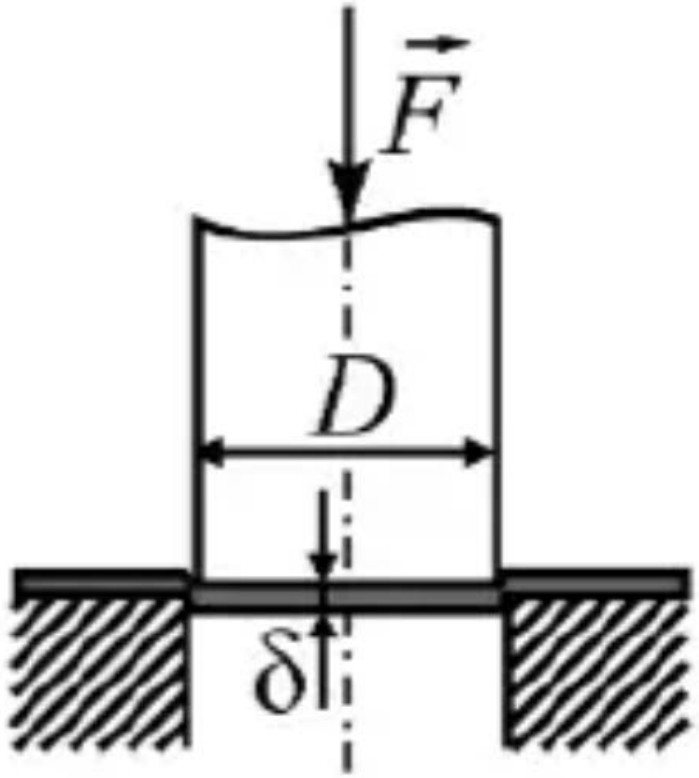
$$A_s = 1000 * \delta \ = 1000 * 2 \ = 2000\, mm^2$$

$$\tau_s = \frac{F_t}{A} \leq \tau_{doz}$$

$$F \geq A_S * \tau_{doz}$$

$$F \geq 2000 * 400 \ \geq 800\,000\, N$$

$$F = 800\, kN$$



ZADATAK 5.

- Uz pomoć prese iz lima debljine 2mm iseca se krug prečnika D = 40 mm. Odrediti potrebnu silu na presi ako je dozvoljeni napon smicanja lima $\tau_{doz} = 300\ \frac{N}{mm^2}$

ZADATAK 5.

$$\tau_s = \frac{F_t}{A} \leq \tau_{doz}$$

$$F \geq A_S * \tau_{doz}$$

$$A_s = D * \pi * \delta$$

$obim\ kruga$

$debljina\ lima$

$$A_s = 40 * \pi * 2 \ = 251.33\ mm^2$$

$$F \geq 251.33 * 300$$

$$F \geq 75398N$$

$$F \approx 75.4\ kN$$

HVALA NA PAŽNJI!