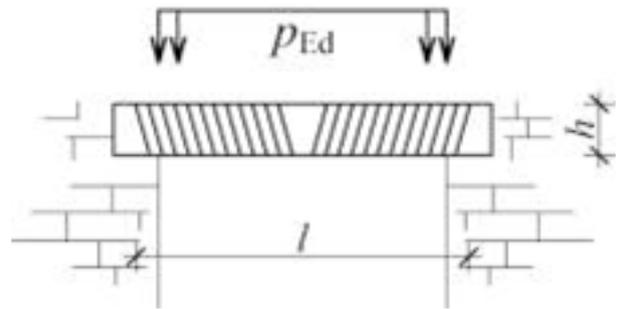


Bonus questions 1.

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Exercise 1. Flat arch

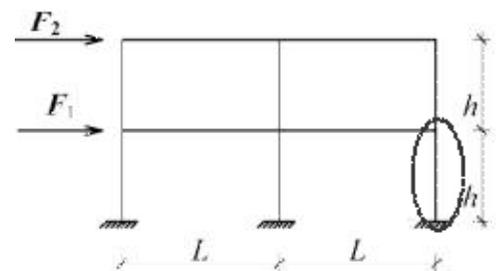
Determine the maximal span of a $h=25\text{cm}$ high flat arch! The vertical load is $p_{Ed} = 20\text{ kN/m}$ and the maximal horizontal load that the shoulders can carry is $H_{\max} = 50\text{ kN}$. The compressive strength can be assumed to infinitely large. Note, that the flat arch can be modeled by an arch and a tie bar, but here we model it with an A-frame without a tie-bar.

**Exercise 2. Choose the true statements about the storey height structures!**

- Moment acting on a truss results in normal internal force in the top and bottom chords.
- Shear force acting on a truss results in shear forces in the members of the truss.
- Moment acting on a Vierendeel truss results in bending moment in the top and bottom beams.
- Shear force acting on a Vierendeel truss results in bending moment in the vertical members.
- Shear force acting on a Vierendeel truss results in normal force in the vertical members.

Exercise 3. Frame

Horizontal loads of the steel frame are $F_1 = 48\text{ kN}$, $F_2 = 24\text{ kN}$ (note, that the figure is not proportional). Calculate the utilization of the marked IPE 240 column loaded by horizontal and vertical forces in the point of the maximal internal forces. Internal force and moment from the dead loads are $N_{Ed} = -300\text{ kN}$, $M_{Ed} = 40\text{ kNm}$. Use the Dunkerley formula! Data: $h = 3,0\text{ m}$, $l = 4,2\text{ m}$ IPE240: $A=39,1\text{ cm}^2$; $W_{pl} = 324\text{ cm}^3$; $\chi_B=0,7$; the column is supported against lateral torsional buckling; material: S355.

**Exercise 4. Choose the true statements about the prestressed reinforced concrete structures!**

- Prestress increases the loadbearing capacity.
- Prestress can be interpreted as an additional load, therefore it reduces the loadbearing capacity of the structure.
- The loadbearing capacity is not affected by the prestress.
- Compared to a normal beam, prestressed beams have lower deflection, because the concrete cracks at higher loads.
- Prestress affects the stress distribution for yielding.

Exercise 5. Truss

The truss is modeled by an overhanging beam. Draw the moment diagram! Calculate the normal force in the top chords at the point of the maximal bending moment! Data: $h=4\text{m}$, $l=3\text{m}$, $p_{Ed}=200\text{ kN/m}$ (vertical, uniformly distributed load along the structure).

