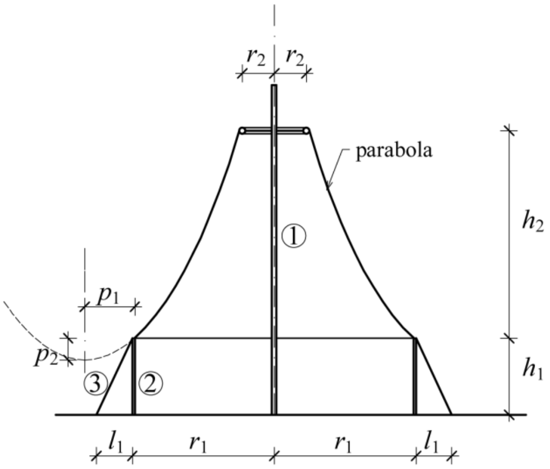
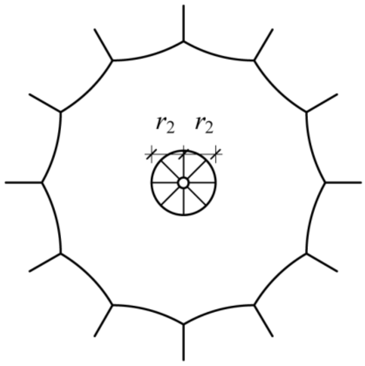
1.) Tent Structure

The following rotationally symmetric tent has a parabola-shape section. The tensioning of the tent is achieved by lifting up the element 1 (and the top ring).

How much force can be applied to the mast (element 1) if the tensile strength of the tent material at the top ring is $N_{br,k}$= 3200 N/5cm, γ=2,5?

Data: r_1=6,0 m; r_2=1,0 m; p_1=3,0 m; p_2=1,0 m





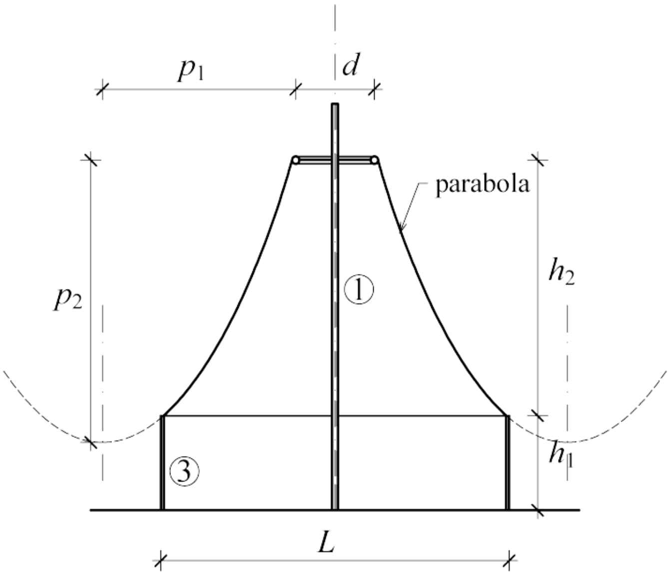
Solution: 140 kN

2.) Tent structure II.

The following rotationally symmetric tent has a parabola-shape section. The tensioning of the tent is achieved by lifting up the element 1 (and the top ring). How much force is caused in the lower edge-ring if the normal force acting in the mast is N_{Ed} **= 110 kN**?

Calculate the minimum required tensile strength of the tent material (design value)!

Data: d=2,0 m, L=15,0 m, h_1=3,5 m, h_2=10,6 m, p_1=8,0 m, p_2=11,0 m.

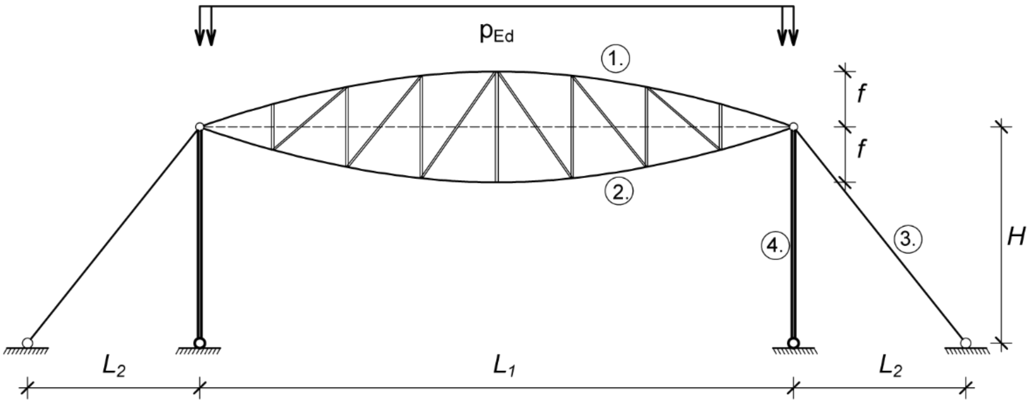


Solution: 32,8 kN; 950 N/5cm

3.) Cable-truss structure

Calculate the normal force acting in the column (element 4). Calculate the utilization factor of this element if the applied pipe cross section has a diameter of d=18 cm with a shell thickness of 10 mm. Material class: S355. The buckling reduction factor based on the slenderness of the column is: χ_B=0,7.

Data: p_{Ed}=20 kN/m, L_1=20,0m, L_2=5 m, f=1,5m, H=5m. **Pretensioning** in element 3: P_d= 1200kN



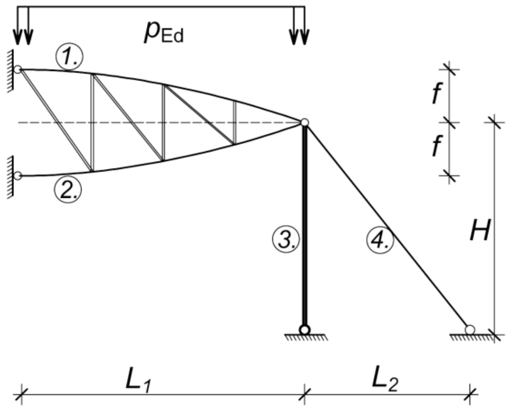
Solution: 1326,5 kN; 79%

3.) Cable-truss structure II.

In the following cable-truss structure $\boldsymbol{P_d}$**=1550 kN** pre-tensioning is applied in cable 4.

Verify the cables in case of a load of $\boldsymbol{p_{Ed}}$**=11 kN/m**. The design value of the tensile strength of cable 1 and 2 is **1100 kN**; of cable 4 is **1600 kN**.

Data: $\boldsymbol{L_1}$**=14,0 m**, $\boldsymbol{L_2}$**=3,2 m**, $\boldsymbol{H}$**=5,0 m**, $\boldsymbol{f}$**=1,5 m**. The shape of the lower and upper cord of the cable-truss is parabola, their tangent at the left-hand support is horizontal.



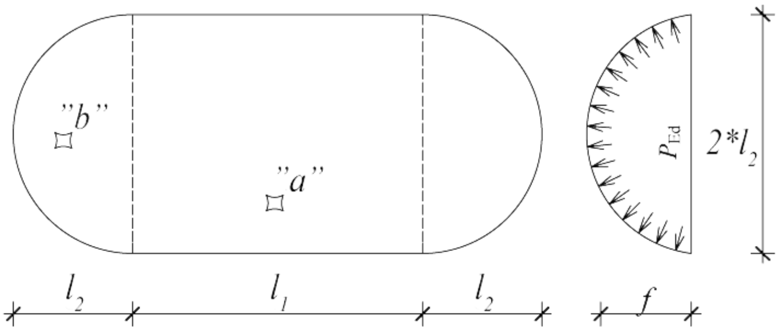
Solution: (1) N_{Ed}=427 kN; (2) N_{Ed}=794 kN; (4) N_{Ed}=1550 kN; all cables are OK.

4.) Pneumatic tent

In the following pneumatic tent P_{Ed}=2,1 kN/m^2 over-pressure is applied to bear the load in case of exceptional snow load.

Calculate the utilization factor (in percentages) of the 2-layer tent material at point "a" and point "b". The characteristic value of the tensile strength of the tent textile is $N_{br,k}$ = 2500N/5cm; the safety factor is γ=3,0.

Geometry: l_1=38 m; l_2=13 m; f=8 m.



Solution: (a) 91%; (b) 45,5%