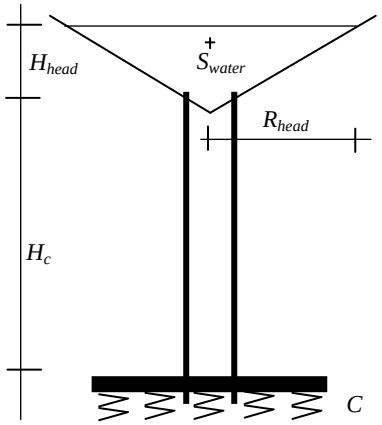
3. Home work

1. A simplified model of a reinforced concrete water tower is shown in the figure. The elastically bedded base plate with R_{base} radius is infinitely rigid for bending. Its bedding factor is C. The inner radius of the cylindrical trunk connected to it is R_{trunk} and the wall thickness is v_{wall}. The water tower head is a full cone (with a peak). The internal tip of the cone (the deepest point of the water space) is at the height of H_c above the base plate. The inner radius of the tank at the height of the working water level is R_w, the water depth is H_w. The wall thickness of the tank does not play in the task and its stiffening effect is not taken into assumption. To simplify the calculation the tower trunk is not continuing in the tower head.
    a. Determine the metacentric radius!
    b. Increase the trunk **above the center of gravity of the water with the metacentric radius received**. Put the sum of the weight of water and the G_{tower} weight of the tower as a load in this fictitious point. Determine the approximate buckling safety of the console bar loaded at its top using the Föppl-Papkovics theorem!



Data:

E = 30 kN/mm^2 C =12000 kN/m^3

R_{base} = 9 m

R_c = 2.2 m v_{wall} = 0.3m

H_{trunk} = 28 m

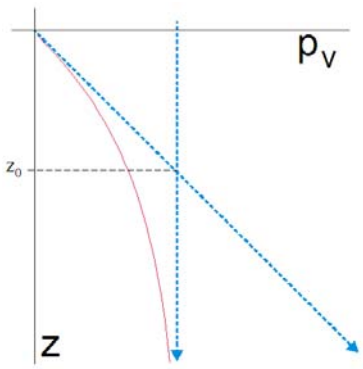
R_w = 13 m

H_w =9.5 m

G_{tower} = 15000 kN

Pay attention: The point of gravity of a triangle and a cone is not identical!
Moment of inertia of a circle in the technical literature.

2. In the Silo with a radius of which is R_{silo} grain cereal is stored with a density of γ_{grain}. The internal friction angle of the grain cereal is α_{grain} the friction coefficient on the internal surface of the wall is f.
    a. Determine the limiting depth!
    b. Find the approximate (asymptotic) pressure on the silo wall bellow the limiting depth!(Calculate k according to Kézdi!)
    c. Calculate the section forces rising in the wall from this pressure!



Data:

R_{silo} = 3m

γ_{grain} = 6kN/m^3

α_{grain} = 24°

f = 0.3