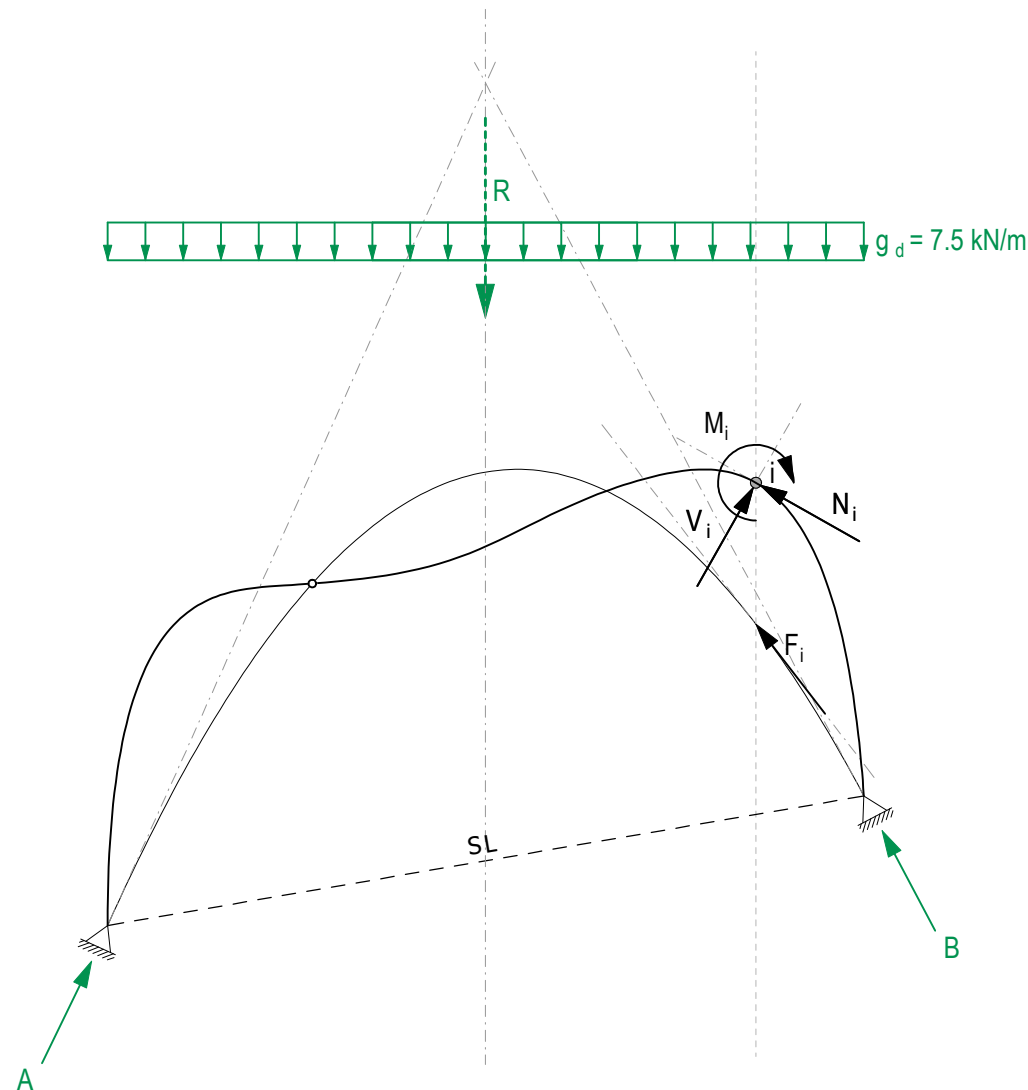


Task 1 Bending moment in frame owing to point load

The form of a load-bearing structure out of steel as well as the line load g_d are given. As shown, the ideal form for this loading condition is a parabola. (Check figure 5 to see how the parabola is drawn through an arbitrary point.)

- a) Draw the force diagram for the ideal loading structure. Find the dimension of the tangential force F_i using graphic statics. Then determine the magnitude of the normal force N_i and the lateral force V_i within the beam. Hint: F_i equals the addition of these two forces.
- b) Calculate the occurring moment M_i in point i.

a)



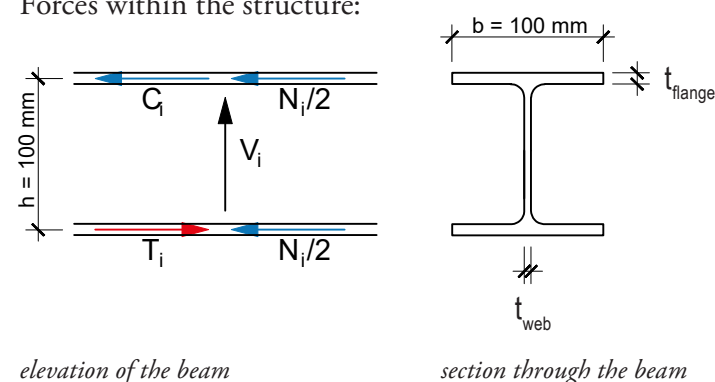
form diagram 1:100

force diagram 1cm $\hat{=}$ 10kN

b) Moment in point i:

- c) The load-bearing structure shall be made out of steel S355. The occurring moment M_i results in the two forces C_i and T_i in the upper and lower flange. Also the normal force N_i appears therein. Determine the resulting forces within the flange.
- d) Take the relevant force and calculate the required cross-sectional area of the flange as well as its thickness t_{Flansch} . Round up the result to mm.
- e) The web of the beam is 10 mm thick. Check whether it would withstand the cross-sectional force V_i appearing within. The load action of V_i is over the width of 20 mm.

c) Forces within the structure:



elevation of the beam

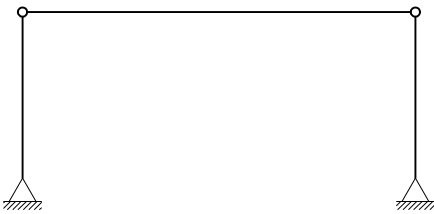
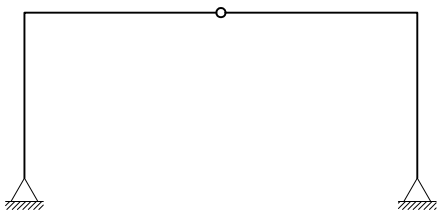
section through the beam

d)

e)

Task 1 Static Determinacy

Draw the possible support reactions for all four cases and determine the degree of external static determinacy.



Task 2 Inner Force Distribution in Reinforced Concrete Frame

Three identical reinforced concrete frames with different support conditions are given. Draw the possible inner force distribution for each case. Indicate tension forces with red and compression forces with blue.

