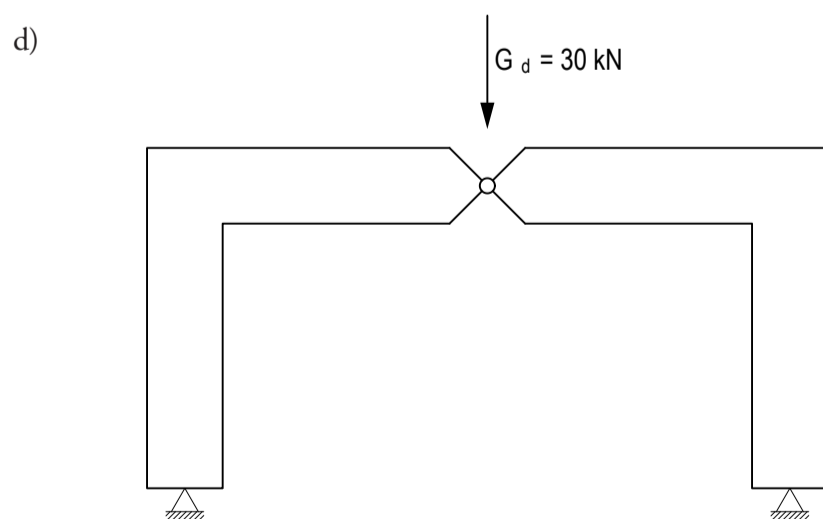
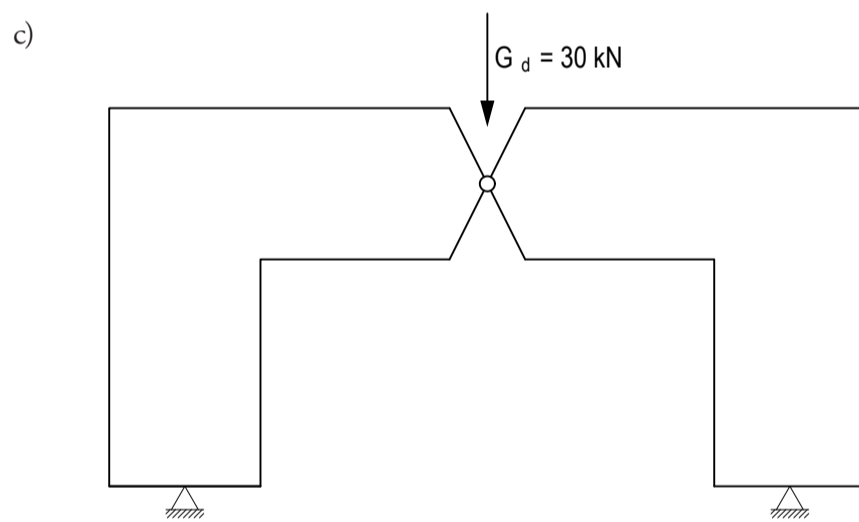
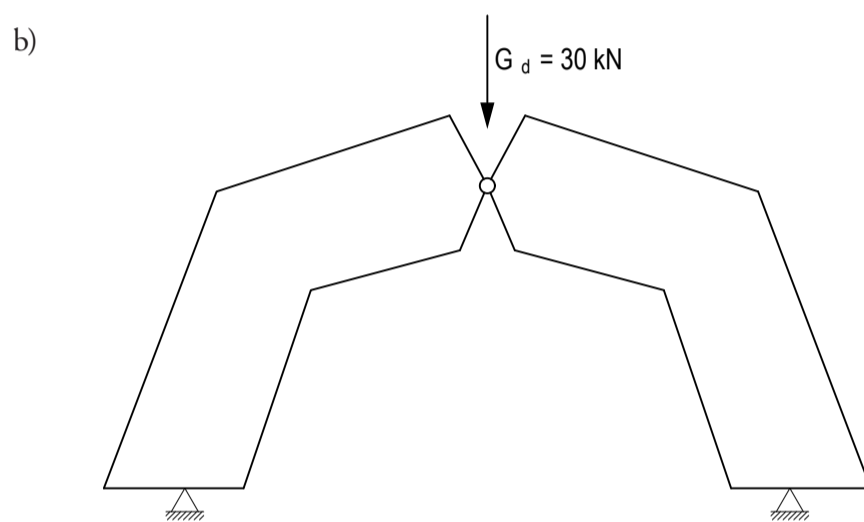
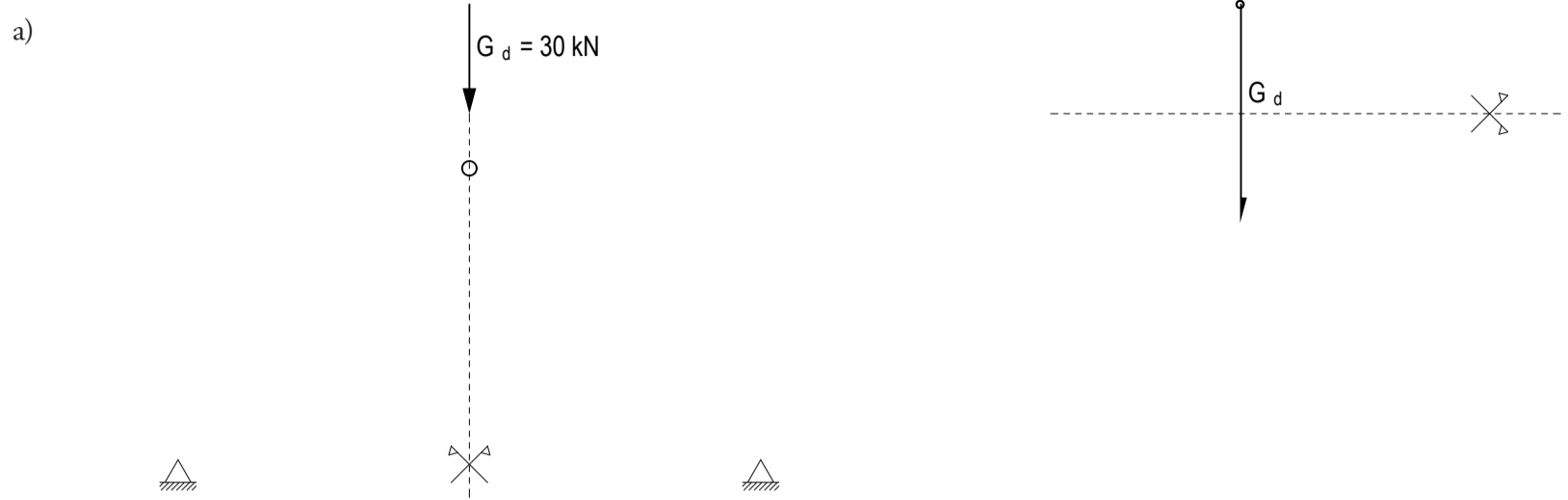


Task 1 Frame corner: From arches to frames

Find the global equilibrium in a) to d) with the help of the thrust line. Then draw a possible force flow and complete the force diagrams. If you add the axis of symmetry in the form as well as in the force diagram, it is sufficient to solve only one side for each situation.



form diagrams 1:100

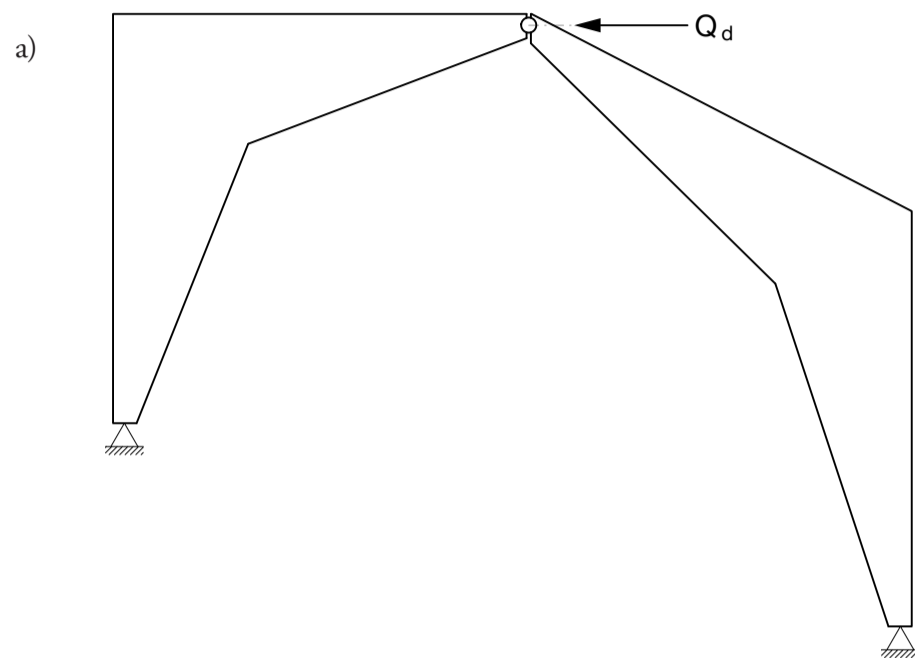
force diagrams 1cm ≙ 10kN

e) Compare situations a) to d). What do you notice?

Task 2 Internal force flow in frames

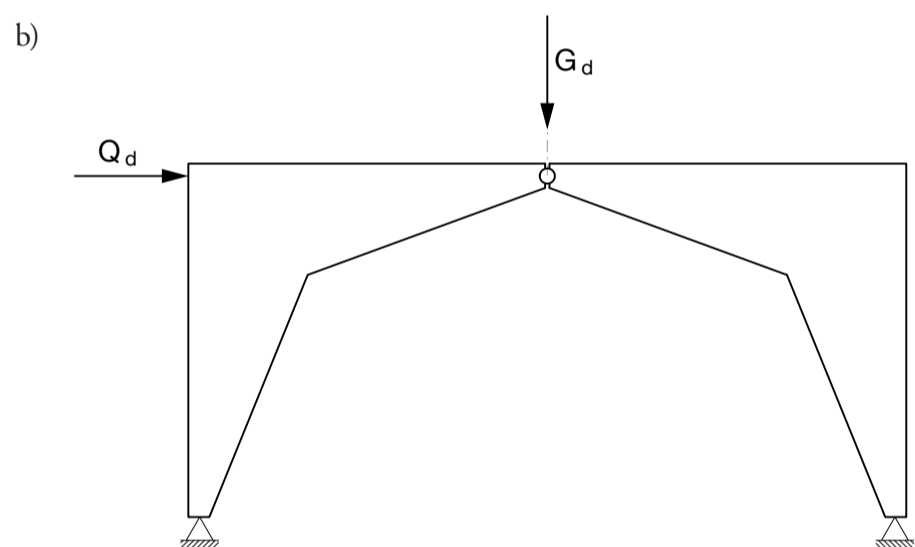
Find a possible internal force flow in the given reinforced concrete frame with the help of the thrust line. First calculate the applied forces at design level. Then draw the corresponding force diagrams and colour tension forces in red, compression forces in blue and external forces in green.

- Assume a horizontal live load $Q_k = 30$ kN.
- The dead load is $G_k = 20$ kN and the live load is $Q_k = 18$ kN.



form diagram 1:100

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



form diagram 1:100

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

Task 3 Dimensioning

Dimension the reinforcement within the reinforced concrete for the relevant tension force of task 2a). Use steel S235 to calculate the diameter of the round steel cable and round the result off to mm. (Round up!)

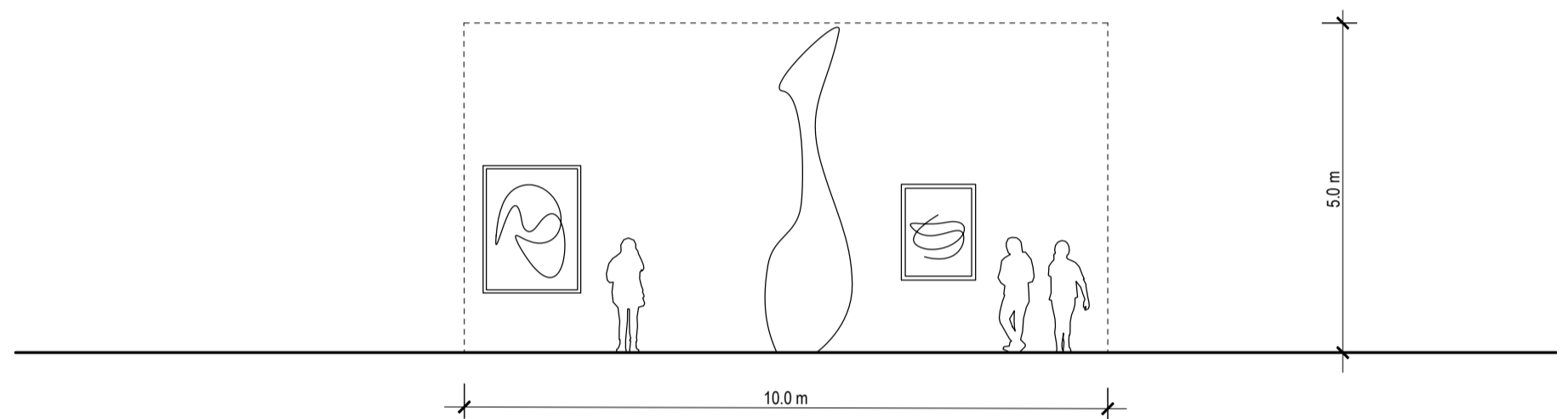
Task 4 Axial Force Proof

Check whether the reinforcement in the reinforced concrete in task 2b) can withstand the relevant tension force. The reinforcement has a round section with a diameter of 18 mm and is made of steel S235.

Creative Art Gallery**Task**

For an art gallery, a frame structure is to be designed such that it provides an interior space of at least 10 meters width and 5 meters height.

- Design the shape of such a frame in the form diagram. Apply the vertical dead load $G_d = 40 \text{ kN}$ as well as the horizontal wind load $Q_d = 35 \text{ kN}$.
- Verify your design. Seek the global equilibrium. Find a possible internal force flow and draw the corresponding force diagram. Indicate tension forces with red, compression forces with blue and reaction forces with green.
- If your force diagram does not fit on the paper, design a second, optimized frame and adjust the force diagram.



form diagram 1:100

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