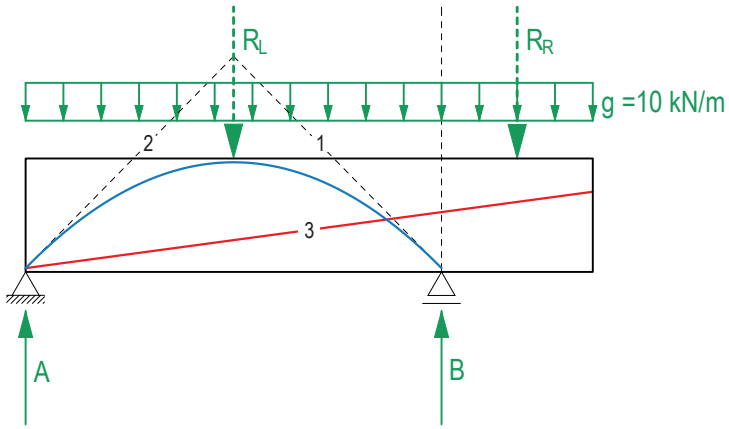
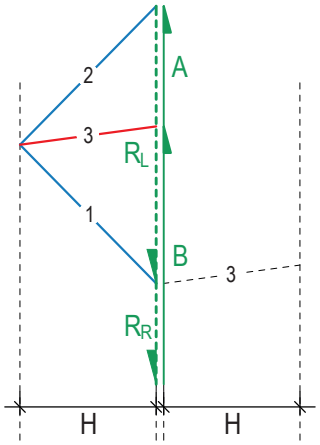
7.2

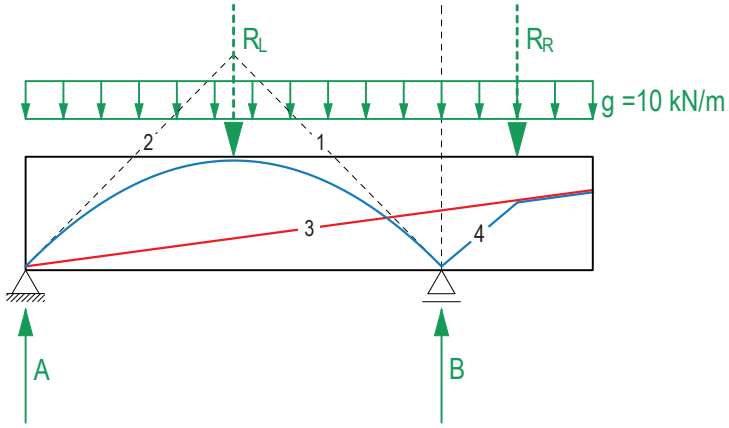
Force Flow in a Beam: Node by Node

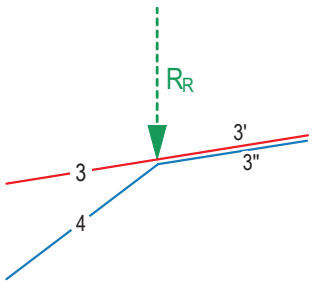
We are looking for a possible force flow in the beam that distributes the applied line load into the two supports. The given beam spans between the two supports on the one hand and also cantilevers on the right side. To solve such a combined system, the line load is divided into two subsystems. It's important to always start with the subsystem with the larger span. There, the entire structural depth is to be used. Under the given load, a parabola with the tangents 1 and 2 results in the left subsystem. With the help of the reaction force A, the inclination of the tension element (3) is then found.
In the subsystem on the right, the second parabola's horizontal thrust (H) must correspond to that of tangent 1 in order to bring the node at the support B into equilibrium. In addition, the compression arch on the right does not run into a support and must therefore be pulled back by the tension element in the same direction.



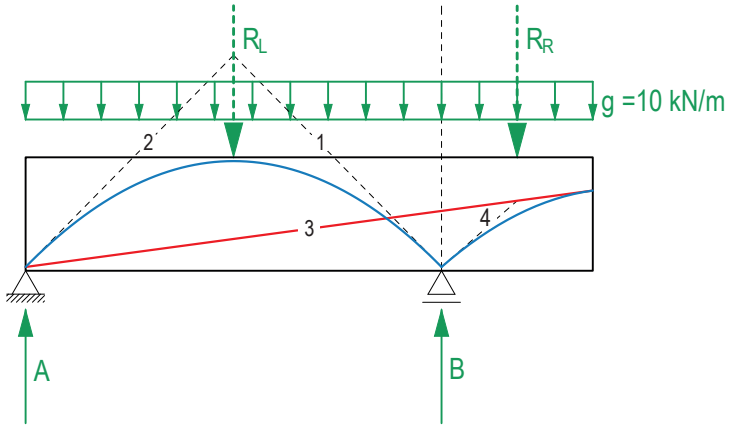


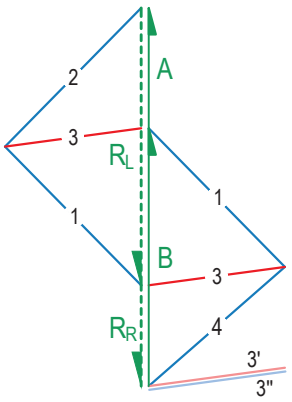
The intersection of the tension element (3) with R_R is a node with a total of five elements, whereby 3' and 3'', which cannot run into a support on the far right, must cancel each other out. Accordingly, these two elements in the node can be neglected and first the tangent (4) and then the tension band (3) are transferred clockwise into the force diagram.





Finally, all elements are brought together in the force diagram and the parabolas are drawn into the form diagram with the help of the respective tangents. For completeness, the two elements 3' and 3'' were also drawn into the force diagram in this example.





form diagrams 1:100

force diagrams 1cm ≙ 15kN