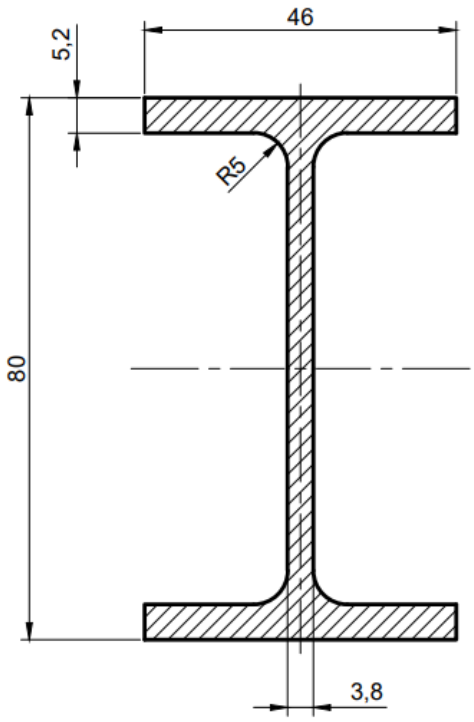
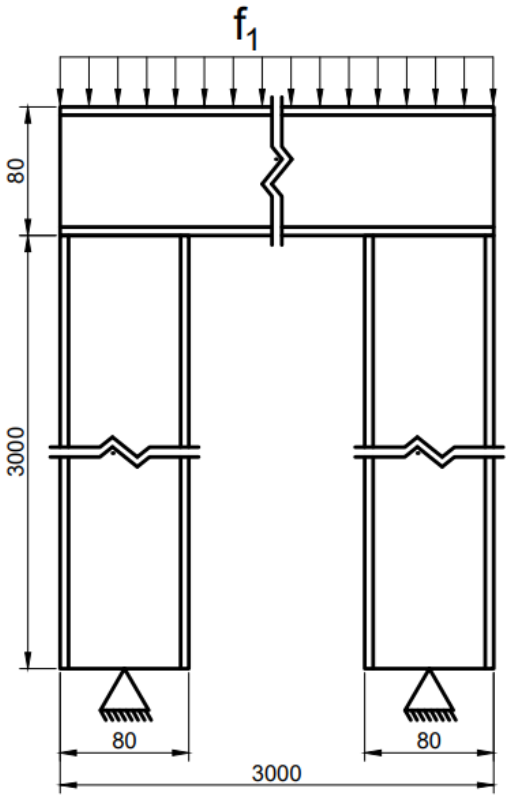
List 7

Task 1

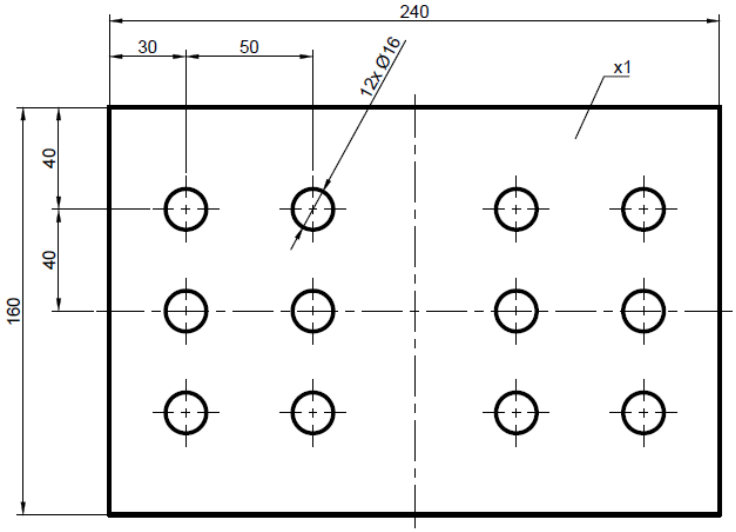
Prepare a model of the load-bearing structure, made entirely of three IPE 80 beams, each 3000 mm in length, according to the dimensions shown in the drawings below. Define the computational model based on the provided load and support scheme, assuming that the structure is made of structural steel (Young's Modulus E = 200 GPa; Poisson's ratio υ = 0,3), and that the force acting on the entire upper flange is: f_1 = 0,7 kN/m. For the analyzed structure, determine the total displacements, reduced stresses according to the Huber-von Mises hypothesis, and the reaction forces at the supports.





Task 2

Create a shell model of a steel plate with holes, according to the dimensions shown in the drawing below. Define the computational model of the plate, assuming that it connects the webs of two I-beams at the locations of the holes (6 holes for each I-beam). The entire structure undergoes tension due to a force F = 9 kN, which acts at the locations of the holes, and its direction is parallel to the side with a length of 240 mm. Assuming the plate is made of structural steel (Young's modulus E = 200 GPa; Poisson's ratio υ = 0,3), determine the required thickness of the plate so that the maximum stress, reduced according to the Huber-von Mises hypothesis, is less than 35 MPa.



Task 3

Create a shell model of a steel angle bracket with holes, according to the dimensions shown in the drawing below. Define the computational model according to the provided load and support scheme, assuming the angle bracket is made of structural steel (Young's modulus E = 200 GPa; Poisson's ratio υ = 0,3), and the force is: F_1 = 9 kN.