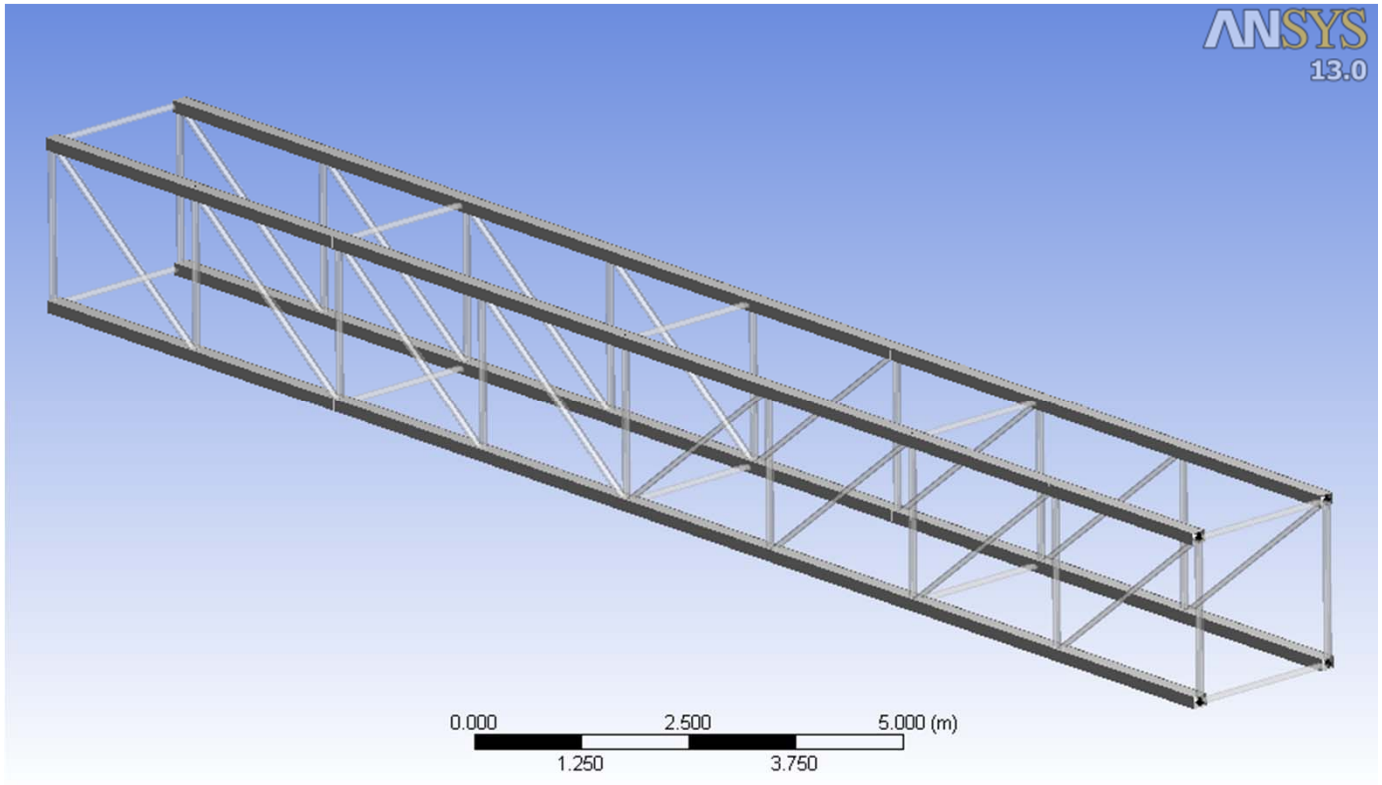
MAE 656 - Advanced Computer Aided Design

03. Beams and Trusses

Description of the week assignment

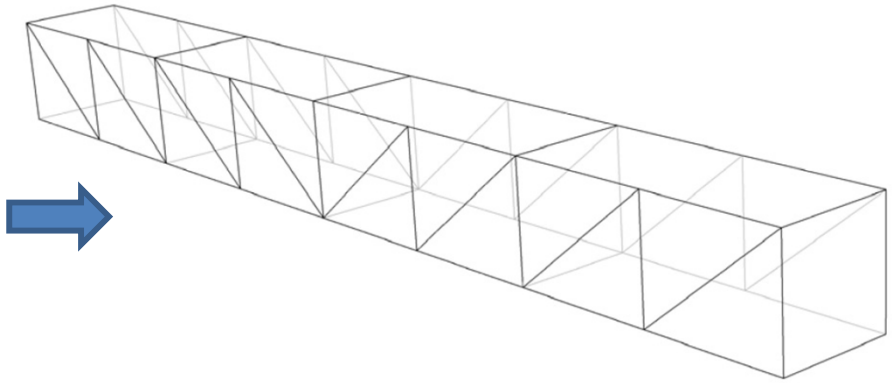
Description of the problem

In current assignment we want to design and validate the following structural beam

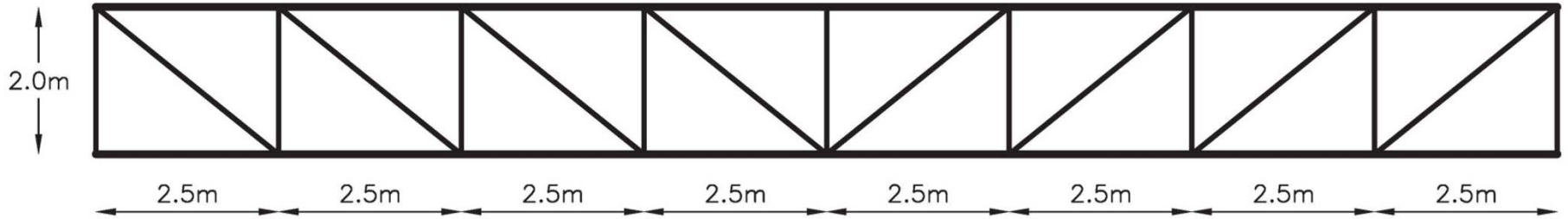


Geometry

The dimensions of the structural beam are

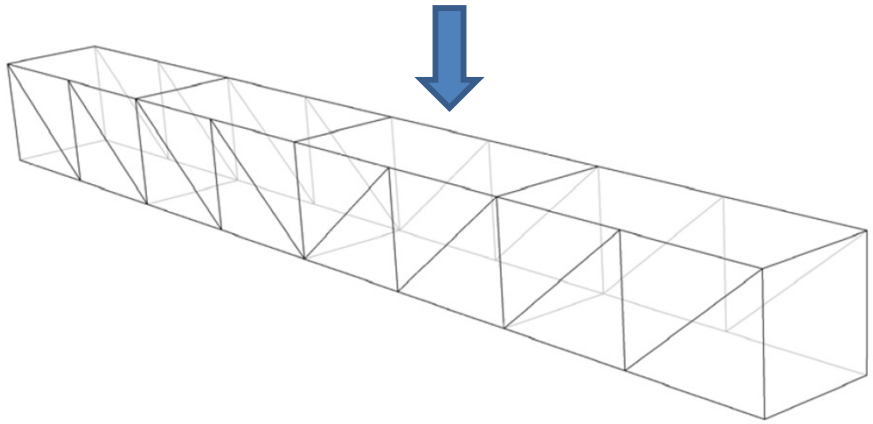


Lateral view

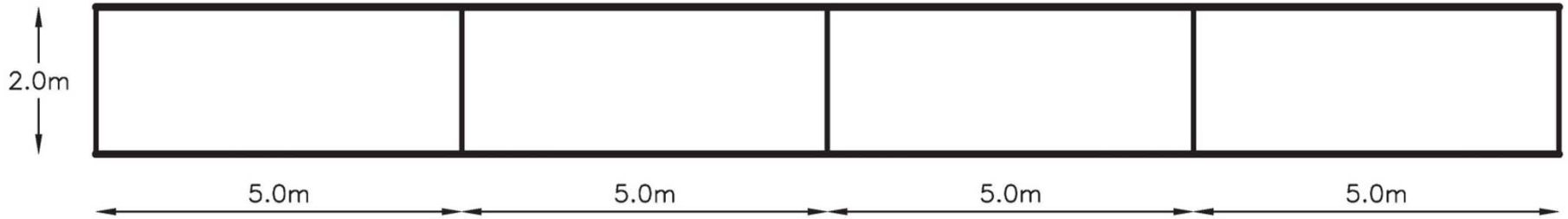


Geometry

The dimensions of the structural beam are

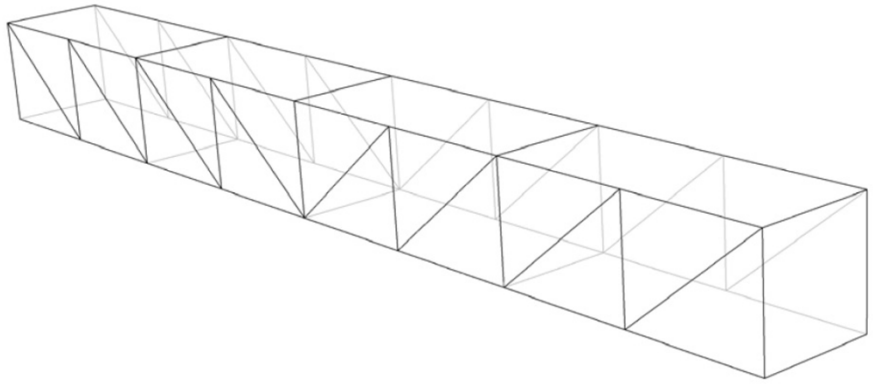


Top view

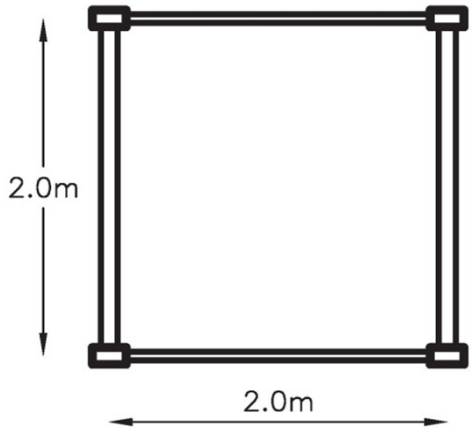


Geometry

The dimensions of the structural beam are

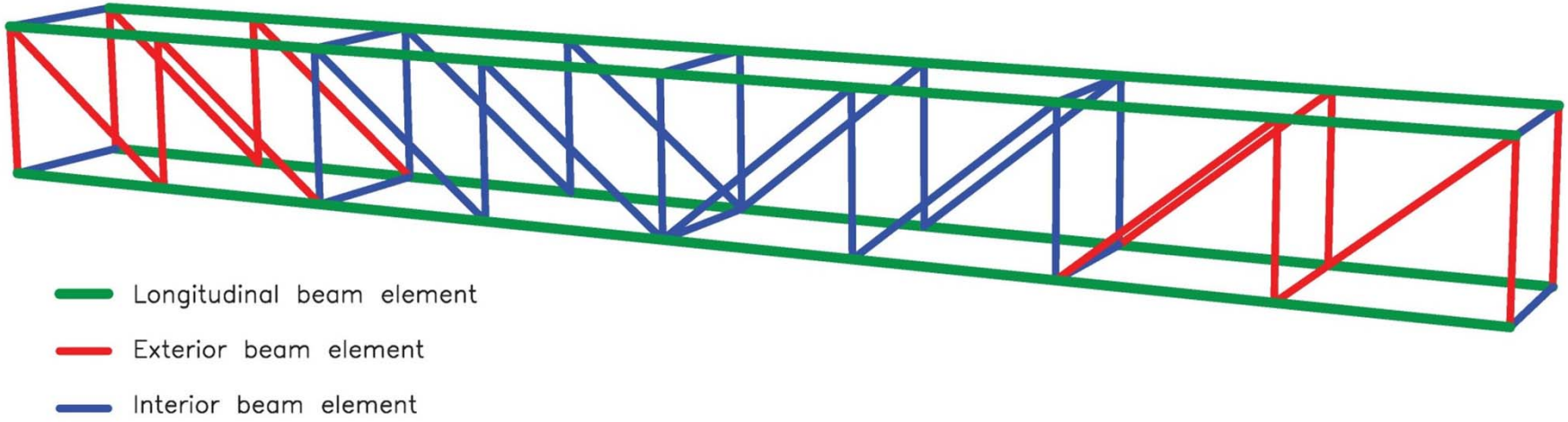


Cross Section

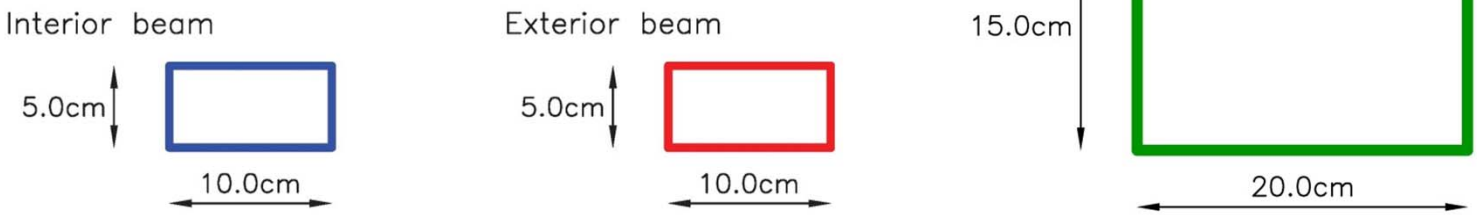


Beam description

The beam is made with three different elements

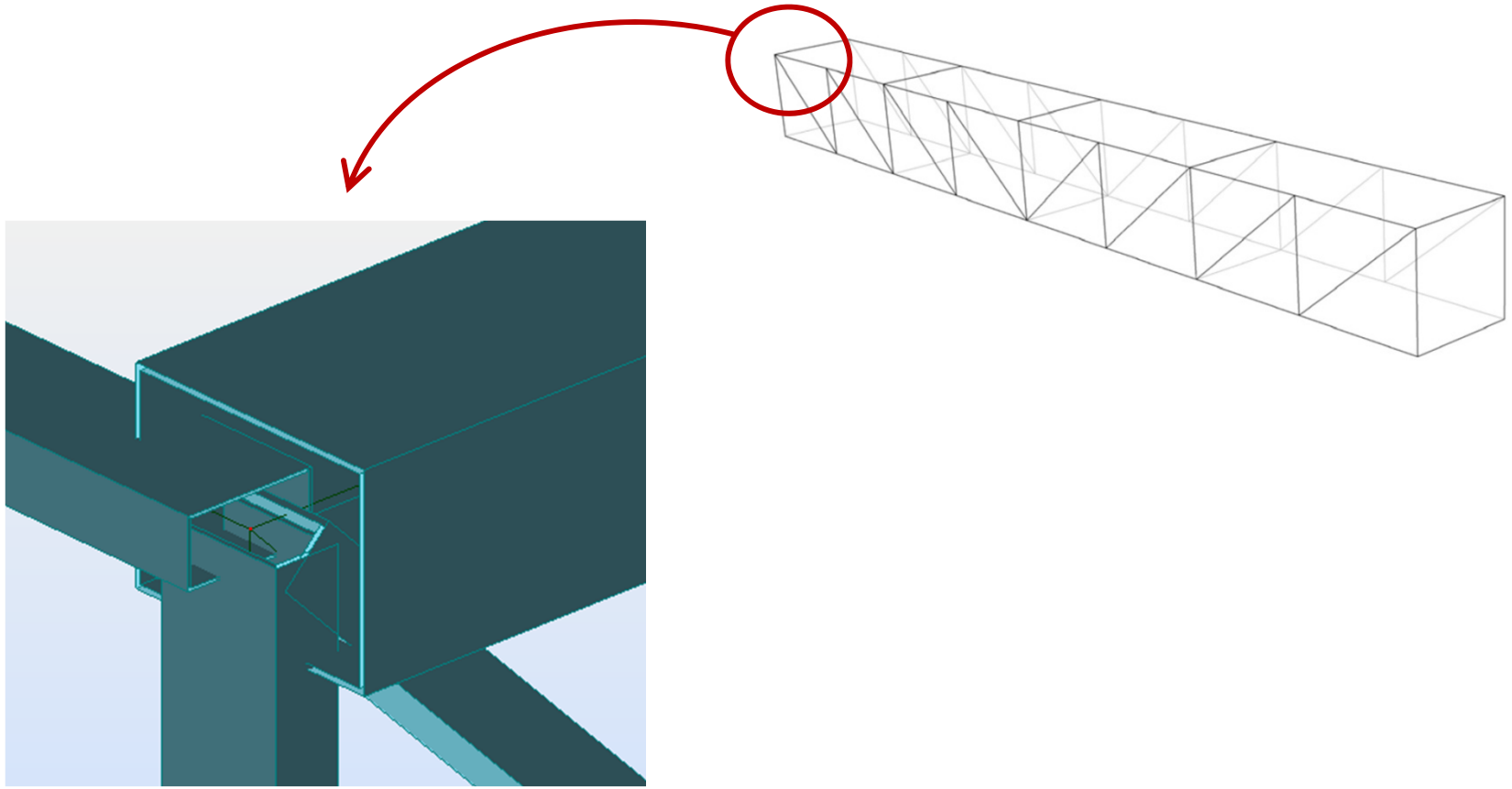


Their cross section is:



Beam orientation

The orientation of the different beams in the structure is



Beam material

Structural Steel:

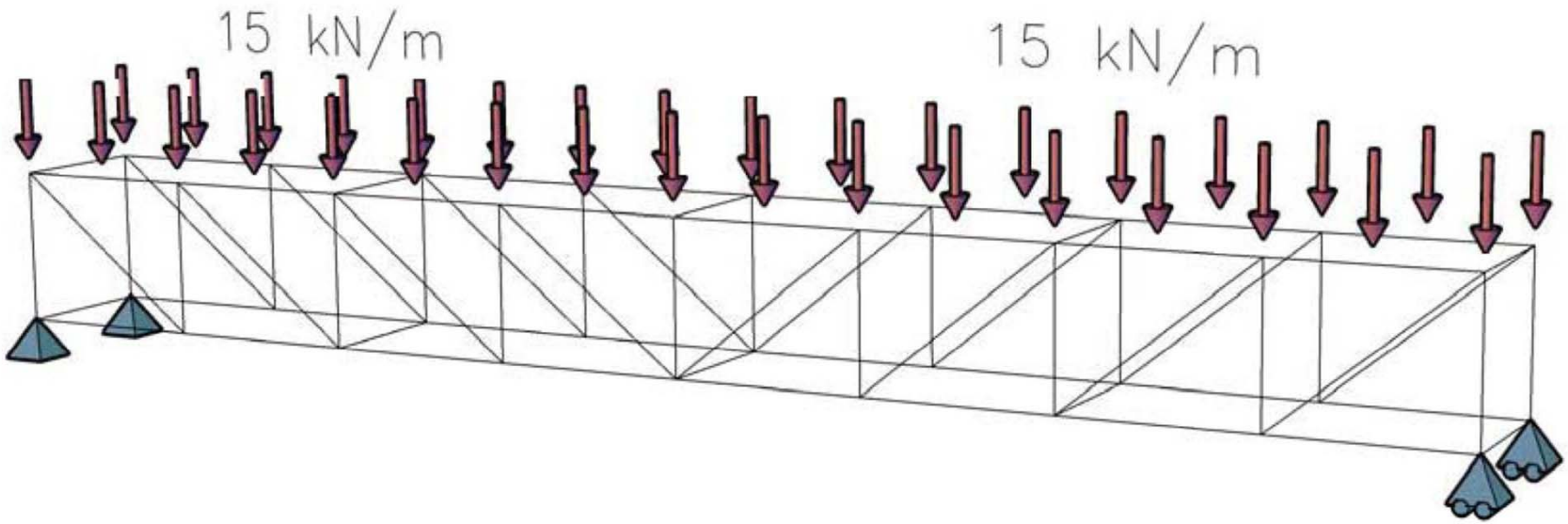
Density	=	7850 kg/m^3
E (Young modulus)	=	2.1·10^5 MPa
ν (Poisson modulus)	=	0.3
Yield stress	=	275 MPa

Assignment

1. Obtain the different elements thickness with the following conditions. Max stress must not exceed 80% of yield stress.

Supports: Simply supported

Loads: Self-weight + distributed load 15kN/m

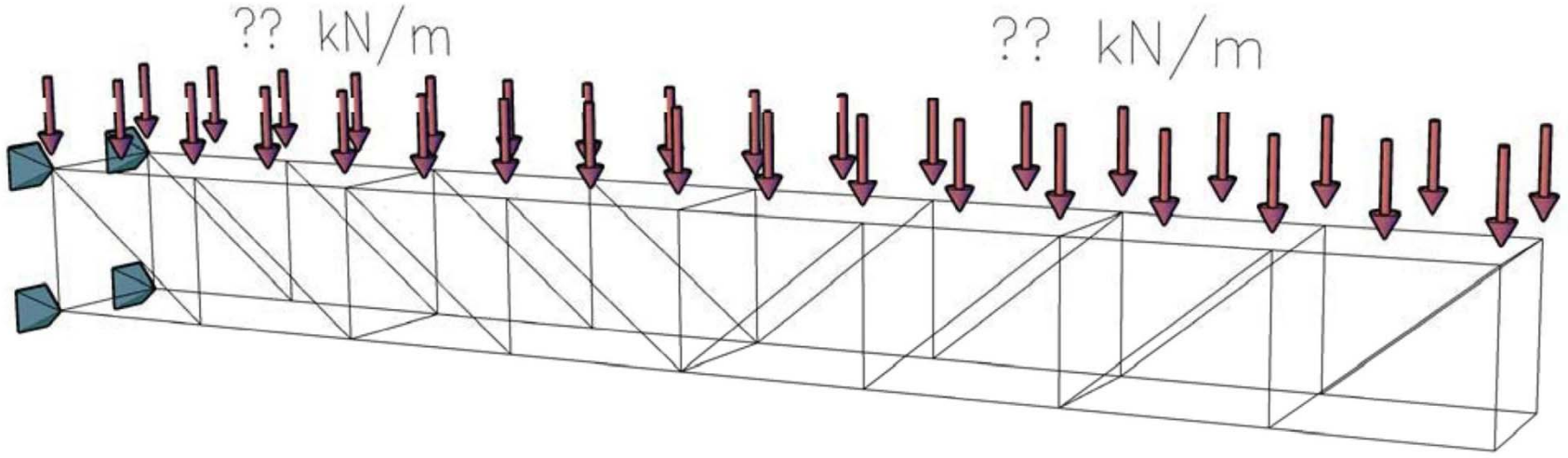


Assignment

2. With the calculated thicknesses, obtain the maximum load that can be applied if the beam is used as a cantilever

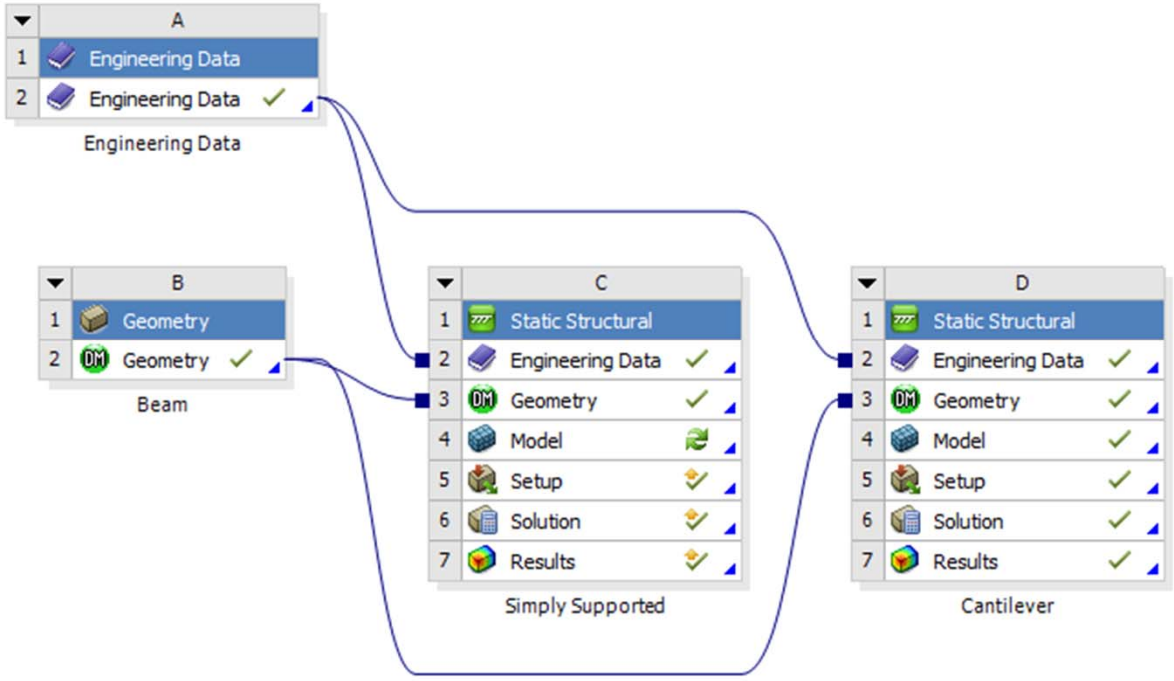
Supports: Clamped

Loads: Self-weight + distributed load of ?? kN/m



Possible Project Schematic

1. Define a common Engineering Data and Geometry for both problems.
2. Solve the simply supported beam problem
3. Create a copy of the first problem to solve the second one. In this copy we will only have to modify the supports and the value of the load applied.



Report

You will have to present a report containing

1. Definition of the problem solved: geometry, beam characteristics, material characteristics, mesh, loads applied and boundary conditions.
   (in order to know what must be included in this section, think that anybody reading your report must be capable of reproducing the same model)

2. Results obtained with the model developed: displacements, internal forces and stresses in all beam elements.
   (again, in order to know what elements are required, think that all possible questions regarding the beam performance should be answered with the data that you provide)

3. Conclusions
   (all the questions asked – in this case, (1) thickness of the elements and (2) maximum load that can be applied – must be emphasized in the conclusions section. You can also add other conclusions that you may think relevant)