

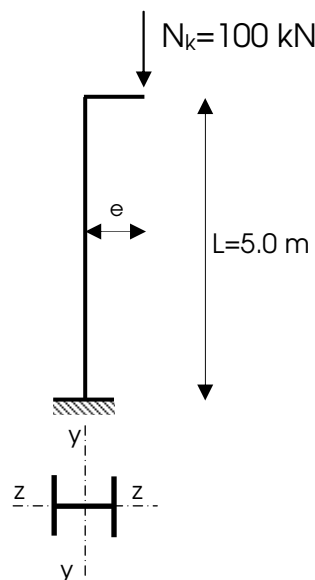
Module B

Stability of Steel Structures

Week 2 – Topic: Stability of beam-columns

Homework 1: Consider the isolated beam-column represented in the following figure, made out of a HE B 280 I-wide flange profile. In the case of $e=0$, answer the following questions:

- classify the transverse section assuming that the profile would be made out of steel S 235, S275 or S 355;
- perform the stability check according to EC3 provisions.

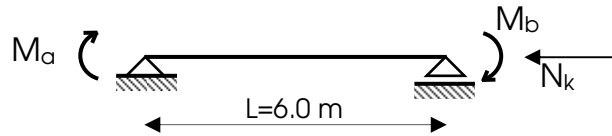


Homework 2: Consider the above beam-column and assume that the profile is made out of steel S 275 and $e=50\text{ cm}$:

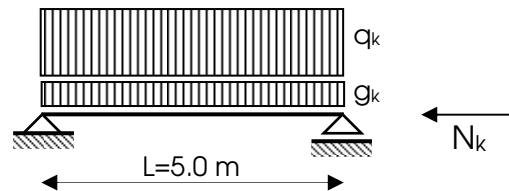
- classify the transverse section according to the actual state of stress consisting in eccentric compression;
- perform the stability check according to the New Italian Code provisions;
- evaluate the maximum value of N_k (keeping $e=50\text{ cm}$) for the column to comply with the above stability verification;
- evaluate the maximum value of e (keeping $N_k=100\text{ kN}$) for the column to comply with the above stability verification.

Homework 3: Consider the beam-column made out of a steel S 355 HE B 240 profile represented in the following figure. Classify the transverse section and perform the stability check assuming the numerical values for axial force and end moments listed below:

- $N_k=200$ kN;
- $M_b=100$ kNm;
- $M_a=2 M_b$.



Homework 4: The beam-column represented in the figure below is loaded by an axial force $N_k=100$ kN and a transverse load whose permanent and variable parts are $g_k=10$ kN/m and $q_k=30$ kN/m, respectively



Assuming that the column is made out of S275 steel profile IPE 200, answer the following questions:

- classify the section looking after the actual state of stress of the member;
- perform the strength check at the Ultimate Limit State (ULS);
- perform the stability check of the member;
- evaluate the maximum deflection taking into account second-order effects.

Homework 5: Assume that the above member would represent the secondary beam within the inclined roof of a single storey industrial beam. If a 10% slope is considered for that roof and a profile HE 200 is consider in lieu of the above IPE section, classify the transverse section and carry out the relevant stability check according to the New Italian Technical Code provisions.

