FACULTE ENVIRONNEMENT NATUREL, ARCHITECTURAL ET CONSTRUIT ENAC
INSTITUT D'INGÉNIERIE CIVILE IIC
Laboratoire des Structures Métalliques Résilientes RESSLab

Téléphone : +41 21 693 24 27
Fax : +41 21 693 28 68
E-mail : dimitrios.lignos@epfl.ch
Site web : http://resslab.epfl.ch
Address: EPFL ENAC IIC RESSLAB
GC B3 485, Station 18,
CH-1015, Lausanne

Exercise #1: "Easy" statics

Consider Figure 1 that depicts a 1-story and 2-bay industrial frame with height "*h*" and beam length "*L*". Assume that the beam connecting columns 1 and 2 and 3 is infinitely rigid since it is a truss. Columns 1 and 3 are pinned to the ground. Column 2 is fixed to the ground. All members are made of steel S355 (f_y=355MPa). Assume that the material is elastic. Assume that *h*=6m and *L*=8m in this case. Ignore the vertical load P acting on the structure for this exercise.

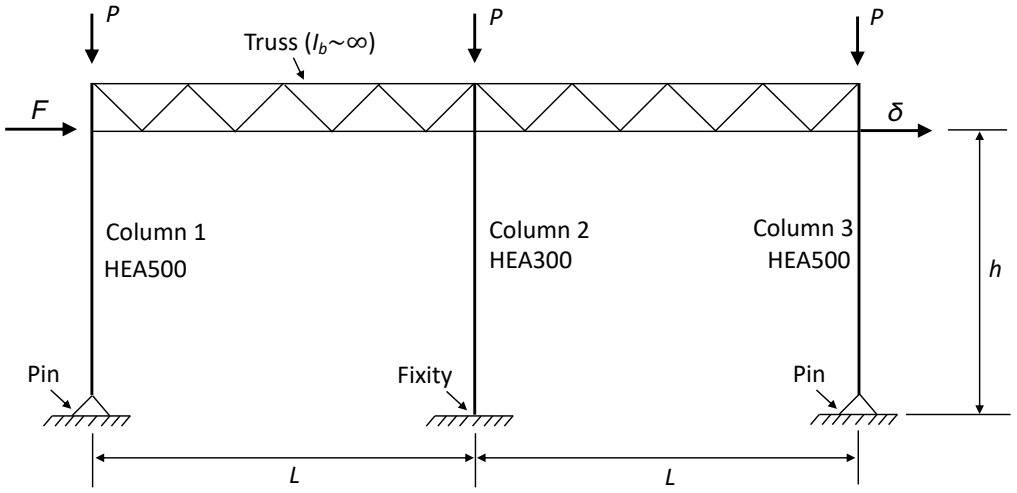

Figure 1. 1 story, 2-bay industrial frame

1. Compute the lateral stiffness, K_{total} of the frame. For stiffness computations assume that flexural deformations dominate the lateral deformation of the steel MRF (i.e., shear and axial deformations can be neglected); ignore the effect of the gravity load on the shear resistance for this computation.
2. Compute the expected lateral displacement, δ of the frame due to the horizontal force F = 800kN.
3. Compute the shear forces and bending moments of the steel MRF (use of "Easy Statics" shown in class).