Pedestrian bridge

FUNDAMENTALS OF STRUCTURAL ANALYSIS

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Group 13
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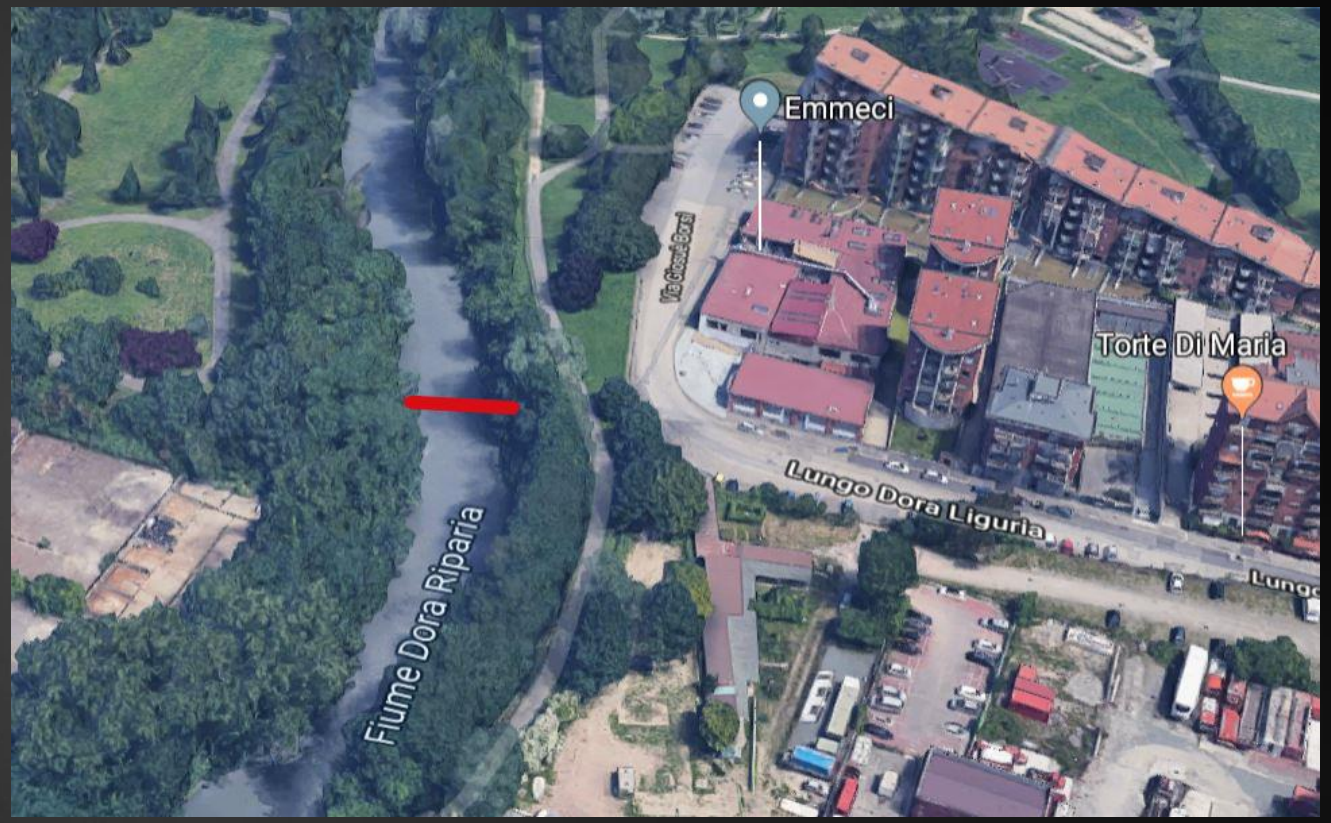
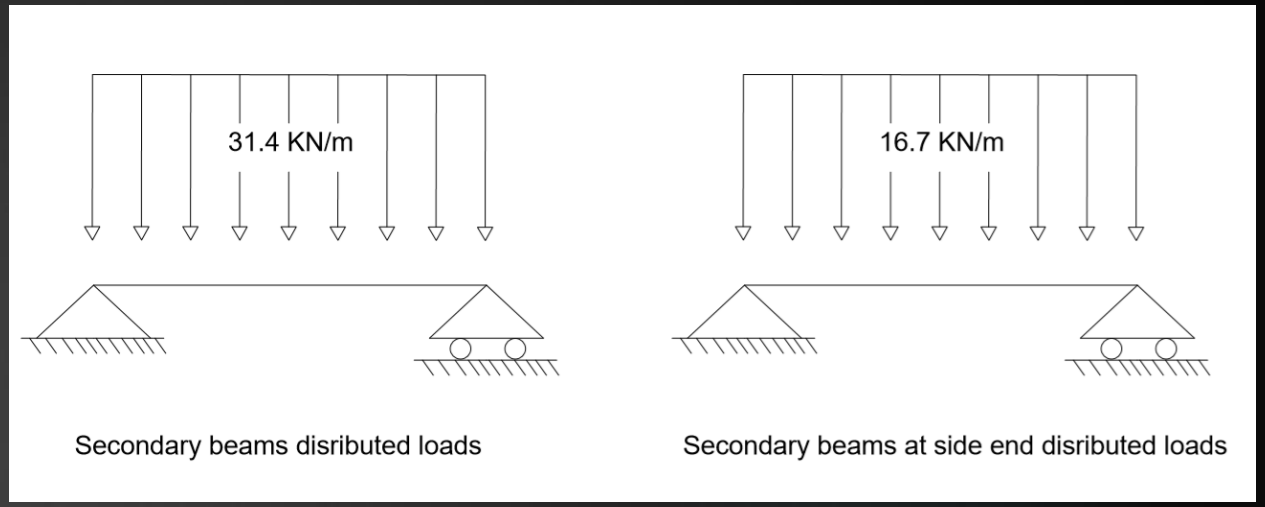
Location and general information

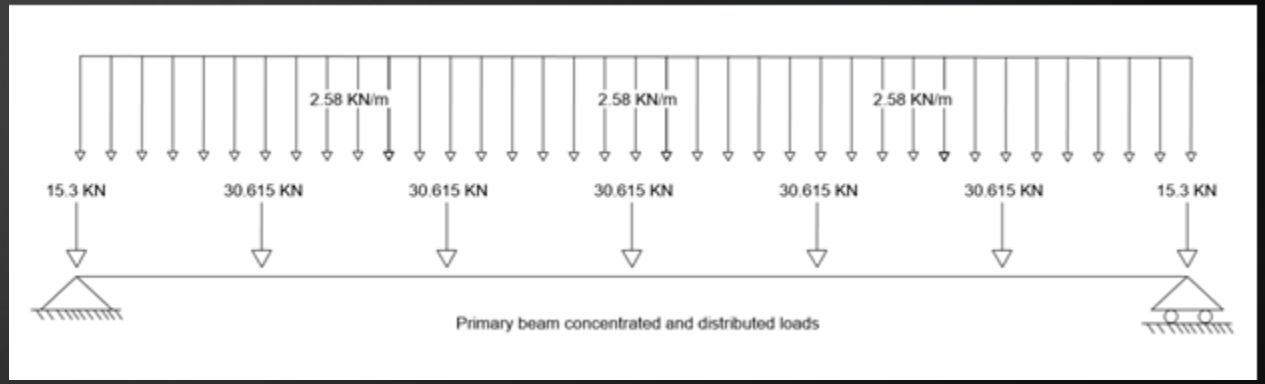
- Located in the city of Turin
- crossing through the Dora Riparia River
- in borough Campidoglio
- spans 18 m long and 3.9 m wide
- Composed of four primary steel beams IPE400 and seven secondary steel beams IPE220
- The handrail 1 m high above the decking level is made of steel with E= 2.1 x e^{17} MPa
- In each intersection between primary and secondary beams we used 16 mm steel circular bracing to resist horizontal forces
- The finishing above the steel beams is a wood decking 390x20x7 cm each tile with E=10300 Mpa
- The primary and secondary beams have their axis on the same plane level



Calculations of loads

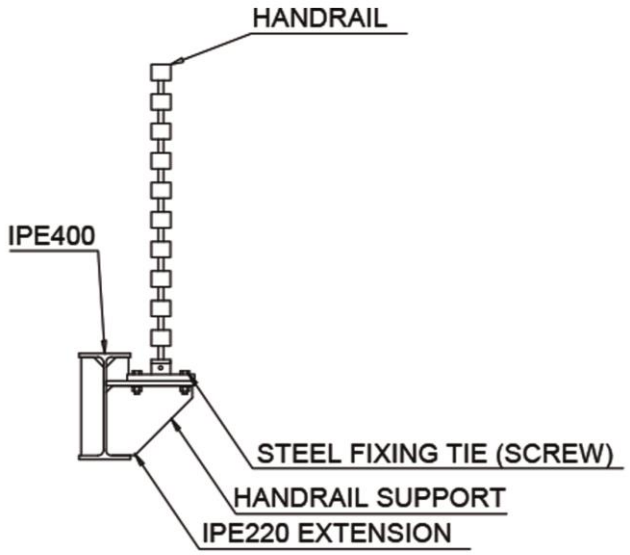
- Live loads : People load 4.5kN/m2 Eurocode Italy
- Dead loads: Wood deck + Snow load + Self load + Railing load
- Total load = 1.6 LL + 1.2 DL
- We did this procedure for the secondary beam to calculate the total distributed load which was equal to 31.4 kN/m, and for the primary beam we calculated only the self load, which is equal to 2.85 kN/m, because we already considered all the other loads for the secondary beams.



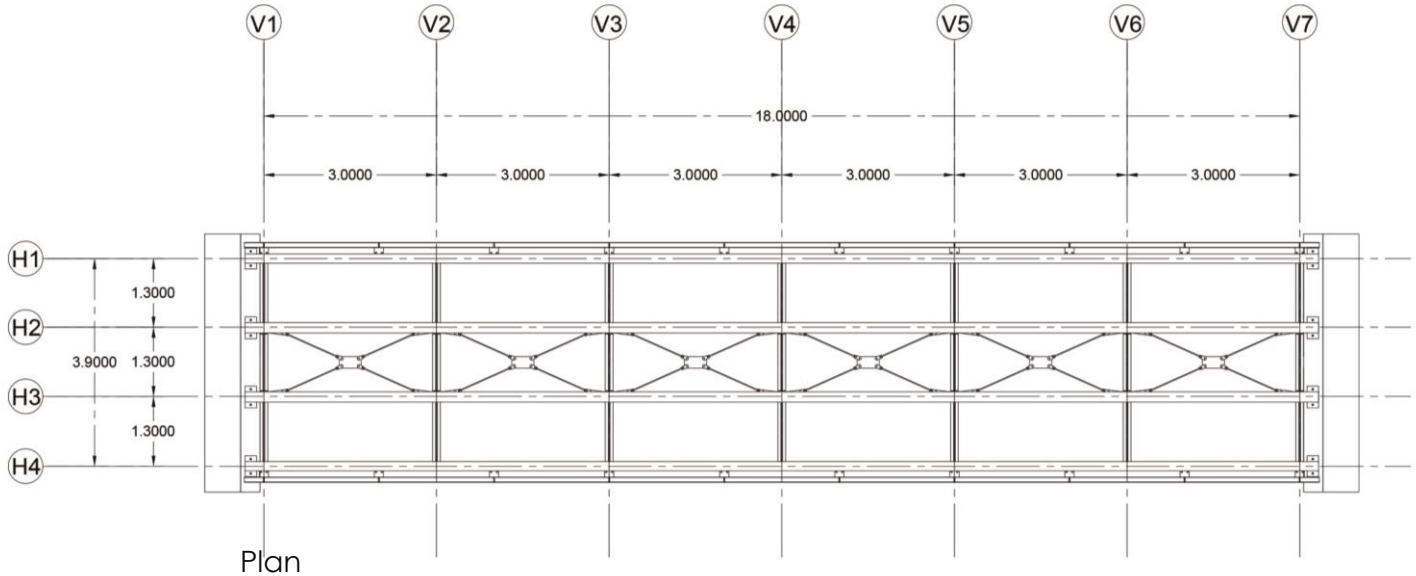


3D renders

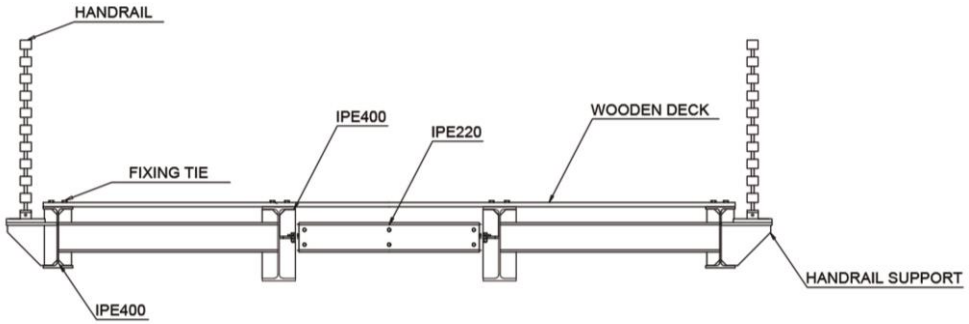
Structural details



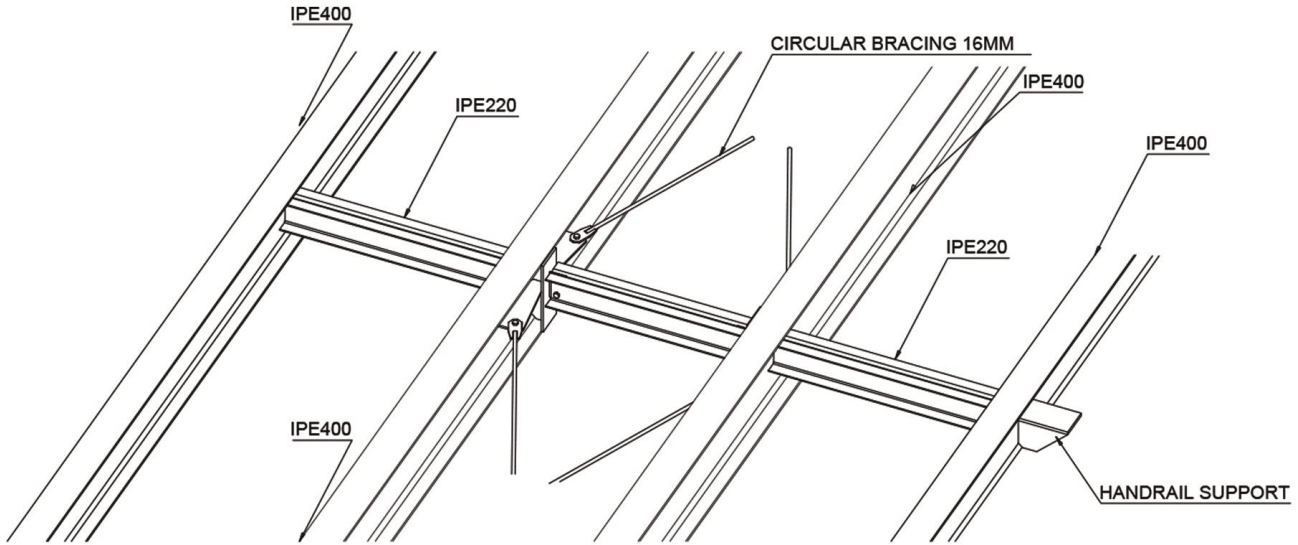
Detail 1



Plan



Section A-A



3D connection of beams

Calculations

The deflection of the primary beam was extracted from Nolian:

Vz= 0.00033477 m

- Strength Design

We calculated the stress in the main beam

$\sigma_z = 0.882 N/mm^2 = 0.882\ Mpa <$ 188 Mpa (checked)

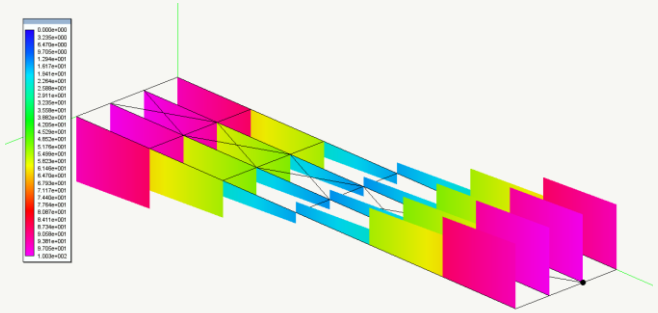
- Slenderness <u>For primary beam IPE 400</u>

$\lambda = \frac{L_0}{\delta} = 105.8 < 200$ (Satisfied)

<u>For Secondary beam IPE 220</u>

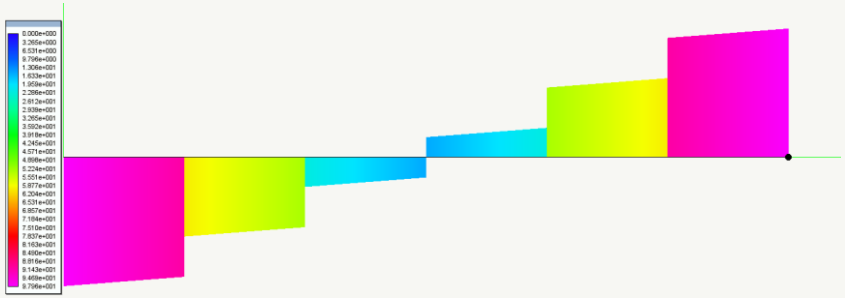
$\lambda = \frac{L_0}{\delta} = 41.99 \approx 42 < 200$ (Satisfied)

Results From Nolian

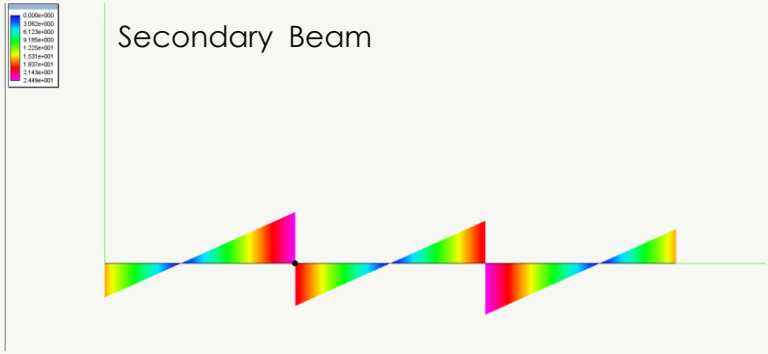


Shear Force diagram

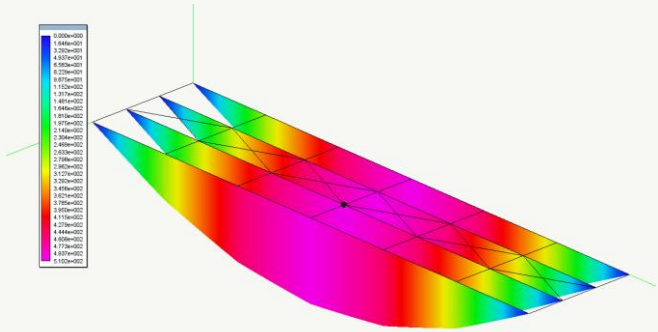
Primary Beam



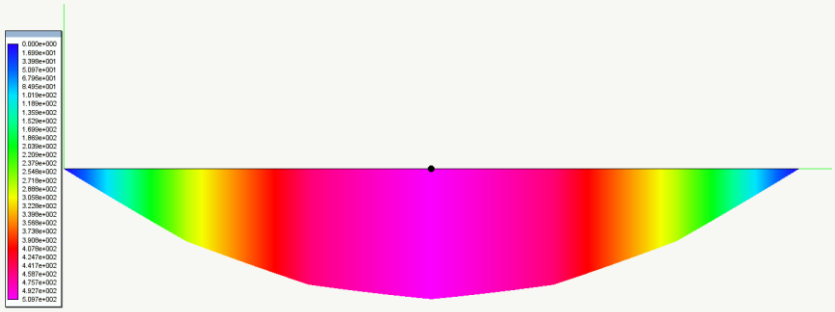
Shear Force diagram



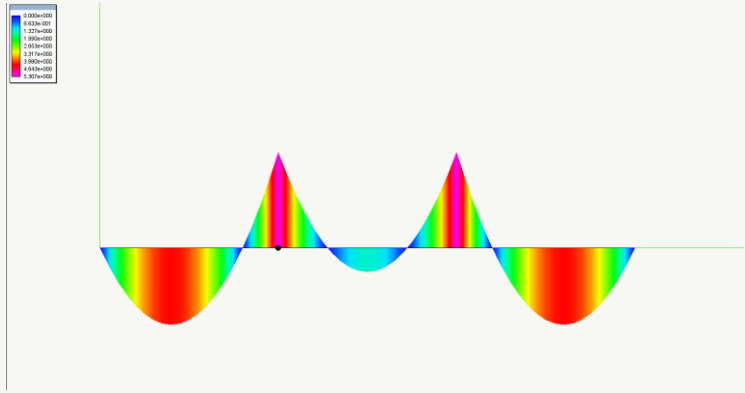
Shear Force diagram



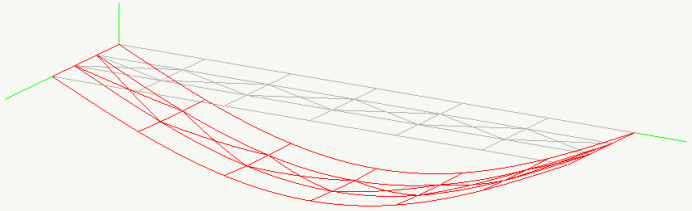
Bending moment diagram



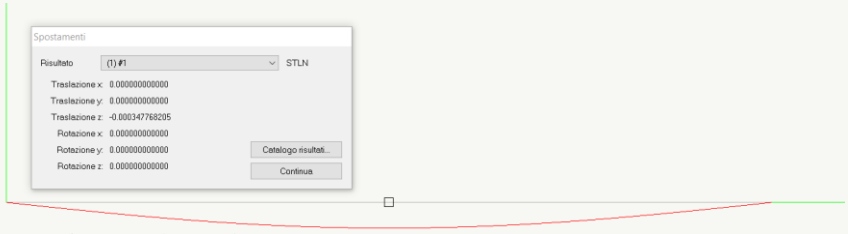
Bending moment diagram



Bending moment diagram



Deformation diagram



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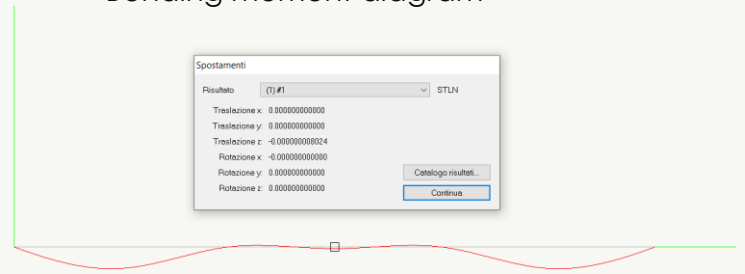

Deformation diagram

Normal Force is equal to zero

Thank You