Bridge Design

GROUP 9
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LOCATION

Thebridge is located along the Dora River in Turin,Italy.The bridge connects the island of the river and the coast side of Corso Umbria, and provides perfect landscape view for pedestrians accessing the bridge.

-Northwest part of City Turin

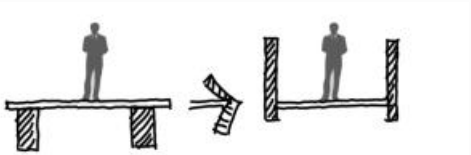
-The distance between river bank and the island is 16m

Basic value of basic wind speed: vb,0 = 25.00 m/s

Basic velocity pressure: qb = 0.39 kN/m²

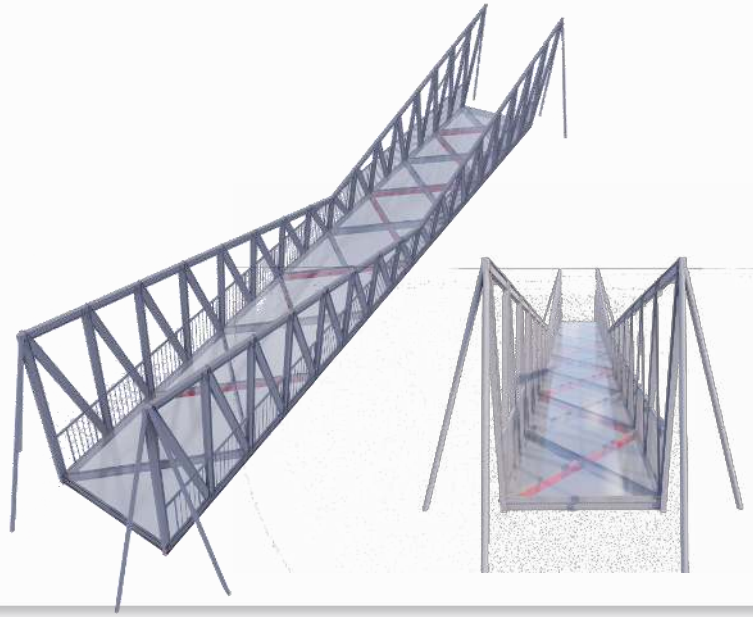
Characteristic value of snow load: sk = 1.54 kN/m2

DESIGN

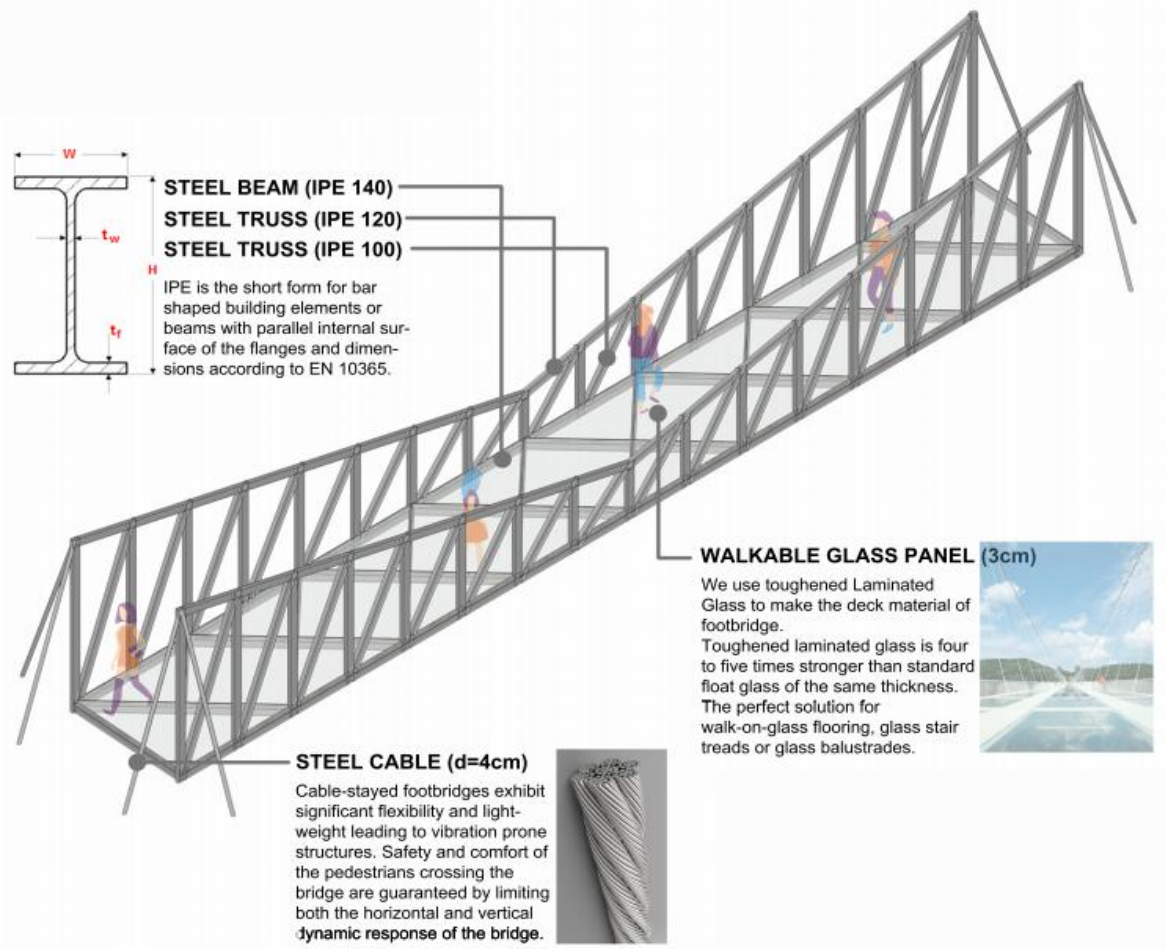


Transform the primary beam to truss structure

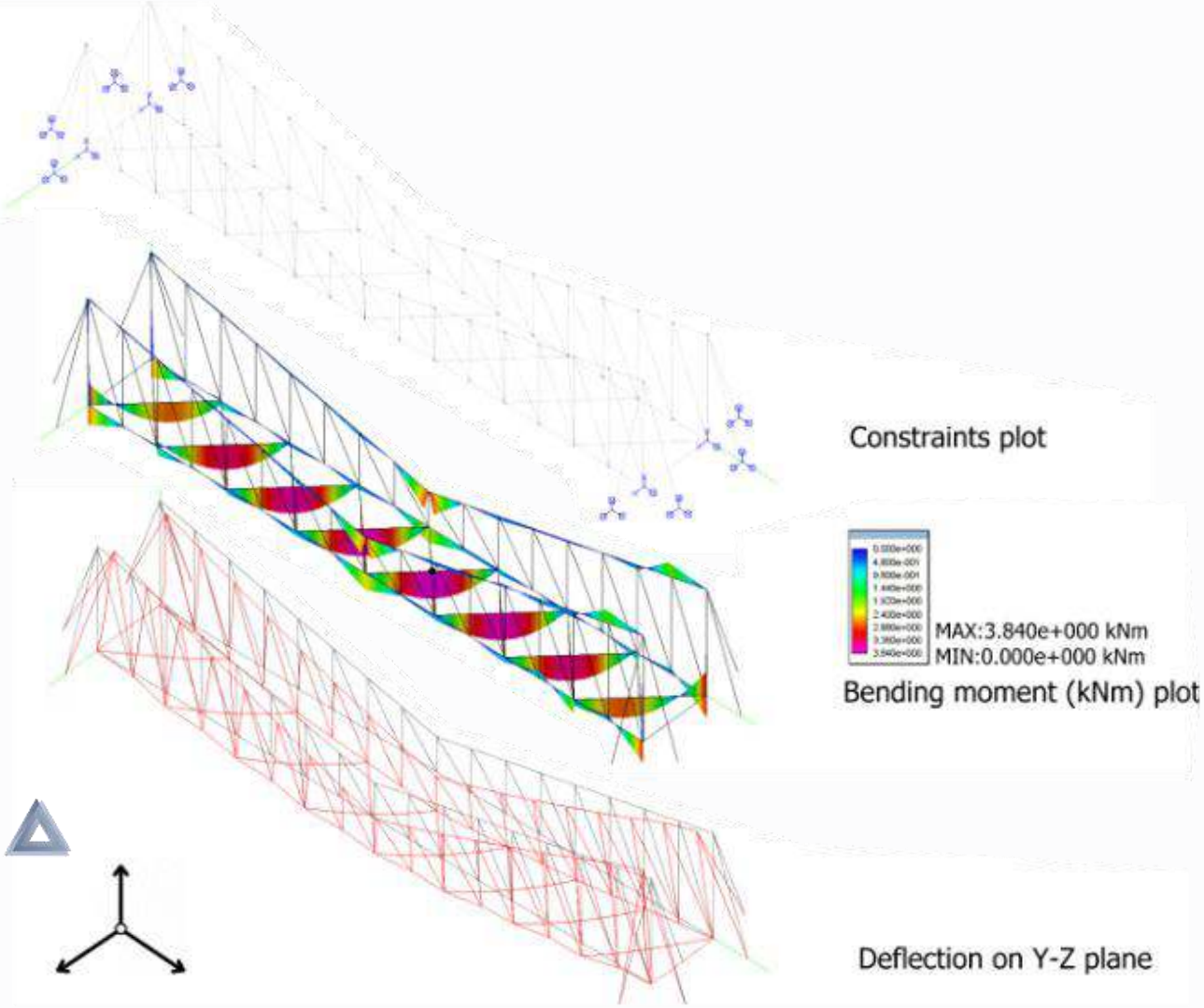
Elevation of structure scheme



STRUCTURE & MATERIAL



CALCULATION



AXIAL LOADING AND BENDING OF BEAM AND TRUSS

Secondary beam(IPE140)

$L_0 = L = 2.828m$

$$F_{cr} = \frac{\pi^2 E I_x}{L_0^2}$$

$$= \frac{\pi^2 \times 210 \times 10^9 N/m^2 \times 541 \times 10^{-8} m^4}{(2.828m)^2}$$

$=1402kN >> 20kN$ → From nolian

Axial Loading:

$$\sigma_z^{max} = \frac{N_z}{A} = \frac{20kN}{16.4 \times 10^{-4} m^2} = 12.2MPa$$

Bending:

$$\sigma_z^{max} = \frac{M_x}{W_{max}}$$

$M_x = 3.84kM/m$ → From nolian

$$W_{max} = \frac{I_x}{h_{IPE}/2} = \frac{541cm^4}{7cm} = 77.3cm^3$$

$$\sigma_z^{max} = \frac{3.84kN*m}{77.3 \times 10^{-6} m^3} = 50MPa$$

$\sigma_{z_{total}}^{max} = 12.2MPa + 50MPa = 62.2MPa$

$\sigma_{lim} = 0.18 f_{yk} = 0.8 \times 250MPa = 200MPa >> 62.2MPa$