Atir Software Development LTD

STRAP - P-Delta

Verification

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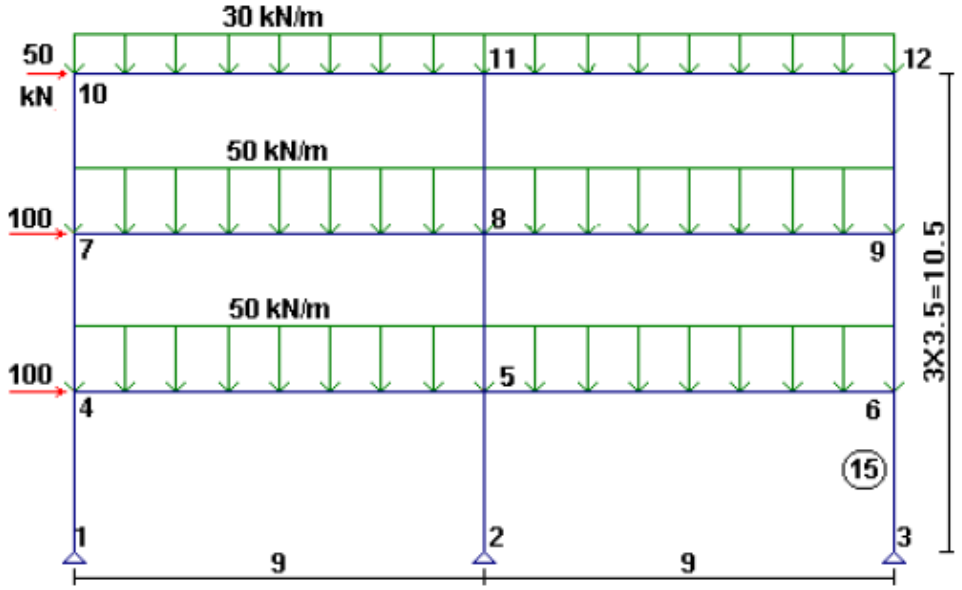
1. Description

A three-story plane frame is analyzed for the additional bending moments and forces generated by the vertical loads acting through the deflected shape of the frame.



2. Geometry

Dimensions: as shown above.

Sections: UB 533x210x122 (British steel I-beam)

Material: Steel – Elastic modulus = 204,100 [kN/mm2]

Supports: pinned.

3. Loads

as shown above

4. Reference

G.L. Kulak, P.F. Adams, M.I Gilmor, *Limit States Design in Structural Steel, 4th Edition 1990 (Chapter 9.4)*, Canadian Institute of Steel Construction.

5. Calculations

Mf = Mfg +U2 Mft

where:

M_f = total factored moment at the beam end including 2nd order effects

M_{fg} = first order moment due to factored gravity load

M_{ft} = first order moment due to factored lateral load

U_2 = $1/(\Sigma C_f \Delta_f / \Sigma V_f h)$

V_f = Total first order lateral shear

C_f = Total vertical axial load

h = story height

Δ_f = relative lateral deflection within the story height, produced by the first order lateral shear only.

6. Comparison of Results

Beam	Result type	Result		Deviation
		Theoretical	STRAP	
15	M_f	388 kN	389	0.26%