Analysis of multi-story multi-bay RC plane frame

Input data

Number of stories - ,  Number of bays -

Story height - , Bay length-

Slab thickness -

Cross section of columns - ,

Cross section of beams - ,

Joint coordinates -

,

Elements - [J1; J2] -

Element endpoint coordinates

, , ,

Element length -

Element direction - ,

Transformation matrix

Diagonal 3x3 block -

Generation of the full transformation matrix

Supports -

Unit weights of building materials

- concrete - - screed -

- finishes - - brickwork -

- plaster/render - - insulation -

Loads

Total halfwidth of adjacent plate spans -

**Self weight**

Plate -

Beam -

Total for beam -

Column -

**Dead loads**

Screed -

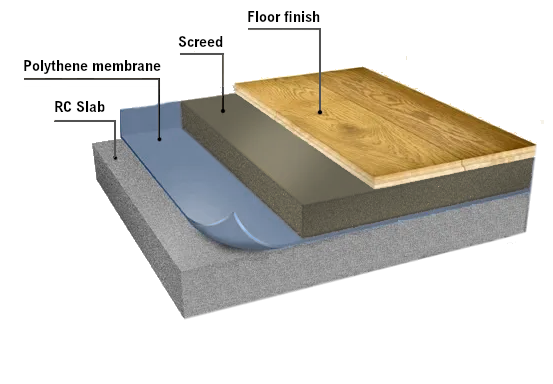
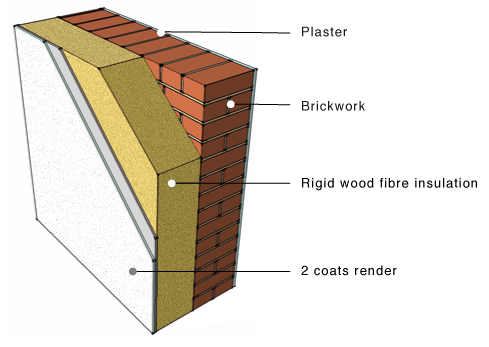
Finishes -

Plaster ceiling -

Brick wall -

Wall insulation -

Wall plaster/render -

Total dead load

**Live load** -

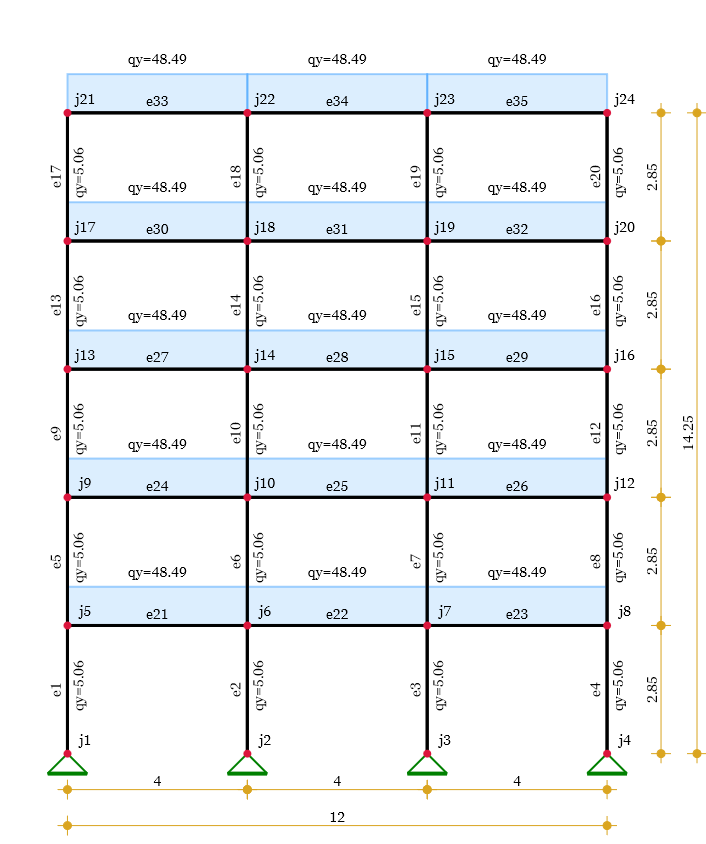
**Total load**

On beams -

On columns -

Load values on elements

Scheme of the structure



Materials

Modules of elasticity -

Poisson coefficients -

Shear modules -

Assignments on elements

Cross sections

Calculation of effective flange width

Section 1 - , - columns

Section 2 - , - beams

  ,

Cross section properties

Area

Web -

Flange -

Total -

First moment of area -

Geometrical center -

Second moment of area

Web -

Flange -

Total -

Shear area -

Assignment on elements

Columns -

Beams -

All-

Element stiffness matrix

Elastic properties for element "e"

, ,

, ,

Stiffness matrix coefficients for element "e"

, ,

,

Assembling the 3x3 stiffness matrix blocks for element "e"

Full element stiffness matrix

Stiffness matrices obtained in local coordinates

Stiffness matrices obtained in global coordinates

Global stiffness matrix

Element load vector

Lateral load in local CS -

Axial load in local CS -

Equivalent loads at element endpoints

, ,

Load vector -

Global load vector

Results

**Solution of the system of equations by PCG method**

**Joint displacements**

**Support reactions**

,

Joint **J1 -** Joint **J2 -**

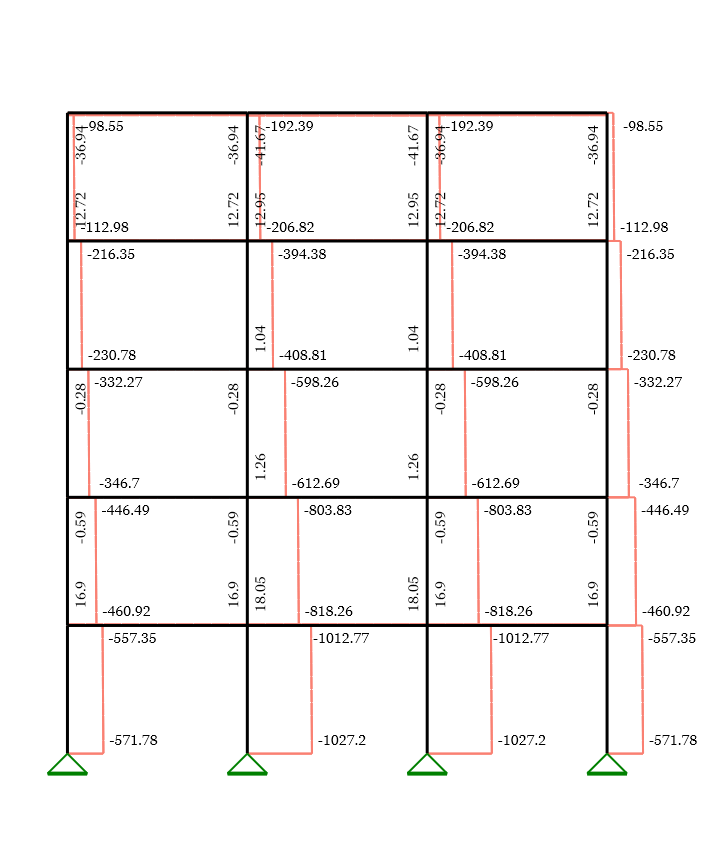
Joint **J3 -** Joint **J4 -**

**Element end forces**

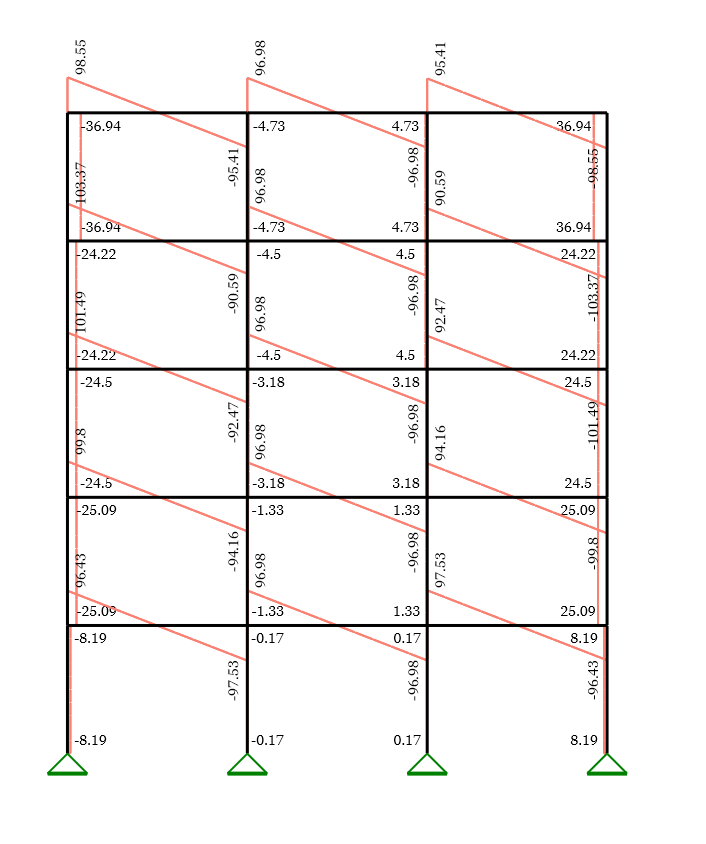
**Element internal forces**

,

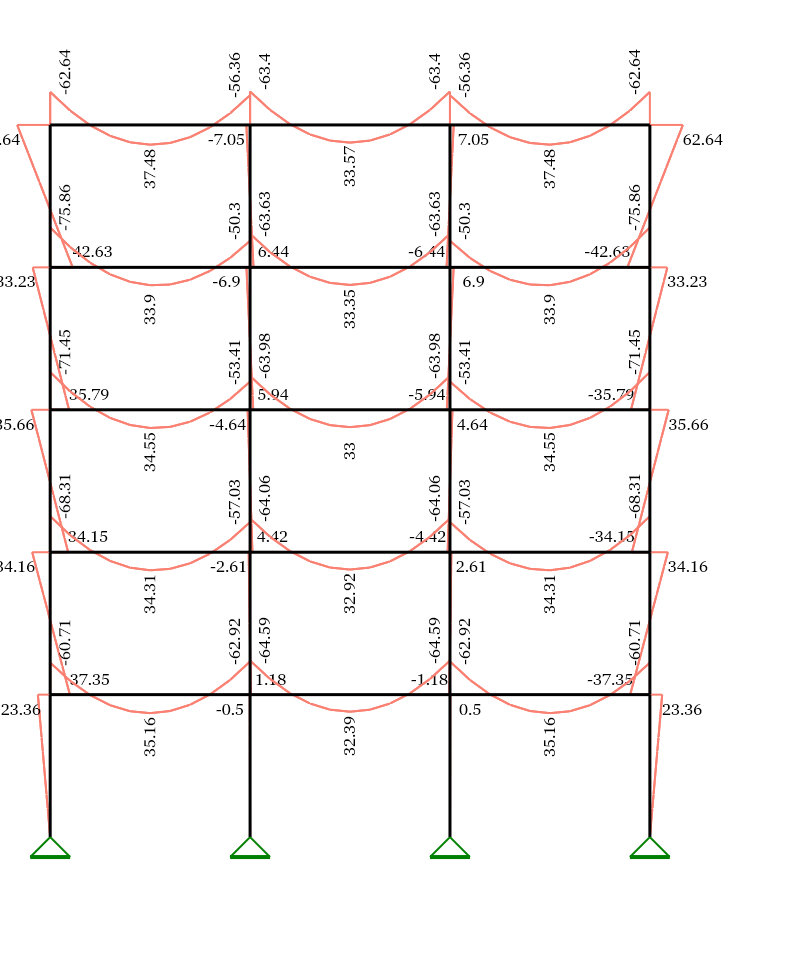
**Axial forces diagram, kN**



**Shear forces diagram, kN**



**Bending moments diagram, kNm**



**Deformed shape**

Shape function in relative coordinates ξ = x/l (with account to shear deflections)

Element endpoint displacements and rotations

, ,

, ,

Displacement functions (with account for intermediate loads)

Deformed shape, mm

