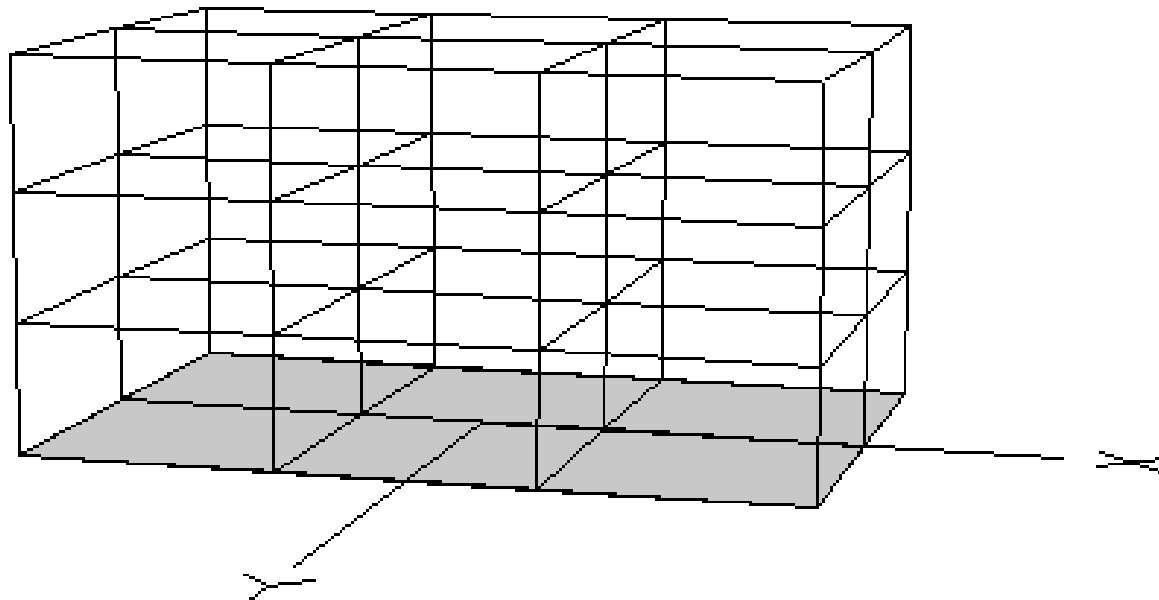


Basic Assumption

RC (Reinforced Concrete)

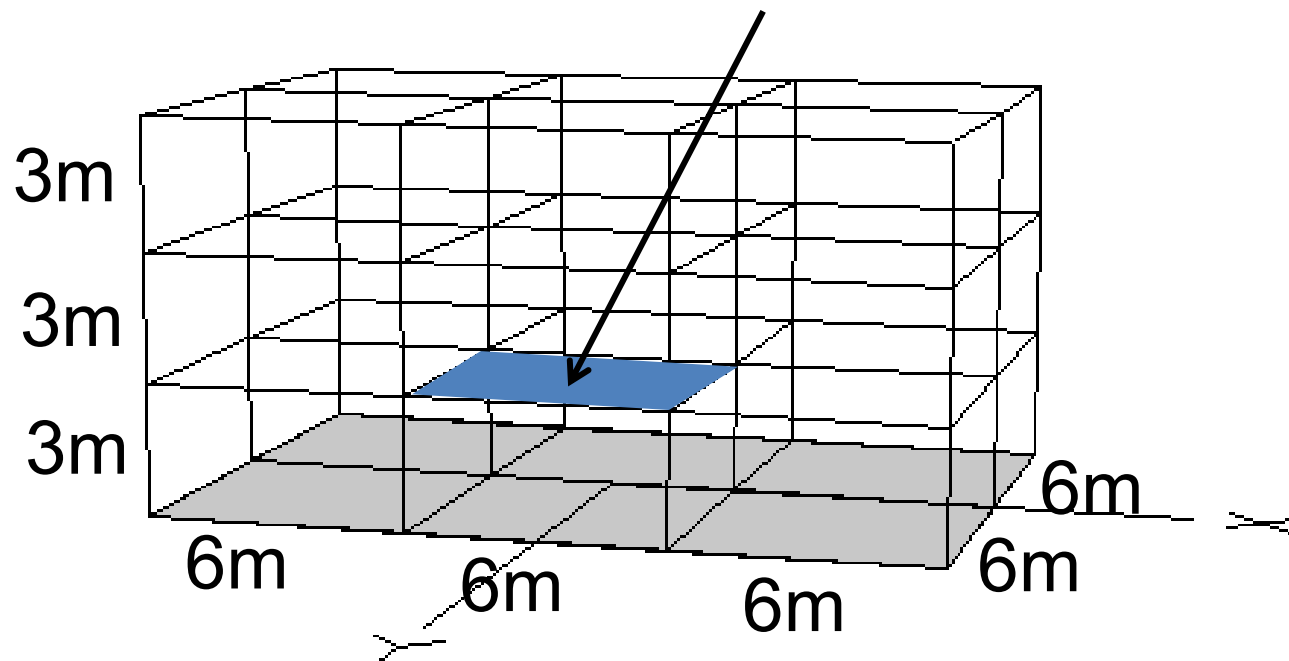
3 Story

2 × 3 Span



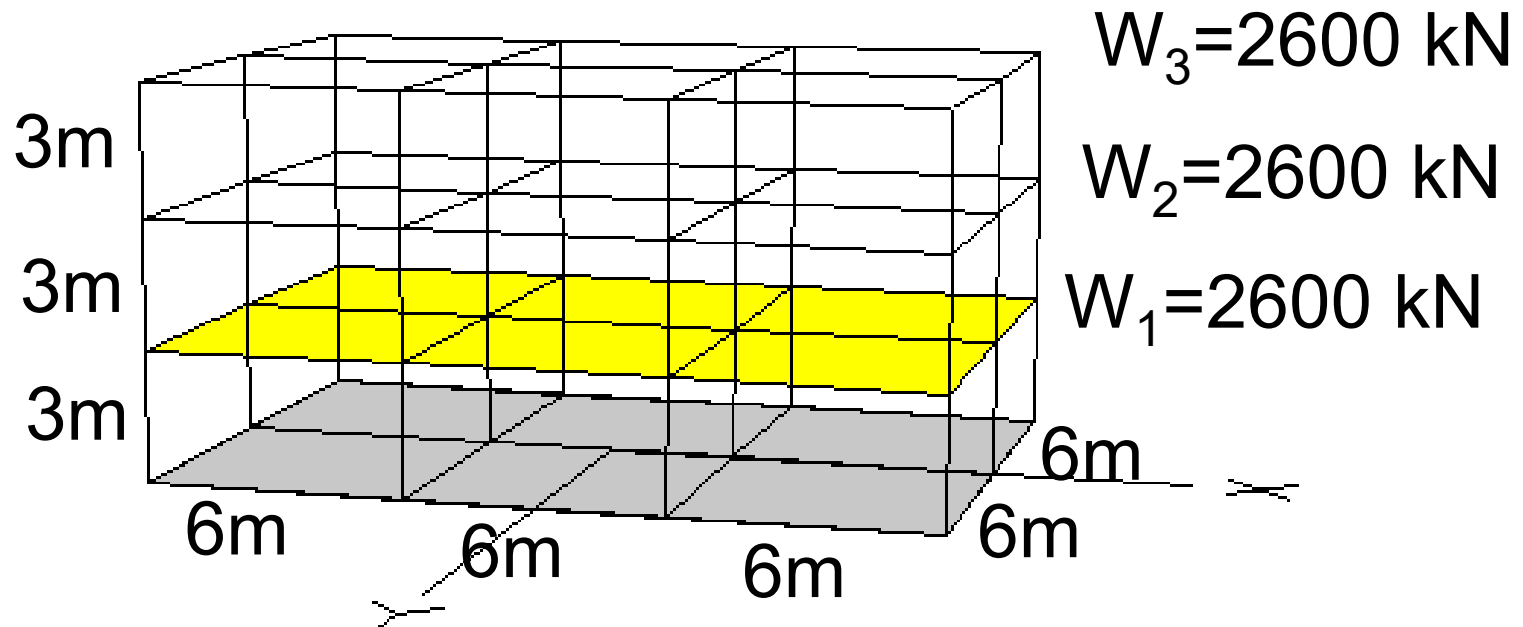
Span

30 m² ~ 50 m²



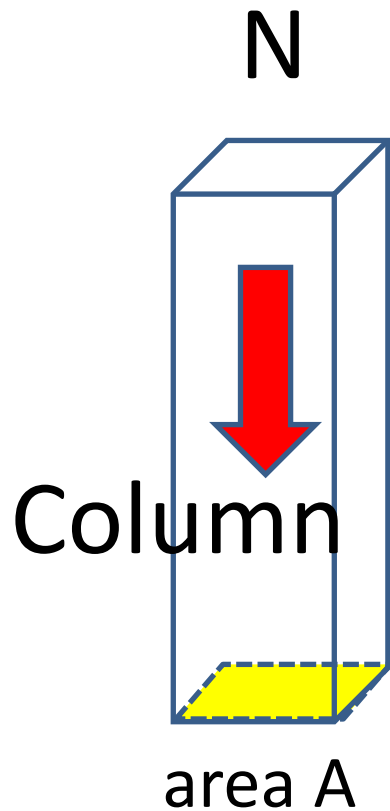
Weight of Building

$$1.2 \text{ ton} / \text{m}^2 \approx 12 \text{ kN} / \text{m}^2$$



Concrete Strength

$$F_c = 240 \text{ (kg/cm}^2\text{)}$$
$$= 24 \text{ (MPa, N/mm}^2\text{)}$$



Axial Load

$$N = 0.2 F_c \times A$$

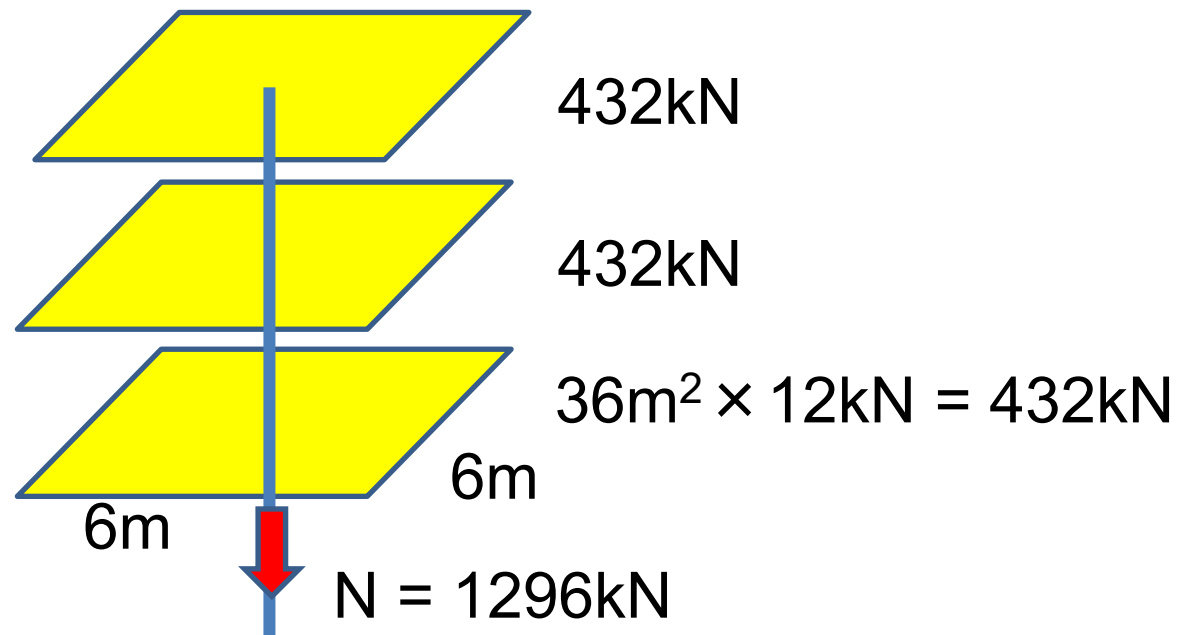
$$< (1/3) F_c \times A$$

Column Size

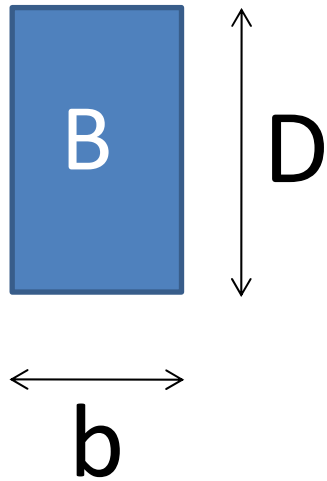


$$A = N / (0.2F_c) = 1296(\text{kN}) / 4.8(\text{N/mm}^2) = 2700 (\text{cm}^2)$$

$$\rightarrow 60\text{cm} \times 60\text{cm}$$



Beam Size



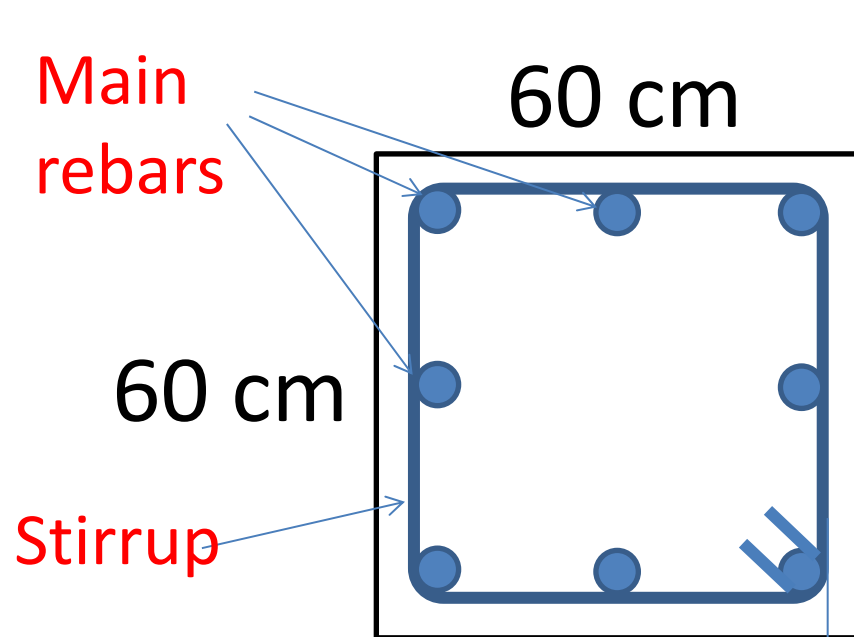
$$D \approx (\text{Span}) \times 1/10$$

$$D = 60 \text{ cm}$$

$$b \approx D \times 1/2$$

$$b = 30 \text{ cm}$$

Reinforcement in Column



D10 or D13
space 10 cm (edge)
15cm (middle)
→ 2-D13@100

Covering Concrete
> 40mm

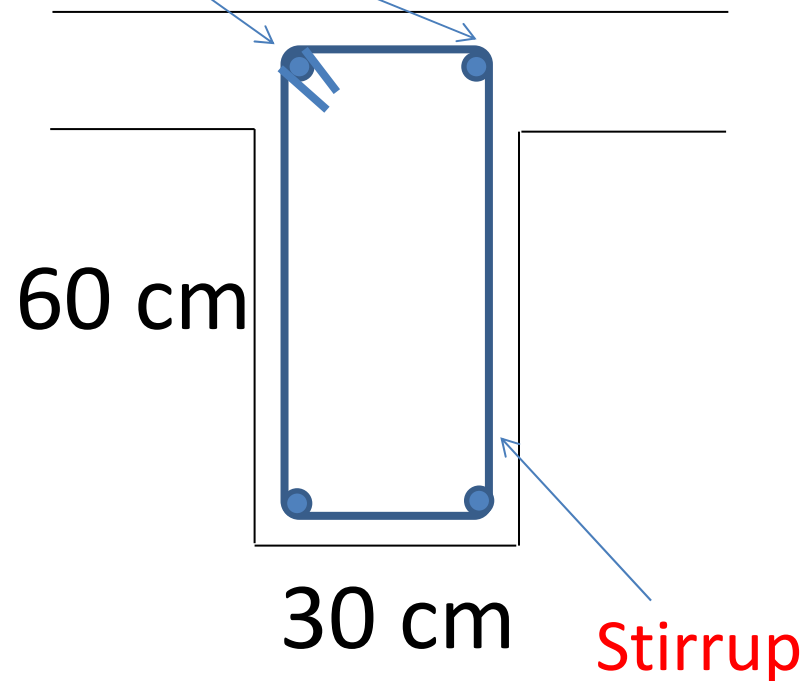
Minimum rebar ratio = $\frac{\text{Total area of rebar}}{\text{Section area}}$

> 0.8 %

Total area of rebar
= $3600\text{cm}^2 \times 0.008 = 28.8\text{ cm}^2$
→ D22 (3.87cm^2) $\times 8$

Reinforcement in Beam

Main
rebars



Minimum rebar
ratio =

Tension side rebar area

Section area

> 0.4 %

Total area of rebar

$$= 1800\text{cm}^2 \times 0.004 = 7.2 \text{ cm}^2$$

→ D22 (3.87cm²) × 2

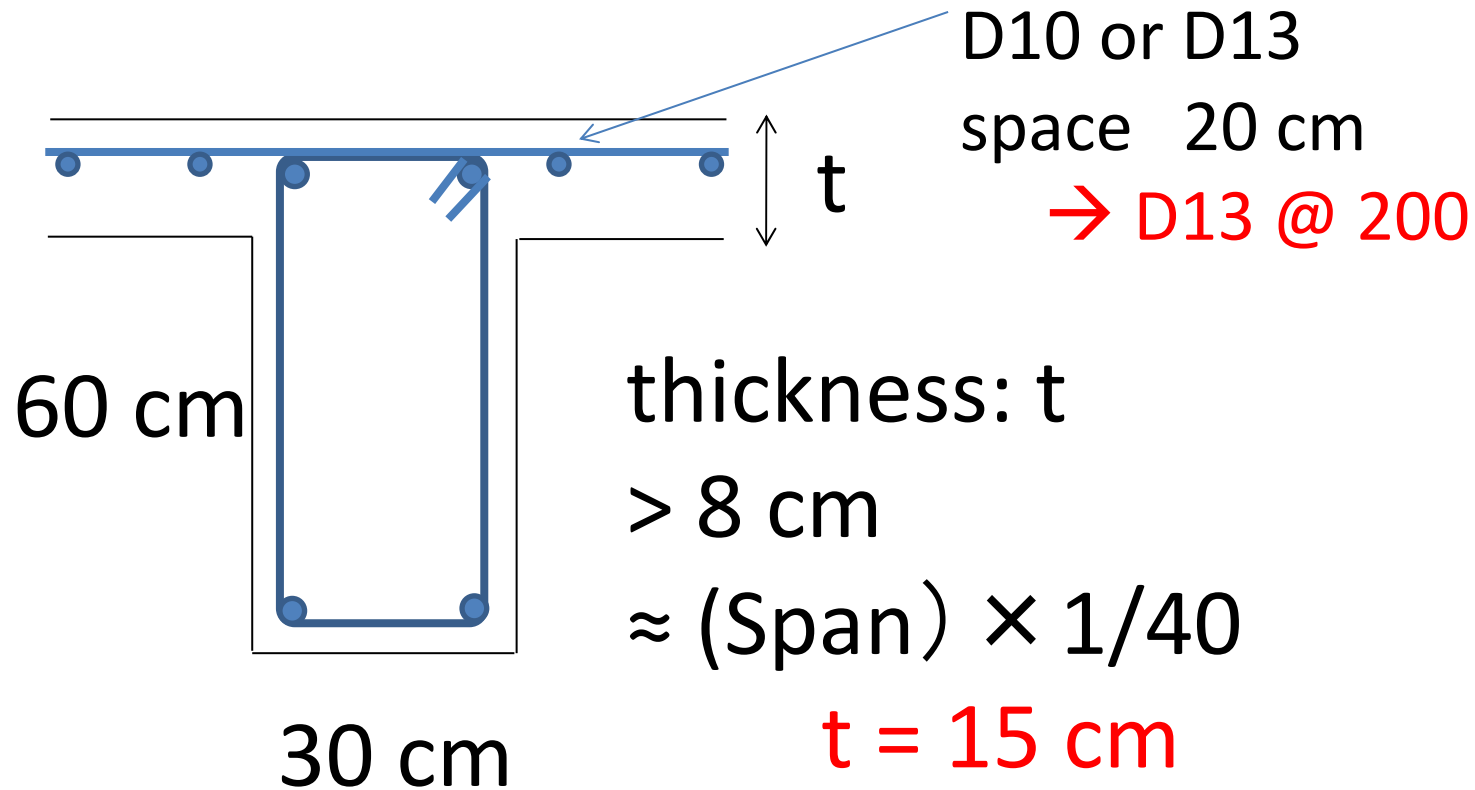
D10 or D13

space 15 cm (edge)

20cm (middle)

→ 2-D13@150

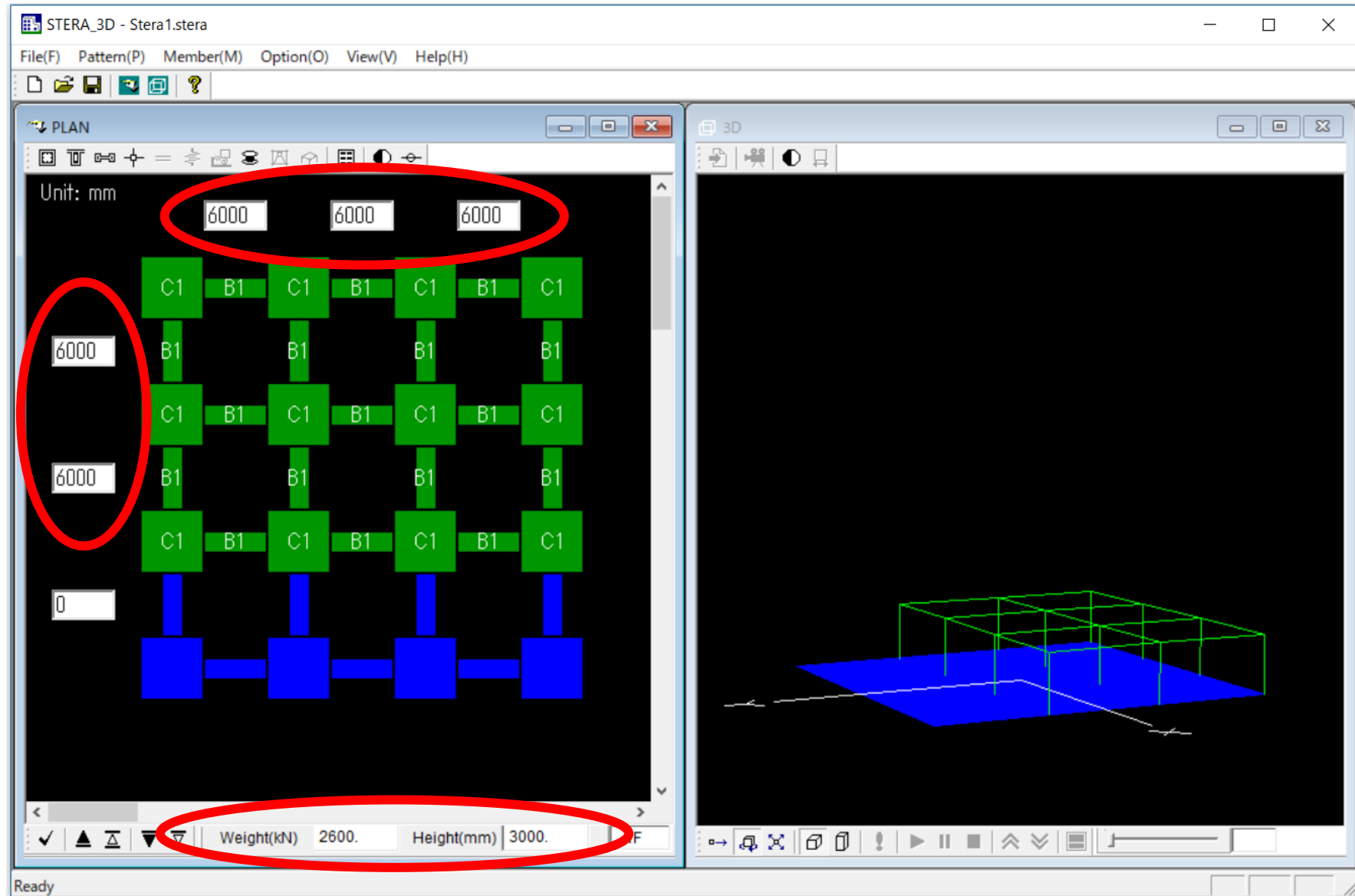
Reinforcement in Slab



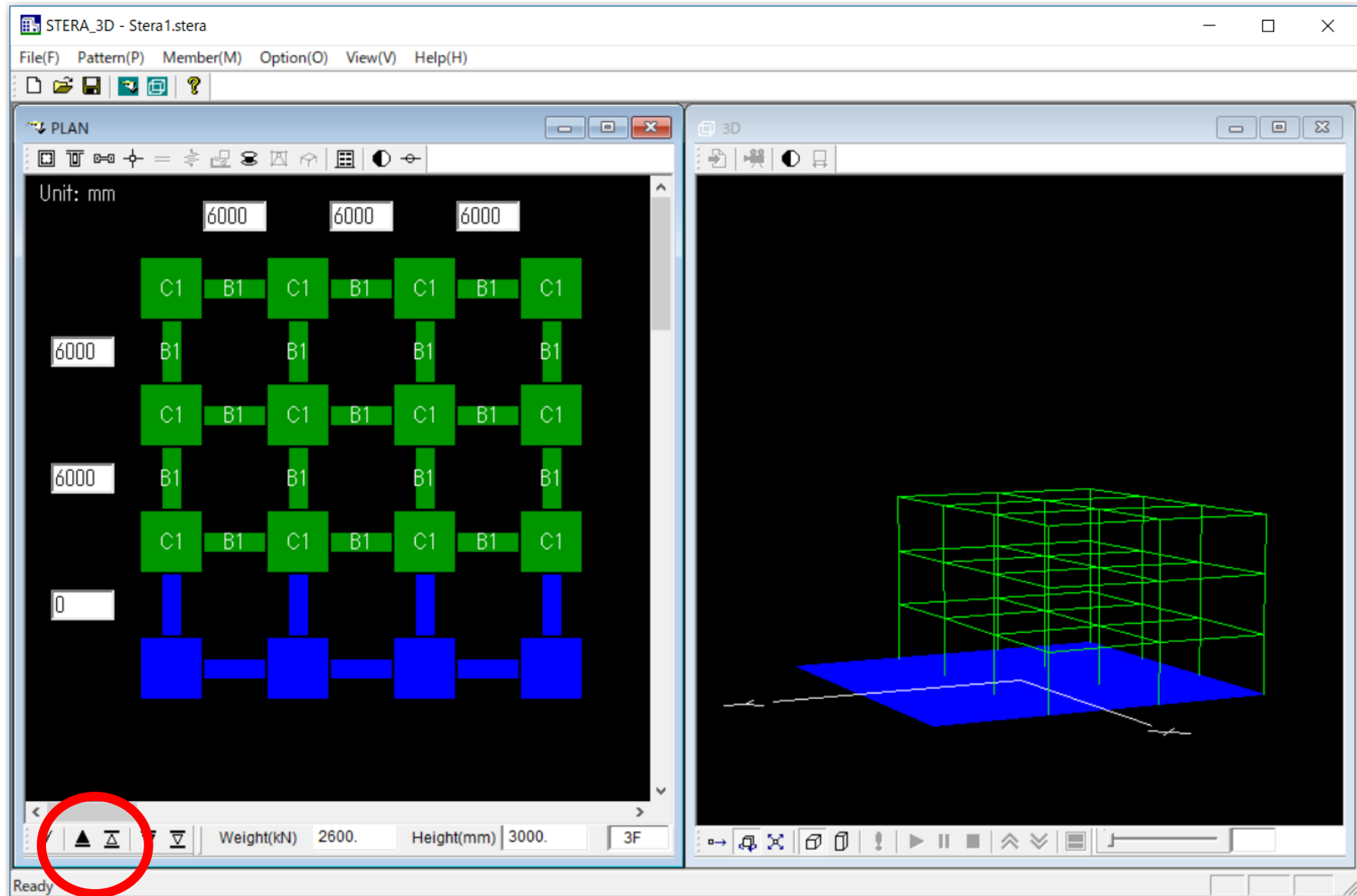
Strength of steel

Name	Tensile strength
SD295	3.0 (t/cm ²) = 295 (MPa, N/mm ²)
SD345	3.5 (t/cm ²) = 345 (MPa, N/mm ²)
SD390	4.0 (t/cm ²) = 390 (MPa, N/mm ²)

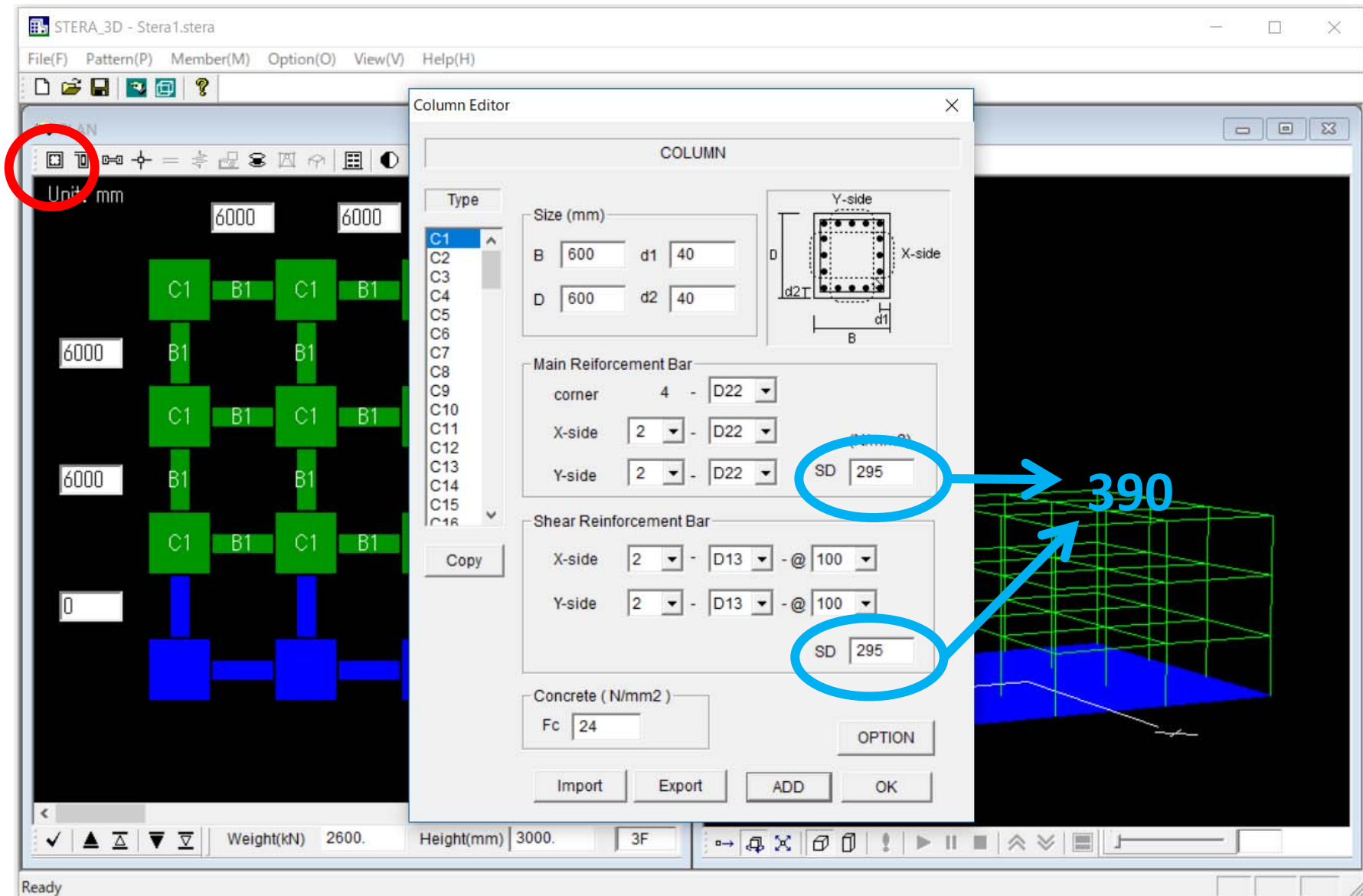
STERA 3D (Input of Size)



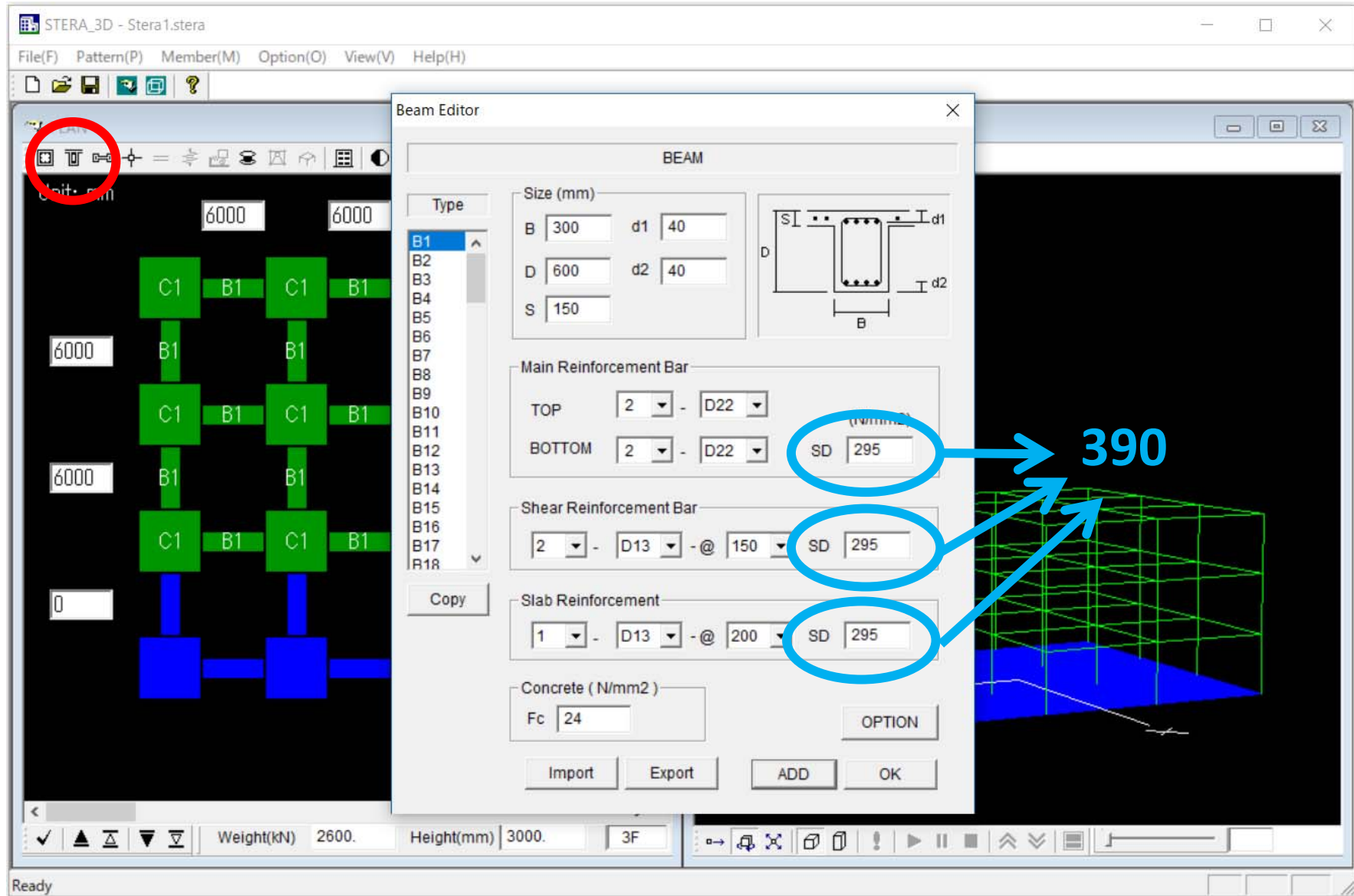
STERA 3D (Upper floor, copy)



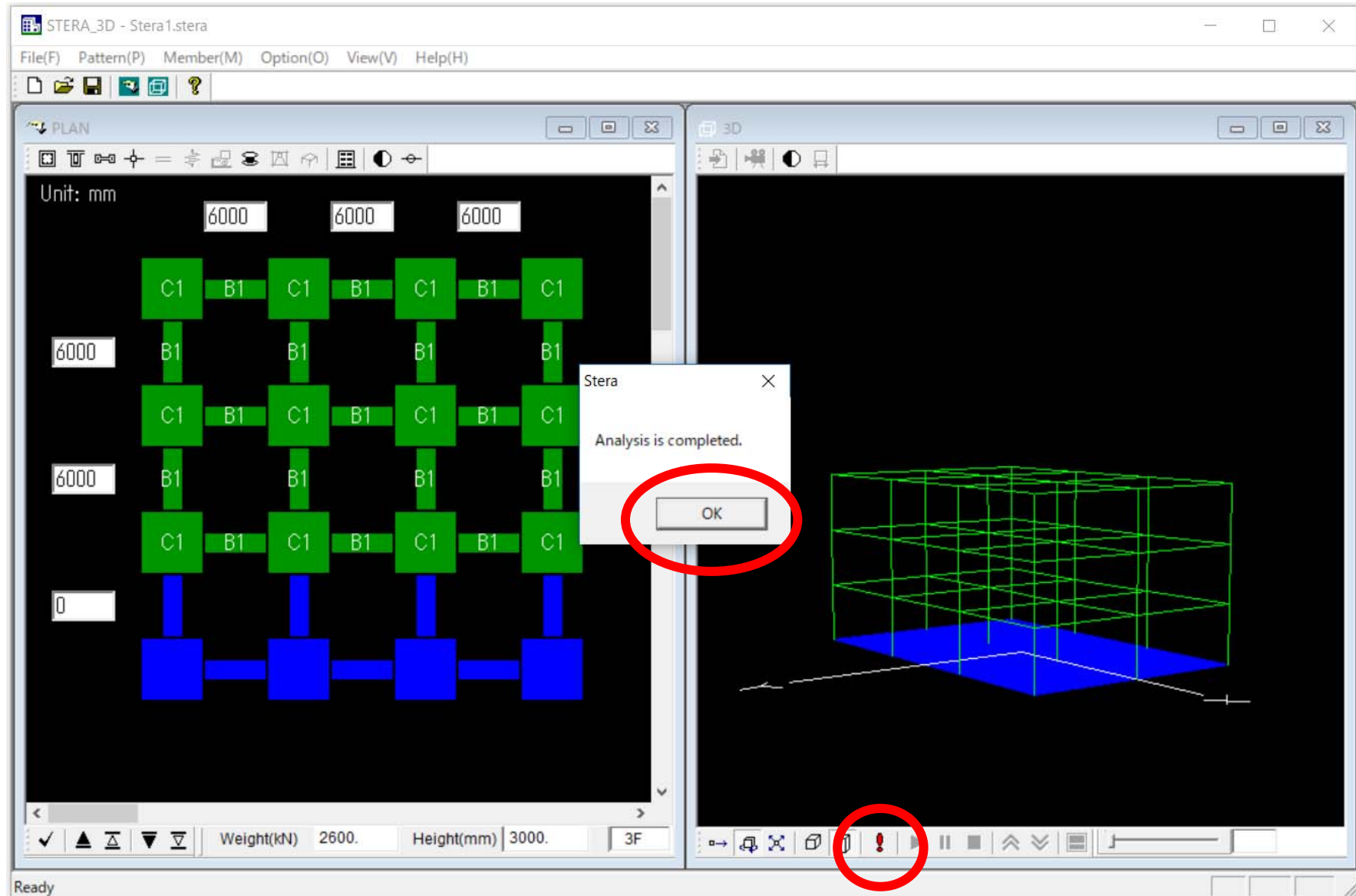
STERA 3D (Column Input)



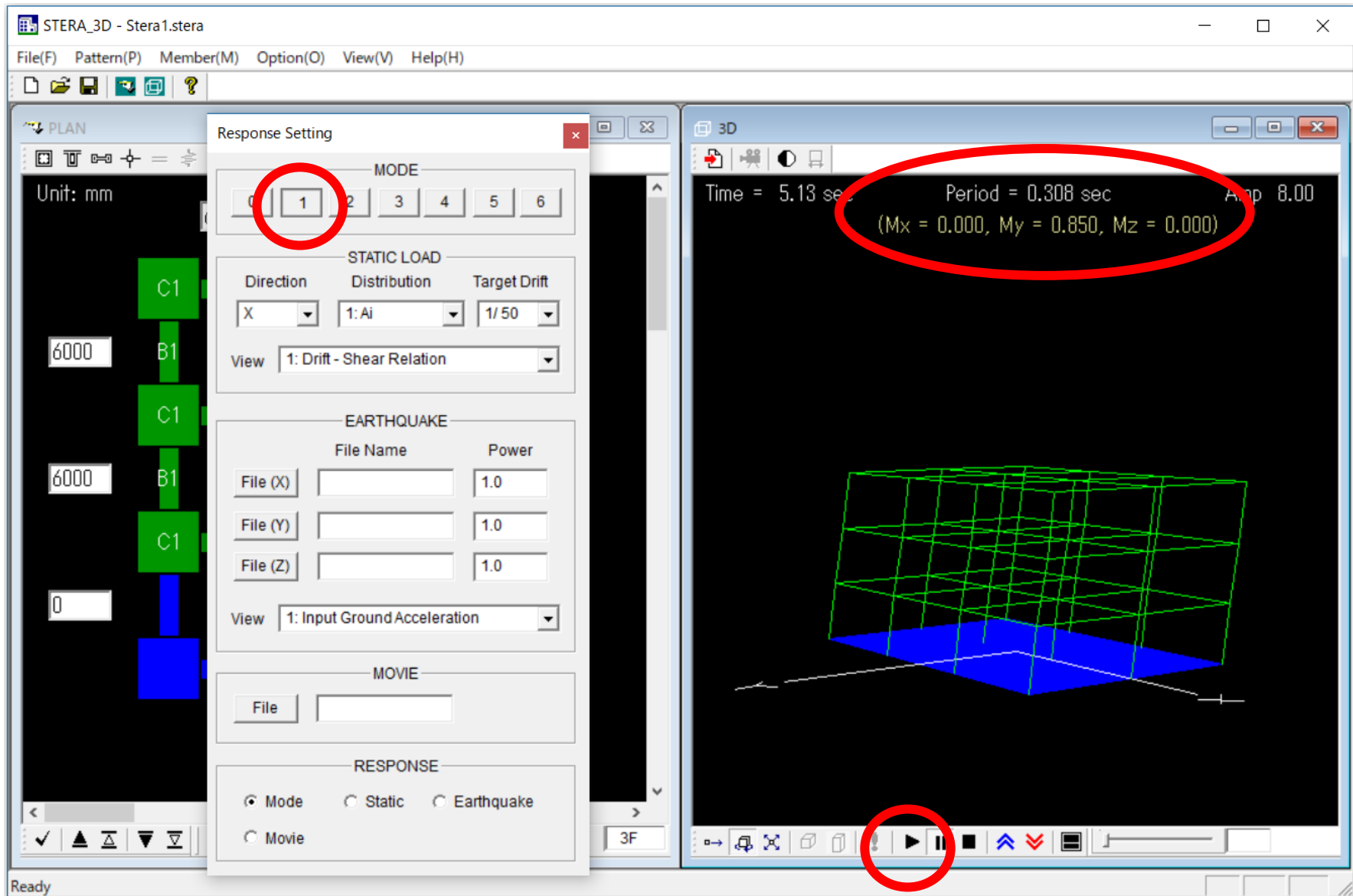
STERA 3D (Beam Input)



STERA 3D (Analyze)



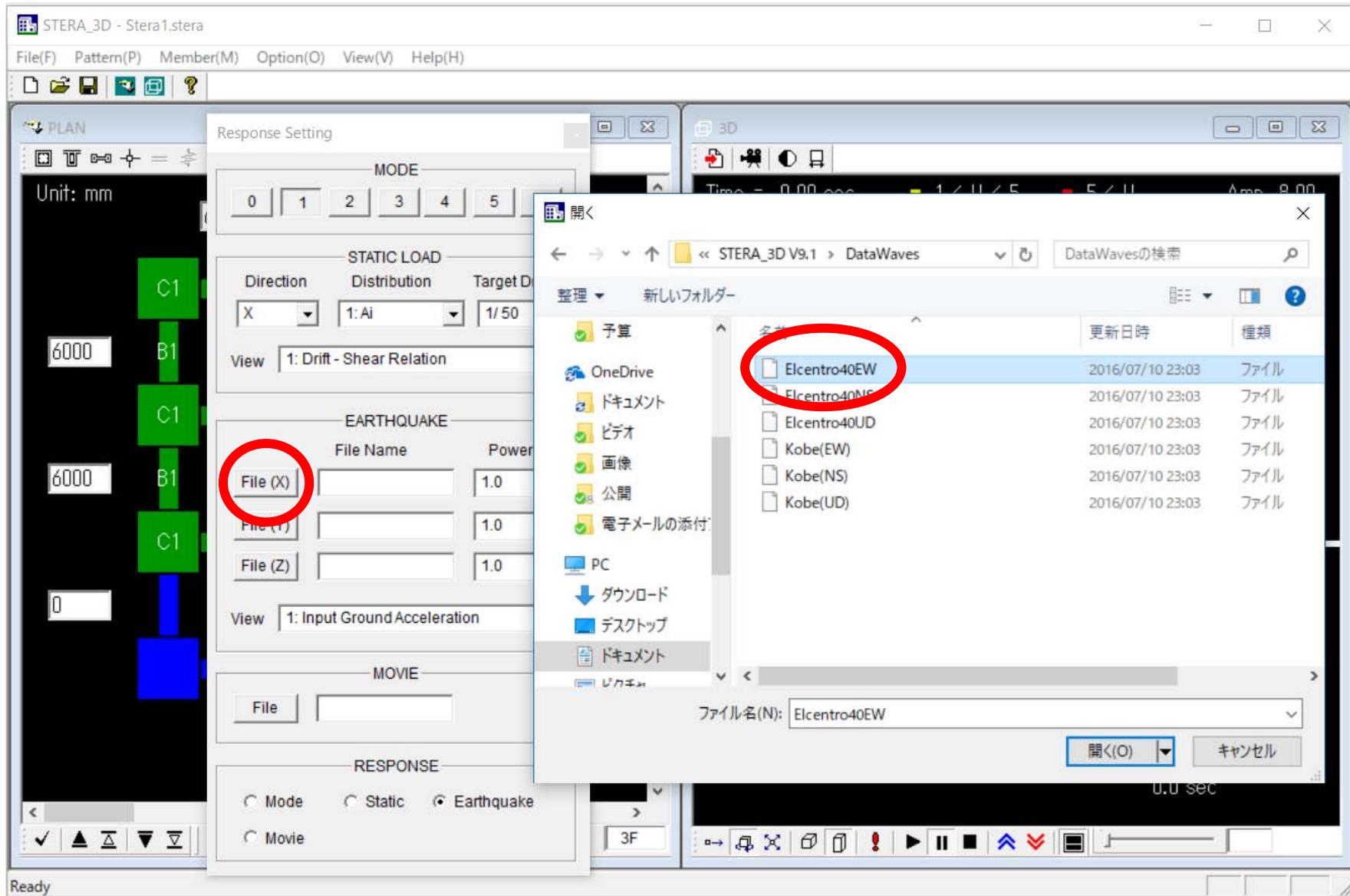
STERA 3D (Elastic Mode)



STERA 3D (Nonlinear Push-over)

The screenshot displays the STERA 3D software interface. On the left, a vertical structural model is shown with columns labeled C1 and B1, and a base. The unit is set to mm. A 'Response Setting' dialog box is open, with the 'STATIC LOAD' section highlighted by a red circle. This section includes a 'MODE' selector (0-6), 'Direction' (X), 'Distribution' (1: Ai), and 'Target Drift' (1/50). Below this, the 'EARTHQUAKE' section has 'File (X)', 'File (Y)', and 'File (Z)' fields, each with a '1.0' power value. The 'MOVIE' section has a 'File' field. The 'RESPONSE' section has radio buttons for 'Mode', 'Static', and 'Earthquake', with 'Static' selected. On the right, a 3D view shows a grid of nodes and elements. A legend indicates '1 < U < 5' (yellow) and '5 < U' (red). The amplitude is set to 8.00. Below the 3D view, a graph plots Q_i / W versus R_i . The graph shows three curves labeled 1, 2, and 3. A horizontal dashed line is drawn at $Q_i / W = 0.3$, with the text 'Base shear factor > 0.3' in yellow. The x-axis has markers for 1/100 and 1/50. A red circle highlights the play/pause button in the graph's control bar.

STERA 3D (Earthquake Response)



STERA 3D (Earthquake Response)

The screenshot displays the STERA 3D software interface. The main window is titled "STERA_3D - Stera1.stera" and contains a "PLAN" view on the left and a "3D" view on the right. The "PLAN" view shows a vertical structure with columns labeled C1 and beams labeled B1, with a unit of mm. The "3D" view shows a 3D model of the structure with a blue base and green/yellow nodes. The "Response Setting" dialog box is open, showing the following settings:

- MODE:** 0, 1, 2, 3, 4, 5, 6
- STATIC LOAD:** Direction: X, Distribution: 1: Ai, Target Drift: 1/50, View: 1: Drift - Shear Relation
- EARTHQUAKE:** File Name: Elcentro40EW, Power: 1.0; File (Y): Elcentro40NS, Power: 1.0; File (Z): Elcentro40UD, Power: 1.0; View: 1: Input Ground Acceleration
- MOVIE:** File: [Empty]
- RESPONSE:** Mode, Static, Earthquake, Movie

The "3D" view window shows the following information:

- Time = 7.76 sec
- 1 < U < 5 (Yellow)
- 5 < U (Red)
- Amp 64.00

The "3D" view also displays three time-series plots for X, Y, and Z ground acceleration:

- X: 210.1 gal
- Y: 341.7 gal
- Z: 206.3 gal
- 15.0 sec

At the bottom of the "3D" view window, there are two red circles highlighting the play/pause and zoom in/out buttons.