

From beam inputs to results

A step-by-step guide to the current Beam Studio workspace. Start with the example, then replace its inputs with your beam’s values.

1. Start with a complete example

Open Beam Studio and choose **Reset example** at the top of the Beam Model panel. Values update as you type; there is no Calculate button.

1. Choose a support preset, or select **Pin, Roller, Fixed or Free** independently at A and B in Geometry or beside the model. Fixed–Fixed, Fixed–Pin, Pin–Fixed and cantilevers in either direction are supported. Unstable pairs show an input error.
2. Enter the span **L in metres** and section width **b** and depth **h in centimetres**.
3. Enter dead and live loads, choose whether to include self-weight, and add any point loads.
4. Set stiffness and material strengths, then choose steel grade, main-bar size, stirrup diameter and cover.
5. Use **Model** to confirm the 3D geometry, support conditions and applied loading. Open **Analysis** to select a diagram case and inspect the force response.
6. Open **Reinforcement** to edit bars and stirrup zones. The engineering summary follows this selected drawing. Expand **Selected layout checks** to see what passed or needs review.
7. Open **Review** for load-case comparisons, stock sizes, quantities and report exports. Engineering-summary links take you directly to checks that need attention.

What the reset example should show

Setting or result	Reset example
Span and section	4 m; 20 × 40 cm
Entered D and L	200 and 300 kgf/m
Added self-weight / service load	192 / 692 kgf/m
Service reactions A and B	1,384 kgf each
Maximum service moment	1,384 kgf·m at x = 2 m
Maximum elastic deflection	0.848 mm
Automatic section recommendation	4 DB10 in 2 layers; RB9 (SR24) @ 150 mm
Default drawing	Top 2 DB10 in 1 layer; bottom 4 DB10 in 2 layers

These results assume kgf force units, the reset material values, no point loads, and Service D + L. Reinforcement uses a separate strength envelope.

Move around the workspace

Follow the four top tabs: **Model** → **Analysis** → **Reinforcement** → **Review**. Each tab shows one task. The left input panel also has four steps: Geometry, Loading, Materials and Reinforcement; open a step or use its Next button. Compact summaries keep the other inputs visible. On desktop, the input and result panels scroll independently. On a phone, tap **Edit beam inputs** to expand the input steps. The top tabs stay available as you scroll.

2. Enter geometry, loads and materials

Choose kgf, **metric tonne-force (tf)**, or kN before entering your example. 1 tf = 1,000 kgf = 9.80665 kN. tf is force; steel quantities continue to use kg mass. Changing units later converts the entered dead/live and point loads automatically.

Input	Unit and meaning
Span L	m; analytical length measured from left end A
Width b / depth h	cm in both the sidebar and 3D editors; 3D labels show mm
Dead D / live L load	kgf/m, tf/m or kN/m; downward line load over the full span
Point-load P / position x	kgf, tf or kN; x in m from A, between 0 and the span
Elastic modulus E	GPa; entered independently from concrete strength
Effective I / Gross I	Multiplier for elastic stiffness; 1.0 uses the full section
Concrete f'c / main fy / stirrup fyr	Always kgf/cm ² , even when force units are tf or kN
Density	kg/m ³ ; used for beam self-weight
Cover / aggregate / bar diameter	mm; cover is measured to the outside of the stirrup

Read the engineering summary

The summary uses the **selected drawing layout**. Bending utilization is $M_u/\phi M_n$; zone shear shows the largest $V_u/\phi V_n$ ratio among active stirrup zones. Their governing strength combinations can differ from the selected diagram case. Fit, strain and other selected checks can still require review when a strength ratio is below 100%. Service deflection uses the envelope of enabled service rows and is compared with the selected L/240, L/360 or L/480 reference. This elastic comparison is not a code pass/fail. Open **Selected layout & review notes** for bar rows, assumptions and the next review items; issues open these notes automatically.

Enter the loads

1. Enter downward **Dead load** and **Live load** as line loads. A slab load in kgf/m² or kN/m² must first be converted using its tributary width.

2. Check **Include beam self-weight** to add the calculated beam weight to D. Read the amount shown beneath the checkbox.
3. Choose **+ Add load** for a point load. Set its dead/live category, magnitude and distance from A. Use **Remove** to delete a row.
4. Open **Combinations / รวมแรง** to edit named D/L rows, enable or disable rows, and choose Service or Strength. The Thai gravity presets are service **D + L** and strength **1.4D, 1.4D + 1.7L**. Choose an enabled row in **Diagram combination** for the displayed analysis. **Reset Thai presets** restores these rows; imported or manually edited rows keep their chosen factors until reset.

If your entered dead load already includes the beam weight, clear Include beam self-weight to avoid counting it twice.

Thai gravity load basis / ชุดแรงโน้มถ่วงไทย: 1.4D + 1.7L follows [Thai ministerial regulation B.E. 2566 \(2023\), Clause 7\(1\)](#) for dead and live loads only. Self-weight is part of D. The preset supplies load factors; verify other required actions and project requirements separately.

Choose material and reinforcement settings

SD40 sets main-bar f_y to 4,000 kgf/cm²; **SD50** sets it to 5,000 kgf/cm². This selection does not change stirrup f_y or E. Enter actual material properties separately.

Choose **Auto** main-bar size or a specific DB diameter, then select the stirrup diameter, clear cover and aggregate size. DB12 means a 12 mm bar diameter; 12 m stock means the length of a supplied bar.

3. Read the model and analysis

Use the 3D beam to confirm dimensions, then use the load/support sketch and diagrams to understand the selected analysis case.

Use the 3D view

Drag the beam to rotate it, or use the **Rotate** and **Tilt** sliders. Choose **3D view**, **Side** or **Section** for a preset view. Edit Length, Width or Depth beneath the model; a dimension label on the model focuses its matching editor.

Sidebar geometry and 3D dimension editors update together. The model shows the undeformed concrete section; it is not a reinforcement cage or deflected shape.

Read the results

Result	How to read it
Reaction A / B	Support reactions for the displayed load case. For a cantilever, the second card is the fixed-end moment.

Result	How to read it
Maximum moment	Largest absolute bending moment and its position; sagging or hogging is identified.
Maximum deflection	Immediate elastic deflection in mm for the selected E and I multiplier.
Shear V / moment M / deflection δ	Separate diagrams with independent vertical scales. V and M are positive above the axis; downward deflection is drawn below it.

Inspect a position

Under the diagrams, change **Inspect a section** or drag the position slider. Position x is in metres from A. Read moment, deflection and **V left / right**. Different shear values at the same position indicate a jump at a point load or support.

Keep the load cases straight

Area of the app	Load case used
Diagrams, reaction cards, station CSV	The enabled row selected in Diagram combination
Automatic section sizing	Envelope of all enabled Strength rows; defaults: 1.4D and 1.4D + 1.7L
Edited reinforcement drawing	The same strength envelope, checked against your selected layout
Deflection reference	Envelope of enabled Service rows (default D + L), plus a separate live-only response

Choosing a different diagram row does not change the reinforcement envelope. Editing, enabling or disabling a Strength row updates the design envelope and report. Force units also do not change the fixed-kN design and comparison tables; read each displayed unit.

New model, materials and layer controls

The model shows $f'c$, main f_y and stirrup f_{yr} beside the 3D beam, always in kgf/cm^2 . The end selectors beside the model stay synchronized with Geometry. The load diagram, reaction forces, reaction moments, reinforcement drawing and report all use the selected restraints.

Automatic main-bar layers selects Auto or 1–3 layers. In the drawing editor, **Bars** is the total count for each face and **Layers** distributes it into 1–3 rows, with at least 2 bars in each row. The layer arrangement updates the section drawing, area centroid and effective depth. Horizontal clear gap is at least $\max(25 \text{ mm}, 2db, 4agg/3)$; vertical gap is at least $\max(30 \text{ mm}, 2db, 4agg/3)$, following the review brief. These are conservative project checks alongside the selected ACI-style equations, not a complete code detailing assessment.

The SR24 preset sets f_{yr} to $2,400 \text{ kgf/cm}^2$ and offers **RB6**, **RB9** and **RB12**. Custom retains 6, 8, 9, 10 and 12 mm diameter calculations; verify the supplied material. RB10 in the comments is treated as a custom 10 mm size, rather than certified SR24 stock. [TISI SR24 material scope](#).

Fixed supports can produce top and bottom tension. Each face with bending demand is checked separately; the overview shows the larger demand/capacity ratio. Compression steel is not credited. Innermost-layer strain must satisfy the implemented tension-controlled limit so all tension layers yield before centroid-based capacity is accepted.

Open **Edit combinations** to edit every D/L factor, or apply the Thai gravity preset or ACI gravity reference. Applying a preset replaces the current register. Basis & limitations shows the Thai Clause 7 cases for wind, seismic, earth/water/fluid pressure and temperature effects. These additional actions are references only and require a suitable structural model; they are not assigned artificial zero demands.

4. Edit main bars and stirrup zones

Choose Beam detailing in the top navigation. The drawing, bar editor and zone summaries describe the selected manual or automatic drawing layout.

Main bars

1. Set the **Beam mark**, such as B1, to label the drawing.
2. Review the elevation and sections **1-1**, **2-2** and **3-3**. Click top or bottom bars, or edit the matching row under **Main bars**.
3. Set the number of bars and the DB diameter for both faces. For example, **3 DB12** means three bars, each 12 mm in diameter.
4. Read the tension-row feedback and expand **Selected layout checks**. A status of **Review selected layout** requires attention to the listed reasons.

Stirrups

1. Set the **Left zone** and **Right zone** lengths in mm. The middle zone is the remaining span; the end zones must not overlap.
2. Select Left, Middle or Right using its tab, its drawing zone or its section. You can also choose **Edit zone** in a summary card.
3. Choose **Auto** spacing or a numeric spacing for the selected zone. **RB9 @ 150** means 9 mm stirrups at 150 mm spacing.
4. Review each zone's length, allocated stirrup count, peak shear and calculated spacing limit. Select **Auto** again to restore automatic spacing for that zone.

Understand manual choices and resets

Editing either bar row keeps both rows as manual choices when beam inputs change. Editing either end-zone length keeps both lengths. Numeric per-zone spacing also stays selected. Recheck the drawing after changing the beam or loads.

Auto select steel rebuilds the drawing from the current sidebar settings and resets its bar rows, zone lengths and spacing. **Reset example** restores the example beam and clears manual drawing choices. Reset preserves the force-unit selection, beam mark, deflection reference and 3D orientation.

Auto sizing is a separate section recommendation. Its alternatives and the Engineering Use buttons update that recommendation; a manually edited drawing remains manual until you use Auto select steel.

Selected checks satisfied means the implemented checks passed. It does not establish a complete design or construction-ready detailing.

5. Compare, export and resolve issues

Use the **Review** tab to compare the automatic section recommendation and understand the assumptions behind each output. The engineering summary above the tabs' content continues to check the selected drawing layout.

Engineering checks

Automatic sizing utilization in the detailed Review panel is demand divided by design strength for the automatic section recommendation. The summary's bending and shear ratios check the selected drawing layout, including manual changes. The load-case table compares all enabled rows; the presets are D + L, 1.4D and 1.4D + 1.7L. Under **Compare SD40 / SD50 and bar sizes**, choose **Use** to update the sidebar grade and main-bar preference.

Choose L/240, L/360 or L/480 under **Deflection reference**. This is a user-selected elastic comparison, not a code pass/fail. Quantity estimates refer to the automatic section, exclude the opposite-face hanger row and detailing allowances, and can differ from the zoned drawing's counts.

Save the output you need

Control	Output
Download drawing SVG	Selected reinforcement schematic; enabled only when its selected checks pass
Export section CSV	Forces and deflections at stations for the selected diagram case, with model metadata; not a reinforcement schedule
Design report / Preview & export report	Opens the current engineering report. Add project metadata and review the inputs, combinations and selected layout checks, then choose Download PDF for a direct PDF file or Export Word (.docx) for editable text and tables with diagram images. These downloads are also available on a phone.
Download report HTML / CSV	Current-input engineering report as a standalone HTML file or calculation record in CSV, including actual enabled factors.
Benchmark Report	Existing validation report; separate from your current beam report

If a result is missing or needs review

Message or symptom	Next step
Inputs invalid / results unavailable	Complete empty values, check positive dimensions and stiffness, and keep point positions within the span.
Bar size unavailable / layout review	Read Why unavailable or Selected layout checks. Confirm units, material values, bar fit, strength and applicable model limits.
Drawing download disabled	Resolve the listed drawing checks; a valid force analysis alone does not enable drawing export.
Values seem unchanged / old page	Refresh the page. Re-enter or export your work as needed; the app has no project save/load control.

Scope of the current app

Beam Studio handles one idealized rectangular single-span beam with constant E and I , vertical downward loads and ideal supports. It does not model continuous spans, axial force, torsion or variable sections. The Thai gravity preset supplies load factors; its reinforcement features still implement selected ACI 318-19 section checks. This combination of selected methods does not establish complete Thai legal or ACI compliance. Verify the applicable design standard and all required load combinations for your project. Anchorage, laps, hooks, support extensions, seismic confinement, cracking, creep, shrinkage and long-term deflection need separate engineering assessment. SVGs and stock estimates are preliminary, not construction or purchasing instructions.