Steel Frame Design — User Guide

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What the app does

The app designs steel frames and portal sheds to Eurocode 3. It:

- designs members to EN 1993-1-1 and simple connections to EN 1993-1-8 and SCI P358 (end plates, fin plates, column bases, splices);
- analyses a braced frame from your column positions and resizes members until the design converges;
- audits every member and connection independently, and draws nothing until the audit passes;
- designs pad and pile foundations to Eurocode 7;
- produces drawings, a design report, schedules and a steel weight take-off.

The section library holds 811 UK sections: UB, UC, angles, CHS, SHS and RHS. Everything the app produces is a **preliminary** design, to be checked and sealed by a chartered or licensed engineer.

Before you start: choose your route

The app has two routes. Pick one per job.

	Building route	Member route
Use it when	You have a building and want it analysed, designed and drawn	You have your own analysis and want members and connections checked
You supply	Column positions, storey heights, braced bays, provisional sections, loads	Every member, its section and the forces on it (kN, kNm, mm)
Form	Building form	Member form
Runs	P1 → AUTO → DRW	A (or S1 → S2 → S3)
Drawings	Yes, eight sheets ST00–ST07	No

Foundations (F1) need the foundation form. Download it **from inside the job** after running P1: its base reactions are then filled in from your frame analysis. You add the borehole logs and the design parameters.

Filling in the forms:

- Choose sections from the dropdowns. Names must match the library exactly, for example *533x210x92 UB*.
- A **blank cell is not a zero**. A blank means "not supplied" and that check isn't made. For example, a blank L_LT means no lateral-torsional buckling check.
- Type numbers only. The unit is in the header, so write 400, not "400 kN".
- Every storey needs a column section, and the building route needs braced bays: it designs simple (braced) construction only, and refuses a frame with no bracing.

Step by step

1. **Sign in** with your Bespa licence email and key, and open Steel Frame Design.
2. **Templates:** give the job a name, choose the route, and download the form for it. A worked example of each form is included.
3. **Upload** the filled form. It's checked on arrival:
    - Anything wrong is named (a missing column, an unknown section with near matches, a storey with no column section) and nothing is saved.
    - Fix it and upload again.
4. **Run:**
    - **Building route: Run P1** (analysis), then **Run AUTO** (design and resizing, up to ten rounds), then **Run DRW** (drawings).
    - **Member route: Run A**, which does member design, connection design and the audit in one go.
    - **Foundations:** after P1, download the foundation form from the job, add your borehole logs and design parameters, upload it, then **Run F1**.
5. **Read the audit** on the Results tab. Drawings are produced only when the gate is open (see below).
6. **Download** the deliverables.

The audit gate. Every member and connection is checked again by a separate method.

Verdict	Meaning	Gate
PASS	Every check made, all at or below 1.0	Open
FAIL	A check is above 1.0	Shut: change sections or details
WARN	A check could not be made because data is missing	Shut: fill in the missing data

A WARN keeps the gate shut just like a FAIL: a check that was never made is not a pass. The gate can be overridden, but the override is recorded in the run log.

What you download

File	Contents
Steel_Design_Report.docx	Basis and partial factors, members, connections, the audit and gate, foundations (if designed), scope limits
Steel_Schedules.xlsx	Members, connections, audit, **quantities**, notation
Steel_Drawings.pdf	Building route only. Eight sheets: register and notes, marking, column setting-out, floor framing, bracing elevations, member schedules, typical connections, column base
Foundation_Design_Report.docx	Pads or piles, with schedules and a concrete take-off

The weight take-off is a design quantity, not a tender weight. Bolts are counted, not weighed. Welds, fittings, stiffeners, coatings and wastage are not included: a fabricator typically adds 5–15%. On the member route, a member is weighed only if you fill in its **Length (m)**, its actual length rather than a buckling length. On an L, T or courtyard plan, the kg/m² rate is worked out over the plan's bounding rectangle, which is more than the real floor area, so the rate comes out low.

Common problems

You see	What to do
not one of the Bespa input forms, or *uploaded in the wrong place*	Use the current forms, and upload each in its own box
… = '400 kN' is not a number	Type the number only. The unit is in the header
the building cannot be analysed: …	Fix each fault listed: columns, bracing, column groups or sections
The gate is shut with **WARN**	A check had no data. Common causes: a blank L_LT, A_net, plate thickness, edge distances, or A_nt/A_nv on a bolt group. Fill them in and run again
The gate is shut with **FAIL**	Choose bigger sections or change the connection details, then run again
Class 4 … Choose a stockier section	Slender sections aren't designed. Pick a thicker one
AUTO doesn't converge	Read the diagnosis. Members at the top of the library need a different arrangement, such as more bracing or a shorter span
soil_project.json is missing	Download the foundation form from this job, add the borehole logs, and upload it before F1
Uplift or sliding *NOT CHECKED*	Fill in N_Ed_min (negative for uplift) on the Base Reactions sheet
STOPPED — exceeded the 900 s limit	The run timed out. Simplify, or run again

Limits, and the engineer's sign-off

- **UK National Annex only.** The partial factors and buckling curves are the UK values, built in. If your project uses another annex, the resistances are not to your code.
- **Braced (simple) frames only.** Unbraced and moment frames are not designed, and Class 4 slender sections are refused.
- **Connections:** simple joints only. There is no form for moment-resisting joints or column splices.

- **Foundations:** pads and piles only, no rafts. Pile tension and lateral capacity are **not checked**: verify them separately.
- **Not covered:** fatigue, fire, plate girders and stiffened webs, cold-formed open sections, composite (EN 1994) behaviour.
- **Watch two inputs:** an L_LT of **0** means the beam is fully restrained against lateral-torsional buckling, so use the real unrestrained length. A blank A_net means net-section rupture isn't checked, so give it for bolted tension members.

Every output is preliminary and must be checked and sealed by a chartered or licensed engineer before use. For detailed questions, contact Bespa Support at info@bespa.online.