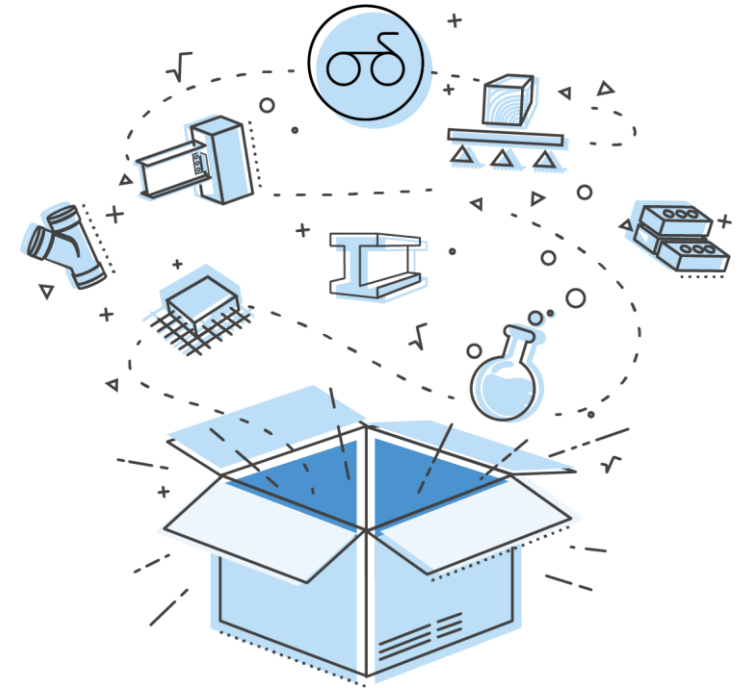


How to Build a House

Using ClearCalcs's Project Features

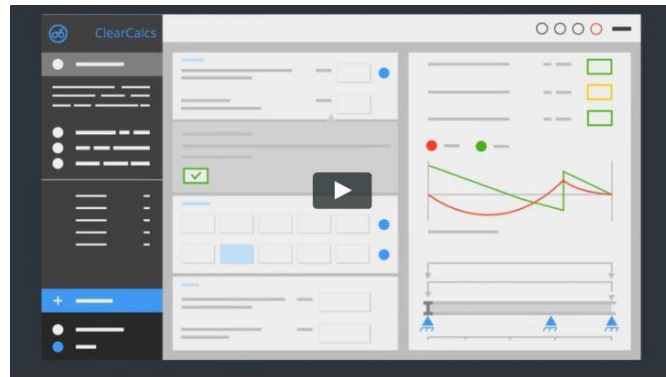


Brooks Smith, CPEng, P.E., NER
brooks@clearcalcs.com

About ClearCalcs.com

ClearCalcs helps engineers design without compromise by bringing together powerful FEA analysis with easy to use design tools for concrete, steel, cold-formed steel and timber.

Explore our range at clearcalcs.com



[Intro Video](#)
[Hyperlink](#)



More Accurate

Design more accurately with unrestricted and accessible FEA analysis



Eliminates Wasted Time

Eliminate time wasted using clunky methods or waiting for software licenses to free up



Available Everywhere

Empower engineers to work effectively from office, home, or site

Meet the Presenter

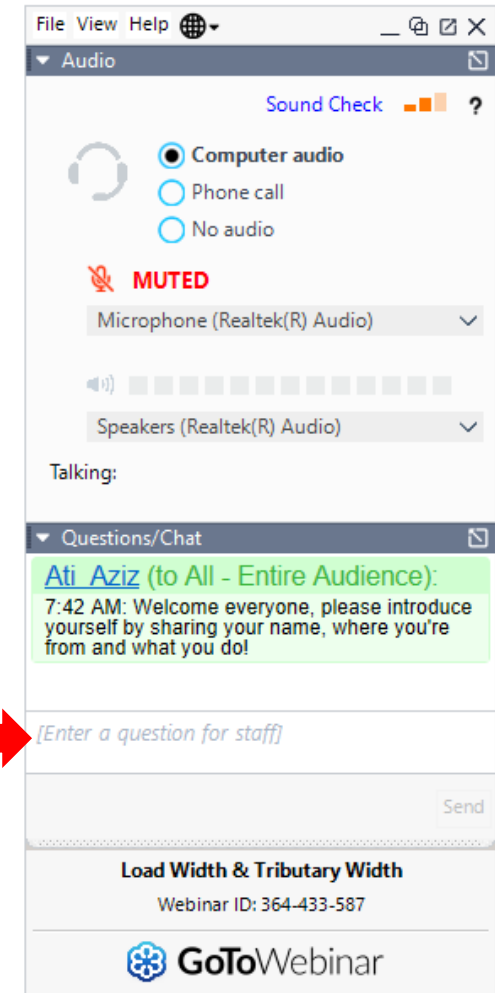
- **Brooks H. Smith | Head of Engineering R&D**
 - Chartered Professional Engineer (AU) & P.E. (USA)
 - MCivE from University of Massachusetts
 - BEng from Dartmouth College
 - 8 years of previous experience in:
 - Structural engineering R&D consulting, specialising in cold-formed steel
 - Research fellowship in system behaviour of thin-walled steel
 - Forensic structural engineering, specialising in reinforced and PT concrete
 - ~4 years now with ClearCalcs
 - Head of Engineering -> Head of Engineering R&D



How to Ask Questions

- **Type your questions in the Questions/Chat tab on your GoTo panel and click Send**
 - We will address all questions in the second half of the webinar during the 30-minute Q&A session
 - We might invite you to unmute yourself to ask your question live!

Ask your questions here

The screenshot displays the GoTo Webinar interface. At the top, there's a menu with 'File', 'View', and 'Help'. Below it, the 'Audio' panel is visible, showing 'Sound Check' with a progress indicator and three options: 'Computer audio' (selected), 'Phone call', and 'No audio'. A red 'MUTED' indicator is present. Below the audio settings are dropdown menus for 'Microphone (Realtek(R) Audio)' and 'Speakers (Realtek(R) Audio)'. The 'Questions/Chat' panel below shows a message from 'Ati Aziz (to All - Entire Audience): 7:42 AM: Welcome everyone, please introduce yourself by sharing your name, where you're from and what you do!'. Below the message is an input field with the placeholder text '[Enter a question for staff]' and a 'Send' button.

Unmute yourself here



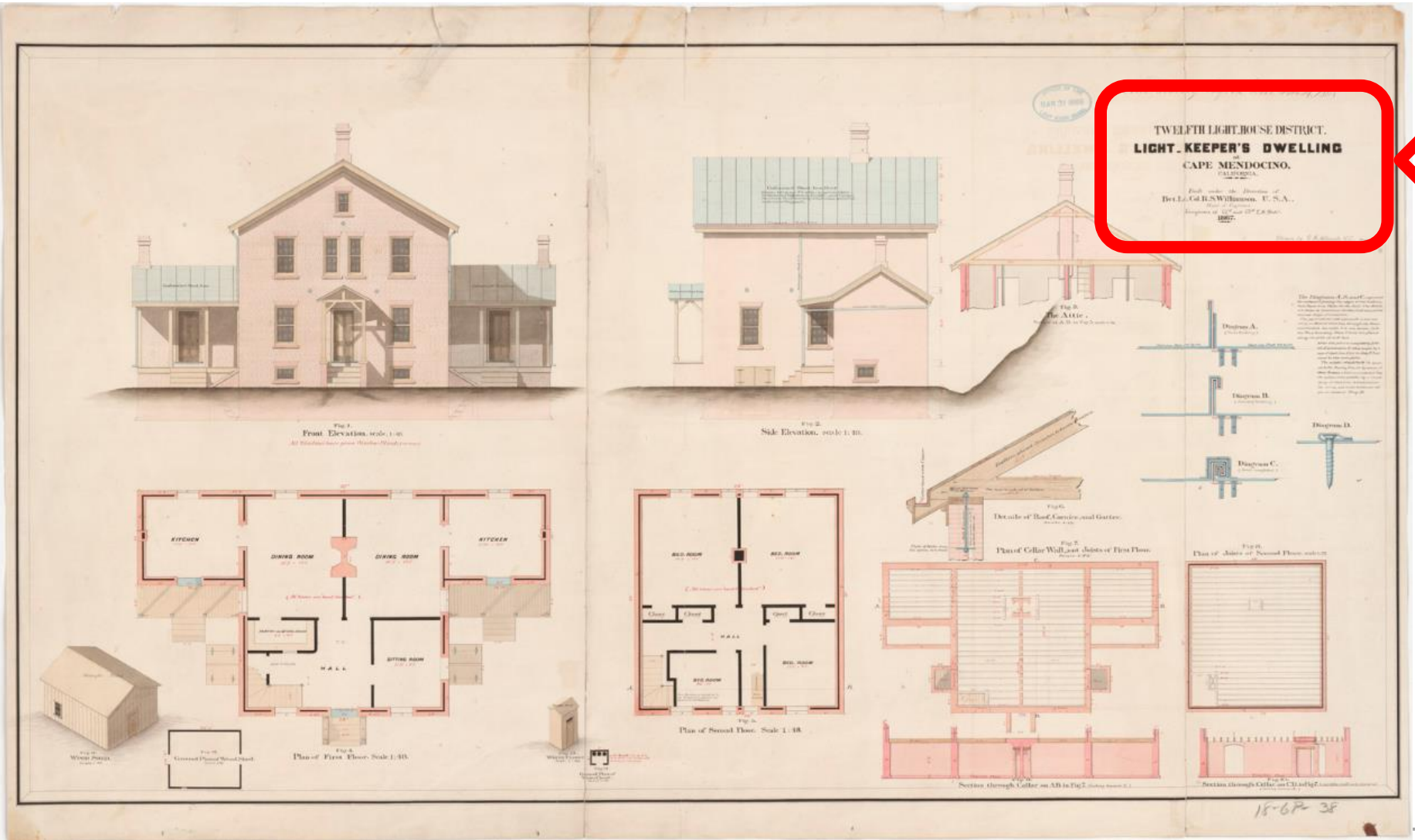
Agenda – Today's Goals

- **From Plans to Reports**
 - Project setup & sharing
 - Loads & overall geometry
 - Identifying members for design
 - Sizing members optimally
 - Following your load path
 - Submitting your work
- **Worked Examples**
 - Using ClearCalcs

From Plans to Reports

The design workflow in ClearCalcs

Project Setup



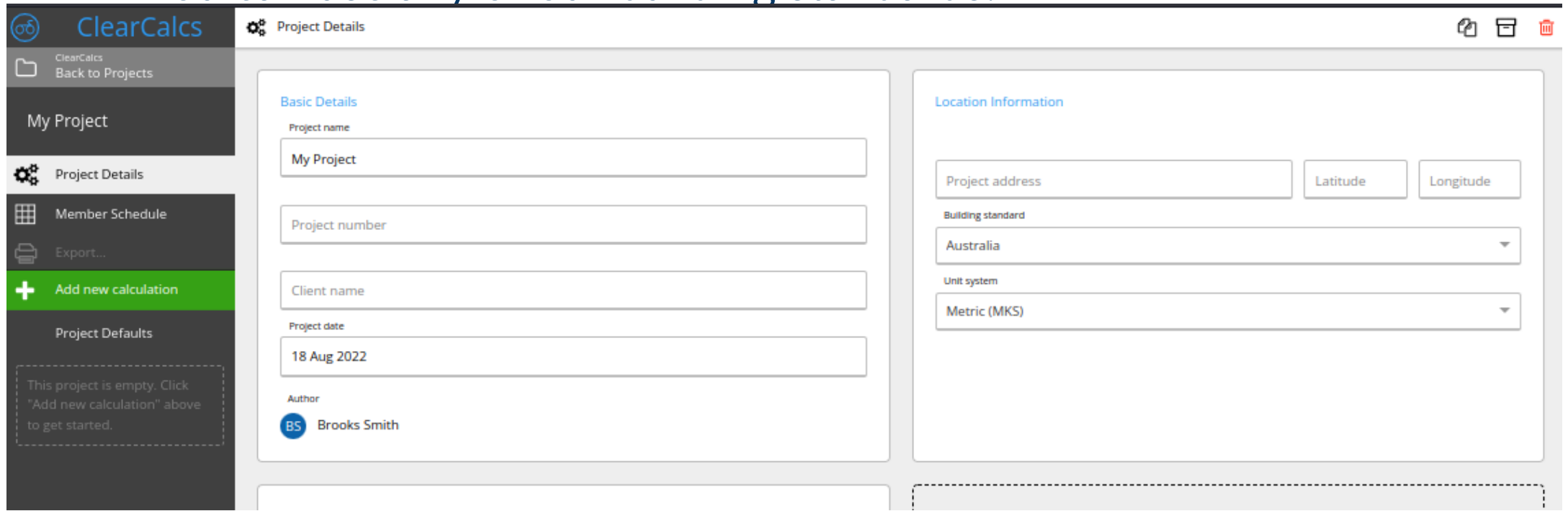
Project Setup: Overall

- ClearCalcs is structured around “projects”
 - Most commonly, 1 project = 1 building
- All projects are shared with everyone in your organisation
 - Just un-tick the “Show only my projects” box
- Power-up: Often work on similar buildings?
 - Create template projects that you can duplicate!

The screenshot displays the ClearCalcs web interface. On the left is a dark sidebar with the ClearCalcs logo and a 'Projects' folder icon. The main content area features a search bar with the placeholder text 'Filter by project name, number, client or author'. Below the search bar are two filter options: 'Show only my projects' (checked) and 'Include archived projects' (unchecked). A green button with a plus sign and the text '+ Create a new project' is located on the right side of the filter area. Below these elements, a project card is visible with the title 'My Project', a date '18 Aug 2022', and the author 'You'. The project card also includes icons for sharing, printing, and deleting. Red circles highlight the 'Show only my projects' checkbox and the '+ Create a new project' button.

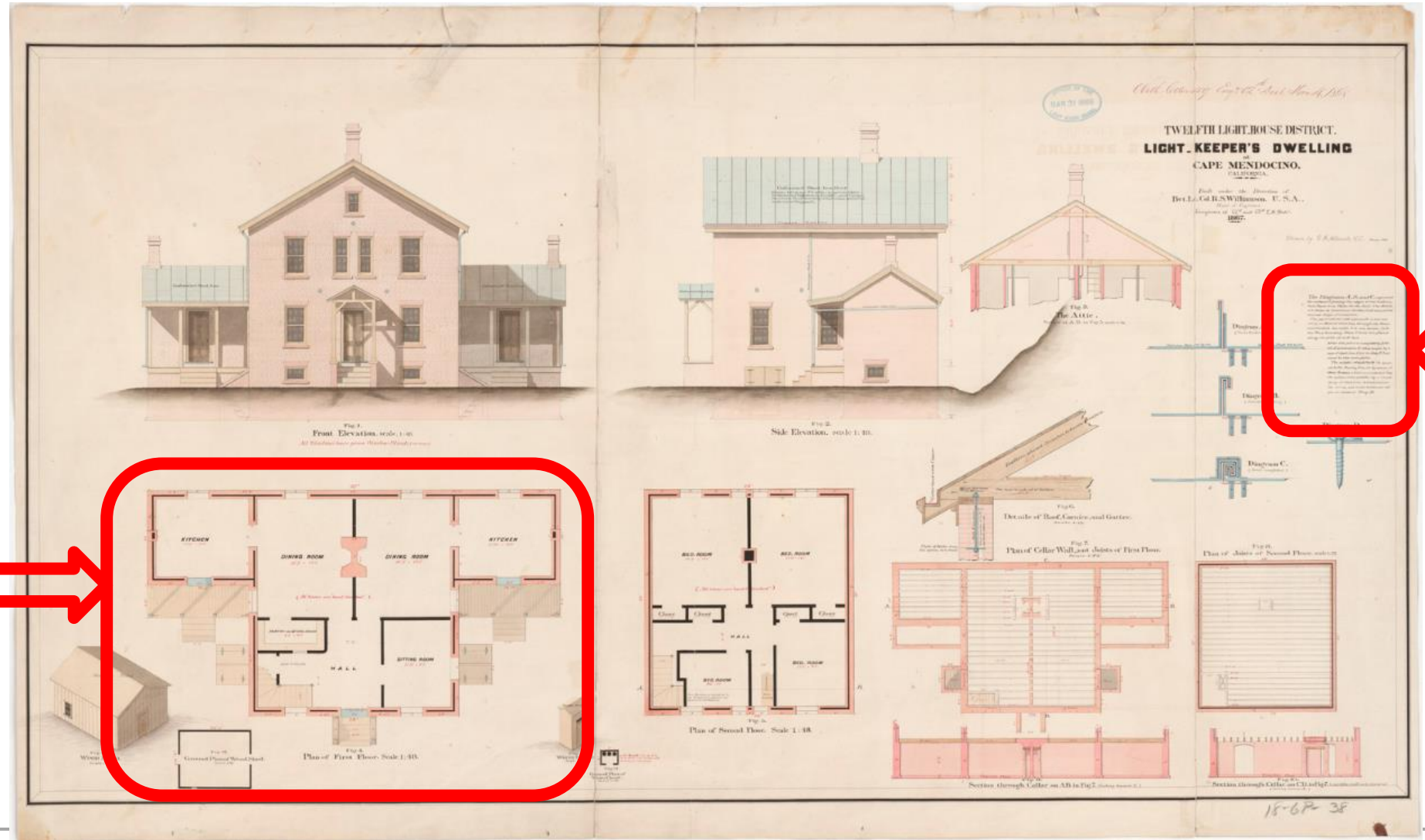
Project Setup: Details

- Project Details is your place for your information
 - Every field is optional!
- Power-up: Work internationally?
 - You can use any of our building standards!



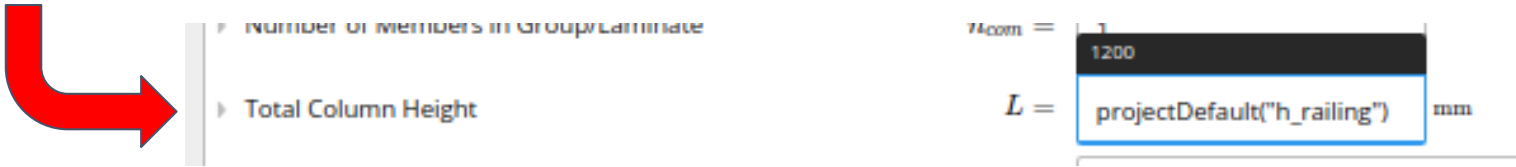
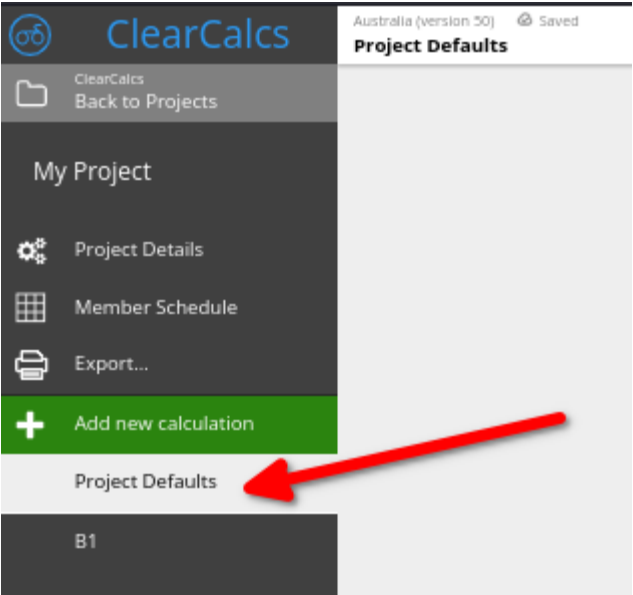
The screenshot shows the 'Project Details' form in the ClearCalcs application. The interface includes a sidebar on the left with navigation options: 'My Project', 'Project Details' (selected), 'Member Schedule', 'Export...', and 'Add new calculation'. The main content area is divided into two columns: 'Basic Details' and 'Location Information'. The 'Basic Details' section contains fields for 'Project name' (My Project), 'Project number', 'Client name', 'Project date' (18 Aug 2022), and 'Author' (Brooks Smith). The 'Location Information' section contains fields for 'Project address', 'Latitude', 'Longitude', 'Building standard' (Australia), and 'Unit system' (Metric (MKS)). A message at the bottom left of the sidebar states: 'This project is empty. Click "Add new calculation" above to get started.'

Loads & Overall Geometry



Loads & Geometry: Project Defaults

- Project Defaults is just that - defaults
 - Almost everything can be overridden
 - Makes your life easier to avoid re-entering the same numbers
- Power-up: Use any project default, anywhere in calcs
 - Use the projectDefault("Formula Reference") function



Loads & Geometry: Overall Geometry

- Rafter / Joist Spacing
→ load widths & restraints
- Bearing Length
→ all beam supports
- Headroom
→ stud height
- Height Above Window
→ lintel load width
- Power-up: Work in QLD?
 - Set you k_6 factor only once here!

The screenshot shows a software interface for inputting building geometry. The interface is divided into three main sections: Building Site, Building Geometry, and Design Criteria. Each section contains several input fields with labels and units. Red ovals highlight specific fields: 'Wind Class' (N1), 'Rafter Spacing' (600 mm), 'Joist Spacing' (450 mm), and 'Default Bearing Length' (90 mm).

Section	Field	Value	Unit
Building Site	Wind Class	N1	
	Temperature Factor for Timber Design (k_6)	1	
Building Geometry	Number of Stories (n_{story})	1	
	Roof Slope (α)	22.5	deg
	Rafter Spacing (s_{rafter})	600	mm
	Joist Spacing (s_{joist})	450	mm
	Top Floor Story Height (Floor-to-Eave) ($h_{story,R}$)	3500	mm
	Top Floor Headroom (Floor-to-Ceiling) ($h_{head,R}$)	3000	mm
	Top Floor Window Height ($h_{window,R}$)	2500	mm
	Top Floor Height Above Window ($h_{lintel,R}$)	500	mm
Design Criteria	Absolute Deflection Limit for Joists ($\Delta_{tim,joists}$)	10	mm
	Absolute Deflection Limit for Bearers & Lintels ($\Delta_{tim,beams}$)	10	mm
	Default Bearing Length (l_b)	90	mm

Loads & Geometry: Loads

- Default loads get passed on to new calculators you create
 - Roof, floor, and wall sections
 - Set *either* the dropdowns *or* the manual table

- Power-up: Have special serviceability checks?
 - Set custom load combinations!

Default Floor Loads

Floor Permanent Load: Floor: AS 1720.3: Timber Construction (Typical Floor... ▼
 Floor Imposed Load: A1: Self-Contained Dwelling: General Areas, Private ... ▼
 Floor Default Loads: $loads_{floor} =$

Permanent Load w_G (kPa)	Imposed Load w_Q (kPa)	Alternate Imposed Load P_{Q2} (kN)
0.4	1.5	1.8

Character of Imposed Load: Floors: Residential and Domestic ▼

Default Wall & Window Loads

Load Cases

Strength Load Cases: AS 1170.0:2002 ▼
 Service Load Cases: Custom ▲
 Short-Term Serviceability Load Cases: $LC_{s_{serv}} =$ AS 1170.0:2002, Supp1 ▼
Custom ▼

Load Case Label	G	Q	Character of Q Factor	Ws_dn	Ws_up	Es	Ss
G, Ws_up	1	0	▼	0	1	0	0
G, Q_st	1	1	*ψ5 ▼	0	0	0	0

Loads & Geometry: Wind Load

- Two options:
 - 1. AS 4055 class
 - 2. Full AS 1170.2 calculation
- Power-up: Use 1170.2 for a more accurate 4055!
 - Refer to the “AS 4055 Equivalent”, set that in Project Defaults

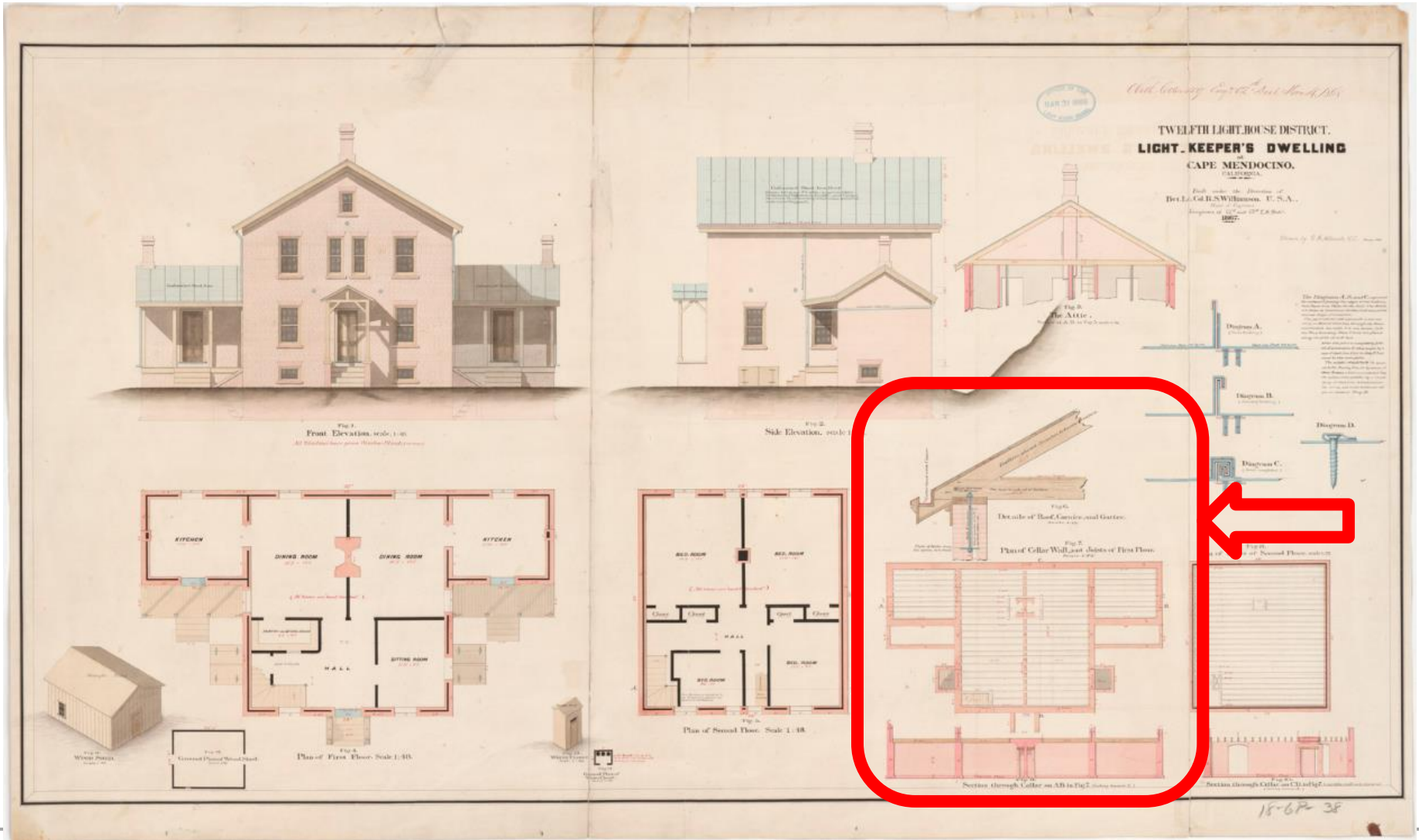
The screenshot shows the Wind1 software interface. On the left, the 'Key Inputs' section includes: Structure Importance Level (2: Normal Structures), Design Working Life (NCC 2019 (-50 years)), Wind Region (AS), Building Directions, Dimensions, and Compass Directions (with a diagram showing wind directions and angles), Compass Orientation of "Front" of Building ($\beta_{0=0} = 0$ deg), Breadth of Building (Left to Right) ($b = 25$ m), Depth of Building (Front to Back) ($d = 15$ m), Average Roof Height of Building ($h = 15$ m), Roof Type (Gable/Monoslope), Roof Pitch ($\alpha = 22.5$ deg), Maximum Ratio of Area of Openings on One Surface to Sum of Total Open Area of All Other ($A_o / \sum A_o$)_{max} = 2, and Surface on Which Largest Openings Area Exists (Front).

The 'Summary' section on the right shows: Design Regional Wind Speed ($V_{Rt} = 45$ m/s), Maximum Design Site Wind Speed ($V_k = 40$ m/s), and AS4055 Wind Class Equivalent ($class_{AS4055} = N2.0$). A red circle highlights the AS4055 Wind Class Equivalent, with a red arrow pointing to it.

Below the summary are two graphs showing Site Wind Speed (m/s) and Design Wind Speed (m/s) versus wind direction. The top graph shows Site Wind Speed (m/s) for directions 'N', 'NE', 'E', 'SE', 'S', 'SW', 'W', 'NW'. The bottom graph shows Design Wind Speed (m/s) for directions 'Front', 'Right', 'Back', 'Left'. Both graphs show two lines: a red line for Ultimate Limit State and a green line for Serviceability Limit State.

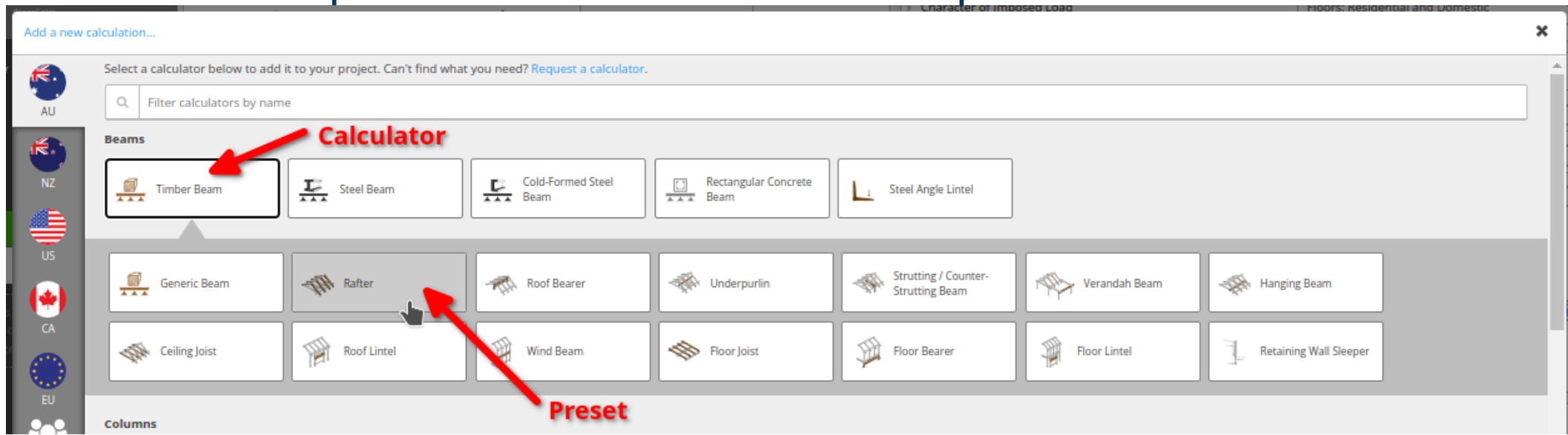
The screenshot shows the 'Wind Loads' summary panel. It includes: Wind Class (N2), Net Downward Pressure Coefficient ($C_{pt,down} = 0.63$), Net Uplift Pressure Coefficient ($C_{pt,up} = -0.99$), and Wind Tributary/Load Width ($LW_{wind} = 1000$ mm).

Identifying Members for Design

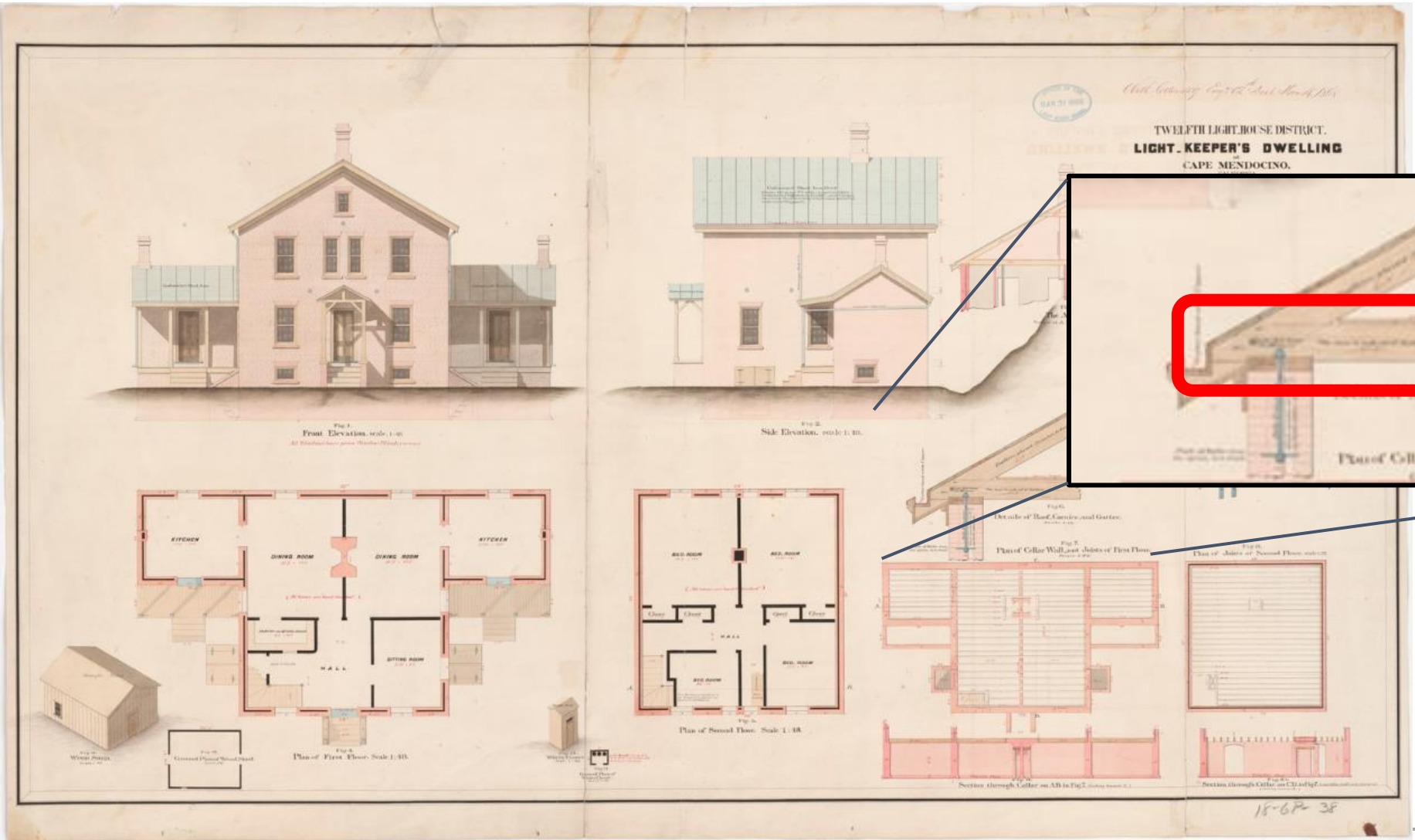


Identifying Members: Presets

- Most calculators in ClearCalcs have “presets”
 - It’s the same calculator - the engineering standard is the same
 - But preloaded with the most common inputs and your project defaults
- Power-up: Don’t see what you need?
 - Click “Request a calculator” and we can prioritise it!



Sizing Members Optimally



Sizing Members Optimally: Selector

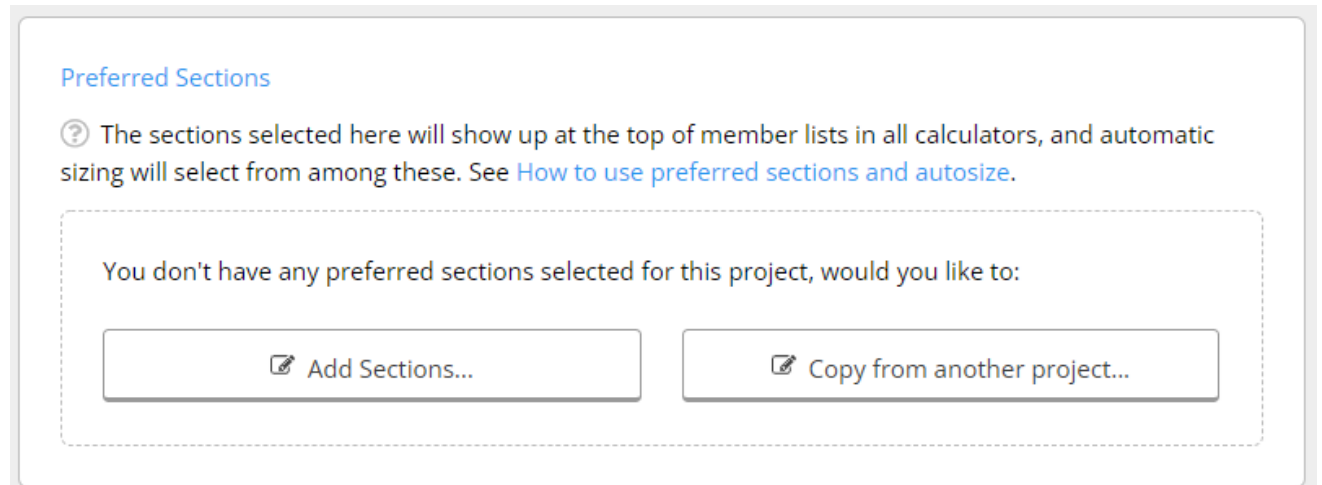
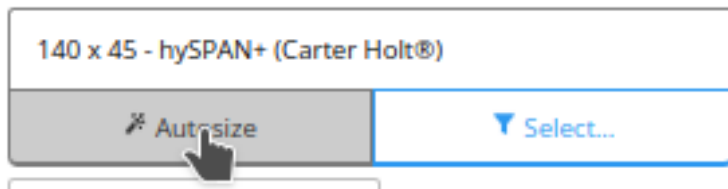
- Member Selector gives a quick view of every section
 - Filter it down by size, manufacturer, and more
- Power-up: Frequently use the same sections?
 - Set them as “Preferred Sections”, and they’ll be at the top of the list!

The screenshot shows the 'Member Selector' interface. It includes filter sections for 'Stress Grade', 'Max Depth', and 'Manufacturer'. A dropdown menu for 'Manufacturer' is open, listing options like 'Hyne Timber, Pty Ltd', 'Innovative Timber Ideas (ITI)', 'LP Building Products', 'MetsaWood', 'ProLam', 'Tilling Timber, Pty Ltd', and 'Wesbeam'. Below the filters is a table of timber sections with columns for grade, mfr, ρ (kg/m³), E (N/m²), I (m⁴), X_e , δ_1 , δ_2 , and Governing limit. The first row is highlighted with a checkmark and a star.

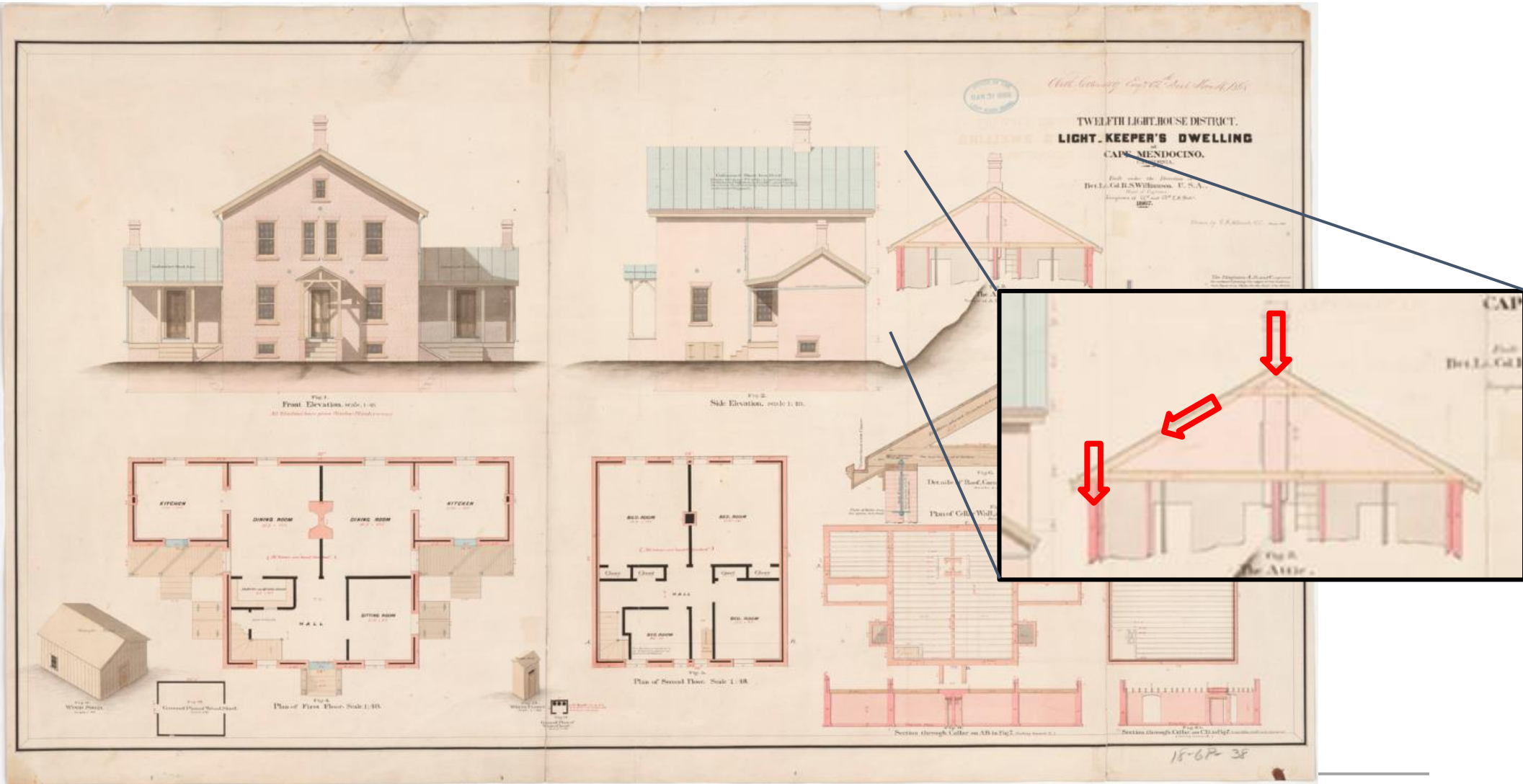
	grade	mfr	ρ (kg/m ³)	E (N/m ²)	I (m ⁴)	X_e	δ_1	δ_2	Governing limit		
✓ 140 x 45 - hySPAN+ (Carter Holt®)	hySPAN+	Carter Holt Harvery Woodprod	650	10 300 000	0		49%	23%	56%	43%	56%
★ 90 x 45 MGP10	MGP10	Generic (WPV standard)	510	2 730 000	MGP		256%	66%	290%	225%	290%
★ 300 x 45 - hySPAN (Carter Holt®)	hySPAN	Carter Holt Harvery Woodprod	650	101 000 000	0		21%	11%	6%	5%	21%
★ 400 x 63 - hySPAN (Carter Holt®)	hySPAN	Carter Holt Harvery Woodprod	650	336 000 000	0		6%	6%	2%	1%	7%
★ 90 x 45 - hySPAN+ (Carter Holt®)	hySPAN+	Carter Holt Harvery Woodprod	650	2 730 000	0		95%	36%	208%	161%	208%
★ 190 x 45 - hySPAN+ (Carter Holt®)	hySPAN+	Carter Holt Harvery Woodprod	650	25 700 000	0		33%	17%	22%	17%	33%
75 x 38 F4 unseasoned, White Cypress	F4	Generic (TQLD standard)	850	1 340 000	White Cypress		581%	164%	✗	755%	✗
100 x 38 F4 unseasoned, White Cypress	F4	Generic (TQLD standard)	850	3 170 000	White Cypress		362%	124%	619%	320%	619%
125 x 38 F4 unseasoned, White Cypress	F4	Generic (TQLD standard)	850	6 180 000	White Cypress		256%	99%	319%	164%	319%

Sizing Members Optimally: Autosize


- Set your “Preferred Sections” on the Project Details page
- Skip the Member Selector entirely and one-click “Autosize”
 - ClearCalcs automatically selects the most structurally efficient section
 - = section closest to 100% utilisation without exceeding 100%
- Power-up: Same preferred sections as a previous project?
 - Just copy your preferred sections from it!









Following Your Load Path

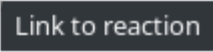


Following Your Load Path: Linking

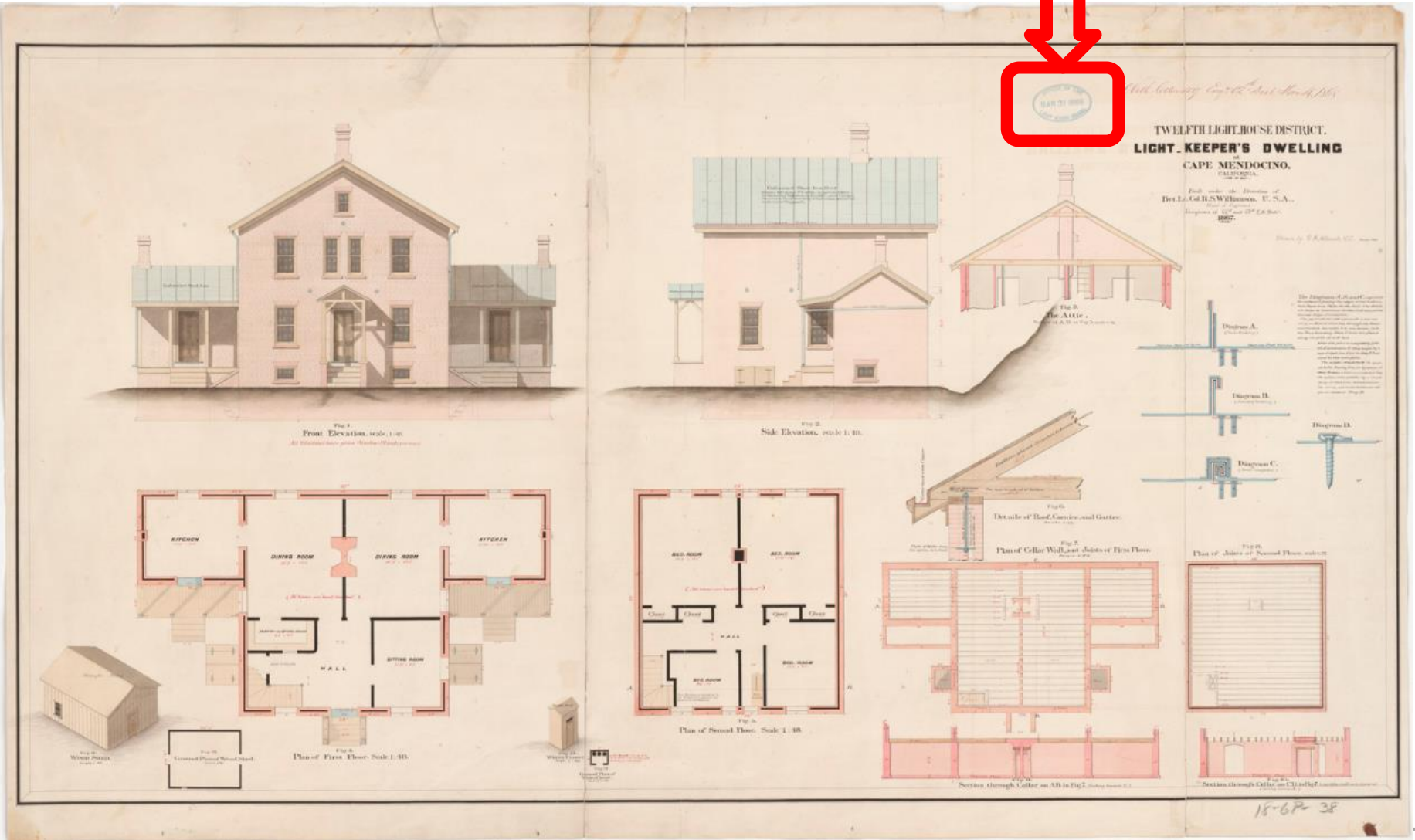
- Copy-pasting numbers is a waste of time
- Instead, click the chain () icon to link to another calculator
 - Results will automatically update if you change upstream sheets!
- Power-up: The sky's the limit!
 - You can create long and complex chains of load linking. ClearCalcs will still automatically update everything
 - (well, maybe the foundation's the limit actually)

Point & Moment Loads $P, M =$

Label	Location x (mm)	Load Magnitudes P, M	
B1-1	1000	Q: 0.114 kN, 0 kN m	View...  
B2-2	1500	G, Q, W_s _up/down, W_u _up/down	View...  
		G, Q	Edit...  

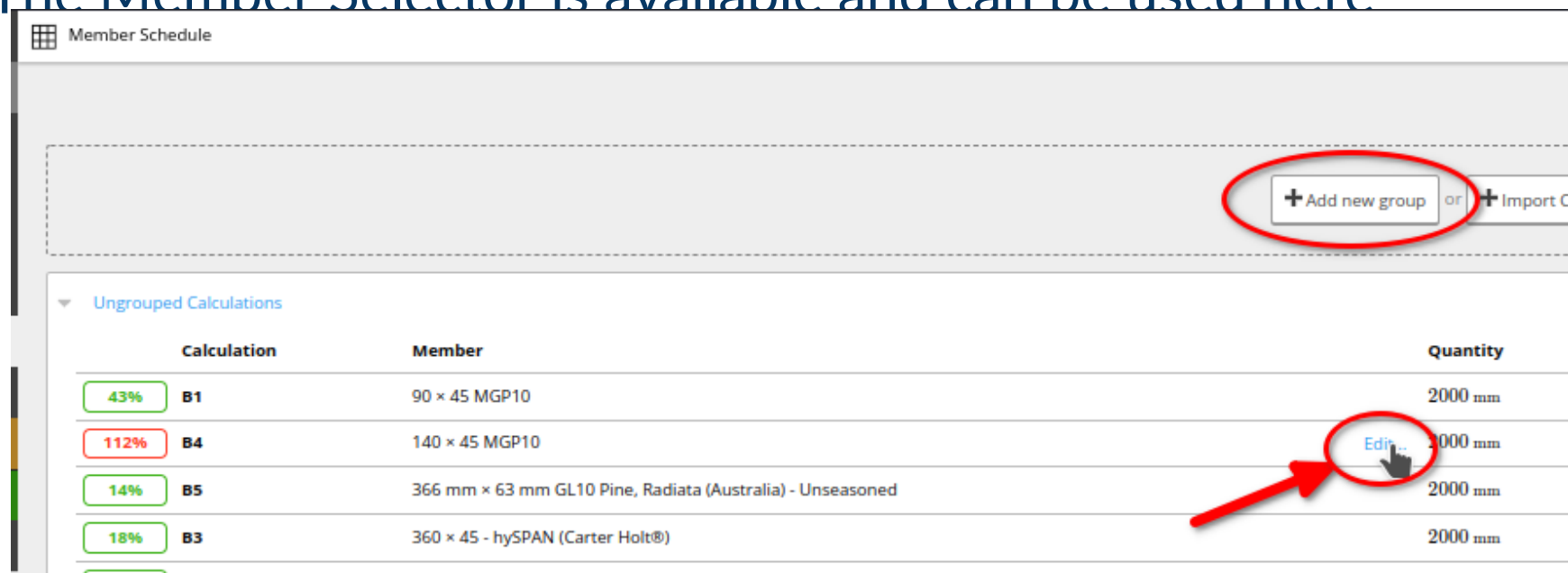


Submitting Your Work



Submitting Your Work: Organising

- Review everything designed in the Member Schedule
 - And re-order or organise the calculations into groups
- Check the quantity of every section type in the Quantity view
- Power-up: Make quick changes here too!
 - The Member Selector is available and can be used here



Member Schedule

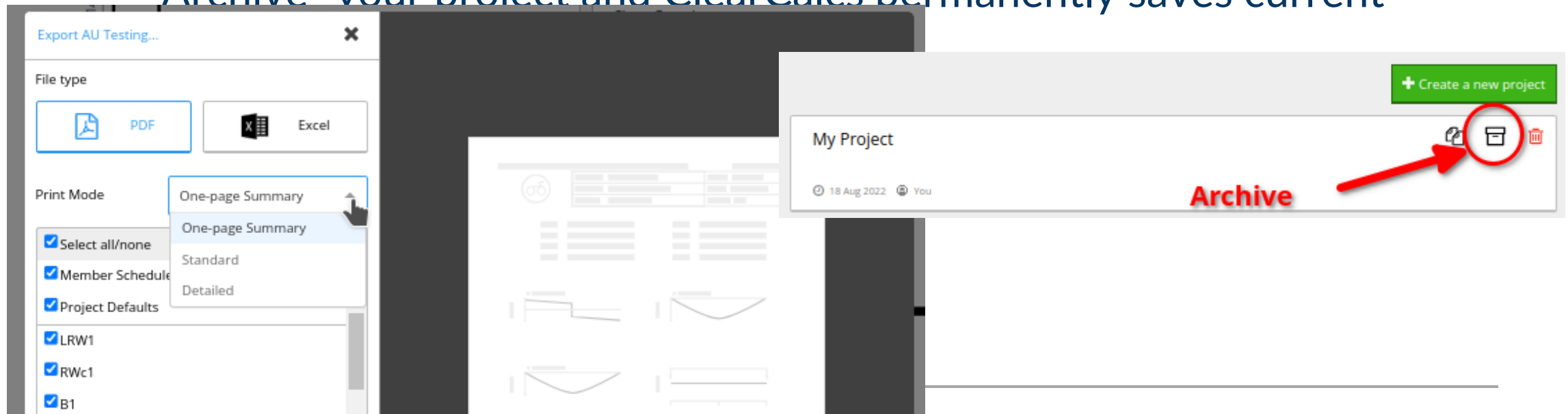
+ Add new group or + Import Cl

Ungrouped Calculations

Calculation	Member	Quantity
43% B1	90 × 45 MGP10	2000 mm
112% B4	140 × 45 MGP10	2000 mm
14% B5	366 mm × 63 mm GL10 Pine, Radiata (Australia) - Unseasoned	2000 mm
18% B3	360 × 45 - hySPAN (Carter Holt®)	2000 mm

Submitting Your Work: Printing

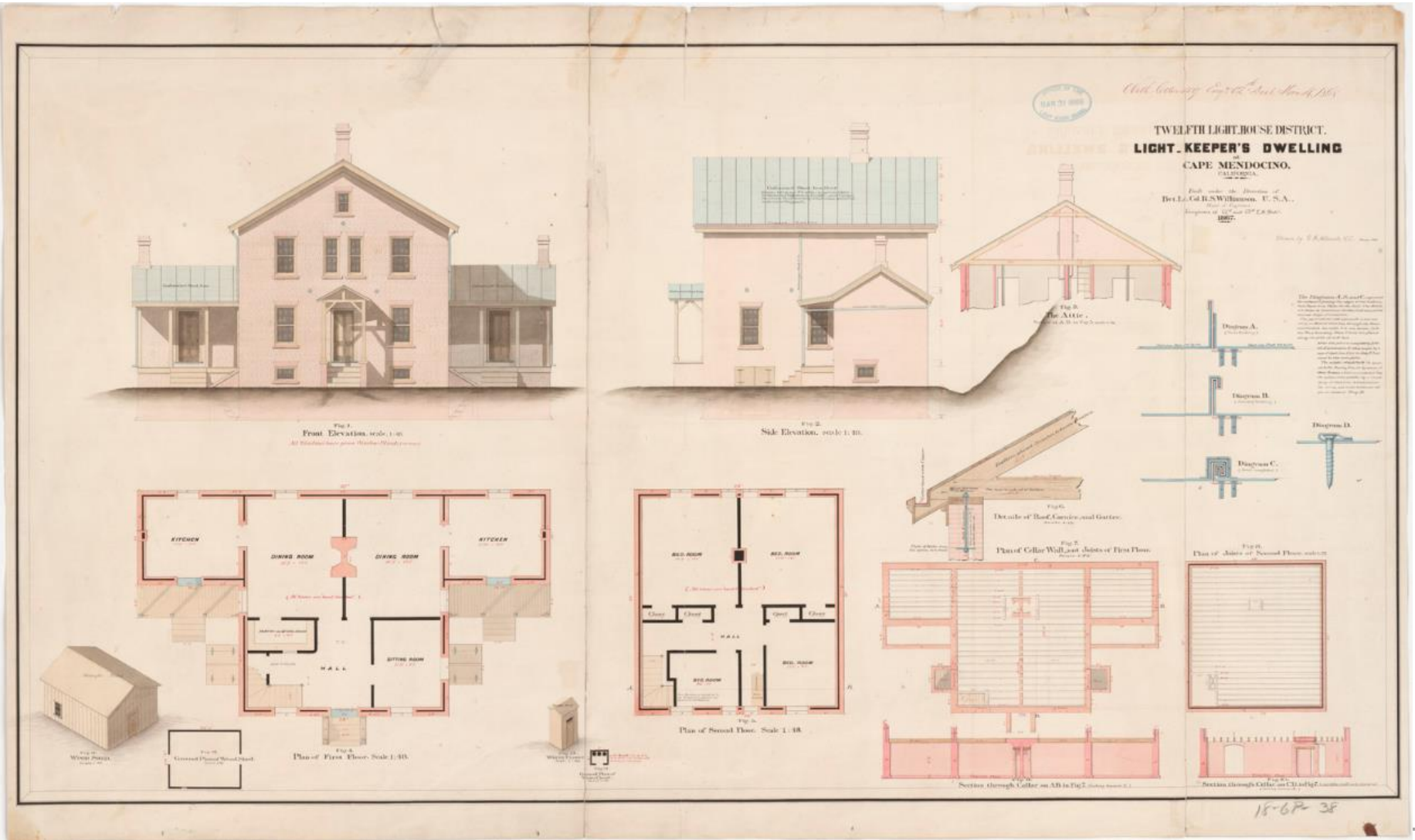
- Ready to submit your work?
- ClearCalcs offers 3 print modes: 1-page, standard, or detailed
 - If you need to justify your fee, just send the detailed calcs!
- Headers are based upon your Project Details
- Power-up: Finalised your project?
 - “Archive” your project and ClearCalcs permanently saves current



Worked Examples

How does the workflow look like in ClearCalcs

Light Keeper's Dwelling



Questions?



Appendix

About ClearCalcs

Happy Engineers Using ClearCalcs

ClearCalcs has been used in 4,500,000+ designs by a growing number of engineers across the globe.



"You are light years ahead of the competition on features and ongoing growth."

Don C.
Foundation Engineering Specialists, LLC

"Why didn't you just use ClearCalcs for that?"

Helen W. via Landon R.
Criterium Engineers

"The program basically does the work for you...Wow, I can finally throw away the last of my spreadsheets!"

Jason M.
J. Michael Engineering, PLLC



The ClearCalcs Team

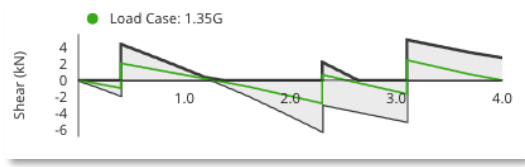
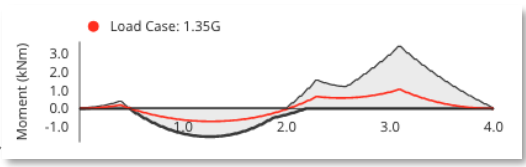
A growing team of passionate engineers, programmers, customer success specialists, product managers, marketers, and more!



What Sets Our Calculations Apart

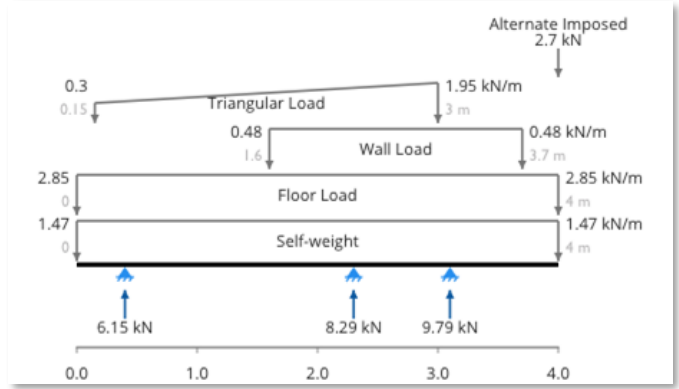
- **Live solutions**

- *Instantly see how every change you make affects the design, in all load cases*



- **Finite Element Analysis**

- *Get the most accurate results no matter what your configuration*



- **As simple or complex as you want**

- *Safely enter in only a few properties, or tune every parameter – it's up to you*

Key Properties

Member Type: 140 x 45 MGP10

Number of Members in Group/Laminate: $n_{com} = 1$

Member Orientation: Major Axis

Total Span Length: $L = 2000$

Modification Factors (AS1720.1, Cl 2.4)

Initial Moisture Content: $m_c = 15\%$

Moisture Content when Fully Loaded: < 25%

Equilibrium Moisture Content (Annual Average): $EMC = 15$

What Sets Our Design Process Apart

- **Member selector**
 - *Check every possible member in seconds*
- **Link your loads**
 - *No need to manually copy reactions into the next sheet – just create a link*
- **Simple traffic light indicators**
 - *See at a glance how close your design is to perfection*

Designation	M_d	V_d	δ_t	δ_s
70 x 35 F5 Seasoned SW	450%	91%	417%	752%
90 x 35 F5 Seasoned SW	273%	71%	198%	354%
120 x 35 F5 Seasoned SW	154%	53%	84%	150%
140 x 35 F5 Seasoned SW	113%	46%	53%	95%
190 x 35 F5 Seasoned SW	62%	34%	22%	38%

Link to reaction ✕

Roof Lintel RL8

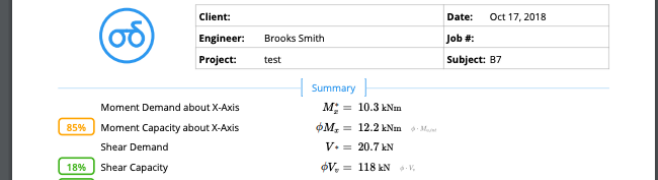
Support	Location (mm)	Governing Reactions R^* (kN)	Permanent Load Reactions R^*_G (kN)	Imposed Load Reactions R^*_Q (kN)
1	0	0.293	0.0667	0.133
2	60	0.293	0.0667	0.133

Summary

Moment Demand	$M^* = 2.14$ kNm	
Moment Capacity	$M_d = 2.33$ kNm	92%
Shear Demand	$V^* = 4.29$ kN	
Shear Capacity	$V_d = 9.24$ kN	46%

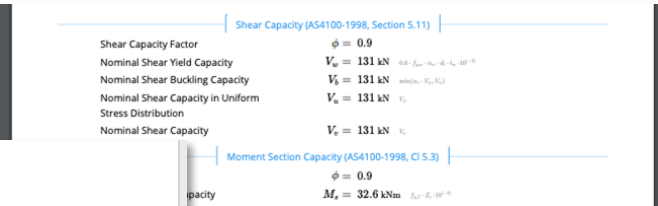
What Sets Our Platform Apart

- **Clean, clear printouts**
 - *Beautiful results your clients can understand*
- **See full detail for every field**
 - *References, equations, and more*
- **Rapid product updates**
 - *Receive new features and calculations within days, not years*

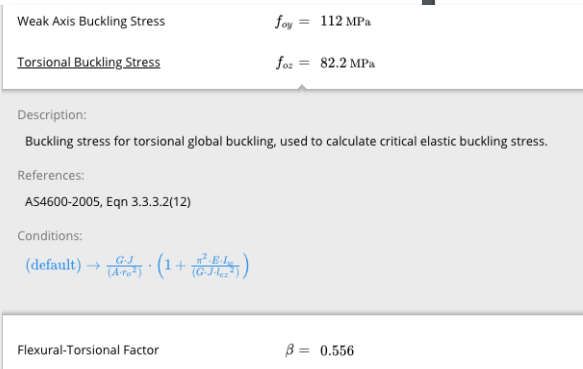


Client:		Date:	Oct 17, 2018
Engineer:	Brooks Smith	Job #:	
Project:	test	Subject:	B7

Summary	
Moment Demand about X-Axis	$M_x^d = 10.3 \text{ kNm}$
Moment Capacity about X-Axis	$\phi M_x^c = 12.2 \text{ kNm}$ $\phi = 85\%$
Shear Demand	$V^d = 20.7 \text{ kN}$
Shear Capacity	$\phi V^c = 118 \text{ kN}$ $\phi = 18\%$



Shear Capacity (AS4100-1998, Section 5.11)	
Shear Capacity Factor	$\phi = 0.9$
Nominal Shear Yield Capacity	$V_n = 131 \text{ kN}$ <small>(Eq. 5.11.1)</small>
Nominal Shear Buckling Capacity	$V_s = 131 \text{ kN}$ <small>(Eq. 5.11.2)</small>
Nominal Shear Capacity in Uniform Stress Distribution	$V_u = 131 \text{ kN}$ <small>(Eq. 5.11.3)</small>
Nominal Shear Capacity	$V_c = 131 \text{ kN}$ <small>(Eq. 5.11.4)</small>




Weak Axis Buckling Stress	$f_{oy} = 112 \text{ MPa}$
Torsional Buckling Stress	$f_{oz} = 82.2 \text{ MPa}$

Description:
Buckling stress for torsional global buckling, used to calculate critical elastic buckling stress.

References:
AS4600-2005, Eqn 3.3.3.2(12)

Conditions:
(default) $\rightarrow \frac{GJ}{(A \cdot r_o^2)} \cdot \left(1 + \frac{\pi^2 E I_{yy}}{(GJ L_{zz}^2)} \right)$

Flexural-Torsional Factor	$\beta = 0.556$
---------------------------	-----------------



What's New - Improved connections, diagrams, and more!

New year, stacks of new ClearCalcs updates! We're excited to kick off 2019 with a bang with a bevy of new and imminent updates including new calculation templates and features.

[Log in now](#) and have a look, or read below to find out more.

Envelope diagrams

It's now easier than ever to graphically discern the shear, moment, and deflection forces acting on beams, with all diagrams updated to a full



Key Advantages

ClearCalcs is designed for the modern efficiency focused engineering practice



More accurate results.

Get far better quality and efficiency than spreadsheets with highly accurate FEM calculations and dynamic load path tracking between members.



Easy to understand.

Work faster and impress clients and checkers with professional, easy to understand calculations and quick export to PDF.



Never lose work again.

ClearCalcs was built in the cloud. That means we automatically save your work as you type and keep it securely backed up on our servers.



Help when you need it.

Need help? Our customer support is built right in to the platform. With a single click you can talk to one of our talented engineers.



Save time.

Our wide range of templates and easy linking, duplication, and export are all designed to help automate creation of repetitive calculations.



Always have access.

Shared licenses and lock-outs are a thing of the past! Our simple pricing model makes it easy to give everyone access to ClearCalcs when they need it.



Easy collaboration.

No more USBs or sending files over email! Everything is shared inside ClearCalcs so you can easily collaborate on projects.



Upgrades are always free.

We added over 250 updates to ClearCalcs last year. All of our users had them as soon as they were released, and we didn't charge them a cent extra.



Mobile. Tablet. Desktop.

ClearCalcs was designed to work on any modern device. Nothing to download or install, all you need is a web browser.