



Using Reactions

Structural Toolkit V5.2 and later has the ability to apply reactions from previously designed steel and timber roof and floor members.

Member reactions are stored in the member file and retrieved during the loading process. The reactions are tracked on the fly during design time ie. When a reaction changes due to a changed loading condition, the dependent documents are automatically updated, even if they are not open at the time.

If you have loaded an older version and want to start using reactions, use the [Project] > [Recalc Reactions]. Refer to Refreshing the Reaction Database.

Applying a reaction

To add a reaction, highlight the load cases you want to add from another member ie. DL/LL/WL in the point loads entry section. Then right click and select [Add reaction].

Loadings

Roof area (A) = 32.0 m² Apply wind reduction = Y (Y

LL = 1.8/A+0.12 ≥ 0.25 = 0.25 kPa AS 1170.1 T3.2 Roof reduction (ka) = 0.89 A:

Ratio Ws/Wu = 0.68 (R

Uniform dead loads

Roof dead load (wdl) = 0.40 kPa * 8000 mm + kPa

Other dead load (wdl) = kPa * 8000 mm + kPa

Down only load (wdl) = kPa * mm + kPa

Include S.Wt = Y (Y)es,(N)o S:

Σwdl.up = 3.52 kN/m

Uniform live loads

Roof live load (wll) = 0.25 kPa * kPa

Other live load (wll) = kPa * kPa

Alternate point live load = 1.40 kPa

Uniform wind loads

Ult. wind load (Wu) = 0.75 kPa

Cp,e = 0.7

Point loads

Dead load (pdl) = kPa

Live load (pll) = kPa

Wind load (pwl*) = kPa

w* = 1.2*wdl + 1.5*wll

p* = 1.2*pdL + 1.5*pll

w.up* = 0.9*wdl.up + wwI*

p.up* = 0.9*pdL + pwl*

M*

M.up*

1000 m

Rdl =

Rll =

Rwl* =

R.dn* =

R.up* =

Info Design

Context menu options:

- Cut
- Copy
- Paste
- Paste Special...
- Clear Contents
- Insert Comment
- Insert Custom Comment
- Edit Comments
- Recalc Reactions
- Track (Hover to Show)
- Add Reaction
- Reset to Default:
- Reset All

You can also add reactions to the Analysis.



onc.,(CS)comp. steel,(O)ther Density = 78.6 kN/m³
 E = 200000 MPa

	DL	LL	
FB02	1.1	3.2	: L L
Σ	1.1	3.2	

Point loads (kN)

	FB02	PL 2	PL 3
Dead load (pdl) =	1.13		
Live load (pll) =	3.20		
Pos. from LHS (mm) =	1000		
Ultimate load (p*) =	6.16		

0.00 Include S.Wt = Y (Yes),
 Loadcase = C (Default)

1.00
0.60
0.43

Position of result (x) = 2400 mm

1.20*G+1.50*Q analysed

Max	At	Min	At	U
28.23	2250	0.00	0	
25.75	0			
3.91	2400	0.00	0	
5.39	2400	0.00	0	
7.93	2400	0.00	0	

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After the right click, the Add Reaction dialog box will appear from which you can select the member the reaction is to come from, along with the member end (right, left or centre for double span timber beams, or the maximum or minimum reaction). Note the maximum excludes a centre reaction if it is a double span timber beam.

Add Reaction ✕

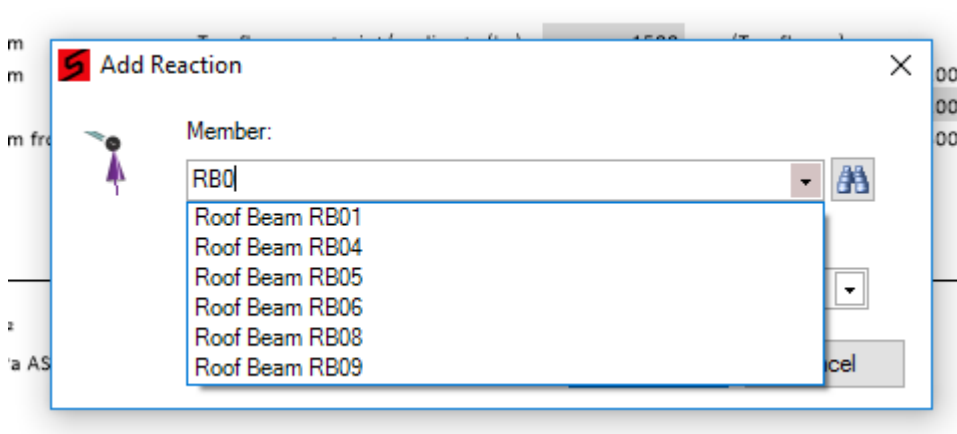
Member:

Loadcase:

End:

- Left (36.0/5.9/-19.8)
- Right (36.0/5.9/-19.8)
- Max (36.0/5.9/-19.8)
- Min (36.0/5.9/-19.8)

You can search for a member by typing part or all of the member name in "Member" section and selecting the beam from the dropdown list.



Once you have selected the member and end to insert as a point load, press [OK] and the reaction will be inserted along with an automatically formatted comment showing the make-up of load with the end used.

Ult. wind load (Wu) = 0.75 kPa * 8000 mm
 Cp,e = 0.7 Cp,i = 0.5

Point loads

	DL	LL	WL	
Dead load (pdl) = 36.0 kN	RB01 36.0	5.9	-19.8	: L L L
Live load (pll) = 5.9 kN	Σ 36.0	5.9	-19.8	

Wind load (pwl*) = -19.8 kN (up) (Point load position within span)

$w^* = 1.2 \cdot wdl + 1.5 \cdot wll = 7.22 \text{ kN/m}$ Rdl.max =
 $p^* = 1.2 \cdot pdl + 1.5 \cdot pll = 52.13 \text{ kN}$ Rll.max =
 $w_{up}^* = 0.9 \cdot wdl_{up} + wwl^* = 3.57 \text{ kN/m (up)}$ Rwl*.max =

The above process can be repeated to add the reaction from as many members as required.

Additional point loads can be added by double clicking in the load cell and typing "+ <additional load>" after the formula within the cell. Do not alter this formula as this will cause an error within your reactions. You can also subtract, multiply or divide a load. These changes will automatically appear as an "Extra" in the comment.

Cp,e = 0.7 Cp,i = 0.5 w.wl* = -6.74 kN/m (up)

Point loads

	DL	LL	WL	
Dead load (pdl) =	RB03 4.9	2.7	-9.3	: L L L
Live load (pll) = 23.7 kN	FB01 7.2	15.0	-	: L L L
Wind load (pwl*) = -29.1 kN	Σ 48.1	23.7	-29.1	

$w^* = 1.2 \cdot wdl + 1.5 \cdot wll =$ Rdl.max = 43.11 kN
 $p^* = 1.2 \cdot pdl + 1.5 \cdot pll = 93.18 \text{ kN}$ Rll.max = 21.74 kN
 $w_{up}^* = 0.9 \cdot wdl_{up} + wwl^* = 3.57 \text{ kN/m (up)}$ Rwl*.max = -35.29 kN

Point load description: "DL","Left")+5

A custom comment can be assigned to the Extra, which will remain if you alter the additional loads. Take care not to modify text elsewhere (extra comments are recorded after the colon to the end of the line).



wind load (wu) = 0.75 kPa 8000 mm
 Cp,e = 0.7 Cp,i = 0.5

Point loads

	DL	LL	WL	
Dead load (pdl) = 53.1 kN	RB01 36.0	5.9	-19.8	: L L L
Live load (pll) = 23.7 kN	RB02 7.2	15.0	-	: L L L
Wind load (pwl*) = -29.1 kN	FB01 7.2	15.0	-	: L L L
$w^* = 1.2*w_{dl} + 1.5*w_{ll}$	Extra 5.0	0.0	0.0	: Girder
$p^* = 1.2*p_{dl} + 1.5*p_{ll}$	Σ 53.1	23.7	-29.1	
$w_{up}^* = 0.9*w_{dl.up} + w_{wl}^*$		3.57 kN/m (up)		

Refreshing the reaction database

The management of reactions is quite complex, and on occasions it may be necessary to refresh all reactions. This may be necessary if you get a circular reference message, or the tracking on the reactions summary or context [Track] appears incorrect. It may also be required if loading an older version that did not support reactions.

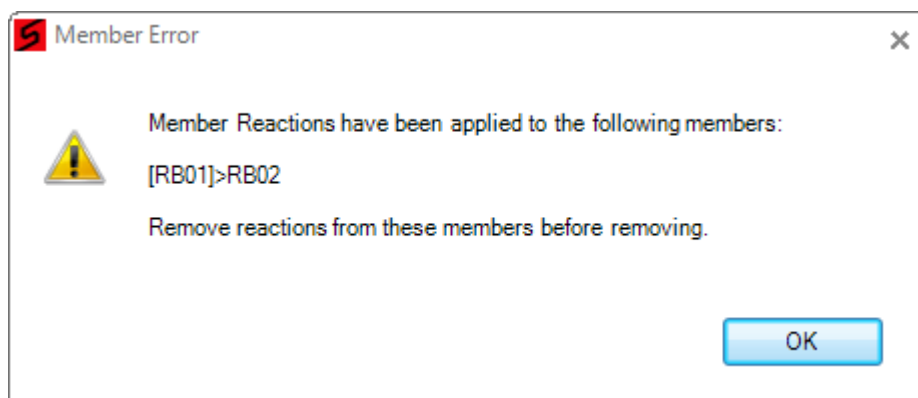
To do this, select the [Project] > [Recalc Reactions].



Removing dependent members

If you try and remove a member that is dependent on another member, you will get a dialog box advising that this can not be done.

To remove the member, the referenced reactions must be removed from the dependent member designs first.





Deleting reactions

Select the cell containing the reaction and right-click to show the context menu. Hover over the [Reactions:] item to show the order of the equation.

Uniform live loads

Floor live load (wll) = 1.50 kPa
 Partitions (wll) = kPa
 Alternate point live load = 1.80 kN

	DL	LL	
RB01	1.2	1.4	: L L
RB02	1.3	1.4	: R R
Σ	2.5	2.8	

Point loads

Dead load (pdl) = 2
 Live load (pll) = 2

Short term LL factor (Ψ_{su})
 Long term LL factor (Ψ_{lu})
 $w_{dl}^* = 1.2 * w_{dl} + 1.5 * \Psi_{lu} * w_{ll}$
 $w^* = 1.2 * w_{dl} + 1.5 * w_{ll}$
 $p_{dl}^* = 1.35 * (p_{dl} + \Psi_{lp} * p_{pl})$
 $p^* = 1.2 * p_{dl} + 1.5 * p_{pl}$

Bending and Shear Capacity - Cl 3.2.1 & Cl 3.2.2

Member = 240mm x 4
 Description = F17k season
 Design depth (dD) = 2
 Design width (dW) =

$S_1 = 1.25 * dD /$
 Strength red

$\phi M(dl) = \phi * (k_1 = 0.57) * k_4 * k_6$
 $\phi M = \phi * k_1 * k_4 * k_6$

Context menu options:
 Cut
 Copy
 Paste
 Paste Special...
 Clear Contents
 Reinsert Reaction Comment
 Insert Custom Comment
 Edit Comments
 Hide All Comments
 Reactions: (Hover to Show)
 Recalc Reactions
 Track (H)
 Add Reaction
 Reset to Default:
 Reset All
 Equ: (Hover to Show)

Reaction equation tooltip:
 $= (RB01:DL:Left) + (RB02:DL:Right)$

Editing the cell, manually delete the "Reaction(...)" part of the equation associated with the reaction in each cell. The comment will automatically update.

	DL	LL	
RB01	1.2	1.4	: L L
RB02	1.3	1.4	: R R
Σ	2.5	2.8	

1 members $\Sigma w_{ll} = 1.00$

Point loads

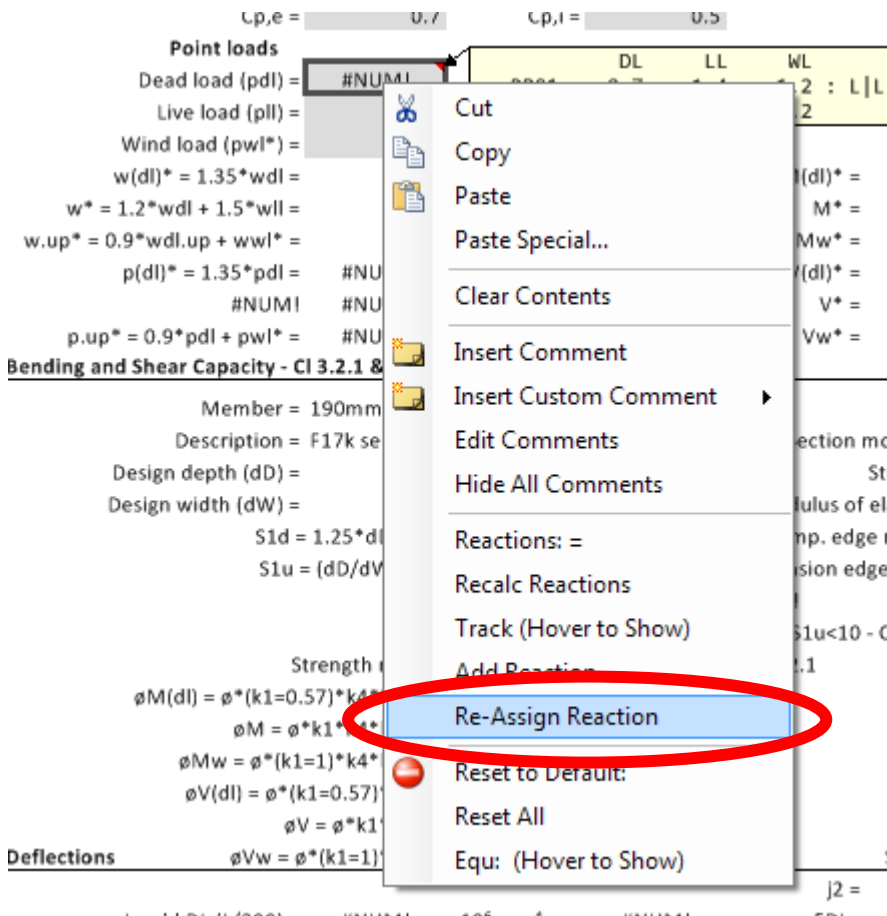
Dead load (pdl) = 2.80 kN
 Live load (pll) = 2.80 kN

Shear using PL at support = N (Yes, No)

Reaction equation: $= \text{Reaction}("519-150617-100742", "DL", "Left") + \text{Reaction}("26-150617-115822", "DL", "Right")$

Re-assigning invalid Reactions

In the event that a dependent document can not be found, you can use the [Re-Assign Reaction] to re-link the document.



Deleting a reaction comment

Reaction comment can be deleted if you do not want to have it displayed. Select the comment frame, and select the [Delete Comment] from the context menu.

Reinserting a reaction comment

To re-insert the comment associated with a reaction, select the cells for commenting ie. the DL/LL/WL fields and select [Reinsert Reaction Comment] from the context menu.

Reaction Summaries

Summaries of the reactions and tracking (ie. What load goes to where) can be produced in landscape, portrait, or excel formats.

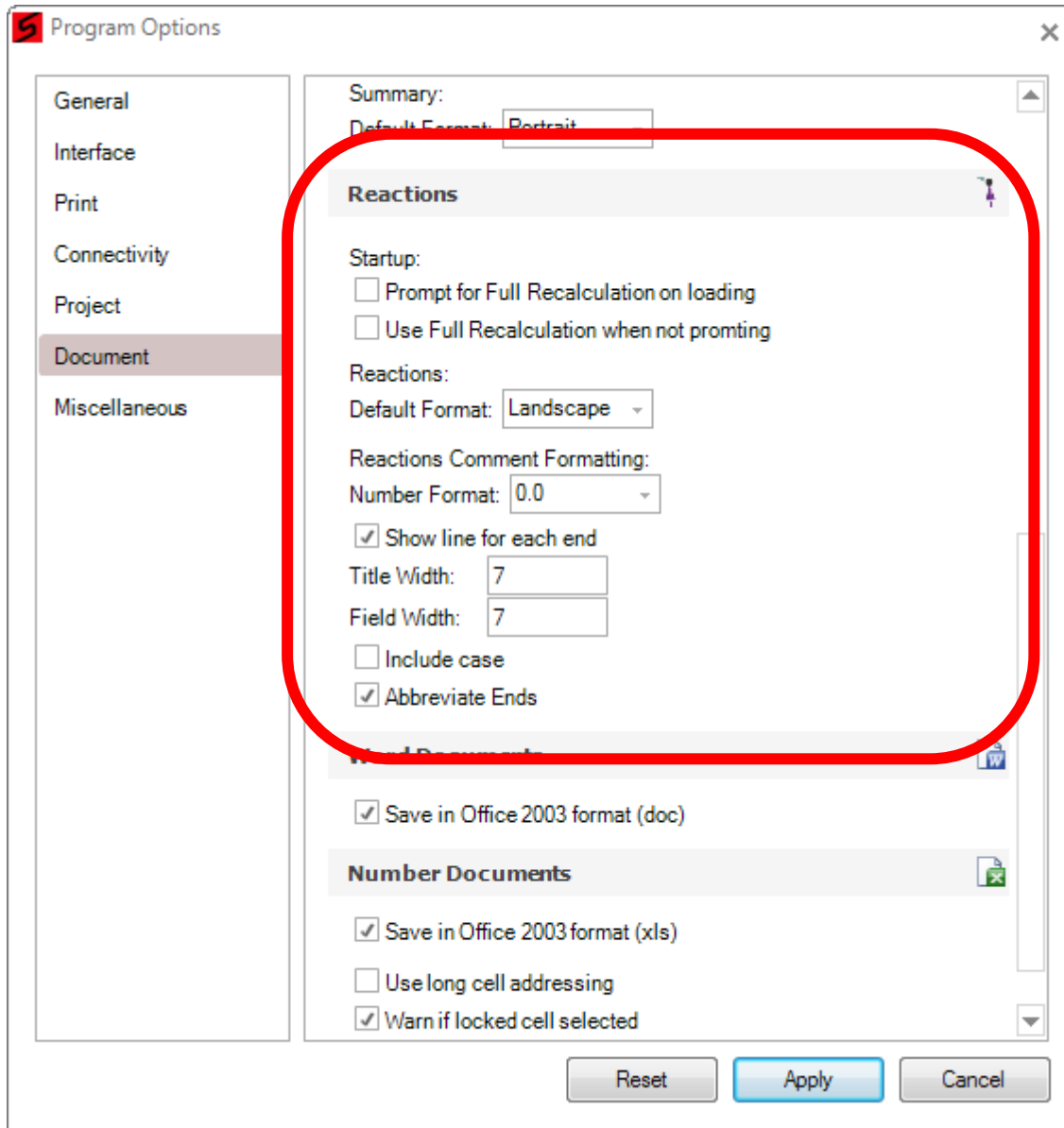
The summary includes the reactions at each end (Dead, Live and Wind (ult.)), if applicable. Combination reactions are not displayed.

In the second section of the summary, reactions are tracked showing the path of reactions from other members and to other members.



Options

Options for the Reactions are found in [File] > [Options] > Documents > Reactions and enables customising of the automatic reaction comment.



To use the full recalculation method on loading (a little slower), select the “Use Full Recalculation when not prompting”.



Tips

Naming members

When naming members, avoid adding text after the member designation. Use a bracketed small entry if necessary, but preferably use the following:

Roof Beam RB01a > Shows as "RB01a"

Roof Beam RB01b > Shows as "RB01b"

Try to avoid text after the member as this will not format the reaction summary properly

Roof Beam RB01 Alt > Shows as "Alt"

Roof Beam RB01 Steel > Shows as "Steel"

Note that text within the brackets is abbreviated as:

Roof Beam RB01 (Alt) > Shows as "RB01*"

Roof Beam RB01 (Steel) > Shows as "RB01*" (also!)

Renaming members

If you rename a member used by another member design, the referenced name will not automatically update. To update the referenced names, either re-insert the reaction comment, or perform a Recalculation of reactions (see Refreshing the reaction database).