

TowGeom User Manual

Tower geometry, clearance and detailing
Illustrated workflows and input reference

TowGeom 3.6.08.0

Manual 1.1.1 · Reviewed 2026-10-20

Customer reference · Includes clearly labeled Developer and integration features.
Use project specifications when selecting engineering requirements.

Contents

1. Getting started
2. Files, specifications and libraries
3. Tower geometry inputs
4. Model viewer and context menus
5. Complete clearance workflow
6. Validation, Run and output files
7. Vistār detailing
8. Exports and external integrations
9. Settings and preferences
10. Troubleshooting and quick reference

Links and PDF bookmarks navigate to each chapter. Screenshots show the documented build and the approved training examples.

Getting started with TowGeom

TowGeom assembles a tower from panel patterns, dimensions and project specifications. Use it to enter tower geometry, inspect the three-dimensional arrangement, check clearance inputs and produce the files used in the next stage of your work. Vistār adds member-level detailing and downstream model output after a completed design-output workbook is available.

This manual describes TowGeom 3.6.08.0. Some controls depend on the active project, enabled modules and application mode. A disabled button usually indicates that its prerequisite is not yet available. Developer controls are identified explicitly in the relevant chapter.

The working sequence

For a new tower, work through the following sequence. For an existing tower, begin by checking its library, specifications and units before editing it.

1. Choose the panel **Library File** and the **Project Specs** source in **Settings** → **Browse Files**.
2. Create a project with **New**, or open its `.tgi` file with **Open**.
3. Enter or review the tower data in **Slopes**, **Panels** and, when required, **Extensions**.
4. Inspect the main 3D model and the selected tower combination.
5. Enable and complete the clearance module when clearance drawings or checks are required.
6. Select **Validate** and resolve the reported errors and relevant warnings.
7. Save the input file and use **Run** to generate outputs.
8. If using Vistār, complete the design-report information in the matching output workbook, use **Upload Output**, then review the detailed model in **IFC Viewer**.
9. Apply member-detailing changes, validate the arrangement and use **Save Inputs** to retain Vistār inputs before creating downstream outputs.

Saving, generating outputs and applying Vistār edits are different operations. A saved tower input does not prove that its output workbook is current, and a changed value in the IFC Viewer does not become a saved detailing input until the appropriate Apply and Save steps are complete.

Find your way around the main window

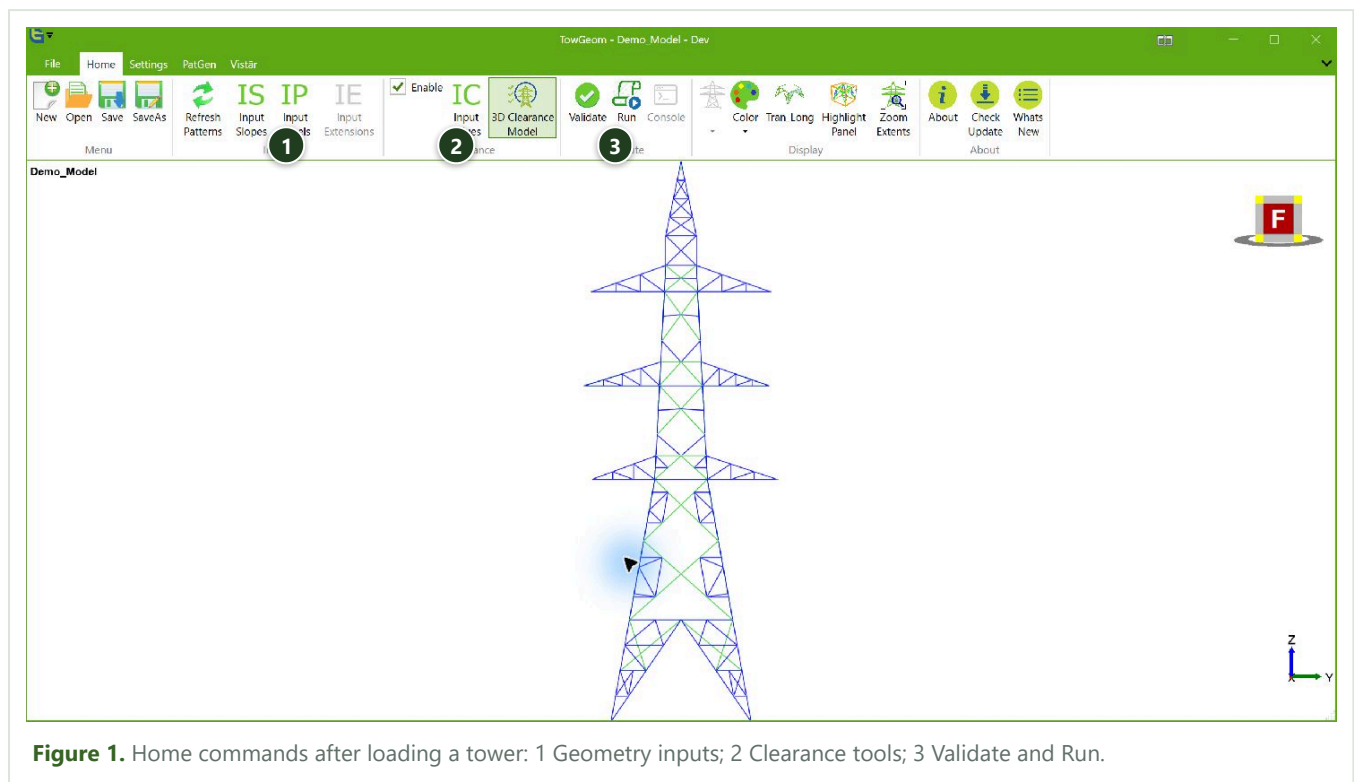


Figure 1. Home commands after loading a tower: 1 Geometry inputs; 2 Clearance tools; 3 Validate and Run.

The ribbon groups commands by purpose. The model occupies the main viewing area; input panels open alongside it so that you can compare the entered dimensions with the resulting tower. The model title helps identify the active project. An unsaved new project begins as **Untitled***.

Area	What you use it for
File	New, Open, Save, SaveAs and Exit.
Home → Menu	The same everyday file commands, with keyboard shortcuts.
Home → Inputs	Refresh the pattern library and open Slopes, Panels or Extensions inputs.
Home → Clearance	Enable clearance work, open Input values and display the 3D Clearance Model .
Home → Execute	Validate inputs, Run output generation and view the recent run in Console.
Home → Display	Choose a tower combination, coloring, elevation visibility, panel highlighting and Zoom Extents.
Settings	Select files and change General application settings.
PatGen	Open the pattern editor and export the patterns used by the active tower.
Vistär	Upload design output, open IFC Viewer and create detailing outputs or update connected models.

Open input areas through the ribbon or their tabs. **Input Extensions** becomes available when **With Extensions** is selected. Commands associated with a generated or uploaded model become available only after the corresponding data has been prepared.

A first practice project

Use a copy of the supplied demo files so that you can repeat each exercise from a known starting point. Keep the original input and any accompanying library, output workbook and `.tgvi` sidecar together.

1. Open **Settings** → **Browse Files**.
2. Select the installed `Library.plib` for the standard demo towers. For the Vistār exercise, use `IFC_Test_Library.plib` supplied with `IFC_Test.tgi`.
3. For an existing demo, choose **If any input file is opened, select Project Specs sheet from the input file**.
4. Select **OK**, then **Home** → **Open** and choose `Demo_Model.tgi`.
5. Select **Zoom Extents** if the complete tower is not visible.
6. Open **Input Slopes** and **Input Panels** to compare the tower dimensions and pattern choices with the model.
7. Select **Validate**. Read the messages before attempting **Run**.
8. Use **SaveAs** to create your practice input under a new name.

The additional demos illustrate different arrangements: `Demo_Horz.tgi` for horizontal tower geometry, `Demo_Aux.tgi` for auxiliary arrangements and `Demo_Clearance_S.tgi` for a suspension-clearance example. Use each with its intended library and embedded project specifications.

For Vistār, the practice set is `IFC_Test.tgi`, `IFC_Test_Library.plib`, `IFC_Test_Output.xlsm` and the accompanying `.tgvi`. The completed workbook includes the report information that Vistār needs. A freshly generated output workbook may need its design report completed before it is suitable for Upload Output.

Understand units before entering values

Read the unit suffix on the active input or column heading. TowGeom distinguishes main tower dimensions from smaller detailing dimensions. In a metric project, tower dimensions are normally displayed in metres and small detailing lengths in millimetres; imperial display uses the corresponding feet and inches. A unit change affects how values are displayed and entered, so use the visible suffix as the immediate reference.

Some external-data tables retain their own fixed units. The Vistār **Bolt Parameters** library uses millimetres. The design report's **Hole Diameter (cm)** field uses centimetres. Do not convert those values by interpreting them as the unit shown beside an unrelated tower input.

Everyday editing habits

Finish the active cell edit before changing tabs, validating or saving. For example, press Tab or click another cell after typing a value. Read any validation indicator that remains beside the input. A numeric-looking expression or a blank field may have a different meaning from a literal number, so follow the field instructions in the tower-input chapter.

After changing a panel pattern, inspect its geometry and additional inputs. A library pattern defines how members are arranged; tower dimensions define where the pattern is placed. Refresh the library after changing a pattern in PatGen, then review the tower again.

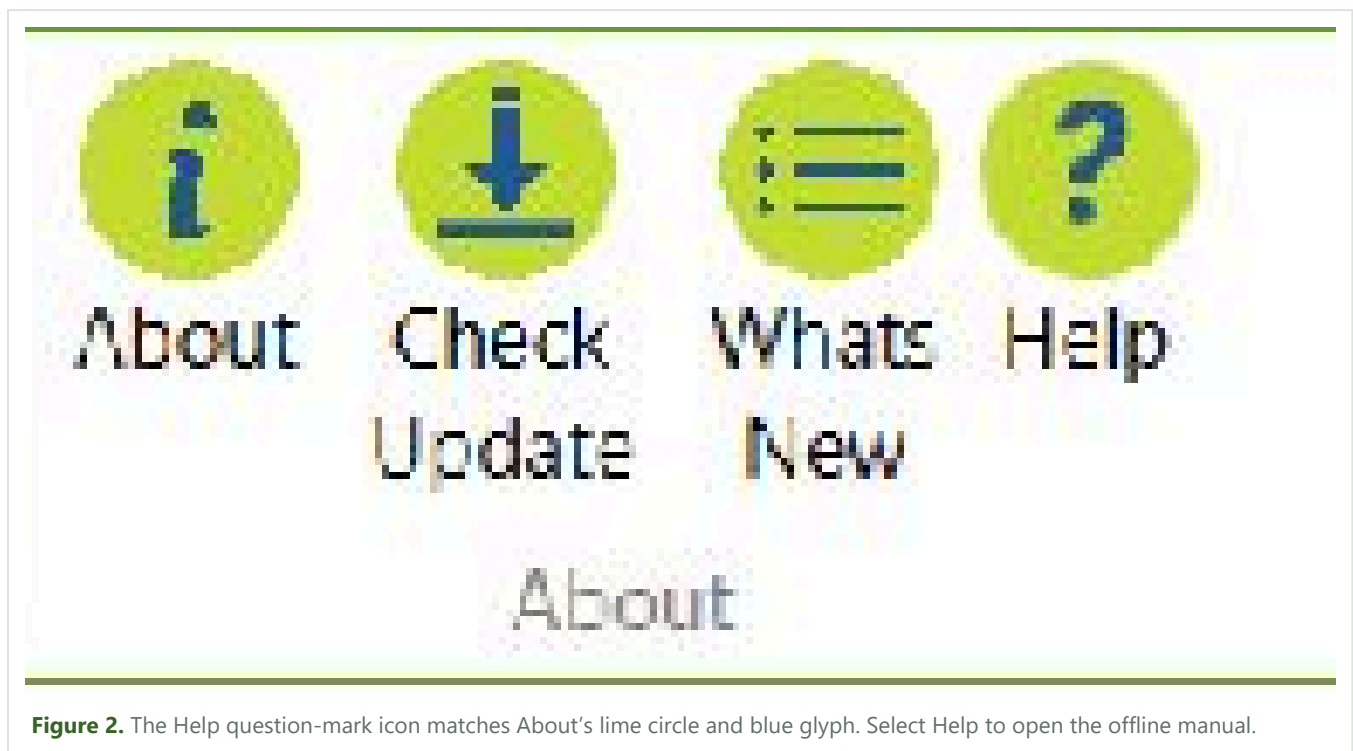
Check the selected tower combination before reviewing extensions or creating combination-specific outputs. Changes intended for one combination should be checked in that combination, particularly when comparing base-tower and extension arrangements.

Keyboard shortcuts you will use first

Action	Shortcut
New	Ctrl+N
Open	Ctrl+O
Save	Ctrl+S
SaveAs	Ctrl+Shift+S or F12
Browse Files	Alt+I
General settings	Alt+G
Refresh Patterns	Alt+R
Input Slopes	Alt+S
Input Panels	Alt+P
Input Extensions	Alt+E
Clearance Input values	Alt+C
Validate	Alt+V
Run	Ctrl+R
Console	Alt+Shift+C
Zoom Extents	Ctrl+E
Open PatGen	Ctrl+G

Ctrl+S has a different target when the **IFC Viewer** is active: it runs **Save Inputs** for Vistār. Return to the main window to save tower geometry.

Use the manual



Select **Home** → **Help** to open the offline manual. Press **F1** while working in an input, viewer or dialog to open help for that section. Keep the help window beside the application while following a procedure. **About** remains the separate version and licence-information dialog.

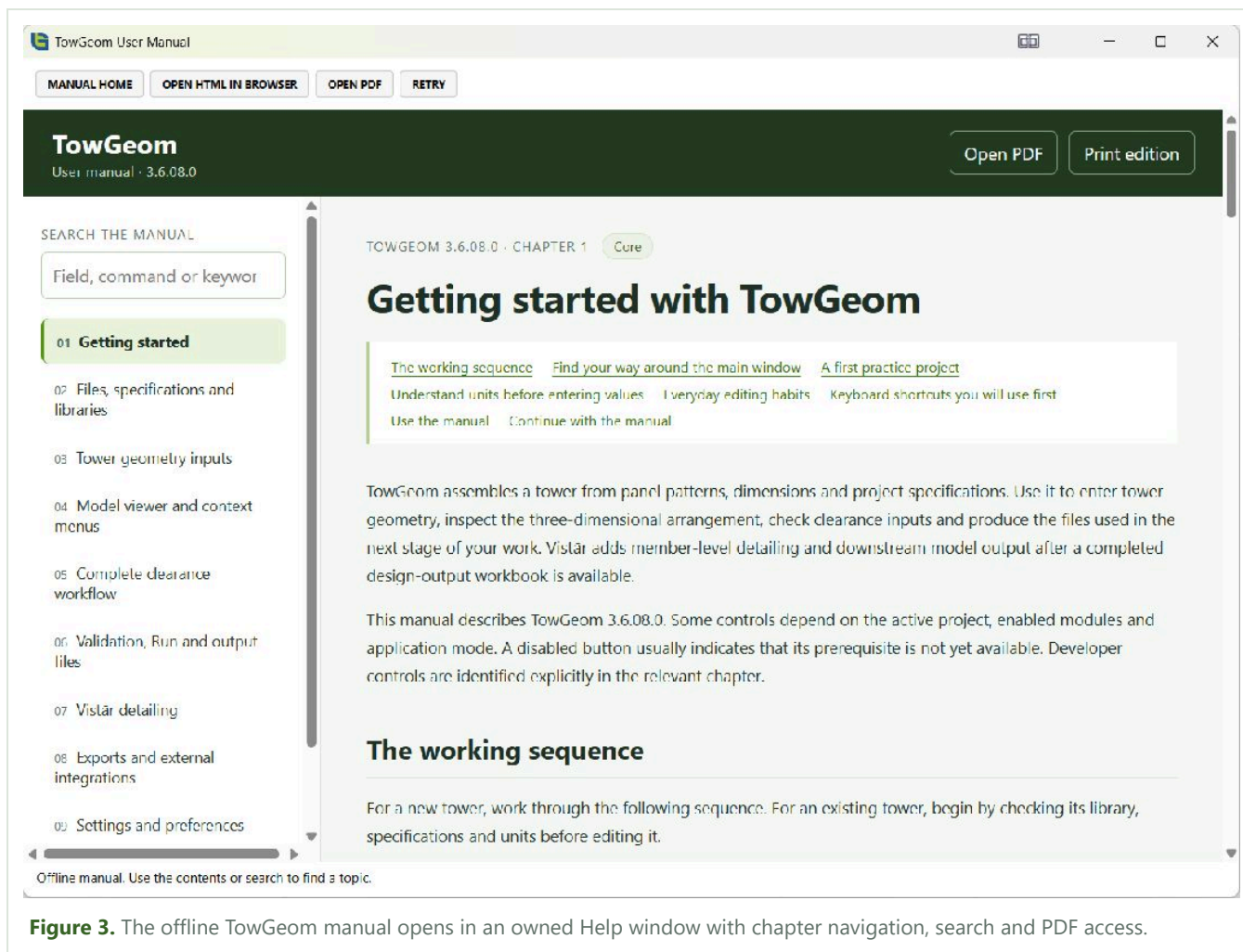


Figure 3. The offline TowGeom manual opens in an owned Help window with chapter navigation, search and PDF access.

Choose a chapter from the contents at the left. The links below the chapter title jump to sections on that page; the links at the bottom move to the preceding or next chapter. On a narrow window, select **Chapters** to show the contents.

Type a field label, command, file extension or other keyword in **Search the manual**. Search finds sections containing all the words you entered and displays the section title, chapter and a short excerpt. Select a result to jump directly to that section. Clear the search field to restore the full contents. Within the manual page, **Ctrl+K** moves focus to search.

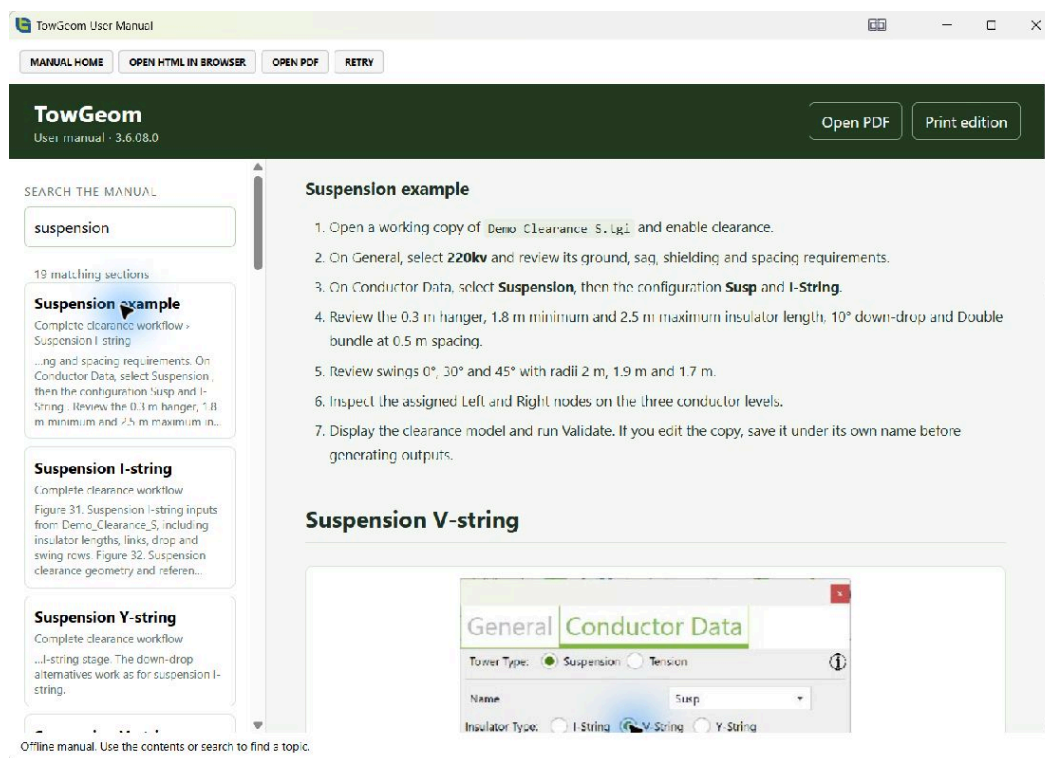


Figure 4. Search finds individual manual sections and opens the selected result at its heading.

Click an illustration to open an enlarged view. Use **Close** or **Escape** to return to the chapter. A cropped illustration can open the complete original image so that you can inspect its surrounding controls.

Help-window control	Use
Manual home	Return to Getting started.
Open HTML in Browser	Open the same manual topic and search in the system browser.
Open PDF	Open the installed printable manual with the registered PDF application.
Retry	Try starting embedded help again after its runtime or content availability has been restored.

The manual page also provides **Open PDF** and **Print edition** links. The print edition combines the chapters for browser printing; the PDF is the prepared printable copy.

The chapters, search and illustrations work offline. If embedded help cannot start, use **Open HTML in Browser** or **Open PDF**. The status message explains missing content or an unavailable WebView2 Runtime. Ask your administrator to restore the required component when necessary; help does not install it automatically. Retry after recovery, or reopen TowGeom if the message requests a restart. Opening help and searching its chapters does not change the tower inputs.

Continue with the manual

Read [Files, specifications and libraries](#) before creating a project from scratch. Use the tower-input and clearance chapters when entering the model. Read [Vistār member detailing](#) before editing the physical arrangement, and [Outputs and external model handoff](#) before using the Vistār export or connection controls.

Files, specifications and libraries

A TowGeom project uses several related files. Select the correct panel library and specifications before editing a tower, then preserve the input and its associated outputs as a coherent project set.

Know which file does what

File	Purpose	When it matters
<code>.tgi</code>	The TowGeom input, including geometry inputs and project-specification data.	Open, Save, SaveAs and Run.
<code>.plib</code>	A library of PatGen panel patterns.	Pattern selection, Refresh Patterns and tower generation.
Specifications <code>.xlsm</code> , <code>.xlsx</code> or <code>.tgi</code>	A source containing the Project Specs data used when saving an input.	Browse Files and the specification-source selection.
<code>..._Output.xlsm</code>	The generated output workbook, including member information and report sheets.	Reviewing outputs and preparing Vistär Upload Output.
<code>.tgvi</code>	Saved Vistär member inputs and topology operations beside the matching <code>.tgi</code> .	Reopening member detailing and retaining edits between sessions.
<code>.tg1b</code>	A Vistär detailing library, such as backmarks, splice rules or bolt parameters.	Vistär Settings and model recalculation.
<code>.scr</code> , <code>.dxf</code> , <code>.ifc</code>	Drawing scripts, drawings or model-exchange outputs.	Handoff to downstream software.

A `.plib` panel library and a `.tg1b` detailing library serve different purposes. Selecting a `.plib` in Browse Files changes the available panel patterns. Editing Bolt Parameters or Angle Backmarks changes the detailing data used by Vistär.

New, Open, Save, SaveAs and Exit

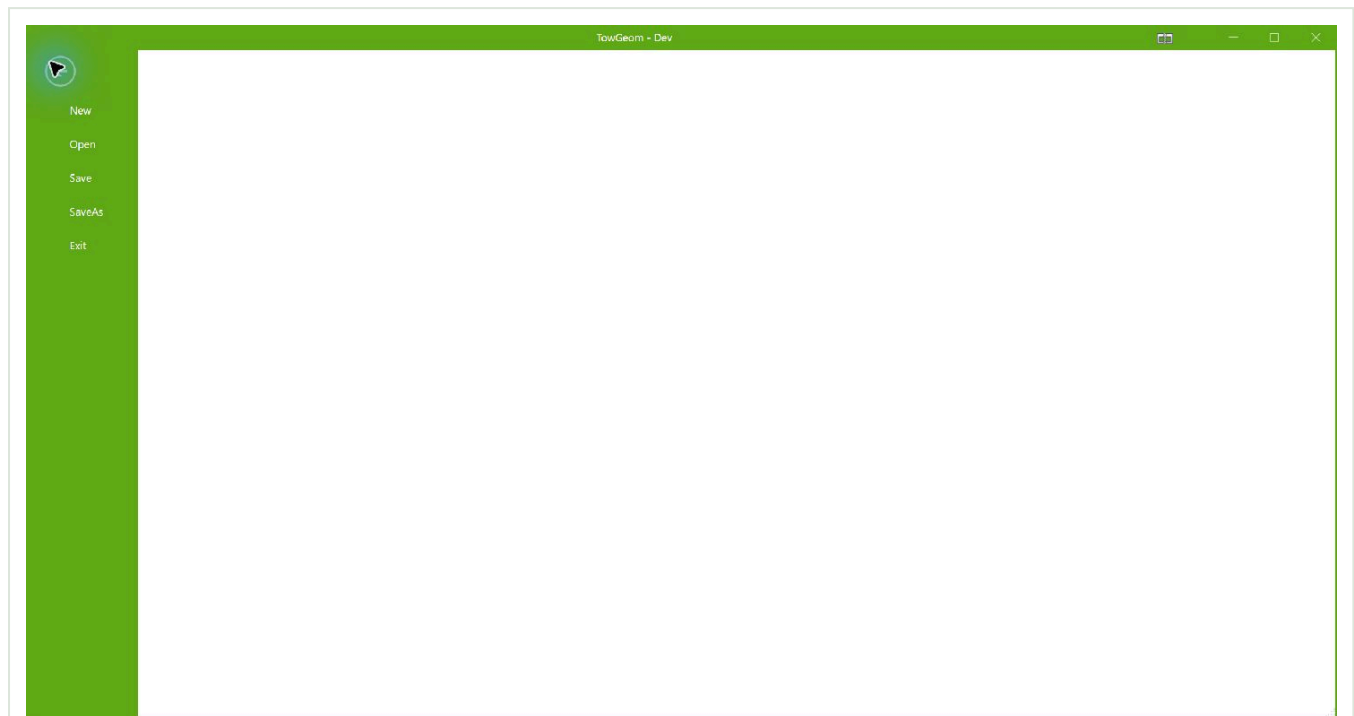


Figure 5. The File menu provides New, Open, Save, Save As and Exit.

These commands are available in **File** and on **Home → Menu**.

Command	Result	Before using it
New	Starts an Untitled* project.	Choose the library and specification source appropriate to the new tower.
Open	Loads an existing .tgi ; legacy .xlsx inputs can also be selected.	Confirm that the intended panel library is available.
Save	Writes the active tower input. A new project opens the Save Input File dialog.	Complete cell edits and confirm the specifications selection.
SaveAs	Saves the project under a selected .tgi name.	Choose a distinct practice or revision name when preserving an earlier input.
Exit	Closes TowGeom after resolving any unsaved changes.	Resolve both tower-input changes and Vistār applied-input changes when prompted.

New and **Open** ask about unsaved tower data when required. **Yes** saves the current data before continuing; **No** continues without retaining those changes; **Cancel** keeps the existing project open. A separate Vistār prompt may appear because tower inputs and member-detailing inputs have separate saved states.

Open an existing project

1. Choose **Open** or press Ctrl+O.
2. Select the **.tgi** file in **Select TowGeom Input File**.

3. Wait for the loading progress to finish.
4. Confirm the project name in the main window and review the visible tower.
5. Check its library, unit display and specifications-selection option before saving it again.

Dragging a supported input file into the application also opens it. The usual unsaved-change handling still applies.

Save a new project or revision

1. Finish the current field or grid-cell edit.
2. Choose **Save** for the active input, or **SaveAs** for a new name.
3. In **Save Input File**, choose a writable project folder and a **.tgi** filename.
4. If the specifications-selection mode asks for a source, choose the intended workbook.
5. Wait for the save operation to finish before opening the file elsewhere or starting another save.

TowGeom must be able to write the destination. If an input was moved or deleted after opening, Save asks for a new path. If the input is open in Excel, close it there before saving in TowGeom.

Legacy **.xlsx** inputs are saved through the current **.tgi** workflow. Use the resulting **.tgi** as the active project for later edits and retain the original legacy file if you need to compare it.

Select the panel library

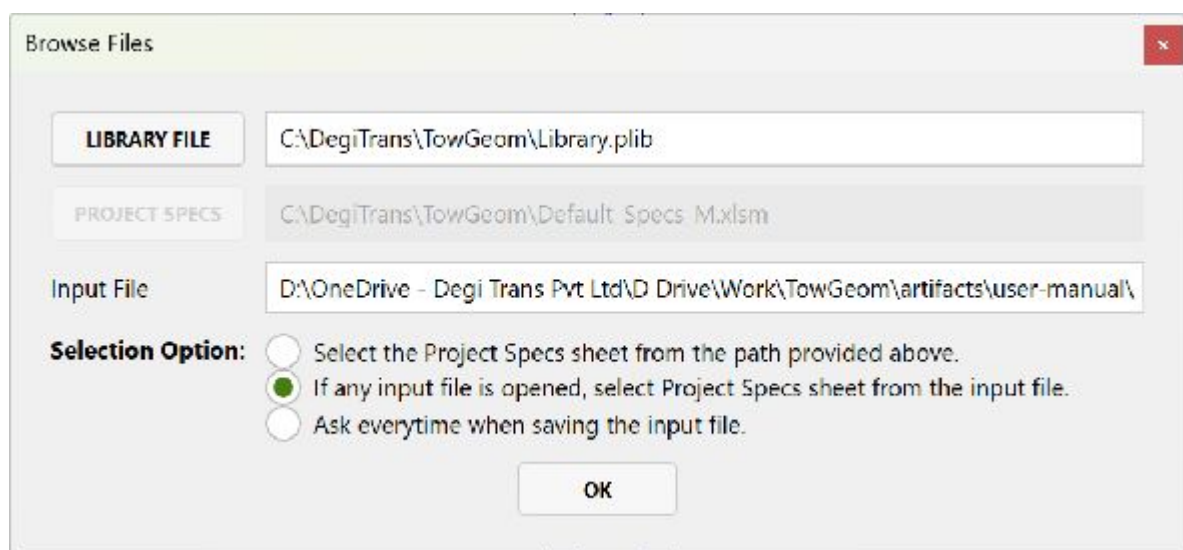


Figure 6. Browse Files selects the pattern library and determines whether project specifications come from a fixed file, the opened input or a save-time selection.

Open **Settings** → **Browse Files** or press Alt+I. The **Library File** row displays the selected **.plib**; its path is read-only in the dialog, so use the button to change it.

1. Select **Library File**.
2. In **Select TowGeom Library File**, choose the intended **.plib**.
3. Select the specification-source option described below.

4. Select **OK**. TowGeom refreshes the patterns from the selected library.
5. Review the pattern names used by the active tower.

The standard demos use the installed `Library.plib`. The Vistār example uses `IFC_Test_Library.plib`. Selecting a different library with different pattern definitions can change the tower even when some pattern names appear similar. Match the project's library to the tower being reviewed.

Refresh patterns after editing a library

Use **Home** → **Refresh Patterns** or Alt+R after a pattern has been saved in PatGen. Refresh rereads the library; it does not create a missing pattern or automatically reconcile a tower with an unrelated library.

If a required pattern is missing, select the correct library or add the required pattern through PatGen, then refresh. Review the affected panels and additional inputs before validation and output generation.

Export the patterns used by the tower

Use **PatGen** → **Export Tower Library** to create a `.plib` containing the panel patterns referenced by the opened tower. This is useful when handing a project to another user without supplying an entire general-purpose library.

Select the output filename in the export dialog and read the completion message, which reports the number of exported panel patterns. Keep the exported library with the project. It represents the patterns used by that tower at export time; subsequent library changes require a new export when they are needed by the recipient.

Select the project specifications

The **Project Specs** source supplies specification and angle-database data used when an input is saved. It is separate from the panel library. Specifications can be selected from `.xls`, `.xlsx` or an existing `.tgi` through the **Project Specs** button.

The **Selection Option** determines which source wins at save time.

Visible option	Source used when saving	Suitable use
Select the Project Specs sheet from the path provided above.	The selected specifications file.	A new project or deliberate adoption of a chosen specification set.
If any input file is opened, select Project Specs sheet from the input file.	The specifications loaded with the input, when available. A new project without embedded input specifications uses the selected default source.	Editing an existing project while retaining its own specification data.
Ask everytime when saving the input file.	The source selected in the save-time dialog.	Work where the specification source must be chosen deliberately for each save.

The **Input File** row shows the current input when the input-source option is selected. If there is no saved input, the row reports that no input file is opened. The Project Specs path becomes unavailable for selection while the input-source option is active because the opened input is the intended source.

The save-time **Ask everytime** dialog accepts `.xlsm` and `.xlsx` specification workbooks. Selecting `.tgi` as a specification source is available through the regular **Project Specs** selector; it is not an option in that particular save-time dialog.

Retain the specifications of an existing project

1. Open **Browse Files**.
2. Select **If any input file is opened, select Project Specs sheet from the input file**.
3. Select **OK**.
4. Open the existing tower input and review its specifications-related settings.
5. Save your revision when the correct source is confirmed.

Use a different specification set deliberately

1. Open **Browse Files**.
2. Select **Select the Project Specs sheet from the path provided above**.
3. Select **Project Specs** and choose the new source.
4. Select **OK**.
5. Review units, section availability and the affected settings before saving and regenerating outputs.

Changing the source is an input change, not merely a change to a recent-file list. The next saved input may contain different specification or angle-database data. Revalidate the tower and recreate its outputs when the changed data affects the project.

In an active online OptiTower session, specification controls can be disabled because the connected workflow supplies them. Offline OptiTower allows the local controls. Use the controls available in the current workflow rather than trying to enter a path into a disabled row.

Preserve the Vistār file pair

Saved member-detailing inputs use the same basename as the tower input:

Tower input	Vistār sidecar
IFC_Test.tgi	IFC_Test.tgvi

Keep both files together when copying, archiving or handing over a detailed model. The `.tgvi` stores accepted member inputs, including applicable symmetry/continuity choices and merge, divide or move-connection operations. It does not replace the `.tgi`, its panel library or the completed design-output workbook.

Save Inputs in the IFC Viewer saves the last accepted Vistār inputs. It requires an existing saved `.tgi` and loaded Vistār members. Visible member-property drafts that have not been applied are excluded; TowGeom explains this when it saves with pending drafts present.

If an existing sidecar is malformed or was created by a newer unsupported version, TowGeom protects it. Replacing it requires an explicit choice and preserves the original as a timestamped backup. Read that prompt carefully when exchanging projects between application versions.

Use TowGeom **SaveAs** for a revised project name so that its input/sidecar handling runs together. Read any unsaved-Vistär prompt before completing the operation. The completed output workbook is a separate artifact: copying or renaming the `.tgi` does not establish a newly generated or newly designed output workbook.

Match output filenames to the active input

Vistär **Upload Output** looks beside the active saved input for the expected workbook. For an input without tower combinations, `IFC_Test.tgi` expects `IFC_Test_Output.xlsm`.

For a selected tower combination, the expected name includes `_TC_` followed by its ID, with a leading zero for IDs below 10. If **IncludeDescription** is enabled and the combination has a description, the description is included in the filename as well. Use the generated name for the active combination rather than substituting the workbook for a different one.

If Upload Output reports that the file does not exist, check the input's folder, basename, selected combination and description setting. Create the output through **Run** when it has not yet been generated. Complete the design report before relying on it for detailed member geometry.

Project handover checklist

Before handing a tower to another TowGeom user, collect the saved `.tgi`, its matching `.plib`, the completed output workbook if Vistär is involved, and its matching `.tgvi` if detailing edits must be preserved. Record the TowGeom version and the specification source used. Include downstream export files only when they are part of the requested handoff.

After reopening the handover set, verify the pattern selections, units, tower combination and Vistär arrangement. If the recipient changes the tower input or specifications, the previous output workbook may no longer represent that tower; regenerate and update the report as required before uploading it again.

Tower geometry and input tabs

Build the tower from its overall dimensions, then populate the panel patterns and their additional inputs. Extensions are reusable panel definitions assembled below the basic body into tower combinations. The 3D viewer refreshes as committed values change, so inspect the geometry throughout entry rather than waiting for the final Run.

Use a working copy of `Demo_Model.tgi` for the basic workflow, `Demo_Horz.tgi` for horizontal and extension features, and `Demo_Aux.tgi` for auxiliary Back crossarms. The selected installation library contains their required patterns. Save the copy separately before modifying it.

Enter the model in a practical order

1. Select the intended library, specifications and angles database.
2. Open **Input Slopes (Alt+S)** and set the tower overview.
3. Enter slope widths, heights and panel counts from the bottom of the basic body upwards.
4. Open **Input Panels (Alt+P)** and enter each slope's panel patterns and heights in the same physical order.
5. Select wind-load positions and open **Addl. Inputs** for special geometry and attachments.
6. If needed, enable extensions, define extension slopes and reusable panels, then create leg and tower combinations.
7. Inspect the active combination in 3D, complete clearance if required, and select **Validate**.
8. Save the model, then Run to generate outputs.

Length fields use **m** in Metric or **ft** in Imperial. Integer counts are numbers of entries, not dimensions. Read the unit-aware column headers and field labels. A field displaying **Auto** derives its value from the applicable geometry; it is not an instruction to enter zero. Only the fields that support automatic geometry accept that behavior.

Tower Overview

SlopesPanelsExtensions

Tower Overview:

Tower Unit System

☒ Metric
 ☐ Imperial

Model with Redundants:

☒ Yes
 ☐ No

Redundant Angle Groups:

☒ Continuous
 ☐ Panel wise

Panel height for Wind load distribution:

☒ Panel CG
 ☐ Half of Panel Height

Include PLS inputs for Insulator details

☐ Yes
 ☒ No

Shape:

Square

Dimensions Type:

Back to Back

Slopes

4 + -

	Base Width Tran (m)	Top Width Tran (m)	Base Width Long (m)	Top Width Long (m)	Height (m)	No. of Panels
Slope-1	8	3	8	3	13.8	3
Slope-2	3	1.75	3	1.75	12.2	7
Slope-3	1.75	1.75	1.75	1.75	1.7	1
Slope-4	1.75	0	1.75	0	4.2	1

EXTENSIONS

Figure 7. Slopes reference: 1 Tower-wide options; 2 Slope dimensions in the current units; 3 Extension configuration.

Input	Choices / new model default	Effect
Tower Unit System	Metric / Imperial; Metric unless Imperial preference is enabled	Determines the units of the model's input values. Switching systems converts the current dimensional data.
Model with Redundants	Yes / No; Yes	Includes or excludes redundant members in the generated model workflow.
Redundant Angle Groups	Continuous / Panel wise; Continuous	Controls whether redundant groups continue or are assigned panel by panel.

Input	Choices / new model default	Effect
Panel height for Wind load distribution	Panel CG / Half of Panel Height; Panel CG	Chooses the height reference used for wind-load distribution.
Include PLS inputs for Insulator details	Yes / No; No	Reveals additional insulator properties and uplift selections in clearance inputs.
Shape	Square / Rectangle; Square	Determines whether transverse and longitudinal widths are coupled.
Dimensions Type	Back to Back / Center to Center; Back to Back	Selects the dimensional convention for the geometry.
Slopes	Entry count; new model starts with 0	Creates the slope rows and their panel-input sections.

For Square, longitudinal widths follow transverse widths and the longitudinal editors are disabled. For Rectangle, enter the two directions separately. Select the intended dimension convention before populating the tower; do not mix dimension conventions within a model.

The Imperial startup preference affects a new input. An existing input uses its recorded unit system. After changing units, review both numeric values and selected specification sources, then validate and save the converted model deliberately.

Slopes table

Each slope describes a height interval of the basic body. Slope-1 is at the bottom; following slopes continue upwards. Top widths feed the base widths of the next slope, maintaining the shared boundary.

Column	Entry	Meaning
Base Width Tran	Length	Transverse width at the slope bottom. Editable for the first slope; subsequent base values follow the preceding top.
Top Width Tran	Length	Transverse width at the slope top.
Base Width Long	Length	Longitudinal width at the slope bottom; coupled for Square, separately entered for Rectangle's first slope.
Top Width Long	Length	Longitudinal width at the slope top.
Height	Length	Total slope interval height.
No. of Panels	Whole number	Number of panel rows assigned to this slope.

Negative widths, height and panel counts produce input validation feedback. Zero dimensions can represent an unfinished entry or a valid special endpoint such as a peak; complete the intended geometry and use Validate to check the actual arrangement. Do not infer that a zero-valued new row is ready to generate.

Press Enter to move to the next input in the Slopes grid. Leave the cell to commit an edit. Changing a top width updates the next slope's base, while changing height updates the panel-height summary. Changing No. of Panels creates or removes panel rows. A reduction warns that entries at the end can be lost; review the affected rows before confirming.

Changing the overall Slopes count similarly changes the corresponding panel sections. The Slopes table does not expose the Panels table's row context-menu commands.

Panels table

The screenshot shows a software interface with three tabs: 'Slopes', 'Panels' (selected), and 'Extensions'. The 'Panels' tab displays two sections for panel information, each with a table of data.

Panel Information of Slope-1: 13.8m of 13.8m

	Height (m)	Pattern Name	Wind Load At	Addl. Inputs
1	5.8	A2L4D4-1	Bottom	...
2	4.5	X1L3D4-1		...
3	3.5	X3L2D4-1		...

Panel Information of Slope-2: 12.2m of 12.2m

	Height (m)	Pattern Name	Wind Load At	Addl. Inputs
1	1.35	A2L2D2-1	Bottom	...
2	1.2	V1L1D1-1		...
3	2.8	X3L2D2-1		...
4	1.35	A2L1D1-1	Bottom	...
5	1.2	V1L1D1-1		...
6	2.8	X3L2D2-1		...
7	1.5	X2L2D2-1	Bottom	...

Figure 8. Panels are grouped by slope. Each row contains height, pattern, wind-load position and an Additional Inputs button.

The Panels tab contains one collapsible section per slope. Its heading displays how much panel height has been entered compared with the slope height. Expand only the slopes being edited to reduce scrolling.

Column	Entry / behavior	Use
Row number	Generated identity within the slope	Identifies the panel in messages and additional inputs.
Height	Numeric length	Physical panel height. Leave the field to commit it.
Pattern Name	Library pattern list	Defines the panel's nodes, member arrangement and supported additional inputs.
Wind Load At	Blank / Bottom / Top	Selects the panel wind-load reference.
Addl. Inputs	Button marked ...	Opens the selected panel's special geometry and attachments.

Panel rows run from bottom to top within their slope. Match the sum of their physical heights to the intended slope height. The section heading helps identify a mismatch. Body panel height is a numeric input; the automatic fields in additional inputs do not make this column an Auto-height editor.

A **Diaphragm** has zero height. Its Height, Wind Load and Addl. Inputs controls are disabled. Where a first diaphragm occupies the base row, the next physical panel receives the bottom wind-load reference. Do not add height to a diaphragm to compensate for a missing physical panel.

Changing Pattern Name can reset pattern-specific body-slope or other additional data. Reopen the additional inputs and check physical attachments after changing a pattern, even when its name resembles the previous selection.

Panels context menu

Select the intended panel row and right-click it.

Command	Result
Copy Pattern Name	Copies only the selected library pattern name as text.
Copy row data / Ctrl+C	Copies the panel input data. If Left/Right crossarms exist, a prompt asks whether their data should also be copied.
Paste row data / Ctrl+V	Replaces the selected row with copied panel data. Existing populated data prompts for confirmation.
Insert a new row	Inserts a blank panel at the selected position and increases the slope panel count.
Deletes the selected row	Removes that row and reduces the slope panel count. Following row identities are updated.

Review height totals after inserting, deleting or pasting a panel. Copy/Paste does not establish a permanent link between the two rows. Inspect all attachments in the pasted row, particularly auxiliary arms and clearance selections. The menu does not include a panel-row Cut command.

Open and interpret Additional Inputs

Select the panel's **Addl. Inputs** button. A pattern and nonzero physical panel height must be present before the flyout opens. The same button closes an already opened flyout for that row. The selected pattern determines which expandable groups appear.

The information buttons beside group headings display reference diagrams. Use the diagram's dimensions together with the current field labels. Numerical geometry edits usually take effect when you leave a field; automatic fields are displayed as Auto where supported.

Double Peak

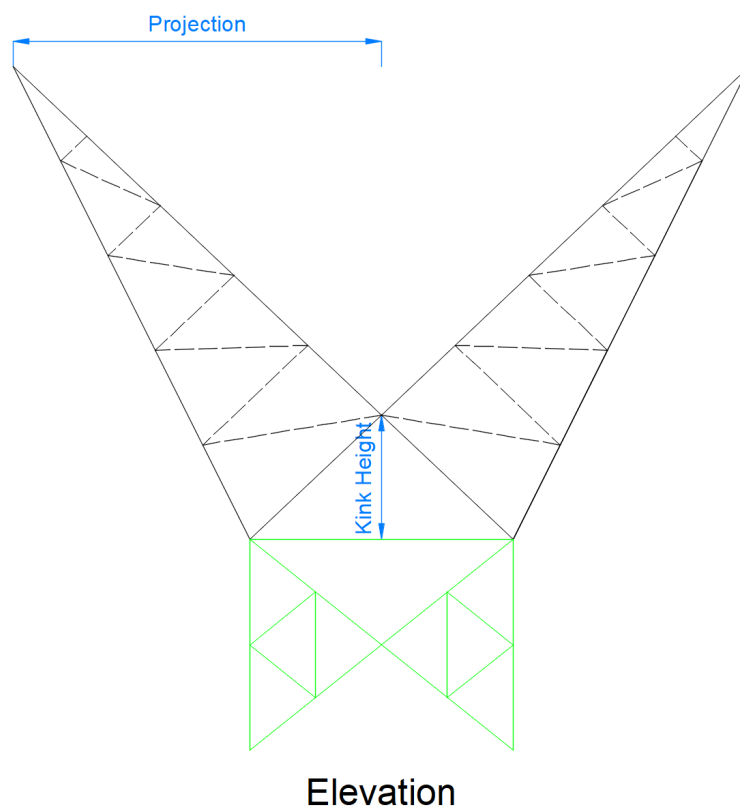


Figure 9. Double peak dimensions.

This group appears for Double Peak patterns.

Field	Meaning / conditional behavior
Kink Height	Height of the kink in the peak geometry; automatically derived when left as Auto.
Kink Width	Width at the kink; automatically derived when left as Auto.
Projection	Additional asymmetric projection/distance input for an unequal Double Peak. It is hidden for an equal Double Peak.
Left / Right	Selects the side to which the unequal projection refers.

Field	Meaning / conditional behavior
Panel Direction: Trans / Long	Orients the peak panel in the transverse or longitudinal direction.

All dimensions use length units. New pattern-specific automatic values are shown as Auto. Enter the dimension indicated by the diagram, select the unequal side when applicable, then inspect both elevation and plan. Changing direction rotates the intended pattern orientation, so confirm related nodes and attachments afterwards.

Horizontal window and beam geometry

The screenshot displays a software interface with two main sections: 'HORIZONTAL' and 'INCLINED PEAK'.

HORIZONTAL Section:

- WTW: 2 (m)
- WPB: 5 (m)
- HPB: 1.38975 (m)
- HM: 1.38975 (m)
- HS: 0.8 (m)
- WTWS: Auto (m)

INCLINED PEAK Section:

☒ **Left Inclined Peak**

- ☐ Wind Load at Peak Tip
- Name: IP1P2-1
- Height: 2 (m)
- Projection: Auto (m)

☒ **Right Inclined Peak** SAME AS LEFT

- ☐ Wind Load at Peak Tip
- Name: IP1P2-1
- Height: 2 (m)
- Projection: Auto (m)

Figure 10. Horizontal beam geometry exposes WTW, WPB, HPB, HM, HS and WTWS, with Left and Right inclined-peak inputs below.

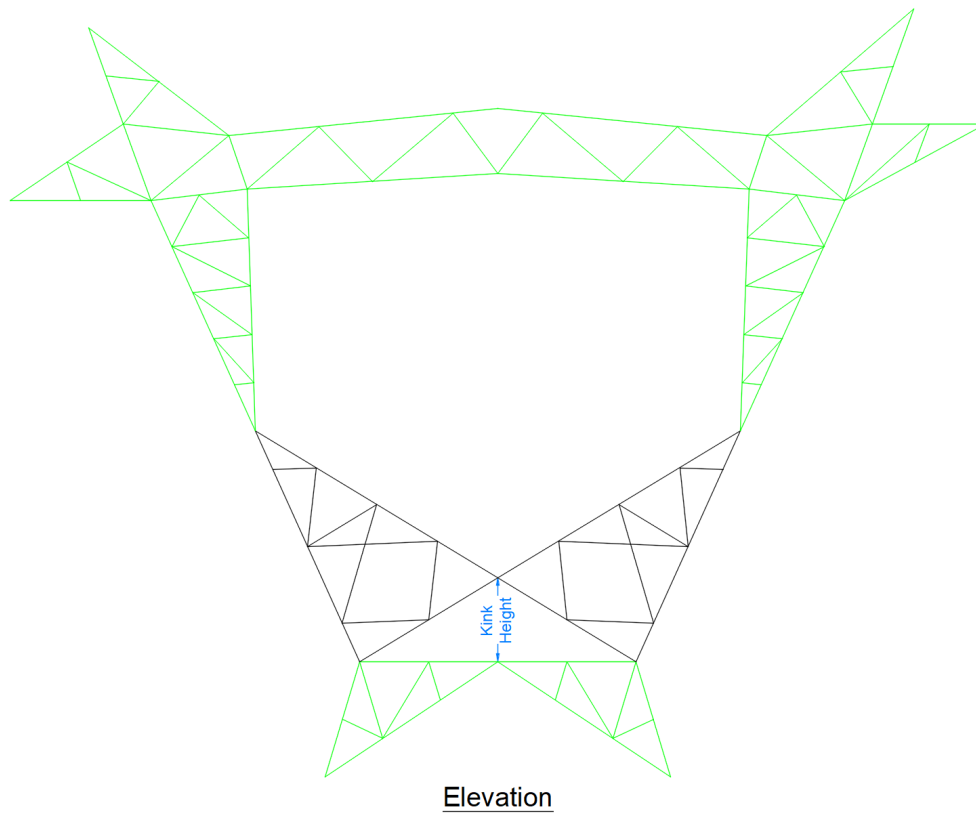


Figure 11. Horizontal window geometry and dimension labels.

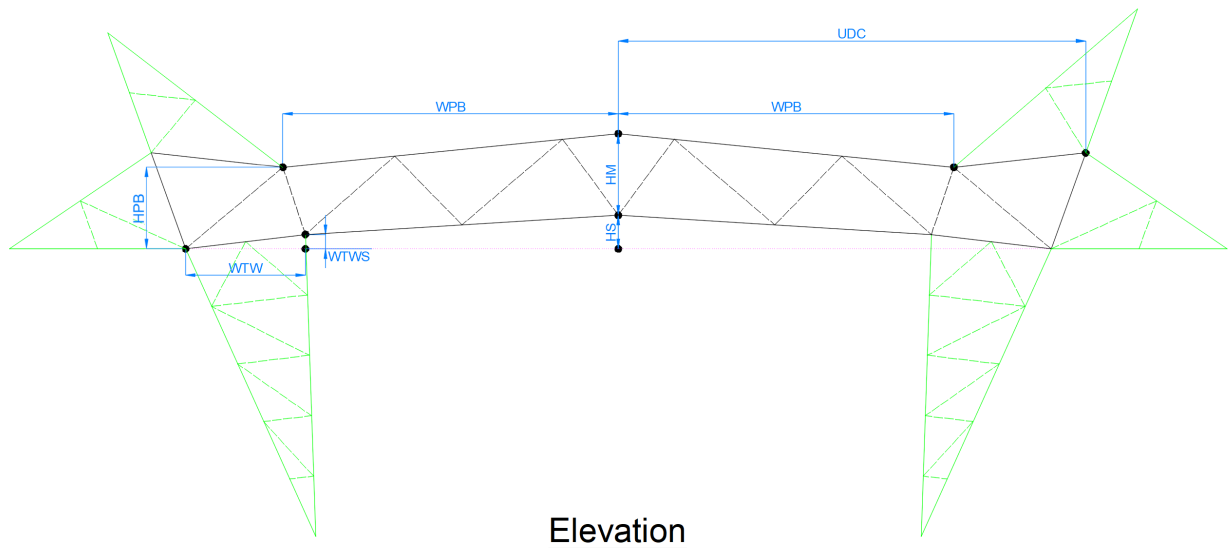


Figure 12. Horizontal beam arrangement.

The **HORIZONTAL** group adapts to horizontal-window and beam patterns. The abbreviations correspond to the labelled dimensions in the diagram.

Field	Meaning	Typical visibility
Kink Height	Horizontal Window Bottom kink height	HWB.

Field	Meaning	Typical visibility
Kink Width	Horizontal Window Bottom kink width	HWB.
WTW	Window Top Width	HWT/beam geometry where applicable.
WPB	Width to Peak Base from Center	Beam geometry.
HPB	Height of Peak Base	Beam geometry.
HM	Height at Middle	Beam geometry.
HS	Height Shift at Middle	HWT/beam geometry where applicable.
WTWS	Window Top Width Shift	HWT/beam geometry where applicable; supports Auto.
UDC	Unequal Distance from Center	Unequal beam arrangement.
Left / Right	Side referred to by UDC	Unequal arrangement; disabled for equal beam geometry.

Use length units for these values. HWB reveals its kink fields and hides the beam-dimension group. Beam patterns show the geometry needed to locate the peaks and middle. Equal beam patterns keep the unequal distance selection disabled and Auto. Automatic fields derive the appropriate location from the current panel geometry; clear a supported automatic field to restore its automatic value rather than substituting an arbitrary dimension.



For an inspection example, open the working copy of `Demo_Horz.tgi`. In its second slope, inspect HWB, HWT and the equal-height Beam panel in sequence. Compare their different visible fields. Review the Beam's Left/Right arms and inclined peaks in plan as well as elevation.

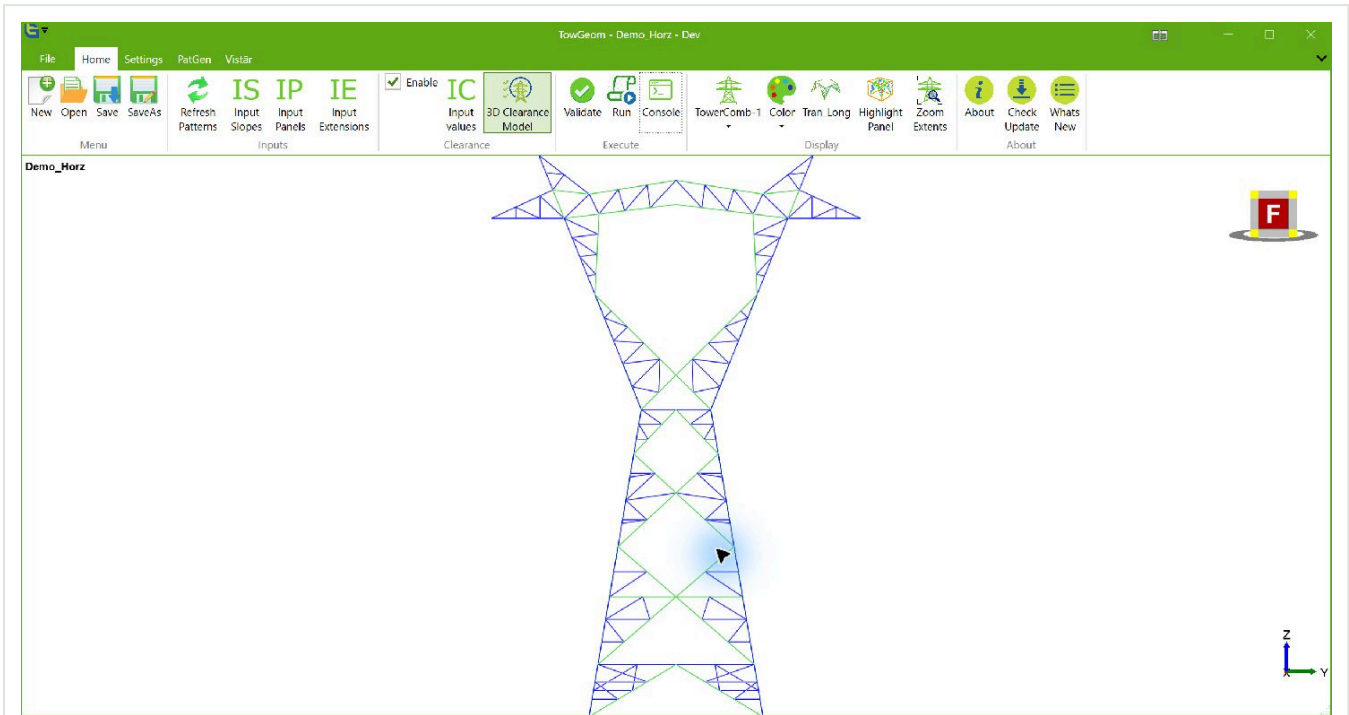


Figure 14. The horizontal training tower with its default Tower Combination displayed.

Inclined peaks on horizontal/beam panels

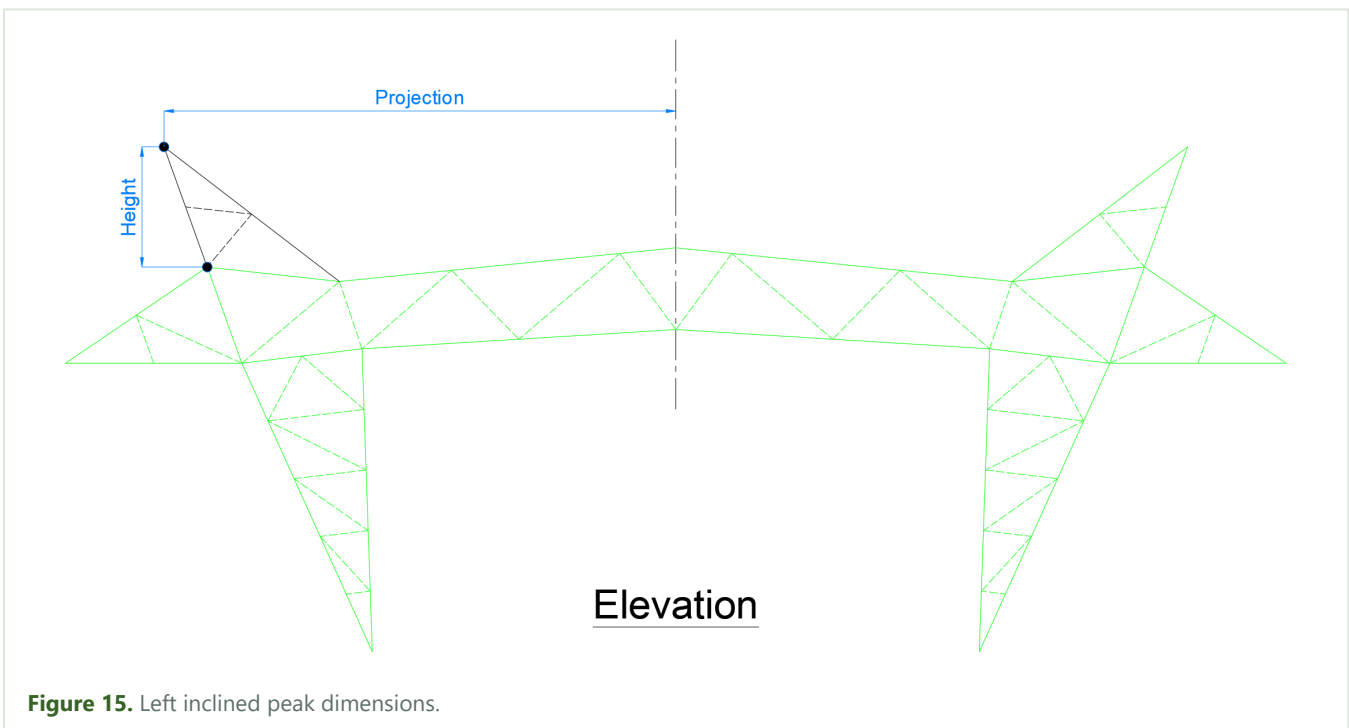


Figure 15. Left inclined peak dimensions.

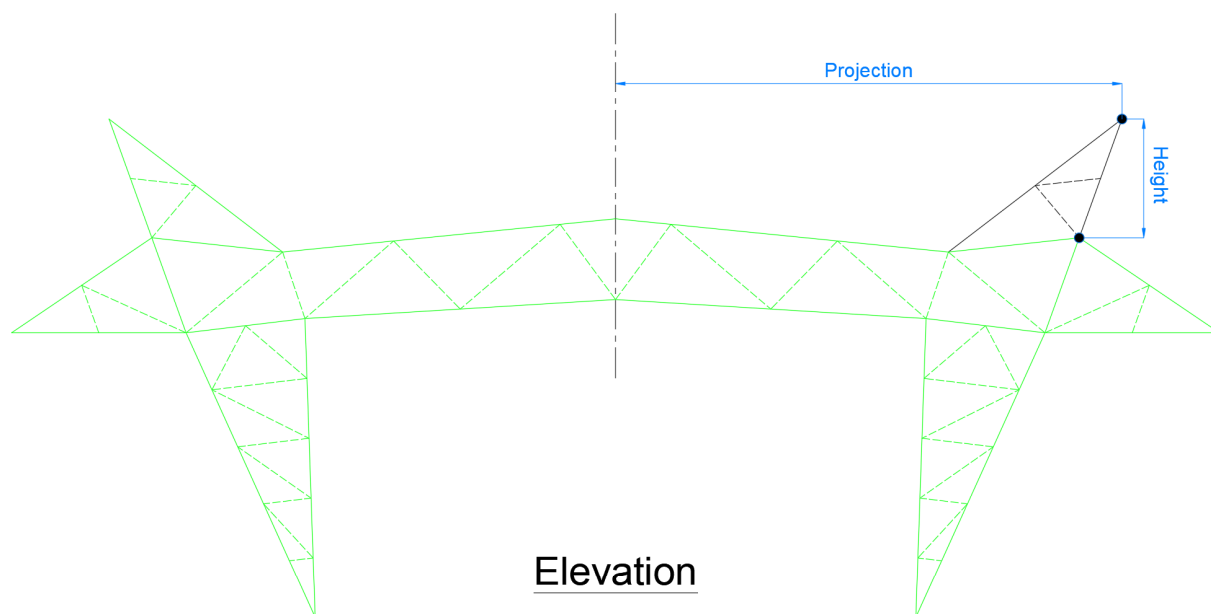


Figure 16. Right inclined peak dimensions.

Control / input	Use
Left Inclined Peak / Right Inclined Peak	Enables the peak on that physical side.
Name	Selects its library pattern.
Height	Peak height in the active length unit.
Projection	Peak projection; automatic geometry can be displayed as Auto.
Wind Load at Peak Tip	Uses the eligible peak tip as a wind-load point.
Same as Left	Copies the Left inclined-peak inputs to the enabled Right peak.

The source peak must exist before **Same as Left** can copy it. Review the copied Right geometry afterwards; this is a copy action, not a continuing link. Wind-tip availability depends on the panel/peak geometry and wind-load position. A disabled wind-tip control indicates that the current arrangement does not satisfy its placement conditions.

Body Slope

Elevation

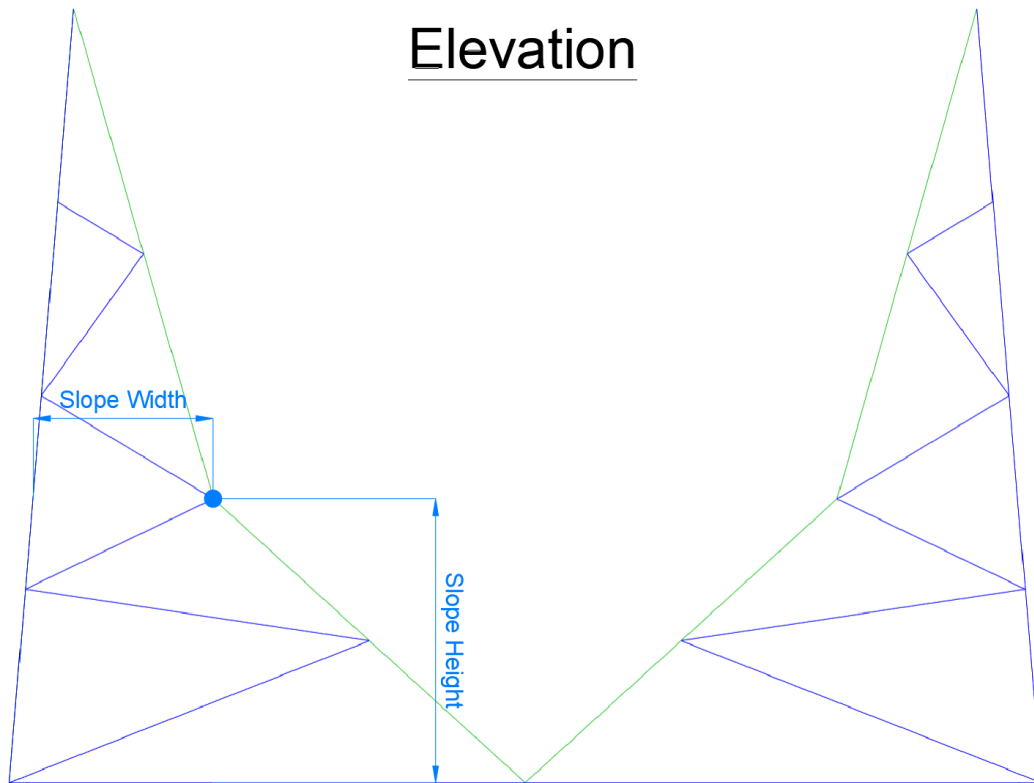


Figure 17. V-pattern body slope dimensions.

Elevation

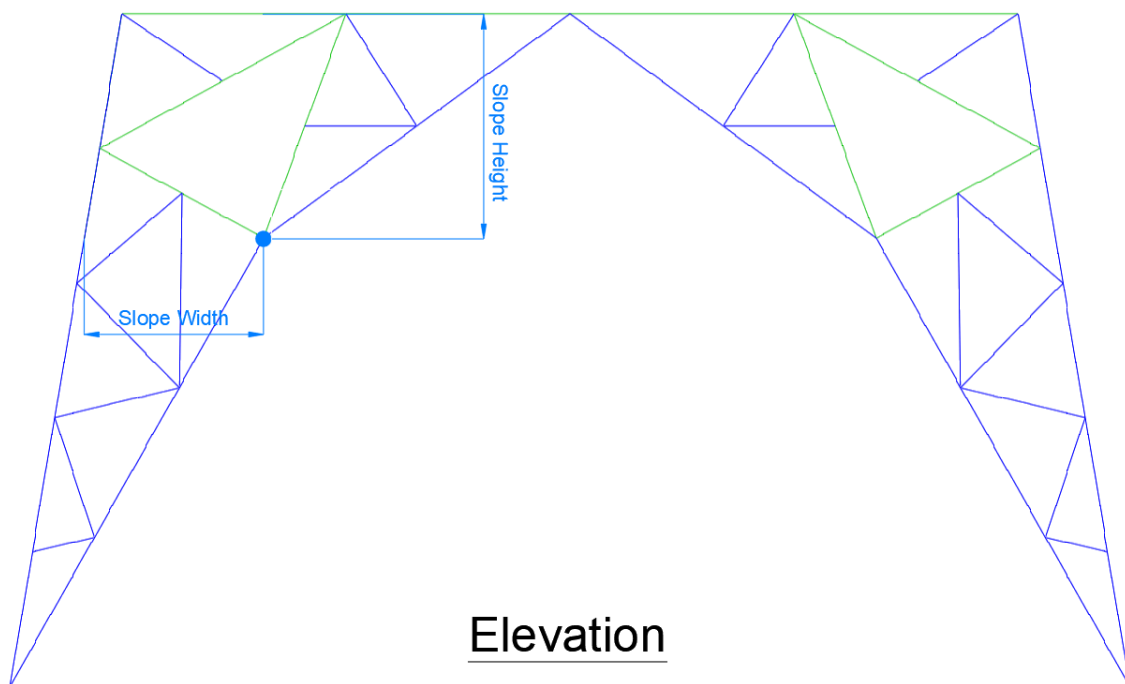


Figure 18. A-pattern body slope dimensions.

The **BODY SLOPE** group is available for supported A, V and Leg Extension pattern types. It describes an internal change of slope at an eligible physical pattern node.

Input	Use
Add Body Slope	Enables the pattern's additional slope geometry.
Body Slope Point	Selects an eligible node marking the change.
Slope Width	Transverse width at the selected slope change; supports automatic geometry.
Slope Height	Height/location dimension for the change; supports automatic geometry.

For extension panels the width label is **Slope Tran Width**. The longitudinal geometry is derived for the physical location and tower shape; separate longitudinal editors are not exposed. Use the reference diagram for the selected pattern rather than assuming the A and V dimensions describe the same arrangement.

The node list excludes Ghost nodes. Changing the pattern resets the body-slope point so that an obsolete attachment is not carried into the new topology. After changing a pattern, re-enable and reselect the body slope if it remains required. Leave Auto where the intended geometry should follow the surrounding panel dimensions.

Normal Left and Right crossarms

Additional Inputs 

 BODY SLOPE 

 CROSSARMS

 Left Crossarm 

☐ Invert

☒ Wind Load at Arm Tip

☐ Mirror-Y

Node-1: 1P Node-2: 2P 

Name: ATB3T3-1

Projection: 5.1 (m)

Tip Z-Height: 0 (m)

 LEFT CLEARANCE

 LEFT INCLINED PEAK 

 Right Crossarm SAME AS LEFT 

☐ Invert

☒ Wind Load at Arm Tip

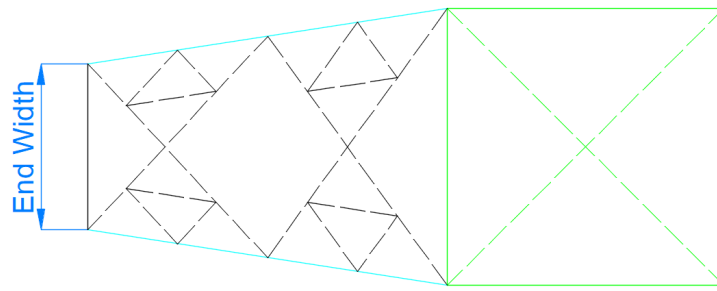
☐ Mirror-Y

Node-1: 1X Node-2: 2X 

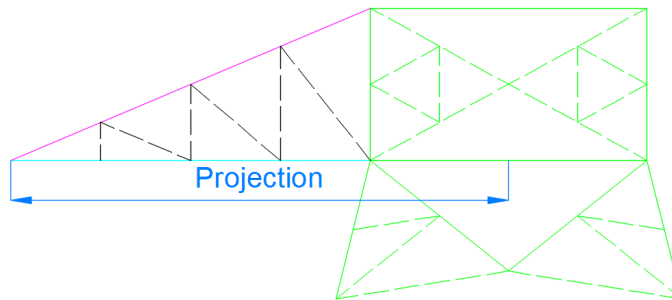
Name: ATB3T3-1

Projection: 5.5 (m)

Tip Z-Height: 0 (m)

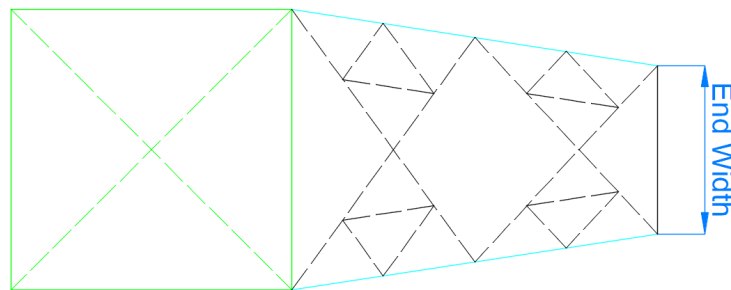


Bottom Plan

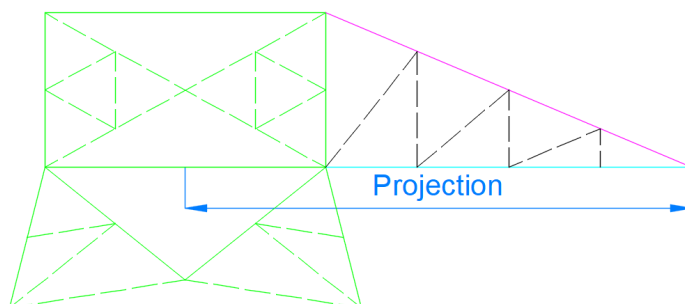


Elevation

Figure 20. Left crossarm attachment and dimensions.



Bottom Plan



Elevation

Figure 21. Right crossarm attachment and dimensions.

Enable **Left Crossarm** or **Right Crossarm** under CROSSARMS, then complete its physical attachment and geometry.

Field / control	Meaning
Crossarm enable checkbox	Adds/removes that side's arm in the panel arrangement.
Node-1 / Node-2	Body nodes to which the arm is connected. Choose from the eligible list or use the graphical selection button.
Name	Crossarm library pattern.
Projection	Arm projection length.
End Width	Width of the arm end; shown for patterns needing an end-width value. Triangular-arm patterns hide it.
Auto beside End Width	Derives the end width from the tower's longitudinal width at the tip level for Left/Right arms. The numerical editor is disabled while Auto is selected.
Tip Z-Height	Tip height measured from the base attachment level; with Invert, the tip is measured down from the top attachment level.
Invert	Inverts the crossarm arrangement. Inspect attachment order and tip location.
Mirror-Y	Mirrors the normal arm pattern in its Y direction.
Wind Load at Arm Tip	Uses the eligible arm tip for the wind reference when aligned with the panel wind-load position.
Same as Left, on Right	Copies Left arm geometry, symmetric attachment selection and associated configuration into the enabled Right arm.

Projection, widths and heights use length units. Pattern selection and attachment nodes determine meaningful starting geometry. Review any populated starting values before treating them as design dimensions.

Attach a crossarm

1. Open a non-diaphragm panel with pattern and height completed.
2. Enable the required crossarm.
3. Select its pattern Name.
4. Select Node-1 and Node-2. Their eligibility depends on the body pattern; Ghost nodes are excluded.
5. Enter Projection and Tip Z-Height. Set explicit End Width or retain its Auto option where appropriate.
6. Set Invert/Mirror only as required and inspect the physical result in plan/elevation.
7. Set Wind Load at Arm Tip when available and intended.
8. If repeating the arm, enable Right and use Same as Left, then inspect the copied Right attachments and dimensions.
9. Add arm inclined peaks or clearance assignments if required.

Same as Left requires an existing Left arm and is a one-time copy. Later Left edits do not automatically update Right. When opposite arm tips share a level, wind-tip changes can be coordinated between them; review both sides after changing the wind point.

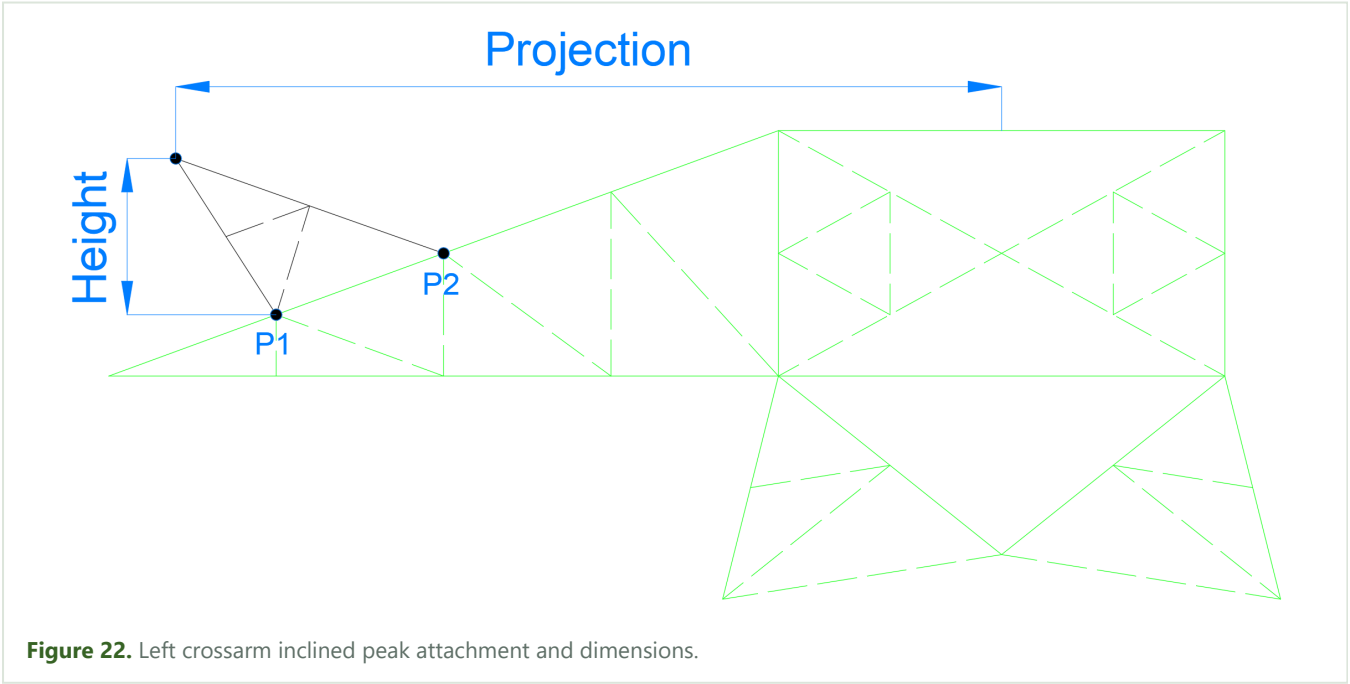
Crossarms with two slopes

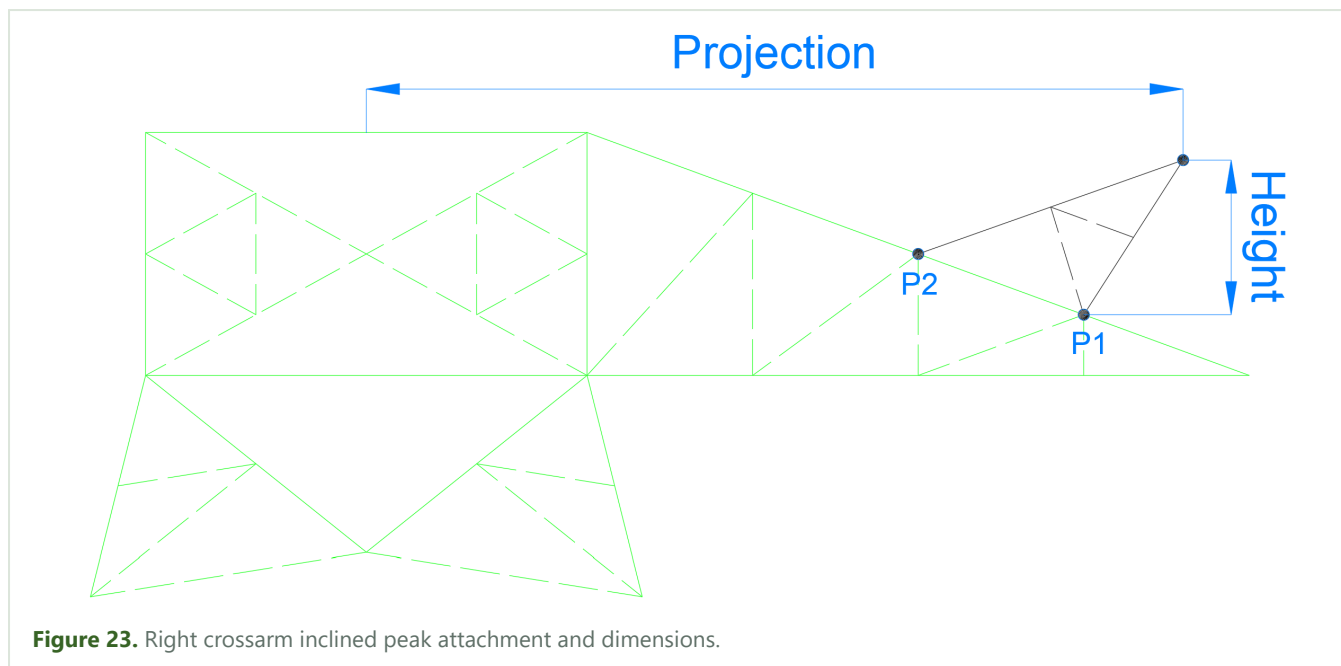
Two-slope arm patterns reveal an additional group of fields on each physical side.

Field	Use
Slope Bot Length	Bottom-chord slope-break length.
Slope Top Length	Top-chord slope-break length.
Slope Height Shift	Vertical shift for the slope-break geometry.
Slope Height	Height of the added slope region; supports Auto.
Slope Bot Width	Width at the bottom slope break; supports Auto.
Slope Top Width	Width at the top slope break; supports Auto.
Calculate Bot Width Auto based on Top Width value	Changes which slope-break width supplies the automatic calculation.

These lengths are distinct from the total arm Projection and End Width. The fields disappear when a standard arm pattern is selected. Retain automatic values when the break is intended to follow the derived geometry; enter explicit project dimensions where required and inspect the complete arm after the change.

Arm inclined peaks





Each arm side has its own inclined-peak group: LEFT, RIGHT, BACK or FRONT INCLINED PEAK.

Input	Use
Arm Inclined Peak checkbox	Enables a peak on the selected enabled crossarm.
P1 / P2	Eligible crossarm nodes carrying the peak.
Name	Inclined-peak library pattern.
Height	Peak height in length units.
Projection	Peak projection in length units.
Wind Load at Peak Tip	Uses an eligible peak tip for the wind reference.

Choose the arm pattern and body attachments before completing its peak. Changing the arm regenerates the eligible node lists, so recheck P1/P2 and the resulting peak. Do not treat the Left/Right reference diagrams as permission to substitute the same node names on every side; use the names available for that arm.

Figure 24. Auxiliary crossarms in Additional Inputs. This working-copy variant enables Front Crossarm and uses Same as Back to copy its dimensions.

Difference	Back/Front behavior
End Width Auto	Follows the tower's transverse width at the tip level.
Copy action	Same as Back on Front copies the Back arrangement, its symmetric connections and associated inputs.
Peak inputs	BACK/FRONT INCLINED PEAK with P1/P2, Name, Height, Projection and eligible wind-tip selection.
Clearance inputs	Separate BACK CLEARANCE and FRONT CLEARANCE assignments.

Use `Demo_Aux.tgi` to inspect its three Back arms. For a Front example, make the change only in a working copy, enable Front and use Same as Back where a symmetric arrangement is intended. Review plan view and the chosen body/peak nodes. Copying requires an existing Back arm and does not create a permanent link.

Clearance selections for all four sides and the horizontal beam are explained in [Clearance module](#). Model/display support is broader than current 2D clearance drawing support; check its limits before expecting auxiliary clearance drawings.

Extensions: slopes and definitions

Slopes
Panels
Extensions

Panels Details

6 + -

Pattern Name	Panel Code	Height (m)	Girder Width Tran (m)	Girder Width Long (m)	Addl Inputs
A1L3D4-1	P1	3	0	0	...
A2L4D4-1	P2	6	0	0	...
G1L1D2-1	G1	3	4.5	4.5	...
LGL5D5-1	L1	6	0	0	...
LGL6D6-1	L2	9	0	0	...
D2-1	D1	0	0	0	...

Leg Combinations

2 + -

i

ID	Corner 1	Corner 2	Corner 3	Corner 4	Corner for Wind Calc
LegComb-1	L1	L1	L1	L1	Corner 1
LegComb-2	L2	L2	L1	L1	Corner 1

Figure 25. Extensions define reusable panel codes and leg combinations. This example includes a girder, two leg heights and four-corner assignments.

Enable **With Extensions** in the Slopes tab to make the Extensions tab available (**Alt+E**). Define reusable extension slopes first, then extension panel definitions. The basic body remains the common tower above the combinations.

Extension-slope input	Use
Extension Slopes count	Number of reusable extension-slope rows.
Continue 1st Slope as Base Tower bottom	Makes the first extension slope continue the basic body's bottom slope automatically. Its geometry cells become disabled/Auto.
Base Width Tran / Top Width Tran	Transverse extension-slope width bounds.

Extension-slope input	Use
Base Width Long / Top Width Long	Longitudinal bounds; coupled to transverse for Square.
Height	Extension-slope interval height.

Extension-slope dimensions support the displayed Auto behavior or nonnegative numeric lengths. If the first continuation option is cleared, review and populate its numeric geometry. A reusable slope can be selected in more than one tower combination. Reducing the slope count is blocked while the removed rows are still in use; remove the dependency first.

Panels Details

Column	Use
Pattern Name	Extension-compatible library pattern.
Panel Code	Generated reference code used by combinations; read-only.
Height	Reusable panel height in length units. Diaphragm is zero and disabled.
Girder Width Tran	Transverse width dimension for Girder patterns; otherwise disabled.
Girder Width Long	Longitudinal width dimension for Girder patterns; otherwise disabled.
Addl Inputs	Body-slope editor for eligible definitions; disabled for Girder and Diaphragm.

The count above Panels Details creates or removes definition rows. Generated codes distinguish ordinary panels **P...**, girders **G...**, diaphragms **D...** and leg extensions **L...**. Select the pattern and enter the definition's dimensions, then use its code in a combination. The same definition can be reused; editing it affects every combination referencing it.

A referenced definition cannot be changed to an incompatible panel category until its dependencies are removed. Pattern changes reset its body-slope point and automatic body-slope values. Reducing definition counts or removing a used entry prompts or blocks according to the dependency; follow the identified uses instead of renaming a code manually.

Leg Combinations

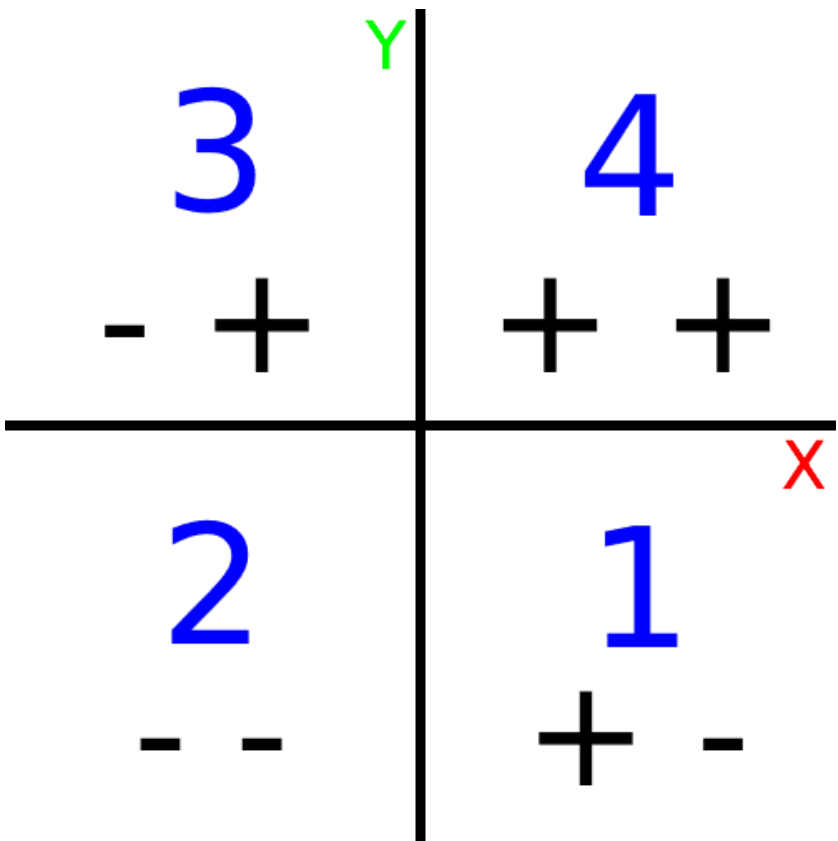


Figure 26. Tower leg corner numbering.

A Leg Combination assigns one defined leg-extension panel to each of four tower corners. Define at least one Leg Extension in Panels Details before adding a Leg Combination.

Column	Use
ID	Generated LegComb reference.
Corner 1 / Corner 2 / Corner 3 / Corner 4	Selects the L... panel definition used at each corner.
Corner for Wind Calc	Chooses which corner is used for the leg wind calculation.

Use the corner reference diagram to assign physical corners. A newly added combination starts with available leg definitions assigned; check all four selections. The General setting **Add new LegComb when a new LegExtn panel is added** can create a LegComb automatically, with the new leg definition applied to its corners.

Equal corner heights allow a LegComb to have further extension rows below it. **Unequal corner heights require the LegComb to be the last extension row.** Panels below an unequal LegComb are not supported and trigger an edit-time warning. Changing a referenced leg definition's height can introduce this condition, so validate the combinations after changing reusable leg data.

Deleting a LegComb used by a tower combination is blocked until that use is removed. Changing a corner definition also updates the affected geometry; inspect every combination that references the LegComb.

Tower Combinations

Leg Combinations

2 + -

i

ID	Corner 1	Corner 2	Corner 3	Corner 4	Corner for Wind Calc
LegComb-1	L1 ▾	L1 ▾	L1 ▾	L1 ▾	Corner 1 ▾
LegComb-2	L2 ▾	L2 ▾	L1 ▾	L1 ▾	Corner 1 ▾

Tower Combinations

5 + -

	Description	Edit Panels	Total Extn Panels	Extn Height
TowerComb-1	+0M		1	3
TowerComb-2	+3M		3	6
TowerComb-3	+6M		2	9
TowerComb-4	Girder		4	12
TowerComb-5	Girder Unequal		4	15

Figure 27. Tower Combinations combine reusable extension codes and leg combinations; each row reports its extension panel count and height.

Create the number of combinations needed for the project. Each combination automatically includes the basic body; its editable rows describe the additional extension assembly **from the basic-body connection downwards**.

Main table column	Use
Description	Meaningful combination name, used in output filenames when enabled.
Edit Panels	Opens Tower Combinations Inputs for that row.
Total Extn Panels	Read-only number of additional entries.
Extn Height	Read-only calculated extension height in active length units.

In **Edit Panels**, set the entry count and complete the rows.

Tower Combinations Inputs



Note: Basic Body will always be attached to the extension panels.

TowerComb-2

 + -

ID	Slope	Panel Code	Wind Load At
1	ESlope-1 ▼	P1 ▼	▼
2	ESlope-1 ▼	D1 ▼	▼
3	ESlope-1 ▼	P1 ▼	Bottom ▼

Figure 28. Edit Panels assembles a Tower Combination from slope and panel codes. The Basic Body is attached automatically above the listed extension rows.

Combination entry column	Use
ID	Generated order within the added assembly.
Slope	Selects the reusable ESlope definition for this entry.
Panel Code	Selects an ordinary extension, girder, diaphragm or LegComb definition.
Wind Load At	Blank / Bottom / Top where applicable. Diaphragm wind selection is disabled.

The last physical entry needs the appropriate Bottom wind-load position. If a diaphragm is last, check the adjacent physical panel's position as requested by validation. New rows use an available slope and initialize the final row's wind position, but you must still select valid panel codes and review the assembly.

Create and inspect a combination

1. Define the required ESlope and extension panel records.
2. Define LegComb records if four-corner leg extensions are needed.
3. Add a Tower Combination and enter its description.

4. Open Edit Panels and set the additional entry count.
5. Enter the sequence nearest to the basic body first, progressing down to the support end.
6. Select slope and panel/LegComb codes for every entry; set wind positions.
7. Close the editor and select the combination from the ribbon's Tower Combination dropdown.
8. Use Zoom Extents and inspect all four sides. Compare calculated extension height and intended bottom geometry.
9. Validate, save and generate the required outputs.

The `Demo_Horz.tgi` example has five combinations, including regular extensions, a girder arrangement and an unequal-girder/leg arrangement. Use its rows to understand reusable codes and physical ordering before adding your own variants.

Combination context menu and saved default

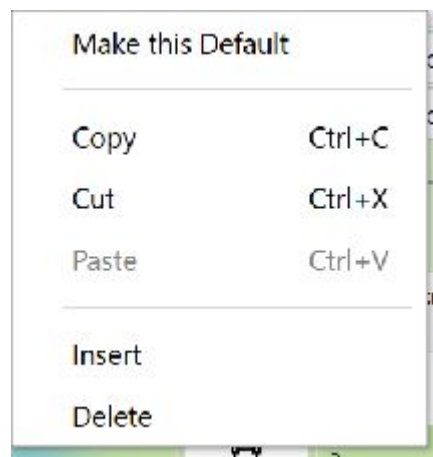


Figure 29. Tower Combination row actions include Make this Default, Copy, Cut, Paste, Insert and Delete.

Command	Behavior
Make this Default	Marks that combination as the one selected when this input is opened. Only one explicit file default can be set. Unchecking clears it.
Copy / Ctrl+C	Copies description and extension-entry data.
Cut / Ctrl+X	Copies the data, then clears that row's configuration and calculated count/height; the combination row remains.
Paste / Ctrl+V	Replaces the selected target combination after confirmation. Referenced panel/leg definitions must exist.
Insert	Inserts a new combination row and updates identities.
Delete	Removes the selected combination and updates identities.

Right-click selects the row under the pointer before showing this menu. The default row is highlighted. Save the file after choosing its default. Merely selecting a combination in the ribbon changes the displayed model; it does not make it the saved default. Copy/Paste does not transfer the source's default flag, and pasting into an existing

default row preserves that target's default status. Without an explicit saved default, the first combination is used on opening.

Tower Combinations 5 + -				
	Description	Edit Panels	Total Extn Panels	Extn Height
TowerComb-1	+0M		1	3
TowerComb-2	+3M		3	6
TowerComb-3	+6M		2	9
TowerComb-4	Girder		4	12
TowerComb-5	Girder Unequal		4	15

Figure 30. Make this Default marks the selected combination. Its row header is pale yellow while the selected cells retain the selection color.

Descriptions are filename fragments. Avoid `\ / : * ? " < > \ |` and correct any invalid-description finding. OptiTower/family generation also requires the described combinations to be meaningful and distinct. Read [Generating and using outputs](#) for output names, common bottom nodes and group consolidation.

Validate after structural changes

Recheck the model after changing Shape, units, slope dimensions, panel patterns, attachment nodes, extension definitions or combination ordering. Such edits affect more than the active row: shared boundaries, reused definitions, body slopes, clearance points and wind references can change. Correct errors, review warnings, inspect the active physical geometry and save before Run. See [Validation and troubleshooting](#) for common findings.

Working in the 3D model viewer

The main viewer lets you inspect the tower geometry while entering slopes, panels, attachments and extensions. It also links a highlighted physical panel to its input row. Use several orientations when reviewing a connection; a single elevation can conceal depth or an incorrect attachment.

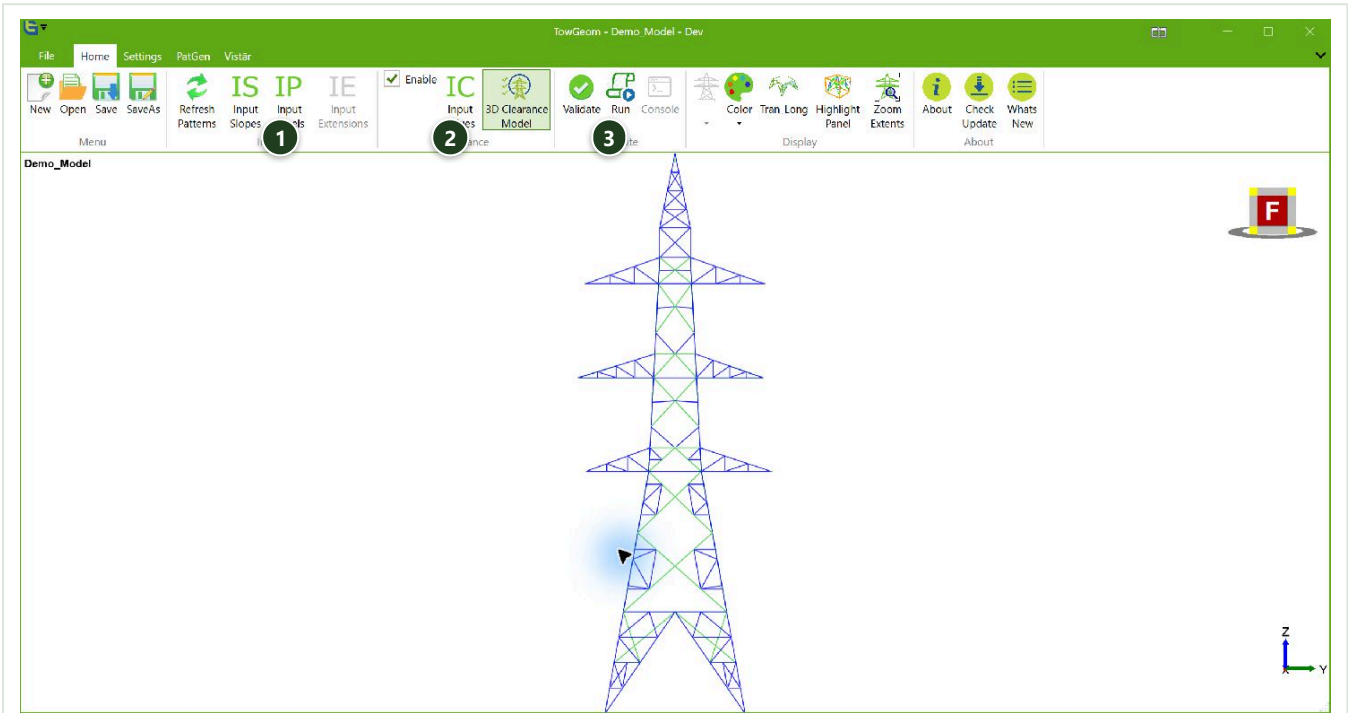


Figure 1. Home commands after loading a tower: 1 Geometry inputs; 2 Clearance tools; 3 Validate and Run.

Navigate the model

Click in the viewer before using its letter keys. If a text field or grid editor has focus, the same letter is input text rather than a camera instruction.

Action	Control	Result
Fit the complete displayed model	Zoom Extents, Ctrl+E	Fits the current geometry in the viewport. Use it after opening a model or selecting a combination.
Rotate	Hold Shift and drag with the left mouse button	Rotates around the mouse-down region using a turntable-style camera.
Pan	Drag with the middle mouse button	Moves the model across the viewport.
Select a standard orientation	Click a View Cube face or use a letter below	Returns to an identifiable tower side. Cube edges can also be clicked for intermediate views.

The cube is labelled **R, L, F, B, U, D**. TowGeom's tower axes and side labels use the following camera mapping. In particular, L/R correspond to the camera's Back/Front orientations and F/B to its Left/Right orientations.

Key	Cube face	Camera orientation
L	L	Back orientation
R	R	Front orientation
F	F	Left orientation
B	B	Right orientation
U	U	Top / plan
D	D	Bottom

Use the cube letter and displayed directional text to identify the tower side. The coordinate indicator labels the green direction Y and the red direction X; the model's vertical direction is Z. Keep the visible labels in mind when moving between transverse, longitudinal and auxiliary-arm views.

If the model seems to disappear after rotation or panning, use **Ctrl+E**. If a member still appears missing, check the active tower combination, display filters, selected pattern and input geometry.

Viewer context menu

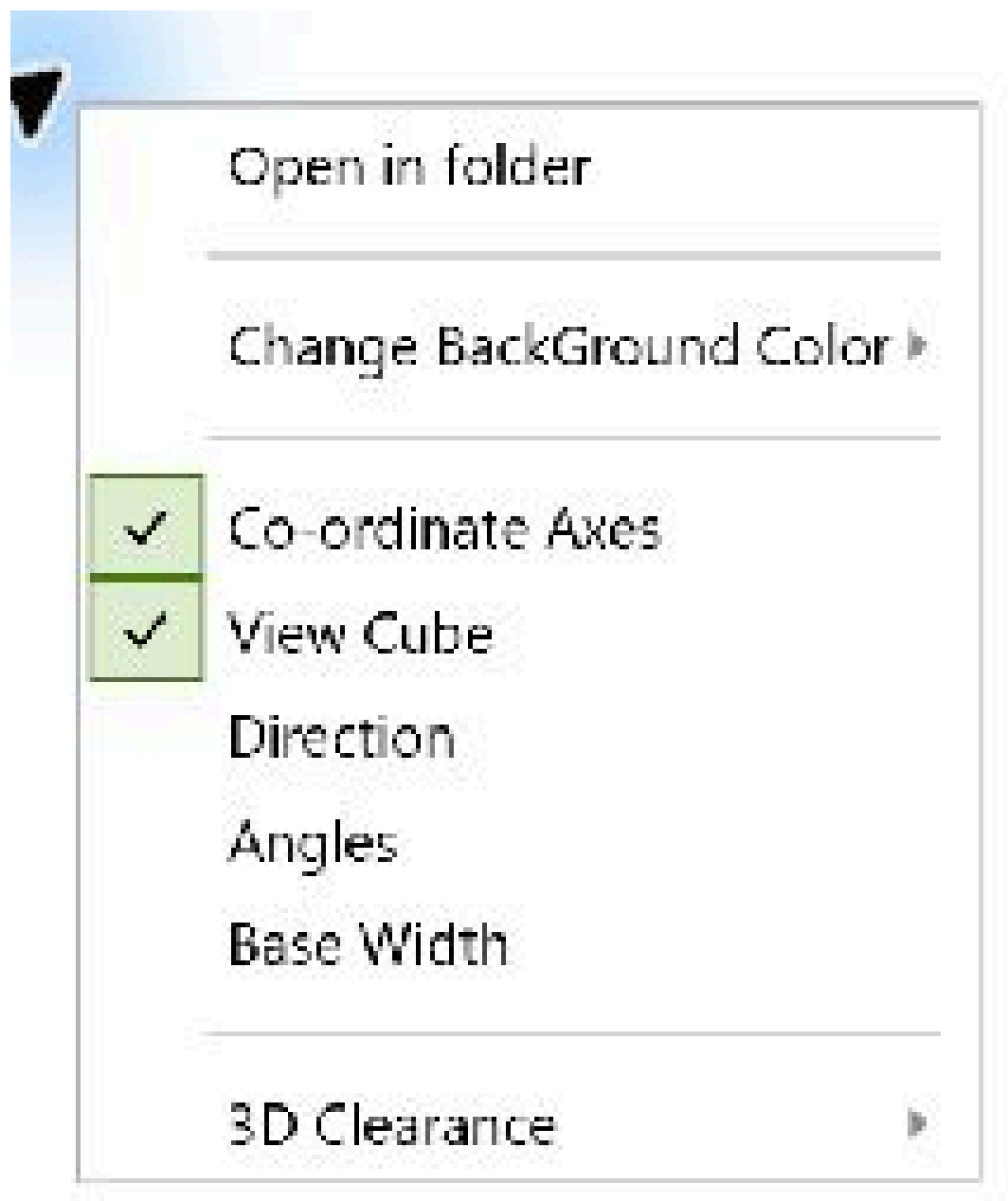


Figure 31. Right-click the main viewer to control background, axes, cube, labels and clearance display components.

Right-click the viewer to open its context menu.

Menu item	Use
Open in folder	Opens the saved input's containing folder. Available when the input file exists.
Change BackGround Color > Black / White	Changes the viewer background. Pick a background that keeps lines and annotations readable.
Co-ordinate Axes	Shows or hides the coordinate indicator.

Menu item	Use
View Cube	Shows or hides the orientation cube.
Direction	Shows or hides tower direction text.
Angles	Shows or hides available angle annotations.
Base Width	Shows or hides available base-width annotations.
3D Clearance	Appears when clearance is enabled; provides overall/component display switches.

The matching General Settings display controls provide the same annotation preferences. Hiding an annotation or clearance component does not change its model input. **3D Clearance** includes Clearance Model, Hangar Lines, Strain Plate, Insulator Lines, Conductors, Swing Spheres and Offset Planes. Read the [Clearance module](#) for their use.

Strain-plate lines currently follow **Hangar Lines** visibility. Keep that switch on to inspect them; **Strain Plate** is not an independent visibility switch in this release.

Colors and structural display filters



Figure 32. The Color menu separates tower-model color schemes from the viewer background.

On the main ribbon, open **Color > Tower Model** to choose the information emphasized by the line colors.

Mode	Shortcut	Meaning
Default	Alt+Shift+D	Normal model appearance.
Banded	Alt+Shift+B	Alternating panel bands, useful for distinguishing adjoining panels.
Beam/Truss	Alt+Shift+T	Shows the beam/truss member-design types in the model.
PatGen	Alt+Shift+P	Uses the member-class colors from the PatGen color configuration.

Color > Background also offers Black and White. The drawing-output setting **Use PatGen Member Colors** is separate: a viewer color choice does not regenerate an existing drawing script.

Tran_Long (Alt+Shift+E) displays the transverse/front and longitudinal/left elevation surface members. Turn it off to review the full structure, particularly plan, hip, auxiliary and redundant members. This is a display filter and does not remove those members from the model.

Joint-error indicators can appear in the viewer when connectivity is inconsistent. Review Validate and inspect the identified geometry. Color modes and hidden annotations are inspection aids; a different color mode does not correct a joint error.

Highlight a panel and find its inputs

Highlight Panel (Alt+W) links the model to the input grids.

1. Enable Highlight Panel.
2. Move the pointer over a model panel or an input row to identify the associated geometry.
3. Click a physical panel in the viewer to open the corresponding inputs.
4. For a basic-body panel, TowGeom selects the Panels tab and expands its slope's panel section.
5. For an extension panel, TowGeom opens the extension/combination inputs for the active combination.
6. Verify the selected row before editing. Disable Highlight Panel when you want to navigate without selecting inputs.

Highlighted bounds are orange. If several members overlap, choose another view or zoom to identify the intended panel more clearly. The active combination determines which extension geometry is being inspected.

Graphical attachment-node selection

Crossarm attachment and clearance node fields have graphical selection buttons. Use them when the correct node is easier to identify on the model than by its name.

1. Open the selected panel's additional inputs.
2. Select the relevant crossarm or clearance placement.
3. Click the node-selection button beside the required field.
4. Follow the displayed selection prompt and pick eligible nodes in the viewer.

5. Confirm the node names returned to the input fields and inspect the resulting connection.
6. Press **Escape** to cancel an active node-picking session, or close the additional-input flyout.

A picking session takes precedence over ordinary panel highlighting. Eligible nodes are governed by the pattern and attachment type; Ghost nodes cannot be selected as physical attachments. Node picking is a selection aid and does not add a node to the pattern.

Clipboard commands and focus

Clipboard actions differ between an input grid, a text editor and the model viewer.

Location	Available action
Panels grid, selected row	Ctrl+C copies row data; Ctrl+V pastes the copied row data. Copy Pattern Name in the context menu copies just the selected library name.
Tower Combinations grid, selected row	Ctrl+C , Ctrl+X , Ctrl+V copy, cut and paste combination data. Cut clears the row's configuration; the row remains.
Validation text	Select text and use Ctrl+C to copy findings.
Console	Use Copy to copy recent output. Word wrap affects the display only.
Text input	Normal text-selection and clipboard editing apply to that field.

The main viewer context menu has no model-image copy or screenshot command. Use the application's permitted screen-capture workflow when preparing an illustration. To copy row data reliably, select the intended row before invoking its context menu. Do not expect the Slopes grid to offer the Panels grid's row-editing menu.

A useful inspection sequence

After editing an attachment or panel, fit the model with **Ctrl+E**, inspect the relevant elevation, inspect plan with **U**, then rotate with Shift+left drag. Use Banded color to distinguish panels, Beam/Truss when reviewing design type and PatGen when reviewing member class. Turn on Highlight Panel to locate the input row for an unexpected member. Finish with Validate and save the corrected model.

Clearance module

The clearance module combines circuit requirements, insulator and conductor configurations, attachment nodes, a 3D clearance display, input validation and supported 2D drawing output. Configure the circuit and conductor data first, then assign them to each crossarm or beam. A named conductor configuration can be reused at several attachment locations.

For the examples in this chapter, use working copies of `Demo_Clearance_S.tgi` for suspension and `Demo_Clearance_T.tgi` for tension. Both use the installed `C:\DegiTrans\TowGeom\Library.plib`. Save your copy under a different name before experimenting with values.

Start a clearance workflow

1. Open the tower input and check its library, units, slopes, panels and crossarms.
2. On the main ribbon, select **Clearance > Enable**.
3. Select **Input values**, or press **Alt+C**. The window contains **General** and **Conductor Data** tabs.
4. Complete the circuit requirements on General.
5. On Conductor Data, choose **Suspension** or **Tension** and complete the named configurations you need.
6. In each crossarm or beam's additional inputs, assign the circuit, conductor configuration and attachment nodes.
7. Select **3D Clearance Model**, or press **Alt+3**, and inspect the model from several directions.
8. Select **Validate (Alt+V)**. Correct errors and review warnings before saving and running the model.

Changes in the clearance window update the current model; many numeric edits take effect when you leave the field. **Close** dismisses the window. It is not a separate Save command. Use the main **Save** command to persist the edited model.

Units and new configuration defaults

Length inputs and clearance radii use the active unit system: **m** in Metric and **ft** in Imperial. Angles remain **degrees** and percentages remain **%**. Wind areas use **m²** or **ft²**. Insulator weight and capacity fields use **N** or **lbs**, as shown beside the control; do not enter a mass in kilograms in a field labelled N.

A new conductor configuration starts with I-string, Single bundle, Default deviation direction, Back Insulator same as Front enabled, and one swing row at 0° with zero clearance. Numeric dimensions and capacities start at zero; pilot insulators start disabled. These are blank starting values, so enter the project's requirements before using the configuration. In particular, a zero maximum insulator length or zero clearance radius is not a completed drawing specification.

General inputs and the ground reference

General Conductor Data

Muffing Height: 0.6 (m)

Clamp Drop at Peak: 0.5 (m)

Clamp Offset at Peak: 0 (m)

Base of the Tower is considered for:

CIRCUIT DATA

Circuit Name: 220kv

Minimum Ground Clearance: 7.36 (m)

Maximum Conductor Sag: 4.5 (m)

Sag Error: 3 (%) (OR) 0.135 (m)

Minimum Vertical spacing of Conductors: 5.34 (m)

Minimum Horizontal spacing of Conductors: 9 (m)

Maximum Shielding Angle: 30 (deg)

Minimum Slope of Crossarm in Elevation view: 17 (deg)

Minimum angle of Main members in Plan view: 20 (deg)

NEW DELETE COPY PASTE

CLOSE

Figure 33. General clearance inputs and the 220 kV circuit requirements in the suspension example.

Field	Meaning and use	New model default
Muffing Height	Additional height applied to the tower's ground reference in ground-clearance checks. Enter a nonnegative length.	0
Clamp Drop at Peak	Vertical drop from the peak reference to the shield-wire clamp point. Enter a nonnegative length.	0
Clamp Offset at Peak	Horizontal offset of the shield-wire clamp point. Enter a nonnegative length and inspect the physical side in the model.	0
Base of the Tower is considered for	Selects the reference or Normal Tower combination when extensions exist. Choose the combination whose base defines the clearance reference.	First combination

With extensions, confirm the reference combination before interpreting ground heights. The clearance drawing is generated for the selected reference combination. Clamp drop and offset adjust the shield point; they do not substitute for insulator length or conductor sag.

Circuit Data

A circuit stores the requirements applied to its assigned crossarms or beam. The conductor configuration separately describes the insulators, bundle and swings.

Field	Unit / permitted entry	Purpose
Circuit Name	Editable text	Identifies the circuit in attachment selections. Use a meaningful project name.
Minimum Ground Clearance	Length, zero or greater	Required clearance above the flat ground reference. A zero value does not request a positive ground-clearance check.
Maximum Conductor Sag	Length, zero or greater	Maximum span sag deducted in the ground-clearance calculation.
Sag Error (%)	Percent, zero or greater	Extra sag expressed as a percentage of Maximum Conductor Sag.
Sag Error, distance	Length, zero or greater	Alternative way to enter the same extra sag.
Minimum Vertical spacing of Conductors	Length, zero or greater	Requirement used to compare successive conductor levels on the same side.
Minimum Horizontal spacing of Conductors	Length, zero or greater	Requirement used for opposed conductor/crossarm spacing.
Maximum Shielding Angle	0-79°	Maximum angle between peak/shield reference and conductor. Zero disables this check.
Minimum Slope of Crossarm in Elevation view	0-79°	Minimum angle between the crossarm's top and bottom members in elevation.
Minimum angle of Main members in Plan view	0-79°	Minimum angle between the main members in plan.

Sag Error is one quantity displayed in two forms. When you edit the percentage, the distance becomes $\text{Maximum Conductor Sag} \times \text{percentage} \div 100$. When you edit the distance, the percentage is recalculated. If maximum sag is zero, the derived percentage is zero. For example, the suspension demonstration uses 4.5 m sag and 3% error, giving 0.135 m additional sag.

Manage circuits

1. Select the circuit in **Circuit Name** to display its values.
2. Use **New** to add a circuit, then rename it and enter its requirements.
3. Use **Copy**, select a different target circuit, then **Paste** to replace that target's data after confirming the prompt.

4. Use **Delete** only when the circuit is no longer assigned to a crossarm or beam. TowGeom identifies assignments that prevent deletion.

At least one circuit must remain. Copy/Paste transfers the circuit values; it does not add another physical attachment to the tower. A circuit with all checks at zero is a default record, not evidence that the tower has passed project requirements.

Conductor Data: names and tower mode

Select the named configuration before changing its fields. **Suspension** and **Tension** select the clearance behavior for the tower, rather than a separate mode for each individual arm. Changing the tower mode changes the visible configuration and attachment inputs, so review existing assignments afterwards.

Use **New** for another named configuration. Use **Copy** and **Paste** to replace an existing target configuration with copied data. Paste asks for confirmation. **Delete** is blocked while the configuration is in use, and at least one configuration must remain. Enter distinct descriptive names so that users can identify the correct configuration in each attachment list.

Suspension I-string

General **Conductor Data**

Tower Type: ☒ Suspension ☐ Tension ⓘ

Name: Susp ▾

Insulator Type: ☒ I-String ☐ V-String ☐ Y-String

Hanger Length from Crossarm: 0.3 (m)

Min Insulator Length: 1.8 (m)

Max Insulator Length: 2.5 (m)

Additional Links length for Insulator: 0 (m)

Down drop value for Conductor: 10 (deg) (OR) 0 (m)

Distance for checking in drawing: 1 (m)

⌵ OFFSET INPUTS

⌵ BUNDLE CONDUCTORS

SWINGS AND CLEARANCES 3 + -

Swing Angle (deg)	Clearance (m)
0	2
30	1.9
45	1.7

NEW DELETE COPY PASTE

CLOSE

Figure 34. Suspension I-string inputs from Demo_Clearance_S, including insulator lengths, links, drop and swing rows.

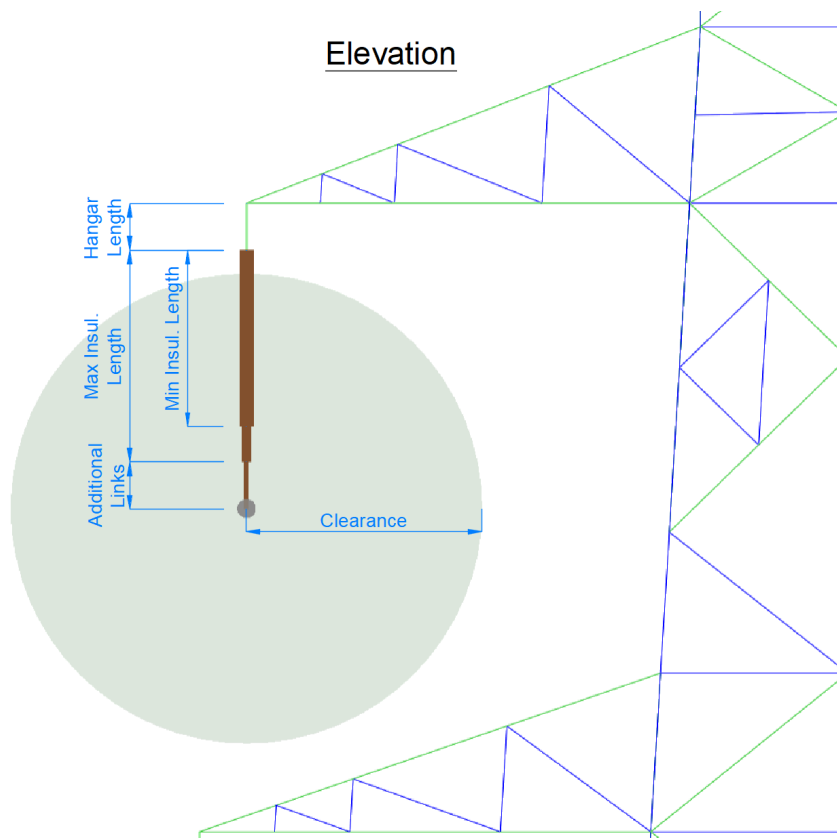


Figure 35. Suspension clearance geometry and reference dimensions.

I-string uses one selected insulator attachment node. Its hanger and insulator extend downward, and the swing rows describe conductor positions and clearance envelopes.

Input	Unit / range	How to use it
Hangar Length from Crossarm	Length ≥ 0	Distance from the attachment to the start of the insulator. The UI spells this field "Hangar".
Min Insulator Length	Length ≥ 0	Minimum specified insulator length; it must not exceed maximum length.
Max Insulator Length	Length ≥ 0	Maximum specified insulator length. Enter a positive value for drawing output.
Additional Links length for Insulator	Length ≥ 0	Separate additional hardware/link length after the insulator. It remains distinct from the main insulator length.
Down drop angle	-79° to $+79^\circ$	Describes conductor down-drop by angle. A nonzero entry clears the alternative distance.
Down drop distance	Length	Alternative down-drop description. A nonzero entry clears the alternative angle.
Distance for checking in drawing	Length ≥ 0	Stored drawing reference value. This release does not apply it as an extra 3D or 2D clearance allowance.

When both down-drop entries are zero, the conductor clearance is checked at a point. A nonzero down-drop describes the conductor segment used for the 3D clearance envelope. Enter the required physical value and inspect the resulting segment, rather than adding this value to the clearance radius.

Suspension example

1. Open a working copy of `Demo_Clearance_S.tgi` and enable clearance.
2. On General, select **220kv** and review its ground, sag, shielding and spacing requirements.
3. On Conductor Data, select **Suspension**, then the configuration **Susp** and **I-String**.
4. Review the 0.3 m hanger, 1.8 m minimum and 2.5 m maximum insulator length, 10° down-drop and Double bundle at 0.5 m spacing.
5. Review swings 0°, 30° and 45° with radii 2 m, 1.9 m and 1.7 m.
6. Inspect the assigned Left and Right nodes on the three conductor levels.
7. Display the clearance model and run Validate. If you edit the copy, save it under its own name before generating outputs.

Suspension V-string

The image shows a software dialog box titled "Conductor Data" with a "General" tab. The "Tower Type" is set to "Suspension". The "Name" dropdown is set to "Susp". The "Insulator Type" is set to "V-String". Below this, there are input fields for "Hanger Length from Crossarm", "Min V-String Insulator Length", "Max V-String Insulator Length", and "Additional Links length for V-String Insulator", all currently set to 0 (m). Further down are "Clearance Radius" and "Vertical Offset from V Point", also set to 0 (m). At the bottom, there are expandable sections for "OFFSET INPUTS" and "BUNDLE CONDUCTORS", and a row of buttons: "NEW", "DELETE", "COPY", "PASTE", and a "CLOSE" button at the very bottom.

Figure 36. V-string editor on a working-copy variant. Zero values are blank starting inputs and must be replaced with project dimensions.

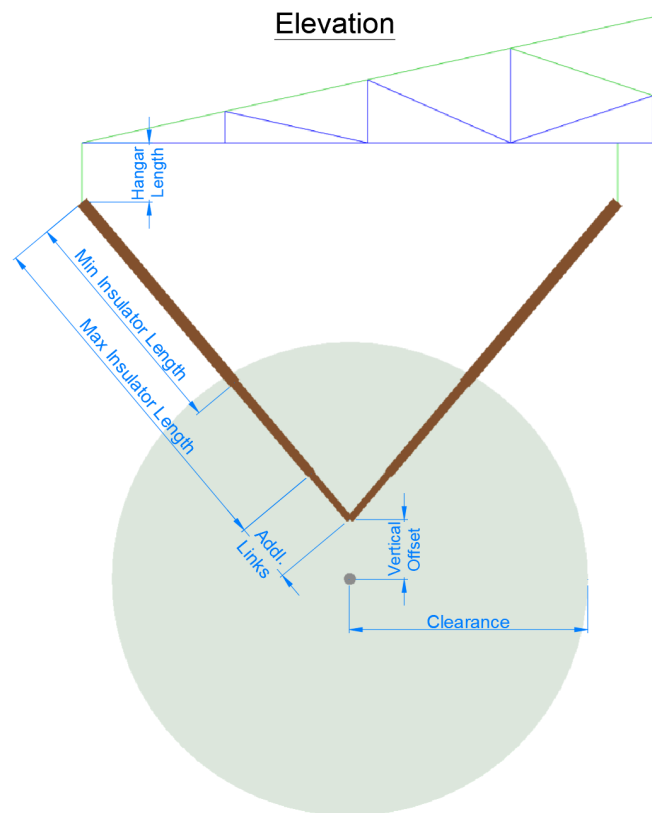


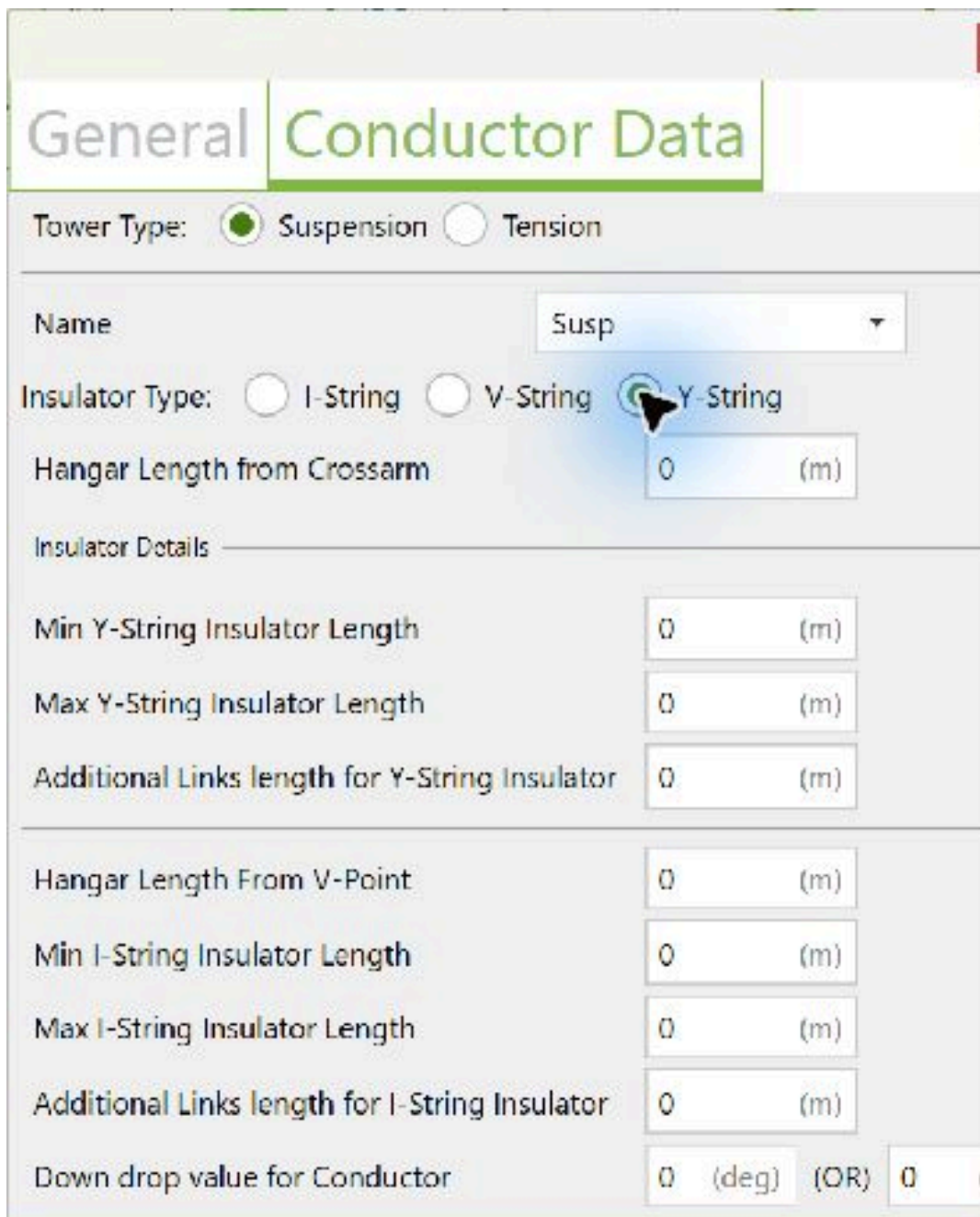
Figure 37. V-string attachment geometry and clearance radius.

V-string uses two attachment nodes whose legs converge at the V point. Select **V-String** to show its fields. Its clearance is static, so the swing table is hidden and **Clearance Radius** supplies the envelope radius.

Input	Unit / range	How to use it
Hangar Length from Crossarm	Length ≥ 0	Upper hanger length.
Min V-String Insulator Length	Length ≥ 0	Minimum leg length; must not exceed the maximum.
Max V-String Insulator Length	Length ≥ 0	Maximum leg length; positive for drawing output.
Additional Links length for V-String Insulator	Length ≥ 0	Additional length retained separately from the V leg.
Clearance Radius	Length ≥ 0	Static conductor clearance radius; positive for 2D clearance drawing.
Vertical Offset from V Point	Length ≥ 0	Additional vertical offset from the convergence point; separate from insulator length.

Assign both V attachment nodes in the crossarm or beam inputs. Review the displayed length and angle between nodes and inspect the convergence point in 3D. Do not reuse the single I-string attachment without completing the V node selections.

Suspension Y-string



The image shows a software interface for configuring conductor data. It has two tabs: 'General' and 'Conductor Data', with 'Conductor Data' being the active tab. Under 'Tower Type', 'Suspension' is selected with a radio button. The 'Name' field contains 'Susp'. For 'Insulator Type', three radio buttons are present: 'I-String', 'V-String', and 'Y-String', with 'Y-String' being selected. A mouse cursor is pointing at the 'Y-String' radio button. Below this, 'Hangar Length from Crossarm' is set to '0 (m)'. A section titled 'Insulator Details' contains two groups of input fields. The first group, for Y-string insulators, includes 'Min Y-String Insulator Length', 'Max Y-String Insulator Length', and 'Additional Links length for Y-String Insulator', all set to '0 (m)'. The second group, for I-string insulators, includes 'Hangar Length From V-Point', 'Min I-String Insulator Length', 'Max I-String Insulator Length', and 'Additional Links length for I-String Insulator', all also set to '0 (m)'. At the bottom, 'Down drop value for Conductor' is set to '0 (deg) (OR) 0 (m)'.

General **Conductor Data**

Tower Type: ☒ Suspension ☐ Tension

Name: Susp

Insulator Type: ☐ I-String ☐ V-String ☒ Y-String

Hangar Length from Crossarm: 0 (m)

Insulator Details

Min Y-String Insulator Length	0 (m)
Max Y-String Insulator Length	0 (m)
Additional Links length for Y-String Insulator	0 (m)
Hangar Length From V-Point	0 (m)
Min I-String Insulator Length	0 (m)
Max I-String Insulator Length	0 (m)
Additional Links length for I-String Insulator	0 (m)
Down drop value for Conductor	0 (deg) (OR) 0 (m)

Figure 38. Y-string editor exposes both the upper Y-string and lower I-string dimensions. This editor variant shows blank starting values.

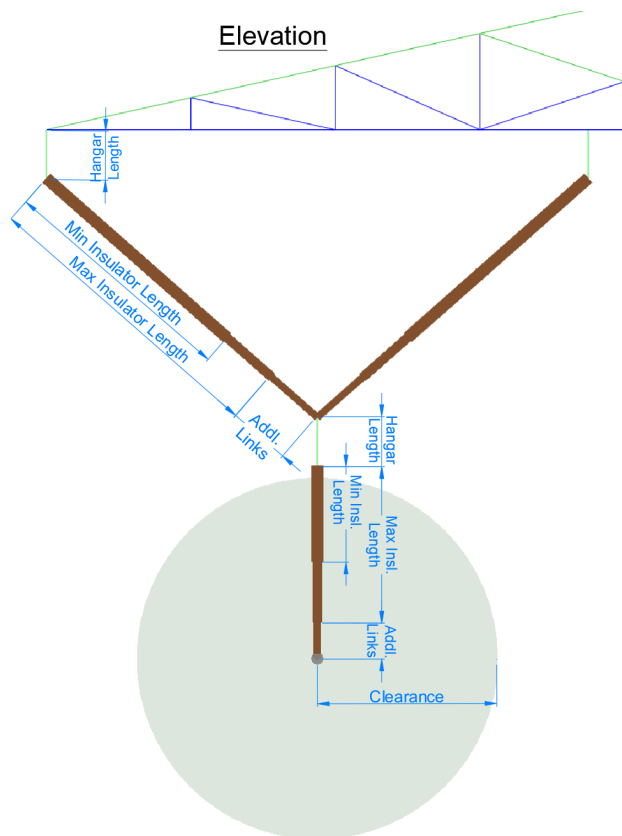


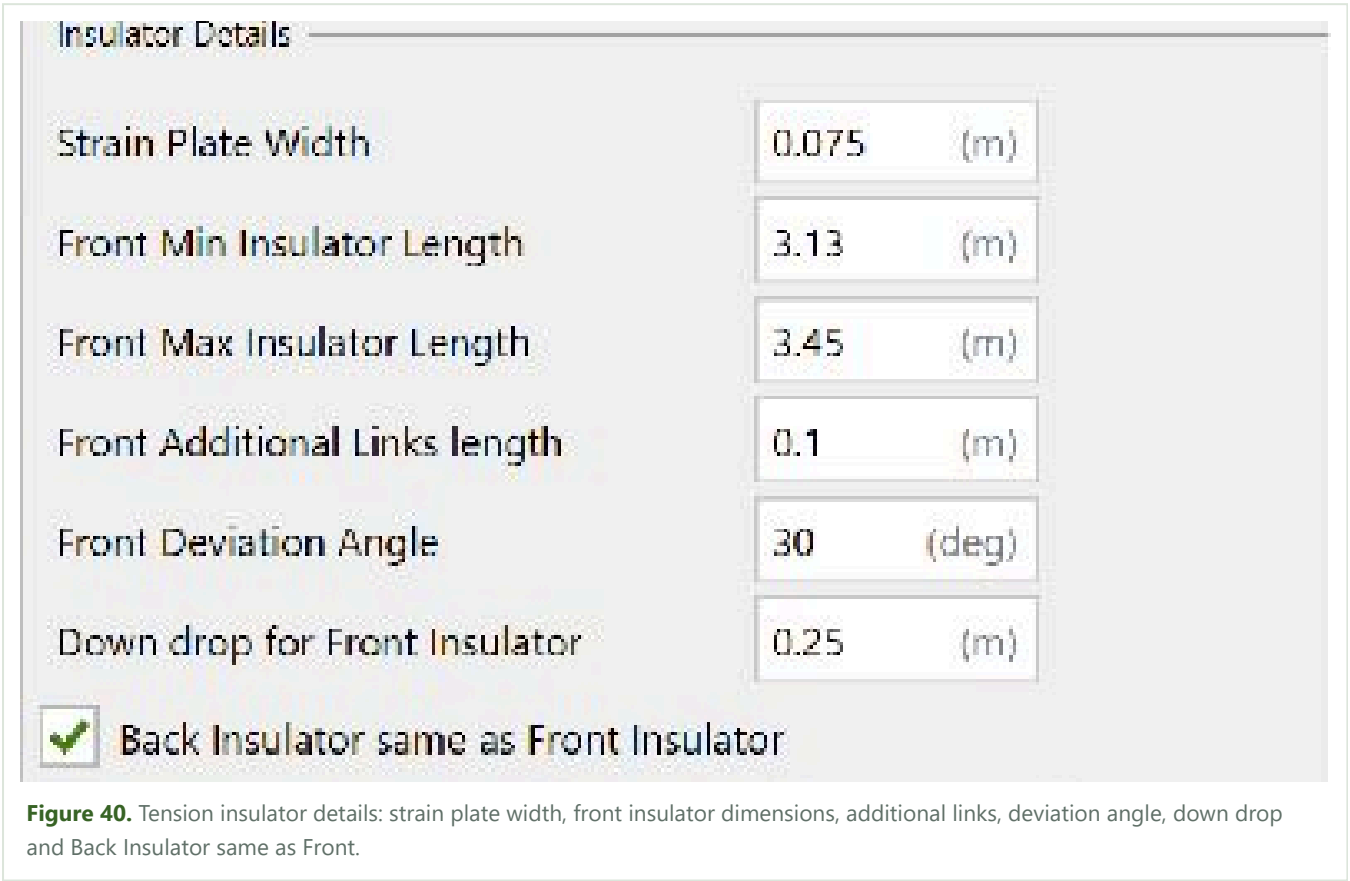
Figure 39. Y-string attachment geometry with upper and lower legs.

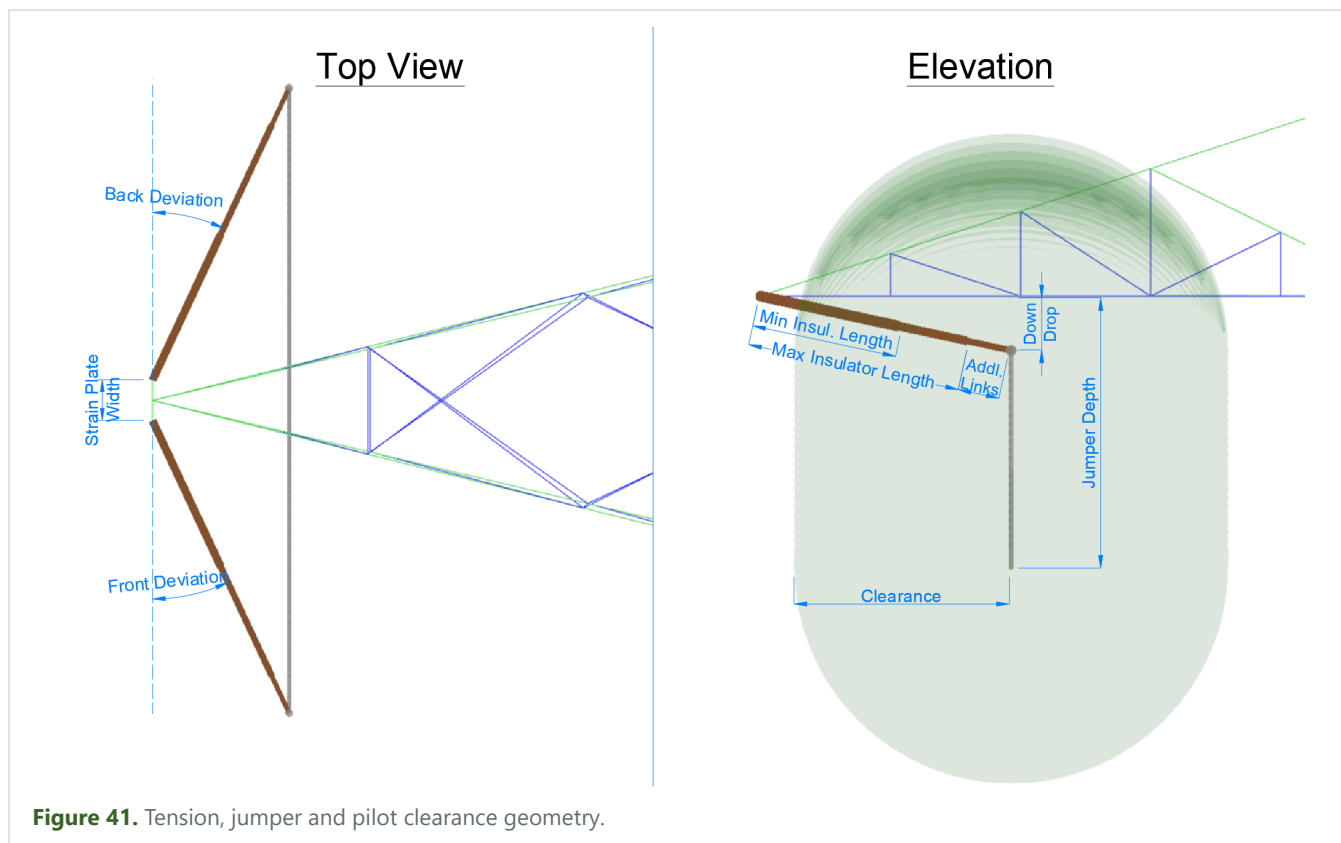
Y-string combines two upper converging legs with a lower I-string. Select **Y-String**, enter both upper and lower assemblies, then complete the swing table.

Input	Unit / range	How to use it
Hanger Length from Crossarm	Length ≥ 0	Hanger above the upper Y legs.
Min / Max Y-String Insulator Length	Length ≥ 0	Upper leg length bounds; minimum $\leq$ maximum. Maximum must be positive for drawing.
Additional Links length for Y-String Insulator	Length ≥ 0	Additional upper-stage length.
Hanger Length From V-Point	Length ≥ 0	Lower hanger from the convergence point.
Min / Max I-String Insulator Length	Length ≥ 0	Lower I-string length bounds; minimum $\leq$ maximum. Maximum must be positive for drawing.
Additional Links length for I-String Insulator	Length ≥ 0	Additional lower-stage length.
Down drop angle	-79° to +79°	Lower conductor segment description; alternative to distance.
Down drop distance	Length	Alternative lower conductor down-drop.

Assign the two upper attachment nodes and inspect both the convergence point and the lower conductor positions. Y-string swings apply to the lower I-string stage. The down-drop alternatives work as for suspension I-string.

Tension insulators





Tension configurations describe front and back strain assemblies and the jumper or pilot arrangement. **Front** and **Back** refer to the two strain branches; they are separate from a Front or Back auxiliary crossarm on the tower.

Input	Unit / permitted entry	How to use it
Deviation Direction: Default / Inside / Outside	Choice; Default initially	Sets the plan deviation orientation. Inspect the actual arm side in plan after changing it.
Front Strain Plate Width	Length ≥ 0	Offset/width for the front strain-plate attachment.
Front Min / Max Insulator Length	Length ≥ 0	Front length bounds; minimum $\leq$ maximum.
Front Additional Links length	Length ≥ 0	Additional front link length after the insulator.
Front Deviation Angle	Degrees ≥ 0	Front plan deviation.
Down drop for Front Insulator	Length	Front elevation drop. The editor limits it to $\pm 90\%$ of total maximum insulator-plus-link length.
Back Insulator same as Front Insulator	Checkbox; initially enabled	Copies front strain width, lengths, links, deviation and down-drop distance to the back assembly and hides the separate back fields.
Back Strain Plate Width	Length ≥ 0	Separate back value when the same-as-front option is off.
Back Min / Max Insulator Length	Length ≥ 0	Separate back length bounds.
Back Additional Links length	Length ≥ 0	Separate back links.

Input	Unit / permitted entry	How to use it
Back Deviation Angle	Degrees ≥ 0	Separate back plan deviation.
Down drop for Back Insulator	Length	Separate back elevation drop, with the same $\pm 90\%$ limit.
Jumper Depth	Length ≥ 0	Defines jumper depth for the modeled arrangement.
Distance for checking in drawing	Length ≥ 0	Stored reference value; not an extra clearance allowance in this release.

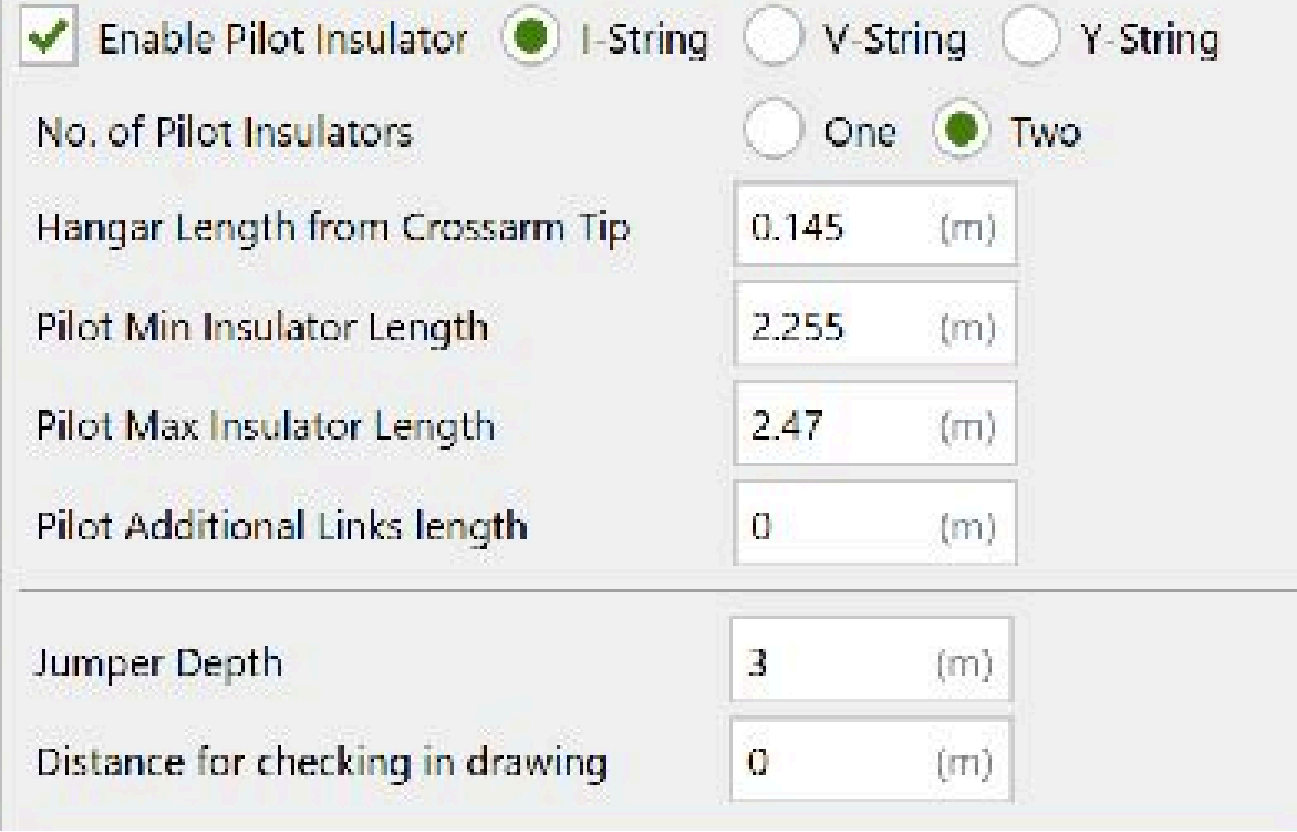
The tension editor displays down-drop **distance**. Although its tooltip refers to angle or distance, there is no separate tension down-drop angle control in this window.

Tension example

1. Open a working copy of the revised `Demo_Clearance_T.tgi` using the installed library.
2. Enable clearance and choose **Tension** on Conductor Data.
3. Select **Tension**. Review equal front/back maximum lengths of 3.45 m, minimum lengths of 3.13 m, 0.075 m strain widths, 30° deviation and 0.25 m down-drop.
4. Review the 0.1 m additional strain links, 3 m jumper depth and pilot settings.
5. In the arm assignments, inspect the two placements without pilots and the four with pilots enabled.
6. Compare the arrangement in elevation and plan. Run Validate and review the release drawing limits below before generating outputs.

The demonstration is useful for inspecting tension geometry. Its nonzero additional links also illustrate a current 2D output limitation; do not remove a real required link length merely to suppress an output warning.

Pilot insulators on tension towers



☒ Enable Pilot Insulator ☒ I-String ☐ V-String ☐ Y-String

No. of Pilot Insulators ☐ One ☒ Two

Hangar Length from Crossarm Tip 0.145 (m)

Pilot Min Insulator Length 2.255 (m)

Pilot Max Insulator Length 2.47 (m)

Pilot Additional Links length 0 (m)

Jumper Depth 3 (m)

Distance for checking in drawing 0 (m)

Figure 42. Two I-string pilots in Demo_Clearance_T, with hanger, insulator length range, additional links and jumper depth.

Enable Pilot Insulator makes pilot data available in the named configuration. **Use Pilot Insulators** in each arm or beam placement determines whether that individual placement uses it. Both selections are needed for a pilot arrangement.

Pilot type	Inputs displayed	Attachment requirements
I-String	One or Two pilots; Hangar Length from Crossarm Tip; Pilot Min/Max Insulator Length; Pilot Additional Links length	Uses the placement's selected Ins. Node; inspect the selected and mirrored arrangement for the chosen pilot count.
V-String	Hangar Length from Crossarm Tip; Pilot Min/Max Insulator Length; Pilot Additional Links length; Clearance Radius; Vertical Offset from V Point	Complete the two V pilot node selections.
Y-String	Upper hanger; Pilot Min/Max Insulator Length; upper Pilot Additional Links; Hangar Length from V-Point; lower Min/Max I-String Insulator Length; lower Additional Links	Complete the two upper pilot node selections and both stages of data.

All pilot lengths use m/ft and accept nonnegative inputs; minimum must not exceed maximum. Use positive maximum lengths for a completed arrangement. For V pilots, use a positive clearance radius. One/Two is shown for I pilots; a newly created record has Two selected if pilot is later enabled. V pilot clearance is static, so its swing table is hidden. I and Y pilot configurations use the swing rows.

The current 2D clearance drawing supports I pilots. V and Y pilot inputs can be modeled and retained in the input file, but their tension drawing output is deferred in this release.

Additional PLS-Tower inputs

On the main tower inputs, select **Include PLS inputs for Insulator details > Yes** to reveal this group and the placement uplift selections. Enter the supplier's properties for the actual assembly.

Property	Units	When displayed
Insulator Weight	N / lbs	Additional PLS-Tower inputs enabled.
Insulator Wind Area	m ² / ft ²	Same.
Tension Capacity	N / lbs	Same.
Hardware Capacity	N / lbs	Same.
Pilot Insulator Weight	N / lbs	Pilot enabled as well.
Pilot Insulator Wind Area	m ² / ft ²	Pilot enabled as well.
Pilot Tension Capacity	N / lbs	Pilot enabled as well.
Pilot Hardware Capacity	N / lbs	Pilot enabled as well.

These values start at zero and accept nonnegative entries. Enabling the group is not a calculation of capacities. It supplies the properties written into the relevant output/PLS data. The placement's **Min. Vertical Load** list offers **No Limit** or **No Uplift**. Choose the restriction required for that attachment.

Offset Inputs

Expand **Offset Inputs** to define the additional space used around structural checking planes in the 3D model.

Field	Unit / range	Plane affected
Offset from Tower	Length ≥ 0; initially 0	Tower/body checking boundary.
Offset from Crossarm Bottom	Length ≥ 0; initially 0	Crossarm lower boundary.
Offset from Crossarm Top	Length ≥ 0; initially 0	Crossarm upper boundary.

After editing an offset, leave the field and inspect **Offset Planes** in the 3D display. Shared structural planes can use the largest required offset among configurations assigned to that arm. These inputs do not relocate the structural nodes. Current 2D clearance drawings use physical structural planes and do not reproduce these extra 3D offset allowances.

Bundle Conductors

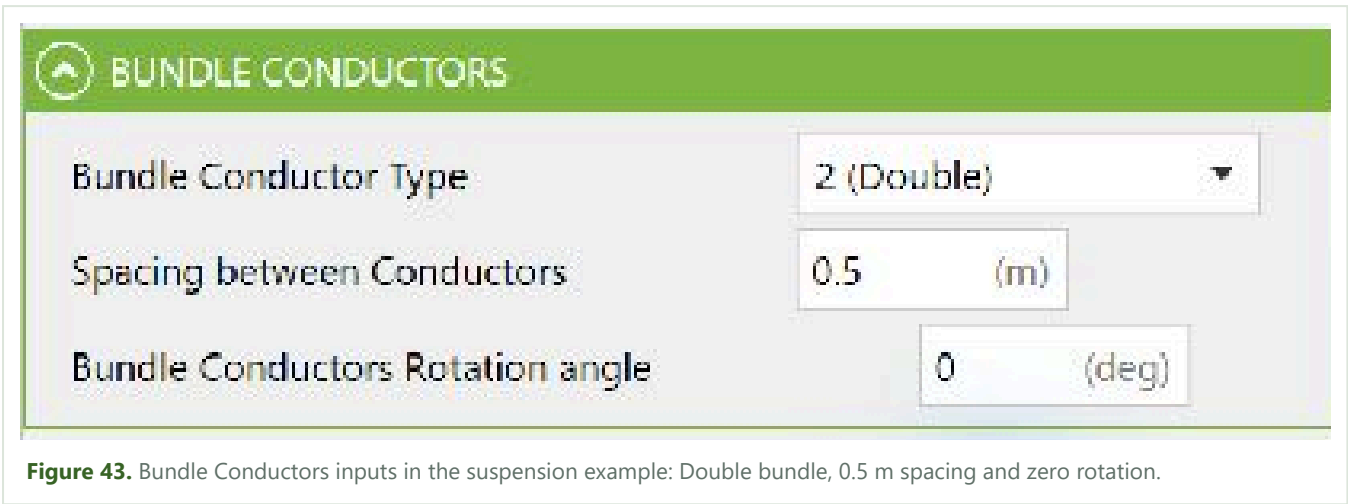
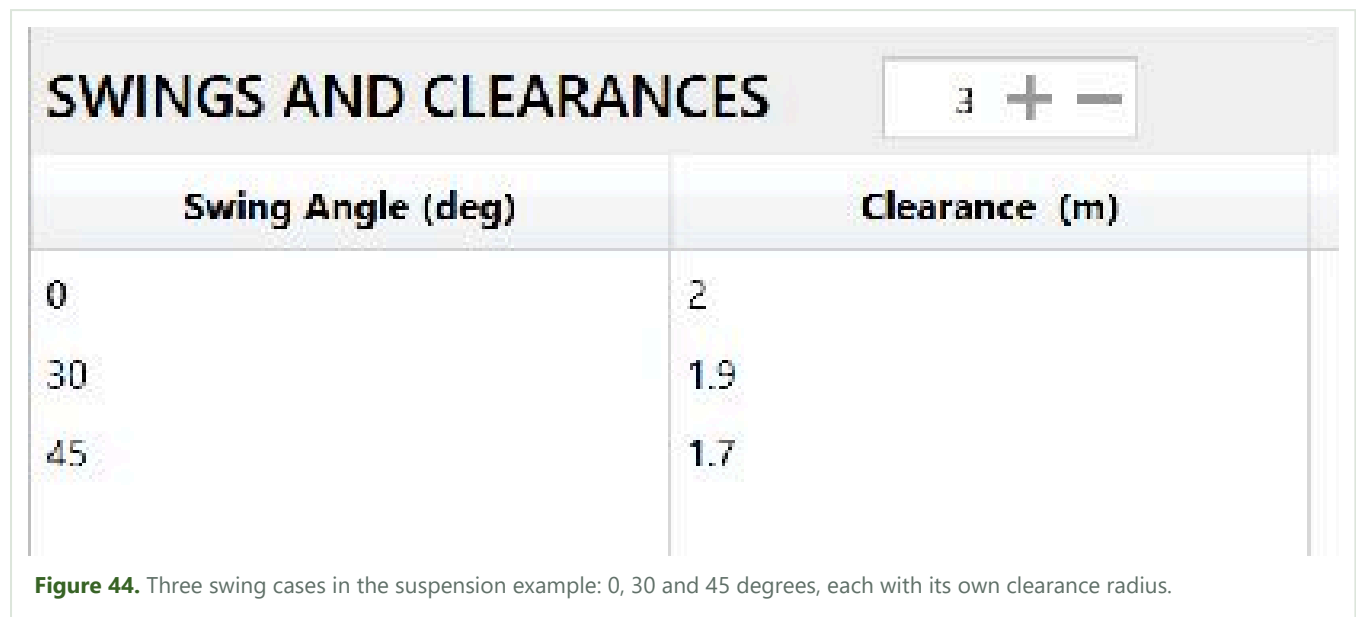


Figure 43. Bundle Conductors inputs in the suspension example: Double bundle, 0.5 m spacing and zero rotation.

Choice	Conductor count	Spacing fields
1 (Single)	1	Spacing and rotation controls disabled.
2 (Double)	2	Spacing length.
3 (Triangle)	3	Spacing length.
4 (Square)	4	Spacing length.
4 (Rectangle)	4	Spacing length and separately displayed spacing height.
6 (Hexagon)	6	Spacing length.
8 (Octagon)	8	Spacing length.

Spacing uses length units. Enter positive spacing for a multi-conductor bundle; Rectangle also needs positive spacing height for 2D drawing. **Bundle Conductors Rotation angle** uses degrees, starts at zero and becomes editable for bundles other than Single. Inspect the bundle orientation in 3D. Nonzero bundle rotation is currently deferred in 2D clearance drawing output.

Swings and Clearances



The number beside **SWINGS AND CLEARANCES** controls the row count. Increasing it adds rows; decreasing it removes rows from the end. Check the rows before reducing the count.

Column	Unit	Meaning
Swing Angle (deg)	Degrees	Angular position to be checked. Enter zero or a positive value for supported 2D drawing.
Clearance	m / ft	Required envelope radius at that swing. Enter a positive value for supported drawing.

Enter each required angle/radius pair, then leave the edited cell so that the value is committed. Adding a row in the grid updates the swing count. A radius is a clearance envelope around each modeled conductor, not conductor spacing or sag.

The table is visible for suspension I and Y; it is hidden for static V. For tension, it is visible without pilots and with I/Y pilots, and hidden for V pilots. I/Y drawing cases require at least one valid row. The program handles Left/Right orientation; enter the required swing magnitude instead of manually reversing signs for opposite arms.

Assign circuits, configurations and nodes

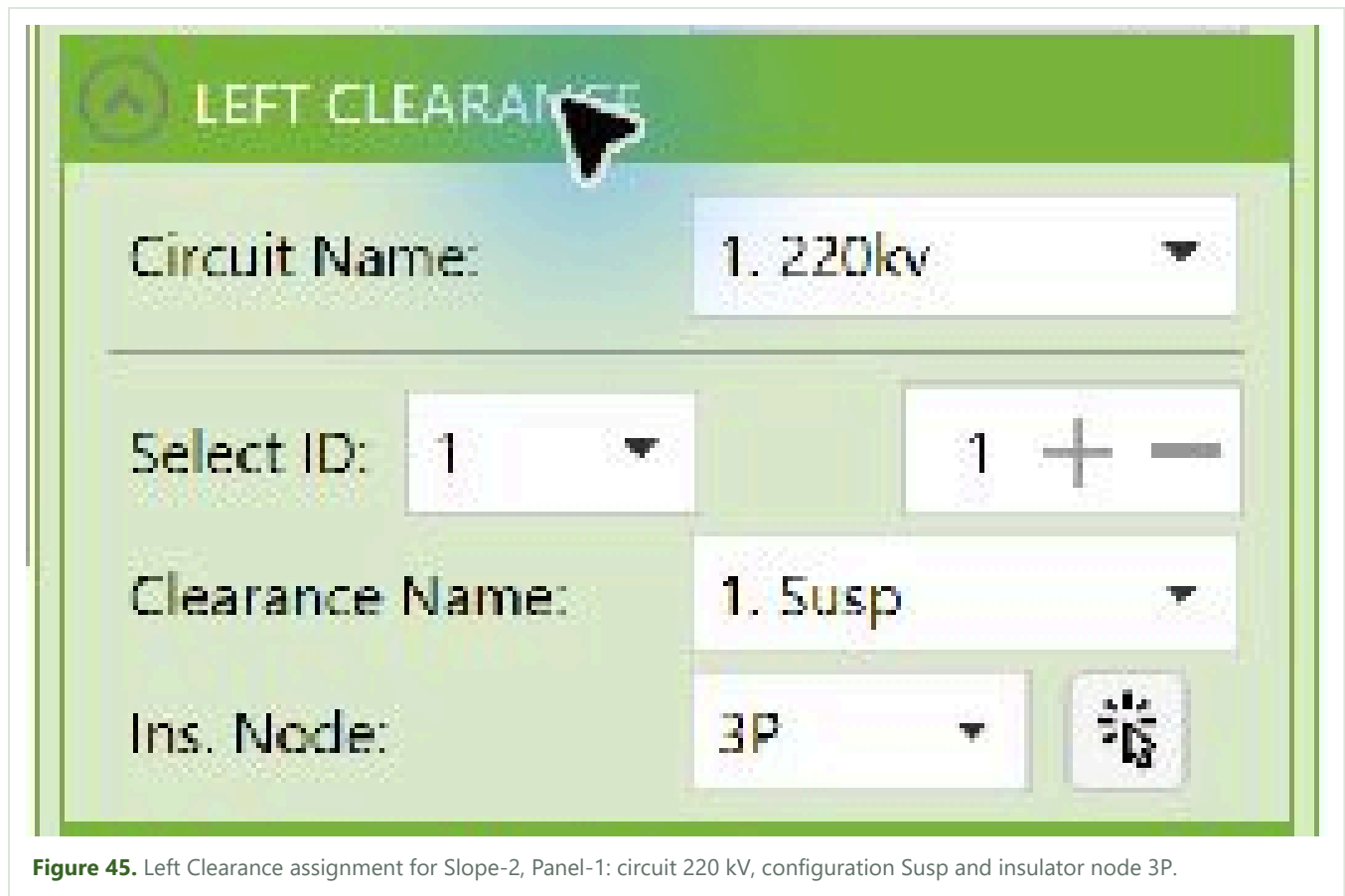


Figure 45. Left Clearance assignment for Slope-2, Panel-1: circuit 220 kV, configuration Susp and insulator node 3P.

Open the appropriate panel's additional inputs and expand **LEFT CLEARANCE**, **RIGHT CLEARANCE**, **BACK CLEARANCE**, **FRONT CLEARANCE** or **BEAM CLEARANCE**. An arm's input area must be enabled for its assignments to be editable.

1. Select **Circuit Name** for that arm or beam.
2. Set the number of clearance placements with the numeric control beside **Select ID**.
3. Select the placement ID you are editing. Each ID represents a separate conductor/insulator placement on that arm.
4. Choose its **Clearance Name** from the named conductor configurations.
5. For I-string or tension, select the required **Ins. Node**. For V/Y, complete the two upper node selections shown for that configuration.
6. Use the small graphical selection button beside the node input when you want to identify the node in the 3D viewer. Follow the selection prompt and verify the resulting node names.
7. For V/Y, review **Length b/w nodes** and **Angle b/w nodes**. These describe the attachment geometry and are separate from the leg lengths in Conductor Data.
8. For tension pilots, select **Use Pilot Insulators** at the placement that needs the enabled pilot configuration.
9. If PLS insulator inputs are enabled, choose **Min. Vertical Load**.
10. Repeat for every ID and every physical side, then validate the complete model.

Eligible node lists depend on the panel pattern and clearance mode. Ghost nodes are excluded from physical insulator attachments. If a node is missing, check the pattern and its eligible connection nodes; choosing a different string type can require different node selections. Changing a pattern, tower mode or named configuration can invalidate an earlier selection, so inspect the attachments again.

Inspect the 3D clearance model

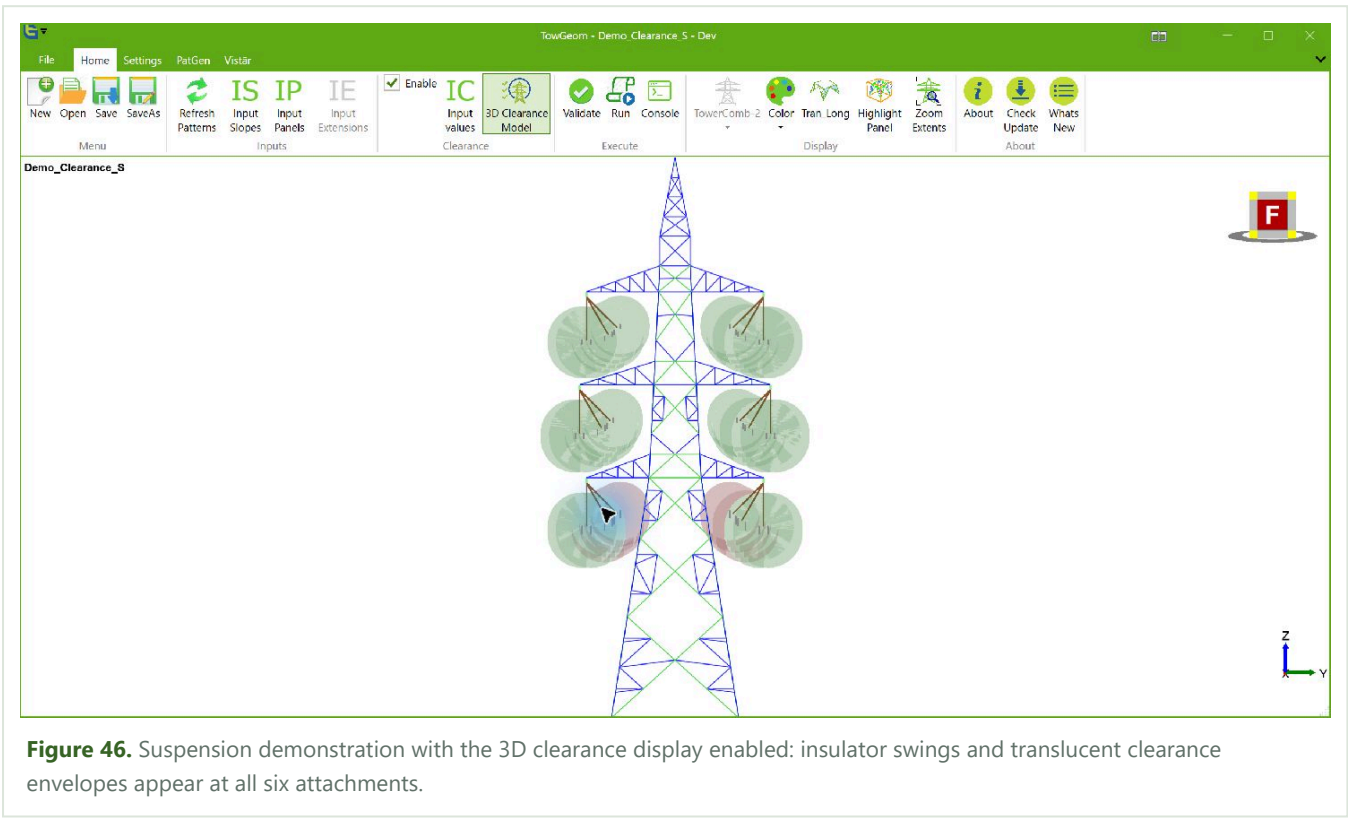


Figure 46. Suspension demonstration with the 3D clearance display enabled: insulator swings and translucent clearance envelopes appear at all six attachments.

Enable **3D Clearance Model**, then right-click the viewer and open **3D Clearance**. Its component switches help isolate the geometry you need to inspect.

Switch	Displayed component
Clearance Model	Overall clearance display.
Hanger Lines	Hanger connections from the structural attachment.
Strain Plate	Tension strain-plate lines.
Insulator Lines	Insulator and additional-link geometry.
Conductors	Conductor points, segments and jumper geometry.
Swing Spheres	Clearance envelopes for the required swing positions.
Offset Planes	Structural checking planes and additional offsets.

For strain-plate inspection, leave **Hanger Lines** enabled. In this release, strain-plate lines follow that visibility switch; the **Strain Plate** menu choice does not independently hide or show them.

Use plan and elevation views as well as a rotated 3D view. Show the conductors and insulator lines first to check attachments, then show envelopes and planes to inspect interference. Envelopes with detected intersections are displayed separately from clear envelopes. If the display is crowded, hide individual components; hiding a component does not delete its input data.

Interpret clearance validation

Validation checks the model's geometry and current circuit requirements. Missing required I, V, Y or pilot attachment nodes are errors. Other reported conditions can include insufficient ground clearance, shielding angle above the maximum, insufficient horizontal/vertical spacing and crossarm angles below their minimums. Read the identified panel, side and clearance name before making a correction.

For suspension ground clearance, TowGeom examines the lowest resolved modeled conductor point. It adds extension height and muffing height, then subtracts maximum sag and sag error for span attachment points. The check uses a flat ground datum; it does not model surveyed terrain. For tension ground clearance, the reference is the selected structural clearance attachment point with sag and sag error applied. Insulator, bundle, pilot and jumper geometry are not deducted again in that tension ground-height check.

A ground-clearance warning gives calculated height, required height and deficit. Suspension warnings also identify the worst conductor sample, bundle and swing. A zero required ground clearance, unresolved geometry or missing reference prevents a meaningful positive requirement check. Resolve the missing inputs instead of interpreting silence as a completed assessment.

Current 2D clearance drawing limits

The 3D input/display capability and 2D drawing capability differ. Review these limits before expecting a complete clearance drawing from Run.

Arrangement or input	Current 2D clearance drawing behavior
Suspension I, V or Y on normal Left/Right arms	Supported when attachments and configuration are valid.
Tension with one or two I pilots on normal Left/Right arms	Supported when the tension and pilot configuration is representable.
Front, Back or horizontal placements	Clearance drawing placement skipped with a console reason.
Tension without pilots	Clearance drawing skipped in this release because the supplied drawing routine is incomplete.
Tension V/Y pilots	Deferred; placement skipped.
Nonzero additional links	Deferred for this drawing workflow; values stay in the model.
Nonzero bundle rotation	Deferred; placement skipped.
Unequal front/back maximum lengths, strain widths, deviation or down-drop	Deferred for the current tension drawing.
Minimum insulator lengths	Preserved in input; current clearance drawing uses maximum lengths.

Arrangement or input	Current 2D clearance drawing behavior
Suspension down-drop angle/distance	Used for the 3D conductor-segment inspection; not emitted by the current 2D clearance workflow.
3D tower/crossarm offsets and drawing reference distance	Not applied as extra allowances by the current 2D clearance workflow.

Hangers must be nonnegative, maximum insulator lengths positive, dynamic radii positive, and multi-conductor spacing positive. Static V requires a positive V radius; Y requires valid upper and lower stages. Missing or Ghost physical attachments cannot be used for the drawing.

The console reports **TowGeom clearance drawing skipped** with combination, panel, side, clearance ID and reason. Other tower output can still be produced, so review these messages before treating the drawing set as complete. Read [Generating and using outputs](#) for output filenames and workflow, and [Troubleshooting](#) for corrective steps.

Generating and using outputs

Run produces the geometry workbook and the enabled drawing scripts for the saved tower. With extensions, it generates a separate workbook and enabled scripts for each tower combination. Detailed member exports use the generated design output through the Vistār commands when those features are available in your installation.

Run the model

1. Review the selected specifications, angles database, library and unit system.
2. Complete the tower inputs and, if enabled, clearance assignments.
3. Use **Validate** (**Alt+V**) to inspect errors and warnings. Correct errors and assess any remaining warnings.
4. Save the model. If Run detects unsaved changes, it asks to save them and resumes after a successful save. Declining the save stops Run.
5. Close the input and existing output workbooks in Excel so that TowGeom can read and replace them.
6. Open **Settings > General** and choose **2D.scr**, **3D.scr**, drawing colors and the other required output options.
7. Select **Run**, or press **Ctrl+R**. Read the progress and console messages.
8. At completion, inspect the output folder and review the results for each required tower combination.

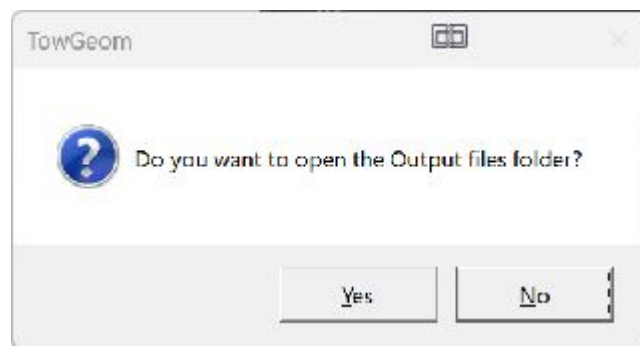


Figure 47. After generation, the optional prompt opens the output folder; choose No to continue in TowGeom.

When **Always ask to open the Output files folder** is enabled, successful generation offers this prompt. Choose **Yes** to open the results folder or **No** to remain in TowGeom.

Run checks validation again. Errors block generation. Warnings produce a confirmation asking whether to continue; select **Validate** to see their details before accepting them. A legacy `.xls` or old-format input must be saved in the current `.tgi` format before running.

Outputs are placed beside the input file. For a demonstration, use a separately named working copy; its output names will follow that copy's name. Run can replace existing outputs with the same names, so preserve any earlier result you need to retain under another name or in another folder before running again.

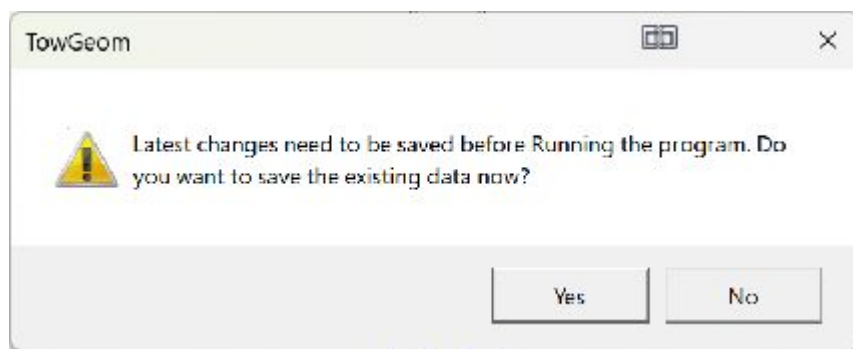


Figure 48. Run asks to save the latest input changes before generating outputs.

Console output

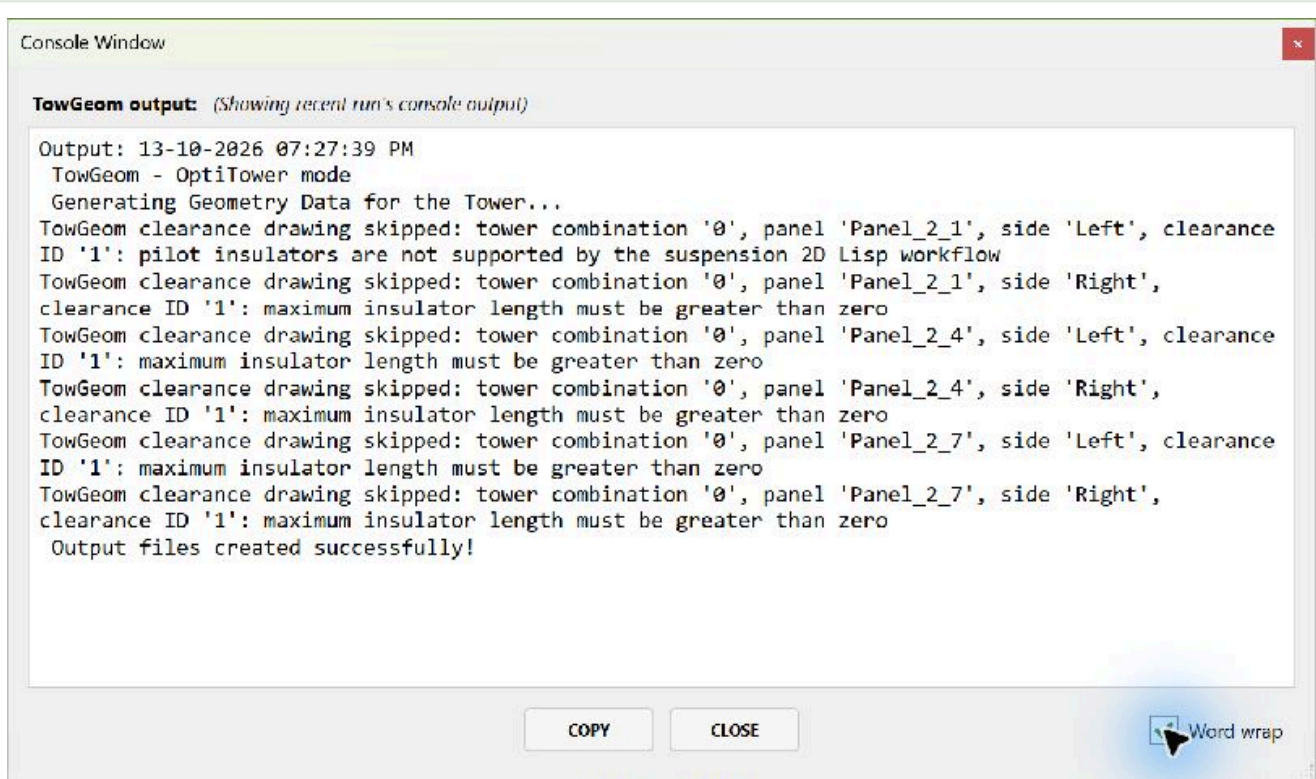


Figure 49. The completed training Run reports output success and identifies clearance placements skipped from the 2D script, including their reasons.

The console opens for a new run and starts with its local date and time. It reports tower combinations, generation progress, completion and errors. Each new run clears the previous displayed run's text.

Select **Console** on the ribbon, or press **Alt+Shift+C**, to reopen the recent run's output. **Copy** copies the log text. **Word wrap** makes long messages fit the window without changing the copied text. **Close** hides the console. If automatic console closing is enabled, the window can disappear after completion; reopen it to inspect warnings or a failure.

Pay particular attention to **clearance drawing skipped** messages. They identify a placement that was omitted from the clearance drawing; a successful workbook run does not mean every requested clearance placement was drawn.

Output names and locations

The following table uses `Demo` as the saved input basename. Replace it with your own basename. Tower combination descriptions appear only when **Include Description in Tower combinations output files names** is enabled.

Output	Typical filename / location	Purpose
Tower workbook, no extensions	<code>Demo_Output.xlsx</code> beside the input	Geometry, member groups, weights, wind data and related tables.
Tower combination workbook	<code>Demo_Output_TC_01.xlsx</code> or <code>Demo_Output_TC_01_Description.xlsx</code>	Results for one combination; TC numbers are padded to two digits below 10.
2D drawing script	Workbook basename plus <code>_2D.scr</code>	Tower elevation, plan and panel views, dimensions and supported clearance drawings.
3D drawing script	Workbook basename plus <code>_3D.scr</code>	Structural member line geometry in 3D.
Exported tower library	Default <code>Demo_Library.plib</code> ; destination selected in its save dialog	Patterns used by the open tower, extracted from its selected panel library.
Detailed solid drawing export	Design-output basename plus <code>_IFC.scr</code>	Detailed member solids generated through Export DWG .
IFC2x3 export	Design-output basename plus <code>_v2x3.ifc</code>	Detailed model in IFC2x3.
IFC4 export	Design-output basename plus <code>_v4.ifc</code>	Detailed model in IFC4.
IFC4x3 export	Design-output basename plus <code>_v4x3.ifc</code>	Detailed model in IFC4x3.
GA drawing PDF export	<code>PlotFiles</code> beside the design output, when enabled	PDF plots from the connected Tekla GA drawing workflow.

The normal drawing outputs are `.scr` scripts. The General Settings labels refer to the drawings created from them, but Run does not directly create `.dwg` files. Direct DXF output is not exposed as an available output choice in this release.

When an SCR option is disabled, a previously generated script with the same current output basename is removed on the next run. This prevents a stale script from appearing to be part of the new output set. Preserve earlier scripts separately if you need them.

Read the generated workbook

The workbook groups the geometry, material and reporting data needed for the next stage of work. Sheet availability can depend on the model and enabled options.

Worksheet or group	What to inspect
Project Specs	Specifications carried into the output, including design assumptions and property defaults.

Worksheet or group	What to inspect
AnglesDatabase, Steel DataBase, Bolts DataBase	Angle section, steel and bolt properties used by the output.
Primary Nodes / Secondary Nodes	Node labels, coordinates and generated connectivity references.
Sections	Structural section/group data and related load factors.
Angle Groups	Group names and section assignments. Use the sorting or unique-group settings when required.
Angle Members	Member endpoints and association with the generated groups.
Members Info	Detailed member information used by downstream design/modeling operations.
Panel Info	Panel-level information for the generated tower.
panel wise weight	Panel weight summary.
Loads Input	Load attachment/connectivity information.
Suspension / Strain / 2-Part Properties	Insulator property tables when applicable.
Suspension / Strain / 2-Part Insulators	Insulator placement/connectivity tables when applicable.
Wind Calc 0 / 30 / 45 deg	Body wind calculations for the indicated directions.
Narrow Front Wind Calc 0 / 45 / 90 deg	Narrow-front directional wind calculations.
Wind Loads Summary	Consolidated wind results.
Long Wind on Trans face Area / Trans Wind on Long face Area	Directional projected face-area calculations.
Copy Tension Report / Copy Compression Report	Report/data areas used in the design workflow.
Redundant Design	Additional redundant design calculations when that workflow applies.

Check that the expected panel and combination are represented before using the result elsewhere. The preliminary section-design setting selects sections using the implemented KL/R and bending checks; switching it off uses minimum angle sections. Keep this distinction visible when interpreting section assignments.

2D and 3D SCR drawings

Select **2D.scr** and/or **3D.scr** in General Settings before Run. The drawing coordinates are emitted in millimetres. The 2D settings control the number of view columns, use of TowGeom dimension settings and PatGen member colors.

To use a generated script in the intended CAD application, open the appropriate drawing/template, run its script command and select the **.scr** file. Keep the script and installed supporting files available. Review the created geometry and dimensions before saving the drawing.

The 3D SCR describes structural line geometry. TowGeom's displayed clearance spheres and offset planes are inspection components of its 3D viewer; they are not promised as part of that structural 3D script. Detailed solid geometry is available through the separate **Export DWG** command after design-output upload.

Clearance in the 2D script

Enable clearance and complete the circuit, conductor and attachment inputs. If tower combinations exist, confirm the **Base of the Tower is considered for** selection. Clearance output is enabled for that selected reference combination.

The supported clearance views accompany retained tower/reference dimensions and plan views. Additional clearance views are positioned 50,000 mm to the left of the original drawing layout. The current drawing uses maximum insulator lengths. Read [Clearance module](#) for supported string types, placements and skipped configurations.

Clearance script execution requires the installed clearance support files. An incomplete installation can prevent the script from being generated or loaded. Do not alter the real model to conceal a skipped feature; preserve its required geometry and record the limitation for the drawing review.

Output settings for combinations

Setting	Effect
Include Description in filenames	Adds the combination description after its TC number. Use valid filename characters.
Include all combinations unique Angle Groups data in the first combination output file	Makes the first workbook carry the combined unique angle-group data required by the family workflow.
Create a Common bottom node for all Tower Combinations	Enables a common bottom-node arrangement across combinations. Validate the compatibility of their endings.
Sort Angle Groups	Sorts the generated angle-group data.
Create individual PLS .tow files for each Tower Combination	Controls retention of separate PLS tower files in the PLS generation mode.

Descriptions must avoid filename characters such as `\ / : * ? " < > |`. Use meaningful, distinct descriptions. Common-bottom-node workflows need compatible tower-combination endings; mixed LegComb and Body endings can produce validation findings. The unique-group and common-node choices are enforced by OptiTower mode, so their controls are not editable there.

PLS tower files and Family Manager

PLS `.tow` file generation applies when TowGeom runs in **OptiTower mode**, including an enabled development session that uses that generation mode. A standard standalone Run produces its workbook and selected SCR outputs; the presence of the `.tow` setting alone does not make every run a PLS run.

Folder / file	Contents
PLS\Demo.tow	Tower file for a model without extensions.
PLS\Demo_Output_TC_01[...].tow	Individual tower-combination file.
PLS\Demo_Family_Manager.tow	Consolidated Family Manager tower file for multiple combinations.
PLS\Demo.lca	Associated load data.
Loads\Demo.lcg	Load-case group file.
PLS\Demo.ang	Angle properties.
PLS\Demo.smp	Steel properties.
PLS\Demo.blt	Bolt properties.
PLS\Demo.inl	Insulator property library.
PLS\Demo.cab , .eqp , .can	Associated PLS property files generated with the tower set.

Retain the related property and load folders when transferring the tower set. The tower file refers to its associated files; moving only the `.tow` can leave those references unresolved.

For multiple combinations, clearing **Create individual PLS .tow files for each Tower Combination** keeps the consolidated Family Manager result after it has been successfully created. Individual files tracked by that run are removed afterwards. A single-combination run still creates its tower file. If Family Manager generation fails, inspect the console and the generated files before assuming consolidation completed.

Export the tower's panel library

1. Open the tower and confirm that its current library exists.
2. Open the **PatGen** ribbon tab and select **Export Tower Library**.
3. Choose the destination and filename; the default ends in `_Library.plib`.
4. Confirm replacement if the destination already exists.
5. Read the reported number of exported patterns.

This export gathers patterns used by the opened tower from the selected source library. It is useful for transferring the required patterns together with an input. If no used patterns are found, or the source library is missing, correct that condition before retrying. It does not create an updated complete master library automatically.

Upload design output and export detailed members

Where Vistār is available, **Upload Output** reads the generated workbook for the currently selected tower combination. It expects the standard output filename beside the input and the worksheets **AnglesDatabase**, **Members info** and **Copy Tension Report**. Add the intended optimized/design data to the output before uploading when your workflow requires it.

1. Run TowGeom and confirm that the selected combination's output workbook exists.
2. Select the required tower combination in TowGeom.
3. Select **Upload Output** and let the member-reading operation finish.
4. Inspect the resulting members and their names in TowGeom's IFC/Vistār viewer.
5. Select **Export DWG** for the solid-member `_IFC.scr`, or choose **Export IFC2x3**, **Export IFC4** or **Export IFC4x3** from the IFC split button.
6. Read completion/error messages and inspect the file for the selected combination.

Detailed exports require the design output to remain available and the members to have names. **Export DWG** writes a script for member solids rather than directly saving a DWG. The IFC format choice changes the schema and filename suffix. Use the schema accepted by the receiving workflow.

Connected Tekla and Bocad commands require an available model or project session. **Create GA Drawings** is part of the Tekla workflow; optional PDF export writes into `PlotFiles`. Review each connection and confirmation in TowGeom before updating the target model. External model editing and detailing are covered by the target product's own instructions.

After a failed or interrupted run

Reopen **Console** and copy the relevant messages. Check whether the failure occurred before generation, in a specific tower combination or during a detailed export. Earlier combinations or files may already exist when a later step fails; their presence alone is not a completed run. Correct the reported issue, close workbooks and run again. Use the completion message, timestamps and expected file set together to identify the current results.

See [Troubleshooting](#) for file locks, validation failures, missing patterns, clearance skips and save diagnostics.

Vistār member detailing

Vistār turns the tower arrangement and completed design-output data into a detailed member model. It combines angle sections, backmarks, flange orientation, connection offsets, bolt information and saved member edits. Use **IFC Viewer** to inspect that arrangement and make accepted detailing changes before exporting or updating another model.

This chapter describes the Vistār controls available in TowGeom 3.6.08.0. Availability depends on the active application mode. Calculation-mode and dependency-graph controls are Developer features; ordinary detailing workflows do not require them.

Prepare the design-output workbook

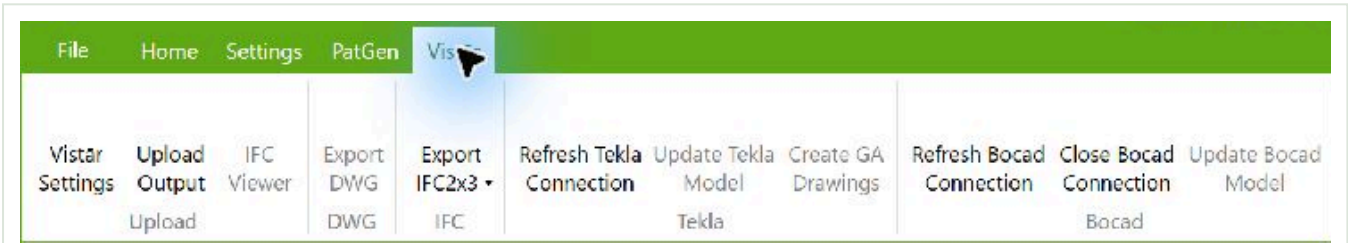


Figure 50. Vistār ribbon: settings, report upload, IFC Viewer and export commands, followed by Tekla and Bocad integration controls.

Start with a saved tower input and the correct panel library. Vistār reads the expected output workbook beside that input. For the practice project, open `IFC_Test.tgi`, select `IFC_Test_Library.plib` and use its completed `IFC_Test_Output.xlsm`.

The workbook must include **AnglesDatabase**, **Members info** and **Copy Tension Report**. A generated workbook contains geometric member information, but its report may still need completed design results. The presence of the workbook alone does not mean that the design data is ready.

Required report field	What it supplies
Group Label	The design group linked to the member information.
Angle Type	The angle arrangement/category used to locate the section.
Angle Size	The exact section-size text in AnglesDatabase.
Steel Strength (MPa)	The report's steel-strength value.
No. Of Bolts Tens.	The reported bolt quantity.
Hole Diameter (cm)	The report hole diameter, in centimetres.
No. Of Holes	The reported hole count.

Members info must contain the panel identifier, member number, member name, design-group name and symmetry count. The **PatGen Member Number** column is required by current Vistār output. An older output without that column must be regenerated in the current format.

The reported angle type and size must resolve to a section in **AnglesDatabase**, and every member's group must resolve to **Copy Tension Report**. Differences in section text, such as thickness formatting, can prevent a match even when the dimensions appear similar.

Upload and open the detailed model

1. Check the active tower combination, if extensions are used.
2. Confirm that its matching completed output workbook is beside the saved input.
3. Select **Vistār → Upload Output**.
4. Wait while TowGeom reads the angle database, design groups and members, then calculates the arrangement.
5. Read any upload error before continuing. Missing report columns, missing groups and unmatched sections must be corrected in the workbook.
6. Select **IFC Viewer** and use **Zoom Extents**.

Auto Upload Excel Design output when Input file is opened, in Vistār Settings, can run this preparation automatically. Manual Upload Output is useful after report data has been updated. Re-uploading must be based on the current tower input; a report for an earlier geometry revision can contain different member identities.

Read the IFC Viewer

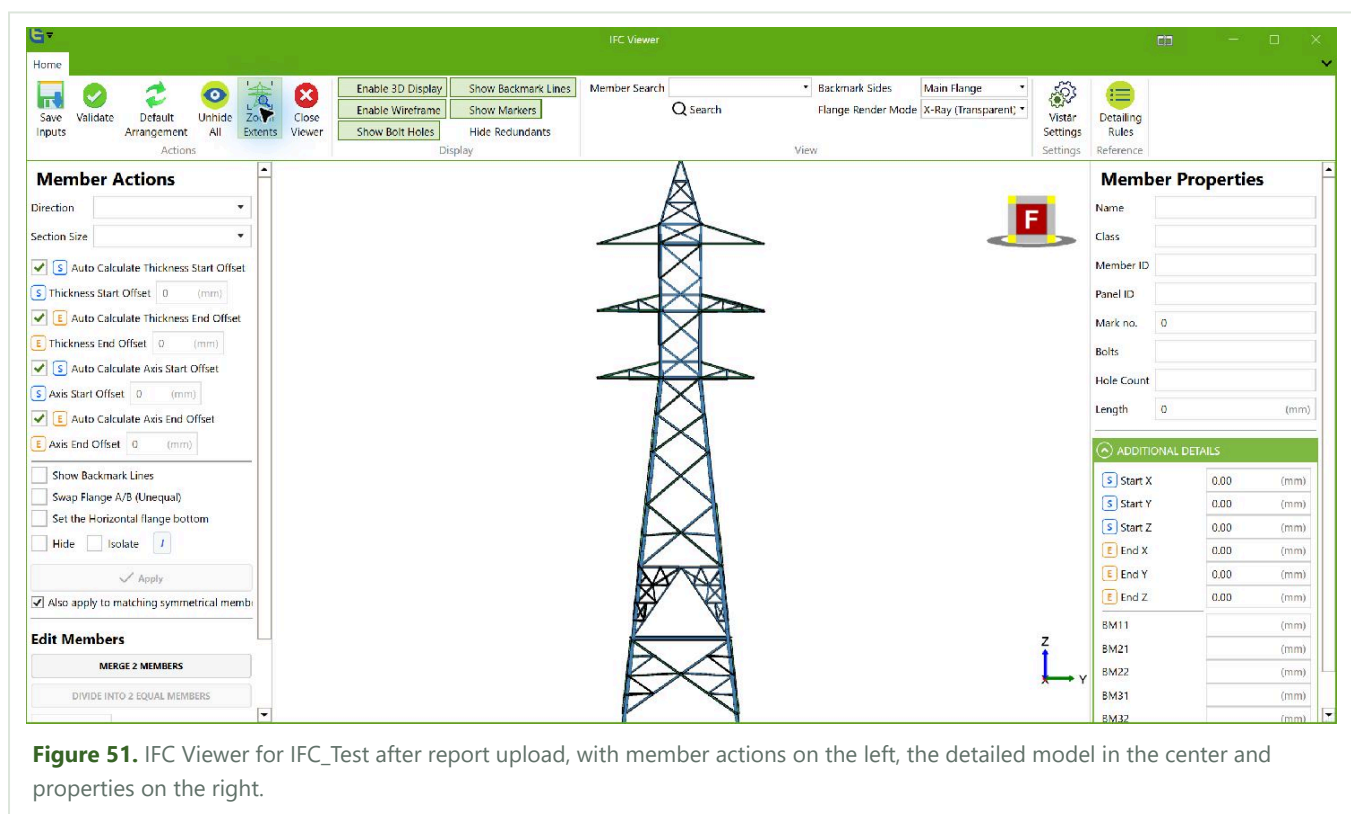


Figure 51. IFC Viewer for IFC_Test after report upload, with member actions on the left, the detailed model in the center and properties on the right.

The centre is a workspace containing one to four tower views. The left side contains **Member Actions**, **Physical Steel Ends** and **Edit Members**. The right side contains read-only **Member Properties** and **Additional Details**. All views share one member selection and these editing panels.

Ribbon command	Purpose
Save Inputs	Save the last accepted Vistār inputs to the matching <code>.tgvi</code> ; Ctrl+S.
Validate	Open categorized detailing errors and warnings.
Default Arrangement	Rebuild the active variant from its original generated defaults after confirmation.
Unhide This View	Clear hiding and isolation in the active pane.
Zoom Extents	Fit the working members in the active pane; Ctrl+E.
Distance	Measure between two physical points in one pane and show 3D and global-plane distances.
Close Viewer	Return to the main TowGeom window after resolving unsaved detailing inputs.
Vistār Settings	Edit preferences and detailing libraries.
Detailing Rules	Open the searchable reference describing current detailing behavior.

Work with several views

The viewer opens with one **3D Model** pane. Select **Add View** as needed, up to four panes in total. Each pane has its own view selector at the top left. Choose **3D Model**, **Front Face**, **Back Face**, **Left Face**, **Right Face**, **Hip Q2**, **Diaphragm Q2** or **Special Surface**. At least one 3D Model pane remains available for checking the complete arrangement. Its view selector is disabled while it is the only 3D pane; add another view before choosing a face.

With two panes, compare the model and a working face side by side. Three panes keep a larger view beside two stacked views; four panes form a two-by-two workspace. Drag the dividers to resize the views. Use a pane's **Max** button to enlarge it temporarily and **Restore** to return to the split layout. The **X** stays at the top right of each pane and closes that pane, including when the other header controls wrap. Clear **Inputs** or **Properties** above the workspace to give the views more space. Adding, closing, maximizing or changing a pane does not apply or discard member input drafts.

Click a pane to make it active; its border identifies the active view. Panning, zooming, fitting, hiding and isolation operate in that pane. The other panes keep their own cameras and visibility choices. Selecting a member in any pane updates the shared editing panels and highlights that member wherever it is a working member. A selection can include members outside the active face; check the complete selection before Apply. If a selected member is hidden from every working view, Apply is unavailable until you use **Reveal in 3D**.

Work on a slope-aligned face

A face pane works on one slope region at a time. Choose the region from its selector, or use < and > to move between regions. Front and Back follow the region's transverse face; Left and Right follow its longitudinal face. The camera looks squarely at that sloping surface, so the view represents the face's own plane rather than a global front or side projection.

The region selector includes each placed extension row in the active tower combination separately, even when several rows use the same slope template. Regions run from the bottom of the tower upwards. In Front, Back, Left and Right face views, an extension diaphragm row joins the row below it instead of creating a separate slope-face region. Stubs belong to the matching faces of the lowest extension region, or **Slope-1** when there are no extensions. Their physical steel remains included when using Zoom Extents.

Face views allow pan, zoom and **Ctrl+E (Zoom Extents)** while keeping their orientation locked. Rotation, the view cube and standard-view keys are available only in a 3D Model pane. Regions that cannot supply a usable plane show an explanatory status instead of falling back to a misleading global view.

Enable **Context** to show applicable connecting members faintly around the working face. These members are references: their points can be measured, but the members cannot be selected for editing or included by Ctrl+A. Zoom Extents uses the working face members, so distant context does not shrink the useful view. Isolate shows only the selected working members and suppresses connecting context.

Work on front-left Hip and Diaphragm surfaces

Choose **Hip Q2** or **Diaphragm Q2** to work in the front-left quadrant: $X < 0, Y < 0$, including its axis boundaries. The region selector lists the actual surfaces in each rendered body panel and selected extension row. Top and bottom hips, changes of hip plane and separate diaphragm levels have their own choices. The camera follows the chosen surface plane; a horizontal diaphragm is viewed from above with +Y upwards.

In a Diaphragm pane, enable **Show all members** to include the symmetry members in every quadrant of the selected panel surface. The checkbox is off by default and applies independently to each pane. It keeps the same surface alignment and fits the expanded members; other diaphragm levels remain separate. Clear it to return to Q2.

In Q2 mode, members need a positive length within Q2 on that plane; a corner touching the plane at one point does not qualify. Shared elevation/hip or elevation/diaphragm boundary members remain selectable. A member crossing a quadrant boundary remains a whole selectable member. Context stays reference-only, and pan, zoom, Ctrl+E, selection and editing work as in the slope-face panes. Dedicated diaphragm choices remain separate from the slope-face grouping of extension diaphragm rows. Missing or degenerate source anchors show an unavailable status instead of a global projection.

Work on a named special surface

Choose **Special Surface** to work on a named surface supplied by the rendered tower panel, a child panel or the selected extension combination. The region selector identifies the complete panel occurrence and surface name, so repeated templates and different child panels remain separate choices. Choices follow their physical elevation, panel occurrence and source surface order.

The view follows the surface's actual plane after tower width corrections. Built-in surfaces show their complete working members on that plane. A custom surface follows its original defined area, excluding separate mirrored copies even when they lie on the same plane. Necessary symmetry members inside that area remain included, and the area may span several quadrants; it is not restricted to Q2. Custom surfaces with different defined areas remain separate choices even on the same plane. Shared boundary members remain whole accepted steel pieces. **Show all members** remains specific to Diaphragm Q2. An absent or unusable source plane shows an explanatory status.

Horizontal custom surfaces on body panels and selected extensions are viewed from above, with +Y upwards and +X to the right, so the front-left Q2 corner appears at the lower left. An explicitly reversed surface keeps its authored viewing side.

Pan, zoom, Ctrl+E, Context, selection, measurement and flange-orientation colours work as in the other 2D panes. Rotation stays locked. Changing the named surface preserves the shared selection and unapplied member drafts; other panes keep their own cameras and display choices.

Identify flange orientation

Every 2D pane starts with **Flange orientation** enabled. Green members have their outstanding flange pointing outwards from the selected surface, towards the viewer. Purple members point inwards into the tower. The direction follows the actual slope, Hip, Diaphragm or named special plane; in a Diaphragm view from above, inwards means down into the tower. Grey indicates an edge-on, mixed or unavailable orientation.

Clear the checkbox to restore the usual member colours in that pane. The 3D Model keeps its usual colours. Selection remains red, Context stays faint and reference-only, and wireframe-only display uses the same orientation colours. Backmark guides also follow these colours while enabled so they do not mask the cue on narrow members. The pane legend explains the colours, and the status shows the orientation of a single selected working member. The toggle does not move the camera, apply member inputs or create unsaved geometry changes. Colours follow the accepted physical flange geometry after Apply; pending inputs and failed calculations do not change them.

Pane visibility lasts for this viewer session

Hide and Isolate change only the active pane. They do not delete steel, change connections, apply symmetry edits or save new visibility inputs to the `.tgvi`. The other views remain available for checking the same members.

Unhide This View clears that pane's hiding and isolation while retaining its selected face, slope and redundant-member filter.

Reopening the IFC Viewer starts a fresh workspace with one 3D Model pane. Split layout, cameras, temporary reveals, local visibility and measurements are session choices. Older `.tgvi` files can retain saved hidden-member flags, which remain effective for compatibility. **Restore saved hidden members** clears those older flags; use **Save Inputs** to retain that change. Ordinary pane hiding and Unhide This View do not replace or clear the older saved flags.

Navigate and select members

Gesture	Result
Left-click a member	Select that member.
Ctrl+left-click a member	Add it to, or remove it from, the selection.
Left-click empty space	Clear the selection.
Shift+left-drag	Rotate a 3D Model pane.
Middle-button drag	Pan the pointed-to pane.
Mouse wheel	Zoom the pointed-to pane.

Gesture	Result
Ctrl+A	Select visible working members in the active pane, excluding faint context.
Ctrl+E	Fit the active pane's working members.
L / R / U / D / F / B in a 3D Model pane	Switch to the configured standard views.

The configured view keys are L = Back View, R = Front View, U = Top View, D = Bottom View, F = Left View and B = Right View. Use the view cube and visible axis labels to identify the physical direction; the engineering coordinate conventions may differ from an assumed screen-left or screen-right direction.

The current selection also helps determine the 3D Model rotation point. Shift+left-drag performs rotation without selecting the member under the pointer. Clicking a different pane or changing its face does not select a different member or discard unapplied inputs.

Search by member name

Type part of a name in **Member Search**, choose the intended result and select **Search**. Search activates a 3D Model pane, reveals the found member there, selects it and fits it. This reveal is temporary and local; it does not unhide the member in every pane or change saved visibility. Use it when a validation message identifies a member that is difficult to locate.

Reveal in 3D similarly locates the current selection without replacing a face pane's chosen surface. The receiving 3D pane clears its isolation and temporarily overrides visibility filters for the requested members. A hidden member can still have valid detailing data and participate in validation. Search, Unhide This View and the separate saved-hidden-member restore command help distinguish a display choice from a missing member.

Measure a physical distance

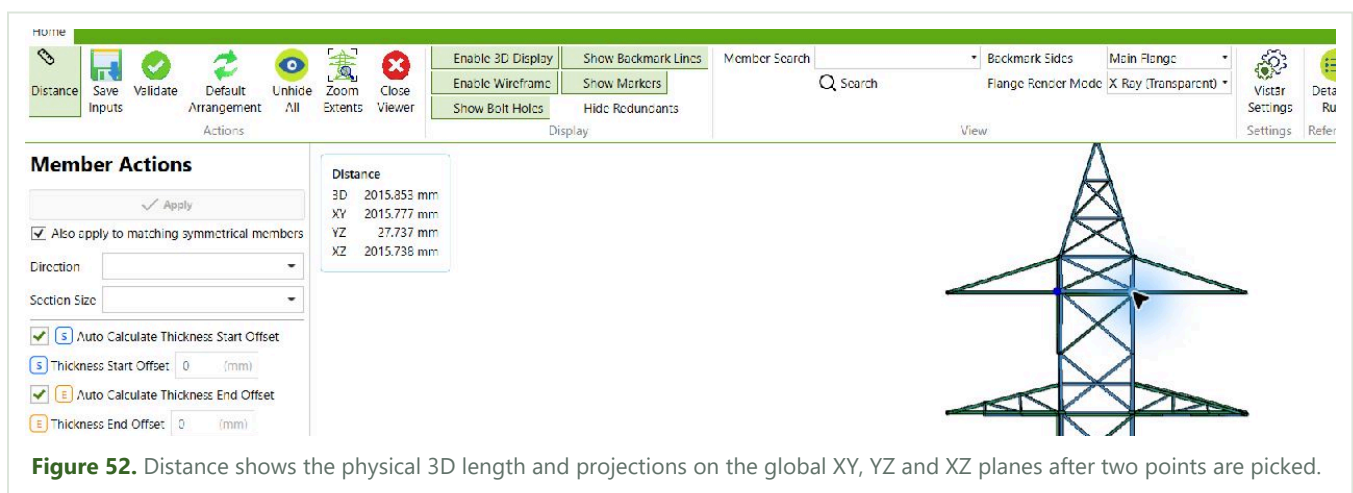


Figure 52. Distance shows the physical 3D length and projections on the global XY, YZ and XZ planes after two points are picked.

Activate the pane to measure, then select **Distance** in the IFC Viewer ribbon. Both points must be picked in that pane; measurements do not join picks from different views. Keep **Enable 3D Display** or **Enable Wireframe** on so that the points belong to displayed working steel. Faint context also supplies measurement points while Context is enabled; measuring it does not make it editable. Move the pointer near a physical heel endpoint, an angle-profile corner or a bolt-hole centre. A snap sphere and a temporary member tint identify the candidate that will be picked. Bolt-hole centres are available only while **Show Bolt Holes** is on.

1. Move the pointer until the sphere appears at the intended first point, then left-click without a modifier key.
2. Follow the **Select the 2nd point** prompt. Move to another distinct point and left-click its displayed sphere.
3. Read **3D**, **XY**, **YZ** and **XZ** in the Distance panel.
4. Pick another point to start a new pair, or press Escape to leave Distance mode. Clicking the Distance toggle again also leaves the mode and clears its readout.

3D is the direct spatial distance. **XY**, **YZ** and **XZ** are distances projected onto the tower's global coordinate planes, not onto the current camera view. Rotating the model therefore does not change them. Values use millimetres in Metric and inches in Imperial. Picking the same coordinate twice leaves the tool waiting for a different second point.

Shift+left-drag still rotates a 3D Model pane, middle-button drag pans and the wheel zooms while measuring. A face pane remains aligned to its surface. Unmodified left-clicks pick points instead of selecting members. Rotate the 3D Model or zoom to distinguish closely spaced candidates, and check the snap sphere before clicking: a point behind a shaded flange can still be a candidate. Each pane retains its own measurement when you activate another pane. Measurement does not change member inputs or create saved dimensions. A geometry or visibility change that removes a picked point clears the pair; pick it again after the refreshed model is ready.

Display controls and context menu

Control	Effect
Enable 3D Display	Show or hide the solid flange representation.
Enable Wireframe	Show or hide member-edge wireframes.
Show Bolt Holes	Show calculated bolt-hole markers.
Show Backmark Lines	Set backmark visibility for the model.
Show Markers	Show START and END markers for the active selected member.
Hide Redundants	Filter members classified as Redundant; a member-search reveal can temporarily show a requested member.
Backmark Sides → Both Flanges	Draw applicable backmarks on both flange sides.
Backmark Sides → Main Flange	Draw the main-side backmarks. The main side is the elevation flange, except on diaphragm members where it is the horizontal flange.
Flange Render Mode → Shaded	Use the solid shaded appearance.
Flange Render Mode → X-Ray (Transparent)	Make flanges transparent to inspect overlapping members and connections.

Leg and Horizontal members retain backmarks on both sides under the Backmark Sides control. The control is a display choice; it does not remove the extra backmark data from output.

Right-click a member to open its context menu. A right-click outside a multiple selection selects the clicked member first; a right-click on a member already in the multiple selection preserves that selection.

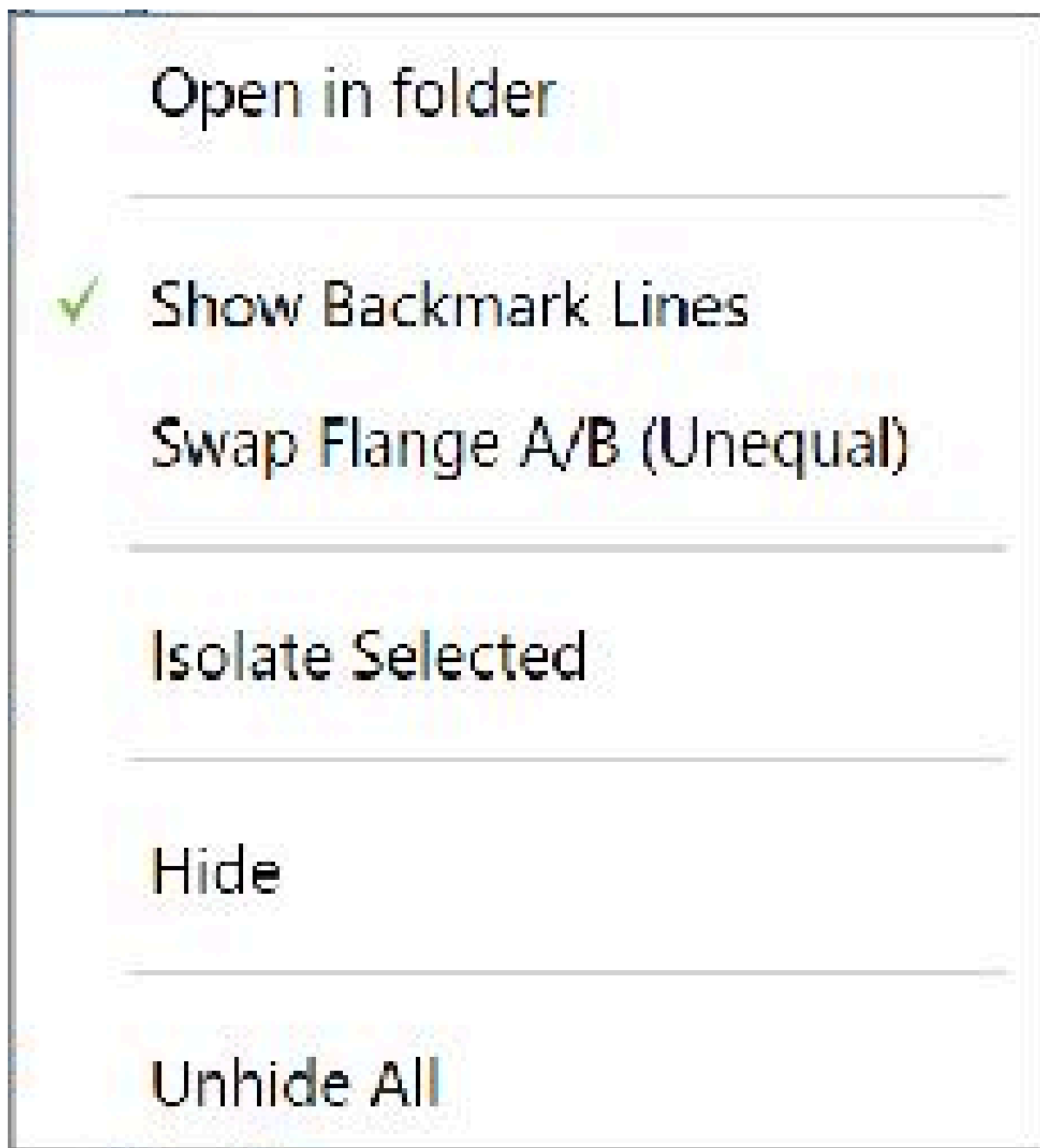


Figure 53. IFC member context menu for a selected crossing diagonal, with backmark, flange, isolation and visibility actions.

Context command	Use
Open in folder	Open the input's location.
Show Backmark Lines	Change backmark visibility for the applicable selection.
Swap Flange A/B (Unequal)	Change the unequal-angle leg assignment. Review and apply the corresponding geometry change.
Isolate in this view	Show the selected working members in the active pane while hiding its other members.
Hide	Hide the applicable selection in the active pane.
Unhide This View	Clear the active pane's temporary hiding and isolation.

Manual hiding, redundant filtering, face membership, isolation and older saved hidden-member flags are distinct visibility controls. After Unhide This View, a face pane still shows its chosen slope and face, and the redundant filter or older saved flags can still exclude a member. Use the 3D Model pane to review the complete arrangement. Hide and Isolate affect the active pane's display without changing the shared member inputs.

Single-member actions

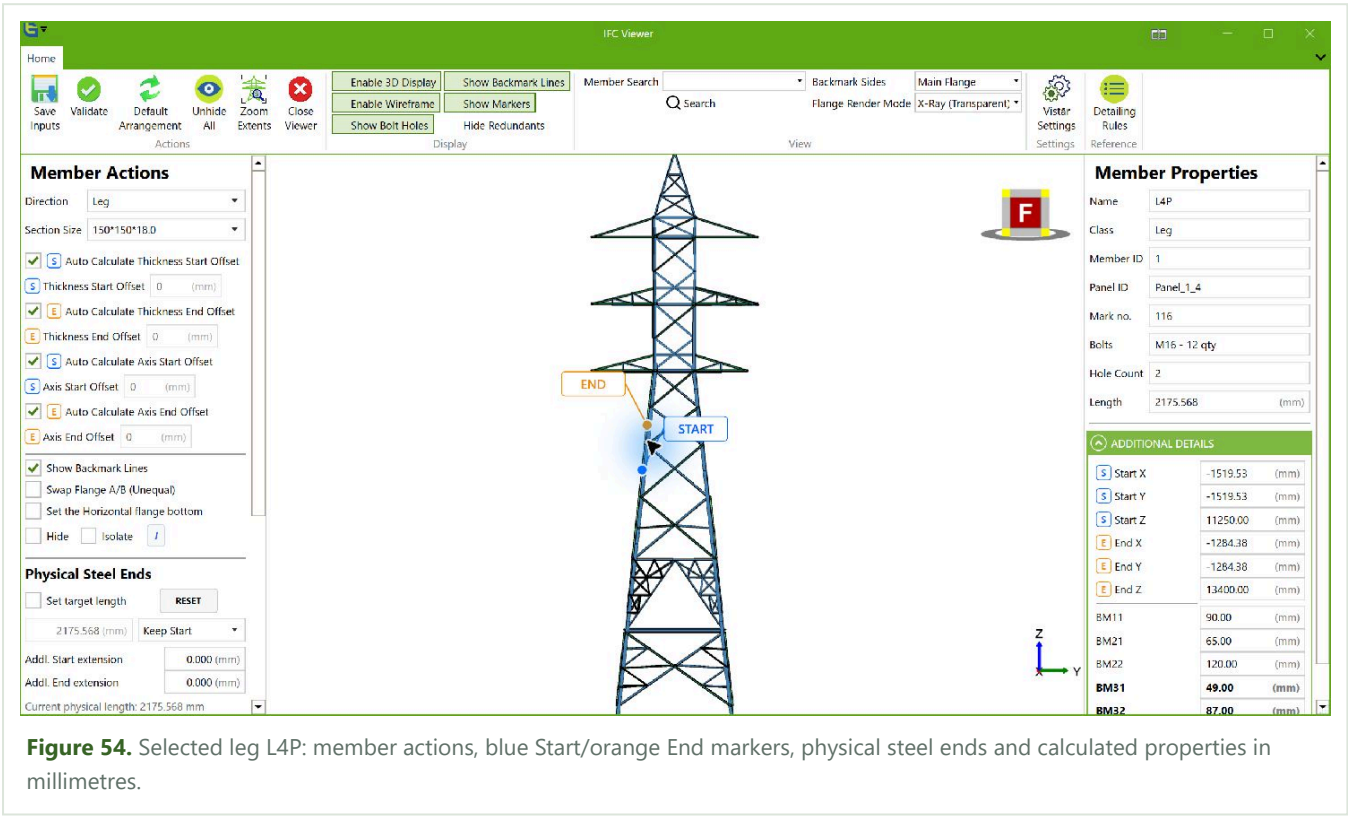


Figure 54. Selected leg L4P: member actions, blue Start/orange End markers, physical steel ends and calculated properties in millimetres.

Select one member and inspect its START/END markers before changing endpoint-specific inputs. Screen position, height and selection order do not redefine a member's stored Start and End.

Member Actions

Direction Leg

Section Size 150*150*18.0

☒ S Auto Calculate Thickness Start Offset

S Thickness Start Offset 0 (mm)

☒ E Auto Calculate Thickness End Offset

E Thickness End Offset 0 (mm)

☒ S Auto Calculate Axis Start Offset

S Axis Start Offset 0 (mm)

☒ E Auto Calculate Axis End Offset

E Axis End Offset 0 (mm)

☒ Show Backmark Lines

☐ Swap Flange A/B (Unequal)

☐ Set the Horizontal flange bottom

☐ Hide ☐ Isolate I

Figure 55. Member Actions for leg L4P: direction, section, automatic/manual endpoint offsets and visibility options.

Field	What it controls	How to use it
Direction	The angle flange orientation.	Legs offer Leg . Other members offer ITPI or OTPO . Inspect both flanges after Apply.
Section Size	The angle section used by the member's design data.	Choose an available section; members sharing the design group can be affected.
Auto Calculate Thickness Start Offset	Automatic thickness stacking at the Start end.	Leave selected for calculated treatment; clear it to enter a manual Start value.
Thickness Start Offset	Manual thickness offset at Start when Auto is off.	Enter a value in the displayed small-length unit.

Field	What it controls	How to use it
Auto Calculate Thickness End Offset	Automatic thickness stacking at the End end.	Leave selected for calculated treatment; clear it to enter a manual End value.
Thickness End Offset	Manual thickness offset at End when Auto is off.	Check the END marker before editing.
Auto Calculate Axis Start Offset	Automatic connection working-point offset at Start.	Clear it when a manual value is required.
Axis Start Offset	Manual Start movement along the applicable connection direction.	A usable connecting member must define that direction.
Auto Calculate Axis End Offset	Automatic connection working-point offset at End.	Clear it when a manual End value is required.
Axis End Offset	Manual End movement along the applicable connection direction.	Check the supporting connection and the END marker.
Show Backmark Lines	This member's viewer backmark visibility.	Show the lines when reviewing bolt layout and alignment.
Swap Flange A/B (Unequal)	Which unequal angle leg serves each flange side.	Use for unequal sections and check the resulting leg widths/orientation.
Set the Horizontal flange bottom	The horizontal flange orientation.	Apply and inspect the relevant horizontal/diaphragm arrangement.
Hide	Visibility in the active pane.	Hide temporarily; use Search or Unhide This View in that pane to recover it.
Isolate	Visibility of the selected arrangement in the active pane.	Clear isolation to return to that pane's chosen face or model.

ITPI means Inside Tower, Pointing Inside; **OTPO** means Outside Tower, Pointing Outside. These are the two non-leg choices offered by the standard editor. Leg orientation is calculated through its leg-specific behavior.

Thickness offsets and axis offsets solve different problems. Thickness offsets account for flange stacking and separation. Axis offsets position connection working points along the applicable support. Use **Physical Steel Ends** to change steel length or trim an end; an axis offset is not a substitute for an explicit steel-length change.

Automatic offsets depend on the connected arrangement, bolt data and applicable settings. An automatic result can change when a neighbouring member or library value changes. Review the final geometry, not only the numeric draft shown before Apply.

Apply an edit

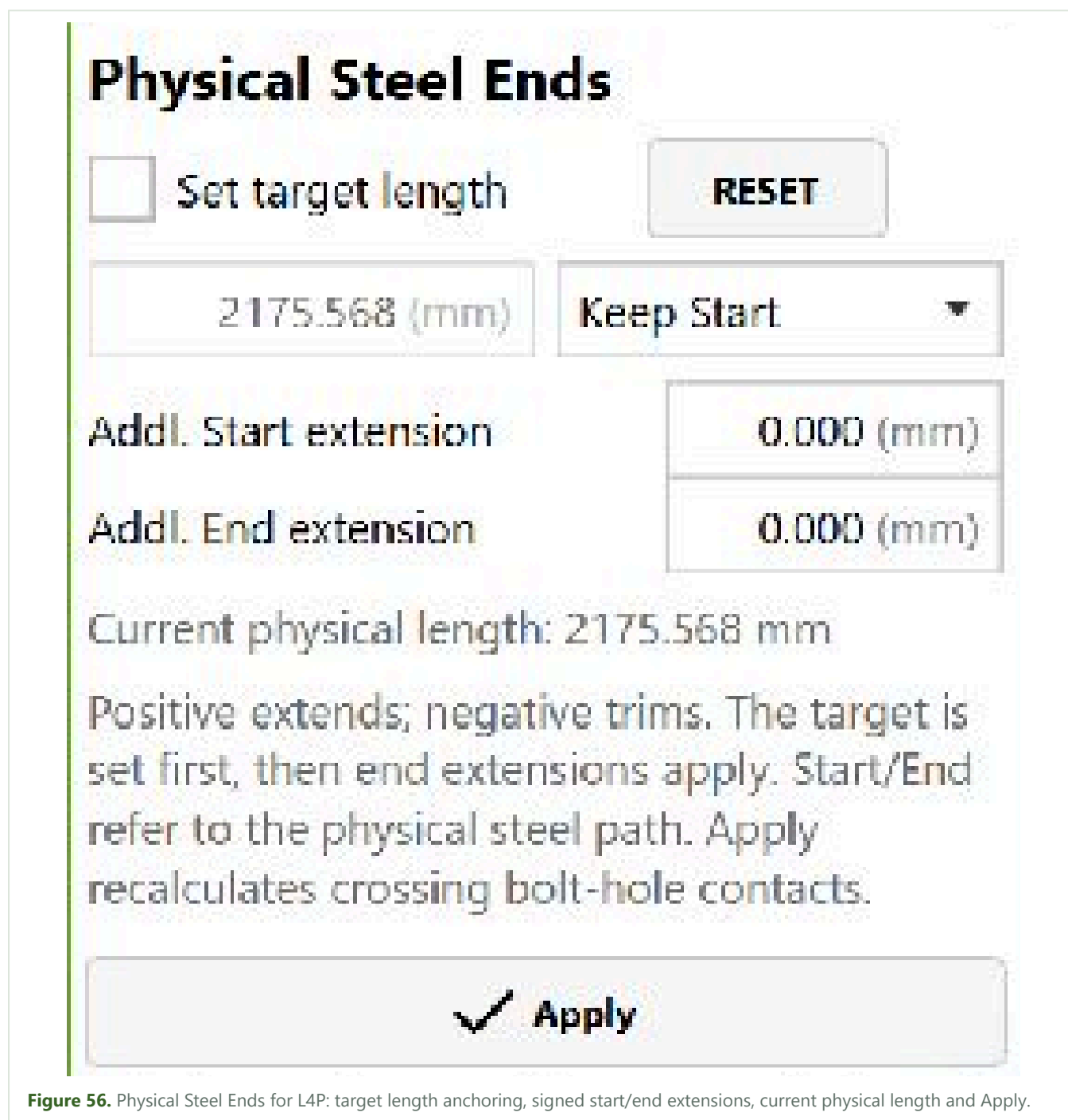
1. Select the member and inspect its identity and endpoints.
2. Change the intended fields.
3. Check **Also apply to matching symmetrical members**.
4. Select **Apply**.
5. If a continuity choice appears, choose Maintain, Break or Cancel deliberately.
6. Wait for calculation and drawing refresh to complete.

- 7. Check Length, endpoints, flange arrangement and bolt/backmark lines.
- 8. Validate the arrangement, then use **Save Inputs** when the accepted result should be retained.

Some visibility commands update the display immediately. Geometry-related drafts need Apply. Changing selection can discard unapplied single-member drafts, so complete the Apply step before moving to another member when you intend to retain the edit.

Section changes can affect members sharing the same design group even when they are not all explicitly selected. After changing Section Size, review the associated group and its reflected copies.

Physical Steel Ends



These controls operate on the physical steel path. They are available for one straight steel segment; bent paths and members with intermediate joints are restricted. The status text explains whether the selected member supports the controls.

Control	Meaning
Set target length	Enable an exact target length for the straight steel segment.
Target-length input	The requested length before additional end extensions are applied.
Keep Start	Retain the physical Start point while moving End to obtain the target.
Keep End	Retain the physical End point while moving Start.
Keep Centre	Retain the physical centre while moving both ends.
Addl. Start extension	Additional signed adjustment at the physical Start end. Positive extends; negative trims.
Addl. End extension	Additional signed adjustment at the physical End end. Positive extends; negative trims.
Reset	Prepare the original solved length, zero additional extensions and no physical inclination. Select Apply to update the model.

The target is resolved first and the end extensions apply afterwards. For example, a 1,000 mm target plus a 20 mm Start extension and a 10 mm End trim produces a 1,010 mm straight length. Use equivalent values in the displayed unit when the input shows inches.

The target and final length must remain usable and positive. A trim that collapses or reverses the segment is rejected. Reset changes the inputs; the displayed geometry changes after Apply. Use **Reset slope** in Physical Inclination when you want to clear only the slope and retain a separately entered length or trim.

Set an exact length

1. Select a supported straight member and enable **Show Markers**.
2. Select **Set target length**.
3. Enter the required length and choose Keep Start, Keep End or Keep Centre.
4. Enter additional extensions only if they are required.
5. Check symmetry and continuity choices, then select Apply.
6. Inspect **Length** in Member Properties. **Original length** appears when an applied physical-length change differs from the original solved length.

Changing physical steel ends recalculates crossing bolt-hole contacts. It does not replace the main tower's analytical geometry inputs. Check downstream physical output after the change, particularly when extending past a connection or trimming near a bolt line.

Physical Inclination

Physical Inclination

Set inclination

RESET SLOPE

End rise

End rise

0.000 (mm)

Fixed steel heel

Keep outer steel heel (Auto)

Current pitch: 0°; end rise: 0 mm

Positive raises the free steel heel. Rise is the total end height difference; pitch is measured above horizontal. The fixed heel controls target length placement; leave its additional extension at zero. Changes take effect on Apply.

Figure 57. Physical Inclination provides rise or pitch input, a fixed steel heel and a separate Reset slope control for supported Horizontal members.

Expand **Physical Inclination** below Physical Steel Ends to slope the physical steel of a supported straight **Horizontal** member on an elevation. Bent members, members with intermediate joints and other member classes do not support this editor. Its status reports the current applied pitch and end rise, or explains the restriction.

Control	Meaning
Set inclination	Enable the physical slope inputs. Select Apply to change the model.

Control	Meaning
End rise	Enter the total vertical height difference from the fixed steel heel to the free heel, in the displayed small-length unit.
Pitch angle	Enter the angle above the horizontal projection in degrees.
Fixed steel heel → Keep outer steel heel (Auto)	On an independently divided half, retain its real outer heel and slope the free cut end. Requires exactly one Independent end.
Fixed steel heel → Keep Start / Keep End	Explicitly retain the stored Start or End heel. Use the endpoint markers to identify it.
Reset slope	Clear inclination while retaining target length and additional end extensions. Select Apply to update the model.

Positive rise or pitch raises the free heel relative to the fixed heel; negative lowers it. Rise is an absolute final height difference, not an extra movement added to each Apply. Pitch is measured above horizontal, not added to the member's previous slope. End rise must be smaller in magnitude than the final physical steel length, and pitch must be strictly between -90° and 90° .

Slope a straight horizontal member

1. Select a supported elevation Horizontal and enable **Show Markers**.
2. Select **Set inclination**, then choose End rise or Pitch angle.
3. Choose the fixed heel. Auto is useful on an independently divided half; choose Keep Start or Keep End when neither end is uniquely identified as the outer end.
4. Enter the requested rise or pitch. Keep the additional extension at the fixed end at zero, and resolve any message about Maintain continuity at the free end before applying.
5. Check **Also apply to matching symmetrical members** and select **Apply**.
6. Inspect both steel heels, the applied pitch/rise, physical length and bolt contacts. Validate, then select **Save Inputs** to retain the accepted result.

Inclination preserves the final requested steel length while rotating the steel and its flanges about the fixed heel. The fixed heel controls target-length placement while inclination is enabled; the Physical Steel Ends length-anchor selector is disabled and its earlier choice is retained for use when inclination is cleared. Additional free-end extension or trim remains part of the final length. An additional extension at the fixed heel is rejected.

The free end cannot retain Maintain continuity while being independently sloped. Read the blocking message and continuity choices instead of using an offset to bypass the restriction. Auto resolves the outer heel separately for each matching symmetry half, so Start on one half need not correspond to Start on its reflected copy. Physical inclination changes the steel shape; the tower's analytical working points and connection identities retain their solved locations. Recheck the physical contacts and downstream output after Apply.

Multiple selection and symmetry

483 Members Selected

Apply selected options to all selected members:

- ☒ Show Backmark Lines
- ☐ Swap Flange A/B (Unequal)
- ☐ Set the Horizontal flange bottom
- ☐ Hide
- ☐ Isolate

✓ Apply

☒ Also apply to matching symmetrical members

Edit Members

MERGE 2 MEMBERS

DIVIDE INTO 2 EQUAL MEMBERS

0.000 (mm)

MOVE CONNECTION

Merge and Move Connection work with exactly two members; Divide works with one.

Figure 58. Ctrl+A selects all 483 visible active detailing members in this arrangement. The panel offers common Boolean edits and states the selection requirements for topology commands.

Ctrl+click members to form a multiple selection. The panel changes to **Multiple Members Selected** and offers the common Boolean options: **Show Backmark Lines**, **Swap Flange A/B (Unequal)**, **Set the Horizontal flange bottom**, **Hide** and **Isolate**.

The shared-property checkboxes can have three states. Checked applies True to all applicable targets; unchecked applies False; indeterminate leaves each member's existing value unchanged. Mixed current values are therefore not an instruction to make all members equal. Set a definite state only for fields you intend to change.

Also apply to matching symmetrical members expands applicable detailing edits to the matching reflected members. It is initially selected in the viewer. Clear it for a deliberately local edit. Hide and Isolate remain local display choices; this checkbox does not expand them. After Apply, inspect each relevant side to confirm the intended result.

Symmetry and continuity are separate decisions. Symmetry relates reflected members around the tower. Continuity relates joined members along a continuous arrangement. Turning symmetry off does not automatically break continuity at a selected member's joint.

For topology operations, symmetry requires a complete set of eligible matching members. An incomplete or incompatible family is reported; the operation does not silently proceed on only part of the requested family.

Maintain or break continuity

Some end-to-end arrangements are treated as continuous members. Editing offsets, direction, section or related settings can therefore affect a connected pair. TowGeom presents **Maintain**, **Break** and **Cancel** when an explicit continuity decision is required.

Choice	Result
Maintain	Update the connected members together as a continuous arrangement.
Break	Update the explicit edit targets independently at their affected joints.
Cancel	Return to editing without applying the pending change.

With Maintain, outer ends control the continuous span and its internal point follows the straight line. For an original back-to-back pair, an internal-end offset can control the far outer end of the adjoining member. For a complete divided pair, the Start/End axis and thickness controls correspond to the original member's outer ends.

If a neighbouring joint was already broken, only the remaining maintained span stays straight between its own outer ends. Break does not require further untouched joints in the chain to be broken as well.

For a divided member, changing flange direction, horizontal-flange orientation or Swap Flange A/B with an automatic split end allows that split end to follow its own piece, preserving the piece's direction and length where the arrangement supports it. A manually controlled split-end axis or thickness offset remains independent. Review both pieces after such changes rather than assuming the old midpoint remains fixed.

Use the small **i** button beside the member actions to reread the continuity explanation while editing.

Edit Members: merge, divide and move a connection

Apply pending member-property drafts before using these operations. The status text and button tooltips explain eligibility for the current selection. The accepted result is committed to the working Vistär arrangement; use Save Inputs to retain it between sessions.

Merge 2 Members

1. Select the first member, then Ctrl+click the second.

2. Confirm that they meet end to end on the same straight terminal axis.
3. Check the status, symmetry selection and both members' detailing compatibility.
4. Select **Merge 2 Members** and wait for the recalculation.
5. Inspect the resulting member's path, outer endpoints, section and bolt contacts.

The merge requires compatible class, flange orientation, unequal-angle swap, horizontal-flange setting, material/design data, section and backmark data. Automatic modes and manual offsets also have compatibility requirements. Eligible original continuous brace pairs can preserve different outer-end controls; this does not make arbitrary dissimilar members mergeable.

Clear physical target-length, end-extension and inclination controls before merging, then apply any required physical controls to the resulting member. An incompatible selection leaves the model unchanged and reports the reason. A merge may retain the source path's intermediate geometry, so do not assume that every merged member subsequently supports one-segment physical-length or divide controls.

Divide into 2 Equal Members

1. Select one straight member without bends or intermediate joints.
2. Clear and apply any physical-length, extension or inclination controls that would prevent division.
3. Check whether the Divide button and status indicate that the member is eligible.
4. Choose the symmetry scope, then select **Divide into 2 Equal Members**.
5. Review both halves and their newly created shared end.

The split is at the exact midpoint and produces two equal halves. It does not accept an arbitrary split distance. Each half retains its own original outer-end bolt working point; the new split end does not inherit the opposite outer-end hole. Genuine connections at the new end can be detailed during recalculation.

Maintain treats the complete divided pair as one continuous span for relevant outer-end inputs. Break allows the selected half to be detailed independently. Read the continuity rules before changing offsets or flange orientation on the new pieces.

Move Connection

This operation moves one shared joint while retaining the two members as separate members, with their own sections, bolt quantities and detailing data.

1. Select the member whose length-change direction you want to use as the reference.
2. Ctrl+click the second joined member.
3. Read the status message: it names the primary member and reports the available offset range.
4. Enter the signed distance and select **Move Connection**.
5. Inspect both joined endpoints, neighbouring connections and final lengths.

The first-selected member is the primary reference. Positive values lengthen it; negative values shorten it. The entered offset is an **absolute distance from the original joint position**, not an additional displacement each time you click. Repeating the same value does not request a second identical movement.

Move Connection requires exactly two members that meet at one end along the same straight terminal axis. It allows different bolt quantities and detailing data because it does not use Merge's full compatibility test. The requested position must remain strictly inside the available terminal span. A position that collapses/reverses a member, reaches a bend or intermediate joint, coincides with a third-member connection or detaches another connection is rejected.

When symmetry is enabled, the corresponding valid offset is applied to the complete matching family. Recheck the reference member and range if you change selection order.

Read the calculated member properties

Member Properties

Name	L4P	
Class	Leg	
Member ID	1	
Panel ID	Panel_1_4	
Mark no.	116	
Bolts	M16 - 12 qty	
Hole Count	2	
Length	2175.568	(mm)

^

 ADDITIONAL DETAILS

S Start X	-1519.53	(mm)
S Start Y	-1519.53	(mm)
S Start Z	11250.00	(mm)
E End X	-1284.38	(mm)
E End Y	-1284.38	(mm)
E End Z	13400.00	(mm)
BM11	90.00	(mm)
BM21	65.00	(mm)
BM22	120.00	(mm)
BM31	49.00	(mm)

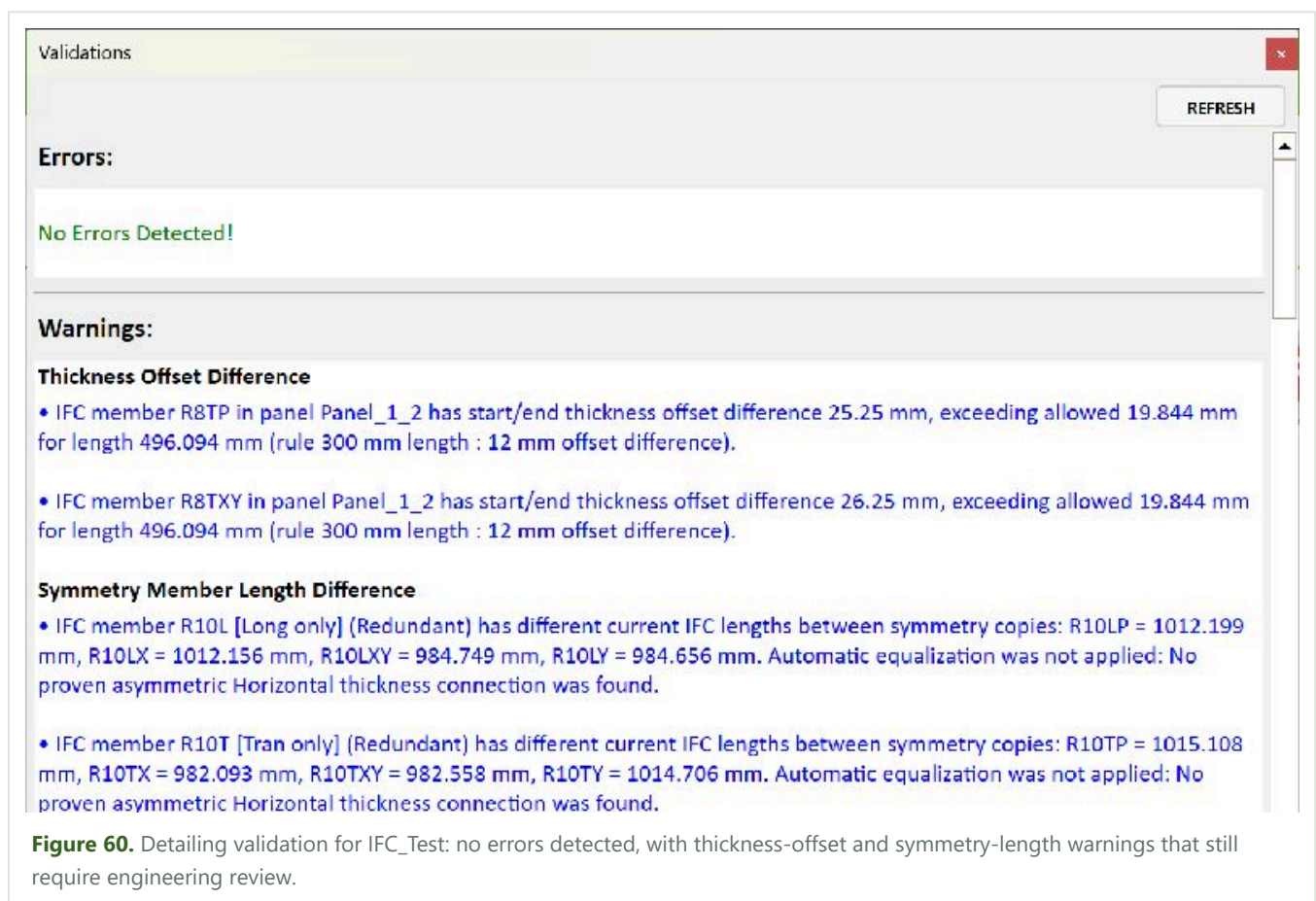
Figure 59. Read-only properties and additional details for L4P, including its member/panel identity, bolt data, length, endpoints and backmarks.

The right-hand **Member Properties** are read-only: **Name**, **Class**, **Member ID**, **Panel ID**, **Mark no.**, **Bolts**, **Hole Count** and **Length**. Use these to match a selected member to a validation message or external output.

Length shows the current physical length. **Original length** appears only for an applied physical-length modification, not merely for a pending draft or an ordinary support-offset change.

Additional Details shows Start X/Y/Z, End X/Y/Z and **BM11**, **BM21**, **BM22**, **BM31**, **BM32**, **BM33**. Coordinates identify the member endpoints; the backmark values describe one-row, two-row and three-row gauge arrangements. The governing first backmark is taken from an available three-row arrangement first, then a two-row arrangement, otherwise the single-row value. Additional backmarks remain relevant to display and downstream output.

Validate the detailed arrangement



Validations

Errors:

No Errors Detected!

Warnings:

Thickness Offset Difference

- IFC member R8TP in panel Panel_1_2 has start/end thickness offset difference 25.25 mm, exceeding allowed 19.844 mm for length 496.094 mm (rule 300 mm length : 12 mm offset difference).
- IFC member R8TX in panel Panel_1_2 has start/end thickness offset difference 26.25 mm, exceeding allowed 19.844 mm for length 496.094 mm (rule 300 mm length : 12 mm offset difference).

Symmetry Member Length Difference

- IFC member R10L [Long only] (Redundant) has different current IFC lengths between symmetry copies: R10LP = 1012.199 mm, R10LX = 1012.156 mm, R10LXY = 984.749 mm, R10LY = 984.656 mm. Automatic equalization was not applied: No proven asymmetric Horizontal thickness connection was found.
- IFC member R10T [Tran only] (Redundant) has different current IFC lengths between symmetry copies: R10TP = 1015.108 mm, R10TX = 982.093 mm, R10TXY = 982.558 mm, R10TY = 1014.706 mm. Automatic equalization was not applied: No proven asymmetric Horizontal thickness connection was found.

Figure 60. Detailing validation for IFC_Test: no errors detected, with thickness-offset and symmetry-length warnings that still require engineering review.

Select **Validate** in the IFC Viewer. The validation window is modeless, so you can inspect or correct members while it remains open. Use its **Refresh** control after changes to recalculate the displayed results.

Category	What to review
Backmark Values	Missing or incomplete backmark data for used sections.
Bolt Parameters	Used nominal bolt diameters missing from the editable library.

Category	What to review
Thickness Offset Difference	Excessive difference between signed Start and End thickness offsets for the member length.
Symmetry Member Length Difference	Different physical lengths between relevant symmetry copies and any rejected automatic correction.
Arm Top Backmark Alignment	Arm-top/body alignment cases that could not be resolved.

Hidden active members are included in the relevant checks. Merged-away source pieces and unused report groups do not become extra active members merely because they remain in source data.

Search for the reported name, inspect the relevant field/library and Apply or Save the correction as appropriate. Then Refresh validation. Missing backmarks or undefined bolt-library sizes can leave fallback geometry available, but the fallback does not resolve the reported missing data.

Vistār Settings: General

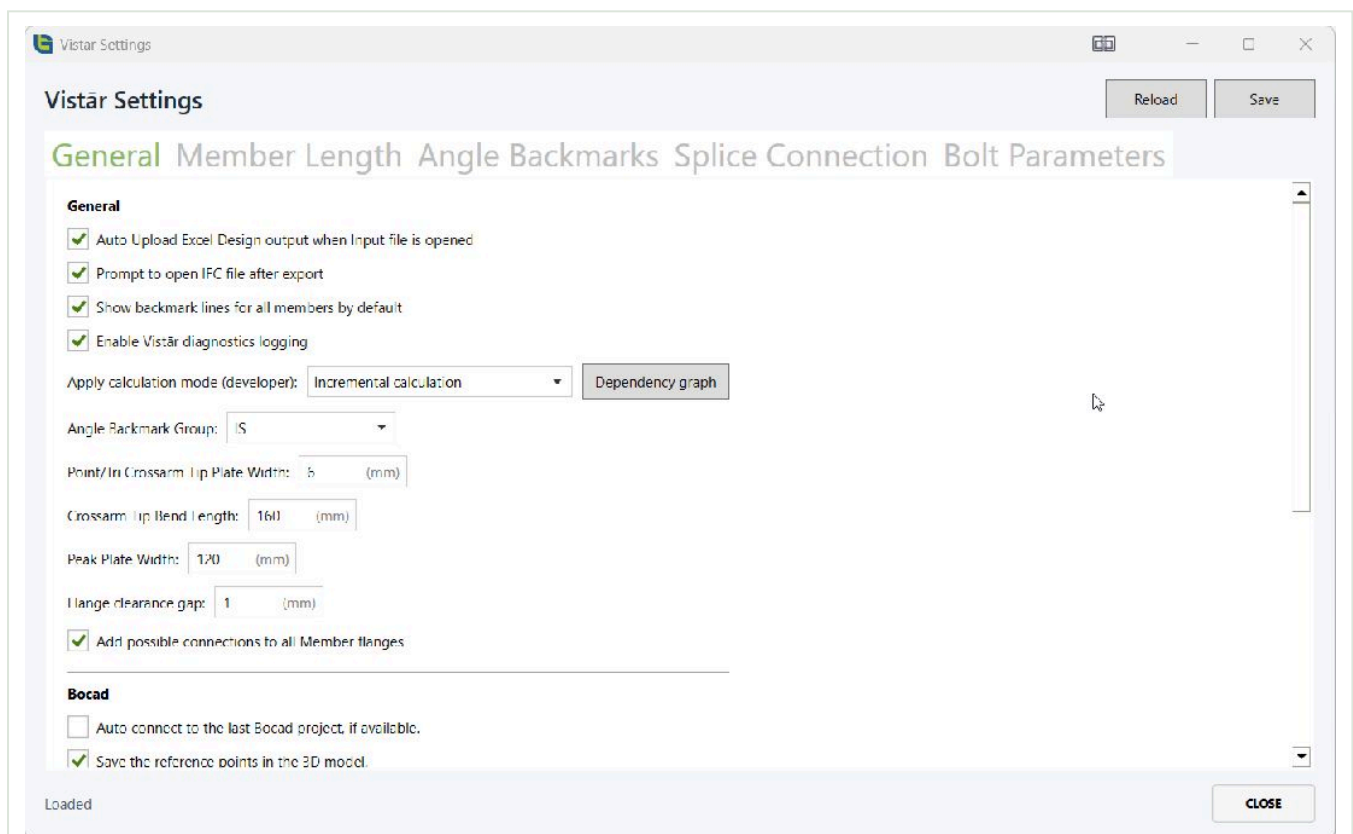


Figure 61. Vistār General settings control output upload, display defaults, connection geometry and external integrations.

Open **Vistār Settings** from the main ribbon or IFC Viewer. Settings reflect the current user's saved preferences; a changed preference can therefore differ from the first-install values listed below.

General control	Effect	Initial value where applicable
Auto Upload Excel Design output when Input file is opened	Try to load the matching design workbook automatically on input open.	Off.
Prompt to open IFC file after export	Offer to open the created IFC file through the associated application.	On.
Show bookmark lines for all members by default	Initial bookmark choice for variants without saved inputs and for Default Arrangement.	On.
Enable Vistār diagnostics logging	Enable additional timing/issue-diagnostic events. General application logs remain available.	On.
Angle Backmark Group	Choose the group used to resolve section backmarks.	IS.
Point/Tri Crossarm Tip Plate Width	Plate-width input used for applicable arm-tip detailing.	6 mm.
Crossarm Tip Bend Length	Bend-length input for applicable arm-tip geometry.	150 mm.
Peak Plate Width	Plate-width input for applicable peak detailing.	100 mm.
Flange clearance gap	Required flange separation used by applicable geometric checks/corrections.	1 mm.
Add possible connections to all Member flanges	Enable the additional connection/common-point treatment used for applicable flange working points.	Off.

Read the small-length suffix on each dimension when entering imperial values. **Angle Backmark Group** changes can affect member geometry as well as the drawn lines because the governing backmark is used in the arrangement.

The same General tab contains Bocad and Tekla preferences. Their effects are explained in [Outputs and external model handoff](#).

Developer calculation controls

Apply calculation mode (developer) offers **Full calculation**, **Compare with full calculation** and **Incremental calculation**. Full is the initial mode. Compare evaluates the candidate arrangement against a full calculation; Incremental uses the applicable dependency scope. A mode can fall back to Full when the edit or current session does not support the selected route.

Read the calculation summary beside Apply to see what actually happened. Selecting Compare does not itself prove that a comparison completed. A fallback status must be read as a fallback.

Dependency graph is available for the relevant Compare/Incremental workflow. It supports Find member, Find next, All members, zoom and Follow connections. Its arrows show why a member was included, not execution order. Blue marks an edited member; each member appears once. Merged members are represented through their original pieces, with the displayed member identified in the details.

Vistār Settings: Member Length

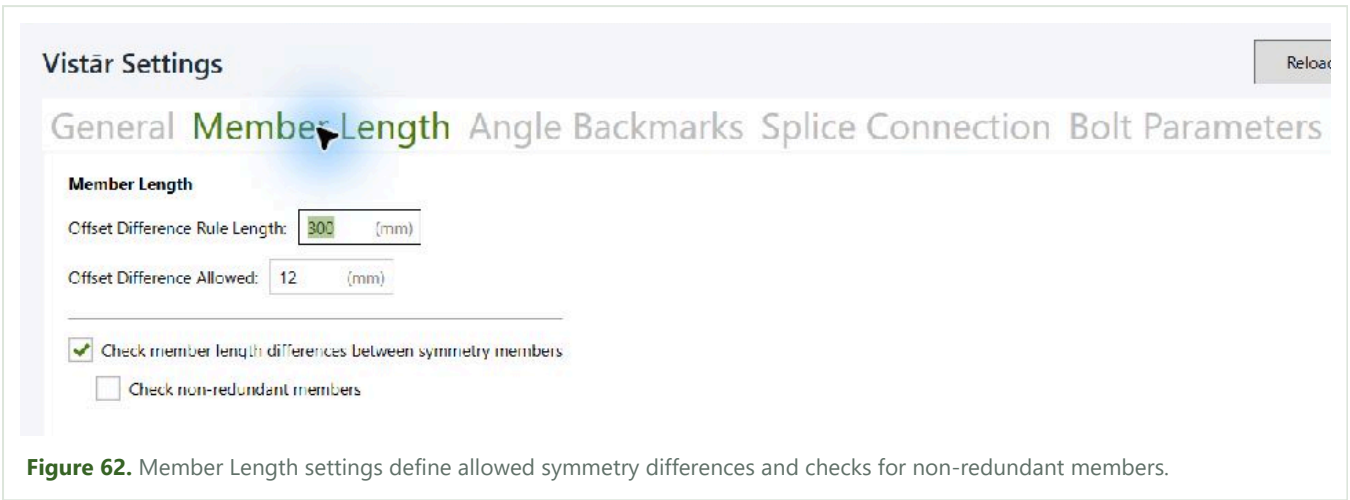


Figure 62. Member Length settings define allowed symmetry differences and checks for non-redundant members.

Control	Meaning	Initial value
Offset Difference Rule Length	Reference length for the signed thickness-offset-difference check.	300 mm.
Offset Difference Allowed	Allowed difference over that reference length.	12 mm.
Check member length differences between symmetry members	Enable the applicable symmetry length warning.	On.
Check non-redundant members	Include non-redundant members in that warning; available when the parent check is enabled.	Off.

The allowed offset difference scales with length: $\text{allowed difference} = \text{member length} \div \text{rule length} \times \text{allowed reference difference}$. With the initial 300 mm/12 mm rule, a 600 mm member permits a 24 mm signed Start/End difference. Both rule values must be greater than zero; invalid values cause this validation check to be skipped with a warning.

These options govern validation. They do not replace the Physical Steel Ends controls for an explicit steel-length edit.

Edit the detailing libraries

The settings window adds a tab for each available library. Choose its group from the group selector before editing rows. These are shared installed libraries rather than private values stored in one tower input. A saved change can affect other projects that use the same library.

Editor action	Result
Add Row	Add a blank row to the selected group.
Duplicate	Copy selected rows after the selected source rows.

Editor action	Result
Paste	Paste a tabular clipboard range starting at the active cell; rows can be added as needed.
Fill Down	Copy the top selected value down each selected column.
Clear	Clear selected editable cells.
Delete	Remove selected rows.
Reload	Discard library drafts and reread the saved library files.
Save	Commit edits, validate and write the libraries; the current model is refreshed after a successful save.
Close	Close the settings window. Use Save first when library edits must be retained.

Ctrl+V pastes and Ctrl+D fills down when the grid has focus. The Delete key clears selected cells; the **Delete** toolbar button removes rows. Keyboard shortcuts are not intercepted while typing inside a cell's text editor.

Generated **key** columns are read-only. Editing the row's identifying dimensions/parameters updates the key. Blank or duplicate keys prevent saving where a key field is used. A duplicated keyed row needs a distinct identifier before Save can succeed.

Complete all required values before Save. Read any error message and correct the affected row. Saving can recalculate the currently loaded arrangement; wait for that refresh to finish before closing the window or applying another operation. A library save does not automatically export a new IFC file or update an external model.

Angle Backmarks

Vistar Settings

General Member Length **Angle Backmarks** Splice Connection Bolt Parameters

Group: IS

Add Row Duplicate Paste Fill Down Clear Delete

	key	height	width	thickness	bm11	bm21	bm22	bm31	bm32	bm33	spliceGap	cleatClearance
1	20_20_3	20	20	3	10	0	0	0	0	0	6	1
2	20_20_4	20	20	4	10	0	0	0	0	0	6	1
3	25_25_3	25	25	3	13	0	0	0	0	0	6	1
4	25_25_4	25	25	4	13	0	0	0	0	0	6	1
5	25_25_5	25	25	5	13	0	0	0	0	0	6	1
6	30_30_3	30	30	3	15	0	0	0	0	0	6	1
7	30_30_4	30	30	4	15	0	0	0	0	0	6	1
8	30_30_5	30	30	5	15	0	0	0	0	0	6	1
9	35_35_3	35	35	3	17	0	0	0	0	0	6	1
10	35_35_4	35	35	4	17	0	0	0	0	0	6	1
11	35_35_5	35	35	5	17	0	0	0	0	0	6	1

Loaded

CLOSE

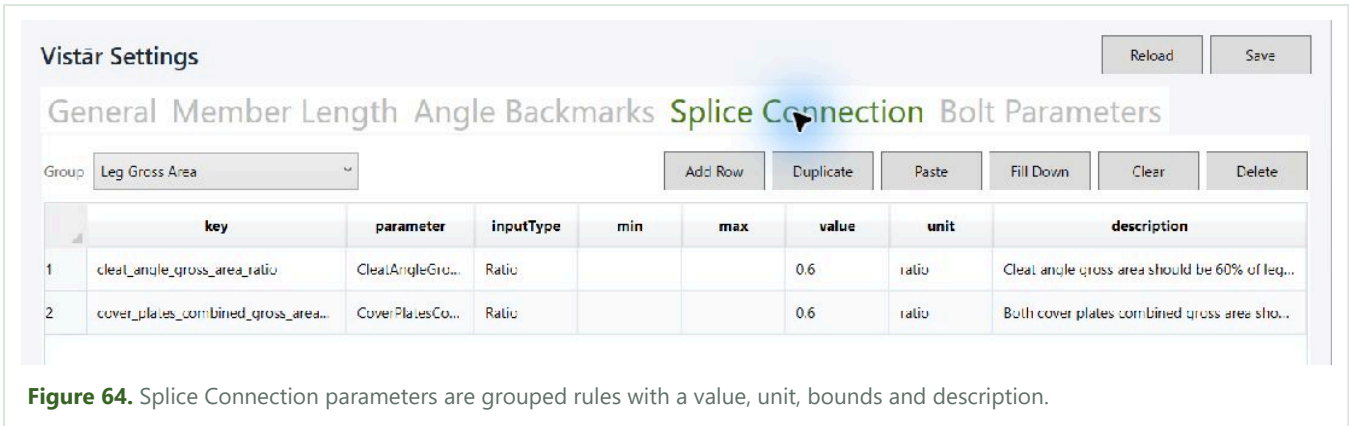
Figure 63. Angle Backmarks stores section dimensions, backmarks and connection allowances by section group; scroll horizontally for further columns.

Column	Meaning
key	Generated section identity from height, width and thickness.
height, width, thickness	Angle dimensions in millimetres used for the exact section lookup.
bm11	Single-row backmark.
bm21, bm22	Two-row backmark arrangement.
bm31, bm32, bm33	Three-row backmark arrangement.
spliceGap	Section-specific splice gap.
cleatClearance	Section-specific cleat clearance.

Select the intended **Angle Backmark Group** in General. Within that group, the dimensions must match the used section. The initial group is IS; if the saved group is unavailable, the application prefers IS, then the first available group.

Populate the complete gauge arrangement needed for a section. A missing or partly populated arrangement can generate a Backmark Values error. Zero values do not become valid gauges merely because the model can still be drawn. The first available three-row gauge governs geometry before a two-row gauge or the single-row gauge.

Splice Connection

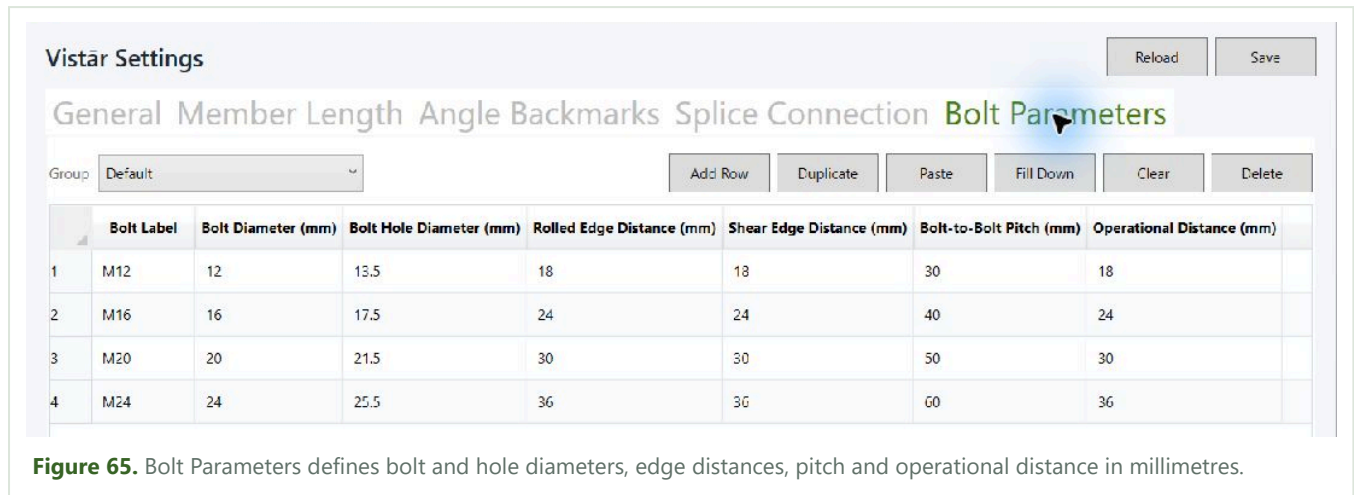


This tab edits the stored splice-reference parameters. The supplied **Leg Gross Area** group includes cleat-angle and combined-cover-plate gross-area ratio entries with an initial value of **0.6**.

Column	Meaning
key	Read-only parameter identifier.
parameter	Parameter name represented by the row.
inputType	Kind of input, such as Ratio.
min, max	Stored range metadata when supplied.
value	The stored parameter value.
unit	Its unit or ratio notation.
description	Explanation of the parameter's intended meaning.

A ratio of 0.6 represents 60%, not 0.6%. The editable min/max fields are reference metadata; do not treat them as proof that an entered value has been checked against every downstream detailing requirement. The current editor stores these reference entries. Do not assume that changing a ratio automatically resizes Tekla or Bocad splice components; inspect the actual downstream connection and its documented detailing rules.

Bolt Parameters



All dimensional columns in this library use millimetres, including in an imperial-display project. Rows are matched by their exact nominal **Bolt Diameter**, not by label.

Column	Meaning
Bolt Label	Description shown in the viewer, such as M16.
Bolt Diameter (mm)	Nominal diameter used to match the row.
Bolt Hole Diameter (mm)	Configured viewer hole size and applicable detailing spacing.
Rolled Edge Distance (mm)	Clearance across the flange from a rolled edge.
Shear Edge Distance (mm)	Clearance from a cut end for applicable detailing.
Bolt-to-Bolt Pitch (mm)	Applicable spacing between bolt stations.
Operational Distance (mm)	Operating/access dimension used by applicable connection output.

The initial Default rows are:

Label	Diameter	Hole	Rolled edge	Shear edge	Pitch	Operational
M12	12	13.5	18	18	30	18
M16	16	17.5	24	24	40	24
M20	20	21.5	30	30	50	30
M24	24	25.5	36	36	60	36

All dimensions must be positive decimal numbers; the hole diameter cannot be smaller than the nominal diameter. Labels cannot be blank. A nominal diameter must occur only once across the library, and the Default group must remain available. Editing diameter does not rescale the other columns automatically.

Vistār derives nominal diameter from the report as hole diameter in cm $\times 10 - 1.5$ mm. Thus a report hole diameter of 1.75 cm selects the 16 mm row. A missing size produces a Bolt Parameters validation error and uses legacy fallback dimensions until the row is supplied. Add the missing row and Save; the model refresh can clear the error without another report upload.

Configured hole dimensions are not a blanket override of the actual hole tolerances exported to Tekla or Bocad. Custom labels appear in viewer descriptions; those applications retain their numeric nominal-size conventions. Read the integration chapter before assuming that every library column is passed to every connection type.

Detailing Rules reference

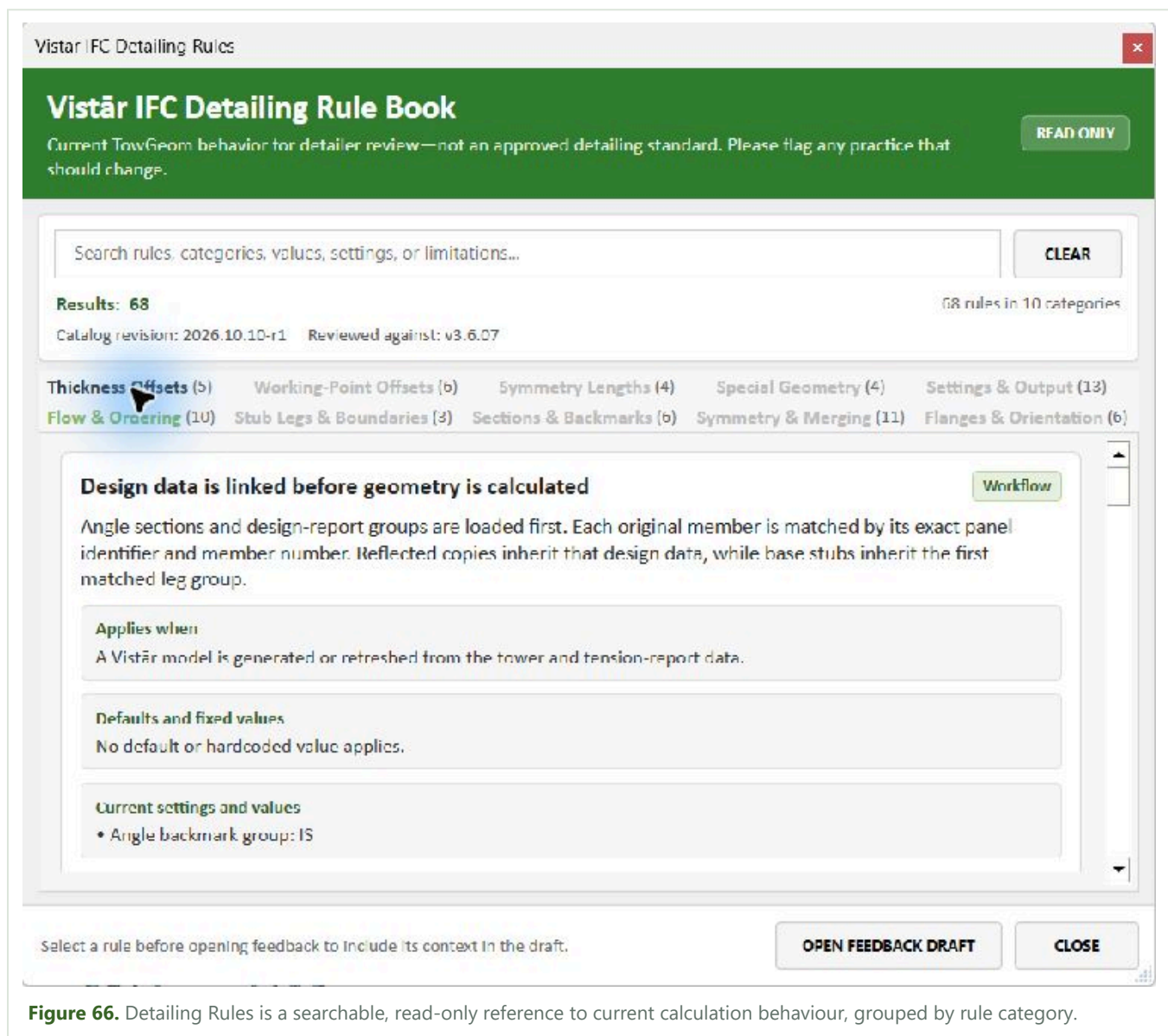


Figure 66. Detailing Rules is a searchable, read-only reference to current calculation behaviour, grouped by rule category.

Select **Detailing Rules** to search the current rule book. Search across behavior, categories, values, setting names and limitations. Select a category or rule and review **Applies when**, **Defaults and fixed values**, **Current settings and values** and **Known limitations**.

The reference describes current TowGeom behavior. It is a read-only review aid, not an approved project detailing standard. Its catalog revision and reviewed-against version identify the reference baseline. Current values help relate a rule to the active settings or selected member.

Open Feedback Draft opens a prefilled message in the default mail application. Select the relevant rule first so that its context is included. Opening a draft does not send it.

Save the accepted arrangement and reset deliberately

Use **Save Inputs** or Ctrl+S after Apply and validation to retain the accepted arrangement. The `.tgvi` can contain multiple tower-combination variants. Member edits are associated with the active variant; reviewing one variant does not establish that another has the same detailing.

Current saves use the `.tgvi` format that supports physical inclination. Older supported sidecars open with inclination disabled, retaining their existing length inputs. Use a TowGeom build that supports the saved sidecar format on another computer; a newer unsupported sidecar is reported rather than silently read as an older arrangement. Keep the matching tower input, library and sidecar together when transferring the project.

The unsaved-input prompt provides **Yes = Save**, **No = Discard** and **Cancel = Stay**. Save retains accepted working inputs; unapplied visible drafts are excluded. Discard restores the last saved state, with recalculation when the transition requires it. Cancel keeps the current viewer/project open.

Default Arrangement removes user Merge, Divide and Move Connection operations for the active variant, restores the original members and replaces its applied member inputs with generated defaults. Pending drafts are discarded as part of this action. Read the confirmation and choose Yes only for that intended reset. The reset remains unsaved until Save Inputs; other variants are not reset by this active-variant command.

After a failed Apply, inspect the message and the restored arrangement. Correct the stated input or compatibility problem and try the revised edit. A failure message is not evidence that the draft was accepted or saved.

Before exporting, check the current combination, accepted member edits, relevant validation results and saved sidecar. Continue with [Outputs and external model handoff](#).

Outputs and external model handoff

Use the Vistār ribbon to create detailing exchange files or update a connected Tekla or Bocad model. Complete Upload Output, member editing and validation first. The export commands use the accepted detailed arrangement, so check the active tower combination and final geometry before starting the handoff.

This chapter covers the TowGeom controls and their effects. Work inside AutoCAD, Tekla Structures and Bocad follows the recipient application's project procedures. The screenshots show TowGeom's interface; they do not imply that an external update has been performed.

Before any detailing handoff

1. Open the intended `.tgi` with its matching panel library.
2. Confirm the selected tower combination.
3. Use **Upload Output** with the completed matching workbook.
4. Open **IFC Viewer**, Apply required edits and review validation.
5. Use **Save Inputs** to retain the accepted Vistār arrangement.
6. Review the export schema or connection settings for the recipient.

Vistār output commands require the expected workbook to exist and the detailed members to have names. If commands remain disabled, review the upload result and workbook matching before trying another export button.

Generating files with **Home** → **Run** and creating Vistār outputs are separate workflows. See [Output generation](#) for the standard output settings and run process.

Export DWG: the AutoCAD script handoff

The Vistār ribbon command is labelled **Export DWG**. It creates an AutoCAD script named after the uploaded design-output workbook, with `_IFC.scr` appended. For the practice set, the file is `IFC_Test_Output_IFC.scr`.

1. Complete the accepted detailing arrangement in IFC Viewer.
2. Return to the main **Vistār** ribbon and select **Export DWG**.
3. Wait for the drawing-export progress to finish.
4. Locate the resulting `_IFC.scr` beside the uploaded output workbook.
5. Hand this script to the AutoCAD workflow used by your project. The resulting drawing is saved in AutoCAD through that workflow.

The `.scr` is the generated artifact from this command; the button does not itself constitute a saved `.dwg` drawing. Standard Run separately offers **2D.scr** and **3D.scr** in General Settings. DXF output choices are unavailable in this release.

When reviewing a script handoff, distinguish the physical Vistār member arrangement from the tower's other drawing outputs. Include the correct script and state the model revision and combination it represents.

Export IFC

The split-button menu offers three schemas. Selecting a schema updates the main button so that the next click uses that selection.

Command	Filename suffix	Use
Export IFC2x3	_v2x3.ifc	Exchange with a workflow expecting IFC2x3.
Export IFC4	_v4.ifc	Exchange with a workflow expecting IFC4.
Export IFC4x3	_v4x3.ifc	Exchange with a workflow expecting IFC4x3.

Files are created beside the uploaded design-output workbook. For example, IFC4 produces `IFC_Test_Output_v4.ifc`. Combination-specific workbook names carry through to their export basenames.

1. Confirm the recipient's required schema.
2. Open the export split-button menu and choose that schema.
3. Wait for export to complete.
4. If **Prompt to open IFC file after export** is enabled, respond to the open-file prompt.
5. Review the exported model in the recipient's IFC application before accepting the handoff.

The schema selection controls the exchange format. It does not resolve missing design data, unapplied drafts or detailing-validation messages. Resolve those in TowGeom before generating the file.

Tekla connection and model update

The Tekla group contains **Refresh Tekla Connection**, **Update Tekla Model** and **Create GA Drawings**. The connection/model-name readout helps identify the destination. If TowGeom reports **Tekla Structures model is not connected**, open the intended Tekla model and refresh the connection before updating.

Review Tekla preferences

Open **Vistār Settings** → **General** and inspect the Tekla section.

Setting	Effect	Initial preference
Remove all the existing objects from the model before exporting	Delete the existing model objects before creating the TowGeom output.	Off.
Auto Create GA Drawings after updating the model	Start the GA-drawing operation after a successful model update.	Off.

Setting	Effect	Initial preference
Auto export PDF files after creating GA drawings	Export PDFs through the GA-drawing operation.	Off.
Refresh Tekla Viewbox after updating model	Refresh the model view after the update.	On.
Display confirmation message after updating model	Show the completion confirmation.	On.

The removal option applies to the connected Tekla model's existing objects. Confirm the destination and this option before **Update Tekla Model**, especially when the model contains work created outside TowGeom. Turning removal off avoids that preliminary deletion, but it does not establish that repeated exports cannot create overlapping or duplicate objects; inspect the intended downstream update strategy.

Update the model

1. Open the intended project in Tekla Structures.
2. Use **Refresh Tekla Connection** where it is available and verify the displayed model identity.
3. Review the General Tekla preferences.
4. Select **Update Tekla Model**.
5. Wait for member/connection creation and the configured completion behavior.
6. Review member positions, sections and connections in the destination model.

The connection output uses calculated design data and applicable Bolt Parameters for peak-tip, crossarm-tip, brace, leg-to-diagonal and leg-splice treatment. Different connection types consume different dimensions.

Operational Distance is used by applicable tip and brace connections, but is not sent by the leg-splice connection. Configured hole diameter affects applicable geometry/spacing; it is not a universal override of Tekla's actual hole tolerance.

Create GA drawings and PDFs

After the intended model is ready, select **Create GA Drawings**. The explicit command prepares a **PlotFiles** folder beside the uploaded output workbook for the drawing/PDF operation. Enable **Auto export PDF files after creating GA drawings** when PDFs are required by that operation.

The auto-create and auto-PDF checkboxes control separate stages: requesting an automatic model update does not request PDFs unless the relevant drawing and PDF preferences are enabled. Inspect the resulting drawings and exports in the project workflow before issuing them.

Bocad connection and model update

The Bocad group contains **Refresh Bocad Connection**, **Close Bocad Connection** and **Update Bocad Model**. Choose the destination project deliberately. The model-name readout identifies the attached project; **Model Name: N/A** indicates that TowGeom is not holding a usable connection.

Configure the Bocad installation

In **Vistār Settings** → **General**, select **Bocad Installed Folder**. Choose either the installation folder containing `bocrun64` or `bocrun64` itself. An unrelated folder is rejected. Restart TowGeom after changing the folder so that its Bocad dependencies reload correctly.

The installation folder locates Bocad's runtime. It is different from the project folder selected for an individual connection.

Review Bocad preferences

Setting	Effect	Initial preference
Auto connect to the last Bocad project, if available.	Try to reconnect to the last available project.	Off.
Save the reference points in the 3D model.	Include reference points in the model output.	Off.
Add only splice connections to the Bocad model.	Skip brace connections and add splice connections only.	On.
Export only main surface members into Bocad model	Limit future Bocad exports to the original source surfaces, excluding separate mirrored copies.	Off.
Export all members in Diaphragm views	When main-surface export is enabled, include all quadrants of each original diaphragm surface instead of Q2 alone.	Off; enabled only when the parent is checked.
Member Family ID Assignment	Choose Type-1 or Type-2 family mapping. The adjacent i button explains the current mapping.	Type-1.
First Bocad Mark no.	Starting mark number for the assigned sequence; minimum 1.	1001.
Bocad Installed Folder	Select the installation runtime location.	Depends on the installation.

Choose the exported surface scope

Leave **Export only main surface members into Bocad model** off to export the complete accepted arrangement. Enable it to export the original main surfaces and their required coplanar members. This includes the complete Front and Left faces across all body slopes and selected extensions, including stubs; front-left Q2 Hip and Diaphragm surfaces across the panels; and all original built-in or custom Special Surface groups on rendered panels and attachments. Separately defined right or back attachments retain their own original surfaces; separate mirrored copies are excluded. The scope follows the source surfaces and does not depend on which viewer panes are open or locally hidden.

The indented **Export all members in Diaphragm views** checkbox is enabled only while the parent is checked. Leave it off for the front-left Q2 diaphragm scope. Enable it to include every quadrant on each selected diaphragm surface, keeping distinct levels separate. Disabling the parent remembers the child's checked value for the next time it is enabled. Both preferences are off initially and are saved for the current user.

Custom Special Surface exports use the same corrected surface area as the viewer. Separate mirrored copies outside the original defined area are excluded even when they share its plane; necessary symmetry members within the area remain included across any quadrants. Built-in Special Surfaces continue to include their complete working members on the selected plane.

A member shared by multiple surfaces is exported once, with all of its accepted physical segments. Missing required source anchors or unusable geometry stops the operation before writing to Bocad; a valid surface with no Q2 working members is simply skipped. Connections requiring an excluded host are skipped and reported, without substituting a different host.

These preferences affect future exports. They do not remove steel or mirrored copies already present in the Bocad job. Updates are additive, and repeated exports can create duplicates; use a new or empty job when you need a reduced model containing only the chosen scope. IFC, DWG and Tekla exports retain their own behavior.

Connect, switch or close

1. Open the required project in Bocad.
2. Select **Refresh Bocad Connection** in TowGeom and choose the project when prompted.
3. Verify the attached project name before updating it.
4. If a connection is already active, Refresh asks whether to close it and connect to a different project. Choose Yes only when switching is intended.
5. Use **Close Bocad Connection** to close TowGeom's active connection when the handoff is complete.

If the Bocad process/project has ended or its connection becomes unusable, TowGeom clears the stale connection and reports the recovery action. Keep or reopen the intended project in Bocad, then use Refresh Bocad Connection. Repeating Update without restoring a usable connection does not repair it.

Update the Bocad model

1. Complete and validate the Vistār arrangement.
2. Connect to the intended Bocad project.
3. Check the member-surface scope, diaphragm exception, splice-only, reference-point, family-ID and starting-mark preferences.
4. Select **Update Bocad Model** and wait for completion.
5. Review the resulting members and applicable connections in Bocad.

When splice-only is enabled, the absence of exported brace connections is expected. Configured bolt pitch and shear-edge distances are passed to applicable Bocad brace/splice output. The Bolt Parameters library's hole, rolled-edge and operational values are not all exported as Bocad overrides. Connection macros retain Bocad's nominal M-size convention; the member attributes below use the resolved display label shown in the TowGeom viewer.

Read design bolt details on a member

Every newly exported physical member receives the available design bolt details as user-defined attributes in the **TowGeom** context/bundle:

Attribute	Value
Bolt size	The current resolved bolt label, such as M16 , matching the TowGeom viewer.
No. of bolts	The exact design quantity, such as 3 .

These attributes describe design data, independently of generated connections. Quantities are not rounded to an even splice quantity or multiplied by the number of physical segments. Missing values are omitted. The attributes are added automatically for both complete and main-surface exports; they do not change which members are exported.

Understand family IDs

Type-1 uses an ordered set of assignments for body elevation, crossarm member classes and body/crossarm views. Body transverse/longitudinal classes can have different IDs. If no Type-1 rule matches, the output uses the Type-2 assignment. Use the **i** reference for the complete current Type-1 table while selecting the setting.

Type-2 forms a three-digit ID from surface, direction and class:

Digit	Assignment
First: surface	1 = Elevation; 2 = Diaphragm; 3 = other surface.
Second: direction	1 = Tran only; 2 = Long only; 3 = other direction.
Third: class	1 = Leg; 2 = Arm; 3 = Horizontal; 4 = Diagonal; 5 = Redundant; 6 = other class.

For example, the reference shows Leg = 131 and a longitudinal Horizontal = 123. Where descriptions satisfy more than one category, the ordered rules shown in the reference govern the result.

Confirm what was delivered

Record the input revision, tower combination, uploaded report and accepted Vistār arrangement associated with the handoff. Keep the relevant output file or destination-model identification with that record. Inspect final member sections, lengths, endpoints, connections and marks before treating the handoff as complete.

Saving a **.tgvi** retains detailing inputs; it does not update an already exported IFC or script, and it does not update a connected external model. Regenerate the relevant artifact or deliberately run the model update after subsequent accepted changes.

General settings

Open **Settings > General**, or press **Alt+G**, to change application preferences. The window scrolls vertically; use the scroll bar to reach Input Data, Display, Support and Update below the output options. Close the window when finished. The preferences are reused between sessions; model values such as circuit requirements and insulator lengths belong to the saved input file.

The defaults below describe a fresh settings profile. Your screenshots and installation may show preferences retained from earlier sessions.

Output Files and Output Data

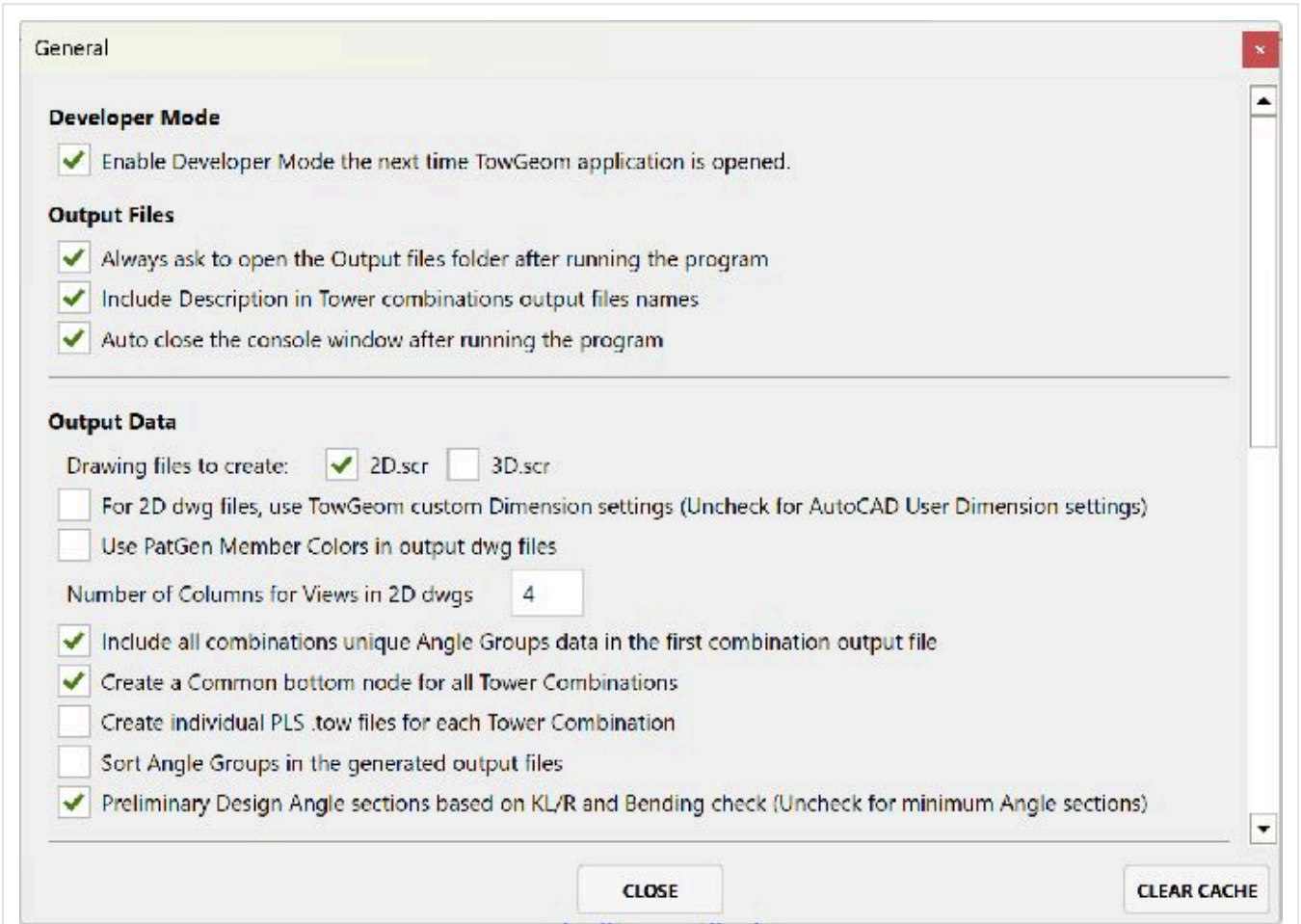


Figure 67. General Settings: output folder prompts, drawing selection, naming and generated data policies.

Setting	Fresh default	Effect and recommended use
Always ask to open the Output files folder after running the program	On	Prompts to open the folder after successful output generation. It does not choose another output location.

Setting	Fresh default	Effect and recommended use
Include Description in Tower combinations output files names	On	Appends each combination's description to its TC output name. Choose valid filename characters.
Auto close the console window after running the program	On	Hides the console when Run completes. Use Console to reopen the recent log. Turn it off when investigating generation.
Drawing files to create: 2D.scr	On	Generates the 2D tower drawing script. Clearing it removes a stale script with the same output name during the next run.
Drawing files to create: 3D.scr	On	Generates the structural 3D line script, with the same stale-file behavior when disabled.
For 2D dwg files, use TowGeom custom Dimension settings	On	Uses TowGeom's dimension configuration in the generated script. Clearing it uses the CAD user's dimension settings when the script is processed.
Use PatGen Member Colors in output dwg files	On	Applies the configured PatGen member-class colors to drawing layers.
Number of Columns for Views in 2D dwgs	3	Controls the 2D view layout. Enter a positive whole number suitable for the required sheet layout.
Include all combinations unique Angle Groups data in the first combination output file	Off	Consolidates unique groups in the first workbook for family workflows. OptiTower mode enforces this option.
Create a Common bottom node for all Tower Combinations	Off	Enables a common bottom-node arrangement. Review validation findings about compatible combination endings. OptiTower mode enforces this option.
Create individual PLS .tow files for each Tower Combination	On	In PLS generation mode, retains separate combination files. Clearing it retains the consolidated Family Manager result after successful consolidation.
Sort Angle Groups in the generated output files	Off	Sorts generated angle-group data.
Preliminary Design Angle sections based on KL/R and Bending check	Off	When on, selects preliminary sections using the implemented KL/R and bending checks. When off, output uses minimum angle sections.

Drawing option labels mention DWG because they control the drawing made from the SCR. The generated files are `.scr`; direct DWG generation is not part of the normal Run command. DXF choices and the output-folder chooser are not available in this release. Outputs are placed in the input folder.

Changing an output preference affects the next Run; it does not regenerate existing files. Read [Generating and using outputs](#) before changing consolidation or overwrite-related choices.

Input Data

Input Data

☐

Calculate 3D angles in Elevation view (Uncheck to calculate in 2D)

☒

Add new LegComb when a new LegExtn panel is added in Extensions

☐

Always prefer and enable Imperial units when creating a new input file

Setting	Fresh default	Effect
Calculate 3D angles in Elevation view	Off	Uses the 3D member angle when displaying/checking elevation angles. Clearing it uses the 2D elevation calculation. Changing this option refreshes the drawing.
Add new LegComb when a new LegExtn panel is added in Extensions	On	Adds a leg-combination entry when adding a new leg-extension panel, reducing repeated entry. Review the resulting corner assignments.
Always prefer and enable Imperial units when creating a new input file	Off	Starts new inputs in Imperial when enabled. It is a preference for newly created models, not a replacement for the unit system recorded in an existing input.

When opening an existing model, check the model's own unit selection and field labels. A units preference does not justify entering values without units. Review values after changing a model's unit system and save the converted model deliberately.

Display

Display

☒

Show View Cube

☒

Show Co-ordinate Axis

☐

Show Directional Text

☐

Show Angles Values

☐

Show Base Width Text

Setting	Fresh default	Display affected
Show View Cube	On	Orientation cube in the 3D viewer.
Show Co-ordinate Axis	On	Coordinate-axis indicator.

Setting	Fresh default	Display affected
Show Directional Text	Off	Direction labels around the model.
Show Angles Values	Off	Angle annotations.
Show Base Width Text	Off	Base-width annotations.

Use these switches to make screenshots or inspections easier to read. They control annotations, not structural dimensions. The ribbon's **Color** menu separately controls model coloring and background. Clearance component visibility is controlled through the 3D viewer's **3D Clearance** context menu.

TowGeom remembers the main window's position, restored size and normal/maximized state when it closes. The IFC Viewer remembers its own placement separately. Minimized state is not retained. Move and resize the relevant window to the preferred monitor before closing it; on a later session Windows adjusts saved bounds when the former monitor is unavailable. These window preferences do not belong to the tower input.

Support and save diagnostics



Figure 70. Save diagnostics and update preferences in General Settings. Diagnostic tools become available when diagnostics are enabled.

Control	Fresh default	Use
Enable Save Diagnostics	Off	Records detailed save evidence and recovery information to help investigate a save failure.
Display Excel alerts while saving with diagnostics	Off	Shows Excel alerts during a diagnostic save. Available only when diagnostics are enabled.
Run Save Location Test	Disabled until diagnostics enabled	Tests a folder selected in the folder dialog and reports its classified save result.
Export Save Diagnostics Bundle	Disabled until diagnostics enabled	Copies relevant logs, diagnostic records and recovery files into a bundle folder at the selected destination.

Test a save location

1. Enable **Save Diagnostics**.

2. Select **Run Save Location Test**.
3. Choose the folder where the save problem occurs.
4. Allow the test to finish and read its result.
5. Record the reported paths or export a diagnostics bundle if support needs the evidence.

The location test creates its own small test files; it is not a save of your open tower. Use the normal Save command to save the model afterwards. A successful test helps distinguish a folder problem from a model-specific save problem.

Export evidence for support

1. Reproduce the save problem with diagnostics enabled.
2. Read the save message, including any diagnostics or recovery path.
3. Select **Export Save Diagnostics Bundle**.
4. Choose a destination folder and note the new `TowGeom_SaveDiagnosticsBundle_...` folder shown at completion.

The bundle is a folder containing logs, JSON/text diagnostic records, recovery copies where available and bundle information. Recovery material can contain project data. Share only the bundle and model files appropriate to the support request.

Diagnostic records are normally under `C:\DegiTrans\TowGeom\logs\save-diagnostics` ; recovery copies under `C:\DegiTrans\TowGeom\save-recovery` ; automatic bundles under `C:\DegiTrans\TowGeom\save-diagnostics-bundles` . The failure message gives the actual path to use. A recovery file is evidence or a recovery candidate; verify its contents and save it as a separate model before treating it as the current project.

Update and Clear Cache

Check for updates on startup is on in a fresh profile. It controls the startup update check. Use the application's explicit update command when you want to check during a session, and save the model before following an update flow that closes or restarts TowGeom.

Clear Cache removes eligible hidden `~TGM_...xlsx` cache files from the TowGeom installation folder while retaining the currently used temporary specifications workbook. It does not delete saved `.tgi` models or the panel library. Use it for stale temporary-cache problems, then retry the relevant operation. It does not correct an invalid pattern or missing specifications file.

Some installations also expose **Developer Mode**. This conditional setting applies the next time TowGeom opens and enables development-specific features; it is not required for an ordinary tower workflow. Enable it only when that mode is part of your intended workflow. The output chapter distinguishes mode-specific PLS generation from standard standalone Run.

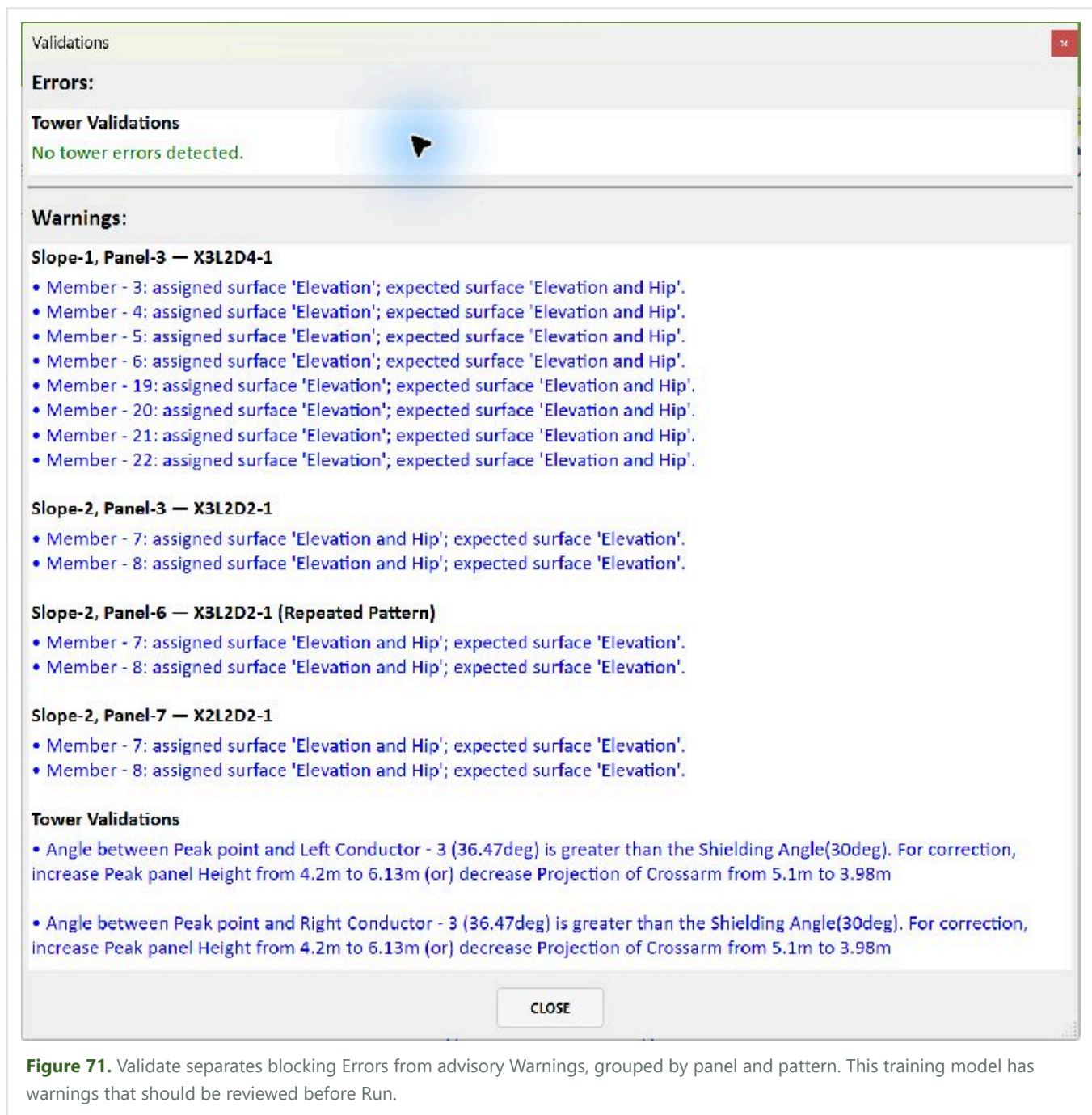
Related settings areas

Browse Files on the Settings ribbon selects the panel library and specifications sources. Use that dialog when a file path or source selection needs correction. **Vistār Settings**, where available, contains the detailed-member and connection preferences for its workflow; those settings are separate from General. Do not use a display option to compensate for incorrect model or library data.

Validation and troubleshooting

Start with the message closest to the failed operation. **Validate** explains input/model findings; **Console** explains the recent Run; save diagnostics explain saving problems. Record the file, tower combination, panel, side and clearance ID named in the message so that you correct the relevant input.

Use the validation window



1. Select **Validate** on the main ribbon, or press **Alt+V**.
2. Read **Errors** first, then **Warnings**. Results can be grouped by model or panel category.
3. Select message text and press **Ctrl+C** if you need to record it.
4. Close the dialog, correct the identified inputs and run Validate again.
5. Save the corrected model before Run.

Errors are displayed in red and block Run. Warnings are displayed in blue and require review; Run asks whether to continue when warnings remain. Green messages identify categories without detected findings. An unrequested or unresolved check is different from a satisfied project requirement, so confirm that circuit limits, geometry and attachments have actually been entered.

If the ribbon has keyboard focus, its keytips can intercept **Alt+V** and select a ribbon tab. In that case, open **Home** and click **Validate** directly.

Opening files, patterns and specifications

Symptom	What to check	Corrective action
Input is not supported	Correct TowGeom file and workbook contents.	Select a valid .tgi or supported legacy .xlsx . Do not use an output workbook as an input.
Library file does not exist	Selected library path in Browse Files.	Select the installed or project library that contains the required patterns, then refresh the pattern lists.
A selected pattern is missing	Body, crossarm, peak or extension pattern name against the selected library.	Use the intended library or correct the selection. A similarly named pattern may have different topology.
Model geometry does not match the expected pattern	Pattern name, panel type, dimensions and optional attachments.	Inspect the affected panel's inputs and refresh the model after correction.
Default specification path is unavailable	Browse Files specification selection and the referenced file.	Select a valid specifications file or the intended input-contained specification source.
Unit-system warning	Units recorded in the input and active units.	Review the model unit selection and field labels before editing or saving.
Legacy input cannot Run	Old workbook format.	Save it in the current .tgi format, then run the saved model.

The approved demonstration inputs use **C:\DegiTrans\TowGeom\Library.plib**. The revised suspension and tension clearance examples match that library. If your copy has older pattern names, inspect the actual file and library used in your session rather than assuming every version of a demonstration has identical contents.

Geometry and tower-combination findings

Finding	Action
Joint errors highlighted in 3D	Inspect the highlighted members/nodes and the pattern inputs. Correct the connectivity before relying on output.
Missing panel pattern or incompatible panel dimensions	Complete the selected row's pattern and required geometry. Recheck its neighbors and slope totals.
Combination description contains invalid filename characters	Remove \ / : * ? " < > and any other character reported by validation. Save and validate again.
Missing/duplicate descriptions in a Family Manager workflow	Give combinations meaningful, distinct descriptions as requested by the validation.
Combination has no panels	Complete its extension/body/leg sequence before generation.
Last combination entry does not have the required Bottom wind-load position	Correct the final applicable panel's wind-load selection and validate again.
Mixed LegComb and Body endings with common bottom nodes	Review all combinations together and use a compatible ending policy. Do not change only one combination without checking the others.

Some conditions are warnings in standalone output but become errors in OptiTower-sensitive generation. Use the classification shown for your actual workflow.

Clearance: no geometry or wrong attachment

1. Confirm that **Clearance > Enable** is selected and a tower is open.
2. Confirm the tower's **Suspension/Tension** mode in Conductor Data.
3. Verify the selected circuit and named conductor configuration at every placement ID.
4. Check the required physical nodes. I needs its attachment; V/Y need the two upper attachments; tension pilots need their applicable pilot selections as well.
5. For a pilot placement, enable pilot data in the named configuration and **Use Pilot Insulators** at that placement.
6. Show **Clearance Model**, **Conductors**, **Insulator Lines** and **Swing Spheres** in the 3D Clearance context menu.
7. Review positive maximum lengths, radius and bundle spacing, then validate.

Changing a library pattern or string type can make an earlier attachment ineligible. Ghost nodes are not physical insulator attachment choices. If a dropdown has no suitable node, correct the pattern/connection arrangement instead of substituting an arbitrary node name.

Clearance warnings and their meaning

Warning or behavior	Interpretation and next step
Ground clearance below requirement	Read calculated height, required height and deficit. Check the selected ground reference, extension/muffing height, sag, sag error and attachment. Correct the actual geometry or approved requirements.
Ground check produces no warning with zero minimum requirement	The circuit requests no positive minimum clearance. Enter the real project limit if the check is required.
Tension ground height differs from visible pilot/jumper low point	The tension ground check uses the structural clearance attachment with sag/error applied. Inspect local geometry separately.
Shielding angle above maximum	Check the peak/shield reference and clamp drop/offset. Review the suggested peak height or arm projection corrections.
Horizontal or vertical conductor spacing insufficient	Check circuit spacing requirements and the relevant arm projections or conductor levels.
Crossarm elevation/plan angle below minimum	Review the panel height/width and arm projection indicated by the warning.
Bundle spacing is zero	Enter positive spacing for a multi-conductor bundle. Rectangle also needs its separate height spacing.
Minimum insulator length exceeds maximum	Correct both length bounds. Equal bounds are permitted.
Additional links entered while maximum length is zero	Enter the actual main insulator length; a link is not a substitute for the assembly.
Swing table disappears	V-string uses static radius; tension V pilots do the same. Change the intended configuration or enter its static radius.
A value appears unchanged immediately after typing	Leave the field or edited grid cell to commit it, then inspect the refreshed model.
Red/intersecting envelope persists	Show planes and conductor geometry, rotate the model and inspect the physical interference. Hiding an envelope does not correct it.

For circuit Sag Error, percent and distance are alternative forms of one value. For suspension I/Y down-drop, entering a nonzero angle clears the distance and entering a nonzero distance clears the angle. Keep those automatic updates in mind when comparing successive edits.

Clearance drawings skipped during Run

The console message **TowGeom clearance drawing skipped** includes the tower combination, panel, physical side, clearance ID and reason. It identifies an omitted clearance drawing placement. Other output files can still be generated.

Reason	Response
Front/Back/horizontal placement unsupported	Retain the real placement and inspect it in TowGeom. Record that its current 2D clearance view is unavailable.
Missing, Ghost or unresolved physical attachment	Correct eligible node selections and regenerate.
Missing carrying crossarm or copied plan view	Check the arm's geometry/pattern and the intended view arrangement.
Additional links deferred	Keep required links in the project. Use a separately identified representative example only when demonstrating the supported drawing path.
Bundle rotation deferred	Keep the required bundle orientation; record the current drawing limitation.
Unequal front/back tension data deferred	Review which front/back fields differ and retain the actual specification.
V/Y tension pilot deferred	Use TowGeom's input and 3D inspection for that arrangement; current 2D pilot drawing supports I pilots.
Non-pilot tension drawing requires a correction	Current 2D non-pilot tension output is skipped in this release. Do not treat a missing view as an empty requirement.
At least one swing or positive radius required	Complete angle/radius rows, or positive static V radius where applicable.
Clearance runtime incomplete	Repair/reinstall the current TowGeom package so its supporting clearance files are present.

Current 2D output uses maximum lengths and physical structural planes. It does not reproduce every 3D input allowance. Consult the [clearance drawing limits](#) before comparing the SCR result with the 3D inspection.

If processing a clearance script produces `TG-CLEARANCE-ERROR`, record the complete message and placement context. Preserve the input and script used for that result. Do not change CAD security settings merely to bypass an error; use the intended installed package and the target application's approved file-loading process.

Run, workbook and export failures

Message / symptom	Response
Latest changes need to be saved	Save the model from TowGeom, then resume Run. Declining stops generation.
Input file missing	Save the open model to a valid new input path.
Input file opened or in use	Close it in Excel and any other process holding it, then retry.
Please close the Output file	Close the named generated workbook before rerunning.
Run fails for one tower combination	Copy its console message and inspect that combination's panels and description. Earlier outputs may already exist.
AnglesDatabase column A is blank or has gaps	Correct the indicated source database row or remove the unused empty row from the angle list.

Message / symptom	Response
PLS W/T value is not numeric	Correct the indicated width-to-thickness value/formula so that it returns a number.
No <code>.tow</code> after ordinary Run	Check the generation mode. Standard standalone Run generates workbooks/scripts; <code>.tow</code> belongs to OptiTower/PLS generation mode.
No 2D or 3D script	Check the corresponding General output setting and the console. Disabled scripts are removed under their current output names.
Upload Output says output does not exist	Generate the selected combination's standard output beside the input, then upload it. Check its TC number and description suffix.
Output file is not valid during upload	Use the expected TowGeom design output containing AnglesDatabase, Members info and Copy Tension Report.
Detailed export unavailable	Upload the design output and resolve unnamed members. Confirm that the corresponding feature is available in the installation.
Export DWG produces <code>.scr</code>	This is the expected detailed-solid script output. Process it in the intended CAD workflow.
Tekla/Bocad connection unavailable or lost	Open the intended target model/project and refresh its connection in TowGeom. Inspect any changes already made before retrying.

After an error, use console completion and file timestamps together. The presence of a workbook or script does not show that every stage finished. Correct the cause and rerun the complete required set.

Save failures and recovery

If Save reports failure, keep the open model available and record the message. Avoid treating a pre-existing file as the latest saved version solely because it has the same name.

1. Open **Settings > General > Support** and enable **Save Diagnostics**.
2. Retry the save operation and read the classified result and paths.
3. Use **Run Save Location Test** on the destination folder to distinguish a location problem from a model-specific failure.
4. If appropriate, save a separate copy to a known writable local folder and verify it by opening that saved copy.
5. Use **Export Save Diagnostics Bundle** to collect records for support.

The diagnostic save process can retain a recovery `.xlsx` and automatic bundle when a save fails. The message names the actual recovery path. Inspect the recovery candidate through the supported input workflow and save a new `.tgi` copy after verifying the model. Keep the original project and recovery candidate until you have confirmed the recovered result.

Clear Cache is available for stale hidden TowGeom caches. It does not repair library contents, invalid model data or a restricted save destination. Read [General settings](#) for support controls and folders.

Vistār physical controls and measurement

Message / symptom	Response
Inclination editor unavailable	Select one computed straight Horizontal on an elevation. Bent paths, intermediate joints and other classes do not support it.
Keep Outer needs one Independent cut end	Choose Keep Start or Keep End explicitly, or review the divided half's continuity. Auto needs a unique retained outer heel.
Free end has Maintain continuity	Resolve that end's continuity before applying an independent physical slope.
Additional extension at the fixed steel end must be zero	Set that end's additional extension to zero. Use the other end for a supported extension or trim.
Rise or pitch rejected	Keep the rise magnitude smaller than the final physical length and pitch strictly between -90° and 90° . Check target length and trims together.
Distance does not pick a point	Keep 3D Display or Wireframe on and move the pointer until the snap sphere is visible. Click without modifier keys; enable Show Bolt Holes when measuring a hole centre.
Distance values disappear after an edit or hiding	A picked point is no longer in the displayed geometry. Measure again after the arrangement refreshes.

Read [Vistār member detailing](#) for the physical slope workflow. Physical changes do not move analytical working points; verify the rendered steel, contacts and exports separately.

Licence connectivity and About status

About shows the active plan. When TowGeom uses a previously validated licence offline, the plan includes **Offline – ... days left**. The countdown is checked again when About opens. Offline use can also result from an unavailable licensing service while the computer still has network access.

The cached licence permits up to seven days from its last successful online validation. The displayed whole-day count is rounded up; it is not an extra full day of use beyond that deadline. If startup reports that offline usage is completed, connect to the internet and restart TowGeom to validate again. Record the exact message if online validation still fails. A paused, terminated or expired licence needs the corresponding licensing issue resolved with Degi Trans; reconnecting alone does not change that entitlement.

Information to include in a support report

Provide the TowGeom version, input filename, selected library/specification sources, units, exact operation, full error or console text and the affected combination/panel/side. Include the smallest representative input and required patterns permitted for the support request. For save problems, add the diagnostic result or exported bundle. For drawing skips, include the clearance ID and configuration fields named by the message. Keep the saved project, generated output and screenshot from the same run together so the reported result can be reproduced.