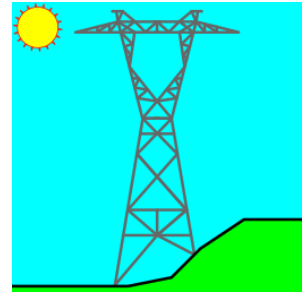


# 2017 PLS-CADD Advanced Training and User Group Meeting **What's New in TOWER™**



Summary of changes since June 2015 User Group, covers versions 14.00-14.53

## Engineering

- 1) Added "Connection Rupture checks RBSH only (not RDIS)" checkbox to General Data "Design Checks" tab. When this is selected RDIS won't be checked for ASCE-10, EN50341-1:2012, EN50341-1:2012-EN1993, EN50341-2-22:2016, IS 802, SP 16.13330.2011, ANSI/TIA 222-G-1, or CSA S37-01.
- 2) Angle members now allow input of just the tension and shear path lengths for calculating rupture capacity based on RBSH only. Previously required end and edge distances before would use path lengths.
- 3) Added "Interaction-2xLong" CAN check where longitudinal load and capacity are shared, but transverse and vertical are checked separately.
- 4) Added RLClimb override of unbraced length used for climbing load check in **Geometry/Members/Capacities and Overrides...**
- 5) Added Tension, Compression, Bearing, Shear and Rupture capacity strength factors to "Design Check Options" tab of General Data. One use of these is to customize TOWER's EN50341-1:2012 implementation for NNA specific "partial material factors" as per 7.3.6.1. Note that these factors are applied in addition to any factors specified by the currently selected code.
- 6) Reversed sign of Torsional and Longitudinal Moments in "Overturning Moments For User Input Concentrated Loads" so that clockwise is positive in accordance with our new conventions.
- 7) Introduced the Guy Strain Insulator (GSI), an insulator that may be inserted in Guy elements.
  - a. GSI properties are edited via **Components/Insulators/Guy Strain Properties...** and are stored in your existing Insulator Library (".inl").
  - b. GSI elements are created using **Geometry/Insulators/Guy Strain...** and may be moved using the graphical move command.
  - c. GSI elements have a tension capacity and are checked using the "SF for Guys and Cables".
  - d. GSI elements have a stock number and can contribute material to a model.
  - e. GSI elements insulate a portion of a guy and impact the results produced by **Geometry/Insulators/Find Allowable Suspension Swing Angles...** and Structure Clearances in PLS-CADD.
- 8) Relaxed the collinear detection criteria for Redundant Member load distribution as members that are very nearly collinear cause a singularity. Now treat any member within 7.5 deg of supported member as being collinear to it.

## Standards and Codes

- 1) The Loading Method Parameters dialog has been reworked to give each code a tab that contains a "notes" section that describes what calculations the software automates for that code.
- 2) Added "NESC 2017" wind loading method to **Loads/Vector Loads** and **Loads/Wire Loads**. This is identical to "NESC 2012".
- 3) Added "ASCE 10-2015" climbing load check (C2.2 refers to ASCE 74-2009 section 3.1.2.1 which requires a 1.5 load factor so load is 375 lbs vs. 250 lbs in ASCE 10-1997).
- 4) Added "EN50341-2-9:2015" and "EN50341-2-9:2015-EN1993" (UK NNA) member strength and connection check options. These are identical to the corresponding EN50341-1:2012 except for different partial safety factors, extra warnings and allowable slenderness.
- 5) Added "EN50341-2-9:2015" (UK NNA) wind/ice model in **Loads/Vector Loads** and **Loads/Wire Loads**.
- 6) EN50341-1:2012 users may now input a "ZO override" in the Loading Method Parameters dialog which overrides the terrain roughness otherwise specified by terrain category as per table 4.1 on page 56.
- 7) Added EN50341-2-22 (Poland NNA) option for wind/ice loading method (similar to EN50341-1:2012 except  $G_t = 1.05$  for towers).
- 8) Added EN50341-1:2012 (EN93) and EN50341-1:2012 (ECCS) redundant check methods for calculating the percent of load to apply to the redundant system. Other provisions of these methods have not been automated.
- 9) Revised EN50341-1:2012 EN1993 (ENC12) rupture capacity calculation to incorporate bolt spacing into equation ENC12-66 and use the minimum of  $\text{AlphaEdge} * K_{\text{Edge}}$  and  $\text{AlphaInner} * K_{\text{Inner}}$  (this generally results in less conservative capacities).
- 10) Implemented EN50341-2-22:2016 (Poland NNA) strength and connection check options.
- 11) Now allow use of round members with EN50341-1:2012 EN1993 by setting  $F_{cr} = F_y$  for compression capacity and give error when try to use round members with EN50341-1:2001 or EN50341-1:2012 ECCS variants.
- 12) EN50341-1:2012-EN1993, EN50341-2-9:2015-EN1993 and EN50341-2-22:2016 now have access to an eccentricity code of 4 so can handle Table G.1 Case (d) (staggered bracing) less conservatively. Refer to the version 14.60 TOWER manual for details.
- 13) Added IS802:2015 option for wind/ice loading method.
- 14) Added AS/NZS 7000:2016 option for wind/ice loading method (effectively identical to the 2010 edition).
- 15) Added IEC 60826:2017 option for wind/ice loading method including Face and Member based options.

## Graphics

- 1) Now draw angle members using a "L" shape rather than a rectangle. The member's orientation about its axis, the Beta angle, has an automatically determined default value. Entity Info has commands to manipulate the Beta angle (enter a negative Beta angle to transpose the short (x-x) and long (y-y) axes of the angle). This can be disabled using the "Draw angles as L shape rather than rectangle" setting in **File/Preferences**.
- 2) Now draw insulator bells on very short insulators (previously did not draw bells on insulators < 40cm long).
- 3) Added two render modes: "Remove hidden lines" and "Dot hidden Lines" to Structure/View "Set Rotation, Color & Label Options" dialog and inset structure view "Structure Draw Style".
- 4) The Vanishing Point drawing mode from PLS-CADD is now available in TOWER. You may access it by pressing the 'V' key in the geometry view.
- 5) Load vectors are now drawn in purple to easily distinguish them from other numbers (member forces, usages, etc.) that may be printed in the view.

## Interface

- 1) Modified window user interface so that views appear as tabs rather than icons (the **"File/Preferences"** setting "Tab location for open windows" has tab options: "top", "bottom" or "off" for same behavior as previous versions).
- 2) Added option to display "PLS-CADD Wires" for Load Vectors in the "3D Controls" dialog reached via **"View/Display Options/Set Rotation, Color and Label Options..."**. PLS-CADD Wires are only available when the loads have come directly from PLS-CADD.
- 3) Numerous changes to improve look and functionality of the program on high DPI displays (like 13" notebook with 3200x1800 resolution). These include: scaling of toolbar buttons, a new fixed width font for dialogs, scaling of automatic text height for annotation and graph views, fixes for overlapping list box text, etc.
- 4) May now drag pictures inset in many dialogs to our reports and to other programs (Word, paint programs, etc.).
- 5) The "Point load placed on non-existent joint" error now has an option to remove the LCA/LIC file reference to fix the problem.
- 6) Annotation Improvements
  - a. You may now graphically copy and paste annotation. If you hold the Ctrl key while doing this you will be able to immediately move the pasted annotation.
  - b. Annotation move point and move object now support Ctrl key to force horizontal or vertical movement.
  - c. Dimension Snap has an entirely new and fully graphical user interface for selecting which axis to dimension and how much to offset from joints being measured. It can optionally add leader lines as well.
- 7) May now delete the contents of most sub-tables by pressing the "Delete" key while in the cell that contains

the sub-table edit button (for example the "Interaction Capacities" sub-table for post insulators).

- 8) You may now right click on the list of attachments in the Attachment Manager to access a menu of commands that can be applied to the selected attachments. This includes a new "Relocate Files" command which allows you to move the attachments to a different folder.
- 9) **View/Cut** now has three modes that make it possible to precisely select what you want cut: "Drag a rectangle, all joints and any member intersecting this area will be cut", "Drag a rectangle, all joints and any member enclosed in this area will be cut" and "Select the member to cut and click on it to cut".
- 10) Cut and Uncut operations are now undoable via **Edit/Undo**.
- 11) Enhanced drag-to-resize of windows to also support resizing into quadrants of the screen, similar to Windows 10, and added ability to drag minimized windows to the edges of the screen to resize.
- 12) Various Member, Joint, Component, Result and Inset view dialogs when invoked graphically for editing a particular item now display a "properties-style" single column table that only lists the properties for the relevant item. Previous versions showed table including properties for all items, a presentation that is still available if one presses the new "Transpose" button.
- 13) Made the ordering of items in **File/Batch Modify** more consistent and color coded geometry and components items to make them easier to identify. Finally, added the three-letter file extension of component files to the description of Component File items.
- 14) Added **File/Batch Modify** option "Remove Raster and Vector Attachments" that does just that.
- 15) Added **View/Cycle/** sub-menu that contains entries for the major items in the "3D Controls" dialog reached via **View/Display Options/Set Rotation, Color and Label Options...** such as Color By, Load Case Display, Vector Loads, Joint Labels, Member Labels and Render Mode. You may wish to add some of these commands to a custom toolbar.
- 16) Changed entity info snapping for groups, members, and joints. If all three modes are enabled, the outer 20% of a member (on either end) will snap to a joint, the next 20% (on either end) will snap to the member, and the middle 20% will snap to the group.
- 17) Added Entity Info command to graphically rotate guys, equipment, strain and post insulators.
- 18) Made the **File/Open** dialog resizable.
- 19) Now set the background color of the group column in the angle members table to the color of the group type that it corresponds to.
- 20) Now color Section Label with the section color in **Geometry/Members/Table Edit** and the Graphical Add Member dialog.
- 21) Now color code groups by group type in Graphical Add Member dialog and provide tooltips for each group with the group description, angle size and element type.
- 22) Tables now check the luminance of text background color and switch to opaque draw with white background if contrast is insufficient to be readable.
- 23) Moved some of the items in **General/General Data** "Design Checks" tab into new "Design Check Options" tab.

- 24) **File/Preferences** now has a "Table header font" input to change font used for column headings in spreadsheet tables the bold version of this font will be used. Tables also have improved outlining of active cell, text justification, etc.
- 25) Quicksearch Toolbar now searches **File/Preferences Settings**, clicking on a setting allows you to edit it right then and there.
- 26) Streamlined upgrade experience by detecting when an upgrade code is in the clipboard and asking you for permission to perform an upgrade so that you no longer need to visit **Help/Download Upgrade**.
- 27) May now download components files directly from our Online Library using the "Open Web" button now available in **File/Preferences** file selection dialogs.
- 28) Added tab context menu command to close all graph, deformed geometry, and report tabs at once (right click on tab title to access).
- 29) Right click on Windows Taskbar icon of TOWER to access most frequently and most recently used models as well as "pin" your favorite models.
- 30) Many more minor user interface refinements too numerous to list here.

## Drafting

- 1) In the Sheets View now adjust spacing between individual characters (font kerning) to produce more consistent text widths across zoom levels. Width of text varied far more in earlier versions such that text that appeared to fit in a title block at one zoom level might not appear to fit after zoomed in or out.
- 2) Report view right click menu "Add as Annotation to Inset View" dialog now provides a graphical preview of inset view size and position adjustable with spin button controls, buttons to add additional title/notes/appendix pages, and controls to customize text appearing in inset view footers.
- 3) Inset Report views created from a table with filters applied will now respect those filters.
- 4) Can now attach Bitmaps and DXF files directly to any named inset view.
- 5) Added new context menu command for drafting sheets so can insert a new blank sheet before any other drafting sheet.
- 6) Sheets view can now display a grid that drafting functions can snap to. This is enabled and configured through the Change Snap Settings dialog.
- 7) Sheets structure inset views now have an option to draw the compass rose.

## Reports

- 1) Made the "A potentially damaging moment exists in the following members" warning suppressible in **General/Output Options**.
- 2) Added total Torsional Moment (for user input and automatically calculated loads) to Summary results for design of grade beam foundations.

- 3) Angle Member Capacities and Overrides table now has separate columns for calculated beta and for overridden beta so you can compare them.
- 4) Added sum of VTL forces on foundation joints to the Overturning Moment Summary.
- 5) Now supply complete Post Processing XML information to PLS-CADD when performing a Structure Check for inclusion in PLS-CADD's XML export.
- 6) Now supply PLS-CADD with CAN element results so it can include them in the "Summary of Maximum Element Usages" table shown by Lines/Reports/Structure Usage.
- 7) In the "Summary of Post Capacities and Usages" schema revised names of "Trans. +" and "Trans. -" Capacity columns to "Trans. Pos." and "Trans. Neg." so that derived XML tags for these columns will be unique.
- 8) Reports now highlight URLs in blue and let you click on them to open them in the system default web browser.
- 9) Restored ability to select a printer to use for reports under **File/Page Setup (Reports)**. Changes Microsoft made to the "Page Setup" dialog box took away our ability to select a printer with this command in recent versions of Windows.
- 10) Added Bolt Type for Compression and Tension to the Groups Summary (both the full version and full superset), but not to the split Tension/Compression versions that are designed to be printable.
- 11) Sped up generation of long reports with many page breaks by ~20% and fixed a random crash in 64 bit version when generating reports.

## Commands

- 1) **View/Display Options/Show Structure Compass** which displays a compass rose in the graphics. It can be turned on and off for the Undeformed and Deformed Geometry views separately. It defaults to "On" in the undeformed and "Off" in the deformed geometry.
- 2) **File/Backup** now includes a reference to any files that have been excluded from the backup (but not the file itself) so that **File/Restore Backup** can be used to remap any folders that do not exist on the destination system.
- 3) **File/Backup** "Transmit to PLS for technical support" now sends using secure HTTPS. It is also able to transparently navigate proxy servers
- 4) **File/Restore Backup** now allows selection of multiple ".bak" files to restore at once and has a "Change Common Directory Path" button for faster search and replace of directory paths used by a project.
- 5) **File/Export/PLS-CADD LITE** command that is equivalent to the PLS-POLE graphical member toolbar PLS-CADD/LITE button.
- 6) **Edit/Autosize Font** is now in main menu which makes it available without a mouse (used to be only in right click menu).
- 7) Added **Geometry/Groups/Delete Unused Groups...** which does just that
- 8) **File/Export/STL** improved with input to scale thickness of members (many printers have thickness design rules that preclude printing typical transmission structures), exclude insulators option (insulator bells cause

trouble for some 3D printers) and fixes for "flipped triangles" and "non-manifold geometry" errors when working with PLS exported STL files. The built in "3D Builder" application in Windows 10 can 3D print a structure simply by opening the exported ".stl" file and then printing to the "i.Materialize" service which will print and mail you your structure. We recently printed a 250mm tall model of an H-Frame for \$42 with this service by entering a thickness scale factor of 2 and excluding the insulators.

- 9) Material Options dialog may now control whether to show/hide parts, decompose assemblies, and show/hide assemblies when listing components for structure.
- 10) SDNF Export now uses beta angle to derive SDNF orientation vector which is "perpendicular to the member in the direction of the member web". We interpret this as being in the direction of the connected leg.
- 11) Added **General/Output Options** warning suppression for "Configuration '%s': none of the extensions land on the Z of ground of ##### defined for this configuration." warning.
- 12) Added **General/Output Options** warning suppression for "Angle member X has an eccentricity code other than 1 and a leg connect code of "Both", but should be "Short" or "Long"" since some users do this to account for effects of having a lap splice instead of a butt splice.
- 13) When **General/Output Options** "Print extended diagnostic output" is set now print "Extended Angle Wind Load Diagnostics" for code based and wind on face load cases. This provides projected length and area for transverse and longitudinal faces along with wind width which makes manual verification much easier.

## Miscellaneous

- 1) Supports Windows 10.
- 2) Now support Acrobat Reader and Writer 2017 for display of the online help.
- 3) Reevaluated 2002 decision to only use physical cores rather than logical (hyper-threaded) cores for analysis. Testing on the last few generations of Intel processors (from 2012 on) shows that hyper-threading now yields 10-30% performance improvement in nonlinear analysis for models with many load cases.
- 4) XML output now respects any filtering that may have been done in a table. It also sets the *nrows* attribute to the actual number of rows output rather than the original number (the two can differ when have filtered output).
- 5) Increased the maximum number of Angle Groups from 1000 to 2000 to aid 3rd party software that automatically creates TOWER models.
- 6) Replaced the Angle Properties "Number of Angles" column with "Angle Cross Section" that has the following options: "Round", "Single", "DoubleLBB", "DoubleSBB", "Double Cruciform" and "Cruciform".
  - a. "DoubleLBB" stands for Double Long leg Back to Back. "DoubleSBB" stands for Double Short leg Back to Back.
  - b. Selecting the new DoubleSBB option correctly draws Double Angles that have Short leg Back to Back in both the graphics and the Orientation view.
  - c. Crossing diagonals that use DoubleSBB no longer need a special Angle Type since TOWER will automatically swap RLX and RLY to make the crossing diagonal check work with the standard AISC

strong axis definition for a double angle when the short legs are connected back to back.

- 7) The TOWER version 14.6 manual is now available via **Help/Check For Updated Manual**. This version of the manual includes all changes made to the various Euro codes up to TOWER version 14.53.
- 8) Sped up several non-analysis operations for very large models (particularly Family Manager models). Opening large Project Reports now 10x faster.
- 9) Minor changes to reduce memory usage, improve interface or performance too numerous to mention here.

## Family Manager (Body and Leg Extensions)

- 1) Family Manager optimization now runs up to 30x faster and produces results for models that it wouldn't previously.
- 2) Family Manager analysis sped up for large models with many load cases. For the model used in testing (144 configurations with 456 load cases), analysis was sped up by more than 3x.
- 3) Sped up creation of Group Summary Super Set for the Family Manager and dramatically reduced the amount of memory used if not opening a deformed geometry for each configuration.
- 4) Family Manager graphical preview generation time reduced by ~25%.
- 5) As a result of the efficiency improvements above, increased the maximum number of configurations in the Family Manager from 512 to 640.
- 6) Added info field to Family Manager that lists number of configurations, number included in analysis and number selected.
- 7) Body Extensions now have a "Extension may be used as a leg and as a body" option. When checked the following happens: IFF this is the last extension in the configuration: at the bottom of the extension: fixes joints with respect to translation, deletes horizontal members and finally removes any joints "stranded" by the member deletion. This should only be used when an extension can be stacked on another extension and be attached directly to the foundation.
- 8) Added right click "Filter non-controlling BLE configurations from analysis" command to the deformed geometry view when the Family Manager is engaged. Will set "Include In Analysis" to "No" for any BLE configuration that doesn't control at least one group.
- 9) The Family Manager now handles canceling and failure to converge better. In the latter case, the Family Manager now offers to enter/run NLI Debug Mode if the active configuration fails to converge. If other (non-active) configuration fails it tells you to make it active and rerun.
- 10) The Family Manager now allows export of a BLE configuration when the model was opened read-only.
- 11) Family Manager now forces each configuration to have a unique name. Ability to duplicate configuration names led to much confusion for the user and programmer.
- 12) BLE Configuration Extension Edit once again enables "Z end" editing. This is required to easily change the size of body extensions. With Great Power comes Great Responsibility, be cautious using this.
- 13) Model/Check list of unused groups now considers usage in all BLE Configurations, not just the active one.



Eliminates false positive note about unused groups that are actually used in an inactive configuration.

- 14) Family Manager Export button now gives option to export .TOW, .XML or both, can use this to batch export XML files for an entire family.
- 15) Family Manager optimization now works with climbing load check when the active configuration doesn't contain any climbing members.

## Repeated information from the 2015 ATUG

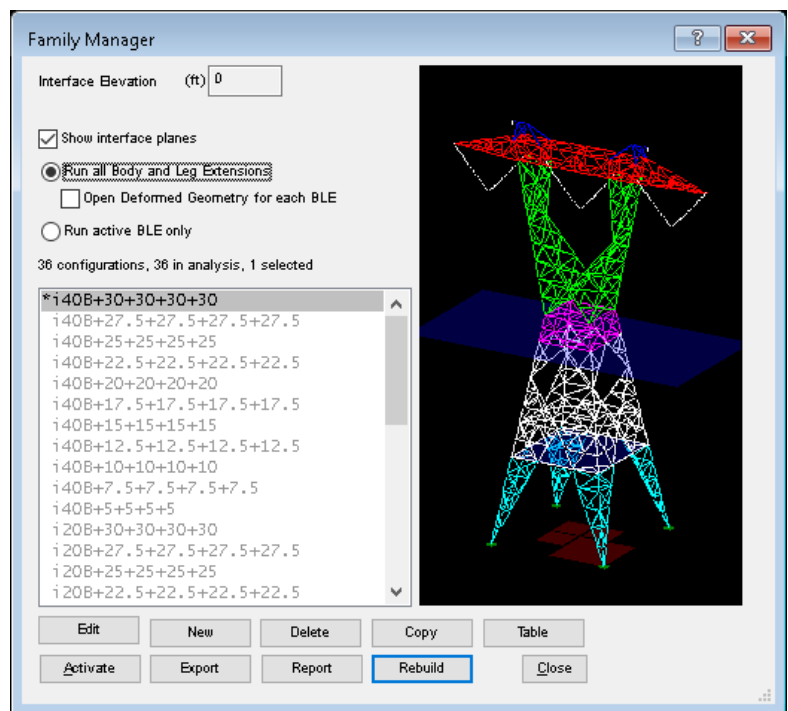
You may enable the *Family Manager* via **Model/Family Manager**. The *Family Manager* allows many different body and leg extensions to be modeled in a single TOWER model (.tow file). All of these models share component files, groups definition and all joints and members defined above the interface elevation. When engaged the Family Manager supports the following:

- 1) Ability to build Body and Leg Extensions manually or by importing them from another TOWER model.

- 2) An option to run all defined configurations or just the active one when run an analysis.

- 3) An option to create deformed geometry for each configuration when run an analysis.

- 4) Analysis of all configurations will automatically substitute the *Group Summary Super Set (Compression Portion)* and *Group Summary Super Set (Tension Portion)* outputs for the non-superset version. It also makes the Groups Summary Super Set table available via the deformed geometry.



- 5) Analysis of all configurations will automatically substitute the *Summary of Joint Support Reactions For All Load Cases and Models* and *Summary of Joint Support Reactions For All Load Cases and Models in Direction of Leg* outputs for the non-superset version. It also makes them available via the deformed geometry.
- 6) Optimization can be performed over all configurations that are defined in a model.

- 7) Allowable span/Interaction diagram generation will now iterate over all configurations defined in the model if the *Run all BLEs* Family Manager option is selected.
- 8) For more information view the Family Manager video: <http://youtu.be/2hx8JMw9nRQ>