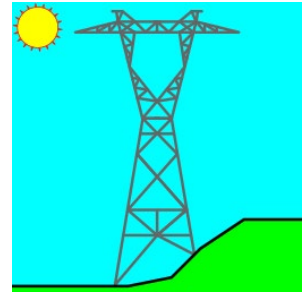


# 2019 PLS-CADD Advanced Training and User Group Meeting **What's New in TOWER™**



Summary of changes since June 2017 User Group, covers versions 14.44-16.00

(Yes, we've been busy)

## Performance

- 1) ~1.5x speedup in SAPS finite element engine reduces analysis times

## Engineering

- 1) Added notes, hardware capacity and draw sheds fields to insulator components (ATUG17 request). Notes allow you to enter additional information regarding an insulator. The hardware capacity allows you to meet new complex NESC requirements by using the new Hardware Strength Factor. Finally, draw sheds allows you to control if weather sheds are shown.
- 2) Wire and Vector Loads now have a SF for Hardware column. Also increased load comments length from 100 to 140 characters.
- 3) Added option to use the "Hardware SF" to CAN properties. When this is selected the ".CAN" library will be saved in a new format only readable by version 15.12 and newer.
- 4) Added "Rigid" setting to suspension insulator component. A rigid suspension insulator will be modeled with a truss rather than a cable in PLS-CADD FE sag-tension and may be useful for a jumper idler.
- 5) Added a Double Cruciform "Angle Cross Section" option to Angle Properties. This enables draw and ice load calculation for cruciform shapes composed of only two angles.
- 6) Now use Angle Properties "Angle Cross Section" to more accurately calculate the surface area of a member subject to ice accretion. Given the uncertainty in input ice load this is essentially pointless, but it was easy so did it anyway.
- 7) Improved tolerance in Crossing Diagonal pair matching algorithm that rejects end-to-end connected members that could inappropriately reject an actual pair of crossing diagonals if they were very, very short.
- 8) Fixed check of suspension insulator used in a floating deadend which could only have loads from one strain transferred to it (resulting in huge unbalanced longitudinal load applied to it) even though the FE analysis used the correct loads.
- 9) Relaxed criteria used to identify collinear members when developing FE model without redundants to avoid joint mechanisms.
- 10) When the Redundant Member Check (RMC) controls now set the controlling load case in all corresponding output to the first load case rather than the load case that controlled the leg load.

- 11) Made bearing calculations more accurate by only using two bearing areas for double angles when the connect leg matches the back to back leg (this was made possible when we started distinguishing between LBB and SBB).
- 12) Converted **General/Optimization Options** setting "Avoid angles that exceed L/r limits" to L/r limits: "Ignore" or "Respect for new only" or "Respect for new and existing". This last option is new and forces selection of members that do not violate L/r limits even when a member isn't over utilized.
- 13) Fixed problem with loads on chained tension-only 2-part insulators for load cases with a dead load factor not equal to one that could greatly increase the number of iterations required to converge.
- 14) Fixed problem with "Overturning Moments For User Input Concentrated Loads" calculation for strain insulators chained on the end of a suspension which could fail to include loads on the strains.
- 15) When manually entering loads (the "Wind loads on insulators included in Point Loads" option is NOT checked so loads are NOT coming from PLS-CADD) the program now adjusts suspension and strain wind loads per the "Wind/Ice Model" and "Wind Area Factor" for the current load case.
- 16) Now set the asymmetrical flag when saving L3 stiffness matrix for models that do have any fixed joints. This will make mid-span tap models run L4 even when the option to downgrade to L3 for symmetrical structures is set.

## Standards and Codes

- 1) Added EN50341-2-4:2016 (German NNA) member strength, connection and crossing diagonal checks.
- 2) Added EN50341-3-2:2001 (Belgium NNA) option for wind/ice loading
- 3) Added EN50341-2-15:2017 (Netherlands NNA) member strength and connection checks.
- 4) Added the EN 1993-1-8:2005 "Long joints" shear reduction factor for EN50341-1:2012, 2012+2017 UK NNA and 2016 PN NNA. Reduces shear capacity when line of connectors exceeds 15\*bolt diameter.
- 5) Added EN50341-2-9:2017 (UK) Wind/Ice Model for loading. When this is selected the ".LCA" and ".LIC" files will be saved in a new format only readable by version 15.12 and newer.
- 6) Added a warning regarding round member use with EN50341-1:2001 variants, PN-90/B-03200, EN50341-1:2012 ECCS variants that can be suppressed in General/Output Options. Section 3.1.3 of the manual explains the limits of using round members.
- 7) Added error for SP 16.13330.2011 (see equation SNiP-24) when bolt spacing is not input and number of bolts is greater than zero.
- 8) Changed minimum allowable Bearing Capacity Coefficient for EN50341-1:2012 to 1.1 from 1.5 to aid in using this for simplified approximate rupture checks.
- 9) Modified ECCS (and derived codes like EN50341-1:2012) Crossing Diagonal Check to make it less conservative by more closely following EN 1993-3-1:2006 H.3.3.
- 10) The Crossing Diagonal Check (CDC) for ECCS derived codes no longer modifies the eccentricity/restraint curve for the Z axis when the check is triggered.
- 11) Fixed problem with EN50341-1:2012 and derived codes where D/t calculation used twice round member

thickness when determining if  $D/t$  is allowable.

- 12) EN50341-3-2:2001 Drag Coefficient for round members is now set to 0.7 times that for angles instead of a constant 0.7 which was erroneously printed in the 2001 edition.
- 13) Updated notes printed for EN50341-2-9:2001 to reflect drag coefficient for rounds is  $0.7 * C_d$  for angles.
- 14) For EN50341-3-2:2001 now set  $G_t = 0.8$  in addition to  $G_{ins} = 0.8$  for Normal/Exceptional wind cases as indicated by  $p > 187.5$  Pa.
- 15) No longer require bolt spacing to be input for EN50341-1:2012, EN50341-2-9:2015, EN50341-2-9:2017, and EN50341-2-15:2017 when have one or more bolts and the number of holes was input. This should have been only when had two or more bolts and the number of holes was input.
- 16) No longer require short edge distance to be input for EN50341-1:2012, EN50341-2-9:2015, EN50341-2-9:2017, and EN50341-2-15:2017 when have a non-zero number of bolts (now only require it when one bolt and no holes input).
- 17) Implemented EN50341-2-9:2017 ECCS and EN93 variants for both member strength and connection capacity calculations. The implementation is preliminary and pending testing.  
Found an error in the bearing and rupture equations given in the UK NNA standard which was written with  $D$  defined as "Bolt Hole Diameter" instead of "Bolt Diameter". A corrigendum will hopefully be published shortly with the correction.  
Read the TOWER manual that documents this new strength check if you intend on using or testing it.

## Drafting and Graphics

- 1) You may now pan, zoom and rotate inset views using the new **Drafting/Inset Views/Pan, Rotate, or Zoom Inset Structure View** command.
- 2) Added **Drafting/Annotation (User Input)/Add/Perpendicular Line** that creates line annotation perpendicular to the line between two joints.
- 3) Inset view tables now allow up to 1000 entries (previously limited to 200).
- 4) DXF text routines modified to support UTF-8 (Unicode) strings that enables symbols and international characters not part of the standard ASCII character set.
- 5) Improved formatting of inset reports that only have a single row of data or that don't have a footer.
- 6) Modified drawing of line styles for multi-pixel thick lines to more closely match pre v15.30 behavior while still maintaining spacing improvements in 15.30 that prevent dashes and/or dots from flowing together.
- 7) Fixed problems with display of Guy Strain Insulators in the deformed geometry view.

## Interface

Watch the PLS Windows User Interface Improvements video at <https://youtu.be/QZeBA8mPsSA>

- 1) Now include a Windows Shell Extension that renders structure geometry inside Windows Explorer when displaying medium, large or extra-large icons. Additionally, structure geometry may be previewed in Windows Explorer.
- 2) Added Apply button to Attachment Manager Bitmap Options and DXF Options dialogs.
- 3) Fixed keyboard shortcuts "ctrl-tab" and "ctrl-shift-tab" for switching between next and previous window tabs.
- 4) The member orientation inset view now supports Double-Cruciform shapes.
- 5) Graphical Member Add now refreshes Group, Section and Bolt combo boxes whenever you edit the model (this prevents "garbage" selections from appearing).
- 6) Combo box controls modified so they no longer allow drop down lists to go off edge of screen.
- 7) No longer convert all file names to lower case.
- 8) You may now select "English" when using **Help/Download Alternate Language**. This makes it easy to return to English from another language.
- 9) Improvements to Setup experience including the ability to install the PLS Windows Shell Extension. This can be uninstalled using Add/Remove Programs and searching for "PLS Shell".
- 10) Added **File/Preferences** setting *"Auto-update model geometry tables as you enter data"* which allows you to control whether the model is live updated/checked as you edit it in a table.
- 11) The nonlinear debug mode now saves member/joint cut status from one iteration to the next.
- 12) The Project Repair Wizard dialog is now always shown on top of all other windows from any other applications you may be running. Done in response to client complaints about "losing" it.
- 13) Added **File/Preferences** setting to limit table and dialog maximize to size of the application rather than full screen (more efficiently uses space on 4k monitors).
- 14) You can now execute F1 commands directly from the **QuickSearch Toolbar**.
- 15) Fixed problem that prevented you from correcting duplicate load case names when exiting the loads editing table.
- 16) The **General/General Data** Design Checks tab options for Crossing Diagonal Check, Included Angle Check and Climbing Load Check now show/hide themselves based on what is selected so you only see inputs that apply to the current selection.
- 17) Made "Problem calculating gross area of face for section X: width is zero at elevation Y" warning suppressible since can have sections with odd geometry when modeling PCS antenna pipes.
- 18) Fixed crash when the number of undo list items changes while in Member Add mode and the Graphical Add dialog is closed by pressing the Escape key rather than by right clicking.
- 19) Inset details report in Angle Member Connectivity (and Connection Inspector) now prints L/r to three decimal places so that you can match KL/r value exactly.
- 20) Added **Loads/Batch Import or Edit Concentrated Loads** command that allows editing of concentrated

loads for all load cases in a single table so can easily copy/paste loads from a spreadsheet.

- 21) **View/Min. Distance Between Members** now prints coordinates of From and To points along with the delta between them in the status bar and has option to drop annotation if middle click or press enter.
- 22) Added **File/Preferences** setting to *"Default to Rich Text Format (RTF) when right-clicking to Save/Save-As in a report"*.
- 23) Added **File/Preferences** setting *"When reading old ".ang" files assume DAE has Short leg Back to Back rather than Long"* which defaults to off. Turn this on if you have previously assumed that your DAE are Short Leg Back to Back.
- 24) Added separate Foundation Usage line to Summary Results and Analysis Results reports of overall controlling usages.
- 25) Improved tables so that row column sizes to number of rows automatically and so that scrolling stops at the last visible row or column.
- 26) Improved look of table control by changing how column and row selections are drawn.
- 27) Many more minor user interface refinements too numerous to list here.

## Miscellaneous

- 1) Major revisions to Setup program: now also available in 64 bit, for new 64 bit only installs target "Program Files" instead of "Program Files (x86)", better handles restarting Windows Explorer when installing the PLS shell extension DLL and avoids UAC elevation prompt until necessary.
- 2) Setup program now has command line arguments for error logging and silent install to enable scripting of installs. Contact support@powline.com for more information.
- 3) Now support Acrobat Reader and Writer 2017 for display of the online help.
- 4) Now automatically detect the appropriate version of Adobe Acrobat to use for viewing the manual.
- 5) **Geometry/Groups/Table Edit** now updates background colors after a "fill" operation.
- 6) Now warn when switching schema files if the new schema file was written by a different application (like trying to load a PLS-POLE .sma into TOWER) as this will only cause trouble.
- 7) Fixed Windows 10 version 1803 incompatibility that prevented our software from running with this Windows update applied.
- 8) Vector and Wire Load Cases XML exports now include "Source File" tag which lists the source LCA/LIC file.
- 9) Other changes to improve stability or customer experience too numerous to list here.

## Reports

- 1) When **General/Output Options** "Print extended diagnostic output" is checked now print Kz and GRF in "Section Load Case Information (Code)" output.
- 2) The "Extended Angle Wind Load Diagnostics" output now applies to Wind on Face load cases in addition to code/standard based ones.
- 3) Added output of program calculated equipment loads for transmission structures (already had it for telecom) for each load case to the Analysis Results report.
- 4) Added "Foundation Design Forces For All Load Cases" which is a simplified version of Joint Support Reactions for All Load Cases, but with vertical reference reversed.
- 5) Fixed "Summary of Guy Strain Capacities and Usages for Load Case" "Input Factored Tension Capacity" which was using Insulator Strength Factor rather than Guy SF. The % usage was correct, only the factored capacity was displayed incorrectly.
- 6) Extended **General/Output Options** suppress KL/R warning option to applicable non-ASCE-10 derived codes.
- 7) "Joint Displacements, Loads and Member Forces on Joints for Load Case" output now includes wind loads calculated by any SAPS (wind on individual Member) option like "SAPS", "RTE Hyp 1/2" or any of the \*M methods).
- 8) The Diagnostic Report now includes information on any 3rd party software that is loaded into TOWER by Windows. These can include anti-virus software, Windows Shell Extensions (Google Drive Sync, Dropbox), etc. Bugs in these programs have been responsible for crashes that are excruciatingly difficult to diagnose.

## Commands

- 1) Added **View/Display Options/Panel Cut** command which will cut everything except for the panel/face selected by the user and orient the camera to look directly at that panel.
- 2) Added **View/Display Options/Connection Cut** which cuts everything except a single joint and all members connected to that joint.
- 3) Added **View/Display Options/Ghost Mode** which shows cut members with a deemphasized texture instead of just hiding them.
- 4) Added entity info command for **Geometry/PLS-CADD/Insulator Link** so can click on an insulator and then jump directly to its link.
- 5) Added **F1/Debugging Stuff/Toggle Background Color** which switches the background color between black (best on screen) and white (best when projecting).
- 6) Added **Geometry/Change Leg Slope** command that makes it trivial to change the base width of a tower and have all joint positions update even for Family Manager models where secondary joints have been replaced with primary joints.
- 7) Added **File/Batch Modify** options for: "General/General Data" Project Title and Project Notes, and "Guy Strain Insulator Geometry".

- 8) **File/Batch Modify** no longer forces PLS-CADD to update structure data once per structure, but instead waits until all structures have been processed before updating PLS-CADD.
- 9) Now hide the "Create Controlling LCA Subset command when the Family Manager is engaged since it is not compatible with the FM.
- 10) Now give an error message when try to use the "Filter non-controlling BLE configurations from the analysis" command when the Family Manager has the "Open Deformed Geometry for each BLE" checked as these options aren't compatible.
- 11) Made **F1/Joint Commands/Convert Secondary Joint To Primary** work with Family Manager models.
- 12) Fixed problem with Interactive Member Sizing in models with redundants that are excluded from the FE analysis that could result in no or nonsensical sizing suggestions. Also made the dialog resizable both vertically and horizontally.
- 13) **Model/Check** will now issue an error when have a joint displacement specified on a joint that also has a Foundation Strength stiffness entered as this can't work.
- 14) Added **Loads/Remove LCA/LIC/EIA File References** command that allows you to disassociate a project from any loads file.
- 15) **Loads/Batch Import or Edit Concentrated Loads** no longer consolidates loads placed on the same joint. This allows you to more easily verify loads match what you input.

## Networking

- 1) Tested all network functionality using IPv6.
- 2) Now check servers @plsccloud.com for availability of upgrades rather than @powline.com
- 3) The new "Web Upgrade Request" feature in **Help/Download Upgrade** enables requesting and obtaining upgrades directly from within the application without using email.
- 4) Made changes to network file access code to reduce the chance of crashing when the network unexpectedly becomes inaccessible.
- 5) Changed how files are uploaded to Power Line Systems for technical support to improve reliability.
- 6) Updated supporting libraries for Internet access. Manuals and SMA files are now downloaded exclusively via HTTPS.
- 7) Fixed issue that could prevent program from detecting the availability of new versions if running on Windows 7 with certain Microsoft security updates installed.
- 8) Improved use of automatic IE proxy server configuration. This should now work for clients who use a proxy server configuration PAC script.

## Family Manager (Body and Leg Extensions)

- 1) The Family Manager now has a "Maximum Differential Leg Height" input. TOWER will warn you when you create a configuration that violates this criteria and TOWER will respect it when auto-generating permutations for the PLS-CADD "Structures/Automatic Spotting/Optimum Body and Leg Extension Selection..." command.
- 2) TOWER models exported from the Family Manager now retain a pointer back to the parent Family Manager model so that PLS-CADD can automatically select it for the **Structures/Automatic Spotting/Optimum Body and Leg Extension Selection** command.
- 3) Increased length of a Family Manager configuration name to 32 from 24 characters. Also increased the maximum number of configurations to 768 from 640.
- 4) The Family Manager report now includes a Model Check section for each configuration reported on.
- 5) Family Manager now automatically applies default configuration before allowing you to edit when first creating a family. This prevents possible error messages later on.
- 6) Fixed Family Manager problem when have multiple levels of Body Extensions and the previous level has several different heights.
- 7) Corrected Family Manager problem that could make the "Extension may be used as a leg and as a body" option reset immediately upon editing an extension.
- 8) Added a Naming Convention dialog to the Family Manager so you can customize the name used for "No Body", the parent family manager name to body separator and leg extension separator characters.
- 9) Family Manager Import of an Extension now only renames joints if they are different (have same label, but different position).
- 10) Family Manager now checks to see if it needs to convert secondary joints to primary whenever it does anything to the model (previously only checked on extension creation, but secondary joint references could be invalidated when edit extension and shrink it).
- 11) Family Manager now updates all extensions in all configurations when convert a secondary joint to a primary since angles that connect to a secondary joint on the interface could be impacted.
- 12) Fixed problem in repair process of pre 15.30 Family Manager models that could have secondary joints in an extension that were relative to joints outside the extension. Previously repair process could introduce errors in other extensions.
- 13) Fixed Family Manager crash when importing extensions from other models that contained joints with the same labels, but different fixity codes as joints already in the model.
- 14) Family Manager now handles stacking body extensions that can also be leg extensions.
- 15) Family Manager now prevents "F1/Joint Commands/Convert All Secondary Joints To Primary Joints" from being used.
- 16) Family Manager now correctly restores your model when canceling out of the configuration edit dialog when using multi-select edit capability.



## Web & Examples

- 1) New Website at <https://www.powerlinesystems.com/>
- 2) New Videos
  - a. TOWER Family Manager Configuration Creation <https://youtu.be/R4Y8Q3jan04>
  - b. PLS Windows User Interface Improvements <https://youtu.be/QZeBA8mPsSA>
  - c. Optimum Body and Leg Extension Selection <https://youtu.be/brghzOH8BWA>
  - d. Panel and Connection Cut with Ghost Mode <https://youtu.be/2R3-zF3z22Y>
- 3) Technical Notes
  - a. Overview of Power Line Systems software and Grid Integrity at [https://www.powline.com/technotes/PLS\\_Grid\\_Integrity\\_Executive\\_Summary\\_Overview.pdf](https://www.powline.com/technotes/PLS_Grid_Integrity_Executive_Summary_Overview.pdf)
  - b. Optimum Body and Leg Extension Selection [https://www.powline.com/technotes/Optimum\\_BLE\\_Selection.pdf](https://www.powline.com/technotes/Optimum_BLE_Selection.pdf)