

# ETABS v21.2.0 Release Notes

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**Notice Date: 28-November-2023**

This document lists changes made to ETABS since v21.1.0, released 11-August-2023. Items marked with an asterisk (\*) in the first column are more significant.

## Analysis

### Enhancements Implemented

*	Ticket	Description
	5055	An enhancement has been implemented that now accounts for section property I23 (product of inertia) in the analysis. Previously, I23 value was being ignored when creating the analysis model. Analysis results may differ for affected models compared to previous versions. Additionally, the I23 section property has also been now exposed in the frame section properties form and the database table. The value of I23 is automatically calculated for angle sections and Section Designer sections, and it can be manually specified for general sections. For all other sections, I23 is zero. For general section, a negative value is also now allowed for I23 on the section properties form and through interactive editing and API.
*	9948	An enhancement has been made to speed up direct-integration time-history load cases with additional modal damping specified that is using a large number of modes. Note that in spite of this speed enhancement, it is generally not recommended to use too many modes for additional modal damping. For building structures, the higher-frequency modes typically respond statically to seismic and wind loading, and stiffness proportional damping is more efficient for the damping at high frequencies. This decision is up to the judgement of the engineer.
*	10079	An enhancement has been made to allow the "Number of (Internal) Threads for Analysis" setting to also control number of threads that can be used by the Multi-threaded Solver. This provides more control to limit the number of processors that are used when running a given model, particularly useful on machines with a very large number of available processors, some of which may needed for other tasks.

## Database Tables

### Enhancements Implemented

*	Ticket	Description
*	9892	The following "Analysis Results" database tables have been parallelized for increased speed during display or export: "Joint Displacements", "Joint Displacements - Absolute", "Joint Drifts", "Pier Forces", "Pier Force Status", "Spandrel Forces, and "Spandrel Force Status". In addition, individual table progress will now be displayed in the status bar while filling any of the "Analysis Results" tables for display/export. The progress bar is effective for tables that take significant time to display/export.

## Design – Composite Beam

### Enhancements Implemented

*	Ticket	Description
	9846	Composite beam design was enhanced where the Display Composite Beam Design Info form now features an option to display the live load reduction factors used when the beams were designed.
	10016	The Composite Beam Design Overwrites form has been enhanced to now include toggle fields that specify whether the following composite beam attributes are calculated automatically or are instead user-defined: live load reduction factor, deck section, deck orientation, deck width, floor width, floor length and free-edge flag. Furthermore, the automatically calculated value of any attribute is now displayed. Previously to make these values automatically calculated, they had to be set to zero in the form or selected as "Program Calculated" from of list of possible values.

* Ticket	Description
10132	Several related enhancements to composite beam design have been implemented: (1.) The calculation of cantilever deflections under loads other live loads has been refined to include the tilts produced by the rotations of their supported ends. (2.) Cantilever backspans are now designed to limit the connected cantilever tilts. (3.) The computation of backspan deflections has been refined to use the moment of inertia of the steel section instead of that of the composite section in areas of negative bending. (4.) When activated from the Interactive Composite Beam Design form, the Diagrams form now shows cantilever deflections as displacements relative to the cantilever support measured along the global z-axis. (5.) When activated from the Interactive Composite Beam Design form, the Diagrams form features a checkbox to display backspans shear, moment, and deflection based on a partial loading of the cantilever. (6.) When activated from the Interactive Composite Beam Design form, the Diagrams form features a checkbox to display cantilever deflections with or without live load on the cantilever (in conjunction with live load or a partial live load on the backspan).

### Design – Concrete Frame Enhancements Implemented

* Ticket	Description
10006	An enhancement has been made to include Tan(Theta) in the design overwrites for the Eurocode 2-2004 and Italian NTC 2008 concrete frame designs where Theta is the angle between the concrete compression strut and the frame member axis perpendicular to the shear force. The range of Tan(Theta) is between 0.4 and 1.0 as specified in Section 6.2.3(2) in EN 1992-1-1:2004.

### Design – Steel Frame Enhancements Implemented

* Ticket	Description
8230	Steel Connection Design based on the AISC 360-10 and AISC 360-16 codes has been added. Beam-Beam, Beam-Column and Column-base connections are covered. Both welded and bolted connections are included. Step-by-step calculation reports are produced for each limit state. Documentation and verification examples are available.
9994	An enhancement has been made to the Eurocode 3-2005 steel frame design to update the design according to Corrigendum 2 released in 2009. These updates include: The calculation of npl and Czz in Annex A. Shear area of rolled T-section for load parallel to web in section 6.2.6 (3c). Previously the shear area was calculated as $0.9 \cdot (A-b \cdot t_f)$ . $C_{m,z}$ in Table B.3 for the case $C_{m,z} = 0.9 + 0.1 \cdot \alpha_h \cdot (1+2 \cdot \psi)$ . Previously it was $C_{m,z} = 0.9 - 0.1 \cdot \alpha_h \cdot (1+2 \cdot \psi)$ . Demand/Capacity ratio calculation according to section 6.2.9.1(6) for circular hollow section (pipe section). Previously, Equation 6.41 was not included in calculation of D/C ratio for the pipe. Now, it is calculated for pipe section and the moment capacity $M_{N,y,Rd} = M_{N,z,Rd} = M_{pl,Rd} \cdot (1-n^{1.7})$ is also implemented. Items 3 and 4 have also been implemented for the Italian NTC 2018 and 2008.
10020	An enhancement has been made for the Eurocode 3-2005 steel frame design to update the name of the design code to the official one, "EN 1993-1-1:2005/A1:2014." In addition, the official name of the national annex name is updated. This change to official code name is shown in the design preferences, the design detail report, and design results tables. Any user-developed scripts or other automated procedures that reference the affected database tables, including tables accessed through the API, will need to be updated to reference the new table names.
10086	An enhancement has been made to the CSA S16-19, CSA S16-14 and CSA S16-09 steel frame design codes to add the warping torsional constant, $C_w$ , to the design overwrites. The value can be modified via the overwrites form, database tables, and API functions.

**External Import and Export  
Enhancements Implemented**

*	Ticket	Description
	9895	The feature to export an ETABS model as a Perform3D model (File menu > Export > Perform3D Structure File) has been enhanced so that frame objects that are assigned a Pier or Spandrel label will be exported to Perform3D in separate element groups based on their Pier or Spandrel label names. This can be useful, for example, where it is desired that coupling beams be in a separate group from other beams.
	9899	Two-joint links of certain types are now exported from ETABS to Perform3D. Only the geometry is exported, and a corresponding property with zero values is created in Perform3D. Proper numerical values of the properties can be specified in Perform3D after importing the model. The following types are exported: (1.) ETABS "Damper - Exponential" > Perform3D "VBAR Inelastic component", (2.) ETABS "Gap" and "Hook" > Perform3D "1D Inelastic Bar", (3.) ETABS "Rubber Isolator" and "Friction Isolator" > Perform3D "ISOL Inelastic component".
	9901	The feature to export ETABS models as a Perform3D model (File menu > Export > Perform3D Structure File) has been expanded to include shell uniform loads in the global coordinate system. These loads will be exported to Perform3D as lumped nodal loads on the nodes which form the shell elements.
	9903	The "Export to Perform3D Model" functionality has been expanded to include the export of Line and Quad gauge elements. Translational type line gauges in ETABS will be exported as Perform3D Axial Strain Gage (2-node) components. Rotational type line gauges in ETABS will be exported as Perform3D Rotational Gage, Beam Type (2-node) components. Shear type quad gauges in ETABS will be exported as Perform3D Shear Strain Gage (4-node) components. Rotation type quad gauges in ETABS will be exported as Perform3D Rotation Gage, Wall Type (4-node) components.
	9935	An enhancement was made to allow selection of the tower while importing from a .DXF file to the Architectural layer for the multi-tower case. Previously all layers were added to the first tower.

**Graphics  
Enhancements Implemented**

*	Ticket	Description
	9987	A new menu command has been added, Options > Graphics Mode > Video Card(s) Information, which will display the available video (graphics) cards present on the computer, along with their GPU memory. The graphics card currently in use by ETABS is indicated, as well as its compatibility for use with DirectX graphics mode in ETABS. Windows Control Panel can be used to select a different graphics card for use next time ETABS is started.

**Installation and Licensing  
Enhancements Implemented**

*	Ticket	Description
	9920	The version number has been changed to 21.2.0 for a new intermediate release.

* Ticket	Description
* 10138	An enhancement has been implemented to provide a new licensing option, "Cloud Sign-in" licensing, that utilizes user credentials to access licenses instead of activation keys. This licensing option can be selected when installing the software, and can be changed later by running the CSILicenseAssistant from the Windows Start menu or found in the CSILicensing subfolder of the ETABS installation folder. With this licensing option, user credentials will be requested when ETABS is first started, unless they have already been supplied in an earlier session of ETABS or another CSI software product that uses Cloud Sign-in licensing. User credentials can be obtained from the customer's IT or other department that manages software access. Cloud Sign-in licensing requires an active internet connection while running the software. A commuter-license option is available which allows checking out a license for a time period up to 30 days, subject to the user's company policy, for use of the software without an internet connection. Until the commuter license is checked back in or the time period expires, no other user will have access to that license. Customers can use the CSI Customer Center to manage which users have access to various CSI products and product levels through user groups. The CSI Customer Center also provides tools to view license usage. Access to these features in the CSI Customer Center is subject to permissions set by the customer's department that manages software access.

## Loading

### ***Enhancements Implemented***

* Ticket	Description
* 8957	The auto-seismic load pattern and response-spectrum function were added for the Malaysian National Annex of Eurocode 8-2004.
10036	The TSC-2018 response-spectrum function has been enhanced to allow specification of the R, D and I parameters. The new parameter values will be set to 1.0 when opening models from versions prior to ETABS v21.2.0 to ensure that results are not changed. The values can be updated in the response-spectrum function definition after opening older models in the new version, if desired.

## Results Display and Output

### ***Enhancements Implemented***

* Ticket	Description
* 9771	An enhancement was made to allow the user to disable the saving of individual fiber analysis results for Fiber P-M2-M3 hinges assigned to frame or wall objects, thereby reducing the amount of results data that is saved for each step. This option is available in the "Frame Assignment - Hinges" form (Assign menu > Frame > Hinges) and can be assigned on a per-hinge basis for User Defined type Hinge Deformation types. For wall hinges, this option is available in the "Shell Assignment - Hinges" form (Assign menu > Shells > Wall Hinge) and can be applied to both vertical and general shear wall hinges. When the saving of individual fibers is disabled, the results for the affected hinges, including state and status, will be available but the option to view individual fiber results will be disabled in the Hinge Plots form as well as in the "Fiber Hinge Fiber States" output table. This option is intended for models with a large number of fiber P-M2-M3 hinges where the user may not be interested in viewing detailed fiber results for all hinges.
9956	An enhancement has been implemented to allow users to specify different diagram fill colors for range positive and range negative values when plotting frame forces/stresses for multi-valued load cases and combinations. Previously, the program was always using same fill color for positive and negative values. The plots in the extended frame force diagram form (accessed by right-clicking the frame in the GUI) have also been updated for the above change.

## Structural Model

### ***Enhancements Implemented***

*	Ticket	Description
*	9630	<p>The frame hinge assignment feature has been enhanced with four new preset hinge assignment distribution types: (1.) Beam Column, which adds a moment or PMM hinge at the ends of the frame object. This is intended to be used for most typical beam and column members which are governed by flexural behavior and expected to yield at one or both ends of the member while maintaining elastic or nearly elastic behavior at the mid-span. (2.) Distributed Plasticity, which adds hinges along the length of the frame object based on a specified integration rule. This is intended to be used for frame objects that are expected to have complex yielding behavior over the entire length. (3.) Equal Spacing, which adds hinges at a fixed spacing along the length of the frame object. Similar to the Distributed Plasticity option, this is intended to be used for frame objects with complex yielding behavior but may be used where yielding is expected to be evenly distributed or concentrated at mid-span. (4.) Continuous Support, which adds one hinge at the center of every frame element associated with the selected frame object. This is intended to be used for piles or grade beams, which are supported by springs at specified intervals and are meshed at the intersection with these supports, to facilitate the placement of hinges between each support. A User Defined hinge distribution type is also available to allow free-form assignment of hinges, which corresponds to the previous method of hinge assignment. When a model from a previous version of the program is opened, the hinge assignment is automatically translated as a User Defined hinge distribution. A new Hinge Length Overwrite parameter is available for hinge assignments using User Defined hinge distribution type. This parameter overwrites the hinge length of the assigned hinge with either an absolute length or a relative length as a ratio to the clear length of the frame object. The overwrite is intended to facilitate the use of Fiber or strain/curvature-type hinge properties in multiple locations or frame objects without having to redefine the hinge property to change the hinge-length setting. The database table "Frame Assignments - Hinge - Distribution Type" has been added to the interactive database. This table can be used to view or edit the hinge-distribution types for the frame hinge assignments. Additionally, the database tables Frame Hinge Assignments hinge types have been updated to include the new Hinge Length Overwrite parameters.</p>
	10155	<p>An enhancement was made for the CoreBrace BRB section where the torsional end release is now a user assignment. Previously any assigned torsional release was ignored and torsional continuity was enforced.</p>

## User Interface

### ***Enhancements Implemented***

*	Ticket	Description
	10070	<p>An enhancement has been implemented to allow drawing a linear tendon throughout between two points. Two options are now available in the Drawing Properties window for the vertical profile when drawing a tendon: (1.) Linear Throughout - This option will draw a tendon with a linear vertical profile between two clicked points irrespective of any support lines, strips, grids, etc. that intersect the line joining the two clicked points. Column supports on the line are also ignored. (2.) Program Determined - With this option, the tendon is generated as before, where support points are automatically traced and the vertical profile for tendon segments is determined by the program. The default option is "Program Determined", which was always the previous behavior.</p>

**Analysis**  
**Incidents Resolved**

*	Ticket	Description
	6555	An incident was resolved where Linear Modal and FNA time-history load cases with acceleration loads that have a non-zero angle would report reaction forces that did not account for the angle of the acceleration loads on masses at restrained degrees of freedom. This issue only affected restrained degrees-of-freedom and only affected the base reaction and joint reaction results. Other analysis results were not affected.

**Database Tables**  
**Incidents Resolved**

*	Ticket	Description
	10150	An incident was resolved where the column filter for a database table would cause an abnormal termination of the software if the filtered value included a single quote (') character.

**Design – Composite Beam**  
**Incidents Resolved**

*	Ticket	Description
	9852	An incident was resolved for composite column design code “Chinese 2010” where the design reported large values of VS-ratio a/D_major and a/D_minor for a concrete-filled tube/pipe, even though the column had in-span loading. Now the design checks for a change in shear force within a design station due to the design load combination and point load applied to the line object in local-2 or/and local-3 axes.
	9986	An incident was resolved for composite beam design where the floor width and length of some beams were miscalculated and set too low when composite beam designs were assessed for vibrations in models with the following characteristics: (1) the floor slab edges were located right above the centerlines of the peripheral beams, and (2) the floor slab edges had highly articulated, non-convex, shapes. This miscalculation only affected beam designs governed by vibrations, it was documented in the output, and it was conservative since ETABS selected heavier sections than necessary. Floor width and length are now properly computed even in models presenting characteristics (1) and (2) above. Correct vibration assessments could be obtained by overriding the values of the floor length and width in the composite beam overwrites. All versions of ETABS that compute floor length and width when assessing composite beam vibrations were affected.

**Design – Concrete Frame**  
**Incidents Resolved**

*	Ticket	Description
	9924	An incident has been resolved that addressed several issues for the serviceability/crack-width design of concrete frames per the Eurocode 2-2004 and Italian NTC 2008 codes: (1.) An error message could be displayed indicating a problem calculating the tension area for the section when multi-processing was utilized. After clicking OK, design would proceed but the design results could be incorrect. This problem did not occur for single-processing of design. (2.) The time to run the design was sometimes longer than expected due to unnecessary calculation of unused design parameters. The speed is now much improved. (3.) For the display of the Serviceability Crack Width Ratio, Serviceability Concrete Stress Ratio, and Serviceability Steel Stress Ratio, the ratio was sometimes displayed inside parentheses. This was related to whether or not the longitudinal reinforcement was to be designed or checked, but was not relevant to the various ratios. The displayed values of the ratios were correct regardless of whether the parentheses were shown or not.
	9984	An incident was resolved for concrete frame design per Eurocode 2-2004 where the column shear rebar for was excessively high for ductility class medium (DCM), ductility class low (DCL), and Secondary frames. This issue affected v20.0.0 to v21.1.0.

* Ticket	Description
9998	An incident was resolved for Chinese 2010 concrete frame design where modification factors of Seismic Design Grade II transition column seismic axial force was used as 1.3 instead of 1.2.
9999	An incident was resolved for Chinese 2010 concrete frame design code where horizontal seismic forces (i.e. moments and shears) in the design combination of transfer beam are now amplified by 1.9, 1.6 and 1.3 factor respectively for SuperI, I and II class (JGJ 3-2010 10.2.4).
10000	An incident was resolved for Chinese 2010 concrete frame design where MMF and SMF factors were incorrectly reported for middle story column when ACR ratio was less than 0.15. This was only a reporting item and design results were not affected.
10027	An incident was resolved for the shear design of columns according to the Italian NTC 2008 concrete frame design code in which the $\alpha_c$ factor was not correctly determined as described in Section 3.5.2.2 of the design manual. In particular, for the case where the column was under tension, $\alpha_c$ was previously not taken to be equal to 1.0. In addition, $V_{Rcd}$ was not calculated using the optimized value of $\tan\theta$ .
10050	An incident was resolved for the steel frame design codes "Eurocode 3-2005", "Italian NTC 2018", and "Italian NTC 2008" where the $\psi$ parameters were not calculated correctly for the section classification of Tee sections when a member was under major axis bending moment. The stress at the top of the web was being calculated at the top of the flange. Now it is calculated at the bottom of the flange. The stress at the bottom of the web was calculated correctly. This affected the calculation of $\psi$ and then $k_{\sigma}$ per EN 1993-1-5:2006 Table 4.2. This error could affect the PMM ratio if the resulting section classification was different.
10128	An incident was resolved for concrete frame design per the Eurocode 2-2004 code where the warning message "Joint shear exceeds limit" could be shown for DCM frames, even though this warning message is not applicable for DCM frames.

### Design – Shear Wall Incidents Resolved

* Ticket	Description
9992	An incident was resolved for Chinese 2010 wall design where the overwritten middle zone vertical reinforcement ratio of piers was reset to the default value during wall design.
10137	An incident was resolved for shear wall design where spandrel design overwrites were not available for the AS 3600-2009 code, while for the AS 3600-2018 code the overwrites were available but the overwrite "Consider $V_c$ ?" was not working.
10173	An incident was resolved for shear wall design code AS 3600-2018 where spandrel shear design reported shear rebar that could be incorrect when the model default database units were not in N-mm. Note that the database units are the consistent units in effect when the model was created and that are reported in the analysis .LOG file.

### Design – Steel Frame Incidents Resolved

* Ticket	Description
9910	An incident was resolved for the CSA S16-19 and CSA S16-14 steel frame design codes where the moment ratio was not determined correctly for calculating the unbraced-length limit according to Section 13.7 for the design of sections in tension. Now the design determines the two ratios of (1) the major-axis bending moment over the segment braced against lateral displacement (minor-axis bracing) and (2) twisting (lateral-torsional buckling, LTB bracing) separately, computes the two laterally unsupported distances ( $L_{cr}$ ), and compares with the corresponding unbraced length of the member to determine whether or not the unbraced length satisfies the requirement. For the moment diagram being non-linear over the considered segment, the value of $\kappa$ will be taken as zero.

* Ticket	Description
9936	An incident was resolved in steel frame design where the KL/r calculated for special concentrically braced frames and ordinary concentrically braced frames were incorrect for seismic design. The major direction KL/r was being calculated as $K_{minor} * L_{major} / r_{major}$ and the minor direction KL/r was being calculated as $K_{major} * L_{minor} / r_{minor}$ . In those cases, $K_{major}$ and $K_{minor}$ were switched. The affected codes were AISC 360-16, AISC 360-10, AISC 360-05, CSA-S16-19, CSA-S16-14, CSA-S16-09, Eurocode 3-2005, Italian NTC 2018, Italian NTC 2008, Indian IS 800:2007, KBC 2016, and KBC 2009. The use of KL/r for compression capacity calculations was correct.
9937	An incident has been resolved for the CSA S16-19 and CSA S16-14 steel frame designs in which the seismic design (or checks) is not performed for member with framing type of LD CBF(V), LD CBF(TC), LD CBF(OT), LD CBF(TO), MD CBF(V), MD CBF(TC), MD CBF(OT) or MD CBF(TO). These seismic design checks include axial load, compactness, slenderness, joint design for doubler plate, panel-zone shear check, and beam/column capacity ratio, connection shear and/or axial force.
9982	An incident has been resolved in certain steel frame design codes in which the member is now red-flagged when it faces an error and a warning condition simultaneously. Previously, the warning condition sometimes superseded the error condition, and the member was not shown in red. For example, when the member is part of an SMF in the "AISC 360-16" code, and the section is not highly ductile compact ( $b/t > \lambda_{hd}$ ), the program considers the condition an error. However, the program considers the condition $l/r > 60$ as a warning. When the column section is not highly ductile, it is reported as an error, and the member is shown in red. When the column section satisfies both the error conditions: (1) the section is not highly ductile, and (2) the $l/r > 60$ , the second condition was taken as a warning, and it erroneously superseded the error; the member was NOT shown in red. This error is now fixed. The affected codes are "AISC 360-16", "AISC 360-10", "Eurocode 3-2005", "Italian NTC 2018", and "Italian NTC 2008".
10022	An incident has been resolved for the Eurocode 3 and Italian NTC 2008 and 2018 steel frame designs in which the calculations related to the fillet radius for Tee sections such as shear area long z-axis (2-axis) and effective section modulus for bending about y-axis (3-axis) were slightly over-conservative due to incorrect value of the fillet radius. In addition, the checks to ignore global buckling effects on compression capacity according to Section 6.3.1.2(4) in EN 1993-1-1:2005 are removed, resulting in more conservative design.
10054	An incident was resolved for the AISC 360-16 and AISC 360-05 steel frame design codes where the flexural strength of wide flange sections considering lateral-torsional buckling was incorrectly calculated. This was due to the torsional constant, J, being taken as zero because the ratio $I_{yc}/I_x$ was used instead of $I_{yc}/I_y$ in the check for being less than or equal to 0.23.

### Detailing Incidents Resolved

* Ticket	Description
9970	An incident was resolved for where the clear cover specified using the beam editor in concrete beam detailing was being ignored.
10041	An incident was resolved to link the concrete beam/column section cover with detailing by taking the side cover as the top cover.

### Drafting and Editing Incidents Resolved

* Ticket	Description
1910	An incident was resolved where modifying the curved edge of a shell object using the "Reshape Object" tool button or command was not working correctly.

**External Import and Export  
Incidents Resolved**

<b>*</b>	<b>Ticket</b>	<b>Description</b>
	9634	An incident was resolved where ETABS frame point loads at ends were not transferred to Perform3D nodes during exporting data from ETABS to Perform3D.
	9928	An incident was resolved to remove the File > Export to CSiDetail menu item, which is no longer in use as the detailing is now directly accessed from inside ETABS.
	10023	An incident resolved where a Revit project that featured family names consisting of only one or two characters was imported in ETABS, the resulting model could not be exported back to Revit. Attempts to export the .EXR file produced an error message and no .EXR file. The workaround was to save the ETABS model to .e2k, re-import in ETABS, and export that to Revit, or rename the families with only one or two characters in their names and create a new ETABS model. ETABS 2016 and later were affected.
	10090	An incident was resolved where ETABS did not import CIS/2 files with measures in units that had prefixes other than milli, centi, kilo, or mega. For example, ETABS could not import a CIS/2 file in which masses were measured in decigrams. When this occurred the error was obvious: an error message was displayed and no model was created. The full range of CIS/2 unit prefixes, from 'atto' to 'tera', is now supported.

**Graphics  
Incidents Resolved**

<b>*</b>	<b>Ticket</b>	<b>Description</b>
	8950	An incident was resolved where horizontal floor area objects were not extruded at the correct Z elevation when the area object was not at a story level. This was a display issue only and did not affect results..
	10135	An incident was resolved where the displayed cross-sectional shape of columns shown in a plan views was not drawn in the correct location for unsymmetrical sections (like angles and channels). This only affected the plan view when the Extruded View option was turned off. The Extruded View was shown correctly in 3-D and in plan views.

**Loading  
Incidents Resolved**

<b>*</b>	<b>Ticket</b>	<b>Description</b>
	8362	An incident has been resolved where selecting a Response Spectrum based on the Italian NTC2018 using Latitude and Longitude values may in some cases result in an abnormal condition and in some other rare cases may select values that are interpolated from known values that are not the closest to the specified location. In such cases the differences were small.
	10034	An incident was resolved for the Eurocode 8-2004 auto seismic load pattern where parameters Tb, Tc and Td were set to default values when the *.SET or .E2K text model files were imported for Country "Other". Results agreed with the model as imported.
	10057	An incident was resolved where models with PT tendons in beams would, in rare cases, give an error message during analysis that the PT loads were not self-balancing. This could happen when the tendon was close to another beam crossing at an angle. The unbalance was in the moments, and was usually very small.
	10105	An incident was resolved for the ASCE 7-22 auto-wind load pattern where the directional factor (kd) was applied twice. This caused an unconservative wind load when kd was less than unity.

**Miscellaneous  
Incidents Resolved**

* Ticket	Description
9820	An incident was resolved where the thumbnails for ETABS models were not saving correctly in when DirectX graphics mode, sometimes including images from other windows on the screen when the model was closed.

**Results Display and Output  
Incidents Resolved**

* Ticket	Description
1432	An incident was resolved where the M2 values reported in the table "Section Cut Forces - Design" were negative for Response Spectrum load cases. Additionally, negative values were shown in Envelope results. This issue was a reporting issue and only affected design-type section cuts.
2228	An incident was resolved where the Capacity Spectrum conversion of the Pushover curve based on the FEMA 440 Equivalent Linearization method was not correct for loading not in the X or Y planes or if a generalized displacement was used for monitoring.
9785	An incident was resolved where the Internal Hysteretic Damping energy for Link objects with a MultiLinear Elastic type property was incorrectly reported as non-zero values for nonlinear load cases. This was an energy-reporting issue only and did not affect any other results.
9940	An incident was resolved for steel frame design codes AISC 360-16, AISC 360-10, and NTC 2008 to correctly display the unbraced length for minor bending (or buckling) in the right-click design details. Previously, the value of the unbraced length for minor bending of the station that governed the design was shown in the design report for all stations. It is now correctly shown for the selected design station. This was only display issue. The design results were calculated using the correct unbraced length for minor bending.
9952	An incident was resolved for composite beam design where the software could terminate abnormally when trying to generate a report or export tables that included the table for composite beam design preferences in the particular case where the design preference for vibration acceptability criteria was set to "sensitive equipment". The design results were not affected, and the error did not occur for reports or sets of tables that did not include the table for composite beam design preferences. This incident affected ETABS 2017 and later.
9968	An incident was resolved where the Project Report was not able to sent to a printer or to Word when all the columns of any of the exported tables could not be fit in on a single page, but needed a vertical split. An example of such a table is Steel Frame Design Overwrites.
9997	An incident was resolved where an abnormal termination error may occur when viewing hinge results (Display->Hinge Results) for P-M2-M3 hinges for a degree-of-freedom that has extremely small deformations, typically the axial direction. This was an issue with displaying the plot only and does not affect analysis results.
10046	An incident was resolved where the images sent to a physical printer using the command File > Print Graphics command did not always use the correct margin settings. This did not affect graphics printed to PDF files.
10058	An incident was resolved where the option "Show Contours in Plan View for Floor" was not available when an area load was assigned using Area Load Sets only. This was just a display issue and the loads were applied correctly.
10083	An incident was resolved for shear wall design per the Chinese 2010 code where the "Right Edge member width", "Area of steel Left" and "Area of steel Right" in the "Table: Shear Wall Pier Design Summary Table" were incorrectly displayed as 0. Also, the boundary zone width was not shown for the right-side boundary element using Display Design Information > Pier Edge/Boundary Zone Widths. These were all reporting issues and the actual design was not affected. The results were shown correctly in the details shown by right-clicking on the pier.
10151	An incident was resolved where story plots for maximum drifts for load combinations involving multi-step wind/seismic load patterns were always displaying the response for the first step instead of displaying the maximum story drifts from all steps. This was just a display issue and the results using tables were correct.

* Ticket	Description
10154	An incident has been resolved in all steel frame design codes where the program used to terminate abnormally after showing the message "An abnormal condition has occurred. Program needs to terminate." while displaying the design details with the form title "ETABS Steel Frame Design". This situation happens when the second-order analysis method is "Amplified 1st Order" and the axial compressive force in a frame member exceeds the Euler buckling capacity, invalidating all analysis and design. The program now reports as much information as possible with normal operations.

### Section Designer Incidents Resolved

* Ticket	Description
4032	An incident was resolved where the computed torsional constant for a user-defined thin-walled open section with fillets was slightly different when compared to the value obtained from the Section Designer for the same section. The difference was because of different discretization being used for the fillets when computing section properties using the two approaches. The effect was very small. Section properties recovered from databases are not affected.

### Structural Model Incidents Resolved

* Ticket	Description
2164	An incident was resolved for the concrete stress-strain relationship based on Mander's model in cases where the concrete modulus of elasticity ( $E_c$ ) was smaller than the ratio of concrete strength over the strain at this strength. In such situations, the Mander model could show peculiar or undesirable behavior in the nonlinear stress-strain curve as shown in the material properties form. Now, the concrete modulus of elasticity, if less than 1.2 times the ratio of concrete strength over the strain at this strength, will be set to this limiting value when it is used to generate a Mander stress-strain curve. See Technical Note - Material Stress-Strain Curves (S-TN-MAT-001) of the documentation. Additionally, the initial value of $E_c$ used in the Mander model is now taken from the concrete material properties, subject to the limit above. Previously, it was always taken as $57,000 \cdot \sqrt{f'_c}$ [psi] for the calculation of the moment-curvature relationship in Section Designer and plastic-hinge properties.
9278	An incident was resolved where the auto-generated concrete coupling-beam shear hinges as per ASCE 41-17 Table 10-20, Item ii, were not scaling the chord rotation correctly. The V-Theta was being used for analysis instead of V-Delta. This only affected v21.0.0 and 21.0.1. It was corrected for the subsequent v21.1.0 release, but was inadvertently omitted from the Release Notes. There is no further change for the present release v21.2.0.
* 9637	An incident was resolved where a floor object assigned a property, but tagged to be only used for mass and rigid-diaphragm assignment, was not transferring mass. This only affected ETABS v21.0.0 and v21.1.0. Earlier versions were not affected. This issue did not occur if the floor object was assigned a Null property, in which case the mass was properly transferred and the rigid-diaphragm assignment also worked.
10130	An incident was resolved where the replication of objects (command Edit > Replicate) would replicate the loads on the objects even if the option to replicate loads was not selected.
10144	An incident was resolved where duplication of mass from self-mass and self-weight has been removed when an area object with property is completely covered with other area objects. This is a rare modeling case. When only part of an underlying area was covered by other area objects this duplication did not occur. It should be noted that any mass converted from loads or any mass specified directly on areas is considered additive. The duplication is removed only from self-mass and self-weight converted to mass. Self-weight as a load was also not duplicated.

**User Interface**  
***Incidents Resolved***

*	Ticket	Description
	5257	An incident was resolved where frame releases were not flipped when model was replicated using mirror or radial replicate option and frame local axis-1 was flipped to keep the frame local axis aligned in the positive X or Y axis. The following additional items are now flipped where applicable: Joint offsets, moment-frame beam type (i.e., SidePlate/RBS assignment), point load assigned to frames, partial uniform load, or variable frame load.
	10146	An incident was resolved where the vertical offset for the slab rebar objects created using the Edit > Add/Edit Slab Rebar > Add Slab Rebar menu were being referenced from the global Z coordinate of zero instead of the specified story level. The slab rebar objects created by drawing were not affected by this issue.