ETABS v20.1.0 Release Notes

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Notice Date: 31-March-2022

This document lists changes made to ETABS since v20.0.1, released 31-January-2022. Items marked with an asterisk (*) in the first column are more significant.

Analysis
Enhancements Implemented

*	Ticket	Description
*	8081	A change has been made to how equilibrium errors are checked for convergence in nonlinear static load cases. Previously, the relative contributions of force unbalance to moment unbalance were dependent upon database length units. This tended to over-emphasize moments for small length units (mm, inch), which are the default database units. In certain cases, this could lead to larger force equilibrium errors than expected based on the relative convergence tolerance specified for a load case (the default is 0.0001). Now these equilibrium measures are independent of length units, and they are better balanced between force and moment for typical structural dimensions. Because of this change, the results of nonlinear static load cases may differ when run in the new version compared to the previous version. Generally any change will be small, but it may be more significant for sensitive or ill-conditioned models. Note that nonlinear static analysis is an approximate, iterative process. Results should be confirmed by engineering judgment, and re-running certain load cases using progressively smaller convergence tolerances may be necessary to get the expected equilibrium for some models. Results for non-iterative, event-to-event load cases should not be affected, except that the reported error at the end may differ.

Data Files
Enhancements Implemented

*	Ticket	Description
	8118	Three new section-property database files have been added for steel sections produced by certain Indian manufacturers: (1.) TATA_Steel.xml, containing data for steel I/Wide Flange sections manufactured by the TATA group of companies. (2.) Jindal_Steel.xml, containing data for steel Pipe/Tube sections manufactured by Jindal Steel Ltd. (3.) APL_Steel.xml, containing data for steel Pipe/Tube sections manufactured by APL Apollo Ltd.
	8166	The Russian material library has been updated to add materials from the latest standards SP 63.13330.2018 (concrete, rebar, tendon) and SP 63.13330.2017 (steel). The materials from the older standards, available previously, are still present in the updated library.
	8171	Two new Russian frame section libraries have been added to conform to the latest standards. These files are Russian2020_en.XML and Russian2020_ru.XML. The former contains the frame sections with names in the English language, and the later contains the same frame section with names in the Russian language, where applicable.
	8189	The handling of functions (time history and response spectrum) defined in external data files has been enhanced to: (1.) Significantly speed up reading of function data files with many data points, and (2.) Allow users to suppress error messages caused by multiple missing function data files when running the analysis.

Design – Composite Beam
Enhancements Implemented

*	Ticket	Description
	8112	Composite beam design per the AISC 360-16, BS5950-1990 and CSA S16-14 codes has been enhanced to now include, in the design details tables, the value of the bottom-flange steel stress produced by the un-factored loads .

*	Ticket	Description
*	8195	Composite beam design has been added for the CSA S16-19 design code.

Design – Concrete Frame
Enhancements Implemented

*	Ticket	Description
*	8192	Concrete frame design has been added for the CSA A23.3-19 code.

Design – Shear Wall
Enhancements Implemented

*	Ticket	Description
	8241	An enhancement was added for the ACI 318-19, ACI 318-14, ACI 318-11 and ACI 318-08 shear wall design codes where the pier height is now based on tracing the same pier label along the stories to determine total wall height used to determine shear capacity. Previously, the story height was used for computing shear capacity.

Design – Steel Frame
Enhancements Implemented

*	Ticket	Description
	1004	An enhancement has been made for steel frame, concrete frame, composite column, and shear wall design where now the Design Overwrites forms offer an additional choice for decision-type (Yes/No) overwrite items. The previous choices were "Yes" and "No". The new choices are now "Yes", "No", and "Program Determined". The new "Program Determined" option allows easily returning to the default value after the overwrites have been changed. Design results for existing models are not affected unless the design overwrites are changed. Note that composite beam and slab design are not affected by this change.
*	8193	Steel frame design has been added for the CSA S16-19 design code.

External Import and Export
Enhancements Implemented

*	Ticket	Description
	2242	An enhancement has been implemented whereby the parameters for time-history functions matched to a target response spectrum are now exported and imported when a model is exported and imported in any of the available formats. Previously, this functionality was not available and as such the time-history functions of this type were lost when a model was exported and imported.
	3336	Two enhancements have been made to the various imports from DXF files - namely the import of architectural plans, import of architectural grids, import of floor plans, import of 3D models, and import of meshes as shell objects. (1.) Layer names with non-ASCII Unicode characters are now imported with their original names. (2.) When ETABS cannot read a DXF file due to some unexpected content, the error message displayed now includes the line number in the file with the unexpected content.

Installation and Licensing
Enhancements Implemented

*	Ticket	Description
*	7985	The version number has been changed to 20.1.0 for a new intermediate release.

Loading
Enhancements Implemented

*	Ticket	Description
*	8203	An incident was resolved where load combinations of any type except Linear Add and that contained a Range-type of multi-step load case, such as pattern loading, did not produce the correct results. This was because the multi-step load case was being used as an envelope over the multiple steps, whereas it should have been used as a Range sum over the steps. The effect of this could be unconservative. Note that load combinations of type Linear Add were not affected - the multi-step load case was correctly added in as a Range sum. Combos of type Range Add, Envelope, SRSS, and Absolute Add were affected. This same behavior was exhibited for load combinations that contained other load combinations of type Range Add. Design load combinations automatically created by the program always used a Linear Add when combining Range-type Pattern Load cases with other gravity loads and therefore were not affected.

Results Display and Output
Enhancements Implemented

*	Ticket	Description
	8147	An enhancement was made to change the printing resolution from 100 to 300 DPI. This should especially improve print quality on some PDF printers, without significantly affecting file size.

Structural Model
Enhancements Implemented

*	Ticket	Description
*	2046	A new general shear wall hinge has been added that is similar to the general wall element from Perform3D. The previously available wall hinge can still be used and will now be referred to as a vertical shear wall hinge. The general shear wall hinge consists of a pair of orthogonal P-M3 or Fiber P-M3 hinges, plus a linear or nonlinear shear material. Compared to the existing vertical shear wall hinge, the general shear wall hinge offers the ability to assign the hinge to all planar wall objects, even if the shape is not rectangular. The orthogonal P-M3 hinges can take any arbitrary orientation, and one of the hinges can be omitted. These features allow the hinge to be used for modeling spandrels as well as piers, and to handle more complex wall geometries, such as near openings or geometry transitions. General shear wall hinges can be used for nonlinear static, staged-construction, and direct-integration time-history analyses, but they behave linearly for nonlinear modal time history (FNA) analyses.
	8251	An enhancement was added for long term cracked section analysis where the age at which the structure was loaded can now be specified in the Floor Cracking Analysis form of the Load Case Data (Define menu>Load Cases) of nonlinear static and staged-construction load cases. Previously, age at loading was assumed to be 7 days.

User Interface
Enhancements Implemented

*	Ticket	Description
	8009	A change has been made to Elevation views such that slabs, walls and beams not fully in the plane of the elevation are still visible when extruded if they are cut by the elevation plane or have one edge/end on it. This allows easy check on their location when offsets are used. These objects, however, are not selectable on-screen. This is consistent with the selection behavior when objects are not extruded and behavior in earlier versions of ETABS prior to ETABS v20.

Analysis
Incidents Resolved

*	Ticket	Description
	8072	An incident was resolved where the Change Releases operation during staged construction had the following issues when applied to auto-meshed frame objects: (1.) When applied to a single meshed frame object, running the analysis resulted in an error message that preventing the staged construction load case from being run. When this occurred, results for that load cases were not available. (2.) When applied to a group containing one or more meshed frame objects, the specified releases were applied to all meshed elements rather than just the two elements at the ends of each frame object. When this occurred, inadvertent local instabilities could be produced on affected frame objects that could lead to convergence issues for the staged construction load case.
	8327	An incident was resolved where some models containing CoreBrace frame objects with End I located at a higher elevation than End J could report an "Error in creating Analysis Model". When this occurred, the analysis did not run and results were not available.

API
Incidents Resolved

*	Ticket	Description
	8131	An incident was resolved for the Application Programming Interface (API) where calling the function cSelect.Group to select a group would cause the display to be reset to a default 3D view. This behavior has been resolved so the view is not reset in this case.

Data Files
Incidents Resolved

*	Ticket	Description
	6532	An incident was resolved to fix incorrect or missing torsional constant (J) values for double angles in the AISC14, AISC15, AISC14M and AISC15M XML section libraries. In these XML section libraries, the J value for the double-angle sections were either incorrect or missing. Upon import, missing J values were calculated (using formulas if the fillet radius was zero or using FEM analysis if fillet radius was present), but the calculated values were different from the expected values that should be twice that given in the same sections database for the single angle comprising the double angle. This change involved updating the incorrect or missing J values using the J values as available for the corresponding single angles in the same section library.

Database Tables
Incidents Resolved

*	Ticket	Description
	7968	An incident was resolved where the database tables "Line Gauge Object Connectivity" and "Quad Gauge Object Connectivity" did not limit tabulated results based on object selection when the "Selection Only" option is used. This affected both the display tables (Display menu > Show Tables) and the interactive database (Edit menu > Interactive Database). Results were not affected.
	8285	An incident was resolved where modifying point-object locations through the interactive database editor might cause an error if items were selected when creating the table.
	8286	An incident was resolved where the table "Section Designer Shapes - Concrete Straight Wall" could cause an error in the interactive database editor if no rebar was previously defined in the section.

Design – Composite Beam
Incidents Resolved

*	Ticket	Description
*	8087	An incident was resolved which affected composite beam design per AISC360-16, BS5950-1990 and CSA S16-14. The steel tensile elastic stress check was not being performed unless the beam happened to have an output station at the exact location of the maximum positive bending moment. Composite beams designed by other codes were not affected because these codes do not mandate that particular check. When this occurred, the strength of the beams was unaffected. This issue only affected v20.0.
	8214	An incident was resolved for AISC 360-16 and ASIC 360-10 composite column design where the section classification for compactness and PMM D/C ratio were not reported correctly when the steel frame design code and the composite column design code were different. The reported section classification and PMM D/C ratio were based on the steel frame design code instead of the composite column design code. This was just a reporting issue and the design was not otherwise affected.

Design – Concrete Frame
Incidents Resolved

*	Ticket	Description
	7568	An incident was resolved where concrete frame and concrete wall design results were still available for display on screen and through database tables even after the design preferences were modified. Now concrete frame or wall design needs to be re-run after changing their respective preferences in order to obtain design results.
	7921	An incident was resolved for the concrete frame design code "IS 456:2000" in which there was a discrepancy in the maximum PMM D/C ratios for the frames shown in the graphical display and that shown in the detailed design reports for check-type problems of prismatic and non-prismatic members. The value shown in the detailed design report was correct. The discrepancy in the graphical display was due to the determination of k (IS 39.7.1.1) and M_{add} (IS 39.7.1), which are based on the rebar area in the cross-section. This issue did also exist for design-type problems because the rebar-area percentage was corrected with iterations until convergence, where the tolerance was a relaxed value. The tolerance has been tightened now. On the other hand, for the check-type problems, the initial rebar area was based on the minimum rebar-area percentage, and the iteration was not performed, keeping k inconsistent with the actual rebar areas. When this error occurred, the value shown in the graphical display was slightly unconservative.
	7990	An incident was resolved for the Indian concrete frame design code "Indian IS 456-2000" where the section depth for Section Designer (SD) sections was taken as $2 * sqrt(3) * r$, where r is the radius of gyration in the respective direction. This approximation affected calculation of the slenderness limit per IS 25.1.2 and calculation of the additional moment per IS 39.7.1. Now the design will consider the depth as the full section dimension in the respective direction. Previously the behavior was correct for rectangular SD sections, conservative for I-shaped SD sections, and unconservative for diamond-shaped SD sections.
	8060	An incident was resolved for the Eurocode 2-2004 Concrete Column design where the governing design was selected from different design cases due to load cases/combinations with multiple values or directions.
	8062	An incident was resolved where modal load cases included in design load combinations were not included in the design forces. This issue has been resolved and modal load cases will now be included in design forces. Note that the design for modal loads is not common and requires careful determination of the appropriate scale factors from some other known loading condition.
	8184	An incident was resolved for Russian SP 63.13330.2012 concrete design code where design tensile strength of concrete was computed incorrectly by accounting for gamma_b2, gamma_b3 and gamma_b4 factors for R_bt,long and R_bt,short.

*	Ticket	Description
	8315	An incident was resolved for concrete frame design code "Eurocode 2-2004" so that now the design considers the optimization of tan(theta) even when torsion is present. This optimization is limited to matching V_Rd,max with V_Ed per equation (6,9) of EC2 6.2.3(3). In the previous version 20.0.0, the calculation of Asw/s was over-conservative.

Design – Shear Wall
Incidents Resolved

*	Ticket	Description
	8097	An incident was resolved where spandrel design report was not working. This issue was inadvertently introduced in v20.0.0.

Design – Steel Frame
Incidents Resolved

*	Ticket	Description
	8005	An incident was resolved for the steel frame design code "Chinese 2018" where the determination of Beta_t was not correct when there was a uniformly distributed lateral load on the span of the member. The value was correct when there was no lateral load on span or when there were one or more concentrated lateral loads on the span.
	8114	An incident has been resolved in steel frame design codes "Eurocode 3-2005" and "Italian NTC 2018" in which the program calculated stress ratios for torsion check was infinity for some stations and some load combinations when the torsion check is considered, torsion is present, the section was Class 4, the major axis bending moment is significant, and the minor axis bending moment is identically zero for a doubly-symmetric I-shaped section. The program was displaying the wrong governing equation in the details window in this case. Moreover, the program was showing an abnormal error condition. Minor and rare.

Drafting and Editing
Incidents Resolved

*	Ticket	Description
	1792	An incident was resolved where fixed-length drafting controls would not work correctly in Elevation view when in DirectX graphics mode. In addition, snapping to grid intersections is now fixed when in DirectX graphics mode and used with fixed-length drafting controls in both Elevation and Plan view.
	8075	An incident was resolved where the reshaper tool would not work properly if the "Similar Stories" option was ON and the DirectX graphics mode was being used.

External Import and Export
Incidents Resolved

*	Ticket	Description
	8178	An incident affecting the import of Revit projects with wood framing elements was resolved. The section properties of wood framing elements were imported with wrong analytical properties, computed as if the sections were trapezoidal instead of rectangular, with an arbitrary bottom width. Results agreed with the model as imported. The section properties of wood framing elements are now imported with their proper analytical properties. This incident affected ETABS v13.2.0 through v20.0.0.

*	Ticket	Description
	8309	An incident affecting the import of .EXR files exported from SAP2000 models defined in metric units has been resolved: Concrete sections were not recognized when such files were imported in ETABS. This resulted in a warning being displayed in the Revit Data Overview/Controls form displayed when the file was being imported, and it could subsequently be addressed by defining and assigning matching sections in ETABS. If the issue was not addressed, the error was visually obvious and the ETABS results agreed with the model. Note that .EXR files exported from Revit were not affected, and .EXR files exported from SAP2000 models defined in US customary units were not affected. A related enhancement has been implemented: The name-matching criteria used to map .EXR sections to .XML catalog sections has been relaxed so that now blank spaces in the .EXR section names or catalog section names will be ignored if an exact match cannot otherwise be found.

Graphics
Incidents Resolved

*	Ticket	Description
	7972	An incident was resolved for DirectX graphics where the view was rotated 180 degrees from the expected orientation for a 3D plan view with zero aperture and 90-degree elevation angle (looking down from above). In particular, the X axis pointed to the left and the Y axis pointed downward. This issue was not present for Standard Graphics option.
	8031	An enhancement was added for the display of shell/area objects (walls, slabs) to handle joint-thickness overwrites and joint offsets in the extruded view.

Loading
Incidents Resolved

*	Ticket	Description
*	7800	An incident was resolved where the behavior of an area element with a nonlinear layered-shell section property subjected to temperature loads was incorrect: In linear analyses, temperature loads were applied in both in-plane translational degrees of freedom in membrane- and shell-type layers even if the degrees of freedom were set as inactive. This behavior has been corrected so temperature loads only affect the active degrees of freedom of each layer. For a linear analysis where the stiffness of the layer was significantly different from the elastic stiffness of the material property assigned to the layer, the behavior of the layer under temperature load could be incorrect. This could occur if the layer had inactive or nonlinear degrees of freedom and the material had a non-zero Poisson's ratio, or if the linear analysis used the stiffness from the end of a nonlinear analysis. The magnitude of the error was proportional to the difference between the stiffness of the layer and the elastic stiffness of the material property assigned to the layer and, in most cases, was small. This issue has been corrected. Nonlinear static load cases with an Event-to-event only solution scheme could have additional equilibrium errors when temperature loads were applied. This only occurred for nonlinear layered shells and has been resolved. The behavior of other types of shells, such as the thin and thick shell, were not affected by this issue.
	8056	An incident was resolved where the wind load distribution on semi-rigid diaphragms for very narrow buildings with only a few points available to distribute the load would cause an error condition when trying to run the analysis. When this occurred, results were not available.
	8098	An incident was resolved where the NBCC 2015 auto wind load based on the dynamic procedure was incorrect. The calculated pressure on leeward side was using the windward height instead of one-half of the distance from the input bottom story or minimum level to the input top story or maximum level.

*	Ticket	Description
	8122	An incident was resolved for the NBCC 2015 auto-seismic load case that addressed two issues: (1.) After importing the table "Load Pattern Definitions - Auto Seismic - NBCC 2015" from the text file, database tables, or the interactive database editor, the values for the site-class parameters F(0.2), F (0.5), F(1.0), F(2.0), F(5.0) and F(10.0) would subsequently reported incorrectly in the table "Load Pattern Definitions - Auto Seismic - NBCC 2015" and in the auto-seismic report. However, the calculated base shear was not affected and agreed with the specified Site Class. (2.) When defining the load pattern in the "Seismic Load Pattern - NBCC 2015" form (command Define > Load Patterns > Modify Lateral Load), if user-defined values were entered for Site Class "F", then the Site Class was changed from "F" to another class (say "D") and then back to "F", the form would show the values originally entered for class "F" but the table and report would show values defined for the intermediate class (in this case, for "D"). When this occurred, the table and report were correct and agreed with numerical results, but did not agree with the values shown in the form.
	8159	An incident was resolved for the Eurocode 8-2004 vertical elastic response-spectrum function where expressions 3.8, 3.9, 3.10, 3.11 were using a multiplier of 2.5 instead of 3.0.
	8213	An incident was resolved where the values modified on the data form for NZS 1170.5 response-spectrum functions were not being saved correctly. This issue was inadvertently introduced in v20.0.0 and affected v20.0.0 and v20.0.1. Models saved in these versions that included any NZS 1170.5 response-spectrum functions should be checked for the correct parameters of those functions.
*	8321	An incident where resolved where auto-seismic load patterns always used the default mass source when generating the loads. This behavior has been changed so loads for an auto-seismic load pattern will be calculated using the mass source associated with the load case that applies that load pattern. When the auto-seismic load pattern is used in more than one load case, the mass source will be taken from the first such load case in the load-case list, even if the load cases specify different mass sources. The auto-seismic loads are generated based on the mass-source settings when the model is first run from an unlocked state and will not be changed based on any subsequent changes to the load cases after the model is locked. Unlocking the model will cause the auto-seismic loads to be re-generated next time the model is run, based on the then-current load case definitions. Note that a separate auto-seismic load pattern must be defined for each different mass source that is to be considered, even if the load pattern definition is otherwise the same.

Results Display and Output
Incidents Resolved

*	Ticket	Description
	8124	An incident was resolved where the option to show crack widths graphically for nonlinear load cases would show the results for the first step rather than the last step of the load case. When the load case started from zero state, this would end up not showing any results.
	8296	An incident was resolved where the hinge results form would cause an error and not display if there were 3 or 4 model windows being displayed at the same time in the graphical user interface.

Section Designer
Incidents Resolved

*	Ticket	Description
	8049	An incident was resolved where the graphical display will only show the first joint load assigned to a joint in a particular load pattern even if multiple joint loads were present on the same joint in that load pattern. The analysis was correct and accounted for all joint loads. Also the right click information form as well as the database table showed all loads. It is not possible to assign multiple joint loads on a joint in a load pattern through the graphics or through a text import. However, it was possible to assign them by duplicating records in the interactive database or by importing loads through an Excel datasheet multiple times.

Structural Model
Incidents Resolved

*	Ticket	Description
	1839	An incident was resolved where section cuts drawn using Draw > Draw Section Cut and defined Quad-type section cuts that were saved from the drawn section cuts would sometimes give different results. This was due to saved Quad type section cuts only including area elements that were fully cut by the cut line, but drawn section cuts also including area elements which were only partially cut. Both types now only include area elements that are fully cut.
	8059	An incident was resolved where the program-generated nonlinear Panel Zone properties had acceptance criteria defined for plastic deformation only, while the element moment-rotation backbone curve included the elastic behavior. The acceptance criteria of program-generated nonlinear Panel Zone properties have been updated to be defined for total deformation, including elastic deformation, to be consistent with the panel-zone nonlinear property.
	8106	An incident was resolved where joints tagged to be included in the analysis mesh were not being included if they were only connected to null areas.
	8155	An incident was resolved where assigning nonlinear panel-zone properties to joints and running a Ritz modal analysis with starting vectors based on Links would cause a warning message in the analysis .LOG file that loads were being applied to one or more massless degrees of freedom. To resolve this issue, the analysis model now adds a very small mass to the to panel-zone degrees of freedom, based on the mass of connected frame objects. Note that in spite of the warning, no significant effect on results was expected for this case, and no significant change in results is expected with the new version. Only in certain uncommon cases, the new version may provide better convergence behavior for nonlinear modal time-history (FNA) load cases based on the affected Ritz modal cases if the nonlinear behavior was dominated by the panel zones.
	8246	An incident was resolved where the dimensions of a joint load assigned to a point object were not available in the right-click information form. This information has now been added and is available under the Loads tab on the right-click form.

User Interface
Incidents Resolved

*	Ticket	Description
	7969	An incident was resolved where the Line Strain Gauge colors would not change based on "View by Colors of" option chosen in the "Set View Options" form (command View > Set Display Options).
	7981	An incident was resolved where Strain Gauge elements were not available for selection by Name and would not show in Group Assignments Table.
	8051	An incident was resolved where, under certain conditions, clicking OK to close the Pier Section Data form could trigger an abnormal termination error..
	8181	An incident was resolved where, for P-M2-M3 and P-M3 fiber hinges with a user-defined section, all fiber materials were getting reset to the default material upon adding a fiber or clicking "OK" button in the form. This error only affected ETABS v20.0.0.
	8254	An incident was resolved for the AS3600-2018 time-dependent material properties of concrete where the values specified for time-dependent parameters were not updated when form was closed. Analysis results agreed with the values shown when first opening the form or displayed in the tables.