# ETABS v20.0.0 Release Notes

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## Notice Date: 10-January-2022

This document lists changes made to ETABS since v19.1.0, released 31-March-2021. Items marked with an asterisk (*) in the first column are more significant.

## Analysis
### Enhancements Implemented

| * | Ticket | Description |
|---|---|---|
| * | 1295 | An enhancement has been implemented to allow users to specify Change Modifiers and Change Releases operations for a stage in nonlinear staged-construction load cases. The Change Modifiers operation allows property modifiers to be changed for specified frame and shell objects. The property modifiers to be applied are defined in a named set, which is then referenced in the stage-construction load case. These modifiers change the stiffness used for subsequent loading. They have no effect on loads already applied. Property modifiers affecting mass and weight cannot be changed. Similarly, the Change Releases operation allows member end releases to be changed for specified frame objects. The releases to be applied are defined in a named set, which is then referenced in the stage-construction load case. These releases change the stiffness used for subsequent loading. They have no effect on loads already applied. Unlike the Change Section operation, which removes the object and replaces it with a new unstressed object, the Change Modifiers and Change Releases operations do not change the current stressed condition of the target objects. |
| | 1845 | An enhancement was made to Auto Edge Constraint (Assign menu> Shell > Auto Edge Constraint) for layered shells so that the constraint properties depend on the layer modeling type. Layers with the Membrane modeling type will not be used to determine constraint properties in the out-of-plane direction; layers with the Plate modeling type will not be used to determine constraint properties in the in-plane direction. |
| | 3343 | The hyperstatic load case used to calculate secondary forces due to prestress and other self-equilibrating loads has been enhanced to provide additional control over the solution method. The user can now select between distributed flexible spring supports or a statically-determinant set of three restraint points. In addition, the stiffness of the distributed springs can now be modified. Previously distributed springs were always used, since the three-point restraints only work for fully continuous structures, and the spring constants were determined automatically. The new options enable more user control for sensitive models, and are not normally needed. In addition, a warning is issued in the analysis log file (.LOG) if the applied reaction loads from the prestress load case do not appear to be self-equilibrating. |
| | 5271 | An enhancement was added allowing the age at loading to be specified in Nonlinear (Long Term Cracked) analysis when using creep and shrinkage parameters from the material properties. This feature was released with ETABS v19.0.0 but inadvertently omitted from the Release Notes. |
| | 6574 | An enhancement has been made to speed up computation and saving of static and dynamic participation factors by multi-threading and reducing file operations. Medium- to large-sized models with Modal cases (Ritz or eigen) requesting many modes should benefit the most provided that the analysis is run using multiple threads. |
| * | 6642 | An enhancement has been made to speed up nonlinear modal time-history (FNA) load cases for models with a large number of linear link elements that have zero damping (e.g. models with meshed base mats supported by an elastic foundation). |

| * | Ticket | Description |
|---|--------|-------------|
| * | 6997 | An enhancement has been made to improve the consistency of analysis results on Intel and AMD CPUs with an AVX2 instruction set. Most Intel and AMD CPUs released on 2015 or later support AVX2 instruction set and should benefit from this enhancement. For nonlinear analyses of numerically sensitive models, results should be more consistent when run on different CPUs. For typical well-conditioned models and linear analyses, no significant change is results is expected. |

## API
### *Enhancements Implemented*

| * | Ticket | Description |
|---|--------|-------------|
|   | 1262 | For the Application Programming Interface (API), the function DesignSteel.GetSummaryResults_2 has been updated to DesignSteel.GetSummaryResults_3. The new version of this function includes the unique name of the frame object for each result, which was missing from the previous version. |
|   | 2758 | The Application Programming Interface (API) has been updated for the functions and corresponding documentation that get and set values for the Preferences and Overwrites of the SP 63-13330-2012 concrete frame design. Previously, the API was missing certain function calls and the documentation was not consistent with these functions. |
|   | 7163 | An enhancement has been made to the Application Programming Interface (API) to now include functions and documentation for accessing the Eurocode 3-2005 steel frame design code, and documentation has been added for the functions accessing the Italian NTC 2008 steel frame design code. |

## Database Tables
### *Enhancements Implemented*

| * | Ticket | Description |
|---|--------|-------------|
|   | 2326 | An enhancement had been implemented to report the reactions in tabular format for the internal joints based on selections. If an auto-mesh assignment was made to a structural area object using the option to add restraints on area edges if the corner joints have restraints, then the option is now available to tabulate the reactions for internal joints on any area edge. To generate the tabular reactions for such joints, select the area object of interest along with the two corner joints of the area edge for which reactions are desired before requesting the table for joint reactions. |
| * | 6929 | An enhancement was made to add a table to display forces acting on a diaphragm. This table works on selected floor objects and selected load cases and load combinations. It tabulates applied, reactive, and net forces at column and wall locations. A corresponding graphical display was already available. |
|   | 7168 | An item was added to the Options > Database menu to allow printing database table documentation to Microsoft Word. |
|   | 7481 | A change was made to allow the selection of load cases for reporting the story stiffness in tables. In addition, the reporting of story stiffness for response-spectrum cases has been turned off, since the correspondence between different quantities is lost. Exception: response-spectrum reporting has been retained for Chinese license levels, which require response-spectrum values. |
|   | 7631 | An enhancement has been implemented to allow users to select the desired section cuts and generalized displacements for tabular output of results. Previously, users did not have this option and the tabular output was being generated for all section cuts and generalized displacements defined in the model. |

## Design – Composite Beam
### Enhancements Implemented

| * | Ticket | Description |
|---|--------|-------------|
| | 6908 | An enhancement to composite beam design per the BS5950 code has been implemented. When designing composite beams per the BS 5950 code, ETABS now enforces that flexural stresses in beams remain in the elastic range in accordance with BS 5950-3 Clause 6.3. The Composite Beam Design Manual BS 5950-1990 For ETABS has been updated accordingly. |
| | 6939 | An enhancement to composite beam design per the BS5950 code has been implemented. The minimum percentage of composite action to be provided for beams is now computed per Section 5.5.2 of the latest revision of BS5950-3.1. Note that this minimum percentage of composite action may be higher for some beams than computed in previous versions in ETABS. |
| | 6994 | The error message has been improved for the case where steel frame design attempts to design a castellated beam using an unsupported design code. Currently the design of castellated beams is only available for the AISC 360-16 code. Previously the reason that design was not being performed for these beams was not clear. Note that the presence of castellated beams in the model does not affect the design of other members, regardless of which design code is in use. |
| | 6998 | Two enhancements that facilitate the definition of castellated and cellular section properties were made in the Frame Section Property Data form: (1.) As the hole dimensions are entered, an elevation of the section showing the hole geometry is now displayed where the section profile was previously displayed. (2.) Hole dimensions that do not meet the Design Guide 31 Section 3.3 applicability requirements are now flagged as invalid when attempts are made to enter them. |

## Design – Concrete Frame
### Enhancements Implemented

| * | Ticket | Description |
|---|--------|-------------|
| * | 4960 | An enhancement has been made to the Eurocode 2-2004 concrete column design to more accurately calculate the slenderness ratio and slenderness limit. This now includes consideration of the reinforcement when calculating the slenderness limit, assuming symmetrically reinforced sections. These changes should remove the previously over-conservative second-order effects. Additional design preferences and overwrites have been added for more user control of the member design. The corresponding design verification column examples have been updated to demonstrate the use of both the nominal-stiffness and nominal-curvature second-order moment. |
| | 7358 | An enhancement has been made to the concrete frame design code "Eurocode 2-2004" changing the minimum limits for optimized TanTheta used in the shear design of beams to 0.5 for the Polish national annex and to 0.333 for the German national annex. Otherwise, the minimum limit imposed on TanTheta is 0.4 (EC EN 1992-1-1:2004 Sections 6.2.3(2)). By way of background, the shear design of beams considers the optimized Theta only when there is no seismic loading in the load combination and when there is no significant torsion, i.e., torsion is less than the cracking torsion value ($T\_Ed < (1- V\_Ed / V\_Rd,c) * fctd *TeffTorsion * 2 * Ak$), as per EN 1992-1-1:2004 Sections 6.3.2(1) and 6.3.2(5). After optimization, the minimum limit on TanTheta is imposed as specified above. |
| | 7500 | A change has been made to the concrete frame design using "ACI 318-19," in which the factored design torsion (Tu) is no longer increased to phi*Tcr if it is greater than phi*Tth. The previous implementation was too conservative for determinate structures and for structures for which torsion redistribution was not done. If redistribution is desired the user has control to modify the torsion stiffness modifier to obtain the desired Tu. |

## Design – Shear Wall
### Enhancements Implemented

| * | Ticket | Description |
|---|--------|-------------|
|   | 2055 | An enhancement was added in Eurocode 2-2004 shear wall design where Wall Ductility has been exposed in the Wall Design Preferences and Overwrites. Also, Boundary design is now limited to DCH and DCM walls only, as requested by many users. |
|   | 6766 | An enhancement was made to Eurocode 2-2004 shear wall design where now a warning message will be reported in the wall-design report when the axial load on ductile walls exceeds the limit 0.4*fcd*Ag, as required by Eurocode 8 section EC8 5.4.3.4.1(2). |
|   | 7059 | An enhancement was made to AS 3600:2018 shear wall design where shear amplification is now enforced for ductile walls only. There will be no amplification of shear for non-ductile walls. |
| * | 7820 | An enhancement was added for the AS 3600-2009 and AS 3600-2018 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 – Slab
### Enhancements Implemented

| * | Ticket | Description |
|---|--------|-------------|
| * | 4691 | An enhancement has been made for concrete slab design where now the pre-compression due to PT is reported for every design strip in the tabular output. |
| * | 4693 | An enhancement has been implemented where the moment capacity of design strips in a model with PT is now reported for every strip station. Strip-moment capacities can also be plotted in the graphical user interface. |
|   | 7119 | An enhancement was added for IS 456:2000 reinforced concrete slab design where option to increase flexural rebar in slab has been added in the Design Preferences for enhancing concrete slab shear capacity. When this option is activated and shear links are needed, flexural rebar is increased to avoid shear links in slab/mat. Flexural rebar is increased only when shear stress does not exceed the code specified maximum limit and when percentage of reinforcement in slab is less than 3 percent. |
|   | 7803 | ACI 318-19 reinforced- and PT-concrete slab design now provide an option in the Design Preferences to automatically increase flexural rebar in the slab to enhance concrete-slab shear capacity when needed. When this option is activated and shear links would be needed, flexural rebar is increased so as to avoid shear links in slab/mat. Flexural rebar is increased only when shear force does not exceed the code-specified maximum limit for concrete capacity in Section 22.5.5.1.1. |

## Design – Steel Frame
### *Enhancements Implemented*

| * | Ticket | Description |
|---|--------|-------------|
| * | 6975 | An enhancement has been made to the steel frame design codes Eurocode 3-2005, Italian NTC2008, and Italian NTC2018 in which the expression of Mcr is now being calculated according to Equation F.2 in Section F.1.2 of EN 1993-1-1:1992. It includes the $C2*zg$ and $C3*zj$ terms, where zg is the distance between the load application point and the shear center (zs), zj is defined in EC3:1993 Section F.1.2, and C2 and C3 are coefficients that depend on load conditions. Previously these terms were ignored and a simplified version of the formula for Mcr was being used. The term $C2*zg$ considers the destabilizing effect of a compressive load placed on top of the beam and that passes through the shear center. This term can be ignored when either the bending moment diagram is linear along a part of a member due to restraints or when the load is applied at the shear center and therefore no destabilizing moments can occur. However, the term $C2*zg$ cannot be assumed as zero for simply-supported beams without lateral restraint and with the load applied at the top or bottom flanges. The second term $C3*zj$ considers the effect of the section being singly-symmetric. The results were previously unconservative when the load was destabilizing and the beam was a deep beam. There are some limitations in the handling of Angle, Box, Pipe, Solid, Section Designer, General, and Non-prismatic sections as documented in the design manuals. These limitations are made with the intent that the design of non-standard (not typically used) sections will tend to be on the conservative side. |
| * | 7541 | An enhancement has been made to reconcile the design axis notations to the Eurocode 3-2005, Italian NTC 2008, and Italian NTC 2018 steel design codes. Previously, "Major" and "Minor" axis notations were used. They are now changed to "Y-Y" and "Z-Z". These changes have been made to the following database tables: 1) Steel Frame Design Overwrites, 2) Steel Frame Design Summary, 3) Steel Beam Envelope, 4) Steel Column Envelope, and 5) Steel Brace Envelope for the Eurocode 3-2005, Italian NTC 2008, and Italian NTC 2018 steel design codes. |
|  | 7843 | For steel frame design per the Eurocode 3:2005, Italian NTC 2008, and NTC 2018 codes, the values of the geometrical moments of inertia I22, I33, I23 are reported for angle sections in addition to the principal moments of inertia Iy, Iz, and Iyz (= 0). For all other sections, only Iy, Iz, and Iyz are shown. |

## Documentation
### *Enhancements Implemented*

| * | Ticket | Description |
|---|--------|-------------|
|  | 2194 | The documentation for the steel frame design code "IS 800:2007" has been updated to clarify the limitations when designing Section Designer sections. In particular, Section Designer sections do not contain enough information to adequately check local buckling, axial-torsional and flexural-torsional buckling, and flexural-lateral-torsional buckling. Design overwrites can be assigned to the members to provide capacity limits, or the automated design may need to be supplemented by hand calculations. |
|  | 3803 | Documentation for the command Analyze > Check Model has been added in the ETABS Help. |
|  | 3804 | The Help has been updated to clarify the various ways damping can be defined (load case, material property, link property) and how it affects response-spectrum and time-history load cases. |
|  | 6629 | An enhancement was made by documenting the Modulus of Rupture used for floor cracked-deflection calculations under "Material Property Data Form" when "Program Default" option is used. This default is dependent on the slab design code and is documented for each code. |

## External Import and Export
### *Enhancements Implemented*

| * | Ticket | Description |
|---|---|---|
| * | 5520 | An enhancement was made to the Perform3D import feature (File menu > Import > Perform3D Structure File) to support the following Perform3D nonlinear components: "Moment Hinge, Rotation Type", "Shear Hinge, Displacement Type", and "P-M2-M3 Hinge, Concrete Rotation Type". Additionally, the following load types were also added to the import feature: Self Weight, Nodal Loads, and Element Loads. |
| | 6647 | An enhancement has been made so that shell loads defined as a shell uniform load set are now exported to .EXR files for import into all versions of Revit. Note that the changes made in Revit to these exported load sets cannot be later re-imported in ETABS. |
| * | 7057 | An enhancement has been made to the import and export of data exchange .EXR files used by CSiXRevit. Now .EXR files exported from SAFE v20 and SAP2000 can now be imported into ETABS, and .EXR files exported from ETABS can now be imported in SAFE v20 and SAP2000, without going through CSiXRevit. |
| | 7161 | The import of floor plans from .DXF files has been enhanced such that slab strips can now be imported. The functionality is similar to the functionality previously available in the CSI product SAFE. |
| | 7217 | An enhancement to the export of walls to .EXR files has been implemented. Walls with a sloping base are now exported. Walls with a clearly sloping base (more than 2 degrees from horizontal and more than one-eighth of an inch difference in base elevations) are exported with their actual geometry, while walls with a slightly sloping base are exported with a rectified base with a warning to that effect in the .EXR log file. Previously, walls with a clearly sloping base were omitted from the export, with a warning to that effect in the .EXR log file, while walls with a slightly sloping base were exported but could not be imported by CSiXRevit. |
| | 7521 | An enhancement has been implemented where wall sections are now drawn in the floor plans exported from ETABS as .DWG and .DXF files. |
| | 7603 | An enhancement to the export of models as CIS/2 Step files has been implemented. Labels and names of exported objects and definitions containing non-ASCII characters are now exported with the ISO 10303-21 and ISO 10646 encoding of the non-ASCII characters. Previously, such label and names were exported with the non-ASCII characters replaced with their closest ASCII equivalents. |

## Graphics
### *Enhancements Implemented*

| * | Ticket | Description |
|---|---|---|
| * | 4694 | An enhancement was made to provide more display options in the model window(s) for PT tendons, including Number of Strands, Tendon System, Vertical Profile Control Points, Vertical Profile Values, Total Length, Jacking Force, and Elongation. These can be turned on and off using the command View > Set Display Options > Other Assignments. |

## Installation and Licensing
### *Enhancements Implemented*

| * | Ticket | Description |
|---|---|---|
| * | 6593 | The version number has been changed to 20.0.0 for a new major release. |

## Loading
### *Enhancements Implemented*

| * | Ticket | Description |
|---|--------|-------------|
| * | 1721 | An enhancement has been made where temperature gradient loads can now be assigned to frames and shells. For frames, the temperature gradient loads can be assigned in the frame local-2 and/or local-3 directions. For shells, the temperature gradient load can be assigned in the local 3 direction. Temperature gradient loads represent the change in temperature per unit of distance from the neutral axis of the member, and they tend to cause bending moments and/or deformations. |
| | 6669 | An enhancement was added for the UBC 97 auto seismic (Drift) load pattern where the minimum base-shear enforcement based on UBC Equation 30-6 is no longer enforced as per UBC section 1630.10.3. |
| * | 6844 | An enhancement was made to allow automated pattern live loading to be specified. An Auto-Pattern load is available that creates multiple load patterns from specified live loads on slabs, each loading a single slab panel. The results for these are available in a auto-created Load Case with a range combination which gives maximum/minimum values assuming any combination of these slab panels are loaded at any time. This can then be used in design. When default design combinations are requested an additional gravity loading combination is made using the auto-pattern load case. |
| * | 7108 | An enhancement was made to add Pattern Live load as an option in the types of loadings. This allows the user to consider different placements of live loads to get maximum responses. The user can combine these in the loading combinations to get more patterns. If default design combinations are requested or needed in design then the program automatically creates a loading combination of "Range" type of all the different Pattern Live defined which gives maximum and minimum values of every response quantity based on any combination of these Pattern Live loads acting simultaneously. This Range combination is then added to the Dead loads to give an additional design combination together with the usual Dead plus Live combination. When Pattern Live loads are used in default loading combination a Pattern Live Load factor is applied as specified in the Concrete Design Preferences as a factor on top of the Live Load scale factor. The default value of the Pattern Live Load factor is 0.75. |
| * | 7540 | An enhancement has been implemented to add the AS/NZS 1170.2:2021 auto wind loading code. |
| | 7630 | An enhancement was implemented to incorporate Amendment 1 to the NZS 1170.5-2004 code for the code-based response-spectrum function and the auto-seismic loading. |
| | 7781 | An enhancement has been made for the default loading combinations for Chinese Design codes based on changes in the "General Specification for Seismic Resistance of Buildings and Municipal Works", GB55002-2021, Section 4.3.2. The gravity load factors, when combined with seismic loads, have been changed from 1.2 to 1.3, and the seismic load factors have been changed from 1.3 to 1.4. Additionally, in accordance to "General Specification for Steel Structures", GB55006-2021, Section 5.2.3, a factor of 0.5 is applied to notional loads in load combinations that include seismic loads. |
| | 7784 | A change was made to restrict Auto Chinese Wind and Seismic loads to the Chinese versions of the software. They were inadvertently left open in the international version. |
| | 7819 | An enhancement was implemented to add an option to the NZS 1170.5 auto-seismic load pattern to consider the structure as a single story. When this option is selected, the Ft value is set equal to zero and that load is instead redistributed over the height of the structure. |

## Results Display and Output
### *Enhancements Implemented*

| * | Ticket | Description |
|---|--------|-------------|
| | 5907 | An enhancement was implemented to repeat certain table columns in reports when the table is split into multiple parts. Repeated columns are typically used for object labels and similar identifying information. |

| * | Ticket | Description |
|---|--------|-------------|
| | 6986 | An enhancement was made so that, for load combinations and design results, only the last step of a nonlinear static load case with Floor Cracking Analysis enabled will be considered. This is to facilitate processing of floor cracking results where only the final step is relevant for design. This change does not affect the analysis results from the load case, which will continue to save the initial step (0th step) as well as the steps specified in the load case's Results Saved setting. This change does not affect nonlinear static load cases where the Floor Cracking Analysis is set to None. |
| | 7863 | The default values of the zero tolerance have been reduced for the Section Dimensions Length4 and Length6 items of the display units. The previous default values would sometime cause certain section properties to be reported as zero when using larger length units, such as meters, for typical structural sections. This is a display issue only. No results are affected. The zero tolerance can be changed using the Options menu > Display Units. |

## Structural Model
### *Enhancements Implemented*

| * | Ticket | Description |
|---|--------|-------------|
| * | 1709 | An enhancement was made to add new, non-structural geometric entities to the model called Support Lines. The user can draw these objects as poly-lines that connect support points (columns, walls, beams, restraints and springs) such that each line segment represents a span. A layer tag (A or B) can be associated with these Support Lines. Each layer represents Support Lines running essentially parallel to adjacent ones. The Support Lines in the two layers then represent an interconnected mesh demarcating Slab Panels. Support lines can be used to automatically generate Slab Panels, lay out Design Strips, and lay out Post-tensioning Tendons. The Support Lines are also used to control meshing. Support Lines can be drawn and edited on-screen. They can also be automatically generated along grid lines, with some tolerance to allow for slightly offset columns and walls. Replication is available. |
| | 5022 | An enhancement has been implemented to allow users to specify the rebar material for vertical and horizontal wall-hinge reinforcement when the assignment is made to wall areas using the uniform-rebar-ratio option. |
| * | 5024 | An enhancement was made to add the capability for automatic generation of frame nonlinear hinges for columns modeling walls and beams modeling coupling beams. The generated hinges are based on recommendations in ASCE 41-17, Table 10-19 for flexure controlled members and Table 10-20 for shear controlled members. |
| | 6653 | An enhancement was made to remove the effect of non-structural joints (for example joints defining Strip Objects only) from dividing frame objects or creating edge constraints. |
| * | 6943 | An enhancement was made to allow moment and shear releases to be specified in a floor slab along a line inside the slab object. Releases were already available at at the edges of slab objects. |
| | 6963 | An enhancement was made to time-dependent material properties that now provides a scale factor for each of the available time-dependent behaviors. For concrete materials, this is the Compressive Strength and Stiffness (Modulus of Elasticity), Creep, and Shrinkage. The respective scale factors multiply the change in strength or stiffness, the creep strain, or the shrinkage strain. The default scale factors of unity preserve the previous behavior. |
| * | 7036 | An enhancement was made to add non-structural geometric entities to the model called Slab Panels. The Slab Panels are defined as portions of slabs surrounded by lines of support or free slab edges. These are currently used in the program for automatic pattern loading and summarizing displacement and soil-pressure results. Slab Panel edges are also used as lines for meshing. Slab Panels can be added automatically using rectangular grids or already defined support lines. They can also be drawn and edited onscreen. Replication is also available. |
| | 7205 | An enhancement was made to the model-initialization form to allow selection of the geographical region for generating default material properties. Material types (steel, concrete, rebar, etc.) not available for the selected region will default to built-in material properties. |

| * | Ticket | Description |
|---|---|---|
| * | 7513 | AS3600-2018 is added to the types of time-dependent material properties available for concrete materials, supporting creep, shrinkage, and age-dependent stiffness behavior. |
| | 7561 | An enhancement has been implemented to allow users to specify hysteresis data for certain types of auto-hinges assigned to frame objects. Previously, the hysteresis data could only be specified for user-defined hinges. The hysteresis data now applies to auto-hinge types "From Tables In ASCE 41-13", "From Tables ASCE 41-13 with EC8 2005, Part 3 Acceptance Criteria", and "From Table ASCE 41-17". Also, the hysteresis data only applies to the following tables: Concrete Beams, Concrete Columns (M2 and M3 degree of freedom only), Steel Beams, Steel columns (M2 and M3 degree of freedom only), and Steel Braces (Axial). Note that only single degree-of-freedom hinges are impacted by this enhancement. Fiber hinges already use the hysteresis specified for the fiber materials, and the parametric PMM hinge allows for kinematic and degrading hysteresis. The remaining interacting hinges assume isotropic hysteresis. |
| | 7582 | An enhancement was made to warn the user when no slabs or beams have been assigned to be considered for cracking analysis, but a floor cracking load case is specified to be run. The option to consider slabs and beams for cracking is an assignment under the Assign menu. |
| * | 7634 | An enhancement has been made to lump the mass from auto-meshed walls to story levels when the option to lump mass to story levels is turned "ON". Previously, only mass from manually meshed walls was lumped at story levels, while mass from internally meshed walls was left at the interior nodes. This caused local wall modes to be picked up in the analysis. |
| | 7780 | Enhancement request to add tendon materials per GB 50010-2010 standard to the material library for Chinese region. |

## User Interface
### *Enhancements Implemented*

| * | Ticket | Description |
|---|---|---|
| * | 1138 | An enhancement has been made to add on-screen tools for measuring line lengths, the angles between two lines, and the areas and perimeters of closed polygons. These tools can be accessed from View > Measure menu item. |
| | 2987 | An enhancement has been made to allow control over the visibility for layers, design strips, slab rebars, slab panels, support lines, and strain gauges using the command View > Set Display Options. Previously, this functionality was only available for point, frame, area, link, and tendon objects. |
| | 7241 | An enhancement was made to add a warning message when requesting that a load combination be converted to a nonlinear load case if there are loads present in the load combination that cannot be included in the nonlinear load case to be created. Examples include response-spectrum load cases and nested load combinations. |
| | 7551 | New tool buttons have been added to the Area Assignment Toolbar for assigning uniform load sets and nonuniform loads to area objects. |

## Analysis
### *Incidents Resolved*

| * | Ticket | Description |
|---|---|---|
| | 2035 | An incident was resolved where the analysis was not able to run for certain models with nonlinear hinges assigned to walls due to material index error. When this error occurred, trying to run the analysis would display the error message "Unable to write Hinge Fiber" and the analysis was terminated. This was not common. |
| | 6624 | An incident was resolved where the user-specified output time step size for quasi-static load application and nonlinear static load case was ignored and the default output time step size of 1 second was used. Results were consistent with the time step used, and for many models they provided useful engineering results. |
| * | 6703 | An incident was resolved where a model that had P-M3 Fiber hinges assigned to wall objects may have experienced extremely large stiffness-proportional damping in linear direct-integration time-history load cases when stiffness-proportional damping was enabled. This issue only affected models where the analysis model for nonlinear hinges option (Analyze menu > Analysis Model for Nonlinear Hinges) was set to "Model Hinges as Separate Link Elements". This issue did not affect static, modal, or nonlinear direct-integration time-history load cases, and it did not affect models where the hinges were modeled within elements. This issue only affected ETABS versions 19.0.0 to 19.2.0. |
| * | 7505 | An incident was resolved where nonlinear static and staged-construction load cases could converge with equilibrium errors that were larger than expected when large external loads were applied. When this occurred, the errors were typically in a direction or region of the model not significantly affected by the external load. For example, horizontal reactions in one portion of the model may be out of balance due to large vertical loading in a different region of the model. The effect of this error was negligible for most models. Now equilibrium convergence is measured using the relative convergence tolerance times the magnitude of the internal forces, rather than the previous approach of considering the larger of the internal and external forces. This change will have no impact on most models, and will tend to increase iteration and improve equilibrium for other models. A few models that previously converged may now fail to converge under the tightened equilibrium requirements; this can usually be resolved by improving the stability or conditioning of the model. Note that the behavior of the pure event-to-event solution strategy is not affected by this change, except that the reported equilibrium error could be larger; no other results will be affected. |

## API
### *Incidents Resolved*

| * | Ticket | Description |
|---|---|---|
| | 1646 | An incident was resolved for the Application Programming Interface (API) where the function cDesignConcrete.GetSummaryResultsBeam_2 could incorrectly return blank for the argument ErrorSummary. |
| | 1713 | An incident was resolved for the Application Programming Interface (API) where the functions cLoadPatterns.Add, cLoadPatterns.GetLoadType, and cLoadPatterns.SetLoadType did not always set or get the correct values for the enumeration eLoadPatternType, specifically for the values after 14. |
| | 1794 | An incident has been resolved for the Application Programming Interface (API) where the functions cDesignSteel.VerifySections and cDesignCompositeBeam.VerifySections did not return NumberItems and MyName properly. Specifically, NumberItems was returned as "0" and MyName was returned as an empty array. |
| | 1827 | An incident has been resolved for the Application Programming Interface (API) where the function DesignSteel.SetDesignSection did not work properly, and the analysis section was being used instead for design. |

| * | Ticket | Description |
|---|--------|-------------|
| | 1877 | An incident was resolved for the Application Programming Interface (API) that addressed two issues affecting the functions cDesignCompositeBeam.SetDesignSection, cDesignConcrete.SetDesignSection, and cDesignSteel.SetDesignSection: (1.) In order for these function to work, the corresponding type of design must have been run on at least one element in the model. This is not consistent the corresponding design-section overwrite option for member design when performed in the graphical user interface. Now, design need not be run prior to using these functions. (2.) These functions were assigning the specified design section to all applicable frame objects that were currently selected, in addition to the members specified as input to the function. Now these functions only affect the specified members. |
| | 2023 | An incident was resolved for the Application Programming Interface (API) where the function cAreaObj.SetLocalAxes did not properly update the display of the local-axis arrows, even though the actual values were correctly set and the behavior of the model was as expected. This was a display issue only. |
| | 2098 | An incident was resolved for the Application Programming Interface (API) documentation to clarify that the function cStory.SetStories_2 can only be used when no structural objects exist in the model. The provided example code has also been updated so that it shows the correct use of this function in a model without any objects. |
| | 3767 | An incident was resolved for the Application Programming Interface (API) where the function cPropFrame.GetAllFrameProperties_2 could return the incorrect value of the argument PropType. |
| | 6599 | An incident was resolved for the Application Programming Interface (API) where the function cDatabaseTables.GetTableForDisplayArray did not work correctly if the field names were different from the field keys. |
| | 6892 | An incident was resolved for the Application Programming Interface (API) where the function DatabaseTables.GetTableForEditingArray function was providing null keys for some items. This issue affected version 19.1.0 only. |
| | 6902 | An incident was resolved for the Application Programming Interface (API) where the function PropPointSpring.SetLinks was not setting the links on the point spring property when using a COM client. Corrections were also made to the examples for the SetLinks and GetLinks functions in the API documentation. |
| | 6904 | An incident was resolved for the Application Programming Interface (API) where a client application referencing a newer API DLL (ETABSv1.dll or CSiAPIv1.dll) that had recently added classes/interfaces would fail when using cHelper.GetObject*() methods to attach to a running local or remote GUI instance referencing an older API DLL that lacked the aforementioned new classes/interfaces. |
| | 7040 | An incident was resolved for the ETABS Application Programming Interface (API) where using the function cFrameProp.SetPlate could produce a trapezoidal-shaped frame section property. When this issue occurred, the abnormal property could be viewed in the Frame Section Property Data form (Define menu > Section Properties > Frame Sections). The section properties used for analysis was consistent with section properties reported in the Frame Section Property Data form for the trapezoid shape. |

## Data Files
### *Incidents Resolved*

| * | Ticket | Description |
|---|--------|-------------|
| | 1236 | An incident was resolved where exporting a steel or concrete section to XML format in millimeter units and then re-importing would corrupt the section dimensions, and also affect the rebar layout for concrete sections. The issue did not affect the export/import in other length units. |
| | 7173 | An incident was resolved to correct the coefficient of thermal expansion values for concrete materials in the Indian and Spanish material libraries. Models that added materials from these libraries will have produced results consistent with the coefficient of thermal expansion shown in the material property definition. |

| * | Ticket | Description |
|---|--------|-------------|
| * | 7761 | An incident was resolved where the depth and width of unequal angles imported form AISC15.xml and AISC15M.xml libraries were switched. Consequently, the program was showing the longer leg as horizontal but the section properties in the database were based on the longer leg being vertical. This was an issue in the section database itself and has now been addressed. No other section libraries were affected by this bug. Older files that use unequal angles from the AISC15 databases will have the error corrected when opened in the new version by reimporting the section. Older versions of the program can replace the AISC15 databases in their section libraries and reimport any unequal angles used in the models. |
| * | 7871 | An incident was resolved where a certain model with corrupted nonlinear stress-strain values was not able to run analysis. Now if corrupted nonlinear stress-strain data is encountered when a model is opened or imported from a model text or database file, the data will be reset to default values. This was not common. |
|   | 7873 | An incident was resolved where "Material Property Design Data" for Cold-Form and Aluminum materials were not exported to .$ET/.E2K files. Importing such .$ET/.E2K file back into ETABS was causing "Nonlinear Material Data" to be corrupted for these materials. |

## Database Tables
### *Incidents Resolved*

| * | Ticket | Description |
|---|--------|-------------|
|   | 3378 | An incident was resolved where pier and spandrel design reports generated from the Project Report command did not populate the material values or/and material strength factors, which were defaulted to zeros. This was a reporting issue only and no design results were affected. |
|   | 5627 | An incident was resolved where tabular output for the "Max Drift/Average Drift" and "Max Displacement/Average Displacement" tables was not available for the Chinese license levels. |
|   | 6504 | An incident was resolved where using the interactive database (Edit menu > Interactive Database) to edit "Frame Assignments - Hinge" tables for auto-generated hinges might have the unintended effect of removing user-defined hinges that were assigned. This issue primarily occurred when altering the "Frame Assignments - Hinge - ASCE 41-13 - Steel Beam" table. When this issue occurred, the change in hinge assignment was correctly reflected in the database tables, display, right-click menu, and "Frame Assignment Hinges" form (Assign menu > Frame > Hinges). |
|   | 6658 | An incident was resolved where the "Show Selection Only" option did not always work correctly when displaying the tables "Pier Section Properties" and "Spandrel Section Properties". |
| * | 6716 | An incident was resolved where selecting multiple rows in a displayed "Shear Wall Pier Design Summary" table could cause the software to terminate abnormally. No results were affected. |
|   | 6831 | An incident was resolved where database table "Grid Definitions - Grid Lines" were showing length units for Angle. This was just a display issue in the tabular output. No results were affected. |
|   | 7199 | An incident was resolved where the acceleration or velocity units displayed in the column headers for the following tables were incorrect: "Joint Velocities - Relative", "Joint Velocities - Absolute", "Joint Velocities - Generalized - Relative", "Joint Velocities - Generalized - Absolute", "Joint Accelerations - Generalized - Relative" and "Joint Accelerations - Generalized - Absolute". No results were affected. |
|   | 7280 | An incident was resolved where an error could occur during automatic tabular output to Microsoft Access after running analysis more than one time. This was due to an inability to overwrite the existing Access file that was generated during an earlier analysis run. Manually deleting the file would prevent the error. Now the file can be overwritten on subsequent runs, provided that it is not in use. |

| * | Ticket | Description |
|---|--------|-------------|
|  | 7436 | An incident was resolved where using the interactive database (Edit menu > Interactive Database) to edit the "Frame Assignment - Hinge - User" table with the "Selection Only" option enabled had the unintended effect of removing the user-type hinge assignments in frame objects that were not selected. This issue only occurred for user-type hinges and when the "Selection Only" option was used for the interactive database. When this issue occurred, the change in hinge assignments was reflected in the database tables, display, right-click menu, and the "Frame Assignment Hinges" form (Assign menu > Frame > Hinges). |
|  | 7645 | An incident was resolved where interacting P-M2, P-M3, M2-M3, or P-M2-M3 hinges that had been created or modified through interactive database editing (Edit menu > Interactive Database) could not subsequently be changed from a program-generated interaction surface to the "User Definition" interaction surface option using the Hinge Property Data form (Define menu > Section Properties > Frame/Wall Nonlinear Hinges). Trying to open the "Interaction Surface Definition" form would cause an abnormal termination. This issue did not affect the generated hinge property or the analysis results. |
| * | 7733 | An incident was resolved where the weight and mass used in analysis for CoreBrace Buckling Restraint Braces could have been incorrect. The weight and mass were being calculated based on the yielding area of the section instead of the overall weight of the member. This has now been corrected. Users should rerun their models to verify that overall design is not impacted. |

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

| * | Ticket | Description |
|---|--------|-------------|
|  | 6605 | An incident affecting composite beam design reporting per all AISC and CSA codes was resolved. In the report section listing the composite beam design preferences, the reported position of shear studs within the ribs did not always match the position actually selected. This error, which occurred in ETABS versions 18.0.0 to 19.1.0, was a reporting error only and did not affect the beam designs. |
|  | 6816 | An incident affecting the composite beam design per all available codes for beams with concentrated loads has been fixed. When determining the shear-stud distribution for a composite beam with concentrated loads, ETABS did not always compute a number of shear studs sufficient to develop the required composite beam-bending capacity at the various concentrated load points. While the code-specific Composite Beam Design Manuals did disclose that ETABS did not check the bending capacity of the beams at concentrated load points, they also incorrectly stated that a sufficient number of shear studs was computed. When an overstress occurred, it was typically of the order of one percent. This incident affected all versions of ETABS capable of designing composite beams. In addition, a related enhancement has been implemented. When designing a composite beam with concentrated loads, ETABS now reports the bending-capacity check at the most critical concentrated load point if it happens to control the design. This is in addition to the other strength checks already reported in both the Interactive Composite Beam Design form and in the composite beam design output. |
|  | 6907 | An incident affecting composite beam design per the BS5950 code has been resolved. When computing the capacity of stud-headed shear connectors placed on a beam adjacent to a deck with its ribs perpendicular to the beam, ETABS always used the value of the k-factor applicable to a deck with re-entrant rib profiles, instead of using the value of the k-factor corresponding to the actual deck's rib geometry. While this was as documented in the "Composite Beam Design Manual BS 5950-1990 For ETABS", it may have occasionally resulted in ETABS calling for fewer shear studs than required . The manual has been updated and the deck's rib geometry in the BS 5950-1990 CBD Ex001.edb verification model has been modified in order to keep the design results consistent with the independent results. All versions of ETABS capable of designing composite beam per the BS5950 code were affected. |

| * | Ticket | Description |
|---|--------|-------------|
| | 7157 | An incident was resolved which affected composite beam design. When the load combinations selected for composite-beam deflection design were nested (i.e., load combinations that included other load combinations in their definition), the dead-load deflection and the total deflection of the beams were underestimated. This affected all versions of ETABS that offered composite-beam design. When this occurred, the error was obvious in the output. The strength of the composite beams designed by ETABS was not affected. Prior to designing composite beams, ETABS now checks that the load combinations selected for composite-beam deflection design are not nested. Also, attempts to select nested load combinations for the deflection check in the Design Load Combos Selection form will now cause an error message to be displayed. |
| | 7159 | An incident affecting composite beam design per the AISC 360-16 and EC2004 codes was resolved. Under a relaxed set of deflection criteria, certain beam section properties could pass the strength check assuming composite action, and pass the deflection check without it – although with a computed bottom-flange tensile stress then exceeding the yield stress. When designing such beams, ETABS did not always call for enough shear studs to satisfy the elastic bottom-flange stress check and instead deemed the design not acceptable. When the beam was assigned an auto-select list, a slightly heavier section than strictly required was selected. When the beam was assigned a regular section, the beam was marked as failed in the design results, although it could be made to work if designed interactively. This issue did not occur with the default deflection criteria, and when it occurred, the error was conservative. All versions of ETABS that check composite beam bottom flange stresses, i.e ETABS v17.0.0 and later, were affected. |
| * | 7322 | Two related incidents affecting composite beam design have been resolved. (1.) When a story level was surrounded by a wall along its periphery, ETABS underestimated the floor length and width it computed while checking beam vibrations acceptability per the AISC Design Guide 11 Second Edition criteria. (2.) Floor openings were not taken into account when computing these floor lengths and widths. These incidents affected all versions of ETABS capable of checking vibrations acceptability per the the AISC Design Guide 11 Second Edition criteria, that is v17.0.0 to v19.1.0. When either of these incidents occurred, the values used by ETABS were reported in the design output. It was possible to specify different values in the Composite Beam Design overwrites. The strength design of the beams was not affected. Both incidents have been resolved, with the floor length and width now properly computed based on the adjacent floor and floor-opening objects. |
| | 7933 | An incident was resolved which affected composite beam design per the AISC 360-16 code in models defined in length units other than inches. In models defined in millimeters or centimeters, ETABS would specify more shear studs than required to satisfy the minimum average nominal shear stud capacity of 16 kips per foot mandated by AISC Commentary Section I3.2d for beams with spans greater than 30 ft., and in models defined in feet or meters, ETABS would not check that clause explicitly, although the number of shear studs it called for was still sufficient to provide an equivalent percentage of composite action. Only ETABS 19.1.0 was affected; beams with spans of 30 ft. or less, or designed assuming 50% or more partial-composite action were never affected. When the error occurred, it produced conservative designs and was obvious. |

## Design – Concrete Frame
### Incidents Resolved

| * | Ticket | Description |
|---|--------|-------------|
| | 5293 | An incident was resolved for the SP 63.13330.2012 Russian concrete frame design code where the "Snow Load Duration Factor" preference was not taken into account when performing a cracked analysis. Instead, the whole snow load was being considered as short-term. Additionally, the computation of phi3 factor is now enhanced to interpolate values between 1 and 1.2 when section is in pure bending, whereas when the whole section is in tension then phi3 is taken as 1.0. |
| * | 6622 | An incident was resolved for Eurocode 2-2004 concrete beam design where calculation of the Tcr parameter was not including the effect of the factor (1 - VEd/VRdc). The design results were unconservative for torsion rebar. |

| * | Ticket | Description |
|---|--------|-------------|
|   | 6681 | An incident was resolved for ACI 318-19 concrete frame design where computation of the Cm factor was conservatively taken as 1.0 when a response-spectrum load case was present in a design load combination. |
|   | 6989 | An incident was resolved for the TS 500-2000 concrete frame design code where the "Summary" and "Flexural Details" tabs of the design report were showing incorrect units for "Capacity Ratio", and also an incorrect value for "Rebar %" when the column was being checked for a provided amount of rebar. These were just reporting issues and design results were not otherwise affected.In addition, design output tables "Concrete Column PMM Shear Envelope - TS 500-2000" and "Concrete Column PMM Shear Envelope - SP 63 13330-2012" have been renamed to "Concrete Column PMM Envelope - TS 500-2000" and "Concrete Column PMM Envelope - SP 63 13330-2012". This change was made to more accurately reflect their content, which has not changed. |
|   | 7197 | An incident was resolved for the ACI 318-14 concrete frame design code where the Beam Element details (Envelope) results were not correctly displaying the table "Shear Force for Major Shear, Vu2". This was just a reporting issue and design results were not affected. |
| * | 7281 | An incident was resolved for concrete column and wall design based on the TS 500-2000(R2018) code where the axial limit under gravity plus seismic loads was enforced as 0.5*fck*Ag instead of 0.4*fck*Ag. Design needs to be re-run with the new version to ensure that columns and walls do not exceed the code allowable limit. |
|   | 7489 | An incident was resolved for AS 3600-09 and AS3600 -2018 concrete frame design code where parameter delta_b and the design moments were incorrectly reported in the design report when column was designed. Delta_b and designed moments were reported based on the last interaction curve that had the maximum percentage of reinforcement in column rather than the percentage of designed rebar. However, this was only a reporting issue and design results were not affected. Furthermore, column check with provided reinforcement were also not affected. When columns are designed, eight interaction curves are used to compute column capacity. The designed rebar may be in between two interaction curves say 1% and 2%. In this case, ETABS will report the delta_b factor based on 2% reinforcement while designed reinforcement may be between 1 to 2% of reinforcement. In this case delta_b value has an approximate value. Exact value of delta_b can only be obtained using Column Check option instead of Design. |
|   | 7544 | An incident was resolved for "ACI 318-19" concrete frame design where the minimum top longitudinal rebar for flexural design was too conservative for all T-beams of all framing types if there was any negative moment. Previously, the minimum was enforced in these cases based on the assumption that bw was the smaller of 2*b and b_flange, per Section 9.6.1.2 of "ACI 318-19" code. But the use of this enlarged bw is actually only required for statically determinate T-beams where the flange is in tension, per Section 9.6.1.2. Now this enlarged bw is only used for cantilever T-beam where the flange is in tension. |
| * | 7760 | An incident was resolved for Italian NTC 2008 concrete frame design code where enforcement of minimum shear rebar was incorrect when model default database length unit was not mm. |

## Design – Shear Wall
### Incidents Resolved

| * | Ticket | Description |
|---|--------|-------------|
|   | 2404 | An incident was resolved for pier boundary zone design where the assumed position of the neutral axis was not correct when the pier longitudinal rebar was to be designed instead of being checked. The neutral axis depth was computed based on the originally provided rebar ratio instead of the as-designed rebar ratio for P-M-M design. |
|   | 6628 | An incident was resolved for Eurocode 2-2004 shear wall design where changes made in Ticket 5680 for the ETABS v19.1.0 release have been reverted back. Now, the minimum boundary width is being computed as the larger of 0.15 * pier-length and 1.5 * pier-thickness. When boundary length is larger than the pier length then ETABS will report the boundary length equal to the pier length and the user needs to provide confinement to the entire pier leg. |

| * | Ticket | Description |
|---|--------|-------------|
| | 6797 | An incident was resolved where interactive design of a wall pier could, in certain cases, return an error after importing a table. In addition, an incident was resolved where the wall pier D/C ratio could be incorrectly reported as infinity for general pier sections after using the Interactive Database Editor to modify associated pier data in tables "Section Designer Shapes - Concrete Rectangle" and "Section Designer Shapes - Reinforcing - Line Bar". |
| * | 6947 | An incident was resolved for IS 456:2000 shear wall design where boundary design was including non-seismic as well as seismic load combinations. Now only seismic load combinations for ductile walls are included in the boundary design. |
| | 7075 | An incident was resolved for ACI 530-11 Masonry wall design where default load combinations were not being generated. This issue was inadvertently introduced in ETABS v19.0.0 to v19.1.0. |
| | 7479 | An incident was resolved for ACI 318-11 spandrel shear design where Ahmin was being enforced as 0.0015 instead of 0.0025. |

## Design – Slab
### *Incidents Resolved*

| * | Ticket | Description |
|---|--------|-------------|
| | 5204 | An incident was resolved for one-way, ribbed-slab and waffle-slab systems where the design was overly conservative due to the use of an incorrect total depth for design purposes that was much smaller than the depth of the actual system. Analysis results were unaffected by this error. |
| * | 6845 | An incident was resolved where the average punching-shear stress instead of the maximum punching-shear stress was being checked against the stress limit for determining whether shear reinforcement should be allowed. |
| | 7107 | An incident was resolved for ACI 318-19 reinforced- and PT-concrete slab design where the Asmin required by the design code was altered when shear force in the design strip required shear links to enhance the concrete slab shear capacity. This modification of Asmin has now been restored back to the ACI 318-19 limit. |

## Design – Steel Frame
### *Incidents Resolved*

| * | Ticket | Description |
|---|--------|-------------|
| * | 2036 | An incident was resolved for the concrete frame design code "Eurocode 2-2004" where transverse loads acting on columns were being neglected while designing or checking for PMM interaction since the procedure used to calculate the equivalent moment was incorrect. Now the moments Ma, Madd, and Mdesign are correctly determined. This error was normally not significant since most columns do not carry significant intermediate in-span lateral load. |
| * | 2864 | An incident has been resolved in steel frame design codes "AISC 360-16", "AISC 360-10", and "KBC 2016" and composite column design codes "AISC 360-16" and "AISC 360-10" in which the B1 factor was calculated based on the pure Euler buckling force Pe1 with unmodified EI instead of EI* when the Direct Analysis Method was used (AISC 360-16 Appendix 8.2.1, AISC 360-10 Appendix 8.2.1) with certain conditions. The results were affected when Direct Analysis Method was used with Tau_b fixed or Tau_b variable for either generalized second-order method or amplified first-order method of amplification. The results were not affected when Direct Analysis Method was not used or when Direct Analysis Method was used but no modification was assigned in the preferences. The resulting PMM ratio was slightly unconservative. |
| | 2865 | An incident was resolved for AISC 360-16 steel frame deign where no warning was reported in the design output when a brace member with moderate ductility was used in a SCBF setting. |

| * | Ticket | Description |
|---|--------|-------------|
| | 5307 | An incident was resolved for the AISC 360-10 steel frame design code where the section-compactness check for columns and beams were not being performed for BRB frames. Separately, design output and design documentation have been updated for the AISC 360-16 and AISC 360-10 steel frame design codes to reflect the correct code sections. These latter changes were cosmetic only and design results were not affected. |
| | 6454 | An incident was resolved for steel frame design where the warping constant (Cw or Iw) was not reported for the Tee, Angle, and Double Angle sections in the AISC 360-16, AISC 360-10, AISC 360-05, AISC LRFD 93, AISC ASD 89, AS 4100-1998, BS 5950-2000, CSA S16-14, Eurocode 3-2005, IS 800:2007, Italian NTC 2018, Italian NTC 2008, KBC 2016, KBC 2009, NZS 3404:1997, and SP 16.13330.2017 design codes. This was a reporting error only, and no design results were affected. Note that the value may be displayed as "Not Required" in cases where is it not used by the design code or has an insignificant effect for the section type. |
| | 6951 | An incident was resolved for NZS3404 steel frame design where the slenderness classification for the web of the doubly-symmetric, wide-flange I-section for bending about the minor axis was being checked to determine if it was compact or non-compact. Now the web is assumed to be compact for all cases. In addition, values for the slenderness limits have also been corrected. |
| | 7099 | An incident was resolved where joint design was being performed for SidePlate joints as part of steel frame design. Such joints are to be designed by SidePlate suppliers outside of ETABS, and will no longer be designed as part of steel frame design. |
| | 7265 | An incident was resolved for steel frame design code "Chinese 2018" in which some of the section numbers of relevant Chinese codes in the reported error messages were incorrect. This was a reporting error only. No other results were affected. |
| | 7266 | An incident was resolved for steel frame design codes "Eurocode 2-2005" and "Italian NTC 2018" where the resultant stress ratio reported on the Steel Stress Check Information form did not match the sum of the component ratios reported. This happened when torsion was dominant as its component ratio was not reported. This has now been improved. Moreover, for the "Italian NTC 2018" code, the reported interaction equation name was incorrect in the detailed report when the governing equation was "EC3 6.2.7(1)-6.23". This was a reporting issue only. The actual calculations and design results were correct. |
| | 7267 | An incident was resolved in steel frame design codes "Eurocode 2-2005" and "Italian NTC 2018" in which the torsional strength for hollow box shapes was miscalculated. From elastic theory, the torsion strength of such sections is defined by the following equation: $T,Rd = tau\_rd*(2*Ao*t)$ where $tau\_Rd$ is the maximum allowable shear stress that, for steel members, is approximated by $eta* (fy/gamma\_0)/sqrt(3)$ for non-slender sections and $chi* (fy/gamma\_0)/sqrt(3)$ for other section (EN 1993-1-5:2006 Section 5.3, Table 5.1); Ao is the area enclosed by the centerline perimeter; and t is the thickness of the section. Ao was being taken as $Ao = (bf – tf) * (h – tw)$. This has been corrected to $Ao = (bf – tw) * (h – tf)$. There was no error for sections with constant wall thickness, and only a minor effect if the thickness of the webs (tw) was different from that of the flanges (tf). |
| | 7777 | An incident was resolved for the Italian NTC 2018 steel frame design code where setting the design preference "Consider P-Delta Done?" to "Yes" did not properly limit the automatically calculated K factors to unity. Now, K factors calculated to be greater than 1.0 are set to 1.0 when P-Delta is considered to be done. Calculated K factors can be larger or smaller than 1.0 when "Consider P-Delta Done?" is set to "No". |
| | 7789 | An incident was resolved for the Russian steel frame design code "SP 16.13330.2017" in which the phi_b factor was not being calculated correctly because the effective length L_eff was taken as K_LTB * L_22 instead of K_LTB * L_LTB. In the default case where L_22 and L_LTB are determined automatically from the framing condition, they are equal and the results were not affected. However, for frame members for which point bracing or uniform bracing were specified, or whose unbraced lengths were overwritten, then the values L_22 and L_LTB could be different, and the phi_b factor could have been incorrect. |

| * | Ticket | Description |
|---|--------|-------------|
|   | 7805 | An incident was resolved for Russian steel frame design code "SP 16.13330.2017" in which the member color displayed in the "Steel Stress Check Information" window was based on the maximum stress ratios considering P-M interaction, maximum shear stress, and equivalent stress ratios. However, the reported text said that the color was based on the P-M interaction ratios. The "Steel Stress Check Information" form has been updated to include maximum shear stress and equivalent stress ratios. The "Display Steel Design Results" form has been updated to include the following items in the design output section: "Max Ratio Colors & Values", "Max Ratio Colors/No Values", "Max Ratio Colors/P-M Values", "Max Ratio Colors/Average Shear Ratio Values", "Max Ratio Colors/Max Shear Ratio Values", and "Max Ratio Colors/Equivalent Ratio Values". The calculated P-M ratios for the equations "SP 8.2.3 Eq. 51" and "SP 9.1.1 Eq.105" have also changed for the circular sections as the bending components are now subjected to the square root of the sum of squares. |
|   | 7814 | An incident has been resolved for Steel, Concrete, Composite Beam, Composite Column, and Steel Joist frame design, so that now overwriting the design section will remove the Auto Select Section that was assigned to the member before. Previously, if the design section was overwritten, the Auto Select Section was not removed. |
| * | 7894 | An incident was resolved for steel frame design codes "Eurocode 3-2005" and "Italian NTC 2018" where the moment capacity reduction factor for shear, rho, was being miscalculated as unity (1.0) for the case where $V_{Ed}/V_{pl,Rd} < 0.5$, but $V_{Ed}/V_{pl,T,Rd} > 0.5$. This affected the calculation of $M_{y,V,Rd}$. When $V_{Ed}/V_{pl,Rd} > 0.5$, the calculated rho factors were correct. However, the minor-direction rho factor was incorrectly reported to be the same as the major direction rho factor. The effect of this error tended to be unconservative. |
|   | 7929 | An incident has been resolved for the steel frame design code "SP 16.13330.2017" where the phiB calculation was not correct for singly-symmetric I-shapes under certain conditions: (a) the shape was a singly-symmetric I-shape, (b) the narrower flange was under compression, (c) nCoeff = I1 / (I1 + I2) < 0.7, i.e., the flanges were not very different, (d) Leff_LTB > 5*b2, where b2 is the width of the narrower flange, and (e) bending moment was significant in the member. If all these conditions were met, then Phi2 calculated with equation SP 16.13330.2017 G.4 Eq. (G.7) should not be modified per section SP 16.13330.2017 Annex G.6. However, Phi2 was being modified per section SP 16.13330.2017 Annex G.6 for all cases. The effect was that Phi2 was being modified by a factor (1.025 - 0.015 * LeffOverb2) when it should not have been, and eventually PhiB was reduced per section SP 16.13330.2017 Table G.3. The results were slightly conservative for such a case. |

## Documentation
### *Incidents Resolved*

| * | Ticket | Description |
|---|--------|-------------|
|   | 6614 | An incident was resolved that corrected Equation 3.8 in the "Material Time-Dependent Properties" Technical Note documentation. This was a documentation issue only and did not affect the analysis results. |
|   | 6671 | An incident was resolved where pressing F1 to get Help when using the Rebar Selection Rules form would cause an error condition. |

## Drafting and Editing
### *Incidents Resolved*

| * | Ticket | Description |
|---|--------|-------------|
|   | 1315 | An incident was resolved where the Edit operation "Divide Frames" using "Break at Intersection with Selected Frames and Joints" was not working for curved frames. |
|   | 1801 | An incident was resolved where drawing a column object in plan view with the "Cardinal points" option set to a non-default value would result in an incorrect insertion-point assignment. |
|   | 6755 | An incident was resolved where user was not able to switch between grids and the arch layer while column-drafting. |

| * | Ticket | Description |
|---|--------|-------------|
| | 7576 | An incident was resolved where using the reshaper tool to edit a tendon layout graphically would not work correctly and the tendon would move to elevation zero. When this happened, the error was obvious, and results agreed with the model as edited. |

## External Import and Export
### *Incidents Resolved*

| * | Ticket | Description |
|---|--------|-------------|
| | 2845 | An incident affecting the export of models to CIS/2 Step files was resolved. ETABS exported all model point objects and line objects, even when the Export Selected Objects option in the Create CIS/2 STEP File form was chosen. This affected all versions of ETABS capable of exporting models to CIS/2 Step files. ETABS now exports only the selected point and line objects, plus their connected point objects, when the Export Selected Objects Only option is chosen. |
| | 6641 | An incident was resolved where ETABS story levels were not exported from ETABS to .EXR files for import into Revit. This affected ETABS v19.1.0 only. When the .EXR files exported from ETABS were imported into Revit projects which did not already contain story levels matching the ETABS levels, the error was visually obvious. |
| | 6657 | An incident was resolved where models with joint springs could not be exported to Perform3D. |
| | 6842 | An incident was resolved where model exported from ETABS v19 to PERFORM 3D v7 was unable to run analysis due to an indexing problem in the exported Wall Hinge material properties. |
| | 6938 | An incident was resolved which affected the export of ETABS models with vertical rectangular area objects to Architectural Coordination View IFC files. These area objects were exported at an incorrect location, shifted from their correct locations by half the width of the area object. When this occurred, the error was visually obvious. This affected all versions of ETABS capable of exporting IFC files. |
| | 7023 | An incident was resolved where exporting to Perform3D a steel beam or column containing auto-M2 hinge in ETABS was creating the default FEMA beam/column properties in Perform3D. Now the steel beam/column is exported containing the hinge as in the ETABS model. |
| | 7025 | An incident was resolved which affected the import of IFC files. IFC files containing escape sequences specifying non-ASCII characters encoded per the ISO 8859, ISO10646 and Unicode standards could not alway be imported. This affected all versions of ETABS capable of importing IFC files. When this occurred, nothing was imported, and the import log file identified the problematic entities. IFC files containing characters encoded per the ISO 8859, ISO10646 and Unicode standards can now be imported. Characters encoded per the ISO 8859, ISO10646 and Unicode standards include all characters in current use. |
| | 7235 | An incident affecting the export back to Revit of models initially imported from Revit was resolved. After importing a model into ETABS from a Revit project, when a copy of a frame section property was created using the Add Copy of Property option of the Frame Properties form and then assigned to some frame objects, those frame objects would be exported back to Revit with the original section property instead of the newly created and assigned section property. This affected all versions of ETABS capable of exchanging data with Revit. Frame objects assigned section properties created with the Add New Properties and Import New Properties options of the Frame Properties form were exported correctly. |
| | 7259 | An enhancement to the import of .EXR files containing Revit curved framing elements has been implemented. Revit curved framing elements that are not horizontal are now meshed at import and imported as a series of short straight line objects. Previously, they were imported as curved line objects which could occasionally cause some unexpected behavior as curved line objects that are not horizontal are not supported in the ETABS database editing or design post-processors. |

| * | Ticket | Description |
|---|--------|-------------|
| | 7462 | An incident was resolved that addressed two issues for the export of models from ETABS to Perform3D: (1.) Joist sections exported from ETABS caused errors in Perform3D as it does not accept zero sectional properties for torsion and minor moment of inertia. Now small values are exported instead of zeroes for these properties. (2.) In certain cases, a triangular area object in ETABS was being exported as a warped (non-planar) quadrilateral to Perform3D, rather than the expected behavior of converting the triangle to three, non-warped quadrilaterals. |
| | 7549 | An incident affecting the import of .DXF files containing open polylines with curved segments has been resolved. The corresponding frame objects were being imported at the wrong locations. When this occurred, the error was obvious and the results agreed with the model as imported. This affected ETABS v19.0.0 and v19.1.0. Earlier versions of ETABS did not import open polylines and were unaffected. A related enhancement has been implemented for the import of .DXF files containing arcs and open polylines with curved segments that are not horizontal. These are now meshed upon import and imported as a series of short, straight line objects. Previously, they were imported as curved line objects, which could occasionally cause some unexpected behavior as curved line objects that are not horizontal are not supported in ETABS for database editing or design post-processors. |
| | 7596 | An incident was resolved that addressed several issues affecting the import of CIS/2 Step files: (1.) CIS/2 Step files containing print-control directives or character strings containing escape sequences specifying non-ASCII characters encoded per the ISO 10646 standard could not be imported into ETABS. When this occurred, no imported model could be created. (2.) Character strings containing escape sequences specifying non-ASCII characters encoded per the ISO 8859 standard were imported without any conversion of the escape sequences into the characters they specified. When this occurred, the error had no impact on the results. Only the labels of imported entities were affected. (3.) As an enhancement, the error messages reporting fatal errors encountered while ETABS first parses a CIS/2 Step file now include the line number of the problematic line. Note that these error messages are distinct from other error messages reporting incomplete or otherwise incorrect entity definitions in the CIS/2 Step files, which already include the problematic entity number. |
| | 7821 | An incident was resolved which affected the export of floor plans to DXF files when the selected drawing units differed from the ETABS database length units: the generated dimension lines were drawn some distance away from the grid lines they were meant to refer to. When this occurred, the error was obvious and the model and its results were unaffected. This did not affect cases where the drawing units were consistent with the ETABS database length units, which are the units that are in effect when an ETABS model is created or imported. |

## Graphics
### *Incidents Resolved*

| * | Ticket | Description |
|---|--------|-------------|
| | 1517 | An incident was resolved where the extruded shape of a column was shown incorrectly rotated when the column local 2-axis was rotated from default value of zero degrees and a non-default insertion point was assigned. |
| | 1956 | An incident was resolved for the display of a concrete L-shaped columns where the web and flange thicknesses were switched in plan views. This was a display issue only and no results were affected. |
| | 2245 | An incident was resolved where the Special One-way Load Distribution arrow did not match with local-1 slab axes when the area object had more than 4 nodes. This was a display issue only and no results were affected. |
| | 4817 | An incident was resolved in the display of a concrete L-shaped beam where the web and flange thicknesses were switched in extruded views. This was a display issue only and no results were affected. |
| | 5133 | An incident was resolved where openings drawn on floors between two story levels were shown twice: On the correct floor, but also on the floor at the story above. This was a display issue only. Results were not affected. Only the display in standard graphics mode was affected, and DirectX graphics mode. |

| * | Ticket | Description |
|---|--------|-------------|
| | 6046 | An incident was resolved where, in DirectX graphics mode, snapping to the fine grid would not work properly. It was working as expected in Standard graphics mode. |
| | 6462 | An incident was resolved where drawing a joint object while in DirectX graphics mode would not show the drawn joint on the screen until the view was refreshed. This was a display issue only. |
| | 6591 | An incident was resolved where creating and printing a report containing graphics would sometimes cause an error condition when the display graphics mode was DirectX. |
| | 6928 | An incident was resolved where display of deflected shape for multi-step load case was causing an error condition "Running out of memory" in standard-graphics mode under certain conditions. This error occurred right after the animation was started. |
| | 7664 | An incident was resolved where, when toggling a plan view between extruded and normal (non-extruded), previously reshaped shell objects would appear as not reshaped. This was a display issue only, the shell objects were still correctly reshaped. |
| | 7720 | An incident was resolved where developed elevations were not updated when one or more towers were deleted from the model. Because of this, requesting Elevation views could cause an abnormal termination. Results were not affected. |

## Loading
### *Incidents Resolved*

| * | Ticket | Description |
|---|--------|-------------|
| * | 605 | An incident was resolved where in certain rare configurations load was not correctly transferred to adjoining points, beams or walls from a membrane floor object. One such case was when only one edge had a beam support and the floor was specified to span parallel to the beam. Another case was when a edge was supported on a beam which would end up getting meshed into multiple beams and the floor would not. |
| | 1129 | An incident was resolved where, in very flexible diaphragms, the assumed distribution of wind load based on a semi-rigid diaphragm could excite local behavior, appearing as if a small eccentricity had been introduced. A better distribution that includes the extreme points is now implemented. Equilibrium was always satisfied. |
| | 6778 | An incident was resolved where importing an ETABS text file (.E2K, .$ET) was resetting the UBC 97 auto-seismic load patterns to default values. This issue affected versions 19.0.0 to v19.1.0. |
| | 7162 | An incident was resolved where auto-wind load for Mexican code was not available. This issue was inadvertently introduced in v19.0.0 to v19.1.0. |
| | 7759 | An incident was resolved for IS 1893:2002 and IS 1893:2016 auto seismic load case where reported spectral acceleration (Sa/g) in the Project report was not shown correctly for a user-specified time period. This was just a reporting issue and computed loads were not affected. |

## Results Display and Output
### *Incidents Resolved*

| * | Ticket | Description |
|---|--------|-------------|
| | 2077 | An incident was resolved where values were shown on only one loop of each contour color instead of being shown on all loops of the same color. This only affected plots when the option to show values was selected. The contours themselves were correct, only some of the values were missing. |
| | 3530 | An incident was resolved where the shell stress values shown under the cursor were sometimes not correct in DirectX graphics mode when moving the cursor over a stress-contour display. The contour plots themselves were not affected by this error. |
| | 3868 | An incident was resolved where the "Max" values reported for the on-screen display of strip forces could have been incorrect. This occurred only for double-valued load combinations or multi-valued load cases. This was only a display issue and did not affect values reported in tables or used in design. |

| * | Ticket | Description |
|---|--------|-------------|
| | 3869 | An incident was resolved where the direction option for Non-Uniform Load was disabled in the Display > Show Shell Loads form, which prevented the display of Shell Non-Uniform Loads in different directions. |
| | 3972 | An incident was resolved where the joint drift reported by right-clicking on a joint and that reported in the drift table for that joint were sometimes different. This only happened when a brace was connected to that joint but no columns. Now the same logic that uses the displacements from the two ends of the brace to calculate the drift is used for both reporting methods. Previously the right-click value was using the upper brace point and the point vertically below it rather than the lower end of the brace. |
| | 4201 | An incident was resolved where specifying two or more quadrilaterals in a section-cut definition would not give any results. Section cuts defined with a single cutting quadrilateral were not affected by this issue. |
| | 4202 | An incident was resolved where non-uniform shell loads would not display correctly. Non-uniform loads applied in all load patterns would display together even though a particular load pattern was selected for display. Results were not affected. |
| | 5986 | An incident was resolved where section cuts drawn on screen would not work in elevation view when DirectX graphics mode was used. GDI+ graphics mode did not have this issue. Also section cuts in plan views were not affected by this error for either graphics mode. |
| | 6606 | An incident was resolved where the auto lateral loads to stories and diaphragms were not being plotted in the story response plots for load patterns of type Seismic (Drift). |
| | 6621 | An incident was resolved where the display of "Max and Min" results for piers was causing the numerical results to overlap, making them difficult to read. |
| | 6690 | An incident was resolved where the software would sometimes terminate unexpectedly if the main window was minimized immediately after generating a report, and then later the window was maximized again. |
| | 6707 | An incident was resolved where the Story Response Plots operation (Display menu > Story Response Plots) was unable to plot results when the output type was set to "MaxMin" or when viewing results from an enveloped load combination for the display types "Diaphragm CM displ", "Diaph drifts", or "Max Story Drifts". This was a display issue only. Results were not affected. |
| | 6729 | An incident was resolved where exporting a report to a Word document would result in an error, and the resulting document could not be opened in Word. This was an issue only in version 19.1.0. |
| | 6779 | An incident was resolved where displaying area force/stress contours in two windows did not update the contours value correctly when Windows were minimized and then maximized again. This was just a display issue and no results were affected. The contour plots themselves were correct. However, the values shown under the cursor for the two windows would be the same but only correct for one of the windows. |
| | 7029 | An incident was resolved where the control to select the direction of uniform area load to display was disabled on the form. |
| | 7192 | An Incident was resolved where rotational ground-acceleration loading was not being included when reporting absolute displacements, velocities, and accelerations for joints or generalized displacements in modal time-history load cases, linear and nonlinear (FNA). This only affected the reported absolute values, which were identical to the relative values. All other results (relative motion, forces, stresses, energies, etc.) were correct. Translational ground-acceleration loading was not affected. Direct-integration time-history results were not affected. |
| | 7242 | A change has been made to refine the calculation of the area of floor objects with curved boundaries. This is just a reporting item and does not affect the model or its loading. |
| | 7485 | An incident was resolved where area (shell) load contours would not display correctly when adjacent area objects had connectivity issues, i.e., when the points for two area objects were very close to each other instead of being a common point. |

## Section Designer
### *Incidents Resolved*

| * | Ticket | Description |
|---|--------|-------------|
|   | 1419 | An incident was resolved where Section Designer sections when drawn with their centroids away from the origin in Section Designer and assigned to a column would appear offset from the joint in plan view. This was incorrect. The default centroid of the column section is always taken at the joint and any offset should be specified through a Cardinal point assignment or a joint offset assignment to the column. This is irrespective of where the section is drawn in Section Designer. This was a display issue only and no results are affected. |
| * | 2210 | An incident was resolved where the program terminated abnormally when a concrete Section Designer section was created without rebars and an attempt was made to display the interaction surface. The menu items and tool bar buttons for displaying section properties, interaction surfaces and moment curvature plots are now only enabled when these quantities are available. |
|   | 3183 | An incident was resolved where the display of an unsymmetrical I section appears incorrect in Section Designer if the top and bottom flanges have different thicknesses. This was a display issue only. |

## Structural Model
### *Incidents Resolved*

| * | Ticket | Description |
|---|--------|-------------|
|   | 2837 | An incident was resolved where merging two floor areas was reversing the area local 3-axis for the merged area. |
|   | 4174 | An incident was resolved where assigning a multi-story spandrel in a multi-tower model was generating the error message "Error building Spandrel Sections", preventing the spandrel from being assigned. |
| * | 5779 | An incident was resolved where the Floor "General Mesh" option was not explicitly meshing at column locations above the floor, only at column locations below the floor. |
|   | 6608 | An incident was resolved where force-controlled shear hinges assigned to walls with the option for the program to calculate the shear strength were not working and were using a default value for shear strength. Hinges with user-specified shear strength were not affected by this issue. |
|   | 6704 | An incident was resolved where applying the "Do Not Allow Hinges To Drop Load" hinge overwrite assignment (Assign menu > Frame > Hinge Overwrites) to a frame object did not prevent Parametric P-M2-M3 hinges from having strength loss. In some cases, auto-generated Parametric P-M2-M3 hinges based on ASCE 41-17 returned an error when the "Do Not Allow Hinges To Drop Load" hinge overwrite assignment was used, preventing analysis from being run. This issue has been resolved and the "Do Not Allow Hinges To Drop Load" hinge overwrite assignment will now disable strength loss in Steel and Concrete Parametric P-M2-M3 hinges. |
|   | 6937 | An incident was resolved where precast concrete frame sections would have a torsional constant, J, of zero. |
| * | 7008 | An incident was resolved where the torsional constant for concrete-filled and concrete-encased steel composite sections was calculated as zero. This error affected sections defined in or imported into ETABS v19.1.0 only. Earlier program versions did not have this error. Older models opened in v19.1.0 using .EDB model files were also not affected. |
|   | 7013 | An incident was resolved where tower assignments applied to special user joints (those not connected to any structural element) would not be retained when the model was saved and reopened. |

| * | Ticket | Description |
|---|--------|-------------|
| | 7028 | An incident was resolved where a beam object that was assigned a column-type frame section property could have caused analysis to terminate with an error message when running a Nonlinear Static load case with Floor Cracking Analysis enabled. An example of a column-type frame section property is a rectangular concrete frame section with the reinforcement design type set to "P-M2-M3 Design (Column)". This issue did not affect load cases where Floor Cracking Analysis was disabled or unavailable and did not affect linear results. This issue has been resolved and cracked section analysis can now be considered for beam objects assigned with a rectangular concrete frame section with the reinforcement design type set to "P-M2-M3 Design (Column)". |
| * | 7046 | An incident was resolved where, when an ASCE 41-17 auto-generated hinge was created using Tables 10-8 and 10-9 (Concrete Columns) and with the option "Controlled by Inadequate Development or Splicing" (Assign menu > Frame>Hinges), the generated hinge property was corrupt and could have caused the software to terminate unexpectedly when viewing the backbone curve of the hinge (e.g. Define menu > Section Properties > Frame/Wall Nonlinear Hinges). The hinge behavior was incorrect and was not able to exhibit nonlinear behavior at the specified yield strength, and the LS and CP acceptance criteria values in the hinge properties would be incorrectly set to 0 (zero). This issue did not affect ASCE 41-17 concrete column hinges where "Not Controlled by Inadequate Development or Splicing", the default option, was selected. |
| * | 7143 | An incident was resolved where a hinge of the type "Parametric Steel P-M2-M3" that has the option "Use Yield Forces" selected for the force scale factors in the Hinge Property Data form (Define menu > Section Properties > Frame/Wall Nonlinear Hinges) would compute an incorrect yield moment in the Axis-3 bending direction (M3). The incorrect yield moment was too small, typically in the range of 30% to 50% of the correct value. Only doubly-symmetric steel sections were affected. Moment M2 was not affected. When this issue did occur, the analysis results were consistent with the moment M3 scale factor shown in the Hinge Property Data form of the generated hinge property. This issue did not affect other hinge types or Parametric Steel P-M2-M3 hinges that had user-specified force scale factors. |
| | 7194 | An incident was resolved where the capacity calculated for auto M2 and auto M3 SDOF (single degree-of-freedom) hinges for a column-type concrete section was assuming the total rebar to be distributed half on compression face and half on the tension face, regardless of the direction of loading. The capacity will now based on the actual distribution of rebar specified in the section property for column-type sections. This issue did not affect any of the P-M2-M3, P-M2 or P-M3 hinges which would normally be used for column-type sections. |
| | 7207 | An incident was resolved where the section properties calculated for a built-up section with a bottom cover plate but no top cover plate did not correctly account for the cover plate. Results agreed with the calculated section properties as shown for the section property. |
| * | 7389 | An incident was resolved where torsional properties of concrete filled pipe was set to zero causing instabilities during analysis. |
| * | 7569 | An incident was resolved where the shrinkage strain calculated using the Eurocode 2-2004 type time-dependent material property was larger than expected. This issue occurred due to an extra square root in the calculation for the beta_ds factor. Analysis results were consistent with the documentation, which was also incorrect. Both the shrinkage behavior in analysis and the documentation has been corrected to be consistent with Eurocode 2-2004. |

## User Interface
### *Incidents Resolved*

| * | Ticket | Description |
|---|--------|-------------|
| | 1599 | An incident was resolved where, for the exponential damper nonlinear link property, if the display units were different that the database units, the value of the "Damping" input was updated automatically when the value of the "Damping exponent" was changed by the user. This behavior has now been modified where the specified damping value will not change when the exponent value is changed. Instead, the specified value is assumed to be the actual damping value (in the current display units) for the specified exponent and is saved internally in database units. The reason for the previous behavior was that the units of the damping coefficient are related to the exponent on the velocity term. However, to simplify user input, unit conversion will not be performed while the entering the exponent value. Proper handling of the units will be maintained for all analysis calculations and results are not affected. |
| | 2100 | An incident was resolved where the Geometry parameters on the Wall hinge Reinforcement form were not updated to reflect the selected wall object when a single wall object is selected. Most of this data was only for reference and does not affect the wall hinge assignment. Only the Start Zone and End Zone Lengths affected the hinge assignment. |
| | 6654 | An incident was resolved where the tool buttons for assigning pier and spandrel labels to shell areas were inadvertently removed from the shell assignment toolbar. These have now been restored. |
| | 6754 | A incident was resolved related to the form "Force-Deformation Data for Parametric Steel P-M2-M3 Hinge" for steel parametric hinges specified with Curve Shape "Elastic Perfectly Plastic" and Strength Loss "Dependent on P". The M3 backbone curve displayed on the form with P level set to "P lower (PL)" did not correctly show the Force/SF value at point C to be the same as point B. This was a display issue only for this form. The correct values were used for analysis, and results were not affected. |
| | 7390 | An incident was resolved where additional mass assigned to a frame was not displayed in correct units in the graphical user interface. This was just a display issue and analysis results were not affected. |
| | 7427 | An incident was resolved where, in some models, the wrong object was highlighted on the screen when a object-related record was selected in the database tables. |