CSiBridge v24.1.0 Release Notes

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Notice Date: 11-October-2022

This document lists changes made to CSiBridge since v24.0.0, released 11-March-2022. Items marked with an asterisk (*) in the first column are more significant.

Analysis

Enhancements Implemented

*	Ticket	Description
*	8404	A change has been made to the reporting of joint reactions and base reactions for nonlinear static and staged-construction load cases. Previously joint-force loads and acceleration loads applied at restrained degrees of freedom were excluded from the reported joint reactions at these degrees of freedom, including their contribution to overall base reactions. This was intentional for matching the reactions to the force reported in the connected frame objects when performing pushover-types of analyses. However, this is now changed to be consistent with the reactions reported for most other types of load cases, including linear static, nonlinear direct-integration time history, and modal time history, including FNA. This is a reporting issue only. No other results are affected, including the reactions at flexible supports (spring support and one-joint links). The only change in restraint reactions will be due to joint-force loads applied directly on the joint and apportioned acceleration loads from connected objects, including from mass directly assigned to the joint.
*	8947	The speed of influence-based moving-load analysis has been significantly improved for certain models. The third phase where vehicle classes are permuted on the various lanes is now much more efficient when there are multiple vehicle-class assignments on a larger number of lanes. The first phase where the influence lines are computed, and the second phase where vehicles are moved along and across the lanes, are not affected. Results are not affected.

API

Enhancements Implemented

*	Ticket	Description
*	8529	The following enhancements have been made to the Application Programming Interface (API): (1.) The new function cHelper.GetObjectProcess() can be used to attach to any running instance of CSiBridge given its process ID. (2.) A new command "Set as active instance for API" has been added to the Tools menu. This command will make the current instance of CSiBridge the "active instance" so that it will then respond to subsequent calls to cHelper.GetObject() function. If the current instance is the active instance, then this command is disabled. In either case, the process ID of the current instance is displayed for use with the new function cHelper.GetObjectProcess(). (3.) A new interface cPluginContract has been added to simplify plugin development. (4.) Speed has been improved for external .NET clients that call the API by chaining properties and methods (e.g. mySapObject.SapModel.PointObj.GetElm) in deeply nested loops.

Bridge Design and Rating

Enhancements Implemented

*	Ticket	Description
*	2243	The strength design of substructure (bent) columns has been added according to the AASHTO LRFD 2020 code. Design is controlled by defining one or more Design Requests which can specify a set of load combinations, bent columns, column stations, and other parameters to be considered. Similar columns and stations with similar reinforcement can be designed together. The cross section used to calculate capacity can be different from that used for demand, so that different section shapes, materials, and rebar layout can be quickly iterated for design. Results for each Design Request are provided in the form of an Excel spreadsheet that can be used for further calculations and for inclusion in reports. The spreadsheets include plots of the PMM interaction for visualizing demand and capacity. Design results are also available in database tables for display, export, and reporting.
*	8786	Bridge seismic design has been enhanced to add a new measure for the displacement demand and capacity of the bents. Previously, deformation was always measured as the difference between the transverse or longitudinal displacement at the top of the bent and the bottom of the columns, hence measuring only the deformation of the bent itself. The new measure is simply the transverse or longitudinal displacement at the top of the bent, hence measuring the deformation of the entire substructure, including the foundation. The original "Bent Only" displacement measure is consistent with the formula-based capacity measures for Seismic Design Categories B and C, and will always be used for these cases. The new "Bent Plus Foundation" measure is more consistent with the nonlinear static pushover analysis used for Seismic Design Category D, and hence is generally recommended for this case. The new measure will tend to produce more conservative demand-capacity ratios when the foundation is elastic and flexible, especially for more ductile columns. On the other hand, it may be less conservative for models where there is substantial plastic deformation in the foundation before column yielding, or for more massive foundations where the demand comes from the foundation itself. New models will default to the new full-substructure measure, while older models opened in the new version will use the bent-only measure unless subsequently changed.

Bridge Modeler

Enhancements Implemented

*	Ticket	Description
	8249	An enhancement has been implemented for the Bridge Modeler where parametric variation can now be assigned to the offset from the reference point to the insertion point for user-defined bridge sections. This is applicable to spine models, area models, and solid models. Note that the variation of the individual polygon points in the user-defined bridge section is only available for the spine model.
	8284	The Bridge Modeler has been enhanced for the editing of user-defined bridge sections in Section Designer. Previously the lines drawn to specify girder centerlines needed to extend significantly past the top and bottom slab reference lines in order to be properly recognized. The tolerance has been changed so the girder centerlines drawn just to the slab reference lines, as well as those that extend beyond the slab lines, will be recognized.

Data Files

Enhancements Implemented

*	Ticket	Description
	8273	Three new section-property database files have been added for steel sections produced by certain Indian manufacturers: (1.) TATA_Steel.xml, containing data for steel Pipe/Tube sections manufactured by the TATA group of companies. (2.) Jindal_Steel.xml, containing data for steel I/Wide Flange sections manufactured by Jindal Steel Ltd. (3.) APL_Steel.xml, containing data for steel Pipe/Tube sections manufactured by APL Apollo Ltd.

*	Ticket	Description
	8487	A built-in material library has been added for Canada. The library contains steel materials per the CSA G40.20-13/G40.21-13 standard, concrete materials per the CSA A23.3 standard, and rebar materials per the CSA G30.18:21 standard.
	8770	The Chinese frame-section database has been updated where section properties for some of the frame sections have been corrected and several new frame sections have been added for I/Wide Flange, Tee, Angle, and Pipe shapes.

Database Tables

Enhancements Implemented

*	Ticket	Description
*	3958	An enhancement has been implemented that adds two new database tables, "Bridge Object Forces with Tendons" and "Bridge Object Girder Forces with Tendons". These complement the existing tables "Bridge Object Forces" and "Bridge Object Girder Forces", which exclude tendon forces in the results. The two new tables essentially provide the secondary prestress forces on the full bridge section or the individual bridge girders, respectively. These four tables now provide the equivalent data that is available on the Bridge Object Response Display form when toggling the Include Tendon Forces option.

Design – Concrete Frame

Enhancements Implemented

*	Ticket	Description
	2114	Concrete frame design for the Eurocode 2-2004 code has been enhanced to consider the extra longitudinal reinforcement required due to shear according to equation 6.18 of Eurocode 2-2004 clause 6.2.3. This enhancement was previously released in CSiBridge v24.0.0, but was inadvertently omitted from the Release Notes.

Installation and Licensing

Enhancements Implemented

*	Ticket	Description
*	8268	The version number has been changed to v24.1.0 for a new intermediate release.

Loading

Enhancements Implemented

*	Ticket	Description
	8929	An enhancement has been implemented to update the New Zealand vehicle library to incorporate changes introduced in the NZTA Bridge Manual v3.4.

Results Display and Output

Enhancements Implemented

*	Ticket	Description
	6587	An enhancement has been made to allow users to choose colors for Hinge State and Hinge Status for analysis of models with nonlinear frame hinges. This can be accessed using ribbon command File > Settings > Output Colors or menu command Options > Color > Output. The colors are now consistent in deformed-shape display, plots of hinge force-deformation, and in the forms where the nonlinear properties are specified.

User Interface

Enhancements Implemented

*	Ticket	Description
	6541	An enhancement has been implemented to expose additional DirectX settings that can be set for each view window, providing more advanced control of the graphical display. These can be found under the ribbon command Home > View > More > DirectX View Settings or the menu command View > DirectX View Settings.

Analysis

Incidents Resolved

*	Ticket	Description
	8289	An incident was resolved where link elements with a triple-pendulum property that had the U2 and/or U3 degrees of freedom set to linear did not use the specified linear effective stiffness in nonlinear load cases. The triple-pendulum link property has been changed so that now the U2 and U3 degrees of freedom are always nonlinear, similar to the U1 degree of freedom. Older models that had triple-pendulum link properties with the U2 and/or U3 degrees of freedom set to linear will have these degrees of freedom changed to nonlinear upon opening the model in CSiBridge v24.1.0. For such older models, the nonlinear properties will default to zero unless they had been previously defined, and this may make the model unstable or change the behavior from the previous version. Note that such models are uncommon, but they should be updated with realistic nonlinear values for affected triple-pendulum property definitions.
*	8438	An incident was resolved where link elements with a viscous damper property (Linear with non-zero damping coefficients, Exponential Damper, or Bilinear Damper) could experience forces that did not correspond to the velocity of the element. This issue only occurred in direct-integration time-history analyses where the Geometric Nonlinearity option was set to "P-Delta plus Large Displacements". When this issue occurred, the damper elements notably did not return to a small or nearly-zero force value after the structure had come to a standstill.
*	8515	An incident was resolved where the flexibility of fiber hinges in frame objects was not included in the stiffness-proportional damping used for direct-integration time-history load cases. This issue was most apparent when all or most of the frame-object length was modeled as fiber hinges and resulted in very large stiffness-proportional damping forces which could prevent the frame object from experiencing significant deformations in time-history analyses. The effect on frame objects with fibers hinges that covered a small part of the object length was significantly less pronounced. This issue was only present in CSiBridge v24.0.0 and did not affect older versions of the software. This issue only affected direct-integration time-history load cases where stiffness-proportional damping was used. Models that were affected by this issue should be rerun.
*	8762	An incident was resolved where, when target-force loads were applied to a frame object with time-dependent material behavior (e.g., creep/shrinkage) during a stage that had non-zero duration, the target-force iteration did not check for target-force convergence at the end of the stage. When this occurred, the resulting force in the frame object could be quite different from the specified target value. This issue only affected nonlinear staged construction load cases where time-dependent material behavior was enabled. Note that this issue did not affect the equilibrium of the structure, but rather the possible difference between the specified target force and the load that was actually applied.
*	8825	An incident was resolved where a model that had P-M3 Fiber hinges assigned to frame objects may have experienced larger than expected stiffness-proportional damping in linear direct-integration time-history load cases when stiffness-proportional damping was enabled. This issue was more pronounced when the hinge length was a significant portion of the length of the frame. 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 affected CSiBridge versions 22.1.0 to 24.0.0.

*	Ticket	Description
	8852	An incident was resolved where the reported joint reactions did not always include the load applied to the joints for certain types of linear load cases, whether the load was applied directly on the joint or on connected elements. These load cases included linear direct-integration time history, linear frequency-domain time history, steady state, and PSD types. This issue only affect the reported reactions at restrained joints that included force loads, acceleration loads, and/or temperature/strain loads from connected elements, as well as force loads on the restrained joints themselves. Similarly affected were the reactions due to ground-displacement loads applied at joints grounded by springs. Reactions due to displacement loads on joints grounded through restraints or one-joint links were not affected. This was a reporting error only. No other results were affected.
	8962	An incident was resolved where the analysis could not be cancelled from the analysis monitor in the following situation: The Analysis Process Option had been changed to "Separate Process", then the parallel Load Case Option had been enabled, and then the Analysis Process Option had been changed back to "Auto" or "GUI Process" before running the analysis. These options can be set using the command Analysis > Analysis Options > Advanced SAPFire Options. When this occurred, the analysis could still be cancelled using the Cancel button on the main window instead of on the analysis monitor.

Bridge Design and Rating

Incidents Resolved

*	Ticket	Description
*	8294	An incident was resolved for steel I-girder bridge superstructure design and rating where a design or rating request could fail to run for a bridge object having more than one span if some girders were continuous and others were not continuous across a single-bearing bent support. To be considered as continuous, the steel I-girders on either side of the support must have the same transverse locations and the same elevations at the top of their webs. When this error occurred, the corresponding design and/or rating results were not available. This error affected versions 23.3.0 to 24.0.0.
*	8340	An incident was resolved for the bridge superstructure design and rating of steel U-girder bridges where design and/or rating requests would fail to run when there were girder-local section cuts between two general (full-width) bridge section cuts. The girder-local cuts could have been created by the Bridge Modeler for capturing the response at section transitions, staggered diaphragm, or splices. This error could be avoided by adding user discretization points at these local cut locations, this creating general section cuts. This error only affected version 24.0.0.
	8477	An incident has been resolved for bridge superstructure design where the design optimization feature was not available for the AASHTO LRFD 2020 code. Design results were not affected, only access to the optimization feature.
	8588	An incident was resolved for the bridge superstructure design and rating of steel I girder bridges where the design or rating request could fail to run if any of the steel I girders was of a nonprismatic section type that included two adjacent segments, one referencing a standard I-section and the other referencing a hybrid I-section, and either (or both) of the two segment lengths was shorter than 2 inches (5 cm). When this occurred, results were not available. This is not a common case.
	8901	An incident was resolved to correct the derivation of the nonprismatic tension-flange capacity. In the previous version the flange tension capacity was based on panel minimum, while now it is based on the local section-cut Rh factor. The previous derivation would typically result in a more conservative design/rating. Impacted deck section types include steel I-girder with nonprismatic hybrid sections. Impacted design/rating requests include AASHTO LRFD Steel I Strength for all AASHTO versions.
	8924	An incident was resolved for bridge seismic design where the design would fail to run if (1.) the Seismic Design Category was D, (2.) the Longitudinal Pushover Analysis option was set to "Full Bridge Along Chord", and (3.) the number of the girders in the one of the spans was more than that in the previous span. When this happened, an empty error message was displayed, and the seismic design process terminated without results. Results for other types of analysis and design were not affected.

Bridge Modeler

Incidents Resolved

*	Ticket	Description
	6283	An incident was resolved for the Bridge Modeler where the staged-construction operations "Change Section" and "Change Section & Age", when applied to link objects in a bridge group, would be changed or deleted if the associated bridge object was updated.
	7402	An incident was resolved for the Bridge Modeler that addressed two issues for the concrete solid-girder bridge section: (1.) In the bridge section data form, an irrelevant error message occurred when the overhang length was set to zero; (2.) Girder spacing was not adjusted accordingly when the bridge width and/or the overhang lengths were changed. Results agreed with the model as generated.
	7410	The Bridge Modeler now provides a warning when support-bearing overwrites are specified for invalid bearing numbers. For girder-by-girder bearing assignments, this means for a bearing number greater than the number of girders, except for the "Ext. Girders Sloped Max" concrete box-girder bridge section where bearings are also not available under the first and last (exterior) girders. A similar warning will be provided when the bridge object is updated if the bridge section was changed after valid support-bearing overwrites had been assigned.
	8320	An incident was resolved for the Bridge Modeler where the generated geometry of the top flanges of steel U-girders and their adjacent slab area objects would be modeled incorrectly if the parametric variations were assigned to the bridge-width related dimensions and the "Girder Layout Layout" option in the bridge-section data form was set to "Straight Line".
*	8323	An incident was resolved for the Bridge Modeler where a bridge object following a curved or kinked layout line with non-zero grade, and that was modeled using area or solid objects, could generate slightly incorrect longitudinal joint coordinates for some of the area/solid objects. The error was proportional to the vertical distance from the layout line, which is usually located at the top of the superstructure. When this occurred, the links that connect the bottom of the superstructure (either bottom of the bottom slab or bottom of the girders) to the top of the support bearings sometimes did not properly connect to the superstructure, which could cause the model to be unstable. This could be avoided by setting the grade to zero. This error only affected version 24.0.0.
	8349	An incident was resolved for the Bridge Modeler where area (shell) objects representing the web of steel U-girders could could be generated with slightly incorrect vertical coordinates if the U-girder depth was defined as tapered. When this occurred, the analysis would not run because the generated area objects were too distorted.
	8476	An incident was resolved for the Bridge Modeler where the horizontal geometry of a bridge tendon generated for a curved bridge could be incorrect if the bridge was oriented in approximately the North-South direction such that the tendon curved from a Northeast to Northwest direction, Southeast to Southwest direction, or vice-versa. When this occurred, the effect was visibly obvious and results agreed with the model as generated.

*	Ticket	Description
	8502	An incident was resolved that addressed two issues with rail tracks: (1.) The frame objects generated to represent rail tracks could be generated in an unexpected location if there were two or more area objects directly below the rail, such as for a double-deck bridge structure. A new option "Objects Loaded by Rail Track" has been added to the rail-track definition to help reduce the ambiguity when multiple area objects are found below the track. Three choices are available: Program Determined, Bridge Object, and Group. For Bridge Object, only the area objects representing the top slab of the specified bridge object will be considered. For Group, only the area objects in the group will be considered. If the group contains multiple area objects below the rail track at the same location, then the results could still be ambiguous. For Program Determined, all bridge objects referencing the same layout line as the rail track will be used; if none, then all bridge objects will be used. If there are no bridge objects, then all area objects in the model will be considered, with the possibility of an ambiguous result. For all of these options, if no area objects can be found under any portion of the rail track, then the rail track will not be generated and a warning message will be provided. If at least one area object can be found below any portion of the rail track, the track will be generated and will connect only to the specified area objects; portions of the rail track outside the range of the specified area objects will be grounded, even if other area objects are present below the rail track. (2.) When a rail-track support property (say "B") was defined by copying a previously defined property (Say "A") and then modifying it, the generated links representing the copied property ("B") would actually take their values from original property ("A"). This will no longer happen when copying properties in the new version. However, affected models from previous versions, when opened in the new version, will need to be manually corrected by deleting the copied property ("B"), redefining it, and then reassigning it to the rail tracks.
	8538	An incident was resolved for the Bridge Modeler where, for user-specified control points (in-span hinges, full-width splices, full-width external diaphragms, and user discretization points) with a bearing angle set to "Default", the corresponding generated section cut would be created perpendicular to the layout line whenever possible without crossing a skewed support. This could cause poor slab meshing of the slab when very near to skewed supports and thus reduce the accuracy of the analysis results. Now for these user-specified control points with a "Default" bearing angle, the orientation will be adjusted (skewed) near skewed supports to avoid poor slab meshing and therefore may not be perpendicular to the layout line. This can be controlled by specifying a desired bearing angle rather than using "Default", but care should be taken to make sure the resulting model is reasonably meshed. The use of staggered splices and diaphragms can sometimes overcome poor meshing near skewed supports when a specific bearing orientation is required.
	8561	An incident was resolved for the Bridge Modeler affecting steel I-girder bridges where, for steel I-girders modeled as frames, the frame insertion point offset would be incorrect at section transitions with different top flange thicknesses. When this happened, the insertion-point offsets of the steel I-girders before the transition was incorrectly set to be the same as that of the girder after the transition, meaning that the top of the top flange was aligned instead of the bottom of the top flange (at the web-flange junction). This only affected the single frame element just before the transition. When this occurred, the error could be seen by looking at the extruded view of the undeformed shape. The effect on results was of minor significance. This issue did not affect I-girders modeled as shells or as mixed. Models from older versions affected by this issue will need to have their bridge objects updated after opening in the new version in order to correct this error.
	8604	An incident was resolved for the Bridge Modeler where the frame section properties assigned to some of the frame objects generated when updating a bridge object could be incorrect if the following sequence of steps had been performed: (1.) Run concrete frame design on an existing bridge model, (2.) Update the bridge object, (3.) Run the analysis without first saving the model. This error was not caused by running bridge design or rating or any other type of frame design, only concrete frame design. Saving and re-opening the model after updating the bridge object would avoid the problem. Results were consistent with the frame section properties that were assigned to the members, and these could be seen by displaying frame sections on the model or in the database tables.

*	Ticket	Description
	8633	An incident was resolved for the Bridge Modeler where the bearing links at the beginning abutment would be incorrectly located under a bridge section of type "Concrete Box Girder - Advanced" if the bridge section offset X from reference point was non-zero and bridge object was updated as a spine model. Results agreed with the model as generated.
	8670	An incident was resolved for the Bridge Modeler where the feature "Mesh Superstructure to Match Bent Bearing", which is part of the bent assignment to the bridge object, did not always produce a reasonable slab mesh when set to "No", depending on the geometry of the bridge spans on either side of the bent. Because of the need to connect the girders to the slab as well as to produce meaningful section cuts for calculating superstructure forces and moments, the option to NOT match the superstructure mesh to the bent bearing is now limited to steel I-girder, steel U-girder, and concrete I-girder bridge sections under the following conditions: (1.) The bent property must be of the single-bearing type. (2.) The geometry of the spans before and after the bent must be straight, without any kinks or curves. (3.) The same bridge section must be assigned to the spans before and after the bent. (4.) If any parametric variations are assigned to the spans before or after the bent, all dimension changes within and across the two spans must be linear and without any kinks. If any of these conditions are not met, setting "Mesh Superstructure to Match Bent Bearing" to "No" will be disabled when possible, or else it will be ignored when the bridge object is updated if the conditions change after it has been set to "No".
	8700	An incident was resolved for the Bridge Modeler where the bearings were sometimes not properly located and connected to the grade beam at an abutment when the bridge geometry at the abutment combined curve, super-elevation, skew, and grade. A similar issue could occur for steel or concrete U-girder bridges with nonzero grade at the abutment, even without curve or skew. When this occurred, the effect was visually obvious, and the results agreed with the model as generated. This error did not affect abutments without grade beams.
	8713	An incident was resolved for the Bridge Modeler that affected bridge tendon generation in certain cases: When a bridge tendon reference line was set to Bridge Center Line, the generated tendon was correctly located along the centerline of the bridge section (the mid-point between the two exterior girders), but the tendon length and distances were being measured along the bridge layout line. This error would appear in the Bridge Tendon Data form and in the generated tendons when the lengths along the bridge center line and along the layout line were different, such as for curved or skewed bridges with unsymmetrical transverse variation or with a horizontal offset specified for the bridge section.
	8857	An incident has been resolved for the Bridge Modeler where the debond length defined for Super-T girder tendons was being ignored when generating tendons for a bridge girder, meaning the tendons were generated for the full length of the girder.
	8865	An incident was resolved for the analysis of steel I-girder, U-girder, and precast concrete I-girder bridge models in which an error message would display during creation of the analysis model if the bridge slab contained any triangular area objects. When this occurred, the analysis would not run and results were not available. This was not common as the Bridge Modeler favors quadrilateral area objects for modeling the deck.
*	8872	An incident was resolved for the Bridge Modeler where bridge tendons located inside the girders of a user-defined (Section-Designer) bridge section might not connect to the bridge section if the widths of the top and bottom slabs the girder were quite different. This was a rare case and could happen under either of the following two conditions: (1.) the girder cut lines defined for the interior girders were not vertical, or (2.) the interior girder web was not vertical and the bottom or top slab was not continuous at the sloped girder web. When this occurred, the tendon was treated as external, producing different forces in the bridge section and the tendons than expected.

*	Ticket	Description
	8925	An Incident was resolved for the Bridge Modeler where the vertical profile of bridge tendons defined with respect to a girder reference line could be incorrect in regions where the top slab thickness was varying due to an assigned parametric variation. This only occurred in regions where the thickness was actually changing, not where the variation was a constant zero or non-zero value. Where this occurred, the error in the vertical location of the tendon was on the order of half the thickness variation at that location. This error did not affect bridge tendons defined with respect to the bridge centerline.
	8945	An incident was resolved where tendons defined in a Segmental bridge object could have incorrect lengths, and could extend beyond the expected segment boundaries. This issue affected v24.0.0 only.
*	8946	An incident was resolved for the Bridge Modeler where the new-model template for Segmental bridges would cause an abnormal termination of the software if an invalid numerical value was entered for the layout-line length at the beginning of the template. Now an error message will be shown and the value can be corrected.
	8949	An incident was resolved for the Bridge Modeler where adding a new segmental bridge object from the ribbon command Bridge > Bridge Objects > New, and then trying to modify the data in the Define Segmental Bridge Spans table on the Segmental Bridge Object Data form the first time before clicking OK on the form would cause an expected error message. Clicking OK, and returning to the form using command Bridge > Bridge Objects > Modify would resolve the issue with no loss of data. This is no longer necessary. This issue only affected new segmental bridge objects when another bridge object already existed. The first bridge object created did not have this problem.

Data Files

Incidents Resolved

*	Ticket	Description
*	8835	An incident was resolved where, after importing a model file in text (.$BR, .B2K) or database-table format (Excel, Access, XML) that contained a bridge-tendon with the start and end distances defined as type Variable, the start and end distances would be set to zero and the tendon definition corrupted such that the bridge object could not be updated. This could be corrected by redefining the affected bridge tendons after importing the model.

Database Tables

Incidents Resolved

*	Ticket	Description
*	8448	An incident was resolved in which the design values were not reported correctly in the Concrete Shell Design table for envelope-type load combinations. Now, the design values reported (As1Top, As1Bot, As2Top, As2Bot, V1Ratio, and V2Ratio) for an envelope-type load combination are the envelopes (only maxima) over all the designs for each contained load case or load combination, including over all the steps within each of these load cases or combinations. The same is true for each contained lower-level, envelope-type load combination, except that an envelope-type combination will produce envelopes of the shell forces rather than envelopes of shell designs if it is contained within a higher-level, non-envelope load combination. For most practical cases, it can simply be stated that envelope-type load combinations produce the more meaningful envelope of shell designs for different sets of forces rather than the design for the envelope of these forces.
	8572	An incident was resolved where the parametric variations defined for a bridge object could be lost when importing the model from database tables (.B2K or .$BR text files, Excel, Access, or XML formats) or when making changes using the interactive database editor. This error only affected version 24.0.0.

*	Ticket	Description
	8585	An incident was resolved where some of the rebar data defined for a bridge object could be lost when importing the model from database tables (.B2K or .$BR text files, Excel, Access, or XML formats) or when making changes using the interactive database editor. This only affected models where there was more than one bridge object and the number of girders was different in each bridge object. The affected tables were "Bridge Object Definitions 23 - Girder Rebar 2 - Transverse" and "Bridge Object Definitions 23 - Girder Rebar 3 - Longitudinal".

Design – Concrete Frame

Incidents Resolved

*	Ticket	Description
	8303	An incident was resolved in concrete frame design codes "AASHTO LRFD 2014", "AASHTO LRFD 2012", and "AASHTO Concrete 07" in which the design moments were always considered positive. This error affected the design of concrete columns for which the section was unsymmetrical. Symmetric sections with symmetric rebars were unaffected by this error.
	8803	An incident was resolved where the longitudinal reinforcement quantity was reported incorrectly in the right-click design details for members being designed according to the AASHTO concrete frame design codes. The results on screen and in the tables were correct and not affected.

Design – Slab

Incidents Resolved

*	Ticket	Description
*	8503	An incident was resolved to correct the design of concrete shell elements with only a single layer of reinforcement in the middle of the section. Previously, after the design was performed for the top and bottom layers of concrete, only the results for the top layer were reported. This resulted in zero reinforcement being reported if only the bottom concrete layer required reinforcement. Now the single layer of reinforcement at the middle that is required to satisfy the design for both the top and bottom layers of concrete will be reported correctly. Note that it is reported as being for the top layer in the contour plot and table for concrete shell design results, although it applies for both positive and negative bending, as applicable.

Design – Steel Frame

Incidents Resolved

*	Ticket	Description
	8386	An incident was resolved for certain steel frame design codes where the critical buckling capacity was not calculated correctly for unequal-legged angle sections having web height (t2) greater than flange width (t3). However, the critical buckling capacity was calculated correctly for equal-legged angle sections and for unequal-legged angle sections with flange width (t3) larger than the web height (t2). The affected codes are as follows: AASHTO LRFD 2020, AASHTO LRFD 2007, AISC-ASD89, AISC 360-10, AISC360-05/IBC2006, Chinese 2018, CSA S16-19, CSA S16-14, CSA-S16-09, SP 16.13330.2017, SP 16.13330.2011.

Results Display and Output

Incidents Resolved

*	Ticket	Description
	8290	An incident was resolved where the display of bridge-superstructure analysis, design, or rating results in the bridge response display form omitted the response at girder-local section cuts for steel I-girder bridges. The response was correctly plotted at the general (full-width) section cuts. The girder local cuts could have been created by the Bridge Modeler for capturing the response at section transitions, staggered diaphragm, or splices. This was only a display issue. Analysis, design, and rating results presented in the output tables were not affected and were present for all section cuts.
	8474	An incident was resolved for bridge superstructure design where the D/C Ratio for Positive Moment graphically displayed for the AASHTO LRFD steel U-girder bridge design service check was plotted as zero for all locations along the length of the bridge. This was a graphical display issue only. The results shown in the database tables and reports were correct. No other results were affected.

Section Designer

Incidents Resolved

*	Ticket	Description
	7418	An incident was resolved for Section Designer where the moment magnitude shown in the moment-curvature contour plot was always based on the database units instead of current display units. Note that database units are those in effect when the model is created and that are used for analysis. This was a display issue only and did not affect the analysis results.

Structural Model

Incidents Resolved

*	Ticket	Description
	8272	An incident was resolved to fix incorrect or missing torsional constant (J) values for double angles in the AISC14, AISC15, AISC14M and AISC15M XML section libraries. In these XML section libraries, the J value for the double-angle sections were either incorrect or missing. Upon import, missing J values were calculated (using formulas if the fillet radius was zero or using FEM analysis if fillet radius was present), but the calculated values were different from the expected values that should be twice that given in the same sections database for the single angle comprising the double angle. This change involved updating the incorrect or missing J values using the J values as available for the corresponding single angles in the same section library.
	8560	An incident was resolved where the properties of sections that were not available in the XML section libraries were being set to zero when the sections were imported from the respective libraries. All missing section properties for the section being imported are now calculated at the time of import.
	8940	An incident was resolved where the bounding boxes used for connecting tendons to area (shell) elements were not correct for warped (non-planar) areas. The bounding box was being drawn for the average plane rather than following the warped surface. In addition, for certain rare cases, the connectivity of tendons to their bounding area elements could be incorrect, causing the tendon to be connected to a neighboring element instead. When this occurred, the effect was localized, and equilibrium was not affected. The connection to bounding frame and solid elements was not affected. Finally, these bounding boxes are used to apply bridge line and bridge area loads to area elements. These changes could have a very small effect on the magnitude of such applied loads, and could likewise affect mass if these loads are used in the mass source.

User Interface

Incidents Resolved

*	Ticket	Description
	8368	An incident was resolved where, for a frame object with non-zero end-length offsets, the location of an assigned hinge reported in the right-click menu for the Analysis Model could be incorrect. The Analysis Model right-click display has been changed so that the absolute hinge location is reported relative to the total length of the analysis element and the relative hinge location is reported relative to the clear length of the analysis element. The values shown for the object model were already correct. This was a display issue only and results were not affected.
	8840	An incident was resolved for the Bridge Modeler affecting the Bridge Diaphragm Property form where, for the Beam Type Diaphragm, the option "Modeled as Mixed Frame and Shell" was always selected when opening the form even, if it had been previously unchecked and saved. This was only an error initializing the form and did not affect the bridge model model if Cancel was clicked, or the desired option was selected before clicking OK. The value of this option used to create the bridge object could be seen in the database tables.
	8851	An incident was resolved for defining precast I-girder frame section properties where the Debond Point Distance values on the Tendon Layout Data form were not populated when opening the form. When values were input and the form was closed with the OK button the values were correctly stored, so this was only a user interface issue where the assigned values were not recovered by the form. The values actually assigned and used could be seen in the database tables.
*	8926	An incident was resolved where the software could terminate abnormally when attempting to double-click the Cancel button immediately after the analysis was started. Note that a single click is sufficient to cancel the analysis.