CSiBridge® Version 20.1.0
Release Notes

Notice Date: 2018-05-03

This file lists all changes made to CSiBridge since the previous version. **Most changes do not affect most users.** Incidents marked with an asterisk (*****) in the first column of the tables below are more significant.

Changes from v20.0.0 (Released 2017-12-18)

Bridge Modeler

Enhancements Implemented

*	Incident	Description
*	202899	The Bridge Modeler has been enhanced to provide additional features for user-defined bridge sections. Previously user-defined bridge sections could only be updated as spine models and were only used for analysis, not for superstructure design and rating. Now the following capabilities have been added, primarily pertaining to concrete box-girder sections: (1) While editing a user-defined bridge section in Section Designer, slabs and girders can now be identified by drawing horizontal "Cutlines" that separate the top slab and bottom slab (if present) from the webs or girders. Similarly, vertical Cutlines can be drawn that separate the various girders from one another. (2) In Section Designer, horizontal "Centerlines" can be drawn within the top slab and bottom slab (if present). Similarly, vertical Centerlines can be drawn for each web or girder. (3) When updating a bridge object to create a linked model, support bearings will be created at the bottom of the girder Centerlines for a bridge section that reasonably resembles a concrete box girder. For other bridge sections, support bearings need to be located using the general method. (4) Section Designer can automatically generate an area-object (shell) mesh for a bridge section that reasonably resembles a concrete box girder and that has Cutlines and Centerlines defined that identify the top slab, bottom slab, and webs. The resulting area-object mesh can be manually modified by the user. If an area-object mesh has been defined for a bridge section, bridge objects that use this bridge section can be updated as area-object models. (5) Section Designer can automatically generate a solid-object mesh for a bridge section that reasonably resembles a concrete box girder and that has Cutlines and Centerlines defined that identify the top slab, bottom slab, and webs. The resulting solid-object mesh can be manually modified by the user. If a solid-object mesh has been defined for a bridge section, bridge objects that use this bridge section can be updated as solid-object models. (6) Bridge superstructure design and rating are available for user-defined bridge sections that have been identified to be of type concrete box girder and that have properly defined Cutlines and Centerlines that identify the slabs and girders. Design and rating are available for spine, area-object, and solid-object models. (7) User-defined bridge sections can be initiated by starting with a standard bridge section in the bridge Modeler and converting it to user-defined. (8) User-defined bridge sections can be imported from a DXF file. Slab and web/girder Cutlines and Centerlines can optionally be imported on separate layers. Note: Parametric variation of user-defined sections is presently only available for spine models, not yet for area-object or solid-object models.

*	Incident	Description
	212234	A new option to update all bridge objects at once has been added to the Bridge Object drop down list in the Update Bridge Structural Model form when there are two or more bridge objects in the model. This form is displayed using the command Bridge > Update > Update. When this new option is selected, all other items will be disabled except the Action option. The structural Model Option and the discretization information for each bridge object will be based on the existing data previously defined for each bridge object. The user can select each individual bridge object and setup the option and discretization data, and then select the new option "All Bridge Objects" to update all bridge objects at once.

Analysis

Enhancements Implemented

*	Incident	Description
*	42048	Linear time-history analysis can now be performed in the frequency domain, allowing the consideration of frequency-dependent properties, sub-systems, and/or boundary conditions represented by link elements. Loading is identical to that used for modal or direct-integration time-history analysis, and may be by ground acceleration or load patterns applied using one or more independent time-history functions. Damping is of the hysteretic type, and may be constant or vary with frequency.

Bridge Design

Enhancements Implemented

*	Incident	Description
	75799 211955	For bridge superstructure design of steel I-girder bridges according to the CAN/CSA-S6 code, sections classified as Class 4 are now reported as having zero capacity, while showing all section properties for use with manual checking. In the previous versions, Class 4 sections were flagged as not valid, and no results or properties were reported. This sometimes lead to results not being available for positive bending when the section was classified as Class 4 for negative bending, and vice versa. Now results are reported separately for positive and negative bending for cases where the classification may differ between the two. Affected codes: CAN/CSA-S6 all versions. Affected Design Requests: Steel I Comp Strength and Constructability.
*	203572	Design checking has been implemented for I-section steel-girder composite bridge superstructures according to the BS 5400 code. Design checks are currently available for the Ultimate, Service, and Construction limit states. Design requests are defined that allow overwriting the code-default values of input parameters used in the design calculation. The results of the comprehensive nonlinear staged-construction analysis may be used in the Service and Ultimate design requests, but this is not required. For simple and fast design checks the stresses on the composite section can be appropriately distributed throughout the section by assigning individual load cases present in the demand set load combinations to be of either non-composite, long-term composite, or short-term composite design types. Live-load effects can be evaluated using distribution factors specified by the user, or the effects can be determined directly from detailed 3-D live-load analysis. Design-check results are reported on girder and station basis and include plots of demand/capacity ratios and important supporting values. Detailed tables showing results and all intermediate values used in the calculation are available for display, printing, and export to Excel or Access. Interactive section optimization is available allowing the user to change plate dimensions and materials for the web and flanges of each girder along the span, as well as to specify stiffener locations, in order to optimally match the capacity to the demand. The girder may vary nonprismatically along the length. Resistance recalculation of the modified section can be performed immediately to check the new capacity against the existing demand without reanalyzing the model. Once the optimum section is determined, these changes can then be applied to the model for a subsequent cycle of analysis and design.

*	Incident	Description
*	209851	Bridge load rating has been added according to the Canadian CAN/CSA-S6-14 code. Superstructure types supported include prestressed-concrete box girders and composite sections with precast I-girders, precast U-girders, or steel I-girders. Separate rating checks are available for flexural strength of each bridge section type, and for shear strength of multi-celled box girders and composite sections with precast girders. Live-load distribution factors can be specified by the user or determined from detailed 3-D live-load analysis. Rating results are displayed graphically for the entire box section or on a girder-by-girder basis for box girders and composite sections. Detailed tables showing all results and intermediate values are available for display, printing, and export to Excel or Access.
	213321	The previous limit of 100 on the number of nested load combinations contained within a single demand set used for bridge superstructure design or rating has been removed. However, it is still recommended to use a reasonable number of load combinations to avoid hitting memory or speed limits for larger models. In addition, better design information can be obtained by limiting the use of envelope-type combinations to a single level for each demand set, and only using envelope combinations within contained load combinations when truly necessary.

Results Display and Output

Enhancements Implemented

*	Incident	Description
*	20965 26037 40977 67817 89276 201510	Strain response is now available for shell objects similar to stress response that was already available. Strains can be displayed graphically, in plot functions, in tables, and accessed using the API (Application Programming Interface). Strain components and principal values are presented in a one-for-one correspondence with the stress values. The strains reported are due to stress. Stress-free strains caused by temperature load, strain load, creep, and/or shrinkage are not included. Response is available for homogeneous and layered shells.
	76213 212250	New detailed calculation reports have been added for bridge superstructure rating of steel I-girder bridges per the AASHTO Rating code for the following types of rating requests: (1) Steel I Comp Strength, (2) Steel I Comp Service, and (3) Steel I Non Comp Service.
*	214318	Strain response is now available for solid objects similar to stress response that was already available. Strains can be displayed graphically, in plot functions, in tables, and accessed using the API (Application Programming Interface). Strain components and principal values are presented in a one-for-one correspondence with the stress values. The strains reported are due to stress. Stress-free strains caused by temperature load and strain load are not included.

External Import/Export

Enhancements Implemented

*	Incident	Description
	211896	An enhancement was implemented to allow export of areas in a specified X-Y plane to a SAFE text file which can then be imported into SAFE for further analysis, design, and detailing.

Miscellaneous

Enhancements Implemented

*	Incident	Description
*	208854	The version number has been changed to v20.1.0 for a new intermediate release.

User Interface
Incidents Resolved

*	Incident	Description
	70644	An incident was resolved in which data displayed when hovering over the model could be displayed outside the extents of the window making it unable to read. This was a user interface issue only and did not affect results.
	208980	An incident was resolved in which the Edit > Replicate command would open multiple copies of the Replicate form if the command was used multiple times without closing the form. This was a user interface issue only.
	212233	An incident was resolved where pressing the F1 key to display help when a database table or interactive database table was being displayed caused an abnormal termination, closing the program. This was a user interface issue only and did not affect results.

Graphics
Incidents Resolved

*	Incident	Description
	81456	An incident was resolved where displaying bridge line loads and bounding boxes using a coordinate system other than Global could display portions of the model in incorrect locations. This was a display issue only and did not affect results.

Bridge Modeler
Incidents Resolved

*	Incident	Description
	206697	An incident was resolved for the Bridge Modeler where the bridge tendon feature "Copy to All Girders" in the Assign Prestress Tendons form did not work correctly when (1) the bridge section dimensions were assigned with parametric variations, and (2) the distance between the longitudinal location of any tendon vertical-layout control point and the longitudinal midpoint of any parametric variation was less than or equal to the merge tolerance. This was a rare occurrence. When it did occur, the effect was obvious and results agreed with the model as generated. Moving either the tendon vertical-layout control points or the parametric-variation control points could avoid the error, although this is no longer necessary. By way of definition, control points are those user-defined stations or distances used to describe the geometry of the tendons or parametric variations.
	207978	An incident was resolved for the Bridge Modeler in which the bridge sections of the two adjacent spans at an internal bent location might not be connected as expected if (1) the layout line was curved, (2) the bent was skewed, and (3) the bridge section reference point was located outside the bridge width. This third condition is not common. This error affected all types of bridge sections when updated as either an area model or a solid model. Spine models were not affected. Results agree with the model as generated, and the effect of the discontinuity was usually obvious from the structural response.
	208100	An incident was resolved for the Bridge Modeler where the number of bearing generated at the end abutment would be incorrect for a bridge object having two or more spans if the last span was of bridge section type "Concrete Box - Ext. Girders Sloped Max" and the number of girders in the last span was less than the number of girders in any previous span. When this occurred, the incorrectly generated bearings were visible and results agreed with the model as generated.

Modeling
Incidents Resolved

*	Incident	Description
	209730 215260	An incident was resolved where an error was generated and no model was created when trying to create a new model using the cable-stayed template.

Loading
Incidents Resolved

*	Incident	Description
	18533 73569 102769 200948 212082	An incident was resolved for influence-based moving load analysis where the option to "Allow loads to reduce response severity" did not have any effect for lanes having non-zero width. Results were identical to the default case where vehicle loads are not allowed to reduce the severity of the response, and were conservative. For lanes having zero width, the behavior was as expected.
	208698	An incident was resolved where the tendon load calculated from the specified loss parameters could be incorrect if one of the tendon segments created during discretization was much smaller than the merge tolerance. This typically occurred near the ends of the tendon, but was not common. When this occurred, the error was obvious and could be seen in the "Tendon Response Form."
*	208765 209969 214529	An incident was resolved for the Bridge Modeler in which bridge point loads were not being applied to the model when the Bridge Load Stationing option in the Bridge Layout Preferences form was set to "Aligned with Section Cuts." This only affected point loads defined and applied parametrically in the Bridge Modeler.
	208882	An incident was resolved that corrected two user-interface issues related to defining and using floating lanes for bridge moving-load analysis: (1) The Multilane Scale Factors in the "Load Case Data - Moving Load" form for a moving load case could only be set for loading a number of lanes equal to the number of lanes defined (fixed lanes, N1, plus floating-lane sets, N2), but not for the additional number of lanes, N3, created due to floating-lanes sets containing more than one floating lane. The scale factor that was applied for loading N1+N2 lanes would also be applied for loading up to N1+N2+N3 lanes. For example, in a model with one fixed lane and one floating-lane set containing three floating lanes (N1 = 1, N2 = 1, N3 = 2), multilane scale factors could only be set for one or two loaded lanes (N <= N1+N2). The value set for two loaded lanes would also be used for three and four loaded lanes (N1+N2 < N <= N1+N2+N3). Results agreed with the multilane scale factors applied as described above. (2) In the Bridge Lane Data form, when viewing a previously defined floating lane set, the "Auto" checkbox could be automatically checked when opening the form, even if it was not checked when the floating-lane set was originally defined. This only affected the model if the OK button was clicked without first unchecking the "Auto" box.
*	212764	An incident was resolved where load patterns included in a staged construction load case but with a scale factor of zero could cause spurious loading to occur in a subsequent stage of the load case. This did not occur is the load pattern was omitted from the load case or applied with a negligible scale factor. When this occurred the effect on results was generally very obvious.
*	213386	An incident was resolved for the Bridge Modeler where the equivalent exterior-girder bracket load calculated as part of the slab wet concrete loading on composite girder bridges could be incorrect as follows: (1) The slab Self Weight Factor was always being treated as unity. The effect of this error was generally small unless the factor was much different from unity. (2) Permanent and Temporary Additional Loads were ignored for calculating the equivalent bracket load. This error affected both exterior girders for steel I-girder and precast-concrete I-girder bridge sections, and only the left exterior girder for steel U-girder bridges. Other types of bridge sections do not offer slab wet concrete loading and were not affected. The equivalent bracket load causes torsion on the exterior girders during construction. It does not affect vertical load. This load only acts when the Pour Concrete operation is performed during staged construction, and it ceases to act when the Remove Forms operation is performed.

Section Designer
Incidents Resolved

*	Incident	Description
	209735	An incident was resolved for Section Designer where the torsional constant J was sometimes calculated as zero for certain unusual cases where the section contained two shapes that partially overlapped in such a way that they created an opening between them. When this occurred, the value of J was reported as zero, and analysis results were consistent with a section having zero torsional stiffness.
	214235	An incident was resolved for Section Designer where Caltrans sections with three or more overlapping cores would generate an error message when opening or modifying the section, and the intermediate cores were ignored when calculating moment-curvature relationships and hinge properties (fiber and Caltrans). This error affected results by assuming that the nonlinear concrete model for the intermediate cores was the same as the "Other" concrete, which typically is assumed to be unconfined. This error was conservative.

Analysis
Incidents Resolved

*	Incident	Description
*	82168 100727 207475 209096 209790 213129	An incident was resolved where the temperature, strain, and deformation loads applied in a linear load case could, in some cases, be incorrect for certain objects in the model if the linear load case used the stiffness from the end of a nonlinear staged-construction load case. This error would not occur if the linear load case was run in a subsequent session from the preceding nonlinear staged-construction load case. A subsequent session would be anytime the software was restarted, the model was re-opened, or anytime the analysis was run in a separate process (command Analysis > Analyze > Analysis Options > Solver Options). This error was uncommon, model-dependent, and machine-dependent. When it occurred, the results were generally erratic and obviously incorrect. Temperature and strain loads are available for frame, shell, solid, asolid, and plane objects. Deformation loads are available for frame objects. Time-dependent creep and shrinkage act as a strain load can could also affect frame and shell objects. This error could affect CSiBridge versions 17.1.0 to 20.0.0.
	103866 214615	An incident was resolved where bridge section cuts, especially local section cuts for individual girders, would sometimes exhibit large jumps in the force, moment, or stress response between the section cuts before and after a longitudinal station due to the present of edge constraints that were not properly accounted for. This issue did not usually affect global section cuts across the full width of the bridge, since edge constraints are not normally needed to match the mesh on either side of these section cuts. For girder local section cuts, edge constraints are often needed to match meshes between two adjacent girders. Now, when the distance between adjacent section cuts is very small, the edge constraints are omitted to reduce numerical sensitivity due to the otherwise overly stiff constraint. Otherwise, edge constraints are still used and are now properly included in calculating the section cut response. Note that small jumps in the response can still be expected due to real stiffness discontinuities, local loads, the constraints used to connect the top slab with composite girders, numerical sensitivity due to very small or distorted finite elements, and the inherent nature of the finite element method. Such small jumps usually have little engineering significance, and can often be reduced with refined meshing if truly necessary.

*	Incident	Description
	203968	An incident was resolved where the Change Modifiers and Change Releases operations were not being applied in a nonlinear staged-construction load case when all the following conditions were met simultaneously: (1) The nonlinear staged-construction load case did not have any applied loads in any of its stages, (2) The stage with the Change Modifiers/Releases operation had no Add, Remove, or Change Section operations specified, and (3) The stage with the Change Modifiers/Releases operation was either ((a) not the last stage of the load case, or (b) was the last stage and that stage had non-zero duration and time-dependent effects were being considered for the load case. When this issue occurred, the Change Modifiers/Releases operation was ignored for the affected stage or stages.
*	211888	An incident was resolved where frame loads, including self-weight, could have been incorrectly applied during nonlinear load cases where the Geometric Nonlinear Parameters were set to "P-Delta plus Large-Displacements". Load-case types that could be affected are nonlinear static, nonlinear staged construction, and nonlinear direct-integration time-history. This error only occurred when the number of threads used in the analysis procedure, which is reported in the .LOG file, was greater than 1. When this issue occurred, it created a discrepancy between the applied loading and computed results. In most cases this caused the analysis not to converge, and no results were available for the affected load cases. In some cases, the analysis would converge, and the results could then be incorrect. Only self-weight, gravity, concentrated-span and distributed-span loading applied to frames was affected. Temperature, strain, deformation, and target-force loads on frames were not affected. Loads on joints and other types of elements, including cables, were not affected. Nonlinear load cases with the Geometric Nonlinear Parameters set to "None" or "P-Delta" were not affected. This issue was present in CSiBridge 2017 versions 19.1.0 to 19.2.2 and CSiBridge version 20.0.0. Affected load cases in the affected versions should be re-run in the new version to check the results.
	212118	An incident was resolved where nonlinear static load cases with zero load applied may fail to converge if starting from a previous load case. This issue may also occur in staged construction load cases during the instantaneous load application portion of a stage where no major stage operations (loads applied, objects added, or objects removed) have been defined. In this release, the following changes are made: (1) For nonlinear static load cases where no loads are applied, the relative iteration convergence tolerance will be determined relative to the total force present in the model. Normally the convergence tolerance is relative to the magnitude of the applied load, and that is still true when loads are applied, no matter how small. (2) In nonlinear staged construction load cases, a stage that does not have any major stage operations defined will skip the instantaneous load application portion of that stage during analysis if the stage has duration for time-dependent effects. For a stage with no major operations and no duration, iteration will be performed based on a convergence tolerance relative to the total force present in the model. When iteration is performed with tolerances relative to the total force in the model, most models will converge immediately or with just a few iterations that improve equilibrium. Changes in results from previous versions are expected to be small and within the specified convergence tolerance for well-conditioned models.

Bridge Design
Incidents Resolved

*	Incident	Description
*	206826	An incident was resolved where running bridge seismic design requests while the display coordinate system was set to a user-defined system could produce incorrect values for demand, capacity, and demand-capacity ratio in the table "Bridge Seismic Design 01 - Bent D-C" for seismic design categories B, C and D. This was because the internal generalized displacements used to measure deformation of the bents were incorrectly calculated in the display coordinate system but were assumed to be in the Global coordinate system. Other bridge seismic design results presented in the tables were not affected. Bridge seismic design requests that were run while the display coordinate system was set to Global or to any coordinate system parallel to the Global system were not affected. Changing the display coordinate system after the bridge seismic design request was run did not affect the results.
	208339	An incident was resolved for bridge seismic design where the automated pushover analyses for seismic design category D would not run for any bridge object in which all columns for any bent in that bridge object were assigned with user-defined foundation spring properties that referenced a link/support property. In this case, the program-generated link supports at the bottom of the column were not being included in the program-generated bent group "_BENT", which in turn caused the program-generated load case bGRAV not to converge. This prevented the subsequent automated bent pushover load cases from running, and bridge seismic design results were not available for that bridge object. For seismic design analyses that did run due to having adequate support, results were not affected.
*	209965 215101	An incident was resolved for the superstructure design of steel I-girder bridges per the AASHTO code where the controlling value of the flange lateral bending stress, fl, within the unbraced panel length could have been underestimated. Previously, the combined effects of flange lateral bending stress and vertical bending stress were limited to cases where both were maximum or both were minimum within the unbraced length. Now all possible combinations of maximum and minimum of both flange lateral bending stress and vertical bending stress are considered within the panel, leading to selection of highest absolute value of fl within the unbraced panel length that is later used for combination with flange vertical bending stresses. This change was made to comply with AASHTO LRFD requirement to effectively handle the flanges as equivalent beam-columns. The results for the new version may result in a reduced capacity of the section for certain models. This change affects the "Steel I Comp Strength" design check for the AASHTO LRFD code, all versions. Models that could be affected should be re-verified.
	211793	An incident was resolved for bridge superstructure and rating where the panel lengths calculated for one bridge object could become incorrect if another bridge object in the model had been updated more recently. This only affected models with two or more bridge objects. Only steel I-girder bridge sections were affected. When this error occurred, results were consistent with the panel lengths as displayed in the design/rating tables and reports. In some cases, the panel lengths could be negative, in which case an error message was displayed during design/rating and no results were available for the affected bridge object. Superstructure design and/or rating could be correctly performed on the most recently updated bridge object, and results were unaffected.

Results Display and Output
Incidents Resolved

*	Incident	Description
	96885	An incident was resolved where the plotted influence surface for moving load analysis could appear twisted under certain circumstances for lanes having width. This could occur for curved lanes running generally in the negative global-X direction at locations where the curved lane becomes parallel to the global-X axis. At such locations, the left edge of the influence surface could be plotted at the right edge of the lane, and vice-versa. This was a graphical issue affecting the influence-surface plots only. The influence values and locations used for analysis were correct and the results of moving load cases were not affected. The loading points actually used could be viewed using the command Home > Display > Show Lanes > Show Points Only.
	215232	An incident was resolved where the forces from a tendon object could be omitted from a skewed bridge section cut when the tendon ended at the section cut and the bridge object had grade. When this occurred, secondary prestress forces were calculated incorrectly at that section cut. This affected the plots of bridge forces that included tendon force, and affected bridge design and rating for flexural strength at those same section cuts.

Database Tables
Incidents Resolved

*	Incident	Description
	203126 203607	An incident was resolved where in certain instances text that was exported to Excel was interpreted by Excel as a date and was displayed incorrectly.
	214841	An incident was resolved where the two database tables "Bridge Girder Section Cuts 02 - Slab Data - Groups" and "Bridge Girder Section Cuts 03 - Beam Data - Groups" were not available for showing the girder-local section cuts groups for area (shell) models of steel I-girder bridges. This was a display issue only and did not affect results. Only version 20.0.0 was affected.

Data Files
Incidents Resolved

*	Incident	Description
	211835	An incident was resolved where the model file (.BDB) could not be opened in certain cases. This could occur for models where a bridge seismic design request of seismic design category B or C was run, then one of the user-defined (not program-generated) load cases was deleted, after which the model was saved without unlocking. When this occurred and caused the model file to be un-openable, the model text file (.$BR) could still be imported to recover the model.

External Import/Export
Incidents Resolved

*	Incident	Description
	204082	An incident was resolved in which the GT STRUDL file import assigned the same frame section property to all frame members in the model instead of the assignments specified in the GT STRUDL file.