CSiBridge v23.3.0 Release Notes

Notice Date: 06-August-2021

This document lists changes made to CSiBridge since v23.2.0, released 19-May-2021. Items marked with an asterisk (*) in the first column are more significant.

Bridge Design and Rating

Enhancements Implemented

*	Ticket	Description
	6519	Bridge superstructure design per the IRC 2011 code has been enhanced to add detailed calculation reports for flexural and shear design of multi-cell concrete box and concrete T-Beam bridge sections. For flexural design, the calculation of moment capacity was changed to now exclude all rebar on the compression side of the neutral axis, whereas previously only rebar within the rectangular compression block was excluded. The effect of this change is small, since the lever arm of the affected rebar is small compared to that of the rebar on the tension side of the neutral axis. Minor corrections were made to the documentation that have no effect on the results.
*	6855	The calculation of secondary forces in bridge objects has been improved to reduce the oscillation in values that was present when bridge tendons, modeled as elements, were discretized at points between the section cuts. This is a further enhancement to the more significant improvements already made under Ticket 6573 for the previous release (CSiBridge v23.2.0). Note that these secondary forces are those displayed when the option "Include Tendon Forces" is checked on the "Bridge Object Response Display" form. Secondary forces are also used in certain bridge superstructure design and rating checks for prestressed concrete bridge sections, whether pretensioned or post-tensioned. Now the oscillation in secondary forces is removed regardless of tendon discretization, whereas previously only the case with a single discretization point between section cuts was handled. In addition, secondary-force calculation has been improved for the case where the tendon end points are located between section cuts rather than at the ends of the spans. The previous behavior tended to overestimate the magnitude of secondary forces in affected models, particularly shear forces in non-straight tendons.
	6880	A new option has been added to AASHTO LRFD shear rating requests for concrete sections. The previous option (MCFT Formulas), which determines the beta factor and theta angle per section 5.7.3.4.2, has been supplemented by a second option (MCFT Tables) where the procedure follows AASHTO Appendix B5.2. User-specified values may be given instead to override the beta factors and theta angles evaluated by the algorithm.
	6905	For bridge superstructure design of steel U-girder bridges per the AASHTO LRFD code, a new design parameter has been added to the fatigue design request that allows the option to specify the presence of longitudinal stiffeners. Previously the design always considered that longitudinal stiffeners were not present. This affects the Steel U Fatigue design request for AASHTO LRFD, all versions.
	6910	Bridge rating of steel superstructures per the AASHTO code has been enhanced to allow optional specification of a non-rated live load combination that can be included in the numerator of the rating factor, along with the gravity and other permanent loads. The live load to be rated is still specified in the denominator of the rating factor. This new feature allows explicit consideration of the presence of normal traffic on the bridge alongside the permit or other special vehicles being rated. The enveloped nature of the non-rated live load is taken into account when rating positive and negative effects of the rated vehicles. This same feature was previously added for concrete superstructures in version 23.2.0 under Ticket 6572.

*	Ticket	Description
	7039	Several enhancements have been made to the Bridge Modeler for the layout of girder longitudinal rebar for use in bridge superstructure rating and design. The changes are present on the Bridge Girder Reinforcement Layout form and the associated database tables: (1.) A fractional number of longitudinal rebars of a given size and length can be specified. For example, 8.5 bars could be specified for each of two adjacent girders that share a rebar in the slab between them. The rebar area used for design is based on the fractional number specified. (2.) Separate reference locations are now available for specifying the Start and End of a longitudinal rebar. Previously both ends were located from a single reference line, such as the beginning of Span1, and positive distances were measured down-station from the reference line for the Start of the rebar, and up-station for the End of the rebar. Now positive distances for both ends are measured up-station from their respective reference lines (which can be the same or different). (3.) More control is provided for the specification of development length for each set of longitudinal rebars in a girder. The development length can be automatically calculated from a selected code (as before), and a separate scale factor given for each set of rebars. Previously a single scale factor applied to all sets of rebars. The net development length used will be displayed. Alternatively, a given set of rebars can be assigned a user-defined net development length independent of the selected code. The development length is taken to be the same at both ends of each set of rebars. Separate embedment ratios can be specified at the two ends, as before, to account for differing end conditions such as hooks, splices, or embedment in other structures.

Design – Steel Frame

Enhancements Implemented

*	Ticket	Description
*	1239	An enhancement has been implemented to add steel frame design according to the AASHTO LRFD 2020 Bridge Design Specifications, Ninth Edition, 2020. This can be used to perform strength design for steel members in diaphragms, cross frames, bent caps and columns, signage, and auxiliary structures.

Installation and Licensing

Enhancements Implemented

*	Ticket	Description
*	6869	The version number has been changed to v23.3.0 for a new intermediate release.
	7153	The software and installation have been updated to use Microsoft .NET Framework 4.8. The API will continue to use .NET 4.7.1 to avoid a breaking change.

Loading

Enhancements Implemented

*	Ticket	Description
	7091	An enhancement was implemented to add new vehicles to the AASHTO and Caltrans vehicle libraries. The AASHTO vehicles represent the MBE (3rd Ed. App. D6A) rating loads NRL, SU4, SU5, SU6, SU7, plus the FHWA EV2 and EV3 emergency-vehicle loads. The Caltrans vehicles represent permit vehicles P5 through P15 with split axles, and each is defined both with and without lane load. In addition to adding new vehicles, the existing AASHTO rating vehicles were modified to now use a 1.33 scale factor on the axle loads to capture the dynamic load allowance per AASHTO. The existing Caltrans P5 through P15 vehicles were also modified to now use a 1.25 scale factor on the axle loads, consistent with the new split axle vehicles.

Results Display and Output

Enhancements Implemented

*	Ticket	Description
*	5734	An enhancement has been made to speed-up the recovery of analysis results for 'Bridge Object Forces' and 'Bridge Object Girder Forces' tables and the 'Bridge Object Response Display' form by means of multi-threading. Medium- to large-sized spine and area bridge object models should benefit from this enhancement when requesting response for moving load cases and/or load combinations containing moving load cases.
	7027	An enhancement has been implemented so that stresses for the individual girders of concrete tee-beam bridge sections are now available for display in the Bridge Object Response Display form. Previously stresses for tee-beam bridges were only available for the bridge section as a whole.

Analysis

Incidents Resolved

*	Ticket	Description
*	7121	An incident was resolved where running a model that contained solid elements and a large number of load patterns, or multi-step load patterns with a large number of steps, could cause a fatal analysis error (stack overflow). When this occurred, results were not available.

Bridge Design and Rating

Incidents Resolved

*	Ticket	Description
	6882	An incident was resolved for bridge superstructure rating per the CAN/CSA code where shear rating requests that were automatically generated from the new-model template for concrete bridge sections would not run. The same rating requests defined manually by the user would run and produce correct results. This issue affected new models created in CSiBridge version 23.2.0 only. The affected bridge sections were the precast concrete I-girder and U-girder composite sections, and concrete box-girder sections.
	6972	An incident was resolved for steel U-girder bridge design and rating where design or rating requests would fail to run when a double-bearing bent was assigned to one or more of the internal supports. When this occurred, no design or rating results were available. Analysis results were not affected.
*	7018	An incident has been resolved for concrete tee beam bridge design/rating in which the design/rating for exterior girders was incorrect when the bridge section dimensions f1 vertical and f3 vertical were the same, and the slab thickness and overhang slab thickness were the same. When this happened, the stems of the exterior girders were ignored when calculating the girder section properties such that the stresses for the exterior girder designs were incorrectly too large.

Bridge Modeler

Incidents Resolved

*	Ticket	Description
	6891	An incident was resolved for the Bridge Modeler where an error message was sometimes displayed when running the analysis for a bridge object with a Super-T bridge section indicating that the section properties could not be calculated correctly. This message itself was in error, and when it did occur, the analysis and design results were not affected.
	6895	An incident was resolved for the Bridge Modeler affecting curved steel U-girder bridges where the generated steel U-girder area (shell) objects near an abutment that was assigned a double-bearing bent could be modeled incorrectly if (1.) the bridge was curved, (2.) the skew angle at the support was large, and (3.) the U-girder had an internal diaphragm that was very close to the support. When this occurred, the effect was visually obvious in the generated model, and results agreed with the model as generated. Note that the use of a double-bearing bent at the abutment is not common, but can be useful to connect to other bridge objects or for other special modeling purposes.
	6913	An incident was resolved for the Bridge Modeler affecting the generation of bottom-span tendons for segmental bridges with variable depth along the span. In the previous version some of the generated tendons were defined outside of the depth of the segment in the transition area between the anchor and the final duct position. This issue has been resolved and now all the generated bottom span tendons follow the variation of the section along the span. For existing models from previous versions, open the Segmental Bottom Span Tendon Definition form and click OK (without changing anything) for the tendons to be corrected/updated. Updating the Bridge Object will not automatically adjust the tendons in these models.

*	Ticket	Description
*	7026	An incident was resolved for the Bridge Modeler where superstructure hinges that were modeled as interior supports with a discontinuous superstructure and no assigned bent property did not consider the horizontal offset, if any, of the bridge section when generating the link objects representing the bearings. This only affected bridge objects updated as spine models, not bridge objects updated as area- or solid-object models. The common case with no horizontal offset of the two adjacent bridge sections was not affected. This error did not affect in-span hinges defined by assignment within a single span. For affected models, results agreed with the model as generated.
	7103	An incident was resolved for the Bridge Modeler where, for composite bridge sections, when a staggered diaphragm using the layout line as its reference was assigned between two global (entire-width) section cuts that were not parallel, the girder (area and/or line) objects might not have been meshed correctly at the staggered-diaphragm location. When this occurred, the analysis results near this staggered diaphragm could be incorrect. Also, this could affect the panel identification for steel I-girder bridges and cause superstructure design or rating to fail, producing no results.
	7123	An incident was resolved for the Bridge Modeler where the tendons generated for Super-T girders were not accounting for the rotation of the girder when the bridge section was super-elevated, but were instead located as if the girder centerlines were vertical. Because of this, many of the tendons did not properly connect to their girders. This error was visually obvious in the generated model, and results agreed with the model as generated.
	7144	An incident has been resolved for the Bridge Modeler where a bridge object with Super-T bridge sections and two or more spans could not be updated when the number of girders in one span was greater than the number of girders in the previous span. When this occurred, the bridge model could not be generated.

Data Files

Incidents Resolved

*	Ticket	Description
	7175	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.
	7176	An incident was resolved where the software could become non-responsive when opening certain model files (.BDB) saved in older versions of the software if the old model contained any bridge objects for which internal data inconsistencies were detected. Now when such errors are detected, a message will be displayed suggesting that the user update the affected bridge objects in order that these internal data errors be automatically corrected. If this is not done, then analysis can still proceed, but bridge superstructure design/rating will not be available for the affected bridge object until it is subsequently updated.

Database Tables

Incidents Resolved

*	Ticket	Description
	6872	An incident was resolved for displaying bridge object girder forces in the database tables when there were multiple bridge objects with different number of girders in each bridge object. When this happened, some of the girder responses in the table Bridge Object Girder Forces could be missing in some cases. The work around was to use the bridge object response display form, select the target bridge object and desired response, and use the Export to Excel command to see all the results.
	7145	An incident was resolved where in certain uncommon cases joint reactions were not reported in tables. This was due to a formatting issue. Results were not affected.

Drafting and Editing

Incidents Resolved

*	Ticket	Description
	6143	An incident has been resolved where the Undo/Redo feature was inadvertently disabled in versions v23.0.0 to v23.2.0. This has been reinstated to its previous behavior. Note that, as before, Undo is not available for prior operations after updating a bridge object, saving the model, or running the analysis.

Graphics

Incidents Resolved

*	Ticket	Description
	6860	An incident was resolved where trapezoidal loads on frames would not display correctly in DirectX views. No results were affected.

Results Display and Output

Incidents Resolved

*	Ticket	Description
	7191	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.

User Interface

Incidents Resolved

*	Ticket	Description
*	6942	An incident was resolved for the Bridge Modeler where an abnormal termination could occur when editing the tendon properties in a segmental bridge object if the name of a tendon material property had been changed outside the Bridge Modeler since the segmental bridge object was first created. Changing the name of the material property back to the name used when the bridge object was first created would resolve this issue. Old models affected by this issue will run and produce correct results if no changes are made to the model. However, if the segmental bridge object is edited, it will be necessary to reassign the correct material to the tendons, or else a default tendon property will be assumed when the bridge object is updated.
	7081	An incident was resolved where the graphical display of the transverse rebars in the Bridge Girders Reinforcement Layout Form could be incorrectly scaled for a flat-slab bridge section when the ratio of the total bridge section depth to the thickness of overhang (t5 or t6) was large. This was a display issue in the form only. Results agreed with the numerical values entered in the form and shown in the tables.