

# CSiBridge v23.1.0 Release Notes

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**Notice Date: 13-March-2021**

This document lists changes made to CSiBridge since v23.0.0, released 15-January-2021. Items marked with an asterisk (\*) in the first column are more significant.

## API

### Enhancements Implemented

*	Ticket	Description
	5993	The utility that unregisters the Application Programming Interface (API) library types has been enhanced. Previously, not all references to the API were removed from the Windows Registry upon uninstallation of the software. This could cause difficulties using the API with later versions of CSiBridge. Uninstalling the new version will now fully clean the registry of references to the CSiBridge API.
	6083	The CSiBridge API is now limited to start and/or connect to a running instance of CSiBridge on a remote computer that is using a Network or Cloud license.

## Bridge Modeler

### Enhancements Implemented

*	Ticket	Description
	5988	An enhancement has been implemented for the Advanced Concrete Box bridge section definition in which the exterior girder angles now allow negative values greater than or equal to -89 degrees. The legal range is now from -89 to +89 degrees. Previously the range was from 0 to 89 degrees.
	6003	The Bridge Modeler has been enhanced to improve the meshing of the slab for steel I-girder bridges when the "Mesh Slab at Critical Steel I-Girder Location" option in the Update Bridge Structural Model form is checked. Now two nearby slab mesh points created from the local meshing of the slab due to section transitions in two adjacent non-prismatic girders will be merged when either (1) the distance between the two points is within 2 inches (5 cm), or (2) the distance between the two points is less than 10% of the distance between the two global section cuts on either side of these two points. The new point location will be the midpoint between the two merged slab points. Such merging reduces the number of required edge constraints, and reduces the numerical sensitivity that can result from very short edge constraints. In addition, for the case where similar merging is performed manually by the user, definitions such as section cuts and generalized displacements that reference the joint deleted in the merge are updated to reference the surviving joint of the pair (this was not the case for previous versions).
	6087	The Bridge Modeler has been enhanced to improve the sub-meshing of the beam (girder) in the longitudinal direction to better match the sub-meshing of the slab for steel I-girder and U-girder, precast concrete I-girder and U-girder, and Super-T bridge sections. As before, longitudinal sub-meshing of the beam is also affected by the sub-mesh size specified for the flange (if using full-shell modeling) and for the web (if using full-shell or mixed modeling). Note that the sub-mesh size for the slab is specified when updating a bridge object, and it has no effect when the value is larger than the specified segment length (the distance between default global section cuts) except in the case of large skews or curvature. Spine models of the bridge object are not affected by the sub-mesh size.
	6179	An enhancement was implemented to improve the Super-T frame-section tendon layout by 1) allowing a second tendon to be defined at the top of each web, 2) allowing tendons in the bottom of the section to be located closer to the edges, and 3) the default section now contains one tendon at the top of each web.

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

*	Ticket	Description
*	5877	The version number has been changed to v23.1.0 for a new intermediate release.

**Loading**  
***Enhancements Implemented***

*	Ticket	Description
*	4750	An enhancement has been implemented to add automated bridge wind loading according to the IRC:6-2017 code.
	6040	An enhancement has been implemented to add the Special Vehicle (SV), Fatigue Truck (40T), and 70R Tracked Vehicle per the IRC:6-2017 code. The existing Class A, B, and 70R wheeled vehicles were also updated to include edge distances and height to the center of gravity of the load.
*	6041	An enhancement has been implemented to add bridge temperature-gradient loading according to IRC:6-2017.

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

*	Ticket	Description
	6065	An enhancement has been implemented for the design and rating of steel I-girder and steel U-girder bridges where the haunch height (distance between the bottom of top flange and soffit of top slab) is now reported in the design- and rating-results property tables.

**Analysis  
Incidents Resolved**

*	Ticket	Description
	947	<p>An incident was resolved where the acceleration loads generated for thin or thick shells with joint offsets were inconsistent with the mass used for analysis. By way of explanation, mass is always created at the joints. Previously, acceleration loads for shells were computed for the mass at the mid-surface of the shell, then transformed to the joints, creating small moment acceleration loads. This inconsistency between the location of the mass and the associated acceleration load led to errors in the calculation of the participating-mass ratios. It also could generate a warning message during Ritz-vector generation for acceleration loads stating that loads were applied to massless degrees of freedom.</p> <p>Now acceleration loads will be computed at the shell joints, consistent with the location of the mass. Changes in results for acceleration loading and mass-participation factors can be expected for models with shell joint offsets, limited by the size and associated mass of the joint offsets relative to the overall dimensions and mass of the structure. Note that shell joint offsets are common in models created by the Bridge Modeler, but these are generally small and the effect on results will be minimal.</p>
*	6021	<p>An incident was resolved where, when a Parametric PMM hinge underwent a strain reversal between points C and D of the backbone curve, the final strength of the hinge was fixed at the level where the reversal occurred and did not drop further to the force/moment defined for point E of the backbone curve. This issue affected both the steel and concrete type Parametric PMM hinge, but did not affect other hinge types. This behavior was not common because load reversal when losing strength is not common in most practical models.</p>
*	6036	<p>An incident was resolved where an analysis could inadvertently get canceled while performing a license check. This issue was not common. It was timing-dependent and was most likely to occur when running long, multi-stepped load cases. Running such load cases in parallel and/or network connectivity issues that interfered with the license check increased the prevalence. When the issue occurred, full results for completed load cases were available, as well as partial results for load cases that were already running. No results were available for load cases that had not started when the cancellation occurred.</p>
*	6409	<p>An incident was resolved where restraint-displacement loading applied in a nonlinear direct-integration time-history load case using the Hilber-Hughes-Taylor (HHT) integration method was being scaled by the factor one minus alpha (<math>1 - \alpha</math>), where the HHT alpha value can range from <math>-1/3 \leq \alpha \leq 0</math>. The default and most common value is zero, corresponding to the Newmark method, for which there was no error. In the worst case with <math>\alpha = -1/3</math>, the applied load could be 33% too large. Displacement loads applied through springs and one-joint link elements were not affected, only loads applied through restraints. No other type of loading was affected. No other type of load case was affected. In particular, FNA and linear direct-integration load cases were not affected.</p>

**API  
Incidents Resolved**

*	Ticket	Description
*	6129	<p>An incident was resolved in the Application Programming Interface (API) where following changes broke compatibility with earlier API versions: (1) In CSiBridge v22.2.0 (CSiBridge.dll version 1.9 and CSiAPIv1.dll version 1.9), the eMatTypeSteel_Chinese_Q345 enumeration got renamed to eMatTypeSteel_Chinese_Q355. (a) Affected programs: CSiBridge v22.2.0, v22.2.1, v23.0.0 (b) Affected API clients: (i) Compiled COM clients (e.g. VB6, Delphi) failed to start. (ii) Interpreted COM clients (e.g. VBA) failed to compile/run if the affected enumeration was used. (c) Fix: eMatTypeSteel_Chinese_Q345 enumeration got reinstated. CSiBridge versions 22.2.0, 22.2.1, and 23.0.0 and corresponding CSiBridge.dll versions 1.9 and 1.13 &amp; CSiAPIv1.dll versions between 1.9 and 1.13 should not be used for developing plug-ins and/or API scripts to ensure full compatibility with past and future API versions. The cOAPI.GetOAPIVersionNumber() method can be used to check for incompatible API versions before using affected interfaces to prevent run-time errors.</p>

* Ticket	Description
6420	An incident was resolved for the Application Programming Interface (API) where COM clients sometimes could not launch or attach to instances of the software on a remote computer running the CSiAPIService.exe. This was generally not a problem if the client first launched a local instance of the software before attempting to work with a remote instance.
6439	An incident was resolved for the Application Programming Interface (API) where attaching to a running instance of the software and executing methods to create a new template model (e.g. New2DFrame, NewBlank) sometimes resulted in the application becoming non-responsive.

## Bridge Design and Rating Incidents Resolved

* Ticket	Description
6102	An incident was resolved in the procedure for calculating shear-only resistance for the JTG 3662 2018 Concrete Box Shear superstructure design request. Previously, the calculation formulas for the shear-only option were the same as the torsion-only or shear and torsion. Now the shear-only procedure follows JTG 3662 2018 article 5.2.9.
* 6112	An incident was resolved for the bridge design of Super-T bridge sections where the results of the flexure design check were incorrect because the demand was calculated using incorrect girder forces. In particular, the demand included forces from the tendons and the tributary portion of the slab, but not from the Super-T girder itself. No other bridge-section types were affected.
* 6174	An incident was resolved for bridge superstructure design per the AASHTO LRFD 2017 code where the calculation of the torsional cracking moment $T_{cr}$ for the Concrete Segmental Shear Design check incorrectly used the AASHTO LRFD 2014 equation 5.8.2.1-4. This has now been updated to use equation 5.7.2.1-5 of the 2017 code.

## Bridge Modeler Incidents Resolved

* Ticket	Description
5032	An incident was resolved where edits made in the steel beam editor were not applied and maintained after updating the bridge model. The results corresponded to the data shown in the steel beam editor form after updating the bridge model. This was corrected in v23.0.0, but inadvertently omitted from the release notes.
6014	An incident was resolved for the Bridge Modeler where the bridge model could not be generated when the bridge object contained a single-beam type of diaphragm that was modeled as "mixed" (shell web and frame flanges) and the beam section was a steel rectangular section. Now the steel rectangular section, the steel I section, and single-segment non-prismatic sections containing either of these two steel sections can be modeled as "mixed" when used in a single-beam diaphragm. Note that this only applies to steel I-girder bridge sections when the I-girders themselves are modeled as mixed or full shell, in other words, when the steel I-girder webs are modeled as shells.
6056	An incident has been resolved for Bridge Scheduler in which the rigid segments of a segmental bridge object were not available for selection in the Object-Name drop-down list on the form "Define/Edit Operations for Task" when the Object Type was "Segment".
6086	An incident was resolved for the Bridge Modeler where the sub-meshing specified for the slab when updating a bridge object was not being applied to Super-T bridge sections except for the first segment of the bridge object, i.e., between the first two global section cuts. Results agreed with the model as generated. The effect of this was minor. No other bridge-section types were affected.
6089	An incident was resolved for the Bridge Modeler where in which the name of a segmental bridge traveler could not be changed in the Bridge Traveler Data form (command Bridge > Erection > Traveler > Modify/Show). This problem could result in an incorrect traveler name in the staged construction load cases generated by the segmental bridge scheduler (command Bridge > Erection > Schedule Wizard > Generate Schedule).

## Database Tables

### *Incidents Resolved*

*	Ticket	Description
	5385	A minor correction was made to the database table names to match the corresponding design code names: "Function - Response Spectrum - NZS 1170 2004" was changed to "Function - Response Spectrum - NZS 1170.5-2016," and "Function - Response Spectrum - JTGTB0201" was changed to "Function - Response Spectrum - JTGTB02-2013."
	5956	An incident was resolved for importing the text data file (.B2K, .\$BR) or modifying data using the interactive database editor for a segmental bridge in which the operations "Set Traveler for Segment" and "Remove Traveler" in the table "CASE - STATIC 6 - NONLINEAR STAGE DATA" were not recognized. Note that the user might need to save the model file (.BDB) from a previous version in order to correct this problem for subsequent export and import. Note that the specialized definition of a segmental bridge object is not currently saved in the database tables, and cannot be imported through the text or database-table files. However, the bridge will be imported as a general bridge object, and any construction schedules or staged-construction load-case definitions will be retained.

## External Import and Export

### *Incidents Resolved*

*	Ticket	Description
	6295	An incident was resolved where importing a model text file (.\$BR, .B2K) or database-table file (Excel, Access) containing a bridge object with a bridge line load having a value of zero was not allowed and would generate an error message. The rest of the model could be imported and results agreed with the model as imported. Now, the bridge load definition allows zero force and the import will accept a zero bridge load when importing.

## Graphics

### *Incidents Resolved*

*	Ticket	Description
	6167	An incident was resolved where the top and bottom longitudinal stresses were switched in the table obtained by clicking the "Show Table" button in the Bridge Response Display form when plotting stresses for the following specific case: (1) For the entire bridge section with the selected values "Longitudinal Stresses – Top and Bottom", (2) when plotting the Max/Min values for an enveloping load case or combination, and (3) at stations where the top stress was algebraically smaller (more negative) than the bottom stress. The values plotted and tabulated are now determined as follows when plotting the Max/Min for "Longitudinal Stresses – Top and Bottom": The reported top stress is either the maximum or minimum value at each given station, whichever has the larger absolute value. Likewise, the reported bottom stress is either the maximum or minimum value, whichever has the larger absolute value at that station. To find the range of stresses at either the top or bottom location, plot the stress values for that single location rather than for the top and bottom together.

## Loading

### *Incidents Resolved*

*	Ticket	Description
	6080	An incident has been resolved where the tendon load defined in the Super-T frame section tendon layout form was not saved when changed on the form. The tendon load applied to the model would remain the default and was reflected in the tendon object details via right-click and the database tables.
*	6265	An incident was resolved where the wind loads generated for bridge superstructures would be zero for the CAN/CSA S6 and Eurocode codes if the wind load pattern contained only vertical load. Horizontal and vertical wind loads were correctly generated if the load pattern specified any horizontal loading.

* Ticket	Description
6453	An incident was resolved for bridge wind on live load according to Eurocode and the CSA S6-14 code. Previously the height of the surface area used for wind on live load was being taken as a unit height instead of the height specified in the respective loading code, therefore underestimating the load. A height of 2m is now considered for Eurocode. A height of 3m minus the barrier height is now taken for the CSA S6-14 code.

## Results Display and Output

### Incidents Resolved

* Ticket	Description
6141	An incident was resolved where, when linear-type links with non-zero damping coefficients were used in a nonlinear modal time-history (FNA) load case, the link viscous damping energy for these links was incorrectly reported as being zero. When this issue occurred, the missing linear-link viscous damping energy would be included in the energy error, so that the total energy and other energy components were not affected. No other results were affected. Only CSiBridge v23.0.0 was affected.
6150	An incident was resolved where the plotted DC ratio for positive moment for the AASHTO LRFD service design check of steel I-girder bridges was incorrect, and was actually displaying the depth of the web in compression for the elastic range. This was a plotting error and did not affect the design check results. The values of the DC ratio for positive moment presented in tables and reports were correct. Only the plotted results shown using the commands Display > Show Bridge Superstructure Design Results (or Show Bridge Superstructure Forces/Stresses > Design) were affected.

## Section Designer

### Incidents Resolved

* Ticket	Description
6266	An incident was resolved where assigning ASCE 41-17 concrete column hinges to columns with Section Designer sections would cause an error condition.

## Structural Model

### Incidents Resolved

* Ticket	Description
6422	An incident was resolved where the steel and rebar uniaxial stress-strain curves were using minimum instead of expected strengths. Nonlinear results for models run in the new version that use these stress-strain curves, such as models with fiber hinges and/or directional materials in layered shells, can be expected to produce changed results consistent with an increase in the strengths. Materials with user-defined stress-strain curves are not affected.

## User Interface

### Incidents Resolved

* Ticket	Description
5371	An incident was resolved where the units conversion used to display shear and direct force parameters for partial fixity area edge releases in the Object Model - Area Information form which is accessed by right-clicking on an area object was not correct when the display units were different from the database units. This was a display issue only. The correct value was displayed in the tables and was used in analysis.
6151	An incident was resolved where the temperature loads on the bridge section data form were not converted when the units on the form were changed between Fahrenheit and Celsius. The numerical values present, along with the units selected on the form when OK was clicked would define what values were saved and used for analysis. Now the values are converted when changing the selected units on the form.

*	Ticket	Description
*	6155	An incident has been resolved where, for the forms defining bridge design requests for the steel I-girder and steel U-girder strength/ultimate design checks, it was possible to delete the two required demand sets Mdc and Mdc. Now when either of these two rows are selected, the Delete button will be disabled. Previously, deleting either of these two demand sets could cause the software to terminate abnormally. The presence of at least one other demand set will now also be enforced.