Release Note

Release Date : September 2025

Product Ver. : CIVIL NX 2025 (v2.2)

Enhancements

Enhancements in CIVIL NX 2025 (v2.2)

1. *Steel-Composite Girder Design & Assessment Enhancements*
2. *Virtual Beam Display for Plate and Mixed Models*
3. *Virtual Beam + Span Information: Faster LTB checks on plate or mixed models*
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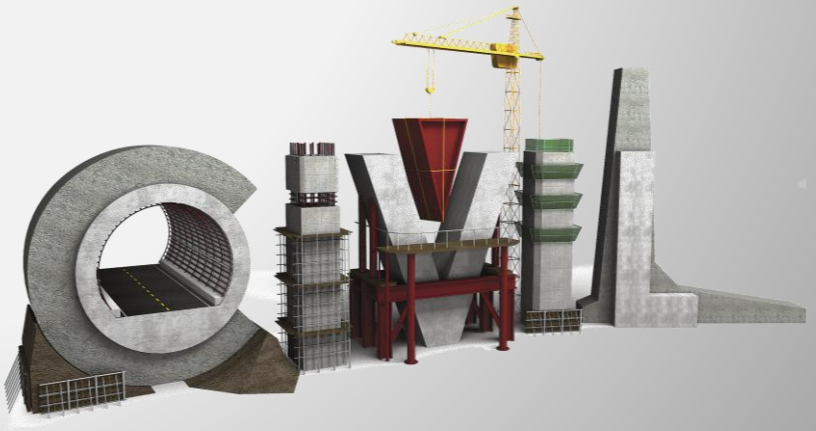
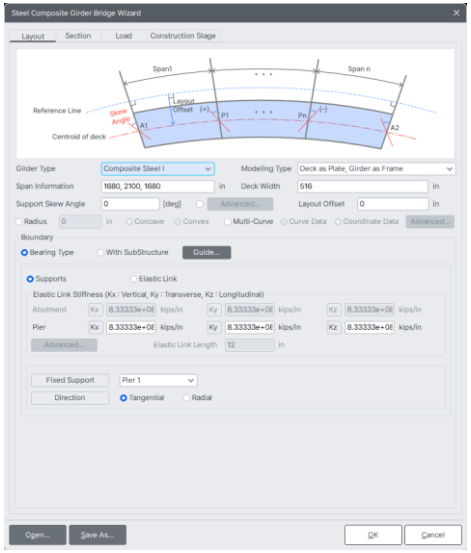
10. *Intermediate Stiffener Check (NR/GN/CIV/025) for Steel Railway Bridges*
11. *Local Coordinate Displacement Output under Moving Load Cases*



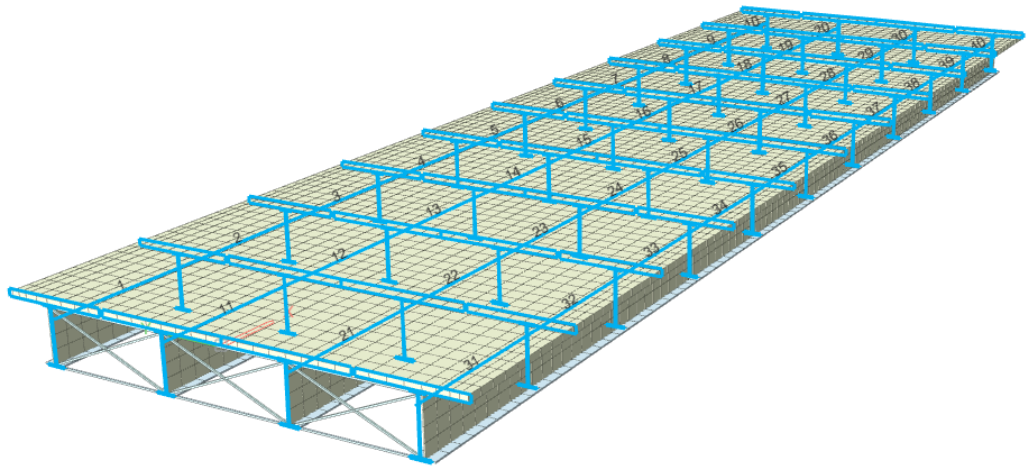
1. Steel-Composite Girder Design & Assessment Enhancements

- Until the previous version, Steel-Composite Girder Design was supported only when the girders were modeled as Beam Elements. With this release, the design workflow has been significantly extended:
  - Full Plate Modeling Support: Entire steel-composite girders modeled with Plate Elements can now be directly designed.
  - Mixed Modeling Support: Structures modeled with a combination of Beam Elements and Plate Elements are also supported, allowing more flexible modeling strategies.
- Supported Codes
  - Design: AASHTO LRFD (Load and Resistance Factor Design), Assessment: CS 454 (Assessment of Highway Structures)
- Key Benefits
  - Engineers can now freely choose between beam-only, plate-only, or hybrid modeling approaches depending on project requirements.
  - Plate-element-based modeling better captures local effects and distribution of stresses in steel-composite girders.
- Limitation
  - Design and Assessment are supported only for Virtual Beams generated via the Steel Composite Bridge Wizard.

▪ ***Structure > Steel Bridge > Steel Composite Bridge***



Steel Composite Bridge Wizard



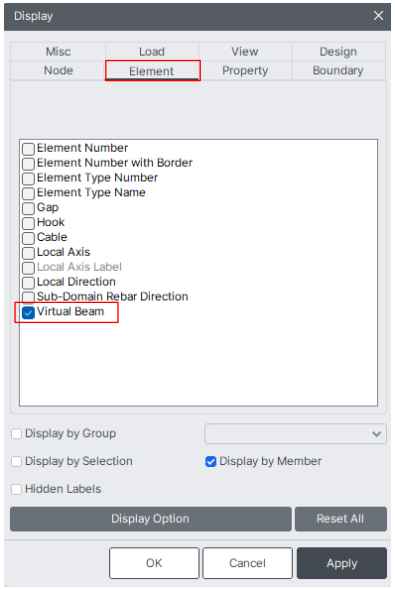
Steel-Composite Girder Bridge — Virtual Beam Display

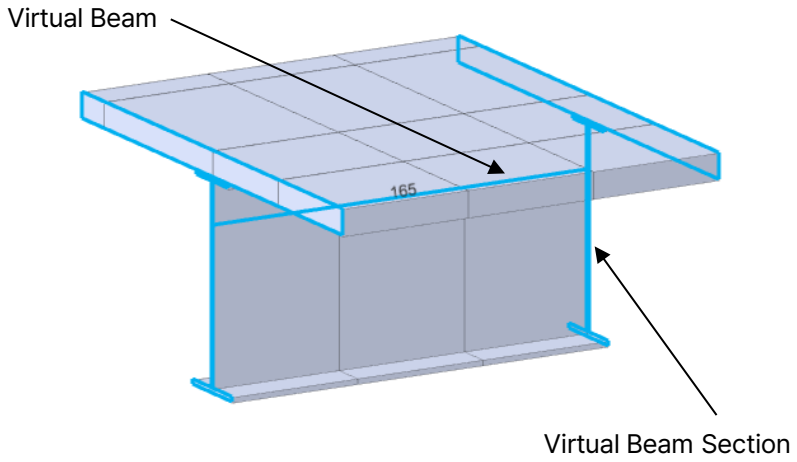
2. Virtual Beam Display for Plate and Mixed Models

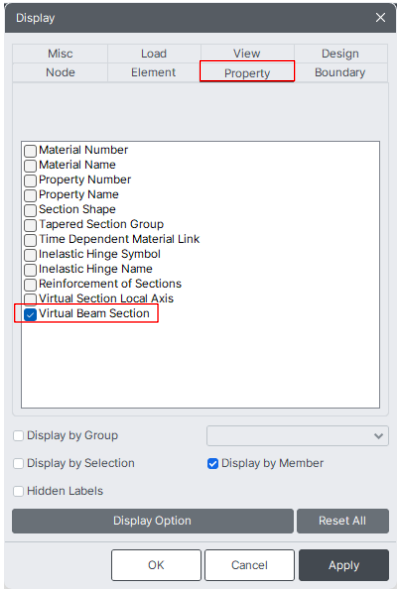
- A new Virtual Beam Display option has been added to support the design of steel-composite girders modeled with Plate Elements or a combination of Plate and Beam Elements.
- Display Settings
  - In the Display > Element tab, users can enable Virtual Beam.
  - In the Display > Property tab, users can enable Virtual Beam Section.
  - Once activated, the model view will display the virtual beam representation.
- What is a Virtual Beam?

  A Virtual Beam is not a physically modeled element. Instead, it is a design-oriented beam representation automatically generated from plate elements (or plate + beam elements). This allows users to conduct design checks as if the structure were modeled with traditional beam elements, while still benefiting from the accuracy of plate modeling.
- Benefits for Users
  - Clear Visualization: View beam-like design references even in complex plate or mixed models.
  - Seamless Design Integration: Perform design checks on virtual beams without remeshing or remodelling.
  - Time Savings: Avoid manual re-modeling by directly using virtual beams derived from your analysis model.

- ***View > Display***







3. Virtual Beam + Span Information: Faster LTB checks on plate or mixed models

- You can now define Virtual Beams per girder and perform lateral-torsional buckling (LTB) checks even when the steel-composite girder is modeled entirely with plates or with a plate + beam (mixed) model.

- How it works

  Create Virtual Beams by Girder

  Open Span Information and set Element Type → Virtual Beam.

  Select the plate/beam elements that belong to each girder to generate its Virtual Beam.

  Tell the program where the girder is braced

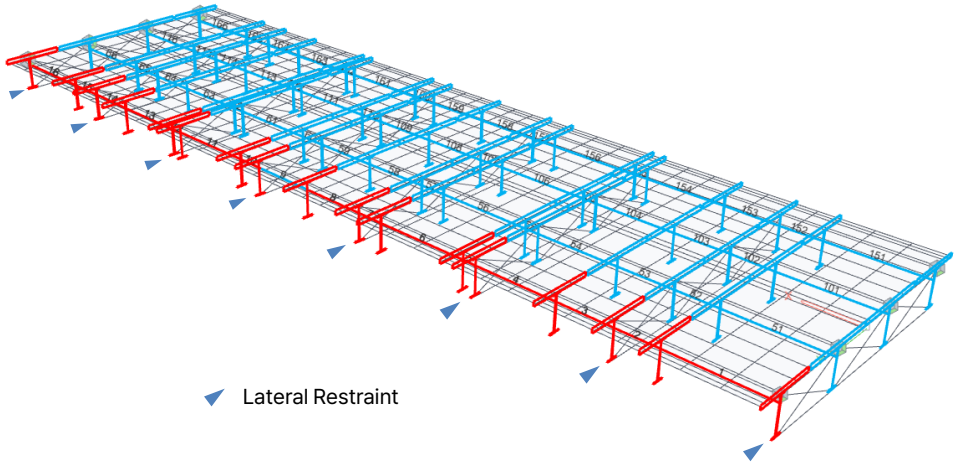
  In Span Information, set Support at each cross-frame (or diaphragm) location.

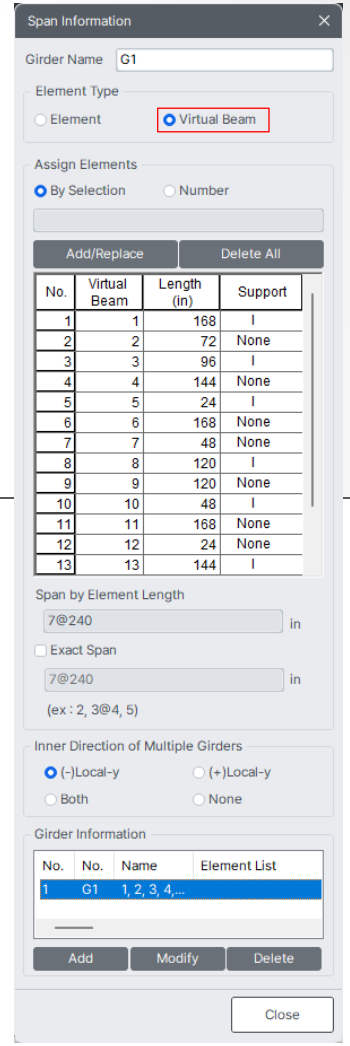
  CIVIL NX then automatically determines the unbraced length between supports.

  Automatic critical moment search

  During the LTB verification, the program searches the maximum bending moment within each unbraced segment and uses that value for the check—no manual segmenting or re-meshing required.

- ***Structure > Steel Bridge > Composite Option > Span Information***





Span Information

4. Virtual Beam Selection & Management

- Selection

  Supported selection icons: Select Single /Select by Window/Select All/Unselect by Window/Unselect All
  When Virtual Beams are displayed, only Virtual Beams can be selected. This ensures a clear and convenient workflow, preventing accidental selection of structural elements.

- Activation :

  Activating or deactivating specific Virtual Beams only is not supported.
  Virtual Beams are always kept in a fully active state when displayed.

- Deletion of Virtual Beams

  Virtual Beams can be deleted in two ways:

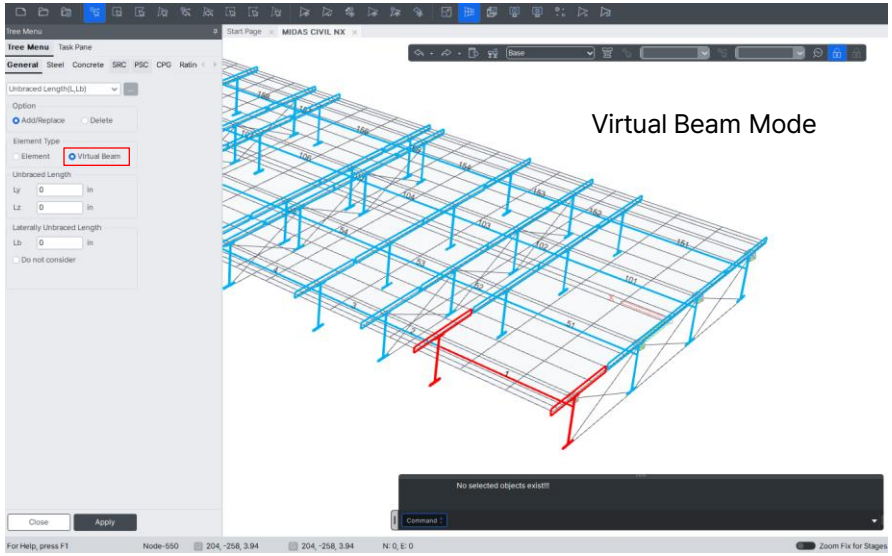
  1. Properties → Section Properties → Section for Resultant Forces → delete the corresponding Virtual Beam.
  2. If the elements assigned to a Virtual Beam are deleted, the Virtual Beam is automatically removed.

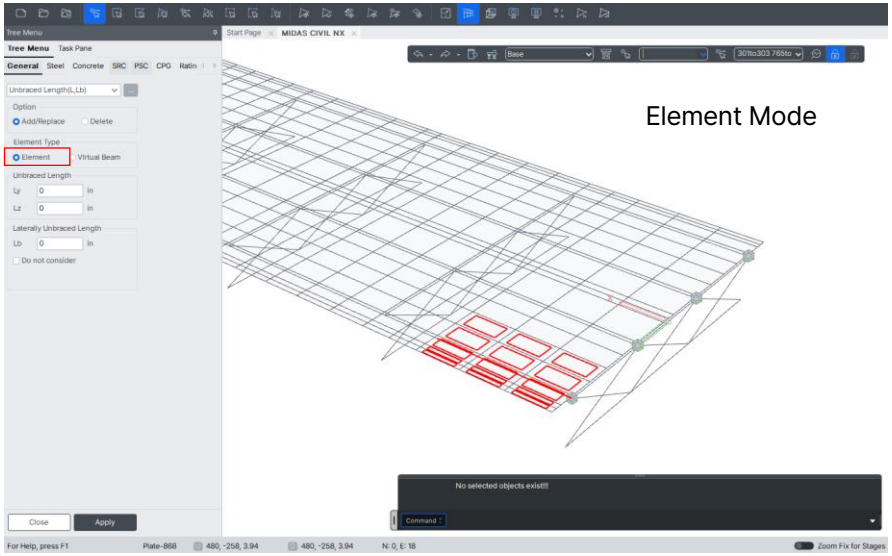
- Zoom Functions

  When all structural elements are deactivated and only Virtual Beams remain active, Zoom All and Zoom Fit do not operate.

  These functions always work relative to activated elements only.

- ***View > Select > Select Single***

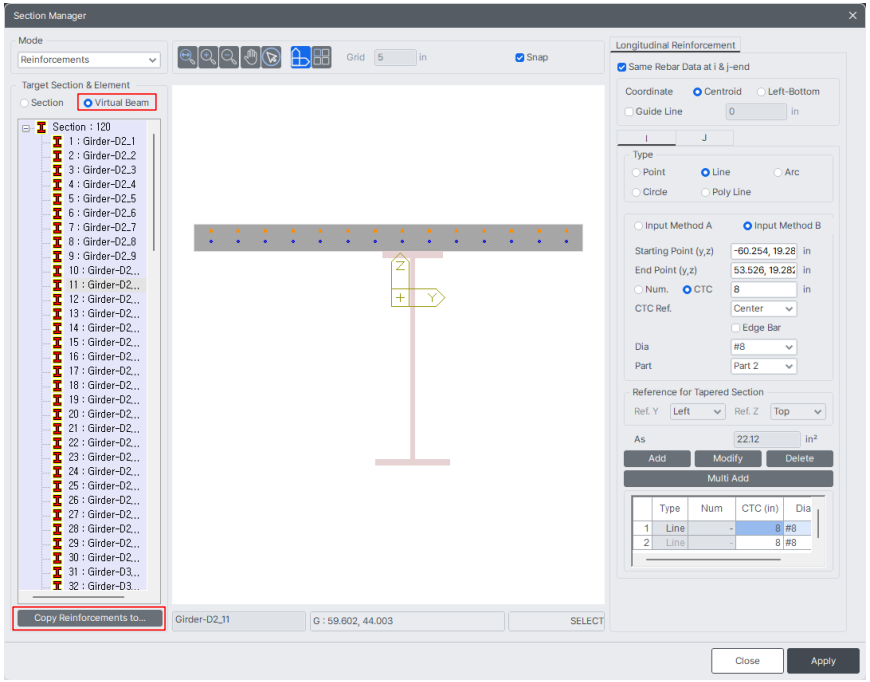




5. Virtual Beam Reinforcement Input

- You can now directly assign reinforcement to Virtual Beams through the familiar Longitudinal Rebar dialog.
  - In the Longitudinal Rebar dialog, select “Virtual Beam” mode.
  - Choose the Virtual Beam number from the list (Virtual Beam IDs can be confirmed in Model View).
  - Reinforcement is then defined in the same manner as for standard Beam Elements, ensuring a consistent workflow.
  - For multiple Virtual Beams with the same reinforcement pattern, the Copy Reinforcement function enables quick and easy input.
  - Design-only usage: Reinforcement assigned to Virtual Beams is used only for design and assessment purposes.
  - No impact on analysis: The reinforcement data is not reflected in the structural analysis results.

▪ ***Design > Composite Design > Design Input Data > Longitudinal Rebar***

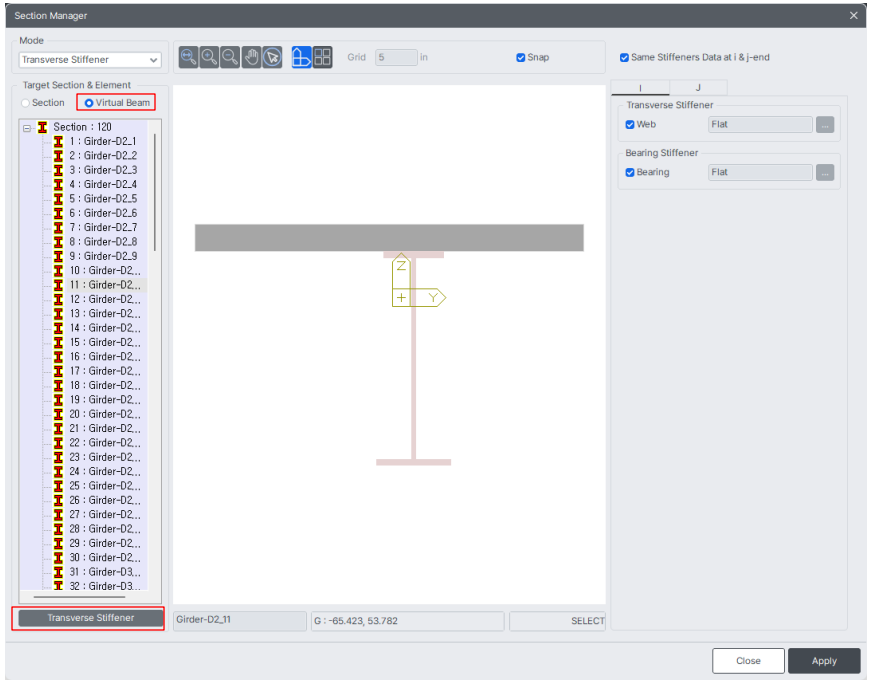


Longitudinal Rebar Dialog

6. Virtual Beam Transverse Stiffener Input

- You can now directly assign transverse stiffener to Virtual Beams through the familiar Transverse Stiffener dialog.
  - In the Transverse Stiffener dialog, select “Virtual Beam” mode.
  - Choose the Virtual Beam number from the list (Virtual Beam IDs can be confirmed in Model View).
  - Transverse stiffener is then defined in the same manner as for standard Beam Elements, ensuring a consistent workflow.
  - For multiple Virtual Beams with the same stiffener pattern, the Copy Transverse Stiffener function enables quick and easy input.

▪ ***Design > Composite Design > Design Input Data > Design Parameters > Transverse Stiffener***

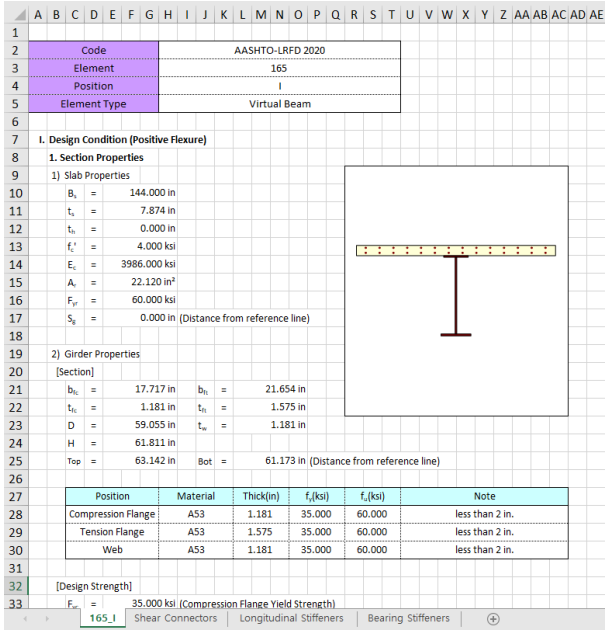


Transverse Stiffener Dialog

7. Virtual Beam Design & Assessment for Steel-Composite Girders

- CIVIL NX now supports the design and assessment of steel-composite girders modeled as Virtual Beams, extending the workflow beyond conventional beam elements.
  - Design: Perform Virtual Beam design according to AASHTO LRFD.
  - Assessment: Carry out Virtual Beam assessment following CS 454 provisions.
  - Virtual Beam design and assessment follow the same calculation procedures as existing beam element design.
  - Results are automatically generated in tabular format and can be exported as comprehensive reports.
  - Section properties, material data, and reinforcement/stiffener inputs defined in the Virtual Beam workflow are fully integrated into the design/assessment process.
  - Design and Assessment are supported only for Virtual Beams generated via the Steel Composite Bridge Wizard.

▪ ***Design > Composite Design > Perform > Perform Design***



Code	AASHTO-LRFD 2020
Element	165
Position	I
Element Type	Virtual Beam

I. Design Condition (Positive Flexure)

1. Section Properties

1) Slab Properties

B_s	=	144.000 in			
t_s	=	7.874 in			
t_h	=	0.000 in			
f_c'	=	4.000 ksi			
E_c	=	3986.000 ksi			
A_r	=	22.120 in²			
F_{yr}	=	60.000 ksi			
S_g	=	0.000 in	(Distance from reference line)		

2) Girder Properties

[Section]

b_{fc}	=	17.717 in	b_{ft}	=	21.654 in
t_{fc}	=	1.181 in	t_{ft}	=	1.575 in
D	=	59.055 in	t_w	=	1.181 in
H	=	61.811 in			
Top	=	63.142 in	Bot	=	61.173 in (Distance from reference line)

Position	Material	Thick(in)	f_y(ksi)	f_u(ksi)	Note
Compression Flange	A53	1.181	35.000	60.000	less than 2 in.
Tension Flange	A53	1.575	35.000	60.000	less than 2 in.
Web	A53	1.181	35.000	60.000	less than 2 in.

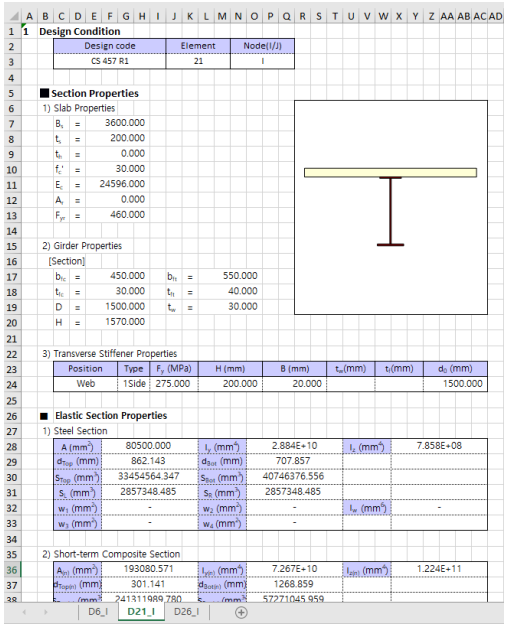
[Design Strength]

F_{yc} = 35.000 ksi (Compression Flange Yield Strength)

165_I | Shear Connectors | Longitudinal Stiffeners | Bearing Stiffeners

Design Report – AASHTO LRFD

▪ ***Rating > Steel/Composite Bridge> Perform > Perform Assessment***



1 Design Condition

Design code	Element	Node(I/J)
CS 457 R1	21	I

Section Properties

1) Slab Properties

B_s	=	3600.000			
t_s	=	200.000			
t_h	=	0.000			
f_c'	=	30.000			
E_c	=	24596.000			
A_r	=	0.000			
F_{yr}	=	460.000			

2) Girder Properties

[Section]

b_{fc}	=	450.000	b_{ft}	=	550.000
t_{fc}	=	30.000	t_{ft}	=	40.000
D	=	1500.000	t_w	=	30.000
H	=	1570.000			

3) Transverse Stiffener Properties

Position	Type	F_y (MPa)	H (mm)	B (mm)	t_w(mm)	t_f(mm)	d_0 (mm)
Web	1Side	275.000	200.000	20.000			1500.000

Elastic Section Properties

1) Steel Section

A (mm²)	80500.000	I_x (mm⁴)	2.884E+10	I_y (mm⁴)	7.858E+08
d_{Top} (mm)	862.143	d_{Bot} (mm)	707.857		
S_{Top} (mm³)	33454564.347	S_{Bot} (mm³)	40746376.556		
S_c (mm³)	2857348.485	S_t (mm³)	2857348.485		
w_1 (mm²)	-	w_2 (mm²)	-	I_w (mm⁶)	-
w_3 (mm²)	-	w_4 (mm²)	-		

2) Short-term Composite Section

$A_{s(r)}$ (mm²)	193080.571	$I_{x(r)}$ (mm⁴)	7.267E+10	$I_{y(r)}$ (mm⁴)	1.224E+11
$d_{Top(r)}$ (mm)	301.141	$d_{Bot(r)}$ (mm)	1268.859		
S_c (mm³)	241311989.780	S_t (mm³)	57271045.959		

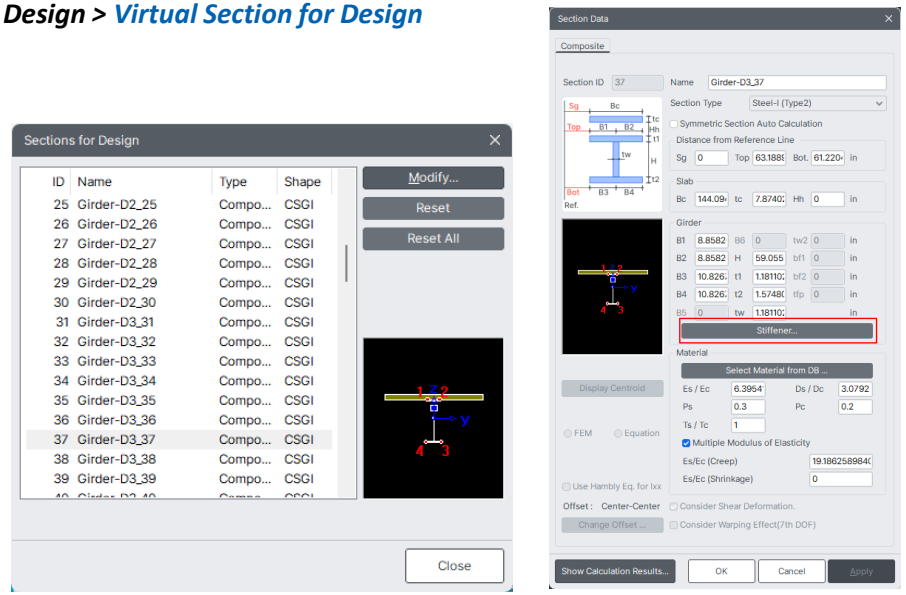
D6_I | D21_I | D26_I

Assessment Report – CS 454

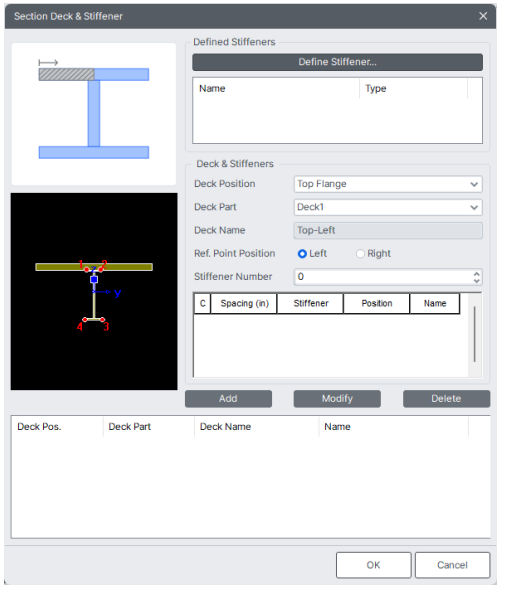
8. Virtual Section for Design

- The new Virtual Section for Design functionality enables engineers to quickly optimize cross-sectional dimensions during the design process.
  - After completing the design with an initial section, if the section fails to meet design requirements, users can:
    - Use Virtual Section for Design to modify flange or web dimensions.
    - Re-run the design checks with the updated dimensions without re-analysis.
  - By repeating the design step with revised dimensions, users can rapidly identify a section that satisfies the design criteria.
  - The same dialog also allows the user to add longitudinal stiffeners into the section.
  - Analysis not updated automatically:
    - Changes made in Virtual Section for Design are applied only to the design process.
    - To update the structural analysis with the final modified dimensions, users must manually reflect the changes in the analysis model.
  - Faster optimization: Quickly iterate on section dimensions without time-consuming re-analysis.

▪ ***Design > Composite Design > Virtual Section for Design***



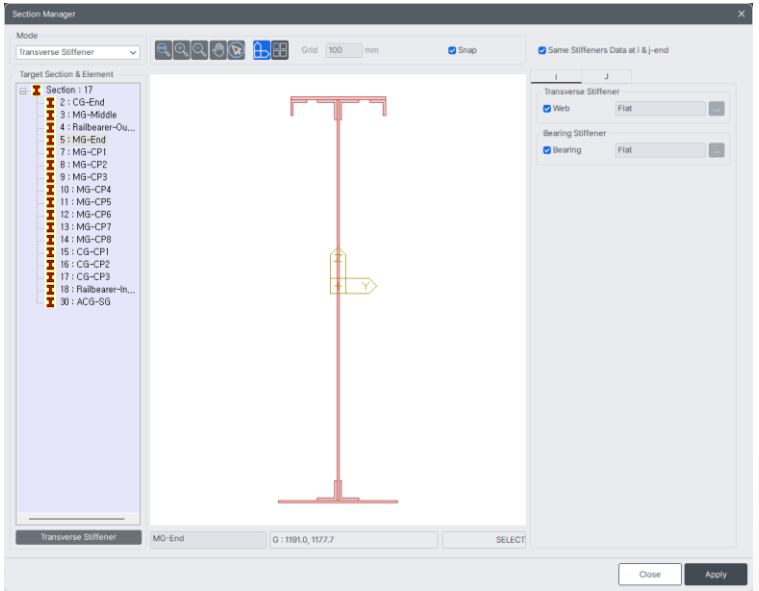
Virtual Section for Design



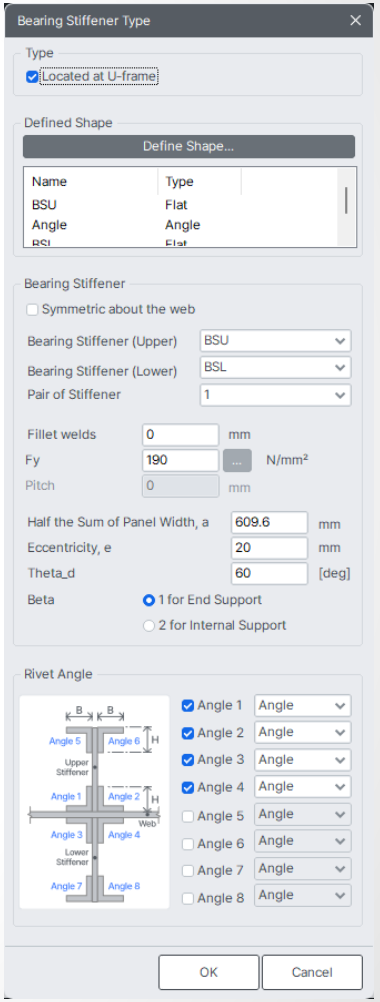
Longitudinal Stiffener

9. Bearing Stiffener Check (NR/GN/CIV/025) for Steel Railway Bridges

- CIVIL NX now supports Bearing Stiffener assessment in accordance with NR/GN/CIV/025 within the steel railway bridge Assessment workflow.
- You can define the angle connecting the web and the stiffener, and account for corrosion of both the stiffener and the angle in the checks.
- Actions & Load Effects Considered
  - Axial Forces on Bearing Stiffener
    - Reaction from the support bearing
    - Destabilising influence of the web
  - Bending Moment
    - Tension-field action moment acting on the bearing stiffener
  - Restraining Forces
    - F_{S1}: Force due to bow of the compression flange
    - F_{S2}: Force due to non-verticality of the web at supports
    - F_L: Additional force due to cross members in U-frames subjected to vertical loading
- Verification Performed
  - Yielding of web plate
  - Yielding of stiffener
  - Buckling of stiffener



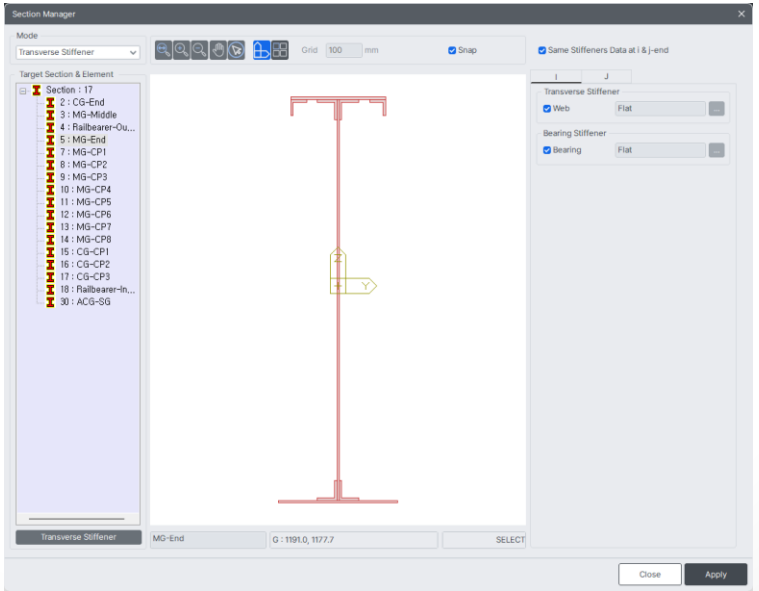
Transverse Stiffener Dialog



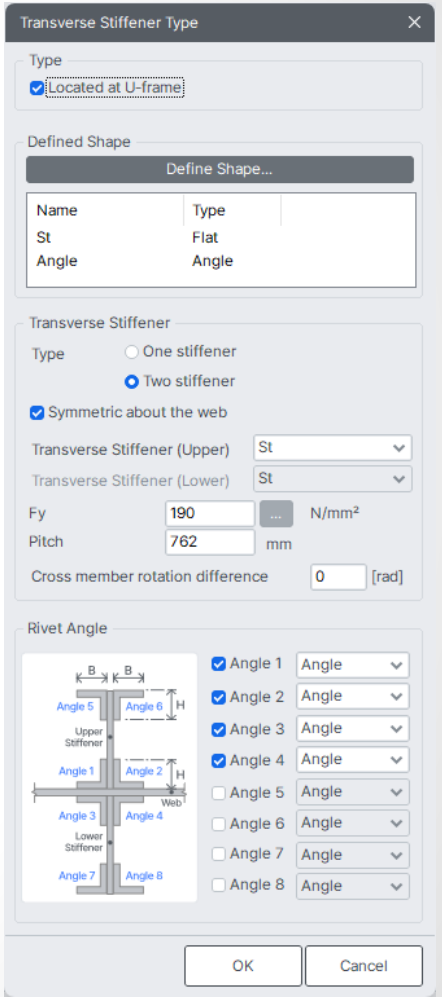
Bearing Stiffener

10. Intermediate Stiffener Check (NR/GN/CIV/025) for Steel Railway Bridges

- CIVIL NX now supports Intermediate Stiffener assessment in accordance with NR/GN/CIV/025 within the steel railway bridge Assessment workflow.
- You can define the angle connecting the web and the stiffener, and account for corrosion of both the stiffener and the angle in the checks.
- Actions & Load Effects Considered
  - Axial Forces on Bearing Stiffener
    - Tension-field action
    - Destabilising influence of the web
  - Restraining Forces on U-frame stiffeners
    - F_R: Elements providing discrete intermediate restraints
    - F_C: U-frames with cross members subjected to vertical loading
- Verification Performed
  - Yielding of web plate
  - Yielding of stiffener
  - Buckling of stiffener



Transverse Stiffener Dialog

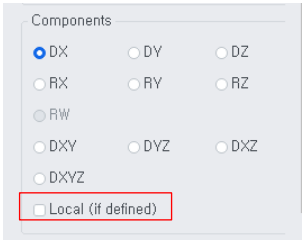


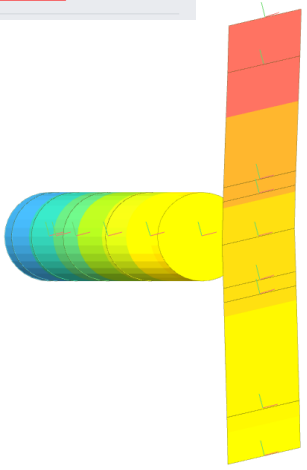
Intermediate Stiffener

11. Local Coordinate Displacement Output under Moving Load Cases

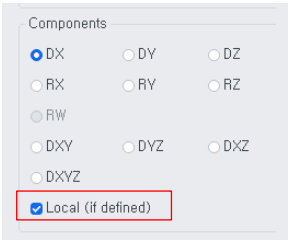
- In previous versions, displacements under Moving Load could only be displayed with respect to the global coordinate system.
- Starting from this release, CIVIL NX additionally provides displacement results in the local coordinate system.
- Local displacement results are supported for all moving load standards.
- The feature is not available in Moving Load Tracer.
- Local displacements can be checked in the bearing movement direction, enabling more accurate evaluation of curved bridge behavior.
- Local displacements are provided only for nodes with a defined Node Local Axis.

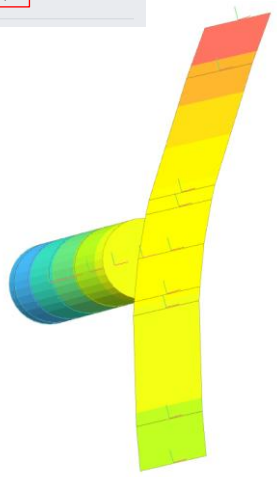
▪ ***Results > Result Display > Deformations > Displacement Contour***





Global Displacements





Local Displacements

▪ ***Results > Result Tables > Displacements***

Start Page | MIDAS CIVIL NX | Result-[Displacement]

	Node	Load	Dx (in)	Dy (in)	Dz (in)	Rx ([rad])	Ry ([rad])	Rz ([rad])
▶	130	MVL(max)	0.185	0.045	0.222	0.002	0.000	0.001
	131	MVL(max)	0.192	0.023	0.221	0.002	0.000	0.001
	132	MVL(max)	0.199	0.025	0.221	0.002	0.000	0.000
	133	MVL(max)	0.206	0.108	0.222	0.001	0.000	0.000
	234	MVL(max)	0.021	0.120	0.214	0.001	0.000	0.000
	235	MVL(max)	0.013	0.034	0.210	0.001	0.000	0.000
	237	MVL(max)	0.005	0.012	0.208	0.001	0.000	0.000
	238	MVL(max)	0.000	0.036	0.207	0.001	0.000	0.000
	130	MVL(min)	-0.270	-0.149	-0.086	-0.001	-0.000	-0.003
	131	MVL(min)	-0.261	-0.060	-0.082	-0.000	-0.000	-0.003
	132	MVL(min)	-0.246	-0.000	-0.077	-0.000	-0.000	-0.002
	133	MVL(min)	-0.229	-0.016	-0.072	-0.000	-0.000	-0.001
	234	MVL(min)	-0.076	-0.032	-0.062	-0.000	-0.000	-0.000
	235	MVL(min)	-0.071	-0.010	-0.065	-0.000	-0.000	-0.000
	237	MVL(min)	-0.072	-0.050	-0.068	-0.000	-0.000	-0.000
	238	MVL(min)	-0.075	-0.141	-0.070	-0.000	-0.000	-0.000
	130	sLCB1(max)	-0.466	-0.391	0.976	0.013	0.000	-0.014
	131	sLCB1(max)	-0.424	-0.153	0.980	0.012	0.001	-0.012
	132	sLCB1(max)	-0.368	0.083	0.977	0.010	0.001	-0.009
	133	sLCB1(max)	-0.297	0.442	0.984	0.008	0.002	-0.005
	234	sLCB1(max)	-0.173	0.505	0.946	0.004	-0.000	0.001
	235	sLCB1(max)	-0.199	0.134	0.923	0.004	-0.000	0.001
	237	sLCB1(max)	-0.238	-0.142	0.916	0.004	-0.000	0.002
	238	sLCB1(max)	-0.272	-0.381	0.906	0.004	-0.000	0.002
	130	sLCB1(min)	-1.262	-0.729	0.439	0.008	0.000	-0.021
	131	sLCB1(min)	-1.217	-0.297	0.449	0.007	0.000	-0.017
	132	sLCB1(min)	-1.148	0.039	0.455	0.006	0.000	-0.013
	133	sLCB1(min)	-1.058	0.224	0.470	0.005	0.001	-0.007
	234	sLCB1(min)	-0.343	0.238	0.463	0.002	-0.000	0.001

Displacements(Global) | Displacements(Local)

Local Displacement Table