UPDATES WITH CIVIL NX

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(UK/IE Region)
MIDAS IT UK

CONTENTS

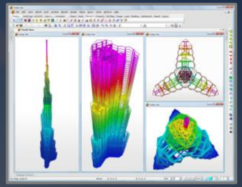
MIDAS
GLOBAL NETWORK

"Through MIDAS, South Korea's design technology is reaching out to the world."

20	1000	110
Overseas Branches	Employees	Countries

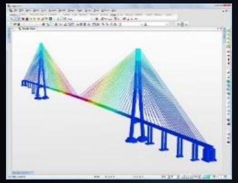
MIDAS CHINA MIDAS JAPAN MIDAS UK MIDAS RUSSIA MIDAS USA MIDAS INDIA MIDAS COLOMBIA MIDAS PHILIPPINES MIDAS MEXICO MIDAS POLAND MIDAS THAILAND MIDAS AUSTRALIA MIDAS MALAYSIA

Burj Khalifa



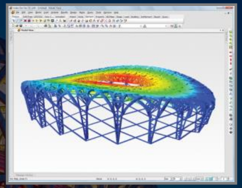
The world's tallest building
- 828 meters
- 163 floors plus 46 maintenance levels in the spire
- Floor area 309,473 m^2

Russky Island Bridge



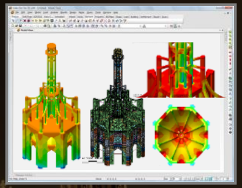
The world's longest cabled-stayed bridge
- Locale: Vladivostok (Nazimov peninsula) & Russky Island (Novosilsky cape)
- Design: Cable-stayed bridge
- Total length: 3,100 meters / Longest span: 1,104 meters

Beijing National Stadium



- Location: Beijing, China
- Capacity: 80,000, 91,000 (2008 Olympics)

Duomo Di Milano



- Location: Milan, Italy
- Capacity: 40,000 width 92 meters

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Regular and on-demand visits to provide hands-on product training.

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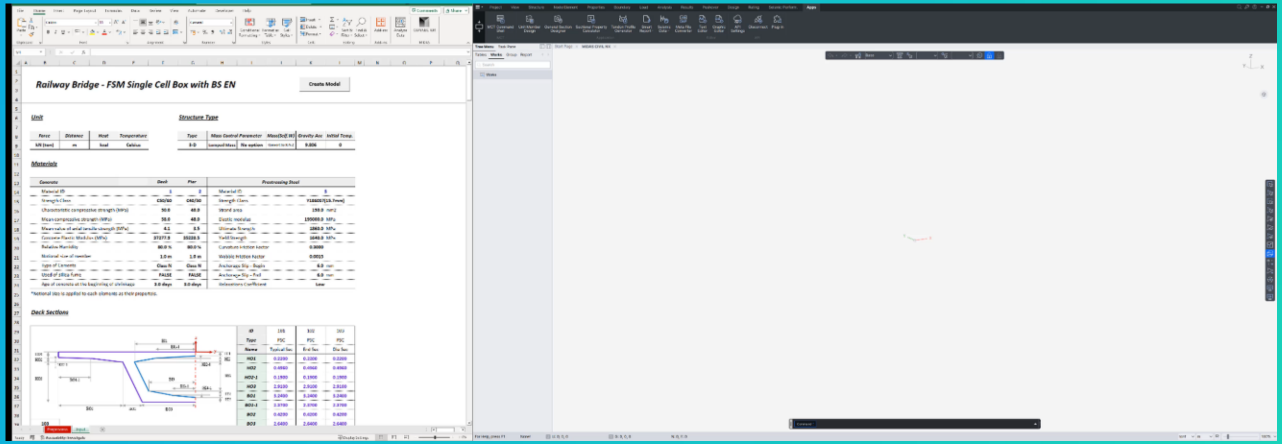
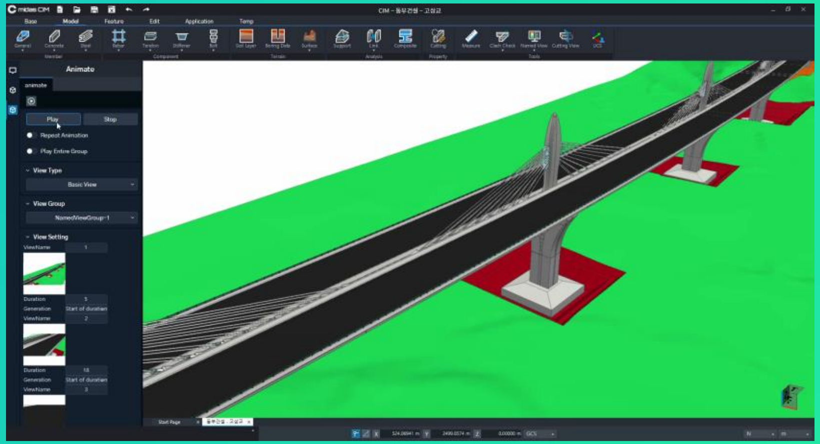
We focus on PRACTICALITY for civil engineers

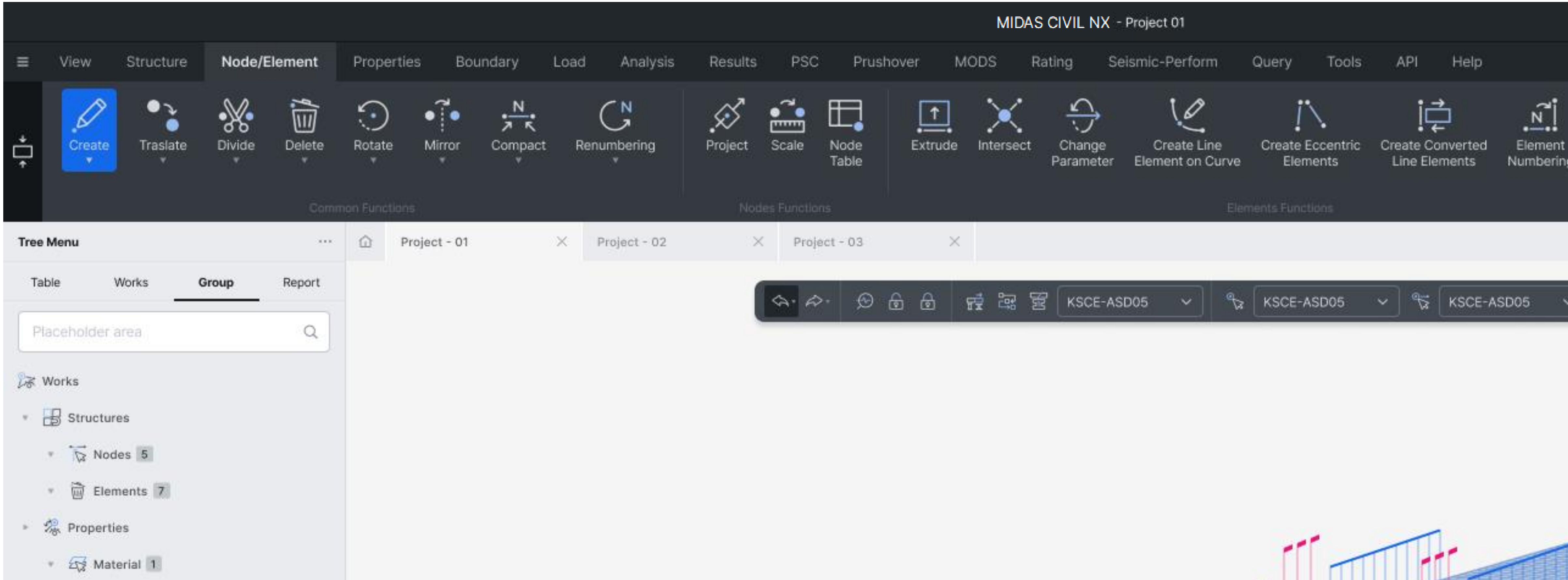


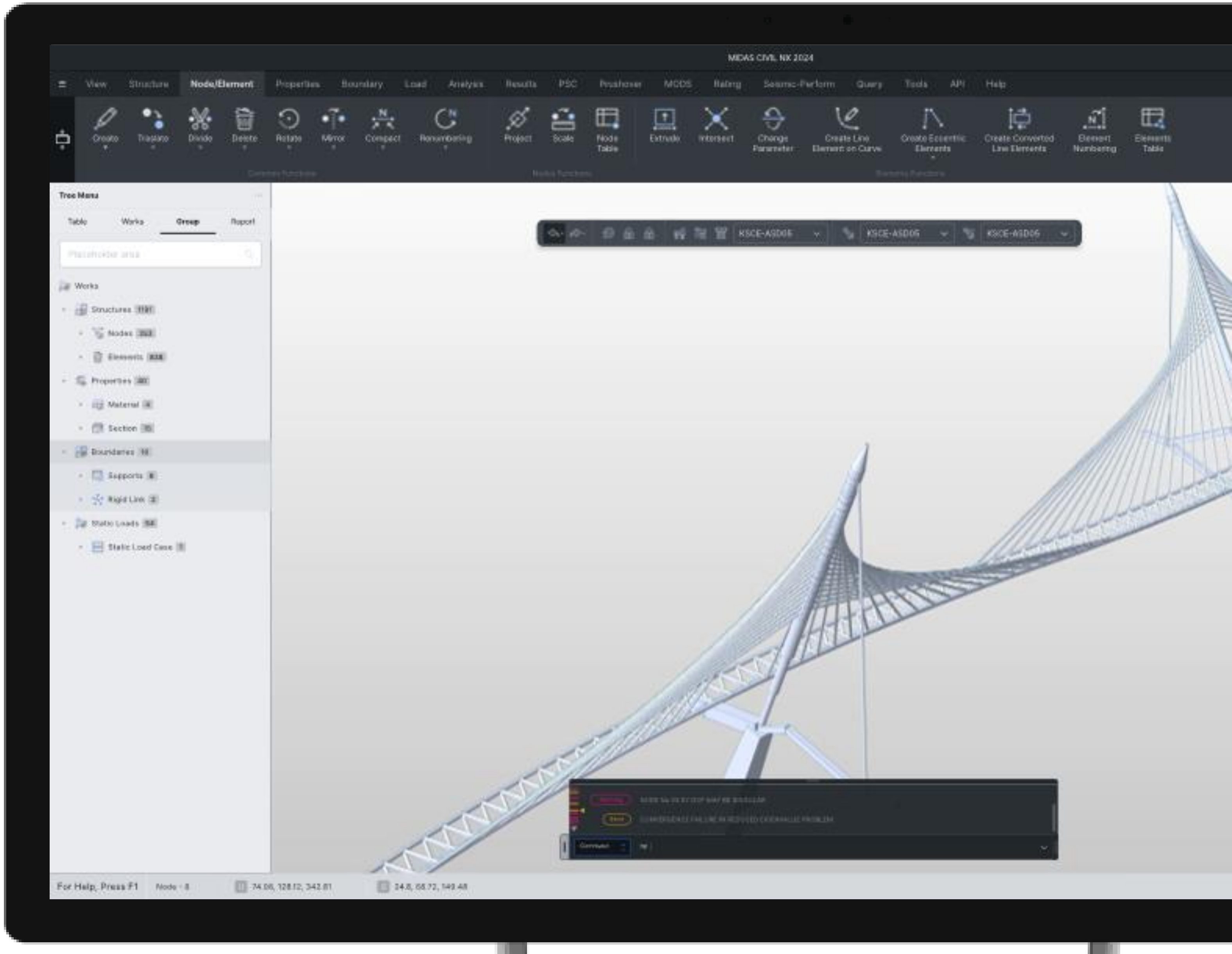


Why MIDAS CIVIL NX?

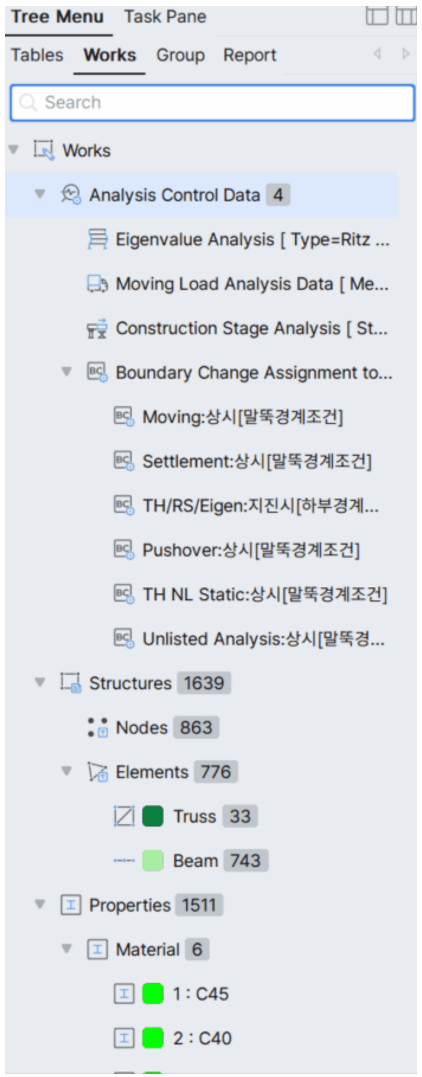
No more hide-and-seek with the icons.

CIVIL NX has updated its design features, introducing a user interface for easier design workflows.
Explore the new changes firsthand.



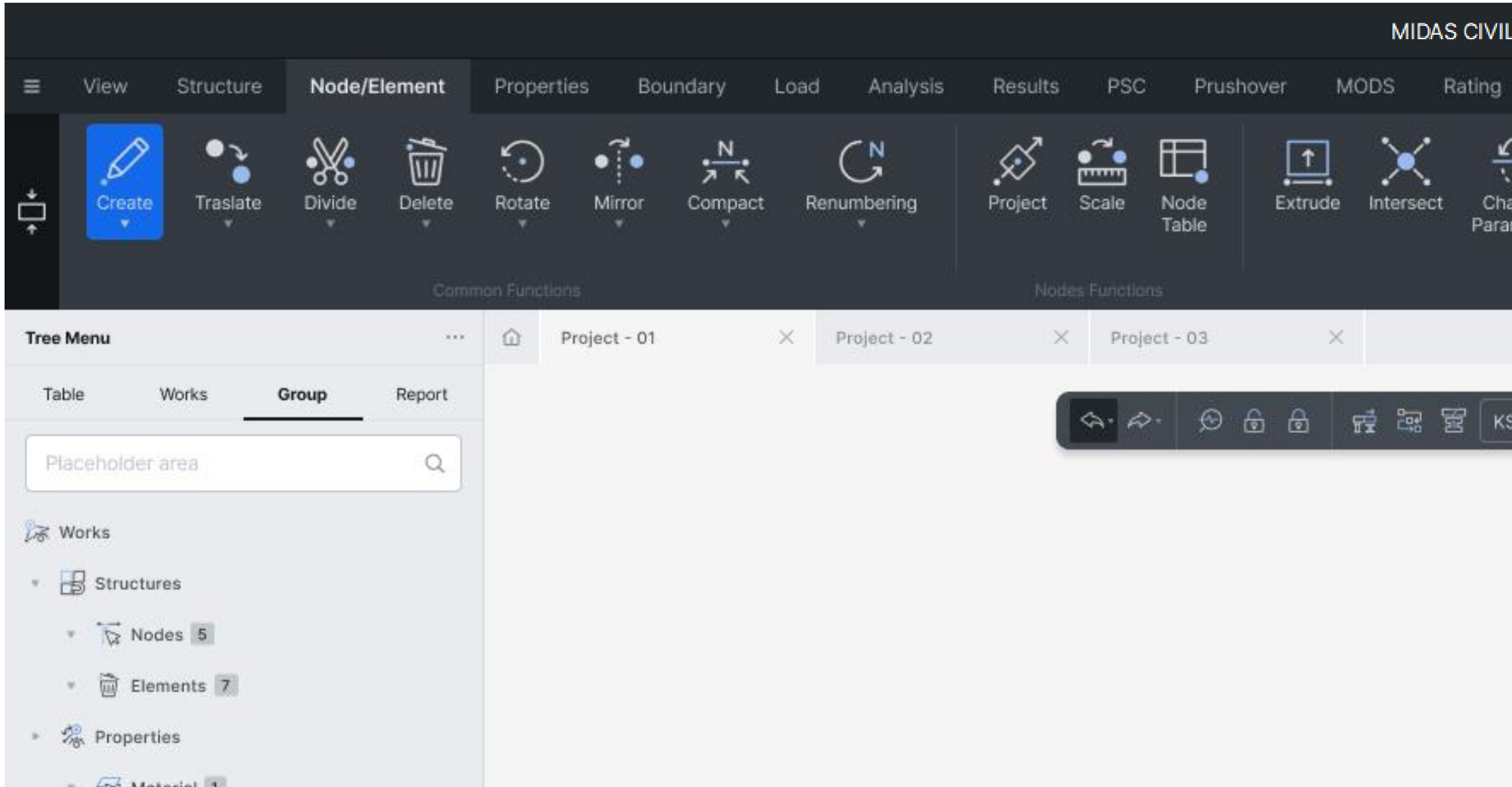

MIDAS CIVIL NX 2024
View
Structure
Node/Element
Properties
Boundary
Load
Analysis
Results
PSC
Pushover
MODS
Rating
Seismic-Perform
Query
Tools
API
Help
Create
Translate
Divide
Delete
Rotate
Mirror
Compact
Renumbering
Project
Scale
Node Table
Extrude
Intersect
Change Parameter
Create Line Element on Curve
Create Eccentric Elements
Create Converted Line Elements
Element Numbering
Elements Table
Tree Menu
Table
Works
Group
Report
Works
Structures
Nodes
Elements
Properties
Material
Section
Boundaries
Supports
Rigid Link
Static Loads
Static Load Case
KSCE-ASD05
For Help, Press F1

Graphic Elements

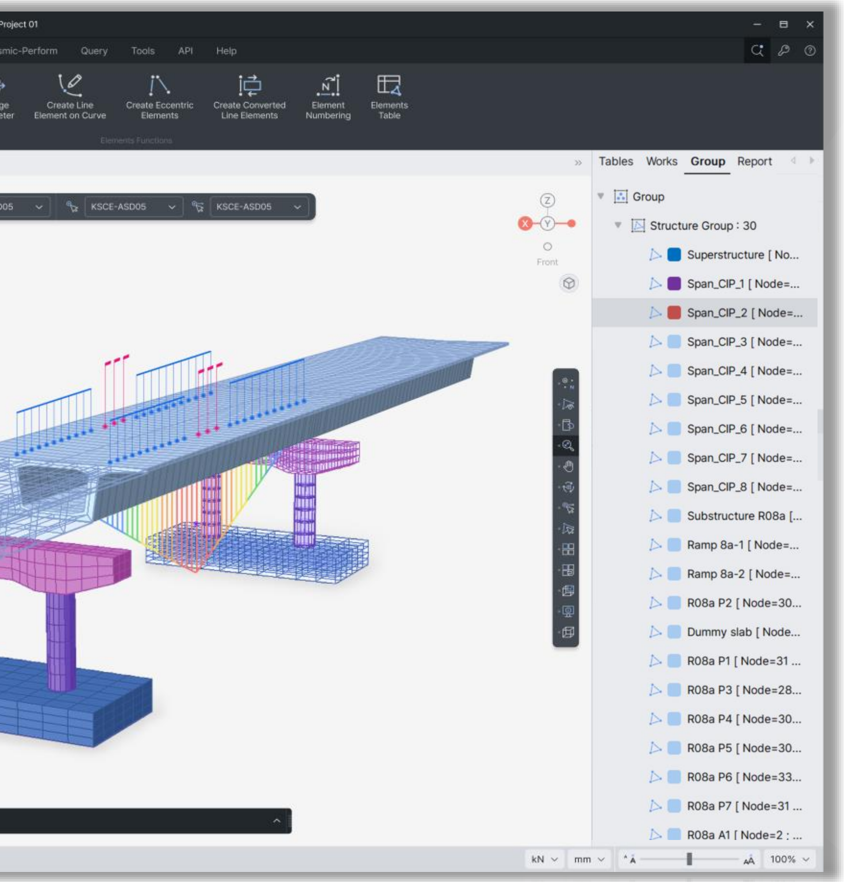


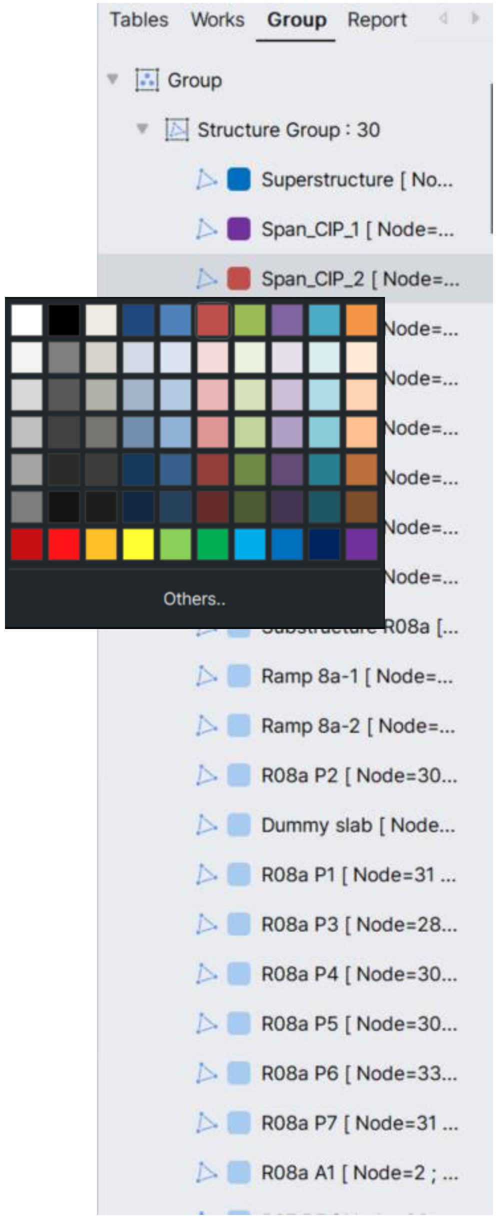
In one quick look.

Tree menu in CIVIL NX allows users to quickly view all the model applications at a glance. Additionally, it features a search function for efficient navigation and review.



Graphic Elements



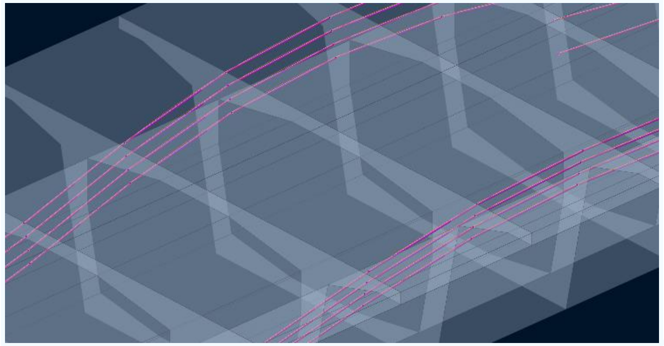


Colors Everywhere

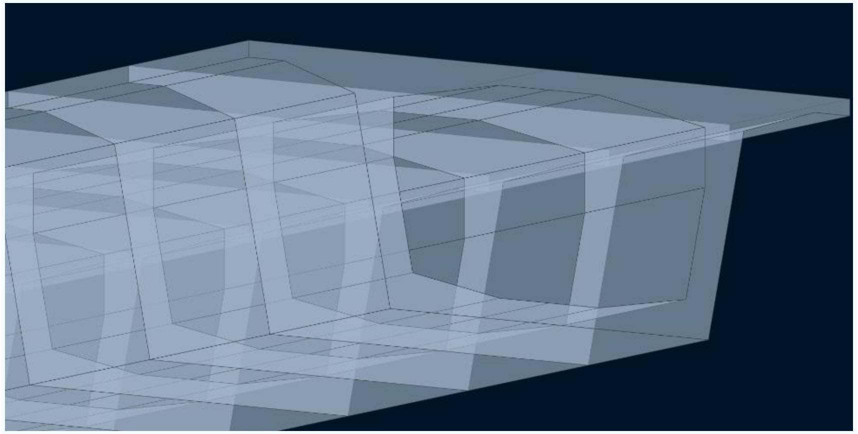
User can assign custom colors to elements and categorize them into groups.
Apply colors according to the construction phase or structure type for intuitive visualization.

Improved Visibility.

CIVIL NX has significantly improved the visibility of the model.
With transparent elements and high-resolution tendon images, users can accurately visualize the shape of the structure.



Improved Tendon graphics

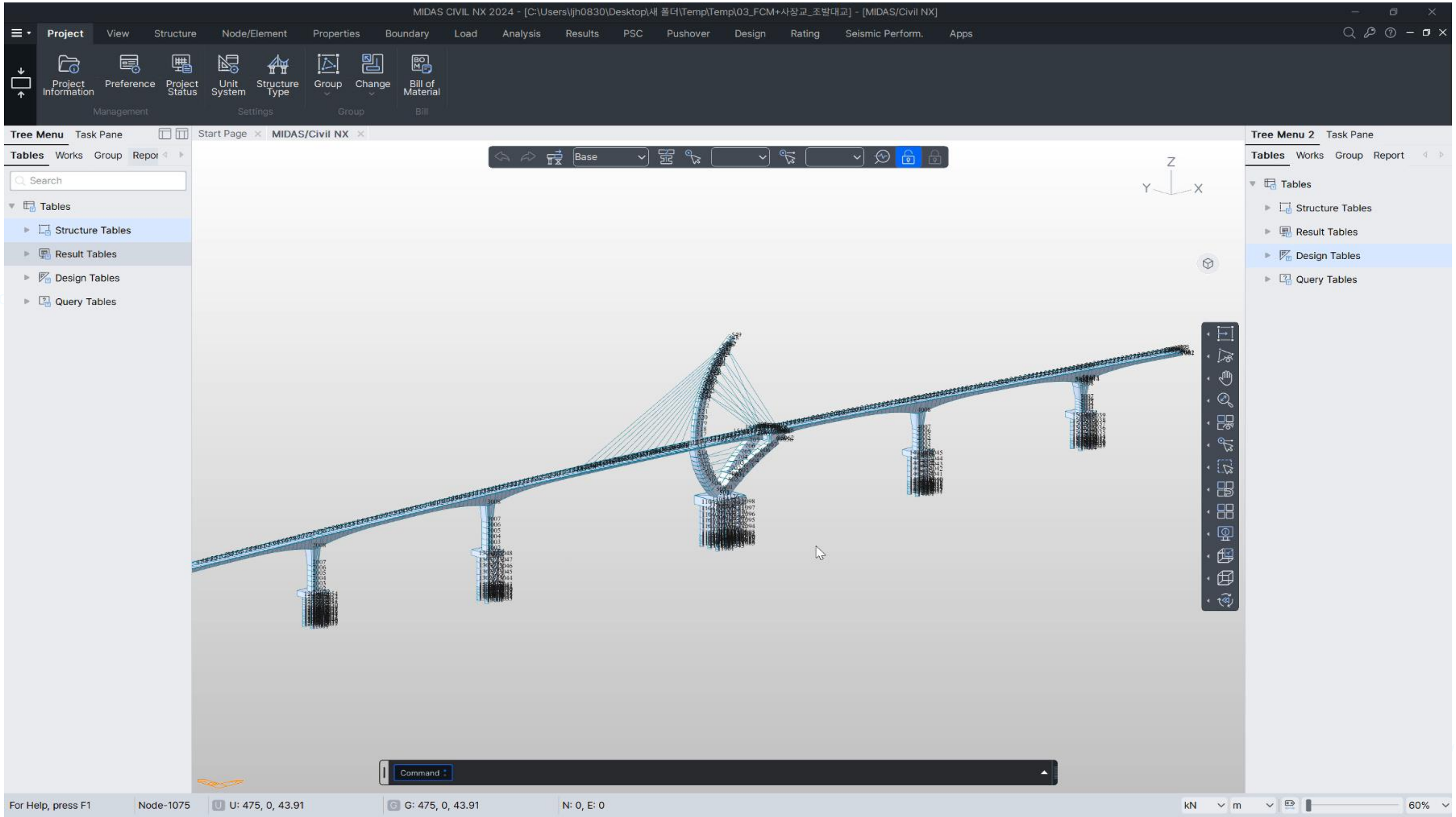


Transparent Element view

Maximized Usability

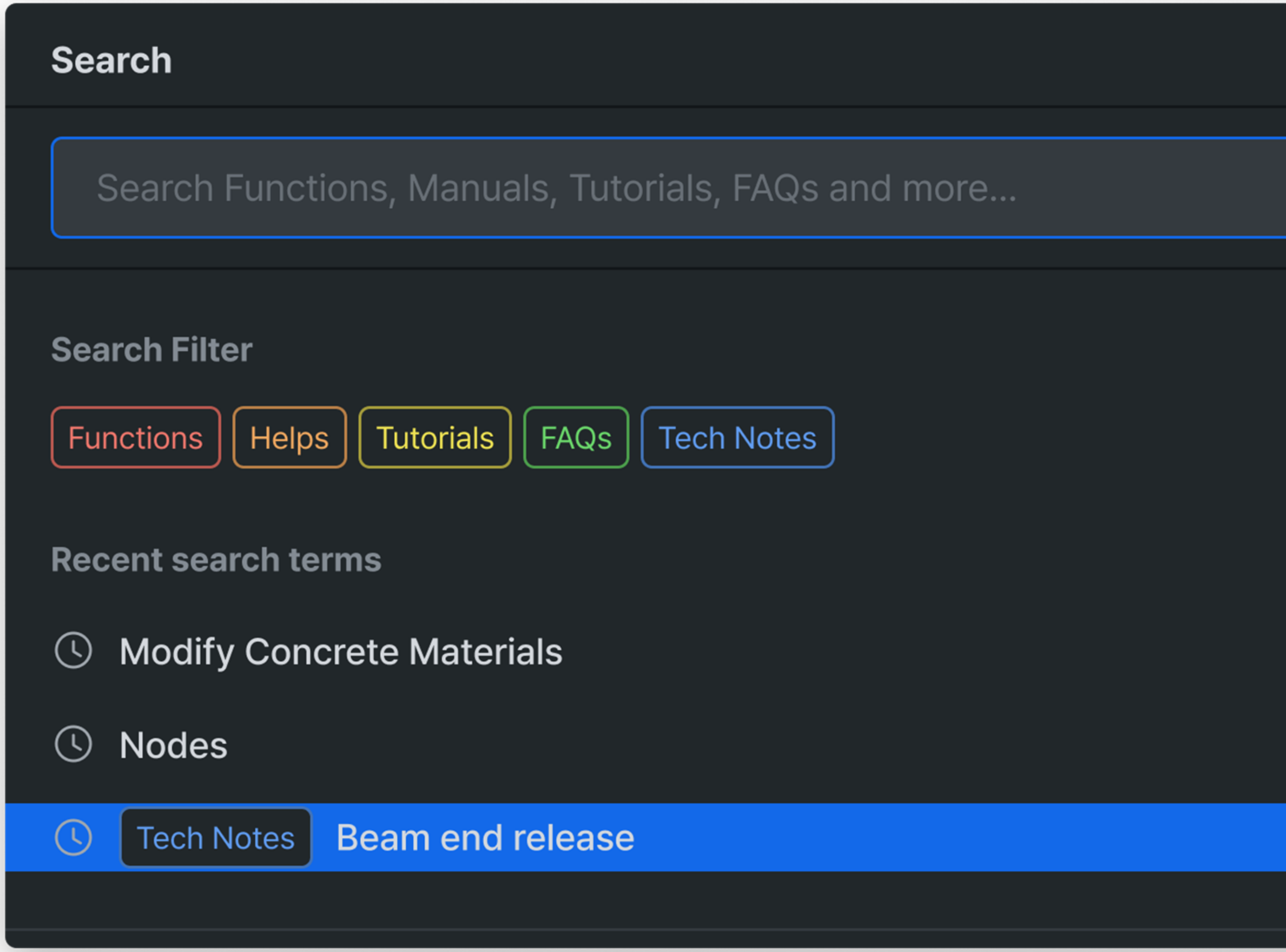
Customized User Interface.

Font size customization is now available,
allowing users to adjust text sizes independently of zoom levels during modeling.



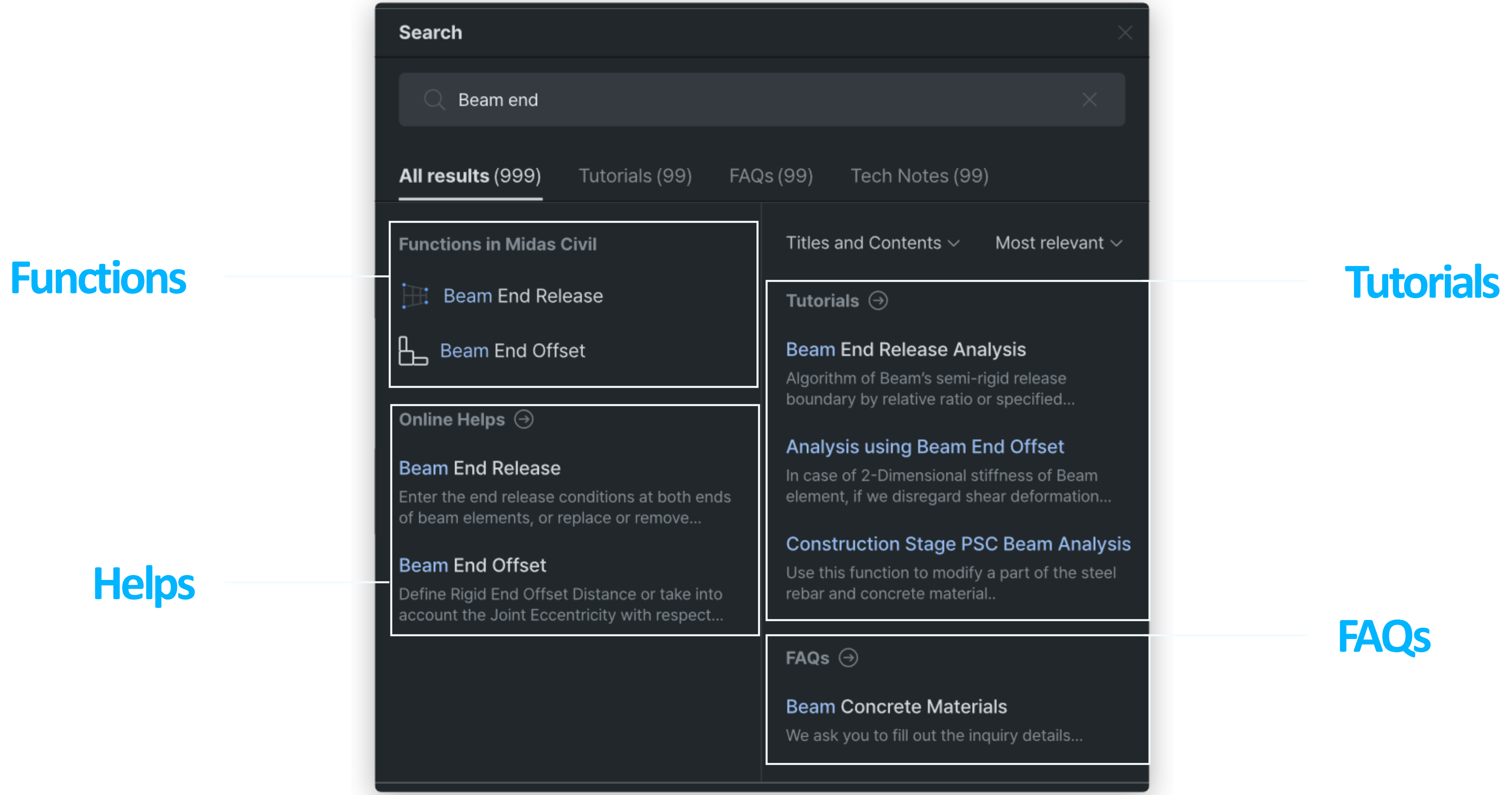
Find all you need In one place

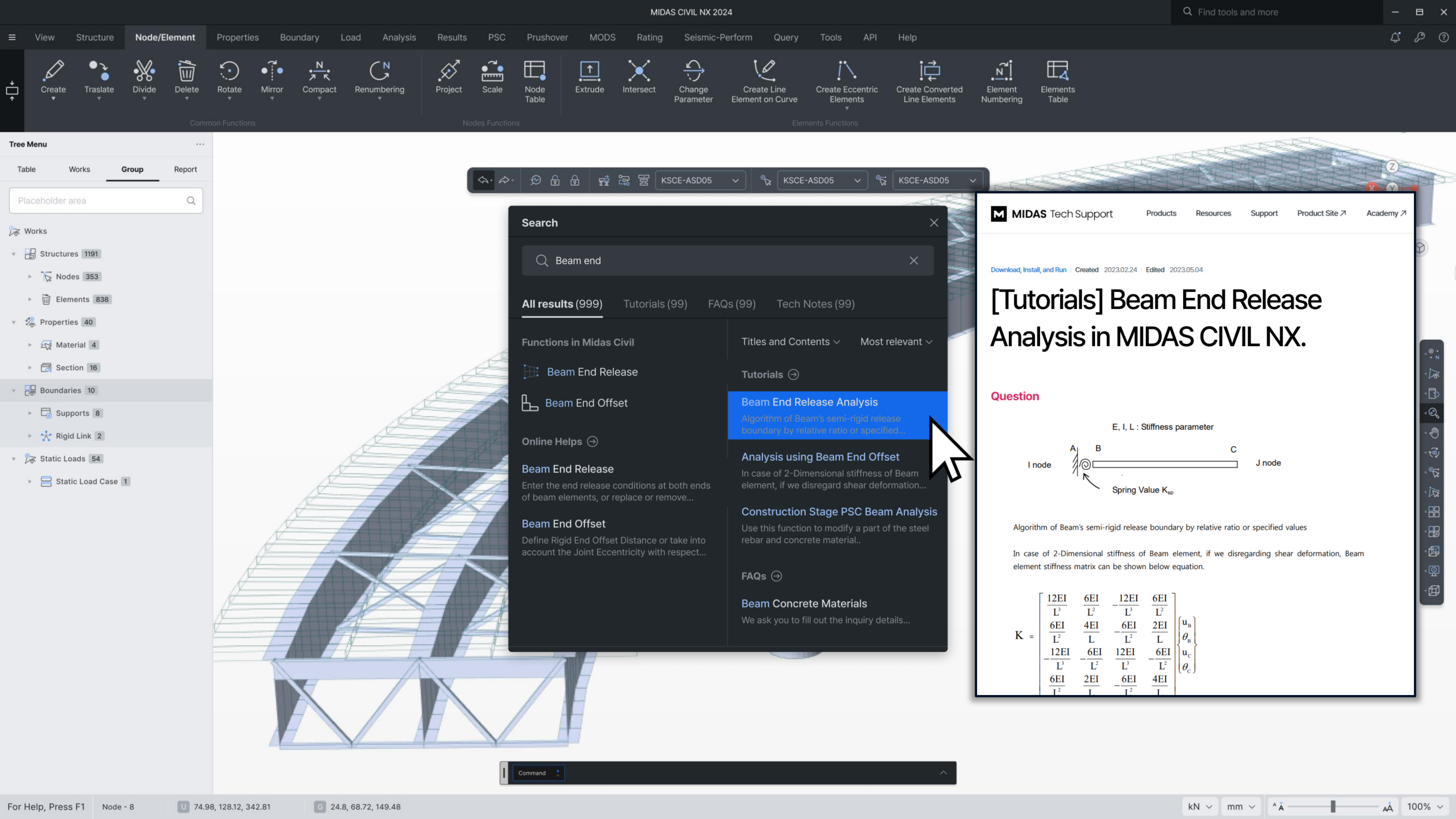
No more Googling:
CIVIL NX brings document Search in-house



Search and get in CIVIL NX

Utilize the search feature in CIVIL NX to quickly and easily obtain the desired information.
From product features to tutorials and technical inquiries, you can find everything you need in one place.

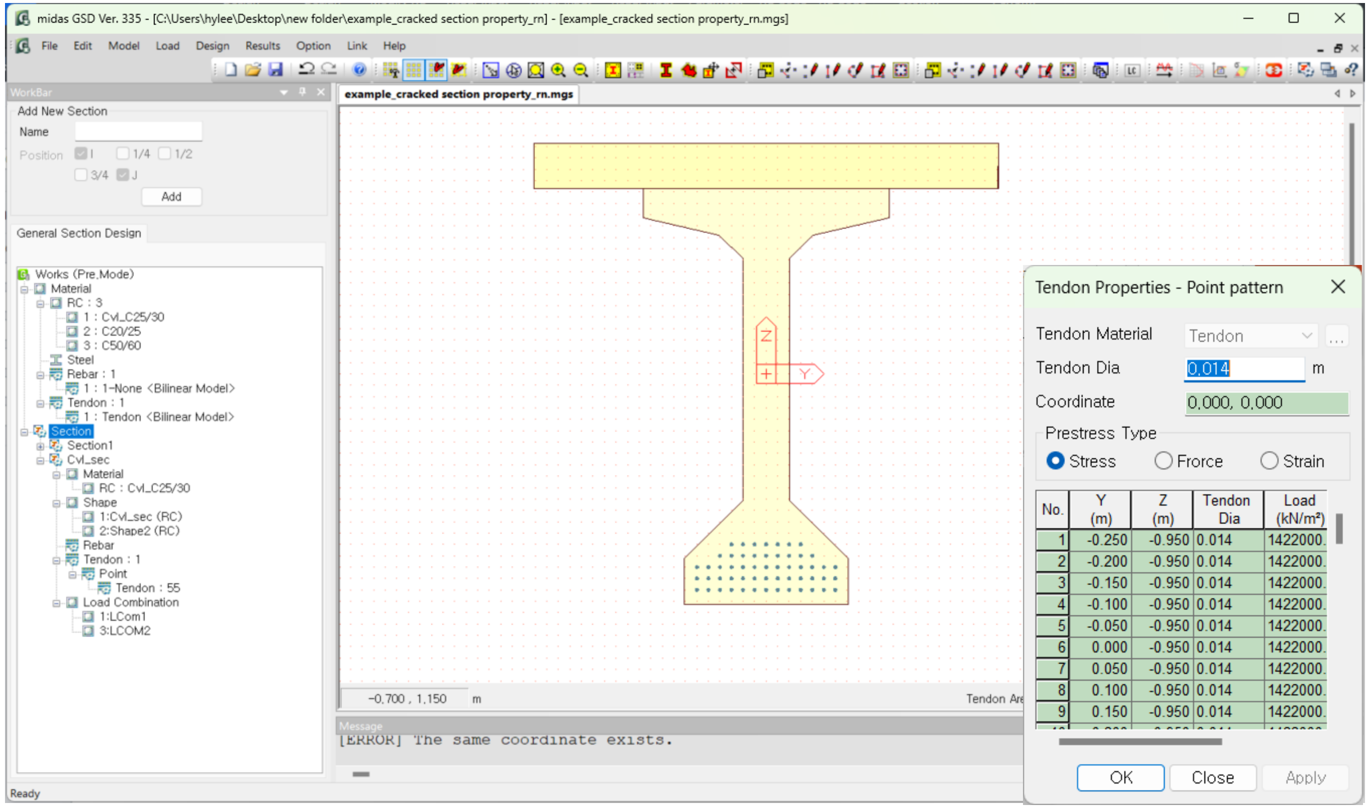



MIDAS CIVIL NX 2024
Find tools and more
View
Structure
Node/Element
Properties
Boundary
Load
Analysis
Results
PSC
Pushover
MODS
Rating
Seismic-Perform
Query
Tools
API
Help
Create
Traslate
Divide
Delete
Rotate
Mirror
Compact
Renumbering
Project
Scale
Node Table
Extrude
Intersect
Change Parameter
Create Line Element on Curve
Create Eccentric Elements
Create Converted Line Elements
Element Numbering
Elements Table
Common Functions
Nodes Functions
Elements Functions
Tree Menu
Table
Works
Group
Report
Placeholder area
Works
Structures 1191
Nodes 353
Elements 838
Properties 40
Material 4
Section 16
Boundaries 10
Supports 8
Rigid Link 2
Static Loads 54
Static Load Case 1
KSCE-ASD05
KSCE-ASD05
KSCE-ASD05
Search
Beam end
All results (999)
Tutorials (99)
FAQs (99)
Tech Notes (99)
Functions in Midas Civil
Beam End Release
Beam End Offset
Online Helps
Beam End Release
Enter the end release conditions at both ends of beam elements, or replace or remove...
Beam End Offset
Define Rigid End Offset Distance or take into account the Joint Eccentricity with respect...
Titles and Contents
Most relevant
Tutorials
Beam End Release Analysis
Algorithm of Beam's semi-rigid release boundary by relative ratio or specified...
Analysis using Beam End Offset
In case of 2-Dimensional stiffness of Beam element, if we disregard shear deformation...
Construction Stage PSC Beam Analysis
Use this function to modify a part of the steel rebar and concrete material..
FAQs
Beam Concrete Materials
We ask you to fill out the inquiry details...
MIDAS Tech Support
Products
Resources
Support
Product Site ↗
Academy ↗
Download, Install, and Run | Created 2023.02.24 | Edited 2023.05.04
[Tutorials] Beam End Release Analysis in MIDAS CIVIL NX.
Question
E, I, L : Stiffness parameter
A
B
C
I node
J node
Spring Value K
Algorithm of Beam's semi-rigid release boundary by relative ratio or specified values
In case of 2-Dimensional stiffness of Beam element, if we disregarding shear deformation, Beam element stiffness matrix can be shown below equation.
Command
For Help, Press F1
Node - 8
74.98, 128.12, 342.81
24.8, 68.72, 149.48
kN
mm
100%

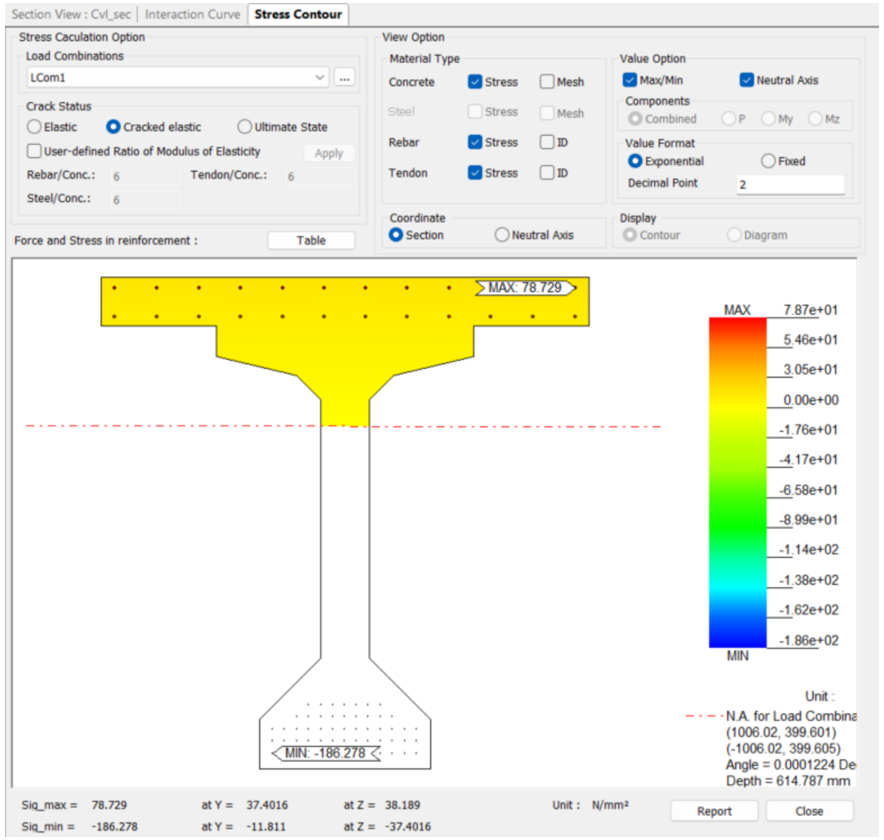
General Section Designer

Comprehensive section verification tool

GSD in CIVIL NX now supports prestressed concrete section verification with tendons and multiple material definitions for cross-section. These features provide enhanced flexibility and are exclusive to MIDAS CIVIL NX.

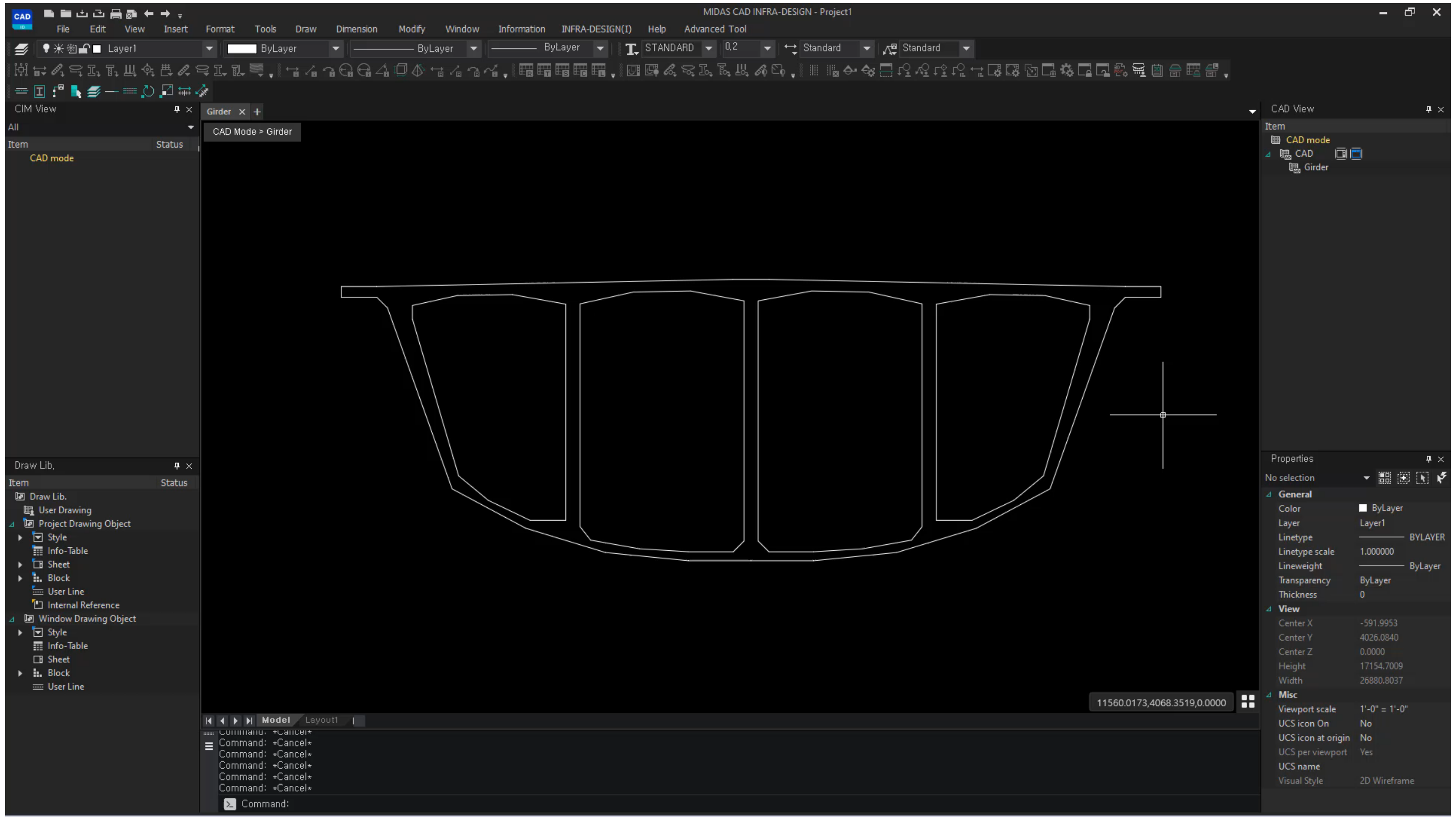


No.	Y (m)	Z (m)	Tendon Dia	Load (kN/m²)
1	-0.250	-0.950	0.014	1422000.
2	-0.200	-0.950	0.014	1422000.
3	-0.150	-0.950	0.014	1422000.
4	-0.100	-0.950	0.014	1422000.
5	-0.050	-0.950	0.014	1422000.
6	0.000	-0.950	0.014	1422000.
7	0.050	-0.950	0.014	1422000.
8	0.100	-0.950	0.014	1422000.
9	0.150	-0.950	0.014	1422000.



Sectional Property Calculator

Create or modify the cross section from CAD. (Easier than existing SPC function)



Design

Built-in Civil Design Standard in 120+ Countries incl. Eurocode

Civil NX supports various Design Codes such as Australian code, AASHTO, Eurocode for Reinforced Concrete, Steel, SRC, Composite, PSC, etc.
It can generate design review reports based on the reviewed.

RC Design

- AASHTO-LRFD17
- AASHTO-LRFD16
- AASHTO-LRFD12
- AASHTO-LRFD07
- AASHTO-LRFD02
- AASHTO-LFD96
- ACI 318-02
- CSA-S6-00
- CSA S6-14
- Eurocode2-2:05
- SNiP 2.05.03-84*
- SP 35.13330.2011
- SNiP 2.05.03-84*(MKS)
- SP 35.13330.2011(MKS)
- JTJ023-85
- IRC:21-2011
- IS456:2000
- IRS
- KSCE-USD
- KSCE-LSD
- KDS 24 14 21
- KCI-USD12
- TWN-BRG-LSD90
- CJJ11-2011
- CJJ166-2011

Steel Design

- AASHTO-LRFD17
- AASHTO-LRFD16
- AASHTO-LRFD12
- AASHTO-LRFD02
- AASHTO-ASD96
- AASHTO-LFD96
- CSA-S6-14
- JTJ025-86
- IRC:24-2010
- ACI 318-02
- TWN-BRG-LSD90
- Eurocode2-2:05
- Eurocode3-2:05
- AISC-LRFD 2K
- AISC-LRFD 93
- AISC-ASD 89
- BS 950-90
- IS:800 - 2007
- IS:800 - 1984
- KSCE-ASD
- KSCE-LSD

SRC Design

- SSRC79
- AIJ-SRC01
- JGJ138-01
- AIK-SRC2K
- KSCE-USD96
- TWN-SRC100
- TWN-SRC92

Composite Design

- AS 5100.6:17
- AASHTO-LRFD17
- AASHTO-LRFD16
- AASHTO-LRFD12
- AASHTO-LRFD07
- CSA-S6-14
- EN 1994-2
- IRC:22-2008
- IRC:22-2015
- KSCE-LSD15
- SNiP 2.05.03-84*
- SP 35.13330.2011

Steel Ortho. Design

- SNiP 2.05.03-84*
- SP 35.13330.2011

Steel Rating Design

- AASHTO LRFR19
- AASHTO LRFR11
- CS 454
- NR/GN/CIV/025

PSC Rating Design

- AASHTO LRFR19
- AASHTO LRFR11
- AASHTO LRFD05
- CS 454

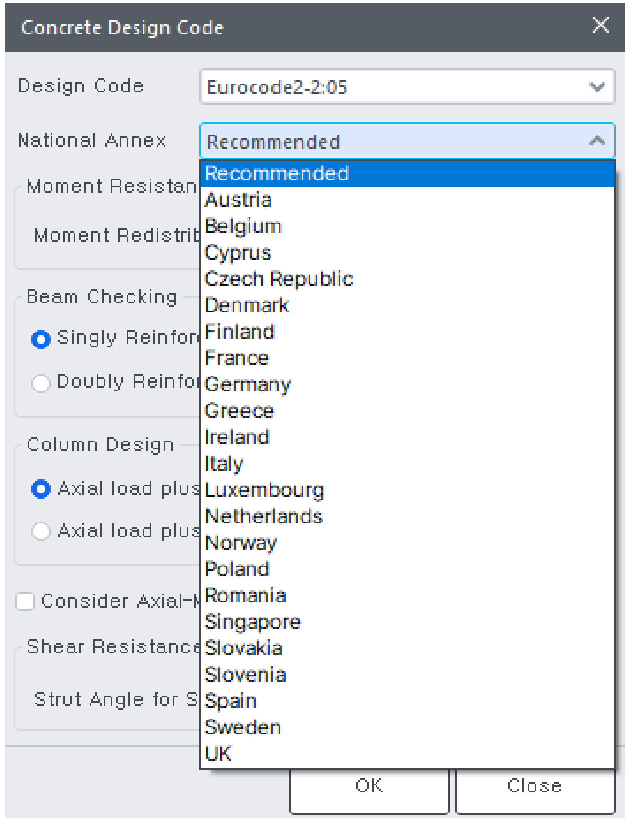
PSC Design

- AS 5100.5:17
- AASHTO-LRFD17
- AASHTO-LRFD16
- AASHTO-LRFD14
- AASHTO-LRFD12
- AASHTO-LRFD07
- CSA-S6S1-10
- CSA-S6-14
- Eurocode2-2:05
- BS 5400-4:1990
- SNiP 2.05.03-84*
- SP 35.13330.2011
- SNiP 2.05.03-84* (MKS)
- SP35.13330.2011(MKS)
- KSCE-USD10
- KSCE-LSD15
- KDS 24 14 21
- JTG D62-04
- CJJ11-2011
- IRC:112-2011
- IRS

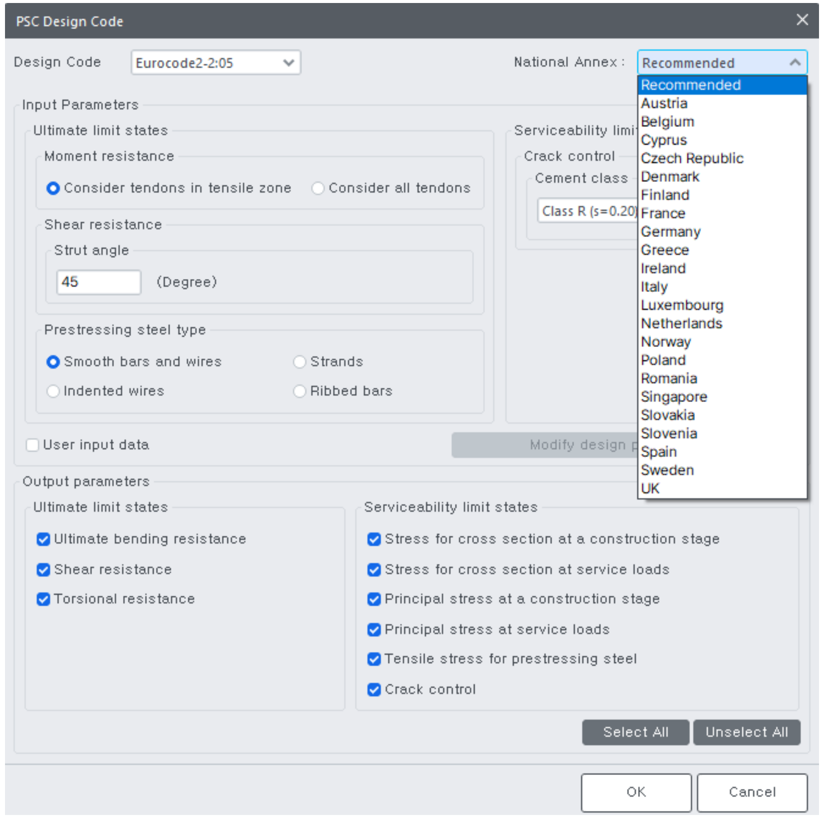
MIDAS CIVIL NX

Eurocode 22 National Annexes for RC and PSC Design

This feature is exclusively available in MIDASCIVIL NX.



Concrete Design Code



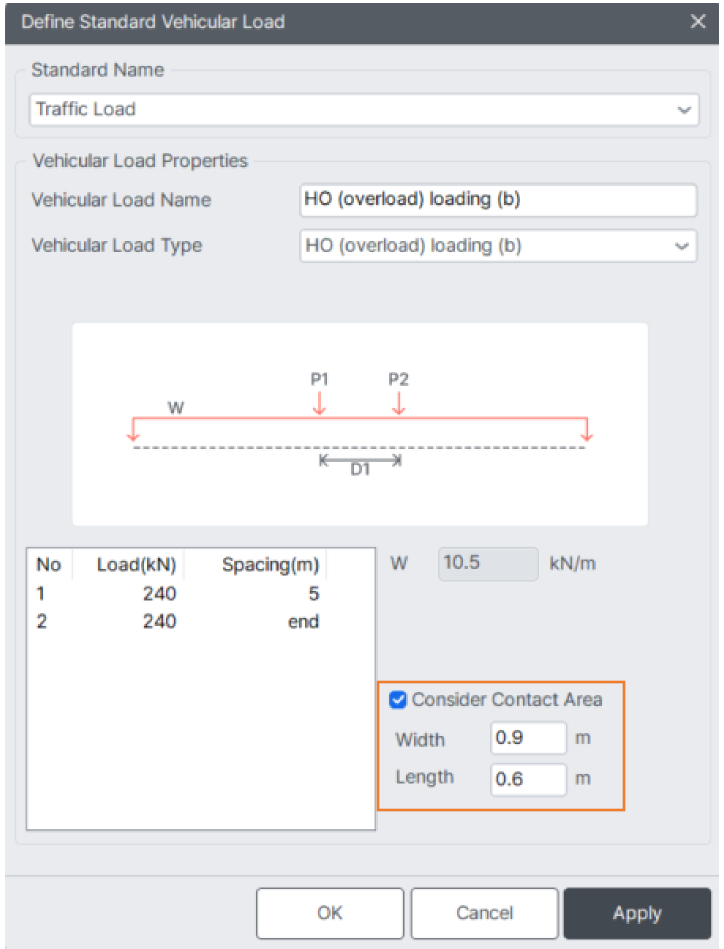
PSC Design Code

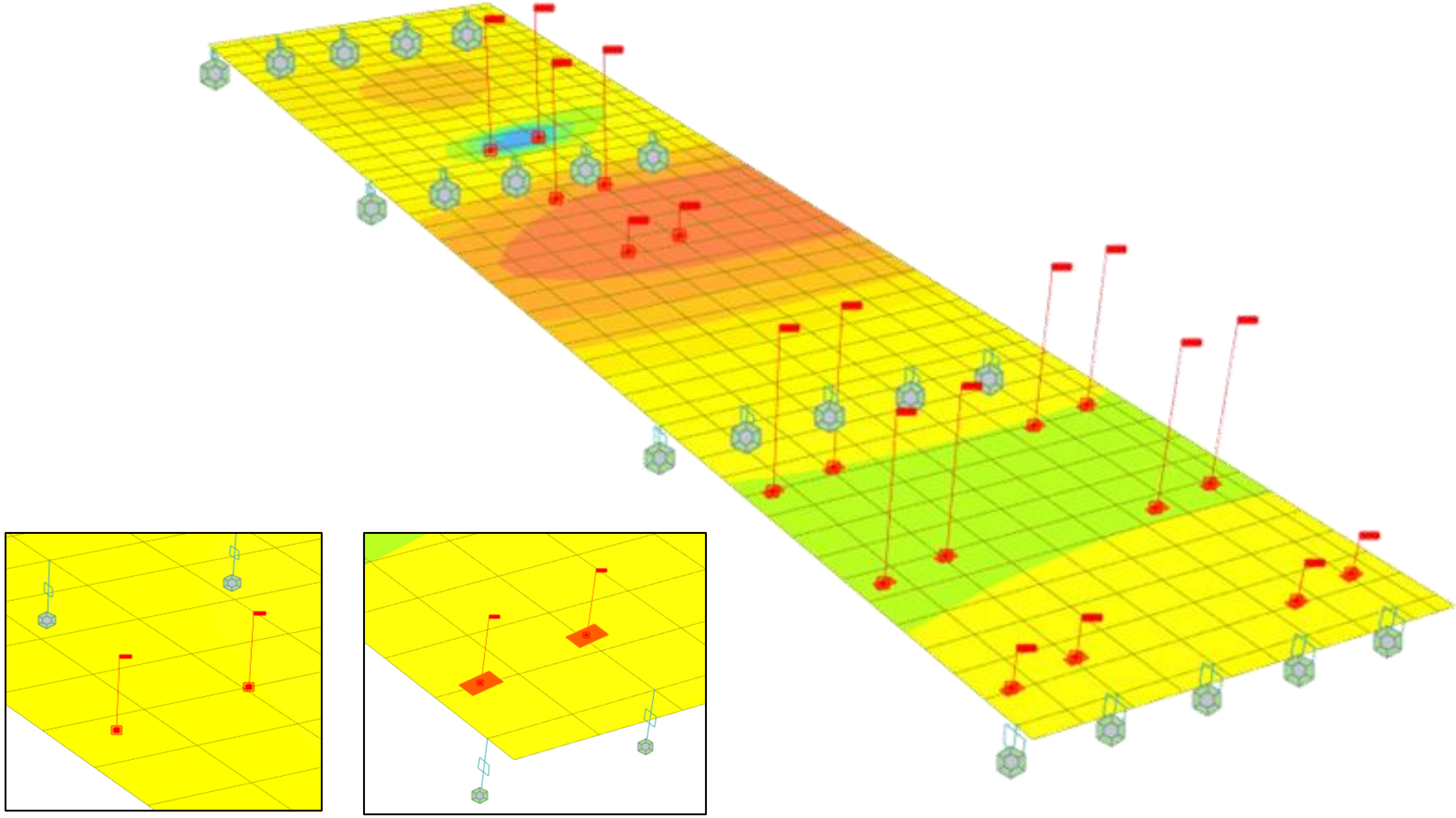
Updates with v2.1

Enhancements in CIVIL NX 2025 (v2.1)

1. Addition of evaluation truck loads for existing bridges in New Zealand(Based on SP/M/022 v3.4)
2. Moving patch load analysis as per Eurocode, BS & NZ traffic loads
3. Addition of special permit trucks for load rating of existing bridges in Western Australia
4. Enhancement of Australian moving load options: Add lateral offset distance option
5. Update PSC section design criteria for Australia to the latest 2024 standard
6. Addition of Material Database for Structural Steel Reinforcement as per NR/GN/CIV/025
7. Addition of Section Properties for U-girder Bridge as per NR/GN/CIV/025
8. Addition of Moving Load for UK Network Rail Bridge Assessment as per NR/GN/CIV/025
9. UK Network Rail Bridge Assessment as per NR/GN/CIV/025
10. Enhancement of Load All Model 1 in the UK rating system to support envelope type loads
11. Addition of cross-section databases for the US and Canada
12. Addition of vehicle database for 46 US states
13. Automated design support for asymmetric (Type 2) composite steel bridges(Eurocode, AASHTO)
14. Add California-specific provisions from AASHTO LRFD
15. RC design support for US railway bridges(Based on AREMA design code)
16. Auto-generate Load combination (RC) as per TMH07 : 1981
17. PSC Design as per TMH07-3 : 1989
18. Significantly Improved Excel Design Report Generation Speed
19. Batch output for tendon loss table by construction stage and tendon group

Moving Patch load – Tyre Contact Area





Concentrated wheel loads

Patch/area wheel loads

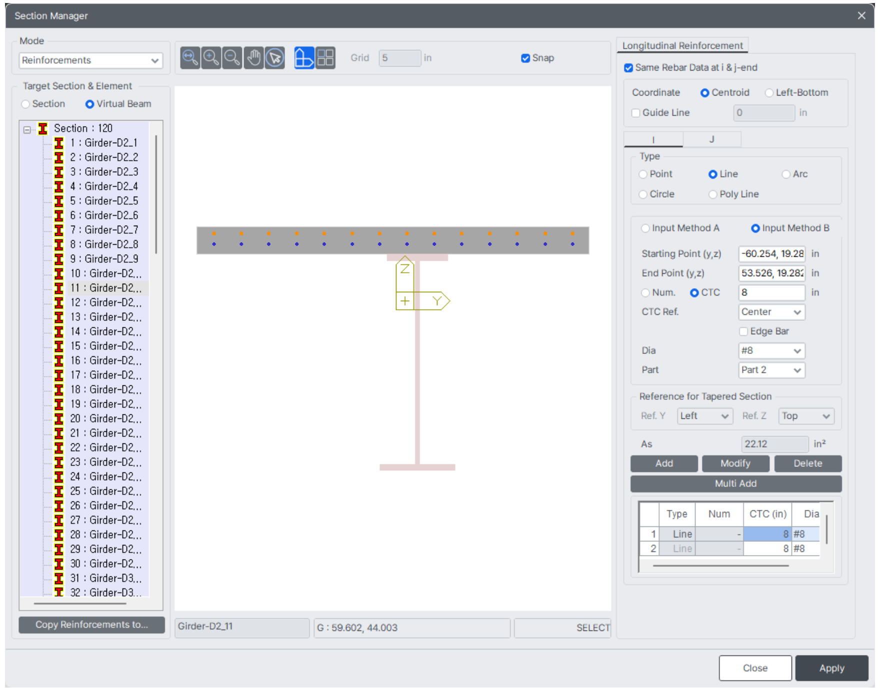
Updates with v2.2

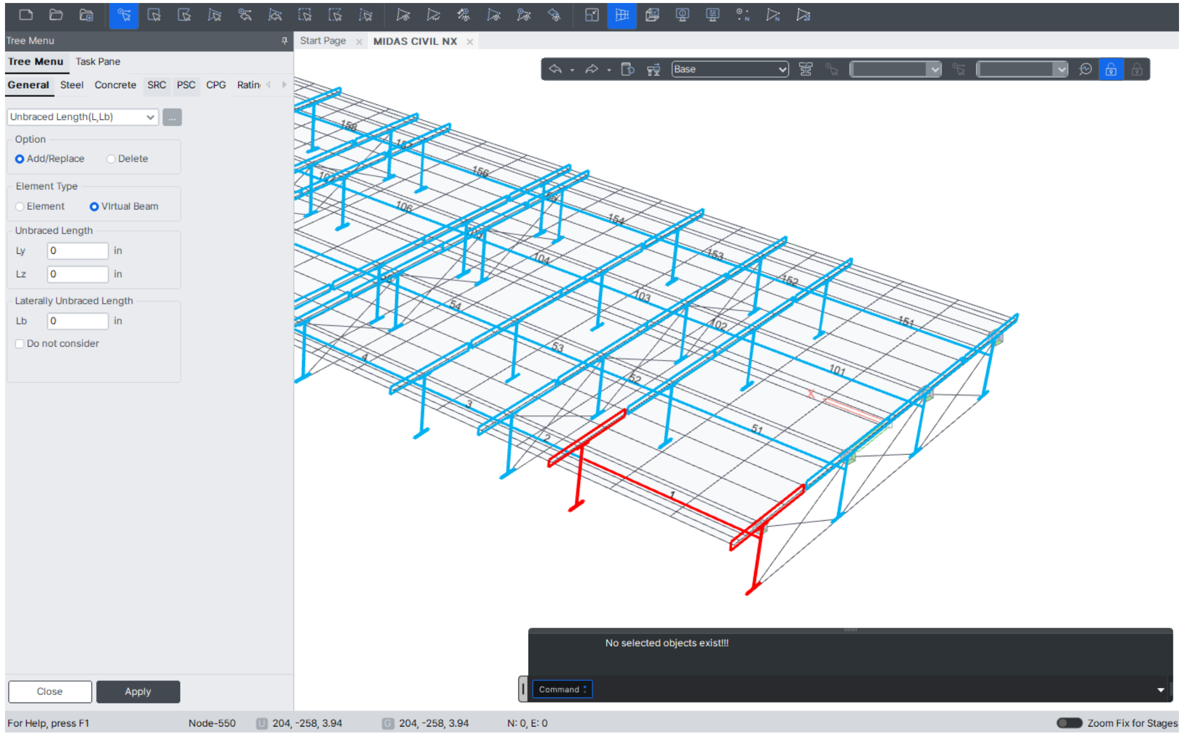
MIDAS

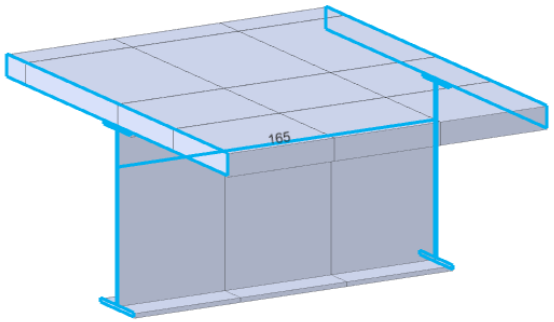
Enhancements in CIVIL NX 2025 (v2.2)

Updates with v2.2

VIRTUAL BEAM DESIGN FEATURES





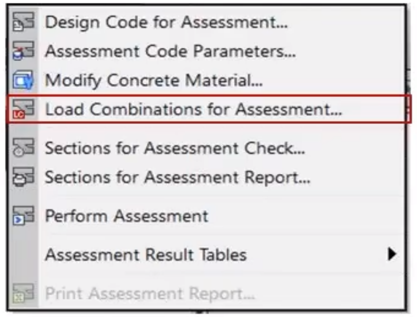


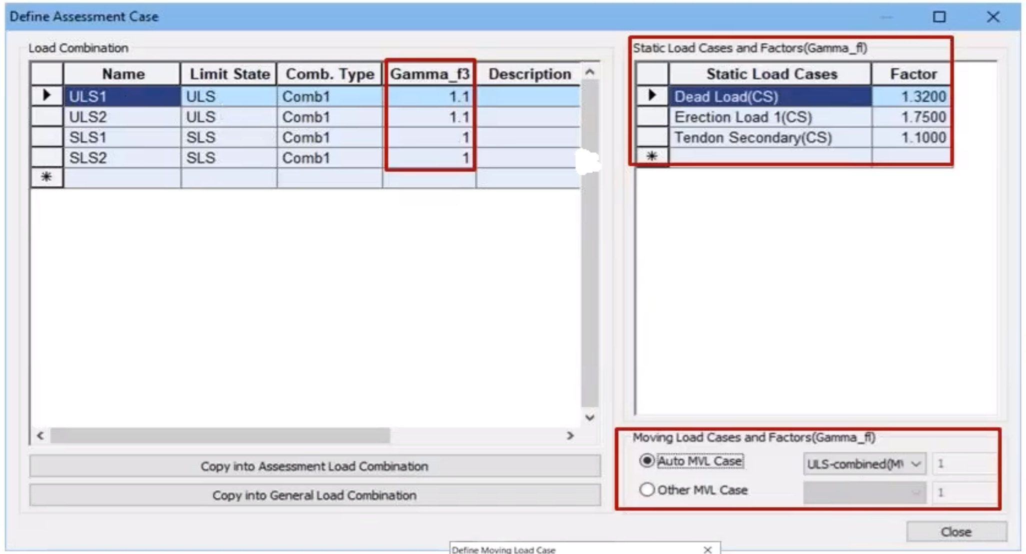
Highway and Railway Bridge Assessment

Highway Bridge Assessments

Overview

- Revision 0 released in June 2019; Revision 1 released in Mar 2020
- Supersedes BD 21/01, BA 16/97, and BD 37/01
  - Inclusion of wind, thermal and HB load models in new appendices, Previously BD 37
  - Traffic load models for loaded lengths greater than 50m, previously in BD 50
  - Increase in the lane width for ALL Model 1 (based on real vehicles) in single vehicle load case
- CS458 (Special vehicles(STGO,SO)), replaces BD 86/11





Equation 3.7 Assessment action effects

$$S_a^* = \gamma_{f3}(\text{effects of}(Q_a^*))$$

Equation 3.3 Assessment actions

$$Q_a^* = \gamma_{fL} Q_k$$

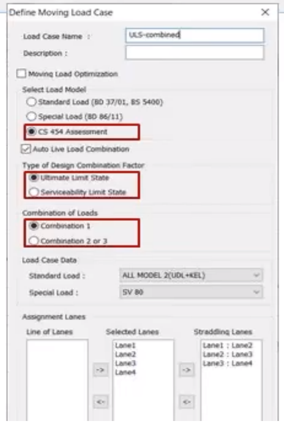
Table A.1 Partial factors for actions

Action	Reference	Limit state	Cast iron structures	Structures excluding cast iron Combination			
				1	2	3	4
Concrete, stone, masonry or timber dead load	Section 5	ULS	1.00	1.15[1]			
		SLS	-	1.00			
Surfacing superimposed dead load	Section 5	ULS	1.5[1]	1.75[1]			
		SLS	-	1.20			
Other superimposed dead loads	Section 5	ULS	1.0	1.20[1]			
		SLS	-	1.00			
Traffic actions for normal traffic and restricted traffic	Section 5	ULS	1.00	1.50	1.25		
		SLS	-	1.20	1.00		
Abnormal traffic actions (SV, SOV, STGO and SO vehicles)	CS 458 [Ref 7.N]	ULS	1.00	1.10	1.00		
		SLS	-	1.00	1.00		

3.8 The value of γ_{f3} at SLS shall be 1.0.

3.9 The value of γ_{f3} at ULS shall be taken as 1.1, except in the following cases:

1) 1.0 for cast iron bridges;
2) 1.0 for masonry arches;



Railway Bridge Assessments – NR/GN/CIV/025

Overview

- The Structural Assessment of Underbridges
- June 2006 – Latest Issue
- **RT/CE/C/025**, titled *The Structural Assessment of Underbridges*, and served as a direct predecessor to **NR /GN/CIV/025**.
- Earlier also BD21/01 was also being used for Railway Bridge Assessments
- It bridges the gap between the BD 21 and the more rail-specific needs.

Ref	NR/GN/CIV/025
Issue	3
Date	June 2006

Guidance Note

The Structural Assessment of Underbridges

Network Rail

Network Rail Live Loads

Assessment Live Load and Level of Assessment

Assessment Objective – To determine load carrying capacity in terms of live load and speed

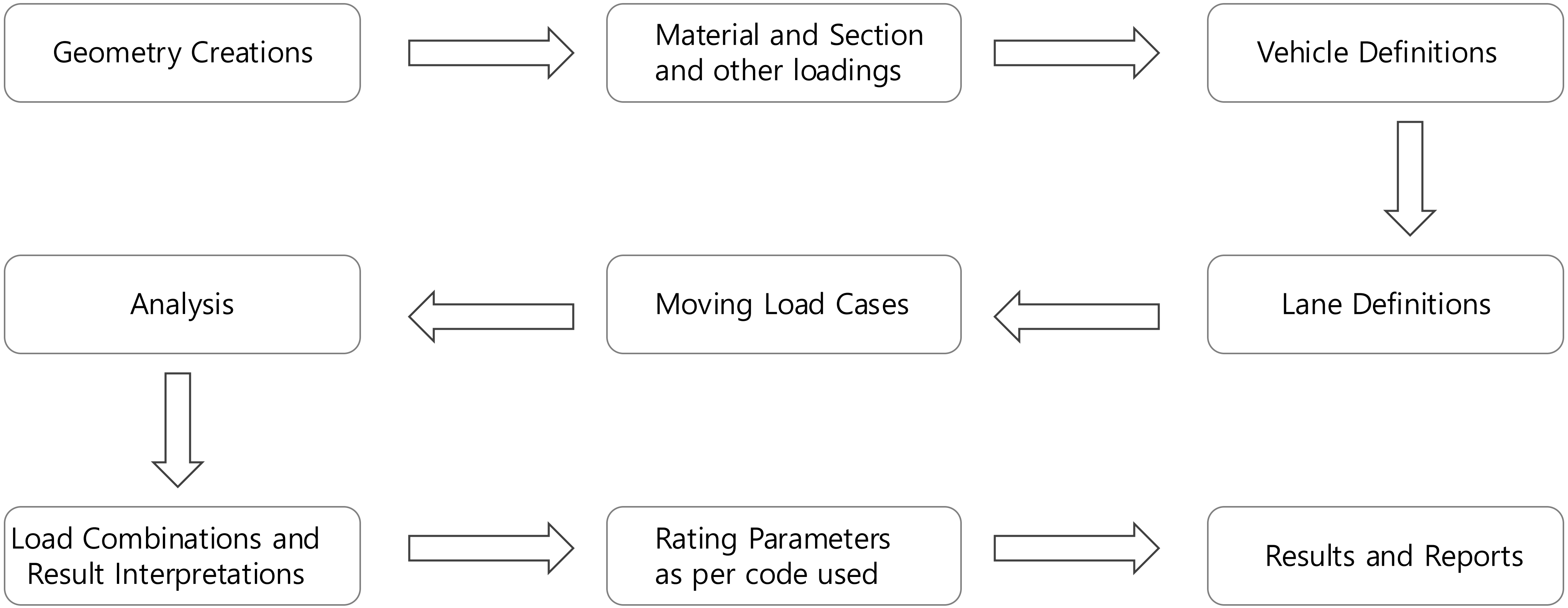
Rail Traffic Loadings (1.5.3 – NR/GN/CIV/025)

- **Route Availability**
  - In terms of BSUs of Type *RAI Loading* at permissible speed

  (other speeds if Capacity < RA10)
- **Wagons**
  - All structures need to be assessed for carrying *D4 Wagons* in accordance with UIC 700-O

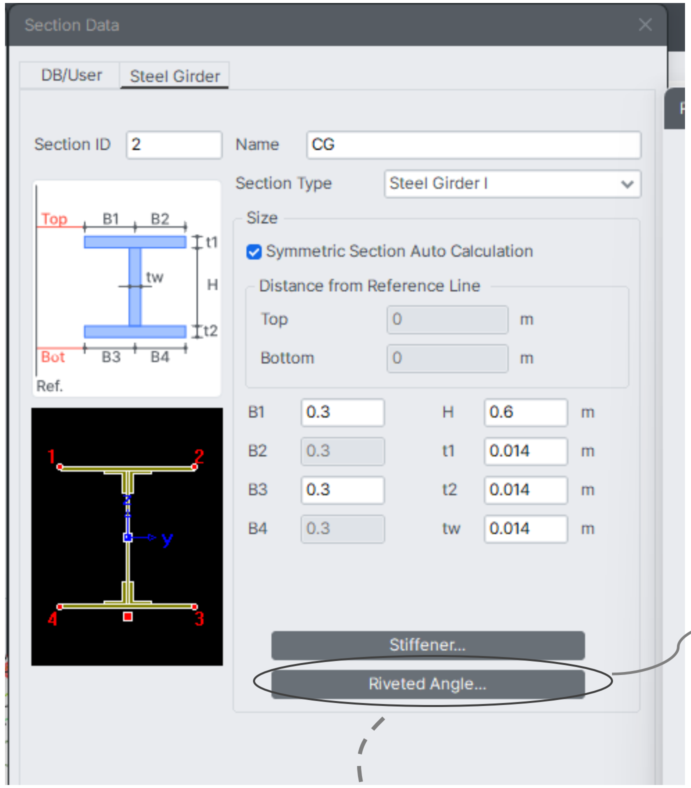
Level 1	Simplest level using assumptions known to be conservative and, where appropriate, consideration of loading by real trains.
Level 2	Use of more refined analysis and better structural idealisation. This level may also include use of data on materials strengths based on mill test certificates or recent material tests on another structure of similar form, materials and age.
Level 3	Use of a bridge specific live loading based on a statistical model of the known traffic and/or the use of tests on materials samples or the use of worst credible strengths or the use of load tests.

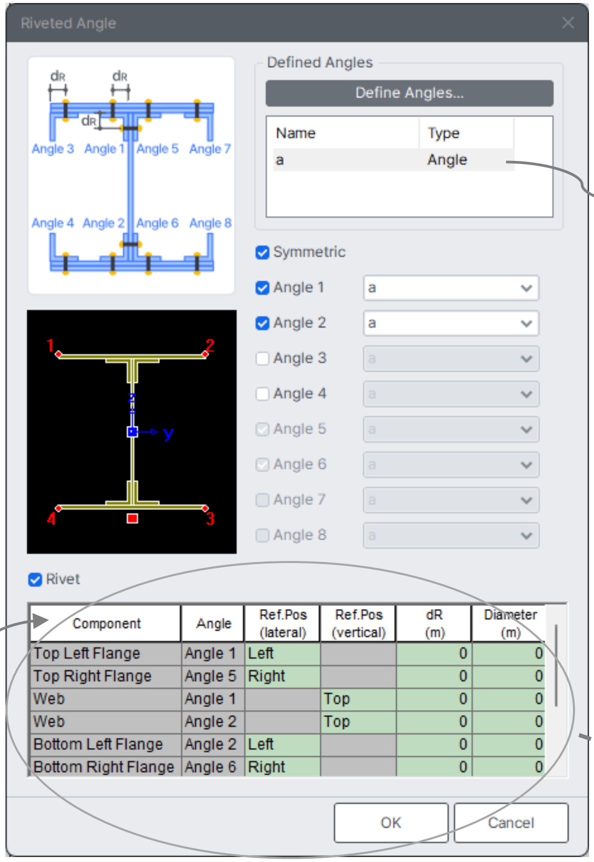
Workflow in Civil NX

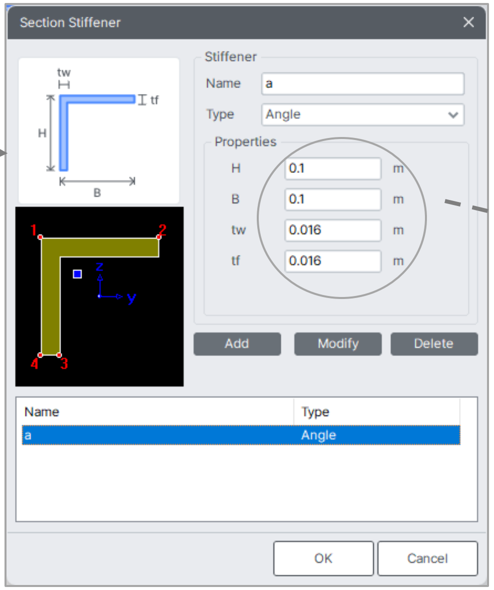


Material and Section Property

Section Property – I Girders





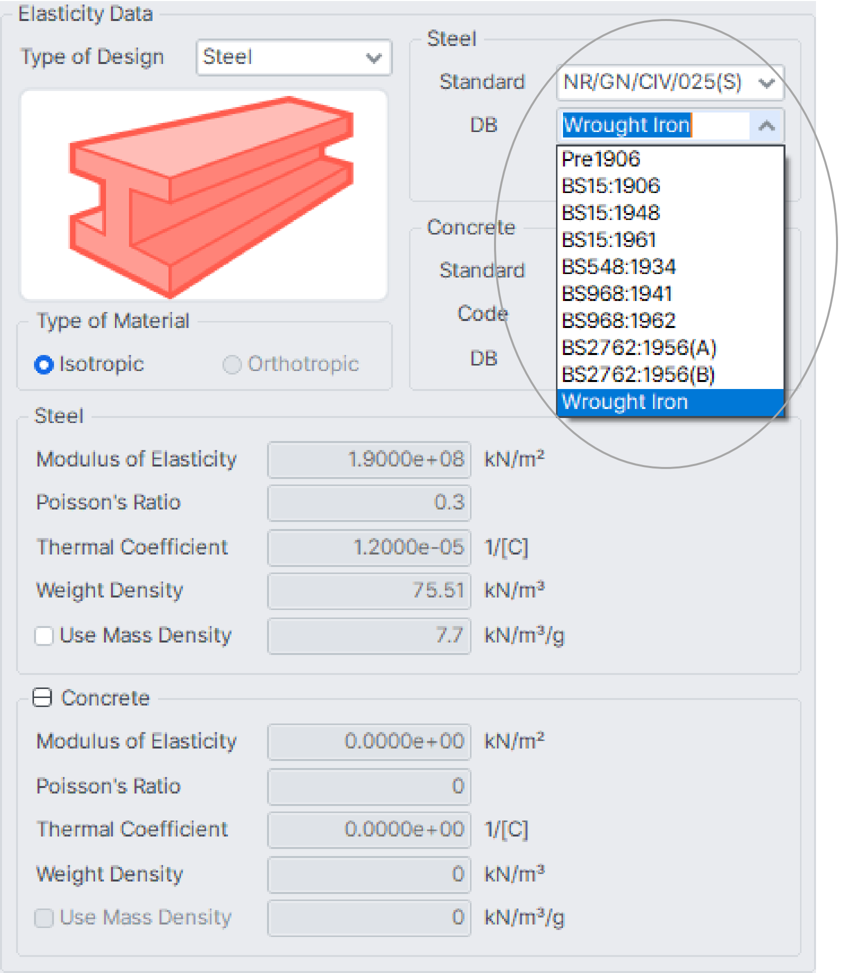


Define different Angle sections

Riveted Angles Definition for I Girders

Control the Rivet Positioning as per different angles

Material Property



Different Steel and Wrought Iron Materials as per old standard codes

Consideration of Live Load for Assessments in Civil NX

Live Load for Railway Assessments

RAI Loading

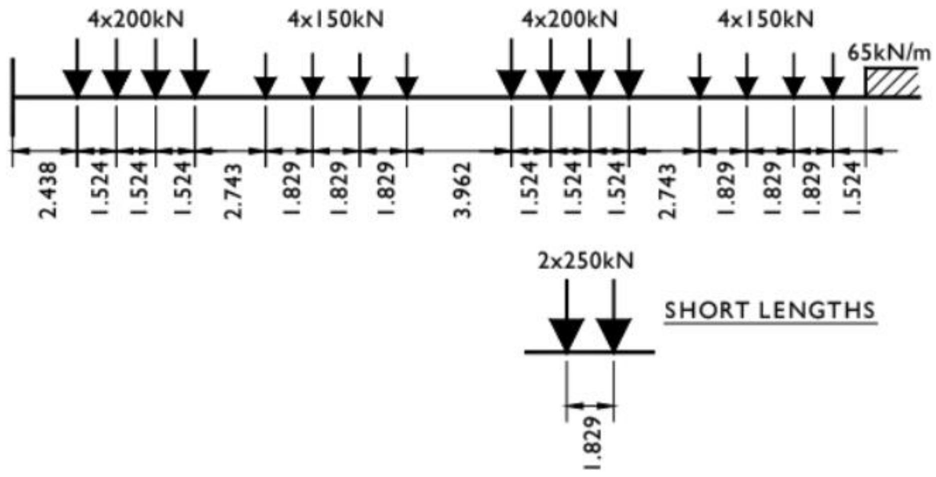
4.3.1.1 Route Availability (RA) Number

The assessment of a Bridge should be determined in terms of its Route Availability (RA) number, that is its safe rail traffic load capacity. Route Availability numbers generally range from the lowest capacity RA0 to the highest at RA15 represented by 25 British Standard Units (BSUs) of Type RA1 loading as shown by Table 4.3.

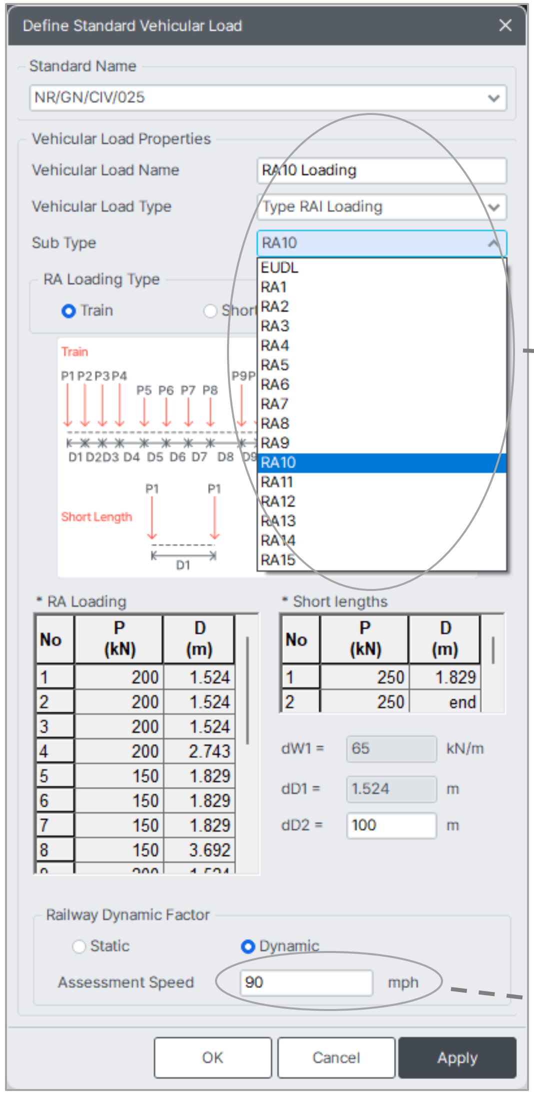
RA NUMBER	RANGE OF UNITS	RANGE OF SINGLE AXLE WEIGHTS
RA0	Up to 10.99 units	Under 13.96 tonnes
RA1	11.00 to 11.99 units	13.97 to 15.23 tonnes
RA2	12.00 to 12.99 units	15.24 to 16.50 tonnes
RA3	13.00 to 13.99 units	16.51 to 17.77 tonnes
RA4	14.00 to 14.99 units	17.78 to 19.04 tonnes
RA5	15.00 to 15.99 units	19.05 to 20.31 tonnes
RA6	16.00 to 16.99 units	20.32 to 21.58 tonnes
RA7	17.00 to 17.99 units	21.59 to 22.85 tonnes
RA8	18.00 to 18.99 units	22.86 to 24.12 tonnes
RA9	19.00 to 19.99 units	24.13 to 25.39 tonnes
RA10	20.00 to 20.99 units	25.40 to 26.66 tonnes
RA11	21.00 to 21.99 units	26.67 to 27.93 tonnes
RA12	22.00 to 22.99 units	27.94 to 29.20 tonnes
RA13	23.00 to 23.99 units	29.21 to 30.47 tonnes
RA14	24.00 to 24.99 units	30.48 to 31.74 tonnes
RA15	25.00 units and over	31.75 tonnes and over

4.3.1.2 RA1 Loading

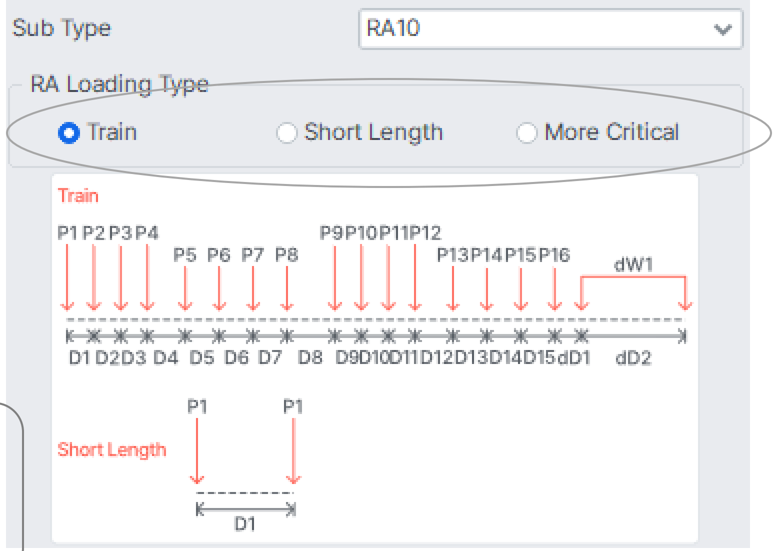
The static loading used to determine the RA number is shown in Figure 4.1 for 20 units of Type RA1 loading. The Short Lengths configuration should be used when it produces more onerous effects than the axle and uniformly distributed load model.



Live Load for Railway Assessments



Can consider both RAI and EUDL for the moving loads



Both Train and Short Length loads can be defined (together or separate)

Assessment Speed for calculation of Dynamic Factor

Assessment Load Wagon

4.3.1.4 Assessment Load Wagon

The loading and axle configuration of the Assessment Load Wagon is as shown in Figure 4.2. Dynamic factors should be based on a maximum speed of the lesser of 60 mph or the permissible speed at the site.

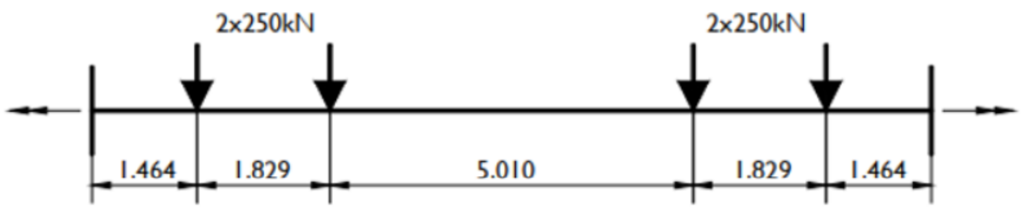
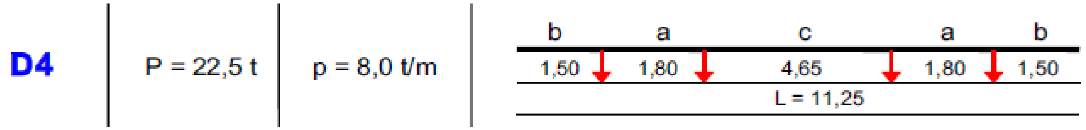


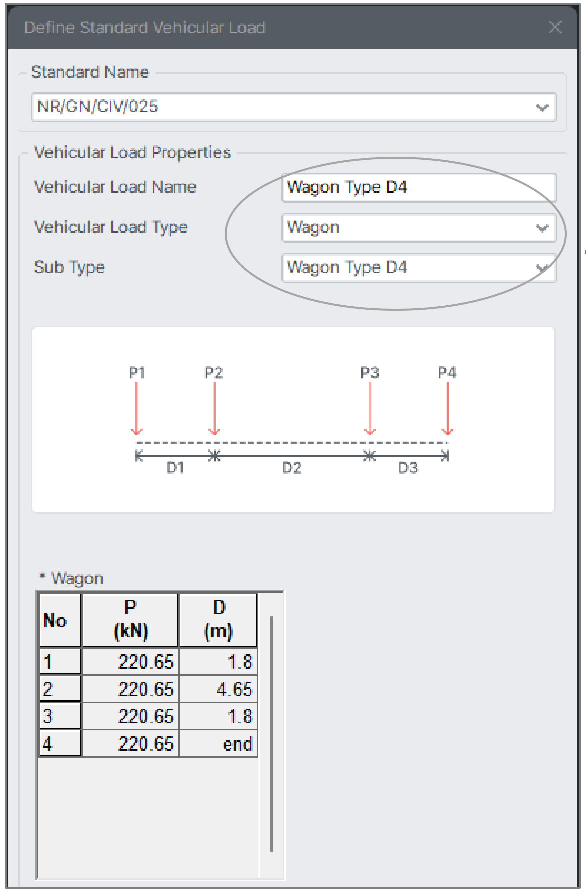
Figure 4.2
Assessment Load Wagon

4.3.1.5 Wagon Type D4

The loading and axle configuration of Wagon Type D4 is defined in UIC700-O. Dynamic factors should be based on a maximum speed of the lesser of 60 mph or the permissible speed at the site.

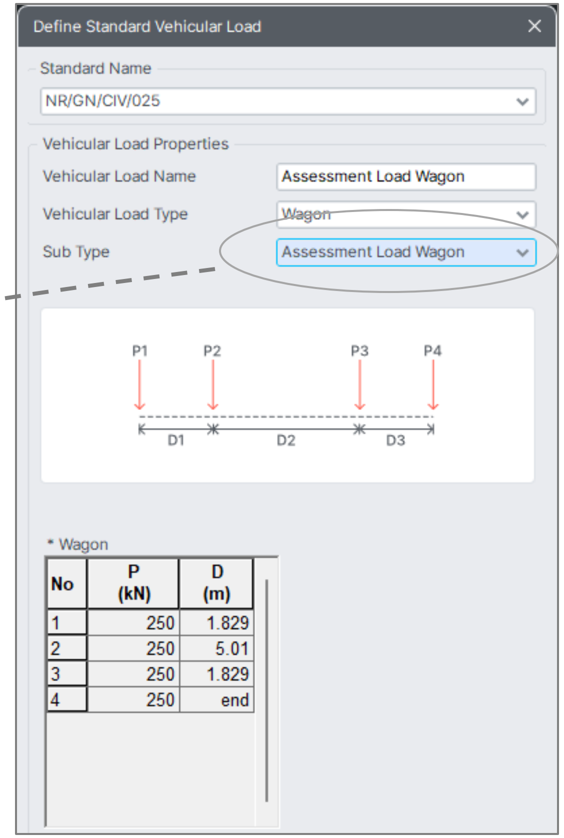


Live Load for Railway Assessments



Wagon Type D4 as per UIC-700

Assessment Load Wagon as per CIV/025



Live Load for Railway Assessments

Dynamic Effects

4.3.2.2 Dynamic Factor for Longitudinal Members

The dynamic factor $(1+\varphi)$ appropriate to the train speed should be applied to all members other than transverse floor members (see Clause 4.3.2.4) using the dynamic increment φ which should be taken as in Table 4.5.

	Dynamic Increment φ for Bending	Dynamic Increment φ for Shear
Normal track maintained for Permissible speed ≤ 100 mph	$(\varphi_1 + \varphi_{11})$	$\frac{2}{3} \times \varphi$ for Bending
Track maintained for Permissible speed > 100 mph – 125 mph	$1.3\left(\varphi_1 + \frac{\varphi_{11}}{2}\right)$ (see note below table)	
Fatigue calculations only	$0.5\left(\varphi_1 + \frac{\varphi_{11}}{2}\right)$	

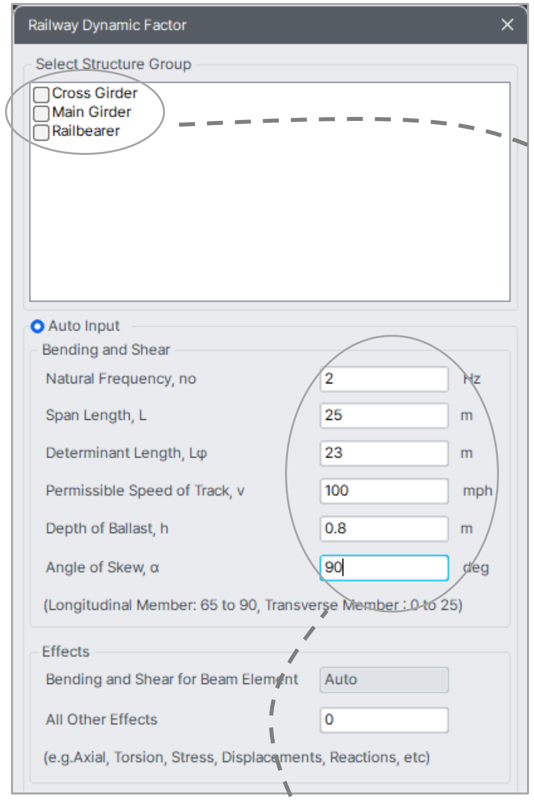
4.3.2.4 Dynamic Factor for Transverse Floor Members

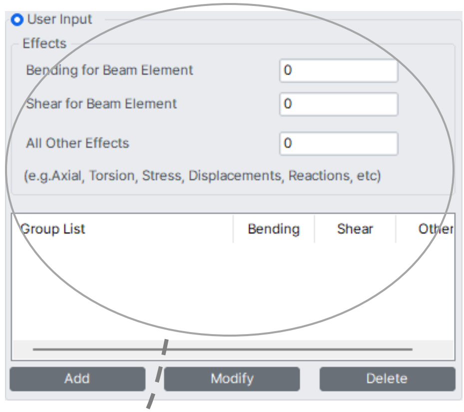
The dynamic factor for cross girders and other discrete transverse floor members $(1 + \varphi_T)$ appropriate to the train speed should be applied using the dynamic increment φ_T, which should be taken as in Table 4.7.

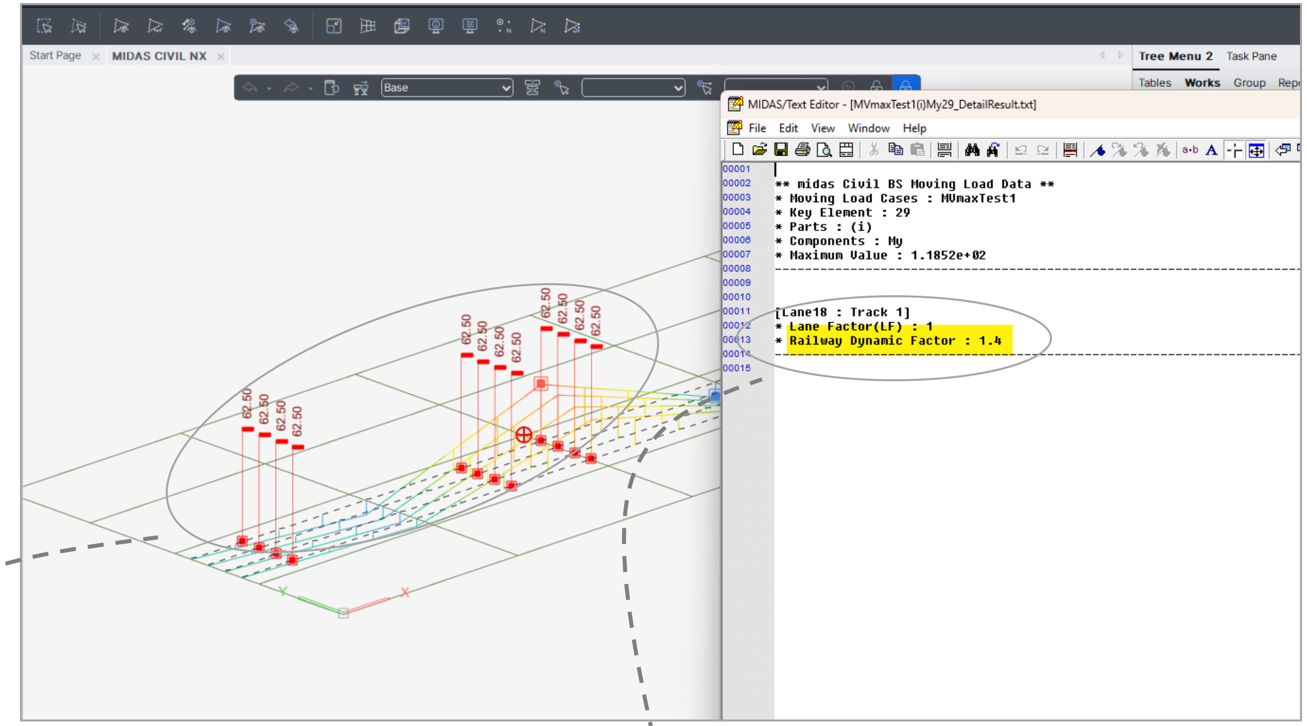
	Dynamic increment φ_T for bending	Dynamic increment φ_T for shear
Normal track maintained for permissible speed ≤ 100 mph	0.008v	$\frac{2}{3} \times \varphi_T$ for bending
Track maintained for permissible speed >100 mph - 125mph	* 1.3 (0.008v)	
Fatigue calculations only.	0.004v	

Live Load for Railway Assessments

Dynamic Effects







Separate Dynamic Factor as per structure group

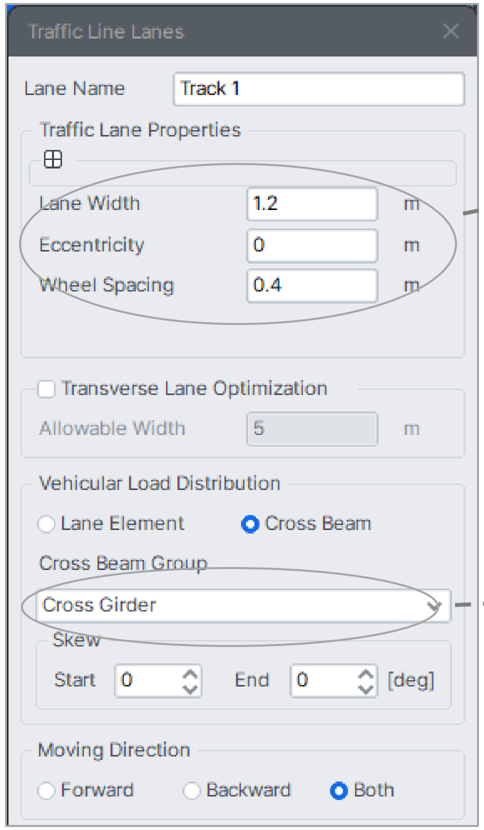
Auto/ User Input of Dynamic Factor as per the different members

Extract Load Positions for any Max/Min Cases

Extract the Dynamic Factor for a particular load positions

Live Load for Railway Assessments

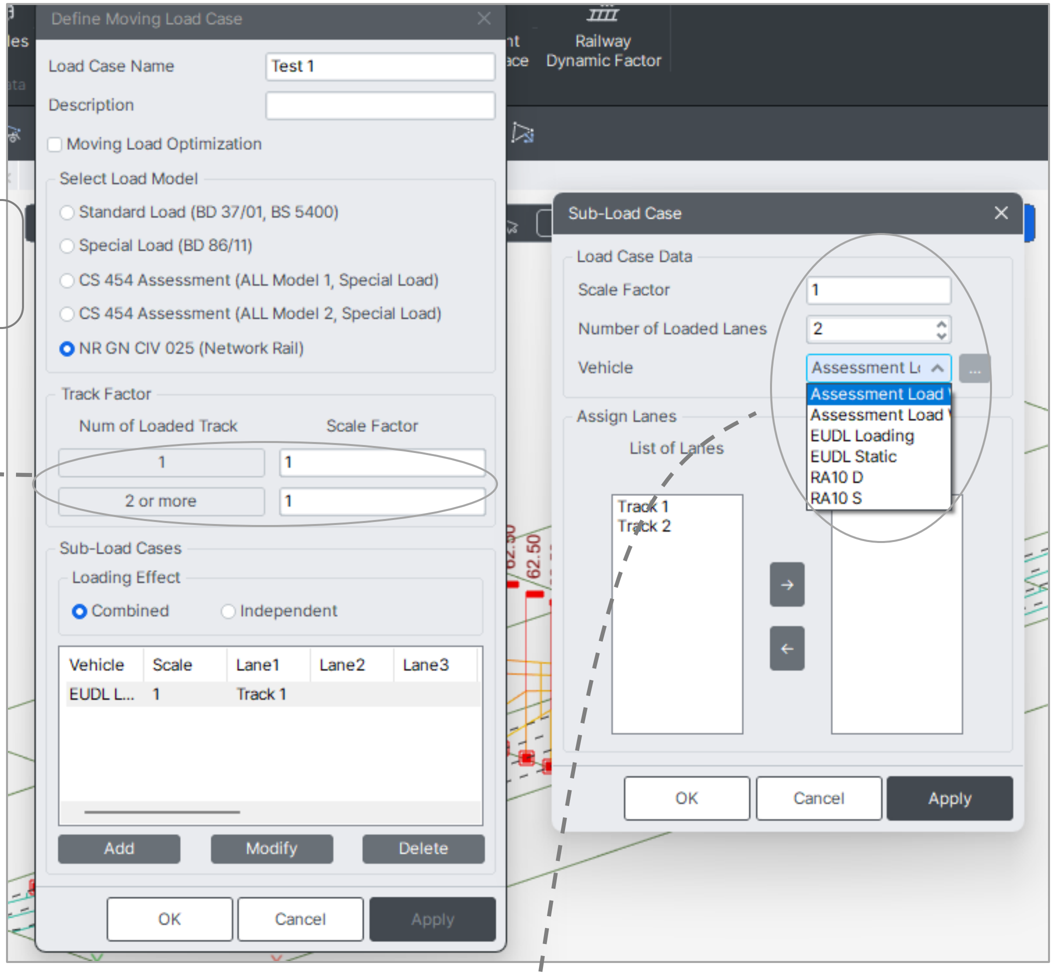
Lane Definitions and Moving Load Cases



Lane Definitions

Input Lane Factors for more than one lane loadings

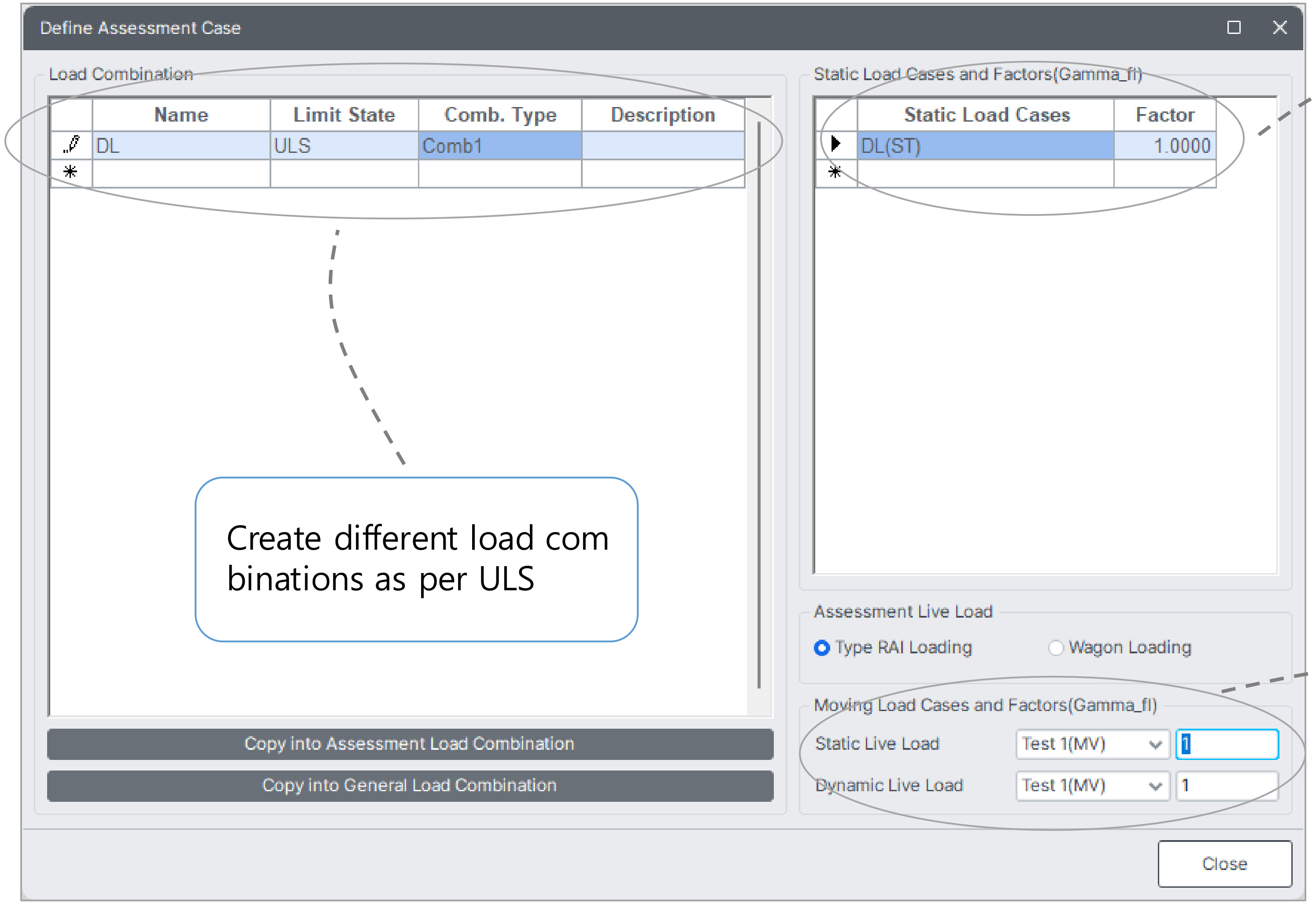
Distribute Loads Transversally as per Cross Girders



Create any combination for the loads for the Trains Loads

Assessment Parameters and Reporting

Assessment Load Combinations

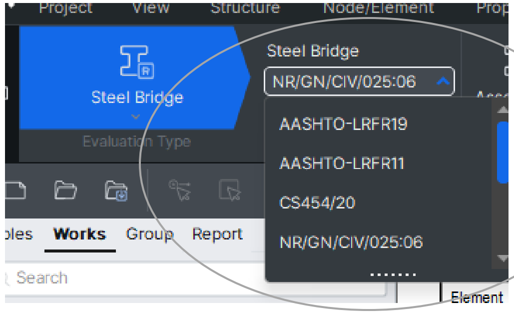


Create different load com binations as per ULS

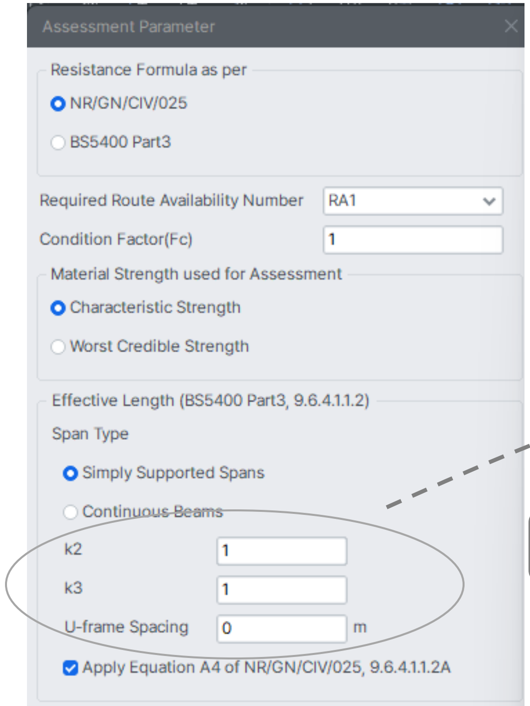
Provide load factors quickly according to combinations

Connect already defined Moving Load and provide gamma_fl accordingly

Factors for Assessment Checks

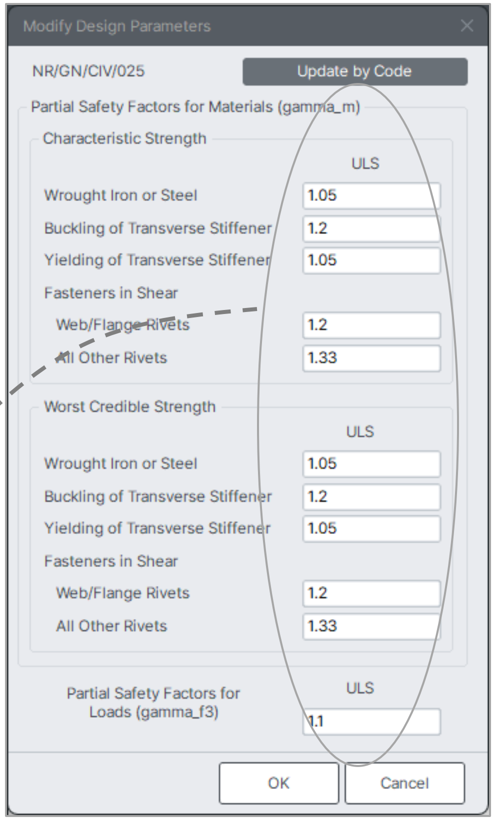


Select Assessment Code

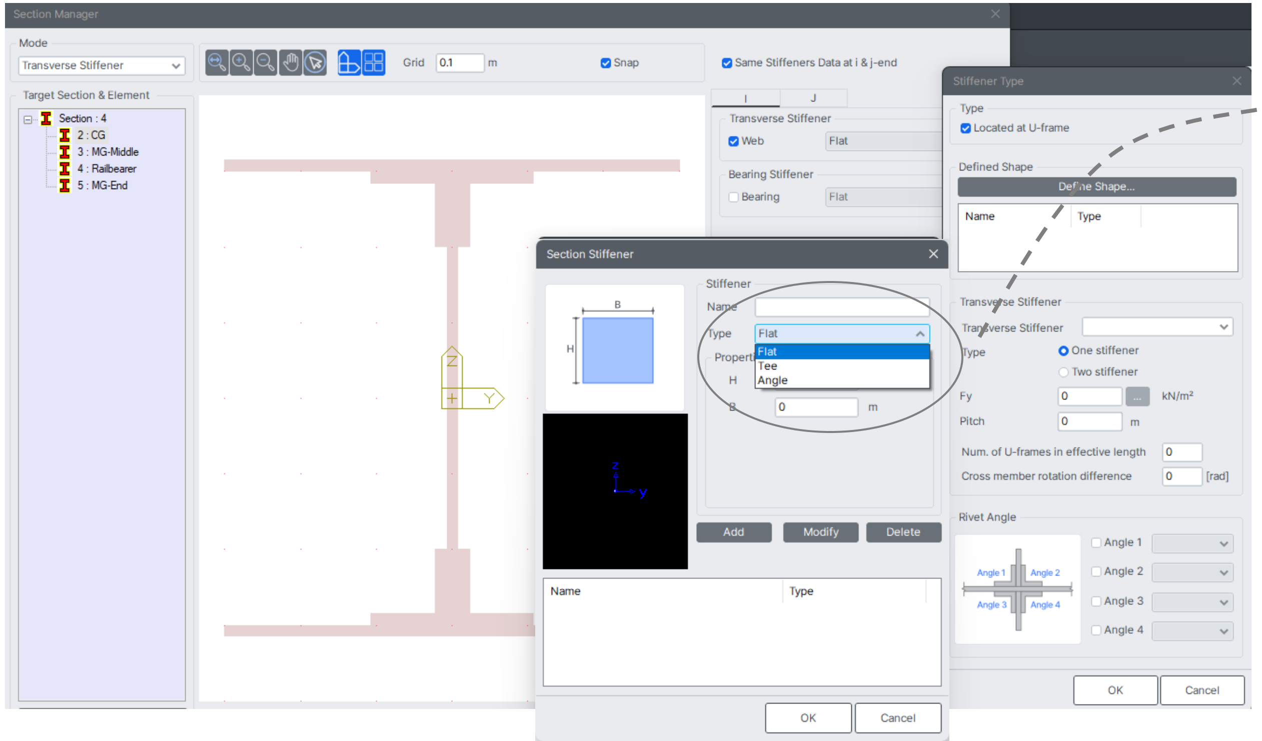


Manual Inputs for k2 and k3

Control material factors as per manual inputs too



Parameters for Assessment Checks



Can define Transverse and Bearing Stiffeners

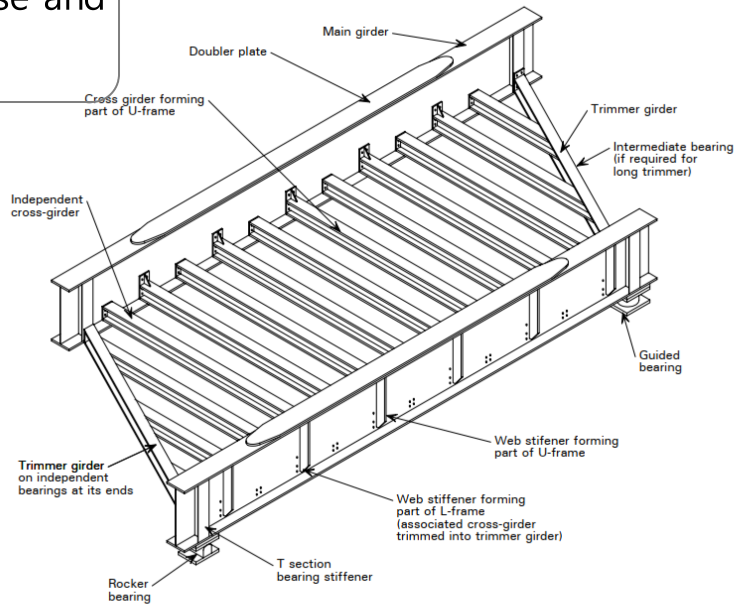
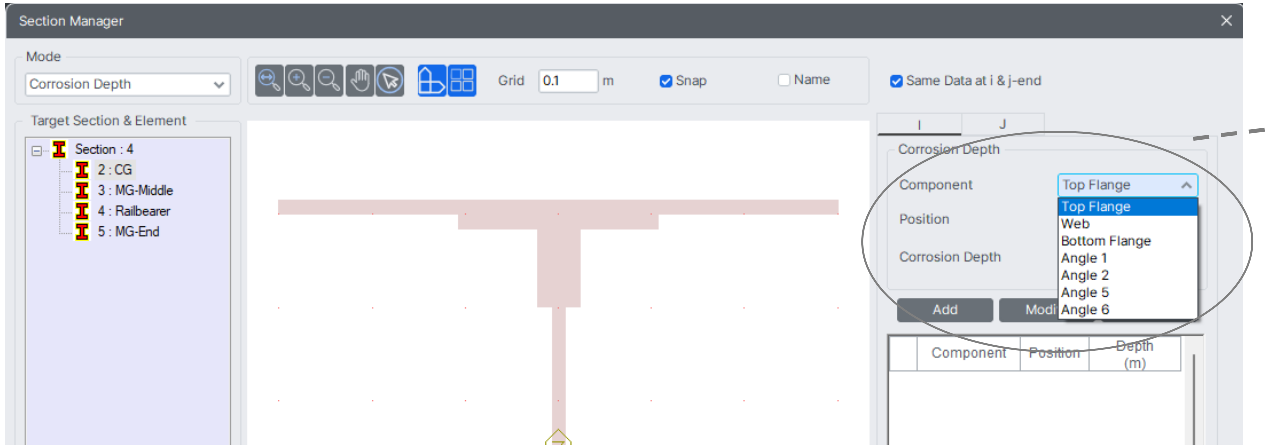
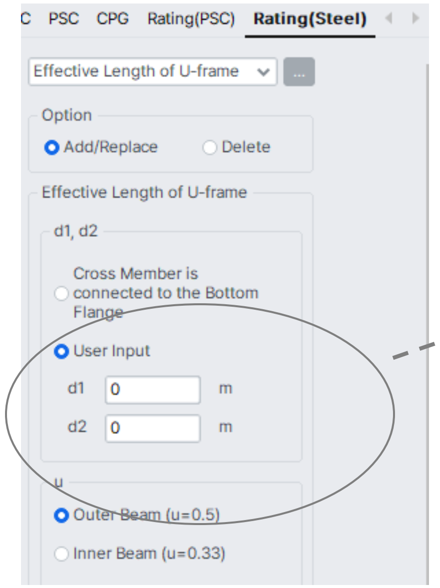


Figure 10.2 *Components of half through plate girder bridge (bridge floor not shown)*

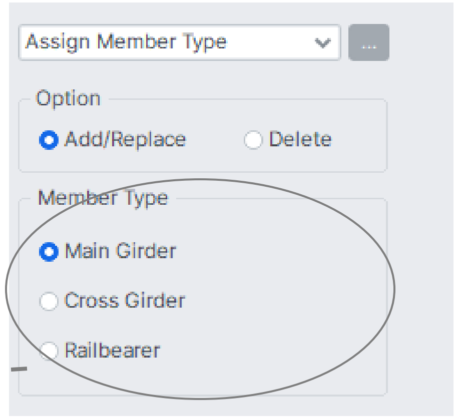


Control Corrosion depth and modify section properties accordingly

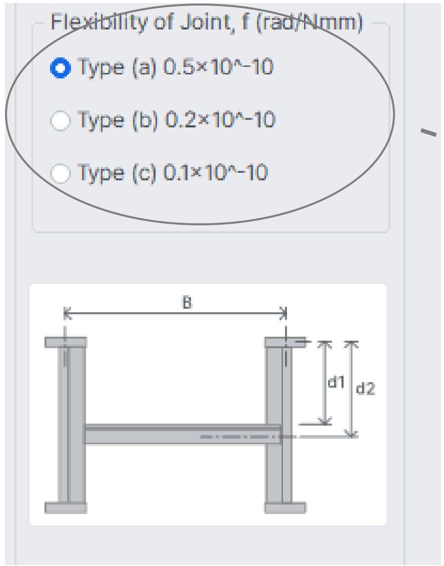
Parameters for Assessment Checks



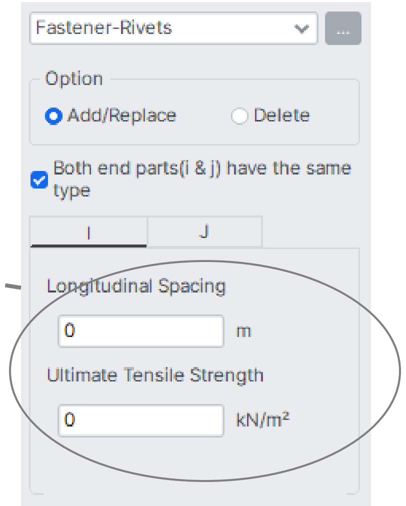
Member Assignments



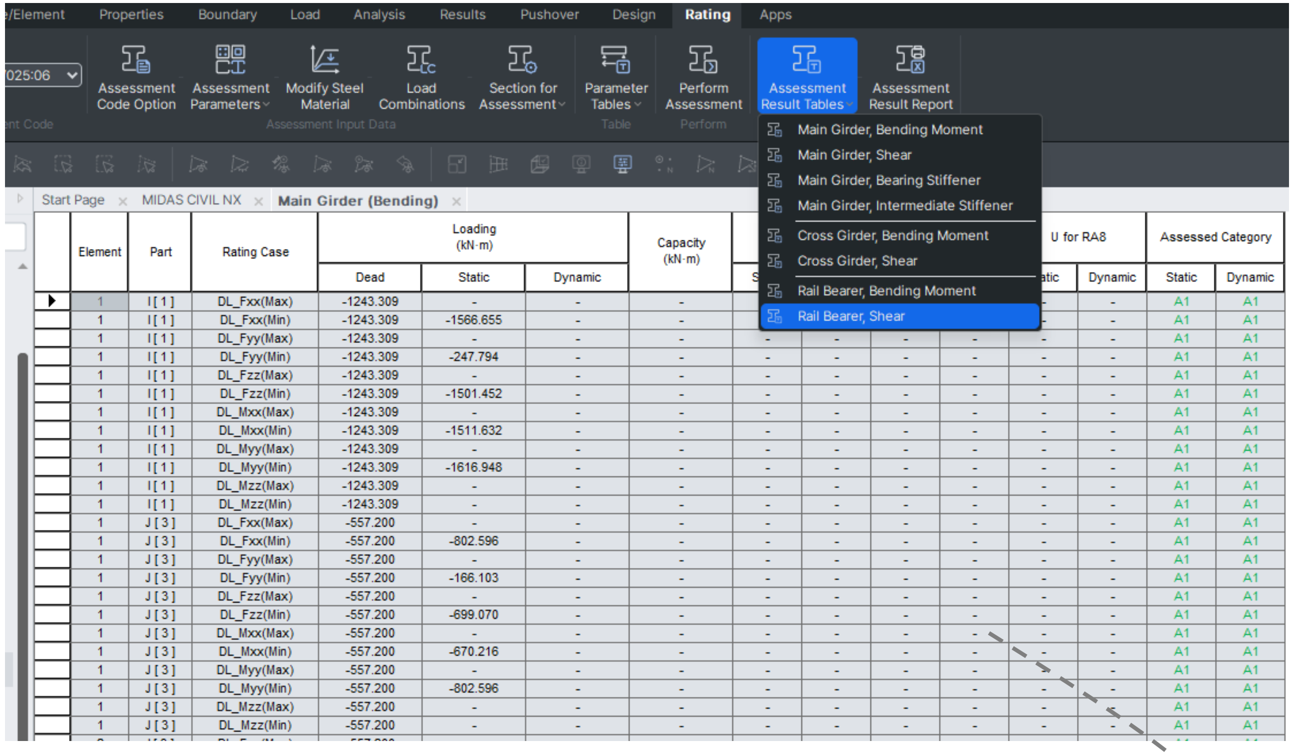
U frame action parameters

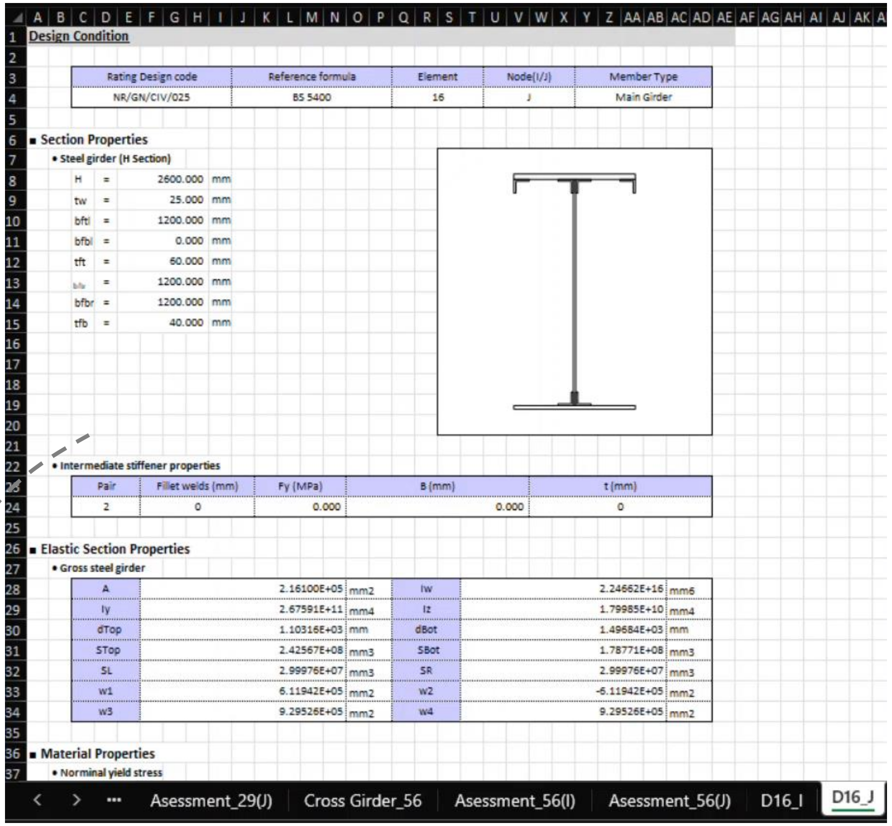


Rivet Parameters



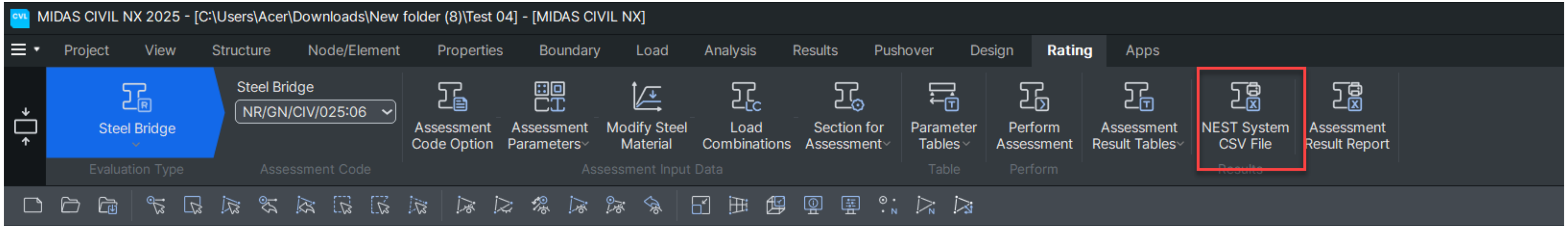
Rating Results





Tabular and Excel Format of Results

NEST CSV



	Work Order ID	Asset / Assessment Group	Parent Asset Name	Major Element Name	Major Element Physical ID	Minor Element Name	Minor Element Physical ID	Minor Element Primary Material	Element Section Reference	Element Section Location (m)	Assessed Condition	Structural Action	Description	Engineer's Line Reference Code	Track ID
DBP1	00000000	-	-	-	-	Main Girder	1	Wrought Iron	-	-	As Built	Bending Moment		DBP1	0000
DBP1	00000000	-	-	-	-	Main Girder	1	Wrought Iron	-	-	As Built	Bending Moment		DBP1	0000
DBP1	00000000	-	-	-	-	Main Girder	1	Wrought Iron	-	-	As Built	Bending Moment		DBP1	0000
DBP1	00000000	-	-	-	-	Main Girder	2	Wrought Iron	-	-	As Built	Bending Moment		DBP1	0000
DBP1	00000000	-	-	-	-	Main Girder	2	Wrought Iron	-	-	As Built	Bending Moment		DBP1	0000
DBP1	00000000	-	-	-	-	Main Girder	3	Wrought Iron	-	-	As Built	Bending Moment		DBP1	0000
DBP1	00000000	-	-	-	-	Main Girder	3	Wrought Iron	-	-	As Built	Bending Moment		DBP1	0000
DBP1	00000000	-	-	-	-	Main Girder	4	Wrought Iron	-	-	As Built	Bending Moment		DBP1	0000
DBP1	00000000	-	-	-	-	Main Girder	4	Wrought Iron	-	-	As Built	Bending Moment		DBP1	0000
DBP1	00000000	-	-	-	-	Main Girder	5	Wrought Iron	-	-	As Built	Bending Moment		DBP1	0000
DBP1	00000000	-	-	-	-	Main Girder	5	Wrought Iron	-	-	As Built	Bending Moment		DBP1	0000
DBP1	00000000	-	-	-	-	Main Girder	6	Wrought Iron	-	-	As Built	Bending Moment		DBP1	0000
DBP1	00000000	-	-	-	-	Main Girder	6	Wrought Iron	-	-	As Built	Bending Moment		DBP1	0000
DBP1	00000000	-	-	-	-	Main Girder	7	Wrought Iron	-	-	As Built	Bending Moment		DBP1	0000
DBP1	00000000	-	-	-	-	Main Girder	7	Wrought Iron	-	-	As Built	Bending Moment		DBP1	0000
DBP1	00000000	-	-	-	-	Main Girder	8	Wrought Iron	-	-	As Built	Bending Moment		DBP1	0000
DBP1	00000000	-	-	-	-	Main Girder	8	Wrought Iron	-	-	As Built	Bending Moment		DBP1	0000
DBP1	00000000	-	-	-	-	Main Girder	9	Wrought Iron	-	-	As Built	Bending Moment		DBP1	0000
DBP1	00000000	-	-	-	-	Main Girder	9	Wrought Iron	-	-	As Built	Bending Moment		DBP1	0000
DBP1	00000000	-	-	-	-	Main Girder	10	Wrought Iron	-	-	As Built	Bending Moment		DBP1	0000
DBP1	00000000	-	-	-	-	Main Girder	10	Wrought Iron	-	-	As Built	Bending Moment		DBP1	0000
DBP1	00000000	-	-	-	-	Main Girder	10	Wrought Iron	-	-	As Built	Bending Moment		DBP1	0000
DBP1	00000000	-	-	-	-	Main Girder	11	Wrought Iron	-	-	As Built	Bending Moment		DBP1	0000
DBP1	00000000	-	-	-	-	Main Girder	11	Wrought Iron	-	-	As Built	Bending Moment		DBP1	0000

NR

Future Roadmap

Future Developments

Shell Elements Assessment Results

- For Level 2 Assessments, mostly shell elements are used
- Development is underway to extend NR assessment checks to plate elements in addition to beam elements.
- This will allow full finite element-based bridge assessments using regulatory standards.

Future Developments

Improved Corrosion Modeling with Mesh Control

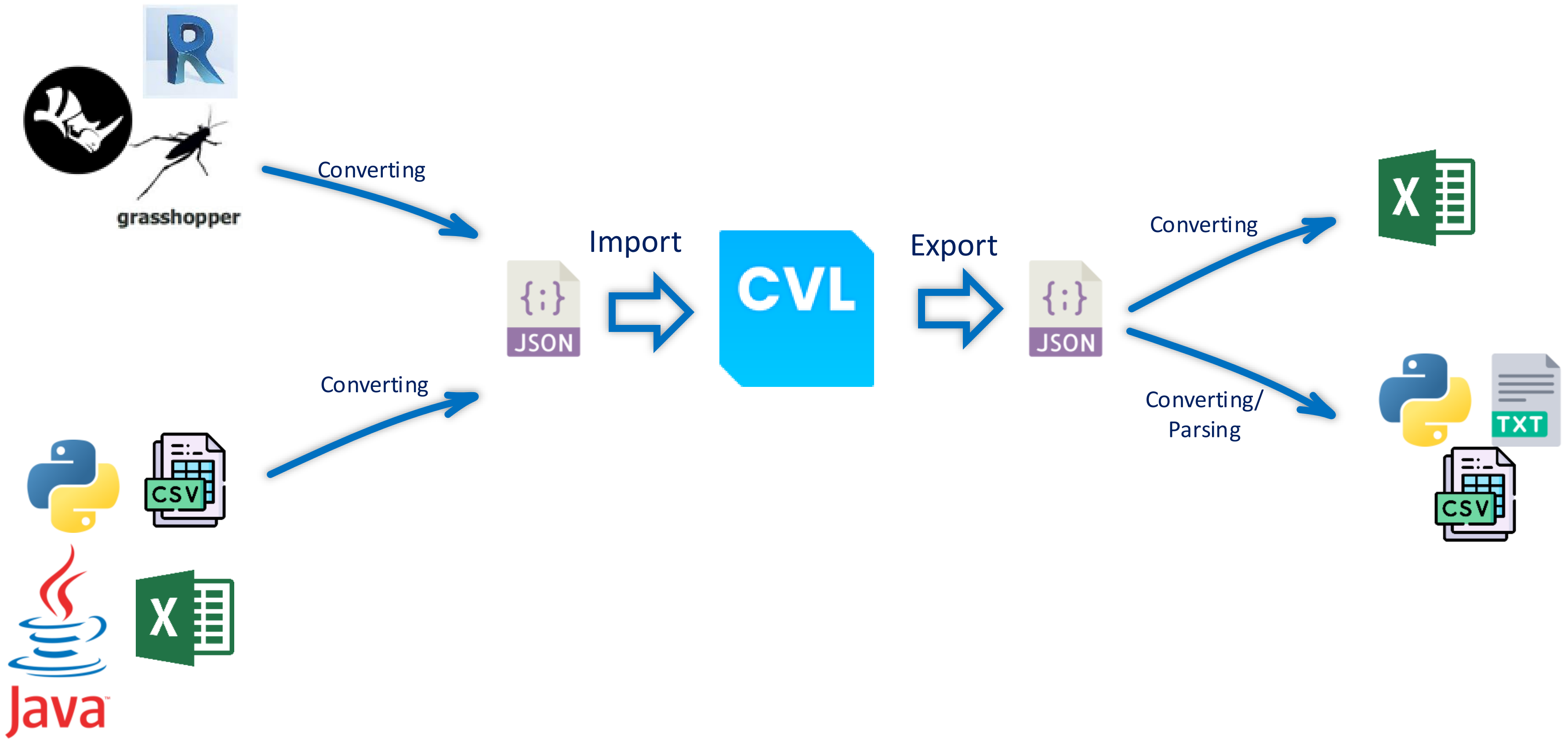
- Investigating a method to model corrosion directly within finite element models by adjusting local mesh geometry.
- This would allow more accurate and flexible representation of corroded regions in steel or composite bri dges.

Updates with API

Application Program Interface

MIDAS CIVIL NX

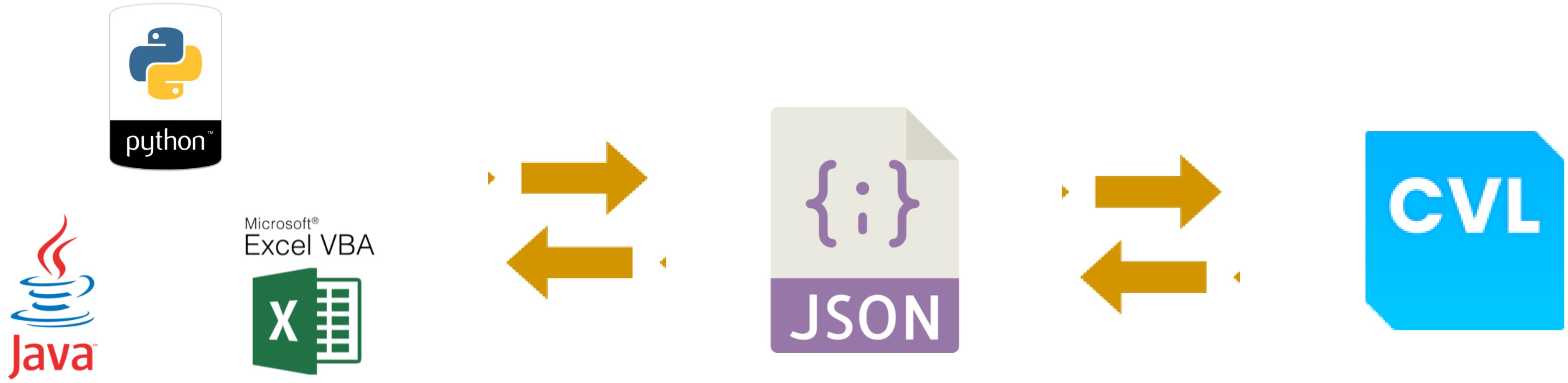
The concept of Data Transferring using API



MIDAS CIVIL NX

Open API Process

Supported by major software packages (Java, Python, C++, C# …)



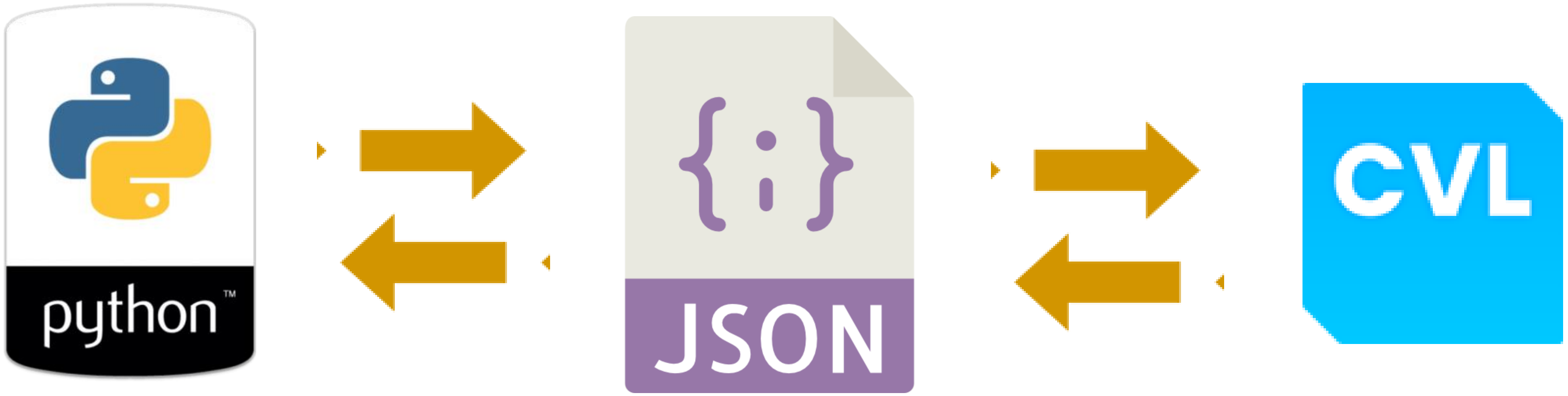
MIDAS CIVIL NX

PYTHON

Python is a high-level, general-purpose programming language. Its design philosophy emphasizes code readability with the use of significant indentation.

TYPICAL USE CASES :

- Optimisation
- Load automation
- Batch File creation

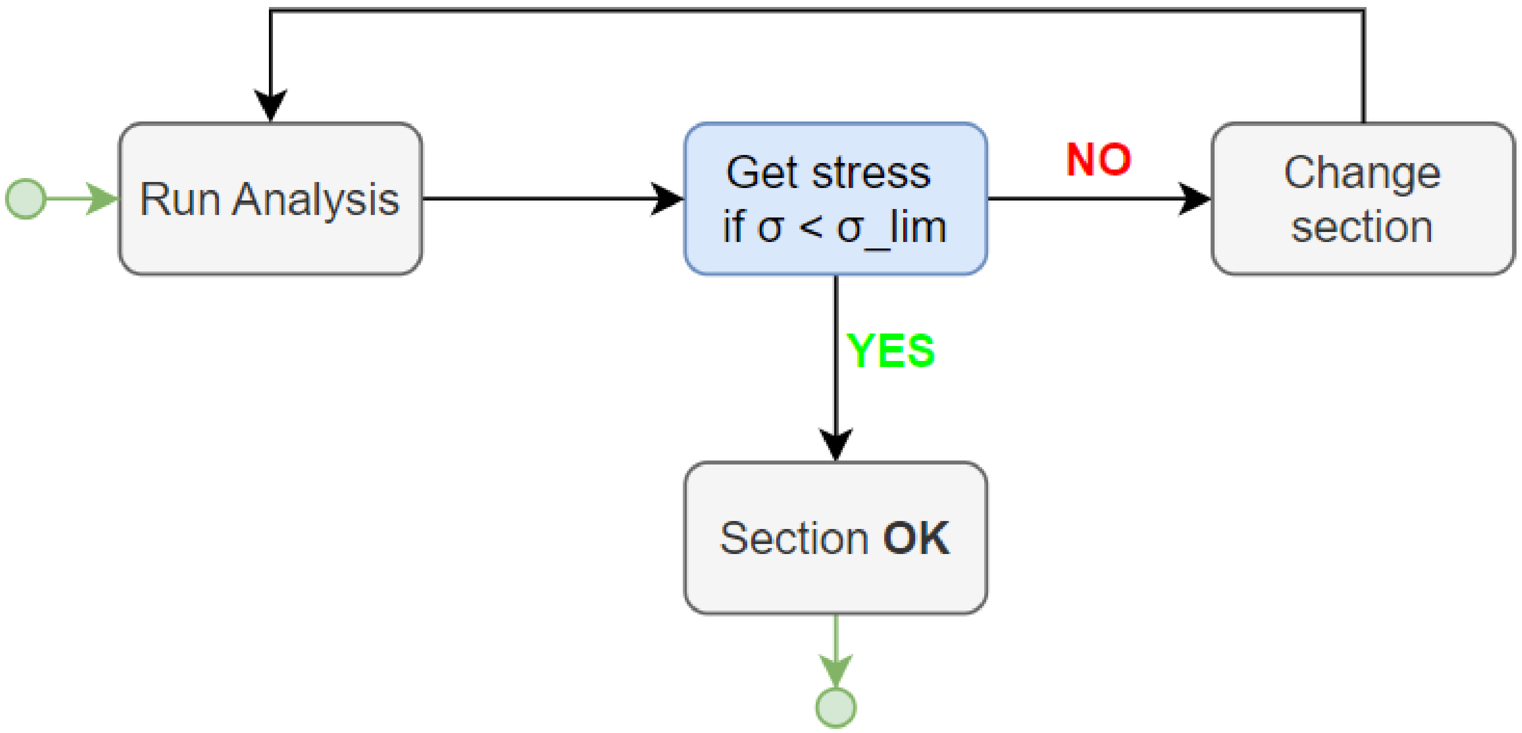


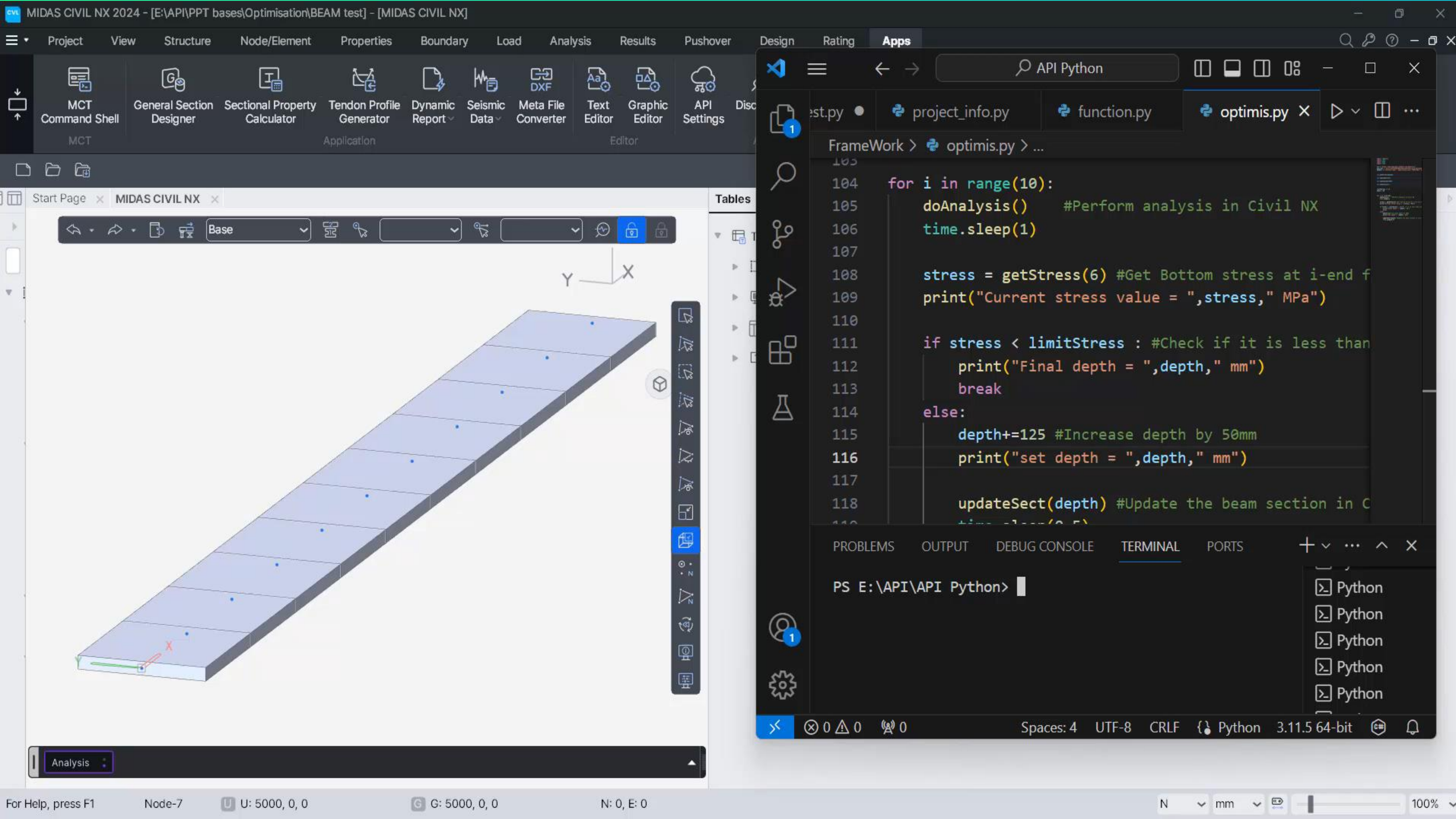
MIDAS CIVIL NX

PYTHON

Now you can control MIDAS Softwares using highly accessible programming languages such as Python or Java. Create the com mands you need to optimize your design and fine-tune your models and parameters in detail.

Design OPTIMISATION




MIDAS CIVIL NX 2024 - [E:\API\PPT bases\Optimisation\BEAM test] - [MIDAS CIVIL NX]
Project View Structure Node/Element Properties Boundary Load Analysis Results Pushover Design Rating Apps
MCT Command Shell
General Section Designer
Sectional Property Calculator
Tendon Profile Generator
Dynamic Report
Seismic Data
Meta File Converter
Text Editor
Graphic Editor
API Settings
Start Page
MIDAS CIVIL NX
Tables
Base
API Python
project_info.py
function.py
optimis.py
FrameWork > optimis.py > ...
for i in range(10):
doAnalysis() #Perform analysis in Civil NX
time.sleep(1)
stress = getStress(6) #Get Bottom stress at i-end f
print("Current stress value = ",stress," MPa")
if stress < limitStress : #Check if it is less than
print("Final depth = ",depth," mm")
break
else:
depth+=125 #Increase depth by 50mm
print("set depth = ",depth," mm")
updateSect(depth) #Update the beam section in C
PROBLEMS OUTPUT DEBUG CONSOLE TERMINAL PORTS
PS E:\API\API Python>
Python
Python
Python
Python
Python
Spaces: 4 UTF-8 CRLF Python 3.11.5 64-bit
Analysis
For Help, press F1
Node-7
U: 5000, 0, 0
G: 5000, 0, 0
N: 0, E: 0
100%

Updates with API

```python
# Create Material Body
matl_json = {"Assign" : {
    material_ID : {
        "TYPE" : "CONC",
        "NAME" : mat_grade,
        "PARAM" : [
            {
            "P_TYPE":1,
            "STANDARD" : mat_standard,
            "DB" : mat_grade
            }
        ]
    }
}}

# Create Section Body
sect_json = {"Assign" : {
    section_ID : {
        "SECTTYPE" : "DBUSER",
        "SECT_NAME" : "Rectangular",
        "SECT_BEFORE" : {
            "USE_SHEAR_DEFORM" : True,
            "SHAPE": "SB",
            "DATATYPE": 2,
            "SECT_I": {
                "vSIZE" : [height, width]
            }
        }
    }
}}
```

Material

Section

MIDAS Python Library

```python
# Create Material Body
Material.CONC(mat_grade, mat_standard, mat_grade, material_ID)

# Create Section Body
Section.DBUSER("Rectangular", "SB", [height, width])
```

Updates with API

MIDAS Python Library

full json.py

full json.py > ...

```python
    }
load_case_req = MidasAPI("PUT", "/db/Stld", stld_json)

bodf_json = {"Assign" : {
    "1" : {
        "LCNAME" : load_case_name[0],
        "FV" :[
            0,
            0,
            -1
        ]
    }
}}
sw_req = MidasAPI("PUT", "/db/bodf", bodf_json)

bmld_json = {"Assign" : {}}

for i in range(num_divisions) :
    bmld_json["Assign"][start_elem_ID + i] = {
        "ITEMS" : [
            {
                "ID" : 1,
                "LCNAME" : load_case_name[1],
                "CMD" : "BEAM",
                "TYPE" : "UNILOAD",
                "DIRECTION" : "GZ",
                "D" : [
                    0,
                    1
                ],
                "P" : [
                    add_vertical_load,
                    add_vertical_load
                ]
            }
        ]
    }
bmld_req = MidasAPI("PUT", "/db/bmld", bmld_json)
```

using library.py

using library.py > ...

```python
#Importing the midas-civil package
from midas_civil import*
MAPI_KEY('eyJ1ciI6InN1bWl0QG1pZGFzaXQuY29tIiwicGciOiJjaXZpbCIsImNuIjoib3R3aXF0NHNR

#Input data
length : float = 10.0
height : float = 1.0
width : float = 0.8
add_vertical_load : float = -30.0

Model.units(length='M', force='KN')

Material.CONC("C32", 'AS17(RC)', "C32", 1)
Section.DBUSER("Rectangular", "SB", [height, width])

num_divisions = 20
Element.Beam.SE([0,0,0],[length,0,0],num_divisions,1,1)

Boundary.Support(1,"1111000")
Boundary.Support(1 + num_divisions, "0111000")

Load_Case("USER", "DL", "SIDL")
Load.SW("DL", "Z", -1)
for i in range(num_divisions):
    Load.Beam(1 + i, "SIDL", add_vertical_load)

Model.create()
```

184 lines vs 27 lines

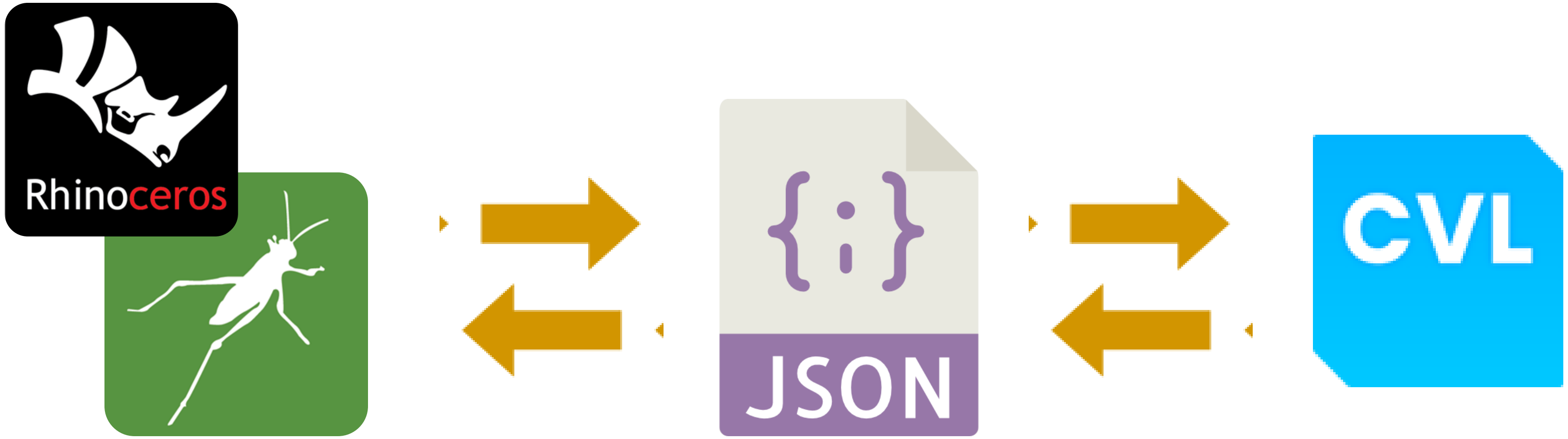
MIDAS CIVIL NX

RHINO X GRASSHOPPER

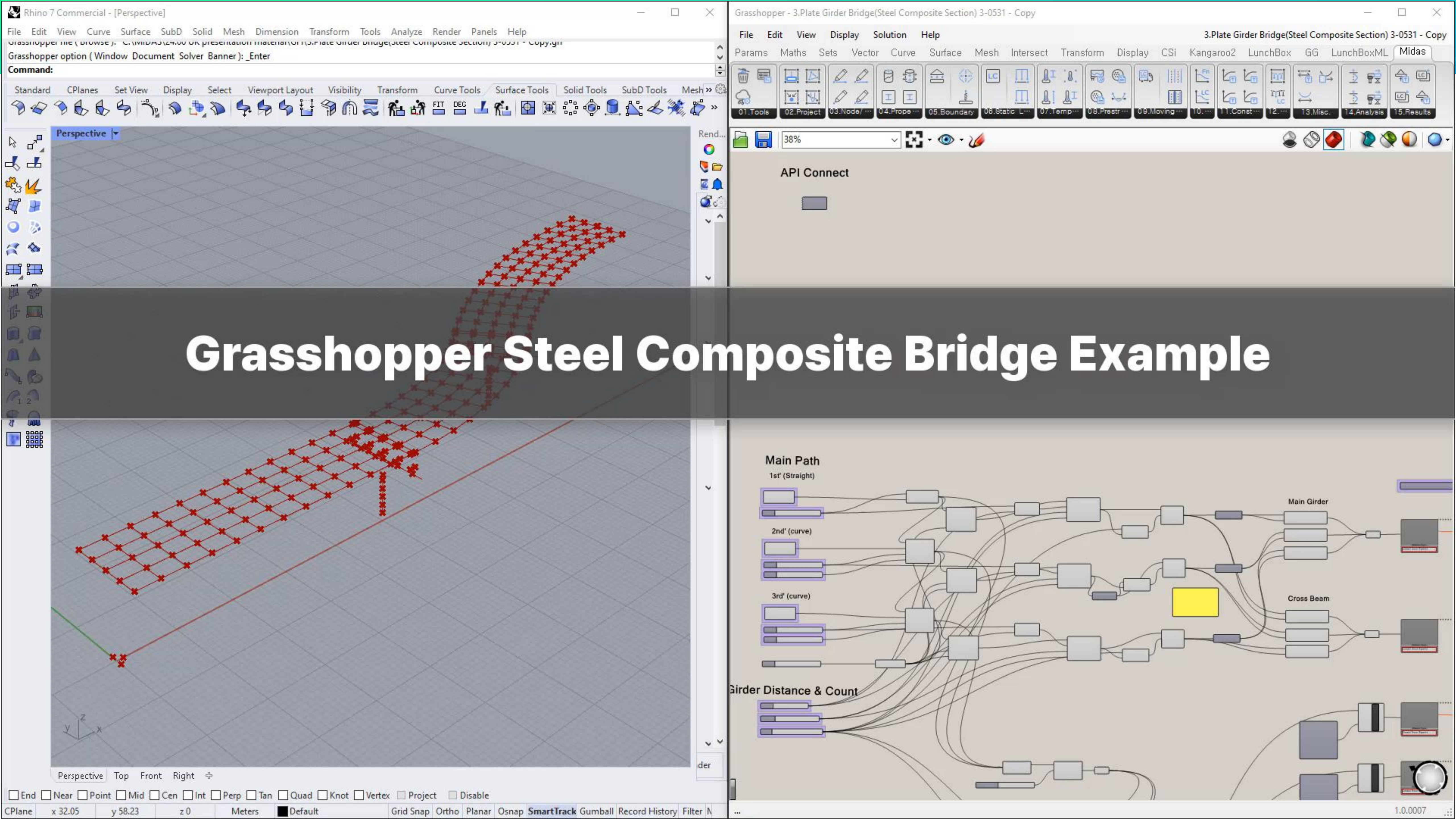
Grasshopper is a visual programming environment tightly integrated with Rhino's 3D modeling tools. Grasshopper requires no kn owle dge of programming or scripting, but still allows designers to build generative forms.

TYPICAL USE CASES :

- Parametric modelling
- Load automation
- BIM export to REVIT



Grasshopper Steel Composite Bridge Example



Updates with API

MIDAS GH v3.0.0 (update)

System Improvements

New Components

- Import from CIVIL NX
- Draw CIVIL model

Bug Fixes

MIDAS Support | Products | Resources | Support | MIDAS ↗ | Academy ↗

MIDAS Support > Online Help_GrassHopper API > Introduction

Introduction | Created 2025.06.13 | Edited 2025.07.04

[MIDAS GH] 2025. V3.0.0

1. Update Item

1) System Improvements

- System Improvements
- Improved Data Review
- Real-time DB Update
- Enhanced Data Processing Speed

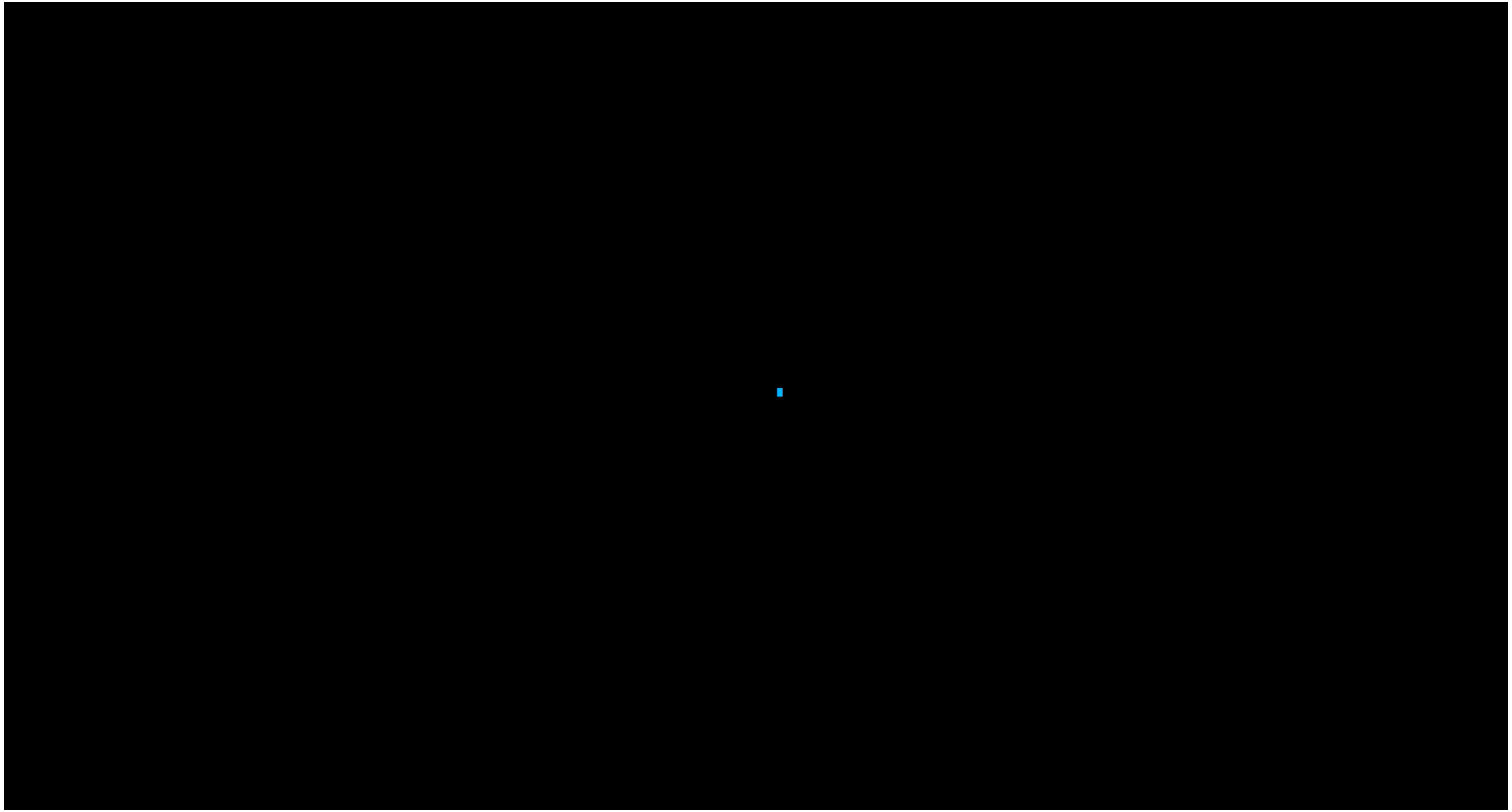
2) Expanded Auto/Manual ID Input Support

- Import Civil NX
- Draw Civil Model

3) Changes to Existing Components

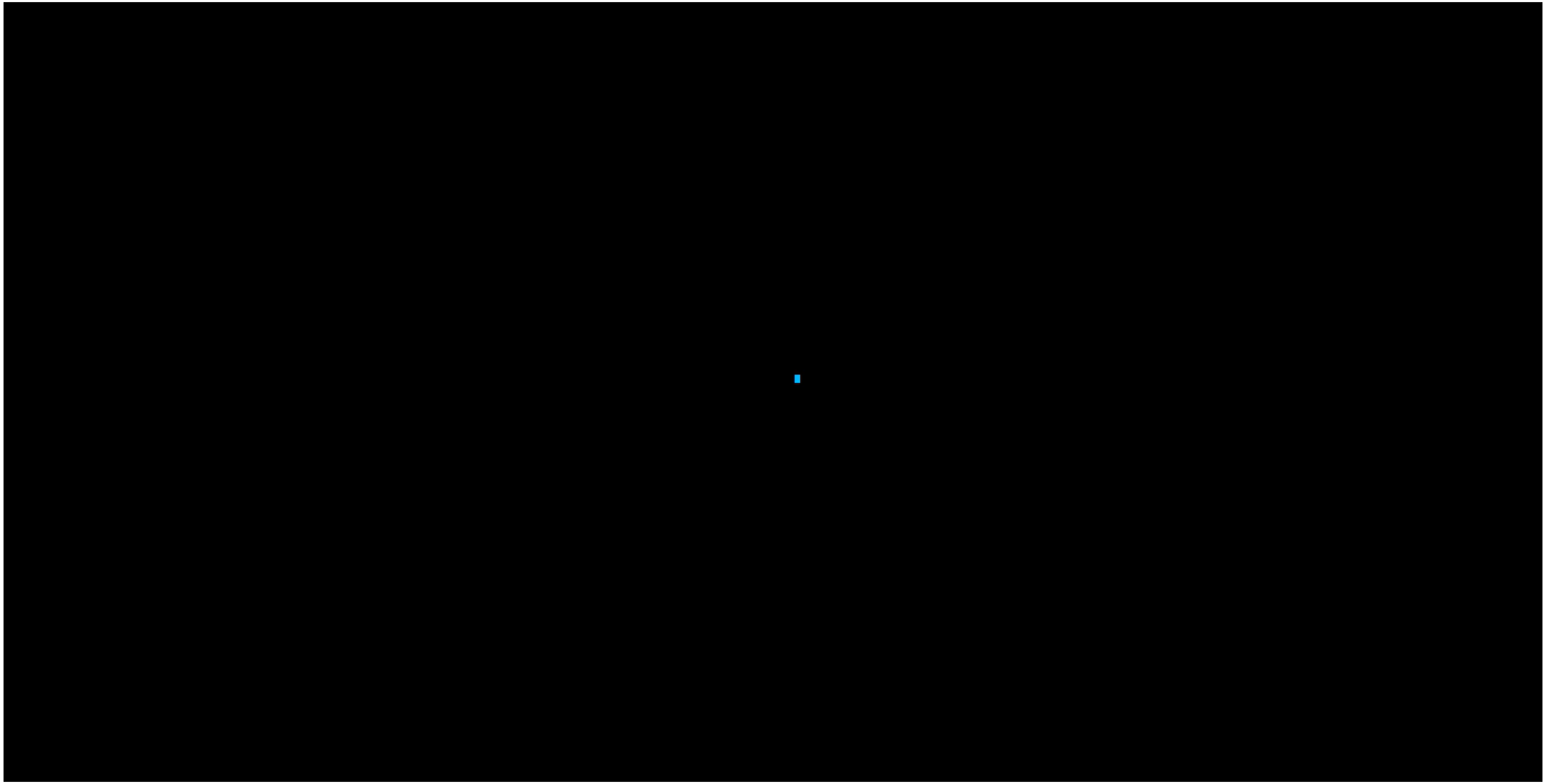
- Added Button
  - Send Request
  - Delete Component
- ID Input Field Removed*
  - Define General Spring Type
  - Small Disp. Initial Force Control Data
  - Settlement Group Name
  - Settlement Load Cases

MIDAS GH v3.0.0 (update) – Import CIVIL NX



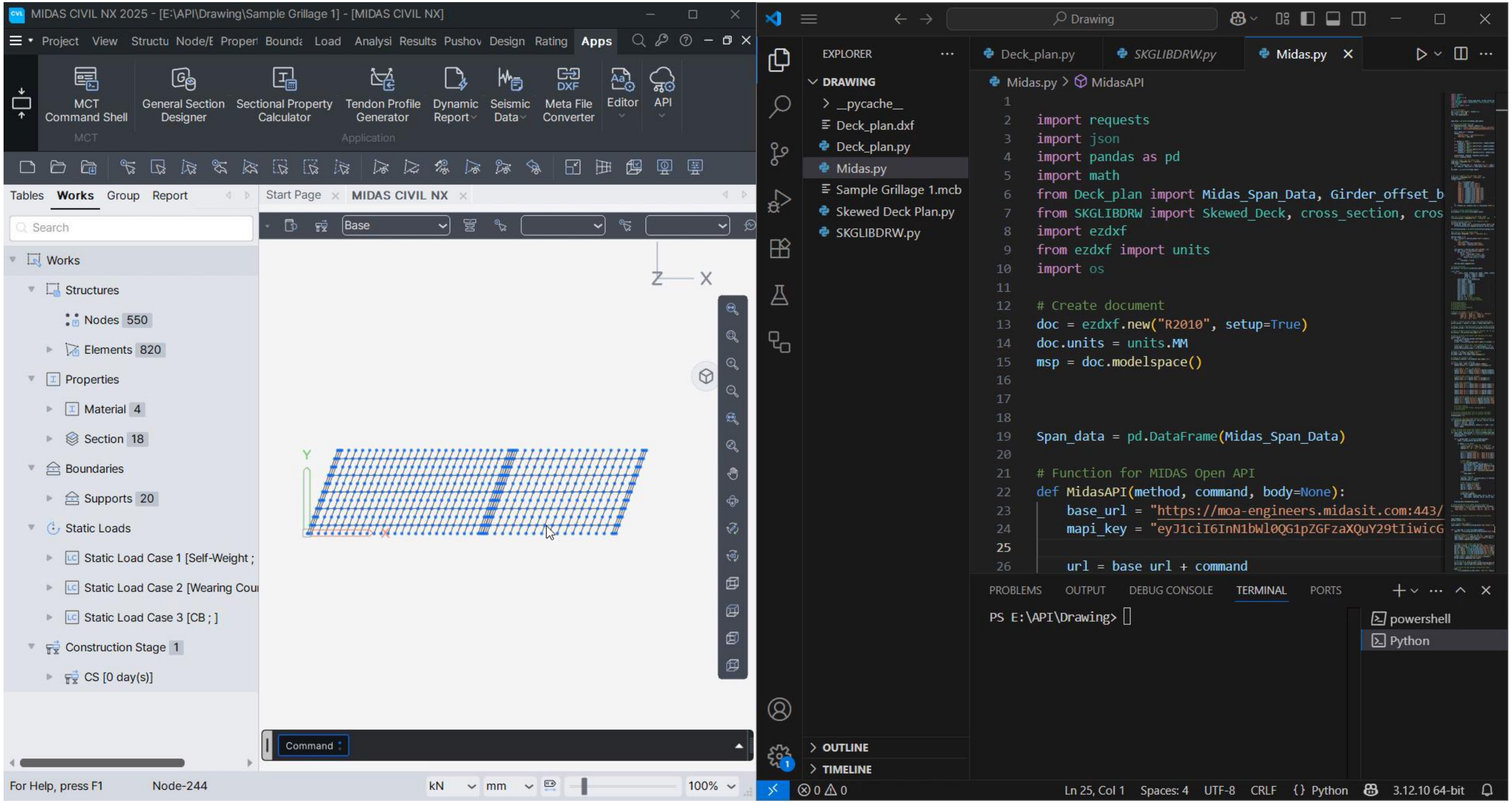
Updates with API

Sneak Peak – Beam to Plate convertor

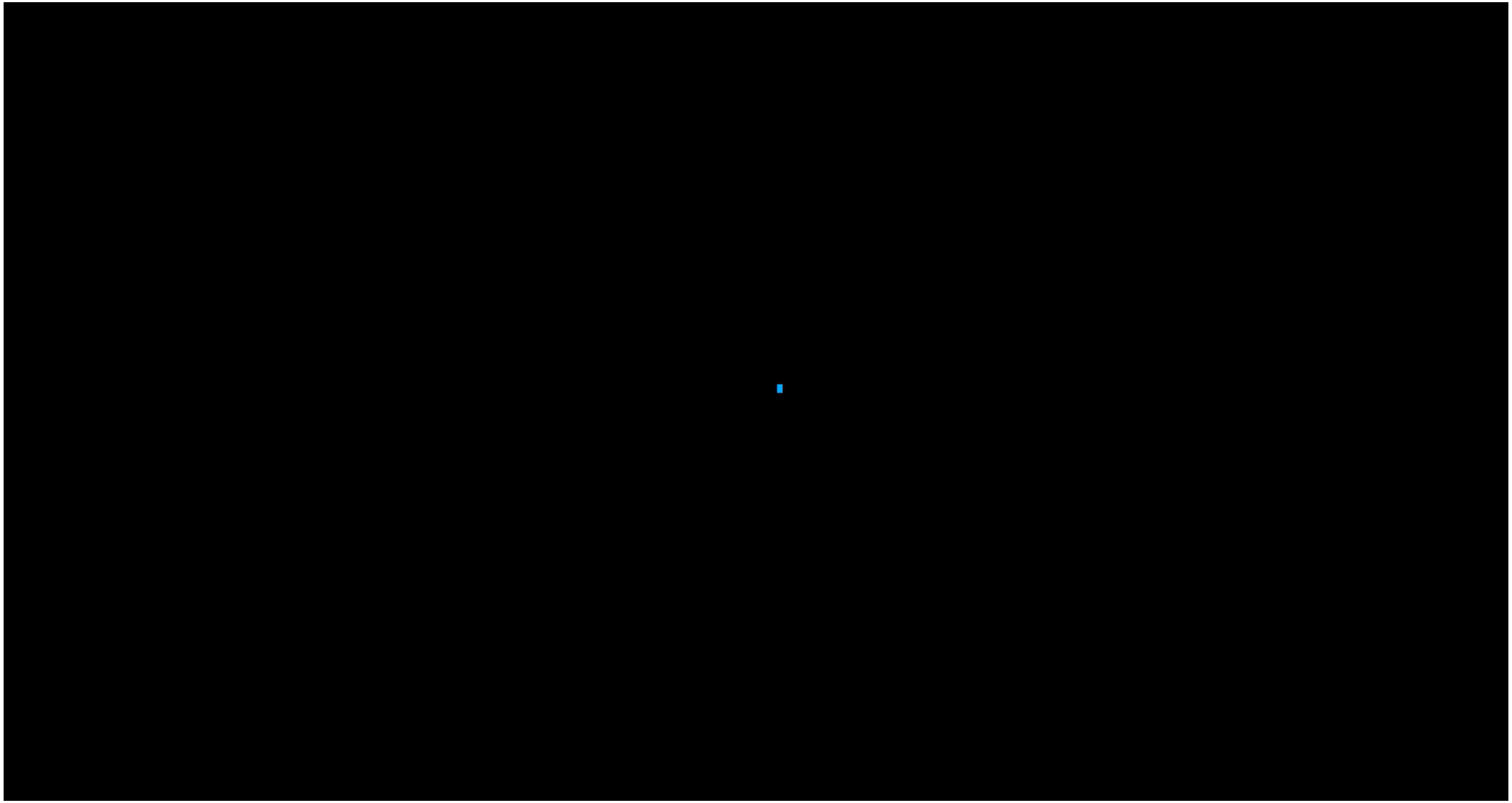


Updates with API

Sneak Peak – Drawing Generation



LLM Integration – future of API !!



Updates with Solver

Updates with Solver

Structural limitations of the existing solver

FES Solver

- Developed in Fortran (Language developed in the 50's)
- Specialized for numerical computation
- Reliable for small to medium-scale models
- Slower for very large or highly nonlinear models
- Less efficient memory usage
- Limited parallel computing capabilities

VS

MEC Solver

- Developed in C++ (Language developed in the 80's)
- Enables performance optimization and versatile programming
- Optimized memory management for ultra-large models (millions of DOFs)
- Faster convergence in nonlinear/dynamic/soil-structure analyses
- More scalable for modern infrastructure and bridge projects

Conventional method vs. MEC Solver method

Conventional method: Analyze all loads at once

Start **Long analysis time** **Completed**

MEC Solver: Individual analysis for each load case

Load Case 1 **Load Case 2** **Load Case 3**

Parallel processing

Time reduction

Updates with Solver

Key Improvements of the MEC Solver

Selective analysis support

Boundary Change Assignment

Improved time-history analysis

Material/Geometric Nonlinear Analysis

Improved analysis speed

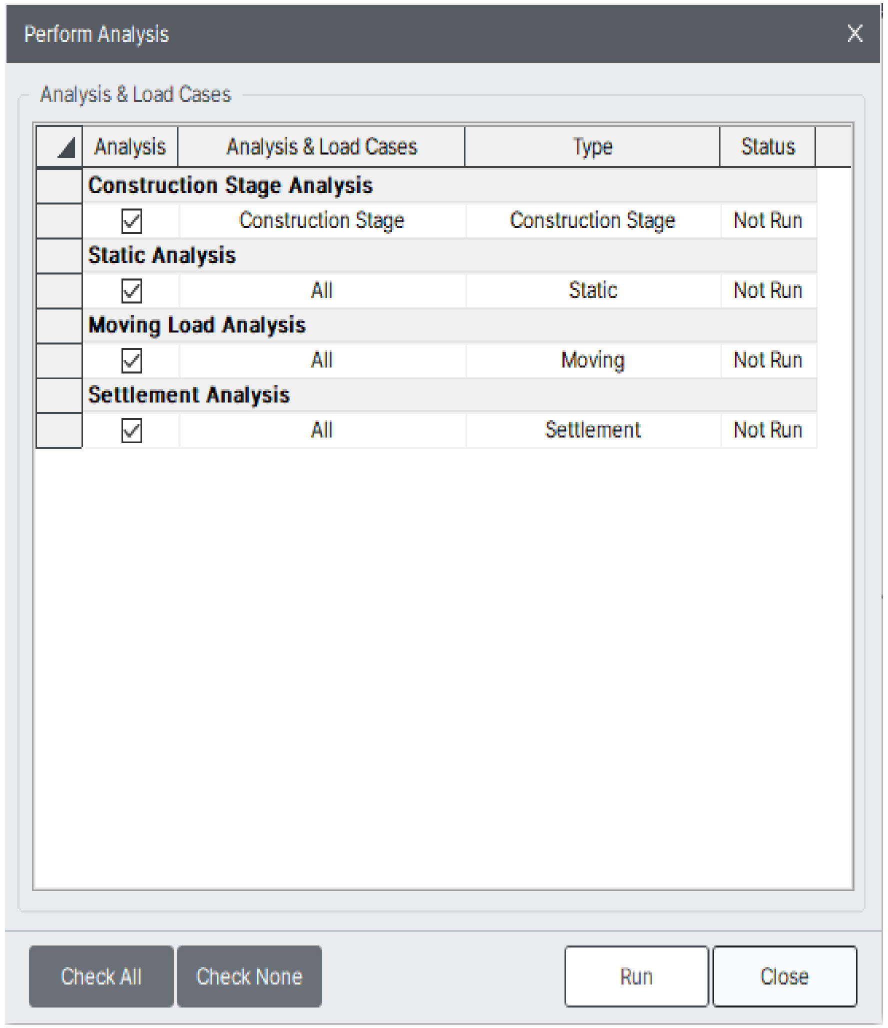
Expansion of analysis functions

Updates with Solver

Selective analysis support – drastically reduced analysis time

Concept of selective analysis

- Rapid decision-making
- Enables precise review
- Reduced analysis time
- Increased design efficiency



Updates with Solver

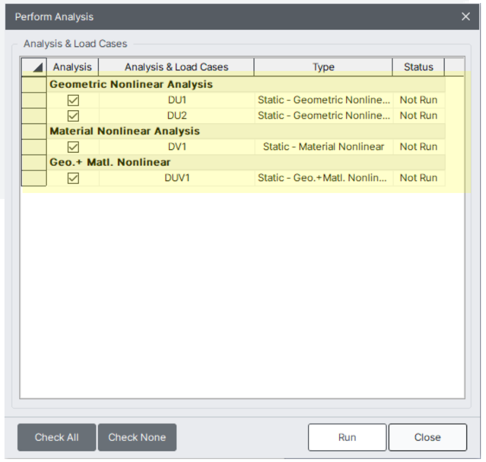
Improved Material and Geometric Nonlinear Analysis

Single-Model Nonlinear Analysis

Conventional method VS **MEC Solver**

Conventional method

- Linear and Nonlinear Models Generated Separately
- Greater complexity in management
- Difficulty in maintaining data consistency
- Inefficient use of computational resources


Perform Analysis

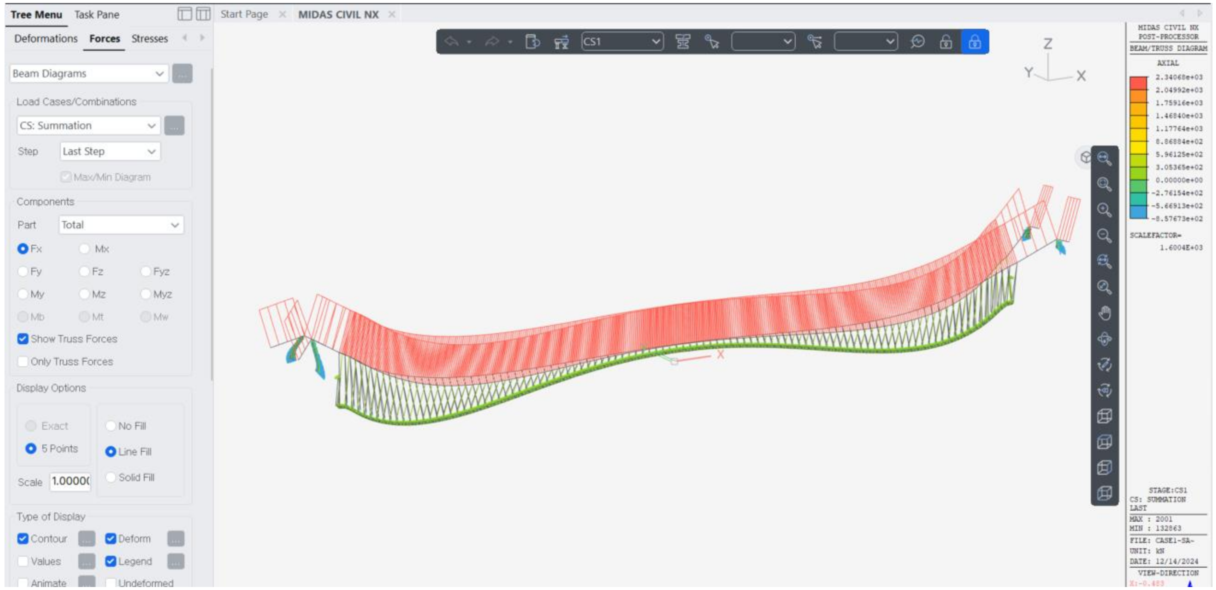
Analysis & Load Cases

Analysis	Analysis & Load Cases	Type	Status
Geometric Nonlinear Analysis			
☑	DU1	Static - Geometric Nonline...	Not Run
☑	DU2	Static - Geometric Nonline...	Not Run
Material Nonlinear Analysis			
☑	DV1	Static - Material Nonlinear	Not Run
Geo.+ Matl. Nonlinear			
☑	DUV1	Static - Geo.+Matl. Nonlin...	Not Run

Check All | Check None | Run | Close

MEC Solver

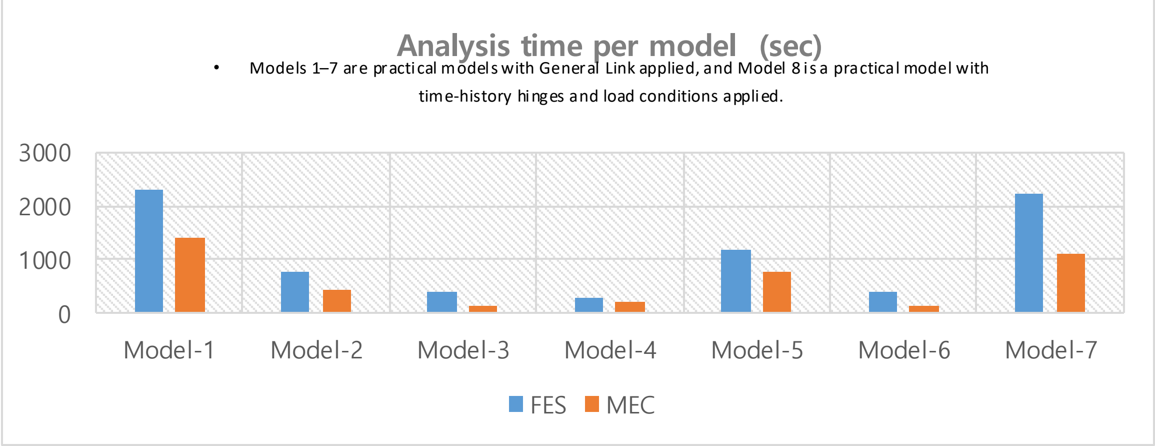
- Nonlinear analysis loads in a single integrated model
- Case-specific nonlinear analysis support
- Accurate nonlinear behavior simulation and analysis
- Optimal use of resources



Improved analysis speed

Nonlinear analysis time reduced by 1.3 to 6 times

Speed improvement by analysis type



	Model-1	Model-2	Model-3	Model-4	Model-5	Model-6	Model-7	Model-8
Number of nodes	3,500	1,189	2,053	1,069	154	679	263	44,325
Number of elements	2,373	1,840	1,992	1,159	147	554	282	49,965
Number of steps	65,000	27,000	7,500	48,000	300,000	14,000	345,000	4,000
FES [sec]	2306.21	776.17	417.59	285.47	1193.06	404.07	2231.98	18,202
MEC [sec]	1419.98	458.65	151.18	219.42	778.09	136.02	1121.10	3,073
Comparison (FES/MEC)	1.6	1.7	2.8	1.3	1.5	3.0	2.0	5.9

Core Technology

- Optimized numerical analysis algorithms
- Parallel processing technology

Key Effects

- Reduced project duration
- More design reviews
- Increased precision
- Cost reduction

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