

A Powerful Move Forward

# CIVIL NX

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Bridge and Civil Engineering  
Structural Analysis & Design Solution





The logo consists of the letters 'CVL' in a bold, white, sans-serif font, centered within a blue square. The square has slightly rounded corners and is positioned on the right side of the slide. The background of the entire slide is white with abstract, overlapping geometric shapes in various shades of light blue, including rectangles and triangles, some of which are semi-transparent.

**CVL**

Bridge and Civil  
Engineering Structures  
Analysis & Design  
Program

# A Powerful Move Forward

Experience the exclusive benefits that are only available in the latest version of CIVIL NX.

Outstanding performance and innovative updates waits you ahead. Say goodbye to past inconveniences and step into a new era of civil structural engineering with enhanced performance. So come and join us to explore the future.

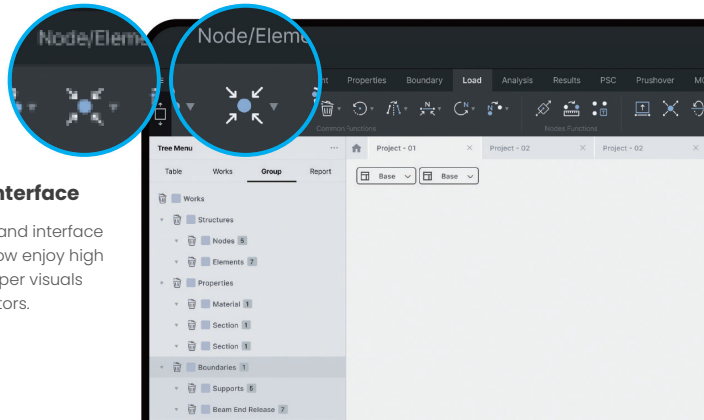
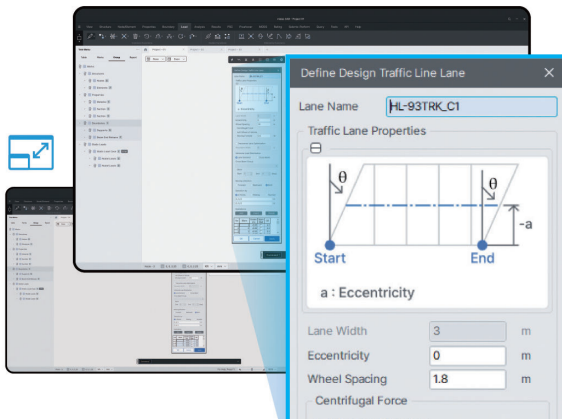


## High-resolution Interface

# Take A Clear Look Even on 4K Screen

### Vector-based interface

By vectorizing icons and interface elements you can now enjoy high resolutions and sharper visuals even on larger monitors.



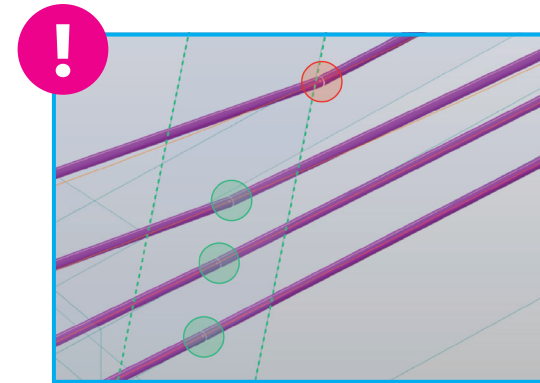
### Dialog Box Image zoom

View images with higher clarity and detail, making it easier to analyze and understand design information or formulas.

## Graphic Detail Upgrades

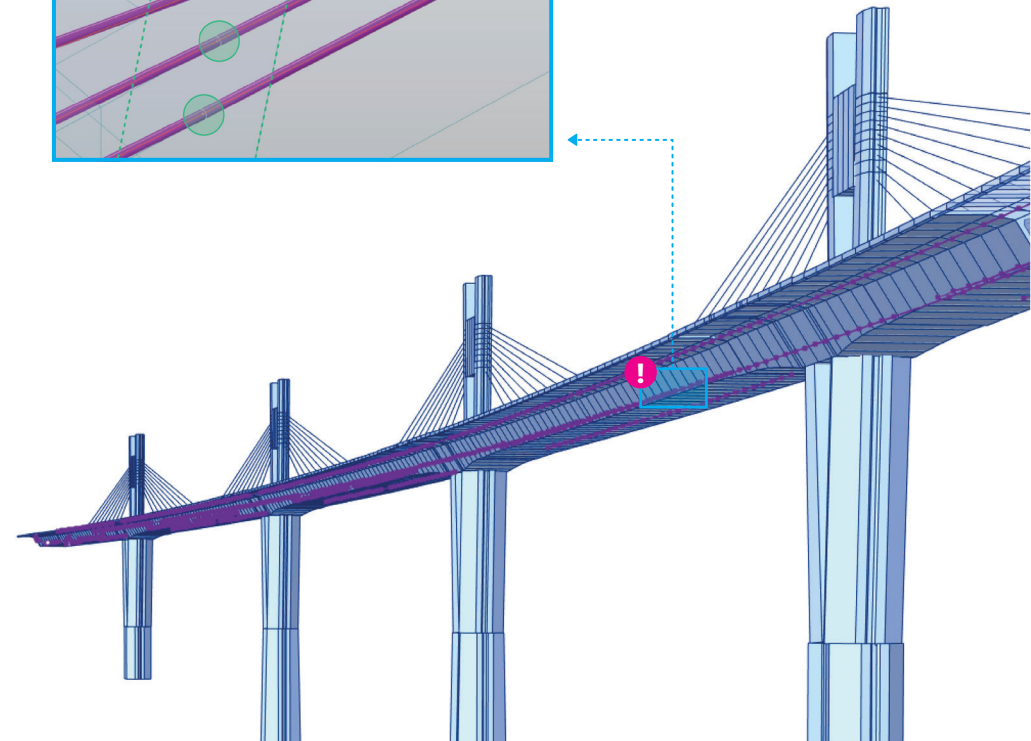
# Clear Insight Unlocks the Details That Matter

MIDAS CIVIL NX allows for more clear representation of tension and transparency, enabling more detailed structural analysis modeling. Verify reliable results with improved graphic elements.



### Tendon / Transparency Upgrades

Adjusting transparency becomes simple, allowing for a flexible and clear model inspection. Where accurate modeling review was hindered by component interference, clear tension representation is now implemented, enabling interference-free analysis model review.



## In-APP Search

# Search with Ease, Get Support in a Breeze

Through the newly added In-app search feature, you can search for all the necessary support such as functionality search, tutorials, manuals, FAQs. while using CIVIL NX.

**Function**

**Tutorial**

**MIDAS Notes**

**FAQ**

**Search**

modify

All results (999) Tutorials (99) FAQs (99) MIDAS Notes (99)

Functions in Midas Product

- Modify Converted Line Elements
- Create Node
- Create Element
- Modify Line Element on Curve
- Converte Modify Line Elements
- Line Element on Curve by Modify

MIDAS Notes

- Modify Concrete Materials
- Modify Concrete Materials

Tutorials

- Modify Concrete Materials
- Modify Concrete Materials
- Modify Concrete Materials

FAQs

- Modify Concrete Materials

Titles and Contents

Most relevant

[Civil NX] FSM Bridge Construction Stage Analysis

Contents

- 1. Overview
- 2. Design profile and general details
- 3. Design and Analysis
- 4. Construction Stage Design
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- 98. Construction Stage Design
- 99. Construction Stage Design

[CIVIL] Why do we get horizontal reactions while applying vertical loads in a grillage model?

Question

Answer

[CIVIL NX] How to generate input & output data \_midas Civil comparison with other design tools.

Question

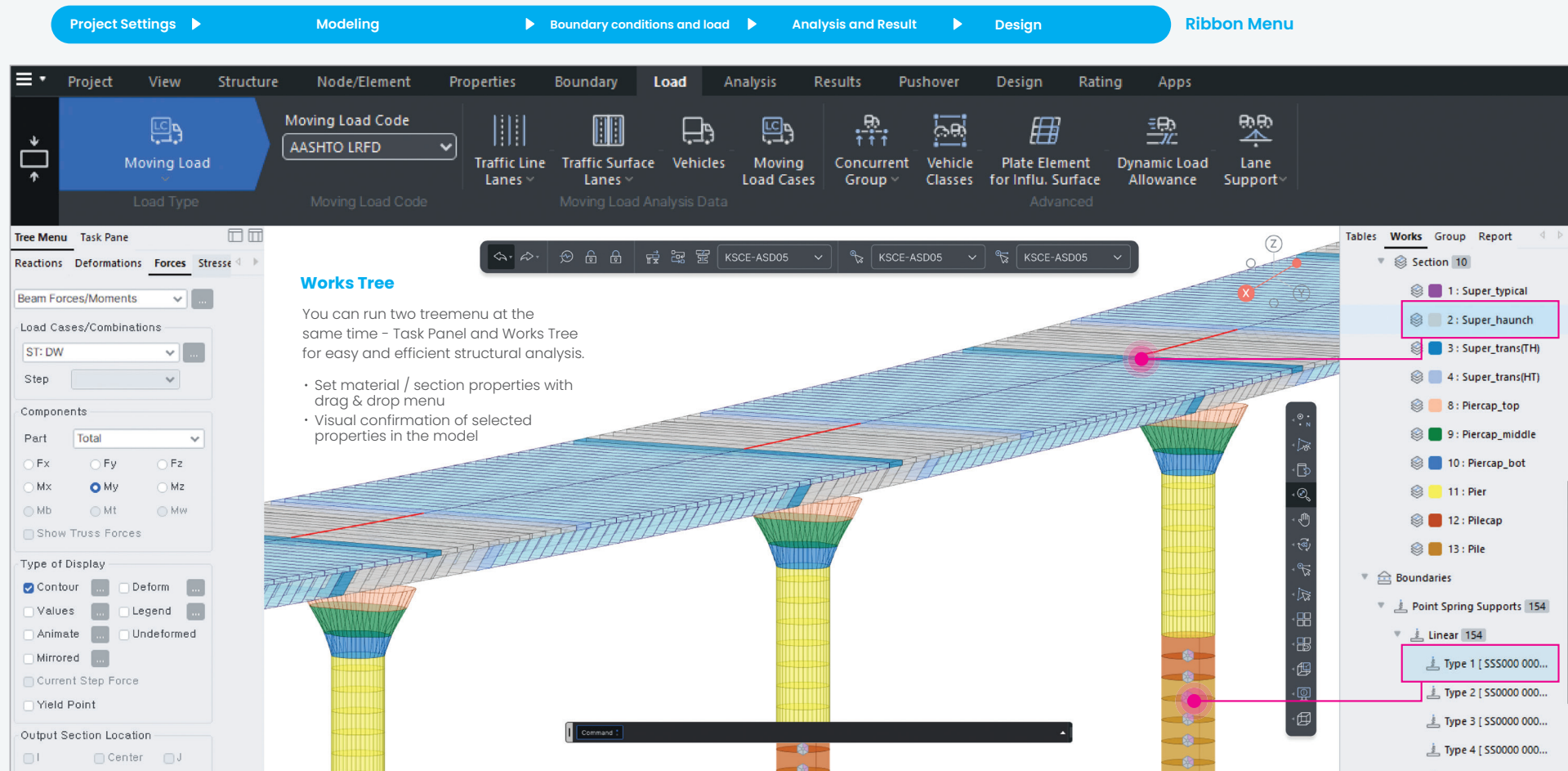
Answer

## User Interface

# Everything You Need Is Here Intuitive User Interface

Ribbon menu placed by the modeling flow, Works Tree with Drag & Drop function.

Experience an intuitive interface that doesn't require explanation even if you're new to it.

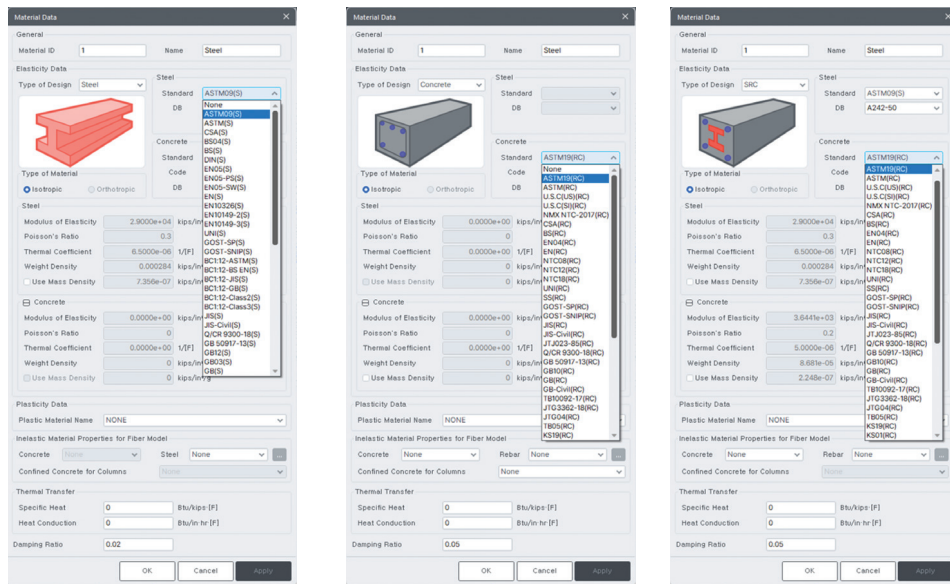


## Material &amp; Section DB

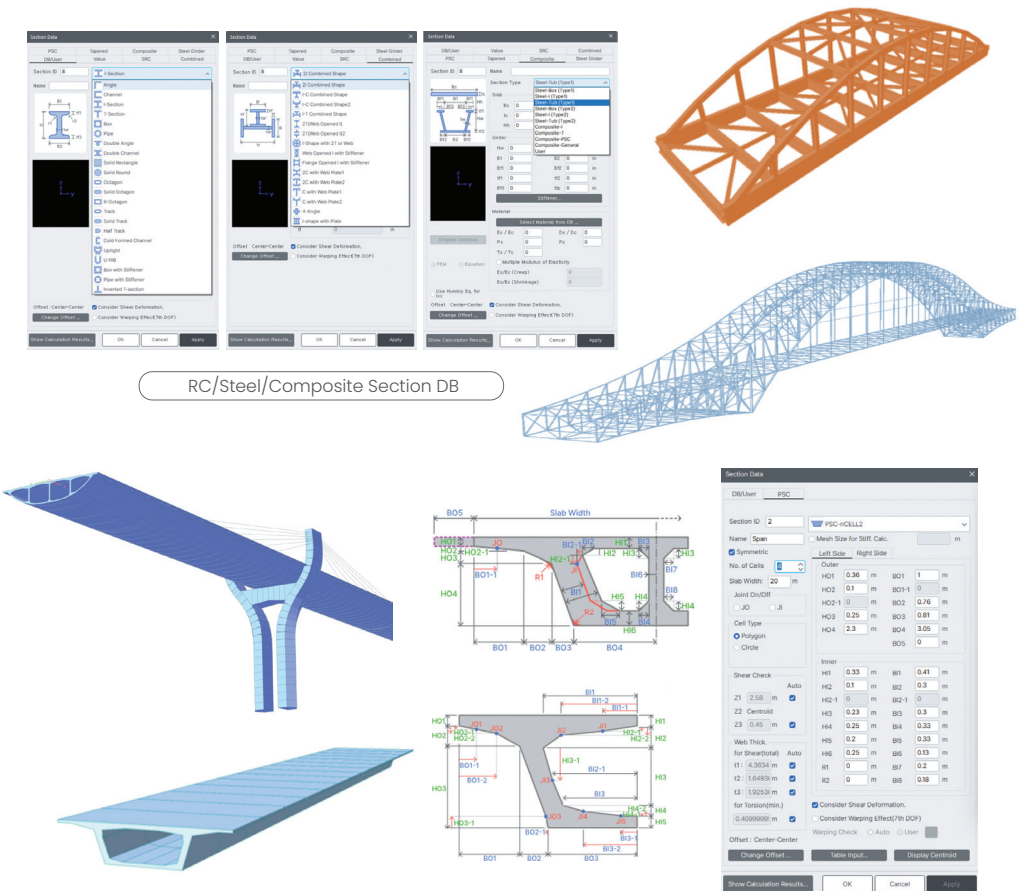
## Build Without Boundaries

MIDAS CIVIL NX stands at the forefront of structural design, providing an unrivaled database of material and section properties tailored to meet global engineering standards.

Whether you're designing with concrete, steel, or composite materials, MIDAS CIVIL NX equips you with a comprehensive suite of options conformant to AASHTO, Eurocode, BS, and other international standards.



Concrete/Steel/Composite Materials



PSC Section DB

## Sectional Property Calculator

# Your Smart Secretary For Civil Engineering

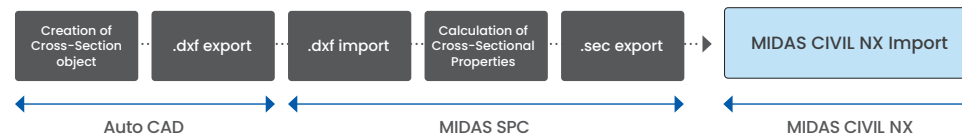
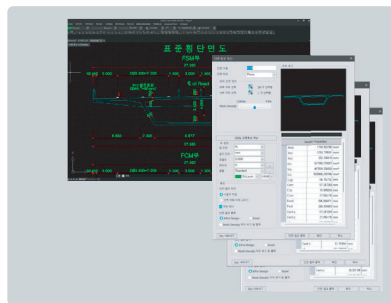
You can now use the SPC (Sectional Property Calculator), an automatic program for effectively calculating the properties of complex cross-sections in a short time, directly within MIDAS CAD. Experience more efficient structural design by calculating cross-sections directly in MIDAS CAD and transferring them to MIDAS CIVIL NX.

### Reflecting dramatically simplified unstructured Cross-Sectional Property

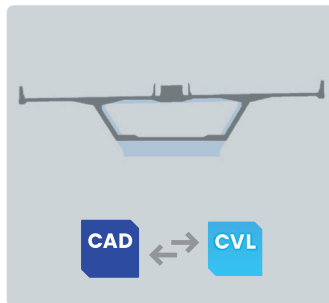
#### SPC function within MIDAS CAD



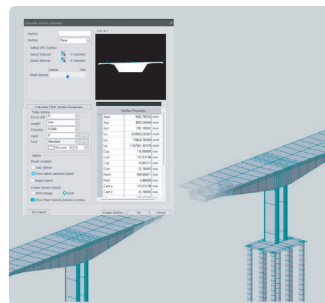
#### Existing workflow



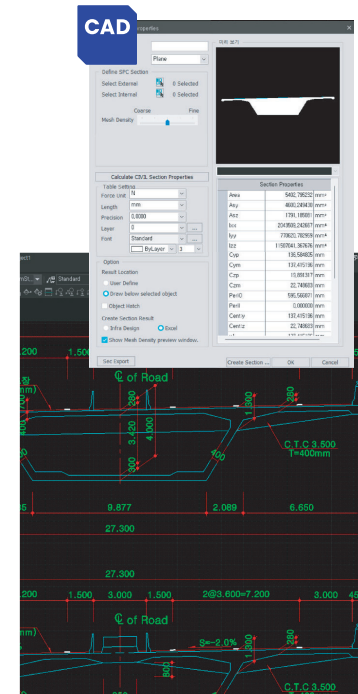
Managing multiple cross-sections in a single Dwg file for easy file management



Modified cross-sections are directly reflected through the CIVIL NX - MIDAS CAD integration



Creation of cross-sections differentiated by parts considering the construction phase, and applied to the construction stage analysis in MIDAS CIVIL NX



Creation of cross-sections without information loss through automatically calculated properties in CAD

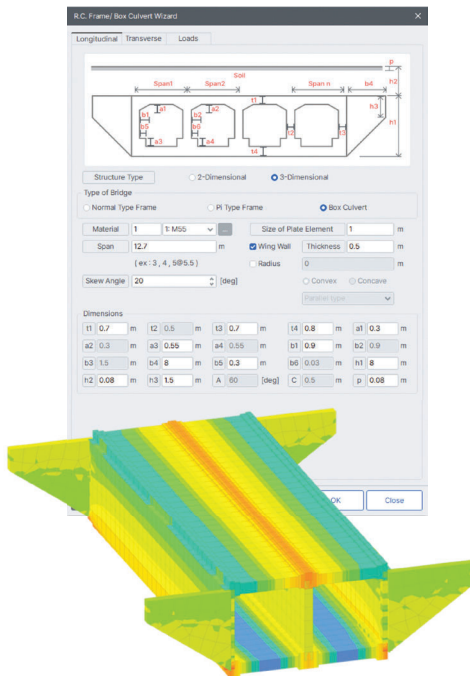
## Modeling Wizard

# Experience The Power of User-Favorite Modeling Wizard

The Modeling Wizard in CIVIL NX automates key aspects of the modeling process, enhancing efficiency, ease of use, and overall productivity. It reduces errors and ensures a consistent and standardized approach to civil engineering design.

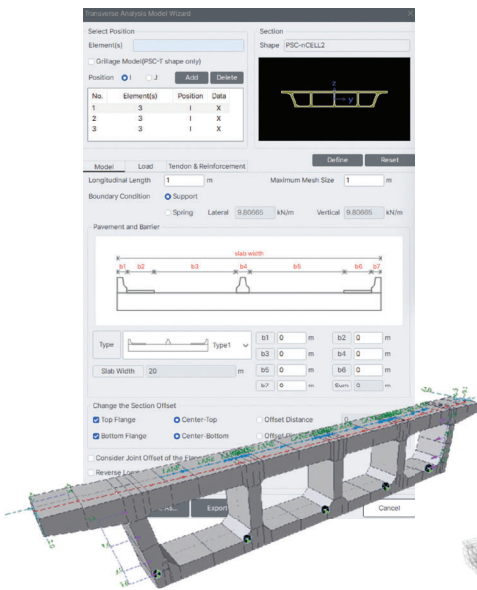
- The automatic generation feature of analysis models integrated with practical design in MIDAS CIVIL NX significantly reduces modeling work time
- Simple Structure Wizards (Beam / Column / Arch / Truss / Plate / Shell)
- RC Structures (RC Frame / Box / Slab Bridge)
- Rahmen / Culvert Auto Generation
- Steel Composite and Prestressed Composite Bridges

RC Frame/ Box Culvert Wizard

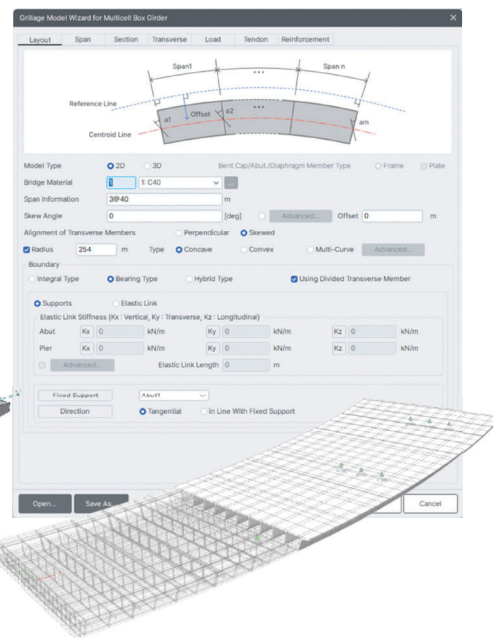


- Cable Bridges ( Cable-Stayed Bridge/ Suspension Bridge)
- PSC Bridges considering method of construction (ILM/ FCM/ MSS/ FSM)
- Auto-generation of Transverse models and Grillage models

Transverse Analysis Model Wizard



Grillage Model Wizard



Cable Stayed Bridge Wizard



Suspension Bridge Wizard

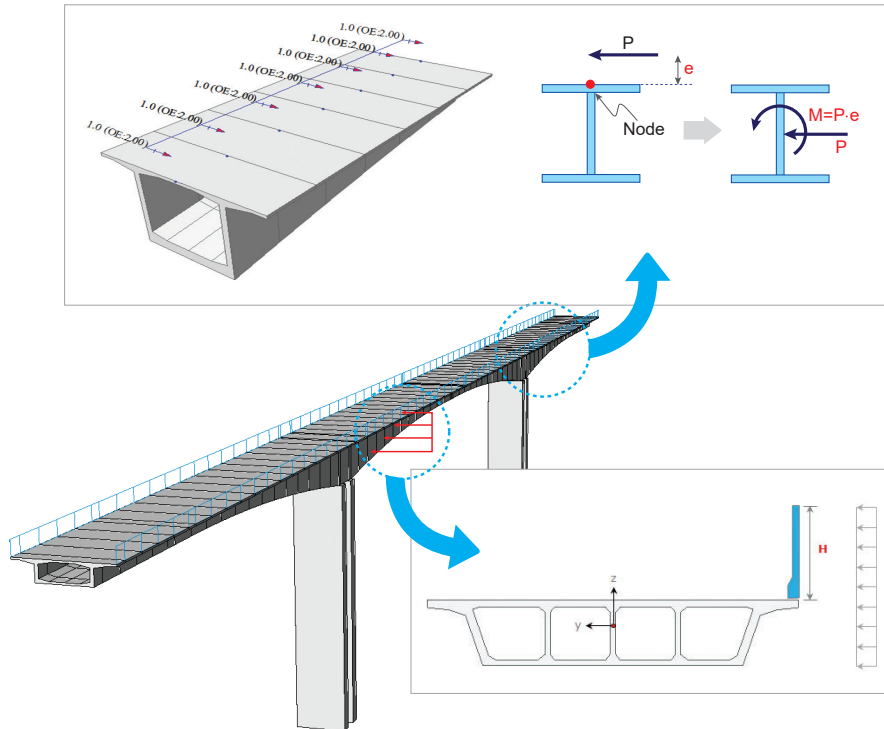


## Load Application Features

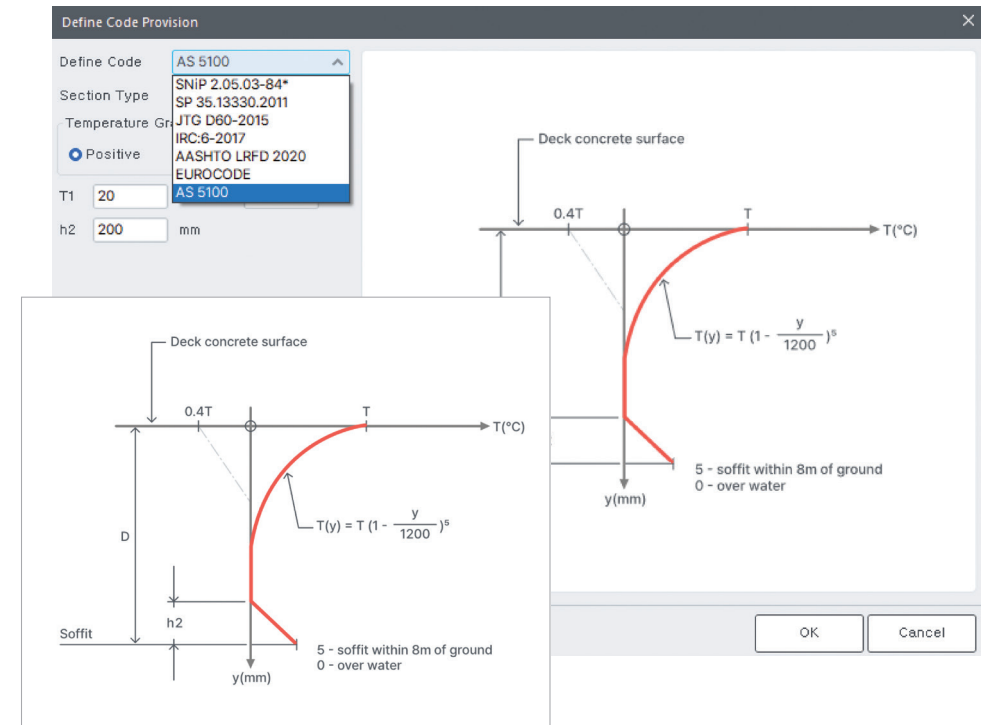
# Practical Load Application Features

MIDAS CIVIL NX provides various different kind of load types that can be applied to the model. For superstructure with tapered sections, users can apply beam eccentric and pressure loads for wind effect. For PSC sections and Composite sections, MIDAS CIVIL NX automatically defines the temperature loads by dividing and transforming the corresponding zones.

Beam Eccentric &amp; Pressure Load For Wind Effect



Section Temperature Gradient



## Moving Load Analysis

# Moving Load Analysis for Real-Life Load Simulations

MIDAS CIVIL NX supports a diverse range of international moving load codes. Furthermore, its horizontal vehicle load optimization feature automatically pinpoints the elements experiencing the maximum horizontal force.

Traffic Line Lanes

Lane Name

HL-93TRK\_C1

Traffic Lane Properties

Lane Width

3

m

Eccentricity

0

m

Wheel Spacing

1.8

m

Centrifugal Force

Left Wheel of Vehicle

Moving Forward

0.5

W

☒ Transverse Lane Optimization

Allowable Width

2

m

Vehicular Load Distribution

☒ Lane Element ☐ Cross Beam

Cross Beam Group

Skew

Start

0

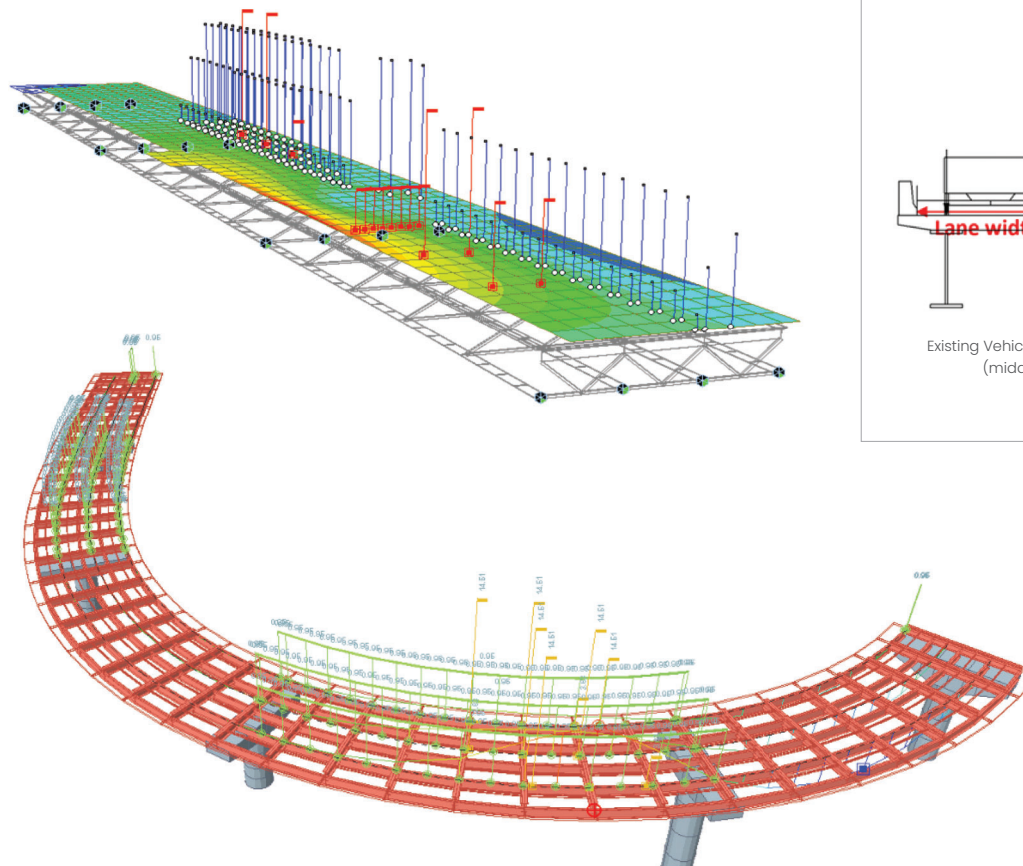
End

0

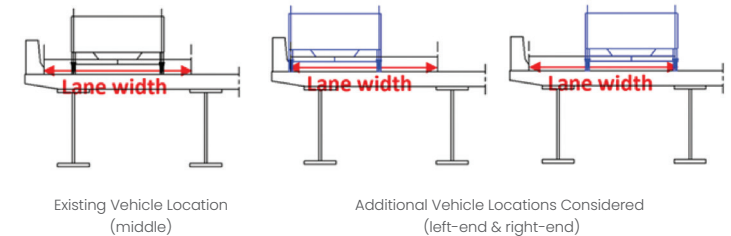
[deg]

Moving Direction

☐ Forward ☐ Backward ☒ Both



Transverse Lane Optimization



## Moving Load Code

AASHTO Standard / AASHTO LRFD / PENNDOT  
Canada / BS / EUROCODE / Australia / Poland  
Russia / South Africa / Korea / KSCE-LSD15  
China / India / Taiwan / Transverse

MIDAS CIVIL NX supports the analysis of complex structural behavior during construction and after completion, considering the time-dependent properties of materials. It visualizes and provides structural systems for each stage of construction.

The diagram illustrates the four-step construction process of a cable-stayed bridge:

- Step 1:** Shows the initial construction of the bridge piers (towers) and the approach viaducts. A small section of the bridge deck is shown being moved into place.
- Step 2:** Shows the bridge deck being extended further from the approach viaducts towards the central piers. The cables are not yet attached to the piers.
- Step 3:** Shows the bridge deck being extended further, now reaching the central piers. The cables are being attached to the piers, and the deck is being pulled up towards the piers.
- Step 4:** Shows the final completed bridge, with the deck fully extended and supported by the cables attached to the piers.

Mod/Modify Time Dependent Material (Creep / Shrinkage)

Name : C50 Code : CEB-FIP(1990)

CEB-FIP(1990)

Characteristic compressive strength of concrete at the age of 28 days ( $f_{ck}$ ) : 50000 kN/m<sup>2</sup>

Relative Humidity of ambient environment (40 - 99) : 55 %

Notional size of member : 0.2218 m

$h = 2 \cdot \sqrt{A_c} / u$  (Ac: Section Area, u: Perimeter in contact with atmosphere)

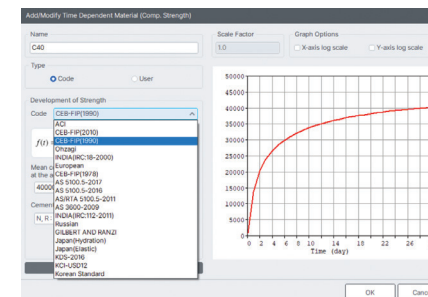
Type of cement

- ☐ Rapid hardening high strength cement (RS)
- ☒ Normal or rapid hardening cement (N, R)
- ☐ Slowly hardening cement (SL)

Age of concrete at the beginning of shrinkage : 3 day

Show Result... OK Cancel Apply

KDS-2016 / KCI-USD12 / KSCE 2010  
Korean Standard / CEB-FIP(2010)  
CEB-FIP(1990) / CEB-FIP(1978)  
ACI / PCA / Combined (ACI & PCA)  
JAPAN(JSCE2012) / JAPAN(JSCE2007)  
Japanese Standard / JAPAN(JSCE)  
Chinese Standard / China (JTG D62-2004)  
China (JTG3362-2018) / ASSHTO  
INDIA(IRC:18-2000) / European  
AS 5100.5-2017 / AS 5100.5-2016  
AS & RTA 5100.5-2011 / AS 3600-2009  
NZ Bridge(SP/M/022) / INDIA(IRC:112-2011)  
Russian / User Defined

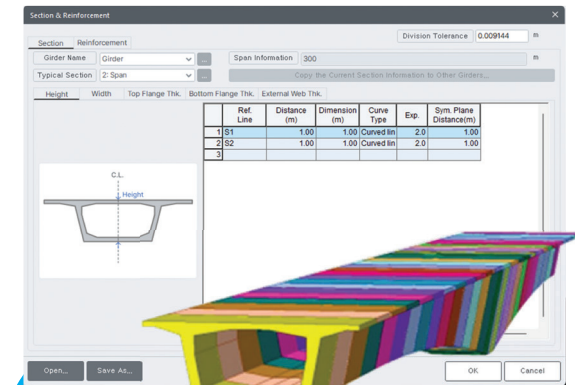


KDS-2016 / KCI-USDI2 / Korean Standard  
 ACI / CEB-FIP(2010) / CEB-FIP(1990)  
 Ohzagi / Japan(Hydration)  
 Japan(Elastic) / INDIA(JRC:18-2000)  
 European / AS 5100.5-2017  
 AS 5100.5-2016 / AS & RTA 5100.5-2011  
 AS 3600-2009 / INDIA(JRC:112-2011)  
 Russian / GILBERT AND RANZI

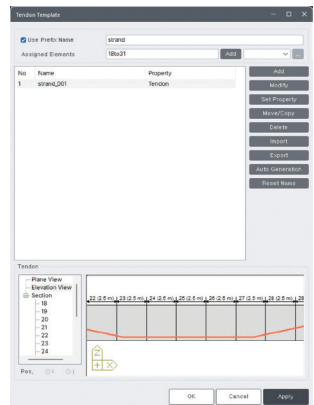
Pre-Stressed Concrete Analysis

# PSC Bridge Analysis & Design Integrated Solution

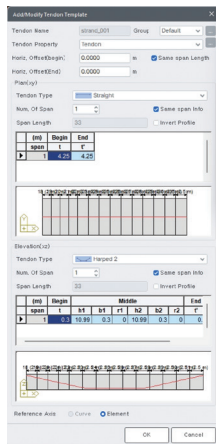
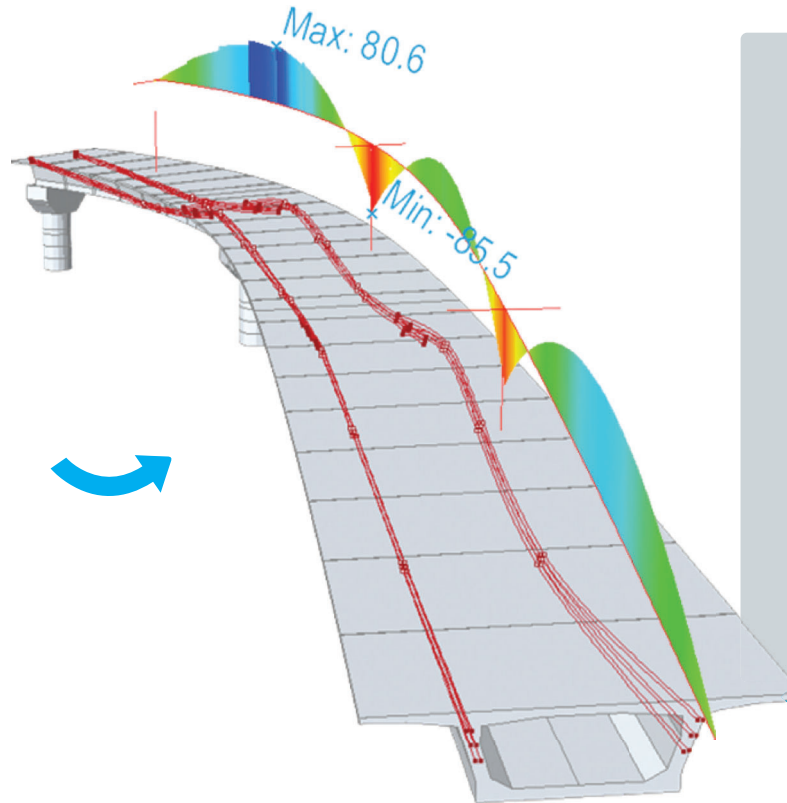
PSC bridge design integrated solution provides everything needed for PSC bridge design, including efficient modeling functions, analysis results, and cross-sectional strength review for various types of PSC bridges.



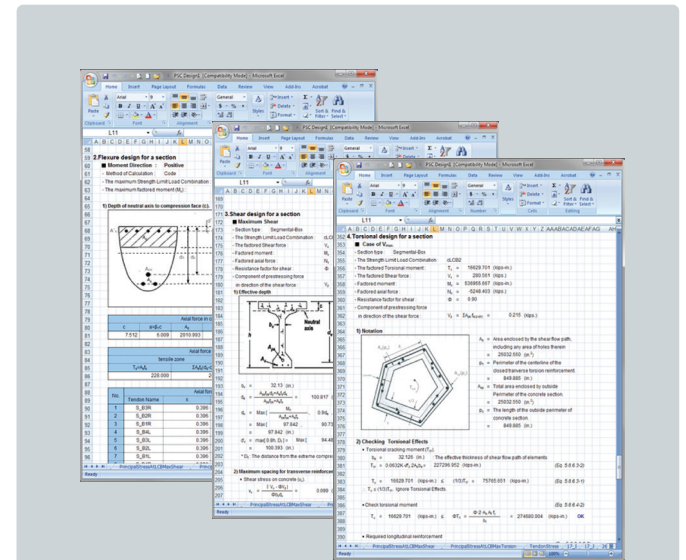
Section & Reinforcement



Tendon Template



PSC Beam Stresses

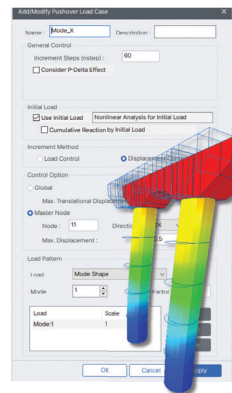


Design Report

## Seismic Nonlinear Analysis

# Pushover Analysis

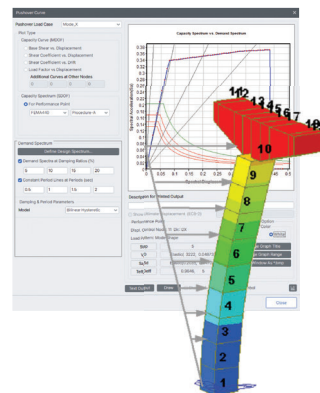
Pushover analysis function enables evaluation by comparing the structural resistance capacity and the required seismic response after yielding, taking into account the material's non-linear characteristics.



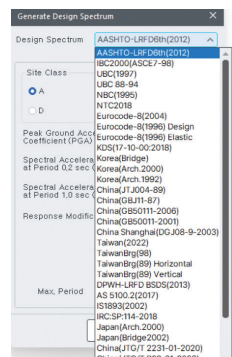
P-Delta Effect



Nonlinear Hinge Properties



Capacity Spectrum Method



Various Design Spectrum

- Load Control and Displacement Control
- Consideration of Gravity Load Effects
- Support for Various Load Patterns (Mode Shape / Static Load / Uniform Acc.)
- Providing Multi-Linear Hinge Types and FEMA Hinge Types
- Checking Analysis Results Step by Step in Pushover Analysis (Hinge Distribution, Displacement, Member Forces, Stresses)

- Providing Various Forms of Capacity Curves
- Offering Spectra According to Each Design Standard
- Seismic Performance Evaluation Using Performance Points

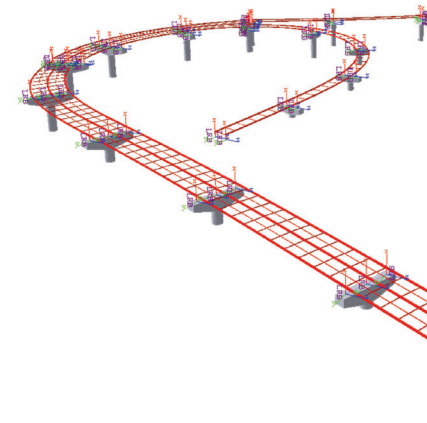
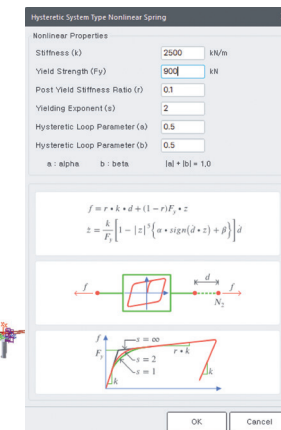
## Seismic Nonlinear Analysis

# Boundary Nonlinear Time History Analysis

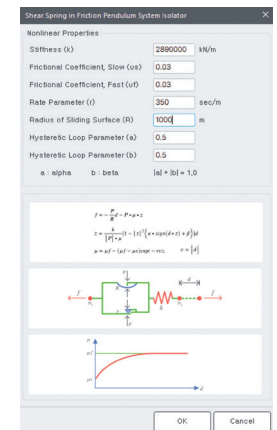
Dynamic boundary nonlinear analysis can be used for detailed analysis of bridge structures, considering the nonlinearity of separation devices and seismic isolation devices.

## Various types of nonlinear connection elements

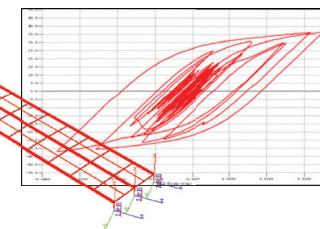
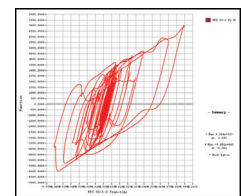
- Structural analysis capabilities including nonlinear connection elements
- Structural/Behavior analysis using spring elements with nonlinear properties
- Various dampers and base isolators provided
- Input of static loads in the form of dynamic loads



Hysteretic System



Friction Pendulum System Isolator



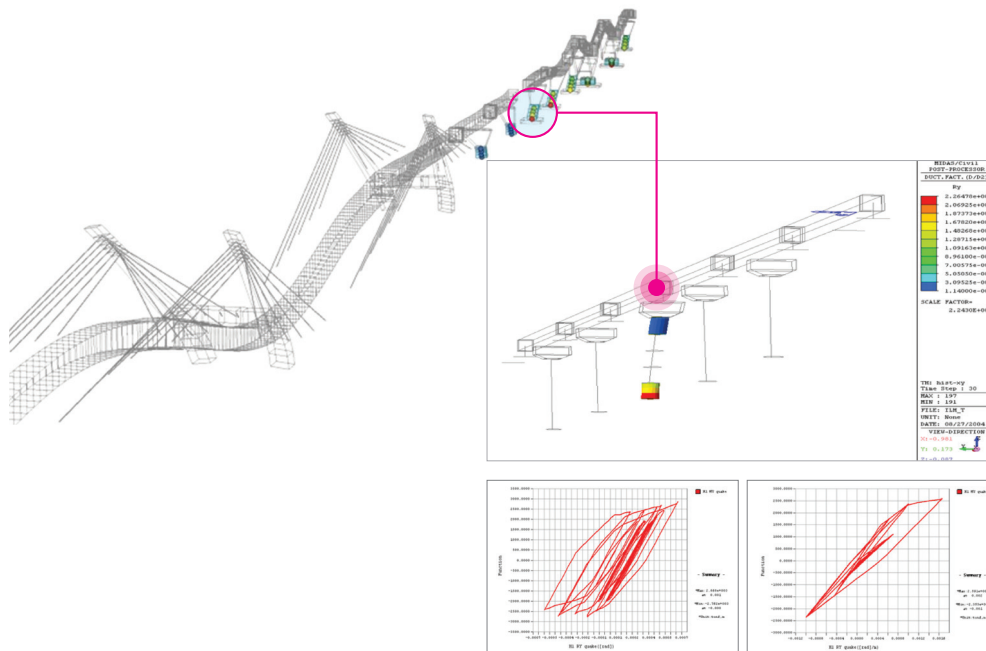
## Analysis of base isolators and damping devices

- Simultaneous consideration of base isolators, bearing elements, and inelastic elements
- Nonlinear time history analysis using the nonlinear direct integration method
- Improved convergence performance using the Runge-Kutta Method

## Seismic Nonlinear Analysis

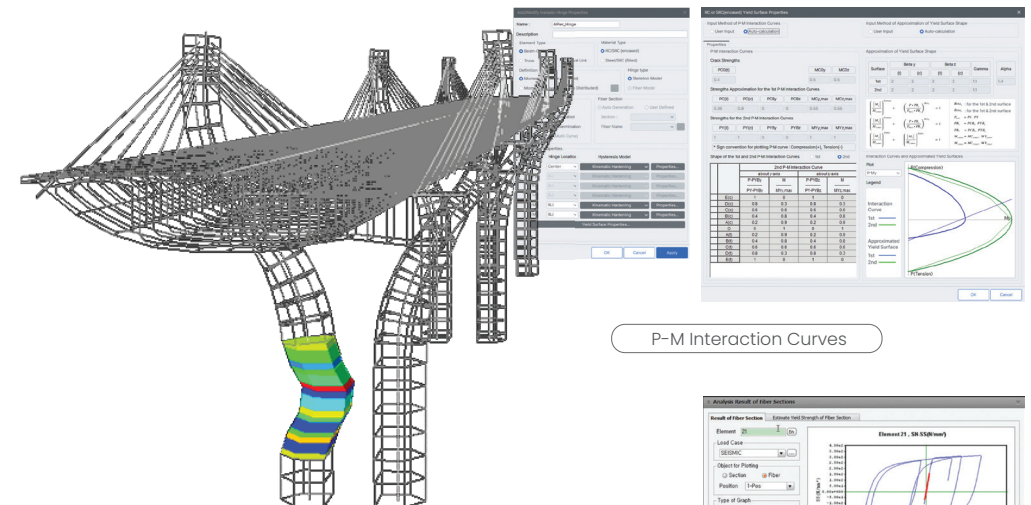
# Inelastic Nonlinear Time History Analysis

Inelastic time history analysis is a function that predicts the inelastic behavior of structural members and assesses the seismic response of the structure using a hysteresis model that simplifies the members' nonlinear characteristics.



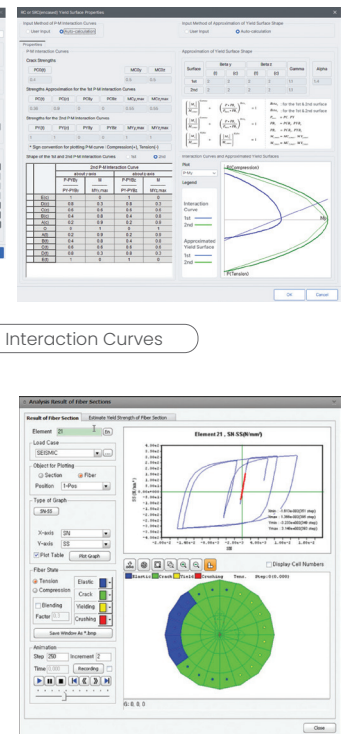
## Various Nonlinear Hinge Type Models

- Elastic Hinge Models
  - Lumped Type / Distributed Type Spring Type / Truss Type Hinge
- History-dependent Behavior Models of Nonlinear Hinges
  - Uni-axial / Multi-axial / Skeleton / Fiber / Displacement Hardening Type Bilinear / Trilinear / Clough / Takeda / SLP, and 23 other models
- Nonlinear Material Models for Concrete
  - Kent & Prak / Japanese Concrete Standard Specifications / Japanese Road and Bridge Specifications / Nagoya Institute of Technology / Trilinear Concrete / Chinese Concrete Specifications (GB50010-02) / Mander
- Nonlinear Material Models for Steel
  - Menegotto-Pinto / Bilinear / Trilinear Steel / Asymmetrical Bilinear / Park



## Various Nonlinear Hinge Type Models

- Limitation of nonlinear hinge models eliminated, which are based on experience such as pushover analysis, seismic analysis, etc.
- Change in axial forces accurately reflected through fiber models in structures whose axial forces change significantly
- Accurate representations of confinement effects of tie reinforcing steel, crushing and cracking in concrete members and tensile yielding in steel members under nonlinear analysis

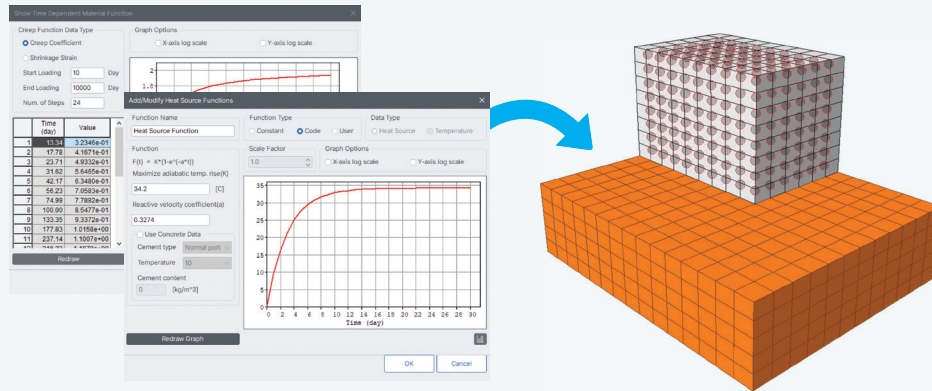


## Damaged Section Check

## Advanced Analysis Standards

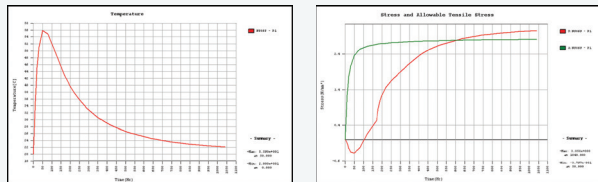
# Heat of Hydration Analysis

## Consideration of Analytical Variables for Crack Index Calculation



- Defining Heat Generation Properties of Cement with Consideration of  $k$  and  $a$  Values
- Defining Strength Development Functions for Various Types of Cement Considering  $a$  and  $b$  Values
- Providing Creep/Shrinkage and Strength Development Database with Embedded Heat Generation Functions
- Variation of Ambient Temperature and Convective Coefficients Over Time
- Application of Various Convective Coefficients Considering the Presence, Type, Thickness, Generation Method

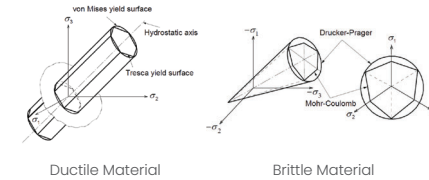
## Verification of Various Analytical Results Considering Pile Driving Stages



- Consideration of Pipe Cooling for Crack Reduction
- Temperature Regulation When Using an Ice Plant by Entering Initial Temperatures for Each Construction Stage

## Advanced Analysis Standards

# Material Nonlinear Analysis

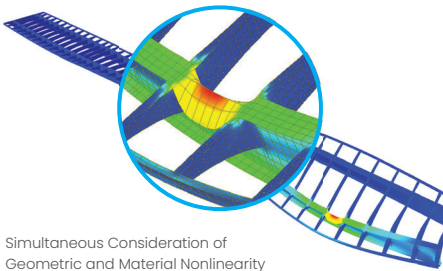


## Diverse Carbonaceous Material Models

- Analysis of the Response Effects of Yield Characteristics in Steel and Yield and Cracking Characteristics in Concrete Materials
- Indication of Yielding in Integration Points for Examination of Yielding Region
- Consideration of Definition of Yield Strain and Expansion and Displacement Changes in Yield Surface
- Checking of Analysis Results by Yield Point Location with Consideration of Load Steps

## Simultaneous Consideration of Geometric and Material Nonlinearity in Analysis

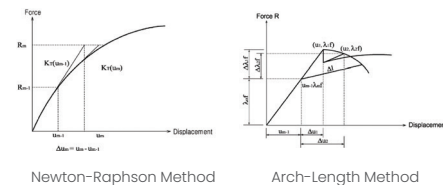
- Implementation of Material Nonlinearity for High Strain Shell Elements using a Layered Approach for Thickness-Direction Stress Integration
- Providing High-Quality Analysis Convergence with Consideration of Large Displacement and Large Rotation
- Concurrent Analysis of Material Nonlinearity and Geometric Nonlinearity for Detailed Analysis of Steel Structures



Simultaneous Consideration of Geometric and Material Nonlinearity

## Advanced Analysis Standards

# Large Displacement Analysis

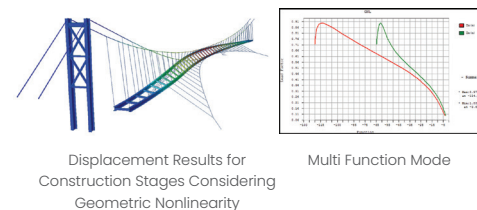


Newton-Raphson Method

Arch-Length Method

## Providing various methods for calculating nonlinear equilibrium equations

- In the case of general analysis, applying the load control method, Newton-Raphson method
- For problems like Snap-Through or Snap-Back, applying the displacement control method, Arch-Length method



Displacement Results for Construction Stages Considering Geometric Nonlinearity

Multi Function Mode

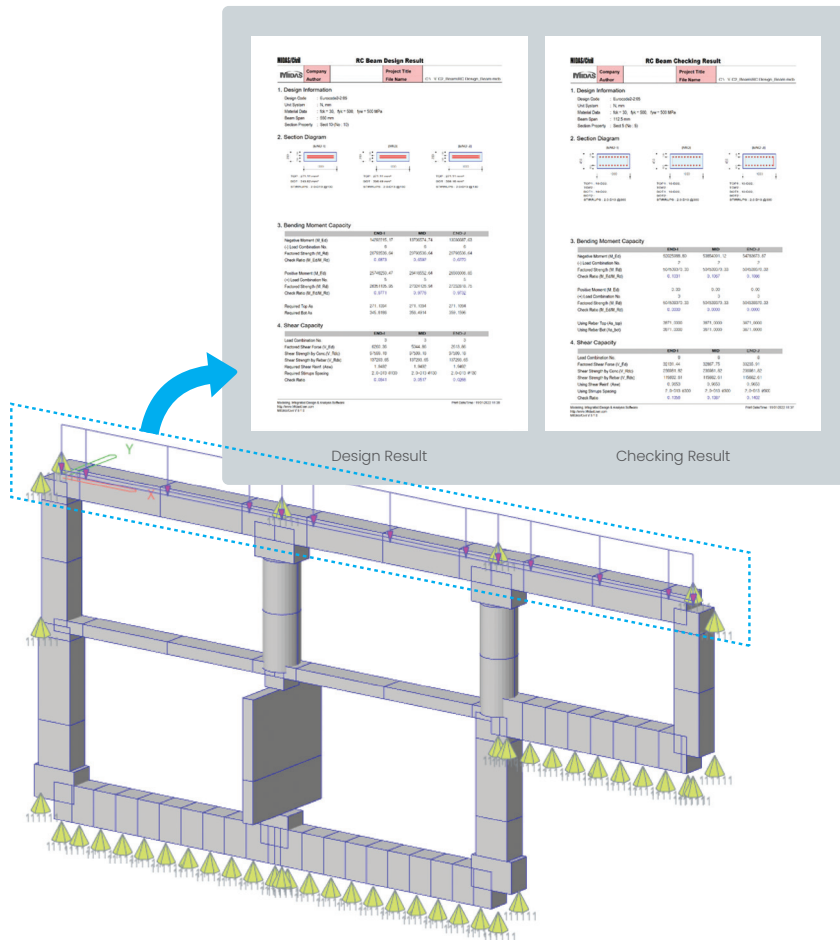
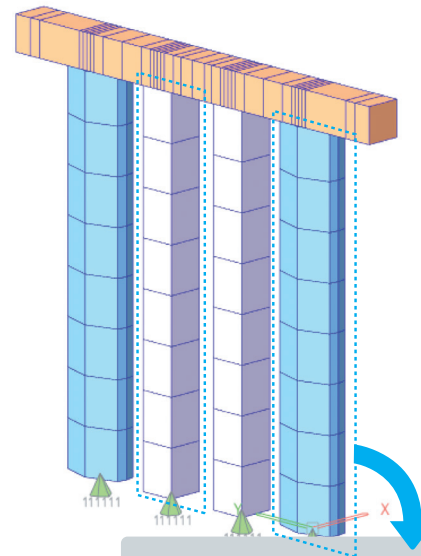
## Application of construction stage analysis considering geometric nonlinearity for cable-stayed bridges

- Applying the large displacement theory to special forms of cable-supported structures or cable mesh structures where significant deformations can occur

## Design

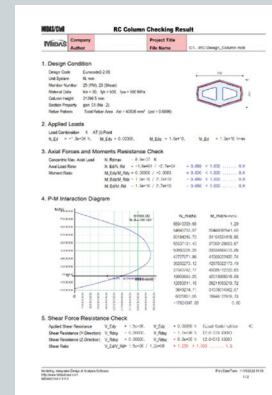
# Trusted Civil Design Standard in 120+ Countries

MIDAS CIVIL NX supports various Design Codes such as AASHTO, Eurocode for Reinforced Concrete, Steel, Steel Ortho., SRC, Composite, PSC, etc. It is capable of generating design review reports based on the reviewed.

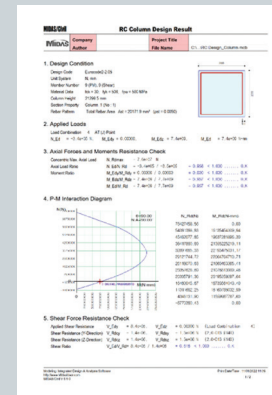


## RC Beam and Column Design

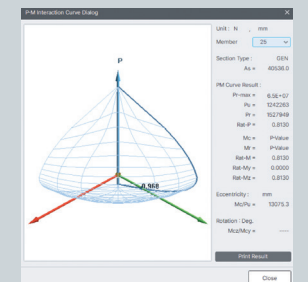
- Automatic pier design contour with simple and detail reports
- Build-in DB column sections with the capability of designing General cross sections
- P-M and 3D P-M-M interaction images with details



General Section



DB Section



3-D P-M Curve

## Design

# Trusted Civil Design Standard in 120+ Countries

MIDAS CIVIL NX supports various Design Codes such as AASHTO, Eurocode for Reinforced Concrete, Steel, Steel Ortho., SRC, Composite, PSC, etc. It is capable of generating design review reports based on the reviewed.

## Steel Composite Design

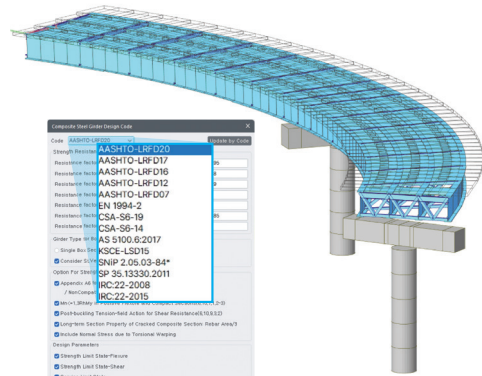


Composite action with  
construction stage analysis

Composite action with  
long-term elastic modulus for concrete

- Composite girder check as per Eurocode, AASHTO LRFD, and other design specifications
- Constructability, strength, service, and fatigue limit checks
- Excel format calculation report, spreadsheet format table, and design result diagram

Main Girder Check   Stiffener Check   Shear Connector Check   Cross Frame / Bracing Check   Design Report



| Classification of sections |       |
|----------------------------|-------|
| Part                       | Class |
| Top Flange                 | 1     |
| Web                        | 1     |
| Bottom Flange              | 1     |
| Bottom                     | 1     |

| Plastic resistance moment $M_{pl,Rd}$        |                         |
|----------------------------------------------|-------------------------|
| Plastic Modulus $W_{pl,y}$                   | 145 640 cm <sup>3</sup> |
| Yield strength $f_y$                         | 355 N/mm <sup>2</sup>   |
| Partial factor $\gamma_{M0}$                 | 1.0                     |
| Design plastic resistance moment $M_{pl,Rd}$ | 52495.903 kN·m          |

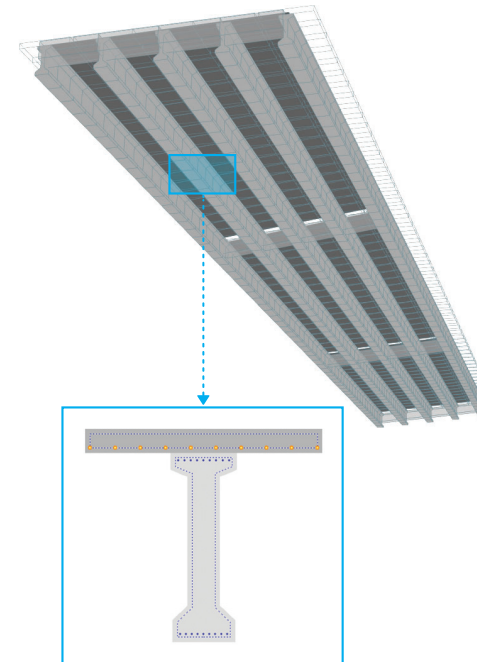
| Plastic resistance moment $M_{pl,Rd}$        |                         |
|----------------------------------------------|-------------------------|
| Plastic Modulus $W_{pl,y}$                   | 145 640 cm <sup>3</sup> |
| Yield strength $f_y$                         | 355 N/mm <sup>2</sup>   |
| Partial factor $\gamma_{M0}$                 | 1.0                     |
| Design plastic resistance moment $M_{pl,Rd}$ | 52495.903 kN·m          |

Flexure and Shear Design Report

| Member Design Detail Report AASHTO LRFD (User's Unit: N, mm) |  |
|--------------------------------------------------------------|--|
| 1. Member Information                                        |  |
| 2. Design Parameters                                         |  |
| 3. Length                                                    |  |
| 4. Section                                                   |  |
| 5. Check Axial Strength                                      |  |
| 6. Check Flexural Strength                                   |  |
| 7. Check Shear Strength                                      |  |
| 8. Check Torsional Strength                                  |  |
| 9. Check Local Buckling                                      |  |
| 10. Check Slenderness                                        |  |
| 11. Check Lateral-Torsional Buckling                         |  |
| 12. Check Distortional Buckling                              |  |
| 13. Check Fatigue                                            |  |
| 14. Check Weld                                               |  |
| 15. Check Connection                                         |  |
| 16. Check Foundation                                         |  |
| 17. Check Deck                                               |  |
| 18. Check Diaphragm                                          |  |
| 19. Check Bracing                                            |  |
| 20. Check Stiffener                                          |  |
| 21. Check Shear Connector                                    |  |
| 22. Check Cross Frame / Bracing                              |  |
| 23. Check Design Report                                      |  |

Detailed Steel Code Check Report

## PSC Composite Design



- Analysis/design that reflects the equivalent cross-sectional properties considering numerous rebars and tendons
- Design incorporating slab rebar stiffness during stage-wise analysis of composite sections

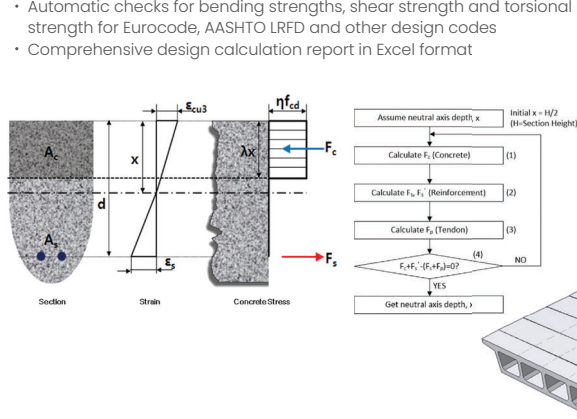
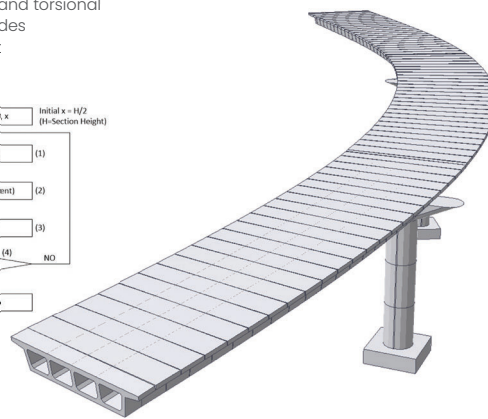
| Flexure/Shear/Torsional Design Report |  |
|---------------------------------------|--|
| 1. Member Information                 |  |
| 2. Design Parameters                  |  |
| 3. Length                             |  |
| 4. Section                            |  |
| 5. Check Axial Strength               |  |
| 6. Check Flexural Strength            |  |
| 7. Check Shear Strength               |  |
| 8. Check Torsional Strength           |  |
| 9. Check Local Buckling               |  |
| 10. Check Slenderness                 |  |
| 11. Check Lateral-Torsional Buckling  |  |
| 12. Check Distortional Buckling       |  |
| 13. Check Fatigue                     |  |
| 14. Check Weld                        |  |
| 15. Check Connection                  |  |
| 16. Check Foundation                  |  |
| 17. Check Deck                        |  |
| 18. Check Diaphragm                   |  |
| 19. Check Bracing                     |  |
| 20. Check Stiffener                   |  |
| 21. Check Shear Connector             |  |
| 22. Check Cross Frame / Bracing       |  |
| 23. Check Design Report               |  |

Flexure/Shear/Torsional Design Report

Positive/Negative Flexure

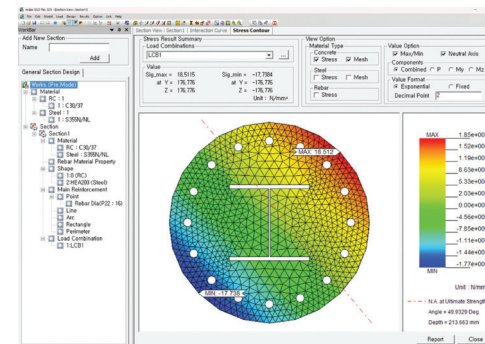
## PSC Bridge Design

- Auto generation of transverse analysis models through global analysis models
- Transverse analysis model generation wizard & auto generation of loading and boundary conditions
- Automatic checks for bending strengths, shear strength and torsional strength for Eurocode, AASHTO LRFD and other design codes
- Comprehensive design calculation report in Excel format

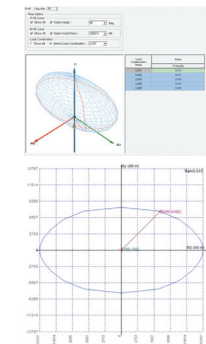


## General Section Designer

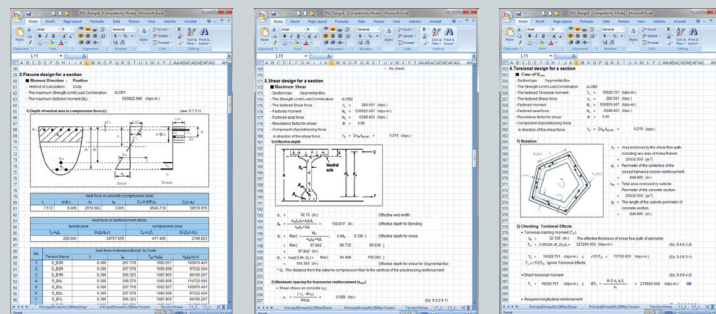
- Safety checks for any irregular RC, steel, composite section. Define properties of any irregular cross-section and calculation of section
- Mander model to define nonlinear properties to concrete
- Generation of P-M, P-My-Mz, M-M interaction curves as per Eurocode, AASHTO LRFD
- Calculation of section capacity (in flexure) and safety ratio based on member forces
- Generation of moment-curvature curve
- Plot of stress contour for all the cross-sections: Uncracked elastic stress & Cracked elastic stress



Nonlinear Section Analysis



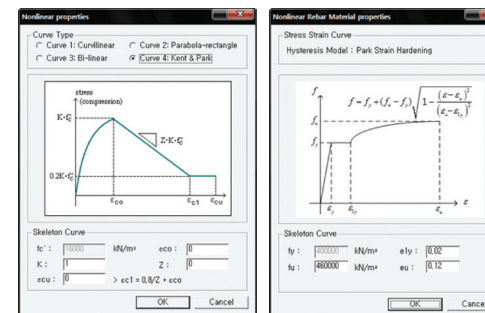
3D P-M & M-M Curve



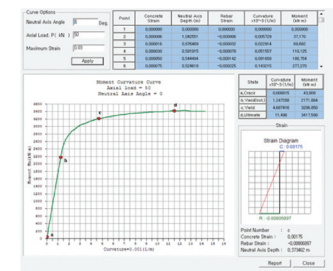
Flexure Design

Shear Design

Torsional Design



Concrete/Steel Nonlinear Materials

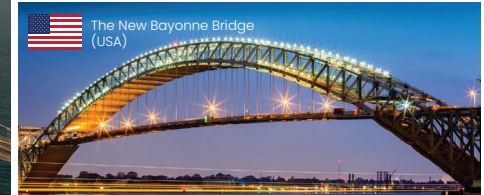


Moment-Curvature Curve

# SUCCESSFUL PROJECTS OF MIDAS SOLUTIONS

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## Special Bridge



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## Conventional Bridge

- Box Culvert
- Girder Bridge
- Integral Bridge
- Pedestrian Overpass
- PSC Box Bridge
- Steel Bridge
- Railway Bridge



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|                                                                                    |                                                                                      |                                                                                      |                                                                                      |                                                                                      |                                                                                      |
|------------------------------------------------------------------------------------|--------------------------------------------------------------------------------------|--------------------------------------------------------------------------------------|--------------------------------------------------------------------------------------|--------------------------------------------------------------------------------------|--------------------------------------------------------------------------------------|
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|   |   |   |   |   |   |
|  |  |  |  |  |  |

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