A Powerful Move Forward

# CIVIL NX

Bridge and Civil Engineering
Structural Analysis & Design Solution

MIDAS COLLECTION

# Bridge and Civil Engineering Structures Analysis & Design Program

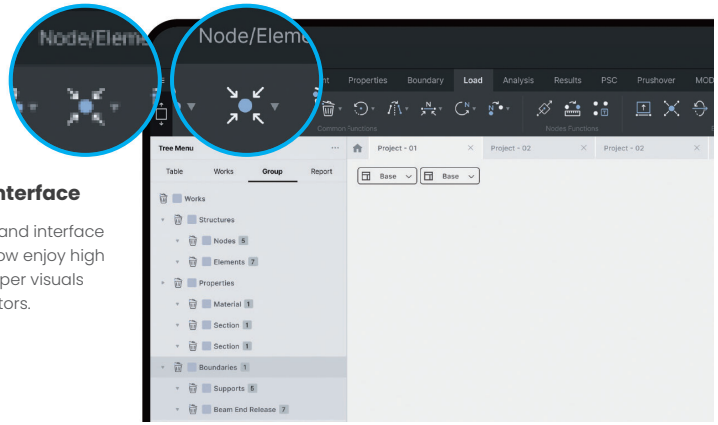
# A Powerful Move Forward

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.

MIDAS

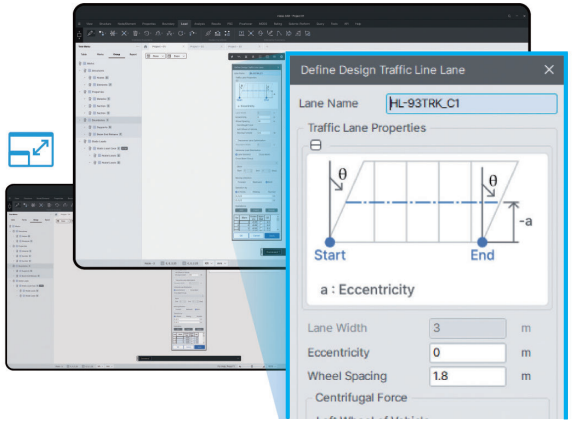
High-resolution Interface

# 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.



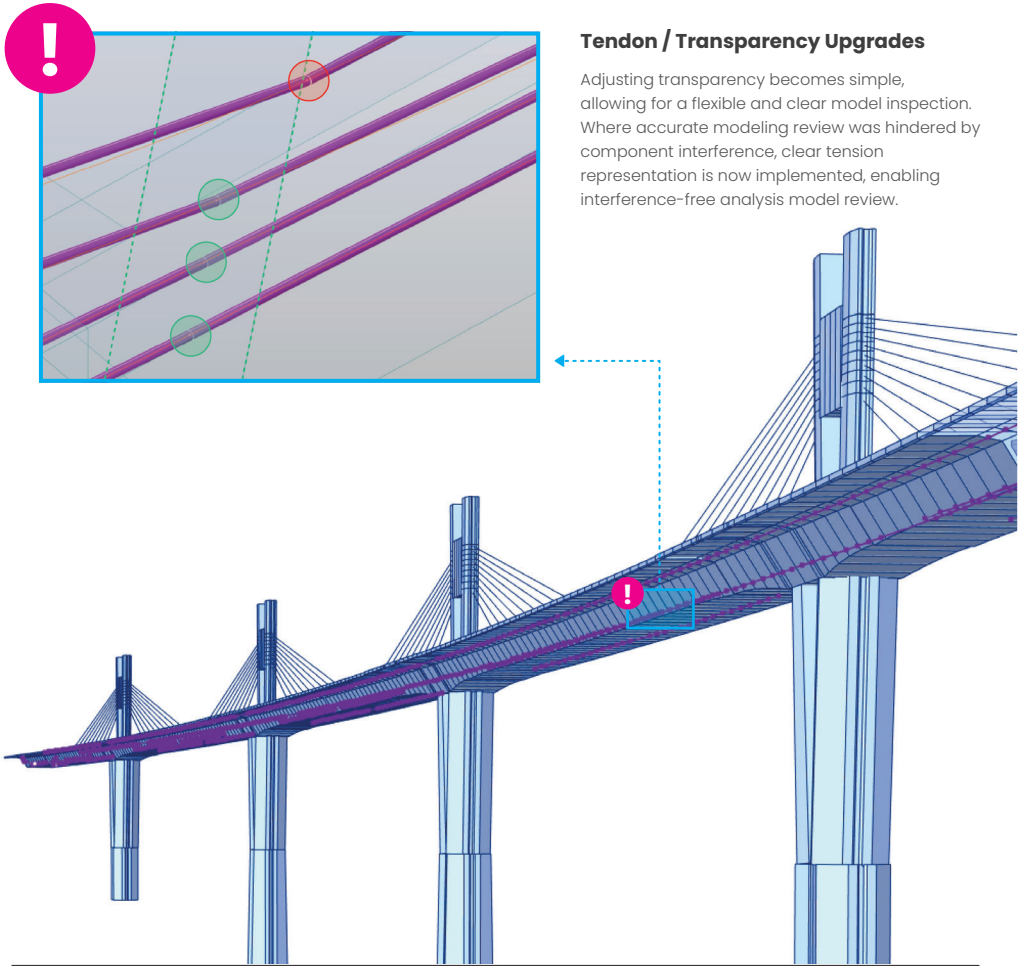

### Dialog Box Image zoom

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.



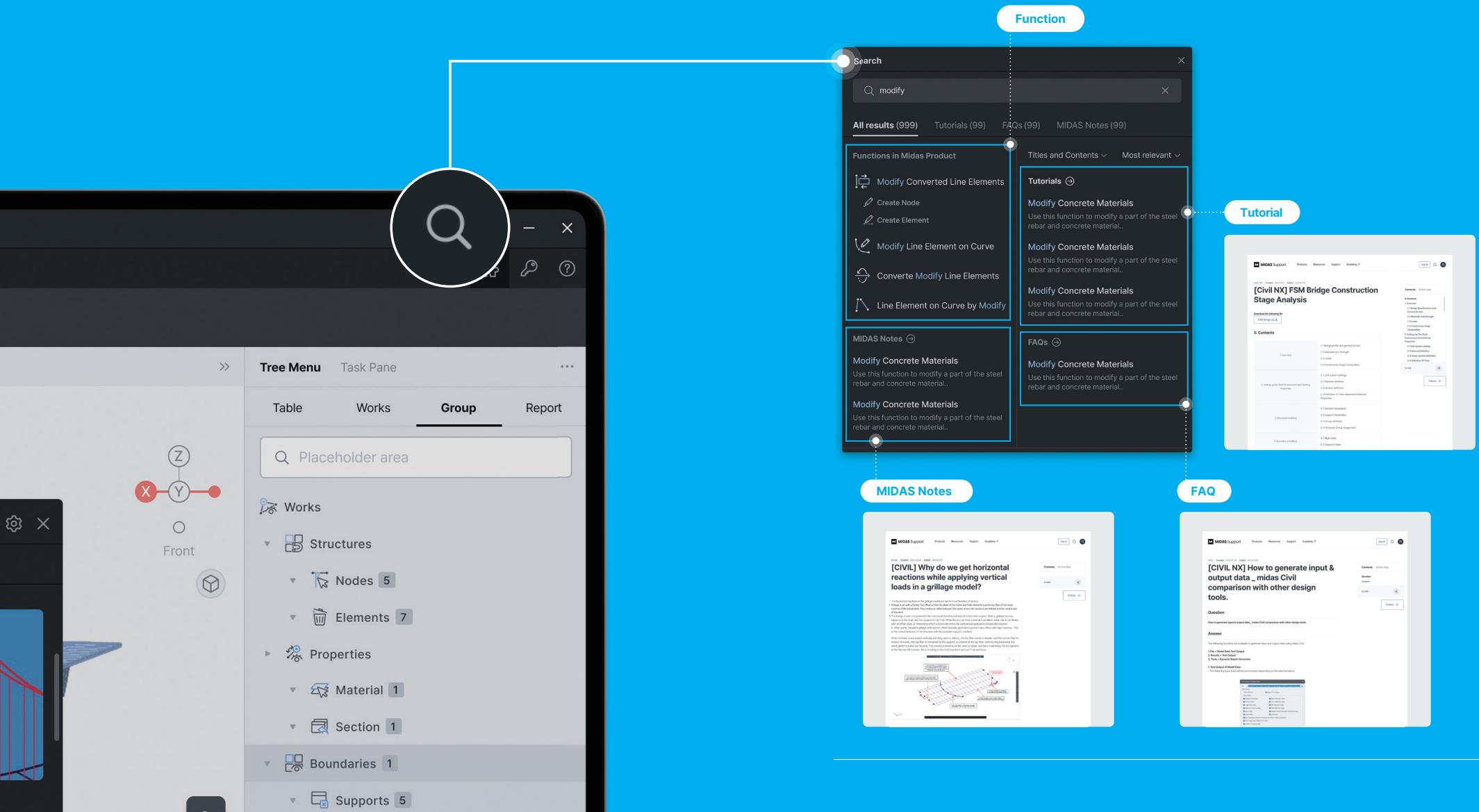
### Tendon / Transparency Upgrades

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.



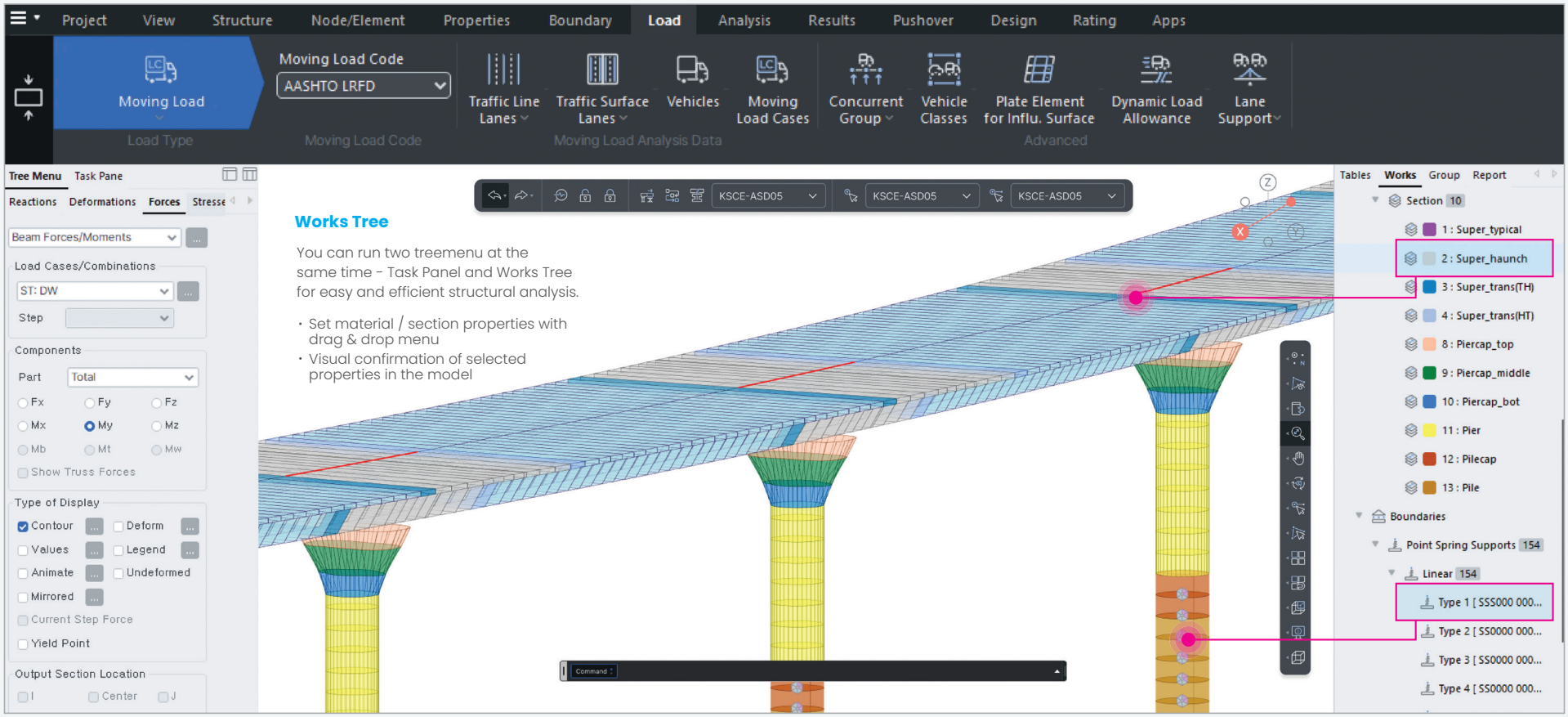
User Interface

# Everything You Need Is Here
# Intuitive User Interface

Ribbon menu placed by the modeling flow, Works Tree with Drag & Drop fuction.
Experience an intuitive interface that doesn't require explanation even if you're new to it.

Project Settings ▶ Modeling ▶ Boundary conditions and load ▶ Analysis and Result ▶ Design

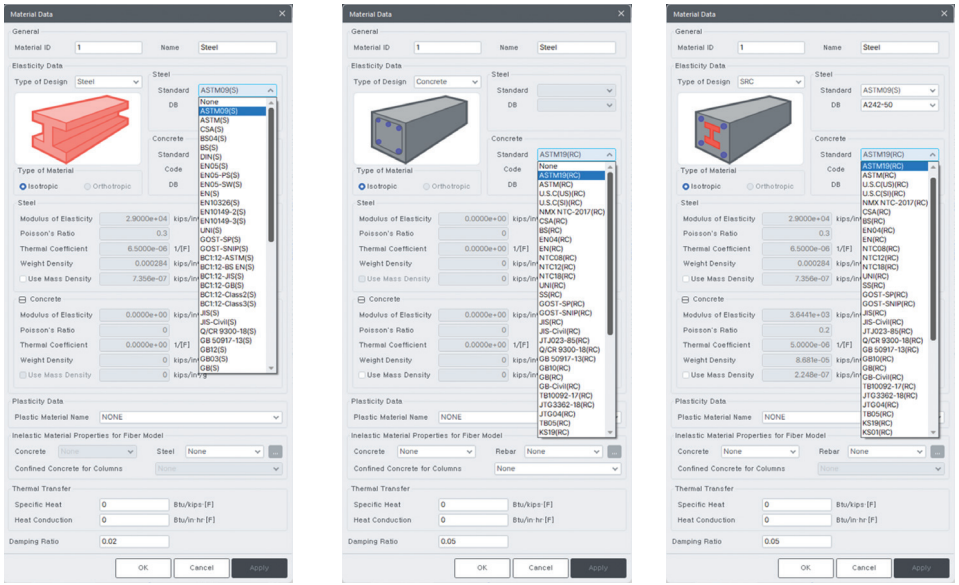
Ribbon Menu



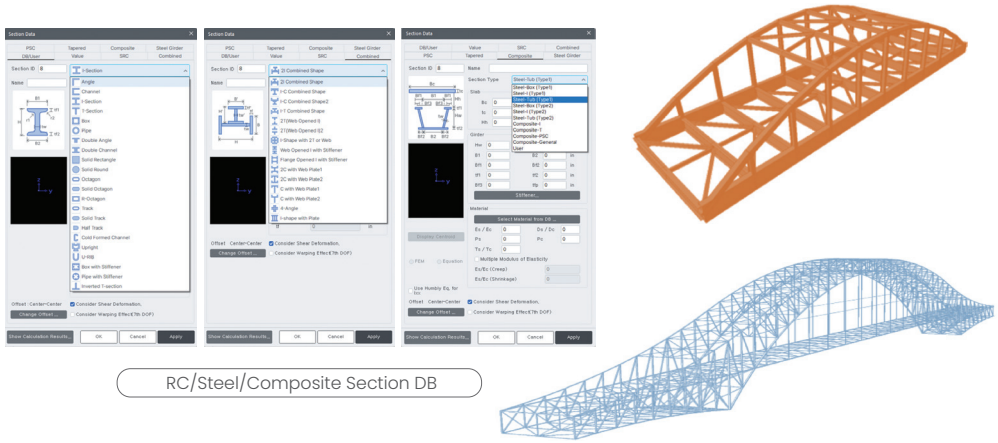
Material & Section DB

# Build Without Boundaries

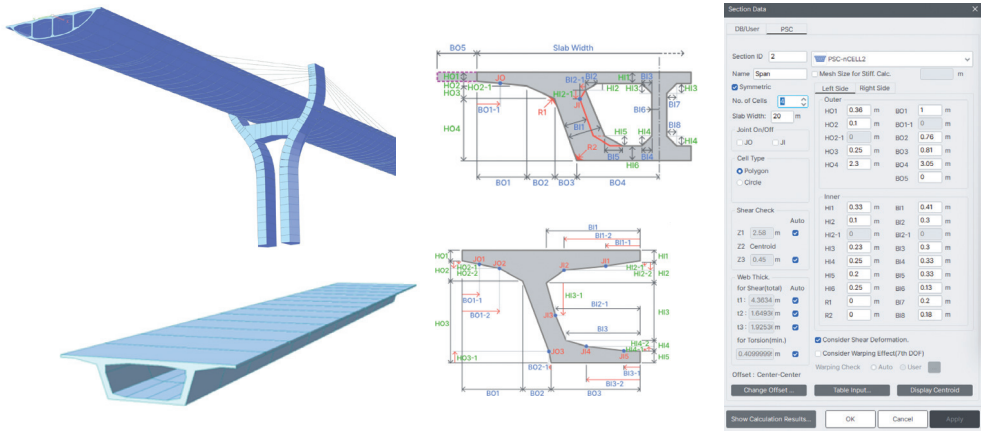
MIDAS CIVIL NX stands at the forefront of structural design, providing an unrivaled database of material and section properties tailored to meet global engineering standards.
Whether you're designing with concrete, steel, or composite materials, MIDAS CIVIL NX equips you with a comprehensive suite of options conformant to AASHTO, Eurocode, BS, and other international standards.



Concrete/Steel/Composite Materials



RC/Steel/Composite Section DB



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 fuction within MIDAS CAD**

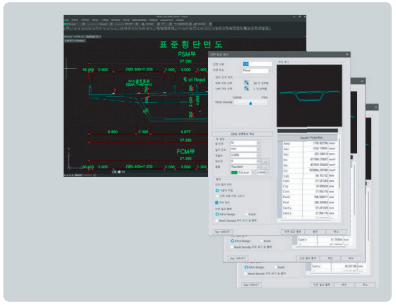
Creation and Calculating Section Objects → File Export (sec*) → MIDAS CIVIL NX Import

** Omitable when integrated with an API

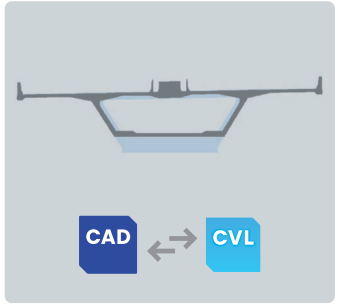
**Existing workflow**

Creation of Cross-Section object → .dxf export → .dxf import → Calculation of Cross-Sectional Properties → .sec export → MIDAS CIVIL NX Import

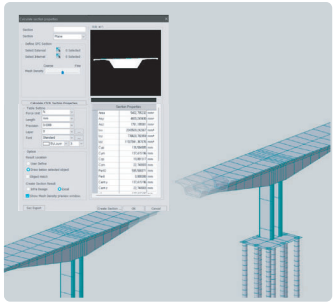
Auto CAD | MIDAS SPC | MIDAS CIVIL NX



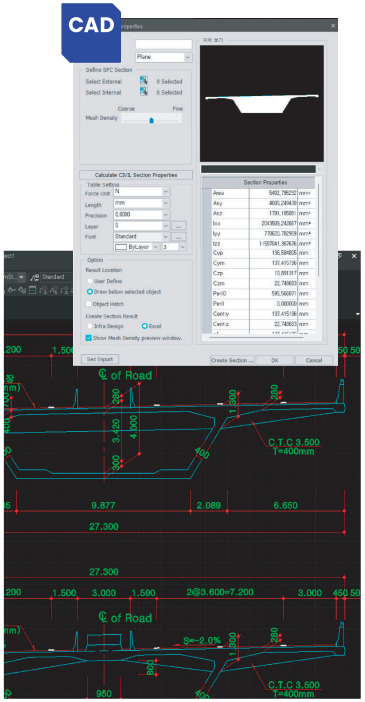
Managing multiple cross-sections in a single Dwg file for easy file management




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

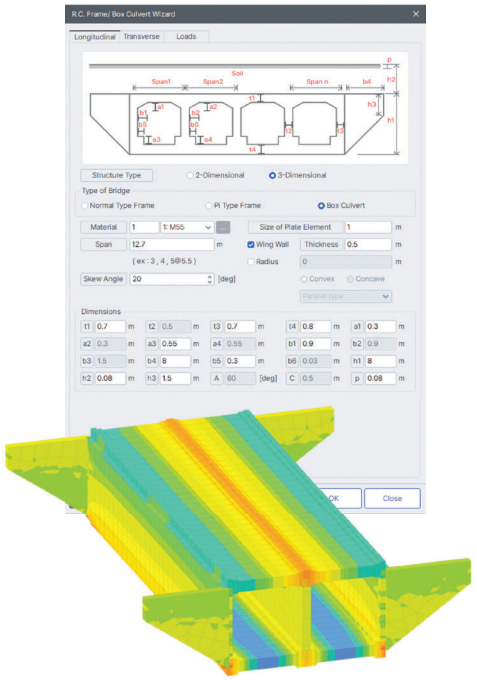
Modeling Wizard

# Experience The Power of User-Favorite Modeling Wizard

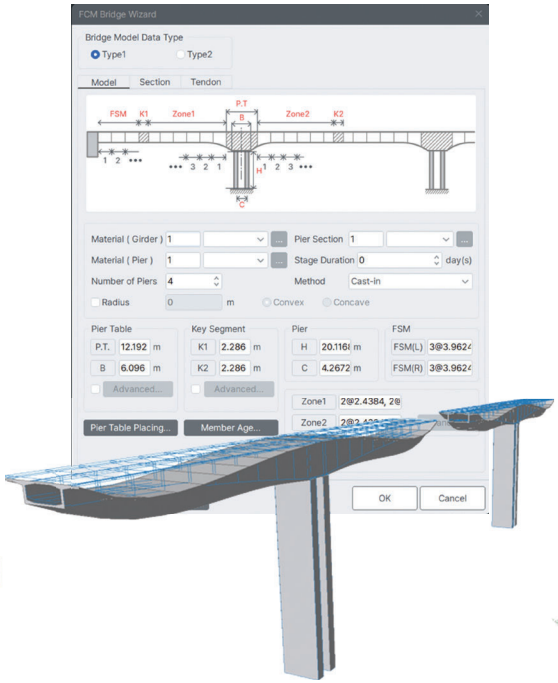
The Modeling Wizard in CIVIL NX automates key aspects of the modeling process, enhancing efficiency, ease of use, and overall productivity. It reduces errors and ensures a consistent and standardized approach to civil engineering design.

- 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

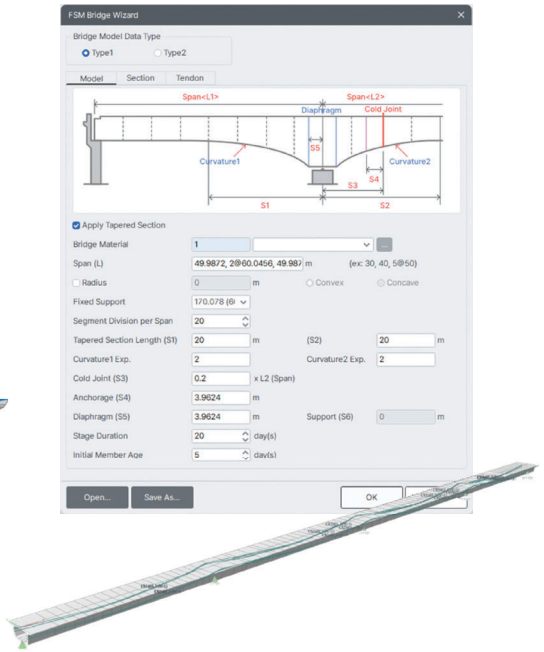
RC Frame/ Box Culvert Wizard



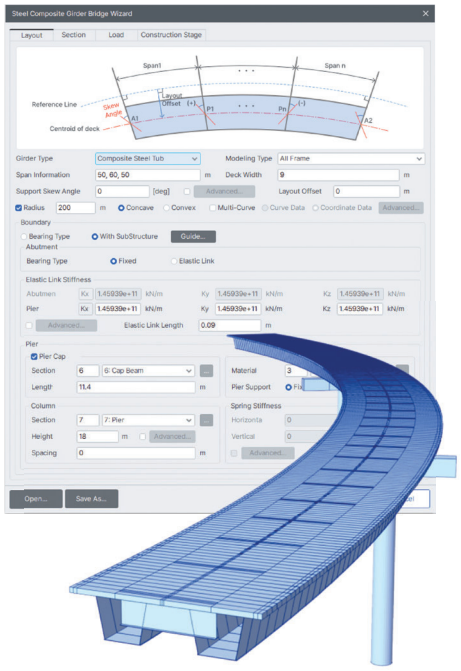

FCM Bridge Wizard




FSM Bridge Wizard

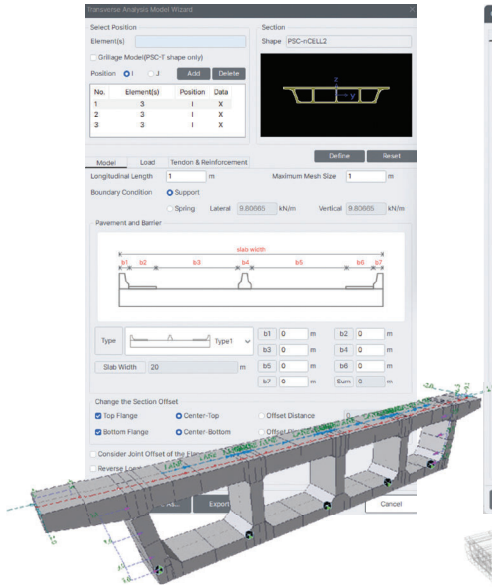



Steel Composite Girder Bridge Wizard

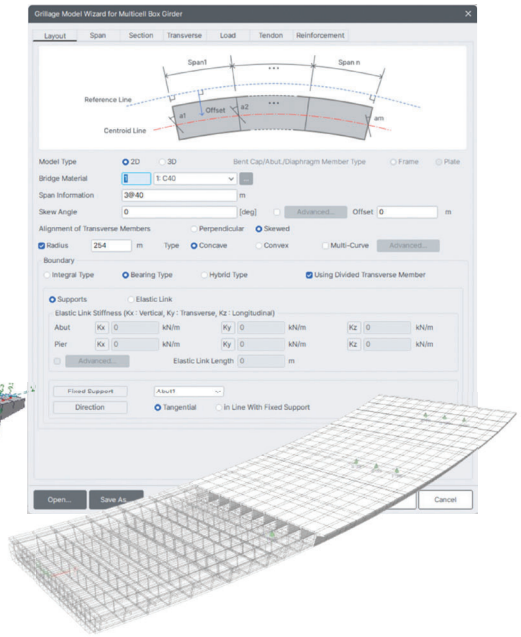


- Cable Bridges ( Cable-Stayed Bridge/ Suspension Bridge)
- PSC Bridges considering method of construction (ILM/ FCM/ MSS/ FSM)
- Auto-generation of Transverse models and Grillage models

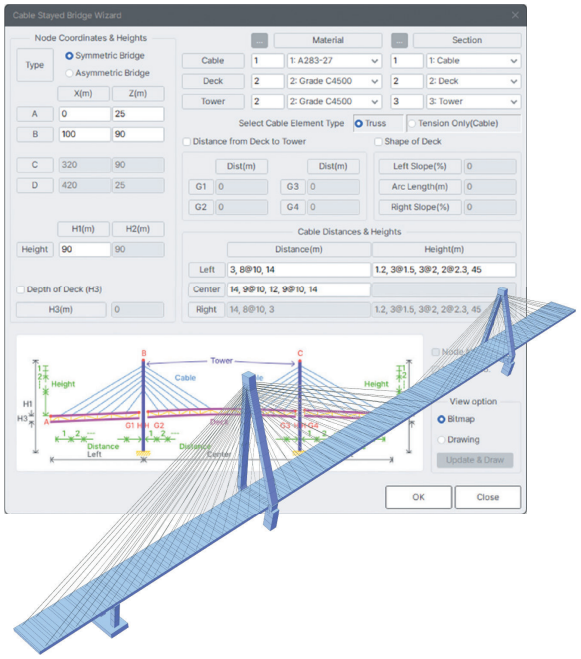
Transverse Analysis Model Wizard



Grillage Model Wizard



Cable Stayed Bridge Wizard



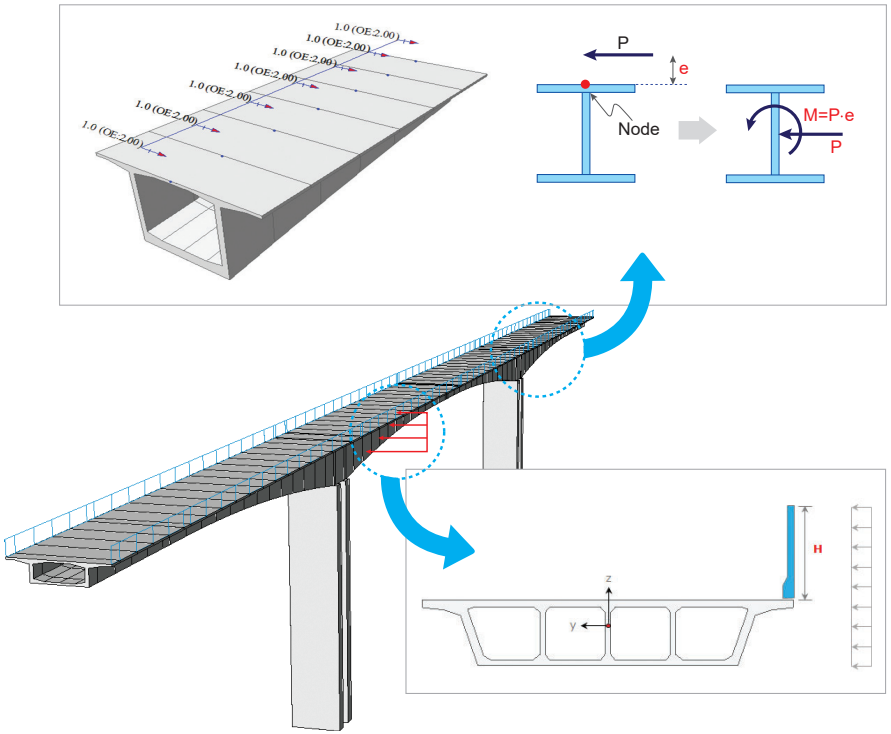
Suspension Bridge Wizard

Load Application Features

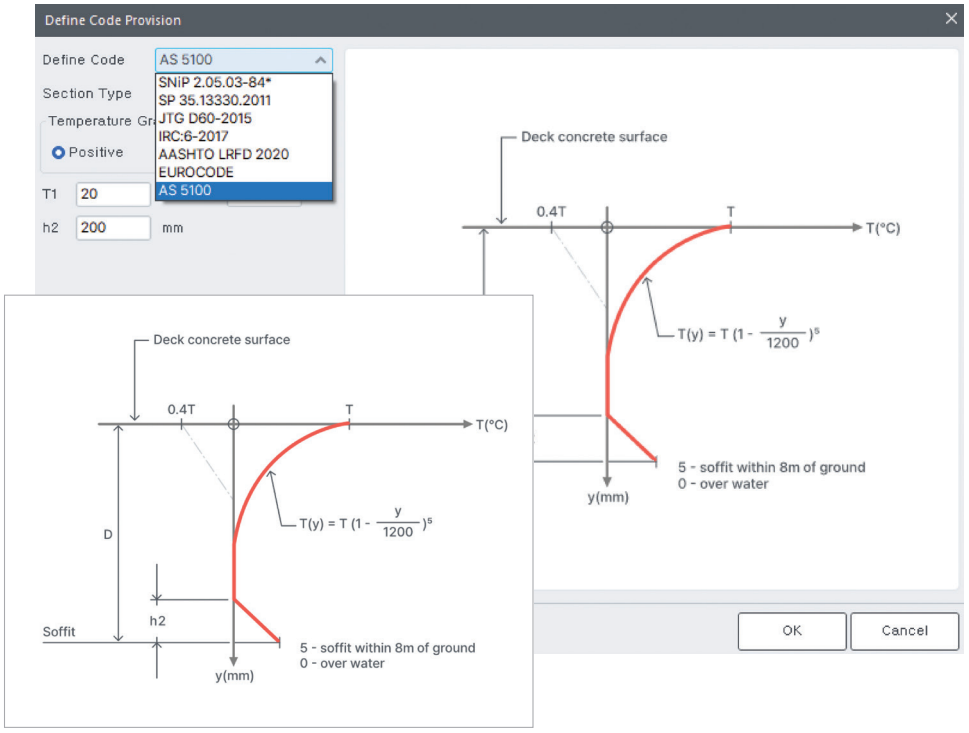
# Practical Load Application Features

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 & Pressure Load For Wind Effect



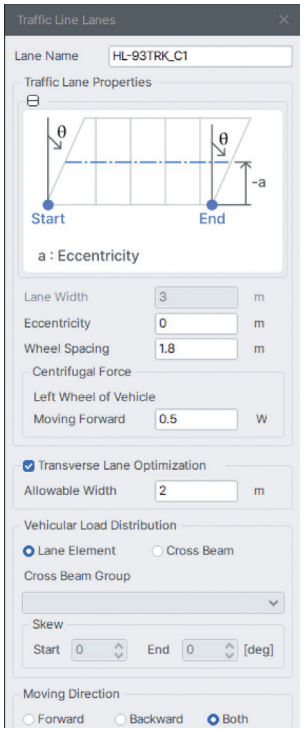

Section Temperature Gradient

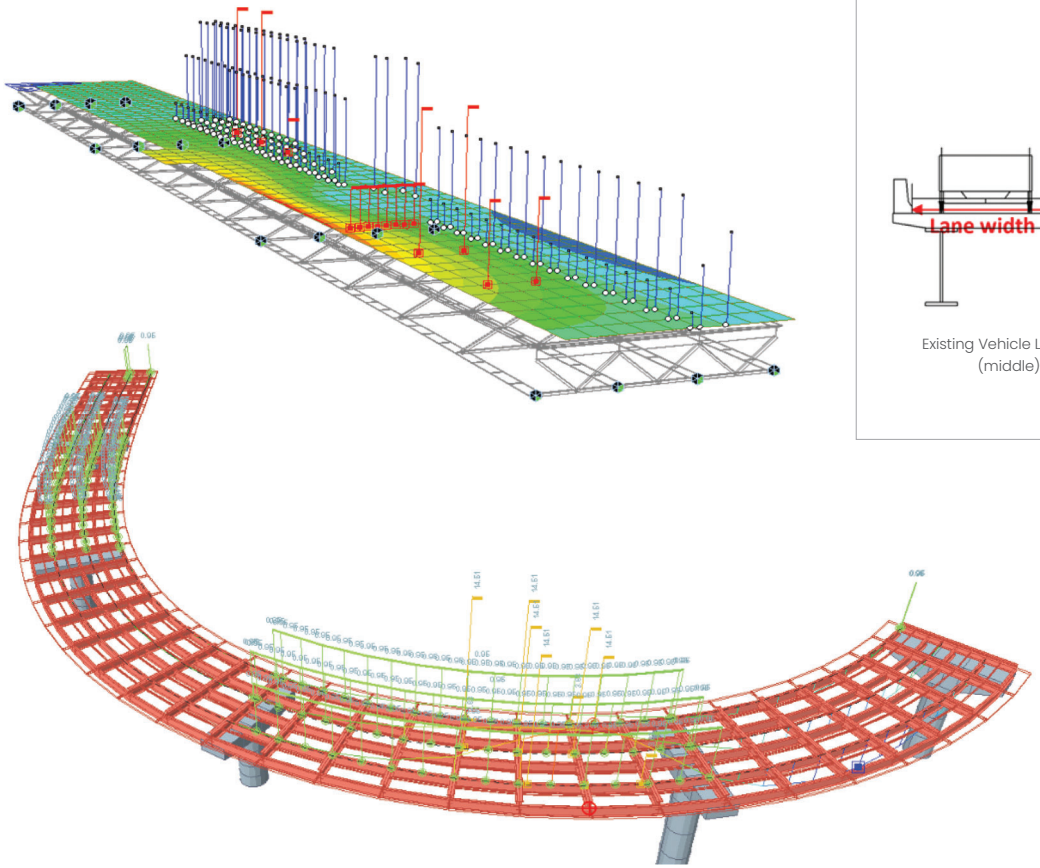


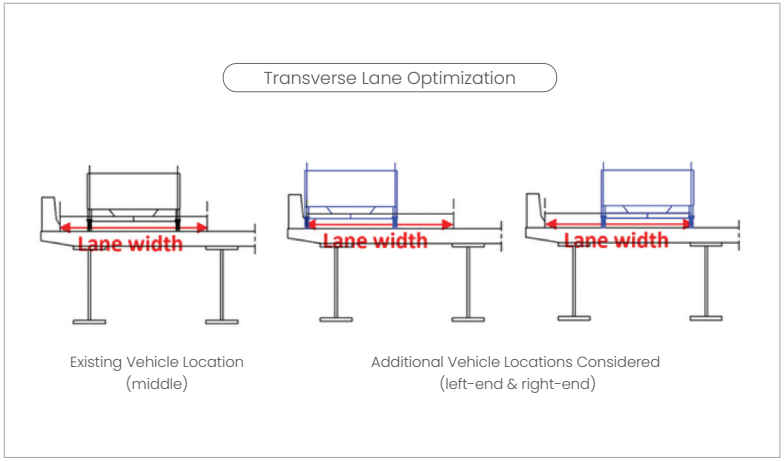
Moving Load Analysis

# 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.






### Moving Load Code

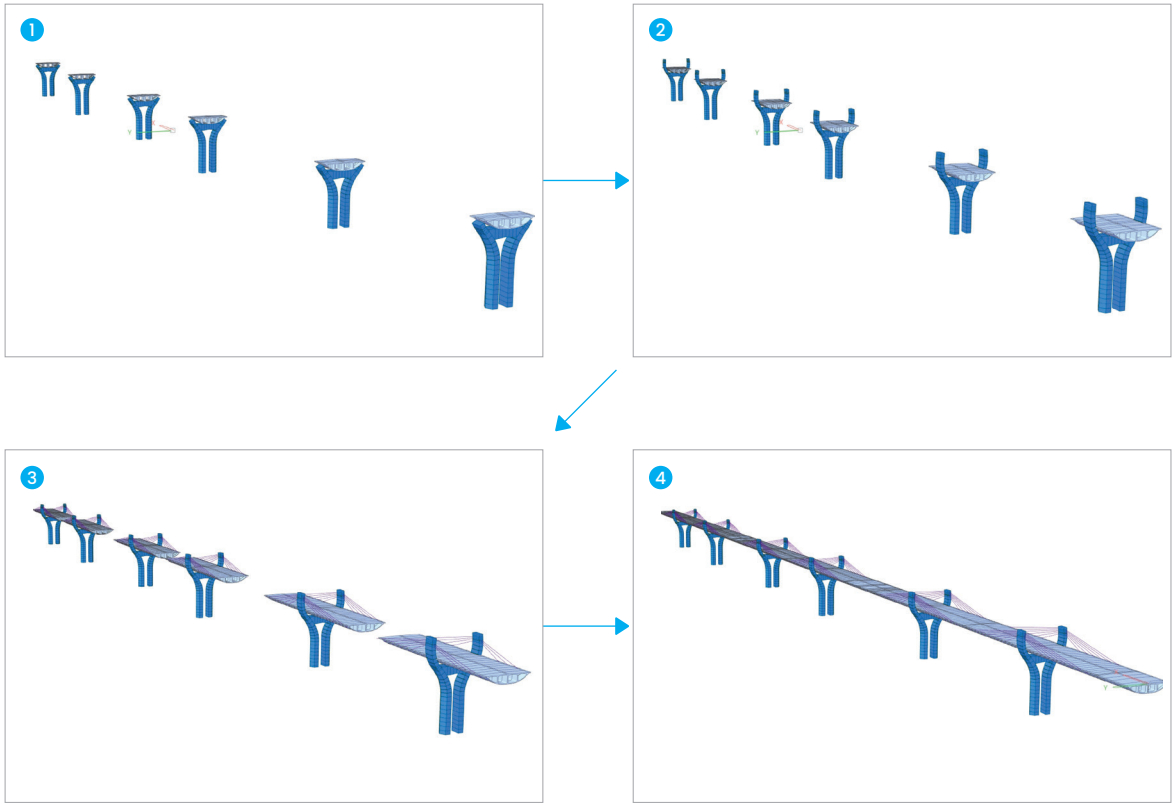
AASHTO Standard / AASHTO LRFD / PENNDOT
Canada / BS / EUROCODE / Australia / Poland
Russia / South Africa / Korea / KSCE-LSD15
China / India / Taiwan / Transverse

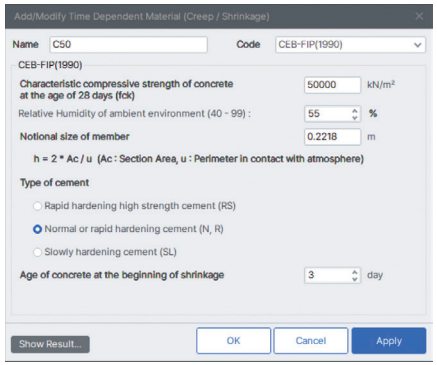
Construction Stage Analysis

# Construction Stage Analysis Considering the Time Dependence

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.

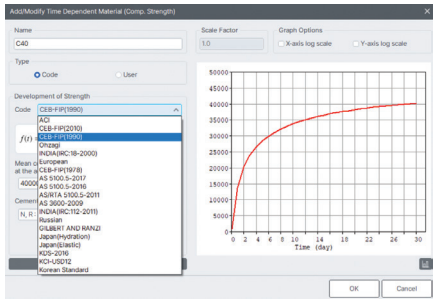
**Construction Stage Analysis Reflecting Time-Dependent Material Properties and Pretensioning Forces**




### Creep / Shrinkage

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



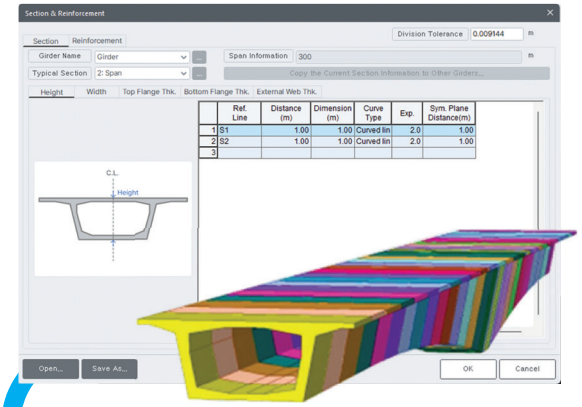

### Comp. Strength

KDS-2016 / KCI-USD12 / Korean Standard
ACI / CEB-FIP(2010) / CEB-FIP(1990)
Ohzagi / Japan(Hydration)
Japan(Elastic) / INDIA(IRC:18-2000)
European / AS 5100.5-2017
AS 5100.5-2016 / AS & RTA 5100.5-2011
AS 3600-2009 / INDIA(IRC:112-2011)
Russian / GILBERT AND RANZI

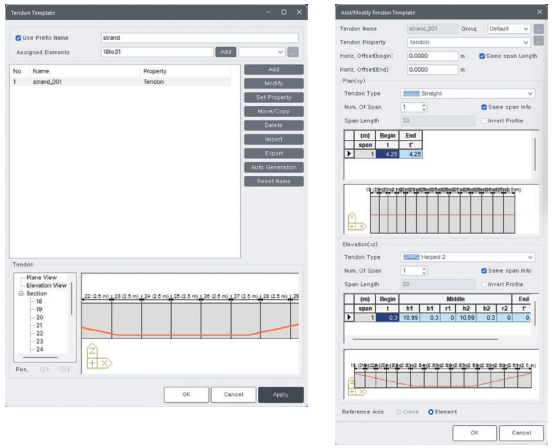
Pre-Stressed Concrete Analysis

# PSC Bridge Analysis & Design Integrated Solution

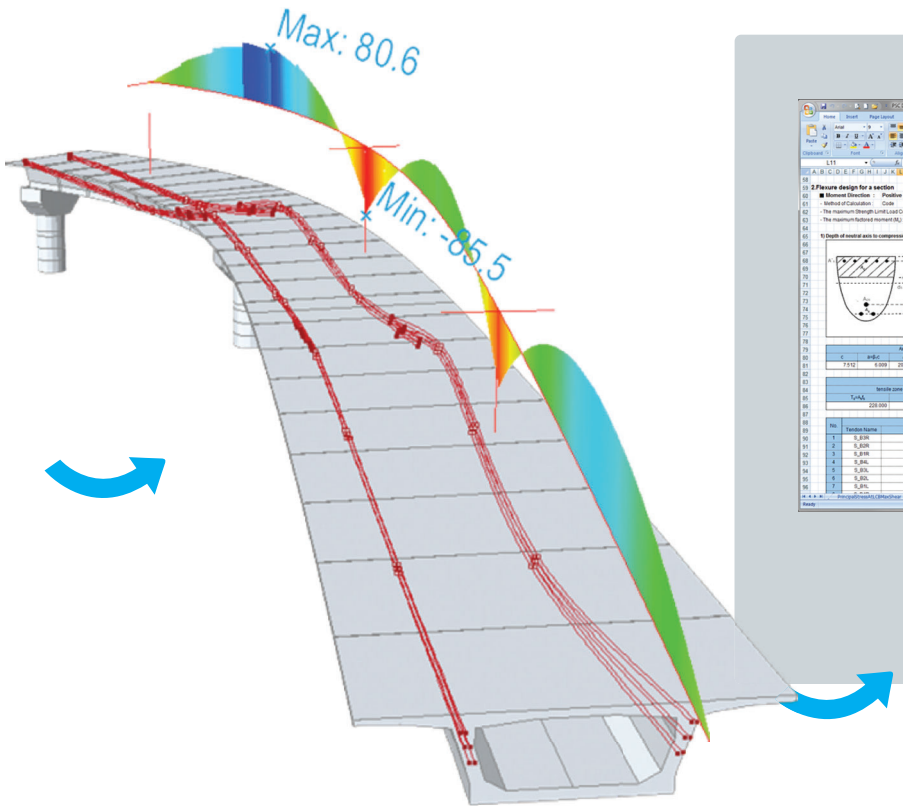
PSC bridge design integrated solution provides everything needed for PSC bridge design, including efficient modeling functions, analysis results, and cross-sectional strength review for various types of PSC bridges.



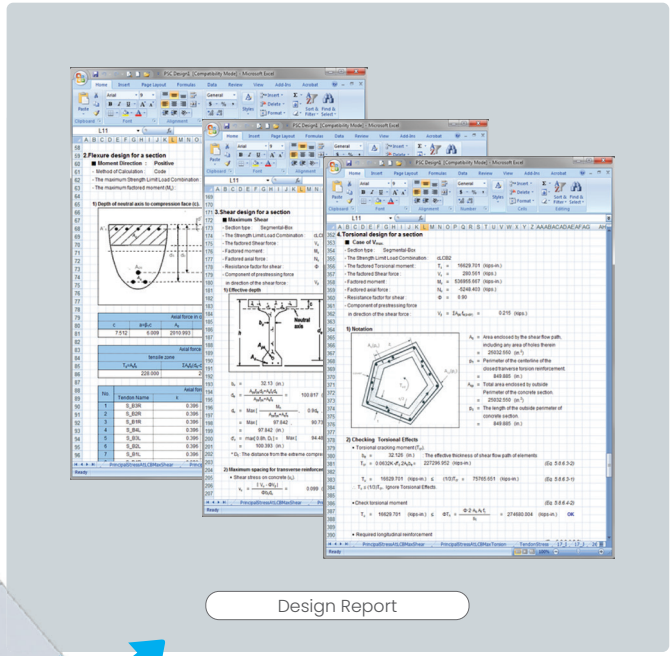
Section & Reinforcement



Tendon Template




PSC Beam Stresses

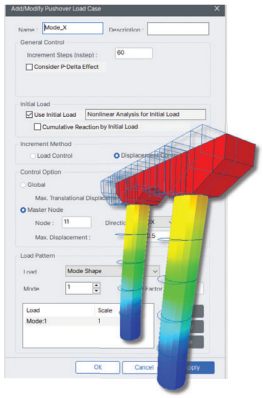


Design Report

Seismic Nonlinear Analysis

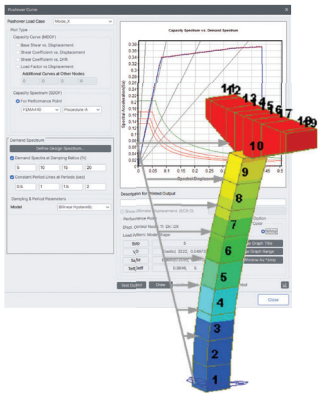
# Pushover Analysis

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.

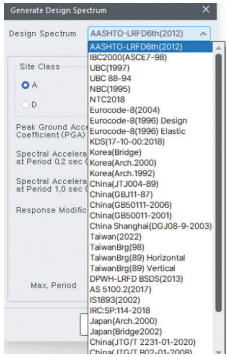


P-Delta Effect

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

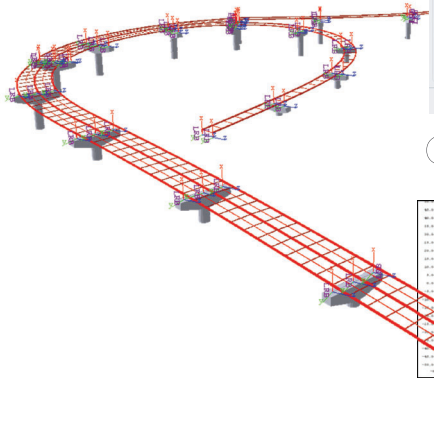
Seismic Nonlinear Analysis

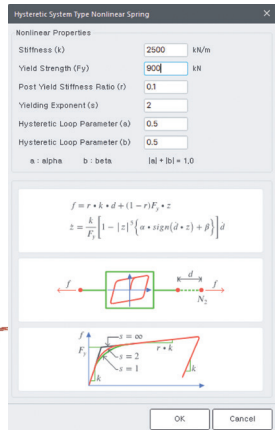
# Boundary Nonlinear Time History Analysis

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

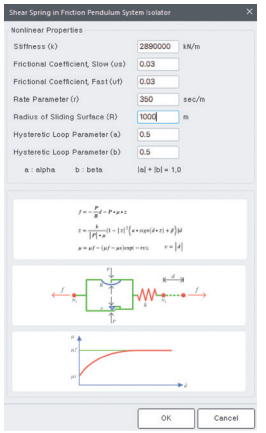
### Various types of nonlinear connection elements

- 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

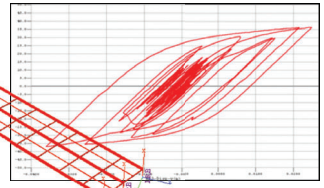


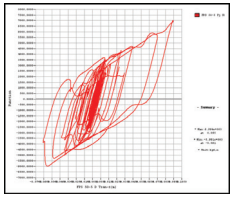



Hysteretic System




Friction Pendulum System Isolator





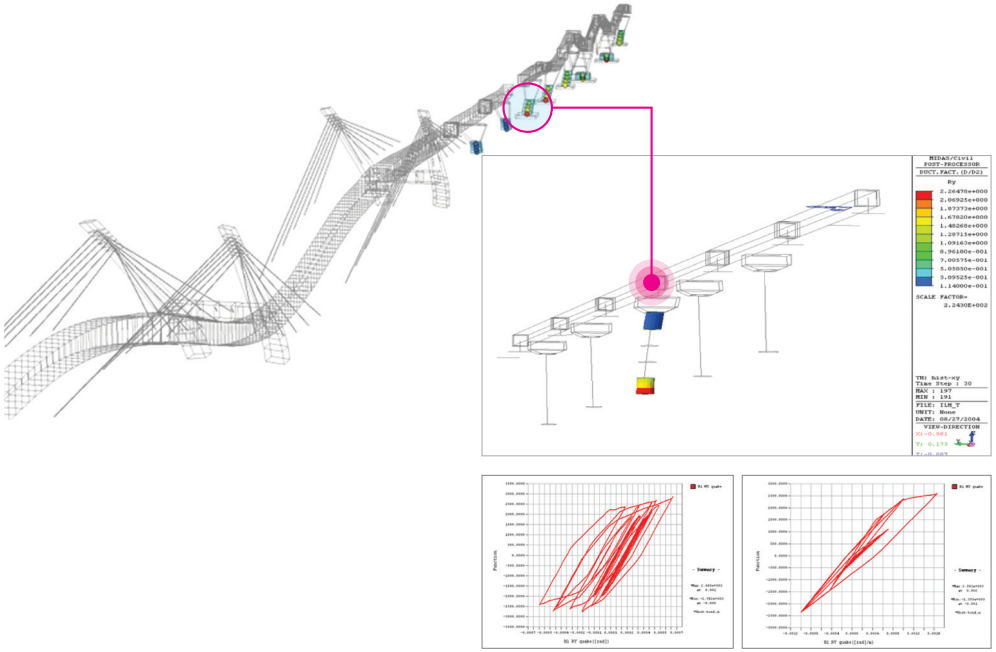
### Analysis of base isolators and damping devices

- 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

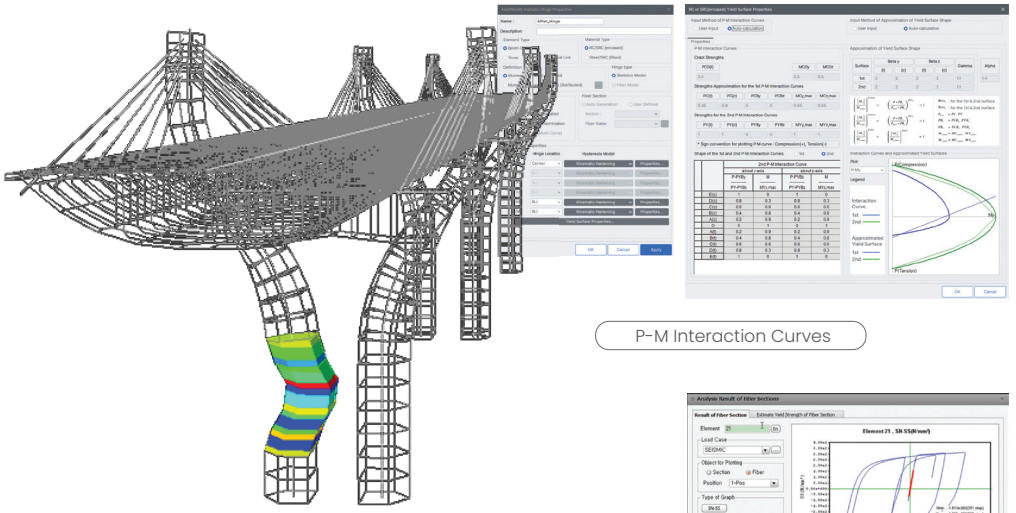
# Inelastic Nonlinear Time History Analysis

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.

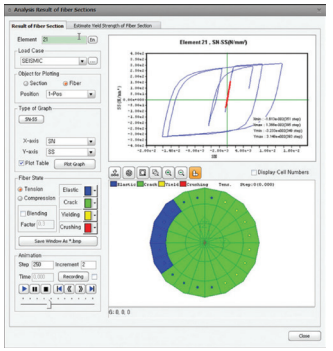


### Various Nonlinear Hinge Type Models

- 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 / SLIP, 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



P-M Interaction Curves



Damaged Section Check

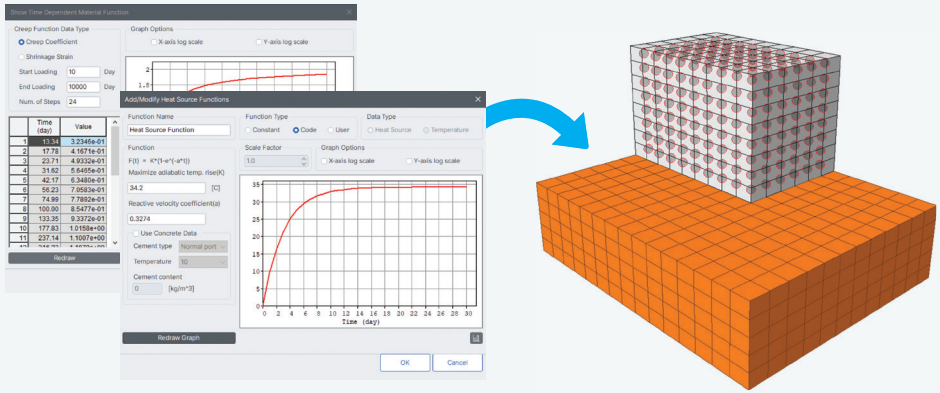
### Various Nonlinear Hinge Type Models

- 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, crashing and cracking in concrete members and tensile yielding in steel members under nonlinear analysis

Advanced Analysis Standards

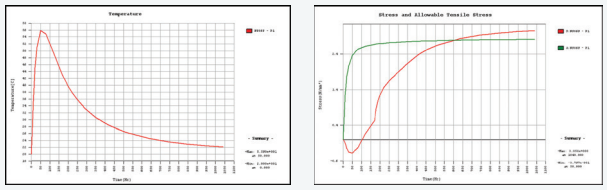
# Heat of Hydration Analysis

### 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

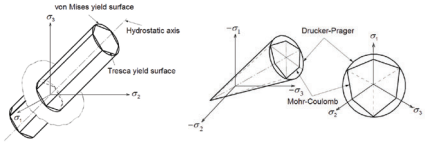
### Verification of Various Analytical Results Considering Pile Driving Stages



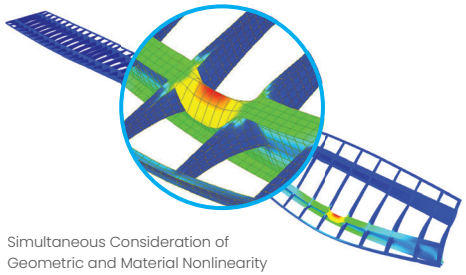
- Consideration of Pipe Cooling for Crack Reduction
- Temperature Regulation When Using an Ice Plant by Entering Initial Temperatures for Each Construction Stage

Advanced Analysis Standards

# Material Nonlinear Analysis




Ductile Material  Brittle Material



Simultaneous Consideration of Geometric and Material Nonlinearity

### Diverse Carbonaceous Material Models

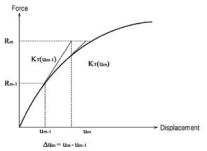
- Analysis of the Response Effects of Yield Characteristics in Steel and Yield and Cracking Characteristics in Concrete Materials
- Indication of Yielding in Integration Points for Examination of Yielding Region
- Consideration of Definition of Yield Strain and Expansion and Displacement Changes in Yield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

### Simultaneous Consideration of Geometric and Material Nonlinearity in Analysis

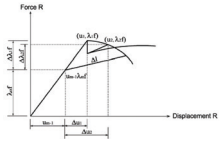
- Implementation of Material Nonlinearity for High Strain Shell Elements using a Layered Approach for Thickness-Direction Stress Integration
- Providing High-Quality Analysis Convergence with Consideration of Large Displacement and Large Rotation
- Concurrent Analysis of Material Nonlinearity and Geometric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

Advanced Analysis Standards

# Large Displacement Analysis

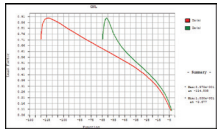



Newton-Raphson Method




Arch-Length Method

Displacement Results for Construction Stages Considering Geometric Nonlinearity



Multi Function Mode

### 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

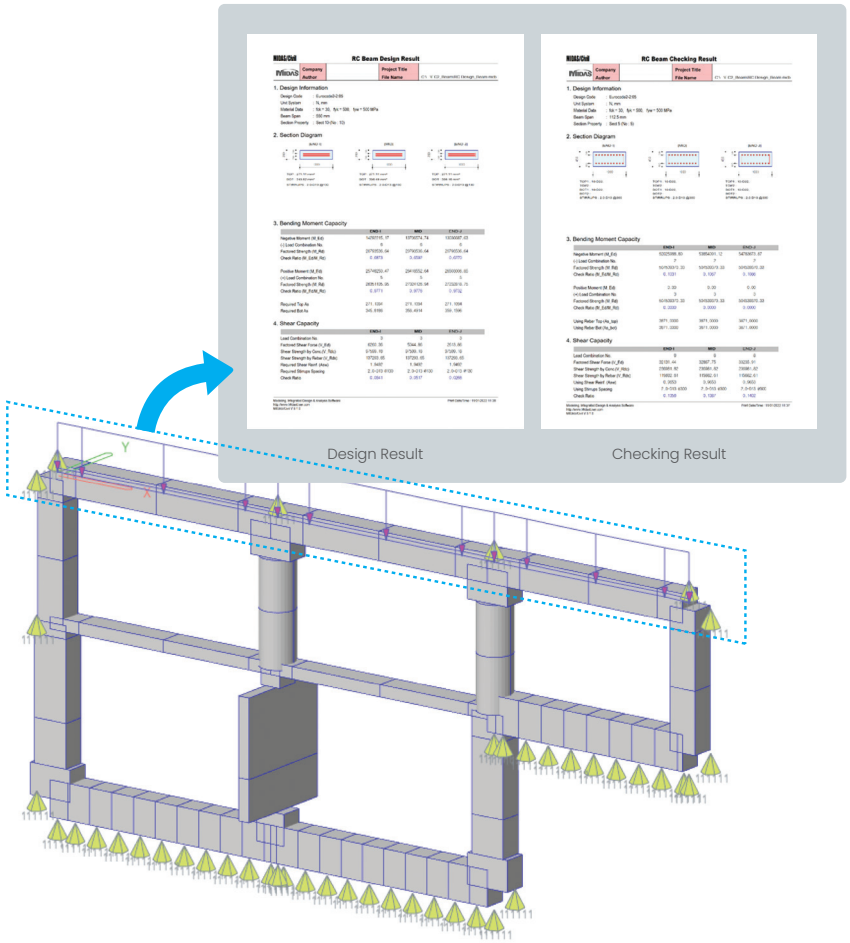
### Application of construction stage analysis considering geometric nonlinearity for cable-stayed bridges

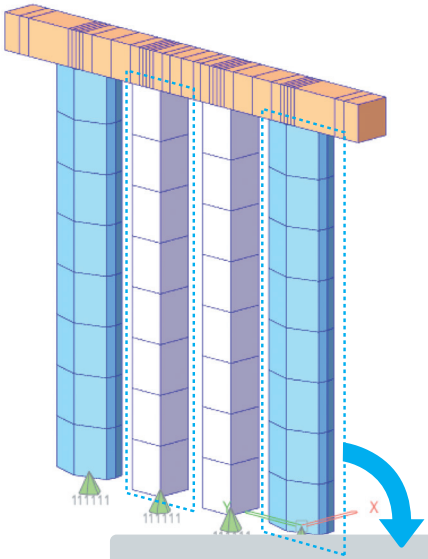
- Applying the large displacement theory to special forms of cable-supported structures or cable mesh structures where significant deformations can occur

Design

# Trusted Civil Design Standard in 120+ Countries

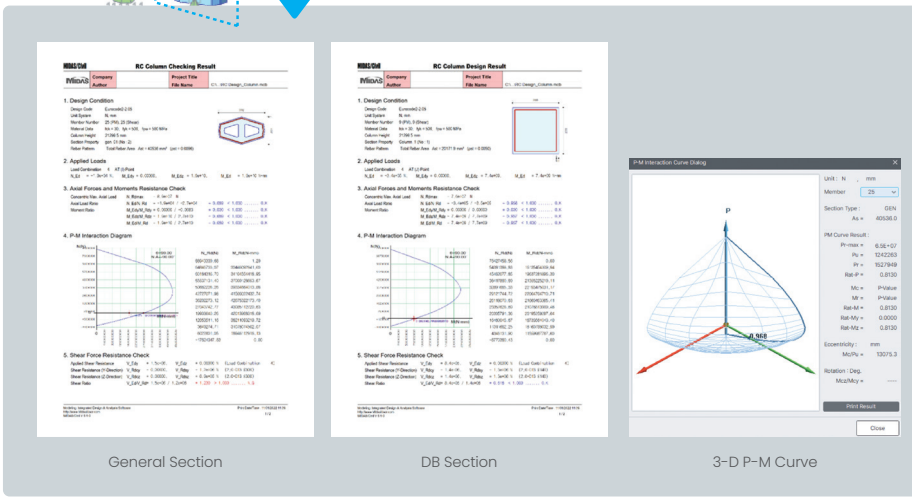
MIDAS CIVIL NX supports various Design Codes such as AASHTO, Eurocode for Reinforced Concrete, Steel, Steel Ortho., SRC, Composite, PSC, etc. It is capable of generating design review reports based on the reviewed.



## 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



Design

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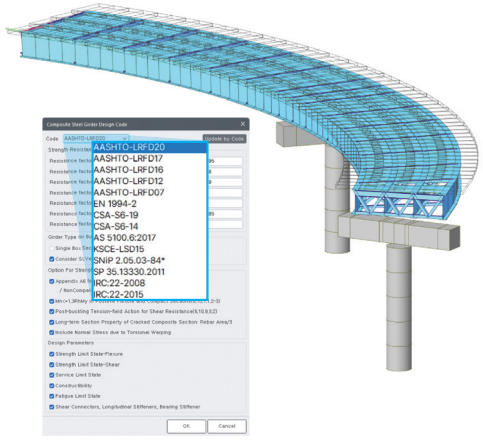
## Steel Composite Design

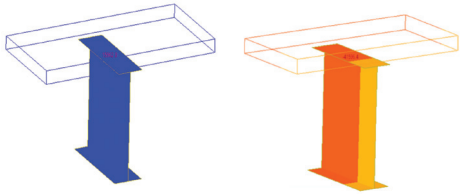
- Composite girder check as per Eurocode, AASHTO LRFD, and other design specifications
- Constructability, strength, service, and fatigue limit checks
- Excel format calculation report, spreadsheet format table, and design result diagram

Composite action with construction stage analysis

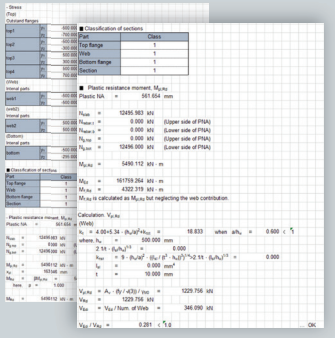
Composite action with long-tern elastic modulus for concrete

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

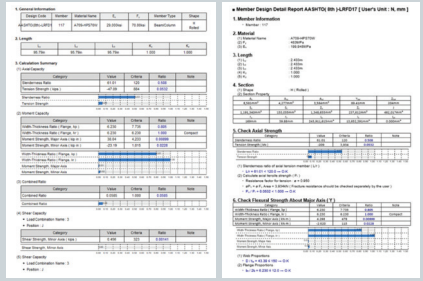


Positive/Negative Flexure



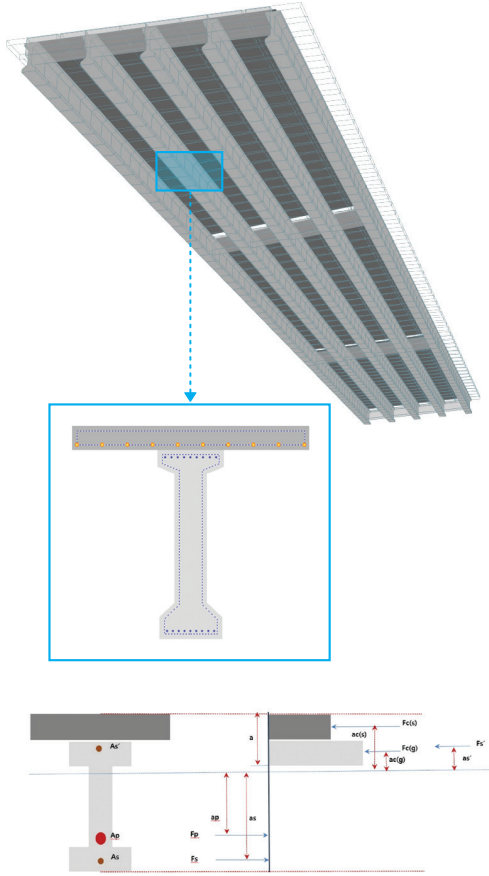
Flexure and Shear Design Report

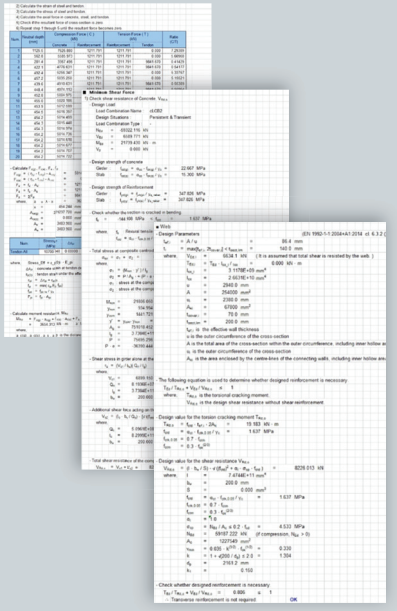


Detailed Steel Code Check Report

## 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

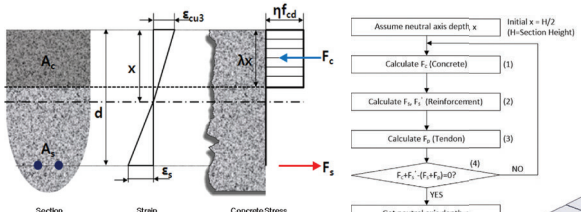


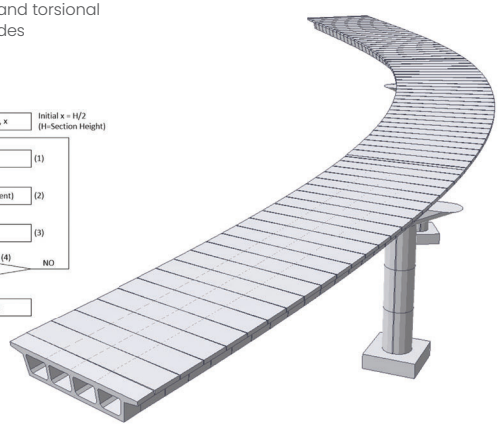



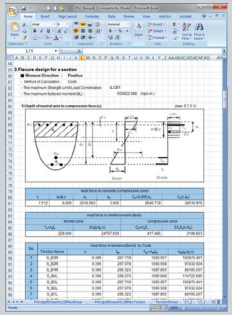
Flexure/Shear/Torsional Design Report

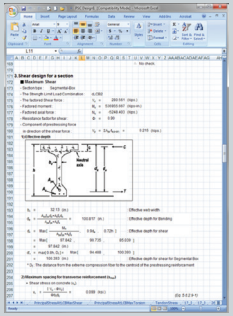
## PSC Bridge Design

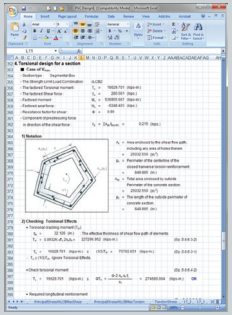
- Auto generation of transverse analysis models through global analysis models
- Transverse analysis model generation wizard & auto generation of loading and boundary conditions
- Automatic checks for bending strengths, shear strength and torsional strength for Eurocode, AASHTO LRFD and other design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



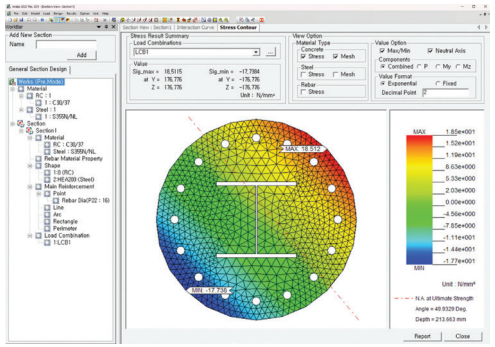

Flexure Design

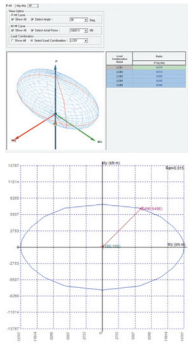

Shear Design

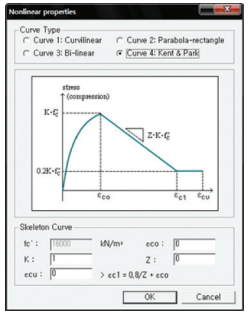

Torsional Design

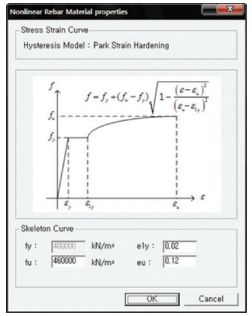
## General Section Designer

- 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

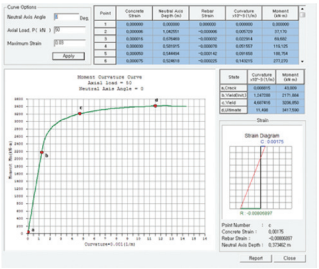

Nonlinear Section Analysis


3D P-M & M-M Curve



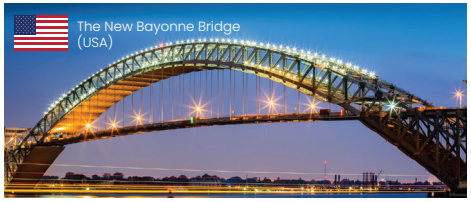



Concrete/Steel Nonlinear Materials


Moment-Curvature Curve

# SUCCESSFUL PROJECTS OF MIDAS SOLUTIONS

## Special Bridge




## Conventional Bridge

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

Your Civil Engineering Journey, Where Excellence Meets Service.

# MIDAS COLLECTION

**Your Civil Engineering Journey,**
**Where Excellence Meets Service**

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