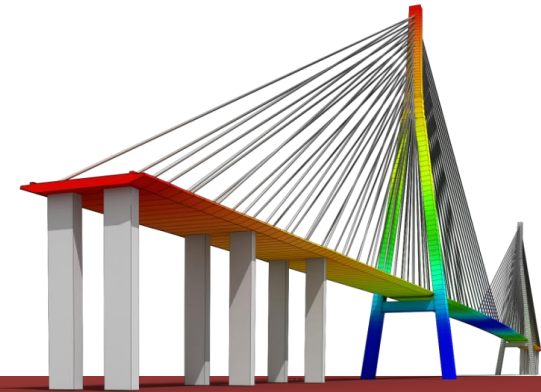


MIDAS *Technical
Material*

Tutorial

Steel Composite Bridge Analysis and Design
as per AS/NZS 5100.6:2017



Steel Composite Bridge

Overview

- Model and analyze a two span Steel Composite Bridge consisting of four girders Connected by bracings.
- The behavior of the bridge under static loads ,dynamic loads and moving loads are examined.
- Design of Steel Composite Girders as per AS/NZS 5100.6:2017 is also illustrated.

In this tutorial we will learn the following things:

- How to undertake modelling of Steel Composite Bridge using wizard.
- How to assign static loads in MIDAS CIVIL NX.
- How to define moving load as per New Zealand code in MIDAS CIVIL NX.
- How to define construction stages in MIDAS CIVIL NX.

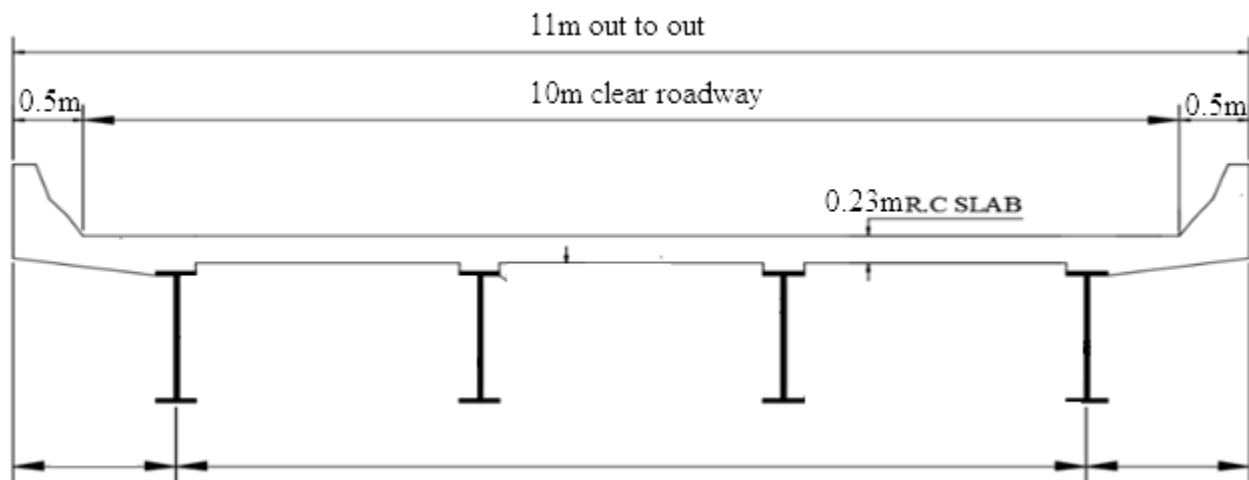
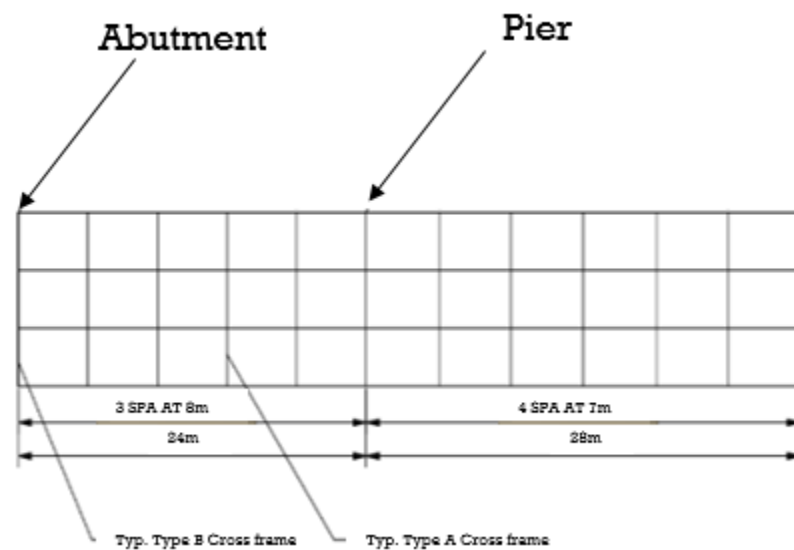
MIDAS CIVIL NX

2025 (v2.1)

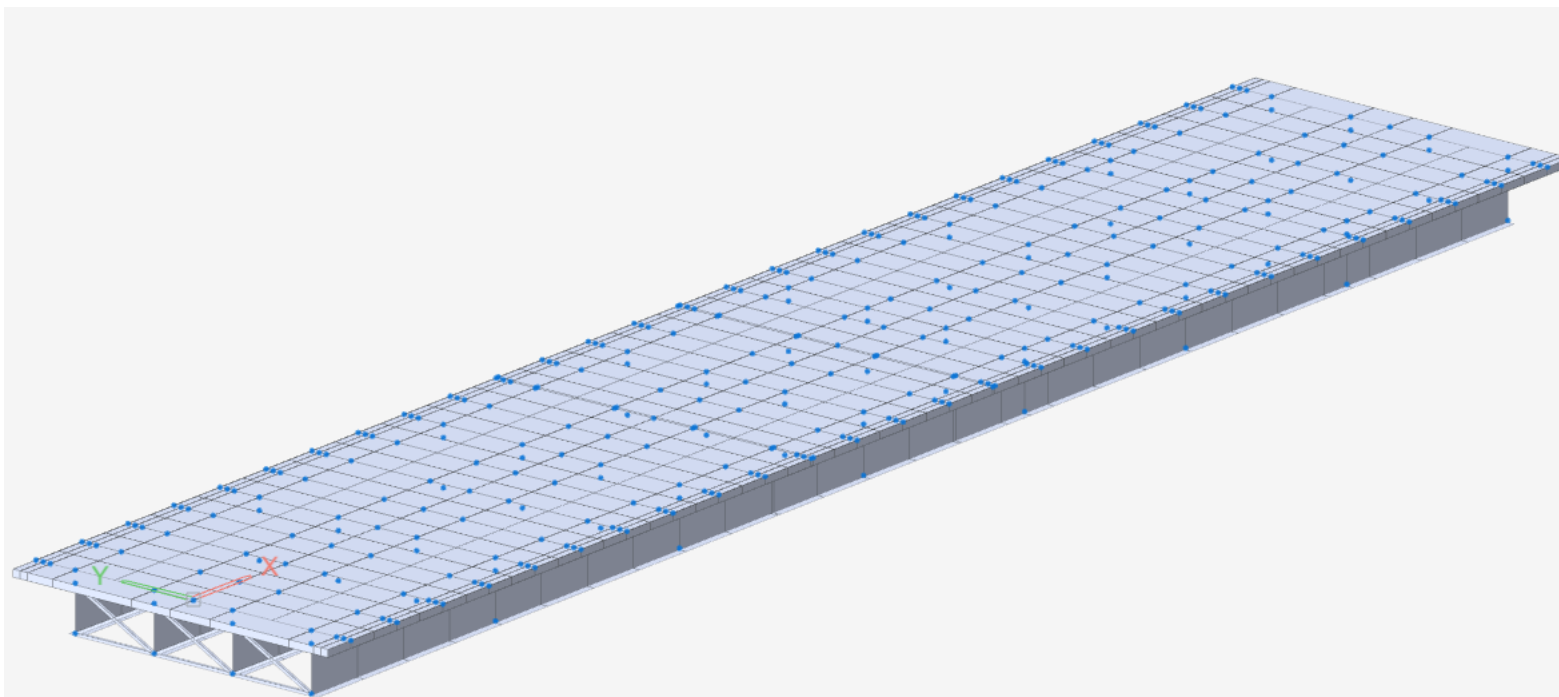
DATE

20/08/2025

Specifications of the Bridge



Specifications of the Bridge



- Bridge Type: Steel Composite Bridge
- Span Length: 24m and 28m
- Carriageway width: 11m
- Spacing of crossbeams: 8m and 7m

Pre Processing

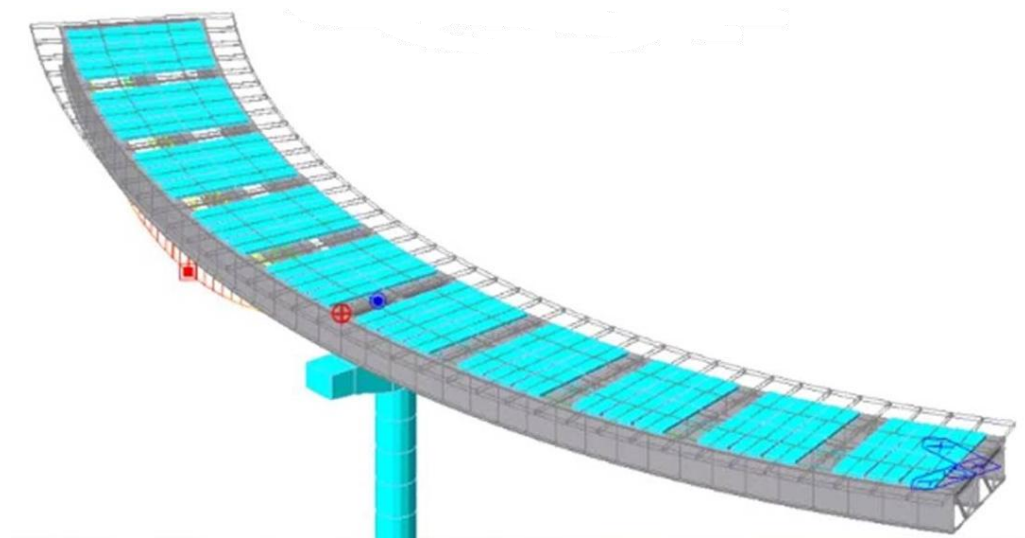
1. Definition of Properties
2. Define Layout- Composite girder wizard
3. Definition of Moving Load
4. Definition of Construction stages
5. Definition of Eigenvalue and Response Spectrum
6. Moving Load Analysis Option
7. Perform Analysis

Post processing-Analysis results

8. Reactions
9. Shear
10. Bending
11. Moving Load Influence Lines
12. Moving Load Tracer
13. Convert Moving Load into a Static Load

Composite Design

14. Load Combination Generation
15. Composite Design
16. Design Results

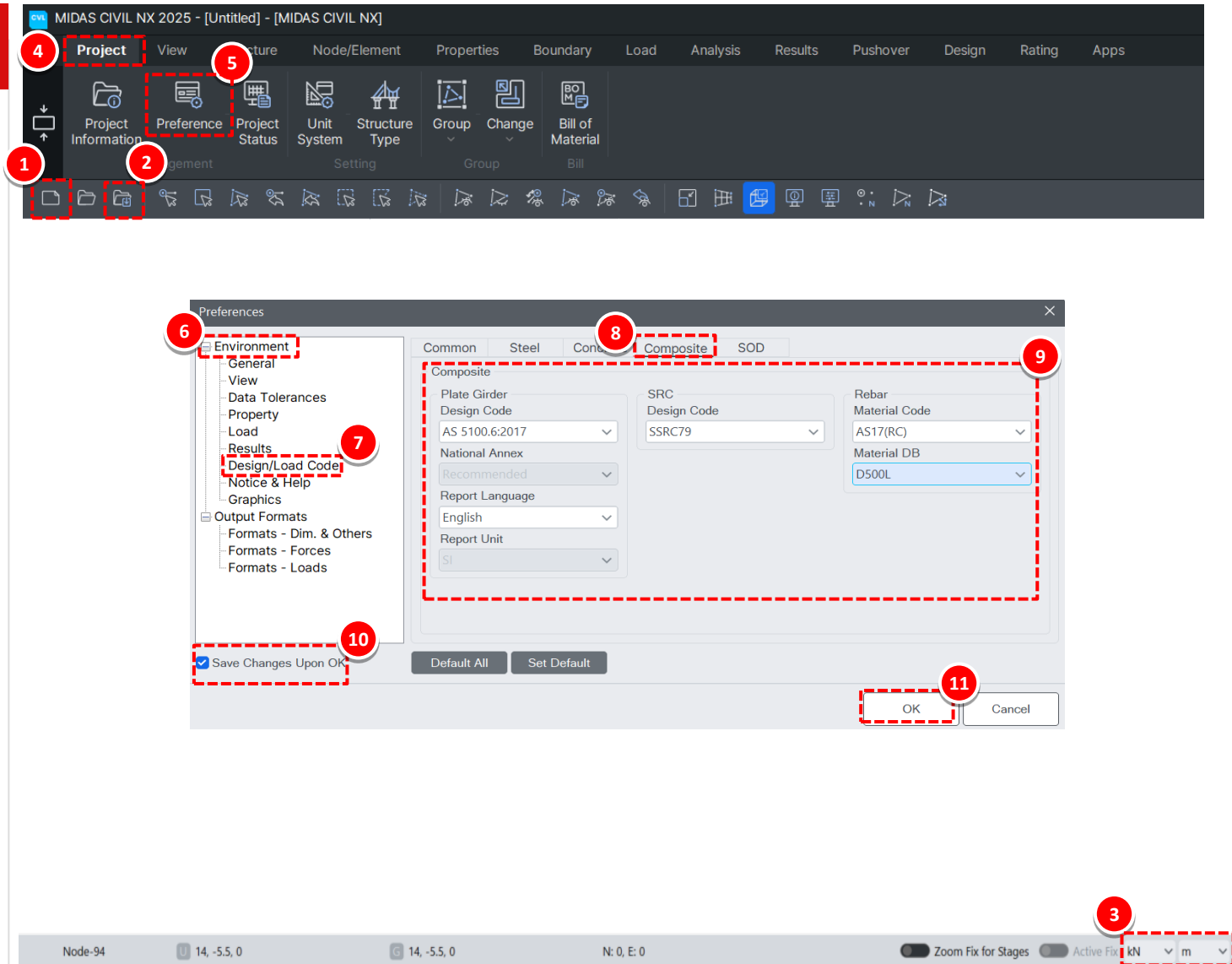


Model Generation – Unit & Preferences

Units and Preferences

1. **Open:** New File
2. **Save:** “Two Span Steel Composite Bridge”
3. Change the units to kN, m
4. **Click:** Project
5. **Click:** Preferences
6. **Click:** Environment
7. **Click:** Design Load Code
8. **Click:** Composite
9. **Change:** Design Codes as shown
 - Plate Girder: Design Code: **AS5100.6:2017**
 - Rebar: Material Code: **AS17 (RC)**
 - Material DB: **D500L**
10. **Check:** Save Changes Upon OK
11. **Click:** OK

If you are designing the concrete slab, bracing, piles, pier cap make changes under Steel, concrete as appropriate



Material Properties

1. Properties-> Material Properties

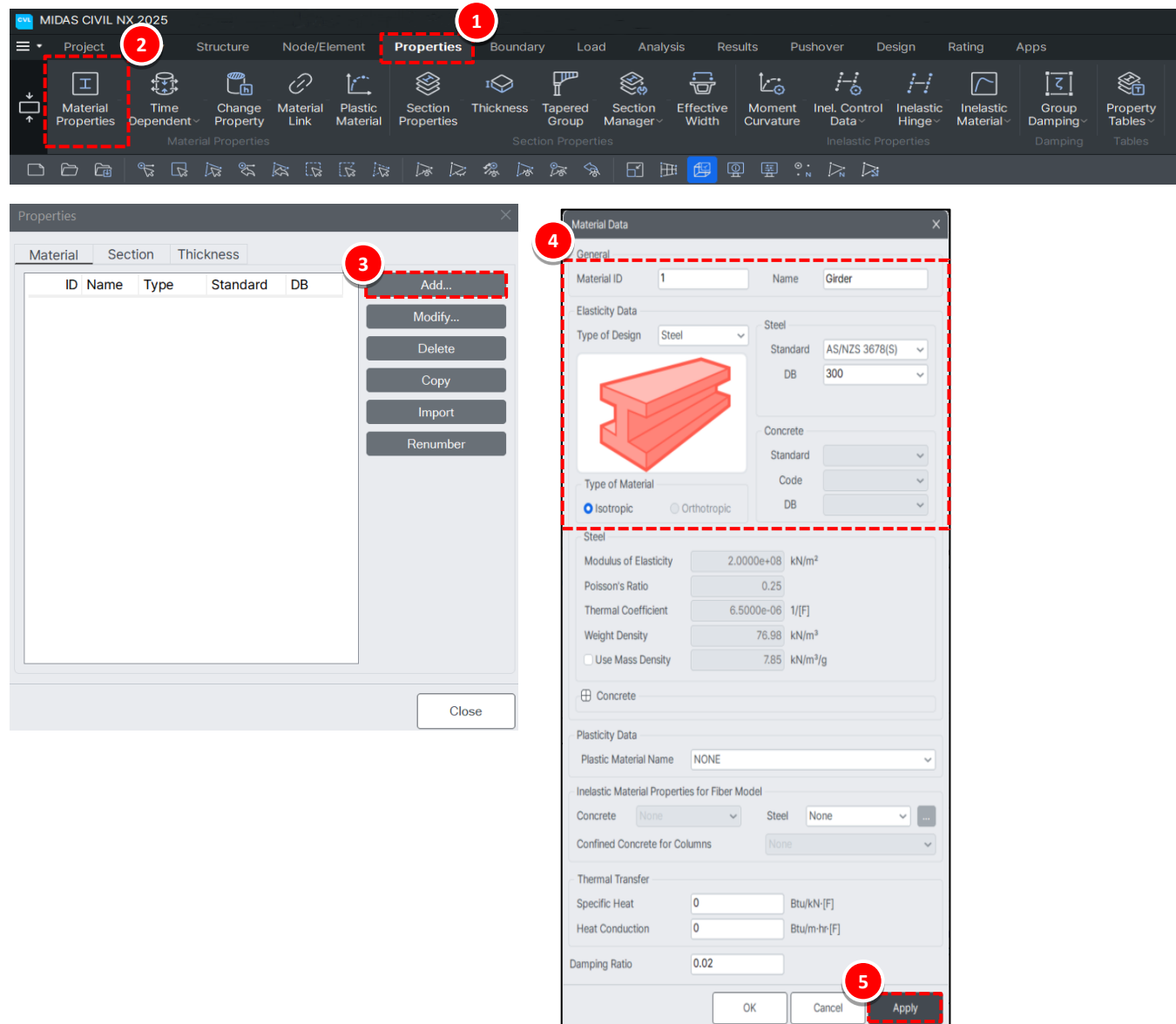
2. Click Add

3. Define Material Properties:

Name: **Girder**Type of Design: **Steel**Standard for steel: **AS/NZS 3678(S)**DB for steel: **300**Click: **Apply**Name: **Bracing**Type of Design: **Steel**Standard: **AS/NZS 3678(S)**DB: **250**Click **Apply**Name: **Deck**Type of Design: **Concrete**Standard: **AS17(RC)**DB: **C40**

4. Click : OK

5. Click : Close



Time-Dependent Material

1. Click: Properties → Time Dependent Property
2. Click: Creep/Shrinkage
3. Click: Add
4. Creep/Shrinkage Parameters
 - Name : C40
 - Code : NZ Bridge(SP/M/022 Amd 4:2022)
 - Compressive strength of concrete at the age of 28 days: 40000 kN/m²
 - Hypothetical Thickness : 1 m
 - Relative Humidity: 0.72
5. Click: Show Result
6. Check: Creep & Shrinkage Graphs
7. Click: Close
8. Click: OK

The screenshot illustrates the process of defining a time-dependent material property in MIDAS CIVIL NX 2025. The interface is divided into several panels and dialog boxes, with numbered steps indicating the sequence of actions.

Step 1: The 'Properties' menu is selected in the top toolbar.

Step 2: The 'Time Dependent' option is selected under the 'Properties' menu.

Step 3: The 'Add' button is clicked in the 'Time Dependent Material (Creep/Shrinkage)' dialog box.

Step 4: The 'Add/Modify Time Dependent Material (Creep / Shrinkage)' dialog box is shown, where the following parameters are entered:

- Name: C40
- Code: NZ Bridge(SP/M/022 Amd 4:2022)
- Compressive strength of concrete at the age of 28 days: 40000 kN/m²
- Relative Humidity Factor for Shrinkage (0.21*0.74): 0.72
- Hypothetical Thickness: 1 m
- Drying Basic Shrinkage Strain (10⁻⁶) (390~1100): 720 (Whangarei, Auckland Hunua, Hamilton)
- Age of concrete at the beginning of shrinkage: 3 day
- Modification factor for aggregate type (0.8~1.4): 1

Step 5: The 'Show Result' button is clicked.

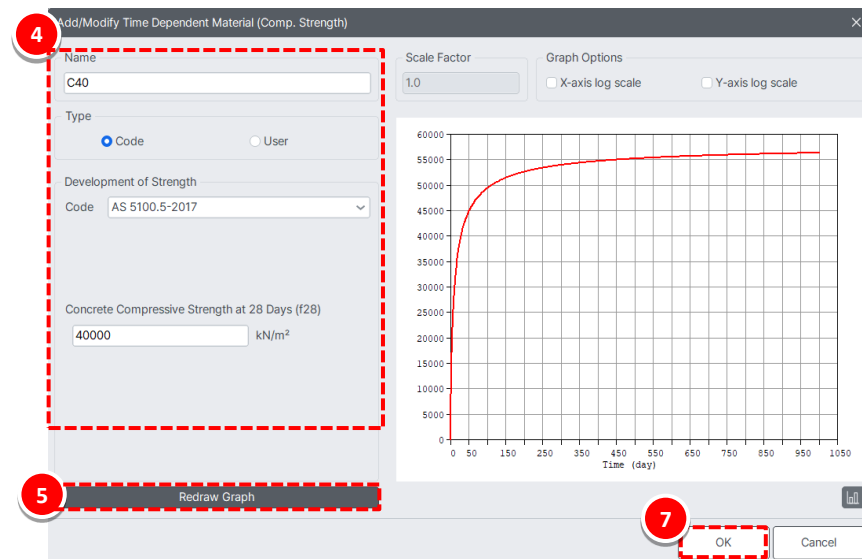
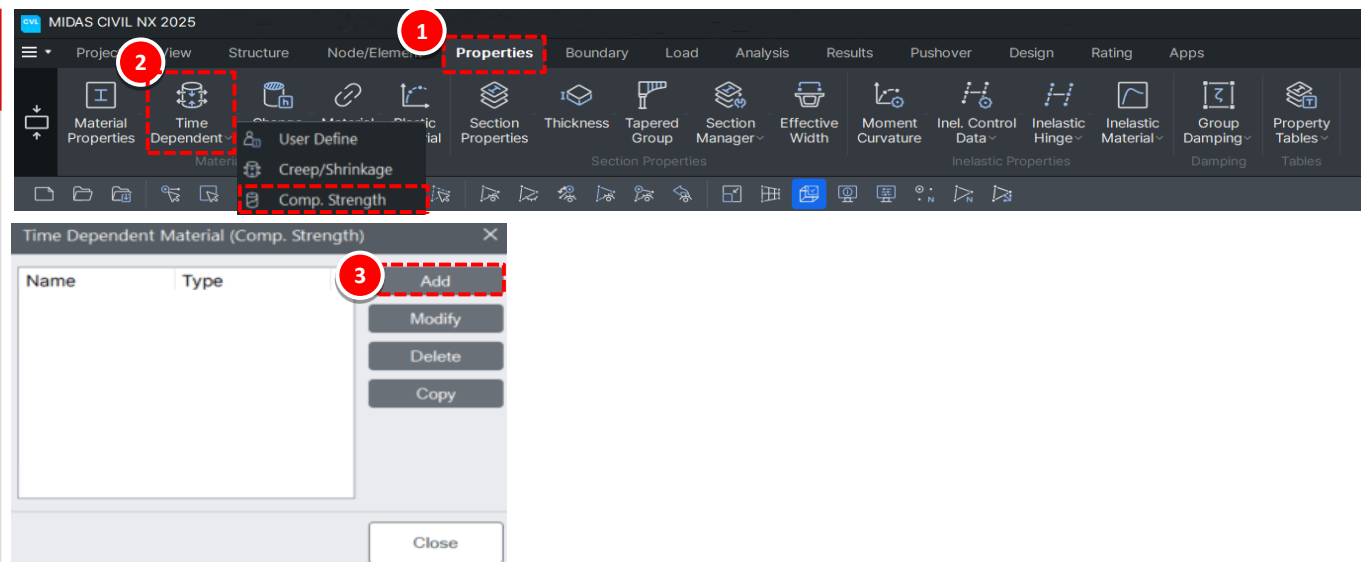
Step 6: The 'Show Time Dependent Material Function' dialog box is shown, displaying a graph of the creep coefficient over time. The graph shows a curve starting at 0 and increasing towards 2.4. The X-axis is labeled 'Time (day)' and ranges from 0 to 10000. The Y-axis is labeled 'Creep Coefficient' and ranges from 0 to 2.4.

Step 7: The 'Close' button is clicked in the 'Show Time Dependent Material Function' dialog box.

Step 8: The 'OK' button is clicked in the 'Add/Modify Time Dependent Material (Creep / Shrinkage)' dialog box.

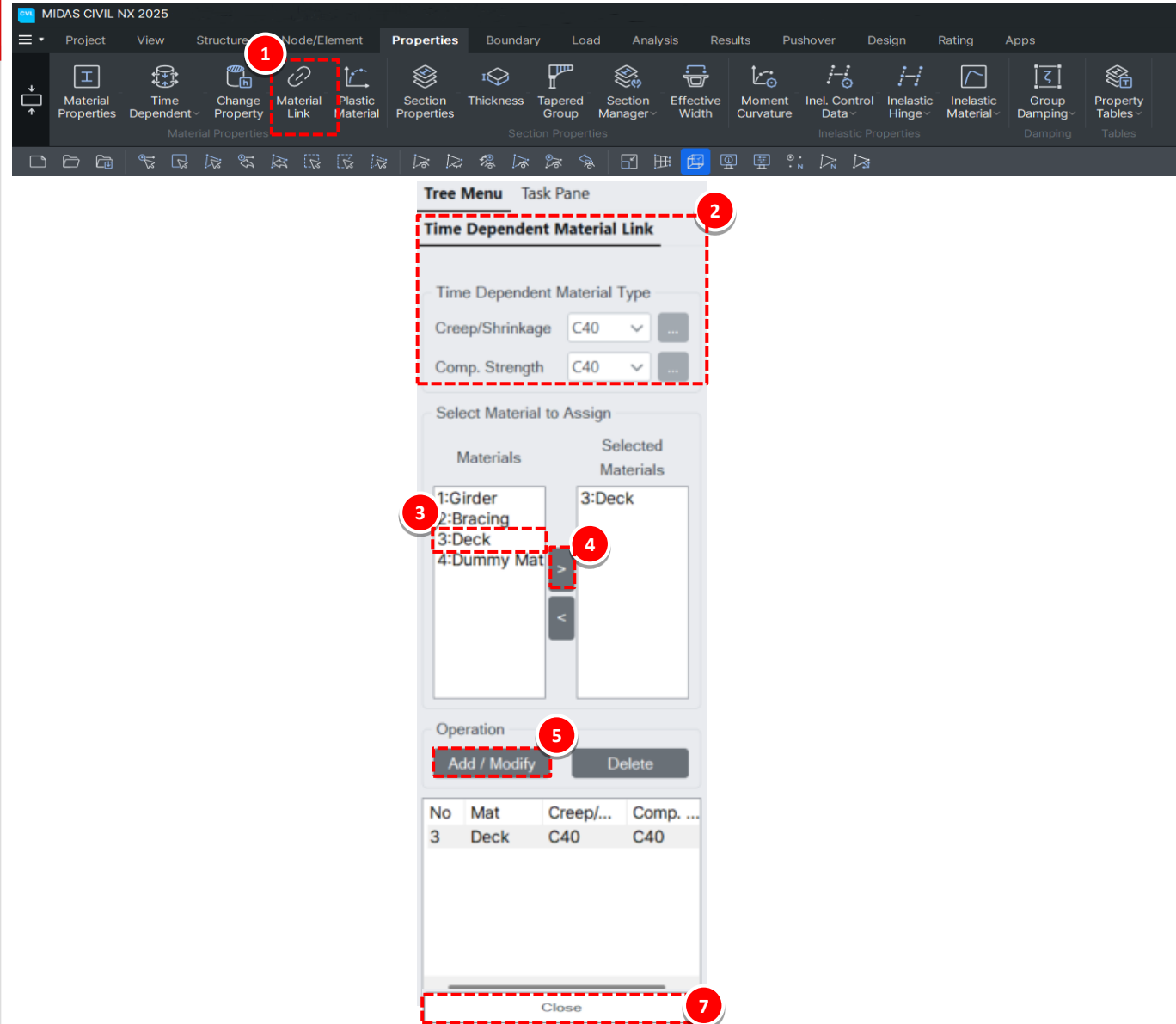
Time-Dependent Material

1. Click: Properties
2. Click: Comp. Strength
3. Click: Add
4. Comp. Strength Parameters
 - Name : C40
 - Type: Code
 - Code : AS 5100.5-2017
 - f28: 40000 kN/m²
5. Click: Redraw Graph
6. Check: Comp. Strength Graph
7. Click: OK



Time Dependent Material Link

1. **Properties-> Material Link**
2. **Time-Dependent Material Type**
 - Creep/Shrinkage: **C40**
 - Comp. Strength: **C40**
3. **Select: Deck**
4. **Click: Right Arrow**
5. **Click: Add/Modify**
6. **Click: Close**



Section Properties

1. Properties-> Section Properties

2. Add

3. Choose the Composite tab:

4. Section ID: 1

➤ Name: **Composite I Girder**➤ Section Type: **Steel – I (Type1)**

➤ Slab:

Bc: **2.75m**tc: **0.23m**Hh: **0.075m**

➤ Girder:

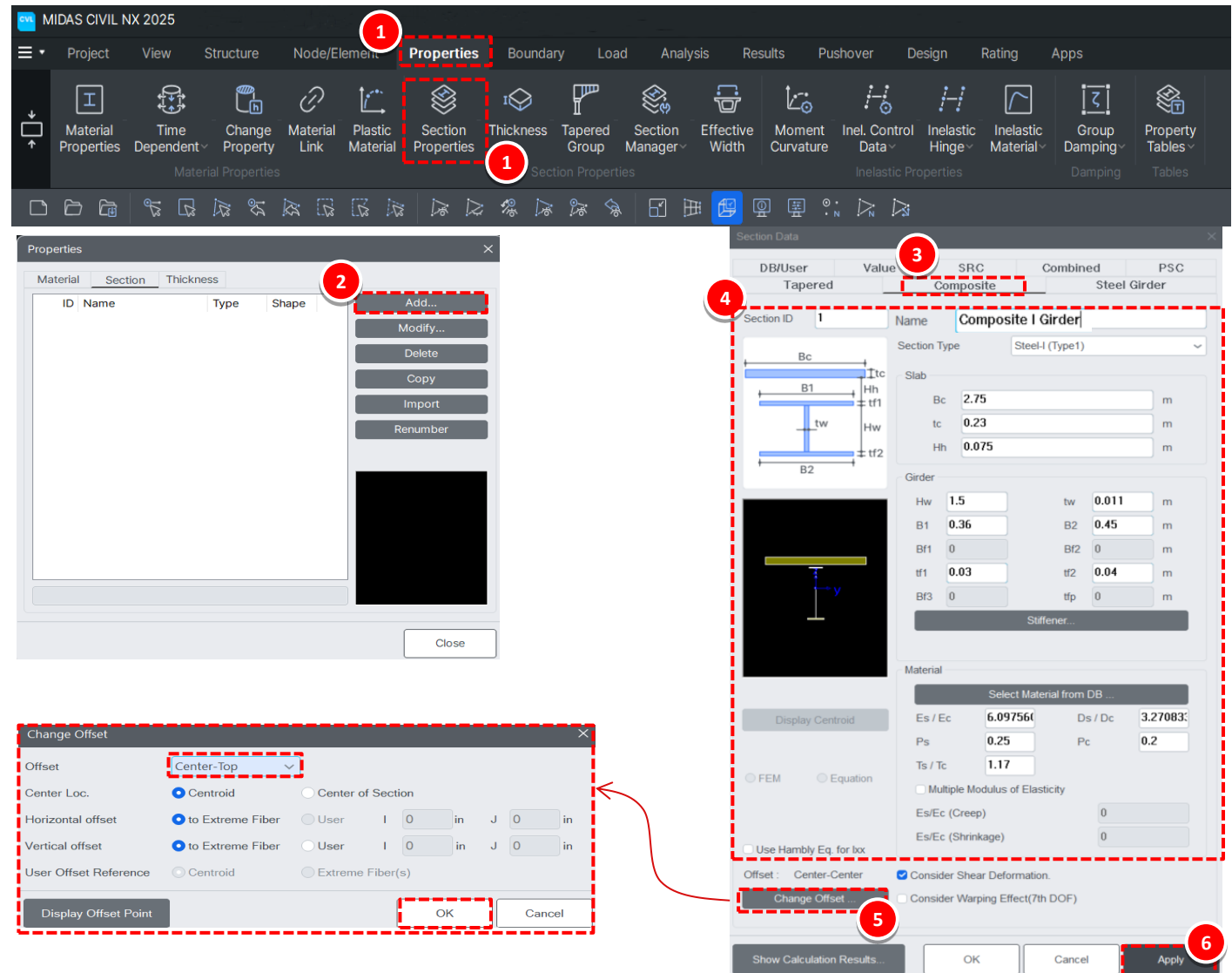
Hw: **1.5m** tw: **0.011m**B1: **0.36m** B2: **0.45m**tf1: **0.03m** tf2: **0.04m**

➤ Material:

Concrete: **AS17(RC)**Name: **C40**Steel: **AS/NZ 3678(S)**Name: **300**

5. Offset : Centre-Top

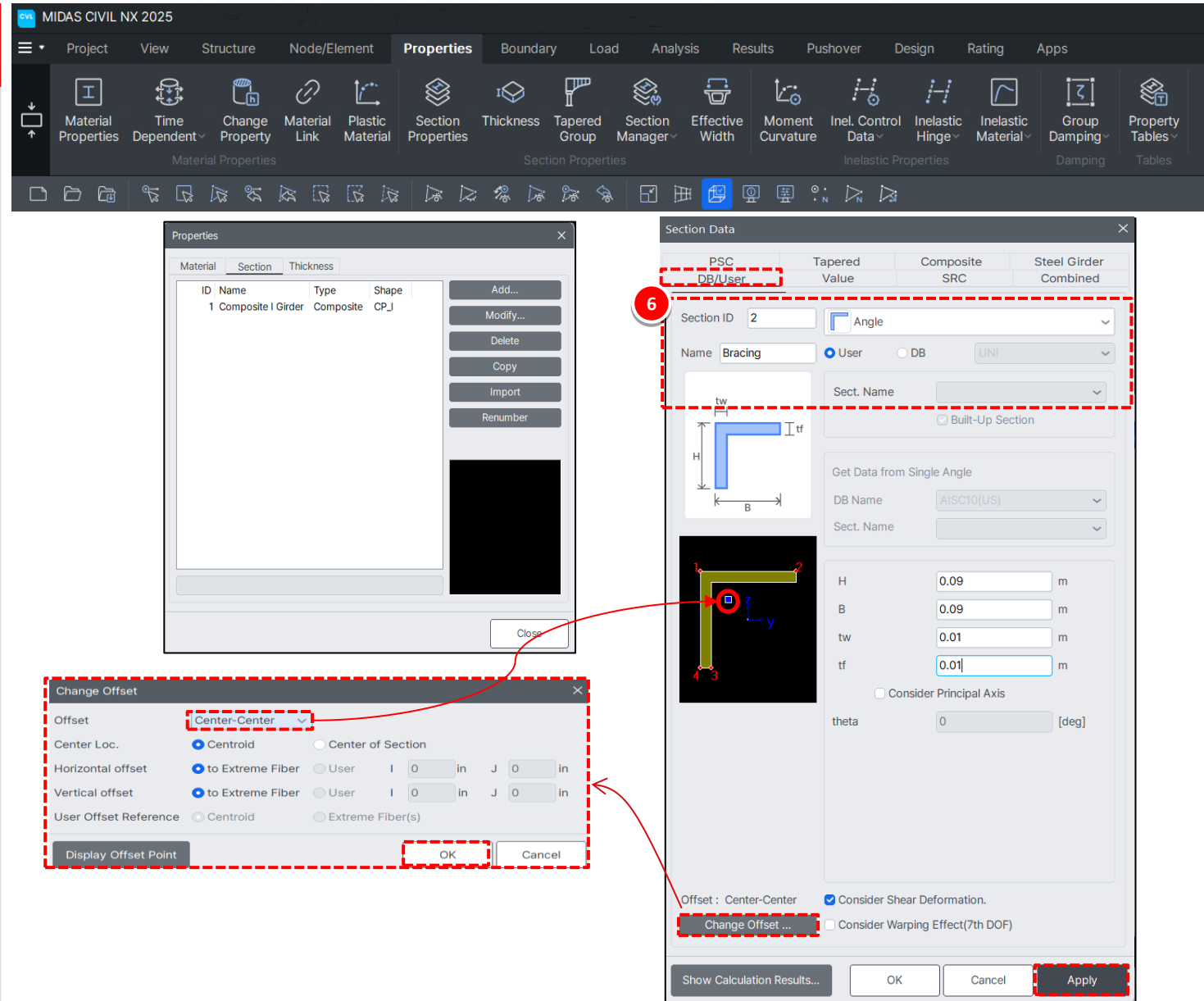
6. Click : Apply



Section Properties

6. Section ID: 2

- Shape: **Angle**
- Name: **Bracing**
- Check: **User**
- Sect. Properties:

H: **0.09m**B: **0.09m**tw: **0.01m**tf: **0.01m****Change offset** : Centre - Centre**Click**: Apply

Section Properties

7. Section ID: 3

➤ Shape: T – Section

➤ Name: T-section

➤ Check: User

➤ Sect. Properties:

H: 0.267m

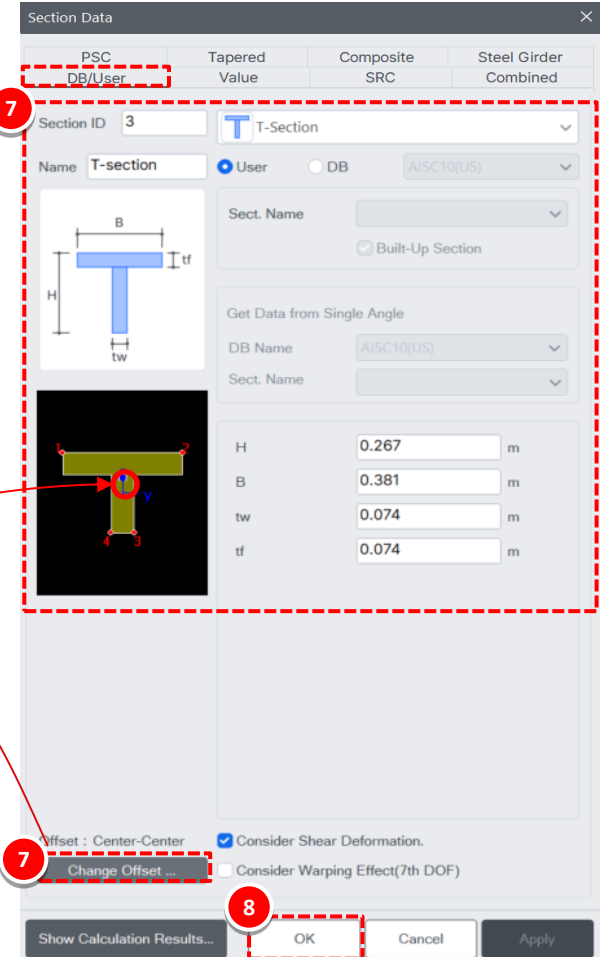
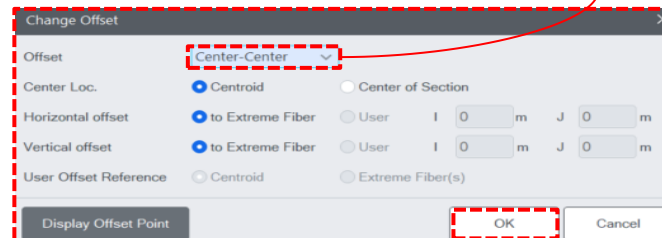
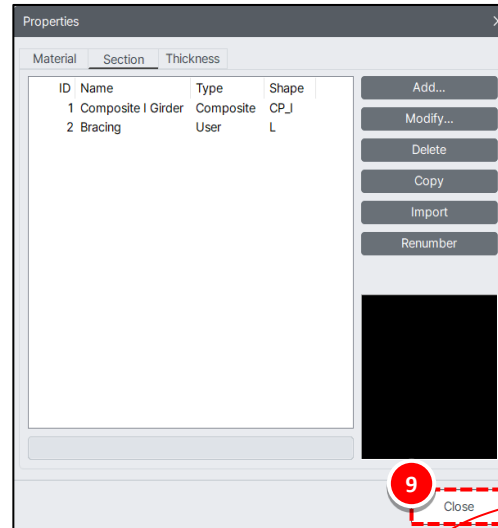
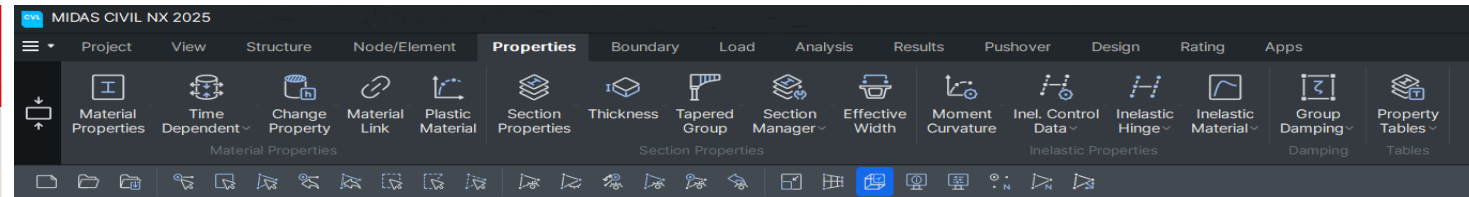
B: 0.381m

tw: 0.074m

tf: 0.074m

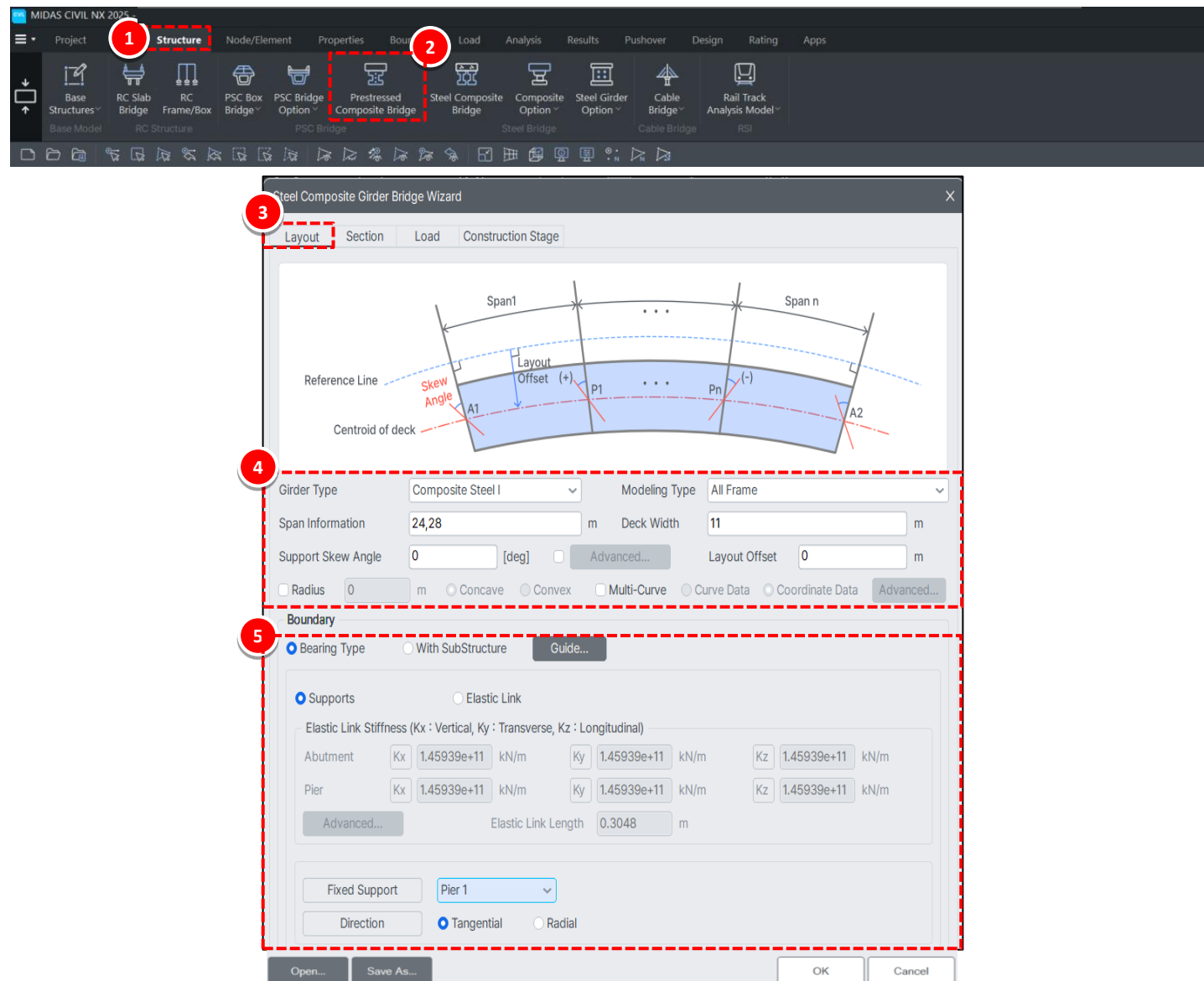
8. Click: OK

9. Click : Close



Layout Tab

1. **Click:** Structure
2. **Click:** Prestressed Composite Bridge
3. **Click:** Layout
4. **Enter following**
 - Girder Type: **Composite Steel I**
 - Modelling Type: **All Frame**
 - Span Information: **24m,28m**
 - Deck Width: **11m**
 - Layout Offset: **0m**
 - Support Skew Angle: **0 deg**
5. **Boundary**
 - Check on: **Bearing Type**
 - Check on: **Supports**
 - Fixed support : **Pier 1**
 - Direction: **Tangential**



Section Tab

1. Click: Section
2. Deck Thickness: 0.23 m
3. Material
 - Deck: 3: Deck
 - Girder: 1: Girder
 - Diaphragm: 2: Bracing
4. Number of Girder: 4
5. Click: Apply
6. Girder Offsets
 - 1: -4.125 m
 - 2: -1.375 m
 - 3: 1.375 m
 - 4: 4.125 m
7. Enter: Distances & 2 m

MIDAS CIVIL NX 2025 -

Project View **Structure** Node/Element Properties Boundary Load Analysis Results Pushover Design Rating Apps

Base Structures RC Slab Bridge RC Frame/Box Bridge PSC Box Bridge PSC Bridge Option Prestressed Composite Bridge Steel Composite Bridge Composite Option Steel Girder Bridge Cable Bridge Rail Track Analysis Model

Base Model RC Structure PSC Bridge Steel Bridge Cable Bridge RSI

Steel Composite Girder Bridge Wizard

Layout **Section** Load Construction Stage

Deck Thickness 0.23 m

Haunch Height 0.0752 m

Material

Deck 3 3: Deck

Girder 1 1: Girder

Bracing 2 2: Bracing

Number of Girders 4

Apply Guide...

Girder No.	Girder Offset (m)
1	-4.125
2	-1.375
3	1.375
4	4.125

Transverse Deck Element

Spacing Distances 2 m

Angle type Perpendicular

Bracing Information

Bracing Details... Guide...

Spacing Divisions per Span Different Brace Spacing per Girder Different Support Bracing

Girder	Name	Divisions per Span	Angle Type	Angle
1~4	Type-A	3,4	Perpendicular	0

Support	Name	Angle Type
1	Type-B	
2	Type-A	Perpendicular
3	Type-B	

Girder Information

Girder 1 Girder 2 Girder 3 Girder 4

No. of Divisions 2 Apply Guide... Symmetry

No.	Name	Start (m)	End (m)
1	1:Composite I Girder	0	26
2	1:Composite I Girder	26	52

Copy Current Girder Data to Other Girders

Stringer

Section 7

Material 1 1: Girder

Define Girder Section...

Splice m

Generate 10th points elements

Open... Save As... OK Cancel

Section Tab

8. Bracing Details

- Name: **Type A**
- Type: **Bracing**
- Bracing Parameter:
- Element Type: **Truss**
- Uncheck: **Top**
- Brace: **Bracing**
- Type: **X Bracing**
- Bottom: **Bracing**
- Gap at top: **0.05 m**
- Gap at bottom: **0.05 m**

9. Click: Modify

10. ID: 2

- Name: **Type B**
- Type: **Bracing**
- Bracing Parameter:
- Check: **Top**
- Top: **T-Section**
- Gap at Top: **0.075**
- Gap at Bottom: **0.05 & Click Add**

MIDAS CIVIL NX 2025 -

Project View **Structure** Node/Element Properties Boundary Load Analysis Results Pushover Design Rating Apps

Base Structures RC Slab Bridge RC Frame/Box Bridge PSC Box Bridge PSC Bridge Option Prestressed Composite Bridge Steel Composite Bridge Composite Option Steel Girder Bridge Cable Bridge Rail Track Analysis Model

Base Model RC Structure PSC Bridge Steel Bridge Cable Bridge RSI

Steel Composite Girder Bridge Wizard

Layout Section Load Construction Stage

Deck Thickness: 0.23 m Number of Girders: 4 Apply Guide...

Haunch Height: 0.0762 m

Girder No.	Girder Offset (m)
1	-4.125
2	-1.375
3	1.375
4	4.125

Material

Deck: 3 3: Deck

Girder: 1 1: Girder

Bracing: 2 2: Bracing

Transverse Deck Element

Spacing: Distances 2 m Angle type: Perpendicular

Bracing Information

Bracing Details... Guide...

Spacing: Divisions per Span Different Brace Spacing per Girder Different Support Bracing

Girder	Name	Divisions per Span	Angle Type	Angle
1~4	Type B	3, 4	Perpendicular	0

Support	Name	Angle Type
1	Type-B	
2	Type-A	Perpendicular
3	Type-B	

Girder Information

Girder 1 Girder 2 Girder 3 Girder 4

No. of Divisions: 2 Apply Guide... Symmetry

No.	Name	Start (m)	End (m)
1	1: Composite I Girder	0	26
2	1: Composite I Girder	26	52

Copy Current Girder Data to Other Girders

Stringer

Section: 7

Material: 1 1: Girder

Define Girder Section...

Splice: m

Generate 10th points elements

Open... Save As... OK Cancel

Define Bracing Details

ID: 1 Name: Type-A

Type: ☒ Bracing ☐ Single Beam Guide...

Bracing Parameter

Element Type: ☒ Truss ☐ Beam

☐ Top

☒ Brace: 2: Bracing

Type: X Brace

☒ Bottom: 2: Bracing

Brace/Chord Location

Gap between Top Chord/Brace End & Top Girder Flange: 0.05 m

Gap between Bottom Chord/Brace End & Bottom Girder Flange: 0.05 m

Add Modify Delete

ID	Name
1	Type-A
2	Type-B

Close

Section Tab

11. Spacing: Divisions per span

Name : Type B

Divisions per span: 3,4

Angle Type: Perpendicular

12. Click: Different Support Bracing

Support 1 and 3: **Type B**Support 2: **Type A**

13. Select: Girder 1 tab

No. of divisions: 1

Click: Apply

14. Click: Copy to Current Girder Data
to Other Girders15. Uncheck: Generate 10th points
elements

MIDAS CIVIL NX 2025 -

Project View **Structure** Node/Element Properties Boundary Load Analysis Results Pushover Design Rating Apps

Base Structures RC Slab Bridge RC Frame/Box Bridge PSC Box Bridge PSC Bridge Option Prestressed Composite Bridge Steel Composite Bridge Composite Option Steel Girder Option Cable Bridge Rail Track Analysis Model

Base Model RC Structure PSC Bridge Steel Bridge Cable Bridge RSI

Steel Composite Girder Bridge Wizard

Layout Section Load Construction Stage

Deck Thickness 0.23 m Number of Girders 4 Apply Guide...

Haunch Height 0.0762 m

Girder No.	Girder Offset (m)
1	-4.125
2	-1.375
3	1.375
4	4.125

Material

Deck 3 3: Deck

Girder 1 1: Girder

Bracing 2 2: Bracing

Transverse Deck Element

Spacing Distances 2 m Angle type Perpendicular

Bracing Information

Bracing Details... Guide...

Spacing Divisions per Span Different Brace Spacing per Girder

Girder	Name	Divisions per Span	Angle Type	Angle
1~4	Type B	3, 4	Perpendicular	0

Different Support Bracing

Support	Name	Angle Type
1	Type-B	Perpendicular
2	Type-A	Perpendicular
3	Type-B	Perpendicular

Girder Information

Girder 1 Girder 2 Girder 3 Girder 4

No. of Divisions 1 Apply Guide... Symmetry

No.	Name	Start (m)	End (m)
1	1: Composite I Girder	0	52

Stringer

Section 7

Material 1 1: Girder

Define Girder Section...

Splice m

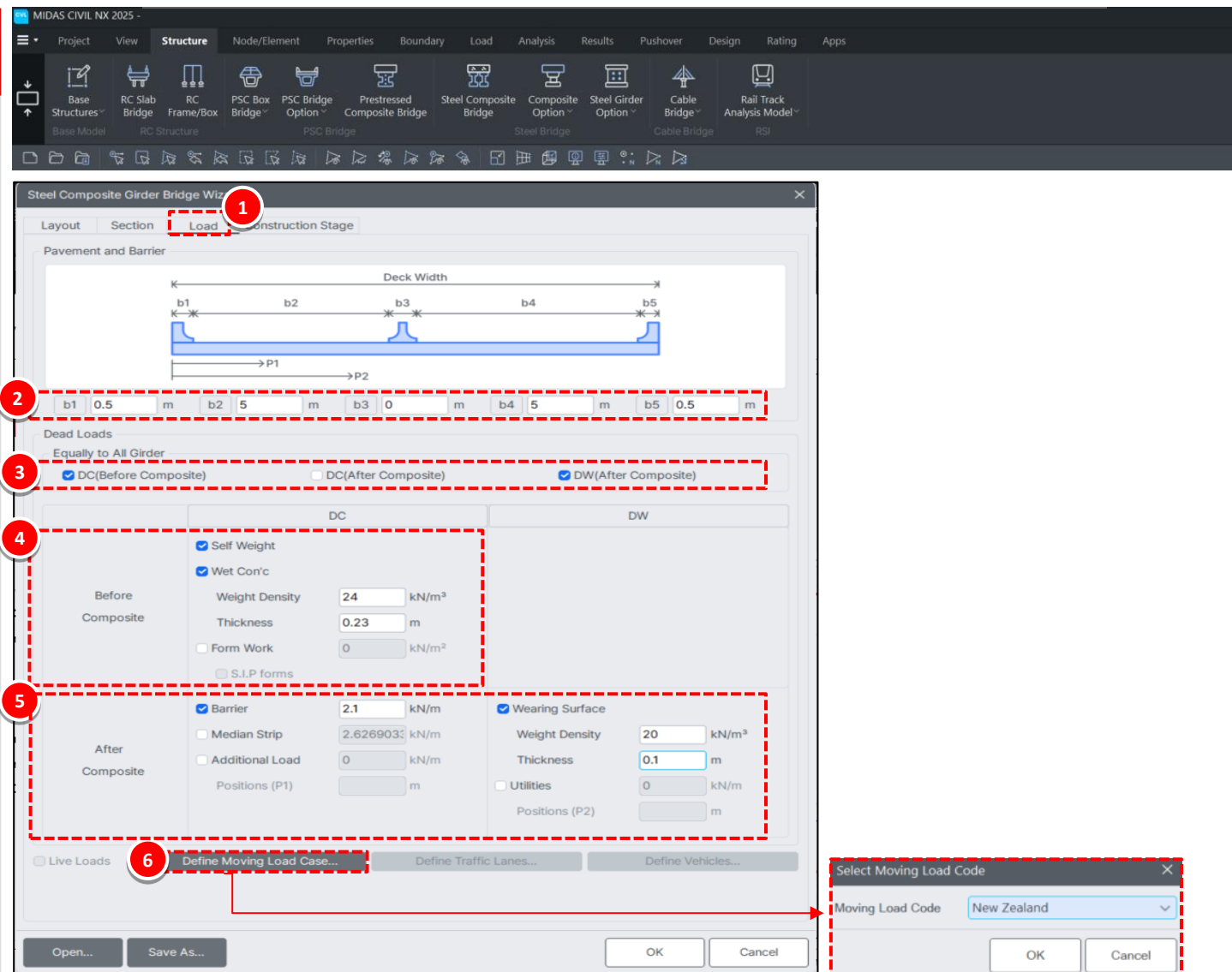
Generate 10th points elements

Copy Current Girder Data to Other Girders

Open... Save As... OK Cancel

Load Tab

1. Click: Load
2. Enter the widths
 - b1: 0.5 m ➤ b3: 0 m
 - b2: 5 m ➤ b4: 5 m
 - b5: 0.5 m
3. Check: DC (Before Composite)
DW (After Composite)
4. Loads Before Composite:
 - Check: Self Weight
 - Check: Wet Concrete
 - Weight Density: 24 kN/m³
 - Thickness: 0.23
5. Loads After Composite:
 - Check: Barrier
 - Barrier: 2.1 kN/m
 - Check: Wearing Surface
 - Weight Density: 20 kN/m³
 - Thickness: 0.1 m
6. Click: Define moving load case
Select: New Zealand



Load Tab

8. **Check:** Live Loads
9. **Click:** Define Traffic lanes
10. **Lane Data**
 - Number of lanes: **3**
 - D1: **2.165 m**
 - D2: **5.495 m**
 - D3: **8.83 m**
11. **Click:** OK
12. **Click:** Define Vehicles
13. **Click:** Add Standard
14. **Traffic Load:**
 - Vehicle Load type: **HN (normal)** loading
15. **Click:** OK
16. **Click:** Close

Define Traffic Lanes

Traffic Lanes

Diagram showing lane spacing: D1, D2, D3, and lane widths: W, P1, P2.

No.	Distance(m)
D1	2.165
D2	5.495
D3	8.83

No. of Lanes: 3

Define Standard Vehicular Load

Standard Name: Traffic Load

Vehicular Load Properties

Vehicular Load Name: HN (normal) loading

Vehicular Load Type: HN (normal) loading

Diagram showing load distribution: W, P1, P2, D1.

No	Load(kN)	Spacing(m)	W
1	120	5	10.5 kN/m
2	120	end	

Width: 0.5 m

Length: 0.2 m

Vehicles

Vehicle Name: Type

Buttons: Add Standard, Add User Defined, Modify, Delete

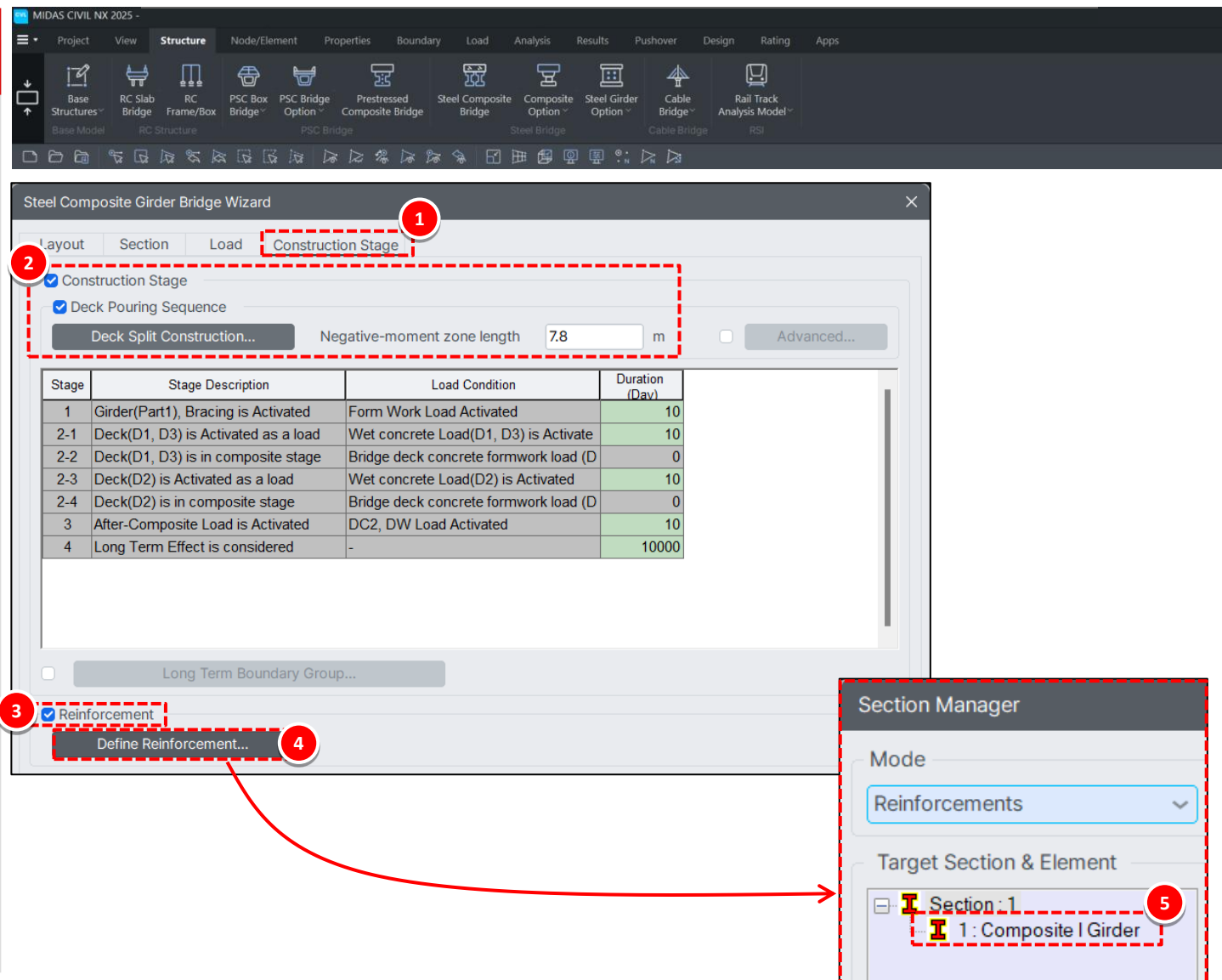
Buttons: Open, Save As, OK, Cancel

Buttons: OK, Cancel, Apply

Buttons: Close

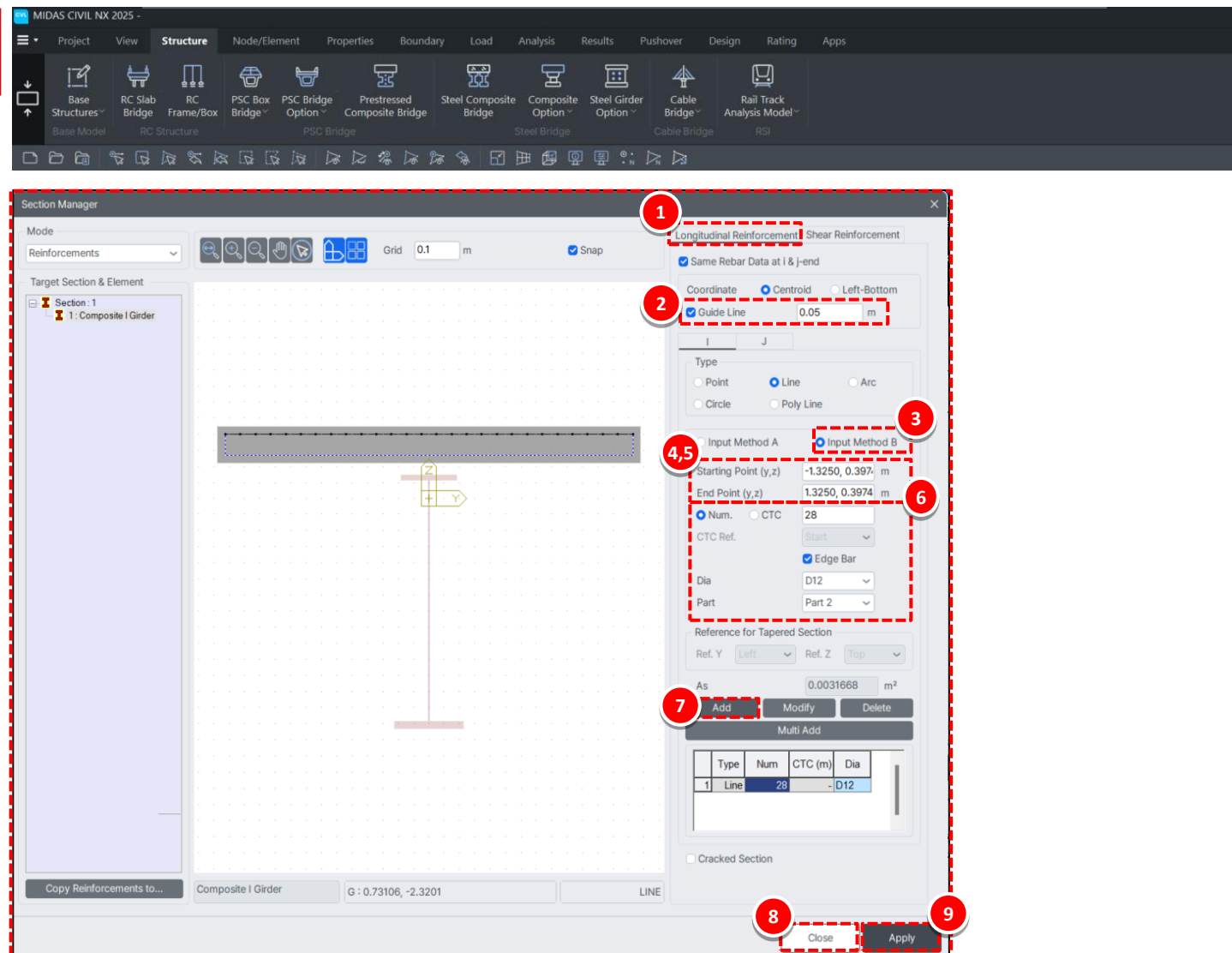
Construction Stage Tab

1. **Click:** Construction stage
2. **Check:** Construction Stage and Deck Pouring Sequence
Negative moment zone length: **7.8m**
3. **Check:** Reinforcement
4. **Click:** Define Reinforcement
5. **Click:** Composite I Girder
(It will display the section)



Construction Stage Tab

1. **Click:** Longitudinal reinforcement
2. **Check:** Guide line : 0.05 m
3. **Check:** Input Method B
4. **Starting point:** -1.3250, 0.39741
5. **End point:** 1.3250,0.39741
6. **Reinforcement at Girder Top:**
 - Num: 28
 - Check: **Edge Bar**
 - Dia: **D12**
 - Part: **Part 2**
- At Bottom Reinforcement**
 - **Start** : -1.325,0.26741
 - **End** : 1.325,0.26741
7. **Click:** Add
8. **Click:** Apply
9. **Click:** Close



Save As.. & Execute wizard

Save As.... The wizard file

Running the wizard

Run the wizard by clicking on **OK**

Steel Composite Girder Bridge Wizard

Layout Section Load **Construction Stage**

☒ Construction Stage

☒ Deck Pouring Sequence

Deck Split Construction... Negative-moment zone length m ☐ Advanced...

Stage	Stage Description	Load Condition	Duration (Day)
1	Girder(Part1), Bracing is Activated	Form Work Load Activated	10
2-1	Deck(D1, D3) is Activated as a load	Wet concrete Load(D1, D3) is Activated	10
2-2	Deck(D1, D3) is in composite stage	Bridge deck concrete formwork load (D1, D3) is p	0
2-3	Deck(D2) is Activated as a load	Wet concrete Load(D2) is Activated	10
2-4	Deck(D2) is in composite stage	Bridge deck concrete formwork load (D2) is passi	0
3	After-Composite Load is Activated	DC2, DW Load Activated	10
4	Long Term Effect is considered	-	10000

☐ Long Term Boundary Group...

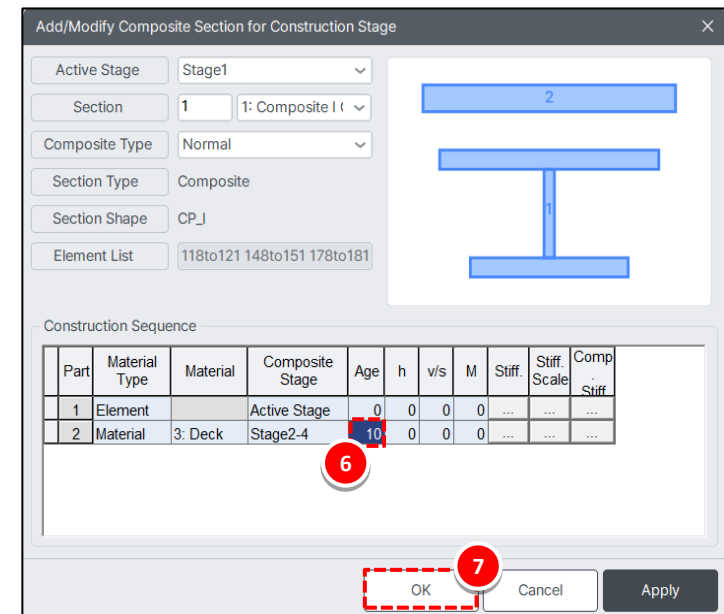
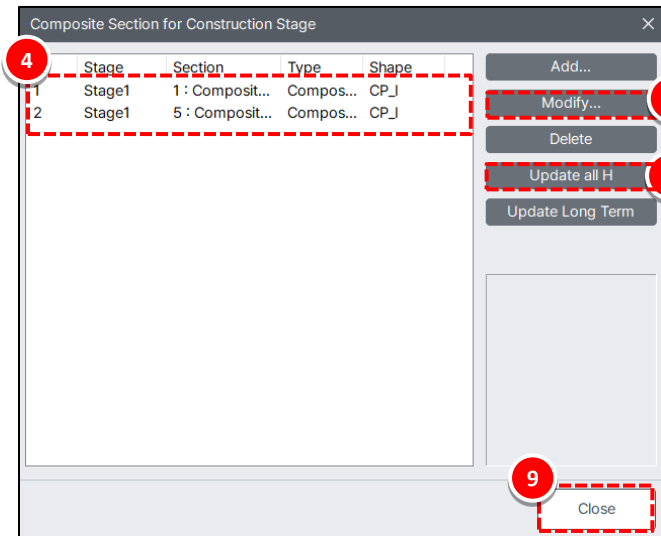
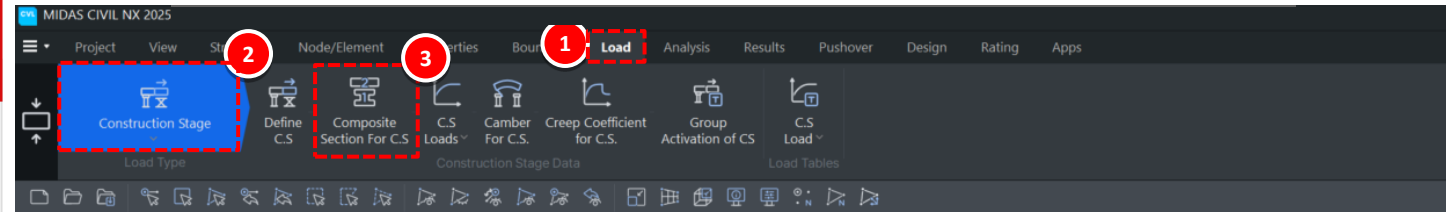
☒ Reinforcement

Define Reinforcement...

Open... **Save As...** **OK** Cancel

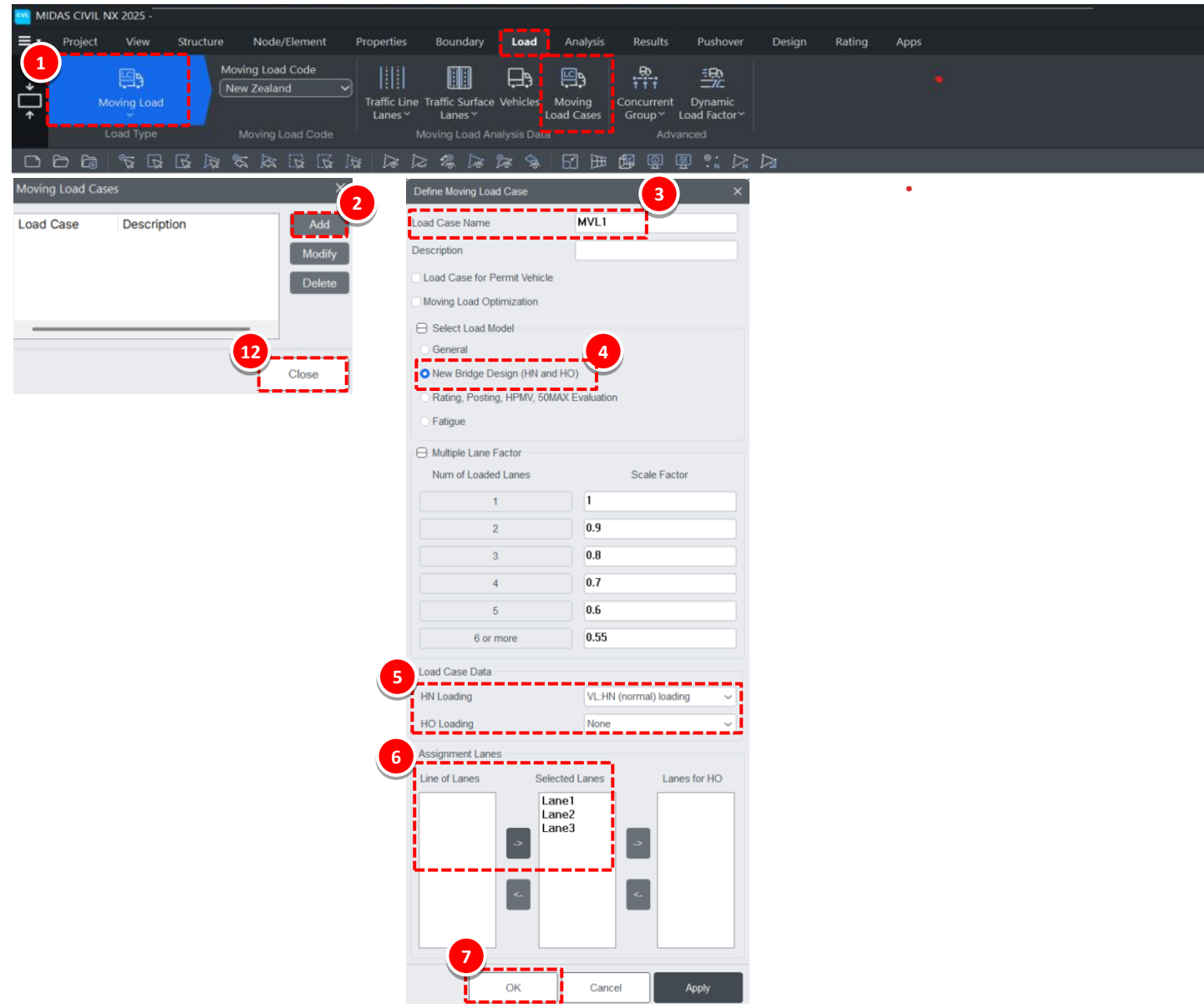
Composite Section for CS

1. Click: Load
2. Click: Construction Stage
3. Click: Composite Section For C.S.
4. Select: ID 1
5. Click: Modify
6. Modify
 - Part2 Age: 10 days
7. Click: OK
8. Click: Update all H
9. Click: OK and Close



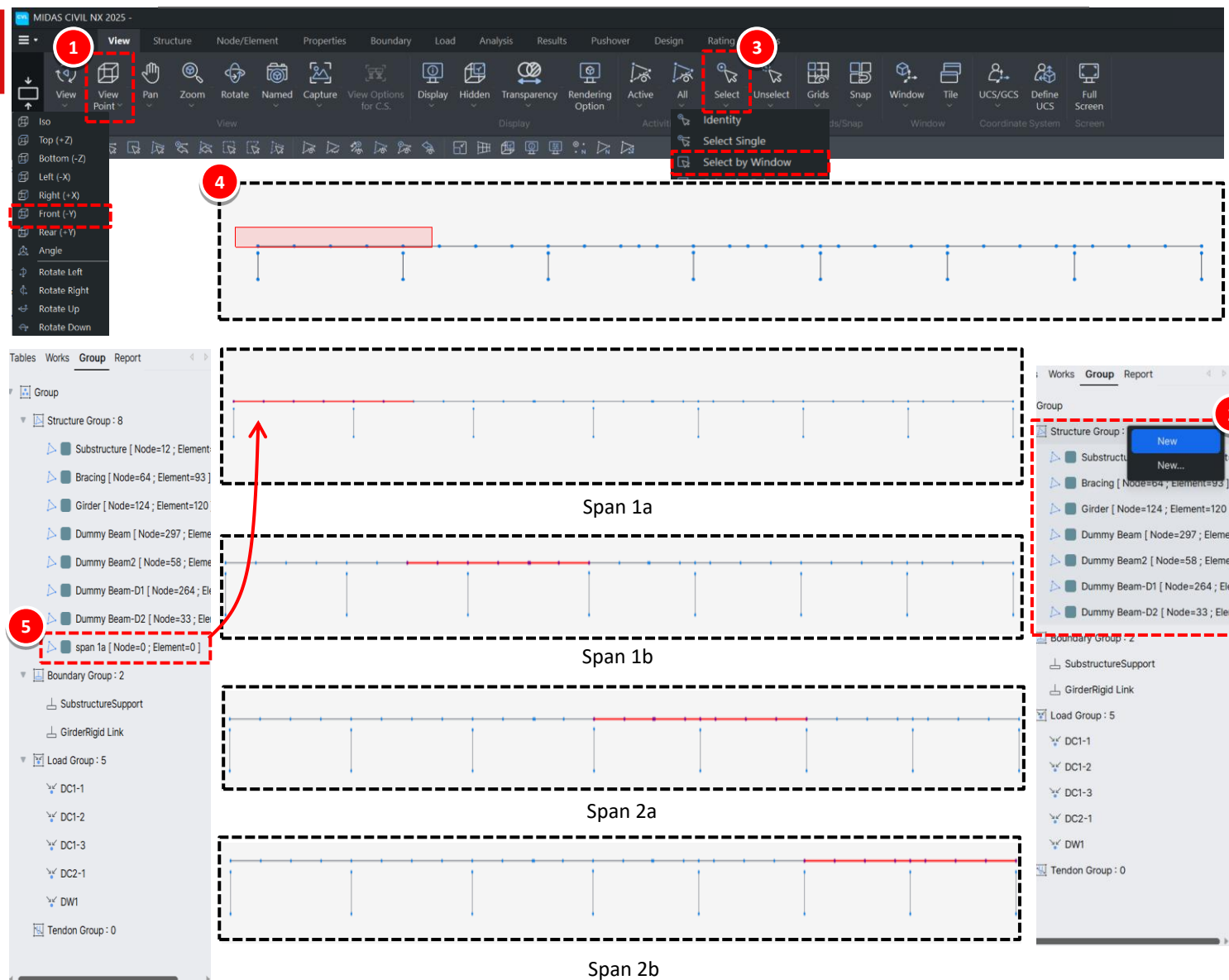
Moving Load Cases

1. Load > Moving Load > Moving Load Cases
2. Click: Add
3. Load Case Name: MVL1
4. Select: New Bridge Design (HN and HO)
5. Select vehicle under HN loading
6. Move all lanes to Selected Lanes side
7. Click: OK



Section Assignments

1. **Change:** Front View
2. **Click:** Group tab
 - Right click on Structure group
 - Click: New
 - Name: Span1a
 - Similarly create group & give name as Span1b, Span2a, Span2b
3. **Click :** Select Window
4. **Select the elements as shown (select from right to left)**
5. **Drag & Drop:** Span 1a
6. **Select for** Span1b, Span2a, Span2b as shown
7. **Repeat** step 5 for Span1b, Span2a, Span2b



Dynamic Load Factor

1. Load > Moving Load >

2. Click: Dynamic Load Factor

3. Check: SG:Span1a

4. Under Auto Calculation

➤ Span Length : 24 m

➤ Average Span Length : 24 m

5. Click: Add

6. Repeat the same for

Span 1b

➤ Check : SG:Span1b

➤ Span Length : 24 m

➤ Average Span Length : 26 m

Span 2a

➤ Check : SG:Span2a

➤ Span Length : 28 m

➤ Average Span Length : 26 m

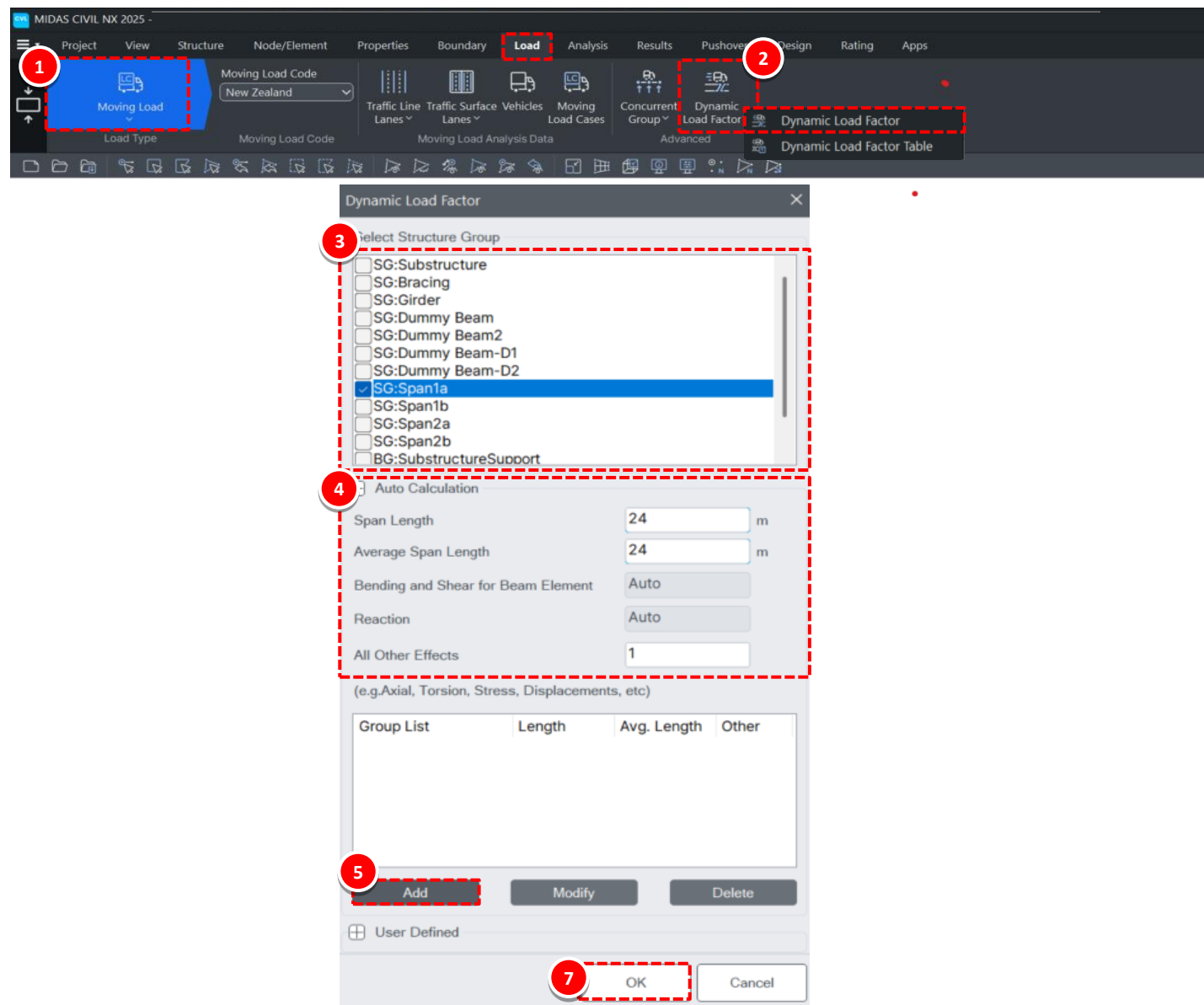
Span 2b

➤ Check : SG:Span2b

➤ Span Length : 28 m

➤ Average Span Length : 28 m

7. Click: OK



Response Spectrum

1. **Apps** → Connect
2. **Click:** Plugins
3. **Search:** [NZS1170.5:2004] Response Spectrum Generator
4. **Click:** Run
5. **Under Response Spectrum Generator**
 - Function Name : **RS 01**
 - Design Spectrum : **NZS1170.5(2004)**
6. **Under Seismic Data**
 - Site SubSoil Class : **A**
 - Return Period Factor : **1.3**
 - Hazard Factor : **0.08**
 - Dist. from nearest major fault : **2 km**
 - Design Ductility Factor : **1.5**
7. **Maximum Period** : 6 seconds
8. **Click:** Update

MIDAS CIVIL NX 2025

Project View Structure Node/Element Properties Boundary Load Analysis Results **Apps** (1) (2)

MCT Command Shell MCT General Section Designer Sectional Property Calculator Tendon Profile Generator Dynamic Report Seismic Data DXF Text Editor Graphic Editor API Settings (1) (2) Connect Plug-in API

Marketplace

Search: 1.5:2004[Response Spectrum Generator]

Rigid Link Generator NX 2025 (v2.1)
Easy Capture Generator NX 2024 (v1.1)
Group File NX 2024 (v1.1)
Alignment Generator NX 2024 (v1.1)
Local Axis NX 2024 (v1.1)
Customized Load Combinations NX 2025 (v1.1)
Wind Load Calculator for bridges (HK) NX 2025 (v1.1)
[NZS1170.5:2004]Response Spectrum Generator NX 2024 (v1.1) (3)
Caltrans Report Generator

[NZS1170.5:2004]Response Spectrum Generator

midas_official@midasit.com
1.1.0
Run (4)

Created at 2024-12-17
Created in NX 2024 (v1.1)

[NZS1170.5:2004]Response Spectrum Generator

This plugin generates Design Response Spectrum Data based on the national code.

Response Spectrum Generator

Function Name: RS 01 (5)

Design Spectrum: NZS 1170.5 (2004)

Seismic Data (6)

Site Sub Soil Class: A (radio button selected)

Return Period Factor (R): 1.3

Hazard Factor (Z): 0.08

Distance From Nearest Major Fault (km): 2.0

Design Ductility Factor: 1.5

Maximum Period (sec): 6.0 (7)

Preview Design Spectrum

Spectral Data

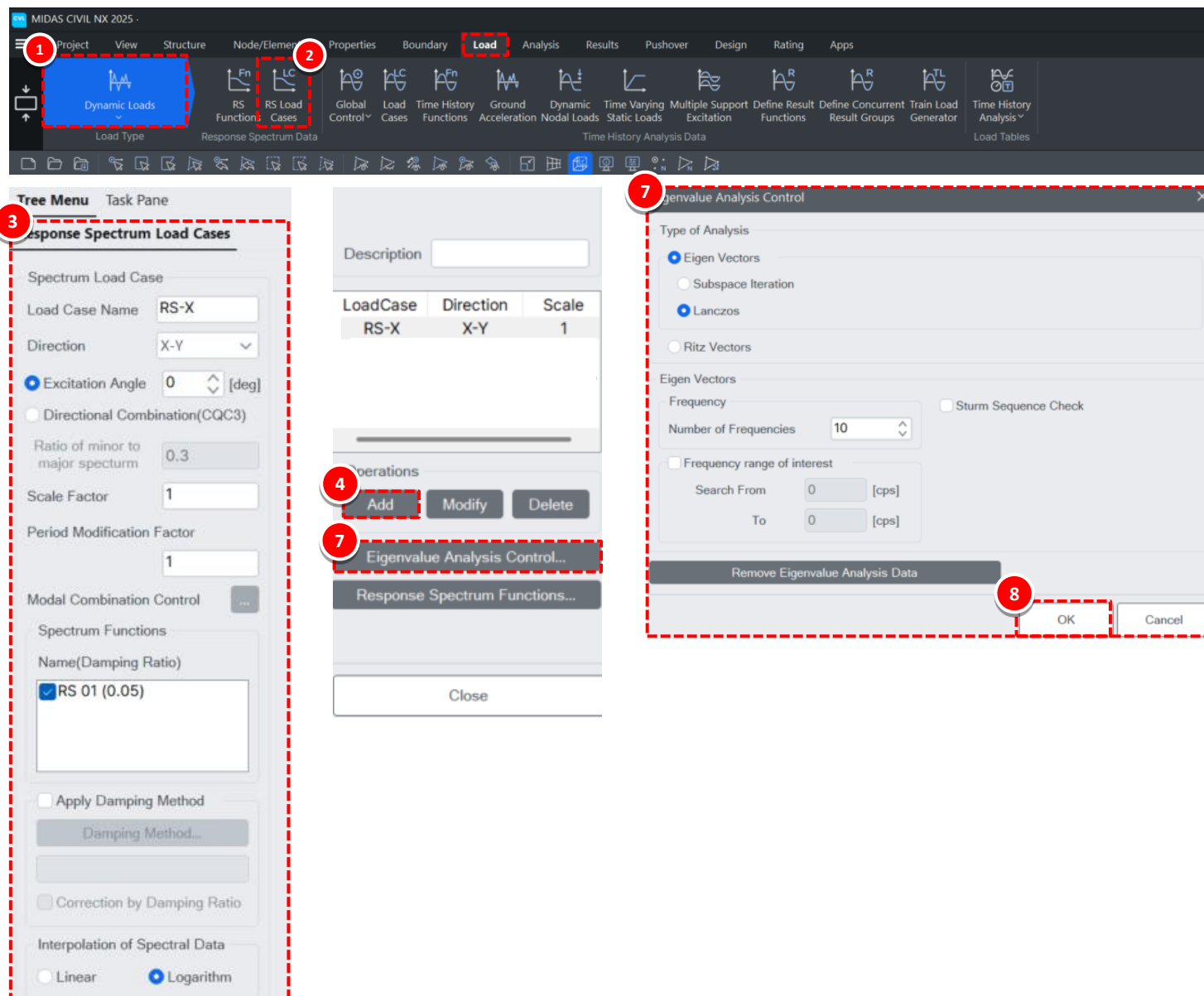
Period (sec)

Update (8)

Response Spectrum Definition

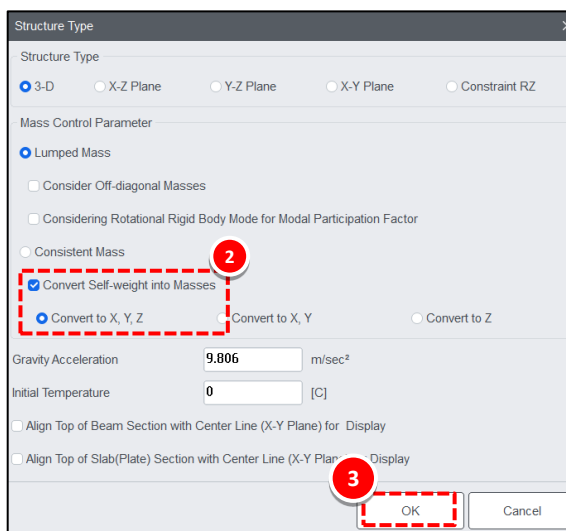
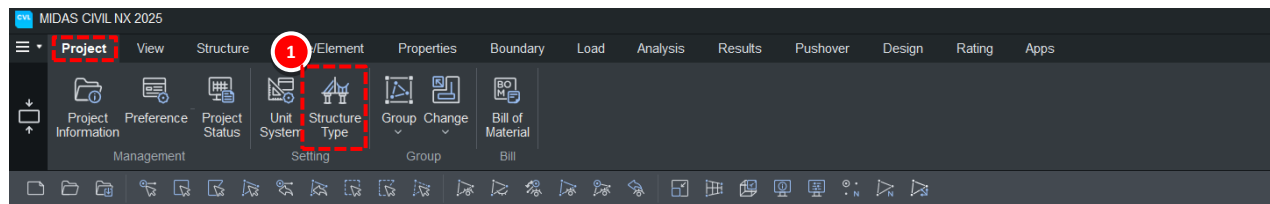
Response Spectrum

1. Click: Load>Dynamic Loads
2. Click: RS Load Cases
3. Under Response Spectrum
 - Load cases Tab
 - Load Case Name : RS-X
 - Direction : X-Y
 - Scale Factor : 1
 - Period Modification Factor : 1
 - Check : RS 01 (0.05)
4. Click : Add
5. Repeat the same for load case : RS-Y
6. Repeat the same for load case : RS-Z
 - Direction : Z
 - Scale Factor : 0.67
7. Click: Eigen Value Control Data
 - Type of Analysis: Eigen vectors
→ Lanczos
 - Number of frequencies : 10
8. Click : OK



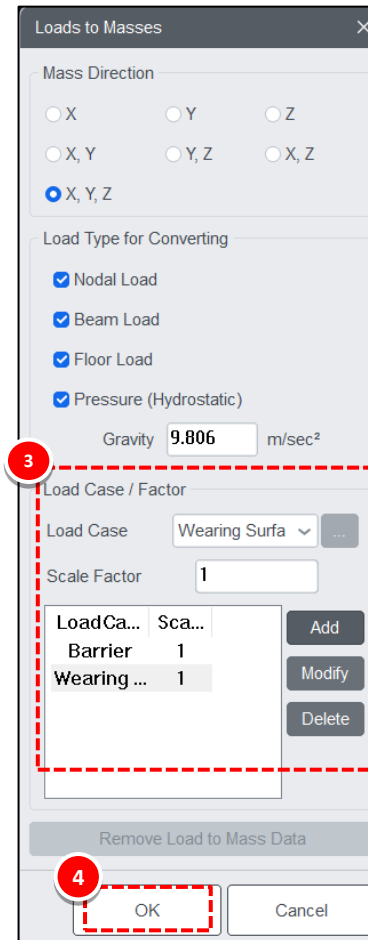
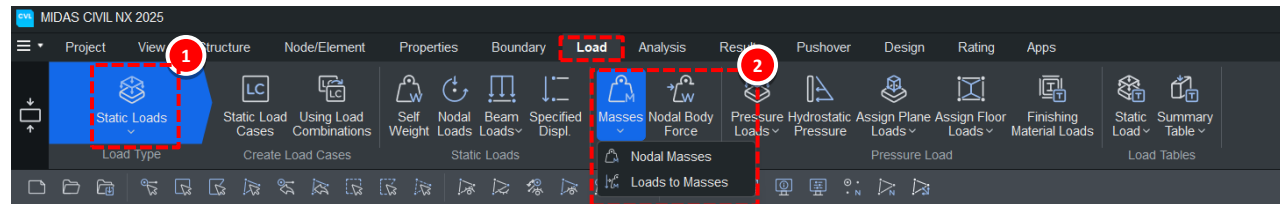
Self-weight to Masses

1. **Click:** Project > Structure Type
2. **Select:** Convert Self-weight into Masses > Convert to X, Y, Z
3. **Click:** OK



Element/Nodal Loads to Masses

1. **Click:** Load > Static Loads
 2. **Click:** Masses > Loads to Masses
 3. **Select:** Load Case: Barrier and click Add
- Similarly, add Wearing Surface load
4. **Click:** OK



Load Combinations

1. Click: Results>Load Combination
2. Click: Composite Steel Girder Design tab
3. Click: Auto Generation
4. Design Code: AS 5100.2:2017
5. Select: Both
6. Click: OK
7. Click: Close

Load Combinations

General | Steel Design | Concrete Design | SRC Design | **Composite Steel Girder Design**

Load Combination List

No	Name	Active	Type	Description
+				

Load Cases and Factors

LoadCase	Factor
+	

Copy | **Auto Generation...** | Spread Sheet Form | Import... | Export... | **Close**

Automatic Generation of Load Combinations

Option: ☒ Add ☐ Replace

Code Selection: ☐ Steel ☐ Concrete ☐ SRC ☒ Steel Composite

Design Code: AS 5100.2:17

Manipulation of Construction Stage Load Case: ☐ ST Only ☐ CS Only ☒ ST+CS

ST : Static Load Case CS : Construction Stage

Bridge Type: Roadway

☐ Load Factors for Permanent Loads

Type of Load	Load Factor		
	R.S	I.S	Both
Dead Load	☐ 1.20	☐ 0.85	☒
Superimposed Dead Load	☐ 2.00	☐ 0.80	☒
Soil Load	☐ 1.50	☐ 0.70	☒
Groundwater Load	☐ 1.00	☐ 1.00	☒

R.S : Reduce Safety
I.S : Increase Safety

Fatigue Load Combination: Road Traffic Case: MVL1

Load Case: Add Delete

OK Cancel

Moving Load Analysis Control

Moving Load Analysis Control

Moving Load Analysis option

1. Go to Analysis → Moving Load
2. Select Normal + Concurrent Force/Stress
2. Click OK

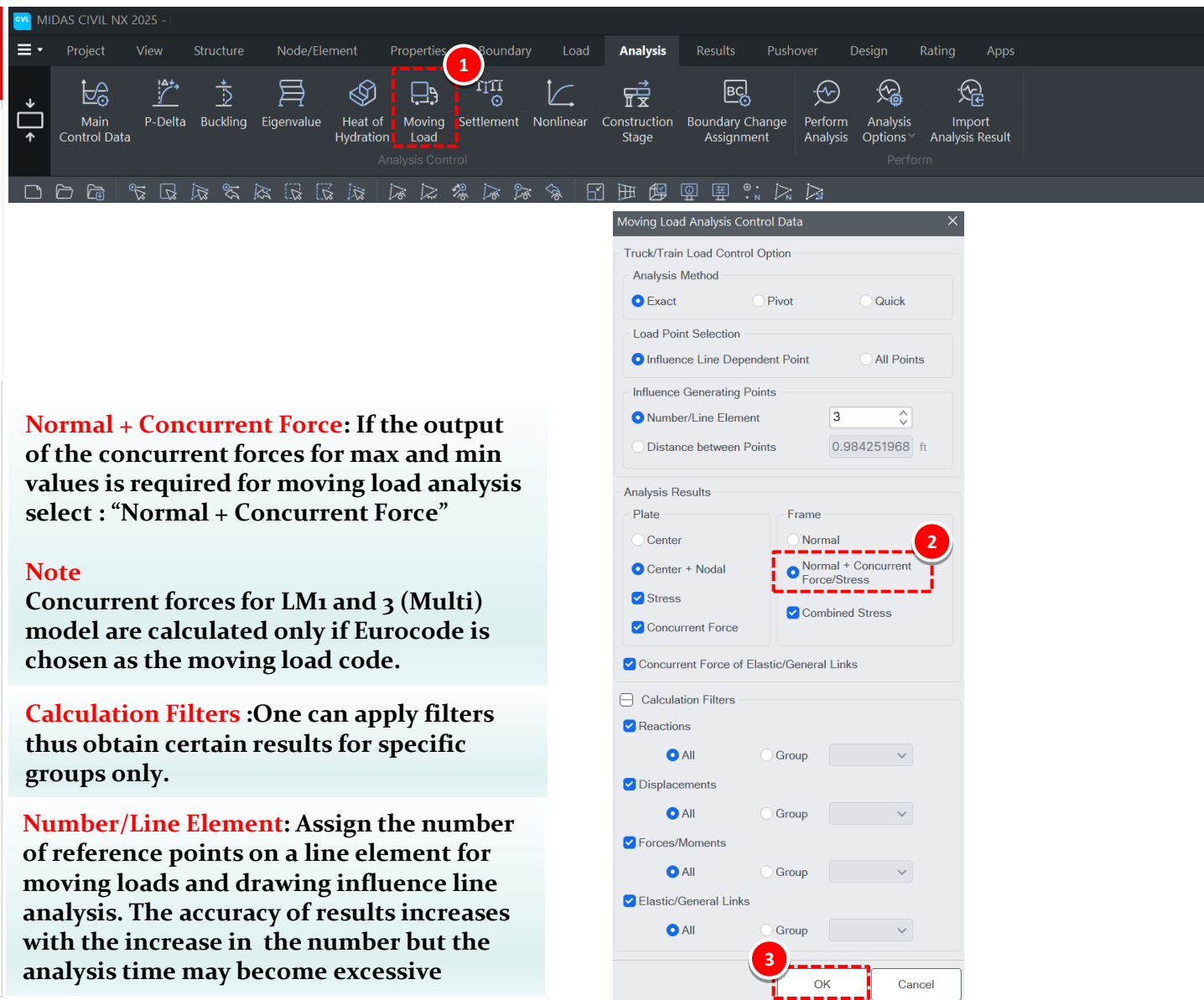
Normal + Concurrent Force: If the output of the concurrent forces for max and min values is required for moving load analysis select : “Normal + Concurrent Force”

Note

Concurrent forces for LM1 and 3 (Multi) model are calculated only if Eurocode is chosen as the moving load code.

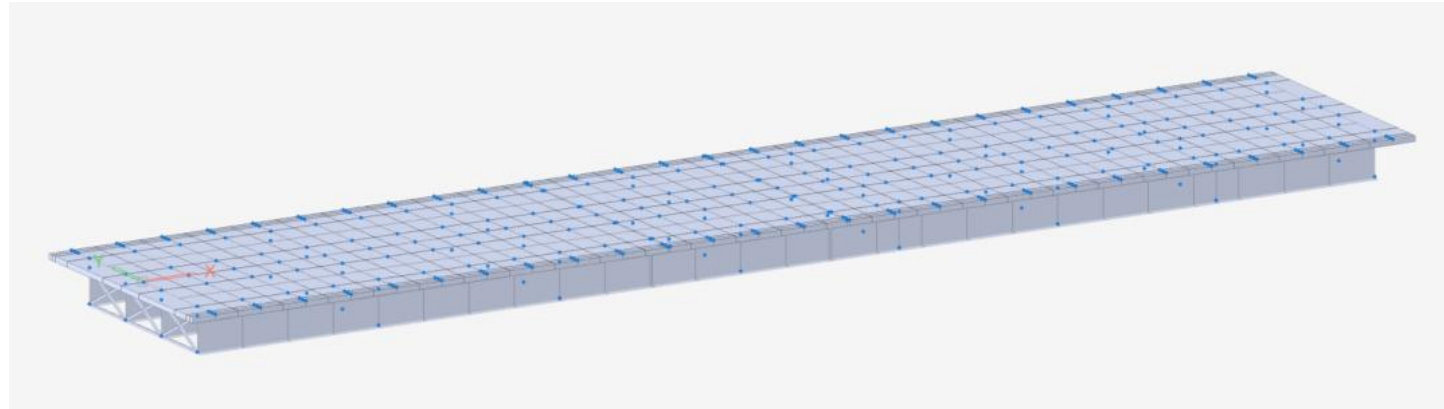
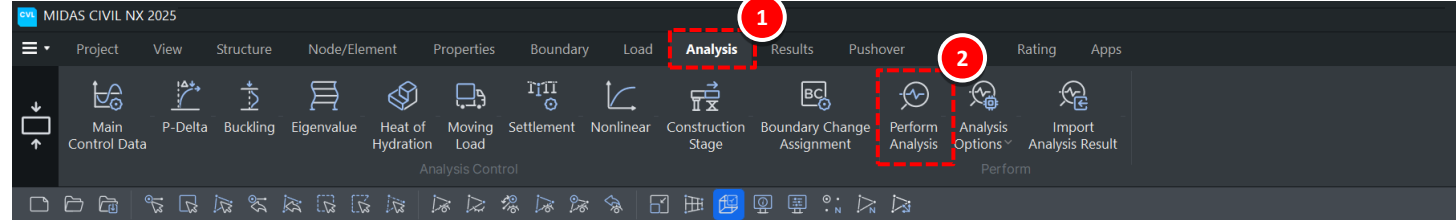
Calculation Filters: One can apply filters thus obtain certain results for specific groups only.

Number/Line Element: Assign the number of reference points on a line element for moving loads and drawing influence line analysis. The accuracy of results increases with the increase in the number but the analysis time may become excessive



Perform Analysis

1. Click: Analysis Tab
2. Perform Analysis



Reactions

1. Result -> Reactions
2. Select : Stage 3
3. Click : Reactions Forces/Moments
4. Select the required load combination, say **CS: Dead Load**
5. Select the required Components, say **Fz** for vertical Reaction
6. Check on **Value & Legend** to directly see the reaction values and range.
7. Click : Apply

The screenshot shows the MIDAS CIVIL NX 2025 - Results window. The 'Results' tab is selected in the top menu. The 'Reactions Forces/Moments' dialog is open, showing the following settings:

- Reaction Forces/Moments (selected)
- Load Cases/Combinations: CS: Dead Load
- Step: First Step
- Components: FZ (selected)
- Type of Display: Values and Legend (both checked)
- Arrow Scale Factor: 1.000000

The 3D model of the bridge structure is displayed, showing reaction values at various nodes. The values are: 164.0, 171.1, 171.1, 164.0, 621.7, 626.9, 626.9, 621.7, 214.3, 221.4, 221.3, 214.3.

The right panel shows the 'MIDAS CIVIL NX POST-PROCESSOR REACTION FORCE' results for 'FORCE-Z'.

MIDAS CIVIL NX POST-PROCESSOR REACTION FORCE	
FORCE-Z	
MIN. REACTION	
NODE=	9
FZ:	1.6399E+02
MAX. REACTION	
NODE=	146
FZ:	6.2693E+02

Below the table, the 'STAGE: Stage3' and 'CS: DEAD LOAD FIRST' are indicated. The 'MAX : 146' and 'MIN : 9' values are shown. The 'FILE: STEEL CO-UNIT: kN' and 'DATE: 08/19/2025' are also displayed. The 'VIEW-DIRECTION' is shown as X: -0.483, Y: -0.837, Z: 0.259.

MVmin: The minimum force resulting from vehicle load applied to the structure
Mvmax: The maximum force resulting from vehicle load applied to the structure
Mvall: The maximum and minimum force enveloped

Forces and Moments

1. Result -> Forces-> Beam Diagrams
2. Select : Post CS
3. Select the required load combination, say **Mvmax:MVL 1**
4. Select the required Components, say **My**
5. Check on **Contour & Legend**
6. Click : Apply

MIDAS CIVIL NX 2025 -

Project View Structure Node/Element Properties Boundary Load Analysis Results Pushover Design Rating Apps

Analysis result Load Combination Result Tables Reactions Deformations Forces Stresses Diagram Local Direction Force Sum Set Reduction Moment Beam/Element Stage/Step Graph Strain Influ. Lines Influ. Surfaces Moving Load Batch Conversion Mode Shapes Damping Ratio Nodal Results Text Output

Truss Forces
Beam Forces/Moments
Beam Diagrams
Plate Forces/Moments
Plate Cutting Line Diagram
Resultant Force Diagram

Deformations Forces Stresses

Beam Diagrams

Load Cases/Combinations
MVmax: MVL 1

Step
Max/Min Diagram

Components
Part Total
Fx Fy Fz Mb Mt Mw
My Mz Mw

Show Truss Forces
Only Truss Forces

Display Options
Exact 5 Points No Fill Line Fill Solid Fill
Scale 1.0000

Type of Display
Contour Values Animate Deform Legend Undeformed

PostCS

MIDAS CIVIL NX POST-PROCESSOR
BEAM DIAGRAM
MOMENT-y
1.61118e+03
1.46471e+03
1.31824e+03
1.17177e+03
1.02530e+03
8.78827e+02
7.32356e+02
5.85885e+02
4.39414e+02
2.92942e+02
1.46471e+02
0.00000e+00

PostCS
MVMAX: MVL1
MAX : 145
MIN : 94
FILE: STEEL CO-
UNIT: kN-m
DATE: 08/19/2025
VIEW-DIRECTION
X: -0.483
Y: -0.837
Z: 0.259

Moving Load Tracer

1. Result ->Moving Tracer->

Beam Forces/Moments

2. Select the required Moving load Case

say **MVmax: MVL 1**

- Key Element : 130
- Part : i

3. Check on Contour, Applied Loads & Legend

4. Click : Apply

The screenshot displays the MIDAS CIVIL NX 2025 software interface. The 'Results' tab is active, and the 'Moving Tracer' tool is selected from the 'Result Display' toolbar. The 'Tree Menu' on the left shows the 'MVL Tracer' tool selected. The 'Moving Load Cases' section shows 'MVmax: MVL1' selected. The 'Key Element' is set to '130' and the 'Scale Factor' is '1.000000'. The 'Parts' section shows 'i' selected. The 'Components' section shows 'My' selected. The 'Type of Display' section shows 'Contour' and 'Applied Loads' checked. The 'Maximum Value' is '1.0175e+03'. The 'Apply' button is highlighted. The main window shows a 3D model of a bridge with a color-coded contour plot of beam forces/moments. A color scale on the right ranges from -9.92750e-01 to 2.90807e+00. The 'KEY ELEM., 130' section shows 'PART, 1-node' and 'MAX.VAL.= 1.0175e+03'. The 'PostCS' section shows 'MVMAX: MVL1', 'MAX: None', 'MIN: None', 'FILE: NZ_STEEL ~', 'UNIT: kN-m', 'DATE: 08/20/2025', and 'VIEW-DIRECTION' with X: -0.483, Y: -0.837, and Z: 0.259.

Mode Shapes

1. Result -> Mode Shapes -> Vibration

Mode Shapes

2. Select Load Case : Mode 10

3. Select : Md-Y

4. Check on Contour & Legend

5. Click : Apply

MIDAS CIVIL NX 2025 -

Project View Structure Node/Element Properties Boundary Load Analysis **Results** Pushover Design Rating Apps

Analysis result Load Combination Result Tables Reactions Deformations Forces Stresses Diagram Local Direction Force Sum Set Reduction Moment Beam/Element Stage/Step Graph Strain Infl. Lines Infl. Surfaces Moving Load Batch Conversion **Mode Shapes** Damping Ratio Nodal Results Text Output

Result Type Combination Table Result Display Detail Result C.S/Nonlinear Moving Load

Vibration Mode Shapes
Buckling Mode Shapes

Tree Menu Task Pane

Mode Shapes

Vibration Mode Shapes

Load Cases (Mode Numbers)
Mode 10

Multi-Modes

Components
Md-X ☒ Md-Y Md-Z
Md-XY Md-YZ Md-XZ
Md-XYZ

Type of Display
☒ Md.Shp. ☐ Undeformed
☐ Values ☒ Legend
☐ Animate ☒ Contour

Close Apply

MIDAS CIVIL NX
POST-PROCESSOR
VIBRATION MODE

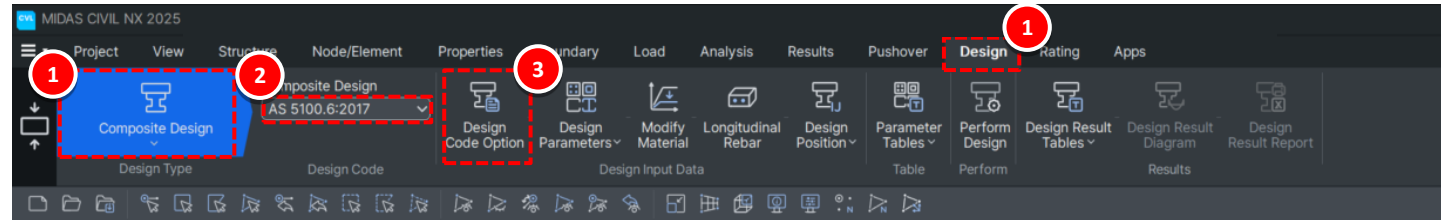
6.97535e-02
5.71742e-02
4.45948e-02
3.20155e-02
1.94361e-02
6.85678e-03
0.00000e+00
-1.83019e-02
-3.08813e-02
-4.34606e-02
-5.60399e-02
-6.86193e-02

NATURAL PERIOD=
5.372E-02

PostCS
MODE 10
MAX : 324
MIN : 369
FILE: NZ_STEEL -
UNIT: kN,m
DATE: 08/20/2025
VIEW-DIRECTION
X: 0.000
Y: 0.000
Z: 1.000

Design Parameters

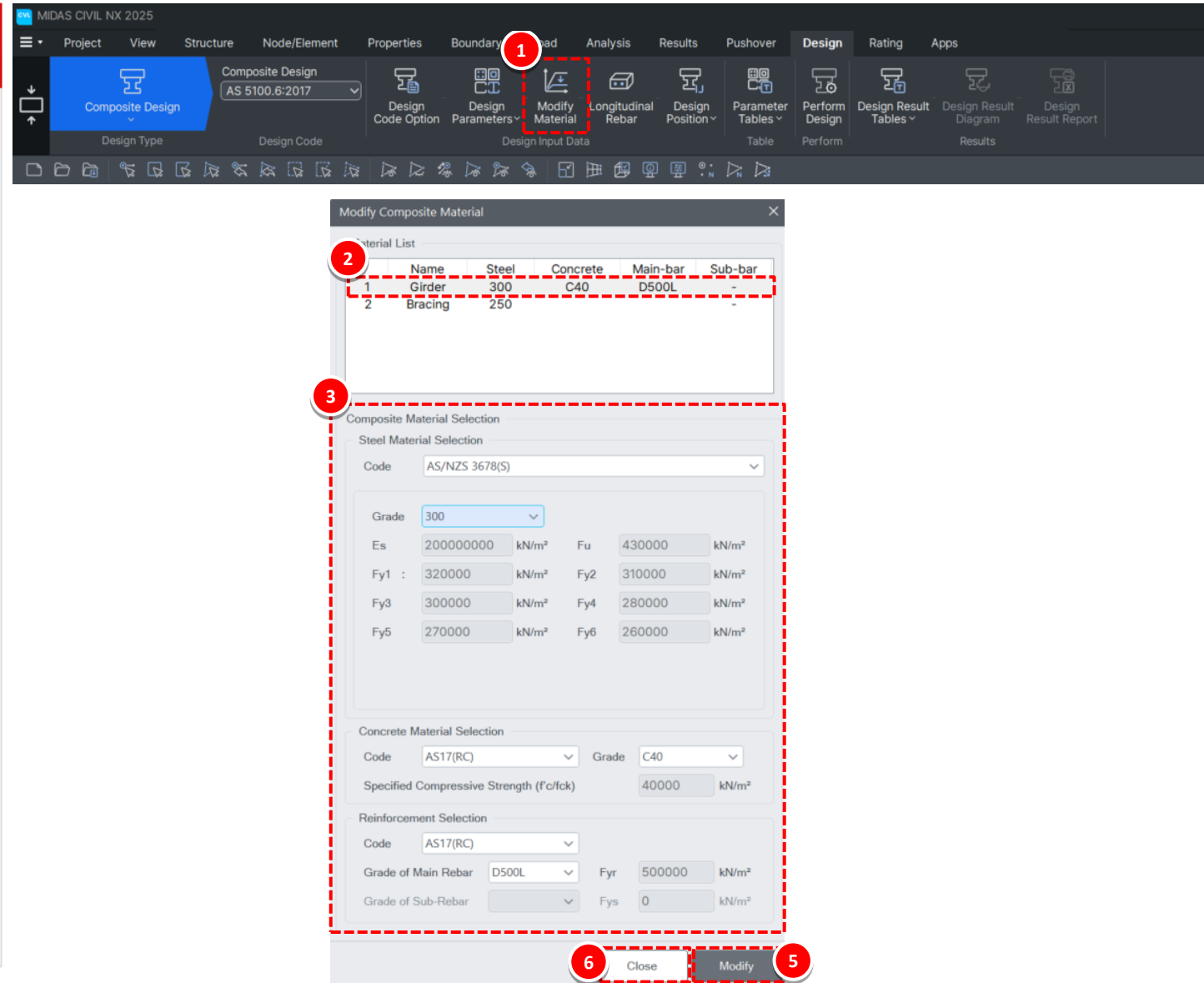
1. Go to **Design -> Composite Design**
2. Select Design Code as
AS 5100.6:2017
3. Click on **Design Code Option** to
check/modify the design parameters
4. Click **OK**



 This screenshot shows the 'Composite Steel Girder Design Code' dialog box. The 'Code' dropdown menu is set to 'AS 5100.6:2017'. The 'Capacity reduction factor' section includes three input fields for ULS: 'Member subject to bending for flexure' (0.9), 'Member subject to bending for web in shear' (0.9), and 'Member subject to bending for stiffener' (0.9). The 'SLS' section includes one input field for 'Member subject to bending for shear connectors' (1). The 'Ultimate Limit State' section has four checked checkboxes: 'Flexure', 'Shear', 'Flexure & Shear & Torsion for Box Girders with Longitudinal Stiffeners', and 'Constructibility (I-section only)'. The 'Serviceability Limit State' section has two checked checkboxes: 'Crack Control of Slab' and 'Longitudinal Shear'. The 'OK' button is highlighted with a red dashed box and a red circle with the number 4.

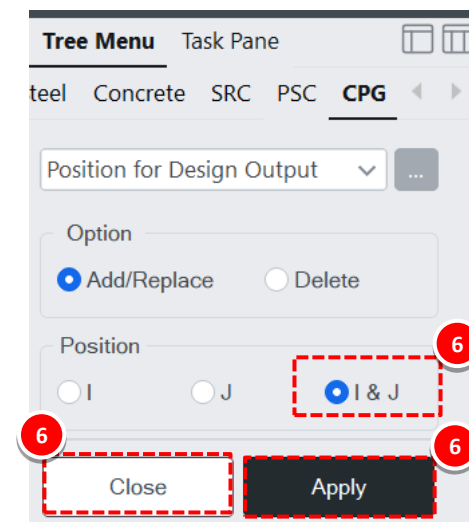
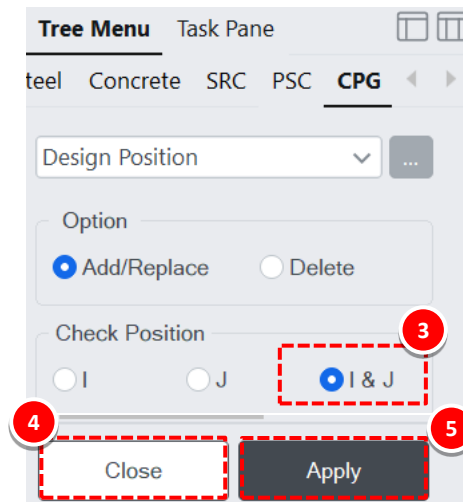
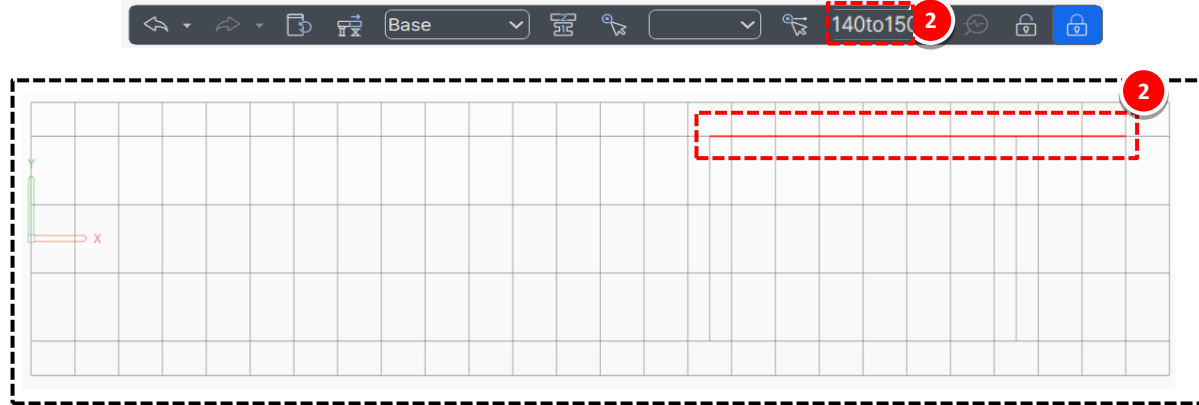
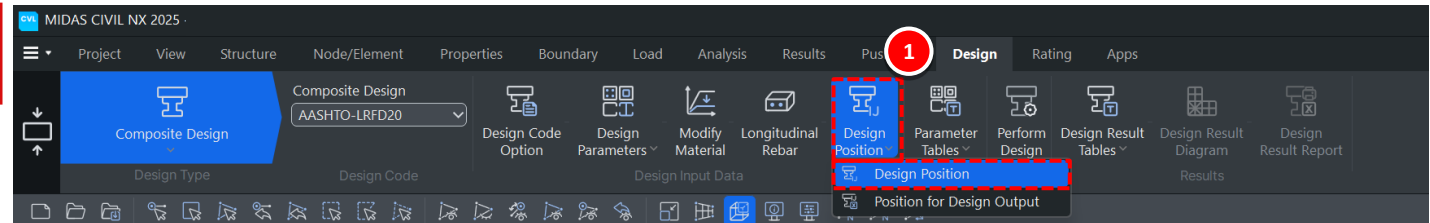
Design Material

1. Click on **Modify Material**
2. Select **Girder**
3. Enter the data as shown in the image
4. Click **Modify**
5. Click **Close**



Design Position

1. Click on **Design Position**
2. Input **140 to 150** in the element selection window and press Enter
3. Select **I&J**
4. Select Click Apply
5. Click **Close**
6. Repeat the same steps for **Position for Design Output...**
Select Only Elements nos. **145**
for Design Output...



Longitudinal Reinforcement

1. Click on Longitudinal Reinforcement
2. Click on 1: Composite I girder
3. Click : Copy Reinforcements to.....
4. Select 5: Composite I Girder_1
5. Click on: ->
6. Click : OK
7. Click : Apply
8. Click : Close

MIDAS CIVIL NX 2025

Project View Structure Node/Element Properties Boundary Load Analysis Results Pushover Design Rating Apps

Composite Design AS 5100.6:2017

Design Type Design Code Design Input Data

Design Code Option Design Parameters Modify Material Longitudinal Rebar Design Position Parameter Tables Perform Design Design Result Tables Design Result Diagram Design Result Report

Section Manager

Mode Reinforcements

Target Section & Element

1: Composite I Girder

Copy Reinforcements to

Composite I Girder G : -1.4490, 1.3308

Longitudinal Reinforcement Shear Reinforcement

Same Rebar Data at i & j-end

Coordinate Centroid Left-Bottom

Guide Line 0 m

Type Point Line Arc

Circle Poly Line

Input Method A Input Method B

Ref. Y Centroid Y 0 m

Ref. Z Top Z 0 m

Num 0

Spacing 0 m

Dia D6

Part Part 2

Reference for Tapered Section

Ref. Y Left Ref. Z Top

As 0.0063335996 m²

Add Modify Delete

Multi Add

Type	Num	CTC (m)	Dia
1 Line	28	-	D12
2 Line	28	-	D12

Copy Data

Section List

5: Composite I Girder_1

Selected Section List

Longitudinal Reinforcement

Reinforced Shear

End-I End-J

End-I End-J

OK Cancel

Shear Connector Details

1. Click on Design Parameters →

Shear Connector

2. Input **140 to 150** in the element selection window and Press Enter.
3. Enter data as shown in the image
4. Click **Apply**

Click **Close**

The screenshot displays the MIDAS CIVIL NX 2025 software interface. The 'Design' menu is open, and 'Design Parameters' is selected (1). The 'Base' dropdown in the top right is set to '140to150' (2). The 'Shear Connector' dialog box is open, showing fields for Option, Pitch, Height, Dia, Fu, Transverse Spacing, and Num. of Shear Connectors (3). The 'Fy of Shear Connector' dialog box is open, showing fields for Code, Grade, and Fy (4). The 'Diameter of Shear connector' dialog box is open, showing fields for Name and Dia. The main workspace shows a grid of blue dots representing the shear connector layout.

Design Results

1. Click **Perform Design** to initiate design
2. Click on **Design Result Report**

MIDAS CIVIL NX 2025

Project View Structure Node/Element Properties Boundary Load Analysis Results Pushover **Design** Results Apps

Composite Design AASHTO-LRFD20

Design Type Design Code

Design Code Option Design Parameters Modify Material Longitudinal Rebar Design Position Parameter Tables Perform Design Design Result Tables Design Result Diagram Design Result Report

1 2

■ MEMBER NAME : Steel Composite : 145 - i

1. Member Information

1) Design Code
AS 5100.6:2017

2) Section Property
Composite I Girder_1

3) Material
Steel
 $f_y = 320.000\text{MPa}$, $E = 200,000.000\text{MPa}$
Concrete
 $f_c = 40.000\text{MPa}$, $E_c = 32,800.000\text{MPa}$
Reinforcement
 $f_{yk} = 500.000\text{MPa}$, $E_s = 200,000.000\text{MPa}$

4) Length
 $L = 2.000\text{m}$

5) Section Properties

Part I_{xx}

Left top-flange	6.156
Right top-flange	6.156
Left bottom-flange	5.807
Right bottom-flange	5.807
Web	351.848

Class of cross-section

4) Plastic Neutral Axis
Plastic NA = 958.739mm (from the b)

- Effective Plastic Neutral Axis
Plastic NA = 1,062.469mm (from the b)

5) Design for bending moment
- Effective Section Property

Steel Section	
Area	44,494.365m
I_y	1.931699e+10
C_y	672.095mm

- Top
 $\phi f_y = 252.000\text{MPa}$
 $\phi f_y = 252.000\text{MPa}$
 $f_y = \frac{M_y}{Z_{top}} = 444.709\text{MPa} > f_y = 280.000\text{MPa}$
 $f_y = 280.000\text{MPa}$

- Bottom
 $\phi f_y = 252.000\text{MPa}$
 $\phi f_y = 252.000\text{MPa}$
 $f_y = \frac{M_y}{Z_{bot}} = 305.901\text{MPa} > f_y = 280.000\text{MPa}$
 $f_y = 280.000\text{MPa}$

6) Moment Capacity M_u

- Top
 $M_u = M_{u0} \left(\frac{Z_{top}}{Z_{u0}} \right) = 15,195.092\text{kN-m}$
where,
 $Z_{u0} = 34,168,595.485\text{mm}^3$
 $Z_{u0} = 21,513,395.361\text{mm}^3$
 $M_{u0} = \phi_u \cdot \phi_u \cdot M_u = 11,259.679\text{kN-m} > M_u$
 $M_u = 9,567.207\text{kN-m}$

- Bottom
 $M_u = M_{u0} \left(\frac{Z_{bot}}{Z_{u0}} \right) = 9,605.335\text{kN-m}$
where,
 $Z_{u0} = 31,400,140.013\text{mm}^3$
 $Z_{u0} = 28,741,451.054\text{mm}^3$
 $M_{u0} = \phi_u \cdot \phi_u \cdot M_u = 10,569.359\text{kN-m} > M_u$
 $M_u = 8,792.039\text{kN-m}$

7) Moment modification factor α_m

$\alpha_m = \frac{1.7M_{u0}}{M_u}$

$\alpha_m = 1.163$

where,
 $M_{u0} = -1,005.895\text{kN-m}$
 $M_u = -906.129\text{kN-m}$
 $M_{u0} = -906.129\text{kN-m}$
 $M_u = -722.188\text{kN-m}$

8) Moment modification factor α_m

AS 5100.6:2017, 8.6.1.1(3)

2. Moment Capacity (y-Dir., Negative)

LCB SCLCB8

Neg. Moment $f_y, \phi f_y$ 29.112MPa / 252.000MPa = 0.116 OK

1) Design Force

Force	Steel	Long-Term Composite	Short-Term Composite	Summation
$P_x (\text{kN})$	-0.123	2.800	-202.645	-199.967
$M_y (\text{kN-m})$	992.168	-1,451.015	-547.049	-1,005.895
$M_z (\text{kN-m})$	-0.0154	-4.421	-19.043	-23.479

2) Stress

Stresses (MPa)	Steel	Long-Term Composite	Short-Term Composite	Summation
Reinforcement	0.000	-59.693	-21.505	-81.198
Top flange	46.119	-42.466	-16.610	-12.958
Bottom flange	-34.520	46.210	17.422	29.112

MEMBER NAME : Steel Composite : 145 - i

1) Design Code
AS 5100.6:2017

2) Section Property
Composite I Girder_1

3) Material
Steel
 $f_y = 320.000\text{MPa}$, $E = 200,000.000\text{MPa}$
Concrete
 $f_c = 40.000\text{MPa}$, $E_c = 32,800.000\text{MPa}$
Reinforcement
 $f_{yk} = 500.000\text{MPa}$, $E_s = 200,000.000\text{MPa}$

4) Length
 $L = 2.000\text{m}$

5) Section Properties

Part I_{xx}

Left top-flange	6.156
Right top-flange	6.156
Left bottom-flange	5.807
Right bottom-flange	5.807
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Class of cross-section

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- Effective Plastic Neutral Axis
Plastic NA = 1,062.469mm (from the b)

5) Design for bending moment
- Effective Section Property

Steel Section	
Area	44,494.365m
I_y	1.931699e+10
C_y	672.095mm

- Top
 $\phi f_y = 252.000\text{MPa}$
 $\phi f_y = 252.000\text{MPa}$
 $f_y = \frac{M_y}{Z_{top}} = 444.709\text{MPa} > f_y = 280.000\text{MPa}$
 $f_y = 280.000\text{MPa}$

- Bottom
 $\phi f_y = 252.000\text{MPa}$
 $\phi f_y = 252.000\text{MPa}$
 $f_y = \frac{M_y}{Z_{bot}} = 305.901\text{MPa} > f_y = 280.000\text{MPa}$
 $f_y = 280.000\text{MPa}$

6) Moment Capacity M_u

- Top
 $M_u = M_{u0} \left(\frac{Z_{top}}{Z_{u0}} \right) = 15,195.092\text{kN-m}$
where,
 $Z_{u0} = 34,168,595.485\text{mm}^3$
 $Z_{u0} = 21,513,395.361\text{mm}^3$
 $M_{u0} = \phi_u \cdot \phi_u \cdot M_u = 11,259.679\text{kN-m} > M_u$
 $M_u = 9,567.207\text{kN-m}$

- Bottom
 $M_u = M_{u0} \left(\frac{Z_{bot}}{Z_{u0}} \right) = 9,605.335\text{kN-m}$
where,
 $Z_{u0} = 31,400,140.013\text{mm}^3$
 $Z_{u0} = 28,741,451.054\text{mm}^3$
 $M_{u0} = \phi_u \cdot \phi_u \cdot M_u = 10,569.359\text{kN-m} > M_u$
 $M_u = 8,792.039\text{kN-m}$

7) Moment modification factor α_m

$\alpha_m = \frac{1.7M_{u0}}{M_u}$

$\alpha_m = 1.163$

where,
 $M_{u0} = -1,005.895\text{kN-m}$
 $M_u = -906.129\text{kN-m}$
 $M_{u0} = -906.129\text{kN-m}$
 $M_u = -722.188\text{kN-m}$

8) Moment modification factor α_m

AS 5100.6:2017, 8.6.1.1(3)

2. Moment Capacity (y-Dir., Negative)

LCB SCLCB8

Neg. Moment $f_y, \phi f_y$ 29.112MPa / 252.000MPa = 0.116 OK

1) Design Force

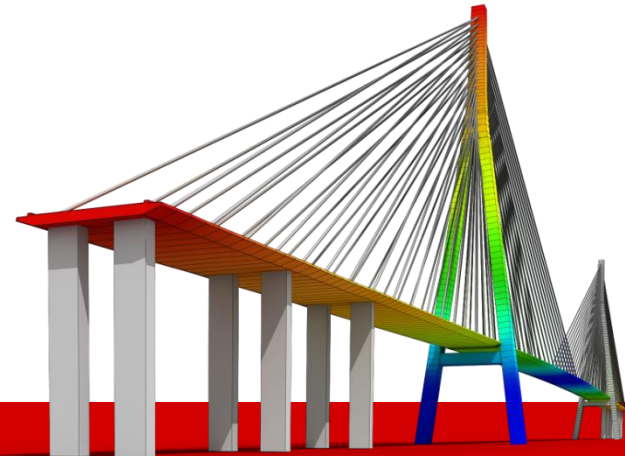
Force	Steel	Long-Term Composite	Short-Term Composite	Summation
$P_x (\text{kN})$	-0.123	2.800	-202.645	-199.967
$M_y (\text{kN-m})$	992.168	-1,451.015	-547.049	-1,005.895
$M_z (\text{kN-m})$	-0.0154	-4.421	-19.043	-23.479

2) Stress

Stresses (MPa)	Steel	Long-Term Composite	Short-Term Composite	Summation
Reinforcement	0.000	-59.693	-21.505	-81.198
Top flange	46.119	-42.466	-16.610	-12.958
Bottom flange	-34.520	46.210	17.422	29.112



For Technical questions:
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