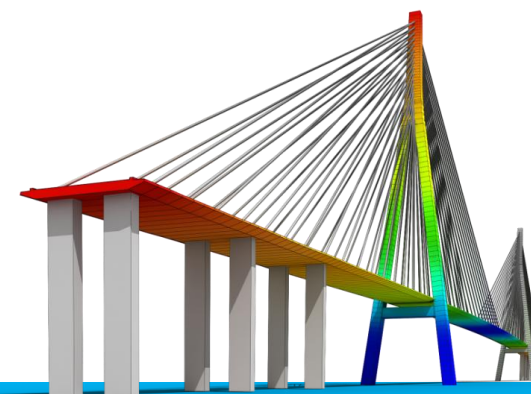




MIDAS *Technical
Material*

Tutorial



Rail Structure Interaction (RSI Wizard 2.0)



Contents

- **Step 1:** Initial Setting
- **Step 2:** Material & Section Definition
- **Step 3:** RSI Wizard - Layout
- **Step 4:** RSI Wizard - Section
- **Step 5:** RSI Wizard - Boundary
- **Step 6:** RSI Wizard - Load
- **Step 7:** Types of Analysis
- **Step 8:** RSI Wizard - Wizard Option
- **Step 9:** Rail Track Analysis
- **Step 10:** Report Generation

Program Version

CIVIL NX 2026
(V2.1)

Revision Date

May 29, 2026

Rail Structure Interaction

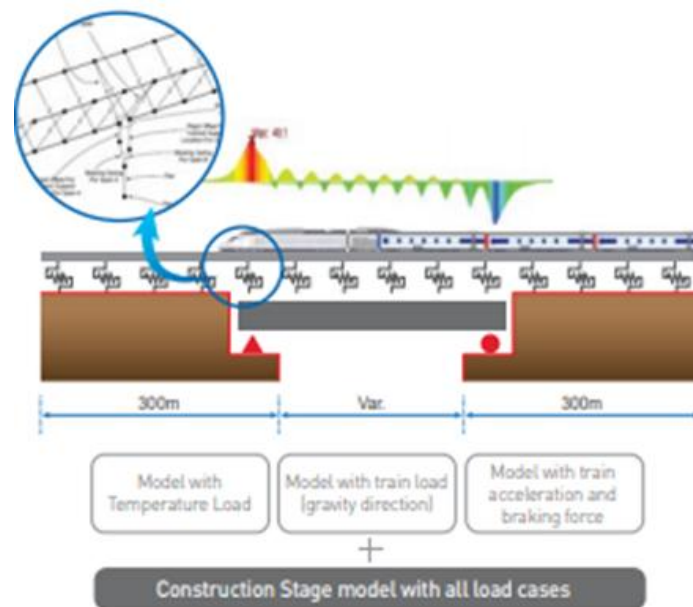
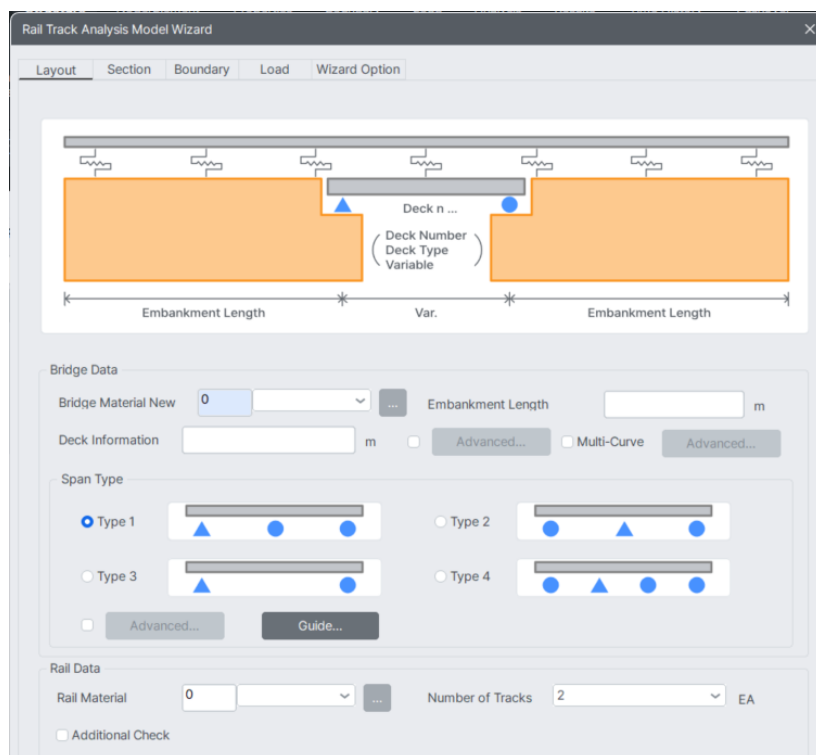
In this tutorial we will learn the following things:

- How to generate a bridge model for rail structure interaction using RSI wizard 2.0 ?
- How to simulate non-linear boundary conditions for ballast/slab ?
- How to define moving load in MIDAS CIVIL NX ?
- How to interpret the various results in the report generated by MIDAS CIVIL NX ?
- What are the different types of analysis considered for RSI ?

Rail Structure Analysis

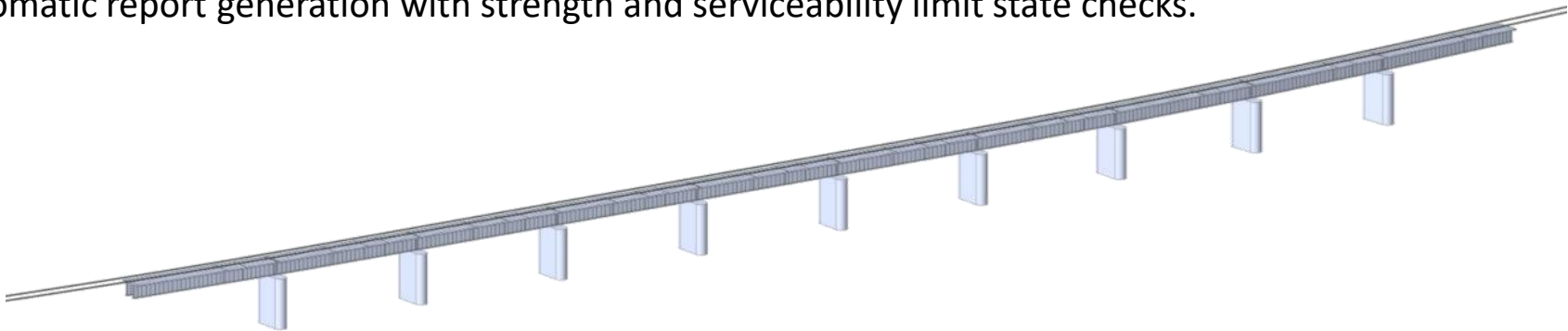
All the upcoming railway projects are using CWR/LWR rails and the existing rail lines are being converted to LWR/CWR. All the bridges having CWR/LWR rails need to be checked for **Rail Structure Interaction**. Rail structure interaction can be easily performed using Rail Track Analysis wizard.

- The wizard facilitates auto generation of rail track analysis model

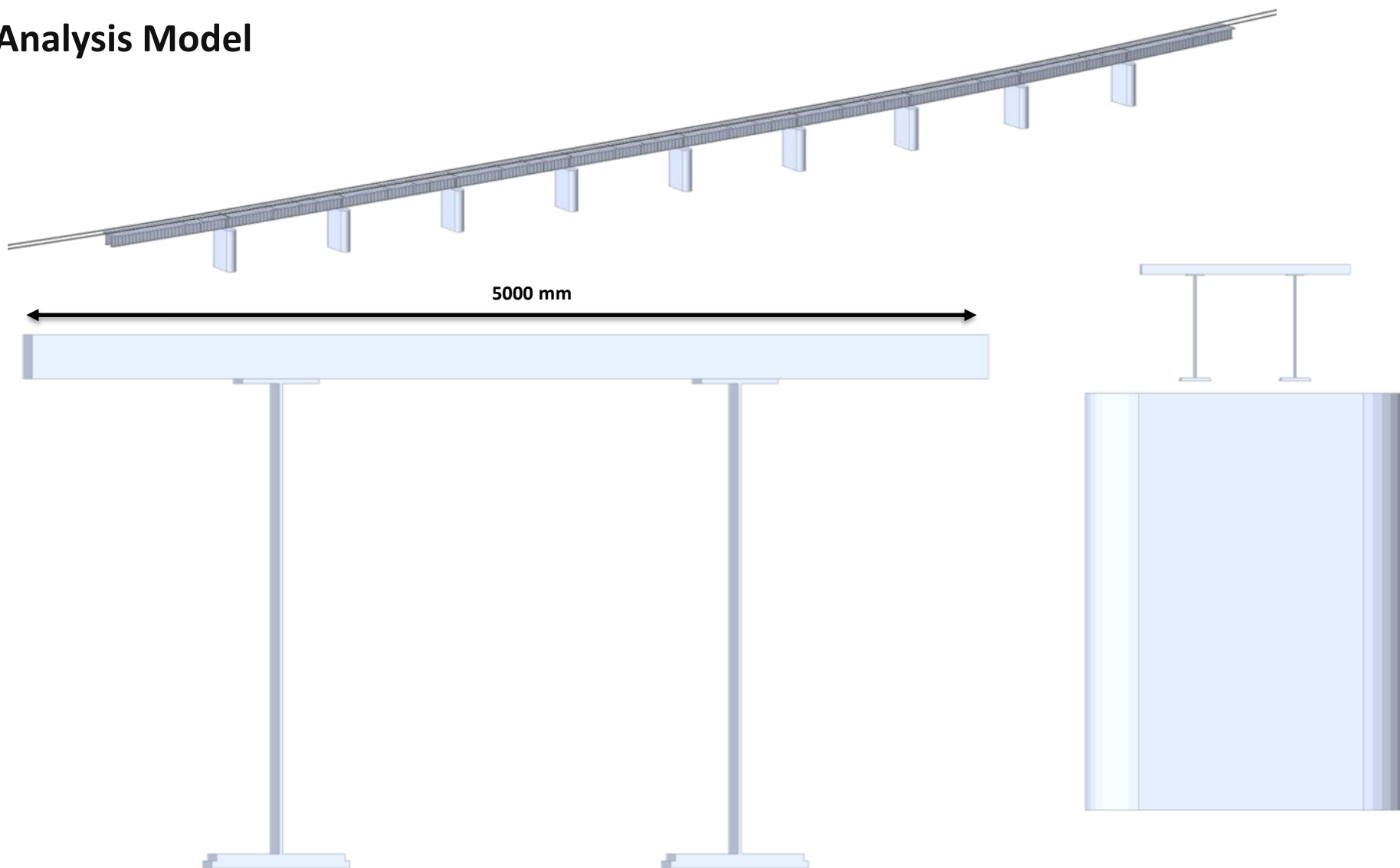


Rail Structure Analysis

- Fast modelling of multi span bridges using Wizard supporting multiple span types for parametric study, tapered bridges, Rail Expansion joints, etc.
- Automatic nonlinear boundary condition for ballast and concrete bed for loaded and unloaded condition.
- Auto-generation of model files for additional verifications whilst considering proper boundary conditions and load cases.
- Longitudinal relative displacement of deck and displacement due to bridge rotational angle.
- Stress and displacement due to temperature gradient by ZLR (Zero Longitudinal Resistance) and REJ (Rail Expansion Joints).
- Automatic report generation with strength and serviceability limit state checks.

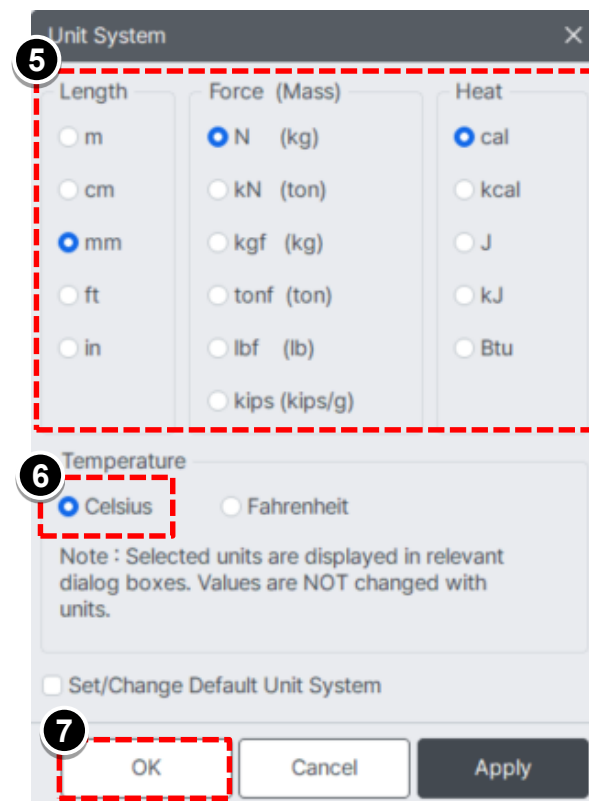
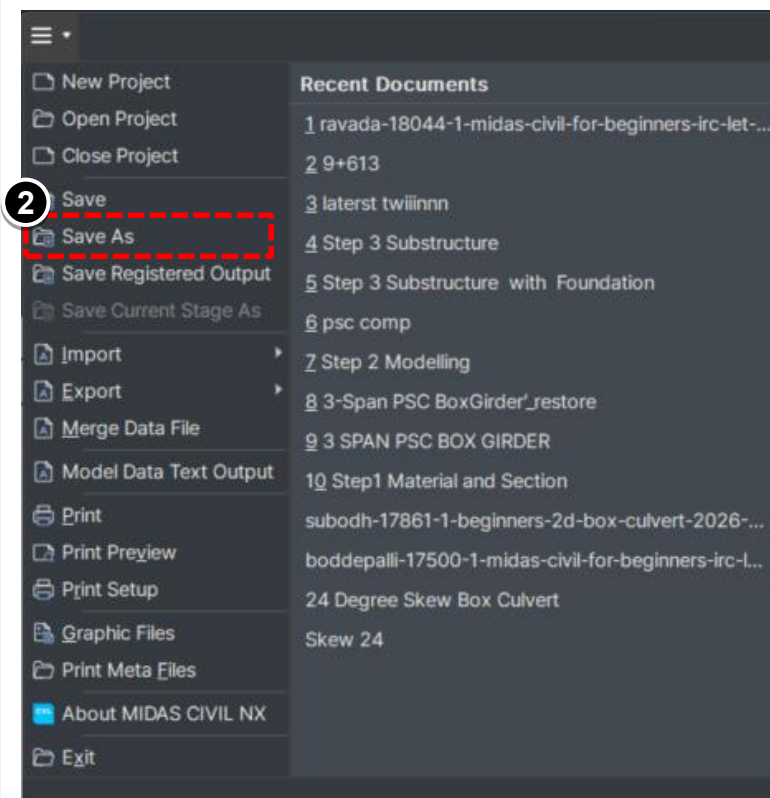
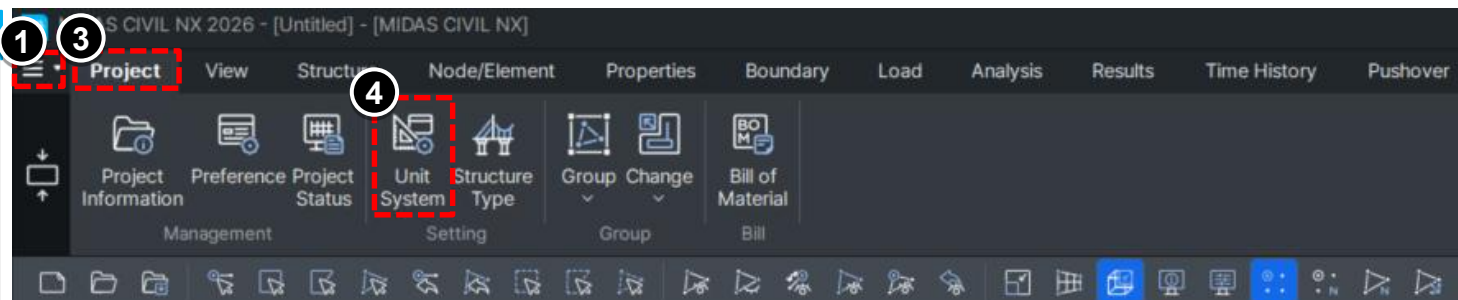


Analysis Model



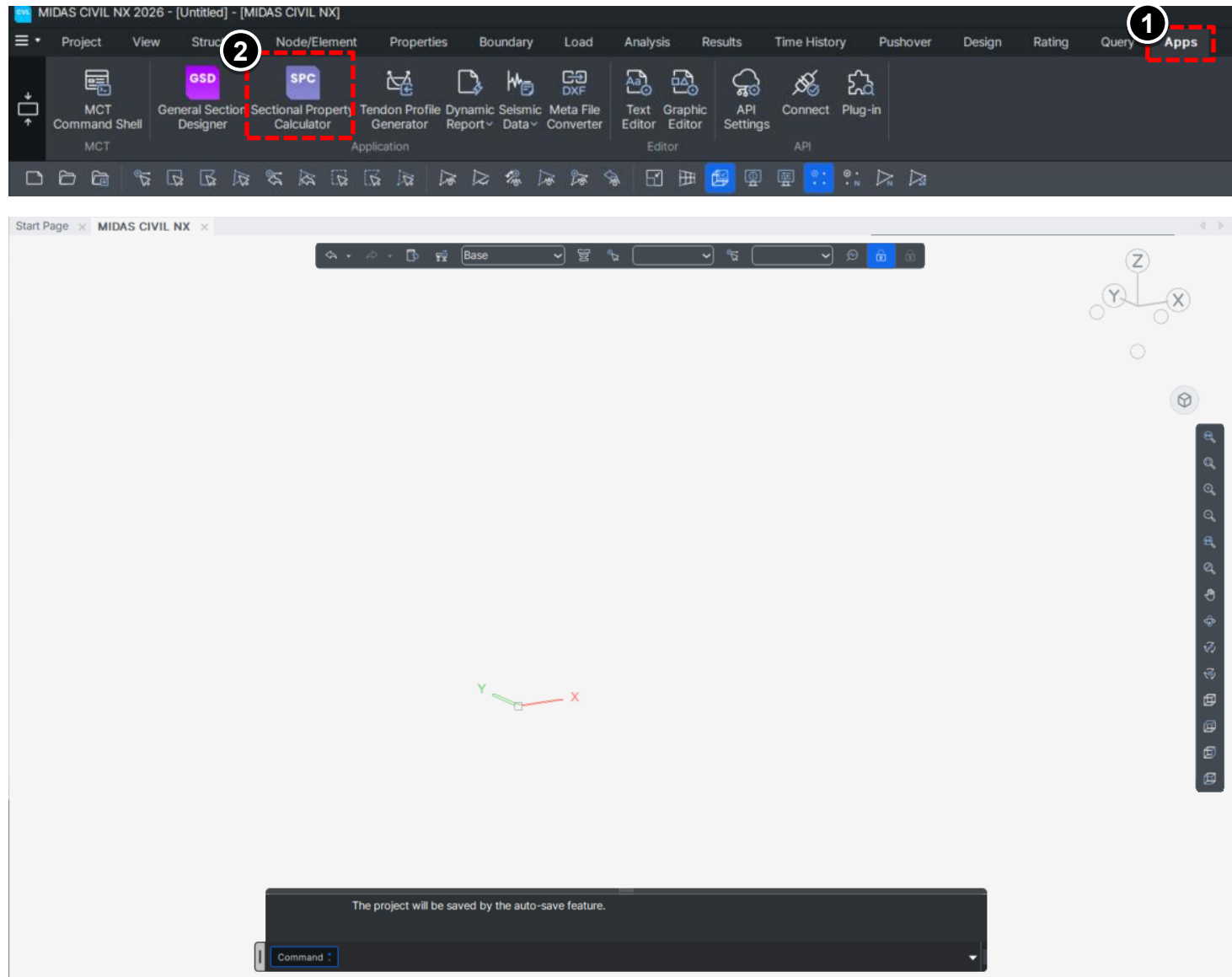
Procedure

- 1) Click on Triple Dash Option as Shown
- 2) Click on Save As
- 3) Go to Project
- 4) Click on Unit System
- 5) Select Length: mm,
Force: N (kg),
Heat: cal
- 6) Select Temperature: Celsius
- 7) Click on OK



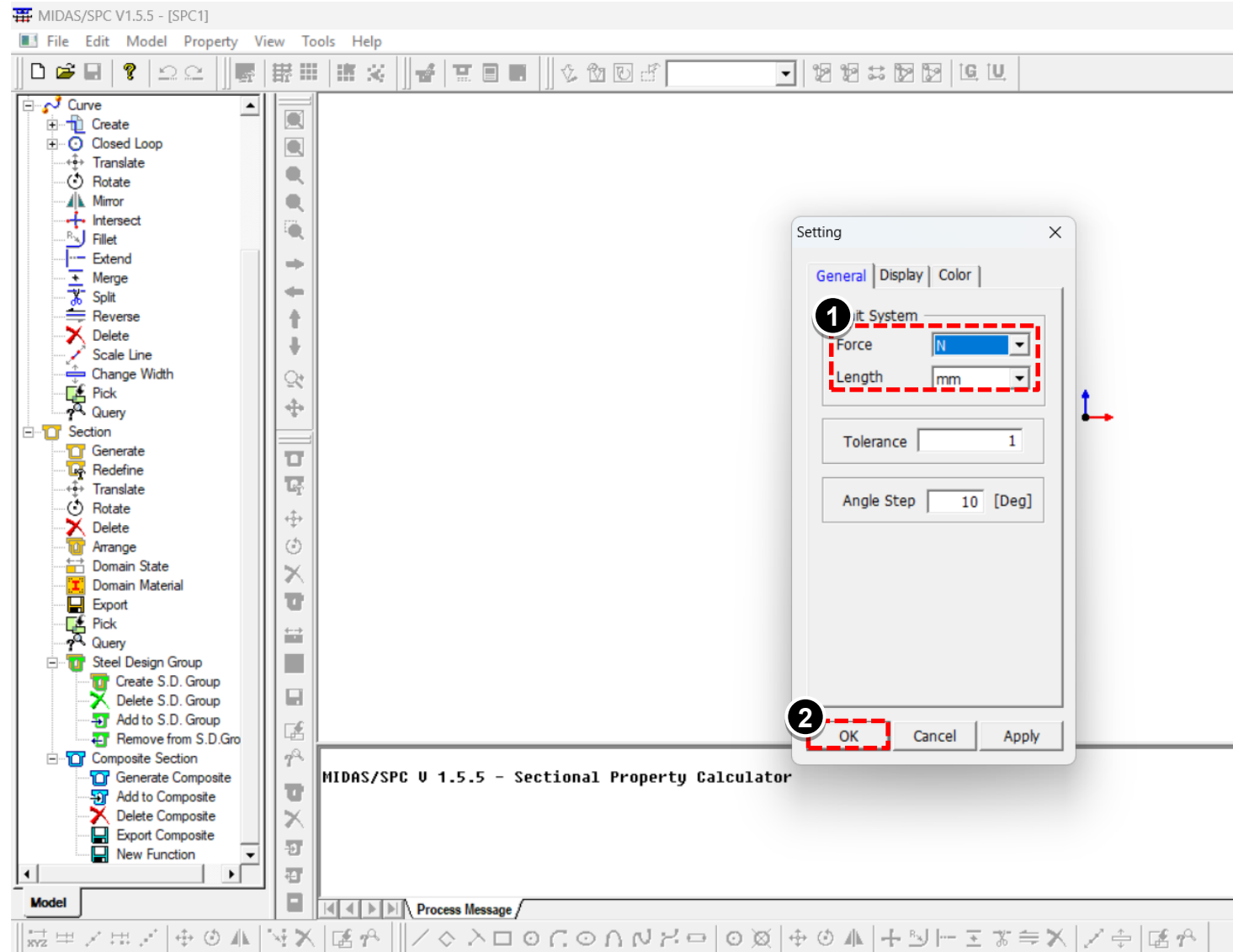
Procedure

- 1) Go to Apps
- 2) Click on Sectional Property Calculator



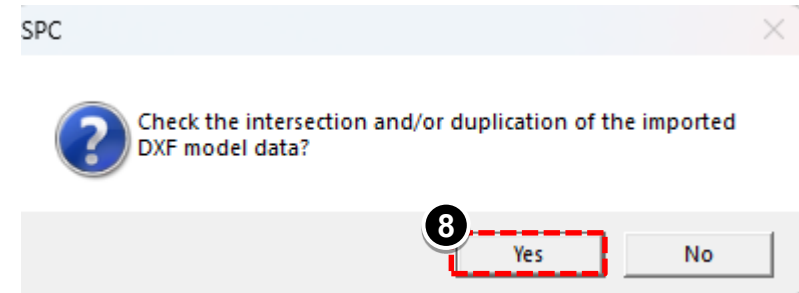
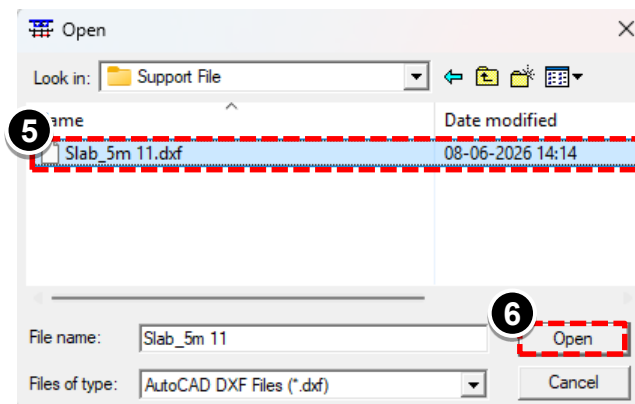
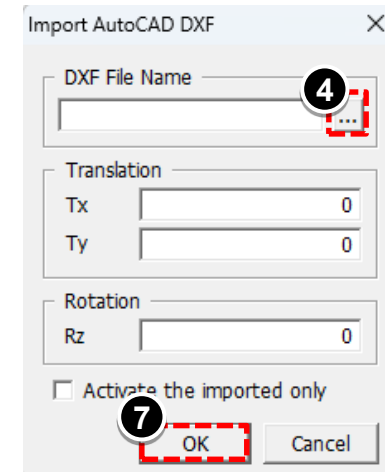
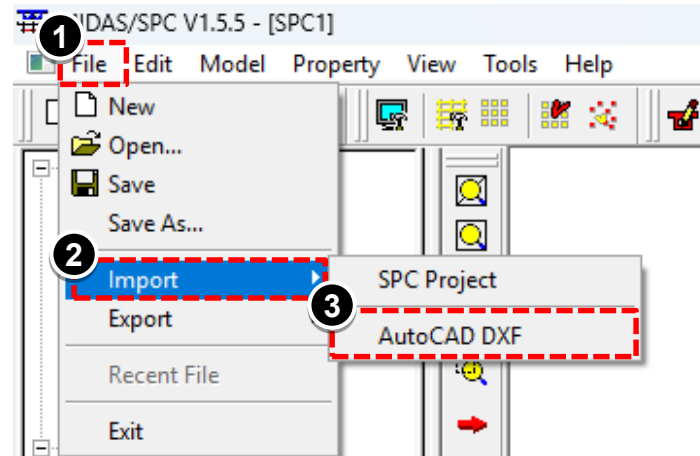
Procedure

- 1) Set Unit for Force : N,
Length: mm
- 1) Click on OK



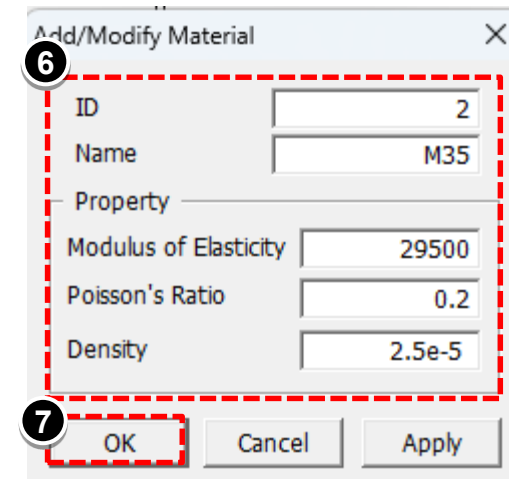
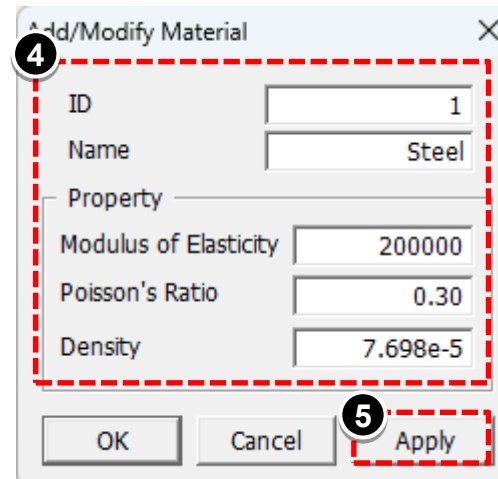
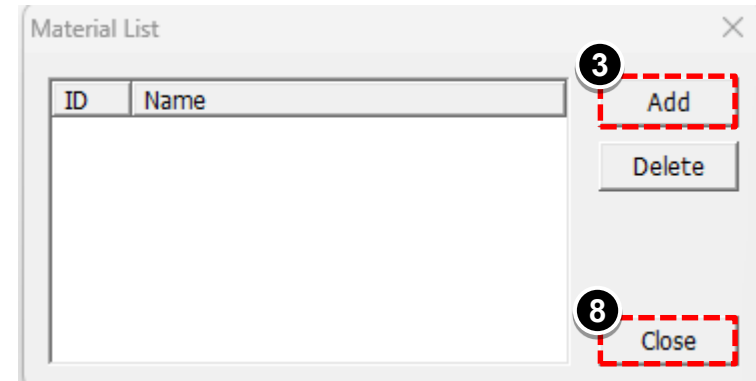
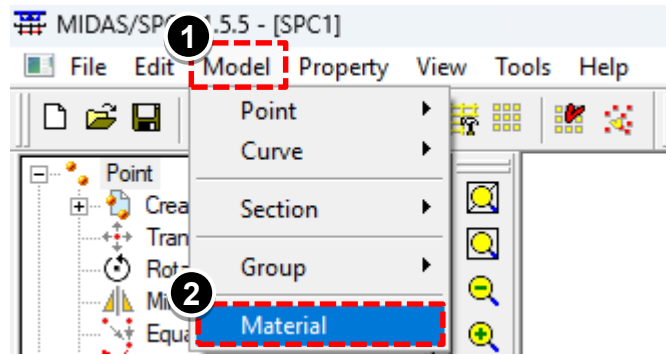
Procedure

- 1) Go to File
- 2) Click on Import
- 3) Select AutoCAD DXF
- 4) Click on
- 5) Select the File Slab_5m 11
- 6) Click on Open
- 7) Click OK
- 8) Click on Yes



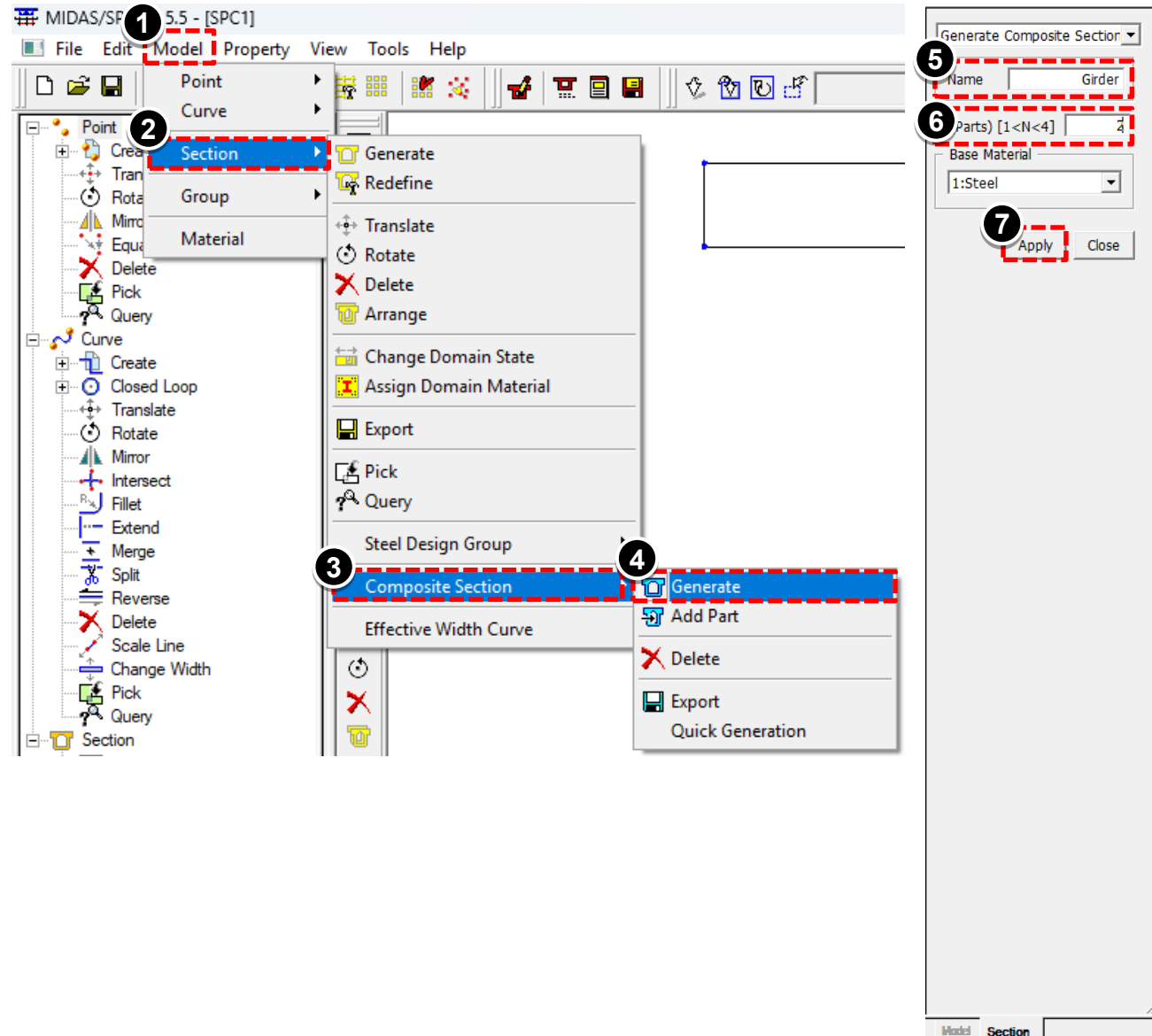
Procedure

- 1) Go to Model
- 2) Click on Material
- 3) Click on Add
- 4) Input Name: Steel
Modulus of Elasticity: 200000 N/mm²
Poisson Ratio: 0.30
Density: 7.698e-5 N/mm²
- 5) Click on Apply
- 6) Input Name: M35
Modulus of Elasticity: 29500 N/mm²
Poisson Ratio: 0.2
Density: 2.5e-5 N/mm²
- 7) Click on OK
- 8) Click on Close



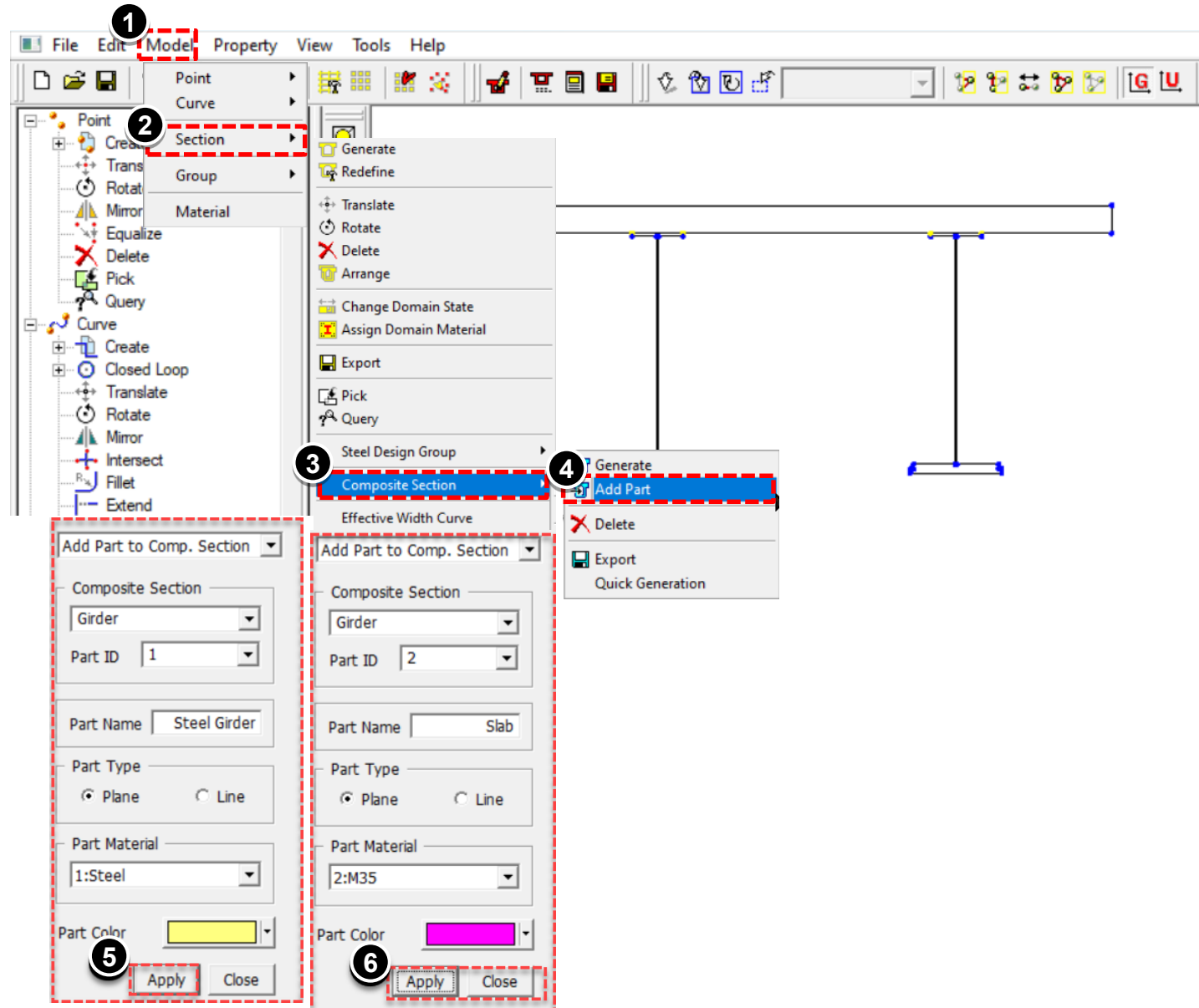
Procedure

- 1) Go to Model
- 2) Click on Section
- 3) Go to Composite section
- 4) Click on Generate
- 5) Input Name: Girder
- 6) Input No. of Part: 2
- 7) Click on Apply



Procedure

- 1) Go to Model
- 2) Click on Section
- 3) Go to Composite section
- 4) Click on Add Part
- 5) ID: 1
Part Name: Steel Girder
Part Material: Steel
Select the Curve
- 6) Click on Apply
- 7) ID: 1
Part Name: Slab
Part Material: M35
- 8) Click Apply and Close



Procedure

- 1) Go to Property
- 2) Click on Calculate Composite Property
- 3) Mesh Size: 100
- 4) Click on Apply
- 5) Click on Composite Property Table
- 6) Click on Close

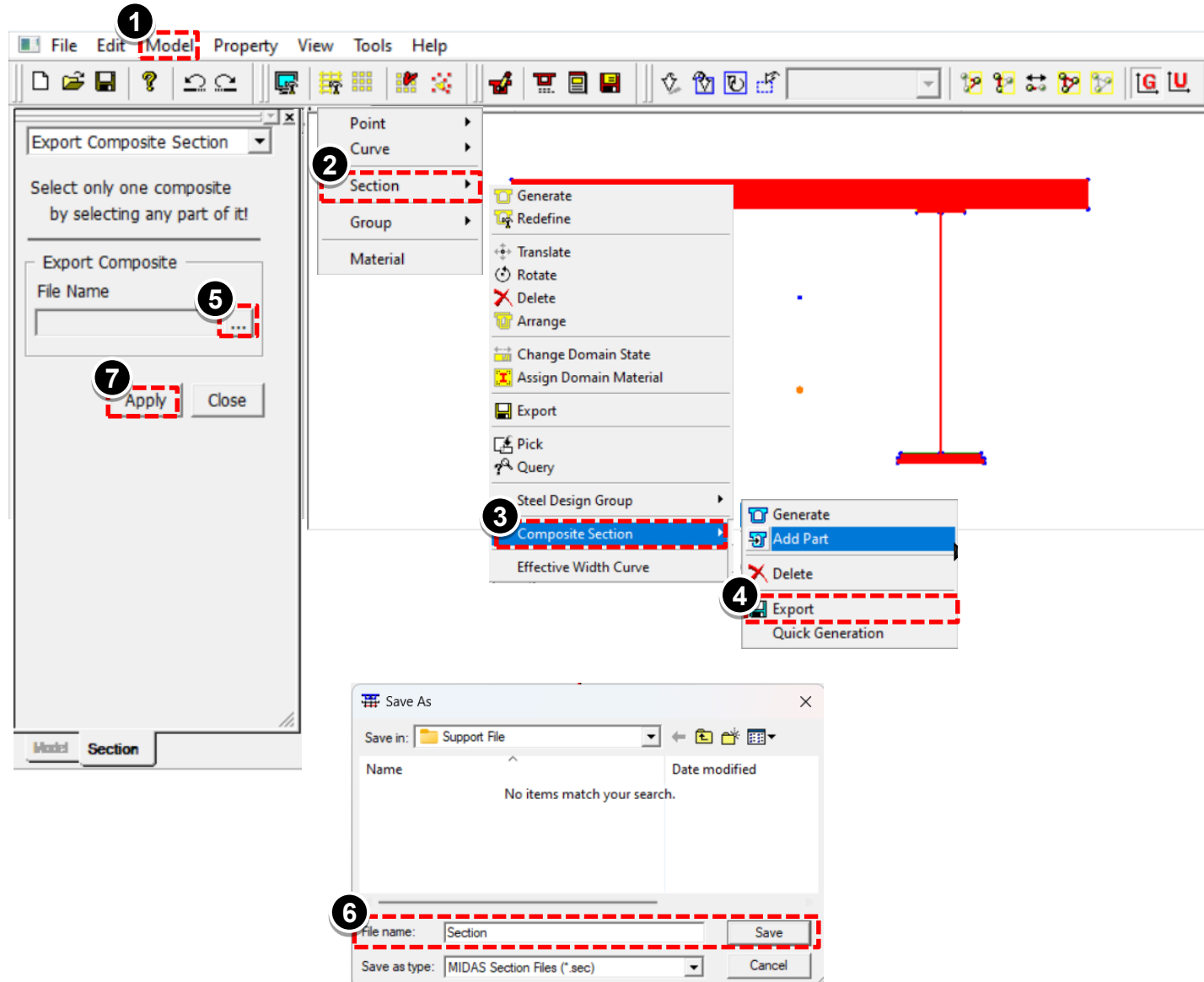
The screenshot shows the MIDAS CIVIL interface. The 'Property' menu is open, and the 'Calculate Composite Property' option is selected. The 'Calculate Composite' dialog box is displayed, with the 'Mesh Size' set to 100. The 'Composite Property Table' window is also open, showing the calculated properties for a 'Girder' composite section.

Composite Section Property Table

	Value [Length-Unit:mm]
Area	198832.000000
S _{Ax}	91649.267362
S _{Ay}	78112.451607
I _{xx}	179106299329.995000
I _{yy}	290630492709.333310
I _{xy}	0.000433
J	1141334488.332943
(+)C _x	1560.000000
(-)C _x	1560.000000
(+)C _y	1768.275207
(-)C _y	789.724793

Procedure

- 1) Go to Model
- 2) Click on Section
- 3) Go to Composite section
- 4) Click on Export
- 5) Click on
- 6) Input File Name: Section and
Click on Save
- 7) Click on Apply



Procedure

- 1) Go to Properties
- 2) Click on Section Properties
- 3) Click on Add
- 4) Select Composite
- 5) Input Name: Girder
- 6) Section Type: Composite - General
- 7) Click on Import SEC Files....

MIDAS CIVIL NX 2026 - [E:\MIDAS 2026\Tutorial Work\Material\New File\Model File\Model !] - [MIDAS CIVIL NX]

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

Material Properties: Material Properties, Time Dependent Property, Change Material Link, Plastic Material, Section Properties, Thickness, Tapered Group, Section Manager, Effective Width, Moment Curvature, Output Control, Inelastic Hinge, Fiber Section, Group Damping, Property Tables

Section Properties: Section Properties, Thickness, Tapered Group, Section Manager, Effective Width, Moment Curvature, Output Control, Inelastic Hinge, Fiber Section, Group Damping, Property Tables

Inelastic Properties: Moment Curvature, Output Control, Inelastic Hinge, Fiber Section, Group Damping, Property Tables

Damping: Group Damping, Property Tables

Tables: Property Tables

Properties

Material Section Thickness

ID Name Type Shape Add... Modify... Delete Copy Import Renumber

Section Data

DB/User Value SRC Combined
PSC Tapered Composite Steel Girder

Section ID 1 Name Girder
Section Type Composite-General
Part Total

Section Properties

Area	0.00000e+00 m ²
WArea	0.00000e+00 m ²
Asy	0.00000e+00 m ²
Asz	0.00000e+00 m ²
Ixx	0.00000e+00 m ⁴
Iyy	0.00000e+00 m ⁴
Izz	0.00000e+00 m ⁴
Cyp	0.0000 m
Cym	0.0000 m
Czp	0.0000 m
Czm	0.0000 m
Qyb	0.0000 m ²
Qzb	0.0000 m ²
Peri:O	0.00000e+00 m
Peri:I	0.00000e+00 m
Cent:y	0.0000 m
Cent:z	0.0000 m
y1	0.0000 m
z1	0.0000 m

Calc. Sect. Properties

Composite Section for PSC Design

Web Thick. for Shear(total) 0 m

Before Composite Section Part1

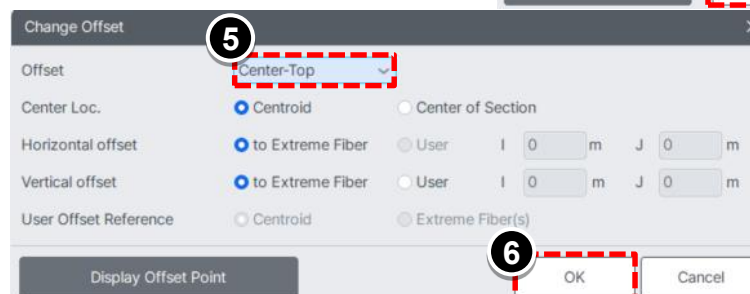
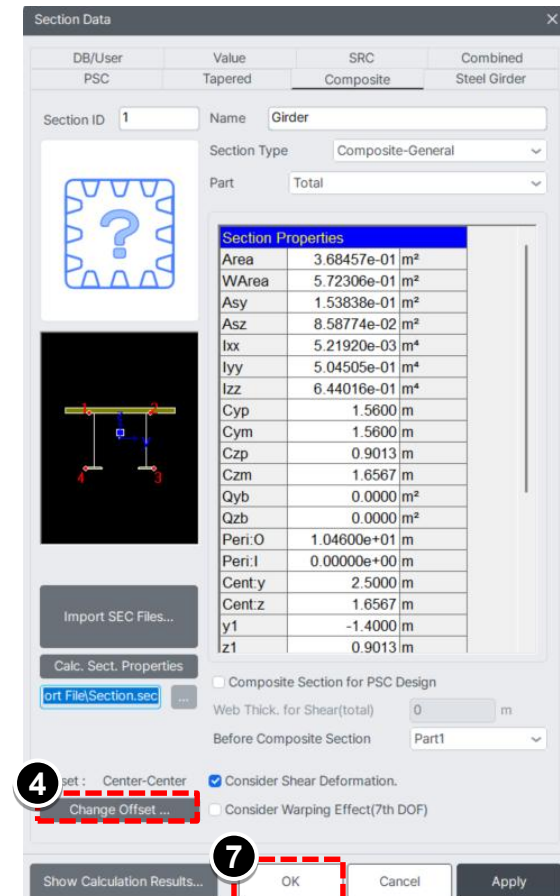
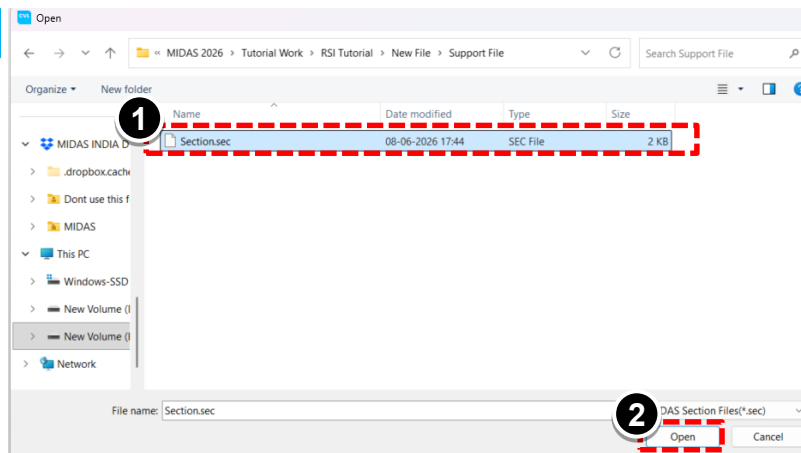
Offset: Center-Center ☒ Consider Shear Deformation.

Change Offset ... ☐ Consider Warping Effect(7th DOF)

Show Calculation Results... OK Cancel Apply

Procedure

- 1) Select the File which you had Import from the SPC
- 2) Click on Open
- 3) Click on OK
- 4) Click on Change Offset...
- 5) Select Offset as Center -Top
- 6) Click on OK
- 7) Click on OK



Procedure

- 1) Click on Material
- 2) Click on Add...
- 3) Select the Type of Design: Steel
- 4) Select Standard: IS (S)
DB: E250
- 5) Click on Apply

Properties

Material Section Thickness

1

ID	Name	Type	Standard	DB
Add...				
Modify...				
Delete				
Copy				
Import				
Renumber				

2

Close

Material Data

General

Material ID 1 Name E250

3

Plasticity Data

Type of Design Steel

4

Standard IS(S)

DB E250

Concrete

Standard

Code

DB

Type of Material

☒ Isotropic ☐ Orthotropic

Steel

Modulus of Elasticity 2.0500e+08 kN/m²

Poisson's Ratio 0.3

Thermal Coefficient 6.6667e-06 1/[F]

Weight Density 76.98 kN/m³

☐ Use Mass Density 7.85 kN/m³/g

Concrete

Modulus of Elasticity 0.0000e+00 kN/m²

Poisson's Ratio 0

Thermal Coefficient 0.0000e+00 1/[F]

Weight Density 0 kN/m³

☐ Use Mass Density 0 kN/m³/g

Plasticity Data

Plastic Material Name NONE

Thermal Transfer

Specific Heat 0 Btu/kN-[F]

Heat Conduction 0 Btu/m-hr-[F]

Damping Ratio 0.02

5

OK Cancel Apply

Procedure

- 1) Select DB: E250
- 2) Click on Apply
- 3) Select Type of Design: Concrete
- 4) Input Standard: IRS (RC)
- 5) Select DB: M35
- 6) Click on OK

Material Data

General
Material ID: 2 Name: E350

Elasticity Data
Type of Design: Steel
Standard: IS(S)
DB: E350

Type of Material
☒ Isotropic ☐ Orthotropic

Steel
Modulus of Elasticity: 2.0000e+08 kN/m²
Poisson's Ratio: 0.3
Thermal Coefficient: 6.6667e-06 1/[F]
Weight Density: 76.98 kN/m³
☐ Use Mass Density: 7.85 kN/m³/g

Concrete
Modulus of Elasticity: 0.0000e+00 kN/m²
Poisson's Ratio: 0
Thermal Coefficient: 0.0000e+00 1/[F]
Weight Density: 0 kN/m³
☐ Use Mass Density: 0 kN/m³/g

Plasticity Data
Plastic Material Name: NONE

Thermal Transfer
Specific Heat: 0 Btu/kN·[F]
Heat Conduction: 0 Btu/m·hr·[F]

Damping Ratio: 0.02

OK Cancel Apply

Material Data

General
Material ID: 3 Name: M35

Elasticity Data
Type of Design: Concrete
Standard: IRS(RC)
DB: M35

Type of Material
☒ Isotropic ☐ Orthotropic

Steel
Modulus of Elasticity: 0.0000e+00 kN/m²
Poisson's Ratio: 0
Thermal Coefficient: 0.0000e+00 1/[F]
Weight Density: 0 kN/m³
☐ Use Mass Density: 0 kN/m³/g

Concrete
Modulus of Elasticity: 2.9500e+07 kN/m²
Poisson's Ratio: 0.2
Thermal Coefficient: 6.5000e-06 1/[F]
Weight Density: 25 kN/m³
☐ Use Mass Density: 2.549 kN/m³/g

Plasticity Data
Plastic Material Name: NONE

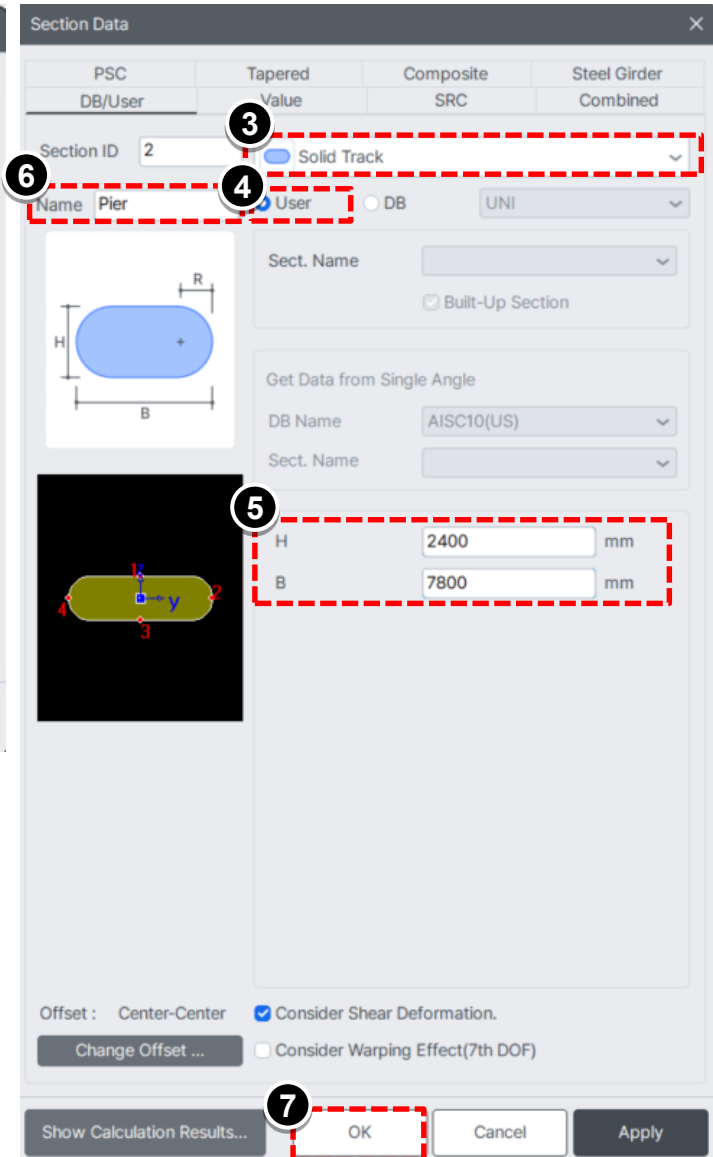
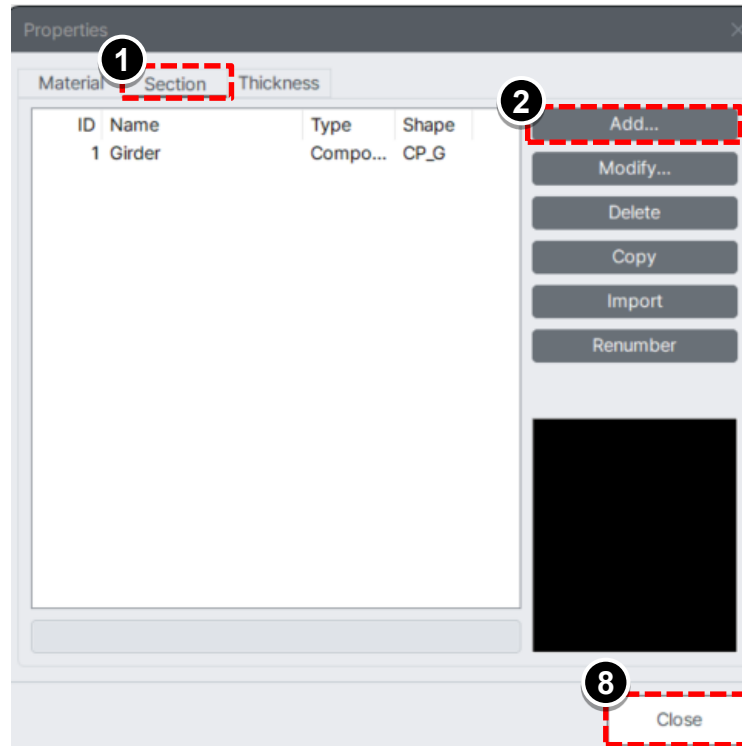
Thermal Transfer
Specific Heat: 0 Btu/kN·[F]
Heat Conduction: 0 Btu/m·hr·[F]

Damping Ratio: 0.05

OK Cancel Apply

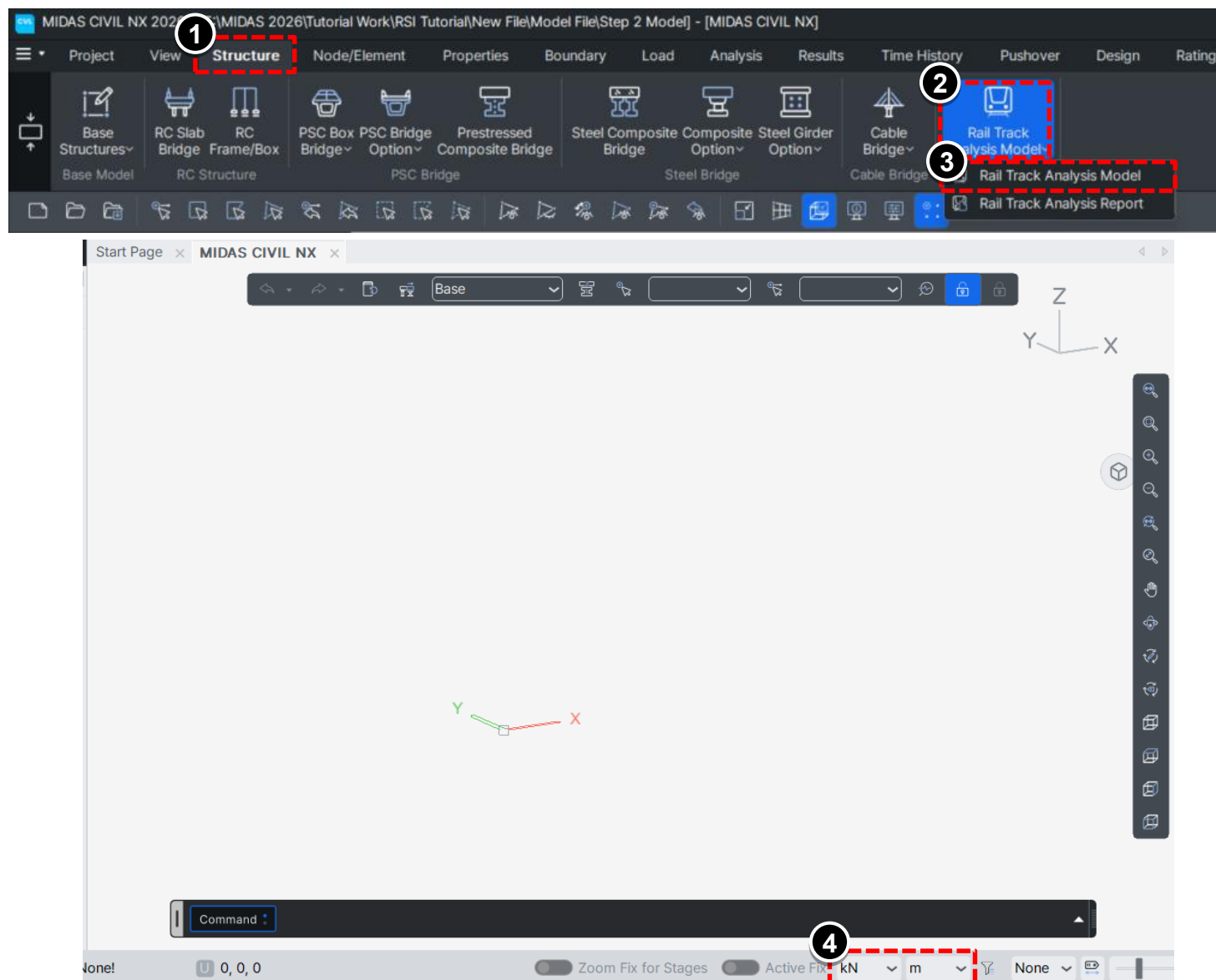
Procedure

- 1) Select Section
- 2) Click on Add..
- 3) Select Solid Track
- 4) Select User
- 5) Input H: 2400 mm
B: 7800 mm
- 6) Input Name: Pier
- 7) Click on OK
- 8) Click on Close



Procedure

- 1) Go to Structure
- 2) Click on Rail Track Analysis Model
- 3) Select Rail Track Analysis Model
- 4) Make the Unit: kN and m



Procedure

- 1) Select Bridge Material New:
E350
- 2) Input Embankment Length: 150 m
- 3) Deck Information: 10@32.6 m
- 4) Select Multi - Curve and
Click on Advanced

NOTE: Before proceeding to the next steps, please review the Midas Civil NX Help Manual link provided below. The manual explains exactly how to input these curve values and clarifies the differences between the Rail and Rail/Deck types.

[Rail Track Analysis Model - Layout - MIDAS Support](#)

Rail Track Analysis Model Wizard

Layout Section Boundary Load Wizard Option

Deck n ...
(Deck Number
Deck Type
Variable)

Embankment Length Var. Embankment Length

1 Bridge Material New 2: E350

2 Embankment Length 150 m

3 Deck Information 10@32.6 m

4 Multi-Curve Advanced...

Span Type

Type 1 Type 2 Type 3 Type 4

Advanced... Guide...

Rail Data

Rail Material 1: E250 Number of Tracks 2 EA

Additional Check

Open... Save As... OK Cancel

Procedure

- 1) Select Rail
- 2) Check on Straight Line
Start: 0 m
End: 100 m
- 3) Click on Add and
Check off Straight Line
- 4) Check on Transition Curve
Start: 100 m
End: 135 m
Radius 2: 1000 m
- 5) Click on Add and
Check off Transition Curve

Advanced Curve

☒ Rail ☐ Rail/Deck

☒ Straight Line Start 0 m End 100 m

☐ Circular Curve Start 0 m End 0 m
Radius 0 m Type ☐ Concave ☐ Convex

☐ Transition Curve Start 0 m End 0 m
Transition Curve Type ☐ Clothoid ☐ Third Parabola
☐ Radius 1 0 m ☐ Radius 2 0 m
Transition Curve Length 0 m
Type ☐ Concave ☐ Convex

Add Modify Delete

Deck...	Curve	Start	End	R1	R	R2	Ls	Typ

OK Cancel

Advanced Curve

☒ Rail ☐ Rail/Deck

☐ Straight Line Start 0 m End 100 m

☐ Circular Curve Start 0 m End 0 m
Radius 0 m Type ☐ Concave ☐ Convex

☒ Transition Curve Start 100 m End 135 m
Transition Curve Type ☒ Clothoid ☐ Third Parabola
☐ Radius 1 0 m ☒ Radius 2 1000 m
Transition Curve Length 35 m
Type ☒ Concave ☐ Convex

Add Modify Delete

Deck...	Curve	Start	End	R1	R	R2	Ls	Typ
Rail		0	100	-	-	-	-	Str

OK Cancel

Procedure

- 1) Check on Circular Curve
Start: 135 m
End: 175 m
Radius: 1000 m
- 2) Click on Add and
Check off Circular Curve
- 3) Check on Transition Curve
Start: 175 m
End: 215 m
Radius 1: 1000 m
- 4) Click on Add and
Check off Transition Curve

Advanced Curve

☒ Rail ☐ Rail/Deck

☐ Straight Line Start 0 m End 100 m

1 ☒ Circular Curve Start 135 m End 175 m
Radius 1000 m Type ☒ Concave ☐ Convex

☐ Transition Curve Start 100 m End 135 m
Transition Curve Type ☐ Clothoid ☐ Third Parabola
☐ Radius 1 0 m ☒ Radius 2 1000 m
Transition Curve Length 35 m
Type ☐ Concave ☐ Convex

2 Add Modify Delete

Deck...	Curve	Start	End	R1	R	R2	Ls	Typ
Rail		0	100	-	-	-	-	Str
Rail	TR	100	135	-	-	1000	35	Co

OK Cancel

Advanced Curve

☒ Rail ☐ Rail/Deck

☐ Straight Line Start 0 m End 100 m

☐ Circular Curve Start 135 m End 175 m
Radius 1000 m Type ☐ Concave ☐ Convex

3 ☒ Transition Curve Start 175 m End 215 m
Transition Curve Type ☒ Clothoid ☐ Third Parabola
☒ Radius 1 1000 m ☐ Radius 2 1000 m
Transition Curve Length 40 m
Type ☒ Concave ☐ Convex

4 Add Modify Delete

Deck...	Curve	Start	End	R1	R	R2	Ls	Typ
Rail		0	100	-	-	-	-	Str
Rail	TR	100	135	-	-	1000	35	Co
Rail	R	135	175	-	1000	-	-	Co

OK Cancel

Procedure

- 1) Check Straight Line
Start: 215 m
End: 315 m
- 2) Click on Add and
Check off Straight Line
- 3) Check in Transition Curve
Start: 315 m
End: 375 m
Radius 2: 1000 m
- 4) Click on Add and
Check off Transition Curve

Advanced Curve

☒ Rail ☐ Rail/Deck

1 ☒ Straight Line Start m End m

☐ Circular Curve Start m End m
Radius m Type ☒ Concave ☐ Convex

☐ Transition Curve Start m End m
Transition Curve Type ☒ Clothoid ☐ Third Parabola
☒ Radius 1 m ☐ Radius 2 m
Transition Curve Length m
Type ☐ Concave ☐ Convex

2

Deck...	Curve	Start	End	R1	R	R2	Ls	Typ
Rail		0	100	-	-	-	-	Str
Rail	TR	100	135	-	-	1000	35	Co
Rail	R	135	175	-	1000	-	-	Co
Rail	TR	175	215	1000	-	-	40	Co

Advanced Curve

☒ Rail ☐ Rail/Deck

☐ Straight Line Start m End m

☐ Circular Curve Start m End m
Radius m Type ☒ Concave ☐ Convex

3 ☒ Transition Curve Start m End m
Transition Curve Type ☒ Clothoid ☐ Third Parabola
☐ Radius 1 m ☒ Radius 2 m
Transition Curve Length m
Type ☒ Concave ☐ Convex

4

Deck...	Curve	Start	End	R1	R	R2	Ls	Typ
Rail		0	100	-	-	-	-	Str
Rail	TR	100	135	-	-	1000	35	Co
Rail	R	135	175	-	1000	-	-	Co
Rail	TR	175	215	1000	-	-	40	Co
Rail		215	315	-	-	-	-	Str

Procedure

- 1) Check on Circular Curve
Start: 375 m
End: 450 m
Radius: 1000 m
- 2) Click on Add and
Check off Circular Curve
- 3) Check in Straight Line
Start: 450 m
End: 626 m
- 4) Click on Add
- 5) Click on OK

Advanced Curve

☒ Rail ☐ Rail/Deck

☐ Straight Line Start 215 m End 315 m

1 ☒ Circular Curve Start 375 m End 450 m
Radius 1000 m Type ☒ Concave ☐ Convex

☐ Transition Curve Start 315 m End 375 m
Transition Curve Type ☐ Clothoid ☐ Third Parabola
☐ Radius 1 1000 m ☒ Radius 2 1000 m
Transition Curve Length 60 m
Type ☐ Concave ☐ Convex

2 Add Modify Delete

Deck...	Curve	Start	End	R1	R	R2	Ls	Ty
Rail		0	100	-	-	-	-	Str
Rail	TR	100	135	-	-	1000	35	Co
Rail	R	135	175	-	1000	-	-	Co
Rail	TR	175	215	1000	-	-	40	Co
Rail		215	315	-	-	-	-	Str
Rail	TR	315	375	-	-	1000	60	Co

OK Cancel

Advanced Curve

☒ Rail ☐ Rail/Deck

3 ☒ Straight Line Start 450 m End 626 m

☐ Circular Curve Start 375 m End 450 m
Radius 1000 m Type ☐ Concave ☐ Convex

☐ Transition Curve Start 315 m End 375 m
Transition Curve Type ☐ Clothoid ☐ Third Parabola
☐ Radius 1 1000 m ☒ Radius 2 1000 m
Transition Curve Length 60 m
Type ☐ Concave ☐ Convex

4 Add Modify Delete

Deck...	Curve	Start	End	R1	R	R2	Ls	Ty
Rail		0	100	-	-	-	-	Str
Rail	TR	100	135	-	-	1000	35	Co
Rail	R	135	175	-	1000	-	-	Co
Rail	TR	175	215	1000	-	-	40	Co
Rail		215	315	-	-	-	-	Str
Rail	TR	315	375	-	-	1000	60	Co
Rail	R	375	450	-	1000	-	-	Co

5 OK Cancel

Procedure

- 1) Check on and Click Advanced Option

NOTE: Click the Guide button before continuing to see exactly how to enter values in the Advanced option.

- 2) Input Deck 1 (32.6 m)

N Span: 1

Support Condition: Fixed

Fixed

Span Length (m): 31.975 m

Edge Dist. (m): 0.275 m

0.275 m

Bearing Spacing: 0.7 m

Input for all Deck as per value shown in image

- 3) Click on OK

Rail Track Analysis Model Wizard

Layout Section Boundary Load Wizard Option

Deck n ...
(Deck Number
Deck Type
Variable)

Embankment Length Var. Embankment Length

Bridge Data

Bridge Material New 2 2: E350 Embankment Length 150 m

Deck Information 10@32.6 m Advanced... Multi-Curve Advanced...

Span Type

Type 1 Type 2 Type 3 Type 4

Advanced... Guide...

Rail Data

Rail Material 1 1: E250 Number of Tracks 1 EA

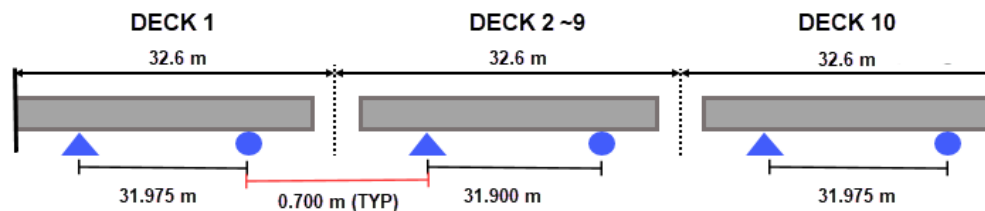
Additional Check

Open... Save As... OK Cancel

Advanced Span Type

Deck Num	Support Condition	Span Length(m)	Edge Dist. (m)	N Span
Deck1 (32.6m)	Fixed	0	0.275	1
	Fixed	31.975	0.275	
Bearing Spacing		0.7	0	
Deck2 (32.6m)	Fixed	0	0.275	1
	Fixed	31.9	0.275	
Bearing Spacing		0.7	0	
Deck3 (32.6m)	Fixed	0	0.275	1
	Fixed	31.9	0.275	
Bearing Spacing		0.7	0	
Deck4 (32.6m)	Fixed	0	0.275	1
	Fixed	31.9	0.275	
Bearing Spacing		0.7	0	
Deck5 (32.6m)	Fixed	0	0.275	1
	Fixed	31.9	0.275	
Bearing Spacing		0.7	0	
Deck6 (32.6m)	Fixed	0	0.275	1
	Fixed	31.9	0.275	
Bearing Spacing		0.7	0	
Deck7 (32.6m)	Fixed	0	0.275	1
	Fixed	31.9	0.275	
Bearing Spacing		0.7	0	
Deck8 (32.6m)	Fixed	0	0.275	1
	Fixed	31.9	0.275	
Bearing Spacing		0.7	0	
Deck9 (32.6m)	Fixed	0	0.275	1
	Fixed	31.9	0.275	
Bearing Spacing		0.7	0	
Deck10 (32.6m)	Fixed	0	0.275	1
	Fixed	31.975	0.275	

OK Cancel

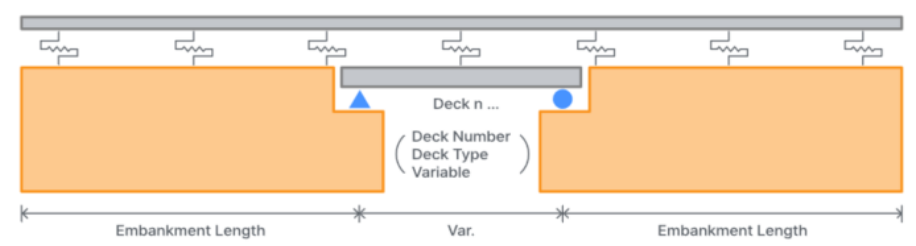


Procedure

- 1) Select Rail Material: E250
- 2) Select Number of Tracks: 2

Rail Track Analysis Model Wizard

Layout Section Boundary Load Wizard Option



Deck n ...
(Deck Number
Deck Type
Variable)

Embankment Length Var. Embankment Length

Bridge Data

Bridge Material New 2 2: E350 ... Embankment Length 150 m

Deck Information 10@32.6 m ☐ Advanced... ☒ Multi-Curve Advanced...

Span Type

☐ Type 1 ☐ Type 2

☐ Type 3 ☐ Type 4

☒ Advanced... Guide...

1 Data

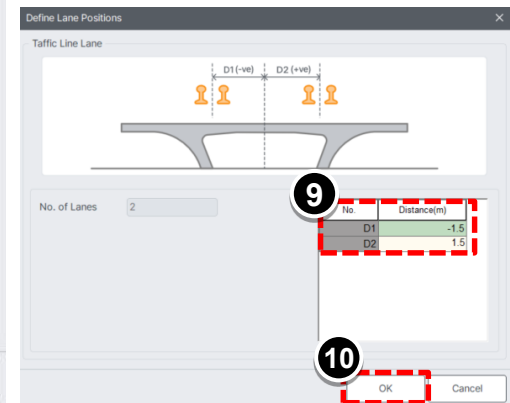
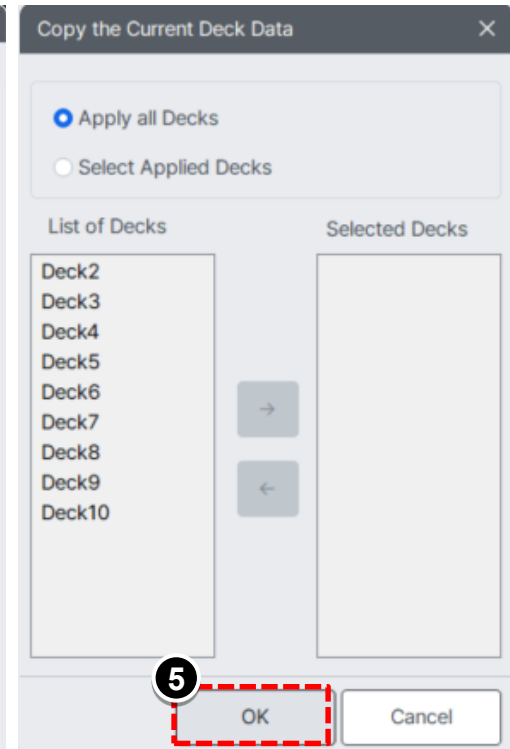
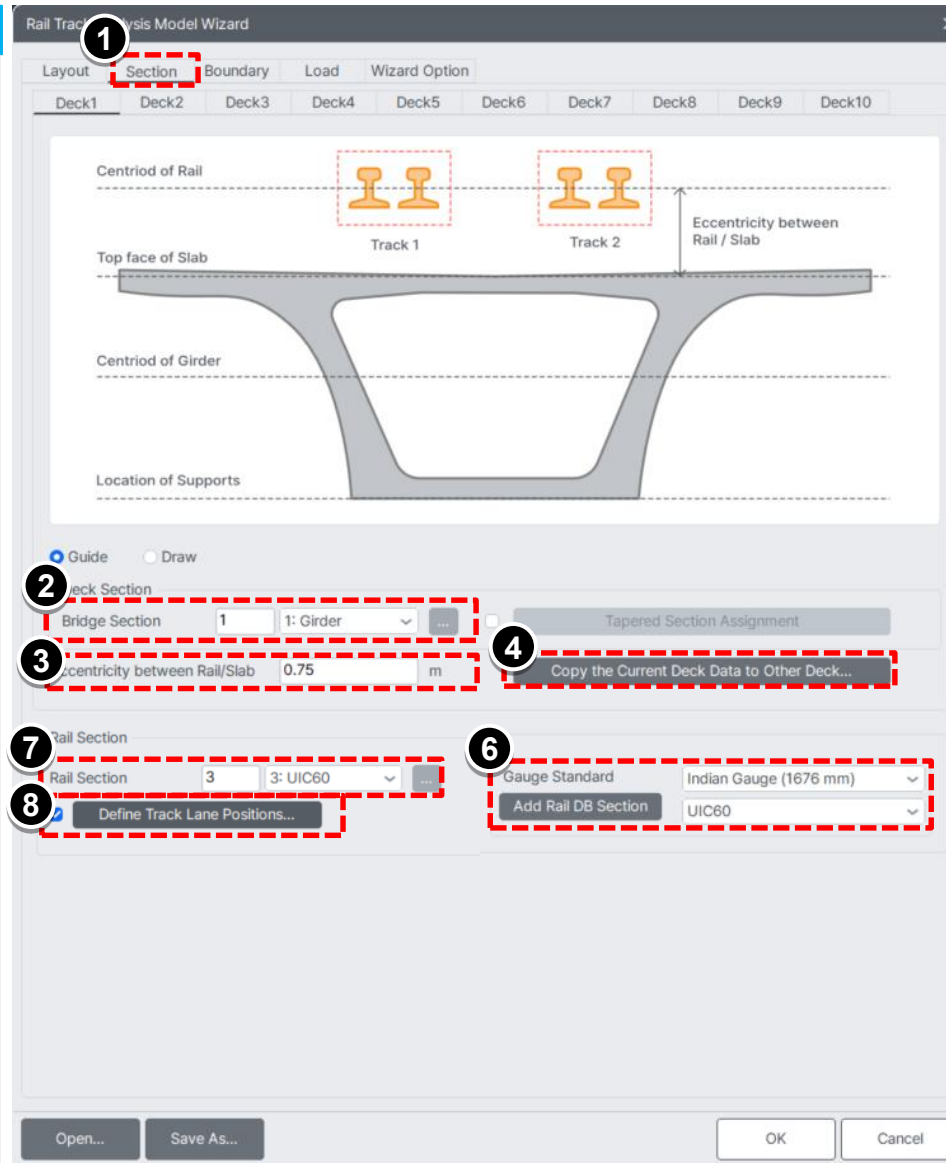
1 Rail Material 1 1: E250 ... 2 Number of Tracks 2 EA

☐ Additional Check

Open... Save As... OK Cancel

Procedure

- 1) Go to Section
- 2) Select Bridge Section: Girder
- 3) Input Eccentricity between Rail/Slab: 0.75 m
- 4) Click on Copy the current Deck Data to other Deck
- 5) Click on OK
- 6) Select
 - > Gauge Standard: Indian Gauge (1676 mm)
 - > Add Rail DB Section: UIC60
- 7) Select Rail Section: UIC60
- 8) Check in Define Track Lane Positions..
- 9) Input D1: -1.5 m
D2: 1.5 m
- 10) Click on OK



Procedure

- 1) Go to Boundary
- 2) Input Longitudinal Resistance Data
 U_d (Longitudinal Limited Disp.) : 0.002 m
 F_{max} (For Stress Check): 25 kN/m
 F_{max} (For Disp. Check): 25 kN/m
 F_{max} (Yield Force): 50 kN/m
- 3) Select Transverse Resistance Data
- 4) Input Same Value as Step 2
- 5) Select Bearing Type
- 6) Input Elastic Link Data
 Longitudinal: 15000 kN/m
 Transverse: 15000 kN/m
- 7) Elastic Link Length: 0.3 m
- 8) Input Pier Section: Pier
 Pier Material: M35
 Pier Height: 10 m

Rail Track Analysis Mod. Wizard

Layout Section **Boundary** Load Wizard Option

1

2

Longitudinal Resistance Data Transverse Resistance Data

Ballast Bed Concrete Bed

3

Ud (Longitudinal Limited Disp.) 0.002 m

Unloaded Condition

F_{max} (For Stress Check) 25 kN/m

F_{max} (For Disp. Check) 25 kN/m

Loaded Condition

F_{max} (Yield Force) 50 kN/m

Define Condition

☒ Ballast Bed ☐ Concrete Bed

4

Transverse Rigidity

Ud (Longitudinal Limited Disp.) 0.002 m

Unloaded Condition

F_{max} (For Stress Check) 25 kN/m

F_{max} (For Disp. Check) 25 kN/m

Loaded Condition

F_{max} (Yield Force) 50 kN/m

Define Condition

☒ Ballast Bed ☐ Concrete Bed

5

Boundary

☐ Spring Type ☒ Bearing Type

6

Elastic Link Data

Longitudinal 15000 kN/m

Transverse 15000 kN/m

7

Elastic Link Length 0.3 m

8

Pier Data

Pier Section 2 2: Pier

Pier Material 3 3: M35

Pier Height 10 m

Bottom of Pier ☒ Fixed ☐ Spring Support

☒ Shear Spring Location Check Distance Ratio From End | 0.5

Longitudinal Resistance Data **3** Transverse Resistance Data

Ballast Bed Concrete Bed

4

Transverse Rigidity

Ud (Longitudinal Limited Disp.) 0.002 m

Unloaded Condition

F_{max} (For Stress Check) 25 kN/m

F_{max} (For Disp. Check) 25 kN/m

Loaded Condition

F_{max} (Yield Force) 50 kN/m

Define Condition

☒ Ballast Bed ☐ Concrete Bed

Procedure

- 1) Go to Load
- 2) Input Deck Temperature: 25 C
- 3) Select Running Direction:
Keep Left
- 4) Input the Value as Show for
Track 1

Rail Track Analysis Model Wizard

Layout Section Boundary **Load** Wizard Option

Temperature Load

Deck Temperature 25 [C] ☐ Advanced Temp. Rail Temperature 0 [F]

Acceleration / Braking / Vertical Load

Running Direction - Keep Left

Track Loads ☐ Train Section : 0 ~ 0

Load Type	Track	Loads (kN/m)	Start Pt (m)	End Pt (m)	Length (m)
Vertical	Track1	182.95	496.60	508.60	12.00
Vertical	Track1	104.00	0.00	496.60	496.60
Accel.	Track1	47.00	496.60	508.60	12.00
Accel.	Track1	22.00	468.60	496.60	28.00
Centrifugal	Track1	182.95	496.60	508.60	12.00
Centrifugal	Track1	104.00	0.00	496.60	496.60

☒ Guide ☐ Draw

Track 1

Track 2

Vertical Load
Braking Load

Vertical Load
Acceleration Load

☒ Moving Load Data

Number of Track Loading Locations 11

☐ Apply Unique Location increment for all track ☐ Apply Unique Train Speed for all track

Location Increment for Track1 -32.6 m Train Speed for Track1 60 km/h

Open... Save As... OK Cancel

Procedure

- 1) Input the Value for Track 2 as Shown
- 2) Check in Moving Load Data
 - > Number of Track Loading Location: 11
 - > Location Increment for Track -32.6 m
 - > Train Speed: 60 km/h

Rail Track Analysis Model Wizard

Layout Section Boundary Load Wizard Option

Temperature Load

Deck Temperature 25 [C] ☐ Advanced Temp. Rail Temperature 0 [F]

Acceleration / Braking / Vertical Load

Running Direction - Keep Left

Track Loads ☐ Train Section : 0 ~ 0

Load Type	Track	Loads (kN/m)	Start Pt (m)	End Pt (m)	Length (m)
Vertical	Track2	182.95	496.60	508.60	12.00
Vertical	Track2	104.00	0.00	496.60	496.60
Braking	Track2	47.00	496.60	508.60	12.00
Braking	Track2	22.00	0.00	496.60	496.60
Centrifugal	Track2	182.95	496.60	508.60	12.00
Centrifugal	Track2	104.00	0.00	496.60	496.60

☒ Guide ☐ Draw

Track 1

Track 2

Vertical Load Braking Load

Vertical Load Acceleration Load

☒ Moving Load Data

Number of Track Loading Locations 11

☐ Apply Unique Location Increment for all track ☐ Apply Unique Train Speed for all track

Location Increment for Track1 -32.6 m Train Speed for Track1 60 km/h

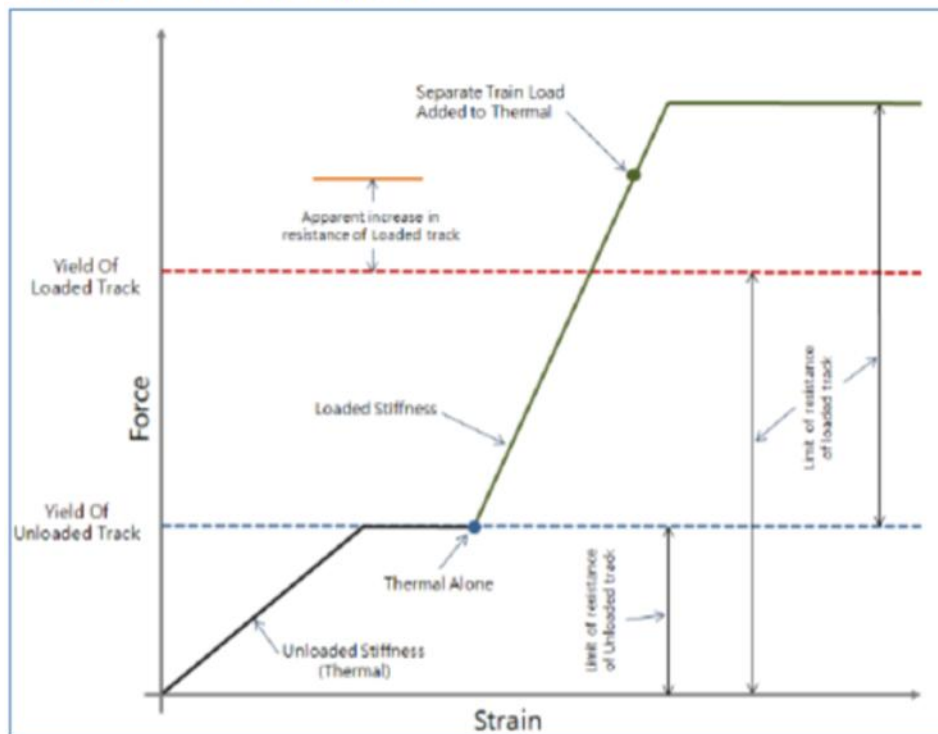
Open... Save As... OK Cancel

Types of analytical methods for RSI

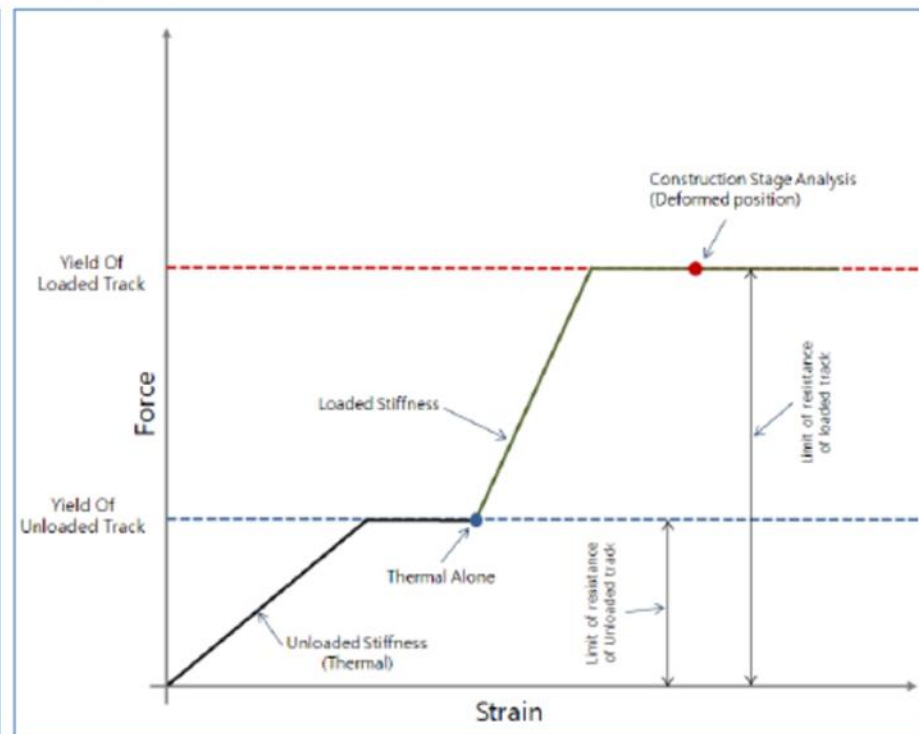
- The accuracy depends on the computational analysis methods.
- The following two computational analysis methods are available:
 - . Separate analysis: thermal loading, traction/braking loading and train vertical loading are separately considered.
 - . Complete Analysis: thermal loading, traction/braking loading and train vertical loading are concurrently applied.
- Depending on the global structural system, the separate analysis is more likely to produce the greater axial forces than the staged analysis.

Types of analytical methods for RSI

Simplified Separate Analysis



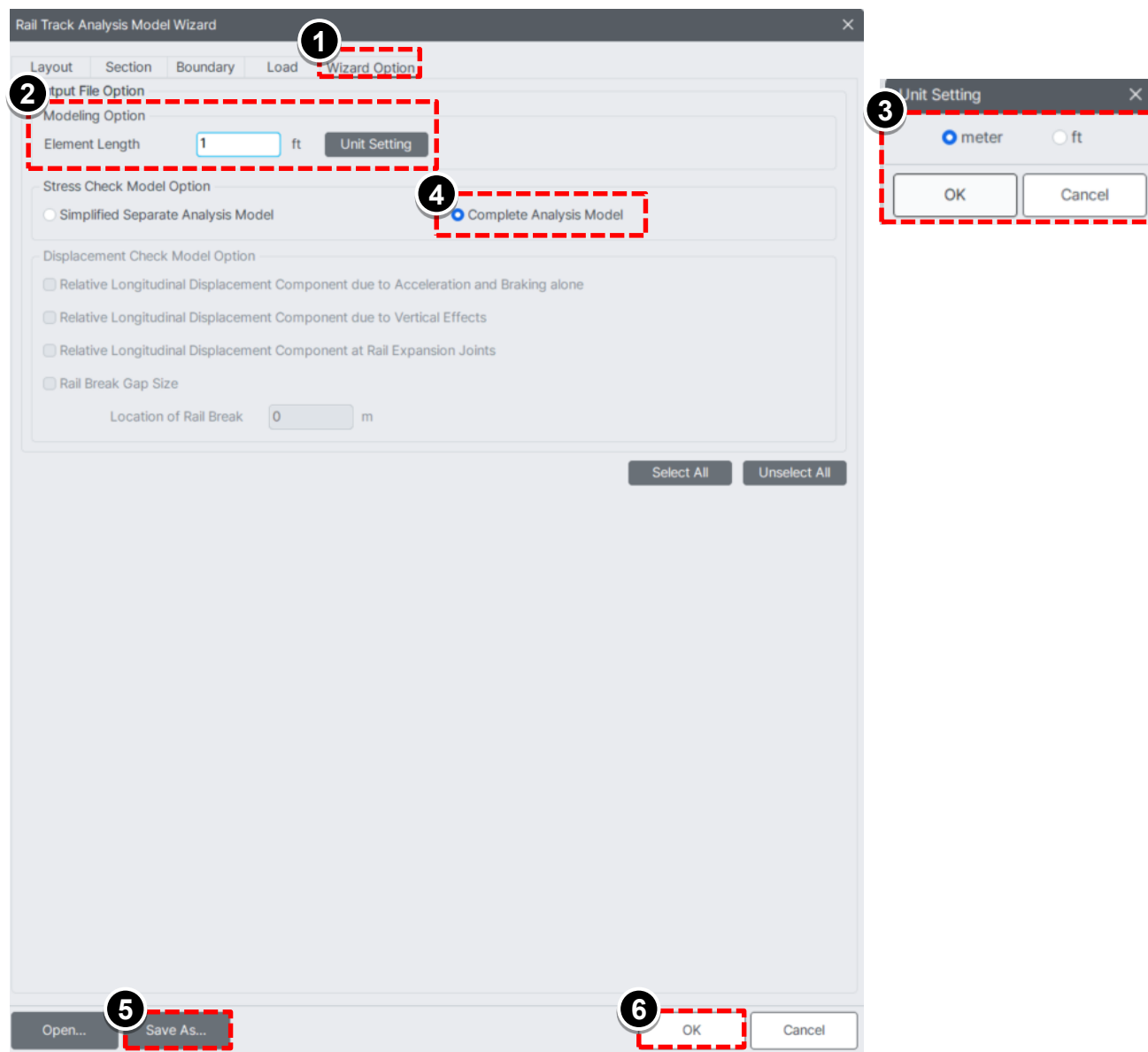
Complete Analysis



Depending on the global structural system, the simplified separate analysis is a conservative approach and results in greater stresses on the in the rail as compared to the complete staged analysis..

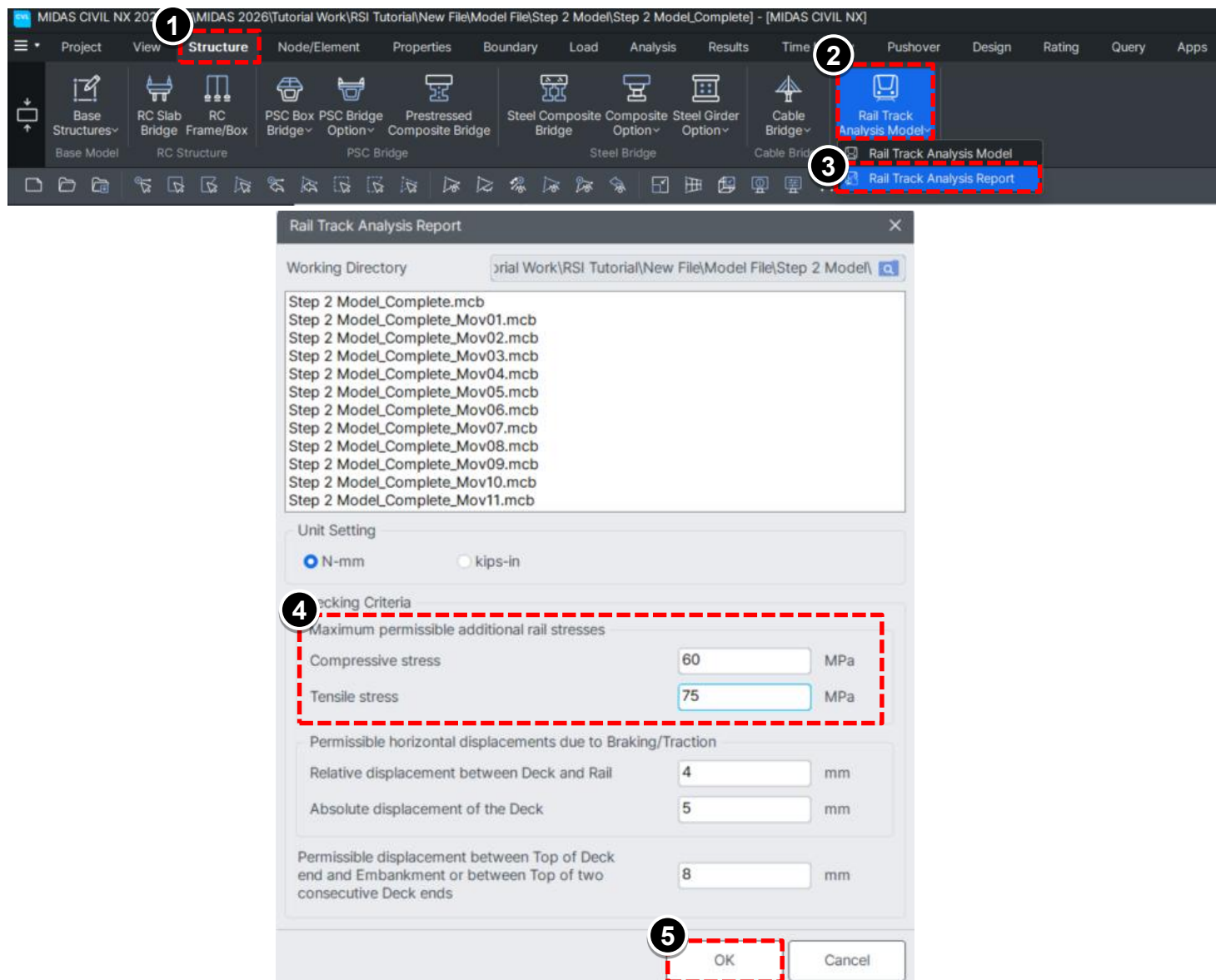
Procedure

- 1) Go to Wizard Option
- 2) Input Element Length: 1 m
Click on unit Setting
- 3) Select meter and click OK
- 4) Click on Complete Analysis Model
- 5) Click on Save As...
- 6) Click on OK



Procedure

- 1) Go to Structure Tab
- 2) Click on Rail Track Analysis Model
- 3) Click on Rail Track Analysis Report
- 4) Input the
Compressive Stress: 60 MPa
Tensile Stress: 75 MPa
- 5) Click on OK



Procedure

Go to the folder in which model file has been saved.

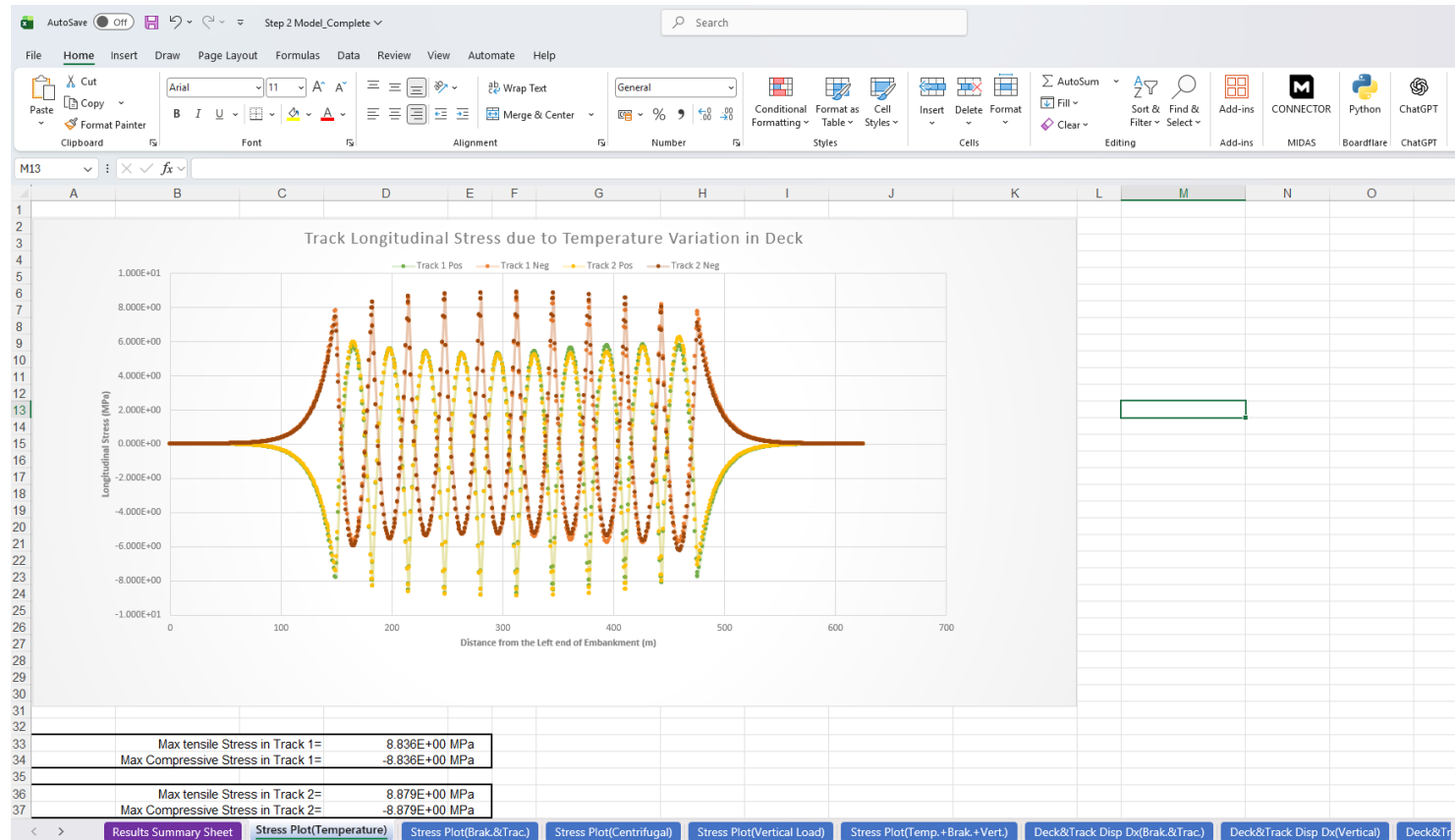
It contains an Auto-generated folder having all the model files as well as the Report.

Say, the model File named “RSI.mcb” is saved in the Local Drive (D) then the report could be found in:

Local Drive (D) > RSI (folder) >
RSI_Add1_RelativeDisp
 (Excel File)

In the **Report** document,

Stress plots due to **temperature**, **braking** and **tractive forces**, **centrifugal forces**, and **vertical loads**, as well as displacement graphs and longitudinal reaction table, can be found here.



12) Longitudinal Reaction (Fx,N) due to Braking/Traction + Centrifugal Force + Vertical Effect + Temperature

Node	Reaction
3500	2.21E+07
3504	5.86E+12
3508	9.12E+12
3512	1.11E+13
3516	1.75E+13
3520	2.54E+13
3524	1.26E+13
3528	-3.53E+13
3532	-1.55E+13
3536	-2.30E+13
3537	-1.19E+13

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