MODELLING PHILOSOPHY:
WHY MIDAS
Agenda

- Modeling Philosophy
- Similarities in workflow in midas Civil & MDX
- MDX result verification using midas Civil
- Using midas Civil for more complex problems
MODELING PHILOSOPHY
MODELING

Three main modeling methods

• 2D Grillage models
• 3D Grillage models
• Meshed Finite Element model
2D MODELING

- Most common modeling method
- Modeled as orthogonal or skewed grillage depending on site requirements

(a) Orthogonal grillage

(b) Grillage for spans with small skew < 20°

(c) Grillage for spans with large skew (> 20°)

<table>
<thead>
<tr>
<th>MDX</th>
<th>midas Civil</th>
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3D MODELING

- 3D Grillages are quite useful when dealing with ladder deck bridges
FINITE ELEMENT MODELING

• More realistic structural response. Accurate representation of local and global responses.
• Models can be built using combination of plate and beam elements.

(Slab on near span not shown)
Conclusion

- For simple projects including 2D grillage with skew < 20°, either MDX or midas Civil can be used for the preliminary design
  - Owing to similarity of input/output, midas Civil/MDX can be used to verify the results

- For bridges with skew > 20°, MDX can be used with some spreadsheet calculations to support large skew, or midas Civil can be used directly

- For bridges requiring Finite Element Modeling, midas Civil can be used
Similarities in workflow
midas Civil & MDX
Similarity in workflow

Model View
Similarity in workflow

Wizard Tabs

Wizard Tabs in the software interface for different workflows and stages.
Similarity in workflow

Steel Composite Girder Bridge Wizard
Similarity in workflow

Temperature Load

<table>
<thead>
<tr>
<th>Type of Construction</th>
<th>Temperature Difference (ΔT)</th>
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<tr>
<td>100mm surfacing</td>
<td>(a) Heating</td>
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<tr>
<td>200mm surfacing</td>
<td>(b) Cooling</td>
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<td>3a. Concrete slab</td>
<td>h₁ = 0.25m but ≤0.15m</td>
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<tr>
<td>3b. Concrete beams</td>
<td>h₂ = 0.36m but ≤0.15m</td>
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Temperature Loads

Section Type
- General
- PSC/Composite

Section Temperatures
- Initial: 0°C
- Material: Element
- Elast.: 0 kN/mm²
- Therm.: 0°C
- Ref.: Top

B: Section 0 mm
H1: 21 mm 0 mm
H2: 22 mm
T1: 0 mm [C]
T2: 0 mm [C]

Add  Modify  Delete
Modeling Features for Practical Analysis

Vehicle Load

- EUROCODE
  - Canada
  - BS
  - Australia
  - Russia
  - Korea
  - KSCE-LSD12
  - China
  - India
  - Taiwan
  - Transverse

- Moving Load Analysis Control Data
  - Truck/Train Load Control Option
    - Analysis Method: Quick, Pivot, Quick
  - Load Point Selection
    - Influence Line Dependent Point, All Points
  - Influence Generating Points
    - Number/Line Element: [3]
    - Distance between Points: [0.3 m]

- Analysis Results
  - Plate: Center, Center + Node, Normal + Concurrent Force, Combined Stress Calculation

- Calculation Filters
  - Reactions: All
  - Displacements: All
  - Forces/Moments: All

- Define Standard Vehicular Load
  - Vehicular Load Name: M1000
  - Vehicular Load Type: M1200
  - Dynamic Load Allowance: [0.4]

- Design Lane: [3.5 m]

- Result By Max Value [Beam Force]
  - [Data Table]
MDX result verification in midas Civil
MDX result verification in midas Civil

Effects of Live Load

[Graph and diagram showing live load deflection and analysis results]
MDX result verification in midas Civil

- Heating Condition – Bending Moment Diagram
- Heating Condition – Deflection Shape
MDX result verification in midas Civil

Resultant Force Diagram

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Using midas Civil
For
more complex problems
Advanced Features in midas Civil

Sub-structure Analysis
Advanced Features in midas Civil

Sub-structure Analysis

- Non-linear springs
Advanced Features in midas Civil

Torsion Calculation
Advanced Features in midas Civil

Construction Stage Analysis
Simple 2D Grillage Model

Design: Use MDX

Verification: Use midas Civil which has similar workflow as MDX

Complex 2D/3D Model

Design: Use midas Civil
Thank you