MODELLING PHILOSOPHY: WHY MIDAS

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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

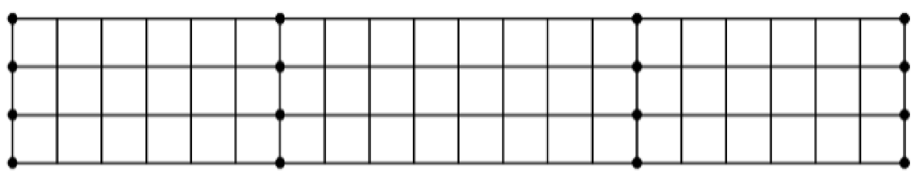
MODELING

Three main modeling methods

- 2D Grillage models
- 3D Grillage models
- Meshed Finite Element model

2D MODELING

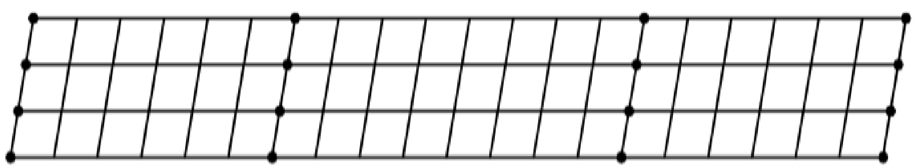
- Most common modeling method
- Modeled as orthogonal or skewed grillage depending on site requirements



(a) Orthogonal grillage

MDX ✓

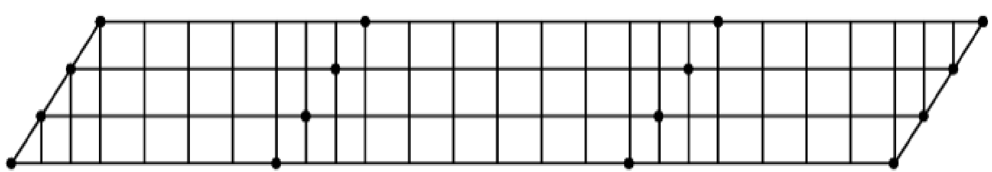
midas Civil ✓



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

MDX ✓

midas Civil ✓



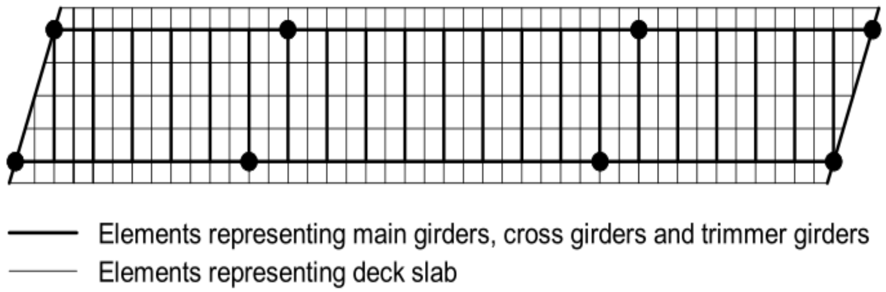
(c) Grillage for spans with large skew (>20°)

MDX ✗

midas Civil ✓

3D MODELING

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

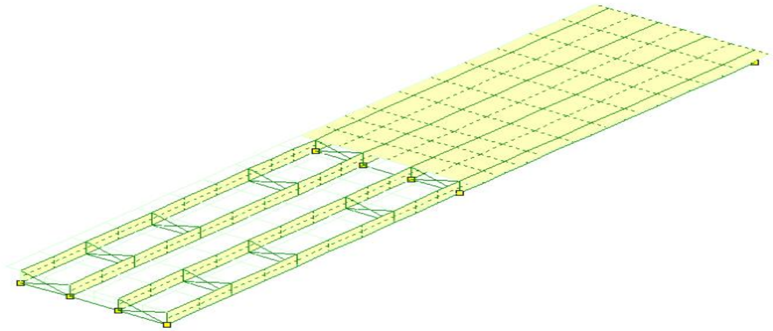


MDX ✗

midas Civil ✓

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)

MDX	✗
midas Civil	✓

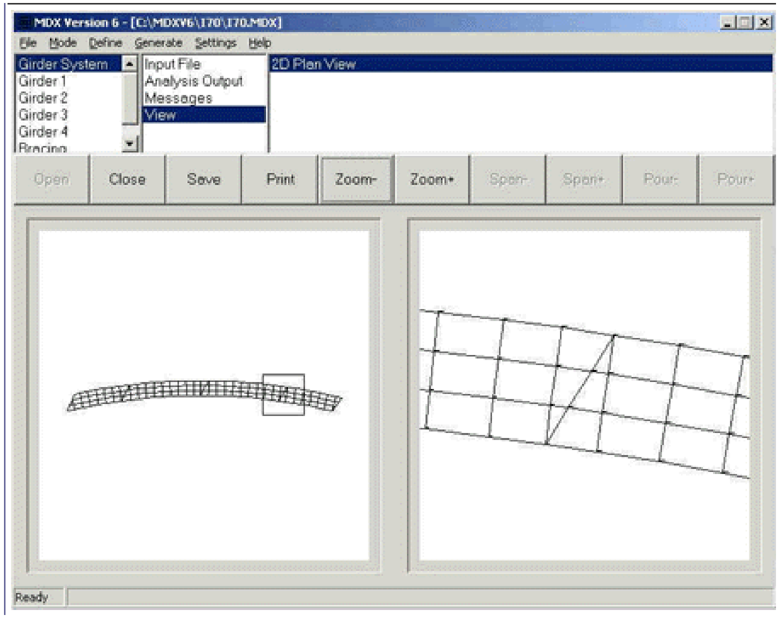
Conclusion

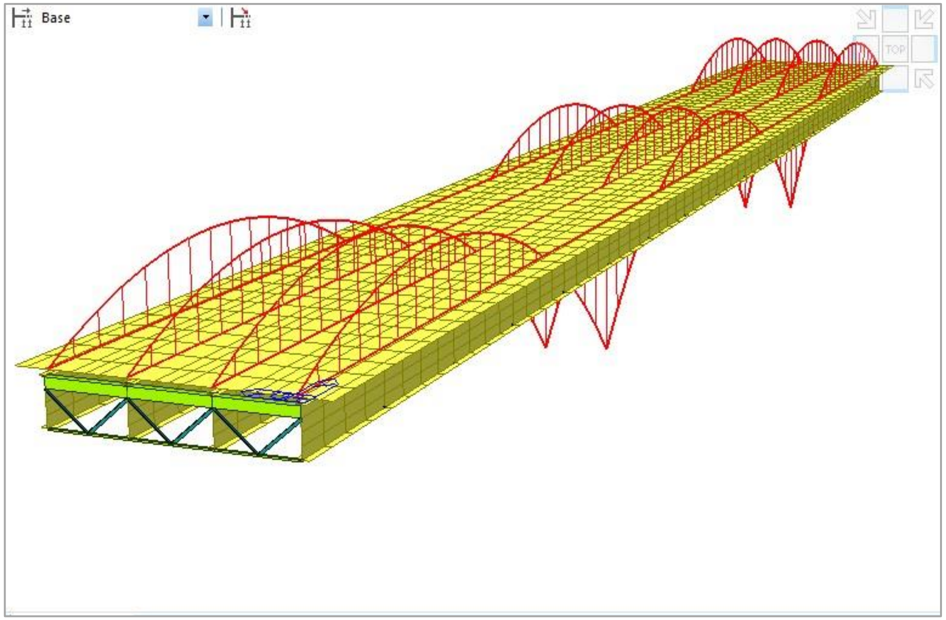
- For simple projects including 2D grillage with skew < 20°, either MDX or midas Civil can be used for the preliminary design
  - Owing to similarity of input/output, midas Civil/MDX can be used to verify the results
- For bridges with skew > 20°, MDX can be used with some spreadsheet calculations to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

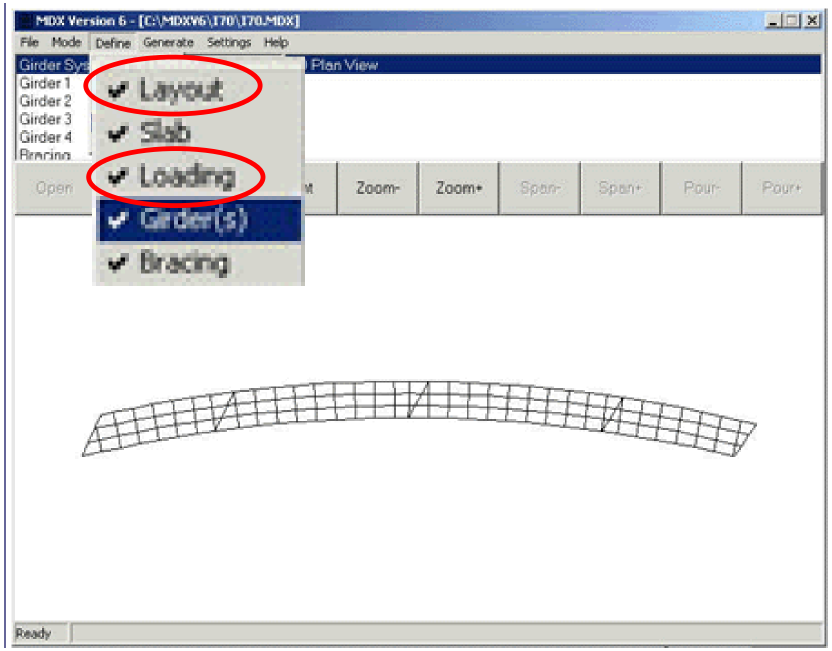
Model View

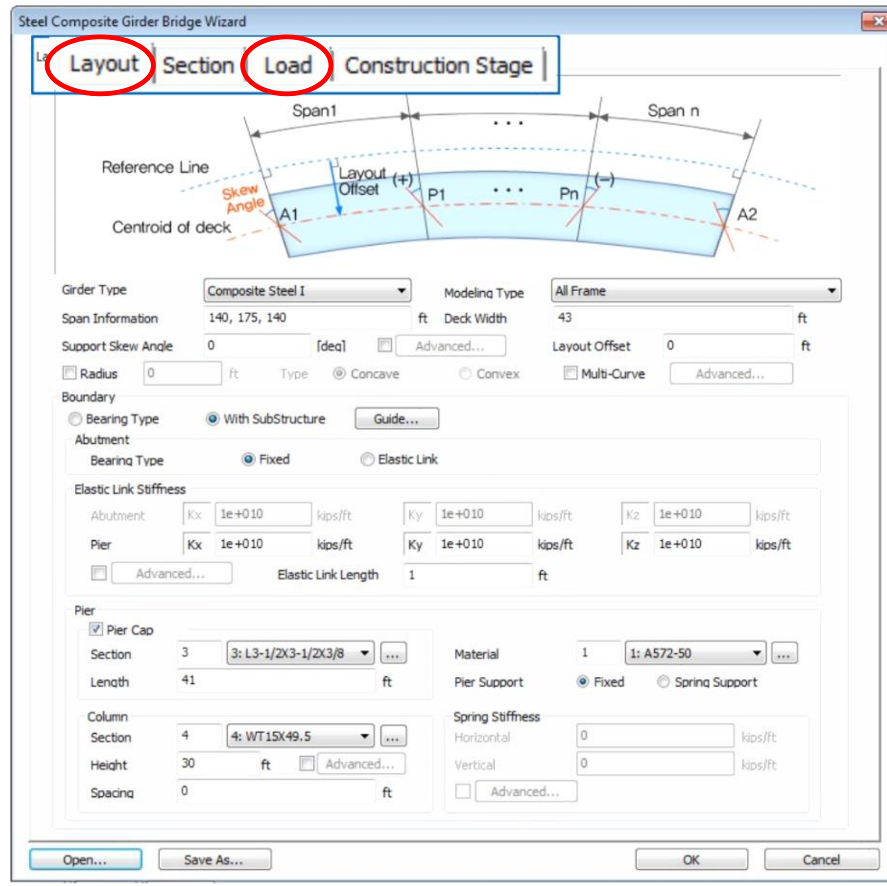




Similarity in workflow

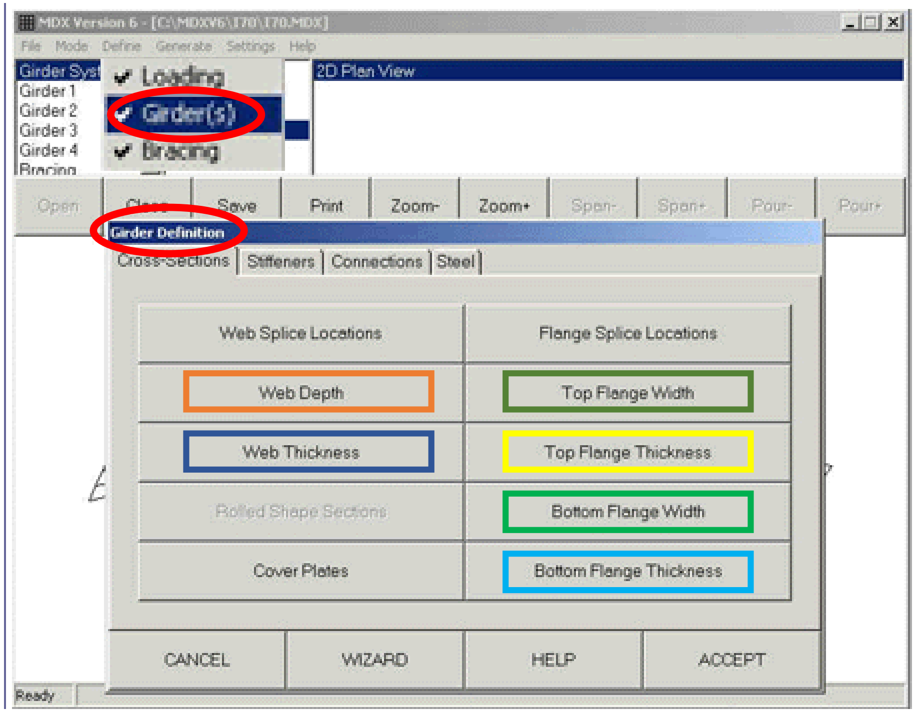
Wizard Tabs

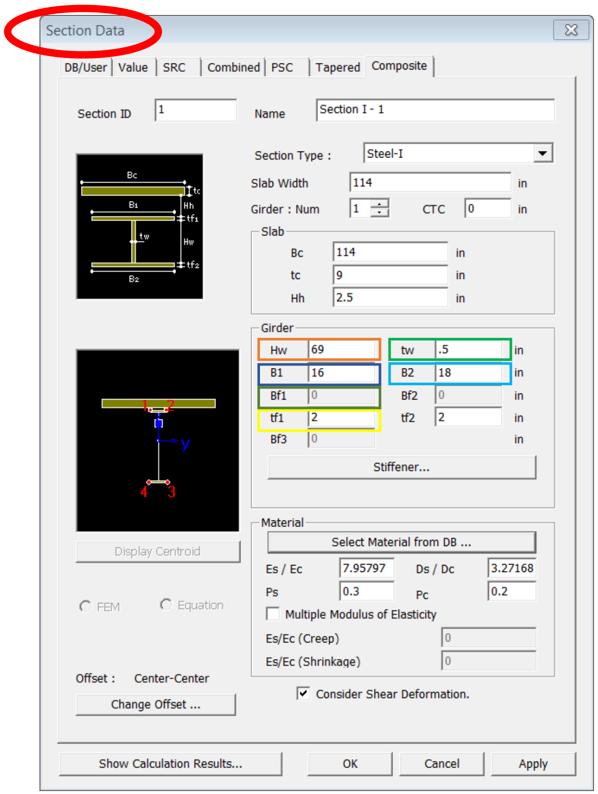




Similarity in workflow

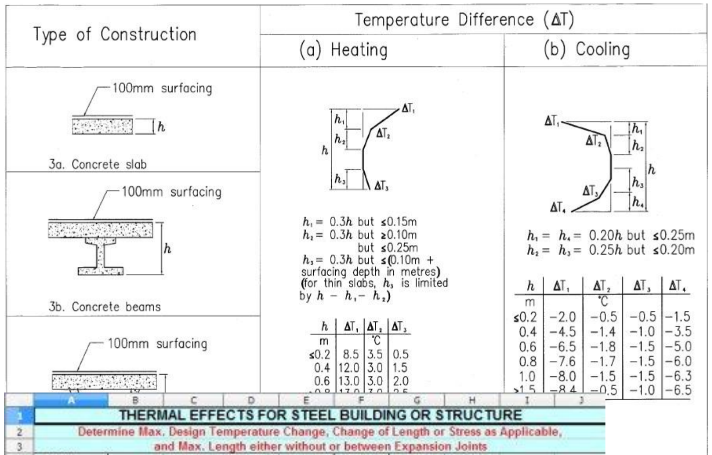
Steel Composite Girder Bridge Wizard

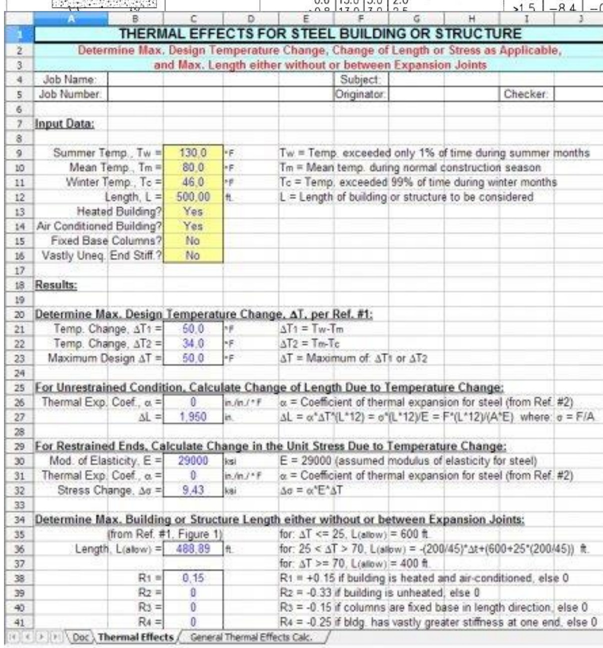


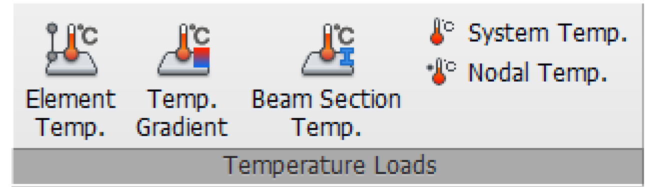


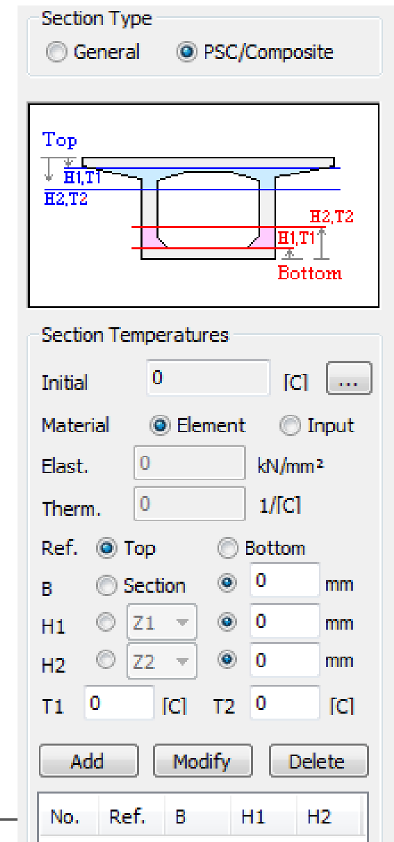
Similarity in workflow

Temperature Load



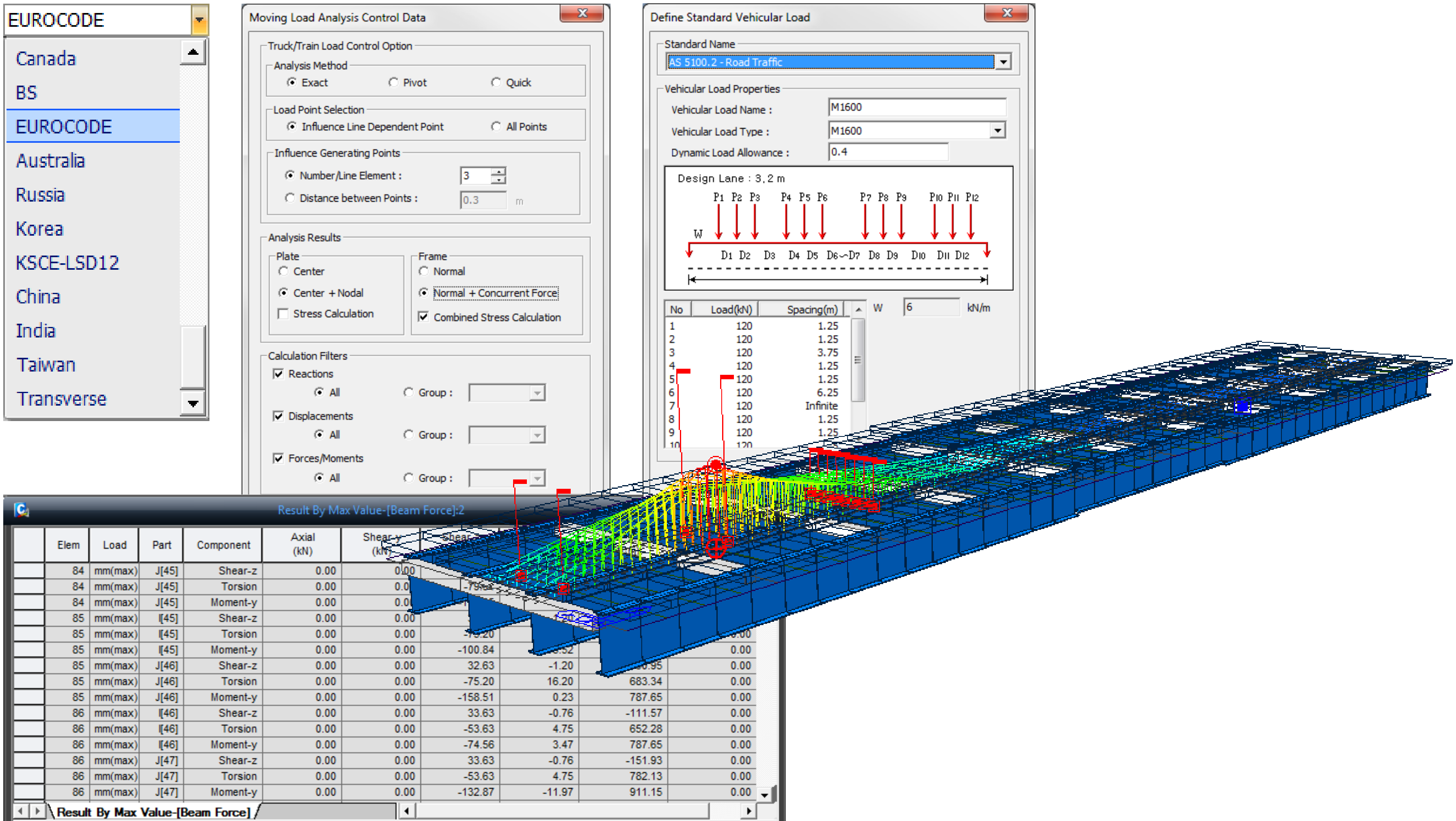






Modeling Features for Practical Analysis

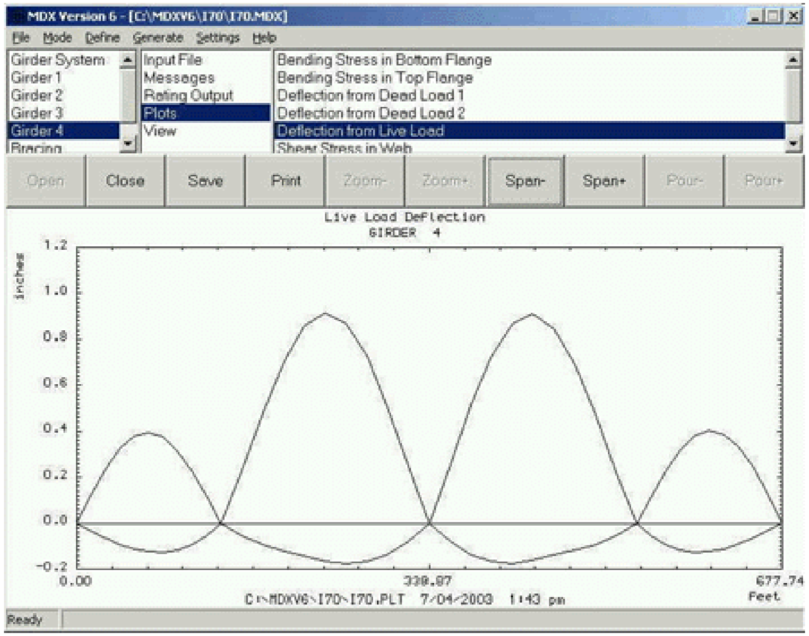
Vehicle Load

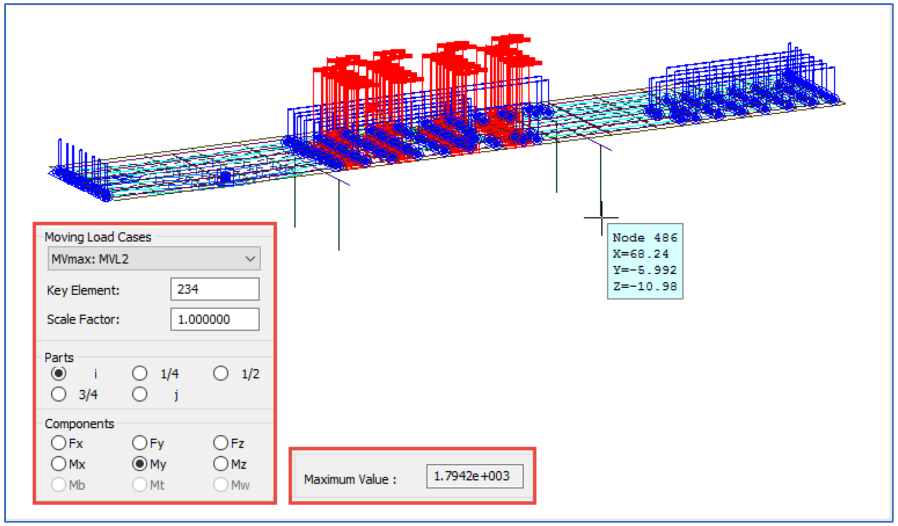


MDX result verification in midas Civil

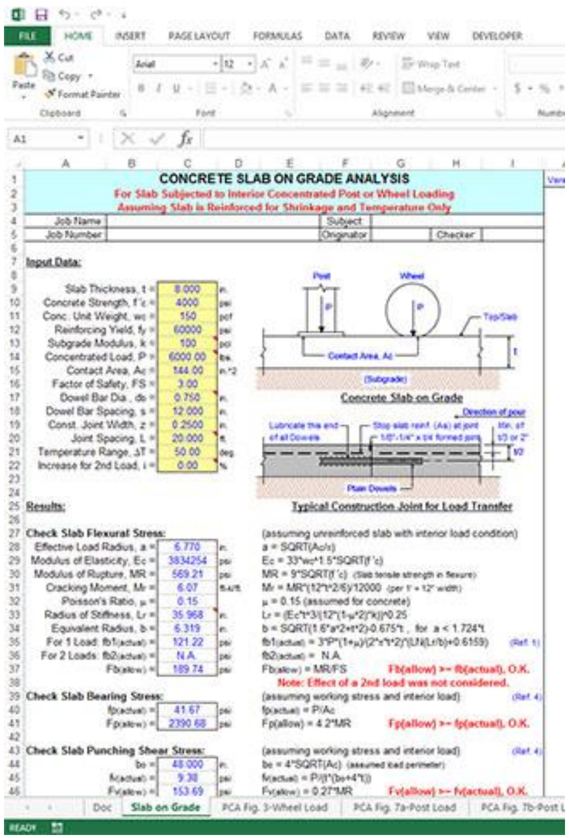
MDX result verification in midas Civil

Effects of Live Load

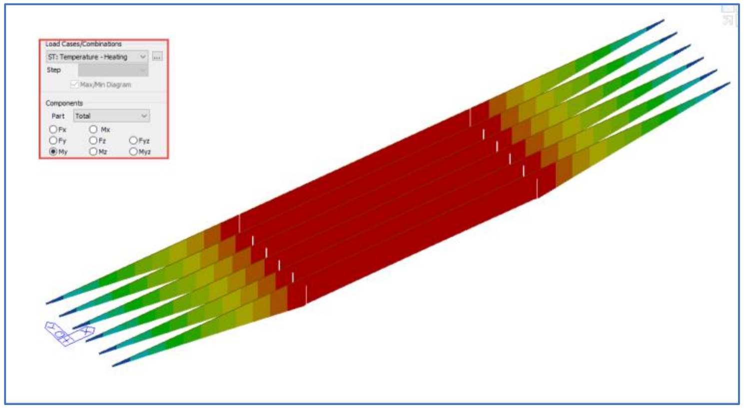




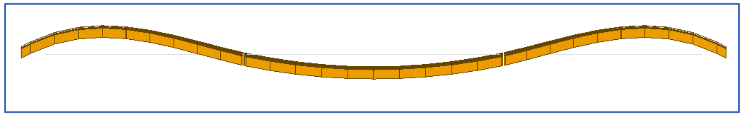
MDX result verification in midas Civil



- **Heating Condition – Bending Moment Diagram**

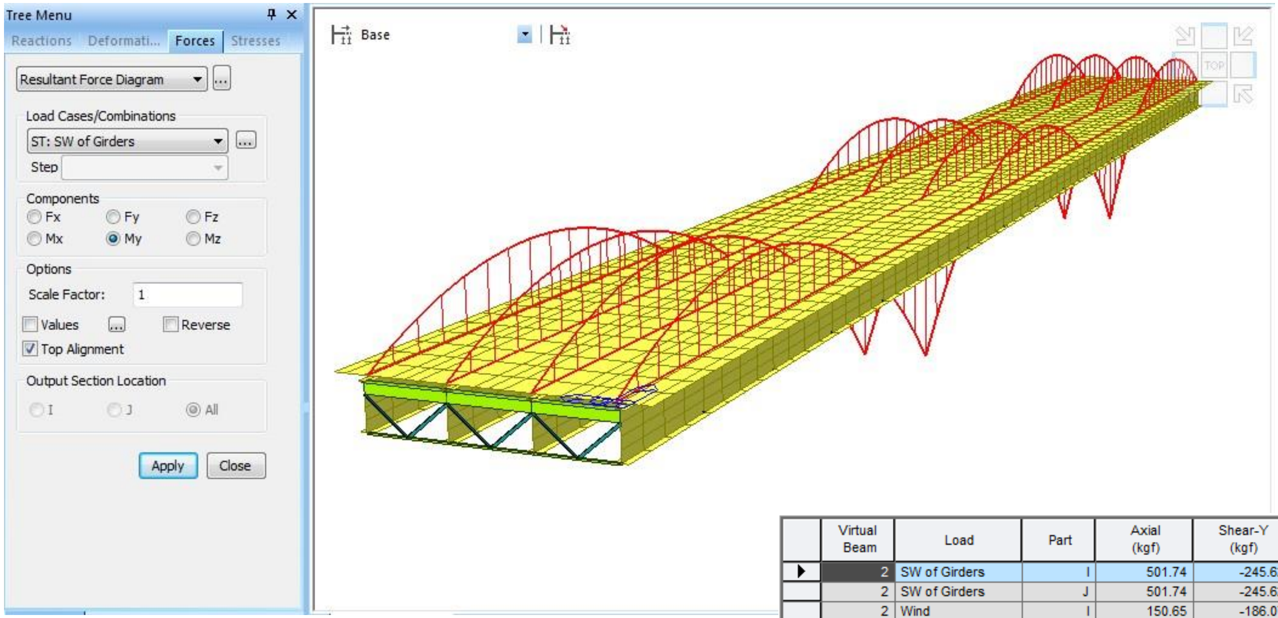


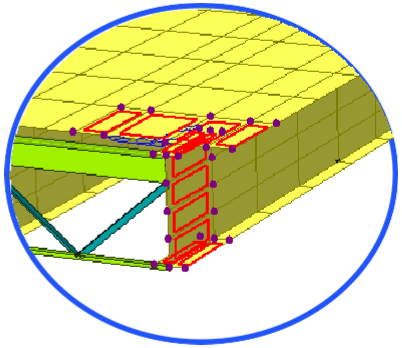
- **Heating Condition – Deflection Shape**



MDX result verification in midas Civil

Resultant Force Diagram





	Virtual Beam	Load	Part	Axial (kgf)	Shear-Y (kgf)	Shear-Z (kgf)	Torsion (kgf*m)	Moment-Y (kgf*m)	Moment-Z (kgf*m)
▶	2	SW of Girders	I	501.74	-245.62	-2219.74	14.80	2636.96	-243.32
	2	SW of Girders	J	501.74	-245.62	-1870.91	22.75	5130.62	56.13
	2	Wind	I	150.65	-186.07	-2574.51	-22.65	-88.46	-141.15
	2	Wind	J	150.65	-186.07	-2225.68	-14.70	2837.74	85.71
	2	Seasonal Temp	I	150.65	-186.07	-2574.51	-22.65	-88.46	-141.15
	2	Seasonal Temp	J	150.65	-186.07	-2225.68	-14.70	2837.74	85.71
	2	MV-P(max)	I	1954.27	438.15	2565.28	337.16	10103.30	662.73
	2	MV-P(max)	J	1954.27	438.15	2565.28	337.16	20877.30	1368.01
	2	MV-N(all)	I	1936.99	-1247.51	-8770.18	-1292.31	10014.00	-859.63
	2	MV-N(all)	J	1936.99	-1247.51	-8770.18	-1292.31	20692.70	1355.91
	2	gLCB7(max)	I	2614.94	592.31	3494.30	455.03	13518.90	886.78
	2	gLCB7(max)	J	2614.94	592.31	3494.30	455.03	27935.10	1830.48
	2	STL ENV_STR(max)	I	3419.98	767.81	4529.65	590.03	17680.80	1159.78
	2	STL ENV_STR(max)	J	3419.98	767.81	4529.65	590.03	36535.20	2394.01
	2	gLCB3(all)	I	3389.74	-2183.13	-15347.80	-2261.54	17524.50	-1504.35
	2	gLCB3(all)	J	3389.74	-2183.13	-15347.80	-2261.54	36212.10	2372.84
	2	STL ENV_STR(all)	I	3419.98	-2202.61	-15484.70	-2281.71	17680.80	-1517.77
	2	STL ENV_STR(all)	J	3419.98	-2202.61	-15484.70	-2281.71	36535.20	2394.01

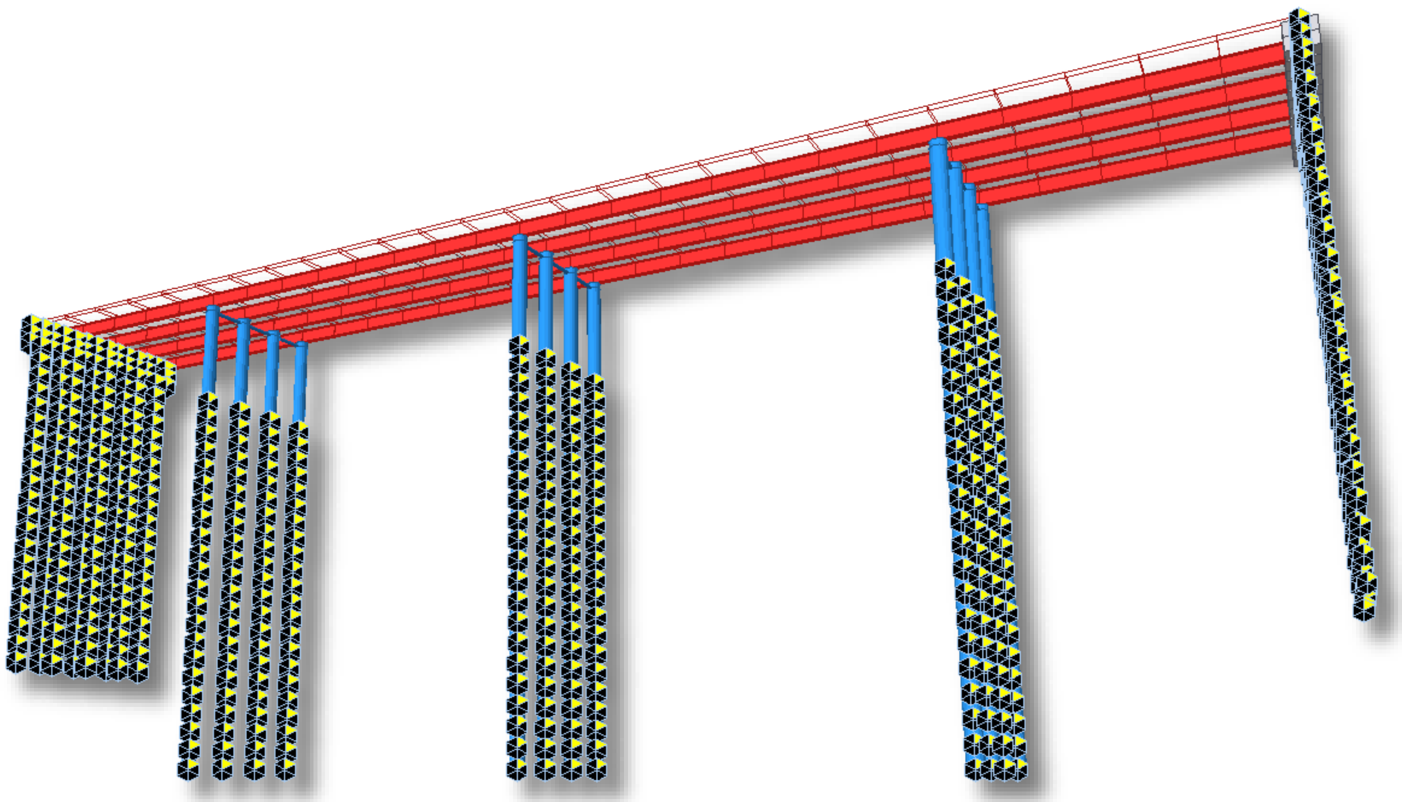
Resultant Forces

Model View | Result-[Resultant Force Diagram]

Using midas Civil
For
more complex problems

Advanced Features in midas Civil

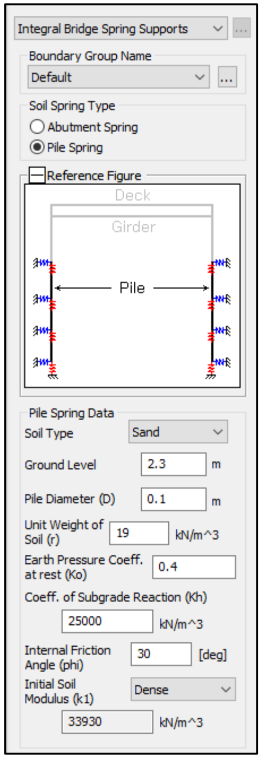
Sub-structure Analysis

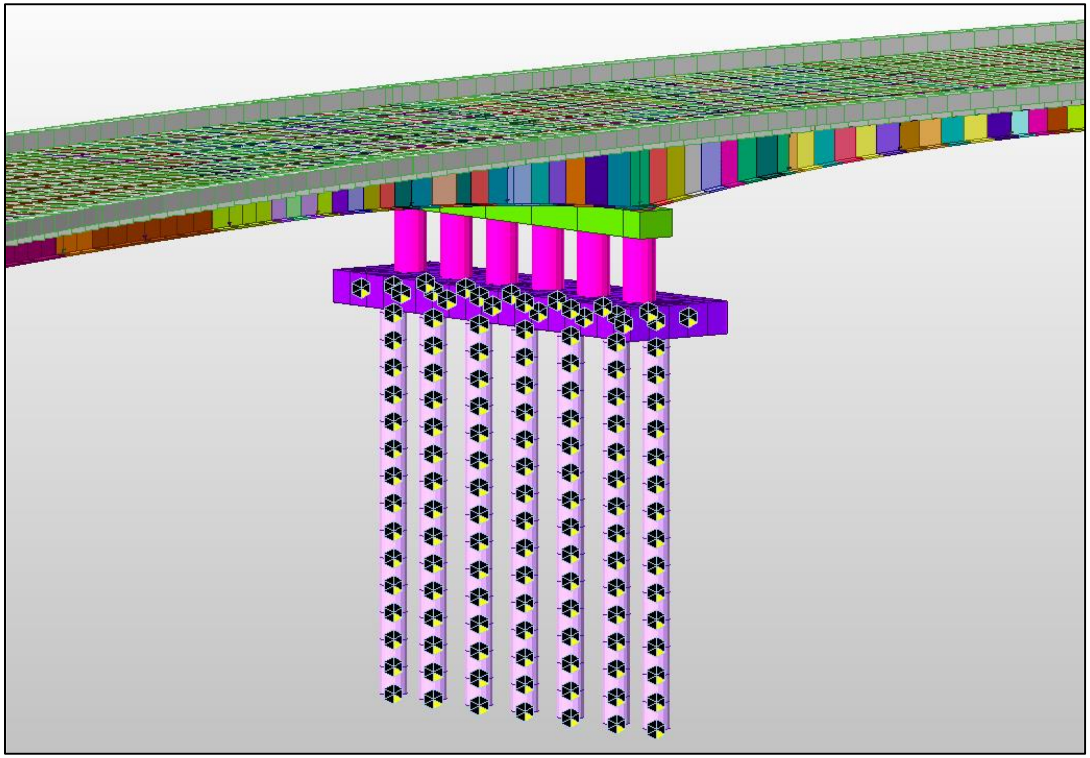


Advanced Features in midas Civil

Sub-structure Analysis

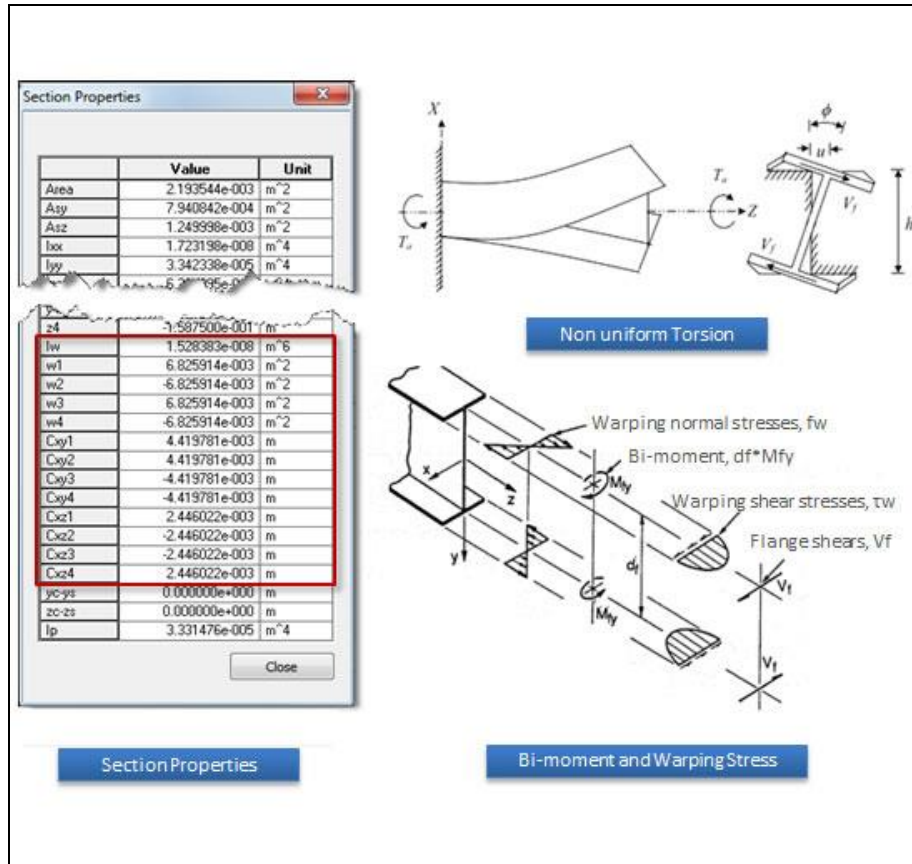
- **Non-linear springs**





Advanced Features in midas Civil

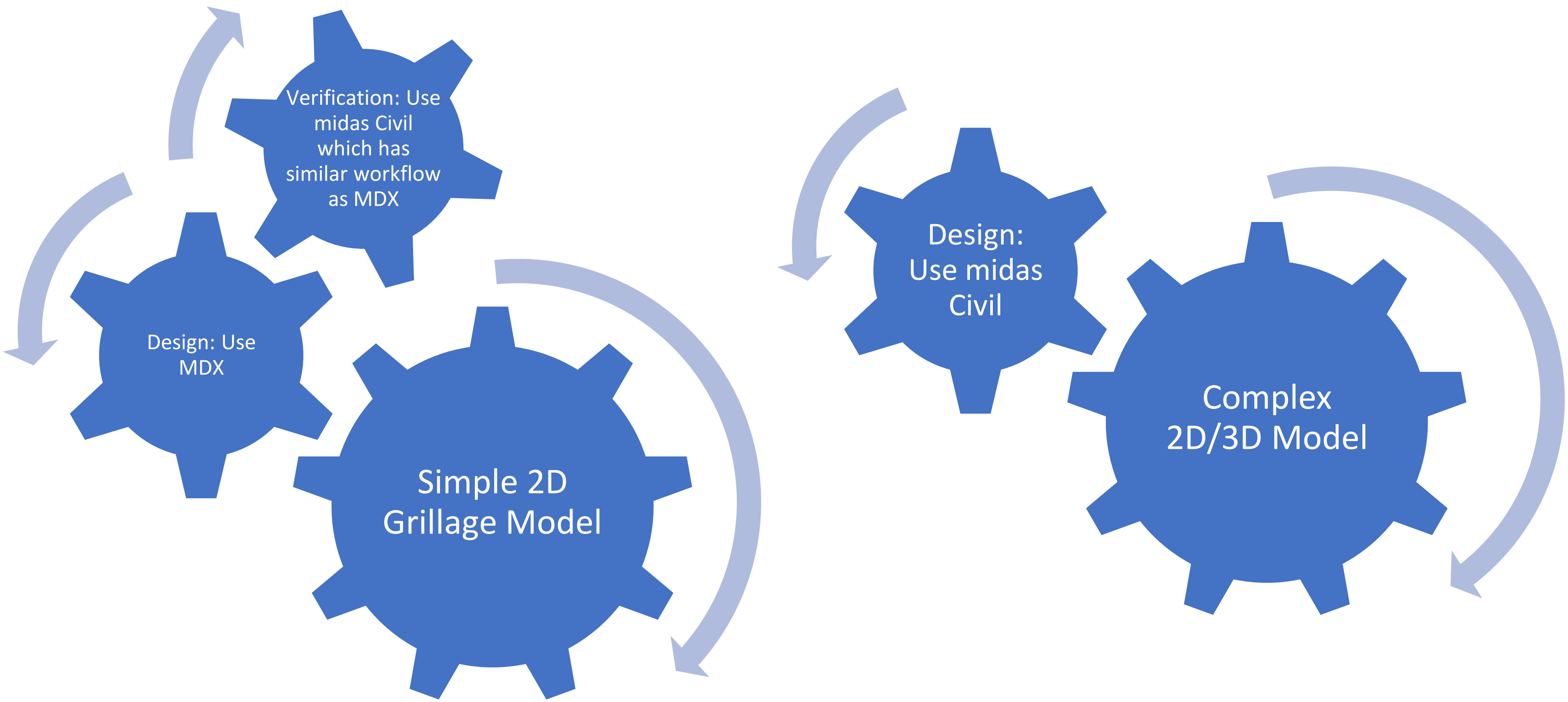
Torsion Calculation



Advanced Features in midas Civil

Construction Stage Analysis

Conclusion


Verification: Use midas Civil which has similar workflow as MDX
Design: Use MDX
Simple 2D Grillage Model
Design: Use midas Civil
Complex 2D/3D Model

Thank you