



midas **Civil** 2006 (V7.6.1) Enhancements

Analysis

- Automatic Check for Tendon Stress Limits
- Addition of Cable Efficiency Table
- Addition of Time Dependent Material (Creep/Shrinkage, Compressive Strength and Tendon Loss) as per Eurocode2:04
- Addition of the Time Dependent Material (Compressive Strength) as per CEB-FIP (1978)
- Update on Time Dependent Material (Creep/Shrinkage, Compressive Strength and Tendon Loss) as per IRC:18-2000
- Improvements of the Moving Load Analysis as per IRC: 6-2000
- Addition of distributed springs
- Addition of Sturm Sequence Check and Load Factor Range option in Buckling analysis
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- Considering buckling load in the Pushover Yield Surface
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- Nonlinear Point Spring Supports for Construction Stage Analysis



midas Civil 2006 (V7.6.1) Enhancements

Pre/Post-Processing

- Importing Composite Sections generated from SPC
- Improvements on the display of Supports and Point Spring Supports
- Addition of the Preference in online help
- Addition of upside-down T-shape beam
- Improvements in IS84 section DB
- Save an image in JPG format
- Addition of an export option in result tables
- Export frame model to solid/plate model
- Improvements in Beam Wizard

Analysis

Automatic Check for Tendon Stress Limits

Upgrade Contents

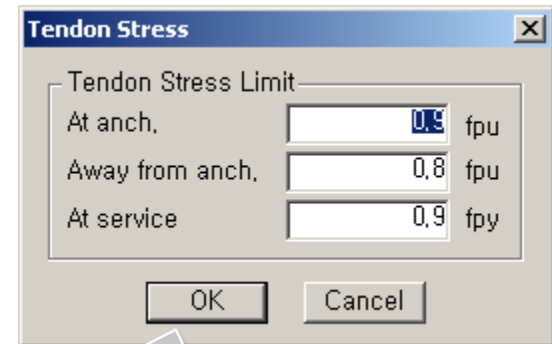
- The program checks stresses in tendons based on the stress limits specified by the user.

Effects & Usage

- In the Tendon Stress Limit Check table, the stresses in tendons, and the stress limits at the anchorages and elsewhere along the length of the member are displayed. If the stress in a tendon exceeds the stress limit, the corresponding row is marked in red.
- When numerous tendons exist in a model file, this function is very convenient in checking the stress limits in a spreadsheet table format.

Results > Result Tables > Tendon > Tendon Stress Limit Check

	Tendon	Tendon Stress			Tendon Stress Limit		
		FDL1 (N/mm ²)	FDL2 (N/mm ²)	FLL (N/mm ²)	Immediately after and/or set		At service
					At anch.	Away from anch.	
▶ Bot1	867.1222	1008.6050	1008.6050	1330.0000	1406.0000	1280.0000	
Bot2	866.9082	1008.4515	1008.4515	1330.0000	1406.0000	1280.0000	
CS01a01_↓	951.7275	1086.9387	1079.3223	1330.0000	1406.0000	1280.0000	
CS01a01_↑	951.9741	1087.2330	1079.6144	1330.0000	1406.0000	1280.0000	
CS01a02_↓	970.9649	1098.5414	1087.4911	1330.0000	1406.0000	1280.0000	
CS01a02_↑	971.2241	1098.8414	1087.7895	1330.0000	1406.0000	1280.0000	
CS01a03_↓	982.9584	1103.6489	1095.1710	1330.0000	1406.0000	1280.0000	
CS01a03_↑	983.2302	1103.9547	1095.4758	1330.0000	1406.0000	1280.0000	
CS01b01_↓	928.6975	1069.5204	1069.5204	1330.0000	1406.0000	1280.0000	
CS01b01_↑	928.8691	1069.7805	1069.7805	1330.0000	1406.0000	1280.0000	
CS01b02_↓	946.5612	1076.5253	1069.6800	1330.0000	1406.0000	1280.0000	
CS01b02_↑	946.7449	1076.8016	1069.9516	1330.0000	1406.0000	1280.0000	
CS01b03_↓	959.7907	1079.9189	1070.4710	1330.0000	1406.0000	1280.0000	
CS01b03_↑	959.9866	1080.2054	1070.7541	1330.0000	1406.0000	1280.0000	
CS02a01_↓	932.7898	1071.1960	1071.1960	1330.0000	1406.0000	1280.0000	
CS02a01_↑	932.9301	1071.3970	1071.3970	1330.0000	1406.0000	1280.0000	
CS02a02_↓	953.0878	1079.1348	1070.7337	1330.0000	1406.0000	1280.0000	
CS02a02_↑	953.2380	1079.3484	1070.9434	1330.0000	1406.0000	1280.0000	
CS02a03_↓	970.7999	1081.7421	1071.2847	1330.0000	1406.0000	1280.0000	
CS02a03_↑	970.9601	1081.9655	1071.5031	1330.0000	1406.0000	1280.0000	
CS02b01_↓	781.8189	990.2175	990.2175	1330.0000	1406.0000	1280.0000	
CS02b01_↑	782.0235	990.4289	990.4289	1330.0000	1406.0000	1280.0000	
CS02b02_↓	826.3534	1017.4450	1017.4450	1330.0000	1406.0000	1280.0000	
CS02b02_↑	826.5675	1017.6609	1017.6609	1330.0000	1406.0000	1280.0000	
CS02b03_↓	865.6381	1042.1207	1042.1207	1330.0000	1406.0000	1280.0000	
CS02b03_↑	865.8604	1042.3412	1042.3412	1330.0000	1406.0000	1280.0000	
CS03a01_↓	932.3756	1070.9447	1070.9447	1330.0000	1406.0000	1280.0000	
CS03a01_↑	932.5233	1071.1613	1071.1613	1330.0000	1406.0000	1280.0000	
CS03a02_↓	952.9029	1079.3094	1070.7975	1330.0000	1406.0000	1280.0000	
CS03a02_↑	953.0611	1079.5400	1071.0235	1330.0000	1406.0000	1280.0000	



[Tendon Stress Limit Check Table]

Analysis

Addition of Cable Efficiency Table

Upgrade Contents

- Efficiency of inclined cables is computed in the Cable Efficiency Table.

Results > Result Tables > Cable Efficiency

Effects & Usage

Model View		Result-[Cable Efficiency]							
Elem	Node I	Node J	Load	Chord Length (m)	E x A (tonf)	Weight (tonf)	Tension (tonf)	E x A (mod) (tonf)	Efficiency
1	1	2	LC1	16.4888	835600.0000	5.6951	1562.6295	835128.7113	0.9994
2	2	3	LC1	12.8621	835600.0000	4.4425	1570.0398	835319.8499	0.9997
3	3	4	LC1	12.9263	835600.0000	4.4647	1577.7526	835323.9370	0.9997
4	4	5	LC1	12.9956	835600.0000	4.4886	1586.0393	835328.2402	0.9997
5	5	6	LC1	13.0701	835600.0000	4.5143	1594.9089	835332.7475	0.9997
6	6	7	LC1	13.1496	835600.0000	4.5418	1604.3685	835337.4455	0.9997
7	7	8	LC1	13.2342	835600.0000	4.5710	1614.4276	835342.3212	0.9997
8	8	9	LC1	13.3237	835600.0000	4.6020	1625.1001	835347.3632	0.9997
9	9	10	LC1	13.4183	835600.0000	4.6346	1636.4039	835352.5609	0.9997
10	10	11	LC1	13.5178	835600.0000	4.6690	1648.3249	835357.8892	0.9997
11	11	12	LC1	13.1575	835600.0000	4.5446	1590.1108	835330.3217	0.9997
12	12	13	LC1	13.0761	835600.0000	4.5164	1580.4509	835325.3481	0.9997
13	13	14	LC1	12.9999	835600.0000	4.4901	1571.4416	835320.5987	0.9997
14	14	15	LC1	12.9290	835600.0000	4.4656	1563.0916	835316.0986	0.9997
15	15	16	LC1	12.8634	835600.0000	4.4430	1555.3855	835311.8594	0.9997
16	16	17	LC1	12.8032	835600.0000	4.4222	1548.3122	835307.8937	0.9997
17	17	18	LC1	12.7484	835600.0000	4.4032	1541.8645	835304.2151	0.9996
18	18	19	LC1	12.6990	835600.0000	4.3862	1536.0383	835300.8378	0.9996
19	19	20	LC1	12.6550	835600.0000	4.3710	1530.8305	835297.7753	0.9996
20	20	21	LC1	12.6165	835600.0000	4.3577	1526.2386	835295.0402	0.9996
21	21	22	LC1	12.5835	835600.0000	4.3463	1522.2607	835292.6441	0.9996
22	22	23	LC1	12.5559	835600.0000	4.3367	1518.8960	835290.5978	0.9996
23	23	24	LC1	12.5338	835600.0000	4.3291	1516.1464	835288.9120	0.9996
24	24	25	LC1	12.5173	835600.0000	4.3234	1514.0206	835287.6002	0.9996
25	25	26	LC1	12.5062	835600.0000	4.3196	1512.5421	835286.6836	0.9996
26	26	27	LC1	12.5008	835600.0000	4.3177	1511.7641	835286.1998	0.9996
27	27	28	LC1	12.5008	835600.0000	4.3177	1511.7641	835286.1998	0.9996
28	28	29	LC1	12.5062	835600.0000	4.3196	1512.5421	835286.6836	0.9996
29	29	30	LC1	12.5173	835600.0000	4.3234	1514.0206	835287.6002	0.9996
30	30	31	LC1	12.5338	835600.0000	4.3291	1516.1464	835288.9120	0.9996
31	31	32	LC1	12.5559	835600.0000	4.3367	1518.8960	835290.5978	0.9996

[Cable Efficiency Table]

Cable efficiency, r , is calculated from the following equation:

$$(EA)_{\text{mod}} = r(E_c A_c)$$

$$r = \frac{1}{1 + G^2 \cos^5 \alpha E_c A_c / 12H^3}$$

where, G = the total weight of the cable

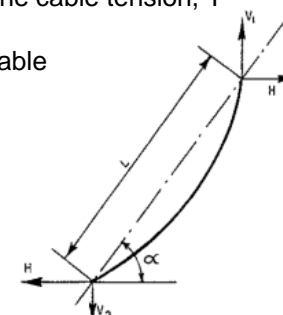
L = the length of the chord

H = the horizontal component of the cable tension, T

E_c = the modulus of elasticity

A_c = cross-sectional area of the cable

α = the angle of the cable



Only cable elements can be checked in Cable Efficiency table.

Analysis

Addition of Time Dependent Material (Creep/Shrinkage, Compressive Strength and Tendon Loss) as per Eurocode2:04

Upgrade Contents

- Time Dependent Material (Creep/Shrinkage, Compressive Strength and Tendon Loss) as per Eurocode2:04 is newly implemented.

Model > Properties > Time Dependent Material(Creep/Shrinkage)
Model > Properties > Time Dependent Material(Comp. Strength)
Load > Prestress loads > Tendon Property

1 Creep/Shrinkage

Add/Modify Time Dependent Material (Creep / Shrinkage)

Name: Eurocode Code: European

European

Characteristic compressive cylinder strength of concrete at the age of 28 days (f_{ck}): 40 N/mm²

Relative Humidity of ambient environment (40 - 99): 70 %

Notational size of member: 1 mm

$h = 2 * A_c / u$ (A_c: Section Area, u: Perimeter in contact with atmosphere)

Type of cement: Class S Class N Class R

Type of code: EN 1992-1 (General Structure) EN 1992-2 (Concrete Bridge)

of silica-fume

Age of concrete at the beginning of shrinkage: 3 day

Show Result...

Show Time Dependent Material Function

Creep Function Data Type: Creep Coefficient Shrinkage Strain

Start Loading: 10 Day End Loading: 10000 Day Num. of Steps: 24

Time (day)	Value
1	13.34 2.3121e-001
2	17.78 3.2520e-001
3	23.71 4.0133e-001
4	31.62 4.6962e-001
5	42.17 5.3356e-001
6	56.23 5.9464e-001
7	74.99 6.5354e-001
8	100.00 7.1051e-001
9	133.35 7.6556e-001
10	177.83 8.1927e-001

Graph options: X-axis log scale Y-axis log scale

Creep Coefficient vs Time (day) graph showing a curve that levels off over time.

Close

2 Compressive Strength

Add/Modify Time Dependent Material (Comp. Strength)

Name: Eurocode2 Scale Factor: 1.0 Graph Options: X-axis log scale Y-axis log scale

Type: Code User

Development of Strength

Code: European

$f(t) = (f_k + \Delta f) \exp(-\beta (t - t_0)^{\alpha})$

Mean compressive strength of concrete at the age of 28 days (f_{cm,28}): 40 N/mm²

Cement Type(s): Class N: 0.25

Development of Strength graph showing a curve that levels off over time.

Redraw Graph OK Cancel

3 Tendon Loss

Add/Modify Tendon Property

Tendon Name: tendon

Tendon Type: Internal(Post-Tension)

Material: 4: tendon

Total Tendon Area: 296.13 mm²

Duct Diameter: 50 mm

Relaxation Coefficient: European Strain

Ultimate Strength: 1912.3 N/mm²

Curvature Friction Factor: 0.3

Wobble Friction Factor: 2.2e-005 1/mm

External Cable Moment Magnifier: 0 N/mm²

Anchorage Slip(Draw in): Begin: 3.6 mm End: 6 mm

Bond Type: Bonded Unbonded

OK Cancel Apply

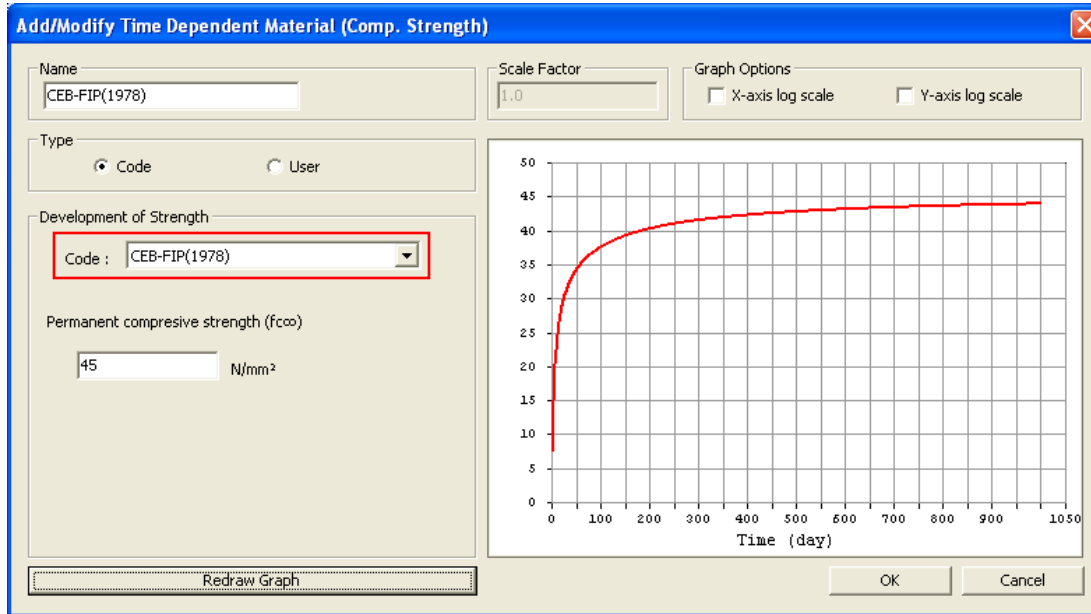
Analysis

Addition of the Time Dependent Material (Compressive Strength) as per CEB-FIP (1978)

Upgrade Contents

- Time Dependent Material (Compressive Strength) as per CEB-FIP(1978) is newly implemented.

Model > Properties > Time Dependent Material (Comp. Strength)



Note. Time Dependent Materials based on CEB-FIP are supported by midas Civil as shown in the table below.

Items	CEB-FIP (1978)	CEB-FIP (1990)
Creep	Available	Available
Shrinkage	Available	Available
Comp. Strength	Available	Available

Analysis

Update on Time Dependent Material (Creep/Shrinkage, Compressive Strength and Tendon Loss) as per IRC:18-2000

Upgrade Contents

- Time Dependent Material (Creep/Shrinkage, Compressive Strength and Tendon Loss) as per IRC18:2000 is newly implemented.
- Creep function can be shown as “creep strain per 10MPa” as well as “Creep Coefficient”.

Model > Properties > Time Dependent Material(Creep/Shrinkage)

Model > Properties > Time Dependent Material(Comp. Strength)

Load > Prestress loads > Tendon Property

1 Creep/Shrinkage

Add/Modify Time Dependent Material (Creep / Shrinkage)

Name : IRC18-2000 Code : INDIA(IRC:18-2000)

INDIA(IRC : 18-2000)

Compressive strength of concrete at the age of 28 days : 40 N/mm²

Relative Humidity of ambient environment (40-99) : 70 %

Notational size of member : 1

$h = 2 * A_c / u$ (Ac : Section Area, u : Perimeter in contact with atmosphere)

Age of concrete at the beginning of shrinkage :

Show Result...

Show Time Dependent Material Function

Creep Function Data Type : Creep Shrinkage Strain

Graph Options : 3-axis log scale Y-axis log scale

Start Loading : 10

End Loading : 10000

Num. of Steps : 24

Creep Function Data Type

Creep Strain/10MPa Coefficient

Time (day)	Value
1	13.34 1.5373e-004
2	17.78 1.9719e-004
3	23.71 2.3213e-004
4	31.62 2.6375e-004
5	42.17 2.9376e-004
6	56.23 3.2279e-004
7	74.99 3.5098e-004
8	100.00 3.7822e-004
9	133.35 4.0423e-004
10	177.83 4.2862e-004
11	237.14 4.5103e-004

2 Compressive Strength

Add/Modify Time Dependent Material (Comp. Strength)

Name : COMP Scale Factor : 1.0 Graph Options : 3-axis log scale Y-axis log scale

Type : Code User

Development of Strength Code : INDIA(IRC:18-2000)

$f_{ct} = [2.008 - 1.2134(\log t)^{0.5}]$

Concrete Compressive Strength at 28 Days (f28) : 40 N/mm²

Redraw Graph OK Cancel

3 Tendon Loss

Add/Modify Tendon Property

Tendon Type : tendon

Tendon Type : Internal(Post-Tension)

Material : 4 tendon

Total Tendon Area : 296.13 mm²

Duct Diameter : 50 mm

Relaxation Coefficient : INDIA(IRC:18-200) Normal

Ultimate Strength : 1912.3 N/mm²

Curvature Friction Factor : 0.3

Wobble Friction Factor : 2.2e-005 1/mm

External Cable Moment Magnifier : 0 N/mm²

Anchorage Slip(Draw in) : Begin : 3.6 mm End : 6 mm

Bond Type : Bonded Unbonded

OK Cancel Apply

Analysis

Improvements of the Moving Load Analysis as per IRC: 6-2000

Upgrade Contents

- User-defined Live Load Combinations, using both standard vehicle loads and user-defined vehicle loads, are newly implemented.
- User-defined Impact Factors for Traffic Line Lanes are newly implemented.
- The auto-calculated Impact Factors or user-defined Impact Factors can be checked in the *.OUT file.

Effects & Usage

- The user can perform Moving Load Analysis by user-defined Live Load Combinations. The user can define a specific live load combination, and check the member forces obtained from the combination quickly and easily. This feature significantly reduces work-time when performing Moving Load Analysis. (Please refer to overleaf example.)

Load > Moving Load Analysis Data > Traffic Line Lane, Moving Load Cases
Tools > Text Editor

No	Elem	Eccen. (m)	Span (m)	Impact Factor
1	1	0	-	0.2
2	2	0	-	0.2
3	3	0	-	0.2

[User-defined Impact Factor]

Multipl. Num	Scale	Lane1	Lane2
3	0.9		
4	0.8		
>= 5	0.8		

Vehicle	Scale	Lane1	Lane2
Class 40R	1	L1	
Class A	1	L2	L3
Class 70R	1	L1	L2

[User-defined Live Load Combinations]

```

00118 IMPACT FACTOR (T= AUTO CALCULATION, F=
00119 FACTOR 1 = CLASS A & CLASS B, FACTOR 2 = R
00120
00121 LANE 1
00122 DIST. AUTO. FACTOR 1 FACTOR 2 FACTOR 3
00123
00124 0.00 F 0.10000 0.10000 0.10000
00125 0.38 F 0.20000 0.20000 0.20000
00126 0.75 F 0.20000 0.20000 0.20000
00127 2.71 F 0.20000 0.20000 0.20000
00128 4.67 F 0.20000 0.20000 0.20000
00129 7.00 F 0.20000 0.20000 0.20000
00130 9.34 F 0.20000 0.20000 0.20000
00131 11.68 F 0.20000 0.20000 0.20000
00132 14.01 F 0.20000 0.20000 0.20000
00133 16.34 F 0.20000 0.20000 0.20000
00134 18.68 F 0.20000 0.20000 0.20000
00135 21.02 F 0.20000 0.20000 0.20000
00136 23.35 F 0.20000 0.20000 0.20000
00137 25.69 F 0.20000 0.20000 0.20000
00138 28.02 F 0.20000 0.20000 0.20000
00139 30.35 F 0.20000 0.20000 0.20000
    
```

[Output of Impact Factors in the *.OUT file]

Analysis

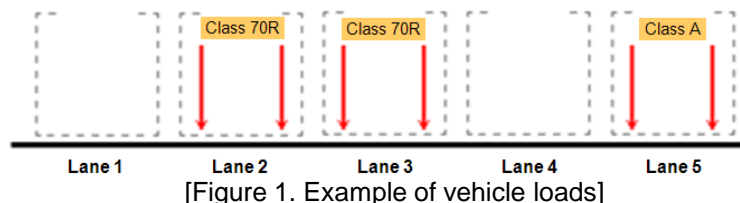
Example: Improvements of the Moving Load Analysis as per IRC: 6-2000

Procedure

This example introduces how to define a specific Live Load Combination as shown in the figure 1. The user can consider this specific case by defining Moving Load Case as described below.

- 1 After defining 5 Traffic Line Lanes and 2 vehicles (Class 70R and Class A), Click *Load > Moving Load Analysis Data > Moving Load Cases*.
- 2 Click Add.
- 3 Enter the Load Case Name and Description.
- 4 Unselect **Auto Live Load Combination*** option.
- 5 Click Add
- 6 Select the Class 70R vehicle and select the Min./Max. Number of Loaded Lanes as 2
- 7 Select the Lane 2 & 3 and click **->**
- 8 Click OK.
- 9 Click Add.
- 10 Select the Class A vehicle and select the Min./Max. Number of Loaded Lanes as 1
- 11 Select the Lane 5 and click **->**
- 12 Click OK.

***Note.** Auto Live Load Combination
Select this option to define the Live Load Combinations according to the clause 207.4. of IRC: 6-2000. Unselect this option for user-defined Live Load Combination.



[Figure 2. Moving Load Tracer]

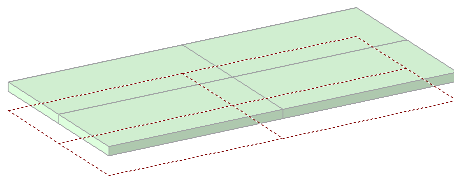
Analysis

Addition of distributed springs

Upgrade Contents

- Distributed springs on the beam, plate and solid elements.
- Generate surface springs to represent the stiffness of the soil.
- Consider accurate boundary conditions when modeling members on elastic subgrade.
- Compression-only spring can be considered.

Model > Boundaries > Surface Spring Supports



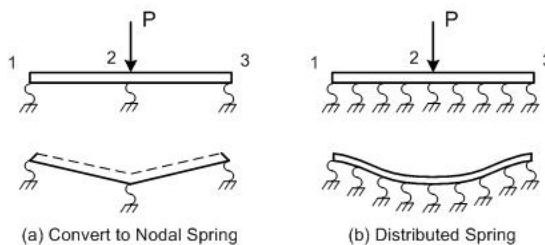
[Display of Distributed Surface Spring Supports]

Element Type	Surface Spring Type	Element	Load	Node & Part	Reaction (N/mm²)	Displacement (mm)
PLATE	Planar(Face)	1	LC1	2	0.000000	0.000000
PLATE	Planar(Face)	1	LC1	4	0.000000	0.000000
PLATE	Planar(Face)	1	LC1	3	0.000000	0.000000
PLATE	Planar(Face)	1	LC1	1	0.000000	0.000000
PLATE	Planar(Face)	2	LC1	9	0.007173	-0.731482
PLATE	Planar(Face)	2	LC1	11	0.031848	-3.247630
PLATE	Planar(Face)	2	LC1	10	-0.010773	1.098570
PLATE	Planar(Face)	2	LC1	5	-0.006456	0.658316
PLATE	Planar(Face)	3	LC1	9	0.007173	-0.731482
PLATE	Planar(Face)	3	LC1	6	-0.006456	0.658316
PLATE	Planar(Face)	3	LC1	12	-0.010773	1.098570

[Reaction (Local-Surface Spring) tab]

***Note. Difference between “Convert to Nodal Spring” and “Distributed Spring”**

When Convert to Nodal Spring is selected, springs are entered at the nodes of the elements. When Distributed Spring is selected, springs are uniformly distributed on a face or edge of the elements.



	Convert to Nodal Spring	Distributed Spring (Winkler Spring)
Spring location	Nodes of elements	Distributed on the elements
Unit of reaction	kN	Beam: kN(kN/M) Planar or Solid: kN(kN/M²)
Deformation	Concentrated at the nodes	As element stiffness increases, deformations are distributed throughout the elements.

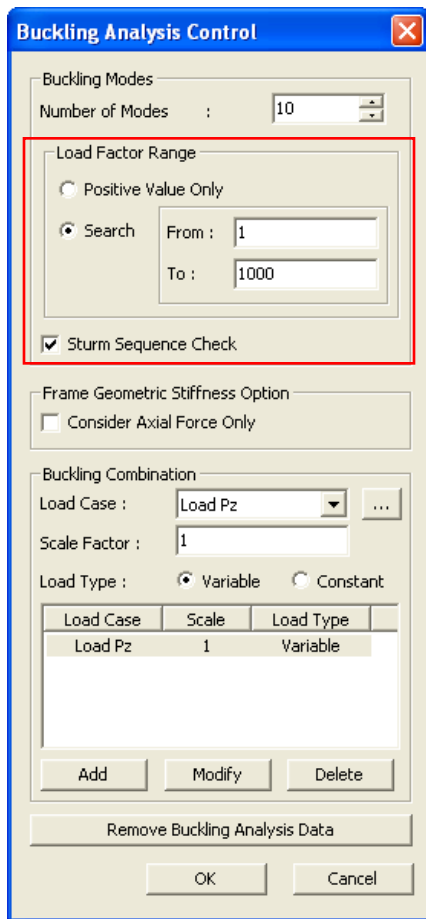
Analysis

Addition of Sturm Sequence Check and Load Factor Range option in Buckling analysis

Upgrade Contents

- Sturm Sequence Check option for detecting any missed buckling modes and Load Factor Range option for setting the range of the buckling load factor have been newly added.

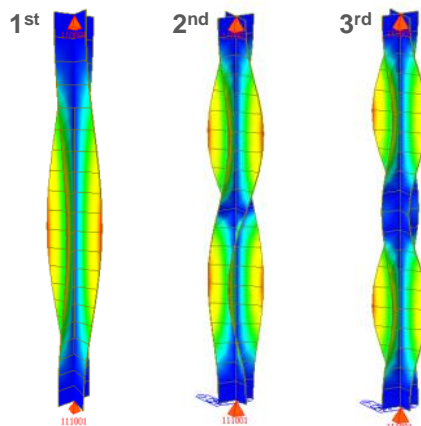
Analysis > *Buckling Analysis Control*



```

ENTRY EIGENVALUE ANALYSIS
EIGEN SOLUTION : LANCZOS METHOD
LINEAR BUCKLING ANALYSIS
MULTI-FRONTAL SOLUTION HAS BEEN COMPLETED.
THERE ARE 10 EIGENVALUES BETWEEN 0.9123 AND 891.2190
EIGENVALUES HAVE SUCCESSFULLY PASSED STURM SEQUENCE CHECK
MULTI-FRONTAL SOLUTION HAS BEEN COMPLETED.
MODE SHAPE OUTPUT.
DISPLACEMENT/FORCE/STRESS OUTPUT FOR EACH MODE.
    
```

[Message window]



[Buckling mode shapes]

Node	Mode	UX	UY	UZ	RX	RY	RZ
BUCKLING ANALYSIS							
	Mode	Eigenvalue	Tolerance				
	1	471.201	2.4984e-009				
	2	483.422	3.0508e-009				
	3	506.201	3.6989e-010				
	4	532.748	1.2758e-009				
	5	570.987	5.8727e-009				
	6	613.777	5.4283e-009				
	7	670.032	6.5623e-010				
	8	731.385	2.6047e-008				
	9	808.529	2.4969e-008				
	10	891.218	4.6323e-008				

[Buckling mode shapes]

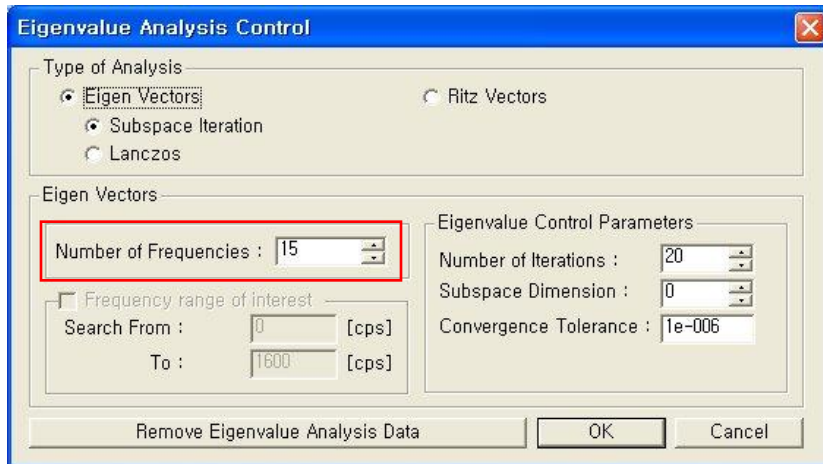
Analysis

Improvements on the Eigenvalue analysis considering the maximum number of frequencies

Upgrade Contents

- When the Number of Frequencies exceeds the maximum number of eigenvalues for a corresponding structure, the program automatically updates the number of frequencies. In the old version, error message was displayed and analysis was terminated.

Analysis > Eigenvalue Analysis Control



❶ Old version

```
ERROR : NUMBER OF NON-ZERO MASSES REQUIRED = 15
        NUMBER OF EXISTING MASSES IN THE MODEL = 10
        JOB WILL BE TERMINATED.
```

```
-----
ERRORS ENCOUNTERED. MIDAS JOB TERMINATED. REFER TO .OUT FILE
-----
```

❷ Ver.761

```
ENTRY LOAD_BLOCK
TOTAL NUMBER OF VALID DOFS IN MODEL : 33
ENTRY ASSM_STIFF_LOAD ( FORM GLOBAL EQUILIBRIUM EQUATIONS IN BLOCKS )

ENTRY EIGENVALUE ANALYSIS

WARNING : THE NUMBER OF NON-ZERO MASSES REQUIRED = 15
          THE NUMBER OF EXISTING MASSES IN THE MODEL = 10
```

Node	Mode	UX	UY	UZ	RX	RY	RZ
EIGENVALUE ANALYSIS							
	Mode No	Frequency		Period	Tolerance		
		(rad/sec)	(cycle/sec)	(sec)			
	1	4,2567	0,6775	1,4761	7,8428e-016		
	2	7,9076	1,2585	0,7946	2,2727e-016		
	3	23,8602	3,7975	0,2633	0,0000e+000		
	4	59,4597	9,4633	0,1057	6,4312e-016		
	5	111,2954	17,7132	0,0565	5,8740e-016		
	6	195,9872	31,1923	0,0321	7,5770e-016		
	7	302,4954	48,1436	0,0208	3,1806e-016		
	8	350,0455	55,7115	0,0179	2,3752e-016		
	9	630,5800	100,3599	0,0100	1,4639e-016		
	10	694,2793	110,4980	0,0090	9,6605e-016		

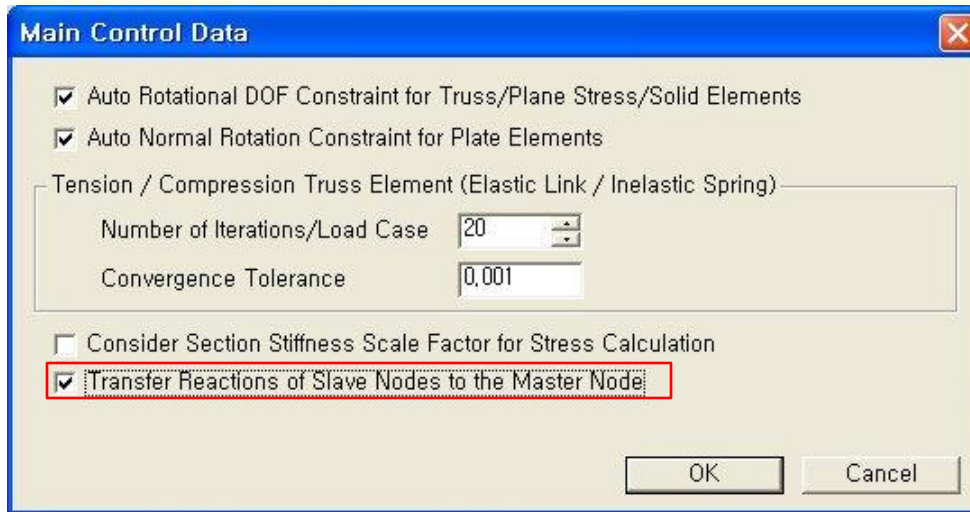
Analysis

Transfer reactions of slave nodes to the master node

Upgrade Contents

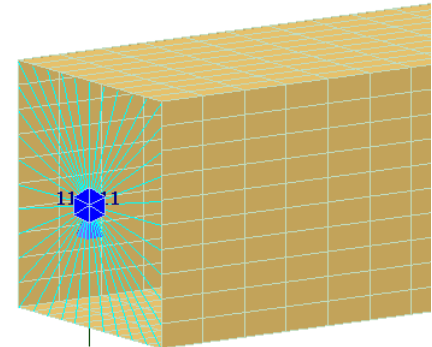
- In the old version, reactions were produced at the master node only when rigid links were assigned. In Civil V761, the user can select if reactions of slave nodes are transferred to the master node or not.

Analysis > Main Control Data > Transfer Reactions of Slave Nodes to the Master Node



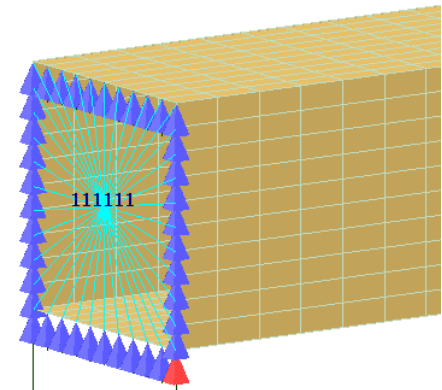
[Selected]

When reactions of slab nodes are transferred to the master node



[Unselected]

When reactions of slab nodes are not transferred to the master node



Analysis

Considering buckling load in the Pushover Yield Surface

Upgrade Contents

- In the pushover PMM hinge properties, buckling load can be considered by checking on the 'Calc. Yield Surface of Beam considering Buckling' option.

Design > Pushover > Pushover Global Control

Pushover Global Control

Initial Load
Load Case: **DL** Scale Factor: **1**

Static Load Case	Scale
DL	1
LL	0.25

Buttons: Add, Modify, Delete

Nonlinear Analysis Option
 Permit Convergence Failure
 Max. Number of Substeps: **10**
 Maximum Iteration: **5**

Convergence Criteria
 Displacement Norm: **0.001**
 Force Norm: **0.001**
 Energy Norm: **0.001**

Pushover Hinge Data Option
 Default Stiffness Reduction Ratio of Skeleton Curve
 Trilinear / Slip Trilinear Type
 Symmetric

	(+)	(-)
α_1	0.1	0.1
α_2	0.05	0.05

 Bilinear / Slip Bilinear Type
 Symmetric

	(+)	(-)
α_1	0.05	0.05

Data for Auto-Calculation of Strength
 Reference Location only for Distributed Hinges
 Beam: **I-end**
 Calc. Yield Surface of Beam considering Buckling

Buttons: Remove Pushover Global Control, OK, Cancel

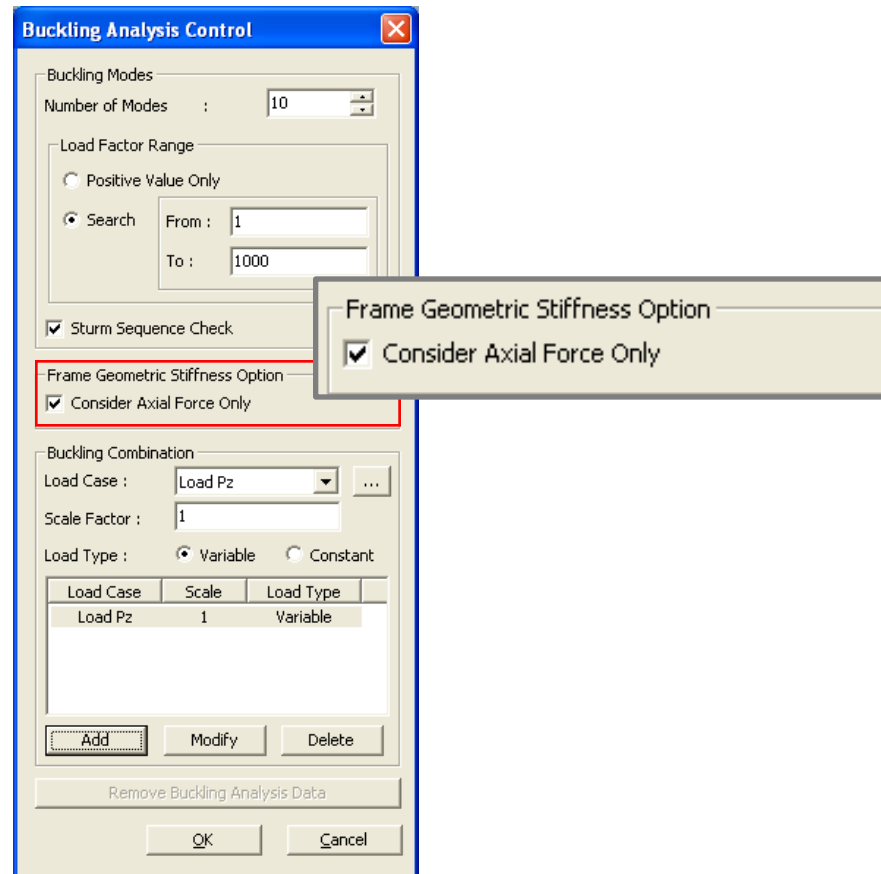
Analysis

Option for ignoring Lateral-Torsional Buckling mode in Buckling Analysis

Upgrade Contents

- midas Civil considered Lateral-Torsional Buckling mode in any case. The Frame Geometric Stiffness Option is newly implemented to ignore the Lateral-Torsional Buckling effect in Buckling Analysis.

Analysis > **Buckling Analysis Control**



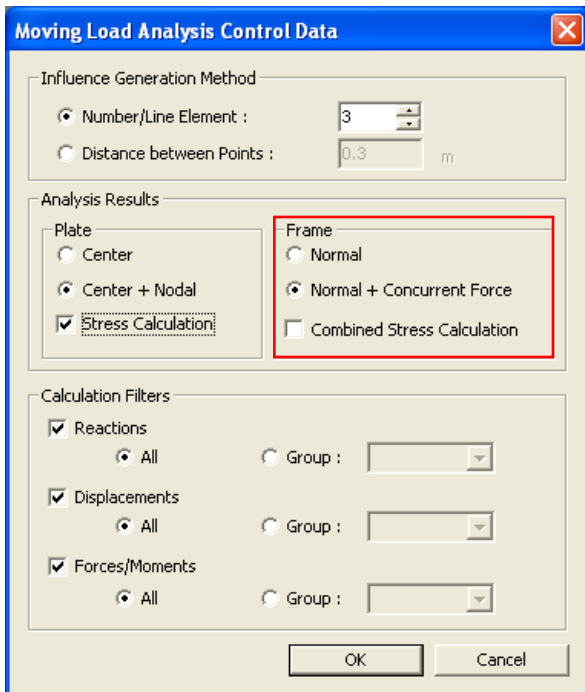
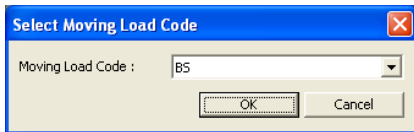
Analysis

Finding Concurrent Forces in Moving Load Analysis as per BS5400

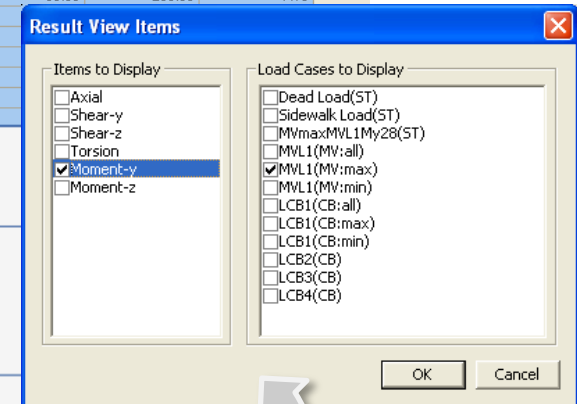
Upgrade Contents

- Moving Load Analysis considering Concurrent Member Forces is newly implemented.

*Analysis > Moving Load Analysis Control
Results > Result Tables > Beam > Force*



Elem	Load	Part	Axial (kN)	Shear-y (kN)	Shear-z (kN)	Torsion (kN-m)	Moment-y (kN-m)	Moment-z (kN-m)
1	MVL1(ma	[1]	0.00	1.11	45.22	7.80	98.38	10.05
2	MVL1(ma	[2]	0.00	8.54	19.59	14.56	282.73	5.19
3	MVL1(ma	[3]	0.00	13.47	33.25	21.71	378.40	43.52
4	MVL1(ma	[4]	0.00	15.90	46.97	57.12	357.93	75.73
5	MVL1(ma	[5]	0.00	5.60	52.82	73.37	264.98	10.23
6	MVL1(ma	[6]	0.00	1.69	48.16	59.72	256.64	4.04
7	MVL1(ma	[7]	0.00	18.52	36.80	35.93	266.80	7.18
8	MVL1(ma	[8]	0.00	14.89	32.93			
9	MVL1(ma	[9]	0.00	9.40	38.17			
10	MVL1(ma	[10]	0.00	1.13	52.68			
11	MVL1(ma	[12]	343.46	0.00	7.44			
12	MVL1(ma	[3]	375.60	0.00	5.04			
13	MVL1(ma	[4]	381.58	0.00	5.86			
14	MVL1(ma	[5]	389					
15	MVL1(ma	[6]	391					
16	MVL1(ma	[7]	389					
17	MVL1(ma	[8]	382					
18	MVL1(ma	[9]	375					
19	MVL1(ma	[10]	342					
20	MVL1(ma	[1]	1922					
21	MVL1(ma	[12]	1856					
22	MVL1(ma	[13]	1815					
23	MVL1(ma	[14]	1775					
24	MVL1(ma	[15]	1709					
25	MVL1(ma	[16]	1709					
26	MVL1(ma	[17]	1826					
27	MVL1(ma	[18]	1917					
28	MVL1(ma	[19]	2009					
29	MVL1(ma	[20]	2126					
30	MVL1(ma	[21]	0					
31	MVL1(ma	[22]	0					
32	MVL1(ma	[23]	0					
33	MVL1(ma	[24]	0					
34	MVL1(ma	[25]	0					
35	MVL1(ma	[26]	0.00	5.82	46.16	73.52	5885.20	4460.96
36	MVL1(ma	[27]	0.00	15.71	36.80	57.98	98.38	11
37	MVL1(ma	[28]	0.00	13.42	32.93	21.13	282.73	6



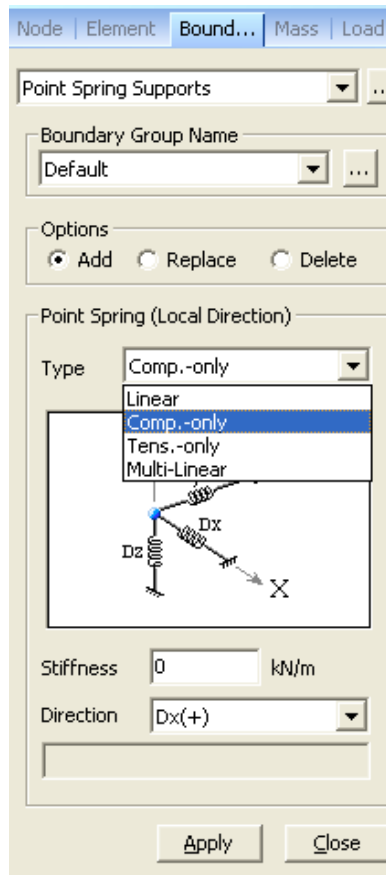
Analysis

Nonlinear Point Spring Supports for Construction Stage Analysis

Upgrade Contents

- Nonlinear Point Spring Supports can be included in Construction Stage Analysis (Comp. -only, Tens.-only and Multi-Linear type)

Model > Boundaries > Point Spring Supports



Pre / Post-processing

Importing Composite Sections Generated from SPC

Upgrade Contents

- Composite sections can be generated, and parts of these sections can be defined in midas SPC for construction stage analysis.
- Composite sections generated from SPC can be exported to midas Civil.

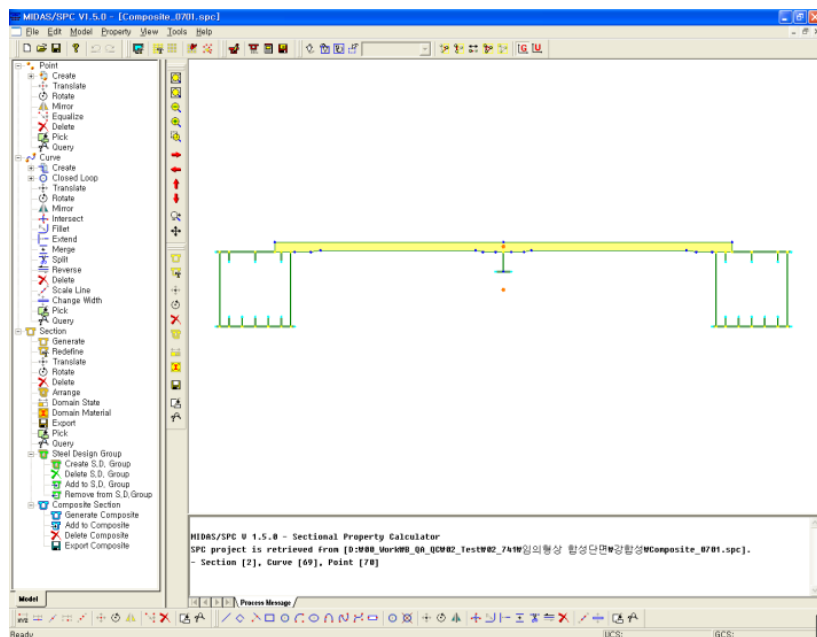
Effects & Usage

- Various types of composite sections can be applied to construction stage analysis.

Model > Properties > Section

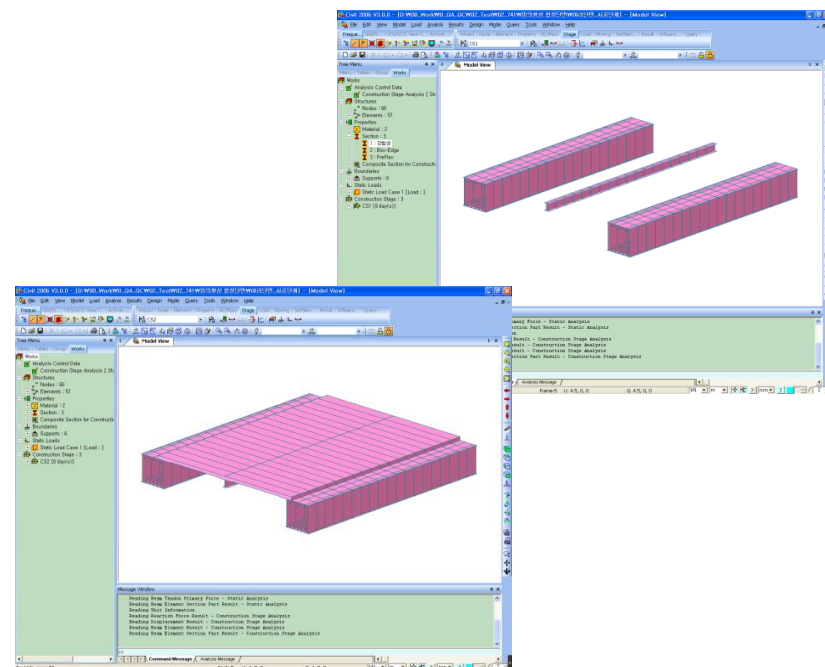
Load > Construction State Analysis Data > Composite Section for Construction Stage

Tools > Sectional Property Calculator



[Composite Section in SPC]

[Before composite action (Part 1)]



[Before composite action (Part 1+2)]

Pre / Post-processing

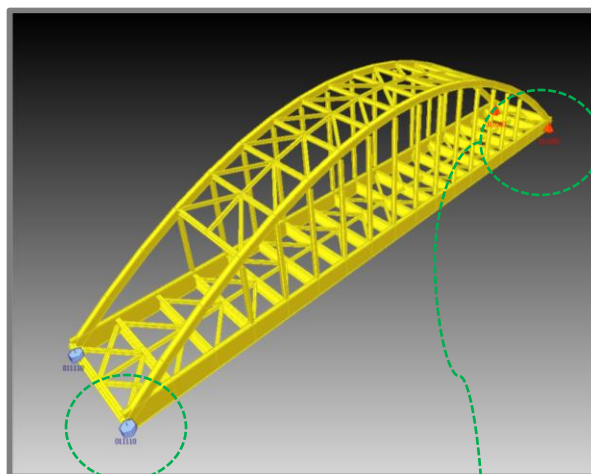
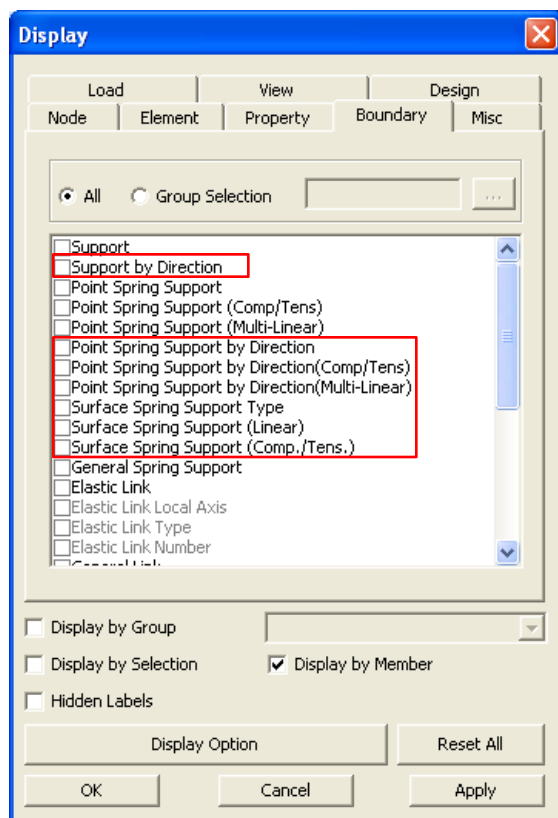
Improvements on the Display of Supports and Point Spring Supports

Upgrade Contents

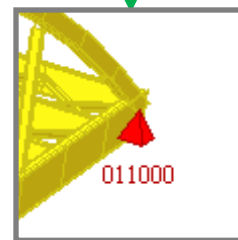
- A new feature that displays the Support and Point Spring Support offering an intuitive way of identifying boundary conditions.

Model > Boundaries > Define Constraint Label Direction

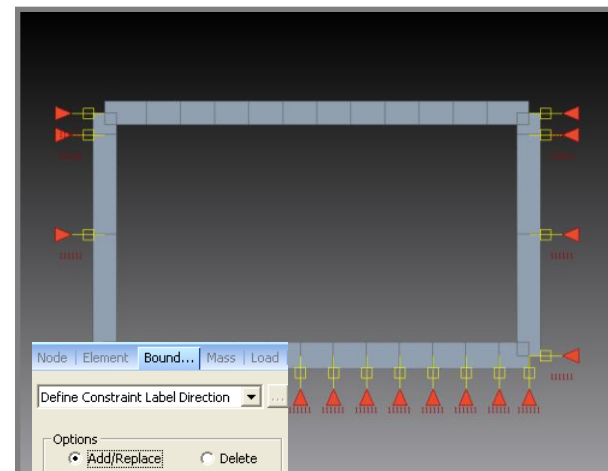
View > Display > Boundary



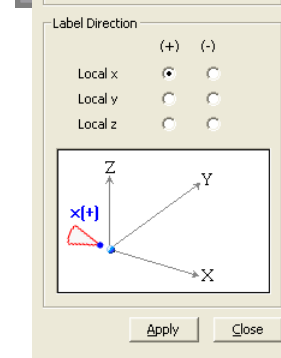
[Point spring support]



[Support]



[Example of Label Direction – Box Culvert]



[Define Constraint Label Direction]

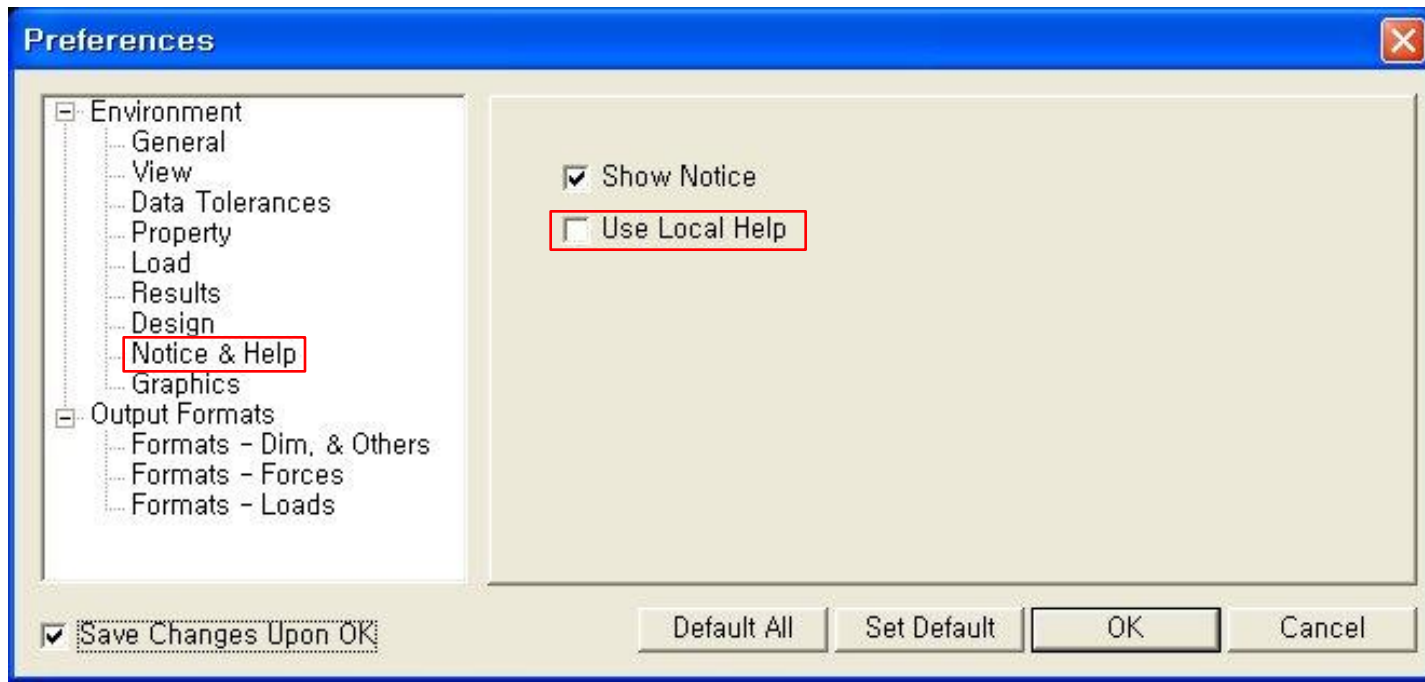
Pre / Post-processing

Addition of the Preference in online help

Upgrade Contents

- The user can select a Local Help or Web-based Help in the preference.
- When 'Use Local Help' option is checked on, a Local help file (CVLw.chm) which has been installed in the local computer is invoked by pressing 'F1' key.
- Default setting is check-off, which invokes a Web-based Help. Since Web-based Help can be frequently updated, default setting is recommended.

Tools > Preferences > Environment



[Web-based Help]

Pre / Post-processing

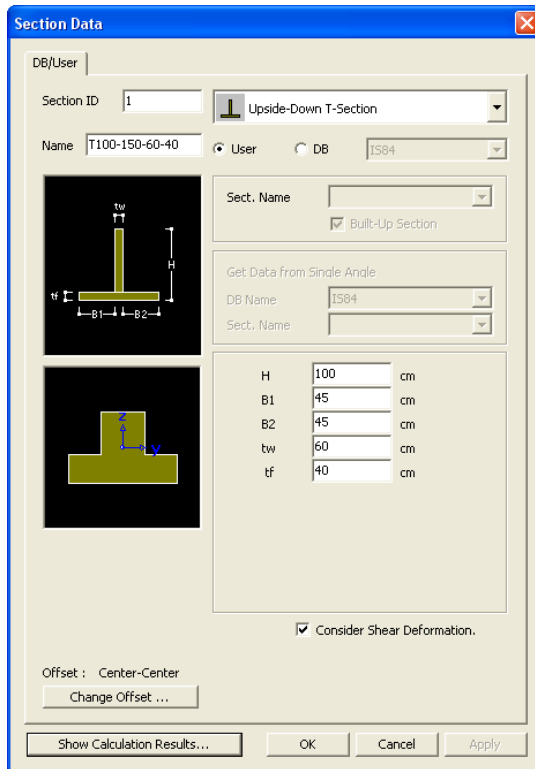
Addition of upside-down T-shape beam

Upgrade Contents

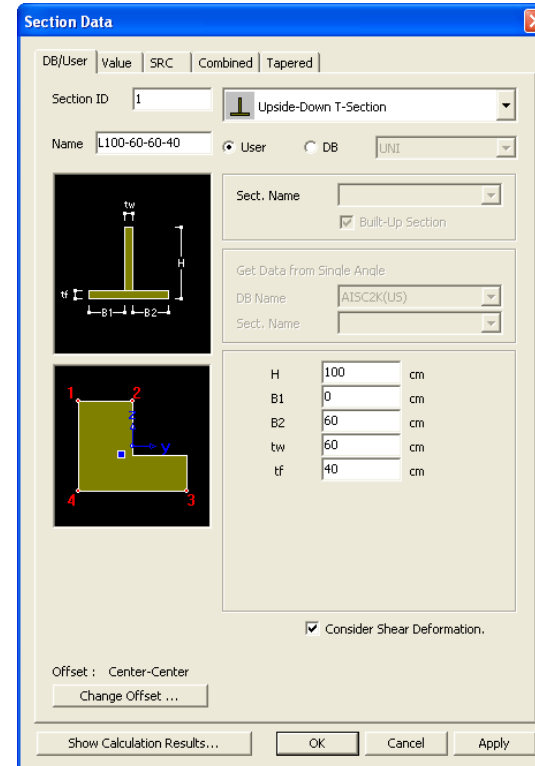
- Generate the strip foundations using upside-down T-shape beam.
- Both upside-down T-shape and L-shape section can be generated.

Model > Properties > Section

Tables > Structure Tables > Properties > Section



[Upside-down T-shape section]



[L-shape section]

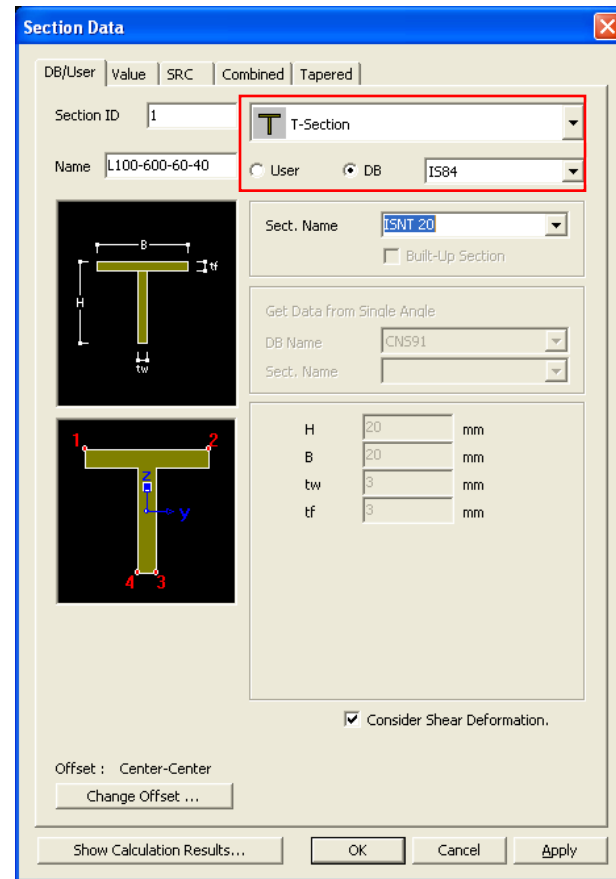
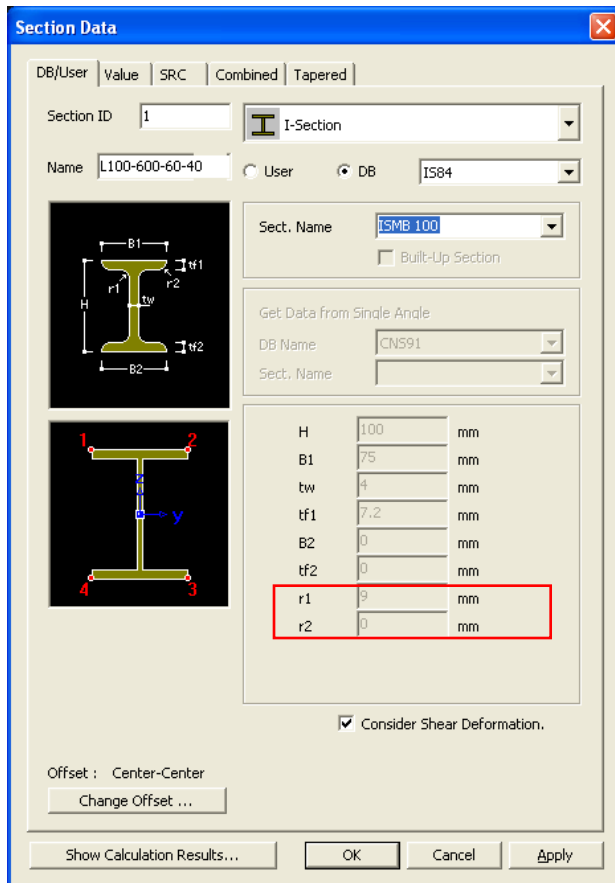
Pre / Post-processing

Improvements in IS84 section DB

Upgrade Contents

- In IS84 section DB, H-Section and Channel now reflect 'r' value.
- T-Section has been newly added as per IS84.

Model > Properties > Section



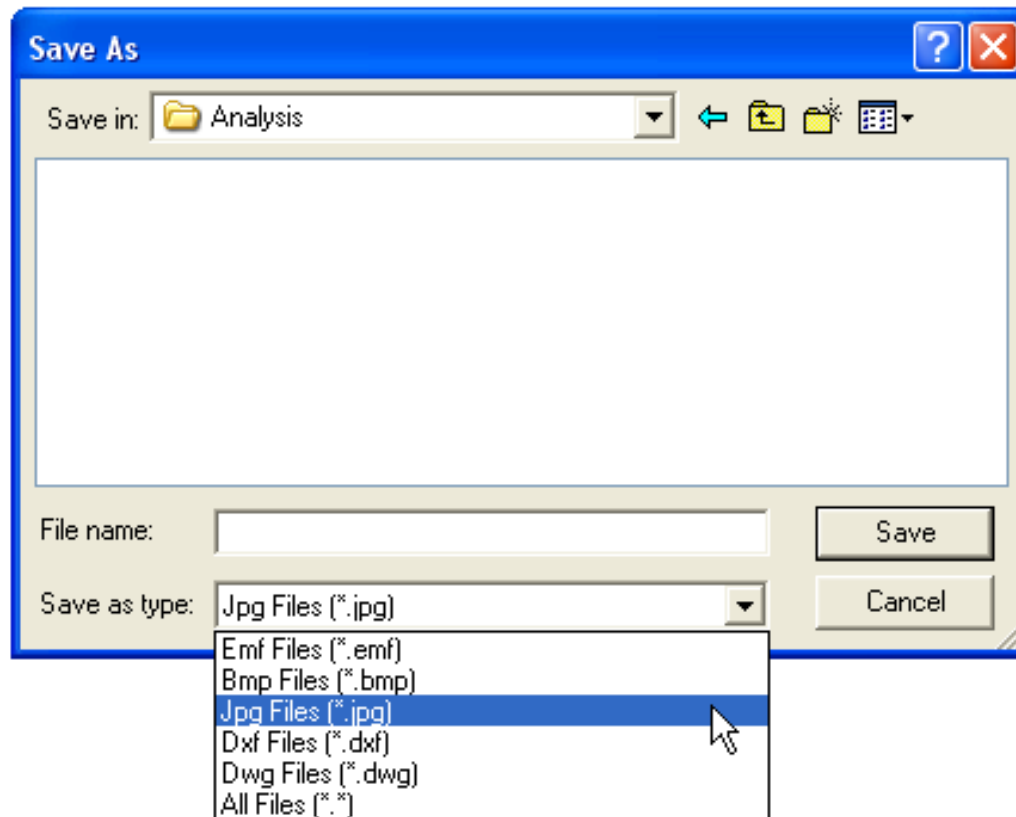
Pre / Post-processing

Save an image in JPG format

[Upgrade Contents](#)

- Graphic data of the Model Window can be saved in JPG format as well as AutoCAD DXF, BMP or EMF.

File > Graphic files > JPG files



Pre / Post-processing

Addition of an export option in result tables

Upgrade Contents

- New feature that can export databases to an Excel Spreadsheet.

Results > Result Tables

Elem	Load	Part	Axial (tonf)	Shear-y (tonf)	Shear-z (tonf)	Torsion (tonf-m)	Moment-y (tonf-m)	Moment-z (tonf-m)
1	cLCB1	J[1]	0.00	0.00	0.00	0.00	0.00	0.00
1	cLCB1	J[3]	0.00	0.00	0.00	0.00	0.00	0.00
2	cLCB1	J[3]	0.00	0.00	0.00	0.00	0.00	0.00
2	cLCB1	J[4]	0.00	0.00	0.00	0.00	0.00	0.00
3	cLCB1	J[4]	0.00	0.00	0.00	0.00	0.00	0.00
3	cLCB1	J[5]	0.00	0.00	0.00	0.00	0.00	0.00
4	cLCB1	J[5]	0.00	0.00	0.00	0.00	0.00	0.00
4	cLCB1	J[6]	0.00	0.00	0.00	0.00	0.00	0.00
5	cLCB1	J[6]	0.00	0.00	0.00	0.00	0.00	0.00
5	cLCB1	J[7]	0.00	0.00	0.00	0.00	0.00	0.00
6	cLCB1	J[7]	0.00	0.00	0.00	0.00	0.00	0.00
6	cLCB1	J[8]	0.00	0.00	0.00	0.00	0.00	0.00
7	cLCB1	J[8]	0.00	0.00	0.00	0.00	0.00	0.00
7	cLCB1	J[2]	0.00	0.00	0.00	0.00	0.00	0.00
8	cLCB1	J[9]	0.00	0.00	0.00	0.00	0.00	0.00
8	cLCB1	J[10]	0.00	0.00	0.00	0.00	0.00	0.00
9	cLCB1	J[10]	0.00	0.00	0.00	0.00	0.00	0.00
9	cLCB1	J[11]	0.00	0.00	0.00	0.00	0.00	0.00
9	cLCB1	J[11]	0.00	0.00	0.00	0.00	0.00	0.00
10	cLCB1	J[11]	0.00	0.00	0.00	0.00	0.00	0.00
10	cLCB1	J[12]	0.00	0.00	0.00	0.00	0.00	0.00
10	cLCB1	J[12]	0.00	0.00	0.00	0.00	0.00	0.00
11	cLCB1	J[12]	0.00	0.00	0.00	0.00	0.00	0.00
11	cLCB1	J[13]	0.00	0.00	0.00	0.00	0.00	0.00
11	cLCB1	J[13]	0.00	0.00	0.00	0.00	0.00	0.00
12	cLCB1	J[13]	0.00	0.00	0.00	0.00	0.00	0.00
12	cLCB1	J[14]	0.00	0.00	0.00	0.00	0.00	0.00
12	cLCB1	J[14]	0.00	0.00	0.00	0.00	0.00	0.00
13	cLCB1	J[14]	0.00	0.00	0.00	0.00	0.00	0.00
13	cLCB1	J[15]	0.00	0.00	0.00	0.00	0.00	0.00
13	cLCB1	J[15]	0.00	0.00	0.00	0.00	0.00	0.00
14	cLCB1	J[15]	0.00	0.00	0.00	0.00	0.00	0.00
14	cLCB1	J[16]	0.00	0.00	0.00	0.00	0.00	0.00
14	cLCB1	J[16]	0.00	0.00	0.00	0.00	0.00	0.00
15	cLCB1	J[17]	0.00	0.00	0.00	0.00	0.00	0.00
15	cLCB1	J[17]	0.00	0.00	0.00	0.00	0.00	0.00
15	cLCB1	J[18]	0.00	0.00	0.00	0.00	0.00	0.00
15	cLCB1	J[18]	0.00	0.00	0.00	0.00	0.00	0.00
16	cLCB1	J[18]	0.00	0.00	0.00	0.00	0.00	0.00
16	cLCB1	J[18]	0.00	0.00	0.00	0.00	0.00	0.00
16	cLCB1	J[19]	0.00	0.00	0.00	0.00	0.00	0.00
16	cLCB1	J[19]	0.00	0.00	0.00	0.00	0.00	0.00

Elem	Load	Part	Axial (tonf)	Shear-y (tonf)	Shear-z (tonf)	Torsion (tonf-m)	Moment-y (tonf-m)	Moment-z (tonf-m)
1	cLCB1	J[1]	0	0	-5.58	0.02	-7.22	0
1	cLCB1	J[3]	0	0	5.82	0.02	-8.14	0
2	cLCB1	J[3]	0	0	-5.75	-0.04	-8.25	0
2	cLCB1	J[4]	0	0	5.65	-0.04	-7.84	0
3	cLCB1	J[4]	0	0	-5.7	0	-8.03	0
3	cLCB1	J[5]	0	0	5.7	0	-8.02	0
3	cLCB1	J[5]	0	0	-5.7	0	-8.03	0
3	cLCB1	J[6]	0	0	5.7	0	-8.03	0
3	cLCB1	J[6]	0	0	-5.7	0	-8.02	0
3	cLCB1	J[7]	0	0	5.7	0	-8.03	0
3	cLCB1	J[7]	0	0	-5.65	0.04	-7.84	0
3	cLCB1	J[8]	0	0	5.75	0.04	-8.25	0
7	cLCB1	J[8]	0	0	-5.82	-0.02	-8.14	0
7	cLCB1	J[2]	0	0	5.58	-0.02	-7.22	0
8	cLCB1	J[9]	0	0	-6.64	0	-7.73	0
8	cLCB1	J[10]	0	0	7.9	0	-12.72	0
9	cLCB1	J[10]	0	0	-7.66	0.01	-12.19	0
9	cLCB1	J[11]	0	0	6.88	0.01	-9.12	0
10	cLCB1	J[11]	0	0	-7.28	0	-10.62	0
10	cLCB1	J[12]	0	0	7.26	0	-10.57	0
11	cLCB1	J[12]	0	0	-7.27	0	-10.62	0
11	cLCB1	J[13]	0	0	7.27	0	-10.62	0
11	cLCB1	J[13]	0	0	-7.27	0	-10.62	0
11	cLCB1	J[18]	0	0	7.27	0	-10.62	0
11	cLCB1	J[18]	0	0	-7.26	0	-10.57	0

Pre / Post-processing

Export frame model to solid/plate model

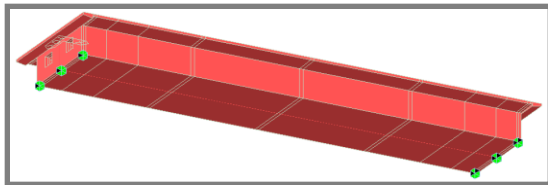
Upgrade Contents

- Tendon Profiles as well as concrete girder can be exported to midas FEA for detail analysis.
- Exporting frame model to plate model in midas FEA is newly implemented.

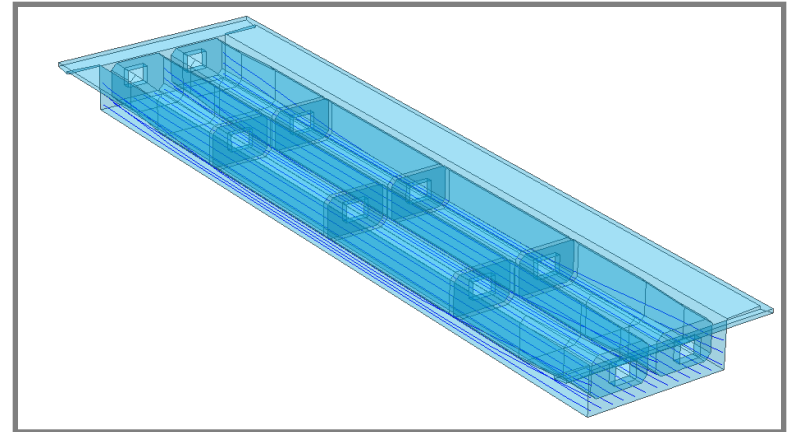
Effects & Usage

- The user can easily generate the solid/plate model with tendons, which will be analyzed in midas FEA.

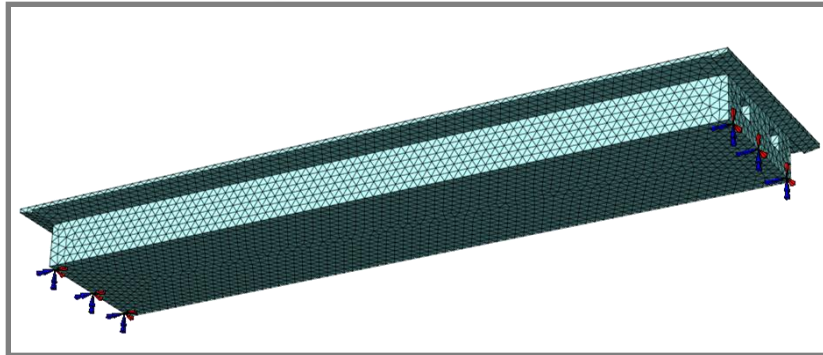
File > Export > Frame Section for Solid, Frame Section for Plate



[midas Civil: line beam model]



[midas FEA: Imported tendons]



[midas FEA: Solid model]

Pre / Post-processing

Improvements in Beam Wizard

Upgrade Contents

- Span-oriented input type for Beam Wizard is newly implemented.

Model > Structure Wizard > Beam

