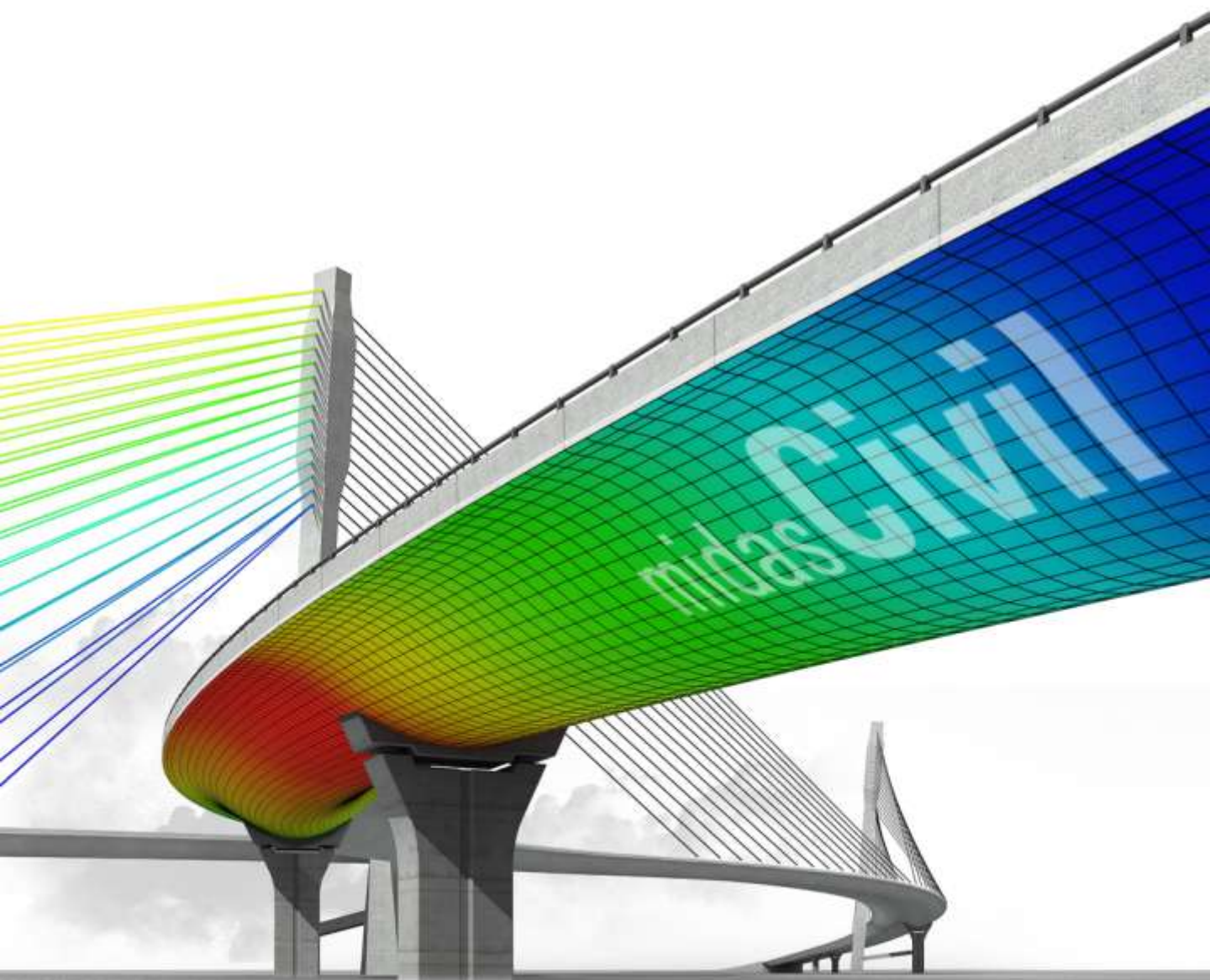


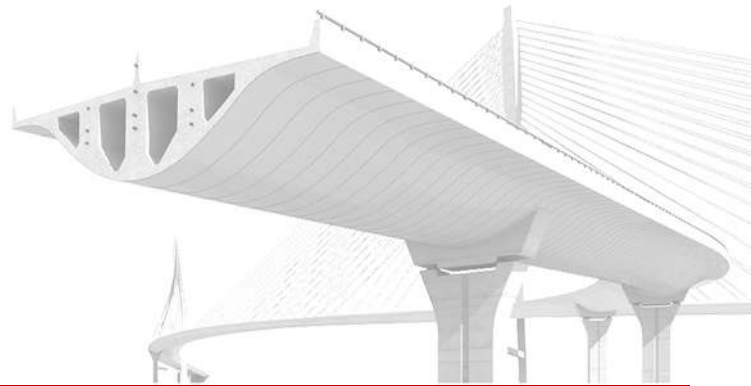


Referente MIDAS per l' ITALIA
www.cspfea.net

Civil 2010 (v2.1) Release Note

Integrated Solution System for Bridge and Civil Engineering





Enhancements

▪ Pre/Post Processing	3
1. Dynamic Report Generation	
2. Addition of Concurrent Reaction for BD37-01 Vehicle Load	
3. Pressure Type of Beam Loads	
4. Improved Eccentricity Option in the Element Beam Load and Line Beam Load	
5. Improved India Standard section DB	
▪ Analysis	10
1. Mander Model in Inelastic Material Properties	
2. Improved MINEGOTTO-PINTO Steel Model	
3. Improved Pushover Analysis Result	
▪ Design	13
1. Addition of EUROCODE PSC Design	

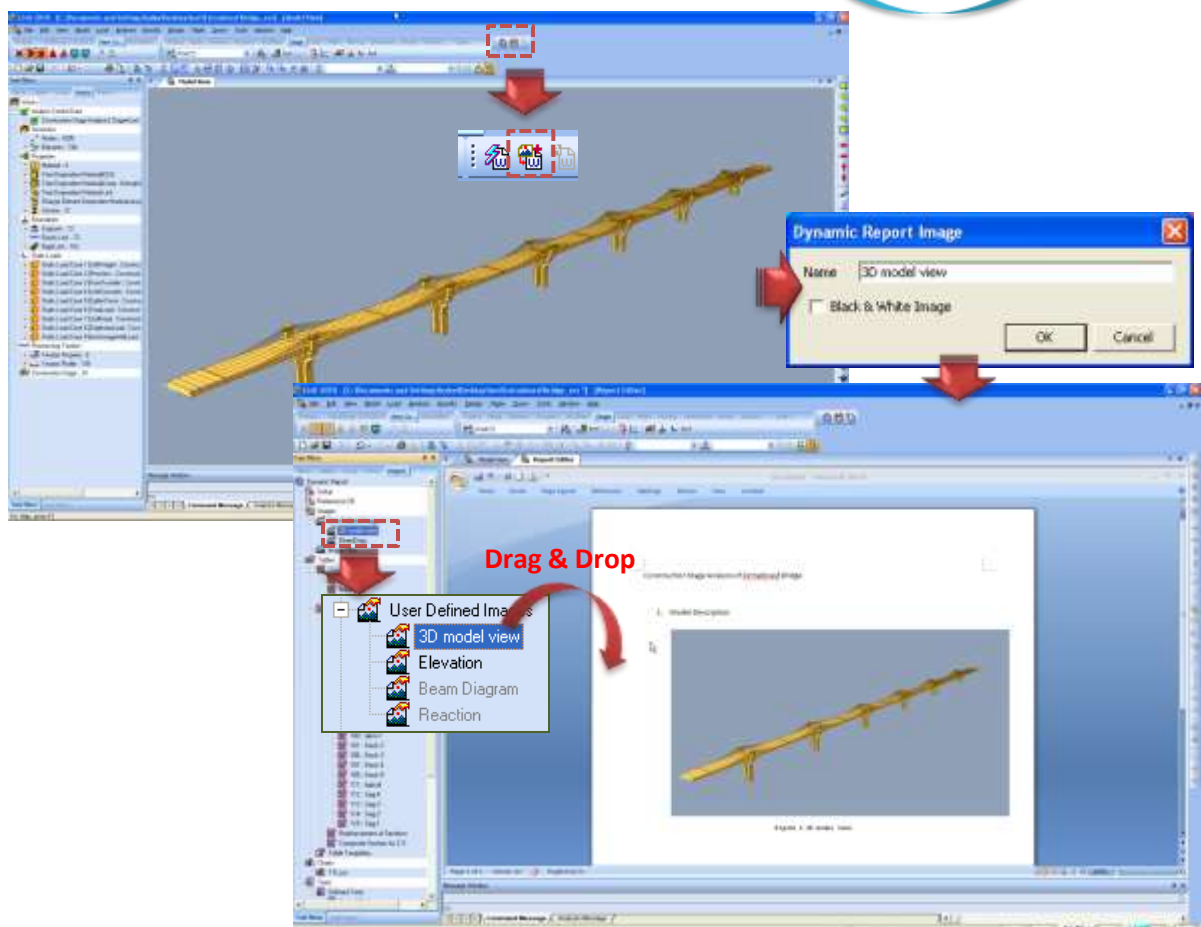
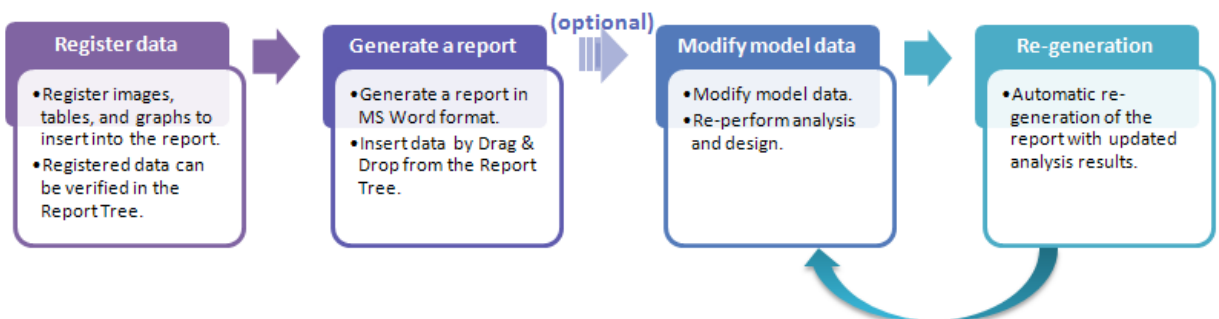
1. Dynamic Report Generation

- Word format report can automatically be generated for selected input & output data (figures, tables, graphs, and text).
- Using “Dynamic Report Regenerator” function, changes of a model file are automatically updated in the report.
- User defined report format can be used and saved.

Tools > Dynamic Report Generator

Tools > Dynamic Report Image

Tools > Dynamic Report Auto Generation



Procedure for Dynamic Report Generation

Step 1. Open midas Civil model file.

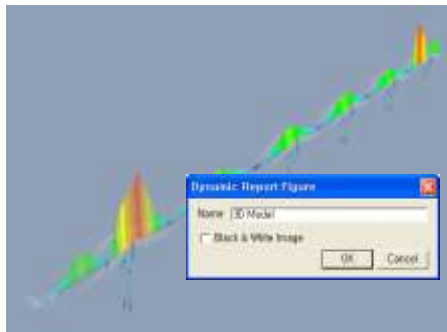
Step 2. Register contents(image, table, chart, summary...) to enter them in the report.

Registered contents are displayed in the Report Tree.

Step 3. Open a new report.

Step 4. Enter the contents by Drag & Drop from report tree.

Step 5. Modify the report file if required.



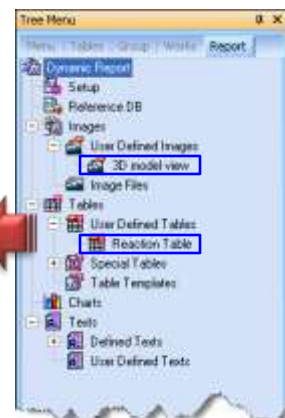
Register a image



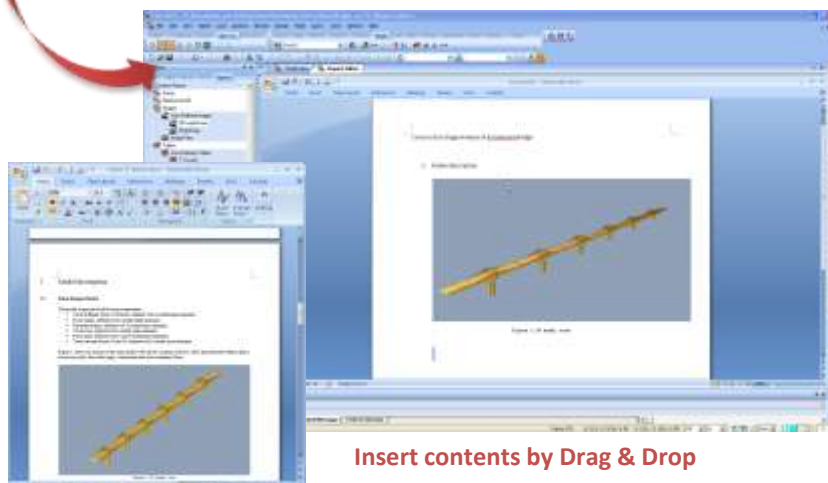
Register a table



Open a new report



Report Tree

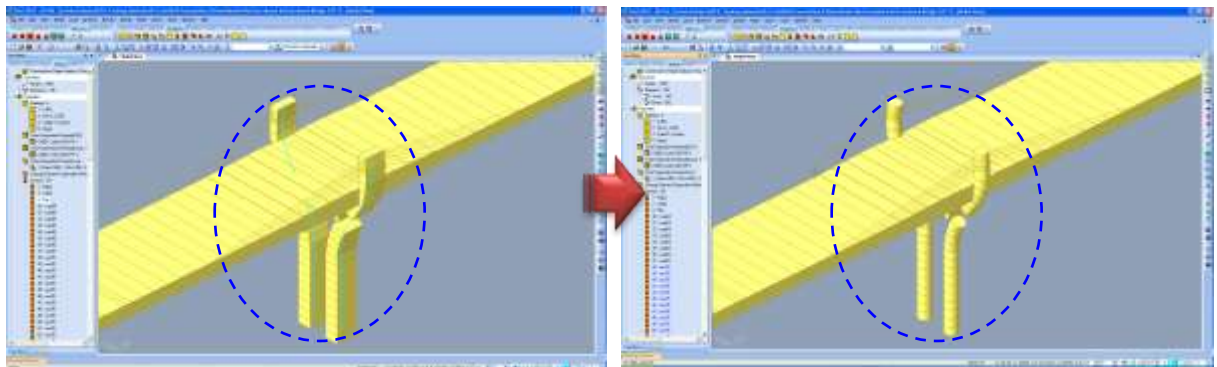


Insert contents by Drag & Drop

Procedure for Auto Regeneration

If there are any changes in the model file, we can automatically update the pre-generated report.

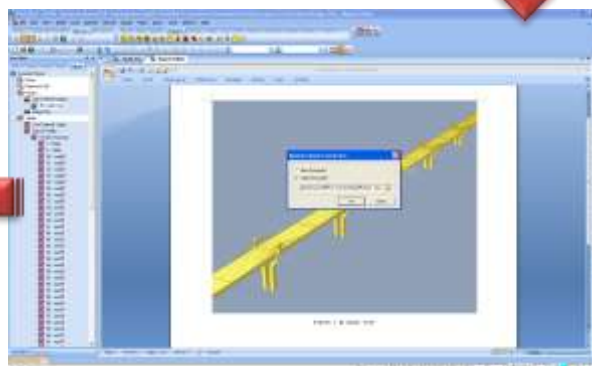
- Step 1. Modify a model file if required.
- Step 2. Open the pre-generated report.
- Step 3. Re-generate the report.
- Step 4. Check the updated contents



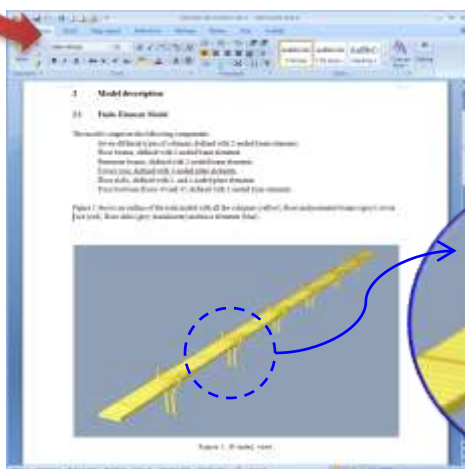
Modify a model file if required



Regeneration



Open the pre-generated report

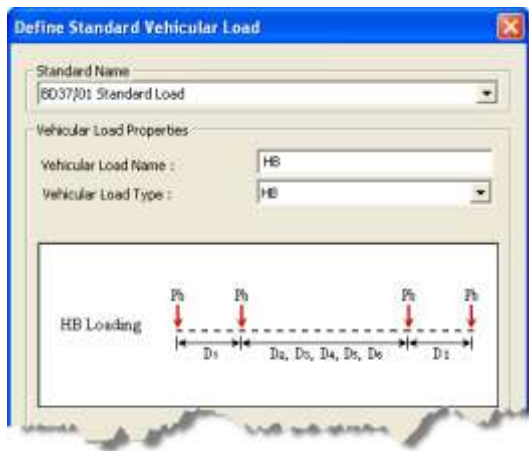


Check the updated contents

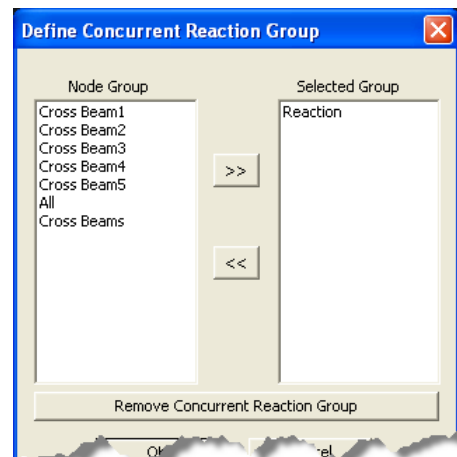
2. Addition of Concurrent Reaction for BD37-01 Vehicle Load

- “Concurrent Reactions” can now be calculated for BD37-01 Vehicle load.
- Generally, the reactions or member forces calculated due to moving load analysis are the Max/Min values for each reaction values (ex. FX, FY, ... etc.). However, for the support nodes included in the **Concurrent Reaction Group**, the concurrent reactions are calculated.

Result > Result table > **Concurrent (Max/Min) Reaction**



BD37-01 Vehicle



Concurrent Reaction Group

Load Case		Node		1							
Node	Reaction	FX (kN)	FY (kN)	FZ (kN)	MX (kNm)	MY (kNm)	MZ (kNm)	FX (kN)	FY (kN)		
111111	Reaction	MVL	Apply								
1	FX(kN)	111.1780	26.1422	-44.7787	0.0000	0.0000	0.0000	46.6373	0.0000		
	FY(kN)	103.0470	26.5359	-46.3811	0.0000	0.0000	0.0000	41.0065	0.0000		
	FZ(kN)	-13.2327	-22.2372	216.8420	0.0000	0.0000	0.0000	30.0215	0.0000		
	MX(kNm)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000		
6	MY(kNm)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000		
	MZ(kNm)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000		
	FX(kN)	46.4851	-23.3941	164.3090	0.0000	0.0000	0.0000	103.7350	0.0000		
	FY(kN)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000		
29	FZ(kN)	37.2126	24.0333	-22.4907	0.0000	0.0000	0.0000	-13.7618	0.0000		
	MX(kNm)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000		
	MY(kNm)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000		
	MZ(kNm)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000		
30	FX(kN)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000		
	FY(kN)	16.6856	-24.9572	196.7380	0.0000	0.0000	0.0000	73.2978	0.0000		
	FZ(kN)	-22.4249	-21.1960	141.4550	0.0000	0.0000	0.0000	34.1205	0.0000		
	MX(kNm)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000		
	MY(kNm)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000		
	MZ(kNm)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000		
	FX(kN)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000		
	FY(kN)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000		
	FZ(kN)	33.4956	19.4610	-22.4344	0.0000	0.0000	0.0000	-15.9581	0.0000		
	MX(kNm)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000		
	MY(kNm)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000		
	MZ(kNm)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000		

Concurrent Reaction Result Table

3. Pressure Type of Beam Loads

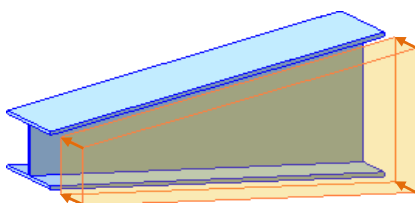
- “**Uniform Pressure**” and “**Trapezoidal Pressure**” type of Line Beam Loads and Element Beam Loads have been implemented to consider the width of beam elements when entering wind loads.
- This feature is useful to assign wind loads to the tapered girders (ex. longitudinal girders in bridges).

Loads > Element Beam Loads

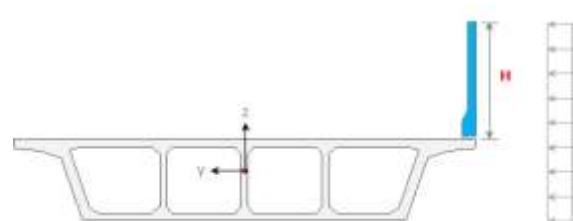
Loads > Line Beam Loads

Uniform Pressure type

Trapezoidal Pressure type



Assign a beam load as a pressure load considering the beam width



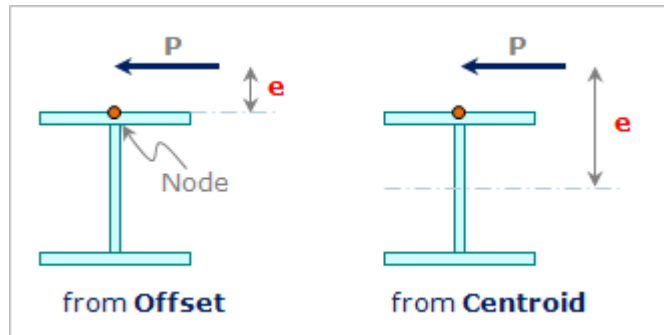
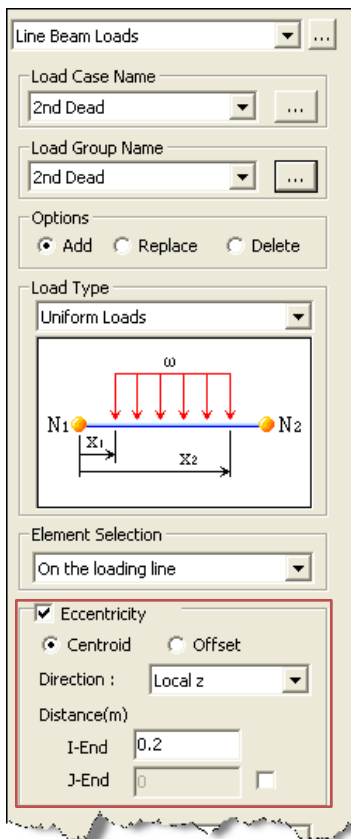
Additional H
to consider the additional height of the structures which was not included in the modeling (ex. guard fence)

4. Improved Eccentricity Option in the Element Beam Load and Line Beam Load

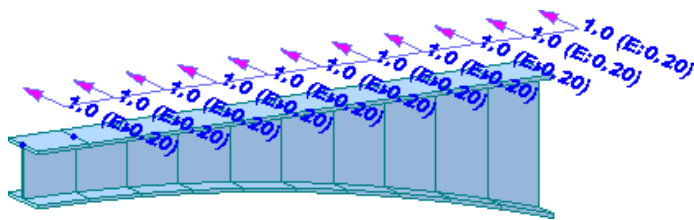
- Eccentricity can be entered by the following 2 methods: 1) from the centroid, and 2) from the offset point.
- In the previous version, the eccentricity was entered only from the centroid. In case of the tapered section, beam loads with eccentricity can be easily entered from the offset point.

Loads > **Element Beam Loads**

Loads > **Line Beam Loads**



Two methods to enter the eccentricity

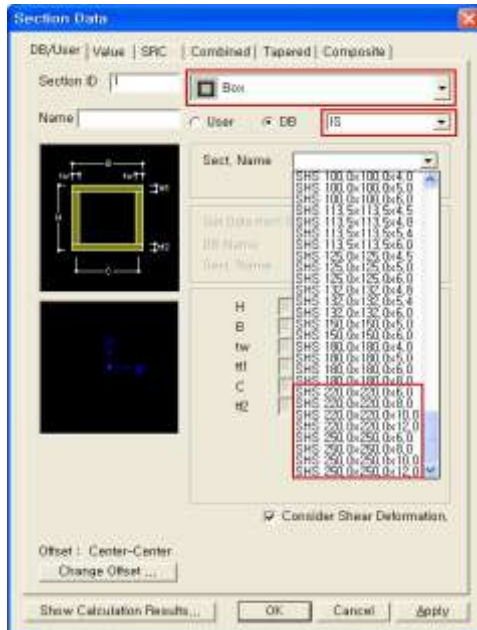


Enter the eccentricity *from Offset* (nodal position) for the tapered sections

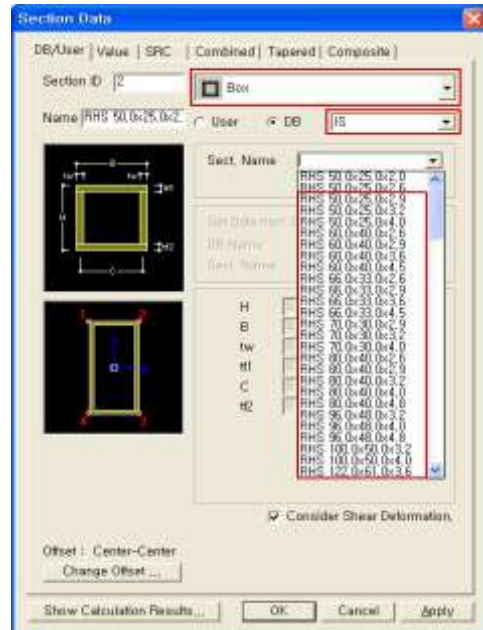
5. Improved India Standard section DB

- New sections (Box, Pipe, and Angle) have been implemented in IS, IS1161, and IS808 section DB.

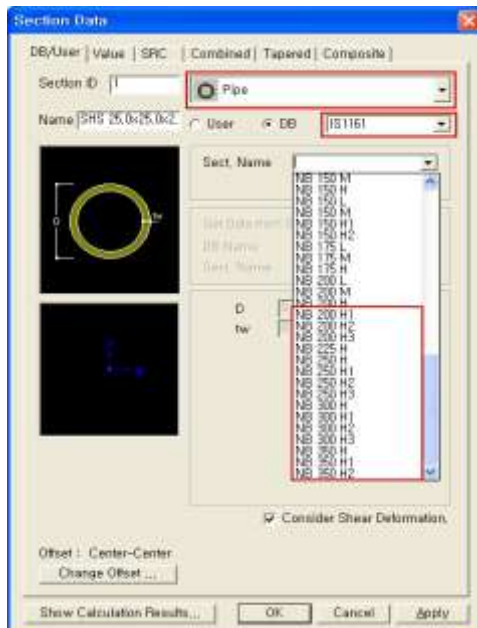
Model > Properties > Section



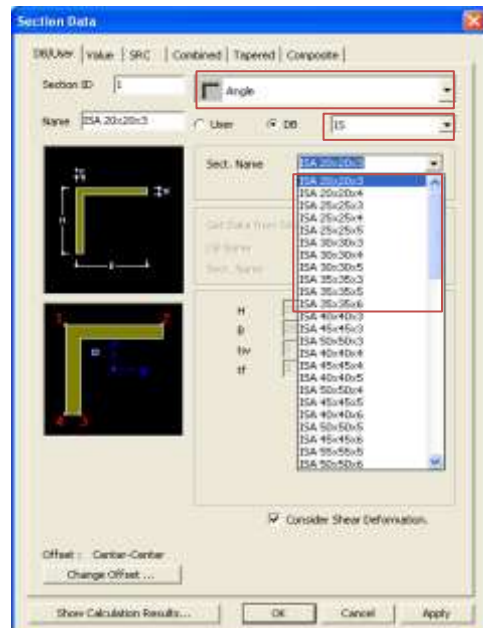
Box Section SHS



Box Section RHS



Pipe Section NB



Angle Section Data

1. Mander Model in Inelastic Material Properties

- Mander Model has been added to model the behavior of concrete confined with steel stirrups.
- The menu name, **Fiber Material Properties**, has been changed to **Inelastic Material Properties**.

Model > Properties > Inelastic Material Properties

Inelastic Material Model

Name : Concrete
 Material Type : Concrete
 Hysteresis Model : Mander Model

Concrete Type
 Unconfined Concrete : Cover Concrete
 Confined Concrete : Core Concrete

Section & Confinement Rebar Type
 Rectangular
 Circular : Hoop Confinement Steel
 User Defined
 Circular : Spiral Confinement Steel

Import Reference Material & Section Data

Section Data

Rebar Data

Material(C40/50) and section() data are only referred to during a file import. Modified material(C40/50) and section() data will not be updated. Re-importing a file is not required.

Unconfined Concrete Data
 fco' : Unconfined Concrete Strength 40.0000 N/mm²
 ecco : Unconfined Concrete Strain 0.002
 Corresponding to fco' (generally ecco=0.002 can be assumed)
 Ec : Elastic Modulus of Concrete
 Mander et al. 31622.7766 N/mm²

ft' : Tensile Strength of Concrete

Confinement Effectiveness Coefficient, ke
 Acc : Area of Effective Concrete Core 1800000.0000 mm²
 Ae : Total Area of Effectively Confined Core Concrete
 820000.0000 mm² Note
 ke = Ae / (Ac (1-ρcc)) = Ae / Acc = 0.455556 < 1.0

The Effective Lateral Confining Stress on the Concrete

The Effective Lateral Confining Stress on the Concrete

Material...
 Time Dependent Material(Creep/Shrinkage) Function...
 Time Dependent Material(Creep/Shrinkage)...
 Time Dependent Material(Comp. Strength)...
 Time Dependent Material Link...
 Change Element Dependent Material Property...
 Plastic Material...
 Section...
 Section Stiffness Scale Factor...
 Tapered Section Group...
 Thickness...
 Wall Stiffness Scale Factor...
 Inelastic Hinge Properties...
 Inelastic Hinges...
 Group Damping...
Inelastic Material Properties...
 Fiber Division of Section
 Material Table... Ctrl+Alt+L
 Table... Ctrl+Alt+L

Mander Material Data

Compressive Stress, f_c

Compressive Strain, ϵ_c

Unconfined Concrete

Confined Concrete

Assumed for Cover Concrete

Elastic modulus of Concrete : $E_c = 5,000 \sqrt{f_{cm}}$ MPa
 Tensile Strength of Concrete : $f_t = 0.62 \sqrt{f_{cm}}$ MPa
 Tensile Strain of Concrete : $\epsilon_t = \frac{f_t}{E_t}$

2. Improved MINEGOTTO-PINTO Steel Model

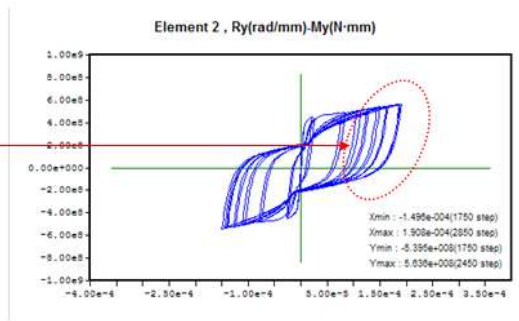
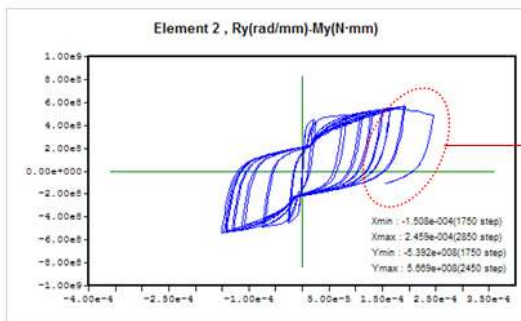
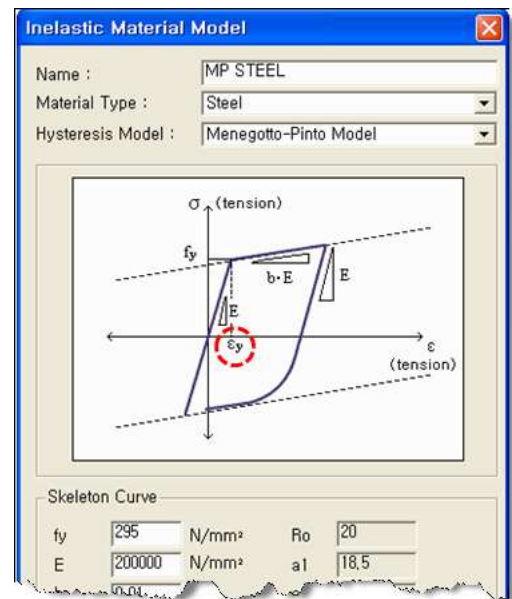
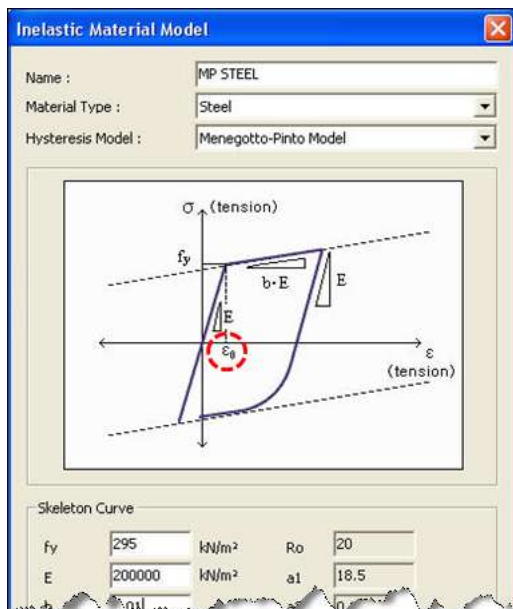
- In MINEGOTTO-PINTO steel model, the equation for calculating the plastic strain, ξ , has been changed in order to enhance the convergence performance.

Previous version

$$\xi = \begin{cases} \Delta\varepsilon > 0 ; \xi_1 = \frac{\varepsilon_{\max} - \varepsilon_0}{\varepsilon_0 - \varepsilon_r} \\ \Delta\varepsilon < 0 ; \xi_2 = \frac{\varepsilon_0 - \varepsilon_{\min}}{\varepsilon_0 - \varepsilon_r} \end{cases}$$

New version

$$\xi = \begin{cases} \Delta\varepsilon > 0 ; \xi_1 = \frac{\varepsilon_{\max} - \varepsilon_0}{\varepsilon_y} \\ \Delta\varepsilon < 0 ; \xi_2 = \frac{\varepsilon_0 - \varepsilon_{\min}}{\varepsilon_y} \end{cases}$$



TIME STEPS	SUBSTEPS	ITERATIONS
2950 /	2950	2961 7578

TIME STEPS	SUBSTEPS	ITERATIONS
2950 /	2950	2958 7496

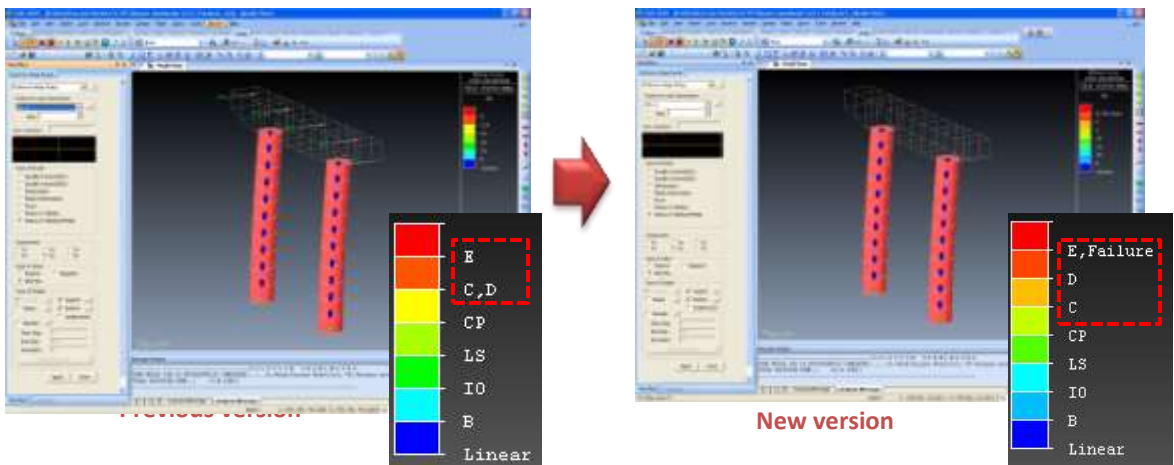
3. Improved Pushover Analysis Result

- Pushover analysis results have been graphically improved in order to prevent the user's confusion.
- In FEMA and Eurocode type hinge, the hinge status of "C" point and "D" point is now displayed separately. In the previous version, the hinge status of "C,D" was displayed after the C point.

Result > Deformations > Deformed Shape

Design > Pushover Analysis > Pushover Hinge Status Result

Design > Pushover Analysis > Pushover Hinge Result Table > Beam Summary



Pushover Hinge Status Result

Step	Deform	Force	Plastic Deform	Initial Stiff	D/D1	D/D2	Status
139	1.195e-003	34665.670	8.015e-004	88057971.014	3.036e+000		CP
140	1.293e-003	34665.670	8.991e-004	88057971.014	3.264e+000		CP
141	5.258e-003	6933.134	4.865e-003	88057971.014	1.336e+001		Failure
142	5.301e-003	6933.134	4.907e-003	88057971.014	1.346e+001		Failure
143	5.341e-003	6933.134	4.947e-003	88057971.014	1.357e+001		Failure
144	5.390e-003	6933.134	4.986e-003	88057971.014	1.367e+001		Failure
145	5.410e-003	6933.134	5.024e-003	88057971.014	1.376e+001		Failure
146	5.515e-003	6933.134	5.121e-003	88057971.014	1.401e+001		Failure
147	5.592e-003	6933.134	5.188e-003	88057971.014	1.418e+001		Failure
148	1.197e-002	0.000	1.158e-002	88057971.014	3.042e+001		Failure
149	1.190e-002	0.000	1.158e-002	88057971.014	3.042e+001		Failure

Plastic Deform	Initial Stiff	D/D1	D/D2	Status
8.015e-004	88057971.014	3.036e+000		CP(+)
8.991e-004	88057971.014	3.264e+000		CP(+)
4.865e-003	88057971.014	1.336e+001		D(+)
4.907e-003	88057971.014	1.346e+001		D(+)
4.947e-003	88057971.014	1.357e+001		D(+)
4.986e-003	88057971.014	1.367e+001		D(+)
5.024e-003	88057971.014	1.376e+001		D(+)
5.121e-003	88057971.014	1.401e+001		D(+)
5.188e-003	88057971.014	1.418e+001		D(+)
1.158e-002	88057971.014	3.042e+001		E, Failure
1.158e-002	88057971.014	3.042e+001		E, Failure

Previous version

New version

Beam Summary Table

1. Addition of EUROCODE PSC Design

Prestressed box girder design as per **EUROCODE 2-2:05** has been added.

The following limit states are verified:

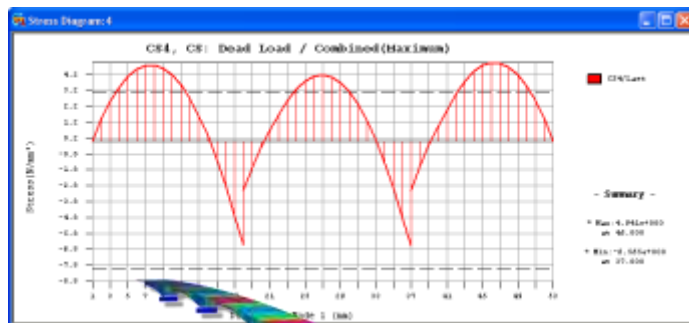
- Ultimate Bending Resistance – Clause 6.1
- Shear Resistance – Clause 6.2
- Torsional Resistance – Clause 6.3
- Crack Width Calculation and Control – Clause 7.3
- Stress Limitations for Pre stressing Tendons – Clause 7.2
- Stress limits for concrete at service and Construction Stages – Clause 7.2
- Principal stresses for pre stressing Steels – Clause 7.1

Graphical results, tabular output, and design reports are provided in *Microsoft Excel* format.

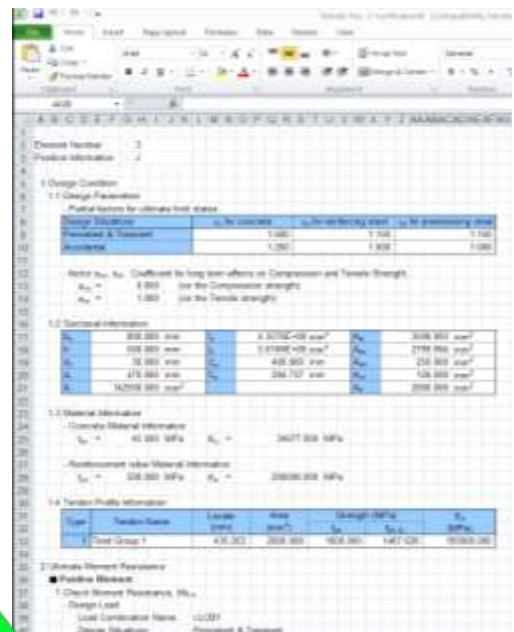
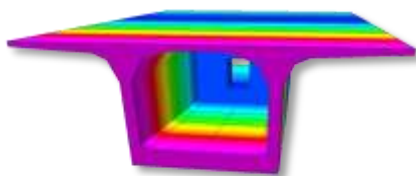
Load combination to Eurocode has also been added.

Exposure class for Top and Bottom surfaces.

Design > PSC Design > PSC Design



Stress Diagram



Design Report in Excel Format

Elem	Part	Max/Min	LCom Name	Design Situations	Type	CHK	T_Ed (kN-mm)	T_Rd,max (kN-mm)	V_Ed (kN)	V_Rd,max (kN)	Ratio
3	[8]	T-Max	cLCB2	Persistent & T -		OK	116666.6667	319078.5577	-357.0833	921.5120	0.7531
3	[8]	V-Max	cLCB2	Persistent & T -		OK	116666.6667	319078.5577	-357.0833	921.5120	0.7531
3	[8]	V-Min	cLCB2	Persistent & T -		OK	116666.6667	319078.5577	-357.0833	921.5120	0.7531
3	J[9]	T-Max	cLCB2	Persistent & T -		OK	116666.6667	319078.5577	-178.5417	921.5120	0.5594
3	J[9]	V-Max	cLCB2	Persistent & T -		OK	116666.6667	319078.5577	-178.5417	921.5120	0.5594
3	J[9]	V-Min	cLCB2	Persistent & T -		OK	116666.6667	319078.5577	-178.5417	921.5120	0.5594
4	[9]	T-Max	cLCB2	Persistent & T -		OK	16666.6667	319078.5577	-178.5417	921.5120	0.2460
4	[9]	V-Max	cLCB2	Persistent & T -		OK	16666.6667	319078.5577	-178.5417	921.5120	0.2460
4	[9]	V-Min	cLCB2	Persistent & T -		OK	16666.6667	319078.5577	-178.5417	921.5120	0.2460

Design Results in Tabular Format