

Gen 2011 (v2.1) Release Note

Integrated Design System for Building and General Structures





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1. Revit Structure 2012 Interface

Using **Midas Link for Revit Structure**, direct data transfer between **midas Gen** and **Revit Structure 2012** is available for Building Information Modeling (BIM) workflow. **Midas Link for Revit Structure** enables us to directly transfer a Revit model data to midas Gen, and delivery back to the Revit model file. It is provided as an **Add-In** module in Revit Structure and midas Gen text file (*.mgt) is used for the roundtrip.

Midas Link for Revit Structure supports the following workflows:

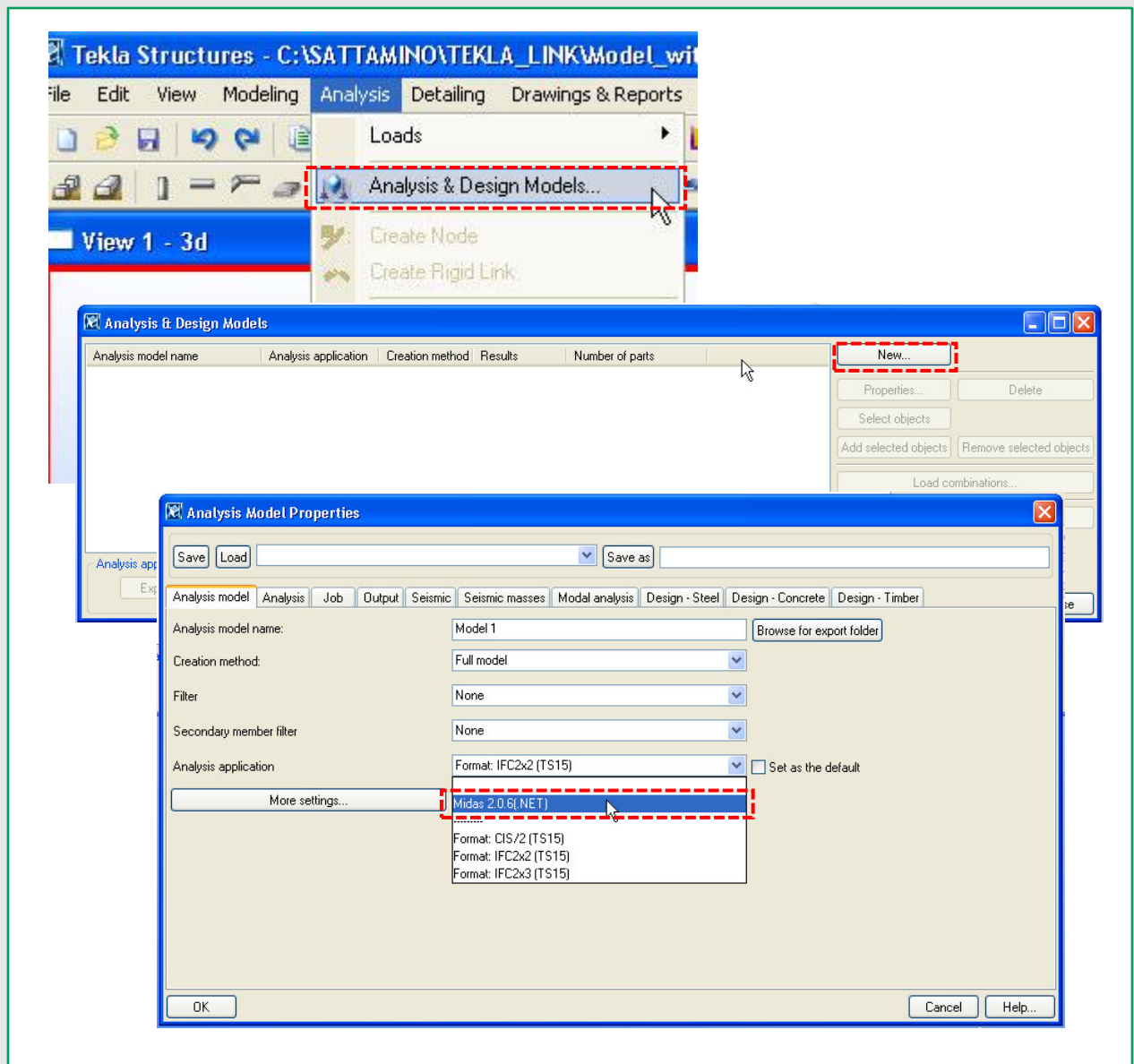
- (1) Send the Revit Structure analytical model to midas Gen.
- (2) Import the MGT file of the Revit model in midas Gen.
- (3) Export the midas model file to the MGT file.
- (4) Update the Revit Structure model from midas Gen

For more information, see Getting Started file in your installation folder.

2. Tekla Structure v17 Interface

Midas Link for **Tekla Structure v17** is now available to transfer a Tekla model data to Midas Gen, and delivery back to Tekla model files. It is provided as an Analysis & Design modules in Tekla Structure and Midas Gen text file(*.mgt) is used for the roundtrip. For more information, see the related documents in your installation folder.

e.g.) C:\Program Files\MIDAS\MIDAS Gen\Midas Link for Tekla Structure



3. Local Direction Force Sum for Unstructured Mesh

In the previous version, the Local Direction Force Sum function was able to be applied to structured mesh. Now the program can provide resultant forces and moments for the unstructured mesh as well. The **Plate Edge Line Select** and **Plate Edge Polygon Select** method are supported in this version. The **Solid Face Polygon Select** method will be supported in the next version.

Results > Local Direction Force Sum

The screenshot displays the Midas Gen 2011 software interface. The main window shows a color-coded mesh plot representing the Local Direction Force Sum for an unstructured mesh. The plot is divided into two regions: a yellow region on the left and a blue region on the right, separated by a vertical dashed line. The color scale on the right indicates the magnitude of the force sum, ranging from -31.77 (blue) to 247.85 (red).

The **Local Direction Force Sum** dialog box is open, showing the following settings:

- Mode: Plate Edge Line Select
- LoadCase: ST: LC1
- Tolerance: 0.0001
- Coordinate Input: Positions 1.5, 0, 0
- z Vector:
- Calculate: All Load Case/Comb
- Result Output: at X=3 Y=1.5 Z=0, Line Length=3, Fx: 1.0000e+002, Fy: 1.0000e+002, Fz: 1.0000e+002, Mx: 1.5000e+002, My: 1.5000e+002, Mz: -3.0000e+002
- Name:
- Buttons: Add, Modify, Delete, Text Output, Close

The Message Window at the bottom displays the following text:

```
YOUR MIDAS JOB IS SUCCESSFULLY COMPLETED.....D:\DK\Support\LDFS
TOTAL SOLUTION TIME... 1.68 [SEC]
```

The status bar at the bottom shows: Node-22 U: 1.5, 0, 0 G: 1.5, 0, 0 kN m non ? 0 / 2

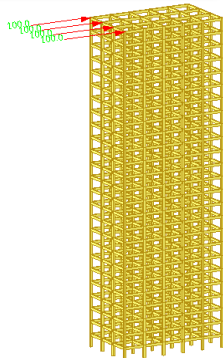
Local Direction Force Sum for the unstructured mesh

4. Improvement in Pushover Analysis Speed

Pushover analysis speed has been significantly improved by enhancing the analysis algorithm and output process.

Design > Pushover Analysis > *Perform Pushover Analysis*

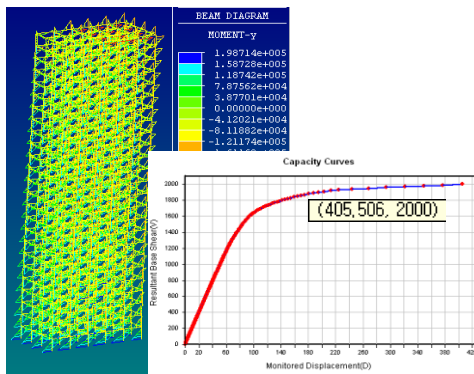
Pushover analysis model



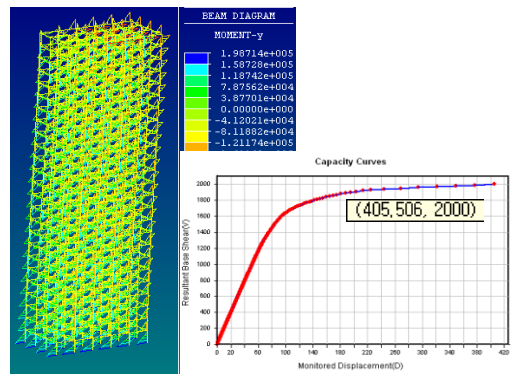
1,550 beam elements

Analysis results

[Gen 2011 v1.1] Pushover curve



[Gen 2011 v2.1] Pushover curve



Analysis time

Program	Total Analysis Time (sec) : 1,550 elements			
	20 steps	50 steps	100 steps	200 steps
Civil 2011 (v1.1)	14.72	95.35	446.02	1443.00
Civil 2011 (v2.1)	9.30	20.28	36.76	71.93
Ratio	63.17%	20.97%	8.24%	4.98%

5. Improvement in Definition of Pushover Hinge Position

- Axial, shear and torsion hinges (Fx, Fy, Fz, and Mx) can now be assigned to i-end and j-end of a member separately. In the previous version, they were assigned to the center of the member.
- It is applicable to RC, Steel and SRC members. For the masonry material, axial, shear, and torsion hinges are assigned to the center of the member.

Design > Pushover Analysis > *Define Pushover Hinge Properties*

Add/Modify Pushover Hinge Properties

Name : Torsion Description :

Element Type
 Beam/Column Wall (CRB) Membrane
 Truss General Link Plate

Material Type Definition
 RC / SRC (encased) Moment - Rotation (M- Θ)
 Steel / SRC (filled) Moment - Curvature (M- Φ Lumped)
 Masonry Moment - Curvature (M- Φ Distributed)

Interaction Type
 None P-M-M in Status Determination

Component	Hinge Location	Skeleton Curve	
<input checked="" type="checkbox"/> Fx	Center	Trilinear Type	Properties...
<input checked="" type="checkbox"/> Fy	Center	Bilinear Type	Properties...
<input checked="" type="checkbox"/> Fz	Center	Bilinear Type	Properties...
<input checked="" type="checkbox"/> Mx	Center	Trilinear Type	Properties...
<input checked="" type="checkbox"/> My	I&J-end	Trilinear Type	Properties...
<input checked="" type="checkbox"/> Mz	I&J-end	Trilinear Type	Properties...

Yield Surface Properties... Masonry Properties...

OK Cancel Apply

[Gen 2011 v1.1]

Add/Modify Pushover Hinge Properties

Name : Torsion Description :

Element Type
 Beam/Column Wall (CRB) Membrane
 Truss General Link Plate

Material Type Definition
 RC / SRC (encased) Moment - Rotation (M- Θ)
 Steel / SRC (filled) Moment - Curvature (M- Φ Lumped)
 Masonry Moment - Curvature (M- Φ Distributed)

Interaction Type
 None P-M-M in Status Determination

Component	Hinge Location	Skeleton Curve	
<input checked="" type="checkbox"/> Fx	I&J-end	Trilinear Type	Properties...
<input checked="" type="checkbox"/> Fy	I&J-end	Bilinear Type	Properties...
<input checked="" type="checkbox"/> Fz	I&J-end	Bilinear Type	Properties...
<input checked="" type="checkbox"/> Mx	I&J-end	Trilinear Type	Properties...
<input checked="" type="checkbox"/> My	I&J-end	Trilinear Type	Properties...
<input checked="" type="checkbox"/> Mz	I&J-end	Trilinear Type	Properties...

Yield Surface Properties... Masonry Properties...

OK Cancel Apply

[Gen 2011 v2.1]

6. Auto Termination Option for Axial Component in Pushover Analysis

- When the axial hinge of column, wall or truss element reaches buckling in the pushover analysis, the program can automatically stop running with a warning message and save the results up to the terminated step.
- Analysis results can be checked up to the terminated step.

Design > Pushover Analysis > *Pushover Global Control*

Pushover Global Control

Initial Load

Perform Nonlinear Static Analysis for Initial Load

Import Static Analysis / Construction Stage Analysis Results

- When the boundary conditions are different between initial load and pushover load
- When the element forces in the last construction stage are used as an initial load

Load Case: Scale Factor:

Static Load Case	Scale

Nonlinear Analysis Option

Permit Convergence Failure

Max. Number of Substeps:

Maximum Iteration:

Convergence Criteria

Displacement Norm:

Force Norm:

Energy Norm:

Analysis Stop

Shear Component Yield

Axial Component Collapse/Buckling

Beam/Column Wall Truss

Pushover Hinge Data Option

Default Stiffness Reduction Ratio of Skeleton Curve

Trilinear / Slip Trilinear Type

Symmetric

	(+)	(-)
α_1	<input type="text" value="0.1"/>	<input type="text" value="0.1"/>
α_2	<input type="text" value="0.05"/>	<input type="text" value="0.05"/>

Bilinear / Slip Bilinear Type

Symmetric

	(+)	(-)
α_1	<input type="text" value="0.05"/>	<input type="text" value="0.05"/>

Data for Auto-Calculation of Strength

Reference Location only for Distributed Hinges

Beam:

Calc. Yield Surface of Beam considering Buckling

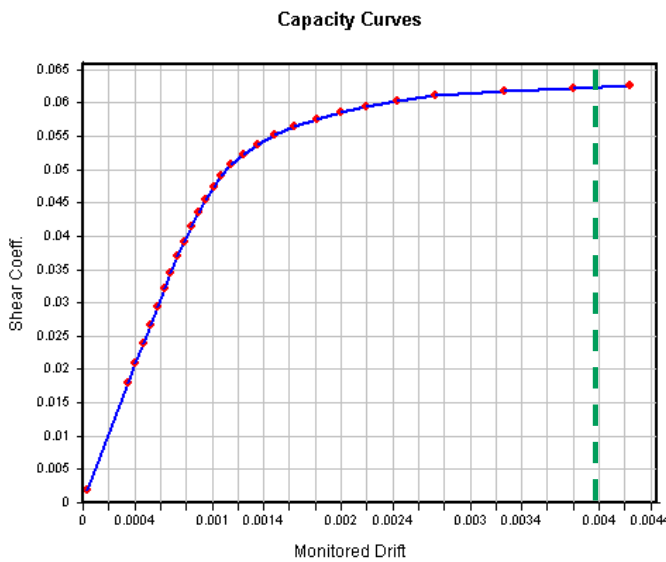
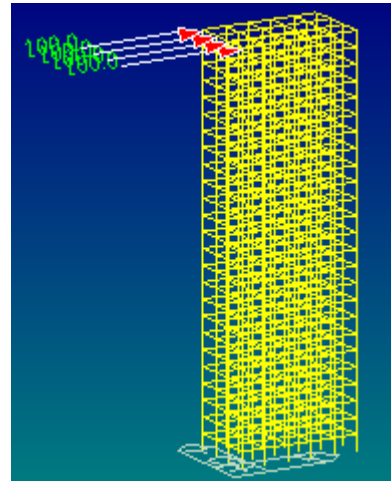
7. Improvement in Limit Inter-Story Deformation Angle Option in Pushover Analysis

In the previous version, if the Limit Inter-Story Deformation Angle is entered and the maximum inter-story deformation angle exceeds the specified value, the analysis was terminated. In the new version, the analysis can be terminated once the inter-story deformation angle reaches the specified angle with 0.5% deformation tolerance.

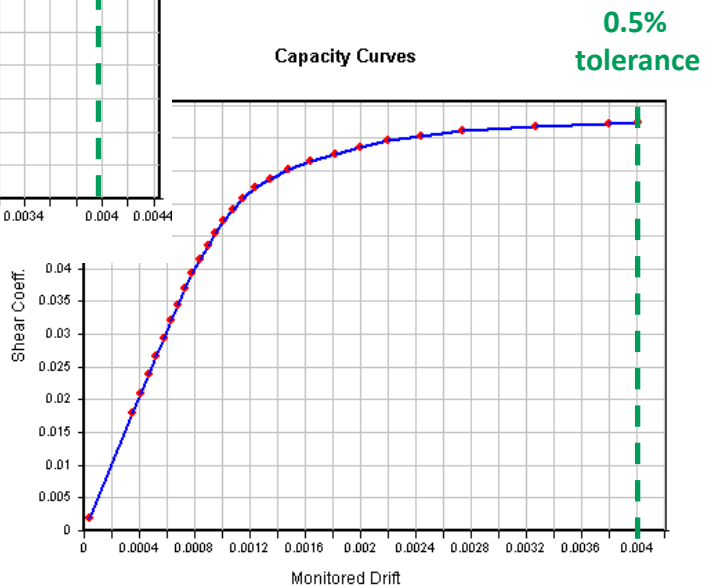
Design > Pushover Analysis > *Pushover Load Case*

Analysis Stopping Condition

- Limit Inter-Story Deformation Angle : 1 / 200 [rad]
- Maximum Drift of All Vertical Elements
- Drift at the Center of Floor Diaphragm (Story Center)
- Drift calculated by Average Displacement of Story



[Gen 2011 v1.1]



[Gen 2011 v2.1]

8. Improvement in Buckling Resistance Check as per EN 1993-1-1:2005

A new option is added to determine the design values of the compression force and biaxial bending moments along the member when performing the buckling resistance check for the columns as per the equation (6.61) and (6.62) of EN 1993-1-1. In the previous version, the program took the design values of N_{Ed} , $M_{y,Ed}$ and $M_{z,Ed}$ at the same location along the member. In this version, the program provides an option with which the user can apply the maximum moments about the y-y and z-z axis separately along the member.

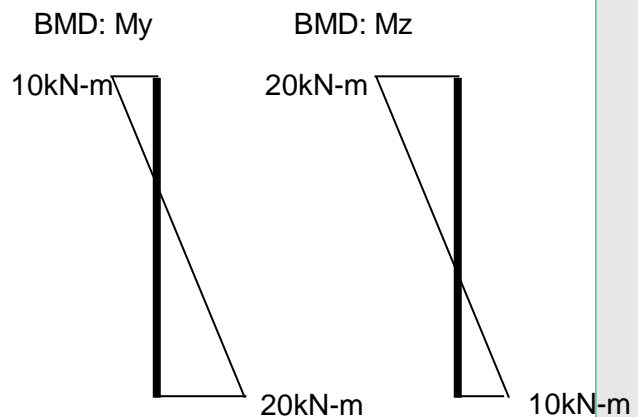
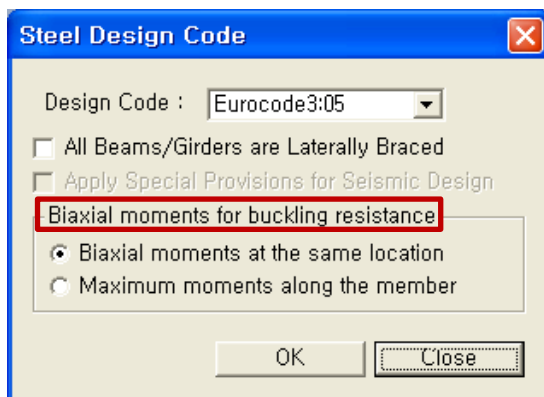
Design > Steel Design Parameter > *Design Code*

EN1993-1-1:2005 Equation (6.61), (6.62)

Members which are subjected to combined bending and axial compression should satisfy:

$$\frac{N_{Ed}}{\chi_y N_{Rk}} + k_{yy} \frac{M_{y,Ed} + \Delta M_{y,Ed}}{\chi_{LT} \frac{M_{y,Rk}}{\gamma_{M1}}} + k_{yz} \frac{M_{z,Ed} + \Delta M_{z,Ed}}{\gamma_{M1}} \leq 1 \quad (6.61)$$

$$\frac{N_{Ed}}{\chi_z N_{Rk}} + k_{zy} \frac{M_{y,Ed} + \Delta M_{y,Ed}}{\chi_{LT} \frac{M_{y,Rk}}{\gamma_{M1}}} + k_{zz} \frac{M_{z,Ed} + \Delta M_{z,Ed}}{\gamma_{M1}} \leq 1 \quad (6.62)$$



The Biaxial moments for buckling resistance option

When the Biaxial moments at the same location option is selected:

Design values of moments at the top $M_y=10\text{kN-m}$, $M_z=20\text{kN-m}$

Design values of moments at the bottom $M_y=20\text{kN-m}$, $M_z=10\text{kN-m}$

When the Maximum moments along the member option is selected:

Design values of moments $M_y=20\text{kN-m}$, $M_z=20\text{kN-m}$