

CSiXRevit V9.0.0

CSi Revit Data Interchange Program

The CsiXRevit program allows users to transfer data between Autodesk Revit Structural V2 and ETABS V9. This program is rapidly evolving. The current capabilities are documented below.

As a general rule if an imported value will be illegal in ETABS or if some referenced item is not found in the ETABS database then the ETABS default value is substituted. If this substitution is made a warning message is written to a warning file with a .wrn extension. This file should always be checked after every new import.

Import of Etabs, Revit Data Exchange (.exr) file:

Following Revit Entities are currently being imported into ETABS:

1. Material
2. Level
3. Wall
4. Grid
5. Floor
6. Frame
7. Frame Sections
8. Footing
9. Load Case
10. Load Combo
11. Point Load
12. Line Load
13. Area Load

1) Material:

Following material attributes are being imported from Revit to ETABS

- Material Name:
- Material Type:
- Young's Modulus:
- Poisson Ratio:
- Shear Modulus: For isotropic material ETABS will calculate this value on the basis of Young's Modulus and Poisson's Ratio
- Thermal Expansion Coefficient:
- Unit Weight: For unit mass ETABS divides the unit weight by the gravitational constant
- Damping Ratio: Not used
- Bending Reinforcement:
- Shear Reinforcement:
- Resistance Calculation Strength: Not used
- Behavior:
- Concrete Compression:
- Lightweight:
- Shear Strength Reduction:
- Yield Stress:
- Tensile Strength:
- Steel Reduction Factor: Not used

Only those materials are imported which are linked with a floor or a frame in the Revit model.

2) Levels:

Following level attributes are being imported from Revit to ETABS

- Level Name: Level is translated as an ETABS Story.
- Level Elevation: Level elevation is used to fill the ETABS story elevation.

ETABS allows the user to edit/modify the structure's stories at the time of import. Following dialogue will appear at the time of import

The 'Story Level Selection' dialog box contains the following data:

	Label	Elevation	Height
1	STORY5	354.3307	118.1102
2	STORY4	236.2205	118.1102
3	STORY3	118.1102	118.1102
4	STORY2	-3.908E-10	8.8583
5	STORY1	-8.8583	27.5591
6	BASE	-36.4173	0.

Rows to be Inserted:

Height	144.
Label (Initial Caption)	STORY
Label (Separator Character)	.
Label (End Identification Number)	1
Label = ''	

Story Limits:

Min. Elev.	-36.4173
Max. Elev.	354.3307
Min. Height	8.8583
Max. Height	118.1102

Elevation Tolerance for Merging: Tolerance: 0.1

Length Tolerance: Tolerance: 0.1

Units: Change Units: **Kip-in**

User has option to select the tolerances for the story height and for lengths. User also has option to delete or insert one or multiple stories as needed.

3) Wall:

Following wall attributes are being imported from Revit to ETABS

- Points: All points are being transferred from Revit to ETABS. ETABS wall has 3 to 4 nodes. In Revit wall may be defined as continuous having more than 4 points. In this case ETABS breaks the Revit walls in to four noded walls.
- Wall Curve: Curved walls are not allowed in ETABS. ETABS breaks the curved walls of Revit in to small segments to keep the required curvature of the walls.
- Wall Openings: In Revit, walls are stored as loops (including the curves) of points. There is no tag for the loop for opening. ETABS treats the opening loop same like wall loop. User has to manually assign it opening after import.
- Wall Thickness: Revit wall thickness is used to define the wall section thickness of ETABS. Default
- Wall material: Revit wall material is not available to read. So all the wall sections are using the default concrete materials.

4) Grid:

Following Grid attributes are being imported from Revit to ETABS

- Grid Name: Same grid name will be used in ETABS grid bubble

- Grid Points: The start and end points are used to define the general grid line in ETABS
- Curved Grid: In case of curved grid, ETABS breaks it into number of segment to get the suitable curvature.

5) Floor:

Following floor attributes are being imported from Revit to ETABS

- Floor Points: All floor points are used to define the same geometry of the floor in ETABS
- Floor Curves: ETABS does not allow defining the curves for the area objects. So all the curves in Revit floor will be converted in to number of segments, which will give the suitable curvature for the area boundary.
- Number of Layers: In Revit, different layers may be defined within a floor. ETABS is reading the all layers information and treats the floor as deck if more than one layer are present in the floor. Otherwise floor is treated as slab for uni-layer.
- Layer Thickness: ETABS gets the thickness of each layer. In case of deck its section property is defined by the maximum thickness of the layers.
- Layer Materials: ETABS gets the material of each layer. Same layer will be assigned to the Slab or Deck section. Default material will be used if not material is defined in Revit
- Floor Span Direction: Same span direction will be used in ETABS for the decks. Default direction will be used if no span direction is defined in Revit.

6) Frame:

Following frame attributes are being imported from Revit to ETABS

- Frame Points: All floor points are used to define the same geometry of the floor in ETABS.
- Frame Curves: ETABS does not allow defining the curves for the line objects. So all the curves in Revit frame will be converted in to number of segments, which will give the suitable curvature for the frame centerline.
- Frame Section: ETABS gets the currently assigned section to the frame in Revit along with the whole family. ETABS convert the Revit whole family to ETABS auto section. For details see the Revit Frame Sections
- Frame Releases: All frame releases in the Revit being assigned in the ETABS as line objects releases. However, for the columns ETABS always fix them at the both ends except the bottom end of columns located at the base story. This is being done to make the structure stable. Similarly, for any beams or brace both end torsion cannot be released.
- Orientation Angle: Same angle is used for defining the line orientation along with its local 1-axis in ETABS.
- Camber Size: It is being read and also sent back if it is being modified in ETABS after the analysis and design
- Number Of Studs: It is being read and also sent back if it is being modified in ETABS after the analysis and design

- **Rigid Link:** It is being read and used to define the end offsets in the ETABS. To see the effect of rigid offset, check the ETABS model in extruded view.

7) Frame Section:

Revit frame section attributes depend upon the type.

ETABS first try to find the name of the section from it database. If ETABS can find the same name in database then same section will be used. So for all steel standard section names used AISC, CISC, etc. it is recommended to load the corresponding .PRO file in the ETABS at the time of Revit import by choosing the .edb file option.

The parameters list is given for concrete and wood structural families in the following table.

Member Type	Family Name	Parameters
CONCRETE COLUMNS	CONCRETE-RECTANGULAR-COLUMN	B, H
	CONCRETE-ROUND-COLUMN	B
	CONCRETE-SQUARE-COLUMN	B
	PRECAST-RECTANGULAR COLUMN	B, H CHAMFER
CONCRETE FRAMING	PRECAST-DOUBLE TEE	WIDTH, TEE WIDTH, STEM WIDTH, SLAB DEPTH, DEPTH
	CONCRETE-RECTANGULAR BEAM	B, H
	PRECAST-INVERTED TEE	H1, H, B, SEAT
	PRECAST-L SHAPED BEAM	H1, H, B, SEAT
	PRECAST-RECTANGULAR BEAM	B, H
	PRECAST-SINGLE TEE	WIDTH, STEM WIDTH, SLAB DEPTH, DEPTH
WOOD COLUMNS	DIMENSION LUMBER-COLUMN	B, D, SY, SX, IY, IX, A
	GLULAM-SOUTHERN PINE-COLUMN	B, D, SY, SX, IY, IX, A
	GLULAM-WESTERN SPECIES-COLUMN	B, D, SY, SX, IY, IX, A
	PSL-PARALLEL STRAND LUMBER-COLUMN	B, D, SY, SX, IY, IX, A
	TIMBER-COLUMN	B, D, SY, SX, IY, IX, A
WOOD FRAMING	DIMENSION LUMBER	B, D, SY, SX, IY, IX, A
	GLULAM-SOUTHERN PINE	B, D, SY, SX, IY, IX, A
	GLULAM-WESTERN SPECIES	B, D, SY, SX, IY, IX, A
	LVL-LAMINATED VENEER LUMBER	B, D, SY, SX, IY, IX, A
	TIMBER	B, D, SY, SX, IY, IX, A
	OPEN WEB JOIST	B, H
	PLYWOOD WEB JOIST	B, H

8) Footing:

Following footing properties are being imported from Revit to ETABS

- Points: All the points defining the shape of the footing. In ETABS all columns, which are located in this area, will be restrained.
- Width, Length and Thickness: For rectangular cases, width, length and thickness are being defined. In this case, ETABS locates the all columns within the rectangular area and these columns will be restrained

9) Load Case:

Following load case attributes are being imported from Revit to ETABS

- Load Case Name: Same name will be used for ETABS Load case name except 'Rvt-' will be added at the start of the name.
- Load Case Category: It is used to define the load case type in ETABS.

The mapping is shown in the following table

Revit Structure Load Case Category	ETABS Load Case Type
Dead	Dead
Live	Live
Wind	Wind
Snow	Snow
Roof Live	Live
Accidental	Other
Temperature	Other
Seismic	Quake

10) Load Combination:

Following load combination attributes are being imported from Revit to ETABS

- Load Combination Name: Same name will be used for ETABS Load combo name. Following prefixes are reserved and Load Combo will not be added in ETABS if same prefixes are used in Revit
 - DCON
 - DSTL
 - DWAL
 - DCMPC
 - DCMP5
 - DCMPD
- Load Cases:
- Load Case Factor:

11) Point Load:

Following point load attributes are being imported from Revit to ETABS

- Load Case Name: Use to set the corresponding load case number in ETABS.
- Location: Used to define the point of application of the load.
- Fx, Fy, Fz, Mx, My, Mz: All forces and moments are applied in global direction in Revit and transferred in the similar manner to ETABS.

12) Line Load:

Following line load attributes are being imported from Revit to ETABS

- Load Case Name: Use to set the corresponding load case number in ETABS.
- Start and End point Location: Used to define the starting and end point of the line load. In ETABS, if a line load is carrying the gravitational load and it is overlapping more than one beam then it will be distributed to the corresponding beams. But in case of lateral line load, user must check no line load should overlap more than one beam. Otherwise, it will not be processed in the analysis.
- Fx, Fy, Fz, Mx, My, Mz: All forces and moments are applied in global direction in Revit and transferred in the similar manner to ETABS.

13) Area Load:

Following area load attributes are being imported from Revit to ETABS

- Load Case Name: Use to set the corresponding load case number in ETABS.
- Points: Points will be used to define the geometry of the loading area. It should be noted that each curve is used as straight line in ETABS.
- LoadX, LoadY, LoadZ: All loads are applied in global direction in Revit and transferred in the similar manner to ETABS. The non-uniform surface load is not allowed in ETABS. In case of Revit non-uniform surface load, ETABS will convert it in to equivalent uniform area load.

Export of Etabs, Revit Data Exchange (.exr) file:

Following Revit Entities are currently being updated while transferring data from ETABS to Revit

1) Frame:

Following frame attributes are being sent back to Revit from ETABS

- Frame Section: Frame sections, which are changed by users or due to ETABS design, will be updated if same structural family name is also available in Revit. If same structural family name is not available or loaded in Revit, then program will give a warning that section is not present in the Revit database.
- Composite Beam Results: Following attributes are being updated in Revit after performing the composite beam design in ETABS.
 - Camber Size
 - Number of studs
- Maximum Shear Reaction at both ends: These attributes will be updated after only in the case if user has previously defined the shared parameter file in Revit. If no shared parameter file is defined before sending the model to ETABS then these attributes will not available in Revit.