RISA-Revit 2027 Link (27.0)

General Reference

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Introduction

The RISA-Revit Link is intended to provide a seamless and thorough transfer of data between RISA and Revit. This data transfer is constantly improving and evolving, and this version of the RISA-Revit Link represents an evolution of many previous versions of the Link. The level of integration between the two programs is made possible by the Revit API, which provides a back door into Revit for RISA to communicate through. The close partnership between RISA and Autodesk means that RISA developers have unrestricted access to the Revit API, resulting in the most seamless third-party Revit Link on the market.

How will using Revit and RISA together help me?

The fundamental advantage of linking RISA and Revit together is that it helps you to avoid mistakes, and eliminate redundancies (duplication of effort). Traditionally, structural models were created in RISA either from scratch or based off of existing drawings. The model was solved, and then results were printed and used to manually update drawings. Any simple oversight or typo could cause serious problems. A mistakenly entered beam size on the drawings meant that an undersized beam would be erected, which could potentially fail. Furthermore, hours were wasted manually transcribing text from one program to another. Eventually RISA developed a DXF Import/Export process that eliminated some of these problems. DXF drawings could be imported to and exported from RISA, but they could not 'update' existing drawings, so most of the drafting work on framing plans had to wait until the structural engineer's analysis was complete. Any changes made to the structure during a project had to separately be made to both RISA and CAD drawings.

With BIM (Building Information Modeling) these limitations no longer exist. By creating a 3D model of smart 'elements' (rather than just linework) it is possible to link large amounts of information between the drawings (Revit) and the analysis model (RISA). The concept of round-tripping is part of the standard BIM workflow, whereby changes and updates can be continuously shared between models. By utilizing the BIM workflow you can ensure that your analysis model and drawings match each other, even after multiple revisions over the life of the project.

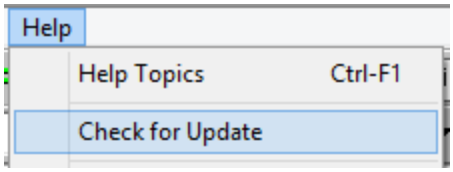
Installing the RISA-Revit Link

The RISA-Revit Link works best when both RISA and Revit are installed on the same computer. This is not a strict requirement though. For this reason the installation instructions below present steps for both the Revit computer and the RISA computer. If both programs are present on one machine then ensure that all steps are followed for that machine:

Revit Computer

1. Ensure that Revit is installed, and that the version matches that shown on the Version Information page.
2. Find the Autodesk Application Manager in the Windows Start Menu. Use that program to determine if Revit updates are available. If Revit updates are listed as available then install them.
3. Download the latest RISA-Revit Link from the RISA website: https://risa.com/products/risa-revit-link
4. Close Revit (if it is currently open) and run the installer. Once the installation is complete you are ready to begin using the RISA-Revit Link.

RISA Computer (may be separate from Revit Computer)



1. Launch RISA-3D, and go to the Help menu. Click on 'Check for Update'. If an update is available then download and install it.
2. Repeat Step 1 for RISAFloor if applicable.
3. Repeat Step 1 for RISAFoundation if applicable.
4. Repeat Step 1 for RISAConnection if applicable

License Agreement

For the full license agreement, please visit: risa.com/eula

Version Information

Link Information

RISA-Revit 27.0 Link

Compatibility Information

Product	Required Version
Revit	2027
RISA–3D	23.0 (or Higher)
RISAFloor	19.0 (or Higher)
RISAFoundation	17.0 (or Higher)

The RISA-Revit Link is not compatible with Revit LT because Revit LT does not have an API to communicate with third-party applications.

One of the following operating systems is required:

- Microsoft Windows 11

Workflow

There are a variety of options for workflow between RISA and Revit. Before using the RISA-Revit Link it is best to understand what these are, and how they can best be used for your project.

Which Program Should I Start In?

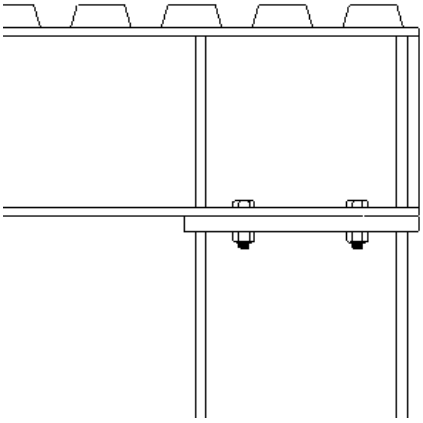
The RISA-Revit Link encompasses four programs (RISA-3D, RISAFloor, RISAFoundation, and Revit). Each program has its own purpose, but all four fully integrate for one complete building design. The reasons for starting in each program are listed below:

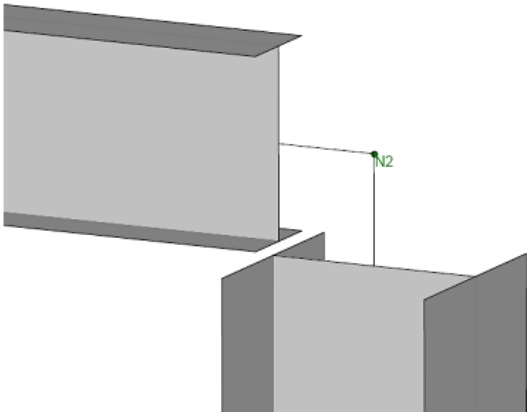
Starting in Revit

This is the most common workflow. Remember that the goal of the Revit model is to represent the physical model as accurately as possible, whereas the goal of the RISA model is to represent the analytical model as accurately as possible. There are many circumstances where physical arrangements are better represented in different ways from each other.

A Revit model may have a very complex physical arrangement that can be greatly simplified for structural analysis. By starting in Revit you can model these physical complexities, and assign an analytical arrangement for RISA to use. If you instead start in RISA, the link will create members in Revit, but it will create them with the most basic physical geometry, since it does not know your intentions for details.

Take the detail shown below for example. On the left is the Revit representation of a column and beam. On the right is the RISA representation. The connection details shown in Revit are necessary for construction drawings, however in RISA a simple 'fixed' connection is sufficient to give an accurate analysis.



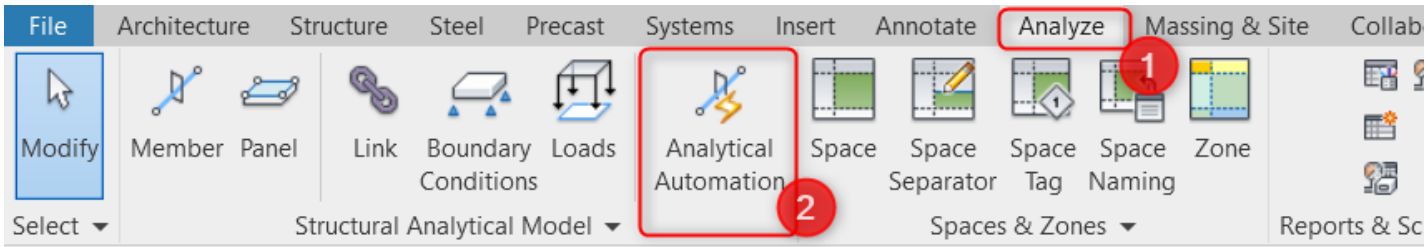


A proficient Revit user can assemble a structure in Revit as fast as a proficient RISA user can assemble a structure in RISA. Therefore, especially if the architect has already started a Revit model, it may be fastest to generate a model first in Revit which uses the architect's model as a template.

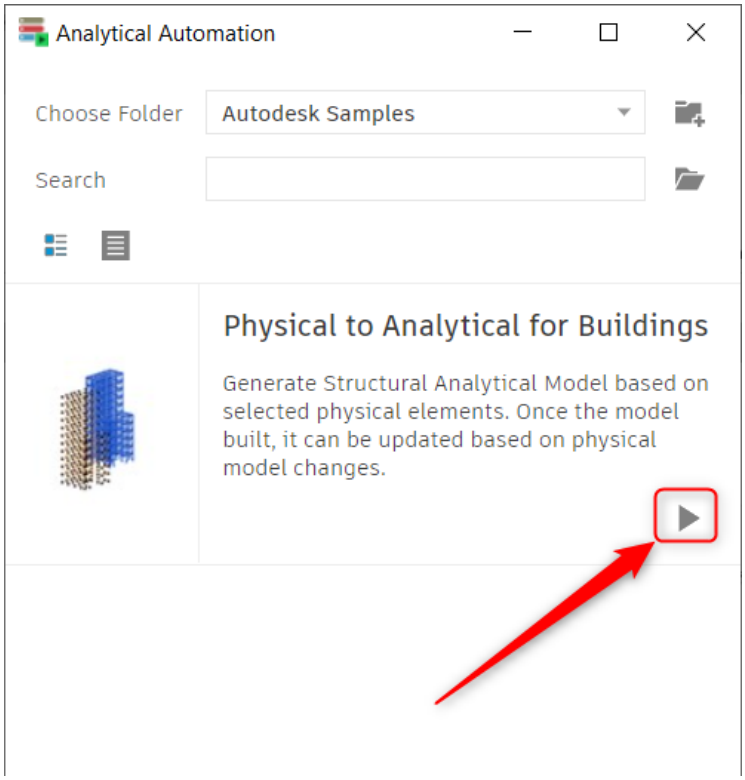
Be aware that your Revit model must be in good condition prior to exporting to RISA. This means that the analytical model especially should be thoroughly reviewed to ensure that all elements properly connect to each other. A messy Revit model will create a messy RISA model full of instabilities.

Prior versions of Revit 2023 automatically creates an analytical model based on the physical model (elements drawn in Revit). However, Revit 2023 requires the user to create an analytical model after drawing the physical members. A blank model will be created in RISA if no analytical model is present in the Revit model. Steps are provided below to create an analytical model using the "Analytical Automation" tool within Revit.

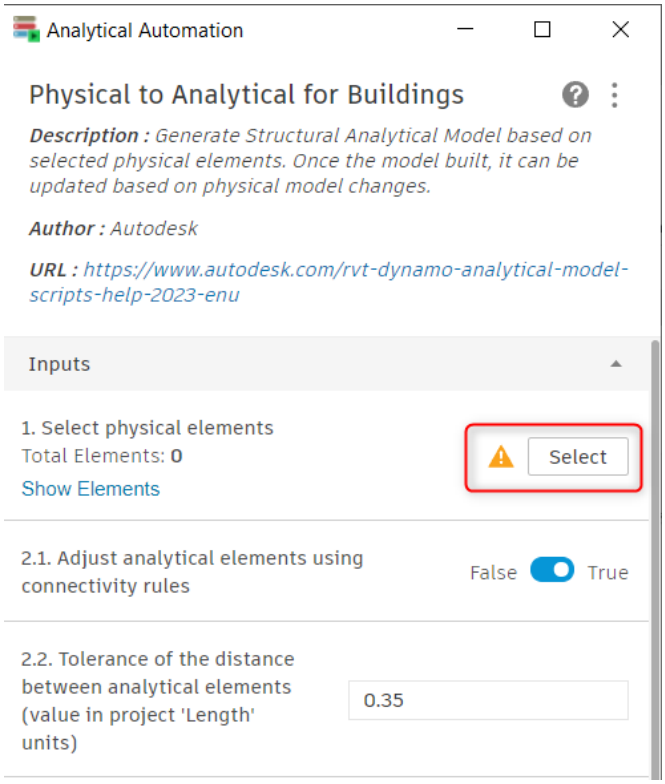
1. Open the "Analytical Automation" tool under the "Analyze" tab in Revit as shown below:



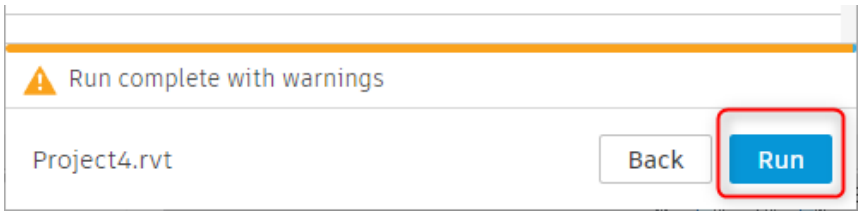
2. Click on the arrow as shown below in the "Physical to Analytical for Buildings" box.



3. In the next dialog box, the user will be prompted to select the physical model within Revit.



4. Upon highlighting and selecting the physical model in Revit, click on the "Run" button.



5. Once the analytical model is created, the user can simply close out of the "Analytical Automation" tool dialog box to return to the Revit model.
6. Verify that the analytical model is correct and then continue to proceed to use the RISA-Revit Link to export the model to RISA.

Starting in RISAFloor

This is the second most common workflow. RISAFloor and Revit are very similar in their scope, in that they are both designed around building-type structures which have floors, roofs, and gridlines. This is as opposed to industrial structures which do not fit this profile. Most users who start in RISAFloor do so for the following reasons:

1. There is no Revit model from the architect, or the structural analysis must be underway prior to its availability.
2. Your proficiency in RISAFloor modeling exceeds that of Revit modeling, so you can create a building model much faster by working within RISAFloor.

There are many users who prefer to start the model in RISAFloor, just be aware that after importing to Revit for the first time your Revit model may need some massaging in order to be ready for construction documentation.

Any RISA-3D elements that are present in the RISAFloor model (from RISAFloor-3D integration) will automatically be transferred over to Revit.

Starting in RISA-3D

It is less common that RISA-3D and Revit would be linked together without also using RISAFloor. While RISA-3D does link with Revit, it is not constrained by some of the limitations that both Revit and RISAFloor have with regards to structure type. Revit is a Building Information Modeling program, so some structures which RISA-3D is well suited for (tanks, bridges, oil platforms, etc) do not fit Revit's mold of clearly defined floor levels and grids. Since the creation of RISAFloor, and due to its complete integration with RISA-3D, it is rare that RISA-3D is used on its own for building modeling purposes.

Two-Way Integration (Round-Tripping)

Initial Linking Between RISA and Revit Elements

Whenever a RISA model is imported to Revit for the first time, or vice versa, a link is formed between the elements. This link is maintained by the Exchange File, which handles all of the bookkeeping between the two models. For this reason it is important to always use the same Exchange File when transferring back and forth multiple times (round-tripping). Whenever an Exchange File is exported and "overwrites" a previous version of the exchange file, it is actually a "merge" of new data into the existing exchange file.

The exchange file maps RISA element ID's with Revit element ID's. For example, a beam in the RISA model with the label M16 may be represented as a Revit beam with BIM ID #949. The Exchange File maintains a relationship between M16 and BIM ID #949 in order to track changes and map them between the two programs.

Round Trips (Exporting Revit to RISA)

Whenever a Revit model is exported to RISA, the Link performs a sophisticated comparison using the Revit model and the Exchange File to determine what has changed between the Revit model as it currently exists, and what was imported from RISA during the last RISA to Revit import. This optimizes the export process and prevents the Link from making unintended modifications to existing RISA elements, resulting in much faster transfers if few changes were made within the Revit model.

Certain RISA properties are not mapped to Revit, such as unbraced lengths. These properties are not modified by the RISA-Revit Link, so they will always remain as whatever they have been set to in RISA.

Round Trips (Importing RISA into Revit)

Whenever a RISA model is imported to Revit, the Link performs a sophisticated comparison using the RISA model and the Exchange File to determine what has changed between the RISA model as it currently exists, and what was

exported from Revit during the last Revit to RISA export. Certain element properties which are associated with a "solution" in RISA are always transferred into Revit regardless. These include:

- RISAFloor beam and column sizes (when members are set to be optimized)
- Number of composite studs
- Beam camber
- Beam end reactions

With other element properties such as a beam's location or material, the Link performs a sophisticated comparison using the RISA model and the Exchange File to determine what has changed between the RISA model as it currently exists, and what was exported to RISA during the last Revit to RISA export. This optimizes the import process and prevents the Link from making unintended modifications to existing Revit elements, resulting in much faster transfers if few changes were made within the RISA model.

Updating Member Sizes Only

The Import from RISA dialog box contains an option to update only the member sizes and wood wall parameters. This forces the Link to ignore any changes to element geometry (such as the location of a beam or the slope of a roof).

The primary reason for using this option is when a discrepancy in geometry between both models ought to be maintained. These circumstances have become rare since the analytical adjustment tools in Revit have been improved. However, there may be circumstances where it is necessary within a RISA model to create "Dummy Members" which should not be transferred to the Revit model, and this option will prevent those members from being imported into the Revit model.

Examples

The examples below can help illustrate typical workflow and Link behavior in a way that is easy to understand.

Example A (Model Originating in Revit)

A typical workflow process can be easily understood from the example below:

1. An engineer exported his Revit model to RISAFloor, however the Link reported that some elements were not transferred to RISA because the Revit model had errors in it.
2. Before working in RISAFloor, the engineer corrected problems with the Revit model, then exported to RISAFloor again, this time without any errors.
3. Loads were added to the RISA model, the model was solved, and the beams were sized. From within RISA a Revit Exchange File was exported, overwriting the existing Exchange File for that project (which was created upon the first successful export from Revit).
4. The Exchange File was imported back into Revit, completing the first round trip. Because the size of every member in the model had changed, the import to Revit took several minutes.

Example B (Model Originating in RISA)

A typical workflow process can be easily understood from the example below:

1. An engineer built a RISA model based on architectural drawings, as the architect is not using Revit.
2. Import RISA model using the RISA-Revit Link.
3. This populated the Revit model with all of the members, levels, gridlines, etc. Because the RISA model was large this import process took several minutes.
4. The engineer then cleaned up the Revit model so that the physical geometry of the elements would appear correctly on the construction drawings. This required changes such as moving beams downward using their *z-direction offset* so that their top flanges were all at the same elevation.
5. The Revit model was then exported back to RISA, therefore completing the first round-trip. Because the RISA-Revit Link ignores z-direction offsets the transfer back to RISA was fast, since no changes in the Revit model would impact the RISA model.

Example C (Subsequent Round Trips)

The Link's behavior when dealing with changes to models is illustrated in the example below. Assume for this example that the model has already completed a successful roundtrip such as those illustrated in Example A or Example B, and that all of the members have been initially sized in both the RISA and Revit models:

1. The location of a shaft opening was moved in the Revit model. The location and spacing of the beams surrounding the shaft opening was changed accordingly (within the Revit model).
2. The model was then exported to RISAFloor. The *RISAFloor Design Method* was set to *Analyze sizes from Revit Model*, ensuring that RISAFloor would merely check the already established member sizes rather than automatically resizing the members.
3. The model was solved in RISAFloor, and the engineer had to manually upsize several beams and columns. From within RISA a Revit Exchange File was exported, overwriting the existing Exchange File for that project.
4. Concurrently with Step 3, another engineer added a penthouse structure to the roof of the Revit model. This means that both the Revit and RISA model were being modified simultaneously, and were no longer in sync with each other.
5. The RISA Exchange File was imported into Revit. The import process was very quick, as only a few members (those that had been modified in RISA) were updated in the Revit model. The import process ignored the penthouse from Step 4, because the import only affects items that were modified in RISA.
6. Some columns were then moved in the RISA model, and some beams were upsized accordingly.
7. The Revit model was then exported back to RISA so that the penthouse could be designed. The penthouse came over, and the changes made in Step 6 were retained, since nothing relating to the columns had been modified in Revit.
8. The two models have been out of sync with each other since Step 4, which should be avoided whenever possible. At this point the column locations are inconsistent between the two models. In order to resynchronize the models so that they are once again identical the engineer exported the RISA model to Revit, at which point the columns were moved in the Revit model.

The link therefore supports concurrent work to be done on both models as described above, so long as the RISA user and the Revit user are not working on the same element at the same time. If the penthouse addition in Step 4 would have affected anything the columns from Step 6 then the Link would have changed the affected RISA elements to match the Revit model (since the Revit model was being exported to RISA and not the other way around).

What if Something Goes Wrong?

Occasionally a lack of communication between multiple people working on a given model can lead to unintended mistakes. For this reason the RISA-Revit Link always creates a backup of the entire project (RISA and Revit files) immediately before any import or export operations. Whenever importing or exporting, save your Revit model first. Then, before any import or export operation is performed an ImportBackup or ExportBackup folder will be

created in the same location as your Revit model. This folder contains your entire project in the state it was in immediately prior to importing/exporting. If anything goes wrong with your Revit or RISA models you can delete the current versions and retrieve the prior versions from the ImportBackup or ExportBackup folder, depending on whether you were importing to or exporting from Revit.

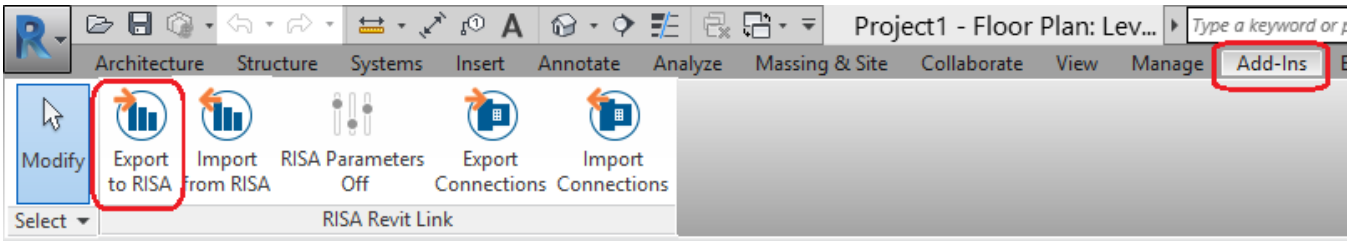
Getting Started

Prior to using the features of the RISA-Revit Link it is advisable to learn the proper workflow procedures outlined in the previous chapter. Also, ensure that the link has been installed on the Revit computer.

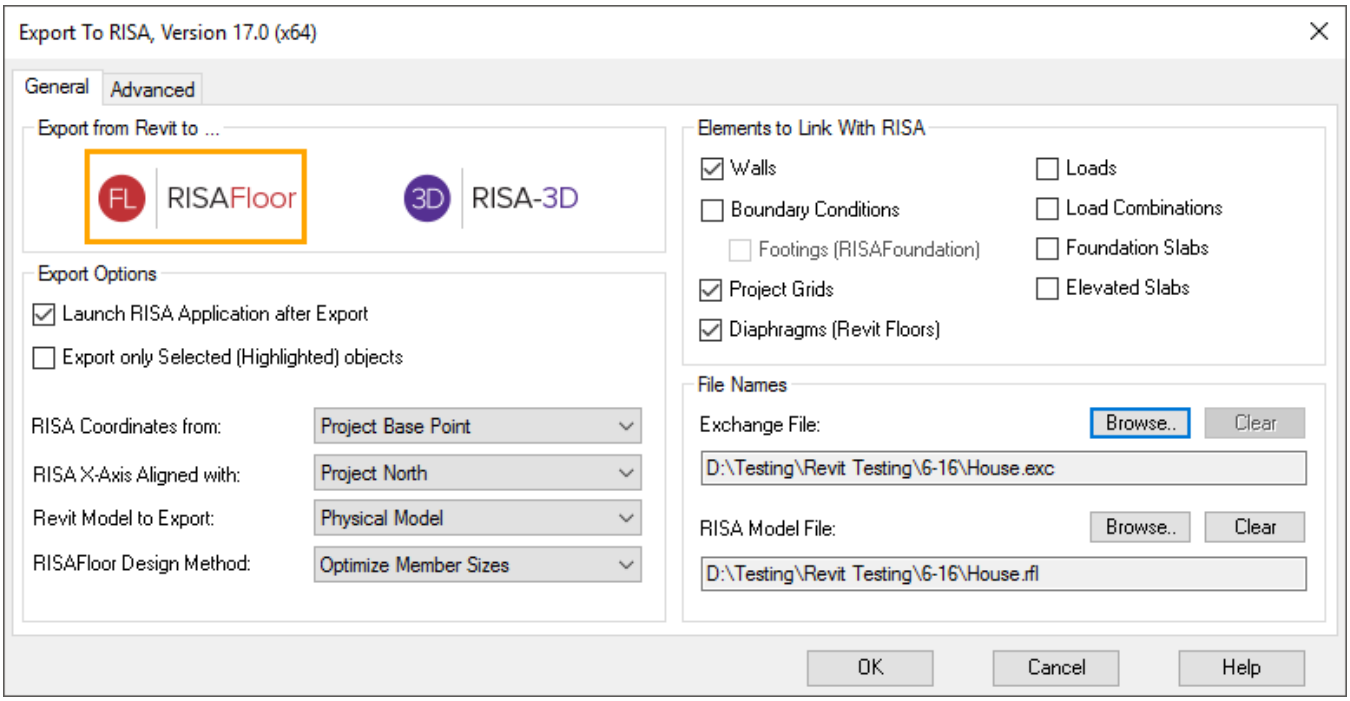
Export Revit Model to RISAFloor or RISA-3D

Once the Revit model is ready to be exported to RISA, be sure to save the model .

Click on the Add-Ins tab, and then click on the Export to RISA button.



The Export dialog will appear as shown below:



Export to...

Click on the logo of a RISA application in order to specify which one the Revit model should be exported to.

Note:

- RISAFloor models contain a RISA-3D model embedded within them. By exporting to RISAFloor you are also exporting RISA-3D information to the RISAFloor model. You can access this 3D-only information by using the Director tool within RISAFloor.
- Foundation data from the Revit model is always exported to the RISAFoundation model embedded in every RISA-3D and/or RISAFloor model.

Export Options

Launch RISA Application exports an Exchange File to the specified destination, then launches the RISA application and automatically imports that Exchange File into the RISA application. This option is unavailable if RISA is not installed on the Revit Computer. If this box is left unchecked then the Link exports an Exchange File to the specified destination. To load the exchange file as a model in RISA go to File\Import\Autodesk Revit Exchange File.

Export only Selected objects exports only the elements currently selected in the Revit Model.

Coordinates specifies which Revit base point will be used to establish an origin (0,0,0) for coordinates in the RISA model. Either the "Project Base Point" or the "Survey Base Point" may be used to define the origin for all three Global Axes in RISA. The Survey Base Point is typically used with the Shared Coordinates feature in Revit, which allows a common coordinate system to be used across multiple Revit models.

It is important to choose one of the two base points, and maintain the use of that base point throughout all transfers back and forth. To see the location of both points in the Revit Model look under the Architecture Filter List in the Visibility/Graphic Overrides, under the Site category.

RISA X-Axis Alignment allows the export of Revit models to RISA using "True North" as the vertical plan direction, as opposed to "Project North". Revit allows a discrepancy between True North as dictated by surveying and "Project North" (Plan North) such that floor plans are not shown as skewed on drawings. If a structure is exported to RISA using True North then it is unlikely that the framing will align with RISA's Global Axes, which makes the generation of lateral loads difficult.

Revit Model to Export allows the export of either the Revit Physical or Revit Analytical model to be exported to RISAFloor. When Physical Model option is set, the Link will take the physical geometry of elevated slabs and/or foundation slabs into RISAFloor - all other elements such as walls, beams, and columns will require an analytical element. For RISA-3D only the Revit Analytical model may be exported. This option is grayed out if the model does not contain elevated slabs or if it is being exported to RISA-3D.

RISAFloor Design Method is a RISAFloor specific option. In RISAFloor a Shape Group may be assigned to members (beams, columns, etc) from which the program will automatically choose an optimum size. An example of a Shape Group would be "Wide Flange", as opposed to an explicit Shape such as "W24x55"

When "Optimize Member Sizes" is chosen the RISA-Revit Link will ignore the explicit member size specified in the Revit model, and instead assign a corresponding shape group to the member in RISAFloor. This means that the member size in Revit will be ignored, and that RISAFloor will optimize the member size. Otherwise, if "Analyze Sizes from Revit Model" is chosen then RISAFloor will perform analysis and code checks for the member sizes in Revit without optimization.

Elements to Link With RISA

Walls specifies whether walls (and their openings) should be linked to the RISA model.

Boundary Conditions specifies whether boundary conditions should be linked to the RISA model.

Footings specifies whether Isolated Structural Foundations in Revit should be linked to RISA as Footing elements in RISAFoundation. Because RISA requires a boundary condition at footing locations, boundary conditions must also be included.

Project Grids specifies whether Revit project grids should be linked to the RISA model. Only grids that are present in the structural plan views of the Revit model will be imported. Grids from other plan views, such as architectural plans, will not be included.

Diaphragms specifies whether the Revit Floors should be linked to RISAFloor as Decks and Diaphragm Edges.

Loads specifies whether loads should be linked between the RISA and Revit models.

Load Combinations specifies whether load combinations should be linked between the RISA and Revit models.

Foundation Slabs specifies whether Structural Foundation Slab elements in the Revit model should be linked to Mat Slab elements in RISAFoundation.

Elevated Slabs specifies whether Levels with the RISA Elevated Slab parameter turned on should be exported to RISAFloor as Concrete Slab Floors. A RISAFloor ES license is required in order to open a model exported with this feature.

File Names

Exchange File Name designates the name of the Exchange File that will be created by the Link. Browse to a target folder in which this file will be created, or browse to an existing Exchange File that is to be updated.

The Exchange File acts an intermediary between RISA and Revit. It contains data that is not stored in either the RISA or Revit files. This data allows the link to keep track of both models to ensure that they are linked correctly.

If you already have an Exchange File for the current project then be sure to specify that same file (as opposed to specifying a new one). The new information will be merged into the existing Exchange File.

Base File Name designates the name of the base file (RISA model file) that will be created from the exchange file. By default this will be given the same name and placed in the same location as the exchange file. Browse to a target folder in which this file will be created, or browse to an existing base file that is to be updated.

Advanced Options

Prefix for RISA Labels specifies the prefix to applied to all RISA element names. For example, with the "REV_" prefix member M1 will be created in RISA with the name "REV_M1".

Merge Tolerance specifies a tolerance below which the RISA-Revit Link will automatically connect elements that are very close to each other. This is especially useful in the case of beams that (accidentally) only *nearly* intersect in the Revit model.

Coordinate Precision controls the rounding off of joint coordinates during export. Using the 1/8" option eliminates some issues that RISA's finite element mesher has with the extreme precision (1/256") that Revit uses.

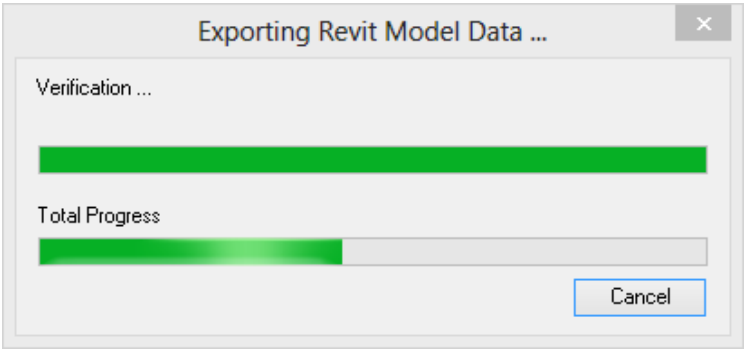
The **Export Process** will Export only changed items by default. However you can override that behavior with this setting and export all of the Revit elements to RISA, regardless of whether they were changed since the last import from RISA.

Reset Revit Structural Tolerances automatically adjusts the following tolerance values in the Revit model to the indicated value. The default values in Revit are very large (6" to 12") which can cause problems with round-tripping with RISA, so the RISA-Revit Link resets these to 1" by default.

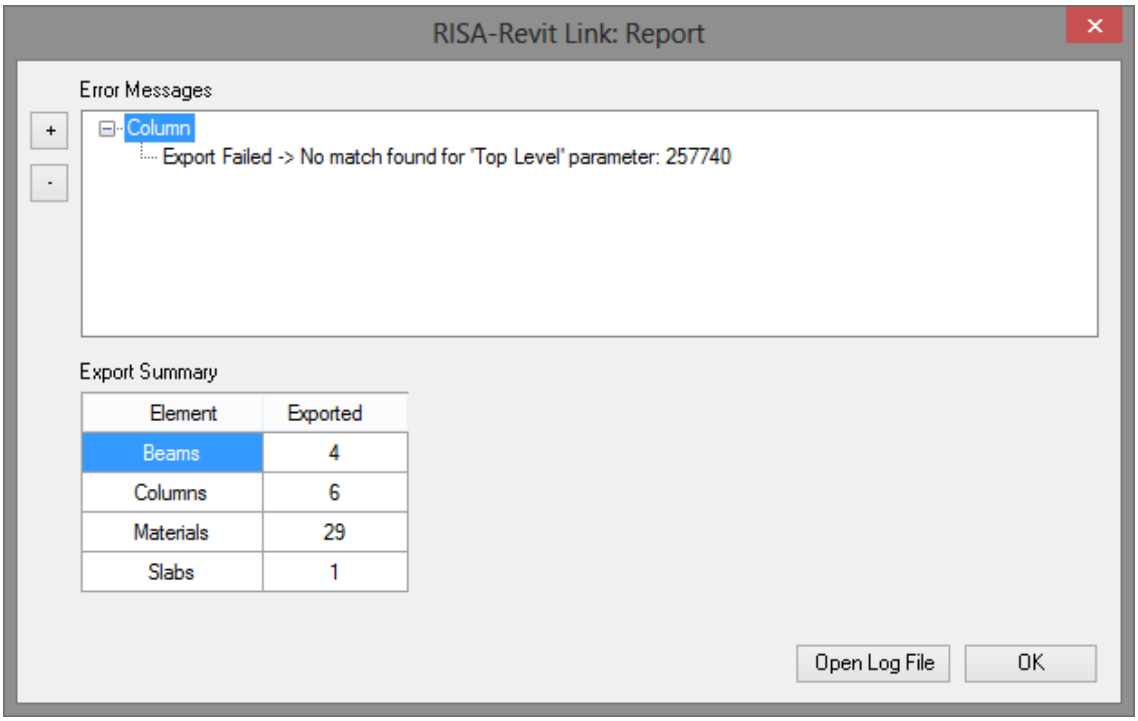
- Support Distance
- Analytical-to-physical model distance
- Analytical auto detect - Horizontal
- Analytical auto detect - Vertical
- Analytical Link auto detect

Export Process

Click OK to begin the export process. A progress bar will be shown during this process.



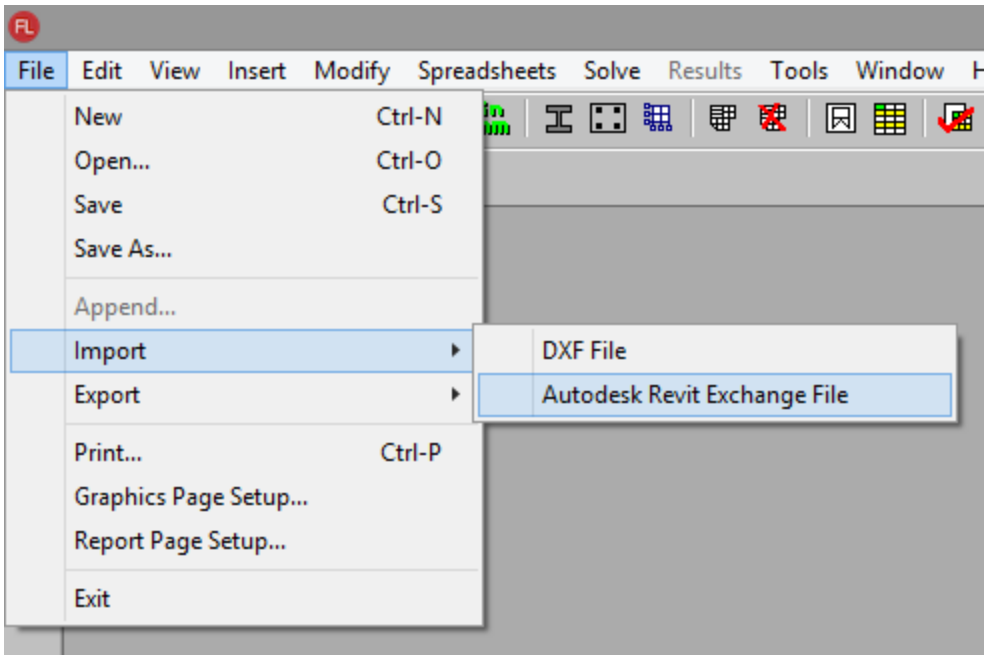
Once the export process is complete a Report window will pop up which provides any error messages related to the export, along with a summary of elements exported.



Errors will be grouped together by type. Use the +/- buttons to expand the trees and read each error. It is best to correct problems with the Revit model which generate errors before moving forward with the RISA model.

If the Launch Program option was selected during export then the RISA program will automatically be launched.

If Write to File was selected then you must import the exchange file into RISA. Launch the relevant RISA program, and Import the Autodesk Revit Exchange File using the File Menu.



After importing the Exchange File, RISA automatically creates a corresponding base (model) file in the same folder as the exchange file.

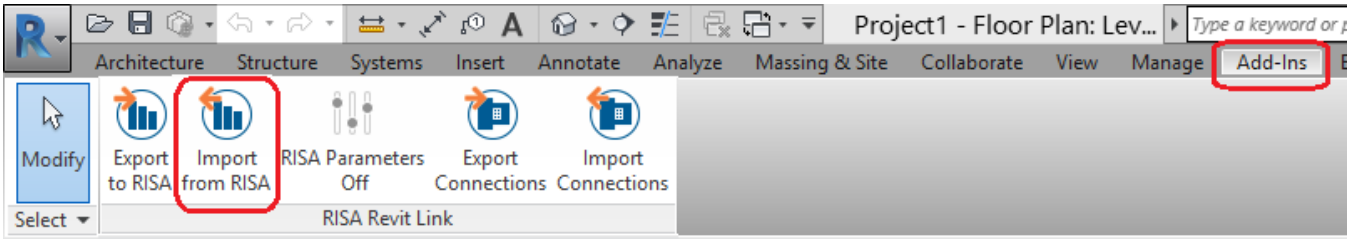
Import RISAFloor or RISA-3D model to Revit

Save the latest changes (including results) in the RISAFloor or RISA-3D model, then open Revit if it is not already open, and either open an existing model or create a new model into which the RISA model will be imported.

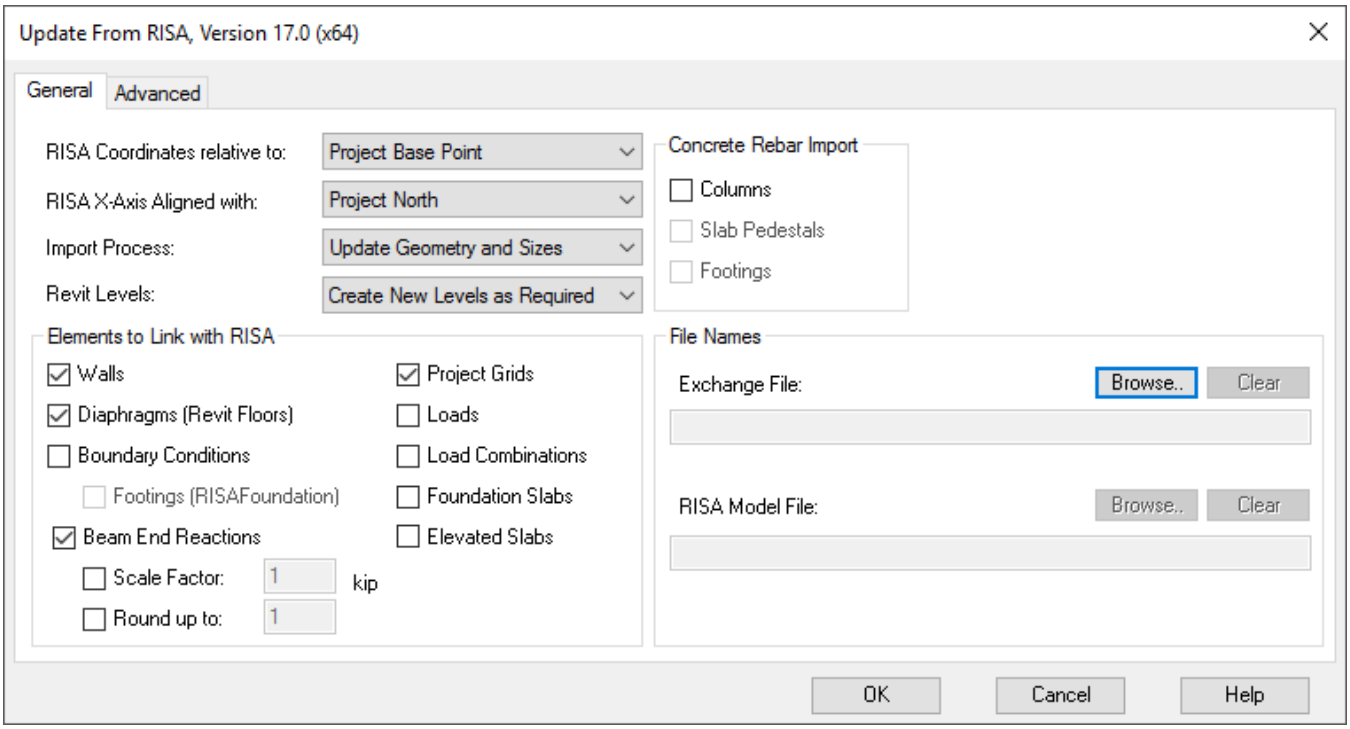
Once the Revit model is ready for RISA Import, be sure to save the model .

Be sure that the current (active) view in Revit is a 3D view.

Click on the Add-Ins tab, and then click on the Import from RISA button.



The Update From RISA dialog will appear:



Coordinates specifies which Revit base point will be used to establish a link to the origin (0,0,0) for coordinates in the RISA model. Either the "Project Base Point" or the "Survey Base Point" may be used to define the origin for all three Global Axes in RISA. The Survey Base Point is typically used with the Shared Coordinates feature in Revit, which allows a common coordinate system to be used across multiple Revit models.

It is important to choose one of the two base points, and maintain the use of that base point throughout all transfers back and forth. To see the location of both points in the Revit Model look under the Architecture Filter List in the Visibility/Graphic Overrides, under the Site category.

RISA X-Axis Alignment allows the import of RISA models to Revit using "True North" as the vertical plan direction, as opposed to "Project North". Revit allows a discrepancy between True North as dictated by surveying and "Project North" (Plan North) such that floor plans are not shown as skewed on drawings.

Import Process sets whether geometry changes should be brought in from the RISA model, or whether only member size changes should be brought over. The "Update Member Sizes Only" option should be used where a discrepancy between the geometry of the RISA model and the Revit model ought to be maintained. See the Workflow topic for more information on this option.

Revit Levels is only available to set when importing from RISA-3D. This allows the user to prevent new levels from being created in the Revit model. When "Use Only Existing Levels" is selected all elements will be assigned to the nearest existing Level in Revit. Otherwise the Link will create new levels in the Revit model for each elevation that RISA-3D elements exist.

Elements to Link With RISA

Walls specifies whether walls (and their openings) should be linked to the RISA model.

Diaphragms specifies whether the Revit Floors should be linked to RISAFloor as Decks and Diaphragm Edges.

Boundary Conditions specifies whether boundary conditions should be linked to the RISA model.

Footings specifies whether Isolated Structural Foundations in Revit should be linked to RISA as Footing elements in RISAFoundation. Because RISA requires a boundary condition at footing locations, boundary conditions must also be included.

Reactions specifies whether beam end reactions should be imported to the Revit model. An option exists to scale the end reactions, or specify a minimum value which smaller reactions should be rounded up to.

Project Grids specifies whether Revit project grids should be linked to the RISA model.

Loads specifies whether loads should be linked between the RISA and Revit models.

Load Combinations specifies whether load combinations should be linked between the RISA and Revit models.

Foundation Slabs specifies whether Structural Foundation Slab elements in the Revit model should be linked to Mat Slab elements in RISAFoundation.

Elevated Slabs specifies whether Concrete Slab Floors from the RISAFloor model should be imported to the Revit model.

Rebar may be imported into Revit as Rebar elements tied to concrete columns/footings/pedestals in Revit. This is currently only available for import to Revit, not export to RISA. RISA is seeking as much feedback as possible on this new feature. Please provide any feedback that you have regarding this feature to RISA so that the future development can proceed in a direction that makes this feature as useful as possible.

File Names

Exchange File Name designates the name of the Exchange File that will be loaded by the Link. Browse to the folder in which this file exits.

Base File Name designates the name of the base file (RISA model file) that is linked to the exchange file.

Advanced Tab

Merge Tolerance specifies a tolerance below which the RISA-Revit Link will automatically connect elements that are very close to each other. This is especially useful in the case of beams that (accidentally) only *nearly* intersect in the Revit model.

The **Import Process** will Import only changed items by default. However you can override that behavior with this setting and import all of the RISA elements to Revit, regardless of whether they were changed since the last export to RISA.

Beam Horizontal Projection is automatically detected by default. However, in models where beams are placed very close to other elements (such as beams or walls) Revit automatically snaps the beam's analytical line to align with the other element. Using the "Centerline" option effectively disables that auto-snapping feature, and maintains correct analytical geometry. The "Centerline" option will set all beams to have a centerline horizontal projection though, so any intentional horizontal projections within the Revit model will also be reset. This is typically only used when troubleshooting an import where beams were incorrectly snapped to nearby elements.

Remove Link is useful for changing which Revit model your RISA model is linked to. Once a RISA model is linked with a Revit model, that RISA model cannot be then linked to a different Revit model without removing the link to the first Revit model. In other words, a given RISA model may only be linked to one Revit model at a time. Check this box if your RISA model was previously linked to a different Revit model, and this is the first time you are importing it to this new Revit model.

The **Correct Alignment** option is only available when importing to a new (blank) Revit model. Revit has been known to incorrectly imports member geometries from certain RISA models (not RISA's fault) causing the alignment of some members to be slightly off. This can result in members that were connected to each other in the RISA model to be unconnected in the Revit model. This option fixes those alignment issues, but is unchecked by default because it slows down the import process.

Reset Revit Structural Tolerances automatically adjusts the following tolerance values in the Revit model to the indicated value. The default values in Revit are very large (6" to 12") which can cause problems with round-tripping with RISA, so the RISA-Revit Link resets these to 1" by default.

- Support Distance
- Analytical-to-physical model distance
- Analytical auto detect - Horizontal
- Analytical auto detect - Vertical
- Analytical Link auto detect

Shape Library Options allows you to specify which Revit libraries are used to load shapes when importing from RISA. When the Link searches for a shape to be loaded into the Revit model it will look at these libraries in sequential order.

The Imperial and Metric library paths are set in the Revit File Locations defaults. To modify where the Revit default libraries are go to the File Menu and choose Options/File Locations/Places

You can also specify a path to a custom library (by checking the Use Custom Library box), which the Link will use if it cannot find the shapes in the Revit libraries.

When using custom libraries you must browse to a folder which has subfolders titled *Structural Columns* and *Structural Framing*.Those folders must then have material-specific folder names, which contain the custom families. This folder hierarchy matches the Revit default folder hierarchy.

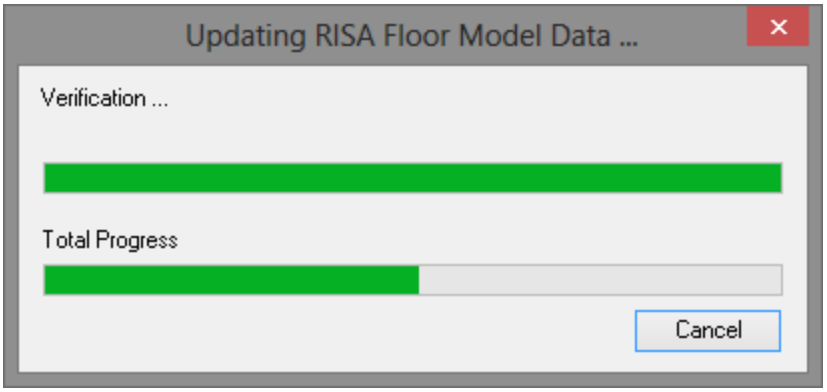
The **Disable Revit's automatic wall joining feature** checkbox, when selected, prevents Revit from auto-joining walls. This is particularly useful for circumventing import errors such as 'Can't keep elements joined' from RISA.

The **Only update analytical model** checkbox, when checked, updates member sizes in both physical and analytical models without merging or relocating physical elements in Revit.

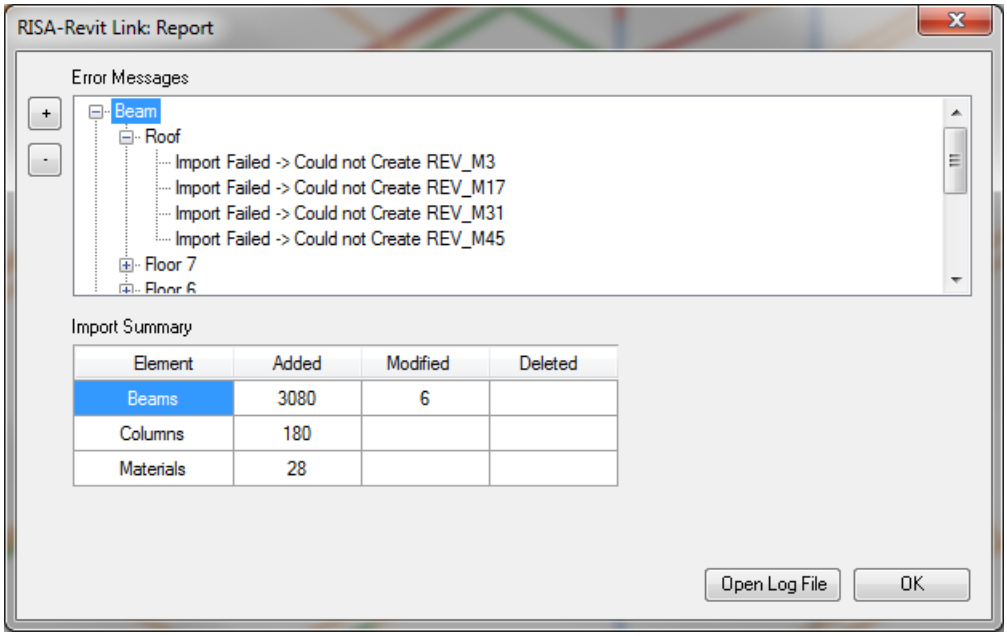
The **Round Off Coordinates** drop down, allows the link to round up coordinates of elements from RISA up to three decimal places to help improve model quality when importing from RISA to REVIT.

Import Process

Click OK to begin the import process. A progress bar will be shown during this process.



Once the import process is complete a Report window will pop up which provides any error messages related to the export, along with a summary of elements added, modified, or deleted.

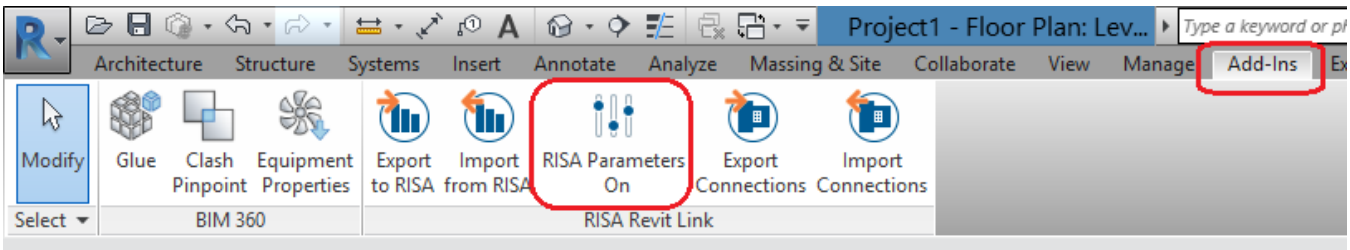


Errors will be grouped together by type. Use the +/- buttons to expand the trees and read each error. It is best to correct problems with the RISA model which generate errors before moving forward with the Revit model.

After the import is complete a new view is created in the Revit model. It is a 3D view titled **RISA Import Summary**. This view shows the entire model color coded, new elements colored green, modified elements colored yellow, and unchanged elements colored black.

RISA Parameters

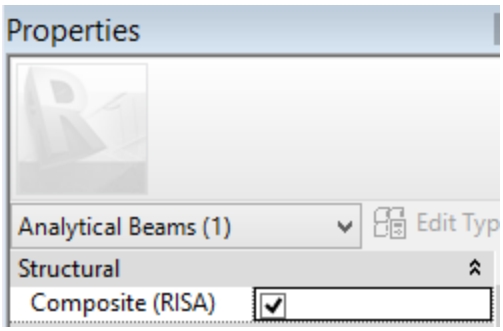
In order to make the mapping of element properties more complete, RISA has the capability to add parameters to Revit elements. These parameters do not exist by default in a Revit model which has been created from scratch, but they can be enable (and disabled) with the RISA Parameters button:



The button icon shows the current status, whether the RISA Parameters are turned on or off. Below is a list of all of the parameters that are created by the Link:

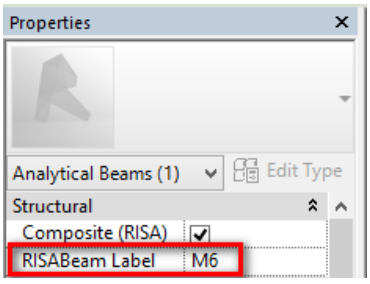
Composite (Yes/No)

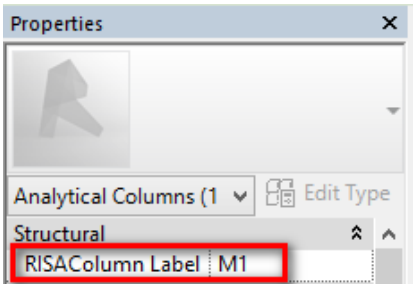
This parameter affects Analytical Beams. When it is enabled it maps to the "Composite" option on the Hot Rolled Tab of the Beams spreadsheet in RISAFloor, and controls whether the beams will be designed as composite members in RISAFloor. This parameter has no impact on RISA-3D.

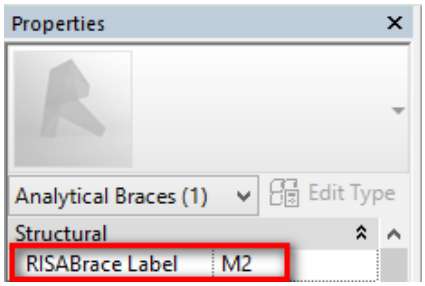


Member/Wall Labels

For beams, columns, braces, and walls both the Physical and Analytical Element has RISA member/wall label information imported from RISA. This does not export back to RISA, and these labels are overwritten with each import from RISA.



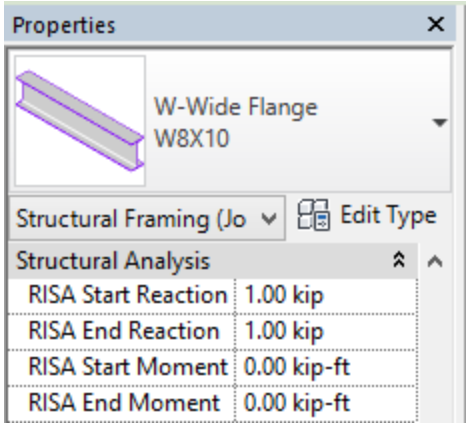




Beam End Reactions

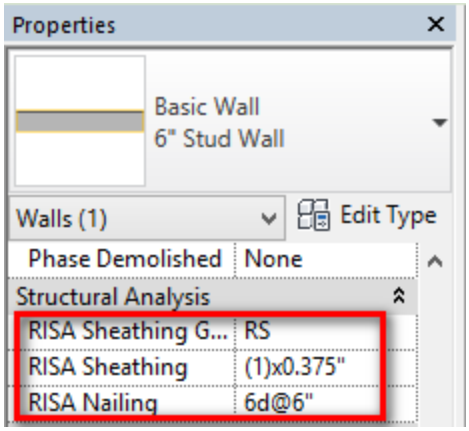
For beams (Structural Framing) the Physical Element has RISA end reactions (shear and moment) imported from RISA. This does not export back to RISA, and these reactions are overwritten with each import from RISA. The

"Start" Reaction refers to the maximum shear at the i-end of the beam. The "End" Reaction refers to the maximum shear at the j-end of the beam. The same convention also applies to end moments.



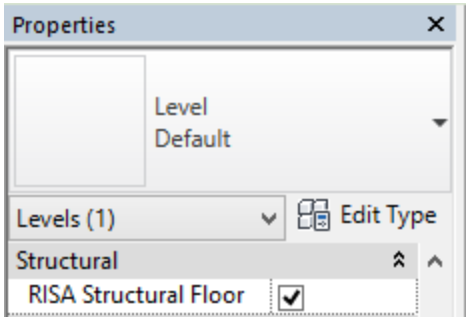
Wood Wall Design

For wood walls the Physical Element has design information imported from RISA. This does not export back to RISA, and this information is overwritten with each import from RISA. Parameters are created for the sheathing grade, sheathing thickness (including whether sheathing is one sided or on both sides of the wall), and the nailing required at the edge of each piece of sheathing.



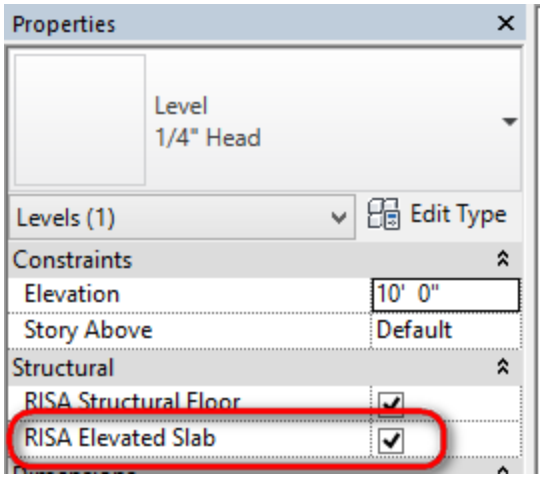
RISA Structural Floor

When exporting from Revit to RISAFloor this Level parameter controls whether the "Level" is brought into RISAFloor as a "Floor". By unchecking this box for Levels which are irrelevant in RISAFloor (such as levels that exist in the Revit model for architectural reasons only) the RISA model is greatly simplified.

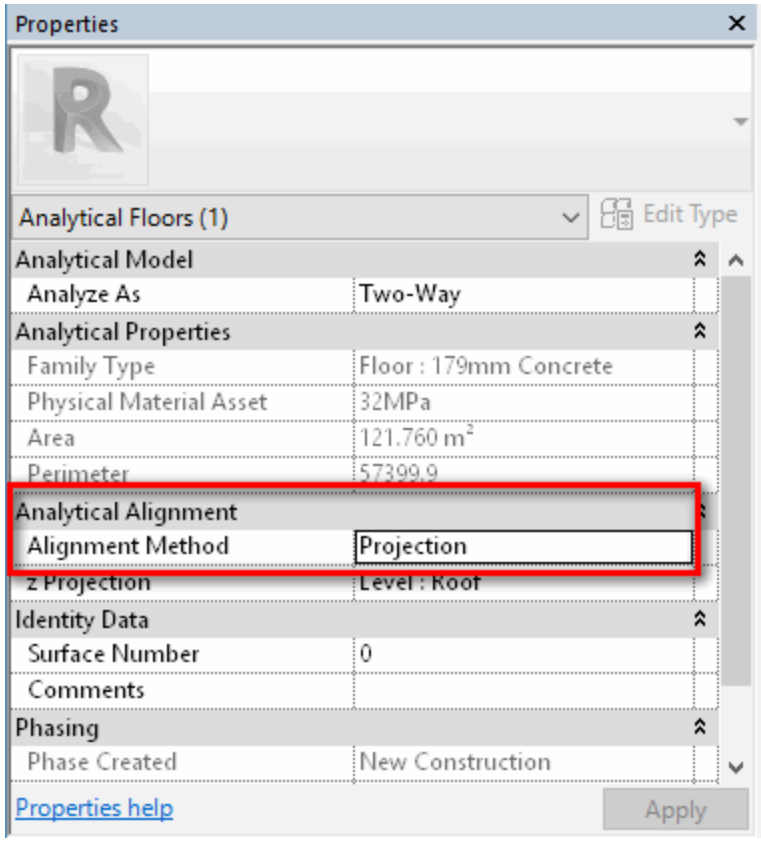


RISA Elevated Slab

The state of this parameter (on/off) is ignored if "RISA Structural Floor" is unchecked. When this parameter is unchecked the Level will be exported to RISAFloor as a Beam Supported Floor. When the is parameter is checked the Level will be exported as a Concrete Slab Floor. You must have a RISAFloor ES license in order to use Concrete Slab Floors.

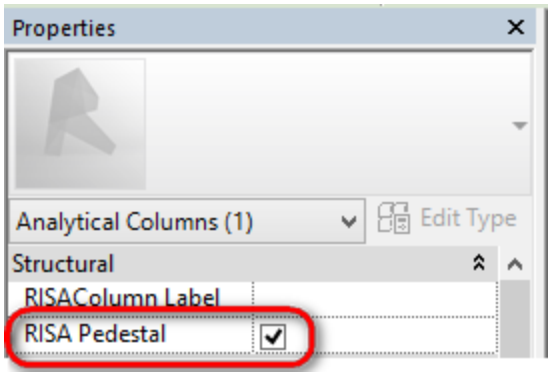


When you export to RISAFloor using the Analytical model option, the Analytical Floor- Alignment Method must be set to Projection. The z Projection will then be set to the floor Level as the Concrete Slab level.



RISA Pedestal

This parameter is only used for concrete columns. It is used to differentiate between column members and pedestal members. When specifying a concrete column as a RISA Pedestal it will be ignored by RISA-3D and RISAFloor, and will instead be brought over into RISAFoundation as a Pedestal.



RISA Drop Panel

This parameter allows RISA to remember which Floor Slab elements are Drop Panels versus Thickened Regions when round-tripping. Do not ever manually edit this parameter.

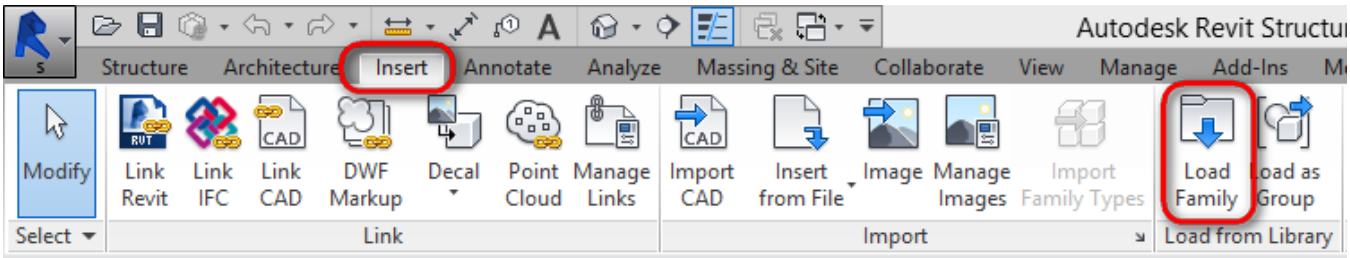
Tagging Beams

Beams within the Revit model contain parameters (member data such as beam size, camber, end reactions, etc) that can be displayed on framing plans. This information is automatically transferred from RISA models. The RISA-Revit Link comes with several useful tags to display this information.

The directions below explain how to tag all of the beams in a framing plan at once. Specific tags may be omitted from this process if desired.

Loading Tags

If you have not already done so, load the RISA tags into your Revit model. To do so, click on the **Insert** tab, and click on the **Load Family** button.



Navigate to the following folder:

C:\RISA User Data\%USERNAME%\Revit Link 2027\Beam Tags

Note:

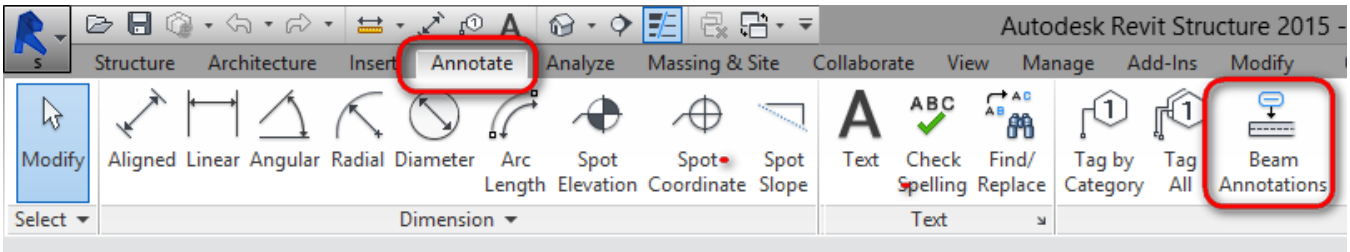
- If the Revit Link has been installed to a custom location such as C:\RISA then look for the Revit Link 2027 folder under the C:\RISA folder.

Select all of the files in that folder and click the **Open** button. This will load the RISA tags into your Revit model.

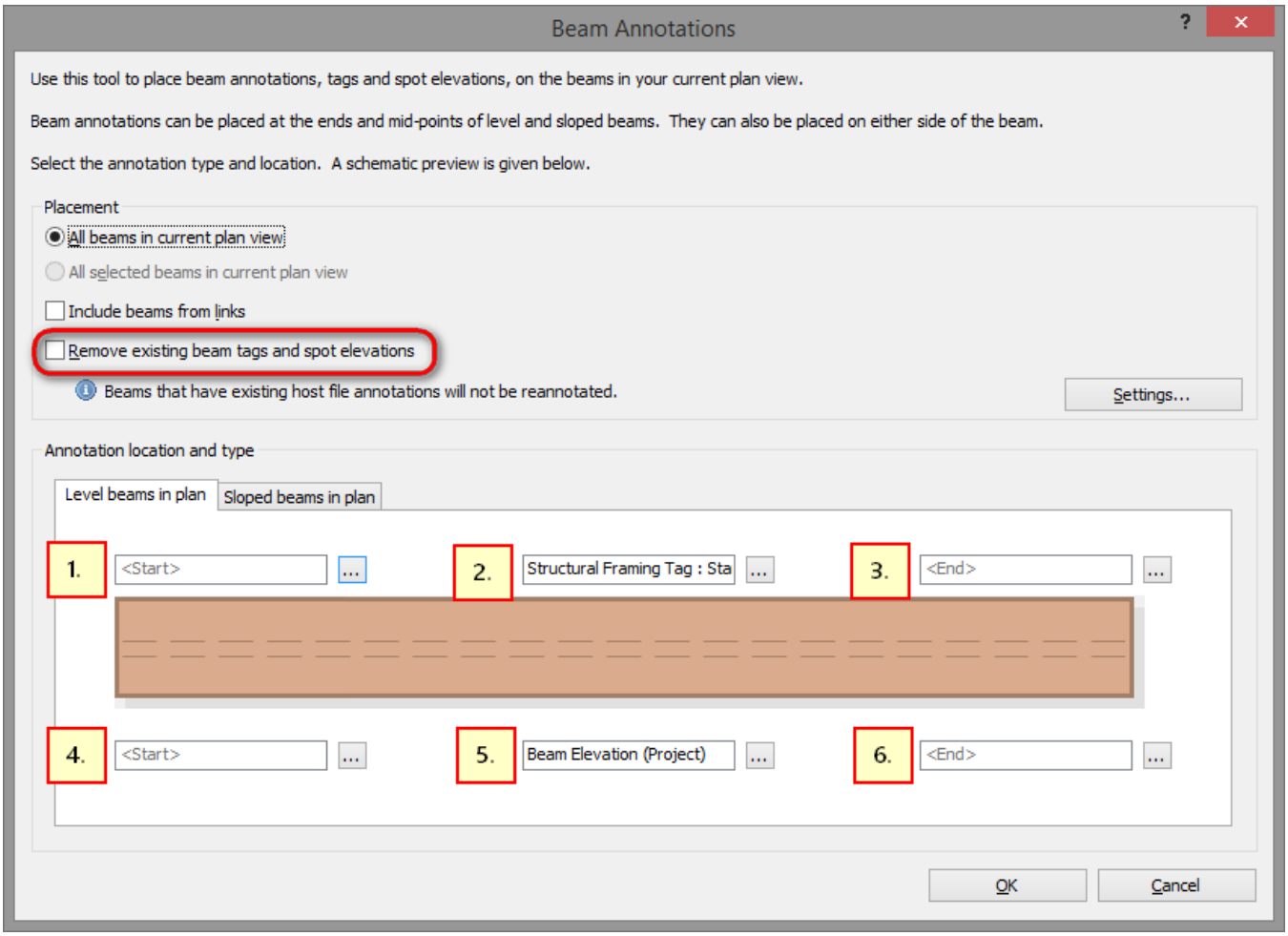
Procedure

Ensure that the Revit model has had a RISA model imported, and that end reactions were also imported (if applicable). The tagging process must be done for each framing plan separately, so open the first relevant framing plan.

Click on the Annotate tab within Revit, and then click on the "Beam Annotations" button:



The Beam Annotation Dialog will open. If the beams already have tags you may want to check the box "Remove existing beam tags...", which will replace the existing tags with the new RISA tags. Choose between the "Level beams in plan" and "Sloped beams in plan" tabs as applicable.

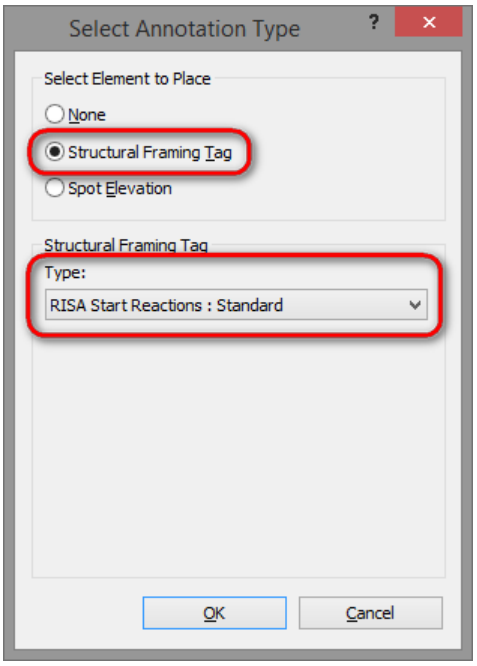


The procedure for each tag is shown below:

Loading Tag #1

Click on the Load Tag button ...

Choose the "Structural Framing Tag" radio button, then click in the "Type" dropdown and choose **RISA Start Reactions**.



Loading Tag #2

Repeat the procedure for Tag #1, loading the **Beam Size** tag instead (or the RISA Label tag to get the RISA member name)

Loading Tag #3

Repeat the procedure for Tag #1, loading the **RISA End Reactions** tag instead.

Loading Tag #4

Repeat the procedure for Tag #1, loading the **RISA Start Moments** tag instead.

Loading Tag #5

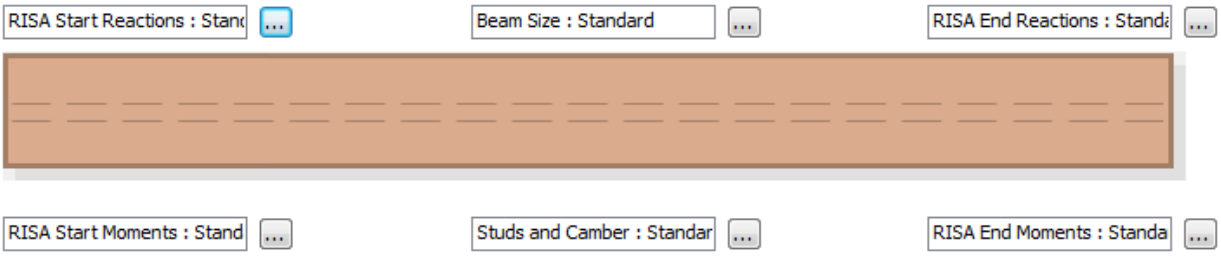
Repeat the procedure for Tag #1, loading the **Studs and Camber** tag instead.

Loading Tag #6

Repeat the procedure for Tag #1, loading the **RISA End Moments** tag instead.

Applying Tags

The framing tags should now be shown as below:



Click OK in the "Beam Annotations" dialog, and the tags will automatically be applied to the beams. Each tag is an individual element that may be deleted or moved as necessary.

Technical Support

Technical support is an important part of the RISA-Revt Link. There is no charge for technical support for all licensed owners of the **current** version of RISA-3D, RISAFloor and/or RISAConnection. Technical support is very important to the staff at RISA. We want our users to able to reach us when they are having difficulties with the Link. However, this service is not to be used as a way to avoid learning the program or learning how to perform structural modeling in general.

Hours: 6am to 5pm Pacific Time, Monday through Friday

Before contacting technical support, please do the following:

1. **Search the Help File or User's Manual**. Most questions asked about the RISA-Revit Link are already answered there. Use the table of contents or index to find specific topics and appropriate sections. We go to great lengths to provide extensive written and online documentation for the link. We do this in order to help you understand the link and make it easier to use.
2. Open the Import from RISA or Export to RISA dialog in Revit. Go to the Advanced tab and click the **Check for Updates** button. If a newer version of the link is available, download and install it.
3. Within RISA-3D or RISAFloor click on the Help Menu and select **Check for Updates**. Occasionally there are known issues which get corrected in periodic updates released by RISA.
4. Look at your analytical model in Revit to see if anything is wrong with it. Nine times out of ten the errors that occur during transfer are due to incorrect analytical models.
5. Take a few minutes to experiment with the problem to try to understand and solve it.

If none of the steps above correct your problem then contact support via e-mail for instructions on how to upload your files to the website. We will need those files to recreate the problem on our computers.

- If you encountered a problem importing from RISA to Revit, send us the entire contents of the automatically created **ImportBackup** folder.
- If you encountered a problem exporting from Revit to RISA, send us the entire contents of the automatically created **ExportBackup** folder.

RISA Demo Compatibility

RISA-3D Demo and RISAFloor Demo will integrate with Revit using the RISA-Revit Link only when the model stays within the RISA program demo limits. In general, this means that the model must be small so that the RISA file can be saved when running in demo mode. To view the RISA-3D Demo and RISAFloor Demo limits, launch the RISA program in demonstration mode and a dialog will pop-up with information about what is supported to save a RISA model in demo mode.

Note: The link will not automatically launch the RISA demo program. When the Revit model is exported to a RISA Demo program using the RISA-Revit Link, you must manually launch the RISA program in Demo mode and open the RISA file.

The RISAConnection Demo is not compatible with the RISA-Revit Link because the demo version of RISAConnection does not allow saving.

RISA Trial Compatibility

RISA-3D and RISAFloor Trial versions will integrate with Revit using the RISA-REVIT Link.

The RISAConnection Trial version is compatible with the RISA-REVIT Link.

E-Mail: support@risa.com

This method is the only way to send us a model you would like help with. Make sure you tell us your name, company name, RISA Key ID (go to Help\About), phone number, and give a decent problem description. Make sure to specify which program you are integrating with, and whether you are using the "Export Selected Items Only" option.

Phone Support: (949) 951-5815

Feel free to call, especially if you need a quick answer and your question is not model specific and therefore doesn't require us to look at your file.

Appendix A - Element Linking Details

This appendix lists every type of element that is linked between RISA and Revit, and explains in detail the linking that is performed between RISA and Revit for that element type. If a given parameter from RISA or Revit is not listed in this document then it is not linked between the two programs. In that case the RISA-Revit Link will not modify that particular piece o f data. For example, the RISA-Revit Link does not impact unbraced lengths in RISA, or z-direction offsets in Revit.

Floors/Levels

Floors within RISAFloor are linked to Revit as Levels. Each Level within Revit has a RISA parameter called "RISA Structural Floor". This parameter is turned on by default for all Levels, but it can be disabled in order to prevent that level from being linked with RISAFloor. This is useful when there are many non-structural related levels in a Revit model, where the presence of those levels would only clutter up the RISAFloor model with extra floors. Structural elements assigned to a floor where the "RISA Structural Floor" parameter has been turned off will not be linked to the RISAFloor model. This parameter is ignored when linking to RISA-3D.

An additional parameter called "RISA Elevated Slab" is also present. The state of this parameter (on/off) is ignored if "RISA Structural Floor" is unchecked. When this parameter is unchecked the Level will be exported to RISAFloor as a Beam Supported Floor. When the is parameter is checked the Level will be exported as a Concrete Slab Floor. You must have a RISAFloor ES license in order to use Concrete Slab Floors.

Note:

- The RISA Elevated Slab parameter is only available in Revit 2016 and newer.
- Revit Level names may not exceed 32 characters when used with the RISA-Revit Link.
- RISAFloor ES does not support non-concrete beams on Concrete Slab Floors. Therefore if the RISA Elevated Slab box is checked, any non-concrete beams on that Level will not be exported to RISA.
- RISAFloor Floors are mapped to Revit Levels on a one-to-one basis. Each RISAFloor Floor must have a corresponding Revit Level, however there may be additional Revit Levels with the "RISA Structural Floor" parameter turned off, RISAFloor will ignore those.
- When importing from RISA-3D to Revit new Revit Levels will be created as necessary unless the "Use only Existing Levels" option is selected.

Beams

Beams within RISAFloor and Members assigned to Member Type "Beam" in RISA-3D are both transferred to Revit as Structural Framing Beams. Revit Structural Framing Beams are transferred to RISAFloor as Beams, and to RISA-3D as Members assigned to Member Type "Beam".

Shape

The Mapping File is used to match RISA Shape names with Revit Family Instance names. When exporting to RISA-3D or RISAFloor, if a matching shape name cannot be found in the mapping file then the beam is created as a rectangular 1"x1" shape.

When importing from RISA-3D or RISAFloor into Revit, if a matching shape name cannot be found in the mapping file then the shape is brought over using a random family instance (such as a W12x30). These members are color coded purple in the RISA Import Summary view, for easy identification.

A notification will be made in the warning log if a shape cannot be mapped.

RISAFloor members which are not assigned an explicit beam size are assigned to a Shape Group. The RISA-Revit Link does not transfer shape groups. Therefore the RISAFloor model must be solved, and the results must be saved in order to transfer the beam sizes chosen by RISAFloor during solution.

RISA-3D Members are assigned a Design List of "None" when transferred from Revit.

Reference Level

This parameter is only used when linking the Revit Physical model to RISAFloor. When linking to RISAFloor, the Reference Level parameter of the Revit beam is used to determine which floor the beam should exist on.

Level Offset

When linking to RISAFloor, the Start Level Offset and End Level Offset parameters of the Revit beam are used to assign Elevation Offsets in the RISAFloor model. The Elevation Offsets in RISAFloor are used to defined sloping beams. Because RISAFloor only supports sloping at the top-most Floor, any beams assigned to Reference Level other than the top-most Floor will be flattened during export (i.e. all Level Offsets are set to zero).

RISAFloor does not support negative Elevation Offsets, so the Level Offsets in Revit must always be positive values. This means that the sloped roof "Level" in Revit should be at the base of the slope.

Joists on the top-most Floor are included in this sloping behavior along with other beam types, so a joist no longer needs its Structural Usage changed to Other to slope correctly on export.

Cross-Section Rotation

The Cross-Section Rotation parameter in Revit is used to set the "Orientation" parameter in the Beams spreadsheet in RISAFloor, and the Members spreadsheet in RISA-3D. Because RISAFloor only supports "Strong Axis" or "Weak Axis" orientation, RISAFloor will analyze the member with either a 0 degree or 90 degree orientation, depending on which angle the Revit rotation is closest to. This will not reset the orientation in Revit during round-tripping, so it is safe to bring geometry back and forth for any rotation angle.

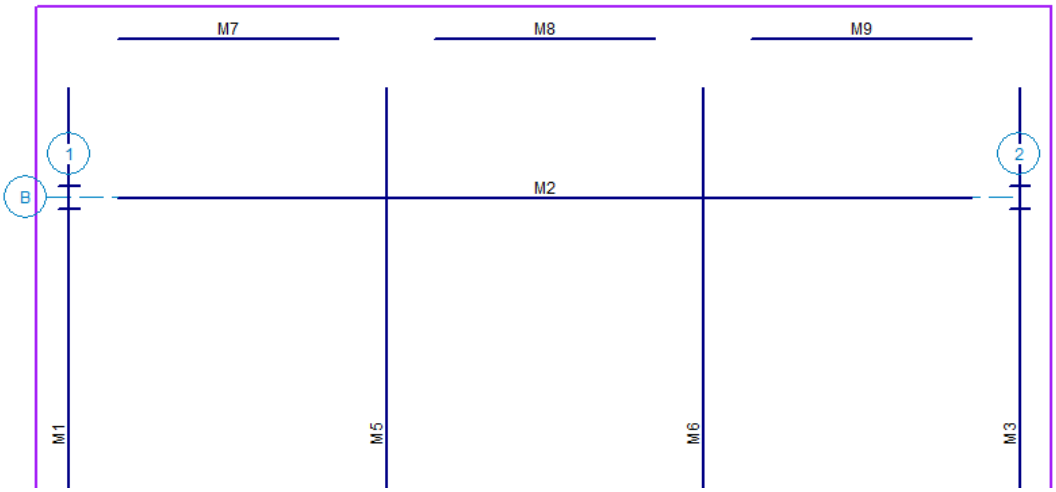
Material

The Revit Material is linked to the Material designated in the RISAFloor Beams spreadsheet or the RISA-3D Members spreadsheet. For more information on Material linking see the Materials topic.

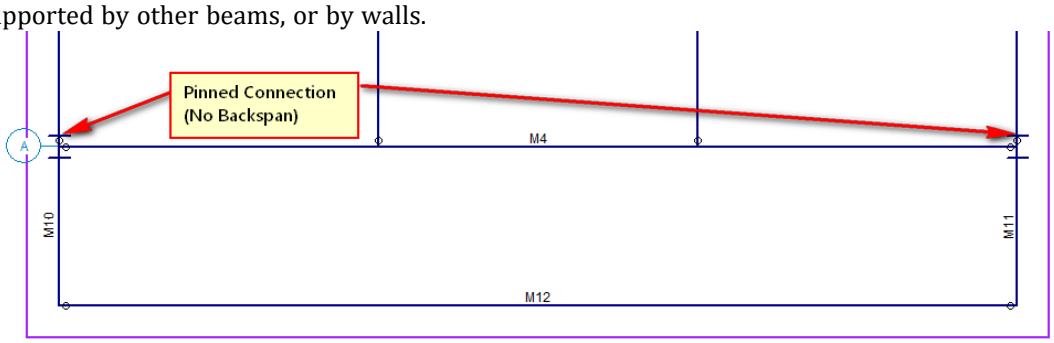
Start/End (Moment) Connections

The Start Connection and End Connection parameters in Revit are used to indicate Cantilevers in a RISAFloor model. These parameters are ignored by RISA-3D. Below are guidelines for usage of these parameters:

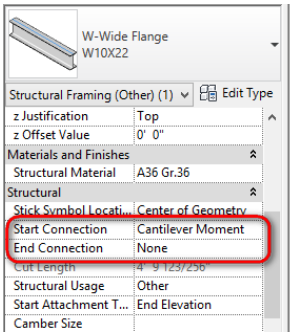
- RISAFloor has two different types of cantilever members:
    1. Cantilever Beams are beams which are continuous over a support, and unsupported on at least one end. In the example below, beams M1, M3, M5, and M6 are all cantilever beams. They are either continuous passing over supporting member M2 (and Columns B1 and B2) or they are two members that have moment connections to each other at that support location. Either way the analysis would be treated the same, so RISAFloor does not differentiate between these two possibilities. Cantilever beams always have a backspan.

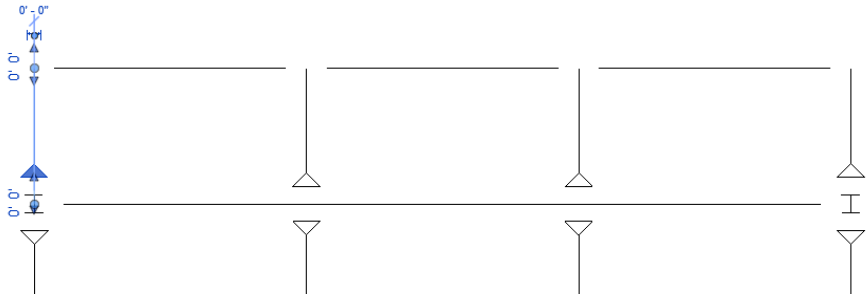


2. Outriggers are beams which cantilever directly off of a column, and which have no backspan. Therefore the entire moment generated by the outrigger beam is carried by the column it is projecting from. In the example below, beams M10 and M11 are outriggers from columns A1 and A2 respectively. An outrigger must connect to a column at its supported end in RISAFloor. Outriggers may not be supported by other beams, or by walls.



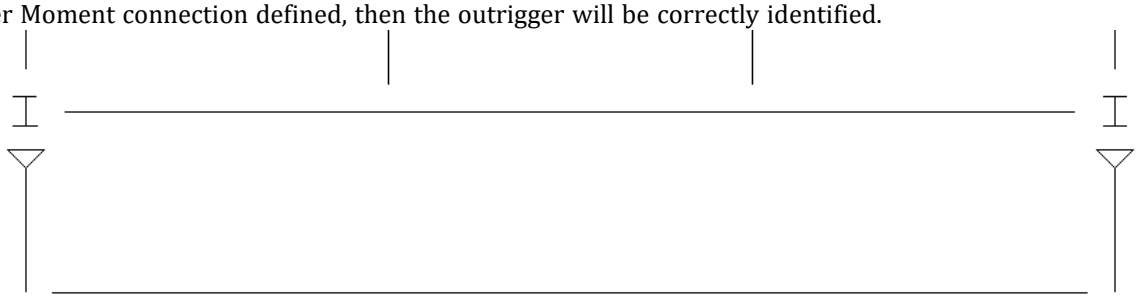
- A cantilever beam must be drawn as two members in Revit in order to transfer correctly into RISAFloor as a cantilever beam. Otherwise, modeling the beam as a single element in Revit will result in an instability in RISAFloor. Below is an example of how the cantilever beams in the above example import to RISAFloor. Note that each beam is modeled as two elements in Revit, with a Cantilever Moment connection on each beam.





- An outrigger may be drawn as one member in Revit. As long as the member attaches to a column, and has a Cantilever Moment connection defined at that column, and no backspan beam is present that also has a Canti-

lever Moment connection defined, then the outrigger will be correctly identified.



Structural Usage

The Structural Usage parameter in Revit is used to identify whether a beam is acting as a girder, joist, horizontal brace, etc. Most of the available designations in Revit are irrelevant to RISA. RISA exports all beams as structural usage "Other" in Revit. The only relevant designation for the RISA-Revit link is "Horizontal Bracing". All beams in Revit that are designated with Structural Usage: Horizontal Bracing are imported as Horizontal Brace (HBrace) members to RISA. Because RISAFloor does not model horizontal bracing, an HBrace member is only visible in the RISA-3D model embedded in RISAFloor.

Camber Size

The camber size parameter in Revit is filled in by the camber values in the RISAFloor solution. This is a one way link, which means that Camber Size is only transferred from RISA to Revit, not from Revit to RISA. This field is not used when linking to RISA-3D.

Number of Studs

The Number of Studs parameter in Revit is filled in by the stud values in the RISAFloor solution. This is a one way link, which means that studs are only transferred from RISA to Revit, not from Revit to RISA. This field is not used when linking to RISA-3D, and it is not used for non-composite beams.

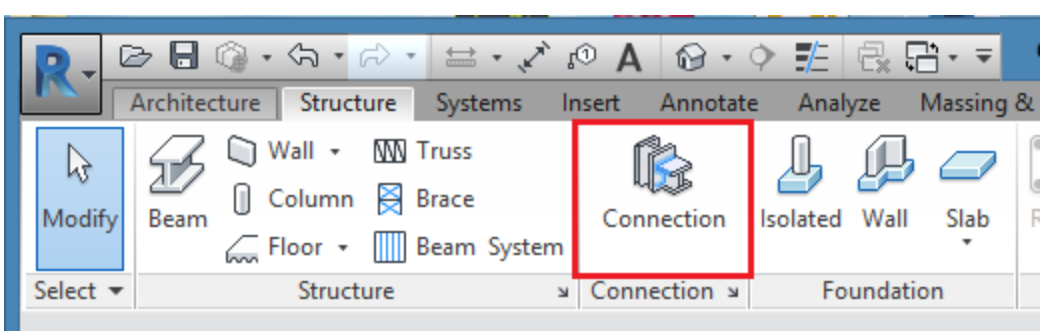
Enable Analytical Model

This flag in Revit allows the user to designate a beam as non-analytical. Any element that does not have its Analytical Model enabled is ignored by the RISA-Revit Link. Therefore this flag is a useful way to have the Link ignore miscellaneous framing members that are not intended for RISA analysis.

RISA Reactions

Beam end reactions are transferred to Revit from both RISA-3D and RISAFloor.

The reactions from RISAFloor are determined from the Load Combinations spreadsheet- Design tab- Connection column. RISAFloor will run each load combination and will send to Revit the maximum reactions found with the Connection checkbox turned on.



Reactions transferred from RISA-3D are envelope values determined from the load combinations. The values are exact shear and moment values determined from Load Combinations, so if Strength-Level Load Combinations (e.g. 1.2D + 1.6L) are used in RISA-3D then the end reactions sent to Revit will be at strength level.

When a RISA-3D model is integrated with RISAFloor the envelope of the absolute values of shears and moments is used comparing both RISAFloor and RISA-3D end reactions. This ensures that the controlling reaction is sent to Revit for lateral members.

The RISAFloor model must be solved, and the results must be saved in order to transfer the end reactions to Revit. The RISA-3D model must be solved using an Envelope solution, and the results must be saved in order to transfer end reactions to Revit. Both models must be solved as described above in order to get automatic enveloping of gravity and lateral reactions.

- RISA I-End Maximum Shear is mapped to Revit parameter "RISA Start Reaction".
- RISA J-End Maximum Shear is mapped to Revit parameter "RISA End Reaction".
- RISA I-End Maximum Moment is mapped to Revit parameter "RISA Start Moment".
- RISA J-End Maximum Moment is mapped to Revit parameter "RISA Start Moment".

Member Forces

The envelope end forces from the RISA model are imported to the "Member End Forces" container for each analytical beam/column/brace whenever an Envelope solution file is present with the RISA model. The absolute value maximum force is imported to Revit without a sign. In the case of lateral beams and columns the maximum force between RISAFloor and RISA-3D is imported.

Composite

This analytical parameter is a RISA parameter used to designate whether a steel beam should be designed as composite in RISAFloor. It is ignored for non-steel beams, and for RISA-3D. This setting links to the composite flag in the RISAFloor Beams spreadsheet, on the Hot Rolled tab.

RISABeam Label

The RISABeam Label parameter in Revit is a RISA parameter which is filled in by the member label from the RISA model. This is a one way link, which means that RISA beam label is only transferred from RISA to Revit, not from Revit to RISA.

Analyze As

This analytical parameter is used to designate which members are part of the lateral force resisting system versus the members which are intended to support gravity loads only. This maps to the "Function" parameter in the Beams spreadsheet in RISAFloor, and in the Members spreadsheet, Hot Rolled tab in RISA-3D. Members designated as Lateral will appear in both RISAFloor and the RISA-3D model embedded under RISAFloor. Members designated as Gravity will appear only in RISAFloor, and not in the RISA-3D model embedded under RISAFloor.

End Releases

This analytical parameter is linked to the end releases in RISAFloor and RISA-3D. RISAFloor only supports "Pinned" or "Fixed" end releases. If the end releases of a Revit Beam do not correspond with standard Pinned or Fixed releases then the link chooses the closest match when transferring to RISAFloor. The Revit end releases in this circumstance are not affected when transferring back to Revit.

Curved Beams

Curved beams in Revit are split into multiple straight-line segment members in RISA-3D. The member size, material, and other parameters from the first segment are then linked back to the entire curved beam in Revit. It is important to set the unbraced lengths correctly in RISA-3D, so that each segment uses the full length of the beam as its

unbraced length if appropriate. Leaving the unbraced lengths blank in RISA-3D will result in the program assuming brace points between each segment.

Curved beams may not be exported to RISAFloor.

Analytical Links

Analytical links in Revit are linked to Rigid Links in RISA-3D, regardless of whether the analytical link was automatically generated in Revit or whether it was manually drawn. Rigid Links that are drawn in RISA-3D are not brought into Revit as analytical links though. The analytical link must originate in Revit, at which point it can round-trip to RISA mapped as a rigid link. Analtyical links in Revit are ignored by RISAFloor.

Braces

Braces assigned to Member Type "VBrace" in RISA-3D are transferred to Revit as Structural Framing Braces. Revit Structural Framing Braces are transferred to RISA-3D as Members assigned to Member Type "VBrace". Because RISAFloor does not model horizontal bracing, a VBrace member is only visible in the RISA-3D model embedded in RISAFloor.

Shape

The Mapping File is used to match RISA Shape names with Revit Family Instance names. When exporting to RISA-3D or RISAFloor, if a matching shape name cannot be found in the mapping file then the beam is created as a rectangular 1"x1" shape.

When importing from RISA-3D or RISAFloor into Revit, if a matching shape name cannot be found in the mapping file then the shape is brought over using a random family instance (such as a W12x30). These members are color coded purple in the RISA Import Summary view, for easy identification.

A notification will be made in the warning log if a shape cannot be mapped.

Cross-Section Rotation

The Cross-Section Rotation parameter in Revit is linked to the "x-axis Rotation" parameter in the Members spreadsheet in RISA-3D.

Material

The Revit Material is linked to the Material designated in the RISA-3D Members spreadsheet. For more information on Material linking see the Materials topic.

Enable Analytical Model

This flag in Revit allows the user to designate a brace as non-analytical. Any element that does not have its Analytical Model enabled is ignored by the RISA-Revit Link. Therefore this flag is a useful way to have the Link ignore miscellaneous framing members that are not intended for RISA analysis.

RISABrace Label

The RISABrace Label parameter in Revit is a RISA parameter which is filled in by the member label from the RISA model. This is a one way link, which means that RISA brace label is only transferred from RISA to Revit, not from Revit to RISA.

Analyze As

This analytical parameter is used to designate which members are part of the lateral force resisting system versus the members which are intended to support gravity loads only. Braces are always part of the lateral force resisting

system, so they are always designated as "Lateral" in Revit and they therefore always created with function type "Lateral" in the Hot Rolled tab of the RISA-3D Members spreadsheet.

End Releases

This analytical parameter is linked to the end releases in RISA-3D, as defined in the Members spreadsheet, Advanced tab.

Columns

Columns within RISAFloor and Members assigned to Member Type "Column" in RISA-3D are both transferred to Revit as Structural Columns. Revit Structural Columns are transferred to RISAFloor as Columns, and to RISA-3D as Members assigned to Member Type "Column".

Shape

The Mapping File is used to match RISA Shape names with Revit Family Instance names. When exporting to RISA-3D or RISAFloor, if a matching shape name cannot be found in the mapping file then the beam is created as a rectangular 1"x1" shape.

When importing from RISA-3D or RISAFloor into Revit, if a matching shape name cannot be found in the mapping file then the shape is brought over using a random family instance (such as a W12x30). These members are color coded purple in the RISA Import Summary view, for easy identification.

A notification will be made in the warning log if a shape cannot be mapped.

RISAFloor members which are not assigned an explicit beam size are assigned to a Shape Group. The RISA-Revit Link does not transfer shape groups. Therefore the RISAFloor model must be solved, and the results must be saved in order to transfer the beam sizes chosen by RISAFloor during solution.

RISA-3D Members are assigned a Design List of "None" when transferred from Revit.

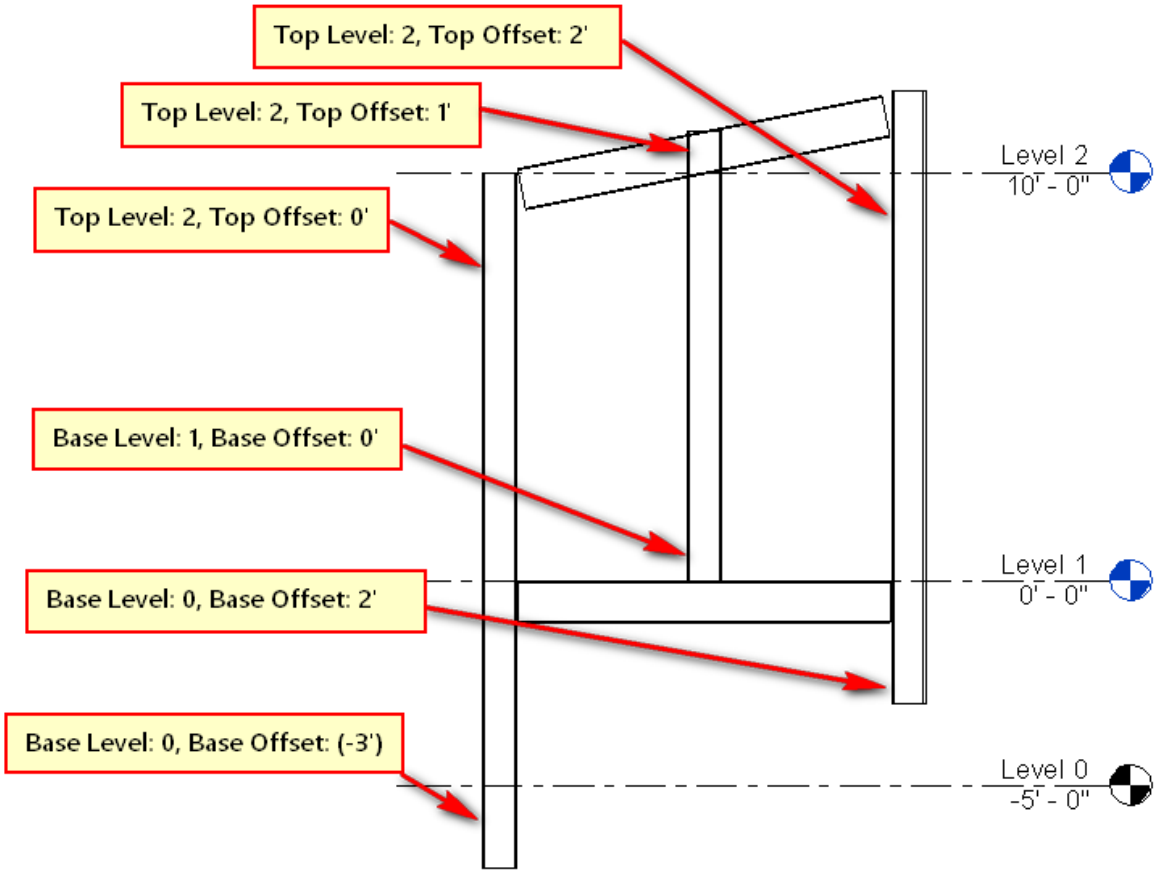
Material

The Revit Material is linked to the Material designated in the RISA-3D Members spreadsheet. For more information on Material linking see the Materials topic.

Base Level/Offset

These parameters are only used when linking the Revit Physical model to RISAFloor. When linking to RISAFloor, the Base Level parameter of the Revit column is used to determine the base of the structure. The Base Level should not include structural framing, and there should be no structural framing below the Base Level other than foundation elements. The Base Offset is then used to set the "Splice Distance Below" parameter in the RISAFloor Columns spreadsheet.

For columns not terminating at the "base" of the structure, the Base Level sets the bottom-most Floor where that column exists. See the example below where the middle column terminates at a transfer beam. The Base Level for this column should be the Reference Level for the transfer beam.



Level 0 is taken as the structure's "Base". This level will not appear in the list of RISAFloor "Floors"

These Parameters are not used when linking to RISA-3D.

Top Level/Offset

These parameters are only used when linking the Revit Physical model to RISAFloor. When linking to RISAFloor, the Top Level parameter of the Revit column is used to set the top-most floor where the column exists. The Top Offset is then used to set the Elevation point for sloping members (along with the member End Offsets). Negative values of Top Offset are not allowed, and are rounded to zero during export to RISA. Positive values of Top Offset are only allowed on the top-most floor, and will be rounded to zero during export if the Top Level is not the top-most structural Level.

These Parameters are not used when linking to RISA-3D.

Splices

There are three different hierarchies of columns in RISAFloor:

- Column: Defines the column from Floor-to-Floor.
- Lift: Defines the physical column, as it would be cut by the fabricator. Spans at least one floor, terminates at splices.
- Stack: Defines all Lifts that share the same horizontal coordinates.

For a single story structure there would only be one Lift per Stack because there are no splices. However, for a six story structure there may be two or three lifts per column stack, depending on how many splices are present.

Columns in Revit should be modeled to match Column Lifts. That is, each column element in the Revit model should be the same length as the physical piece that will be fabricated. The RISA-Revit Link automatically includes column splices in between Column Elements that are stacked in the Revit model. The splice type is determined by the **Top Connection** parameter of the lower column. Specifying a Shear Connection or Moment Connection for the Top Connection of the lower column at the splice results in RISAFloor using a Shear or Moment connection at that location. Specifying "None" for a top connection results in RISAFloor using the Default splice type, as defined in the Floors spreadsheet.

Enable Analytical Model

This flag in Revit allows the user to designate a brace as non-analytical. Any element that does not have its Analytical Model enabled is ignored by the RISA-Revit Link. Therefore this flag is a useful way to have the Link ignore miscellaneous framing members that are not intended for RISA analysis.

RISAColumn Label

The RISAColumn Label parameter in Revit is a RISA parameter which is filled in by the member label from the RISA model. This is a one way link, which means that RISA column label is only transferred from RISA to Revit, not from Revit to RISA.

RISA Pedestal

This parameter is only used for concrete columns. It is used to differentiate between column members and pedestal members. When specifying a concrete column as a RISA Pedestal it will be ignored by RISA-3D and RISAFloor, and will instead be brought over into RISAFoundation as a Pedestal.

Analyze As

This analytical parameter is used to designate which members are part of the lateral force resisting system versus the members which are intended to support gravity loads only. This maps to the "Function" parameter in the Columns spreadsheet in RISAFloor, and in the Members spreadsheet, Hot Rolled tab in RISA-3D. Members designated as Lateral will appear in both RISAFloor and the RISA-3D model embedded under RISAFloor. Members designated as Gravity will appear only in RISAFloor, and not in the RISA-3D model embedded under RISAFloor.

Note:

- Gravity Columns from Revit are automatically created as Lateral in RISA-3D and RISAFloor if they share a node with any lateral elements.

End Releases

These analytical parameters are linked to the end releases in RISA-3D, in the Members spreadsheet, Advanced tab. These parameters are not used when linking to RISAFloor.

Walls

Wall Panel elements in RISAFloor and RISA-3D are linked to Revit as Walls.

Structure/Assembly

Each Wall Type in Revit has a "Structure" assembly which defines the makeup of the wall. Only the layer that is marked as the "Structural Material" is linked to RISA. The Material determines the wall type (Wood, Masonry, Concrete) and the thickness determines the wall thickness (or stud thickness for wood walls). This information is linked to the Wall Panels spreadsheet in RISAFloor and RISA-3D, specifically the "Material Type" and "Thickness" fields.

Layers

EXTERIOR SIDE

	Function	Material	Thickness	Wraps	Structural Material
1	Membrane Layer	Air Infiltration Barrier	0' 0"	☑	
2	Substrate [2]	Plywood, Sheathing	0' 0 3/4"	☑	
3	**Core Boundary**	**Layers Above Wrap**	**0' 0"**		
4	Structure [1]	Softwood, Lumber	0' 5 1/2"		☑
5	**Core Boundary**	**Layers Below Wrap**	**0' 0"**		
6	Membrane Layer	Vapor Retarder	0' 0"	☑	
7	Finish 2 [5]	Gypsum Wall Board	0' 0 1/2"	☑	

INTERIOR SIDE

Openings

Wall openings may be modeled in Revit as "Wall Openings", "Door" Elements, "Window" Elements, or by Editing the Profile of the wall. All of these opening types are linked to RISA as openings in the wall panel. Openings which are Excluded from the Analytical Model in Revit (accessible through the Analytical Adjust mode) are ignored by the Link. Openings which violate the limitations of wall openings in RISA are not transferred to the RISA model, such as door openings at the corner of a wall (resulting in an L-shaped wall). Only rectangular openings are supported.

Geometry

RISA-3D only supports rectangular walls. RISAFloor supports rectangular walls, and walls with a monoslope on top only if the top of the wall is at the top-most level of the building. Walls which do not meet the limitations of RISA are either flattened on top, modified to be rectangular based on the smallest possible bounding rectangle, or not brought over at all. The link provides a warning whenever the wall is modified during transfer to RISA, due to RISA limitations.

Embedded Columns

RISAFloor does not support embedded columns within walls. Therefore, walls in Revit that have embedded columns are split into multiple walls in RISA, with each wall butting up against the column. The Link keeps track of these split walls, and brings them back as a single wall element during round trips to Revit. In the case of wall parameters not matching (e.g. different wall thicknesses) the properties from one of the two walls from RISA will be assigned to the single wall in Revit.

Note:

- Do not rename the split walls in RISA. Otherwise the Link will no longer be able to recombine them to the single wall in Revit, since the Link uses the wall name to keep track of the splitting/recombining.

Base Constraint/Offset

These parameters are only used when linking the Revit Physical model to RISAFloor. When linking to RISAFloor, the Base Constraint parameter of the Revit Wall is used to determine the base of the structure. The Base Level should not include structural framing, and there should be no structural framing below the Base Level other than foundation elements. The Base Constraint is then used to set the "Distance Below" parameter in the RISAFloor Wall Panels spreadsheet.

For walls not terminating at the "base" of the structure, the Base Constraint sets the bottom-most Floor where that wall exists. This sets the "Bottom Floor" parameter in the RISAFloor Wall Panels spreadsheet. See the Columns topic for more information.

These Parameters are not used when linking to RISA-3D.

Top Constraint

This parameter is only used when linking the Revit Physical model to RISAFloor. When linking to RISAFloor, the Top Constraint parameter of the Revit column is used to set the top-most floor where the column exists. This sets the "Top Floor" parameter in the RISAFloor Wall Panels spreadsheet.

These Parameters are not used when linking to RISA-3D.

Wall Stacks

For masonry and concrete walls, with consistent thickness, material, reinforcing, etc over their entire height it is best to define a single wall spanning multiple stories, as opposed to wood walls where it is best to define a separate wall at each story, with the walls stacking atop each other. The RISA-Revit Link also supports the "Stacked Wall" element in Revit. The stacked wall is split into multiple elements when transferring into RISA, similar to the behavior of Embedded Columns (see above). Each wall in RISA that was split from the Stacked Wall in Revit links its information back to Revit for the specific location in the stacked wall.

Enable Analytical Model

This flag in Revit allows the user to designate a wall as non-analytical. Any element that does not have its Analytical Model enabled is ignored by the RISA-Revit Link. Therefore this flag is a useful way to have the Link ignore walls that are not intended for RISA analysis, such as partition walls.

Wood Wall Design

For wood walls the Physical Wall Element has design information imported from RISA. This does not export back to RISA, and this information is overwritten with each import from RISA. Parameters are created for the sheathing grade, sheathing thickness (including whether sheathing is one sided or on both sides of the wall), and the nailing required at the edge of each piece of sheathing. The stud size, stud spacing, and chord size is also imported from RISA into Revit.

Analyze As

This analytical parameter is used to designate which walls are part of the lateral force resisting system (shear walls) versus the walls which are intended to support gravity loads only (bearing walls). This maps to the "Function" parameter in the Wall Panels spreadsheet in RISAFloor. Walls designated as "Lateral" or "Gravity and Lateral" will appear in both RISAFloor and the RISA-3D model embedded under RISAFloor. Walls designated as "Gravity" will appear only in RISAFloor, and not in the RISA-3D model embedded under RISAFloor. This parameter is not used when linking only to RISA-3D.

RISAWall Label

The RISAWall Label parameter in Revit is a RISA parameter which is filled in by the wall label from the RISA model. This is a one way link, which means that RISA wall label is only transferred from RISA to Revit, not from Revit to RISA.

Footings

Footings within RISAFoundation (embedded under RISAFloor or RISA-3D) are linked to Revit as Isolated Structural Foundations. To import footings from RISAFoundation into Revit there must be a solution file saved with the RISAFoundation model. Only rectangular footings are supported.

Dimensions

The dimensions of a Revit Footing are imported to RISAFoundation as the "Footing Definition". RISAFoundation is intended to optimize footing sizes by providing a user input with a Min and Max Length, Width, and Thickness. When exporting from Revit to RISAFoundation, each footing is assigned a Footing Definition where the Min and Max values for each dimension are set to the same value, effectively turning off the optimization. When importing from RISAFoundation into Revit the footing size is determined from the RISAFoundation solution, and new family types are created to match those dimensions.

Material

The Revit Material is linked to the Material designated in the RISAFoundation Footing Definitions spreadsheet. For more information on Material linking see the Materials topic.

Enable Analytical Model

This flag in Revit allows the user to designate a footing as non-analytical. Any element that does not have its Analytical Model enabled is ignored by the RISA-Revit Link. Therefore this flag is a useful way to have the Link ignore footings that are not intended for RISA analysis.

Footing Pedestals

in Revit, concrete columns that have the "RISA Pedestal" analytical parameter turned on, and which sit atop Isolated Structural Foundations, are treated as Pedestals. This means that they are linked to RISAFoundation as the footing pedestal. These columns are not imported to RISA-3D or RISAFloor as columns. The dimensions of the footing pedestal are linked to the pedestal dimensions in the Footing Definitions spreadsheet of RISAFoundation.

Note:

- Footings that are not attached to a column are imported to Revit at the lowest Level in the Revit model.
- Footings that are attached to a column are imported to Revit at the bottom of that column.
- Footings are not allowed to overlap in plan, even if one is above or below another.

Foundation Slabs

Mat Slabs within RISAFoundation (embedded under RISAFloor or RISA-3D) are linked to Revit as Structural Foundation Slabs. RISA does not have an elevation parameter for foundation slabs, so they are always imported to Revit at the lowest Level in the Revit model. Their elevation in the Revit model is not altered during round-tripping, so you may set the elevation for each slab correctly in Revit and it will remain there.

Slab Openings

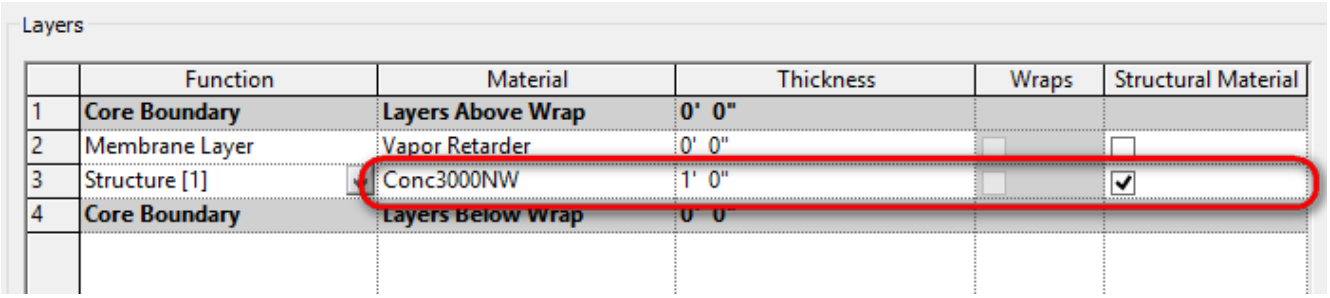
Slab openings in Revit may be represented by drawing internal loops using the "Edit Profile" tool in Revit. If the opening has any curves the curve will be broken up into straight-line segments approximating the curve when exporting to RISAFoundation.

Thickened Regions

In RISAFoundation, thickened regions may be defined within slabs. Because a given foundation slab must be of uniform thickness in Revit, when importing to Revit the Link creates an additional slab underneath the main slab, to represent the thickened portion. The fact that this additional slab is actually a thickened part of the main slab is then remembered during round-tripping.

Structure/Assembly

Each Foundation Slab in Revit has a "Structure" assembly which defines the makeup of the slab. Only the layer that is marked as the "Structural Material" is linked to RISA. The Material determines the concrete properties and the thickness determines the thickness of the slab (linked to the Material and Thickness parameters in the RISAFoundation Slabs spreadsheet).



Enable Analytical Model

This flag in Revit allows the user to designate a foundation slab as non-analytical. Any element that does not have its Analytical Model enabled is ignored by the RISA-Revit Link. Therefore this flag is a useful way to have the Link ignore foundation slabs that are not intended for RISA analysis.

Foundation Slab Pedestals

in Revit, concrete columns that have the "RISA Pedestal" analytical parameter turned on, and which do not sit above Footings, are treated as Pedestals. This means that they are linked to RISAFoundation as the foundation slab pedestal. These columns are not imported to RISA-3D or RISAFloor as columns. The dimensions of the foundation pedestal are linked to the pedestal dimensions in the Pedestals spreadsheet of RISAFoundation.

Note:

- Unless all columns terminate at the same elevation *and* all pedestals are the same height, all Foundation Slabs and Pedestals are imported 20 feet below the bottom-most Revit Level during their first import to Revit. This is because RISAFoundation does not contain elevation data for foundation elements. You can correct the elevation in Revit and your changes will remain through subsequent round trips of those elements.

Grids

Project Girds within RISAFloor and RISA-3D are linked to Revit as Grids. RISA does not have an elevation parameter for grids, so they are always imported to Revit at elevation 0'-0".

Decks/Diaphragms/Floor Slabs

Revit Floor elements are linked to RISAFloor as explicitly defined Decks. The contiguous perimeter of a Revit Floor or group of Floors is linked to RISAFloor as the Diaphragm Edge. Revit Floors are not linked to RISA-3D.

Elevated Slabs

On Revit Levels that have the "RISA Elevated Slab" parameter turned on, the Floor element in Revit is linked as a Slab in RISAFloor ES

Note:

- In RISAFloor ES, thickened regions may be defined within slabs. Because a given Floor must be of uniform thickness in Revit, when importing to Revit the Link creates an additional floor slab underneath the main

floor slab, to represent the thickened portion. The fact that this additional slab is actually a thickened part of the main slab is then remembered during round-tripping.

- Drop Panels in RISAFloor ES are imported to Revit using the geometry of the Column Strip from RISAFloor ES. Since this is not always accurate for construction, you may edit the profile of the Drop Panel element that is imported to Revit and its geometry will be remembered during round trips. Drop Panel geometry other than Thickness is never exported to RISAFloor ES.

Diaphragm Edge Overhang

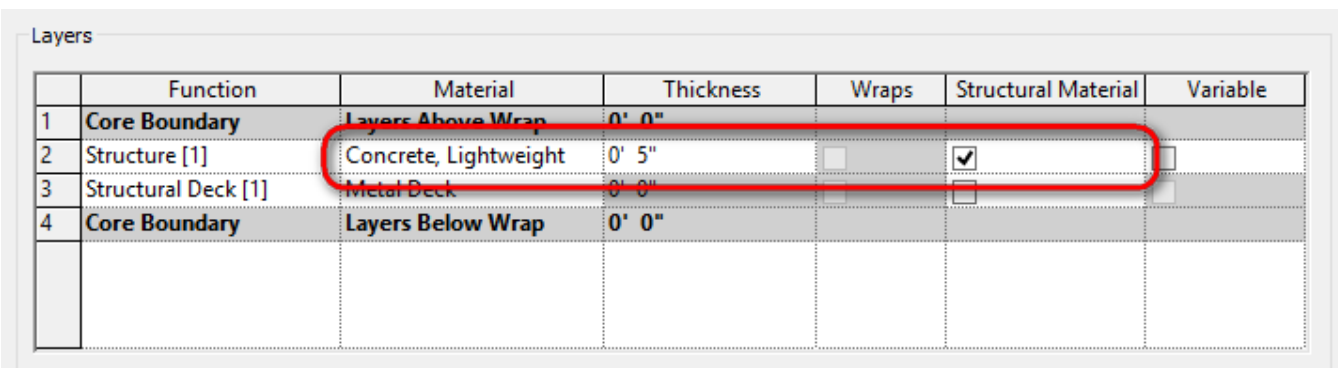
The Diaphragm Edge overhang is approximated when exporting from RISAFloor to Revit, based on the location of the physical Revit Floor edge relative to the perimeter beam which that Floor edge projects from. This frequently requires adjustment in RISAFloor since the Link can only approximate the intended overhang.

Openings

Diaphragm Openings in RISAFloor are linked to Revit as "Vertical Opening" or "Shaft Opening" elements. When importing from RISAFloor to Revit new openings are always created as Vertical Openings. Shaft openings may be defined in Revit, exported to RISAFloor, and then will be remembered during round-trips. The opening overhang is approximated when exporting from RISAFloor to Revit, based on the location of the Revit opening edge relative to the perimeter beams which that opening edge projects from. This means that a closed circuit of beams must be placed around every opening in Revit in order to get proper load attribution in RISAFloor.

Structure/Assembly

Each Floor in Revit has a "Structure" assembly which defines the makeup of the floor. Only the layer that is marked as the "Structural Material" is linked to RISA. The Material determines the concrete properties and the thickness determines the thickness of the slab. These properties are typically insufficient for RISAFloor though, so it is recommended that you review and update the Deck Definitions in RISAFloor to ensure that all properties have been entered.



Level

This parameter is only used when linking the Revit Physical model to RISAFloor. When linking to RISAFloor, the Level parameter of the Revit Floor is used to determine which floor the Deck and Diaphragm Edge should exist on.

Enable Analytical Model

This flag in Revit allows the user to designate a footing as non-analytical. Any element that does not have its Analytical Model enabled is ignored by the RISA-Revit Link. Therefore this flag is a useful way to have the Link ignore footings that are not intended for RISA analysis.

Analyze As

This analytical parameter is used to designate whether the load distribution should be treated as one way or two way. It is linked to RISAFloor as the Two Way checkbox on the Loads tab of the Deck Definitions spreadsheet.

Rebar

The link currently has the ability to export rebar from RISA to Revit for concrete columns, foundation slab pedestals, footings, and footing pedestals. The rebar exporting capabilities will be expanded in upcoming versions, and eventually two way transfer will be possible. The rebar in Revit is overwritten during each export from RISA if the rebar design in RISA changed since the last import to Revit.

RISA is seeking as much feedback as possible on this new feature. Please provide any feedback that you have regarding this feature to RISA so that the future development can proceed in a direction that makes this feature as useful as possible.

Note:

- When linking to RISAFloor it is important to go back to RISAFloor after solving in RISA-3D and solve one more time in RISAFloor so that the rebar design is consistent between the RISAFloor solution and the RISA-3D solution. Otherwise the rebar exported to Revit will only match one of the solutions in RISA (since the RISA solutions would have two different designs).
- A RISAFoundation saved solution is required in order to import Footing and Pedestal rebar to Revit.
- Only equally spaced rebar in footings may be imported to Revit. Footings with banded rebar have their rebar ignored for import.

Materials

Materials in Revit are linked to materials in RISA. The Mapping File is used for transferring materials between RISA and Revit. The following material types are supported:

- Hot Rolled Steel
- Cold Formed Steel
- Concrete
- Wood
- General
- Aluminum
- Masonry

Many material parameters that RISA needs for analysis and design are either incorrect, or not present in the default Revit libraries. Therefore it is recommended that all material properties be reviewed and updated in the RISA Materials spreadsheet after exporting to RISA.

Note:

- Currently wood species information is not linked between RISA and Revit. Revit creates a default wood material when exporting to RISA, and RISA creates a default wood material when importing to Revit. The material is not updated or affected during round trips.

Boundary Conditions

Boundary conditions assigned to Joints in RISA-3D are linked to Revit as Boundary Conditions. Translations, rotations, and spring stiffnesses are supported. Pinned boundary conditions are automatically applied to the bottom of column stacks transferred to RISA-3D regardless of whether the Boundary Condtions box was checked in the Export dialog. to prevent instabilities.

Loads

Note:

- Only loads applied in Global Directions are supported. All others are ignored.

Point Loads

Point and Joint loads defined within RISA-3D and RISAFloor are transferred to Revit as Point Loads. Point Loads in Revit are transferred to RISA-3D and RISAFloor as Point or Joint loads, depending on whether the load falls on a member or a joint.

Line Loads

Distributed Loads defined within RISA-3D and RISAFloor are transferred to Revit as Line Loads. Line Loads in Revit are transferred to RISA-3D and RISAFloor as distributed loads.

Note:

- Revit Line Loads which span multiple members will be broken down into multiple distributed loads when transferred to RISA-3D.

Area Loads

Area Loads defined in RISA-3D and RISAFloor are transferred to Revit as Area Loads. Area Loads defined in Revit are transferred to RISA-3D and RISAFloor as Area Loads.

Note:

- Revit Area Loads which are defined by more than 4-points are ignored by the Link when transferring to RISA-3D.
- Each Revit Area Load is given its own Area Load definition within RISAFloor. Identical area loads are lumped into one Definition.
- Revit only allows one load case per load. Therefore when importing RISAFloor into Revit, only one load magnitude will be transferred from a given Area Load Definition. The load chosen will be the first encountered in the following order: LL, DL, OL1, etc..

Load Cases/Categories

Load Cases and Categories are mapped between RISA and Revit using the Mapping File.

Load Combinations

The transfer of Load Combinations between RISA and Revit is limited due to inherent differences in how the programs handle them.

Note:

- The "State" flag within Revit maps to the "Service" flag within RISA-3D
- The "Type" flag within Revit maps to the "Solve" flag within RISA-3D
- RISA-3D only supports load combination nesting up to one level deep. Any further nesting will be ignored by the Link.

Appendix B - Mapping Files

The mapping file may be opened in Microsoft Excel. It can be found the following folder:

C:\RISA User Data\%USERNAME%\Revit Link 2027)

Note:

- If the Revit Link has been installed to a custom location such as C:\RISA then look for the Revit Link 2027 folder under the C:\RISA folder.

RISA and Revit use different terminologies for Shape Names, Material Names, and Load Categories. These terminologies are linked to each other by a process of "Mapping". Mapping is done using a Mapping file designed to be customized per your standards.

Mapping does not need to be done for shapes which share the same name in both RISA and Revit. For example, a W8x10 is called "W8x10" in both programs, so it is omitted from the mapping file, but still transfers. A L3x3x3/16 is called "L3x3x3" in RISA, so it must be mapped and is included in the mapping file.

The Excel based XML mapping file “RISA_Revit_Mapping_File.xml” is installed to the RISA-Revit Link folder. The Link uses the mapping file during transfers between RISA and Revit. The file consists of three tabs: Shapes, Materials, and RF Load Cases.

Shape Mapping

The Shapes tab consists of three columns: “RISA ShapeName”, “REVIT ShapeName”, and “ShapeType”. There are many shapes already mapped in the file that is installed. Additional shapes may be added, and existing shapes may be changed.

The Link looks for shape names from this tab of the spreadsheet. If they are not found, it looks for shape names that are identical between RISA and Revit, and maps them automatically.

For automatic concrete shape mapping the general conventions must be followed for naming in Revit. For example, rectangular concrete shapes must be named in the format 'a x b' and circular shapes must be named in the format ' c" '. a, b, and c are the width, depth and diameter respectively. It is important to note that Revit stores rectangular concrete shape names as ‘width x depth’ whereas RISA stores these names as ‘depth x width’. This behavior is being accounted for by the Link.

The following ‘Shape Types’ should be used in the Shape Mapping File.

Hot Rolled	
WF_SHAPE	Wide Flange
TUBE_SHAPE	Tube
PIPE_SHAPE	Pipe
CHANNEL_SHAPE	Channel
WT_SHAPE	WT
DBL_L_SHAPE	Double L
SNGL_L_SHAPE	Single L
RECT_SHAPE	Rectangular
BAR_SHAPE	Bar
TAP_WF_SHAPE	Tapered Wide Flange
Wood	
NDS_SHAPE	Rectangular
NDS_ROUND_SHAPE	Round

Concrete	
CRECT_SHAPE	Rectangular
CRND_SHAPE	Round
CL_SHAPE	L Shape
CT_SHAPE	T Shape
Joists	
KJOIST_SHAPE	K Joist
LHJOIST_SHAPE	LH Joist
DLHJOIST_SHAPE	DLH Joist
SLHJOIST_SHAPE	SLH Joist
KCSJOIST_SHAPE	KCS Joist
JOISTGIRDER_SHAPE	Joist Girder
WOOD_JOIST_SHAPE	Wood Joist
Aluminum	
AL_WF_SHAPE	Wide Flange
AL_Z_SHAPE	Zee Shape
AL_T_SHAPE	Tee Shape
AL_PL_SHAPE	Solid Rectangle
AL_L_SHAPE	Single Angle
AL_CS_SHAPE	Cee Shape
AL_ROUNDTUBE_SHAPE	Round Tube
AL_RECTTUBE_SHAPE	Rectangular Tube
Cold-Formed Steel	
CU_SHAPE	Cee Shape
CS_SHAPE	Cee with Lips
ZU_SHAPE	Zee Shape
ZS_SHAPE	Zee with Lips
HU_SHAPE	Hat Shape

Material Mapping

The Materials tab consists of three columns: “RISA MaterialName”, “REVIT MaterialName”, and “MaterialType”. There are many materials already mapped in the file that is installed. Additional materials may be added, and existing shapes may be changed.

Revit to RISA

If the mapping for a particular Revit material exists in the Mapping File, it is mapped over the RISA material name mentioned on the spreadsheet. The material properties are preserved in RISA, and are not overwritten.

If a material match is not found in the mapping file, the Revit material name is sent to RISA. Material properties are created based on Revit material properties during the initial transfer, and are not overwritten thereafter regardless of changes made to the RISA material properties.

RISA to Revit

If the mapping for a particular RISA material exists in the Mapping File, it is mapped over the Revit material name mentioned on the spreadsheet. The material properties in Revit are updated to the RISA material properties.

If a material match is not found in the mapping file, the RISA material name is sent to Revit. Material properties are created based on RISA material properties during the initial transfer.

Available Material Types in RISA	
CONCRETE_MATL	Concrete Material (Family Instances)
HOT_ROLLED_STEEL_MATL	Steel Material (Family Instances)
NDS_WOOD_MATL	Wood Material (Family Instances)
GENERAL_MATL	General Material (WallTypes)

Note:

- The RISA Material Name may not exceed 19 characters in length.
- No two RISA materials should be mapped to the same Revit material.
- No two Revit materials should be mapped to the same RISA material.
- Material property changes should be made in both RISA and Revit simultaneously for consistency.

RISAFloor Load Case Mapping

This RF Load Cases tab consists of three columns: “RISA LoadCaseName”, “REVIT LoadCaseName” and “LoadCaseType”. There are many load cases already mapped in the file that is installed. Additional load cases may be added, and existing shapes may be changed.

RISAFloor is limited to a set of predefined Load Cases (Categories). For this reason, new Revit Load Cases cannot be created in a RISAFloor model, so the Revit Load Cases must be mapped to the RISAFloor ones.

Revit to RISA

The Load Case of every load that is transferred from Revit to RISA is mapped using the mapping file. If no mapping for a given Revit Load Case is present then the load will be transferred to RISAFloor under the OL4 category. RISA-3D does not have this limitation, so it will create new Load Cases using the Revit names.

The “LoadCaseType” is used to distinguish whether the load should be applied to the RISAFloor model, or to the RISA-3D model embedded within RISAFloor.

RISA to Revit

The Load Case of every load that is transferred from RISA to Revit is mapped using the mapping file. If no mapping for a given RISA Load Case is present then a new Load Case will be created in Revit using the RISA Load Case name.

Available Load Cases in RISAFloor	
DL PreComp	Pre Composite Dead Load
DL PostComp	Post Composite Dead Load
LL- Non	Live Load
LL-Reduce	Reducible Live Load
LLS - Non	Live Load Special
LLS-Reduce	Reducible Live Load Special
RLL- Non	Roof Live Load
RLL-Reduce	Reducible Roof Live Load
SL	Snow Load
SLN	Non Shedding Snow Load
RL	Rain Load
OL1	Other Load 1
OL2	Other Load 2

OL3	Other Load 3
OL4	Other Load 4
Dyn Mass	Dynamic Mass
VLL	Vibration Load

Note:

- RISA Load Case names may not exceed 11 characters in length.

Appendix C - Connections

Overview

The RISA-Revit Link has the ability to export connections assigned in Revit to RISAConnection for design. The connection types currently supported by the link are listed below. The link will send the member geometry, loads, connection type, and design code information to RISAConnection. After the connections are exported to RISAConnection, the engineer can make modifications to the connection assembly and perform code checks per the selected AISC or Canadian design codes. Once the engineer is satisfied with an appropriate connection design, the updated RISAConnection file can be imported back into Revit. The imported connections will reflect the geometry changes and also provide basic code checking information from RISAConnection.

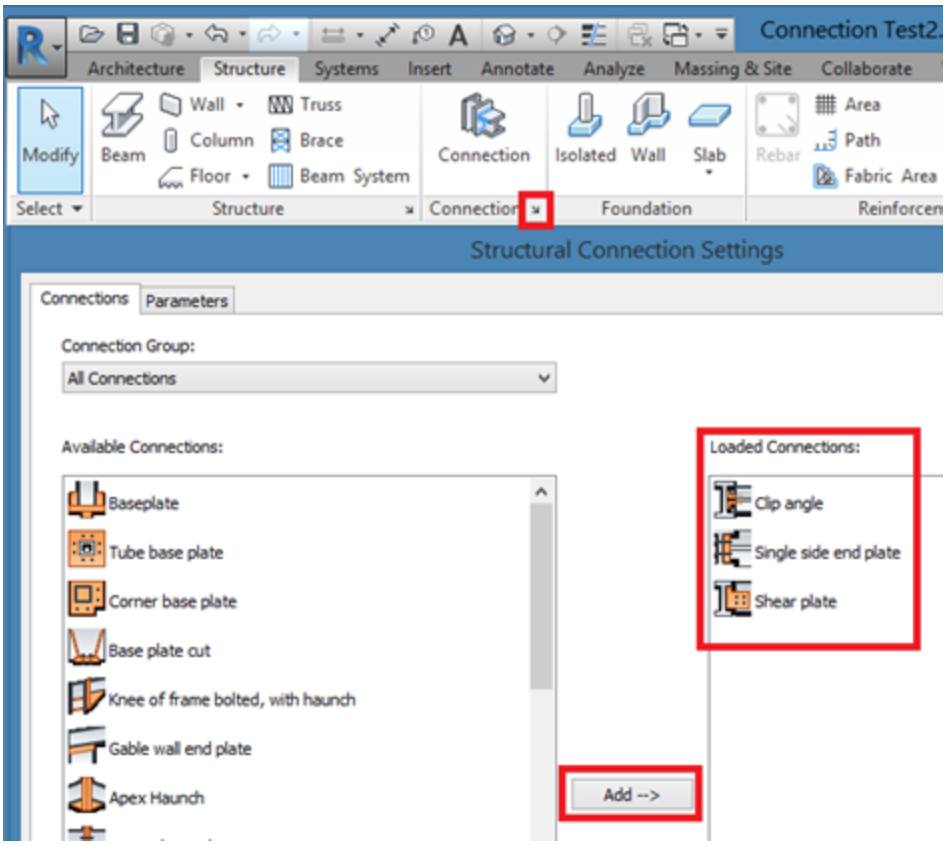
Assigning Structural Connections in Revit

The connection types which are currently supported by the RISA-Revit link are listed below:

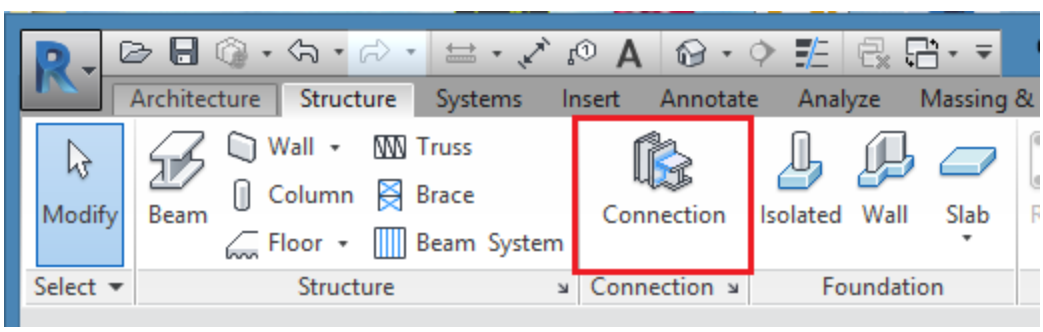
- Beam to Column Shear Connections (shear tab, clip angle, end plate).
    - Columns may be Wide Flanges, HSS tubes, or HSS pipes (shear tab only).
    - Beams may be Wide Flanges or Channels (not for end plate).
- Beam to Girder Shear Connections (shear tab, clip angle, end plate).
    - Girders may only be Wide Flanges.
    - Beams may be Wide Flanges or Channels (not for end plate)
- Shear Splices For Beams and Columns
    - Beams may only be Wide Flanges
    - Columns may only be Wide Flanges
- Moment Splices for Beams and Columns
    - Beams may only be Wide Flanges
    - Columns may only be Wide Flanges
- Beam to Column Moment Connection (end plate, extended end plate, direct weld)
    - Beams may only be Wide Flanges
    - Columns may only be Wide Flanges

The RISA-Revit Link User's Manual is intended to give basic guidance on assigning structural connections in Revit. For further information on assigning connections in Revit; refer to the Revit User's Manual under the structural connections topic.

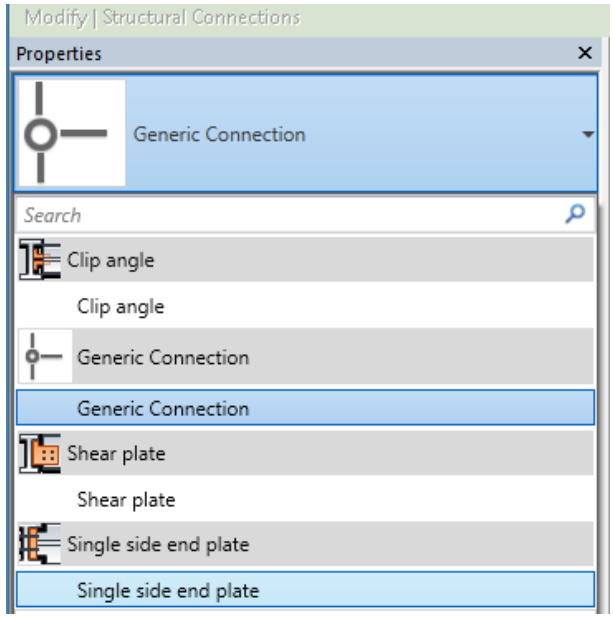
The members in the Revit model must be loaded from the steel families in Revit. The user will also need to load the structural connection types in Revit before they are able to assign them to members in the model. To load the connections, under the Structure menu, click on the connection settings. In the Structural Connection Settings dialog box, add the connection types so that they appear under the loaded connections section.



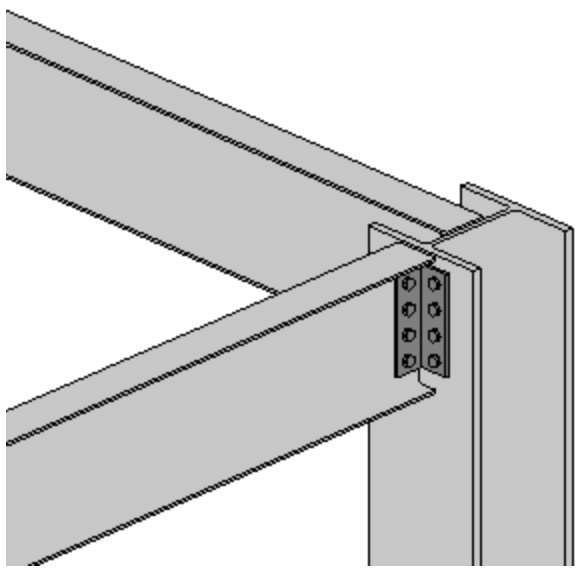
To assign the connection, highlight the members in the connection configuration (eg. the beam and column) and under the Structure menu, click on the connection icon. This will assign a generic connection to those members.



The generic connection will display a circle at the connection joint with line segments out towards the elements included in the connection configuration. After assigning the generic connection, the user can select the appropriate connection type from the drop down menu. The connection must be loaded in the Connection settings prior to assigning them in Revit.

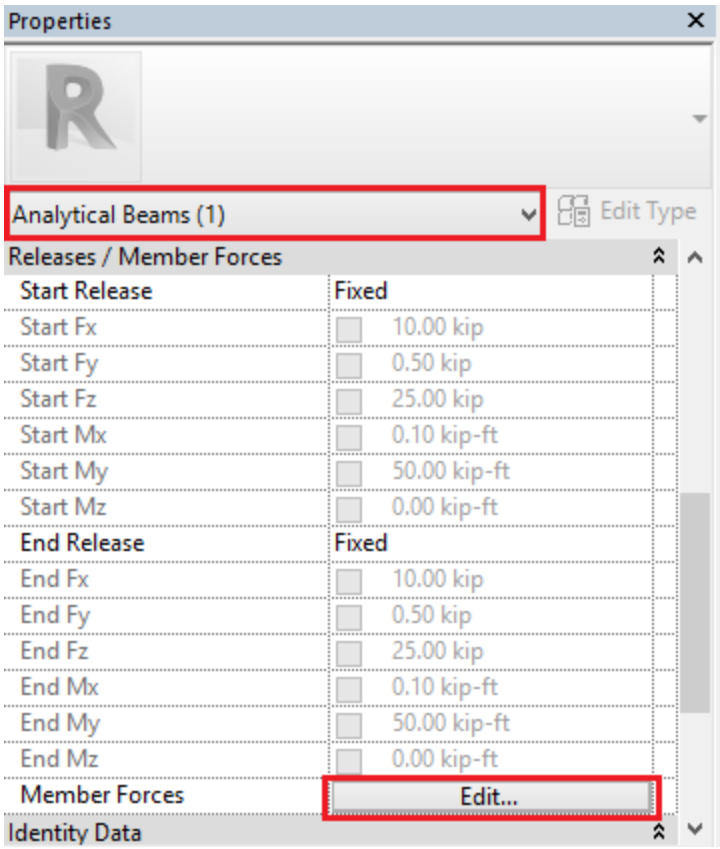


Graphically, the generic connection will change to show details of the connection type selected.

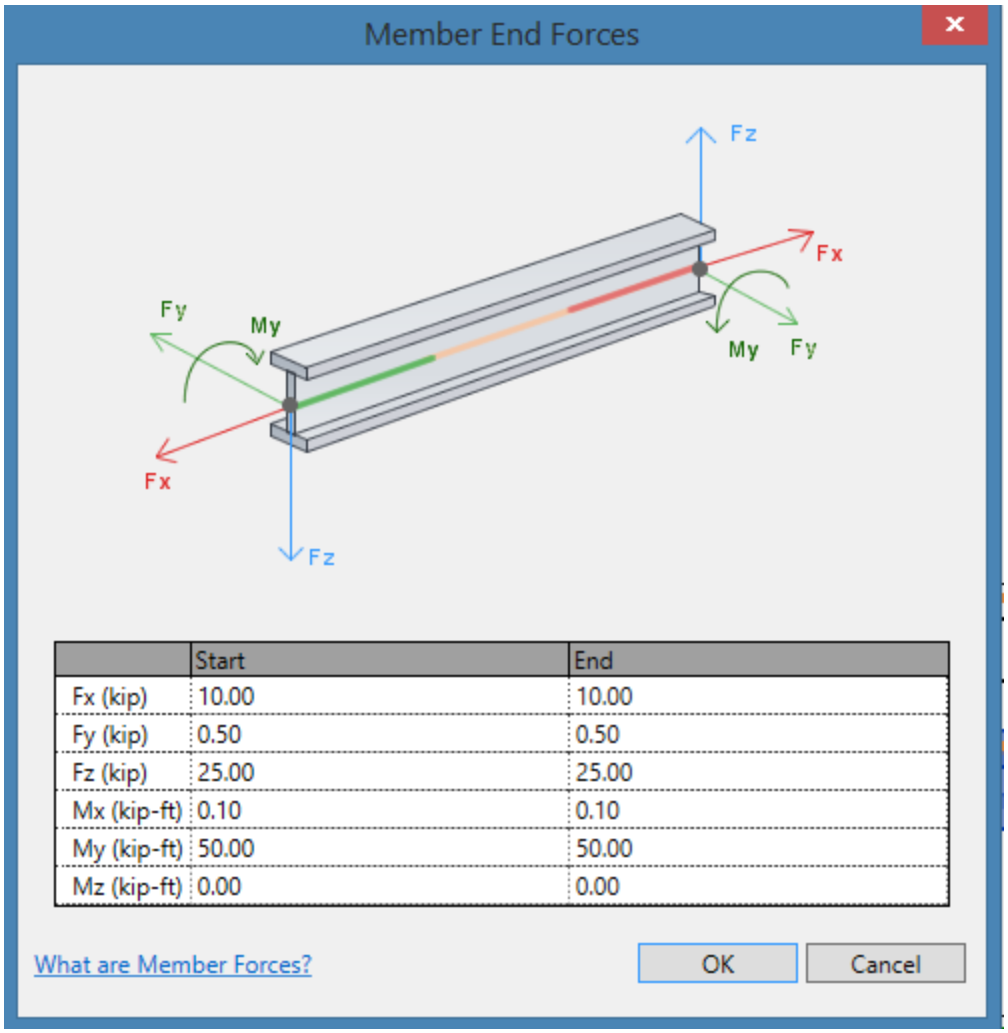


Assigning Loads for Connection Design

The member end forces assigned to the analytical model in Revit will transfer to RISAConnection. If the Revit model was imported from RISA-3D or RISAFloor, these end reactions will automatically transfer as long as the beam end reactions box was checked in the Import from RISA dialog box. To assign an end reaction in a Revit model, click on a member to open the analytical member's properties and enter in the forces under the RISA Start and End Reactions.



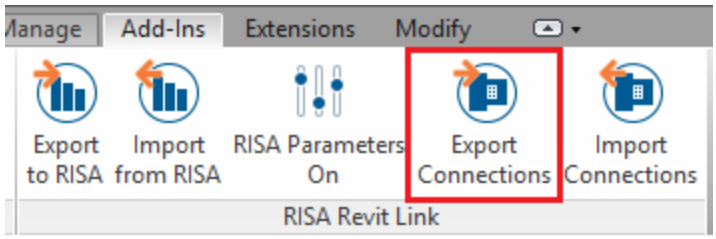
The Edit button under the Member Forces section will allow the user to modify these reactions in the Member End Forces dialog box.



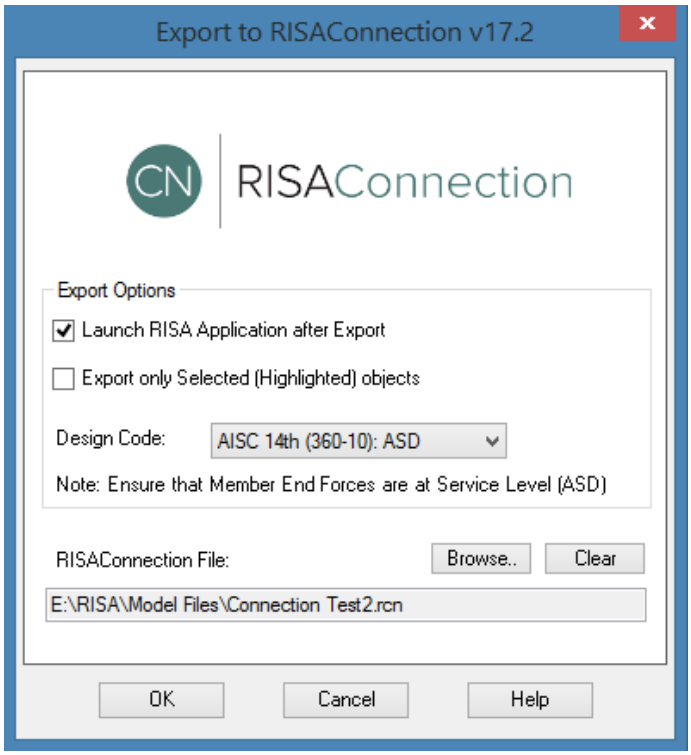
	Start	End
Fx (kip)	10.00	10.00
Fy (kip)	0.50	0.50
Fz (kip)	25.00	25.00
Mx (kip-ft)	0.10	0.10
My (kip-ft)	50.00	50.00
Mz (kip-ft)	0.00	0.00

Export to RISAConnection

After the structural connections are assigned in Revit, the user can export to RISAConnection to design their connections. Click on the Export Connections button under the Add-Ins tab.



The Export to RISAConnection dialog box will appear and the user is prompted with a few options before the file is exported.



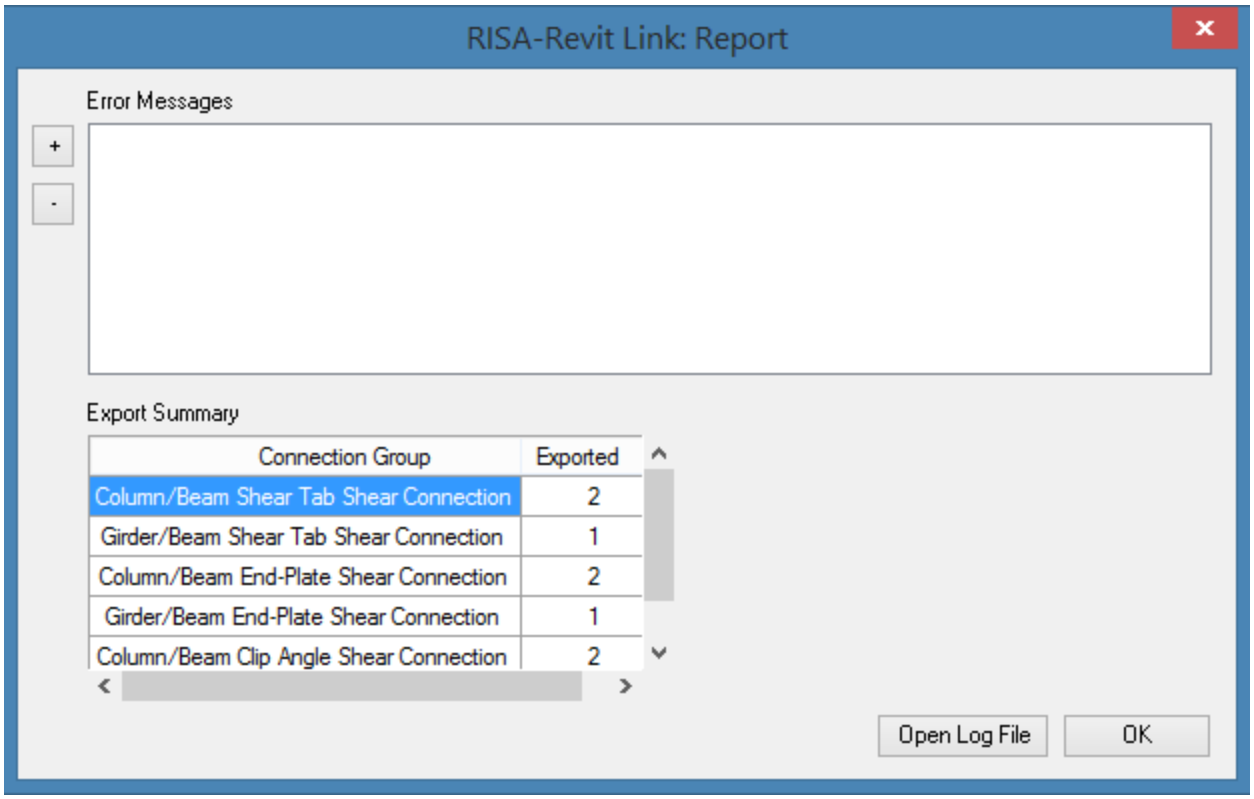
The check box for **Launch RISA Application after Export** will open the RISAConnection program automatically after the connections are exported from Revit. This option is useful when both Revit and RISAConnection are on the same machine. Leaving this option unchecked is useful if Revit and RISAConnection programs are not on the same computer. The .rcn file will be created in the path specified at the bottom of the dialog box. The RISAConnection file can be sent to and opened by the engineer who has RISAConnection installed on their machine.

If the user does not want to export all of the assigned structural connections in their model, they have the option to only export only the selected connections by checking the **Export only Selected (Highlighted) objects** box. This option could be useful if the user is satisfied with a majority of their connection designs and would like to modify or design a few connections in RISAConnection without needing to export and import the entire connection file.

The **Design Code** drop down menu will specify which design code to use for connection design in RISAConnection. The available codes for connection design are dictated by RISAConnection. The end forces will transfer at the magnitude which they are entered. For ASD codes, ensure that the end reactions are entered at the service level or unfactored magnitude. For LRFD design, the magnitude of the load which transfers to RISAConnection assumes that the reactions are factored according to the strength level condition.

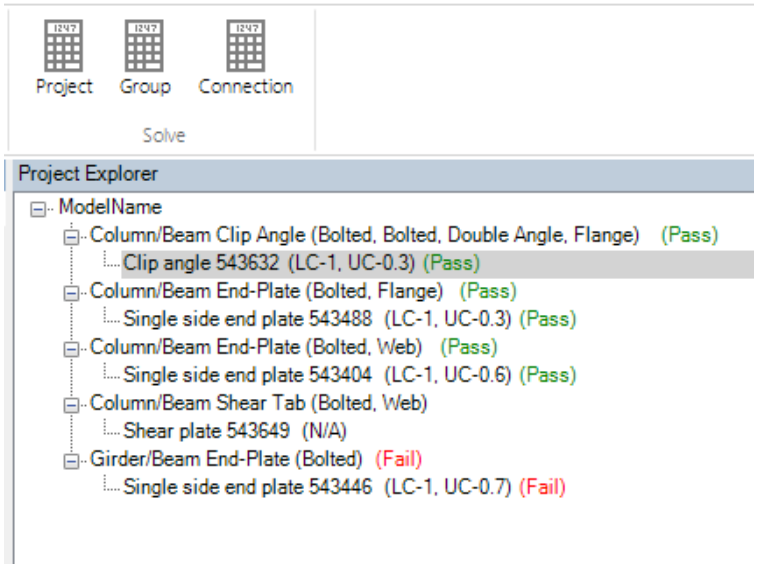
The **RISAConnection File** specifies the path location for the directory where the RISAConnection file will be saved on the user's computer.

Once exported, a RISA-Revit Link Report log will show an export summary of all of the connection types which are included in the .rcn export file. If there are any error messages related to an invalid connection, they will appear in the report. If a connection is invalid, check to see if it is a supported connection and orientation listed under the RISA-Revit link supported connection types above.

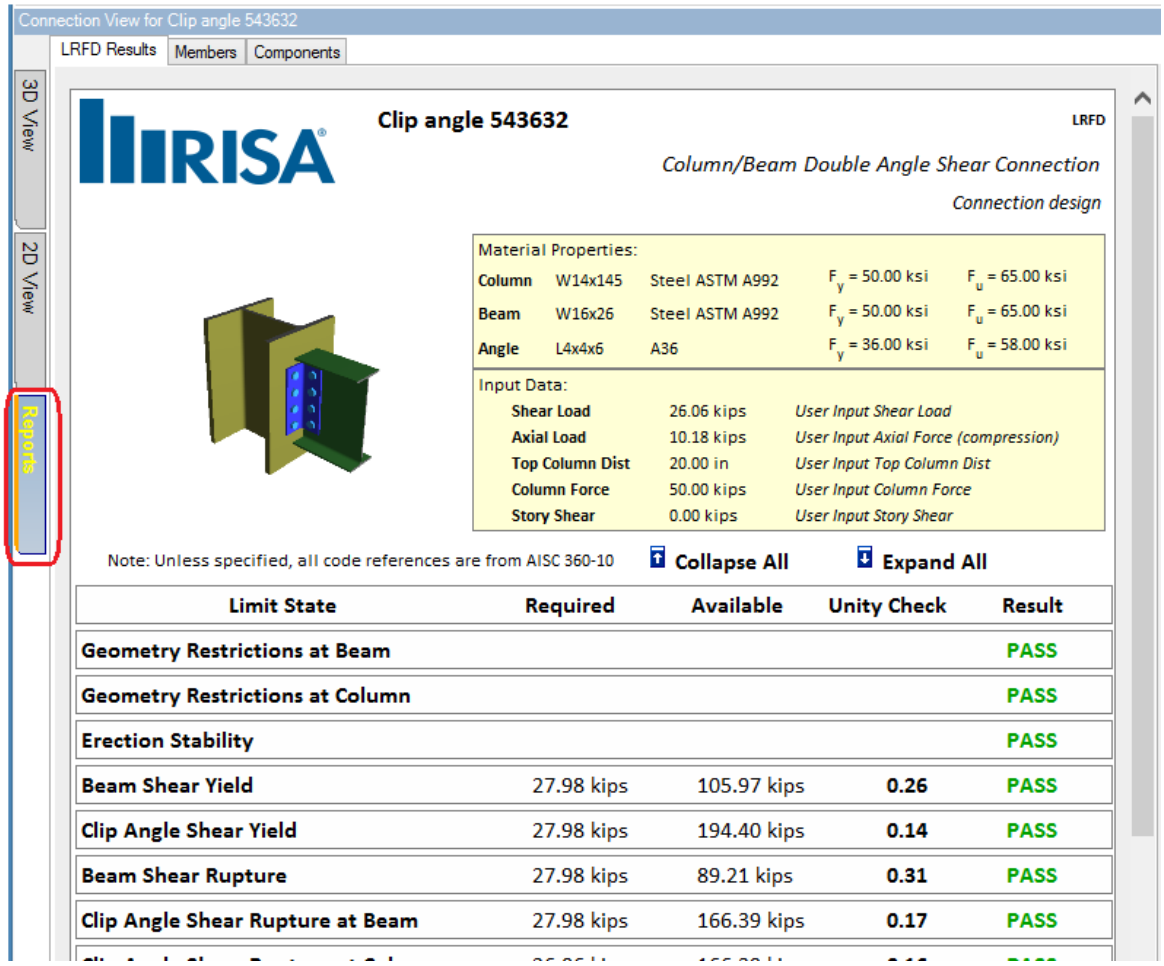


Connection Design in RISAConnection

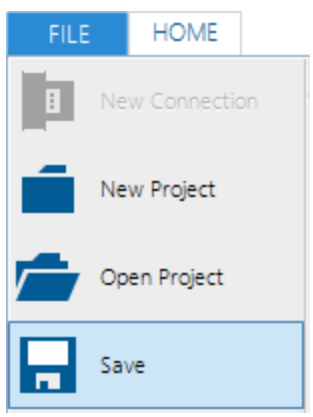
The connections transferred from Revit will appear under RISAConnection's Project Explorer. In RISAConnection the user can solve the connection design for the entire project, by group for a connection type, as well as a single connection. The Project explorer will report the design code check next to each connection as Pass, Fail, or N/A if the connection design calculations were not yet solved for.



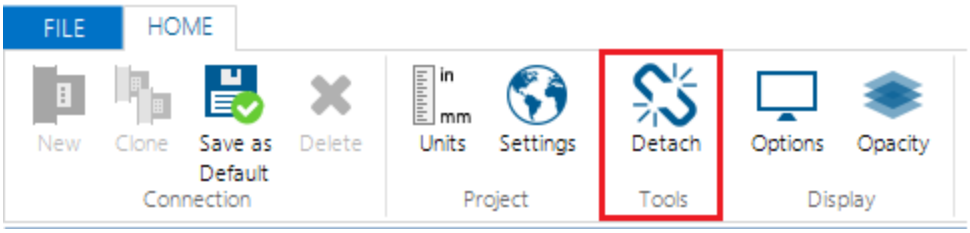
In RISAConnection, the engineer can review the connection report with a summary of the code checks for each limit state.



The engineer can modify the geometry, the bolts, and the welds in RISAConnection to make adjustments to optimize the code checks. After the engineer is satisfied with their connections and code checks, simply save the RISAConnection file and it is ready to be imported back into Revit.



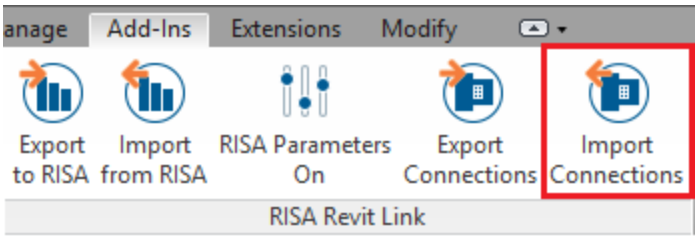
The loads, member sizes, and design code are specified in Revit before the connections are exported to RISAConnection. If the engineer wishes to modify these parameters, there is a menu option to **Detach** the RISAConnection model. The engineer will have full control in a detached file to edit the loads, member sizes, connection type, as well as the design code. A detached model will become a standalone RISAConnection file which severs the link between the Revit model and the RISAConnection model. A detached connection file cannot be imported back into Revit.



Please see the RISAConnection General Reference Manual for guidance on connection design using RISAConnection.

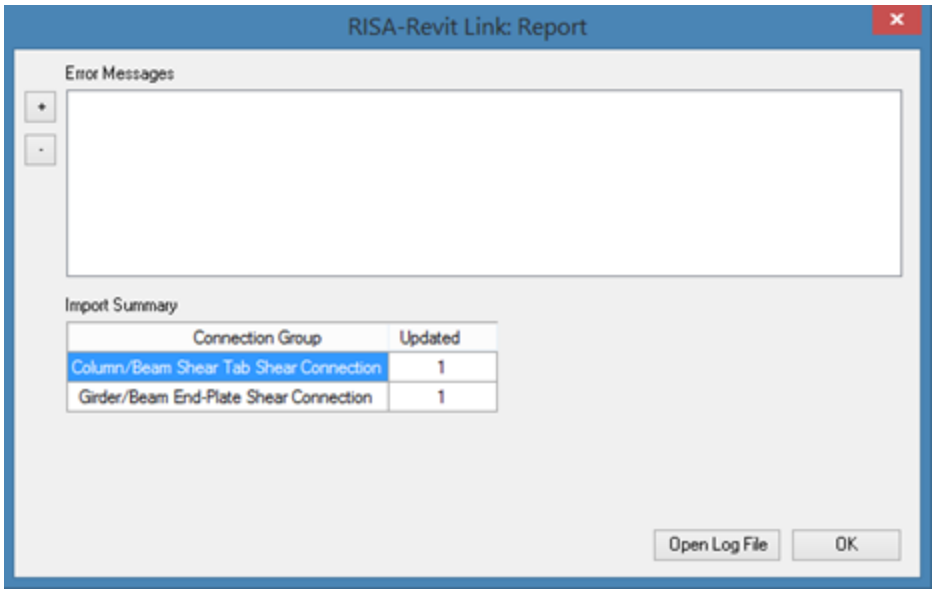
Importing Updated Connections to Revit

The engineer must save the RISAConnection file before importing the updated connections back into Revit. With the same Revit model open, the updated connection file can be transferred back into Revit by clicking on Import Connections under the Add-Ins tab.

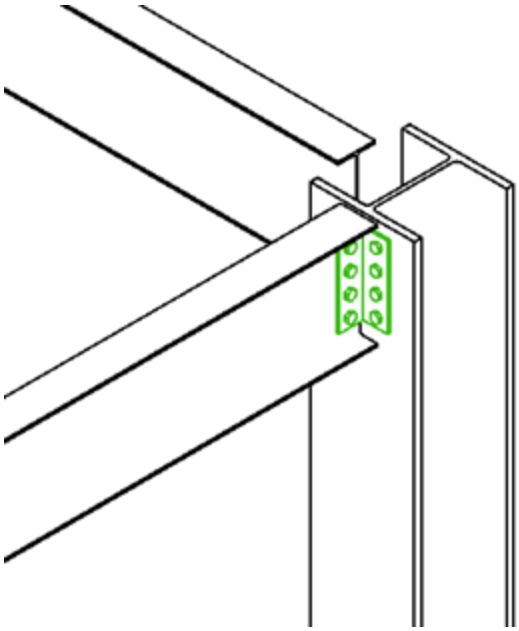


The Import from RISAConnection dialog box allows the user to browse to the path of the connection file. If the updated connection file was saved under the same name, the path should appear automatically.

The RISA-Revit Link Report log will display an import summary of the connections which were updated.



After the updated connections are imported back into Revit, the connections will color code in the model as green, red, or black according to RISA's code check. Green corresponds to a connection with a passing code check, red to a failed code check, and black for a code check which was not calculated in RISAConnection.



Round-Tripping

The Revit user can make adjustments to their model after the connections have been imported back in Revit. If any changes are made to the connection components, the connection must be exported back to RISAConnection to check if the changes made produce an adequate connection design and code check in RISAConnection. The user can then import the updated design back in Revit and repeat this process as needed.

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