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Revit® Structure: Documents, Linking to Third-Party Structural Analysis Programs (Yes, You Can) and Beyond! (Part 2 of Handouts)

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SE214-1L A brief overview of documentation in Revit Structure followed by an introduction to 3rd party analysis for internal electronic data interchange and formats for taking the models downstream into construction.

About the Speaker:

Mr. Ikerd directs INTERTECH Design, Inc.'s, department of Advanced Building Design, which focuses on structural engineering using interoperable data for multidimensional modeling beyond 3D and constructible solutions for project scheduling requirements. Mr. Ikerd is on the National ASCE Structural Engineering Institute committee for BIM, chairs the national sub-committee of SEI on BIM Developments, Software & Training, participates in the National BIM Standards committee, and chairs the Structural Engineers Association of Texas' State Committee on BIM in design, construction, and facility management. He is a speaker, author, and a member of the advisory board for the University of North Texas' Construction Engineering Department where he teaches one of the first classes in the country to incorporate BIM into undergraduate structural design and construction curriculum using Revit Structure.

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These handouts have been developed to make it easier for you to follow the lab exercise. The typical format will be for the instructions to be given on the same page as the corresponding images.

There are 3 main parts to this lab.

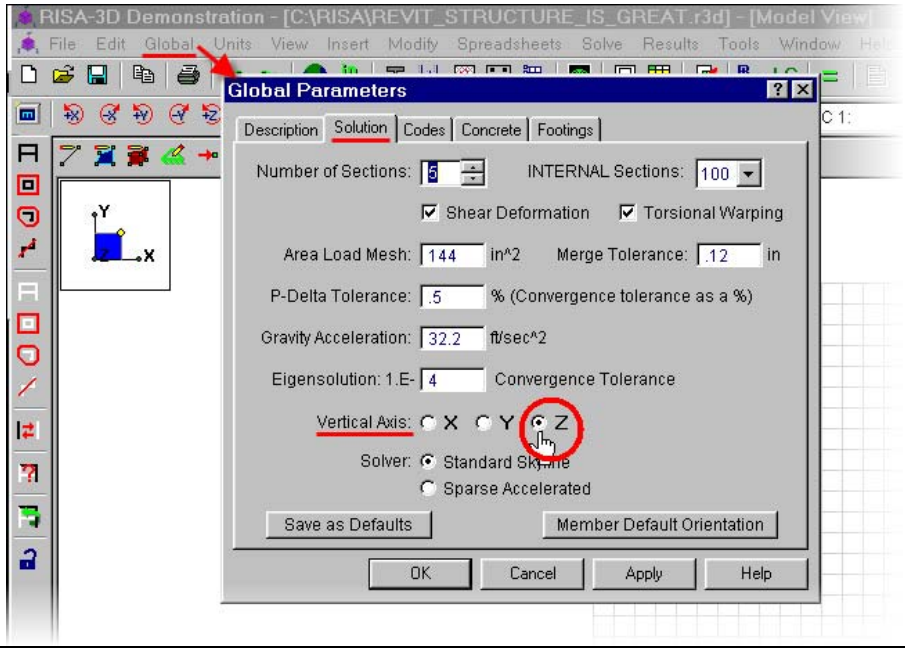
1. The Origin Location Exercise (Making your template), demonstrate creating object externally.
2. Simple steel and concrete structural analysis.
3. Examples of going beyond using Revit Structure for only drawings.

INSTRUCTIONS

Part 1: Origin and Templates

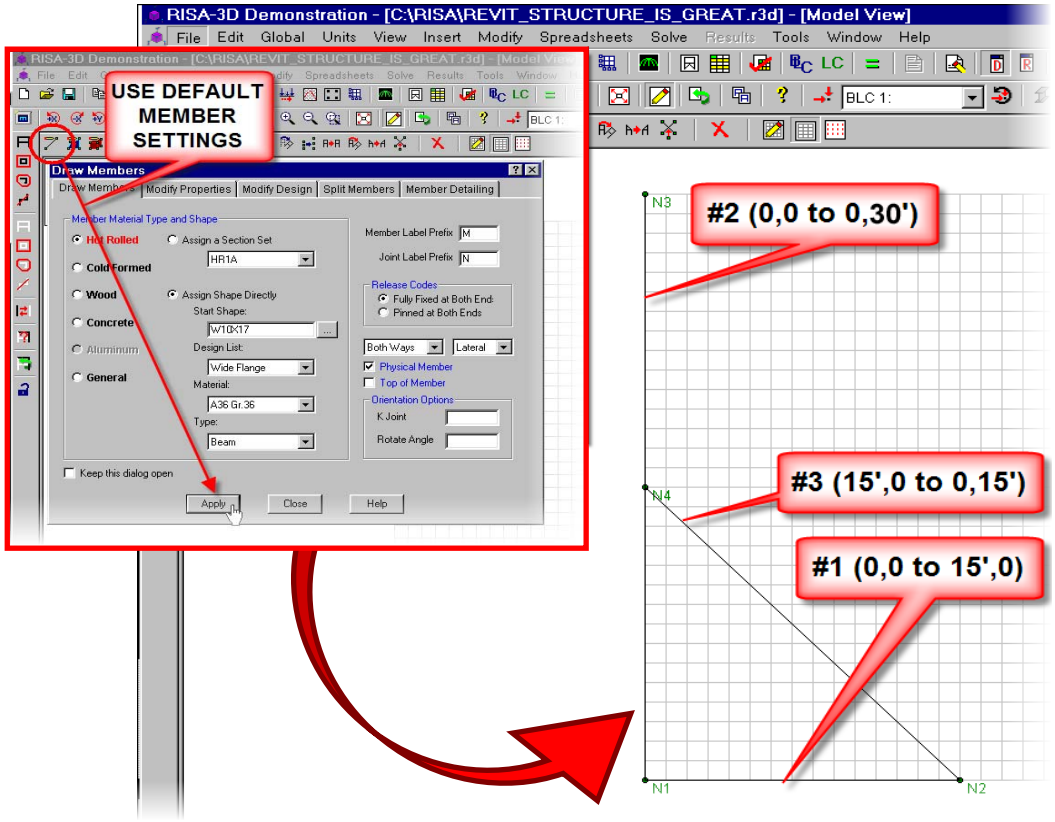
In this first part of the exercise, we will make a very simple model in Risa 3D to understand the origin and direction of the axis between Revit and Risa. We will create 3 members in Risa located at the origin, export them into Revit, and then create a reference system in Revit. Finally, we will create a second Revit file, link in the one with the Risa created members, draw grids in this new second model at the origin corresponding to Risa, and save that model as a Revit Template for future use. NOTE: There may be more expedient methods to approach this problem, but this method was selected because it is very intuitive to follow as we learn to work with 3rd party analysis applications.

P1-1. Open Risa
P1-2. Check Global Settings
1-2.1. Solutions Tab, Set Global Up to Z-axis

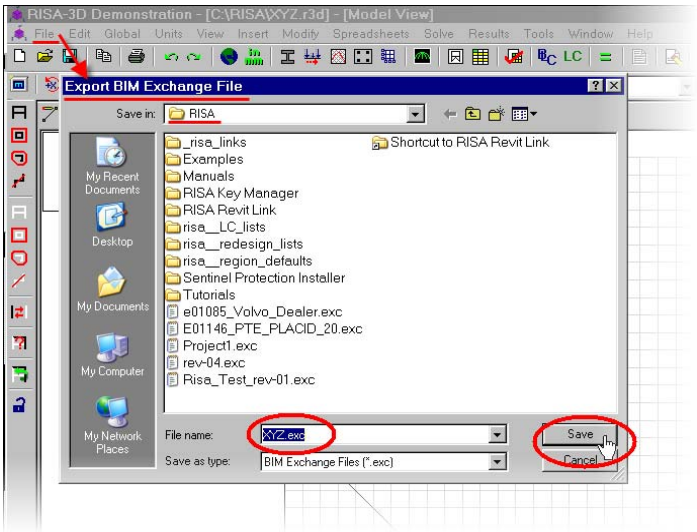


P1-3. Draw 3 members,

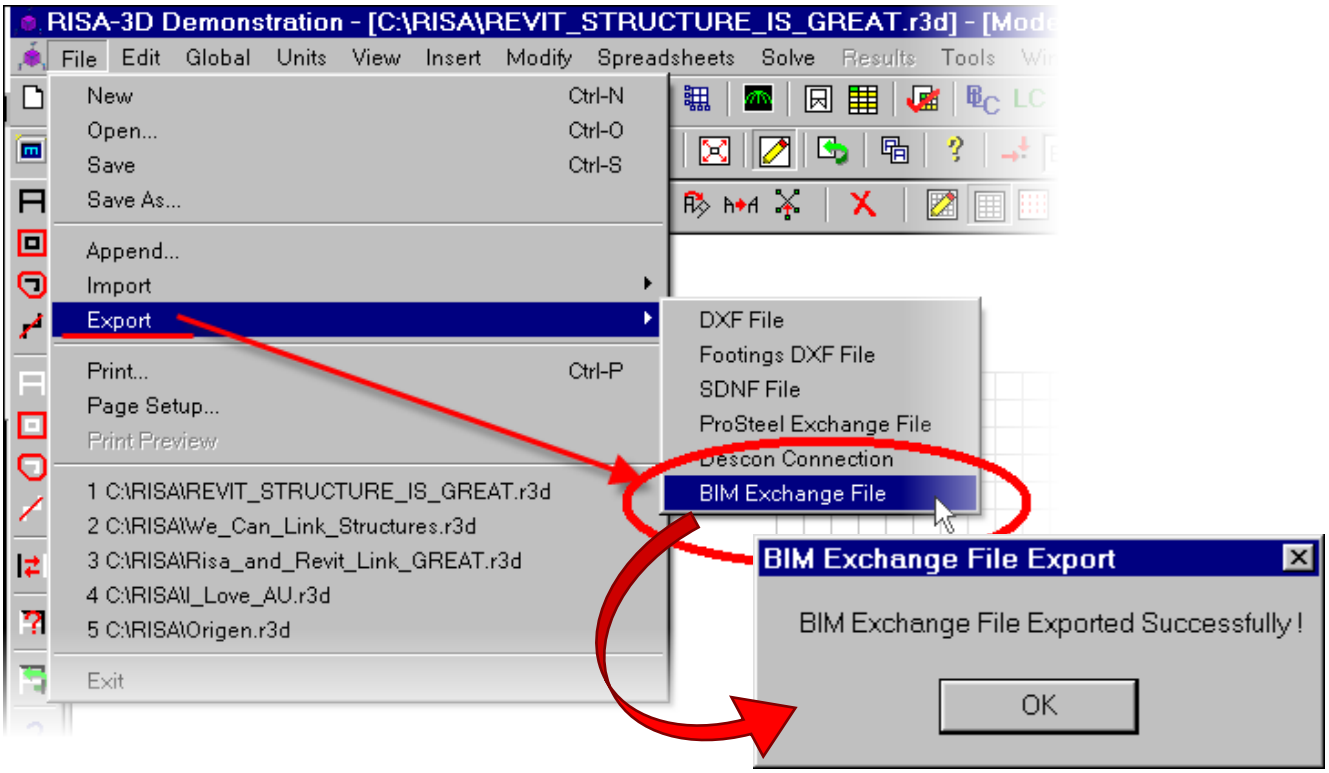
1-3.1. Line 1: from 0,0,0 to 15 feet along the X-axis
1-3.2. Line 2: from 0,0,0 to 30 feet along the Y-axis
1-3.3. Line 3: from 15,0,0 to 0,15,0



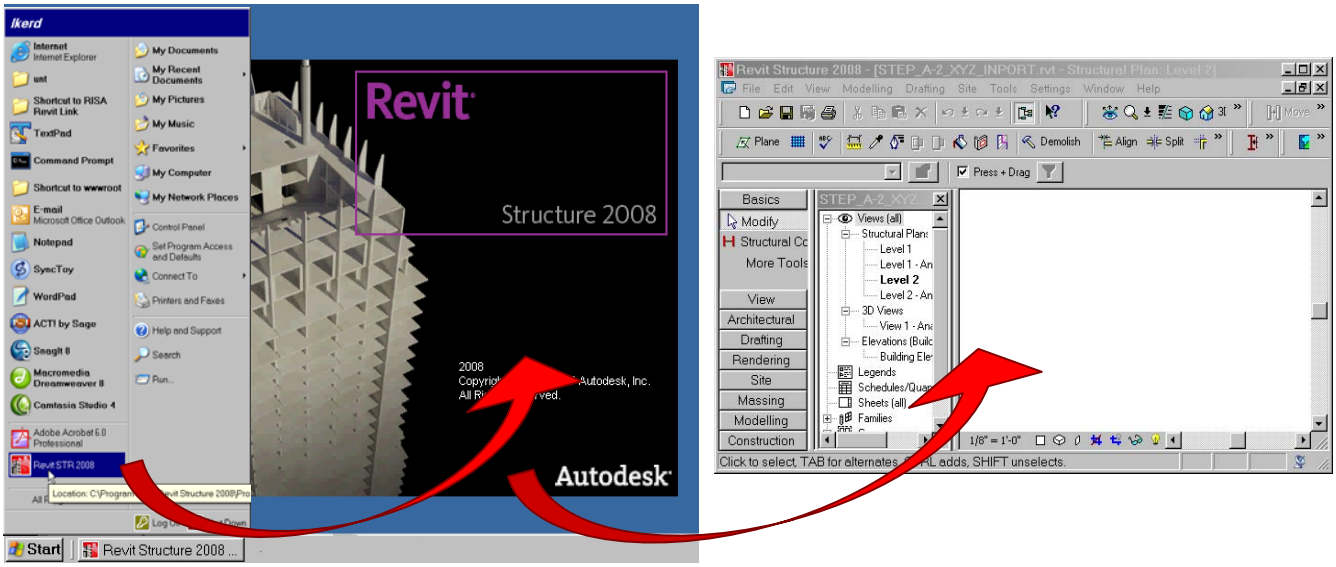
P1-4. Save As with the file name as "XYZ.r3d" (in the My Document Folder)



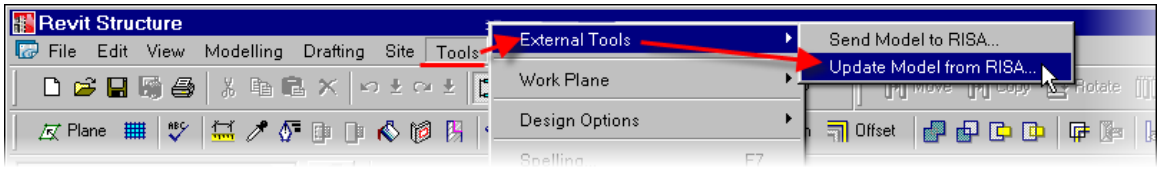
P1-5. Create the BIM Exchange File (default location: C:\RISA\



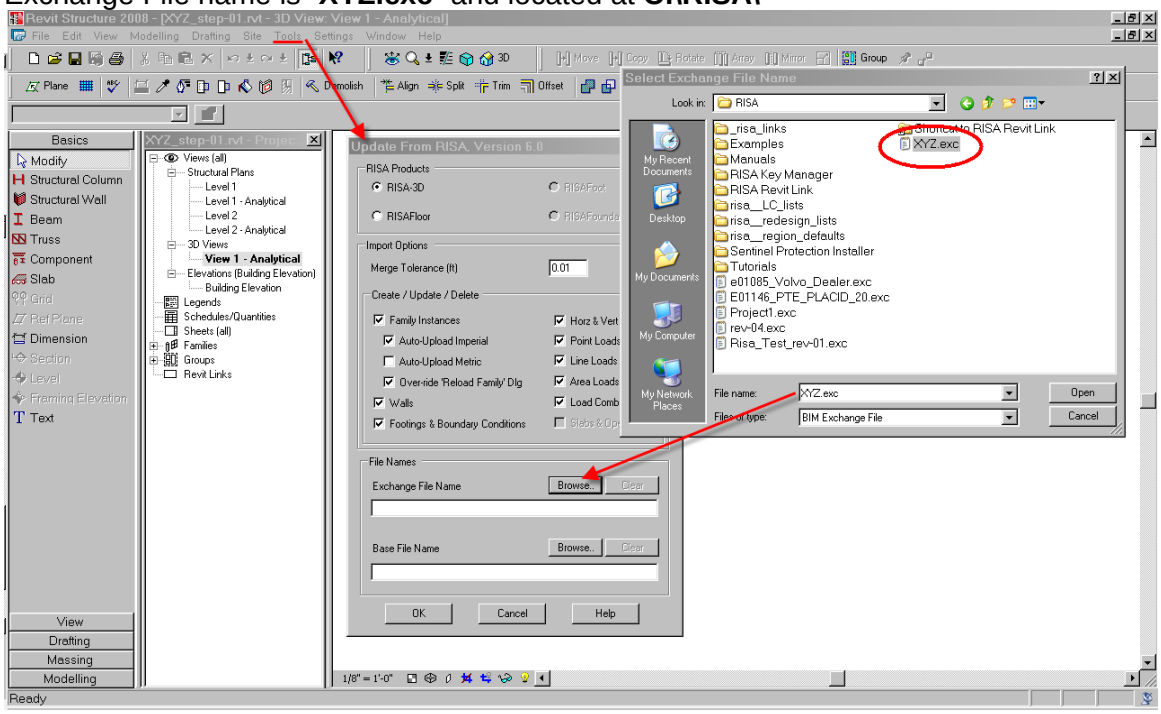
P1-6. Start Revit with the default project started. Save this new project in My Documents as "XYZ_step-01.rvt".



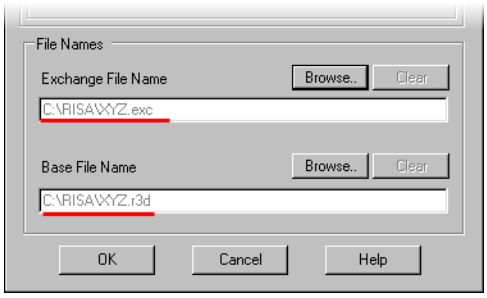
P1-7. Set active view to **3D View** and select the **Tools > External Tools > Update Model from Risa…,** Select the options in the screen below and import the Risa model geometry.

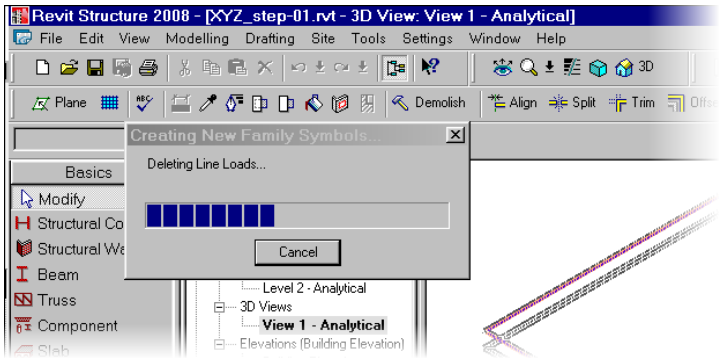


Exchange File name is "**XYZ.exc**" and located at **C:\RISA**

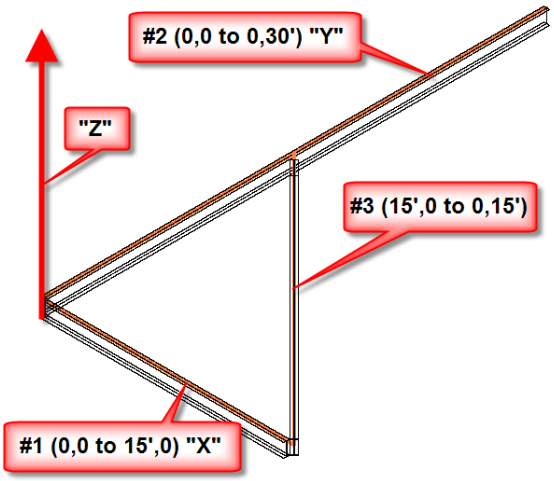


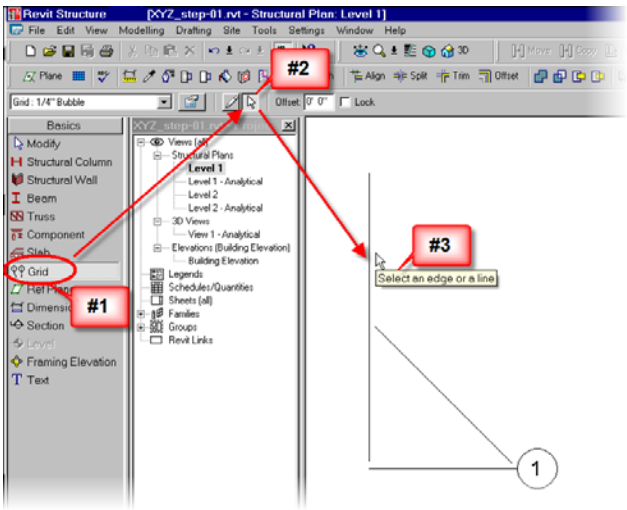
When the exchnage file is loaded, the dialog box should look as follows. **Press "OK" to start the update.** You should see the progress dialog similar to the right hand image below:



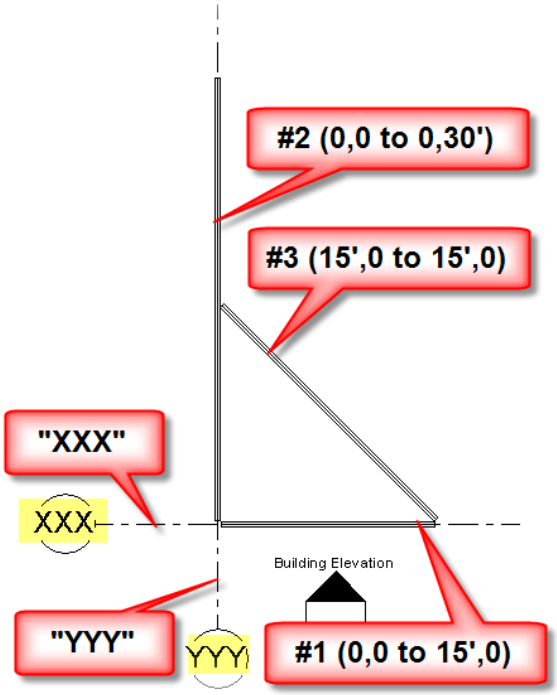


P1-8. View the 3D model and Set some Grids: Look at the members that you created. The short 15' member orthoginal to the longer 30' member is the Global X-axis in Risa. The 30' member is the Global Y-Axis. The intersection of the two is the location of 0,0,0. The vertical direction that columns would be oriented in would be the Z-axis in Risa. **Go to Level 1** in the project Browser and set some reference grids with the Grid tool (see image on right below):

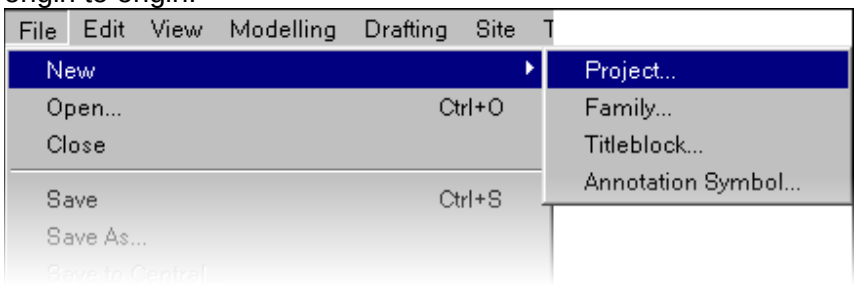




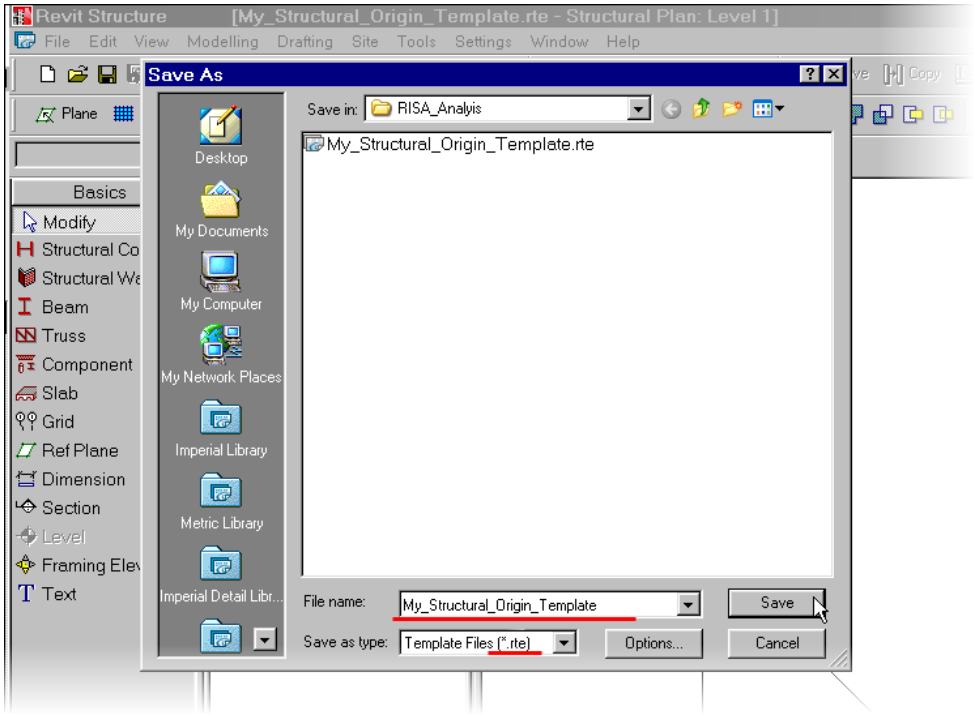
Then Label the new grid lines "XXX" & "YYY" respectively, so that the Level 1 view looks similar to the images below.



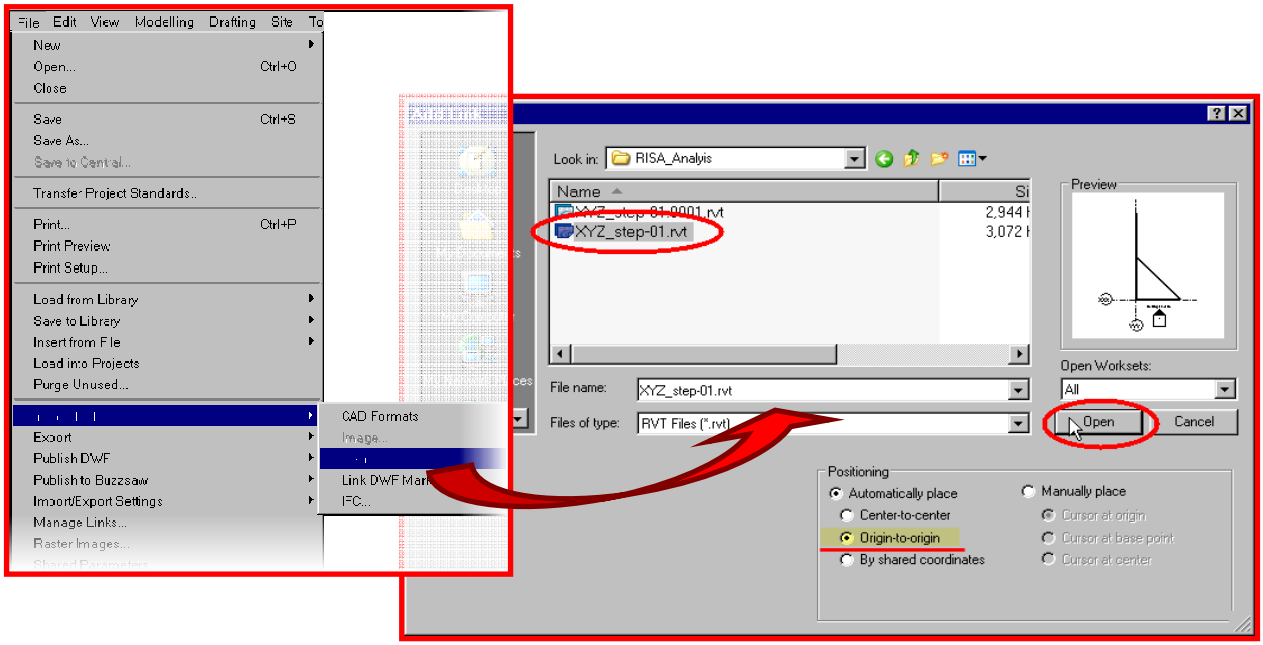
P1-9. Make a new Template File: **NOTE**: Since this file was created from importing a Risa 3D file, the Revit model will retain the associated linked file in memory. This is not what we would want for a template file. The solution would be to make a new second Revit file and link in the first Revit file origin to origin.



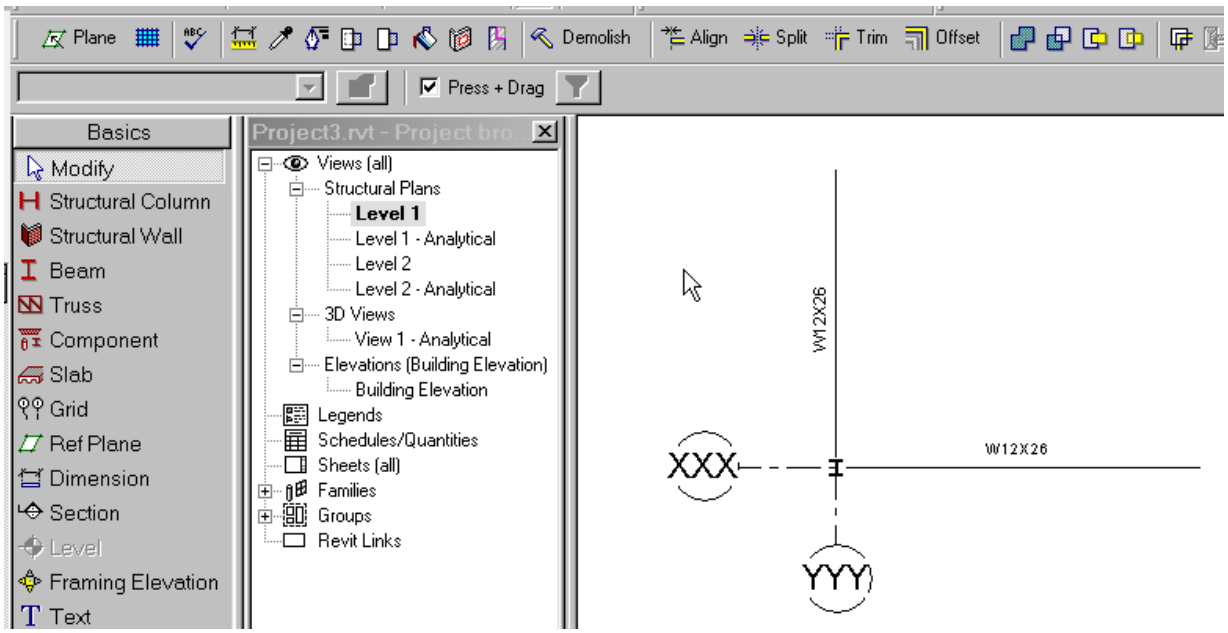
Save the new file as a template file **" My_Structural_Origin_Template.rte**".



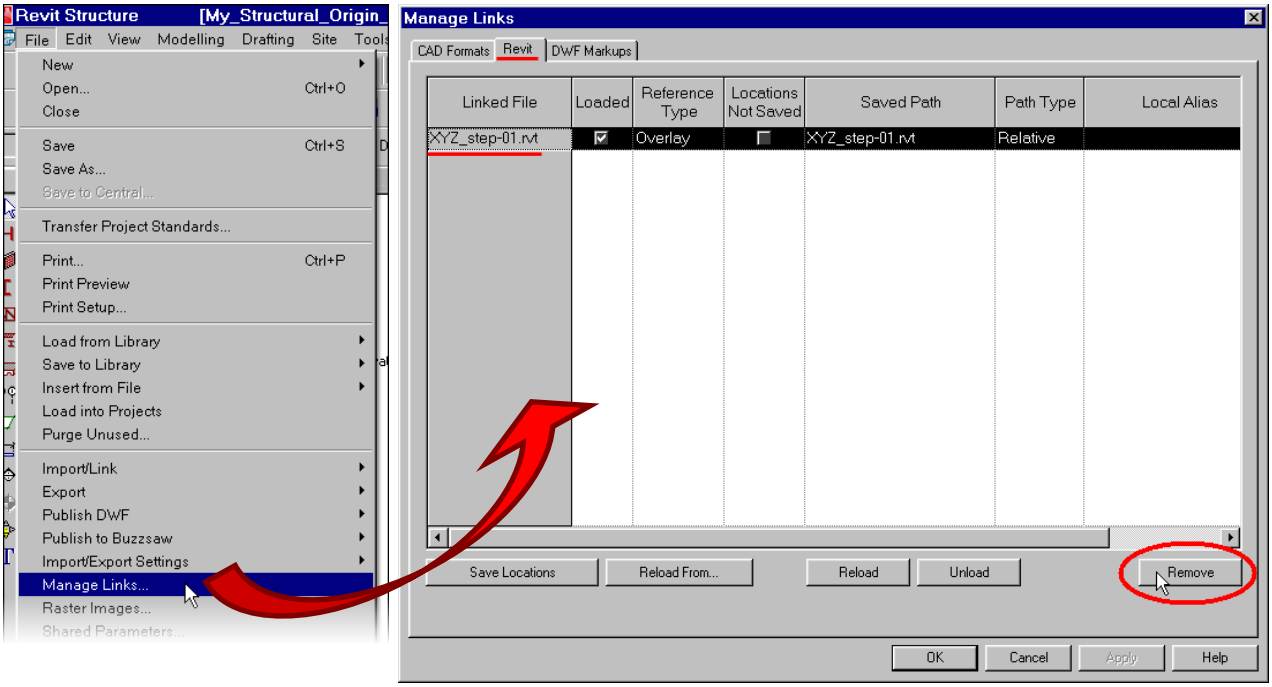
P1-10. Link in **the XYZ_STEP-01.rvt** file we made earlier with position set to **Origin-to-Origin**.
NOTE: YOU WILL NEED TO CLOSE THIS FILE BEFORE YOU CAN LINK IT INTO THE NEW FILE.



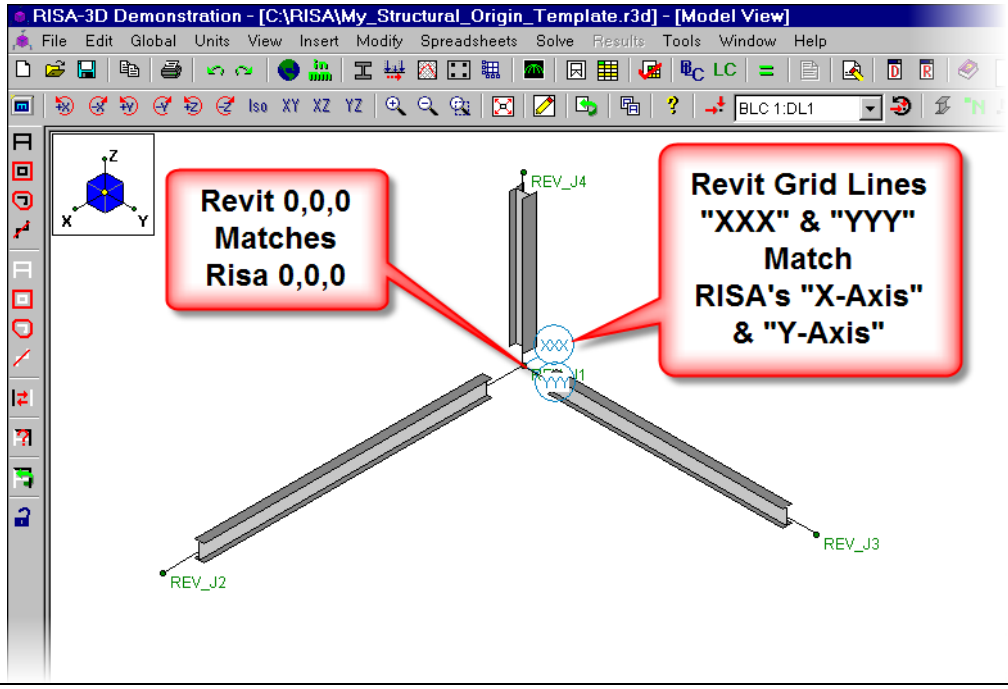
P1-11. Draw in reference grids to match the ones on the linked files.



P1-12. Remove the linked file, and save the template file :



P1-13. Now create a new project with the template you created "**My_Structural_Origin_Template.rte**".
Draw in some beams along the XXX & YYY grids on Level 1. Also place a column on level 2 at the origin and send the model to Risa-3D. Note that the members came in at 0,0,0 and are oriented along the axis.

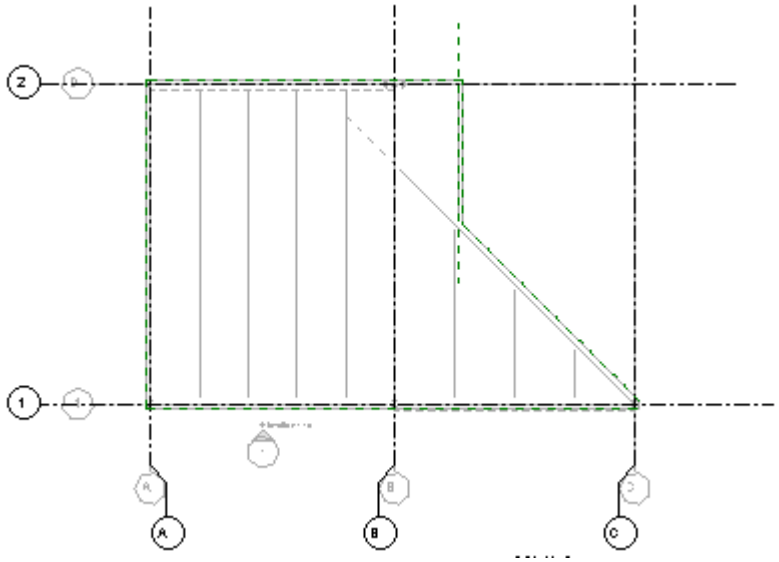


PART 2

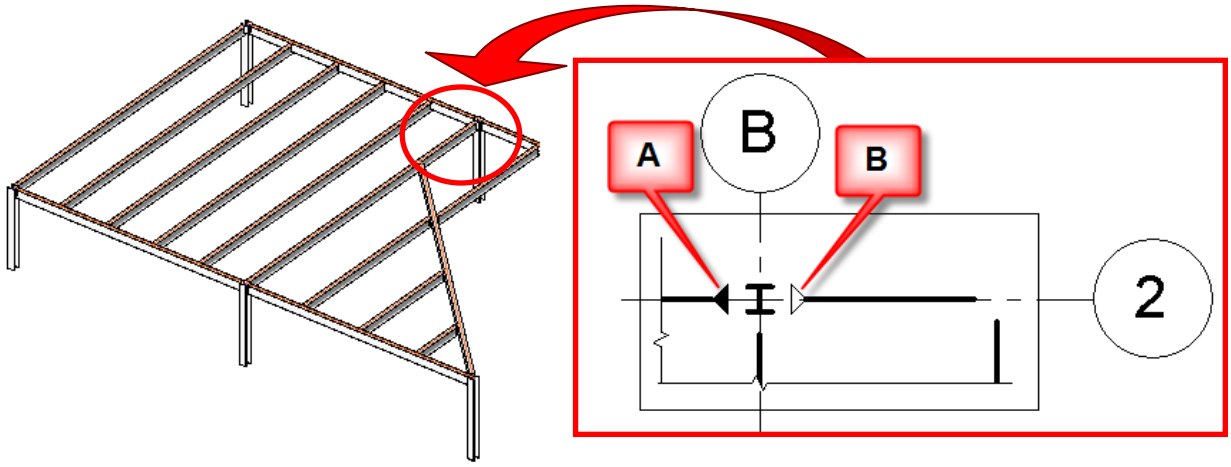
Simple Steel and Concrete Structure Analysis

P2-1. **Start a new project** with the template we created in part 1 that shows the XXX & YYY axis origins. If you have not done part 1, you can use the PART-2_XYZ.rte template that is provided. Create a new revit model from the referenced template.

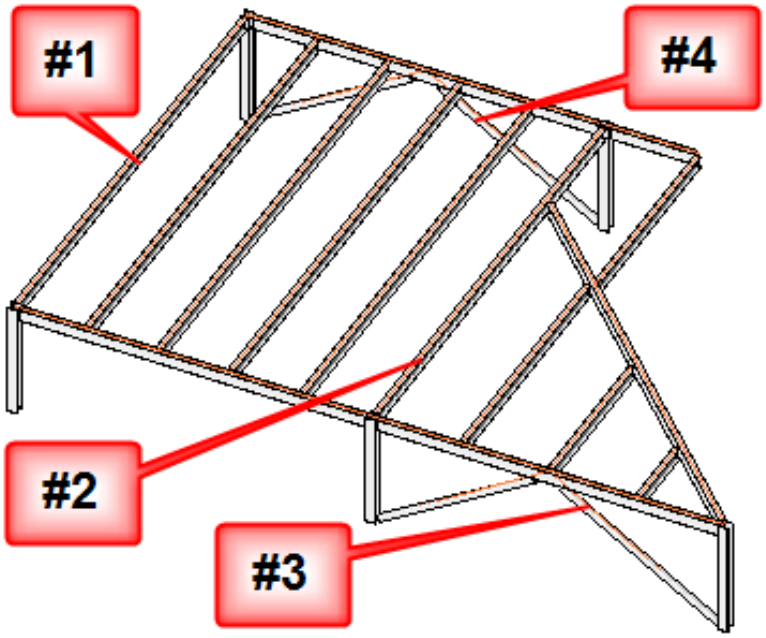
a. On level 2, link in a CAD file named "**PART-2_STEEL_LAYOUT.dxf**" from the datasets. Using visibility graphics make the linked in CAD file a haft-tone shade.
b. Using the grid tool, place vertical and horizontal grids as show below.
c. Using the reference plane tool, draw a N-S reference plane at the end of the cantilever.



P2-2. **Place Columns, Girders and Beam Systems**: Note, the cantilevered beam at grid line intersection B-2 needs to have a Cantilevered End moment Connection and the back span beam needs to have a framed moment end connection. In the image on the right from the level 2 framing plan, "**A**" denotes a "Moment Frame" end connection selection in that member's properties and "**B**" denotes a "Cantilevered Moment".

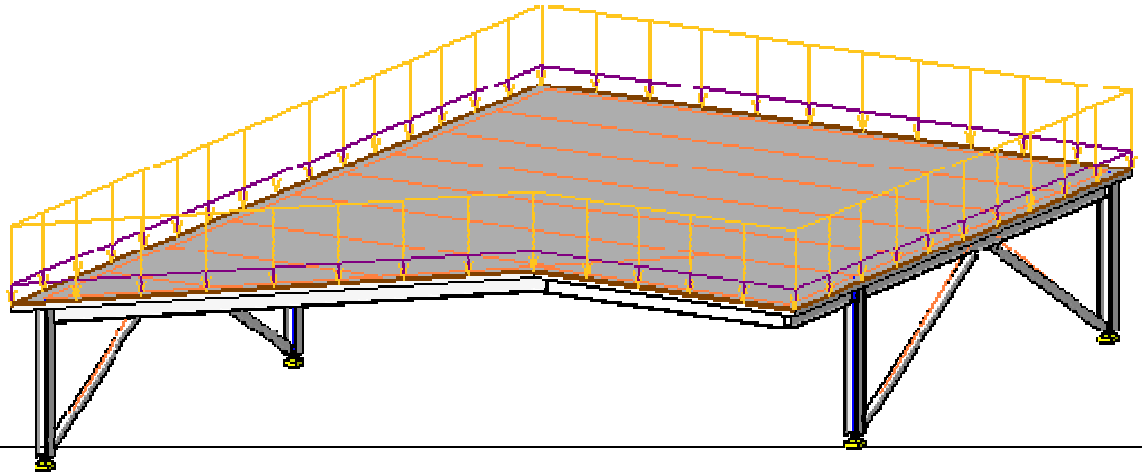


P2-3. Add Braces and Lateral Moment Frame Connections. Define Lateral Members for "ANALYZE AS": Note: the two North-South girders are going to be Lateral Moment Frame (#1 and #2 in the image below). The two other lateral load resisting systems will be in the East-West direction consisting of Chevron Style braced frames (#3 and #4 below).



P2-4. Draw in the Slab, Assign Loads and Boundary Conditions:

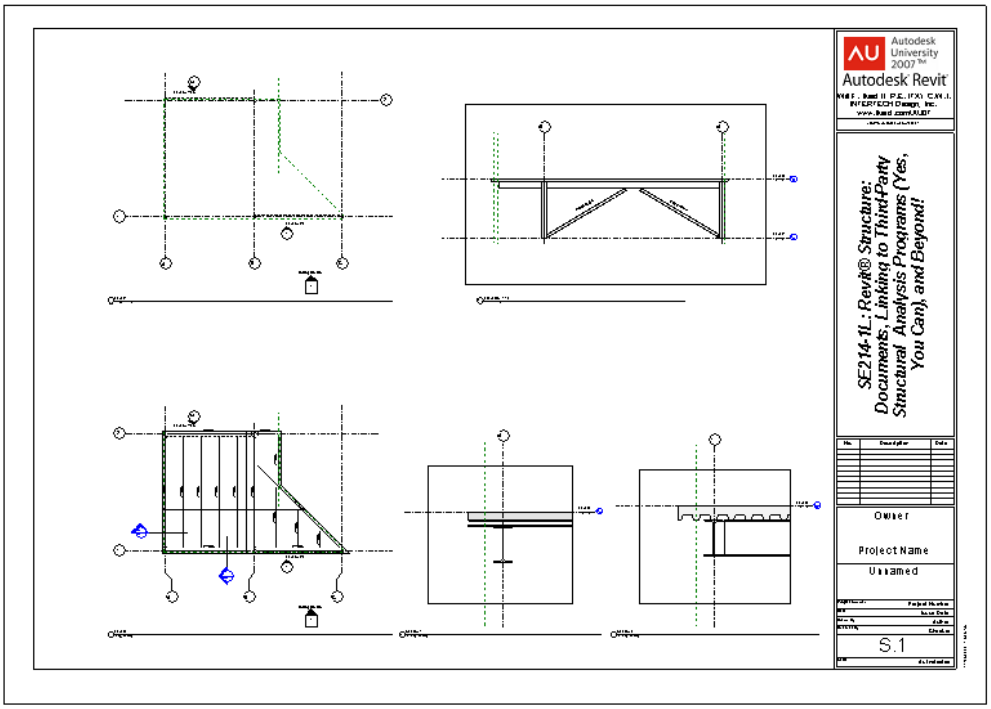
a. **Draw in the Slab** with the default 3" LW concrete on 2" metal deck. It is important to define the edge on the centerline of perimeter beams on the gridlines. Also, it is helpful if you draw the perimeter in sketch mode in a counter clock-wise fashion starting at grid C-1.
b. **Define the slab cantilever beyond the perimeter beam** in the slabs sketch mode by selecting each slab edge and setting its steel and concrete cantilever property in the options bar. Set the Cantilever to 1 foot.
c. **Apply Area Loads With Host:** Dead load of -0.025 KSF, and LIVE load of -0.100 KSF
d. **Set Point Boundary Conditions:** Make column bases fixed.



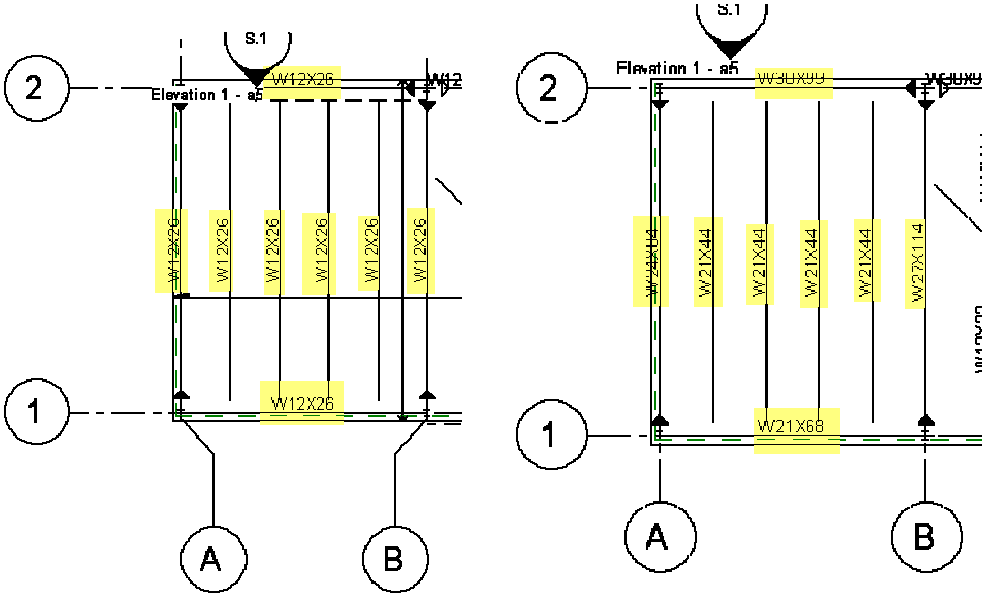
P2-5. Send the Model to Analysis: See demonstration.

P2-6. Create Sheet with Plan and Sections:

a. **Load Title Block: E1_30x42_AU_boarder.rfa** (see data set)
b. **Sheet:** Create a sheet with the Title Block provided in the data sets.
c. **Plans: Place the two levels on the new sheet at 1/8" scale.**
d. **Sections: Place the two sections on the sheet.**



P2-7. Update Revit From Risa: Image on the left is before the update, the right is after.



Part 3: Beyond

We will review a demonstration of exporting the model using CIS/2 for the steel structure, with a discussion.

Conclusion

The software versions used in this lab exercise are as follows:

Revit Structure 2008

RISA-REVIT Link 6.0
RISA-3D 7.0.2 or Higher
RISAFloor 3.1.2 or Higher

Robobat Extensions Engine, Version: 1.6
Robobat Export model to CIS/2 file (This application allows Revit® Structure users to export files to other applications in the CIS/2 format.)
Robobat Freeze drawings, Version: 1.5

Movie clips of all aspects of this presentation have been included at the following website:

www.Ikerd.com/AU07/

If you have specific or general questions or comments on the content or topic of this handout, please feel free to email me at the following address and reference this AU-2007 presentation:

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