

**Revit Structure 2010
Link to INDUCTA
SLABS 2009 and
R/C Building 2009**

1. Welcome to Revit Structure Link to INDUCTA Softwares



Welcome to Revit Structure® 2010 Link to INDUCTA Softwares

This Link provides a powerful way to exchange data between Revit® Structure and INDUCTA softwares. Models created in either programs can be easily visualized, updated, and opened in the other program, utilize respective features and functions in either the area of modeling or structural analysing.

Currently two software programs from INDUCTA Engineering are supported by this Link, SLABS 2009 and R/C Building 2009.

SLABS 2009 is an advanced version of INDUCTA's popular SLABS design program, it provides FEM modeling and design of the suspended or on-ground concrete floor system. In this new version, we introduce a new modeling method, so called Geometryline modeling. It allows the user to import or define model boundaries of any shape using Geometrylines. By using this new feature, INDUCTA software will be able to import or export Floor elements with Revit Structure 2010.

R/C Building 2009 program is a 3D modeling and analysis package, coupled with its wide range of design features, it automatically calculates the lateral loads (wind and earthquake load) and torsion effect, performing the columns design, soil-structure interaction calculation and construction stages analysis, etc.. This new version also supports the Geometryline modeling.

2. Getting Started

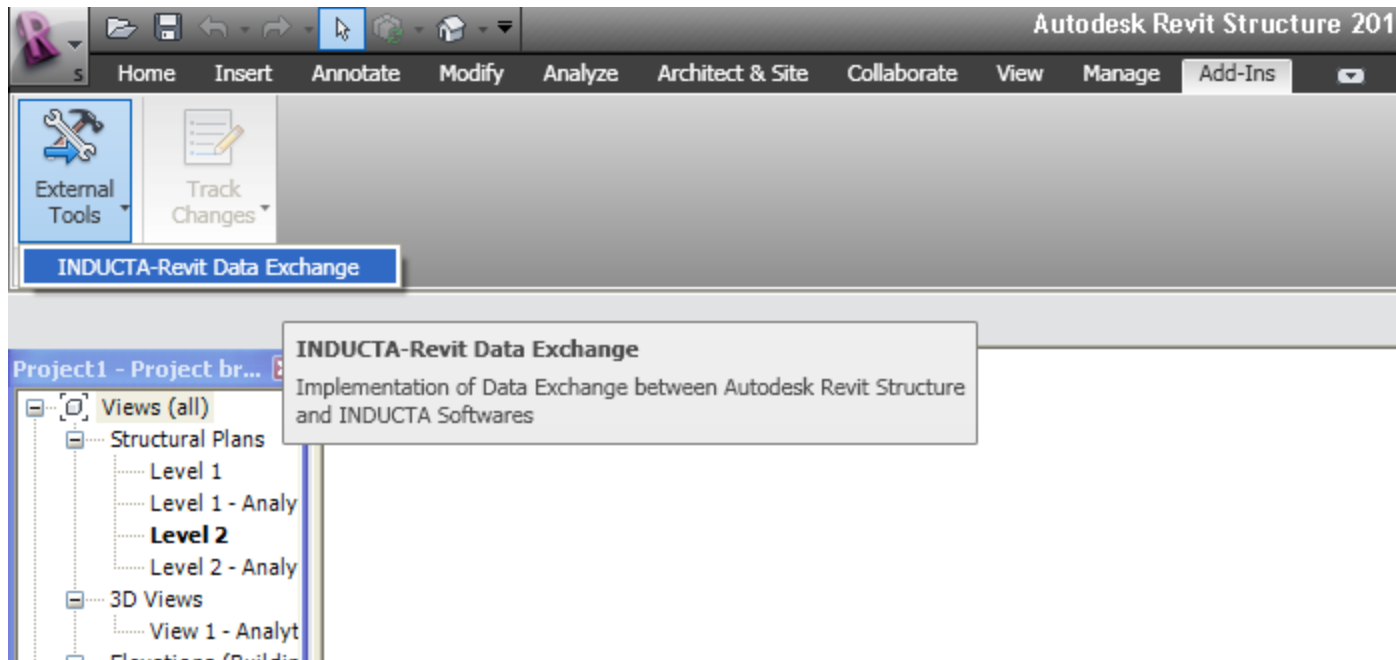


After the installation of Revit INDUCTA Link program, the program will include an initialization block to the end of Revit.ini which is under the Revit structure 2010 program folder:

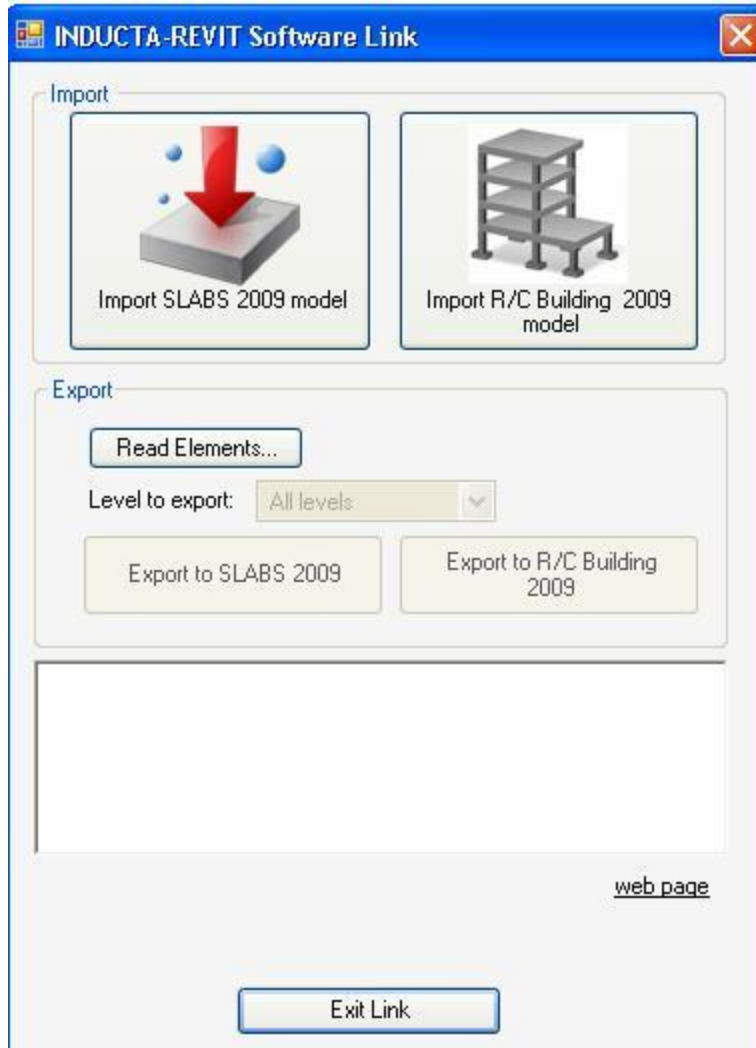
```
[ExternalCommands]
ECCount=1
ECClassName1=RevitInductaLink.Command
ECAssembly1= Link_path & \RevitInductaLink.dll
ECName1=INDUCTA-Revit Data Exchange
ECDescription1=Implementation of Data Exchange between Autodesk Revit Structure
and INDUCTA Softwares
```

Note: Link_path will be the installed RevitInductaLink path. User does not need to worry about inserting the above text, it will be done automatically during the installation.

Then after starting Revit Structure 2010, the Revit Structure Link to INDUCTA Software will be created on Revit Structure2010's menu bar, under " Add-Ins| External Tools | Inducta-Revit Data Exchange"



The following program window pops up when clicking the Data Exchange button.



To import models prepared in SLABS or R/C Building programs, user can click on the respective button to specify the file. But if there is a project opened in Revit at the moment, importing will not work. User will be advised to close the project first and try again.

To export a Revit model, user should click on the "Read Elements..." button inside the "Export" group box as shown above. After successfully reading in all the information (supported by this Link) about the model, two buttons for exporting will become enabled. User can choose "All levels" from the "Level to export" combobox and "Export to R/C Building 2009" button will then become available; or user can specify a level from the combobox, and as expected the button for "Export to SLABS 2009" will become enabled.

Currently the link supports the following data during exchange:

- Slabs
- Beams
- Columns

- Walls
- Area loads
- Line Loads
- Point Loads
- Load Cases
- Load Combinations
- Level

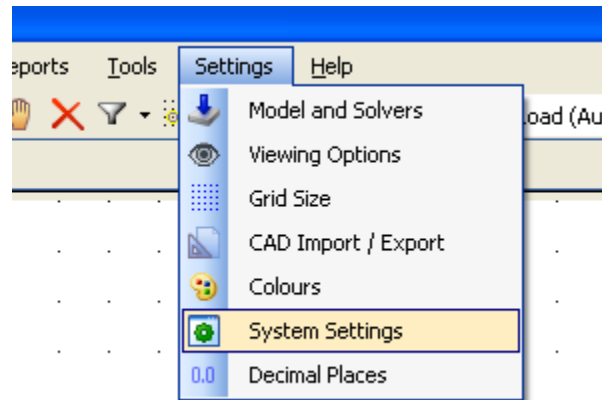
3. Import a SLABS 2009 model into Revit

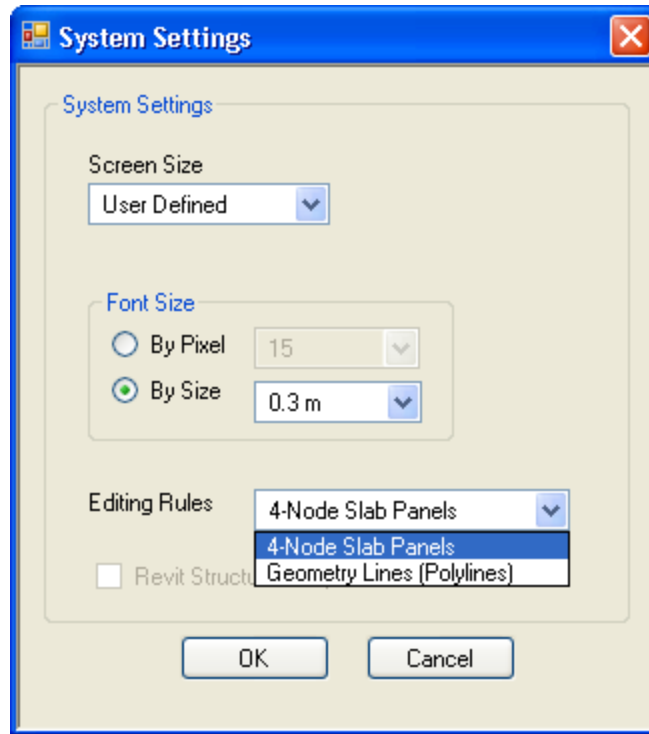


1. Creating a SLABS model

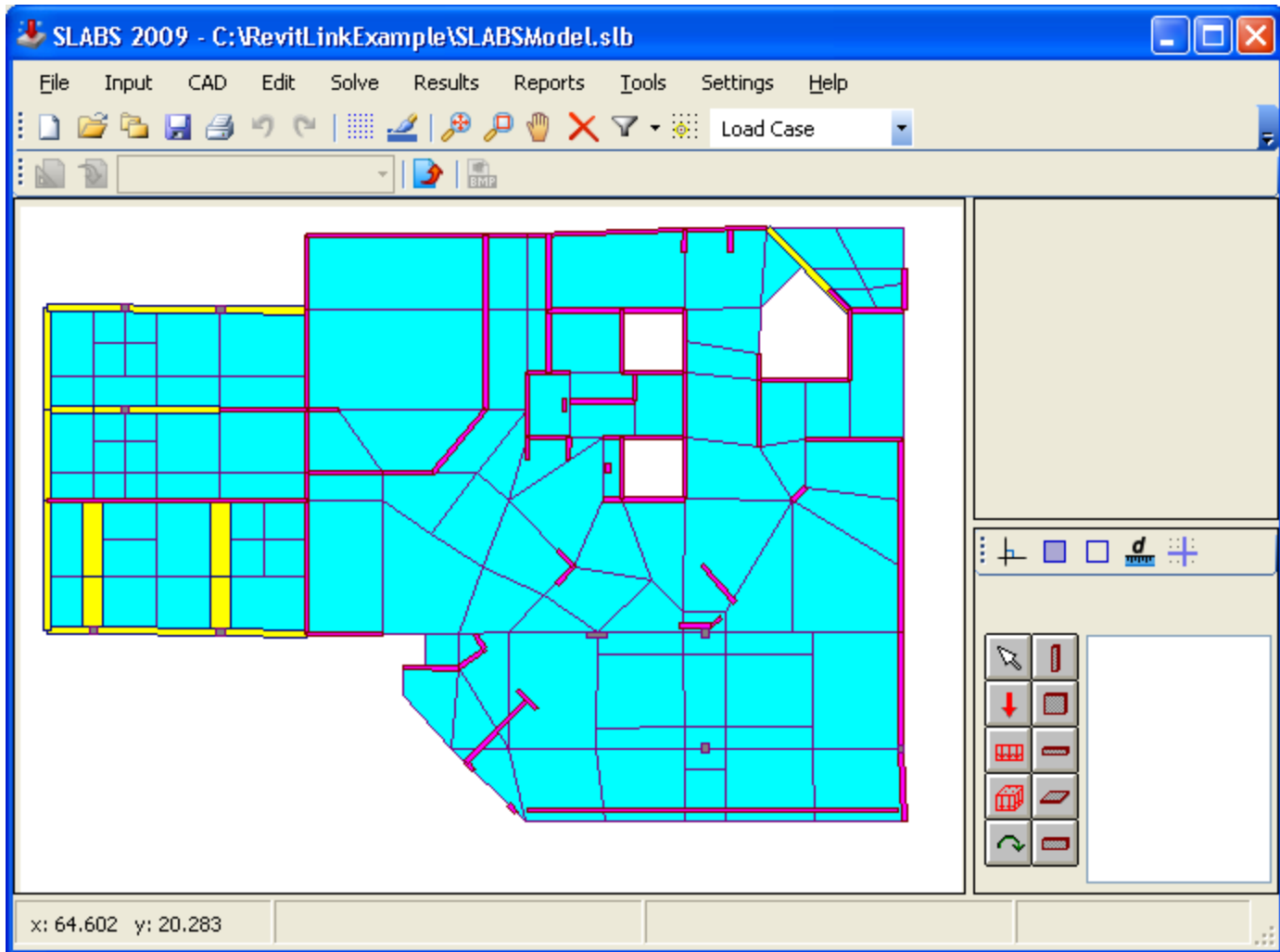
i) SLABS model using 4-Node Slab Panels

In SLABS 2009, we have **two methods** to allow the user to model Slab panels. First one is implemented by previous version (SLABS 3.5, SLABS 4), which only allows 4-node polygon slab panel to be used. The model prepared using this method is fully supported by this [Link](#).





Below is an example:



(model constructed using 4-node slab panel method can be imported to Revit Structure 2010 without problem)

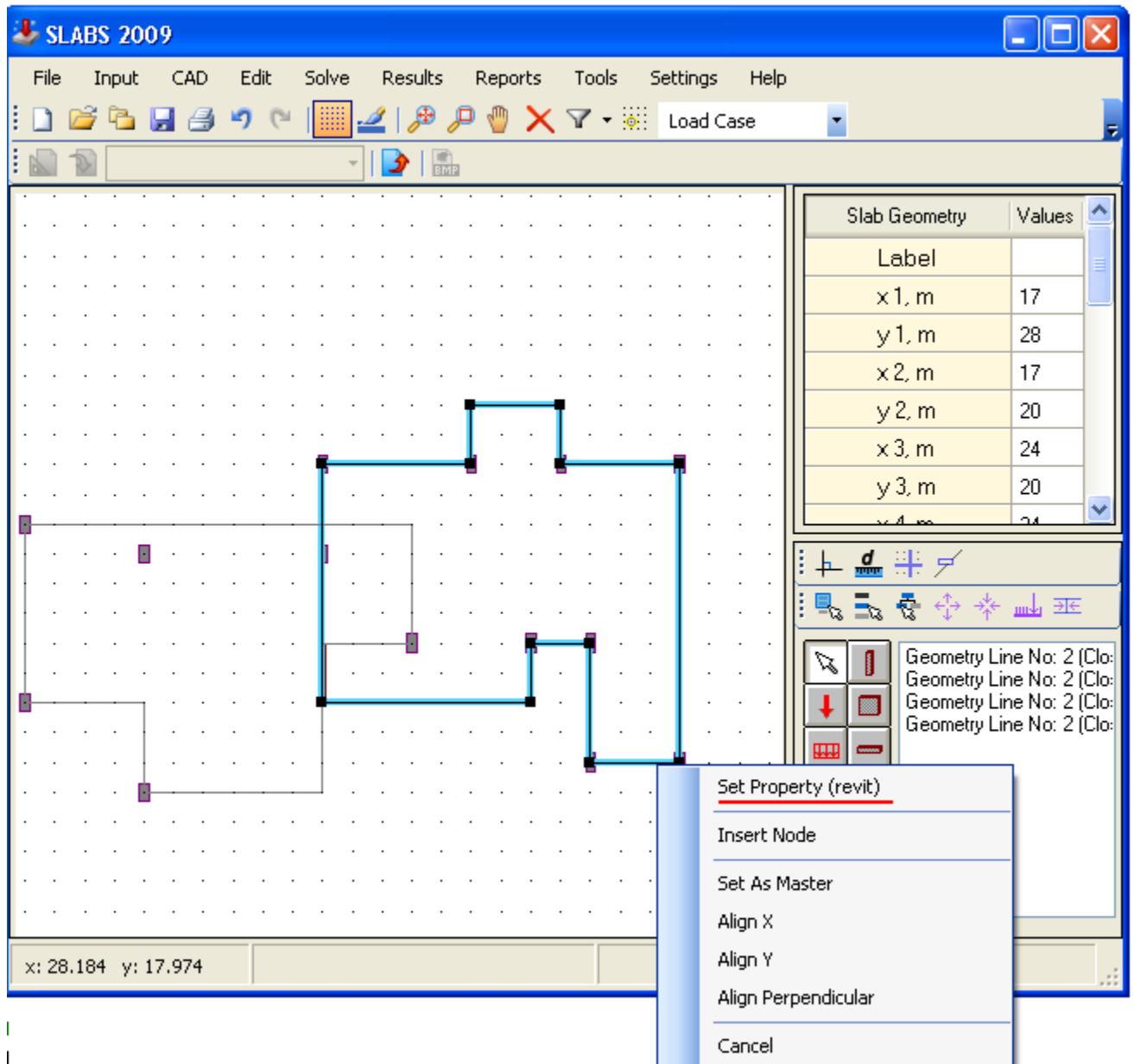
2) SLABS model using new Geometry line modeling (Recommended)

SLABS 2009 (along with R/C Building 2009) has introduced another modeling method - Geometryline modeling, which allows irregular shape boundary to be defined. To understand the concept, please check the explanation from our website: [Geometryline modeling concept](#) .

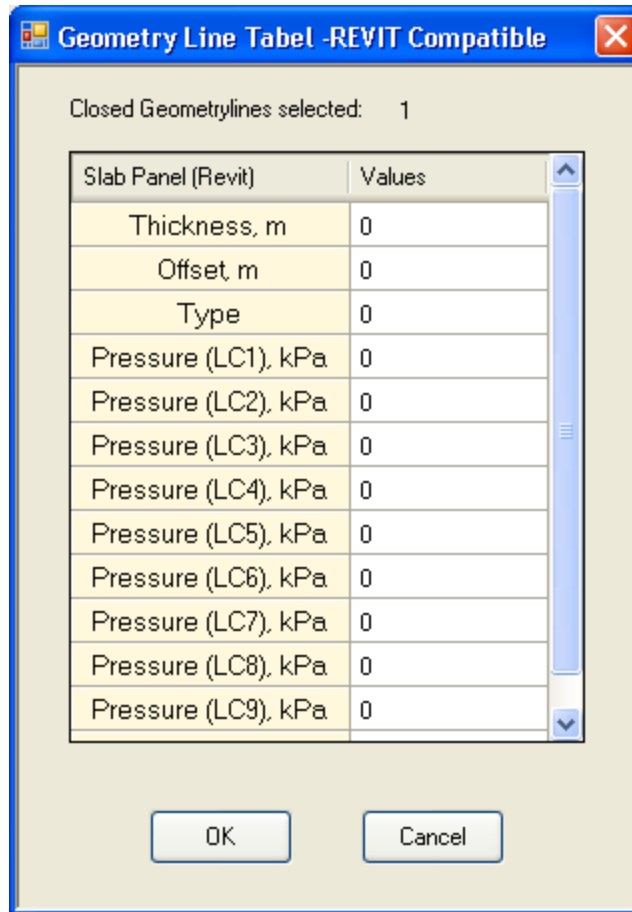
To create a SLABS model using the Geometryline modeling method, the "Editing Rules" under the "System Settings" window should be set to "Geometry Lines (Polylines)" (see above figure) , also, "Revit Structure Compatible" checkbox below should be ticked. When defining geometry lines, we can define it either as a closed or an open polyline, but for a model to be used in Revit Structure, when should **always** construct a slab panel as

a closed polyline. This is a key difference to be noted between a regular SLABS 2009 model and a Revit Structure-Compatible SLABS 2009 model.

To specify the property for the slab panel (closed polyline), select the line, right click, and select "Set properties (Revit)" from the context menu.



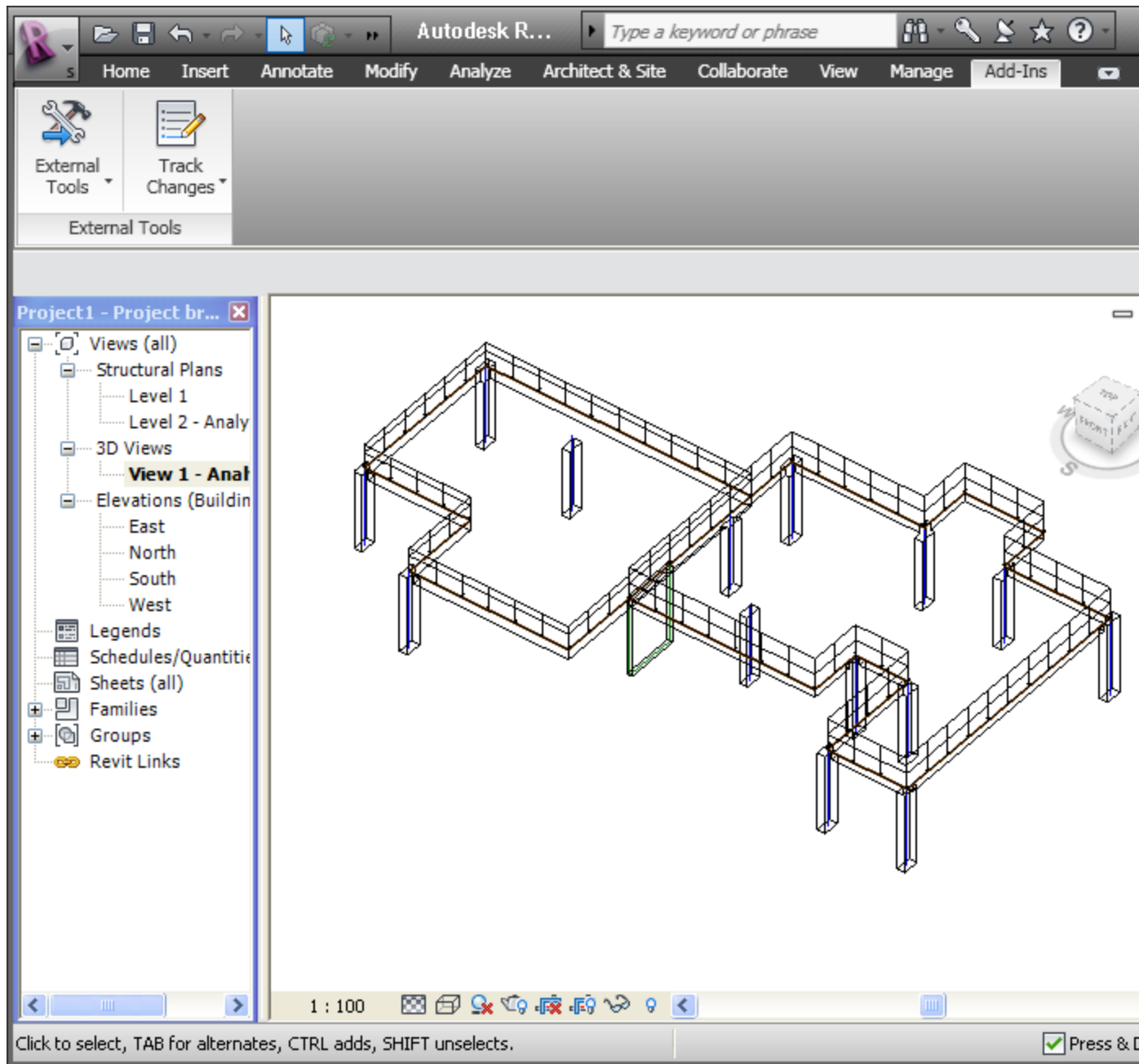
In the pop-up window, user can specify the thickness, offset and pressure loading for this slab panel. Program also support multiple selection of slab panels, which enables the one-off set up the common properties.



Note that overlapped slab panels are also supported in SLABS 2009 and R/C Building 2009, the thickness and pressure properties of the overlapped area will be added up once **meshing** operation is performed.

Step 2: Open the Link window from Revit Structure (Add-Ins| External Tools | Inducta-Revit Data Exchange):

Click on the "Import SLABS 2009 model " button inside the import pane, and select the SLABS 2009 data file you just saved to be imported. A progress bar will indicate the status of the imporing process. If it is successful, close the Link window, and the model should be shown in Revit window.



(a SLABS 2009 model that has been imported to Revit Structure 2010)

4. Import a R/C Building 2009 model into Revit

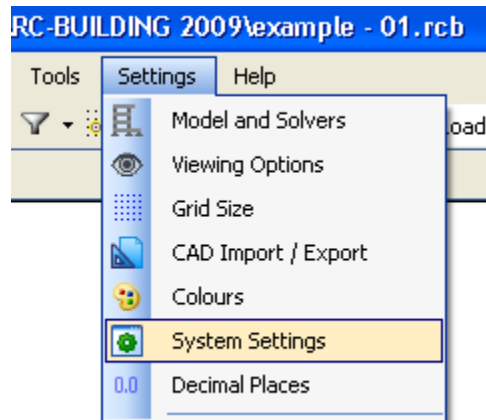


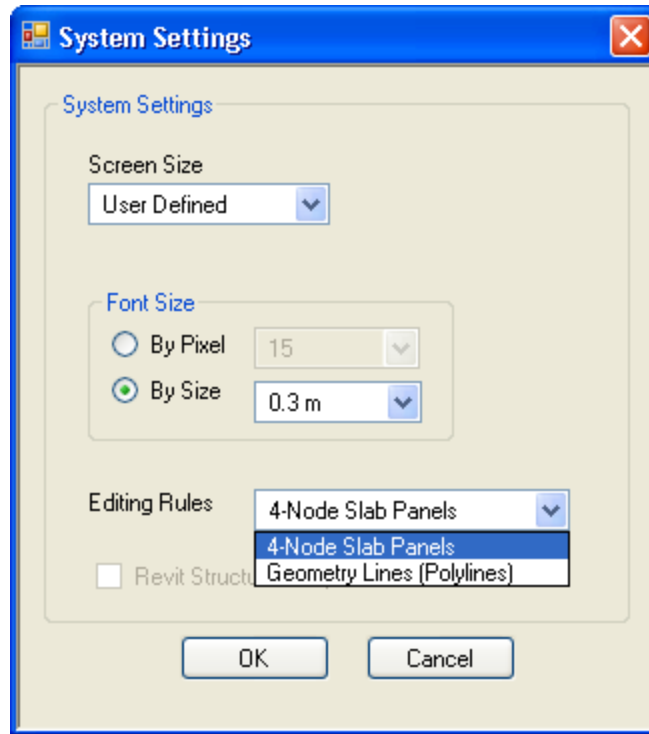
Note: R/C Building 2009 and SLABS 2009 share same modeling method for slab panels. Some text below may have appeared in article "Import a SLABS 2009 model into Revit".

1. Creating a R/C Building model

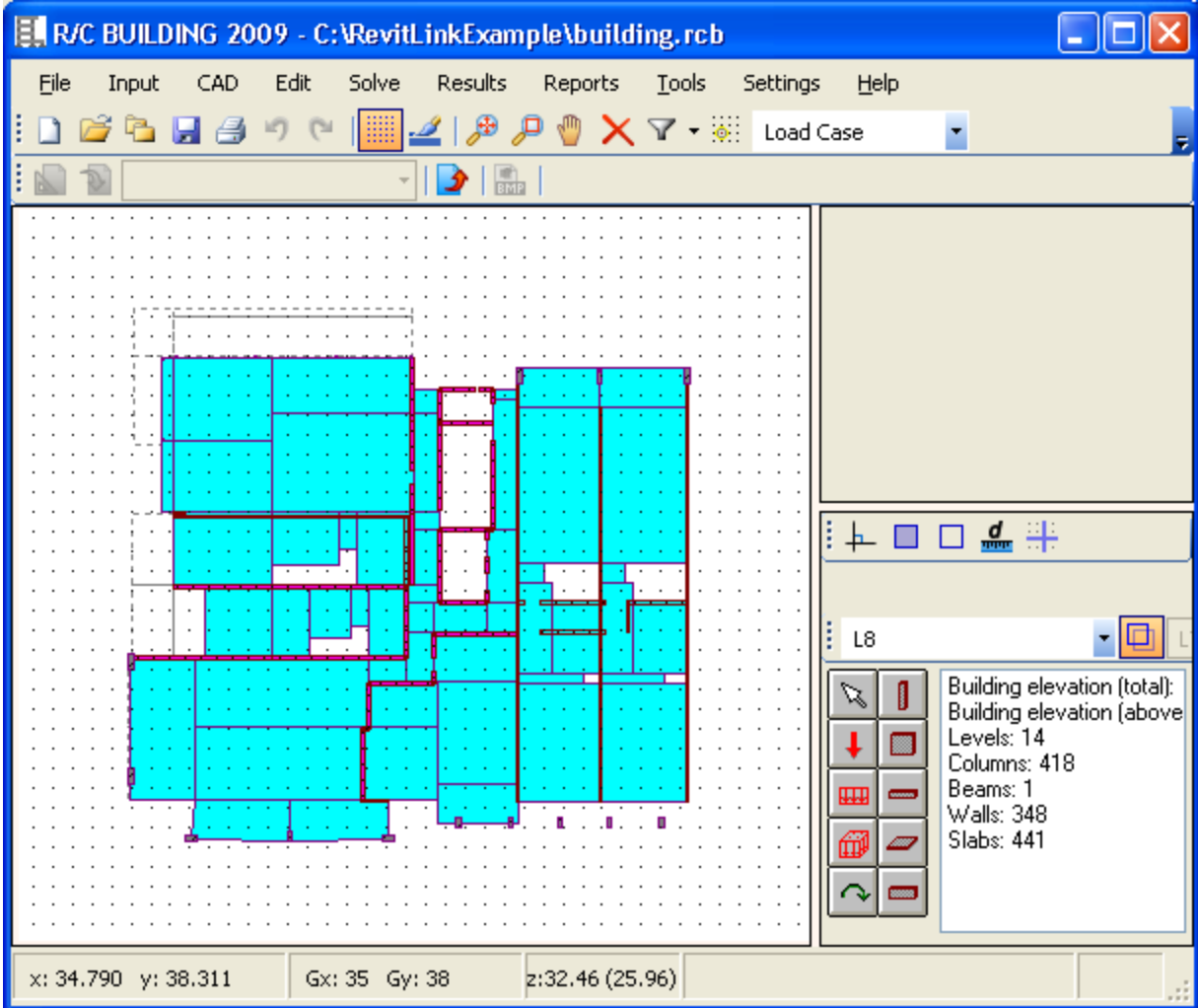
i) R/C Building model using 4-Node Slab Panels

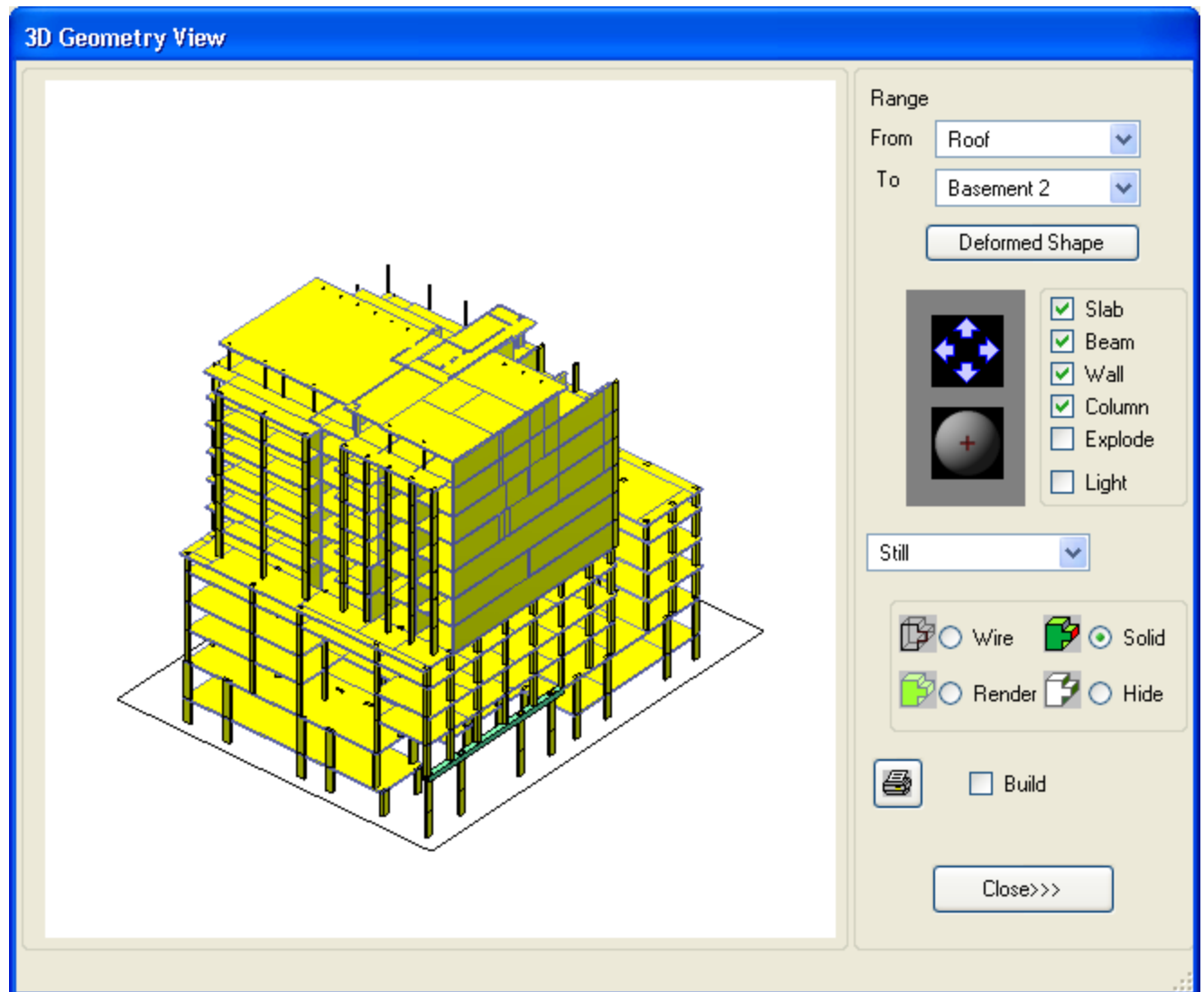
In R/C Building 2009, we have **two methods** to allow the user to model Slab panels. First one is implemented by previous version, which only allows 4-node polygon slab panel to be used. The model prepared using this method is fully supported by this Link.





Below is an example:





(model constructed using 4-node slab panel method can be imported to Revit Structure 2010 without problem)

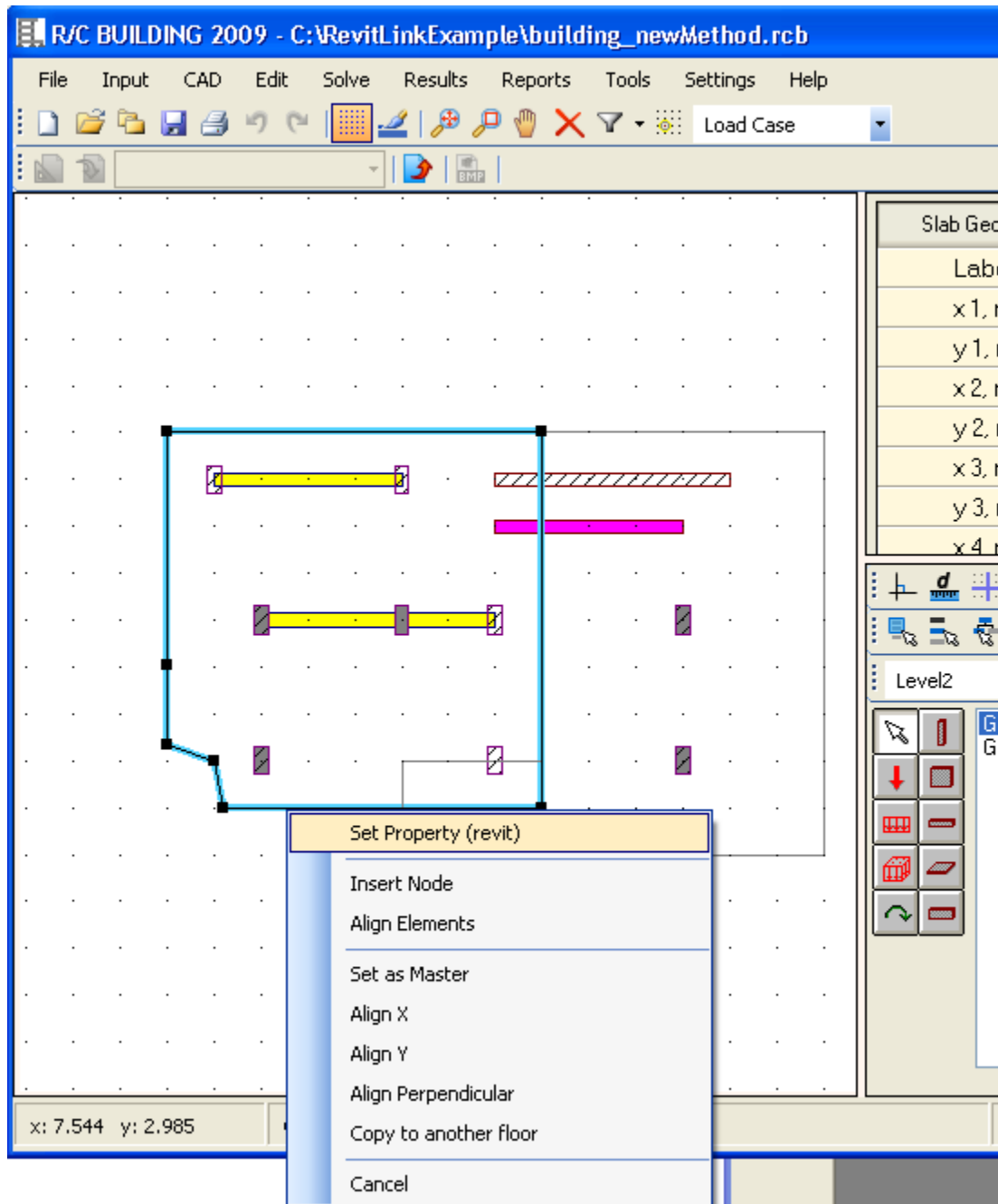
2) R/C Building 2009 model using new Geometry line modeling (Recommended)

R/C Building 2009 (along with SLABS 2009) has introduced another modeling method - Geometryline modeling, which allows irregular shape boundary to be defined. To understand the concept, please check the explanation from our website: [Geometryline modeling concept](#) .

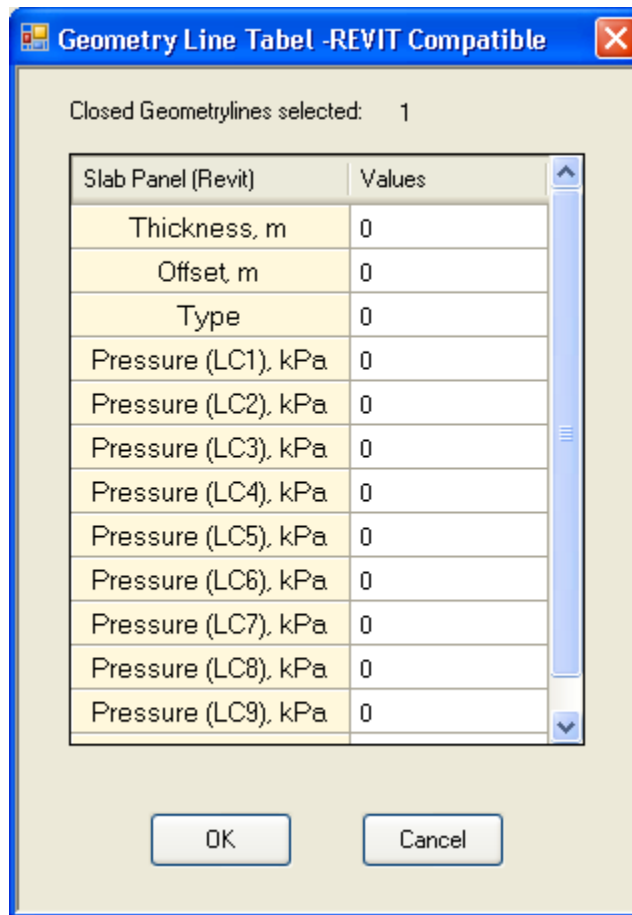
To create a R/C Building model using the Geometryline modeling method, the "Editing Rules" under the "System Settings" window should be set to "Geometry Lines

(Polylines)" (see above figure) , also, "Revit Structure Compatible" checkbox below should be ticked. When defining geometry lines, we can define it either as a closed or an open polyline, but for a model to be used in Revit Structure, when should **always** construct a slab panel as a closed polyline. This is a key difference to be noted between a regular R/C Building 2009 model and a Revit Structure-Compatible R/C Building 2009 model.

To specify the property for the slab panel (closed polyline), select the line, right click, and select "Set properties (Revit)" from the context menu.



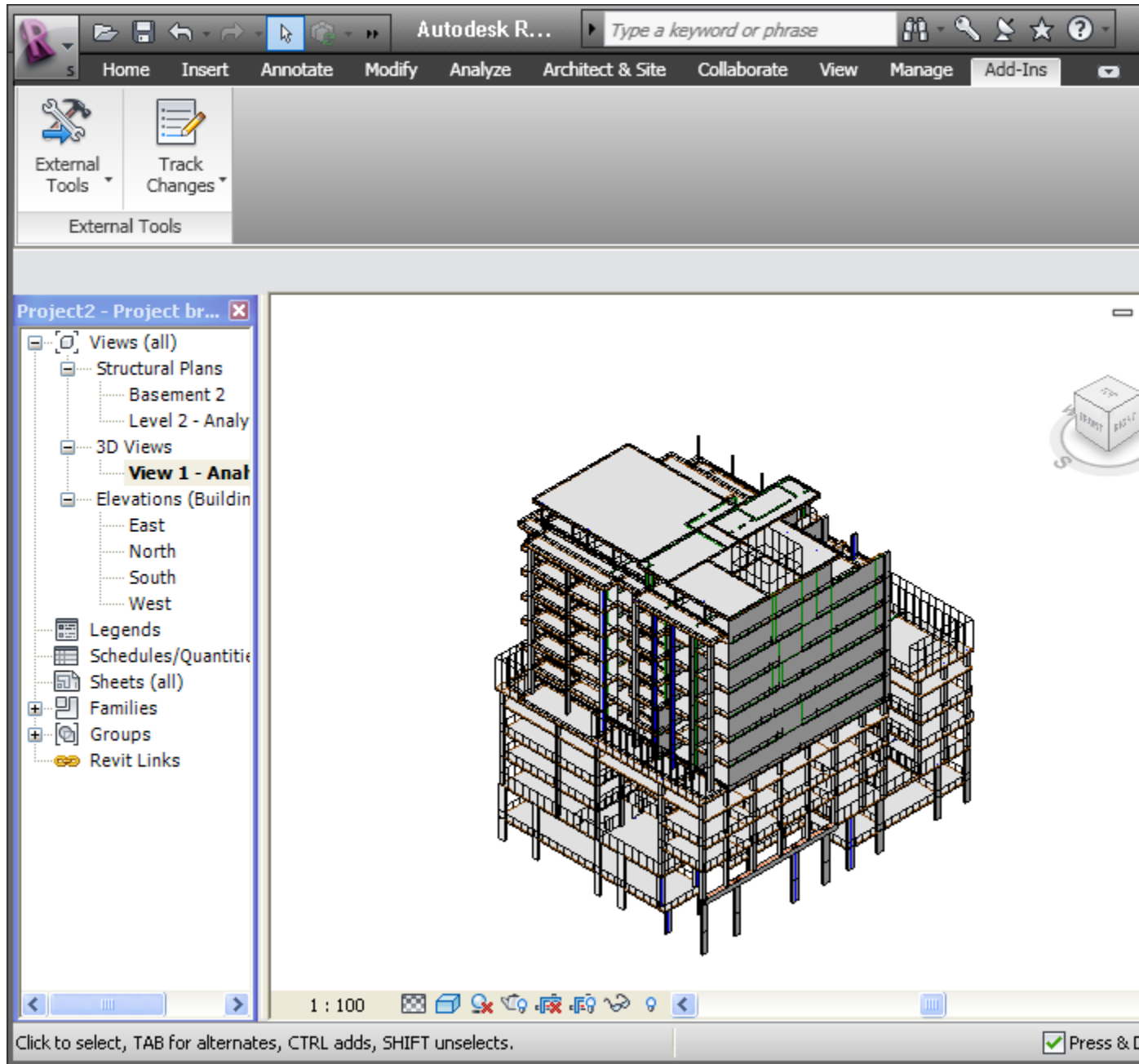
In the pop-up window, user can specify the thickness, offset and pressure loading for this slab panel. Program also support multiple selection of slab panels, which enables the one-off set up the common properties.



Note that overlapped slab panels are also supported in SLABS 2009 and R/C Building 2009, the thickness and pressure properties of the overlapped area will be added up once **meshing** operation is performed.

Step 2: Open the Link window from Revit Structure (Add-Ins| External Tools | Inducta-Revit Data Exchange):

Click on the "Import R/C Building 2009 model " button inside the import pane, and select the R/C Building 2009 data file you just saved to be imported. A progress bar will indicate the status of the importing process. If it is successful, close the Link window, and the model should be shown in Revit window.



(a R/C Building 2009 model that has been imported to Revit Structure 2010)

Note:

Material setting and load case, load combination etc., these building information will be imported correctly into Revit Structure 2010.

Structural Settings

Symbolic Representation Settings | **Load Cases** | Load Combinations | Analy

Load Cases

	Name	Case Number	Natu
1	Dead Load	1	0
2	Live Load	2	1
3	Earthquake Ex	3	0
4	Earthquake Ey	4	0
5	Wind Wx	5	0
6	Wind Wy	6	0

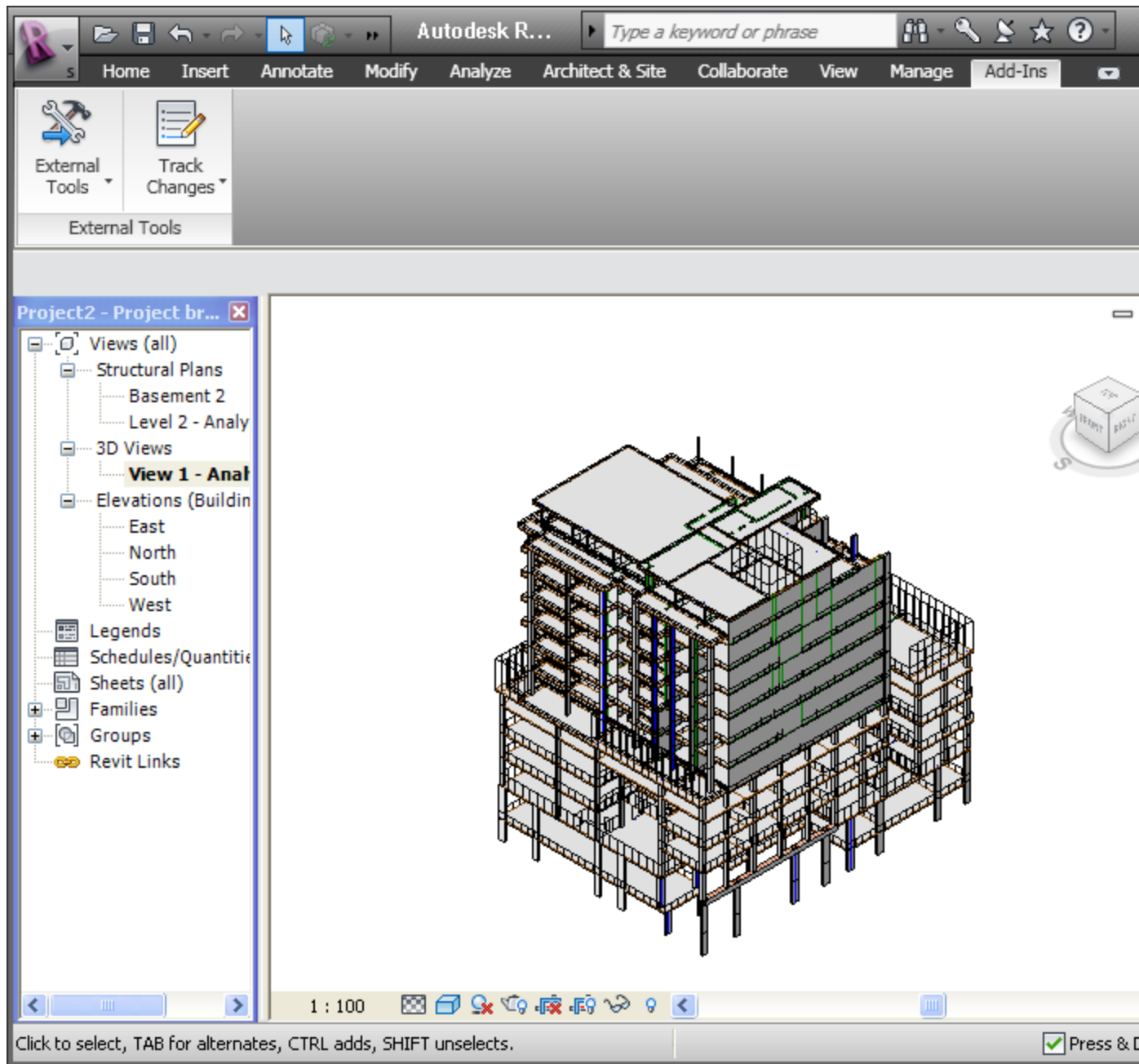
Load Natures

	Name
1	Dead
2	Live
3	Wind
4	Snow
5	Roof Live
6	Accidental
7	Temperature
8	Seismic
9	0
10	1

5. Export a Revit Model to SLABS2009 or R/C Building 2009



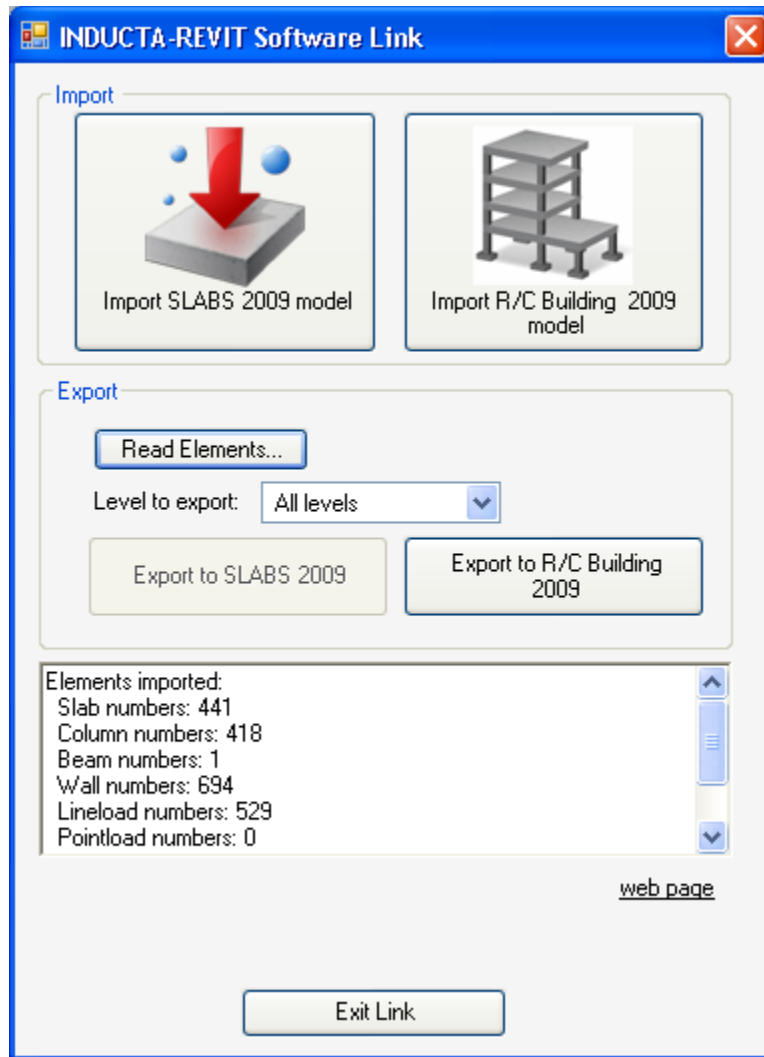
Step 1: Create/Open a model in Revit Structure 2010.



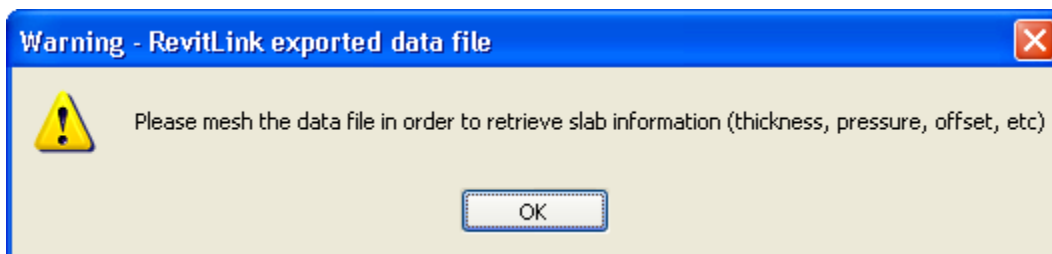
Step 2: Open the Link window from Revit Structure (" Add-Ins| External Tools | Inducta-Revit Data Exchange"):

Step 3: Click on the "Read Elements..." button inside the export pane, the Link will start to extract all the data information from the underlying Revit model. A progress bar will indicate the status of the reading process. Depending on the size of the model, this may take longer if there are many elements in the model. When it is done, "Export to R/C Building" button will be enabled. By clicking this button, user can specify the name and the location of the output file and proceed to export the Revit model to a R/C Building file. If the user chooses to export only one floor to the SLABS 2009 program, he can

select the level from the "Level to export" dropdown box, and then proceed to save it to a SLABS 2009 data file.

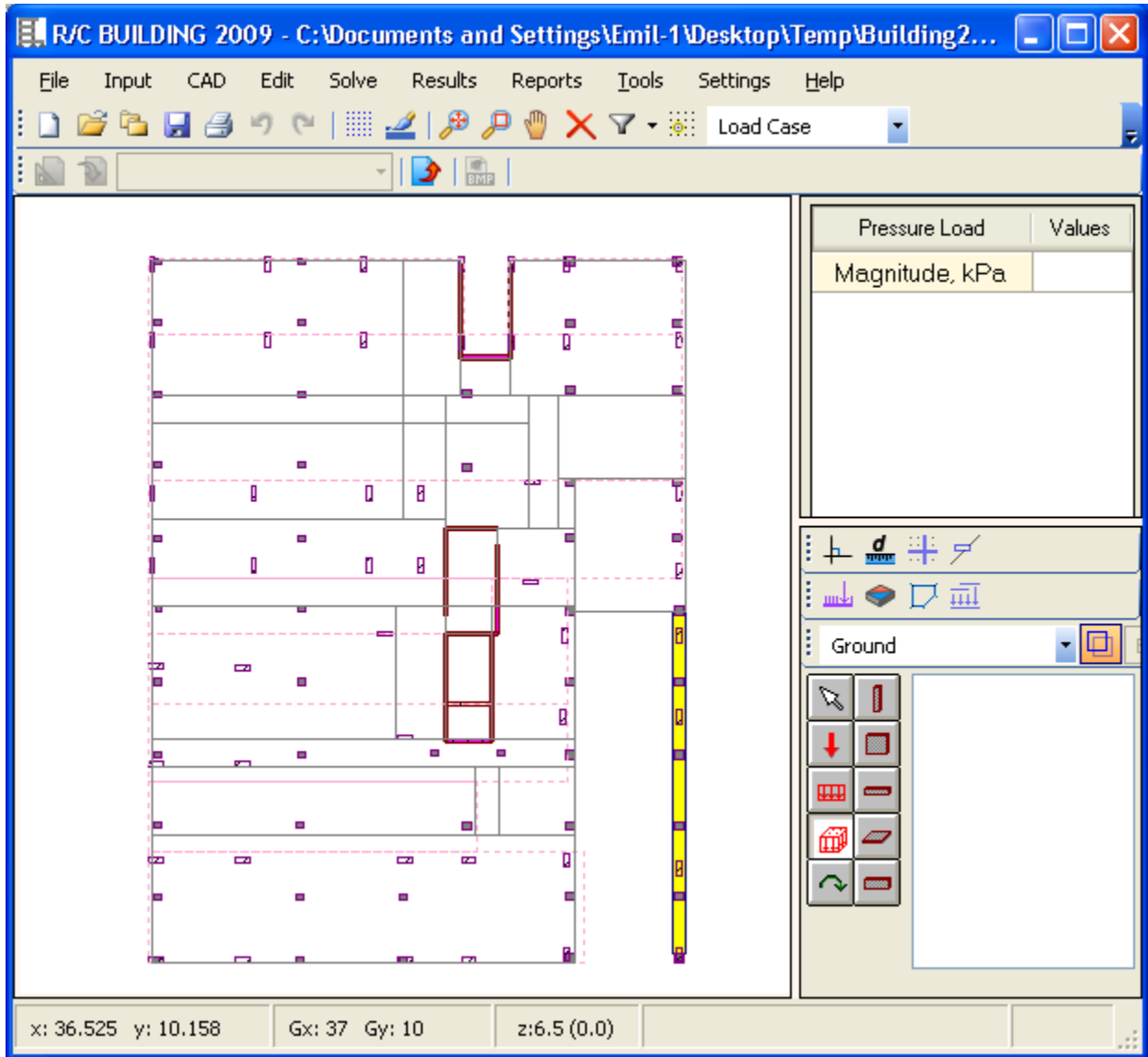


Step 4: If Export the model to R/C Building 2009. Open the target file in R/C Building. Note that, default editing rule is set to "Geometry lines" ([see "Import a R/C Building model into Revit"](#)). A warning message will appear:



which asks the user to **Mesh** the model in order to retrieve slab thickness, offset, type and pressure information. Note also, since **Footing** is not supported in this version of the Link, user should manually assign footing ("vertical support" property) for relevant elements (columns and walls) in order to make the model analysable.

See the example below what the exported model will be looked like in the R/C Building:



Load Case Labels

Load Case Labels

LC	Label	Load Case Nature
1	Dead Load	Dead
2	Live Load	Live
3	Earthquake Ex	Dead
4	Earthquake Ey	Dead
5	Wind Wx	Dead
6	Wind Wy	Dead
7		
8		

Structural Materials

Structural Materials

No	Material Label	Modulus of Elasticity, kPa	Possion's Ratio	Weight, kN/m3	Strength, kPa
1	C32	3.05E+07	0.2	23.6	32000
2					
3					
4					
5					
6					

After reviewing the model, it is now ready to be analysed!

6. Rules



It has to be noted that in order to make a complete link between REVIT and INDUCTA software packages, the models created in REVIT Structure should be compatible with INDUCTA programs. Therefore, the following rules are recommended to be followed by the REVIT user.

Rules to build a REVIT model in order to export it to SLABS 2009 or R/C Building 2009 :

1) SLABS 2009 and R/C Building 2009 software are for the analysis of reinforced concrete structures. Therefore the elements created in REVIT should be concrete. However the slab and wall elements will be imported regardless of their material. Please note that this does not apply for the column and beam elements (they should be concrete).

To allow the link to recognize the column and beam elements, the family name text of these elements should contain "Concrete" or "CONCRETE" or "concrete". User is suggested to use the built-in family symbol for the structural columns or beams, such as "M_Concrete-Rectangular-Column", "Concrete-Round-Column", "Concrete-Square-Column", "M_Concrete-Rectangular Beam".

2) Slab elements should be created as closed polygons in REVIT, otherwise they will not be exported.

3) Slab elements should have the analytical equivalent, it means that the created slab element should be visible in the analytical model in REVIT.

4) Beam, slab, poinload, lineload and areaload elements should be defined on a level in order to be exported by the link.

5) The user should define the floor levels at actual floor levels of the building, as it would be defined in a structural analysis program such as R/C Building.

6) Footing data exchange is not supported by the link.

7) The link supports only rectangular and circular shape columns. The family name should include text such as "Circular" (or "Round") for the circular shape columns, such as the built-in "Concrete-Round-Column".

Rules to build a model from SLABS 2009 or R/C Building 2009 in order to be imported to REVIT:

1) Each loading should belong to one load case and the user should make sure that the load case label is not empty.

7. Notes



1) Currently the link supports the following data during exchange:

- Slabs
- Beams
- Columns
- Walls
- Area loads
- Line Loads
- Point Loads
- Load Cases
- Load Combinations
- Level

2) Slab elements created on top of other slab elements (as layers) can be identified by the link.

3) Each slab element exported to SLABS 2009 or R/C Building 2009 is converted to a group of geometrylines (in form of closed polygone).

4) Average of the end offsets will be used by the link for the beam elements.

5) Beams defined in REVIT as continuous beams that span over multiple supports will be exported.

6) Columns and walls that span multiple levels will be divided into floor height pieces. The link also supports the continuous walls.

7) SLABS 2009 and R/C Building support 10 and 20 Load Cases and Load Combinations respectively.

8) Load nature is not currently included in R/C Building, however it is available in SLABS 2009

9) Material properties of the concrete (such as modulus of elasticity etc.) will be exported to SLABS 2009 and R/C Building 2009 . Up to 20 material types (concrete) are supported.

10) Footing data exchange is not supported by the link.

11) The link supports only rectangle and circular shape columns.

12) To enable the successful importing of model into REVIT Structure 2010, at least one concrete material type should be loaded into the program by the user, for example, material type name "Concrete - Cast-in-Place Concrete - 35 MPa". Usually by default, Revit Structure 2010 should preload this, but for some cases, it might not. So it is important to ensure Revit has one material type whose name contains "Concrete" and "Mpa" to be present while importing R/C Building 2009 or SLABS 2009 data