AUTODESK **UNIVERSITY** 2015

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Revit and SOFiSTiK, the Perfect BIM Solution for Design and Structural Analysis

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Learning Objectives

- Learn how to start a structural design project from scratch.
- Discover how to model analytical lines and areas in Revit, and then design and analyze in SOFiSTiK FEA.
- Discover how to easily assemble shop drawings.
- Learn how to optimize your design workflow.

Description

In this class we will show the whole Building Information Modeling (BIM) workflow, from the design and analysis phase, passing from modeling to delivering drawings. Traditional workflows suffer from loss of information and lack of coordination causing a lot of rework. We will show you how to model a project in Revit in order to be useful for design and analysis; how to place loads and then export the analytical lines and areas to SOFiSTiK FEA; and how to analyze and design the structure and to use the results to place rebars in the concrete. Finally, the client needs drawings, so with some tools from SOFiSTiK we will show how to derive 2D drawings sheets from the 3D model. In this session we will use as an example a 20-story building. We will start with Revit for the first design phases, then use SOFiSTiK FEA for the analysis and design. Finally we create 3D rebars using design results and will produce drawings sheets.

Your AU Experts

__Juan Carlos__ holds a Major in Civil Engineering by Anahuac University, Mexico City, with a Minor in sustainable development and a CAPM title. Juan has six years of experience in project management and construction. He started working at FCC SA. Four years ago, he joined the BIM department at ICA, the largest construction company in Mexico. At ICA he was in charge of advising the clients in bim management strategies. In May of 2014 he was invited to the Autodesk NAC3 event. At the end of 2014 he co-found The BIM Group, a company dedicated to innovate the construction industry in Mexico, implementing BIM and applying other VDC technologies. He works closely with the structural design departments and the survey areas, innovating new ways of delivering more information in less time to the customers. Nowadays The BIM Group owns a portfolio of 1.3 billion dollars in projects. He is a proudly Autodesk Gunslinger since 2014. He has a passion for sports cars and enjoys going to the beach.

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After receiving his diploma in structural engineering at Technical University in Munich, __Thomas Fink__ has worked in structural engineering and software development for over 30 years. He is co-founder and CEO of SOFiSTiK AG, a leading German supplier of software for analysis, design, and detailing. He was on the

board of the German section of buildingSMART for more than 10 years, and chaired the working group "innovations" of the Bavarian Chamber of Building Engineers. Whenever he has time, he loves to fly balloons and to sail.

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Learn how to start a structure design project from scratch.

Getting Started.
Some consideration for this Lecture:

The example of the lecture is based on the US ACI-318M-08 code and was adapted to the Mexican Code 2004 (Reglamento de Construccion del DF y sus Normas tecnicas Complementarias).

For this Lecture we will not take into account the foundations (at the end Sofistik only use them as a support for calculating) and we will only use fixed supports.

For this example we are using Sofistik SSD 2016 and Revit 2016, you can download them from: http://www.sofistik.com/en/support/ and http://www.autodesk.com/products/revit-family/free-trial respectively.

This lecture is a testimonial of the experience that we have acquired, the good practices of these softwares and some tips and tricks that we would have liked to know.

Setting a New Project in SOFiSTiK.

There are two ways to start a new project in SOFiSTiK, from Revit or from SOFiSTiK FEA.

The best practice is to open SOFiSTiK SDD and click on *New Project*.

It will open the following window:

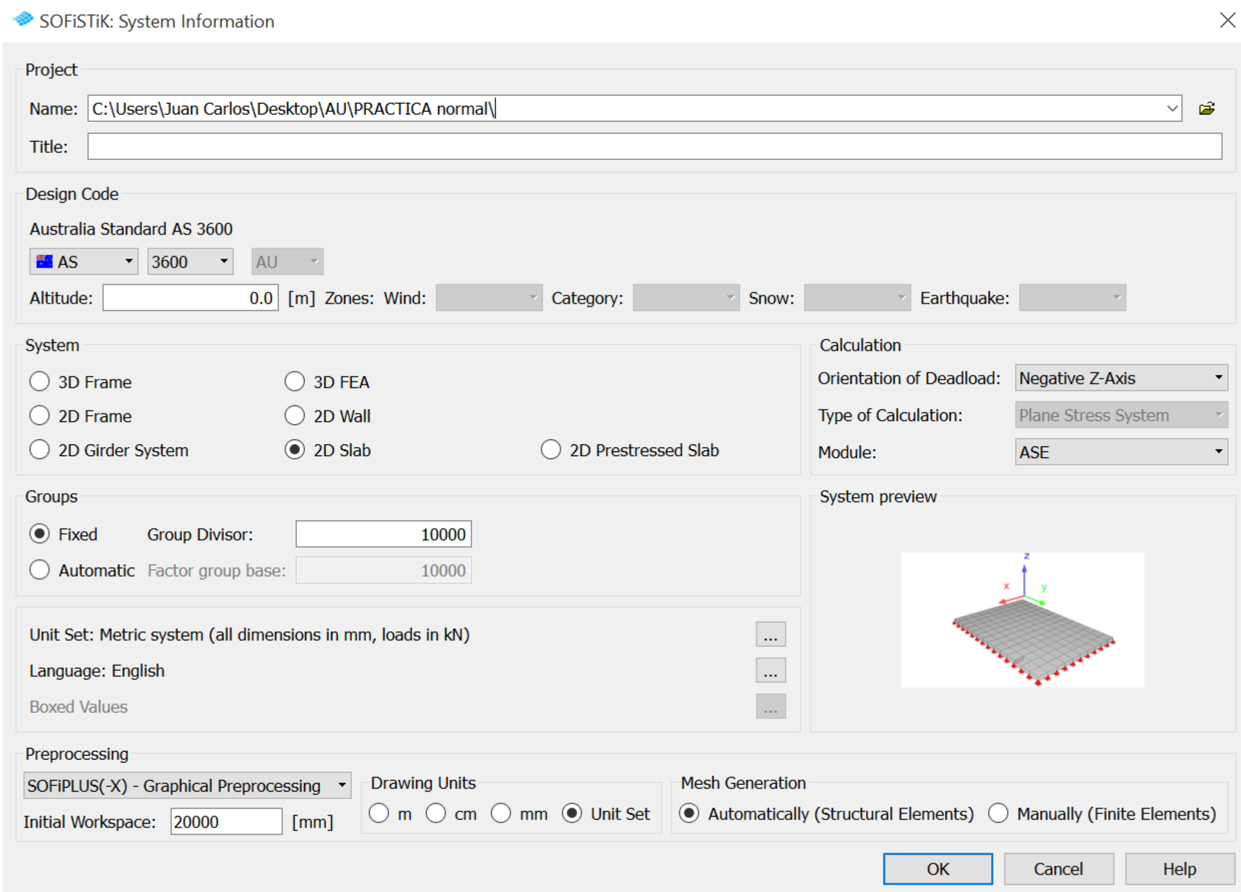


FIGURE 1: STEP 1 OPENING A NEW PROJECT IN SOFISTIK

In this window you can set all the parameters that you need.

It´s important that you save the file in an individual folder, as Sofistik generates many files. You can name it as you want.

Then you have the opportunity to select a country and a code. If by any chance you don’t find yours, don’t worry, Sofistik allows you to introduce the software code and adapt it to your needs. In this example, as I’m from Mexico, and there is no code program for Mexico, I will use the US ACI-318M-08. This code is the most similar to the Mexican Code.

The following images show the preliminary settings in order to start a project.

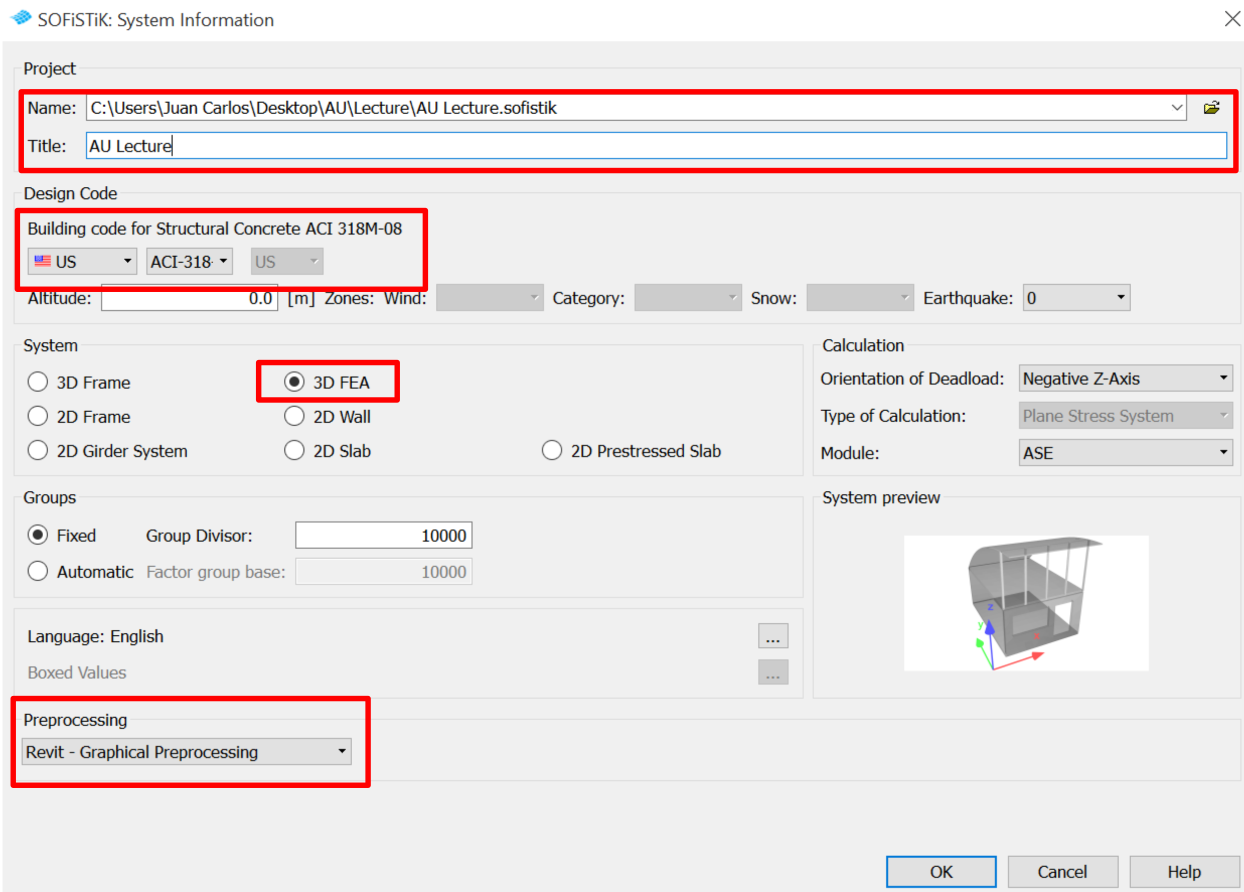


FIGURE 2: STEP 2 OPENING A NEW PROJECT IN SOFISTIK

Beware to change the Preprocessing to *Revit – Graphical Preprocessing*.

Now you have set your Sofistik Project.

The next step is to start modeling your Project.

To do this you have to open Revit within Sofistik. To do this look for *Revit: GUI for Model Creation.*

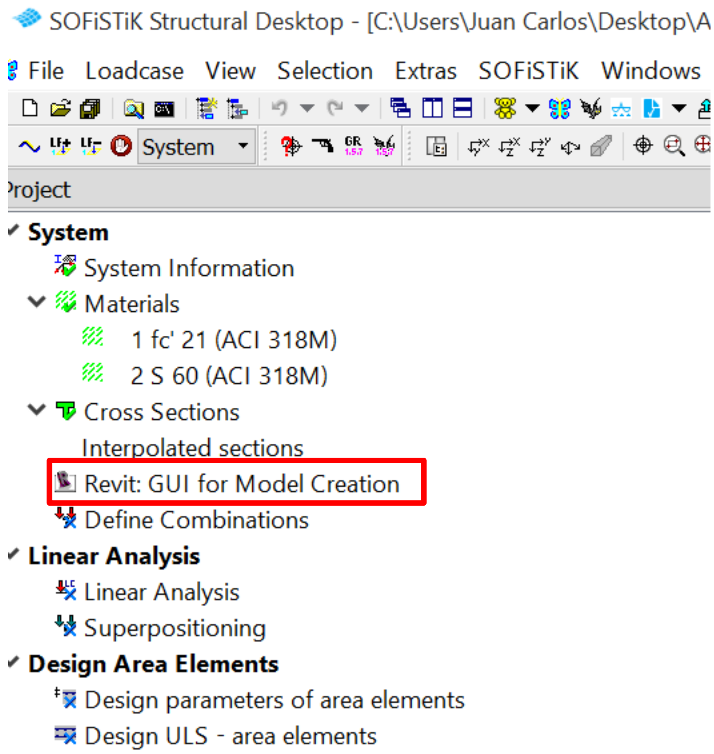


FIGURE 3: STEP 1 OPENING REVIT USING SOFISTIK

Tip: if for some reason Revit doesn't open or an error appears, you probably have a wrong path for Revit.exe define. To fix this go to *SOFiSTiK/User Option,* search for *Revit: GUI for Model Creation* and click on *Paths/General*. Change the path to the current location of the Revit.exe in your computer.

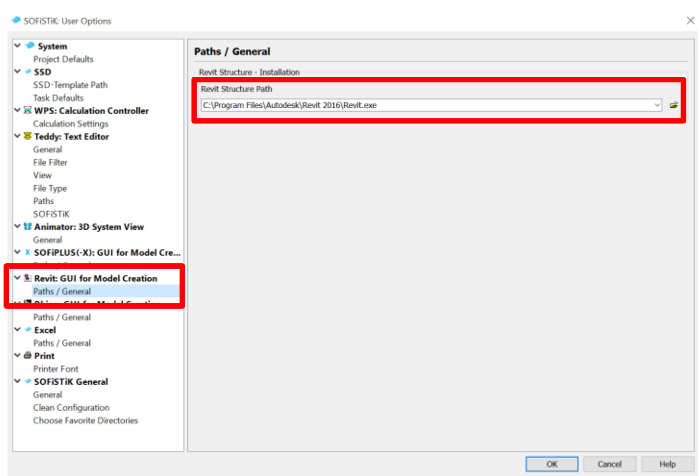


FIGURE 4: STEP 1 CHANGE OPENING PATH

Modeling.
Once Revit is opened you can start a model the traditional way. For me, the easiest way to start modeling is sketching the grids and levels. As you know, grids and levels are very important in Revit, so please be careful.

Next, you can follow two workflows (it depends on the type of information you have).

If you are lucky and manage to have a BIM model, you can start reviewing the model and the families and then export this model to SOFiSTiK.

If not, you can always link a CAD file and start tracing beams and columns.

Tip: you can use an existing model and export it to SOFiSTiK.

The First Draft.
Order is the mother of all good models, and for designing is crucial to have order. The names of the families and types are going to be very important.

I suggest to use the following format.

For the Family:

A Prefix: S (for Structure)

Material: Concrete

Description: Beam

And for the type:

Name: T-1

Dimensions (in centimeters): (90X40)

Example.

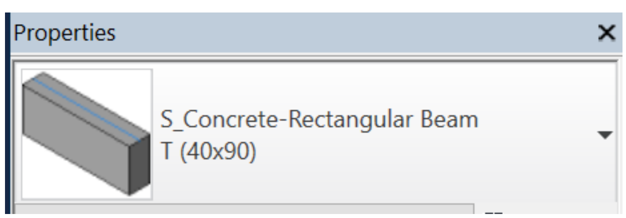


FIGURE 5: FAMILY PROPERTIES

This way we can know the element properties without going to the type properties (Structural Concrete Rectangular Beam, named T-1 that is 90 cm height and 40 cm width.

The next step is to start modeling. For this I don’t have any recommendation, I´m sure you are better than me doing this.

Using the "Template" in Revit.

We have made a special *Template* in Revit that contains certain *View Templates* that can help you model and visualize the *Analytical Lines*.

In order to easily visualize the *Analytical Lines* we are going to use the *05 Analytical Model 3D View Template*. This *Template* shows the *Analytical Lines* and also the geometry in transparency. The Analytical Lines has a filter applied in order to see the beginning, the middle and the end of the *Analytical Line*, this will help us to see if all our lines are connected as we expect.

FIGURE 6: COLUMN WITH ANALYTICAL LINE

Discover how to model analytical lines and areas in Revit, and then design and analyze in SOFiSTiK FEA.

Analytical lines.

How to view and manipulate the analytical lines.

I'm sure that every one of you has created analytical lines without noticing. Yes, they are there. In order to activate them you have to enter the *Visibility Graphic* Menu (short cut *"V+V"*) and go to the third *TAB* named *"Analytical Model Categories",* then press *ALL* and turn them *ON*. Press *OK*. The final step to see the Analytical Lines is to turn the Visual Style into Wire Frame.

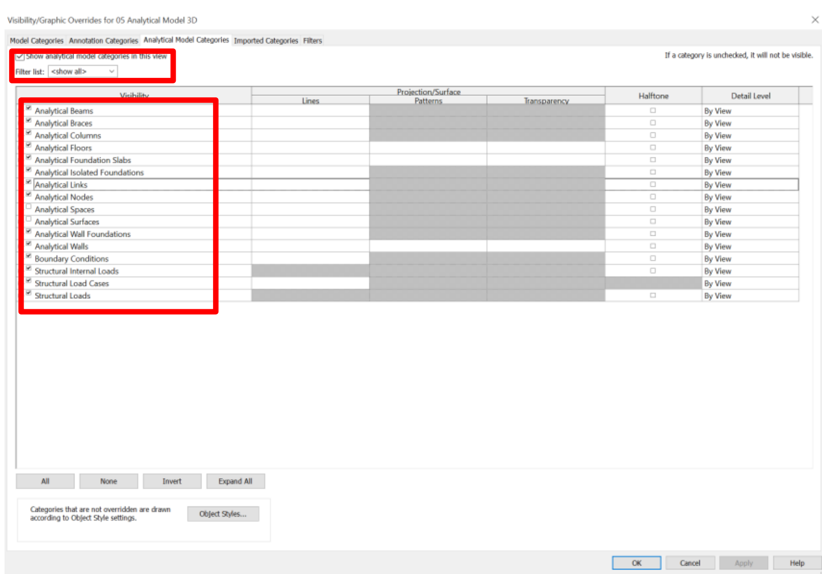


FIGURE 7: VISIBILITY GRAPHICS/ANALYTICAL MODEL CATEGORIES

Tip: Use the 05 Analytical Model 3D View Template.

Sometimes the Analytical Lines are not in the desired location. To move the *Analytical Line* you have several methods. If it´s just a small adjustment you can select the *Analytical Line* and then, select the correct alignment.

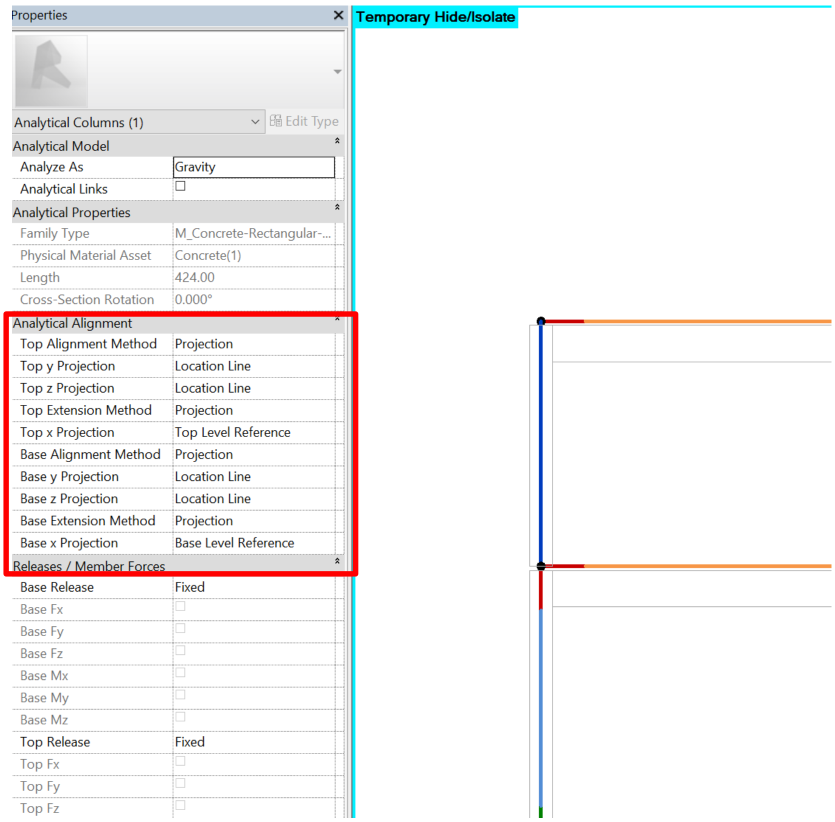


FIGURE 8: ADJUSTMENT OF COLUMN ANALYTICAL LINE

Tip: you can adjust also the beams and floors.

If you have to make a major fix, select an *Analytical Line* and then, in the *Modify* tab, select *Analytical Adjust*. This way you can adjust the line to the desire location.

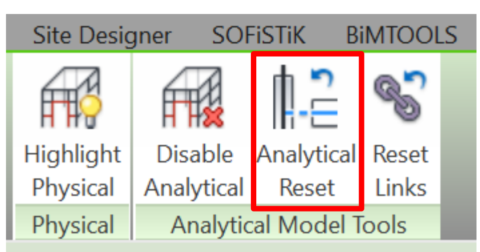


FIGURE 9: STEP 1 ACTIVATE ANALYTICAL RESET

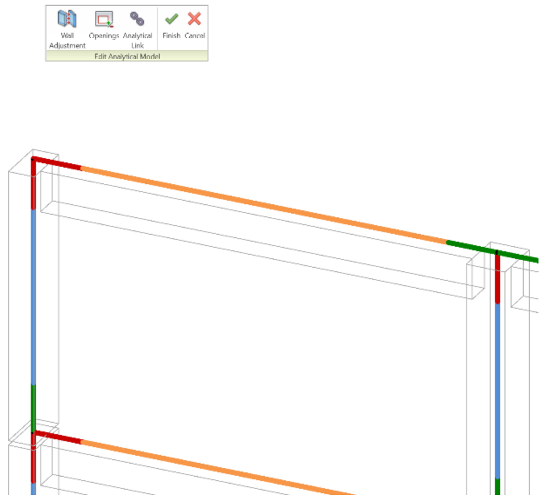


FIGURE 10: STEP 2 ADJUSTMENT OF BEAM ANALYTICAL LINE

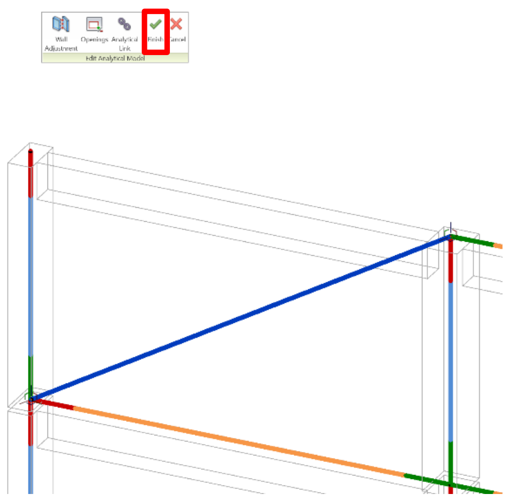


FIGURE 11: STEP 3 ADJUSTMENT OF BEAM ANALYTICAL LINE

Note: only structural elements can have *Analytical Lines*.

Setting Foundations (Boundary Conditions).
This step is very easy. If you have used a *Foundation Family,* by default a support appears when we you activate the *Analytical Lines*.

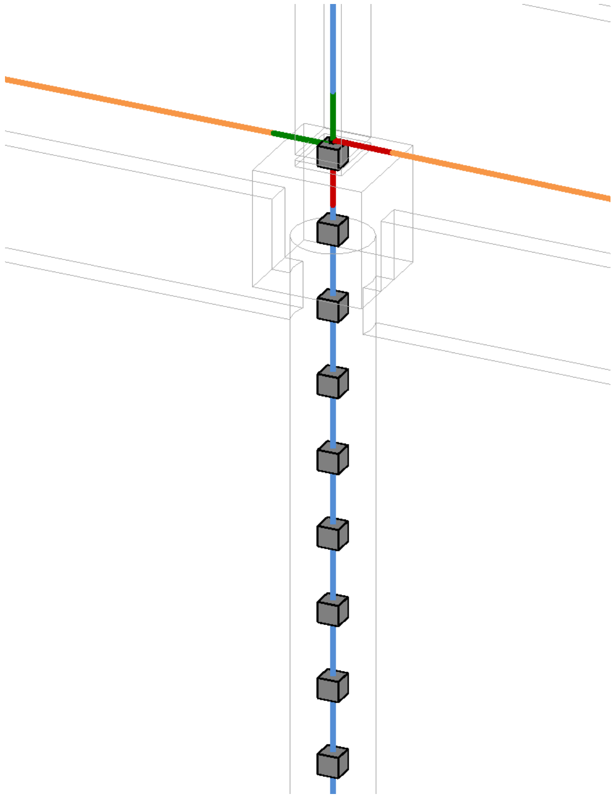


FIGURE 12: PILE WITH BOUNDARY CONDITION

If you didn't model any Foundations you can still add *Boundary Conditions* to your model. In order to do this, go to the *Analyze* tab in the *Ribbon* and click on *Boundary Conditions.*

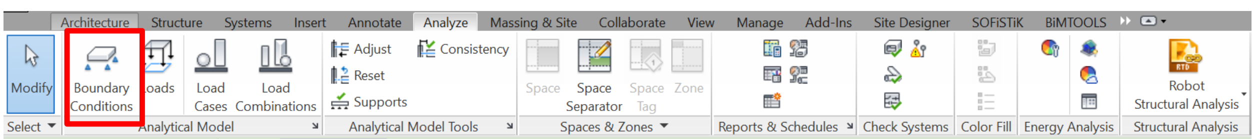


FIGURE 13: ANALYZE TAB

Add the *Boundary Condition* at the end of the Columns.

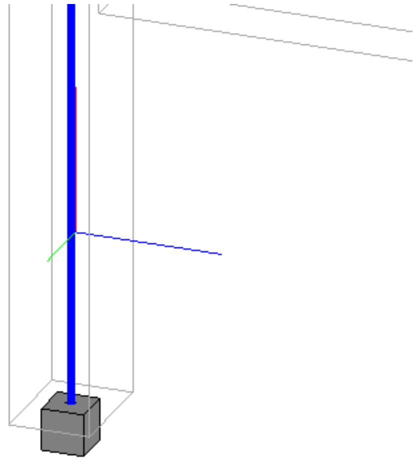


FIGURE 14: BOUNDARY CONDITION FOR COLUMN

You can change the way the boundary behaves in its properties.

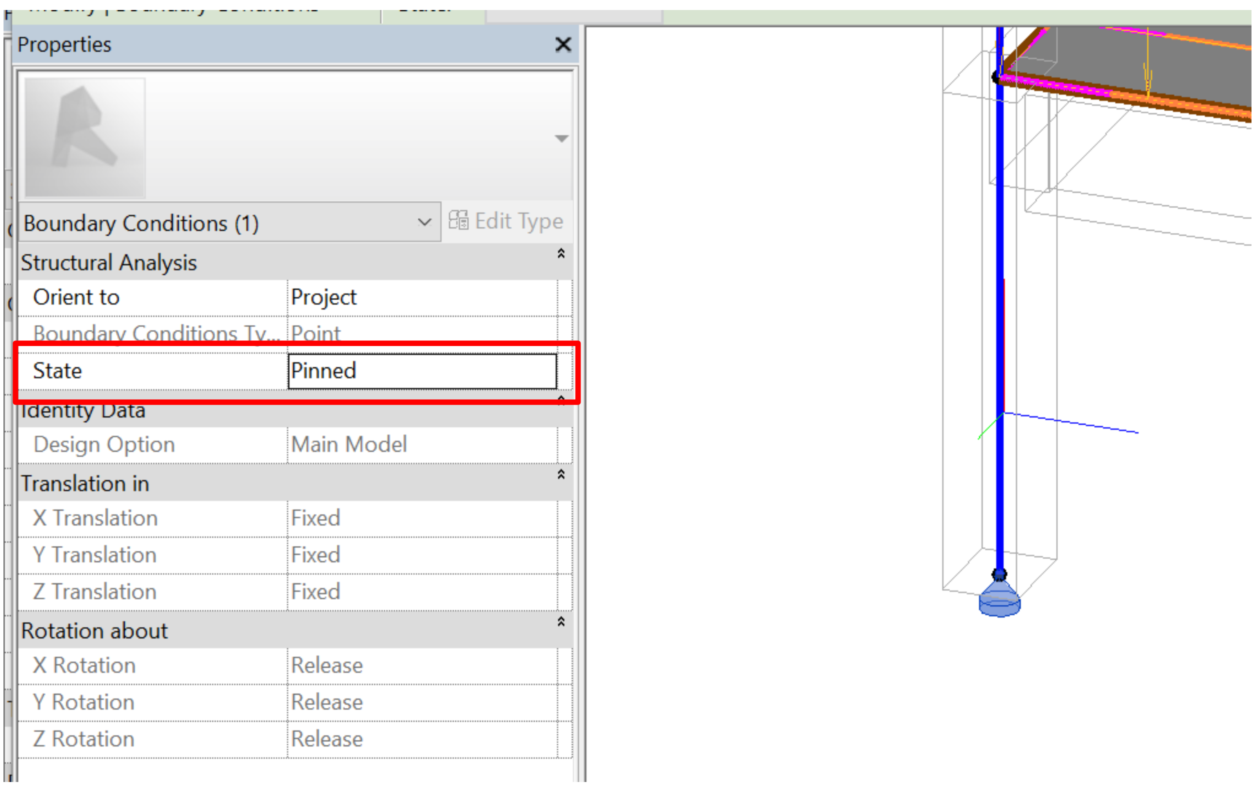
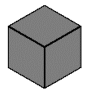
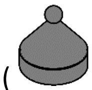
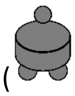


FIGURE 15: CHANGING BOUNDARY CONDITION STATE

You can select: Fixed (), Pinned (), Roller () or even a user defined boundary conditions.

For this example we will use a *Fixed Boundary*.

Setting the Load Cases.
To introduce load cases, go to the Analyze Tab /Analytical Model/Load Combinations.

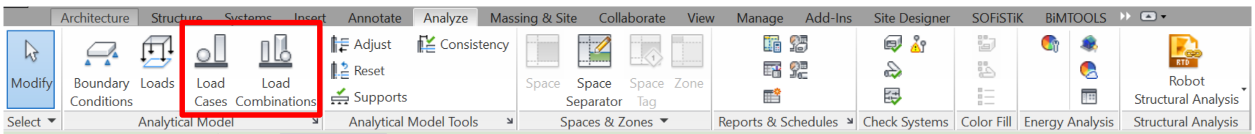


FIGURE 16: REVIT RIBBON, LOAD CASES & LOAD COMBINATIONS

You have to enter the load cases in Revit in order to have them recognised by SOSFiSTiK.

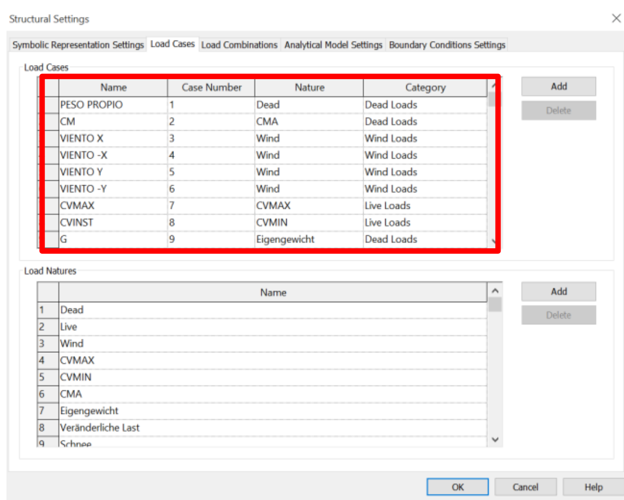


FIGURE 17: STRUCTURAL SETTINGS, LOAD CASES

Setting Loads.
You can set a load in a *3d view* or in a plane view.

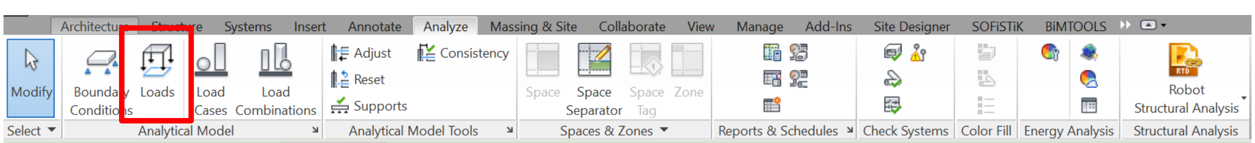


FIGURE 18: REVIT RIBBON, ANALYZE TAB

Select the *Loads* icon and then select the type of load you want to insert:

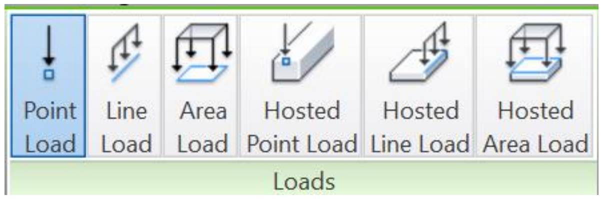


FIGURE 19: LOADS

Then you have to add the value of the load. To do this you have to select the load and enter the desired value in the properties dialog.

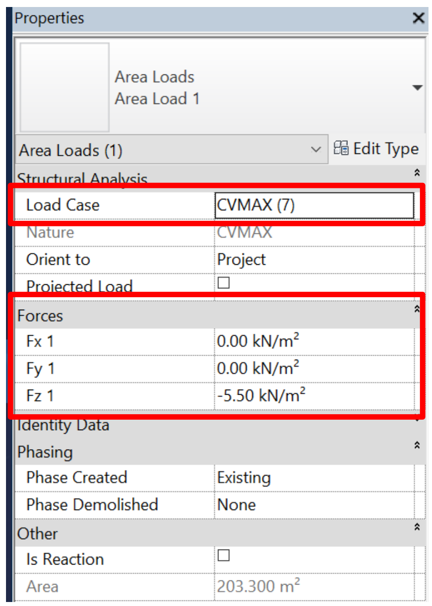


FIGURE 20: LOADS PROPERTIES

Here you can also set the *Load Case* for each load.

Tip: it´s easier to set loads in a *3D view*, just take into account the *work plane* you are using.

Mapping Materials.

Materials, Families and Load Types in Revit can´t be mapped to Materials, Cross Sections and Actions in finite element software. Therefore SOFiSTiK offer the possibility to map this information to the corresponding definitions in their software.

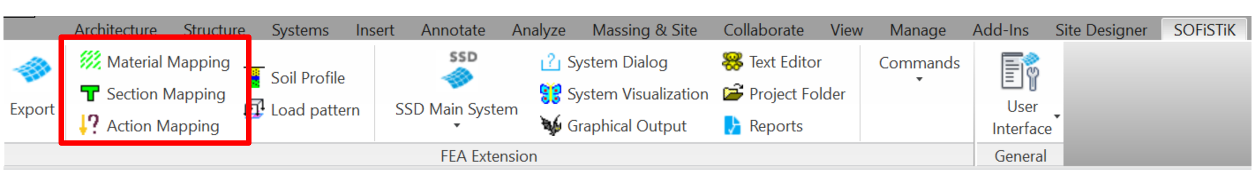


FIGURE 21: SOFISTIK FEA EXTENSIONS.

To map Materials, click on *Material Mapping*.

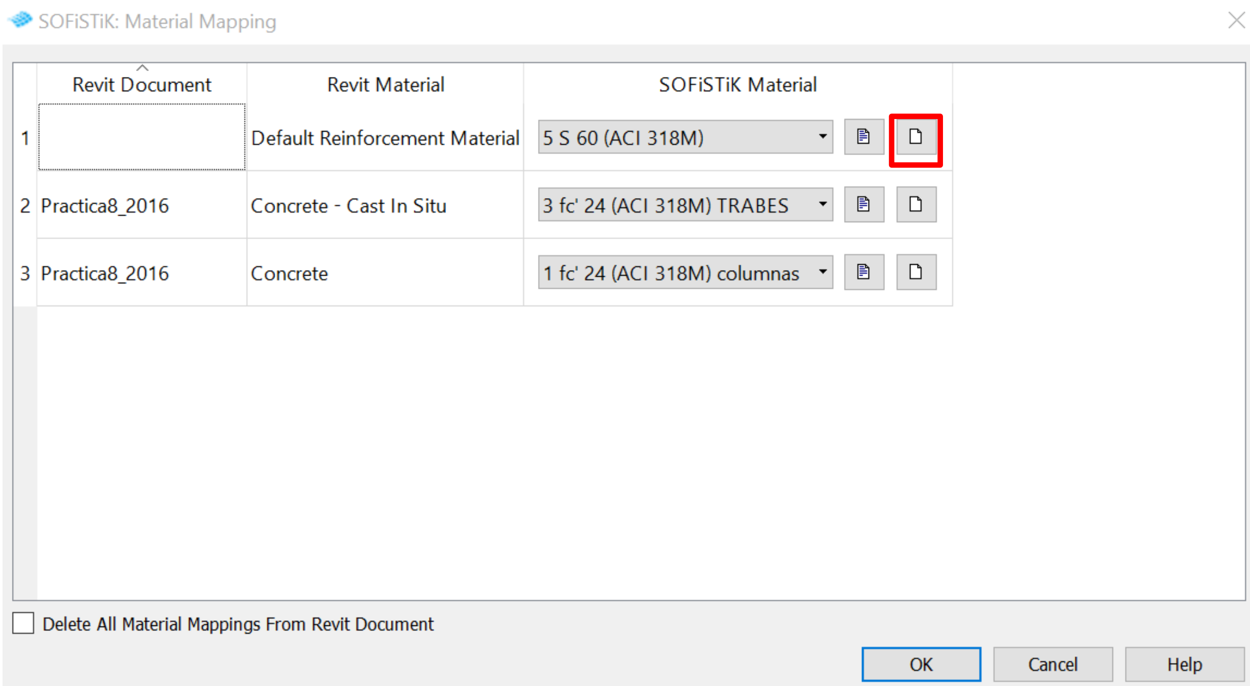


FIGURE 22: SOFISTIK MATERIAL MAPPING.

SOFiSTiK makes an intelligent mapping, but if you are not satisfied with the result you can always change some material settings by clicking .

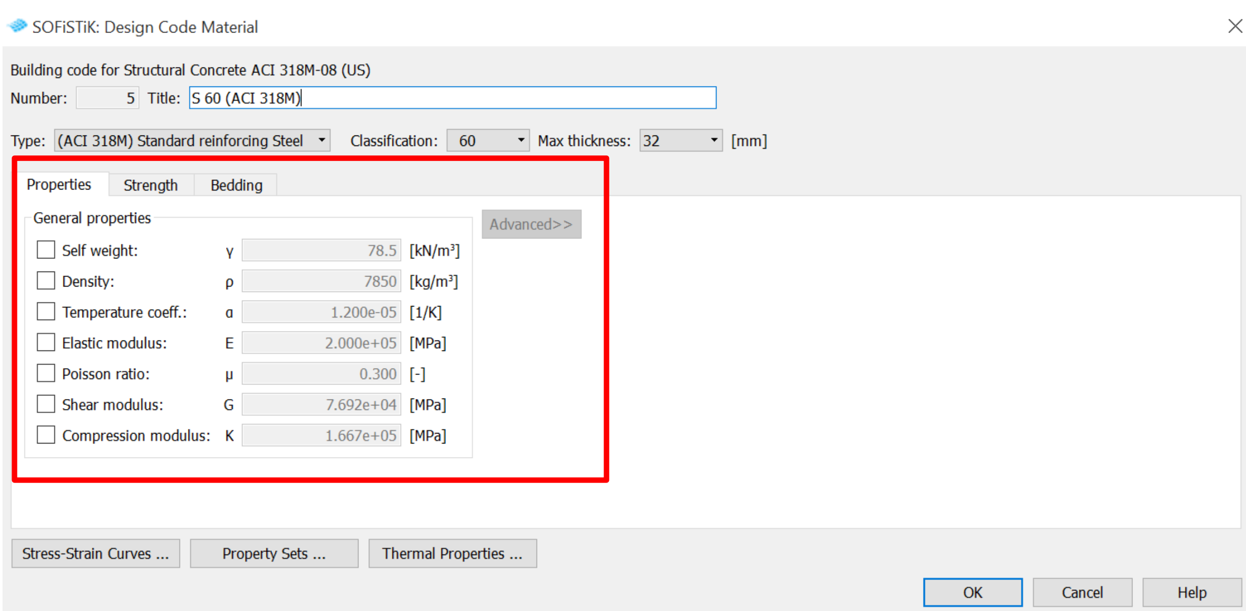


FIGURE 23: SOFISTIK DESIGN CODE MATERIAL.

In this dialog box you can change properties, strength and bedding.

Mapping Sections.
To map Sections click on *Section Mapping*. The following window will open:

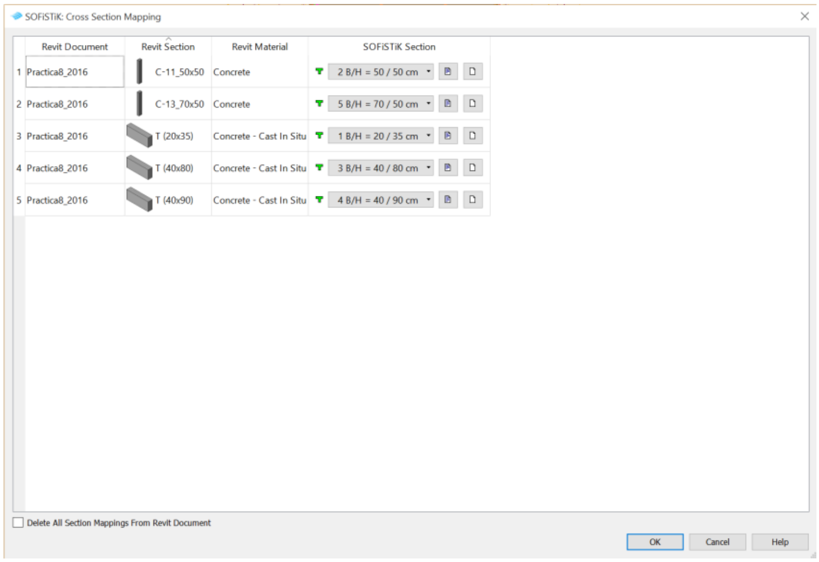


FIGURE 24: SOFISTIK CROSS SECTION MAPPING.

SOFiSTiK also makes an intelligent mapping for sections. You can also change the section if you don't agree with the one SOFiSTiK proposed.

Mapping Loads.
Last step before exporting to SOFiStiK is to map the loads. To do so you have to click on *Action Mapping*.

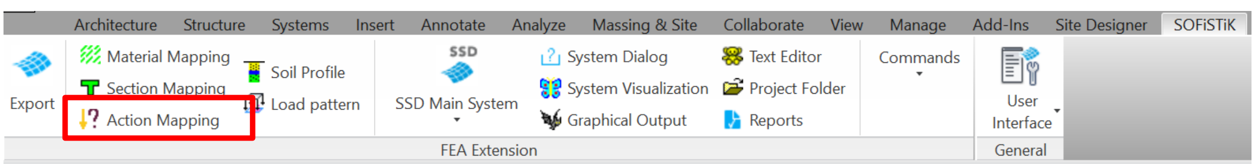


FIGURE 25: SOFISTIK FEA EXTENSIONS.

A similar window will open.

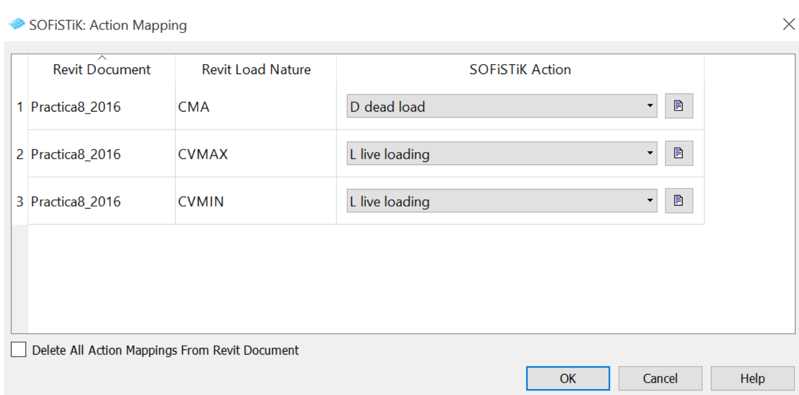


FIGURE 26: SOFISTIK ACTION MAPPING.

Export to SOFiSTiK.

As for this step you are all set to export all the relevant information from Revit into SOFiSTiK.

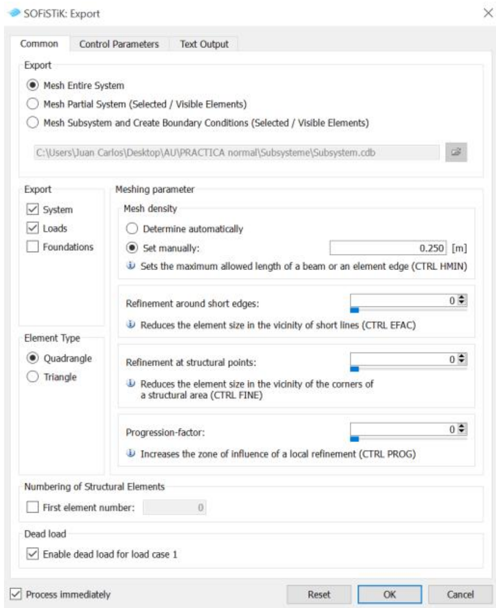


FIGURE 27: SOFISTIK EXPORT.

In the export settings you can select many options. For example, you can only export a part of your system, or you can export a subsystem. Subsystems are commonly used to analyze slabs as a 2-D system. SOFiSTiK automatically created rigid or elastic supports where columns or walls have been cut.

An important parameter to be set is the *Mesh Density*. As it says the *Mesh Density* is how precise we want our models to be calculated. Be aware that if the density is very high, the calculations will take longer.

After setting the parameters click *OK*.

Use the *SSD Main System Button* to open SOFiSTiK.

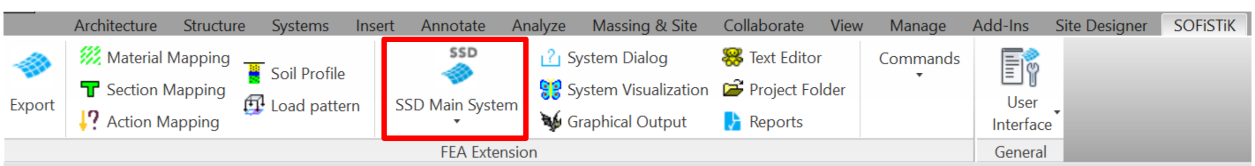


FIGURE 28: SOFISTIK FEA EXTENSIONS.

Tip: I'm pretty sure that you will get an error in your first export. Try to find the *Analytical Line* or the element that is causing the problem. If you can't, try to export less elements. I extremely recommend to start by modeling a simple frame (columns and beams) and start to see how the model behaves in the export.

SOFiSTiK Overview.

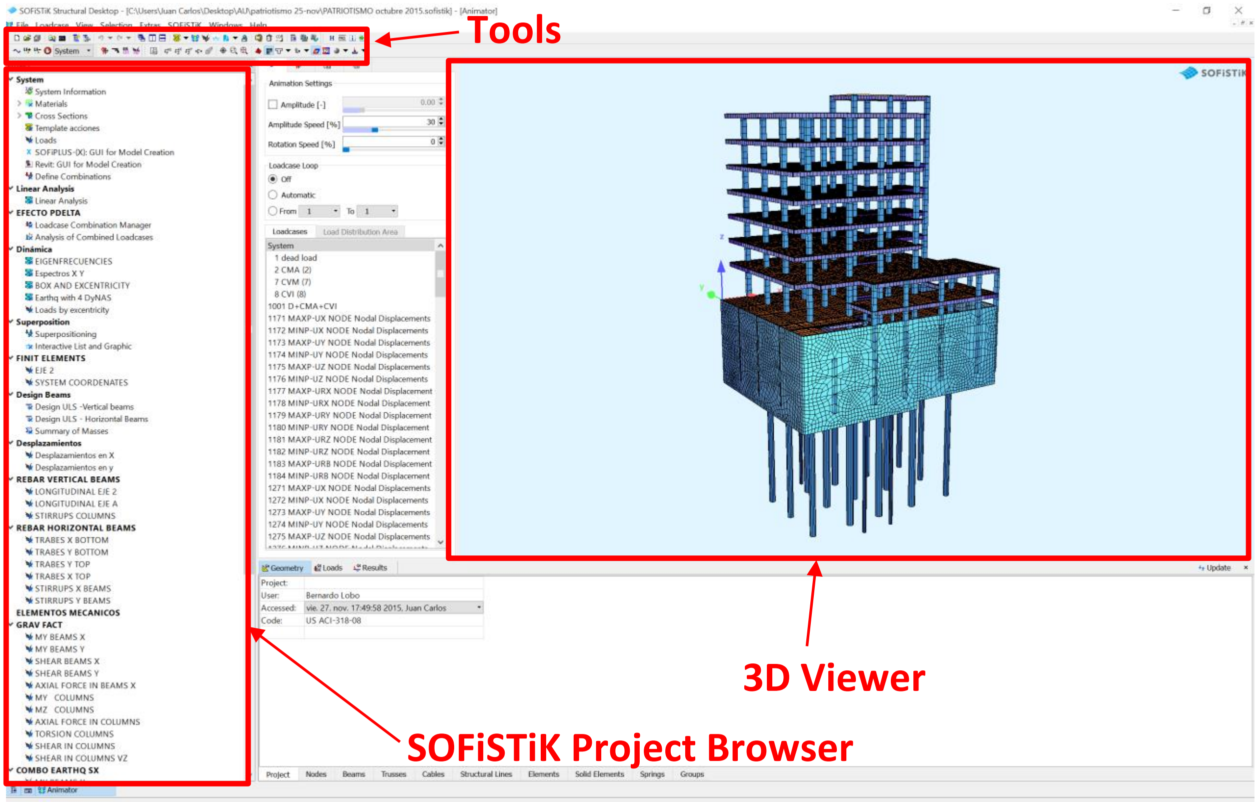


FIGURE 29: SOFISTIK FEA OVERVIEW.

Setting the Load Cases Combinations.

In order to do this you have to add a task into SOFiSTiK. To add task, simply make right click on the Project Browser and add a task.

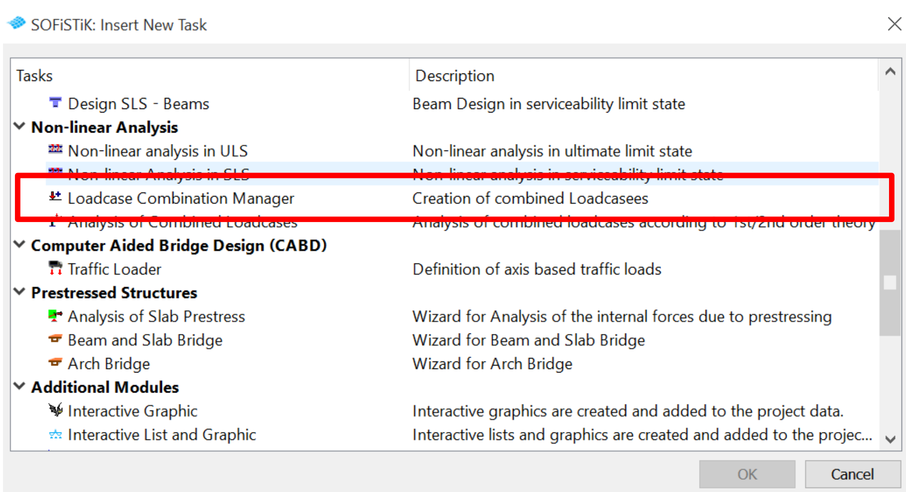


FIGURE 30: SOFISTIK INSERT NEW TASK.

After inserting the task double click on the *Loadcase Combination Manager*. A window like this will open:

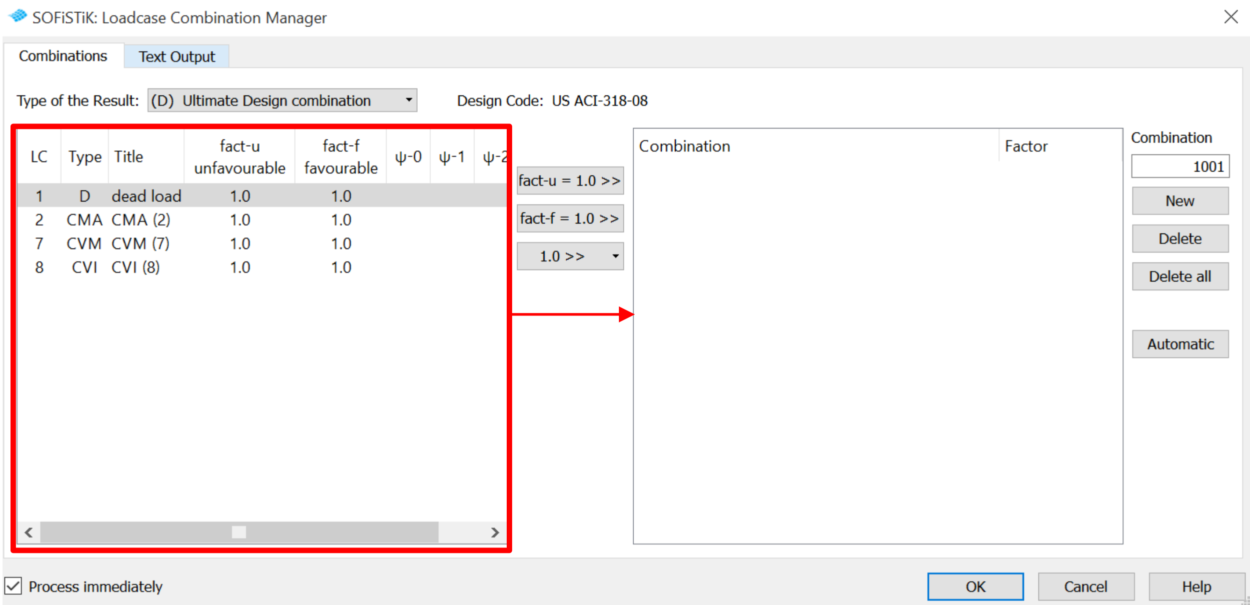


FIGURE 31: STEP 1 SOFISTIK LOADCASE COMBINATION MANAGER.

Here you can set the factor for the unfavourable, the favourable cases and the load combinations.

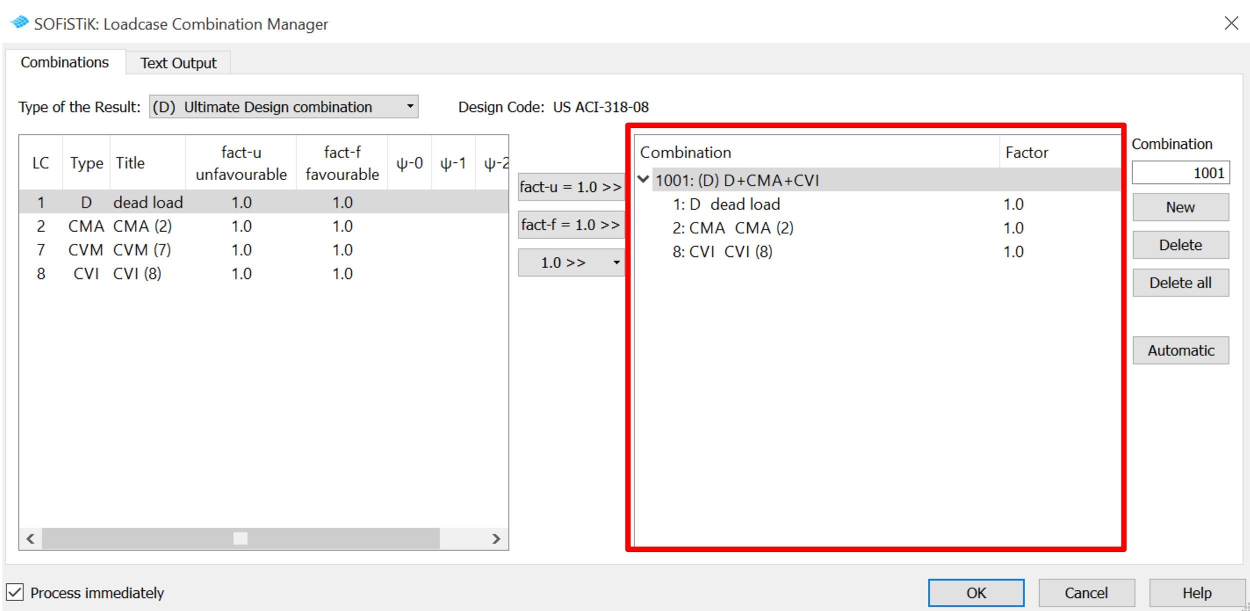


FIGURE 32: STEP 2 SOFISTIK LOADCASE COMBINATION MANAGER.

Getting the Design Spectrum into SOFiSTiK.
Here is when it starts to become a little complicated for those who are not familiar to coding. In many cases it pays off to learn this, as you can reuse your work for upcoming projects.

There are two ways of doing this. The easiest one and the hard one.

The easiest way is to simply add a task (see image below).

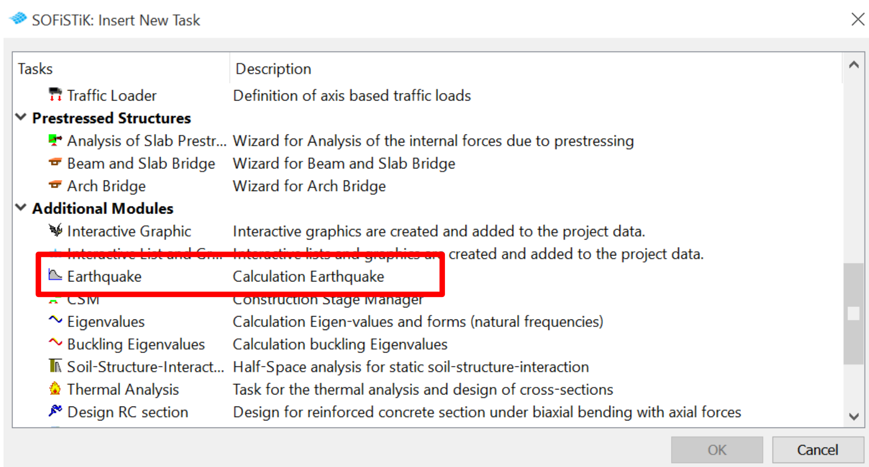


FIGURE 33: STEP 1 SOFISTIK INSERT NEW TASK.

Double click on the task.

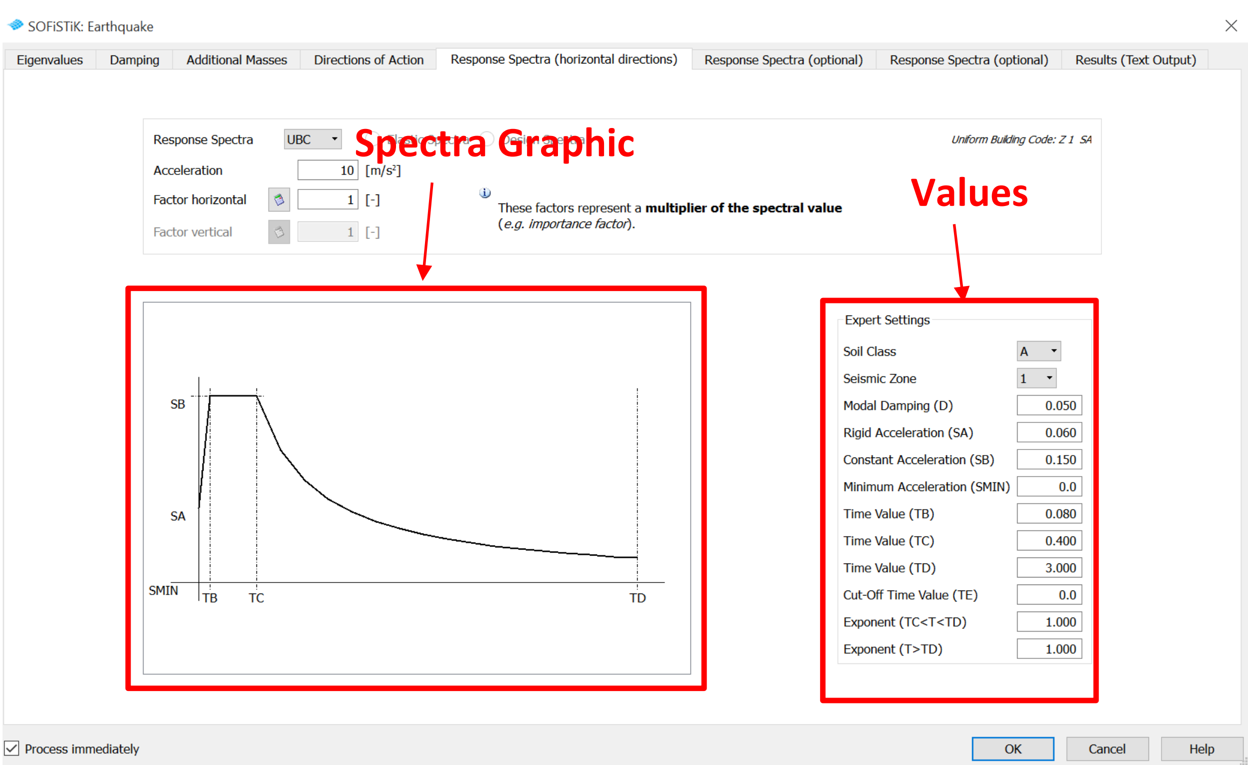


FIGURE 34: SOFISTIK EARTQUAKE & SPECTRUM SETTINGS.

Fill the dialog box with the appropriate values.

Important note: you can modify the spectra with your own values. Please see the hard way.

The hard way.

You may want to determine the function outside the software. A good recommendation is to calculate the spectra in Excel and then copy and paste it into SOFiSTiK. To do this task you have to add a white *Teddy Editor Task*.

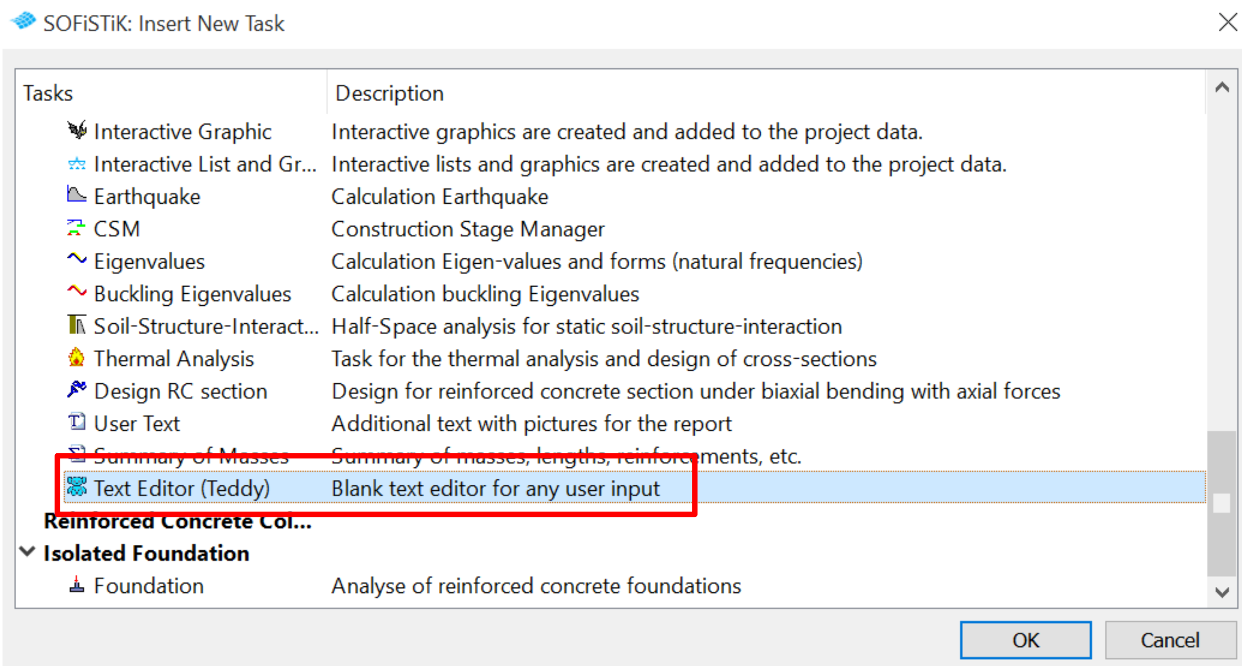


FIGURE 35: INSERT TAKS EXT EDITOR (TEDDY).

Tip: you can sort your task by creating Groups (right click, add group).

Next the code tells SOFiSTiK what to do.

```
+PROG SOFILOAD urs:25.1 $ Espectro de respuesta
head
#define Espectro_diseno_Mexico_X
RESP user  MOD 0.05 ag 1 TITL 'd=5%' AH 1.35

FUNC 0.000   0.79461
0.025   1.055309064
0.050   1.264714484
0.075   1.436608743
0.100   1.58024246
0.125   1.58024246
0.150   1.58024246
0.175   1.58024246
0.200   1.58024246
0.225   1.58024246
0.250   1.58024246
0.275   1.58024246
0.300   1.58024246
0.325   1.58024246
0.350   1.58024246
0.375   1.58024246
0.400   1.58024246
0.425   1.58024246
0.450   1.58024246
0.475   1.58024246
0.500   1.58024246
0.525   1.529101236
0.550   1.48311374
0.575   1.441407113
0.600   1.403311204
0.625   1.368300215
0.650   1.335954
0.675   1.305931551
0.700   1.277952318
0.725   1.251782752
0.750   1.227226391
```

FIGURE 36: SPECTRA CODE IN SOFISTIK

These values are used by SOFiSTiK to create the spectrum of design.

Tip: you will find a SOFiSTiK template file in the AU cloud for your use.

Accidental Eccentricity.

You can also calculate Accidental Eccentricity. This can get a little tricky. In order to make this you have to calculate the maximum length in the X axis and the maximum length in the Y axis for all levels. After that, we have to create a section box for every story and obtain their coordinates. With this information and a little bit of code we can tell SOFiSTik how to calculate all building eccentricity. This will works Earthquake analysis (Dynamic Analysis).

```
+prog sofiload  urs:22 $ RS-Family of curves req. parameters
head RS
ECHO LOAD YES

$Definición de excentricidad
let#excenDF 0.1

$ RESPONSE SPECTRA FOR HORIZONTAL-DIRECTION
let#rs_type 'h'    $ Composante:     'h'=horizontale,'v'=verticale
```

X axis   Y axis

```
$Dimensiones de piso
$ h=direction y , b=direction x

let#b1   21.08   ;      let#h1   29.64   $ Story S 4 1/2 (basement)
let#b2   19      ;      let#h2   29.64   $ Story S 4 (basement)
let#b3   21.08   ;      let#h3   29.64   $ Story S 3 1/2 (basement)
let#b4   19      ;      let#h4   29.64   $ Story S 3 (basement)
let#b5   21.08   ;      let#h5   29.64   $ Story S 2 1/2 (basement)
let#b6   19      ;      let#h6   29.64   $ Story S 2  (basement)
let#b7   20.9    ;      let#h7   29.64   $ Story S 1 1/2 (basement)
let#b8   16.5    ;      let#h8   29.64   $ Story S 1 (basement)
let#b9   35.78   ;      let#h9   30.47   $ Story PB
let#b10  25.52   ;      let#h10  11.87   $ Story 1/2 (comercio)
let#b11  15      ;      let#h11  7       $ Story 1
let#b12  35.5    ;      let#h12  29.6    $ Story 2
let#b13  31.8    ;      let#h13  24.3    $ Story 3
let#b14  31.8    ;      let#h14  24.3    $ Story 4
let#b15  31.8    ;      let#h15  24.3    $ Story 5
let#b16  31.8    ;      let#h16  24.3    $ Story 6
let#b17  31.8    ;      let#h17  24.3    $ Story 7
let#b18  31.8    ;      let#h18  24.3    $ Story 8  (azotea)
let#b19  14.85   ;      let#h19  7       $ Story 9  (cubierta de escalera)

$Definición de cajas para aplicar la excentricidad accidental
```

FIGURE 37: ACCIENDTAL EXXENTRICITY CODE IN SOFISTIK, MAXIMUN LENGTHS

```
$Definición de cajas para aplicar la excentricidad accidental
let#xmin_s1 -2  ;  let#ymin_s1 -32   ;  let#zmin_s1 -13.55  ;  let#xmax_s1 22  ;  let#ymax_s1 2   ;  let#zmax_s1 -11.85
let#xmin_s2 18  ;  let#ymin_s2 -32   ;  let#zmin_s2 -11.85  ;  let#xmax_s2 40  ;  let#ymax_s2 2   ;  let#zmax_s2 -10.45
let#xmin_s3 -2  ;  let#ymin_s3 -32   ;  let#zmin_s3 -10.45  ;  let#xmax_s3 22  ;  let#ymax_s3 2   ;  let#zmax_s3 -9.05
let#xmin_s4 18  ;  let#ymin_s4 -32   ;  let#zmin_s4 -9.05   ;  let#xmax_s4 40  ;  let#ymax_s4 2   ;  let#zmax_s4 -7.65
let#xmin_s5 -2  ;  let#ymin_s5 -32   ;  let#zmin_s5 -7.65   ;  let#xmax_s5 22  ;  let#ymax_s5 2   ;  let#zmax_s5 -6.25
let#xmin_s6 18  ;  let#ymin_s6 -32   ;  let#zmin_s6 -6.25   ;  let#xmax_s6 40  ;  let#ymax_s6 2   ;  let#zmax_s6 -4.85
let#xmin_s7 -2  ;  let#ymin_s7 -32   ;  let#zmin_s7 -4.85   ;  let#xmax_s7 40  ;  let#ymax_s7 2   ;  let#zmax_s7 -3.45
let#xmin_s8  -2 ;  let#ymin_s8  -32  ;  let#zmin_s8  -3.45  ;  let#xmax_s8  40 ;  let#ymax_s8  2  ;  let#zmax_s8  -1.375
let#xmin_s9  -2 ;  let#ymin_s9  -32  ;  let#zmin_s9  -1.375 ;  let#xmax_s9  40 ;  let#ymax_s9  2  ;  let#zmax_s9  1.08
let#xmin_s10 12 ;  let#ymin_s10 -32  ;  let#zmin_s10 1.08   ;  let#xmax_s10 40 ;  let#ymax_s10 -17;  let#zmax_s10 2.83
let#xmin_s11 18 ;  let#ymin_s11 -14  ;  let#zmin_s11 2.83   ;  let#xmax_s11 34 ;  let#ymax_s11 -7 ;  let#zmax_s11 4.95
let#xmin_s12 -2 ;  let#ymin_s12 -32  ;  let#zmin_s12 4.95   ;  let#xmax_s12 40 ;  let#ymax_s12 2  ;  let#zmax_s12 8.5
let#xmin_s13 -2 ;  let#ymin_s13 -32  ;  let#zmin_s13 8.5    ;  let#xmax_s13 40 ;  let#ymax_s13 2  ;  let#zmax_s13 12.7
let#xmin_s14 -2 ;  let#ymin_s14 -32  ;  let#zmin_s14 12.7   ;  let#xmax_s14 40 ;  let#ymax_s14 2  ;  let#zmax_s14 16.9
let#xmin_s15 -2 ;  let#ymin_s15 -32  ;  let#zmin_s15 16.9   ;  let#xmax_s15 40 ;  let#ymax_s15 2  ;  let#zmax_s15 21.1
let#xmin_s16 -2 ;  let#ymin_s16 -32  ;  let#zmin_s16 21.1   ;  let#xmax_s16 40 ;  let#ymax_s16 2  ;  let#zmax_s16 25.3
let#xmin_s17 -2 ;  let#ymin_s17 -32  ;  let#zmin_s17 25.3   ;  let#xmax_s17 40 ;  let#ymax_s17 2  ;  let#zmax_s17 29.5
let#xmin_s18 -2 ;  let#ymin_s18 -32  ;  let#zmin_s18 29.5   ;  let#xmax_s18 40 ;  let#ymax_s18 2  ;  let#zmax_s18 33.1
let#xmin_s19 -2 ;  let#ymin_s19 -32  ;  let#zmin_s19 33.1   ;  let#xmax_s19 40 ;  let#ymax_s19 2  ;  let#zmax_s19 35.6
```

Section box coordinates

```
$ X DIRECTION +e
lc 300 type none titl 'resp-x positive eccentricity'
#include Espectro_diseno_Mexico_X
$story 1
ACCE DIRN Ax 1 REFY +#excenDF*#h1   XMIN #xmin_s1   YMIN #ymin_s1   ZMIN #zmin_s1   $$
                                    XMAX #xmax_s1   YMAX     #ymax_s1   ZMAX #zmax_s1
$story 2
ACCE DIRN Ax 1 REFY +#excenDF*#h2   XMIN #xmin_s2   YMIN #ymin_s2   ZMIN #zmin_s2   $$
                                    XMAX #xmax_s2   YMAX #ymax_s2   ZMAX #zmax_s2
$story 3
ACCE DIRN Ax 1 REFY +#excenDF*#h3   XMIN #xmin_s3   YMIN #ymin_s3   ZMIN #zmin_s3   $$
                                    XMAX #xmax_s3   YMAX #ymax_s3   ZMAX #zmax_s3
$story 4
ACCE DIRN Ax 1 REFY +#excenDF*#h4   XMIN #xmin_s4   YMIN #ymin_s4   ZMIN #zmin_s4   $$
                                    XMAX #xmax_s4   YMAX #ymax_s4   ZMAX #zmax_s4
$story 5
ACCE DIRN Ax 1 REFY +#excenDF*#h5   XMIN #xmin_s5   YMIN #ymin_s5   ZMIN #zmin_s5   $$
                                    XMAX #xmax_s5   YMAX #ymax_s5   ZMAX #zmax_s5
$story 6
ACCE DIRN Ax 1 REFY +#excenDF*#h6   XMIN #xmin_s6   YMIN #ymin_s6   ZMIN #zmin_s6   $$
                                    XMAX #xmax_s6   YMAX #ymax_s6   ZMAX #zmax_s6
$story 7
ACCE DIRN Ax 1 REFY +#excenDF*#h7   XMIN #xmin_s7   YMIN #ymin_s7   ZMIN #zmin_s7   $$
                                    XMAX #xmax_s7   YMAX #ymax_s7   ZMAX #zmax_s7
```

Code for calculating Accidental eccentricity

FIGURE 38: ACCIDENTAL ECCENTRICITY CODE IN SOFISTIK, SECTION BOX COORDINATES AND ACCIDENTAL ECCENTRICITY CALCULATION

Running the Model.
After a couple of iterations you will have fulfilled all code requirements.

To run the model using all analysis, give right click and *Calculate All*.

Go and get a cup of coffee.

Tip: SOFiSTiK runs faster if you have the file saved in the local disk. Using a server will take long time to run. SOFiSTiK prefer SSD hard drives.

Reviewing the model.
SOFiSTiK has a very wild variety of reports. You can review the model results using a tool called *WinGraf* (). You can create a report by inserting a new task and select *WinGraf*.

Some examples of reports are the Story Drift and the Base Shear. You can easily view this reports. You can also review the 3D Model.

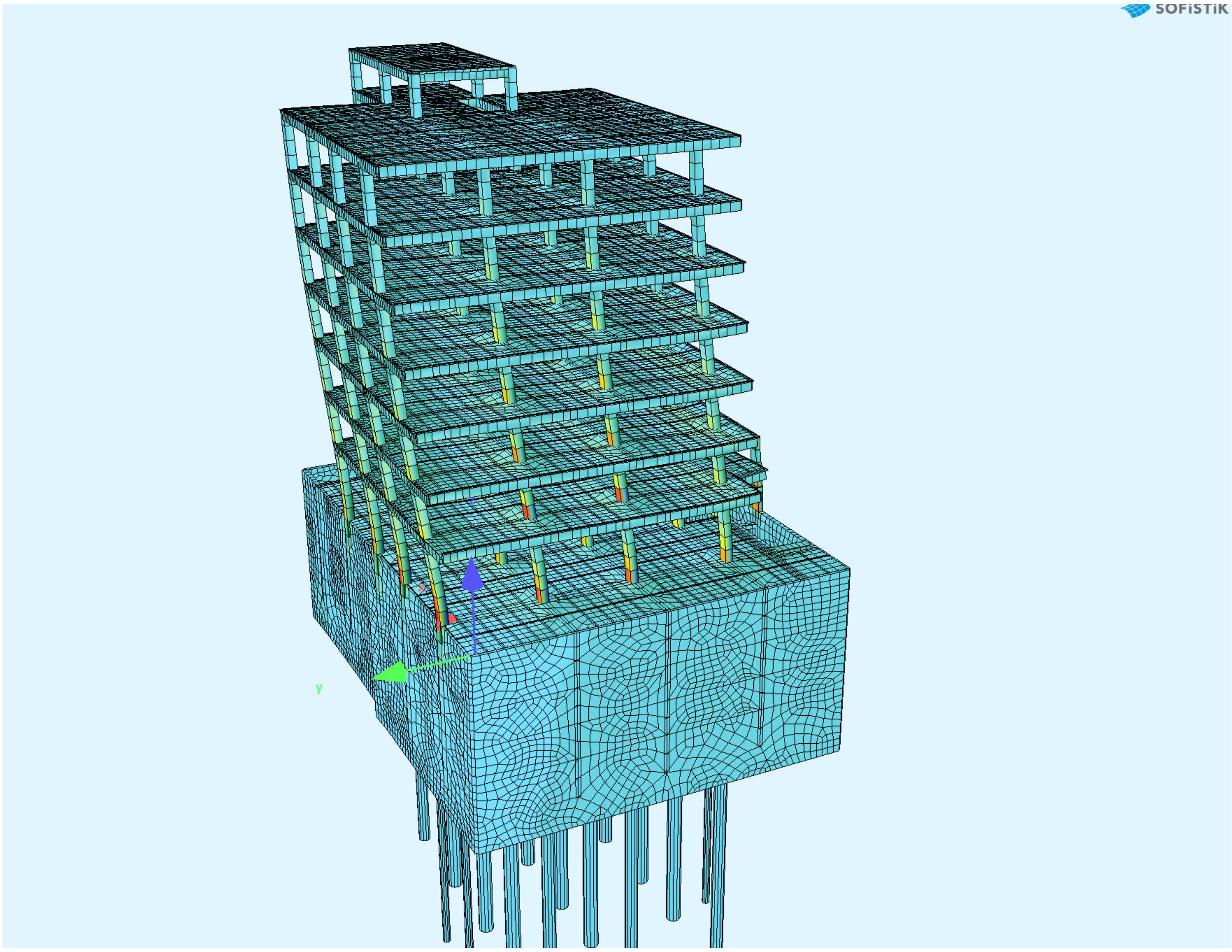


FIGURE 39: SOFISTIK 3D ANIMATION

Designing the Elements (Columns, Slabs and Framings).
You can use WinGraf to visualize all the results (Moments, shear).

Discover how to assemble easy shop drawings.

Returning information to Autodesk Revit.
Returning the reinforcement to Revit is very fast. After running SOFiSTiK all the result will be saved in the database. In Revit you can create reinforcement with the information saved in the database. In order to bring it back you have to use SOFiSTiK you have to open Revit through SOFiSTiK.

Creating Rebar with Reinforcement Generation.
To generate rebar you have to use SOFiSTiK Reinforcement Generation Tool.

First you have to select the elements that you want to reinforce.

Open *Create*.

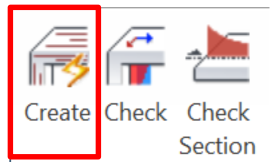


FIGURE 40: SOFISTIK REINFORCEMENT GENERATION TOOLS

Select the database and the design case.

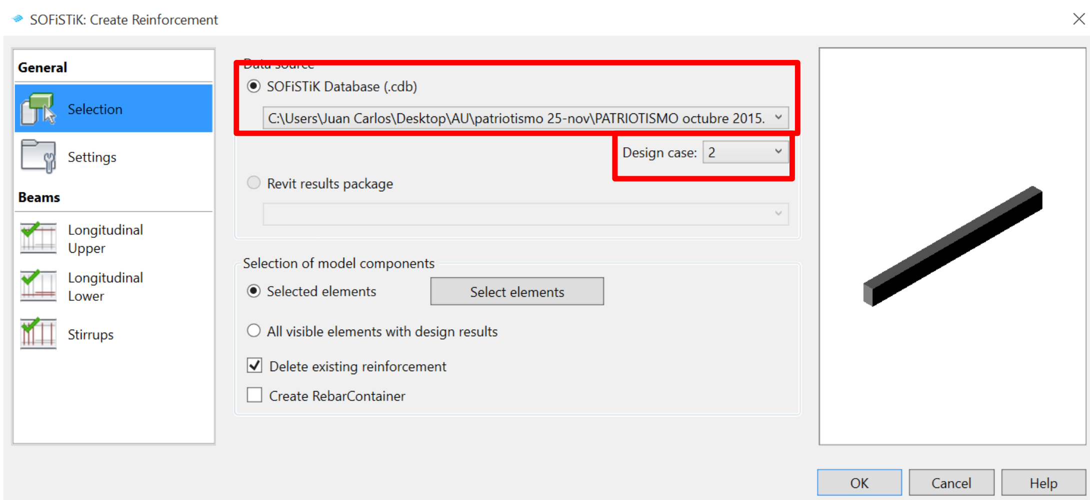


FIGURE 41: STEP 1 SOFISTIK CREATE REINFORCEMENT

You can set your own rules for reinforcement and save this files for futures projects or organizational templates.

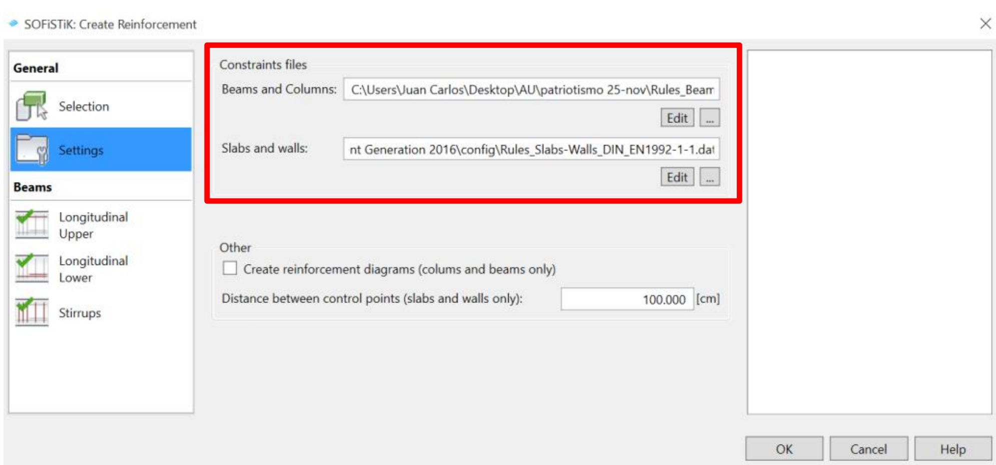


FIGURE 42: STEP 2 SOFISTIK CREATE REINFORCEMENT

Select the rebars types you want to use in order to fulfill required reinforcement.

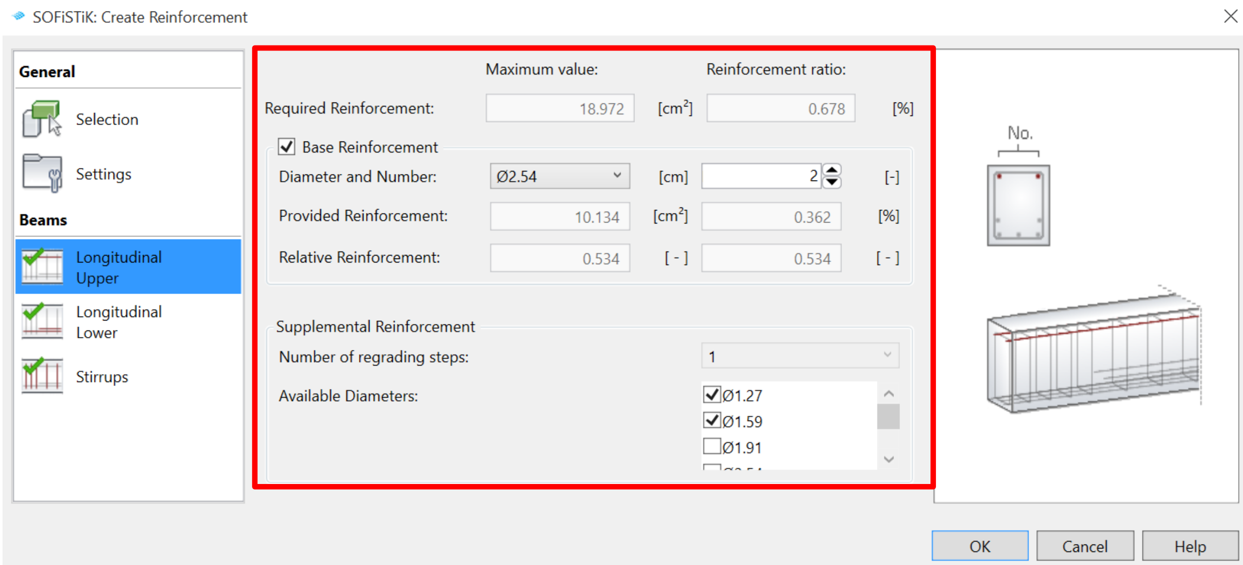


FIGURE 43: STEP 3 SOFISTIK CREATE REINFORCEMENT

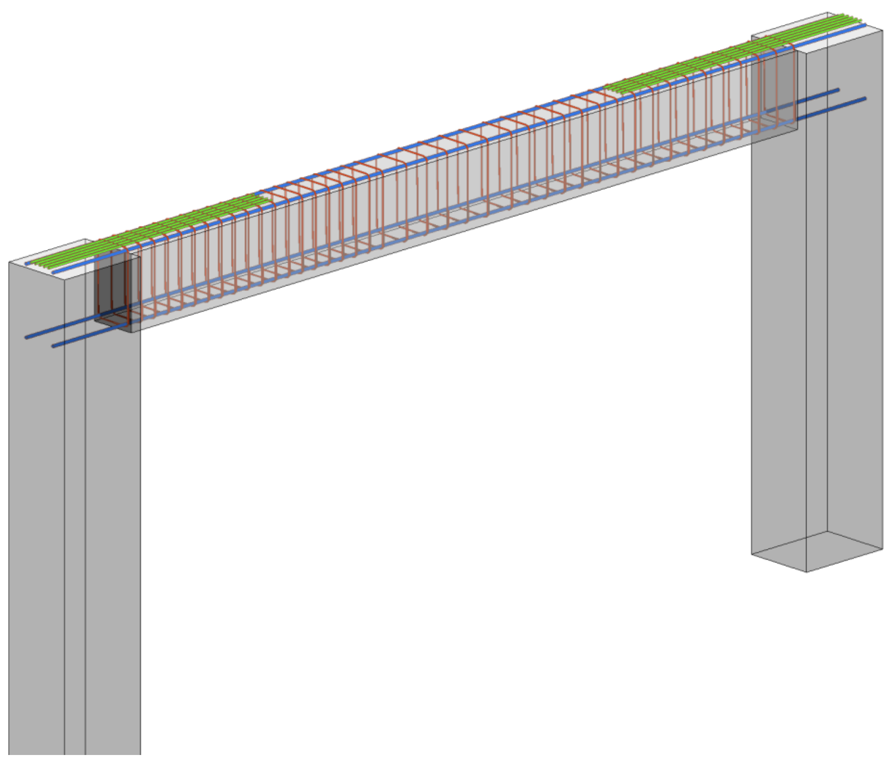


FIGURE 43: STEP 4 REVIT BEAM REINFORCEMENT

You can check the reinforcement generated vs the rebar required.

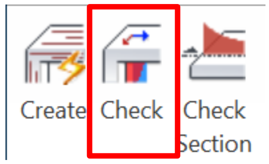


FIGURE 44: STEP 1 SOFISTIK CHECK TOOL

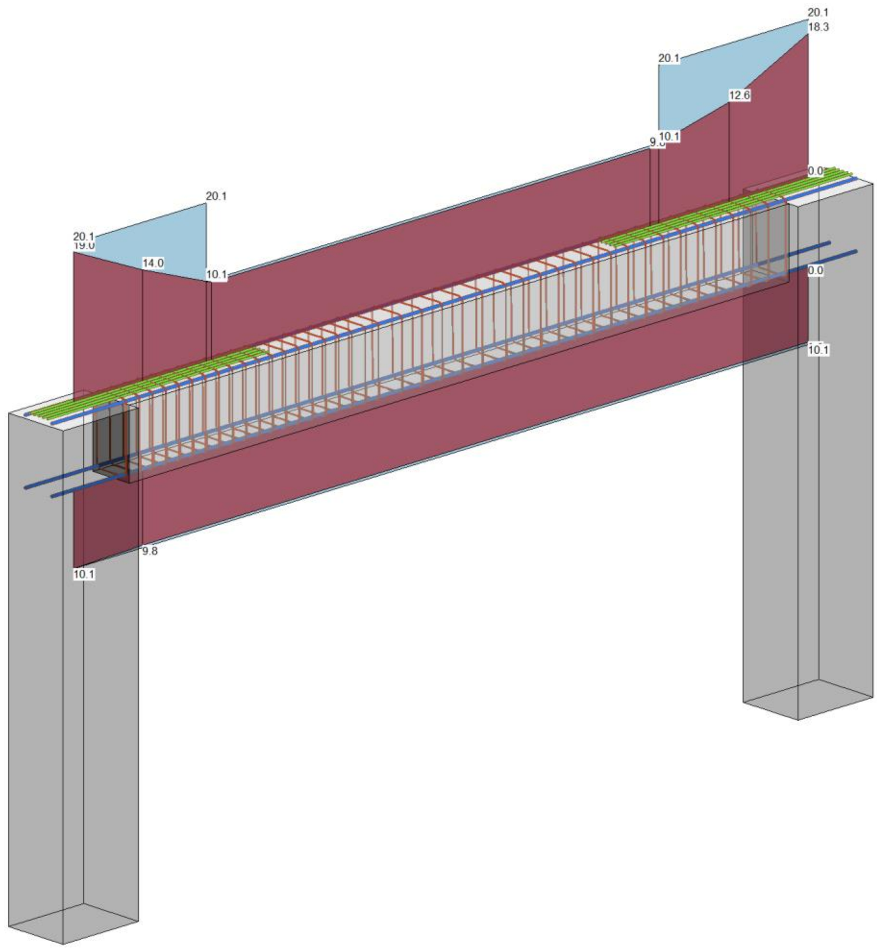


FIGURE 44: STEP 2 SOFISTIK CHECK TOOL (RED REQUIRED, BLUE ACTUAL REBAR IN BEAM).

Using SOFiSTiK Reinforcement Detailing to make 2D drawings.

To finalize we will show you a small live demo of how to easily generate rebar using the SOFiSTiK tools and how to detail a beam.

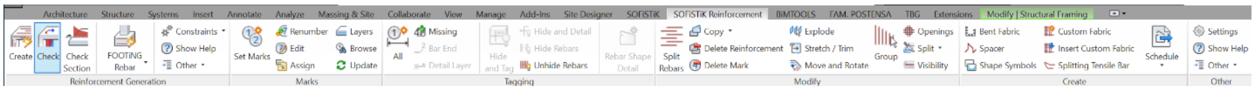


FIGURE 42: SOFISTIK REINFORCEMENT DETAILING TAB

SOFiSTiK Reinforcement Detailing is a very powerful tool, you can make from rebar detailing, passing to schedules, to sending BVBS files to rebar bending machines.

Tip: for more information of *Reinforcement Generation* and *Detailing*, please refer to:

http://aucache.autodesk.com/au2014/sessionsFiles/5174/4991/handout_5174_DE5174.pdf

http://aucache.autodesk.com/au2013/sessionsFiles/1669/1035/presentation_1669_au2013_SE1669_16x9.pdf

Summary.

Using Revit and SOFiSTiK correctly in your workflow can potentiate your BIM production. We demonstrated that SOFiSTiK can be adapted to several design codes even if they are not available from the factory. SOFiSTiK FEA is a very powerful general tool. To take best use out of it, you will have to pass a learning curve. As it is an open system with many interfaces available, it can be customized to different problems. Your input files can easily be used for similar projects in the future.

The possibility to use your BIM Model for reinforcement design to generate and check your design against requirements has a huge potential to streamline your processes and to help you producing better quality at less cost.