

The Holistic Workflow  
for the Calculation of  
Masonry Structures

with SCIA & FRILO

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# Phase 1: Preparing the model in SCIA Engineer

## Step 1: Defining masonry walls

This workflow starts in the 3-d model that you have prepared in SCIA Engineer. First, you have to define the masonry walls in this model. Currently, SCIA Engineer does not offer a material library for masonry. Therefore, only the material type “masonry” can currently be selected.

However, to automatically transfer a material quality to FRILO, you can use a clear notation for masonry of simplified design. Follow our recommended notation to define the material name exactly.

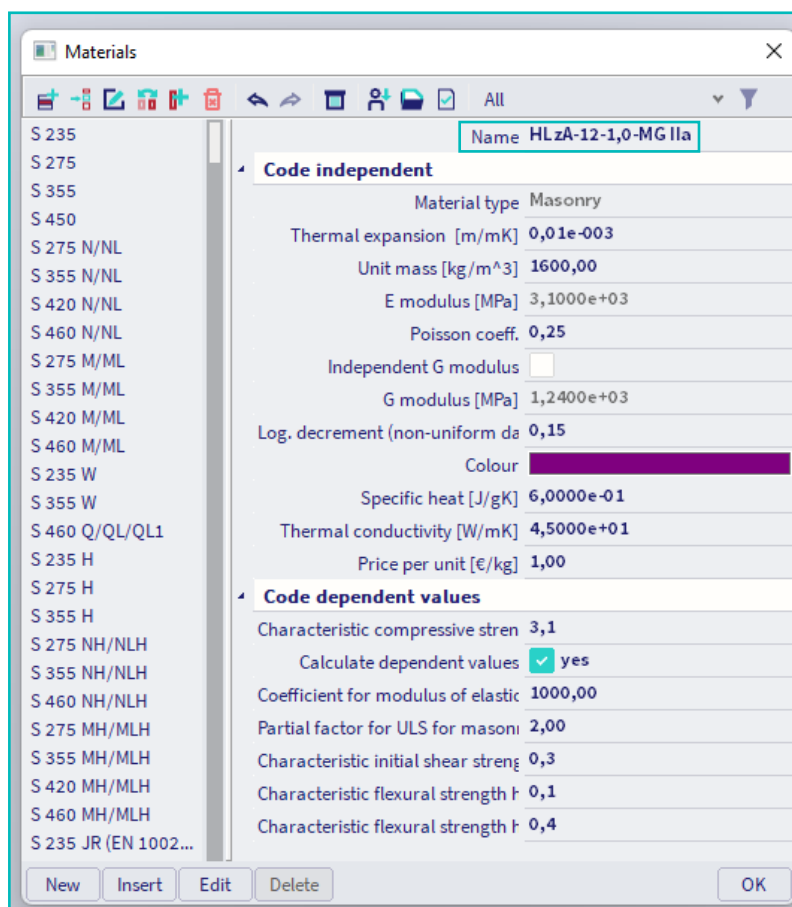


Figure 1: Definition of the material name and the quality

### TIP

#### The designation scheme for masonry of simplified design

Brick type–compressive resistance class–raw density class–mortar group, e. g. HLzA-12-1.0-MG IIa

#### Brick types

HLzA, HLzB, HLzW, LLz, Mz, HLzT1, HLzT2, HLzT3, HLzT4, KS, KSP, KSL, KSLP, KSXL, SXLN, KSXLE, V, Vbl, Hbl, VblS, VblSW, Vn, Vbn, Hbn, Vm, Vmb, PP, PPE

#### Brick strength classes

2, 4, 6, 8, 10, 12, 16, 20, 28, 36, 48, 60

#### Raw density classes

0.35; 0.4; 0.45; 0.5; 0.55; 0.6; ; 0.65; 0.7; 0.75; 0.8; 0.85; 0.9; 1.0; 1.2; 1.4; 1.6; 1.8; 2.0; 2.2; 2.4

#### Mortar groups

I, II, IIa, III, IIIa, LM21, LM36, DM

## Step 2: Localising components relevant for the design

Once the model has been calculated, the area subject to the highest effects of actions can be localised by displaying the wall internal forces. The wall to be verified can thus be identified and further tracked.

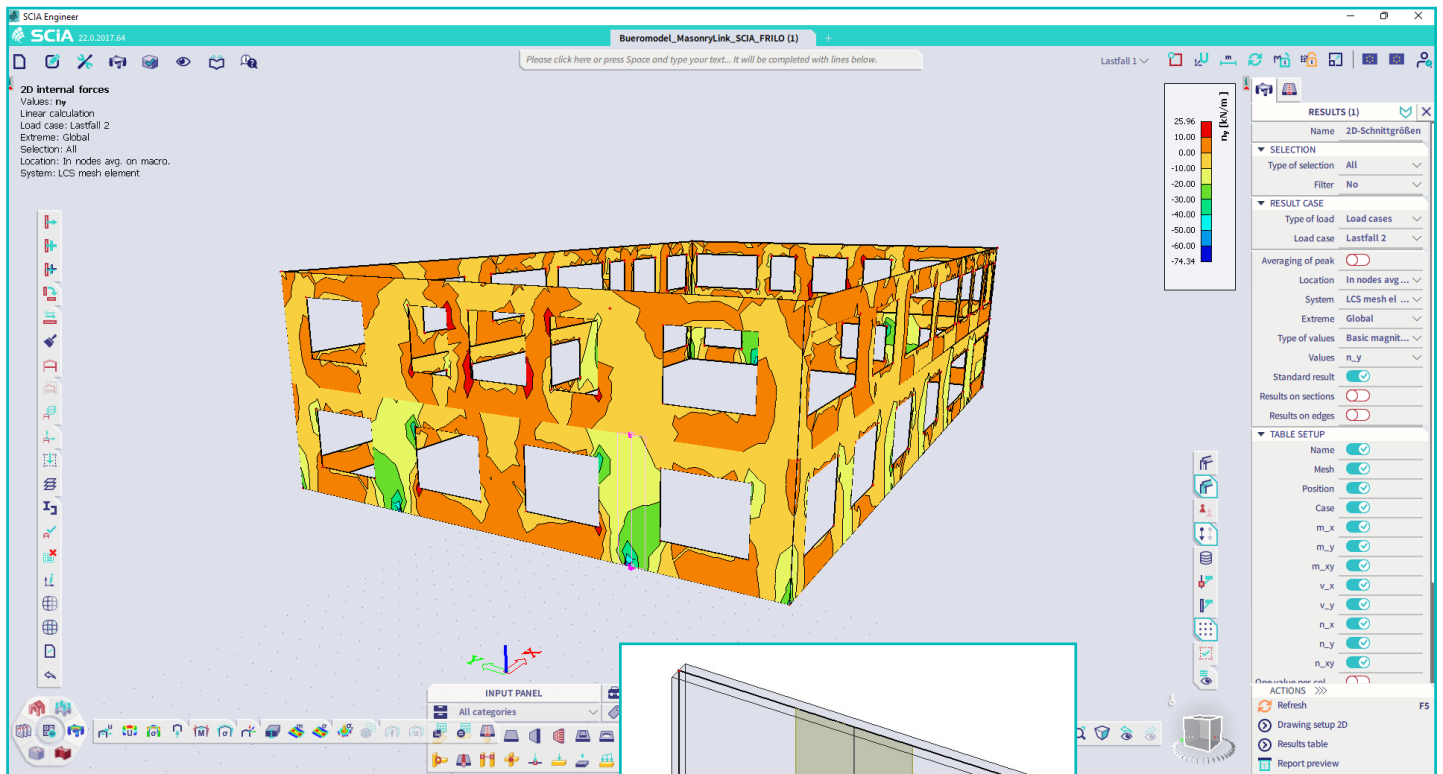


Figure 2: Representation of the wall internal forces

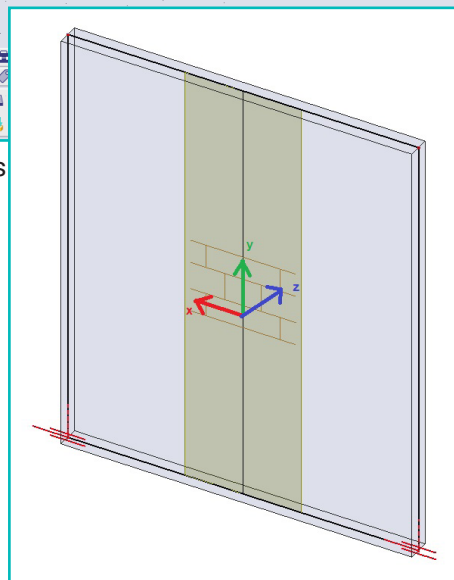


Figure 3: Local system of coordinates



## Step 3: Creating integration strips

For the most heavily loaded area and the walls with the greatest internal forces, you must define a so-called “integration strip”. An integration strip always extends over a storey height. The default width is always assumed to be one metre. This width is usually sufficient for vertical load transfer. However, you can adjust the width as you wish.

The functions to control the integration strip can be accessed via the interactive search field centrally at the top edge of the screen or via a user-defined quick-access toolbar. Simply enter the term “integration strip” and select the command “Integration strip”. Select subsequently the masonry wall for which the verification is to be performed. Now, you can draw a vertical strip over the wall height via a start point and an end point. In the properties dialogue of the integration strip, you can edit the coordinates and adjust the contributing width once more.

If no horizontal loads acting on the wall strips are considered, a strip of one metre width is usually sufficient. If the wall is subjected to horizontal loads in the wall plane (bracing loads), the full wall width of the strip should be considered. Depending on the location where a verification is subsequently to be performed in the FRILO program MWX+, any number of integration strips can be defined. You can find further information on integration strips [here](#).

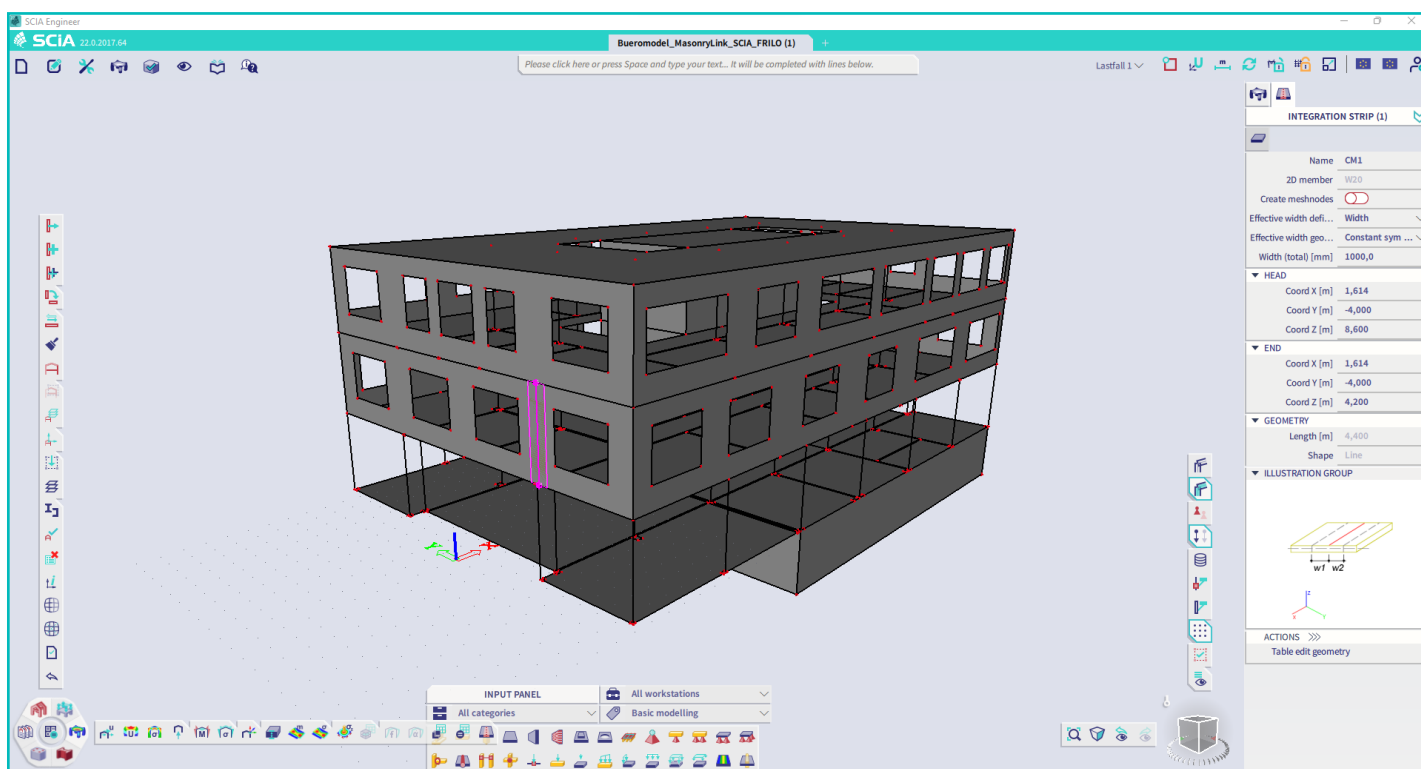


Figure 4: Creating integrations strips

## Step 4: Calling up the masonry interface

After everything has been predefined in SCIA, you can transfer the masonry wall to the FRILO program MWX+. For this purpose, the function “FRILO masonry verification” must be called up. You can find this function at “**Design As,Erf**” > “**Masonry**” > “**FRILO masonry verification**”. Alternatively, you can search for the keyword “masonry” using the interactive search box centrally at the top edge of the screen. This way, you can also find and activate the function.

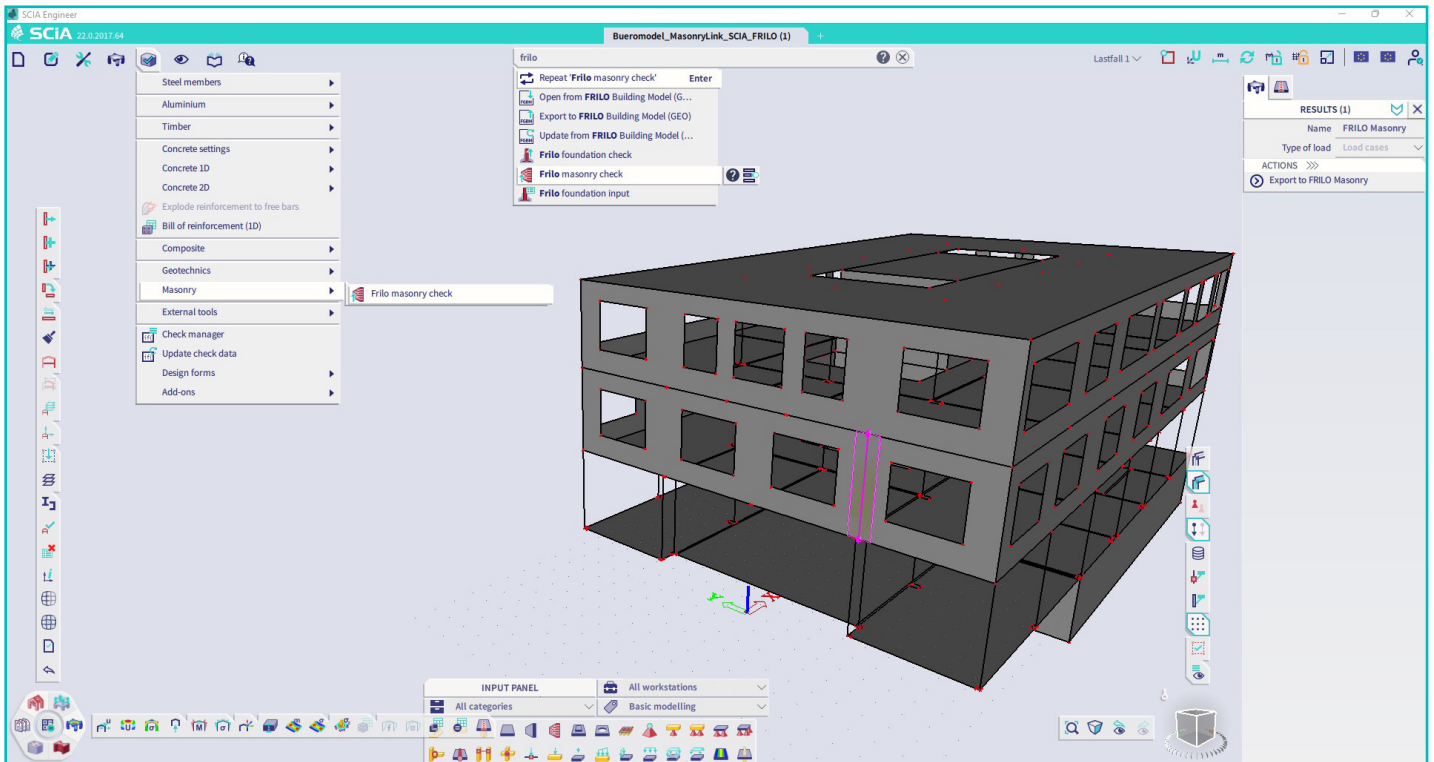


Figure 5: Accessing the masonry interface

Subsequently, you must select the integration strip of a wall for which the masonry verification is to be performed in MWX+. Only one strip can be selected at a time. MWX+ is launched automatically and all existing geometry information is transferred. If available, in addition to the selected integration strip, the floor slab below and above as well as the walls below and above are exported from SCIA for the width of the integration strip. The loads are imported separately as external and internal loads. The nominal values of the wind and slab loads are transferred as external loads. The internal loads are transmitted as characteristic internal forces per load case. Additional effects to be considered in the verification are determined from the external loads (additional node moments from the slab loads, additional wall moments from the wind loads).

# Phase 2: Performing the design in MWX+ by FRILO

## Step 5: Assigning standardised material

The combination of loads and the verifications are now performed in the MWX+ program. A few settings still need to be readjusted here. On the one hand, you can adjust the material in the left-hand program tree in the “System” section. In addition to the masonry of simplified design in compliance with the standard, you can also select masonry according to approval or enter user-defined masonry.

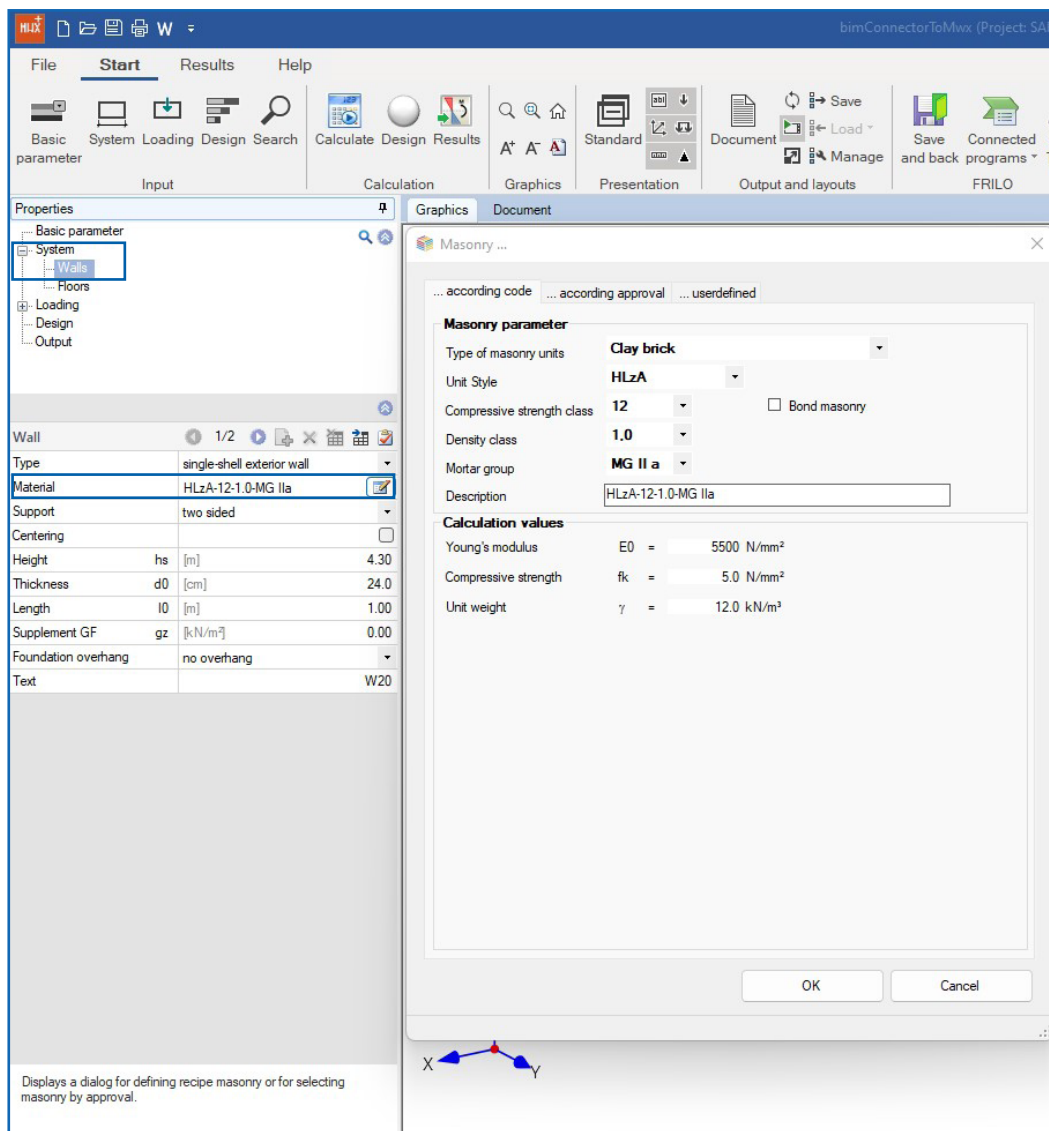


Figure 6: Material definition in MWX+

# Step 6: Determining the properties of the floor slabs

On the other hand, you will also have to revise the slab span, the type of support or the support depth. You can also find these parameters on the left-hand side of the user interface under **“System” > “Floor slabs”**.

# Step 7: Modifying the design model

Of course, you can modify the model even further if you wish. For example, the design standard or the verification method (simplified or accurate with consideration of shear) can be changed.

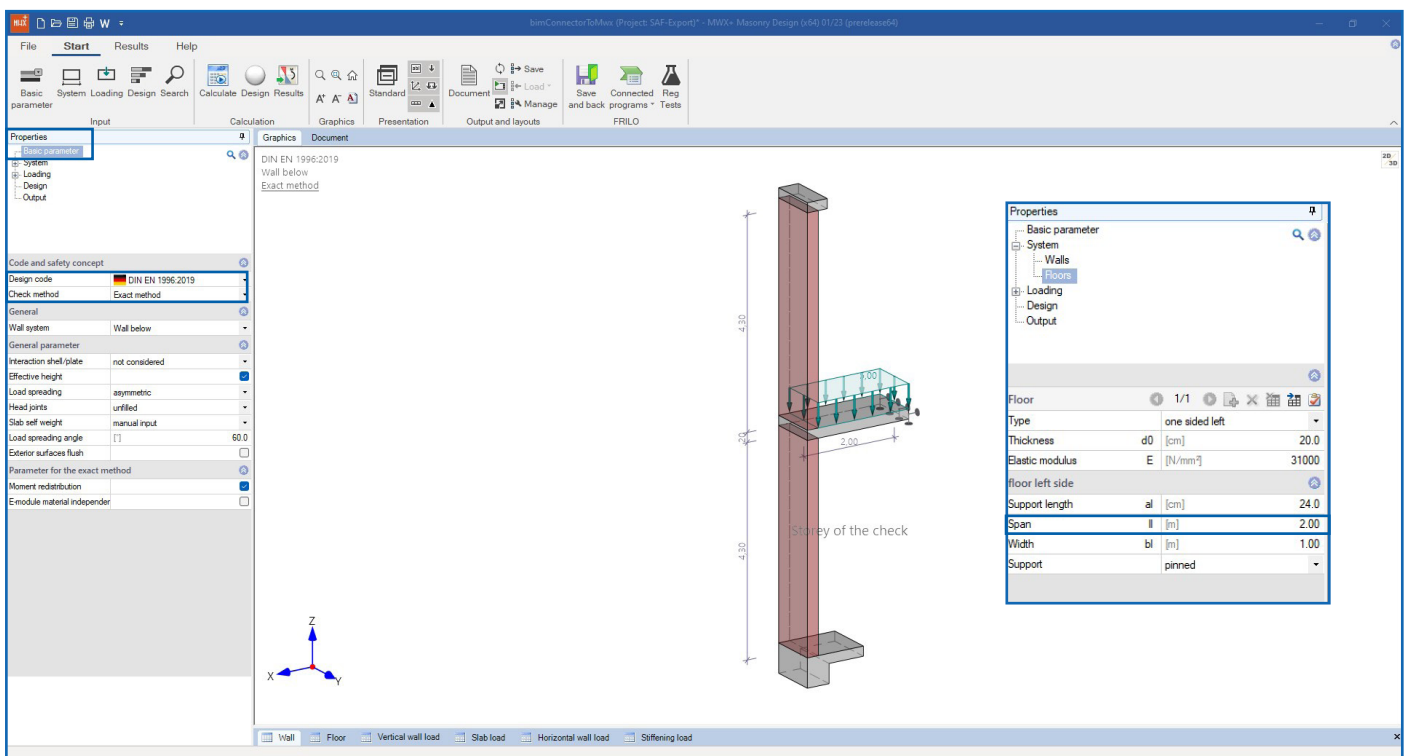


Figure 7: Modifying the verification method and the spans of the storey floor slabs



## Step 8: Performing masonry verifications

Finally, the masonry wall is designed and all necessary verifications are automatically performed by the program. Depending on the selected calculation method and the external effects of actions, the following verifications have to be performed:

- Resistance to axial forces
- Resistance to shear
  - wall-related shear (diaphragm-related shear)
  - slab-related shear (plate-related shear)
- Edge strain and eccentricities (only required in combination with DIN EN 1996 NA)
  - in the length direction of the wall
  - in the thickness direction of the wall

You can find more information about the MWX+ program and the verification process on our [website](#).



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