HOW TO IMPORT BISCO FILES TO TRISCO?

1. Introduction

Importing BISCO data into TRISCO is a common practice when extending a 2D analysis into the third dimension to obtain a more representative thermal assessment. However, using a very small pixel size in BISCO to capture fine geometric details may result in a large number of blocks in the 3D TRISCO model. This increases the number of calculation nodes and may significantly extend the calculation time. Therefore, it can be useful to simplify the BISCO model to an acceptable level before importing it into TRISCO. This process is demonstrated through the two example cases below.

2. Case 1 Curtain wall mullion

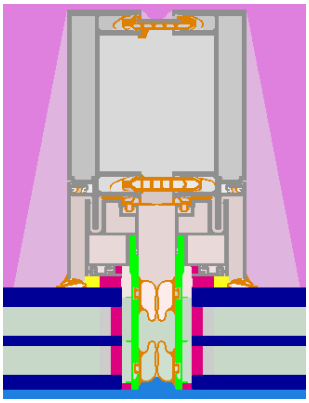
The starting model is the file mullion_BISCO_0.1mm.bsc, a 2D geometry with a pixel size of 0.1 mm. To reduce the complexity, the first attempt is to increase the pixel size from 0.1 mm to 1 mm, which produces the file mullion_BISCO_1mm.bsc. The pixel size can be increased via *Bitmap → Resize Pixel*. Afterwards, the triangulation pixel size must be adjusted to match the previous case via *Measures → All → Triangulation*.

Now we re-ran the model to verify that the numerical results remain unchanged. Table 1 illustrates that the impact on the result is less than 1%, while the number of nodes is reduced by about a factor 100.

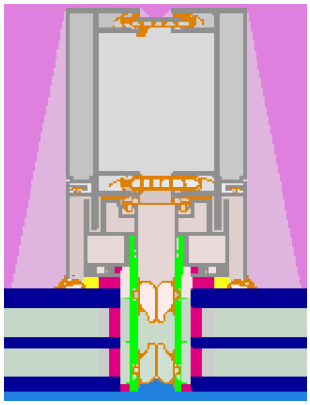
Since TRISCO operates on a block-based geometry and the model still uses a spatial resolution of 1 mm, the geometry can be simplified further by merging pixels in a second step. Using the BISCO drawing functions 'Rectangle' and 'Line', the geometry is manually reduced to a more elementary representation. Geometric features that have only a limited influence on the thermal behaviour are approximated by rectangular shapes wherever possible. This simplification can be performed iteratively, with the BISCO model being recalculated after each modification to verify that the introduced geometric approximations do not significantly affect the simulation results. This results in the simplified model mullion_BISCO_1mm_rect.bsc.

The two simplified models are then imported into TRISCO to assess the effect of the simplifications, and the resulting heat flow values are compared. As shown in Table 1, all deviations remain within 1% of the original heat flow, which is acceptable. Although the second step – the rectangular simplification (mullion_BISCO_1mm_rect.bsc) - appears to offer little advantage in BISCO, it reduces the number of nodes in TRISCO by 36.6% compared with the 1 mm pixel size TRISCO model. On import, the bitmap pixels become rectangular blocks and the 2D section is extruded in the third direction, keeping the material properties and boundary conditions from BISCO. Figure 2 shows the extruded model and temperature contours in TRISCO (mullion_TRISCO_1mm_rect.trc).

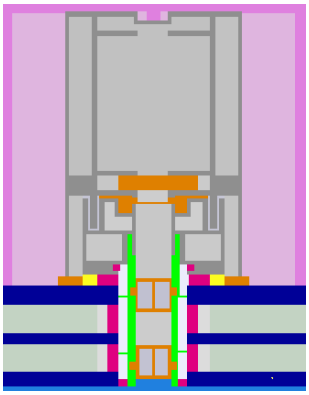
It is also worth noting that BISCO has a limit of 500 000 nodes under the basic licence. To calculate models with a higher number of nodes, the Unlimited Nodes add-on is required. This makes simplification valuable even when the model is not imported into TRISCO.



mullion_BISCO_0.1mm.bsc



mullion_BISCO_1mm.bsc



mullion_BISCO_1mm_rect.bsc

Figure 1 Case 1 (BISCO): left) full detail (0.1mm), middle) after resize pixel size (1m) and right) after further manual simplification.

Table 1 Results of the BISCO and TRISCO simulations of case 1

File	Model	Pixel size (mm)	nodes	Q (W)
mullion_BISCO_0.1mm.bsc	BISCO	0.1	545 401	7.727
mullion_TRISCO_0.1mm.trc	TRISCO		2734486	7.7469
mullion_BISCO_1mm.bsc	BISCO	1	5 886	7.770 (+0.55%)
mullion_TRISCO_1mm.trc	TRISCO		51 564	7.758 (+0.40%)
mullion_BISCO_1mm_rect.bsc	BISCO	1	5 471	7.731 (+0.05%)
mullion_TRISCO_1mm_rect.trc	TRISCO		32 716	7.710 (-0.22%)

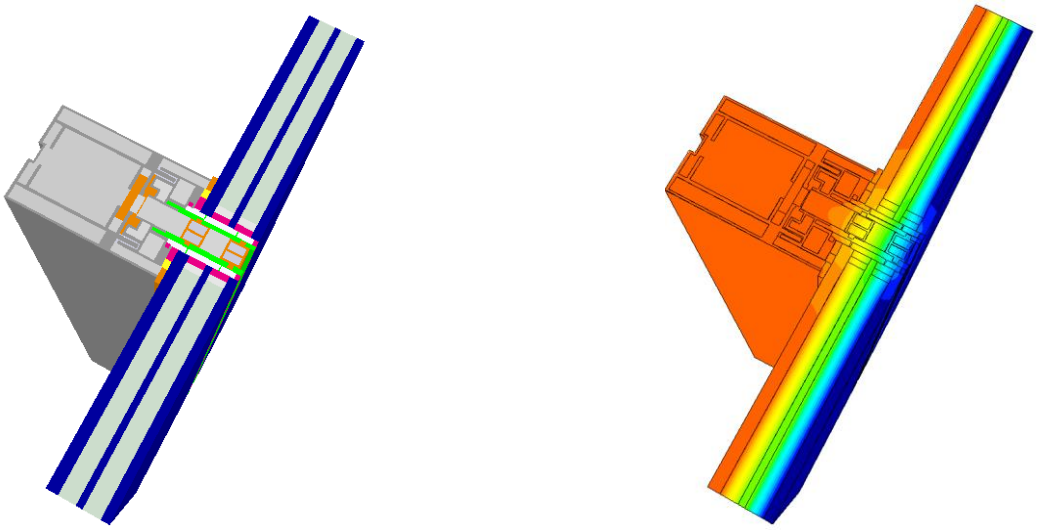


Figure 2 mullion_TRISCO_1mm_rect.trc TRISCO model (left), and temperature contour (right)

It is worth knowing that several TRISCO files can be imported and merged into a single model. Once imported, the blocks can be rotated, transformed, scaled and revolved with the geometrical modification tools. This makes it possible to build up a complete 3D model from several separate BISCO sections, as illustrated in Figure 3.

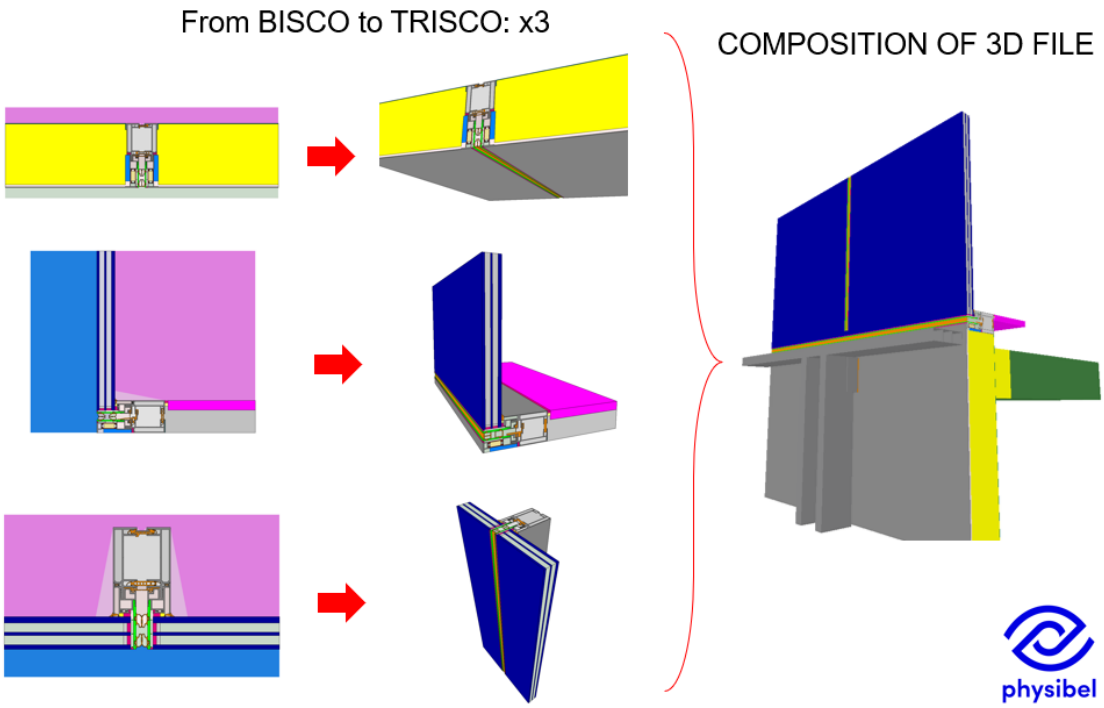
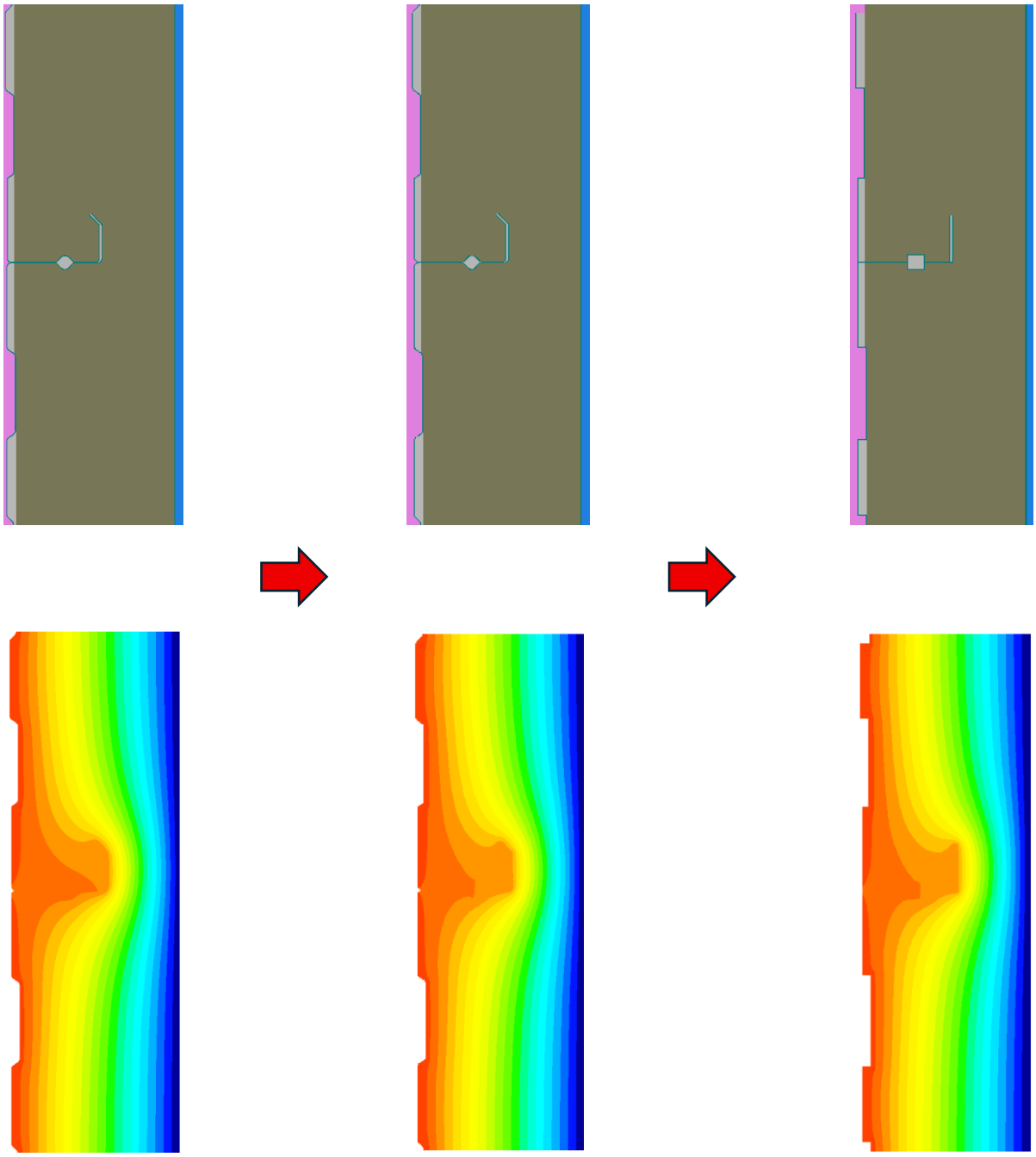


Figure 3 Composition of 3D TRISCO file from BISCO sections

3. Case 2 Metal wall element

This case studies the complex geometry (curved and thin objects) of the fixings for an outer cladding system. As shown in Figure 4, the same strategy as in Case 1 is applied here: the pixel size is first increased in BISCO, and the geometry is then simplified using rectangular elements. The models are subsequently imported into TRISCO to verify the effect of the simplifications.



WALL_BISCO_0.1mm.bsc WALL_BISCO_1mm.bsc WALL_BISCO_1mm_rect.bsc

Figure 4 BISCO models of case 2

In this case, 5 mm × 5 mm screws are placed every 500 mm. A repeating section containing one screw is therefore simulated in TRISCO. Because BISCO is a 2D program, the effect of a screw cannot be analysed there. This is one of the typical applications of importing BISCO models into TRISCO: it allows the effect of the screws to be accounted for more accurately. The TRISCO model including the screw is shown in Figure 5.

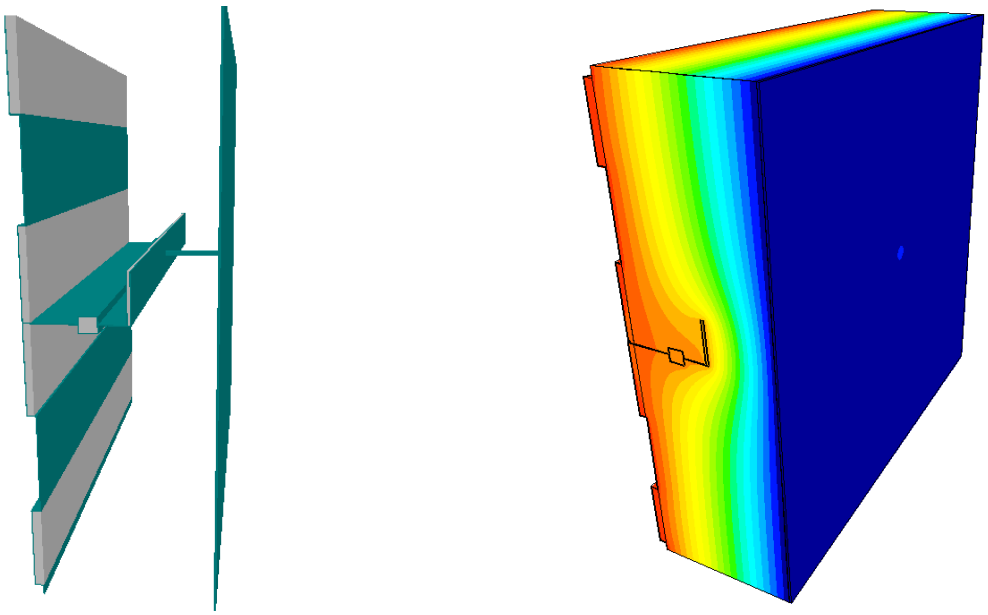


Figure 5 WALL_TRISCO_1mm_rect_screw.trc TRISCO model (left), and temperature contour (right)

As shown in Table 2, the simplifications remain within 1% of the original heat flow, while the rectangular simplification reduces the number of TRISCO nodes by 34%. This margin is what makes the screw model feasible, since adding the screw increases the node count substantially. The screw itself increases the heat flow through the element by 15.4%: a point thermal bridge that a 2D analysis cannot capture, which is precisely why the model is extended into TRISCO.

Table 2 Results of the BISCO and TRISCO simulations of case 2

File	Pixel size (mm)	Number of nodes	Q (W)
WALL_BISCO_0.1mm.bsc	0.1	361 861	2.485
WALL_BISCO_1mm.bsc	1	4 072	2.465 (-0.80%)
WALL_TRISCO_1mm.trc		25 436	2.461 (-0.97%)
WALL_BISCO_1mm_rect.bsc	1	3 921	2.489 (+0.16%)
WALL_TRISCO_1mm_rect.trc		16 782	2.482 (-0.12%)
WALL_TRISCO_1mm_rect_screw.trc		272 850	2.867 (+15.4%)