Tutorial

Geometrical input by using a DXF-underlayer

(unprepared DXF file)

TRC Tutorial c

physibel

TRISCO

1. Introduction

Window_wall_junction_unprepared.dxf
Window_wall_junction_Trisco2D.tr2
Window_wall_junction_TRISCO.trc

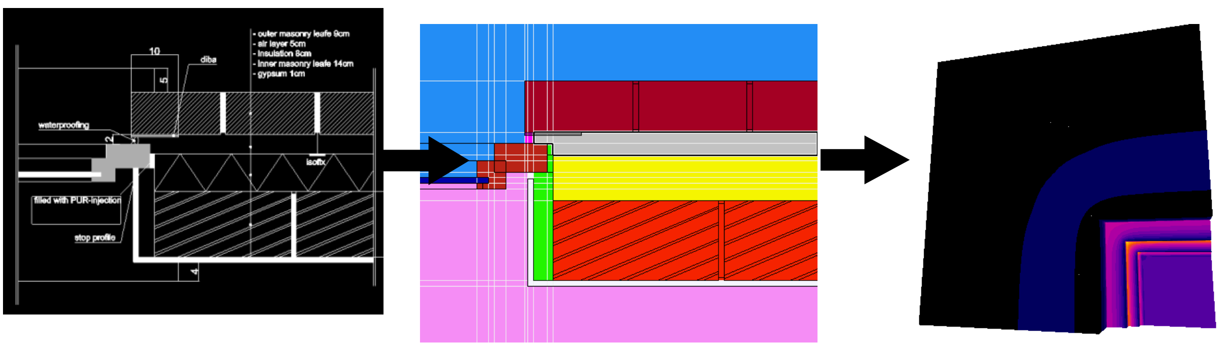
This tutorial illustrates how to create a TRISCO model by using a DXF file as underlayer. The DXF file is first imported as underlayer in Trisco2D which allows to automatically generate the objects geometry by means of grid lines. Thereafter, the materials and boundary conditions can be linked to the model in Trisco2D and exported to TRISCO for 3D adjustments (revolving in this example).

Key elements:

- Creating a geometrical model with the help of a DXF-underlayer
- Automatic grid line detection in Trisco2D
- Interactive material and boundary condition selection
- Loading Trisco2D models in TRISCO
- Revolve function to get a 3D object from a 2D geometry
- Changing thermal palette

2. Case study

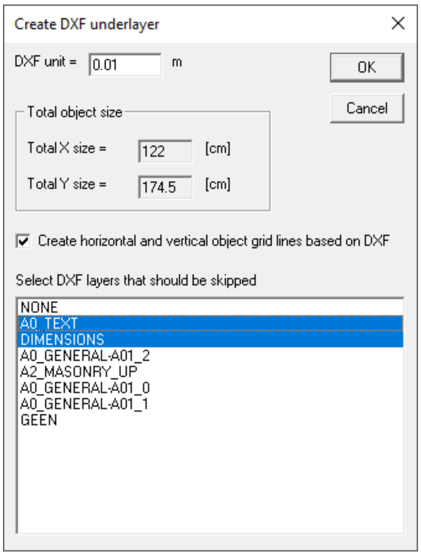
The case study is a window-to-wall-junction available via a CAD drawing (DXF file). This DXF file is not prepared according to the Physibel conventions by containing dimensions, non-closed polylines, hatches and the use of several (mixed) layers. As a consequence this DXF file is not useful for direct input via TriscoDXF (see rules direct input of a "prepared DXF" in Tutorial TRC-b). The present tutorial illustrates how this "unprepared" DXF can be used as underlayer allowing to generate quickly a 3D TRISCO model.

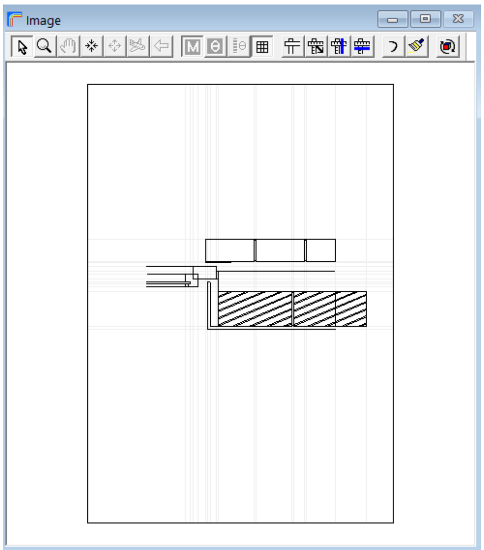


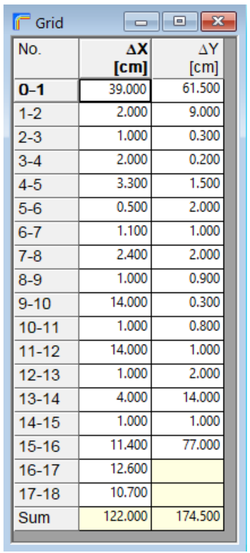
geometry in DXF file | DXF-Underlayer in Trisco2D | Outer surface temperatures in 3D detail

3. Creating the minimum grid from a .dxf file in Trisco2D

- Open Trisco2D and Load the .dxf underlayer: *File → Import DXF*: select "Window_wall_junction_unprepared.dxf"
- In the Create DXF underlayer dialog box:
    - Define the DXF unit: "0.01 m" (DXF is drawn in cm)
    - Select "create horizontal and vertical object grid line based on DXF".
    - Select DXF layers which should not be recognized: "A0 TEXT" and "DIMENSIONS"
- The grid lines to create the model geometry are now automatically recognised and drawn.
- Note that not all grid lines are relevant (e.g. the DXF files includes mortar joints,…). Non-relevant grid lines can be removed (see next step) to facilitate adding materials and boundary conditions to the geometry.







Grid

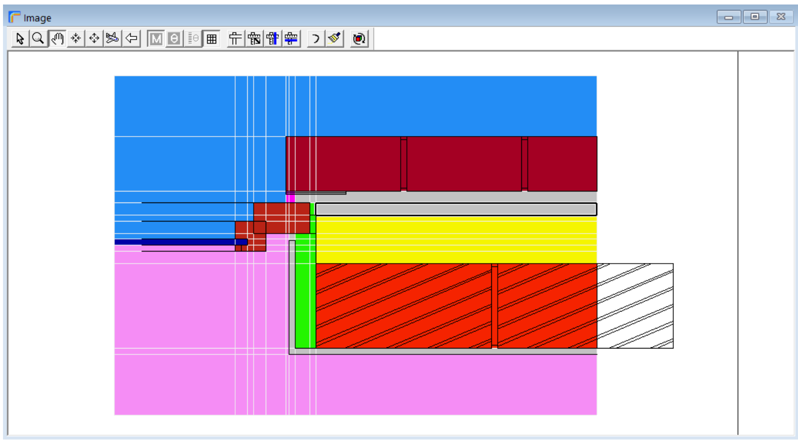
No.	ΔX [cm]	ΔY [cm]
0-1	39.000	61.500
1-2	2.000	9.000
2-3	1.000	0.300
3-4	2.000	0.200
4-5	3.300	1.500
5-6	0.500	2.000
6-7	1.100	1.000
7-8	2.400	2.000
8-9	1.000	0.900
9-10	14.000	0.300
10-11	1.000	0.800
11-12	14.000	1.000
12-13	1.000	2.000
13-14	4.000	14.000
14-15	1.000	1.000
15-16	11.400	77.000
16-17	12.600	
17-18	10.700	
Sum	122.000	174.500

- Via the **Image window** the grid lines can be adjusted/removed (optional step).
    - Reduce the size of the grid cells at the boundaries by selecting Move Grid Line. Select the grid line with the left mouse button and drag the grid line (while holding the left mouse button down) towards the junction to reduce the size of the adjacent grid cell.
    - To remove unnecessary grid lines: select the function Move Grid Line: select a grid line with the left mouse button and drag the grid line across an adjacent grid line.

4. Adding material properties and boundary conditions

- Select *Colours → List Defined*
- Materials and boundary conditions can be added to the model by first selecting the desired colour in the **Colours window** and then pick the desired grid cells with ("Draw") or select a desired zone ("Fill").
    - To colour multiple grid cells with the "Draw" function: hold the left mouse button down while moving the cursor over the model.
    - To colour a line of grid meshes with the "Draw" function: select the starting grid cell with the left mouse button and hold down <Shift> while selecting the end point grid cell with the left mouse button.
- To select a colour already used in the model: click with the right mouse button in this coloured zone in the model.

- When selecting materials with the “Draw” option the number of blocks can increase rapidly. To reduce the number of blocks it is advisable to intermediately optimise the number of blocks by *Blocks → Optimise Blocks* .
- When all colours are linked to the model: select Create Minimum Grid to remove unnecessary grid lines. The picture below shows the resulting windows:



Grid

No.	ΔX [cm]	ΔY [cm]
0-1	20.000	10.000
1-2	2.000	9.000
2-3	1.000	2.000
3-4	2.000	2.000
4-5	3.300	1.000
5-6	0.500	2.000
6-7	1.100	0.900
7-8	2.400	1.100
8-9	1.000	1.000
9-10	46.400	2.000
10-11		14.000
11-12		1.000
12-13		10.000
Sum	79.700	56.000

Blocks

No.		Col.	Xmin	Xmax	Ymin	Ymax
1		170	0	10	0	7
2		12	1	3	5	9
3		12	3	8	3	9
4		174	4	6	6	9
5		174	0	1	8	9
6		174	0	10	9	13
7		131	8	9	3	6
8		131	7	9	6	11
9		129	7	10	11	12
10		129	6	7	6	12
11		192	9	10	3	4
12		192	7	10	2	3
13		135	9	10	4	10
14		132	9	10	10	11
15		180	5	10	1	2
16		102	5	7	2	3
17		18	0	2	7	8

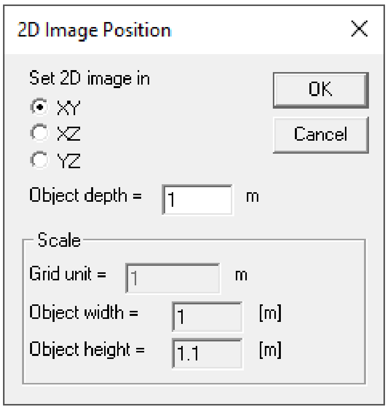
Colours

Col.		Type	Subtype	Physical flow dir.	Geometrical flow dir.	Name	ε1 / ε2 [- / -]	λ [W/mK]	θ [°C]	h [W/m²K]	q [W/m²]	Standard
12		MATERIAL				hardwood		0.180				
18		MATERIAL				equivalent DGU		0.015				
102		MATERIAL				silicone pure		0.350				
131		MATERIAL				insulation 0.040 W/mK		0.040				
132		MATERIAL				masonry light		0.220				
135		MATERIAL				insulation 0.025 W/mK		0.025				
170		BC_SIMPL	HE			exterior			0.0	25.00	0	EN6946
174		BC_SIMPL	HI	HOR		interior (normal) horizc			20.0	7.70	0	EN6946
180		MATERIAL				masonry heavy		0.900				
192		EQUIMAT	LAYER	HOR	Y		0.90 / 0.90	0.647				EN6946

Note: the double glazing unit is modelled as a single material with an equivalent thermal conductivity corresponding to a U-value of 1.1 W/m^2.K. The unventilated layer (colour 192) is modeled according to EN ISO 6946 (type EQUIMAT, subtype LAYER).

5. Loading a Trisco2D file in TRISCO

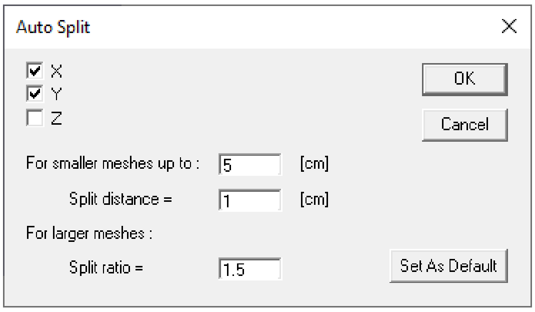
- First save and close the generated Trisco2D file: *File → Save as...* .
- Open TRISCO and import the Trisco2D file: *Open → Import Data...* and select the corresponding tr2-file.
- A dialog box will open to define the position of the 2D Trisco2D file. Select “XY” and depth of 1 m in the Z-direction:



- Save the TRISCO file: *File* → *Save as...* (e.g. Window_wall_junction_TRISCO.trc)

6. Set-up the calculation grid and run the simulation

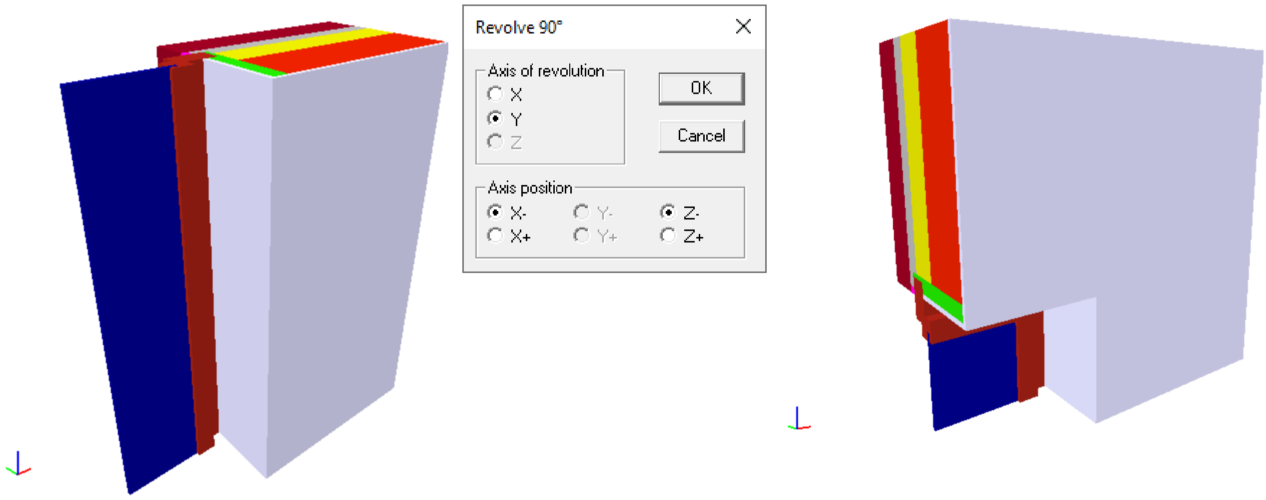
- To define the calculation grid: Choose *Grid* → *Auto Split...*, and accept the settings of the dialog box.



- The grid is automatically subdivided. Smaller meshes (up to 5 mm) are subdivided into equal meshes of 1 mm. Larger meshes are split into a geometric sequence with split ratio 1.5.
- Calculate the system (*Calc* → *Calc System*)

7. Revolve function

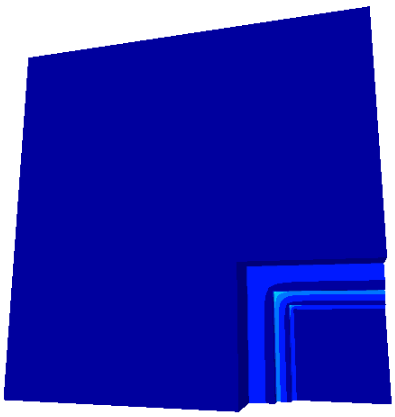
- From this 2D section a 3D corner joint can be created by using the revolve function.
- Choose *Blocks* → *Revolve 90°....*
- Set the parameters as in the picture above middle.
- The 2D section is revolved around the Y axis positioned at the front end of X (= X-) and the bottom end of Z (= Z-). The picture above right shows the result.



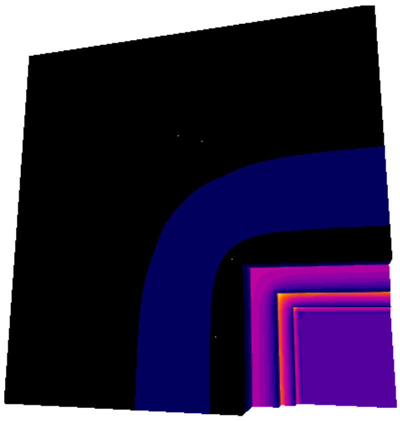
- Calculate the system (*Calc → Calc System*)

8. Change thermal palette

- Change thermal palette: *Setting → Thermal Palette…* and select the preferred visualisation colour of the temperature field.
- Change the Temperature range to emphasise colder area's.
- The figures below illustrate the outer surface temperature of the 3D model for 2 different thermal palette representations.



Thermal palette: **Rainbow**



Thermal palette: **Ironbow**