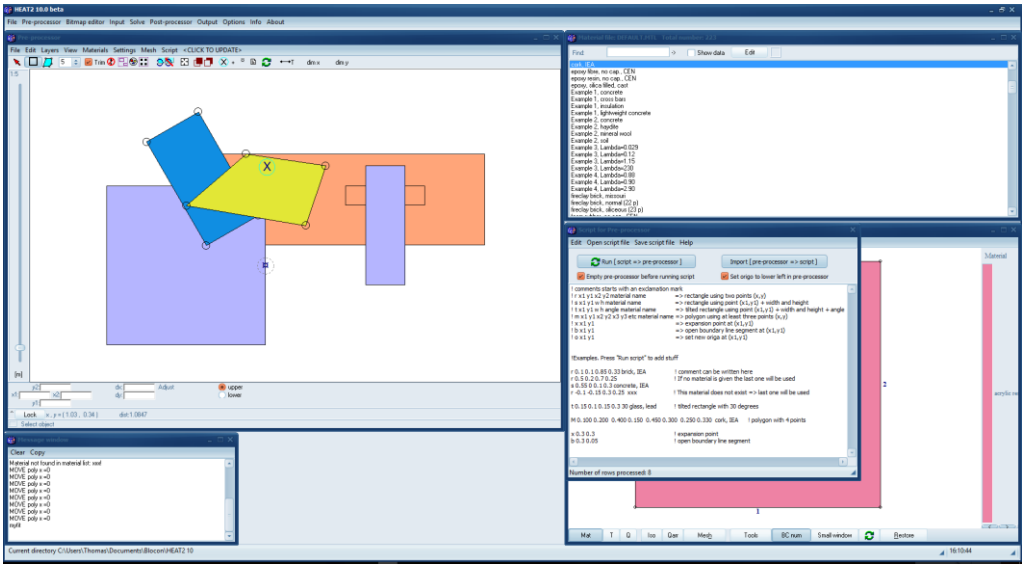
HEAT2 version 10

A PC-program for heat transfer in two dimensions

Update manual



March 21, 2024

First edition	v10.0	March 1, 2016
Latest revision	v10.2	March 21, 2024

See Appendix A for update news

The latest version of this document is available at
https://www.buildingphysics.com/manuals/HEAT2_10_update.pdf

BLOCON

www.buildingphysics.com

Contents

1. What's new in HEAT2 version 10

Blocon is proud to present a new version of HEAT2. Many new important features have been added. Up-to-date information is given on www.buildingphysics.com.

This update manual covers new features that have been added since version 9. New users should also read the update manuals for versions 6, 7, 8, 9 and the full manual for version 5 at

http://www.buildingphysics.com/manuals/HEAT2_9_update.pdf

http://www.buildingphysics.com/manuals/HEAT2_8_update.pdf

http://www.buildingphysics.com/manuals/HEAT2_7_update_english.pdf

http://www.buildingphysics.com/manuals/Heat2_6_update.pdf

http://www.buildingphysics.com/manuals/HEAT2_5.pdf

Tips for reading for beginners: For a quick start read Chapter 4 (pages 23-27) in Manual HEAT2 5.0. The example in chapter 8 (pages 117-121) would also give a short introduction. After this, look at the update manuals for versions 6, 7, 8, and 9. Also see the examples for the test cases: ISO 10211 & 10077-2 validation test cases

1.1 Script for pre-processor

The complete geometry can now be described by text. It is also possible to vice versa convert already drawn geometry in the pre-processor to a script. See Chapter 2.

1.2 Repeating function values

It is now easy to repeat functions values for dynamic calculations for any period. See Chapter 3.

1.3 Changeable user interface of HEAT2

The user interface of HEAT2 can now be "personalized" using different windows style themes. See Chapter 4.

1.4 Light version

The light (demo) version has the following restrictions:

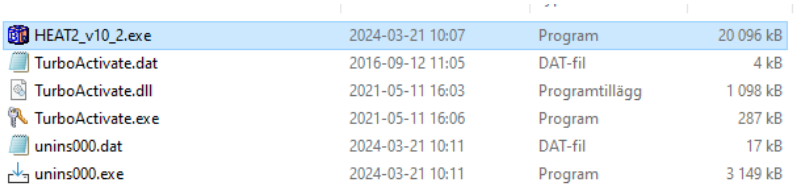
- Data cannot be saved.
- Materials cannot be added or changed.
- Max 1,000,000 (1,000·1,000) nodes.
- Results for heat flows are hidden for larger problems with more than 5,000 nodes and with more than 60 nodes in each direction.
- Thermal coupling coefficients (L2D) will not be calculated.
- Report preview is disabled.
- Some other restrictions apply.

1.5 Installation and requirements

HEAT2 v10 requires only about 0.2 GB RAM (a pc with 2 GB RAM is recommended), and less than 10 MB hard disk space. HEAT2 runs on both 32-bit and 64-bit Windows 10, 8, and 7.

HEAT2 v9 is fully adapted for Windows 7, 8, and 10 and works on both 32- and 64-bit machines.

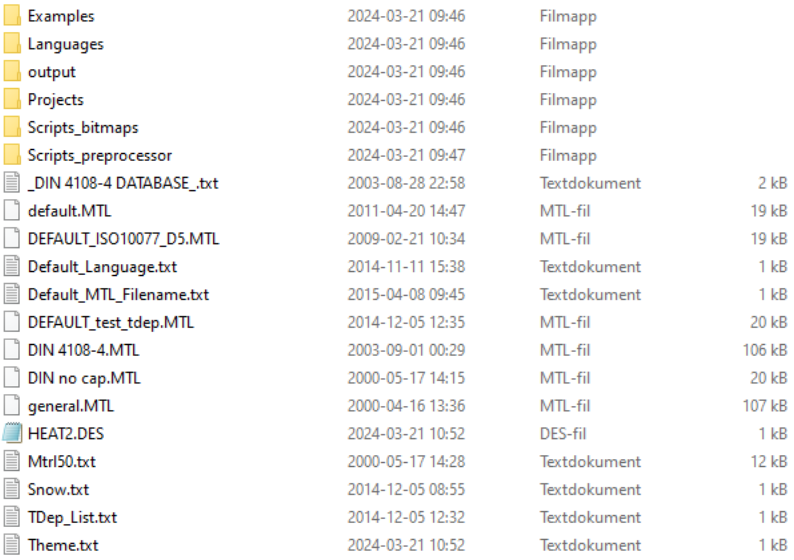
Use the setup program to install HEAT2. This will install the HEAT2 exe-file and some other files to folder “C:\Program Files (x86)\BLOCON\HEAT2_v10.2”.



HEAT2_v10_2.exe	2024-03-21 10:07	Program	20 096 kB
TurboActivate.dat	2016-09-12 11:05	DAT-fil	4 kB
TurboActivate.dll	2021-05-11 16:03	Programtillägg	1 098 kB
TurboActivate.exe	2021-05-11 16:06	Program	287 kB
unins000.dat	2024-03-21 10:11	DAT-fil	17 kB
unins000.exe	2024-03-21 10:11	Program	3 149 kB

Files installed to C:\Program Files (x86)\BLOCON\HEAT2_v10.2

Note: From version 10.2 the setup file will install material files (and some other files) to the shared folder “C:\Users\Public\Documents\BLOCON\HEAT2 10” by default. This is also the folder where the user stores project data files.



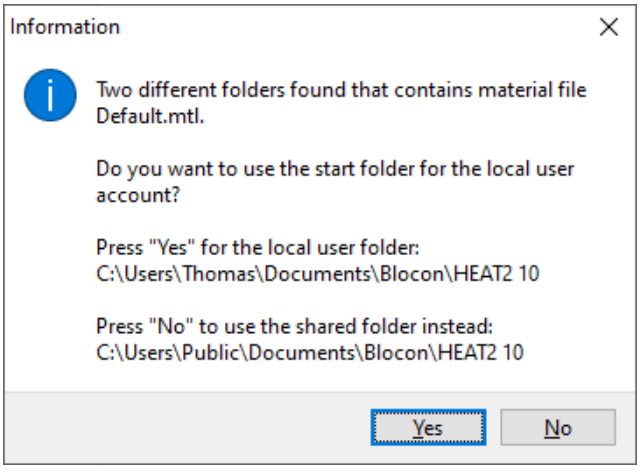
Examples	2024-03-21 09:46	Filmapp	
Languages	2024-03-21 09:46	Filmapp	
output	2024-03-21 09:46	Filmapp	
Projects	2024-03-21 09:46	Filmapp	
Scripts_bitmaps	2024-03-21 09:46	Filmapp	
Scripts_preprocessor	2024-03-21 09:47	Filmapp	
DIN 4108-4 DATABASE.txt	2003-08-28 22:58	Textdokument	2 kB
default.MTL	2011-04-20 14:47	MTL-fil	19 kB
DEFAULT_ISO10077_D5.MTL	2009-02-21 10:34	MTL-fil	19 kB
Default_Language.txt	2014-11-11 15:38	Textdokument	1 kB
Default_MTL_Filename.txt	2015-04-08 09:45	Textdokument	1 kB
DEFAULT_test_tdep.MTL	2014-12-05 12:35	MTL-fil	20 kB
DIN 4108-4.MTL	2003-09-01 00:29	MTL-fil	106 kB
DIN no cap.MTL	2000-05-17 14:15	MTL-fil	20 kB
general.MTL	2000-04-16 13:36	MTL-fil	107 kB
HEAT2.DES	2024-03-21 10:52	DES-fil	1 kB
Mtrl50.txt	2000-05-17 14:28	Textdokument	12 kB
Snow.txt	2014-12-05 08:55	Textdokument	1 kB
TDep_List.txt	2014-12-05 12:32	Textdokument	1 kB
Theme.txt	2024-03-21 10:52	Textdokument	1 kB

Files installed to C:\Users\Public\Documents\BLOCON\HEAT2 10

Before v10.2, the setup file installed these files to the local user documents folder “My documents\Blocon\HEAT2 10” (e.g. ”C:\Users\[user name]\Documents\Blocon\HEAT2 10”).

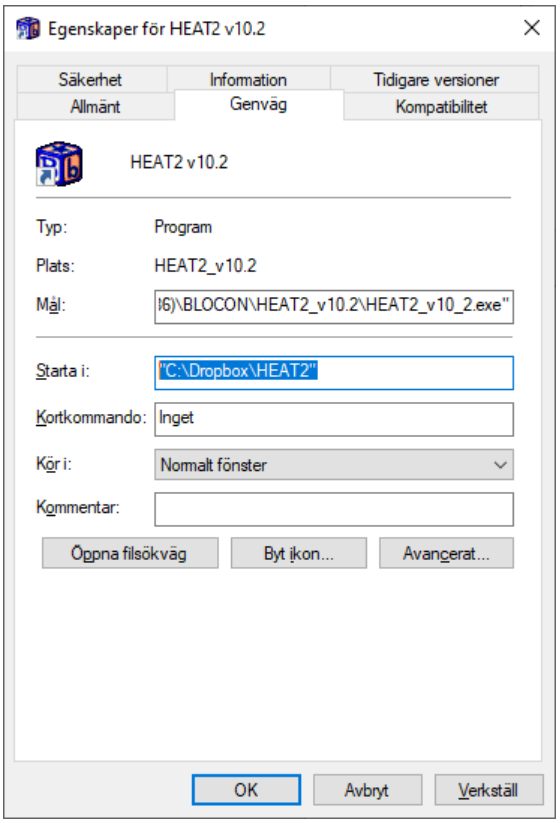
This could be a problem when an admin account was used for installation and another local user account was running the program and had no access to the (admin) document folder (where material files and data files were present). With v10.2 different users on the same machine can now access shared files.

This means that when you update your old version to v10.2 there may be two document folders (the old local document folder and the new shared document folder). If HEAT2 detects both folders upon start (it will actually search for the file “Default.mtl”) it will ask what folder you want to start in, see picture below. Simply erase the folder you don’t want to use and HEAT2 will use the other one upon start. Remember to move your input files first if applicable.



The used folder name is shown in the header for the material pick list window. It is also shown by the menu item Info/System info in HEAT2.

It is also possible to change to another start up folder (e.g. to a Dropbox folder). To do this open the shortcut for HEAT2 that is located in "C:\ProgramData\Microsoft\Windows\Start Menu\Programs\BLOCON". Right-click on the shortcut for “HEAT2 v10.2” and choose Properties and set folder name in the “Start in” field. See picture below. Make sure you copy all the files (with sub-directories) to the new folder. However, if HEAT2 finds the default shared or local user folders it will try to use them first so make sure you delete (or rename) these folders.



2. Script for Pre-processor

2.1 Introduction

Geometrical input can now be given using text scripts. It is possible to run different scripts in order to build a complete geometry. E.g. the user can have different scripts describing e.g. wall types and combine those with different scripts describing e.g. window frames.

It is also possible to vice versa generate a script from an already drawn geometry in the pre-processor. This means that a user can "export" already drawn geometries from the pre-processor and save them in a library for future use.

Do not confuse scripts for the pre-processor with scripts for bitmaps, see further p. 44-48 in *http://www.buildingphysics.com/manuals/HEAT2_9_update.pdf*

The following script commands are possible.

Rectangles can be specified using one of the below options:

r x1 y1 x2 y2 material name	=>	rectangle using two points (x,y)
s x1 y1 w h material name	=>	rectangle using point (x1,y1), width, height
t x1 y1 w h angle material name	=>	tilted rectangle using point (x1,y1), width, height, angle [°]

Polygons are specified using
m x1 y1 x2 y2 x3 y3 ... xn yn material name => polygon using *n* points (x,y) (at least three points)

The "*material name*" above should be a string from the material list, e.g. "concrete, IEA". If no material is given, the last one specified will be used (if no material has been used before, the current material in the material list will be used). This script will draw two rectangles with "concrete, IEA":

R 0.1 0.1 0.5 0.2 concrete, IEA
R 0.3 0.4 0.7 0.2

If a material does not exist, the last one specified will be used. This script will draw two rectangles with "concrete, IEA":

R 0.1 0.1 0.5 0.2 concrete, IEA
R 0.3 0.4 0.7 0.2 dummymaterial

Note the message in the "Message Window": "*Material not found in material list: dummymaterial*"

There is a short cut to insert the current material from the material list: *Ctrl-N* (or menu item "Edit/Insert material name".

Expansion points are specified using
x x1 y1 => expansion point at (x1,y1)

Open boundary line segments are specified using
b x1 y1 => open boundary line segment at (x1,y1)

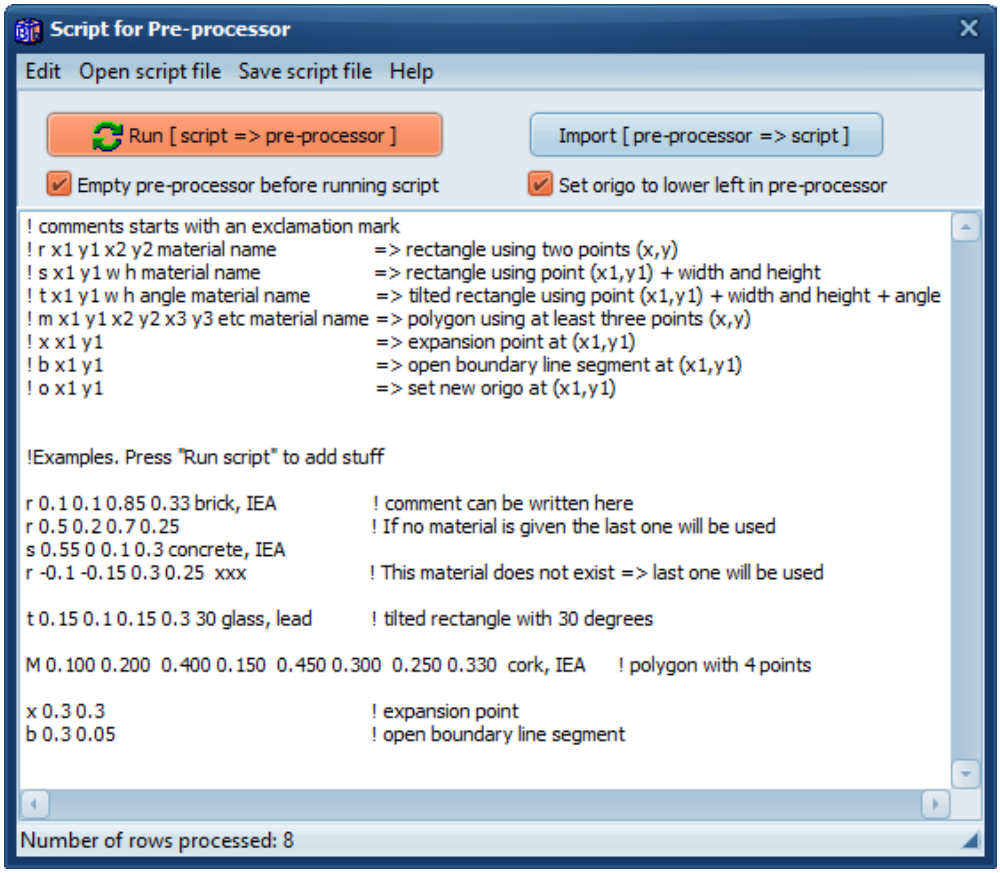
Origo can be moved by
o x1 y1 => set new origo reference at (x1,y1)

Comments are given by
! comments starts with an exclamation mark

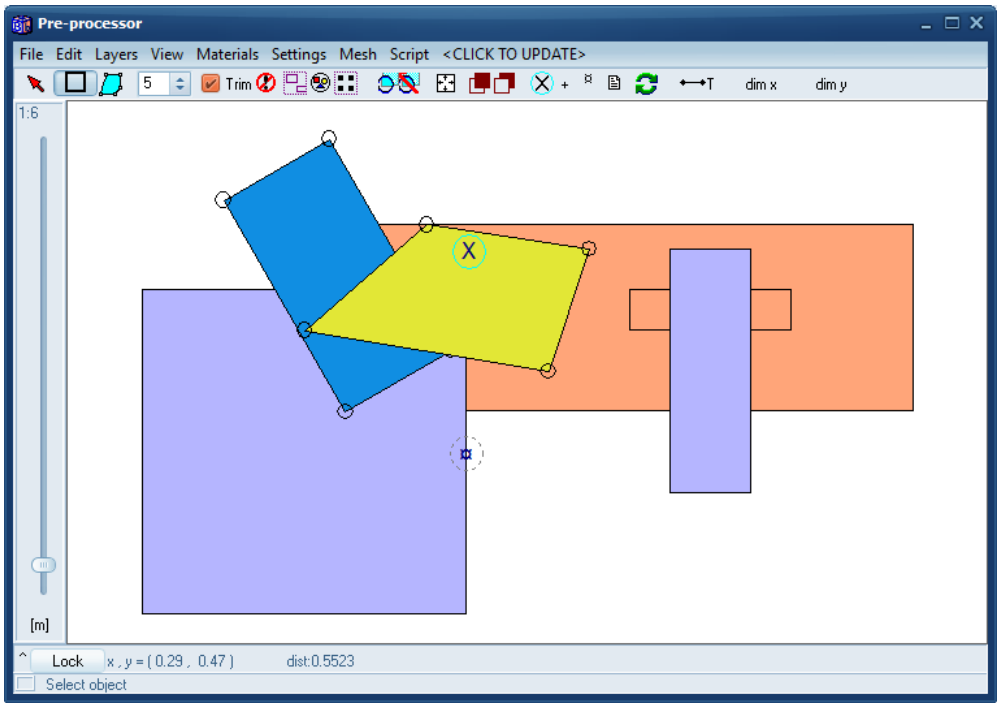
A tip: comment out objects if you do not want to draw them:
! R 0.1 0.1 0.5 0.2 concrete, IEA

2.2 Executing the script

The script window is available from the top menu bar in the pre-processor:

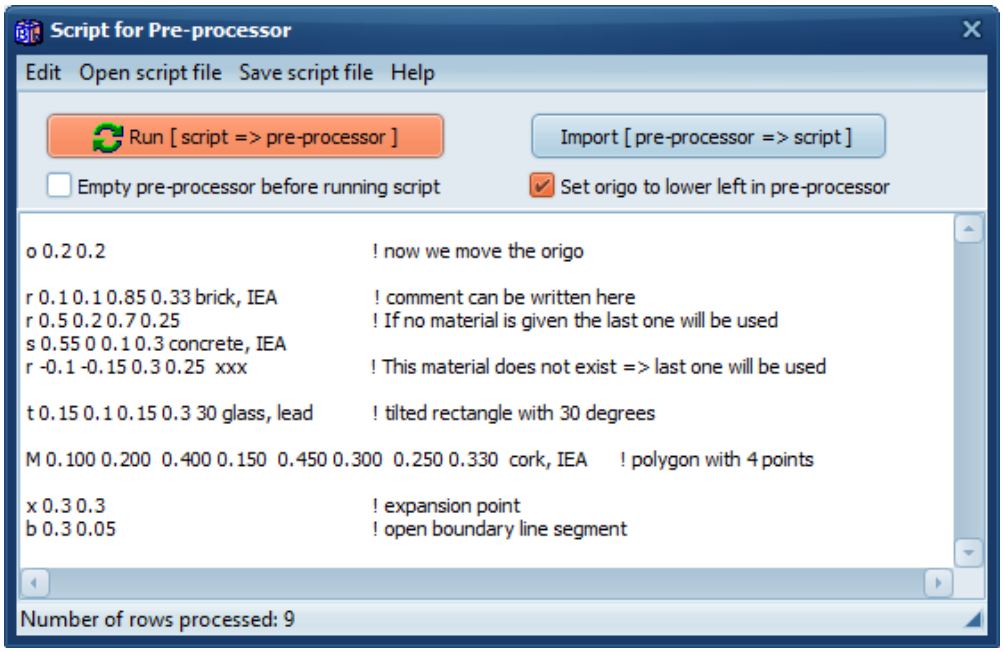


The button "**Run (script => pre-processor)**" (or short cut *Ctrl+R*) will execute the script. The example above will generate the following geometry with eight objects drawn:

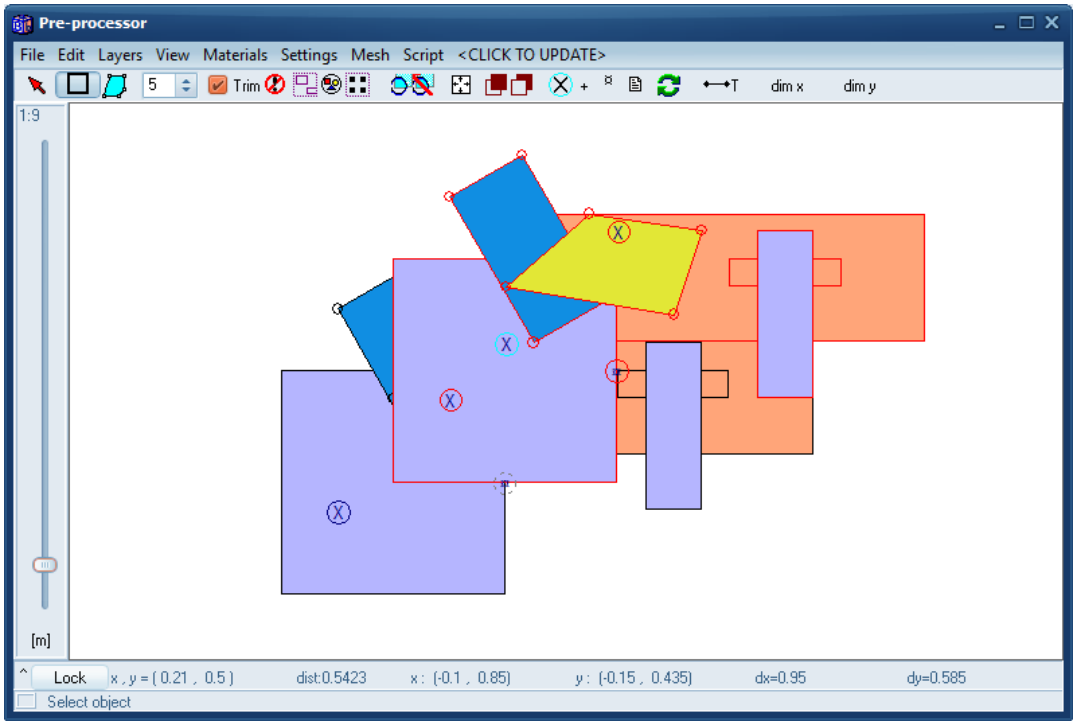


The geometry will be added to the existing pre-processor drawing If "**Empty pre-processor before running script**" is not checked.

In the example below we have inserted "o 0.2 0.2" which means that we move the origo with offset (0.2, 0.2) and then all objects are added again referenced to the new origo.

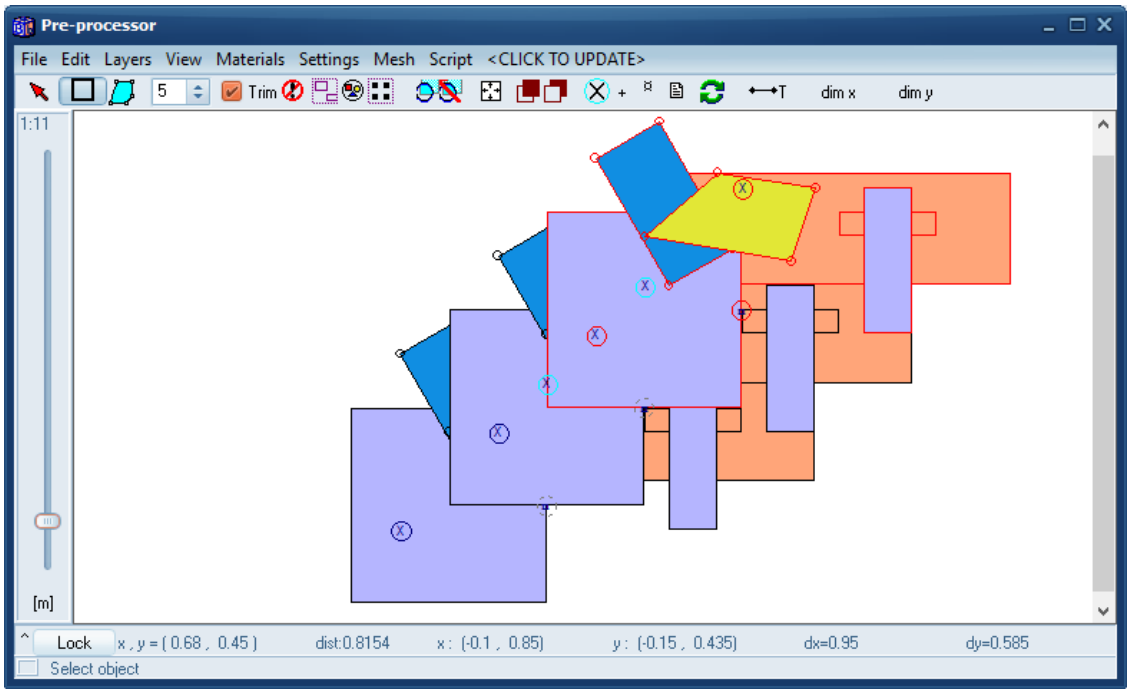


This will give the following geometry:



Note that all objects for the last imported script will be marked (in red) thus making it easier to move, delete, etc.

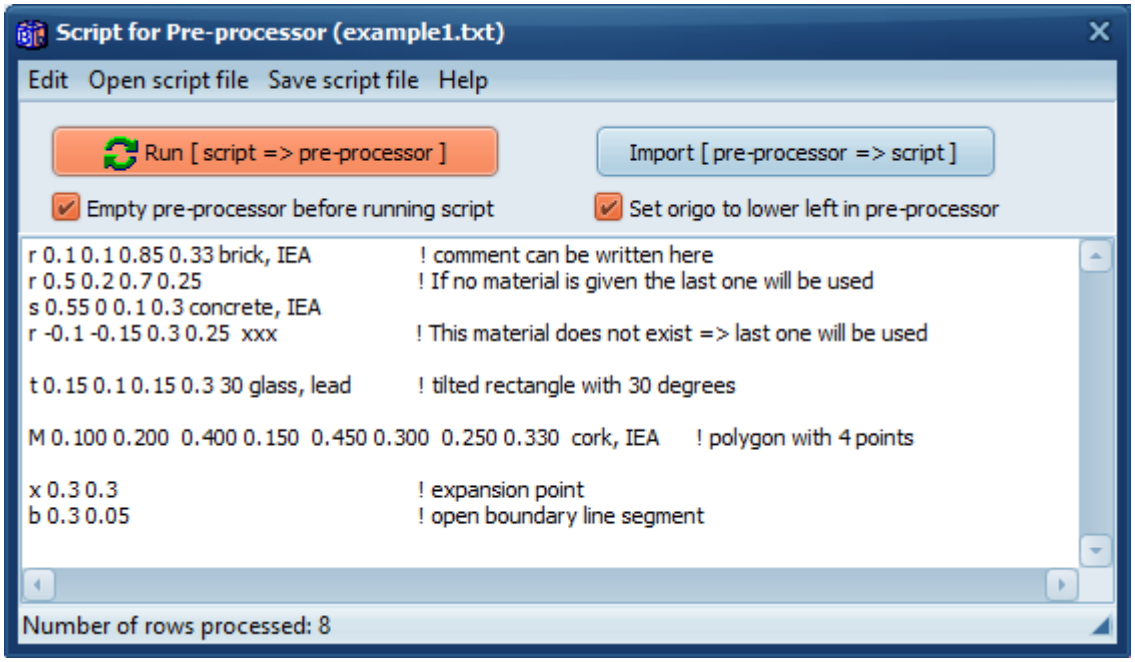
Running the script again will give:

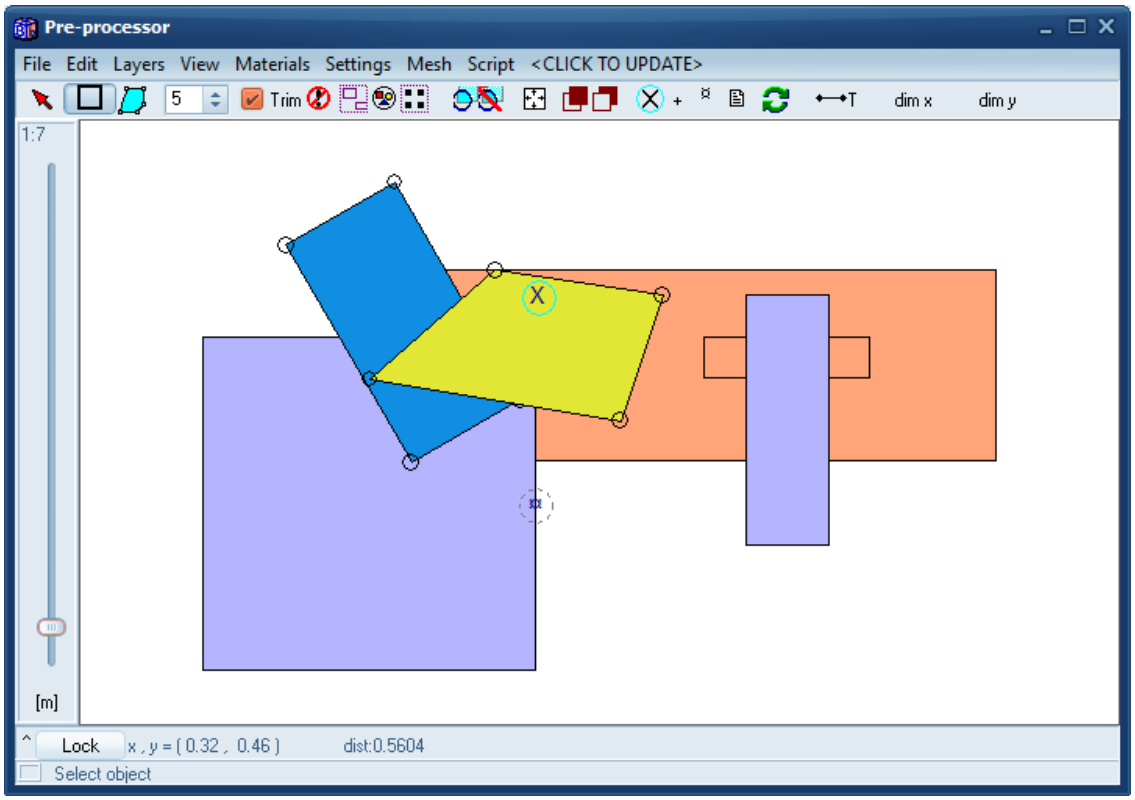


Setting a new origo can be useful e.g. in the following scenario: Assume you have a script that describes a detail (e.g. a window frame). You can use the same script over and over again and place the detail anywhere by first setting a new origo as a reference.

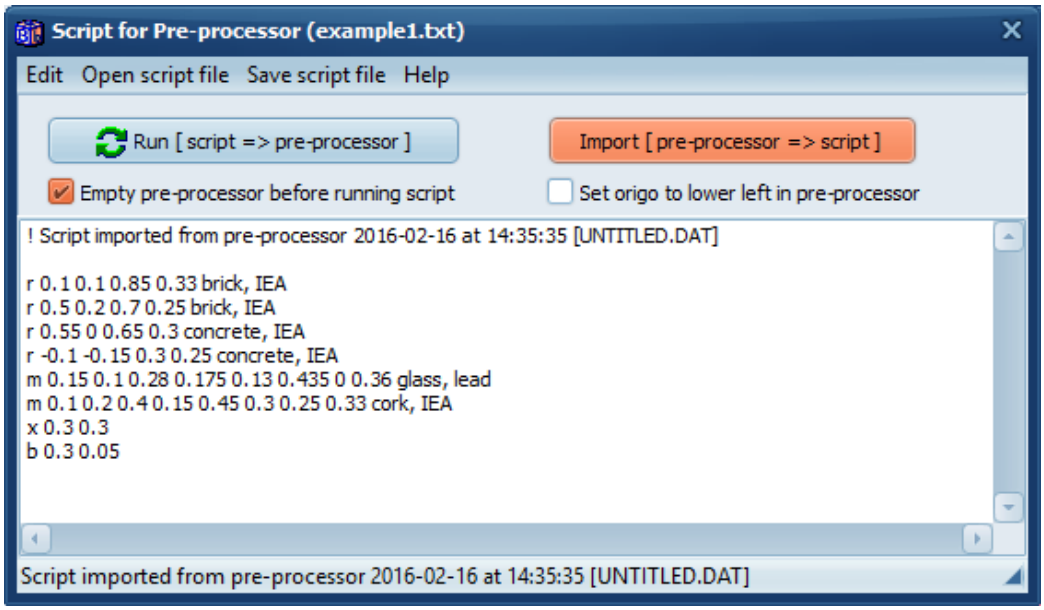
2.3 Importing geometry from pre-processor to script

The button "**Import [pre-processor => script]**" will generate a script for the drawn objects. Assume we have the first example (see file *example1.txt* in folder "*Scripts_preprocessor*") where the geometry was generated by the following script:





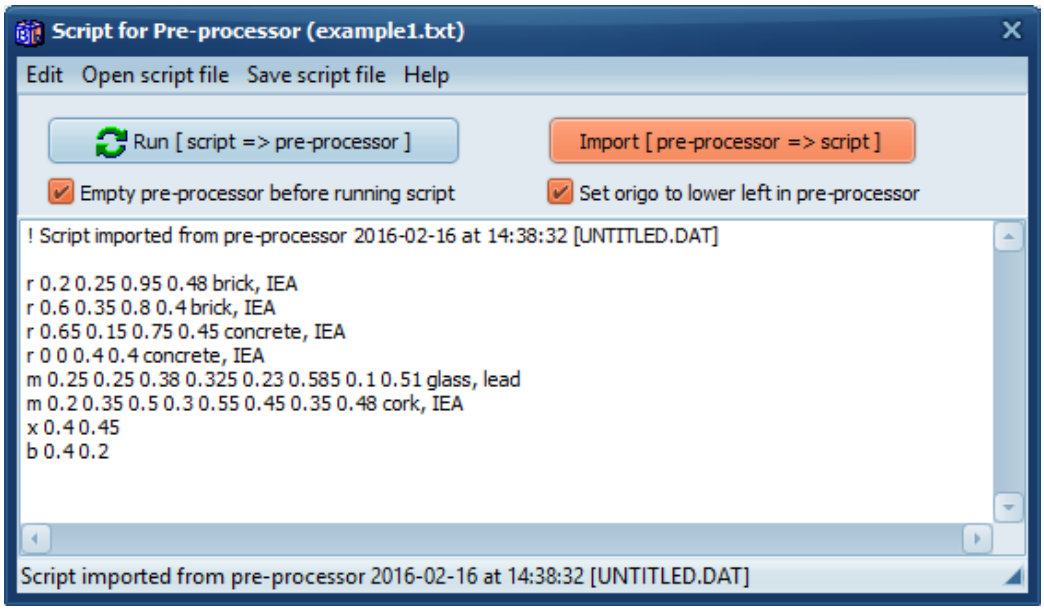
First, uncheck “Set origo to lower left in pre-processor” and press the button “**Import [pre-processor => script]**”. The generated script will be as follows:



A comment is shown on the first row (and at the window bottom) when the script was generated.

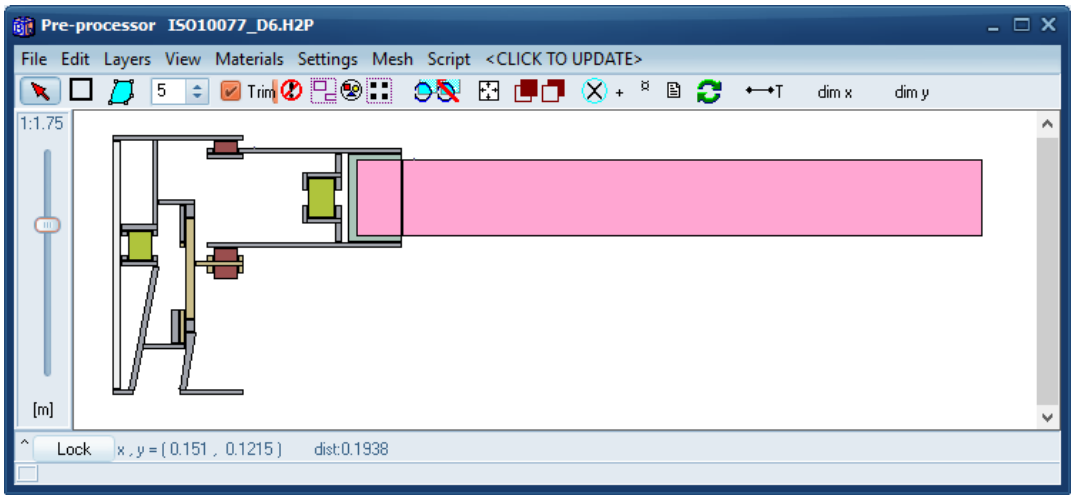
Note that the exported rectangle “*s 0.55 0 0.1 0.3 concrete, IEA*” is imported as “*r 0.55 0 0.65 0.3 concrete, IEA*”, and that the tilted rectangle “*t 0.15 0.1 0.15 0.3 30 glass, lead*” is imported as a polygon “*m 0.15 0.1 0.28 0.175 0.13 0.435 0 0.36 glass, lead*”.

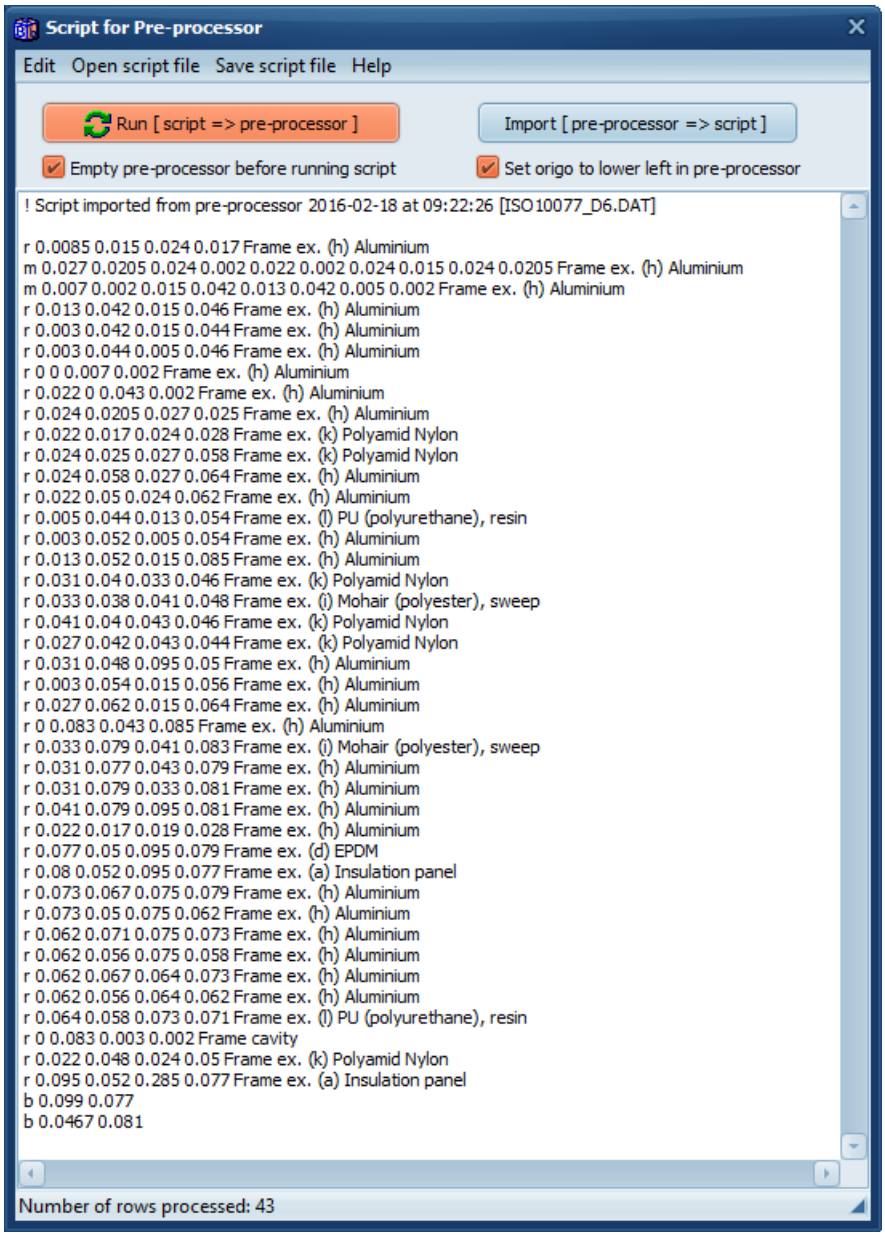
If “*Set origo to lower left in pre-processor*” is checked, the origo will always be at the lower left. The generated script will now be as follows:



The lower left-most object is here “*r 0 0 0.4 0.4 concrete, IEA*”.

The script for case “ISO10077_D6.dat” is shown below.

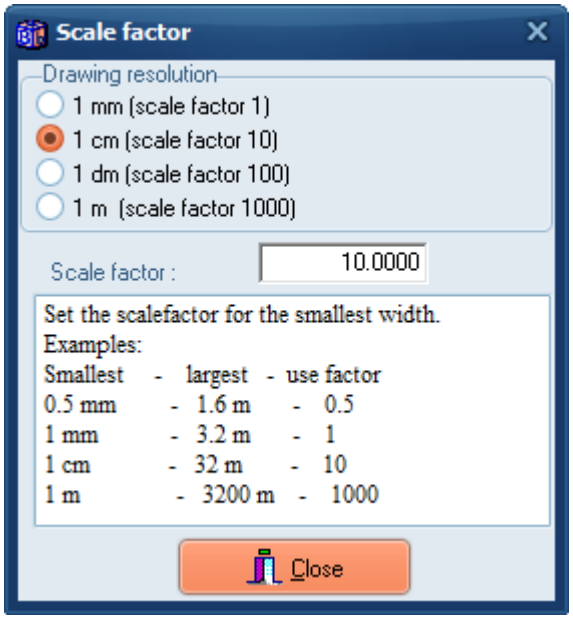




2.4 Adjustment of the scale-factor

The scale factor should initially be set according to the smallest width that is to be drawn, see p. 45 at http://www.buildingphysics.com/manuals/HEAT2_5.pdf

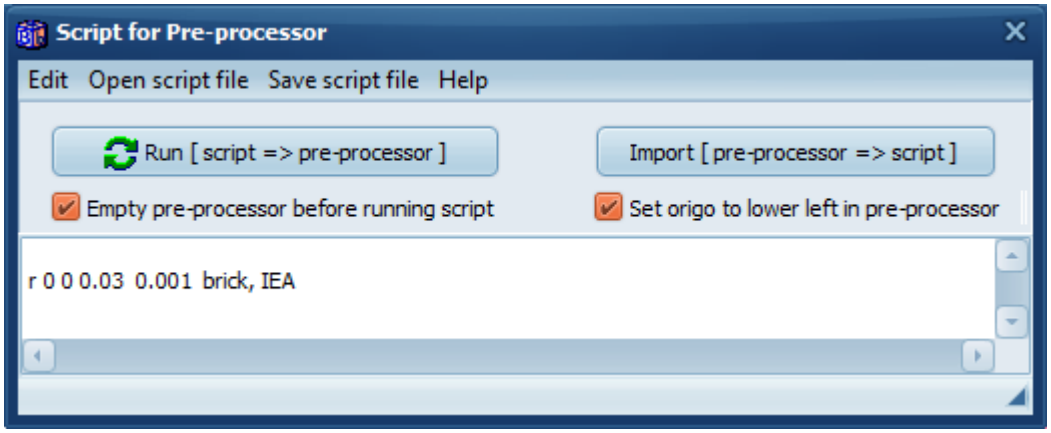
By default, the scale factor is 10 which would give 10 mm:



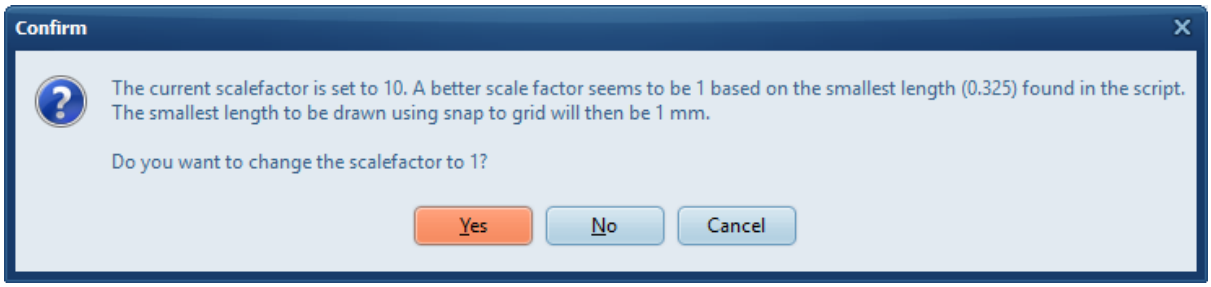
When a script is exported a suitable scale factor will be proposed if the current scale factor is too high. The reason is that it will easier for the user to draw new objects aligned with the objects created by the script using a proper scale factor (by default there is a grid of 10 pixels in the pre-processor that the drawn objects will snap to).

It should be noted that it is not necessary to change the scale factor when executing the script. The correct geometry will be created regardless of the chosen scale factor. It will just be easier to edit/add objects using the existing alignment with a proper scale factor.

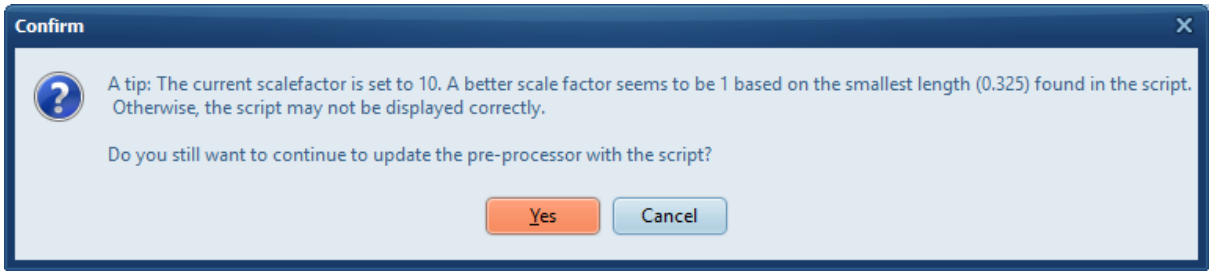
As an example, assume the default scale factor is "10" (meaning a resolution of 10 mm) and that we run a script with a rectangle that is 30x1 mm (that would require a resolution of 1 mm):



There will be a suggestion to change the scale factor when running the script:



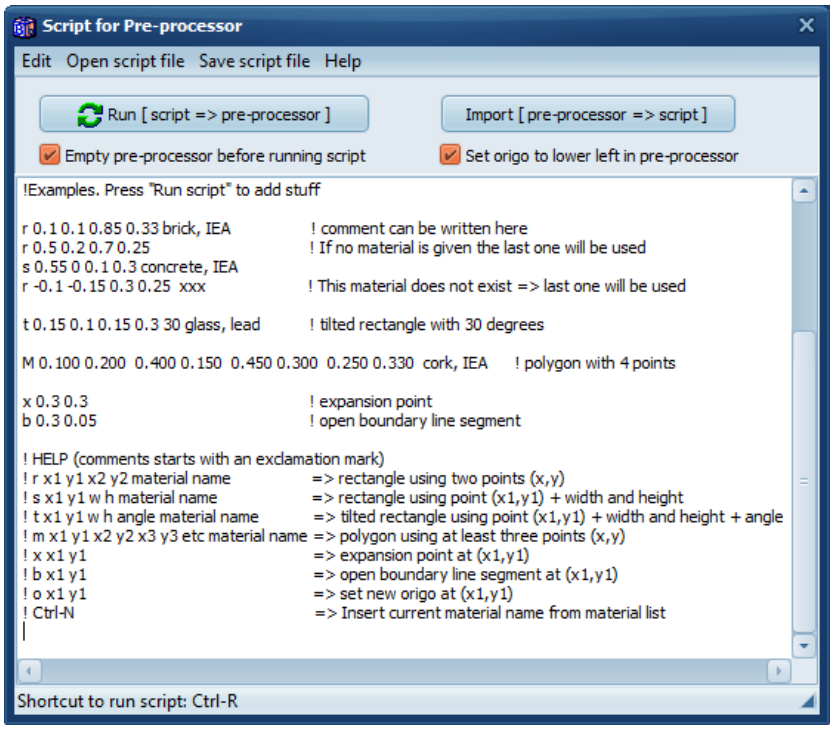
If "**Empty pre-processor before running script**" is not checked, and if the pre-processor is not empty, there will be a warning instead (if the current scale factor is too high):



So, if the pre-processor is not empty, and we want to add objects from a script, the scale factor will not be changed if it is too high since this would affect the geometry already drawn. Only a warning will be shown.

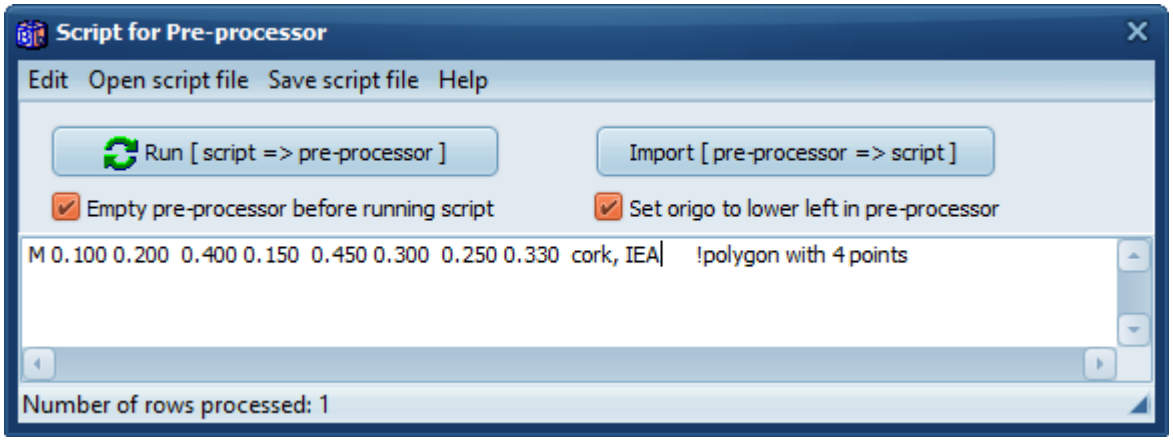
2.5 Help

Press menu item *Help* and some information will be added to the editor:

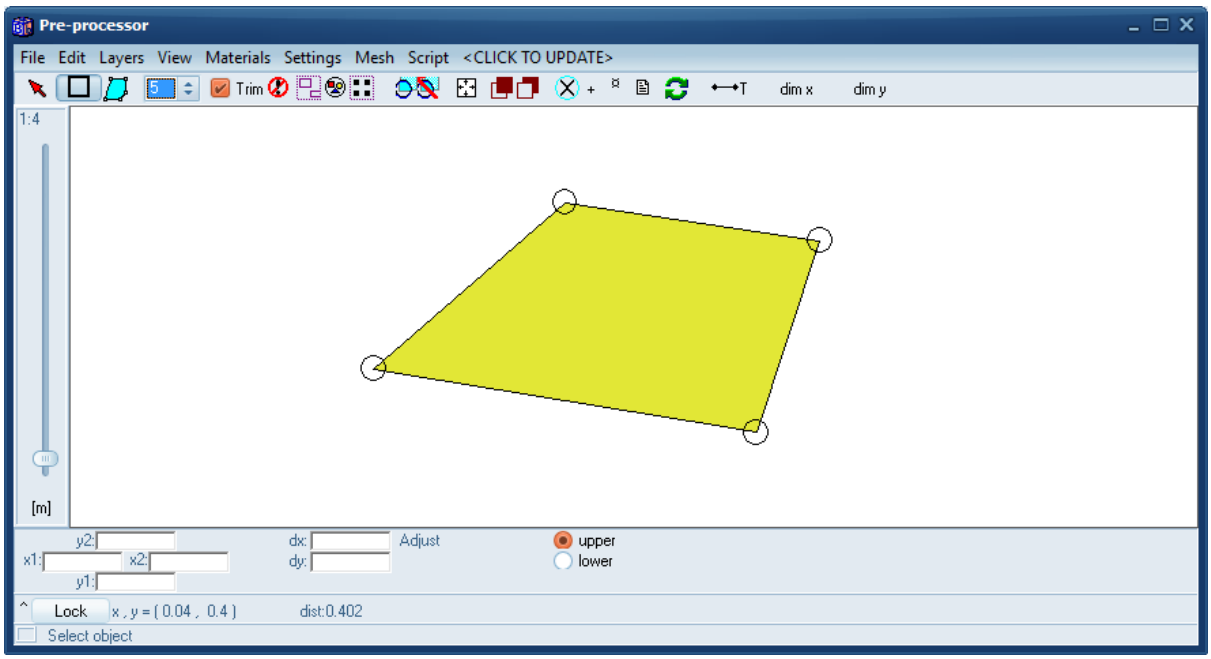


2.6 Adjustment of polygon grid step

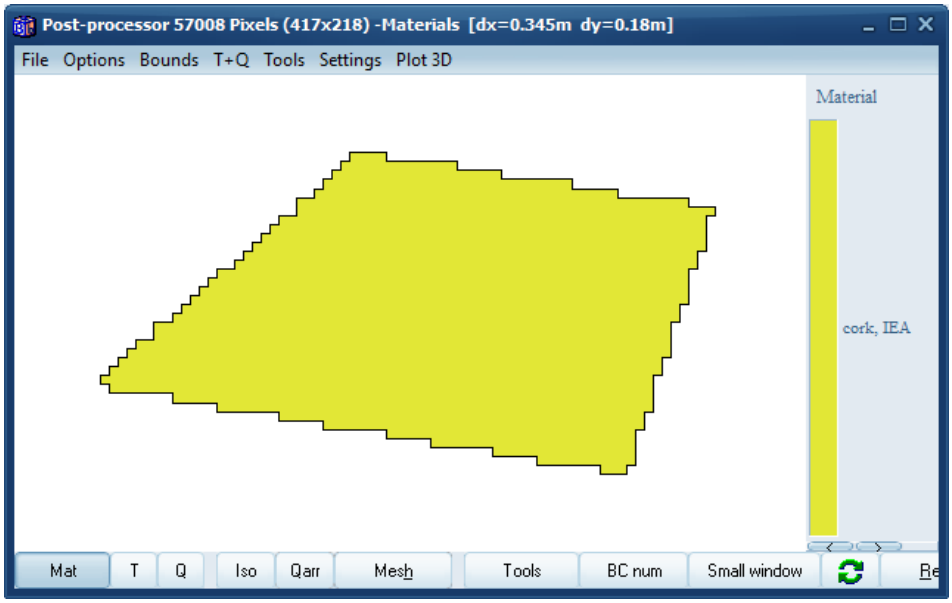
There might be a need to adjust the polygon grid step in the pre-processor when polygons/tilted rectangles are used in order to get a proper mesh. Assume we run the following script:



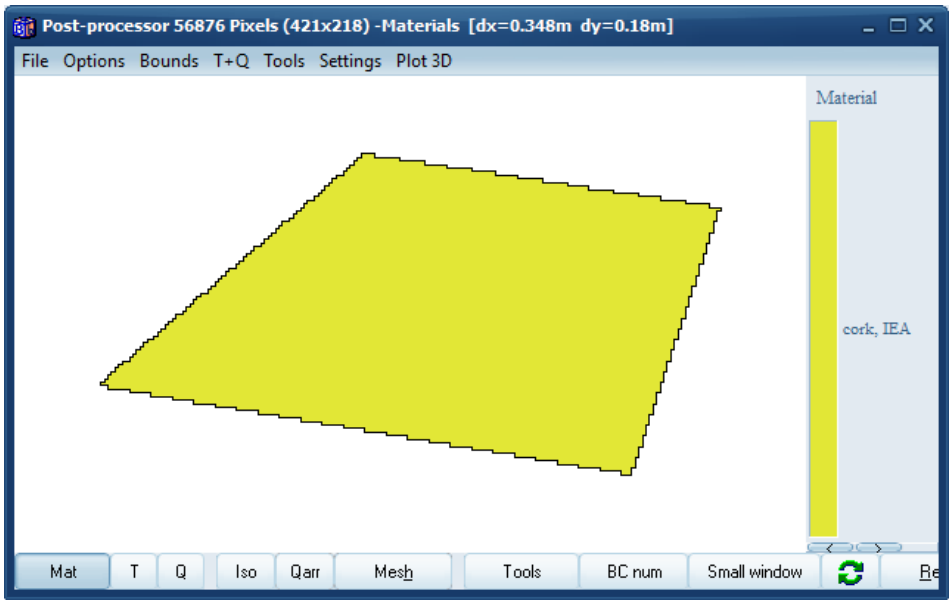
This will draw the following polygon:



Press "**CLICK TO UPDATE**" to update the geometry. The post-processor gives the following pictures for two choices of the polygon grid step:



Grid step=5



Grid step=2

2.7 Save/open script files

The scrips can be saved and opened to/from text files. A suggestion is to put the files in folder

"*…Documents\Blocon\HEAT2 10\Scripts_preprocessor*"

In order to avoid confusion for scripts for pre-processor with scripts for bitmaps we suggest that you put bitmaps scripts in folder

"…Documents\Blocon\HEAT2 10\Scripts_bitmaps"

(this folder was named "…Documents\Blocon\HEAT2 9\Scripts" in version 9.

3. Repeating function values

3.1 Introduction

It is now possible to easily repeat function values for dynamic calculations for any given period (e.g. daily, weekly, monthly, or yearly variation).

To repeat the values just add the string "*% repeat timestring*" as the first row in a function (*.fun). The "timestring" is just the time given as a string, e.g. "1y2q3d4h5s", "8760h", 3600s (or just 3600), etc. Here is a recap from http://www.buildingphysics.com/manuals/HEAT2_5.pdf how time-strings are used:

The time-string is a sequence of pairs with a number and one of the following letters:

y	year (365 days, 31536000 seconds)
q	month (year/12, 30.417 days, 2628000 seconds)
d	day (86400 seconds)
h	hour (3600 seconds)
m	minute (60 seconds)
s	second (can be omitted)

Please note that *m* is minute and *q* is month. Here are some examples:

1y14h	1 year and 14 hours
14q3d15	1 year, 2 months, 3 days and 15 seconds (same as 1y2q3d15)
86400	1 day
~~1h2d~~	Not valid. The expression must be in descending order, see next row.
2d1h	This string is OK, meaning 2 days and 1 hour

Normally, one would use a repeat period of one day (1d), one week (7d), one month (1q), or one year (1y). Here is an example where the values are repeated for the first three months (3q) in a function:

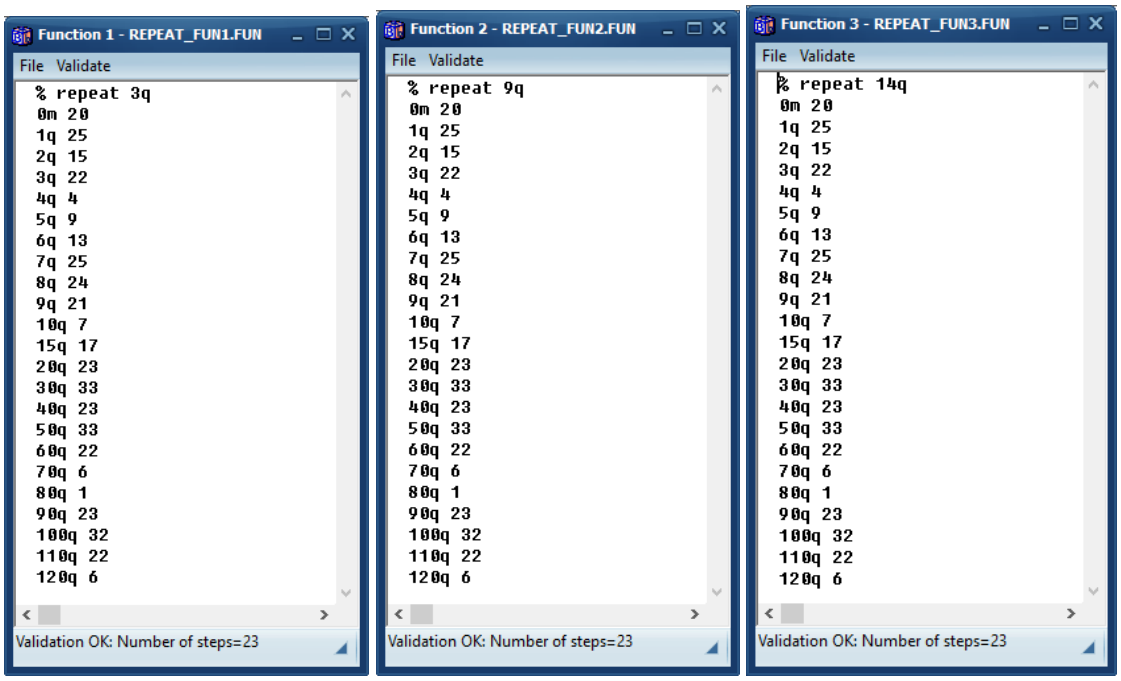
```
% repeat 3q
0m 20
1q 25
2q 15
3q 22
4q 4
5q 9
6q 13
7q 25
8q 24
```

Here is an example where the values are repeated for a monthly period with daily values:

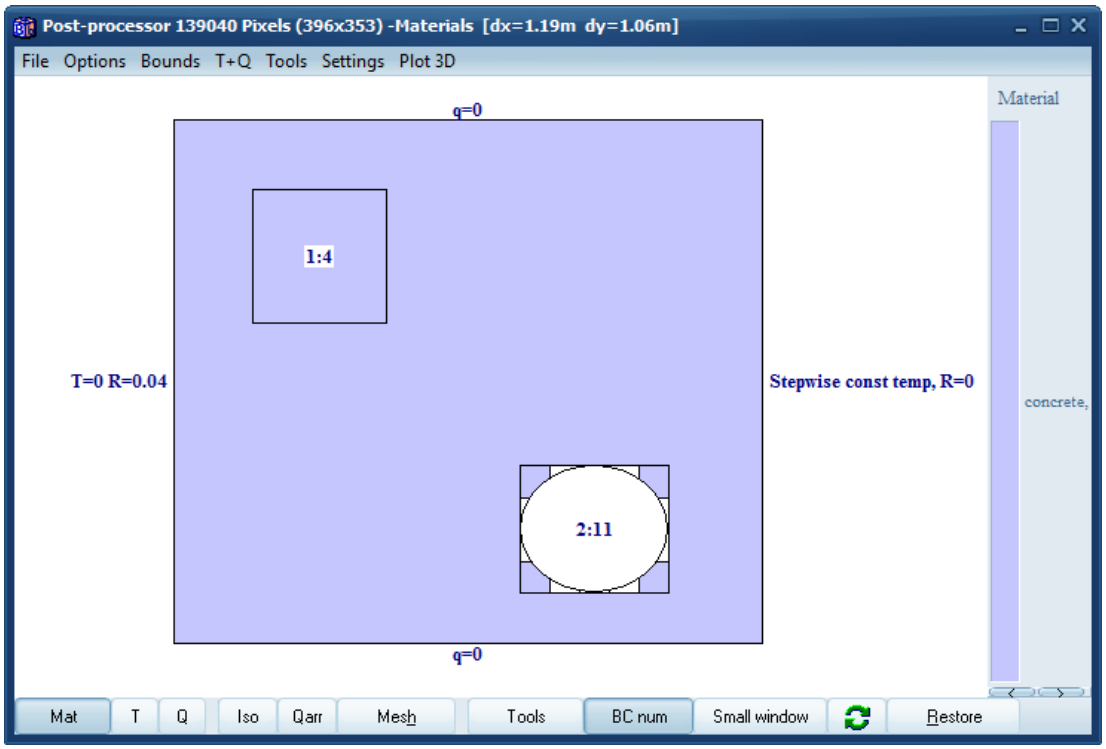
```
% repeat 1q
0d  24
1d  23
2d  21
3d  19
4d  23
...
31d 22
```

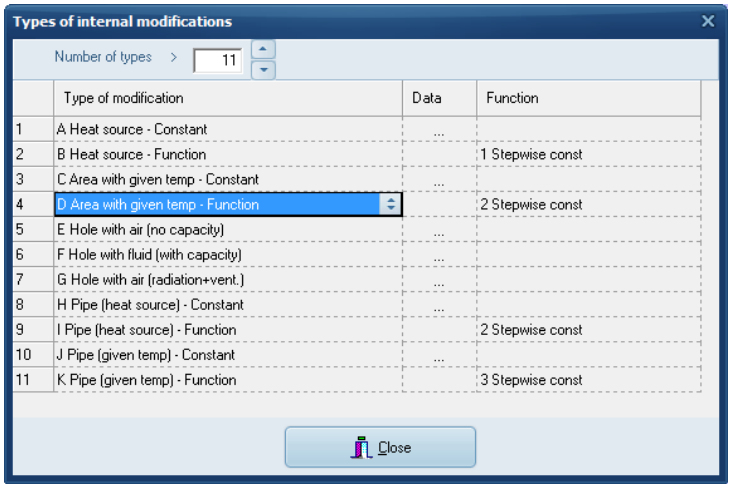
3.2 Example

The following example (*Repeat_example.dat*) uses three functions that are repeated for different periods of 3, 9, and 14 months for a total of two years. All files are available in folder "…Documents\Blocon\HEAT2 10\Examples\Manual\repeatingfunction"

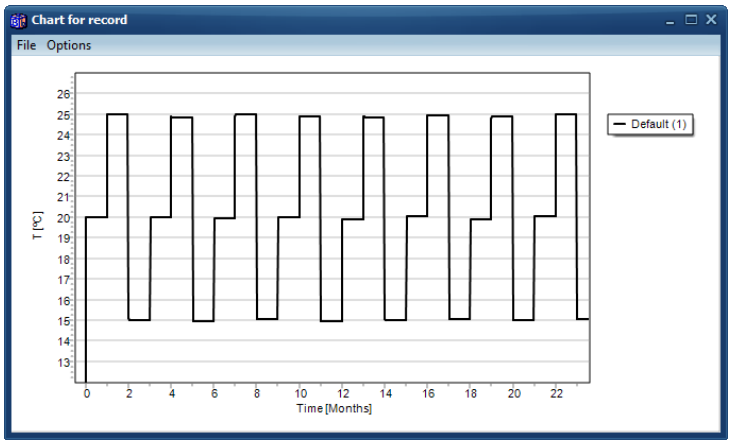


Function 1 is used for the right boundary condition (stepwise constant temperature).
Function 2 is used for area 1 (type 4) with a given temperature.
Function 3 is used for area 2 (type 11) which is a pipe with a given temperature.

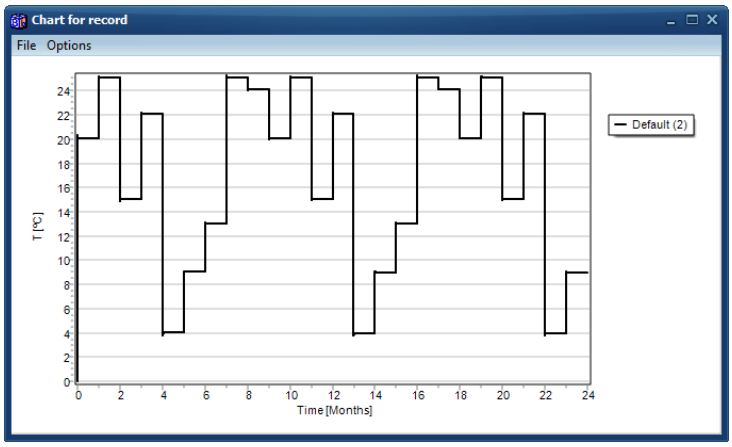




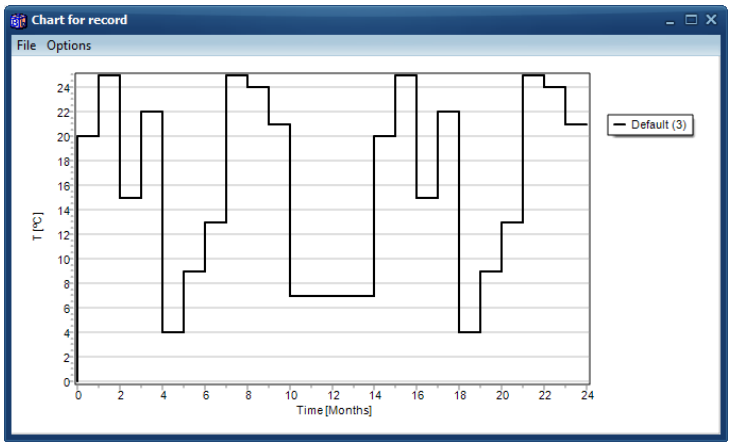
Types 4 and 11 are used



Function 1 repeated after 3 months

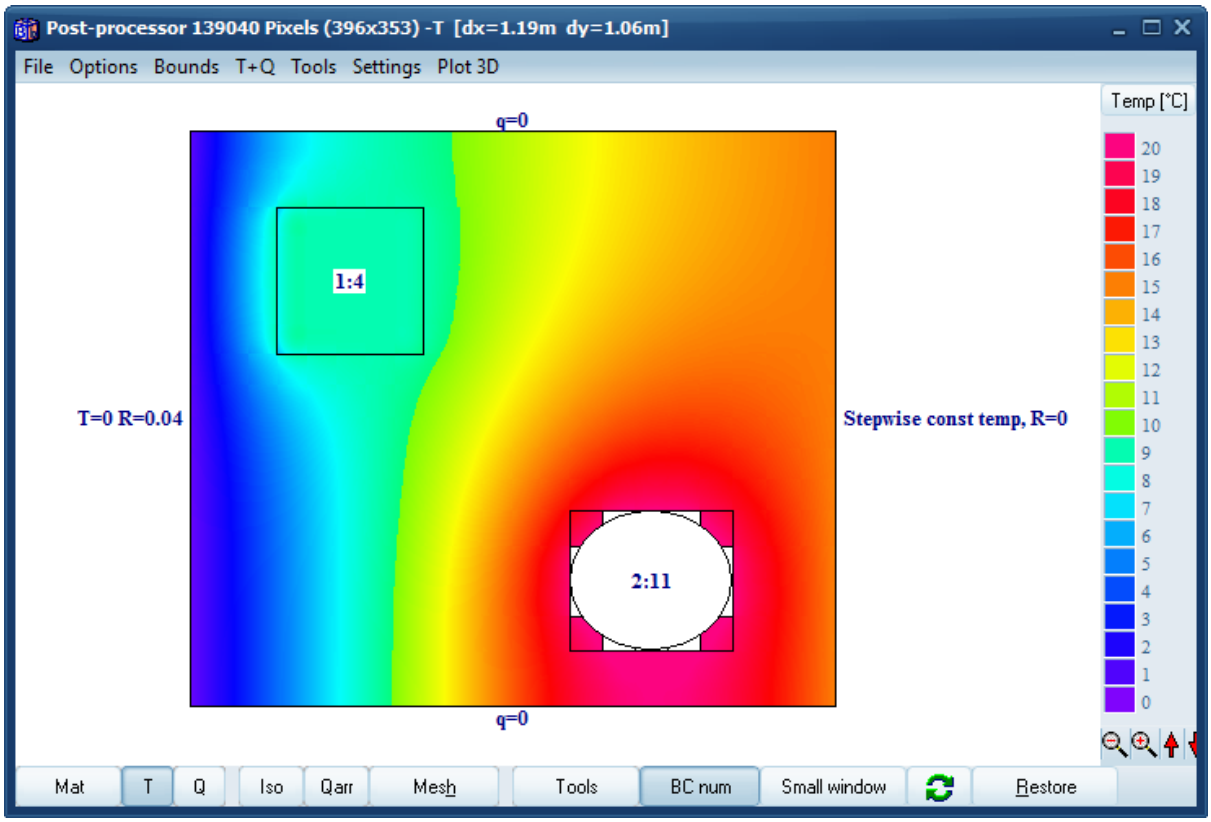


Function 2 repeated after 9 months



Function 3 repeated after 14 months

Temperatures at two years:



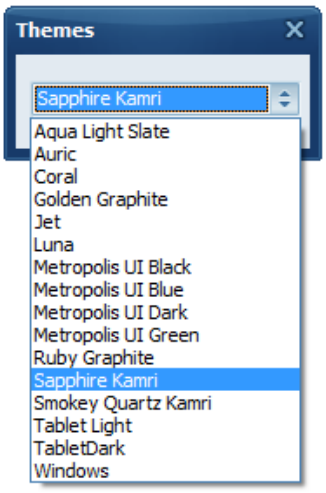
Open the example in HEAT2. Open the three steps windows as above and run the dynamic case (F10) in order to see how the steps are executed during the calculation.

4. Changeable user interface of HEAT2

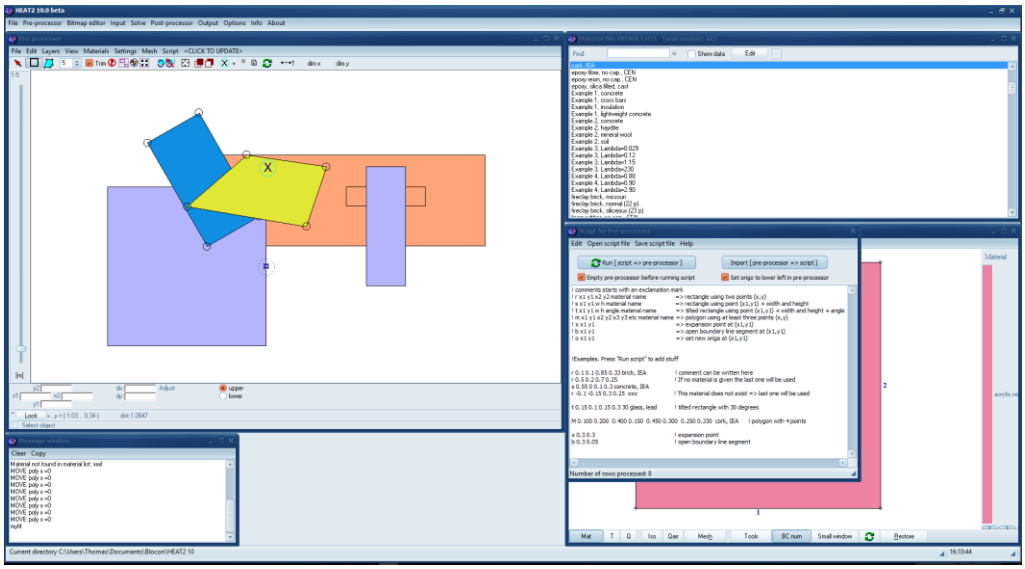
4.1 Introduction

The user interface of HEAT2 can now be "personalized" using different windows style themes. A style is a collection of painting rules you can dynamically apply to an entire Windows application, changing the size and appearance of various elements, the fonts, and the color scheme. One example of the available styles is the so-called Modern UI (originally known as "Metro").

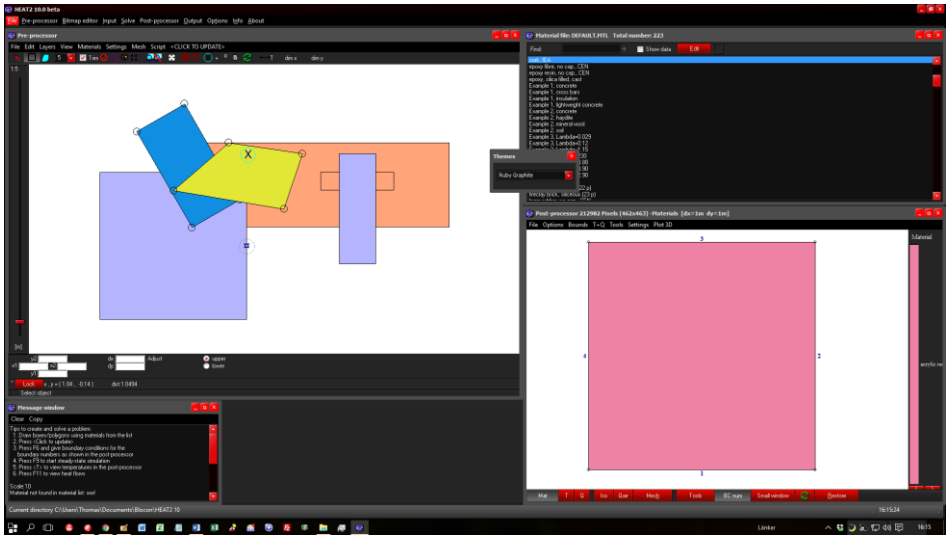
Goto menu item *Options/Themes* to change current appearance:



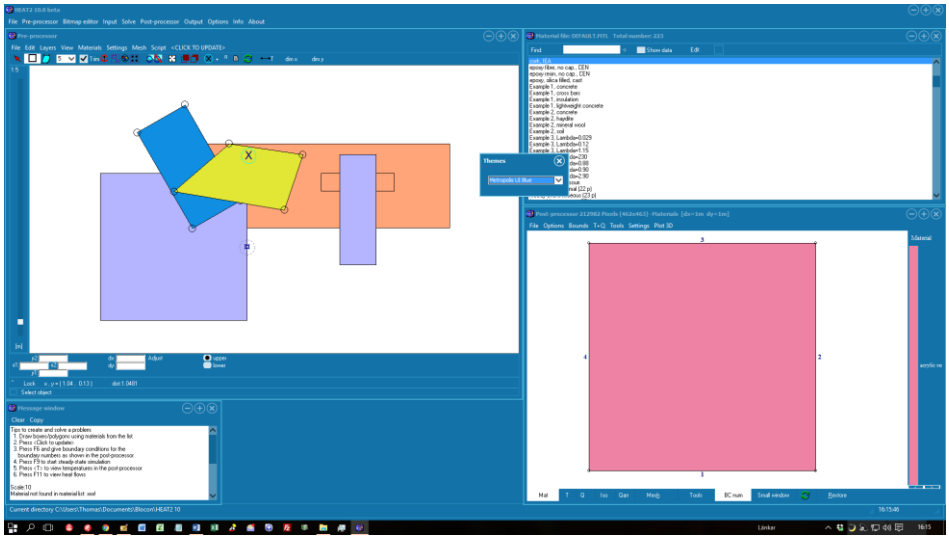
The default theme is "*Sapphire Kamri*":



Below are examples of a couple of other themes.



Ruby Graphite



Metropolis UI blue:

The theme is saved to file “Theme.txt” in folder “C:\Users*username*\Documents\Blocon\HEAT2 10” and read every time HEAT2 is started.

5. Appendix A. List of new update features

For update info, see also section "Version update info" at
https://buildingphysics.com/heat2-3/

Update 10.03 *(June 7, 2016)*

- Maximum value for coordinates for "Areas with internal modifications" raised from 250 to 32767
- The small "squares" indicating current material color were not updated when "Themes" were applied. (The squares are shown in Material pick list (at upper right), Pre-processor (at lower left), Bitmap editor (black and white squares on the tool bar), and in the Tool menu in the Bitmap editor).

Update 10.1 *(July 25, 2016)*

- New look of file open/save dialogs
- Preview possible for Dxf/Dwg-files in the Cad import open file dialog
- Fixed problem: clicking in the post-processor menu sometimes froze the image for a short while
- Fixed problem: some windows were earlier hidden when toggling between HEAT2 and other applications
- Fixed problem: "cannot open clipboard: access denied" sometimes came when pasting objects in pre-processor
- Max value for coordinates for "Input/Initial Temperatures" raised from 250 to 32767
- Max value for coordinates for "Input/Resistances" raised from 250 to 32767

Update 10.11 *(August 30, 2016)*

- Compatibility with Windows 10 Anniversary added.

Update 10.12 *(April 14, 2017)*

- Compatibility with Windows 10 “Creators update” added.
  Earlier versions of HEAT2 will not start if your OS is updated to Windows 10 “Creators update”.
  There is however a quick fix that will make old versions of HEAT2 run under this OS:
  Go to folder C:Program Files (x86)BLOCONHEAT2_v10.11, right-click “HEAT2_v10_11.exe” and choose Properties. In the Compatibility tab, change “Compatibility mode” to “Windows 7”.

- New version of TurboActivate (4.0.9.6).* IMPORTANT WHEN YOU INSTALL V10.12 *:
  If you have any old versions prior to HEAT2 v10.12 on the PC you need to uninstall them first in the control panel before continuing.

Update 10.12b *(April 23, 2017)*

- For admins/superusers: It is now possible to silently install, uninstall, activate, and deactivate HEAT2 using a command line in a batch-file, see
  buildingphysics.com/download/silent_heat2.pdf

Update 10.13 *(June 11, 2020)*

- This update contains a fix for a rare calculation type where temperature dependent material properties have been used, see chapter two in
  https://buildingphysics.com/manuals/HEAT2_9_update.pdf

  The bug was recently reported by a user and it is only affecting the case “Type 2, piecewise linear volumetric heat capacity and thermal conductivity”

  In some cases where EITHER the volumetric heat capacity OR the thermal conductivity were depending on temperature, the resulting calculated temperatures may have an error depending on the input range for temperatures.

  Therefore we suggest that you re-calculate your old cases if this specific case has been used.

  If BOTH the volumetric heat capacity AND the thermal conductivity were depending on temperature the results in the old versions are ok.

  If you have used “Type 1, Freezing of soil”, or the predefined material for steel named “TDEP_STEEL”, all calculations using older versions are also ok.

  Please use your original download link that you earlier received by email to download and install the latest version.

  For floating licenses: please download and install the latest version for each client (use your old download link that is updated).

Update 10.2 *(March 21, 2024)*

- The license manager has been updated with many performance improvements
- HEAT2 now install material files (and some other files) to the common folder C:\Users\Public\Documents\BLOCON\HEAT2 9 by default so that the files can be shared by different users. See also Section 1.5 “Installation”.
- Windows theme now default at start-up. This can be changed in menu item Options/Themes.
- Modern design for the open/save file dialog.
- New version for setup program
- Bug for loading old files saved with v8 fixed.
- The font for materials heading in the post-processor can be changed, see menu item Settings/text font in right panel in the post-processor.