Tutorial

SOFiCAD-BAMTEC

Introduction Module BAMTEC®

Program Version SOFiCAD 17.1

Contents

1   General

With SOFiCAD-BAMTEC you can create construction plans for BAMTEC® carpets in a easy way. Manufacturing, roll-out and key plans will be created automatically within one DWG file.

The following tutorial describes the general workflow of the SOFICAD-BAMTEC module and guides the user through a small and simple example.

This tutorials is meant as a quick reference to start working. In addition to this tutorial a small film is available to introduce the workflow.

For additional information please see the handbook BAMTEC.pdf, or the SOFiCAD Help -> BAMTEC.

⚠️	SOFiCAD Version 17.2 is based on AutoCAD 2009
	SOFiCAD Version 17.1 is based on AutoCAD 2007 and 2008
	SOFiCAD Version 16.5 is identical to 17.1 but is based on AutoCAD 2006

2   General Description

In the following chapter, you will find general descriptions about BAMTEC®.

2.1   Arrangement of the plane reinforcement carpets

Optional based on the FEM results or on given reinforcement the reinforcement plan is produced automatically. For two installation directions in the lower and upper reinforcement layers at a time a BAMTEC® -carpet (carpet) is dimensioned corresponding exactly to the necessary reinforcement. The layer of the individual bars is calculated independently. All lapping within a carpet are no longer necessary. Individual bars are welded onto installation straps made of rolled steel resulting in a carpet which is transported to site in the form of rolls. In this way the reinforcement is supplied as calculated by the FEM calculation taking into consideration the norms. Each bar can be of different length. A production file can be created from the reinforcement plans which is able to steer the robot at the steel benders.

Computer Integrated Manufacturing

First the carpets are created and then divided into convenient parts. It has to be considered that the reinforcement layers are produced in rolls that can be laid with no restrictions. The detailer needs to make sure that the reinforcement carpets are rolled from the widest end. To ensure a clean and even roll-out of the carpets (e.g. reentrant angles when opening the formwork) on the building site, it is recommended to pre-define the carpet geometry in a logical layout.

2.2   Suspension band

The bars within a carpet never may be shorter than the spacing of the suspension bands of the carpet. The suspension bands are arranged rolled up on the reinforcement setting machine. They are made of spring steel of 1,5 mm thickness. The spacing between the suspension bands during the carpet construction depends on the machine.

2.3   Maximum BAMTECâ -carpet weight

The maximum weight of a carpet should not exceed 1400 kg. Trials have shown that a carpet with a total weight of 1400 kg could be rolled out by two men. The carpet must ultimately be subject to the load capacity of the crane used on site. The maximum load capacity depending on the range of the crane has to be taken into consideration. In individual cases, a discussion with the site staff is recommended. During the construction phase of a carpet it is recommended to check the weight in accordance with the construction site guidelines. As a general rule, carpets with a weight of appr. 1000 kg are only needed for ceilings subject to

heavy duties, e.g. ceilings of underground garages, ceilings with very large spans or ceilings covered with earth.

2.4   Maximum BAMTECâ -carpet dimensions

The maximum width of a carpet, i.e. the length of the carpet may not exceed 15 meters. The maximum length of a carpet may be up to 25 meters. Lifting long carpets may cause the roll to deflect adversely. This presents no problems in laying. To avoid large lift deflections of carpets with small bars, it is recommended to add 2-3 larger size bars (e.g. 16 or 20) during manufacturing.

2.5   Minimum anchorage length

The required anchorage length must be considered and should be defined by the Engineer.

2.6   Dimension of the initial bar

The initial bar (coloured marked) always starts around 100 mm approx from the inside edge of the wall running parallel to the steel. The coloured bar appears on the end of the carpet and can be recognized immediately for correct site placement.

2.7   Precast Formwork

Execution of the floors as precast formwork causes no problems to BAMTEC®. Only the two upper carpet layers are to be defined. The carpets should be divided into convenient parts. To minimize deflection of the upper carpet layer, the first upper carpet layer must always be less than 90 degrees to the lattice girder. Additional reinforcement which is laid on the precast formwork shall be stated unter the heading: **"Additional reinforcement before and after installation"**

2.8   Holes

For holes larger than 300x300 mm additional bars should be added in the carpet.
As a rule it has been tried and tested that for holes (below 300x300 mm) the carpet can be laid over these holes and the carpet trimmed to suit. The hole formwork is added after. With large holes or free sheet borders the lap reinforcement is placed after having laying the lower carpet. This additional lap reinforcement and separate bending schedule is shown separately on the construction plan under the heading: "Additional reinforcement."

2.9   Numbering and description of carpets

Carpets are detailed and laid in a specific sequence.
(Starting with no. 1, 2, 3 etc.)

The numbering of the carpet is as follows:

    B = lower reinforcement layer

    T = upper reinforcement layer

    It is divided floor by floor

    KG = cellar

    EG = basement

    1.OG = first floor

    2.OG = second floor

The reinforcement direction is stipulated by

    XSI

    ETA

An example of carpet marking is as follows:

B KG 1 XSI
B = lower layer
KG = cellar
1 = carpet serial number

XSI = main direction

T 2.OG 1 ETA
T = upper layer
2.OG = second floor
1 = carpet serial number
ETA = secondary direction

The numbering of the carpet is shown **twice** on the Rollout plan.

* At the end of the carpet (always on the colour marked bar)

* As plan number

> Further information including descriptions of all commands you will find in the handbook BAMTEC.pdf

3 Example 2D-Slab

The following example will guide you throught the basic workflow to create BAMTEC®
carpets. We recommend to start working on this eyample with watching the small film.

In our example we consider a simple 2D slab, which is supported by surrounding linear
supports and 4 column supports. Inside the slab there is one opening.
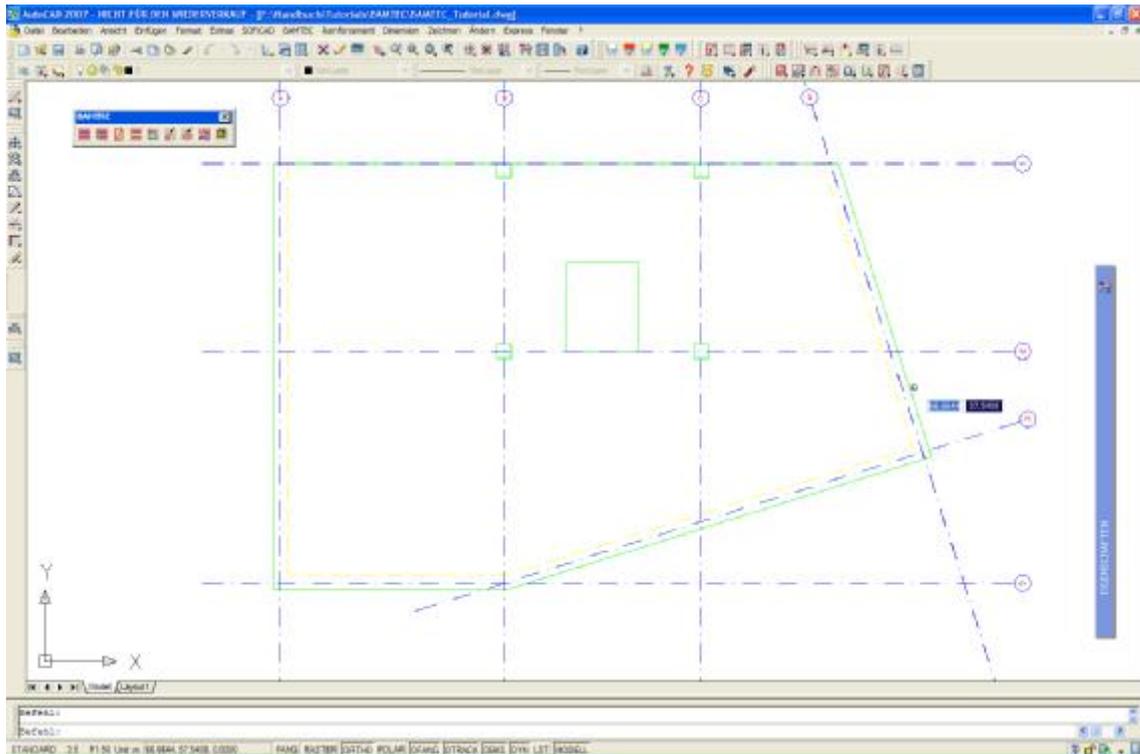
Picture 1: Floor Plan

First start the program SOFiCAD and open the drawing BAMTEC-Tutorial.dwg .

To start working with BAMTEC® please open the Toolbar „BAMTEC" out of the SOFiCAD-
Menu (SOFiCAD > Load /Unload Modules > BAMTEC).

All necessary commands are inside the BAMTEC Toolbar.

Creating BAMTEC® carpets is based on the result of a FEA calculation saved in
the central database CDB. This you can easily do with our SOFiSTiK Structural
Desktop (SSD)

3.1   Import FEM-Result

Starting the import of the FEM results please use the command „BFE-Show 📊" and select the source database with the results.
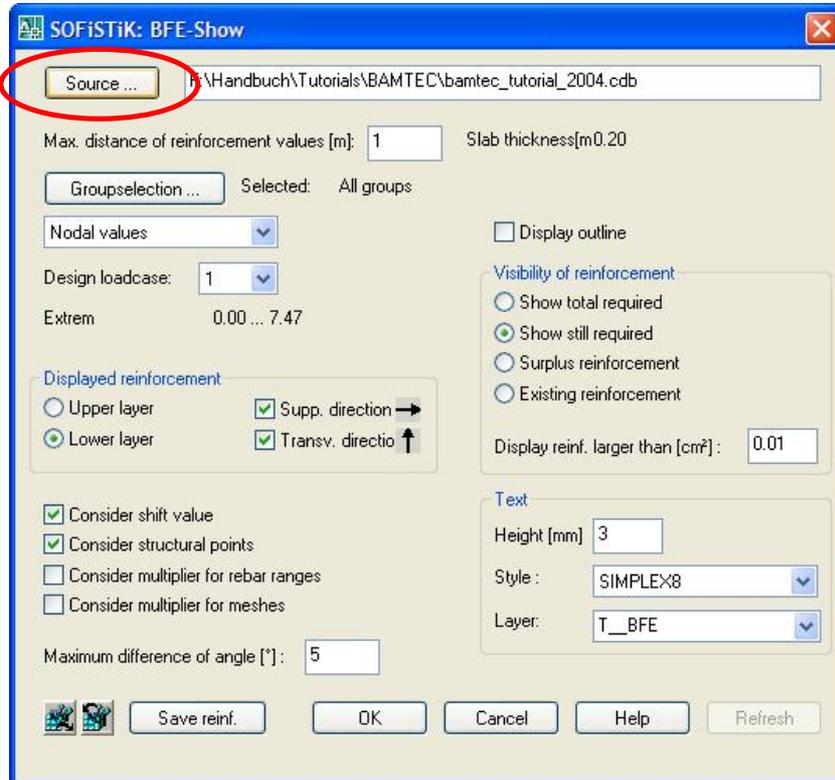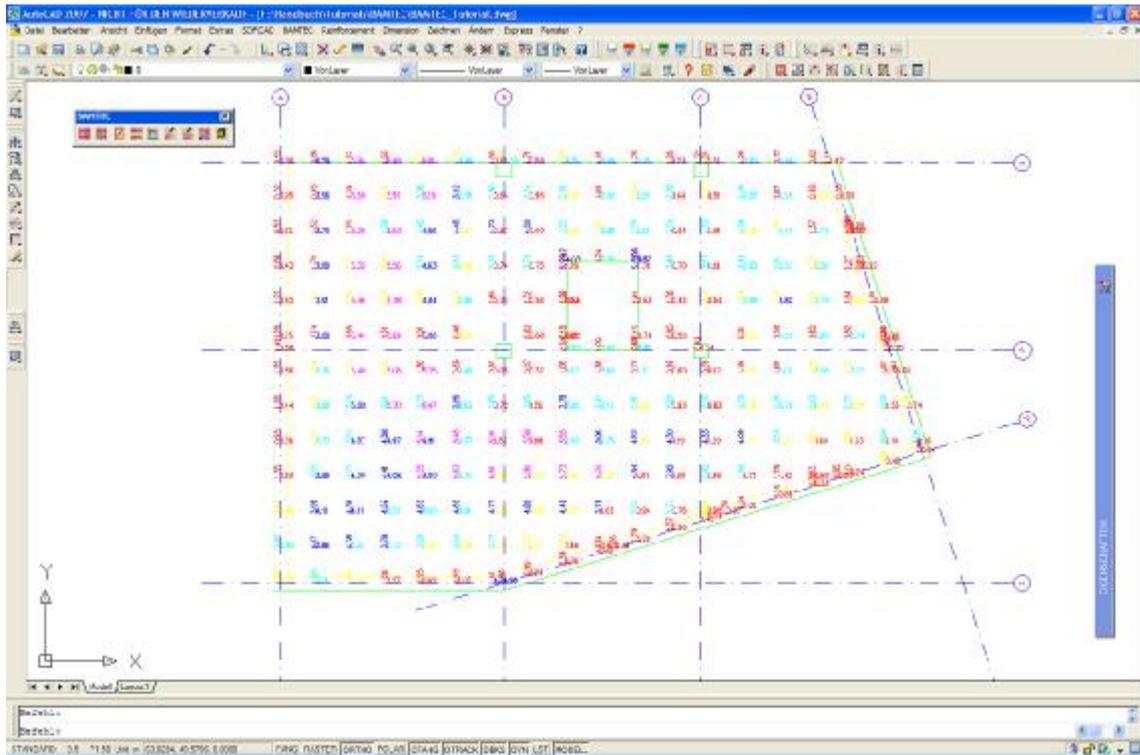

Picture 2: Dialog BFE-Show

The default settings select the results of nodal values in design loadcase no.1. for the lower reinforcement layer. Confirm the input with OK and place the BFE-Show-object inside your drawing.

> A simple way to place the BFE-Show-object correctly inside the construction plan is, to place it anywhere and move the object from one corner of the outline to the associated corner of the construction.

After that you will get the following desktop view, which shows you the lower layer reinforcement in a grid of 1 by 1 m.
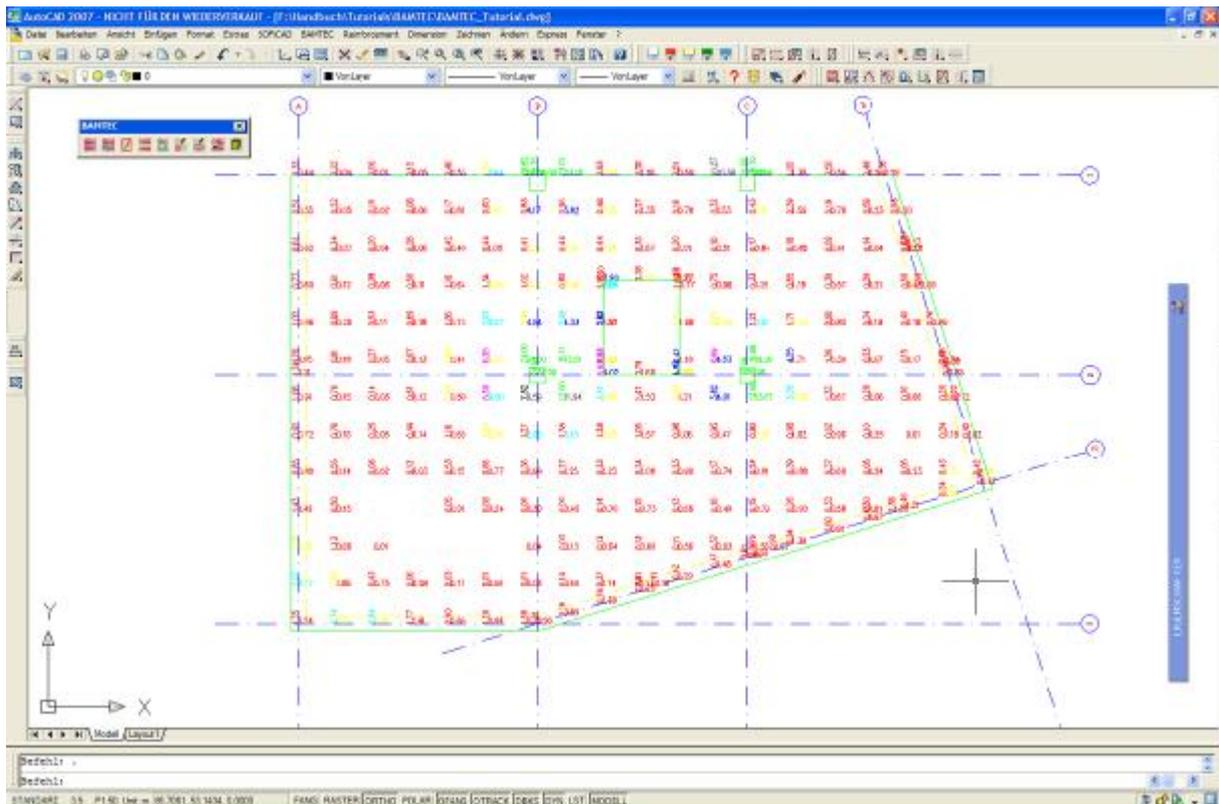
Picture 3: BFE-Show - Lower Layer Reinforcement

Activating the BFE-Show-object again and changing the displayed reinforcement you may look also at the upper layer reinforcement.
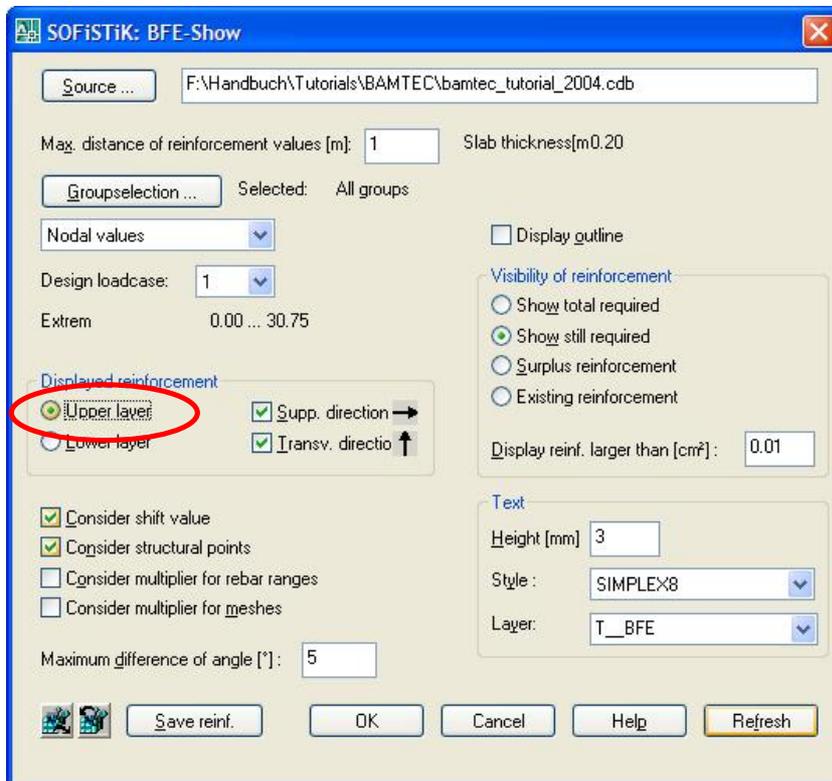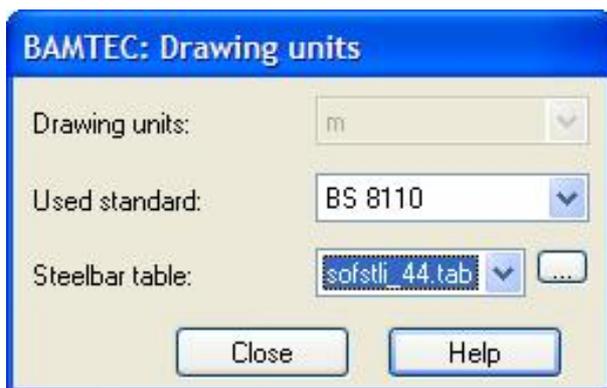

Picture 4: Dialog BFE-Show – Upper Layer

Picture 5: BFE-Show – Upper Layer Reinforcement

3.2   Creating Carpets from FEM-Data

In the next step we start creating the carpets from FEM-data using the command "Create carpet from FEM-data 🔳". To store the drawing units the following dialog shows up.
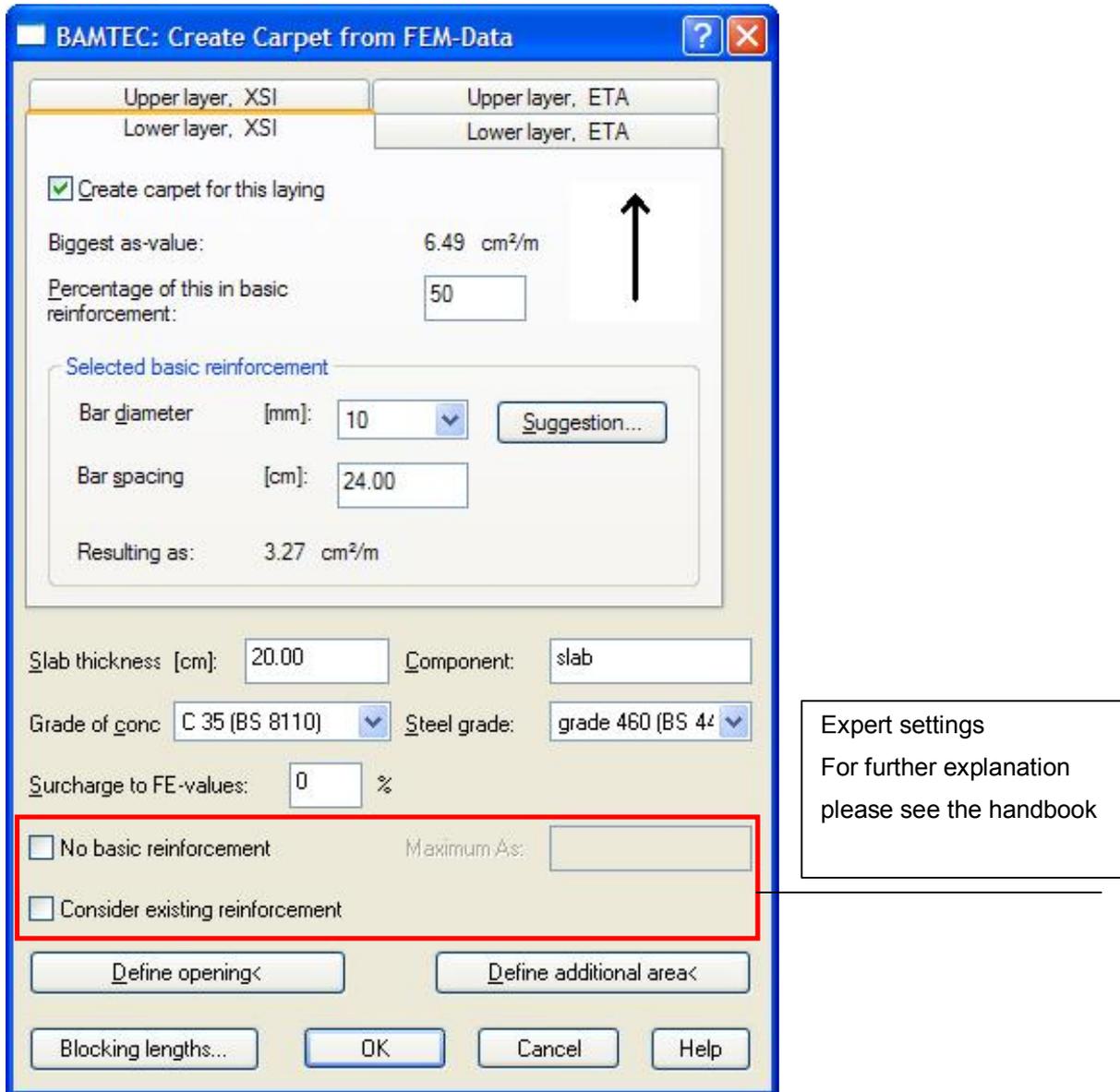

Picture 6: Dialog – Drawing Units, Used Standard , Steelbar Table

> ⚠️ This dialog appears only the first time you start creating carpets. Please make sure the settings are all correct, because a later change is not possible.

When confirming the settings with close the following dialog shows up


Picture 7: Dialog Create Carpet from FEM Data

With this dialog you may create carpetes for every layer and every direction. In this dialog you define all the necessary settings for the carpet creation.

> Default setting is to create a carpet for every layer and direction
> Basic reinforcement is selected up to 50% of the maximum as-value.
> Grade of concrete and steel material has to be checked.
> Slab thickness is taken from the CDB import.
> For special purposes you may choose a surcharge on the FE-values

For the opening in our slab please select the Button "Define opening<" and finish with OK.

Next you will be guided through two dialogs to select the template files for creating the layouts for the Roll-out-/Check-plan and the production plan.
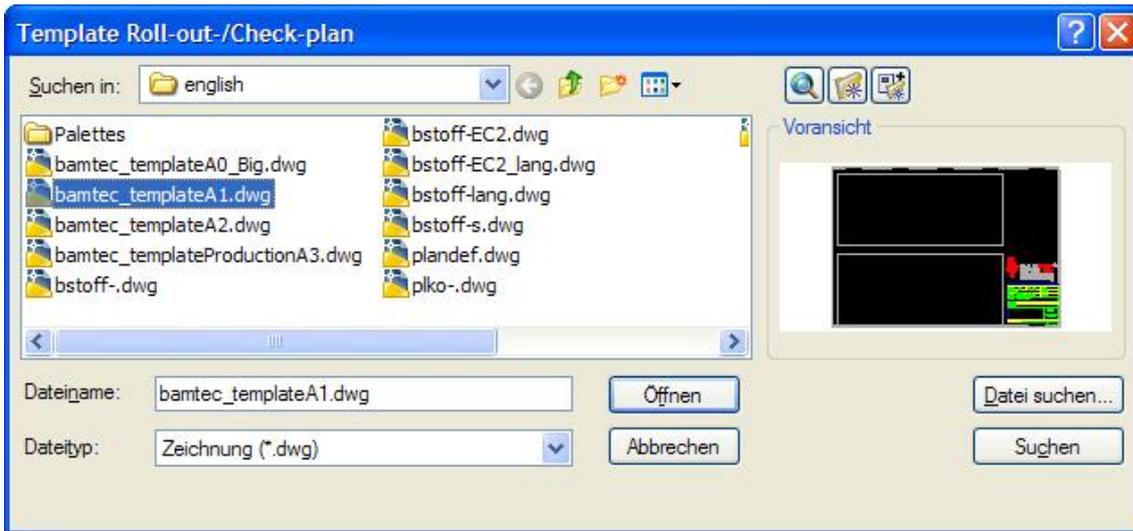
Picture 8: Dialog – Template Roll-out-/Check-plan

In our case select the bamtec_templateA1.dwg file for the Roll-out/Check-plan and the
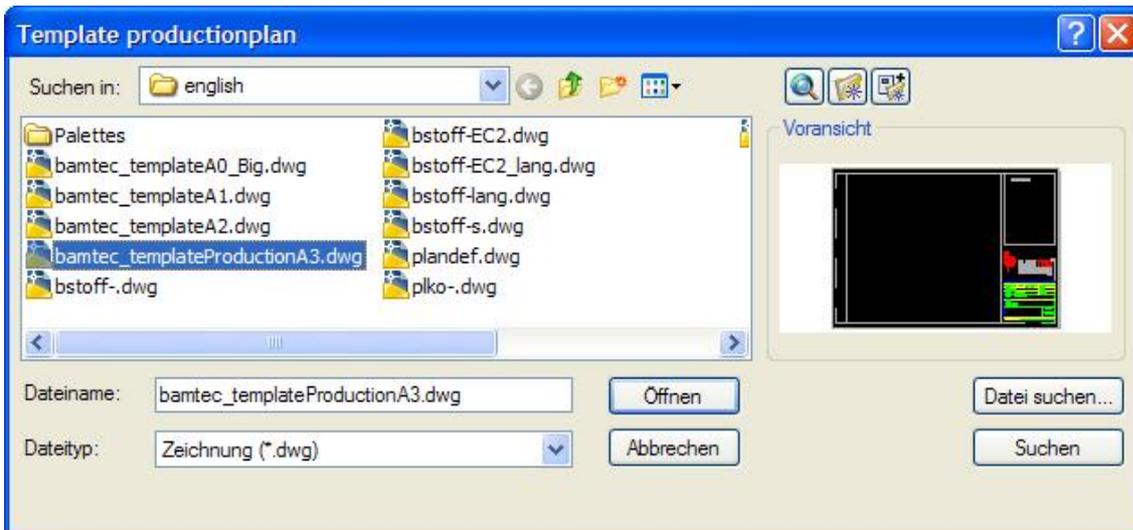
Picture 9: Dialog – Template Productionplan

Bamtec_templateProductionA3.dwg file for the productionplan. In both cases confirm the selection with the OPEN button. Now the programm will generate the new layouts and will give you the following warning.
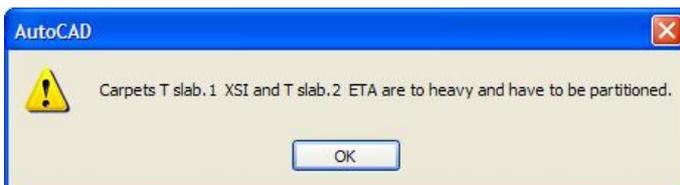
Picture 10: Warning – Limitation of carpet weigth

This warning is correct, because in the first step you have only one carpet for every layer and every direction. Therefore the carpet weight exceeds the maximum allowed weight.

Picture 11: Check-Plan Lower Level

Picture 12: Roll-Out-Plan Lower Level

3.3   Partitioning the Carpet

To reduce the carpet weight please use the command „Partion Carpet ▦„. After that you have to renew ▦ all production plans to create the new carpet which was made by dividing. You will get a list of all carpets inside your Roll-out-/Check-plan as shown below.

```
T slab.1   XSI:
      16 mm, d = 16 cm, as = 12.56 cm²/m
      Max as = 24.00 cm²/m
      Netto weight (without belts and rolling aids) 554.261 kg

T slab.2   ETA:
      16 mm, d = 13 cm, as = 15.46 cm²/m
      Max as = 28.82 cm²/m
      Netto weight (without belts and rolling aids) 1493.840 kg

T slab.9   XSI:
      16 mm, d = 16 cm, as = 12.56 cm²/m
      Max as = 24.00 cm²/m
      Netto weight (without belts and rolling aids) 474.991 kg

T slab.10   XSI:
      16 mm, d = 16 cm, as = 12.56 cm²/m
      Max as = 24.00 cm²/m
      Netto weight (without belts and rolling aids) 552.635 kg

T slab.11   XSI:
      16 mm, d = 16 cm, as = 12.56 cm²/m
      Max as = 24.00 cm²/m
      Netto weight (without belts and rolling aids) 523.500 kg

T slab.12   ETA:
      16 mm, d = 13 cm, as = 15.46 cm²/m
      Max as = 21.05 cm²/m
      Netto weight (without belts and rolling aids) 862.784 kg
```

**Picture 13: List of Carpet weights in Check Plan Top Level**

For further descriptions also see the Handbook.

3.4   Creating Machine Control Files

Fianally there is an option to create machine control files with activating the command ▦. With this command you will be forced to select a directory to save the control files. A machine control file (ASCII-format) will be generated for every carpet.
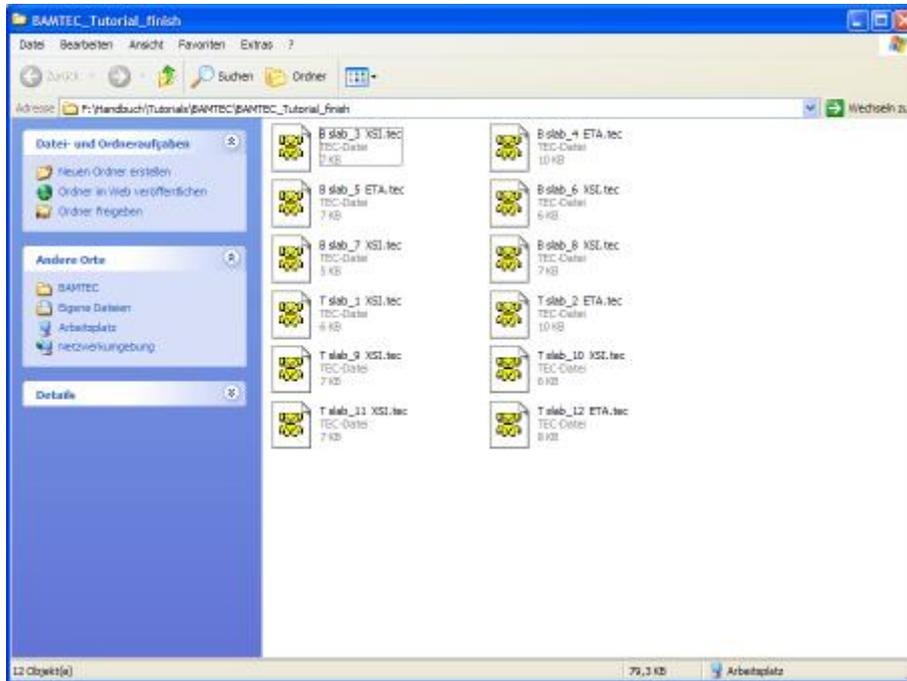
Picture 14: List of machine control files
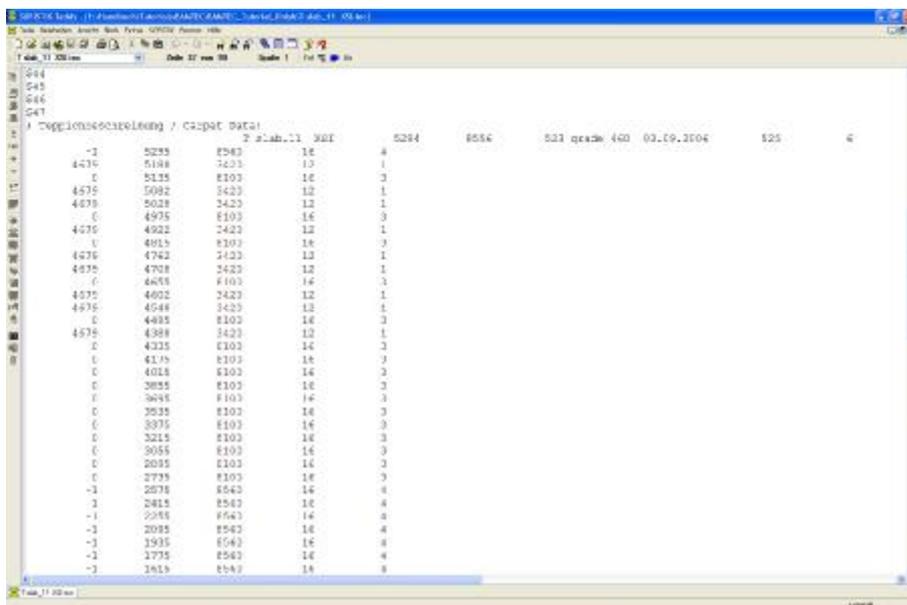
Picture 15: Text-File of Machine Control Data

3.5   Data Files

The following data files are necessary to work on this tutorial

- BAMTEC_Tutorial.dwg (AutoCAD 2007 file)

- BAMTEC_ Tutorial.cdb (Central Database with FEM Results)

- BAMTEC_ Tutorial _finish.dwg (finished project)

All files are available as BAMTEC_Tutorial.zip on our ftp-server

(http://ftp.sofistik.de/pub/infoline/Tutorials/SOFiCAD/Version_17.1/english/BAMTEC/)