

**Corrugated Cardboard to Shell V1.0**

# **User Manual**

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**2024/5/25**

## Introduction

**Corrugated Cardboard to Shell** is a Python script for homogenization of corrugated cardboard running on Abaqus. The program outputs the ABDH matrix of a single-wall/double-wall/Triple-wall corrugated board, which can be used with the "General Shell Section" of conventional shell in Abaqus.

## How to use

### 1. Edit the parameter of the script.

Edit the region as Figure.1 shown. Recommended to edit using code editor or IDE. The meaning of variable names is explained by comments. The name and order of each ply is given by Figure.2. The largest flute defined as Flute 1. Noted that the script can not contain any Chinese or other non-ASCII character.

```
#####parameter#####
#User needs to modify the parameter here before running.
wallnum=2                                #1,2,3 stands for
h=[3.6,2.54]                             #height of flute,
period=[7.7,6.41]                        #period of flute,
tc=[0.221,0.221]                         #thickness of flu
tf=[0.369,0.17,0.369]                   #thickness of lin
Mat_core=(                               #Elastic constant
    (5740,2060,0.43,1330,133,75),
    (5710,2050,0.43,1320,133,75),
    )
Mat_face=(                               #Elastic constant
    (6520,2460,0.43,1550,133,75),
    (5770,2590,0.43,1500,133,75),
    (6520,2460,0.43,1550,133,75),
    )
grammage_core=[200,200]                  #grammage of flut
grammage_face=[250,250,250]             #grammage of lin
CPUnum=6                                #CPU numbers to u
ch11=1.33                               #correction coeff
ch22=0.94                               #correction coeff
#####
```

Figure.1 Parameter

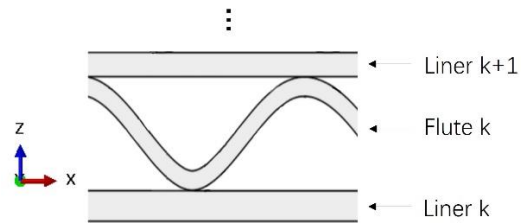


Figure.2 Order of liners and flutes

### 2. Open Abaqus CAE and choose a work directory

All files generated in the program will be in the work directory. An empty directory is recommended for the first run.

### 3. Create a new Model Database

If there has been a model existing or the script has been run for a time, a new Model Database is needed to clear all the operations before(see Figure.3), otherwise errors will be reported. The models generated by the program are not necessary to save as ".cae" files.

### 4. Run script

See Figure.4 to run the script. It doesn't matter which folder the script is placed in, but it's recommended to place it under the work directory.

### 5. Wait for result

The result is written to file "ABDH\_Matrix.txt".

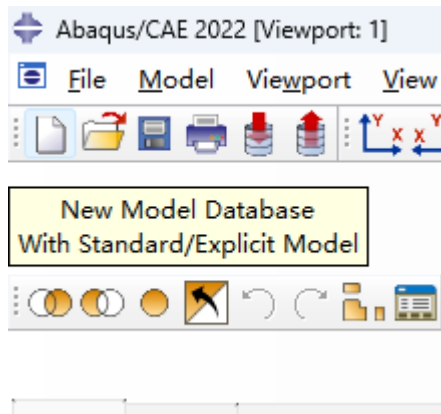


Figure.3 open a new model database

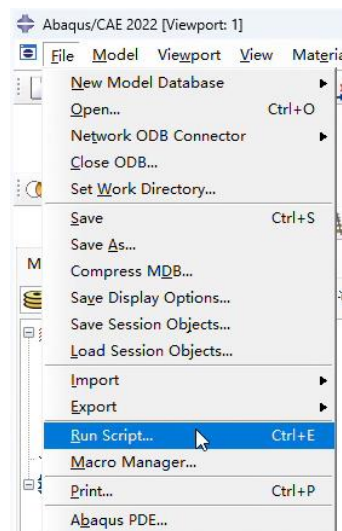


Figure.4 run script

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