Instructions for introducing residual stresses in SAFIR shell elements

In order to introduce the residual stresses in the shell elements of SAFIR, it is necessary to create a file with the name "*resi_str_shell.txt*", which should be placed in the same folder of the structural input file.

In this file the residual stresses should be placed in MPa, for each point of integration. The numbering of the integration point is made with the figure 1.

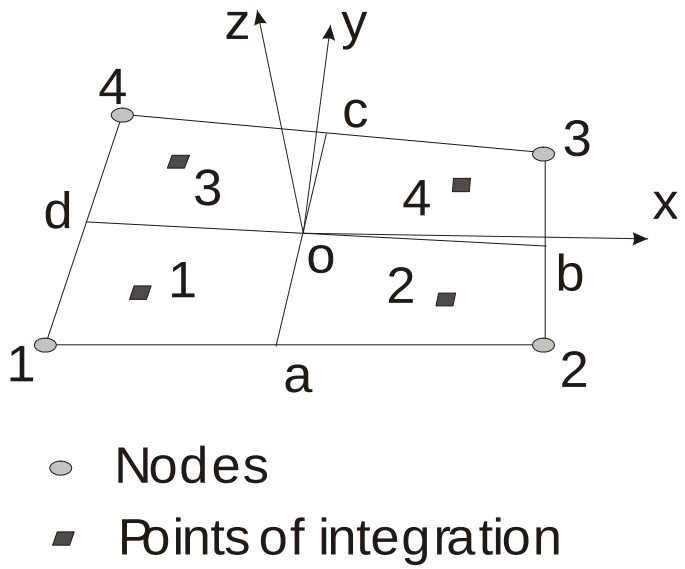

Figure 1 : Definition of the geometry and local axes

There are 4 points of integration on the surface of the element, see Figure 1. In each direction, the integration is by the method of gauss.

The number of integration points on the thickness is chosen by the user, from 2 to 9. The integration is also by the method of Gauss.

Format of the file "*resi_str_shell.txt*":

One line for shell element.
'ELEM', NE,
NE = Number of this element.
One line for each gauss point of the shell element.
'pg', NPG, Sx, Sy, Sxy
NE = Number of this gauss point.
Sx = Residual strength in x axis.
Sy = Residual strength in y axis.
Sxy = Residual tangential strength.

or for automatic generation of the elements
'GELEM', NLE, KGENE
NLE = Number of the last element with automatic generation.
KGENE = Step for the automatic generation of the elements.

or for automatic generation of the gauss points
'Gpg', NLPG, KGENE
NLPG = Number of the last gauss point with automatic generation.
KGENE = Step for the automatic generation of the gauss points.

Example

```
ELEM    1
pg      1   100    0    0
pg      2   100    0    0
pg      3   100    0    0
pg      4   100    0    0
pg      5   100    0    0
pg      6   100    0    0
pg      7   100    0    0
pg      8   100    0    0
ELEM    2
pg      1   -100    0    0
pg      2   -100    0    0
pg      3   -100    0    0
pg      4   -100    0    0
pg      5   -100    0    0
pg      6   -100    0    0
pg      7   -100    0    0
pg      8   -100    0    0
ELEM    3
pg      1   -100    0    0
pg      2   -100    0    0
pg      3   -100    0    0
pg      4   -100    0    0
pg      5   -100    0    0
pg      6   -100    0    0
pg      7   -100    0    0
pg      8   -100    0    0
ELEM    4
pg      1   100    0    0
pg      2   100    0    0
pg      3   100    0    0
pg      4   100    0    0
pg      5   100    0    0
pg      6   100    0    0
pg      7   100    0    0
pg      8   100    0    0
```

Or with automatic generation:

```
ELEM    1
pg      1   100    0    0
Gpg     8     1
GELEM   4     3
ELEM    2
pg      1  -100    0    0
Gpg     8     1
GELEM   3     1
```