

ZZZZ344 – Validation of the calculation of the angular deviations in `DEFI_CABLE_BP`

Summary:

The calculation of the angular deviations in the operator `DEFI_CABLE_BP` is made by using interpolations by spline cubic. However it happens sometimes that this method fails when the grid is too irregular. In this case one uses a method without interpolation for calculation of the angular deviations.

The objective of this test is to validate the calculation of the angular deviations by this method. For that, one compares for the same geometry, the calculation of the angular deviations by spline and without interpolation. The grids for which the interpolation by spline fails result from various grids of the Vercors enclosure. The grid for which it is correct was created starting from the equation of the circle to be possible nearest other grids.

1 Problem of reference

1.1 Geometry and grids

One considers a horizontal cable and circular contents in concrete. The grid of the concrete part is the same one for each modeling. But the grid of the cable changes.

Modeling a: the cable was built starting from the equation of the circle; it comprises 100 meshes of the type SEG2. It is very regular, the interpolation by spline is correct. This modeling is used as reference for the two others.

Modeling b: the cable (as the concrete) is resulting from a grid of the Vercors enclosure. The discretization of the cable is identical to modeling A (100 meshes).

Modeling C: the cable (as the concrete) is resulting from a finer grid of the enclosure Vercors, it comprises 302 meshes.

2 Reference solution

Modeling A.

3 Modeling A

3.1 Characteristics of the grid

The grid of the cable is generated starting from the equation of the circle. It comprises 100 meshes.

3.2 Sizes tested and results

One tests the value of the cumulated angular deviation of the last node of the cable.

Node	NOM_PARA	Value of reference	Tolerance	Reference
N1229	ALPHA	6.461066164316	1.E-6	NON_REGRESSION

4 Modeling B

4.1 Characteristics of the grid

The grid of the cable is resulting from a grid of the Vercors enclosure. It comprises 100 meshes.

4.2 Sizes tested and results

One tests the value of the cumulated angular deviation of the last node of the cable.

Node	NOM_PARA	Value of reference	Tolerance	Reference
N1328	ALPHA	6.461066164316	1.2E-2	AUTRE_ASTER

Note: without the passage to the method without interpolation, the error is of 5%.

5 Modeling C

5.1 Characteristics of the grid

The grid of the cable is resulting from a finer grid of the Vercors enclosure. It comprises 302 meshes.

5.2 Sizes tested and results

One tests the value of the cumulated angular deviation of the last node of the cable.

Node	NOM_PARA	Value of reference	Tolerance	Reference
N1531	ALPHA	6.461066164316	2.0E-2	AUTRE_ASTER

Note: without the passage to the method without interpolation, the error is of 80%.

6 Summary of the results

It is noted that on a sufficiently regular geometry, the results of the method without interpolation are very close to those obtained with the method of interpolation by spline cubic. Moreover, as indicated in remark, the swing towards this method makes it possible well to correct the errors related to the failure of the interpolation by spline when the grid is very irregular.