SSLV301 - Cylindrical beam comforts under load linearly distributed

Summary:

The goal of the test is to validate a load linearly distributed, starting from an analysis 2D with decomposition in Fourier series of the load.

2 calculations here are carried out:

1) a calculation with the first 2 modes (0 and 1),
2) a calculation with the first 10 modes.
1 Problem of reference

1.1 Geometry

![Diagram of a cylinder with labeled dimensions and loads](image)

Length : \( L = 0.240 \text{ m} \)
Ray : \( R = 0.006 \text{ m} \)

1.2 Material properties

\[ E = 2.1 \times 10^{11} \text{ N/m}^2 \]
\[ \nu = 0.3 \]

1.3 Boundary conditions and loadings

- Edge \( AB \) embedded
- Load varying linearly according to \( z \) on the generator \( BC \), being worth:

\[ q = 0 \text{ in } C \text{ and } q = -3000 \text{ N/m in } B \]

1.4 Initial conditions

Without object for the static analysis.
2 Reference solution

2.1 Method of calculating used for the reference solution

The reference solution is obtained analytically [bib1].

2.2 Results of reference

1) Radial displacement of the point $C: u_r = -1.552 \times 10^{-3} \text{ m}$

2) Constraints of embedding at the point $B: \sigma_{zz}(B) = 169.8 \times 10^6 \text{ Pa}$

2.3 Uncertainty on the solution

Analytical solution.

2.4 Bibliographical reference

3 Modeling A

3.1 Characteristics of modeling

**AXIS\_FOURIER, T6 nets**

Cutting: 80 elements according to the length
2 elements in the thickness

3.2 Characteristics of the grid

Many nodes: 805
Many meshes and types: 320 TRIA6

3.3 Values tested

Values provided for $\theta = 0$.

<table>
<thead>
<tr>
<th>Localization</th>
<th>Type of value</th>
<th>Reference</th>
<th>Aster</th>
<th>% difference</th>
</tr>
</thead>
<tbody>
<tr>
<td>Calculation</td>
<td>$u_r(m)$</td>
<td>$-1.552 \times 10^{-3}$</td>
<td>$-1.54839 \times 10^{-3}$</td>
<td>$-0.232$</td>
</tr>
<tr>
<td>Not $C$</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Not $B$</td>
<td>$\sigma_z(Pa)$</td>
<td>$169.8 \times 10^6$</td>
<td>$168.73 \times 10^6$</td>
<td>$-0.63$</td>
</tr>
</tbody>
</table>
### Calculation modes

<table>
<thead>
<tr>
<th>Calculation</th>
<th>2 (10 modes)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Not $C$</td>
<td>$u_r(m)$</td>
</tr>
<tr>
<td></td>
<td>$-1.552 \times 10^{-3}$</td>
</tr>
<tr>
<td>Not $B$</td>
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</tr>
<tr>
<td></td>
<td>$169.8 \times 10^6$</td>
</tr>
</tbody>
</table>

### Notice

The values of the arrow of the beam and the constraint of embedding are obtained with precision with the first two modes only.

### Summary of the results

The results resulting from calculation are in concord with the analytical solution.