Summary

This test makes it possible to validate level 2 of model CJS. It is about a triaxial compression test in drained condition. Calculations are carried out only on the solid part of the ground, without hydraulic coupling. The level of containment is of $100 \, kPa$.

By reason of symmetry, one is interested only in the eighth of a sample 3D subjected to a triaxial compression test.
It is about a test of nonregression. Nevertheless, results got with Code_Aster for model CJS2 are compared with those obtained with a private version of the software SPLASH -2D.
1 Problem of reference

1.1 Geometry

<table>
<thead>
<tr>
<th></th>
<th>A</th>
<th>B</th>
<th>C</th>
</tr>
</thead>
<tbody>
<tr>
<td>x</td>
<td>0.</td>
<td>0.</td>
<td>0.5</td>
</tr>
<tr>
<td>y</td>
<td>0.</td>
<td>1.</td>
<td>0.5</td>
</tr>
<tr>
<td>z</td>
<td>0.</td>
<td>0.</td>
<td>0.5</td>
</tr>
</tbody>
</table>

Coordinates of the points (in meters):

1.2 Material property

\[ E = 35,661,6541 \times 10^3 \text{kPa} \]
\[ \nu = 0.15037594 \]

Parameters CJS2:
\[ \beta = -0.55 \quad \gamma = 0.82 \quad R_m = 0.289 \quad R_c = 0.265 \quad n = 0.6 \]
\[ K_p^o = 25.5 \times 10^3 \text{kPa} \quad A = 0.25 \text{kPa} \quad P_a = -100 \text{kPa} \]

1.3 Initial conditions, boundary conditions, and loading

Phase 1:
One brings the sample in a homogeneous state: \( \sigma_{xx}^0 = \sigma_{yy}^0 = \sigma_{zz}^0 \), by imposing the corresponding confining pressure on the front, side right-hand side and higher faces. Displacements are blocked on the faces postpones \( u_x = 0 \), side left \( u_y = 0 \) and lower \( u_z = 0 \).

Phase 2:
One maintains displacements blocked on the faces postpones \( u_x = 0 \), side left \( u_y = 0 \) and lower \( u_z = 0 \), as well as the confining pressure on the front faces and side right-hand side. One applies a displacement imposed to the higher face: \( u_z(t) \), in order to obtain a deformation \( \varepsilon_{zz} = -20\% \) (counted starting from the beginning of phase 2).

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2 Reference solution

2.1 Method of calculating used for the reference solution

The results got with the software a private version of the Flac-2D software are used as reference.

2.2 Results of reference

Constraints $\sigma_{xx}$, $\sigma_{yy}$ and $\sigma_{zz}$ at the points $A$, $B$ and $C$.

2.3 Uncertainty on the solution

Uncertainty related to the Flac-2D software.

2.4 Bibliography


3 Modeling A

3.1 Characteristics of modeling

3D:

Cutting: 2 in height, in width and thickness.

Loading of phase 1:
Confining pressure: \( \sigma_{xx}^0 = \sigma_{yy}^0 = \sigma_{zz}^0 \): successively \(-100 \, kPa\), \(-200 \, kPa\) and \(-400 \, kPa\).
Level 2 of model CJS

3.2 Characteristic of the grid

Many nodes: 27
Many meshes and types: 8 HEXA8 and 24 QUA4

3.3 Values tested

For \( \sigma_{xx}^0 = \sigma_{yy}^0 = \sigma_{zz}^0 : -100 \, kPa \)

<table>
<thead>
<tr>
<th>Localization</th>
<th>Sequenc e number</th>
<th>axial deformation ( \varepsilon_{zz} ) (%)</th>
<th>constraint (kPa)</th>
<th>Reference</th>
</tr>
</thead>
<tbody>
<tr>
<td>Not A, B and C</td>
<td></td>
<td>-0.8%</td>
<td>( \sigma_{xx} )</td>
<td>-100.0</td>
</tr>
<tr>
<td></td>
<td></td>
<td>-20.0%</td>
<td>( \sigma_{xx} )</td>
<td>-100.0</td>
</tr>
<tr>
<td></td>
<td></td>
<td>-0.8%</td>
<td>( \sigma_{yy} )</td>
<td>-100.0</td>
</tr>
<tr>
<td></td>
<td></td>
<td>-20.0%</td>
<td>( \sigma_{yy} )</td>
<td>-100.0</td>
</tr>
<tr>
<td></td>
<td></td>
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<td>( \sigma_{zz} )</td>
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<td></td>
<td></td>
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<td>( \sigma_{zz} )</td>
<td>-358.8</td>
</tr>
</tbody>
</table>

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4 Summary of the results

Values of the constraints obtained with Aster coincide with those of the software SPLASH with a lower deviation than 0.05%.