

ZZZZ362 - Checking of the coherence of the fields produced by under-cutting X-FEM

Summary

This test does not have any physical meaning, it acts of a data-processing test.

The fields produced by under-cutting X-FEM correspond to `cham_elem` products by the options of calculation `TOPOSE` and `TOPOFA`, and stored in `sd_modele_xfem` [D4.10.02]. The dimensioning of these `cham_elem` same manner for all elements X-FEM pertaining to the same "topological" category must be carried out. 4 categories are considered:

- finite elements affected on principal meshes 3D;
- finite elements affected on meshes 3D of edge;
- finite elements affected on principal meshes 2D;
- finite elements affected on meshes 2D of edge;

The objective of this test consists in making sure that all modelings being able to be affected on a given grid lead well to the same dimensioning of these fields. In the contrary case, the test fails. 2 "modelings" are considered

- **modeling A** : comparison of modelings `MECANIQUE/3D`, `MECANIQUE/3D/CONTACT`, `THERMIQUE/3D`, `MECANIQUE/3D_HM`
- **modeling B** : comparison of modelings `MECANIQUE/C_PLAN`, `MECANIQUE/C_PLAN/CONTACT`, `MECANIQUE/D_PLAN`, `MECANIQUE/D_PLAN/CONTACT`, `MECANIQUE/AXIS`, `MECANIQUE/AXIS/CONTACT`, `THERMIQUE/PLAN`, `THERMIQUE/AXIS`, `MECANIQUE/D_PLAN_HM`

1 Principle of the test

The principle of this test consists:

1. to define starting from the same grid as much of model nouveau riches (with the operator `MODI_MODELE_XFEM`) that modelings being able to be affected on this grid;
2. to ensure itself, by using the procedure `IMPR_CO/NIVEAU=-1` [U4.91.11], that the models nouveau riches thus created contain all the same number of `cham_elem` products by the options `TOPOSE` and `TOPOFA` ;
3. to ensure itself, always by using the procedure `IMPR_CO/NIVEAU=-1`, that each one of these `cham_elem` is dimensioned same manner of a model enriched with the other.

These checks which require the use of python and the carrying out of the test in `PAR_LOT = 'NOT'` .

2 Modeling A

It is a question of comparing, while being based on a grid 3D, the models nouveau riches produced by the assignment of modelings: MECANIQUE/3D, MECANIQUE/3D/CONTACT, THERMIQUE/3D, MECANIQUE/3D_HM.

With X-FEM, modeling THERMIQUE/3D is available only for linear elements, and modeling MECANIQUE/3D_HM with quadratic elements.

One thus compares the models nouveau riches produced by the assignment of modelings:

- MECANIQUE/3D, MECANIQUE/3D/CONTACT and THERMIQUE/3D, on a linear grid
- MECANIQUE/3D and MECANIQUE/3D_HM on a quadratic grid

2.1 Characteristics of the linear grid

The linear grid contains all the linear types of meshes being able to support finite elements X-FEM of modelings MECANIQUE/3D, MECANIQUE/3D/CONTACT, and THERMIQUE/3D. The cracks are laid out of such kind that all elements X-FEM of modeling are tested. The grid, as well as the two cracks considered (a circular crack and an interface) are represented with the figure below.

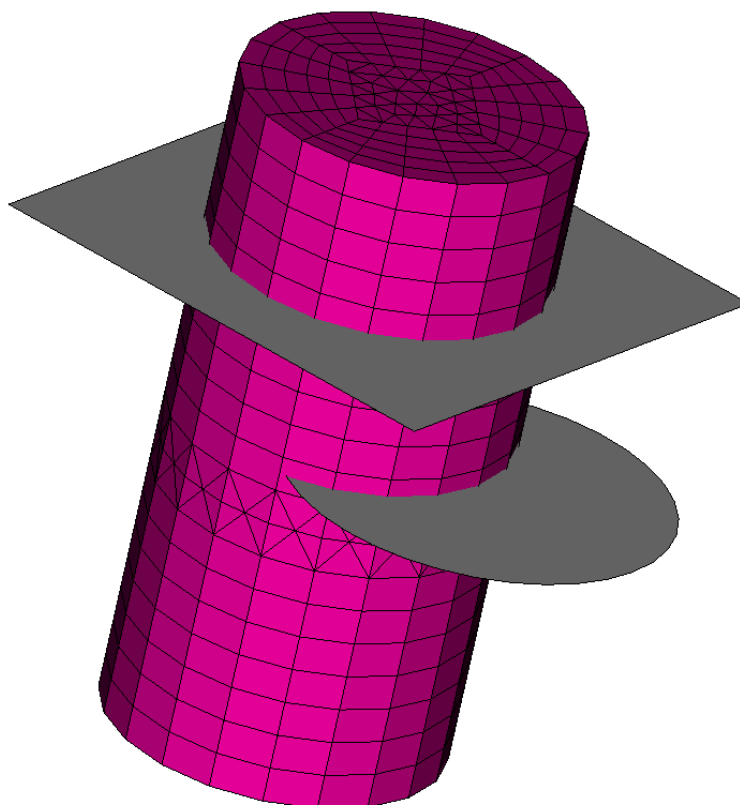


Figure 2.1-a: linear grid A, and localizations of the cracks

The characteristics of the grid are recapitulated in the table below.

SEG2	TRIA3	QUAD4	TETRA4	PENTA6	PYRAM5	HEXA8
80	228	540	1988	918	1000	1700

2.2 Characteristics of the quadratic grid

The quadratic grid contains all the quadratic types of meshes (except TETRA10) being able to support finite elements X-FEM for modeling MECANIQUE/3D_HM. The interface is laid out of such kind that all elements X-FEM (except those which are pressed on meshes TETRA10) modeling MECANIQUE/3D_HM are tested (here one does not consider a crack because the elements "ace-tip" do not exist for the modelisation MECANIQUE/3D_HM). Grid, as well as the interface are represented with the figure below.

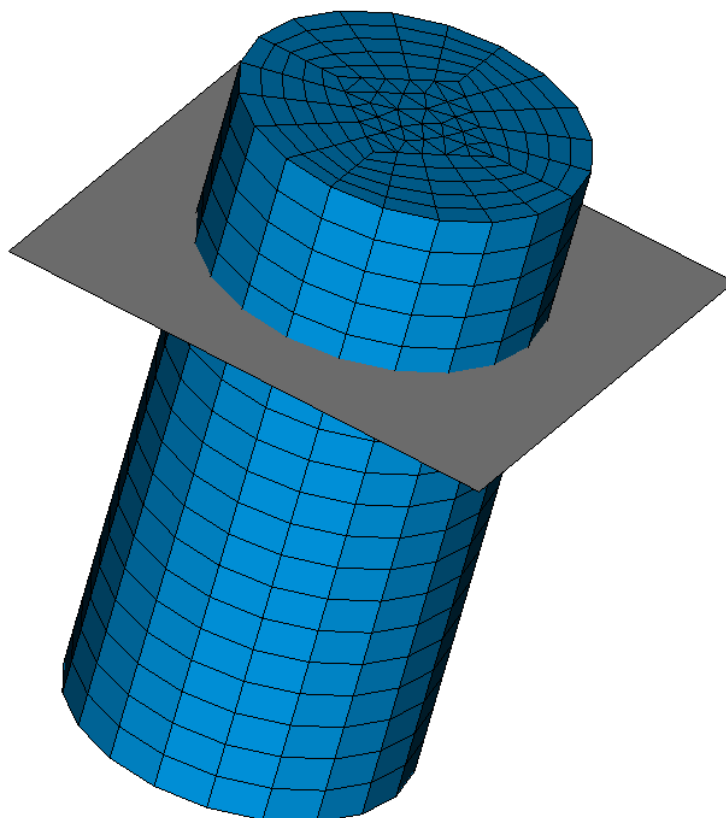


Figure 2.2-a: quadratic grid A, and localization of the interface

The characteristics of the grid are recapitulated in the table below.

SEG3	TRIA6	QUAD8	PENTA15	HEXA20
80	108	580	1026	1900

3 Modeling B

It is a question of comparing, while being based on a grid 2D, the models nouveau riches produced by the assignment of modelings: MECANIQUE/C_PLAN, MECANIQUE/C_PLAN/CONTACT, MECANIQUE/D_PLAN, MECANIQUE/D_PLAN/CONTACT, MECANIQUE/AXIS, MECANIQUE/AXIS/CONTACT, THERMIQUE/PLAN, THERMIQUE/AXIS, MECANIQUE/D_PLAN_HM.

With X-FEM, modelings THERMIQUE/PLAN and THERMIQUE/AXIS are available only for linear elements, and modeling MECANIQUE/D_PLAN_HM is available only for quadratic elements.

One thus compares the models nouveau riches produced by the assignment of modelings:

- MECANIQUE/C_PLAN, MECANIQUE/C_PLAN/CONTACT, MECANIQUE/D_PLAN, MECANIQUE/D_PLAN/CONTACT, MECANIQUE/AXIS, MECANIQUE/AXIS/CONTACT, THERMIQUE/PLAN, and THERMIQUE/AXIS, on a linear grid
- MECANIQUE/D_PLAN and MECANIQUE/D_PLAN_HM on a quadratic grid

3.1 Characteristics of the linear grid

The linear grid contains all the linear types of meshes being able to support finite elements X-FEM of modelings MECANIQUE/C_PLAN, MECANIQUE/C_PLAN/CONTACT, MECANIQUE/D_PLAN, MECANIQUE/D_PLAN/CONTACT, MECANIQUE/AXIS, MECANIQUE/AXIS/CONTACT, THERMIQUE/PLAN, and THERMIQUE/AXIS. The cracks are laid out of such kind that all elements X-FEM of modeling are tested. Grid, as well as the 3 cracks considered are represented with the figure below.

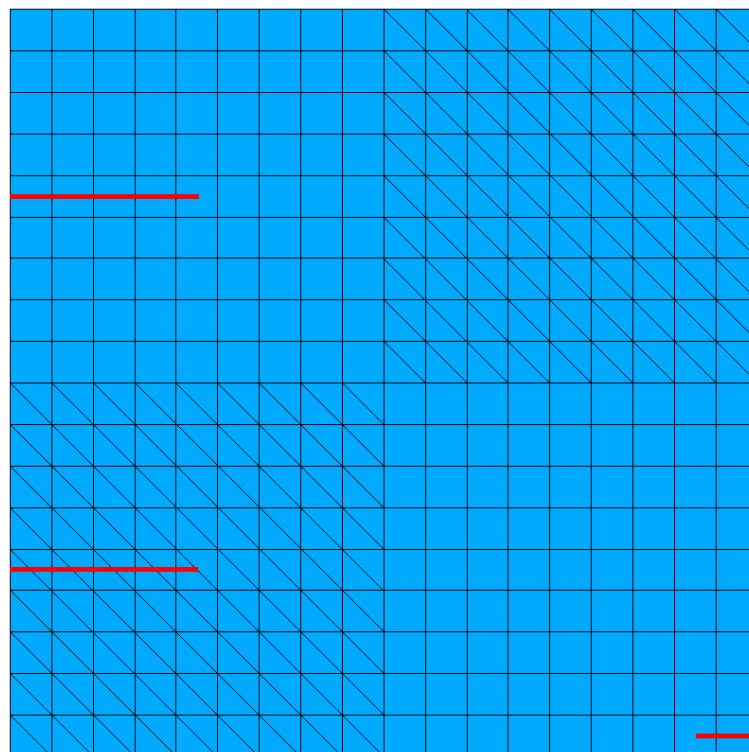


Figure 3.1-a: linear grid B and localizations of the cracks

The characteristics of the grid are recapitulated in the table below.

SEG2	TRIA3	QUAD4
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72	324	162
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3.2 Characteristics of the quadratic grid

The quadratic grid contains all the linear types of meshes being able to support finite elements X-FEM of modelings MECANIQUE/D_PLAN_HM. The interface is laid out of such kind that all elements X-FEM of modeling MECANIQUE/D_PLAN_HM are tested (here one does not consider a crack because the elements “ace-tip” do not exist for the modeilsation MECANIQUE/D_PLAN_HM). Grid, as well as the interface are represented with the figure below.

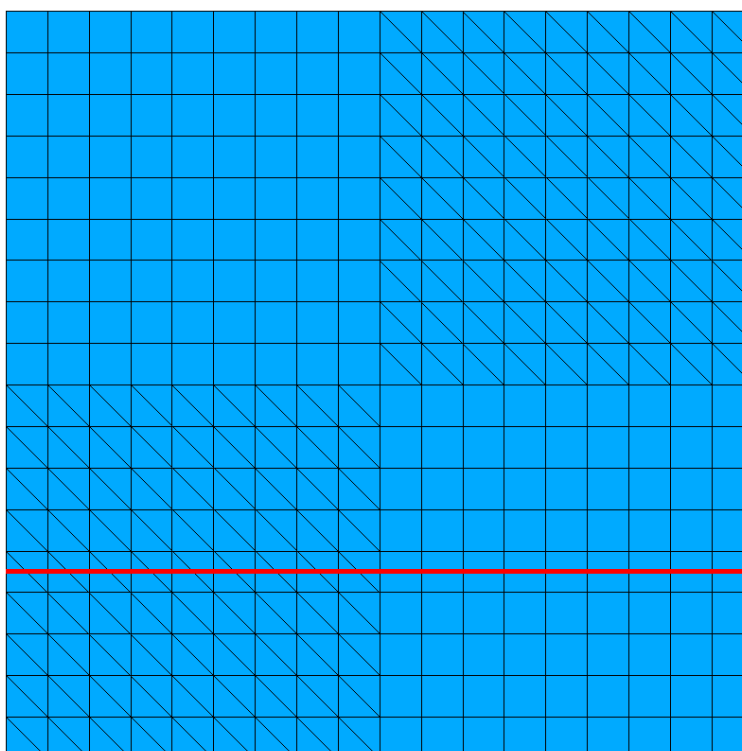


Figure 3.2-a: quadratic grid B and localization of the interface

The characteristics of the grid are recapitulated in the table below.

SEG3	TRIA6	QUAD8
72	324	162