ZZZZ323 – Validation of the impression of the local reference marks by IMPR_RESU/CONCEPT

Summary:
The objective of this test is to validate the impression in a file MED local reference marks assigned to the elements by the operator AFFE_CARA_ELEM .

5 modelings are made:
- A: beams, elements discrete
- B: hulls and grids on linear meshs
- C: hulls and grids on quadratic meshs
- D: solid elements 3D
- E: solid elements 2D

5 modelings have different geometries, the paragraphs “Geometry” and “Results of reference” will thus be treated in each modeling.

To test the file MED, it is read again by LIRE_CHAMP after createbeing created by IMPR_RESU.

1 Modeling A

1.1 Geometry and modeling

The grid is composed of:

- 9 meshs SEG2 on which are modelled the 6 types of beams and the 2 types of discrete elements with two nodes (there are two elements in POU_D_T).
- 2 meshs SEG3 on which the 2 types of pipes with 3 nodes are modelled.
- 1 meshs SEG4 on which is modelled pipes with 4 nodes.
- 2 meshs POI1 on which the 2 types of discrete elements to a node are modelled.

All the meshs having a length are directed according to the vector $(1,1,0)$.

1.2 Orientation of the local reference mark

In order to define the local reference mark of these elements one uses the keyword ANGL_VRIL for the beams and the discrete elements with two nodes, GENE_TUYAU for the pipes and ANGL_NAUT for the discrete elements with a node of the keyword factor ORIENTATION of the operator AFFE_CARA_ELEM (see U4.42.01).

The table above gives the orientations chosen for each element:

Beams	ANGL_VRIL	90
Discrete with two nodes	ANGL_VRIL	-90
Discrete with a node	ANGL_NAUT	$(90,-90.0,90.0)$
Pipes	GENE_TUYAU	$(0.,0.,1.)$

1.3 Calculation of the local reference marks

The local reference marks are formed by the vectors x , y and z .

1.3.1 Beams

The vector x east defines by the geometry and is thus equal to $(\frac{\sqrt{2}}{2},\frac{\sqrt{2}}{2},0)$. The value 90 of ANGL_VRIL fact of turning the reference mark by default of $90°$, which gives $y=(0,0,1)$ and $z=(\frac{\sqrt{2}}{2},-\frac{\sqrt{2}}{2},0)$.

1.3.2 Discrete with two nodes

As for the beams $x=(\frac{\sqrt{2}}{2},\frac{\sqrt{2}}{2},0)$, but this time one swivels in the other direction what gives $y=(0,0,-1)$ and $z=(\frac{-\sqrt{2}}{2},\frac{\sqrt{2}}{2},0)$.

1.3.3 Pipes

Pas de change for x . The value was given $(0.,0.,1.)$ with GENE_TUYAU, the vector y is then the projection of $(0.,0.,1.)$ on the orthogonal level with x , i.e. $(0.,0.,1.)$ itself.

One has then $z=(\frac{\sqrt{2}}{2},-\frac{\sqrt{2}}{2},0)$.

But a treatment different from the angle GAMMA1 in Code_Aster an additional rotation of 90° induces around x what gives finally:

$y=(\frac{\sqrt{2}}{2},-\frac{\sqrt{2}}{2},0)$ and $z=(0.,0.,-1.)$

Note:
Pipes carried of the meshs SEG4 are not Co mpatibles with those carried by meshs SEG3 .
They are thus treated except for.

1.3.4 Discrete with a node

In this case the local reference mark is only defined by the values of ANGL_NAUT. The second component of the vector given gives $x=(0.,0.,1.)$. From the three components one determines that $y=(0.,-1.,0.)$ and $z=(1.,0.,0.)$.

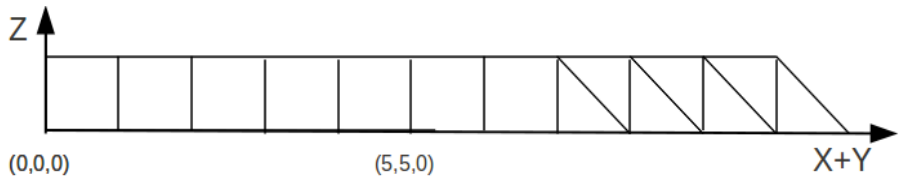
1.4 Sizes tested

The results tested are presented in the following table:

MESH	Vector	Component	Value of reference	Tolerance
POU1	x	X	0.707106781186E0	1.E−8
POU3	x	Y	0.707106781186E0	1.E−8
POU5	x	X	0.707106781186E0	1.E−8
POU7	x	Y	0.707106781186E0	1.E−8
DISL1	x	X	0.707106781186E0	1.E−8
TUY32	x	Y	0.707106781186E0	1.E−8
DISN2	x	Z	1.0	1.E−8
POU2	y	Z	1.0	1.E−8
POU4	y	Z	1.0	1.E−8
POU6	y	Z	1.0	1.E−8
DISL2	y	Z	−1.0	1.E−8
DISN1	y	Y	−1.0	1.E−8
TUY31	y	Y	−0.707106781186E0	1.E−8
TUY41	x	X	0.707106781186E0	1.E−8
TUY41	x	Y	0.707106781186E0	1.E−8
TUY41	y	X	0.707106781186E0	1.E−8
TUY41	y	Y	−0.707106781186E0	1.E−8
TUY41	z	Z	−1.0	1.E−8

2 Modeling B

2.1 Geometry and modeling



The grid is composed of:

- 7 meshs QUAD4 on which one affects modeling DKT, DST, Q4G, DKTG, Q4GG, GRILLE_EXCENTRE and GRILLE_MEMBRANE.
- 7 meshs TRIA3 on which one affects modeling DKT, DST, Q4G, DKTG, Q4GG, GRILLE_EXCENTRE and GRILLE_MEMBRANE.

2.2 Orientation of the local reference mark

In order to define the local reference mark of these elements one uses the keyword ANGL_REP for the hulls and the grids present in the keyword factor HULL and GRID of the operator AFFE_CARA_ELEM (see U4.42.01).

The table above gives the orientations chosen for each element:

Hulls	ANGL_REP	$(45.0,-45.0)$
Grids	ANGL_REP	$(45.0,-45.0)$

2.3 Calculation of the local reference marks

The local reference marks are formed by the vectors x, y and z.
For the hulls and the grids the vector z is defined by the normal outgoing one in the hull. In our example one will have $z=(\frac{-\sqrt{2}}{2},\frac{\sqrt{2}}{2},0)$.

The value given to ANGL_REP a vector defines whose projection on the tangent level with the element gives the vector x. The values of the example thus give $x=(0.5,0.5,\frac{\sqrt{2}}{2})$ and $y=(-0.5,-0.5,\frac{\sqrt{2}}{2})$ for the hulls and $x=(0.5,0.5,-\frac{\sqrt{2}}{2})$ and $y=(0.5,0.5,\frac{\sqrt{2}}{2})$ for the grids.

2.4 Sizes tested

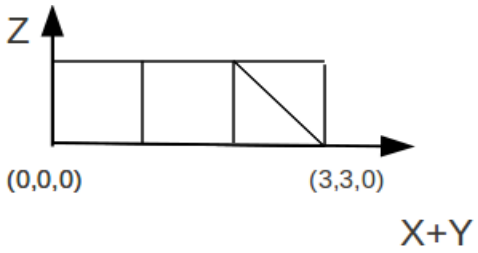
The results tested are presented in the following table:

MESH	Vector	Component	**Value of reference**	**Tolerance**
DKT4	x	X	0.5	1.E−8
DKT3	x	Y	0.5	1.E−8
DST4	x	Z	0.707106781186E0	1.E−8
DST3	x	X	0.5	1.E−8
Q4G4	x	Y	0.5	1.E−8
DKTG4	x	Z	0.707106781186E0	1.E−8

GRME3	x	X	0.5	1.E−8
Q4GG3	x	Y	0.5	1.E−8
GREX4	x	Z	0.707106781186E0	1.E−8
DKT4	z	X	−0.707106781186E0	1.E−8
DKT3	z	Y	0.707106781186E0	1.E−8
DST3	z	X	−0.707106781186E0	1.E−8
Q4G4	z	Y	0.707106781186E0	1.E−8
GRME3	z	X	−0.707106781186E0	1.E−8
Q4GG3	z	Y	0.707106781186E0	1.E−8

3 Modeling C

3.1 Geometry and modeling



The grid is composed of:
- 1 mesh QUAD9 on which one affects modeling COQUE_3D
- 1 mesh QUAD8 on which one affects modeling GRILLE_MEMBRANE
- 1 mesh TRIA7 on which one affects modeling COQUE_3D
- 1 mesh TRIA6 on which one affects modeling GRILLE_MEMBRANE

3.2 Orientation of the local reference mark

In order to define the local reference mark of these elements one uses the keyword ANGL_REP for the hulls and the grids present in the keyword factor HULL and GRID of the operator AFFE_CARA_ELEM (see U4.42.01).

The table above gives the orientations chosen for each element:

Hulls	ANGL_REP	$(45.0,-45.0)$
Grids	ANGL_REP	$(45.0,-45.0)$

3.3 Calculation of the local reference marks

The local reference marks are formed by the vectors x, y and z.
For the hulls and the grids the vector z is defined by the normal outgoing one in the hull. In our example one will have $z=(\frac{-\sqrt{2}}{2},\frac{\sqrt{2}}{2},0)$.

The value given to ANGL_REP a vector defines whose projection on the tangent level with the element gives the vector x. The values of the example thus give $x=(0.5,0.5,\frac{\sqrt{2}}{2})$ and $y=(-0.5,-0.5,\frac{\sqrt{2}}{2})$ for the hulls and $x=(0.5,0.5,-\frac{\sqrt{2}}{2})$ and $y=(0.5,0.5,\frac{\sqrt{2}}{2})$ for the grids.

3.4 Sizes tested

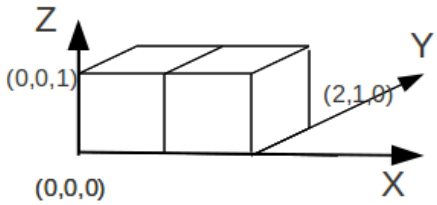
The results tested are presented in the following table:

MESH	Vector	Component	**Value of reference**	**Tolerance**
CQ3D4	x	X	0.5	1.E−8
CQ3D3	x	Y	0.5	1.E−8
CQ3D4	x	Z	0.707106781186E0	1.E−8
GRME4	x	X	0.5	1.E−8

GRME3	x	Y	0.5	1.E−8
GRME4	x	Z	0.707106781186E0	1.E−8
CQ3D4	z	X	0.707106781186E0	1.E−8
CQ3D3	z	Y	−0.707106781186E0	1.E−8
GRME4	z	X	0.707106781186E0	1.E−8
GRME3	z	Y	−0.707106781186E0	1.E−8

4 Modeling D

4.1 Geometry and modeling



The grid is composed of:
- 2 meshs HEXA8 on which one affects modeling 3D

4.2 Orientation of the local reference mark

In order to define the local reference mark of these elements the keyword factor is used SOLID MASS of the operator AFFE_CARA_ELEM (see U4.42.01).
Several manner of defining a local reference mark are proposed, we test here ANGL_REP and couples it ANGL_AXE/ORIG_AXE.

The table above gives the orientations chosen for each element:

HEXA1	ANGL_REP	$(45.0,45.0,90.0)$
HEXA2	ORIG_AXE/ANGL_AXE	$(100.0,0.5,0.5)$ / $(0.0,-45.0)$

4.3 Calculation of the local reference marks

The local reference marks are formed by the vectors x, y and z.

Values given in ANGL_REP defines the following reference mark:

$x=(0.5,0.5,-\frac{\sqrt{2}}{2})$, $y=(0.5,0.5,\frac{\sqrt{2}}{2})$ and $z=(\frac{\sqrt{2}}{2},-\frac{\sqrt{2}}{2},0)$.

The couple ANGL_AXE/ORIG_AXE in the case of a model with cylindrical geometry is used. They define an axis e_z being the axis of the cylindrical reference mark.
x corresponds to the vector e_z this cylindrical reference mark, the point of reference being the barycentre of the mesh here $(1.5,0.5,0.5)$. y corresponds to the vector $-e_\theta$ and z have vector e_r.

In this example $x=(\frac{\sqrt{2}}{2},0,\frac{\sqrt{2}}{2})$, $y=(0,1,0)$ and $z=(\frac{-\sqrt{2}}{2},0,\frac{\sqrt{2}}{2})$.

4.4 Sizes tested

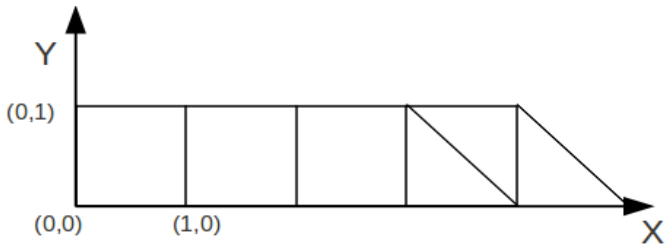
The results tested are presented in the following table:

MESH	Vector	Component	**Value of reference**	**Tolerance**
HEXA1	x	X	0.5	1.E−8
HEXA1	x	Y	0.5	1.E−8
HEXA1	x	Z	−0.707106781186E0	1.E−8

HEXA2	x	X	0.707106781186E0	1.E−8
HEXA2	x	Y	0	1.E−8
HEXA2	x	Z	0.707106781186E0	1.E−8
HEXA1	y	X	0.5	1.E−8
HEXA1	y	Y	0.5	1.E−8
HEXA1	y	Z	0.707106781186E0	1.E−8
HEXA2	y	Y	1	1.E−8
HEXA2	z	X	−0.707106781186E0	1.E−8
HEXA2	z	Y	0	1.E−8
HEXA2	z	Z	0.707106781186E0	1.E−8

5 Modeling E

5.1 Geometry and modeling



The grid is composed of:
- 3 meshs QUAD4 on which one affects modelings C_PLAN , D_PLAN and AXIS .
- 3 meshs TRIA3 on which one affects modelings C_PLAN , D_PLAN and AXIS .

5.2 Orientation of the local reference mark

In order to define the local reference mark of these elements the keyword factor is used SOLID MASS of the operator AFFE_CARA_ELEM (see U4.42.01).
In the case 2D, the orientation of the reference mark is taken into account by the keyword ANGL_REP who has nothing any more but one component.

The table above gives the orientations chosen for each element:

QUAD4	ANGL_REP	90
TRIA3	ANGL_REP	45

5.3 Calculation of the local reference marks

The local reference marks are formed by the vectors x and y.

Values given in ANGL_REP defines the following reference mark:

- $x=(0,1)$ and $y=(-1,0)$ for QUAD4
- $x=(\frac{\sqrt{2}}{2},\frac{\sqrt{2}}{2})$ and $y=(\frac{-\sqrt{2}}{2},\frac{\sqrt{2}}{2})$ for TRIA3

5.4 Sizes tested

The results tested are presented in the following table:

MESH	Vector	Component	**Value of reference**	**Tolerance**
CPL4	x	X	0	1.E−8
CPL4	x	Y	1	1.E−8
DPL4	x	X	0	1.E−8
DPL4	x	Y	1	1.E−8
AXI4	x	X	0	1.E−8
AXI4	x	Y	1	1.E−8
CPL3	x	X	0.707106781186E0	1.E−8

CPL3	x	Y	0.707106781186E0	1.E−8
DPL3	x	X	0.707106781186E0	1.E−8
DPL3	x	Y	0.707106781186E0	1.E−8
AXI3	x	X	0.707106781186E0	1.E−8
AXI3	x	Y	0.707106781186E0	1.E−8
CPL4	y	X	−1	1.E−8
CPL4	y	X	0	1.E−8
DPL4	y	Y	−1	1.E−8
DPL4	y	X	0	1.E−8
AXI4	y	Y	−1	1.E−8
AXI4	y	X	0	1.E−8
CPL3	y	Y	−0.707106781186E0	1.E−8
CPL3	y	X	0.707106781186E0	1.E−8
DPL3	y	Y	−0.707106781186E0	1.E−8
DPL3	y	X	0.707106781186E0	1.E−8
AXI3	y	Y	−0.707106781186E0	1.E−8
AXI3	y	X	0.707106781186E0	1.E−8

6 Summary of the results

The local reference marks are well written in file MED.