Code_Aster

Titre : Opérateur DEFI_GEOM_FIBRE
Responsable : François VOLDOIRE

Version default

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Clé : U4.26.01 Révision : 10851

Operator `DEFI_GEOM_FIBRE`

1 Drank

In the frame of a modelization of the type multifibers, there are two "levels" of modelization. There is the modelization known as "longitudinal" which will be represented by a beam (geometrical support `SEG2`) and a plane modelization of the section (perpendicular to the `SEG2`).

Operator `DEFI_GEOM_FIBRE` allows to define the geometry of the groups of fibers which will be used in the definition of the cross section using operator `AFFE_CARA_ELEM`. The fibers can be described either using a plane mesh beforehand read by the operator `LIRE_MAILLAGE`, (key word `SECTION`) and/or in the form of "specific" surfaces (key word `FIBER`). Each occurrence of `SECTION` or `FIBER` defines a group of fibers (which should be named). A group of fibers will have the same behavior for all its fibers, definite using `DEFI_COMPOR`.

The command creates a data structure of the geom_fibre `type`.

Caution:

With the information given in `SECTION` or `FIBER`, it is possible to calculate the majority of the integrated characteristics of the cross-sections (area, statical moments and quadratic). However, it is not possible to calculate inertias of torsion, of warping as well as the position of the center of torsion. These quantities must be given operator `AFFE_CARA_ELEM`.

If the fibers are defined from a mesh operator `MACR_CARA_POUTRE` makes it possible to read this mesh and to calculate all the characteristics. Result which is array can directly be given to `AFFE_CARA_ELEM` .

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2   Syntax

```
gf [geom_fibre] = DEFI_GEOM_FIBRE (
    ◊ INFO =      1                                            [default]
                /2
    ♦ | SECTION = _F (
        ♦                     GROUP_FIBRE= nom_gfs             [K8]
        ♦                     MAILLAGE_SECT= my                [mesh]
            ♦/                TOUT_SECT= "YES"
             /                MAILLE_SECT= mail                [l_maille]
             /                GROUP_MA_SECT= g_mail            [l_gr_maille]
        ◊                     COOR_AXE_POUTRE=/0.0, 0.0        [default]
                               /X, there                       [l_R]
    ),
      | FIBER = _F (
        ♦      GROUP_FIBRE= nom_gfp                            [K8]
        ◊ CARA=           /"SURFACE"                           [default]
                           /"DIAMETRE"
        ♦ VALE=           l_val                                [l_R]
        ◊                 COOR_AXE_POUTRE=/0.0, 0.0            [default]
                           /X, there                           [l_R]
    ),
)
```

3   Operands

3.1   Operand **INFO**

◊ INFO

If the value of INFO is 2, the operator prints in the file "MESSAGE", for each occurrence of key keys SECTION or FIBER, the characteristics of each fiber (position and area).

Note:

  All the characteristics are given compared to the axis defined in operand COOR_AXE_POUTRE *, by calling the coordinates of the section* x *(horizontal) and* y *(vertical).*

3.2   Key keys **SECTION** and **FIBER**

♦ | SECTION
  | FIBER

Define the entities of the mesh of beams concerned and the sections which are affected for them.

Key word SECTION makes it possible to affect a section defined by a plane mesh (the elements of this mesh are the sections of fibers). The numeration of fibers is completely dependant on the mesh and the type of meshes (quadrangle or triangle).

Key word FIBER makes it possible to affect a section where the fibers are defined by "points". The fibers are numbered of 1 to N in the order where they were defined.

In the presence of both key word, the classification of fibers will begin with fibers defined under key word SECTION then by those definite under key word FIBER. To obtain it, it is possible to define INFO=2 in DEFI_GEOM_FIBRE.

Note:

  Currently the number of group of fibers on an element beam is restricted to 10.

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## 3.2.1 Operands commun runs with SECTION and FIBER

♦ GROUP_FIBRE

This operand makes it possible to define a name for the group of fibers (8 characters). This name will be useful in operator DEFI_COMPOR to allot a material and a behavior to this group of fibers. It is pointed out that all the fibers defined by an occurrence of SECTION or FIBER will have the same behavior.

◊ COOR_AXE_POUTRE = (xg, yg)

This operand makes it possible to define the coordinates of the axis of the beam in the reference of the cross-section. Integrations (statical moments or of inertias) will be made compared to this axis. The position by default is $(0.0, 0.0)$.

When one gives the coordinates of fibers either by a mesh (key key SECTION) or by triplets of values (key key FIBER), they are in a reference which is not related to the beam. That makes it possible to define complex sections without obligation to define them in the principal reference of inertia of the beam.

It is easier to parameterize the mesh of a corner section (figure3.2.1-a) in the reference (x_1, y_1) that in the reference (x_2, y_2). The mesh of the section is in the plane XY.

Appear
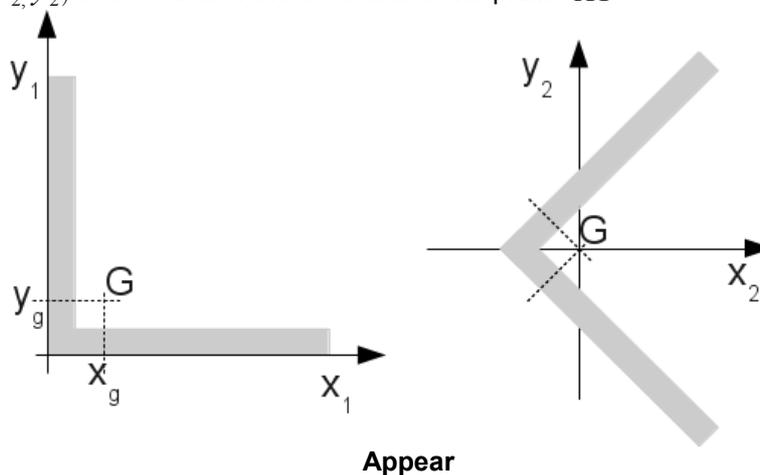
Characteristics of the beams (section, inertias,…) are defined in the principal reference of inertia, it is thus necessary to make the relation between the reference of definition of fibers and the principal reference of inertia of the beam. Key key COOR_AXE_POUTRE makes it possible to define the translation of the reference related to the mesh of the section to make it correspond to that of the beam.

In the example of the angle (figure 3.2.1-a) for:

*   the reference (x_1, y_1) : COOR_AXE_POUTRE = (xg, yg)
*   the reference (x_2, y_2) : COOR_AXE_POUTRE = (0.0, 0.0)

Always for the example of the angle but only in the case of the reference (x_1, y_1) it is necessary to turn the reference of the section of $45°$, that is carried out by key key ORIENTATION of operator AFFE_CARA_ELEM. In the case of the reference (x_2, y_2), key key ORIENTATION of AFFE_CARA_ELEM will be $()$, the default value.

3.2.2 Operands specific to SECTION

the group of fibers is defined by a set of "surface" fibers.

♦ MAILLAGE_SECT

Name of plane "mesh" the "which contains the "description of the section".
By "mesh", one understands a set of meshes triangular with 3 nodes and/or quadrilaterals with 4 nodes. By "description of the section", one understands part of this "mesh" specified by one of

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operands `TOUT_SECT`, `MAILLE_SECT` or `GROUP_MA_SECT`. Each mesh represents the section of a fiber.

♦ /`TOUT_SECT`
   /`MAILLE_SECT`
   /`GROUP_MA_SECT`

Operands	Contained/Meaning
`TOUT_SECT`	the section is defined by the totality of meshes mesh defined under `MAILLAGE_SECT`
`MAILLE_SECT`	the section is defined by a list of meshes
`GROUP_MA_SECT`	the section is defined by a list of Note:

mesh groups
> *Since it is not used as support with of the finite elements, the "mesh" should not obligatorily have a connectivity, it can be made up of a set of meshes juxtaposed or not.*
> *The coordinates x and y of the plane mesh of the section (x horizontal, y vertical) are defined in a plane perpendicular to the axis of the beam. To define the angle of gimlet, i.e. the angle between the axis x of the plane mesh of the section and the axis Y of the element beam, it is necessary to use key word `ORIENTATION` of operator `AFFE_CARA_ELEM` .*

3.2.3   Operands specific to `FIBER`

the group of fibers is defined by a set of "specific" fibers.

◊ `CARA = "SURFACE" | "DIAMETRE"`
Makes it possible to specify if the third value given for each fiber is surface or the diameter (see `VALE`).

♦ `VALE`
Each fiber is described by a triplet of values: (x, y, val) It is necessary to give the values according to this sequence, as many triplets as of fibers.
- x and y are the coordinates of the center of fiber in a plane perpendicular to the axis of the beam.
- val is either the area of a fiber, or the diameter of a cylindrical fiber.

The position of the reference can be modified thanks to `COOR_AXE_POUTRE`. To give an angle of gimlet, it is necessary to use key key `ORIENTATION` of operator `AFFE_CARA_ELEM`.

4   Example

One wishes to build a section of reinforced concrete beam, with two cylindrical steel reinforcements, of diameter 32.
One creates a named data structure `GF` comprising two groups of fibers:
- one is named `SBET` , and is created with a plane mesh ,
- the other is named `SACI` , and is created with two specific fibers for steels.

```
MASEC1 = LIRE_MAILLAGE (UNITE = 21)

GF=DEFI_GEOM_FIBER (
    SECTION=_F (GROUP_FIBRE=' SBET', MAILLAGE_SECT=MASEC1,
            TOUT_SECT=' OUI',
            COOR_AXE_POUTRE= (0. , 0.),),
    FIBER=_F (GROUP_FIBRE=' SACI',
            CARA=' DIAMETRE',
            VALE= ( 0.05,-0.2,32.E-3,
                  -0.05,-0.2,32.E-3),
            COOR_AXE_POUTRE= (0. , 0.),),
```

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