Code_Aster

Version
default

Titre : Opérateur POST_K_BETA

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Responsable : Aurore PARROT

Clé : U4.82.07   Révision : 5501

Operator POST_K_BETA

1   Drank

Analysis of harmfulness of default by the method K-beta.

This method aims to evaluate the factors of margins with respect to the starting of the tear of the coating (in first point of the default) and with respect to the brittle fracture of the base metal or the welded joint (in second point of the default).

POST_K_BETA calculates the stress intensity factors with the two points of the default, using the nodal stresses resulting from the mechanical resolution [R7.02.10].

This method calculates the stress intensity factors on models in which the crack is not represented. It uses the nodal stresses along a segment of bearing of the applied default. The stress intensity factors obtained are those of a default under elliptic coating of profile, under the assumption of an elastic behavior of the materials.

The "correction β", specific to the defaults under coating stuck to the interface, makes it possible to take account of plasticization with the two points of the crack side coating (point A) and side base metal (point B).

Product a concept of the table_sdaster type.

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2   Syntax

```
tk [table_sdaster]  =POST_K_BETA    (

        ♦MAILLAGE=ma          ,                           [mesh]

        ♦MATER_REV=mat            ,                        [material]

         ♦ EPAIS_REV=epais_rev      ,                    [R]

        ♦FISSURE=_F                (
                        ◊DECALAGE=/-2.10          ⁻⁴, [DEFAULT]
                                        /d shelling,  [R]
                        ♦PROFONDEUR=profondor          ,    [R]
                        ♦LONGUEUR=longuor                ,   [R]
                        ♦   ORIENTATION=/         " CIRC ",
                                        /    " LONGI ",
                        ),

        ♦K1D=_F                    (
                        ♦TABL_MECA_REV=table_rev          ,    [table_sdaster]
                        ♦TABL_MECA_MDB=table_mdb          ,    [table_sdaster]
                        ♦TABL_THER=table_ther             ,    [table_sdaster]
                        ♦INTITULE=intitulé          ,    [K]
                        ),

        ◊TITER=titer            ,                        [l_K]
                                );
```

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3   Operands

axisymmetric Schematization of a slice of tank with presence of a default under-coating.
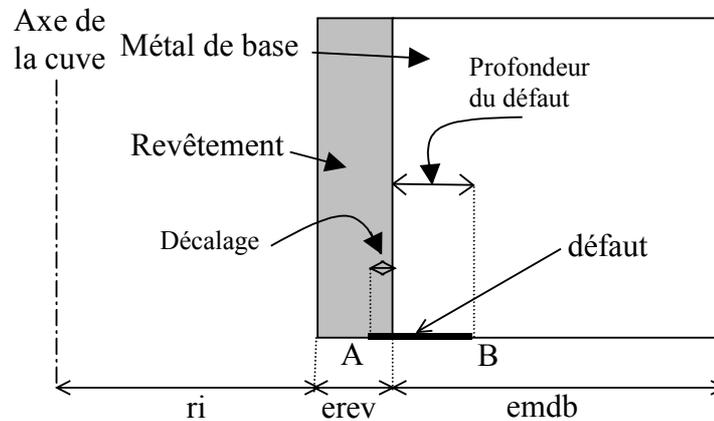
3.1   Operand MAILLAGE

Concept of mesh type .

3.2   Operand MATER_REV

Name of the concept of type material defining the material constituting the coating. Necessary to recover the yield stresses, for the plastic correction of the stress intensity factors.

3.3   Operand EPAIS_REV

Thickness of the coating. Necessary for the correction of the stress intensity factors by the edge factors and for the plastic correction.

3.4   Key word FISSURES

Factor key word for the geometrical characterization of the default. It can be used only once.

3.4.1   Operand DECALAGE

Shift of crack in the coating from the interface coating/base metal. It should be noted that the shift is necessarily negative. By default, shift = − 2.10-4.

3.4.2   Operand PROFONDEUR

radial Dimension of the default.

3.4.3   Operand LONGUEUR

Second dimension of the default (axial or orthoradiale according to the directional sense of the default).

3.4.4   Operand ORIENTATION

Characterization of the directional sense "CIRC" for a circumferential default,

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of the default:

"LONGI" for a longitudinal default.

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3.5 Key word K1D

Factor key word for the characterization of the thermomechanical transient. The repetition of this key word is possible.

3.5.1 Operands TABL_MECA_REV and TABL_MECA_MDB

Arrays providing the transient of the stresses undergone by the tank during the history on the loading, respectively side coating (of the point A of the default to the interface) and the side base metal (of the interface to the point B of the default).

The common parameters necessary to these arrays are:
- "INST" [R],
- "SIXX" [R] (in 3D with "LONGI"),
- "SIYY" [R] (in 3D with "LONGI" or 2D with "CIRC"),
- "SIXY" [R] (in 3D with "LONGI"),
- "SIZZ" [R] (in 2D with "LONGI" or 3D   with "CIRC").

Necessary parameters specific to:
- TABL_MECA_REV are:
  - "COOR_X" [R],
  - "COOR_Y" [R]

- TABL_MECA_MDB are :
  - "ABSC_CURV" [R]

the reader is invited to consult of the command documentation POST_RELEVE_T [U4.81.21] for more information on the meaning of the parameters.

3.5.2 Operand TABL_THER

Counts providing the thermal transient in the tank during the history of the loading of the point A to the point B.

the parameters necessary of this array are:
- "INST" [R],
- "ABSC_CURV" [R],
- "TEMP" [R].

The reader is invited to consult of the command documentation POST_RELEVE_T [U4.81.21] for more information on the meaning of the parameters.

3.5.3 Operand INTITULE

Entitled to specify the nodes group considered.

3.6 Operand TITER

Titrates attached to the product concept by this operand [U4.03.01].

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4 Count produced

the parameters of the produced array are described in the tables according to:

PARAMETRE	TYPE	DESCRIPTION
GROUP_NO	K32	entitled to specify the name of the nodes group considered,
INST	R	urgent
K1_REV	R	factor of intensity of the stresses to the forefront of crack side coating (point A)
KCP_REV	R	factor of intensity of the stresses with plastic correction to the forefront of crack side coating (point A)
TEMPPF_REV	R	temperature to the forefront of crack side coating (point A)
K1_MDB	R	factor of intensity of the stresses to the forefront of crack side base metal (point B)
KCP_MDB	R	factor of intensity of the stresses with plastic correction to the forefront of crack side base metal (point B)
TEMPPF_MDB	R	temperature to the forefront of crack side base metal (point B)

5 Example

Of the examples of use of the command POST_K_BETA are provided in the case test EPICU01.

Before use of the command POST_K_BETA, it is necessary to record the stresses and the temperatures along the default.

In the example below, the paths chem1, chem2 and chem3 on which the statements of stress and temperature will be carried out are first of all defined.

Definition of chem1 which goes from the point of the default side coating until the interface.

```
CHEM1=INTE_MAIL_2D   ( MAILLAGE = MAIL,
                       GROUP_MA = "R",
                       INFO = 2,
                       accuracy = 1.0E-6,
                       DEFI_SEGMENT = _F    (
                                             ORIGINE = (DEBFIS, 0.0),
                                             GROUP_NO_EXTR = "pi",
                                       )
                 )
```

Definition of chem2 which goes from the interface to the forefront of default side base metal.

```
CHEM2=INTE_MAIL_2D   ( MAILLAGE = MAIL,
                       GROUP_MA = "Me,
                       accuracy = 1.0E-6,
                       INFO = 2,
                       DEFI_SEGMENT = _F    (
                                             GROUP_NO_ORIG = "pi",
                                             ENDING = (EXTRABS, 0.0),
                                       )
                 )
```

Definition of chem3 which goes from the point of the default side coating to that side base metal.

```
CHEM3=INTE_MAIL_2D   ( MAILLAGE = MAIL,
                       accuracy = 1.0E-6,
                       INFO = 2,
                       DEFI_SEGMENT = _F    (
```

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```
                                              ORIGINE = (DEBFIS, 0.0),
                                              ENDING = (EXTRABS, 0.0),
                                          )
                     )
```

Raised of the stresses on chem1 : the stresses are recorded on the part of the default located in the coating.

```
S1_G=POST_RELEVE_T   ( ACTION=_F ( PATH = CHEM1,
                                   INTITULE = "GLOBAL1",
                                   RESULTAT = SIG,
                                   TOUT_CMP = "OUI',
                                   NOM_CHAM = "SIGM_ELNO",
                                   LIST_INST = LINST_ME,
                                   OPERATION = "EXTRACTION",
                                 )
                     )
```

Raised of the stresses on chem2 : the stresses are recorded on the part of the default located in the base metal.

```
S2_G=POST_RELEVE_T   ( ACTION=_F ( PATH = CHEM2,
                                   INTITULE = "GLOBAL2",
                                   RESULTAT = SIG,
                                   TOUT_CMP = "OUI',
                                   NOM_CHAM = "SIGM_ELNO",
                                   LIST_INST = LINST_ME,
                                   OPERATION = "EXTRACTION",
                                 )
                     )
```

Raised of the temperatures on chem3 : the temperature is recorded along the default.

```
TEMP_G=POST_RELEVE_T    ( ACTION=_F  ( PATH = CHEM3,
                                       INTITULE = "GLOBAL3",
                                       RESULTAT = TEMP,
                                       TOUT_CMP = "OUI',
                                       NOM_CHAM = "TEMP",
                                       LIST_INST = LINST_TH,
                                       OPERATION = "EXTRACTION",
                                     )
                       )
```

After having taken these various readings, the computation of the stress intensity factor can be done indeed using command POST_K_BETA.

```
TB_KBETA = POST_K_BETA  ( MAILLAGE=  MAIL,
                           MATER_REV=   MAME_RE2,
                          EPAIS_REV=    EPREV,
                          FISSURE=   _F (
                                          PROFONDEUR = 6. ,
                                          LONGUEUR  = 60. ,
                                          DECALAGE  = -1.E-05,
                                          ORIENTATION= "CIRC"),
                         K1D=         (_F ( TABL_MECA_REV = S1_G,
                                       TABL_MECA_MDB = S2-G,
                                       TABL_THER     = TEMP_G,
                                       INTITULE      = "NOEINF",),),
                          TITER=      "FIC PAR METHODE K-BETA"
                        )
```