
Procédure IMPR_MACR_ELEM

1 Drank

To print with the formats `IDEAS` and `MISS_3D` a data structure `macr_elem_dyna`.

One prints:

- the definition of an interface of connection between a macrostructure and its external environment,
- a modal base (dynamic modes of the macrostructure and static modes resulting either from unit displacements imposed on the interface, or of unit forces imposed on the interface),
- the mass matrixes and of stiffness of the macrostructure projected on preceding modal base.

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2 Syntax

```
IMPR_MACR_ELEM (
    ♦ MACR_ELEM_DYNA=melem,
    [macr_elem_dyna]
        ◊ FORMAT=/ "IDEAS", [DEFAULT]
        ◊UNITE=/30 ,
    [DEFAULT]
        /unit , [I]
        ◊VERSION=5 , [DEFAULT]
        / "MISS_3D",
        ◊UNITE=/26 ,
    [DEFAULT]
        /unit , [I]
        ◊SOUS_TITER=1_st , [l_Kn]
        ◊/AMOR_REDUIT=lam , [l_R]
        /LIST_AMOR =l_amor , [listr8]
        ♦GROUP_MA_INTERF=gr_inter , [l_group_ma]
        ◊GROUP_MA_FLU_STR=gr_flustr , [l_group_ma]
        ◊GROUP_MA_FLU_SOL=gr_flusol , [l_group_ma]
        ◊GROUP_MA_SOL_SOL=gr_solsol , [l_group_ma]
        ◊GROUP_MA_CONTROL=gr_control , [l_group_ma]
        ◊IMPR_MODE_STAT=/ "YES", [DEFAULT]
        / "NON",
        ◊IMPR_MODE_MECA=/ "YES", [DEFAULT]
        / "NON",
        ◊FORMAT_R=/ "1PE12.5", [DEFAULT]
        / "1PE16.9",
    )
```

3 Operands

3.1 Operand MACR_ELEM_DYNA

◇ MACR_ELEM_DYNA=melem
[macr_elem_dyna]

Name of the concept of the type macr_elem_dyna qu" one wishes to print in the file.

3.2 FORMAT = "IDEAS"

◇FORMAT=/ "IDEAS" [DEFAULT]

Makes it possible to specify the format D" printing. The format "IDEAS" is taken by default. Currently only the printing is carried out according to the specifications of version 5. The upward compatibility with the versions of IDEAS is thus assured.

3.2.1 Operand UNITE

◇UNITE=/30 , [DEFAULT]
/unit [I]

This key word makes it possible to define the logical unit of printing in the format "IDEAS" (30 per default).

3.2.2 Operand VERSION

◇VERSION=/5 , [DEFAULT]

This key word makes it possible to define the version of printing in the format "IDEAS" (5 per default).

3.3 FORMAT = "MISS_3D"

◇ FORMAT=/ "MISS_3D"

format "MISS_3D" is used by the code of dynamics of soils MISS3D to import structural data coming from *the Code_Aster* (contained dynamic macro-element which corresponds under the terms of contribution of structure to the impedance of the total problem of interaction soil-structure). One also prints the mesh of the interface soil-structure in his local classification and possibly the modes dynamic and statics reduced to this interface.

For this format one will have to provide operand GROUP_MA_INTERF and five operands are optional UNITE, SOUS_TITRE, AMOR_REDUIT, IMPR_MODE_STAT and IMPR_MODE_MECA.

3.3.1 Operand UNITE

◇UNITE=/26 , [DEFAULT]
/unit [I]

This key word makes it possible to define the logical unit of printing in format "MISS_3D" (26 per default).

3.3.2 Operand SOUS_TITRE

◇SOUS_TITER=1_st [l_Kn]

Makes it possible to the user to give a name to the data transferred in code MISS3D.

3.3.3 Operand AMOR_REDUIT

```
◇/AMOR_REDUIT=lam [l_R]
  /LIST_AMOR =l_amor [listr8]
```

These key keys make it possible to enter a list of depreciation for the dynamic modes. One can thus supplement the terms of the dynamic macro-element.

3.3.4 Operand GROUP_MA_INTERF

```
◆ GROUP_MA_INTERF=gr_inter [l_group_ma]
```

This key word, makes it possible to define the list of the surface mesh groups constitutive of the interface soil-structure. One prints the coordinates of the "Nb_nœuds" nodes of all the interfaces, then the "Nb_elem" elements with their connectivities in the local classification of all the interfaces (1 in "Nb_nœuds").

3.3.5 Operand IMPR_MODE_STAT

```
◇IMPR_MODE_STAT=/ "YES" [DEFAULT]
                  / "NON"
```

This key word possibly makes it possible (so "YES") to print the static modes reduced to the interface. That proves to be necessary for the 6 modes of rigid bodies. In this case, the macro-element leans on a dynamic interface of type CRAIGB reduced to a point with a rigid connection of the interface (key word LIAISON_SOLIDE of AFFE_CHAR_MECA [U4.44.01]).

3.3.6 Operand IMPR_MODE_MECA

```
◇IMPR_MODE_MECA=/ "YES" [DEFAULT]
                  / "NON"
```

This key word possibly makes it possible (so "YES") to print the dynamic modes reduced to the interface.

3.3.7 Operand FORMAT_R

```
◇FORMAT_R=/ "1PE12.5" [DEFAULT]
            / "1PE16.9"
```

This key word gives the format of printing of the real numbers used during the printing of the structure impedances which one assembles with the impedances of soil in MISS3D.

3.3.8 Operands GROUP_MA_FLU_STR/GROUP_MA_FLU_SOL/GROUP_MA_SOL_SOL

```
◇ GROUP_MA_FLU_STR= gr_flustr [l_group_ma]
◇GROUP_MA_FLU_SOL= gr_flusol [l_group_ma]
◇GROUP_MA_SOL_SOL= gr_solcsol [l_group_ma]
```

In the case of an interaction soil-fluid-structure, these keywords make it possible to supplement the list of the surface mesh groups respectively made up of the interfaces fluid structure, fluid-soil and free soil.

In this case, one supplements the printing of their elements with their connectivities in the local classification of all the interfaces (1 with "Nb-nodes") (including the interface soil-structure).

3.3.9 Operand GROUP_MA_CONTROL

```
◇ GROUP_MA_CONTROL= gr_control [l_group_ma]
```

This key word makes it possible to introduce mesh groups specific POI1 in order to model by Code_Aster of the check-points in the part of soil modelled by MISS3D. That then makes it possible to

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operate any postprocessing on their nodes by operators of *Code_Aster* after recovery of the evolution calculated by `LIRE_IMPE_MISS`.

That thus requires for these check-points:

- to introduce them into the mesh like isolated nodes,
- to affect a modelization `DIS_T` by `AFFE_MODELE` to them,
- to impose to them blockings in "DX", "DY", "DZ" by `AFFE_CHAR_MECA`,
- to calculate the corresponding constrained static modes by `MODE_STATIQUE` to supplement the base of the eigen modes and statics used for the call to `MACRO_MISS_3D`. The correction of modal base by `DEFI_BASE_MODAL` should obligatorily intervene only after the call with `MACRO_MISS_3D` but before the call to `LIRE_MISS_3D`. An illustrative example is given in the case test `ZZZZ108A`.

In this case, one supplements the printing of these point elements with their connectivity with only one node in the local classification of all the interfaces (1 with "Nb-nodes") (including the nodes of the modelled check-points).

4 Example of printing of data to format MISS3D

One gives in the example below the principal commands which allow the sequence between *the Code_Aster* and code MISS3D, and which illustrates of the command use IMPR_MACR_ELEM in this context.

```
#
# computation of modes
#
mode = MODE_ITER_SIMULT (      MATR_RIGI= stiffness,  MATR_MASS= mass,
                             CALC_FREQ=_F      ( NMAX_FREQ=30 )
                             );

#
# computation of dynamic macro-element
#
interdyn = DEFI_INTERF_DYNA    ( NUMÉRIQUE_DDL= nume_ddl,
                                INTERFACE=      ( NOM = "RIGHT",
                                                  TYPE = "CRAIGB",
                                                  NOEUD= "N98"
                                                  )
                                );

bamo = DEFI_BASE_MODALE        ( CLASSIQUE=_F      ( INTERF_DYNA = interdyn,
                                                  MODE_MECA   = mode,
                                                  NMAX_MODE   = 30
                                                  )
                                );

mael = MACR_ELEM_DYNA          ( BASE_MODALE=bamo ,   OPTION=    `CLASSIQUE' );

fo1 = DEFI_FONCTION            ( NOM_PARA=          `FREQ',
                                VALE=              ( 0. , 1. , 100. , 1. ) );

#
# reading of the accelerogram of soil acce
#
ACCE = DEFI_FONCTION           ( NOM_PARA = "INST",
                                VALE =            ( 0.00000E+00, 1.1940E-03,
                                                    _ _ _ _ _
                                                    )
                                );

#
# pré-processing of MISS3D
#
# (mesh and impedances of interface)

IMPR_MACR_ELEM                ( MACR_ELEM_DYNA=mael ,
                                FORMAT=            `MISS_3D',
                                SOUS_TITRE=        `CIVAUX RIGIDE',
                                IMPR_MODE_STAT=    `OUI',
                                IMPR_MODE_MECA=    `NON',
                                AMOR_REDUIT=       ( 0.07 ),
                                GROUP_MA_INTERF=   ("SRADIER")
                                );
```

```
#
# forces harmonic horizontal at the top of structure

#
IMPR_MISS_3D      ( MACR_ELEM_DYNA=mael ,
                   FREQ_INIT=0  .,  FREQ_FIN=10  .,  PAS=0.1  ,
                   EXCIT=_F      (VECT_ASSE=vecas1  ,  FONC_MULT=fo1
                   )
                   );

#
# horizontal transitory acceleration in soil

#
IMPR_MISS_3D      ( MACR_ELEM_DYNA: mael,
                   INST_INIT=0  .,  INST_FIN=10  .,  PAS=0.01  ,
                   EXCIT_SOL=_F  ( DIRECTION=      (1.  ,  0.  ,  0.),
                                   NOM_CHAM=        `ACCE`,
                                   FONC_SIGNAL = ACCE)
                   );
```