
Macro-order POST_NEWMARK

1 Goal

To check the stability of a work in fill in 2D (dam/stopping) according to the criterion of maximum horizontal displacement acceptable during a seismic loading via the method of Newmark [1]. The procedure depends as starter on the concept result of a temporal linear calculation dynamic or not linear, as well as position of the potential rings slip and of the associated seismic coefficient. macroorder provides in exit a table containing the horizontal average acceleration of the slipping mass and horizontal displacement.

2 Syntax

```
resu [table] = POST_NEWMARK (  
  
  ♦ RAY                = ray,                [R]  
  ♦ CENTRE_X           = posx ,              [ R ]  
  ♦ CENTRE_Y           = posy ,              [ R ]  
  ♦ RESULT             = result ,           [dyna_trans , evol_noli ]  
  ♦ KY                 = ky,                [R]  
  ♦ GROUP_MA_CALC     = grpma ,            [grma]
```

3 Description of the macro-order

The macro-order `POST_NEWMARK` allows to obtain an estimate of the irreversible side displacement of a potential zonelies slipping of a work in fill (stopping/dam) via the method of Newmark [1].

The method of Newmark is based on the idea that the zone potentially slipping of the work can be approximate by a block slipping on a tilted level. During the earthquake, this block slips along the tilted plan when L'average acceleration (a_m) block exceed a fixed value, called critical acceleration (a_y). The method considers that the residual displacement of the slipping block can be obtained while integrating twice moments of the average acceleration exceeding critical acceleration.

From a dynamic calculation of standard elementS stop, the average acceleration of a zone potentially slipping is definedE like LE quotient of the resultant of the lateral forces F_L along the interface between the zone potentially slipping and the rest of the work and the mass m of this zone:

$$a_m = \frac{F_L}{m} \quad (1)$$

Critical acceleration is definedE like acceleration who carries out with a safety coefficient of value 1,0 for the zone potentially slipping. With to leave critical acceleration, one definite the seismic coefficient k_y by bringing back acceleration criticizes with the value of the acceleration of gravity g :

$$k_y = \frac{a_y}{g} \quad (2)$$

The macro-order `POST_NEWMARK` only accept grids 2D and a zone potentially slipping of circular form. The position of the circle of slip and the seismic coefficient k_y must be provided by the user as starter of the macro-order. They can be obtained by a calculation of stability pseudo-statics with a nonlinear law of behavior integrating a criterion of rupture.

One will be able to consult: the CAS-test `zzzz402` [V1.01.402] based on the dynamic response of a work in fill on earthquake.

[1] Newmark, N.M. 1965. Effects of earthquakes one prejudices and embankments. Geotechnics, 15(2): 139-160.

4 Operands

4.1 Operands `RAY`, `CENTRE_X`, `CENTRE_Y`

◆ `RAY = ray`

Ray of the circle of slip to which the work is to be checked

◆ `CENTRE_X = posx`

Position according to coordinate X of the center of the circle of slip

◆ `CENTRE_Y = posy`

Position according to the coordinate Y of the center of the circle of slip

Notice 1 :

The order `POST_NEWMARK draft` only works modelled according to a geometry 2D. Lorder has stop in fatal error if grid used is 3D.

Notice 2 :

The user must check the adequacy of the provided position of the circle of slip and the grid on which dynamic calculation was carried out.

4.2 Operand RESULT

◆ `RESULT = result`

This obligatory operand makes it possible to inform the concept result integrating the seismic answer of the work.

Note:

In the case of one result of type `dyna_trans`, it is necessary that the user calculate it stress field `S` of type `SIEF_ELGA` by reallocating it with concept result. This operation is carried out with the order `CALC_CHAMP` (see case test `zzzz402a`).

4.3 Operand KY

◆ `KY = ky`

This obligatory operand makes it possible to inform the value seismic coefficient obtained for the circle of slip and for which the work must be checked.

4.4 Operand GROUP_MA_CALC

◆ `GROUP_MA_CALC = grma`

This obligatory operand makes it possible to inform the whole of the groups of meshes on which dynamic calculation was carried out. These groups of meshes are used in order to determine the meshes belonging to the circle of slip.