

FORMA06 - Practical works of the formation “advanced Use”: plate multi-fissured in traction

Summary:

This test 2D plane deformation, into quasi-static, enters within the framework of the validation of postprocessings in linear elastic breaking process. The plate multi-is fissured. The cracks are represented by method X-FEM.

1 Problem of reference

One studies the behavior of a plate multi-fissured in traction. In order not to net the cracks, method X-FEM is used.

One considers an infinite plate in traction, comprising 2 cracks length $2a$ (see Figure 1-1).

A Pair of Eccentric Parallel Cracks (Isida [1973])

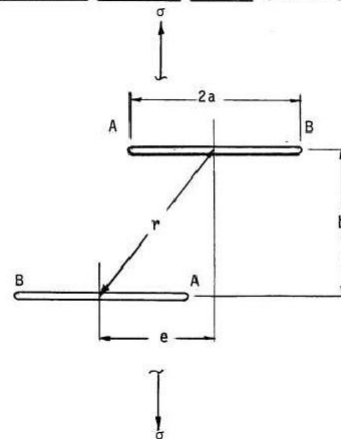


Figure 1-1: geometry of the problem

One proposes to check the abacuses provided by the "Handbook of stress-intensity factors" of G. Sih. The factor of intensity of the constraints K_I at the point A is given by the following formula:

$$K_I^A = F\left(\frac{2a}{r}, \frac{e}{b}\right) \sigma \sqrt{\pi a} \text{ where } F\left(\frac{2a}{r}, \frac{e}{b}\right) \text{ is given by the graphics of Figure 2.1-1.}$$

2 Modeling A

2.1 Unfolding of the TP

Under Salomé-Méca, carry out the geometry.

One will be able to consider a plate centered in the beginning, of finished size: $2m$ of width dimensions.

Carry out the grid. It is pointed out that the cracks are not with a grid, one will be able to thus use a regulated grid of quadrangles sufficiently fine everywhere (algorithm 1D = Wire discretization + algorithm 2D = Quadrangle).

The command file for only one fissures horizontal length $2a=0,3m$ is given: `forma06a.comm`, in which one applies a tractive effort to the faces 'M_haut' and 'M_bas', the rigid modes are blocked by embedding the node in bottom on the left 'N_A' and by blocking following displacement Y node in bottom on the right 'N_B'. It however remains to supplement postprocessing.

Realize to card-index it orders for the following case:

$$a=0,15 \text{ and } b=0,4 \text{ (either } 2a/b=0,75 \text{)}$$

$$e=0$$

One is reminded that each call `DEFI_FISS_XFEM` product a crack. For 2 cracks, this order should be called twice . Also, orders `POST_K1_K2_K3` and `CALC_G` produce structure of data of the type Counts. Yew is necessary to add the order `IMPR_TABLE` to display the computation results.

Note: not to take account of alarm in `CALC_CHAMP` which specifies that `EXCIT` should be added.

Compare with the solution of Handbook.

To go further, one will be able:

- to prolong the abacuses for $2a/r > 0.9$ (for example $2a/r = 1$),
- to study the smoothness of the grid,
- to make a parametric study for $e = [0 ; 2b]$ (to think of using python),
- to study other configurations (inclined cracks, addition of other cracks...).

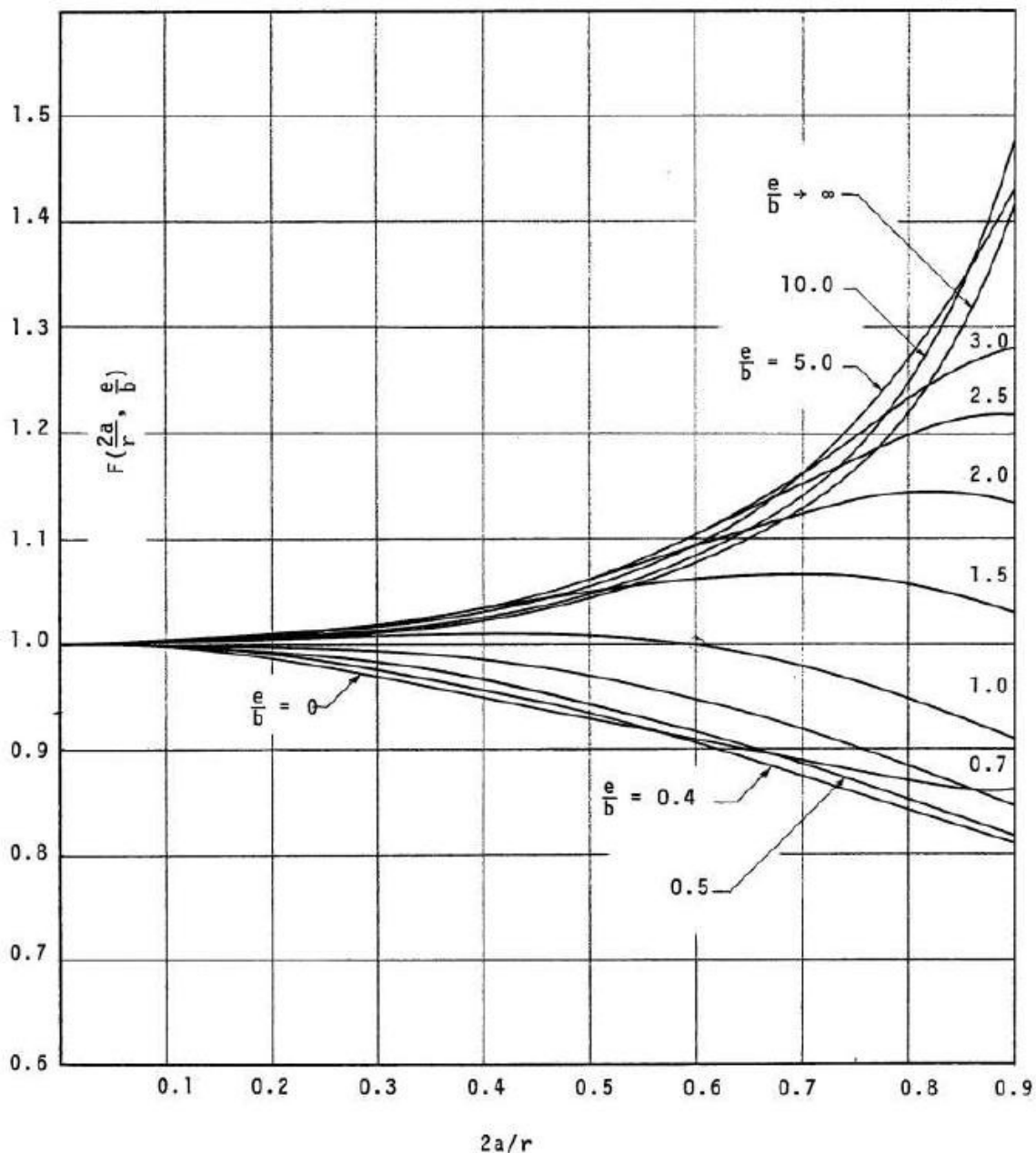


Figure 2.1-1: Abacus