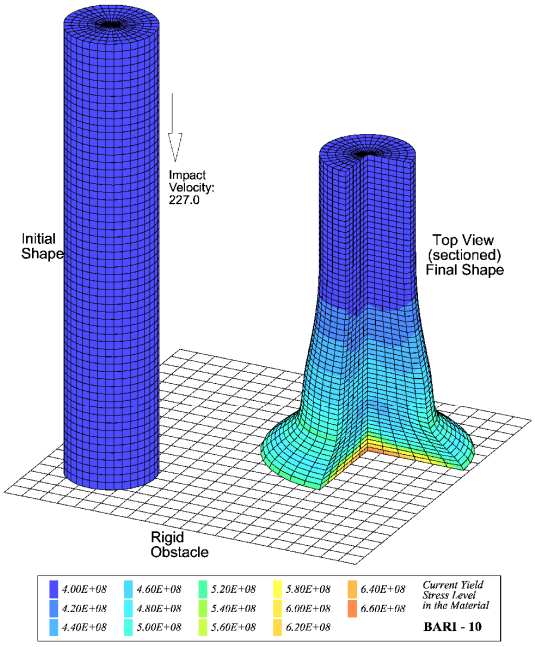
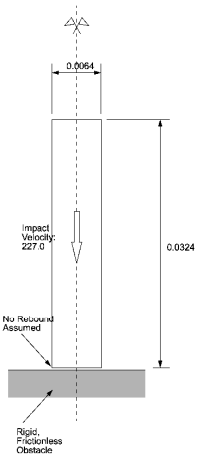
Example 1 – Taylor bar impact





Material Data	
Density	8930
Young's Modulus	1.17×10^{11}
Yield Stress	4.0×10^{8}
Plastic Modulus	1.0×10^{8}
Poisson's Ratio	0.35

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Geometric data and materials:

See slide.

Numerical Solution

BARI10

The mesh generation file is:

```
*%siz 40

opti echo 1;
*
opti titr 'BARI - 10';
opti dime 2 elem qua4;
*
p0=0 0;
p1=3.2E-3 0;
p2=0 32.4E-3;
tol=0.01E-3;
*
base=p0 d 6 p1;
stru=base TRAN 60 p2;
elim tol (stru et p2);
*
symax=stru poin droi p0 p2 tol;
top=stru poin droi p2 (p1 PLUS p2) tol;
*
str1=chan 'POI1' stru;
bas1=chan 'POI1' base;
viti=diff str1 bas1;
lili=diff bas1 (p0 et p1);
slin=stru poin droi p1 (p1 plus p2) tol;
*
mesh=stru et symax et viti et lili et slin;
tass mesh;
*
opti sauv form 'bari10.msh';
sauv form mesh;
```

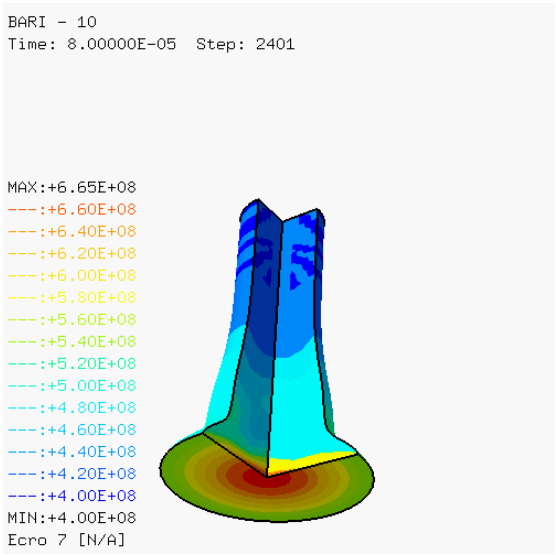
The input file is:

```
BARI - 10
*------------------------------------------------------------------------
ECHO
  CONV win
CAST MESH
*-------------------------------------------------------------Problem type
AXIS NONL ALE
*-------------------------------------------------------------Dimensioning
DIME
   PTZL 1000 Q41 360
   TABL 1 5
   ECRO 3960
   NALE 4 NBLE 354
   SLPC 1 SLPN 61
TERM
*------------------------------------------------------------------Geometry
GEOM Q41 STRU TERM
*-----------------------------------------------------Geometric Complements
COMP EPAI 1 TOUS
*-------------------------------------------------------------Grid motion
GRIL LAGR LECT P0 P1 TOP TERM
     ALE TOUS
     LIGN BASE LECT P0 P1 TERM LIST LECT LILI TERM
     SLIP EQUI LECT SLIN TERM
     AUTO AUTR
*-------------------------------------------------------------Material data
MATE VM23 RO 8930. YOUN 1.17D11 NU 0.35D0 ELAS 4.D8
          TRAC 2 4.D8 3.418803D-03 1.004D11 1000.003418803
          TOUS
*-----------------------------------------------------Boundary conditions
LINK COUP
     BLOQ 2 LECT BASE TERM
     CONT SPLA NX 1 NY 0 LECT SYMAX TERM
*-----------------------------------------------------Initial conditions
INIT VITE 2 -227. LECT VITI TERM
*------------------------------------------------------------------Outputs
ECRI DEPL VITE TFRE 10.E-6
          POIN LECT P1 TOP TERM
     FICH K200 TFRE 10.E-6 POIN TOUS
          VARI DEPL VITE ECRO ECRC LECT 2 7 TERM
     fich alic temp FREQ 1
                poin lect P1 P2 term
     fich alic tfre 1.e-6
*-------------------------------------------------------------------Options
OPTI NOTE
     CSTA 0.5
     LOG 1
*-----------------------------------------------------Transient calculation
```

```
CALC TINI 0. TEND 80.D-6
*================================================================ANIMATION
PLAY
CAME   1 EYE    4.47289E-02 -3.66604E-02  6.13469E-02
!        Q      9.09576E-01  2.93578E-01  2.86788E-01 -6.50846E-02
         VIEW -4.83497E-01  5.71394E-01 -6.63129E-01
         RIGH  8.27033E-01  4.99905E-02 -5.59926E-01
         UP    2.86788E-01  8.19152E-01  4.96732E-01
         FOV   2.48819E+01
SCEN GEOM NAVI FREE
         LINE HEOU SSHA
     ISO  FILL FIEL ECRO 7 SCAL USER PROG 4.0D8 PAS 0.2D8 6.6D8 TERM
     TEXT ISCA
     colo pape
     LIMA ON
titl tit1 'EUROPLEXUS (C) Animation'
     tit2 'Taylor Bar Impact'
     tit3 'Author: F. Casadei'
sler cam1 1       nfra 20
trac offs fich avi                nocl nfto 101 fps 10 kfre 10 comp -1
                                                  AXIS 27 270 REND
sler cam1 1       nfra  1
TRAC OFFS FICH AVI CONT NOCL
                                                  AXIS 27 270 REND
```

```
FREQ 0 tfre 1.d-6
GOTR LOOP 79  OFFS FICH AVI CONT NOCL
                                                  AXIS 27 270 REND
GOTR          OFFS FICH AVI CONT
                                                  AXIS 27 270 REND
ENDPLAY
*=========================================================POST-TREATMENT
SUIT
Post-treatment
ECHO
RESU ALIC TEMP GARD PSCR
SORT GRAP
AXTE 1000.0 'Time [ms]'
*-----------------------------------------------------------Curve definitions
COUR 1 'dx_P1'  DEPL COMP 1  LECT  P1 TERM
COUR 2 'dy_P2'  DEPL COMP 2  LECT  P2 TERM
*-------------------------------------------------------------------Plots
trac 1 2 axes 1.0 'DISPL. [M]' yzer
*-----------------------------------------------------Results qualification
QUAL DEPL COMP 1 lect  P1 term REFE  3.90999E-3 TOLE 5.E-3
     DEPL COMP 2 lect  P2 term REFE -1.09017E-2 TOLE 5.E-3
*=================================================================
FIN
```

The resulting final deformed mesh with superposed current yield stress (a measure of plastic deformation) is:



The displacements are: