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THE INCLUSION OF FRACTURE IN THE PUFF COMPUTER CODE

Richard J. Scammon
Capt USAF

TECHNICAL REPORT NO AFWL-TR-69-73

July 1969

AIR FORCE WEAPONS LABORATORY
Air Force Systems Command
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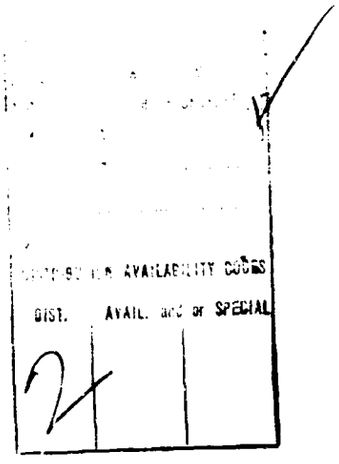

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FOREWORD

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Inclusive dates of research were June 1968 to May 1969. The report was submitted 6 June 1969 by the Air Force Weapons Laboratory Project Officer, Mr. A. Foster Cooper (WLRP). Former Project Officer was Captain Richard J. Scammon (WLRP).

This technical report has been reviewed and is approved.

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ABSTRACT

(Distribution Limitation Statement No. 2)

This report describes in some detail the addition of a fracture routine to FOR 66, a one-dimensional Lagrangian hydrodynamics computer program. The report concerns itself mainly with the logic required in creating, following, and deleting free surfaces using a simple tension criterion for fracture plane location.

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SECTION I

INTRODUCTION

This report describes a method of handling material fracture in PUFF 66, a one-dimensional Lagrangian hydrodynamics computer program. (The reader is referred to AFWL-TR-66-48 for a detailed description of the basic code.) The changes made to PUFF 66 are discussed and a listing of the revised program is provided, with a sample problem demonstrating the use of the modified program.

The fracture routine creates right- and left-hand free surfaces or boundaries at a location where the fracture criterion has been exceeded and then follows these surfaces as the program progresses. If the two surfaces should come in contact at some later time, they are combined, the free surfaces are deleted, and the resulting zone boundary is given a new fracture strength. This report is concerned with the code mechanics required in creating, following, and deleting the free surfaces; no attempt is made to address the question of fracture criteria. Tension is used as the fracture criterion although another criterion could be substituted with little change to the rest of the routine.

Although this report is concerned only with PUFF 66, a radiation deposition code, the same approach with minor modifications can be adopted to P PUFF 66, the flyer plate version of PUFF.

SECTION II

COMPUTER CODE IMPLEMENTATION

The insertion of a fracture or spall capability into PUFF can be separated into two segments: (1) the criterion to be used in defining when a material should fracture, and (2) the code mechanics used to create and follow the free surfaces resulting from a fracture. As stated in the introduction, the criterion used with this routine is simple tension. Once the magnitude of the tension in an area is greater than the strength assigned to the material, the material is considered to have spalled and the appropriate action is taken to create and follow the resulting free surfaces. This criterion was chosen because of its simplicity. The mechanics of handling the fracture are relatively independent of the criterion and a more realistic criterion can be incorporated with only minor changes to the rest of the routine.

The routine identifies fracture by comparing the zone-mass-weighted average tension of two adjacent zones to the strength of the material attributed to the zone boundary between the zones. If the average tension exceeds the strength of the zone boundary, the routine creates right- and left-hand free surfaces at the boundary. The existing zone boundary is used as the left-hand free surface, while a new boundary is introduced to act as the right-hand free surface. This boundary is essentially imaginary in that it does not change the zone number of the following zones. Both surfaces are given the position and velocity of the original zone boundary; the velocity in subsequent cycles is calculated using the same equation used to calculate front and rear surface velocity in PUFF 66. The resulting free surface motion is followed cycle by cycle by a special spall path in the HYDRO subroutine and, if the two surfaces come in contact, they are combined, the imaginary zone boundary is deleted, and the resulting zone boundary is given a strength of zero.

The majority of the additions and changes required to incorporate the fracture scheme into PUFF are found in the HYDRO subroutine with minor changes in the GENRAT, REZONE, EQUATION OF STATE, and EDIT subroutines. No new subroutines were needed. These changes are discussed in some detail in the following paragraphs. Four new dimensioned variables were added to PUFF 66. Two of these, TSPALL (801) and US (100) are located in the common declaration while

XS (100) and SM (100) are dimensioned in HYDRO. The variable, TSPALL, is the zone boundary spall strength in dynes per square centimeter and is used in several subroutines. US is the velocity of the right-hand free surface of a fracture and is used in HYDRO and in the momentum calculation of the EDIT subroutine. The variable XS is the position of the right-hand free surfaces and SM is the storage for the momentum edit of the spalled sections calculated in HYDRO.

1. GENRAT

The material strength for the fracture criteria is read into the program in the GENRAT subroutine as part of the material data. The existing material variable PMIN is used for this purpose. It possesses the units of dynes per square centimeter and is negative in keeping with the sign convention used in PUFF. The material strength is converted to the zonal parameter TSPALL(J) at the same point in the program that GENRAT initializes the other zone variables. If PMIN is given a value of zero for a material, TSPALL(J) for the zones in that material is set to an arbitrarily large negative number which effectively locks out the spall routine in the material. An option allows the user to read in the spall strength for an individual zone boundary such as a material interface. The flag for this option is NSPAL which is set to the number of specific inputs desired. Each input consists of a separate card following the JEDIT input card in sequence and contains the index number of the material involved, the fractional thickness of that material at which the input is to be located, and the material strength desired at that location. The spall strength is given to the zone boundary nearest the indicated location after zoning is completed. This specific input overrides the general material input PMIN.

2. HYDRO

Subroutine HYDRO contains the majority of the changes required in incorportating the spall routine. These are grouped for the most part into four sections: (1) the check against the fracture criterion which creates the free surfaces when fracture occurs, (2) the spall path which updates the velocity and position of the free surfaces created by fracture, (3) the combine routine which checks to see if the free surfaces have come in contact and if so deletes them, and (4) a momentum edit of the spalled regions.

As the stress of each zone is updated, the stress in that zone and the stress in the zone immediately preceding it are checked. If both zones are in tension, the zone mass weighted average of the tension in the two zones is

calculated and this result checked against the material strength attributed to the zone boundary between the two zones. If the tension exceeds the boundary strength, the material is considered to have fractured at that point and the strength of the boundary is set equal to 1.234 as a flag to mark the fracture during the rest of the program. These zone boundaries are then treated as left-hand free surfaces by the spall path in HYDRO when their position and velocity are updated. The right-hand free surface is also created at this time. Given the same initial position and velocity as the left-hand free surface (the position and velocity for the original zone boundary), this boundary is treated as a right-hand free surface in the spall loop. The spall locations are indexed consecutively from left to right for identification purposes and a check is made to update the index numbers for spall locations to the right of the new fracture. Upon establishing a spall location, the program provides an edit print giving the spall location, time of spall, the zone mass weighted average of the stress of the two zones involved, the strength at the zone boundary, and the total number of spalls existing at that time. A flag is also set which calls for a momentum edit at the completion of the HYDRO cycle.

The spall path in HYDRO keeps track of the free surfaces created by fracture, calculating the velocity and position of the two free surfaces at zones flagged by TSPALL(J)=1.234. As discussed above, the expression used to calculate boundary velocity as a function of stress and time is the same as that used to calculate the free surface velocity of the front and rear surfaces in PUFF 66.

When HYDRO updates the positions of the two free surfaces of a fracture in the spall loop, it checks to see if the surfaces have come together. If the free surfaces have come in contact during the time step, the program "combines" them. After combination the imaginary right-hand free surface is deleted and the spall strength of the boundary reset. Given a strength of zero, the interface may freely separate at a future time. Upon combination, the velocity of the zone boundary replacing the two free surfaces is calculated in such a way as to conserve momentum, and the initial position of the boundary is calculated as a ratio of the zone masses considering the relative positions of the free surfaces prior to combination. As with the creation of the free surfaces, any spall locations to the right of the one being combined must be re-indexed. An edit print provides zone number, position, and problem time at combination, and a flag is set so that the zone is not checked for spall during that cycle.

Before HYDRO is exited after completion of a cycle, a flag is checked to see if a fracture occurred during the cycle. If so, an edit print routine provides the momentum of all of the spalled regions. The momentum calculation uses the mass of the zone and the average velocity of the two corresponding zone boundaries.

3. REZONE

Some changes to the REZONE subroutine are necessary to keep track of TSPALL(J), both as a variable and as a flag marking fractured zones, during the combine and divide operations of the subroutine.

The divide section of REZONE includes these changes necessary to re-index TSPALL(J) to the right of the divided zone. The left half of the newly divided zone takes on the same value of TSPALL(J) as the zone to the left of it unless that zone is a spalled zone, in which case it assumes the value that the divided zone held originally. The right half of the divided zone keeps the value of TSPALL(J) held by the original zone. This is done to keep individual zone strength inputs from multiplying or spreading from their intended location during divide (i.e., a zero zone strength input at a material interface will remain as a value for only one zone).

In the combine loop of REZONE a check is made to see if either of the two zones to be combined, or if the zone immediately on the left and on the right of these two, is flagged as fractured zones. If so, that zone is bypassed and the next zone is checked. This is necessary to conserve momentum in the problem. The equations used to adjust the zonal parameters when combining two zones will not conserve momentum in the region of a free surface. The spall strength of the REZONE combined zone is the lesser of the two zones combined. Provision is also made to re-index the TSPALL(J) variable to the right of the combined zone.

4. EQUATION OF STATE

The only change required in the EQUATION OF STATE subroutine is the deletion of PMIN from the equation where it was previously used to limit the tension which a material could achieve. The equation

```
P1 = AMAX 1 (PMIN(M), (E1-TS1)*TS2*RHO(M))
```

was replaced by

```
P1 = (E1-TS1)*TS2*RHO(M))
```

5. EDIT

The changes to the EDIT subroutine involve the momentum calculation which sums all of the positive and all of the negative momentum in the problem. These calculations must be corrected in the case of fractured zones to account for the free surface velocities.

SECTION III

USE OF THE MODIFIED CODE

The fracture routine has many applications such as studying the effect on shock pulse profile and momentum transfer during fracture in materials and at material interfaces. It can be combined with a routine that calculates the temperature of materials caused by energy deposition to remove front surface vapor and melt, thereby significantly improving momentum calculations. Added to the plate slap version of PUFF, the fracture routine can be used to allow the flyer plate to rebound from the target giving a more realistic treatment of flyer plate experiments.

Use of the routine is quite straightforward, requiring only a strength parameter for each material in addition to the data already required by PUFF 66. Its function can be suppressed in any material by simply setting PMIN to zero for that material. Unless a large number of fractures occur, the execution time in HYDRO and the total problem execution time are not significantly affected by the routine.

Some problems with the REZONE subroutine can be encountered when using the fracture routine. When REZONE is used to adjust the zone mesh in the vicinity of a pressure pulse, the smaller zones in the problem will normally be found in the pressure pulse. These, then, are the zones that will constrain or control the size of the time step because the time step cannot exceed the shortest shock transit time found in any zone in the problem. As the pulse progresses and attenuates, REZONE allows the zone size under the pulse to increase, thereby letting the time step increase. This in turn allows the problem to reach completion in fewer cycles. If two zones that are adjacent or in close proximity should fracture, REZONE may not be able to adequately combine the zones between them, and will produce small zones that may control the time step for the rest of the problem, significantly increasing the number of cycles and thus the computer time required to complete the problem. This is especially true for front surface fracture where the initial zoning is normally quite fine. A similar problem can be encountered for a single fracture near the front surface, since, as discussed in Section II, REZONE is not allowed to combine zones in the immediate vicinity of a fracture to conserve momentum. If the zone size in the area of a fracture is small, these zones may then control the time step.

One possible approach to correcting the first problem is to artificially force the code to allow a certain number of zones or a certain distance between fracture locations. This, of course, will produce a corresponding loss in accuracy in fracture location. In the second case, the best solution is to modify the combine section of REZONE to allow momentum conservation while combining zones in the area of the fracture. Neither of these corrections has been incorporated into the present program.

A potential problem that should be kept in mind when using the fracture routine again concerns the REZONE subroutine. While REZONE provides a fine mesh, with correspondingly good resolution, for pressure pulses, it does not do this for tensile pulses. A tensile pulse in PUFF 66 often travels in an area where the zones are quite large, resulting in a loss of pulse resolution. Short of major reprogramming or replacement of REZONE, one correction for cases where this could be a problem is the use of uniform zoning throughout the problem. This is not satisfactory in many cases because of the increase in problem time.

The sample problem provided in Appendix II demonstrates the use of the fracture routine with its various options. The problem is a two-material problem similar to the sample problem used in the PUFF 66 technical report, run with the fracture modification. Material 1 was assigned a strength of 5×10^9 dynes/cm^2. This value is somewhat smaller in magnitude than the trailing tensile pulse at the front surface, thus providing an example of front surface fracture. The boundary between the two materials was given a strength of zero to demonstrate the option of assigning strength to individual zones, while for the second material PMIN was set to zero suppressing the fracture routine in that material. The normal PUFF output is listed with graphs of pressure versus distance at several problem times. The solid vertical straight lines in these plots indicate free surfaces while the dashed vertical line indicates a material interface. Only one free surface is marked for each fracture location. Starting with the second plot, the deviation of the sample problem run without spall is marked by a dashed line. Note that the material interface fractured before the 1.31-microsecond plot.

APPENDIX I

FORTRAN LISTING OF PUFF 66 WITH FRACTURE CAPABILITY

```
      PROGRAM PUFF 66(INPUT,OUTPUT,TAPE6,TAPE4)
C        PUFF 66                                                          P66  10
C                                                                         P66  20
      COMMON CS(801),D(801),E(801),P(801),Q(801),S(801),SD(801),U(801),YP66  30
     1U7(801),ZM(801),TSPALL(801),US(100)
C                                                                         P66  50
      COMMON AMU(6),CUSP1(6),CUSPA(6),CUSPC(6),CUSPD(6),CUSPG(6),CUSPS(6P66  60
     1),DISCPT(12),EQSTC(6),EQSTD(6),EQSTE(6),EQSTG(6),EQSTH(6),EQSTN(6)P66  70
     2,EQSTS(6),JBND(6),JEDIT(10),JORG(10),PMIN(6),RHO(6),SSTOP(5),SS(80P66  80
     31,5),START(5),TEDIT(25),X(801),YADD(6),YMU(6),Y0(6)                 P66  90
C                                                                         P66 100
      COMMON CKS,C0,C1,DTN,DTNH,IT,JCYCS,JFIN,JSMAX,JSMAXI,JRZL,JSTAR,JTP66 110
     1S,JZPUL,LINE,LOZHIZ,N,NJEDIT,NMTRLS,NPRIN,NREZON,NRZ,NSPEC,NTAPE,NP66 120
     2TEDT,PDTNEG,PDTPOS,SOURM,SK2M,SMAX,SSTOPM,TIME,TS,WTAPE             P66 130
C                                                                         P66 140
C        ZEROES COMMON                                                    P66 150
      DO 1 J=1,13037                                                      P66 160
1     CS(J)=0.                                                            P66 170
      CALL GENPAT                                                         P66 180
      N=1                                                                 P66 190
2     CALL HYDRO                                                          P66 200
C        STOP PARAMETERS                                                  P66 210
      IF (SMAX) 11,11,3                                                   P66 220
3     IF (TIME-TS) 4,8,8                                                  P66 230
4     IF (N-JCYCS) 5,8,8                                                  P66 240
5     IF (X(JSMAX)-CKS) 6,8,8                                             P66 250
6     IF (SENSE SWITCH 2) 7,12                                            P66 260
7     PRINT 39, N                                                         P66 270
8     WTAPE=1.                                                            P66 280
      CALL EDIT                                                           P66 290
      IF (NJEDIT) 9,10,9                                                  P66 300
9     END FILE 4                                                          P66 310
      REWIND 4                                                            P66 320
10    END FILE 6                                                          P66 330
      REWIND 6                                                            P66 340
      STOP                                                                P66 350
11    PRINT 38, N                                                         P66 360
      STOP                                                                P66 370
C        EDIT CONTROLS                                                    P66 380
12    IF (NJEDIT) 13,18,13                                                P66 390
13    JB=JEDIT(1)                                                         P66 400
      IF (S(JB+1)) 14,18,14                                               P66 410
14    DO 15 I=1,NJEDIT                                                    P66 420
      JB=JEDIT(I)                                                         P66 430
15    WRITE (4) JORG(I),JEDIT(I),S(JB+1),TIME,N                           P66 440
      JB=JB+1                                                             P66 450
      IF (S(JB)+Q(JB)) 16,18,17                                           P66 460
16    PDTNEG=PDTNEG+(S(JB)+Q(JB))*DTNH                                    P66 470
      GO TO 18                                                            P66 480
17    PDTPOS=PDTPOS+(S(JB)+Q(JB))*DTNH                                    P66 490
18    IF (MOD(N,NTAPE)) 20,19,20                                          P66 500
19    WTAPE=1.                                                            P66 510
      CALL EDIT                                                           P66 520
      GO TO 22                                                            P66 530
20    IF (MOD(N,NPRIN)) 22,21,22                                          P66 540
21    WTAPE=0.                                                            P66 550
      CALL EDIT                                                           P66 560
C        REZONE CONTROLS                                                  P66 570
22    IF (JZPUL) 26,26,23                                                 P66 580
23    IF (MOD(N,NREZON)) 26,24,26                                         P66 590
24    IF (JSMAX-JZPUL-JSMAXI) 26,26,25                                    P66 600
```

```
25    CALL REZONE                                                    P66 610
C        TIME STEP CALCULATION                                       P66 620
26    SK2M=AMIN1(.9/SK2M,1.2*DTNH)                                   P66 630
      IF (SSTOPM-TIME) 28,28,27                                      P66 640
27    SK2M=AMIN1(.01*SDURM,SK2M)                                     P66 650
28    DTN=DTNH                                                       P66 660
      DTNH=SK2M                                                      P66 670
C        TIME EDIT                                                   P66 680
      IF (NTEDT) 32,32,29                                            P66 690
29    WTAPE=1.                                                       P66 700
      CALL EDIT                                                      P66 710
      IT=IT+1                                                        P66 720
      IF (IT-26) 31,30,31                                            P66 730
30    IT=1                                                           P66 740
      TEDIT(1)=0.                                                    P66 750
31    NTEDT=0                                                        P66 760
32    IF (TEDIT(IT)) 35,35,33                                        P66 770
33    IF (TIME+DTNH-TEDIT(IT)) 35,34,34                              P66 780
34    DTNH=TEDIT(IT)-TIME                                            P66 790
      NTEDT=1                                                        P66 800
35    TIME=TIME+DTNH                                                 P66 810
      DTN=DTN+DTNH                                                   P66 820
      N=N+1                                                          P66 830
      IF (DTNH) 36,36,?                                              P66 840
36    PRINT 37, N                                                    P66 850
      STOP                                                           P66 860
C                                                                    P66 870
37    FORMAT (///,2X,15HDTNH=0 AT CYCLE,I5)                          P66 880
38    FORMAT (///,2X,15HSMAX=0 AT CYCLE,I5)                          P66 890
39    FORMAT (31H SENSE SWITCH 2 IS ON AT CYCLE I10)                 P66 900
      END                                                            P66 910
```

```
      SUBROUTINE HYDRO                                                  HYD  10
C                                                                       HYD  20
      COMMON CS(801),D(801),E(801),P(801),Q(801),S(801),SD(801),U(801),YHYD  30
     1Z(801),ZM(801),TSPALL(801),US(100)
C                                                                       HYD  50
      COMMON AMU(6),CUSP1(6),CUSPA(6),CUSPC(6),CUSPD(6),CUSPG(6),CUSPS(6HYD  60
     1),DISCPT(12),EQSTC(6),EQSTD(6),EQSTE(6),EQSTG(6),EQSTH(6),EQSTN(6)HYD  70
     2,EQSTS(6),JBND(6),JEDIT(10),JORG(10),PMIN(6),RHO(6),SSTOP(5),SS(80HYD  80
     31,5),START(5),TEDIT(25),X(801),YADD(6),YMU(6),Y0(6)               HYD  90
C                                                                       HYD 100
      COMMON CKS,C0,C1,DTN,DTNH,IT,JCYCS,JFIN,JSMAX,JSMAXI,JRZL,JSTAR,JTHYD 110
     1S,JZPUL,LINE,LOZHIZ,N,NJEDIT,NMTRLS,NPRIN,NREZON,NRZ,NSPEC,NTAPE,NHYD 120
     2TEDT,PDTNEG,PDTPOS,SDURM,SK2M,SMAX,SSTOPM,TIME,TS,WTAPE           HYD 130
C
      DIMENSION XS(100), SM(100)
C                                                                       HYD 140
      SDURM=SSTOPM                                                      HYD 150
      SK2M=0.                                                           HYD 160
      SMAX=0.                                                           HYD 170
      M=1                                                               HYD 180
      LL=1                                                              HYD 190
      MS=1
C        LEFT BOUNDARY CONDITIONS                                       HYD 200
      U(1)=U(1)-DTN*(S(2)+Q(2))/ZM(2)                                   HYD 210
      X(1)=X(1)+DTNH*U(1)                                               HYD 220
C        HYDRO ZONE LOOP                                                HYD 230
      DO 38 J=2,JFIN                                                    HYD 240
      DOLD=D(J)                                                         HYD 250
      QOLD=Q(J)                                                         HYD 260
      POLD=P(J)                                                         HYD 270
C        CHANGE MATERIAL INDEX AND ADD NEW ACTIVE ZONE                  HYD 280
      IF (J-JBND(M)) 2,1,2                                              HYD 290
1     LL=LL+1                                                           HYD 300
2     IF (J-1-JSTAR) 4,3,3                                              HYD 310
3     NWHAT=3                                                           HYD 320
      CALL SSCAL (NWHAT,EADD,J+1)                                       HYD 330
      E(J+1)=EADD                                                       HYD 340
      IF (E(J+1)) 5,4,5                                                 HYD 350
4     P(J+1)=0.                                                         HYD 360
      GO TO 8                                                           HYD 370
5     IF (D(J+1)) 6,6,7                                                 HYD 380
6     P(J+1)=0.                                                         HYD 390
      S(J+1)=0.                                                         HYD 400
      GO TO 8                                                           HYD 410
7     CALL EQST (E(J+1),D(J+1),P(J+1),LL)                               HYD 420
      S(J+1)=P(J+1)-SD(J+1)                                             HYD 430
C        CHECK FOR SPALLED ZONE
8     IF (TSPALL(J),EQ.1.234)GO TO 9
C        VELOCITY CALCULATION
      U(J)=U(J)-DTN*(S(J+1)+Q(J+1)-S(J)-Q(J))/(ZM(J)+ZM(J+1))
      IF (ABS(U(J)),LT.1.E-3)U(J)=0.0
      DU=U(J)-U(J-1)
C        COORDINATE CALCULATION
      X(J)=X(J)+DTNH*U(J)
C        DENSITY CALCULATION
      D(J)=ZM(J)/(X(J)-X(J-1))
      GO TO 10
C           SPALL PATH
C        VELOCITY CALCULATION
9     TSPALL=3
      U(J)=U(J)-DTN*(S(J+1)+Q(J+1))/ZM(J+1)
```

```
      US(MS)=US(MS)+DTN*(S(J)+Q(J))/ZM(J)
      IF (ABS(U(J)).LT.1.E-3)U(J)=0.0
      IF (ABS(US(MS)).LT.1.E-3)US(MS)=0.0
      DU=US(MS)-U(J-1)
C        COORDINATE CALCULATION
      X(J)=X(J)+DTNH*U(J)
      XS(MS)=XS(MS)+DTNH*US(MS)
C        DENSITY CALCULATION
      D(J)=ZM(J)/(XS(MS)-X(J-1))
C        CHECK FOR COMBINE
      IF (XS(MS).LT.X(J)) GO TO 10
      U(J)=(U(J)*ZM(J+1)+US(MS)*ZM(J))/(ZM(J+1)+ZM(J))
      X(J)=X(J)+(XS(MS)-X(J))*ZM(J+1)/(ZM(J)+ZM(J+1))
      DU=U(J)-U(J-1)
      D(J)=ZM(J)/(X(J)-X(J-1))
      ISM=ISM-1
      IF (MS-1.EQ.ISM) GO TO 140
      DO 130 II=MS,ISM
      XS(II)=XS(II+1)
130   US(II)=US(II+1)
140   TSPALL(J)=0.0
      ISPALL=1
      XS(ISM+1)=0.0
      US(ISM+1)=0.0
      PRINT 66, J,X(J),N,TIME
      LINE=LINE+2
      IF (LINE.LE.50) GO TO 10
      PRINT 69
      LINE=0
10    IF (D(J).LT.0.0) PRINT 68, J,MS,N,XS(MS),X(J),X(J-1)
      DAVG=(D(J)+DOLD)/2.                                          HYD 530
      DV=DTNH*DU/ZM(J)                                             HYD 540
      IF (DU*1.) 11,12,12                                          HYD 550
C        ARTIFICIAL VISCOSITY CALCULATION                          HYD 560
11    Q(J)=(DU*C0*C0-C1*CS(J))*DU*DAVG                             HYD 570
      IF (Q(J)-1.E5) 12,13,13                                      HYD 580
12    Q(J)=0.                                                      HYD 590
      DU=0.                                                        HYD 600
      CS(J)=0.                                                     HYD 610
C        ENERGY ADDITION FROM DEPOSITION                           HYD 620
13    IF (TIME-DTNH-SSTOPM) 14,14,15                               HYD 630
14    NMAT=1                                                       HYD 640
      CALL SSCAL (NMAT,EADD,J)                                     HYD 650
      E(J)=E(J)+EADD                                               HYD 660
C        STRESS - STRAIN CALCULATION                               HYD 670
15    VELS=DV*DAVG                                                 HYD 680
      SD(J)=SD(J)+4./3.*AMU(M)*VELS                                HYD 690
      VMC=3./2.*SD(J)*SD(J)                                        HYD 700
      EMU=D(J)/RHO(M)-1.                                           HYD 710
      IF (VMC-2./3.*Y0Z(J)*Y0Z(J)) 18,18,16                        HYD 720
16    Y0Z(J)=Y07(J)+YADD(M)*ABS(DV)*D(J)*DOLD/RHO(M)/(.2-YMU(M))   HYD 730
      IF (VMC-2./3.*Y0Z(J)*Y0Z(J)) 18,18,17                        HYD 740
17    SD(J)=SD(J)*Y07(J)*SQRT(2./(3.*VMC))                         HYD 750
18    CONTINUE                                                     HYD 760
      IF (EMU) 19,21,21                                            HYD 770
19    IF (E(J)-EQSTE(M)) 21,21,20                                  HYD 780
20    SD(J)=0.                                                     HYD 790
21    DISTE=SD(J)*VELS/DAVG                                        HYD 800
      E(J)=E(J)+DISTE                                              HYD 810
C        P - E INTERPOLATION SCHEME                                HYD 820
      IF (P(J)) 22,23,22                                           HYD 830
22    CALL EQST (E(J),D(J),P2,M)                                   HYD 840
```

```
      E1=E(J)-P(J)*DV                                                    HYD 850
      CALL EOST (E1,D(J),P1,M)                                           HYD 860
      E(J)=E(J)-(P2+P(J)+Q(J)+QOLD)*DV/(2.-(P1-P2)/P(J))                 HYD 870
23    CALL EOST (E(J),D(J),P(J),M)                                       HYD 880
      S(J)=P(J)-SD(J)                                                    HYD 890
C        CHECK FOR FRACTURE
      JS=J-1
      IF (S(J).GE.0..0.S(JS).GE.0.)GO TO 41
      IF (TSPALL(J).EQ.1.234.0.TSPALL(J).EQ.0.0)GO TO 41
      IF (ISPALL.NE.0.0.TSPALL(JS).EQ.1.234)GO TO 41
      SJ=(S(J)*ZM(J)+S(JS)*ZM(JS))/(ZM(J)+ZM(JS))
      IF (TSPALL(JS)+SJ.GE.0.0)GO TO 41
      IF (MS.LE.99) GO TO 380
      PRINT 70
      STOP
380   ISM=ISM+1
      II=ISM
      PRINT 65,JS,X(JS),N,TIME,SJ,TSPALL(JS),ISM
      TSPALL(JS)=1.234
      IS=1
      LINE=LINE+3
      IF (LINE.LT.50) GO TO 40
      PRINT 69
      LINE=0
      GO TO 40
390   XS(II)=XS(II-1)
      US(II)=US(II-1)
      II=II-1
40    IF (II.GT.MS) GO TO 390
      XS(MS)=X(JS)
      US(MS)=U(JS)
      ISPALL=2
C        SMAX CALCULATION
41    IF (S(J)-SMAX) 25,25,24
24    SMAX=S(J)                                                          HYD 920
      JSMAX=J                                                            HYD 930
C        SOUND SPEED CALCULATION                                         HYD 940
25    IF (DV) 27,26,26                                                   HYD 950
26    DFUDG=1.001*D(J)                                                   HYD 960
      GO TO 28                                                           HYD 970
27    DFUDG=.999*D(J)                                                    HYD 980
28    CALL EOST (E(J),DFUDG,PFUDG,M)                                     HYD 990
      DPDRHO=(PFUDG-P(J))/(DFUDG-D(J))                                   HYD1000
      IF (DPDRHO) 29,29,30                                               HYD1010
29    CS(J)=0.                                                           HYD1020
      GO TO 31                                                           HYD1030
30    CS(J)=SQRT(DPDRHO)                                                 HYD1040
31    SK2M1=(CS(J)+2.*C1*CS(J)-4.*C0*C0*DU)/(X(J)-X(J-1))                HYD1050
      IF (TSPALL(J).EQ.1.234) SK2M1=(CS(J)+2.*C1*CS(J)-4.*C0*C0*DU)/(XS(
     1MS)-X(J-1))
      IF (SK2M-SK2M1) 32,32,33                                           HYD1060
32    SK2M=SK2M1                                                         HYD1070
      JTS=J                                                              HYD1080
33    M=LL                                                               HYD1090
      IF (ISPALL.GE.2) MS=MS+1
      ISPALL=0
C        END OF CYCLE CHECKS                                             HYD1100
      IF (U(J)) 38,34,38                                                 HYD1110
34    IF (N-1) 35,35,36                                                  HYD1120
35    JSMAX=JSMAX+10                                                     HYD1130
      IF (LOOMIT) 36,37,36                                               HYD1140
C        JSTAR CALCULATION                                               HYD1150
```

```
36    IF (J-JSTAR) 38,36,37                                          HYD1160
37    JSTAR=J-1                                                      HYD1170
      GO TO 39                                                       HYD1180
38    CONTINUE                                                       HYD1190
      JSTAR=JFIN-1                                                   HYD1200
39    IF (IS.LE.0) RETURN
C        SPALL MOMENTUM CALCULATION
      IS=0
      I=0
      MS=1
      SMM=0
      DO 63 J=2,JFIN
      IF (TSPALL(J).EQ.1.234) GO TO 60
      SMM=SMM+ZM(J)*(U(J)+U(J-1))/2
      IF (J.EQ.JFIN) GO TO 62
      GO TO 63
60    SMM=SMM+ZM(J)*(US(MS)+U(J-1))/2
      MS=MS+1
62    I=I+1
      SM(I)=SMM
      SMM=0.0
63    CONTINUE
      PRINT 67, (SM(J),J=1,I)
      I=I/8
      LINE=LINE+I+3
      IF (LINE.LE.50) GO TO 64
      PRINT 69
      LINE=0
64    RETURN
C
C
65    FORMAT (/*  *** SPALL OCCURED AT ZONE*I4* LOCATION*E12.4* CM AT CY
     1CLE*I4* TIME=*E11.4* SEC   SJ =*E11.4* TSPALL(J)=*E11.4,/,9X*TOTAL
     2 NO OF FRACTURES IS*I3)
66    FORMAT (/*  $$$ COMBINED ZONE*I4* LOCATION*E12.4* CM  AT CYCLE*I4*
     1 TIME=*E11.4* SEC*)
67    FORMAT (/* MOMENTUM AFTER FRACTURE*/(8E14.4))
68    FORMAT (*  NEGATIVE DENSITY ZONE*I4*  MS=*I3*  CYCLE NO*I4,/,*  XS
     1(MS)=*E14.4*  X(J)=*E14.4*  X(J-1)=*E14.4)
69    FORMAT (1H1)
70    FORMAT (/*   PROGRAM HAS REACHED THE NO OF SPALLS DIMENSIONED*)
      END                                                            HYD1220-
```

```
      SUBROUTINE GENRAT                                                 GEN  10
C                                                                       GEN  20
      COMMON CS(801),D(801),E(801),P(801),Q(801),S(801),SD(801),U(801),YGEN  30
     1OZ(801),ZM(801),TSPALL(801),US(100)
C                                                                       GEN  50
      COMMON AMU(6),CUSP1(6),CUSPA(6),CUSPC(6),CUSPD(6),CUSPB(6),CUSPS(6GEN  60
     1),DISCPT(12),EQSTC(6),EQSTD(6),EQSTE(6),EQSTB(6),EQSTH(6),EQSTN(6)GEN  70
     2,EQSTS(6),JBND(6),JEDIT(10),JORB(10),PMIN(6),RHO(6),SSTOP(5),SS(80GEN  80
     31,5),START(5),TEDIT(25),X(801),YADD(6),YMU(6),Y0(6)               GEN  90
                                                                        GEN 100
C                                                                       GEN 110
      COMMON CKS,C0,C1,DTN,DTNH,IT,JCYCS,JFIN,JSMAX,JSMAXI,JRZL,JSTAR,JTGEN 110
     1S,JZPUL,LINE,LOZHIZ,N,NJEDIT,NMTRLS,NPRIN,NREZON,NRZ,NSPEC,NTAPE,NGEN 120
     2TEDT,PDTNEG,PDTPOS,SDURM,SK2M,SMAX,SSTOPM,TIME,TS,WTAPE           GEN 130
                                                                        GEN 140
C                                                                       GEN 150
      DIMENSION MATL(6), NOE(6), NZ(20), RZ(20), T(10), TBL(109)        GEN 160
C                                                                       GEN 170
      DIMENSION AA(6,20), AC(10,109,6), B(6,20), EDGE(6,20), EE(10), EI(GEN 180
     110,109)
C
      DIMENSION MSPALL(6),RSPALL(6),TTSPAL(6)
                                                                        GEN 190
C                                                                       GEN 200
      EQUIVALENCE (CS,AA), (CS(121),AC), (CS(6661),B), (CS(6781),EDGE), GEN 210
     1(CS(6901),EE), (CS(6911),EI)
C                                                                       GEN 220
C                                                                       GEN 230
C        READ ALL NON-ENERGY SOURCE DEPENDENT DATA                      GEN 240
1     READ 67, (DISCPT(I),I=1,12)
      READ 68, NSPEC,NTEDT,NJEDIT,LOZHIZ,NSPAL
      IF (NTEDT) 3,3,2                                                  GEN 260
2     READ 69, (TEDIT(I),I=1,NTEDT)                                     GEN 270
3     IF (NJEDIT) 5,5,4                                                 GEN 280
4     READ 68, (JEDIT(I),I=1,NJEDIT)                                    GEN 290
5     IF (NSPAL.GT.0)READ 680, (MSPALL(I),RSPALL(I),TTSPAL(I),I=1,NSPAL)
      READ 68, NRZC,NMTRLS,JRZL,JZPUL,NPRIN,NTAPE,NREZON,JCYCS
      READ 69, CKS,TS,ANGLE                                             GEN 310
      NMT=NMTRLS=1                                                      GEN 320
      READ 68, (NOE(M),M=1,NMTRLS)                                      GEN 330
      IF (NMT) 7,7,6                                                    GEN 340
6     READ 68, (JBND(M),M=1,NMT)                                        GEN 350
7     READ 68, JFIN,(NZ(L),L=1,NRZC)                                    GEN 360
      READ 69, DX,TIME,(RZ(M),M=1,NRZC)                                 GEN 370
      DX=DX/RZ(1)                                                       GEN 380
      DO 8 M=1,NMTRLS                                                   GEN 390
      READ 67, MATL(M)                                                  GEN 400
      READ 69, RHO(M),EQSTC(M),EQSTD(M),EQSTE(M),EQSTB(M),EQSTH(M),EQSTSGEN 410
     1(M),PMIN(M)                                                       GEN 420
      READ 69, CUSP1(M),CUSPA(M),CUSPC(M),CUSPD(M),CUSPB(M),CUSPS(M)    GEN 430
      READ 69, Y0(M),AMU(M),YADD(M),YMU(M)                              GEN 440
      EQSTN(M)=EQSTC(M)/EQSTB(M)/(EQSTE(M)*RHO(M))                      GEN 450
      NOED=NOE(M)                                                       GEN 460
8     READ 69, (AA(M,I),B(M,I),EDGE(M,I),I=1,NOED)                      GEN 470
C        CALCULATE ZONING                                               GEN 480
      LZ=1                                                              GEN 490
      DO 11 J=2,JFIN                                                    GEN 500
      IF (J-NZ(LZ)) 10,10,9                                             GEN 510
9     LZ=LZ+1                                                           GEN 520
10    DX=DX*RZ(LZ)                                                      GEN 530
11    X(J)=X(J-1)+DX                                                    GEN 540
C        PRINT ALL NON-ENERGY SOURCE DEPENDENT DATA                     GEN 550
      PRINT 86                                                          GEN 560
      PRINT 67, (DISCPT(K),K=1,12)                                      GEN 570
      PRINT 71                                                          GEN 580
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      PRINT 73, NRZC,NMTRLS,JRZL,JZPUL,NPRIN,NTAPE,LOZHIZ,JFIN,JCYCS,NREGEN 590
     1ZON                                                                GEN 600
      PRINT 78, ANGLE,TIME,CKS,TS                                        GEN 610
      PRINT 74                                                           GEN 620
      PRINT 75, (RZ(I),NZ(I),I=1,NRZC)                                   GEN 630
      IF (NJEDIT) 13,13,12                                               GEN 640
12    PRINT 88, (JEDIT(I),I=1,NJEDIT)                                    GEN 650
      WRITE (4) (DISCPT(I),I=1,12),NJEDIT                                GEN 660
13    IF (NTEDT) 14,15,14                                                GEN 670
14    PRINT 87, (TEDIT(I),I=1,NTEDT)                                     GEN 680
15    JR1=1                                                              GEN 690
      DO 19 M=1,NMTRLS                                                   GEN 700
      IF (JBND(M)) 17,16,17                                              GEN 710
16    JR2=JFIN                                                           GEN 720
      GO TO 18                                                           GEN 730
17    JR2=JBND(M)                                                        GEN 740
18    THKNS=X(JR2)-X(JR1)                                                GEN 750
      PRINT 79, MATL(M),RHO(M),JR1,JR2,THKNS                             GEN 760
      JR1=JR2                                                            GEN 770
      PRINT 80, EQSTC(M),EQSTD(M),EQSTE(M),EQSTG(M),EQSTH(M),EQSTS(M),EQGEN 780
     1STN(M),PMIN(M)                                                     GEN 790
      PRINT 81, CUSP1(M),CUSPA(M),CUSPC(M),CUSPD(M),CUSPG(M),CUSPS(M)    GEN 800
      PRINT 82, Y0(M),AMU(M),YADD(M),YMU(M)                              GEN 810
      NOED=NOE(M)                                                        GEN 820
      PRINT 83, NOED,(AA(M,I),B(M,I),EDGE(M,I),I=1,NOED)                 GEN 830
19    CONTINUE                                                           GEN 840
      PRINT 86                                                           GEN 850
C                                                                        GEN 860
C                                                                        GEN 870
C        MULTI-ENERGY SOURCE CALCULATIONS                                GEN 880
C                                                                        GEN 890
C                                                                        GEN 900
      ANGLE=COS(ANGLE/57.2957795)                                        GEN 910
      DO 49 NS=1,NSPEC                                                   GEN 920
C        READ ENERGY SOURCE DATA                                         GEN 930
      READ 68, NHNU,NBR                                                  GEN 940
      READ 69, START(NS),SSTOP(NS),(T(KK),EE(KK),KK=1,NBB)               GEN 950
      SSTOPM=AMAX1(SSTOPM,SSTOP(NS))                                     GEN 960
C                                                                        GEN 970
C        CALCULATE ABSORPTION COEFFICIENTS                               GEN 980
C                                                                        GEN 990
      IF (NHNU) 20,26,20                                                 GEN1000
C        FOR ARBITRARY SPECTRUM                                          GEN1010
20    READ 70, (TBL(I),EI(1,I),I=1,NHNU)                                 GEN1020
      DO 24 M=1,NMTRLS                                                   GEN1030
      K=1                                                                GEN1040
      DO 24 I=1,NHNU                                                     GEN1050
21    IF (EDGE(M,K)-TBL(I)) 22,23,23                                     GEN1060
22    K=K+1                                                              GEN1070
      GO TO 21                                                           GEN1080
23    AC(1,I,M)=-RHO(M)*AA(M,K)*(TBL(I)**B(M,K))/ANGLE                   GEN1090
24    CONTINUE                                                           GEN1100
      EITOT=0.                                                           GEN1110
      DO 25 II=1,NHNU                                                    GEN1120
      EI(1,II)=EI(1,II)*ANGLE                                            GEN1130
25    EITOT=EITOT+EI(1,II)                                               GEN1140
      GO TO 34                                                           GEN1150
C        FOR BLACK BODY SPECTRUM                                         GEN1160
26    READ 69, (TBL(I),I=1,109)                                          GEN1170
      EITOT=0.                                                           GEN1180
      DO 30 M=1,NMTRLS                                                   GEN1190
      DO 30 L=1,NBB                                                      GEN1200
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      K=1                                                                GEN1210
      DO 30 I=1,109                                                      GEN1220
27    IF (EDGE(M,K)-TBL(I))*T(L)) 28,29,29                               GEN1230
28    K=K+1                                                              GEN1240
      GO TO 27                                                           GEN1250
29    AC(L,I,M)=-RHO(M)*AA(M,K)*(TBL(I)*T(L))**B(M,K)/ANGLE              GEN1260
30    CONTINUE                                                           GEN1270
      DO 33 L=1,NBB                                                      GEN1280
      EE(L)=EE(L)*ANGLE                                                  GEN1290
      DO 33 I=1,109                                                      GEN1300
      IF (I-99) 31,31,32                                                 GEN1310
31    EI(L,I)=EE(L)*.01                                                  GEN1320
      GO TO 33                                                           GEN1330
32    EI(L,I)=EE(L)*.001                                                 GEN1340
33    CONTINUE                                                           GEN1350
C                                                                        GEN1360
C        CALCULATE ENERGY DEPOSITION                                     GEN1370
C                                                                        GEN1380
34    M=1                                                                GEN1390
      DO 44 J=2,JFIN                                                     GEN1400
      ESUM=0.                                                            GEN1410
      IF (J-1-JBND(M)) 36,35,36                                          GEN1420
35    M=M+1                                                              GEN1430
36    IF (NHNU) 37,40,37                                                 GEN1440
C        FOR ARBITRARY SPECTRUM                                          GEN1450
37    DO 39 I=1,NHNU                                                     GEN1460
      IF (EI(1,I)-1.E-20) 39,38,38                                       GEN1470
38    EIZ=EI(1,I)*(1.-EXP(AC(1,I,M)*(X(J)-X(J-1))))                      GEN1480
      EI(1,I)=EI(1,I)-EIZ                                                GEN1490
      ESUM=ESUM+EIZ                                                      GEN1500
39    CONTINUE                                                           GEN1510
      GO TO 43                                                           GEN1520
C        FOR BLACK BODY SPECTRUM                                         GEN1530
40    DO 42 L=1,NBB                                                      GEN1540
      DO 42 I=1,109                                                      GEN1550
      IF (EI(L,I)-1.E-20) 42,41,41                                       GEN1560
41    EIZ=EI(L,I)*(1.-EXP(AC(L,I,M)*(X(J)-X(J-1))))                      GEN1570
      EI(L,I)=EI(L,I)-EIZ                                                GEN1580
      ESUM=ESUM+EIZ                                                      GEN1590
42    CONTINUE                                                           GEN1600
43    SS(J,NS)=ESUM*4.186E7/RHO(M)/(X(J)-X(J-1))/(SSTOP(NS)-START(NS))   GEN1610
      IF (SS(J,NS)-1.E12/RHO(M)) 45,44,44                                GEN1620
44    CONTINUE                                                           GEN1630
C        ENERGY INPUT EDIT                                               GEN1640
45    IF (NHNU) 47,46,47                                                 GEN1650
46    PRINT 72, (TBL(I),I=1,109)                                         GEN1660
      GO TO 48                                                           GEN1670
47    PRINT 72, (TBL(I),I=1,NHNU)                                        GEN1680
48    PRINT 90                                                           GEN1690
      PRINT 89, EITOT,NBR,START(NS),SSTOP(NS)                            GEN1700
      PRINT 76                                                           GEN1710
      PRINT 77, (T(I),EE(I),I=1,NBB)                                     GEN1720
      PRINT 90                                                           GEN1730
49    CONTINUE                                                           GEN1740
C                                                                        GEN1750
C        CLEAR STORAGE FOR HYDRO                                         GEN1760
C                                                                        GEN1770
      DO 50 I=1,8010                                                     GEN1780
50    CS(I)=0.                                                           GEN1790
C        INITIALIZE COUNTERS AND CONSTANTS                               GEN1800
      NRZ=50                                                             GEN1810
      C0=1.8                                                             GEN1820
```

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      C1=.25                                                          GEN1830
      IT=1                                                            GEN1840
      NTEDT=0                                                         GEN1850
      LINE=0                                                          GEN1860
      PDTPOS=0.                                                       GEN1870
      PDTNEG=0.                                                       GEN1880
      DTN=TIME                                                        GEN1890
      DTNH=TIME                                                       GEN1900
      IF (NJEDIT) 53,53,51                                            GEN1910
51    DO 52 I=1,NJEDIT                                                GEN1920
52    JORG(I)=JEDIT(I)                                                GEN1930
53    CONTINUE                                                        GEN1940
C        INITIALIZE ZONE VARIABLES                                    GEN1950
      M=1                                                             GEN1960
      DO 55 J=2,JFIN                                                  GEN1970
      YOZ(J)=YO(M)                                                    GEN1980
      O(J)=RHO(M)                                                     GEN1990
      ZM(J)=(X(J)-X(J-1))*O(J)                                        GEN2000
      TSPALL(J)=-PMIN(M)
      IF (PMIN(M).EQ.0.0) TSPALL(J)=1.E+15
      IF (J-JBND(M)) 55,54,55                                         GEN2010
54    M=M+1                                                           GEN2020
55    CONTINUE                                                        GEN2030
C
C        TSPALL(J) INPUT
C
      IF (NSPAL.LE.0) GO TO 910
      DO 900 I=1,NSPAL
      M=MSPALL(I)
      K2=JBND(M)
      IF (K2.EQ.0)K2=JFIN
      IF (M.GT.1) GO TO 850
      K=1
      GO TO 860
850   K=JBND(M-1)
860   THKS=X(K)+(X(K2)  -X(K))*RSPALL(I)
      IF (RSPALL(I).GT.0.) GO TO 870
      J=K+1
      GO TO 890
870   DO 880 J=K,JFIN
      IF (X(J).GE.THKS) GO TO 890
880   CONTINUE
890   MSPALL(I)=J
900   TSPALL(J)=-TTSPAL(I)
      PRINT 164, (I,MSPALL(I),TTSPAL(I),I=1,NSPALL)
910   CONTINUE
C
C        DEPOSITION EDIT                                              GEN2040
C                                                                     GEN2050
      PRINT 84, (DISCPT(I),I=1,12)                                    GEN2060
      M=1                                                             GEN2070
      SUMCAL=0.                                                       GEN2080
      DO 64 J=2,JFIN                                                  GEN2090
      EPS=0.                                                          GEN2100
      DO 56 I=1,NSPEC                                                 GEN2110
56    EPS=SS(J,I)*(SSTOP(I)-START(I))+EPS                             GEN2120
      IF (J-(JBND(M)+1)) 58,57,58                                     GEN2130
57    M=M+1                                                           GEN2140
58    IF (EPS*EQSTG(M)-1.E7) 59,59,61                                 GEN2150
59    IF (JSTAR) 60,60,61                                             GEN2160
60    JSTAR=J                                                         GEN2170
61    DX=X(J)-X(J-1)                                                  GEN2180
                                                                      GEN2190
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      ERGPA=EPG*RHO(M)*DX                                                   GEN2200
      CALPA=ERGPA*1.E-7/4.186                                               GEN2210
      SUMCAL=SUMCAL+CALPA                                                   GEN2220
      PRINT 85, J,DX,X(J),ERGPA,CALPA,SUMCAL,EPG,YOZ(J),ZM(J),J             GEN2230
      IF (MOD(J,50)) 64,62,64                                               GEN2240
62    IF (J-JFIN) 63,64,64                                                  GEN2250
63    PRINT 84, (DISCPT(I),I=1,12)                                          GEN2260
64    CONTINUE                                                              GEN2270
      IF (JSTAR) 65,65,66                                                   GEN2280
65    JSTAR=JFIN                                                            GEN2290
66    PRINT 86                                                              GEN2300
      RETURN                                                                GEN2310
C                                                                           GEN2320
67    FORMAT (12A6)                                                         GEN2330
68    FORMAT (8I10)                                                         GEN2340
69    FORMAT (8E10.3)                                                       GEN2350
70    FORMAT (2E15.7)                                                       GEN2360
71    FORMAT (46H ***** THIS PROBLEM WAS RUN WITH PUFF 66 *****,/)          GEN2370
72    FORMAT (13H TABLE VALUES/(10E10.3,/))                                 GEN2380
73    FORMAT (/,6X,4HNRZC,4X,6HNMTRLS,6X,4HJRZL,5X,5HJZPUL,5X,5HNPRIN5X,GEN2390
     15HNTAPE,4X,6HLOZHIZ,6X,4HJFIN,5X,5HJCYCS,4X,6HNREZON,/,10I10)         GEN2400
74    FORMAT (/12H ZONING USED/)                                            GEN2410
75    FORMAT (3X,6H RATIOE10.3,8H TO ZONEI4)                                GEN2420
76    FORMAT (/17H BLACK BODY INPUT/)                                       GEN2430
77    FORMAT (12H TEMPERATURE5X,7H ENERGY/,10(2E12.3,/))                    GEN2440
78    FORMAT (/,5X,5HANGLE,6X,4HTIME,7X,3HCKS,8X,2HTS,/4E10.3)              GEN2450
79    FORMAT (25HOMATERIAL PROPERTIES FOR A8,5X,4HRHO=E10.3,5X,7HFROM J=GEN2460
     1I4,1X,5HTO J=I4,5X,11HTHICKNESS =E10.3)                              GEN2470
80    FORMAT (/,10X,5HEQSTC10X,5HEQSTD10X,5HEQSTE10X,5HEQSTG10X,5HEQSTH1GEN2480
     10X,5HEQSTS10X,5HEQSTN11X,4HPMIN/8E15.5)                              GEN2490
81    FORMAT (/,10X,5HCUSP110X,5HCUSPA10X,5HCUSPC10X,5HCUSPD10X,5HCUSPG1GEN2500
     10X,5HCUSPS/8E15.5)                                                   GEN2510
82    FORMAT (/,13X,2HY0,12X,3HAMU,11X,4HYADD,12X,3HYMU,/,4E15.5)           GEN2520
83    FORMAT (//,6H NOE =I3,19X,2HAA14X,1HB11X,4HEDGE/,20(15X,3E15.5/))     GEN2530
84    FORMAT (1H1,12A6,/5HO  J 6X,2HDX13X,1HX11X,4HERGS10X,3HCAL10X,7HSUGEN2540
     1M CAL7X,7HERGS/GM9X,3HYOZ,8X,9HZONE MASS4X,1HJ//)                    GEN2550
85    FORMAT (1H I3,8E14.5,I4)                                              GEN2560
86    FORMAT (1H1)                                                          GEN2570
87    FORMAT (/15H THE TEDITS ARE/(10E10.3/))                               GEN2580
88    FORMAT (/15H THE JEDITS ARE/10I10/)                                   GEN2590
89    FORMAT (5X,5HEITOT,7X,3HNBB,5X,5HSTART,5X,5HSSTOP,/,E10.3,I10,2E10GEN2600
     1.3)                                                                  GEN2610
90    FORMAT (//)                                                           GEN2620
680   FORMAT (I10,2E10.3)
164   FORMAT (* SPALL STRENGTH OF INDIVIDUAL ZONES*//(5(I4*.  TSPALL(*I3
     1*)=*E10.3)))
      END                                                                   GEN2630-
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      SUBROUTINE REZONE                                                  REZ  10
C                                                                        REZ  20
      COMMON CS(801),D(801),E(801),P(801),Q(801),S(801),SD(801),U(801),YREZ  30
     1D7(801),Z7M(801),TSPALL(801),US(100)
C                                                                        REZ  50
      COMMON AMU(6),CUSP1(6),CUSPA(6),CUSPC(6),CUSPD(6),CUSPG(6),CUSPS(6REZ  60
     1),DISCPT(12),EQSTC(6),EQSTD(6),EQSTE(6),EQSTG(6),EQSTH(6),EQSTN(6)REZ  70
     2,EQSTS(6),JBND(6),JEDIT(10),JORG(10),PMIN(6),RHO(6),SSTOP(5),SS(80REZ  80
     31,5),START(5),TEDIT(25),X(801),YADD(6),YMU(6),Y0(6)                REZ  90
C                                                                        REZ 100
      COMMON CKS,C0,C1,DTN,DTNH,IT,JCYCS,JFIN,JSMAX,JSMAXI,JRZL,JSTAR,JTREZ 110
     1S,JZPUL,LINE,LOZMIZ,N,NJEDIT,NMTRLS,NPRIN,NREZON,NRZ,NSPEC,NTAPE,NREZ 120
     2TEDT,PDTNFG,PDTPOS,SDURM,SK2M,SMAX,SSTOPM,TIME,TS,WTAPE             REZ 130
C                                                                        REZ 140
      DIMENSION SSL(5), SSR(5)                                           REZ 150
C                                                                        REZ 160
C        REZONE AHEAD OF MAX STRESS                                      REZ 170
C                                                                        REZ 180
C        DETERMINATION OF PULSE TO BE USED IN DIVIDE ROUTINE             REZ 190
      SSMAX=SMAX                                                         REZ 200
      SJSMAX=JSMAX                                                       REZ 210
      IF (X(JSMAX)-XOSM) 1,7,7                                           REZ 220
1     DO 2 J=JSMAX,JSTAR                                                 REZ 230
      IF (S(J)-.5*SMAX) 3,2,2                                            REZ 240
2     CONTINUE                                                           REZ 250
      GO TO 7                                                            REZ 260
3     RSMAX=0.                                                           REZ 270
      DO 5 JJ=J,JSTAR                                                    REZ 280
      IF (RSMAX-S(JJ)) 4,4,5                                             REZ 290
4     RSMAX=S(JJ)                                                        REZ 300
      JRSMAX=JJ                                                          REZ 310
5     CONTINUE                                                           REZ 320
      IF (RSMAX-.5*SMAX) 7,6,6                                           REZ 330
6     SMAX=RSMAX                                                         REZ 340
      JSMAX=JRSMAX                                                       REZ 350
7     XOSM=X(JSMAX)                                                      REZ 360
C        MOMENTUM CALCULATION                                            REZ 370
      JSMAXI=0                                                           REZ 380
      NZDIVD=0                                                           REZ 390
      N7COMB=0                                                           REZ 400
      EMVPP=0.                                                           REZ 410
      J=JSMAX                                                            REZ 420
8     J=J-1                                                              REZ 430
      IF (U(J)) 10,9,9                                                   REZ 440
9     EMVPP=EMVPP+U(J)*.5*(ZM(J+1)+ZM(J))                                REZ 450
      IF (J-1) 10,10,8                                                   REZ 460
10    J=JSMAX-1                                                          REZ 470
11    J=J+1                                                              REZ 480
      IF (U(J)) 13,13,12                                                 REZ 490
12    EMVPP=EMVPP+U(J)*.5*(ZM(J+1)+ZM(J))                                REZ 500
      IF (J-JSTAR) 11,11,13                                              REZ 510
13    DTPP=EMVPP/SMAX                                                    REZ 520
      IF (DTPP) 14,14,15                                                 REZ 530
14    SMAX=SSMAX                                                         REZ 540
      JSMAX=SJSMAX                                                       REZ 550
      GO TO 120                                                          REZ 560
15    CONTINUE                                                           REZ 570
C        CALCULATE OPTIMUM ZONE SIZE FOR DIVIDE                          REZ 580
      R7DX=2.*DTPP*CS(JSMAX)/FLOAT(JZPUL)                                REZ 590
      J=JSMAX                                                            REZ 600
C        DIVIDE ENTRY CHECKS                                             REZ 610
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      IF (JSMAX+50-JAHEAD) 16,17,17                                    REZ 620
16    JDIV=50                                                          REZ 630
      GO TO 18                                                         REZ 640
17    JDIV=75                                                          REZ 650
      JAHEAD=JSMAX+75                                                  REZ 660
18    J=J+1                                                            REZ 670
      IF (J+1-JFIN) 19,58,58                                           REZ 680
19    IF (X(J)-X(J-1)-RZDX) 20,20,21                                   REZ 690
20    IF (J-JSMAX-JDIV) 18,58,58                                       REZ 700
21    JFINO=JFIN                                                       REZ 710
      JBNDCK=0                                                         REZ 720
      DO 23 M=1,NMTRLS                                                 REZ 730
      IF (J-1-JBND(M)) 24,22,23                                        REZ 740
22    JBNDCK=M                                                         REZ 750
23    CONTINUE                                                         REZ 760
      M=NMTRLS                                                         REZ 770
C        DIVIDE LOOP                                                   REZ 780
24    IF (JBNDCK) 25,25,27                                             REZ 790
25    RZR=(.5*(X(J-1)+X(J))-X(J-2))/(X(J)-X(J-2))                      REZ 800
      EL=E(J-1)+RZR*(E(J)-E(J-1))                                      REZ 810
      SDL=SD(J-1)+RZR*(SD(J)-SD(J-1))                                  REZ 820
      YOZL=YOZ(J-1)+RZR*(YOZ(J)-YOZ(J-1))                              REZ 830
      DL=D(J-1)+RZR*(D(J)-D(J-1))                                      REZ 840
      DO 26 I=1,NSPEC                                                  REZ 850
26    SSL(I)=SS(J-1,I)+RZR*(SS(J,I)-SS(J-1,I))                         REZ 860
      IF (J-JBND(M)) 27,29,27                                          REZ 870
27    RZR=(X(J+1)-.5*(X(J)+X(J-1)))/(X(J+1)-X(J-1))                    REZ 880
      ER=E(J+1)+RZR*(E(J)-E(J+1))                                      REZ 890
      SDR=SD(J+1)+RZR*(SD(J)-SD(J+1))                                  REZ 900
      YOZR=YOZ(J+1)+RZR*(YOZ(J)-YOZ(J+1))                              REZ 910
      DR=D(J+1)+RZR*(D(J)-D(J+1))                                      REZ 920
      DO 28 I=1,NSPEC                                                  REZ 930
28    SSR(I)=SS(J+1,I)+RZR*(SS(J,I)-SS(J+1,I))                         REZ 940
      IF (JBNDCK) 33,33,31                                             REZ 950
29    RZR=(.5*(X(J)-X(J-1)))/(X(J)-X(J-2))                             REZ 960
      ER=E(J)+RZR*(E(J)-E(J-1))                                        REZ 970
      SDR=SD(J)+RZR*(SD(J)-SD(J-1))                                    REZ 980
      YOZR=YOZ(J)+RZR*(YOZ(J)-YOZ(J-1))                                REZ 990
      DR=D(J)+RZR*(D(J)-D(J-1))                                        REZ1000
      DO 30 I=1,NSPEC                                                  REZ1010
30    SSR(I)=SS(J,I)+RZR*(SS(J,I)-SS(J-1,I))                           REZ1020
      GO TO 33                                                         REZ1030
31    RZR=(.5*(X(J)-X(J-1)))/(X(J+1)-X(J-1))                           REZ1040
      EL=E(J)+RZR*(E(J)-E(J+1))                                        REZ1050
      SDL=SD(J)+RZR*(SD(J)-SD(J+1))                                    REZ1060
      YOZL=YOZ(J)+RZR*(YOZ(J)-YOZ(J+1))                                REZ1070
      DL=D(J)+RZR*(D(J)-D(J+1))                                        REZ1080
      DO 32 I=1,NSPEC                                                  REZ1090
32    SSL(I)=SS(J,I)+RZR*(SS(J,I)-SS(J+1,I))                           REZ1100
33    XR=X(J)                                                          REZ1110
      XL=.5*(X(J)+X(J-1))                                              REZ1120
      ZMR=(XR-XL)*DR                                                   REZ1130
      ZML=(XR-XL)*DL                                                   REZ1140
      UR=U(J)                                                          REZ1150
      UL=((ZM(J)-ZML)*U(J-1)+(ZM(J)-ZMR)*U(J))/(ZML+ZMR)               REZ1160
      CALL EQST (EL,DL,PL,M)                                           REZ1170
      CALL EQST (ER,DR,PR,M)                                           REZ1180
      SL=PL-SDL                                                        REZ1190
      SR=PR-SDR                                                        REZ1200
      QL=Q(J)                                                          REZ1210
      QR=Q(J)                                                          REZ1220
      CSL=CS(J)                                                        REZ1230
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      CSR=CS(J)                                                          REZ1240
      NMT=NMTRLS-1                                                       REZ1250
      IF (NMT-M) 36,34,34                                                REZ1260
34    DO 35 MI=M,NMT                                                     REZ1270
35    JRND(MI)=JRND(MI)+1                                                REZ1280
36    JCK=J                                                              REZ1290
      J=JFIN                                                             REZ1300
37    X(J+1)=X(J)                                                        REZ1310
      U(J+1)=U(J)                                                        REZ1320
      ZM(J+1)=ZM(J)                                                      REZ1330
      D(J+1)=D(J)                                                        REZ1340
      S(J+1)=S(J)                                                        REZ1350
      E(J+1)=E(J)                                                        REZ1360
      SD(J+1)=SD(J)                                                      REZ1370
      Y0Z(J+1)=Y0Z(J)                                                    REZ1380
      P(J+1)=P(J)                                                        REZ1390
      Q(J+1)=Q(J)                                                        REZ1400
      CS(J+1)=CS(J)                                                      REZ1410
      TSPALL(J+1)=TSPALL(J)
      DO 38 I=1,NSPEC                                                    REZ1420
38    SS(J+1,I)=SS(J,I)                                                  REZ1430
      J=J-1                                                              REZ1440
      IF (J-JCK) 39,39,37                                                REZ1450
39    X(J+1)=XR                                                          REZ1460
      X(J)=XL                                                            REZ1470
      U(J+1)=UR                                                          REZ1480
      U(J)=UL                                                            REZ1490
      ZM(J+1)=ZMR                                                        REZ1500
      ZM(J)=ZML                                                          REZ1510
      D(J+1)=DR                                                          REZ1520
      D(J)=DL                                                            REZ1530
      S(J+1)=SR                                                          REZ1540
      S(J)=SL                                                            REZ1550
      E(J+1)=ER                                                          REZ1560
      E(J)=EL                                                            REZ1570
      SD(J+1)=SDR                                                        REZ1580
      SD(J)=SDL                                                          REZ1590
      Y0Z(J+1)=Y0ZR                                                      REZ1600
      Y0Z(J)=Y0ZL                                                        REZ1610
      P(J+1)=PR                                                          REZ1620
      P(J)=PL                                                            REZ1630
      Q(J+1)=QR                                                          REZ1640
      Q(J)=QL                                                            REZ1650
      CS(J+1)=CSR                                                        REZ1660
      CS(J)=CSL                                                          REZ1670
      TSPALL(J+1)=TSPALL(J)
      IF (TSPALL(J-1).GT.TSPALL(J).A.TSPALL(J-1).NE.1.234) TSPALL(J)=TSP
     1ALL(J-1)
      DO 40 I=1,NSPEC                                                    REZ1680
      SS(J+1,I)=SSR(I)                                                   REZ1690
40    SS(J,I)=SSL(I)                                                     REZ1700
      IF (NJEDIT) 44,44,41                                               REZ1710
41    DO 43 II=1,NJEDIT                                                  REZ1720
      IF (J-JEDIT(II)) 42,42,43                                          REZ1730
42    JEDIT(II)=JEDIT(II)+1                                              REZ1740
43    CONTINUE                                                           REZ1750
44    IF (J-JSTAR) 45,45,46                                              REZ1760
45    JSTAR=JSTAR+1                                                      REZ1770
46    JFIN=JFIN+1                                                        REZ1780
      JAHEAD=JAHEAD+1                                                    REZ1790
C        DIVIDE LOOP EXIT CHECKS                                         REZ1800
      IF (JFIN-799) 47,57,57                                             REZ1810
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47    IF (X(J)-X(J-1)-RZDX) 48,24,24                                    REZ1820
48    IF (J-JSMAX-JDIV) 51,49,49                                        REZ1830
49    IF (JDIV-75) 57,50,50                                             REZ1840
50    JAHEAD=JSMAX+JDIV                                                 REZ1850
      GO TO 57                                                          REZ1860
51    J=J+2                                                             REZ1870
      IF (J-JFIN) 52,57,57                                              REZ1880
52    IF (E(J+1)) 53,53,54                                              REZ1890
53    NWHAT=2                                                           REZ1900
      CALL SSCAL (NWHAT,EADD,J+1)                                       REZ1910
      E(J+1)=EADD                                                       REZ1920
54    IF (J-1-JBND(M)) 55,56,55                                         REZ1930
55    JBNDCK=0                                                          REZ1940
      GO TO 25                                                          REZ1950
56    M=M+1                                                             REZ1960
      JBNDCK=1                                                          REZ1970
      GO TO 27                                                          REZ1980
C        END DIVIDE                                                     REZ1990
57    NZDIVD=IABS(JFINO-JFIN)                                           REZ2000
C                                                                       REZ2010
C        REZONE BEHIND MAX STRESS                                       REZ2020
C                                                                       REZ2030
58    SMAX=SSMAX                                                        REZ2040
      JSMAX=SJSMAX                                                      REZ2050
      IF (JRZL) 116,116,59                                              REZ2060
59    IF (LOZHIZ) 60,61,60                                              REZ2070
60    IF (N-NRZ-100) 116,62,62                                          REZ2080
61    IF (N-NRZ-25) 116,62,62                                           REZ2090
C        DETERMINE FIRST ZONE WITH ENERGY LESS THAN SUBLIMATION ENERGY  REZ2100
62    M=1                                                               REZ2110
      DO 65 J=2,JSTAR                                                   REZ2120
      IF (J-1-JBND(M)) 64,63,64                                         REZ2130
63    M=M+1                                                             REZ2140
64    IF (E(J)-EOSTE(M)) 66,65,65                                       REZ2150
65    CONTINUE                                                          REZ2160
      JV=JSTAR                                                          REZ2170
      GO TO 67                                                          REZ2180
66    JV=J-1                                                            REZ2190
67    JFINO=JFIN                                                        REZ2200
      J=JSMAX                                                           REZ2210
C        DETERMINE LAST ZONE TO THE LEFT OF JSMAX WITH S EQUAL TO OR    REZ2220
C        GREATER THAN .2*SMAX                                           REZ2230
68    J=J-1                                                             REZ2240
      IF (S(J)/SMAX-.2) 69,68,68                                        REZ2250
69    JPLC=J+1                                                          REZ2260
C        COMBINE ENTRY CHECKS                                           REZ2270
      IF (JPLC-JV-JRZL) 70,70,76                                        REZ2280
70    IF (JSMAX-JPLC-JZPUL) 115,115,71                                  REZ2290
C        COMBINE FROM JPLC TO .8*SMAX                                   REZ2300
71    J=JPLC                                                            REZ2310
      DO 72 M=1,NMTRLS                                                  REZ2320
      IF (J-JBND(M)) 73,72,72                                           REZ2330
72    CONTINUE                                                          REZ2340
      M=NMTRLS                                                          REZ2350
73    CONTINUE                                                          REZ2360
      DO 74 MM=1,NMTRLS                                                 REZ2370
      IF (JSMAX-JBND(MM)) 75,75,74                                      REZ2380
74    CONTINUE                                                          REZ2390
      MM=NMTRLS                                                         REZ2400
75    RZR=RZDX+.5/D(JSMAX)+RHO(MM)                                      REZ2410
      NREG=3                                                            REZ2420
      GO TO 80                                                          REZ2430
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C         COMBINE FROM JV TO JPLC                                              REZ2440
76      NREG=1                                                                 REZ2450
77      DO 78 M=1,NMTRLS                                                       REZ2460
        IF (JV+1-JBND(M)) 79,79,78                                             REZ2470
78      CONTINUE                                                               REZ2480
        M=NMTRLS                                                               REZ2490
79      CONTINUE                                                               REZ2500
        RZR=(X(JPLC)-X(JV))/FLOAT(JRZL)                                        REZ2510
        J=JV                                                                   REZ2520
C         COMBINE LOOP                                                         REZ2530
80      IF (TSPALL(J+1).EQ.1.234) GO TO 104
        IF (J.LT.7) GO TO 800
        IF (TSPALL(J).EQ.1.234) GO TO 104
        IF (TSPALL(J+2).EQ.1.234.0.TSPALL(J+3).EQ.1.234) GO TO 104
800     IF (X(J+1)-X(J)-RZR) 81,104,104
81      IF (J+1-JBND(M)) 82,104,82                                             REZ2550
82      IF (NJEDIT) 85,85,83                                                   REZ2560
83      DO 84 II=1,NJEDIT                                                      REZ2570
        IF (J+1-JEDIT(II)) 84,104,84                                           REZ2580
84      CONTINUE                                                               REZ2590
85      ZMINV=1./(ZM(J+1)+ZM(J+2))                                             REZ2600
        DO 86 I=1,NSPEC                                                        REZ2610
86      SS(J+1,I)=(SS(J+1,I)*ZM(J+1)+SS(J+2,I)*ZM(J+2))*ZMINV                  REZ2620
        UR=((U(J+2)+U(J+3))/2.*ZM(J+3)+(U(J+1)+U(J+2))/2.*ZM(J+2))/(ZM(J+2REZ2630
       1)+ZM(J+3))                                                             REZ2640
        UL=(U(J)*(ZM(J)+ZM(J+1))+U(J+1)*(ZM(J+1)+ZM(J+2))+U(J+2)*(ZM(J+2)+REZ2650
       1ZM(J+3))-UR*(ZM(J+1)+ZM(J+2)+ZM(J+3)))/(ZM(J)+ZM(J+1)+ZM(J+2))        REZ2660
        E(J)=E(J)+(U(J-1)+U(J))*(U(J-1)+U(J))/8.-(U(J-1)+UL)*(U(J-1)+UL)/8REZ2670
       1.                                                                      REZ2680
        E(J+1)=(E(J+1)*ZM(J+1)+E(J+2)*ZM(J+2)+((U(J)+U(J+1))*(U(J)+U(J+1))REZ2690
       1*ZM(J+1)+(U(J+1)+U(J+2))*(U(J+1)+U(J+2))*ZM(J+2))/8.)/(ZM(J+1)+ZM(REZ2700
       2J+2))-(UL+UR)*(UL+UR)/8.                                               REZ2710
        EJ2=E(J+3)+(U(J+2)+U(J+3))*(U(J+2)+U(J+3))/8.-(UR+U(J+3))*(UR+U(J+REZ2720
       13))/8.                                                                 REZ2730
        U(J)=UL                                                                REZ2740
        U(J+1)=UR                                                              REZ2750
        SD(J+1)=(SD(J+1)*ZM(J+1)+SD(J+2)*ZM(J+2))*ZMINV                        REZ2760
        YOZ(J+1)=(YOZ(J+1)*ZM(J+1)+YOZ(J+2)*ZM(J+2))*ZMINV                     REZ2770
        ZM(J+1)=ZM(J+1)+ZM(J+2)                                                REZ2780
        Q(J+1)=(Q(J+1)+Q(J+2))/2.0                                             REZ2790
        CS(J+1)=(CS(J+1)+CS(J+2))/2.0                                          REZ2800
        X(J+1)=X(J+2)                                                          REZ2810
        D(J+1)=ZM(J+1)/(X(J+1)-X(J))                                           REZ2820
        IF (TSPALL(J+2).LT.TSPALL(J+1).0.TSPALL(J+2).EQ.1.234) TSPALL(J+1)
       1=TSPALL(J+2)
        IF (M-1) 89,89,87                                                      REZ2830
87      IF (J-JBND(M-1)) 89,88,89                                              REZ2840
88      CALL EQST (E(J),D(J),P(J),M-1)                                         REZ2850
        GO TO 90                                                               REZ2860
89      CALL EQST (E(J),D(J),P(J),M)                                           REZ2870
90      CALL EQST (E(J+1),D(J+1),P(J+1),M)                                     REZ2880
        IF (J+2-JBND(M)) 92,91,92                                              REZ2890
91      CALL EQST (EJ2,D(J+3),PJ2,M+1)                                         REZ2900
        GO TO 93                                                               REZ2910
92      CALL EQST (EJ2,D(J+3),PJ2,M)                                           REZ2920
93      S(J)=P(J)-SD(J)                                                        REZ2930
        S(J+1)=P(J+1)-SD(J+1)                                                  REZ2940
        JK=J+2                                                                 REZ2950
        DO 95 JI=JK,JFIN                                                       REZ2960
        X(JI)=X(JI+1)                                                          REZ2970
        U(JI)=U(JI+1)                                                          REZ2980
        ZM(JI)=ZM(JI+1)                                                        REZ2990
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      D(JI)=D(JI+1)                                                     REZ3000
      S(JI)=S(JI+1)                                                     REZ3010
      E(JI)=E(JI+1)                                                     REZ3020
      SD(JI)=SD(JI+1)                                                   REZ3030
      YOZ(JI)=YOZ(JI+1)                                                 REZ3040
      P(JI)=P(JI+1)                                                     REZ3050
      Q(JI)=Q(JI+1)                                                     REZ3060
      CS(JI)=CS(JI+1)                                                   REZ3070
      TSPALL(JI)=TSPALL(JI+1)
      DO 94 I=1,NSPEC                                                   REZ3080
   94 SS(JI,I)=SS(JI+1,I)                                               REZ3090
   95 CONTINUE                                                          REZ3100
      E(J+2)=EJ2                                                        REZ3110
      P(J+2)=PJ2                                                        REZ3120
      S(J+2)=P(J+2)-SD(J+2)                                             REZ3130
      IF (NJEDIT) 99,99,96                                              REZ3140
   96 DO 98 II=1,NJEDIT                                                 REZ3150
      IF (J-JEDIT(II)) 97,98,98                                         REZ3160
   97 JEDIT(II)=JEDIT(II)-1                                             REZ3170
   98 CONTINUE                                                          REZ3180
   99 JSMAX=JSMAX-1                                                     REZ3190
      JSTAR=JSTAR-1                                                     REZ3200
      JAHEAD=JAHEAD-1                                                   REZ3210
      JFIN=JFIN-1                                                       REZ3220
      IF (J+1-JPLC) 100,101,101                                         REZ3230
  100 JPLC=JPLC-1                                                       REZ3240
  101 DO 103 MM=1,NMTRLS                                                REZ3250
      IF (J-JBND(MM)) 102,103,103                                       REZ3260
  102 JBND(MM)=JBND(MM)-1                                               REZ3270
  103 CONTINUE                                                          REZ3280
C        COMBINE LOOP EXIT CHECKS                                       REZ3290
  104 GO TO (105,106,107), NREG                                         REZ3300
  105 IF (S(J+1)-.2*SMAX) 108,110,110                                   REZ3310
  106 IF (J+1-JPLC) 108,70,70                                           REZ3320
  107 IF (S(J+1)-.8*SMAX) 108,115,115                                   REZ3330
  108 J=J+1                                                             REZ3340
      IF (J-JBND(M)) 80,109,80                                          REZ3350
  109 M=M+1                                                             REZ3360
      GO TO 80                                                          REZ3370
  110 IF (J+1-JPLC) 111,70,70                                           REZ3380
  111 J=JPLC-2                                                          REZ3390
  112 IF (S(J)-.2*SMAX) 113,114,114                                     REZ3400
  113 J=J-1                                                             REZ3410
      IF(J-JV) 70,70,112                                                REZ3420
  114 JV=J                                                              REZ3430
      NREG=2                                                            REZ3440
      GO TO 77                                                          REZ3450
C        END COMBINE                                                    REZ3460
  115 NZCOMB=IABS(JFINO-JFIN)                                           REZ3470
      NDZ=N                                                             REZ3480
  116 IF (NZDIVD+NZCOMB) 120,120,117                                    REZ3490
  117 IF (LINE-55) 119,118,118                                          REZ3500
  118 PRINT 122                                                         REZ3510
      LINE=0                                                            REZ3520
  119 LINE=LINE+2                                                       REZ3530
      PRINT 121, N,NZDIVD,NZCOMB,JSTAR                                  REZ3540
  120 RETURN                                                            REZ3550
C                                                                       REZ3560
  121 FORMAT (/,7X,15HREZONE AT CYCLE,I5,2X,5HADDED,I3,6H ZONES,2X,7HDEL REZ3570
     1ETED,I3,6H ZONES,2X,12HNEW JSTAR IS,I4)                           REZ3580
  122 FORMAT (1H1)                                                      REZ3590
      END                                                               REZ3600-
```

```
      SUBROUTINE EDIT                                                    EDT  10
C                                                                        EDT  20
      COMMON CS(801),D(801),E(801),P(801),Q(801),S(801),SD(801),U(801),YEDT  30
     1Z(801),ZM(801),TSPALL(801),US(100)
C                                                                        EDT  50
      COMMON AMU(6),CUSP1(6),CUSPA(6),CUSPC(6),CUSPD(6),CUSPG(6),CUSPS(6EDT  60
     1),DISCPT(12),EQSTC(6),EQSTD(6),EQSTE(6),EQSTG(6),EQSTH(6),EQSTN(6)EDT  70
     2,EQSTS(6),JBND(6),JEDIT(10),JORG(10),PMIN(6),RHO(6),SSTOP(5),SS(80EDT  80
     31,5),START(5),TEDIT(25),X(801),YADD(6),YMU(6),Y0(6)                EDT  90
C                                                                        EDT 100
      COMMON CKS,C0,C1,DTN,DTNM,IT,JCYCS,JFIN,JSMAX,JSMAXI,JRZL,JSTAR,JTEDT 110
     1S,JZPUL,LINE,LOZHIZ,N,NJEDIT,NMTRLS,NPRIN,NREZON,NRZ,NSPEC,NTAPE,NEDT 120
     2TEDT,PDTNEG,PDTPOS,SDURM,SK2M,SMAX,SSTOPM,TIME,TS,WTAPE             EDT 130
C                                                                        EDT 140
C        TAPE STORAGE FOR FUTURE EDIT                                    EDT 150
      JSTARD=JSTAR+1                                                     EDT 160
      IF (WTAPE) 1,2,1                                                   EDT 170
    1 WRITE (6) N,TIME,(DISCPT(I),I=1,12),JSTAR,JFIN,JSMAX,JSTARD,(JBND(
     1II),II=1,6)
      WRITE (6) (J,X(J),TSPALL(J),P(J),Q(J),E(J),D(J),SD(J),S(J),CS(J),J
     1=1,JSTARD)
C        TOTAL MOMENTUM CALCULATION                                      EDT 210
    2 EMVNEG=0.                                                          EDT 220
      EMVPOS=0.                                                          EDT 230
      ESUM=0.                                                            EDT 240
      EKSUM=0.                                                           EDT 250
      QMAX=0.                                                            EDT 260
      MS=1
      DO 8 J=2,JSTARD                                                    EDT 270
      IF (Q(J)-QMAX) 4,4,3                                               EDT 280
    3 QMAX=Q(J)                                                          EDT 290
      JQMAX=J                                                            EDT 300
    4 IF (TSPALL(J).NE.1.234)GO TO 60
      EMV=ZM(J)*(US(MS)+U(J-1))/2.
      MS=MS+1
      GO TO 61
   60 EMV=ZM(J)*(U(J)+U(J-1))/2.
   61 IF (EMV) 5,6,6
    5 EMVNEG=EMVNEG+EMV                                                  EDT 330
      GO TO 7                                                            EDT 340
    6 EMVPOS=EMVPOS+EMV                                                  EDT 350
    7 CONTINUE                                                           EDT 360
C        TOTAL ENERGY CALCULATION (IN CALORIES)                          EDT 370
      ESUM=ESUM+E(J)*ZM(J)/4.186E7                                       EDT 380
      EKSUM=EKSUM+ZM(J)*(U(J)+U(J-1))*(U(J)+U(J-1))/4.186E7/8.           EDT 390
    8 CONTINUE                                                           EDT 400
      ETOTAL=ESUM+EKSUM                                                  EDT 410
      JM=JSMAX+3                                                         EDT 420
C        CALCULATE MOMENTUM OF MAIN PULSE                                EDT 430
      EMVPL=0.                                                           EDT 440
    9 EMVPL=EMVPL+U(JM)*.5*(ZM(JM+1)+ZM(JM))                             EDT 450
      IF (JM-JSMAX) 10,11,11                                             EDT 460
   10 IF (U(JM-1)) 13,13,11                                              EDT 470
   11 IF (JM-1) 13,13,12                                                 EDT 480
   12 JM=JM-1                                                            EDT 490
      GO TO 9                                                            EDT 500
   13 JM=JSMAX+4                                                         EDT 510
C        CALCULATE MOMENTUM OF PRECURSOR                                 EDT 520
      EMVPR=0.                                                           EDT 530
   14 EMVPR=EMVPR+U(JM)/2.*(ZM(JM)+ZM(JM+1))                             EDT 540
      IF (JM-JSTAR) 15,15,16                                             EDT 550
```

```
15    JM=JM+1                                                          EDT 560
      GO TO 14                                                         EDT 570
16    EMVPP=EMVPL+EMVPR                                                EDT 580
      DTPP=EMVPP/SMAX                                                  EDT 590
      DTPULS=EMVPL/SMAX                                                EDT 600
C        CALCULATE MAXIMUM POTENTIAL MOMENTUM OF VAPOR                 EDT 610
      M=1                                                              EDT 620
      EMVBM=0.                                                         EDT 630
      DO 20 J=2,JSTAR                                                  EDT 640
      IF (J-JBND(M)) 18,18,17                                          EDT 650
17    M=M+1                                                            EDT 660
18    DE=E(J)-EOSTE(M)                                                 EDT 670
      IF (DE) 21,21,19                                                 EDT 680
19    UAVG=(SQRT(U(J-1)*U(J-1)+2.*DE)+SQRT(U(J)*U(J)+2.*DE))/2.        EDT 690
20    EMVBM=EMVBM+UAVG*ZM(J)                                           EDT 700
21    CONTINUE                                                         EDT 710
C        PRINT OUTPUT VARIABLES                                        EDT 720
      JBND1=JBND(1)                                                    EDT 730
      JBND2=JBND(2)                                                    EDT 740
      JBND3=JBND(3)                                                    EDT 750
      IF (LINE-50) 23,22,22                                            EDT 760
22    PRINT 25                                                         EDT 770
      LINE=0                                                           EDT 780
23    LINE=LINE+7                                                      EDT 790
      PRINT 24, N,TIME,DTNM,JTS,ETOTAL,JFIN,JSTAR,JSMAX,SMAX,X(JSMAX),DTEDT 800
     1PP,DTPULS,EMVNEG,EMVPOS,EMVPL,EMVPR,EMVPP,EMVBM,PDTPOS,PDTNEG,X(1)EDT 810
     2,X(JBND1),X(JBND2),X(JBND3),X(JFIN),JQMAX,QMAX,X(JQMAX)          EDT 820
      RETURN                                                           EDT 830
C                                                                      EDT 840
24    FORMAT (/,7X,5HCYCLE,8X,4HTIME,8X,4HDTNM,9X,3HJTS,6X,6HETOTAL,8X,4EDT 850
     1HJFIN,7X,5HJSTAR,7X,5HJSMAX,8X,4HSMAX,4X,8HX(JSMAX),/,I12,2E12.4,IEDT 860
     212,E12.4,3I12,2F12.4,/,8X,4HDTPP,6X,6HDTPULS,6X,6HEMVNEG,6X,6HEMVPEDT 870
     3OS,7X,5HEMVPL,7X,5HEMVPR,7X,5HEMVPP,7X,5HEMVBM,6X,6HPDTPOS,6X,6HPDEDT 880
     4TNEG,/,10F12.4,/,8X,4HX(1),4X,8HX(JBND1),4X,8HX(JBND2),4X,8HX(JBNDEDT 890
     53),5X,7HX(JFIN),7X,5HJQMAX,8X,4HQMAX,4X,8HX(JQMAX),/,5E12.4,I12,2EEDT 900
     612.4)                                                            EDT 910
25    FORMAT (1H1)                                                     EDT 920
      END                                                              EDT 930
```

```
      SUBROUTINE EQST (E1,D1,P1,M)                                      EOS  10
C                                                                       EOS  20
      COMMON CS(801),D(801),E(801),P(801),Q(801),S(801),SD(801),U(801),YEOS  30
     1Z(801),ZM(801),TSPALL(801),US(100)
C                                                                       EOS  50
      COMMON AMU(6),CUSP1(6),CUSPA(6),CUSPC(6),CUSPD(6),CUSPG(6),CUSPS(6EOS  60
     1),DISCPT(12),EQSTC(6),EQSTD(6),EQSTE(6),EQSTG(6),EQSTH(6),EQSTN(6)EOS  70
     2,EQSTS(6),JBND(6),JEDIT(10),JORG(10),PMIN(6),RHO(6),SSTOP(5),SS(80EOS  80
     31,5),START(5),TEDIT(25),X(801),YADD(6),YMU(6),Y0(6)               EOS  90
C                                                                       EOS 100
      COMMON CKS,C0,C1,DTN,DTNH,IT,JCYCS,JFIN,JSMAX,JSMAXI,JRZL,JSTAR,JTEOS 110
     1S,JZPUL,LINE,LOZMIZ,N,NJEDIT,NMTRLS,NPRIN,NREZON,NRZ,NSPEC,NTAPE,NEOS 120
     2TEDT,PDTNEG,PDTPOS,SDURM,SK2M,SMAX,SSTOPM,TIME,TS,WTAPE           EOS 130
C                                                                       EOS 140
      IF (D1) 2,1,2                                                     EOS 150
1     P1=0.                                                             EOS 160
      RETURN                                                            EOS 170
2     V1=RHO(M)/D1                                                      EOS 180
      ENU=D1/RHO(M)                                                     EOS 190
      EMU=ENU-1.                                                        EOS 200
      IF (EMU) 3,7,7                                                    EOS 210
C        EQST FOR EXPANDED ZONES                                        EOS 220
3     ENU2=EQSTN(M)*(1.-V1)*V1                                          EOS 230
      IF (ENU2+10.) 5,5,4                                               EOS 240
4     TS1=EQSTE(M)*(1.-EXP(ENU2))                                       EOS 250
      GO TO 6                                                           EOS 260
5     TS1=EQSTE(M)                                                      EOS 270
6     TS2=ENU*(EQSTH(M)+(EQSTG(M)-EQSTH(M))*SQRT(ENU))                  EOS 280
      P1=(E1-TS1)*TS2*RHO(M)
      RETURN                                                            EOS 300
C        EQST FOR COMPRESSED ZONES                                      EOS 310
7     IF (CUSPA(M)) 10,10,8                                             EOS 320
8     ARG=EMU-CUSPA(M)                                                  EOS 330
      IF (ARG) 10,10,9                                                  EOS 340
C        TWO-WAVE SOLID EQUATION                                        EOS 350
9     TS2=(CUSP1(M)+((CUSPS(M)*ARG+CUSPD(M))*ARG+CUSPC(M))*ARG)*(1.-(CUSEOS 360
     1PG(M)*EMU)/2.)                                                    EOS 370
      GO TO 11                                                          EOS 380
C        ONE-WAVE SOLID EQUATION                                        EOS 390
10    TS2=((EQSTS(M)*EMU+EQSTD(M))*EMU+EQSTC(M))*EMU*(1.-(EQSTG(M)*EMU)/EOS 400
     12.)                                                               EOS 410
11    P1=TS2+E1*EQSTG(M)*D1                                             EOS 420
      RETURN                                                            EOS 430
      END                                                               EOS 440-
```

```
      SUBROUTINE SSCAL (NWHAT,EADD,J)                                   SSC  10
      COMMON CS(801),D(801),E(801),P(801),Q(801),S(801),SD(801),U(801),YSSC  20
     1Z(801),ZM(801),TSPALL(801),US(100)
C                                                                       SSC  40
      COMMON AMU(6),CUSP1(6),CUSPA(6),CUSPC(6),CUSPD(6),CUSPG(6),CUSPS(6SSC  50
     1),DISCPT(12),EQSTC(6),EQSTD(6),EQSTE(6),EQSTG(6),EQSTH(6),EQSTN(6)SSC  60
     2,EQSTS(6),JBND(6),JEDIT(10),JORG(10),PMIN(6),RHO(6),SSTOP(5),SS(80SSC  70
     31,5),START(5),TEDIT(25),X(801),YADD(6),YMU(6),Y0(6)               SSC  80
C                                                                       SSC  90
      COMMON CKS,C0,C1,DTN,DTNH,IT,JCYCS,JFIN,JSMAX,JSMAXI,JRZL,JSTAR,JTSSC 100
     1S,JZPUL,LINE,LOZHI7,N,NJEDIT,NMTRLS,NPRIN,NREZON,NRZ,NSPEC,NTAPE,NSSC 110
     2TEDT,PDTNEG,PDTPOS,SDURM,SK2M,SMAX,SSTOPM,TIME,TS,WTAPE           SSC 120
C                                                                       SSC 130
      EADD=0.                                                           SSC 140
      GO TO (1,11,16), NWHAT                                            SSC 150
C        ENERGY ADDITION ROUTINE FOR ACTIVE ZONES                       SSC 160
1     DO 10 I=1,NSPEC                                                   SSC 170
      IF (TIME-START(I)) 10,10,2                                        SSC 180
2     IF (TIME-DTNH-SSTOP(I)) 3,10,10                                   SSC 190
3     IF (J-2) 5,4,5                                                    SSC 200
4     SDURM=AMIN1(SDURM,SSTOP(I)-START(I))                              SSC 210
5     IF (TIME-DTNH-START(I)) 6,6,7                                     SSC 220
6     EADD=EADD+SS(J,I)*(TIME-START(I))                                 SSC 230
      GO TO 10                                                          SSC 240
7     IF (TIME-SSTOP(I)) 8,8,9                                          SSC 250
8     EADD=EADD+SS(J,I)*DTNH                                            SSC 260
      GO TO 10                                                          SSC 270
9     EADD=EADD+SS(J,I)*(SSTOP(I)-TIME+DTNH)                            SSC 280
10    CONTINUE                                                          SSC 290
      RETURN                                                            SSC 300
C        ENERGY ADDITION ROUTINE FOR ADDING ZONES IN REZONE             SSC 310
11    DO 15 I=1,NSPEC                                                   SSC 320
      IF (TIME-SSTOP(I)) 12,14,14                                       SSC 330
12    IF (TIME-START(I)) 15,15,13                                       SSC 340
13    EADD=EADD+SS(J,I)*(TIME-START(I))                                 SSC 350
      GO TO 15                                                          SSC 360
14    EADD=EADD+SS(J,I)*(SSTOP(I)-START(I))                             SSC 370
15    CONTINUE                                                          SSC 380
      RETURN                                                            SSC 390
C        ENERGY ADDITION ROUTINE FOR ADDING ZONES IN HYDRO              SSC 400
16    DO 20 I=1,NSPEC                                                   SSC 410
      IF (TIME-DTNH-SSTOP(I)) 17,19,19                                  SSC 420
17    IF (TIME-DTNH-START(I)) 20,20,18                                  SSC 430
18    EADD=EADD+SS(J,I)*(TIME-DTNH-START(I))                            SSC 440
      GO TO 20                                                          SSC 450
19    EADD=EADD+SS(J,I)*(SSTOP(I)-START(I))                             SSC 460
20    CONTINUE                                                          SSC 470
      RETURN                                                            SSC 480
      END                                                               SSC 490-
```

APPENDIX II

PUFF 66 TEST PROBLEM WITH FRACTURE

*** PUFF 66 SAMPLE PROBLEM WITH FRACTURE ***
***** THIS PROBLEM WAS RUN WITH PUFF 66 *****

NRZC	NMTRLS	JRZL	JZPUL	NPRIN	NTAPE	LOZMIZ	JFIN	JCYCS	NREZON
3	2	100	40	25	25	1	295	5000	25

ANGLE	TIME	CKS	TS
0.	1.000E-12	3.500E+00	5.552E-06

ZONING USED

RATIO 1.030E+00 TO ZONE 131
RATIO 1.100E-01 TO ZONE 132
RATIO 1.030E+00 TO ZONE 295

THE TEDITS ARE
5.000E-09 3.000E-08 5.000E-07 1.000E-06 2.000E-06

MATERIAL PROPERTIES FOR MATL1 RHO= 1.490E+00 FROM J= 1 TO J= 131 THICKNESS = 3.043E-01

EQSTC	EQSTD	EQSTE	EQSTG	EQSTH	EQSTS	EQSTN	PMIN
1.08790E+11	3.45091E+12	2.20000E+11	5.04000E-01	2.50000E-01	0.	6.58490E-01	-5.00000E+09

CUSP1	CUSPA	CUSPC	CUSPD	CUSPG	CUSPS
1.50000E+10	5.20300E-02	1.18370E+11	1.04660E+12	5.04000E-01	0.

YO	AMU	YADO	YMU
0.	0.	0.	0.

NOE = 17

AA	B	EDGE
6.11270E+02	-2.85220E+00	2.84000E-01
1.72830E+03	-2.85470E+00	4.00000E-01
1.74690E+03	-2.85470E+00	5.32000E-01
2.03820E+03	-2.85860E+00	2.47920E+00
2.03790E+03	-2.85830E+00	3.09900E+00
2.03730E+03	-2.85810E+00	4.13200E+00
2.03600E+03	-2.85770E+00	4.95840E+00
2.03390E+03	-2.85700E+00	6.19800E+00
2.02750E+03	-2.85530E+00	8.26400E+00
1.99240E+03	-2.84720E+00	1.54950E+01
3.00200E+02	-2.13200E+00	2.06600E+01
6.86840E+01	-1.64170E+00	2.47920E+01
1.70530E+01	-1.20770E+00	3.09900E+01
3.87450E+00	-7.76150E-01	4.13200E+01
1.88670E+00	-5.82710E-01	4.95840E+01
7.72380E-01	-3.54490E-01	6.19800E+01
6.16800E-01	-3.03550E-01	1.50000E+02

MATERIAL PROPERTIES FOR MATL2 RHO= 2.700E+00 FROM J= 131 TO J= 295 THICKNESS = 4.199E+00

EQSTC	EQSTD	EQSTE	EQSTG	EQSTH	EQSTS	EQSTN	PMIN
7.21600E+11	1.31336E+12	1.22000E+11	2.04000E+00	2.50000E-01	1.39735E+12	1.07385E+00	-1.00000E+10

CUSP1	CUSPA	CUSPC	CUSPD	CUSPG	CUSPS
0.	0.	0.	0.	0.	0.

YO	AMU	YADD	YMU
3.77900E+08	2.48900E+11	5.00000E+09	7.64000E-04

NOE = 7

AA	B	EDGE
9.26680E+02	-2.60820E+00	1.55900E+00
1.53480E+04	-2.77970E+00	3.09900E+01
3.16070E+03	-2.32260E+00	4.13200E+01
8.95120E+02	-1.98360E+00	4.95840E+01
1.72310E+02	-1.56150E+00	6.19800E+01
2.79320E+01	-1.12060E+00	8.26400E+01
2.58130E+00	-5.87580E-01	1.50000E+02

TABLE VALUES
1.500E+00 4.500E+00 7.500E+00 1.050E+01 1.350E+01 1.650E+01 1.950E+01 2.250E+01 2.550E+01 2.850E+01

EITOT	NBB	START	SSTOP
7.780E+01	1	0.	5.000E-09

BLACK BODY INPUT

TEMPERATURE	ENERGY
-0.	-0.

TABLE VALUES
6.287E-01 8.118E-01 9.464E-01 1.058E+00 1.155E+00 1.242E+00 1.322E+00 1.397E+00 1.468E+00 1.535E+00
1.599E+00 1.660E+00 1.720E+00 1.777E+00 1.833E+00 1.888E+00 1.942E+00 1.994E+00 2.046E+00 2.096E+00
2.146E+00 2.196E+00 2.244E+00 2.292E+00 2.340E+00 2.388E+00 2.435E+00 2.481E+00 2.528E+00 2.574E+00
2.620E+00 2.666E+00 2.712E+00 2.757E+00 2.803E+00 2.849E+00 2.895E+00 2.940E+00 2.986E+00 3.032E+00
3.078E+00 3.124E+00 3.171E+00 3.217E+00 3.264E+00 3.311E+00 3.359E+00 3.406E+00 3.454E+00 3.503E+00
3.552E+00 3.601E+00 3.651E+00 3.701E+00 3.752E+00 3.804E+00 3.856E+00 3.908E+00 3.962E+00 4.016E+00
4.071E+00 4.127E+00 4.184E+00 4.242E+00 4.300E+00 4.360E+00 4.421E+00 4.484E+00 4.548E+00 4.613E+00
4.680E+00 4.748E+00 4.818E+00 4.891E+00 4.965E+00 5.042E+00 5.121E+00 5.203E+00 5.288E+00 5.376E+00
5.468E+00 5.563E+00 5.664E+00 5.749E+00 5.880E+00 5.997E+00 6.122E+00 6.255E+00 6.396E+00 6.553E+00
6.723E+00 6.909E+00 7.119E+00 7.357E+00 7.634E+00 7.968E+00 8.390E+00 8.972E+00 9.942E+00 1.009E+01
1.025E+01 1.043E+01 1.064E+01 1.088E+01 1.118E+01 1.157E+01 1.210E+01 1.303E+01 1.500E+01

EITOT	NBB	START	SSTOP
6.	1	0.	3.000E-08

BLACK BODY INPUT

TEMPERATURE	ENERGY
1.000E+00	2.000E+01

SPALL STRENGTH OF INDIVIDUAL ZONES

1. TSPALL(131)= 0.

*** PUFF 46 SAMPLE PROBLEM WITH FRACTURE ***

J	DX	X	ERGS	CAL	SUM CAL	ERGS/GM	YOZ	ZONE MASS	J
2	2.00000E-04	2.00000E-04	5.81985E+07	1.39031E+00	1.39031E+00	1.95297E+11	0.	2.98000E-04	2
3	2.06000E-04	4.06000E-04	4.09884E+07	9.79178E-01	2.36949E+00	1.33539E+11	0.	3.06940E-04	3
4	2.12180E-04	6.18180E-04	3.44382E+07	8.22698E-01	3.19219E+00	1.08930E+11	0.	3.16148E-04	4
5	2.18545E-04	8.36725E-04	3.07315E+07	7.34151E-01	3.92634E+00	9.43749E+10	0.	3.25633E-04	5
6	2.25102E-04	1.06183E-03	2.82525E+07	6.74928E-01	4.60127E+00	8.42347E+10	0.	3.35402E-04	6
7	2.31855E-04	1.29736E-03	2.64555E+07	6.32000E-01	5.23327E+00	7.65797E+10	0.	3.45464E-04	7
8	2.38811E-04	1.53269E-03	2.50874E+07	5.99316E-01	5.83258E+00	7.05043E+10	0.	3.55828E-04	8
9	2.45975E-04	1.77847E-03	2.40104E+07	5.73588E-01	6.40617E+00	6.55122E+10	0.	3.66502E-04	9
10	2.53354E-04	2.03182E-03	2.31422E+07	5.52848E-01	6.95902E+00	6.13043E+10	0.	3.77497E-04	10
11	2.60955E-04	2.29278E-03	2.24301E+07	5.35835E-01	7.49485E+00	5.76872E+10	0.	3.88822E-04	11
12	2.68783E-04	2.56156E-03	2.18383E+07	5.21698E-01	8.01655E+00	5.45293E+10	0.	4.00487E-04	12
13	2.76847E-04	2.83841E-03	2.13417E+07	5.09835E-01	8.52639E+00	5.17372E+10	0.	4.12502E-04	13
14	2.85152E-04	3.12356E-03	2.09219E+07	4.99808E-01	9.02619E+00	4.92424E+10	0.	4.24877E-04	14
15	2.93707E-04	3.41726E-03	2.05653E+07	4.91288E-01	9.51748E+00	4.69933E+10	0.	4.37623E-04	15
16	3.02519E-04	3.71978E-03	2.02613E+07	4.84025E-01	1.00015E+01	4.49500E+10	0.	4.50752E-04	16
17	3.11593E-04	4.03138E-03	2.00016E+07	4.77821E-01	1.04793E+01	4.30814E+10	0.	4.64274E-04	17
18	3.20941E-04	4.35232E-03	1.97797E+07	4.72519E-01	1.09518E+01	4.13625E+10	0.	4.78203E-04	18
19	3.30570E-04	4.68289E-03	1.95902E+07	4.67993E-01	1.14198E+01	3.97731E+10	0.	4.92549E-04	19
20	3.40487E-04	5.02337E-03	1.94288E+07	4.64138E-01	1.18840E+01	3.82966E+10	0.	5.07325E-04	20
21	3.50701E-04	5.37407E-03	1.92919E+07	4.60868E-01	1.23448E+01	3.69192E+10	0.	5.22545E-04	21
22	3.61222E-04	5.73530E-03	1.91766E+07	4.58112E-01	1.28030E+01	3.56295E+10	0.	5.38221E-04	22
23	3.72059E-04	6.10736E-03	1.90801E+07	4.55807E-01	1.32588E+01	3.44177E+10	0.	5.54368E-04	23
24	3.83221E-04	6.49058E-03	1.90003E+07	4.53901E-01	1.37127E+01	3.32755E+10	0.	5.70999E-04	24
25	3.94717E-04	6.88529E-03	1.89353E+07	4.52349E-01	1.41650E+01	3.21959E+10	0.	5.88129E-04	25
26	4.06559E-04	7.29188E-03	1.88835E+07	4.51111E-01	1.46161E+01	3.11726E+10	0.	6.05773E-04	26
27	4.18756E-04	7.71061E-03	1.88434E+07	4.50153E-01	1.50663E+01	3.02004E+10	0.	6.23946E-04	27
28	4.31319E-04	8.14193E-03	1.88137E+07	4.49444E-01	1.55157E+01	2.92746E+10	0.	6.42664E-04	28
29	4.44259E-04	8.58618E-03	1.87933E+07	4.48956E-01	1.59647E+01	2.83911E+10	0.	6.61944E-04	29
30	4.57586E-04	9.04377E-03	1.87811E+07	4.48665E-01	1.64133E+01	2.75463E+10	0.	6.81802E-04	30
31	4.71313E-04	9.51508E-03	1.87763E+07	4.48549E-01	1.68619E+01	2.67371E+10	0.	7.02257E-04	31
32	4.85452E-04	1.00005E-02	1.87779E+07	4.48588E-01	1.73105E+01	2.59605E+10	0.	7.23324E-04	32
33	5.00016E-04	1.05006E-02	1.87852E+07	4.48762E-01	1.77592E+01	2.52142E+10	0.	7.45024E-04	33
34	5.15017E-04	1.10156E-02	1.87975E+07	4.49055E-01	1.82083E+01	2.44958E+10	0.	7.67375E-04	34
35	5.30467E-04	1.15460E-02	1.88141E+07	4.49452E-01	1.86578E+01	2.38034E+10	0.	7.90396E-04	35
36	5.46381E-04	1.20924E-02	1.88344E+07	4.49938E-01	1.91077E+01	2.31350E+10	0.	8.14108E-04	36
37	5.62772E-04	1.26552E-02	1.88579E+07	4.50500E-01	1.95582E+01	2.24892E+10	0.	8.38531E-04	37
38	5.79656E-04	1.32348E-02	1.88841E+07	4.51124E-01	2.00093E+01	2.18645E+10	0.	8.63687E-04	38
39	5.97045E-04	1.38319E-02	1.89123E+07	4.51800E-01	2.04611E+01	2.12594E+10	0.	8.89598E-04	39
40	6.14957E-04	1.44468E-02	1.89423E+07	4.52515E-01	2.09136E+01	2.06729E+10	0.	9.16285E-04	40
41	6.33405E-04	1.50803E-02	1.89735E+07	4.53261E-01	2.13669E+01	2.01038E+10	0.	9.43774E-04	41
42	6.52408E-04	1.57327E-02	1.90055E+07	4.54026E-01	2.18209E+01	1.95513E+10	0.	9.72087E-04	42
43	6.71980E-04	1.64046E-02	1.90380E+07	4.54802E-01	2.22757E+01	1.90142E+10	0.	1.00125E-03	43
44	6.92139E-04	1.70968E-02	1.90706E+07	4.55580E-01	2.27313E+01	1.84920E+10	0.	1.03129E-03	44
45	7.12903E-04	1.78097E-02	1.91029E+07	4.56353E-01	2.31877E+01	1.79839E+10	0.	1.06223E-03	45
46	7.34290E-04	1.85440E-02	1.91347E+07	4.57112E-01	2.36448E+01	1.74891E+10	0.	1.09409E-03	46
47	7.56319E-04	1.93003E-02	1.91656E+07	4.57850E-01	2.41026E+01	1.70071E+10	0.	1.12692E-03	47
48	7.79009E-04	2.00793E-02	1.91954E+07	4.58562E-01	2.45612E+01	1.65376E+10	0.	1.16072E-03	48
49	8.02379E-04	2.08817E-02	1.92238E+07	4.59240E-01	2.50204E+01	1.60795E+10	0.	1.19554E-03	49
50	8.26450E-04	2.17081E-02	1.92506E+07	4.59880E-01	2.54803E+01	1.56329E+10	0.	1.23141E-03	50

*** PUFF AA SAMPLE PROBLEM WITH FRACTURE ***

J	DX	X	ERGS	CAL	SUM CAL	ERGS/GM	YOZ	ZONE MASS	J
51	8.51244E-04	2.24594E-02	1.92755E+07	4.60476E-01	2.59408E+01	1.51973E+10	0.	1.26835E-03	51
52	8.74781E-04	2.34342E-02	1.92985E+07	4.61025E-01	2.64018E+01	1.47722E+10	0.	1.30640E-03	52
53	9.03045E-04	2.43302E-02	1.93103E+07	4.61521E-01	2.68633E+01	1.43574E+10	0.	1.34560E-03	53
54	9.30177E-04	2.52494E-02	1.93377E+07	4.61962E-01	2.73253E+01	1.39526E+10	0.	1.38596E-03	54
55	9.58082E-04	2.62275E-02	1.93538E+07	4.62345E-01	2.77876E+01	1.35574E+10	0.	1.42754E-03	55
56	9.86025E-04	2.72143E-02	1.93673E+07	4.62668E-01	2.82503E+01	1.31717E+10	0.	1.47037E-03	56
57	1.01643E-03	2.82304E-02	1.93782E+07	4.62929E-01	2.87132E+01	1.27953E+10	0.	1.51448E-03	57
58	1.04692E-03	2.92777E-02	1.93865E+07	4.63126E-01	2.91763E+01	1.24279E+10	0.	1.55991E-03	58
59	1.07833E-03	3.03560E-02	1.93921E+07	4.63260E-01	2.96396E+01	1.20694E+10	0.	1.60671E-03	59
60	1.11068E-03	3.14667E-02	1.93950E+07	4.63331E-01	3.01029E+01	1.17197E+10	0.	1.65491E-03	60
61	1.14400E-03	3.26107E-02	1.93954E+07	4.63340E-01	3.05663E+01	1.13785E+10	0.	1.70456E-03	61
62	1.17832E-03	3.37890E-02	1.93932E+07	4.63287E-01	3.10296E+01	1.10459E+10	0.	1.75570E-03	62
63	1.21367E-03	3.50027E-02	1.93886E+07	4.63176E-01	3.14927E+01	1.07216E+10	0.	1.80837E-03	63
64	1.25008E-03	3.62528E-02	1.93816E+07	4.63009E-01	3.19558E+01	1.04055E+10	0.	1.86262E-03	64
65	1.28758E-03	3.75403E-02	1.93724E+07	4.62789E-01	3.24185E+01	1.00977E+10	0.	1.91850E-03	65
66	1.32621E-03	3.88666E-02	1.93611E+07	4.62521E-01	3.28811E+01	9.79787E+09	0.	1.97605E-03	66
67	1.36600E-03	4.02329E-02	1.93480E+07	4.62208E-01	3.33433E+01	9.50606E+09	0.	2.03533E-03	67
68	1.40698E-03	4.16395E-02	1.93333E+07	4.61856E-01	3.38051E+01	9.22216E+09	0.	2.09639E-03	68
69	1.44919E-03	4.30887E-02	1.93172E+07	4.61471E-01	3.42664E+01	8.94609E+09	0.	2.15929E-03	69
70	1.49266E-03	4.45814E-02	1.92999E+07	4.61059E-01	3.47277E+01	8.67777E+09	0.	2.22407E-03	70
71	1.53744E-03	4.61188E-02	1.92818E+07	4.60626E-01	3.51883E+01	8.41711E+09	0.	2.29079E-03	71
72	1.58356E-03	4.77024E-02	1.92632E+07	4.60180E-01	3.56485E+01	8.16405E+09	0.	2.35951E-03	72
73	1.63107E-03	4.93334E-02	1.92442E+07	4.59729E-01	3.61082E+01	7.91848E+09	0.	2.43030E-03	73
74	1.68000E-03	5.10135E-02	1.92254E+07	4.59279E-01	3.65675E+01	7.68032E+09	0.	2.50321E-03	74
75	1.73040E-03	5.27439E-02	1.92070E+07	4.58840E-01	3.70263E+01	7.44949E+09	0.	2.57830E-03	75
76	1.78232E-03	5.45262E-02	1.91894E+07	4.58418E-01	3.74847E+01	7.22587E+09	0.	2.65565E-03	76
77	1.83579E-03	5.63620E-02	1.91729E+07	4.58023E-01	3.79428E+01	7.00937E+09	0.	2.73532E-03	77
78	1.89086E-03	5.82528E-02	1.91578E+07	4.57664E-01	3.84004E+01	6.79986E+09	0.	2.81738E-03	78
79	1.94758E-03	6.02004E-02	1.91444E+07	4.57347E-01	3.88578E+01	6.59724E+09	0.	2.90190E-03	79
80	2.00601E-03	6.22066E-02	1.91334E+07	4.57082E-01	3.93148E+01	6.40137E+09	0.	2.98896E-03	80
81	2.06619E-03	6.42726E-02	1.91248E+07	4.56875E-01	3.97717E+01	6.21212E+09	0.	3.07863E-03	81
82	2.12818E-03	6.64008E-02	1.91190E+07	4.56736E-01	4.02285E+01	6.02935E+09	0.	3.17099E-03	82
83	2.19202E-03	6.85928E-02	1.91162E+07	4.56671E-01	4.06851E+01	5.85290E+09	0.	3.26611E-03	83
84	2.25778E-03	7.08506E-02	1.91169E+07	4.56686E-01	4.11418E+01	5.68262E+09	0.	3.36410E-03	84
85	2.32551E-03	7.31761E-02	1.91212E+07	4.56789E-01	4.15986E+01	5.51834E+09	0.	3.46502E-03	85
86	2.39528E-03	7.55714E-02	1.91293E+07	4.56983E-01	4.20556E+01	5.35989E+09	0.	3.56897E-03	86
87	2.46714E-03	7.80385E-02	1.91415E+07	4.57274E-01	4.25129E+01	5.20710E+09	0.	3.67604E-03	87
88	2.54116E-03	8.05797E-02	1.91579E+07	4.57666E-01	4.29705E+01	5.05977E+09	0.	3.78632E-03	88
89	2.61739E-03	8.31971E-02	1.91786E+07	4.58162E-01	4.34287E+01	4.91771E+09	0.	3.89991E-03	89
90	2.69591E-03	8.58930E-02	1.92038E+07	4.58763E-01	4.38874E+01	4.78074E+09	0.	4.01691E-03	90
91	2.77679E-03	8.86698E-02	1.92334E+07	4.59471E-01	4.43469E+01	4.64866E+09	0.	4.13742E-03	91
92	2.86009E-03	9.15299E-02	1.92675E+07	4.60285E-01	4.48072E+01	4.52126E+09	0.	4.26154E-03	92
93	2.94589E-03	9.44758E-02	1.93061E+07	4.61205E-01	4.52684E+01	4.39835E+09	0.	4.38939E-03	93
94	3.03427E-03	9.75100E-02	1.93489E+07	4.62229E-01	4.57306E+01	4.27972E+09	0.	4.52107E-03	94
95	3.12530E-03	1.00635E-01	1.93960E+07	4.63354E-01	4.61940E+01	4.16518E+09	0.	4.65670E-03	95
96	3.21906E-03	1.03854E-01	1.94471E+07	4.64575E-01	4.66586E+01	4.05452E+09	0.	4.79640E-03	96
97	3.31563E-03	1.07170E-01	1.95020E+07	4.65887E-01	4.71245E+01	3.94755E+09	0.	4.94029E-03	97
98	3.41510E-03	1.10585E-01	1.95605E+07	4.67285E-01	4.75917E+01	3.84407E+09	0.	5.08850E-03	98
99	3.51755E-03	1.14103E-01	1.96223E+07	4.68761E-01	4.80605E+01	3.74390E+09	0.	5.24116E-03	99
100	3.62308E-03	1.17726E-01	1.96871E+07	4.70309E-01	4.85308E+01	3.64685E+09	0.	5.39839E-03	100

*** PUFF 46 SAMPLE PROBLEM WITH FRACTURE ***

J	DX	X	ERGS	CAL	SUM CAL	ERGS/GM	YOZ	ZONE MASS	J
101	3.73177E-03	1.21458E-01	1.97545E+07	4.71919E-01	4.90027E+01	3.55275E+09	0.	5.56034E-03	101
102	3.84373E-03	1.25301E-01	1.98242E+07	4.73583E-01	4.94763E+01	3.46144E+09	0.	5.72715E-03	102
103	3.95904E-03	1.29260E-01	1.98957E+07	4.75291E-01	4.99516E+01	3.37274E+09	0.	5.89897E-03	103
104	4.07781E-03	1.33338E-01	1.99686E+07	4.77033E-01	5.04286E+01	3.28651E+09	0.	6.07594E-03	104
105	4.20014E-03	1.37543E-01	2.00426E+07	4.78801E-01	5.09074E+01	3.20261E+09	0.	6.25821E-03	105
106	4.32615E-03	1.41844E-01	2.01172E+07	4.80582E-01	5.13880E+01	3.12089E+09	0.	6.44596E-03	106
107	4.45593E-03	1.46323E-01	2.01919E+07	4.82367E-01	5.18704E+01	3.04125E+09	0.	6.63934E-03	107
108	4.58961E-03	1.50910E-01	2.02664E+07	4.84147E-01	5.23545E+01	2.96356E+09	0.	6.83852E-03	108
109	4.72730E-03	1.55637E-01	2.03402E+07	4.85910E-01	5.28404E+01	2.88773E+09	0.	7.04367E-03	109
110	4.86912E-03	1.60506E-01	2.04129E+07	4.87648E-01	5.33281E+01	2.81364E+09	0.	7.25499E-03	110
111	5.01519E-03	1.65522E-01	2.04842E+07	4.89351E-01	5.38174E+01	2.74123E+09	0.	7.47263E-03	111
112	5.16545E-03	1.70687E-01	2.05537E+07	4.91010E-01	5.43085E+01	2.67042E+09	0.	7.69681E-03	112
113	5.32062E-03	1.76008E-01	2.06210E+07	4.92619E-01	5.48011E+01	2.60113E+09	0.	7.92772E-03	113
114	5.48023E-03	1.81488E-01	2.06859E+07	4.94168E-01	5.52952E+01	2.53331E+09	0.	8.16555E-03	114
115	5.64464E-03	1.87133E-01	2.07480E+07	4.95652E-01	5.57909E+01	2.46691E+09	0.	8.41052E-03	115
116	5.81398E-03	1.92947E-01	2.08072E+07	4.97066E-01	5.62880E+01	2.40189E+09	0.	8.66283E-03	116
117	5.98846E-03	1.98935E-01	2.08631E+07	4.98403E-01	5.67864E+01	2.33821E+09	0.	8.92272E-03	117
118	6.16805E-03	2.05103E-01	2.09158E+07	4.99660E-01	5.72860E+01	2.27583E+09	0.	9.19040E-03	118
119	6.35309E-03	2.11456E-01	2.09649E+07	5.00834E-01	5.77869E+01	2.21473E+09	0.	9.46611E-03	119
120	6.54369E-03	2.18000E-01	2.10104E+07	5.01921E-01	5.82888E+01	2.15490E+09	0.	9.75009E-03	120
121	6.74000E-03	2.24740E-01	2.10523E+07	5.02921E-01	5.87917E+01	2.09630E+09	0.	1.00426E-02	121
122	6.94220E-03	2.31682E-01	2.10904E+07	5.03833E-01	5.92955E+01	2.03893E+09	0.	1.03439E-02	122
123	7.15044E-03	2.38833E-01	2.11246E+07	5.04655E-01	5.98002E+01	1.98278E+09	0.	1.06542E-02	123
124	7.36490E-03	2.46198E-01	2.11550E+07	5.05389E-01	6.03056E+01	1.92782E+09	0.	1.09738E-02	124
125	7.58593E-03	2.53783E-01	2.11816E+07	5.06035E-01	6.08116E+01	1.87407E+09	0.	1.13030E-02	125
126	7.81350E-03	2.61597E-01	2.12041E+07	5.06595E-01	6.13182E+01	1.82150E+09	0.	1.16421E-02	126
127	8.04791E-03	2.69645E-01	2.12226E+07	5.07071E-01	6.18253E+01	1.77010E+09	0.	1.19914E-02	127
128	8.28935E-03	2.77934E-01	2.12424E+07	5.07464E-01	6.23327E+01	1.71988E+09	0.	1.23511E-02	128
129	8.53803E-03	2.86472E-01	2.12556E+07	5.07777E-01	6.28405E+01	1.67082E+09	0.	1.27217E-02	129
130	8.79417E-03	2.95266E-01	2.12654E+07	5.08013E-01	6.33485E+01	1.62290E+09	0.	1.31033E-02	130
131	9.05799E-03	3.04324E-01	2.12721E+07	5.08174E-01	6.38567E+01	1.57613E+09	0.	1.34964E-02	131
132	9.93370E-04	3.05321E-01	3.48399E+07	8.32295E-01	6.46890E+01	1.29505E+10	3.77900E+08	2.69022E-03	132
133	1.02627E-03	3.06347E-01	3.48850E+07	8.34263E-01	6.55033E+01	1.23009E+10	3.77900E+08	2.77093E-03	133
134	1.05706E-03	3.07404E-01	3.33654E+07	7.97072E-01	6.63003E+01	1.16905E+10	3.77900E+08	2.85406E-03	134
135	1.08877E-03	3.08493E-01	3.26788E+07	7.80669E-01	6.70810E+01	1.11164E+10	3.77900E+08	2.93968E-03	135
136	1.12143E-03	3.09614E-01	3.20220E+07	7.64998E-01	6.78460E+01	1.05760E+10	3.77900E+08	3.02787E-03	136
137	1.15508E-03	3.10769E-01	3.13952E+07	7.50005E-01	6.85960E+01	1.00667E+10	3.77900E+08	3.11871E-03	137
138	1.18973E-03	3.11959E-01	3.07938E+07	7.35637E-01	6.93316E+01	9.58631E+09	3.77900E+08	3.21227E-03	138
139	1.22542E-03	3.13185E-01	3.02163E+07	7.21842E-01	7.00535E+01	9.13256E+09	3.77900E+08	3.30864E-03	139
140	1.26218E-03	3.14447E-01	2.96604E+07	7.08568E-01	7.07620E+01	8.70351E+09	3.77900E+08	3.40790E-03	140
141	1.30005E-03	3.15747E-01	2.91247E+07	6.95764E-01	7.14578E+01	8.29732E+09	3.77900E+08	3.51013E-03	141
142	1.33905E-03	3.17088E-01	2.86065E+07	6.83384E-01	7.21412E+01	7.91231E+09	3.77900E+08	3.61544E-03	142
143	1.37922E-03	3.18465E-01	2.81040E+07	6.71382E-01	7.28126E+01	7.54694E+09	3.77900E+08	3.72390E-03	143
144	1.42060E-03	3.19886E-01	2.76157E+07	6.59715E-01	7.34723E+01	7.19980E+09	3.77900E+08	3.83562E-03	144
145	1.46322E-03	3.21349E-01	2.71397E+07	6.48343E-01	7.41206E+01	6.86961E+09	3.77900E+08	3.95068E-03	145
146	1.50711E-03	3.22856E-01	2.66745E+07	6.37231E-01	7.47579E+01	6.55521E+09	3.77900E+08	4.06921E-03	146
147	1.55233E-03	3.24406E-01	2.62188E+07	6.26344E-01	7.53842E+01	6.25555E+09	3.77900E+08	4.19128E-03	147
148	1.59890E-03	3.26001E-01	2.57713E+07	6.15654E-01	7.59999E+01	5.96969E+09	3.77900E+08	4.31702E-03	148
149	1.64686E-03	3.27645E-01	2.53309E+07	6.05133E-01	7.66050E+01	5.69677E+09	3.77900E+08	4.44653E-03	149
150	1.69627E-03	3.29339E-01	2.48966E+07	5.94759E-01	7.71998E+01	5.43603E+09	3.77900E+08	4.57993E-03	150

*** PUFF A6 SAMPLE PROBLEM WITH FRACTURE ***

J	DX	X	ERGS	CAL	SUM CAL	ERGS/GM	Y0Z	ZONE MASS	J
151	1.74714E-03	3.31099E-01	2.44677E+07	5.84512E-01	7.77843E+01	5.18677E+09	3.77900E+08	4.71732E-03	151
152	1.79957E-03	3.32897E-01	2.40433E+07	5.74375E-01	7.83586E+01	4.94837E+09	3.77900E+08	4.85884E-03	152
153	1.85356E-03	3.34751E-01	2.36230E+07	5.64334E-01	7.89230E+01	4.72026E+09	3.77900E+08	5.00461E-03	153
154	1.90917E-03	3.36660E-01	2.32063E+07	5.54379E-01	7.94774E+01	4.50193E+09	3.77900E+08	5.15475E-03	154
155	1.96644E-03	3.38626E-01	2.27927E+07	5.44499E-01	8.00219E+01	4.29291E+09	3.77900E+08	5.30939E-03	155
156	2.02543E-03	3.40652E-01	2.23821E+07	5.34688E-01	8.05565E+01	4.09278E+09	3.77900E+08	5.46867E-03	156
157	2.08620E-03	3.42738E-01	2.19740E+07	5.24941E-01	8.10815E+01	3.90113E+09	3.77900E+08	5.63273E-03	157
158	2.14878E-03	3.44887E-01	2.15685E+07	5.15253E-01	8.15967E+01	3.71761E+09	3.77900E+08	5.80171E-03	158
159	2.21325E-03	3.47100E-01	2.11653E+07	5.05621E-01	8.21024E+01	3.54186E+09	3.77900E+08	5.97576E-03	159
160	2.27964E-03	3.49380E-01	2.07644E+07	4.96044E-01	8.25984E+01	3.37356E+09	3.77900E+08	6.15504E-03	160
161	2.34803E-03	3.51728E-01	2.03658E+07	4.86521E-01	8.30849E+01	3.21242E+09	3.77900E+08	6.33969E-03	161
162	2.41847E-03	3.54144E-01	1.99693E+07	4.77049E-01	8.35620E+01	3.05814E+09	3.77900E+08	6.52988E-03	162
163	2.49103E-03	3.56633E-01	1.95750E+07	4.67629E-01	8.40296E+01	2.91044E+09	3.77900E+08	6.72578E-03	163
164	2.56577E-03	3.59203E-01	1.91828E+07	4.58260E-01	8.44879E+01	2.76906E+09	3.77900E+08	6.92755E-03	164
165	2.64273E-03	3.61844E-01	1.87927E+07	4.48942E-01	8.49368E+01	2.63374E+09	3.77900E+08	7.13538E-03	165
166	2.72201E-03	3.64560E-01	1.84047E+07	4.39673E-01	8.53765E+01	2.50423E+09	3.77900E+08	7.34944E-03	166
167	2.80367E-03	3.67371E-01	1.80188E+07	4.30454E-01	8.58069E+01	2.38032E+09	3.77900E+08	7.56992E-03	167
168	2.88778E-03	3.70259E-01	1.76349E+07	4.21284E-01	8.62282E+01	2.26175E+09	3.77900E+08	7.79702E-03	168
169	2.97442E-03	3.73233E-01	1.72531E+07	4.12162E-01	8.66404E+01	2.14833E+09	3.77900E+08	8.03093E-03	169
170	3.06365E-03	3.76297E-01	1.68732E+07	4.03087E-01	8.70435E+01	2.03984E+09	3.77900E+08	8.27184E-03	170
171	3.15556E-03	3.79453E-01	1.64953E+07	3.94060E-01	8.74375E+01	1.93607E+09	3.77900E+08	8.52001E-03	171
172	3.25023E-03	3.82703E-01	1.61194E+07	3.85079E-01	8.78226E+01	1.83684E+09	3.77900E+08	8.77561E-03	172
173	3.34773E-03	3.86051E-01	1.57454E+07	3.76144E-01	8.81987E+01	1.74196E+09	3.77900E+08	9.03888E-03	173
174	3.44817E-03	3.89499E-01	1.53733E+07	3.67256E-01	8.85660E+01	1.65126E+09	3.77900E+08	9.31005E-03	174
175	3.55161E-03	3.93050E-01	1.50032E+07	3.58414E-01	8.89244E+01	1.56457E+09	3.77900E+08	9.58935E-03	175
176	3.65816E-03	3.96709E-01	1.46350E+07	3.49619E-01	8.92740E+01	1.48173E+09	3.77900E+08	9.87703E-03	176
177	3.76790E-03	4.00476E-01	1.42689E+07	3.40872E-01	8.96149E+01	1.40258E+09	3.77900E+08	1.01733E-02	177
178	3.88094E-03	4.04357E-01	1.39048E+07	3.32173E-01	8.99471E+01	1.32698E+09	3.77900E+08	1.04785E-02	178
179	3.99737E-03	4.08355E-01	1.35428E+07	3.23526E-01	9.02706E+01	1.25479E+09	3.77900E+08	1.07929E-02	179
180	4.11729E-03	4.12472E-01	1.31830E+07	3.14931E-01	9.05855E+01	1.18588E+09	3.77900E+08	1.11167E-02	180
181	4.24081E-03	4.16713E-01	1.28256E+07	3.06392E-01	9.08919E+01	1.12012E+09	3.77900E+08	1.14502E-02	181
182	4.36803E-03	4.21081E-01	1.24705E+07	2.97911E-01	9.11898E+01	1.05739E+09	3.77900E+08	1.17937E-02	182
183	4.49907E-03	4.25580E-01	1.21181E+07	2.89491E-01	9.14793E+01	9.97578E+08	3.77900E+08	1.21475E-02	183
184	4.63405E-03	4.30214E-01	1.17683E+07	2.81135E-01	9.17605E+01	9.40568E+08	3.77900E+08	1.25119E-02	184
185	4.77307E-03	4.34987E-01	1.14214E+07	2.72840E-01	9.20333E+01	8.86255E+08	3.77900E+08	1.28873E-02	185
186	4.91626E-03	4.39903E-01	1.10775E+07	2.64633E-01	9.22979E+01	8.34535E+08	3.77900E+08	1.32739E-02	186
187	5.06375E-03	4.44967E-01	1.07368E+07	2.56494E-01	9.25544E+01	7.85309E+08	3.77900E+08	1.36721E-02	187
188	5.21566E-03	4.50183E-01	1.03995E+07	2.48435E-01	9.28029E+01	7.38482E+08	3.77900E+08	1.40823E-02	188
189	5.37213E-03	4.55555E-01	1.00657E+07	2.40461E-01	9.30433E+01	6.93960E+08	3.77900E+08	1.45047E-02	189
190	5.53329E-03	4.61088E-01	9.73504E+06	2.32576E-01	9.32759E+01	6.51654E+08	3.77900E+08	1.49399E-02	190
191	5.69929E-03	4.66787E-01	9.40947E+06	2.24784E-01	9.35007E+01	6.11477E+08	3.77900E+08	1.53881E-02	191
192	5.87027E-03	4.72658E-01	9.08736E+06	2.17089E-01	9.37178E+01	5.73345E+08	3.77900E+08	1.58497E-02	192
193	6.04638E-03	4.78704E-01	8.76850E+06	2.09496E-01	9.39273E+01	5.37175E+08	3.77900E+08	1.63252E-02	193
194	6.22777E-03	4.84932E-01	8.45606E+06	2.02008E-01	9.41293E+01	5.02889E+08	3.77900E+08	1.68150E-02	194
195	6.41460E-03	4.91347E-01	8.14721E+06	1.94630E-01	9.43239E+01	4.70409E+08	3.77900E+08	1.73194E-02	195
196	6.60704E-03	4.97954E-01	7.84310E+06	1.87365E-01	9.45113E+01	4.39660E+08	3.77900E+08	1.78390E-02	196
197	6.80525E-03	5.04759E-01	7.54391E+06	1.80218E-01	9.46915E+01	4.10571E+08	3.77900E+08	1.83742E-02	197
198	7.00941E-03	5.11768E-01	7.24978E+06	1.73191E-01	9.48647E+01	3.83071E+08	3.77900E+08	1.89254E-02	198
199	7.21969E-03	5.18988E-01	6.96086E+06	1.66289E-01	9.50310E+01	3.57092E+08	3.77900E+08	1.94932E-02	199
200	7.43628E-03	5.26424E-01	6.67731E+06	1.59515E-01	9.51905E+01	3.32569E+08	3.77900E+08	2.00780E-02	200

J	DX	X	ERGS	CAL	SUM CAL	ERGS/GM	YOZ	ZONE MASS	J
201	7.65937E-03	5.34084E-01	6.39926E+06	1.52873E-01	9.53434E+01	3.09437E+08	3.77900E+08	2.06803E-02	201
202	7.88915E-03	5.41973E-01	6.12685E+06	1.46365E-01	9.54897E+01	2.87636E+08	3.77900E+08	2.13007E-02	202
203	8.12583E-03	5.50099E-01	5.86021E+06	1.39995E-01	9.56297E+01	2.67105E+08	3.77900E+08	2.19397E-02	203
204	8.36960E-03	5.58468E-01	5.59946E+06	1.33766E-01	9.57635E+01	2.47786E+08	3.77900E+08	2.25979E-02	204
205	8.62069E-03	5.67089E-01	5.34473E+06	1.27681E-01	9.58912E+01	2.29625E+08	3.77900E+08	2.32759E-02	205
206	8.87931E-03	5.75968E-01	5.09612E+06	1.21742E-01	9.60129E+01	2.12568E+08	3.77900E+08	2.39741E-02	206
207	9.14569E-03	5.85114E-01	4.85376E+06	1.15952E-01	9.61289E+01	1.96561E+08	3.77900E+08	2.46934E-02	207
208	9.42006E-03	5.94534E-01	4.61750E+06	1.10308E-01	9.62392E+01	1.81547E+08	3.77900E+08	2.54342E-02	208
209	9.70266E-03	6.04237E-01	4.38792E+06	1.04824E-01	9.63440E+01	1.67496E+08	3.77900E+08	2.61972E-02	209
210	9.99374E-03	6.14230E-01	4.16484E+06	9.94766E-02	9.64435E+01	1.54350E+08	3.77900E+08	2.69831E-02	210
211	1.02956E-02	6.24524E-01	3.94833E+06	9.43222E-02	9.65378E+01	1.42064E+08	3.77900E+08	2.77926E-02	211
212	1.06024E-02	6.35126E-01	3.73844E+06	8.93083E-02	9.66271E+01	1.30594E+08	3.77900E+08	2.86264E-02	212
213	1.09204E-02	6.46047E-01	3.53524E+06	8.44539E-02	9.67116E+01	1.19899E+08	3.77900E+08	2.94852E-02	213
214	1.12480E-02	6.57295E-01	3.33875E+06	7.97599E-02	9.67913E+01	1.09937E+08	3.77900E+08	3.03697E-02	214
215	1.15855E-02	6.68880E-01	3.14900E+06	7.52271E-02	9.68666E+01	1.00669E+08	3.77900E+08	3.12808E-02	215
216	1.19331E-02	6.80813E-01	2.96602E+06	7.08556E-02	9.69374E+01	9.20573E+07	3.77900E+08	3.22192E-02	216
217	1.22910E-02	6.93104E-01	2.78978E+06	6.66456E-02	9.70041E+01	8.40656E+07	3.77900E+08	3.31858E-02	217
218	1.26598E-02	7.05764E-01	2.62030E+06	6.25967E-02	9.70667E+01	7.66587E+07	3.77900E+08	3.41814E-02	218
219	1.30396E-02	7.18804E-01	2.45754E+06	5.87085E-02	9.71254E+01	6.98028E+07	3.77900E+08	3.52068E-02	219
220	1.34308E-02	7.32234E-01	2.30146E+06	5.49799E-02	9.71804E+01	6.34656E+07	3.77900E+08	3.62630E-02	220
221	1.38337E-02	7.46068E-01	2.15201E+06	5.14097E-02	9.72318E+01	5.76160E+07	3.77900E+08	3.73509E-02	221
222	1.42487E-02	7.60317E-01	2.00914E+06	4.79966E-02	9.72798E+01	5.22241E+07	3.77900E+08	3.84715E-02	222
223	1.46761E-02	7.74993E-01	1.87276E+06	4.47388E-02	9.73245E+01	4.72615E+07	3.77900E+08	3.96256E-02	223
224	1.51164E-02	7.90109E-01	1.74280E+06	4.16340E-02	9.73661E+01	4.27007E+07	3.77900E+08	4.08144E-02	224
225	1.55699E-02	8.05679E-01	1.61915E+06	3.86802E-02	9.74048E+01	3.85156E+07	3.77900E+08	4.20388E-02	225
226	1.60370E-02	8.21716E-01	1.50171E+06	3.58745E-02	9.74407E+01	3.46815E+07	3.77900E+08	4.33000E-02	226
227	1.65181E-02	8.38234E-01	1.39035E+06	3.32163E-02	9.74739E+01	3.11745E+07	3.77900E+08	4.45990E-02	227
228	1.70137E-02	8.55248E-01	1.28495E+06	3.06964E-02	9.75046E+01	2.79721E+07	3.77900E+08	4.59369E-02	228
229	1.75241E-02	8.72772E-01	1.18537E+06	2.83176E-02	9.75329E+01	2.50528E+07	3.77900E+08	4.73150E-02	229
230	1.80498E-02	8.90822E-01	1.09147E+06	2.60742E-02	9.75590E+01	2.23962E+07	3.77900E+08	4.87345E-02	230
231	1.85913E-02	9.09413E-01	1.00307E+06	2.39626E-02	9.75830E+01	1.99829E+07	3.77900E+08	5.01965E-02	231
232	1.91490E-02	9.28562E-01	9.20038E+05	2.19789E-02	9.76049E+01	1.77949E+07	3.77900E+08	5.17024E-02	232
233	1.97235E-02	9.48286E-01	8.42186E+05	2.01191E-02	9.76251E+01	1.58147E+07	3.77900E+08	5.32535E-02	233
234	2.03152E-02	9.68601E-01	7.69342E+05	1.83789E-02	9.76434E+01	1.40260E+07	3.77900E+08	5.48511E-02	234
235	2.09247E-02	9.89526E-01	7.01326E+05	1.67541E-02	9.76602E+01	1.24136E+07	3.77900E+08	5.64966E-02	235
236	2.15524E-02	1.01108E+00	6.37953E+05	1.52402E-02	9.76754E+01	1.09630E+07	3.77900E+08	5.81915E-02	236
237	2.21990E-02	1.03328E+00	5.79033E+05	1.38326E-02	9.76893E+01	9.66065E+06	3.77900E+08	5.99376E-02	237
238	2.28650E-02	1.05614E+00	5.24376E+05	1.25269E-02	9.77018E+01	[illegible]392E+06	3.77900E+08	6.17354E-02	238
239	2.35509E-02	1.07969E+00	4.73786E+05	1.13184E-02	9.77131E+01	[illegible]094E+06	3.77900E+08	6.35875E-02	239
240	2.42574E-02	1.10395E+00	4.27071E+05	1.02024E-02	9.77233E+01	6.52066E+06	3.77900E+08	6.54951E-02	240
241	2.49852E-02	1.12894E+00	3.84035E+05	9.17428E-03	9.77325E+01	5.69279E+06	3.77900E+08	6.74599E-02	241
242	2.57347E-02	1.15467E+00	[illegible]485E+05	8.22947E-03	9.77407E+01	4.95779E+06	3.77900E+08	6.94837E-02	242
243	2.65066E-02	1.18118E+00	[illegible]08229E+[illegible]	7.36332E-03	9.77481E+01	4.30678E+06	3.77900E+08	7.15682E-02	243
244	2.73020E-02	1.20848E+00	[illegible]75075E+05	[illegible]57131E-03	9.77547E+01	3.73159E+06	3.77900E+08	7.37153E-02	244
245	2.81210E-02	1.23660E+00	[illegible]44883[illegible]E+05	[illegible]44896E-03	9.77605E+01	3.22465E+06	3.77900E+08	7.59269E-02	245
246	2.89644E-02	1.26556E+00	2.[illegible]E+05	5.19188E-03	9.77657E+01	2.77902E+06	3.77900E+08	7.82046E-02	246
247	2.98336E-02	1.29540E+00	1.92[illegible]E+05	4.59580E-03	9.77703E+01	2.38831E+06	3.77900E+08	8.05507E-02	247
248	3.07286E-02	1.32613E+00	1.69808E+05	4.05656E-03	9.77743E+01	2.04669E+06	3.77900E+08	8.29672E-02	248
249	3.16505E-02	1.35778E+00	1.49445E+05	3.57013E-03	9.77779E+01	1.74880E+06	3.77900E+08	8.54562E-02	249
250	3.26000E-02	1.39038E+00	1.31131E+05	3.13260E-03	9.77810E+01	1.48978E+06	3.77900E+08	8.80199E-02	250

*** PUFF 66 SAMPLE PROBLEM WITH FRACTURE ***

J	DX	X	ERGS	CAL	SUM CAL	ERGS/GM	Y0Z	ZONE MASS	J
251	3.35780E-02	1.42396E+00	1.14706E+05	2.74023E-03	9.77838E+01	1.26523E+06	3.77900E+08	9.08605E-02	251
252	3.45853E-02	1.45854E+00	1.00022E+05	2.38944E-03	9.77862E+01	1.07113E+06	3.77900E+08	9.33803E-02	252
253	3.56229E-02	1.49416E+00	8.69350E+04	2.07680E-03	9.77883E+01	9.03862E+05	3.77900E+08	9.61817E-02	253
254	3.66916E-02	1.53086E+00	7.53088E+04	1.79906E-03	9.77901E+01	7.60179E+05	3.77900E+08	9.90672E-02	254
255	3.77923E-02	1.56865E+00	6.50143E+04	1.55314E-03	9.77916E+01	6.37150E+05	3.77900E+08	1.02039E-01	255
256	3.89261E-02	1.60757E+00	5.59298E+04	1.33612E-03	9.77929E+01	5.32156E+05	3.77900E+08	1.05100E-01	256
257	4.00938E-02	1.64767E+00	4.79409E+04	1.14527E-03	9.77941E+01	4.42858E+05	3.77900E+08	1.08253E-01	257
258	4.12967E-02	1.68896E+00	4.09404E+04	9.78033E-04	9.77951E+01	3.67176E+05	3.77900E+08	1.11501E-01	258
259	4.25356E-02	1.73150E+00	3.48286E+04	8.32025E-04	9.77959E+01	3.03263E+05	3.77900E+08	1.14846E-01	259
260	4.38116E-02	1.77531E+00	2.95126E+04	7.05031E-04	9.77966E+01	2.49491E+05	3.77900E+08	1.18291E-01	260
261	4.51260E-02	1.82044E+00	2.49068E+04	5.95001E-04	9.77972E+01	2.04422E+05	3.77900E+08	1.21840E-01	261
262	4.64798E-02	1.86692E+00	2.09321E+04	5.00049E-04	9.77977E+01	1.66795E+05	3.77900E+08	1.25495E-01	262
263	4.78742E-02	1.91479E+00	1.75161E+04	4.18444E-04	9.77981E+01	1.35510E+05	3.77900E+08	1.29260E-01	263
264	4.93104E-02	1.96410E+00	1.45926E+04	3.48606E-04	9.77985E+01	1.09605E+05	3.77900E+08	1.33138E-01	264
265	5.07897E-02	2.01489E+00	1.21016E+04	2.89098E-04	9.77988E+01	8.82480E+04	3.77900E+08	1.37132E-01	265
266	5.23134E-02	2.06720E+00	9.98862E+03	2.38620E-04	9.77990E+01	7.27178E+04	3.77900E+08	1.41246E-01	266
267	5.38828E-02	2.12109E+00	8.20450E+03	1.95999E-04	9.77992E+01	5.63947E+04	3.77900E+08	1.45484E-01	267
268	5.54993E-02	2.17659E+00	6.70529E+03	1.60184E-04	9.77993E+01	4.47473E+04	3.77900E+08	1.49848E-01	268
269	5.71642E-02	2.23375E+00	5.45168E+03	1.30236E-04	9.77995E+01	3.53217E+04	3.77900E+08	1.54343E-01	269
270	5.88792E-02	2.29263E+00	4.40877E+03	1.05322E-04	9.77996E+01	2.77327E+04	3.77900E+08	1.58974E-01	270
271	6.06455E-02	2.35328E+00	3.54571E+03	8.47039E-05	9.77997E+01	2.16541E+04	3.77900E+08	1.63743E-01	271
272	6.24649E-02	2.41574E+00	2.83534E+03	6.77340E-05	9.77997E+01	1.68115E+04	3.77900E+08	1.68655E-01	272
273	6.43389E-02	2.48008E+00	2.25395E+03	5.38449E-05	9.77998E+01	1.29750E+04	3.77900E+08	1.73715E-01	273
274	6.62690E-02	2.54635E+00	1.78086E+03	4.25432E-05	9.77998E+01	9.95303E+03	3.77900E+08	1.78926E-01	274
275	6.82571E-02	2.61461E+00	1.39821E+03	3.34021E-05	9.77999E+01	7.58684E+03	3.77900E+08	1.84294E-01	275
276	7.03048E-02	2.68491E+00	1.09063E+03	2.60543E-05	9.77999E+01	5.74552E+03	3.77900E+08	1.89823E-01	276
277	7.24140E-02	2.75732E+00	8.44984E+02	2.01859E-05	9.77999E+01	4.32178E+03	3.77900E+08	1.95518E-01	277
278	7.45864E-02	2.83191E+00	6.50098E+02	1.55303E-05	9.77999E+01	3.22817E+03	3.77900E+08	2.01383E-01	278
279	7.68240E-02	2.90873E+00	4.96550E+02	1.18622E-05	9.77999E+01	2.39388E+03	3.77900E+08	2.07425E-01	279
280	7.91287E-02	2.98786E+00	3.76434E+02	8.99268E-06	9.77999E+01	1.76194E+03	3.77900E+08	2.13647E-01	280
281	8.15025E-02	3.06937E+00	0.	0.	9.77999E+01	0.	3.77900E+08	2.20057E-01	281
282	8.39476E-02	3.15331E+00	0.	0.	9.77999E+01	0.	3.77900E+08	2.26659E-01	282
283	8.64660E-02	3.23978E+00	0.	0.	9.77999E+01	0.	3.77900E+08	2.33458E-01	283
284	8.90600E-02	3.32884E+00	0.	0.	9.77999E+01	0.	3.77900E+08	2.40462E-01	284
285	9.17318E-02	3.42057E+00	0.	0.	9.77999E+01	0.	3.77900E+08	2.47676E-01	285
286	9.44838E-02	3.51505E+00	0.	0.	9.77999E+01	0.	3.77900E+08	2.55106E-01	286
287	9.73183E-02	3.61237E+00	0.	0.	9.77999E+01	0.	3.77900E+08	2.62759E-01	287
288	1.00238E-01	3.71261E+00	0.	0.	9.77999E+01	0.	3.77900E+08	2.70642E-01	288
289	1.03245E-01	3.81586E+00	0.	0.	9.77999E+01	0.	3.77900E+08	2.78761E-01	289
290	1.06342E-01	3.92220E+00	0.	0.	9.77999E+01	0.	3.77900E+08	2.87124E-01	290
291	1.09533E-01	4.03173E+00	0.	0.	9.77999E+01	0.	3.77900E+08	2.95738E-01	291
292	1.12819E-01	4.14455E+00	0.	0.	9.77999E+01	0.	3.77900E+08	3.04610E-01	292
293	1.16203E-01	4.26075E+00	0.	0.	9.77999E+01	0.	3.77900E+08	3.13748E-01	293
294	1.19689E-01	4.38044E+00	0.	0.	9.77999E+01	0.	3.77900E+08	3.23161E-01	294
295	1.23280E-01	4.50372E+00	0.	0.	9.77999E+01	0.	3.77900E+08	3.32856E-01	295

CYCLE	TIME	DTNH	JTS	ETOTAL	JFIN	JSTAR	JSMAX	SMAX	X(JSMAX)
25	4.2103E-10	5.0000E-11	2	6.8281E+00	295	243	132	5.8422E+09	3.0532E-01
DTPP	DTPULS	EMVNEG	EMVPOS	EMVPL	EMVPR	EMVPP	EMVBM	PDTPOS	PDTNEG
2.3496E-12	-1.4973E-10	-1.5365E+00	1.5296E+00	-8.7472E-01	8.8845E-01	1.3727E-02	0.	0.	0.
X(1)	X(JBND1)	X(JBND2)	X(JBND3)	X(JFIN)	JQMAX	QMAX	X(JQMAX)		
-5.8028E-07	3.0432E-01	0.	0.	4.5037E+00	131	1.3355E+07	3.0432E-01		

CYCLE	TIME	DTNH	JTS	ETOTAL	JFIN	JSTAR	JSMAX	SMAX	X(JSMAX)
50	1.6710E-09	5.0000E-11	3	2.7099E+01	295	243	133	2.2091E+10	3.0635E-01
DTPP	DTPULS	EMVNEG	EMVPOS	EMVPL	EMVPR	EMVPP	EMVBM	PDTPOS	PDTNEG
8.2652E-10	1.5801E-10	-2.4815E+01	2.4796E+01	3.4906E+00	1.4768E+01	1.8259E+01	0.	0.	0.
X(1)	X(JBND1)	X(JBND2)	X(JBND3)	X(JFIN)	JQMAX	QMAX	X(JQMAX)		
-2.2079E-05	3.0432E-01	0.	0.	4.5037E+00	131	2.4467E+08	3.0432E-01		

CYCLE	TIME	DTNH	JTS	ETOTAL	JFIN	JSTAR	JSMAX	SMAX	X(JSMAX)
75	2.9210E-09	5.0000E-11	4	4.7373E+01	295	244	133	3.7791E+10	3.0635E-01
DTPP	DTPULS	EMVNEG	EMVPOS	EMVPL	EMVPR	EMVPP	EMVBM	PDTPOS	PDTNEG
1.4249E-09	2.1343E-10	-7.2870E+01	7.2838E+01	8.0659E+00	4.5782E+01	5.3848E+01	0.	0.	0.
X(1)	X(JBND1)	X(JBND2)	X(JBND3)	X(JFIN)	JQMAX	QMAX	X(JQMAX)		
-6.0807E-05	3.0432E-01	0.	0.	4.5037E+00	131	8.4615E+08	3.0432E-01		

CYCLE	TIME	DTNH	JTS	ETOTAL	JFIN	JSTAR	JSMAX	SMAX	X(JSMAX)
100	4.1710E-09	5.0000E-11	8	6.7649E+01	295	246	134	5.2148E+10	3.0741E-01
DTPP	DTPULS	EMVNEG	EMVPOS	EMVPL	EMVPR	EMVPP	EMVBM	PDTPOS	PDTNEG
2.1277E-09	4.1017E-10	-1.4496E+02	1.4492E+02	2.1389E+01	8.9566E+01	1.1096E+02	0.	0.	0.
X(1)	X(JBND1)	X(JBND2)	X(JBND3)	X(JFIN)	JQMAX	QMAX	X(JQMAX)		
-1.1676E-04	3.0431E-01	0.	0.	4.5037E+00	131	1.9575E+09	3.0431E-01		

CYCLE	TIME	DTNH	JTS	ETOTAL	JFIN	JSTAR	JSMAX	SMAX	X(JSMAX)
117	5.0000E-09	3.4763E-11	9	8.1095E+01	295	247	134	6.1646E+10	3.0741E-01
DTPP	DTPULS	EMVNEG	EMVPOS	EMVPL	EMVPR	EMVPP	EMVBM	PDTPOS	PDTNEG
2.5507E-09	4.4764E-10	-2.0555E+02	2.0550E+02	2.7596E+01	1.2964E+02	1.5724E+02	0.	0.	0.
X(1)	X(JBND1)	X(JBND2)	X(JBND3)	X(JFIN)	JQMAX	QMAX	X(JQMAX)		
-1.6036E-04	3.0429E-01	0.	0.	4.5037E+00	131	3.0274E+09	3.0429E-01		

CYCLE	TIME	DTNH	JTS	ETOTAL	JFIN	JSTAR	JSMAX	SMAX	X(JSMAX)
125	5.5736E-09	1.2456E-10	10	8.1486E+01	295	252	134	6.0550E+10	3.0741E-01
DTPP	DTPULS	EMVNEG	EMVPOS	EMVPL	EMVPR	EMVPP	EMVBM	PDTPOS	PDTNEG
3.0928E-09	4.9678E-10	-2.4565E+02	2.4559E+02	3.0080E+01	1.5719E+02	1.8727E+02	0.	0.	0.
X(1)	X(JBND1)	X(JBND2)	X(JBND3)	X(JFIN)	JQMAX	QMAX	X(JQMAX)		
-1.9335E-04	3.0428E-01	0.	0.	4.5037E+00	131	3.7625E+09	3.0428E-01		

CYCLE	TIME	DTNH	JTS	ETOTAL	JFIN	JSTAR	JSMAX	SMAX	X(JSMAX)
150	1.2676E-08	3.0000E-10	18	8.6214E+01	295	257	138	5.1858E+10	3.1200E-01
DTPP	DTPULS	EMVNEG	EMVPOS	EMVPL	EMVPR	EMVPP	EMVBM	PDTPOS	PDTNEG
1.0555E-08	2.0697E-09	-7.2732E+02	7.2725E+02	1.0733E+02	4.4005E+02	5.4738E+02	0.	0.	0.
X(1)	X(JBND1)	X(JBND2)	X(JBND3)	X(JFIN)	JQMAX	QMAX	X(JQMAX)		
-6.5740E-04	3.0409E-01	0.	0.	4.5037E+00	131	6.9418E+09	3.0409E-01		

CYCLE	TIME	DTNH	JTS	ETOTAL	JFIN	JSTAR	JSMAX	SMAX	X(JSMAX)
175	2.0176E-08	3.0000E-10	5	9.1228E+01	295	257	142	4.6487E+10	3.1717E-01
DTPP	DTPULS	EMVNEG	EMVPOS	EMVPL	EMVPR	EMVPP	EMVBM	PDTPOS	PDTNEG
1.8104E-08	4.1106E-09	-1.1471E+03	1.1470E+03	1.9109E+02	6.5049E+02	8.4158E+02	0.	0.	0.
X(1)	X(JBND1)	X(JBND2)	X(JBND3)	X(JFIN)	JQMAX	QMAX	X(JQMAX)		
-1.2210E-03	3.0389E-01	0.	0.	4.5037E+00	131	3.6589E+09	3.0389E-01		

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      CYCLE          TIME          DTNH          JTS        ETOTAL         JFIN        JSTAR         JSMAX          SMAX     X(JSMAX)
        200  2.7674E-08  3.0000E-10             5  9.6232E+01          295          257           145  4.2424E+10  3.2149E-01
       DTPP       DTPULS       EMVNEG       EMVPOS       EMVPL       EMVPR       EMVPP       EMVBM       PDTPOS       PDTNEG
 2.5319E-08  5.8754E-09 -1.4970E+03  1.4969E+03  2.4926E+02  8.2487E+02  1.0741E+03  0.           0.           0.
       X(1)       X(JBND1)       X(JBND2)       X(JBND3)       X(JFIN)        JQMAX        QMAX      X(JQMAX)
-1.8496E-03  3.0372E-01  0.           0.           4.5037E+00          130  2.8910E+09  2.9508E-01

      CYCLE          TIME          DTNH          JTS        ETOTAL         JFIN        JSTAR         JSMAX          SMAX     X(JSMAX)
        208  3.0000E-08  2.6887E-10             6  9.7783E+01          295          258           146  4.1480E+10  3.2302E-01
       DTPP       DTPULS       EMVNEG       EMVPOS       EMVPL       EMVPR       EMVPP       EMVBM       PDTPOS       PDTNEG
 2.7469E-08  6.5670E-09 -1.5955E+03  1.5954E+03  2.7240E+02  8.6704E+02  1.1394E+03  0.           0.           0.
       X(1)       X(JBND1)       X(JBND2)       X(JBND3)       X(JFIN)        JQMAX        QMAX      X(JQMAX)
-2.0623E-03  3.0367E-01  0.           0.           4.5037E+00          130  3.0769E+09  2.9504E-01

 === SPALL OCCURED AT ZONE   8 LOCATION -3.4578E-05 CM AT CYCLE 223 TIME= 3.7874E-08 SEC   SJ =-5.1382E+09 TSPALL(J)= 5.0000E+09
       TOTAL NO OF FRACTURES IS  1

MOMENTUM AFTER FRACTURE
 -1.4217E+02    1.4205E+02

      CYCLE          TIME          DTNH          JTS        ETOTAL         JFIN        JSTAR         JSMAX          SMAX     X(JSMAX)
        225  3.8850E-08  4.1598E-10             7  9.7774E+01          295          261           150  3.8179E+10  3.2957E-01
       DTPP       DTPULS       EMVNEG       EMVPOS       EMVPL       EMVPR       EMVPP       EMVBM       PDTPOS       PDTNEG
 3.5185E-08  9.8319E-09 -1.9148E+03  1.9146E+03  3.7533E+02  9.6783E+02  1.3432E+03  0.           0.           0.
       X(1)       X(JBND1)       X(JBND2)       X(JBND3)       X(JFIN)        JQMAX        QMAX      X(JQMAX)
-2.6736E-03  3.0352E-01  0.           0.           4.5037E+00          130  2.6906E+09  2.9486E-01

 === SPALL OCCURED AT ZONE  12 LOCATION  1.2639E-03 CM AT CYCLE 228 TIME= 4.0246E-08 SEC   SJ =-5.0757E+09 TSPALL(J)= 5.0000E+09
       TOTAL NO OF FRACTURES IS  2

MOMENTUM AFTER FRACTURE
 -1.4217E+02   -8.2493E+01    2.2454E+02

 === SPALL OCCURED AT ZONE  19 LOCATION  3.7244E-03 CM AT CYCLE 240 TIME= 4.6500E-08 SEC   SJ =-5.1431E+09 TSPALL(J)= 5.0000E+09
       TOTAL NO OF FRACTURES IS  3

MOMENTUM AFTER FRACTURE
 -1.4217E+02   -8.2493E+01   -1.3968E+02    3.6422E+02

      CYCLE          TIME          DTNH          JTS        ETOTAL         JFIN        JSTAR         JSMAX          SMAX     X(JSMAX)
        250  5.2099E-08  5.7240E-10             7  9.7777E+01          295          261           154  3.4925E+10  3.3697E-01
       DTPP       DTPULS       EMVNEG       EMVPOS       EMVPL       EMVPR       EMVPP       EMVBM       PDTPOS       PDTNEG
 4.5188E-08  1.2769E-08 -2.2851E+03  2.2850E+03  4.4596E+02  1.1322E+03  1.5782E+03  0.           0.           0.
       X(1)       X(JBND1)       X(JBND2)       X(JBND3)       X(JFIN)        JQMAX        QMAX      X(JQMAX)
-3.5122E-03  3.0333E-01  0.           0.           4.5037E+00          129  2.5134E+09  2.8619E-01

 === SPALL OCCURED AT ZONE  28 LOCATION  7.5957E-03 CM AT CYCLE 258 TIME= 5.6485E-08 SEC   SJ =-5.0017E+09 TSPALL(J)= 5.0000E+09
       TOTAL NO OF FRACTURES IS  4

MOMENTUM AFTER FRACTURE
 -1.4217E+02   -8.2493E+01   -1.3968E+02   -1.8416E+02    5.4837E+02
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CYCLE	TIME	DTNH	JTS	ETOTAL	JFIN	JSTAR	JSMAX	SMAX	X(JSMAX)
275	6.6175E-08	5.7839E-10	6	9.7771E+01	295	261	158	3.2260E+10	3.4529E-01
DTPP	DTPULS	EMVNEG	EMVPOS	EMVPL	EMVPR	EMVPP	EMVBM	PDTPOS	PDTNEG
5.4866E-08	1.6303E-08	-2.5847E+03	2.5846E+03	5.2594E+02	1.2441E+03	1.7700E+03	0.	0.	0.
X(1)	X(JBND1)	X(JBND2)	X(JBND3)	X(JFIN)	JQMAX	QMAX	X(JQMAX)		
-4.3862E-03	3.0316E-01	0.	0.	4.5037E+00	128	2.0087E+09	2.7774E-01		

CYCLE	TIME	DTNH	JTS	ETOTAL	JFIN	JSTAR	JSMAX	SMAX	X(JSMAX)
300	8.0328E-08	5.8238E-10	6	9.7776E+01	295	261	162	3.0246E+10	3.5462E-01
DTPP	DTPULS	EMVNEG	EMVPOS	EMVPL	EMVPR	EMVPP	EMVBM	PDTPOS	PDTNEG
6.3493E-08	2.0902E-08	-2.8149E+03	2.8147E+03	6.3221E+02	1.2882E+03	1.9204E+03	0.	0.	0.
X(1)	X(JBND1)	X(JBND2)	X(JBND3)	X(JFIN)	JQMAX	QMAX	X(JQMAX)		
-5.2607E-03	3.0300E-01	0.	0.	4.5037E+00	128	1.6856E+09	2.7750E-01		

CYCLE	TIME	DTNH	JTS	ETOTAL	JFIN	JSTAR	JSMAX	SMAX	X(JSMAX)
325	9.4523E-08	5.8300E-10	6	9.7779E+01	295	262	165	2.8642E+10	3.6240E-01
DTPP	DTPULS	EMVNEG	EMVPOS	EMVPL	EMVPR	EMVPP	EMVBM	PDTPOS	PDTNEG
7.1106E-08	2.3635E-08	-3.0020E+03	3.0018E+03	6.7697E+02	1.3597E+03	2.0366E+03	0.	0.	0.
X(1)	X(JBND1)	X(JBND2)	X(JBND3)	X(JFIN)	JQMAX	QMAX	X(JQMAX)		
-6.1415E-03	3.0288E-01	0.	0.	4.5037E+00	127	1.8589E+09	2.6930E-01		

=== SPALL OCCURED AT ZONE 51 LOCATION 2.2871E-02 CM AT CYCLE 347 TIME= 1.0702E-07 SEC SJ =-5.0110E+09 TSPALL(J)= 5.0000E+09
TOTAL NO OF FRACTURES IS 5

MOMENTUM AFTER FRACTURE
-1.4217E+02 -8.2493E+01 -1.3968E+02 -1.8416E+02 -4.6368E+02 1.0120E+03

CYCLE	TIME	DTNH	JTS	ETOTAL	JFIN	JSTAR	JSMAX	SMAX	X(JSMAX)
350	1.0876E-07	5.8079E-10	6	9.7767E+01	295	262	168	2.7296E+10	3.7087E-01
DTPP	DTPULS	EMVNEG	EMVPOS	EMVPL	EMVPR	EMVPP	EMVBM	PDTPOS	PDTNEG
7.8041E-08	2.7084E-08	-3.1518E+03	3.1516E+03	7.3928E+02	1.3909E+03	2.1302E+03	0.	0.	0.
X(1)	X(JBND1)	X(JBND2)	X(JBND3)	X(JFIN)	JQMAX	QMAX	X(JQMAX)		
-7.0259E-03	3.0277E-01	0.	0.	4.5037E+00	126	1.8306E+09	2.6133E-01		

CYCLE	TIME	DTNH	JTS	ETOTAL	JFIN	JSTAR	JSMAX	SMAX	X(JSMAX)
375	1.2303E-07	5.7922E-10	6	9.7777E+01	295	262	171	2.6178E+10	3.8011E-01
DTPP	DTPULS	EMVNEG	EMVPOS	EMVPL	EMVPR	EMVPP	EMVBM	PDTPOS	PDTNEG
8.4188E-08	3.1266E-08	-3.2775E+03	3.2773E+03	8.1848E+02	1.3854E+03	2.2039E+03	0.	0.	0.
X(1)	X(JBND1)	X(JBND2)	X(JBND3)	X(JFIN)	JQMAX	QMAX	X(JQMAX)		
-7.9123E-03	3.0267E-01	0.	0.	4.5037E+00	125	1.6801E+09	2.5358E-01		

CYCLE	TIME	DTNH	JTS	ETOTAL	JFIN	JSTAR	JSMAX	SMAX	X(JSMAX)
400	1.3733E-07	5.7831E-10	6	9.7774E+01	295	262	174	2.4867E+10	3.9017E-01
DTPP	DTPULS	EMVNEG	EMVPOS	EMVPL	EMVPR	EMVPP	EMVBM	PDTPOS	PDTNEG
9.1148E-08	3.6945E-08	-3.3802E+03	3.3800E+03	9.1872E+02	1.3479E+03	2.2666E+03	0.	0.	0.
X(1)	X(JBND1)	X(JBND2)	X(JBND3)	X(JFIN)	JQMAX	QMAX	X(JQMAX)		
-8.8005E-03	3.0259E-01	0.	0.	4.5037E+00	124	1.4820E+09	2.4605E-01		

CYCLE	TIME	DTNH	JTS	ETOTAL	JFIN	JSTAR	JSMAX	SMAX	X(JSMAX)
425	1.5165E-07	5.7747E-10	6	9.7780E+01	295	263	176	2.4272E+10	3.9744E-01
DTPP	DTPULS	EMVNEG	EMVPOS	EMVPL	EMVPR	EMVPP	EMVBM	PDTPOS	PDTNEG
9.5327E-08	3.8211E-08	-3.4458E+03	3.4456E+03	9.2747E+02	1.3863E+03	2.3138E+03	0.	0.	0.
X(1)	X(JBND1)	X(JBND2)	X(JBND3)	X(JFIN)	JQMAX	QMAX	X(JQMAX)		
-9.6903E-03	3.0251E-01	0.	0.	4.5037E+00	123	1.2827E+09	2.3873E-01		

CYCLE	TIME	DTNH	JTS	ETOTAL	JFIN	JSTAR	JSMAX	SMAX	X(JSMAX)
450	1.659AE-07	5.7472E-10	6	9.7779E+01	295	263	178	2.3523E+10	4.0514E-01
DTPP	DTPULS	EMVNEG	EMVPOS	EMVPL	EMVPR	EMVPP	EMVBM	PDTPOS	PDTNEG
1.0037E-07	4.0582E-08	-3.5349E+03	3.5347E+03	9.5458E+02	1.4063E+03	2.3609E+03	0.	0.	0.
X(1)	X(JBND1)	X(JBND2)	X(JBND3)	X(JFIN)	JQMAX	QMAX	X(JQMAX)		
-1.0581E-02	3.0244E-01	0.	0.	4.5037E+00	123	1.3323E+09	2.3854E-01		

CYCLE	TIME	DTNH	JTS	ETOTAL	JFIN	JSTAR	JSMAX	SMAX	X(JSMAX)
475	1.8032E-07	5.7616E-10	6	9.7781E+01	295	263	180	2.2791E+10	4.1330E-01
DTPP	DTPULS	EMVNEG	EMVPOS	EMVPL	EMVPR	EMVPP	EMVBM	PDTPOS	PDTNEG
1.0520E-07	4.3413E-08	-3.5890E+03	3.5888E+03	9.8942E+02	1.4082E+03	2.3976E+03	0.	0.	0.
X(1)	X(JBND1)	X(JBND2)	X(JBND3)	X(JFIN)	JQMAX	QMAX	X(JQMAX)		
-1.1473E-02	3.0239E-01	0.	0.	4.5037E+00	122	1.3675E+09	2.3145E-01		

CYCLE	TIME	DTNH	JTS	ETOTAL	JFIN	JSTAR	JSMAX	SMAX	X(JSMAX)
500	1.9467E-07	5.7577E-10	6	9.7779E+01	295	263	182	2.2153E+10	4.2193E-01
DTPP	DTPULS	EMVNEG	EMVPOS	EMVPL	EMVPR	EMVPP	EMVBM	PDTPOS	PDTNEG
1.0955E-07	4.6664E-08	-3.6361E+03	3.6359E+03	1.0337E+03	1.3930E+03	2.4267E+03	0.	0.	0.
X(1)	X(JBND1)	X(JBND2)	X(JBND3)	X(JFIN)	JQMAX	QMAX	X(JQMAX)		
-1.2366E-02	3.0233E-01	0.	0.	4.5037E+00	121	1.3618E+09	2.2455E-01		

CYCLE	TIME	DTNH	JTS	ETOTAL	JFIN	JSTAR	JSMAX	SMAX	X(JSMAX)
525	2.0904E-07	5.7551E-10	6	9.7780E+01	295	263	184	2.1540E+10	4.3107E-01
DTPP	DTPULS	EMVNEG	EMVPOS	EMVPL	EMVPR	EMVPP	EMVBM	PDTPOS	PDTNEG
1.1363E-07	5.0400E-08	-3.6727E+03	3.6725E+03	1.0856E+03	1.3621E+03	2.4477E+03	0.	0.	0.
X(1)	X(JBND1)	X(JBND2)	X(JBND3)	X(JFIN)	JQMAX	QMAX	X(JQMAX)		
-1.3260E-02	3.0229E-01	0.	0.	4.5037E+00	120	1.3335E+09	2.1785E-01		

REZONE AT CYCLE 525 ADDED 53 ZONES DELETED 40 ZONES NEW JSTAR IS 276

CYCLE	TIME	DTNH	JTS	ETOTAL	JFIN	JSTAR	JSMAX	SMAX	X(JSMAX)
550	2.2358E-07	5.8494E-10	5	9.7781E+01	308	277	147	2.1011E+10	4.3836E-01
DTPP	DTPULS	EMVNEG	EMVPOS	EMVPL	EMVPR	EMVPP	EMVBM	PDTPOS	PDTNEG
1.1768E-07	4.0045E-08	-3.6915E+03	3.6903E+03	8.4138E+02	1.6313E+03	2.4727E+03	0.	0.	0.
X(1)	X(JBND1)	X(JBND2)	X(JBND3)	X(JFIN)	JQMAX	QMAX	X(JQMAX)		
-1.4148E-02	3.0225E-01	0.	0.	4.5037E+00	85	1.2931E+09	2.1134E-01		

CYCLE	TIME	DTNH	JTS	ETOTAL	JFIN	JSTAR	JSMAX	SMAX	X(JSMAX)
575	2.3824E-07	5.8791E-10	5	9.7783E+01	308	277	150	2.0582E+10	4.4892E-01
DTPP	DTPULS	EMVNEG	EMVPOS	EMVPL	EMVPR	EMVPP	EMVBM	PDTPOS	PDTNEG
1.2137E-07	4.1060E-08	-3.7083E+03	3.7071E+03	8.4430E+02	1.6513E+03	2.4956E+03	0.	0.	0.
X(1)	X(JBND1)	X(JBND2)	X(JBND3)	X(JFIN)	JQMAX	QMAX	X(JQMAX)		
-1.5059E-02	3.0221E-01	0.	0.	4.5037E+00	84	1.2494E+09	2.0502E-01		

CYCLE	TIME	DTNH	JTS	ETOTAL	JFIN	JSTAR	JSMAX	SMAX	X(JSMAX)
600	2.5291E-07	5.8762E-10	5	9.7787E+01	308	277	154	2.0204E+10	4.5648E-01
DTPP	DTPULS	EMVNEG	EMVPOS	EMVPL	EMVPR	EMVPP	EMVBM	PDTPOS	PDTNEG
1.2391E-07	4.6042E-08	-3.7284E+03	3.7272E+03	9.3025E+02	1.5732E+03	2.5035E+03	0.	0.	0.
X(1)	X(JBND1)	X(JBND2)	X(JBND3)	X(JFIN)	JQMAX	QMAX	X(JQMAX)		
-1.5972E-02	3.0218E-01	0.	0.	4.5037E+00	83	1.2030E+09	1.9889E-01		

CYCLE	TIME	DTNH	JTS	ETOTAL	JFIN	JSTAR	JSMAX	SMAX	X(JSMAX)
625	2.6759E-07	5.8759E-10	5	9.7790E+01	308	277	157	1.9837E+10	4.6489E-01
DTPP	DTPULS	EMVNEG	EMVPOS	EMVPL	EMVPR	EMVPP	EMVBM	PDTPOS	PDTNEG
1.2682E-07	4.6993E-08	-3.7280E+03	3.7268E+03	9.3021E+02	1.5855E+03	2.5157E+03	0.	0.	0.
X(1)	X(JBND1)	X(JBND2)	X(JBND3)	X(JFIN)	JQMAX	QMAX	X(JQMAX)		
-1.6884E-02	3.0215E-01	0.	0.	4.5037E+00	82	1.1484E+09	1.9293E-01		

REZONE AT CYCLE 625 ADDED 0 ZONES DELETED 26 ZONES NEW JSTAR IS 251

CYCLE	TIME	DTNH	JTS	ETOTAL	JFIN	JSTAR	JSMAX	SMAX	X(JSMAX)
650	2.8624E-07	7.5823E-10	7	9.7793E+01	282	252	135	1.9396E+10	4.7515E-01
DTPP	DTPULS	EMVNEG	EMVPOS	EMVPL	EMVPR	EMVPP	EMVBM	PDTPOS	PDTNEG
1.3017E-07	4.1338E-08	-3.7082E+03	3.7030E+03	8.0181E+02	1.7231E+03	2.5249E+03	0.	0.	0.
X(1)	X(JBND1)	X(JBND2)	X(JBND3)	X(JFIN)	JQMAX	QMAX	X(JQMAX)		
-1.8042E-02	3.0211E-01	0.	0.	4.5037E+00	49	1.0410E+09	1.3806E-01		

CYCLE	TIME	DTNH	JTS	ETOTAL	JFIN	JSTAR	JSMAX	SMAX	X(JSMAX)
675	3.0522E-07	7.5985E-10	7	9.7788E+01	282	252	142	1.9086E+10	4.8593E-01
DTPP	DTPULS	EMVNEG	EMVPOS	EMVPL	EMVPR	EMVPP	EMVBM	PDTPOS	PDTNEG
1.3274E-07	4.2957E-08	-3.6875E+03	3.6824E+03	8.1988E+02	1.7137E+03	2.5335E+03	0.	0.	0.
X(1)	X(JBND1)	X(JBND2)	X(JBND3)	X(JFIN)	JQMAX	QMAX	X(JQMAX)		
-1.9236E-02	3.0209E-01	0.	0.	4.5037E+00	57	1.0890E+09	1.7614E-01		

CYCLE	TIME	DTNH	JTS	ETOTAL	JFIN	JSTAR	JSMAX	SMAX	X(JSMAX)
700	3.2421E-07	7.5993E-10	7	9.7788E+01	282	252	149	1.8734E+10	4.9731E-01
DTPP	DTPULS	EMVNEG	EMVPOS	EMVPL	EMVPR	EMVPP	EMVBM	PDTPOS	PDTNEG
1.3561E-07	4.5702E-08	-3.6315E+03	3.6263E+03	8.5617E+02	1.6843E+03	2.5405E+03	0.	0.	0.
X(1)	X(JBND1)	X(JBND2)	X(JBND3)	X(JFIN)	JQMAX	QMAX	X(JQMAX)		
-2.0432E-02	3.0206E-01	0.	0.	4.5037E+00	53	1.2239E+09	1.5615E-01		

REZONE AT CYCLE 700 ADDED 24 ZONES DELETED 0 ZONES NEW JSTAR IS 276

CYCLE	TIME	DTNH	JTS	ETOTAL	JFIN	JSTAR	JSMAX	SMAX	X(JSMAX)
725	3.4320E-07	7.5991E-10	7	9.7790E+01	306	276	156	1.8376E+10	5.0926E-01
DTPP	DTPULS	EMVNEG	EMVPOS	EMVPL	EMVPR	EMVPP	EMVBM	PDTPOS	PDTNEG
1.3841E-07	4.9346E-08	-3.4370E+03	3.4319E+03	9.0679E+02	1.6366E+03	2.5434E+03	0.	0.	0.
X(1)	X(JBND1)	X(JBND2)	X(JBND3)	X(JFIN)	JQMAX	QMAX	X(JQMAX)		
-2.1628E-02	3.0204E-01	0.	0.	4.5037E+00	54	1.5604E+09	1.6092E-01		

REZONE AT CYCLE 725 ADDED 0 ZONES DELETED 22 ZONES NEW JSTAR IS 254

CYCLE	TIME	DTNH	JTS	ETOTAL	JFIN	JSTAR	JSMAX	SMAX	X(JSMAX)
750	3.6212E-07	7.5985E-10	5	9.7784E+01	284	254	41	1.9598E+10	1.6095E-01
DTPP	DTPULS	EMVNEG	EMVPOS	EMVPL	EMVPR	EMVPP	EMVBM	PDTPOS	PDTNEG
9.8883E-08	3.1151E-08	-3.1689E+03	3.1578E+03	6.1051E+02	1.3274E+03	1.9379E+03	0.	0.	0.
X(1)	X(JBND1)	X(JBND2)	X(JBND3)	X(JFIN)	JQMAX	QMAX	X(JQMAX)		
-2.2889E-02	3.0203E-01	0.	0.	4.5037E+00	2	6.0145E+08	-1.7545E-02		

CYCLE	TIME	DTNH	JTS	ETOTAL	JFIN	JSTAR	JSMAX	SMAX	X(JSMAX)
775	3.8110E-07	7.5958E-10	5	9.7790E+01	284	255	40	1.8035E+10	1.5642E-01
DTPP	DTPULS	EMVNEG	EMVPOS	EMVPL	EMVPR	EMVPP	EMVBM	PDTPOS	PDTNEG
9.6967E-08	8.0986E-09	-2.9837E+03	2.9726E+03	1.4606E+02	1.6028E+03	1.7488E+03	0.	0.	0.
X(1)	X(JBND1)	X(JBND2)	X(JBND3)	X(JFIN)	JQMAX	QMAX	X(JQMAX)		
-2.4138E-02	3.0201E-01	0.	0.	4.5037E+00	46	6.5996E+08	1.8644E-01		

CYCLE	TIME	DTNH	JTS	ETOTAL	JFIN	JSTAR	JSMAX	SMAX	X(JSMAX)
800	4.0010E-07	7.5969E-10	5	9.7792E+01	284	255	152	1.7156E+10	5.4297E-01
DTPP	DTPULS	EMVNEG	EMVPOS	EMVPL	EMVPR	EMVPP	EMVBM	PDTPOS	PDTNEG
1.4859E-07	5.7491E-08	-2.9462E+03	2.9351E+03	9.8974E+02	1.5595E+03	2.5493E+03	0.	0.	0.
X(1)	X(JBND1)	X(JBND2)	X(JBND3)	X(JFIN)	JQMAX	QMAX	X(JQMAX)		
-2.5390E-02	3.0200E-01	0.	0.	4.5037E+00	47	5.3385E+08	1.9208E-01		

REZONE AT CYCLE 800 ADDED 18 ZONES DELETED 0 ZONES NEW JSTAR IS 273

CYCLE	TIME	DTNH	JTS	ETOTAL	JFIN	JSTAR	JSMAX	SMAX	X(JSMAX)
825	4.1909E-07	7.5985E-10	5	9.7792E+01	302	273	158	1.6685E+10	5.5525E-01
DTPP	DTPULS	EMVNEG	EMVPOS	EMVPL	EMVPR	EMVPP	EMVBM	PDTPOS	PDTNEG
1.5279E-07	6.2572E-08	-3.0239E+03	3.0128E+03	1.0440E+03	1.5053E+03	2.5494E+03	0.	0.	0.
X(1)	X(JBND1)	X(JBND2)	X(JBND3)	X(JFIN)	JQMAX	QMAX	X(JQMAX)		
-2.6646E-02	3.0200E-01	0.	0.	4.5037E+00	49	7.2826E+08	2.0393E-01		

REZONE AT CYCLE 825 ADDED 0 ZONES DELETED 29 ZONES NEW JSTAR IS 244

CYCLE	TIME	DTNH	JTS	ETOTAL	JFIN	JSTAR	JSMAX	SMAX	X(JSMAX)
850	4.4368E-07	9.7588E-10	6	9.7763E+01	273	245	135	1.6232E+10	5.6808E-01
DTPP	DTPULS	EMVNEG	EMVPOS	EMVPL	EMVPR	EMVPP	EMVBM	PDTPOS	PDTNEG
1.5705E-07	6.4178E-08	-3.1851E+03	3.1680E+03	1.0417E+03	1.5075E+03	2.5492E+03	0.	0.	0.
X(1)	X(JBND1)	X(JBND2)	X(JBND3)	X(JFIN)	JQMAX	QMAX	X(JQMAX)		
-2.8234E-02	3.0199E-01	0.	0.	4.5037E+00	4	1.6005E+09	-1.0411E-02		

CYCLE	TIME	DTNH	JTS	ETOTAL	JFIN	JSTAR	JSMAX	SMAX	X(JSMAX)
875	4.6746E-07	9.7598E-10	6	9.7773E+01	273	245	142	1.5742E+10	5.8379E-01
DTPP	DTPULS	EMVNEG	EMVPOS	EMVPL	EMVPR	EMVPP	EMVBM	PDTPOS	PDTNEG
1.6171E-07	7.0077E-08	-3.3448E+03	3.3277E+03	1.1032E+03	1.4425E+03	2.5457E+03	0.	0.	0.
X(1)	X(JBND1)	X(JBND2)	X(JBND3)	X(JFIN)	JQMAX	QMAX	X(JQMAX)		
-2.9844E-02	3.0199E-01	0.	0.	4.5037E+00	24	1.0754E+09	1.1202E-01		

CYCLE	TIME	DTNH	JTS	ETOTAL	JFIN	JSTAR	JSMAX	SMAX	X(JSMAX)
900	4.9185E-07	9.7569E-10	6	9.7781E+01	273	245	147	1.5374E+10	5.9554E-01
DTPP	DTPULS	EMVNEG	EMVPOS	EMVPL	EMVPR	EMVPP	EMVBM	PDTPOS	PDTNEG
1.6535E-07	6.9226E-08	-3.4776E+03	3.4605E+03	1.0643E+03	1.4778E+03	2.5421E+03	0.	0.	0.
X(1)	X(JBND1)	X(JBND2)	X(JBND3)	X(JFIN)	JQMAX	QMAX	X(JQMAX)		
-3.1463E-02	3.0199E-01	0.	0.	4.5037E+00	48	8.1060E+08	2.3715E-01		

CYCLE	TIME	DTNH	JTS	ETOTAL	JFIN	JSTAR	JSMAX	SMAX	X(JSMAX)
909	5.0000E-07	4.1853E-10	6	9.7783E+01	273	245	149	1.5298E+10	6.0039E-01
DTPP	DTPULS	EMVNEG	EMVPOS	EMVPL	EMVPR	EMVPP	EMVBM	PDTPOS	PDTNEG
1.6609E-07	6.9931E-08	-3.5175E+03	3.5004E+03	1.0698E+03	1.4710E+03	2.5408E+03	0.	0.	0.
X(1)	X(JBND1)	X(JBND2)	X(JBND3)	X(JFIN)	JQMAX	QMAX	X(JQMAX)		
-3.2003E-02	3.0199E-01	0.	0.	4.5037E+00	49	7.6068E+08	2.4440E-01		

CYCLE	TIME	DTNH	JTS	ETOTAL	JFIN	JSTAR	JSMAX	SMAX	X(JSMAX)
925	5.1385E-07	9.7555E-10	6	9.7783E+01	273	245	153	1.5081E+10	6.1020E-01
DTPP	DTPULS	EMVNEG	EMVPOS	EMVPL	EMVPR	EMVPP	EMVBM	PDTPOS	PDTNEG
1.6833E-07	7.4866E-08	-3.5767E+03	3.5596E+03	1.1291E+03	1.4096E+03	2.5386E+03	0.	0.	0.
X(1)	X(JBND1)	X(JBND2)	X(JBND3)	X(JFIN)	JQMAX	QMAX	X(JQMAX)		
-3.2919E-02	3.0200E-01	0.	0.	4.5037E+00	49	7.7891E+08	2.4448E-01		

REZONE AT CYCLE 925 ADDED 23 ZONES DELETED 29 ZONES NEW JSTAR IS 239

CYCLE	TIME	DTNH	JTS	ETOTAL	JFIN	JSTAR	JSMAX	SMAX	X(JSMAX)
950	5.5851E-07	1.8979E-09	8	9.7759E+01	267	240	133	1.4661E+10	6.3348E-01
DTPP	DTPULS	EMVNEG	EMVPOS	EMVPL	EMVPR	EMVPP	EMVBM	PDTPOS	PDTNEG
1.7259E-07	7.5730E-09	-3.7497E+03	3.7155E+03	1.1103E+03	1.4201E+03	2.5303E+03	0.	0.	0.
X(1)	X(JAND1)	X(JAND2)	X(JBND3)	X(JFIN)	JQMAX	QMAX	X(JQMAX)		
-3.5874E-02	3.0202E-01	0.	0.	4.5037E+00	42	8.7888E+08	2.6771E-01		

CYCLE	TIME	DTNH	JTS	ETOTAL	JFIN	JSTAR	JSMAX	SMAX	X(JSMAX)
975	6.0592E-07	1.8965E-09	8	9.7769E+01	267	241	143	1.4213E+10	6.6118E-01
DTPP	DTPULS	EMVNEG	EMVPOS	EMVPL	EMVPR	EMVPP	EMVBM	PDTPOS	PDTNEG
1.7711E-07	8.0827E-08	-3.8575E+03	3.8233E+03	1.1488E+03	1.3686E+03	2.5174E+03	0.	0.	0.
X(1)	X(JAND1)	X(JAND2)	X(JBND3)	X(JFIN)	JQMAX	QMAX	X(JQMAX)		
-3.9014E-02	3.0206E-01	0.	0.	4.5037E+00	45	7.9059E+08	2.9311E-01		

CYCLE	TIME	DTNH	JTS	ETOTAL	JFIN	JSTAR	JSMAX	SMAX	X(JSMAX)
1000	6.5334E-07	1.8989E-09	8	9.7777E+01	267	241	152	1.3769E+10	6.8794E-01
DTPP	DTPULS	EMVNEG	EMVPOS	EMVPL	EMVPR	EMVPP	EMVBM	PDTPOS	PDTNEG
1.8190E-07	8.4458E-08	-3.9364E+03	3.9021E+03	1.1657E+03	1.3390E+03	2.5047E+03	0.	0.	0.
X(1)	X(JAND1)	X(JAND2)	X(JBND3)	X(JFIN)	JQMAX	QMAX	X(JQMAX)		
-4.2154E-02	3.0221E-01	0.	0.	4.5037E+00	46	9.0112E+08	3.0221E-01		

REZONE AT CYCLE 1000 ADDED 24 ZONES DELETED 0 ZONES NEW JSTAR IS 265

CYCLE	TIME	DTNH	JTS	ETOTAL	JFIN	JSTAR	JSMAX	SMAX	X(JSMAX)
1025	7.0079E-07	1.8984E-09	8	9.7774E+01	291	266	160	1.3365E+10	7.1329E-01
DTPP	DTPULS	EMVNEG	EMVPOS	EMVPL	EMVP	EMVPP	EMVBM	PDTPOS	PDTNEG
1.8644E-07	8.6255E-08	-4.0063E+03	3.9721E+03	1.1528E+03	1.3390E+03	2.4919E+03	0.	0.	0.
X(1)	X(JAND1)	X(JAND2)	X(JBND3)	X(JFIN)	JQMAX	QMAX	X(JQMAX)		
-4.5295E-02	3.0254E-01	0.	0.	4.5037E+00	11	3.3253E+08	3.8632E-02		

REZONE AT CYCLE 1025 ADDED 0 ZONES DELETED 22 ZONES NEW JSTAR IS 244

CYCLE	TIME	DTNH	JTS	ETOTAL	JFIN	JSTAR	JSMAX	SMAX	X(JSMAX)
1050	7.4894E-07	1.9319E-09	8	9.7784E+01	269	245	146	1.2877E+10	7.4015E-01
DTPP	DTPULS	EMVNEG	EMVPOS	EMVPL	EMVPR	EMVPP	EMVBM	PDTPOS	PDTNEG
1.9261E-07	9.0515E-08	-4.1061E+03	4.0426E+03	1.1656E+03	1.3150E+03	2.4805E+03	0.	0.	0.
X(1)	X(JAND1)	X(JAND2)	X(JBND3)	X(JFIN)	JQMAX	QMAX	X(JQMAX)		
-4.8483E-02	3.0284E-01	0.	0.	4.5037E+00	58	4.0619E+08	3.6761E-01		

CYCLE	TIME	DTNH	JTS	ETOTAL	JFIN	JSTAR	JSMAX	SMAX	X(JSMAX)
1075	7.9773E-07	1.9526E-09	8	9.7794E+01	269	245	154	1.2427E+10	7.6863E-01
DTPP	DTPULS	EMVNEG	EMVPOS	EMVPL	EMVPR	EMVPP	EMVBM	PDTPOS	PDTNEG
1.9841E-07	9.6414E-08	-4.3366E+03	4.2732E+03	1.1981E+03	1.2675E+03	2.4657E+03	0.	0.	0.
X(1)	X(JAND1)	X(JAND2)	X(JBND3)	X(JFIN)	JQMAX	QMAX	X(JQMAX)		
-5.1713E-02	3.0307E-01	0.	0.	4.5037E+00	6	3.1720E+08	2.4540E-03		

CYCLE	TIME	DTNH	JTS	ETOTAL	JFIN	JSTAR	JSMAX	SMAX	X(JSMAX)
1100	8.4658E-07	1.9549E-09	8	9.7788E+01	269	246	[illegible]	1.1974E+10	7.9498E-01
DTPP	DTPULS	EMVNEG	EMVPOS	EMVPL	EMVPR	EMVPP	EMVBM	PDTPOS	PDTNEG
2.0470E-07	9.9273E-08	-4.5134E+03	4.4501E+03	1.1887E+03	1.2624E+03	2.4511E+03	0.	0.	0.
X(1)	X(JAND1)	X(JAND2)	X(JBND3)	X(JFIN)	JQMAX	QMAX	X(JQMAX)		
-5.4947E-02	3.0325E-01	0.	0.	4.5037E+00	70	2.8040E+08	4.1761E-01		

REZONE AT CYCLE 1100 ADDED 25 ZONES DELETED 0 ZONES NEW JSTAR IS 271

CYCLE	TIME	DTNM	JTS	ETOTAL	JFIN	JSTAR	JSMAX	SMAX	X(JSMAX)
1125	8.9545E-07	1.9554E-09	8	9.7791E+01	294	271	168	1.1593E+10	8.2269E-01
DTPP	DTPULS	EMVNEG	EMVPOS	EMVPL	EMVPR	EMVPP	EMVBM	PDTPOS	PDTNEG
2.1029E-07	1.0407E-07	-4.6352E+03	4.5718E+03	1.2065E+03	1.2315E+03	2.4380E+03	0.	0.	0.
X(1)	X(JBND1)	X(JBND2)	X(JBND3)	X(JFIN)	JQMAX	QMAX	X(JQMAX)		
-5.8182E-02	3.0339E-01	0.	0.	4.5037E+00	76	3.1408E+08	4.4607E-01		

REZONE AT CYCLE 1125 ADDED 0 ZONES DELETED 13 ZONES NEW JSTAR IS 258

CYCLE	TIME	DTNM	JTS	ETOTAL	JFIN	JSTAR	JSMAX	SMAX	X(JSMAX)
1150	9.4432E-07	1.9544E-09	8	9.7787E+01	281	258	162	1.1199E+10	8.3193E-01
DTPP	DTPULS	EMVNEG	EMVPOS	EMVPL	EMVPR	EMVPP	EMVBM	PDTPOS	PDTNEG
2.1642E-07	1.1125E-07	-4.7095E+03	4.6461E+03	1.2459E+03	1.1778E+03	2.4236E+03	0.	0	0.
X(1)	X(JBND1)	X(JBND2)	X(JBND3)	X(JFIN)	JQMAX	QMAX	X(JQMAX)		
-6.1417E-02	3.0349E-01	0.	0.	4.5037E+00	69	3.3583E+08	4.7392E-01		

CYCLE	TIME	DTNM	JTS	ETOTAL	JFIN	JSTAR	JSMAX	SMAX	X(JSMAX)
1175	9.9318E-07	1.9550E-09	8	9.7783E+01	281	259	168	1.0908E+10	8.7822E-01
DTPP	DTPULS	EMVNEG	EMVPOS	EMVPL	EMVPR	EMVPP	EMVBM	PDTPOS	PDTNEG
2.2099E-07	1.1329E-07	-4.7523E+03	4.6868E+03	1.2357E+03	1.1747E+03	2.4104E+03	0.	0.	0.
X(1)	X(JBND1)	X(JBND2)	X(JBND3)	X(JFIN)	JQMAX	QMAX	X(JQMAX)		
-6.4652E-02	3.0356E-01	0.	0.	4.5037E+00	172	2.1159E+08	8.9619E-01		

CYCLE	TIME	DTNM	JTS	ETOTAL	JFIN	JSTAR	JSMAX	SMAX	X(JSMAX)
1179	1.0000E-06	1.1423E-09	8	9.7784E+01	281	259	169	1.0835E+10	8.8273E-01
DTPP	DTPULS	EMVNEG	EMVPOS	EMVPL	EMVPR	EMVPP	EMVBM	PDTPOS	PDTNEG
2.2226E-07	1.1479E-07	-4.7557E+03	4.6923E+03	1.2438E+03	1.1647E+03	2.4085E+03	0.	0.	0.
X(1)	X(JBND1)	X(JBND2)	X(JBND3)	X(JFIN)	JQMAX	QMAX	X(JQMAX)		
-6.5103E-02	3.0357E-01	0.	0.	4.5037E+00	173	2.0888E+08	9.0083E-01		

CYCLE	TIME	DTNM	JTS	ETOTAL	JFIN	JSTAR	JSMAX	SMAX	X(JSMAX)
1200	1.0393E-06	1.9544E-09	8	9.7783E+01	281	259	173	1.0563E+10	9.0109E-01
DTPP	DTPULS	EMVNEG	EMVPOS	EMVPL	EMVPR	EMVPP	EMVBM	PDTPOS	PDTNEG
2.2707E-07	1.0768E-07	-4.7604E+03	4.6972E+03	1.1374E+03	1.2612E+03	2.3986E+03	0.	0.	0.
X(1)	X(JBND1)	X(JBND2)	X(JBND3)	X(JFIN)	JQMAX	QMAX	X(JQMAX)		
-6.7708E-02	3.0361E-01	0.	0.	4.5037E+00	82	1.9134E+08	5.2418E-01		

REZONE AT CYCLE 1200 ADDED 23 ZONES DELETED 0 ZONES NEW JSTAR IS 282

*** SPALL OCCURED AT ZONE 32 LOCATION 3.0362E-01 CM AT CYCLE1207 TIME= 1.0530E-06 SEC SJ =-4.6189E+07 TSPALL(J)=0.
TOTAL NO OF FRACTURES IS 4

MOMENTUM AFTER FRACTURE

-1.5117E+02 -8.2894E+01 -1.4758E+02 -2.0034E+02 -4.9097E+02 -3.5677E+03 4.5771E+03

CYCLE	TIME	DTNM	JTS	ETOTAL	JFIN	JSTAR	JSMAX	SMAX	X(JSMAX)
1225	1.0882E-06	1.9544E-09	8	9.7778E+01	304	283	183	1.0418E+10	9.2951E-01
DTPP	DTPULS	EMVNEG	EMVPOS	EMVPL	EMVPR	EMVPP	EMVBM	PDTPOS	PDTNEG
2.2889E-07	1.0368E-07	-4.7475E+03	4.6841E+03	1.0823E+03	1.3023E+03	2.3846E+03	0.	0.	0.
X(1)	X(JBND1)	X(JBND2)	X(JBND3)	X(JFIN)	JQMAX	QMAX	X(JQMAX)		
-7.0943E-02	3.0364E-01	0.	0.	4.5037E+00	12	2.4637E+08	6.3825E-02		

REZONE AT CYCLE 1225 ADDED 0 ZONES DELETED 13 ZONES NEW JSTAR IS 270

CYCLE	TIME	DTNM	JTS	ETOTAL	JFIN	JSTAR	JSMAX	SMAX	X(JSMAX)
1250	1.1371E-06	1.9537E-09	8	9.7774E+01	291	270	181	1.0161E+10	9.5935E-01
DTPP	DTPULS	EMVNEG	EMVPOS	EMVPL	EMVPR	EMVPP	EMVBM	PDTPOS	PDTNEG
2.3319E-07	1.2669E-07	-4.7338E+03	4.6704E+03	1.2649E+03	1.1046E+03	2.3695E+03	0.	0.	0.
X(1)	X(JBND1)	X(JBND2)	X(JBND3)	X(JFIN)	JQMAX	QMAX	X(JQMAX)		
-7.4177E-02	3.0367E-01	0.	0.	4.5037E+00	184	2.1570E+08	9.7456E-01		

CYCLE	TIME	DTNM	JTS	ETOTAL	JFIN	JSTAR	JSMAX	SMAX	X(JSMAX)
1275	1.1859E-06	1.9544E-09	8	9.7761E+01	291	271	186	9.7990E+09	9.8521E-01
DTPP	DTPULS	EMVNEG	EMVPOS	EMVPL	EMVPR	EMVPP	EMVBM	PDTPOS	PDTNEG
2.4068E-07	1.1784E-07	-4.7237E+03	4.6603E+03	1.1528E+03	1.2057E+03	2.3584E+03	0.	0.	0.
X(1)	X(JBND1)	X(JBND2)	X(JBND3)	X(JFIN)	JQMAX	QMAX	X(JQMAX)		
-7.7412E-02	3.0369E-01	0.	0.	4.5037E+00	28	2.9214E+08	2.8469E-01		

REZONE AT CYCLE 1275 ADDED 22 ZONES DELETED 0 ZONES NEW JSTAR IS 293

CYCLE	TIME	DTNM	JTS	ETOTAL	JFIN	JSTAR	JSMAX	SMAX	X(JSMAX)
1300	1.2386E-06	1.9543E-09	8	9.7750E+01	313	293	195	9.5981E+09	1.0120E+00
DTPP	DTPULS	EMVNEG	EMVPOS	EMVPL	EMVPR	EMVPP	EMVBM	PDTPOS	PDTNEG
2.4423E-07	1.1534E-07	-4.7086E+03	4.6452E+03	1.1070E+03	1.2371E+03	2.3441E+03	0.	0.	0.
X(1)	X(JBND1)	X(JBND2)	X(JBND3)	X(JFIN)	JQMAX	QMAX	X(JQMAX)		
-8.0846E-02	3.0372E-01	0.	0.	4.5037E+00	27	4.1784E+08	2.7553E-01		

CYCLE	TIME	DTNM	JTS	ETOTAL	JFIN	JSTAR	JSMAX	SMAX	X(JSMAX)
1325	1.2836E-06	1.9543E-09	8	9.7757E+01	313	294	205	9.4085E+09	1.0399E+00
DTPP	DTPULS	EMVNEG	EMVPOS	EMVPL	EMVPR	EMVPP	EMVBM	PDTPOS	PDTNEG
2.4787E-07	1.1909E-07	-4.6962E+03	4.6327E+03	1.1205E+03	1.2116E+03	2.3321E+03	0.	0.	0.
X(1)	X(JBND1)	X(JBND2)	X(JBND3)	X(JFIN)	JQMAX	QMAX	X(JQMAX)		
-8.3886E-02	3.0375E-01	0.	0.	4.5037E+00	27	4.2836E+08	2.7510E-01		

REZONE AT CYCLE 1325 ADDED 0 ZONES DELETED 29 ZONES NEW JSTAR IS 265

CYCLE	TIME	DTNM	JTS	ETOTAL	JFIN	JSTAR	JSMAX	SMAX	X(JSMAX)
1350	1.3325E-06	1.9542E-09	8	9.7765E+01	284	265	184	9.0731E+09	1.0608E+00
DTPP	DTPULS	EMVNEG	EMVPOS	EMVPL	EMVPR	EMVPP	EMVBM	PDTPOS	PDTNEG
2.5563E-07	1.3549E-07	-4.6893E+03	4.6259E+03	1.2293E+03	1.0900E+03	2.3193E+03	0.	0.	0.
X(1)	X(JBND1)	X(JBND2)	X(JBND3)	X(JFIN)	JQMAX	QMAX	X(JQMAX)		
-8.7119E-02	3.0377E-01	0.	0.	4.5037E+00	24	3.2972E+08	2.5821E-01		

REZONE AT CYCLE 1350 ADDED 24 ZONES DELETED 0 ZONES NEW JSTAR IS 289

CYCLE	TIME	DTNM	JTS	ETOTAL	JFIN	JSTAR	JSMAX	SMAX	X(JSMAX)
1375	1.3813E-06	1.9542E-09	8	9.7769E+01	308	289	190	8.8111E+09	1.0927E+00
DTPP	DTPULS	EMVNEG	EMVPOS	EMVPL	EMVPR	EMVPP	EMVBM	PDTPOS	PDTNEG
2.6183E-07	1.2486E-07	-4.6802E+03	4.6168E+03	1.1001E+03	1.2069E+03	2.3070E+03	0.	0.	0.
X(1)	X(JBND1)	X(JBND2)	X(JBND3)	X(JFIN)	JQMAX	QMAX	X(JQMAX)		
-9.0349E-02	3.0380E-01	0.	0.	4.5037E+00	24	3.3760E+08	2.5779E-01		

CYCLE	TIME	DTNM	JTS	ETOTAL	JFIN	JSTAR	JSMAX	SMAX	X(JSMAX)
1400	1.4302E-06	1.9542E-09	8	9.7773E+01	308	290	199	8.6437E+09	1.1204E+00
DTPP	DTPULS	EMVNEG	EMVPOS	EMVPL	EMVPR	EMVPP	EMVBM	PDTPOS	PDTNEG
2.6534E-07	1.2442E-07	-4.6716E+03	4.6075E+03	1.1100E+03	1.1835E+03	2.2935E+03	0.	0.	0.
X(1)	X(JBND1)	X(JBND2)	X(JBND3)	X(JFIN)	JQMAX	QMAX	X(JQMAX)		
-9.3583E-02	3.0383E-01	0.	0.	4.5037E+00	23	1.4282E+08	2.4193E-01		

CYCLE	TIME	DTNM	JTS	ETOTAL	JFIN	JSTAR	JSMAX	SMAX	X(JSMAX)
1425	1.4791E-04	1.9548E-09	8	9.7774E+01	308	290	208	8.4658E+09	1.1491E+00
DTPP	DTPULS	EMVNEG	EMVPOS	EMVPL	EMVPR	EMVPP	EMVBM	PDTPOS	PDTNEG
2.6944E-07	1.3375E-07	-4.6448E+03	4.6014E+03	1.1323E+03	1.1484E+03	2.2807E+03	0.	0.	0.
X(1)	X(JMND1)	X(JMND2)	X(JBND3)	X(JFIN)	JQMAX	QMAX	X(JQMAX)		
-9.6818E-02	3.0385E-01	0.	0.	4.5037E+00	17	1.9552E+08	1.6357E-01		

REZONE AT CYCLE 1425 ADDED 0 ZONES DELETED 23 ZONES NEW JSTAR IS 267

CYCLE	TIME	DTNM	JTS	ETOTAL	JFIN	JSTAR	JSMAX	SMAX	X(JSMAX)
1450	1.5400E-04	2.4425E-09	3	9.7778E+01	285	268	195	8.1576E+09	1.1820E+00
DTPP	DTPULS	EMVNEG	EMVPOS	EMVPL	EMVPR	EMVPP	EMVBM	PDTPOS	PDTNEG
2.7797E-07	1.3804E-07	-4.7300E+03	4.5949E+03	1.1261E+03	1.1415E+03	2.2676E+03	0.	0.	0.
X(1)	X(JMND1)	X(JMND2)	X(JBND3)	X(JFIN)	JQMAX	QMAX	X(JQMAX)		
-1.0085E-01	3.0388E-01	0.	0.	4.5037E+00	16	3.6521E+08	1.8628E-01		

REZONE AT CYCLE 1450 ADDED 29 ZONES DELETED 0 ZONES NEW JSTAR IS 297

CYCLE	TIME	DTNM	JTS	ETOTAL	JFIN	JSTAR	JSMAX	SMAX	X(JSMAX)
1475	1.6015E-04	2.4425E-09	3	9.7754E+01	314	297	205	7.9248E+09	1.2164E+00
DTPP	DTPULS	EMVNEG	EMVPOS	EMVPL	EMVPR	EMVPP	EMVBM	PDTPOS	PDTNEG
2.8624E-07	1.4226E-07	-4.7293E+03	4.5881E+03	1.1274E+03	1.1252E+03	2.2525E+03	0.	0.	0.
X(1)	X(JMND1)	X(JMND2)	X(JBND3)	X(JFIN)	JQMAX	QMAX	X(JQMAX)		
-1.0491E-01	3.0391E-01	0.	0.	4.5037E+00	16	5.9205E+08	1.8551E-01		
CYCLE	TIME	DTNM	JTS	ETOTAL	JFIN	JSTAR	JSMAX	SMAX	X(JSMAX)
1500	1.6631E-04	2.4420E-09	3	9.7751E+01	314	298	215	7.7430E+09	1.2519E+00
DTPP	DTPULS	EMVNEG	EMVPOS	EMVPL	EMVPR	EMVPP	EMVBM	PDTPOS	PDTNEG
2.8892E-07	1.4750E-07	-4.7269E+03	4.5837E+03	1.1421E+03	1.0950E+03	2.2371E+03	0.	0.	0.
X(1)	X(JMND1)	X(JMND2)	X(JBND3)	X(JFIN)	JQMAX	QMAX	X(JQMAX)		
-1.0906E-01	3.0396E-01	0.	0.	4.5037E+00	16	4.8837E+08	1.8472E-01		
CYCLE	TIME	DTNM	JTS	ETOTAL	JFIN	JSTAR	JSMAX	SMAX	X(JSMAX)
1525	1.7247E-04	2.4420E-09	3	9.7772E+01	314	298	224	7.5426E+09	1.2850E+00
DTPP	DTPULS	EMVNEG	EMVPOS	EMVPL	EMVPR	EMVPP	EMVBM	PDTPOS	PDTNEG
2.9[illegible]E-07	1.4964E-07	-4.7218E+03	4.5806E+03	1.1275E+03	1.0946E+03	2.2221E+03	0.	0.	0.
X(1)	X(JMND1)	X(JMND2)	X(JBND3)	X(JFIN)	JQMAX	QMAX	X(JQMAX)		
-1.1304E-01	3.0397E-01	0.	0.	4.5037E+00	15	2.7410E+08	1.6142E-01		

REZONE AT CYCLE 1525 ADDED 27 ZONES DELETED 26 ZONES NEW JSTAR IS 299

CYCLE	TIME	DTNM	JTS	ETOTAL	JFIN	JSTAR	JSMAX	SMAX	X(JSMAX)
1550	1.7862E-04	2.4420E-09	3	9.7744E+01	315	300	207	7.3547E+09	1.3193E+00
DTPP	DTPULS	EMVNEG	EMVPOS	EMVPL	EMVPR	EMVPP	EMVBM	PDTPOS	PDTNEG
3.0027E-07	1.5339E-07	-4.7197E+03	4.5785E+03	1.1281E+03	1.0798E+03	2.2079E+03	0.	0.	0.
X(1)	X(JMND1)	X(JMND2)	X(JBND3)	X(JFIN)	JQMAX	QMAX	X(JQMAX)		
-1.1715E-01	3.0398E-01	0.	0.	4.5037E+00	13	1.6227E+08	1.4083E-01		
CYCLE	TIME	DTNM	JTS	ETOTAL	JFIN	JSTAR	JSMAX	SMAX	X(JSMAX)
1575	1.8478E-04	2.4420E-09	3	9.7722E+01	315	300	216	7.1543E+09	1.3546E+00
DTPP	DTPULS	EMVNEG	EMVPOS	EMVPL	EMVPR	EMVPP	EMVBM	PDTPOS	PDTNEG
3.0654E-07	1.5937E-07	-4.7146E+03	4.5775E+03	1.1402E+03	1.0531E+03	2.1932E+03	0.	0.	0.
X(1)	X(JMND1)	X(JMND2)	X(JBND3)	X(JFIN)	JQMAX	QMAX	X(JQMAX)		
-1.2121E-01	3.0402E-01	0.	0.	4.5037E+00	20	2.0517E+08	2.7019E-01		

CYCLE	TIME	DTNH	JTS	ETOTAL	JFIN	JSTAR	JSMAX	SMAX	X(JSMAX)
1600	1.9093E-06	2.4625E-09	3	9.7711E+01	315	301	224	6.9970E+09	1.3871E+00
DTPP	DTPULS	EMVNEG	EMVPOS	EMVPL	EMVPR	EMVPP	EMVBM	PDTPOS	PDTNEG
3.1144E-07	1.5984E-07	-4.7182E+03	4.5771E+03	1.1184E+03	1.0608E+03	2.1792E+03	0.	0.	0.
X(1)	X(JBND1)	X(JBND2)	X(JBND3)	X(JFIN)	JQMAX	QMAX	X(JQMAX)		
-1.2530E-01	3.0405E-01	0.	0.	4.5037E+00	20	3.6563E+08	2.6923E-01		

REZONE AT CYCLE 1600 ADDED 22 ZONES DELETED 0 ZONES NEW JSTAR IS 323

CYCLE	TIME	DTNH	JTS	ETOTAL	JFIN	JSTAR	JSMAX	SMAX	X(JSMAX)
1625	1.9709E-06	2.4625E-09	3	9.7705E+01	337	323	232	6.8191E+09	1.4206E+00
DTPP	DTPULS	EMVNEG	EMVPOS	EMVPL	EMVPR	EMVPP	EMVBM	PDTPOS	PDTNEG
6.7164E-07	5.1663E-07	-4.7182E+03	4.5771E+03	3.5229E+03	1.0570E+03	4.5800E+03	0.	0.	0.
X(1)	X(JBND1)	X(JBND2)	X(JBND3)	X(JFIN)	JQMAX	QMAX	X(JQMAX)		
-1.2938E-01	3.0407E-01	0.	0.	4.5037E+00	20	3.7839E+08	2.6830E-01		

REZONE AT CYCLE 1625 ADDED 0 ZONES DELETED 26 ZONES NEW JSTAR IS 297

CYCLE	TIME	DTNH	JTS	ETOTAL	JFIN	JSTAR	JSMAX	SMAX	X(JSMAX)
1637	2.0000E-06	2.4486E-09	3	9.7709E+01	311	297	210	6.7296E+09	1.4377E+00
DTPP	DTPULS	EMVNEG	EMVPOS	EMVPL	EMVPR	EMVPP	EMVBM	PDTPOS	PDTNEG
6.8056E-07	5.2554E-07	-4.7182E+03	4.5771E+03	3.5367E+03	1.0432E+03	4.5799E+03	0.	0.	0.
X(1)	X(JBND1)	X(JBND2)	X(JBND3)	X(JFIN)	JQMAX	QMAX	X(JQMAX)		
-1.3131E-01	3.0409E-01	0.	0.	4.5037E+00	16	3.8154E+08	2.3591E-01		
CYCLE	TIME	DTNH	JTS	ETOTAL	JFIN	JSTAR	JSMAX	SMAX	X(JSMAX)
1650	2.0320E-06	2.4625E-09	3	9.7716E+01	311	298	214	6.6460E+09	1.4550E+00
DTPP	DTPULS	EMVNEG	EMVPOS	EMVPL	EMVPR	EMVPP	EMVBM	PDTPOS	PDTNEG
6.8911E-07	5.3259E-07	-4.7182E+03	4.5771E+03	3.5396E+03	1.0402E+03	4.5798E+03	0.	0.	0.
X(1)	X(JBND1)	X(JBND2)	X(JBND3)	X(JFIN)	JQMAX	QMAX	X(JQMAX)		
-1.3342E-01	3.0410E-01	0.	0.	4.5037E+00	16	3.5333E+08	2.3559E-01		
CYCLE	TIME	DTNH	JTS	ETOTAL	JFIN	JSTAR	JSMAX	SMAX	X(JSMAX)
1675	2.0936E-06	2.4625E-09	3	9.7729E+01	311	298	222	6.4611E+09	1.4905E+00
DTPP	DTPULS	EMVNEG	EMVPOS	EMVPL	EMVPR	EMVPP	EMVBM	PDTPOS	PDTNEG
7.0880E-07	5.5140E-07	-4.7182E+03	4.5771E+03	3.5627E+03	1.0170E+03	4.5797E+03	0.	0.	0.
X(1)	X(JBND1)	X(JBND2)	X(JBND3)	X(JFIN)	JQMAX	QMAX	X(JQMAX)		
-1.3750E-01	3.0412E-01	0.	0.	4.5037E+00	16	3.1681E+08	2.3493E-01		
CYCLE	TIME	DTNH	JTS	ETOTAL	JFIN	JSTAR	JSMAX	SMAX	X(JSMAX)
1700	2.1551E-06	2.4625E-09	3	9.7741E+01	311	298	229	6.3171E+09	1.5225E+00
DTPP	DTPULS	EMVNEG	EMVPOS	EMVPL	EMVPR	EMVPP	EMVBM	PDTPOS	PDTNEG
7.2495E-07	5.6192E-07	-4.7182E+03	4.5771E+03	3.5497E+03	1.0299E+03	4.5796E+03	0.	0.	0.
X(1)	X(JBND1)	X(JBND2)	X(JBND3)	X(JFIN)	JQMAX	QMAX	X(JQMAX)		
-1.4157E-01	3.0415E-01	0.	0.	4.5037E+00	16	2.1171E+08	2.3420E-01		

REZONE AT CYCLE 1700 ADDED 22 ZONES DELETED 0 ZONES NEW JSTAR IS 320

CYCLE	TIME	DTNH	JTS	ETOTAL	JFIN	JSTAR	JSMAX	SMAX	X(JSMAX)
1725	2.2167E-06	2.4620E-09	3	9.7754E+01	333	321	236	6.1440E+09	1.5553E+00
DTPP	DTPULS	EMVNEG	EMVPOS	EMVPL	EMVPR	EMVPP	EMVBM	PDTPOS	PDTNEG
7.4538E-07	5.7705E-07	-4.7182E+03	4.5771E+03	3.5454E+03	1.0342E+03	4.5796E+03	0.	0.	0.
X(1)	X(JBND1)	X(JBND2)	X(JBND3)	X(JFIN)	JQMAX	QMAX	X(JQMAX)		
-1.4565E-01	3.0417E-01	0.	0.	4.5037E+00	14	1.7694E+08	1.8022E-01		

REZONE AT CYCLE 1725 ADDED 0 ZONES DELETED 1 ZONES NEW JSTAR IS 320

CYCLE	TIME	DTNH	JTS	ETOTAL	JFIN	JSTAR	JSMAX	SMAX	X(JSMAX)
1750	2.2782E-06	2.4620E-09	3	9.7760E+01	332	320	242	5.9869E+09	1.5889E+00
DTPP	DTPULS	EMVNEG	EMVPOS	EMVPL	EMVPR	EMVPP	EMVBM	PDTPOS	PDTNEG
7.6494E-07	5.9288E-07	-4.7182E+03	4.5771E+03	9.5495E+03	1.0301E+03	4.5796E+03	0.	0.	0.
X(1)	X(JBND1)	X(JBND2)	X(JBND3)	X(JFIN)	JQMAX	QMAX	X(JQMAX)		
-1.4972E-01	3.0419E-01	0.	0.	4.5037E+00	12	2.6104E+08	1.5700E-01		

CYCLE	TIME	DTNH	JTS	ETOTAL	JFIN	JSTAR	JSMAX	SMAX	X(JSMAX)
1775	2.3398E-06	2.4620E-09	3	9.7762E+01	332	321	249	5.8431E+09	1.6234E+00
DTPP	DTPULS	EMVNEG	EMVPOS	EMVPL	EMVPR	EMVPP	EMVBM	PDTPOS	PDTNEG
7.8374E-07	6.0956E-07	-4.7182E+03	4.5771E+03	9.5617E+03	1.0178E+03	4.5795E+03	0.	0.	0.
X(1)	X(JBND1)	X(JBND2)	X(JBND3)	X(JFIN)	JQMAX	QMAX	X(JQMAX)		
-1.5380E-01	3.0421E-01	0.	0.	4.5037E+00	12	2.8495E+08	1.5635E-01		

CYCLE	TIME	DTNH	JTS	ETOTAL	JFIN	JSTAR	JSMAX	SMAX	X(JSMAX)
1800	2.4013E-06	2.4620E-09	3	9.7765E+01	332	321	256	5.6992E+09	1.6587E+00
DTPP	DTPULS	EMVNEG	EMVPOS	EMVPL	EMVPR	EMVPP	EMVBM	PDTPOS	PDTNEG
8.0351E-07	6.2837E-07	-4.7182E+03	4.5771E+03	9.5812E+03	9.9819E+02	4.5796E+03	0.	0.	0.
X(1)	X(JBND1)	X(JBND2)	X(JBND3)	X(JFIN)	JQMAX	QMAX	X(JQMAX)		
-1.5787E-01	3.0424E-01	0.	0.	4.5037E+00	11	2.8392E+08	1.3586E-01		

REZONE AT CYCLE 1800 ADDED 21 ZONES DELETED 0 ZONES NEW JSTAR IS 342

CYCLE	TIME	DTNH	JTS	ETOTAL	JFIN	JSTAR	JSMAX	SMAX	X(JSMAX)
1825	2.4629E-06	2.4625E-09	3	9.7763E+01	353	343	262	5.5504E+09	1.6897E+00
DTPP	DTPULS	EMVNEG	EMVPOS	EMVPL	EMVPR	EMVPP	EMVBM	PDTPOS	PDTNEG
8.2505E-07	6.4177E-07	-4.7182E+03	4.5771E+03	9.5620E+03	1.0173E+03	4.5793E+03	0.	0.	0.
X(1)	X(JBND1)	X(JBND2)	X(JBND3)	X(JFIN)	JQMAX	QMAX	X(JQMAX)		
-1.6195E-01	3.0426E-01	0.	0.	4.5037E+00	11	2.2978E+08	1.3527E-01		

CYCLE	TIME	DTNH	JTS	ETOTAL	JFIN	JSTAR	JSMAX	SMAX	X(JSMAX)
1850	2.5244E-06	2.4625E-09	3	9.7758E+01	353	343	269	5.4384E+09	1.7269E+00
DTPP	DTPULS	EMVNEG	EMVPOS	EMVPL	EMVPR	EMVPP	EMVBM	PDTPOS	PDTNEG
8.4202E-07	6.6079E-07	-4.7182E+03	4.5771E+03	9.5936E+03	9.8569E+02	4.5793E+03	0.	0.	0.
X(1)	X(JBND1)	X(JBND2)	X(JBND3)	X(JFIN)	JQMAX	QMAX	X(JQMAX)		
-1.6602E-01	3.0428E-01	0.	0.	4.5037E+00	275	1.5561E+08	1.7649E+00		

CYCLE	TIME	DTNH	JTS	ETOTAL	JFIN	JSTAR	JSMAX	SMAX	X(JSMAX)
1875	2.5860E-06	2.4625E-09	3	9.7752E+01	353	343	275	5.2510E+09	1.7651E+00
DTPP	DTPULS	EMVNEG	EMVPOS	EMVPL	EMVPR	EMVPP	EMVBM	PDTPOS	PDTNEG
8.7207E-07	7.1495E-07	-4.7182E+03	4.5771E+03	9.7542E+03	8.2504E+02	4.5793E+03	0.	0.	0.
X(1)	X(JBND1)	X(JBND2)	X(JBND3)	X(JFIN)	JQMAX	QMAX	X(JQMAX)		
-1.7010E-01	3.0430E-01	0.	0.	4.5037E+00	8	2.2596E+08	5.2717E-02		

CYCLE	TIME	DTNH	JTS	ETOTAL	JFIN	JSTAR	JSMAX	SMAX	X(JSMAX)
1900	2.6476E-06	2.4625E-09	3	9.7751E+01	353	344	278	5.0554E+09	1.7986E+00
DTPP	DTPULS	EMVNEG	EMVPOS	EMVPL	EMVPR	EMVPP	EMVBM	PDTPOS	PDTNEG
9.0580E-07	7.4233E-07	-4.7182E+03	4.5771E+03	9.7528E+03	8.2642E+02	4.5792E+03	0.	0.	0.
X(1)	X(JBND1)	X(JBND2)	X(JBND3)	X(JFIN)	JQMAX	QMAX	X(JQMAX)		
-1.7417E-01	3.0432E-01	0.	0.	4.5037E+00	8	2.6924E+08	5.2115E-02		

CYCLE	TIME	DTNH	JTS	ETOTAL	JFIN	JSTAR	JSMAX	SMAX	X(JSMAX)
1925	2.7091E-06	2.4620E-09	3	9.7755E+01	353	344	280	4.9668E+09	1.8212E+00
DTPP	DTPULS	EMVNEG	EMVPOS	EMVPL	EMVPR	EMVPP	EMVBM	PDTPOS	PDTNEG
9.2193E-07	7.4245E-07	-4.7182E+03	4.5771E+03	3.6876E+03	8.9147E+02	4.5791E+03	0.	1.	0.
X(1)	X(JBND1)	X(JBND2)	X(JBND3)	X(JFIN)	JQMAX	QMAX	X(JQMAX)		
-1.7825E-01	3.0434E-01	0.	0.	4.5037E+00	8	2.2862E+08	5.1483E-02		

CYCLE	TIME	DTNH	JTS	ETOTAL	JFIN	JSTAR	JSMAX	SMAX	X(JSMAX)
1950	2.7707E-06	2.4620E-09	3	9.7764E+01	353	345	283	4.8729E+09	1.8561E+00
DTPP	DTPULS	EMVNEG	EMVPOS	EMVPL	EMVPR	EMVPP	EMVBM	PDTPOS	PDTNEG
9.3968E-07	7.5820E-07	-4.7182E+03	4.5770E+03	3.6947E+03	8.8434E+02	4.5790E+03	0.	0.	0.
X(1)	X(JBND1)	X(JBND2)	X(JBND3)	X(JFIN)	JQMAX	QMAX	X(JQMAX)		
-1.8232E-01	3.0435E-01	0.	0.	4.5037E+00	286	1.4053E+08	1.8914E+00		

REZONE AT CYCLE 1950 ADDED 21 ZONES DELETED 0 ZONES NEW JSTAR IS 366

CYCLE	TIME	DTNH	JTS	ETOTAL	JFIN	JSTAR	JSMAX	SMAX	X(JSMAX)
1975	2.8322E-06	2.4620E-09	3	9.7774E+01	374	366	286	4.7542E+09	1.8916E+00
DTPP	DTPULS	EMVNEG	EMVPOS	EMVPL	EMVPR	EMVPP	EMVBM	PDTPOS	PDTNEG
9.6316E-07	7.7949E-07	-4.7182E+03	4.5770E+03	3.7058E+03	8.7320E+02	4.5790E+03	0.	0.	0.
X(1)	X(JBND1)	X(JBND2)	X(JBND3)	X(JFIN)	JQMAX	QMAX	X(JQMAX)		
-1.8646E-01	3.0437E-01	0.	0.	4.5037E+00	289	1.3619E+08	1.9277E+00		

CYCLE	TIME	DTNH	JTS	ETOTAL	JFIN	JSTAR	JSMAX	SMAX	X(JSMAX)
2000	2.8938E-06	2.4620E-09	3	9.7784E+01	374	366	289	4.6153E+09	1.9278E+00
DTPP	DTPULS	EMVNEG	EMVPOS	EMVPL	EMVPR	EMVPP	EMVBM	PDTPOS	PDTNEG
9.9213E-07	8.0608E-07	-4.7182E+03	4.5770E+03	3.7203E+03	8.5869E+02	4.5790E+03	0.	0.	0.
X(1)	X(JBND1)	X(JBND2)	X(JBND3)	X(JFIN)	JQMAX	QMAX	X(JQMAX)		
-1.9048E-01	3.0439E-01	0.	0.	4.5037E+00	292	1.2848E+08	1.9647E+00		

CYCLE	TIME	DTNH	JTS	ETOTAL	JFIN	JSTAR	JSMAX	SMAX	X(JSMAX)
2025	2.9553E-06	2.4625E-09	3	9.7792E+01	374	367	291	4.4917E+09	1.9526E+00
DTPP	DTPULS	EMVNEG	EMVPOS	EMVPL	EMVPR	EMVPP	EMVBM	PDTPOS	PDTNEG
1.0194E-06	8.1696E-07	-4.7182E+03	4.5770E+03	3.6695E+03	9.0947E+02	4.5790E+03	0.	0.	0.
X(1)	X(JBND1)	X(JBND2)	X(JBND3)	X(JFIN)	JQMAX	QMAX	X(JQMAX)		
-1.9455E-01	3.0441E-01	0.	0.	4.5037E+00	295	1.2401E+08	2.0027E+00		

REZONE AT CYCLE 2025 ADDED 0 ZONES DELETED 91 ZONES NEW JSTAR IS 276

CYCLE	TIME	DTNH	JTS	ETOTAL	JFIN	JSTAR	JSMAX	SMAX	X(JSMAX)
2050	3.0169E-06	2.4625E-09	3	9.7796E+01	283	276	203	4.4240E+09	1.9903E+00
DTPP	DTPULS	EMVNEG	EMVPOS	EMVPL	EMVPR	EMVPP	EMVBM	PDTPOS	PDTNEG
1.0350E-06	8.3478E-07	-4.7182E+03	4.5770E+03	3.6931E+03	8.8573E+02	4.5788E+03	0.	0.	0.
X(1)	X(JBND1)	X(JBND2)	X(JBND3)	X(JFIN)	JQMAX	QMAX	X(JQMAX)		
-1.9863E-01	3.0442E-01	0.	0.	4.5037E+00	206	1.2270E+08	2.0285E+00		

CYCLE	TIME	DTNH	JTS	ETOTAL	JFIN	JSTAR	JSMAX	SMAX	X(JSMAX)
2075	3.0784E-06	2.4625E-09	3	9.7795E+01	283	276	206	4.3004E+09	2.0287E+00
DTPP	DTPULS	EMVNEG	EMVPOS	EMVPL	EMVPR	EMVPP	EMVBM	PDTPOS	PDTNEG
1.0648E-06	8.6466E-07	-4.7182E+03	4.5770E+03	3.7184E+03	8.6053E+02	4.5789E+03	0.	0.	0.
X(1)	X(JBND1)	X(JBND2)	X(JBND3)	X(JFIN)	JQMAX	QMAX	X(JQMAX)		
-2.0270E-01	3.0444E-01	0.	0.	4.5037E+00	209	1.1721E+08	2.0678E+00		

CYCLE	TIME	DTNH	JTS	ETOTAL	JFIN	JSTAR	JSMAX	SMAX	X(JSMAX)
2100	3.1401E-06	2.4625E-09	3	9.7790E+01	283	277	208	4.2100E+09	2.0549E+00
DTPP	DTPULS	EMVNEG	EMVPOS	EMVPL	EMVPR	EMVPP	EMVBM	PDTPOS	PDTNEG
1.0874E-06	8.7379E-07	-4.7182E+03	4.5770E+03	3.6787E+03	9.0020E+02	4.5789E+03	0.	0.	0.
X(1)	X(JBND1)	X(JBND2)	X(JBND3)	X(JFIN)	JQMAX	QMAX	X(JQMAX)		
-2.0674E-01	3.0446E-01	0.	0.	4.5037E+00	211	1.1361E+08	2.0947E+00		

CYCLE	TIME	DTNH	JTS	ETOTAL	JFIN	JSTAR	JSMAX	SMAX	X(JSMAX)
2125	3.2016E-06	2.4620E-09	3	9.7780E+01	283	277	211	4.1168E+09	2.0949E+00
DTPP	DTPULS	EMVNEG	EMVPOS	EMVPL	EMVPR	EMVPP	EMVBM	PDTPOS	PDTNEG
1.1122E-06	9.0146E-07	-4.7182E+03	4.5770E+03	3.7112E+03	8.6758E+02	4.5788E+03	0.	0.	0.
X(1)	X(JBND1)	X(JBND2)	X(JBND3)	X(JFIN)	JQMAX	QMAX	X(JQMAX)		
-2.1085E-01	3.0447E-01	0.	0.	4.5037E+00	214	1.1364E+08	2.1355E+00		

REZONE AT CYCLE 2125 ADDED 0 ZONES DELETED 88 ZONES NEW JSTAR IS 189

CYCLE	TIME	DTNH	JTS	ETOTAL	JFIN	JSTAR	JSMAX	SMAX	X(JSMAX)
2150	3.2631E-06	2.4620E-09	3	9.7767E+01	195	189	125	4.0220E+09	2.1219E+00
DTPP	DTPULS	EMVNEG	EMVPOS	EMVPL	EMVPR	EMVPP	EMVBM	PDTPOS	PDTNEG
1.1384E-06	9.1410E-07	-4.7182E+03	4.5770E+03	3.6765E+03	9.0225E+02	4.5788E+03	0.	0.	0.
X(1)	X(JBND1)	X(JBND2)	X(JBND3)	X(JFIN)	JQMAX	QMAX	X(JQMAX)		
-2.1493E-01	3.0449E-01	0.	0.	4.5037E+00	117	1.2596E+08	1.9655E+00		

CYCLE	TIME	DTNH	JTS	ETOTAL	JFIN	JSTAR	JSMAX	SMAX	X(JSMAX)
2175	3.3247E-06	2.4620E-09	3	9.7756E+01	195	190	128	3.9318E+09	2.1634E+00
DTPP	DTPULS	EMVNEG	EMVPOS	EMVPL	EMVPR	EMVPP	EMVBM	PDTPOS	PDTNEG
1.1646E-06	9.4489E-07	-4.7182E+03	4.5770E+03	3.7151E+03	8.6370E+02	4.5788E+03	0.	0.	0.
X(1)	X(JBND1)	X(JBND2)	X(JBND3)	X(JFIN)	JQMAX	QMAX	X(JQMAX)		
-2.1900E-01	3.0451E-01	0.	0.	4.5037E+00	8	2.7345E+08	4.4652E-02		

CYCLE	TIME	DTNH	JTS	ETOTAL	JFIN	JSTAR	JSMAX	SMAX	X(JSMAX)
2200	3.3862E-06	2.4620E-09	3	9.7750E+01	195	190	130	3.8598E+09	2.1916E+00
DTPP	DTPULS	EMVNEG	EMVPOS	EMVPL	EMVPR	EMVPP	EMVBM	PDTPOS	PDTNEG
1.1853E-06	9.5525E-07	-4.7182E+03	4.5770E+03	3.6871E+03	8.9166E+02	4.5788E+03	0.	0.	0.
X(1)	X(JBND1)	X(JBND2)	X(JBND3)	X(JFIN)	JQMAX	QMAX	X(JQMAX)		
-2.2304E-01	3.0452E-01	0.	0.	4.5037E+00	8	3.0843E+08	4.4031E-02		

REZONE AT CYCLE 2200 ADDED 20 ZONES DELETED 0 ZONES NEW JSTAR IS 210

CYCLE	TIME	DTNH	JTS	ETOTAL	JFIN	JSTAR	JSMAX	SMAX	X(JSMAX)
2225	3.4478E-06	2.4625E-09	3	9.7750E+01	215	211	133	3.7299E+09	2.2345E+00
DTPP	DTPULS	EMVNEG	EMVPOS	EMVPL	EMVPR	EMVPP	EMVBM	PDTPOS	PDTNEG
1.2276E-06	9.9930E-07	-4.7182E+03	4.5770E+03	3.7292E+03	8.4957E+02	4.5787E+03	0.	0.	0.
X(1)	X(JBND1)	X(JBND2)	X(JBND3)	X(JFIN)	JQMAX	QMAX	X(JQMAX)		
-2.2715E-01	3.0454E-01	0.	0.	4.5037E+00	8	2.3755E+08	4.3459E-02		

REZONE AT CYCLE 2225 ADDED 0 ZONES DELETED 32 ZONES NEW JSTAR IS 179

CYCLE	TIME	DTNH	JTS	ETOTAL	JFIN	JSTAR	JSMAX	SMAX	X(JSMAX)
2250	3.5093E-06	2.4625E-09	3	9.7753E+01	183	179	103	3.6812E+09	2.2639E+00
DTPP	DTPULS	EMVNEG	EMVPOS	EMVPL	EMVPR	EMVPP	EMVBM	PDTPOS	PDTNEG
1.2438E-06	1.0075E-06	-4.7182E+03	4.5770E+03	3.7087E+03	8.7007E+02	4.5787E+03	0.	0.	0.
X(1)	X(JBND1)	X(JBND2)	X(JBND3)	X(JFIN)	JQMAX	QMAX	X(JQMAX)		
-2.3123E-01	3.0455E-01	0.	0.	4.5037E+00	10	1.3666E+08	9.1467E-02		

CYCLE	TIME	DTNH	JTS	ETOTAL	JFIN	JSTAR	JSMAX	SMAX	X(JSMAX)
2275	3.5709E-06	2.4625E-09	3	9.7756E+01	183	179	105	3.6002E+09	2.2934E+00
DTPP	DTPULS	EMVNEG	EMVPOS	EMVPL	EMVPR	EMVPP	EMVBM	PDTPOS	PDTNEG
1.2718E-06	1.0246E-06	-4.7182E+03	4.5770E+03	3.6887E+03	8.8999E+02	4.5787E+03	0.	0.	0.
X(1)	X(JBND1)	X(JBND2)	X(JBND3)	X(JFIN)	JQMAX	QMAX	X(JQMAX)		
-2.3530E-01	3.0457E-01	0.	0.	4.5037E+00	10	1.3480E+08	9.0855E-02		

CYCLE	TIME	DTNH	JTS	ETOTAL	JFIN	JSTAR	JSMAX	SMAX	X(JSMAX)
2300	3.6325E-06	2.4625E-09	3	9.7758E+01	183	180	107	3.4865E+09	2.3237E+00
DTPP	DTPULS	EMVNEG	EMVPOS	EMVPL	EMVPR	EMVPP	EMVBM	PDTPOS	PDTNEG
1.3132E-06	1.0531E-06	-4.7182E+03	4.5770E+03	3.6717E+03	9.0692E+02	4.5786E+03	0.	0.	0.
X(1)	X(JBND1)	X(JBND2)	X(JBND3)	X(JFIN)	JQMAX	QMAX	X(JQMAX)		
-2.3938E-01	3.0458E-01	0.	0.	4.5037E+00	12	1.0225E+08	1.6816E-01		

CYCLE	TIME	DTNH	JTS	ETOTAL	JFIN	JSTAR	JSMAX	SMAX	X(JSMAX)
2325	3.6940E-06	2.4625E-09	3	9.7758E+01	183	180	110	3.4205E+09	2.3696E+00
DTPP	DTPULS	EMVNEG	EMVPOS	EMVPL	EMVPR	EMVPP	EMVBM	PDTPOS	PDTNEG
1.3388E-06	1.0884E-06	-4.7182E+03	4.5770E+03	3.7230E+03	8.5558E+02	4.5786E+03	0.	0.	0.
X(1)	X(JBND1)	X(JBND2)	X(JBND3)	X(JFIN)	JQMAX	QMAX	X(JQMAX)		
-2.4345E-01	3.0460E-01	0.	0.	4.5037E+00	12	2.3951E+08	1.6753E-01		

CYCLE	TIME	DTNH	JTS	ETOTAL	JFIN	JSTAR	JSMAX	SMAX	X(JSMAX)
2350	3.7556E-06	2.4620E-09	3	9.7757E+01	183	180	112	3.3597E+09	2.4008E+00
DTPP	DTPULS	EMVNEG	EMVPOS	EMVPL	EMVPR	EMVPP	EMVBM	PDTPOS	PDTNEG
1.3628E-06	1.1047E-06	-4.7182E+03	4.5770E+03	3.7116E+03	8.6696E+02	4.5785E+03	0.	0.	0.
X(1)	X(JBND1)	X(JBND2)	X(JBND3)	X(JFIN)	JQMAX	QMAX	X(JQMAX)		
-2.4753E-01	3.0461E-01	0.	0.	4.5037E+00	12	3.1304E+08	1.6689E-01		

CYCLE	TIME	DTNH	JTS	ETOTAL	JFIN	JSTAR	JSMAX	SMAX	X(JSMAX)
2375	3.8171E-06	2.4620E-09	3	9.7753E+01	183	181	114	3.2910E+09	2.4325E+00
DTPP	DTPULS	EMVNEG	EMVPOS	EMVPL	EMVPR	EMVPP	EMVBM	PDTPOS	PDTNEG
1.3912E-06	1.1246E-06	-4.7182E+03	4.5770E+03	3.7012E+03	8.7731E+02	4.5785E+03	0.	0.	0.
X(1)	X(JBND1)	X(JBND2)	X(JBND3)	X(JFIN)	JQMAX	QMAX	X(JQMAX)		
-2.5160E-01	3.0463E-01	0.	0.	4.5037E+00	12	3.2785E+08	1.6626E-01		

CYCLE	TIME	DTNH	JTS	ETOTAL	JFIN	JSTAR	JSMAX	SMAX	X(JSMAX)
2400	3.8787E-06	2.4620E-09	3	9.7752E+01	183	181	116	3.2154E+09	2.4647E+00
DTPP	DTPULS	EMVNEG	EMVPOS	EMVPL	EMVPR	EMVPP	EMVBM	PDTPOS	PDTNEG
1.4239E-06	1.1487E-06	-4.7182E+03	4.5770E+03	3.6936E+03	8.8488E+02	4.5785E+03	0.	0.	0.
X(1)	X(JBND1)	X(JBND2)	X(JBND3)	X(JFIN)	JQMAX	QMAX	X(JQMAX)		
-2.5568E-01	3.0464E-01	0.	0.	4.5037E+00	12	2.9031E+08	1.6566E-01		

CYCLE	TIME	DTNH	JTS	ETOTAL	JFIN	JSTAR	JSMAX	SMAX	X(JSMAX)
2425	3.9402E-06	2.4620E-09	3	9.7747E+01	183	181	118	3.1380E+09	2.4974E+00
DTPP	DTPULS	EMVNEG	EMVPOS	EMVPL	EMVPR	EMVPP	EMVBM	PDTPOS	PDTNEG
1.4590E-06	1.1750E-06	-4.7182E+03	4.5770E+03	3.6871E+03	8.9138E+02	4.5785E+03	0.	0.	0.
X(1)	X(JBND1)	X(JBND2)	X(JBND3)	X(JFIN)	JQMAX	QMAX	X(JQMAX)		
-2.5975E-01	3.0465E-01	0.	0.	4.5037E+00	12	2.1769E+08	1.6509E-01		

CYCLE	TIME	DTNH	JTS	ETOTAL	JFIN	JSTAR	JSMAX	SMAX	X(JSMAX)
2450	4.0019E-06	2.4625E-09	3	9.7742E+01	183	182	120	3.0628E+09	2.5305E+00
DTPP	DTPULS	EMVNEG	EMVPOS	EMVPL	EMVPR	EMVPP	EMVBM	PDTPOS	PDTNEG
1.4949E-06	1.2326E-06	-4.7182E+03	4.5770E+03	3.6834E+03	8.9506E+02	4.5784E+03	0.	0.	0.
X(1)	X(JBND1)	X(JBND2)	X(JBND3)	X(JFIN)	JQMAX	QMAX	X(JQMAX)		
-2.6383E-01	3.0467E-01	0.	0.	4.5037E+00	15	1.3908E+08	2.5113E-01		

CYCLE	TIME	DTNM	JTS	ETOTAL	JFIN	JSTAR	JSMAX	SMAX	X(JSMAX)
2475	4.0633E-06	2.4625E-09	3	9.7738E+01	183	182	122	2.9919E+09	2.5641E+00
DTPP	DTPULS	EMVNEG	EMVPOS	EMVPL	EMVPR	EMVPP	EMVBM	PDTPOS	PDTNEG
1.5303E-06	1.2302E-06	-4.7182E+03	4.5770E+03	3.6806E+03	8.9779E+02	4.5784E+03	0.	0.	0.
X(1)	X(JBND1)	X(JBND2)	X(JBND3)	X(JFIN)	JQMAX	QMAX	X(JQMAX)		
-2.6790E-01	3.0468E-01	0.	0.	4.5037E+00	15	2.2715E+08	2.5037E-01		

CYCLE	TIME	DTNM	JTS	ETOTAL	JFIN	JSTAR	JSMAX	SMAX	X(JSMAX)
2500	4.1249E-06	2.4625E-09	3	9.7736E+01	183	182	124	2.9278E+09	2.5983E+00
DTPP	DTPULS	EMVNEG	EMVPOS	EMVPL	EMVPR	EMVPP	EMVBM	PDTPOS	PDTNEG
1.5637E-06	1.2571E-06	-4.7182E-03	4.5770E+03	3.6806E+03	8.9779E+02	4.5784E+03	0.	0.	0.
X(1)	X(JBND1)	X(JBND2)	X(JBND3)	X(JFIN)	JQMAX	QMAX	X(JQMAX)		
-2.7198E-01	3.0469E-01	0.	0.	4.5037E+00	15	2.5360E+08	2.4959E-01		

REZONE AT CYCLE 2500 ADDED 19 ZONES DELETED 0 ZONES NEW JSTAR IS 201

CYCLE	TIME	DTNM	JTS	ETOTAL	JFIN	JSTAR	JSMAX	SMAX	X(JSMAX)
2525	4.1865E-06	2.4625E-09	3	9.7738E+01	202	201	126	2.8682E+09	2.6329E+00
DTPP	DTPULS	EMVNEG	EMVPOS	EMVPL	EMVPR	EMVPP	EMVBM	PDTPOS	PDTNEG
1.5963E-06	1.2836E-06	-4.7182E+03	4.5770E+03	3.6815E+03	8.9685E+02	4.5783E+03	0.	0.	0.
X(1)	X(JBND1)	X(JBND2)	X(JBND3)	X(JFIN)	JQMAX	QMAX	X(JQMAX)		
-2.7605E-01	3.0470E-01	0.	0.	4.5037E+00	15	2.1496E+08	2.4883E-01		

CYCLE	TIME	DTNM	JTS	ETOTAL	JFIN	JSTAR	JSMAX	SMAX	X(JSMAX)
2550	4.2480E-06	2.4620E-09	3	9.7742E+01	202	201	128	2.8134E+09	2.6681E+00
DTPP	DTPULS	EMVNEG	EMVPOS	EMVPL	EMVPR	EMVPP	EMVBM	PDTPOS	PDTNEG
1.6273E-06	1.3098E-06	-4.7182E+03	4.5770E+03	3.6849E+03	8.9336E+02	4.5783E+03	0.	0.	0.
X(1)	X(JBND1)	X(JBND2)	X(JBND3)	X(JFIN)	JQMAX	QMAX	X(JQMAX)		
-2.8013E-01	3.0472E-01	0.	0.	4.5037E+00	15	1.3332E+08	2.4810E-01		

CYCLE	TIME	DTNM	JTS	ETOTAL	JFIN	JSTAR	JSMAX	SMAX	X(JSMAX)
2575	4.3096E-06	2.4620E-09	3	9.7747E+01	202	201	115	2.8003E+09	2.4655E+00
DTPP	DTPULS	EMVNEG	EMVPOS	EMVPL	EMVPR	EMVPP	EMVBM	PDTPOS	PDTNEG
1.6349E-06	9.4503E-07	-4.7182E+03	4.5770E+03	2.6464E+03	1.9319E+03	4.5783E+03	0.	0.	0.
X(1)	X(JBND1)	X(JBND2)	X(JBND3)	X(JFIN)	JQMAX	QMAX	X(JQMAX)		
-2.8420E-01	3.0473E-01	0.	0.	4.5037E+00	11	8.4298E+07	1.1931E-01		

CYCLE	TIME	DTNM	JTS	ETOTAL	JFIN	JSTAR	JSMAX	SMAX	X(JSMAX)
2600	4.3711E-06	2.4620E-09	3	9.7751E+01	202	201	119	2.7984E+09	2.5146E+00
DTPP	DTPULS	EMVNEG	EMVPOS	EMVPL	EMVPR	EMVPP	EMVBM	PDTPOS	PDTNEG
1.6360E-06	9.7416E-07	-4.7182E+03	4.5770E+03	2.7261E+03	1.8522E+03	4.5783E+03	0.	0.	0.
X(1)	X(JBND1)	X(JBND2)	X(JBND3)	X(JFIN)	JQMAX	QMAX	X(JQMAX)		
-2.8828E-01	3.0474E-01	0.	0.	4.5037E+00	12	9.3714E+07	1.6139E-01		

CYCLE	TIME	DTNM	JTS	ETOTAL	JFIN	JSTAR	JSMAX	SMAX	X(JSMAX)
2625	4.4327E-06	2.4620E-09	3	9.7755E+01	202	201	121	2.7999E+09	2.5477E+00
DTPP	DTPULS	EMVNEG	EMVPOS	EMVPL	EMVPR	EMVPP	EMVBM	PDTPOS	PDTNEG
1.6351E-06	9.7447E-07	-4.7182E+03	4.5770E+03	2.7284E+03	1.8498E+03	4.5783E+03	0.	0.	0.
X(1)	X(JBND1)	X(JBND2)	X(JBND3)	X(JFIN)	JQMAX	QMAX	X(JQMAX)		
-2.9235E-01	3.0475E-01	0.	0.	4.5037E+00	12	1.3132E+08	1.6079E-01		

CYCLE	TIME	DTNH	JTS	ETOTAL	JFIN	JSTAR	JSMAX	SMAX	X(JSMAX)
2650	4.4342E-06	2.4625E-09	3	9.7759E+01	202	201	123	2.7986E+09	2.5819E+00
DTPP	DTPULS	EMVNEG	EMVPOS	EMVPL	EMVPR	EMVPP	EMVBM	PDTPOS	PDTNEG
1.6359E-06	9.7473E-07	-4.7182E+03	4.5770E+03	2.7335E+03	1.8447E+03	4.5782E+03	0.	0.	0.
X(1)	X(JBND1)	X(JBND2)	X(JBND3)	X(JFIN)	JQMAX	QMAX	X(JQMAX)		
-2.9643E-01	3.0474E-01	0.	0.	4.5037E+00	12	1.4113E+08	1.6017E-01		

CYCLE	TIME	DTNH	JTS	ETOTAL	JFIN	JSTAR	JSMAX	SMAX	X(JSMAX)
2675	4.4554E-06	2.4625E-09	3	9.7762E+01	202	201	125	2.7959E+09	2.6160E+00
DTPP	DTPULS	EMVNEG	EMVPOS	EMVPL	EMVPR	EMVPP	EMVBM	PDTPOS	PDTNEG
1.6375E-06	9.7970E-07	-4.7182E+03	4.5770E+03	2.7391E+03	1.8391E+03	4.5782E+03	0.	0.	0.
X(1)	X(JBND1)	X(JBND2)	X(JBND3)	X(JFIN)	JQMAX	QMAX	X(JQMAX)		
-3.0050E-01	3.0477E-01	0.	0.	4.5037E+00	12	1.1867E+08	1.5955E-01		

CYCLE	TIME	DTNH	JTS	ETOTAL	JFIN	JSTAR	JSMAX	SMAX	X(JSMAX)
2700	4.6174E-06	2.4625E-09	3	9.7764E+01	202	201	128	2.7957E+09	2.6687E+00
DTPP	DTPULS	EMVNEG	EMVPOS	EMVPL	EMVPR	EMVPP	EMVBM	PDTPOS	PDTNEG
1.6376E-06	1.0128E-06	-4.7182E+03	4.5770E+03	2.8316E+03	1.7465E+03	4.5782E+03	0.	0.	0.
X(1)	X(JBND1)	X(JBND2)	X(JBND3)	X(JFIN)	JQMAX	QMAX	X(JQMAX)		
-3.0458E-01	3.0478E-01	0.	0.	4.5037E+00	12	7.0486E+07	1.5894E-01		

CYCLE	TIME	DTNH	JTS	ETOTAL	JFIN	JSTAR	JSMAX	SMAX	X(JSMAX)
2725	4.6789E-06	2.4625E-09	3	9.7766E+01	202	201	130	2.7909E+09	2.7043E+00
DTPP	DTPULS	EMVNEG	EMVPOS	EMVPL	EMVPR	EMVPP	EMVBM	PDTPOS	PDTNEG
1.6404E-06	1.0184E-06	-4.7182E+03	4.5770E+03	2.8424E+03	1.7358E+03	4.5782E+03	0.	0.	0.
X(1)	X(JBND1)	X(JBND2)	X(JBND3)	X(JFIN)	JQMAX	QMAX	X(JQMAX)		
-3.0865E-01	3.0479E-01	0.	0.	4.5037E+00	144	6.3224E+07	2.9686E+00		

REZONE AT CYCLE 2725 ADDED 0 ZONES DELETED 23 ZONES NEW JSTAR IS 178

CYCLE	TIME	DTNH	JTS	ETOTAL	JFIN	JSTAR	JSMAX	SMAX	X(JSMAX)
2750	4.7405E-06	2.4620E-09	3	9.7767E+01	179	178	109	2.7776E+09	2.7405E+00
DTPP	DTPULS	EMVNEG	EMVPOS	EMVPL	EMVPR	EMVPP	EMVBM	PDTPOS	PDTNEG
1.6483E-06	1.0283E-06	-4.7182E+03	4.5770E+03	2.8561E+03	1.7221E+03	4.5782E+03	0.	0.	0.
X(1)	X(JBND1)	X(JBND2)	X(JBND3)	X(JFIN)	JQMAX	QMAX	X(JQMAX)		
-3.1273E-01	3.0481E-01	0.	0.	4.5037E+00	123	6.2589E+07	3.0088E+00		

CYCLE	TIME	DTNH	JTS	ETOTAL	JFIN	JSTAR	JSMAX	SMAX	X(JSMAX)
2775	4.8020E-06	2.4620E-09	3	9.7768E+01	179	178	111	2.7643E+09	2.7773E+00
DTPP	DTPULS	EMVNEG	EMVPOS	EMVPL	EMVPR	EMVPP	EMVBM	PDTPOS	PDTNEG
1.6562E-06	1.0385E-06	-4.7182E+03	4.5770E+03	2.8707E+03	1.7075E+03	4.5782E+03	0.	0.	0.
X(1)	X(JBND1)	X(JBND2)	X(JBND3)	X(JFIN)	JQMAX	QMAX	X(JQMAX)		
-3.1688E-01	3.0482E-01	0.	0.	4.5037E+00	124	5.9448E+07	3.0292E+00		

CYCLE	TIME	DTNH	JTS	ETOTAL	JFIN	JSTAR	JSMAX	SMAX	X(JSMAX)
2800	4.8436E-06	2.4620E-09	3	9.7770E+01	179	178	113	2.7475E+09	2.8145E+00
DTPP	DTPULS	EMVNEG	EMVPOS	EMVPL	EMVPR	EMVPP	EMVBM	PDTPOS	PDTNEG
1.6663E-06	1.0514E-06	-4.7182E+03	4.5770E+03	2.8886E+03	1.6896E+03	4.5782E+03	0.	0.	0.
X(1)	X(JBND1)	X(JBND2)	X(JBND3)	X(JFIN)	JQMAX	QMAX	X(JQMAX)		
-3.2088E-01	3.0483E-01	0.	0.	4.5037E+00	126	5.8350E+07	3.0699E+00		

CYCLE	TIME	DTNH	JTS	ETOTAL	JFIN	JSTAR	JSMAX	SMAX	X(JSMAX)
2825	4.9251E-06	2.4620E-09	3	9.7772E+01	179	178	114	2.7343E+09	2.8332E+00
DTPP	DTPULS	EMVNEG	EMVPOS	EMVPL	EMVPR	EMVPP	EMVBM	PDTPOS	PDTNEG
1.6744E-06	1.0311E-06	-4.7182E+03	4.5770E+03	2.8194E+03	1.7587E+03	4.5781E+03	0.	0.	0.
X(1)	X(JBND1)	X(JBND2)	X(JBND3)	X(JFIN)	JQMAX	QMAX	X(JQMAX)		
-3.2495E-01	3.0484E-01	0.	0.	4.5037E+00	128	5.8073E+07	3.1119E+00		
CYCLE	TIME	DTNH	JTS	ETOTAL	JFIN	JSTAR	JSMAX	SMAX	X(JSMAX)
2850	4.9467E-06	2.4625E-09	3	9.7774E+01	179	178	116	2.7218E+09	2.8716E+00
DTPP	DTPULS	EMVNEG	EMVPOS	EMVPL	EMVPR	EMVPP	EMVBM	PDTPOS	PDTNEG
1.6820E-06	1.0441E-06	-4.7182E+03	4.5770E+03	2.8419E+03	1.7362E+03	4.5781E+03	0.	0.	0.
X(1)	X(JBND1)	X(JBND2)	X(JBND3)	X(JFIN)	JQMAX	QMAX	X(JQMAX)		
-3.2903E-01	3.0485E-01	0.	0.	4.5037E+00	129	5.5234E+07	3.1329E+00		
CYCLE	TIME	DTNH	JTS	ETOTAL	JFIN	JSTAR	JSMAX	SMAX	X(JSMAX)
2875	5.0482E-06	2.4625E-09	3	9.7777E+01	179	178	118	2.7082E+09	2.9100E+00
DTPP	DTPULS	EMVNEG	EMVPOS	EMVPL	EMVPR	EMVPP	EMVBM	PDTPOS	PDTNEG
1.6905E-06	1.0580E-06	-4.7182E+03	4.5770E+03	2.8653E+03	1.7128E+03	4.5781E+03	0.	0.	0.
X(1)	X(JBND1)	X(JBND2)	X(JBND3)	X(JFIN)	JQMAX	QMAX	X(JQMAX)		
-3.3310E-01	3.0486E-01	0.	0.	4.5037E+00	131	5.6006E+07	3.1755E+00		
CYCLE	TIME	DTNH	JTS	ETOTAL	JFIN	JSTAR	JSMAX	SMAX	X(JSMAX)
2900	5.1098E-06	2.4625E-09	3	9.7779E+01	179	178	120	2.6931E+09	2.9496E+00
DTPP	DTPULS	EMVNEG	EMVPOS	EMVPL	EMVPR	EMVPP	EMVBM	PDTPOS	PDTNEG
1.6990E-06	1.0741E-06	-4.7182E+03	4.5770E+03	2.9026E+03	1.6856E+03	4.5781E+03	0.	0.	0.
X(1)	X(JBND1)	X(JBND2)	X(JBND3)	X(JFIN)	JQMAX	QMAX	X(JQMAX)		
-3.3718E-01	3.0487E-01	0.	0.	4.5037E+00	133	5.3815E+07	3.2187E+00		
CYCLE	TIME	DTNH	JTS	ETOTAL	JFIN	JSTAR	JSMAX	SMAX	X(JSMAX)
2925	5.1714E-06	2.4625E-09	3	9.7780E+01	179	178	122	2.6753E+09	2.9891E+00
DTPP	DTPULS	EMVNEG	EMVPOS	EMVPL	EMVPR	EMVPP	EMVBM	PDTPOS	PDTNEG
1.7113E-06	1.0917E-06	-4.7182E+03	4.5770E+03	2.9307E+03	1.6574E+03	4.5781E+03	0.	0.	0.
X(1)	X(JBND1)	X(JBND2)	X(JBND3)	X(JFIN)	JQMAX	QMAX	X(JQMAX)		
-3.4125E-01	3.0488E-01	0.	0.	4.5037E+00	134	5.2318E+07	3.2404E+00		
CYCLE	TIME	DTNH	JTS	ETOTAL	JFIN	JSTAR	JSMAX	SMAX	X(JSMAX)
2950	5.2329E-06	2.4620E-09	3	9.7781E+01	179	178	124	2.6549E+09	3.0299E+00
DTPP	DTPULS	EMVNEG	EMVPOS	EMVPL	EMVPR	EMVPP	EMVBM	PDTPOS	PDTNEG
1.7244E-06	1.1121E-06	-4.7182E+03	4.5770E+03	2.9526E+03	1.6256E+03	4.5782E+03	0.	0.	0.
X(1)	X(JBND1)	X(JBND2)	X(JBND3)	X(JFIN)	JQMAX	QMAX	X(JQMAX)		
-3.4533E-01	3.0489E-01	0.	0.	4.5037E+00	136	5.2354E+07	3.2849E+00		
CYCLE	TIME	DTNH	JTS	ETOTAL	JFIN	JSTAR	JSMAX	SMAX	X(JSMAX)
2975	5.2945E-06	2.4620E-09	3	9.7780E+01	179	178	126	2.6308E+09	3.0706E+00
DTPP	DTPULS	EMVNEG	EMVPOS	EMVPL	EMVPR	EMVPP	EMVBM	PDTPOS	PDTNEG
1.7403E-06	1.1296E-06	-4.7182E+03	4.5770E+03	2.9853E+03	1.5929E+03	4.5782E+03	0.	0.	0.
X(1)	X(JBND1)	X(JBND2)	X(JBND3)	X(JFIN)	JQMAX	QMAX	X(JQMAX)		
-3.4940E-01	3.0490E-01	0.	0.	4.5037E+00	137	5.0713E+07	3.3072E+00		
CYCLE	TIME	DTNH	JTS	ETOTAL	JFIN	JSTAR	JSMAX	SMAX	X(JSMAX)
3000	5.3560E-06	2.4620E-09	3	9.7778E+01	179	178	127	2.6198E+09	3.0916E+00
DTPP	DTPULS	EMVNEG	EMVPOS	EMVPL	EMVPR	EMVPP	EMVBM	PDTPOS	PDTNEG
1.7475E-06	1.1181E-06	-4.7182E+03	4.5770E+03	2.9292E+03	1.6490E+03	4.5782E+03	0.	0.	0.
X(1)	X(JBND1)	X(JBND2)	X(JBND3)	X(JFIN)	JQMAX	QMAX	X(JQMAX)		
-3.5344E-01	3.0491E-01	0.	0.	4.5037E+00	139	5.0982E+07	3.3523E+00		

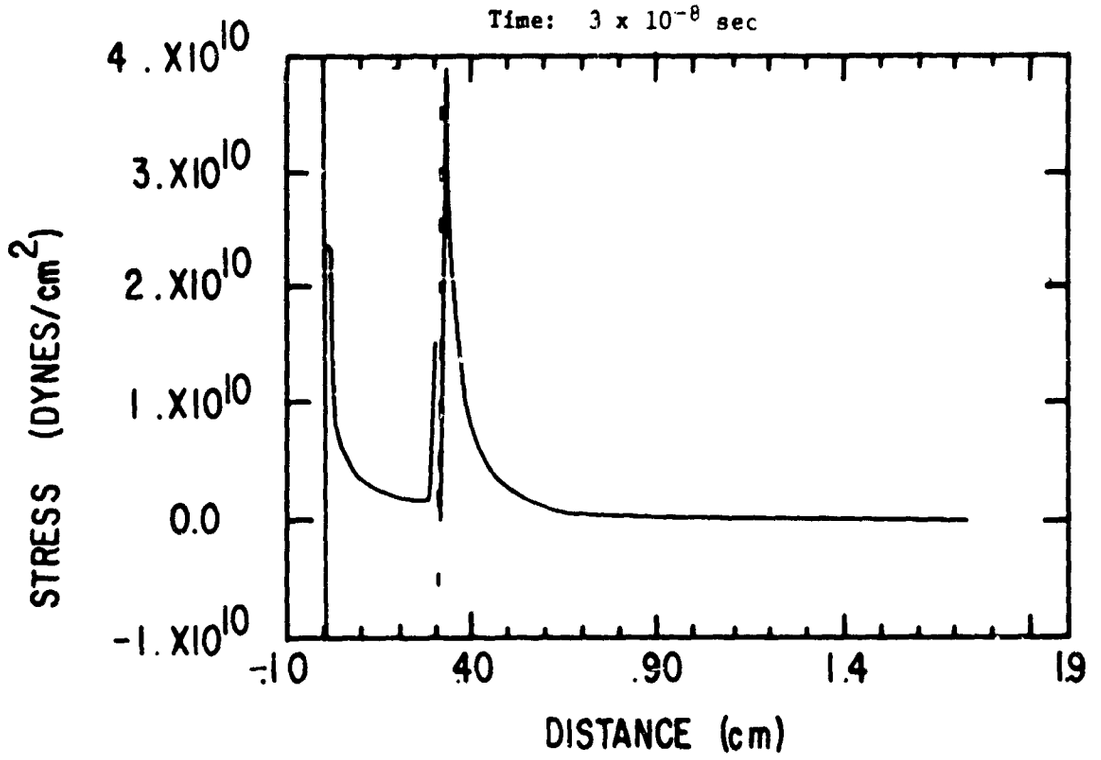
CYCLE	TIME	DTNM	JTS	ETOTAL	JFIN	JSTAR	JSMAX	SMAX	X(JSMAX)
3025	5.4174E-06	2.4620E-09	3	9.7774E+01	179	178	129	2.6049E+09	3.1336E+00
DTPP	DTPULS	EMVNEG	EMVPOS	EMVPL	EMVPR	EMVPP	EMVBM	PDTPOS	PDTNEG
1.7576E-06	1.1392E-06	-4.7182E+03	4.5770E+03	2.9675E+03	1.6107E+03	4.5782E+03	0.	0.	0.
X(1)	X(JANO1)	X(JANO2)	X(JBNO3)	X(JFIN)	JQMAX	QMAX	X(JQMAX)		
-3.5754E-01	3.0492E-01	0.	0.	4.5037E+00	140	4.9589E+07	3.3753E+00		

REZONE AT CYCLE 3025 ADDED 0 ZONES DELETED 35 ZONES NEW JSTAR IS 143

CYCLE	TIME	DTNM	JTS	ETOTAL	JFIN	JSTAR	JSMAX	SMAX	X(JSMAX)
3050	5.4791E-06	2.4620E-09	3	9.7769E+01	144	143	96	2.5828E+09	3.1761E+00
DTPP	DTPULS	EMVNEG	EMVPOS	EMVPL	EMVPR	EMVPP	EMVBM	PDTPOS	PDTNEG
1.7726E-06	1.1439E-06	-4.7182E+03	4.5770E+03	3.0062E+03	1.5720E+03	4.5782E+03	0.	0.	0.
X(1)	X(JANO1)	X(JANO2)	X(JBNO3)	X(JFIN)	JQMAX	QMAX	X(JQMAX)		
-3.6163E-01	3.0493E-01	0.	0.	4.5037E+00	107	4.8287E+07	3.4211E+00		

CYCLE	TIME	DTNM	JTS	ETOTAL	JFIN	JSTAR	JSMAX	SMAX	X(JSMAX)
3075	5.5407E-06	2.4625E-09	3	9.7763E+01	144	143	98	2.5567E+09	3.2193E+00
DTPP	DTPULS	EMVNEG	EMVPOS	EMVPL	EMVPR	EMVPP	EMVBM	PDTPOS	PDTNEG
1.7907E-06	1.1922E-06	-4.7182E+03	4.5770E+03	3.0480E+03	1.5302E+03	4.5782E+03	0.	0.	0.
X(1)	X(JANO1)	X(JANO2)	X(JBNO3)	X(JFIN)	JQMAX	QMAX	X(JQMAX)		
-3.6571E-01	3.0494E-01	0.	0.	4.5037E+00	8	7.8990E+07	7.4331E-02		

CYCLE	TIME	DTNM	JTS	ETOTAL	JFIN	JSTAR	JSMAX	SMAX	X(JSMAX)
3080	5.5530E-06	2.4625E-09	3	9.7762E+01	144	143	98	2.5629E+09	3.2194E+00
DTPP	DTPULS	EMVNEG	EMVPOS	EMVPL	EMVPR	EMVPP	EMVBM	PDTPOS	PDTNEG
1.7864E-06	1.1782E-06	-4.7182E+03	4.5770E+03	3.0197E+03	1.5586E+03	4.5782E+03	0.	0.	0.
X(1)	X(JANO1)	X(JANO2)	X(JBNO3)	X(JFIN)	JQMAX	QMAX	X(JQMAX)		
-3.6652E-01	3.0495E-01	0.	0.	4.5037E+00	8	8.6286E+07	7.4211E-02		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2.X10^{10}
1.X10^{10}
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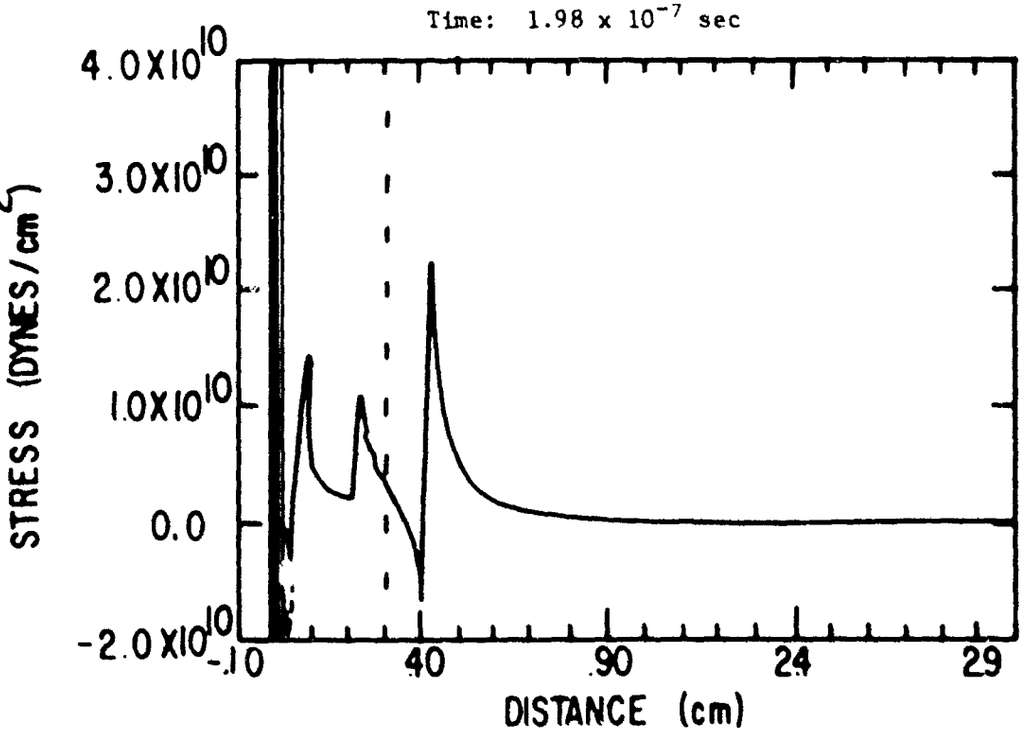
-1.X10^{10}
STRESS (DYNES/cm^2)
-.10
.40
.90
1.4
1.9
DISTANCE (cm)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1.0X10^{10}
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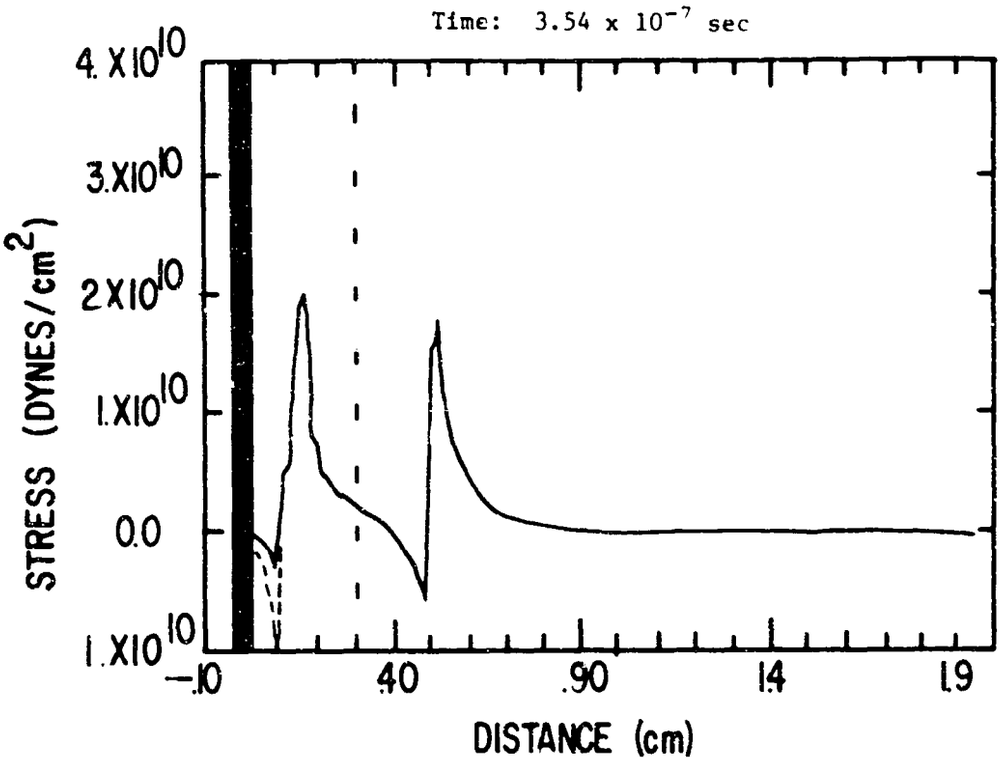
STRESS (DYNES/cm^2)
-.10
.40
.90
2.4
2.9
DISTANCE (cm)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2X10¹⁰
1.X10¹⁰
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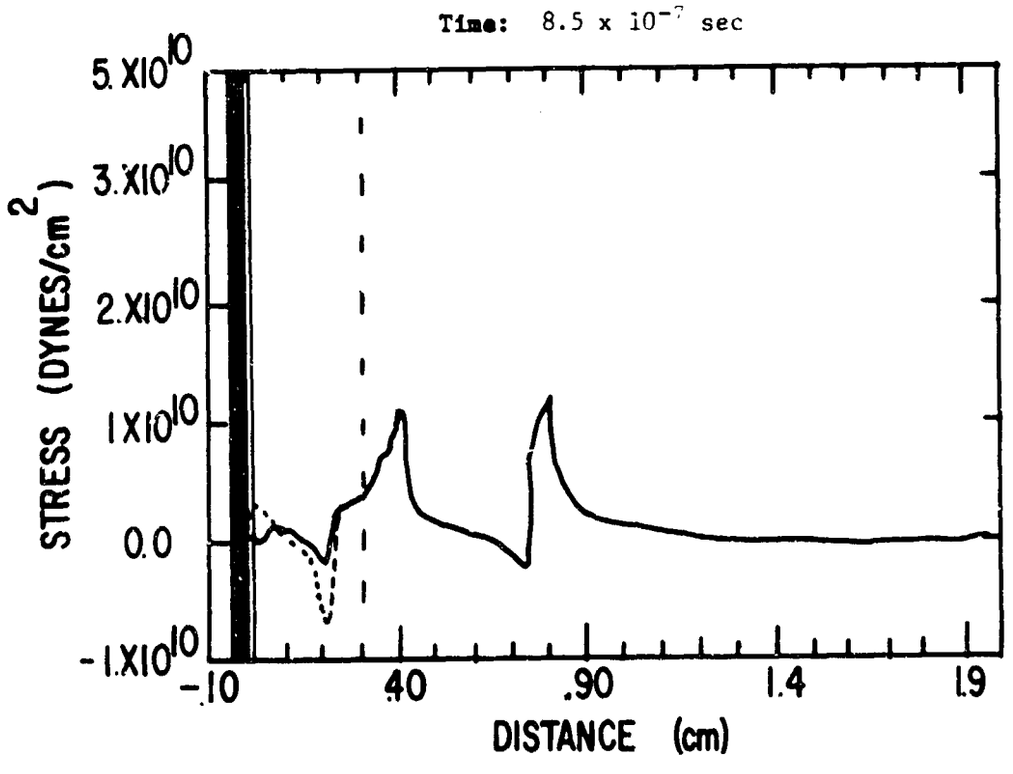
1.X10¹⁰
STRESS (DYNES/cm²)
-.10
.40
.90
1.4
1.9
DISTANCE (cm)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3.X10¹⁰
2.X10¹⁰
1X10¹⁰
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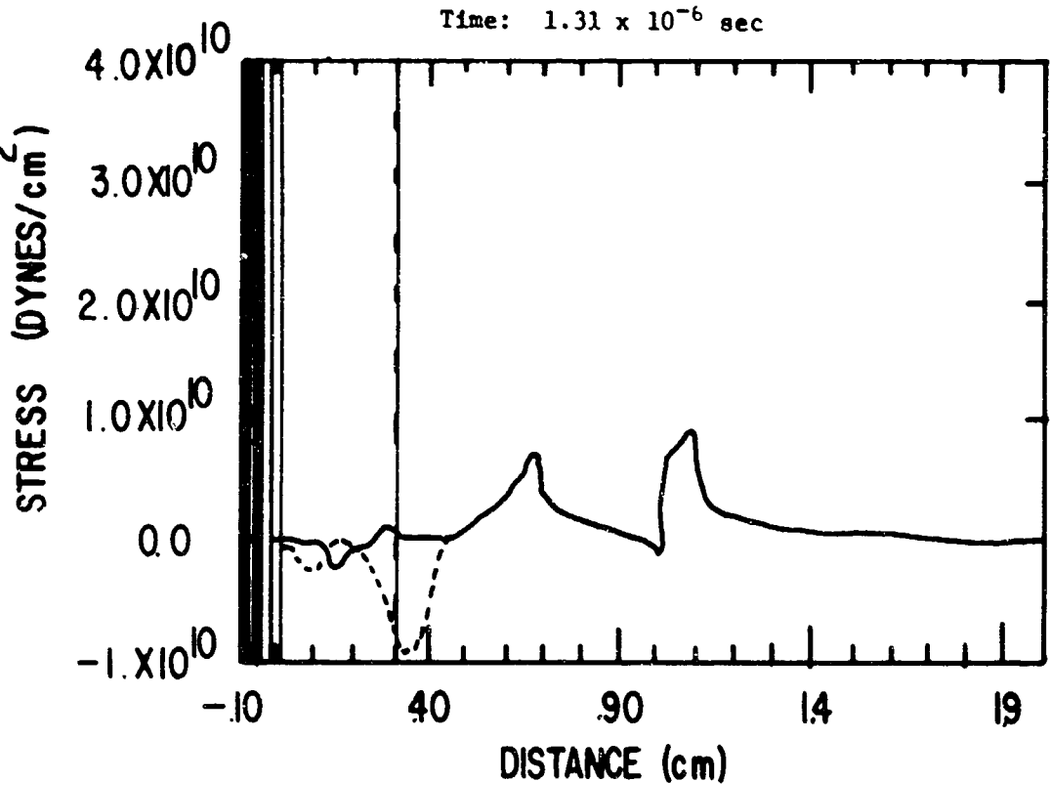
-1.X10¹⁰
STRESS (DYNES/cm²)
-.10
.40
.90
1.4
1.9
DISTANCE (cm)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1.0X10^10
0.0
-1.X10^10
STRESS (DYNES/cm^2)
-.10
.40
.90
1.4
1.9
DISTANCE (cm)

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13. ABSTRACT

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This report describes in some detail the addition of a fracture routine to PUFF 66, a one-dimensional Lagrangian hydrodynamics computer program. The report concerns itself mainly with the logic required in creating, following, and deleting free surfaces using a simple tension criterion for fracture plane location.

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