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CALCULATION PACKAGE SUPPORTING HI-STORM FSAR REVISIONS

FOR

HOLTEC

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DOCUMENT CATEGORIZATION

In accordance with the Holtec Quality Assurance Manual and associated Holtec Quality Procedures (HQPs), this document is categorized as a:

X Calculation Package[3] (Per HQP 3.2)

☐ Technical Report (Per HQP 3.2) (Such as a Licensing Report)

Design Criterion Document (Per HQP 3.4)

☐ Design Specification (Per HQP 3.4)

☐ Other (Specify):

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- The input information utilized in the work effort is drawn from referencable sources. Any assumed input data is so identified.
- All significant assumptions are stated.
- The analysis methodology is consistent with the physics of the problem.
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REVISION LOG[1]

Revision 0 – Original Issue

The original issue of this report contains Supplement 1. Supplement 1 includes all supporting calculations not given in the FSAR(TSAR) or in support of FSAR or certain ECO analyses up to Aug. 31, 2000.

Revision 1

Added Supplement #2 containing a calculation supporting acceleration ratio listed in section 3.4 (page 3.4-100) of LAR#1 to HI-STORM FSAR

Revision 2

[1] The revision status of Holtec documents is subject to updates as the project progresses. This document will be revised if a revision to any of the above-referenced Holtec work products materially affects the instructions, results, conclusions or analyses contained in this document. Otherwise, a revision to this document will not be made and the latest revision of the referenced Holtec documents shall be assumed to supersede the revision numbers cited above. The Holtec Project Manager bears the undivided responsibility to ensure that there is no intra-document conflict with respect to the information contained in all Holtec generated documents on a safety significant project.

This revision supports Proposed Revision 1B. It contains Supplement 2 consisting of 7 calculations. These calculations support the submittal responding to RAI#1 on LAR 1014-1. The first 6 calculations address specific ECO's (Engineering Change Orders) and/or RAI responses, and/or direct changes to the FSAR. Calculation 7 is a compendium of all figures and stress input and output tables that had previously been in the FSAR but are now relocated to the Calculation Package. Appendices 3.N-3.T have been relocated in their entirety (including the MPC 32 stress calculations that were introduced when Proposed Revision 1 was originally submitted. Stress output for the MPC-24E in archived in this calculation 7. The footers in these appendices keep the designation of 3.N-x, etc. for page numbering.

PREFACE

This Calculation Package has been prepared pursuant to the provisions of Holtec Quality Procedures HQP 3.0 and 3.2, which require that all analyses utilized in support of the design of a safety-related or important-to-safety structure, component, or system be fully documented such that the analyses can be reproduced at *any time in the future* by a specialist trained in the discipline(s) involved. HQP 3.2 sets down a rigid format structure for the content and organization of Calculation Packages that are intended to create a document that is complete in terms of the exhaustiveness of content. The Calculation Packages, however, lack the narration smoothness of a Technical Report, and are not intended to serve as a Technical Report.

Because of the Calculation Package's function as a repository of all analyses performed on the subject of its scope, this document is typically revised only if an error is discovered in the computations or the equipment design is modified. Additional analyses in the future will be added as numbered supplements to this Package. Each time a supplement is added or the existing material is revised, the revision status of this Package is advanced to the next number and the Table of Contents is amended.

1.0 INTRODUCTION AND SCOPE

This Calculation Package is compiled to provide archival information to supplement the material presented in the FSAR (and the previous TSAR) [11.2.2], specifically Chapter 3, and to support any 72.48 modifications and ECO's. It also serves, in the future, to support analyses documented in the FSAR for HI-STORM, HI-2002444 as it progresses through updates. The material presented in this Calculation Package is not needed to comprehend the material presented in the above-mentioned Technical Report (which is a self-contained document in full compliance with the USNRC regulations), unless the reader wishes to examine the computational details. This calculation package is a "follow on" report to HI-981928 [11.2.1], which is the calculation package that documents and supports HI-STORM FSAR submittals up to and through June 2000. Herein, we document only specific "singular" calculations that support a specific FSAR summarized result. Where a large body of calculations is necessary to support a FSAR conclusion (such as high seismic supports for anchored casks, for example), this calculation package is supplemented by other specialized reports that deal exclusively with the single topic requiring a substantial calculation effort. The results from these specialized calculation packages are simply summarized in the FSAR.

Because of its function as a repository of analyses performed on the subject of its scope, this document will be revised only if an error is discovered in the computations or the equipment design is modified. Additional analyses in the future, supporting either a new FSAR amendment or a change supported by a 72.48 evaluation, will be added as numbered supplements to this

Package. (Each time a supplement is added or the existing material is revised, the revision status of this Package is advanced to the next number and the Table of Contents is amended).

In order to fully understand the format and layout of this Calculation Package, it is necessary to understand its two key attributes. First, unlike most calculation packages, this package contains a multitude of discrete analyses, all of which share a common body of input data, but are otherwise entirely distinct in their methods, models, and computer simulations. This calculation package is in fact a compendium of an array of distinct calculations.

Revision 0 is the first issue of the calculation package that serves as the follow-on to the previous calc package [11.2.1] (Note that an initial Rev. 11 TSAR submittal was in the first half of 2000 and the supporting calculations and updated weight tables are in [11.2.1].) Reference [11.2.1] is now complete unless revised. All new FSAR submittals or 72.48 evaluations requiring structural calculations are supported by the work herein and by other specialized calculation packages. The use of the terminology "FSAR" is appropriate when the citation or comment is to HI-951312. The term "FSAR" implies the FSAR when the citation or comment is to HI-2002444.

2.0 METHODOLOGY

Calculation specific appendices are attached to this report. In general, the problem descriptions are provided in the introductory section of each calculation in the FSAR document [11.2.2]. The problem descriptions, unique to each calculation, include the description of the component to be analyzed, the nature and source of the applied loading on the component, and the acceptance criteria. Where the calculation is performed to support a 72.48 evaluation, and does not yet appear in summary form in the FSAR, the calculation itself is complete insofar as having a full description of the problem, methodology, etc.

All structural calculations are either based on classical strength of materials solutions, or are based on finite element numerical analysis. Each calculation contains detailed explanation of the analysis methods. As noted earlier, this Calculation Package contains supporting calculations for results that may only be summarized in the FSAR [11.2.2]. Where the work supports a detailed appendix that is included in the FSAR, no detailed text is included within the supporting calculation herein except to describe the nature of the supporting calculation.

3.0 ACCEPTANCE CRITERIA

This calculation package contains one or more appendices that deal with specific calculation items. If acceptance criteria are different for the individual calculations, then the appropriate acceptance criteria associated with each individual calculation are stated within the specific appendix.

The design criteria are compiled in the FSAR in Chapter 2.0. The design criteria represent the basis for the acceptance criteria for the design of the HI-STORM, the MPC, and the HI-TRAC. The stress intensity limit for the confinement and the nonconfinement boundaries are listed in the FSAR in Tables 2.2.10 through 2.2.12. (The ASME Code stress allowable associated with the stress intensity limits are listed in the FSAR in Tables 3.1.6 through 3.1.17.) The applicable design codes for cask components are listed in the FSAR in Tables 2.2.6. and 2.2.7.

4.0 ASSUMPTIONS

In general, each calculation in this package or in the FSAR contains a unique set of conservative analysis assumptions. In most cases these assumptions are listed under a separate section in each of the calculations; for some calculations that supplement work already detailed in the FSAR or in another calculation, references are made to the originating document section for the assumptions.

5.0 INPUT DATA

Input data is provided in the calculation appendices as needed for the specific analysis. Data input requirements for geometry, material properties, and applicable load combinations are provided below:

The sources for the input data that are specific to a calculation are provided within that calculation.

Calculation number 1 in HI-981928 [11.2.1] contains the Excel spreadsheets that are the bases for the cask component weight calculation, with its own source of input data. The weight calculations have performed using drawings appropriate to Revision 11 of the FSAR [11.2.2] supported by the portion of Rev. 11 submitted in the first half of 2000. Where weight modifications for subsequent revisions of the FSAR are required, these changed (or added) weights are documented in this calculation package in the supplement supporting the FSAR revision.

The sources of the input data that are repetitively used are listed as references in Section 11. The global sources of input data are compiled below for quick reference. The drawings revision numbers are omitted here. Applicable revision numbers are found in Section 1.5 of the FSAR.

HI-STORM Dimensions:	Holtec Drawing Nos. 1495 & 1561

HI-STORM 100S Dimensions	Holtec Drawing Nos. 3669
125 Ton HI-TRAC Dimensions:	Holtec Drawing Nos. 1880 & 1928
100 Ton HI-TRAC Dimensions:	Holtec Drawing Nos. 2145 & 2152
MPC(24) Dimension:	Holtec Drawing Nos.1395 & 1396
MPC(32) Dimensions:	Holtec Drawing Nos. 1392 & 1393
MPC(68) Dimensions:	Holtec Drawing Nos.1401 & 1402
MPC(24E) Dimensions	Holtec Drawing Nos. 2889-2892
HI-STORM Weight:	Table 3.2.1 of [11.2.2]
HI-TRAC Weight:	Table 3.2.2 of [11.2.2]
MPC Weight:	Table 3.2.1 of [11.2.2]
Center of Gravity:	Table 3.2.3 of [11.2.2]

Design Pressure:	FSAR, Table 2.2.1
Component Design Temperature:	FSAR, Table 2.2.3
Mechanical Properties:	FSAR, Tables 3.3.1 through 3.3.5
Material Strength:	FSAR, Tables 3.1.6 through 3.1.17

The current weight analysis is as documented in HI-981198, (latest and final revision). However, the weight tables in Sec. 3.2 have been updated to reflect the additional weight of 2000 lb. from the anchoring system. The current spreadsheets within HI-981928 do not reflect this change. However, the spreadsheets have been moved to the HI-2002481 /Rev 0 directory and have been updated.

6.0 COMPUTER CODES

The main section of this report is written using Microsoft Word (Office 2000), while the calculation appendices are prepared using MathCad (Version 2000 unless otherwise noted below), or are also written in MS Word and contain manual calculations and/or finite element results. The computer codes used are documented and referenced within each supplement.

All computer codes used for the analysis and design of HI-STORM, HI-TRAC, and MPC are approved under Holtec's QA program. The FSAR, in Section 3.6.2, contains a concise description of all applicable computer codes.

7.0 ANALYSES

Analyses to support the FSAR amendments and 72.48 evaluations are contained in supplements that contain a series of appendices. As new supporting calculations are added, the revision log and the table of contents will note the additions or modifications to this document.

8.0 COMPUTER FILES

All relevant computer files associated with this calculation package are archived on the Holtec Server. A directory listing appropriate to the supplements is included within each supplement.

9.0 RESULTS OF ANALYSES

All calculations are documented in the FSAR along with an evaluation of the analysis. The analysis evaluation contains details of the analysis results and the comparison of the result to applicable code allowables. The design adequacy is also conclusively demonstrated by the computation of the positive margins of safety. The specific calculations within each supplement also evaluate, if applicable, the margins of safety and the results where applicable.

10.0 SUMMARY AND CONCLUSIONS

The backup calculation package supports the structural integrity evaluation of the HI-STORM 100 System required by the 10CFR72 FSAR Submittal [11.2.2] and also supports interim 72.48 evaluations. All analysis calculations and documentation meet Holtec's Q.A requirements and procedures.

11.0 REFERENCES

11.1 Generic References

A comprehensive list of all references that may be applicable to some or all of the specific calculations performed within this document are given below. Not all references need to be cited within this document to be contained in this comprehensive listing.

[11.1.1] NUREG-0612, "Control of Heavy Loads at Nuclear Power Plants," United States Nuclear Regulatory Commission.

[11.1.2] ANSI N14.6-1993, "American National Standard for Special Lifting Devices for Shipping Containers Weighing 10000 Pounds (4500 kg) or More for Nuclear Materials," American National Standards Institute, Inc.

[11.1.3] D. Burgreen, Design Methods for Power Plant Structures, Arcturus Publishers, 1975.

[11.1.4] NUREG/CR-1815, "Recommendations for Protecting Against Failure by Brittle Fracture in Ferritic Steel Shipping Containers Up to Four Inches Thick".

[11.1.5] ASME Boiler & Pressure Vessel Code, Section II, Part D, 1998.

[11.1.6] American Concrete Institute, "Building Code Requirements for Reinforced Concrete (ACI 318-95) and Commentary - ACI 318R-95", or Latest Edition.

[11.1.7] American Concrete Institute, "Code Requirements for Nuclear Safety Related Structures" (ACI-349-85 to95) and Commentary (ACI-349R-85 to95).

[11.1.8] ASME Boiler & Pressure Vessel Code, Section III, Subsection NF, 1998.

[11.1.9] ASME Boiler & Pressure Vessel Code, Section III, Appendices, 1998.

[11.1.10] ASME Boiler & Pressure Vessel Code, Section III, Subsection NB, 1998.

[11.1.11] Theory of Elastic Stability, S.P. Timoshenko and J. Gere, McGraw Hill, 2nd Edition.

[11.1.12] Marks Standard Handbook for Mechanical Engineering, 9th Ed.

[11.1.13] ASME Boiler and Pressure Vessel Code, Section III, Subsection NG, 1998.

[11.1.14] Manual of Steel Construction – Load and Resistance Factor Design, 1st Edition, AISC, 1986.

[11.1.15] Manual of Steel Construction, AISC.

[11.1.16] Mechanical Engineering Design, J. Shigley, and C. Mischke, 5th Edition, McGraw-Hill, 1989.

[11.1.17] Mechanical Design of Heat Exchangers and Pressure Vessel Components, K.P. Singh, and A.I. Soler, Arcturus Publishers, 1984.

[11.1.18] Strength of Materials, S.P Timoshenko, Vols: I, and II, 3rd Edition, Van Nostrand, 1955.

[11.1.19] Mechanical Design and Systems Handbook, H. Rothbart, Editor, 2nd Edition, McGraw-Hill, 1985.

[11.1.20] Theory of Elasticity, S.P. Timoshenko, and J. Goodier, 3rd Edition, McGraw-Hill, 1951.

[11.1.21] Theory of Elastic Stability, S.P. Timoshenko, and J.M. Gere, 2nd Edition, Mcgraw-Hill, 1961.

11.2 Specific References

In addition to the comprehensive reference list provided in Appendix B, additional project specific references are cited below. If any reference cited below conflicts with an identical reference in Appendix B (e.g., a different applicable year for a Code or Standard), then the specific reference takes precedence.

[11.2.1] HI-981928, HI-STORM 100 CALCULATION PACKAGE, Latest Revision, 1998.

[11.2.2] HI-951312, HI-STORM 100 FSAR, Chapter 3, Latest Revision, 1999. This document has now become HI-2002444, HI-STORM 100 FSAR, Rev. 0 and Proposed Revision 1.

[11.2.3] HI-STORM 100 Storage System Design Specification; HOLTEC Report HI-961555, Revision 0.

[11.2.4] MPC Drawings (Section 1.5 in [11.2]).

[11.2.5] HI-STORM Drawings: (see Section 1.5 in [11.2])

[11.2.6] HI-TRAC Drawings: (see Section 1.5 in [11.2])

[11.2.7] Structural Calculation Package for HI-STORM –100, Holtec Report HI-961589, Revision 1, 2/28/97.

12.0 LIST OF SUPPLEMENTS

12.1 Supplement 1

This supplement contains the following items

App. A – Calculations supporting the structural implication of the thermosiphon effect.

App. B – I/O from finite element analysis of the 24E fuel basket. No discussion of the problem is given

App. C – Trunnion interface stress analysis (This appendix is also in HI-981928 last revision)

App. D – Miscellaneous calculations supporting work in Sec. 3.4 not documented elsewhere.

App. 3.AT – A stress calculation supporting an ECO for alternate construction of HI-TRAC water jacket. This will be issued as a 72:48 in 2001. The calc was requested in Aug. 2000. to support the proposed ECO.

App. 3.AU- The large missile impact evaluation on HI-TRAC is redone here to support the ECO for the alternate construction of the HI-TRAC water jacket.

12.2 Supplement 2

This supplement adds a calculation of the ratio of max. rigid body accelerations of HI-STORM 100S to HI-STORM 100. It supports the contention that the results for the HI-STORM 100 bound the results for the HI-STORM 100S as far as the non-mechanistic tipover is concerned. This calculation was should have been added when LAR#1 was submitted but was "missed". The addition of this supplement brings the calc package up to date.

12.3 Supplement 3

Calculations 1 and 2 support ECO changes brought on by RAI questions.
Calculation 3 replaces Appendices 3.AO and 3.AP that have been modified by changes to the HI-STORM 100S lid required to rfespond to reviewers comments
Calculation 4 is a sample anchor receptacle design analysis to support the typical configuration shown in Fig. 2.A.1 in Chapter 2 of the FSAR.
Calculation 5 presents theory formulas for evaluating load paths for anchored casks during preload and operational conditions
Calculation 6 is Appendix 3.D in the FSAR with specific results and discussion appropriate to the HI-STORM 100S lid. This rewrite was necessary because the two lids (100 vs. 100S) are sufficiently different in how load is supported that a single appendix could no longer be supported.
Calculation 7 is a compendium of figures and appendices that have been relocated from the FSAR to the Calc. Package based on agreements with the NRC staff. It

also contains results of new finite element analyses in support of the analysis of the MPC24E fuel basket.

The supplement contains the director listing for this revision of the report.

SUPPLEMENT # 1 COVER PAGE

Revision 11 of the HI-STORM TSAR includes the thermosiphon effect. This alters the MPC temperature distribution. Therefore, the finite element solution results reported in Table 3.4.8 of the TSAR and discussed in Subsection 3.4.4.3.1.2 have been revised. This appendix provides the archival information necessary

The revised thermal analysis on MPC-24, MPC-24E, MPC-32, and MPC-68 has resulted in temperature distribution solutions significantly different from those obtained in the previous calculation. The new temperature results are summarized in Tables 4.4.19, 4.4.10, 4.4.9, 4.4.26, and 4.4.27 of the TSAR (Holtec Report No. HI-951312). Consequently, the stress analysis on the MPC needs to be updated. This appendix documents the MPC stress analysis using the new temperature results.

In review of the temperature results, MPC-68 is identified to have the maximum temperature gradient across the thickness of its structural members. Therefore, the MPC-68 temperature results are used in the stress analysis, and the results bound the stresses in other MPCs.

The stress analysis is performed using the same ANSYS model developed before for analyzing the MPC subjected to combined pressure and temperature loads. The only modification to the ANSYS model is the temperature load. Note that the geometric configuration of the ANSYS model is conservatively constructed to yield the maximize stress for all types of MPCs. The ANSYS input file is attached at the end of this attachment.

Results of the stress analysis are extracted from the ANSYS output file, result68, and summarized in Table 3.4.8 of the TSAR.

The input and output files as well as this attachment are zipped up and stored under the following Holtec ZIP FILE

calc3-attach.zip in the directory listed in the footer (except on the server)

The fortran listing of the relevant input files are given below:

THERMAL INPUT CODE TO DEFINE TEMPERATURES FOR ANSYS INPUT

```
C   program to compute temperatures for confinement press/temp stress
c input is from temperature info from thermal     5/24/98
      dimension tt(150)
      read(*,*)ta,tb,tc,td
      read(*,*) te,tf,tg,th
      read(*,*) ti,dt,dt1
      tt(1)=ta
      tt(11)=tc
       tt(45)=tb
      tt(55)=td
      tt(111)=tf
      tt(108)=th
      tt(131)=te
      tt(106)=tg
      tt(81)=ti
      tt(76)=tc
      tt(86)=tg+dt
      tt(56)=td
c   temporary nodes for thermal description of base tt121 is redefined later
c   tt 141 is not used but is coincident with node 106
      tt(141)=tt(106)
      tt(121)=tt(108)
       tt(107)=0.5*(tt(108)+tt(106))
1000   format(1x,'BF,',1x,i3,1x,',TEMP,',f8.2)
c   top lid nodes
        ns=1
        es=1.
        ne=11
        er=11.
       do 1,i=ns,ne
       tt(i)=tt(ne)+(tt(ns)-tt(ne))*(1-((i-es)/(er-es))**2)
       write(*,1000)i,tt(i)
1      continue
        ns=45
        es=45.
        ne=55
         ee=55.
       do 2,i=ns,ne
       tt(i)=tt(ne)+(tt(ns)-tt(ne))*(1-((i-es)/(ee-es))**2)
       write(*,1000)i,tt(i)
2      continue
        ns=12
        ne=22
        nu=33
        nd=11
       do 3,i=ns,ne
       tt(i)=tt(i-nd)+.25*(tt(i+nu)-tt(i-nd))
       write(*,1000)i,tt(i)
3      continue
        ns=23
        ne=33
        nu=22
```

```
        nd=22
       do 4,i=ns,ne
       tt(i)=tt(i-nd)+.5*(tt(i+nu)-tt(i-nd))
       write(*,1000)i,tt(i)
4      continue
        ns=34
        ne=44
        nu=11
        nd=33
       do 5,i=ns,ne
       tt(i)=tt(i-nd)+.75*(tt(i+nu)-tt(i-nd))
       write(*,1000)i,tt(i)
5      continue
c   now do shell
         ns=56
        es=56.
        ne=76
        ee=76.
       do 6,i=ns,ne
       y=(i-es)/(ee-es)
       tt(i)=tt(ns)+(tt(ne)-tt(ns))*(y*(2-y))
       write(*,1000)i,tt(i)
6      continue
         ns=76
        es=76.
        ne=81
        ee=81.
       do 7,i=ns,ne
       y=(i-es)/(ee-es)
       tt(i)=tt(ns)+(tt(ne)-tt(ns))*(y*(2-y))
       write(*,1000)i,tt(i)
7      continue
        ns=81
        es=81.
        ne=86
         ee=86.
       do 8,i=ns,ne
       tt(i)=tt(ne)+(tt(ns)-tt(ne))*(1-((i-es)/(ee-es))**2)
       write(*,1000)i,tt(i)
8      continue
        ns=86
        es=86.
        ne=106
         ee=106.
       do 9,i=ns,ne
       tt(i)=tt(ne)+(tt(ns)-tt(ne))*(1-((i-es)/(ee-es))**2)
       write(*,1000)i,tt(i)
9      continue
       ns=111
        es=111.
        ne=121
         ee=121.
       do 10,i=ns,ne
       tt(i)=tt(ne)+(tt(ns)-tt(ne))*(1-((i-es)/(ee-es))**2)
       write(*,1000)i,tt(i)
10      continue
       ns=131
```

```
      es=131.
      ne=141
       ee=141.
     do 11,i=ns,ne
     tt(i)=tt(ne)+(tt(ns)-tt(ne))*(1-((i-es)/(ee-es))**2)
     write(*,1000)i,tt(i)
11    continue
      ns=121
      ne=130
      nu=10
      nd=10
     do 12,i=ns,ne
     tt(i)=tt(i-nd)+.5*(tt(i+nu)-tt(i-nd))
     write(*,1000)i,tt(i)
12    continue
     ns=106
     ne=108
     do 13,i=ns,ne
     write(*,1000)i,tt(i)
13    continue
     stop
      end
```

ANSYS INPUT FILE SUPPORTING RESULTS IN TABLE 3.4.8 of TSAR

```
/BATCH
/COM,ANSYS RELEASE 5.4   UP010997      10:52:43   08/17/2000
/input,menust,tmp   ,,,,,,,,,,,,,,,,,1
/PREP7
/TITLE MPC - Pressure and Temperature
!*
ET,1,PLANE42

!*
KEYOPT,1,1,0
KEYOPT,1,2,0
KEYOPT,1,3,1
KEYOPT,1,5,2
KEYOPT,1,6,4


!*
ET,2,SHELL51
!*
KEYOPT,2,3,0
KEYOPT,2,4,1
!*
! set parameters for geometry
rs=68.375/2
ts=0.5
lmpc=190.5
hf=9.5
lc=178.5
tbp=2.5
rl=33.625
bl=12
rmean=rs-.5*ts
l1=lmpc-2*bl-tbp
l2=hf-bl-l1
l3=l2-bl-tbp

denax=7.51e-04        ! Mass density of alloy x, lbf-sec^2/in^4
nuax=0.30             ! Poisson's ratio of alloy x

! material property tables
*dim,Eax,,16,2        ! Young's modulus of alloy x
Eax(1,1)=-40
Eax(1,2)=28.14e+06    ! Note: First column contains temperature data, F
Eax(2,1)=100          !
Eax(2,2)=28.14e+06    !     Second column contains corresponding data
Eax(3,1)=150          !     for Young's modulus, psi
Eax(3,2)=27.87e+06
Eax(4,1)=200
Eax(4,2)=27.60e+06
Eax(5,1)=250
Eax(5,2)=27.30e+06
Eax(6,1)=300
```

```
Eax(6,2)=27.00e+06
Eax(7,1)=350
Eax(7,2)=26.75e+06
Eax(8,1)=400
Eax(8,2)=26.50e+06
Eax(9,1)=450
Eax(9,2)=26.15e+06
Eax(10,1)=500
Eax(10,2)=25.80e+06
Eax(11,1)=550
Eax(11,2)=25.55e+06
Eax(12,1)=600
Eax(12,2)=25.30e+06
Eax(13,1)=650
Eax(13,2)=25.05e+06
Eax(14,1)=700
Eax(14,2)=24.80e+06
Eax(15,1)=750
Eax(15,2)=24.45e+06
Eax(16,1)=800
Eax(16,2)=24.10e+06

*dim,alax,,16,2        ! Coefficient of thermal expansion of alloy x (max)
alax(1,1)=-40
alax(1,2)=8.55e-06     ! Note: First column contains temperature data, F
alax(2,1)=100          !
alax(2,2)=8.55e-06     !     Second column contains corresponding data
alax(3,1)=150          !     for coeff. of thermal expansion, in/(in-F)
alax(3,2)=8.67e-06
alax(4,1)=200
alax(4,2)=8.79e-06
alax(5,1)=250
alax(5,2)=8.90e-06
alax(6,1)=300
alax(6,2)=9.00e-06
alax(7,1)=350
alax(7,2)=9.11e-06
alax(8,1)=400
alax(8,2)=9.21e-06
alax(9,1)=450
alax(9,2)=9.32e-06
alax(10,1)=500
alax(10,2)=9.42e-06
alax(11,1)=550
alax(11,2)=9.50e-06
alax(12,1)=600
alax(12,2)=9.60e-06
alax(13,1)=650
alax(13,2)=9.69e-06
alax(14,1)=700
alax(14,2)=9.76e-06
alax(15,1)=750
alax(15,2)=9.81e-06
alax(16,1)=800
alax(16,2)=9.90e-06
```

```
! Young's modulus

mptemp
mptemp,1,Eax(1,1),Eax(2,1),Eax(3,1),Eax(4,1),Eax(5,1),Eax(6,1)
mptemp,7,Eax(7,1),Eax(8,1),Eax(9,1),Eax(10,1),Eax(11,1),Eax(12,1)
mptemp,13,Eax(13,1),Eax(14,1),Eax(15,1),Eax(16,1)

*do,i,1,1,1
 mpdata,ex,i,1,Eax(1,2),Eax(2,2),Eax(3,2),Eax(4,2),Eax(5,2),Eax(6,2)
 mpdata,ex,i,7,Eax(7,2),Eax(8,2),Eax(9,2),Eax(10,2),Eax(11,2),Eax(12,2)
 mpdata,ex,i,13,Eax(13,2),Eax(14,2),Eax(15,2),Eax(16,2)
*enddo

! Shear modulus

! Values are calculated using Young's modulus (Eax) and Poisson's
! ratio (nuax) at each temperature for which data is available.
!
! G = E/(2*(1+nu))

mptemp
mptemp,1,Eax(1,1),Eax(2,1),Eax(3,1),Eax(4,1),Eax(5,1),Eax(6,1)
mptemp,7,Eax(7,1),Eax(8,1),Eax(9,1),Eax(10,1),Eax(11,1),Eax(12,1)
mptemp,13,Eax(13,1),Eax(14,1),Eax(15,1),Eax(16,1)

*do,i,1,1,1
 mpdata,gxy,i,1,Eax(1,2)/(2*(1+nuax)),Eax(2,2)/(2*(1+nuax))
 mpdata,gxy,i,3,Eax(3,2)/(2*(1+nuax)),Eax(4,2)/(2*(1+nuax))
 mpdata,gxy,i,5,Eax(5,2)/(2*(1+nuax)),Eax(6,2)/(2*(1+nuax))
 mpdata,gxy,i,7,Eax(7,2)/(2*(1+nuax)),Eax(8,2)/(2*(1+nuax))
 mpdata,gxy,i,9,Eax(9,2)/(2*(1+nuax)),Eax(10,2)/(2*(1+nuax))
 mpdata,gxy,i,11,Eax(11,2)/(2*(1+nuax)),Eax(12,2)/(2*(1+nuax))
 mpdata,gxy,i,13,Eax(13,2)/(2*(1+nuax)),Eax(14,2)/(2*(1+nuax))
 mpdata,gxy,i,15,Eax(15,2)/(2*(1+nuax)),Eax(16,2)/(2*(1+nuax))
*enddo

! Coefficient of thermal expansion

!mptemp
!mptemp,1,alax(1,1),alax(2,1),alax(3,1),alax(4,1),alax(5,1),alax(6,1)
!mptemp,7,alax(7,1),alax(8,1),alax(9,1),alax(10,1),alax(11,1),alax(12,1)
!mptemp,13,alax(13,1),alax(14,1),alax(15,1),alax(16,1)

!*do,i,1,1,1
 ! mpdata,alpx,i,1,alax(1,2),alax(2,2),alax(3,2),alax(4,2),alax(5,2),alax(6,2)
 ! mpdata,alpx,i,7,alax(7,2),alax(8,2),alax(9,2),alax(10,2),alax(11,2),alax(12,2)
 ! mpdata,alpx,i,13,alax(13,2),alax(14,2),alax(15,2),alax(16,2)
!*enddo
alpx,1,0.
! Poisson's ratio

*do,i,1,1,1
 mp,nuxy,i,nuax
*enddo

! Mass density
```

```
mp,dens,1,0.

!nodes
! node 1 is origin of x-y system (x is radial)
!save
n,1
n,11,rl
fill,1,11
ngen,5,11,1,11,1,0,hf/4

n,56,rmean,hf

n,76,rmean,(hf-bl)
fill,56,76


n,86,rmean,hf-bl-l1
fill,76,86

n,106,rmean,l2-bl
fill,86,106
n,108,rmean,l2-bl-tbp
fill,106,108

! nodes for baseplate

n,111,0,l3

n,120,(rs*0.9)
n,120,.9*rs,l3
fill,111,120
ngen,3,10,111,120,1,0,tbp/2

!apply boundary conditions

d,1,ux,0,0,45,11,
d,111,ux,0,0,131,10
d,all,uz,0
d,1,uy
save
! generate elements
!shell thickness
r,1,ts
! top lid
type,1
mat,1
real,1
save
e,1,2,13,12
egen,10,1,1,1,1
save
egen,4,11,1,10,1
save
! weld element
e,44,57,56,55
```

```
!shell elements in upper bending boundary layer
type,2
e,56,57
elist,all
save
egen,20,1,42,42,1
save


eplot

e,76,77
elist,all
!save
egen,10,1,62,62,1
!save
e,86,87
!save


egen,20,1,72,72,1

!generate baseplate elements
type,1
e,111,112,122,121
egen,9,1,92,92,1
egen,2,10,92,100,1

e,120,108,107,130
e,130,107,106,140
type,2
e,106,107
e,107,108
save
! element generation, node generation, bc complete
! loads are applied by picking - lot's of false attempts
save
!*
ANTYPE,0
NLGEOM,0
NROPT,AUTO, ,
LUMPM,0
EQSLV,FRONT,1e-008,0,
SSTIF
PSTRES
TOFFST,0,
!*
tref=70
NPLOT
EPLOT
/ZOOM,1,RECT,-0.277524,0.947283,0.255218,0.760870
tunif=70
! load case 1 internal pressure 100 psi
! properties are temp. independent since all materials the same
SFCUM,PRES,REPL,1,1,
```

```
SFCUM,CONV,REPL,1,1,
SFCUM,HFLUX,REPL,1,
SFCUM,SELV,REPL,1,1,
SFCUM,IMPD,REPL,1,1,
SFCUM,CHRGS,REPL,1,
!*
SFCUM,PRES,REPL,1,1,
SFCUM,CONV,REPL,1,1,
SFCUM,HFLUX,REPL,1,
SFCUM,SELV,REPL,1,1,
SFCUM,IMPD,REPL,1,1,
SFCUM,CHRGS,REPL,1,
!*
FLST,2,113,2,ORDE,2
FITEM,2,1
FITEM,2,-113
save
FLST,2,113,2,ORDE,2
FITEM,2,1
FITEM,2,-113
SFE,P51X,1,PRES, ,100, , , ,
FLST,2,10,2,ORDE,2
FITEM,2,1
FITEM,2,-10
resume

FLST,2,138,1,ORDE,4
FITEM,2,1
FITEM,2,-108
FITEM,2,111
FITEM,2,-140
SF,P51X,PRES,100,
FLST,2,138,1,ORDE,4
FITEM,2,1
FITEM,2,-108
FITEM,2,111
FITEM,2,-140
SF,P51X,PRES,100,
FLST,2,138,1,ORDE,4
FITEM,2,1
FITEM,2,-108
FITEM,2,111
FITEM,2,-140
SF,P51X,PRES,100,
FLST,2,138,1,ORDE,4
FITEM,2,1
FITEM,2,-108
FITEM,2,111
FITEM,2,-140
SF,P51X,PRES,100,
FLST,2,14,1,ORDE,5
FITEM,2,1
FITEM,2,-11
FITEM,2,22
FITEM,2,33
FITEM,2,44
```

```
epdele,all

resume

FLST,2,113,2,ORDE,2
FITEM,2,1
FITEM,2,-113
SFE,P51X,1,PRES, ,100, , , ,
FLST,2,10,2,ORDE,2
FITEM,2,1
FITEM,2,-10

resume
FLST,2,138,1,ORDE,4
FITEM,2,1
FITEM,2,-108
FITEM,2,111
FITEM,2,-140
SF,P51X,PRES,100,
FLST,2,11,1,ORDE,2
FITEM,2,1
FITEM,2,-11

resume
FLST,2,113,2,ORDE,2
FITEM,2,1
FITEM,2,-113
SFE,P51X,1,PRES, ,100, , , ,
FLST,2,113,2,ORDE,2
FITEM,2,1
FITEM,2,-113
SFE,P51X,1,PRES, ,100, , , ,
FLST,2,1,2,ORDE,1
FITEM,2,5
SFE,P51X,1,PRES, ,100, , , ,

resume
FLST,2,14,1,ORDE,5
FITEM,2,1
FITEM,2,-11
FITEM,2,22
FITEM,2,33
FITEM,2,44
SF,P51X,PRES,100,

save
/ZOOM, 1 ,BACK
/ZOOM,1,SCRN,0.635748,0.034239,0.689022,-0.182609
/ZOOM,1,RECT,0.042121,0.700000,0.091590,-0.829348

nplot,1
/ZOOM, 1 ,BACK
/ZOOM, 1, 33.543  , 4.6914  , .00000  , 6.0520
FLST,2,18,1,ORDE,2
FITEM,2,57
```

```
FITEM,2,-74
SF,P51X,PRES,100,

resume

resume
FLST,2,5,1,ORDE,4
FITEM,2,39
FITEM,2,-40
FITEM,2,49
FITEM,2,-51
SF,P51X,PRES,-100,
resume
eplot
/ZOOM,1,RECT,0.631942,0.186413,0.669995,-0.505978
nplot,1
/ZOOM,1,RECT,-0.018764,0.973913,0.430261,1.034783
/ZOOM, 1 ,BACK
/ZOOM, 1, 33.968  , -.72351  , .00000  , 9.6620
/ZOOM,1,RECT,-0.030180,1.015761,0.083979,-0.213043
FLST,2,20,1,ORDE,2
FITEM,2,57
FITEM,2,-76
SF,P51X,PRES,-100,

save
/ZOOM, 1 ,BACK
/ZOOM, 1, 33.968  , -.72351  , .00000  , 9.6620
/ZOOM, 1 ,BACK
/ZOOM, 1, 15.800  , 3.7359  , .00000  , 27.909
/ZOOM, 1 ,BACK
/VIEW, 1
/FOC, 1 ,AUTO
/DIST, 1
/ANG, 1
/LIG, 1 ,1
/REP
/ZOOM,1,RECT,0.148669,0.951087,0.220970,-0.935870
/ZOOM,1,RECT,-0.026374,0.875000,0.000263,-0.817935
FLST,2,10,1,ORDE,2
FITEM,2,76
FITEM,2,-85
SF,P51X,PRES,-100,

save
/ZOOM, 1 ,BACK
/ZOOM, 1, 36.333  , -84.953  , .00000  , 98.853
/ZOOM,1,RECT,-0.037790,-0.631522,0.026900,-0.992935
FLST,2,22,1,ORDE,2
FITEM,2,85
FITEM,2,-106
SF,P51X,PRES,-100,
/ZOOM, 1 ,BACK
/ZOOM, 1, 36.333  , -84.953  , .00000  , 98.853
/ZOOM,1,RECT,-0.391683,-0.905435,0.042121,-0.943478
FLST,2,11,1,ORDE,3
```

```
FITEM,2,106
FITEM,2,131
FITEM,2,-140
SF,P51X,PRES,100,
plist,all
! add pressure on weld
sfe,41,1,pres,,100

BF,  1 ,TEMP, 502.00
BF,  2 ,TEMP, 500.79
BF,  3 ,TEMP, 497.16
BF,  4 ,TEMP, 491.11
BF,  5 ,TEMP, 482.64
BF,  6 ,TEMP, 471.75
BF,  7 ,TEMP, 458.44
BF,  8 ,TEMP, 442.71
BF,  9 ,TEMP, 424.56
BF, 10 ,TEMP, 403.99
BF, 11 ,TEMP, 381.00
BF, 45 ,TEMP, 454.00
BF, 46 ,TEMP, 453.21
BF, 47 ,TEMP, 450.84
BF, 48 ,TEMP, 446.89
BF, 49 ,TEMP, 441.36
BF, 50 ,TEMP, 434.25
BF, 51 ,TEMP, 425.56
BF, 52 ,TEMP, 415.29
BF, 53 ,TEMP, 403.44
BF, 54 ,TEMP, 390.01
BF, 55 ,TEMP, 375.00
BF, 12 ,TEMP, 490.00
BF, 13 ,TEMP, 488.90
BF, 14 ,TEMP, 485.58
BF, 15 ,TEMP, 480.05
BF, 16 ,TEMP, 472.32
BF, 17 ,TEMP, 462.38
BF, 18 ,TEMP, 450.22
BF, 19 ,TEMP, 435.85
BF, 20 ,TEMP, 419.28
BF, 21 ,TEMP, 400.49
BF, 22 ,TEMP, 379.50
BF, 23 ,TEMP, 478.00
BF, 24 ,TEMP, 477.00
BF, 25 ,TEMP, 474.00
BF, 26 ,TEMP, 469.00
BF, 27 ,TEMP, 462.00
BF, 28 ,TEMP, 453.00
BF, 29 ,TEMP, 442.00
BF, 30 ,TEMP, 429.00
BF, 31 ,TEMP, 414.00
BF, 32 ,TEMP, 397.00
BF, 33 ,TEMP, 378.00
BF, 34 ,TEMP, 466.00
BF, 35 ,TEMP, 465.10
BF, 36 ,TEMP, 462.42
BF, 37 ,TEMP, 457.95
```

```
BF, 38 ,TEMP, 451.68
BF, 39 ,TEMP, 443.63
BF, 40 ,TEMP, 433.78
BF, 41 ,TEMP, 422.15
BF, 42 ,TEMP, 408.72
BF, 43 ,TEMP, 393.51
BF, 44 ,TEMP, 376.50
BF, 56 ,TEMP, 375.00
BF, 57 ,TEMP, 375.58
BF, 58 ,TEMP, 376.14
BF, 59 ,TEMP, 376.67
BF, 60 ,TEMP, 377.16
BF, 61 ,TEMP, 377.63
BF, 62 ,TEMP, 378.06
BF, 63 ,TEMP, 378.46
BF, 64 ,TEMP, 378.84
BF, 65 ,TEMP, 379.18
BF, 66 ,TEMP, 379.50
BF, 67 ,TEMP, 379.79
BF, 68 ,TEMP, 380.04
BF, 69 ,TEMP, 380.27
BF, 70 ,TEMP, 380.46
BF, 71 ,TEMP, 380.63
BF, 72 ,TEMP, 380.76
BF, 73 ,TEMP, 380.86
BF, 74 ,TEMP, 380.94
BF, 75 ,TEMP, 380.98
BF, 76 ,TEMP, 381.00
BF, 76 ,TEMP, 381.00
BF, 77 ,TEMP, 368.76
BF, 78 ,TEMP, 359.24
BF, 79 ,TEMP, 352.44
BF, 80 ,TEMP, 348.36
BF, 81 ,TEMP, 347.00
BF, 81 ,TEMP, 347.00
BF, 82 ,TEMP, 344.07
BF, 83 ,TEMP, 335.30
BF, 84 ,TEMP, 320.67
BF, 85 ,TEMP, 300.18
BF, 86 ,TEMP, 273.85
BF, 86 ,TEMP, 273.85
BF, 87 ,TEMP, 273.78
BF, 88 ,TEMP, 273.57
BF, 89 ,TEMP, 273.22
BF, 90 ,TEMP, 272.74
BF, 91 ,TEMP, 272.11
BF, 92 ,TEMP, 271.34
BF, 93 ,TEMP, 270.44
BF, 94 ,TEMP, 269.39
BF, 95 ,TEMP, 268.21
BF, 96 ,TEMP, 266.89
BF, 97 ,TEMP, 265.43
BF, 98 ,TEMP, 263.82
BF, 99 ,TEMP, 262.08
BF, 100 ,TEMP, 260.20
BF, 101 ,TEMP, 258.18
```

```
BF, 102 ,TEMP,  256.03
BF, 103 ,TEMP,  253.73
BF, 104 ,TEMP,  251.29
BF, 105 ,TEMP,  248.72
BF, 106 ,TEMP,  246.00
BF, 111 ,TEMP,  203.00
BF, 112 ,TEMP,  202.93
BF, 113 ,TEMP,  202.72
BF, 114 ,TEMP,  202.37
BF, 115 ,TEMP,  201.88
BF, 116 ,TEMP,  201.25
BF, 117 ,TEMP,  200.48
BF, 118 ,TEMP,  199.57
BF, 119 ,TEMP,  198.52
BF, 120 ,TEMP,  197.33
BF, 121 ,TEMP,  196.00
BF, 131 ,TEMP,  209.00
BF, 132 ,TEMP,  209.37
BF, 133 ,TEMP,  210.48
BF, 134 ,TEMP,  212.33
BF, 135 ,TEMP,  214.92
BF, 136 ,TEMP,  218.25
BF, 137 ,TEMP,  222.32
BF, 138 ,TEMP,  227.13
BF, 139 ,TEMP,  232.68
BF, 140 ,TEMP,  238.97
!BF, 141 ,TEMP,  246.00
BF, 121 ,TEMP,  206.00
BF, 122 ,TEMP,  206.15
BF, 123 ,TEMP,  206.60
BF, 124 ,TEMP,  207.35
BF, 125 ,TEMP,  208.40
BF, 126 ,TEMP,  209.75
BF, 127 ,TEMP,  211.40
BF, 128 ,TEMP,  213.35
BF, 129 ,TEMP,  215.60
BF, 130 ,TEMP,  218.15
BF, 106 ,TEMP,  246.00
BF, 107 ,TEMP,  221.00
BF, 108 ,TEMP,  196.00

SAVE
finish

!/eof

/solu
/output,result68
outpr,all,last
outres,all,last
solve
```

APPENDIX B

FINITE ELEMENT ANALYSIS OF MPC-24E
(INPUT FILES AND RESULTS)

TABLE OF CONTENTS

INPUT FILES

MPC-24E.INP
BC-0DEG.INP
DROP0.INP
SIDE0.INP
BC-45DEG.INP
DROP45.INP
SIDE45.INP
POST.INP

ARCHIVE FILE STORAGE OF ANSYS WORK IS IN \PROJECTS\5014\CBULLARD\MPC24E\HISTORM

THE HARD COPY OF THIS APPENDIX B IS STORED IN \PROJECTS\5014\HISTORM\AIS\HI2002481\REV0

RESULTS

TABLE 1 0 DEGREE SIDE DROP – FUEL BASKET – PRIMARY MEMBRANE

TABLE 2 0 DEGREE SIDE DROP – FUEL BASKET – LOCAL MEMBRANE PLUS PRIMARY BENDING

TABLE 3 0 DEGREE SIDE DROP – ENCLOSURE VESSEL – PRIMARY MEMBRANE

TABLE 4 0 DEGREE SIDE DROP – ENCLOSURE VESSEL – LOCAL MEMBRANE PLUS PRIMARY BENDING

TABLE 5 45 DEGREE SIDE DROP – FUEL BASKET – PRIMARY MEMBRANE

TABLE 6 45 DEGREE SIDE DROP – FUEL BASKET – LOCAL MEMBRANE PLUS PRIMARY BENDING

TABLE 7 45 DEGREE SIDE DROP – ENCLOSURE VESSEL – PRIMARY MEMBRANE

TABLE 8 45 DEGREE SIDE DROP – ENCLOSURE VESSEL – LOCAL MEMBRANE PLUS PRIMARY BENDING

APPENDIX B

FINITE ELEMENT ANALYSIS OF MPC-24E
(INPUT FILES AND RESULTS)

MPC-24E.INP

```
! \\projects\5014\cbullard\mpc-24e\hi-storm\side0\closed\mpc-24e.inp
!
! The following ANSYS input file is used to generate 2-D strucutral models
! of the HI-STORM 100 MPCs.  The input file is parametric and can be used to
! create MPC baskets of various sizes (i.e., MPC-32,MPC-68).  The number of
! elements is controlled by a series of input parameters.
!
! No loads or boundary conditions are defined in this input file.  Separate
! input files are used to apply loads and boundary conditions.
!
! The element types, material property sets, and real constant sets related
! to the canister shell/overpack contact elements (CONTAC26) are defined in
! this file, but they are not used.  This information is intended for later
! use in the "load case" input files.
!
! The following data are for the MPC-24E.

/output,mpc-24e,lst

fini
/clear

/filnam,mpc-24e
/title,MPC-24E Structural Model
/unit,bin

pi=acos(-1)

*afun,deg            ! Change units for angular functions

!**************   Input data   ****************************************

! Geometric data

nbx=24                   ! Number of boxes
nrw=6                    ! Number of rows

*dim,row,,nrw            ! Number of boxes in each row
row(1)=2
row(2)=4
row(3)=6
row(4)=6
row(5)=4
row(6)=2

fblt=176.5           ! Axial length of fuel basket, in
cslt=187.5           ! Axial length of canister shell, in

axlt=1.0                 ! Axial length of model, in

cp=10.847                ! Cell pitch, in
bxid=8.75            ! Inner dimension of box, in
bxid2=9.05           ! Inner dimension of 4 corner boxes, in
bwtk=0.3125          ! Thickness of box walls, in
bwtk2=0.3125         ! Thickness of center walls, in
angtk=0.3125         ! Thickness of angles, in
cptk=0.3125          ! Thickness of connecting plates, in
cstk=0.5                 ! Thickness of canister shell, in
```

APPENDIX B

FINITE ELEMENT ANALYSIS OF MPC-24E
(INPUT FILES AND RESULTS)

```
bstk=0.3125          ! Thickness of basket supports, in
csrd=33.9375             ! Mean radius of canister shell, in
shim=0.5525          ! Thickness of MPC shell shims, in
oprd=34.75-cstk/2-shim     ! Inner radius of overpack, in
gap=0.01             ! Basket/shell gap, in
weld=0.125           ! Size of basket welds, in

offset=0.75          ! Offset length of flux traps (8 locations), in

shearz=6/5               ! Shear deflection constant

kn=1.0e+06               ! Normal contact stiffness (basket/shell)
stifn=1.0e+06        ! Normal contact stiffness (shell/overpack)

! Material data

denax=7.51e-04           ! Mass density of alloy x, lbf-sec^2/in^4
nuax=0.30                ! Poisson's ratio of alloy x

cof=0.0                     ! Coeffficient of friction (basket/shell)

*dim,Eax,,16,2           ! Young's modulus of alloy x
Eax(1,1)=-40
Eax(1,2)=28.14e+06       ! Note: First column contains temperature data, F
Eax(2,1)=100         !
Eax(2,2)=28.14e+06       !       Second column contains corresponding data
Eax(3,1)=150             !       for Young's modulus, psi
Eax(3,2)=27.87e+06
Eax(4,1)=200
Eax(4,2)=27.60e+06
Eax(5,1)=250
Eax(5,2)=27.30e+06
Eax(6,1)=300
Eax(6,2)=27.00e+06
Eax(7,1)=350
Eax(7,2)=26.75e+06
Eax(8,1)=400
Eax(8,2)=26.50e+06
Eax(9,1)=450
Eax(9,2)=26.15e+06
Eax(10,1)=500
Eax(10,2)=25.80e+06
Eax(11,1)=550
Eax(11,2)=25.55e+06
Eax(12,1)=600
Eax(12,2)=25.30e+06
Eax(13,1)=650
Eax(13,2)=25.05e+06
Eax(14,1)=700
Eax(14,2)=24.80e+06
Eax(15,1)=750
Eax(15,2)=24.45e+06
Eax(16,1)=800
Eax(16,2)=24.10e+06

*dim,alax,,16,2          ! Coefficient of thermal expansion of alloy x (max)
alax(1,1)=-40
alax(1,2)=8.55e-06       ! Note: First column contains temperature data, F
alax(2,1)=100            !
alax(2,2)=8.55e-06       !       Second column contains corresponding data
```

```
alax(3,1)=150            !       for coeff. of thermal expansion, in/(in-F)
alax(3,2)=8.67e-06
alax(4,1)=200
alax(4,2)=8.79e-06
alax(5,1)=250
alax(5,2)=8.90e-06
alax(6,1)=300
alax(6,2)=9.00e-06
alax(7,1)=350
alax(7,2)=9.11e-06
alax(8,1)=400
alax(8,2)=9.21e-06
alax(9,1)=450
alax(9,2)=9.32e-06
alax(10,1)=500
alax(10,2)=9.42e-06
alax(11,1)=550
alax(11,2)=9.50e-06
alax(12,1)=600
alax(12,2)=9.60e-06
alax(13,1)=650
alax(13,2)=9.69e-06
alax(14,1)=700
alax(14,2)=9.76e-06
alax(15,1)=750
alax(15,2)=9.81e-06
alax(16,1)=800
alax(16,2)=9.90e-06

! Load data

g=386.4                     ! Acceleration due to gravity, in/sec^2

fawt=1680            ! Weight of PWR fuel assembly, lbf
falt=168             ! Length of basket support structure, in

bpwt=8.5             ! Weight of Boral panel (@ 2.66 g/c), lbf
bplt=156             ! Length of Boral panel, in

shwt=21.0            ! Weight of sheathing panel, lbf
shlt=156.5           ! Length of sheathing panel, in

lidwt=9822           ! Weight of MPC closure lid, lbf

! Finite element data

tol=0.01             ! Tolerance used for node selection, in

nelbw=6                 ! Number of elements per box wall
ltweld=bwtk/2+weld/3! Length of beam elements adjacent to welds, in
ltcpel=2.0           ! Maximum length of connecting plates, in
ltcsel=3.0              ! Maximum length of canister shell elements, deg
ltbsel=2.0              ! Maximum length of basket support elements, in

!**************   Error checking   ***********************************

total=row(1)
*do,i,2,nrw,1
  total=total+row(i)
*enddo
```

```
*if,nbx,ne,total,then
  *msg,error,nbx,total
  NBX (= %I) DOES NOT EQUAL THE SUM OF THE ELEMENTS IN ROW (= %I).
  *go,:end
*endif

*do,i,1,nrw/2,1
  *if,row(i),ne,row(nrw-i+1),then
    *msg,error
    BASKET STRUCTURE IS NOT SYMMETRIC ABOUT THE X AXIS.
    *go,:end
  *endif
*enddo

*if,oprd,lt,csrd,then
  *msg,error,oprd,csrd
  OPRD (= %G) IS LESS THAN CSRD (= %G).
  *go,:end
*endif

!**************   User defined macros    ******************************

*create,ceil,mac            ! This function returns the next integer
  ans=nint(arg1)            ! which is greater than the input value.
  *if,ans,lt,arg1,then            !
    ans=ans+1               ! Example:   ceil,1.3  ->   ans=2
  *endif
*end

!**************   Define element types   ******************************

/prep7

! Type 1 - fuel basket
! Type 2 - connecting plates
! Type 3 - canister shell
! Type 4 - basket supports (plate type)
! Type 5 - basket supports (solid type)
! Type 6 - basket/shell contact
! Type 7 - shell/overpack contact
! Type 8 - 2-D linear spring
! Type 9 - box walls (-y)
! Type 10 - box walls (+x)
! Type 11 - rigid beams

et,1,beam3
et,2,beam3
et,3,beam3
et,4,beam3

et,5,plane82,,,3

et,6,contac12
et,7,contac26

et,8,combin14,,,2

et,9,beam3
et,10,beam3
```

APPENDIX B

FINITE ELEMENT ANALYSIS OF MPC-24E
(INPUT FILES AND RESULTS)

```
!et,11,beam3

!**************   Define material properties   **********************

! Material 1 - box walls (egg crate)
! Material 2 - box walls (angle)
! Material 3 - center walls
! Material 4 - flux trap walls
! Material 5 - connecting plates
! Material 6 - canister shell
! Material 7 - basket supports (plate type)
! Material 8 - basket supports (solid type)
! Material 9 - basket/shell contact

tref,70              ! Reference temperature for thermal strain calculations

! Young's modulus

mptemp
mptemp,1,Eax(1,1),Eax(2,1),Eax(3,1),Eax(4,1),Eax(5,1),Eax(6,1)
mptemp,7,Eax(7,1),Eax(8,1),Eax(9,1),Eax(10,1),Eax(11,1),Eax(12,1)
mptemp,13,Eax(13,1),Eax(14,1),Eax(15,1),Eax(16,1)

*do,i,1,8,1
  mpdata,ex,i,1,Eax(1,2),Eax(2,2),Eax(3,2),Eax(4,2),Eax(5,2),Eax(6,2)
  mpdata,ex,i,7,Eax(7,2),Eax(8,2),Eax(9,2),Eax(10,2),Eax(11,2),Eax(12,2)
  mpdata,ex,i,13,Eax(13,2),Eax(14,2),Eax(15,2),Eax(16,2)
*enddo

! Shear modulus

! Values are calculated using Young's modulus (Eax) and Poisson's
! ratio (nuax) at each temperature for which data is available.
!
! G = E/(2*(1+nu))

mptemp
mptemp,1,Eax(1,1),Eax(2,1),Eax(3,1),Eax(4,1),Eax(5,1),Eax(6,1)
mptemp,7,Eax(7,1),Eax(8,1),Eax(9,1),Eax(10,1),Eax(11,1),Eax(12,1)
mptemp,13,Eax(13,1),Eax(14,1),Eax(15,1),Eax(16,1)

*do,i,1,8,1
  mpdata,gxy,i,1,Eax(1,2)/(2*(1+nuax)),Eax(2,2)/(2*(1+nuax))
  mpdata,gxy,i,3,Eax(3,2)/(2*(1+nuax)),Eax(4,2)/(2*(1+nuax))
  mpdata,gxy,i,5,Eax(5,2)/(2*(1+nuax)),Eax(6,2)/(2*(1+nuax))
  mpdata,gxy,i,7,Eax(7,2)/(2*(1+nuax)),Eax(8,2)/(2*(1+nuax))
  mpdata,gxy,i,9,Eax(9,2)/(2*(1+nuax)),Eax(10,2)/(2*(1+nuax))
  mpdata,gxy,i,11,Eax(11,2)/(2*(1+nuax)),Eax(12,2)/(2*(1+nuax))
  mpdata,gxy,i,13,Eax(13,2)/(2*(1+nuax)),Eax(14,2)/(2*(1+nuax))
  mpdata,gxy,i,15,Eax(15,2)/(2*(1+nuax)),Eax(16,2)/(2*(1+nuax))
*enddo

! Coefficient of thermal expansion

mptemp
mptemp,1,alax(1,1),alax(2,1),alax(3,1),alax(4,1),alax(5,1),alax(6,1)
mptemp,7,alax(7,1),alax(8,1),alax(9,1),alax(10,1),alax(11,1),alax(12,1)
mptemp,13,alax(13,1),alax(14,1),alax(15,1),alax(16,1)

*do,i,1,8,1
```

```
  mpdata,alpx,i,1,alax(1,2),alax(2,2),alax(3,2),alax(4,2),alax(5,2),alax(6,2)
  mpdata,alpx,i,7,alax(7,2),alax(8,2),alax(9,2),alax(10,2),alax(11,2),alax(12,2)
  mpdata,alpx,i,13,alax(13,2),alax(14,2),alax(15,2),alax(16,2)
*enddo

! Poisson's ratio

*do,i,1,8,1
  mp,nuxy,i,nuax
*enddo

! Mass density

bwvol=(bxid+bwtk/2+angtk/2)*bwtk*axlt          ! Volume of one box wall, in^3
bwvol2=(bxid+bwtk/2+angtk/2)*bwtk2*axlt
angvol=(bxid+bwtk/2+angtk/2)*angtk*axlt        ! Volume of one angle wall, in^3

bpdens1=bpwt/(g*bplt*bwvol)        ! Eff. density of Boral, lbf-sec^2/in^4
shdens1=shwt/(g*shlt*bwvol)        ! Eff. density of sheating, lbf-sec^2/in^4

bpdens2=bpwt/(g*bplt*angvol)
shdens2=shwt/(g*shlt*angvol)

bpdens3=bpwt/(g*bplt*bwvol2)
shdens3=shwt/(g*shlt*bwvol2)

mp,dens,1,denax+bpdens1+shdens1
mp,dens,2,denax+bpdens2+shdens2
mp,dens,3,denax+bpdens3+shdens3

*do,i,4,8,1
  mp,dens,i,denax
*enddo

! Coefficient of friction
mp,mu,9,cof

!**************   Define real constants   ****************************

! Real constant 1 - box wall (egg crate) elements
! Real constant 2 - box wall (angle) elements
! Real constant 3 - center walls
! Real constant 4 - canister shell elements
! Real constant 5 - basket support elements (plate type)
! Real constant 6 - basket support elements (solid type)
! Real constant 7 - basket/shell contact elements (x dir., +x)
! Real constant 8 - basket/shell contact elements (y dir., +y)
! Real constant 9 - basket/shell contact elements (x dir., -x)
! Real constant 10 - basket/shell contact elements (y dir., -y)
! Real constant 11 - 2-D linear spring connecting basket to shell
! Real constant 12 - shell/overpack contact elements
! Real constant 13 - 2-D linear spring connecting shell to overpack
! Real constant 14 - rigid beams

r,1,bwtk*axlt,(axlt*bwtk**3)/12,bwtk,shearz      ! Area, inertia, height, shearz
r,2,angtk*axlt,(axlt*angtk**3)/12,angtk,shearz
r,3,bwtk2*axlt,(axlt*bwtk2**3)/12,bwtk2,shearz
r,4,cstk*axlt,(axlt*cstk**3)/12,cstk,shearz
r,5,bstk*axlt,(axlt*bstk**3)/12,bstk,shearz
```

```
r,6,axlt              ! Plate thickness

r,7,270,kn,-gap             ! Interface angle, normal contact stiffness, initial gap
r,8,0,kn,-gap
r,9,270,kn,-gap
r,10,0,kn,-gap

r,11,kn                     ! Normal contact stiffness

r,12,stifn,oprd,0    ! Normal contact stiffness, radius, acute arc

r,13,stifn           ! Normal contact stiffness

!r,14,1000*bwtk*axlt,1000*(axlt*bwtk**3)/12,bwtk,shearz

!**************   Construct finite element model   *******************

!**************   Fuel basket   ***************************************

csys,0               ! Cartesian coordinates

! Define local coordinate system at the center of box #1

ft=cp-bxid-bwtk-angtk              ! Flux trap dimension

local,11,0,ft/2+bwtk+bxid/2,ft/2+bwtk+bxid/2

! Define nodes for box #1

avglt=(bxid+bwtk/2+angtk/2)/nelbw ! Average length of box wall elements
ceil,(cp-bxid-bwtk/2-angtk/2-2*ltweld)/avglt
nelft=ans+2

ninc=6*(nelbw+1)+4*nelft   ! Node number increment between consecutive boxes

n,1,-(bxid+bwtk)/2,-(bxid+bwtk)/2
n,2,-(bxid+bwtk)/2+ltweld,-(bxid+bwtk)/2
n,nelbw,(bxid+angtk)/2-ltweld,-(bxid+bwtk)/2
n,nelbw+1,(bxid+angtk)/2,-(bxid+bwtk)/2
n,nelbw+2,(bxid+angtk)/2+ltweld,-(bxid+bwtk)/2
*if,nelft,gt,2,then
  n,nelbw+nelft,cp-(bxid+bwtk)/2-ltweld,-(bxid+bwtk)/2
*endif
n,nelbw+nelft+1,cp-(bxid+bwtk)/2,-(bxid+bwtk)/2

n,nelbw+nelft+2,cp-(bxid+bwtk)/2,cp-(bxid+bwtk)/2
n,nelbw+nelft+3,cp-(bxid+bwtk)/2-ltweld,cp-(bxid+bwtk)/2
n,2*nelbw+nelft+1,-bxid/2+ft+angtk/2+ltweld,cp-(bxid+bwtk)/2
n,2*nelbw+nelft+2,-bxid/2+ft+angtk/2,cp-(bxid+bwtk)/2
n,2*nelbw+nelft+3,-bxid/2+ft+angtk/2-ltweld,cp-(bxid+bwtk)/2
*if,nelft,gt,2,then
  n,2*(nelbw+nelft)+1,-(bxid+bwtk)/2+ltweld,cp-(bxid+bwtk)/2
*endif
n,2*(nelbw+nelft+1),-(bxid+bwtk)/2,cp-(bxid+bwtk)/2

n,2*(nelbw+nelft)+3,-(bxid+bwtk)/2,-(bxid+bwtk)/2
n,2*(nelbw+nelft+2),-(bxid+bwtk)/2,-(bxid+bwtk)/2+ltweld
n,3*nelbw+2*nelft+2,-(bxid+bwtk)/2,(bxid+angtk)/2-ltweld
n,3*nelbw+2*nelft+3,-(bxid+bwtk)/2,(bxid+angtk)/2
n,3*nelbw+2*nelft+4,-(bxid+bwtk)/2,(bxid+angtk)/2+ltweld
```

```
*if,nelft,gt,2,then
  n,3*(nelbw+nelft)+2,-(bxid+bwtk)/2,cp-(bxid+bwtk)/2-ltweld
*endif
n,3*(nelbw+nelft+1),-(bxid+bwtk)/2,cp-(bxid+bwtk)/2

n,3*(nelbw+nelft)+4,cp-(bxid+bwtk)/2,cp-(bxid+bwtk)/2
n,3*(nelbw+nelft)+5,cp-(bxid+bwtk)/2,cp-(bxid+bwtk)/2-ltweld
n,4*nelbw+3*nelft+3,cp-(bxid+bwtk)/2,-bxid/2+ft+angtk/2+ltweld
n,4*nelbw+3*nelft+4,cp-(bxid+bwtk)/2,-bxid/2+ft+angtk/2
n,4*nelbw+3*nelft+5,cp-(bxid+bwtk)/2,-bxid/2+ft+angtk/2-ltweld
*if,nelft,gt,2,then
  n,4*(nelbw+nelft)+3,cp-(bxid+bwtk)/2,-(bxid+bwtk)/2+ltweld
*endif
n,4*(nelbw+nelft+1),cp-(bxid+bwtk)/2,-(bxid+bwtk)/2

n,4*(nelbw+nelft)+5,-(bxid+bwtk)/2,(bxid+angtk)/2
n,4*(nelbw+nelft)+6,-(bxid+bwtk)/2+ltweld,(bxid+angtk)/2
n,5*nelbw+4*nelft+5,(bxid+angtk)/2,(bxid+angtk)/2
n,5*nelbw+4*nelft+6,(bxid+angtk)/2,-(bxid+bwtk)/2
n,5*nelbw+4*nelft+7,(bxid+angtk)/2,-(bxid+bwtk)/2+ltweld
n,6*nelbw+4*nelft+6,(bxid+angtk)/2,(bxid+angtk)/2

fill,2,nelbw,,,,4,nelbw+nelft+1
*if,nelft,gt,3,then
  fill,nelbw+2,nelbw+nelft,,,,4,nelbw+nelft+1
*endif
fill,4*(nelbw+nelft)+6,5*nelbw+4*nelft+5,,,,2,nelbw+1

cm,box1,node

! Define local coordinate system at the center of box #2

local,12,0,ft/2+bwtk+bxid/2+cp,3*ft/2+bwtk+angtk+bxid/2,,-90

csys,11

transfer,12,ninc,box1

! Define local coordinate system at the center of box #3

local,13,0,ft/2+bwtk+bxid/2+2*cp,ft/2+bwtk+bxid/2

csys,11

transfer,13,2*ninc,box1

! Define local coordinate system at the center of box #4

local,14,0,3*ft/2+bwtk+angtk+bxid/2,ft/2+bwtk+bxid/2+cp,,90

csys,11

transfer,14,3*ninc,box1

! Define local coordinate system at the center of box #5

local,15,0,3*ft/2+bwtk+angtk+bxid/2+cp,3*ft/2+bwtk+angtk+bxid/2+cp,,180

csys,11
```

```
transfer,15,4*ninc,box1

! Define local coordinate system at the center of box #6

local,16,0,ft/2+bwtk+bxid/2,ft/2+bwtk+bxid/2+2*cp

csys,11

transfer,16,5*ninc,box1

csys,0

! Define elements for each box

type,1
mat,4
real,1

*do,i,1,4,1
  e,(i-1)*(nelbw+nelft)+i,(i-1)*(nelbw+nelft)+i+1
  egen,nelbw,1,-1
  e,(i-1)*(nelbw+nelft)+nelbw+i,(i-1)*(nelbw+nelft)+nelbw+i+1
  egen,nelft,1,-1
*enddo

*do,i,1,2,1
  e,(i+3)*nelbw+4*nelft+i-4,(i+3)*nelbw+4*nelft+i+5
  egen,nelbw,1,-1
*enddo

egen,6,ninc,-(6*nelbw+4*nelft)

! Modify box wall element material and real numbers

*do,i,1,6,1
  csys,10+i
  nsel,s,loc,x,-(bxid+bwtk)/2-tol,(bxid+angtk)/2+tol
  nsel,r,loc,y,-(bxid+bwtk)/2-tol,(bxid+angtk)/2+tol
  esln,s,1
  emodif,all,mat,1
  nsel,s,loc,x,(bxid+angtk)/2
  nsel,r,loc,y,-(bxid+bwtk)/2-tol,(bxid+angtk)/2+tol
  esln,s,1
  emodif,all,mat,2
  emodif,all,real,2
  nsel,s,loc,y,(bxid+angtk)/2
  nsel,r,loc,x,-(bxid+bwtk)/2-tol,(bxid+angtk)/2+tol
  esln,s,1
  emodif,all,mat,2
  emodif,all,real,2
*enddo

nsel,all
esel,all

csys,0              ! Cartesian coordinates

nsym,y,6*ninc,all

egen,2,6*ninc,all
```

```
nsym,x,12*ninc,all

egen,2,12*ninc,all

! Define nodes and elements that connect four quadrants

*get,mxnd,node,,num,max

n,mxnd+1,ft/2+bwtk/2,-ft/2-bwtk/2
n,mxnd+2,ft/2+bwtk/2,-ft/2-bwtk/2+ltweld
n,mxnd+3,ft/2+bwtk/2,ft/2+bwtk/2-ltweld
n,mxnd+4,ft/2+bwtk/2,ft/2+bwtk/2

ngen,3,4,mxnd+1,mxnd+4,,cp
ngen,2,4,mxnd+9,mxnd+12,,bxid+bwtk/2+angtk/2

nsym,x,16,mxnd+1,mxnd+16

csys,1

ngen,2,32,mxnd+1,mxnd+32,,,90

csys,0

!type,11
!mat,4
!real,14
!
!e,mxnd+1,mxnd+2
!e,mxnd+3,mxnd+4

type,1
mat,4
real,1

e,mxnd+1,mxnd+2
e,mxnd+2,mxnd+3
e,mxnd+3,mxnd+4

egen,16,4,-3

nsel,all
esel,all

nummrg,node              ! Merge coincident nodes and elements
nummrg,elem

! Delete nodes and elements that form peripheral flux traps

nsel,s,loc,x,-ft/2-bwtk-2*cp-bxid-angtk/2,ft/2+bwtk+2*cp+bxid+angtk/2
nsel,r,loc,y,-ft/2-bwtk-2*cp-bxid-angtk/2,ft/2+bwtk+2*cp+bxid+angtk/2
esln,s,1
esel,inve
nsel,inve
edele,all
ndele,all
nsel,all
esel,all
```

```
nsel,s,loc,y,-ft/2-bwtk/2-cp
nsel,r,loc,x,ft/2+bwtk/2+2*cp+tol,ft/2+bwtk+2*cp+bxid+angtk/2-tol

nd1=node(ft/2+bwtk+2*cp+bxid+angtk/2-offset,-ft/2-bwtk/2-cp,0)

nsel,s,loc,y,-ft/2-bwtk-bxid-angtk/2
nsel,r,loc,x,ft/2+bwtk/2+2*cp+tol,ft/2+bwtk+2*cp+bxid+angtk/2-tol

nd2=node(nx(nd1),-ft/2-bwtk-bxid-angtk/2,0)

nsel,s,node,,nd1
nsel,a,node,,nd2

nmodif,all,ft/2+bwtk+2*cp+bxid+angtk/2-offset

e,nd1,nd2

nsel,s,loc,y,-ft/2-bwtk/2-cp
nsel,r,loc,x,ft/2+bwtk+2*cp+bxid+angtk/2-offset+tol,ft/2+bwtk+2*cp+bxid+angtk/2

esln,s
edele,all
esel,all

nsel,all

nd3=node(ft/2+bwtk/2+2*cp+ltweld,-ft/2-bwtk-bxid-angtk/2,0)

nsel,s,node,,nd3,nd2
esln,s,1
edele,all

nsel,s,node,,nd3+1,nd2-1
ndele,all
nsel,all

fill,nd3,nd2

mat,2
real,2

e,nd3,nd3+1
egen,nd2-nd3,1,-1

nsel,s,loc,y,ft/2+bwtk/2+cp
nsel,r,loc,x,ft/2+bwtk/2+2*cp+tol,ft/2+bwtk+2*cp+bxid+angtk/2-tol

nd1=node(ft/2+bwtk+2*cp+bxid+angtk/2-offset,ft/2+bwtk/2+cp,0)

nsel,s,loc,y,ft/2+bwtk+bxid+angtk/2
nsel,r,loc,x,ft/2+bwtk/2+2*cp+tol,ft/2+bwtk+2*cp+bxid+angtk/2-tol

nd2=node(nx(nd1),ft/2+bwtk+bxid+angtk/2,0)

nsel,s,node,,nd1
nsel,a,node,,nd2

nmodif,all,ft/2+bwtk+2*cp+bxid+angtk/2-offset

mat,4
```

APPENDIX B

FINITE ELEMENT ANALYSIS OF MPC-24E
(INPUT FILES AND RESULTS)

```
real,1

e,nd1,nd2

nsel,s,loc,y,ft/2+bwtk/2+cp
nsel,r,loc,x,ft/2+bwtk+2*cp+bxid+angtk/2-offset+tol,ft/2+bwtk+2*cp+bxid+angtk/2

esln,s
edele,all
esel,all

nsel,all

nd3=node(ft/2+bwtk/2+2*cp+ltweld,ft/2+bwtk+bxid+angtk/2,0)

nsel,s,node,,nd3,nd2
esln,s,1
edele,all

nsel,s,node,,nd3+1,nd2-1
ndele,all
nsel,all

fill,nd3,nd2

mat,2
real,2

e,nd3,nd3+1
egen,nd2-nd3,1,-1

nsel,s,loc,y,-ft/2-bwtk/2-cp
nsel,r,loc,x,-ft/2-bwtk-2*cp-bxid-angtk/2+tol,-ft/2-bwtk/2-2*cp-tol

nd1=node(-ft/2-bwtk-2*cp-bxid-angtk/2+offset,-ft/2-bwtk/2-cp,0)

nsel,s,loc,y,-ft/2-bwtk-bxid-angtk/2
nsel,r,loc,x,-ft/2-bwtk-2*cp-bxid-angtk/2+tol,-ft/2-bwtk/2-2*cp-tol

nd2=node(nx(nd1),-ft/2-bwtk-bxid-angtk/2,0)

nsel,s,node,,nd1
nsel,a,node,,nd2

nmodif,all,-ft/2-bwtk-2*cp-bxid-angtk/2+offset

mat,4
real,1

e,nd1,nd2

nsel,s,loc,y,-ft/2-bwtk/2-cp
nsel,r,loc,x,-ft/2-bwtk-2*cp-bxid-angtk/2,-ft/2-bwtk-2*cp-bxid-angtk/2+offset-tol

esln,s
edele,all
esel,all

nsel,all
```

```
nd3=node(-ft/2-bwtk/2-2*cp-ltweld,-ft/2-bwtk-bxid-angtk/2,0)

nsel,s,node,,nd3,nd2
esln,s,1
edele,all

nsel,s,node,,nd3+1,nd2-1
ndele,all
nsel,all

fill,nd3,nd2

mat,2
real,2

e,nd3,nd3+1
egen,nd2-nd3,1,-1

nsel,s,loc,y,ft/2+bwtk/2+cp
nsel,r,loc,x,-ft/2-bwtk-2*cp-bxid-angtk/2+tol,-ft/2-bwtk/2-2*cp-tol

nd1=node(-ft/2-bwtk-2*cp-bxid-angtk/2+offset,ft/2+bwtk/2+cp,0)

nsel,s,loc,y,ft/2+bwtk+bxid+angtk/2
nsel,r,loc,x,-ft/2-bwtk-2*cp-bxid-angtk/2+tol,-ft/2-bwtk/2-2*cp-tol

nd2=node(nx(nd1),ft/2+bwtk+bxid+angtk/2,0)

nsel,s,node,,nd1
nsel,a,node,,nd2

nmodif,all,-ft/2-bwtk-2*cp-bxid-angtk/2+offset

mat,4
real,1

e,nd1,nd2

nsel,s,loc,y,ft/2+bwtk/2+cp
nsel,r,loc,x,-ft/2-bwtk-2*cp-bxid-angtk/2,-ft/2-bwtk-2*cp-bxid-angtk/2+offset-tol

esln,s
edele,all
esel,all

nsel,all

nd3=node(-ft/2-bwtk/2-2*cp-ltweld,ft/2+bwtk+bxid+angtk/2,0)

nsel,s,node,,nd3,nd2
esln,s,1
edele,all

nsel,s,node,,nd3+1,nd2-1
ndele,all
nsel,all

fill,nd3,nd2

mat,2
```

```
real,2

e,nd3,nd3+1
egen,nd2-nd3,1,-1

nsel,s,loc,x,-ft/2-bwtk/2-cp
nsel,r,loc,y,ft/2+bwtk/2+2*cp+tol,ft/2+bwtk+2*cp+bxid+angtk/2-tol

nd1=node(-ft/2-bwtk/2-cp,ft/2+bwtk+2*cp+bxid+angtk/2-offset,0)

nsel,s,loc,x,-ft/2-bwtk-bxid-angtk/2
nsel,r,loc,y,ft/2+bwtk/2+2*cp+tol,ft/2+bwtk+2*cp+bxid+angtk/2-tol

nd2=node(-ft/2-bwtk-bxid-angtk/2,ny(nd1),0)

nsel,s,node,,nd1
nsel,a,node,,nd2

nmodif,all,,ft/2+bwtk+2*cp+bxid+angtk/2-offset

mat,4
real,1

e,nd1,nd2

nsel,s,loc,x,-ft/2-bwtk/2-cp
nsel,r,loc,y,ft/2+bwtk+2*cp+bxid+angtk/2-offset+tol,ft/2+bwtk+2*cp+bxid+angtk/2

esln,s
edele,all
esel,all

nsel,all

nd3=node(-ft/2-bwtk-bxid-angtk/2,ft/2+bwtk/2+2*cp+ltweld,0)

nsel,s,node,,nd3,nd2
esln,s,1
edele,all

nsel,s,node,,nd3+1,nd2-1
ndele,all
nsel,all

fill,nd3,nd2

mat,2
real,2

e,nd3,nd3+1
egen,nd2-nd3,1,-1

nsel,s,loc,x,ft/2+bwtk/2+cp
nsel,r,loc,y,ft/2+bwtk/2+2*cp+tol,ft/2+bwtk+2*cp+bxid+angtk/2-tol

nd1=node(ft/2+bwtk/2+cp,ft/2+bwtk+2*cp+bxid+angtk/2-offset,0)

nsel,s,loc,x,ft/2+bwtk+bxid+angtk/2
nsel,r,loc,y,ft/2+bwtk/2+2*cp+tol,ft/2+bwtk+2*cp+bxid+angtk/2-tol
```

```
nd2=node(ft/2+bwtk+bxid+angtk/2,ny(nd1),0)

nsel,s,node,,nd1
nsel,a,node,,nd2

nmodif,all,,ft/2+bwtk+2*cp+bxid+angtk/2-offset

mat,4
real,1

e,nd1,nd2

nsel,s,loc,x,ft/2+bwtk/2+cp
nsel,r,loc,y,ft/2+bwtk+2*cp+bxid+angtk/2-offset+tol,ft/2+bwtk+2*cp+bxid+angtk/2

esln,s
edele,all
esel,all

nsel,all

nd3=node(ft/2+bwtk+bxid+angtk/2,ft/2+bwtk/2+2*cp+ltweld,0)

nsel,s,node,,nd3,nd2
esln,s,1
edele,all

nsel,s,node,,nd3+1,nd2-1
ndele,all
nsel,all

fill,nd3,nd2

mat,2
real,2

e,nd3,nd3+1
egen,nd2-nd3,1,-1

nsel,s,loc,x,-ft/2-bwtk/2-cp
nsel,r,loc,y,-ft/2-bwtk-2*cp-bxid-angtk/2+tol,-ft/2-bwtk/2-2*cp-tol

nd1=node(-ft/2-bwtk/2-cp,-ft/2-bwtk-2*cp-bxid-angtk/2+offset,0)

nsel,s,loc,x,-ft/2-bwtk-bxid-angtk/2
nsel,r,loc,y,-ft/2-bwtk-2*cp-bxid-angtk/2+tol,-ft/2-bwtk/2-2*cp-tol

nd2=node(-ft/2-bwtk-bxid-angtk/2,ny(nd1),0)

nsel,s,node,,nd1
nsel,a,node,,nd2

nmodif,all,,-ft/2-bwtk-2*cp-bxid-angtk/2+offset

mat,4
real,1

e,nd1,nd2

nsel,s,loc,x,-ft/2-bwtk/2-cp
```

```
nsel,r,loc,y,-ft/2-bwtk-2*cp-bxid-angtk/2,-ft/2-bwtk-2*cp-bxid-angtk/2+offset-tol

esln,s
edele,all
esel,all

nsel,all

nd3=node(-ft/2-bwtk-bxid-angtk/2,-ft/2-bwtk/2-2*cp-ltweld,0)

nsel,s,node,,nd3,nd2
esln,s,1
edele,all

nsel,s,node,,nd3+1,nd2-1
ndele,all
nsel,all

fill,nd3,nd2

mat,2
real,2

e,nd3,nd3+1
egen,nd2-nd3,1,-1

nsel,s,loc,x,ft/2+bwtk/2+cp
nsel,r,loc,y,-ft/2-bwtk-2*cp-bxid-angtk/2+tol,-ft/2-bwtk/2-2*cp-tol

nd1=node(ft/2+bwtk/2+cp,-ft/2-bwtk-2*cp-bxid-angtk/2+offset,0)

nsel,s,loc,x,ft/2+bwtk+bxid+angtk/2
nsel,r,loc,y,-ft/2-bwtk-2*cp-bxid-angtk/2+tol,-ft/2-bwtk/2-2*cp-tol

nd2=node(ft/2+bwtk+bxid+angtk/2,ny(nd1),0)

nsel,s,node,,nd1
nsel,a,node,,nd2

nmodif,all,,-ft/2-bwtk-2*cp-bxid-angtk/2+offset

mat,4
real,1

e,nd1,nd2

nsel,s,loc,x,ft/2+bwtk/2+cp
nsel,r,loc,y,-ft/2-bwtk-2*cp-bxid-angtk/2,-ft/2-bwtk-2*cp-bxid-angtk/2+offset-tol

esln,s
edele,all
esel,all

nsel,all

nd3=node(ft/2+bwtk+bxid+angtk/2,-ft/2-bwtk/2-2*cp-ltweld,0)

nsel,s,node,,nd3,nd2
esln,s,1
edele,all
```

```
nsel,s,node,,nd3+1,nd2-1
ndele,all
nsel,all

fill,nd3,nd2

mat,2
real,2

e,nd3,nd3+1
egen,nd2-nd3,1,-1

esel,all
nsle
nsel,inve
ndele,all
nsel,all

! Create rigid beam elements
!
!local,17,0,-ft/2-bwtk-bxid/2,ft/2+bwtk+bxid/2,,90
!local,18,0,-ft/2-bwtk-bxid/2-cp,3*ft/2+bwtk+angtk+bxid/2,,180
!local,19,0,-ft/2-bwtk-bxid/2-2*cp,ft/2+bwtk+bxid/2,,90
!local,20,0,-3*ft/2-bwtk-angtk-bxid/2,ft/2+bwtk+bxid/2+cp
!local,21,0,-3*ft/2-bwtk-angtk-bxid/2-cp,3*ft/2+bwtk+angtk+bxid/2+cp,,-90
!local,22,0,-ft/2-bwtk-bxid/2,ft/2+bwtk+bxid/2+2*cp,,90
!
!local,23,0,ft/2+bwtk+bxid/2,-ft/2-bwtk-bxid/2,,-90
!local,24,0,ft/2+bwtk+bxid/2+cp,-3*ft/2-bwtk-angtk-bxid/2
!local,25,0,ft/2+bwtk+bxid/2+2*cp,-ft/2-bwtk-bxid/2,,-90
!local,26,0,3*ft/2+bwtk+angtk+bxid/2,-ft/2-bwtk-bxid/2-cp,,180
!local,27,0,3*ft/2+bwtk+angtk+bxid/2+cp,-3*ft/2-bwtk-angtk-bxid/2-cp,,90
!local,28,0,ft/2+bwtk+bxid/2,-ft/2-bwtk-bxid/2-2*cp,,-90
!
!local,29,0,-ft/2-bwtk-bxid/2,-ft/2-bwtk-bxid/2,,180
!local,30,0,-ft/2-bwtk-bxid/2-cp,-3*ft/2-bwtk-angtk-bxid/2,,90
!local,31,0,-ft/2-bwtk-bxid/2-2*cp,-ft/2-bwtk-bxid/2,,180
!local,32,0,-3*ft/2-bwtk-angtk-bxid/2,-ft/2-bwtk-bxid/2-cp,,-90
!local,33,0,-3*ft/2-bwtk-angtk-bxid/2-cp,-3*ft/2-bwtk-angtk-bxid/2-cp
!local,34,0,-ft/2-bwtk-bxid/2,-ft/2-bwtk-bxid/2-2*cp,,180
!
!*do,i,1,24,1
!  csys,10+i
!  nd1=node(-bxid/2-bwtk/2,-bxid/2-bwtk/2,0)
!  nd2=node(bxid/2+angtk/2,-bxid/2-bwtk/2,0)
!  nd3=node(-bxid/2-bwtk/2,bxid/2+angtk/2,0)
!  *if,mod(i,3),ne,0,then
!    nd4=node(cp-bxid/2-bwtk/2,-bxid/2-bwtk/2,0)
!    nd5=node(cp-bxid/2-bwtk/2,-bxid/2+ft+angtk/2,0)
!    nd6=node(-bxid/2-bwtk/2,cp-bxid/2-bwtk/2,0)
!    nd7=node(-bxid/2+ft+angtk/2,cp-bxid/2-bwtk/2,0)
!    nd8=node(cp-bxid/2-bwtk/2,cp-bxid/2-bwtk/2,0)
!  *endif
!  nsel,s,node,,nd1
!  nsel,a,node,,nd2
!  nsel,a,node,,nd3
!  *if,mod(i,3),ne,0,then
!    nsel,a,node,,nd4
!    nsel,a,node,,nd5
```

```
!     nsel,a,node,,nd6
!     nsel,a,node,,nd7
!     nsel,a,node,,nd8
!   *endif
!   esln
!   nsle
!   emodif,all,type,11
!   emodif,all,real,14
!   nsel,all
!   esel,all
!*enddo
!
!csys,0
!
!nd1=node(3*ft/2+bwtk+cp+angtk/2,-ft/2-bwtk/2,0)
!nd2=node(3*ft/2+bwtk+cp+angtk/2,ft/2+bwtk/2,0)
!nd3=node(ft/2+bwtk/2,3*ft/2+bwtk+cp+angtk/2,0)
!nd4=node(-ft/2-bwtk/2,3*ft/2+bwtk+cp+angtk/2,0)
!nd5=node(-3*ft/2-bwtk-cp-angtk/2,ft/2+bwtk/2,0)
!nd6=node(-3*ft/2-bwtk-cp-angtk/2,-ft/2-bwtk/2,0)
!nd7=node(-ft/2-bwtk/2,-3*ft/2-bwtk-cp-angtk/2,0)
!nd8=node(ft/2+bwtk/2,-3*ft/2-bwtk-cp-angtk/2,0)
!
!nsel,s,node,,nd1
!nsel,a,node,,nd2
!nsel,a,node,,nd3
!nsel,a,node,,nd4
!nsel,a,node,,nd5
!nsel,a,node,,nd6
!nsel,a,node,,nd7
!nsel,a,node,,nd8
!
!esln
!nsle
!emodif,all,type,1
!emodif,all,real,1
!
!nsel,all
!esel,all

! Modify material and real numbers of center walls

nsel,s,loc,x,-ft/2-bwtk/2
nsel,a,loc,x,ft/2+bwtk/2
nsel,a,loc,y,-ft/2-bwtk/2
nsel,a,loc,y,ft/2+bwtk/2

esln,s,1
!esel,u,type,,11
emodif,all,real,3

esel,s,mat,,1,2
nsle
nsel,r,loc,x,-ft/2-bwtk/2
esln,s,1
emodif,all,mat,3

esel,s,mat,,1,2
nsle
nsel,r,loc,x,ft/2+bwtk/2
```

```
esln,s,1
emodif,all,mat,3

esel,s,mat,,1,2
nsle
nsel,r,loc,y,-ft/2-bwtk/2
esln,s,1
emodif,all,mat,3

esel,s,mat,,1,2
nsle
nsel,r,loc,y,ft/2+bwtk/2
esln,s,1
emodif,all,mat,3

nsel,all
esel,all

! Modify element type numbers

! Define local coordinate system at the center of each box

local,101,0,ft/2+bwtk+bxid/2,ft/2+bwtk+bxid/2
local,102,0,ft/2+bwtk+bxid/2+cp,3*ft/2+bwtk+angtk+bxid/2
local,103,0,ft/2+bwtk+bxid/2+2*cp,ft/2+bwtk+bxid/2
local,104,0,3*ft/2+bwtk+angtk+bxid/2,ft/2+bwtk+bxid/2+cp
local,105,0,3*ft/2+bwtk+angtk+bxid/2+cp,3*ft/2+bwtk+angtk+bxid/2+cp
local,106,0,ft/2+bwtk+bxid/2,ft/2+bwtk+bxid/2+2*cp

local,107,0,-ft/2-bwtk-bxid/2,ft/2+bwtk+bxid/2
local,108,0,-ft/2-bwtk-bxid/2-cp,3*ft/2+bwtk+angtk+bxid/2
local,109,0,-ft/2-bwtk-bxid/2-2*cp,ft/2+bwtk+bxid/2
local,110,0,-3*ft/2-bwtk-angtk-bxid/2,ft/2+bwtk+bxid/2+cp
local,111,0,-3*ft/2-bwtk-angtk-bxid/2-cp,3*ft/2+bwtk+angtk+bxid/2+cp
local,112,0,-ft/2-bwtk-bxid/2,ft/2+bwtk+bxid/2+2*cp

local,113,0,ft/2+bwtk+bxid/2,-ft/2-bwtk-bxid/2
local,114,0,ft/2+bwtk+bxid/2+cp,-3*ft/2-bwtk-angtk-bxid/2
local,115,0,ft/2+bwtk+bxid/2+2*cp,-ft/2-bwtk-bxid/2
local,116,0,3*ft/2+bwtk+angtk+bxid/2,-ft/2-bwtk-bxid/2-cp
local,117,0,3*ft/2+bwtk+angtk+bxid/2+cp,-3*ft/2-bwtk-angtk-bxid/2-cp
local,118,0,ft/2+bwtk+bxid/2,-ft/2-bwtk-bxid/2-2*cp

local,119,0,-ft/2-bwtk-bxid/2,-ft/2-bwtk-bxid/2
local,120,0,-ft/2-bwtk-bxid/2-cp,-3*ft/2-bwtk-angtk-bxid/2
local,121,0,-ft/2-bwtk-bxid/2-2*cp,-ft/2-bwtk-bxid/2
local,122,0,-3*ft/2-bwtk-angtk-bxid/2,-ft/2-bwtk-bxid/2-cp
local,123,0,-3*ft/2-bwtk-angtk-bxid/2-cp,-3*ft/2-bwtk-angtk-bxid/2-cp
local,124,0,-ft/2-bwtk-bxid/2,-ft/2-bwtk-bxid/2-2*cp

*do,i,1,24,1
  csys,100+i
  nsel,s,loc,y,-(bxid+angtk)/2,-(bxid+bwtk)/2
  nsel,r,loc,x,-(bxid+bwtk)/2-tol,(bxid+bwtk)/2+tol
  esln,s,1
!  esel,u,type,,11
  emodif,all,type,9
  nsel,s,loc,x,(bxid+angtk)/2,(bxid+bwtk)/2
  nsel,r,loc,y,-(bxid+bwtk)/2-tol,(bxid+bwtk)/2+tol
  esln,s,1
```

```
!  esel,u,type,,11
  emodif,all,type,10
*enddo

nsel,all
esel,all

csys,0                ! Cartesian coordinates

! Increase inner dimension of corner boxes

csys,105
nsel,s,loc,y,-bxid/2-angtk/2-ltweld,-bxid/2-angtk/2+ltweld
nsel,r,loc,x,-bxid/2-angtk/2,bxid/2+bwtk/2
ngen,2,0,all,,,,bxid-bxid2
nsel,s,loc,x,-bxid/2-angtk/2-ltweld,-bxid/2-angtk/2+ltweld
nsel,r,loc,y,bxid/2-bxid2-angtk/2,bxid/2+bwtk/2
ngen,2,0,all,,,bxid-bxid2

csys,111
nsel,s,loc,y,-bxid/2-angtk/2-ltweld,-bxid/2-angtk/2+ltweld
nsel,r,loc,x,-bxid/2-bwtk/2,bxid/2+angtk/2
ngen,2,0,all,,,,bxid-bxid2
nsel,s,loc,x,bxid/2+angtk/2-ltweld,bxid/2+angtk/2+ltweld
nsel,r,loc,y,bxid/2-bxid2-angtk/2,bxid/2+bwtk/2
ngen,2,0,all,,,bxid2-bxid

csys,117
nsel,s,loc,y,bxid/2+angtk/2-ltweld,bxid/2+angtk/2+ltweld
nsel,r,loc,x,-bxid/2-angtk/2,bxid/2+bwtk/2
ngen,2,0,all,,,,bxid2-bxid
nsel,s,loc,x,-bxid/2-angtk/2-ltweld,-bxid/2-angtk/2+ltweld
nsel,r,loc,y,-bxid/2-bwtk/2,bxid2-bxid/2+angtk/2
ngen,2,0,all,,,bxid-bxid2

csys,123
nsel,s,loc,y,bxid/2+angtk/2-ltweld,bxid/2+angtk/2+ltweld
nsel,r,loc,x,-bxid/2-bwtk/2,bxid/2+angtk/2
ngen,2,0,all,,,,bxid2-bxid
nsel,s,loc,x,bxid/2+angtk/2-ltweld,bxid/2+angtk/2+ltweld
nsel,r,loc,y,-bxid/2-bwtk/2,bxid2-bxid/2+angtk/2
ngen,2,0,all,,,bxid2-bxid

nsel,all
csys,0

! Check i,j orientation for each element

*get,nel,elem,,count
*get,el,elem,,num,min

*do,i,1,nel,1
  nd1=nelem(el,1)
  nd2=nelem(el,2)
  *if,nx(nd1),gt,nx(nd2),then
    emodif,el,-1,nd2,nd1
  *elseif,ny(nd1),gt,ny(nd2)
    emodif,el,-1,nd2,nd1
  *endif
  el=elnext(el)
```

```
*enddo

!**************   Canister shell   ************************************

! Define nodes for canister shell

csys,0                ! Cartesian coordinates

*get,mxnd,node,,num,max

x=ft/2+bwtk+2*cp+bxid+angtk/2
ycs=sqrt(csrd**2-x**2)

n,mxnd+1,-x,ycs
n,mxnd+2,-x,-ycs
n,mxnd+3,x,ycs
n,mxnd+4,x,-ycs

x=ft/2+bwtk/2+2*cp
ycs=sqrt(csrd**2-x**2)

n,mxnd+5,-x,ycs
n,mxnd+6,-x,-ycs
n,mxnd+7,x,ycs
n,mxnd+8,x,-ycs

x=ft/2+bwtk/2+cp
ycs=sqrt(csrd**2-x**2)

n,mxnd+9,-x,ycs
n,mxnd+10,-x,-ycs
n,mxnd+11,x,ycs
n,mxnd+12,x,-ycs

x=ft/2+bwtk+bxid+angtk/2
ycs=sqrt(csrd**2-x**2)

n,mxnd+13,-x,ycs
n,mxnd+14,-x,-ycs
n,mxnd+15,x,ycs
n,mxnd+16,x,-ycs

x=ft/2+bwtk/2
ycs=sqrt(csrd**2-x**2)

n,mxnd+17,-x,ycs
n,mxnd+18,-x,-ycs
n,mxnd+19,x,ycs
n,mxnd+20,x,-ycs

csys,1

ngen,2,20,mxnd+1,mxnd+20,,,90

n,mxnd+41,csrd,90
n,mxnd+42,csrd,135
n,mxnd+43,csrd,270
n,mxnd+44,csrd,315

nsel,s,loc,x,csrd,csrd+tol
```

```
*get,nnd,node,,count

*dim,nodes,,nnd
*do,i,1,nnd,1
  *get,y,node,,mnloc,y
  nodes(i)=node(csrd,y,0)
  nsel,u,node,,nodes(i)
*enddo
nsel,all

*get,mxnd,node,,num,max
nd=mxnd+1                    ! First node number for canister shell

n,nd,nx(nodes(1)),ny(nodes(1))
*do,i,1,nnd-1,1
  *get,mxnd,node,,num,max
  th1=ny(nodes(i+1))
  th2=ny(nodes(i))
  arc=th1-th2
  ceil,arc/ltcsel
  ncsel=ans
  n,mxnd+ncsel,nx(nodes(i+1)),ny(nodes(i+1))
  fill
*enddo

th1=ny(nodes(1))
th2=ny(nodes(nnd))
arc=360+th1-th2
ceil,arc/ltcsel
ncsel=ans
yinc=arc/ncsel

*do,i,1,ncsel,1
  *get,mxnd,node,,num,max
  n,mxnd+1,csrd,ny(nodes(nnd))+i*yinc
*enddo

csys,0                ! Cartesian coordinates

! Define elements for canister shell

type,3
mat,6
real,4

*get,mxnd,node,,num,max

e,nd,nd+1
egen,mxnd-nd,1,-1

esel,all
nsel,all
nummrg,node

!**************   Basket/shell contact   ******************************

! Define basket/shell contact elements (x dir.)

type,6
```

```
mat,9
real,7

y=ft/2+bwtk+2*cp+bxid+angtk/2

nsel,s,loc,y,y

*get,x,node,,mnloc,x
nd1=node(x,y,0)
nd2=nnear(nd1)
e,nd1,nd2

*get,x,node,,mxloc,x
nd2=node(x,y,0)
nd1=nnear(nd2)
e,nd1,nd2

nsel,s,loc,y,-y

*get,x,node,,mnloc,x
nd1=node(x,-y,0)
nd2=nnear(nd1)
e,nd1,nd2

*get,x,node,,mxloc,x
nd2=node(x,-y,0)
nd1=nnear(nd2)
e,nd1,nd2

y=ft/2+bwtk/2+2*cp

nsel,s,loc,y,y

*get,x,node,,mnloc,x
nd1=node(x,y,0)
nd2=nnear(nd1)
e,nd1,nd2

*get,x,node,,mxloc,x
nd2=node(x,y,0)
nd1=nnear(nd2)
e,nd1,nd2

nsel,s,loc,y,-y

*get,x,node,,mnloc,x
nd1=node(x,-y,0)
nd2=nnear(nd1)
e,nd1,nd2

*get,x,node,,mxloc,x
nd2=node(x,-y,0)
nd1=nnear(nd2)
e,nd1,nd2

y=ft/2+bwtk/2+cp

nsel,s,loc,y,y

*get,x,node,,mnloc,x
```

```
nd1=node(x,y,0)
nd2=nnear(nd1)
e,nd1,nd2

*get,x,node,,mxloc,x
nd2=node(x,y,0)
nd1=nnear(nd2)
e,nd1,nd2

nsel,s,loc,y,-y

*get,x,node,,mnloc,x
nd1=node(x,-y,0)
nd2=nnear(nd1)
e,nd1,nd2

*get,x,node,,mxloc,x
nd2=node(x,-y,0)
nd1=nnear(nd2)
e,nd1,nd2

y=ft/2+bwtk+bxid+angtk/2

nsel,s,loc,y,y

*get,x,node,,mnloc,x
nd1=node(x,y,0)
nd2=nnear(nd1)
e,nd1,nd2

*get,x,node,,mxloc,x
nd2=node(x,y,0)
nd1=nnear(nd2)
e,nd1,nd2

nsel,s,loc,y,-y

*get,x,node,,mnloc,x
nd1=node(x,-y,0)
nd2=nnear(nd1)
e,nd1,nd2

*get,x,node,,mxloc,x
nd2=node(x,-y,0)
nd1=nnear(nd2)
e,nd1,nd2

y=ft/2+bwtk/2

nsel,s,loc,y,y

*get,x,node,,mnloc,x
nd1=node(x,y,0)
nd2=nnear(nd1)
e,nd1,nd2

*get,x,node,,mxloc,x
nd2=node(x,y,0)
nd1=nnear(nd2)
e,nd1,nd2
```

```
nsel,s,loc,y,-y

*get,x,node,,mnloc,x
nd1=node(x,-y,0)
nd2=nnear(nd1)
e,nd1,nd2

*get,x,node,,mxloc,x
nd2=node(x,-y,0)
nd1=nnear(nd2)
e,nd1,nd2

nsel,all

! Define basket/shell contact elements (y dir.)

type,6
mat,9
real,8

x=ft/2+bwtk+2*cp+bxid+angtk/2

nsel,s,loc,x,x

*get,y,node,,mnloc,y
nd1=node(x,y,0)
nd2=nnear(nd1)
e,nd1,nd2

*get,y,node,,mxloc,y
nd2=node(x,y,0)
nd1=nnear(nd2)
e,nd1,nd2

nsel,s,loc,x,-x

*get,y,node,,mnloc,y
nd1=node(-x,y,0)
nd2=nnear(nd1)
e,nd1,nd2

*get,y,node,,mxloc,y
nd2=node(-x,y,0)
nd1=nnear(nd2)
e,nd1,nd2

x=ft/2+bwtk/2+2*cp

nsel,s,loc,x,x

*get,y,node,,mnloc,y
nd1=node(x,y,0)
nd2=nnear(nd1)
e,nd1,nd2

*get,y,node,,mxloc,y
nd2=node(x,y,0)
nd1=nnear(nd2)
e,nd1,nd2
```

```
nsel,s,loc,x,-x

*get,y,node,,mnloc,y
nd1=node(-x,y,0)
nd2=nnear(nd1)
e,nd1,nd2

*get,y,node,,mxloc,y
nd2=node(-x,y,0)
nd1=nnear(nd2)
e,nd1,nd2

x=ft/2+bwtk/2+cp

nsel,s,loc,x,x

*get,y,node,,mnloc,y
nd1=node(x,y,0)
nd2=nnear(nd1)
e,nd1,nd2

*get,y,node,,mxloc,y
nd2=node(x,y,0)
nd1=nnear(nd2)
e,nd1,nd2

nsel,s,loc,x,-x

*get,y,node,,mnloc,y
nd1=node(-x,y,0)
nd2=nnear(nd1)
e,nd1,nd2

*get,y,node,,mxloc,y
nd2=node(-x,y,0)
nd1=nnear(nd2)
e,nd1,nd2

x=ft/2+bwtk+bxid+angtk/2

nsel,s,loc,x,x

*get,y,node,,mnloc,y
nd1=node(x,y,0)
nd2=nnear(nd1)
e,nd1,nd2

*get,y,node,,mxloc,y
nd2=node(x,y,0)
nd1=nnear(nd2)
e,nd1,nd2

nsel,s,loc,x,-x

*get,y,node,,mnloc,y
nd1=node(-x,y,0)
nd2=nnear(nd1)
e,nd1,nd2
```

```
*get,y,node,,mxloc,y
nd2=node(-x,y,0)
nd1=nnear(nd2)
e,nd1,nd2

x=ft/2+bwtk/2

nsel,s,loc,x,x

*get,y,node,,mnloc,y
nd1=node(x,y,0)
nd2=nnear(nd1)
e,nd1,nd2

*get,y,node,,mxloc,y
nd2=node(x,y,0)
nd1=nnear(nd2)
e,nd1,nd2

nsel,s,loc,x,-x

*get,y,node,,mnloc,y
nd1=node(-x,y,0)
nd2=nnear(nd1)
e,nd1,nd2

*get,y,node,,mxloc,y
nd2=node(-x,y,0)
nd1=nnear(nd2)
e,nd1,nd2

nsel,all

! Modify contact element real constants

nsel,s,loc,x,-csrd-tol,0
esln,s,1
esel,r,real,,7
emodif,all,real,9

nsel,s,loc,y,-csrd-tol,0
esln,s,1
esel,r,real,,8
emodif,all,real,10

esel,all
nsel,all

fini

save

:end

/output,term
```

APPENDIX B

FINITE ELEMENT ANALYSIS OF MPC-24E
(INPUT FILES AND RESULTS)

BC-0DEG.INP

```
! \\projects\5014\cbullard\mpc-24e\hi-storm\side0\closed\bc-0deg.inp
!
! The following ANSYS input file defines the boundary conditions for
! the MPC structural model when accelerations are applied in the
! vertical direction (90 deg - 270 deg axis as shown in Holtec Dwg.
! No. 1395).

/solu

esel,s,type,,7          ! Select shell/overpack contact elements
nsle                ! Select nodes associated with elements

csys,200            ! Local c.s. at center of overpack radius

nsel,r,loc,x,oprd,oprd+tol     ! Select nodes that define overpack
                        ! surface

d,all,all,0         ! Fix nodes in all DOFs

esel,all            ! Select all elements
nsel,all            ! Select all nodes

csys,0                  ! Cartesian coordinates

esel,u,type,,7          ! Unselect shell/overpack contact elements
nsle                ! Select nodes associated with elements

nd1=node(0,-ft/2-bwtk-2*cp-bxid-angtk/2-gap,0)
nd2=node(0,csrd,0)
nd3=node(0,-csrd,0)
nd4=node(0,-csrd-0.1,0)

nsel,s,node,,nd1    ! Select centerline nodes
nsel,a,node,,nd2
nsel,a,node,,nd3

d,all,ux,0          ! Constrain nodes to move only along the
                    ! centerline (ux=0)

nsel,s,node,,nd4    ! Select overpack node that is connected to
                    ! shell by spring

d,all,all,0         ! Fix node in all DOFs

esel,all            ! Select all elements
nsel,all            ! Select all nodes

fini
```

DROP0.INP

```
! \\projects\5014\cbullard\mpc-24e\hi-storm\side0\closed\drop0.inp
!
! The following ANSYS input file simulates the effects of a drop
! accident.  The direction of the impact acceleration is parallel
! with the 90 deg - 270 deg axis as shown in Holtec Dwg. No. 1395.
!
! The weight of the stored fuel assemblies is applied to the
! structural model as a pressure load (lbf/in).  The pressure is applied
! only to the box walls that support the fuel.
!
! The elements that establish contact between the canister shell and
! the overpack are defined in this file.  The element properties
! (type, mat, real) are defined in "mpc-24e.inp".
!
! ANSYS requires that all bodies (i.e., fuel basket) are constrained
! to prevent rigid body motion.  A 2-D linear spring is used to
! connect the fuel basket to the canister shell at the point of intial
! contact.  This provides the necessary constraint to the fuel basket
! in the direction of the impact.  In this location where the gap
! always remains closed, the behavior of the spring is indentical to a
! contact element.  This same modeling technique is used to connect
! the canister shell to the overpack.  The properties of the springs
! are defined in "mpc-24e.inp".


!**************   Input data   ****************************************

! Load data

gload=45            ! Acceleration amplifier, g

theta=0             ! Angle subtended by cask and ground, deg

!**************   Modify finite element model   **********************

/prep7

! Define 2-D linear spring connecting basket to shell

nsel,s,loc,x,-ft/2-bwtk/2

*get,mny,node,,mnloc,y

nd1=node(-ft/2-bwtk/2,mny,0)
nd2=nnear(nd1)

nsel,s,loc,x,ft/2+bwtk/2

*get,mny,node,,mnloc,y

nd3=node(ft/2+bwtk/2,mny,0)
nd4=nnear(nd3)
```

```
nsel,s,node,,nd1
nsel,a,node,,nd2
nsel,a,node,,nd3
nsel,a,node,,nd4

esln,s,1
esel,r,type,,6
edele,all

type,8
real,11

e,nd1,nd2
e,nd3,nd4

esel,all
nsel,all

! Move basket nodes and elements

! The basket is moved downward a distance that is equal to the average
! gap between the fuel basket and the canister shell.  This procedure
! closes the bottom gaps.

esel,s,type,,1
esel,a,type,,9
esel,a,type,,10
nsle

ngen,2,0,all,,,,-gap

esel,all
nsel,all

rmodif,8,3,-2*gap
rmodif,10,3,0

! Define nodes and elements for shell/overpack contact

*get,mxnd,node,,num,max
nd=mxnd+1

local,200,1,0,oprd-csrd

n,nd,oprd,135
n,nd+1,oprd,270
n,nd+2,oprd,45

csys,1                    ! Cylindrical coordinates

esel,s,type,,3
nsle
nsel,r,loc,y,152.5,269.9
```

```
nsel,u,loc,y,162.5+tol,175-tol
nsel,u,loc,y,185+tol,197.5-tol
nsel,u,loc,y,207.5+tol,220-tol
nsel,u,loc,y,230+tol,242.5-tol
nsel,u,loc,y,252.5+tol,265-tol

*get,nnd,node,,count

type,7
real,12

*do,i,1,nnd,1
  *get,mnnd,node,,num,min
  e,mnnd,nd,nd+1
  nsel,u,node,,mnnd
*enddo

nsle
nsel,r,loc,y,-89.9,27.5
nsel,u,loc,y,-85+tol,-72.5-tol
nsel,u,loc,y,-62.5+tol,-50-tol
nsel,u,loc,y,-40+tol,-27.5-tol
nsel,u,loc,y,-17.5+tol,-5-tol
nsel,u,loc,y,5+tol,17.5-tol

*get,nnd,node,,count

*do,i,1,nnd,1
  *get,mnnd,node,,num,min
  e,mnnd,nd+1,nd+2
  nsel,u,node,,mnnd
*enddo

esel,all
nsel,all

! Define 2-D linear spring connecting shell to overpack

csys,0                    ! Cartesian coordinates

*get,mxnd,node,,num,max

n,mxnd+1,0,-csrd-0.1

esel,s,type,,3
nsle

nd=node(0,-csrd,0)

type,8
real,13

e,mxnd+1,nd
```

```
esel,all
nsel,all

fini

!**************   Apply loads to model   ******************************

/solu

fact=gload*cos(theta)     ! Radial component of acceleration

acel,0,fact*g,0           ! Acceleration vector

esel,s,type,,9

sfbeam,all,1,pres,fact*fawt/(falt*(bxid+bwtk/2+angtk/2))     ! Fuel pressure
load

esel,all

fini
```

APPENDIX B

FINITE ELEMENT ANALYSIS OF MPC-24E
(INPUT FILES AND RESULTS)

SIDE0.INP

```
! \\projects\5014\cbullard\mpc-24e\hi-storm\side0\closed\side0.inp
!
! The following ANSYS input file applies the loads and the boundary
! conditions to the structural model which are necessary to simulate
! a 0 degree side drop event.


/output,side0,lst

fini
/clear

resume,mpc-24e,db
/filnam,side0

!**************   Input data   ****************************************

bwref=725          ! Fuel basket reference temperature, F
csref=450          ! Canister shell reference temperature, F

Pi=100                   ! Internal pressure, psi

lcomb1='F2.a'            ! Load case I.D. for fuel basket
                   ! (See Table 2.1.6 of HI-951251, Rev. 4)

lcomb2='E2.a'            ! Load case I.D. for enclosure vessel
                   ! (See Table 2.1.7 of HI-951251, Rev. 4)

!**************   Load and boundary condition files   ****************

/input,drop0,inp

/input,bc-0deg,inp

/solu

tref,70

! Set coefficients of thermal expansion to zero

*do,i,1,8,1
  mp,alpx,i,0
*enddo

! Apply reference temperatures

esel,s,type,,1
esel,a,type,,9
esel,a,type,,10
nsle

bf,all,temp,bwref
```

```
esel,s,type,,3,5
nsle

bf,all,temp,csref

esel,all
nsel,all

save

solve

fini

/output,term
```

APPENDIX B

FINITE ELEMENT ANALYSIS OF MPC-24E
(INPUT FILES AND RESULTS)

BC-45DEG.INP

```
! \\projects\5014\cbullard\mpc-24e\hi-storm\side45\closed\bc-45deg.inp
!
! The following ANSYS input file defines the boundary conditions for
! the MPC structural model when accelerations are applied at a 45 degree
! angle from vertical (135 deg - 315 deg axis as shown in Holtec Dwg.
! No. 1395).

/solu

esel,s,type,,7          ! Select shell/overpack contact elements
nsle                ! Select nodes associated with elements

csys,200            ! Local c.s. at center of overpack radius

nsel,r,loc,x,oprd,oprd+tol     ! Select nodes that define overpack
                        ! surface

d,all,all,0         ! Fix nodes in all DOFs

esel,all            ! Select all elements
nsel,all            ! Select all nodes

csys,0                  ! Cartesian coordinates

nd1=node(ft/2+bwtk/2+2*cp+gap,-ft/2-bwtk/2-2*cp-gap,0)
nd2=node(-ft/2-bwtk/2-2*cp+gap,ft/2+bwtk/2+2*cp-gap,0)

csys,1                  ! Cylindrical coordinates

esel,u,type,,7          ! Unselect shell/overpack contact elements
nsle                ! Select nodes associated with elements

nd3=node(csrd,135,0)
nd4=node(csrd,315,0)
nd5=node(csrd+0.1,315,0)

csys,0                  ! Cartesian coordinates

nsel,s,node,,nd1    ! Select centerline nodes
nsel,a,node,,nd2
nsel,a,node,,nd3
nsel,a,node,,nd4

d,all,ux,0          ! Constrain nodes to move only along the
                    ! 45 degree centerline (ux=0)

nsel,s,node,,nd5    ! Select overpack node that is connected to
                    ! shell by spring

d,all,all,0         ! Fix nodes in all DOFs

esel,all            ! Select all elements
```

```
nsel,all          ! Select all nodes

fini
```

DROP45.INP

```
! \\projects\5014\cbullard\mpc-24e\hi-storm\side45\closed\drop45.inp
!
! The following ANSYS input file simulates the effects of a drop
! accident.  The direction of the impact acceleration is parallel
! with the 135 deg - 315 deg axis as shown in Holtec Dwg. No. 1395.
!
! The weight of the stored fuel assemblies is applied to the
! structural model as a pressure load (lbf/in).  The pressure is applied
! only to the box walls that directly support the fuel.
!
! The elements that establish contact between the canister shell and
! the overpack are defined in this file.  The element properties
! (type, mat, real) are defined in "mpc-24e.inp".
!
! ANSYS requires that all bodies (i.e., fuel basket) are constrained
! to prevent rigid body motion.  A 2-D linear spring is used to
! connect the fuel basket to the canister shell at the point of intial
! contact.  This provides the necessary constraint to the fuel basket
! in the direction of the impact.  In this location where the gap
! always remains closed, the behavior of the spring is indentical to a
! contact element.  This same modeling technique is used to connect
! the canister shell to the overpack.  The properties of the springs
! are defined in "mpc-24e.inp".


!**************   Input data   ****************************************

! Load data

gload=45          ! Acceleration amplifier, g

theta=0                 ! Angle subtended by cask and ground, deg

!**************   Modify finite element model   **********************

/prep7

! Define 2-D linear spring connecting basket to shell

nd1=node(ft/2+bwtk/2+2*cp,-ft/2-bwtk/2-2*cp,0)

nsel,s,node,,nd1

esln,s,0
esel,r,type,,6

edele,all

esel,all
nsel,all

csys,1
```

```
nd2=node(csrd,315,0)

csys,0

type,8
real,11

e,nd2,nd1

esel,all
nsel,all

! Move basket nodes and elements

! The basket is moved downward and to the right a distance that is equal to
! the average gap between the fuel basket and the canister shell.  This
! procedure closes the bottom and the right gaps.

esel,s,type,,1
esel,a,type,,9
esel,a,type,,10
!esel,a,type,,11
nsle

ngen,2,0,all,,,gap,-gap

esel,all
nsel,all

rmodif,7,3,0
rmodif,8,3,-2*gap
rmodif,9,3,-2*gap
rmodif,10,3,0

! Define nodes and elements for shell/overpack contact

*get,mxnd,node,,num,max
nd=mxnd+1

local,200,1,-(oprd-csrd)/sqrt(2),(oprd-csrd)/sqrt(2)

n,nd,oprd,180
n,nd+1,oprd,315
n,nd+2,oprd,90

csys,1                    ! Cylindrical coordinates

esel,s,type,,3
nsle
nsel,r,loc,y,-162.5,-45.1
nsel,u,loc,y,-152.5+tol,-140-tol
nsel,u,loc,y,-130+tol,-117.5-tol
nsel,u,loc,y,-107.5+tol,-95-tol
```

```
nsel,u,loc,y,-85+tol,-72.5-tol
nsel,u,loc,y,-62.5+tol,-50-tol

*get,nnd,node,,count

type,7
real,12

*do,i,1,nnd,1
  *get,mnnd,node,,num,min
  e,mnnd,nd,nd+1
  nsel,u,node,,mnnd
*enddo

nsle
nsel,r,loc,y,-44.9,72.5
nsel,u,loc,y,-40+tol,-27.5-tol
nsel,u,loc,y,-17.5+tol,-5-tol
nsel,u,loc,y,5+tol,17.5-tol
nsel,u,loc,y,27.5+tol,40-tol
nsel,u,loc,y,50+tol,62.5-tol

*get,nnd,node,,count

*do,i,1,nnd,1
  *get,mnnd,node,,num,min
  e,mnnd,nd+1,nd+2
  nsel,u,node,,mnnd
*enddo

esel,all
nsel,all

! Define 2-D linear spring connecting shell to overpack

csys,1                    ! Cylindrical coordinates

*get,mxnd,node,,num,max

n,mxnd+1,csrd+0.1,315

esel,s,type,,3
nsle

nd=node(csrd,315,0)

type,8
real,13

e,mxnd+1,nd

esel,all
nsel,all
```

```
! Rotate nodal coordinate systems

csys,0                    ! Cartesian coordinates

nd2=node(-ft/2-bwtk/2-2*cp+gap,ft/2+bwtk/2+2*cp-gap,0)

csys,1                    ! Cylindrical coordinates

esel,s,type,,3
nsle

nd3=node(csrd,135,0)
nd4=node(csrd,315,0)

nsel,s,node,,nd1
nsel,a,node,,nd2
nsel,a,node,,nd3
nsel,a,node,,nd4

csys,0                    ! Cartesian coordinates

local,300,0,,,,45

nrotat,all

esel,all
nsel,all

fini

!**************   Apply loads to model   ******************************

/solu

fact=gload*cos(theta)    ! Radial component of acceleration

acel,-fact*g/sqrt(2),fact*g/sqrt(2),0        ! Acceleration vector

! Fuel pressure load

esel,s,type,,9

sfbeam,all,1,pres,fact*fawt/(sqrt(2)*falt*(bxid+bwtk/2+angtk/2))

esel,s,type,,10

sfbeam,all,1,pres,fact*fawt/(sqrt(2)*falt*(bxid+bwtk/2+angtk/2))

esel,all

fini
```

APPENDIX B

FINITE ELEMENT ANALYSIS OF MPC-24E
(INPUT FILES AND RESULTS)

SIDE45.INP

```
! \\projects\5014\cbullard\mpc-24e\hi-storm\side45\closed\side45.inp
!
! The following ANSYS input file applies the loads and the boundary
! conditions to the structural model which are necessary to simulate
! a 45 degree side drop event.


/output,side45,lst

fini
/clear

resume,mpc-24e,db
/filnam,side45

!**************   Input data   ****************************************

bwref=725          ! Fuel basket reference temperature, F
csref=450          ! Canister shell reference temperature, F

Pi=100                   ! Internal pressure, psi

lcomb1='F2.b'            ! Load case I.D. for fuel basket
                   ! (See Table 2.1.6 of HI-951251, Rev. 4)

lcomb2='E2.b'            ! Load case I.D. for enclosure vessel
                   ! (See Table 2.1.7 of HI-951251, Rev. 4)

!**************   Load and boundary condition files   ****************

/input,drop45,inp

/input,bc-45deg,inp

/solu

tref,70

! Set coefficients of thermal expansion to zero

*do,i,1,8,1
  mp,alpx,i,0
*enddo

! Apply reference temperatures

esel,s,type,,1
esel,a,type,,9
esel,a,type,,10
!esel,a,type,,11
nsle
```

APPENDIX B

FINITE ELEMENT ANALYSIS OF MPC-24E
(INPUT FILES AND RESULTS)

```
bf,all,temp,bwref

esel,s,type,,3,5
nsle

bf,all,temp,csref

esel,all
nsel,all

save

neqit,200

solve

fini

/output,term
```

POST.INP

```
! \\projects\5014\cbullard\mpc-24e\hi-storm\side45\closed\post.inp
!
! The following ANSYS input file processes and formats the stress
! results.  The final results for the fuel basket, the canister
! shell, and the basket support structure are stored in separate
! output files.

/output,post,lst

fini
/clear

*ask,load,Enter the name of the load case.

/filnam,%load%
resume,%load%,db

*ask,basket,Enter the type of MPC.
*ask,level,Enter the service limit.

!**************   Input data   ****************************************

! Material data

*dim,mtemp,,6            ! Temperature values, F
mtemp(1)=200
mtemp(2)=300             ! ANSYS allows only 6 values (TALLOW)
mtemp(3)=400
mtemp(4)=500             ! Temperatures must be in ascending order
mtemp(5)=600
mtemp(6)=700

*dim,ult,,6        ! Ultimate stress of Alloy X, psi
ult(1)=71000
ult(2)=66000             ! Values correspond with temperatures
ult(3)=64400
ult(4)=63500
ult(5)=63100
ult(6)=62500

! Allowable stress limits

! Fuel basket (See Tables 3.1.15 and 3.1.16 of HI-941184, Rev. 4)

*dim,fbtemp,,6           ! Temperature values, F
fbtemp(1)=300
fbtemp(2)=400            ! ANSYS allows only 6 values (TALLOW)
fbtemp(3)=500
fbtemp(4)=600            ! Temperatures must be in ascending order
fbtemp(5)=700
fbtemp(6)=750
```

```
*dim,fbpmA,,6            ! Primary membrane allowable, psi (Level A)
fbpmA(1)=20000
fbpmA(2)=18700           ! Values correspond with temperatures
fbpmA(3)=17500
fbpmA(4)=16400
fbpmA(5)=15600
fbpmA(6)=15200

*dim,fbpmD,,6            ! Primary membrane allowable, psi (Level D)
fbpmD(1)=46200
fbpmD(2)=44900           ! Values correspond with temperatures
fbpmD(3)=42000
fbpmD(4)=39400
fbpmD(5)=37400
fbpmD(6)=36500

*dim,fbplpbA,,6          ! Local membrane plus primary bending allowable, psi
(Level A)
fbplpbA(1)=30000
fbplpbA(2)=28100  ! Values correspond with temperatures
fbplpbA(3)=26300
fbplpbA(4)=24600
fbplpbA(5)=23400
fbplpbA(6)=22800

*dim,fbplpbD,,6          ! Local membrane plus primary bending allowable, psi
(Level D)
fbplpbD(1)=69300
fbplpbD(2)=67400  ! Values correspond with temperatures
fbplpbD(3)=63000
fbplpbD(4)=59100
fbplpbD(5)=56100
fbplpbD(6)=54800

! Canister shell (See Table 3.1.13 and 3.1.14 of HI-941184, Rev. 4)

*dim,cstemp,,6           ! Temperature values, F
cstemp(1)=200
cstemp(2)=300            ! ANSYS allows only 6 values (TALLOW)
cstemp(3)=400
cstemp(4)=500            ! Temperatures must be in ascending order
cstemp(5)=600
cstemp(6)=700

*dim,cspmA,,6            ! Primary membrane allowable, psi (Level A)
cspmA(1)=20000
cspmA(2)=20000           ! Values correspond with temperatures
cspmA(3)=18700
cspmA(4)=17500
cspmA(5)=16400
cspmA(6)=15600

*dim,cspmD,,6            ! Primary membrane allowable, psi (Level D)
cspmD(1)=48000
```

```
cspmD(2)=46200          ! Values correspond with temperatures
cspmD(3)=44900
cspmD(4)=42000
cspmD(5)=39400
cspmD(6)=37400

*dim,csplpbA,,6         ! Local membrane plus primary bending allowable, psi
(Level A)
csplpbA(1)=30000
csplpbA(2)=30000  ! Values correspond with temperatures
csplpbA(3)=28100
csplpbA(4)=26300
csplpbA(5)=24600
csplpbA(6)=23400

*dim,csplpbD,,6         ! Local membrane plus primary bending allowable, psi
(Level D)
csplpbD(1)=72000
csplpbD(2)=69300  ! Values correspond with temperatures
csplpbD(3)=67400
csplpbD(4)=63000
csplpbD(5)=59100
csplpbD(6)=56100

!**************   Format output files   ******************************

/page,,,10000
/header,off,off,off,off,on,off

!**************   Post-process results   ****************************

/post1

*get,load,active,,jobnam

file,%load%,rst

set,1

! Store results for all beam elements

esel,s,type,,1,4
esel,a,type,,9,10

etab,'ref temp',lbfe,1          ! Temperature (node i)
etab,sdiri,ls,1                 ! Axial stress (node i)
etab,sbyti,ls,2                 ! Bending stress at top (node i)
etab,sbybi,ls,3                 ! Bending stress at bottom (node i)
etab,sdirj,ls,4                 ! Axial stress (node j)
etab,sbytj,ls,5                 ! Bending stress at top (node j)
etab,sbybj,ls,6                 ! Bending stress at bottom (node j)
etab,smaxi,nmisc,1              ! Maximum stress (axial plus bending) (node i)
etab,smini,nmisc,2              ! Minimum stress (axial plus bending) (node i)
etab,smaxj,nmisc,3              ! Maximum stress (axial plus bending) (node j)
```

```
etab,sminj,nmisc,4              ! Minimum stress (axial plus bending) (node j)
etab,mforx,smisc,1              ! Axial force (node i)
etab,mfory,smisc,2              ! Shear force (node i)
etab,mmomz,smisc,6              ! Moment (node i)

sadd,zero,sdiri,sdiri,1,-1      ! Create etable of zeros
sadd,one,zero,,,,1              ! Create etable of ones

!**************   Fuel basket   ***************************************

esel,s,type,,1
esel,a,type,,9,10

! Calculate axial stress component

axlfb=denax*gload*g*sin(theta)*fblt

! Primary membrane

tallow,fbtemp(1),fbtemp(2),fbtemp(3),fbtemp(4),fbtemp(5),fbtemp(6)

*if,level,eq,'A',then
  sallow,fbpmA(1),fbpmA(2),fbpmA(3),fbpmA(4),fbpmA(5),fbpmA(6)
*else
  sallow,fbpmD(1),fbpmD(2),fbpmD(3),fbpmD(4),fbpmD(5),fbpmD(6)
*endif

smax,spos,zero,sdiri
sexp,sone,spos,sdiri,1,-1
smult,saxl,sone,,axlfb

sadd,sinti,sdiri,saxl

smax,spos,zero,sdirj
sexp,sone,spos,sdirj,1,-1
smult,saxl,sone,,axlfb

sadd,sintj,sdirj,saxl

sabs,1
smax,sint,sinti,sintj
sabs,0

sexp,invi,one,sinti,1,-1
smult,signi,sinti,invi
smult,pm,sint,signi

sfcalc,allow,one,'ref temp',1

sfcalc,sf,pm,'ref temp',1

esort,etab,sf,1

/output,table,1
```

APPENDIX B

FINITE ELEMENT ANALYSIS OF MPC-24E
(INPUT FILES AND RESULTS)

```
/title,%basket% Structural Analysis
/stitle,1,Component: Fuel Basket
/stitle,2,Load Combination: %lcomb1% (See Table 2.1.6)
/stitle,3,Stress Result: Primary Membrane (PM)

pretab,'ref temp',pm,allow,sf

/output,term

eusort

! Local membrane plus bending

*if,level,eq,'A',then
  sallow,fbplpbA(1),fbplpbA(2),fbplpbA(3),fbplpbA(4),fbplpbA(5),fbplpbA(6)
*else
  sallow,fbplpbD(1),fbplpbD(2),fbplpbD(3),fbplpbD(4),fbplpbD(5),fbplpbD(6)
*endif

smax,smax,smaxi,smaxj
smin,smin,smini,sminj

smax,spos,zero,smax
sexp,sone,spos,smax,1,-1
smult,saxl,sone,,axlfb

sadd,sintmx,smax,saxl

smax,spos,zero,smin
sexp,sone,spos,smin,1,-1
smult,saxl,sone,,axlfb

sadd,sintmn,smin,saxl

sabs,1
smax,'pl+pb',sintmx,sintmn
sabs,0

sfcalc,allow,one,'ref temp',1

sfcalc,sf,'pl+pb','ref temp',1

esort,etab,sf,1

/output,table,2

/title,%basket% Structural Analysis
/stitle,1,Component: Fuel Basket
/stitle,2,Load Combination: %lcomb1% (See Table 2.1.6)
/stitle,3,Stress Result: Primary Local Plus Primary Bending (PL+PB)

pretab,'ref temp','pl+pb',allow,sf
```

```
/output,term

eusort

!**************   Canister shell   ************************************

esel,s,type,,3

! Calculate axial and hoop stress components

*get,nel,elem,,count
*get,el,elem,,num,min

arcs=0                    ! Canister shell area

*do,i,1,nel,1
  *get,nodei,elem,el,node,1
  *get,nodej,elem,el,node,2
  length=distnd(nodei,nodej)
  *get,rset,elem,el,attr,real
  *get,thick,rcon,rset,const,3
  arcs=arcs+length*thick
  el=elnext(el)
*enddo

axlcs=(denax*g*cslt+lidwt/arcs)*gload*sin(theta)-Pi*csrd/(2*cstk)

hoopcs=Pi*csrd/cstk

! Primary membrane

tallow,cstemp(1),cstemp(2),cstemp(3),cstemp(4),cstemp(5),cstemp(6)

*if,level,eq,'A',then
  sallow,cspmA(1),cspmA(2),cspmA(3),cspmA(4),cspmA(5),cspmA(6)
*else
  sallow,cspmD(1),cspmD(2),cspmD(3),cspmD(4),cspmD(5),cspmD(6)
*endif

sadd,sdir,sdiri,,,,hoopcs

*if,axlcs,gt,0,then
  smax,spos,zero,sdir
  sexp,sone,spos,sdir,1,-1
  smult,saxl,sone,,axlcs
  sadd,pm,sdir,saxl
*else
  smin,sneg,zero,sdir
  sexp,sone,sneg,sdir,1,-1
  smult,saxl,sone,,axlcs
  sadd,pm,sdir,saxl
*endif

sfcalc,allow,one,'ref temp',1
```

```
sfcalc,sf,pm,'ref temp',1

esort,etab,sf,1

/output,table,3

/title,%basket% Structural Analysis
/stitle,1,Component: Enclosure Vessel
/stitle,2,Load Combination: %lcomb2% (See Table 2.1.7)
/stitle,3,Stress Result: Primary Membrane (PM)

pretab,'ref temp',pm,allow,sf

/output,term

eusort

! Local membrane plus bending

*if,level,eq,'A',then
  sallow,csplpbA(1),csplpbA(2),csplpbA(3),csplpbA(4),csplpbA(5),csplpbA(6)
*else
  sallow,csplpbD(1),csplpbD(2),csplpbD(3),csplpbD(4),csplpbD(5),csplpbD(6)
*endif

smax,smax,smaxi,smaxj
smin,smin,smini,sminj

sadd,stotmx,smax,,,,hoopcs
sadd,stotmn,smin,,,,hoopcs

*if,axlcs,gt,0,then
  smax,spos,zero,stotmx
  sexp,sone,spos,stotmx,1,-1
  smult,saxl,sone,,axlcs
  sadd,sintmx,stotmx,saxl
  smax,spos,zero,stotmn
  sexp,sone,spos,stotmn,1,-1
  smult,saxl,sone,,axlcs
  sadd,sintmn,stotmn,saxl
*else
  smin,sneg,zero,stotmx
  sexp,sone,sneg,stotmx,1,-1
  smult,saxl,sone,,axlcs
  sadd,sintmx,stotmx,saxl
  smin,sneg,zero,stotmn
  sexp,sone,sneg,stotmn,1,-1
  smult,saxl,sone,,axlcs
  sadd,sintmn,stotmn,saxl
*endif

sabs,1
smax,'pl+pb',sintmx,sintmn
```

APPENDIX B

FINITE ELEMENT ANALYSIS OF MPC-24E
(INPUT FILES AND RESULTS)

```
sabs,0

sfcalc,allow,one,'ref temp',1

sfcalc,sf,'pl+pb','ref temp',1

esort,etab,sf,1

/output,table,4

/title,%basket% Structural Analysis
/stitle,1,Component: Enclosure Vessel
/stitle,2,Load Combination: %lcomb2% (See Table 2.1.7)
/stitle,3,Stress Result: Primary Local Plus Primary Bending (PL+PB)

pretab,'ref temp','pl+pb',allow,sf

/output,term

eusort

nsel,all
esel,all

!fini
```

APPENDIX B

FINITE ELEMENT ANALYSIS OF MPC-24E
(INPUT FILES AND RESULTS)

Table 1

TITLE=
MPC-24E Structural Analysis

SUBTITLE 1 =
Component: Fuel Basket
SUBTITLE 2 =
Load Combination: F2.a (See Table 2.1.6)
SUBTITLE 3 =
Stress Result: Primary Membrane (PM)

PRINT ELEMENT TABLE ITEMS PER ELEMENT

STAT ELEM	CURRENT REF TEMP	CURRENT PM	PREVIOUS ALLOW	PREVIOUS SF
1134	725.00	-10050.	36950.	3.6767
558	725.00	-10049.	36950.	3.6770
1135	725.00	-10024.	36950.	3.6863
559	725.00	-10023.	36950.	3.6866
1136	725.00	-9995.3	36950.	3.6967
560	725.00	-9994.6	36950.	3.6970
1137	725.00	-9967.0	36950.	3.7072
561	725.00	-9966.3	36950.	3.7075
1138	725.00	-9964.5	36950.	3.7082
562	725.00	-9963.7	36950.	3.7084
1139	725.00	-9961.9	36950.	3.7091
563	725.00	-9961.2	36950.	3.7094
1140	725.00	-9943.7	36950.	3.7159
564	725.00	-9943.0	36950.	3.7162
1017	725.00	-8732.8	36950.	4.2312
441	725.00	-8732.2	36950.	4.2315
1016	725.00	-8730.2	36950.	4.2324
440	725.00	-8729.6	36950.	4.2327
1015	725.00	-8712.1	36950.	4.2412
439	725.00	-8711.5	36950.	4.2415
1014	725.00	-7872.6	36950.	4.6935
438	725.00	-7872.0	36950.	4.6939
1013	725.00	-7869.4	36950.	4.6954
437	725.00	-7868.8	36950.	4.6958
1012	725.00	-7834.6	36950.	4.7163
436	725.00	-7834.0	36950.	4.7166
1011	725.00	-7799.8	36950.	4.7373
435	725.00	-7799.2	36950.	4.7376
1010	725.00	-7765.0	36950.	4.7585
434	725.00	-7764.4	36950.	4.7589
1009	725.00	-7730.2	36950.	4.7799
433	725.00	-7729.7	36950.	4.7803
892	725.00	-6641.7	36950.	5.5634
316	725.00	-6641.2	36950.	5.5637
893	725.00	-6638.5	36950.	5.5660

Table 1 (continued)

ELEM	REF TEMP	PM	ALLOW	SF
317	725.00	-6638.0	36950.	5.5664
894	725.00	-6603.7	36950.	5.5953
318	725.00	-6603.3	36950.	5.5957
895	725.00	-6568.9	36950.	5.6250
319	725.00	-6568.5	36950.	5.6254
896	725.00	-6534.1	36950.	5.6549
320	725.00	-6533.7	36950.	5.6553
897	725.00	-6499.3	36950.	5.6852
321	725.00	-6498.9	36950.	5.6856
898	725.00	-6417.8	36950.	5.7574
322	725.00	-6417.4	36950.	5.7577
899	725.00	-6415.2	36950.	5.7597
323	725.00	-6414.9	36950.	5.7601
900	725.00	-6397.1	36950.	5.7761
324	725.00	-6396.7	36950.	5.7764
1128	725.00	-5990.4	36950.	6.1682
552	725.00	-5990.3	36950.	6.1683
1127	725.00	-5987.2	36950.	6.1715
551	725.00	-5987.1	36950.	6.1716
1126	725.00	-5952.4	36950.	6.2076
550	725.00	-5952.3	36950.	6.2077
1125	725.00	-5917.6	36950.	6.2441
549	725.00	-5917.5	36950.	6.2442
1124	725.00	-5882.8	36950.	6.2810
548	725.00	-5882.7	36950.	6.2811
1123	725.00	-5848.0	36950.	6.3184
547	725.00	-5848.0	36950.	6.3184
442	725.00	-5763.6	36950.	6.4109
1018	725.00	-5763.6	36950.	6.4109
443	725.00	-5761.0	36950.	6.4138
1019	725.00	-5761.0	36950.	6.4138
444	725.00	-5732.7	36950.	6.4454
1020	725.00	-5732.7	36950.	6.4455
445	725.00	-5704.4	36950.	6.4774
1021	725.00	-5704.4	36950.	6.4774
499	725.00	-5694.7	36950.	6.4885
1075	725.00	-5693.2	36950.	6.4902
500	725.00	-5691.5	36950.	6.4922
1076	725.00	-5690.1	36950.	6.4938
446	725.00	-5676.1	36950.	6.5097
1022	725.00	-5676.1	36950.	6.5097
501	725.00	-5656.7	36950.	6.5321
1077	725.00	-5655.3	36950.	6.5337
447	725.00	-5647.9	36950.	6.5423
1023	725.00	-5647.8	36950.	6.5423
448	725.00	-5645.3	36950.	6.5453
1024	725.00	-5645.2	36950.	6.5453
449	725.00	-5642.7	36950.	6.5483
1025	725.00	-5642.7	36950.	6.5483

Table 1 (continued)

ELEM	REF TEMP	PM	ALLOW	SF
450	725.00	-5624.6	36950.	6.5694
1026	725.00	-5624.5	36950.	6.5694
502	725.00	-5621.9	36950.	6.5725
1078	725.00	-5620.5	36950.	6.5742
503	725.00	-5587.1	36950.	6.6134
1079	725.00	-5585.7	36950.	6.6151
504	725.00	-5547.5	36950.	6.6606
1080	725.00	-5546.1	36950.	6.6624
505	725.00	-5480.4	36950.	6.7422
1081	725.00	-5479.0	36950.	6.7439
506	725.00	-5477.8	36950.	6.7454
1082	725.00	-5476.4	36950.	6.7471
507	725.00	-5463.6	36950.	6.7630
1083	725.00	-5462.2	36950.	6.7647
1168	725.00	-5402.0	36950.	6.8400
1156	725.00	-5401.7	36950.	6.8404
1169	725.00	-5399.4	36950.	6.8433
1157	725.00	-5399.1	36950.	6.8437
1170	725.00	-5381.3	36950.	6.8664
1158	725.00	-5381.0	36950.	6.8667
315	725.00	-4740.8	36950.	7.7941
891	725.00	-4740.7	36950.	7.7941
314	725.00	-4738.2	36950.	7.7983
890	725.00	-4738.2	36950.	7.7984
313	725.00	-4720.1	36950.	7.8283
889	725.00	-4720.0	36950.	7.8283
612	725.00	-4413.4	36950.	8.3722
36	725.00	-4413.2	36950.	8.3726
611	725.00	-4410.8	36950.	8.3771
35	725.00	-4410.6	36950.	8.3775
354	725.00	-4395.2	36950.	8.4069
930	725.00	-4394.1	36950.	8.4090
610	725.00	-4392.7	36950.	8.4117
353	725.00	-4392.6	36950.	8.4119
34	725.00	-4392.5	36950.	8.4121
929	725.00	-4391.5	36950.	8.4139
352	725.00	-4374.5	36950.	8.4468
928	725.00	-4373.4	36950.	8.4488
312	725.00	-3871.2	36950.	9.5448
888	725.00	-3871.2	36950.	9.5449
311	725.00	-3868.0	36950.	9.5526
887	725.00	-3868.0	36950.	9.5527
310	725.00	-3833.3	36950.	9.6393
886	725.00	-3833.2	36950.	9.6394
309	725.00	-3798.5	36950.	9.7276
885	725.00	-3798.4	36950.	9.7277
308	725.00	-3763.7	36950.	9.8175
884	725.00	-3763.6	36950.	9.8176
307	725.00	-3728.9	36950.	9.9091

Table 1 (continued)

ELEM	REF TEMP	PM	ALLOW	SF
883	725.00	-3728.9	36950.	9.9092
351	725.00	-3590.5	36950.	10.291
927	725.00	-3589.5	36950.	10.294
350	725.00	-3587.3	36950.	10.300
926	725.00	-3586.3	36950.	10.303
1165	725.00	-3562.5	36950.	10.372
1153	725.00	-3562.4	36950.	10.372
1166	725.00	-3559.9	36950.	10.379
1154	725.00	-3559.9	36950.	10.380
349	725.00	-3552.5	36950.	10.401
609	725.00	-3552.1	36950.	10.402
33	725.00	-3551.9	36950.	10.403
925	725.00	-3551.5	36950.	10.404
608	725.00	-3548.9	36950.	10.412
32	725.00	-3548.8	36950.	10.412
1167	725.00	-3541.8	36950.	10.433
1155	725.00	-3541.7	36950.	10.433
348	725.00	-3517.7	36950.	10.504
924	725.00	-3516.8	36950.	10.507
607	725.00	-3514.1	36950.	10.515
31	725.00	-3514.0	36950.	10.515
347	725.00	-3482.9	36950.	10.609
923	725.00	-3482.0	36950.	10.612
606	725.00	-3479.3	36950.	10.620
30	725.00	-3479.2	36950.	10.620
346	725.00	-3448.1	36950.	10.716
922	725.00	-3447.2	36950.	10.719
605	725.00	-3444.5	36950.	10.727
29	725.00	-3444.4	36950.	10.728
604	725.00	-3409.7	36950.	10.837
28	725.00	-3409.6	36950.	10.837
1159	725.00	-3320.0	36950.	11.129
1171	725.00	-3319.3	36950.	11.132
1160	725.00	-3317.4	36950.	11.138
1172	725.00	-3316.7	36950.	11.141
1161	725.00	-3299.3	36950.	11.199
1173	725.00	-3298.6	36950.	11.202
595	725.00	-2607.0	36950.	14.173
19	725.00	-2606.9	36950.	14.174
596	725.00	-2603.8	36950.	14.191
20	725.00	-2603.7	36950.	14.191
597	725.00	-2569.1	36950.	14.383
21	725.00	-2568.9	36950.	14.384
598	725.00	-2534.3	36950.	14.580
22	725.00	-2534.1	36950.	14.581
599	725.00	-2499.5	36950.	14.783
23	725.00	-2499.3	36950.	14.784
600	725.00	-2464.7	36950.	14.992
24	725.00	-2464.5	36950.	14.993

Table 1 (continued)

ELEM	REF TEMP	PM	ALLOW	SF
58	725.00	-2412.1	36950.	15.318
634	725.00	-2411.7	36950.	15.321
59	725.00	-2409.0	36950.	15.339
635	725.00	-2408.5	36950.	15.342
601	725.00	-2388.7	36950.	15.469
25	725.00	-2388.5	36950.	15.470
602	725.00	-2386.1	36950.	15.486
26	725.00	-2385.9	36950.	15.487
60	725.00	-2374.2	36950.	15.563
636	725.00	-2373.7	36950.	15.566
603	725.00	-2368.0	36950.	15.604
27	725.00	-2367.8	36950.	15.605
61	725.00	-2339.4	36950.	15.795
637	725.00	-2338.9	36950.	15.798
721	725.00	-2326.9	36950.	15.880
145	725.00	-2326.9	36950.	15.880
722	725.00	-2323.7	36950.	15.901
146	725.00	-2323.7	36950.	15.901
62	725.00	-2304.6	36950.	16.033
638	725.00	-2304.1	36950.	16.037
723	725.00	-2288.9	36950.	16.143
147	725.00	-2288.9	36950.	16.143
63	725.00	-2269.8	36950.	16.279
639	725.00	-2269.3	36950.	16.282
724	725.00	-2254.1	36950.	16.392
148	725.00	-2254.1	36950.	16.392
725	725.00	-2219.4	36950.	16.649
149	725.00	-2219.3	36950.	16.649
726	725.00	-2184.6	36950.	16.914
150	725.00	-2184.6	36950.	16.914
64	725.00	-2175.3	36950.	16.986
640	725.00	-2174.9	36950.	16.989
65	725.00	-2172.7	36950.	17.007
641	725.00	-2172.3	36950.	17.010
66	725.00	-2154.5	36950.	17.150
642	725.00	-2154.2	36950.	17.153
151	725.00	-2117.0	36950.	17.454
727	725.00	-2117.0	36950.	17.454
152	725.00	-2114.4	36950.	17.475
728	725.00	-2114.4	36950.	17.475
153	725.00	-2096.3	36950.	17.627
729	725.00	-2096.3	36950.	17.627
738	725.00	-1395.8	36950.	26.473
162	725.00	-1395.6	36950.	26.476
737	725.00	-1393.2	36950.	26.522
161	725.00	-1393.0	36950.	26.525
736	725.00	-1375.0	36950.	26.872
160	725.00	-1374.9	36950.	26.875
735	725.00	-1372.5	36950.	26.922

Table 1 (continued)

ELEM	REF TEMP	PM	ALLOW	SF
159	725.00	-1372.3	36950.	26.926
734	725.00	-1369.9	36950.	26.973
158	725.00	-1369.7	36950.	26.977
733	725.00	-1341.6	36950.	27.542
157	725.00	-1341.4	36950.	27.546
732	725.00	-1313.3	36950.	28.135
156	725.00	-1313.1	36950.	28.139
731	725.00	-1285.0	36950.	28.755
155	725.00	-1284.8	36950.	28.759
730	725.00	-1256.7	36950.	29.402
154	725.00	-1256.5	36950.	29.406
1008	725.00	-1219.7	36950.	30.293
432	725.00	-1219.2	36950.	30.306
1007	725.00	-1191.3	36950.	31.017
431	725.00	-1190.8	36950.	31.031
1006	725.00	-1162.8	36950.	31.777
430	725.00	-1162.3	36950.	31.791
219	725.00	-1155.5	36950.	31.978
795	725.00	-1155.4	36950.	31.980
218	725.00	-1152.9	36950.	32.049
794	725.00	-1152.8	36950.	32.052
217	725.00	-1138.7	36950.	32.450
793	725.00	-1138.6	36950.	32.452
1005	725.00	-1134.3	36950.	32.574
429	725.00	-1133.8	36950.	32.589
1004	725.00	-1105.9	36950.	33.413
428	725.00	-1105.4	36950.	33.428
1003	725.00	-1077.4	36950.	34.295
427	725.00	-1076.9	36950.	34.312
1174	725.00	-1002.3	36950.	36.867
1162	725.00	-1001.9	36950.	36.880
1175	725.00	-999.68	36950.	36.962
1163	725.00	-999.31	36950.	36.975
1176	725.00	-981.54	36950.	37.645
1164	725.00	-981.18	36950.	37.659
811	725.00	927.83	36950.	39.824
235	725.00	927.76	36950.	39.827
812	725.00	924.65	36950.	39.961
236	725.00	924.59	36950.	39.964
813	725.00	896.18	36950.	41.230
237	725.00	896.12	36950.	41.233
469	725.00	895.12	36950.	41.280
1045	725.00	895.09	36950.	41.281
85	725.00	894.07	36950.	41.328
661	725.00	893.99	36950.	41.332
470	725.00	891.94	36950.	41.427
1046	725.00	891.91	36950.	41.428
86	725.00	890.90	36950.	41.475
662	725.00	890.81	36950.	41.479

Table 1 (continued)

ELEM	REF TEMP	PM	ALLOW	SF
331	725.00	885.77	36950.	41.715
907	725.00	885.76	36950.	41.715
332	725.00	882.59	36950.	41.865
908	725.00	882.59	36950.	41.866
814	725.00	867.72	36950.	42.583
238	725.00	867.65	36950.	42.586
471	725.00	863.47	36950.	42.792
1047	725.00	863.45	36950.	42.794
87	725.00	862.43	36950.	42.844
663	725.00	862.34	36950.	42.848
333	725.00	854.12	36950.	43.261
909	725.00	854.12	36950.	43.261
815	725.00	839.25	36950.	44.027
239	725.00	839.19	36950.	44.031
472	725.00	835.01	36950.	44.251
1048	725.00	834.98	36950.	44.252
88	725.00	833.96	36950.	44.307
664	725.00	833.88	36950.	44.311
334	725.00	825.66	36950.	44.752
910	725.00	825.65	36950.	44.752
816	725.00	810.78	36950.	45.573
240	725.00	810.72	36950.	45.577
473	725.00	806.54	36950.	45.813
1049	725.00	806.52	36950.	45.814
89	725.00	805.50	36950.	45.872
665	725.00	805.41	36950.	45.877
335	725.00	797.19	36950.	46.350
911	725.00	797.19	36950.	46.351
474	725.00	778.07	36950.	47.489
1050	725.00	778.05	36950.	47.491
90	725.00	777.03	36950.	47.553
666	725.00	776.94	36950.	47.558
336	725.00	768.73	36950.	48.067
912	725.00	768.72	36950.	48.067
276	725.00	-662.89	36950.	55.741
852	725.00	-662.72	36950.	55.755
275	725.00	-660.30	36950.	55.959
851	725.00	-660.13	36950.	55.974
274	725.00	-642.17	36950.	57.539
850	725.00	-642.00	36950.	57.555
273	725.00	-639.58	36950.	57.772
849	725.00	-639.41	36950.	57.787
272	725.00	-637.00	36950.	58.006
848	725.00	-636.83	36950.	58.022
271	725.00	-608.71	36950.	60.702
847	725.00	-608.54	36950.	60.719
270	725.00	-580.41	36950.	63.662
846	725.00	-580.24	36950.	63.680
1152	725.00	-559.88	36950.	65.996

Table 1 (continued)

ELEM	REF TEMP	PM	ALLOW	SF
576	725.00	-559.80	36950.	66.006
872	725.00	465.85	36950.	79.317
871	725.00	465.85	36950.	79.317
873	725.00	465.85	36950.	79.317
296	725.00	465.80	36950.	79.327
295	725.00	465.80	36950.	79.327
297	725.00	465.80	36950.	79.327
1230	725.00	424.39	36950.	87.067
1225	725.00	424.34	36950.	87.077
584	725.00	-402.30	36950.	91.846
583	725.00	-402.30	36950.	91.846
585	725.00	-402.30	36950.	91.846
9	725.00	-402.25	36950.	91.859
8	725.00	-402.25	36950.	91.859
7	725.00	-402.25	36950.	91.859
1229	725.00	391.81	36950.	94.305
1224	725.00	391.76	36950.	94.317
835	725.00	-382.08	36950.	96.708
259	725.00	-381.98	36950.	96.733
836	725.00	-378.90	36950.	97.519
260	725.00	-378.80	36950.	97.545
966	725.00	374.91	36950.	98.558
964	725.00	374.91	36950.	98.558
963	725.00	374.91	36950.	98.558
962	725.00	374.91	36950.	98.558
965	725.00	374.91	36950.	98.558
961	725.00	374.91	36950.	98.558
386	725.00	374.50	36950.	98.664
389	725.00	374.50	36950.	98.664
388	725.00	374.50	36950.	98.664
387	725.00	374.50	36950.	98.664
385	725.00	374.50	36950.	98.664
390	725.00	374.50	36950.	98.664
678	725.00	-374.14	36950.	98.759
677	725.00	-374.14	36950.	98.759
674	725.00	-374.14	36950.	98.759
675	725.00	-374.14	36950.	98.759
676	725.00	-374.14	36950.	98.759
673	725.00	-374.14	36950.	98.759
102	725.00	-373.74	36950.	98.866
101	725.00	-373.74	36950.	98.866
98	725.00	-373.74	36950.	98.866
100	725.00	-373.74	36950.	98.866
99	725.00	-373.74	36950.	98.866
97	725.00	-373.74	36950.	98.866
975	725.00	371.93	36950.	99.346
972	725.00	371.93	36950.	99.346
973	725.00	371.93	36950.	99.346
977	725.00	371.93	36950.	99.346

Table 1 (continued)

ELEM	REF TEMP	PM	ALLOW	SF
974	725.00	371.93	36950.	99.346
978	725.00	371.93	36950.	99.346
976	725.00	371.93	36950.	99.346
401	725.00	371.58	36950.	99.440
396	725.00	371.58	36950.	99.440
397	725.00	371.58	36950.	99.440
398	725.00	371.58	36950.	99.440
400	725.00	371.58	36950.	99.440
399	725.00	371.58	36950.	99.440
402	725.00	371.58	36950.	99.440
1228	725.00	359.24	36950.	102.86
1223	725.00	359.19	36950.	102.87
870	725.00	352.50	36950.	104.82
869	725.00	352.50	36950.	104.82
867	725.00	352.50	36950.	104.82
868	725.00	352.50	36950.	104.82
866	725.00	352.50	36950.	104.82
865	725.00	352.50	36950.	104.82
294	725.00	352.44	36950.	104.84
292	725.00	352.44	36950.	104.84
293	725.00	352.44	36950.	104.84
291	725.00	352.44	36950.	104.84
290	725.00	352.44	36950.	104.84
289	725.00	352.44	36950.	104.84
837	725.00	-344.11	36950.	107.38
261	725.00	-344.01	36950.	107.41
577	725.00	-335.80	36950.	110.04
581	725.00	-335.80	36950.	110.04
580	725.00	-335.80	36950.	110.04
579	725.00	-335.80	36950.	110.04
578	725.00	-335.80	36950.	110.04
582	725.00	-335.80	36950.	110.04
6	725.00	-335.73	36950.	110.06
1	725.00	-335.73	36950.	110.06
2	725.00	-335.73	36950.	110.06
3	725.00	-335.73	36950.	110.06
4	725.00	-335.73	36950.	110.06
5	725.00	-335.73	36950.	110.06
1227	725.00	326.67	36950.	113.11
1222	725.00	326.62	36950.	113.13
997	725.00	-316.56	36950.	116.72
1213	725.00	-316.56	36950.	116.72
1212	725.00	-316.56	36950.	116.72
1215	725.00	-316.56	36950.	116.72
1214	725.00	-316.56	36950.	116.72
421	725.00	-316.28	36950.	116.83
1203	725.00	-316.28	36950.	116.83
1205	725.00	-316.28	36950.	116.83
1204	725.00	-316.28	36950.	116.83

Table 1 (continued)

ELEM	REF TEMP	PM	ALLOW	SF
1202	725.00	-316.28	36950.	116.83
838	725.00	-309.32	36950.	119.45
262	725.00	-309.22	36950.	119.49
283	725.00	294.09	36950.	125.64
859	725.00	294.05	36950.	125.66
133	725.00	-280.66	36950.	131.66
1209	725.00	-280.66	36950.	131.66
1208	725.00	-280.66	36950.	131.66
1207	725.00	-280.66	36950.	131.66
1210	725.00	-280.66	36950.	131.66
1219	725.00	-280.38	36950.	131.79
1217	725.00	-280.38	36950.	131.79
1218	725.00	-280.38	36950.	131.79
1220	725.00	-280.38	36950.	131.79
709	725.00	-280.38	36950.	131.79
216	725.00	-274.55	36950.	134.59
839	725.00	-274.53	36950.	134.59
792	725.00	-274.51	36950.	134.60
263	725.00	-274.43	36950.	134.64
215	725.00	-271.37	36950.	136.16
791	725.00	-271.33	36950.	136.18
1181	725.00	-247.90	36950.	149.05
1180	725.00	-247.90	36950.	149.05
1182	725.00	-247.90	36950.	149.05
840	725.00	-239.74	36950.	154.12
264	725.00	-239.65	36950.	154.19
1099	725.00	-236.76	36950.	156.07
523	725.00	-236.69	36950.	156.11
1100	725.00	-233.58	36950.	158.19
524	725.00	-233.52	36950.	158.23
214	725.00	-231.76	36950.	159.43
790	725.00	-231.73	36950.	159.45
114	725.00	227.59	36950.	162.35
108	725.00	227.59	36950.	162.35
110	725.00	227.59	36950.	162.35
109	725.00	227.59	36950.	162.35
113	725.00	227.59	36950.	162.35
111	725.00	227.59	36950.	162.35
112	725.00	227.59	36950.	162.35
690	725.00	227.24	36950.	162.60
685	725.00	227.24	36950.	162.60
684	725.00	227.24	36950.	162.60
686	725.00	227.24	36950.	162.60
689	725.00	227.24	36950.	162.60
687	725.00	227.24	36950.	162.60
688	725.00	227.24	36950.	162.60
181	725.00	-226.63	36950.	163.04
757	725.00	-226.61	36950.	163.06
1184	725.00	223.86	36950.	165.06

Table 1 (continued)

ELEM	REF TEMP	PM	ALLOW	SF
1185	725.00	223.86	36950.	165.06
1183	725.00	223.86	36950.	165.06
182	725.00	-223.45	36950.	165.36
758	725.00	-223.43	36950.	165.38
43	725.00	-218.19	36950.	169.35
619	725.00	-218.19	36950.	169.35
44	725.00	-215.01	36950.	171.85
620	725.00	-215.01	36950.	171.85
373	725.00	-212.76	36950.	173.67
949	725.00	-212.67	36950.	173.74
374	725.00	-209.58	36950.	176.30
950	725.00	-209.49	36950.	176.38
753	725.00	205.54	36950.	179.77
751	725.00	205.54	36950.	179.77
750	725.00	205.54	36950.	179.77
749	725.00	205.54	36950.	179.77
752	725.00	205.54	36950.	179.77
748	725.00	205.54	36950.	179.77
172	725.00	205.53	36950.	179.78
176	725.00	205.53	36950.	179.78
173	725.00	205.53	36950.	179.78
174	725.00	205.53	36950.	179.78
175	725.00	205.53	36950.	179.78
177	725.00	205.53	36950.	179.78
1101	725.00	-205.11	36950.	180.14
525	725.00	-205.05	36950.	180.20
213	725.00	-196.97	36950.	187.59
789	725.00	-196.94	36950.	187.62
715	725.00	-195.03	36950.	189.46
183	725.00	-194.98	36950.	189.50
759	725.00	-194.96	36950.	189.52
139	725.00	-194.82	36950.	189.66
716	725.00	-191.85	36950.	192.60
140	725.00	-191.64	36950.	192.81
45	725.00	-186.55	36950.	198.07
621	725.00	-186.54	36950.	198.08
593	725.00	-184.83	36950.	199.91
594	725.00	-184.83	36950.	199.91
592	725.00	-184.83	36950.	199.91
17	725.00	-184.80	36950.	199.95
16	725.00	-184.80	36950.	199.95
18	725.00	-184.80	36950.	199.95
375	725.00	-181.11	36950.	204.01
951	725.00	-181.03	36950.	204.11
644	725.00	-180.05	36950.	205.22
646	725.00	-180.05	36950.	205.22
648	725.00	-180.05	36950.	205.22
643	725.00	-180.05	36950.	205.22
645	725.00	-180.05	36950.	205.22

Table 1 (continued)

ELEM	REF TEMP	PM	ALLOW	SF
647	725.00	-180.05	36950.	205.22
72	725.00	-179.94	36950.	205.35
71	725.00	-179.94	36950.	205.35
69	725.00	-179.94	36950.	205.35
68	725.00	-179.94	36950.	205.35
70	725.00	-179.94	36950.	205.35
67	725.00	-179.94	36950.	205.35
1102	725.00	-176.65	36950.	209.17
526	725.00	-176.58	36950.	209.25
184	725.00	-166.52	36950.	221.90
760	725.00	-166.49	36950.	221.93
717	725.00	-163.38	36950.	226.16
141	725.00	-163.18	36950.	226.44
212	725.00	-162.19	36950.	227.82
788	725.00	-162.15	36950.	227.87
1194	725.00	158.22	36950.	233.54
1193	725.00	158.22	36950.	233.54
1192	725.00	158.22	36950.	233.54
46	725.00	-158.08	36950.	233.74
622	725.00	-158.08	36950.	233.75
481	725.00	154.93	36950.	238.50
486	725.00	154.93	36950.	238.50
483	725.00	154.93	36950.	238.50
482	725.00	154.93	36950.	238.50
484	725.00	154.93	36950.	238.50
485	725.00	154.93	36950.	238.50
1059	725.00	154.91	36950.	238.52
1057	725.00	154.91	36950.	238.52
1062	725.00	154.91	36950.	238.52
1060	725.00	154.91	36950.	238.52
1058	725.00	154.91	36950.	238.52
1061	725.00	154.91	36950.	238.52
277	725.00	-152.97	36950.	241.56
278	725.00	-152.97	36950.	241.56
280	725.00	-152.97	36950.	241.56
279	725.00	-152.97	36950.	241.56
281	725.00	-152.97	36950.	241.56
282	725.00	-152.97	36950.	241.56
857	725.00	-152.96	36950.	241.57
858	725.00	-152.96	36950.	241.57
853	725.00	-152.96	36950.	241.57
854	725.00	-152.96	36950.	241.57
856	725.00	-152.96	36950.	241.57
855	725.00	-152.96	36950.	241.57
376	725.00	-152.65	36950.	242.06
952	725.00	-152.56	36950.	242.20
1103	725.00	-148.18	36950.	249.36
527	725.00	-148.12	36950.	249.46
185	725.00	-138.05	36950.	267.66

Table 1 (continued)

ELEM	REF TEMP	PM	ALLOW	SF
761	725.00	-138.03	36950.	267.70
882	725.00	136.56	36950.	270.57
880	725.00	136.56	36950.	270.57
881	725.00	136.56	36950.	270.57
304	725.00	136.52	36950.	270.65
305	725.00	136.52	36950.	270.65
306	725.00	136.52	36950.	270.65
477	725.00	135.36	36950.	272.97
478	725.00	135.36	36950.	272.97
476	725.00	135.36	36950.	272.97
479	725.00	135.36	36950.	272.97
475	725.00	135.36	36950.	272.97
480	725.00	135.36	36950.	272.97
1052	725.00	135.34	36950.	273.02
1055	725.00	135.34	36950.	273.02
1053	725.00	135.34	36950.	273.02
1054	725.00	135.34	36950.	273.02
1056	725.00	135.34	36950.	273.02
1051	725.00	135.34	36950.	273.02
718	725.00	-134.91	36950.	273.88
142	725.00	-134.71	36950.	274.29
47	725.00	-129.61	36950.	285.08
623	725.00	-129.61	36950.	285.09
91	725.00	129.32	36950.	285.72
94	725.00	129.32	36950.	285.72
95	725.00	129.32	36950.	285.72
96	725.00	129.32	36950.	285.72
93	725.00	129.32	36950.	285.72
92	725.00	129.32	36950.	285.72
668	725.00	129.25	36950.	285.87
670	725.00	129.25	36950.	285.87
672	725.00	129.25	36950.	285.87
669	725.00	129.25	36950.	285.87
667	725.00	129.25	36950.	285.87
671	725.00	129.25	36950.	285.87
211	725.00	-127.40	36950.	290.04
787	725.00	-127.36	36950.	290.12
377	725.00	-124.18	36950.	297.55
953	725.00	-124.09	36950.	297.76
807	725.00	123.19	36950.	299.93
810	725.00	123.19	36950.	299.93
808	725.00	123.19	36950.	299.93
809	725.00	123.19	36950.	299.93
806	725.00	123.19	36950.	299.93
805	725.00	123.19	36950.	299.93
232	725.00	123.16	36950.	300.02
234	725.00	123.16	36950.	300.02
233	725.00	123.16	36950.	300.02
230	725.00	123.16	36950.	300.02

Table 1 (continued)

ELEM	REF TEMP	PM	ALLOW	SF
229	725.00	123.16	36950.	300.02
231	725.00	123.16	36950.	300.02
1104	725.00	-119.71	36950.	308.65
528	725.00	-119.65	36950.	308.82
369	725.00	-115.89	36950.	318.84
371	725.00	-115.89	36950.	318.84
365	725.00	-115.89	36950.	318.84
367	725.00	-115.89	36950.	318.84
364	725.00	-115.89	36950.	318.84
366	725.00	-115.89	36950.	318.84
368	725.00	-115.89	36950.	318.84
372	725.00	-115.89	36950.	318.84
370	725.00	-115.89	36950.	318.84
941	725.00	-115.54	36950.	319.81
942	725.00	-115.54	36950.	319.81
947	725.00	-115.54	36950.	319.81
946	725.00	-115.54	36950.	319.81
945	725.00	-115.54	36950.	319.81
944	725.00	-115.54	36950.	319.81
943	725.00	-115.54	36950.	319.81
940	725.00	-115.54	36950.	319.81
948	725.00	-115.54	36950.	319.81
326	725.00	114.36	36950.	323.11
329	725.00	114.36	36950.	323.11
327	725.00	114.36	36950.	323.11
328	725.00	114.36	36950.	323.11
330	725.00	114.36	36950.	323.11
325	725.00	114.36	36950.	323.11
904	725.00	114.35	36950.	323.13
903	725.00	114.35	36950.	323.13
902	725.00	114.35	36950.	323.13
906	725.00	114.35	36950.	323.13
905	725.00	114.35	36950.	323.13
901	725.00	114.35	36950.	323.13
1178	725.00	112.62	36950.	328.08
1179	725.00	112.62	36950.	328.08
1177	725.00	112.62	36950.	328.08
81	725.00	111.82	36950.	330.44
83	725.00	111.82	36950.	330.44
80	725.00	111.82	36950.	330.44
77	725.00	111.82	36950.	330.44
79	725.00	111.82	36950.	330.44
76	725.00	111.82	36950.	330.44
78	725.00	111.82	36950.	330.44
84	725.00	111.82	36950.	330.44
82	725.00	111.82	36950.	330.44
657	725.00	111.47	36950.	331.49
659	725.00	111.47	36950.	331.49
654	725.00	111.47	36950.	331.49

Table 1 (continued)

ELEM	REF TEMP	PM	ALLOW	SF
653	725.00	111.47	36950.	331.49
655	725.00	111.47	36950.	331.49
652	725.00	111.47	36950.	331.49
656	725.00	111.47	36950.	331.49
658	725.00	111.47	36950.	331.49
660	725.00	111.47	36950.	331.49
186	725.00	-109.58	36950.	337.19
762	725.00	-109.56	36950.	337.25
198	725.00	-107.91	36950.	342.41
194	725.00	-107.91	36950.	342.41
195	725.00	-107.91	36950.	342.41
196	725.00	-107.91	36950.	342.41
197	725.00	-107.91	36950.	342.41
193	725.00	-107.91	36950.	342.41
769	725.00	-107.90	36950.	342.44
774	725.00	-107.90	36950.	342.44
772	725.00	-107.90	36950.	342.44
771	725.00	-107.90	36950.	342.44
770	725.00	-107.90	36950.	342.44
773	725.00	-107.90	36950.	342.44
719	725.00	-106.45	36950.	347.12
143	725.00	-106.24	36950.	347.78
192	725.00	-102.59	36950.	360.15
188	725.00	-102.59	36950.	360.15
189	725.00	-102.59	36950.	360.15
190	725.00	-102.59	36950.	360.15
191	725.00	-102.59	36950.	360.15
187	725.00	-102.59	36950.	360.15
765	725.00	-102.57	36950.	360.24
768	725.00	-102.57	36950.	360.24
764	725.00	-102.57	36950.	360.24
767	725.00	-102.57	36950.	360.24
766	725.00	-102.57	36950.	360.24
763	725.00	-102.57	36950.	360.24
1187	725.00	-102.12	36950.	361.83
1186	725.00	-102.12	36950.	361.83
1188	725.00	-102.12	36950.	361.83
48	725.00	-101.15	36950.	365.31
624	725.00	-101.14	36950.	365.33
755	725.00	97.404	36950.	379.35
754	725.00	97.404	36950.	379.35
756	725.00	97.404	36950.	379.35
180	725.00	97.394	36950.	379.39
178	725.00	97.394	36950.	379.39
179	725.00	97.394	36950.	379.39
378	725.00	-95.715	36950.	386.04
954	725.00	-95.628	36950.	386.39
1093	725.00	-94.598	36950.	390.60
1097	725.00	-94.598	36950.	390.60

Table 1 (continued)

ELEM	REF TEMP	PM	ALLOW	SF
1096	725.00	-94.598	36950.	390.60
1095	725.00	-94.598	36950.	390.60
1094	725.00	-94.598	36950.	390.60
1098	725.00	-94.598	36950.	390.60
517	725.00	-94.559	36950.	390.76
520	725.00	-94.559	36950.	390.76
522	725.00	-94.559	36950.	390.76
519	725.00	-94.559	36950.	390.76
518	725.00	-94.559	36950.	390.76
521	725.00	-94.559	36950.	390.76
382	725.00	-92.737	36950.	398.44
380	725.00	-92.737	36950.	398.44
384	725.00	-92.737	36950.	398.44
381	725.00	-92.737	36950.	398.44
383	725.00	-92.737	36950.	398.44
379	725.00	-92.737	36950.	398.44
957	725.00	-92.668	36950.	398.74
958	725.00	-92.668	36950.	398.74
956	725.00	-92.668	36950.	398.74
959	725.00	-92.668	36950.	398.74
960	725.00	-92.668	36950.	398.74
955	725.00	-92.668	36950.	398.74
1235	725.00	-84.033	36950.	439.71
1240	725.00	-84.020	36950.	439.77
586	725.00	-82.263	36950.	449.17
587	725.00	-82.263	36950.	449.17
590	725.00	-82.263	36950.	449.17
588	725.00	-82.263	36950.	449.17
589	725.00	-82.263	36950.	449.17
591	725.00	-82.263	36950.	449.17
10	725.00	-82.201	36950.	449.51
15	725.00	-82.201	36950.	449.51
13	725.00	-82.201	36950.	449.51
11	725.00	-82.201	36950.	449.51
14	725.00	-82.201	36950.	449.51
12	725.00	-82.201	36950.	449.51
720	725.00	-77.981	36950.	473.83
144	725.00	-77.778	36950.	475.07
932	725.00	76.928	36950.	480.32
934	725.00	76.928	36950.	480.32
933	725.00	76.928	36950.	480.32
931	725.00	76.928	36950.	480.32
935	725.00	76.928	36950.	480.32
936	725.00	76.928	36950.	480.32
360	725.00	76.806	36950.	481.08
358	725.00	76.806	36950.	481.08
356	725.00	76.806	36950.	481.08
359	725.00	76.806	36950.	481.08
357	725.00	76.806	36950.	481.08

Table 1 (continued)

ELEM	REF TEMP	PM	ALLOW	SF
355	725.00	76.806	36950.	481.08
37	725.00	-66.515	36950.	555.52
40	725.00	-66.515	36950.	555.52
42	725.00	-66.515	36950.	555.52
38	725.00	-66.515	36950.	555.52
39	725.00	-66.515	36950.	555.52
41	725.00	-66.515	36950.	555.52
613	725.00	-66.506	36950.	555.58
614	725.00	-66.506	36950.	555.58
617	725.00	-66.506	36950.	555.58
616	725.00	-66.506	36950.	555.58
615	725.00	-66.506	36950.	555.58
618	725.00	-66.506	36950.	555.58
1200	725.00	-65.624	36950.	563.05
1198	725.00	-65.624	36950.	563.05
1199	725.00	-65.624	36950.	563.05
489	725.00	60.366	36950.	612.10
488	725.00	60.366	36950.	612.10
487	725.00	60.366	36950.	612.10
1065	725.00	60.316	36950.	612.60
1063	725.00	60.316	36950.	612.60
1064	725.00	60.316	36950.	612.60
1002	725.00	55.369	36950.	667.35
426	725.00	55.300	36950.	668.17
714	725.00	-54.134	36950.	682.56
138	725.00	-54.067	36950.	683.41
649	725.00	-51.801	36950.	713.31
651	725.00	-51.801	36950.	713.31
650	725.00	-51.801	36950.	713.31
75	725.00	-51.614	36950.	715.90
73	725.00	-51.614	36950.	715.90
74	725.00	-51.614	36950.	715.90
1234	725.00	-51.460	36950.	718.03
1239	725.00	-51.448	36950.	718.20
571	725.00	50.448	36950.	732.44
1147	725.00	50.435	36950.	732.62
1237	725.00	47.270	36950.	781.68
1232	725.00	47.257	36950.	781.89
1036	725.00	-47.115	36950.	784.25
1040	725.00	-47.115	36950.	784.25
1037	725.00	-47.115	36950.	784.25
1038	725.00	-47.115	36950.	784.25
1039	725.00	-47.115	36950.	784.25
1041	725.00	-47.115	36950.	784.25
460	725.00	-47.106	36950.	784.39
464	725.00	-47.106	36950.	784.39
462	725.00	-47.106	36950.	784.39
463	725.00	-47.106	36950.	784.39
461	725.00	-47.106	36950.	784.39

Table 1 (continued)

ELEM	REF TEMP	PM	ALLOW	SF
465	725.00	-47.106	36950.	784.39
1231	725.00	-46.763	36950.	790.16
1236	725.00	-46.748	36950.	790.41
1191	725.00	-45.604	36950.	810.23
1190	725.00	-45.604	36950.	810.23
1189	725.00	-45.604	36950.	810.23
1226	725.00	-44.829	36950.	824.24
1221	725.00	-44.819	36950.	824.43
864	725.00	-41.544	36950.	889.41
288	725.00	-41.534	36950.	889.62
1196	725.00	-30.452	36950.	1213.4
1197	725.00	-30.452	36950.	1213.4
1195	725.00	-30.452	36950.	1213.4
1206	725.00	29.130	36950.	1268.5
1216	725.00	29.022	36950.	1273.2
1201	725.00	-27.593	36950.	1339.1
1211	725.00	-27.483	36950.	1344.5
1233	725.00	-18.888	36950.	1956.3
1238	725.00	-18.875	36950.	1957.6
1043	725.00	-18.103	36950.	2041.1
1042	725.00	-18.103	36950.	2041.1
1044	725.00	-18.103	36950.	2041.1
466	725.00	-18.095	36950.	2042.0
468	725.00	-18.095	36950.	2042.0
467	725.00	-18.095	36950.	2042.0
1142	725.00	-17.750	36950.	2081.6
1143	725.00	-17.750	36950.	2081.6
1144	725.00	-17.750	36950.	2081.6
1141	725.00	-17.750	36950.	2081.6
1145	725.00	-17.750	36950.	2081.6
1146	725.00	-17.750	36950.	2081.6
565	725.00	-17.736	36950.	2083.3
566	725.00	-17.736	36950.	2083.3
567	725.00	-17.736	36950.	2083.3
568	725.00	-17.736	36950.	2083.3
569	725.00	-17.736	36950.	2083.3
570	725.00	-17.736	36950.	2083.3
361	725.00	-16.931	36950.	2182.4
362	725.00	-16.931	36950.	2182.4
363	725.00	-16.931	36950.	2182.4
938	725.00	-16.740	36950.	2207.4
939	725.00	-16.740	36950.	2207.4
937	725.00	-16.740	36950.	2207.4
775	725.00	15.292	36950.	2416.3
776	725.00	15.292	36950.	2416.3
777	725.00	15.292	36950.	2416.3
199	725.00	15.245	36950.	2423.8
200	725.00	15.245	36950.	2423.8
201	725.00	15.245	36950.	2423.8

Table 1 (continued)

ELEM	REF TEMP	PM	ALLOW	SF
874	725.00	2.2247	36950.	16609.
875	725.00	2.2247	36950.	16609.
876	725.00	2.2247	36950.	16609.
877	725.00	2.2247	36950.	16609.
878	725.00	2.2247	36950.	16609.
879	725.00	2.2247	36950.	16609.
298	725.00	2.1593	36950.	17112.
299	725.00	2.1593	36950.	17112.
300	725.00	2.1593	36950.	17112.
301	725.00	2.1593	36950.	17112.
302	725.00	2.1593	36950.	17112.
303	725.00	2.1593	36950.	17112.

Table 2

TITLE=
MPC-24E Structural Analysis

SUBTITLE 1 =
Component: Fuel Basket
SUBTITLE 2 =
Load Combination: F2.a (See Table 2.1.6)
SUBTITLE 3 =
Stress Result: Primary Local Plus Primary Bending (PL+PB)

PRINT ELEMENT TABLE ITEMS PER ELEMENT

STAT ELEM	CURRENT REF TEMP	CURRENT PL+PB	PREVIOUS ALLOW	PREVIOUS SF
1065	725.00	31912.	55450.	1.7376
489	725.00	31908.	55450.	1.7378
577	725.00	30485.	55450.	1.8189
1	725.00	30485.	55450.	1.8190
585	725.00	29419.	55450.	1.8848
9	725.00	29418.	55450.	1.8849
1017	725.00	28955.	55450.	1.9151
441	725.00	28953.	55450.	1.9151
1016	725.00	28480.	55450.	1.9470
440	725.00	28479.	55450.	1.9471
18	725.00	28329.	55450.	1.9573
594	725.00	28329.	55450.	1.9574
1064	725.00	27890.	55450.	1.9882
488	725.00	27887.	55450.	1.9884
578	725.00	27052.	55450.	2.0497
2	725.00	27052.	55450.	2.0497
363	725.00	26747.	55450.	2.0732
939	725.00	26736.	55450.	2.0740
584	725.00	25979.	55450.	2.1344
8	725.00	25979.	55450.	2.1344
172	725.00	25744.	55450.	2.1539
748	725.00	25743.	55450.	2.1540
931	725.00	25672.	55450.	2.1600
355	725.00	25663.	55450.	2.1607
1015	725.00	25151.	55450.	2.2047
439	725.00	25149.	55450.	2.2049
17	725.00	24694.	55450.	2.2455
593	725.00	24693.	55450.	2.2455
586	725.00	24393.	55450.	2.2732
10	725.00	24390.	55450.	2.2735
499	725.00	23553.	55450.	2.3542
1075	725.00	23549.	55450.	2.3546
362	725.00	23219.	55450.	2.3881
938	725.00	23209.	55450.	2.3892
500	725.00	22965.	55450.	2.4145

Table 2 (continued)

ELEM	REF TEMP	PM	ALLOW	SF
1076	725.00	22961.	55450.	2.4149
352	725.00	22830.	55450.	2.4288
928	725.00	22829.	55450.	2.4289
173	725.00	22541.	55450.	2.4600
749	725.00	22540.	55450.	2.4601
932	725.00	22348.	55450.	2.4812
356	725.00	22340.	55450.	2.4821
97	725.00	22189.	55450.	2.4990
673	725.00	22175.	55450.	2.5005
565	725.00	22069.	55450.	2.5126
1141	725.00	22068.	55450.	2.5127
229	725.00	21831.	55450.	2.5400
805	725.00	21824.	55450.	2.5408
353	725.00	21585.	55450.	2.5689
929	725.00	21584.	55450.	2.5690
901	725.00	21581.	55450.	2.5694
325	725.00	21581.	55450.	2.5694
1051	725.00	21555.	55450.	2.5725
475	725.00	21553.	55450.	2.5727
36	725.00	21304.	55450.	2.6028
612	725.00	21303.	55450.	2.6029
667	725.00	21290.	55450.	2.6045
91	725.00	21282.	55450.	2.6055
587	725.00	21124.	55450.	2.6250
11	725.00	21121.	55450.	2.6253
421	725.00	21053.	55450.	2.6338
997	725.00	21046.	55450.	2.6347
611	725.00	20937.	55450.	2.6484
35	725.00	20937.	55450.	2.6485
678	725.00	20640.	55450.	2.6865
102	725.00	20626.	55450.	2.6883
484	725.00	20415.	55450.	2.7162
483	725.00	20415.	55450.	2.7162
1060	725.00	20414.	55450.	2.7162
1059	725.00	20414.	55450.	2.7162
98	725.00	19208.	55450.	2.8868
674	725.00	19195.	55450.	2.8887
566	725.00	18997.	55450.	2.9188
1142	725.00	18997.	55450.	2.9189
756	725.00	18917.	55450.	2.9312
180	725.00	18914.	55450.	2.9316
230	725.00	18623.	55450.	2.9776
806	725.00	18616.	55450.	2.9786
809	725.00	18558.	55450.	2.9880
808	725.00	18558.	55450.	2.9880
233	725.00	18557.	55450.	2.9881
232	725.00	18557.	55450.	2.9881
1052	725.00	18441.	55450.	3.0069
476	725.00	18439.	55450.	3.0072

Table 2 (continued)

ELEM	REF TEMP	PM	ALLOW	SF
902	725.00	18431.	55450.	3.0085
326	725.00	18431.	55450.	3.0086
610	725.00	18366.	55450.	3.0192
34	725.00	18363.	55450.	3.0197
1167	725.00	18182.	55450.	3.0498
1155	725.00	18180.	55450.	3.0500
668	725.00	18171.	55450.	3.0515
92	725.00	18163.	55450.	3.0528
1202	725.00	18150.	55450.	3.0551
1212	725.00	18143.	55450.	3.0563
481	725.00	18014.	55450.	3.0782
1057	725.00	18011.	55450.	3.0787
873	725.00	17969.	55450.	3.0858
297	725.00	17969.	55450.	3.0859
1161	725.00	17944.	55450.	3.0902
1173	725.00	17943.	55450.	3.0904
888	725.00	17755.	55450.	3.1230
312	725.00	17755.	55450.	3.1231
677	725.00	17727.	55450.	3.1280
101	725.00	17714.	55450.	3.1303
12	725.00	17628.	55450.	3.1456
13	725.00	17628.	55450.	3.1456
588	725.00	17627.	55450.	3.1457
589	725.00	17627.	55450.	3.1457
933	725.00	17602.	55450.	3.1503
934	725.00	17602.	55450.	3.1503
357	725.00	17601.	55450.	3.1504
358	725.00	17601.	55450.	3.1504
887	725.00	17285.	55450.	3.2080
311	725.00	17285.	55450.	3.2081
755	725.00	17179.	55450.	3.2277
179	725.00	17177.	55450.	3.2282
904	725.00	17169.	55450.	3.2297
905	725.00	17169.	55450.	3.2297
329	725.00	17168.	55450.	3.2298
328	725.00	17168.	55450.	3.2298
1152	725.00	17162.	55450.	3.2310
576	725.00	17160.	55450.	3.2313
649	725.00	17159.	55450.	3.2316
73	725.00	17155.	55450.	3.2324
777	725.00	17126.	55450.	3.2378
201	725.00	17122.	55450.	3.2386
304	725.00	16961.	55450.	3.2693
880	725.00	16960.	55450.	3.2694
807	725.00	16807.	55450.	3.2992
231	725.00	16804.	55450.	3.2997
670	725.00	16618.	55450.	3.3367
671	725.00	16618.	55450.	3.3367
94	725.00	16618.	55450.	3.3368

Table 2 (continued)

ELEM	REF TEMP	PM	ALLOW	SF
95	725.00	16618.	55450.	3.3368
1182	725.00	16565.	55450.	3.3475
1180	725.00	16564.	55450.	3.3476
501	725.00	16527.	55450.	3.3551
1181	725.00	16525.	55450.	3.3555
1077	725.00	16524.	55450.	3.3558
1156	725.00	16391.	55450.	3.3829
1168	725.00	16384.	55450.	3.3843
1146	725.00	16376.	55450.	3.3860
570	725.00	16375.	55450.	3.3862
1055	725.00	16248.	55450.	3.4127
1054	725.00	16248.	55450.	3.4127
478	725.00	16248.	55450.	3.4128
479	725.00	16248.	55450.	3.4128
1166	725.00	16208.	55450.	3.4211
1154	725.00	16207.	55450.	3.4213
1200	725.00	16184.	55450.	3.4263
1198	725.00	16183.	55450.	3.4264
1199	725.00	16144.	55450.	3.4347
1160	725.00	16042.	55450.	3.4566
1172	725.00	16041.	55450.	3.4569
327	725.00	15937.	55450.	3.4794
903	725.00	15937.	55450.	3.4794
1211	725.00	15920.	55450.	3.4831
1201	725.00	15916.	55450.	3.4840
3	725.00	15793.	55450.	3.5111
4	725.00	15793.	55450.	3.5111
579	725.00	15793.	55450.	3.5111
580	725.00	15793.	55450.	3.5111
93	725.00	15669.	55450.	3.5389
669	725.00	15666.	55450.	3.5394
1176	725.00	15644.	55450.	3.5446
1164	725.00	15635.	55450.	3.5465
504	725.00	15355.	55450.	3.6111
1080	725.00	15355.	55450.	3.6113
477	725.00	15334.	55450.	3.6161
1194	725.00	15334.	55450.	3.6162
1053	725.00	15334.	55450.	3.6162
1192	725.00	15333.	55450.	3.6164
1193	725.00	15294.	55450.	3.6255
1158	725.00	15252.	55450.	3.6355
1170	725.00	15245.	55450.	3.6372
1062	725.00	15227.	55450.	3.6416
486	725.00	15223.	55450.	3.6425
1083	725.00	15129.	55450.	3.6651
507	725.00	15124.	55450.	3.6663
750	725.00	15033.	55450.	3.6886
751	725.00	15033.	55450.	3.6886
175	725.00	15033.	55450.	3.6886

Table 2 (continued)

ELEM	REF TEMP	PM	ALLOW	SF
174	725.00	15033.	55450.	3.6886
482	725.00	14908.	55450.	3.7194
1082	725.00	14906.	55450.	3.7199
1058	725.00	14906.	55450.	3.7201
506	725.00	14901.	55450.	3.7212
1140	725.00	14854.	55450.	3.7331
564	725.00	14851.	55450.	3.7337
816	725.00	14838.	55450.	3.7369
240	725.00	14834.	55450.	3.7379
503	725.00	14774.	55450.	3.7533
1079	725.00	14773.	55450.	3.7535
892	725.00	14744.	55450.	3.7609
316	725.00	14738.	55450.	3.7623
1139	725.00	14678.	55450.	3.7776
563	725.00	14676.	55450.	3.7782
643	725.00	14629.	55450.	3.7903
67	725.00	14621.	55450.	3.7925
872	725.00	14547.	55450.	3.8119
296	725.00	14546.	55450.	3.8120
893	725.00	14495.	55450.	3.8254
317	725.00	14490.	55450.	3.8268
474	725.00	14485.	55450.	3.8280
1050	725.00	14483.	55450.	3.8285
568	725.00	14287.	55450.	3.8812
569	725.00	14287.	55450.	3.8812
1145	725.00	14286.	55450.	3.8813
1144	725.00	14286.	55450.	3.8813
485	725.00	14268.	55450.	3.8864
1061	725.00	14266.	55450.	3.8870
810	725.00	14184.	55450.	3.9093
234	725.00	14180.	55450.	3.9104
181	725.00	14077.	55450.	3.9389
757	725.00	14075.	55450.	3.9396
1157	725.00	14075.	55450.	3.9397
1169	725.00	14070.	55450.	3.9411
90	725.00	14038.	55450.	3.9501
666	725.00	14031.	55450.	3.9520
66	725.00	14024.	55450.	3.9539
1175	725.00	14019.	55450.	3.9554
642	725.00	14017.	55450.	3.9559
1163	725.00	14012.	55450.	3.9573
753	725.00	13983.	55450.	3.9656
177	725.00	13982.	55450.	3.9659
650	725.00	13976.	55450.	3.9675
74	725.00	13971.	55450.	3.9689
480	725.00	13871.	55450.	3.9975
1056	725.00	13869.	55450.	3.9981
644	725.00	13867.	55450.	3.9987
68	725.00	13859.	55450.	4.0010

Table 2 (continued)

ELEM	REF TEMP	PM	ALLOW	SF
935	725.00	13846.	55450.	4.0048
359	725.00	13841.	55450.	4.0062
675	725.00	13825.	55450.	4.0108
676	725.00	13825.	55450.	4.0108
99	725.00	13825.	55450.	4.0110
100	725.00	13825.	55450.	4.0110
874	725.00	13809.	55450.	4.0154
298	725.00	13806.	55450.	4.0163
1143	725.00	13762.	55450.	4.0291
567	725.00	13762.	55450.	4.0291
305	725.00	13740.	55450.	4.0356
881	725.00	13740.	55450.	4.0358
182	725.00	13684.	55450.	4.0521
758	725.00	13682.	55450.	4.0528
1081	725.00	13681.	55450.	4.0532
505	725.00	13675.	55450.	4.0550
295	725.00	13469.	55450.	4.1169
871	725.00	13468.	55450.	4.1171
1138	725.00	13450.	55450.	4.1227
562	725.00	13448.	55450.	4.1233
776	725.00	13436.	55450.	4.1270
200	725.00	13432.	55450.	4.1282
96	725.00	13418.	55450.	4.1324
672	725.00	13412.	55450.	4.1345
1099	725.00	13384.	55450.	4.1431
523	725.00	13381.	55450.	4.1440
1014	725.00	13325.	55450.	4.1612
438	725.00	13324.	55450.	4.1616
1185	725.00	13316.	55450.	4.1640
1183	725.00	13315.	55450.	4.1645
1013	725.00	13284.	55450.	4.1743
437	725.00	13283.	55450.	4.1747
792	725.00	13282.	55450.	4.1748
216	725.00	13282.	55450.	4.1750
1184	725.00	13277.	55450.	4.1764
1137	725.00	13275.	55450.	4.1771
561	725.00	13273.	55450.	4.1776
373	725.00	13271.	55450.	4.1782
590	725.00	13267.	55450.	4.1797
14	725.00	13266.	55450.	4.1798
949	725.00	13266.	55450.	4.1799
581	725.00	13226.	55450.	4.1925
5	725.00	13226.	55450.	4.1925
1136	725.00	13100.	55450.	4.2330
560	725.00	13098.	55450.	4.2335
875	725.00	13081.	55450.	4.2391
299	725.00	13078.	55450.	4.2401
65	725.00	13024.	55450.	4.2576
1100	725.00	13021.	55450.	4.2585

Table 2 (continued)

ELEM	REF TEMP	PM	ALLOW	SF
524	725.00	13018.	55450.	4.2594
641	725.00	13017.	55450.	4.2597
1203	725.00	13008.	55450.	4.2629
1204	725.00	13008.	55450.	4.2629
1213	725.00	13008.	55450.	4.2629
1214	725.00	13008.	55450.	4.2629
1231	725.00	12988.	55450.	4.2694
1236	725.00	12986.	55450.	4.2699
374	725.00	12916.	55450.	4.2933
950	725.00	12910.	55450.	4.2950
336	725.00	12898.	55450.	4.2991
912	725.00	12898.	55450.	4.2993
791	725.00	12869.	55450.	4.3089
215	725.00	12868.	55450.	4.3090
354	725.00	12854.	55450.	4.3137
930	725.00	12847.	55450.	4.3161
1012	725.00	12826.	55450.	4.3232
436	725.00	12825.	55450.	4.3235
306	725.00	12707.	55450.	4.3639
882	725.00	12706.	55450.	4.3642
1134	725.00	12601.	55450.	4.4006
558	725.00	12599.	55450.	4.4012
1215	725.00	12404.	55450.	4.4703
1205	725.00	12396.	55450.	4.4732
1011	725.00	12369.	55450.	4.4830
435	725.00	12368.	55450.	4.4834
313	725.00	12300.	55450.	4.5080
889	725.00	12300.	55450.	4.5081
330	725.00	12272.	55450.	4.5183
906	725.00	12272.	55450.	4.5185
314	725.00	12267.	55450.	4.5204
890	725.00	12266.	55450.	4.5205
886	725.00	12137.	55450.	4.5685
310	725.00	12137.	55450.	4.5686
315	725.00	12030.	55450.	4.6092
891	725.00	12030.	55450.	4.6095
75	725.00	12008.	55450.	4.6178
651	725.00	11998.	55450.	4.6217
552	725.00	11923.	55450.	4.6505
1128	725.00	11922.	55450.	4.6510
1010	725.00	11912.	55450.	4.6551
434	725.00	11911.	55450.	4.6555
894	725.00	11775.	55450.	4.7090
318	725.00	11772.	55450.	4.7102
551	725.00	11738.	55450.	4.7239
1127	725.00	11737.	55450.	4.7243
1009	725.00	11454.	55450.	4.8410
433	725.00	11453.	55450.	4.8414
1226	725.00	11364.	55450.	4.8796

Table 2 (continued)

ELEM	REF TEMP	PM	ALLOW	SF
1221	725.00	11363.	55450.	4.8799
752	725.00	11293.	55450.	4.9102
176	725.00	11292.	55450.	4.9106
883	725.00	11227.	55450.	4.9389
307	725.00	11227.	55450.	4.9391
1135	725.00	11183.	55450.	4.9586
559	725.00	11182.	55450.	4.9591
609	725.00	11103.	55450.	4.9941
33	725.00	11099.	55450.	4.9962
608	725.00	10976.	55450.	5.0517
32	725.00	10972.	55450.	5.0538
884	725.00	10763.	55450.	5.1517
308	725.00	10763.	55450.	5.1520
859	725.00	10562.	55450.	5.2501
283	725.00	10561.	55450.	5.2503
469	725.00	10539.	55450.	5.2615
1045	725.00	10536.	55450.	5.2628
199	725.00	10344.	55450.	5.3605
775	725.00	10343.	55450.	5.3611
145	725.00	10295.	55450.	5.3863
721	725.00	10294.	55450.	5.3864
450	725.00	10273.	55450.	5.3976
1026	725.00	10271.	55450.	5.3989
219	725.00	10262.	55450.	5.4033
795	725.00	10256.	55450.	5.4066
402	725.00	10223.	55450.	5.4240
978	725.00	10214.	55450.	5.4290
218	725.00	10205.	55450.	5.4334
794	725.00	10199.	55450.	5.4368
183	725.00	10164.	55450.	5.4558
759	725.00	10162.	55450.	5.4566
449	725.00	10157.	55450.	5.4593
1025	725.00	10155.	55450.	5.4606
1222	725.00	10154.	55450.	5.4609
1227	725.00	10154.	55450.	5.4611
502	725.00	10089.	55450.	5.4961
1078	725.00	10086.	55450.	5.4977
146	725.00	10043.	55450.	5.5210
722	725.00	10043.	55450.	5.5211
470	725.00	10025.	55450.	5.5312
1046	725.00	10023.	55450.	5.5325
815	725.00	10008.	55450.	5.5403
239	725.00	10006.	55450.	5.5418
473	725.00	9940.1	55450.	5.5784
1049	725.00	9939.0	55450.	5.5790
85	725.00	9933.0	55450.	5.5824
661	725.00	9927.7	55450.	5.5854
217	725.00	9893.5	55450.	5.6047
793	725.00	9886.1	55450.	5.6089

Table 2 (continued)

ELEM	REF TEMP	PM	ALLOW	SF
1101	725.00	9772.4	55450.	5.6741
525	725.00	9771.0	55450.	5.6749
43	725.00	9765.6	55450.	5.6781
619	725.00	9764.7	55450.	5.6786
375	725.00	9730.3	55450.	5.6987
951	725.00	9727.6	55450.	5.7003
550	725.00	9711.4	55450.	5.7098
1126	725.00	9710.8	55450.	5.7102
401	725.00	9710.7	55450.	5.7102
977	725.00	9701.7	55450.	5.7155
89	725.00	9698.0	55450.	5.7177
665	725.00	9693.5	55450.	5.7203
15	725.00	9653.6	55450.	5.7440
591	725.00	9652.0	55450.	5.7449
897	725.00	9625.2	55450.	5.7609
321	725.00	9620.1	55450.	5.7640
607	725.00	9589.0	55450.	5.7826
31	725.00	9586.9	55450.	5.7839
44	725.00	9509.6	55450.	5.8309
620	725.00	9508.8	55450.	5.8314
86	725.00	9442.2	55450.	5.8726
662	725.00	9437.2	55450.	5.8757
114	725.00	9418.4	55450.	5.8874
690	725.00	9408.5	55450.	5.8936
896	725.00	9383.1	55450.	5.9096
320	725.00	9378.2	55450.	5.9126
448	725.00	9342.3	55450.	5.9354
1024	725.00	9340.5	55450.	5.9365
447	725.00	9226.2	55450.	6.0101
1023	725.00	9224.5	55450.	6.0112
1177	725.00	9181.1	55450.	6.0396
1179	725.00	9179.3	55450.	6.0407
1178	725.00	9141.5	55450.	6.0657
446	725.00	9110.1	55450.	6.0867
1022	725.00	9108.5	55450.	6.0877
335	725.00	9067.9	55450.	6.1150
911	725.00	9067.6	55450.	6.1152
895	725.00	9055.5	55450.	6.1233
319	725.00	9054.7	55450.	6.1239
595	725.00	9046.9	55450.	6.1291
19	725.00	9046.1	55450.	6.1297
113	725.00	8904.0	55450.	6.2276
689	725.00	8894.4	55450.	6.2342
162	725.00	8864.3	55450.	6.2554
738	725.00	8862.3	55450.	6.2568
811	725.00	8832.5	55450.	6.2780
235	725.00	8829.8	55450.	6.2799
596	725.00	8767.9	55450.	6.3242
20	725.00	8767.1	55450.	6.3248

Table 2 (continued)

ELEM	REF TEMP	PM	ALLOW	SF
600	725.00	8652.8	55450.	6.4083
24	725.00	8651.9	55450.	6.4090
865	725.00	8627.6	55450.	6.4270
289	725.00	8627.3	55450.	6.4273
161	725.00	8598.9	55450.	6.4485
737	725.00	8596.9	55450.	6.4500
331	725.00	8452.2	55450.	6.5604
907	725.00	8451.4	55450.	6.5611
360	725.00	8411.4	55450.	6.5922
936	725.00	8402.3	55450.	6.5994
599	725.00	8380.1	55450.	6.6168
23	725.00	8379.3	55450.	6.6175
812	725.00	8365.0	55450.	6.6288
236	725.00	8362.4	55450.	6.6308
324	725.00	8273.6	55450.	6.7020
900	725.00	8273.4	55450.	6.7022
648	725.00	8253.3	55450.	6.7186
547	725.00	8244.2	55450.	6.7259
72	725.00	8244.0	55450.	6.7261
1123	725.00	8243.1	55450.	6.7268
6	725.00	8242.2	55450.	6.7275
582	725.00	8242.2	55450.	6.7275
30	725.00	8201.8	55450.	6.7607
606	725.00	8201.7	55450.	6.7608
154	725.00	8192.1	55450.	6.7687
730	725.00	8190.2	55450.	6.7703
899	725.00	8169.1	55450.	6.7878
323	725.00	8168.9	55450.	6.7880
548	725.00	8065.4	55450.	6.8751
1124	725.00	8064.3	55450.	6.8759
866	725.00	8057.7	55450.	6.8816
290	725.00	8057.4	55450.	6.8818
647	725.00	8031.8	55450.	6.9038
71	725.00	8023.0	55450.	6.9114
332	725.00	8018.3	55450.	6.9154
908	725.00	8017.5	55450.	6.9161
1008	725.00	7967.5	55450.	6.9595
432	725.00	7960.4	55450.	6.9657
155	725.00	7931.8	55450.	6.9908
731	725.00	7930.0	55450.	6.9925
445	725.00	7839.1	55450.	7.0736
1021	725.00	7838.4	55450.	7.0741
790	725.00	7719.0	55450.	7.1836
214	725.00	7717.9	55450.	7.1846
1125	725.00	7684.4	55450.	7.2159
549	725.00	7684.4	55450.	7.2159
442	725.00	7617.4	55450.	7.2794
1018	725.00	7615.0	55450.	7.2817
443	725.00	7496.1	55450.	7.3972

Table 2 (continued)

ELEM	REF TEMP	PM	ALLOW	SF
1019	725.00	7493.8	55450.	7.3995
898	725.00	7437.5	55450.	7.4555
322	725.00	7433.9	55450.	7.4591
1225	725.00	7412.8	55450.	7.4803
1230	725.00	7412.6	55450.	7.4805
147	725.00	7293.3	55450.	7.6029
723	725.00	7292.9	55450.	7.6033
45	725.00	7217.0	55450.	7.6832
621	725.00	7216.5	55450.	7.6838
879	725.00	7184.6	55450.	7.7179
303	725.00	7182.9	55450.	7.7197
878	725.00	6996.7	55450.	7.9252
302	725.00	6995.1	55450.	7.9270
309	725.00	6989.7	55450.	7.9330
885	725.00	6989.7	55450.	7.9331
29	725.00	6816.7	55450.	8.1344
605	725.00	6814.3	55450.	8.1374
1002	725.00	6803.1	55450.	8.1507
426	725.00	6796.5	55450.	8.1586
1165	725.00	6737.1	55450.	8.2306
160	725.00	6736.3	55450.	8.2315
1153	725.00	6735.7	55450.	8.2322
1044	725.00	6735.3	55450.	8.2328
736	725.00	6734.9	55450.	8.2332
468	725.00	6733.5	55450.	8.2349
603	725.00	6725.8	55450.	8.2444
27	725.00	6724.8	55450.	8.2456
602	725.00	6705.2	55450.	8.2697
26	725.00	6704.3	55450.	8.2708
184	725.00	6642.7	55450.	8.3475
760	725.00	6642.1	55450.	8.3483
1020	725.00	6568.4	55450.	8.4420
444	725.00	6568.0	55450.	8.4424
601	725.00	6561.1	55450.	8.4514
25	725.00	6560.6	55450.	8.4520
376	725.00	6545.1	55450.	8.4720
952	725.00	6544.7	55450.	8.4725
1102	725.00	6523.8	55450.	8.4996
526	725.00	6523.7	55450.	8.4997
211	725.00	6515.6	55450.	8.5103
787	725.00	6513.1	55450.	8.5136
193	725.00	6499.3	55450.	8.5317
769	725.00	6496.8	55450.	8.5349
159	725.00	6470.9	55450.	8.5692
735	725.00	6469.5	55450.	8.5709
400	725.00	6391.5	55450.	8.6755
976	725.00	6385.5	55450.	8.6838
645	725.00	6311.6	55450.	8.7854
69	725.00	6307.7	55450.	8.7909

Table 2 (continued)

ELEM	REF TEMP	PM	ALLOW	SF
158	725.00	6205.4	55450.	8.9357
734	725.00	6204.2	55450.	8.9376
1043	725.00	6175.2	55450.	8.9795
467	725.00	6173.4	55450.	8.9820
212	725.00	6108.7	55450.	9.0772
788	725.00	6106.3	55450.	9.0808
1007	725.00	6088.3	55450.	9.1076
431	725.00	6083.6	55450.	9.1147
194	725.00	6033.3	55450.	9.1906
770	725.00	6031.0	55450.	9.1942
64	725.00	6004.0	55450.	9.2354
640	725.00	6003.1	55450.	9.2369
1223	725.00	5974.4	55450.	9.2812
1228	725.00	5974.3	55450.	9.2815
399	725.00	5957.8	55450.	9.3071
975	725.00	5952.2	55450.	9.3159
1063	725.00	5943.4	55450.	9.3297
487	725.00	5942.0	55450.	9.3319
259	725.00	5891.7	55450.	9.4116
876	725.00	5891.6	55450.	9.4117
835	725.00	5891.2	55450.	9.4123
300	725.00	5889.7	55450.	9.4147
814	725.00	5877.4	55450.	9.4345
238	725.00	5876.0	55450.	9.4366
351	725.00	5869.6	55450.	9.4470
927	725.00	5860.8	55450.	9.4612
1159	725.00	5847.2	55450.	9.4832
1171	725.00	5846.1	55450.	9.4849
350	725.00	5821.3	55450.	9.5253
926	725.00	5812.8	55450.	9.5393
715	725.00	5796.5	55450.	9.5662
139	725.00	5791.0	55450.	9.5752
870	725.00	5789.3	55450.	9.5779
294	725.00	5789.2	55450.	9.5782
869	725.00	5760.3	55450.	9.6262
293	725.00	5760.2	55450.	9.6264
597	725.00	5713.2	55450.	9.7055
21	725.00	5712.7	55450.	9.7064
260	725.00	5695.3	55450.	9.7361
836	725.00	5694.9	55450.	9.7368
716	725.00	5587.6	55450.	9.9238
140	725.00	5582.3	55450.	9.9331
726	725.00	5572.0	55450.	9.9515
150	725.00	5571.4	55450.	9.9526
112	725.00	5570.4	55450.	9.9543
270	725.00	5563.9	55450.	9.9660
688	725.00	5563.8	55450.	9.9662
846	725.00	5563.2	55450.	9.9674
277	725.00	5552.8	55450.	9.9860

Table 2 (continued)

ELEM	REF TEMP	PM	ALLOW	SF
853	725.00	5552.0	55450.	9.9875
398	725.00	5534.0	55450.	10.020
974	725.00	5528.7	55450.	10.029
28	725.00	5431.6	55450.	10.209
604	725.00	5426.9	55450.	10.218
471	725.00	5422.7	55450.	10.225
1047	725.00	5421.2	55450.	10.228
598	725.00	5395.0	55450.	10.278
472	725.00	5394.8	55450.	10.278
1048	725.00	5394.6	55450.	10.279
22	725.00	5394.5	55450.	10.279
88	725.00	5358.4	55450.	10.348
664	725.00	5356.3	55450.	10.352
725	725.00	5327.2	55450.	10.409
149	725.00	5326.5	55450.	10.410
349	725.00	5292.9	55450.	10.476
925	725.00	5287.4	55450.	10.487
754	725.00	5262.7	55450.	10.536
178	725.00	5261.8	55450.	10.538
334	725.00	5237.6	55450.	10.587
910	725.00	5237.6	55450.	10.587
111	725.00	5134.7	55450.	10.799
687	725.00	5128.5	55450.	10.812
278	725.00	5117.9	55450.	10.834
854	725.00	5117.2	55450.	10.836
156	725.00	5082.4	55450.	10.910
732	725.00	5081.4	55450.	10.912
87	725.00	5045.7	55450.	10.990
663	725.00	5043.0	55450.	10.995
46	725.00	4924.4	55450.	11.260
622	725.00	4924.1	55450.	11.261
76	725.00	4864.1	55450.	11.400
652	725.00	4854.9	55450.	11.422
58	725.00	4828.2	55450.	11.485
634	725.00	4822.9	55450.	11.497
646	725.00	4817.9	55450.	11.509
70	725.00	4813.2	55450.	11.520
348	725.00	4764.6	55450.	11.638
924	725.00	4762.1	55450.	11.644
59	725.00	4761.6	55450.	11.645
948	725.00	4757.8	55450.	11.654
635	725.00	4756.5	55450.	11.658
372	725.00	4749.9	55450.	11.674
937	725.00	4744.5	55450.	11.687
361	725.00	4740.7	55450.	11.697
110	725.00	4708.8	55450.	11.776
686	725.00	4703.0	55450.	11.790
868	725.00	4652.9	55450.	11.917
292	725.00	4652.8	55450.	11.918

Table 2 (continued)

ELEM	REF TEMP	PM	ALLOW	SF
77	725.00	4554.2	55450.	12.175
653	725.00	4545.4	55450.	12.199
148	725.00	4543.0	55450.	12.205
724	725.00	4542.6	55450.	12.207
16	725.00	4464.2	55450.	12.421
592	725.00	4463.4	55450.	12.423
947	725.00	4419.0	55450.	12.548
371	725.00	4411.4	55450.	12.570
288	725.00	4372.2	55450.	12.682
864	725.00	4371.2	55450.	12.685
923	725.00	4236.8	55450.	13.088
347	725.00	4236.2	55450.	13.090
1006	725.00	4209.1	55450.	13.174
430	725.00	4206.7	55450.	13.181
108	725.00	4188.4	55450.	13.239
684	725.00	4180.4	55450.	13.264
813	725.00	4177.0	55450.	13.275
237	725.00	4175.7	55450.	13.279
877	725.00	4149.3	55450.	13.364
301	725.00	4148.8	55450.	13.365
955	725.00	4137.0	55450.	13.403
333	725.00	4131.1	55450.	13.423
909	725.00	4130.6	55450.	13.424
379	725.00	4128.8	55450.	13.430
192	725.00	4103.4	55450.	13.513
768	725.00	4101.5	55450.	13.520
186	725.00	4081.9	55450.	13.584
762	725.00	4080.0	55450.	13.591
60	725.00	4032.2	55450.	13.752
636	725.00	4030.1	55450.	13.759
1206	725.00	3990.0	55450.	13.897
1216	725.00	3982.2	55450.	13.924
1098	725.00	3952.7	55450.	14.029
522	725.00	3948.5	55450.	14.043
1104	725.00	3944.5	55450.	14.058
528	725.00	3940.3	55450.	14.073
714	725.00	3872.0	55450.	14.321
271	725.00	3871.3	55450.	14.323
847	725.00	3871.0	55450.	14.324
720	725.00	3867.4	55450.	14.338
138	725.00	3865.5	55450.	14.345
144	725.00	3860.8	55450.	14.362
956	725.00	3845.3	55450.	14.420
380	725.00	3837.5	55450.	14.450
1003	725.00	3786.6	55450.	14.644
427	725.00	3780.8	55450.	14.666
1235	725.00	3757.2	55450.	14.758
1240	725.00	3757.2	55450.	14.758
717	725.00	3716.4	55450.	14.920

Table 2 (continued)

ELEM	REF TEMP	PM	ALLOW	SF
141	725.00	3713.4	55450.	14.932
922	725.00	3711.4	55450.	14.940
346	725.00	3707.8	55450.	14.955
133	725.00	3598.3	55450.	15.410
709	725.00	3590.5	55450.	15.444
396	725.00	3586.0	55450.	15.463
1004	725.00	3583.2	55450.	15.475
972	725.00	3578.5	55450.	15.495
428	725.00	3577.6	55450.	15.499
264	725.00	3574.3	55450.	15.514
840	725.00	3573.8	55450.	15.516
261	725.00	3545.2	55450.	15.641
837	725.00	3545.1	55450.	15.641
263	725.00	3384.3	55450.	16.385
839	725.00	3383.8	55450.	16.387
953	725.00	3361.8	55450.	16.494
377	725.00	3359.8	55450.	16.504
637	725.00	3303.7	55450.	16.784
61	725.00	3302.8	55450.	16.789
157	725.00	3299.4	55450.	16.806
733	725.00	3299.0	55450.	16.808
527	725.00	3276.5	55450.	16.924
1103	725.00	3275.3	55450.	16.930
1207	725.00	3257.1	55450.	17.024
1217	725.00	3249.7	55450.	17.063
385	725.00	3246.9	55450.	17.078
961	725.00	3233.2	55450.	17.150
789	725.00	3195.5	55450.	17.353
213	725.00	3194.0	55450.	17.361
384	725.00	3170.6	55450.	17.489
1224	725.00	3168.1	55450.	17.502
1229	725.00	3168.1	55450.	17.503
960	725.00	3163.8	55450.	17.527
378	725.00	3145.1	55450.	17.630
954	725.00	3138.3	55450.	17.669
761	725.00	3122.1	55450.	17.760
185	725.00	3121.9	55450.	17.761
966	725.00	3096.4	55450.	17.908
390	725.00	3082.6	55450.	17.988
1041	725.00	3026.2	55450.	18.323
465	725.00	3024.6	55450.	18.333
386	725.00	2972.9	55450.	18.652
151	725.00	2961.1	55450.	18.726
727	725.00	2959.9	55450.	18.734
962	725.00	2959.8	55450.	18.734
965	725.00	2828.9	55450.	19.601
152	725.00	2816.7	55450.	19.686
389	725.00	2815.7	55450.	19.693
728	725.00	2815.6	55450.	19.694

Table 2 (continued)

ELEM	REF TEMP	PM	ALLOW	SF
276	725.00	2808.1	55450.	19.747
852	725.00	2806.8	55450.	19.756
281	725.00	2800.3	55450.	19.801
282	725.00	2800.3	55450.	19.801
857	725.00	2799.8	55450.	19.805
858	725.00	2799.8	55450.	19.805
196	725.00	2776.1	55450.	19.974
197	725.00	2776.1	55450.	19.974
773	725.00	2774.0	55450.	19.989
772	725.00	2774.0	55450.	19.989
63	725.00	2755.9	55450.	20.120
639	725.00	2747.7	55450.	20.180
1040	725.00	2743.6	55450.	20.210
464	725.00	2742.0	55450.	20.222
62	725.00	2695.7	55450.	20.570
638	725.00	2687.7	55450.	20.631
763	725.00	2650.3	55450.	20.922
187	725.00	2648.5	55450.	20.936
275	725.00	2635.1	55450.	21.043
851	725.00	2633.9	55450.	21.052
623	725.00	2631.8	55450.	21.069
47	725.00	2631.8	55450.	21.070
198	725.00	2628.0	55450.	21.100
774	725.00	2624.2	55450.	21.130
1162	725.00	2624.0	55450.	21.132
1174	725.00	2618.0	55450.	21.180
109	725.00	2610.2	55450.	21.244
867	725.00	2608.6	55450.	21.256
291	725.00	2608.4	55450.	21.258
685	725.00	2606.3	55450.	21.275
1239	725.00	2594.6	55450.	21.371
1234	725.00	2594.6	55450.	21.371
729	725.00	2528.5	55450.	21.930
153	725.00	2528.3	55450.	21.932
1042	725.00	2521.4	55450.	21.992
466	725.00	2519.8	55450.	22.006
1190	725.00	2485.9	55450.	22.306
1191	725.00	2485.9	55450.	22.306
1189	725.00	2484.5	55450.	22.318
460	725.00	2471.4	55450.	22.437
1036	725.00	2470.0	55450.	22.449
764	725.00	2411.6	55450.	22.993
188	725.00	2409.9	55450.	23.010
660	725.00	2371.6	55450.	23.380
84	725.00	2363.7	55450.	23.459
280	725.00	2350.7	55450.	23.588
856	725.00	2350.5	55450.	23.591
1005	725.00	2330.0	55450.	23.799
429	725.00	2329.9	55450.	23.800

Table 2 (continued)

ELEM	REF TEMP	PM	ALLOW	SF
946	725.00	2317.5	55450.	23.926
370	725.00	2312.1	55450.	23.982
461	725.00	2213.0	55450.	25.056
1037	725.00	2211.7	55450.	25.071
1186	725.00	2164.1	55450.	25.623
1188	725.00	2163.9	55450.	25.625
659	725.00	2152.7	55450.	25.758
83	725.00	2145.1	55450.	25.849
1187	725.00	2124.7	55450.	26.098
583	725.00	2122.9	55450.	26.120
7	725.00	2122.1	55450.	26.129
613	725.00	2105.9	55450.	26.330
37	725.00	2105.5	55450.	26.336
48	725.00	2098.8	55450.	26.419
624	725.00	2098.3	55450.	26.427
42	725.00	2092.7	55450.	26.497
618	725.00	2092.1	55450.	26.505
945	725.00	2057.4	55450.	26.951
719	725.00	2053.2	55450.	27.007
369	725.00	2052.3	55450.	27.018
143	725.00	2048.8	55450.	27.065
848	725.00	2034.8	55450.	27.251
272	725.00	2034.7	55450.	27.252
397	725.00	2028.3	55450.	27.338
973	725.00	2025.1	55450.	27.382
517	725.00	1934.5	55450.	28.664
1093	725.00	1927.4	55450.	28.770
1209	725.00	1900.5	55450.	29.176
1210	725.00	1900.5	55450.	29.176
1195	725.00	1898.5	55450.	29.208
1196	725.00	1898.5	55450.	29.208
1197	725.00	1896.8	55450.	29.234
1219	725.00	1896.2	55450.	29.242
1220	725.00	1896.2	55450.	29.242
718	725.00	1845.2	55450.	30.051
142	725.00	1844.5	55450.	30.062
614	725.00	1835.2	55450.	30.215
38	725.00	1834.8	55450.	30.221
191	725.00	1826.7	55450.	30.356
767	725.00	1825.5	55450.	30.375
944	725.00	1807.1	55450.	30.685
78	725.00	1804.6	55450.	30.727
368	725.00	1802.3	55450.	30.766
654	725.00	1799.1	55450.	30.820
957	725.00	1771.0	55450.	31.310
381	725.00	1766.1	55450.	31.397
279	725.00	1761.4	55450.	31.481
855	725.00	1760.9	55450.	31.489
195	725.00	1721.6	55450.	32.209

Table 2 (continued)

ELEM	REF TEMP	PM	ALLOW	SF
771	725.00	1720.7	55450.	32.225
518	725.00	1697.5	55450.	32.666
1094	725.00	1690.6	55450.	32.799
1208	725.00	1637.1	55450.	33.871
1218	725.00	1636.5	55450.	33.882
943	725.00	1443.1	55450.	38.425
942	725.00	1443.1	55450.	38.425
367	725.00	1441.7	55450.	38.461
366	725.00	1441.7	55450.	38.461
1238	725.00	1432.0	55450.	38.721
1233	725.00	1432.0	55450.	38.722
274	725.00	1421.7	55450.	39.002
850	725.00	1420.8	55450.	39.027
838	725.00	1395.3	55450.	39.741
262	725.00	1395.2	55450.	39.745
383	725.00	1366.0	55450.	40.593
959	725.00	1362.1	55450.	40.710
273	725.00	1248.8	55450.	44.403
849	725.00	1247.9	55450.	44.435
941	725.00	1187.1	55450.	46.710
365	725.00	1182.3	55450.	46.899
1097	725.00	1175.1	55450.	47.188
521	725.00	1173.4	55450.	47.256
40	725.00	1102.1	55450.	50.314
39	725.00	1102.1	55450.	50.314
616	725.00	1102.1	55450.	50.315
615	725.00	1102.1	55450.	50.315
617	725.00	1050.7	55450.	52.776
41	725.00	1050.5	55450.	52.784
1147	725.00	1007.6	55450.	55.030
571	725.00	1007.6	55450.	55.034
1232	725.00	894.20	55450.	62.011
1237	725.00	894.14	55450.	62.015
658	725.00	893.01	55450.	62.093
82	725.00	887.59	55450.	62.472
765	725.00	811.56	55450.	68.325
189	725.00	810.56	55450.	68.409
387	725.00	762.81	55450.	72.692
963	725.00	756.28	55450.	73.319
657	725.00	752.84	55450.	73.655
964	725.00	749.86	55450.	73.947
388	725.00	749.10	55450.	74.022
81	725.00	747.73	55450.	74.158
1096	725.00	694.35	55450.	79.858
1095	725.00	694.35	55450.	79.858
520	725.00	691.68	55450.	80.167
519	725.00	691.68	55450.	80.167
364	725.00	675.68	55450.	82.065
940	725.00	666.47	55450.	83.199

Table 2 (continued)

ELEM	REF TEMP	PM	ALLOW	SF
958	725.00	665.71	55450.	83.295
382	725.00	663.74	55450.	83.542
656	725.00	622.48	55450.	89.079
80	725.00	617.69	55450.	89.770
190	725.00	518.96	55450.	106.85
766	725.00	518.51	55450.	106.94
462	725.00	511.11	55450.	108.49
463	725.00	511.11	55450.	108.49
1038	725.00	510.96	55450.	108.52
1039	725.00	510.96	55450.	108.52
79	725.00	387.31	55450.	143.17
655	725.00	385.23	55450.	143.94

FINITE ELEMENT ANALYSIS OF MPC-24E
(INPUT FILES AND RESULTS)

Table 3

TITLE=
MPC-24E Structural Analysis

SUBTITLE 1 =
Component: Enclosure Vessel
SUBTITLE 2 =
Load Combination: E2.a (See Table 2.1.7)
SUBTITLE 3 =
Stress Result: Primary Membrane (PM)

PRINT ELEMENT TABLE ITEMS PER ELEMENT

STAT ELEM	CURRENT REF TEMP	MIXED PM	PREVIOUS ALLOW	PREVIOUS SF
1354	450.00	6585.8	43450.	6.5976
1355	450.00	6585.7	43450.	6.5976
1353	450.00	6584.4	43450.	6.5989
1356	450.00	6584.2	43450.	6.5991
1349	450.00	6583.9	43450.	6.5994
1350	450.00	6583.5	43450.	6.5998
1348	450.00	6583.0	43450.	6.6004
1352	450.00	6581.5	43450.	6.6019
1357	450.00	6581.4	43450.	6.6019
1351	450.00	6581.4	43450.	6.6020
1347	450.00	6580.6	43450.	6.6027
1361	450.00	6578.0	43450.	6.6053
1358	450.00	6577.3	43450.	6.6061
1346	450.00	6576.9	43450.	6.6064
1362	450.00	6576.4	43450.	6.6070
1342	450.00	6575.6	43450.	6.6078
1345	450.00	6571.9	43450.	6.6115
1359	450.00	6571.8	43450.	6.6116
1363	450.00	6568.3	43450.	6.6151
1344	450.00	6568.1	43450.	6.6154
1360	450.00	6567.8	43450.	6.6156
1341	450.00	6567.7	43450.	6.6157
1343	450.00	6563.8	43450.	6.6197
1364	450.00	6558.8	43450.	6.6247
1340	450.00	6558.6	43450.	6.6249
1339	450.00	6548.0	43450.	6.6356
1365	450.00	6547.8	43450.	6.6358
1338	450.00	6536.0	43450.	6.6478
1366	450.00	6535.4	43450.	6.6484
1337	450.00	6522.7	43450.	6.6614
1367	450.00	6521.8	43450.	6.6623
1336	450.00	6508.1	43450.	6.6763
1368	450.00	6507.0	43450.	6.6774
1335	450.00	6492.4	43450.	6.6924
1369	450.00	6491.4	43450.	6.6935

Table 3 (continued)

ELEM	REF TEMP	PM	ALLOW	SF
1370	450.00	6482.2	43450.	6.7030
1334	450.00	6479.9	43450.	6.7053
1371	450.00	6472.7	43450.	6.7128
1333	450.00	6467.1	43450.	6.7186
1372	450.00	6462.9	43450.	6.7230
1332	450.00	6453.8	43450.	6.7325
1373	450.00	6452.8	43450.	6.7335
1331	450.00	6435.5	43450.	6.7516
1374	450.00	6434.5	43450.	6.7527
1330	450.00	6416.5	43450.	6.7716
1375	450.00	6415.7	43450.	6.7725
1329	450.00	6397.0	43450.	6.7922
1376	450.00	6396.5	43450.	6.7927
1328	450.00	6377.3	43450.	6.8133
1377	450.00	6377.2	43450.	6.8133
1378	450.00	6357.9	43450.	6.8340
1327	450.00	6357.4	43450.	6.8346
1379	450.00	6338.6	43450.	6.8548
1326	450.00	6337.5	43450.	6.8561
1380	450.00	6318.9	43450.	6.8762
1325	450.00	6317.8	43450.	6.8774
1381	450.00	6313.2	43450.	6.8824
1324	450.00	6312.3	43450.	6.8834
1382	450.00	6301.8	43450.	6.8949
1323	450.00	6301.7	43450.	6.8950
1322	450.00	6290.2	43450.	6.9076
1383	450.00	6288.9	43450.	6.9090
1321	450.00	6269.7	43450.	6.9302
1384	450.00	6268.8	43450.	6.9312
1320	450.00	6249.3	43450.	6.9528
1385	450.00	6249.3	43450.	6.9528
1386	450.00	6230.6	43450.	6.9736
1319	450.00	6229.7	43450.	6.9747
1387	450.00	6212.8	43450.	6.9936
1318	450.00	6210.8	43450.	6.9958
1388	450.00	6193.6	43450.	7.0153
1317	450.00	6192.9	43450.	7.0161
1316	450.00	6173.7	43450.	7.0379
1389	450.00	6173.0	43450.	7.0387
1315	450.00	6161.5	43450.	7.0519
1390	450.00	6161.5	43450.	7.0519
1241	450.00	6150.7	43450.	7.0643
1314	450.00	6149.9	43450.	7.0651
1313	450.00	6130.7	43450.	7.0872
1242	450.00	6129.8	43450.	7.0883
1312	450.00	6109.9	43450.	7.1114
1243	450.00	6107.2	43450.	7.1146
1311	450.00	6087.4	43450.	7.1377
1244	450.00	6086.1	43450.	7.1392

Table 3 (continued)

ELEM	REF TEMP	PM	ALLOW	SF
1245	450.00	6066.9	43450.	7.1618
1310	450.00	6066.5	43450.	7.1623
1246	450.00	6049.5	43450.	7.1824
1309	450.00	6047.5	43450.	7.1848
1247	450.00	6033.3	43450.	7.2017
1308	450.00	6030.3	43450.	7.2052
1248	450.00	6021.8	43450.	7.2155
1307	450.00	6021.7	43450.	7.2156
1306	450.00	6010.2	43450.	7.2293
1249	450.00	6007.1	43450.	7.2331
1305	450.00	6000.5	43450.	7.2411
1250	450.00	4822.5	43450.	9.0098
1251	450.00	4808.0	43450.	9.0370
1304	450.00	4802.1	43450.	9.0481
1303	450.00	4788.2	43450.	9.0744
1252	450.00	4786.3	43450.	9.0779
1302	450.00	4767.0	43450.	9.1147
1253	450.00	4756.9	43450.	9.1341
1301	450.00	4738.0	43450.	9.1705
1254	450.00	4734.0	43450.	9.1782
1255	450.00	4717.9	43450.	9.2097
1300	450.00	4715.6	43450.	9.2141
1256	450.00	4708.6	43450.	9.2279
1299	450.00	4700.0	43450.	9.2448
1257	450.00	4698.0	43450.	9.2486
1298	450.00	4691.2	43450.	9.2620
1297	450.00	4689.1	43450.	9.2662
1258	450.00	4688.0	43450.	9.2683
1296	450.00	4682.1	43450.	9.2799
1259	450.00	4679.9	43450.	9.2844
1295	450.00	4677.4	43450.	9.2893
1294	450.00	4670.8	43450.	9.3025
1277	450.00	-3996.7	43450.	10.871
1276	450.00	-3996.6	43450.	10.872
1281	450.00	-3904.2	43450.	11.129
1272	450.00	-3900.6	43450.	11.139
1282	450.00	-3900.2	43450.	11.140
1271	450.00	-3895.7	43450.	11.153
1280	450.00	-3891.6	43450.	11.165
1273	450.00	-3888.8	43450.	11.173
1283	450.00	-3879.5	43450.	11.200
1270	450.00	-3874.1	43450.	11.216
1278	450.00	-3870.8	43450.	11.225
1275	450.00	-3869.8	43450.	11.228
1279	450.00	-3862.2	43450.	11.250
1274	450.00	-3860.3	43450.	11.255
1285	450.00	-3601.7	43450.	12.064
1268	450.00	-3597.6	43450.	12.077
1284	450.00	-3596.6	43450.	12.081

Table 3 (continued)

ELEM	REF TEMP	PM	ALLOW	SF
1269	450.00	-3592.8	43450.	12.093
1260	450.00	1942.4	43450.	22.369
1293	450.00	1926.9	43450.	22.549
1261	450.00	1908.7	43450.	22.765
1264	450.00	1895.8	43450.	22.919
1292	450.00	1894.3	43450.	22.938
1265	450.00	1891.7	43450.	22.968
1262	450.00	1889.5	43450.	22.995
1263	450.00	1885.2	43450.	23.048
1289	450.00	1885.0	43450.	23.051
1288	450.00	1882.0	43450.	23.087
1291	450.00	1876.3	43450.	23.157
1290	450.00	1873.2	43450.	23.196
1266	450.00	1872.4	43450.	23.205
1287	450.00	1863.6	43450.	23.315
1267	450.00	1855.2	43450.	23.421
1286	450.00	1852.5	43450.	23.454

Table 4

TITLE=
MPC-24E Structural Analysis

SUBTITLE 1 =
Component: Enclosure Vessel
SUBTITLE 2 =
Load Combination: E2.a (See Table 2.1.7)
SUBTITLE 3 =
Stress Result: Primary Local Plus Primary Bending (PL+PB)

PRINT ELEMENT TABLE ITEMS PER ELEMENT

STAT ELEM	CURRENT REF TEMP	MIXED PL+PB	PREVIOUS ALLOW	PREVIOUS SF
1268	450.00	23100.	65200.	2.8225
1285	450.00	23097.	65200.	2.8229
1269	450.00	23091.	65200.	2.8236
1284	450.00	23088.	65200.	2.8240
1278	450.00	20707.	65200.	3.1486
1275	450.00	20707.	65200.	3.1488
1279	450.00	20700.	65200.	3.1498
1274	450.00	20699.	65200.	3.1499
1281	450.00	15602.	65200.	4.1791
1282	450.00	15601.	65200.	4.1791
1272	450.00	15601.	65200.	4.1792
1271	450.00	15601.	65200.	4.1793
1280	450.00	12512.	65200.	5.2110
1273	450.00	12512.	65200.	5.2110
1288	450.00	12292.	65200.	5.3043
1289	450.00	12285.	65200.	5.3073
1283	450.00	12218.	65200.	5.3362
1270	450.00	12217.	65200.	5.3367
1265	450.00	12179.	65200.	5.3535
1264	450.00	12172.	65200.	5.3565
1294	450.00	11921.	65200.	5.4692
1295	450.00	11919.	65200.	5.4701
1259	450.00	11627.	65200.	5.6075
1292	450.00	10655.	65200.	6.1190
1291	450.00	10650.	65200.	6.1220
1261	450.00	10485.	65200.	6.2185
1262	450.00	10479.	65200.	6.2217
1258	450.00	10251.	65200.	6.3607
1290	450.00	9911.8	65200.	6.5780
1296	450.00	9837.0	65200.	6.6280
1263	450.00	9835.2	65200.	6.6293
1276	450.00	9380.7	65200.	6.9504
1277	450.00	9380.4	65200.	6.9507
1303	450.00	9259.2	65200.	7.0417
1302	450.00	9258.0	65200.	7.0426

Table 4 (continued)

ELEM	REF TEMP	PM	ALLOW	SF
1251	450.00	9175.5	65200.	7.1059
1252	450.00	9174.3	65200.	7.1068
1353	450.00	8938.2	65200.	7.2945
1350	450.00	8937.6	65200.	7.2950
1352	450.00	8935.0	65200.	7.2971
1351	450.00	8934.5	65200.	7.2976
1260	450.00	8901.4	65200.	7.3247
1257	450.00	8578.9	65200.	7.6001
1297	450.00	8561.9	65200.	7.6151
1293	450.00	8542.5	65200.	7.6324
1256	450.00	8329.4	65200.	7.8277
1299	450.00	8328.1	65200.	7.8289
1300	450.00	8325.7	65200.	7.8312
1255	450.00	8213.7	65200.	7.9379
1254	450.00	8211.2	65200.	7.9404
1327	450.00	8181.7	65200.	7.9690
1328	450.00	8181.6	65200.	7.9691
1377	450.00	8181.1	65200.	7.9696
1376	450.00	8181.0	65200.	7.9696
1329	450.00	8129.4	65200.	8.0203
1375	450.00	8129.1	65200.	8.0205
1364	450.00	8113.3	65200.	8.0362
1365	450.00	8113.1	65200.	8.0364
1339	450.00	8112.8	65200.	8.0367
1338	450.00	8112.6	65200.	8.0369
1363	450.00	8110.6	65200.	8.0389
1340	450.00	8109.5	65200.	8.0400
1301	450.00	8091.4	65200.	8.0580
1298	450.00	8082.1	65200.	8.0672
1253	450.00	8042.9	65200.	8.1066
1326	450.00	8032.1	65200.	8.1174
1378	450.00	8031.1	65200.	8.1185
1337	450.00	7960.0	65200.	8.1910
1366	450.00	7960.0	65200.	8.1910
1362	450.00	7929.1	65200.	8.2229
1341	450.00	7927.3	65200.	8.2248
1374	450.00	7916.3	65200.	8.2362
1330	450.00	7916.2	65200.	8.2362
1354	450.00	7900.9	65200.	8.2523
1349	450.00	7900.6	65200.	8.2525
1248	450.00	7777.3	65200.	8.3834
1247	450.00	7777.1	65200.	8.3836
1306	450.00	7775.5	65200.	8.3853
1307	450.00	7775.3	65200.	8.3855
1336	450.00	7677.6	65200.	8.4923
1367	450.00	7677.1	65200.	8.4928
1325	450.00	7638.1	65200.	8.5362
1379	450.00	7636.5	65200.	8.5379
1373	450.00	7583.0	65200.	8.5982

Table 4 (continued)

ELEM	REF TEMP	PM	ALLOW	SF
1331	450.00	7582.8	65200.	8.5984
1361	450.00	7548.6	65200.	8.6374
1342	450.00	7546.0	65200.	8.6403
1358	450.00	7520.1	65200.	8.6701
1359	450.00	7520.0	65200.	8.6702
1345	450.00	7518.0	65200.	8.6725
1344	450.00	7518.0	65200.	8.6726
1360	450.00	7476.7	65200.	8.7204
1343	450.00	7474.2	65200.	8.7233
1357	450.00	7448.9	65200.	8.7530
1346	450.00	7447.4	65200.	8.7547
1313	450.00	7336.9	65200.	8.8866
1241	450.00	7336.4	65200.	8.8872
1312	450.00	7336.1	65200.	8.8876
1242	450.00	7335.6	65200.	8.8881
1335	450.00	7293.7	65200.	8.9393
1368	450.00	7292.9	65200.	8.9402
1309	450.00	7200.9	65200.	9.0545
1310	450.00	7200.4	65200.	9.0551
1245	450.00	7200.2	65200.	9.0553
1244	450.00	7199.8	65200.	9.0558
1356	450.00	7194.3	65200.	9.0627
1347	450.00	7193.3	65200.	9.0640
1319	450.00	7171.8	65200.	9.0911
1320	450.00	7171.8	65200.	9.0912
1385	450.00	7170.8	65200.	9.0924
1384	450.00	7170.8	65200.	9.0925
1372	450.00	7168.4	65200.	9.0955
1332	450.00	7168.3	65200.	9.0956
1316	450.00	7160.8	65200.	9.1051
1388	450.00	7160.1	65200.	9.1060
1317	450.00	7160.0	65200.	9.1061
1387	450.00	7159.4	65200.	9.1070
1311	450.00	7073.2	65200.	9.2179
1243	450.00	7072.9	65200.	9.2183
1348	450.00	7061.4	65200.	9.2332
1355	450.00	7061.3	65200.	9.2335
1321	450.00	7033.9	65200.	9.2694
1383	450.00	7032.3	65200.	9.2716
1324	450.00	6956.0	65200.	9.3732
1380	450.00	6953.8	65200.	9.3761
1318	450.00	6938.8	65200.	9.3964
1386	450.00	6938.4	65200.	9.3970
1371	450.00	6916.8	65200.	9.4263
1305	450.00	6902.1	65200.	9.4464
1249	450.00	6885.3	65200.	9.4694
1286	450.00	6862.4	65200.	9.5011
1267	450.00	6845.0	65200.	9.5252
1334	450.00	6838.9	65200.	9.5337

Table 4 (continued)

ELEM	REF TEMP	PM	ALLOW	SF
1369	450.00	6838.0	65200.	9.5350
1333	450.00	6830.7	65200.	9.5451
1314	450.00	6710.1	65200.	9.7168
1390	450.00	6709.4	65200.	9.7176
1323	450.00	6674.7	65200.	9.7682
1381	450.00	6672.3	65200.	9.7717
1246	450.00	6663.0	65200.	9.7854
1308	450.00	6661.6	65200.	9.7875
1315	450.00	6658.6	65200.	9.7918
1370	450.00	6658.3	65200.	9.7923
1389	450.00	6658.0	65200.	9.7928
1322	450.00	6556.5	65200.	9.9444
1382	450.00	6554.1	65200.	9.9479
1304	450.00	5724.7	65200.	11.389
1250	450.00	5707.5	65200.	11.424
1287	450.00	5496.8	65200.	11.861
1266	450.00	5451.9	65200.	11.959

Table 5

TITLE=
MPC-24E Structural Analysis

SUBTITLE 1 =
Component: Fuel Basket
SUBTITLE 2 =
Load Combination: F2.b (See Table 2.1.6)
SUBTITLE 3 =
Stress Result: Primary Membrane (PM)

PRINT ELEMENT TABLE ITEMS PER ELEMENT

STAT ELEM	CURRENT REF TEMP	CURRENT PM	PREVIOUS ALLOW	PREVIOUS SF
558	725.00	-7020.5	36950.	5.2631
396	725.00	-7020.5	36950.	5.2631
559	725.00	-7002.1	36950.	5.2770
397	725.00	-7002.1	36950.	5.2770
560	725.00	-6982.1	36950.	5.2921
398	725.00	-6982.1	36950.	5.2921
561	725.00	-6962.1	36950.	5.3073
399	725.00	-6962.1	36950.	5.3073
562	725.00	-6960.3	36950.	5.3087
400	725.00	-6960.3	36950.	5.3087
563	725.00	-6958.4	36950.	5.3101
401	725.00	-6958.4	36950.	5.3101
564	725.00	-6945.6	36950.	5.3199
402	725.00	-6945.6	36950.	5.3199
1134	725.00	-6677.4	36950.	5.5336
108	725.00	-6677.4	36950.	5.5336
1135	725.00	-6659.0	36950.	5.5489
109	725.00	-6659.0	36950.	5.5489
1136	725.00	-6639.0	36950.	5.5656
110	725.00	-6639.0	36950.	5.5656
1137	725.00	-6619.0	36950.	5.5824
111	725.00	-6619.0	36950.	5.5824
1138	725.00	-6617.2	36950.	5.5840
112	725.00	-6617.2	36950.	5.5840
1139	725.00	-6615.3	36950.	5.5855
113	725.00	-6615.3	36950.	5.5855
1140	725.00	-6602.5	36950.	5.5964
114	725.00	-6602.5	36950.	5.5964
363	725.00	-6175.3	36950.	5.9835
441	725.00	-6175.3	36950.	5.9835
362	725.00	-6173.5	36950.	5.9852
440	725.00	-6173.5	36950.	5.9852
361	725.00	-6160.7	36950.	5.9977
439	725.00	-6160.7	36950.	5.9977
75	725.00	-6123.7	36950.	6.0340

Table 5 (continued)

ELEM	REF TEMP	PM	ALLOW	SF
1017	725.00	-6123.7	36950.	6.0340
74	725.00	-6121.8	36950.	6.0358
1016	725.00	-6121.8	36950.	6.0358
1015	725.00	-6109.0	36950.	6.0484
73	725.00	-6109.0	36950.	6.0484
1014	725.00	-5620.9	36950.	6.5737
72	725.00	-5620.9	36950.	6.5737
1013	725.00	-5618.7	36950.	6.5763
71	725.00	-5618.7	36950.	6.5763
1012	725.00	-5594.1	36950.	6.6052
70	725.00	-5594.1	36950.	6.6052
1011	725.00	-5569.5	36950.	6.6344
69	725.00	-5569.5	36950.	6.6344
1010	725.00	-5544.9	36950.	6.6638
68	725.00	-5544.9	36950.	6.6638
67	725.00	-5520.3	36950.	6.6935
1009	725.00	-5520.3	36950.	6.6935
360	725.00	-5487.5	36950.	6.7334
438	725.00	-5487.5	36950.	6.7334
359	725.00	-5485.3	36950.	6.7362
437	725.00	-5485.3	36950.	6.7362
358	725.00	-5460.7	36950.	6.7666
436	725.00	-5460.7	36950.	6.7666
357	725.00	-5436.1	36950.	6.7972
435	725.00	-5436.1	36950.	6.7972
356	725.00	-5411.5	36950.	6.8281
434	725.00	-5411.5	36950.	6.8281
355	725.00	-5386.9	36950.	6.8593
433	725.00	-5386.9	36950.	6.8593
892	725.00	-4681.8	36950.	7.8923
10	725.00	-4681.8	36950.	7.8923
893	725.00	-4679.5	36950.	7.8961
11	725.00	-4679.5	36950.	7.8961
298	725.00	-4674.4	36950.	7.9047
316	725.00	-4674.4	36950.	7.9047
299	725.00	-4672.2	36950.	7.9085
317	725.00	-4672.2	36950.	7.9085
894	725.00	-4654.9	36950.	7.9378
12	725.00	-4654.9	36950.	7.9378
300	725.00	-4647.6	36950.	7.9504
318	725.00	-4647.6	36950.	7.9504
13	725.00	-4630.3	36950.	7.9800
895	725.00	-4630.3	36950.	7.9800
301	725.00	-4623.0	36950.	7.9927
319	725.00	-4623.0	36950.	7.9927
896	725.00	-4605.7	36950.	8.0226
14	725.00	-4605.7	36950.	8.0226
302	725.00	-4598.4	36950.	8.0354
320	725.00	-4598.4	36950.	8.0354

Table 5 (continued)

ELEM	REF TEMP	PM	ALLOW	SF
15	725.00	-4581.1	36950.	8.0657
897	725.00	-4581.1	36950.	8.0657
898	725.00	-4578.2	36950.	8.0708
16	725.00	-4578.2	36950.	8.0708
17	725.00	-4576.4	36950.	8.0741
899	725.00	-4576.4	36950.	8.0741
303	725.00	-4573.8	36950.	8.0787
321	725.00	-4573.8	36950.	8.0787
18	725.00	-4563.6	36950.	8.0967
900	725.00	-4563.6	36950.	8.0967
304	725.00	-4437.1	36950.	8.3275
322	725.00	-4437.1	36950.	8.3275
305	725.00	-4435.3	36950.	8.3309
323	725.00	-4435.3	36950.	8.3309
324	725.00	-4422.4	36950.	8.3551
306	725.00	-4422.4	36950.	8.3551
364	725.00	-4293.3	36950.	8.6064
442	725.00	-4293.3	36950.	8.6064
365	725.00	-4291.5	36950.	8.6101
443	725.00	-4291.5	36950.	8.6101
366	725.00	-4271.5	36950.	8.6504
444	725.00	-4271.5	36950.	8.6504
367	725.00	-4251.5	36950.	8.6911
445	725.00	-4251.5	36950.	8.6911
368	725.00	-4231.5	36950.	8.7322
446	725.00	-4231.5	36950.	8.7322
390	725.00	-4218.2	36950.	8.7596
552	725.00	-4218.2	36950.	8.7596
389	725.00	-4216.0	36950.	8.7643
551	725.00	-4216.0	36950.	8.7643
369	725.00	-4211.4	36950.	8.7737
447	725.00	-4211.4	36950.	8.7737
370	725.00	-4209.6	36950.	8.7775
448	725.00	-4209.6	36950.	8.7775
371	725.00	-4207.8	36950.	8.7813
449	725.00	-4207.8	36950.	8.7813
372	725.00	-4195.0	36950.	8.8082
450	725.00	-4195.0	36950.	8.8082
388	725.00	-4191.4	36950.	8.8157
550	725.00	-4191.4	36950.	8.8157
387	725.00	-4166.8	36950.	8.8678
549	725.00	-4166.8	36950.	8.8678
386	725.00	-4142.2	36950.	8.9204
548	725.00	-4142.2	36950.	8.9204
1075	725.00	-4136.5	36950.	8.9327
193	725.00	-4136.5	36950.	8.9327
1076	725.00	-4134.3	36950.	8.9375
194	725.00	-4134.3	36950.	8.9375
385	725.00	-4117.6	36950.	8.9737

Table 5 (continued)

ELEM	REF TEMP	PM	ALLOW	SF
547	725.00	-4117.6	36950.	8.9737
1128	725.00	-4110.0	36950.	8.9903
102	725.00	-4110.0	36950.	8.9903
1077	725.00	-4109.7	36950.	8.9910
195	725.00	-4109.7	36950.	8.9910
1127	725.00	-4107.7	36950.	8.9952
101	725.00	-4107.7	36950.	8.9952
1078	725.00	-4085.1	36950.	9.0452
196	725.00	-4085.1	36950.	9.0452
1126	725.00	-4083.1	36950.	9.0494
100	725.00	-4083.1	36950.	9.0494
1079	725.00	-4060.5	36950.	9.1000
197	725.00	-4060.5	36950.	9.1000
1125	725.00	-4058.5	36950.	9.1043
99	725.00	-4058.5	36950.	9.1043
1124	725.00	-4033.9	36950.	9.1598
98	725.00	-4033.9	36950.	9.1598
1080	725.00	-4032.4	36950.	9.1632
198	725.00	-4032.4	36950.	9.1632
1123	725.00	-4009.3	36950.	9.2160
97	725.00	-4009.3	36950.	9.2160
1168	725.00	-3925.2	36950.	9.4134
1180	725.00	-3925.2	36950.	9.4134
1169	725.00	-3923.4	36950.	9.4178
1181	725.00	-3923.4	36950.	9.4178
499	725.00	-3917.6	36950.	9.4319
481	725.00	-3917.6	36950.	9.4319
500	725.00	-3915.3	36950.	9.4373
482	725.00	-3915.3	36950.	9.4373
1081	725.00	-3913.0	36950.	9.4428
199	725.00	-3913.0	36950.	9.4428
1082	725.00	-3911.2	36950.	9.4473
200	725.00	-3911.2	36950.	9.4473
1182	725.00	-3910.6	36950.	9.4487
1170	725.00	-3910.6	36950.	9.4487
1083	725.00	-3901.1	36950.	9.4716
201	725.00	-3901.1	36950.	9.4716
501	725.00	-3890.7	36950.	9.4970
483	725.00	-3890.7	36950.	9.4970
502	725.00	-3866.1	36950.	9.5574
484	725.00	-3866.1	36950.	9.5574
503	725.00	-3841.5	36950.	9.6186
485	725.00	-3841.5	36950.	9.6186
505	725.00	-3818.2	36950.	9.6775
487	725.00	-3818.2	36950.	9.6775
506	725.00	-3816.3	36950.	9.6821
488	725.00	-3816.3	36950.	9.6821
486	725.00	-3813.5	36950.	9.6893
504	725.00	-3813.5	36950.	9.6893

Table 5 (continued)

ELEM	REF TEMP	PM	ALLOW	SF
507	725.00	-3806.3	36950.	9.7077
489	725.00	-3806.3	36950.	9.7077
1018	725.00	-3716.6	36950.	9.9419
76	725.00	-3716.6	36950.	9.9419
1019	725.00	-3714.8	36950.	9.9468
77	725.00	-3714.8	36950.	9.9468
1020	725.00	-3694.8	36950.	10.001
78	725.00	-3694.8	36950.	10.001
1156	725.00	-3683.6	36950.	10.031
1192	725.00	-3683.6	36950.	10.031
1193	725.00	-3681.8	36950.	10.036
1157	725.00	-3681.8	36950.	10.036
1021	725.00	-3674.8	36950.	10.055
79	725.00	-3674.8	36950.	10.055
1158	725.00	-3669.0	36950.	10.071
1194	725.00	-3669.0	36950.	10.071
1022	725.00	-3654.8	36950.	10.110
80	725.00	-3654.8	36950.	10.110
1023	725.00	-3634.7	36950.	10.166
81	725.00	-3634.7	36950.	10.166
1024	725.00	-3632.9	36950.	10.171
82	725.00	-3632.9	36950.	10.171
1025	725.00	-3631.1	36950.	10.176
83	725.00	-3631.1	36950.	10.176
1026	725.00	-3618.3	36950.	10.212
84	725.00	-3618.3	36950.	10.212
891	725.00	-3406.2	36950.	10.848
9	725.00	-3406.2	36950.	10.848
890	725.00	-3404.3	36950.	10.854
8	725.00	-3404.3	36950.	10.854
889	725.00	-3391.5	36950.	10.895
7	725.00	-3391.5	36950.	10.895
612	725.00	-3203.9	36950.	11.533
594	725.00	-3203.9	36950.	11.533
593	725.00	-3202.1	36950.	11.539
611	725.00	-3202.1	36950.	11.539
592	725.00	-3189.3	36950.	11.586
610	725.00	-3189.3	36950.	11.586
930	725.00	-3109.2	36950.	11.884
180	725.00	-3109.2	36950.	11.884
929	725.00	-3107.4	36950.	11.891
179	725.00	-3107.4	36950.	11.891
297	725.00	-3107.2	36950.	11.892
315	725.00	-3107.2	36950.	11.892
296	725.00	-3105.3	36950.	11.899
314	725.00	-3105.3	36950.	11.899
468	725.00	-3101.5	36950.	11.914
354	725.00	-3101.5	36950.	11.914
467	725.00	-3099.7	36950.	11.921

Table 5 (continued)

ELEM	REF TEMP	PM	ALLOW	SF
353	725.00	-3099.7	36950.	11.921
928	725.00	-3094.5	36950.	11.940
178	725.00	-3094.5	36950.	11.940
295	725.00	-3092.5	36950.	11.948
313	725.00	-3092.5	36950.	11.948
466	725.00	-3086.8	36950.	11.970
352	725.00	-3086.8	36950.	11.970
882	725.00	-2978.8	36950.	12.404
36	725.00	-2978.8	36950.	12.404
881	725.00	-2977.0	36950.	12.412
35	725.00	-2977.0	36950.	12.412
34	725.00	-2964.1	36950.	12.466
880	725.00	-2964.1	36950.	12.466
888	725.00	-2727.4	36950.	13.548
6	725.00	-2727.4	36950.	13.548
887	725.00	-2725.2	36950.	13.559
5	725.00	-2725.2	36950.	13.559
886	725.00	-2700.6	36950.	13.682
4	725.00	-2700.6	36950.	13.682
885	725.00	-2676.0	36950.	13.808
3	725.00	-2676.0	36950.	13.808
884	725.00	-2651.4	36950.	13.936
2	725.00	-2651.4	36950.	13.936
883	725.00	-2626.8	36950.	14.067
1	725.00	-2626.8	36950.	14.067
294	725.00	-2588.5	36950.	14.275
312	725.00	-2588.5	36950.	14.275
293	725.00	-2586.2	36950.	14.287
311	725.00	-2586.2	36950.	14.287
1189	725.00	-2585.5	36950.	14.291
1153	725.00	-2585.5	36950.	14.291
1190	725.00	-2583.7	36950.	14.301
1154	725.00	-2583.7	36950.	14.301
465	725.00	-2582.1	36950.	14.310
351	725.00	-2582.1	36950.	14.310
464	725.00	-2579.8	36950.	14.323
350	725.00	-2579.8	36950.	14.323
1191	725.00	-2570.8	36950.	14.373
1155	725.00	-2570.8	36950.	14.373
292	725.00	-2561.6	36950.	14.424
310	725.00	-2561.6	36950.	14.424
463	725.00	-2555.2	36950.	14.461
349	725.00	-2555.2	36950.	14.461
291	725.00	-2537.0	36950.	14.564
309	725.00	-2537.0	36950.	14.564
462	725.00	-2530.6	36950.	14.601
348	725.00	-2530.6	36950.	14.601
290	725.00	-2512.4	36950.	14.707
308	725.00	-2512.4	36950.	14.707

Table 5 (continued)

ELEM	REF TEMP	PM	ALLOW	SF
461	725.00	-2506.0	36950.	14.744
347	725.00	-2506.0	36950.	14.744
591	725.00	-2503.4	36950.	14.760
609	725.00	-2503.4	36950.	14.760
590	725.00	-2501.2	36950.	14.773
608	725.00	-2501.2	36950.	14.773
289	725.00	-2487.8	36950.	14.852
307	725.00	-2487.8	36950.	14.852
879	725.00	-2481.6	36950.	14.889
33	725.00	-2481.6	36950.	14.889
460	725.00	-2481.4	36950.	14.891
346	725.00	-2481.4	36950.	14.891
878	725.00	-2479.4	36950.	14.903
32	725.00	-2479.4	36950.	14.903
589	725.00	-2476.6	36950.	14.920
607	725.00	-2476.6	36950.	14.920
877	725.00	-2454.8	36950.	15.052
31	725.00	-2454.8	36950.	15.052
588	725.00	-2452.0	36950.	15.070
606	725.00	-2452.0	36950.	15.070
927	725.00	-2448.3	36950.	15.092
177	725.00	-2448.3	36950.	15.092
926	725.00	-2446.1	36950.	15.106
176	725.00	-2446.1	36950.	15.106
876	725.00	-2430.2	36950.	15.205
30	725.00	-2430.2	36950.	15.205
605	725.00	-2427.4	36950.	15.222
587	725.00	-2427.4	36950.	15.222
925	725.00	-2421.5	36950.	15.259
175	725.00	-2421.5	36950.	15.259
875	725.00	-2405.6	36950.	15.360
29	725.00	-2405.6	36950.	15.360
586	725.00	-2402.8	36950.	15.378
604	725.00	-2402.8	36950.	15.378
924	725.00	-2396.9	36950.	15.416
174	725.00	-2396.9	36950.	15.416
874	725.00	-2381.0	36950.	15.519
28	725.00	-2381.0	36950.	15.519
1159	725.00	-2376.6	36950.	15.548
1195	725.00	-2376.6	36950.	15.548
1196	725.00	-2374.7	36950.	15.560
1160	725.00	-2374.7	36950.	15.560
923	725.00	-2372.3	36950.	15.576
173	725.00	-2372.3	36950.	15.576
1161	725.00	-2361.9	36950.	15.644
1197	725.00	-2361.9	36950.	15.644
922	725.00	-2347.7	36950.	15.739
172	725.00	-2347.7	36950.	15.739
1165	725.00	-2257.9	36950.	16.365

Table 5 (continued)

ELEM	REF TEMP	PM	ALLOW	SF
1177	725.00	-2257.9	36950.	16.365
1166	725.00	-2256.1	36950.	16.378
1178	725.00	-2256.1	36950.	16.378
1167	725.00	-2243.3	36950.	16.471
1179	725.00	-2243.3	36950.	16.471
1171	725.00	-2238.7	36950.	16.505
1183	725.00	-2238.7	36950.	16.505
1172	725.00	-2236.9	36950.	16.519
1184	725.00	-2236.9	36950.	16.519
1173	725.00	-2224.0	36950.	16.614
1185	725.00	-2224.0	36950.	16.614
595	725.00	-1962.4	36950.	18.829
577	725.00	-1962.4	36950.	18.829
596	725.00	-1960.2	36950.	18.850
578	725.00	-1960.2	36950.	18.850
597	725.00	-1935.6	36950.	19.090
579	725.00	-1935.6	36950.	19.090
598	725.00	-1911.0	36950.	19.335
580	725.00	-1911.0	36950.	19.335
599	725.00	-1886.4	36950.	19.588
581	725.00	-1886.4	36950.	19.588
600	725.00	-1861.8	36950.	19.846
582	725.00	-1861.8	36950.	19.846
601	725.00	-1836.9	36950.	20.116
583	725.00	-1836.9	36950.	20.116
602	725.00	-1835.1	36950.	20.136
584	725.00	-1835.1	36950.	20.136
603	725.00	-1822.2	36950.	20.277
585	725.00	-1822.2	36950.	20.277
1036	725.00	-1744.0	36950.	21.187
58	725.00	-1744.0	36950.	21.187
1037	725.00	-1741.7	36950.	21.215
59	725.00	-1741.7	36950.	21.215
1038	725.00	-1717.1	36950.	21.519
60	725.00	-1717.1	36950.	21.519
643	725.00	-1707.1	36950.	21.645
721	725.00	-1707.1	36950.	21.645
722	725.00	-1704.8	36950.	21.674
644	725.00	-1704.8	36950.	21.674
1039	725.00	-1692.5	36950.	21.831
61	725.00	-1692.5	36950.	21.831
723	725.00	-1680.2	36950.	21.991
645	725.00	-1680.2	36950.	21.991
1040	725.00	-1667.9	36950.	22.153
62	725.00	-1667.9	36950.	22.153
646	725.00	-1655.6	36950.	22.318
724	725.00	-1655.6	36950.	22.318
1041	725.00	-1643.3	36950.	22.485
63	725.00	-1643.3	36950.	22.485

Table 5 (continued)

ELEM	REF TEMP	PM	ALLOW	SF
725	725.00	-1631.0	36950.	22.655
647	725.00	-1631.0	36950.	22.655
648	725.00	-1606.4	36950.	23.002
726	725.00	-1606.4	36950.	23.002
634	725.00	-1604.2	36950.	23.034
748	725.00	-1604.2	36950.	23.034
635	725.00	-1601.9	36950.	23.066
749	725.00	-1601.9	36950.	23.066
64	725.00	-1585.7	36950.	23.302
1042	725.00	-1585.7	36950.	23.302
1043	725.00	-1583.9	36950.	23.329
65	725.00	-1583.9	36950.	23.329
636	725.00	-1577.3	36950.	23.426
750	725.00	-1577.3	36950.	23.426
66	725.00	-1571.1	36950.	23.519
1044	725.00	-1571.1	36950.	23.519
145	725.00	-1566.1	36950.	23.593
931	725.00	-1566.1	36950.	23.593
865	725.00	-1564.8	36950.	23.613
19	725.00	-1564.8	36950.	23.613
932	725.00	-1563.9	36950.	23.627
146	725.00	-1563.9	36950.	23.627
866	725.00	-1562.6	36950.	23.647
20	725.00	-1562.6	36950.	23.647
637	725.00	-1552.7	36950.	23.797
751	725.00	-1552.7	36950.	23.797
933	725.00	-1539.3	36950.	24.004
147	725.00	-1539.3	36950.	24.004
867	725.00	-1538.0	36950.	24.025
21	725.00	-1538.0	36950.	24.025
638	725.00	-1528.1	36950.	24.180
752	725.00	-1528.1	36950.	24.180
934	725.00	-1514.7	36950.	24.394
148	725.00	-1514.7	36950.	24.394
868	725.00	-1513.4	36950.	24.416
22	725.00	-1513.4	36950.	24.416
639	725.00	-1503.5	36950.	24.575
753	725.00	-1503.5	36950.	24.575
640	725.00	-1496.8	36950.	24.686
754	725.00	-1496.8	36950.	24.686
641	725.00	-1495.0	36950.	24.716
755	725.00	-1495.0	36950.	24.716
935	725.00	-1490.1	36950.	24.797
149	725.00	-1490.1	36950.	24.797
869	725.00	-1488.8	36950.	24.819
23	725.00	-1488.8	36950.	24.819
649	725.00	-1487.5	36950.	24.841
727	725.00	-1487.5	36950.	24.841
728	725.00	-1485.6	36950.	24.872

Table 5 (continued)

ELEM	REF TEMP	PM	ALLOW	SF
650	725.00	-1485.6	36950.	24.872
642	725.00	-1482.1	36950.	24.930
756	725.00	-1482.1	36950.	24.930
651	725.00	-1472.8	36950.	25.088
729	725.00	-1472.8	36950.	25.088
150	725.00	-1465.5	36950.	25.213
936	725.00	-1465.5	36950.	25.213
937	725.00	-1464.6	36950.	25.228
151	725.00	-1464.6	36950.	25.228
870	725.00	-1464.2	36950.	25.236
24	725.00	-1464.2	36950.	25.236
938	725.00	-1462.8	36950.	25.260
152	725.00	-1462.8	36950.	25.260
153	725.00	-1450.0	36950.	25.483
939	725.00	-1450.0	36950.	25.483
871	725.00	-1347.4	36950.	27.424
25	725.00	-1347.4	36950.	27.424
872	725.00	-1345.6	36950.	27.461
26	725.00	-1345.6	36950.	27.461
873	725.00	-1332.7	36950.	27.725
27	725.00	-1332.7	36950.	27.725
948	725.00	-1021.3	36950.	36.181
162	725.00	-1021.3	36950.	36.181
947	725.00	-1019.4	36950.	36.246
161	725.00	-1019.4	36950.	36.246
946	725.00	-1006.6	36950.	36.707
160	725.00	-1006.6	36950.	36.707
159	725.00	-1004.8	36950.	36.774
945	725.00	-1004.8	36950.	36.774
944	725.00	-1003.0	36950.	36.841
158	725.00	-1003.0	36950.	36.841
943	725.00	-982.95	36950.	37.591
157	725.00	-982.95	36950.	37.591
942	725.00	-962.95	36950.	38.372
156	725.00	-962.95	36950.	38.372
432	725.00	-950.47	36950.	38.876
570	725.00	-950.47	36950.	38.876
941	725.00	-942.94	36950.	39.186
155	725.00	-942.94	36950.	39.186
431	725.00	-930.34	36950.	39.717
569	725.00	-930.34	36950.	39.717
940	725.00	-922.93	36950.	40.035
154	725.00	-922.93	36950.	40.035
430	725.00	-910.21	36950.	40.595
568	725.00	-910.21	36950.	40.595
282	725.00	-910.05	36950.	40.602
1008	725.00	-910.05	36950.	40.602
429	725.00	-890.08	36950.	41.513
567	725.00	-890.08	36950.	41.513

Table 5 (continued)

ELEM	REF TEMP	PM	ALLOW	SF
1007	725.00	-889.92	36950.	41.521
281	725.00	-889.92	36950.	41.521
428	725.00	-869.95	36950.	42.474
566	725.00	-869.95	36950.	42.474
1006	725.00	-869.79	36950.	42.482
280	725.00	-869.79	36950.	42.482
795	725.00	-856.20	36950.	43.156
777	725.00	-856.20	36950.	43.156
794	725.00	-854.38	36950.	43.248
776	725.00	-854.38	36950.	43.248
427	725.00	-849.82	36950.	43.480
565	725.00	-849.82	36950.	43.480
1005	725.00	-849.66	36950.	43.488
279	725.00	-849.66	36950.	43.488
793	725.00	-844.32	36950.	43.763
775	725.00	-844.32	36950.	43.763
1004	725.00	-829.53	36950.	44.543
278	725.00	-829.53	36950.	44.543
1162	725.00	-822.73	36950.	44.911
1198	725.00	-822.73	36950.	44.911
138	725.00	-822.16	36950.	44.942
1152	725.00	-822.16	36950.	44.942
1163	725.00	-820.90	36950.	45.011
1199	725.00	-820.90	36950.	45.011
277	725.00	-809.40	36950.	45.651
1003	725.00	-809.40	36950.	45.651
1164	725.00	-808.08	36950.	45.726
1200	725.00	-808.08	36950.	45.726
1065	725.00	-805.58	36950.	45.868
219	725.00	-805.58	36950.	45.868
738	725.00	-804.11	36950.	45.951
660	725.00	-804.11	36950.	45.951
218	725.00	-803.75	36950.	45.972
1064	725.00	-803.75	36950.	45.972
737	725.00	-802.28	36950.	46.056
659	725.00	-802.28	36950.	46.056
1063	725.00	-793.70	36950.	46.554
217	725.00	-793.70	36950.	46.554
658	725.00	-789.46	36950.	46.804
736	725.00	-789.46	36950.	46.804
735	725.00	-787.63	36950.	46.913
657	725.00	-787.63	36950.	46.913
734	725.00	-785.81	36950.	47.022
656	725.00	-785.81	36950.	47.022
733	725.00	-765.80	36950.	48.250
655	725.00	-765.80	36950.	48.250
805	725.00	760.33	36950.	48.597
811	725.00	760.33	36950.	48.597
812	725.00	758.08	36950.	48.741

Table 5 (continued)

ELEM	REF TEMP	PM	ALLOW	SF
806	725.00	758.08	36950.	48.741
732	725.00	-745.79	36950.	49.545
654	725.00	-745.79	36950.	49.545
85	725.00	744.33	36950.	49.642
1051	725.00	744.33	36950.	49.642
86	725.00	742.09	36950.	49.792
1052	725.00	742.09	36950.	49.792
91	725.00	738.75	36950.	50.017
1045	725.00	738.75	36950.	50.017
813	725.00	737.95	36950.	50.071
807	725.00	737.95	36950.	50.071
1174	725.00	-736.64	36950.	50.161
1186	725.00	-736.64	36950.	50.161
92	725.00	736.50	36950.	50.170
1046	725.00	736.50	36950.	50.170
1175	725.00	-734.81	36950.	50.285
1187	725.00	-734.81	36950.	50.285
731	725.00	-725.79	36950.	50.910
653	725.00	-725.79	36950.	50.910
331	725.00	722.81	36950.	51.120
325	725.00	722.81	36950.	51.120
1176	725.00	-721.99	36950.	51.178
1188	725.00	-721.99	36950.	51.178
87	725.00	721.96	36950.	51.180
1053	725.00	721.96	36950.	51.180
326	725.00	720.56	36950.	51.280
332	725.00	720.56	36950.	51.280
808	725.00	717.82	36950.	51.475
814	725.00	717.82	36950.	51.475
1047	725.00	716.37	36950.	51.579
93	725.00	716.37	36950.	51.579
730	725.00	-705.78	36950.	52.353
652	725.00	-705.78	36950.	52.353
1054	725.00	701.83	36950.	52.648
88	725.00	701.83	36950.	52.648
327	725.00	700.43	36950.	52.753
333	725.00	700.43	36950.	52.753
809	725.00	697.69	36950.	52.960
815	725.00	697.69	36950.	52.960
1048	725.00	696.24	36950.	53.071
94	725.00	696.24	36950.	53.071
1055	725.00	681.70	36950.	54.203
89	725.00	681.70	36950.	54.203
334	725.00	680.30	36950.	54.314
328	725.00	680.30	36950.	54.314
816	725.00	677.57	36950.	54.533
810	725.00	677.57	36950.	54.533
95	725.00	676.11	36950.	54.651
1049	725.00	676.11	36950.	54.651

Table 5 (continued)

ELEM	REF TEMP	PM	ALLOW	SF
90	725.00	661.57	36950.	55.852
1056	725.00	661.57	36950.	55.852
329	725.00	660.17	36950.	55.970
335	725.00	660.17	36950.	55.970
96	725.00	655.98	36950.	56.328
1050	725.00	655.98	36950.	56.328
336	725.00	640.05	36950.	57.730
330	725.00	640.05	36950.	57.730
235	725.00	572.30	36950.	64.565
1093	725.00	572.30	36950.	64.565
1094	725.00	570.05	36950.	64.819
236	725.00	570.05	36950.	64.819
907	725.00	562.77	36950.	65.657
37	725.00	562.77	36950.	65.657
908	725.00	560.52	36950.	65.920
38	725.00	560.52	36950.	65.920
379	725.00	553.68	36950.	66.735
469	725.00	553.68	36950.	66.735
470	725.00	551.44	36950.	67.007
380	725.00	551.44	36950.	67.007
1095	725.00	549.92	36950.	67.192
237	725.00	549.92	36950.	67.192
661	725.00	541.00	36950.	68.300
763	725.00	541.00	36950.	68.300
39	725.00	540.40	36950.	68.376
909	725.00	540.40	36950.	68.376
662	725.00	538.75	36950.	68.585
764	725.00	538.75	36950.	68.585
381	725.00	531.31	36950.	69.545
471	725.00	531.31	36950.	69.545
1096	725.00	529.79	36950.	69.744
238	725.00	529.79	36950.	69.744
910	725.00	520.27	36950.	71.021
40	725.00	520.27	36950.	71.021
765	725.00	518.62	36950.	71.246
663	725.00	518.62	36950.	71.246
472	725.00	511.18	36950.	72.284
382	725.00	511.18	36950.	72.284
239	725.00	509.66	36950.	72.499
1097	725.00	509.66	36950.	72.499
911	725.00	500.14	36950.	73.880
41	725.00	500.14	36950.	73.880
664	725.00	498.49	36950.	74.123
766	725.00	498.49	36950.	74.123
383	725.00	491.05	36950.	75.247
473	725.00	491.05	36950.	75.247
1098	725.00	489.53	36950.	75.480
240	725.00	489.53	36950.	75.480
42	725.00	480.01	36950.	76.978

Table 5 (continued)

ELEM	REF TEMP	PM	ALLOW	SF
912	725.00	480.01	36950.	76.978
665	725.00	478.36	36950.	77.242
767	725.00	478.36	36950.	77.242
474	725.00	470.92	36950.	78.463
384	725.00	470.92	36950.	78.463
1210	725.00	-467.12	36950.	79.101
1235	725.00	-467.12	36950.	79.101
835	725.00	-466.29	36950.	79.243
673	725.00	-466.29	36950.	79.243
836	725.00	-464.04	36950.	79.627
674	725.00	-464.04	36950.	79.627
666	725.00	458.24	36950.	80.635
768	725.00	458.24	36950.	80.635
1209	725.00	-444.09	36950.	83.204
1234	725.00	-444.09	36950.	83.204
837	725.00	-439.44	36950.	84.084
675	725.00	-439.44	36950.	84.084
1208	725.00	-421.06	36950.	87.755
1233	725.00	-421.06	36950.	87.755
838	725.00	-414.84	36950.	89.070
676	725.00	-414.84	36950.	89.070
1207	725.00	-398.03	36950.	92.833
1232	725.00	-398.03	36950.	92.833
839	725.00	-390.24	36950.	94.685
677	725.00	-390.24	36950.	94.685
133	725.00	-374.99	36950.	98.535
1147	725.00	-374.99	36950.	98.535
840	725.00	-365.64	36950.	101.06
678	725.00	-365.64	36950.	101.06
792	725.00	-337.29	36950.	109.55
774	725.00	-337.29	36950.	109.55
791	725.00	-335.04	36950.	110.29
773	725.00	-335.04	36950.	110.29
790	725.00	-307.04	36950.	120.34
772	725.00	-307.04	36950.	120.34
789	725.00	-282.44	36950.	130.83
771	725.00	-282.44	36950.	130.83
788	725.00	-257.84	36950.	143.31
770	725.00	-257.84	36950.	143.31
787	725.00	-233.24	36950.	158.42
769	725.00	-233.24	36950.	158.42
690	725.00	-228.12	36950.	161.97
852	725.00	-228.12	36950.	161.97
851	725.00	-226.30	36950.	163.28
689	725.00	-226.30	36950.	163.28
523	725.00	-219.49	36950.	168.34
517	725.00	-219.49	36950.	168.34
853	725.00	-218.45	36950.	169.14
715	725.00	-218.45	36950.	169.14

Table 5 (continued)

ELEM	REF TEMP	PM	ALLOW	SF
524	725.00	-217.24	36950.	170.09
518	725.00	-217.24	36950.	170.09
854	725.00	-216.21	36950.	170.90
716	725.00	-216.21	36950.	170.90
850	725.00	-213.47	36950.	173.09
688	725.00	-213.47	36950.	173.09
849	725.00	-211.65	36950.	174.58
687	725.00	-211.65	36950.	174.58
139	725.00	-209.97	36950.	175.98
1141	725.00	-209.97	36950.	175.98
686	725.00	-209.82	36950.	176.10
848	725.00	-209.82	36950.	176.10
140	725.00	-207.73	36950.	177.88
1142	725.00	-207.73	36950.	177.88
181	725.00	-207.14	36950.	178.38
955	725.00	-207.14	36950.	178.38
949	725.00	-205.11	36950.	180.15
187	725.00	-205.11	36950.	180.15
956	725.00	-204.90	36950.	180.34
182	725.00	-204.90	36950.	180.34
950	725.00	-202.86	36950.	182.14
188	725.00	-202.86	36950.	182.14
525	725.00	-197.11	36950.	187.45
519	725.00	-197.11	36950.	187.45
717	725.00	-196.08	36950.	188.45
855	725.00	-196.08	36950.	188.45
276	725.00	-191.55	36950.	192.90
978	725.00	-191.55	36950.	192.90
685	725.00	-189.81	36950.	194.66
847	725.00	-189.81	36950.	194.66
275	725.00	-189.73	36950.	194.75
977	725.00	-189.73	36950.	194.75
141	725.00	-187.60	36950.	196.96
1143	725.00	-187.60	36950.	196.96
183	725.00	-184.77	36950.	199.98
957	725.00	-184.77	36950.	199.98
619	725.00	-183.11	36950.	201.80
613	725.00	-183.11	36950.	201.80
189	725.00	-182.73	36950.	202.21
951	725.00	-182.73	36950.	202.21
264	725.00	182.66	36950.	202.29
966	725.00	182.66	36950.	202.29
620	725.00	-180.86	36950.	204.30
614	725.00	-180.86	36950.	204.30
263	725.00	180.41	36950.	204.81
965	725.00	180.41	36950.	204.81
520	725.00	-176.99	36950.	208.77
526	725.00	-176.99	36950.	208.77
274	725.00	-176.90	36950.	208.87

Table 5 (continued)

ELEM	REF TEMP	PM	ALLOW	SF
976	725.00	-176.90	36950.	208.87
718	725.00	-175.95	36950.	210.00
856	725.00	-175.95	36950.	210.00
975	725.00	-175.08	36950.	211.05
273	725.00	-175.08	36950.	211.05
272	725.00	-173.25	36950.	213.28
974	725.00	-173.25	36950.	213.28
684	725.00	-169.81	36950.	217.60
846	725.00	-169.81	36950.	217.60
142	725.00	-167.47	36950.	220.64
1144	725.00	-167.47	36950.	220.64
958	725.00	-164.64	36950.	224.43
184	725.00	-164.64	36950.	224.43
190	725.00	-162.60	36950.	227.24
952	725.00	-162.60	36950.	227.24
615	725.00	-160.73	36950.	229.89
621	725.00	-160.73	36950.	229.89
527	725.00	-156.86	36950.	235.57
521	725.00	-156.86	36950.	235.57
719	725.00	-155.82	36950.	237.13
857	725.00	-155.82	36950.	237.13
262	725.00	155.81	36950.	237.15
964	725.00	155.81	36950.	237.15
271	725.00	-153.24	36950.	241.12
973	725.00	-153.24	36950.	241.12
143	725.00	-147.34	36950.	250.78
1145	725.00	-147.34	36950.	250.78
185	725.00	-144.51	36950.	255.69
959	725.00	-144.51	36950.	255.69
953	725.00	-142.48	36950.	259.34
191	725.00	-142.48	36950.	259.34
616	725.00	-140.60	36950.	262.80
622	725.00	-140.60	36950.	262.80
528	725.00	-136.73	36950.	270.24
522	725.00	-136.73	36950.	270.24
858	725.00	-135.69	36950.	272.31
720	725.00	-135.69	36950.	272.31
270	725.00	-133.24	36950.	277.33
972	725.00	-133.24	36950.	277.33
963	725.00	131.21	36950.	281.61
261	725.00	131.21	36950.	281.61
144	725.00	-127.21	36950.	290.46
1146	725.00	-127.21	36950.	290.46
186	725.00	-124.38	36950.	297.07
960	725.00	-124.38	36950.	297.07
192	725.00	-122.35	36950.	302.01
954	725.00	-122.35	36950.	302.01
617	725.00	-120.47	36950.	306.71
623	725.00	-120.47	36950.	306.71

Table 5 (continued)

ELEM	REF TEMP	PM	ALLOW	SF
260	725.00	106.61	36950.	346.58
962	725.00	106.61	36950.	346.58
624	725.00	-100.34	36950.	368.24
618	725.00	-100.34	36950.	368.24
216	725.00	-98.631	36950.	374.63
1062	725.00	-98.631	36950.	374.63
1061	725.00	-96.384	36950.	383.36
215	725.00	-96.384	36950.	383.36
1099	725.00	-95.406	36950.	387.29
229	725.00	-95.406	36950.	387.29
1230	725.00	93.505	36950.	395.17
1215	725.00	93.505	36950.	395.17
230	725.00	-93.159	36950.	396.63
1100	725.00	-93.159	36950.	396.63
901	725.00	-91.236	36950.	405.00
43	725.00	-91.236	36950.	405.00
757	725.00	-89.084	36950.	414.78
667	725.00	-89.084	36950.	414.78
44	725.00	-88.989	36950.	415.22
902	725.00	-88.989	36950.	415.22
668	725.00	-86.837	36950.	425.51
758	725.00	-86.837	36950.	425.51
1220	725.00	84.156	36950.	439.07
1225	725.00	84.156	36950.	439.07
961	725.00	82.013	36950.	450.54
259	725.00	82.013	36950.	450.54
231	725.00	-73.030	36950.	505.95
1101	725.00	-73.030	36950.	505.95
475	725.00	-71.347	36950.	517.89
373	725.00	-71.347	36950.	517.89
1229	725.00	70.472	36950.	524.32
1214	725.00	70.472	36950.	524.32
476	725.00	-69.100	36950.	534.73
374	725.00	-69.100	36950.	534.73
1205	725.00	-69.074	36950.	534.93
1240	725.00	-69.074	36950.	534.93
903	725.00	-68.860	36950.	536.60
45	725.00	-68.860	36950.	536.60
214	725.00	-68.379	36950.	540.37
1060	725.00	-68.379	36950.	540.37
759	725.00	-66.708	36950.	553.90
669	725.00	-66.708	36950.	553.90
1211	725.00	-61.481	36950.	601.00
1226	725.00	-61.481	36950.	601.00
1219	725.00	61.124	36950.	604.51
1224	725.00	61.124	36950.	604.51
1206	725.00	-59.538	36950.	620.61
1231	725.00	-59.538	36950.	620.61
232	725.00	-52.902	36950.	698.47

Table 5 (continued)

ELEM	REF TEMP	PM	ALLOW	SF
1102	725.00	-52.902	36950.	698.47
714	725.00	-51.736	36950.	714.20
864	725.00	-51.736	36950.	714.20
375	725.00	-48.971	36950.	754.52
477	725.00	-48.971	36950.	754.52
46	725.00	-48.731	36950.	758.25
904	725.00	-48.731	36950.	758.25
1228	725.00	47.440	36950.	778.88
1213	725.00	47.440	36950.	778.88
760	725.00	-46.579	36950.	793.27
670	725.00	-46.579	36950.	793.27
1204	725.00	-46.042	36950.	802.53
1239	725.00	-46.042	36950.	802.53
213	725.00	-43.780	36950.	844.00
1059	725.00	-43.780	36950.	844.00
576	725.00	41.767	36950.	884.68
426	725.00	41.767	36950.	884.68
1223	725.00	38.091	36950.	970.04
1218	725.00	38.091	36950.	970.04
1103	725.00	-32.773	36950.	1127.5
233	725.00	-32.773	36950.	1127.5
480	725.00	32.544	36950.	1135.4
378	725.00	32.544	36950.	1135.4
376	725.00	-28.843	36950.	1281.1
478	725.00	-28.843	36950.	1281.1
47	725.00	-28.602	36950.	1291.9
905	725.00	-28.602	36950.	1291.9
761	725.00	-26.450	36950.	1397.0
671	725.00	-26.450	36950.	1397.0
571	725.00	26.302	36950.	1404.8
421	725.00	26.302	36950.	1404.8
1212	725.00	24.408	36950.	1513.9
1227	725.00	24.408	36950.	1513.9
1237	725.00	24.055	36950.	1536.1
1202	725.00	24.055	36950.	1536.1
1201	725.00	-23.483	36950.	1573.4
1236	725.00	-23.483	36950.	1573.4
1203	725.00	23.010	36950.	1605.9
1238	725.00	-23.010	36950.	1605.9
212	725.00	-19.180	36950.	1926.5
1058	725.00	19.180	36950.	1926.5
1216	725.00	-17.161	36950.	2153.1
1221	725.00	-17.161	36950.	2153.1
1217	725.00	15.059	36950.	2453.7
1222	725.00	-15.059	36950.	2453.7
672	725.00	14.807	36950.	2495.4
762	725.00	-14.807	36950.	2495.4
48	725.00	-12.656	36950.	2919.6
906	725.00	12.656	36950.	2919.6

Table 5 (continued)

ELEM	REF TEMP	PM	ALLOW	SF
234	725.00	12.644	36950.	2922.4
1104	725.00	-12.644	36950.	2922.4
377	725.00	-12.415	36950.	2976.2
479	725.00	12.415	36950.	2976.2
709	725.00	-11.220	36950.	3293.1
859	725.00	-11.220	36950.	3293.1
211	725.00	8.6661	36950.	4263.7
1057	725.00	8.6661	36950.	4263.7
288	725.00	-5.8168	36950.	6352.3
1002	725.00	5.8168	36950.	6352.3
283	725.00	-1.8716	36950.	19743.
997	725.00	1.8716	36950.	19743.

Table 6

TITLE=
MPC-24E Structural Analysis

SUBTITLE 1 =
Component: Fuel Basket
SUBTITLE 2 =
Load Combination: F2.b (See Table 2.1.6)
SUBTITLE 3 =
Stress Result: Primary Local Plus Primary Bending (PL+PB)

PRINT ELEMENT TABLE ITEMS PER ELEMENT

STAT ELEM	CURRENT REF TEMP	CURRENT PL+PB	PREVIOUS ALLOW	PREVIOUS SF
75	725.00	30436.	55450.	1.8218
1017	725.00	30436.	55450.	1.8218
499	725.00	29876.	55450.	1.8560
481	725.00	29876.	55450.	1.8560
577	725.00	29191.	55450.	1.8995
595	725.00	29191.	55450.	1.8995
892	725.00	28808.	55450.	1.9248
10	725.00	28808.	55450.	1.9248
74	725.00	27664.	55450.	2.0044
1016	725.00	27664.	55450.	2.0044
482	725.00	27240.	55450.	2.0356
500	725.00	27240.	55450.	2.0356
931	725.00	26624.	55450.	2.0827
145	725.00	26624.	55450.	2.0827
667	725.00	26526.	55450.	2.0904
757	725.00	26526.	55450.	2.0904
578	725.00	26510.	55450.	2.0917
596	725.00	26510.	55450.	2.0917
229	725.00	26463.	55450.	2.0954
1099	725.00	26463.	55450.	2.0954
893	725.00	26269.	55450.	2.1109
11	725.00	26269.	55450.	2.1109
373	725.00	25581.	55450.	2.1677
475	725.00	25581.	55450.	2.1677
18	725.00	25076.	55450.	2.2113
900	725.00	25076.	55450.	2.2113
433	725.00	24631.	55450.	2.2512
355	725.00	24631.	55450.	2.2512
882	725.00	24419.	55450.	2.2708
36	725.00	24419.	55450.	2.2708
932	725.00	24044.	55450.	2.3062
146	725.00	24044.	55450.	2.3062
668	725.00	23971.	55450.	2.3132
758	725.00	23971.	55450.	2.3132
230	725.00	23873.	55450.	2.3227

Table 6 (continued)

ELEM	REF TEMP	PM	ALLOW	SF
1100	725.00	23873.	55450.	2.3227
1156	725.00	23563.	55450.	2.3533
1192	725.00	23563.	55450.	2.3533
901	725.00	23509.	55450.	2.3587
43	725.00	23509.	55450.	2.3587
102	725.00	23424.	55450.	2.3672
1128	725.00	23424.	55450.	2.3672
283	725.00	23190.	55450.	2.3911
997	725.00	23190.	55450.	2.3911
374	725.00	23074.	55450.	2.4032
476	725.00	23074.	55450.	2.4032
634	725.00	23002.	55450.	2.4106
748	725.00	23002.	55450.	2.4106
642	725.00	22800.	55450.	2.4321
756	725.00	22800.	55450.	2.4321
17	725.00	22554.	55450.	2.4585
899	725.00	22554.	55450.	2.4585
434	725.00	22376.	55450.	2.4780
356	725.00	22376.	55450.	2.4780
810	725.00	22123.	55450.	2.5065
816	725.00	22123.	55450.	2.5065
1083	725.00	21923.	55450.	2.5293
201	725.00	21923.	55450.	2.5293
881	725.00	21716.	55450.	2.5534
35	725.00	21716.	55450.	2.5534
1157	725.00	21596.	55450.	2.5676
1193	725.00	21596.	55450.	2.5676
297	725.00	21451.	55450.	2.5850
315	725.00	21451.	55450.	2.5850
1182	725.00	21304.	55450.	2.6028
1170	725.00	21304.	55450.	2.6028
101	725.00	21202.	55450.	2.6153
1127	725.00	21202.	55450.	2.6153
673	725.00	21196.	55450.	2.6161
835	725.00	21196.	55450.	2.6161
90	725.00	21126.	55450.	2.6247
1056	725.00	21126.	55450.	2.6247
96	725.00	21121.	55450.	2.6254
1050	725.00	21121.	55450.	2.6254
902	725.00	21036.	55450.	2.6359
44	725.00	21036.	55450.	2.6359
641	725.00	20868.	55450.	2.6571
755	725.00	20868.	55450.	2.6571
1227	725.00	20787.	55450.	2.6675
1212	725.00	20787.	55450.	2.6675
1062	725.00	20721.	55450.	2.6760
216	725.00	20721.	55450.	2.6760
635	725.00	20618.	55450.	2.6894
749	725.00	20618.	55450.	2.6894

Table 6 (continued)

ELEM	REF TEMP	PM	ALLOW	SF
777	725.00	20456.	55450.	2.7107
795	725.00	20456.	55450.	2.7107
361	725.00	20369.	55450.	2.7222
439	725.00	20369.	55450.	2.7222
153	725.00	20183.	55450.	2.7474
939	725.00	20183.	55450.	2.7474
1181	725.00	19896.	55450.	2.7869
1169	725.00	19896.	55450.	2.7869
489	725.00	19887.	55450.	2.7883
507	725.00	19887.	55450.	2.7883
9	725.00	19649.	55450.	2.8220
891	725.00	19649.	55450.	2.8220
586	725.00	19555.	55450.	2.8355
604	725.00	19555.	55450.	2.8355
1141	725.00	19553.	55450.	2.8360
139	725.00	19553.	55450.	2.8360
888	725.00	19389.	55450.	2.8598
6	725.00	19389.	55450.	2.8598
1082	725.00	19273.	55450.	2.8771
200	725.00	19273.	55450.	2.8771
330	725.00	19181.	55450.	2.8909
336	725.00	19181.	55450.	2.8909
922	725.00	19017.	55450.	2.9158
172	725.00	19017.	55450.	2.9158
296	725.00	18939.	55450.	2.9278
314	725.00	18939.	55450.	2.9278
836	725.00	18886.	55450.	2.9360
674	725.00	18886.	55450.	2.9360
603	725.00	18472.	55450.	3.0019
585	725.00	18472.	55450.	3.0019
1061	725.00	18276.	55450.	3.0340
215	725.00	18276.	55450.	3.0340
362	725.00	18140.	55450.	3.0568
440	725.00	18140.	55450.	3.0568
152	725.00	17711.	55450.	3.1308
938	725.00	17711.	55450.	3.1308
794	725.00	17672.	55450.	3.1378
776	725.00	17672.	55450.	3.1378
587	725.00	17392.	55450.	3.1882
605	725.00	17392.	55450.	3.1882
883	725.00	17336.	55450.	3.1985
1	725.00	17336.	55450.	3.1985
488	725.00	17285.	55450.	3.2080
506	725.00	17285.	55450.	3.2080
887	725.00	17261.	55450.	3.2125
5	725.00	17261.	55450.	3.2125
1142	725.00	17246.	55450.	3.2152
140	725.00	17246.	55450.	3.2152
1123	725.00	17106.	55450.	3.2415

Table 6 (continued)

ELEM	REF TEMP	PM	ALLOW	SF
97	725.00	17106.	55450.	3.2415
8	725.00	17069.	55450.	3.2486
890	725.00	17069.	55450.	3.2486
468	725.00	17055.	55450.	3.2513
354	725.00	17055.	55450.	3.2513
923	725.00	16855.	55450.	3.2899
173	725.00	16855.	55450.	3.2899
432	725.00	16854.	55450.	3.2900
570	725.00	16854.	55450.	3.2900
360	725.00	16786.	55450.	3.3033
438	725.00	16786.	55450.	3.3033
467	725.00	16744.	55450.	3.3117
353	725.00	16744.	55450.	3.3117
1065	725.00	16646.	55450.	3.3312
219	725.00	16646.	55450.	3.3312
304	725.00	16580.	55450.	3.3443
322	725.00	16580.	55450.	3.3443
610	725.00	16224.	55450.	3.4179
592	725.00	16224.	55450.	3.4179
602	725.00	16184.	55450.	3.4261
584	725.00	16184.	55450.	3.4261
27	725.00	16025.	55450.	3.4602
873	725.00	16025.	55450.	3.4602
426	725.00	15937.	55450.	3.4793
576	725.00	15937.	55450.	3.4793
609	725.00	15904.	55450.	3.4865
591	725.00	15904.	55450.	3.4865
927	725.00	15414.	55450.	3.5973
177	725.00	15414.	55450.	3.5973
502	725.00	15313.	55450.	3.6211
503	725.00	15313.	55450.	3.6211
484	725.00	15313.	55450.	3.6211
485	725.00	15313.	55450.	3.6211
884	725.00	15297.	55450.	3.6248
2	725.00	15297.	55450.	3.6248
13	725.00	15266.	55450.	3.6323
12	725.00	15266.	55450.	3.6323
895	725.00	15266.	55450.	3.6323
894	725.00	15266.	55450.	3.6323
402	725.00	15230.	55450.	3.6409
564	725.00	15230.	55450.	3.6409
1124	725.00	15160.	55450.	3.6576
98	725.00	15160.	55450.	3.6576
312	725.00	15032.	55450.	3.6889
294	725.00	15032.	55450.	3.6889
501	725.00	14890.	55450.	3.7241
483	725.00	14890.	55450.	3.7241
359	725.00	14874.	55450.	3.7280
437	725.00	14874.	55450.	3.7280

Table 6 (continued)

ELEM	REF TEMP	PM	ALLOW	SF
401	725.00	14854.	55450.	3.7329
563	725.00	14854.	55450.	3.7329
427	725.00	14798.	55450.	3.7470
565	725.00	14798.	55450.	3.7470
352	725.00	14754.	55450.	3.7583
466	725.00	14754.	55450.	3.7583
311	725.00	14733.	55450.	3.7636
293	725.00	14733.	55450.	3.7636
896	725.00	14628.	55450.	3.7906
14	725.00	14628.	55450.	3.7906
358	725.00	14548.	55450.	3.8116
357	725.00	14548.	55450.	3.8116
435	725.00	14548.	55450.	3.8116
436	725.00	14548.	55450.	3.8116
305	725.00	14479.	55450.	3.8297
323	725.00	14479.	55450.	3.8297
1171	725.00	14252.	55450.	3.8907
1183	725.00	14252.	55450.	3.8907
608	725.00	13901.	55450.	3.9891
590	725.00	13901.	55450.	3.9891
611	725.00	13835.	55450.	4.0079
593	725.00	13835.	55450.	4.0079
1064	725.00	13744.	55450.	4.0346
218	725.00	13744.	55450.	4.0346
26	725.00	13710.	55450.	4.0446
872	725.00	13710.	55450.	4.0446
598	725.00	13633.	55450.	4.0673
599	725.00	13633.	55450.	4.0673
581	725.00	13633.	55450.	4.0673
580	725.00	13633.	55450.	4.0673
1014	725.00	13594.	55450.	4.0791
72	725.00	13594.	55450.	4.0791
1013	725.00	13474.	55450.	4.1154
71	725.00	13474.	55450.	4.1154
1240	725.00	13473.	55450.	4.1158
1205	725.00	13473.	55450.	4.1158
926	725.00	13409.	55450.	4.1351
176	725.00	13409.	55450.	4.1351
928	725.00	13315.	55450.	4.1646
178	725.00	13315.	55450.	4.1646
1162	725.00	13267.	55450.	4.1794
1198	725.00	13267.	55450.	4.1794
566	725.00	12760.	55450.	4.3457
428	725.00	12760.	55450.	4.3457
597	725.00	12709.	55450.	4.3629
579	725.00	12709.	55450.	4.3629
1172	725.00	12665.	55450.	4.3782
1184	725.00	12665.	55450.	4.3782
214	725.00	12462.	55450.	4.4495

Table 6 (continued)

ELEM	REF TEMP	PM	ALLOW	SF
213	725.00	12462.	55450.	4.4495
1060	725.00	12462.	55450.	4.4495
1059	725.00	12462.	55450.	4.4495
1188	725.00	12455.	55450.	4.4520
1176	725.00	12455.	55450.	4.4520
400	725.00	12414.	55450.	4.4667
562	725.00	12414.	55450.	4.4667
649	725.00	12371.	55450.	4.4824
727	725.00	12371.	55450.	4.4824
307	725.00	12369.	55450.	4.4831
289	725.00	12369.	55450.	4.4831
441	725.00	12333.	55450.	4.4962
363	725.00	12333.	55450.	4.4962
1165	725.00	12282.	55450.	4.5146
1177	725.00	12282.	55450.	4.5146
1125	725.00	12236.	55450.	4.5315
1126	725.00	12236.	55450.	4.5315
99	725.00	12236.	55450.	4.5315
100	725.00	12236.	55450.	4.5315
808	725.00	12204.	55450.	4.5435
807	725.00	12204.	55450.	4.5435
813	725.00	12204.	55450.	4.5435
814	725.00	12204.	55450.	4.5435
933	725.00	12174.	55450.	4.5548
934	725.00	12174.	55450.	4.5548
147	725.00	12174.	55450.	4.5548
148	725.00	12174.	55450.	4.5548
399	725.00	12094.	55450.	4.5848
561	725.00	12094.	55450.	4.5848
94	725.00	12017.	55450.	4.6144
93	725.00	12017.	55450.	4.6144
1048	725.00	12017.	55450.	4.6144
1047	725.00	12017.	55450.	4.6144
935	725.00	11993.	55450.	4.6234
149	725.00	11993.	55450.	4.6234
594	725.00	11969.	55450.	4.6327
612	725.00	11969.	55450.	4.6327
925	725.00	11962.	55450.	4.6353
924	725.00	11962.	55450.	4.6353
175	725.00	11962.	55450.	4.6353
174	725.00	11962.	55450.	4.6353
1163	725.00	11861.	55450.	4.6751
1199	725.00	11861.	55450.	4.6751
398	725.00	11781.	55450.	4.7066
560	725.00	11781.	55450.	4.7066
879	725.00	11729.	55450.	4.7275
33	725.00	11729.	55450.	4.7275
327	725.00	11726.	55450.	4.7287
334	725.00	11726.	55450.	4.7287

Table 6 (continued)

ELEM	REF TEMP	PM	ALLOW	SF
328	725.00	11726.	55450.	4.7287
333	725.00	11726.	55450.	4.7287
930	725.00	11710.	55450.	4.7351
180	725.00	11710.	55450.	4.7351
308	725.00	11692.	55450.	4.7425
290	725.00	11692.	55450.	4.7425
1009	725.00	11690.	55450.	4.7434
67	725.00	11690.	55450.	4.7434
421	725.00	11639.	55450.	4.7642
571	725.00	11639.	55450.	4.7642
1012	725.00	11603.	55450.	4.7791
70	725.00	11603.	55450.	4.7791
878	725.00	11561.	55450.	4.7963
32	725.00	11561.	55450.	4.7963
606	725.00	11559.	55450.	4.7973
607	725.00	11559.	55450.	4.7973
589	725.00	11559.	55450.	4.7973
588	725.00	11559.	55450.	4.7973
138	725.00	11552.	55450.	4.7999
1152	725.00	11552.	55450.	4.7999
324	725.00	11459.	55450.	4.8390
306	725.00	11459.	55450.	4.8390
1054	725.00	11452.	55450.	4.8420
1053	725.00	11452.	55450.	4.8420
87	725.00	11452.	55450.	4.8420
88	725.00	11452.	55450.	4.8420
637	725.00	11381.	55450.	4.8723
636	725.00	11381.	55450.	4.8723
751	725.00	11381.	55450.	4.8723
750	725.00	11381.	55450.	4.8723
885	725.00	11374.	55450.	4.8753
886	725.00	11374.	55450.	4.8753
4	725.00	11374.	55450.	4.8753
3	725.00	11374.	55450.	4.8753
1187	725.00	11306.	55450.	4.9044
1175	725.00	11306.	55450.	4.9044
929	725.00	11257.	55450.	4.9260
179	725.00	11257.	55450.	4.9260
1010	725.00	11192.	55450.	4.9544
68	725.00	11192.	55450.	4.9544
1075	725.00	11112.	55450.	4.9899
193	725.00	11112.	55450.	4.9899
1076	725.00	11077.	55450.	5.0060
194	725.00	11077.	55450.	5.0060
1103	725.00	10950.	55450.	5.0639
1102	725.00	10950.	55450.	5.0639
232	725.00	10950.	55450.	5.0639
233	725.00	10950.	55450.	5.0639
292	725.00	10906.	55450.	5.0845

Table 6 (continued)

ELEM	REF TEMP	PM	ALLOW	SF
310	725.00	10906.	55450.	5.0845
678	725.00	10851.	55450.	5.1099
840	725.00	10851.	55450.	5.1099
905	725.00	10613.	55450.	5.2248
904	725.00	10613.	55450.	5.2248
47	725.00	10613.	55450.	5.2248
46	725.00	10613.	55450.	5.2248
1166	725.00	10556.	55450.	5.2531
1178	725.00	10556.	55450.	5.2531
650	725.00	10345.	55450.	5.3599
728	725.00	10345.	55450.	5.3599
1168	725.00	10217.	55450.	5.4270
1180	725.00	10217.	55450.	5.4270
142	725.00	10175.	55450.	5.4497
143	725.00	10175.	55450.	5.4497
1144	725.00	10175.	55450.	5.4497
1145	725.00	10175.	55450.	5.4497
889	725.00	10145.	55450.	5.4657
7	725.00	10145.	55450.	5.4657
1077	725.00	10128.	55450.	5.4749
195	725.00	10128.	55450.	5.4749
1206	725.00	10094.	55450.	5.4932
1231	725.00	10094.	55450.	5.4932
670	725.00	9897.0	55450.	5.6027
671	725.00	9897.0	55450.	5.6027
761	725.00	9897.0	55450.	5.6027
760	725.00	9897.0	55450.	5.6027
809	725.00	9883.2	55450.	5.6105
815	725.00	9883.2	55450.	5.6105
316	725.00	9875.3	55450.	5.6150
298	725.00	9875.3	55450.	5.6150
1191	725.00	9874.6	55450.	5.6154
1155	725.00	9874.6	55450.	5.6154
568	725.00	9780.4	55450.	5.6695
567	725.00	9780.4	55450.	5.6695
430	725.00	9780.4	55450.	5.6695
429	725.00	9780.4	55450.	5.6695
1202	725.00	9771.9	55450.	5.6744
1237	725.00	9771.9	55450.	5.6744
450	725.00	9696.3	55450.	5.7187
372	725.00	9696.3	55450.	5.7187
1197	725.00	9633.5	55450.	5.7559
1161	725.00	9633.5	55450.	5.7559
792	725.00	9623.6	55450.	5.7619
774	725.00	9623.6	55450.	5.7619
76	725.00	9516.4	55450.	5.8268
1018	725.00	9516.4	55450.	5.8268
276	725.00	9503.3	55450.	5.8348
978	725.00	9503.3	55450.	5.8348

Table 6 (continued)

ELEM	REF TEMP	PM	ALLOW	SF
874	725.00	9482.5	55450.	5.8476
28	725.00	9482.5	55450.	5.8476
317	725.00	9482.3	55450.	5.8478
299	725.00	9482.3	55450.	5.8478
791	725.00	9465.8	55450.	5.8579
773	725.00	9465.8	55450.	5.8579
376	725.00	9463.5	55450.	5.8594
377	725.00	9463.5	55450.	5.8594
479	725.00	9463.5	55450.	5.8594
478	725.00	9463.5	55450.	5.8594
449	725.00	9414.4	55450.	5.8899
371	725.00	9414.4	55450.	5.8899
144	725.00	9365.1	55450.	5.9209
1146	725.00	9365.1	55450.	5.9209
329	725.00	9303.0	55450.	5.9604
335	725.00	9303.0	55450.	5.9604
212	725.00	9248.4	55450.	5.9956
1058	725.00	9248.4	55450.	5.9956
66	725.00	9233.6	55450.	6.0052
1044	725.00	9233.6	55450.	6.0052
639	725.00	9216.2	55450.	6.0166
753	725.00	9216.2	55450.	6.0166
675	725.00	9190.5	55450.	6.0334
837	725.00	9190.5	55450.	6.0334
838	725.00	9190.5	55450.	6.0334
676	725.00	9190.5	55450.	6.0334
77	725.00	9171.2	55450.	6.0461
1019	725.00	9171.2	55450.	6.0461
877	725.00	9162.1	55450.	6.0521
31	725.00	9162.1	55450.	6.0521
331	725.00	9130.4	55450.	6.0731
325	725.00	9130.4	55450.	6.0731
729	725.00	9082.8	55450.	6.1049
651	725.00	9082.8	55450.	6.1049
638	725.00	9052.3	55450.	6.1255
752	725.00	9052.3	55450.	6.1255
569	725.00	9001.8	55450.	6.1599
431	725.00	9001.8	55450.	6.1599
677	725.00	8993.8	55450.	6.1654
839	725.00	8993.8	55450.	6.1654
275	725.00	8979.6	55450.	6.1751
977	725.00	8979.6	55450.	6.1751
805	725.00	8942.8	55450.	6.2005
811	725.00	8942.8	55450.	6.2005
875	725.00	8936.5	55450.	6.2049
29	725.00	8936.5	55450.	6.2049
1049	725.00	8860.8	55450.	6.2579
95	725.00	8860.8	55450.	6.2579
660	725.00	8825.9	55450.	6.2827

Table 6 (continued)

ELEM	REF TEMP	PM	ALLOW	SF
738	725.00	8825.9	55450.	6.2827
559	725.00	8809.0	55450.	6.2947
397	725.00	8809.0	55450.	6.2947
469	725.00	8758.7	55450.	6.3309
379	725.00	8758.7	55450.	6.3309
1190	725.00	8754.6	55450.	6.3338
1154	725.00	8754.6	55450.	6.3338
1011	725.00	8707.9	55450.	6.3678
69	725.00	8707.9	55450.	6.3678
1196	725.00	8663.2	55450.	6.4006
1160	725.00	8663.2	55450.	6.4006
141	725.00	8638.9	55450.	6.4187
1143	725.00	8638.9	55450.	6.4187
396	725.00	8607.4	55450.	6.4421
558	725.00	8607.4	55450.	6.4421
321	725.00	8509.9	55450.	6.5160
303	725.00	8509.9	55450.	6.5160
320	725.00	8503.8	55450.	6.5206
302	725.00	8503.8	55450.	6.5206
1055	725.00	8486.1	55450.	6.5342
89	725.00	8486.1	55450.	6.5342
659	725.00	8441.7	55450.	6.5686
737	725.00	8441.7	55450.	6.5686
73	725.00	8408.5	55450.	6.5945
1015	725.00	8408.5	55450.	6.5945
1051	725.00	8302.0	55450.	6.6791
85	725.00	8302.0	55450.	6.6791
470	725.00	8249.8	55450.	6.7213
380	725.00	8249.8	55450.	6.7213
108	725.00	8233.2	55450.	6.7349
1134	725.00	8233.2	55450.	6.7349
1078	725.00	8156.1	55450.	6.7986
196	725.00	8156.1	55450.	6.7986
65	725.00	8140.9	55450.	6.8113
1043	725.00	8140.9	55450.	6.8113
1228	725.00	8004.0	55450.	6.9278
1214	725.00	8004.0	55450.	6.9278
1213	725.00	8004.0	55450.	6.9278
1229	725.00	8004.0	55450.	6.9278
1204	725.00	7997.5	55450.	6.9334
1203	725.00	7997.5	55450.	6.9334
1239	725.00	7997.5	55450.	6.9334
1238	725.00	7997.5	55450.	6.9334
1194	725.00	7995.2	55450.	6.9354
1158	725.00	7995.2	55450.	6.9354
1080	725.00	7986.4	55450.	6.9431
198	725.00	7986.4	55450.	6.9431
15	725.00	7950.2	55450.	6.9746
897	725.00	7950.2	55450.	6.9746

Table 6 (continued)

ELEM	REF TEMP	PM	ALLOW	SF
319	725.00	7878.3	55450.	7.0383
301	725.00	7878.3	55450.	7.0383
1230	725.00	7735.5	55450.	7.1683
1215	725.00	7735.5	55450.	7.1683
92	725.00	7706.7	55450.	7.1950
1046	725.00	7706.7	55450.	7.1950
787	725.00	7652.5	55450.	7.2460
769	725.00	7652.5	55450.	7.2460
643	725.00	7641.1	55450.	7.2569
721	725.00	7641.1	55450.	7.2569
448	725.00	7631.8	55450.	7.2657
370	725.00	7631.8	55450.	7.2657
45	725.00	7588.4	55450.	7.3073
903	725.00	7588.4	55450.	7.3073
234	725.00	7563.5	55450.	7.3313
1104	725.00	7563.5	55450.	7.3313
1079	725.00	7559.8	55450.	7.3348
197	725.00	7559.8	55450.	7.3348
1167	725.00	7518.9	55450.	7.3748
1179	725.00	7518.9	55450.	7.3748
640	725.00	7513.2	55450.	7.3804
754	725.00	7513.2	55450.	7.3804
1140	725.00	7409.1	55450.	7.4841
114	725.00	7409.1	55450.	7.4841
447	725.00	7405.5	55450.	7.4876
369	725.00	7405.5	55450.	7.4876
1045	725.00	7324.5	55450.	7.5705
91	725.00	7324.5	55450.	7.5705
871	725.00	7294.1	55450.	7.6020
25	725.00	7294.1	55450.	7.6020
1139	725.00	7286.3	55450.	7.6101
113	725.00	7286.3	55450.	7.6101
332	725.00	7266.3	55450.	7.6312
326	725.00	7266.3	55450.	7.6312
547	725.00	7237.7	55450.	7.6612
385	725.00	7237.7	55450.	7.6612
644	725.00	7220.0	55450.	7.6800
722	725.00	7220.0	55450.	7.6800
446	725.00	7186.2	55450.	7.7161
368	725.00	7186.2	55450.	7.7161
295	725.00	7126.3	55450.	7.7810
313	725.00	7126.3	55450.	7.7810
788	725.00	7103.8	55450.	7.8056
770	725.00	7103.8	55450.	7.8056
505	725.00	7095.5	55450.	7.8148
487	725.00	7095.5	55450.	7.8148
486	725.00	7076.8	55450.	7.8354
504	725.00	7076.8	55450.	7.8354
812	725.00	7067.3	55450.	7.8460

Table 6 (continued)

ELEM	REF TEMP	PM	ALLOW	SF
806	725.00	7067.3	55450.	7.8460
1135	725.00	6988.8	55450.	7.9341
1136	725.00	6988.8	55450.	7.9341
109	725.00	6988.8	55450.	7.9341
110	725.00	6988.8	55450.	7.9341
1057	725.00	6984.6	55450.	7.9389
211	725.00	6984.6	55450.	7.9389
86	725.00	6951.8	55450.	7.9763
1052	725.00	6951.8	55450.	7.9763
548	725.00	6947.7	55450.	7.9811
386	725.00	6947.7	55450.	7.9811
763	725.00	6939.2	55450.	7.9909
661	725.00	6939.2	55450.	7.9909
1101	725.00	6870.5	55450.	8.0708
231	725.00	6870.5	55450.	8.0708
790	725.00	6783.5	55450.	8.1743
772	725.00	6783.5	55450.	8.1743
517	725.00	6762.4	55450.	8.1997
523	725.00	6762.4	55450.	8.1997
111	725.00	6744.7	55450.	8.2212
1137	725.00	6744.7	55450.	8.2212
270	725.00	6740.4	55450.	8.2265
972	725.00	6740.4	55450.	8.2265
518	725.00	6729.7	55450.	8.2396
524	725.00	6729.7	55450.	8.2396
1226	725.00	6687.1	55450.	8.2921
1211	725.00	6687.1	55450.	8.2921
474	725.00	6686.0	55450.	8.2934
384	725.00	6686.0	55450.	8.2934
112	725.00	6681.0	55450.	8.2997
1138	725.00	6681.0	55450.	8.2997
898	725.00	6563.0	55450.	8.4489
16	725.00	6563.0	55450.	8.4489
217	725.00	6536.5	55450.	8.4831
1063	725.00	6536.5	55450.	8.4831
764	725.00	6497.7	55450.	8.5338
662	725.00	6497.7	55450.	8.5338
83	725.00	6458.3	55450.	8.5858
82	725.00	6458.3	55450.	8.5858
1025	725.00	6458.3	55450.	8.5858
1024	725.00	6458.3	55450.	8.5858
81	725.00	6434.8	55450.	8.6173
1023	725.00	6434.8	55450.	8.6173
84	725.00	6428.3	55450.	8.6259
1026	725.00	6428.3	55450.	8.6259
80	725.00	6404.2	55450.	8.6583
1022	725.00	6404.2	55450.	8.6583
1098	725.00	6318.9	55450.	8.7753
240	725.00	6318.9	55450.	8.7753

Table 6 (continued)

ELEM	REF TEMP	PM	ALLOW	SF
480	725.00	6267.8	55450.	8.8468
378	725.00	6267.8	55450.	8.8468
235	725.00	6231.2	55450.	8.8987
1093	725.00	6231.2	55450.	8.8987
300	725.00	6229.6	55450.	8.9011
318	725.00	6229.6	55450.	8.9011
551	725.00	6216.2	55450.	8.9203
550	725.00	6216.2	55450.	8.9203
388	725.00	6216.2	55450.	8.9203
389	725.00	6216.2	55450.	8.9203
672	725.00	6196.6	55450.	8.9485
762	725.00	6196.6	55450.	8.9485
42	725.00	6184.4	55450.	8.9662
912	725.00	6184.4	55450.	8.9662
906	725.00	6171.3	55450.	8.9852
48	725.00	6171.3	55450.	8.9852
759	725.00	6131.4	55450.	9.0437
669	725.00	6131.4	55450.	9.0437
477	725.00	6129.8	55450.	9.0460
375	725.00	6129.8	55450.	9.0460
852	725.00	6120.6	55450.	9.0596
690	725.00	6120.6	55450.	9.0596
648	725.00	6089.1	55450.	9.1064
726	725.00	6089.1	55450.	9.1064
519	725.00	6055.8	55450.	9.1565
525	725.00	6055.8	55450.	9.1565
647	725.00	6055.0	55450.	9.1577
725	725.00	6055.0	55450.	9.1577
291	725.00	6055.0	55450.	9.1577
309	725.00	6055.0	55450.	9.1577
658	725.00	5941.2	55450.	9.3331
736	725.00	5941.2	55450.	9.3331
187	725.00	5915.0	55450.	9.3745
949	725.00	5915.0	55450.	9.3745
188	725.00	5903.3	55450.	9.3930
950	725.00	5903.3	55450.	9.3930
282	725.00	5885.6	55450.	9.4213
1008	725.00	5885.6	55450.	9.4213
78	725.00	5846.3	55450.	9.4846
1020	725.00	5846.3	55450.	9.4846
851	725.00	5833.2	55450.	9.5060
689	725.00	5833.2	55450.	9.5060
37	725.00	5818.0	55450.	9.5308
907	725.00	5818.0	55450.	9.5308
552	725.00	5812.4	55450.	9.5399
390	725.00	5812.4	55450.	9.5399
1094	725.00	5787.9	55450.	9.5803
236	725.00	5787.9	55450.	9.5803
30	725.00	5739.9	55450.	9.6604

Table 6 (continued)

ELEM	REF TEMP	PM	ALLOW	SF
876	725.00	5739.9	55450.	9.6604
1236	725.00	5639.6	55450.	9.8323
1201	725.00	5639.6	55450.	9.8323
34	725.00	5624.1	55450.	9.8594
880	725.00	5624.1	55450.	9.8594
79	725.00	5616.2	55450.	9.8733
1021	725.00	5616.2	55450.	9.8733
1081	725.00	5615.8	55450.	9.8740
199	725.00	5615.8	55450.	9.8740
657	725.00	5612.7	55450.	9.8794
735	725.00	5612.7	55450.	9.8794
387	725.00	5596.6	55450.	9.9078
549	725.00	5596.6	55450.	9.9078
583	725.00	5574.8	55450.	9.9465
601	725.00	5574.8	55450.	9.9465
181	725.00	5563.3	55450.	9.9671
955	725.00	5563.3	55450.	9.9671
182	725.00	5559.4	55450.	9.9742
956	725.00	5559.4	55450.	9.9742
274	725.00	5500.8	55450.	10.080
976	725.00	5500.8	55450.	10.080
41	725.00	5465.1	55450.	10.146
911	725.00	5465.1	55450.	10.146
1097	725.00	5440.6	55450.	10.192
239	725.00	5440.6	55450.	10.192
281	725.00	5431.0	55450.	10.210
1007	725.00	5431.0	55450.	10.210
189	725.00	5417.8	55450.	10.235
951	725.00	5417.8	55450.	10.235
768	725.00	5394.0	55450.	10.280
666	725.00	5394.0	55450.	10.280
38	725.00	5384.7	55450.	10.298
908	725.00	5384.7	55450.	10.298
656	725.00	5291.1	55450.	10.480
734	725.00	5291.1	55450.	10.480
473	725.00	5289.8	55450.	10.482
383	725.00	5289.8	55450.	10.482
277	725.00	5252.7	55450.	10.556
1003	725.00	5252.7	55450.	10.556
445	725.00	5239.8	55450.	10.582
367	725.00	5239.8	55450.	10.582
1189	725.00	5144.0	55450.	10.780
1153	725.00	5144.0	55450.	10.780
183	725.00	5143.1	55450.	10.781
957	725.00	5143.1	55450.	10.781
646	725.00	5123.7	55450.	10.822
724	725.00	5123.7	55450.	10.822
154	725.00	5095.2	55450.	10.883
940	725.00	5095.2	55450.	10.883

Table 6 (continued)

ELEM	REF TEMP	PM	ALLOW	SF
1216	725.00	5044.6	55450.	10.992
1221	725.00	5044.6	55450.	10.992
273	725.00	5032.8	55450.	11.018
975	725.00	5032.8	55450.	11.018
1002	725.00	4979.2	55450.	11.136
288	725.00	4979.2	55450.	11.136
1004	725.00	4858.0	55450.	11.414
278	725.00	4858.0	55450.	11.414
155	725.00	4818.0	55450.	11.509
941	725.00	4818.0	55450.	11.509
151	725.00	4782.7	55450.	11.594
937	725.00	4782.7	55450.	11.594
443	725.00	4699.2	55450.	11.800
444	725.00	4699.2	55450.	11.800
365	725.00	4699.2	55450.	11.800
366	725.00	4699.2	55450.	11.800
520	725.00	4696.7	55450.	11.806
526	725.00	4696.7	55450.	11.806
63	725.00	4694.9	55450.	11.811
1041	725.00	4694.9	55450.	11.811
767	725.00	4601.5	55450.	12.050
665	725.00	4601.5	55450.	12.050
272	725.00	4571.8	55450.	12.129
974	725.00	4571.8	55450.	12.129
364	725.00	4485.9	55450.	12.361
442	725.00	4485.9	55450.	12.361
62	725.00	4438.7	55450.	12.492
1040	725.00	4438.7	55450.	12.492
528	725.00	4363.8	55450.	12.707
522	725.00	4363.8	55450.	12.707
280	725.00	4291.2	55450.	12.922
1006	725.00	4291.2	55450.	12.922
620	725.00	4276.7	55450.	12.966
621	725.00	4276.7	55450.	12.966
614	725.00	4276.7	55450.	12.966
615	725.00	4276.7	55450.	12.966
1173	725.00	4248.9	55450.	13.050
1185	725.00	4248.9	55450.	13.050
190	725.00	4247.2	55450.	13.056
952	725.00	4247.2	55450.	13.056
865	725.00	4183.4	55450.	13.255
19	725.00	4183.4	55450.	13.255
460	725.00	4168.3	55450.	13.303
346	725.00	4168.3	55450.	13.303
471	725.00	4072.6	55450.	13.615
381	725.00	4072.6	55450.	13.615
40	725.00	4060.7	55450.	13.655
910	725.00	4060.7	55450.	13.655
271	725.00	4048.4	55450.	13.697

Table 6 (continued)

ELEM	REF TEMP	PM	ALLOW	SF
973	725.00	4048.4	55450.	13.697
184	725.00	4041.6	55450.	13.720
958	725.00	4041.6	55450.	13.720
64	725.00	4041.2	55450.	13.721
1042	725.00	4041.2	55450.	13.721
463	725.00	4023.5	55450.	13.781
462	725.00	4023.5	55450.	13.781
348	725.00	4023.5	55450.	13.781
349	725.00	4023.5	55450.	13.781
850	725.00	4011.8	55450.	13.822
688	725.00	4011.8	55450.	13.822
464	725.00	3987.9	55450.	13.905
350	725.00	3987.9	55450.	13.905
1096	725.00	3946.3	55450.	14.051
238	725.00	3946.3	55450.	14.051
613	725.00	3943.9	55450.	14.060
619	725.00	3943.9	55450.	14.060
461	725.00	3938.1	55450.	14.080
347	725.00	3938.1	55450.	14.080
616	725.00	3924.2	55450.	14.130
622	725.00	3924.2	55450.	14.130
866	725.00	3917.6	55450.	14.154
20	725.00	3917.6	55450.	14.154
150	725.00	3855.1	55450.	14.384
936	725.00	3855.1	55450.	14.384
849	725.00	3780.0	55450.	14.669
687	725.00	3780.0	55450.	14.669
1195	725.00	3617.2	55450.	15.329
1159	725.00	3617.2	55450.	15.329
1217	725.00	3595.8	55450.	15.421
709	725.00	3595.8	55450.	15.421
859	725.00	3595.8	55450.	15.421
1222	725.00	3595.8	55450.	15.421
186	725.00	3582.4	55450.	15.478
960	725.00	3582.4	55450.	15.478
192	725.00	3580.4	55450.	15.487
954	725.00	3580.4	55450.	15.487
848	725.00	3555.2	55450.	15.597
686	725.00	3555.2	55450.	15.597
1174	725.00	3440.7	55450.	16.116
1186	725.00	3440.7	55450.	16.116
600	725.00	3406.3	55450.	16.279
582	725.00	3406.3	55450.	16.279
652	725.00	3399.4	55450.	16.312
730	725.00	3399.4	55450.	16.312
653	725.00	3392.5	55450.	16.345
731	725.00	3392.5	55450.	16.345
789	725.00	3333.2	55450.	16.636
771	725.00	3333.2	55450.	16.636

Table 6 (continued)

ELEM	REF TEMP	PM	ALLOW	SF
1220	725.00	3324.6	55450.	16.679
1225	725.00	3324.6	55450.	16.679
1218	725.00	3240.8	55450.	17.110
1223	725.00	3240.8	55450.	17.110
472	725.00	3208.4	55450.	17.283
382	725.00	3208.4	55450.	17.283
645	725.00	3169.5	55450.	17.495
723	725.00	3169.5	55450.	17.495
766	725.00	3123.9	55450.	17.750
664	725.00	3123.9	55450.	17.750
868	725.00	3042.9	55450.	18.223
869	725.00	3042.9	55450.	18.223
23	725.00	3042.9	55450.	18.223
22	725.00	3042.9	55450.	18.223
264	725.00	3017.3	55450.	18.377
966	725.00	3017.3	55450.	18.377
465	725.00	2929.0	55450.	18.932
351	725.00	2929.0	55450.	18.932
765	725.00	2924.3	55450.	18.962
663	725.00	2924.3	55450.	18.962
623	725.00	2886.6	55450.	19.210
617	725.00	2886.6	55450.	19.210
654	725.00	2862.9	55450.	19.369
732	725.00	2862.9	55450.	19.369
21	725.00	2787.7	55450.	19.891
867	725.00	2787.7	55450.	19.891
263	725.00	2751.4	55450.	20.154
965	725.00	2751.4	55450.	20.154
60	725.00	2665.5	55450.	20.803
59	725.00	2665.5	55450.	20.803
1037	725.00	2665.5	55450.	20.803
1038	725.00	2665.5	55450.	20.803
521	725.00	2652.3	55450.	20.906
527	725.00	2652.3	55450.	20.906
159	725.00	2516.5	55450.	22.034
158	725.00	2516.5	55450.	22.034
944	725.00	2516.5	55450.	22.034
945	725.00	2516.5	55450.	22.034
160	725.00	2486.4	55450.	22.302
946	725.00	2486.4	55450.	22.302
775	725.00	2478.2	55450.	22.375
793	725.00	2478.2	55450.	22.375
279	725.00	2466.3	55450.	22.483
1005	725.00	2466.3	55450.	22.483
161	725.00	2449.2	55450.	22.640
947	725.00	2449.2	55450.	22.640
1039	725.00	2416.3	55450.	22.948
61	725.00	2416.3	55450.	22.948
157	725.00	2392.8	55450.	23.174

Table 6 (continued)

ELEM	REF TEMP	PM	ALLOW	SF
943	725.00	2392.8	55450.	23.174
953	725.00	2391.3	55450.	23.188
191	725.00	2391.3	55450.	23.188
1209	725.00	2371.1	55450.	23.386
1208	725.00	2371.1	55450.	23.386
1233	725.00	2371.1	55450.	23.386
1234	725.00	2371.1	55450.	23.386
870	725.00	2274.7	55450.	24.377
24	725.00	2274.7	55450.	24.377
959	725.00	2254.9	55450.	24.590
185	725.00	2254.9	55450.	24.590
156	725.00	2237.5	55450.	24.783
942	725.00	2237.5	55450.	24.783
655	725.00	2224.7	55450.	24.925
733	725.00	2224.7	55450.	24.925
1235	725.00	2219.6	55450.	24.982
1210	725.00	2219.6	55450.	24.982
1095	725.00	2197.8	55450.	25.230
237	725.00	2197.8	55450.	25.230
1200	725.00	2185.8	55450.	25.369
1164	725.00	2185.8	55450.	25.369
1219	725.00	2005.5	55450.	27.649
1224	725.00	2005.5	55450.	27.649
162	725.00	1993.5	55450.	27.816
948	725.00	1993.5	55450.	27.816
909	725.00	1971.1	55450.	28.131
39	725.00	1971.1	55450.	28.131
857	725.00	1912.1	55450.	28.999
719	725.00	1912.1	55450.	28.999
856	725.00	1912.1	55450.	28.999
718	725.00	1912.1	55450.	28.999
58	725.00	1891.3	55450.	29.318
1036	725.00	1891.3	55450.	29.318
714	725.00	1838.7	55450.	30.157
864	725.00	1838.7	55450.	30.157
717	725.00	1690.5	55450.	32.800
855	725.00	1690.5	55450.	32.800
1207	725.00	1625.4	55450.	34.114
1232	725.00	1625.4	55450.	34.114
685	725.00	1548.3	55450.	35.814
847	725.00	1548.3	55450.	35.814
853	725.00	1465.3	55450.	37.841
715	725.00	1465.3	55450.	37.841
963	725.00	1451.2	55450.	38.209
260	725.00	1451.2	55450.	38.209
962	725.00	1451.2	55450.	38.209
261	725.00	1451.2	55450.	38.209
858	725.00	1448.5	55450.	38.280
720	725.00	1448.5	55450.	38.280

Table 6 (continued)

ELEM	REF TEMP	PM	ALLOW	SF
618	725.00	1404.7	55450.	39.474
624	725.00	1404.7	55450.	39.474
716	725.00	1240.6	55450.	44.696
854	725.00	1240.6	55450.	44.696
262	725.00	1194.0	55450.	46.442
964	725.00	1194.0	55450.	46.442
133	725.00	971.11	55450.	57.099
1147	725.00	971.11	55450.	57.099
259	725.00	685.15	55450.	80.931
961	725.00	685.15	55450.	80.931
684	725.00	373.60	55450.	148.42
846	725.00	373.60	55450.	148.42

Table 7

TITLE=
MPC-24E Structural Analysis

SUBTITLE 1 =
Component: Enclosure Vessel
SUBTITLE 2 =
Load Combination: E2.b (See Table 2.1.7)
SUBTITLE 3 =
Stress Result: Primary Membrane (PM)

PRINT ELEMENT TABLE ITEMS PER ELEMENT

STAT ELEM	CURRENT REF TEMP	MIXED PM	PREVIOUS ALLOW	PREVIOUS SF
1371	450.00	6533.6	43450.	6.6502
1370	450.00	6533.4	43450.	6.6504
1372	450.00	6533.3	43450.	6.6506
1369	450.00	6532.7	43450.	6.6511
1373	450.00	6498.1	43450.	6.6866
1374	450.00	6497.3	43450.	6.6874
1368	450.00	6496.2	43450.	6.6886
1375	450.00	6494.9	43450.	6.6899
1367	450.00	6494.2	43450.	6.6906
1376	450.00	6491.0	43450.	6.6938
1366	450.00	6490.7	43450.	6.6942
1365	450.00	6485.7	43450.	6.6993
1377	450.00	6485.7	43450.	6.6994
1364	450.00	6479.2	43450.	6.7060
1378	450.00	6478.9	43450.	6.7064
1363	450.00	6471.4	43450.	6.7142
1379	450.00	6470.7	43450.	6.7148
1362	450.00	6462.1	43450.	6.7238
1380	450.00	6461.4	43450.	6.7245
1361	450.00	6458.5	43450.	6.7276
1381	450.00	6458.1	43450.	6.7280
1360	450.00	6452.8	43450.	6.7335
1382	450.00	6452.3	43450.	6.7341
1359	450.00	6446.7	43450.	6.7399
1383	450.00	6445.9	43450.	6.7407
1358	450.00	6436.2	43450.	6.7509
1384	450.00	6435.1	43450.	6.7520
1357	450.00	6424.5	43450.	6.7631
1385	450.00	6423.5	43450.	6.7643
1356	450.00	6412.1	43450.	6.7762
1386	450.00	6411.1	43450.	6.7773
1355	450.00	6399.0	43450.	6.7901
1387	450.00	6398.0	43450.	6.7912
1354	450.00	6385.2	43450.	6.8048
1388	450.00	6384.3	43450.	6.8058

Table 7 (continued)

ELEM	REF TEMP	PM	ALLOW	SF
1353	450.00	6370.8	43450.	6.8201
1389	450.00	6370.2	43450.	6.8208
1352	450.00	6362.1	43450.	6.8296
1390	450.00	6361.7	43450.	6.8299
1351	450.00	6353.4	43450.	6.8389
1241	450.00	6353.1	43450.	6.8392
1350	450.00	6338.2	43450.	6.8552
1242	450.00	6338.0	43450.	6.8554
1243	450.00	6322.8	43450.	6.8720
1349	450.00	6322.6	43450.	6.8722
1244	450.00	6307.4	43450.	6.8887
1348	450.00	6306.8	43450.	6.8894
1245	450.00	6291.9	43450.	6.9057
1347	450.00	6290.9	43450.	6.9069
1246	450.00	6276.6	43450.	6.9226
1346	450.00	6274.9	43450.	6.9244
1247	450.00	6260.8	43450.	6.9400
1345	450.00	6259.1	43450.	6.9419
1248	450.00	6250.7	43450.	6.9513
1344	450.00	6249.9	43450.	6.9521
1343	450.00	6239.6	43450.	6.9636
1249	450.00	6238.7	43450.	6.9646
1342	450.00	6232.2	43450.	6.9719
1250	450.00	5450.3	43450.	7.9720
1251	450.00	5433.3	43450.	7.9970
1341	450.00	5429.3	43450.	8.0028
1340	450.00	5411.9	43450.	8.0286
1252	450.00	5411.3	43450.	8.0295
1339	450.00	5389.5	43450.	8.0620
1253	450.00	5383.9	43450.	8.0703
1338	450.00	5361.8	43450.	8.1036
1254	450.00	5359.7	43450.	8.1068
1255	450.00	5338.8	43450.	8.1385
1337	450.00	5337.4	43450.	8.1407
1256	450.00	5321.4	43450.	8.1651
1336	450.00	5316.3	43450.	8.1730
1257	450.00	5303.2	43450.	8.1931
1335	450.00	5298.8	43450.	8.2000
1258	450.00	5288.6	43450.	8.2158
1334	450.00	5286.3	43450.	8.2193
1259	450.00	5274.4	43450.	8.2378
1333	450.00	5271.7	43450.	8.2421
1332	450.00	5257.6	43450.	8.2643
1260	450.00	3321.2	43450.	13.083
1331	450.00	3298.6	43450.	13.172
1261	450.00	3285.5	43450.	13.225
1330	450.00	3263.0	43450.	13.316
1262	450.00	3259.2	43450.	13.331
1263	450.00	3242.7	43450.	13.399

Table 7 (continued)

ELEM	REF TEMP	PM	ALLOW	SF
1329	450.00	3236.9	43450.	13.423
1264	450.00	3236.0	43450.	13.427
1328	450.00	3220.6	43450.	13.491
1265	450.00	3219.4	43450.	13.496
1327	450.00	3214.2	43450.	13.518
1326	450.00	3198.0	43450.	13.587
1266	450.00	3192.0	43450.	13.612
1325	450.00	3171.0	43450.	13.703
1267	450.00	3166.8	43450.	13.720
1324	450.00	3160.3	43450.	13.749
1286	450.00	2989.3	43450.	14.535
1305	450.00	2986.3	43450.	14.550
1288	450.00	2083.4	43450.	20.855
1287	450.00	2082.6	43450.	20.863
1303	450.00	2075.9	43450.	20.931
1304	450.00	2073.9	43450.	20.950
1289	450.00	2071.0	43450.	20.981
1302	450.00	2064.5	43450.	21.046
1294	450.00	2062.3	43450.	21.069
1297	450.00	2061.7	43450.	21.075
1293	450.00	2055.3	43450.	21.140
1298	450.00	2053.5	43450.	21.159
1290	450.00	2044.9	43450.	21.248
1301	450.00	2039.6	43450.	21.303
1295	450.00	2037.8	43450.	21.322
1296	450.00	2037.6	43450.	21.324
1292	450.00	2037.1	43450.	21.330
1299	450.00	2034.0	43450.	21.361
1291	450.00	2033.6	43450.	21.366
1300	450.00	2029.4	43450.	21.410
1268	450.00	1805.0	43450.	24.072
1269	450.00	1798.6	43450.	24.158
1323	450.00	1793.9	43450.	24.221
1322	450.00	1787.6	43450.	24.306
1270	450.00	1516.7	43450.	28.647
1321	450.00	1499.2	43450.	28.982
1271	450.00	1488.3	43450.	29.195
1284	450.00	1476.5	43450.	29.428
1274	450.00	1474.1	43450.	29.475
1272	450.00	1471.6	43450.	29.525
1320	450.00	1471.2	43450.	29.533
1307	450.00	1470.9	43450.	29.540
1273	450.00	1466.9	43450.	29.621
1285	450.00	1463.4	43450.	29.690
1317	450.00	1458.7	43450.	29.788
1306	450.00	1458.1	43450.	29.798
1319	450.00	1455.1	43450.	29.861
1275	450.00	1455.1	43450.	29.861
1318	450.00	1450.9	43450.	29.948

Table 7 (continued)

ELEM	REF TEMP	PM	ALLOW	SF
1316	450.00	1440.2	43450.	30.169
1278	450.00	1436.0	43450.	30.259
1279	450.00	1429.3	43450.	30.400
1313	450.00	1422.5	43450.	30.545
1312	450.00	1416.5	43450.	30.675
1280	450.00	1394.0	43450.	31.168
1311	450.00	1382.0	43450.	31.440
1281	450.00	1371.3	43450.	31.685
1283	450.00	1363.6	43450.	31.863
1282	450.00	1361.2	43450.	31.921
1310	450.00	1360.0	43450.	31.949
1276	450.00	1358.6	43450.	31.980
1308	450.00	1353.8	43450.	32.094
1309	450.00	1350.6	43450.	32.171
1315	450.00	1350.3	43450.	32.178
1277	450.00	1349.1	43450.	32.207
1314	450.00	1340.9	43450.	32.403

Table 8

```
TITLE=
MPC-24E Structural Analysis

SUBTITLE  1 =
Component: Enclosure Vessel
SUBTITLE  2 =
Load Combination: E2.b (See Table 2.1.7)
SUBTITLE  3 =
Stress Result: Primary Local Plus Primary Bending (PL+PB)

PRINT ELEMENT TABLE ITEMS PER ELEMENT
```

STAT ELEM	CURRENT REF TEMP	MIXED PL+PB	PREVIOUS ALLOW	PREVIOUS SF
1322	450.00	1.7124.	65200.	3.8076
1269	450.00	1.7124.	65200.	3.8076
1323	450.00	1.7119.	65200.	3.8086
1268	450.00	1.7119.	65200.	3.8086
1306	450.00	1.5131.	65200.	4.3091
1285	450.00	1.5131.	65200.	4.3091
1307	450.00	1.5123.	65200.	4.3113
1284	450.00	1.5123.	65200.	4.3113
1275	450.00	1.4442.	65200.	4.5148
1316	450.00	1.4442.	65200.	4.5148
1274	450.00	1.4438.	65200.	4.5159
1317	450.00	1.4438.	65200.	4.5159
1278	450.00	1.3961.	65200.	4.6703
1313	450.00	1.3961.	65200.	4.6703
1279	450.00	1.3954.	65200.	4.6726
1312	450.00	1.3954.	65200.	4.6726
1297	450.00	1.2589.	65200.	5.1793
1294	450.00	1.2589.	65200.	5.1793
1298	450.00	1.2580.	65200.	5.1829
1293	450.00	1.2580.	65200.	5.1829
1296	450.00	1.0978.	65200.	5.9389
1295	450.00	1.0978.	65200.	5.9389
1288	450.00	1.0871.	65200.	5.9979
1303	450.00	1.0871.	65200.	5.9979
1289	450.00	1.0866.	65200.	6.0006
1302	450.00	1.0866.	65200.	6.0006
1320	450.00	1.0820.	65200.	6.0257
1271	450.00	1.0820.	65200.	6.0257
1319	450.00	1.0820.	65200.	6.0259
1272	450.00	1.0820.	65200.	6.0259
1326	450.00	1.0256.	65200.	6.3573
1265	450.00	1.0256.	65200.	6.3573
1327	450.00	1.0251.	65200.	6.3606
1264	450.00	1.0251.	65200.	6.3606
1281	450.00	1.0244.	65200.	6.3647

Table 8 (continued)

ELEM	REF TEMP	PM	ALLOW	SF
1310	450.00	10244.	65200.	6.3647
1282	450.00	10243.	65200.	6.3655
1309	450.00	10243.	65200.	6.3655
1332	450.00	10008.	65200.	6.5149
1259	450.00	10008.	65200.	6.5149
1333	450.00	9222.2	65200.	7.0699
1258	450.00	9222.2	65200.	7.0699
1290	450.00	9188.8	65200.	7.0956
1301	450.00	9188.8	65200.	7.0956
1261	450.00	9183.6	65200.	7.0996
1330	450.00	9183.6	65200.	7.0996
1291	450.00	9182.8	65200.	7.1002
1300	450.00	9182.8	65200.	7.1002
1262	450.00	9179.9	65200.	7.1025
1329	450.00	9179.9	65200.	7.1025
1299	450.00	8848.0	65200.	7.3689
1292	450.00	8848.0	65200.	7.3689
1263	450.00	8752.8	65200.	7.4491
1328	450.00	8752.8	65200.	7.4491
1350	450.00	8651.2	65200.	7.5365
1241	450.00	8651.2	65200.	7.5365
1349	450.00	8651.1	65200.	7.5367
1242	450.00	8651.1	65200.	7.5367
1348	450.00	8635.8	65200.	7.5500
1243	450.00	8635.8	65200.	7.5500
1270	450.00	8635.2	65200.	7.5505
1321	450.00	8635.2	65200.	7.5505
1390	450.00	8533.6	65200.	7.6404
1351	450.00	8533.6	65200.	7.6404
1347	450.00	8461.9	65200.	7.7052
1244	450.00	8461.9	65200.	7.7052
1352	450.00	8414.4	65200.	7.7487
1389	450.00	8414.4	65200.	7.7487
1318	450.00	8349.7	65200.	7.8087
1273	450.00	8349.7	65200.	7.8087
1280	450.00	8286.5	65200.	7.8682
1311	450.00	8286.5	65200.	7.8682
1388	450.00	8263.6	65200.	7.8900
1353	450.00	8263.6	65200.	7.8900
1376	450.00	8157.6	65200.	7.9926
1365	450.00	8157.6	65200.	7.9926
1377	450.00	8157.5	65200.	7.9926
1364	450.00	8157.5	65200.	7.9926
1346	450.00	8103.0	65200.	8.0464
1245	450.00	8103.0	65200.	8.0464
1375	450.00	8102.8	65200.	8.0466
1366	450.00	8102.8	65200.	8.0466
1378	450.00	8075.7	65200.	8.0736
1363	450.00	8075.7	65200.	8.0736

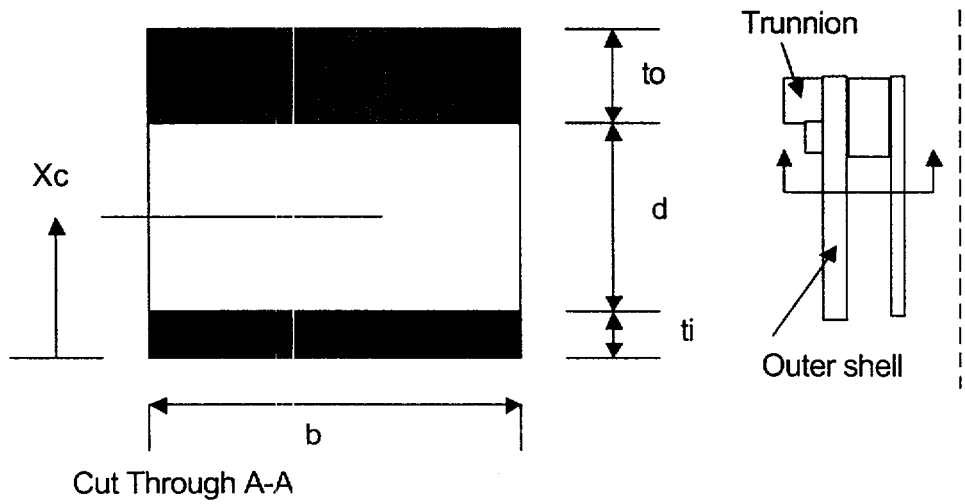
Table 8 (continued)

ELEM	REF TEMP	PM	ALLOW	SF
1331	450.00	8071.6	65200.	8.0777
1260	450.00	8071.6	65200.	8.0777
1340	450.00	8006.4	65200.	8.1435
1251	450.00	8006.4	65200.	8.1435
1339	450.00	8005.8	65200.	8.1441
1252	450.00	8005.8	65200.	8.1441
1387	450.00	7942.4	65200.	8.2091
1354	450.00	7942.4	65200.	8.2091
1374	450.00	7900.4	65200.	8.2527
1367	450.00	7900.4	65200.	8.2527
1379	450.00	7871.8	65200.	8.2828
1362	450.00	7871.8	65200.	8.2828
1257	450.00	7868.4	65200.	8.2863
1334	450.00	7868.4	65200.	8.2863
1386	450.00	7564.1	65200.	8.6197
1355	450.00	7564.1	65200.	8.6197
1361	450.00	7562.5	65200.	8.6214
1380	450.00	7562.5	65200.	8.6214
1373	450.00	7542.1	65200.	8.6448
1368	450.00	7542.1	65200.	8.6448
1345	450.00	7532.5	65200.	8.6558
1246	450.00	7532.5	65200.	8.6558
1360	450.00	7446.4	65200.	8.7559
1381	450.00	7446.4	65200.	8.7559
1336	450.00	7419.0	65200.	8.7882
1255	450.00	7419.0	65200.	8.7882
1337	450.00	7417.6	65200.	8.7899
1254	450.00	7417.6	65200.	8.7899
1256	450.00	7395.9	65200.	8.8157
1335	450.00	7395.9	65200.	8.8157
1283	450.00	7343.8	65200.	8.8782
1308	450.00	7343.8	65200.	8.8782
1253	450.00	7294.5	65200.	8.9383
1338	450.00	7294.5	65200.	8.9383
1359	450.00	7228.8	65200.	9.0195
1382	450.00	7228.8	65200.	9.0195
1371	450.00	7185.1	65200.	9.0743
1370	450.00	7185.1	65200.	9.0743
1286	450.00	7170.2	65200.	9.0931
1305	450.00	7170.2	65200.	9.0931
1372	450.00	7153.3	65200.	9.1147
1369	450.00	7153.3	65200.	9.1147
1385	450.00	7150.5	65200.	9.1182
1356	450.00	7150.5	65200.	9.1182
1383	450.00	6991.3	65200.	9.3259
1358	450.00	6991.3	65200.	9.3259
1249	450.00	6888.3	65200.	9.4654
1342	450.00	6888.3	65200.	9.4654
1344	450.00	6722.7	65200.	9.6985

Table 8 (continued)

ELEM	REF TEMP	PM	ALLOW	SF
1247	450.00	6722.7	65200.	9.6985
1384	450.00	6722.6	65200.	9.6986
1357	450.00	6722.6	65200.	9.6986
1314	450.00	6492.5	65200.	10.042
1277	450.00	6492.5	65200.	10.042
1248	450.00	6406.5	65200.	10.177
1343	450.00	6406.5	65200.	10.177
1250	450.00	6106.4	65200.	10.677
1341	450.00	6106.4	65200.	10.677
1266	450.00	5768.2	65200.	11.303
1325	450.00	5768.2	65200.	11.303
1267	450.00	5315.1	65200.	12.267
1324	450.00	5315.1	65200.	12.267
1315	450.00	5244.3	65200.	12.432
1276	450.00	5244.3	65200.	12.432
1304	450.00	4272.7	65200.	15.260
1287	450.00	4272.7	65200.	15.260

This calculation determines the centroid location and moment of inertia, relative to the inside edge of the inner cylinder of the transfer cask. The result is needed so that the interface stress in the HI-TRAC 100 can be estimated from the finite element results for the HI-TRAC 125.



HI-TRAC 125 Dwg. 1880, Sheet 2

$b := 10 \cdot in$ $ti := 0.75 \cdot in$ $to := 1.0 \cdot in$ $d := 4.5 \cdot in$

$A_o := b \cdot to$ $A_o = 10\,in^2$ $A_i := b \cdot ti$ $A_i = 7.5\,in^2$

$$Xc := \frac{A_o \cdot (ti + d + .5 \cdot to) + A_i \cdot (.5 \cdot ti)}{A_o + A_i}$$ $Xc = 3.446\,in$

$C := (ti + to + d) - Xc$ $C = 2.804\,in$ $c_{125} := C$

$$I := A_i \cdot (Xc - .5 \cdot ti)^2 + A_o \cdot (C - .5 \cdot to)^2 + \frac{b}{12} \cdot \left(ti^3 + to^3\right)$$

$C_{125} := Xc$ $r_{125} := \frac{I}{C}$ $r_{125} = 44.587\,in^3$ $I = 125.002\,in^4$

HI-TRAC 100 Dwg. 2145, Sheet 2

$ti := 0.75 \cdot in$ $to := 1.0 \cdot in$ $d := 2.875 \cdot in$

$A_o := b \cdot to$ $A_o = 10\,in^2$ $A_i := b \cdot ti$ $A_i = 7.5\,in^2$

$$Xc := \frac{A_o \cdot (ti + d + .5 \cdot to) + A_i \cdot (.5 \cdot ti)}{A_o + A_i} \qquad Xc = 2.518\,in$$

$C := (ti + to + d) - Xc$ $C = 2.107\,in$ $c_{100} := C$

$$I := A_i \cdot (Xc - .5 \cdot ti)^2 + A_o \cdot (C - .5 \cdot to)^2 + \frac{b}{12} \cdot \left(ti^3 + to^3\right) \qquad I = 61.453\,in^4$$

$C_{100} := Xc$ $r_{100} := \frac{I}{C}$ $r_{100} = 29.164\,in^3$

Calculate $X := \frac{r_{125}}{r_{100}}$ $X = 1.529$

Calculate Moment arms

$ID := 68.75 \cdot in$ $w := 2.5 \cdot in$ Lift Yoke contact width

$OD := 90 \cdot in$ Outer edge of trunnion to match with HI-STAR 100

$Span := .5 \cdot (OD - ID)$ $Span = 10.625\,in$

$arm_{125} := Span - .5 \cdot w - C_{125}$ $arm_{125} = 5.929\,in$

$arm_{100} := Span - .5 \cdot w - C_{100}$ $arm_{100} = 6.857\,in$

$F_{125} := 125000 \cdot lbf$ $F_{100} := 100500 \cdot lbf$

$M_{125} := F_{125} \cdot arm_{125}$ $M_{125} = 7.411 \times 10^5\,lbf \cdot in$

$M_{100} := F_{100} \cdot arm_{100}$ $M_{100} = 6.891 \times 10^5\,lbf \cdot in$

$$\sigma_{125} := \frac{F_{125} \cdot arm_{125}}{r_{125}} + \frac{F_{125}}{A_o + A_i} \qquad \sigma_{100} := \frac{F_{100} \cdot arm_{100}}{r_{100}} + \frac{F_{100}}{A_o + A_i} \qquad \frac{\sigma_{100}}{\sigma_{125}} = 1.236$$

MISCELLANEOUS CALCULATIONS FOR CHAPTER 3, REV 11

D2.1 Introduction

This Calculation contains results of individual calculations that appear directly in the text of chapter 3 of the TSAR. The purpose of this Calculation is simply to provide a location in the backup calculation package of items in the text. The calculations are identified by section; references, assumptions, if needed, are in the text, and are not repeated here. No descriptive text is given here. The calculations are updated to support Rev. 11 of the TSAR document.

D2.2 Section 3.4.6 - Calculation of flood water effects

$W := 303000 \cdot lbf$ $\quad$ $Diameter := 132.5 \cdot in$ $\quad$ $g = 32.174\, ft\, sec^{-2}$

$H := 231.25 \cdot in$ $\quad$ $\gamma := 62.4 \cdot \frac{lbf}{ft^3}$ $\quad$ Drg. 1495 has dimensions

$A := H \cdot Diameter$ $\quad$ $A = 212.782\, ft^2$

The force resisting sliding is the coefficient of friction multiplied by the vertical load on the pad. For a conservative (low) estimate of the sliding velocity limit, a minimum sliding force needs to be computed. Therefore, we compute the bouyant force existing for a fully submerged cask, recognizing that there will be water inside the overpack in the annular space.

We need to compute the total volume of the cask so as to compute the weight of water displaced. We compute this volume by considering the cask as a solid cylinder and then subtracting out the annular spaces and channels that will be filled with water during submergence.

$Total_Volume := \frac{\pi}{4} \cdot Diameter^2 \cdot H$ $\quad$ $Total_Volume = 3.189 \times 10^6 in^3$

The Inner diameter of the overpack is(see Drg. 1495,sheet 2) $\quad ID := 73.5 \cdot in$

The outer diameter of the HI-STAR MPC is (Drg. 1402) $\quad OD := 68.375 \cdot in$

An approximate calculation of the water volume in the annulus is simply

$Volume_{annulus} := \frac{\pi}{4} \cdot \left(ID^2 - OD^2\right) \cdot H$ $\quad$ $Volume_{annulus} = 1.321 \times 10^5 in^3$

This calculation neglects the "c" channels which will subtract off a minor amount of water volume.

The water volume in the inlet and outlet cutouts (see Drg. 1495, 1496 for dimensions) is computed approximately as follows:

Outlets (4 total at top)

$$Volume_{top} := 4 \cdot 25 \cdot in \cdot 6 \cdot in \cdot \frac{(Diameter - ID)}{2} \qquad Volume_{top} = 1.77 \times 10^4 in^3$$

Inlets (4 total at bottom)

$$Volume_{bottom} := 4 \cdot 15 \cdot in \cdot 10 \cdot in \cdot \frac{(Diameter - ID)}{2}$$

$$Volume_{bottom} = 1.77 \times 10^4 in^3$$

Therefore, the displaced volume is approximately computed as

$$Volume_{displaced} := Total_Volume - Volume_{annulus} - Volume_{top} \ldots + -Volume_{bottom}$$

$$Volume_{displaced} = 3.021 \times 10^6 in^3$$

We now compute the ratio of wet weight to dry weight, K

$$K := 1 - \frac{\gamma \cdot Volume_{displaced}}{W} \qquad K = 0.64$$

The coefficient for friction is conservatively set at a low value of 0.25. Data for steel on steel in water indicates a lower bound on coefficient of friction equal to 0.2 (E. Rabinowicz, "Friction Coefficients of Water Lubricated Stainless Steels for a Spent Fuel Rack Facility, MIT, 1976, (a report for Boston Edison Company)). .It is conservative to use a value higher than that for wet steel on steel

$$\mu := 0.25$$

$$F_{slide} := \mu \cdot K \cdot W \qquad F_{slide} = 4.8476 \times 10^4 lbf$$

$$Value := \frac{2 \cdot g \cdot F_{slide}}{A \cdot \gamma} \qquad Velocity := \sqrt{Value} \qquad Velocity = 15.327 \frac{ft}{sec}$$

For the static stability calculation, the centroid location is conservatively set at the highest location (defined as $H_{asterisk}$):

$$H_{asterisk} := 118.51 \cdot in$$ Table 3.2.3

$$F_T := \frac{K \cdot Diameter}{2 \cdot H_{asterisk}} \cdot W \qquad F_T = 1.08396 \times 10^5 lbf$$

Note that what is being computed here is the force required to just initiate a rotational motion to tip the cask.

D2.3 Calculations Supporting Section 3.4.7

From Table 3.2.1 (Note that Loaded weights are used).

$W_{ovp} := 265866 \cdot lbf$ $\quad H_{ovp} := 116.8 \cdot in$ Tables 3.2.1 and 3.2.3

$W_{mpc24} := 39667 \cdot lbf$ $\quad h_{mpc24} := 108.9 \cdot in$

$W_{mpc32} := 34375 \cdot lbf$ $\quad h_{mpc32} := 109.3 \cdot in$

$W_{mpc68} := 39641 \cdot lbf$ $\quad h_{mpc68} := 109.9 \cdot in$

$W_{mpc24e} := 42069 \cdot lbf$ $\quad h_{mpc24e} := 107.9 \cdot in$

$h_{ped} := 22 \cdot in$ height of concrete pedestal

$h_{plate} := 2 \cdot in$ thickness of overpack bottom plate

The composite centroid is obtained from the equation

$$H_{cg24} := \frac{W_{ovp} \cdot H_{ovp} + W_{mpc24} \cdot (h_{mpc24} + h_{ped} + h_{plate})}{W_{ovp} + W_{mpc24}}$$

$H_{cg24} = 118.89\,in$

$$H_{cg32} := \frac{W_{ovp} \cdot H_{ovp} + W_{mpc32} \cdot (h_{mpc32} + h_{ped} + h_{plate})}{W_{ovp} + W_{mpc32}}$$

$H_{cg32} = 118.689\,in$

$$H_{cg68} := \frac{W_{ovp} \cdot H_{ovp} + W_{mpc68} \cdot (h_{mpc68} + h_{ped} + h_{plate})}{W_{ovp} + W_{mpc68}}$$

$H_{cg68} = 119.019\,in$

$$H_{cg24e} := \frac{W_{ovp} \cdot H_{ovp} + W_{mpc24e} \cdot (h_{mpc24e} + h_{ped} + h_{plate})}{W_{ovp} + W_{mpc24e}}$$

$H_{cg24e} = 118.863\,in$

For the limiting G value calculation $r := 66.25 \cdot in$ $H := H_{cg68}$

The vertical acceleration multiplier is (net from 2 equal horizontal inputs)

$G_v := 0.16$ $G_{max} := \frac{r}{H} \cdot (1 - G_v)$ $G_{max} = 0.468$

$G_v := 0.2$ $G_{max} := \frac{r}{H} \cdot (1 - G_v)$ $G_{max} = 0.445$

$G_v := 0.25$ $G_{max} := \frac{r}{H} \cdot (1 - G_v)$ $G_{max} = 0.417$

$G_v := .357$ $G_{max} := \frac{r}{H} \cdot (1 - G_v)$ $G_{max} = 0.358$

From Table 3.2.1 (Note that empty weights are used for conservatism since the results for the centroid will be the largest).

$W_{ovp} := 252337 \cdot lbf$	$H_{ovp} := 111.3 \cdot in$	Tables 3.2.1 and 3.2.3
$W_{mpc24} := 39667 \cdot lbf$	$h_{mpc24} := 108.9 \cdot in$	
$W_{mpc32} := 34375 \cdot lbf$	$h_{mpc32} := 109.3 \cdot in$	
$W_{mpc68} := 39641 \cdot lbf$	$h_{mpc68} := 109.9 \cdot in$	
$W_{mpc24e} := 42069 \cdot lbf$	$h_{mpc24e} := 107.9 \cdot in$	
	$h_{ped} := 17 \cdot in$	height of concrete pedestal(reduced in 100S
	$h_{plate} := 2 \cdot in$	thickness of overpack bottom plate

The composite centroid is obtained from the equation

$$H_{cg24} := \frac{W_{ovp} \cdot H_{ovp} + W_{mpc24} \cdot (h_{mpc24} + h_{ped} + h_{plate})}{W_{ovp} + W_{mpc24}}$$

$H_{cg24} = 113.555\,in$

$$H_{cg32} := \frac{W_{ovp} \cdot H_{ovp} + W_{mpc32} \cdot (h_{mpc32} + h_{ped} + h_{plate})}{W_{ovp} + W_{mpc32}}$$

$H_{cg32} = 113.338\,in$

$$H_{cg68} := \frac{W_{ovp} \cdot H_{ovp} + W_{mpc68} \cdot (h_{mpc68} + h_{ped} + h_{plate})}{W_{ovp} + W_{mpc68}}$$

$H_{cg68} = 113.69\,in$

$$H_{cg24e} := \frac{W_{ovp} \cdot H_{ovp} + W_{mpc24e} \cdot (h_{mpc24e} + h_{ped} + h_{plate})}{W_{ovp} + W_{mpc24e}}$$

$H_{cg24e} = 113.529\,in$

For the limiting G value calculation $r := 66.25 \cdot in$ $H := H_{cg68}$

The vertical acceleration multiplier is

$G_v := 0.16$ $G_{max} := \frac{r}{H} \cdot (1 - G_v)$ $G_{max} = 0.489$

$G_v := 0.2$ $G_{max} := \frac{r}{H} \cdot (1 - G_v)$ $G_{max} = 0.466$

$G_v := 0.25$ $G_{max} := \frac{r}{H} \cdot (1 - G_v)$ $G_{max} = 0.437$

$G_v := .368$ $G_{max} := \frac{r}{H} \cdot (1 - G_v)$ $G_{max} = 0.368$

D2.4 Calculations in Support of Section 3.4.8.1.b

Determine denting of overpack top lid

$KE := 1.755 \cdot 10^6 \cdot lbf \cdot in$ $S_u := 69400 \cdot psi$ $D := 8 \cdot in$

The dent is based on a shear plug failure where the lid is assumed globally rigid and the object "drills" a hole into the lid with all of the energy absorbed by shearing action. The limit shear stress is assumed to be 50% of the ultimate strength in tension.

$$Dent := \sqrt{\frac{2 \cdot KE}{\pi \cdot D \cdot S_u}} \qquad Dent = 1.419\,in$$

D2.5 Calculations in Support of Appendix 3.A

In this computation, the initial angular velocity of the cask is computed from basic rigid bogy mechanics. Input data is listed in Appendix 3.A, Table 3.A.3.

Compute the Cask Moment of inertia. Consider the mass distribution as uniform over the length. The mass moment of inertia is computed as a hollow cylinder having an effective mass equal to the total mass of the loaded HI-STORM 100. All formulas used are derived in the Appendix 3.A. Here, we use the formulas without further explaination.

$W_{total} := 356521 \cdot lbf$ We use a representative weight.

Note that the calculation of angular speed at impact will be independent of the weight. This is because, the angular speed is proportional to the ratio of weight to mass moment of inertia. Since the mass moment of inertia is linearly proportional to the weight, the effect dissapears. Therefore, although a value for weight must be input in order to evaluate the individual quantities, the result for angular velocity at impact are independent of the weight input into this calculation.

$h := 118.5 \cdot in$ $L := 231.5 \cdot in$

$d := 132.5 \cdot in$ $d_i := 72.5 \cdot in$

$$r := \sqrt{\frac{d^2}{4} + (h)^2} \qquad r = 66.25\,in$$

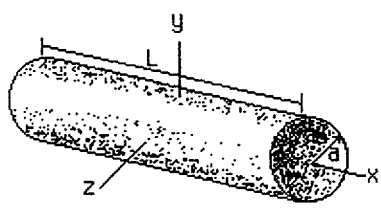
The effective mass density is computed below

$$Volume := \frac{\pi}{4}\cdot\left(d^2 - d_i^2\right)\cdot(2\cdot h) \qquad Volume = 2.29\times 10^6\,in^3$$

$$\rho_{eff} := \frac{W_{total}}{Volume\cdot g} \qquad \rho_{eff} = 4.033\times 10^{-4}\,lbf\cdot\frac{sec^2}{in^4}$$

We compute the mass moment of inertia by subtracting the results obtained for two solid cylinders.

Determine the mass moment of inertia, *I*, of a circular cylinder about the *x*-, *y*-, and *z*-axes, as shown, given the length, *L*, and radius, *a*, of the cylinder, and its mass.



Using the outside dimension

$$L = 231.5\,in \qquad a := \frac{d}{2}$$

$$mass := \rho_{eff}\cdot\pi\cdot a^2\cdot L$$

$$I_{yo} := \frac{1}{12}\cdot mass\cdot\left(3\cdot a^2 + L^2\right)$$ Moment about *y*

$$I_{zo} := I_{yo}$$ Moment about *z*

$$I_{yo} = 7.162\times 10^6\,lbf\cdot in\cdot sec^2 \qquad I_{zo} = 7.162\times 10^6\,lbf\cdot in\cdot sec^2$$

Using the inside dimension

$$L = 231.5\,in \qquad a := \frac{d_i}{2} \qquad mass := \rho_{eff}\cdot\pi\cdot a^2\cdot L$$

$$I_{yi} := \frac{1}{12} \cdot mass \cdot \left(3 \cdot a^2 + L^2\right)$$ Moment about y

$$I_{zi} := I_{yi}$$ Moment about z

$$I_{yi} = 1.848 \times 10^6 \, lbf \cdot in \cdot sec^2 \qquad I_{zi} = 1.848 \times 10^6 \, lbf \cdot in \cdot sec^2$$

The moment of inertia of the hollow cylinder about its centroid is

$$I_z := I_{zo} - I_{zi} \qquad I_z = 5.314 \times 10^6 \, lbf \cdot in \cdot sec^2$$

The moment of inertia about the lower pivot point A (Fig. 3.A.16 in TSAR) is

$$I_A := I_z + \frac{W_{total}}{g} \cdot r^2 \qquad I_A = 2.233 \times 10^7 \, lbf \cdot in \cdot sec^2$$

Find the angle θ per equation 3.A.12

$$\theta := acos\left(\frac{d}{2 \cdot r}\right) \qquad \theta = 60.792 \, deg$$

$$\cos(\theta) = 0.488$$

Then the initial angular velocity for the tipover calculation is

$$\omega := \sqrt{\frac{2 \cdot W_{total} \cdot r}{I_A} \cdot \left(1 - \frac{d}{2 \cdot r}\right)} \qquad \omega = 1.49 \, sec^{-1}$$