TELEMETRY DATA SUMMARY FOR CASK 2000
GENERATED ON 5/24/90 AT 16:16:01

Page 1 of 9
SCANS VERSION: 1b

0.76 Wall Toroid

==

ic geometry data set is COMPLETE

GENERAL SAR INFORMATION

SAR: MODEL 2000 RADIOACTIVE MATERIAL TRANSPORT PACKAGE
Report number: NEDO-31581
Report date: 4-1988
Docket number: 71-9228
Docket start date:

REVIEW TEAM:
Review leader: R.J.POMARES
Thermal analyst: R.J.POMARES
Structural analyst: R.J.POMARES
Nucleonics analyst: P.VAN DIEMEN/B.M.MURRAY

TELEMETRY DATA SUMMARY FOR CASK 2000
GENERATED ON 5/24/90 AT 16:16:01

Page 2 of 9
SCANS VERSION: 1b

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GENERAL DIMENSIONS AND SPECIFICATIONS

Cavity inner radius:	13.250 inches
Cavity length:	54.000 inches
Cask body outer radius:	19.250 inches
Cask body length:	68.620 inches

Top impact limiter	is	included in model
Bottom impact limiter	is	included in model
Neutron shield	is	included in model
Water jacket	is	included in model

Contents maximum heat generation rate: 34.14 Btu/minute

Temperature defining stress free condition: 70 degrees F

Initial cavity charge pressure:	14.70 psia
Initial cavity charge temperature:	70.00 degrees F
Maximum normal operating pressure:	30.00 psia

WEIGHTS (By component)

Gross package:	33550. lbs	
Contents/internals:	5450. lbs	
Top impact limiter:	4080. lbs	
Bottom impact limiter:	4080. lbs	
Cask shell/end caps:	19940. lbs	Gross wt - (Contents Limiters)
Top end cap:	3696. lbs	
Bottom end cap:	2273. lbs	
Shell:	13971. lbs	

Cask shell/end caps: 17409. lbs (Calculated)
NG -- Calculated cask body weight less than 95% of specified weight

TELEMETRY DATA SUMMARY FOR CASK 2000 Page 3 of 9
GENERATED ON 5/24/90 AT 16:16:01 SCANS VERSION: 1b

CASK SHELL DESCRIPTION

Layer	Material Name	Thickness Inches	Inner Radius Inches	Outer Radius Inches	X-section Area Sq Inches
Inner Shell	SS304	1.000	13.250	14.250	86.394
Shield	LEAD	4.000	14.250	18.250	408.407
Outer Shell	SS304	1.000	18.250	19.250	117.810
	Total Thickness	6.000		Total Area	612.611

Inner Shell additional thickness at end cap interface: 7.000 inches
Outer Shell additional thickness at end cap interface: 11.000 inches

Shield height: 56.000 inches

TOP END CAP DESCRIPTION

Layer	Material Name	Thickness Inches
Inner Shell	SS304	1.500
Shield	LEAD	5.370
Outer Shell	SS304	1.750
	Total Thickness	8.620

Shield radius: 13.250 inches

BOTTOM END CAP DESCRIPTION

Layer	Material Name	Thickness Inches
Endcap	SS304	6.000

TELEMETRY DATA SUMMARY FOR CASK 2000 Page 4 of 9
GENERATED ON 5/24/90 AT 16:16:01 SCANS VERSION: 1b

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==============================================================================

______ LIMITERS

TOP Impact Limiter
    Material:  POLYFOAM
    Radius:                     36.000 inches
    Thickness above end cap:    24.000 inches
    Overhang along cask body:     .000 inches
NG -- Limiter overhang overlaps the Neutron Shield/Water Jacket

BOTTOM Impact Limiter
    Material:  POLYFOAM
    Radius:                     36.000 inches
    Thickness above end cap:    24.000 inches
    Overhang along cask body:     .000 inches
NG -- Limiter overhang overlaps the Neutron Shield/Water Jacket

ON SHIELD
---------
Material:  AIRCONV
Thickness:    3.000 inches
Length:      82.520 inches
NG -- Neutron Shield length exceeds the cavity length

JACKET
------
Material:  SS304
Thickness:    1.000 inches
Length:      82.520 inches
DG -- Water Jacket length exceeds the cavity length
```

TELEMETRY DATA SUMMARY FOR CASK 2000 Page 5 of 9
GENERATED ON 5/24/90 AT 16:16:01 SCANS VERSION: 1b

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CLOSURE BOLTS

```
    Number of bolts:         15
    Bolt diameter:        1.250
    Bolt circle radius:  16.125
```

FINITE ELEMENT MESH GRADING (Applies to 2-D Thermal and Stress calculations)

```
    Cavity
        Number of mesh divisions along inner radius:              6
        Number of mesh divisions along cavity half length:        8
    Shell
        Number of mesh divisions through inner layer:             2
        Number of mesh divisions through shield layer:            4
        Number of mesh divisions through outer layer:             2
    Top End Cap
        Number of mesh divisions through inner layer:             2
        Number of mesh divisions through shield layer:            4
        Number of mesh divisions through outer layer:             2
    Bottom End Cap
        Number of mesh divisions through end cap:                 4
    Top Impact Limiter
        Number of mesh divisions through center-line thickness:   4
        Number of mesh divisions through overhang width:          3
    Bottom Impact Limiter
        Number of mesh divisions through center-line thickness:   4
        Number of mesh divisions through overhang width:          3
    Neutron Shield and Water Jacket
        Number of mesh divisions through neutron shield:          3
        Number of mesh divisions through water jacket:            1

    Finite element meshes have not been generated
```

TELEMETRY DATA SUMMARY FOR CASK 2000 Page 6 of 9
GENERATED ON 5/24/90 AT 16:16:01 SCANS VERSION: 1b

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MATERIAL PROPERTIES

This model uses 4 different materials

SS304 (SS 304)
Used in: Shell inner layer
Shell outer layer
Top end cap inner layer
Top end cap outer layer
Bottom end cap
Water jacket

Impact Young's Modulus: 2.830E+07 psi
Impact Poisson's ratio: .2900
Density: .2841 lb/cu. inch

Temp F	Thermal Conductivity BTU/in min F	Specific Heat Capacity BTU/lbm F	Young's Modulus psi	Poisson's Ratio	Coefficient of Thermal Expansion in/in F
-58.	.011250	.1200	2.910E+07	.2900	8.700E-06
68.	.011400	.1230	2.840E+07	.2900	8.700E-06
212.	.012083	.1238	2.760E+07	.2900	8.700E-06
392.	.012083	.1275	2.660E+07	.2900	8.700E-06
572.	.013056	.1312	2.560E+07	.2900	8.700E-06
752.	.013889	.1350	2.390E+07	.2900	8.700E-06
1112.	.015278	.1425	2.250E+07	.2900	8.700E-06
1472.	.018056	.1500	2.250E+07	.2900	8.700E-06

TELEMETRY DATA SUMMARY FOR CASK 2000 Page 7 of 9
GENERATED ON 5/24/90 AT 16:16:01 SCANS VERSION: 1b

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LEAD (Cast Lead)

Used in: Shell shield layer
Top end cap shield layer

Impact Young's Modulus: 2.775E+04 psi
Impact Poisson's ratio: .4200
Impact Yield Stress : 4.300E+03 psi
Impact Plastic Modulus: 2.400E+03 psi

Density: .4110 lb/cu. inch

Temp F	Thermal Conductivity BTU/in min F	Specific Heat Capacity BTU/lbm F	Young's Modulus psi	Poisson's Ratio	Coefficient of Thermal Expansion in/in F
-58.	.028888	.0300	2.000E+06	.4200	1.600E-05
68.	.028000	.0307	2.000E+06	.4200	1.600E-05
212.	.026800	.0315	2.000E+06	.4200	1.600E-05
392.	.025278	.0326	2.000E+06	.4200	1.600E-05
572.	.023889	.0327	2.000E+06	.4200	1.600E-05
630.	.016806	.0340	2.000E+06	.4200	1.600E-05
717.	.013472	.0339	2.000E+06	.4200	1.600E-05
1276.	.012028	.0337	2.000E+06	.4200	1.600E-05

POLYFOAM (Polyfoam)

Used in: Top impact limiter
Bottom impact limiter

Density: .0116 lb/cu. inch

Temp F	Thermal Conductivity BTU/in min F	Specific Heat Capacity BTU/lbm F
-58.	.000278	.3000
68.	.000278	.3000
1300.	.000278	.3000

TELEMETRY DATA SUMMARY FOR CASK 2000
GENERATED ON 5/24/90 AT 16:16:01

SCANS VERSION: 1b

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AIRCONV (Conv. Air)

Used in: Neutron shield

Density: .0000 lb/cu. inch

Temp F	Thermal Conductivity BTU/in min F	Specific Heat Capacity BTU/lbm F
-38.	.000139	.2400
68.	.000139	.2401
263.	.000139	.2421
533.	.000139	.2482
803.	.000139	.2568
983.	.000139	.2621
1253.	.000139	.2704
1523.	.000139	.2770

TELEMETRY DATA SUMMARY FOR CASK 2000 Page 9 of 9
GENERATED ON 5/24/90 AT 16:16:01 SCANS VERSION: 1b

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IMPACT MODEL DESCRIPTION

Nodal masses and shell stiffness values

Node Number	Position inches	Translational Mass lb-sec**2/in	Rotational Mass lb-sec**2-in	AE lbs	EI lb-in**2
1 BOT	0.	21.	2178.		
2	14.	9.	1229.	5.790E+09	8.194E+11
3	27.	9.	1229.	5.790E+09	8.194E+11
4	41.	9.	1229.	5.790E+09	8.194E+11
5 TOP	54.	25.	2686.		

Shell areas and inertias for nodes 2 through 4

Layer	Area in**2	Moment of Inertia in**4
Inner Shell	86.39	8178.
Shield	408.41	54739.
Outer Shell	117.81	20723.

LIMITER CURVE SUMMARY FOR CASK 2000 Page 1 of 3
GENERATED ON 5/24/90 AT 15:57:54 SCANS VERSION: 1b

0.75 Wall Toroid

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Limiter F/D data set is COMPLETE

IMPACT LIMITER FORCE/DEFLECTION CURVES

Bottom Limiter
Side Impact (0 degrees)

Deflection inches	Force Kips	Slope Kips/inch
0	0	
.599	248.70	415.19
1.419	525.78	337.90
1.809	656.58	335.38
2.235	742.00	200.52
2.623	870.46	331.08
3.098	1046.72	371.07
3.634	1221.40	325.90
3.887	1307.72	341.19
4.222	1388.92	242.39
4.343	1447.52	484.33

End Impact (90 degrees)

Deflection inches	Force Kips	Slope Kips/inch
0	0	
.300	2366.88	7889.60
.600	2952.80	1953.07
.900	3319.04	1220.80
1.178	3616.72	1070.79
1.452	3977.08	1315.18
1.736	4194.40	765.21
1.923	4308.00	607.49
2.210	4468.80	560.28
2.407	4712.80	1238.58

LIMITER CURVE SUMMARY FOR CASK 2000 Page 2 of 3
GENERATED ON 5/24/90 AT 15:57:54 SCANS VERSION: 1b

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Center-of-Gravity Impact (approx 60.7 degrees)

Deflection inches	Force Kips	Slope Kips/inch
0	0	
.854	364.34	426.63
1.791	614.76	267.26
2.743	874.40	272.73
3.545	1055.16	225.39
4.462	1296.48	263.16
5.462	1528.18	231.70
6.462	1718.16	189.98
7.462	1859.54	141.38
8.321	1967.96	126.22
9.067	2090.80	164.67

Top Limiter

Side Impact (0 degrees)

Deflection inches	Force Kips	Slope Kips/inch
0	0	
.599	248.70	415.19
1.419	525.78	337.90
1.809	656.58	335.38
2.235	742.00	200.52
2.623	870.46	331.08
3.098	1046.72	371.07
3.634	1221.40	325.90
3.887	1307.72	341.19
4.222	1388.92	242.39
4.343	1447.52	484.33

LIMITER CURVE SUMMARY FOR CASK 2000
GENERATED ON 5/24/90 AT 15:57:54

Page 3 of 3
SCANS VERSION: 1b

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End Impact (90 degrees)

Deflection inches	Force Kips	Slope Kips/inch
0	0	
.300	2366.88	7889.60
.600	2952.80	1953.07
.900	3319.04	1220.80
1 178	3616.72	1070.79
1 452	3977.08	1315.18
1 736	4194.40	765.21
1 923	4308.00	607.49
2 210	4468.80	560.28
2.407	4712.80	1238.58

Center-of-Gravity Impact (approx 60.7 degrees)

Deflection inches	Force Kips	Slope Kips/inch
0	0	
.854	364.34	426.63
1 791	614.76	267.26
2 743	874.40	272.73
3 545	1055.16	225.39
4 462	1296.48	263.16
5 462	1528.18	231.70
6 462	1718.16	189.98
7.462	1859.54	141.38
8.321	1967.96	126.22
9.067	2090.80	164.67

Unloading slope is defined as 5 times the maximum slope of limiter curve
(for no elastic recover of impact limiter)

DYNAMIC IMPACT OUTPUT FOR CASK 2000 Page 1 of 5
GENERATED ON 5/24/90 AT 16:01:01 SCANS VERSION: 1b
SAR: MODEL 2000 RADIOACTIVE MATERIAL TRANSPORT PACKAGE
30 ft accident drop on cask bottom - primary & secondary impact
Angle of primary impact is 0 degrees - shield/shell interface is bonded

==

I M P A C T   S U M M A R Y

SIDE IMPACT (Cask Bottom)

Impact Velocity	=	527.5 in/sec
Impact Angle	=	.0 degrees
CG Over Corner Angle	=	60.6 degrees
Maximum Limiter Crush	=	5.9 inches
Maximum Rigid Body Accelerations		
Vertical Acceleration	=	130.8 g's
Horizontal Acceleration	=	.0 g's
Rotational Acceleration	=	113.2 rad/sec**2
Maximum Impact Forces		
Axial Force In Cask	=	7.7 kips
Shear Force In Cask	=	2178.3 kips
Maximum Impact Moment (C.L.)	=	6652.1 in-kips

SIDE IMPACT (Cask Top)

Impact Velocity	=	527.5 in/sec
Impact Angle	=	.0 degrees
Limiter Angle Used	=	.0 degrees
Maximum Limiter Crush	=	6.0 inches
Maximum Rigid Body Accelerations		
Vertical Acceleration	=	130.8 g's
Horizontal Acceleration	=	.0 g's
Rotational Acceleration	=	113.2 rad/sec**2
Maximum Impact Forces		
Axial Force In Cask	=	-2.2 kips
Shear Force In Cask	=	-2244.5 kips
Maximum Impact Moment (C.L.)	=	9605.9 in-kips

DYNAMIC IMPACT OUTPUT FOR CASK 2000 Page 2 of 5
GENERATED ON 5/24/90 AT 16:01:01 SCANS VERSION: 1b
SAR: MODEL 2000 RADIOACTIVE MATERIAL TRANSPORT PACKAGE
30 ft accident drop on cask bottom - primary & secondary impact
Angle of primary impact is 0 degrees - shield/shell interface is bonded

MAXIMUM FORCES AND MOMENTS

NOTE: Node 1 is at Cavity BOTTOM, Node 5 is at Cavity TOP

SIDE IMPACT

Node Number (Location)	Axial Position (Inches)	Max Axial Force (Kips)	Max Shear Force (Kips)	Max Moment (In-Kips)
Cask Bottom		7.7	2178.3	6652.1
1	.0	3.9	1068.2	6890.5
2	13.5	2.7	736.0	21355.3
3	27.0	.8	60.5	26840.2
4	40.5	-1.2	-616.7	22935.1
5	54.0	-1.5	-950.0	10043.0
Cask Top		-2.2	-2244.5	9605.9

DYNAMIC IMPACT OUTPUT FOR CASK 2000 Page 3 of 5
GENERATED ON 5/24/90 AT 16:01:01 SCANS VERSION: 1b
SAR: MODEL 2000 RADIOACTIVE MATERIAL TRANSPORT PACKAGE
30 ft accident drop on cask bottom - primary & secondary impact
Angle of primary impact is 0 degrees - shield/shell interface is bonded

===

S T R E S S   I N T E N S I T Y

NOTE: SI is based on maximum combined axial & bending stress
or maximum shear stress

NOTE: Node 1 is at Cavity BOTTOM, Node 5 is at Cavity TOP

SIDE IMPACT

Node Number (Location)	Axial Position (Inches)	STRESS INTENSITY BASED ON ... Max (P/A+Mc/I) (psi)	Max (P/A-Mc/I) (psi)	Max Shear (psi)
Inner Shell				
1	.0	3289.	3256.	20884.
2	13.5	10151.	10131.	14390.
3	27.0	12746.	12746.	1183.
4	40.5	10887.	10895.	12057.
5	54.0	4765.	4774.	18573.
Shield				
1	.0	4.	4.	20.
2	13.5	12.	12.	14.
3	27.0	15.	15.	1.
4	40.5	13.	13.	12.
5	54.0	6.	6.	18.
Outer Shell				
1	.0	4478.	4446.	20884.
2	13.5	13839.	13819.	14390.
3	27.0	17380.	17381.	1183.
4	40.5	14848.	14856.	12057.
5	54.0	6499.	6508.	18573.

DYNAMIC IMPACT OUTPUT FOR CASK 2000 Page 4 of 5
GENERATED ON 5/24/90 AT 16:01:01 SCANS VERSION: 1b
SAR: MODEL 2000 RADIOACTIVE MATERIAL TRANSPORT PACKAGE
30 ft accident drop on cask bottom - primary & secondary impact
Angle of primary impact is 0 degrees - shield/shell interface is bonded

E N D C A P S T R E S S E S

NOTE: Limiters contribute no bending stiffness to the end caps
Inertial forces are evenly distributed across the end caps

All stresses are in PSI

SIDE IMPACT

BOTTOM END CAP (based on inertia of end cap and contents)

	Solid End Cap
Maximum Bending Stresses	
At center of end cap	-24.2
At edge near inner shell	37.5
Average Shear Stresses	
At radius = 13.3 inches	11.3

TOP END CAP (based on inertia of end cap)

	Inner Layer	Shield	Outer Layer
Maximum Bending Stresses			
At center of end cap	-12.4	n/a	56.1
Average Shear Stresses	1.3	.0	2.0
At radius = 13.3 inches			

DYNAMIC IMPACT OUTPUT FOR CASK 2000 Page 5 of 5
GENERATED ON 5/24/90 AT 16:01:01 SCANS VERSION: 1b
SAR: MODEL 2000 RADIOACTIVE MATERIAL TRANSPORT PACKAGE
30 ft accident drop on cask bottom - primary & secondary impact
Angle of primary impact is 0 degrees - shield/shell interface is bonded

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T O P   C L O S U R E   B O L T   S T R E S S E S

Bolt Shear Stress (psi)	SIDE IMPACT
Applied to ALL bolts equally	80639.

Bolt Axial Tensile Stress (psi)	SIDE IMPACT
Case 1: Applied to ALL bolts equally	573.
Case 2: Maximum stress based on bolt position relative to impacting edge of the cask	780.

NOTE: 1. Axial load is due to mass of the contents and top end cap
2. Compressive stresses are printed as zero
3. Case 2 is best case when impact angle is less than C.G. angle

```
DYNAMIC IMPACT OUTPUT FOR CASK 2000                    Page    1  of    6
GENERATED ON 5/24/90 AT 16:03:06                       SCANS VERSION:  1b
SAR: MODEL 2000 RADIOACTIVE MATERIAL TRANSPORT PACKAGE
30 ft accident drop on cask top    - primary impact only
Angle of primary impact is 90 degrees - shield/shell interface is bonded

=============================================================================

                        I M P A C T   S U M M A R Y
                        ----------------------------

PRIMARY IMPACT  (Cask Top)
--------------

    Impact Velocity               =        527.5 in/sec
    Impact Angle                  =         90.0 degrees
    CG Over Corner Angle          =         60.8 degrees

    Maximum Limiter Crush         =          3.3 inches

    Maximum Rigid Body Accelerations
      Vertical Acceleration       =        139.5 g's
      Horizontal Acceleration     =           .0 g's
      Rotational Acceleration     =           .0 rad/sec**2

    Maximum Impact Forces
      Axial Force In Cask         =      -4712.8 kips
      Shear Force In Cask         =           .0 kips

    Maximum Impact Moment (C.L.) =           .0 in-kips

    Permanent Lead Slump          =         .000 inches


Run Time for Dynamic Analysis     =        139.2 seconds
```

DYNAMIC IMPACT OUTPUT FOR CASK 2000 Page 2 of 6
GENERATED ON 5/24/90 AT 16:03:06 SCANS VERSION: 1b
SAR: MODEL 2000 RADIOACTIVE MATERIAL TRANSPORT PACKAGE
30 ft accident drop on cask top - primary impact only
Angle of primary impact is 90 degrees - shield/shell interface is bonded

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M A X I M U M   F O R C E S   A N D   M O M E N T S

NOTE: Node 1 is at Cavity BOTTOM, Node 5 is at Cavity TOP

PRIMARY IMPACT (on cask top)

Node Number (Location)	Axial Position (Inches)	Max Axial Force (Kips)	Max Shear Force (Kips)	Max Moment (In-Kips)
Cask Bottom		.0	.0	.0
1	.0	-2072.9	.0	.0
2	13.5	-2532.2	.0	.0
3	27.0	-3430.6	.0	.0
4	40.5	-4136.7	.0	.0
5	54.0	-4420.7	.0	.0
Cask Top		-4712.8	.0	.0

DYNAMIC IMPACT OUTPUT FOR CASK 2000 Page 3 of 6
GENERATED ON 5/24/90 AT 16:03:06 SCANS VERSION: 1b
SAR: MODEL 2000 RADIOACTIVE MATERIAL TRANSPORT PACKAGE
30 ft accident drop on cask top - primary impact only
Angle of primary impact is 90 degrees - shield/shell interface is bonded

S T R E S S   I N T E N S I T Y

NOTE: SI is based on maximum combined axial & bending stress
or maximum shear stress

NOTE: Node 1 is at Cavity BOTTOM, Node 5 is at Cavity TOP

PRIMARY IMPACT (on cask top)

Node Number (Location)	Axial Position (Inches)	STRESS INTENSITY BASED ON ... Max (P/A+Mc/I) (psi)	Max (P/A-Mc/I) (psi)	Max Shear (psi)
Inner Shell				
1	.0	11119.	11119.	11119.
2	13.5	14775.	14775.	14775.
3	27.0	28069.	28069.	28069.
4	40.5	27385.	27385.	27385.
5	54.0	27586.	27586.	27586.
Shield				
1	.0	255.	255.	255.
2	13.5	587.	587.	587.
3	27.0	1168.	1168.	1168.
4	40.5	1427.	1427.	1427.
5	54.0	1437.	1437.	1437.
Outer Shell				
1	.0	9845.	9845.	9845.
2	13.5	11041.	11041.	11041.
3	27.0	33662.	33662.	33662.
4	40.5	29546.	29546.	29546.
5	54.0	19719.	19719.	19719.

DYNAMIC IMPACT OUTPUT FOR CASK 2000 Page 4 of 6
GENERATED ON 5/24/90 AT 16:03:06 SCANS VERSION: 1b
SAR: MODEL 2000 RADIOACTIVE MATERIAL TRANSPORT PACKAGE
30 ft accident drop on cask top - primary impact only
Angle of primary impact is 90 degrees - shield/shell interface is bonded

==

I N T E R F A C E   F O R C E S   A N D   M O M E N T S

A positive moment results in compression in the outermost fiber of shell.
A positive shear force is directed radially inward.

Edge moment of inner shell at top closure	=-691.958 in-kips/in.
Edge moment of outer shell at top closure	=1951.058 in-kips/in.
Edge shear of inner shell at top closure	=-178.694 kips/in.
Edge shear of outer shell at top closure	= 364.639 kips/in.
Edge moment of inner shell at bottom end cap	=-321.601 in-kips/in.
Edge moment of outer shell at bottom end cap	=1210.689 in-kips/in.
Edge shear of inner shell at bottom end cap	= -59.476 kips/in.
Edge shear of outer shell at bottom end cap	= 149.990 kips/in.

DYNAMIC IMPACT OUTPUT FOR CASK 2000 Page 5 of 6
GENERATED ON 5/24/90 AT 16:03:06 SCANS VERSION: 1b
SAR: MODEL 2000 RADIOACTIVE MATERIAL TRANSPORT PACKAGE
30 ft accident drop on cask top - primary impact only
Angle of primary impact is 90 degrees - shield/shell interface is bonded

E N D C A P S T R E S S E S

NOTE: Limiters contribute no bending stiffness to the end caps
Inertial forces are evenly distributed across the end caps

All stresses are in PSI

PRIMARY IMPACT (on cask top)

BOTTOM END CAP (based on inertia of end cap and contents)

	Solid End Cap
Maximum Bending Stresses	
At center of end cap	945.4
At edge near inner shell	-1454.8
Average Shear Stresses	442.5
At radius = 13.3 inches	

TOP END CAP (based on inertia of end cap and contents)

	Inner Layer	Shield	Outer Layer
Maximum Bending Stresses			
At center of end cap	-21639.7	n/a	19665.4
Average Shear Stresses	7344.7	6.4	7344.7
At radius = 13.3 inches			

DYNAMIC IMPACT OUTPUT FOR CASK 2000 Page 6 of 6
GENERATED ON 5/24/90 AT 16:03:06 SCANS VERSION: 1b
SAR: MODEL 2000 RADIOACTIVE MATERIAL TRANSPORT PACKAGE
30 ft accident drop on cask top - primary impact only
Angle of primary impact is 90 degrees - shield/shell interface is bonded

===

T O P   C L O S U R E   B O L T   S T R E S S E S

Bolt Shear Stress (psi)	PRIMARY IMPACT
Applied to ALL bolts equally	0.

Bolt Axial Tensile Stress (psi)	PRIMARY IMPACT
Case 1: Applied to ALL bolts equally	266225.
Case 2: Maximum stress based on bolt position relative to impacting edge of the cask	266225.

NOTE: 1. Axial load is due to mass of the contents and top end cap
2. Compressive stresses are printed as zero
3. Case 2 is best case when impact angle is less than C.G. angle

DYNAMIC IMPACT OUTPUT FOR CASK 2000 Page 1 of 6
GENERATED ON 5/24/90 AT 16:05:22 SCANS VERSION: 1b
SAR: MODEL 2000 RADIOACTIVE MATERIAL TRANSPORT PACKAGE
30 ft accident drop on cask top - primary impact only
Angle of primary impact is CG degrees - shield/shell interface is unbonded

==

I M P A C T   S U M M A R Y

PRIMARY IMPACT (Cask Top)

Impact Velocity	=	527.5	in/sec
Impact Angle	=	60.8	degrees
CG Over Corner Angle	=	60.8	degrees
Maximum Limiter Crush	=	9.6	inches
Maximum Rigid Body Accelerations			
Vertical Acceleration	=	64.1	g's
Horizontal Acceleration	=	.0	g's
Rotational Acceleration	=	.9	rad/sec**2
Maximum Impact Forces			
Axial Force In Cask	=	-1908.2	kips
Shear Force In Cask	=	1065.1	kips
Maximum Impact Moment (C.L.)	=	-27582.5	in-kips
Permanent Lead Slump	=	.000	in-kips
Run Time for Dynamic Analysis	=	298.5	seconds

DYNAMIC IMPACT OUTPUT FOR CASK 2000 Page 2 of 6
GENERATED ON 5/24/90 AT 16:05:22 SCANS VERSION: 1b
SAR: MODEL 2000 RADIOACTIVE MATERIAL TRANSPORT PACKAGE
30 ft accident drop on cask top - primary impact only
Angle of primary impact is CG degrees - shield/shell interface is unbonded

M A X I M U M F O R C E S A N D M O M E N T S

NOTE: Node 1 is at Cavity BOTTOM, Node 5 is at Cavity TOP

PRIMARY IMPACT (on cask top)

Node Number (Location)	Axial Position (Inches)	Max Axial Force (Kips)	Max Shear Force (Kips)	Max Moment (In-Kips)
Cask Bottom		.0	.0	.0
1	.0	-534.1	301.7	540.7
2	13.5	-675.8	382.0	-4308.6
3	27.0	-951.7	540.1	-9998.9
4	40.5	-1219.0	694.9	-17788.0
5	54.0	-1354.4	770.8	-28049.1
Cask Top		-1908.2	1065.1	-27582.5

DYNAMIC IMPACT OUTPUT FOR CASK 2000 Page 3 of 6
GENERATED ON 5/24/90 AT 16:05:22 SCANS VERSION: 1b
SAR: MODEL 2000 RADIOACTIVE MATERIAL TRANSPORT PACKAGE
30 ft accident drop on cask top - primary impact only
Angle of primary impact is CG degrees - shield/shell interface is unbonded

==

S T R E S S   I N T E N S I T Y

NOTE: SI is based on maximum combined axial & bending stress
or maximum shear stress

NOTE: Node 1 is at Cavity BOTTOM, Node 5 is at Cavity TOP

PRIMARY IMPACT (on cask top)

		STRESS INTENSITY BASED ON ...		
Node Number (Location)	Axial Position (Inches)	Max (P/A+Mc/I) (psi)	Max (P/A-Mc/I) (psi)	Max Shear (psi)
Inner Shell				
1	.0	2711.	3006.	6213.
2	13.5	3199.	5557.	7589.
3	27.0	7583.	10007.	10622.
4	40.5	6441.	15293.	13690.
5	54.0	10282.	20709.	15326.
Shield				
1	.0	60.	61.	31.
2	13.5	147.	150.	82.
3	27.0	301.	310.	143.
4	40.5	387.	404.	228.
5	54.0	406.	432.	259.
Outer Shell				
1	.0	2152.	2573.	6007.
2	13.5	3160.	6404.	8244.
3	27.0	8483.	13159.	12318.
4	40.5	10325.	17891.	14977.
5	54.0	16397.	23096.	15871.

DYNAMIC IMPACT OUTPUT FOR CASK 2000 Page 4 of 6
GENERATED ON 5/24/90 AT 16:05:22 SCANS VERSION: 1b
SAR: MODEL 2000 RADIOACTIVE MATERIAL TRANSPORT PACKAGE
30 ft accident drop on cask top - primary impact only
Angle of primary impact is CG degrees - shield/shell interface is unbonded

==

I N T E R F A C E   F O R C E S   A N D   M O M E N T S

A positive moment results in compression in the outermost fiber of shell.
A positive shear force is directed radially inward.

```
    Edge moment of inner shell at top closure     =-160.445 in-kips/in.
    Edge moment of outer shell at top closure     = 546.966 in-kips/in.

    Edge shear of inner shell at top closure      = -42.950 kips/in.
    Edge shear of outer shell at top closure      = 106.020 kips/in.


    Edge moment of inner shell at bottom end cap  = -62.170 in-kips/in.
    Edge moment of outer shell at bottom end cap  = 307.254 in-kips/in.

    Edge shear of inner shell at bottom end cap   = -10.737 kips/in.
    Edqe shear of outer shell at bottom end cap   =  37.346 kips/in.
```

DYNAMIC IMPACT OUTPUT FOR CASK 2000 Page 5 of 6
GENERATED ON 5/24/90 AT 16:05:22 SCANS VERSION: 1b
SAR: MODEL 2000 RADIOACTIVE MATERIAL TRANSPORT PACKAGE
30 ft accident drop on cask top - primary impact only
Angle of primary impact is CG degrees - shield/shell interface is unbonded

E N D C A P S T R E S S E S

NOTE: Limiters contribute no bending stiffness to the end caps
Inertial forces are evenly distributed across the end caps

All stresses are in PSI

PRIMARY IMPACT (on cask top)

BOTTOM END CAP (based on inertia of end cap)

	Solid End Cap
Maximum Bending Stresses	
At center of end cap	241.1
At edge near inner shell	-373.9
Average Shear Stresses	112.9
At radius = 13.3 inches	

TOP END CAP (based on inertia of end cap and contents)

	Inner Layer	Shield	Outer Layer
Maximum Bending Stresses			
At center of end cap	-5811.1	n/a	5280.9
Average Shear Stresses	1972.3	1.8	1972.3
At radius = 13.3 inches			

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DYNAMIC IMPACT OUTPUT FOR CASK 2000                      Page    6  of    6
GENERATED ON 5/24/90 AT 16:05:22                         SCANS VERSION:  1b
SAR: MODEL 2000 RADIOACTIVE MATERIAL TRANSPORT PACKAGE
30 ft accident drop on cask top     - primary impact only
Angle of primary impact is CG degrees - shield/shell interface is unbonded

============================================================================

              T O P    C L O S U R E    B O L T    S T R E S S E S
              ----------------------------------------------------


Bolt Shear Stress    (psi)                 PRIMARY IMPACT
-----------------                          --------------

    Applied to ALL bolts equally              65429.

Bolt Axial Tensile Stress (psi)            PRIMARY IMPACT
-------------------------                  --------------

Case 1:  Applied to ALL bolts equally         71492.

Case 2:  Maximum stress based on bolt         97256.
         position relative to impacting
         edge of the cask

NOTE: 1. Axial load is due to mass of the contents and top end cap
      2. Compressive stresses are printed as zero
      3. Case 2 is best case when impact angle is less than C.G. angle
```

2.10.9 Tabulation of Stresses for Individual Load Cases and Summary of Load Combinations Under Normal and Accident Conditions of Transport

In this subsection the resulting stresses from the finite element analyses for each load condition and load combination at each stress point are tabulated. Figure 2.10.9.1 shows the location of each stress point within the cask model. These stress points are selected because they are points of maximum stresses identified by the load condition analyses and provide a map of the cask state of stress in the radial and longitudinal directions. These stress points are labeled 1 through 27. Stress points 7 through 16 are located on the inner and outer shells of the cask. These shell stress points are further subdivided in "a" and "b". The subdivisions "a" and "b" are located in the inside and outside surfaces of each shell element. These surface stress values given at points "a" and "b" represent an average stress over the surface of the element that they applied. The tabulations of principal stresses and stress

intensities (primary membrane and primary membrane plus primary bending) for each individual normal and accident condition loading (e.g., pressure, hot and cold temperatures, vibration, impact, etc.) are given in Tables 2.10.9.1 through 2.10.9.41.

A summary of the load combinations for normal and hypothetical accident conditions of transport required by Regulatory Guide 7.8, Reference 2.11.3 is shown in Table 2.10.9.42. A combination index used to identify each required combination is given in this table. The stress intensities, categorized as specified in Regulatory Guide 7.6, Reference 2.11.2, for each required stress combination at each point are given in Tables 2.10.9.43 through 2.10.9.116. Combinations for normal conditions of transport are found in Tables 2.10.9.43 through 2.10.9.79, and those for accident conditions are found in Tables 2.10.9.80 through 2.10.9.116. In each of these tables, the maximum stress intensity value found for each stress intensity category is given in the last line of the table. There are two sets of tables given for the drop conditions, under normal and accident environment for both principal stresses and stress intensity and summary of load combinations categories. Tables without the "A" subscript are for a 0.50 in. wall toroid while those with it are for a 0.76 in. wall toroid. Comparison of these values against the allowables given the Notes of each table explicitly show that the Model 2000 design meets the criteria required by Regulatory Guide 7.6, Reference 2.11.2.

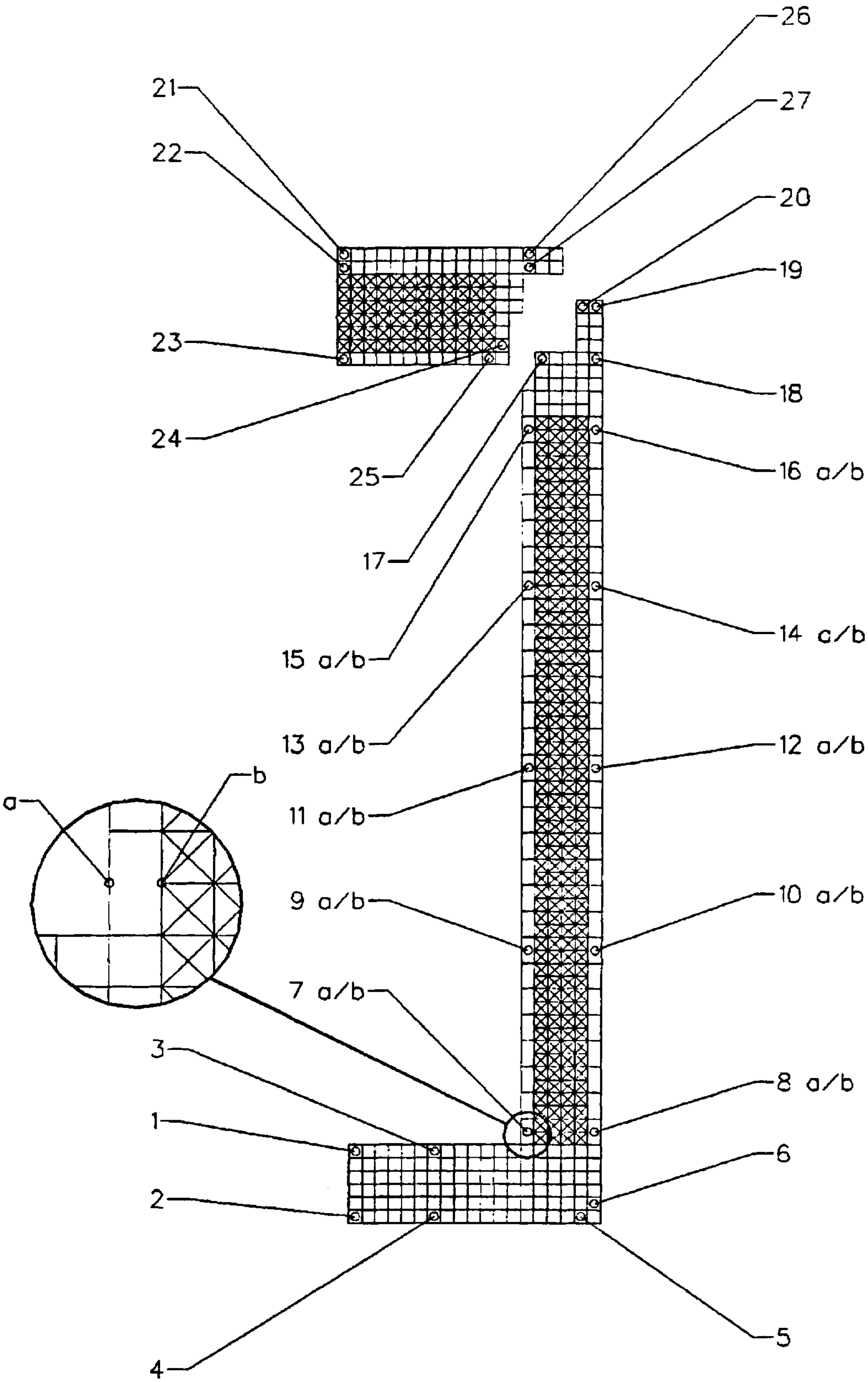

FIGURE 2.10.9.1. STRESS POINT LOCATIONS

TABLE 2.10.9.1. 100ºF AMBIENT WITH DECAY HEAT

	LOCATION DESCRIPTION	STRESS (PSI) SIGMA1	SIGMA2	SIGMA3	STRESS INTENSITY Q
	BOTTOM FORGING, CENTER				
1	CAVITY SURFACE	-.120E+01	-.302E+03	-.294E+03	.301E+03
2	OUTSIDE SURFACE	.269E+03	.217E+02	.274E+03	.252E+03
	BOTTOM FORGING, MID-SECTION				
3	CAVITY SURFACE	.373E+01	-.227E+03	-.217E+03	.230E+03
4	OUTSIDE SURFACE	.270E+03	.276E+02	.315E+03	.287E+03
	BOTTOM FORGING, CORNER				
5	BOTTOM SURFACE	.183E+03	.280E+02	.708E+03	.680E+03
6	OUTER SURFACE	.512E+02	-.905E+02	.509E+03	.600E+03
	CASK WALL SHELLS				
7a	INNER SHELL	-.369E+04	-.114E+05	-.787E+04	.773E+04
7b		.655E+04	.537E+04	.348E+03	.620E+04
8a	OUTER SHELL	.993E+04	.673E+04	.558E+04	.435E+04
8b		-.370E+04	-.996E+04	-.360E+04	.636E+04
9a	INNER SHELL	-.235E+02	-.321E+03	-.484E+04	.481E+04
9b		-.114E+03	-.211E+03	-.449E+04	.437E+04
10a	OUTER SHELL	.191E+04	-.315E+03	.523E+04	.554E+04
10b		.272E+04	.398E+02	.525E+04	.521E+04
11a	INNER SHELL	-.205E+02	-.290E+03	-.493E+04	.491E+04
11b		-.123E+03	-.231E+03	-.460E+04	.448E+04
12a	OUTER SHELL	.226E+04	-.295E+03	.547E+04	.577E+04
12b		.237E+04	.321E+01	.527E+04	.526E+04
13a	INNER SHELL	-.310E+02	-.339E+03	-.495E+04	.492E+04
13b		-.635E+02	-.210E+03	-.456E+04	.450E+04
14a	OUTER SHELL	.279E+04	-.213E+03	.541E+04	.562E+04
14b		.187E+04	-.290E+02	.487E+04	.490E+04
15a	INNER SHELL	.627E+03	-.174E+04	-.260E+04	.323E+04
15b		.506E+03	-.120E+04	-.247E+04	.298E+04
16a	OUTER SHELL	.445E+04	-.205E+04	.235E+04	.649E+04
16b		.200E+04	-.463E+03	.196E+04	.246E+04
	TOP FORGING				
17	INNER SURFACE	.854E+03	.329E+03	.856E+03	.526E+03
18	OUTER SURFACE	-.679E+01	-.877E+02	.588E+03	.675E+03
19	TOP OUTER EL.	.441E+02	-.375E+02	.923E+03	.960E+03
20	TOP INNER EL.	.431E+02	-.410E+02	.966E+03	.101E+04
	LID, CENTER				
21	TOP FLANGE, TOP EL.	.935E+03	.193E+02	.934E+03	.916E+03
22	TOP FLANGE, BTM EL.	.847E+03	.521E+02	.865E+03	.813E+03
23	BOTTOM FLANGE EL.	.812E+02	-.106E+03	-.675E+02	.187E+03
	LID, INNER LOWER CORNER				
24	CYL. SHELL	.335E+04	-.725E+02	.115E+04	.343E+04
25	BTM FLANGE	.270E+04	-.209E+04	.183E+03	.479E+04
	LID, UPPER FLANGE (SEAL AREA)				
26	TOP EL.	-.303E+02	-.840E+03	.481E+03	.132E+04
27	BTM EL.	-.935E+02	-.610E+03	.468E+03	.108E+04

NOTES:

1. Stresses at locations 1 thru 6 and 17 thru 27 are given at the centroid of the element, therefore, the same stress value is used for Pm and Pm+Pb.
2. a = small radius surface,
   b = large radius surface.
3. Prefabrication stresses are included in the inner shell stresses. See Table 2.6.1.3.1 for values.

TABLE 2.10.9.2. 100ºF AMBIENT WITH DECAY HEAT PLUS SOLAR

	LOCATION DESCRIPTION	STRESS (PSI) SIGMA1	SIGMA2	SIGMA3	STRESS INTENSITY Q
	BOTTOM FORGING, CENTER				
1	CAVITY SURFACE	-.197E+01	-.223E+03	-.216E+03	.221E+03
2	OUTSIDE SURFACE	.528E+03	.450E+02	.529E+03	.484E+03
	BOTTOM FORGING, MID-SECTION				
3	CAVITY SURFACE	.950E+01	-.130E+03	-.161E+03	.170E+03
4	OUTSIDE SURFACE	.475E+03	.901E+02	.518E+03	.428E+03
	BOTTOM FORGING, CORNER				
5	BOTTOM SURFACE	.206E+03	.460E+02	.735E+03	.689E+03
6	OUTER SURFACE	.594E+02	-.117E+03	.473E+03	.590E+03
	CASK WALL SHELLS				
7a	INNER SHELL	-.592E+04	-.181E+05	-.110E+05	.121E+05
7b		.114E+05	.804E+04	.212E+04	.923E+04
8a	OUTER SHELL	.147E+05	.114E+05	.818E+04	.648E+04
8b		-.573E+04	-.169E+05	-.653E+04	.112E+05
9a	INNER SHELL	-.166E+02	-.508E+03	-.628E+04	.626E+04
9b		-.232E+03	-.470E+03	-.587E+04	.564E+04
10a	OUTER SHELL	.271E+04	-.370E+03	.681E+04	.718E+04
10b		.280E+04	.786E+01	.652E+04	.651E+04
11a	INNER SHELL	-.251E+02	-.545E+03	-.638E+04	.636E+04
11b		-.221E+03	-.439E+03	-.593E+04	.570E+04
12a	OUTER SHELL	.270E+04	-.372E+03	.687E+04	.724E+04
12b		.282E+04	.535E+01	.659E+04	.658E+04
13a	INNER SHELL	-.256E+02	-.611E+03	-.635E+04	.633E+04
13b		-.217E+03	-.384E+03	-.586E+04	.565E+04
14a	OUTER SHELL	.270E+04	-.378E+03	.693E+04	.731E+04
14b		.281E+04	.695E+01	.664E+04	.663E+04
15a	INNER SHELL	.118E+04	-.267E+04	-.274E+04	.392E+04
15b		.874E+03	-.153E+04	-.246E+04	.334E+04
16a	OUTER SHELL	.703E+04	-.289E+04	.298E+04	.992E+04
16b		.145E+04	-.106E+04	.170E+04	.276E+04
	TOP FORGING				
17	INNER SURFACE	.116E+04	.427E+03	.916E+03	.736E+03
18	OUTER SURFACE	.327E+02	-.170E+03	.515E+03	.685E+03
19	TOP OUTER EL.	.394E+02	-.355E+02	.836E+03	.871E+03
20	TOP INNER EL.	.377E+02	-.329E+02	.868E+03	.901E+03
	LID, CENTER				
21	TOP FLANGE, TOP EL.	.140E+04	.446E+02	.140E+04	.136E+04
22	TOP FLANGE, BTM EL.	.761E+03	.142E+03	.756E+03	.620E+03
23	BOTTOM FLANGE EL.	.116E+03	.532E+01	.507E+02	.110E+03
	LID, INNER LOWER CORNER				
24	CYL. SHELL	.425E+04	-.150E+02	.151E+04	.427E+04
25	BTM FLANGE	.369E+04	-.279E+04	.379E+03	.647E+04
	LID, UPPER FLANGE (SEAL AREA)				
26	TOP EL.	-.396E+02	-.921E+03	.537E+03	.146E+04
27	BTM EL.	-.119E+03	-.824E+03	.455E+03	.128E+04

NOTES:

1. Stresses at locations 1 thru 6 and 17 thru 27 are given at the centroid of the element, therefore, the same stress value is used for Pm and Pm+Pb.
2. a = small radius surface,
   b = large radius surface.
3. Prefabrication stresses are included in the inner shell stresses. See Table 2.6.1.3.1 for values.

TABLE 2.10.9.3. -20ºF AMBIENT WITH DECAY HEAT

LOCATION	DESCRIPTION	STRESS (PSI) SIGMA1	SIGMA2	SIGMA3	STRESS INTENSITY Q
	BOTTOM FORGING, CENTER				
1	CAVITY SURFACE	-.241E+01	-.499E+03	-.489E+03	.497E+03
2	OUTSIDE SURFACE	.744E+02	-.156E+02	.750E+02	.905E+02
	BOTTOM FORGING, MID-SECTION				
3	CAVITY SURFACE	-.180E+01	-.502E+03	-.457E+03	.500E+03
4	OUTSIDE SURFACE	.121E+03	-.509E+02	.138E+03	.189E+03
	BOTTOM FORGING, CORNER				
5	BOTTOM SURFACE	.138E+03	.318E+02	.613E+03	.581E+03
6	OUTER SURFACE	.757E+02	-.106E+03	.431E+03	.537E+03
	CASK WALL SHELLS				
7a	INNER SHELL	.359E+04	-.363E+04	-.191E+04	.723E+04
7b		-.190E+04	-.643E+04	-.425E+04	.453E+04
8a	OUTER SHELL	-.980E+03	-.224E+04	-.973E+03	.126E+04
8b		.368E+04	.615E+03	.132E+04	.306E+04
9a	INNER SHELL	-.406E+01	-.458E+04	-.417E+04	.458E+04
9b		-.103E+03	-.438E+04	-.391E+04	.428E+04
10a	OUTER SHELL	.325E+03	.768E-01	-.521E+02	.378E+03
10b		.453E+03	-.393E+00	.376E+02	.453E+03
11a	INNER SHELL	-.364E+01	-.458E+04	-.407E+04	.458E+04
11b		-.972E+02	-.439E+04	-.381E+04	.429E+04
12a	OUTER SHELL	.322E+03	-.365E+00	-.463E+02	.368E+03
12b		.456E+03	-.481E+00	.463E+02	.457E+03
13a	INNER SHELL	-.393E+01	-.458E+04	-.418E+04	.458E+04
13b		-.103E+03	-.438E+04	-.391E+04	.428E+04
14a	OUTER SHELL	.321E+03	.172E+00	-.469E+02	.368E+03
14b		.457E+03	-.565E+00	.455E+02	.458E+03
15a	INNER SHELL	-.416E+03	-.515E+04	-.392E+04	.473E+04
15b		.254E+03	-.410E+04	-.330E+04	.435E+04
16a	OUTER SHELL	.118E+04	.205E+03	.291E+03	.973E+03
16b		.260E+03	-.618E+03	-.182E+03	.879E+03
	TOP FORGING				
17	INNER SURFACE	-.143E+03	-.273E+03	-.244E+03	.130E+03
18	OUTER SURFACE	.161E+03	.269E+02	.216E+03	.189E+03
19	TOP OUTER EL.	.397E+02	-.350E+02	.652E+03	.687E+03
20	TOP INNER EL.	.356E+02	-.444E+02	.669E+03	.714E+03
	LID, CENTER				
21	TOP FLANGE, TOP EL.	.393E+02	-.845E+03	-.868E+03	.907E+03
22	TOP FLANGE, BTM EL.	.129E+03	-.881E+03	-.870E+03	.101E+04
23	BOTTOM FLANGE EL.	.728E+01	-.178E+04	-.178E+04	.179E+04
	LID, INNER LOWER CORNER				
24	CYL. SHELL	-.199E+03	-.262E+04	-.175E+04	.242E+04
25	BTM FLANGE	.620E+03	-.267E+04	-.184E+04	.329E+04
	LID, UPPER FLANGE (SEAL AREA)				
26	TOP EL.	.455E+03	-.542E+02	-.122E+02	.509E+03
27	BTM EL.	.201E+03	-.148E+03	-.134E+03	.349E+03

NOTES:
1. Stresses at locations 1 thru 6 and 17 thru 27 are given at the centroid of the element, therefore, the same stress value is used for Pm and Pm+Pb.
2. a = small radius surface,
   b = large radius surface.
3. Prefabrication stresses are included in the inner shell stresses. See Table 2.6.1.3.1 for values.

TABLE 2.10.9.4. -40°F AMBIENT WITH DECAY HEAT

	LOCATION DESCRIPTION	STRESS (PSI) SIGMA1	SIGMA2	SIGMA3	STRESS INTENSITY Q
	BOTTOM FORGING, CENTER				
1	CAVITY SURFACE	-.264E+01	-.501E+03	-.490E+03	.498E+03
2	OUTSIDE SURFACE	.711E+02	-.235E+02	.715E+02	.950E+02
	BOTTOM FORGING, MID-SECTION				
3	CAVITY SURFACE	-.269E+01	-.521E+03	-.468E+03	.518E+03
4	OUTSIDE SURFACE	.131E+03	-.726E+02	.140E+03	.212E+03
	BOTTOM FORGING, CORNER				
5	BOTTOM SURFACE	.113E+03	.717E+01	.595E+03	.588E+03
6	OUTER SURFACE	.414E+02	-.165E+03	.403E+03	.568E+03
	CASK WALL SHELLS				
7a	INNER SHELL	.573E+04	-.302E+04	-.130E+04	.875E+04
7b		-.279E+04	-.762E+04	-.508E+04	.482E+04
8a	OUTER SHELL	-.188E+04	-.355E+04	-.151E+04	.205E+04
8b		.578E+04	.961E+03	.217E+04	.482E+04
9a	INNER SHELL	-.535E+01	-.427E+04	-.451E+04	.450E+04
9b		-.110E+03	-.431E+04	-.429E+04	.420E+04
10a	OUTER SHELL	.363E+03	.371E+00	-.577E+02	.421E+03
10b		.485E+03	-.408E+00	.310E+02	.486E+03
11a	INNER SHELL	-.361E+01	-.443E+04	-.418E+04	.443E+04
11b		-.970E+02	-.415E+04	-.390E+04	.405E+04
12a	OUTER SHELL	.357E+03	-.364E+00	-.461E+02	.403E+03
12b		.491E+03	-.480E+00	.464E+02	.492E+03
13a	INNER SHELL	.770E+01	-.421E+04	-.443E+04	.444E+04
13b		-.140E+03	-.437E+04	-.427E+04	.423E+04
14a	OUTER SHELL	.358E+03	.449E+00	-.509E+02	.409E+03
14b		.490E+03	-.619E+00	.405E+02	.491E+03
15a	INNER SHELL	-.566E+03	-.517E+04	-.407E+04	.461E+04
15b		.585E+03	-.381E+04	-.322E+04	.440E+04
16a	OUTER SHELL	.164E+04	.109E+03	.536E+03	.153E+04
16b		.353E+03	-.895E+03	-.108E+03	.125E+04
	TOP FORGING				
17	INNER SURFACE	-.144E+03	-.361E+03	-.187E+03	.217E+03
18	OUTER SURFACE	.178E+03	.404E+02	.287E+03	.247E+03
19	TOP OUTER EL.	.403E+02	-.346E+02	.685E+03	.720E+03
20	TOP INNER EL.	.350E+02	-.446E+02	.704E+03	.748E+03
	LID, CENTER				
21	TOP FLANGE, TOP EL.	-.268E+01	-.883E+03	-.883E+03	.881E+03
22	TOP FLANGE, BTM EL.	-.665E+01	-.813E+03	-.810E+03	.806E+03
23	BOTTOM FLANGE EL.	.514E+01	-.179E+04	-.178E+04	.179E+04
	LID, INNER LOWER CORNER				
24	CYL. SHELL	-.262E+03	-.280E+04	-.175E+04	.254E+04
25	BTM FLANGE	.605E+03	-.280E+04	-.189E+04	.340E+04
	LID, UPPER FLANGE (SEAL AREA)				
26	TOP EL.	.534E+03	-.611E+02	.330E+02	.595E+03
27	BTM EL.	.286E+03	-.143E+03	-.706E+02	.429E+03

NOTES:
1. Stresses at locations 1 thru 6 and 17 thru 27 are given at the centroid of the element, therefore, the same stress value is used for Pm and Pm+Pb.
2. a = small radius surface,
   b = large radius surface.
3. Prefabrication stresses are included in the inner shell stresses. See Table 2.6.1.3.1 for values.

TABLE 2.10.9.5. -20ºF AMBIENT

	LOCATION DESCRIPTION	STRESS (PSI) SIGMA1	SIGMA2	SIGMA3	STRESS INTENSITY Q
	BOTTOM FORGING, CENTER				
1	CAVITY SURFACE	-.684E+00	-.844E+02	-.838E+02	.837E+02
2	OUTSIDE SURFACE	-.288E+02	-.996E+02	-.100E+03	.716E+02
	BOTTOM FORGING, MID-SECTION				
3	CAVITY SURFACE	-.227E+01	-.153E+03	-.120E+03	.150E+03
4	OUTSIDE SURFACE	-.456E+02	-.105E+03	-.851E+02	.596E+02
	BOTTOM FORGING, CORNER				
5	BOTTOM SURFACE	.205E+02	.106E+02	-.690E+01	.274E+02
6	OUTER SURFACE	.220E+02	-.384E+00	-.716E+01	.292E+02
	CASK WALL SHELLS				
7a	INNER SHELL	.954E+04	-.255E+04	.620E+03	.121E+05
7b		-.385E+04	-.100E+05	-.558E+04	.619E+04
8a	OUTER SHELL	-.362E+04	-.573E+04	-.248E+04	.325E+04
8b		.923E+04	.137E+04	.350E+04	.787E+04
9a	INNER SHELL	-.287E+01	-.420E+04	-.432E+04	.431E+04
9b		-.106E+03	-.431E+04	-.422E+04	.421E+04
10a	OUTER SHELL	.237E+03	.128E+01	-.200E+02	.257E+03
10b		.210E+03	-.489E-01	-.266E+02	.237E+03
11a	INNER SHELL	-.619E+01	-.409E+04	-.426E+04	.425E+04
11b		-.115E+03	-.442E+04	-.423E+04	.431E+04
12a	OUTER SHELL	.224E+03	.132E-02	.533E+00	.224E+03
12b		.223E+03	.325E-02	.203E+00	.223E+03
13a	INNER SHELL	-.701E+01	-.399E+04	-.426E+04	.425E+04
13b		-.111E+03	-.453E+04	-.429E+04	.442E+04
14a	OUTER SHELL	.229E+03	.129E+01	-.375E+01	.233E+03
14b		.218E+03	-.253E+00	-.712E+01	.225E+03
15a	INNER SHELL	-.541E+03	-.585E+04	-.394E+04	.531E+04
15b		.130E+04	-.360E+04	-.265E+04	.489E+04
16a	OUTER SHELL	.244E+04	-.158E+03	.795E+03	.260E+04
16b		.635E+02	-.137E+04	-.282E+03	.143E+04
	TOP FORGING				
17	INNER SURFACE	-.190E+03	-.532E+03	-.304E+03	.342E+03
18	OUTER SURFACE	.134E+03	.311E+02	-.228E+02	.157E+03
19	TOP OUTER EL.	.510E+01	-.375E+01	-.378E+02	.429E+02
20	TOP INNER EL.	.729E+00	-.651E+01	-.426E+02	.434E+02
	LID, CENTER				
21	TOP FLANGE, TOP EL.	-.290E+02	-.571E+03	-.537E+03	.542E+03
22	TOP FLANGE, BTM EL.	-.116E+03	-.895E+03	-.919E+03	.803E+03
23	BOTTOM FLANGE EL.	-.646E+02	-.180E+04	-.179E+04	.173E+04
	LID, INNER LOWER CORNER				
24	CYL. SHELL	-.213E+03	-.351E+04	-.182E+04	.330E+04
25	BTM FLANGE	.965E+03	-.333E+04	-.197E+04	.430E+04
	LID, UPPER FLANGE (SEAL AREA)				
26	TOP EL.	.848E+03	-.288E+02	-.748E+02	.922E+03
27	BTM EL.	.517E+03	-.431E+02	-.132E+03	.649E+03

NOTES:

1. Stresses at locations 1 thru 6 and 17 thru 27 are given at the centroid of the element, therefore, the same stress value is used for Pm and Pm+Pb.
2. a = small radius surface, b = large radius surface.
3. Prefabrication stresses are included in the inner shell stresses. See Table 2.6.1.3.1 for values.

TABLE 2.10.9.6. -40ºF AMBIENT

	LOCATION DESCRIPTION	STRESS (PSI) SIGMA1	SIGMA2	SIGMA3	STRESS INTENSITY Q
	BOTTOM FORGING, CENTER				
1	CAVITY SURFACE	-.923E+00	-.102E+03	-.101E+03	.101E+03
2	OUTSIDE SURFACE	-.387E+02	-.122E+03	-.123E+03	.838E+02
	BOTTOM FORGING, MID-SECTION				
3	CAVITY SURFACE	.281E+01	-.193E+03	-.149E+03	.190E+03
4	OUTSIDE SURFACE	.495E+02	-.140E+03	-.102E+03	.905E+02
	BOTTOM FORGING, CORNER				
5	BOTTOM SURFACE	.713E+01	-.131E+02	-.247E+02	.319E+02
6	OUTER SURFACE	.610E+01	-.710E+02	-.370E+02	.771E+02
	CASK WALL SHELLS				
7a	INNER SHELL	.118E+05	-.202E+04	.113E+04	.139E+05
7b		-.477E+04	-.113E+05	-.655E+04	.654E+04
8a	OUTER SHELL	.459E+04	-.709E+04	-.303E+04	.406E+04
8b		.113E+05	.173E+04	.439E+04	.961E+04
9a	INNER SHELL	-.597E+01	-.413E+04	-.403E+04	.412E+04
9b		-.860E+02	-.393E+04	-.388E+04	.384E+04
10a	OUTER SHELL	.244E+03	.155E+01	-.261E+02	.270E+03
10b		.213E+03	-.705E-01	-.338E+02	.247E+03
11a	INNER SHELL	-.102E+02	-.408E+04	-.392E+04	.407E+04
11b		-.103E+01	-.402E+04	-.379E+04	.402E+04
12a	OUTER SHELL	.229E+03	.176E-02	.750E+00	.229E+03
12b		.228E+03	.452E-02	.265E+00	.228E+03
13a	INNER SHELL	-.132E+02	-.397E+04	-.404E+04	.403E+04
13b		-.782E+02	-.407E+04	-.397E+04	.400E+04
14a	OUTER SHELL	.237E+03	.155E+01	-.886E+01	.246E+03
14b		.220E+03	-.304E+00	-.136E+02	.234E+03
15a	INNER SHELL	-.727E+03	-.610E+04	-.417E+04	.537E+04
15b		.190E+04	-.301E+04	-.240E+04	.491E+04
16a	OUTER SHELL	.288E+04	-.331E+03	.106E+04	.321E+04
16b		.171E+03	-.162E+04	-.150E+03	.179E+04
	TOP FORGING				
17	INNER SURFACE	-.150E+03	-.588E+03	-.212E+03	.438E+03
18	OUTER SURFACE	.157E+03	.302E+02	.584E+02	.127E+03
19	TOP OUTER EL.	.492E+01	-.279E+01	-.169E+02	.218E+02
20	TOP INNER EL.	.890E+00	-.696E+01	-.205E+02	.214E+02
	LID, CENTER				
21	TOP FLANGE, TOP EL.	-.365E+02	-.903E+03	-.893E+03	.867E+03
22	TOP FLANGE, BTM EL.	-.115E+03	-.467E+03	-.462E+03	.351E+03
23	BOTTOM FLANGE EL.	-.625E+02	-.187E+04	-.187E+04	.181E+04
	LID, INNER LOWER CORNER				
24	CYL. SHELL	-.152E+03	-.342E+04	-.166E+04	.327E+04
25	BTM FLANGE	.108E+04	-.371E+04	-.210E+04	.479E+04
	LID, UPPER FLANGE (SEAL AREA)				
26	TOP EL.	.872E+03	-.315E+02	-.402E+02	.912E+03
27	BTM EL.	.610E+03	-.388E+02	-.581E+02	.668E+03

NOTES:

1. Stresses at locations 1 thru 6 and 17 thru 27 are given at the centroid of the element, therefore, the same stress value is used for Pm and Pm+Pb.
2. a = small radius surface,
   b = large radius surface.
3. Prefabrication stresses are included in the inner shell stresses. See Table 2.6.1.3.1 for values.

TABLE 2.10.9.7. FIRE ACCIDENT - T=0.5 HR.

	LOCATION DESCRIPTION	STRESS (PSI) SIGMA1	SIGMA2	SIGMA3	STRESS INTENSITY Q
	BOTTOM FORGING, CENTER				
1	CAVITY SURFACE	.391E+04	-.841E+01	.393E+04	.394E+04
2	OUTSIDE SURFACE	-.192E+01	-.207E+04	-.208E+04	.207E+04
	BOTTOM FORGING, MID-SECTION				
3	CAVITY SURFACE	.382E+04	-.696E+01	.386E+04	.386E+04
4	OUTSIDE SURFACE	-.769E+01	-.223E+04	-.230E+04	.229E+04
	BOTTOM FORGING, CORNER				
5	BOTTOM SURFACE	.156E+04	-.202E+04	-.148E+05	.163E+05
6	OUTER SURFACE	.995E+03	-.296E+04	-.115E+05	.125E+05
	CASK WALL SHELLS				
7a	INNER SHELL	-.581E+03	-.148E+05	-.308E+04	.142E+05
7b		.128E+05	.112E+05	.837E+04	.438E+04
8a	OUTER SHELL	.157E+05	.120E+05	.353E+04	.122E+05
8b		-.100E+05	-.259E+05	-.167E+05	.159E+05
9a	INNER SHELL	.537E+04	-.175E+01	-.756E+02	.545E+04
9b		.560E+04	-.402E+00	.483E+02	.560E+04
10a	OUTER SHELL	.339E+03	-.657E+03	.286E+04	.352E+04
10b		-.141E+02	-.561E+04	-.272E+03	.559E+04
11a	INNER SHELL	.542E+04	.458E+01	-.433E+02	.547E+04
11b		.555E+04	-.618E+01	.451E+02	.556E+04
12a	OUTER SHELL	-.909E+02	-.202E+04	.303E+04	.505E+04
12b		.842E+01	-.421E+04	.799E+03	.501E+04
13a	INNER SHELL	.539E+04	.183E+01	-.134E+03	.552E+04
13b		.559E+04	-.551E+01	-.150E+02	.560E+04
14a	OUTER SHELL	.299E+03	-.141E+04	.238E+04	.379E+04
14b		.411E+01	-.491E+04	-.294E+03	.492E+04
15a	INNER SHELL	.404E+04	.135E+04	.415E+04	.280E+04
15b		.769E+04	-.101E+04	.419E+04	.870E+04
16a	OUTER SHELL	.808E+03	-.398E+04	-.408E+04	.488E+04
16b		.261E+04	-.623E+04	-.552E+04	.884E+04
	TOP FORGING				
17	INNER SURFACE	.117E+04	.370E+03	.865E+03	.797E+03
18	OUTER SURFACE	.369E+02	-.223E+04	-.419E+04	.422E+04
19	TOP OUTER EL.	.417E+03	-.439E+03	-.614E+04	.655E+04
20	TOP INNER EL.	.172E+03	-.147E+03	-.511E+04	.529E+04
	LID, CENTER				
21	TOP FLANGE, TOP EL.	.867E+03	-.597E+01	.853E+03	.873E+03
22	TOP FLANGE, BTM EL.	.743E+03	.234E+02	.712E+03	.720E+03
23	BOTTOM FLANGE EL.	.377E+04	.442E+02	.374E+04	.373E+04
	LID, INNER LOWER CORNER				
24	CYL. SHELL	.538E+04	.298E+03	.481E+04	.509E+04
25	BTM FLANGE	.571E+04	-.117E+04	.426E+04	.688E+04
	LID, UPPER FLANGE (SEAL AREA)				
26	TOP EL.	.427E+02	-.187E+04	-.785E+03	.191E+04
27	BTM EL.	.341E+03	-.598E+03	.136E+03	.940E+03

NOTES:
1. Stresses at locations 1 thru 6 and 17 thru 27 are given at the centroid of the element, therefore, the same stress value is used for Pm, and Pm+Pb.
2. a = small radius surface,
   b = large radius surface.

TABLE 2.10.9.8. FIRE ACCIDENT - T=1.0 HR.

	LOCATION DESCRIPTION	STRESS (PSI) SIGMA1	SIGMA2	SIGMA3	STRESS INTENSITY Q
	BOTTOM FORGING, CENTER				
1	CAVITY SURFACE	.116E+05	-.209E+01	.117E+05	.117E+05
2	OUTSIDE SURFACE	-.108E+02	-.448E+04	-.451E+04	.450E+04
	BOTTOM FORGING, MID-SECTION				
3	CAVITY SURFACE	.111E+05	-.129E+02	.108E+05	.111E+05
4	OUTSIDE SURFACE	-.187E+01	-.500E+04	-.563E+04	.562E+04
	BOTTOM FORGING, CORNER				
5	BOTTOM SURFACE	.117E+04	-.138E+04	-.176E+05	.187E+05
6	OUTER SURFACE	.706E+03	-.231E+04	-.147E+05	.154E+05
	CASK WALL SHELLS				
7a	INNER SHELL	-.345E+04	-.211E+05	-.153E+04	.196E+05
7b		.345E+05	.190E+05	.209E+05	.155E+05
8a	OUTER SHELL	.228E+05	.103E+05	.222E+04	.206E+05
8b		-.162E+05	-.441E+05	-.259E+05	.280E+05
9a	INNER SHELL	.152E+05	.479E+01	-.201E+03	.154E+05
9b		.157E+05	-.870E+01	.181E+02	.157E+05
10a	OUTER SHELL	-.478E+00	-.107E+05	.735E+03	.114E+05
10b		.435E+01	-.114E+05	-.550E+02	.114E+05
11a	INNER SHELL	.154E+05	.155E+01	-.511E+02	.154E+05
11b		.155E+05	-.244E+01	.482E+02	.155E+05
12a	OUTER SHELL	.345E+01	-.107E+05	.373E+03	.111E+05
12b		.407E+01	-.114E+05	-.378E+03	.114E+05
13a	INNER SHELL	.152E+05	-.119E+01	-.266E+03	.155E+05
13b		.157E+05	-.136E+01	-.442E+02	.157E+05
14a	OUTER SHELL	-.137E+00	-.112E+05	.801E+03	.120E+05
14b		.508E+01	-.109E+05	.307E+03	.112E+05
15a	INNER SHELL	.952E+04	.111E+04	.852E+04	.841E+04
15b		.243E+05	.758E+03	.120E+05	.236E+05
16a	OUTER SHELL	-.242E+04	-.603E+04	-.859E+04	.617E+04
16b		.454E+04	-.181E+05	-.104E+05	.226E+05
	TOP FORGING				
17	INNER SURFACE	.201E+04	-.761E+03	-.988E+03	.300E+04
18	OUTER SURFACE	.639E+02	-.387E+04	-.750E+04	.756E+04
19	TOP OUTER EL.	.375E+03	-.499E+03	-.125E+05	.129E+05
20	TOP INNER EL.	.417E+03	-.315E+03	-.125E+05	.130E+05
	LID, CENTER				
21	TOP FLANGE, TOP EL.	.672E+03	-.663E+01	.528E+03	.679E+03
22	TOP FLANGE, BTM EL.	.201E+04	.182E+03	.205E+04	.187E+04
23	BOTTOM FLANGE EL.	.853E+04	.109E+03	.847E+04	.842E+04
	LID, INNER LOWER CORNER				
24	CYL. SHELL	.939E+04	-.763E+03	.939E+04	.102E+05
25	BTM FLANGE	.107E+05	-.148E+04	.816E+04	.121E+05
	LID, UPPER FLANGE (SEAL AREA)				
26	TOP EL.	.261E+03	-.231E+04	-.454E+04	.480E+04
27	BTM EL.	.135E+04	-.557E+03	-.232E+04	.367E+04

NOTES:

1. Stresses at locations 1 thru 6 and 17 thru 27 are given at the centroid of the element, therefore, the same stress value is used for Pm and Pm+Pb.
2. a = small radius surface,
   b = large radius surface.

TABLE 2.10.9.9. FIRE ACCIDENT - T=1.5 HR.

	LOCATION DESCRIPTION	STRESS (PSI) SIGMA1	SIGMA2	SIGMA3	STRESS INTENSITY Q
	BOTTOM FORGING, CENTER				
1	CAVITY SURFACE	.123E+05	.953E+01	.123E+05	.123E+05
2	OUTSIDE SURFACE	.239E+01	-.488E+04	-.493E+04	.493E+04
	BOTTOM FORGING, MID-SECTION				
3	CAVITY SURFACE	.117E+05	-.202E+01	.107E+05	.117E+05
4	OUTSIDE SURFACE	.144E+02	-.536E+04	-.641E+04	.642E+04
	BOTTOM FORGING, CORNER				
5	BOTTOM SURFACE	.716E+03	-.104E+04	-.126E+05	.133E+05
6	OUTER SURFACE	.443E+03	-.168E+04	-.104E+05	.108E+05
	CASK WALL SHELLS				
7a	INNER SHELL	-.781E+04	-.240E+05	-.291E+04	.211E+05
7b		.422E+05	.219E+05	.248E+05	.203E+05
8a	OUTER SHELL	.227E+05	.592E+04	.354E+04	.192E+05
8b		-.147E+05	-.446E+05	-.227E+05	.299E+05
9a	INNER SHELL	.168E+05	.416E+00	-.238E+03	.170E+05
9b		.170E+05	-.431E+01	-.635E+02	.171E+05
10a	OUTER SHELL	-.815E+01	-.122E+05	.320E+03	.126E+05
10b		.608E+01	-.119E+05	.244E+03	.121E+05
11a	INNER SHELL	.168E+05	.484E+01	-.444E+02	.169E+05
11b		.170E+05	-.539E+01	.496E+02	.170E+05
12a	OUTER SHELL	.293E+00	-.120E+05	.107E+03	.121E+05
12b		.205E+01	-.122E+05	-.130E+03	.122E+05
13a	INNER SHELL	.167E+05	.535E+01	-.256E+03	.170E+05
13b		.171E+05	-.624E+01	-.882E+02	.171E+05
14a	OUTER SHELL	-.544E+01	-.131E+05	.250E+03	.133E+05
14b		.199E+01	-.111E+05	.654E+03	.117E+05
15a	INNER SHELL	.102E+05	.108E+04	.840E+04	.915E+04
15b		.271E+05	.928E+03	.125E+05	.262E+05
16a	OUTER SHELL	-.388E+04	-.690E+04	-.773E+04	.385E+04
16b		.511E+04	-.185E+05	-.846E+04	.236E+05
	TOP FORGING				
17	INNER SURFACE	.196E+04	-.100E+04	-.223E+04	.419E+04
18	OUTER SURFACE	.220E+02	-.361E+04	-.673E+04	.675E+04
19	TOP OUTER EL.	.314E+03	-.442E+03	-.113E+05	.116E+05
20	TOP INNER EL.	.397E+03	-.299E+03	-.116E+05	.120E+05
	LID, CENTER				
21	TOP FLANGE, TOP EL.	.166E+04	.517E+02	.159E+04	.161E+04
22	TOP FLANGE, BTM EL.	.238E+04	.189E+03	.240E+04	.221E+04
23	BOTTOM FLANGE EL.	.102E+05	.115E+03	.102E+05	.101E+05
	LID, INNER LOWER CORNER				
24	CYL. SHELL	.103E+05	-.842E+03	.939E+04	.112E+05
25	BTM FLANGE	.118E+05	-.137E+04	.835E+04	.131E+05
	LID, UPPER FLANGE (SEAL AREA)				
26	TOP EL.	.265E+03	-.248E+04	-.579E+04	.606E+04
27	BTM EL.	.131E+04	-.804E+03	-.358E+04	.488E+04

NOTES:
1. Stresses at locations 1 thru 6 and 17 thru 27 are given at the centroid of the element, therefore, the same stress value is used for Pm and Pm+Pb.
2. a = small radius surface,
   b = large radius surface.

TABLE 2.10.9.10. FIRE ACCIDENT - T=2.0 HR.

	LOCATION DESCRIPTION	STRESS (PSI) SIGMA1	SIGMA2	SIGMA3	STRESS INTENSITY Q
	BOTTOM FORGING, CENTER				
1	CAVITY SURFACE	.107E+05	.105E+02	.107E+05	.107E+05
2	OUTSIDE SURFACE	.620E+01	-.517E+04	-.522E+04	.523E+04
	BOTTOM FORGING, MID-SECTION				
3	CAVITY SURFACE	.102E+05	-.303E+00	.921E+04	.102E+05
4	OUTSIDE SURFACE	.163E+02	-.550E+04	-.647E+04	.649E+04
	BOTTOM FORGING, CORNER				
5	BOTTOM SURFACE	.478E+03	-.880E+03	-.899E+04	.947E+04
6	OUTER SURFACE	.322E+03	-.134E+04	-.724E+04	.756E+04
	CASK WALL SHELLS				
7a	INNER SHELL	-.922E+04	-.239E+05	-.319E+04	.207E+05
7b		.420E+05	.226E+05	.251E+05	.194E+05
8a	OUTER SHELL	.209E+05	.201E+04	.336E+04	.189E+05
8b		-.124E+05	-.411t+05	-.194E+05	.286E+05
9a	INNER SHELL	.162E+05	.370E+01	-.161E+03	.163E+05
9b		.161E+05	-.645E+01	-.118E+03	.162E+05
10a	OUTER SHELL	-.581E+01	-.126E+05	.138E+03	.128E+05
10b		.123E+01	-.114E+05	.441E+03	.119E+05
11a	INNER SHELL	.160E+05	-.884E+00	-.607E+02	.161E+05
11b		.162E+05	-.328E-01	.606E+02	.162E+05
12a	OUTER SHELL	.633E+00	-.121E+05	.227E+02	.121E+05
12b		.619E+00	-.120E+05	-.828E+01	.120E+05
13a	INNER SHELL	.161E+05	.535E+01	-.209E+03	.163E+05
13b		.162E+05	-.599E+01	-.108E+03	.163E+05
14a	OUTER SHELL	-.798E+01	-.135E+05	-.712E+02	.135E+05
14b		-.753E+00	-.106E+05	.726E+03	.113E+05
15a	INNER SHELL	.951E+04	.892E+03	.758E+04	.862E+04
15b		.262E+05	.786E+03	.117E+05	.254E+05
16a	OUTER SHELL	-.544E+04	-.836E+04	-.745E+04	.292E+04
16b		.555E+04	-.163E+05	-.640E+04	.219E+05
	TOP FORGING				
17	INNER SURFACE	.179E+04	-.122E+04	-.275E+04	.454E+04
18	OUTER SURFACE	-.916E+01	-.324E+04	-.587E+04	.586E+04
19	TOP OUTER EL.	.265E+03	-.383E+03	-.981E+04	.101E+05
20	TOP INNER EL.	.348E+03	-.261E+03	-.102E+05	.105E+05
	LID, CENTER				
21	TOP FLANGE, TOP EL.	.192E+04	.586E+02	.186E+04	.186E+04
22	TOP FLANGE, BTM EL.	.219E+04	.195E+03	.217E+04	.199E+04
23	BOTTOM FLANGE EL.	.105E+05	.116E+03	.104E+05	.103E+05
	LID, INNER LOWER CORNER				
24	CYL. SHELL	.981E+04	-.851E+03	.862E+04	.107E+05
25	BTM FLANGE	.113E+05	-.108E+04	.775E+04	.124E+05
	LID, UPPER FLANGE (SEAL AREA)				
26	TOP EL.	.254E+03	-.268E+04	-.600E+04	.625E+04
27	BTM EL.	.123E+04	-.103E+04	-.391E+04	.514E+04

NOTES:
1. Stresses at locations 1 thru 6 and 17 thru 27 are given at the centroid of the element, therefore, the same stress value is used for Pm and Pm+Pb.
2. a = small radius surface,
   b = large radius surface.

TABLE 2.10.9.11. FIRE ACCIDENT - T=2.5 HR.

	LOCATION DESCRIPTION	STRESS (PSI) SIGMA1	SIGMA2	SIGMA3	STRESS INTENSITY Q
	BOTTOM FORGING, CENTER				
1	CAVITY SURFACE	.900E+04	.130E+02	.901E+04	.900E+04
2	OUTSIDE SURFACE	.429E+01	-.532E+04	-.537E+04	.538E+04
	BOTTOM FORGING, MID-SECTION				
3	CAVITY SURFACE	.861E+04	-.160E+01	.789E+04	.861E+04
4	OUTSIDE SURFACE	.140E+02	-.552E+04	-.623E+04	.624E+04
	BOTTOM FORGING, CORNER				
5	BOTTOM SURFACE	.353E+03	-.847E+03	-.660E+04	.695E+04
6	OUTER SURFACE	.265E+03	-.120E+04	-.512E+04	.539E+04
	CASK WALL SHELLS				
7a	INNER SHELL	-.913E+04	-.242E+05	-.370E+04	.205E+05
7b		.409E+05	.221E+05	.242E+05	.188E+05
8a	OUTER SHELL	.202E+05	.371E+04	.552E+04	.164E+05
8b		-.117E+05	-.401E+05	-.171E+05	.283E+05
9a	INNER SHELL	.157E+05	.209E+01	-.102E+03	.158E+05
9b		.154E+05	-.426E+01	-.119E+03	.155E+05
10a	OUTER SHELL	-.697E+01	-.112E+05	-.263E+02	.112E+05
10b		.111E+01	-.999E+04	.355E+03	.103E+05
11a	INNER SHELL	.155E+05	.429E+01	-.516E+02	.155E+05
11b		.156E+05	-.566E+01	.426E+02	.156E+05
12a	OUTER SHELL	.178E+01	-.107E+05	-.327E+02	.107E+05
12b		-.236E+01	-.105E+05	.636E+02	.105E+05
13a	INNER SHELL	.156E+05	-.338E+00	-.186E+03	.158E+05
13b		.155E+05	-.307E+00	-.107E+03	.156E+05
14a	OUTER SHELL	-.522E+01	-.120E+05	-.203E+03	.120E+05
14b		-.372E+01	-.919E+04	.636E+03	.982E+04
15a	INNER SHELL	.911E+04	.134E+04	.711E+04	.777E+04
15b		.249E+05	.415E+03	.108E+05	.245E+05
16a	OUTER SHELL	-.500E+04	-.832E+04	-.620E+04	.333E+04
16b		.525E+04	-.139E+05	-.467E+04	.191E+05
	TOP FORGING				
17	INNER SURFACE	.160E+04	-.122E+04	-.271E+04	.431E+04
18	OUTER SURFACE	-.414E+02	-.286E+04	-.499E+04	.495E+04
19	TOP OUTER EL.	.222E+03	-.326E+03	-.828E+04	.851E+04
20	TOP INNER EL.	.296E+03	-.221E+03	-.864E+04	.894E+04
	LID, CENTER				
21	TOP FLANGE, TOP EL.	.195E+04	.562E+02	.189E+04	.189E+04
22	TOP FLANGE, BTM EL.	.215E+04	.180E+03	.211E+04	.197E+04
23	BOTTOM FLANGE EL.	.102E+05	.113E+03	.101E+05	.100E+05
	LID, INNER LOWER CORNER				
24	CYL. SHELL	.952E+04	-.435E+03	.800E+04	.996E+04
25	BTM FLANGE	.109E+05	-.107E+04	.724E+04	.120E+05
	LID, UPPER FLANGE (SEAL AREA)				
26	TOP EL.	.220E+03	-.273E+04	-.559E+04	.581E+04
27	BTM EL.	.107E+04	-.117E+04	-.373E+04	.481E+04

NOTES:
1. Stresses at locations 1 thru 6 and 17 thru 27 are given at the centroid of the element, therefore, the same stress value is used for Pm and Pm+Pb.
2. a = small radius surface, b = large radius surface.

TABLE 2.10.9.12. FIRE ACCIDENT - T=3.0 HR.

	LOCATION DESCRIPTION	STRESS (PSI) SIGMA1	SIGMA2	SIGMA3	STRESS INTENSITY Q
	BOTTOM FORGING, CENTER				
1	CAVITY SURFACE	.738E+04	.883E+01	.741E+04	.740E+04
2	OUTSIDE SURFACE	.218E+01	-.524E+04	-.528E+04	.528E+04
	BOTTOM FORGING, MID-SECTION				
3	CAVITY SURFACE	.712E+04	-.317E+01	.665E+04	.712E+04
4	OUTSIDE SURFACE	.123E+02	-.532E+04	-.578E+04	.580E+04
	BOTTOM FORGING, CORNER				
5	BOTTOM SURFACE	.269E+03	-.782E+03	-.488E+04	.515E+04
6	OUTER SURFACE	.218E+03	-.105E+04	-.364E+04	.385E+04
	CASK WALL SHELLS				
7a	INNER SHELL	-.928E+04	-.238E+05	-.401E+04	.198E+05
7b		.372E+05	.216E+05	.227E+05	.156E+05
8a	OUTER SHELL	.198E+05	.365E+04	.631E+04	.161E+05
8b		-.113E+05	-.387E+05	-.157E+05	.274E+05
9a	INNER SHELL	.138E+05	.338E+01	-.727E+02	.139E+05
9b		.134E+05	-.479E+01	-.110E+03	.135E+05
10a	OUTER SHELL	-.239E+01	-.109E+05	-.906E+02	.109E+05
10b		-.319E+01	-.963E+04	.319E+03	.995E+04
11a	INNER SHELL	.136E+05	.234E+01	-.478E+02	.136E+05
11b		.136E+05	-.329E+01	.390E+02	.136E+05
12a	OUTER SHELL	-.280E+01	-.104E+05	-.701E+02	.104E+05
12b		.110E+01	-.101E+05	.949E+02	.101E+05
13a	INNER SHELL	.137E+05	-.566E+00	-.153E+03	.138E+05
13b		.135E+05	.748E-01	-.964E+02	.136E+05
14a	OUTER SHELL	-.800E+01	-.116E+05	-.233E+03	.116E+05
14b		-.650E+00	-.891E+04	.608E+03	.952E+04
15a	INNER SHELL	.793E+04	.118E+04	.617E+04	.675E+04
15b		.220E+05	.116E+03	.945E+04	.218E+05
16a	OUTER SHELL	-.563E+04	-.801E+04	-.581E+04	.238E+04
16b		.549E+04	-.130E+05	-.380E+04	.185E+05
	TOP FORGING				
17	INNER SURFACE	.137E+04	-.122E+04	-.260E+04	.396E+04
18	OUTER SURFACE	-.711E+02	-.251E+04	-.429E+04	.421E+04
19	TOP OUTER EL.	.184E+03	-.277E+03	-.708E+04	.726E+04
20	TOP INNER EL.	.258E+03	-.191E+03	-.742E+04	.768E+04
	LID, CENTER				
21	TOP FLANGE, TOP EL.	.125E+04	.506E+02	.115E+04	.120E+04
22	TOP FLANGE, BTM EL.	.210E+04	.199E+03	.206E+04	.190E+04
23	BOTTOM FLANGE EL.	.914E+04	.114E+03	.907E+04	.903E+04
	LID, INNER LOWER CORNER				
24	CYL. SHELL	.836E+04	-.883E+03	.689E+04	.924E+04
25	BTM FLANGE	.984E+04	-.104E+04	.635E+04	.109E+05
	LID, UPPER FLANGE (SEAL AREA)				
26	TOP EL.	.168E+03	-.237E+04	-.508E+04	.524E+04
27	BTM EL.	.861E+03	-.118E+04	-.348E+04	.434E+04

NOTES:
1. Stresses at locations 1 thru 6 and 17 thru 27 are given at the centroid of the element, therefore, the same stress value is used for Pm and Pm+Pb.
2. a = small radius surface,
   b = large radius surface.

TABLE 2.10.9.13. 30 PSI INTERNAL PRESSURE

	LOCATION DESCRIPTION	STRESS (PSI) SIGMA1	SIGMA2	SIGMA3	STRESS INTENSITY Pm	Pm+Pb
	BOTTOM FORGING, CENTER					
1	CAVITY SURFACE	-.746E+01	-.199E+02	-.691E+01	-.130E+02	-.130E+02
2	OUTSIDE SURFACE	-.107E+02	-.245E+02	-.108E+02	.137E+02	.137E+02
	BOTTOM FORGING, MID-SECTION					
3	CAVITY SURFACE	-.135E+02	-.278E+02	-.127E+02	.151E+02	.151E+02
4	OUTSIDE SURFACE	-.916E+01	-.267E+02	-.984E+01	.176E+02	.176E+02
	BOTTOM FORGING, CORNER					
5	BOTTOM SURFACE	-.686E+01	-.940E+01	-.633E+01	.307E+01	.307E+01
6	OUTER SURFACE	-.222E+01	-.101E+02	-.558E+01	.786E+01	.786E+01
	CASK WALL SHELLS					
7a	INNER SHELL	.996E+02	-.624E+00	.453E+02	.622E+02	.100E+03
7b		-.242E+02	-.485E+02	-.923E+01	.622E+02	.393E+02
8a	OUTER SHELL	.245E+02	-.187E+02	-.514E+01	.301E+02	.432E+02
8b		.329E+01	-.136E+02	-.102E+02	.301E+02	.169E+02
9a	INNER SHELL	.294E+02	-.335E+02	.110E+03	.133E+03	.144E+03
9b		.283E+02	-.213E+02	.101E+03	.133E+03	.123E+03
10a	OUTER SHELL	.872E+01	-.196E+02	.436E+02	.606E+02	.632E+02
10b		.118E+02	-.167E+02	.413E+02	.606E+02	.580E+02
11a	INNER SHELL	.303E+02	-.335E+02	.108E+03	.131E+03	.142E+03
11b		.274E+02	-.215E+02	.987E+02	.131E+03	.120E+03
12a	OUTER SHELL	.102E+02	-.194E+02	.422E+02	.588E+02	.616E+02
12b		.104E+02	-.168E+02	.391E+02	.588E+02	.559E+02
13a	INNER SHELL	.260E+02	-.337E+02	.110E+03	.134E+03	.144E+03
13b		.316E+02	-.212E+02	.103E+03	.134E+03	.125E+03
14a	OUTER SHELL	.775E+01	-.197E+02	.439E+02	.612E+02	.636E+02
14b		.128E+02	-.166E+02	.422E+02	.612E+02	.588E+02
15a	INNER SHELL	.910E+02	.194E+01	.734E+01	.451E+02	.890E+02
15b		-.289E+02	-.229E+02	-.354E+02	.451E+02	.125E+02
16a	OUTER SHELL	.600E+02	-.336E+01	-.829E+00	.342E+02	.634E+02
16b		-.301E+02	-.353E+02	-.370E+02	.342E+02	.692E+01
	TOP FORGING					
17	INNER SURFACE	.535E+02	-.194E+02	-.770E+00	.728E+02	.728E+02
18	OUTER SURFACE	-.818E+01	-.209E+02	-.195E+02	.127E+02	.127E+02
19	TOP OUTER EL.	-.946E+01	-.240E+02	-.138E+02	.145E+02	.145E+02
20	TOP INNER EL.	-.661E+00	-.940E+01	-.705E+01	.874E+01	.874E+01
	LID, CENTER					
21	TOP FLANGE, TOP EL.	.648E+02	-.379E+02	-.434E+02	.108E+03	.108E+03
22	TOP FLANGE, BTM EL.	.204E+03	.143E+02	.670E+02	.190E+03	.190E+03
23	BOTTOM FLANGE EL.	-.133E+02	-.214E+02	-.130E+02	.836E+01	.836E+01
	LID, INNER LOWER CORNER					
24	CYL. SHELL	-.683E+01	-.925E+02	-.146E+02	.857E+02	.857E+02
25	BTM FLANGE	.387E+01	-.534E+02	-.168E+02	.573E+02	.573E+02
	LID, UPPER FLANGE (SEAL AREA)					
26	TOP EL.	-.992E+01	-.485E+02	-.143E+02	.385E+02	.385E+02
27	BTM EL.	-.763E+01	-.775E+02	-.286E+02	.698E+02	.698E+02

NOTES:
1. Stresses at locations 1 thru 6 and 17 thru 27 are given at the centroid of the element, therefore, the same stress value is used for Pm and Pm+Pb.
2. a = small radius surface,
   b = large radius surface.

TABLE 2.10.9.14. INCREASED EXTERNAL PRESSURE - 20 PSIA

	LOCATION DESCRIPTION	STRESS (PSI) SIGMA1	SIGMA2	SIGMA3	STRESS INTENSITY Pm	Pm+Pb
	BOTTOM FORGING, CENTER					
1	CAVITY SURFACE	-.154E+02	-.207E+02	-.157E+02	.525E+01	.525E+01
2	OUTSIDE SURFACE	-.201E+02	-.240E+02	-.202E+02	.393E+01	.393E+01
	BOTTOM FORGING, MID-SECTION					
3	CAVITY SURFACE	-.216E+02	-.278E+02	-.211E+02	.672E+01	.672E+01
4	OUTSIDE SURFACE	-.188E+02	-.271E+02	-.196E+02	.832E+01	.832E+01
	BOTTOM FORGING, CORNER					
5	BOTTOM SURFACE	-.134E+02	-.198E+02	-.168E+02	.641E+01	.641E+01
6	OUTER SURFACE	-.107E+02	-.200E+02	-.164E+02	.927E+01	.927E+01
	CASK WALL SHELLS					
7a	INNER SHELL	.556E+02	-.364E+01	.196E+02	.418E+02	.592E+02
7b		-.274E+02	-.518E+02	-.214E+02	.418E+02	.304E+02
8a	OUTER SHELL	-.693E+01	-.238E+02	-.242E+02	.268E+02	.173E+02
8b		.132E+02	-.235E+02	-.176E+02	.268E+02	.368E+02
9a	INNER SHELL	.924E+01	-.356E+02	.617E+02	.896E+02	.973E+02
9b		.725E+01	-.261E+02	.559E+02	.896E+02	.820E+02
10a	OUTER SHELL	-.381E+01	-.255E+02	.108E+02	.356E+02	.363E+02
10b		-.459E+00	-.251E+02	.980E+01	.356E+02	.349E+02
11a	INNER SHELL	.986E+01	-.355E+02	.602E+02	.880E+02	.956E+02
11b		.663E+01	-.263E+02	.540E+02	.880E+02	.803E+02
12a	OUTER SHELL	-.288E+01	-.252E+02	.990E+01	.344E+02	.351E+02
12b		-.134E+01	-.253E+02	.826E+01	.344E+02	.336E+02
13a	INNER SHELL	.784E+01	-.357E+02	.613E+02	.897E+02	.970E+02
13b		.862E+01	-.260E+02	.564E+02	.897E+02	.823E+02
14a	OUTER SHELL	-.398E+01	-.256E+02	.108E+02	.356E+02	.363E+02
14b		-.291E+00	-.250E+02	.987E+01	.356E+02	.349E+02
15a	INNER SHELL	.273E+02	-.164E+02	.522E+00	.273E+02	.437E+02
15b		-.113E+02	-.222E+02	-.137E+02	.273E+02	.109E+02
16a	OUTER SHELL	.921E+01	-.167E+02	-.966E+01	.181E+02	.259E+02
16b		-.153E+02	-.255E+02	-.198E+02	.181E+02	.102E+02
	TOP FORGING					
17	INNER SURFACE	-.123E+02	-.256E+02	-.256E+02	.134E+02	.134E+02
18	OUTER SURFACE	-.342E+01	-.213E+02	-.203E+02	.179E+02	.179E+02
19	TOP OUTER EL.	-.118E+02	-.224E+02	-.453E+02	.334E+02	.334E+02
20	TOP INNER EL.	-.244E+01	-.224E+02	-.450E+02	.426E+02	.426E+02
	LID, CENTER					
21	TOP FLANGE, TOP EL.	-.907E+01	-.198E+02	-.113E+02	.107E+02	.107E+02
22	TOP FLANGE, BTM EL.	-.183E+02	-.463E+02	-.472E+02	.290E+02	.290E+02
23	BOTTOM FLANGE EL.	-.150E+02	-.207E+02	-.143E+02	.642E+01	.642E+01
	LID, INNER LOWER CORNER					
24	CYL. SHELL	-.308E+02	-.813E+02	-.385E+02	.505E+02	.505E+02
25	BTM FLANGE	.807E+01	-.547E+02	-.168E+02	.627E+02	.627E+02
	LID, UPPER FLANGE (SEAL AREA)					
26	TOP EL.	-.205E+02	-.515E+02	-.381E+02	.310E+02	.310E+02
27	BTM EL.	-.229E+02	-.450E+02	-.363E+02	.222E+02	.222E+02

NOTES:
1. Stresses at locations 1 thru 6 and 17 thru 27 are given at the centroid of the element, therefore, the same stress value is used for Pm and Pm+Pb.
2. a = small radius surface, b = large radius surface.

TABLE 2.10.9.15. MINIMUM EXTERNAL PRESSURE - 3.5 PSIA

	LOCATION DESCRIPTION	STRESS (PSI) SIGMA1	SIGMA2	SIGMA3	STRESS INTENSITY Pm	Pm+Pb
	BOTTOM FORGING, CENTER					
1	CAVITY SURFACE	.496E+01	-.198E+02	.569E+01	.255E+02	.255E+02
2	OUTSIDE SURFACE	.335E+01	-.254E+02	.325E+01	.288E+02	.288E+02
	BOTTOM FORGING, MID-SECTION					
3	CAVITY SURFACE	-.224E+01	-.278E+02	-.905E+00	.269E+02	.269E+02
4	OUTSIDE SURFACE	.539E+01	-.255E+02	.502E+01	.309E+02	.309E+02
	BOTTOM FORGING, CORNER					
5	BOTTOM SURFACE	.797E+01	-.333E+01	.552E+01	.113E+02	.113E+02
6	OUTER SURFACE	.885E+01	-.351E+01	.519E+01	.124E+02	.124E+02
	CASK WALL SHELLS					
7a	INNER SHELL	.195E+03	.607E+01	.971E+02	.107E+03	.189E+03
7b		-.184E+02	-.431E+02	.126E+02	.107E+03	.557E+02
8a	OUTER SHELL	.104E+03	-.960E+01	.353E+02	.558E+02	.113E+03
8b		-.152E+01	.997E-01	.499E+01	.558E+02	.652E+01
'9a	INNER SHELL	.745E+02	-.317E+02	.213E+03	.227E+03	.244E+03
9b		.749E+02	-.134E+02	.197E+03	.227E+03	.210E+03
10a	OUTER SHELL	.475E+02	-.991E+01	.114E+03	.118E+03	.124E+03
10b		.517E+02	-.345E+01	.109E+03	.118E+03	.113E+03
11a	INNER SHELL	.759E+02	-.317E+02	.209E+03	.223E+03	.240E+03
11b		.735E+02	-.136E+02	.192E+03	.223E+03	.206E+03
12a	OUTER SHELL	.499E+02	-.980E+01	.112E+03	.115E+03	.121E+03
12b		.493E+02	-.346E+01	.105E+03	.115E+03	.109E+03
13a	INNER SHELL	.696E+02	-.318E+02	.212E+03	.228E+03	.244E+03
13b		.797E+02	-.133E+02	.199E+03	.228E+03	.213E+03
14a	OUTER SHELL	.462E+02	-.991E+01	.114E+03	.119E+03	.124E+03
14b		.530E+02	-.345E+01	.110E+03	.119E+03	.113E+03
15a	INNER SHELL	.144E+03	.342E+00	.603E+02	.824E+02	.143E+03
15b		.788E+01	-.135E+02	.115E+02	.824E+02	.250E+02
16a	OUTER SHELL	.135E+03	.705E+01	.464E+02	.680E+02	.128E+03
16b		-.201E+02	-.283E+02	-.122E+02	.680E+02	.161E+02
	TOP FORGING					
17	INNER SURFACE	.157E+03	.127E+02	.651E+02	.144E+03	.144E+03
18	OUTER SURFACE	-.349E-01	-.155E+02	.521E+01	.207E+02	.207E+02
19	TOP OUTER EL.	-.112E+01	-.635E+01	.295E+02	.359E+02	.359E+02
20	TOP INNER EL.	.865E+00	-.307E+01	.334E+02	.365E+02	.365E+02
	LID, CENTER					
21	TOP FLANGE, TOP EL.	.112E+03	.110E+02	.462E+02	.101E+03	.101E+03
22	TOP FLANGE, BTM EL.	.216E+03	.382E+02	.938E+02	.178E+03	.178E+03
23	BOTTOM FLANGE EL.	-.159E+02	-.510E+02	-.450E+02	.351E+02	.351E+02
	LID, INNER LOWER CORNER					
24	CYL. SHELL	-.576E+01	-.130E+03	-.424E+02	.124E+03	.124E+03
25	BTM FLANGE	.540E+01	-.952E+02	-.513E+02	.101E+03	.101E+03
	LID, UPPER FLANGE (SEAL AREA)					
26	TOP EL.	.240E+01	-.558E+02	.240E+02	.797E+02	.797E+02
27	BTM EL.	.229E+02	-.491E+02	.185E+02	.721E+02	.721E+02

NOTES:
1. Stresses at locations 1 thru 6 and 17 thru 27 are given at the centroid of the element, therefore, the same stress value is used for Pm and Pm+Pb.
2. a = small radius surface, b = large radius surface.

TABLE 2.10.9.16. 10 G'S VERTICAL - NORMAL CONDITION

	LOCATION DESCRIPTION	STRESS (PSI) SIGMA1	SIGMA2	SIGMA3	STRESS INTENSITY Pm	Pm+Pb
	BOTTOM FORGING, CENTER					
1	CAVITY SURFACE	.140E+00	-.480E+00	.530E-07	.620E+00	.620E+00
2	OUTSIDE SURFACE	.171E-01	-.103E-06	.722E+00	.722E+00	.722E+00
	BOTTOM FORGING, MID-SECTION					
3	CAVITY SURFACE	.615E+00	-.163E+03	.202E+03	.365E+03	.365E+03
4	OUTSIDE SURFACE	.184E+03	-.177E+03	.114E+02	.361E+03	.361E+03
	BOTTOM FORGING, CORNER					
5	BOTTOM SURFACE	.671E+01	-.217E+03	-.117E+02	.223E+03	.223E+03
6	OUTER SURFACE	.269E+01	-.265E+03	-.335E+01	.268E+03	.268E+03
	CASK WALL SHELLS					
7a	INNER SHELL	.269E+02	-.312E+03	-.330E+02	.329E+03	.339E+03
7b		.861E+01	-.387E+03	-.186E+02	.329E+03	.395E+03
8a	OUTER SHELL	.318E+02	-.644E+03	-.479E+02	.521E+03	.676E+03
8b		.268E+02	-.460E+03	-.351E+02	.521E+03	.487E+03
9a	INNER SHELL	.801E+02	-.299E+03	-.109E+03	.380E+03	.379E+03
9b		.816E+02	-.300E+03	-.109E+03	.380E+03	.381E+03
10a	OUTER SHELL	.127E+03	-.473E+03	-.173E+03	.600E+03	.600E+03
10b		.127E+03	-.474E+03	-.173E+03	.600E+03	.601E+03
11a	INNER SHELL	.800E+02	-.299E+03	-.109E+03	.380E+03	.379E+03
11b		.816E+02	-.300E+03	-.109E+03	.380E+03	.382E+03
12a	OUTER SHELL	.127E+03	-.473E+03	-.173E+03	.600E+03	.599E+03
12b		.127E+03	-.474E+03	-.174E+03	.600E+03	.601E+03
13a	INNER SHELL	.884E+02	-.330E+03	-.121E+03	.381E+03	.419E+03
13b		.734E+02	-.269E+03	-.979E+02	.381E+03	.343E+03
14a	OUTER SHELL	.135E+03	-.502E+03	-.184E+03	.601E+03	.636E+03
14b		.119E+03	-.446E+03	-.163E+03	.601E+03	.565E+03
15a	INNER SHELL	.180E+03	-.337E+03	-.113E+03	.430E+03	.517E+03
15b		-.399E+02	-.695E+03	-.657E+02	.430E+03	.655E+03
16a	OUTER SHELL	-.402E+01	-.123E+03	.311E+03	.599E+03	.434E+03
16b		.154E+02	-.108E+04	-.947E+02	.599E+03	.110E+04
	TOP FORGING					
17	INNER SURFACE	.718E+02	-.139E+00	.736E+03	.736E+03	.736E+03
18	OUTER SURFACE	.256E+03	-.958E+03	-.351E+03	.121E+04	.121E+04
19	TOP OUTER EL.	.131E+03	-.154E+04	-.635E-04	.167E+04	.167E+04
20	TOP INNER EL.	.135E+03	-.826E+03	-.138E-04	.961E+03	.961E+03
	LID, CENTER					
21	TOP FLANGE, TOP EL.	.331E-05	-.868E+01	.302E+02	.389E+02	.389E+02
22	TOP FLANGE, BTM EL.	-.538E-05	-.726E+02	-.148E+02	.726E+02	.726E+02
23	BOTTOM FLANGE EL.	-.621E-05	-.804E+02	-.174E+02	.804E+02	.804E+02
	LID, INNER LOWER CORNER					
24	CYL. SHELL	-.118E-03	-.897E+03	-.161E+03	.897E+03	.897E+03
25	BTM FLANGE	-.124E-03	-.974E+03	-.113E+03	.974E+03	.974E+03
	LID, UPPER FLANGE (SEAL AREA)					
26	TOP EL.	.125E+02	-.477E-05	.487E+03	.487E+03	.487E+03
27	BTM EL.	.287E-04	-.538E+01	.203E+03	.208E+03	.208E+03

NOTES:
1. Stresses at locations 1 thru 6 and 17 thru 27 are given at the centroid of the element, therefore, the same stress value is used for Pm and Pm+Pb.
2. a = small radius surface,
   b = large radius surface.

TABLE 2.10.9.17. 5 G'S LATERAL - 0 DEGREE MERIDIAN, NORMAL CONDITION

	LOCATION DESCRIPTION	STRESS (PSI) SIGMA1	SIGMA2	SIGMA3	STRESS INTENSITY Pm	Pm+Pb
	BOTTOM FORGING, CENTER					
1	CAVITY SURFACE	.326E-01	-.806E+01	.104E+02	.185E+02	.185E+02
	OUTSIDE SURFACE	.958E+01	-.164E+02	-.201E-01	.260E+02	.260E+02
	BOTTOM FORGING, MID-SECTION					
3	CAVITY SURFACE	.866E+02	-.632E+03	-.857E+00	.719E+03	.719E+03
4	OUTSIDE SURFACE	.585E+02	-.163E+03	-.504E+00	.221E+03	.221E+03
	BOTTOM FORGING, CORNER					
5	BOTTOM SURFACE	.305E+02	-.111E+03	-.403E+02	.142E+03	.142E+03
6	OUTER SURFACE	.130E+02	-.124E+03	.173E+00	.136E+03	.136E+03
	CASK WALL SHELLS					
7a	INNER SHELL	-.153E+03	-.152E+03	-.939E+02	.447E+03	.596E+02
7b		.742E+02	-.789E+02	.100E+04	.447E+03	.108E+04
8a	OUTER SHELL	.393E+02	-.681E+03	-.197E+03	.277E+03	.721E+03
8b		.145E+02	-.418E+02	.219E+03	.277E+03	.260E+03
9a	INNER SHELL	.766E+02	-.197E+02	-.534E+02	.175E+03	.130E+03
9b		-.167E+03	-.286E+03	.115E+03	.175E+03	.401E+03
10a	OUTER SHELL	.218E+02	-.293E+03	-.108E+03	.428E+03	.315E+03
10b		-.301E+01	-.563E+03	-.110E+03	.428E+03	.560E+03
11a	INNER SHELL	-.209E+02	-.258E+02	.289E+01	.217E+03	.287E+02
11b		-.146E+03	-.322E+03	.111E+03	.217E+03	.433E+03
12a	OUTER SHELL	.255E+02	-.329E+03	-.110E+03	.453E+03	.354E+03
12b		-.364E+01	-.573E+03	-.109E+03	.453E+03	.570E+03
13a	INNER SHELL	.116E+03	-.485E+02	.810E+02	.137E+03	.165E+03
13b		-.146E+03	-.147E+03	.731E+02	.137E+03	.220E+03
14a	OUTER SHELL	.201E+02	-.171E+03	-.997E+02	.310E+03	.191E+03
14b		-.273E+01	-.461E+03	-.108E+03	.310E+03	.458E+03
15a	INNER SHELL	-.361E+00	-.478E+03	-.121E+03	.844E+03	.478E+03
15b		.234E+02	-.226E+03	.136E+04	.844E+03	.158E+04
16a	OUTER SHELL	-.293E+01	-.429E+03	-.186E+03	.168E+03	.427E+03
16b		.820E+02	-.508E+02	.277E+03	.168E+03	.328E+03
	TOP FORGING					
17	INNER SURFACE	.322E+01	-.172E+03	-.824E+02	.175E+03	.175E+03
18	OUTER SURFACE	.355E+00	-.124E+03	.224E+03	.348E+03	.348E+03
19	TOP OUTER EL.	.803E+02	-.256E+03	.147E+01	.336E+03	.336E+03
20	TOP INNER EL.	.398E+02	-.122E+03	-.759E+01	.161E+03	.161E+03
	LID, CENTER					
21	TOP FLANGE, TOP EL.	.114E+01	-.626E+01	.617E+00	.740E+01	.740E+01
22	TOP FLANGE, BTM EL.	.367E+01	-.552E+00	.113E+02	.119E+02	.119E+02
23	BOTTOM FLANGE EL.	.934E+00	-.124E+01	.565E+01	.689E+01	.689E+01
	LID, INNER LOWER CORNER					
24	CYL. SHELL	.339E+02	-.924E+02	.343E+01	.126E+03	.126E+03
25	BTM FLANGE	.310E+02	-.769E+03	-.246E+02	.800E+03	.800E+03
	LID, UPPER FLANGE (SEAL AREA)					
26	TOP EL.	.203E+02	-.451E+03	-.129E+02	.472E+03	.472E+03
27	BTM EL.	.374E+02	-.431E+03	-.492E+02	.468E+03	.468E+03

NOTES:

1. Stresses at locations 1 thru 6 and 17 thru 27 are given at the centroid of the element, therefore, the same stress value is used for Pm and Pm+Pb.
2. a = small radius surface,
   b = large radius surface.

TABLE 2.10.9.18. 5 G'S LATERAL - 45 DEGREE MERIDIAN, NORMAL CONDITION

	LOCATION DESCRIPTION	STRESS (PSI) SIGMA1	SIGMA2	SIGMA3	STRESS INTENSITY Pm	Pm+Pb
	BOTTOM FORGING, CENTER					
1	CAVITY SURFACE	.129E+02	-.370E+01	.575E+01	.166E+02	.166E+02
2	OUTSIDE SURFACE	-.731E+01	-.187E+02	.686E+01	.255E+02	.255E+02
	BOTTOM FORGING, MID-SECTION					
3	CAVITY SURFACE	.947E+02	-.230E+03	-.505E+00	.324E+03	.324E+03
4	OUTSIDE SURFACE	-.436E+00	-.490E+02	.925E+02	.141E+03	.141E+03
	BOTTOM FORGING, CORNER					
5	BOTTOM SURFACE	.333E+01	-.358E+00	.116E+02	.119E+02	.119E+02
6	OUTER SURFACE	.235E+02	-.705E+01	.109E+02	.305E+02	.305E+02
	CASK WALL SHELLS					
7a	INNER SHELL	-.129E+01	-.336E+03	.465E+03	.683E+03	.801E+03
7b		-.359E+01	-.725E+02	.517E+03	.683E+03	.590E+03
8a	OUTER SHELL	.284E+03	-.265E+03	-.622E+02	.337E+03	.548E+03
8b		-.625E+02	-.322E+02	.263E+03	.337E+03	.325E+03
9a	INNER SHELL	.406E+01	-.181E+03	.557E+03	.449E+03	.738E+03
9b		-.246E+02	-.104E+03	.753E+02	.449E+03	.179E+03
10a	OUTER SHELL	.167E+02	-.309E+03	-.135E+02	.441E+03	.325E+03
10b		.155E+02	-.553E+03	-.156E+01	.441E+03	.569E+03
11a	INNER SHELL	.511E+01	-.194E+03	.661E+03	.526E+03	.855E+03
11b		-.304E+02	-.107E+03	.998E+02	.526E+03	.207E+03
12a	OUTER SHELL	.150E+02	-.282E+03	-.760E+02	.454E+03	.297E+03
12b		.135E+02	-.601E+03	-.301E+02	.454E+03	.615E+03
13a	INNER SHELL	.248E+01	-.195E+03	.558E+03	.526E+03	.753E+03
13b		-.149E+02	-.177E+03	.152E+03	.526E+03	.329E+03
14a	OUTER-SHELL	.110E+03	-.377E+03	.124E+02	.541E+03	.487E+03
14b		.609E+02	-.553E+03	.124E+02	.541E+03	.614E+03
15a	INNER SHELL	-.772E+02	-.260E+03	.461E+03	.713E+03	.721E+03
15b		.278E+02	-.730E+02	.666E+03	.713E+03	.739E+03
16a	OUTER SHELL	.382E+01	-.291E+03	.275E+03	.440E+03	.565E+03
16b		.112E+02	-.424E+02	.280E+03	.440E+03	.322E+03
	TOP FORGING					
17	INNER SURFACE	-.111E+02	-.465E+02	.117E+03	.163E+03	.163E+03
18	OUTER SURFACE	.719E+02	.101E+02	.558E+02	.618E+02	.618E+02
19	TOP OUTER EL.	-.913E+02	-.126E+03	.431E+02	.169E+03	.169E+03
20	TOP INNER EL.	-.545E+02	-.840E+02	.178E+02	.102E+03	.102E+03
	LID, CENTER					
21	TOP FLANGE, TOP EL.	.250E+01	-.391E+01	.143E-01	.642E+01	.642E+01
22	TOP FLANGE, BTM EL.	.272E+01	.610E-01	.624E+01	.618E+01	.618E+01
23	BOTTOM FLANGE EL.	.408E+01	.127E+00	.852E+01	.839E+01	.839E+01
	LID INNER LOWER CORNER					
24	CYL. SHELL	-.129E+02	-.541E+02	.683E+02	.122E+03	.122E+03
25	BTM FLANGE	.636E+00	-.142E+03	-.624E+02	.143E+03	.143E+03
	LID, UPPER FLANGE (SEAL AREA)					
26	TOP EL.	-.384E+01	-.144E+03	-.250E+02	.140E+03	.140E+03
27	BTM EL.	-.883E+01	-.149E+03	-.279E+02	.140E+03	.140E+03

NOTES:
1. Stresses at locations 1 thru 6 and 17 thru 27 are given at the centroid of the element, therefore, the same stress value is used for Pm and Pm+Pb.
2. a = small radius surface,
   b = large radius surface.

TABLE 2.10.9.19. 5 G'S LATERAL - 90 DEGREE MERIDIAN, NORMAL CONDITION

		STRESS (PSI)			STRESS INTENSITY	
	LOCATION DESCRIPTION	SIGMA1	SIGMA2	SIGMA3	Pm	Pm+Pb
	BOTTOM FORGING, CENTER					
1	CAVITY SURFACE	.123E+02	-.779E+01	.365E+01	.201E+02	.201E+02
2	OUTSIDE SURFACE	-.587E+01	-.152E+02	.115E+02	.267E+02	.267E+02
	BOTTOM FORGING, MID-SECTION					
3	CAVITY SURFACE	.820E-03	-.480E+02	.144E+03	.192E+03	.192E+03
4	OUTSIDE SURFACE	.330E+01	.171E+02	.763E+02	.934E+02	.934E+02
	BOTTOM FORGING, CORNER					
5	BOTTOM SURFACE	.119E+00	-.129E+02	.138E+03	.151E+03	.151E+03
6	OUTER SURFACE	-.481E+00	.132E+02	.135E+03	.148E+03	.148E+03
	CASK WALL SHELLS					
7a	INNER SHELL	.392E+02	-.135E+03	.134E+03	.402E+03	.269E+03
7b		.205E+03	_.369E+03	-.643E+02	.402E+03	.575E+03
8a	OUTER SHELL	.188E+02	-.139E+02	.305E+03	.278E+03	.319E+03
8b		-.107E+02	-.118E+03	.184E+03	.278E+03	.302E+03
9a	INNER SHELL	.559E+02	-.435E+03	-.726E+01	.429E+03	.491E+03
9b		.163E+03	-.209E+03	-.236E+02	.429E+03	.371E+03
10a	OUTER SHELL	-.208E+02	-.139E+03	.172E+03	.288E+03	.311E+03
10b		-.137E+02	-.122E+02	.254E+03	.288E+03	.268E+03
11a	INNER SHELL	.649E+02	-.440E+03	-.807E+01	.430E+03	.505E+03
11b		.174E+03	-.184E+03	-.278E+02	.430E+03	.358E+03
12a	OUTER SHELL	-.280E+02	-.109E+03	.160E+03	.242E+03	.270E+03
12b		.120E+02	.786E+01	.240E+03	.242E+03	.233E+03
13a	INNER SHELL	.537E+02	-.454E+03	-.684E+01	.467E+03	.507E+03
13b		.166E+03	-.266E+03	-.213E+02	.467E+03	.432E+03
14a	OUTER SHELL	-.202E+02	-.190E+03	.188E+03	.368E+03	.378E+03
14b		-.137E+02	-.865E+02	.273E+03	.368E+03	.359E+03
15a	INNER SHELL	.211E+03	-.205E+03	.586E+02	.522E+03	.416E+03
15b		.239E+03	-.432E+03	-.180E+02	.522E+03	.671E+03
16a	OUTER SHELL	.550E+01	-.140E+02	.277E+03	.328E+03	.291E+03
16b		-.210E+02	-.140E+03	.255E+03	.328E+03	.394E+03
	TOP FORGING					
17	INNER SURFACE	-.617E+01	-.117E+02	.403E+02	.520E+02	.520E+02
18	OUTER SURFACE	-.123E+01	-.125E+02	.164E+03	.176E+03	.176E+03
19	TOP OUTER EL.	-.236E+01	-.150E+02	.111E+02	.261E+02	.261E+02
20	TOP INNER EL.	.361E+01	-.205E+02	.331E-01	.241E+02	.241E+02
	LID, CENTER					
21	TOP FLANGE, TOP EL.	.168E+01	-.294E+01	.380E+00	.462E+01	.462E+01
22	TOP FLANGE, BTM EL.	.827E+00	-.363E+00	.542E+01	.578E+01	.578E+01
23	BOTTOM FLANGE EL.	.122E+01	-.665E+00	.639E+01	.705E+01	.705E+01
	LID, INNER LOWER CORNER					
24	CYL. SHELL	.765E+01	-.145E+02	.298E+00	.222E+02	.222E+02
25	BTM FLANGE	.551E+01	-.709E+02	.121E+03	.192E+03	.192E+03
	LID, UPPER FLANGE (SEAL AREA)					
26	TOP EL.	-.266E+00	-.539E+02	-.109E+02	.536E+02	.536E+02
27	BTM EL.	-.259E+01	-.421E+02	-.218E+02	.395E+02	.395E+02

NOTES:
1. Stresses at locations 1 thru 6 and 17 thru 27 are given at the centroid of the element, therefore, the same stress value is used for Pm and Pm+Pb.
2. a = small radius surface,
   b = large radius surface.

TABLE 2.10.9.20. 5 G'S LATERAL - 135 DEGREE MERIDIAN, NORMAL CONDITION

	LOCATION DESCRIPTION	STRESS (PSI) SIGMA1	SIGMA2	SIGMA3	STRESS INTENSITY Pm	Pm+Pb
	BOTTOM FORGING, CENTER					
1	CAVITY SURFACE	-.709E+01	-.887E+01	.395E+01	.128E+02	.128E+02
2	OUTSIDE SURFACE	.132E+02	-.786E+01	.847E+01	.211E+02	.211E+02
	BOTTOM FORGING, MID-SECTION					
3	CAVITY SURFACE	.192E+00	-.697E+02	.204E+03	.274E+03	.274E+03
4	OUTSIDE SURFACE	.145E+01	-.109E+02	.111E+03	.122E+03	.122E+03
	BOTTOM FORGING, CORNER					
5	BOTTOM SURFACE	.184E+02	-.427E+00	.104E+03	.105E+03	.105E+03
6	OUTER SURFACE	.152E+02	-.552E+01	.890E+02	.945E+02	.945E+02
	CASK WALL SHELLS					
7a	INNER SHELL	.102E+03	-.774E+02	.493E+02	.152E+03	.179E+03
7b		.376E+02	-.160E+03	-.426E+02	.152E+03	.198E+03
8a	OUTER SHELL	.122E+03	-.255E+02	.966E+02	.158E+03	.147E+03
8b		-.235E+02	-.839E+02	.102E+03	.158E+03	.186E+03
9a	INNER SHELL	.870E+02	-.301E+03	.560E+01	.337E+03	.388E+03
9b		.120E+03	-.168E+03	.955E+01	.337E+03	.287E+03
10a	OUTER SHELL	.406E+02	.130E+02	.101E+03	.118E+03	.880E+02
10b		.749E+02	.130E+02	.165E+03	.118E+03	.152E+03
11a	INNER SHELL	.115E+03	-.391E+03	.576E+01	.423E+03	.506E+03
11b		.142E+03	-.199E+03	.103E+02	.423E+03	.341E+03
12a	OUTER SHELL	.115E+03	.131E+02	.587E+02	.122E+03	.102E+03
12b		.161E+03	.131E+02	.139E+03	.122E+03	.148E+03
13a	INNER SHELL	.318E+02	-.256E+03	.538E+01	.269E+03	.288E+03
13b		.898E+02	-.164E+03	.900E+01	.269E+03	.254E+03
14a	OUTER SHELL	.134E+02	.481E+01	.853E+02	.113E+03	.805E+02
14b		.216E+02	.104E+02	.165E+03	.113E+03	.154E+03
15a	INNER SHELL	.187E+03	-.592E+02	.295E+02	.225E+03	.246E+03
15b		-.357E+02	-.265E+03	.130E+03	.225E+03	.394E+03
16a	OUTER SHELL	.930E+02	-.214E+02	.104E+03	.187E+03	.126E+03
16b		.515E+02	-.125E+03	.540E+02	.187E+03	.179E+03
	TOP FORGING					
17	INNER SURFACE	.623E+02	.231E+02	.444E+02	.391E+02	.391E+02
18	OUTER SURFACE	.102E+03	-.888E+02	.151E+02	.191E+03	.191E+03
19	TOP OUTER EL.	.124E+02	-.469E+02	.119E+03	.165E+03	.165E+03
20	TOP INNER EL.	.632E+02	-.209E+02	.377E+02	.841E+02	.841E+02
	LID, CENTER					
21	TOP FLANGE, TOP EL.	.955E+00	-.337E+01	-.866E+00	.432E+01	.432E+01
22	TOP FLANGE, BTM EL.	.529E+01	-.536E+00	.364E+01	.583E+01	.583E+01
23	BOTTOM FLANGE EL.	.580E+00	-.316E+01	-.441E+00	.374E+01	.374E+01
	LID, INNER LOWER CORNER					
24	CYL. SHELL	-.156E+01	-.145E+02	.237E+02	.382E+02	.382E+02
25	BTM FLANGE	.273E+01	-.301E+02	.178E+03	.208E+03	.208E+03
	LID, UPPER FLANGE (SEAL AREA)					
26	TOP EL.	.567E+01	-.358E+02	.120E+03	.155E+03	.155E+03
27	BTM EL.	.224E+02	-.419E+02	.120E+03	.162E+03	.162E+03

NOTES:
1. Stresses at locations 1 thru 6 and 17 thru 27 are given at the centroid of the element, therefore, the same stress value is used for Pm and Pm+Pb.
2. a = small radius surface,
   b = large radius surface.

TABLE 2.10.9.21. 5 G'S LATERAL - 180 DEGREE MERIDIAN, NORMAL CONDITION

LOCATION	DESCRIPTION	STRESS (PSI) SIGMA1	SIGMA2	SIGMA3	STRESS INTENSITY Pm	Pm+Pb
	BOTTOM FORGING, CENTER					
1	CAVITY SURFACE	.531E+01	-.202E+02	-.236E+00	.255E+02	.255E+02
2	OUTSIDE SURFACE	.651E-01	-.732E+01	.256E+02	.329E+02	.329E+02
	BOTTOM FORGING, MID-SECTION					
3	CAVITY SURFACE	.196E+00	-.274E+02	.173E+03	.200E+03	.200E+03
4	OUTSIDE SURFACE	.183E+00	.578E+02	.132E+03	.190E+03	.190E+03
	BOTTOM FORGING CORNER					
5	BOTTOM SURFACE	.588E+01	-.106E+02	-.277E+00	.165E+02	.165E+02
6	OUTER SURFACE	.390E+00	-.114E+02	-.130E+01	.118E+02	.118E+02
	CASK WALL SHELLS					
7a	INNER SHELL	.658E+02	-.265E+02	.618E+02	.995E+02	.922E+02
7b		.534E+02	-.272E+02	.867E+02	.995E+02	.114E+03
8a	OUTER SHELL	-.321E+02	-.561E+02	.285E+02	.319E+02	.846E+02
8b		.267E+02	-.270E+02	-.148E+02	.319E+02	.537E+02
9a	INNER SHELL	-.134E+02	-.682E+01	.159E+03	.122E+03	.172E+03
9b		.104E+03	-.328E+02	.880E+00	.122E+03	.137E+03
10a	OUTER SHELL	.402E+02	-.232E+02	.187E+02	.308E+02	.634E+02
10b		-.633E+01	-.146E+02	-.737E+01	.308E+02	.824E+01
11a	INNER SHELL	-.709E+01	-.715E+01	.159E+03	.121E+03	.167E+03
11b		.917E+02	-.372E+02	.921E+01	.121E+03	.129E+03
12a	OUTER SHELL	.523E+02	-.259E+02	.233E+02	.376E+02	.782E+02
12b		-.817E+01	-.137E+02	-.707E+01	.376E+02	.661E+01
13a	INNER SHELL	-.960E+01	-.655E+01	.118E+03	.963E+02	.127E+03
13b		.822E+02	-.294E+02	.625E+01	.963E+02	.112E+03
14a	OUTER SHELL	.175E+02	-.199E+02	.749E+01	.225E+02	.374E+02
14b		-.939E+01	-.203E+02	-.609E+01	.225E+02	.142E+02
15a	INNER SHELL	.105E+02	.225E+01	.135E+03	.851E+02	.133E+03
15b		.586E+01	-.388E+02	.115E+03	.851E+02	.153E+03
16a	OUTER SHELL	-.901E+01	-.166E+02	.628E+01	.460E+02	.229E+02
16b		.686E+01	-.741E+02	-.179E+02	.460E+02	.810E+02
	TOP FORGING					
17	INNER SURFACE	.144E+02	-.133E+00	.645E+02	.646E+02	.646E+02
18	OUTER SURFACE	.493E+00	-.897E+02	-.110E+02	.902E+02	.902E+02
19	TOP OUTER EL.	-.618E-01	-.628E+02	.138E+03	.201E+03	.201E+03
20	TOP INNER EL.	.322E+00	-.223E+02	.811E+02	.103E+03	.103E+03
	LID, CENTER					
21	TOP FLANGE, TOP EL.	.973E+00	-.436E+01	.274E-02	.533E+01	.533E+01
22	TOP FLANGE, BTM EL.	-.192E-01	-.149E+01	.847E+01	.996E+01	.996E+01
23	BOTTOM FLANGE EL.	.133E+01	-.655E+01	-.984E-01	.788E+01	.788E+01
	LID, INNER LOWER CORNER					
24	CYL. SHELL	.187E+02	-.202E+02	-.411E-01	.390E+02	.390E+02
25	BTM FLANGE	-.156E+01	-.339E+01	.868E+02	.902E+02	.902E+02
	LID, UPPER FLANGE (SEAL AREA)					
26	TOP EL.	.696E+01	-.107E-01	.970E+02	.970E+02	.970E+02
27	BTM EL.	.287E+02	-.152E+01	.972E+02	.987E+02	.987E+02

NOTES:
1. Stresses at locations 1 thru 6 and 17 thru 27 are given at the centroid of the element, therefore, the same stress value is used for Pm and Pm+Pb.
2. a = small radius surface,
   b = large radius surface.

TABLE 2.10.9.22. SHOCK AND VIBRATION - STRESS INTENSITY - PM

		STRESS INTENSITY			
	LOCATION DESCRIPTION	LAT	LONG	VERT	SRSS
	BOTTOM FORGING, CENTER				
1	CAVITY SURFACE	.185E+02	.201E+02	.620E+00	.273E+02
2	OUTSIDE SURFACE	.260E+02	.267E+02	.722E+00	.373E+02
	BOTTOM FORGING, MID-SECTION				
3	CAVITY SURFACE	.719E+03	.192E+03	.365E+03	.829E+03
4	OUTSIDE SURFACE	.221E+03	.934E+02	.361E+03	.434E+03
	BOTTOM FORGING, CORNER				
5	BOTTOM SURFACE	.142E+03	.151E+03	.223E+03	.304E+03
6	OUTER SURFACE	.136E+03	.148E+03	.268E+03	.335E+03
	CASK WALL SHELLS				
7a	INNER SHELL	.447E+03	.402E+03	.329E+03	.685E+03
7b		.447E+03	.402E+03	.329E+03	.685E+03
8a	OUTER SHELL	.277E+03	.278E+03	.521E+03	.653E+03
8b		.277E+03	.278E+03	.521E+03	.653E+03
9a	INNER SHELL	.175E+03	.429E+03	.380E+03	.599E+03
9b		.175E+03	.429E+03	.380E+03	.599E+03
10a	OUTER SHELL	.428E+03	.288E+03	.600E+03	.792E+03
10b		.428E+03	.288E+03	.600E+03	.792E+03
11a	INNER SHELL	.217E+03	.430E+03	.380E+03	.614E+03
11b		.217E+03	.430E+03	.380E+03	.614E+03
12a	OUTER SHELL	.453E+03	.242E+03	.600E+03	.790E+03
12b		.453E+03	.242E+03	.600E+03	.790E+03
13a	INNER SHELL	.137E+03	.467E+03	.381E+03	.618E+03
13b		.137E+03	.467E+03	.381E+03	.618E+03
14a	OUTER SHELL	.310E+03	.368E+03	.601E+03	.770E+03
14b		.310E+03	.368E+03	.601E+03	.770E+03
15a	INNER SHELL	.844E+03	.522E+03	.430E+03	.108E+04
15b		.844E+03	.522E+03	.430E+03	.108E+04
16a	OUTER SHELL	.168E+03	.328E+03	.599E+03	.703E+03
16b		.168E+03	.328E+03	.599E+03	.703E+03
	TOP FORGING				
17	INNER SURFACE	.175E+03	.520E+02	.736E+03	.758E+03
18	OUTER SURFACE	.348E+03	.176E+03	.121E+04	.128E+04
19	TOP OUTER EL.	.336E+03	.261E+02	.167E+04	.170E+04
20	TOP INNER EL.	.161E+03	.241E+02	.961E+03	.974E+03
	LID, CENTER				
21	TOP FLANGE, TOP EL.	.740E+01	.462E+01	.389E+02	.398E+02
22	TOP FLANGE, BTM EL.	.119E+02	.578E+01	.726E+02	.738E+02
23	BOTTOM FLANGE EL.	.689E+01	.705E+01	.804E+02	.810E+02
	LID, INNER LOWER CORNER				
24	CYL. SHELL	.126E+03	.222E+02	.897E+03	.907E+03
25	BTM FLANGE	.800E+03	.192E+03	.974E+03	.127E+04
	LID, UPPER FLANGE (SEAL AREA)				
26	TOP EL.	.472E+03	.536E+02	.487E+03	.680E+03
27	BTM EL.	.468E+03	.395E+02	.208E+03	.514E+03

a = SMALL RADIUS SURFACE
b = LARGE RADIUS SURFACE

TABLE 2.10.9.23. SHOCK AND VIBRATION - STRESS INTENSITY - PM+PB

		STRESS INTENSITY			
	LOCATION DESCRIPTION	LAT	LONG	VERT	SRSS
	BOTTOM FORGING, CENTER				
1	CAVITY SURFACE	.185E+02	.201E+02	.620E+00	.273E+02
2	OUTSIDE SURFACE	.260E+02	.267E+02	.722E+00	.373E+02
	BOTTOM FORGING, MID-SECTION				
3	CAVITY SURFACE	.719E+03	.192E+03	.365E+03	.829E+03
4	OUTSIDE SURFACE	.221E+03	.934E+02	.361E+03	.434E+03
	BOTTOM FORGING, CORNER				
5	BOTTOM SURFACE	.142E+03	.151E+03	.223E+03	.304E+03
6	OUTER SURFACE	.136E+03	.148E+03	.268E+03	.335E+03
	CASK WALL SHELLS				
7a	INNER SHELL	.596E+02	.269E+03	.339E+03	.437E+03
7b		.108E+04	.575E+03	.395E+03	.129E+04
8a	OUTER SHELL	.721E+03	.319E+03	.676E+03	.104E+04
8b		.260E+03	.302E+03	.487E+03	.629E+03
9a	INNER SHELL	.130E+03	.491E+03	.379E+03	.634E+03
9b		.401E+03	.371E+03	.381E+03	.666E+03
10a	OUTER SHELL	.315E+03	.311E+03	.600E+03	.746E+03
10b		.560E+03	.268E+03	.601E+03	.864E+03
11a	INNER SHELL	.287E+02	.505E+03	.379E+03	.632E+03
11b		.433E+03	.358E+03	.382E+03	.679E+03
12a	OUTER SHELL	.354E+03	.270E+03	.599E+03	.747E+03
12b		.570E+03	.233E+03	.601E+03	.860E+03
13a	INNER SHELL	.165E+03	.507E+03	.419E+03	.678E+03
13b		.220E+03	.432E+03	.343E+03	.594E+03
14a	OUTER SHELL	.191E+03	.378E+03	.636E+03	.764E+03
14b		.458E+03	.359E+03	.565E+03	.811E+03
15a	INNER SHELL	.478E+03	.416E+03	.517E+03	.818E+03
15b		.158E+04	.671E+03	.655E+03	.184E+04
16a	OUTER SHELL	.427E+03	.291E+03	.434E+03	.674E+03
16b		.328E+03	.394E+03	.110E+04	.121E+04
	TOP FORGING				
17	INNER SURFACE	.175E+03	.520E+02	.736E+03	.758E+03
18	OUTER SURFACE	.348E+03	.176E+03	.121E+04	.128E+04
19	TOP OUTER EL.	.336E+03	.261E+02	.167E+04	.170E+04
20	TOP INNER EL.	.161E+03	.241E+02	.961E+03	.974E+03
	LID, CENTER				
21	TOP FLANGE, TOP EL.	.740E+01	.462E+01	.389E+02	.398E+02
22	TOP FLANGE, BTM EL.	.119E+02	.578E+01	.726E+02	.738E+02
23	BOTTOM FLANGE EL.	.689E+01	.705E+01	.804E+02	.810E+02
	LID, INNER LOWER CORNER				
24	CYL. SHELL	.126E+03	.222E+02	.897E+03	.907E+03
25	BTM FLANGE	.800E+03	.192E+03	.974E+03	.127E+04
	LID, UPPER FLANGE (SEAL AREA)				
26	TOP EL.	.472E+03	.536E+02	.487E+03	.680E+03
27	BTM EL.	.468E+03	.395E+02	.208E+03	.514E+03

a = SMALL RADIUS SURFACE
b = LARGE RADIUS SURFACE

TABLE 2.10.9.24. 1 FOOT DROP - TOP, NORMAL CONDITION

	LOCATION DESCRIPTION	STRESS (PSI) SIGMA1	SIGMA2	SIGMA3	STRESS INTENSITY Pm	Pm+Pb
	BOTTOM FORGING, CENTER					
1	CAVITY SURFACE	.263E+00	-.901E+00	.916E-07	.116E+01	.116E+01
2	OUTSIDE SURFACE	.149E-01	-.177E-06	.135E+01	.135E+01	.135E+01
	BOTTOM FORGING, MID-SECTION					
3	CAVITY SURFACE	.116E+01	-.311E+03	.385E+03	.697E+03	.697E+03
4	OUTSIDE SURFACE	.352E+03	-.338E+03	.214E+02	.690E+03	.690E+03
	BOTTOM FORGING, CORNER					
5	BOTTOM SURFACE	.129E+02	-.408E+03	-.222E+02	.420E+03	.420E+03
6	OUTER SURFACE	.515E+01	-.499E+03	-.640E+01	.504E+03	.504E+03
	CASK WALL SHELLS					
7a	INNER SHELL	.512E+02	-.593E+03	-.629E+02	.625E+03	.644E+03
7b		.163E+02	-.735E+03	-.353E+02	.625E+03	.751E+03
8a	OUTER SHELL	.604E+02	-.121E+04	-.907E+02	.979E+03	.127E+04
8b		.505E+02	-.866E+03	-.660E+02	.979E+03	.916E+03
9a	INNER SHELL	.152E+03	-.568E+03	-.208E+03	.723E+03	.720E+03
9b		.155E+03	-.570E+03	-.207E+03	.723E+03	.725E+03
10a	OUTER SHELL	.238E+03	-.889E+03	-.325E+03	.113E+04	.113E+04
10b		.239E+03	-.890E+03	-.326E+03	.113E+04	.113E+04
11a	INNER SHELL	.152E+03	-.567E+03	-.208E+03	.723E+03	.719E+03
11b		.155E+03	-.571E+03	-.208E+03	.723E+03	.726E+03
12a	OUTER SHELL	.238E+03	-.888E+03	-.325E+03	.113E+04	.113E+04
12b		.239E+03	-.891E+03	-.326E+03	.113E+04	.113E+04
13a	INNER SHELL	.167E+03	-.626E+03	-.229E+03	.723E+03	.793E+03
13b		.140E+03	-.514E+03	-.187E+03	.723E+03	.654E+03
14a	OUTER SHELL	.252E+03	-.942E+03	-.345E+03	.113E+04	.119E+04
14b		.225E+03	-.839E+03	-.307E+03	.113E+04	.106E+04
15a	INNER SHELL	.369E+03	-.622E+03	-.223E+03	.818E+03	.991E+03
15b		-.825E+02	-.130E+04	-.136E+03	.818E+03	.122E+04
16a	OUTER SHELL	-.750E+01	-.237E+03	.586E+03	.113E+04	.822E+03
16b		.289E+02	-.203E+04	-.178E+03	.113E+04	.206E+04
	TOP FORGING					
17	INNER SURFACE	.126E+03	-.290E+00	.135E+04	.135E+04	.135E+04
18	OUTER SURFACE	.476E+03	-.179E+04	-.655E+03	.226E+04	.226E+04
19	TOP OUTER EL.	.243E+03	-.286E+04	-.151E-03	.310E+04	.310E+04
20	TOP INNER EL.	.250E+03	-.154E+04	-.416E-04	.179E+04	.179E+04
	LID, CENTER					
21	TOP FLANGE, TOP EL.	-.194E-04	-.163E+02	.582E+02	.745E+02	.745E+02
22	TOP FLANGE, BTM EL.	.448E-04	-.136E+03	-.279E+02	.136E+03	.136E+03
23	BOTTOM FLANGE EL.	.771E-01	-.148E+03	-.350E+02	.148E+03	.148E+03
	LID, INNER LOWER CORNER					
24	CYL. SHELL	.494E+03	-.180E+04	-.540E+03	.229E+04	.229E+04
25	BTM FLANGE	.456E+04	-.622E+04	-.324E+03	.108E+05	.108E+05
	LID, UPPER FLANGE (SEAL AREA)					
26	TOP EL.	.243E+02	-.188E+02	.933E+03	.951E+03	.951E+03
27	BTM EL.	.592E+02	-.946E+02	.404E+03	.499E+03	.499E+03

NOTES:
1. Stresses at locations 1 thru 6 and 17 thru 27 are given at the centroid of the element, therefore, the same stress value is used for Pm, and Pm+Pb.
2. a = small radius surface, b = large radius surface.

TABLE 2.10.9.24A. 1 FOOT DROP - TOP, NORMAL CONDITION

LOCATION	DESCRIPTION	STRESS (PSI) SIGMA1	SIGMA2	SIGMA3	STRESS INTENSITY Pm	Pm+Pb
	BOTTOM FORGING, CENTER					
1	CAVITY SURFACE	.517E+03	.572E+01	.520E+03	.515E+03	.515E+03
2	OUTSIDE SURFACE	-.572E+01	-.502E+03	-.505E+03	.500E+03	.500E+03
	BOTTOM FORGING, MID-SECTION					
3	CAVITY SURFACE	.364E+03	.390E+01	.425E+03	.421E+03	.421E+03
4	OUTSIDE SURFACE	-.176E+01	-.343E+03	-.407E+03	.405E+03	.405E+03
	BOTTOM FORGING, CORNER					
5	BOTTOM SURFACE	.986E+01	-.966E+01	-.117E+03	.126E+03	.126E+03
6	OUTER SURFACE	.590E+00	-.313E+02	-.673E+02	.679E+02	.679E+02
	CASK WALL SHELLS					
7a	INNER SHELL	-.166E+03	-.116E+04	-.162E+03	.116E+04	.100E+04
7b		.132E+03	-.119E+04	-.618E+02	.116E+04	.132E+04
8a	OUTER SHELL	.130E+03	-.519E+03	.567E+02	.494E+03	.649E+03
8b		-.113E+03	-.303E+03	.109E+03	.494E+03	.412E+03
9a	INNER SHELL	-.598E+01	-.144E+04	-.117E+03	.144E+04	.143E+04
9b		-.386E+01	-.146E+04	-.898E+02	.144E+04	.146E+04
10a	OUTER SHELL	-.139E+02	-.603E+03	.563E+03	.122E+04	.117E+04
10b		-.197E+02	-.629E+03	.645E+03	.122E+04	.127E+04
11a	INNER SHELL	-.400E+02	-.171E+04	-.176E+04	.198E+04	.172E+04
11b		-.109E+03	-.174E+04	-.235E+04	.198E+04	.224E+04
12a	OUTER SHELL	-.585E+02	-.881E+03	.318E+04	.446E+04	.406E+04
12b		-.128E+03	-.910E+03	.396E+04	.446E+04	.487E+04
13a	INNER SHELL	-.173E+03	-.200E+04	-.568E+04	.579E+04	.551E+04
13b		-.248E+03	-.203E+04	-.632E+04	.579E+04	.607E+04
14a	OUTER SHELL	-.196E+03	-.117E+04	.889E+04	.105E+05	.101E+05
14b		-.239E+03	-.121E+04	.981E+04	.105E+05	.110E+05
15a	INNER SHELL	-.613E+03	-.231E+04	-.794E+04	.626E+04	.733E+04
15b		.124E+04	-.303E+04	-.396E+04	.626E+04	.520E+04
16a	OUTER SHELL	-.867E+03	-.269E+04	.178E+04	.688E+04	.447E+04
16b		.641E+04	-.553E+04	-.108E+04	.688E+04	.119E+05
	TOP FORGING					
17	INNER SURFACE	.606E+04	.583E+03	.361E+04	.548E+04	.548E+04
18	OUTER SURFACE	.424E+02	-.550E+04	-.229E+03	.554E+04	.554E+04
19	TOP OUTER EL.	-.290E+01	-.480E+04	.211E+04	.692E+04	.692E+04
20	TOP INNER EL.	.260E+02	-.924E+04	.900E+03	.101E+05	.101E+05
	LID, CENTER					
21	TOP FLANGE, TOP EL.	.970E+04	-.912E+02	.980E+04	.990E+04	.990E+04
22	TOP FLANGE, BTM EL.	.167E+04	-.888E+03	.429E+03	.256E+04	.256E+04
23	BOTTOM FLANGE EL.	-.131E+03	-.241E+04	-.199E+04	.228E+04	.228E+04
	LID, INNER LOWER CORNER					
24	CYL. SHELL	.148E+03	-.504E+04	-.149E+04	.519E+04	.519E+04
25	BTM FLANGE	.980E+03	-.478E+04	-.237E+04	.577E+04	.577E+04
	LID, UPPER FLANGE (SEAL AREA)					
26	TOP EL.	.121E+04	-.149E+03	.397E+04	.412E+04	.412E+04
27	BTM EL.	.118E+04	-.958E+03	.266E+04	.362E+04	.362E+04

NOTES:
1. Stresses at locations 1 thru 6 and 17 thru 27 are given at the centroid of the element, therefore, the same stress value is used for Pm and Pm+Pb.
2. a = small radius surface,
   b = large radius surface.

TABLE 2.10.9.25. 1 FOOT DROP - SIDE - 0 DEGREE MERIDIAN, NORMAL CONDITION

		STRESS (PSI)			STRESS INTENSITY	
	LOCATION DESCRIPTION	SIGMA1	SIGMA2	SIGMA3	Pm	Pm+Pb
	BOTTOM FORGING, CENTER					
1	CAVITY SURFACE	.399E+02	-.420E+02	.156E+00	.819E+02	.819E+02
2	OUTSIDE SURFACE	.447E+02	-.591E+02	-.143E+00	.104E+03	.104E+03
	BOTTOM FORGING, MID-SECTION					
3	CAVITY SURFACE	.361E+03	-.256E+04	-.337E+01	.292E+04	.292E+04
4	OUTSIDE SURFACE	.209E+03	-.500E+03	-.191E+01	.709E+03	.709E+03
	BOTTOM FORGING, CORNER					
5	BOTTOM SURFACE	.266E+02	-.285E+03	.886E+01	.312E+03	.312E+03
6	OUTER SURFACE	.442E+00	-.474E+03	-.207E+02	.474E+03	.474E+03
	CASK WALL SHELLS					
7a	INNER SHELL	-.619E+03	-.667E+03	-.399E+03	.196E+04	.267E+03
7b		.312E+03	-.257E+03	.453E+04	.196E+04	.478E+04
8a	OUTER SHELL	.152E+03	-.325E+04	-.733E+03	.131E+04	.340E+04
8b		.562E+02	-.593E+02	.835E+03	.131E+04	.894E+03
9a	INNER SHELL	.210E+03	.437E+02	-.585E+02	.789E+03	.268E+03
9b		-.642E+03	-.128E+04	.525E+03	.789E+03	.181E+04
10a	OUTER SHELL	.134E+03	-.133E+04	-.431E+03	.197E+04	.146E+04
10b		-.188E+02	-.256E+04	-.406E+03	.197E+04	.254E+04
11a	INNER SHELL	-.797E+02	.372E+02	.388E+02	.976E+03	.119E+03
11b		-.589E+03	-.144E+04	.562E+03	.976E+03	.200E+04
12a	OUTER SHELL	.157E+03	-.149E+04	-.445E+03	.209E+03	.165E+04
12b		-.225E+02	-.261E+04	-.403E+03	.209E+04	.259E+04
13a	INNER SHELL	.543E+03	-.123E+03	.366E+03	.583E+03	.666E+03
13b		-.676E+03	-.601E+03	.379E+03	.583E+03	.105E+04
14a	OUTER SHELL	.122E+03	-.829E+03	-.413E+03	.150E+04	.951E+03
14b		-.168E+02	-.215E+04	-.403E+03	.150E+04	.213E+04
15a	INNER SHELL	.356E+01	-.190E+04	-.522E+03	.357E+04	.190E+04
15b		.104E+03	-.819E+03	.586E+04	.357E+04	.668E+04
16a	OUTER SHELL	.754E+01	-.203E+04	-.760E+03	.679E+03	.203E+04
16b		.236E+03	-.788E+02	.985E+03	.679E+03	.106E+04
	TOP FORGING					
17	INNER SURFACE	.441E+01	-.557E+03	-.180E+03	.562E+03	.562E+03
18	OUTER SURFACE	.465E+03	-.470E+03	.133E+01	.934E+03	.934E+03
19	TOP OUTER EL.	.127E+02	-.232E+03	.208E+01	.244E+03	.244E+03
20	TOP INNER EL.	.352E+02	-.638E+02	-.202E+01	.990E+02	.990E+02
	LID, CENTER					
21	TOP FLANGE, TOP EL.	.640E+01	-.218E+02	.243E+01	.282E+02	.282E+02
22	TOP FLANGE, BTM EL.	.125E+02	-.305E+01	.479E+02	.510E+02	.510E+02
23	BOTTOM FLANGE EL.	.163E+02	-.108E+02	.433E+01	.271E+02	.271E+02
	LID, INNER LOWER CORNER					
24	CYL. SHELL	.169E+03	-.364E+03	.946E+01	.532E+03	.532E+03
25	BTM FLANGE	.114E+03	-.318E+04	-.107E+03	.329E+04	.329E+04
	LID, UPPER FLANGE (SEAL AREA)					
26	TOP EL.	.572E+02	-.118E+04	-.204E+02	.123E+04	.123E+04
27	BTM EL.	.146E+03	-.120E+04	-.813E+02	.134E+04	.134E+04

NOTES:

1. Stresses at locations 1 thru 6 and 17 thru 27 are given at the centroid of the element, therefore, the same stress value is used for Pm and Pm+Pb.
2. a = small radius surface,
   b = large radius surface.

TABLE 2.10.9.25A. 1 FOOT DROP - SIDE - 0 DEGREE MERIDIAN, NORMAL CONDITION

	LOCATION DESCRIPTION	STRESS (PSI) SIGMA1	SIGMA2	SIGMA3	STRESS INTENSITY Pm	Pm+Pb
	BOTTOM FORGING, CENTER					
1	CAVITY SURFACE	.148E+03	-.156E+03	.578E+00	.304E+03	.304E+03
2	OUTSIDE SURFACE	.166E+03	-.219E+03	-.529E+00	.385E+03	.385E+03
	BOTTOM FORGING, MID-SECTION					
3	CAVITY SURFACE	.134E+04	-.948E+04	-.125E+02	.108E+05	.108E+05
4	OUTSIDE SURFACE	.775E+03	-.185E+04	-.709E+01	.263E+04	.263E+04
	BOTTOM FORGING, CORNER					
5	BOTTOM SURFACE	.986E+02	-.106E+04	.328E+02	.116E+04	.116E+04
6	OUTER SURFACE	.164E+01	-.176E+04	-.767E+02	.176E+04	.176E+04
	CASK WALL SHELLS					
7a	INNER SHELL	-.230E+04	-.247E+04	-.148E+04	.727E+04	.991E+03
7b		.116E+04	-.953E+03	.168E+05	.727E+04	.177E+05
8a	OUTER SHELL	.564E+03	-.120E+05	-.272E+04	.485E+04	.126E+05
8b		.208E+03	-.220E+03	.309E+04	.485E+04	.332E+04
9a	INNER SHELL	.778E+03	.162E+03	-.217E+03	.293E+04	.995E+03
9b		-.238E+04	-.475E+04	.196E+04	.293E+04	.670E+04
10a	OUTER SHELL	.498E+03	-.492E+04	-.160E+04	.731E+04	.542E+04
10b		-.698E+02	-.949E+04	-.151E+04	.731E+04	.942E+04
11a	INNER SHELL	-.295E+03	.137E+03	.144E+03	.362E+04	.440E+03
11b		-.218E+04	-.534E+04	.208E+04	.362E+04	.743E+04
12a	OUTER SHELL	.584E+03	-.553E+04	-.165E+04	.775E+04	.611E+04
12b		-.835E+02	-.969E+04	-.149E+04	.775E+04	.960E+04
13a	INNER SHELL	.201E+04	-.457E+03	.136E+04	.216E+04	.247E+04
13b		-.251E+04	-.223E+04	.141E+04	.216E+04	.391E+04
14a	OUTER SHELL	.452E+03	-.308E+04	-.153E+04	.558E+04	.353E+04
14b		-.623E+02	-.798E+04	-.150E+04	.558E+04	.792E+04
15a	INNER SHELL	.133E+02	-.704E+04	-.194E+04	.132E+05	.705E+04
15b		.385E+03	-.304E+04	.217E+05	.132E+05	.248E+05
16a	OUTER SHELL	.280E+02	-.751E+04	-.282E+04	.252E+04	.754E+04
16b		.876E+03	-.292E+03	.365E+04	.252E+04	.395E+04
	TOP FORGING					
17	INNER SURFACE	.164E+02	-.207E+04	-.667E+03	.208E+04	.208E+04
18	OUTER SURFACE	.172E+04	-.174E+04	.492E+01	.347E+04	.347E+04
19	TOP OUTER EL.	.472E+02	-.859E+03	.773E+01	.906E+03	.906E+03
20	TOP INNER EL.	.130E+03	-.237E+03	-.752E+01	.367E+03	.367E+03
	LID, CENTER					
21	TOP FLANGE, TOP EL.	.237E+02	-.810E+02	.900E+01	.105E+03	.105E+03
22	TOP FLANGE, BTM EL.	.462E+02	-.113E+02	.178E+03	.189E+03	.189E+03
23	BOTTOM FLANGE EL.	.604E+02	-.402E+02	.161E+02	.101E+03	.101E+03
	LID, INNER LOWER CORNER					
24	CYL. SHELL	.625E+03	-.135E+04	.351E+02	.197E+04	.197E+04
25	BTM FLANGE	.424E+03	-.118E+05	-.397E+03	.122E+05	.122E+05
	LID, UPPER FLANGE (SEAL AREA)					
26	TOP EL.	.212E+03	-.436E+04	-.757E+02	.457E+04	.457E+04
27	BTM EL.	.541E+03	-.444E+04	-.301E+03	.498E+04	.498E+04

NOTES:
1. Stresses at locations 1 thru 6 and 17 thru 27 are given at the centroid of the element, therefore, the same stress value is used for Pm and Pm+Pb.
2. a = small radius surface,
   b = large radius surface.

TABLE 2.10.9.26. 1 FOOT DROP - SIDE - 45 DEGREE MERIDIAN, NORMAL CONDITION

		STRESS (PSI)			STRESS INTENSITY	
	LOCATION DESCRIPTION	SIGMA1	SIGMA2	SIGMA3	Pm	Pm+Pb
	BOTTOM FORGING, CENTER					
1	CAVITY SURFACE	.533E+02	-.123E+02	.230E+02	.656E+02	.656E+02
2	OUTSIDE SURFACE	-.303E+02	-.725E+02	.235E+02	.960E+02	.960E+02
	BOTTOM FORGING, MID-SECTION					
3	CAVITY SURFACE	.415E+03	-.823E+03	-.196E+01	.124E+04	.124E+04
4	OUTSIDE SURFACE	-.295E+01	-.186E+03	.333E+03	.518E+03	.518E+03
	BOTTOM FORGING, CORNER					
5	BOTTOM SURFACE	.172E+02	-.246E+02	.190E+01	.418E+02	.418E+02
6	OUTER SURFACE	.100E+03	-.843E+02	.423E+02	.184E+03	.184E+03
	CASK WALL SHELLS					
7a	INNER SHELL	-.218E+02	-.140E+04	.211E+04	.300E+04	.351E+04
7b		-.208E+02	-.395E+03	.225E+04	.300E+04	.264E+04
8a	OUTER SHELL	.119E+04	-.108E+04	-.246E+03	.131E+04	.227E+04
8b		-.268E+03	-.859E+02	.102E+04	.131E+04	.129E+04
9a	INNER SHELL	-.116E+02	-.735E+03	.279E+04	.206E+04	.352E+04
9b		-.113E+03	-.361E+03	.321E+03	.206E+04	.682E+03
10a	OUTER SHELL	.604E+02	-.142E+04	-.500E+02	.207E+04	.148E+04
10b		.654E+02	-.266E+04	.298E+02	.207E+04	.273E+04
11a	INNER SHELL	-.701E+01	-.792E+03	.333E+04	.248E+04	.412E+04
11b		-.139E+03	-.394E+03	.485E+03	.248E+04	.879E+03
12a	OUTER SHELL,	.481E+02	-.133E+04	-.301E+03	.216E+04	.138E+04
12b		.502E+02	-.291E+04	-.859E+02	.216E+04	.296E+04
13a	INNER SHELL	-.168E+02	-.808E+03	.269E+04	.232E+04	.350E+04
13b		-.783E+02	-.670E+03	.607E+03	.232E+04	.128E+04
14a	OUTER SHELL	.396E+03	-.167E+04	.378E+02	.239E+04	.207E+04
14b		.225E+03	-.259E+04	.463E+02	.239E+04	.282E+04
15a	INNER SHELL	-.269E+03	-.106E+04	.200E+04	.310E+04	.306E+04
15b		.577E+02	-.468E+03	.281E+04	.310E+04	.327E+04
16a	OUTER SHELL	.748E+03	-.117E+04	.411E+03	.173E+04	.192E+04
16b		-.158E+03	-.243E+03	.116E+04	.173E+04	.140E+04
	TOP FORGING					
17	INNER SURFACE	-.662E+01	-.116E+03	.495E+03	.611E+03	.611E+03
18	OUTER SURFACE	.371E+02	.230E+02	.203E+03	.180E+03	.180E+03
19	TOP OUTER EL.	.362E+02	-.151E+03	-.311E+02	.188E+03	.188E+03
20	TOP INNER EL.	-.345E+02	-.593E+02	.323E+02	.916E+02	.916E+02
	LID, CENTER					
21	TOP FLANGE, TOP EL.	.930E+01	-.121E+02	.352E+01	.213E+02	.213E+02
22	TOP FLANGE, BTM EL.	.100E+02	.141E+01	.267E+02	.253E+02	.253E+02
23	BOTTOM FLANGE EL.	.941E+01	-.413E-01	.308E+02	.309E+02	.309E+02
	LID, INNER LOWER CORNER					
24	CYL. SHELL	-.830E+02	-.261E+03	.191E+03	.451E+03	.451E+03
25	BTM FLANGE	.278E+01	-.636E+03	-.262E+03	.639E+03	.639E+03
	LID, UPPER FLANGE (SEAL AREA)					
26	TOP EL.	.107E+03	-.377E+03	-.376E+01	.484E+03	.484E+03
27	BTM EL.	.955E+02	-.413E+03	-.221E+02	.508E+03	.508E+03

NOTES:

1. Stresses at locations 1 thru 6 and 17 thru 27 are given at the centroid of the element, therefore, the same stress value is used for Pm and Pm+Pb.
2. a = small radius surface,
   b = large radius surface.

TABLE 2.10.9.26A. 1 FOOT DROP - SIDE - 45 DEGREE MERIDIAN, NORMAL CONDITION

	LOCATION DESCRIPTION	STRESS (PSI) SIGMA1	SIGMA2	SIGMA3	STRESS INTENSITY Pm	Pm+Pb
	BOTTOM FORGING, CENTER					
1	CAVITY SURFACE	.198E+03	-.455E+02	.854E+02	.243E+03	.243E+03
2	OUTSIDE SURFACE	-.112E+03	-.269E+03	.871E+02	.356E+03	.356E+03
	BOTTOM FORGING, MID-SECTION					
3	CAVITY SURFACE	.154E+04	-.305E+04	-.729E+01	.459E+04	.459E+04
4	OUTSIDE SURFACE	-.109E+02	-.689E+03	.123E+04	.192E+04	.192E+04
	BOTTOM FORGING, CORNER					
5	BOTTOM SURFACE	.637E+02	-.912E+02	.701E+01	.155E+03	.155E+03
6	OUTER SURFACE	.371E+03	-.313E+03	.157E+03	.684E+03	.684E+03
	CASK WALL SHELLS					
7a	INNER SHELL	-.807E+02	-.519E+04	.784E+04	.111E+05	.130E+05
7b		-.771E+02	-.147E+04	.834E+04	.111E+05	.980E+04
8a	OUTER SHELL	.440E+04	-.402E+04	-.912E+03	.488E+04	.842E+04
8b		-.995E+03	-.318E+03	.378E+04	.488E+04	.477E+04
9a	INNER SHELL	-.431E+02	-.272E+04	.103E+05	.765E+04	.131E+05
9b		-.421E+03	-.134E+04	.119E+04	.765E+04	.253E+04
10a	OUTER SHELL	.224E+03	-.526E+04	-.186E+03	.769E+04	.549E+04
10b		.243E+03	-.987E+04	.111E+03	.769E+04	.101E+05
11a	INNER SHELL	-.261E+02	-.294E+04	.124E+05	.921E+04	.153E+05
11b		-.516E+03	-.146E+04	.180E+04	.921E+04	.326E+04
12a	OUTER SHELL	.178E+03	-.494E+04	-.112E+04	.802E+04	.512E+04
12b		.186E+03	-.108E+05	-.318E+03	.802E+04	.110E+05
13a	INNER SHELL	-.624E+02	-.300E+04	.999E+04	.859E+04	.130E+05
13b		-.291E+03	-.248E+04	.225E+04	.859E+04	.473E+04
14a	OUTER SHELL	.147E+04	-.620E+04	.140E+03	.888E+04	.766E+04
14b		.836E+03	-.961E+04	.172E+03	.888E+04	.104E+05
15a	INNER SHELL	-.996E+03	-.393E+04	.742E+04	.115E+05	.113E+05
15b		.214E+03	-.174E+04	.104E+05	.115E+05	.121E+05
16a	OUTER SHELL	.278E+04	-.434E+04	.153E+04	.641E+04	.712E+04
16b		-.587E+03	-.903E+03	.430E+04	.641E+04	.521E+04
	TOP FORGING					
17	INNER SURFACE	-.246E+02	-.430E+03	.184E+04	.227E+04	.227E+04
18	OUTER SURFACE	.138E+03	.854E+02	.752E+03	.667E+03	.667E+03
19	TOP OUTER EL.	.134E+03	-.562E+03	-.115E+03	.696E+03	.696E+03
20	TOP INNER EL.	-.128E+03	-.220E+03	.120E+03	.340E+03	.340E+03
	LID, CENTER					
21	TOP FLANGE, TOP EL.	.345E+02	-.447E+02	.130E+02	.792E+02	.792E+02
22	TOP FLANGE, BTM EL.	.371E+02	.524E+01	.991E+02	.939E+02	.939E+02
23	BOTTOM FLANGE EL.	.349E+02	-.153E+00	.114E+03	.114E+03	.114E+03
	LID, INNER LOWER CORNER					
24	CYL. SHELL	-.308E+03	-.966E+03	.707E+03	.167E+04	.167E+04
25	BTM FLANGE	.103E+02	-.236E+04	-.970E+03	.237E+04	.237E+04
	LID, UPPER FLANGE (SEAL AREA)					
26	TOP EL.	.396E+03	-.140E+04	-.139E+02	.179E+04	.179E+04
27	BTM EL.	.354E+03	-.153E+04	-.820E+02	.189E+04	.189E+04

NOTES:
1. Stresses at locations 1 thru 6 and 17 thru 27 are given at the centroid of the element, therefore, the same stress value is used for Pm and Pm+Pb.
2. a = small radius surface,
   b = large radius surface.

TABLE 2.10.9.27. 1 FOOT DROP - SIDE - 90 DEGREE MERIDIAN, NORMAL CONDITION

		STRESS (PSI)			STRESS INTENSITY	
	LOCATION DESCRIPTION	SIGMA1	SIGMA2	SIGMA3	Pm	Pm+Pb
	BOTTOM FORGING, CENTER					
1	CAVITY SURFACE	.127E+02	-.329E+02	.587E+02	.917E+02	.917E+02
2	OUTSIDE SURFACE	-.233E+02	-.663E+02	.460E+02	.112E+03	.112E+03
	BOTTOM FORGING MID-SECTION					
3	CAVITY SURFACE	-.492E-01	-.220E+03	.720E+03	.940E+03	.940E+03
4	OUTSIDE SURFACE	.117E+02	.128E+03	.295E+03	.423E+03	.423E+03
	BOTTOM FORGING, CORNER					
5	BOTTOM SURFACE	.174E+01	-.320E+02	.562E+03	.594E+03	.594E+03
6	OUTER SURFACE	-.137E+02	-.519E+02	.537E+03	.589E+03	.589E+03
	CASK WALL SHELLS					
7a	INNER SHELL	.101E+03	-.333E+03	.477E+03	.151E+04	.810E+03
7b		.649E+03	-.188E+04	-.293E+03	.151E+04	.253E+04
8a	OUTER SHELL	.167E+03	-.534E+01	.151E+04	.112E+04	.152E+04
8b		-.598E+02	-.496E+03	.648E+03	.112E+04	.114E+04
9a	INNER SHELL	.173E+03	-.193E+04	-.671E+02	.181E+04	.211E+04
9b		.782E+03	-.761E+03	-.129E+03	.181E+04	.154E+04
10a	OUTER SHELL	-.125E+03	-.425E+03	.813E+03	.119E+04	.124E+04
10b		.107E+03	.298E+02	.128E+04	.119E+04	.125E+04
11a	INNER SHELL	.558E+03	-.199E+04	-.386E+03	.188E+04	.255E+04
11b		-.314E+03	-.693E+03	.103E+04	.188E+04	.172E+04
12a	OUTER SHELL	-.159E+03	-.299E+03	.779E+03	.110E+04	.108E+04
12b		.338E+03	-.494E+01	.122E+04	.110E+04	.123E+04
13a	INNER SHELL	.722E+02	-.194E+04	-.646E+02	.182E+04	.201E+04
13b		.717E+03	-.948E+03	-.121E+03	.182E+04	.167E+04
14a	OUTER SHELL	-.882E+02	-.602E+03	.774E+03	.134E+04	.138E+04
14b		-.506E+02	-.648E+02	.125E+04	.134E+04	.132E+04
15a	INNER SHELL	.718E+03	-.697E+03	.298E+03	.201E+04	.141E+04
15b		.663E+03	-.220E+04	-.114E+03	.201E+04	.286E+04
16a	OUTER SHELL	.765E+02	.593E+02	.117E+04	.118E+04	.111E+04
16b		-.101E+03	-.632E+03	.815E+03	.118E+04	.145E+04
	TOP FORGING					
17	INNER SURFACE	-.238E+02	-.784E+02	.256E+03	.334E+03	.334E+03
18	OUTER SURFACE	-.373E+02	-.467E+02	.580E+03	.626E+03	.626E+03
19	TOP OUTER EL.	-.148E+01	-.211E+02	.498E+03	.519E+03	.519E+03
20	TOP INNER EL.	-.908E+00	-.134E+01	.427E+03	.428E+03	.428E+03
	LID, CENTER					
21	TOP FLANGE, TOP EL.	.658E+01	-.969E+01	.216E+01	.163E+02	.163E+02
22	TOP FLANGE, BTM EL.	.633E+01	-.318E+01	.204E+02	.236E+02	.236E+02
23	BOTTOM FLANGE EL.	.404E+01	-.497E+01	.211E+02	.261E+02	.261E+02
	LID, INNER LOWER CORNER					
24	CYL. SHELL	.281E+02	-.186E+03	-.274E+02	.214E+03	.214E+03
25	BTM FLANGE	.311E+02	-.380E+03	.660E+03	.104E+04	.104E+04
	LID, UPPER FLANGE (SEAL AREA)					
26	TOP EL.	.106E+03	-.183E+03	-.657E+01	.289E+03	.289E+03
27	BTM EL.	.321E+02	-.107E+03	-.338E+02	.139E+03	.139E+03

NOTES:
1. Stresses at locations 1 thru 6 and 17 thru 27 are given at the centroid of the element, therefore, the same stress value is used for Pm and Pm+Pb.
2. a = small radius surface,
   b = large radius surface.

TABLE 2.10.9.27A. 1 FOOT DROP - SIDE - 90 DEGREE MERIDIAN, NORMAL CONDITION

	LOCATION DESCRIPTION	STRESS (PSI) SIGMA1	SIGMA2	SIGMA3	STRESS INTENSITY Pm	Pm+Pb
	BOTTOM FORGING, CENTER					
1	CAVITY SURFACE	.470E+02	-.122E+03	.218E+03	.340E+03	.340E+03
2	OUTSIDE SURFACE	-.866E+02	-.246E+03	.170E+03	.416E+03	.416E+03
	BOTTOM FORGING, MID-SECTION					
3	CAVITY SURFACE	-.182E+00	-.815E+03	.267E+04	.349E+04	.349E+04
4	OUTSIDE SURFACE	.435E+02	-.474E+03	.110E+04	.157E+04	.157E+04
	BOTTOM FORGING, CORNER					
5	BOTTOM SURFACE	.644E+01	-.119E+03	.208E+04	.220E+04	.220E+04
6	OUTER SURFACE	-.507E+02	-.193E+03	.199E+04	.219E+04	.219E+04
	CASK WALL SHELLS					
7a	INNER SHELL	.373E+03	-.124E+04	.177E+04	.560E+04	.301E+04
7b		.241E+04	-.696E+04	-.109E+04	.560E+04	.937E+04
8a	OUTER SHELL	.619E+03	-.199E+02	.560E+04	.417E+04	.562E+04
8b		-.222E+03	-.184E+04	.240E+04	.417E+04	.424E+04
9a	INNER SHELL	.644E+03	-.717E+04	-.249E+03	.672E+04	.781E+04
9b		.290E+04	-.282E+04	-.480E+03	.672E+04	.572E+04
10a	OUTER SHELL	-.464E+03	-.158E+04	.302E+04	.442E+04	.459E+04
10b		.398E+03	.111E+03	.473E+04	.442E+04	.462E+04
11a	INNER SHELL	.207E+04	-.739E+04	-.143E+04	.698E+04	.946E+04
11b		-.117E+04	-.257E+04	.380E+04	.698E+04	.638E+04
12a	OUTER SHELL	-.590E+03	-.111E+04	.289E+04	.409E+04	.400E+04
12b		.126E+04	-.183E+02	.453E+04	.409E+04	.455E+04
13a	INNER SHELL	.268E+03	-.720E+04	-.240E+03	.677E+04	.747E+04
13b		.266E+04	-.351E+04	-.449E+03	.677E+04	.618E+04
14a	OUTER SHELL	-.327E+03	-.223E+04	.287E+04	.498E+04	.510E+04
14b		-.188E+03	-.240E+03	.465E+04	.498E+04	.489E+04
15a	INNER SHELL	.266E+04	-.259E+04	.110E+04	.745E+04	.525E+04
15b		.246E+04	-.815E+04	-.424E+03	.745E+04	.106E+05
16a	OUTER SHELL	.284E+03	.220E+03	.435E+04	.439E+04	.413E+04
16b		-.376E+03	-.234E+04	.302E+04	.439E+04	.537E+04
	TOP FORGING					
17	INNER SURFACE	-.884E+02	-.291E+03	.949E+03	.124E+04	.124E+04
18	OUTER SURFACE	-.138E+03	-.173E+03	.215E+04	.232E+04	.232E+04
19	TOP OUTER EL.	-.548E+01	-.782E+02	.185E+04	.192E+04	.192E+04
20	TOP INNER EL.	-.337E+01	-.498E+01	.158E+04	.159E+04	.159E+04
	LID, CENTER					
21	TOP FLANGE, TOP EL.	.244E+02	-.359E+02	.800E+01	.604E+02	.604E+02
22	TOP FLANGE, BTM EL.	.235E+02	-.118E+02	.757E+02	.875E+02	.875E+02
23	BOTTOM FLANGE EL.	.150E+02	-.184E+02	.784E+02	.968E+02	.968E+02
	LID, INNER LOWER CORNER					
24	CYL. SHELL	.104E+03	-.688E+03	-.102E+03	.792E+03	.792E+03
25	BTM FLANGE	.115E+03	-.141E+04	.245E+04	.386E+04	.386E+04
	LID, UPPER FLANGE (SEAL AREA)					
26	TOP EL.	.394E+03	-.678E+03	-.244E+02	.107E+04	.107E+04
27	BTM EL.	.119E+03	-.398E+03	-.126E+03	.517E+03	.517E+03

NOTES:
1. Stresses at locations 1 thru 6 and 17 thru 27 are given at the centroid of the element, therefore, the same stress value is used for Pm and Pm+Pb.
2. a = small radius surface,
   b = large radius surface.

TABLE 2.10.9.28. 1 FOOT DROP - SIDE - 135 DEGREE MERIDIAN, NORMAL CONDITION

	LOCATION DESCRIPTION	STRESS (PSI) SIGMA1	SIGMA2	SIGMA3	STRESS INTENSITY Pm	Pm+Pb
	BOTTOM FORGING, CENTER					
1	CAVITY SURFACE	-.299E+02	-.351E+02	.115E+02	.467E+02	.467E+02
2	OUTSIDE SURFACE	.475E+02	-.248E+02	.376E+02	.723E+02	.723E+02
	BOTTOM FORGING, MID-SECTION					
3	CAVITY SURFACE	.748E+00	-.289E+03	.715E+03	.100E+04	.100E+04
4	OUTSIDE SURFACE	.785E+01	-.308E+02	.433E+03	.463E+03	.463E+03
	BOTTOM FORGING, CORNER					
5	BOTTOM SURFACE	.501E+02	-.350E+01	.433E+03	.437E+03	.437E+03
6	OUTER SURFACE	.583E+02	-.171E+02	.357E+03	.374E+03	.374E+03
	CASK WALL SHELLS					
7a	INNER SHELL	.285E+03	-.334E+03	.198E+03	.513E+03	.619E+03
7b		.812E+02	-.552E+03	-.176E+03	.513E+03	.633E+03
8a	OUTER SHELL	.345E+03	-.669E+02	.370E+03	.536E+03	.437E+03
8b		.128E+03	-.322E+03	.150E+03	.536E+03	.472E+03
9a	INNER SHELL	.390E+03	-.137E+04	.450E+02	.142E+04	.176E+04
9b		.408E+03	-.680E+03	.615E+02	.142E+04	.109E+04
10a	OUTER SHELL	.405E+03	.545E+02	.291E+03	.495E+03	.351E+03
10b		.530E+03	.488E+02	.576E+03	.495E+03	.527E+03
11a	INNER SHELL	.505E+03	-.181E+04	.459E+02	.184E+04	.231E+04
11b		.526E+03	-.856E+03	.664E+02	.184E+04	.138E+04
12a	OUTER SHELL	.423E+03	.552E+02	.425E+03	.606E+03	.370E+03
12b		.908E+03	.494E+02	.501E+03	.606E+03	.858E+03
13a	INNER SHELL	.189E+03	-.113E+04	.427E+02	.108E+04	.131E+04
13b		.267E+03	-.608E+03	.571E+02	.108E+04	.875E+03
14a	OUTER SHELL	.426E+03	.535E+02	.974E+02	.427E+03	.373E+03
14b		.162E+03	.473E+02	.724E+03	.427E+03	.677E+03
15a	INNER SHELL	.328E+03	-.258E+03	.295E+03	.740E+03	.586E+03
15b		-.182E+03	-.773E+03	.294E+03	.740E+03	.107E+04
16a	OUTER SHELL	.236E+03	-.638E+02	.352E+03	.551E+03	.416E+03
16b		.349E+03	-.345E+03	-.374E+02	.551E+03	.693E+03
	TOP FORGING					
17	INNER SURFACE	.990E+02	.706E+02	.276E+03	.206E+03	.206E+03
18	OUTER SURFACE	.590E+02	-.150E+03	.369E+03	.518E+03	.518E+03
19	TOP OUTER EL.	.627E+02	-.252E+02	.418E+03	.443E+03	.443E+03
20	TOP INNER EL.	.324E+02	-.151E+02	.469E+03	.484E+03	.484E+03
	LID, CENTER					
21	TOP FLANGE, TOP EL.	.455E+00	-.128E+02	-.446E+01	.133E+02	.133E+02
22	TOP FLANGE, BTM EL.	.149E+02	.400E+00	.143E+02	.145E+02	.145E+02
23	BOTTOM FLANGE EL.	-.694E+01	-.114E+02	.385E+01	.152E+02	.152E+02
	LID, INNER LOWER CORNER					
24	CYL. SHELL	.110E+03	-.131E+03	-.979E+00	.241E+03	.241E+03
25	BTM FLANGE	.677E+01	-.155E+03	.610E+03	.765E+03	.765E+03
	LID, UPPER FLANGE (SEAL AREA)					
26	TOP EL.	.840E+01	-.232E+02	.215E+03	.238E+03	.238E+03
27	BTM EL.	.385E+02	-.590E+02	.249E+03	.308E+03	.308E+03

NOTES:
1. Stresses at locations 1 thru 6 and 17 thru 27 are given at the centroid of the element, therefore, the same stress value is used for Pm and Pm+Pb.
2. a = small radius surface,
   b = large radius surface.

TABLE 2.10.9.28A. 1 FOOT DROP - SIDE - 135 DEGREE MERIDIAN, NORMAL CONDITION

	LOCATION DESCRIPTION	STRESS (PSI) SIGMA1	SIGMA2	SIGMA3	STRESS INTENSITY Pm	Pm+Pb
	BOTTOM FORGING, CENTER					
1	CAVITY SURFACE	-.111E+03	-.130E+03	.428E+02	.173E+03	.173E+03
2	OUTSIDE SURFACE	.176E+03	-.919E+02	.140E+03	.268E+03	.268E+03
	BOTTOM FORGING, MID-SECTION					
3	CAVITY SURFACE	.277E+01	-.107E+04	.265E+04	.372E+04	.372E+04
4	OUTSIDE SURFACE	.291E+02	-.114E+03	.161E+04	.172E+04	.172E+04
	BOTTOM FORGING, CORNER					
5	BOTTOM SURFACE	.186E+03	-.130E+102	.161E+04	.162E+04	.162E+04
6	OUTER SURFACE	.216E+03	-.633E+02	.133E+04	.139E+04	.139E+04
	CASK WALL SHELLS					
7a	INNER SHELL	.106E+04	-.124E+04	.733E+03	.190E+04	.230E+04
7b		.301E+03	-.205E+04	-.655E+03	.190E+04	.235E+04
8a	OUTER SHELL	.128E+04	-.248E+03	.137E+04	.199E+04	.162E+04
8b		.473E+03	-.120E+04	.555E+03	.199E+04	.175E+04
9a	INNER SHELL	.144E+04	-.507E+04	.167E+03	.525E+04	.652E+04
9b		.151E+04	-.252E+04	.228E+03	.525E+04	.404E+04
10a	OUTER SHELL	.150E+04	.202E+03	.108E+04	.184E+04	.130E+04
10b		.197E+04	.181E+03	.214E+04	.184E+04	.195E+04
11a	INNER SHELL	.187E+04	-.671E+04	.170E+03	.684E+04	.858E+04
11b		.195E+04	-.317E+04	.247E+03	.684E+04	.513E+04
12a	OUTER SHELL	.157E+04	.205E+03	.158E+04	.225E+04	.137E+04
12b		.337E+04	.183E+03	.186E+04	.225E+04	.318E+04
13a	INNER SHELL	.701E+03	-.417E+04	.158E+03	.401E+04	.488E+04
13b		.990E+03	-.226E+04	.212E+03	.401E+04	.325E+04
14a	OUTER SHELL	.158E+04	.198E+03	.362E+03	.158E+04	.138E+04
14b		.602E+03	.176E+03	.269E+04	.158E+04	.251E+04
15a	INNER SHELL	.122E+04	-.956E+03	.109E+04	.274E+04	.217E+04
15b		-.677E+03	-.287E+04	.109E+04	.274E+04	.396E+04
16a	OUTER SHELL	.874E+03	-.237E+03	.131E+04	.204E+04	.154E+04
16b		.129E+04	-.128E+04	-.139E+03	.204E+04	.257E+04
	TOP FORGING					
17	INNER SURFACE	.367E+03	.262E+03	.102E+04	.762E+03	.762E+03
18	OUTER SURFACE	.219E+03	-.555E+03	.137E+04	.192E+04	.192E+04
19	TOP OUTER EL.	.233E+03	-.935E+02	.155E+04	.164E+04	.164E+04
20	TOP INNER EL.	.120E+03	-.559E+02	.174E+04	.180E+04	.180E+04
	LID, CENTER					
21	TOP FLANGE, TOP EL.	.169E+01	-.475E+02	-.166E+02	.492E+02	.492E+02
22	TOP FLANGE, BTM EL.	.553E+02	.149E+01	.532E+02	.538E+02	.538E+02
23	BOTTOM FLANGE EL.	-.258E+02	-.421E+02	.143E+02	.564E+02	.564E+02
	LID, INNER LOWER CORNER					
24	CYL. SHELL	.408E+03	-.486E+03	-.361E+01	.894E+03	.894E+03
25	BTM FLANGE	.251E+02	-.576E+03	.226E+04	.284E+04	.284E+04
	LID, UPPER FLANGE (SEAL AREA)					
26	TOP EL.	.312E+02	-.862E+02	.798E+03	.885E+03	.885E+03
27	BTM EL.	.143E+03	-.219E+03	.923E+03	.114E+04	.114E+04

NOTES:
1. Stresses at locations 1 thru 6 and 17 thru 27 are given at the centroid of the element, therefore, the same stress value is used for Pm and Pm+Pb.
2. a = small radius surface,
   b = large radius surface.

TABLE 2.10.9.29. 1 FOOT DROP - SIDE - 180 DEGREE MERIDIAN, NORMAL CONDITION

	LOCATION DESCRIPTION	STRESS (PSI) SIGMA1	SIGMA2	SIGMA3	STRESS INTENSITY Pm	Pm+Pb
	BOTTOM FORGING, CENTER					
1	CAVITY SURFACE	.243E+02	-.854E+02	-.971E+00	.110E+03	.110E+03
2	OUTSIDE SURFACE	.283E+00	-.303E+02	.104E+03	.135E+03	.135E+03
	BOTTOM FORGING, MID-SECTION					
3	CAVITY SURFACE	.437E+00	-.817E+02	.478E+03	.560E+03	.560E+03
4	OUTSIDE SURFACE	.773E+00	-.221E+03	.580E+03	.800E+03	.800E+03
	BOTTOM FORGING, CORNER					
5	BOTTOM SURFACE	.686E+00	-.453E+02	.478E+02	.931E+02	.931E+02
6	OUTER SURFACE	.208E+01	-.444E+02	-.134E+02	.465E+02	.465E+02
	CASK WALL SHELLS					
7a	INNER SHELL	.535E+02	-.780E+02	.338E+03	.476E+03	.416E+03
7b		.114E+03	-.907E+02	.686E+03	.476E+03	.777E+03
8a	OUTER SHELL	-.133E+03	-.435E+03	.987E+02	.211E+03	.533E+03
8b		.100E+03	-.664E+02	-.361E+02	.211E+03	.167E+03
9a	INNER SHELL	-.934E+01	-.241E+02	.506E+03	.377E+03	.530E+03
9b		.249E+03	-.129E+03	.407E+02	.377E+03	.378E+03
10a	OUTER SHELL	-.272E+02	-.435E+02	.981E+02	.131E+03	.142E+03
10b		.209E+02	-.219E+03	-.884E+02	.131E+03	.240E+03
11a	INNER SHELL	.134E+02	-.258E+02	.472E+03	.328E+03	.497E+03
11b		.219E+03	-.150E+03	.662E+01	.328E+03	.369E+03
12a	OUTER SHELL	.978E+02	-.540E+02	.390E+02	.127E+03	.152E+03
12b		-.770E+01	-.221E+03	-.750E+02	.127E+03	.214E+03
13a	INNER SHELL	-.270E+02	-.228E+02	.459E+03	.360E+03	.486E+03
13b		.281E+03	-.115E+03	.286E+02	.360E+03	.396E+03
14a	OUTER SHELL	-.424E+02	-.494E+02	.829E+02	.112E+03	.132E+03
14b		.221E+02	-.171E+03	-.813E+02	.112E+03	.193E+03
15a	INNER SHELL	.599E+02	.116E+02	.379E+03	.457E+03	.368E+03
15b		.162E+02	-.519E+02	.799E+03	.457E+03	.851E+03
16a	OUTER SHELL	.323E+02	-.232E+03	-.643E+02	.146E+03	.264E+03
16b		-.360E+02	-.602E+02	.996E+01	.146E+03	.702E+02
	TOP FORGING					
17	INNER SURFACE	.971E+01	-.309E+01	.192E+03	.195E+03	.195E+03
18	OUTER SURFACE	-.414E+02	-.834E+02	.255E+01	.859E+02	.859E+02
19	TOP OUTER EL.	-.111E-01	-.496E+02	.570E+02	.107E+03	.107E+03
20	TOP INNER EL.	.701E-01	-.233E+02	.500E+02	.732E+02	.732E+02
	LID, CENTER					
21	TOP FLANGE, TOP EL.	.169E+01	-.202E+02	-.544E+00	.219E+02	.219E+02
22	TOP FLANGE, BTM EL.	-.365E+00	-.321E+01	.252E+02	.284E+02	.284E+02
23	BOTTOM FLANGE EL.	.791E+01	-.218E+02	-.137E+00	.297E+02	.297E+02
	LID, INNER LOWER CORNER					
24	CYL. SHELL	-.102E+01	-.619E+02	.810E+02	.143E+03	.143E+03
25	BTM FLANGE	-.190E+02	-.378E+02	.244E+03	.282E+03	.282E+03
	LID, UPPER FLANGE (SEAL AREA)					
26	TOP EL.	.774E+01	-.956E+01	.997E+02	.109E+03	.109E+03
27	BTM EL.	.464E+02	-.380E+02	.156E+03	.194E+03	.194E+03

NOTES:

1. Stresses at locations 1 thru 6 and 17 thru 27 are given at the centroid of the element, therefore, the same stress value is used for Pm and Pm+Pb.
2. a = small radius surface,
   b = large radius surface.

TABLE 2.10.9.29A. 1 FOOT DROP - SIDE - 180 DEGREE MERIDIAN, NORMAL CONDITION

LOCATION	DESCRIPTION	STRESS (PSI) SIGMA1	SIGMA2	SIGMA3	STRESS INTENSITY Pm	Pm+Pb
	BOTTOM FORGING, CENTER					
1	CAVITY SURFACE	.900E+02	-.317E+03	-.360E+01	.407E+03	.407E+03
2	OUTSIDE SURFACE	.105E+01	-.112E+03	.387E+03	.499E+03	.499E+03
	BOTTOM FORGING MID-SECTION					
3	CAVITY SURFACE	.162E+01	-.303E+03	.177E+04	.208E+04	.208E+04
4	OUTSIDE SURFACE	.287E+01	-.818E+03	.215E+04	.297E+04	.297E+04
	BOTTOM FORGING, CORNER					
5	BOTTOM SURFACE	.255E+01	-.168E+03	.177E+03	.345E+03	.345E+03
6	OUTER SURFACE	.771E+01	-.165E+03	-.497E+02	.173E+03	.173E+03
	CASK WALL SHELLS					
7a	INNER SHELL	.198E+03	-.289E+03	.126E+04	.177E+04	.154E+04
7b		.422E+03	-.337E+03	.254E+04	.177E+04	.288E+04
8a	OUTER SHELL	-.493E+03	-.161E+04	.366E+03	.782E+03	.198E+04
8b		.372E+03	-.246E+03	-.134E+03	.782E+03	.618E+03
9a	INNER SHELL	-.346E+02	-.893E+02	.188E+04	.140E+04	.197E+04
9b		.924E+03	-.479E+03	.151E+03	.140E+04	.140E+04
10a	OUTER SHELL	-.101E+03	-.161E+03	.364E+03	.485E+03	.525E+03
10b		.775E+02	-.814E+03	-.328E+03	.485E+03	.891E+03
11a	INNER SHELL	.497E+02	-.957E+02	.175E+04	.121E+04	.185E+04
11b		.812E+03	-.556E+03	.241E+02	.121E+04	.137E+04
12a	OUTER SHELL	.363E+03	-.200E+03	.144E+03	.472E+03	.563E+03
12b		-.285E+02	-.822E+03	-.278E+03	.472E+03	.793E+03
13a	INNER SHELL	-.100E+03	-.847E+02	.170E+04	.134E+04	.180E+04
13b		.104E+04	-.427E+03	.106E+03	.134E+04	.147E+04
14a	OUTER SHELL	-.157E+03	-.183E+03	.307E+03	.415E+03	.491E+03
14b		.821E+02	-.634E+03	-.301E+03	.415E+03	.716E+03
15a	INNER SHELL	.222E+03	.430E+02	.141E+04	.170E+04	.136E+04
15b		.602E+02	-.192E+03	.296E+04	.170E+04	.316E+04
16a	OUTER SHELL	.120E+03	-.861E+03	-.238E+03	.543E+03	.980E+03
16b		-.134E+03	-.223E+03	.369E+02	.543E+03	.260E+03
	TOP FORGING					
17	INNER SURFACE	.360E+02	-.115E+02	.713E+03	.725E+03	.725E+03
18	OUTER SURFACE	-.153E+03	-.309E+03	.944E+01	.319E+03	.319E+03
19	TOP OUTER EL.	-.412E-01	-.184E+03	.212E+03	.396E+03	.396E+03
20	TOP INNER EL.	.260E+00	-.863E+02	.185E+03	.272E+03	.272E+03
	LID, CENTER					
21	TOP FLANGE, TOP EL.	.626E+01	-.749E+02	-.202E+01	.812E+02	.812E+02
22	TOP FLANGE, BTM EL.	-.135E+01	-.119E+02	.934E+02	.105E+03	.105E+03
23	BOTTOM FLANGE EL.	.293E+02	-.810E+02	-.507E+00	.110E+03	.110E+03
	LID, INNER LOWER CORNER					
24	CYL. SHELL	-.379E+01	-.230E+03	.300E+03	.530E+03	.530E+03
25	BTM FLANGE	-.705E+02	-.140E+03	.906E+03	.105E+04	.105E+04
	LID, UPPER FLANGE (SEAL AREA)					
26	TOP EL.	.287E+02	-.355E+02	.370E+03	.405E+03	.405E+03
27	BTM EL.	.172E+03	-.141E+03	.577E+03	.718E+03	.718E+03

NOTES:
1. Stresses at locations 1 thru 6 and 17 thru 27 are given at the centroid of the element, therefore, the same stress value is used for Pm and Pm+Pb.
2. a = small radius surface,
   b = large radius surface.

TABLE 2.10.9.30. 30 FOOT DROP - TOP - ACCIDENT CONDITION

	LOCATION DESCRIPTION	STRESS (PSI) SIGMA1	SIGMA2	SIGMA3	STRESS INTENSITY Pm	Pm+Pb
	BOTTOM FORGING, CENTER					
1	CAVITY SURFACE	.623E+03	.830E+01	.628E+03	.619E+03	.619E+03
2	OUTSIDE SURFACE	-.826E+01	-.583E+03	-.587E+03	.579E+03	.579E+03
	BOTTOM FORGING, MID-SECTION					
3	CAVITY SURFACE	.402E+03	.499E+01	.491E+03	.486E+03	.486E+03
4	OUTSIDE SURFACE	-.523E+00	-.352E+03	-.445E+03	.444E+03	.444E+03
	BOTTOM FORGING, CORNER					
5	BOTTOM SURFACE	.313E+02	-.148E+02	-.756E+02	.107E+03	.107E+03
6	OUTER SURFACE	.696E+01	-.303E+02	-.388E+02	.457E+02	.457E+02
	CASK WALL SHELLS					
7a	INNER SHELL	.156E+02	-.190E+04	-.330E+03	.204E+04	.191E+04
7b		-.131E+03	-.230E+04	-.464E+03	.204E+04	.217E+04
8a	OUTER SHELL	.432E+02	-.180E+03	.167E+03	.416E+03	.348E+03
8b		-.313E+02	-.423E+03	.600E+02	.416E+03	.483E+03
9a	INNER SHELL	-.512E+01	-.301E+04	-.580E+03	.249E+04	.300E+04
9b		-.225E+02	-.199E+04	-.243E+03	.249E+04	.197E+04
10a	OUTER SHELL	-.341E+02	.110E+03	.157E+04	.194E+04	.161E+04
10b		-.579E+01	-.139E+04	.104E+04	.194E+04	.242E+04
11a	INNER SHELL	-.893E+01	-.290E+04	-.540E+04	.503E+04	.539E+04
11b		-.362E+03	-.291E+04	-.504E+04	.503E+04	.467E+04
12a	OUTER SHELL	-.381E+03	-.110E+04	.811E+04	.896E+04	.921E+04
12b		-.433E+01	-.102E+04	.768E+04	.896E+04	.871E+04
13a	INNER SHELL	-.218E+02	-.374E+04	-.106E+05	.974E+04	.106E+05
13b		-.687E+03	-.291E+04	-.961E+04	.974E+04	.892E+04
14a	OUTER SHELL	-.650E+03	-.155E+04	.157E+05	.168E+05	.173E+05
14b		-.233E+02	-.147E+04	.149E+05	.168E+05	.163E+05
15a	INNER SHELL	.833E+03	-.241E+04	-.933E+04	.102E+05	.102E+05
15b		.454E+03	-.664E+04	-.983E+04	.102E+05	.103E+05
16a	OUTER SHELL	.128E+05	.368E+04	.649E+04	.110E+05	.914E+04
16b		-.354E+04	-.164E+05	-.451E+04	.110E+05	.128E+05
	TOP FORGING					
17	INNER SURFACE	.920E+04	.841E+03	.545E+04	.836E+04	.836E+04
18	OUTER SURFACE	.585E+02	-.807E+04	-.284E+03	.812E+04	.812E+04
19	TOP OUTER EL.	-.284E+01	-.703E+04	.321E+04	.102E+05	.102E+05
20	TOP INNER EL.	.403E+02	-.136E+05	.141E+04	.150E+05	.150E+05
	LID, CENTER					
21	TOP FLANGE, TOP EL.	.167E+05	-.280E+03	.169E+05	.172E+05	.172E+05
22	TOP FLANGE, BTM EL.	.202E+04	-.296E+04	-.146E+04	.498E+04	.498E+04
23	BOTTOM FLANGE EL.	.301E+03	-.393E+04	-.281E+04	.423E+04	.423E+04
	LID, INNER LOWER CORNER					
24	CYL. SHELL	.548E+03	-.794E+04	-.193E+04	.849E+04	.849E+04
25	BTM FLANGE	.195E+04	-.771E+04	-.345E+04	.966E+04	.966E+04
	LID, UPPER FLANGE (SEAL AREA)					
26	TOP EL.	.157E+04	-.218E+03	.591E+04	.613E+04	.613E+04
27	BTM EL.	.169E+04	-.133E+04	.401E+04	.533E+04	.533E+04

NOTES:
1. Stresses at locations 1 thru 6 and 17 thru 27 are given at the centroid of the element, therefore, the same stress value is used for Pm and Pm+Pb.
2. a = small radius surface,
   b = large radius surface.

TABLE 2.10.9.30A. 30 FOOT DROP - TOP - ACCIDENT CONDITION

	LOCATION DESCRIPTION	STRESS (PSI) SIGMA1	SIGMA2	SIGMA3	STRESS INTENSITY Pm	Pm+Pb
	BOTTOM FORGING, CENTER					
1	CAVITY SURFACE	.529E+03	.106E+02	.534E+03	.523E+03	.523E+03
2	OUTSIDE SURFACE	-.104E+02	-.441E+03	-.445E+03	.435E+03	.435E+03
	BOTTOM FORGING, MID-SECTION					
3	CAVITY SURFACE	.253E+03	.113E+01	.361E+03	.360E+03	.360E+03
4	OUTSIDE SURFACE	.165E+02	-.161E+03	-.264E+03	.281E+03	.281E+03
	BOTTOM FORGING, CORNER					
5	BOTTOM SURFACE	.837E+02	-.293E+02	.973E+02	.127E+03	.127E+03
6	OUTER SURFACE	.496E+02	-.353E+02	.721E+02	.107E+03	.107E+03
	CASK WALL SHELLS					
7a	INNER SHELL	-.485E+03	-.355E+04	-.115E+04	.338E+04	.306E+04
7b		.242E+03	-.345E+04	-.827E+03	.338E+04	.369E+04
8a	OUTER SHELL	.345E+03	-.901E+02	.829E+02	.328E+03	.435E+03
8b		.202E+03	-.193E+02	.181E+03	.328E+03	.221E+03
9a	INNER SHELL	-.199E+02	-.396E+04	-.157E+04	.391E+04	.394E+04
9b		-.141E+03	-.401E+04	-.262E+04	.391E+04	.387E+04
10a	OUTER SHELL	.115E+03	-.401E+03	.269E+04	.374E+04	.309E+04
10b		-.512E+02	-.414E+03	.396E+04	.374E+04	.438E+04
11a	INNER SHELL	-.278E+03	-.449E+04	-.930E+04	.952E+04	.902E+04
11b		-.420E+03	-.454E+04	-.104E+05	.952E+04	.100E+05
12a	OUTER SHELL	-.211E+03	-.878E+03	.130E+05	.146E+05	.138E+05
12b		-.328E+03	-.952E+03	.144E+05	.146E+05	.154E+05
13a	INNER SHELL	-.538E+03	-.505E+04	-.168E+05	.168E+05	.162E+05
13b		-.667E+03	-.510E+04	-.180E+05	.168E+05	.173E+05
14a	OUTER SHELL	-.395E+03	-.150E+04	.238E+05	.262E+05	.253E+05
14b		-.475E+03	-.159E+04	.256E+05	.262E+05	.272E+05
15a	INNER SHELL	-.203E+04	-.557E+04	-.188E+05	.145E+05	.168E+05
15b		.386E+04	-.794E+04	-.838E+04	.145E+05	.122E+05
16a	OUTER SHELL	-.114E+04	-.574E+04	.568E+04	.162E+05	.114E+05
16b		.157E+05	-.121E+05	-.144E+04	.162E+05	.278E+05
	TOP FORGING					
17	INNER SURFACE	.122E+05	.104E+04	.724E+04	.112E+05	.112E+05
18	OUTER SURFACE	.687E+02	-.104E+05	-.285E+03	.105E+05	.105E+05
19	TOP OUTER EL.	-.194E+01	-.909E+04	.432E+04	.134E+05	.134E+05
20	TOP INNER EL.	.546E+02	-.178E+05	.195E+04	.197E+05	.197E+05
	LID, CENTER					
21	TOP FLANGE, TOP EL.	.237E+05	-.477E+03	.239E+05	.244E+05	.244E+05
22	TOP FLANGE, BTM EL.	.242E+04	-.511E+04	-.336E+04	.753E+04	.753E+04
23	BOTTOM FLANGE EL.	.807E+03	-.544E+04	-.356E+04	.625E+04	.625E+04
	LID, INNER LOWER CORNER					
24	CYL. SHELL	.968E+03	-.107E+05	-.230E+04	.117E+05	.117E+05
25	BTM FLANGE	.291E+04	-.105E+05	-.445E+04	.134E+05	.134E+05
	LID, UPPER FLANGE (SEAL AREA)					
26	TOP EL.	.200E+04	-.288E+03	.781E+04	.810E+04	.810E+04
27	BTM EL.	.220E+04	-.170E+04	.533E+04	.703E+04	.703E+04

NOTES:
1. Stresses at locations 1 thru 6 and 17 thru 27 are given at the centroid of the element, therefore, the same stress value is used for Pm and Pm+Pb.
2. a = small radius surface,
   b = large radius surface.

TABLE 2.10.9.31. 30 FOOT DROP - BOTTOM - ACCIDENT CONDITION

	LOCATION DESCRIPTION	STRESS (PSI) SIGMA1	SIGMA2	SIGMA3	STRESS INTENSITY Pm	Pm+Pb
	BOTTOM FORGING, CENTER					
1	CAVITY SURFACE	.518E+03	-.675E+03	.546E+03	.122E+04	.122E+04
2	OUTSIDE SURFACE	.173E+03	-.101E+04	.168E+03	.118E+04	.118E+04
	BOTTOM FORGING, MID-SECTION					
3	CAVITY SURFACE	.425E+03	-.108E+04	.374E+03	.151E+04	.151E+04
4	OUTSIDE SURFACE	.133E+03	-.119E+04	.126E+03	.133E+04	.133E+04
	BOTTOM FORGING, CORNER					
5	BOTTOM SURFACE	-.106E+03	-.266E+04	-.247E+03	.256E+04	.256E+04
6	OUTER SURFACE	-.244E+02	-.316E+04	-.344E+03	.313E+04	.313E+04
	CASK WALL SHELLS					
7a	INNER SHELL	-.288E+04	-.177E+05	-.848E+04	.810E+04	.148E+05
		.355E+04	.218E+04	-.323E+03	.810E+04	.388E+04
8a	OUTER SHELL	.116E+05	.505E+04	.891E+04	.900E+04	.654E+04
		-.535E+04	-.168E+05	-.304E+04	.900E+04	.138E+05
9a	INNER SHELL	-.200E+02	-.534E+04	-.117E+05	.108E+05	.116E+05
		-.775E+03	-.509E+04	-.108E+05	.108E+05	.100E+05
10a	OUTER SHELL	-.421E+03	-.112E+04	.177E+05	.181E+05	.188E+05
		-.106E+03	-.830E+03	.166E+05	.181E+05	.175E+05
11a	INNER SHELL	-.826E+01	-.479E+04	-.549E+04	.511E+04	.548E+04
		-.373E+03	-.481E+04	-.512E+04	.511E+04	.475E+04
12a	OUTER SHELL	-.251E+03	-.637E+03	.913E+04	.937E+04	.977E+04
		-.458E+02	-.317E+03	.866E+04	.937E+04	.898E+04
13a	INNER SHELL	-.599E+01	-.484E+04	-.628E+03	.438E+04	.483E+04
		-.233E+02	-.396E+04	-.327E+03	.438E+04	.394E+04
14a	OUTER SHELL	.692E+03	.977E+02	.189E+04	.185E+04	.180E+04
		-.204E+03	-.595E+03	.130E+04	.185E+04	.190E+04
15a	INNER SHELL	.365E+02	-.304E+04	-.798E+03	.392E+04	.308E+04
		-.376E+03	-.513E+04	-.146E+04	.392E+04	.476E+04
16a	OUTER SHELL	.978E+03	.616E+02	.499E+03	.536E+03	.916E+03
		-.771E+02	-.234E+03	.741E+02	.536E+03	.308E+03
	TOP FORGING					
17	INNER SURFACE	.292E+03	-.146E+03	.108E+03	.438E+03	.438E+03
18	OUTER SURFACE	.502E+02	-.402E+02	.674E+02	.108E+03	.108E+03
19	TOP OUTER EL.	.128E+01	-.137E+02	.464E+02	.601E+02	.601E+02
20	TOP INNER EL.	.108E+01	-.158E+02	.490E+02	.648E+02	.648E+02
	LID, CENTER					
21	TOP FLANGE, TOP EL.	.424E+02	-.848E+03	-.850E+03	.892E+03	.892E+03
22	TOP FLANGE, BTM EL.	.708E+03	-.512E+02	.701E+03	.759E+03	.759E+03
23	BOTTOM FLANGE EL.	.575E+03	-.142E+03	.410E+03	.717E+03	.717E+03
	LID, INNER LOWER CORNER					
24	CYL. SHELL	.149E+04	-.138E+03	.447E+03	.163E+04	.163E+04
25	BTM FLANGE	.119E+04	-.531E+03	.484E+03	.172E+04	.172E+04
	LID, UPPER FLANGE (SEAL AREA)					
26	TOP EL.	.520E+03	-.366E+02	.170E+03	.556E+03	.556E+03
27	BTM EL.	.232E+03	-.136E+03	.660E+02	.368E+03	.368E+03

NOTES:
1. Stresses at locations 1 thru 6 and 17 thru 27 are given at the centroid of the element, therefore, the same stress value is used for Pm and Pm+Pb.
2. a = small radius surface,
   b = large radius surface.

TABLE 2.10.9.31A. 30 FOOT DROP - BOTTOM - ACCIDENT CONDITION

	LOCATION DESCRIPTION	STRESS (PSI) SIGMA1	SIGMA2	SIGMA3	STRESS INTENSITY Pm	Pm+Pb
	BOTTOM FORGING, CENTER					
1	CAVITY SURFACE	.673E+03	-.877E+03	.709E+03	.159E+04	.159E+04
2	OUTSIDE SURFACE	.213E+03	-.131E+04	.207E+03	.153E+04	.153E+04
	BOTTOM FORGING, MID-SECTION					
3	CAVITY SURFACE	.550E+03	-.141E+04	.486E+03	.196E+04	.196E+04
4	OUTSIDE SURFACE	.167E+03	-.158E+04	.150E+03	.174E+04	.174E+04
	BOTTOM FORGING, CORNER					
5	BOTTOM SURFACE	-.143E+03	-.338E+04	-.286E+03	.323E+04	.323E+04
6	OUTER SURFACE	-.338E+02	-.401E+04	-.412E+03	.397E+04	.397E+04
	CASK WALL SHELLS					
7a	INNER SHELL	.307E+04	-.142E+05	-.236E+04	.114E+05	.173E+05
7b		-.203E+04	-.747E+04	-.101E+05	.114E+05	.809E+04
8a	OUTER SHELL	.876E+04	-.119E+05	.518E+03	.128E+05	.207E+05
8b		.710E+03	-.419E+04	.778E+04	.128E+05	.120E+05
9a	INNER SHELL	-.653E+03	-.728E+04	-.171E+05	.160E+05	.165E+05
9b		-.517E+03	-.723E+04	-.160E+05	.160E+05	.155E+05
10a	OUTER SHELL	-.275E+03	-.114E+04	.254E+05	.256E+05	.265E+05
10b		-.167E+03	-.107E+04	.236E+05	.256E+05	.247E+05
11a	INNER SHELL	-.388E+03	-.674E+04	-.943E+04	.854E+04	.904E+04
11b		-.246E+03	-.669E+04	-.829E+04	.854E+04	.805E+04
12a	OUTER SHELL	-.860E+02	-.534E+03	.145E+05	.143E+05	.151E+05
12b		-.111E+02	-.418E+03	.131E+05	.143E+05	.135E+05
13a	INNER SHELL	-.969E+02	-.622E+04	-.172E+04	.614E+04	.612E+04
13b		-.671E+01	-.617E+04	-.980E+03	.614E+04	.616E+04
14a	OUTER SHELL	.341E+03	-.146E+03	.410E+04	.362E+04	.425E+04
14b		.473E+03	-.992E+02	.289E+04	.362E+04	.298E+04
15a	INNER SHELL	-.820E+02	-.579E+04	-.139E+04	.554E+04	.571E+04
15b		-.439E+03	-.580E+04	-.205E+04	.554E+04	.537E+04
16a	OUTER SHELL	.783E+03	-.273E+03	.478E+03	.102E+04	.106E+04
16b		.106E+04	.704E+02	.296E+03	.102E+04	.988E+03
	TOP FORGING					
17	INNER SURFACE	.488E+03	-.187E+03	.233E+03	.675E+03	.675E+03
18	OUTER SURFACE	.111E+03	-.398E+02	.149E+03	.189E+03	.189E+03
19	TOP OUTER EL.	.218E+01	-.165E+02	.192E+03	.208E+03	.208E+03
20	TOP INNER EL.	.401E+01	-.246E+02	.204E+03	.229E+03	.229E+03
	LID, CENTER					
21	TOP FLANGE, TOP EL.	.630E+02	-.928E+03	-.921E+03	.991E+03	.991E+03
22	TOP FLANGE, BTM EL.	.105E+04	-.555E+02	.105E+04	.110E+04	.110E+04
23	BOTTOM FLANGE EL.	.680E+03	-.217E+03	.424E+03	.898E+03	.898E+03
	LID, INNER LOWER CORNER					
24	CYL. SHELL	.205E+04	-.202E+03	.480E+03	.225E+04	.225E+04
25	BTM FLANGE	.167E+04	-.859E+03	.541E+03	.253E+04	.253E+04
	LID, UPPER FLANGE (SEAL AREA)					
26	TOP EL.	.774E+03	-.521E+02	.369E+03	.826E+03	.826E+03
27	BTM EL.	.345E+03	-.209E+03	.177E+03	.554E+03	.554E+03

NOTES:

1. Stresses at locations 1 thru 6 and 17 thru 27 are given at the centroid of the element, therefore, the same stress value is used for Pm and Pm+Pb.
2. a = small radius surface,
   b = large radius surface.

TABLE 2.10.9.32. 30 FOOT DROP - SIDE - 0º MERIDIAN, ACCIDENT CONDITION

	LOCATION DESCRIPTION	STRESS (PSI) SIGMA1	SIGMA2	SIGMA3	STRESS INTENSITY Pm	Pm+Pb
	BOTTOM FORGING, CENTER					
1	CAVITY SURFACE	.364E+00	-.139E+03	.191E+03	.330E+03	.330E+03
2	OUTSIDE SURFACE	.170E+03	-.314E+03	-.253E+00	.484E+03	.484E+03
	BOTTOM FORGING, MID-SECTION					
3	CAVITY SURFACE	.151E+04	-.117E+05	-.158E+02	.132E+05	.132E+05
4	OUTSIDE SURFACE	.111E+04	-.298E+04	-.988E+01	.410E+04	.410E+04
	BOTTOM FORGING, CORNER					
5	BOTTOM SURFACE	.492E+03	-.178E+04	-.645E+03	.227E+04	.227E+04
6	OUTER SURFACE	.223E+03	-.196E+04	.228E+01	.218E+04	.218E+04
	CASK WALL SHELLS					
7a	INNER SHELL	-.270E+04	-.292E+04	-.165E+04	.739E+04	.127E+04
7b		.139E+04	-.129E+04	.170E+05	.739E+04	.183E+05
8a	OUTER SHELL	.738E+03	-.116E+05	-.334E+04	.461E+04	.124E+05
8b		.309E+03	-.538E+03	.377E+04	.461E+04	.431E+04
9a	INNER SHELL	-.331E+03	-.273E+03	.369E+02	.333E+04	.368E+03
9b		-.205E+04	-.529E+04	.139E+04	.333E+04	.669E+04
10a	OUTER SHELL	.296E+03	-.538E+04	-.162E+04	.749E+04	.567E+04
10b		-.438E+02	-.959E+04	-.174E+04	.749E+04	.955E+04
11a	INNER SHELL	-.810E+03	-.105E+04	.278E+03	.429E+04	.133E+04
11b		.180E+04	-.607E+04	-.228E+04	.429E+04	.787E+04
12a	OUTER SHELL	.354E+03	-.615E+04	-.165E+04	.812E+04	.650E+04
12b		-.537E+02	-.100E+05	-.174E+04	.812E+04	.996E+04
13a	INNER SHELL	.157E+04	-.577E+03	.109E+04	.195E+04	.214E+04
13b		-.234E+04	-.249E+04	.103E+04	.195E+04	.352E+04
14a	OUTER SHELL	.273E+03	-.328E+04	-.155E+04	.556E+04	.355E+04
14b		-.396E+02	-.795E+04	-.172E+04	.556E+04	.791E+04
15a	INNER SHELL	-.177E+02	-.835E+04	-.225E+04	.144E+05	.834E+04
15b		.330E+03	-.401E+04	.232E+05	.144E+05	.272E+05
16a	OUTER SHELL	-.136E+02	-.724E+04	-.313E+04	.260E+04	.723E+04
16b		.126E+04	-.657E+03	.428E+04	.260E+04	.494E+04
	TOP FORGING					
17	INNER SURFACE	.193E+02	-.249E+04	-.114E+04	.251E+04	.251E+04
18	OUTER SURFACE	.285E+01	-.199E+04	.246E+04	.445E+04	.445E+04
19	TOP OUTER EL.	.365E+03	-.177E+04	.169E+02	.214E+04	.214E+04
20	TOP INNER EL.	.286E+03	-.684E+03	-.680E+02	.970E+03	.970E+03
	LID, CENTER					
21	TOP FLANGE, TOP EL.	.334E+02	-.104E+03	.756E+01	.137E+03	.137E+03
22	TOP FLANGE, BTM EL.	.657E+02	-.124E+02	.247E+03	.259E+03	.259E+03
23	BOTTOM FLANGE EL.	.765E+02	-.382E+02	.198E+02	.115E+03	.115E+03
	LID, INNER LOWER CORNER					
24	CYL. SHELL	.701E+03	-.171E+04	.330E+02	.241E+04	.241E+04
25	BTM FLANGE	.359E+03	-.134E+05	-.417E+03	.138E+05	.138E+05
	LID, UPPER FLANGE (SEAL AREA)					
26	TOP EL.	.214E+03	-.563E+04	-.128E+03	.585E+04	.585E+04
27	BTM EL.	.483E+03	-.557E+04	-.523E+03	.605E+04	.605E+04

NOTES:
1. Stresses at locations 1 thru 6 and 17 thru 27 are given at
the centroid of the element, therefore, the same stress value
18 . used for Pm and Pm+Pb.
2. a - small radius surface,
b = large radius surface.

TABLE 2.10.9.32A. 30 FOOT DROP - SIDE - 0º MERIDIAN, ACCIDENT CONDITION

LOCATION	DESCRIPTION	STRESS (PSI) SIGMA1	SIGMA2	SIGMA3	STRESS INTENSITY Pm	Pm+Pb
	BOTTOM FORGING, CENTER					
1	CAVITY SURFACE	.473E+00	-.180E+03	.249E+03	.429E+03	.429E+03
2	OUTSIDE SURFACE	.221E+03	-.408E+03	-.329E+00	.629E+03	.629E+03
	BOTTOM FORGING, MID-SECTION					
3	CAVITY SURFACE	.196E+04	-.152E+05	-.206E+02	.172E+05	.172E+05
4	OUTSIDE SURFACE	.145E+04	-.388E+04	-.129E+02	.533E+04	.533E+04
	BOTTOM FORGING, CORNER					
5	BOTTOM SURFACE	.639E+03	-.232E+04	-.838E+03	.296E+04	.296E+04
6	OUTER SURFACE	.290E+03	-.255E+04	.296E+01	.284E+04	.284E+04
	CASK WALL SHELLS					
7a	INNER SHELL	-.352E+04	-.380E+04	-.214E+04	.961E+04	.165E+04
7b		.180E+04	-.167E+04	.222E+05	.961E+04	.238E+05
8a	OUTER SHELL	.959E+03	-.151E+05	-.434E+04	.600E+04	.161E+05
8b		.402E+03	-.698E+03	.490E+04	.600E+04	.560E+04
9a	INNER SHELL	-.430E+03	-.354E+03	.480E+02	.432E+04	.478E+03
9b		-.267E+04	-.688E+04	.181E+04	.432E+04	.869E+04
10a	OUTER SHELL	.385E+03	-.699E+04	-.211E+04	.973E+04	.737E+04
10b		-.569E+02	-.125E+05	-.227E+04	.973E+04	.124E+05
11a	INNER SHELL	-.105E+04	-.136E+04	.362E+03	.558E+04	.172E+04
11b		.234E+04	-.789E+04	-.297E+04	.558E+04	.102E+05
12a	OUTER SHELL	.460E+03	-.800E+04	-.215E+04	.106E+05	.846E+04
12b		-.698E+02	-.130E+05	-.226E+04	.106E+05	.129E+05
13a	INNER SHELL	.204E+04	-.750E+03	.141E+04	.253E+04	.279E+04
13b		-.305E+04	-.324E+04	.134E+04	.253E+04	.458E+04
14a	OUTER SHELL	.354E+03	-.426E+04	-.202E+04	.722E+04	.462E+04
14b		-.514E+02	-.103E+05	-.224E+04	.722E+04	.103E+05
15a	INNER SHELL	-.230E+02	-.109E+05	-.293E+04	.187E+05	.108E+05
15b		.428E+03	-.521E+04	.301E+05	.187E+05	.354E+05
16a	OUTER SHELL	-.178E+02	-.942E+04	-.407E+04	.338E+04	.940E+04
16b		.164E+04	-.854E+03	.557E+04	.338E+04	.642E+04
	TOP FORGING					
17	INNER SURFACE	.251E+02	-.324E+04	-.148E+04	.326E+04	.326E+04
18	OUTER SURFACE	.370E+01	-.259E+04	.320E+04	.579E+04	.579E+04
19	TOP OUTER EL.	.474E+03	-.230E+04	.220E+02	.278E+04	.278E+04
20	TOP INNER EL.	.372E+03	-.889E+03	-.884E+02	.126E+04	.126E+04
	LID, CENTER					
21	TOP FLANGE, TOP EL.	.434E+02	-.135E+03	.983E+01	.178E+03	.178E+03
22	TOP FLANGE, BTM EL.	.854E+02	-.161E+02	.321E+03	.337E+03	.337E+03
23	BOTTOM FLANGE EL.	.995E+02	-.497E+02	.257E+02	.149E+03	.149E+03
	LID, INNER LOWER CORNER					
24	CYL. SHELL	.911E+03	-.222E+04	.429E+02	.313E+04	.313E+04
25	BTM FLANGE	.466E+03	-.174E+05	-.542E+03	.179E+05	.179E+05
	LID, UPPER FLANGE (SEAL AREA)					
26	TOP EL.	.278E+03	-.732E+04	-.167E+03	.760E+04	.760E+04
27	BTM EL.	.628E+03	-.724E+04	-.680E+03	.787E+04	.787E+04

NOTES:
1. Stresses at locations 1 thru 6 and 17 thru 27 are given at the centroid of the element, therefore, the same stress value is used for Pm and Pm+Pb.
2. a = small radius surface,
   b = large radius surface.

TABLE 2.10.9.33. 30 FOOT DROP - SIDE - 45º MERIDIAN, ACCIDENT CONDITION

	LOCATION DESCRIPTION	STRESS (PSI) SIGMA1	SIGMA2	SIGMA3	STRESS INTENSITY Pm	Pm+Pb
	BOTTOM FORGING, CENTER					
1	CAVITY SURFACE	.232E+03	-.684E+02	.104E+03	.301E+03	.301E+03
2	OUTSIDE SURFACE	-.135E+03	-.348E+03	.131E+03	.478E+03	.478E+03
	BOTTOM FORGING, MID-SECTION					
3	CAVITY SURFACE	.172E+04	-.501E+04	-.980E+01	.673E+04	.673E+04
4	OUTSIDE SURFACE	-.107E+02	-.116E+04	.181E+04	.297E+04	.297E+04
	BOTTOM FORGING, CORNER					
5	BOTTOM SURFACE	.206E+02	-.229E+03	.392E+03	.621E+03	.621E+03
6	OUTER SURFACE	.116E+02	.171E+03	.586E+03	.757E+03	.757E+03
	CASK WALL SHELLS					
7a	INNER SHELL	-.188E+03	-.674E+04	.802E+04	.121E+05	.148E+05
7b		.138E+03	-.124E+03	.977E+04	.121E+05	.990E+04
8a	OUTER SHELL	.468E+04	-.549E+04	-.155E+04	.638E+04	.102E+05
8b		-.136E+04	-.337E+03	.521E+04	.638E+04	.657E+04
9a	INNER SHELL	.270E+02	-.294E+04	.892E+04	.753E+04	.119E+05
9b		-.425E+03	-.238E+04	.108E+04	.753E+04	.346E+04
10a	OUTER SHELL	.265E+02	-.574E+04	-.406E+03	.746E+04	.576E+04
10b		-.138E+03	-.947E+04	-.850E+03	.746E+04	.933E+04
11a	INNER SHELL	.375E+02	-.303E+04	.105E+05	.848E+04	.135E+05
11b		-.490E+03	-.222E+04	.130E+04	.848E+04	.352E+04
12a	OUTER SHELL	-.284E+02	-.503E+04	-.179E+04	.750E+04	.500E+04
12b		-.127E+03	-.102E+05	-.149E+04	.750E+04	.101E+05
13a	INNER SHELL	.169E+02	-.333E+04	.927E+04	.929E+04	.126E+05
13b		-.343E+03	-.372E+04	.264E+04	.929E+04	.635E+04
14a	OUTER SHELL	.177E+04	-.689E+04	-.452E+02	.912E+04	.866E+04
14b		.220E+03	-.961E+04	-.130E+03	.912E+04	.983E+04
15a	INNER SHELL	-.240E+04	-.512E+04	.805E+04	.128E+05	.132E+05
15b		.147E+04	-.143E+04	.124E+05	.128E+05	.138E+05
16a	OUTER SHELL	-.281E+03	-.565E+04	.452E+04	.804E+04	.102E+05
16b		-.103E+03	-.877E+03	.509E+04	.804E+04	.597E+04
	TOP FORGING					
17	INNER SURFACE	-.392E+03	-.642E+03	.238E+04	.302E+04	.302E+04
18	OUTER SURFACE	.488E+03	-.175E+03	.120E+04	.138E+04	.138E+04
19	TOP OUTER EL.	.787E+02	-.399E+03	-.717E+02	.478E+03	.478E+03
20	TOP INNER EL.	-.740E+02	-.111E+03	.416E+03	.527E+03	.527E+03
	LID, CENTER					
21	TOP FLANGE, TOP EL.	.401E+02	-.711E+02	.174E+02	.111E+03	.111E+03
22	TOP FLANGE, BTM EL.	.543E+02	.109E+02	.154E+03	.143E+03	.143E+03
23	BOTTOM FLANGE EL.	.502E+02	-.326E+01	.132E+03	.136E+03	.136E+03
	LID, INNER LOWER CORNER					
24	CYL. SHELL	-.542E+03	-.106E+04	.870E+03	.193E+04	.193E+04
25	BTM FLANGE	-.202E+04	-.375E+04	-.471E+02	.370E+04	.370E+04
	LID, UPPER FLANGE (SEAL AREA)					
26	TOP EL.	-.155E+02	-.177E+04	-.294E+03	.175E+04	.175E+04
27	BTM EL.	-.138E+03	-.189E+04	-.354E+03	.175E+04	.175E+04

NOTES:
1. Stresses at locations 1 thru 6 and 17 thru 27 are given at the centroid of the element, therefore, the same stress value is used for Pm and Pm+Pb.
2. a = small radius surface,
   b = large radius surface.

TABLE 2.10.9.33A. 30 FOOT DROP - SIDE - 45º MERIDIAN, ACCIDENT CONDITION

LOCATION	DESCRIPTION	STRESS (PSI) SIGMA1	SIGMA2	SIGMA3	STRESS INTENSITY Pm	Pm+Pb
	BOTTOM FORGING, CENTER					
1	CAVITY SURFACE	.302E+03	-.889E+02	.136E+03	.391E+03	.391E+03
2	OUTSIDE SURFACE	-.175E+03	-.452E+03	.170E+03	.622E+03	.622E+03
	BOTTOM FORGING, MID-SECTION					
3	CAVITY SURFACE	.223E+04	-.651E+04	-.127E+02	.874E+04	.874E+04
4	OUTSIDE SURFACE	-.139E+02	-.151E+04	.236E+04	.387E+04	.387E+04
	BOTTOM FORGING, CORNER					
5	BOTTOM SURFACE	.268E+02	-.297E+03	.510E+03	.807E+03	.807E+03
6	OUTER SURFACE	.150E+02	-.222E+03	.762E+03	.984E+03	.984E+03
	CASK WALL SHELLS					
7a	INNER SHELL	-.244E+03	-.877E+04	.104E+05	.158E+05	.192E+05
7b		.179E+03	-.161E+03	.127E+05	.158E+05	.129E+05
8a	OUTER SHELL	.608E+04	-.713E+04	-.201E+04	.329E+04	.132E+05
8b		-.177E+04	-.438E+03	.677E+04	.829E+04	.854E+04
9a	INNER SHELL	.351E+02	-.383E+04	.116E+05	.979E+04	.154E+05
9b		-.553E+03	-.310E+04	.141E+04	.979E+04	.450E+04
10a	OUTER SHELL	.344E+02	-.746E+04	-.527E+03	.970E+04	.749E+04
10b		-.180E+03	-.123E+05	-.110E+04	.970E+04	.121E+05
11a	INNER SHELL	.488E+02	-.394E+04	.137E+05	.110E+05	.176E+05
11b		-.637E+03	-.289E+04	.169E+04	.110E+05	.458E+04
12a	OUTER SHELL	-.370E+02	-.654E+04	-.232E+04	.976E+04	.650E+04
12b		-.166E+03	-.132E+05	-.194E+04	.976E+04	.131E+05
13a	INNER SHELL	.219E+02	-.432E+04	.120E+05	.121E+05	.164E+05
13b		-.446E+03	-.483E+04	.343E+04	.121E+05	.826E+04
14a	OUTER SHELL	.230E+04	-.896E+04	-.589E+02	.118E+05	.113E+05
14b		.286E+03	-.125E+05	-.169E+03	.118E+05	.128E+05
15a	INNER SHELL	-.311E+04	-.666E+04	.105E+05	.167E+05	.171E+05
15b		.191E+04	-.185E+04	.161E+05	.167E+05	.179E+05
16a	OUTER SHELL	-.365E+03	-.735E+04	.587E+04	.104E+05	.132E+05
16b		-.134E+03	-.114E+04	.662E+04	.104E+05	.776E+04
	TOP FORGING					
17	INNER SURFACE	-.510E+03	-.835E+03	.309E+04	.392E+04	.392E+04
18	OUTER SURFACE	.634E+03	-.227E+03	.156E+04	.179E+04	.179E+04
19	TOP OUTER EL.	.102E+03	-.519E+03	-.934E+02	.621E+03	.621E+03
20	TOP INNER EL.	-.963E+02	-.144E+03	.541E+03	.685E+03	.685E+03
	LID, CENTER					
21	TOP FLANGE, TOP EL.	.522E+02	-.924E+02	.226E+02	.145E+03	.145E+03
22	TOP FLANGE, BTM EL.	.706E+02	.141E+02	.200E+03	.186E+03	.186E+03
23	BOTTOM FLANGE EL.	.652E+02	-.425E+01	.172E+03	.176E+03	.176E+03
	LID, INNER LOWER CORNER					
CYL. SHELL		-.705E+03	-.138E+04	.113E+04	.251E+04	.251E+04
BTM FLANGE		-.263E+04	-.487E+04	-.612E+02	.481E+04	.481E+04
	LID, UPPER FLANGE (SEAL AREA)					
26	TOP EL.	-.201E+02	-.230E+04	-.383E+03	.228E+04	.228E+04
27	BTM EL.	-.180E+03	-.246E+04	-.461E+03	.228E+04	.228E+04

NOTES:
1. Stresses at locations 1 thru 6 and 17 thru 27 are given at the centroid of the element, therefore, the same stress value is used for Pm and Pm+Pb.
2. a = small radius surface,
   b = large radius surface.

TABLE 2.10.9.34. 30 FOOT DROP - SIDE - 90º MERIDIAN, ACCIDENT CONDITION

	LOCATION DESCRIPTION	STRESS (PSI) SIGMA1	SIGMA2	SIGMA3	STRESS INTENSITY Pm	Pm+Pb
	BOTTOM FORGING, CENTER					
1	CAVITY SURFACE	.217E+03	-.139E+03	.669E+02	.356E+03	.356E+03
2	OUTSIDE SURFACE	-.109E+03	-.279E+03	.213E+03	.492E+03	.492E+03
	BOTTOM FORGING, MID-SECTION					
3	CAVITY SURFACE	-.505E+00	-.812E+03	.241E+04	.322E+04	.322E+04
4	OUTSIDE SURFACE	.964E+02	-.174E+03	.155E+04	.173E+04	.173E+04
	BOTTOM FORGING, CORNER					
5	BOTTOM SURFACE	.117E+02	-.739E+02	.255E+04	.262E+04	.262E+04
6	OUTER SURFACE	.321E+01	-.837E+02	.249E+04	.257E+04	.257E+04
	CASK WALL SHELLS					
7a	INNER SHELL	-.165E+04	-.306E+04	.566E+04	.853E+04	.871E+04
7b		.541E+04	-.690E+04	-.187E+04	.853E+04	.123E+05
8a	OUTER SHELL	.406E+03	-.688E+03	.605E+04	.580E+04	.674E+04
8b		-.551E+02	-.225E+04	.371E+04	.580E+04	.597E+04
9a	INNER SHELL	.852E+03	-.703E+04	.393E+02	.743E+04	.789E+04
9b		.306E+04	-.395E+04	-.313E+03	.743E+04	.701E+04
10a	OUTER SHELL	-.178E+03	-.296E+04	.319E+04	.603E+04	.615E+04
10b		-.863E+02	-.113E+04	.480E+04	.603E+04	.593E+04
11a	INNER SHELL	.772E+03	-.681E+04	.208E+02	.696E+04	.758E+04
11b		.303E+04	-.337E+04	-.359E+03	.696E+04	.640E+04
12a	OUTER SHELL	-.180E+03	-.237E+04	.280E+04	.494E+04	.516E+04
12b		-.861E+02	-.290E+03	.443E+04	.494E+04	.472E+04
13a	INNER SHELL	.116E+04	-.773E+04	.493E+02	.859E+04	.889E+04
13b		.323E+04	-.509E+04	-.290E+03	.859E+04	.833E+04
14a	OUTER SHELL	-.171E+03	-.382E+04	.348E+04	.724E+04	.730E+04
14b		-.838E+02	-.226E+04	.492E+04	.724E+04	.718E+04
15a	INNER SHELL	.441E+04	-.442E+04	.121E+04	.107E+05	.883E+04
15b		.514E+04	-.814E+04	-.240E+03	.107E+05	.133E+05
16a	OUTER SHELL	.258E+03	-.998E+03	.537E+04	.656E+04	.637E+04
16b		-.230E+03	-.271E+04	.452E+04	.656E+04	.723E+04
	TOP FORGING					
17	INNER SURFACE	.598E+01	-.144E+03	.150E+04	.164E+04	.164E+04
18	OUTER SURFACE	-.588E+02	-.173E+03	.278E+04	.296E+04	.296E+04
19	TOP OUTER EL.	.109E+02	-.717E+02	.237E+04	.244E+04	.244E+04
20	TOP INNER EL.	-.211E-01	-.234E+02	.204E+04	.206E+04	.206E+04
	LID, CENTER					
21	TOP FLANGE, TOP EL.	.217E+02	-.578E+02	.142E+02	.796E+02	.796E+02
22	TOP FLANGE, BTM EL.	.469E+02	-.499E+01	.109E+03	.114E+03	.114E+03
23	BOTTOM FLANGE EL.	.288E+02	-.264E+02	.915E+02	.118E+03	.118E+03
	LID, INNER LOWER CORNER					
24	CYL. SHELL	.135E+03	-.824E+03	-.528E+02	.959E+03	.959E+03
25	BTM FLANGE	.233E+04	-.217E+04	.103E+03	.450E+04	.450E+04
	LID, UPPER FLANGE (SEAL AREA)					
26	TOP EL.	-.173E+02	-.245E+03	.226E+03	.470E+03	.470E+03
27	BTM EL.	.464E+02	-.250E+03	-.240E+02	.297E+03	.297E+03

NOTES:
1. Stresses at locations 1 thru 6 and 17 thru 27 are given at the centroid of the element, therefore, the same stress value is used for Pm and Pm+Pb.
2. a = small radius surface,
   b = large radius surface.

TABLE 2.10.9.34A. 30 FOOT DROP - SIDE - 90º MERIDIAN, ACCIDENT CONDITION

LOCATION	DESCRIPTION	STRESS (PSI) SIGMA1	SIGMA2	SIGMA3	STRESS INTENSITY Pm	Pm+Pb
	BOTTOM FORGING, CENTER					
1	CAVITY SURFACE	.282E+03	-.181E+03	.869E+02	.463E+03	.463E+03
2	OUTSIDE SURFACE	-.142E+03	-.363E+03	.277E+03	.639E+03	.639E+03
	BOTTOM FORGING, MID-SECTION					
3	CAVITY SURFACE	-.656E+00	-.106E+04	.313E+04	.418E+04	.418E+04
4	OUTSIDE SURFACE	.125E+03	-.226E+03	.202E+04	.224E+04	.224E+04
	BOTTOM FORGING, CORNER					
5	BOTTOM SURFACE	.152E+02	-.961E+02	.331E+04	.341E+04	.341E+04
6	OUTER SURFACE	.419E+01	-.109E+03	.323E+04	.334E+04	.334E+04
	CASK WALL SHELLS					
7a	INNER SHELL	-.214E+04	-.398E+04	.735E+04	.111E+05	.113E+05
7b		.703E+04	-.898E+04	-.243E+04	.111E+05	.160E+05
8a	OUTER SHELL	.528E+03	-.894E+03	.786E+04	.754E+04	.876E+04
8b		-.717E+02	-.293E+04	.483E+04	.754E+04	.776E+04
9a	INNER SHELL	.111E+04	-.914E+04	.512E+02	.965E+04	.103E+05
9b		.398E+04	-.513E+04	-.407E+03	.965E+04	.911E+04
10a	OUTER SHELL	-.231E+03	-.385E+04	.415E+04	.784E+04	.799E+04
10b		-.112E+03	-.147E+04	.624E+04	.784E+04	.770E+04
11a	INNER SHELL	.100E+04	-.885E+04	.271E+02	.905E+04	.985E+04
11b		.394E+04	-.438E+04	-.467E+03	.905E+04	.832E+04
12a	OUTER SHELL	-.234E+03	-.307E+04	.364E+04	.642E+04	.671E+04
12b		-.112E+03	-.376E+03	.576E+04	.642E+04	.613E+04
13a	INNER SHELL	.151E+04	-.100E+05	.642E+02	.112E+05	.116E+05
13b		.420E+04	-.662E+04	-.377E+03	.112E+05	.108E+05
14a	OUTER SHELL	-.222E+03	-.497E+04	.452E+04	.941E+04	.949E+04
14b		-.109E+03	-.293E+04	.640E+04	.941E+04	.933E+04
15a	INNER SHELL	.573E+04	-.574E+04	.157E+04	.139E+05	.115E+05
15b		.668E+04	-.106E+05	-.312E+03	.139E+05	.173E+05
16a	OUTER SHELL	.336E+03	-.130E+04	.698E+04	.853E+04	.828E+04
16b		-.298E+03	-.352E+04	.588E+04	.853E+04	.940E+04
	TOP FORGING					
17	INNER SURFACE	.783E+01	-.187E+03	.195E+04	.214E+04	.214E+04
18	OUTER SURFACE	-.764E+02	-.225E+03	.362E+04	.384E+04	.384E+04
19	TOP OUTER EL.	.142E+02	-.932E+02	.308E+04	.317E+04	.317E+04
20	TOP INNER EL.	-.252E-01	-.304E+02	.265E+04	.268E+04	.268E+04
	LID, CENTER					
21	TOP FLANGE, TOP EL.	.283E+02	-.752E+02	.184E+02	.103E+03	.103E+03
22	TOP FLANGE, BTM EL.	.609E+02	-.649E+01	.141E+03	.148E+03	.148E+03
23	BOTTOM FLANGE EL.	.375E+02	-.343E+02	.119E+03	.153E+03	.153E+03
	LID, INNER LOWER CORNER					
24	CYL. SHELL	.175E+03	-.107E+04	-.685E+02	.125E+04	.125E+04
25	BTM FLANGE	.302E+04	-.282E+04	.134E+03	.585E+04	.585E+04
	LID, UPPER FLANGE (SEAL AREA)					
26	TOP EL.	-.225E+02	-.318E+03	.293E+03	.611E+03	.611E+03
27	BTM EL.	.605E+02	-.325E+03	-.311E+02	.386E+03	.386E+03

NOTES:
1. Stresses at locations 1 thru 6 and 17 thru 27 are given at the centroid of the element, therefore, the same stress value is used for Pm and Pm+Pb.
2. a = small radius surface,
   b = large radius surface.

TABLE 2.10.9.35. 30 FOOT DROP - SIDE - 135° MERIDIAN, ACCIDENT CONDITION

	LOCATION DESCRIPTION	STRESS (PSI) SIGMA1	SIGMA2	SIGMA3	STRESS INTENSITY Pm	Pm+Pb
	BOTTOM FORGING, CENTER					
1	CAVITY SURFACE	-.124E+03	-.162E+03	.740E+02	.236E+03	.236E+03
2	OUTSIDE SURFACE	.248E+03	-.154E+03	.152E+03	.401E+03	.401E+03
	BOTTOM FORGING, MID-SECTION					
3	CAVITY SURFACE	.430E+01	-.134E+04	.384E+04	.518E+04	.518E+04
4	OUTSIDE SURFACE	.357E+02	-.142E+03	.226E+04	.240E+04	.240E+04
	BOTTOM FORGING, CORNER					
5	BOTTOM SURFACE	.223E+03	-.544E+01	.206E+04	.207E+04	.207E+04
6	OUTER SURFACE	.141E+03	.854E+02	.181E+04	.189E+04	.189E+04
	CASK WALL SHELLS					
7a	INNER SHELL	.189E+04	-.159E+04	.814E+03	.314E+04	.348E+04
7b		.998E+03	-.298E+04	-.645E+03	.314E+04	.398E+04
8a	OUTER SHELL	.225E+04	-.547E+03	.177E+04	.322E+04	.280E+04
8b		-.489E+03	-.159E+04	.224E+04	.322E+04	.383E+04
9a	INNER SHELL	.192E+04	-.610E+04	.154E+03	.679E+04	.801E+04
9b		.236E+04	-.325E+04	.155E+03	.679E+04	.561E+04
10a	OUTER SHELL	.479E+03	.121E+03	.220E+04	.261E+04	.208E+04
10b		.128E+04	.102E+03	.330E+04	.261E+04	.320E+04
11a	INNER SHELL	.252E+04	-.771E+04	.157E+03	.839E+04	.102E+05
11b		.280E+04	-.377E+04	.169E+03	.839E+04	.657E+04
12a	OUTER SHELL	.663E+03	.124E+03	.269E+04	.260E+04	.257E+04
12b		.351E+04	.103E+03	.225E+04	.260E+04	.340E+04
13a	INNER SHELL	.947E+03	-.527E+04	.151E+03	.555E+04	.621E+04
13b		.177E+04	-.321E+04	.145E+03	.555E+04	.498E+04
14a	OUTER SHELL	.962E+02	.281E+02	.187E+04	.242E+04	.184E+04
14b		.351E+03	.114E+03	.322E+04	.242E+04	.311E+04
15a	INNER SHELL	.328E+04	-.179E+04	.549E+03	.451E+04	.507E+04
15b		-.498E+03	-.467E+04	.246E+04	.451E+04	.712E+04
16a	OUTER SHELL	.488E+03	-.541E+03	.281E+04	.350E+04	.335E+04
16b		-.166E+02	-.190E+04	.201E+04	.350E+04	.391E+04
	TOP FORGING					
17	INNER SURFACE	.466E+03	.255E+03	.141E+04	.116E+04	.116E+04
18	OUTER SURFACE	.156E+03	-.597E+03	.189E+04	.249E+04	.249E+04
19	TOP OUTER EL.	.136E+03	-.817E+02	.207E+04	.216E+04	.216E+04
20	TOP INNER EL.	.888E+02	-.566E+02	.224E+04	.230E+04	.230E+04
	LID, CENTER					
21	TOP FLANGE, TOP EL.	.412E+01	-.741E+02	-.128E+02	.782E+02	.782E+02
22	TOP FLANGE, BTM EL.	.865E+02	.419E+01	.759E+02	.823E+02	.823E+02
23	BOTTOM FLANGE EL.	-.197E+02	-.558E+02	.239E+02	.797E+02	.797E+02
	LID, INNER LOWER CORNER					
24	CYL. SHELL	.489E+03	-.726E+03	-.646E+02	.121E+04	.121E+04
25	BTM FLANGE	.338E+02	-.110E+04	.309E+04	.419E+04	.419E+04
	LID, UPPER FLANGE (SEAL AREA)					
26	TOP EL.	.104E+03	.166E+02	.652E+03	.636E+03	.636E+03
27	BTM EL.	.152E+03	-.125E+03	.863E+03	.989E+03	.989E+03

NOTES:
1. Stresses at locations 1 thru 6 and 17 thru 27 are given at the centroid of the element, therefore, the same stress value is used for Pm and Pm+Pb.
2. a = small radius surface,
   b = large radius surface.

TABLE 2.10.9.35A. 30 FOOT DROP - SIDE - 135º MERIDIAN, ACCIDENT CONDITION

LOCATION	DESCRIPTION	STRESS (PSI) SIGMA1	SIGMA2	SIGMA3	STRESS INTENSITY Pm	Pm+Pb
	BOTTOM FORGING, CENTER					
1	CAVITY SURFACE	-.161E+03	-.211E+03	.961E+02	.307E+03	.307E+03
	OUTSIDE SURFACE	.322E+03	-.200E+03	.197E+03	.522E+03	.522E+03
	BOTTOM FORGING, MID-SECTION					
3	CAVITY SURFACE	.560E+01	-.174E+04	.499E+04	.673E+04	.673E+04
4	OUTSIDE SURFACE	.464E+02	-.184E+03	.294E+04	.312E+04	.312E+04
	BOTTOM FORGING, CORNER					
5	BOTTOM SURFACE	.289E+03	-.706E+01	.268E+04	.269E+04	.269E+04
6	OUTER SURFACE	.183E+03	-.111E+03	.235E+04	.246E+04	.246E+04
	CASK WALL SHELLS					
7a	INNER SHELL	.246E+04	-.206E+04	.106E+04	.408E+04	.452E+04
7b		.130E+04	-.387E+04	-.838E+03	.408E+04	.517E+04
8a	OUTER SHELL	.293E+04	-.712E+03	.231E+04	.419E+04	.364E+04
8b		-.636E+03	-.207E+04	.291E+04	.419E+04	.499E+04
9a	INNER SHELL	.249E+04	-.793E+04	.201E+03	.882E+04	.104E+05
9b		.307E+04	-.422E+04	.202E+03	.882E+04	.729E+04
10a	OUTER SHELL	.623E+03	.157E+03	.286E+04	.339E+04	.270E+04
10b		.167E+04	.133E+03	.429E+04	.339E+04	.416E+04
11a	INNER SHELL	.327E+04	-.100E+05	.204E+03	.109E+05	.133E+05
11b		.364E+04	-.490E+04	.220E+03	.109E+05	.853E+04
12a	OUTER SHELL	.861E+03	.161E+03	.350E+04	.339E+04	.334E+04
12b		.456E+04	.133E+03	.293E+04	.339E+04	.442E+04
13a	INNER SHELL	.123E+04	-.685E+04	.196E+03	.722E+04	.808E+04
13b		.230E+04	-.417E+04	.188E+03	.722E+04	.647E+04
14a	OUTER SHELL	.125E+03	.366E+02	.242E+04	.315E+04	.239E+04
14b		.457E+03	.147E+03	.419E+04	.315E+04	.404E+04
15a	INNER SHELL	.426E+04	-.233E+04	.714E+03	.586E+04	.659E+04
15b		-.648E+03	-.607E+04	.319E+04	.586E+04	.926E+04
16a	OUTER SHELL	.634E+03	-.703E+03	.365E+04	.455E+04	.436E+04
16b		-.216E+02	-.247E+04	.261E+04	.455E+04	.508E+04
	TOP FORGING					
17	INNER SURFACE	.605E+03	.331E+03	.183E+04	.150E+04	.150E+04
18	OUTER SURFACE	.203E+03	-.776E+03	.246E+04	.323E+04	.323E+04
19	TOP OUTER EL.	.176E+03	-.106E+03	.270E+04	.280E+04	.280E+04
20	TOP INNER EL.	.115E+03	-.736E+02	.291E+04	.298E+04	.298E+04
	LID, CENTER					
21	TOP FLANGE, TOP EL.	.536E+01	-.964E+02	-.166E+02	.102E+03	.102E+03
22	TOP FLANGE, BTM EL.	.112E+03	.545E+01	.986E+02	.107E+03	.107E+03
23	BOTTOM FLANGE EL.	-.256E+02	-.726E+02	.310E+02	.104E+03	.104E+03
	LID, INNER LOWER CORNER					
24	CYL. SHELL	.635E+03	-.944E+03	-.839E+02	.158E+04	.158E+04
25	BTM FLANGE	.439E+02	-.142E+04	.402E+04	.544E+04	.544E+04
	LID, UPPER FLANGE (SEAL AREA)					
26	TOP EL.	.135E+03	.216E+02	.848E+03	.826E+03	.826E+03
27	BTM EL.	.197E+03	-.163E+03	.112E+04	.128E+04	.128E+04

NOTES:
1. Stresses at locations 1 thru 6 and 17 thru 27 are given at the centroid of the element, therefore, the same stress value is used for Pm and Pm+Pb.
2. a = small radius surface,
   b = large radius surface.

TABLE 2.10.9.36. 30 FOOT DROP - SIDE - 180º MERIDIAN, ACCIDENT CONDITION

LOCATION	DESCRIPTION	STRESS (PSI) SIGMA1	SIGMA2	SIGMA3	STRESS INTENSITY Pm	Pm+Pb
	BOTTOM FORGING, CENTER					
1	CAVITY SURFACE	.945E+02	-.360E+03	-.486E+01	.455E+03	.455E+03
2	OUTSIDE SURFACE	.129E+01	-.136E+03	.468E+03	.603E+03	.603E+03
	BOTTOM FORGING, MID-SECTION					
3	CAVITY SURFACE	.429E+01	-.637E+03	.349E+04	.413E+04	.413E+04
4	OUTSIDE SURFACE	.343E+01	-.111E+04	.279E+04	.390E+04	.390E+04
	BOTTOM FORGING, CORNER					
5	BOTTOM SURFACE	-.324E+01	-.153E+03	.220E+03	.373E+03	.373E+03
6	OUTER SURFACE	.372E+02	-.951E+02	-.206E+02	.132E+03	.132E+03
	CASK WALL SHELLS					
7a	INNER SHELL	.122E+04	-.512E+03	.127E+04	.154E+04	.179E+04
7b		.773E+03	-.478E+03	.128E+04	.154E+04	.176E+04
8a	OUTER SHELL	-.350E+03	-.711E+03	.706E+03	.307E+03	.142E+04
8b		.654E+02	-.404E+03	.155E+03	.307E+03	.559E+03
9a	INNER SHELL	.125E+03	-.291E+02	.260E+04	.225E+04	.263E+04
9b		.690E+03	-.422E+03	.146E+04	.225E+04	.188E+04
10a	OUTER SHELL	.355E+03	-.314E+03	.117E+04	.979E+03	.148E+04
10b		-.213E+02	-.844E+02	.401E+03	.979E+03	.486E+03
11a	INNER SHELL	-.208E+03	-.379E+02	.318E+04	.235E+04	.339E+04
11b		.215E+04	-.509E+03	.310E+02	.235E+04	.266E+04
12a	OUTER SHELL	.443E+03	-.370E+03	.152E+04	.123E+04	.189E+04
12b		-.202E+02	-.832E+02	.491E+03	.123E+04	.574E+03
13a	INNER SHELL	-.319E+02	-.227E+02	.204E+04	.171E+04	.207E+04
13b		.113E+04	-.359E+03	.603E+03	.171E+04	.149E+04
14a	OUTER SHELL	.891E+03	-.272E+03	.164E+03	-.708E+03	.116E+04
14b		-.181E+03	-.860E+02	.471E+03	.708E+03	.652E+03
15a	INNER SHELL	.323E+03	-.260E+03	.242E+04	.163E+04	.268E+04
15b		.480E+02	-.969E+03	.236E+04	.163E+04	.333E+04
16a	OUTER SHELL	-.282E+03	-.245E+03	.301E+03	.476E+03	.583E+03
16b		-.917E+01	-.556E+03	-.541E+02	.476E+03	.547E+03
	TOP FORGING					
17	INNER SURFACE	.138E+03	-.305E+01	.821E+03	.824E+03	.824E+03
18	OUTER SURFACE	.238E+02	-.383E+03	-.522E+02	.407E+03	.407E+03
19	TOP OUTER EL.	.233E+02	-.120E+03	-.564E+00	.144E+03	.144E+03
20	TOP INNER EL.	.785E+02	-.797E+02	.453E+00	.158E+03	.158E+03
	LID, CENTER					
21	TOP FLANGE, TOP EL.	.473E+01	-.987E+02	-.164E+01	.103E+03	.103E+03
22	TOP FLANGE, BTM EL.	.103E+00	-.129E+02	.132E+03	.144E+03	.144E+03
23	BOTTOM FLANGE EL.	.327E+02	-.979E+02	-.148E+00	.131E+03	.131E+03
	LID, INNER LOWER CORNER					
24	CYL. SHELL	-.151E+01	-.272E+03	.507E+03	.779E+03	.779E+03
25	BTM FLANGE	-.277E+02	-.524E+02	.218E+04	.223E+04	.223E+04
	LID, UPPER FLANGE (SEAL AREA)					
26	TOP EL.	.207E+02	-.197E+02	.511E+03	.531E+03	.531E+03
27	BTM EL.	.176E+03	-.533E+02	.766E+03	.819E+03	.819E+03

NOTES:
1. Stresses at locations 1 thru 6 and 17 thru 27 are given at the centroid of the element, therefore, the same stress value is used for Pm and Pm+Pb.
2. a = small radius surface,
   b = large radius surface.

TABLE 2.10.9.36A. 30 FOOT DROP - SIDE - 180º MERIDIAN, ACCIDENT CONDITION

	LOCATION DESCRIPTION	STRESS (PSI) SIGMA1	SIGMA2	SIGMA3	STRESS INTENSITY Pm	Pm+Pb
	BOTTOM FORGING, CENTER					
1	CAVITY SURFACE	.123E+03	-.468E+03	-.632E+01	.591E+03	.591E+03
2	OUTSIDE SURFACE	.168E+01	-.177E+03	.608E+03	.784E+03	.784E+03
	BOTTOM FORGING, MID-SECTION					
3	CAVITY SURFACE	.557E+01	-.828E+03	.454E+04	.536E+04	.536E+04
4	OUTSIDE SURFACE	.446E+01	-.145E+04	.363E+04	.507E+04	.507E+04
	BOTTOM FORGING, CORNER					
5	BOTTOM SURFACE	-.421E+01	-.199E+03	.286E+03	.484E+03	.484E+03
6	OUTER SURFACE	.483E+02	-.124E+03	-.268E+02	.172E+03	.172E+03
	CASK WALL SHELLS					
7a	INNER SHELL	.158E+04	-.665E+03	.166E+04	.200E+04	.232E+04
7b		.100E+04	-.621E+03	.167E+04	.200E+04	.229E+04
8a	OUTER SHELL	-.455E+03	-.923E+03	.918E+03	.400E+03	.184E+04
8b		.850E+02	-.526E+03	.201E+03	.400E+03	.727E+03
9a	INNER SHELL	.162E+03	-.378E+02	.338E+04	.293E+04	.342E+04
9b		.897E+03	-.548E+03	.190E+04	.293E+04	.245E+04
10a	OUTER SHELL	.461E+03	-.408E+03	.152E+04	.127E+04	.193E+04
10b		-.277E+02	-.110E+03	.522E+03	.127E+04	.632E+03
11a	INNER SHELL	-.271E+03	-.492E+02	.414E+04	.306E+04	.441E+04
11b		.280E+04	-.661E+03	.400E+02	.306E+04	.346E+04
12a	OUTER SHELL	.576E+03	-.480E+03	.197E+04	.159E+04	.245E+04
12b		-.262E+02	-.108E+03	.638E+03	.159E+04	.746E+03
13a	INNER SHELL	-.417E+02	-.294E+02	.266E+04	.222E+04	.270E+04
13b		.147E+04	-.467E+03	.783E+03	.222E+04	.194E+04
14a	OUTER SHELL	.116E+04	-.353E+03	.213E+03	.920E+03	.151E+04
14b		-.236E+03	-.112E+03	.613E+03	.920E+03	.848E+03
15a	INNER SHELL	.420E+03	-.339E+03	.315E+04	.212E+04	.348E+04
15b		.624E+02	-.126E+04	.306E+04	.212E+04	.432E+04
16a	OUTER SHELL	-.366E+03	-.318E+03	.391E+03	.619E+03	.758E+03
16b		-.120E+02	-.723E+03	-.704E+02	.619E+03	.711E+03
	TOP FORGING					
17	INNER SURFACE	.179E+03	-.397E+01	.107E+04	.107E+04	.107E+04
18	OUTER SURFACE	.310E+02	-.498E+03	-.679E+02	.529E+03	.529E+03
19	TOP OUTER EL.	.303E+02	-.156E+03	-.730E+00	.187E+03	.187E+03
20	TOP INNER EL.	.102E+03	-.104E+03	.588E+00	.206E+03	.206E+03
	LID, CENTER					
21	TOP FLANGE, TOP EL.	.615E+01	-.128E+03	-.213E+01	.134E+03	.134E+03
22	TOP FLANGE, BTM EL.	.141E+00	-.167E+02	.171E+03	.188E+03	.188E+03
23	BOTTOM FLANGE EL.	.425E+02	-.127E+03	-.192E+00	.170E+03	.170E+03
	LID, INNER LOWER CORNER					
24	CYL. SHELL	-.196E+01	-.354E+03	.659E+03	.101E+04	.101E+04
25	BTM FLANGE	-.361E+02	-.681E+02	.283E+04	.290E+04	.290E+04
	LID, UPPER FLANGE (SEAL AREA)					
26	TOP EL.	.269E+02	-.255E+02	.664E+03	.690E+03	.690E+03
27	BTM EL.	.229E+03	-.693E+02	.995E+03	.106E+04	.106E+04

NOTES:
1. Stresses at locations 1 thru 6 and 17 thru 27 are given at the centroid of the element, therefore, the same stress value is used for Pm. and Pm+Pb.
2. a = small radius surface,
   b = large radius surface.

TABLE 2.10.9.37. 30 FOOT DROP - THRU CG - 0º MERIDIAN, ACCIDENT CONDITION

	LOCATION DESCRIPTION	STRESS (PSI) SIGMA1	SIGMA2	SIGMA3	STRESS INTENSITY Pm	Pm+Pb
	BOTTOM FORGING, CENTER					
1	CAVITY SURFACE	.154E+01	-.749E+01	.713E+00	.903E+01	.903E+01
2	OUTSIDE SURFACE	.764E+01	-.251E-02	.278E+02	.278E+02	.278E+02
	BOTTOM FORGING, MID-SECTION					
3	CAVITY SURFACE	.307E+02	-.824E+03	-.312E+01	.855E+03	.855E+03
4	OUTSIDE SURFACE	.335E+02	-.953E+03	-.512E+02	.986E+03	.986E+03
	BOTTOM FORGING, CORNER					
5	BOTTOM SURFACE	-.316E+03	-.351E+03	.262E+01	.353E+03	.353E+03
6	OUTER SURFACE	-.284E+03	-.385E+03	.339E+00	.385E+03	.385E+03
	CASK WALL SHELLS					
7a	INNER SHELL	.931E+02	-.130E+04	-.739E+03	.584E+03	.139E+04
7b		.885E+02	-.147E+02	.165E+04	.584E+03	.166E+04
-8a	OUTER SHELL	.951E+02	-.351E+04	-.333E+03	.180E+04	.360E+04
8b		.804E+02	-.332E+03	-.187E+03	.180E+04	.412E+03
9a	INNER SHELL	-.210E+01	-.101E+04	-.104E+03	.146E+04	.101E+04
9b		.184E+03	-.174E+04	-.275E+03	.146E+04	.192E+04
10a	OUTER SHELL	.368E+02	-.230E+04	-.239E+03	.258E+04	.233E+04
10b		-.543E+01	-.286E+04	-.261E+03	.258E+04	.285E+04
11a	INNER SHELL	-.164E+01	-.130E+04	-.104E+03	.175E+04	.129E+04
11b		.214E+03	-.201E+04	-.286E+03	.175E+04	.222E+04
12a	OUTER SHELL	.459E+02	-.258E+04	-.242E+03	.286E+04	.263E+04
12b		-.697E+01	-.312E+04	-.260E+03	.286E+04	.311E+04
13a	INNER SHELL	-.214E+01	-.996E+03	-.105E+03	.137E+04	.994E+03
13b		.182E+03	-.157E+04	-.278E+03	.137E+04	.175E+04
14a	OUTER SHELL	.358E+02	-.239E+04	-.241E+03	.261E+04	.243E+04
14b		-.517E+01	-.282E+04	-.261E+03	.261E+04	.282E+04
15a	INNER SHELL	-.139E+03	-.195E+04	-.354E+03	.217E+04	.181E+04
15b		.749E+03	-.247E+04	.134E+04	.217E+04	.381E+04
16a	OUTER SHELL	.610E+03	-.113E+04	-.259E+03	.204E+04	.174E+04
16b		-.156E+03	-.312E+04	-.261E+03	.204E+04	.296E+04
	TOP FORGING					
17	INNER SURFACE	.207E+02	-.701E+02	.242E+04	.249E+04	.249E+04
18	OUTER SURFACE	.954E+00	-.346E+04	-.288E+03	.346E+04	.346E+04
19	TOP OUTER EL.	.278E+03	-.557E+04	-.393E+01	.585E+04	.585E+04
20	TOP INNER EL.	.430E+03	-.300E+04	-.290E+01	.343E+04	.343E+04
	LID, CENTER					
21	TOP FLANGE, TOP EL.	-.105E+00	-.279E+02	.989E+02	.127E+03	.127E+03
22	TOP FLANGE, BTM EL.	.264E+00	-.233E+03	-.452E+02	.233E+03	.233E+03
23	BOTTOM FLANGE EL.	.465E+00	-.290E+03	-.560E+02	.290E+03	.290E+03
	LID, INNER LOWER CORNER					
24	CYL. SHELL	.890E+00	-.331E+04	-.637E+03	.331E+04	.331E+04
25	BTM FLANGE	.217E+02	-.515E+04	-.592E+03	.517E+04	.517E+04
	LID, UPPER FLANGE (SEAL AREA)					
26	TOP EL.	.274E+02	-.235E+02	.103E+04	.105E+04	.105E+04
27	BTM EL.	.391E+03	-.502E+03	.477E+02	.893E+03	.893E+03

NOTES:
1. Stresses at locations 1 thru 6 and 17 thru 27 are given at the centroid of the element, therefore, the same stress value is used for Pm and Pm+Pb.
2. a = small radius surface, b = large radius surface.

TABLE 2.10.9.37A. 30 FOOT DROP - THRU CG - 0º MERIDIAN, ACCIDENT CONDITION

	LOCATION DESCRIPTION	STRESS (PSI) SIGMA1	SIGMA2	SIGMA3	STRESS INTENSITY Pm	Pm+Pb
	BOTTOM FORGING, CENTER					
1	CAVITY SURFACE	.249E+01	-.121E+02	.116E+01	.146E+02	.146E+02
2	OUTSIDE SURFACE	.124E+02	-.407E-02	.450E+02	.450E+02	.450E+02
	BOTTOM FORGING, MID-SECTION					
3	CAVITY SURFACE	.498E+02	-.134E+04	-.506E+01	.138E+04	.138E+04
4	OUTSIDE SURFACE	.544E+02	-.154E+04	-.829E+02	.160E+04	.160E+04
	BOTTOM FORGING, CORNER					
5	BOTTOM SURFACE	-.512E+03	-.568E+03	.424E+01	.572E+03	.572E+03
6	OUTER SURFACE	-.460E+03	-.623E+03	.549E+00	.623E+03	.623E+03
	CASK WALL SHELLS					
7a	INNER SHELL	.151E+03	-.210E+04	-.120E+04	.946E+03	.225E+04
7b		.143E+03	-.238E+02	.267E+04	.946E+03	.269E+04
8a	OUTER SHELL	.154E+03	-.568E+04	-.539E+03	.291E+04	.583E+04
8b		.130E+03	-.537E+03	-.304E+03	.291E+04	.668E+03
9a	INNER SHELL	-.340E+01	-.164E+04	-.169E+03	.237E+04	.163E+04
9b		.298E+03	-.282E+04	-.446E+03	.237E+04	.312E+04
10a	OUTER SHELL	.596E+02	-.372E+04	-.386E+03	.419E+04	.378E+04
10b		-.879E+01	-.463E+04	-.423E+03	.419E+04	.462E+04
11a	INNER SHELL	-.267E+01	-.210E+04	-.168E+03	.284E+04	.210E+04
11b		.347E+03	-.325E+04	-.464E+03	.284E+04	.360E+04
12a	OUTER SHELL	.744E+02	-.419E+04	-.392E+03	.463E+04	.426E+04
12b		-.113E+02	-.505E+04	-.421E+03	.463E+04	.504E+04
13a	INNER SHELL	-.345E+01	-.162E+04	-.170E+03	.222E+04	.161E+04
13b		.295E+03	-.254E+04	-.450E+03	.222E+04	.284E+04
14a	OUTER SHELL	.580E+02	-.388E+04	-.390E+03	.423E+04	.393E+04
14b		-.837E+01	-.457E+04	-.423E+03	.423E+04	.456E+04
15a	INNER SHELL	-.225E+03	-.316E+04	-.574E+03	.351E+04	.294E+04
15b		.121E+04	-.400E+04	.217E+04	.251E+04	.617E+04
16a	OUTER SHELL	.987E+03	-.184E+04	-.419E+03	.331E+04	.282E+04
16b		-.253E+03	-.505E+04	-.423E+03	.331E+04	.480E+04
	TOP FORGING					
17	INNER SURFACE	.335E+02	-.114E+03	.392E+04	.403E+04	.403E+04
18	OUTER SURFACE	.155E+01	-.561E+04	-.467E+03	.561E+04	.561E+04
19	TOP OUTER EL.	.451E+03	-.902E+04	-.636E+01	.947E+04	.947E+04
20	TOP INNER EL.	.696E+03	-.486E+04	-.470E+01	.555E+04	.555E+04
	LID, CENTER					
21	TOP FLANGE, TOP EL.	-.170E+00	-.451E+02	.160E+03	.205E+03	-.205E+03
22	TOP FLANGE, BTM EL.	.428E+00	-.377E+03	-.732E+02	.377E+03	.377E+03
23	BOTTOM FLANGE EL.	.753E+00	-.470E+03	-.907E+02	.470E+03	.470E+03
	LID, INNER LOWER CORNER					
24	CYL. SHELL	.144E+01	-.536E+04	-.103E+04	.536E+04	.536E+04
25	BTM FLANGE	.351E+02	-.834E+04	-.959E+03	.837E+04	.837E+04
	LID, UPPER FLANGE (SEAL AREA)					
26	TOP EL.	.444E+02	-.381E+02	.167E+04	.171E+04	.171E+04
27	BTM EL.	.634E+03	-.813E+03	.773E+02	.145E+04	.145E+04

NOTES:

1. Stresses at locations 1 thru 6 and 17 thru 27 are given at the centroid of the element, therefore, the same stress value is used for Pm and Pm+Pb.
2. a = small radius surface,
   b = large radius surface.

TABLE 2.10.9.38. 30 FOOT DROP - THRU CG - 45º MERIDIAN, ACCIDENT CONDITION

	LOCATION DESCRIPTION	STRESS (PSI) SIGMA1	SIGMA2	SIGMA3	STRESS INTENSITY Pm	Pm+Pb
	BOTTOM FORGING, CENTER					
1	CAVITY SURFACE	.313E+01	-.444E+01	.100E+01	.757E+01	.757E+01
2	OUTSIDE SURFACE	.744E+01	-.945E+00	.231E+02	.240E+02	.240E+02
	BOTTOM FORGING, MID-SECTION					
3	CAVITY SURFACE	.503E+03	-.531E+03	-.534E+00	.103E+04	.103E+04
4	OUTSIDE SURFACE	.412E+03	-.657E+03	-.685E+01	.107E+04	.107E+04
	BOTTOM FORGING, CORNER					
5	BOTTOM SURFACE	.250E+03	-.695E+03	-.588E+02	.944E+03	.944E+03
6	OUTER SURFACE	.240E+03	-.836E+03	-.266E+02	.108E+04	.108E+04
	CASK WALL SHELLS					
7a	INNER SHELL	.152E+04	-.193E+04	-.620E+03	.268E+04	.346E+04
7b		-.497E+03	-.111E+04	.188E+04	.268E+04	.299E+04
8a	OUTER SHELL	.312E+03	-.269E+04	-.189E+03	.237E+04	.301E+04
8b		.573E+03	-.144E+04	-.417E+02	.237E+04	.201E+04
9a	INNER SHELL	.114E+04	-.158E+04	-.846E+01	.210E+04	.272E+04
9b		.529E+02	-.143E+04	-.733E+02	.210E+04	.149E+04
10a	OUTER SHELL	-.726E+01	-.218E+04	-.489E+03	.213E+04	.217E+04
10b		-.184E+02	-.211E+04	-.113E+04	.213E+04	.209E+04
11a	INNER SHELL	.140E+04	-.163E+04	-.945E+01	.232E+04	.303E+04
11b		.134E+03	-.150E+04	-.732E+02	.232E+04	.163E+04
12a	OUTER SHELL	.453E+03	-.211E+04	-.115E+04	.206E+04	.256E+04
12b		-.174E+04	-.204E+04	.288E+03	.206E+04	.233E+04
13a	INNER SHELL	.112E+04	-.169E+04	-.101E+02	.210E+04	.281E+04
13b		.685E+02	-.134E+04	-.678E+02	.210E+04	.141E+04
14a	OUTER SHELL	-.758E+01	-.226E+04	-.470E+03	.211E+04	.225E+04
14b		-.184E+02	-.198E+04	-.110E+04	.211E+04	.197E+04
15a	INNER SHELL	.261E+03	-.164E+04	.480E+03	.297E+04	.212E+04
15b		.551E+03	-.262E+04	.661E+03	.297E+04	.328E+04
16a	OUTER SHELL	.102E+03	-.789E+03	.112E+04	.239E+04	.190E+04
16b		.348E+03	-.372E+04	-.322E+03	.239E+04	.406E+04
	TOP FORGING					
17	INNER SURFACE	.311E+03	.197E+03	.254E+04	.234E+04	.234E+04
18	OUTER SURFACE	.139E+03	-.375E+04	-.281E+02	.389E+04	.389E+04
19	TOP OUTER EL.	.459E+03	-.557E+04	-.691E+02	.603E+04	.603E+04
20	TOP INNER EL.	.481E+03	-.299E+04	.187E+02	.347E+04	.347E+04
	LID, CENTER					
21	TOP FLANGE, TOP EL.	.440E+01	-.284E+02	.102E+03	.130E+03	.130E+03
22	TOP FLANGE, BTM EL.	.223E+01	-.244E+03	-.477E+02	.247E+03	.247E+03
23	BOTTOM FLANGE EL.	.185E+02	-.290E+03	-.569E+02	.308E+03	.308E+03
	LID, INNER LOWER CORNER					
24	CYL. SHELL	-.774E+02	-.323E+04	-.608E+03	.315E+04	.315E+04
25	BTM FLANGE	-.290E+03	-.388E+04	-.459E+03	.359E+04	.359E+04
	LID, UPPER FLANGE (SEAL AREA)					
26	TOP EL.	.410E+02	-.201E+03	.169E+04	.189E+04	.189E+04
27	BTM EL.	-.355E+02	-.219E+03	.656E+03	.874E+03	.874E+03

NOTES:
1. Stresses at locations 1 thru 6 and 17 thru 27 are given at the centroid of the element, therefore, the same stress value is used for Pm and Pm+Pb.
2. a = small radius surface,
   b = large radius surface.

TABLE 2.10.9.38A. 30 FOOT DROP - THRU CG - 45º MERIDIAN, ACCIDENT CONDITION

	LOCATION DESCRIPTION	STRESS (PSI) SIGMA1	SIGMA2	SIGMA3	STRESS INTENSITY Pm	Pm+Pb
	BOTTOM FORGING, CENTER					
1	CAVITY SURFACE	.507E+01	-.720E+01	.162E+01	.123E+02	.123E+02
2	OUTSIDE SURFACE	.121E+02	-.153E+01	.374E+02	.389E+02	.389E+02
	BOTTOM FORGING, MID-SECTION					
3	CAVITY SURFACE	.815E+03	-.860E+03	-.865E+00	.167E+04	.167E+04
4	OUTSIDE SURFACE	.668E+03	-.107E+04	-.111E+02	.173E+04	.173E+04
	BOTTOM FORGING, CORNER					
5	BOTTOM SURFACE	.404E+03	-.113E+04	-.952E+02	.153E+04	.153E+04
6	OUTER SURFACE	.390E+03	-.136E+04	-.431E+02	.174E+04	.174E+04
	CASK WALL SHELLS					
7a	INNER SHELL	.247E+04	-.313E+04	-.101E+04	.433E+04	.560E+04
7b		-.804E+03	-.180E+04	.305E+04	.433E+04	.485E+04
8a	OUTER SHELL	.505E+03	-.436E+04	-.307E+03	.384E+04	.487E+04
8b		.928E+03	-.233E+04	-.675E+02	.384E+04	.326E+04
9a	INNER SHELL	.185E+04	-.256E+04	-.137E+02	.339E+04	.440E+04
9b		.857E+02	-.232E+04	-.119E+03	.339E+04	.241E+04
10a	OUTER SHELL	-.117E+02	-.353E+04	-.793E+03	.345E+04	.352E+04
10b		-.297E+02	-.341E+04	-.182E+04	.345E+04	.338E+04
11a	INNER SHELL	.228E+04	-.263E+04	-.153E+02	.377E+04	.491E+04
11b		.218E+03	-.242E+04	-.119E+03	.377E+04	.264E+04
12a	OUTER SHELL	.734E+03	-.342E+04	-.187E+04	.334E+04	.415E+04
12b		-.282E+04	-.330E+04	.467E+03	.334E+04	.377E+04
13a	INNER SHELL	.182E+04	-.274E+04	-.164E+02	.341E+04	.456E+04
13b		.111E+03	-.217E+04	-.110E+03	.341E+04	.228E+04
14a	OUTER SHELL	-.123E+02	-.366E+04	-.762E+03	.341E+04	.365E+04
14b		-.297E+02	-.321E+04	-.178E+04	.341E+04	.318E+04
15a	INNER SHELL	.422E+03	-.266E+04	.778E+03	.481E+04	.344E+04
15b		.892E+03	-.425E+04	.107E+04	.481E+04	.532E+04
16a	OUTER SHELL	.166E+03	-.128E+04	.181E+04	.387E+04	.309E+04
16b		.564E+03	-.602E+04	-.522E+03	.387E+04	.659E+04
	TOP FORGING					
17	INNER SURFACE	.504E+03	.319E+03	.411E+04	.379E+04	.379E+04
18	OUTER SURFACE	.225E+03	-.607E+04	-.455E+02	.629E+04	.629E+04
19	TOP OUTER EL.	.744E+03	-.902E+04	-.112E+03	.976E+04	.976E+04
20	TOP INNER EL.	.779E+03	-.485E+04	.303E+02	.563E+04	.563E+04
	LID, CENTER					
21	TOP FLANGE, TOP EL.	.712E+01	-.460E+02	.165E+03	.211E+03	.211E+03
	TOP FLANGE, BTM EL.	.361E+01	-.396E+03	-.772E+02	.399E+03	.399E+03
23	BOTTOM FLANGE EL.	.299E+02	-.470E+03	-.921E+02	.500E+03	.500E+03
	LID, INNER LOWER CORNER					
24	CYL. SHELL	-.125E+03	-.523E+04	-.984E+03	.510E+04	.510E+04
25	BTM FLANGE	-.470E+03	-.629E+04	-.744E+03	.582E+04	.582E+04
	LID, UPPER FLANGE (SEAL AREA)					
26	TOP EL.	.665E+02	-.326E+03	.275E+04	.307E+04	.307E+04
27	BTM EL.	-.575E+02	-.354E+03	.106E+04	.142E+04	.142E+04

NOTES:
1. Stresses at locations 1 thru 6 and 17 thru 27 are given at the centroid of the element, therefore, the same stress value is used for Pm and Pm+Pb.
2. a = small radius surface,
   b = large radius surface.

TABLE 2.10.9.39. 30 FOOT DROP - THRU CG - 90º MERIDIAN, ACCIDENT CONDITION

	LOCATION DESCRIPTION	STRESS (PSI) SIGMA1	SIGMA2	SIGMA3	STRESS INTENSITY Pm	Pm+Pb
	BOTTOM FORGING, CENTER					
1	CAVITY SURFACE	.195E+01	-.443E+01	.792E+00	.639E+01	.639E+01
2	OUTSIDE SURFACE	.138E+02	.181E+01	.879E+01	.120E+02	.120E+02
	BOTTOM FORGING, MID-SECTION					
3	CAVITY SURFACE	.304E+01	-.537E+03	.958E+03	.149E+04	.149E+04
4	OUTSIDE SURFACE	.528E+02	.611E+03	.841E+03	.145E+04	.145E+04
	BOTTOM FORGING, CORNER					
5	BOTTOM SURFACE	.355E+03	-.992E+03	-.270E+02	.135E+04	.135E+04
6	OUTER SURFACE	.384E+03	-.120E+04	-.130E+02	.159E+04	.159E+04
	CASK WALL SHELLS					
7a	INNER SHELL	.484E+03	-.148E+04	-.230E+03	.246E+04	.196E+04
7b		.666E+03	-.269E+04	-.110E+03	.246E+04	.335E+04
8a	OUTER SHELL	.443E+03	-.217E+04	-.250E+03	.251E+04	.262E+04
8b		.579E+03	-.224E+04	-.988E+02	.251E+04	.282E+04
9a	INNER SHELL	-.100E+02	-.153E+04	-.689E+03	.137E+04	.152E+04
9b		-.348E+02	-.125E+04	-.275E+03	.137E+04	.121E+04
10a	OUTER SHELL	-.172E+03	-.189E+04	-.386E+02	.172E+04	.185E+04
10b		.536E+03	-.145E+04	-.720E+03	.172E+04	.198E+04
11a	INNER SHELL	-.964E+03	-.118E+04	-.120E+02	.997E+03	.116E+04
11b		-.460E+03	-.884E+03	-.476E+02	.997E+03	.837E+03
12a	OUTER SHELL	-.289E+02	-.161E+04	-.331E+03	.148E+04	.158E+04
12b		-.122E+02	-.139E+04	-.331E+02	.148E+04	.138E+04
13a	INNER SHELL	-.111E+02	-.169E+04	-.630E+03	.143E+04	.168E+04
13b		-.304E+02	-.122E+04	-.188E+03	.143E+04	.119E+04
14a	OUTER SHELL	-.160E+03	-.195E+04	-.458E+02	.168E+04	.190E+04
14b		.500E+03	-.130E+04	-.672E+03	.168E+04	.180E+04
15a	INNER SHELL	.671E+03	-.123E+04	-.282E+03	.243E+04	.190E+04
15b		.410E+03	-.347E+04	-.495E+03	.243E+04	.388E+04
16a	OUTER SHELL	.241E+03	-.301E+03	.125E+04	.236E+04	.155E+04
16b		.409E+03	-.411E+04	-.349E+03	.236E+04	.452E+04
	TOP FORGING					
17	INNER SURFACE	.259E+03	.167E+03	.259E+04	.242E+04	.242E+04
18	OUTER SURFACE	.338E+03	-.383E+04	-.149E+02	.416E+04	.416E+04
19	TOP OUTER EL.	.466E+03	-.557E+04	.297E+03	.603E+04	.603E+04
20	TOP INNER EL.	.486E+03	-.299E+04	.249E+03	.348E+04	.348E+04
	LID, CENTER					
21	TOP FLANGE, TOP EL.	.152E+01	-.297E+02	.105E+03	.135E+03	.135E+03
22	TOP FLANGE, BTM EL.	.884E+01	-.257E+03	-.513E+02	.265E+03	.265E+03
23	BOTTOM FLANGE EL.	.102E+02	-.291E+03	-.598E+02	.301E+03	.301E+03
	LID, INNER LOWER CORNER					
24	CYL. SHELL	-.104E+03	-.319E+04	-.611E+03	.309E+04	.309E+04
25	BTM FLANGE	-.277E+03	-.317E+04	-.347E+03	.289E+04	.289E+04
	LID, UPPER FLANGE (SEAL AREA)					
26	TOP EL.	.458E+02	.356E+02	.173E+04	.170E+04	.170E+04
27	BTM EL.	.117E+02	-.340E+02	.721E+03	.754E+03	.754E+03

NOTES:
1. Stresses at locations 1 thru 6 and 17 thru 27 are given at the centroid of the element, therefore, the same stress value is used for Pm and Pm+Pb.
2. a = small radius surface,
   b = large radius surface.

TABLE 2.10.9.39A. 30 FOOT DROP - THRU CG - 90º MERIDIAN, ACCIDENT CONDITION

LOCATION	DESCRIPTION	STRESS (PSI) SIGMA1	SIGMA2	SIGMA3	STRESS INTENSITY Pm	Pm+Pb
	BOTTOM FORGING, CENTER					
1	CAVITY SURFACE	.317E+01	-.718E+01	.128E+01	.103E+02	.103E+02
	OUTSIDE SURFACE	.223E+02	.293E+01	.142E+02	.194E+02	.194E+02
	BOTTOM FORGING, MID-SECTION					
3	CAVITY SURFACE	.492E+01	-.869E+03	.155E+04	.242E+04	.242E+04
4	OUTSIDE SURFACE	.856E+02	-.990E+03	.136E+04	.235E+04	.235E+04
	BOTTOM FORGING, CORNER					
5	BOTTOM SURFACE	.575E+03	-.161E+04	-.437E+02	.218E+04	.218E+04
6	OUTER SURFACE	.622E+03	-.195E+04	-.210E+02	.257E+04	.257E+04
	CASK WALL SHELLS					
7a	INNER SHELL	.784E+03	-.239E+04	-.373E+03	.398E+04	.317E+04
		.108E+04	-.436E+04	-.177E+03	.398E+04	.543E+04
8a	OUTER SHELL	.718E+03	-.352E+04	-.406E+03	.407E+04	.424E+04
8b		.937E+03	-.363E+04	-.160E+03	.407E+04	.457E+04
9a	INNER SHELL	-.163E+02	-.248E+04	-.112E+04	.221E+04	.247E+04
9b		-.564E+02	-.202E+04	-.446E+03	.221E+04	.197E+04
10a	OUTER SHELL	-.278E+03	-.305E+04	-.625E+02	.279E+04	.299E+04
10b		.868E+03	-.234E+04	-.117E+04	.279E+04	.321E+04
11a	INNER SHELL	-.156E+04	-.191E+04	-.194E+02	.161E+04	.189E+04
11b		-.745E+03	-.143E+04	-.771E+02	.161E+04	.136E+04
12a	OUTER SHELL	-.467E+02	-.261E+04	-.536E+03	.240E+04	.257E+04
12b		-.198E+02	-.226E+04	-.535E+02	.240E+04	.224E+04
13a	INNER SHELL	-.179E+02	-.274E+04	-.102E+04	.232E+04	.272E+04
13b		-.493E+02	-.197E+04	-.304E+03	.232E+04	.192E+04
14a	OUTER SHELL	-.259E+03	-.316E+04	-.741E+02	.272E+04	.309E+04
14b		.810E+03	-.211E+04	-.109E+04	.272E+04	.292E+04
15a	INNER SHELL	.109E+04	-.199E+04	-.457E+03	.394E+04	.308E+04
15b		.664E+03	-.563E+04	-.801E+03	.394E+04	.629E+04
16a	OUTER SHELL	.391E+03	-.487E+03	.202E+04	.382E+04	.251E+04
16b		.663E+03	-.666E+04	-.566E+03	.382E+04	.732E+04
	TOP FORGING					
17	INNER SURFACE	.419E+03	.271E+03	.419E+04	.392E+04	.392E+04
18	OUTER SURFACE	.548E+03	-.620E+04	-.241E+02	.675E+04	.675E+04
19	TOP OUTER EL.	.754E+03	-.902E+04	.481E+03	.978E+04	.978E+04
20	TOP INNER EL.	.787E+03	-.485E+04	.403E+03	.563E+04	.563E+04
	LID, CENTER					
21	TOP FLANGE, TOP EL.	.247E+01	-.481E+02	.170E+03	.219E+03	.219E+03
22	TOP FLANGE, BTM EL.	.143E+02	-.416E+03	-.831E+02	.430E+03	.430E+03
23	BOTTOM FLANGE EL.	.165E+02	-.471E+03	-.969E+02	.488E+03	.488E+03
	LID, INNER LOWER CORNER					
24	CYL. SHELL	-.169E+03	-.517E+04	-.989E+03	.500E+04	.500E+04
25	BTM FLANGE	-.448E+03	-.513E+04	-.562E+03	.468E+04	.468E+04
	LID, UPPER FLANGE (SEAL AREA)					
26	TOP EL.	.742E+02	.576E+02	.281E+04	.275E+04	.275E+04
27	BTM EL.	.190E+02	-.550E+02	.117E+04	.122E+04	.122E+04

NOTES:
1. Stresses at locations 1 thru 6 and 17 thru 27 are given at the centroid of the element, therefore, the same stress value is used for Pm and Pm+Pb.
2. a = small radius surface,
   b = large radius surface.

TABLE 2.10.9.40. 30 FOOT DROP - THRU CG - 135º MERIDIAN, ACCIDENT CONDITION

LOCATION	DESCRIPTION	STRESS (PSI) SIGMA1	SIGMA2	SIGMA3	STRESS INTENSITY Pm	Pm+Pb
	BOTTOM FORGING, CENTER					
1	CAVITY SURFACE	.865E+00	-.594E+01	-.243E+01	.681E+01	.681E+01
2	OUTSIDE SURFACE	.719E+01	.637E+00	.148E+02	.142E+02	.142E+02
	BOTTOM FORGING, MID-SECTION					
3	CAVITY SURFACE	.417E+01	-.623E+03	.113E+04	.176E+04	.176E+04
4	OUTSIDE SURFACE	.773E+02	-.672E+03	.107E+04	.174E+04	.174E+04
	BOTTOM FORGING, CORNER					
5	BOTTOM SURFACE	.193E+03	-.915E+03	.176E+01	.111E+04	.111E+04
6	OUTER SURFACE	.191E+03	.113E+04	.165E+02	.132E+04	.132E+04
	CASK WALL SHELLS					
7a	INNER SHELL	.213E+03	-.968E+03	-.248E+03	.147E+04	.118E+04
7b		.144E+03	-.210E+04	-.123E+03	.147E+04	.224E+04
8a	OUTER SHELL	.333E+03	-.218E+04	-.234E+03	.216E+04	.251E+04
8b		.258E+03	-.204E+04	-.112E+03	.216E+04	.230E+04
9a	INNER SHELL	-.926E+03	-.111E+04	.182E+03	.112E+04	.129E+04
9b		.273E+03	-.109E+04	-.631E+03	.112E+04	.137E+04
10a	OUTER SHELL	.782E+02	-.179E+04	.140E+02	.194E+04	.187E+04
10b		.262E+03	-.175E+04	.149E+02	.194E+04	.201E+04
11a.	INNER SHELL	-.101E+04	-.987E+03	.725E+01	.985E+03	.101E+04
11b		-.495E+03	-.956E+03	.248E+02	.985E+03	.981E+03
12a	OUTER SHELL	.118E+03	-.169E+04	.142E+02	.192E+04	.181E+04
12b		.383E+03	-.165E+04	.149E+02	.192E+04	.203E+04
13a	INNER SHELL	-.449E+03	-.129E+04	-.257E+03	.117E+04	.104E+04
13b		.144E+03	-.102E+04	-.472E+03	.117E+04	.116E+04
14a	OUTER SHELL	.599E+02	-.192E+04	.142E+02	.192E+04	.198E+04
14b		.235E+03	-.163E+04	.147E+02	.192E+04	.186E+04
15a	INNER SHELL	.555E+03	-.106E+04	-.243E+03	.164E+04	.162E+04
15b		-.157E+03	-.284E+04	-.431E+03	.164E+04	.269E+04
16a	OUTER SHELL	-.341E+02	-.514E+03	.141E+04	.228E+04	.192E+04
16b		.830E+03	-.382E+04	-.125E+04	.228E+04	.465E+04
	TOP FORGING					
17	INNER SURFACE	.298E+03	.169E+03	.265E+04	.248E+04	.248E+04
18	OUTER SURFACE	.217E+03	-.388E+04	.133E+02	.410E+04	.410E+04
19	TOP OUTER EL.	.483E+03	-.557E+04	.262E+03	.605E+04	.605E+04
20	TOP INNER EL.	.491E+03	-.299E+04	.285E+03	.348E+04	.348E+04
	LID, CENTER					
21	TOP FLANGE, TOP EL.	-.205E+01	-.309E+02	.102E+03	.133E+03	.133E+03
22	TOP FLANGE, BTM EL.	.991E+01	-.252E+03	-.531E+02	.262E+03	.262E+03
23	BOTTOM FLANGE EL.	-.290E+01	-.296E+03	-.627E+02	.293E+03	.293E+03
	LID, INNER LOWER CORNER					
24	CYL. SHELL	-.807E+02	-.318E+04	-.575E+03	.310E+04	.310E+04
25	BTM FLANGE	-.148E+03	-.307E+04	-.338E+03	.293E+04	.293E+04
	LID, UPPER FLANGE (SEAL AREA)					
26	TOP EL.	.481E+02	.245E+02	.183E+04	.181E+04	.181E+04
27	BTM EL.	.391E+02	-.108E+02	.809E+03	.820E+03	.820E+03

NOTES:
1. Stresses at locations 1 thru 6 and 17 thru 27 are given at the centroid of the element, therefore, the same stress value is used for Pm and Pm+Pb.
2. a = small radius surface,
   b = large radius surface.

TABLE 2.10.9.40A. 30 FOOT DROP - THRU CG - 135º MERIDIAN, ACCIDENT CONDITION

LOCATION	DESCRIPTION	STRESS (PSI) SIGMA1	SIGMA2	SIGMA3	STRESS INTENSITY Pm	Pm+Pb
	BOTTOM FORGING, CENTER					
1	CAVITY SURFACE	.140E+01	-.963E+01	-.394E+01	.110E+02	.110E+02
2	OUTSIDE SURFACE	.117E+02	.103E+01	.240E+02	.230E+02	.230E+02
	BOTTOM FORGING, HID-SECTION					
3	CAVITY SURFACE	.676E+01	-.101E+04	.184E+04	.284E+04	.284E+04
4	OUTSIDE SURFACE	.125E+03	-.109E+04	.173E+04	.282E+04	.282E+04
	BOTTOM FORGING, CORNER					
5	BOTTOM SURFACE	.312E+03	-.148E+04	.285E+01	.180E+04	.180E+04
6	OUTER SURFACE	.309E+03	-.182E+04	.268E+02	.213E+04	.213E+04
	CASK WALL SHELLS					
7a	INNER SHELL	.346E+03	-.157E+04	-.402E+03	.239E+04	.191E+04
7b		.234E+03	-.340E+04	-.200E+03	.239E+04	.364E+04
8a	OUTER SHELL	.540E+03	-.353E+04	-.379E+03	.350E+04	.407E+04
8b		.417E+03	-.331E+04	-.182E+03	.350E+04	.373E+04
9a	INNER SHELL	-.150E+04	-.180E+04	.295E+03	.181E+04	.209E+04
9b		.443E+03	-.177E+04	-.102E+04	.181E+04	.222E+04
10a	OUTER SHELL	.127E+03	-.290E+04	.227E+02	.314E+04	.302E+04
10b		.425E+03	-.283E+04	.241E+02	.314E+04	.326E+04
11a	INNER SHELL	-.163E+04	-.160E+04	.117E+02	.160E+04	.164E+04
11b		-.802E+03	-.155E+04	.401E+02	.160E+04	.159E+04
12a	OUTER SHELL	.191E+03	-.274E+04	.230E+02	.311E+04	.293E+04
12b		.621E+03	-.267E+04	.241E+02	.311E+04	.329E+04
13a	INNER SHELL	-.728E+03	-.209E+04	-.416E+03	.189E+04	.168E+04
13b		.234E+03	-.165E+04	-.765E+03	.189E+04	.189E+04
14a	OUTER SHELL	.971E+02	-.310E+04	.230E+02	.311E+04	.320E+04
14b		.380E+03	-.264E+04	.239E+02	.311E+04	.302E+04
15a	INNER SHELL	.900E+03	-.172E+04	-.394E+03	.265E+04	.262E+04
15b		-.254E+02	-.461E+04	-.698E+03	.265E+04	.435E+04
16a	OUTER SHELL	-.553E+02	-.833E+03	.229E+04	.370E+04	.312E+04
16b		.135E+04	-.619E+04	-.202E+04	.370E+04	.753E+04
	TOP FORGING					
17	INNER SURFACE	.483E+03	.273E+03	.429E+04	.401E+04	.401E+04
18	OUTER SURFACE	.352E+03	-.629E+04	.216E+02	.664E+04	.664E+04
19	TOP OUTER EL.	.782E+03	-.902E+04	.424E+03	.980E+04	.980E+04
20	TOP INNER EL.	.795E+03	-.484E+04	.461E+03	.564E+04	.564E+04
	LID, CENTER					
21	TOP FLANGE, TOP EL.	-.332E+01	-.501E+02	.165E+03	.215E+03	.215E+03
22	TOP FLANGE, BTM EL.	.161E+02	-.409E+03	-.860E+02	.425E+03	.425E+03
223	BOTTOM FLANGE EL.	-.470E+01	-.479E+03	-.102E+03	.474E+03	.474E+03
	LID, INNER LOWER CORNER					
24	CYL. SHELL	-.131E+03	-.515E+04	-.931E+03	.502E+04	.502E+04
25	BTM FLANGE	-.239E+03	-.498E+04	-.548E+03	.474E+04	.474E+04
	LID, UPPER FLANGE (SEAL AREA)					
26	TOP EL.	.779E+02	.397E+02	.297E+04	.293E+04	.293E+04
27	BTM EL.	.633E+02	-.175E+02	.131E+04	.133E+04	.133E+04

NOTES:
1. Stresses at locations 1 thru 6 and 17 thru 27 are given at the centroid of the element, therefore, the same stress value is used for Pm and Pm+Pb.
2. a = small radius surface,
   b = large radius surface.

TABLE 2.10.9.41. 30 FOOT DROP - THRU CG - 180º MERIDIAN, ACCIDENT CONDITION

	LOCATION DESCRIPTION	STRESS (PSI) SIGMA1	SIGMA2	SIGMA3	STRESS INTENSITY Pm	Pm+Pb
	BOTTOM FORGING, CENTER					
1	CAVITY SURFACE	.104E+01	-.899E+01	.192E+00	.100E+02	.100E+02
2	OUTSIDE SURFACE	-.793E+00	-.264E+01	.203E+02	.229E+02	.229E+02
	BOTTOM FORGING, MID-SECTION					
3	CAVITY SURFACE	.440E+01	-.659E+03	.114E+04	.180E+04	.180E+04
4	OUTSIDE SURFACE	.816E+02	-.691E+03	.111E+04	.180E+04	.180E+04
	BOTTOM FORGING, CORNER					
5	BOTTOM SURFACE	.389E+02	-.824E+03	-.470E+02	.863E+03	.863E+03
6	OUTER SURFACE	.106E+02	-.102E+04	-.200E+02	.103E+04	.103E+04
	CASK WALL SHELLS					
7a	INNER SHELL	.178E+03	-.785E+03	-.189E+03	.107E+04	.964E+03
7b		.977E+02	-.148E+04	-.115E+03	.107E+04	.158E+04
8a	OUTER SHELL	.187E+03	-.231E+04	-.243E+03	.194E+04	.249E+04
8b		.113E+03	-.181E+04	-.159E+03	.194E+04	.192E+04
9a	INNER SHELL	.631E+01	-.989E+03	-.901E+01	.110E+04	.996E+03
9b		.858E+02	-.112E+04	-.509E+02	.110E+04	.121E+04
10a	OUTER SHELL	-.125E+03	-.191E+04	.188E+03	.191E+04	.210E+04
10b		.617E+03	-.170E+04	-.865E+03	.191E+04	.232E+04
11a	INNER SHELL	.917E+01	-.958E+03	-.106E+02	.112E+04	.967E+03
11b		.113E+03	-.117E+04	-.667E+02	.112E+04	.128E+04
12a	OUTER SHELL	-.111E+03	-.188E+04	.179E+03	.192E+04	.206E+04
12b		.619E+03	-.173E+04	-.868E+03	.192E+04	.235E+04
13a	INNER SHELL	.567E+01	-.118E+04	-.929E+01	.115E+04	.118E+04
13b		.830E+02	-.104E+04	-.501E+02	.115E+04	.112E+04
14a	OUTER SHELL	-.125E+03	-.208E+04	.186E+03	.196E+04	.226E+04
14b		.610E+03	-.163E+04	-.855E+03	.196E+04	.224E+04
15a	INNER SHELL	.664E+03	-.106E+04	-.282E+03	.141E+04	.173E+04
15b		-.162E+03	-.232E+04	-.338E+03	.141E+04	.216E+04
16a	OUTER SHELL	-.142E+02	-.578E+03	.103E+04	.229E+04	.161E+04
16b		.535E+02	-.402E+04	-.326E+03	.229E+04	.407E+04
	TOP FORGING					
17	INNER SURFACE	.284E+03	-.747E+00	.268E+04	.268E+04	.268E+04
18	OUTER SURFACE	.934E+03	-.352E+04	-.129E+04	.446E+04	.446E+04
19	TOP OUTER EL.	.461E+03	-.557E+04	-.536E-02	.603E+04	.603E+04
20	TOP INNER EL.	.484E+03	-.299E+04	-.609E-02	.347E+04	.347E+04
	LID, CENTER					
21	TOP FLANGE, TOP EL.	-.300E+01	-.314E+02	.987E+02	.130E+03	.130E+03
22	Top FLANGE, BTM EL.	.163E+00	-.247E+03	-.538E+02	.248E+03	.248E+03
23	BOTTOM FLANGE EL.	.258E+00	-.300E+03	-.641E+02	.300E+03	.300E+03
	LID, INNER LOWER CORNER					
24	CYL. SHELL	.179E+01	-.320E+04	.559E+03	.320E+04	.320E+04
25	BTM FLANGE	.790E+00	-.319E+04	-.370E+03	.319E+04	.319E+04
	LID, UPPER FLANGE (SEAL AREA)					
26	TOP EL.	.486E+02	-.109E+00	.180E+04	.180E+04	.180E+04
27	BTM EL.	.304E+02	-.878E+01	.800E+03	.808E+03	.808E+03

NOTES:
1. Stresses at locations 1 thru 6 and 17 thru 27 are given at the centroid of the element, therefore, the same stress value is used for Pm and Pm+Pb.
2. a = small radius surface,
   b = large radius surface.

TABLE 2.10.9.41A. 30 FOOT DROP - THRU CG - 130º MERIDIAN, ACCIDENT CONDITION

	LOCATION DESCRIPTION	STRESS (PSI) SIGMA1	SIGMA2	SIGMA3	STRESS INTENSITY Pm	Pm+Pb
	BOTTOM FORGING, CENTER					
1	CAVITY SURFACE	.169E+01	-.146E+02	.311E+00	.162E+02	.162E+02
2	OUTSIDE SURFACE	-.129E+01	-.428E+01	.328E+02	.371E+02	.371E+02
	BOTTOM FORGING, MID-SECTION					
3	CAVITY SURFACE	.713E+01	-.107E+04	.185E+04	.292E+04	.292E+04
4	OUTSIDE SURFACE	.132E+03	-.112E+04	.180E+04	.292E+04	.292E+04
	BOTTOM FORGING, CORNER					
5	BOTTOM SURFACE	.630E+02	-.133E+04	-.761E+02	.140E+04	.140E+04
6	OUTER SURFACE	.172E+02	-.165E+04	-.324E+02	.167E+04	.167E+04
	CASK WALL SHELLS					
7a	INNER SHELL	.289E+03	-.127E+04	-.306E+03	.173E+04	.156E+04
7b		.158E+03	-.240E+04	-.187E+03	.173E+04	.256E+04
8a	OUTER SHELL	.303E+03	-.374E+04	-.394E+03	.315E+04	.404E+04
8b		.183E+03	-.293E+04	-.258E+03	.315E+04	.312E+04
9a	INNER SHELL	.102E+02	-.160E+04	-.146E+02	.179E+04	.161E+04
9b		.139E+03	-.182E+04	-.824E+02	.179E+04	.196E+04
10a	OUTER SHELL	-.203E+03	-.309E+04	.304E+03	.309E+04	.339E+04
10b		.100E+04	-.276E+04	-.140E+04	.309E+04	.376E+04
11a	INNER SHELL	.148E+02	-.155E+04	-.172E+02	.182E+04	.157E+04
11b		.183E+03	-.189E+04	-.108E+03	.182E+04	.207E+04
12a	OUTER SHELL	-.180E+03	-.304E+04	.290E+03	.310E+04	.333E+04
12b		.100E+04	-.280E+04	-.141E+04	.310E+04	.380E+04
13a	INNER SHELL	.916E+01	-.190E+04	-.151E+02	.187E+04	.191E+04
13b		.134E+03	-.169E+04	-.811E+02	.187E+04	.182E+04
14a	OUTER SHELL	-.203E+03	-.337E+04	.301E+03	.317E+04	.367E+04
14b		.988E+03	-.264E+04	-.138E+04	.317E+04	.363E+04
15a	INNER SHELL	.108E+04	-.172E+04	-.457E+03	.228E+04	.280E+04
15b		-.263E+03	-.375E+04	-.548E+03	.228E+04	.349E+04
16a	OUTER SHELL	-.229E+02	-.937E+03	.168E+04	.370E+04	.261E+04
16b		.866E+02	-.651E+04	-.529E+03	.370E+04	.660E+04
	TOP FORGING					
17	INNER SURFACE	.460E+03	-.121E+01	.435E+04	.435E+04	.435E+04
12	OUTER SURFACE	.151E+04	-.570E+04	-.210E+04	.722E+04	.722E+04
19	TOP OUTER EL.	.747E+03	-.902E+04	-.876E+02	.977E+04	.977E+04
	TOP INNER EL.	.785E+03	-.484E+04	-.990E+02	.563E+04	.563E+04
	LID, CENTER					
	TOP FLANGE, TOP EL.	-.486E+01	-.508E+02	.160E+03	.211E+03	.211E+03
22	TOP FLANGE, BTM EL.	.265E+00	-.401E+03	-.872E+02	.401E+03	.401E+03
23	BOTTOM FLANGE EL.	.419E+00	-.485E+03	-.104E+03	.486E+03	.486E+03
	LID, INNER LOWER CORNER					
24	CYL. SHELL	.289E+01	-.518E+04	-.905E+03	.518E+04	.518E+04
25	BTM FLANGE	.128E+01	.517E+04	-.599E+03	.517E+04	.517E+04
	LID, UPPER FLANGE (SEAL AREA)					
26	TOP EL.	.788E+02	-.177E+00	.292E+04	.292E+04	.292E+04
27	BTM EL.	.492E+02	-.142E+02	.130E+04	.131E+04	.131E+04

NOTES:
1. Stresses at locations 1 thru 6 and 17 thru 27 are given at the centroid of the element, therefore, the same stress value is used for Pm and Pm+Pb.
2. a = small radius surface,
   b = large radius surface.

TABLE 2.10.9.42. SUMMARY OF LOAD COMBINATIONS FOR NORMAL AND HYPOTHETICAL ACCIDENT CONDITIONS OF TRANSPORT

Normal or Accident Condition	Combination Index	Applicable Initial Condition							
		Ambient Temperature °F		Insolation		Decay Heat		Max. Int. Pressure 30 psia	Max. Wt. of Contents
		100	-20	Max.	None	Max. 600 Watts	None		
NORMAL CONDITIONS									
Hot environment - 100°F ambient temp.	1	X		X		X		X	
Cold environment - -40°F ambient temp.	2a				X	X		X	
	2b				X		X	X	
Minimum external pressure - 3.5 psia	3a	X		X		X		X	
	3b		X		X	X		X	
Increased external pressure - 20 psia	4a	X		X		X		X	
	4b		X		X	X		X	
Vibration and shock - Normally incident to the mode of transport	5a	X		X		X		X	
	5b		X		X	X		X	
	5c		X		X		X	X	
Free drop - 1 foot drop	6a	X		X		X		X	X
	6b		X		X	X		X	X
	6c		X		X		X	X	X

TABLE 2.10.9.42. SUMMARY OF LOAD COMBINATIONS FOR NORMAL AND HYPOTHETICAL ACCIDENT CONDITIONS OF TRANSPORT (CONTINUED)

Normal or Accident Condition	Combination Index	Applicable Initial Condition: Ambient Temperature °F 100	-20	Insolation Max.	Insolation None	Decay Heat Max. 600 Watts	Decay Heat None	Max. Int. Pressure 30 psia	Max. Wt. of Contents
ACCIDENT CONDITIONS									
Free drop - 30 foot drop	7a	X		X		X		X	X
	7b		X		X	X		X	X
	7c		X		X		X	X	X
Puncture - Drop onto bar	8a	X		X		X		X	X
	8b		X		X	X		X	X
	8c		X		X		X	X	X
Thermal - Fire accident	9	X		X		X		X	

TABLE 2.10.9.43. SUMMARY OF STRESSES FOR LOAD COMBINATIONS, NORMAL CONDITIONS OF TRANSPORT, STRESS POINT 1

LOAD COMBINATION	COMBINATION INDEX	Q	STRESS INTENSITY CATEGORY Pm	Pm+Pb	Pm+Pb+Q	FATIGUE Salt
HOT ENVIRONMENT	1	.221E+03	.130E+02	.130E+02	.234E+03	
COLD ENVIRONMENT	2a	.498E+03	.130E+02	.130E+02	.511E+03	
COLD ENVIRONMENT	2b	.101E+03	.130E+02	.130E+02	.114E+03	
MINIMUM EXT. PRESS.	3a	.221E+03	.255E+02	.255E+02	.247E+03	
MINIMUM EXT. PRESS.	3b	.497E+03	.255E+02	.255E+02	.522E+03	
INCREASE EXT. PRESS.	4a	.221E+03	.525E+01	.525E+01	.227E+03	
INCREASE EXT. PRESS.	4b	.497E+03	.525E+01	.525E+01	.502E+03	
VIBRATION AND SHOCK	5a	.221E+03	.403E+02	.403E+02	.262E+03	.131E+03
VIBRATION AND SHOCK	5b	.497E+03	.403E+02	.403E+02	.537E+03	.268E+03
VIBRATION AND SHOCK	5c	.837E+02	.403E+02	.403E+02	.124E+03	.620E+02
FREE DROP-TOP	6a	.221E+03	.142E+02	.142E+02	.235E+03	
FREE DROP-TOP	6b	.497E+03	.142E+02	.142E+02	.511E+03	
FREE DROP-TOP	6c	.837E+02	.142E+02	.142E+02	.978E+02	
FREE DROP-SIDE, 0 MER	6a	.221E+03	.949E+02	.949E+02	.316E+03	
FREE DROP-SIDE, 0 MER	6b	.497E+03	.949E+02	.949E+02	.591E+03	
FREE DROP-SIDE, 0 MER	6c	.837E+02	.949E+02	.949E+02	.179E+03	
FREE DROP-SIDE, 45 MER	6a	.221E+03	.786E+02	.786E+02	.300E+03	
FREE DROP-SIDE, 45 MER	6b	.497E+03	.786E+02	.786E+02	.575E+03	
FREE DROP-SIDE, 45 MER	6c	.837E+02	.786E+02	.786E+02	.162E+03	
MAXIMUM STRESS INTENSITY			.949E+02	.949E+02	.591E+03	

NOTES:
1. Pm < Sm = 20.0 ksi
   Pm+Pb< 1.5*Sm = 30.0 ksi
   Pm+Pb+Q < 3.0*Sm = 60.0 ksi
2. See Table 2.10.9.42 for combination index identification.
3. For combinations with Salt not listed, the number of load cycles are few and therefore, the fatigue qualifications are met.
4. MER = Meridian, angle of orientation from the contact edge where stresses are given.
5. Stresses are given at the centroid of the element, therefore, the same stress value is used for Pm and Pm+Pb.

TABLE 2.10.9.43A. SUMMARY OF STRESSES FOR LOAD COMBINATIONS, NORMAL CONDITIONS OF TRANSPORT, STRESS POINT 1

LOAD	COMBINATION	STRESS INTENSITY CATEGORY				FATIGUE
COMBINATION	INDEX	Q	Pm	Pm+Pb	Pm+Pb+Q	Salt
HOT ENVIRONMENT	1	.221E+03	.130E+02	.130E+02	.234E+03	
COLD ENVIRONMENT	2a	.498E+03	.130E+02	.130E+02	.511E+03	
COLD ENVIRONMENT	2b	.101E+03	.130E+02	.130E+02	.114E+03	
MINIMUM EXT. PRESS.	3a	.221E+03	.255E+02	.255E+02	.247E+03	
MINIMUM EXT. PRESS.	3b	.497E+03	.255E+02	.255E+02	.522E+03	
INCREASE EXT. PRESS.	4a	.221E+03	.525E+01	.525E+01	.227E+03	
INCREASE EXT. PRESS.	4b	.497E+03	.525E+01	.525E+01	.502E+03	
VIBRATION AND SHOCK	5a	.221E+03	.403E+02	.403E+02	.262E+03	.131E+03
VIBRATION AND SHOCK	5b	.497E+03	.403E+02	.403E+02	.537E+03	.268E+03
VIBRATION AND SHOCK	5c	.837E+02	.403E+02	.403E+02	.124E+03	.620E+02
FREE DROP-TOP	6a	.221E+03	.528E+03	.528E+03	.749E+03	
FREE DROP-TOP	6b	.497E+03	.528E+03	.528E+03	.102E+04	
FREE DROP-TOP	6c	.837E+02	.528E+03	.528E+03	.611E+03	
FREE DROP-SIDE, 0 MER	6a	.221E+03	.317E+03	.317E+03	.538E+03	
FREE DROP-SIDE, 0 MER	6b	.497E+03	.317E+03	.317E+03	.813E+03	
FREE DROP-SIDE, 0 MER	6c	.837E+02	.317E+03	.317E+03	.400E+03	
FREE DROP-SIDE, 45 MER	6a	.221E+03	.256E+03	.256E+03	.478E+03	
FREE DROP-SIDE, 45 MER	6b	.497E+03	.256E+03	.256E+03	.753E+03	
FREE DROP-SIDE, 45 MER	6c	.837E+02	.256E+03	.256E+03	.340E+03	
MAXIMUM STRESS INTENSITY			.528E+03	.528E+03	.102E+04	

NOTES:
1. Pm < Sm = 20.0 ksi
   Pm+Pb< 1.5*Sm = 30.0 ksi
   Pm+Pb+Q < 3.0*Sm = 60.0 ksi
2. See Table 2.10.9.42 for combination index identification.
3. For combinations with Salt not listed, the number of load cycles are few and therefore, the fatigue qualifications are met.
4. MER = Meridian, angle of orientation from the contact edge where stresses are given.
5. Stresses are given at the centroid of the element, therefore, the same stress value is used for Pm and Pm+Pb.

TABLE 2.10.9.44. SUMMARY OF STRESSES FOR LOAD COMBINATIONS, NORMAL CONDITIONS OF TRANSPORT, STRESS POINT 2

LOAD	COMBINATION	STRESS INTENSITY CATEGORY				FATIGUE
COMBINATION	INDEX	Q	Pm	Pm+Pb	Pm+Pb+Q	Salt
HOT ENVIRONMENT	1	.484E+03	.137E+02	.137E+02	.497E+03	
COLD ENVIRONMENT	2a	.950E+02	.137E+02	.137E+02	.109E+03	
COLD ENVIRONMENT	2b	.838E+02	.137E+02	.137E+02	.976E+02	
MINIMUM EXT. PRESS.	3a	.484E+03	.288E+02	.288E+02	.513E+03	
MINIMUM EXT. PRESS.	3b	.905E+02	.288E+02	.288E+02	.119E+03	
INCREASE EXT. PRESS.	4a	.484E+03	.393E+01	.393E+01	.488E+03	
INCREASE EXT. PRESS.	4b	.905E+02	.393E+01	.393E+01	.945E+02	
VIBRATION AND SHOCK	5a	.484E+03	.511E+02	.511E+02	.535E+03	.267E+03
VIBRATION AND SHOCK	5b	.905E+02	.511E+02	.511E+02	.142E+03	.708E+02
VIBRATION AND SHOCK	5c	.716E+02	.511E+02	.511E+02	.123E+03	.613E+02
FREE DROP-TOP	6a	.484E+03	.151E+02	.151E+02	.499E+03	
FREE DROP-TOP	6b	.905E+02	.151E+02	.151E+02	.106E+03	
FREE DROP-TOP	6c	.716E+02	.151E+02	.151E+02	.867E+02	
FREE DROP-SIDE, 0 MER	6a	.484E+03	.118E+03	.118E+03	.601E+03	
FREE DROP-SIDE, 0 MER	6b	.905E+02	.118E+03	.118E+03	.208E+03	
FREE DROP-SIDE, 0 MER	6c	.716E+02	.118E+03	.118E+03	.189E+03	
FREE DROP-SIDE, 45 MER	6a	.484E+03	.110E+03	.110E+03	.593E+03	
FREE DROP-SIDE, 45 MER	6b	.905E+02	.110E+03	.110E+03	.200E+03	
FREE DROP-SIDE, 45 MER	6c	.716E+02	.110E+03	.110E+03	.181E+03	
MAXIMUM STRESS INTENSITY			.118E+03	.118E+03	.601E+03	

NOTES:
1. Pm < Sm = 20.0 ksi
   Pm+Pb< 1.5*Sm = 30.0 ksi
   Pm+Pb+Q < 3.0*Sm = 60.0 ksi
2. See Table 2.10.9.42 for combination index identification.
3. For combinations with Salt not listed, the number of load cycles are few and therefore, the fatigue qualifications are met.
4. MER = Meridian, angle of orientation from the contact edge where stresses are given.
5. Stresses are given at the centroid of the element, therefore, the same stress value is used for Pm and Pm+Pb.

TABLE 2.10.9.44A. SUMMARY OF STRESSES FOR LOAD COMBINATIONS, NORMAL CONDITIONS OF TRANSPORT, STRESS POINT 2

LOAD	COMBINATION		STRESS INTENSITY CATEGORY			FATIGUE
COMBINATION	INDEX	Q	Pm	Pm+Pb	Pm+Pb+Q	Salt
HOT ENVIRONMENT	1	.484E+03	.137E+02	.137E+02	.497E+03	
COLD ENVIRONMENT	2a	.950E+02	.137E+02	.137E+02	.109E+03	
COLD ENVIRONMENT	2b	.838E+02	.137E+02	.137E+02	.976E+02	
MINIMUM EXT. PRESS.	3a	.484E+03	.288E+02	.288E+02	.513E+03	
MINIMUM EXT. PRESS.	3b	.905E+02	.288E+02	.288E+02	.119E+03	
INCREASE EXT. PRESS.	4a	.484E+03	.393E+01	.393E+01	.488E+03	
INCREASE EXT. PRESS.	4b	.905E+02	.393E+01	.393E+01	.945E+02	
VIBRATION AND SHOCK	5a	.484E+03	.511E+02	.511E+02	.535E+03	.267E+03
VIBRATION AND SHOCK	5b	.905E+02	.511E+02	.511E+02	.142E+03	.708E+02
VIBRATION AND SHOCK	5c	.716E+02	.511E+02	.511E+02	.123E+03	.613E+02
FREE DROP-TOP	6a	.484E+03	.513E+03	.513E+03	.997E+03	
FREE DROP-TOP	6b	.905E+02	.513E+03	.513E+03	.604E+03	
FREE DROP-TOP	6c	.716E+02	.513E+03	.513E+03	.585E+03	
FREE DROP-SIDE, 0 MER	6a	.484E+03	.399E+03	.399E+03	.882E+03	
FREE DROP-SIDE, 0 MER	6b	.905E+02	.399E+03	.399E+03	.489E+03	
FREE DROP-SIDE, 0 MER	6c	.716E+02	.399E+03	.399E+03	.470E+03	
FREE DROP-SIDE, 45 MER	6a	.484E+03	.370E+03	.370E+03	.854E+03	
FREE DROP-SIDE, 45 MER	6b	.905E+02	.370E+03	.370E+03	.461E+03	
FREE DROP-SIDE, 45 MER	6c	.716E+02	.370E+03	.370E+03	.442E+03	
MAXIMUM STRESS INTENSITY			.513E+03	.513E+03	.997E+03	

NOTES:
1. Pm < Sm = 20.0 ksi
   Pm+Pb< 1.5*Sm = 30.0 ksi
   Pm+Pb+Q < 3.0*Sm = 60.0 ksi
2. See Table 2.10.9.42 for combination index identification.
3. For combinations with Salt not listed, the number of load cycles are few and therefore, the fatigue qualifications are met.
4. MER = Meridian, angle of orientation from the contact edge where stresses are given.
5. Stresses are given at the centroid of the element, therefore, the same stress value is used for Pm and Pm+Pb.

TABLE 2.10.9.45. SUMMARY OF STRESSES FOR LOAD COMBINATIONS, NORMAL CONDITIONS OF TRANSPORT, STRESS POINT 3

LOAD	COMBINATION	STRESS INTENSITY CATEGORY				FATIGUE
COMBINATION	INDEX	Q	Pm	Pm+Pb	Pm+Pb+Q	Salt
HOT ENVIRONMENT	1	.170E+03	.151E+02	.151E+02	.185E+03	
COLD ENVIRONMENT	2a	.518E+03	.151E+02	.151E+02	.533E+03	
COLD ENVIRONMENT	2b	.190E+03	.151E+02	.151E+02	.205E+03	
MINIMUM EXT. PRESS.	3a	.170E+03	.269E+02	.269E+02	.197E+03	
MINIMUM EXT. PRESS.	3b	.500E+03	.269E+02	.269E+02	.527E+03	
INCREASE EXT. PRESS.	4a	.170E+03	.672E+01	.672E+01	.177E+03	
INCREASE EXT. PRESS.	4b	.500E+03	.672E+01	.672E+01	.507E+03	
VIBRATION AND SHOCK	5a	.170E+03	.844E+03	.844E+03	.101E+04	.507E+03
VIBRATION AND SHOCK	5b	.500E+03	.844t+03	.844E+03	.134E+04	.672E+03
VIBRATION AND SHOCK	5c	.150E+03	.844E+03	.844E+03	.994E+03	.497E+03
FREE DROP-TOP	6a	.170E+03	.712E+03	.712E+03	.882E+03	
FREE DROP-TOP	6b	.500E+03	.712E+03	.712E+03	.121E+04	
FREE DROP-TOP	6c	.150E+03	.712E+03	.712E+03	.862E+03	
FREE DROP-SIDE, 0 MER	6a	.170E+03	.293E+04	.293E+04	.310E+04	
FREE DROP-SIDE, 0 MER	6b	.500E+03	.293E+04	.293E+04	.343E+04	
FREE DROP-SIDE, 0 MER	6c	.150E+03	.293E+04	.293E+04	.308E+04	
FREE DROP-SIDE, 45 MER	6a	.170E+03	.125E+04	.125E+04	.142E+04	
FREE DROP-SIDE, 45 MER	6b	.500E+03	.125E+04	.125E+04	.175E+04	
FREE DROP-SIDE, 45 MER	6c	.150E+03	.125E+04	.125E+04	.140E+04	
MAXIMUM STRESS INTENSITY			.293E+04	.293E+04	.343E+04	

NOTES:

1. Pm < Sm = 20.0 ksi
   Pm+Pb< 1.5*Sm = 30.0 ksi
   Pm+Pb+Q < 3.0*Sm = 60.0 ksi
2. See Table 2.10.9.42 for combination index identification.
3. For combinations with Salt not listed, the number of load cycles are few and therefore, the fatigue qualifications are met.
4. MER = Meridian, angle of orientation from the contact edge where stresses are given.
5. Stresses are given at the centroid of the element, therefore, the same stress value is used for Pm and Pm+Pb.

TABLE 2.10.9.45A. SUMMARY OF STRESSES FOR LOAD COMBINATIONS, NORMAL CONDITIONS OF TRANSPORT, STRESS POINT 3

LOAD COMBINATION	COMBINATION INDEX	STRESS INTENSITY CATEGORY Q	Pm	Pm+Pb	Pm+Pb+Q	FATIGUE Salt
HOT ENVIRONMENT	1	.170E+03	.151E+02	.151E+02	.185E+03	
COLD ENVIRONMENT	2a	.518E+03	.151E+02	.151E+02	.533E+03	
COLD ENVIRONMENT	2b	.190E+03	.151E+02	.151E+02	.205E+03	
MINIMUM EXT. PRESS.	3a	.170E+03	.269E+02	.269E+02	.197E+03	
MINIMUM EXT. PRESS.	3b	.500E+03	.269E+02	.269E+02	.527E+03	
INCREASE EXT. PRESS.	4a	.170E+03	.672E+01	.672E+01	.177E+03	
INCREASE EXT. PRESS.	4b	.500E+03	.672E+01	.672E+01	.507E+03	
VIBRATION AND SHOCK	5a	.170E+03	.844E+03	.844E+03	.101E+04	.507E+03
VIBRATION AND SHOCK	5b	.500E+03	.844E+03	.844E+03	.134E+04	.672E+03
VIBRATION AND SHOCK	5c	.150E+03	.844E+03	.844E+03	.994E+03	.497E+03
FREE DROP-TOP	6a	.170E+03	.436E+03	.436E+03	.607E+03	
FREE DROP-TOP	6b	.500E+03	.436E+03	.436E+03	.937E+03	
FREE DROP-TOP	6c	.150E+03	.436E+03	.436E+03	.587E+03	
FREE DROP-SIDE, 0 MER	6a	.170E+03	.108E+05	.108E+05	.110E+05	
FREE DROP-SIDE, 0 MER	6b	.500E+03	.108E+05	.108E+05	.113E+05	
FREE DROP-SIDE, 0 MER	6c	.150E+03	.108E+05	.108E+05	.110E+05	
FREE DROP-SIDE, 45 MER	6a	.170E+03	.461E+04	.461E+04	.478E+04	
FREE DROP-SIDE, 45 MER	6b	.500E+03	.461E+04	.461E+04	.511E+04	
FREE DROP-SIDE, 45 MER	6c	.150E+03	.461E+04	.461E+04	.476E+04	
MAXIMUM STRESS INTENSITY			.108E+05	.108E+05	.113E+05	

NOTES
1 Pm < Sm = 20.0 ksi
  Pm+Pb< 1.5*Sm = 30.0 ksi
  Pm+Pb+Q < 3.0*Sm = 60.0 ksi
2. See Table 2.10.9.42 for combination index identification.
3. For combinations with Salt not listed, the number of load cycles are few and therefore, the fatigue qualifications are met.
4. MER = Meridian, angle of orientation from the contact edge where stresses are given.
5. Stresses are given at the centroid of the element, therefore, the same stress value is used for Pm and Pm+Pb.

TABLE 2.10.9.46. SUMMARY OF STRESSES FOR LOAD COMBINATIONS, NORMAL CONDITIONS OF TRANSPORT, STRESS POINT 4

LOAD COMBINATION	COMBINATION INDEX	STRESS INTENSITY CATEGORY Q	Pm	Pm+Pb	Pm+Pb+Q	FATIGUE Salt
HOT ENVIRONMENT	1	.428E+03	.176E+02	.176E+02	.445E+03	
COLD ENVIRONMENT	2a	.212E+03	.176E+02	.176E+02	.230E+03	
COLD ENVIRONMENT	2b	.905E+02	.176E+02	.176E+02	.108E+03	
MINIMUM EXT. PRESS.	3a	.428E+03	.309E+02	.309E+02	.459E+03	
MINIMUM EXT. PRESS.	3b	.189E+03	.309E+02	.309E+02	.220E+03	
INCREASE EXT. PRESS.	4a	.428E+03	.832E+01	.832E+01	.436E+03	
INCREASE EXT. PRESS.	4b	.189E+03	.832E+01	.832E+01	.198E+03	
VIBRATION AND SHOCK	5a	.428E+03	.451E+03	.451E+03	.879E+03	.440E+03
VIBRATION AND SHOCK	5b	.189E+03	.451E+03	.451E+03	.641E+03	.320E+03
VIBRATION AND SHOCK	5c	.596E+02	.451E+03	.451E+03	.511E+03	.255E+03
FREE DROP-TOP	6a	.428E+03	.707E+03	.707E+03	.114E+04	
FREE DROP-TOP	6b	.189E+03	.707E+03	.707E+03	.897E+03	
FREE DROP-TOP	6c	.596E+02	.707E+03	.707E+03	.767E+03	
FREE DROP-SIDE, 0 MER	6a	.428E+03	.726E+03	.726E+03	.115E+04	
FREE DROP-SIDE, 0 MER	6b	.189E+03	.726E+03	.726E+03	.915E+03	
FREE DROP-SIDE, 0 MER	6c	.596E+02	.726E+03	.726E+03	.786E+03	
FREE DROP-SIDE, 45 MER	6a	.428E+03	.536E+03	.536E+03	.964E+03	
FREE DROP-SIDE, 45 MER	6b	.189E+03	.536E+03	.536E+03	.725E+03	
FREE DROP-SIDE, 45 MER	6c	.596E+02	.536E+03	.536E+03	.595E+03	
MAXIMUM STRESS INTENSITY			.726E+03	.726E+03	.115E+04	

NOTES:
1. Pm < Sm = 20.0 ksi
   Pm+Pb< 1.5*Sm = 30.0 ksi
   Pm+Pb+Q < 3.0*Sm = 60.0 ksi
2. See Table 2.10.9.42 for combination index identification.
3. For combinations with Salt not listed, the number of load cycles are few and therefore, the fatigue qualifications are met.
4. MER = Meridian, angle of orientation from the contact edge where stresses are given.
5. Stresses are given at the centroid of the element, therefore, the same stress value is used for Pm and Pm+Pb.

TABLE 2.10.9.46A. SUMMARY OF STRESSES FOR LOAD COMBINATIONS, NORMAL CONDITIONS OF TRANSPORT, STRESS POINT 4

LOAD COMBINATION	COMBINATION INDEX	Q	STRESS INTENSITY CATEGORY Pm	Pm+Pb	Pm+Pb+Q	FATIGUE Salt
HOT ENVIRONMENT	1	.428E+03	.176E+02	.176E+02	.445E+03	
COLD ENVIRONMENT	2a	.212E+03	.176E+02	.176E+02	.230E+03	
COLD ENVIRONMENT	2b	.905E+02	.176E+02	.176E+02	.108E+03	
MINIMUM EXT. PRESS.	3a	.428E+03	.309E+02	.309E+02	.459E+03	
MINIMUM EXT. PRESS.	3b	.189E+03	.309E+02	.309E+02	.220E+03	
INCREASE EXT. PRESS.	4a	.428E+03	.832E+01	.832E+01	.436E+03	
INCREASE EXT. PRESS.	4b	.189E+03	.832E+01	.832E+01	.198E+03	
VIBRATION AND SHOCK	5a	.428E+03	.451E+03	.451E+03	.379E+03	.440E+03
VIBRATION AND SHOCK	5b	.189E+03	.451E+03	.451E+03	.641E+03	.320E+03
VIBRATION AND SHOCK	5c	.596E+02	.451E+03	.451E+03	.511E+03	.255E+03
FREE DROP-TOP	6a	.428E+03	.423E+03	.423E+03	.851E+03	
FREE DROP-TOP	6b	.189E+03	.423E+03	.423E+03	.612E+03	
FREE DROP-TOP	6c	.596E+02	.423E+03	.423E+03	.483E+03	
FREE DROP-SIDE, 0 MER	6a	.428E+03	.265E+04	.265E+04	.307E+04	
FREE DROP-SIDE, 0 MER	6b	.189E+03	.265E+04	.265E+04	.284E+04	
FREE DROP-SIDE, 0 MER	6c	.596E+02	.265E+04	.265E+04	.271E+04	
FREE DROP-SIDE, 45 MER	6a	.428E+03	.194E+04	.194E+04	.237E+04	
FREE DROP-SIDE, 45 MER	6b	.189E+03	.194E+04	.194E+04	.213E+04	
FREE DROP-SIDE, 45 MER	6c	.596E+02	.194E+04	.194E+04	.200E+04	
MAXIMUM STRESS INTENSITY			.265E+04	.265E+04	.307E+04	

NOTES:
1. Pm < Sm = 20.0 ksi
   Pm+Pb< 1.5*Sm = 30.0 ksi
   Pm+Pb+Q < 3.0*Sm = 60.0 ksi
2. See Table 2.10.9.42 for combination index identification.
3. For combinations with Salt not listed, the number of load cycles are few and therefore, the fatigue qualifications are met.
4. MER = Meridian, angle of orientation from the contact edge where stresses are given.
5. Stresses are given at the centroid of the element, therefore, the same stress value is used for Pm and Pm+Pb.

TABLE 2.10.9.47. SUMMARY OF STRESSES FOR LOAD COMBINATIONS, NORMAL CONDITIONS OF TRANSPORT, STRESS POINT 5

LOAD COMBINATION	COMBINATION INDEX	STRESS INTENSITY CATEGORY Q	Pm	Pm+Pb	Pm+Pb+Q	FATIGUE Salt
HOT ENVIRONMENT	1	.689E+03	.307E+01	.307E+01	.692E+03	
COLD ENVIRONMENT	2a	.588E+03	.307E+01	.307E+01	.591E+03	
COLD ENVIRONMENT	2b	.319E+02	.307E+01	.307E+01	.349E+02	
MINIMUM EXT. PRESS.	3a	.689E+03	.113E+02	.113E+02	.700E+03	
MINIMUM EXT. PRESS.	3b	.581E+03	.113E+02	.113E+02	.593E+03	
INCREASE EXT. PRESS.	4a	.689E+03	.641E+01	.641E+01	.695E+03	
INCREASE EXT. PRESS.	4b	.581E+03	.641E+01	.641E+01	.588E+03	
VIBRATION AND SHOCK	5a	.689E+03	.307E+03	.307E+03	.996E+03	.498E+03
VIBRATION AND SHOCK	5b	.581E+03	.307E+03	.307E+03	.889E+03	.444E+03
VIBRATION AND SHOCK	5c	.274E+02	.307E+03	.307E+03	.335E+03	.167E+03
FREE DROP-TOP	6a	.689E+03	.424E+03	.424E+03	.111E+04	
FREE DROP-TOP	6b	.581E+03	.424E+03	.424E+03	.100E+04	
FREE DROP-TOP	6c	.274E+02	.424E+03	.424E+03	.451E+03	
FREE DROP-SIDE, 0 MER	6a	.689E+03	.315E+03	.315E+03	.100E+04	
FREE DROP-SIDE, 0 MER	6b	.581E+03	.315E+03	.315E+03	.896E+03	
FREE DROP-SIDE, 0 MER	6c	.274E+02	.315E+03	.315E+03	.342E+03	
FREE DROP-SIDE, 45 MER	6a	.689E+03	.448E+02	.448E+02	.733E+03	
FREE DROP-SIDE, 45 MER	6b	.581E+03	.448E+02	.448E+02	.626E+03	
FREE DROP-SIDE, 45 MER	6c	.274E+02	.448E+02	.448E+02	.722E+02	
MAXIMUM STRESS INTENSITY			.424E+03	.424E+03	.111E+04	

NOTES:

1. PM < Sm = 20.0 ksi
   Pm+Pb< 1.5*Sm = 30.0 ksi
   Pm+Pb+Q < 3.0*Sm = 60.0 ksi
2. See Table 2.10.9.42 for combination index identification.
3. For combinations with Salt not listed, the number of load cycles are few and therefore, the fatigue qualifications are met.
4. MER = Meridian, angle of orientation from the contact edge where stresses are given.
5. Stresses are given at the centroid of the element, therefore, the same stress value is used for Pm and Pm+Pb.

TABLE 2.10.9.47A. SUMMARY OF STRESSES FOR LOAD COMBINATIONS, NORMAL CONDITIONS OF TRANSPORT, STRESS POINT 5

LOAD	COMBINATION	STRESS INTENSITY CATEGORY				FATIGUE
COMBINATION	INDEX	Q	Pm	Pm+Pb	Pm+Pb+Q	Salt
HOT ENVIRONMENT	1	.689E+03	.307E+01	.307E+01	.692E+03	
COLD ENVIRONMENT	2a	.588E+03	.307E+01	.307E+01	.591E+03	
COLD ENVIRONMENT	2b	.319E+02	.307E+01	.307E+01	.349E+02	
MINIMUM EXT. PRESS.	3a	.689E+03	.113E+02	.113E+02	.700E+03	
MINIMUM EXT. PRESS.	3b	.581E+03	.113E+02	.113E+02	.593E+03	
INCREASE EXT. PRESS.	4a	.689E+03	.641E+01	.641E+01	.695E+03	
INCREASE EXT. PRESS.	4b	.581E+03	.641E+01	.641E+01	.588E+03	
VIBRATION AND SHOCK	5a	.689E+03	.307E+03	.307E+03	.996E+03	.498E+03
VIBRATION AND SHOCK	5b	.581E+03	.307E+03	.307E+03	.889E+03	.444E+03
VIBRATION AND SHOCK	5c	.274E+02	.307E+03	.307E+03	.335E+03	.167E+03
FREE DROP-TOP	6a	.689E+03	.130E+03	.130E+03	.818E+03	
FREE DROP-TOP	6b	.581E+03	.130E+03	.130E+03	.711E+03	
FREE DROP-TOP	6c	.274E+02	.130E+03	.130E+03	.157E+03	
FREE DROP-SIDE, 0 MER	6a	.689E+03	.116E+04	.116E+04	.185E+04	
FREE DROP-SIDE, 0 MER	6b	.581E+03	.116E+04	.116E+04	.174E+04	
FREE DROP-SIDE, 0 MER	6c	.274E+02	.116E+04	.116E+04	.119E+04	
FREE DROP-SIDE, 45 MER	6a	.689E+03	.158E+03	.158E+03	.846E+03	
FREE DROP-SIDE, 45 MER	6b	.581E+03	.158E+03	.158E+03	.739E+03	
FREE DROP-SIDE, 45 MER	6c	.274E+02	.158E+03	.158E+03	.185E+03	
MAXIMUM STRESS INTENSITY			.116E+04	.116E+04	.185E+04	

NOTES:

1. Pm < Sm = 20.0 ksi
   Pm+Pb< 1.5*Sm = 30.0 ksi
   Pm+Pb+Q < 3.0*Sm = 60.0 ksi
2. See Table 2.10.9.42 for combination index identification.
3. For combinations with Salt not listed, the number of load cycles are few and therefore, the fatigue qualifications are met.
4. MER = Meridian, angle of orientation from the contact edge where stresses are given.
5. Stresses are given at the centroid of the element, therefore, the same stress value is used for Pm and Pm+Pb.

TABLE 2.10.9.48. SUMMARY OF STRESSES FOR LOAD COMBINATIONS, NORMAL CONDITIONS OF TRANSPORT, STRESS POINT 6

LOAD COMBINATION	COMBINATION INDEX	Q	STRESS INTENSITY CATEGORY Pm	Pm+Pb	Pm+Pb+Q	FATIGUE Salt
HOT ENVIRONMENT	1	.590E+03	.786E+01	.786E+01	.597E+03	
COLD ENVIRONMENT	2a	.568E+03	.786E+01	.786E+01	.576E+03	
COLD ENVIRONMENT	2b	.771E+02	.786E+01	.786E+01	.849E+02	
MINIMUM EXT. PRESS.	3a	.590E+03	.124E+02	.124E+02	.602E+03	
MINIMUM EXT. PRESS.	3b	.537E+03	.124E+02	.124E+02	.550E+03	
INCREASE EXT. PRESS.	4a	.590E+03	.927E+01	.927E+01	.599E+03	
INCREASE EXT. PRESS.	4b	.537E+03	.927E+01	.927E+01	.546E+03	
VIBRATION AND SHOCK	5a	.590E+03	.343E+03	.343E+03	.933E+03	.466E+03
VIBRATION AND SHOCK	5b	.537E+03	.343E+03	.343E+03	.880E+03	.440E+03
VIBRATION AND SHOCK	5c	.292E+02	.343E+03	.343E+03	.372E+03	.186E+03
FREE DROP-TOP	6a	.590E+03	.512E+03	.512E+03	.110E+04	
FREE DROP-TOP	6b	.537E+03	.512E+03	.512E+03	.105E+04	
FREE DROP-TOP	6c	.292E+02	.512E+03	.512E+03	.541E+03	
FREE DROP-SIDE, 0 MER	6a	.590E+03	.482E+03	.482E+03	.107E+04	
FREE DROP-SIDE, 0 MER	6b	.537E+03	.482E+03	.482E+03	.102E+04	
FREE DROP-SIDE, 0 MER	6c	.292E+02	.482E+03	.482E+03	.511E+03	
FREE DROP-SIDE, 45 MER	6a	.590E+03	.192E+03	.192E+03	.782E+03	
FREE DROP-SIDE, 45 MER	6b	.537E+03	.192E+03	.192E+03	.729E+03	
FREE DROP-SIDE, 45 MER	6c	.292E+02	.192E+03	.192E+03	.221E+03	
MAXIMUM STRESS INTENSITY			.512E+03	.512E+03	.110E+04	

NOTES:
1. Pm < Sm = 20.0 ksi
   Pm+Pb< 1.5*Sm = 30.0 ksi
   Pm+Pb+Q < 3.0*Sm = 60.0 ksi
2. See Table 2.10.9.42 for combination index identification.
3. For combinations with Salt not listed, the number of load cycles are few and therefore, the fatigue qualifications are met.
4. MER = Meridian, angle of orientation from the contact edge where stresses are given.
5. Stresses are given at the centroid of the element, therefore, the same stress value is used for Pm and Pm+Pb.

TABLE 2.10.9.48A. SUMMARY OF STRESSES FOR LOAD COMBINATIONS, NORMAL CONDITIONS OF TRANSPORT, STRESS POINT 6

LOAD COMBINATION	COMBINATION INDEX	STRESS INTENSITY CATEGORY Q	Pm	Pm+Pb	Pm+Pb+Q	FATIGUE Salt
HOT ENVIRONMENT	1	.590E+03	.786E+01	.786E+01	.597E+03	
COLD ENVIRONMENT	2a	.568E+03	.786E+01	.786E+01	.576E+03	
COLD ENVIRONMENT	2b	.771E+02	.786E+01	.786E+01	.849E+02	
MINIMUM EXT. PRESS.	3a	.590E+03	.124E+02	.124E+02	.602E+03	
MINIMUM EXT. PRESS.	3b	.537E+03	.124E+02	.124E+02	.550E+03	
INCREASE EXT. PRESS.	4a	.590E+03	.927E+01	.927E+01	.599E+03	
INCREASE EXT. PRESS.	4b	.537E+03	.927E+01	.927E+01	.546E+03	
VIBRATION AND SHOCK	5a	.590E+03	.343E+03	.343E+03	.933E+03	.466E+03
VIBRATION AND SHOCK	5b	.537E+03	.343E+03	.343E+03	.880E+03	.440E+03
VIBRATION AND SHOCK	5c	.292E+02	.343E+03	.343E+03	.372E+03	.186E+03
FREE DROP-TOP	6a	.590E+03	.758E+02	.758E+02	.665E+03	
FREE DROP-TOP	6b	.537E+03	.758E+02	.758E+02	.613E+03	
FREE DROP-TOP	6c	.292E+02	.758E+02	.758E+02	.105E+03	
FREE DROP-SIDE, 0 MER	6a	.590E+03	.177E+04	.177E+04	.236E+04	
FREE DROP-SIDE, 0 MER	6b	.537E+03	.177E+04	.177E+04	.230E+04	
FREE DROP-SIDE, 0 MER	6c	.292E+02	.177E+04	.177E+04	.180E+04	
FREE DROP-SIDE, 45 MER	6a	.590E+03	.691E+03	.691E+03	.128E+04	
FREE DROP-SIDE, 45 MER	6b	.537E+03	.691E+03	.691E+03	.123E+04	
FREE DROP-SIDE, 45 MER	6c	.292E+02	.691E+03	.691E+03	.721E+03	
MAXIMUM STRESS INTENSITY			.177E+04	.177E+04	.236E+04	

NOTES:
1. Pm < Sm = 20.0 ksi
   Pm+Pb< 1.5*Sm = 30.0 ksi
   Pm+Pb+Q < 3.0*Sm = 60.0 ksi
2. See Table 2.10.9.42 for combination index identification.
3, For combinations with Salt not listed, the number of load cycles are few and therefore, the fatigue qualifications are met.
4. MER = Meridian, angle of orientation from the contact edge where stresses are given.
5. Stresses are given at the centroid of the element, therefore, the same stress value is used for Pm and Pm+Pb.

TABLE 2.10.9.49. SUMMARY OF STRESSES FOR LOAD COMBINATIONS, NORMAL CONDITIONS OF TRANSPORT, STRESS POINT 7A

LOAD COMBINATION	COMBINATION INDEX	STRESS INTENSITY CATEGORY Q	Pm	Pm+Pb	Pm+Pb+Q	FATIGUE Salt
HOT ENVIRONMENT	1	.121E+05	.622E+02	.100E+03	.122E+05	
COLD ENVIRONMENT	2a	.875E+04	.622E+02	.100E+03	.885E+04	
COLD ENVIRONMENT	2b	.139E+05	.622E+02	.100E+03	.140E+05	
MINIMUM EXT. PRESS.	3a	.121E+05	.107E+03	.189E+03	.123E+05	
MINIMUM EXT. PRESS.	3b	.723E+04	.107E+03	.189E+03	.741E+04	
INCREASE EXT. PRESS.	4a	.121E+05	.418E+02	.592E+02	.122E+05	
INCREASE EXT. PRESS.	4b	.723E+04	.418E+02	.592E+02	.728E+04	
VIBRATION AND SHOCK	5a	.121E+05	.747E+03	.537E+03	.127E+05	.633E+04
VIBRATION AND SHOCK	5b	.723E+04	.747E+03	.537E+03	.776E+04	.388E+04
VIBRATION AND SHOCK	5c	.121E+05	.747E+03	.537E+03	.126E+05	.631E+04
FREE DROP-TOP	6a	.121E+05	.687E+03	.745E+03	.129E+05	
FREE DROP-TOP	6b	.723E+04	.687E+03	.745E+03	.797E+04	
FREE DROP-TOP	6c	.121E+05	.687E+03	.745E+03	.128E+05	
FREE DROP-SIDE, 0 MER	6a	.121E+05	.202E+04	.368E+03	.125E+05	
FREE DROP-SIDE, 0 MER	6b	.723E+04	.202E+04	.368E+03	.759E+04	
FREE DROP-SIDE, 0 MER	6c	.121E+05	.202E+04	.368E+03	.125E+05	
FREE DROP-SIDE, 45 MER	6a	.121E+05	.306E+04	.361E+04	.157E+05	
FREE DROP-SIDE, 45 MER	6b	.723E+04	.306E+04	.361E+04	.108E+05	
FREE DROP-SIDE, 45 MER	6c	.121E+05	.306E+04	.361E+04	.157E+05	
MAXIMUM STRESS INTENSITY			.306E+04	.361E+04	.157E+05	

NOTES:
1. PM < Sm = 20.0 ksi
   Pm+Pb< 1.5*Sm = 30.0 ksi
   Pm+Pb+Q < 3.0*Sm = 60.0 ksi
2. See Table 2.10.9.42 for combination index identification.
3. For combinations with Salt not listed, the number of load cycles are few and therefore, the fatigue qualifications are met.
4. MER = Meridian, angle of orientation from the contact edge where stresses are given.

TABLE 2.10.9.49A. SUMMARY OF STRESSES FOR LOAD COMBINATIONS, NORMAL CONDITIONS OF TRANSPORT, STRESS POINT 7A

LOAD COMBINATION	COMBINATION INDEX	Q	Pm	Pm+Pb	Pm+Pb+Q	FATIGUE Salt
			STRESS INTENSITY CATEGORY			
HOT ENVIRONMENT	1	.121E+05	.622E+02	.100E+03	.122E+05	
COLD ENVIRONMENT	2a	.875E+04	.622E+02	.100E+03	.885E+04	
COLD ENVIRONMENT	2b	.139E+05	.622E+02	.100E+03	.140E+05	
MINIMUM EXT. PRESS.	3a	.121E+05	.107E+03	.189E+03	.123E+05	
MINIMUM EXT. PRESS.	3b	.723E+04	.107E+03	.189E+03	.741E+04	
INCREASE EXT. PRESS.	4a	.121E+05	.418E+02	.592E+02	.122E+05	
INCREASE EXT. PRESS.	4b	.723E+04	.418E+02	.592E+02	.728E+04	
VIBRATION AND SHOCK	5a	.121E+05	.747E+03	.537E+03	.127E+05	.633E+04
VIBRATION AND SHOCK	5b	.723E+04	.747E+03	.537E+03	.776E+04	.388E+04
VIBRATION AND SHOCK	5c	.121E+05	.747E+03	.537E+03	.126E+05	.631E+04
FREE DROP-TOP	6a	.121E+05	.122E+04	.110E+04	.132E+05	
FREE DROP-TOP	6b	.723E+04	.122E+04	.110E+04	.833E+04	
FREE DROP-TOP	6c	.121E+05	.122E+04	.110E+04	.132E+05	
FREE DROP-SIDE, 0 MER	6a	.121E+05	.734E+04	.109E+04	.132E+05	
FREE DROP-SIDE, 0 MER	6b	.723E+04	.734E+04	.109E+04	.832E+04	
FREE DROP-SIDE, 0 MER	6c	.121E+05	.734E+04	.109E+04	.132E+05	
FREE DROP-SIDE, 45 MER	6a	.121E+05	.112E+05	.131E+05	.253E+05	
FREE DROP-SIDE, 45 MER	6b	.723E+04	.112E+05	.131E+05	.204E+05	
FREE DROP-SIDE, 45 MER	6c	.121E+05	.112E+05	.131E+05	.252E+05	
MAXIMUM STRESS INTENSITY			.112E+05	.131E+05	.253E+05	

NOTES:

1. Pm < Sm = 20.0 ksi
   Pm+Pb< 1.5*Sm = 30.0 ksi
   Pm+Pb+Q < 3.0*Sm = 60.0 ksi
2. See Table 2.10.9.42 for combination index identification.
3. For combinations with Salt not listed, the number of load cycles are few and therefore, the fatigue qualifications are met.
4. MER = Meridian, angle of orientation from the contact edge where stresses are given.

TABLE 2.10.9.50. SUMMARY OF STRESSES FOR LOAD COMBINATIONS, NORMAL CONDITIONS OF TRANSPORT, STRESS POINT 7B

LOAD COMBINATION	COMBINATION INDEX	STRESS INTENSITY CATEGORY Q	Pm	Pm+Pb	Pm+Pb+Q	FATIGUE Salt
HOT ENVIRONMENT	1	.923E+04	.622E+02	.393E+02	.927E+04	
COLD ENVIRONMENT	2a	.482E+04	.622E+02	.393E+02	.486E+04	
COLD ENVIRONMENT	2b	.654E+04	.622E+02	.393E+02	.658E+04	
MINIMUM EXT. PRESS.	3a	.923E+04	.107E+03	.557E+02	.929E+04	
MINIMUM EXT. PRESS.	3b	.453E+04	.107E+03	.557E+02	.459E+04	
INCREASE EXT. PRESS.	4a	.923E+04	.418E+02	.304E+02	.926E+04	
INCREASE EXT. PRESS.	4b	.453E+04	.418E+02	.304E+02	.456E+04	
VIBRATION AND SHOCK	5a	.923E+04	.747E+03	.133E+04	.106E+05	.528E+04
VIBRATION AND SHOCK	5b	.453E+04	.747E+03	.133E+04	.586E+04	.293E+04
VIBRATION AND SHOCK	5c	.619E+04	.747E+03	.133E+04	.752E+04	.376E+04
FREE DROP-TOP	6a	.923E+04	.687E+03	.790E+03	.100E+05	
FREE DROP-TOP	6b	.453E+04	.687E+03	.790E+03	.532E+04	
FREE DROP-TOP	6c	.619E+04	.687E+03	.790E+03	.698E+04	
FREE DROP-SIDE, 0 MER	6a	.923E+04	.202E+04	.482E+04	.141E+05	
FREE DROP-SIDE, 0 MER	6b	.453E+04	.202E+04	.482E+04	.936E+04	
FREE DROP-SIDE, 0 MER	6c	.619E+04	.202E+04	.482E+04	.110E+05	
FREE DROP-SIDE, 45 MER	6a	.923E+04	.306E+04	.268E+04	.119E+05	
FREE DROP-SIDE, 45 MER	6b	.453E+04	.306E+04	.268E+04	.722E+04	
FREE DROP-SIDE, 45 MER	6c	.619E+04	.306E+04	.268E+04	.887E+04	
MAXIMUM STRESS INTENSITY			.306E+04	.482E+04	.141E+05	

NOTES:

1. Pm < Sm = 20.0 ksi
   Pm+Pb< 1.5*Sm = 30.0 ksi
   Pm+Pb+Q < 3.0*Sm = 60.0 ksi
2. See Table 2.10.9.42 for combination index identification.
3. For combinations with Salt not listed, the number of load cycles are few and therefore, the fatigue qualifications are met.
4. MER = Meridian, angle of orientation from the contact edge where stresses are given.

TABLE 2.10.9.50A. SUMMARY OF STRESSES FOR LOAD COMBINATIONS, NORMAL CONDITIONS OF TRANSPORT, STRESS POINT 7B

LOAD COMBINATION	COMBINATION INDEX	STRESS INTENSITY CATEGORY Q	Pm	Pm+Pb	Pm+Pb+Q	FATIGUE Salt
HOT ENVIRONMENT	1	.923E+04	.622E+02	.393E+02	.927E+04	
COLD ENVIRONMENT	2a	.482E+04	.622E+02	.393E+02	.486E+04	
COLD ENVIRONMENT	2b	.654E+04	.622E+02	.393E+02	.658E+04	
MINIMUM EXT. PRESS.	3a	.923E+04	.107E+03	.557E+02	.929E+04	
MINIMUM EXT. PRESS.	3b	.453E+04	.107E+03	.557E+02	.459E+04	
INCREASE EXT. PRESS.	4a	.923E+04	.418E+02	.304E+02	.926E+04	
INCREASE EXT. PRESS.	4b	.453E+04	.418E+02	.304E+02	.456E+04	
VIBRATION AND SHOCK	5a	.923E+04	.747E+03	.133E+04	.106E+05	.528E+04
VIBRATION AND SHOCK	5b	.453E+04	.747E+03	.133E+04	.586E+04	.293E+04
VIBRATION AND SHOCK	5c	.619E+04	.747E+03	.133E+04	.752E+04	.376E+04
FREE DROP-TOP	6a	.923E+04	.122E+04	.136E+04	.106E+05	
FREE DROP-TOP	6b	.453E+04	.122E+04	.136E+04	.589E+04	
FREE DROP-TOP	6c	.619E+04	.122E+04	.136E+04	.755E+04	
FREE DROP-SIDE, 0 MER	6a	.923E+04	.734E+04	.178E+05	.270E+05	
FREE DROP-SIDE, 0 MER	6b	.453E+04	.734E+04	.178E+05	.223E+05	
FREE DROP-SIDE, 0 MER	6c	.619E+04	.734E+04	.178E+05	.240E+05	
FREE DROP-SIDE, 45 MER	6a	.923E+04	.112E+05	.984E+04	.191E+05	
FREE DROP-SIDE, 45 MER	6b	.453E+04	.112E+05	.984E+04	.144E+05	
FREE DROP-SIDE, 45 MER	6c	.619E+04	.112E+05	.984E+04	.160E+05	
MAXIMUM STRESS INTENSITY			.112E+05	.178E+05	.270E+05	

NOTES:
1. Pm < Sm = 20.0 ksi
   Pm+Pb< 1.5*Sm = 30.0 ksi
   Pm+Pb+Q < 3.0*Sm = 60.0 ksi
2. See Table 2.10.9.42 for combination index identification.
3. For combinations with Salt not listed, the number of load cycles are few and therefore, the fatigue qualifications are met.
4. MER = Meridian, angle of orientation from the contact edge where stresses are given.

TABLE 2.10.9.51. SUMMARY OF STRESSES FOR LOAD COMBINATIONS, NORMAL CONDITIONS OF TRANSPORT, STRESS POINT 8A

LOAD COMBINATION	COMBINATION INDEX	Q	STRESS INTENSITY CATEGORY Pm	Pm+Pb	Pm+Pb+Q	FATIGUE Salt
HOT ENVIRONMENT	1	.648E+04	.301E+02	.432E+02	.652E+04	
COLD ENVIRONMENT	2a	.205E+04	.301E+02	.432E+02	.209E+04	
COLD ENVIRONMENT	2b	.406E+04	.301E+02	.432E+02	.410E+04	
MINIMUM EXT. PRESS.	3a	.648E+04	.558E+02	.113E+03	.659E+04	
MINIMUM EXT. PRESS.	3b	.126E+04	.558E+02	.113E+03	.138E+04	
INCREASE EXT. PRESS.	4a	.648E+04	.268E+02	.173E+02	.650E+04	
INCREASE EXT. PRESS.	4b	.126E+04	.268E+02	.173E+02	.128E+04	
VIBRATION AND SHOCK	5a	.648E+04	.683E+03	.108E+04	.756E+04	.378E+04
VIBRATION AND SHOCK	5b	.126E+04	.683E+03	.108E+04	.235E+04	.117E+04
VIBRATION AND SHOCK	5c	.325E+04	.683E+03	.108E+04	.433E+04	.216E+04
FREE DROP-TOP	6a	.648E+04	.101E+04	.131E+04	.779E+04	
FREE DROP-TOP	6b	.126E+04	.101E+04	.131E+04	.258E+04	
FREE DROP-TOP	6c	.325E+04	.101E+04	.131E+04	.456E+04	
FREE DROP-SIDE, 0 MER	6a	.648E+04	.134E+04	.344E+04	.992E+04	
FREE DROP-SIDE, 0 MER	6b	.126E+04	.134E+04	.344E+04	.471E+04	
FREE DROP-SIDE, 0 MER	6c	.325E+04	.134E+04	.344E+04	.669E+04	
FREE DROP-SIDE, 45 MER	6a	.648E+04	.134E+04	.231E+04	.879E+04	
FREE DROP-SIDE, 45 MER	6b	.126E+04	.134E+04	.231E+04	.358E+04	
FREE DROP-SIDE, 45 MER	6c	.325E+04	.134E+04	.231E+04	.556E+04	
MAXIMUM STRESS INTENSITY			.134E+04	.344E+04	.992E+04	

NOTES:
1. Pm < Sm = 20.0 ksi
   Pm+Pb< 1.5*Sm = 30.0 ksi
   Pm+Pb+Q < 3.0*Sm = 60.0 ksi
2. See Table 2.10.9.42 for combination index identification.
3. For combinations with Salt not listed, the number of load cycles are few and therefore, the fatigue qualifications are met.
4. MER = Meridian, angle of orientation from the contact edge where stresses are given.

TABLE 2.10.9.51A. SUMMARY OF STRESSES FOR LOAD COMBINATIONS, NORMAL CONDITIONS OF TRANSPORT, STRESS POINT 8A

LOAD COMBINATION	COMBINATION INDEX	Q	STRESS INTENSITY CATEGORY Pm	Pm+Pb	Pm+Pb+Q	FATIGUE Salt
HOT ENVIRONMENT	1	.648E+04	.301E+02	.432E+02	.652E+04	
COLD ENVIRONMENT	2a	.205E+04	.301E+02	.432E+02	.209E+04	
COLD ENVIRONMENT	2b	.406E+04	.301E+02	.432E+02	.410E+04	
MINIMUM EXT. PRESS.	3a	.648E+04	.558E+02	.113E+03	.659E+04	
MINIMUM EXT. PRESS.	3b	.126E+04	.558E+02	.113E+03	.138E+04	
INCREASE EXT. PRESS.	4a	.648E+04	.268E+02	.173E+02	.650E+04	
INCREASE EXT. PRESS.	4b	.126E+04	.268E+02	.173E+02	.128E+04	
VIBRATION AND SHOCK	5a	.648E+04	.683E+03	.108E+04	.756E+04	.378E+04
VIBRATION AND SHOCK	5b	.126E+04	.683E+03	.108E+04	.235E+04	.117E+04
VIBRATION AND SHOCK	5c	.325E+04	.683E+03	.108E+04	.433E+04	.216E+04
FREE DROP-TOP	6a	.648E+04	.524E+03	.692E+03	.717E+04	
FREE DROP-TOP	6b	.126E+04	.524E+03	.692E+03	.196E+04	
FREE DROP-TOP	6c	.325E+04	.524E+03	.692E+03	.394E+04	
FREE DROP-SIDE, 0 MER	6a	.648E+04	.488E+04	.127E+05	.191E+05	
FREE DROP-SIDE, 0 MER	6b	.126E+04	.488E+04	.127E+05	.139E+05	
FREE DROP-SIDE, 0 MER	6c	.325E+04	.488E+04	.127E+05	.159E+05	
FREE DROP-SIDE, 45 MER	6a	.648E+04	.491E+04	.846E+04	.149E+05	
FREE DROP-SIDE, 45 MER	6b	.126E+04	.491E+04	.846E+04	.973E+04	
FREE DROP-SIDE, 45 MER	6c	.325E+04	.491E+04	.846E+04	.117E+05	
MAXIMUM STRESS INTENSITY			.491E+04	.127E+05	.191E+05	

NOTES:

1. Pm < Sm = 20.0 ksi
   Pm+Pb< 1.5*Sm = 30.0 ksi
   Pm+Pb+Q < 3.0*Sm = 60.0 ksi
2. See Table 2.10.9.42 for combination index identification.
3. For combinations with Salt not listed, the number of load cycles are few and therefore, the fatigue qualifications are met.
4. MER = Meridian, angle of orientation from the contact edge where stresses are given.

TABLE 2.10.9.52. SUMMARY OF STRESSES FOR LOAD COMBINATIONS, NORMAL CONDITIONS OF TRANSPORT, STRESS POINT 8B

LOAD COMBINATION	COMBINATION INDEX	STRESS INTENSITY CATEGORY Q	Pm	Pm+Pb	Pm+Pb+Q	FATIGUE Salt
HOT ENVIRONMENT	1	.112E+05	.301E+02	.169E+02	.112E+05	
COLD ENVIRONMENT	2a	.482E+04	.301E+02	.169E+02	.484E+04	
COLD ENVIRONMENT	2b	.961E+04	.301E+02	.169E+02	.963E+04	
MINIMUM EXT. PRESS.	3a	.112E+05	.558E+02	.652E+01	.112E+05	
MINIMUM EXT. PRESS.	3b	.306E+04	.558E+02	.652E+01	.307E+04	
INCREASE EXT. PRESS.	4a	.112E+05	.268E+02	.368E+02	.112E+05	
INCREASE EXT. PRESS.	4b	.306E+04	.268E+02	.368E+02	.310E+04	
VIBRATION AND SHOCK	5a	.112E+05	.683E+03	.646E+03	.118E+05	.592E+04
VIBRATION AND SHOCK	5b	.306E+04	.683E+03	.646E+03	.371E+04	.185E+04
VIBRATION AND SHOCK	5c	.787E+04	.683E+03	.646E+03	.851E+04	.426E+04
FREE DROP-TOP	6a	.112E+05	.101E+04	.933E+03	.121E+05	
FREE DROP-TOP	6b	.306E+04	.101E+04	.933E+03	.400E+04	
FREE DROP-TOP	6c	.787E+04	.101E+04	.933E+03	.880E+04	
FREE DROP-SIDE, 0 MER	6a	.112E+05	.134E+04	.911E+03	.121E+05	
FREE DROP-SIDE, 0 MER	6b	.306E+04	.134E+04	.911E+03	.397E+04	
FREE DROP-SIDE, 0 MER	6c	.787E+04	.134E+04	.911E+03	.878E+04	
FREE DROP-SIDE, 45 MER	6a	.112E+05	.134E+04	.130E+04	.125E+05	
FREE DROP-SIDE, 45 MER	6b	.306E+04	.134E+04	.130E+04	.437E+04	
FREE DROP-SIDE, 45 MER	6c	.787E+04	.134E+04	.130E+04	.917E+04	
MAXIMUM STRESS INTENSITY			.134E+04	.130E+04	.125E+05	

NOTES:

1. Pm < Sm = 20.0 ksi
   Pm+Pb< 1.5*Sm = 30.0 ksi
   Pm+Pb+Q < 3.0*Sm = 60.0 ksi
2. See Table 2.10.9.42 for combination index identification.
3. For combinations with Salt not listed, the number of load cycles are few and therefore, the fatigue qualifications are met.
4. MER = Meridian, angle of orientation from the contact edge where stresses are given.

TABLE 2.10.9.52A. SUMMARY OF STRESSES FOR LOAD COMBINATIONS, NORMAL CONDITIONS OF TRANSPORT, STRESS POINT 8B

LOAD COMBINATION	COMBINATION INDEX	Q	STRESS INTENSITY CATEGORY Pm	Pm+Pb	Pm+Pb+Q	FATIGUE Salt
HOT ENVIRONMENT	1	.112E+05	.301E+02	.169E+02	.112E+05	
COLD ENVIRONMENT	2a	.482E+04	.301E+02	.169E+02	.484E+04	
COLD ENVIRONMENT	2b	.961E+04	.301E+02	.169E+02	.963E+04	
MINIMUM EXT. PRESS.	3a	.112E+05	.558E+02	.652E+01	.112E+05	
MINIMUM EXT. PRESS.	3b	.306E+04	.558E+02	.652E+01	.307E+04	
INCREASE EXT. PRESS.	4a	.112E+05	.268E+02	.368E+02	.112E+05	
INCREASE EXT. PRESS.	4b	.306E+04	.268E+02	.368E+02	.310E+04	
VIBRATION AND SHOCK	5a	.112E+05	.683E+03	.646E+03	.118E+05	.592E+04
VIBRATION AND SHOCK	5b	.306E+04	.683E+03	.646E+03	.371E+04	.185E+04
VIBRATION AND SHOCK	5c	.787E+04	.683E+03	.646E+03	.851E+04	.426E+04
FREE DROP-TOP	6a	.112E+05	.524E+03	.429E+03	.116E+05	
FREE DROP-TOP	6b	.306E+04	.524E+03	.429E+03	.349E+04	
FREE DROP-TOP	6c	.787E+04	.524E+03	.429E+03	.829E+04	
FREE DROP-SIDE, 0 MER	6a	.112E+05	.488E+04	.333E+04	.145E+05	
FREE DROP-SIDE, 0 MER	6b	.306E+04	.488E+04	.333E+04	.639E+04	
FREE DROP-SIDE, 0 MER	6c	.787E+04	.488E+04	.333E+04	.112E+05	
FREE DROP-SIDE, 45 MER	6a	.112E+05	.491E+04	.479E+04	.160E+05	
FREE DROP-SIDE, 45 MER	6b	.306E+04	.491E+04	.479E+04	.785E+04	
FREE DROP-SIDE, 45 MER	6c	.787E+04	.491E+04	.479E+04	.127E+05	
MAXIMUM STRESS INTENSITY			.491E+04	.479E+04	.160E+05	

NOTES:
1. Pm < Sm = 20.0 ksi
   Pm+Pb< 1.5*Sm = 30.0 ksi
   Pm+Pb+Q < 3.0*Sm = 60.0 ksi
2. See Table 2.10.9.42 for combination index identification,
3. For combinations with Salt not listed, the number of load cycles are few and therefore, the fatigue qualifications are met.
4. MER = Meridian, angle of orientation from the contact edge where stresses are given.

TABLE 2.10.9.53. SUMMARY OF STRESSES FOR LOAD COMBINATIONS, NORMAL CONDITIONS OF TRANSPORT, STRESS POINT 9A

LOAD	COMBINATION		STRESS INTENSITY CATEGORY			FATIGUE
COMBINATION	INDEX	Q	Pm	Pm+Pb	Pm+Pb+Q	Salt
HOT ENVIRONMENT	1	.626E+04	.133E+03	.144E+03	.640E+04	
COLD ENVIRONMENT	2a	.450E+04	.133E+03	.144E+03	.465E+04	
COLD ENVIRONMENT	2b	.412E+04	.133E+03	.144E+03	.426E+04	
MINIMUM EXT. PRESS.	3a	.626E+04	.227E+03	.244E+03	.650E+04	
MINIMUM EXT. PRESS.	3b	.458E+04	.227E+03	.244E+03	.482E+04	
INCREASE EXT. PRESS.	4a	.626E+04	.896E+02	.973E+02	.636E+04	
INCREASE EXT. PRESS.	4b	.458E+04	.896E+02	.973E+02	.468E+04	
VIBRATION AND SHOCK	5a	.626E+04	.733E+03	.778E+03	.704E+04	.352E+04
VIBRATION AND SHOCK	5b	.458E+04	.733E+03	.778E+03	.536E+04	.268E+04
VIBRATION AND SHOCK	5c	.431E+04	.733E+03	.778E+03	.509E+04	.255E+04
FREE DROP-TOP	6a	.626E+04	.856E+03	.864E+03	.712E+04	
FREE DROP-TOP	6b	.458E+04	.856E+03	.864E+03	.544E+04	
FREE DROP-TOP	6c	.431E+04	.856E+03	.864E+03	.518E+04	
FREE DROP-SIDE, 0 MER	6a	.626E+04	.922E+03	.412E+03	.667E+04	
FREE DROP-SIDE, 0 MER	6b	.458E+04	.922E+03	.412E+03	.499E+04	
FREE DROP-SIDE, 0 MER	6c	.431E+04	.922E+03	.412E+03	.473E+04	
FREE DROP-SIDE, 45 MER	6a	.626E+04	.220E+04	.367E+04	.993E+04	
FREE DROP-SIDE, 45 MER	6b	.458E+04	.220E+04	.367E+04	.825E+04	
FREE DROP-SIDE, 45 MER	6c	.431E+04	.220E+04	.367E+04	.798E+04	
MAXIMUM STRESS INTENSITY			.220E+04	.367E+04	.993E+04	

NOTES:

1. Pm < Sm = 20.0 ksi
   Pm+Pb< 1.5*Sm = 30.0 ksi
   Pm+Pb+Q < 3.0*Sm = 60.0 ksi
2. See Table 2.10.9.42 for combination index identification.
3. For combinations with Salt not listed, the number of load cycles are few and therefore, the fatigue qualifications are met.
4. MER = Meridian, angle of orientation from the contact edge where stresses are given.

TABLE 2.10.9.53A. SUMMARY OF STRESSES FOR LOAD COMBINATIONS, NORMAL CONDITIONS OF TRANSPORT, STRESS POINT 9A

LOAD COMBINATION	COMBINATION INDEX	Q	STRESS INTENSITY CATEGORY Pm	Pm+Pb	Pm+Pb+Q	FATIGUE Salt
HOT ENVIRONMENT	1	.626E+04	.133E+03	.144E+03	.640E+04	
COLD ENVIRONMENT	2a	.450E+04	.133E+03	.144E+03	.465E+04	
COLD ENVIRONMENT	2b	.412E+04	.133E+03	.144E+03	.426E+04	
MINIMUM EXT. PRESS.	3a	.626E+04	.227E+03	.244E+03	.650E+04	
MINIMUM EXT. PRESS.	3b	.458E+04	.227E+03	.244E+03	.482E+04	
INCREASE EXT. PRESS.	4a	.626E+04	.896E+02	.973E+02	.636E+04	
INCREASE EXT. PRESS.	4b	.458E+04	.896E+02	.973E+02	.468E+04	
VIBRATION AND SHOCK	5a	.626E+04	.733E+03	.778E+03	.704E+04	.352E+04
VIBRATION AND SHOCK	5b	.458E+04	.733E+03	.778E+03	.536E+04	.268E+04
VIBRATION AND SHOCK	5c	.431E+04	.733E+03	.778E+03	.509E+04	.255E+04
FREE DROP-TOP	6a	.626E+04	.158E+04	.157E+04	.783E+04	
FREE DROP-TOP	6b	.458E+04	.158E+04	.157E+04	.616E+04	
FREE DROP-TOP	6c	.431E+04	.158E+04	.157E+04	.589E+04	
FREE DROP-SIDE, 0 MER	6a	.626E+04	.306E+04	.114E+04	.740E+04	
FREE DROP-SIDE, 0 MER	6b	.458E+04	.306E+04	.114E+04	.572E+04	
FREE DROP-SIDE, 0 MER	6c	.431E+04	.306E+04	.114E+04	.545E+04	
FREE DROP-SIDE, 45 MER	6a	.626E+04	.779E+04	.132E+05	.195E+05	
FREE DROP-SIDE, 45 MER	6b	.458E+04	.779E+04	.132E+05	.178E+05	
FREE DROP-SIDE, 45 MER	6c	.431E+04	.779E+04	.132E+05	.175E+05	
MAXIMUM STRESS INTENSITY			.779E+04	.132E+05	.195E+05	

NOTES:
1. Pm < Sm = 20.0 ksi
   Pm+Pb< 1.5*Sm = 30.0 ksi
   Pm+Pb+Q < 3.0*Sm = 60.0 ksi
2. See Table 2.10.9.42 for combination index identification.
3. For combinations with Salt not listed, the number of load cycles are few and therefore, the fatigue qualifications are met.
4. MER = Meridian, angle of orientation from the contact edge where stresses are given.

TABLE 2.10.9.54. SUMMARY OF STRESSES FOR LOAD COMBINATIONS, NORMAL CONDITIONS OF TRANSPORT, STRESS POINT 9B

LOAD COMBINATION	COMBINATION INDEX	Q	Pm	Pm+Pb	Pm+Pb+Q	FATIGUE Salt
HOT ENVIRONMENT	1	.564E+04	.133E+03	.123E+03	.576E+04	
COLD ENVIRONMENT	2a	.420E+04	.133E+03	.123E+03	.432E+04	
COLD ENVIRONMENT	2b	.384E+04	.133E+03	.123E+03	.396E+04	
MINIMUM EXT. PRESS.	3a	.564E+04	.227E+03	.210E+03	.585E+04	
MINIMUM EXT. PRESS.	3b	.428E+04	.227E+03	.210E+03	.449E+04	
INCREASE EXT. PRESS.	4a	.564E+04	.896E+02	.820E+02	.572E+04	
INCREASE EXT. PRESS.	4b	.428E+04	.896E+02	.820E+02	.436E+04	
VIBRATION AND SHOCK	5a	.564E+04	.733E+03	.789E+03	.643E+04	.321E+04
VIBRATION AND SHOCK	5b	.428E+04	.733E+03	.789E+03	.507E+04	.253E+04
VIBRATION AND SHOCK	5c	.421E+04	.733E+03	.789E+03	.500E+04	.250E+04
FREE DROP-TOP	6a	.564E+04	.856E+03	.847E+03	.649E+04	
FREE DROP-TOP	6b	.428E+04	.856E+03	.847E+03	.513E+04	
FREE DROP-TOP	6c	.421E+04	.856E+03	.847E+03	.505E+04	
FREE DROP-SIDE, 0 MER	6a	.564E+04	.922E+03	.193E+04	.757E+04	
FREE DROP-SIDE, 0 MER	6b	.428E+04	.922E+03	.193E+04	.621E+04	
FREE DROP-SIDE, 0 MER	6c	.421E+04	.922E+03	.193E+04	.614E+04	
FREE DROP-SIDE, 45 MER	6a	.564E+04	.220E+04	.805E+03	.645E+04	
FREE DROP-SIDE, 45 MER	6b	.428E+04	.220E+04	.805E+03	.509E+04	
FREE DROP-SIDE, 45 MER	6c	.421E+04	.220E+04	.805E+03	.501E+04	
MAXIMUM STRESS INTENSITY			.220E+04	.193E+04	.757E+04	

NOTES:
1. Pm < Sm = 20.0 ksi
   Pm+Pb< 1.5*Sm = 30.0 ksi
   Pm+Pb+Q < 3.0*Sm = 60.0 ksi
2. See Table 2.10.9.42 for combination index identification.
3. For combinations with Salt not listed, the number of load cycles are few and therefore, the fatigue qualifications are met.
4. MER = Meridian, angle of orientation from the contact edge where stresses are given.

TABLE 2.10.9.54A. SUMMARY OF STRESSES FOR LOAD COMBINATIONS, NORMAL CONDITIONS OF TRANSPORT, STRESS POINT 9B

LOAD COMBINATION	COMBINATION INDEX	Q	STRESS INTENSITY CATEGORY Pm	Pm+Pb	Pm+Pb+Q	FATIGUE Salt
HOT ENVIRONMENT	1	.564E+04	.133E+03	.123E+03	.576E+04	
COLD ENVIRONMENT	2a	.420E+04	.133E+03	.123E+03	.432E+04	
COLD ENVIRONMENT	2b	.384E+04	.133E+03	.123E+03	.396E+04	
MINIMUM EXT. PRESS.	3a	.564E+04	.227E+03	.210E+03	.585E+04	
MINIMUM EXT. PRESS.	3b	.428E+04	.227E+03	.210E+03	.449E+04	
INCREASE EXT. PRESS.	4a	.564E+04	.896E+02	.820E+02	.572E+04	
INCREASE EXT. PRESS.	4b	.428E+04	.896E+02	.820E+02	.436E+04	
VIBRATION AND SHOCK	5a	.564E+04	.733E+03	.789E+03	.643E+04	.321E+04
VIBRATION AND SHOCK	5b	.428E+04	.733E+03	.789E+03	.507E+04	.253E+04
VIBRATION AND SHOCK	5c	.421E+04	.733E+03	.789E+03	.500E+04	.250E+04
FREE DROP-TOP	6a	.564E+04	.158E+04	.158E+04	.722E+04	
FREE DROP-TOP	6b	.428E+04	.158E+04	.158E+04	.586E+04	
FREE DROP-TOP	6c	.421E+04	.158E+04	.158E+04	.579E+04	
FREE DROP-SIDE, 0 MER	6a	.564E+04	.306E+04	.683E+04	.125E+05	
FREE DROP-SIDE, 0 MER	6b	.428E+04	.306E+04	.683E+04	.111E+05	
FREE DROP-SIDE, 0 MER	6c	.421E+04	.306E+04	.683E+04	.110E+05	
FREE DROP-SIDE, 45 MER	6a	.564E+04	.779E+04	.265E+04	.830E+04	
FREE DROP-SIDE, 45 MER	6b	.428E+04	.779E+04	.265E+04	.693E+04	
FREE DROP-SIDE, 45 MER	6c	.421E+04	.779E+04	.265E+04	.686E+04	
MAXIMUM STRESS INTENSITY			.779E+04	.683E+04	.125E+05	

NOTES:

1. Pm < Sm = 20.0 ksi
   Pm+Pb< 1.5*Sm = 30.0 ksi
   Pm+Pb+Q < 3.0*Sm = 60.0 ksi
2. See Table 2.10.9.42 for combination index identification.
3. For combinations with Salt not listed, the number of load cycles are few and therefore, the fatigue qualifications are met.
4. MER = Meridian, angle of orientation from the contact edge where stresses are given.

TABLE 2.10.9.55. SUMMARY OF STRESSES FOR LOAD COMBINATIONS, NORMAL CONDITIONS OF TRANSPORT, STRESS POINT 10A

LOAD COMBINATION	COMBINATION INDEX	STRESS INTENSITY CATEGORY Q	Pm	Pm+Pb	Pm+Pb+Q	FATIGUE Salt
HOT ENVIRONMENT	1	.718E+04	.606E+02	.632E+02	.724E+04	
COLD ENVIRONMENT	2a	.421E+03	.606E+02	.632E+02	.484E+03	
COLD ENVIRONMENT	2b	.270E+03	.606E+02	.632E+02	.333E+03	
MINIMUM EXT. PRESS.	3a	.718E+04	.118E+03	.124E+03	.730E+04	
MINIMUM EXT. PRESS.	3b	.378E+03	.118E+03	.124E+03	.502E+03	
INCREASE EXT. PRESS.	4a	.718E+04	.356E+02	.363E+02	.721E+04	
INCREASE EXT. PRESS.	4b	.378E+03	.356E+02	.363E+02	.414E+03	
VIBRATION AND SHOCK	5a	.718E+04	.852E+03	.809E+03	.799E+04	.399E+04
VIBRATION AND SHOCK	5b	.378E+03	.852E+03	.809E+03	.119E+04	.593E+03
VIBRATION AND SHOCK	5c	.257E+03	.852E+03	.809E+03	.107E+04	.533E+03
FREE DROP-TOP	6a	.718E+04	.119E+04	.119E+04	.837E+04	
FREE DROP-TOP	6b	.378E+03	.119E+04	.119E+04	.157E+04	
FREE DROP-TOP	6c	.257E+03	.119E+04	.119E+04	.145E+04	
FREE DROP-SIDE, 0 MER	6a	.718E+04	.203E+04	.152E+04	.870E+04	
FREE DROP-SIDE, 0 MER	6b	.378E+03	.203E+04	.152E+04	.190E+04	
FREE DROP-SIDE, 0 MER	6c	.257E+03	.203E+04	.152E+04	.178E+04	
FREE DROP-SIDE, 45 MER	6a	.718E+04	.213E+04	.154E+04	.872E+04	
FREE DROP-SIDE, 45 MER	6b	.378E+03	.213E+04	.154E+04	.192E+04	
FREE DROP-SIDE, 45 MER	6c	.257E+03	.213E+04	.154E+04	.180E+04	
MAXIMUM STRESS INTENSITY			.213E+04	.154E+04	.872E+04	

NOTES:
1. Pm < Sm = 20.0 ksi
   Pm+Pb< 1.5*Sm = 30.0 ksi
   Pm+Pb+Q < 3.0*Sm = 60.0 ksi
2. See Table 2.10.9.42 for combination index identification.
3. For combinations with Salt not listed, the number of load cycles are few and therefore, the fatigue qualifications are met.
4. MER = Meridian, angle of orientation from the contact edge where stresses are given.

TABLE 2.10.9.55A. SUMMARY OF STRESSES FOR LOAD COMBINATIONS, NORMAL CONDITIONS OF TRANSPORT, STRESS POINT 10A

LOAD COMBINATION	COMBINATION INDEX	Q	Pm	Pm+Pb	Pm+Pb+Q	FATIGUE Salt
		STRESS INTENSITY CATEGORY				
HOT ENVIRONMENT	1	.718E+04	.606E+02	.632E+02	.724E+04	
COLD ENVIRONMENT	2a	.421E+03	.606E+02	.632E+02	.484E+03	
COLD ENVIRONMENT	2b	.270E+03	.606E+02	.632E+02	.333E+03	
MINIMUM EXT. PRESS.	3a	.718E+04	.118E+03	.124E+03	.730E+04	
MINIMUM EXT. PRESS.	3b	.378E+03	.118E+03	.124E+03	.502E+03	
INCREASE EXT. PRESS.	4a	.718E+04	.356E+02	.363E+02	.721E+04	
INCREASE EXT. PRESS.	4b	.378E+03	.356E+02	.363E+02	.414E+03	
VIBRATION AND SHOCK	5a	.718E+04	.852E+03	.809E+03	.799E+04	.399E+04
VIBRATION AND SHOCK	5b	.378E+03	.852E+03	.809E+03	.119E+04	.593E+03
VIBRATION AND SHOCK	5c	.257E+03	.852E+03	.809E+03	.107E+04	.533E+03
FREE DROP-TOP	6a	.718E+04	.128E+04	.123E+04	.841E+04	
FREE DROP-TOP	6b	.378E+03	.128E+04	.123E+04	.161E+04	
FREE DROP-TOP	6c	.257E+03	.128E+04	.123E+04	.149E+04	
FREE DROP-SIDE, 0 MER	6a	.718E+04	.737E+04	.548E+04	.127E+05	
FREE DROP-SIDE, 0 MER	6b	.378E+03	.737E+04	.548E+04	.586E+04	
FREE DROP-SIDE, 0 MER	6c	.257E+03	.737E+04	.548E+04	.574E+04	
FREE DROP-SIDE, 45 MER	6a	.718E+04	.775E+04	.555E+04	.127E+05	
FREE DROP-SIDE, 45 MER	6b	.378E+03	.775E+04	.555E+04	.593E+04	
FREE DROP-SIDE, 45 MER	6c	.257E+03	.775E+04	.555E+04	.581E+04	
MAXIMUM STRESS INTENSITY			.775E+04	.555E+04	.127E+05	

NOTES:
1. Pm < Sm = 20.0 ksi
   Pm+Pb< 1.5*Sm = 30.0 ksi
   Pm+Pb+Q < 3.0*Sm = 60.0 ksi
2. See Table 2.10.9.42 for combination index identification.
3. For combinations with Salt not listed, the number of load cycles are few and therefore, the fatigue qualifications are met.
4. MER = Meridian, angle of orientation from the contact edge where stresses are given.

TABLE 2.10.9.56. SUMMARY OF STRESSES FOR LOAD COMBINATIONS, NORMAL CONDITIONS OF TRANSPORT, STRESS POINT 10B

LOAD COMBINATION	COMBINATION INDEX	Q	STRESS INTENSITY CATEGORY Pm	Pm+Pb	Pm+Pb+Q	FATIGUE Salt
HOT ENVIRONMENT	1	.651E+04	.606E+02	.580E+02	.657E+04	
COLD ENVIRONMENT	2a	.486E+03	.606E+02	.580E+02	.544E+03	
COLD ENVIRONMENT	2b	.247E+03	.606E+02	.580E+02	.305E+03	
MINIMUM EXT. PRESS.	3a	.651E+04	.118E+03	.113E+03	.662E+04	
MINIMUM EXT. PRESS.	3b	.453E+03	.118E+03	.113E+03	.565E+03	
INCREASE EXT. PRESS.	4a	.651E+04	.356E+02	.349E+02	.654E+04	
INCREASE EXT. PRESS.	4b	.453E+03	.356E+02	.349E+02	.488E+03	
VIBRATION AND SHOCK	5a	.651E+04	.852E+03	.922E+03	.743E+04	.371E+04
VIBRATION AND SHOCK	5b	.453E+03	.852E+03	.922E+03	.137E+04	.687E+03
VIBRATION AND SHOCK	5c	.237E+03	.852E+03	.922E+03	.116E+04	.579E+03
FREE DROP-TOP	6a	.651E+04	.119E+04	.119E+04	.769E+04	
FREE DROP-TOP	6b	.453E+03	.119E+04	.119E+04	.164E+04	
FREE DROP-TOP	6c	.237E+03	.119E+04	.119E+04	.142E+04	
FREE DROP-SIDE, 0 MER	6a	.651E+04	.203E+04	.260E+04	.910E+04	
FREE DROP-SIDE, 0 MER	6b	.453E+03	.203E+04	.260E+04	.305E+04	
FREE DROP-SIDE, 0 MER	6c	.237E+03	.203E+04	.260E+04	.283E+04	
FREE DROP-SIDE, 45 MER	6a	.651E+04	.213E+04	.279E+04	.929E+04	
FREE DROP-SIDE, 45 MER	6b	.453E+03	.213E+04	.279E+04	.324E+04	
FREE DROP-SIDE, 45 MER	6c	.237E+03	.213E+04	.279E+04	.302E+04	
MAXIMUM STRESS INTENSITY			.213E+04	.279E+04	.929E+04	

NOTES:
1. Pm < Sm = 20.0 ksi
   Pm+Pb< 1.5*Sm = 30.0 ksi
   Pm+Pb+Q < 3.0*Sm = 60.0 ksi
2. See Table 2.10.9.42 for combination index identification.
3. For combinations with Salt not listed, the number of load cycles are few and therefore, the fatigue qualifications are met,
4. MER = Meridian, angle of orientation from the contact edge where stresses are given.

TABLE 2.10.9.56A. SUMMARY OF STRESSES FOR LOAD COMBINATIONS, NORMAL CONDITIONS OF TRANSPORT, STRESS POINT 10B

LOAD COMBINATION	COMBINATION INDEX	Q	STRESS INTENSITY CATEGORY Pm	Pm+Pb	Pm+Pb+Q	FATIGUE Salt
HOT ENVIRONMENT	1	.651E+04	.606E+02	.580E+02	.657E+04	
COLD ENVIRONMENT	2a	.486E+03	.606E+02	.580E+02	.544E+03	
COLD ENVIRONMENT	2b	.247E+03	.606E+02	.580E+02	.305E+03	
MINIMUM EXT. PRESS.	3a	.651E+04	.118E+03	.113E+03	.662E+04	
MINIMUM EXT. PRESS.	3b	.453E+03	.118E+03	.113E+03	.565E+03	
INCREASE EXT. PRESS.	4a	.651E+04	.356E+02	.349E+02	.654E+04	
INCREASE EXT. PRESS.	4b	.453E+03	.356E+02	.349E+02	.488E+03	
VIBRATION AND SHOCK	5a	.651E+04	.852E+03	.922E+03	.743E+04	.371E+04
VIBRATION AND SHOCK	5b	.453E+03	.852E+03	.922E+03	.137E+04	.687E+03
VIBRATION AND SHOCK	5c	.237E+03	.852E+03	.922E+03	.116E+04	.579E+03
FREE DROP-TOP	6a	.651E+04	.128E+04	.133E+04	.784E+04	
FREE DROP-TOP	6b	.453E+03	.128E+04	.133E+04	.179E+04	
FREE DROP-TOP	6c	.237E+03	.128E+04	.133E+04	.157E+04	
FREE DROP-SIDE, 0 MER	6a	.651E+04	.737E+04	.948E+04	.160E+05	
FREE DROP-SIDE, 0 MER	6b	.453E+03	.737E+04	.948E+04	.993E+04	
FREE DROP-SIDE, G MER	6c	.237E+03	.737E+04	.948E+04	.971E+04	
FREE DROP-SIDE, 45 MER	6a	.651E+04	.775E+04	.102E+05	.167E+05	
FREE DROP-SIDE, 45 MER	6b	.453E+03	.775E+04	.102E+05	.106E+05	
FREE DROP-SIDE, 45 MER	6c	.237E+03	.775E+04	.102E+05	.104E+05	
MAXIMUM STRESS INTENSITY			.775E+04	.102E+05	.167E+05	

NOTES:
1. Pm < Sm = 20.0 ksi
   Pm+Pb< 1.5*Sm = 30.0 ksi
   Pm+Pb+Q < 3.0*Sm = 60.0 ksi
2. See Table 2.10.9.42 for combination index identification.
3. For combinations with Salt not listed, the number of load cycles are few and therefore, the fatigue qualifications are met.
4. MER = Meridian, angle of orientation from the contact edge where stresses are given.

TABLE 2.10.9.57. SUMMARY OF STRESSES FOR LOAD COMBINATIONS, NORMAL CONDITIONS OR TRANSPORT, STRESS POINT 11A

LOAD	COMBINATION		STRESS INTENSITY CATEGORY			FATIGUE
COMBINATION	INDEX	Q	Pm	Pm+Pb	Pm+Pb+Q	Salt
HOT ENVIRONMENT	1	.636E+04	.131E+03	.142E+03	.650E+04	
COLD ENVIRONMENT	2a	.443E+04	.131E+03	.142E+03	.457E+04	
COLD ENVIRONMENT	2b	.407E+04	.131E+03	.142E+03	.422E+04	
MINIMUM EXT. PRESS.	3a	.636E+04	.223E+03	.240E+03	.660E+04	
MINIMUM EXT. PRESS.	3b	.458E+04	.223E+03	.240E+03	.482E+04	
INCREASE EXT. PRESS.	4a	.636E+04	.880E+02	.956E+02	.646E+04	
INCREASE EXT. PRESS.	4b	.458E+04	.880E+02	.956E+02	.467E+04	
VIBRATION AND SHOCK	5a	.636E+04	.745E+03	.773E+03	.713E+04	.357E+04
VIBRATION AND SHOCK	5b	.458E+04	.745E+03	.773E+03	.535E+04	.268E+04
VIBRATION AND SHOCK	5c	.425E+04	.745E+03	.773E+03	.502E+04	.251E+04
FREE DROP-TOP	6a	.636E+04	.854E+03	.861E+03	.722E+04	
FREE DROP-TOP	6b	.458E+04	.854E+03	.861E+03	.544E+04	
FREE DROP-TOP	6c	.425E+04	.854E+03	.861E+03	.511E+04	
FREE DROP-SIDE, 0 MER	6a	.636E+04	.111E+04	.260E+03	.662E+04	
FREE DROP-SIDE, 0 MER	6b	.458E+04	.111E+04	.260E+03	.484E+04	
FREE DROP-SIDE, 0 MER	6c	.425E+04	.111E+04	.260E+03	.451E+04	
FREE DROP-SIDE, 45 MER	6a	.636E+04	.261E+04	.427E+04	.106E+05	
FREE DROP-SIDE, 45 MER	6b	.458E+04	.261E+04	.427E+04	.884E+04	
FREE DROP-SIDE, 45 MER	6c	.425E+04	.261E+04	.427E+04	.852E+04	
MAXIMUM STRESS INTENSITY			.261E+04	.427E+04	.106E+05	

NOTES:
1. Pm < Sm = 20.0 ksi
   Pm+Pb< 1.5*Sm = 30.0 ksi
   Pm+Pb+Q < 3.0*Sm = 60.0 ksi
2. See Table 2.10.9.42 for combination index identification.
3. For combinations with Salt not listed, the number of load cycles are few and therefore, the fatigue qualifications are met.
4. MER = Meridian, angle of orientation from the contact edge where stresses are given.

TABLE 2.10.9.57A. SUMMARY OF STRESSES FOR LOAD COMBINATIONS, NORMAL CONDITIONS OF TRANSPORT, STRESS POINT 11A

LOAD COMBINATION	COMBINATION INDEX	STRESS INTENSITY CATEGORY Q	Pm	Pm+Pb	Pm+Pb+Q	FATIGUE Salt
HOT ENVIRONMENT	1	.636E+04	.131E+03	.142E+03	.650E+04	
COLD ENVIRONMENT	2a	.443E+04	.131E+03	.142E+03	.457E+04	
COLD ENVIRONMENT	2b	.407E+04	.131E+03	.142E+03	.422E+04	
MINIMUM EXT. PRESS.	3a	.636E+04	.223E+03	.240E+03	.660E+04	
MINIMUM EXT. PRESS.	3b	.458E+04	.223E+03	.240E+03	.482E+04	
INCREASE EXT. PRESS.	4a	.636E+04	.880E+02	.956E+02	.646E+04	
INCREASE EXT. PRESS.	4b	.458E+04	.880E+02	.956E+02	.467E+04	
VIBRATION AND SHOCK	5a	.636E+04	.745E+03	.773E+03	.713E+04	.357E+04
VIBRATION AND SHOCK	5b	.458E+04	.745E+03	.773E+03	.535E+04	.268E+04
VIBRATION AND SHOCK	5c	.425E+04	.745E+03	.773E+03	.502E+04	.251E+04
FREE DROP-TOP	6a	.636E+04	.212E+04	.187E+04	.823E+04	
FREE DROP-TOP	6b	.458E+04	.212E+04	.187E+04	.644E+04	
FREE DROP-TOP	6c	.425E+04	.212E+04	.187E+04	.612E+04	
FREE DROP-SIDE, 0 MER	6a	.636E+04	.375E+04	.581E+03	.694E+04	
FREE DROP-SIDE, 0 MER	6b	.458E+04	.375E+04	.581E+03	.516E+04	
FREE DROP-SIDE, 0 MER	6c	.425E+04	.375E+04	.581E+03	.483E+04	
FREE DROP-SIDE, 45 MER	6a	.636E+04	.934E+04	.154E+05	.218E+05	
FREE DROP-SIDE, 45 MER	6b	.458E+04	.934E+04	.154E+05	.200E+05	
FREE DROP-SIDE, 45 MER	6c	.425E+04	.934E+04	.154E+05	.197E+05	
MAXIMUM STRESS INTENSITY			.934E+04	.154E+05	.218E+05	

NOTES:

1. Pm < Sm = 20.0 ksi
   Pm+Pb< 1.5*Sm = 30.0 ksi
   Pm+Pb+Q < 3.0*Sm = 60.0 ksi
2. See Table 2.10.9.42 for combination index identification.
3. For combinations with Salt not listed, the number of load cycles are few and therefore, the fatigue qualifications are met.
4. MER = Meridian, angle of orientation from the contact edge where stresses are given.

TABLE 2.10.9.58. SUMMARY OF STRESSES FOR LOAD COMBINATIONS, NORMAL CONDITIONS OF TRANSPORT, STRESS POINT 11B

LOAD COMBINATION	COMBINATION INDEX	Q	Pm	Pm+Pb	Pm+Pb+Q	FATIGUE Salt
HOT ENVIRONMENT	1	.570E+04	.131E+03	.120E+03	.582E+04	
COLD ENVIRONMENT	2a	.405E+04	.131E+03	.120E+03	.417E+04	
COLD ENVIRONMENT	2b	.402E+04	.131E+03	.120E+03	.414E+04	
MINIMUM EXT. PRESS.	3a	.570E+04	.223E+03	.206E+03	.591E+04	
MINIMUM EXT. PRESS.	3b	.429E+04	.223E+03	.206E+03	.450E+04	
INCREASE EXT. PRESS.	4a	.570E+04	.880E+02	.803E+02	.578E+04	
INCREASE EXT. PRESS.	4b	.429E+04	.880E+02	.803E+02	.437E+04	
VIBRATION AND SHOCK	5a	.570E+04	.745E+03	.800E+03	.650E+04	.325E+04
VIBRATION AND SHOCK	5b	.429E+04	.745E+03	.800E+03	.509E+04	.254E+04
VIBRATION AND SHOCK	5c	.431E+04	.745E+03	.800E+03	.511E+04	.255E+04
FREE DROP-TOP	6a	.570E+04	.854E+03	.846E+03	.655E+04	
FREE DROP-TOP	6b	.429E+04	.854E+03	.846E+03	.513E+04	
FREE DROP-TOP	6c	.431E+04	.854E+03	.846E+03	.516E+04	
FREE DROP-SIDE, 0 MER	6a	.570E+04	.111E+04	.212E+04	.783E+04	
FREE DROP-SIDE, 0 MER	6b	.429E+04	.111E+04	.212E+04	.641E+04	
FREE DROP-SIDE, 0 MER	6c	.431E+04	.111E+04	.212E+04	.643E+04	
FREE DROP-SIDE, 45 MER	6a	.570E+04	.261E+04	.999E+03	.670E+04	
FREE DROP-SIDE, 45 MER	6b	.429E+04	.261E+04	.999E+03	.529E+04	
FREE DROP-SIDE, 45 MER	6c	.431E+04	.261E+04	.999E+03	.531E+04	
MAXIMUM STRESS INTENSITY			.261E+04	.212E+04	.783E+04	

NOTES:
1. Pm < Sm = 20.0 ksi
   Pm+Pb< 1.5*Sm = 30.0 ksi
   Pm+Pb+Q < 3.0*Sm = 60.0 ksi
2. See Table 2.10.9.42 for combination index identification.
3. For combinations with Salt not listed, the number of load cycles are few and therefore, the fatigue qualifications are met.
4. MER = Meridian, angle of orientation from the contact edge where stresses are given.

TABLE 2.10.9.58A. SUMMARY OF STRESSES FOR LOAD COMBINATIONS, NORMAL CONDITIONS OF TRANSPORT, STRESS POINT 11B

LOAD COMBINATION	COMBINATION INDEX	Q	STRESS INTENSITY CATEGORY Pm	Pm+Pb	Pm+Pb+Q	FATIGUE Salt
HOT ENVIRONMENT	1	.570E+04	.131E+03	.120E+03	.582E+04	
COLD ENVIRONMENT	2a	.405E+04	.131E+03	.120E+03	.417E+04	
COLD ENVIRONMENT	2b	.402E+04	.131E+03	.120E+03	.414E+04	
MINIMUM EXT. PRESS.	3a	.570E+04	.223E+03	.206E+03	.591E+04	
MINIMUM EXT. PRESS.	3b	.429E+04	.223E+03	.206E+03	.450E+04	
INCREASE EXT. PRESS.	4a	.570E+04	.880E+02	.803E+02	.578E+04	
INCREASE EXT. PRESS.	4b	.429E+04	.880E+02	.803E+02	.437E+04	
VIBRATION AND SHOCK	5a	.570E+04	.745E+03	.800E+03	.650E+04	.325E+04
VIBRATION AND SHOCK	5b	.429E+04	.745E+03	.800E+03	.509E+04	.254E+04
VIBRATION AND SHOCK	5c	.431E+04	.745E+03	.800E+03	.511E+04	.255E+04
FREE DROP-TOP	6a	.570E+04	.212E+04	.236E+04	.807E+04	
FREE DROP-TOP	6b	.429E+04	.212E+04	.236E+04	.665E+04	
FREE DROP-TOP	6c	.431E+04	.212E+04	.236E+04	.667E+04	
FREE DROP-SIDE, 0 MER	6a	.570E+04	.375E+04	.755E+04	.133E+05	
FREE DROP-SIDE, 0 MER	6b	.429E+04	.375E+04	.755E+04	.118E+05	
FREE DROP-SIDE, 0 MER	6c	.431E+04	.375E+04	.755E+04	.119E+05	
FREE DROP-SIDE, 45 MER	6a	.570E+04	.934E+04	.338E+04	.908E+04	
FREE DROP-SIDE, 45 MER	6b	.429E+04	.934E+04	.338E+04	.767E+04	
FREE DROP-SIDE, 45 MER	6c	.431E+04	.934E+04	.338E+04	.769E+04	
MAXIMUM STRESS INTENSITY			.934E+04	.755E+04	.133E+05	

NOTES:
1. Pm < Sm = 20.0 ksi
   Pm+Pb< 1.5*Sm = 30.0 ksi
   Pm+Pb+Q < 3.0*Sm = 60.0 ksi
2. See Table 2.10.9.42 for combination index identification.
3. For combinations with Salt not listed, the number of load cycles are few and therefore, the fatigue qualifications are met.
4. MER = Meridian, angle of orientation from the contact edge where stresses are given.

TABLE 2.10.9.59. SUMMARY OF STRESSES FOR LOAD COMBINATIONS, NORMAL CONDITIONS OF TRANSPORT, STRESS POINT 12A

LOAD COMBINATION	COMBINATION INDEX	Q	Pm	Pm+Pb	Pm+Pb+Q	FATIGUE Salt
HOT ENVIRONMENT	1	.724E+04	.588E+02	.616E+02	.730E+04	
COLD ENVIRONMENT	2a	.403E+03	.588E+02	.616E+02	.465E+03	
COLD ENVIRONMENT	2b	.229E+03	.588E+02	.616E+02	.291E+03	
MINIMUM EXT. PRESS.	3a	.724E+04	.115E+03	.121E+03	.736E+04	
MINIMUM EXT. PRESS.	3b	.368E+03	.115E+03	.121E+03	.489E+03	
INCREASE EXT. PRESS.	4a	.724E+04	.344E+02	.351E+02	.728E+04	
INCREASE EXT. PRESS.	4b	.368E+03	.344E+02	.351E+02	.403E+03	
VIBRATION AND SHOCK	5a	.724E+04	.849E+03	.808E+03	.805E+04	.402E+04
VIBRATION AND SHOCK	5b	.368E+03	.849E+03	.808E+03	.118E+04	.588E+03
VIBRATION AND SHOCK	5c	.224E+03	.849E+03	.808E+03	.103E+04	.516E+03
FREE DROP-TOP	6a	.724E+04	.119E+04	.119E+04	.843E+04	
FREE DROP-TOP	6b	.368E+03	.119E+04	.119E+04	.156E+04	
FREE DROP-TOP	6c	.224E+03	.119E+04	.119E+04	.141E+04	
FREE DROP-SIDE, 0 MER	6a	.724E+04	.215E+04	.171E+04	.895E+04	
FREE DROP-SIDE, 0 MER	6b	.368E+03	.215E+04	.171E+04	.208E+04	
FREE DROP-SIDE, 0 MER	6c	.224E+03	.215E+04	.171E+04	.193E+04	
FREE DROP-SIDE, 45 MER	6a	.724E+04	.222E+04	.144E+04	.868E+04	
FREE DROP-SIDE, 45 MER	6b	.368E+03	.222E+04	.144E+04	.181E+04	
FREE DROP-SIDE, 45 MER	6c	.224E+03	.222E+04	.144E+04	.167E+04	
MAXIMUM STRESS INTENSITY			.222E+04	.171E+04	.895E+04	

NOTES:
1. Pm < Sm = 20.0 ksi
   Pm+Pb< 1.5*Sm = 30.0 ksi
   Pm+Pb+Q < 3.0*Sm = 60.0 ksi
2. See Table 2.10.9.42 for combination index identification.
3. For combinations with Salt not listed, the number of load cycles are few and therefore, the fatigue qualifications are met.
4. MER = Meridian, angle of orientation from the contact edge where stresses are given.

TABLE 2.10.9.59A. SUMMARY OF STRESSES FOR LOAD COMBINATIONS, NORMAL CONDITIONS OF TRANSPORT, STRESS POINT 12A

LOAD COMBINATION	COMBINATION INDEX	STRESS INTENSITY CATEGORY Q	Pm	Pm+Pb	Pm+Pb+Q	FATIGUE Salt
HOT ENVIRONMENT	1	.724E+04	.588E+02	.616E+02	.730E+04	
COLD ENVIRONMENT	2a	.403E+03	.588E+02	.616E+02	.465E+03	
COLD ENVIRONMENT	2b	.229E+03	.588E+02	.616E+02	.291E+03	
MINIMUM EXT. PRESS.	3a	.724E+04	.115E+03	.121E+03	.736E+04	
MINIMUM EXT. PRESS.	3b	.368E+03	.115E+03	.121E+03	.489E+03	
INCREASE EXT. PRESS.	4a	.724E+04	.344E+02	.351E+02	.728E+04	
INCREASE EXT. PRESS.	4b	.368E+03	.344E+02	.351E+02	.403E+03	
VIBRATION AND SHOCK	5a	.724E+04	.849E+03	.808E+03	.805E+04	.402E+04
VIBRATION AND SHOCK	5b	.368E+03	.849E+03	.808E+03	.118E+04	.588E+03
VIBRATION AND SHOCK	5c	.224E+03	.849E+03	.808E+03	.103E+04	.516E+03
FREE DROP-TOP	6a	.724E+04	.452E+04	.412E+04	.114E+05	
FREE DROP-TOP	6b	.368E+03	.452E+04	.412E+04	.449E+04	
FREE DROP-TOP	6c	.224E+03	.452E+04	.412E+04	.434E+04	
FREE DROP-SIDE, 0 MER	6a	.724E+04	.781E+04	.617E+04	.134E+05	
FREE DROP-SIDE, 0 MER	6b	.368E+03	.781E+04	.617E+04	.654E+04	
FREE DROP-SIDE, 0 MER	6c	.224E+03	.781E+04	.617E+04	.640E+04	
FREE DROP-SIDE, 45 MER	6a	.724E+04	.808E+04	.518E+04	.124E+05	
FREE DROP-SIDE, 45 MER	6b	.368E+03	.808E+04	.518E+04	.555E+04	
FREE DROP-SIDE, 45 MER	6c	.224E+03	.808E+04	.518E+04	.540E+04	
MAXIMUM STRESS INTENSITY			.808E+04	.617E+04	.134E+05	

NOTES:
1. Pm < Sm = 20.0 ksi
   Pm+Pb< 1.5*Sm = 30.0 ksi
   Pm+Pb+Q < 3.0*Sm = 60.0 ksi
2. See Table 2.10.9.42 for combination index identification.
3. For combinations with Salt not listed, the number of load cycles are few and therefore, the fatigue qualifications are met.
4. MER = Meridian, angle of orientation from the contact edge where stresses are given.

TABLE 2.10.9.60. SUMMARY OF STRESSES FOR LOAD COMBINATIONS, NORMAL CONDITIONS OF TRANSPORT, STRESS POINT 12B

LOAD	COMBINATION	STRESS INTENSITY CATEGORY				FATIGUE
COMBINATION	INDEX	Q	Pm	Pm+Pb	Pm+Pb+Q	Salt
HOT ENVIRONMENT	1	.658E+04	.588E+02	.559E+02	.664E+04	
COLD ENVIRONMENT	2a	.492E+03	.588E+02	.559E+02	.547E+03	
COLD ENVIRONMENT	2b	.228E+03	.588E+02	.559E+02	.284E+03	
MINIMUM EXT. PRESS.	3a	.658E+04	.115E+03	.109E+03	.669E+04	
MINIMUM EXT. PRESS.	3b	.457E+03	.115E+03	.109E+03	.565E+03	
INCREASE EXT. PRESS.	4a	.658E+04	.344E+02	.336E+02	.661E+04	
INCREASE EXT. PRESS.	4b	.457E+03	.344E+02	.336E+02	.490E+03	
VIBRATION AND SHOCK	5a	.658E+04	.849E+03	.916E+03	.750E+04	.375E+04
VIBRATION AND SHOCK	5b	.457E+03	.849E+03	.916E+03	.137E+04	.686E+03
VIBRATION AND SHOCK	5c	.223E+03	.849E+03	.916E+03	.114E+04	.570E+03
FREE DROP-TOP	6a	.658E+04	.119E+04	.119E+04	.777E+04	
FREE DROP-TOP	6b	.457E+03	.119E+04	.119E+04	.164E+04	
FREE DROP-TOP	6c	.223E+03	.119E+04	.119E+04	.141E+04	
FREE DROP-SIDE, 0 MER	6a	.658E+04	.215E+04	.265E+04	.923E+04	
FREE DROP-SIDE, 0 MER	6b	.457E+03	.215E+04	.265E+04	.310E+04	
FREE DROP-SIDE, 0 MER	6c	.223E+03	.215E+04	.265E+04	.287E+04	
FREE DROP-SIDE, 45 MER	6a	.658E+04	.222E+04	.302E+04	.960E+04	
FREE DROP-SIDE, 45 MER	6b	.457E+03	.222E+04	.302E+04	.348E+04	
FREE DROP-SIDE, 45 MER	6c	.223E+03	.222E+04	.302E+04	.324E+04	
MAXIMUM STRESS INTENSITY			.222E+04	.302E+04	.960E+04	

NOTES:
1. Pm < Sm = 20.0 ksi
   Pm+Pb< 1.5*Sm = 30.0 ksi
   Pm+Pb+Q < 3.0*Sm = 60.0 ksi
2. See Table 2.10.9.42 for combination index identification.
3. For combinations with Salt not listed, the number of load cycles are few and therefore, the fatigue qualifications are met.
4. MER = Meridian, angle of orientation from the contact edge where stresses are given.

TABLE 2.10.9.60A. SUMMARY OF STRESSES FOR LOAD COMBINATIONS, NORMAL CONDITIONS OF TRANSPORT, STRESS POINT 12B

LOAD COMBINATION	COMBINATION INDEX	STRESS INTENSITY CATEGORY Q	Pm	Pm+Pb	Pm+Pb+Q	FATIGUE Salt
HOT ENVIRONMENT	1	.658E+04	.588E+02	.559E+02	.664E+04	
COLD ENVIRONMENT	2a	.492E+03	.588E+02	.559E+02	.547E+03	
COLD ENVIRONMENT	2b	.228E+03	.588E+02	.559E+02	.284E+03	
MINIMUM EXT. PRESS.	3a	.658E+04	.115E+03	.109E+03	.669E+04	
MINIMUM EXT. PRESS.	3b	.457E+03	.115E+03	.109E+03	.565E+03	
INCREASE EXT. PRESS.	4a	.658E+04	.344E+02	.336E+02	.661E+04	
INCREASE EXT. PRESS.	4b	.457E+03	.344E+02	.336E+02	.490E+03	
VIBRATION AND SHOCK	5a	.658E+04	.849E+03	.916E+03	.750E+04	.375E+04
VIBRATION AND SHOCK	5b	.457E+03	.849E+03	.916E+03	.137E+04	.686E+03
VIBRATION AND SHOCK	5c	.223E+03	.849E+03	.916E+03	.114E+04	.570E+03
FREE DROP-TOP	6a	.658E+04	.452E+04	.492E+04	.115E+05	
FREE DROP-TOP	6b	.457E+03	.452E+04	.492E+04	.538E+04	
FREE DROP-TOP	6c	.223E+03	.452E+04	.492E+04	.515E+04	
FREE DROP-SIDE, 0 MER	6a	.658E+04	.781E+04	.966E+04	.162E+05	
FREE DROP-SIDE, 0 MER	6b	.457E+03	.781E+04	.966E+04	.101E+05	
FREE DROP-SIDE, 0 MER	6c	.223E+03	.781E+04	.966E+04	.988E+04	
FREE DROP-SIDE, 45 MER	6a	.658E+04	.808E+04	.111E+05	.176E+05	
FREE DROP-SIDE, 45 MER	6b	.457E+03	.808E+04	.111E+05	.115E+05	
FREE DROP-SIDE, 45 MER	6c	.223E+03	.808E+04	.111E+05	.113E+05	
MAXIMUM STRESS INTENSITY			.808E+04	.111E+05	.176E+05	

NOTES:

1. Pm < Sm = 20.0 ksi
   Pm+Pb< 1.5*Sm = 30.0 ksi
   Pm+Pb+Q < 3.0*Sm = 60.0 ksi
2. See Table 2.10.9.42 for combination index identification.
3. For combinations with Salt not listed, the number of load cycles are few and therefore, the fatigue qualifications are met.
4. MER = Meridian, angle of orientation from the contact edge where stresses are given.

TABLE 2.10.9.61. SUMMARY OF STRESSES FOR LOAD COMBINATIONS, NORMAL CONDITIONS OF TRANSPORT, STRESS POINT 13A

LOAD COMBINATION	COMBINATION INDEX	STRESS INTENSITY CATEGORY Q	Pm	Pm+Pb	Pm+Pb+Q	FATIGUE Salt
HOT ENVIRONMENT	1	.633E+04	.134E+03	.144E+03	.647E+04	
COLD ENVIRONMENT	2a	.444E+04	.134E+03	.144E+03	.458E+04	
COLD ENVIRONMENT	2b	.403E+04	.134E+03	.144E+03	.417E+04	
MINIMUM EXT. PRESS.	3a	.633E+04	.228E+03	.244E+03	.657E+04	
MINIMUM EXT. PRESS.	3b	.458E+04	.228E+03	.244E+03	.482E+04	
INCREASE EXT. PRESS.	4a	.633E+04	.897E+02	.970E+02	.643E+04	
INCREASE EXT. PRESS.	4b	.458E+04	.897E+02	.970E+02	.468E+04	
VIBRATION AND SHOCK	5a	.633E+04	.753E+03	.822E+03	.715E+04	.358E+04
VIBRATION AND SHOCK	5b	.458E+04	.753E+03	.822E+03	.540E+04	.270E+04
VIBRATION AND SHOCK	5c	.425E+04	.753E+03	.822E+03	.507E+04	.254E+04
FREE DROP-TOP	6a	.633E+04	.858E+03	.938E+03	.727E+04	
FREE DROP-TOP	6b	.458E+04	.858E+03	.938E+03	.552E+04	
FREE DROP-TOP	6c	.425E+04	.858E+03	.938E+03	.519E+04	
FREE DROP-SIDE, 0 MER	6a	.633E+04	.717E+03	.810E+03	.714E+04	
FREE DROP-SIDE, 0 MER	6b	.458E+04	.717E+03	.810E+03	.539E+04	
FREE DROP-SIDE, 0 MER	6c	.425E+04	.717E+03	.810E+03	.506E+04	
FREE DROP-SIDE, 45 MER	6a	.633E+04	.245E+04	.364E+04	.997E+04	
FREE DROP-SIDE, 45 MER	6b	.458E+04	.245E+04	.364E+04	.822E+04	
FREE DROP-SIDE, 45 MER	6c	.425E+04	.245E+04	.364E+04	.790E+04	
MAXIMUM STRESS INTENSITY			.245E+04	.364E+04	.997E+04	

NOTES:
1. Pm < Sm = 20.0 ksi
   Pm+Pb< 1.5*Sm = 30.0 ksi
   Pm+Pb+Q < 3.0*Sm = 60.0 ksi
2. See Table 2.10.9.42 for combination index identification.
3. For combinations with Salt not listed, the number of load cycles are few and therefore, the fatigue qualifications are met.
4. MER = Meridian, angle of orientation from the contact edge where stresses are given.

TABLE 2.10.9.61A. SUMMARY OF STRESSES FOR LOAD COMBINATIONS, NORMAL CONDITIONS OF TRANSPORT, STRESS POINT 13A

LOAD	COMBINATION	STRESS INTENSITY CATEGORY				FATIGUE
COMBINATION	INDEX	Q	Pm	Pm+Pb	Pm+Pb+Q	Salt
HOT ENVIRONMENT	1	.633E+04	.134E+03	.144E+03	.647E+04	
COLD ENVIRONMENT	2a	.444E+04	.134E+03	.144E+03	.458E+04	
COLD ENVIRONMENT	2b	.403E+04	.134E+03	.144E+03	.417E+04	
MINIMUM EXT. PRESS.	3a	.633E+04	.228E+03	.244E+03	.657E+04	
MINIMUM EXT. PRESS.	3b	.458E+04	.228E+03	.244E+03	.482E+04	
INCREASE EXT. PRESS.	4a	.633E+04	.897E+02	.970E+02	.643E+04	
INCREASE EXT. PRESS.	4b	.458E+04	.897E+02	.970E+02	.468E+04	
VIBRATION AND SHOCK	5a	.633E+04	.753E+03	.822E+03	.715E+04	.358E+04
VIBRATION AND SHOCK	5b	.458E+04	.753E+03	.822E+03	.540E+04	.270E+04
VIBRATION AND SHOCK	5c	.425E+04	.753E+03	.822E+03	.507E+04	.254E+04
FREE DROP-TOP	6a	.633E+04	.593E+04	.565E+04	.120E+05	
FREE DROP-TOP	6b	.458E+04	.593E+04	.565E+04	.102E+05	
FREE DROP-TOP	6c	.425E+04	.593E+04	.565E+04	.990E+04	
FREE DROP-SIDE, 0 MER	6a	.633E+04	.230E+04	.261E+04	.894E+04	
FREE DROP-SIDE, 0 MER	6b	.458E+04	.230E+04	.261E+04	.719E+04	
FREE DROP-SIDE, 0 MER	6c	.425E+04	.230E+04	.261E+04	.687E+04	
FREE DROP-SIDE, 45 MER	6a	.633E+04	.873E+04	.131E+05	.195E+05	
FREE DROP-SIDE, 45 MER	6b	.458E+04	.873E+04	.131E+05	.177E+05	
FREE DROP-SIDE, 45 MER	6c	.425E+04	.873E+04	.131E+05	.174E+05	
MAXIMUM STRESS INTENSITY			.873E+04	.131E+05	.195E+05	

NOTES:
1. Pm < Sm = 20.0 ksi
   Pm+Pb< 1.5*Sm = 30.0 ksi
   Pm+Pb+Q < 3.0*Sm = 60.0 ksi
2. See Table 2.10.9.42 for combination index identification.
3. For combinations with Salt not listed, the number of load cycles are few and therefore, the fatigue qualifications are met.
4. MER = Meridian, angle of orientation from the contact edge where stresses are given.

TABLE 2.10.9.62. SUMMARY OF STRESSES FOR LOAD COMBINATIONS, NORMAL CONDITIONS OF TRANSPORT, STRESS POINT 13B

LOAD COMBINATION	COMBINATION INDEX	STRESS INTENSITY CATEGORY Q	Pm	Pm+Pb	Pm+Pb+Q	FATIGUE Salt
HOT ENVIRONMENT	1	.565E+04	.134E+03	.125E+03	.577E+04	
COLD ENVIRONMENT	2a	.423E+04	.134E+03	.125E+03	.435E+04	
COLD ENVIRONMENT	2b	.400E+04	.134E+03	.125E+03	.412E+04	
MINIMUM EXT. PRESS.	3a	.565E+04	.228E+03	.213E+03	.586E+04	
MINIMUM EXT. PRESS.	3b	.428E+04	.228E+03	.213E+03	.449E+04	
INCREASE EXT. PRESS.	4a	.565E+04	.897E+02	.823E+02	.573E+04	
INCREASE EXT. PRESS.	4b	.428E+04	.897E+02	.823E+02	.436E+04	
VIBRATION AND SHOCK	5a	.565E+04	.753E+03	.718E+03	.636E+04	.318E+04
VIBRATION AND SHOCK	5b	.428E+04	.753E+03	.718E+03	.500E+04	.250E+04
VIBRATION AND SHOCK	5c	.442E+04	.753E+03	.718E+03	.513E+04	.257E+04
FREE DROP-TOP	6a	.565E+04	.858E+03	.778E+03	.642E+04	
FREE DROP-TOP	6b	.428E+04	.858E+03	.778E+03	.506E+04	
FREE DROP-TCP	6c	.442E+04	.858E+03	.778E+03	.519E+04	
FREE DROP-SIDE, 0 MER	6a	.565E+04	.717E+03	.118E+04	.682E+04	
FREE DROP-SIDE, 0 MER	6b	.428E+04	.717E+03	.118E+04	.546E+04	
FREE DROP-SIDE, 0 MER	6c	.442E+04	.717E+03	.118E+04	.559E+04	
FREE DROP-SIDE, 45 MER	6a	.565E+04	.245E+04	.140E+04	.705E+04	
FREE DROP-SIDE, 45 MER	6b	.428E+04	.245E+04	.140E+04	.568E+04	
FREE DROP-SIDE, 45 MER	6c	.442E+04	.245E+04	.140E+04	.582E+04	
MAXIMUM STRESS INTENSITY			.245E+04	.140E+04	.705E+04	

NOTES:
1. Pm < Sm = 20.0 ksi
   Pm+Pb< 1.5*Sm = 30.0 ksi
   Pm+Pb+Q < 3.0*Sm = 60.0 ksi
2. See Table 2.10.9.42 for combination index identification.
3. For combinations with Salt not listed, the number of load cycles are few and therefore, the fatigue qualifications are met.
4. MER = Meridian, angle of orientation from the contact edge where stresses are given.

TABLE 2.10.9.62A. SUMMARY OF STRESSES FOR LOAD COMBINATIONS, NORMAL CONDITIONS OF TRANSPORT, STRESS POINT 13B

LOAD COMBINATION	COMBINATION INDEX	Q	STRESS INTENSITY CATEGORY Pm	Pm+Pb	Pm+Pb+Q	FATIGUE Salt
HOT ENVIRONMENT	1	.565E+04	.134E+03	.125E+03	.577E+04	
COLD ENVIRONMENT	2a	.423E+04	.134E+03	.125E+03	.435E+04	
COLD ENVIRONMENT	2b	.400E+04	.134E+03	.125E+03	.412E+04	
MINIMUM EXT. PRESS.	3a	.565E+04	.228E+03	.213E+03	.586E+04	
MINIMUM EXT. PRESS.	3b	.428E+04	.228E+03	.213E+03	.449E+04	
INCREASE EXT. PRESS.	4a	.565E+04	.897E+02	.823E+02	.573E+04	
INCREASE EXT. PRESS.	4b	.428E+04	.897E+02	.823E+02	.436E+04	
VIBRATION AND SHOCK	5a	.565E+04	.753E+03	.718E+03	.636E+04	.318E+04
VIBRATION AND SHOCK	5b	.428E+04	.753E+03	.718E+03	.500E+04	.250E+04
VIBRATION AND SHOCK	5c	.442E+04	.753E+03	.718E+03	.513E+04	.257E+04
FREE DROP-TOP	6a	.565E+04	.593E+04	.620E+04	.118E+05	
FREE DROP-TOP	6b	.428E+04	.593E+04	.620E+04	.105E+05	
FREE DROP-TOP	6c	.442E+04	.593E+04	.620E+04	.106E+05	
FREE DROP-SIDE, 0 MER	6a	.565E+04	.230E+04	.404E+04	.968E+04	
FREE DROP-SIDE, 0 MER	6b	.428E+04	.230E+04	.404E+04	.332E+04	
FREE DROP-SIDE, 0 MER	6c	.442E+04	.230E+04	.404E+04	.845E+04	
FREE DROP-SIDE, 45 MER	6a	.565E+04	.873E+04	.486E+04	.105E+05	
FREE DROP-SIDE, 45 MER	6b	.428E+04	.873E+04	.486E+04	.914E+04	
FREE DROP-SIDE, 45 MER	6c	.442E+04	.873E+04	.486E+04	.927E+04	
MAXIMUM STRESS INTENSITY			.873E+04	.620E+04	.118E+05	

NOTES:

1. Pm < Sm = 20.0 ksi
   Pm+Pb< 1.5*Sm = 30.0 ksi
   Pm+Pb+Q < 3.0*Sm = 60.0 ksi
2. See Table 2.10.9.42 for combination index identification.
3. For combinations with Salt not listed, the number of load cycles are few and therefore, the fatigue qualifications are met.
4. MER = Meridian, angle of orientation from the contact edge where stresses are given.

TABLE 2.10.9.63. SUMMARY OF STRESSES FOR LOAD COMBINATIONS, NORMAL CONDITIONS OF TRANSPORT, STRESS POINT 14A

LOAD COMBINATION	COMBINATION INDEX	Q	STRESS INTENSITY CATEGORY Pm	Pm+Pb	Pm+Pb+Q	FATIGUE Salt
HOT ENVIRONMENT	1	.731E+04	.612E+02	.636E+02	.737E+04	
COLD ENVIRONMENT	2a	.409E+03	.612E+02	.636E+02	.472E+03	
COLD ENVIRONMENT	2b	.246E+03	.612E+02	.636E+02	.309E+03	
MINIMUM EXT. PRESS.	3a	.731E+04	.119E+03	.124E+03	.743E+04	
MINIMUM EXT. PRESS.	3b	.368E+03	.119E+03	.124E+03	.492E+03	
INCREASE EXT. PRESS.	4a	.731E+04	.356E+02	.363E+02	.734E+04	
INCREASE EXT. PRESS.	4b	.368E+03	.356E+02	.363E+02	.404E+03	
VIBRATION AND SHOCK	5a	.731E+04	.831E+03	.828E+03	.814E+04	.407E+04
VIBRATION AND SHOCK	5b	.368E+03	.831E+03	.828E+03	.120E+04	.598E+03
VIBRATION AND SHOCK	5c	.233E+03	.831E+03	.828E+03	.106E+04	.530E+03
FREE DROP-TOP	6a	.731E+04	.119E+04	.126E+04	.857E+04	
FREE DROP-TOP	6b	.368E+03	.119E+04	.126E+04	.163E+04	
FREE DROP-TOP	6c	.233E+03	.119E+04	.126E+04	.149E+04	
FREE DROP-SIDE, 0 MER	6a	.731E+04	.157E+04	.101E+04	.832E+04	
FREE DROP-SIDE, 0 MER	6b	.368E+03	.157E+04	.101E+04	.138E+04	
FREE DROP-SIDE, 0 MER	6c	.233E+03	.157E+04	.101E+04	.125E+04	
FREE DROP-SIDE, 45 MER	6a	.731E+04	.245E+04	.213E+04	.944E+04	
FREE DROP-SIDE, 45 MER	6b	.368E+03	.245E+04	.213E+04	.250E+04	
FREE DROP-SIDE, 45 MER	6c	.233E+03	.245E+04	.213E+04	.236E+04	
MAXIMUM STRESS INTENSITY			.245E+04	.213E+04	.944E+04	

NOTES:
1. Pm < Sm = 20.0 ksi
   Pm+Pb< 1.5*Sm = 30.0 ksi
   Pm+Pb+Q < 3.0*Sm = 60.0 ksi
2. See Table 2.10.9.42 for combination index identification.
3. For combinations with Salt not listed, the number of load cycles are few and therefore, the fatigue qualifications are met.
4. MER = Meridian, angle of orientation from the contact edge where stresses are given.

TABLE 2.10.9.63A. SUMMARY OF STRESSES FOR LOAD COMBINATIONS, NORMAL CONDITIONS OF TRANSPORT, STRESS POINT 14A

LOAD COMBINATION	COMBINATION INDEX	STRESS INTENSITY CATEGORY Q	Pm	Pm+Pb	Pm+Pb+Q	FATIGUE Salt
HOT ENVIRONMENT	1	.731E+04	.612E+02	.636E+02	.737E+04	
COLD ENVIRONMENT	2a	.409E+03	.612E+02	.636E+02	.472E+03	
COLD ENVIRONMENT	2b	.246E+03	.612E+02	.636E+02	.309E+03	
MINIMUM EXT. PRESS.	3a	.731E+04	.119E+03	.124E+03	.743E+04	
MINIMUM EXT. PRESS.	3b	.368E+03	.119E+03	.124E+03	.492E+03	
INCREASE EXT. PRESS.	4a	.731E+04	.356E+02	.363E+02	.734E+04	
INCREASE EXT. PRESS.	4b	.368E+03	.356E+02	.363E+02	.404E+03	
VIBRATION AND SHOCK	5a	.731E+04	.831E+03	.828E+03	.814E+04	.407E+04
VIBRATION AND SHOCK	5b	.368E+03	.831E+03	.828E+03	.120E+04	.598E+03
VIBRATION AND SHOCK	5c	.233E+03	.831E+03	.828E+03	.106E+04	.530E+03
FREE DROP-TOP	6a	.731E+04	.106E+05	.101E+05	.174E+05	
FREE DROP-TOP	6b	.368E+03	.106E+05	.101E+05	.105E+05	
FREE DROP-TOP	6c	.233E+03	.106E+05	.101E+05	.104E+05	
FREE DROP-SIDE, 0 MER	6a	.731E+04	.564E+04	.359E+04	.109E+05	
FREE DROP-SIDE, 0 MER	6b	.368E+03	.564E+04	.359E+04	.396E+04	
FREE DROP-SIDE, 0 MER	6c	.233E+03	.564E+04	.359E+04	.383E+04	
FREE DROP-SIDE, 45 MER	6a	.731E+04	.894E+04	.773E+04	.150E+05	
FREE DROP-SIDE, 45 MER	6b	.368E+03	.894E+04	.773E+04	.810E+04	
FREE DROP-SIDE, 45 MER	6c	.233E+03	.894E+04	.773E+04	.796E+04	
MAXIMUM STRESS INTENSITY			.106E+05	.101E+05	.174E+05	

NOTES:
1. Pm < Sm = 20.0 ksi
   Pm+Pb< 1.5*Sm = 30.0 ksi
   Pm+Pb+Q < 3.0*Sm = 60.0 ksi
2. See Table 2.10.9.42 for combination index identification.
3. For combinations with Salt not listed, the number of load cycles are few and therefore, the fatigue qualifications are met.
4. MER = Meridian, angle of orientation from the contact edge where stresses are given.

TABLE 2.10.9.64. SUMMARY OF STRESSES FOR LOAD COMBINATIONS, NORMAL CONDITIONS OF TRANSPORT, STRESS POINT 14B

LOAD COMBINATION	COMBINATION INDEX	STRESS INTENSITY CATEGORY Q	Pm	Pm+Pb	Pm+Pb+Q	FATIGUE Salt
HOT ENVIRONMENT	1	.663E+04	.612E+02	.588E+02	.669E+04	
COLD ENVIRONMENT	2a	.491E+03	.612E+02	.588E+02	.550E+03	
COLD ENVIRONMENT	2b	.234E+03	.612E+02	.588E+02	.292E+03	
MINIMUM EXT. PRESS.	3a	.663E+04	.119E+03	.113E+03	.675E+04	
MINIMUM EXT. PRESS.	3b	.458E+03	.119E+03	.113E+03	.571E+03	
INCREASE EXT. PRESS.	4a	.663E+04	.356E+02	.349E+02	.667E+04	
INCREASE EXT. PRESS.	4b	.458E+03	.356E+02	.349E+02	.493E+03	
VIBRATION AND SHOCK	5a	.663E+04	.831E+03	.870E+03	.750E+04	.375E+04
VIBRATION AND SHOCK	5b	.458E+03	.831E+03	.870E+03	.133E+04	.664E+03
VIBRATION AND SHOCK	5c	.225E+03	.831E+03	.870E+03	.110E+04	.548E+03
FREE DROP-TOP	6a	.663E+04	.119E+04	.112E+04	.776E+04	
FREE DROP-TOP	6b	.458E+03	.119E+04	.112E+04	.158E+04	
FREE DROP-TOP	6c	.225E+03	.119E+04	.112E+04	.135E+04	
FREE DROP-SIDE, 0 MER	6a	.663E+04	.157E+04	.219E+04	.883E+04	
FREE DROP-SIDE, 0 MER	6b	.458E+03	.157E+04	.219E+04	.265E+04	
FREE DROP-SIDE, 0 MER	6c	.225E+03	.157E+04	.219E+04	.242E+04	
FREE DROP-SIDE, 45 MER	6a	.663E+04	.245E+04	.288E+04	.951E+04	
FREE DROP-SIDE, 45 MER	6b	.458E+03	.245E+04	.288E+04	.333E+04	
FREE DROP-SIDE, 45 MER	6c	.225E+03	.245E+04	.288E+04	.310E+04	
MAXIMUM STRESS INTENSITY			.245E+04	.288E+04	.951E+04	

NOTES:

1. Pm < Sm = 20.0 ksi
   Pm+Pb< 1.5*Sm = 30.0 ksi
   Pm+Pb+Q < 3.0*Sm = 60.0 ksi
2. See Table 2.10.9.42 for combination index identification.
3. For combinations with Salt not listed, the number of load cycles are few and therefore, the fatigue qualifications are met.
4. MER = Meridian, angle of orientation from the contact edge where stresses are given.

TABLE 2.10.9.64A. SUMMARY OF STRESSES FOR LOAD COMBINATIONS, NORMAL CONDITIONS OF TRANSPORT, STRESS POINT 14B

LOAD COMBINATION	COMBINATION INDEX	Q	STRESS INTENSITY CATEGORY Pm	Pm+Pb	Pm+Pb+Q	FATIGUE Salt
HOT ENVIRONMENT	1	.663E+04	.612E+02	.588E+02	.669E+04	
COLD ENVIRONMENT	2a	.491E+03	.612E+02	.588E+02	.550E+03	
COLD ENVIRONMENT	2b	.234E+03	.612E+02	.588E+02	.292E+03	
MINIMUM EXT. PRESS.	3a	.663E+04	.119E+03	.113E+03	.675E+04	
MINIMUM EXT. PRESS.	3b	.458E+03	.119E+03	.113E+03	.571E+03	
INCREASE EXT. PRESS.	4a	.663E+04	.356E+02	.349E+02	.667E+04	
INCREASE EXT. PRESS.	4b	.458E+03	.356E+02	.349E+02	.493E+03	
VIBRATION AND SHOCK	5a	.663E+04	.831E+03	.870E+03	.750E+04	.375E+04
VIBRATION AND SHOCK	5b	.458E+03	.831E+03	.870E+03	.133E+04	.664E+03
VIBRATION AND SHOCK	5c	.225E+03	.831E+03	.870E+03	.110E+04	.548E+03
FREE DROP-TOP	6a	.663E+04	.106E+05	.111E+05	.177E+05	
FREE DROP-TOP	6b	.458E+03	.106E+05	.111E+05	.115E+05	
FREE DROP-TOP	6c	.225E+03	.106E+05	.111E+05	.113E+05	
FREE DROP-SIDE, 0 MER	6a	.663E+04	.564E+04	.798E+04	.146E+05	
FREE DROP-SIDE, 0 MER	6b	.458E+03	.564E+04	.798E+04	.843E+04	
FREE DROP-SIDE, 0 MER	6c	.225E+03	.564E+04	.798E+04	.820E+04	
FREE DROP-SIDE, 45 MER	6a	.663E+04	.894E+04	.105E+05	.171E+05	
FREE DROP-SIDE, 45 MER	6b	.458E+03	.894E+04	.105E+05	.110E+05	
FREE DROP-SIDE, 45 MER	6c	.225E+03	.894E+04	.105E+05	.107E+05	
MAXIMUM STRESS INTENSITY			.106E+05	.111E+05	.177E+05	

NOTES:
1. Pm < Sm = 20.0 ksi
   Pm+Pb< 1.5*Sm = 30.0 ksi
   Pm+Pb+Q < 3.0*Sm = 60.0 ksi
2. See Table 2.10.9.42 for combination index identification.
3. For combinations with Salt not listed, the number of load cycles are few and therefore, the fatigue qualifications are met.
4. MER = Meridian, angle of orientation from the contact edge where stresses are given.

TABLE 2.10.9.65. SUMMARY OF STRESSES FOR LOAD COMBINATIONS, NORMAL CONDITIONS OF TRANSPORT, STRESS POINT 15A

LOAD COMBINATION	COMBINATION INDEX	STRESS INTENSITY CATEGORY Q	Pm	Pm+Pb	Pm+Pb+Q	FATIGUE Salt
HOT ENVIRONMENT	1	.392E+04	.451E+02	.890E+02	.401E+04	
COLD ENVIRONMENT	2a	.461E+04	.451E+02	.890E+02	.469E+04	
COLD ENVIRONMENT	2b	.537E+04	.451E+02	.890E+02	.546E+04	
MINIMUM EXT. PRESS.	3a	.392E+04	.824E+02	.143E+03	.406E+04	
MINIMUM EXT. PRESS.	3b	.473E+04	.824E+02	.143E+03	.488E+04	
INCREASE EXT. PRESS.	4a	.392E+04	.273E+02	.437E+02	.396E+04	
INCREASE EXT. PRESS.	4b	.473E+04	.273E+02	.437E+02	.478E+04	
VIBRATION AND SHOCK	5a	.392E+04	.113E+04	.907E+03	.483E+04	.241E+04
VIBRATION AND SHOCK	5b	.473E+04	.113E+04	.907E+03	.564E+04	.282E+04
VIBRATION AND SHOCK	5c	.531E+04	.113E+04	.907E+03	.622E+04	.311E+04
FREE DROP-TOP	6a	.392E+04	.863E+03	.108E+04	.500E+04	
FREE DROP-TOP	6b	.473E+04	.863E+03	.108E+04	.581E+04	
FREE DROP-TOP	6c	.531E+04	.863E+03	.108E+04	.639E+04	
FREE DROP-SIDE, 0 MER	6a	.392E+04	.361E+04	.199E+04	.591E+04	
FREE DROP-SIDE, 0 MER	6b	.473E+04	.361E+04	.199E+04	.672E+04	
FREE DROP-SIDE, 0 MER	6c	.531E+04	.361E+04	.199E+04	.730E+04	
FREE DROP-SIDE, 45 MER	6a	.392E+04	.314E+04	.315E+04	.707E+04	
FREE DROP-SIDE, 45 MER	6b	.473E+04	.314E+04	.315E+04	.788E+04	
FREE DROP-SIDE, 45 MER	6c	.531E+04	.314E+04	.315E+04	.846E+04	
MAXIMUM STRESS INTENSITY			.361E+04	.315E+04	.846E+04	

NOTES:
1. Pm < Sm = 20.0 ksi
   Pm+Pb< 1.5*Sm = 30.0 ksi
   Pm+Pb+Q < 3.0*Sm = 60.0 ksi
2. See Table 2.10.9.42 for combination index identification.
3. For combinations with Salt not listed, the number of load cycles are few and therefore, the fatigue qualifications are met.
4. MER = Meridian, angle of orientation from the contact edge where stresses are given.

TABLE 2.10.9.65A. SUMMARY OF STRESSES FOR LOAD COMBINATIONS, NORMAL CONDITIONS OF TRANSPORT, STRESS POINT 15A

LOAD COMBINATION	COMBINATION INDEX	Q	Pm	Pm+Pb	Pm+Pb+Q	FATIGUE Salt
HOT ENVIRONMENT	1	.392E+04	.451E+02	.890E+02	.401E+04	
COLD ENVIRONMENT	2a	.461E+04	.451E+02	.890E+02	.469E+04	
COLD ENVIRONMENT	2b	.537E+04	.451E+02	.890E+02	.546E+04	
MINIMUM EXT. PRESS.	3a	.392E+04	.824E+02	.143E+03	.406E+04	
MINIMUM EXT. PRESS.	3b	.473E+04	.824E+02	.143E+03	.488E+04	
INCREASE EXT. PRESS.	4a	.392E+04	.273E+02	.437E+02	.396E+04	
INCREASE EXT. PRESS.	4b	.473E+04	.273E+02	.437E+02	.478E+04	
VIBRATION AND SHOCK	5a	.392E+04	.113E+04	.907E+03	.483E+04	.241E+04
VIBRATION AND SHOCK	5b	.473E+04	.113E+04	.907E+03	.564E+04	.282E+04
VIBRATION AND SHOCK	5c	.531E+04	.113E+04	.907E+03	.622E+04	.311E+04
FREE DROP-TOP	6a	.392E+04	.631E+04	.742E+04	.113E+05	
FREE DROP-TOP	6b	.473E+04	.631E+04	.742E+04	.122E+05	
FREE DROP-TOP	6c	.531E+04	.631E+04	.742E+04	.127E+05	
FREE DROP-SIDE, 0 MER	6a	.392E+04	.133E+05	.714E+04	.111E+05	
FREE DROP-SIDE, 0 MER	6b	.473E+04	.133E+05	.714E+04	.119E+05	
FREE DROP-SIDE, 0 MER	6c	.531E+04	.133E+05	.714E+04	.125E+05	
FREE DROP-SIDE, 45 MER	6a	.392E+04	.115E+05	.114E+05	.154E+05	
FREE DROP-SIDE, 45 MER	6b	.473E+04	.115E+05	.114E+05	.162E+05	
FREE DROP-SIDE, 45 MER	6c	.531E+04	.115E+05	.114E+05	.167E+05	
MAXIMUM STRESS INTENSITY			.133E+05	.114E+05	.167E+05	

NOTES:

1. Pm < Sm = 20.0 ksi
   Pm+Pb< 1.5*Sm = 30.0 ksi
   Pm+Pb+Q < 3.0*Sm = 60.0 ksi
2. See Table 2.10.9.42 for combination index identification.
3. For combinations with Salt not listed, the number of load cycles are few and therefore, the fatigue qualifications are met.
4. MER = Meridian, angle of orientation from the contact edge where stresses are given.

TABLE 2.10.9.66. SUMMARY OF STRESSES FOR LOAD COMBINATIONS, NORMAL CONDITIONS OF TRANSPORT, STRESS POINT 15B

LOAD COMBINATION	COMBINATION INDEX	Q	STRESS INTENSITY CATEGORY Pm	Pm+Pb	Pm+Pb+Q	FATIGUE Salt
HOT ENVIRONMENT	1	.334E+04	.451E+02	.125E+02	.335E+04	
COLD ENVIRONMENT	2a	.440E+04	.451E+02	.125E+02	.441E+04	
COLD ENVIRONMENT	2b	.491E+04	.451E+02	.125E+02	.492E+04	
MINIMUM EXT. PRESS.	3a	.334E+04	.824E+02	.250E+02	.336E+04	
MINIMUM EXT. PRESS.	3b	.435E+04	.824E+02	.250E+02	.438E+04	
INCREASE EXT. PRESS.	4a	.334E+04	.273E+02	.109E+02	.335E+04	
INCREASE EXT. PRESS.	4b	.435E+04	.273E+02	.109E+02	.436E+04	
VIBRATION AND SHOCK	5a	.334E+04	.113E+04	.185E+04	.519E+04	.259E+04
VIBRATION AND SHOCK	5b	.435E+04	.113E+04	.185E+04	.620E+04	.310E+04
VIBRATION AND SHOCK	5c	.489E+04	.113E+04	.185E+04	.675E+04	.337E+04
FREE DROP-TOP	6a	.334E+04	.863E+03	.123E+04	.456E+04	
FREE DROP-TOP	6b	.435E+04	.863E+03	.123E+04	.558E+04	
FREE DROP-TOP	6c	.489E+04	.863E+03	.123E+04	.612E+04	
FREE DROP-SIDE, 0 MER	6a	.334E+04	.361E+04	.669E+04	.100E+05	
FREE DROP-SIDE, 0 MER	6b	.435E+04	.361E+04	.669E+04	.110E+05	
FREE DROP-SIDE, 0 MER	6c	.489E+04	.361E+04	.669E+04	.116E+05	
FREE DROP-SIDE, 45 MER	6a	.334E+04	.314E+04	.329E+04	.662E+04	
FREE DROP-SIDE, 45 MER	6b	.435E+04	.314E+04	.329E+04	.764E+04	
FREE DROP-SIDE, 45 MER	6c	.489E+04	.314E+04	.329E+04	.818E+04	
MAXIMUM STRESS INTENSITY			.361E+04	.669E+04	.116E+05	

NOTES:
1. Pm < Sm = 20.0 ksi
   Pm+Pb< 1.5*Sm = 30.0 ksi
   Pm+Pb+Q < 3.0*Sm = 60.0 ksi
2. See Table 2.10.9.42 for combination index identification.
3. For combinations with Salt not listed, the number of load cycles are few and therefore, the fatigue qualifications are met.
4, MER = Meridian, angle of orientation from the contact edge where stresses are given.

TABLE 2.10.9.66A. SUMMARY OF STRESSES FOR LOAD COMBINATIONS, NORMAL CONDITIONS OF TRANSPORT, STRESS POINT 15B

LOAD COMBINATION	COMBINATION INDEX	STRESS INTENSITY CATEGORY Q	Pm	Pm+Pb	Pm+Pb+Q	FATIGUE Salt
HOT ENVIRONMENT	1	.334E+04	.451E+02	.125E+02	.335E+04	
COLD ENVIRONMENT	2a	.440E+04	.451E+02	.125E+02	.441E+04	
COLD ENVIRONMENT	2b	.491E+04	.451E+02	.125E+02	.492E+04	
MINIMUM EXT. PRESS.	3a	.334E+04	.824E+02	.250E+02	.336E+04	
MINIMUM EXT. PRESS.	3b	.435E+04	.824E+02	.250E+02	.438E+04	
INCREASE EXT. PRESS.	4a	.334E+04	.273E+02	.109E+02	.335E+04	
INCREASE EXT. PRESS.	4b	.435E+04	.273E+02	.109E+02	.436E+04	
VIBRATION AND SHOCK	5a	.334E+04	.113E+04	.185E+04	.519E+04	.259E+04
VIBRATION AND SHOCK	5b	.435E+04	.113E+04	.185E+04	.620E+04	.310E+04
VIBRATION AND SHOCK	5c	.489E+04	.113E+04	.185E+04	.675E+04	.337E+04
FREE DROP-TOP	6a	.334E+04	.631E+04	.521E+04	.855E+04	
FREE DROP-TOP	6b	.435E+04	.631E+04	.521E+04	.957E+04	
FREE DROP-TOP	6c	.489E+04	.631E+04	.521E+04	.101E+05	
FREE DROP-SIDE, 0 MER	6a	.334E+04	.133E+05	.248E+05	.281E+05	
FREE DROP-SIDE, 0 MER	6b	.435E+04	.133E+05	.248E+05	.291E+05	
FREE DROP-SIDE, 0 MER	6c	.489E+04	.133E+05	.248E+05	.297E+05	
FREE DROP-SIDE, 45 MER	6a	.334E+04	.115E+05	.122E+05	.155E+05	
FREE DROP-SIDE, 45 MER	6b	.435E+04	.115E+05	.122E+05	.165E+05	
FREE DROP-SIDE, 45 MER	6c	.489E+04	.115E+05	.122E+05	.170E+05	
MAXIMUM STRESS INTENSITY			.133E+05	.248E+05	.297E+05	

NOTES:
1. Pm < Sm = 20.0 ksi
   Pm+Pb< 1.5*Sm = 30.0 ksi
   Pm+Pb+Q < 3.0*Sm = 60.0 ksi
2. See Table 2.10.9.42 for combination index identification.
3. For combinations with Salt not listed, the number of load cycles are few and therefore, the fatigue qualifications are met.
4. MER = Meridian, angle of orientation from the contact edge where stresses are given.

TABLE 2.10.9.67. SUMMARY OF STRESSES FOR LOAD COMBINATIONS, NORMAL CONDITIONS OF TRANSPORT, STRESS POINT 16A

LOAD	COMBINATION	STRESS INTENSITY CATEGORY				FATIGUE
COMBINATION	INDEX	Q	Pm	Pm+Pb	Pm+Pb+Q	Salt
HOT ENVIRONMENT	1	.992E+04	.342E+02	.634E+02	.998E+04	
COLD ENVIRONMENT	2a	.153E+04	.342E+02	.634E+02	.159E+04	
COLD ENVIRONMENT	2b	.321E+04	.342E+02	.634E+02	.327E+04	
MINIMUM EXT. PRESS.	3a	.992E+04	.680E+02	.128E+03	.100E+05	
MINIMUM EXT. PRESS.	3b	.973E+03	.680E+02	.128E+03	.110E+04	
INCREASE EXT. PRESS.	4a	.992E+04	.181E+02	.259E+02	.995E+04	
INCREASE EXT. PRESS.	4b	.973E+03	.181E+02	.259E+02	.998E+03	
VIBRATION AND SHOCK	5a	.992E+04	.737E+03	.738E+03	.107E+05	.533E+04
VIBRATION AND SHOCK	5b	.973E+03	.737E+03	.738E+03	.171E+04	.855E+03
VIBRATION AND SHOCK	5c	.260E+04	.737E+03	.738E+03	.334E+04	.167E+04
FREE DROP-TOP	6a	.992E+04	.116E+04	.885E+03	.108E+05	
FREE DROP-TOP	6b	.973E+03	.116E+04	.885E+03	.186E+04	
FREE DROP-TOP	6c	.260E+04	.116E+04	.885E+03	.349E+04	
FREE DROP-SIDE, 0 MER	6a	.992E+04	.713E+03	.210E+04	.120E+05	
FREE DROP-SIDE, 0 MER	6b	.973E+03	.713E+03	.210E+04	.307E+04	
FREE DROP-SIDE, 0 MER	6c	.260E+04	.713E+03	.210E+04	.470E+04	
FREE DROP-SIDE, 45 MER	6a	.992E+04	.176E+04	.198E+04	.119E+05	
FREE DROP-SIDE, 45 MER	6b	.973E+03	.176E+04	.198E+04	.296E+04	
FREE DROP-SIDE, 45 MER	6c	.260E+04	.176E+04	.198E+04	.459E+04	
MAXIMUM STRESS INTENSITY			.176E+04	.210E+04	.120E+05	

NOTES:

1. Pm < Sm = 20.0 ksi
   Pm+Pb< 1.5*Sm = 30.0 ksi
   Pm+Pb+Q < 3.0*Sm = 60.0 ksi
2. See Table 2.10.9.42 for combination index identification.
3. For combinations with Salt not listed, the number of load cycles are few and therefore, the fatigue qualifications are met.
4. MER = Meridian, angle of orientation from the contact edge where stresses are given.

TABLE 2.10.9.67A. SUMMARY OF STRESSES FOR LOAD COMBINATIONS, NORMAL CONDITIONS OF TRANSPORT, STRESS POINT 16A

LOAD COMBINATION	COMBINATION INDEX	STRESS INTENSITY CATEGORY Q	Pm	Pm+Pb	Pm+Pb+Q	FATIGUE Salt
HOT ENVIRONMENT	1	.992E+04	.342E+02	.634E+02	.998E+04	
COLD ENVIRONMENT	2a	.153E+04	.342E+02	.634E+02	.159E+04	
COLD ENVIRONMENT	2b	.321E+04	.342E+02	.634E+02	.327E+04	
MINIMUM EXT. PRESS.	3a	.992E+04	.680E+02	.128E+03	.100E+05	
MINIMUM EXT. PRESS.	3b	.973E+03	.680E+02	.128E+03	.110E+04	
INCREASE EXT. PRESS.	4a	.992E+04	.181E+02	.259E+02	.995E+04	
INCREASE EXT. PRESS.	4b	.973E+03	.181E+02	.259E+02	.998E+03	
VIBRATION AND SHOCK	5a	.992E+04	.737E+03	.738E+03	.107E+05	.533E+04
VIBRATION AND SHOCK	5b	.973E+03	.737E+03	.738E+03	.171E+04	.855E+03
VIBRATION AND SHOCK	5c	.260E+04	.737E+03	.738E+03	.334E+04	.167E+04
FREE DROP-TOP	6a	.992E+04	.691E+04	.453E+04	.144E+05	
FREE DROP-TOP	6b	.973E+03	.691E+04	.453E+04	.550E+04	
FREE DROP-TOP	6c	.260E+04	.691E+04	.453E+04	.713E+04	
FREE DROP-SIDE, 0 MER	6a	.992E+04	.255E+04	.760E+04	.175E+05	
FREE DROP-SIDE, 0 MER	6b	.973E+03	.255E+04	.760E+04	.858E+04	
FREE DROP-SIDE, 0 MER	6c	.260E+04	.255E+04	.760E+04	.102E+05	
FREE DROP-SIDE, 45 MER	6a	.992E+04	.644E+04	.718E+04	.171E+05	
FREE DROP-SIDE, 45 MER	6b	.973E+03	.644E+04	.718E+04	.816E+04	
FREE DROP-SIDE, 45 MER	6c	.260E+04	.644E+04	.718E+04	.979E+04	
MAXIMUM STRESS INTENSITY			.691E+04	.760E+04	.175E+05	

NOTES:
1. Pm < Sm = 20.0 ksi
   Pm+Pb< 1.5*Sm = 30.0 ksi
   Pm+Pb+Q < 3.0*Sm = 60.0 ksi
2. See Table 2.10.9.42 for combination index identification.
3. For combinations with Salt not listed, the number of load cycles are few and therefore, the fatigue qualifications are met.
4. MER = Meridian, angle of orientation from the contact edge where stresses are given.

TABLE 2.10.9.68. SUMMARY OF STRESSES FOR LOAD COMBINATIONS, NORMAL CONDITIONS OF TRANSPORT, STRESS POINT 16B

LOAD	COMBINATION	STRESS INTENSITY CATEGORY				FATIGUE
COMBINATION	INDEX	Q	Pm	Pm+Pb	Pm+Pb+Q	Salt
HOT ENVIRONMENT	1	.276E+04	.342E+02	.692E+01	.277E+04	
COLD ENVIRONMENT	2a	.125E+04	.342E+02	.692E+01	.125E+04	
COLD ENVIRONMENT	2b	.179E+04	.342E+02	.692E+01	.180E+04	
MINIMUM EXT. PRESS.	3a	.276E+04	.680E+02	.161E+02	.277E+04	
MINIMUM EXT. PRESS.	3b	.879E+03	.680E+02	.161E+02	.895E+03	
INCREASE EXT. PRESS.	4a	.276E+04	.181E+02	.102E+02	.277E+04	
INCREASE EXT. PRESS.	4b	.879E+03	.181E+02	.102E+02	.889E+03	
VIBRATION AND SHOCK	5a	.276E+04	.737E+03	.122E+04	.398E+04	.199E+04
VIBRATION AND SHOCK	5b	.879E+03	.737E+03	.122E+04	.210E+04	.105E+04
VIBRATION AND SHOCK	5c	.143E+04	.737E+03	.122E+04	.265E+04	.133E+04
FREE DROP-TOP	6a	.276E+04	.116E+04	.206E+04	.482E+04	
FREE DROP-TOP	6b	.879E+03	.116E+04	.206E+04	.294E+04	
FREE DROP-TOP	6c	.143E+04	.116E+04	.206E+04	.350E+04	
FREE DROP-SIDE, 0 MER	6a	.276E+04	.713E+03	.107E+04	.383E+04	
FREE DROP-SIDE, 0 MER	6b	.879E+03	.713E+03	.107E+04	.195E+04	
FREE DROP-SIDE, 0 MER	6c	.143E+04	.713E+03	.107E+04	.251E+04	
FREE DROP-SIDE, 45 MER	6a	.276E+04	.176E+04	.141E+04	.417E+04	
FREE DROP-SIDE, 45 MER	6b	.879E+03	.176E+04	.141E+04	.229E+04	
FREE DROP-SIDE, 45 MER	6c	.143E+04	.176E+04	.141E+04	.284E+04	
MAXIMUM STRESS INTENSITY			.176E+04	.206E+04	.482E+04	

NOTES:
1. Pm < Sm = 20.0 ksi
   Pm+Pb< 1.5*Sm = 30.0 ksi
   Pm+Pb+Q < 3.0*Sm = 60.0 ksi
2. See Table 2.10.9.42 for combination index identification.
3. For combinations with Salt not listed, the number of load cycles are few and therefore, the fatigue qualifications are met.
4. MER = Meridian, angle of orientation from the contact edge where stresses are given.

TABLE 2.10.9.68A. SUMMARY OF STRESSES FOR LOAD COMBINATIONS, NORMAL CONDITIONS OF TRANSPORT, STRESS POINT 16B

LOAD COMBINATION	COMBINATION INDEX	STRESS INTENSITY CATEGORY Q	Pm	Pm+Pb	Pm+Pb+Q	FATIGUE Salt
HOT ENVIRONMENT	1	.276E+04	.342E+02	.692E+01	.277E+04	
COLD ENVIRONMENT	2a	.125E+04	.342E+02	.692E+01	.125E+04	
COLD ENVIRONMENT	2b	.179E+04	.342E+02	.692E+01	.180E+04	
MINIMUM EXT. PRESS.	3a	.276E+04	.680E+02	.161E+02	.277E+04	
MINIMUM EXT. PRESS.	3b	.879E+03	.680E+02	.161E+02	.895E+03	
INCREASE EXT. PRESS.	4a	.276E+04	.181E+02	.102E+02	.277E+04	
INCREASE EXT. PRESS.	4b	.879E+03	.181E+02	.102E+02	.889E+03	
VIBRATION AND SHOCK	5a	.276E+04	.737E+03	.122E+04	.398E+04	.199E+04
VIBRATION AND SHOCK	5b	.879E+03	.737E+03	.122E+04	.210E+04	.105E+04
VIBRATION AND SHOCK	5c	.143E+04	.737E+03	.122E+04	.265E+04	.133E+04
FREE DROP-TOP	6a	.276E+04	.691E+04	.119E+05	.147E+05	
FREE DROP-TOP	6b	.879E+03	.691E+04	.119E+05	.128E+05	
FREE DROP-TOP	6c	.143E+04	.691E+04	.119E+05	.134E+05	
FREE DROP-SIDE, 0 MER	6a	.276E+04	.255E+04	.395E+04	.671E+04	
FREE DROP-SIDE, 0 MER	6b	.879E+03	.255E+04	.395E+04	.483E+04	
FREE DROP-SIDE, 0 MER	6c	.143E+04	.255E+04	.395E+04	.539E+04	
FREE DROP-SIDE, 45 MER	6a	.276E+04	.644E+04	.521E+04	.797E+04	
FREE DROP-SIDE, 45 MER	6b	.879E+03	.644E+04	.521E+04	.609E+04	
FREE DROP-SIDE, 45 MER	6c	.143E+04	.644E+04	.521E+04	.665E+04	
MAXIMUM STRESS INTENSITY			.691E+04	.119E+05	.147E+05	

NOTES:

1. Pm < Sm = 20.0 ksi
   Pm+Pb< 1.5*Sm = 30.0 ksi
   Pm+Pb+Q < 3.0*Sm = 60.0 ksi
2. See Table 2.10.9.42 for combination index identification.
3. For combinations with Salt not listed, the number of load cycles are few and therefore, the fatigue qualifications are met.
4. MER = Meridian, angle of orientation from the contact edge where stresses are given.

TABLE 2.10.9.69. SUMMARY OF STRESSES FOR LOAD COMBINATIONS, NORMAL CONDITIONS OF TRANSPORT, STRESS POINT 17

LOAD COMBINATION	COMBINATION INDEX	STRESS INTENSITY CATEGORY Q	Pm	Pm+Pb	Pm+Pb+Q	FATIGUE Salt
HOT ENVIRONMENT	1	.736E+03	.728E+02	.728E+02	.809E+03	
COLD ENVIRONMENT	2a	.217E+03	.728E+02	.728E+02	.290E+03	
COLD ENVIRONMENT	2b	.438E+03	.728E+02	.728E+02	.511E+03	
MINIMUM EXT. PRESS.	3a	.736E+03	.144E+03	.144E+03	.880E+03	
MINIMUM EXT. PRESS.	3b	.130E+03	.144E+03	.144E+03	.273E+03	
INCREASE EXT. PRESS.	4a	.736E+03	.134E+02	.134E+02	.750E+03	
INCREASE EXT. PRESS.	4b	.130E+03	.134E+02	.134E+02	.143E+03	
VIBRATION AND SHOCK	5a	.736E+03	.831E+03	.831E+03	.157E+04	.784E+03
VIBRATION AND SHOCK	5b	.130E+03	.831E+03	.831E+03	.961E+03	.430E+03
VIBRATION AND SHOCK	5c	.342E+03	.831E+03	.831E+03	.117E+04	.587E+03
FREE DROP-TOP	6a	.736E+03	.142E+04	.142E+04	.216E+04	
FREE DROP-TOP	6b	.130E+03	.142E+04	.142E+04	.155E+04	
FREE DROP-TOP	6c	.342E+03	.142E+04	.142E+04	.176E+04	
FREE DROP-SIDE, 0 MER	6a	.736E+03	.634E+03	.634E+03	.137E+04	
FREE DROP-SIDE, 0 MER	6b	.130E+03	.634E+03	.634E+03	.764E+03	
FREE DROP-SIDE, 0 MER	6c	.342E+03	.634E+03	.634E+03	.977E+03	
FREE DROP-SIDE, 45 MER	6a	.736E+03	.684E+03	.684E+03	.142E+04	
FREE DROP-SIDE, 45 MER	6b	.130E+03	.684E+03	.684E+03	.813E+03	
FREE DROP-SIDE, 45 MER	6c	.342E+03	.684E+03	.684E+03	.103E+04	
MAXIMUM STRESS INTENSITY			.142E+04	.142E+04	.216E+04	

NOTES:
1. Pm < Sm = 20.0 ksi
   Pm+Pb< 1.5*Sm = 30.0 ksi
   Pm+Pb+Q < 3.0*Sm = 60.0 ksi
2. See Table 2.10.9.42 for combination index identification.
3. For combinations with Salt not listed, the number of load cycles are few and therefore, the fatigue qualifications are met.
4. MER = Meridian, angle of orientation from the contact edge where stresses are given.
5. Stresses are given at the centroid of the element, therefore, the same stress value is used for Pm and Pm+Pb.

TABLE 2.10.9.69A. SUMMARY OF STRESSES FOR LOAD COMBINATIONS, NORMAL CONDITIONS OF TRANSPORT, STRESS POINT 17

LOAD	COMBINATION	STRESS INTENSITY CATEGORY				FATIGUE
COMBINATION	INDEX	Q	Pm	Pm+Pb	Pm+Pb+Q	Salt
HOT ENVIRONMENT	1	.736E+03	.728E+02	.728E+02	.809E+03	
COLD ENVIRONMENT	2a	.217E+03	.728E+02	.728E+02	.290E+03	
COLD ENVIRONMENT	2b	.438E+03	.728E+02	.728E+02	.511E+03	
MINIMUM EXT. PRESS.	3a	.736E+03	.144E+03	.144E+03	.880E+03	
MINIMUM EXT. PRESS.	3b	.130E+03	.144E+03	.144E+03	.273E+03	
INCREASE EXT. PRESS.	4a	.736E+03	.134E+02	.134E+02	.750E+03	
INCREASE EXT. PRESS.	4b	.130E+03	.134E+02	.134E+02	.143E+03	
VIBRATION AND SHOCK	5a	.736E+03	.831E+03	.831E+03	.157E+04	.784E+03
VIBRATION AND SHOCK	5b	.130E+03	.831E+03	.831E+03	.961E+03	.480E+03
VIBRATION AND SHOCK	5c	.342E+03	.831E+03	.831E+03	.117E+04	.587E+03
FREE DROP-TOP	6a	.736E+03	.555E+04	.555E+04	.629E+04	
FREE DROP-TOP	6b	.130E+03	.555E+04	.555E+04	.568E+04	
FREE DROP-TOP	6c	.342E+03	.555E+04	.555E+04	.590E+04	
FREE DROP-SIDE, 0 MER	6a	.736E+03	.216E+04	.216E+04	.289E+04	
FREE DROP-SIDE, 0 MER	6b	.130E+03	.216E+04	.216E+04	.229E+04	
FREE DROP-SIDE, 0 MER	6c	.342E+03	.216E+04	.216E+04	.250E+04	
FREE DROP-SIDE, 45 MER	6a	.736E+03	.234E+04	.234E+04	.307E+04	
FREE DROP-SIDE, 45 MER	6b	.130E+03	.234E+04	.234E+04	.247E+04	
FREE DROP-SIDE, 45 MER	6c	.342E+03	.234E+04	.234E+04	.268E+04	
MAXIMUM STRESS INTENSITY			.555E+04	.555E+04	.629E+04	

NOTES:
1. Pm < Sm = 20.0 ksi
   Pm+Pb< 1.5*Sm = 30.0 ksi
   Pm+Pb+Q < 3.0*Sm = 60.0 ksi
2. See Table 2.10.9.42 for combination index identification.
3. For combinations with Salt not listed, the number of load cycles are few and therefore, the fatigue qualifications are met.
4. MER = Meridian, angle of orientation from the contact edge where stresses are given.
5. Stresses are given at the centroid of the element, therefore, the same stress value is used for Pm and Pm+Pb.

TABLE 2.10.9.70. SUMMARY OF STRESSES FOR LOAD COMBINATIONS, NORMAL CONDITIONS OF TRANSPORT, STRESS POINT 18

LOAD COMBINATION	COMBINATION INDEX	STRESS INTENSITY CATEGORY Q	Pm	Pm+Pb	Pm+Pb+Q	FATIGUE Salt
HOT ENVIRONMENT	1	.685E+03	.127E+02	.127E+02	.698E+03	
COLD ENVIRONMENT	2a	.247E+03	.127E+02	.127E+02	.260E+03	
COLD ENVIRONMENT	2b	.127E+03	.127E+02	.127E+02	.140E+03	
MINIMUM EXT. PRESS.	3a	.685E+03	.207E+02	.207E+02	.706E+03	
MINIMUM EXT. PRESS.	3b	.189E+03	.207E+02	.207E+02	.210E+03	
INCREASE EXT. PRESS.	4a	.685E+03	.179E+02	.179E+02	.703E+03	
INCREASE EXT. PRESS.	4b	.189E+03	.179E+02	.179E+02	.207E+03	
VIBRATION AND SHOCK	5a	.685E+03	.129E+04	.129E+04	.197E+04	.986E+03
VIBRATION AND SHOCK	5b	.189E+03	.129E+04	.129E+04	.148E+04	.739E+03
VIBRATION AND SHOCK	5c	.157E+03	.129E+04	.129E+04	.144E+04	.722E+03
FREE DROP-TOP	6a	.685E+03	.227E+04	.227E+04	.296E+04	
FREE DROP-TOP	6b	.189E+03	.227E+04	.227E+04	.246E+04	
FREE DROP-TOP	6c	.157E+03	.227E+04	.227E+04	.243E+04	
FREE DROP-SIDE, 0 MER	6a	.685E+03	.947E+03	.947E+03	.163E+04	
FREE DROP-SIDE, 0 MER	6b	.189E+03	.947E+03	.947E+03	.114E+04	
FREE DROP-SIDE, 0 MER	6c	.157E+03	.947E+03	.947E+03	.110E+04	
FREE DROP-SIDE, 45 MER	6a	.685E+03	.192E+03	.192E+03	.877E+03	
FREE DROP-SIDE, 45 MER	6b	.189E+03	.192E+03	.192E+03	.382E+03	
FREE DROP-SIDE, 45 MER	6c	.157E+03	.192E+03	.192E+03	.350E+03	
MAXIMUM STRESS INTENSITY			.227E+04	.227E+04	.296E+04	

NOTES:
1. Pm < Sm = 20.0 ksi
   Pm+Pb< 1.5*Sm = 30.0 ksi
   Pm+Pb+Q < 3.0*Sm = 60.0 ksi
2. See Table 2.10.9.42 for combination index identification.
3. For combinations with Salt not listed, the number of load cycles are few and therefore, the fatigue qualifications are met.
4. MER = Meridian, angle of orientation from the contact edge where stresses are given.
5. Stresses are given at the centroid of the element, therefore, the same stress value is used for Pm and Pm+Pb.

TABLE 2.10.9.70A. SUMMARY OF STRESSES FOR LOAD COMBINATIONS, NORMAL CONDITIONS OF TRANSPORT, STRESS POINT 18

LOAD COMBINATION	COMBINATION INDEX	Q	STRESS INTENSITY CATEGORY Pm	Pm+Pb	Pm+Pb+Q	FATIGUE Salt
HOT ENVIRONMENT	1	.685E+03	.127E+02	.127E+02	.698E+03	
COLD ENVIRONMENT	2a	.247E+03	.127E+02	.127E+02	.260E+03	
COLD ENVIRONMENT	2b	.127E+03	.127E+02	.127E+02	.140E+03	
MINIMUM EXT. PRESS.	3a	.685E+03	.207E+02	.207E+02	.706E+03	
MINIMUM EXT. PRESS.	3b	.189E+03	.207E+02	.207E+02	.210E+03	
INCREASE EXT. PRESS.	4a	.685E+03	.179E+02	.179E+02	.703E+03	
INCREASE EXT. PRESS.	4b	.189E+03	.179E+02	.179E+02	.207E+03	
VIBRATION AND SHOCK	5a	.685E+03	.129E+04	.129E+04	.197E+04	.986E+03
VIBRATION AND SHOCK	5b	.189E+03	.129E+04	.129E+04	.148E+04	.739E+03
VIBRATION AND SHOCK	5c	.157E+03	.129E+04	.129E+04	.144E+04	.722E+03
FREE DROP-TOP	6a	.685E+03	.555E+04	.555E+04	.624E+04	
FREE DROP-TOP	6b	.189E+03	.555E+04	.555E+04	.574E+04	
FREE DROP-TOP	6c	.157E+03	.555E+04	.555E+04	.571E+04	
FREE DROP-SIDE, 0 MER	6a	.685E+03	.348E+04	.348E+04	.416E+04	
FREE DROP-SIDE, 0 MER	6b	.189E+03	.348E+04	.348E+04	.367E+04	
FREE DROP-SIDE, 0 MER	6c	.157E+03	.348E+04	.348E+04	.364E+04	
FREE DROP-SIDE, 45 MER	6a	.685E+03	.679E+03	.679E+03	.136E+04	
FREE DROP-SIDE, 45 MER	6b	.189E+03	.679E+03	.679E+03	.869E+03	
FREE DROP-SIDE, 45 MER	6c	.157E+03	.679E+03	.679E+03	.336E+03	
MAXIMUM STRESS INTENSITY			.555E+04	.555E+04	.624E+04	

NOTES:

1. Pm < Sm = 20.0 ksi
   Pm+Pb< 1.5*Sm = 30.0 ksi
   Pm+Pb+Q < 3.0*Sm = 60.0 ksi
2. See Table 2.10.9.42 for combination index identification.
3. For combinations with Salt not listed, the number of load cycles are few and therefore, the fatigue qualifications are met.
4. MER = Meridian, angle of orientation from the contact edge where stresses are given.
5. Stresses are given at the centroid of the element, therefor the same stress value is used for Pm and Pm+Pb.

TABLE 2.10.9.71. SUMMARY OF STRESSES FOR LOAD COMBINATIONS, NORMAL CONDITIONS OF TRANSPORT, STRESS POINT 19

LOAD COMBINATION	COMBINATION INDEX	Q	STRESS INTENSITY CATEGORY Pm	Pm+Pb	Pm+Pb+Q	FATIGUE Salt
HOT ENVIRONMENT	1	.871E+03	.145E+02	.145E+02	.886E+03	
COLD ENVIRONMENT	2a	.720E+03	.145E+02	.145E+02	.734E+03	
COLD ENVIRONMENT	2b	.218E+02	.145E+02	.145E+02	.363E+02	
MINIMUM EXT. PRESS.	3a	.871E+03	.359E+02	.359E+02	.907E+03	
MINIMUM EXT. PRESS.	3b	.687E+03	.359E+02	.359E+02	.723E+03	
INCREASE EXT. PRESS.	4a	.871E+03	.334E+02	.334E+02	.905E+03	
INCREASE EXT. PRESS.	4b	.687E+03	.334E+02	.334E+02	.721E+03	
VIBRATION AND SHOCK	5a	.871E+03	.172E+04	.172E+04	.259E+04	.129E+04
VIBRATION AND SHOCK	5b	.687E+03	.172E+04	.172E+04	.240E+04	.120E+04
VIBRATION AND SHOCK	5c	.429E+02	.172E+04	.172E+04	.176E+04	.880E+02
FREE DROP-TOP	6a	.871E+03	.312E+04	.312E+04	.399E+04	
FREE DROP-TOP	6b	.687E+03	.312E+04	.312E+04	.381E+04	
FREE DROP-TOP	6c	.429E+02	.312E+04	.312E+04	.316E+04	
FREE DROP-SIDE, 0 MER	6a	.871E+03	.259E+03	.259E+03	.113E+04	
FREE DROP-SIDE, 0 MER	6b	.687E+03	.259E+03	.259E+03	.946E+03	
FREE DROP-SIDE, 0 MER	6c	.429E+02	.259E+03	.259E+03	.302E+03	
FREE DROP-SIDE, 45 MER	6a	.871E+03	.202E+03	.202E+03	.107E+04	
FREE DROP-SIDE, 45 MER	6b	.687E+03	.202E+03	.202E+03	.889E+03	
FREE DROP-SIDE, 45 MER	6c	.429E+02	.202E+03	.202E+03	.245E+03	
MAXIMUM STRESS INTENSITY			.312E+04	.312E+04	.399E+04	

NOTES:

1. Pm < Sm = 20.0 ksi
   Pm+Pb< 1.5*Sm = 30.0 ksi
   Pm+Pb+Q < 3.0*Sm = 60.0 ksi
2. See Table 2.10.9.42 for combination index identification.
3. For combinations with Salt not listed, the number of load cycles are few and therefore, the fatigue qualifications are met.
4. MER = Meridian, angle of orientation from the contact edge where stresses are given.
5. Stresses are given at the centroid of the element, therefore, the same stress value is used for Pm and Pm+Pb.

TABLE 2.10.9.71A. SUMMARY OF STRESSES FOR LOAD COMBINATIONS, NORMAL CONDITIONS OF TRANSPORT, STRESS POINT 19

LOAD COMBINATION	COMBINATION INDEX	STRESS INTENSITY CATEGORY Q	Pm	Pm+Pb	Pm+Pb+Q	FATIGUE Salt
HOT ENVIRONMENT	1	.871E+03	.145E+02	.145E+02	.886E+03	
COLD ENVIRONMENT	2a	.720E+03	.145E+02	.145E+02	.734E+03	
COLD ENVIRONMENT	2b	.218E+02	.145E+02	.145E+02	.363E+02	
MINIMUM EXT. PRESS.	3a	.871E+03	.359E+02	.359E+02	.907E+03	
MINIMUM EXT. PRESS.	3b	.687E+03	.359E+02	.359E+02	.723E+03	
INCREASE EXT. PRESS.	4a	.871E+03	.334E+02	.334E+02	.905E+03	
INCREASE EXT. PRESS.	4b	.687E+03	.334E+02	.334E+02	.721E+03	
VIBRATION AND SHOCK	5a	.871E+03	.172E+04	.172E+04	.259E+04	.129E+04
VIBRATION AND SHOCK	5b	.687E+03	.172E+04	.172E+04	.240E+04	.120E+04
VIBRATION AND SHOCK	5c	.429E+02	.172E+04	.172E+04	.176E+04	.880E+03
FREE DROP-TOP	6a	.871E+03	.693E+04	.693E+04	.780E+04	
FREE DROP-TOP	6b	.687E+03	.693E+04	.693E+04	.762E+04	
FREE DROP-TOP	6c	.429E+02	.693E+04	.693E+04	.698E+04	
FREE DROP-SIDE, 0 MER	6a	.871E+03	.921E+03	.921E+03	.179E+04	
FREE DROP-SIDE, 0 MER	6b	.687E+03	.921E+03	.921E+03	.161E+04	
FREE DROP-SIDE, 0 MER	6c	.429E+02	.921E+03	.921E+03	.964E+03	
FREE DROP-SIDE, 45 MER	6a	.871E+03	.710E+03	.710E+03	.158E+04	
FREE DROP-SIDE, 45 MER	6b	.687E+03	.710E+03	.710E+03	.140E+04	
FREE DROP-SIDE, 45 MER	6c	.429E+02	.710E+03	.710E+03	.753E+03	
MAXIMUM STRESS INTENSITY			.693E+04	.693E+04	.780E+04	

NOTES:

1. Pm < Sm = 20.0 ksi
   Pm+Pb< 1.5*Sm = 30.0 ksi
   Pm+Pb+Q < 3.0*Sm = 60.0 ksi
2. See Table 2.10.9.42 for combination index identification.
3. For combinations with Salt not listed, the number of load cycles are few and therefore, the fatigue qualifications are met.
4. MER = Meridian, angle of orientation from the contact edge where stresses are given.
5. Stresses are given at the centroid of the element, therefore, the same stress value is used for Pm and Pm+Pb.

TABLE 2.10.9.72. SUMMARY OF STRESSES FOR LOAD COMBINATIONS, NORMAL CONDITIONS OF TRANSPORT, STRESS POINT 20

LOAD COMBINATION	COMBINATION INDEX	Q	STRESS INTENSITY CATEGORY Pm	Pm+Pb	Pm+Pb+Q	FATIGUE Salt
HOT ENVIRONMENT	1	.901E+03	.874E+01	.874E+01	.909E+03	
COLD ENVIRONMENT	2a	.748E+03	.874E+01	.874E+01	.757E+03	
COLD ENVIRONMENT	2b	.214E+02	.874E+01	.874E+01	.302E+02	
MINIMUM EXT. PRESS.	3a	.901E+03	.365E+02	.365E+02	.937E+03	
MINIMUM EXT. PRESS.	3b	.714E+03	.365E+02	.365E+02	.750E+03	
INCREASE EXT. PRESS.	4a	.901E+03	.426E+02	.426E+02	.943E+03	
INCREASE EXT. PRESS.	4b	.714E+03	.426E+02	.426E+02	.756E+03	
VIBRATION AND SHOCK	5a	.901E+03	.983E+03	.983E+03	.188E+04	.942E+03
VIBRATION AND SHOCK	5b	.714E+03	.983E+03	.983E+03	.170E+04	.848E+03
VIBRATION AND SHOCK	5c	.434E+02	.983E+03	.983E+03	.103E+04	.513E+03
FREE DROP-TOP	6a	.901E+03	.180E+04	.180E+04	.270E+04	
FREE DROP-TOP	6b	.714E+03	.180E+04	.180E+04	.251E+04	
FREE DROP-TOP	6c	.434E+02	.180E+04	.180E+04	.184E+04	
FREE DROP-SIDE, 0 MER	6a	.901E+03	.108E+03	.108E+03	.101E+04	
FREE DROP-SIDE, 0 MER	6b	.714E+03	.108E+03	.108E+03	.821E+03	
FREE DROP-SIDE, 0 MER	6c	.434E+02	.108E+03	.108E+03	.151E+03	
FREE DROP-SIDE, 45 MER	6a	.901E+03	.100E+03	.100E+03	.100E+04	
FREE DROP-SIDE, 45 MER	6b	.714E+03	.100E+03	.100E+03	.814E+03	
FREE DROP-SIDE, 45 MER	6c	.434E+02	.100E+03	.100E+03	.144E+03	
MAXIMUM STRESS INTENSITY			.180E+04	.180E+04	.270E+04	

NOTES:
1. Pm < Sm = 20.0 ksi
   Pm+Pb< 1.5*Sm = 30.0 ksi
   Pm+Pb+Q < 3.0*Sm = 60.0 ksi
2. See Table 2.10.9.42 for combination index identification.
3. For combinations with Salt not listed, the number of load cycles are few and therefore, the fatigue qualifications are met.
4. MER = Meridian, angle of orientation from the contact edge where stresses are given.
5. Stresses are given at the centroid of the element, therefore, the same stress value is used for Pm and Pm+Pb.

TABLE 2.10.9.72A. SUMMARY OF STRESSES FOR LOAD COMBINATIONS, NORMAL CONDITIONS OF TRANSPORT, STRESS POINT 20

LOAD COMBINATION	COMBINATION INDEX	STRESS INTENSITY CATEGORY Q	Pm	Pm+Pb	Pm+Pb+Q	FATIGUE Salt
HOT ENVIRONMENT	1	.901E+03	.874E+01	.874E+01	.909E+03	
COLD ENVIRONMENT	2a	.748E+03	.874E+01	.874E+01	.757E+03	
COLD ENVIRONMENT	2b	.214E+02	.874E+01	.874E+01	.302E+02	
MINIMUM EXT. PRESS.	3a	.901E+03	.365E+02	.365E+02	.937E+03	
MINIMUM EXT. PRESS.	3b	.714E+03	.365E+02	.365E+02	.750E+03	
INCREASE EXT. PRESS.	4a	.901E+03	.426E+02	.426E+02	.943E+03	
INCREASE EXT. PRESS.	4b	.714E+03	.426E+02	.426E+02	.756E+03	
VIBRATION AND SHOCK	5a	.901E+03	.983E+03	.983E+03	.188E+04	.942E+03
VIBRATION AND SHOCK	5b	.714E+03	.983E+03	.983E+03	.170E+04	.848E+03
VIBRATION AND SHOCK	5c	.434E+02	.983E+03	.983E+03	.103E+04	.513E+03
FREE DROP-TOP	6a	.901E+03	.101E+05	.101E+05	.110E+05	
FREE DROP-TOP	6b	.714E+03	.101E+05	.101E+05	.109E+05	
FREE DROP-TOP	6c	.434E+02	.101E+05	.101E+05	.102E+05	
FREE DROP-SIDE, 0 MER	6a	.901E+03	.376E+03	.376E+03	.128E+04	
FREE DROP-SIDE, 0 MER	6b	.714E+03	.376E+03	.376E+03	.109E+04	
FREE DROP-SIDE, 0 MER	6c	.434E+02	.376E+03	.376E+03	.419E+03	
FREE DROP-SIDE, 45 MER	6a	.901E+03	.349E+03	.349E+03	.125E+04	
FREE DROP-SIDE, 45 MER	6b	.714E+03	.349E+03	.349E+03	.106E+04	
FREE DROP-SIDE, 45 MER	6c	.434E+02	.349E+03	.349E+03	.392E+03	
MAXIMUM STRESS INTENSITY			.101E+05	.101E+05	.110E+05	

NOTES:
1. Pm < Sm = 20.0 ksi
   Pm+Pb< 1.5*Sm = 30.0 ksi
   Pm+Pb+Q < 3.0*Sm = 60.0 ksi
2. See Table 2.10.9.42 for combination index identification.
3. For combinations with Salt not listed, the number of load cycles are few and therefore, the fatigue qualifications are met.
4. MER = Meridian, angle of orientation from the contact edge where stresses are given.
5. Stresses are given at the centroid of the element, therefore, the same stress value is used for Pm and Pm+Pb.

TABLE 2.10.9.73. SUMMARY OF STRESSES FOR LOAD COMBINATIONS, NORMAL CONDITIONS OF TRANSPORT, STRESS POINT 21

LOAD	COMBINATION		STRESS INTENSITY CATEGORY			FATIGUE
COMBINATION	INDEX	Q	Pm	Pm+Pb	Pm+Pb+Q	Salt
HOT ENVIRONMENT	1	.136E+04	.108E+03	.108E+03	.147E+04	
COLD ENVIRONMENT	2a	.881E+03	.108E+03	.108E+03	.989E+03	
COLD ENVIRONMENT	2b	.867E+03	.108E+03	.108E+03	.975E+03	
MINIMUM EXT. PRESS.	3a	.136E+04	.101E+03	.101E+03	.146E+04	
MINIMUM EXT. PRESS.	3b	.907E+03	.101E+03	.101E+03	.101E+04	
INCREASE EXT. PRESS.	4a	.136E+04	.107E+02	.107E+02	.137E+04	
INCREASE EXT. PRESS.	4b	.907E+03	.107E+02	.107E+02	.918E+03	
VIBRATION AND SHOCK	5a	.136E+04	.148E+03	.148E+03	.151E+04	.754E+03
VIBRATION AND SHOCK	5b	.907E+03	.148E+03	.148E+03	.106E+04	.528E+03
VIBRATION AND SHOCK	5c	.542E+03	.148E+03	.148E+03	.690E+03	.345E+03
FREE DROP-TOP	6a	.136E+04	.183E+03	.183E+03	.154E+04	
FREE DROP-TOP	6b	.907E+03	.183E+03	.183E+03	.109E+04	
FREE DROP-TOP	6c	.542E+03	.183E+03	.183E+03	.725E+03	
FREE DROP-SIDE, 0 MER	6a	.136E+04	.136E+03	.136E+03	.150E+04	
FREE DROP-SIDE, 0 MER	6b	.907E+03	.136E+03	.136E+03	.104E+04	
FREE DROP-SIDE, 0 MER	6c	.542E+03	.136E+03	.136E+03	.678E+03	
FREE DROP-SIDE, 45 MER	6a	.136E+04	.130E+03	.130E+03	.149E+04	
FREE DROP-SIDE, 45 MER	6b	.907E+03	.130E+03	.130E+03	.104E+04	
FREE DROP-SIDE, 45 MER	6c	.542E+03	.130E+03	.130E+03	.672E+03	
MAXIMUM STRESS INTENSITY			.183E+03	.183E+03	.154E+04	

NOTES:
1. Pm < Sm = 20.0 ksi
   Pm+Pb < 1.5*Sm = 30.0 ksi
   Pm+Pb+Q < 3.0*Sm = 60.0 ksi
2. See Table 2.10.9.42 for combination index identification.
3. For combinations with Salt not listed, the number of load cycles are few and therefore, the fatigue qualifications are met.
4. MER = Meridian, angle of orientation from the contact edge where stresses are given.
5. Stresses are given at the centroid of the element, therefore, the same stress value is used for Pm and Pm+Pb.

TABLE 2.10.9.73A. SUMMARY OF STRESSES FOR LOAD COMBINATIONS, NORMAL CONDITIONS OF TRANSPORT, STRESS POINT 21

LOAD	COMBINATION	STRESS INTENSITY CATEGORY				FATIGUE
COMBINATION	INDEX	Q	Pm	Pm+Pb	Pm+Pb+Q	Salt
HOT ENVIRONMENT	1	.136E+04	.108E+03	.108E+03	.147E+04	
COLD ENVIRONMENT	2a	.881E+03	.108E+03	.108E+03	.989E+03	
COLD ENVIRONMENT	2b	.867E+03	.108E+03	.108E+03	.975E+03	
MINIMUM EXT. PRESS.	3a	.136E+04	.101E+03	.101E+03	.146E+04	
MINIMUM EXT. PRESS.	3b	.907E+03	.101E+03	.101E+03	.101E+04	
INCREASE EXT. PRESS.	4a	.136E+04	.107E+02	.107E+02	.137E+04	
INCREASE EXT. PRESS.	4b	.907E+03	.107E+02	.107E+02	.918E+03	
VIBRATION AND SHOCK	5a	.136E+04	.148E+03	.148E+03	.151E+04	.754E+03
VIBRATION AND SHOCK	5b	.907E+03	.148E+03	.148E+03	.106E+04	.528E+03
VIBRATION AND SHOCK	5c	.542E+03	.148E+03	.148E+03	.690E+03	.345E+03
FREE DROP-TOP	6a	.136E+04	.100E+05	.100E+05	.114E+05	
FREE DROP-TOP	6b	.907E+03	.100E+05	.100E+05	.109E+05	
FREE DROP-TOP	6c	.542E+03	.100E+05	.100E+05	.105E+05	
FREE DROP-SIDE, 0 MER	6a	.136E+04	.213E+03	.213E+03	.157E+04	
FREE DROP-SIDE, 0 MER	6b	.907E+03	.213E+03	.213E+03	.112E+04	
FREE DROP-SIDE, 0 MER	6c	.542E+03	.213E+03	.213E+03	.755E+03	
FREE DROP-SIDE, 45 MER	6a	.136E+04	.187E+03	.187E+03	.155E+04	
FREE DROP-SIDE, 45 MER	6b	.907E+03	.187E+03	.187E+03	.109E+04	
FREE DROP-SIDE, 45 MER	6c	.542E+03	.187E+03	.187E+03	.729E+03	
MAXIMUM STRESS INTENSITY			.100E+05	.100E+05	.114E+05	

NOTES:
1. Pm < Sm = 20.0 ksi
   Pm+Pb< 1.5*Sm = 30.0 ksi
   Pm+Pb+Q < 3.0*Sm = 60.0 ksi
2. See Table 2.10.9.42 for combination index identification.
3. For combinations with Salt not listed, the number of load cycles are few and therefore, the fatigue qualifications are met.
4. MER = Meridian, angle of orientation from the contact edge where stresses are given.
5. Stresses are given at the centroid of the element, therefore, the same stress value is used for Pm and Pm+Pb.

TABLE 2.10.9.74. SUMMARY OF STRESSES FOR LOAD COMBINATIONS, NORMAL CONDITIONS OF TRANSPORT, STRESS POINT 22

LOAD COMBINATION	COMBINATION INDEX	Q	STRESS INTENSITY CATEGORY Pm	Pm+Pb	Pm+Pb+Q	FATIGUE Salt
HOT ENVIRONMENT	1	.620E+03	.190E+03	.190E+03	.810E+03	
COLD ENVIRONMENT	2a	.806E+03	.190E+03	.190E+03	.996E+02	
COLD ENVIRONMENT	2b	.351E+03	.190E+03	.190E+03	.541E+03	
MINIMUM EXT. PRESS.	3a	.620E+03	.178E+03	.178E+03	.798E+03	
MINIMUM EXT. PRESS.	3b	.101E+04	.178E+03	.178E+03	.119E+04	
INCREASE EXT. PRESS.	4a	.620E+03	.290E+02	.290E+02	.649E+03	
INCREASE EXT. PRESS.	4b	.101E+04	.290E+02	.290E+02	.104E+04	
VIBRATION AND SHOCK	5a	.620E+03	.264E+03	.264E+03	.883E+03	.442E+03
VIBRATION AND SHOCK	5b	.101E+04	.264E+03	.264E+03	.127E+04	.637E+03
VIBRATION AND SHOCK	5c	.803E+03	.264E+03	.264E+03	.107E+04	.533E+03
FREE DROP-TOP	6a	.620E+03	.326E+03	.326E+03	.945E+03	
FREE DROP-TOP	6b	.101E+04	.326E+03	.326E+03	.134E+04	
FREE DROP-TOP	6c	.803E+03	.326E+03	.326E+03	.113E+04	
FREE DROP-SIDE, 0 MER	6a	.620E+03	.241E+03	.241E+03	.861E+03	
FREE DROP-SIDE, 0 MER	6b	.101E+04	.241E+03	.241E+03	.125E+04	
FREE DROP-SIDE, 0 MER	6c	.803E+03	.241E+03	.241E+03	.104E+04	
FREE DROP-SIDE, 45 MER	6a	.620E+03	.215E+03	.215E+03	.835E+03	
FREE DROP-SIDE, 45 MER	6b	.101E+04	.2115E+03	.215E+03	.122E+04	
FREE DROP-SIDE, 45 MER	6c	.803E+03	.215E+03	.215E+03	.102E+04	
MAXIMUM STRESS INTENSITY			.326E+03	.326E+03	.134E+04	

NOTES:
1. Pm < Sm = 20.0 ksi
   Pm+Pb< 1.5*Sm = 30.0 ksi
   Pm+Pb+Q < 3.0*Sm = 60.0 ksi
2. See Table 2.10.9.42 for combination index identification.
3. For combinations with Salt not listed, the number of load cycles are few and therefore, the fatigue qualifications are met.
4. MER = Meridian, angle of orientation from the contact edge where stresses are given.
5. Stresses are given at the centroid of the element, therefore, the same stress value is used for Pm and Pm+Pb.

TABLE 2.10.9.74A. SUMMARY OF STRESSES FOR LOAD COMBINATIONS, NORMAL CONDITIONS OF TRANSPORT, STRESS POINT 22

LOAD COMBINATION	COMBINATION INDEX	STRESS INTENSITY CATEGORY Q	Pm	Pm+Pb	Pm+Pb+Q	FATIGUE Salt
HOT ENVIRONMENT	1	.620E+03	.190E+03	.190E+03	.810E+03	
COLD ENVIRONMENT	2a	.806E+03	.190E+03	.190E+03	.996E+03	
COLD ENVIRONMENT	2b	.351E+03	.190E+03	.190E+03	.541E+03	
MINIMUM EXT. PRESS.	3a	.620E+03	.178E+03	.178E+03	.798E+03	
MINIMUM EXT. PRESS.	3b	.101E+04	.178E+03	.178E+03	.119E+04	
INCREASE EXT. PRESS.	4a	.620E+03	.290E+02	.290E+02	.649E+03	
INCREASE EXT. PRESS.	4b	.101E+04	.290E+02	.290E+02	.104E+04	
VIBRATION AND SHOCK	5a	.620E+03	.264E+03	.264E+03	.883E+03	.442E+03
VIBRATION AND SHOCK	5b	.101E+04	.264E+03	.264E+03	.127E+04	.637E+03
VIBRATION AND SHOCK	5c	.803E+03	.264E+03	.264E+03	.107E+04	.533E+03
FREE DROP-TOP	6a	.620E+03	.275E+04	.275E+04	.337E+04	
FREE DROP-TOP	6b	.101E+04	.275E+04	.275E+04	.376E+04	
FREE DROP-TOP	6c	.803E+03	.275E+04	.275E+04	.355E+04	
FREE DROP-SIDE, 0 MER	6a	.620E+03	.379E+03	.379E+03	.999E+03	
FREE DROP-SIDE, 0 MER	6b	.101E+04	.379E+03	.379E+03	.139E+04	
FREE DROP-SIDE, 0 MER	6c	.803E+03	.379E+03	.379E+03	.118E+04	
FREE DROP-SIDE, 45 MER	6a	.620E+03	.284E+03	.284E+03	.904E+03	
FREE DROP-SIDE, 45 MER	6b	.101E+04	.234E+03	.284E+03	.129E+04	
FREE DROP-SIDE, 45 MER	6c	.803E+03	.284E+03	.284E+03	.109E+04	
MAXIMUM STRESS INTENSITY			.275E+04	.275E+04	.376E+04	

NOTES:
1. Pm < Sm = 20.0 ksi
   Pm+Pb< 1.5*Sm = 30.0 ksi
   Pm+Pb+Q < 3.0*Sm = 60.0 ksi
2. See Table 2.10.9.42 for combination index identification.
3. For combinations with Salt not listed, the number of load cycles are few and therefore, the fatigue qualifications are met.
4. MER = Meridian, angle of orientation from the contact edge where stresses are given.
5. Stresses are given at the centroid of the element, therefore, the same stress value is used for Pm and Pm+Pb.

TABLE 2.10.9.75. SUMMARY OF STRESSES FOR LOAD COMBINATIONS, NORMAL CONDITIONS OF TRANSPORT, STRESS POINT 23

LOAD	COMBINATION	STRESS INTENSITY CATEGORY				FATIGUE
COMBINATION	INDEX	Q	Pm	Pm+Pb	Pm+Pb+Q	Salt
HOT ENVIRONMENT	1	.110E+03	.836E+01	.836E+01	.119E+03	
COLD ENVIRONMENT	2a	.179E+04	.836E+01	.836E+01	.180E+04	
COLD ENVIRONMENT	2b	.181E+04	.836E+01	.836E+01	.182E+04	
MINIMUM EXT. PRESS.	3a	.110E+03	.351E+02	.351E+02	.146E+03	
MINIMUM EXT. PRESS.	3b	.179E+04	.351E+02	.351E+02	.182E+04	
INCREASE EXT. PRESS.	4a	.110E+03	.642E+01	.642E+01	.117E+03	
INCREASE EXT. PRESS.	4b	.179E+04	.642E+01	.642E+01	.179E+04	
VIBRATION AND SHOCK	5a	.110E+03	.894E+02	.894E+02	.200E+03	.999E+02
VIBRATION AND SHOCK	5b	.179E+04	.894E+02	.894E+02	.188E+04	.939E+03
VIBRATION AND SHOCK	5c	.173E+04	.894E+02	.894E+02	.182E+04	.911E+03
FREE DROP-TOP	6a	.110E+03	.157E+03	.157E+03	.267E+03	
FREE DROP-TOP	6b	.179E+04	.157E+03	.157E+03	.194E+04	
FREE DROP-TOP	6c	.173E+04	.157E+03	.157E+03	.189E+04	
FREE DROP-SIDE, 0 MER	6a	.110E+03	.355E+02	.355E+02	.146E+03	
FREE DROP-SIDE, 0 MER	6b	.179E+04	.355E+02	.355E+02	.182E+04	
FREE DROP-SIDE, 0 MER	6c	.173E+04	.355E+02	.355E+02	.177E+04	
FREE DROP-SIDE, 45 MER	6a	.110E+03	.392E+02	.392E+02	.150E+03	
FREE DROP-SIDE, 45 MER	6b	.179E+04	.392E+02	.392E+02	.183E+04	
FREE DROP-SIDE, 45 MER	6c	.173E+04	.392E+02	.392E+02	.177E+04	
MAXIMUM STRESS INTENSITY			.157E+03	.157E+03	.194E+04	

NOTES:
1. Pm < Sm = 20.0 ksi
   Pm+Pb< 1.5*Sm = 30.0 ksi
   Pm+Pb+Q < 3.0*Sm = 60.0 ksi
2. See Table 2.10.9.42 for combination index identification.
3. For combinations with Salt not listed, the number of load cycles are few and therefore, the fatigue qualifications are met.
4. MER = Meridian, angle of orientation from the contact edge where stresses are given.
5. Stresses are given at the centroid of the element, therefore, the same stress value is used for Pm and Pm+Pb.

TABLE 2.10.9.75A. SUMMARY OF STRESSES FOR LOAD COMBINATIONS, NORMAL CONDITIONS OF TRANSPORT, STRESS POINT 23

LOAD	COMBINATION	STRESS INTENSITY CATEGORY				FATIGUE
COMBINATION	INDEX	Q	Pm	Pm+Pb	Pm+Pb+Q	Salt
HOT ENVIRONMENT	1	.110E+03	.836E+01	.336E+01	.119E+03	
COLD ENVIRONMENT	2a	.179E+04	.836E+01	.836E+01	.180E+04	
COLD ENVIRONMENT	2b	.181E+04	.836E+01	.836E+01	.182E+04	
MINIMUM EXT. PRESS.	3a	.110E+03	.351E+02	.351E+02	.146E+03	
MINIMUM EXT. PRESS.	3b	.179E+04	.351E+02	.351E+02	.182E+04	
INCREASE EXT. PRESS.	4a	.110E+03	.642E+01	.642E+01	.117E+03	
INCREASE EXT. PRESS.	4b	.179E+04	.642E+01	.642E+01	.179E+04	
VIBRATION AND SHOCK	5a	.110E+03	.894E+02	.894E+02	.200E+03	.999E+02
VIBRATION AND SHOCK	5b	.179E+04	.894E+02	.894E+02	.188E+04	.939E+03
VIBRATION AND SHOCK	5c	.173E+04	.894E+02	.894E+02	.182E+04	.911E+03
FREE DROP-TOP	6a	.110E+03	.229E+04	.229E+04	.240E+04	
FREE DROP-TOP	6b	.179E+04	.229E+04	.229E+04	.408E+04	
FREE DROP-TOP	6c	.173E+04	.229E+04	.229E+04	.402E+04	
FREE DROP-SIDE, 0 MER	6a	.110E+03	.109E+03	.109E+03	.219E+03	
FREE DROP-SIDE, 0 MER	6b	.179E+04	.109E+03	.109E+03	.190E+04	
FREE DROP-SIDE, 0 MER	6c	.173E+04	.109E+03	.109E+03	.184E+04	
FREE DROP-SIDE, 45 MER	6a	.110E+03	.123E+03	.123E+03	.233E+03	
FREE DROP-SIDE, 45 MER	6b	.179E+04	.123E+03	.123E+03	.191E+04	
FREE DROP-SIDE, 45 MER	6c	.173E+04	.123E+03	.123E+03	.186E+04	
MAXIMUM STRESS INTENSITY			.229E+04	.229E+04	.408E+04	

NOTES:
1. Pm < Sm = 20.0 ksi
   Pm+Pb< 1.5*Sm = 30.0 ksi
   Pm+Pb+Q < 3.0*Sm = 60.0 ksi
2. See Table 2.10.9.42 for combination index identification.
3. For combinations with Salt not listed, the number of load cycles are few and therefore, the fatigue qualifications are met.
4. MER = Meridian, angle of orientation from the contact edge where stresses are given.
5. Stresses are given at the centroid of the element, therefore, the same stress value is used for Pm and Pm+Pb.

TABLE 2.10.9.76. SUMMARY OF STRESSES FOR LOAD COMBINATIONS, NORMAL CONDITIONS OF TRANSPORT, STRESS POINT 24

LOAD COMBINATION	COMBINATION INDEX	STRESS INTENSITY CATEGORY Q	Pm	Pm+Pb	Pm+Pb+Q	FATIGUE Salt
HOT ENVIRONMENT	1	.427E+04	.857E+02	.857E+02	.435E+04	
COLD ENVIRONMENT	2a	.254E+04	.857E+02	.857E+02	.263E+04	
COLD ENVIRONMENT	2b	.327E+04	.857E+02	.857E+02	.336E+04	
MINIMUM EXT. PRESS.	3a	.427E+04	.124E+03	.124E+03	.439E+04	
MINIMUM EXT. PRESS.	3b	.242E+04	.124E+03	.124E+03	.254E+04	
INCREASE EXT. PRESS.	4a	.427E+04	.505E+02	.505E+02	.432E+04	
INCREASE EXT. PRESS.	4b	.242E+04	.505E+02	.505E+02	.247E+04	
VIBRATION AND SHOCK	5a	.427E+04	.992E+03	.992E+03	.526E+04	.263E+04
VIBRATION AND SHOCK	5b	.242E+04	.992E+03	.992E+03	.341E+04	.170E+04
VIBRATION AND SHOCK	5c	.330E+04	.992E+03	.992E+03	.429E+04	.215E+04
FREE DROP-TOP	6a	.427E+04	.238E+04	.238E+04	.665E+04	
FREE DROP-TOP	6b	.242E+04	.238E+04	.238E+04	.480E+04	
FREE DROP-TOP	6c	.330E+04	.238E+04	.238E+04	.568E+04	
FREE DROP-SIDE, 0 MER	6a	.427E+04	.618E+03	.618E+03	.489E+04	
FREE DROP-SIDE, 0 MER	6b	.242E+04	.618E+03	.618E+03	.304E+04	
FREE DROP-SIDE, 0 MER	6c	.330E+04	.618E+03	.618E+03	.392E+04	
FREE DROP-SIDE, 45 MER	6a	.427E+04	.537E+03	.537E+03	.481E+04	
FREE DROP-SIDE, 45 MER	6b	.242E+04	.537E+03	.537E+03	.295E+04	
FREE DROP-SIDE, 45 MER	6c	.330E+04	.537E+03	.537E+03	.384E+04	
MAXIMUM STRESS INTENSITY			.238E+04	.238E+04	.665E+04	

NOTES:
1. Pm < Sm = 20.0 ksi
   Pm+Pb< 1.5*Sm = 30.0 ksi
   Pm+Pb+Q < 3.0*Sm = 60.0 ksi
2. See Table 2.10.9.42 for combination index identification.
3. For combinations with Salt not listed, the number of load cycles are few and therefore, the fatigue qualifications are met.
4. MER = Meridian, angle of orientation from the contact edge where stresses are given.
5. Stresses are given at the centroid of the element, therefore, the same stress value is used for Pm and Pm+Pb.

TABLE 2.10.9.76A. SUMMARY OF STRESSES FOR LOAD COMBINATIONS, NORMAL CONDITIONS OF TRANSPORT, STRESS POINT 24

LOAD	COMBINATION	STRESS INTENSITY CATEGORY				FATIGUE
COMBINATION	INDEX	Q	Pm	Pm+Pb	Pm+Pb+Q	Salt
HOT ENVIRONMENT	1	.427E+04	.857E+02	.857E+02	.435E+04	
COLD ENVIRONMENT	2a	.254E+04	.857E+02	.857E+02	.263E+04	
COLD ENVIRONMENT	2b	.327E+04	.857E+02	.857E+02	.336E+04	
MINIMUM EXT. PRESS.	3a	.427E+04	.124E+03	.124E+03	.439E+04	
MINIMUM EXT. PRESS.	3b	.242E+04	.124E+03	.124E+03	.254E+04	
INCREASE EXT. PRESS.	4a	.427E+04	.505E+02	.505E+02	.432E+04	
INCREASE EXT. PRESS.	4b	.242E+04	.505E+02	.505E+02	.247E+04	
VIBRATION AND SHOCK	5a	.427E+04	.992E+03	.992E+03	.526E+04	.263E+04
VIBRATION AND SHOCK	5b	.242E+04	.992E+03	.992E+03	.341E+04	.170E+04
VIBRATION AND SHOCK	5c	.330E+04	.992E+03	.992E+03	.429E+04	.215E+04
FREE DROP-TOP	6a	.427E+04	.527E+04	.527E+04	.954E+04	
FREE DROP-TOP	6b	.242E+04	.527E+04	.527E+04	.769E+04	
FREE DROP-TOP	6c	.330E+04	.527E+04	.527E+04	.857E+04	
FREE DROP-SIDE, 0 MER	6a	.427E+04	.206E+04	.206E+04	.633E+04	
FREE DROP-SIDE, 0 MER	6b	.242E+04	.206E+04	.206E+04	.448E+04	
FREE DROP-SIDE, 0 MER	6c	.330E+04	.206E+04	.206E+04	.536E+04	
FREE DROP-SIDE, 45 MER	6a	.427E+04	.176E+04	.176E+04	.603E+04	
FREE DROP-SIDE, 45 MER	6b	.242E+04	.176E+04	.176E+04	.418E+04	
FREE DROP-SIDE, 45 MER	6c	.330E+04	.176E+04	.176E+04	.506E+04	
MAXIMUM STRESS INTENSITY			.527E+04	.527E+04	.954E+04	

NOTES:
1. Pm < Sm = 20.0 ksi
   Pm+Pb< 1.5*Sm = 30.0 ksi
   Pm+Pb+Q < 3.0*Sm = 60.0 ksi
2. See Table 2.10.9.42 for combination index identification.
3. For combinations with Salt not listed, the number of load cycles are few and therefore, the fatigue qualifications are met.
4. MER = Meridian, angle of orientation from the contact edge where stresses are given.
5. Stresses are given at the centroid of the element, therefore, the same stress value is used for Pm and Pm+Pb.

TABLE 2.10.9.77. SUMMARY OF STRESSES FOR LOAD COMBINATIONS, NORMAL CONDITIONS OF TRANSPORT, STRESS POINT 25

LOAD	COMBINATION	STRESS INTENSITY CATEGORY				FATIGUE
COMBINATION	INDEX	Q	Pm	Pm+Pb	Pm+Pb+Q	Salt
HOT ENVIRONMENT	1	.647E+04	.573E+02	.573E+02	.653E+04	
COLD ENVIRONMENT	2a	.340E+04	.573E+02	.573E+02	.346E+04	
COLD ENVIRONMENT	2b	.479E+04	.573E+02	.573E+02	.484E+04	
MINIMUM EXT. PRESS.	3a	.647E+04	.101E+03	.101E+03	.657E+04	
MINIMUM EXT. PRESS.	3b	.329E+04	.101E+03	.101E+03	.339E+04	
INCREASE EXT. PRESS.	4a	.647E+04	.627E+02	.627E+02	.654E+04	
INCREASE EXT. PRESS.	4b	.329E+04	.627E+02	.627E+02	.335E+04	
VIBRATION AND SHOCK	5a	.647E+04	.133E+04	.133E+04	.781E+04	.390E+04
VIBRATION AND SHOCK	5b	.329E+04	.133E+04	.133E+04	.462E+04	.231E+04
VIBRATION AND SHOCK	5c	.430E+04	.133E+04	.133E+04	.563E+04	.281E+04
FREE DROP-TOP	6a	.647E+04	.108E+05	.108E+05	.173E+05	
FREE DROP-TOP	6b	.329E+04	.108E+05	.108E+05	.141E+05	
FREE DROP-TOP	6c	.430E+04	.108E+05	.108E+05	.151E+05	
FREE DROP-SIDE, 0 MER	6a	.647E+04	.335E+04	.335E+04	.982E+04	
FREE DROP-SIDE, 0 MER	6b	.329E+04	.335E+04	.335E+04	.664E+04	
FREE DROP-SIDE, 0 MER	6c	.430E+04	.335E+04	.335E+04	.765E+04	
FREE DROP-SIDE, 45 MER	6a	.647E+04	.696E+03	.696E+03	.717E+04	
FREE DROP-SIDE, 45 MER	6b	.329E+04	.696E+03	.696E+03	.398E+04	
FREE DROP-SIDE, 45 MER	6c	.430E+04	.696E+03	.696E+031	.499E+04	
MAXIMUM STRESS INTENSITY			.108E+05	.108E+05	.173E+05	

NOTES:
1. Pm < Sm = 20.0 ksi
   Pm+Pb< 1.5*Sm = 30.0 ksi
   Pm+Pb+Q < 3.0*Sm = 60.0 ksi
2. See Table 2.10.9.42 for combination index identification.
3. For combinations with Salt not listed, the number of load cycles are few and therefore, the fatigue qualifications are met.
4. MER = Meridian, angle of orientation from the contact edge where stresses are given.
5. Stresses are given at the centroid of the element, therefore, the same stress value is used for Pm and Pm+Pb.

TABLE 2.10.9.77A. SUMMARY OF STRESSES FOR LOAD COMBINATIONS, NORMAL CONDITIONS OF TRANSPORT, STRESS POINT 25

LOAD COMBINATION	COMBINATION INDEX	Q	STRESS INTENSITY CATEGORY Pm	Pm+Pb	Pm+Pb+Q	FATIGUE Salt
HOT ENVIRONMENT	1	.647E+04	.573E+02	.573E+02	.653E+04	
COLD ENVIRONMENT	2a	.340E+04	.573E+02	.573E+02	.346E+04	
COLD ENVIRONMENT	2b	.479E+04	.573E+02	.573E+02	.484E+04	
MINIMUM EXT. PRESS.	3a	.647E+04	.101E+03	.101E+03	.657E+04	
MINIMUM EXT. PRESS.	3b	.329E+04	.101E+03	.101E+03	.339E+04	
INCREASE EXT. PRESS.	4a	.647E+04	.627E+02	.627E+02	.654E+04	
INCREASE EXT. PRESS.	4b	.329E+04	.627E+02	.627E+02	.335E+04	
VIBRATION AND SHOCK	5a	.647E+04	.133E+04	.133E+04	.781E+04	.390E+04
VIBRATION AND SHOCK	5b	.329E+04	.133E+04	.133E+04	.462E+04	.231E+04
VIBRATION AND SHOCK	5c	.430E+04	.133E+04	.133E+04	.563E+04	.281E+04
FREE DROP-TOP	6a	.647E+04	.582E+04	.582E+04	.123E+05	
FREE DROP-TOP	6b	.329E+04	.582E+04	.582E+04	.911E+04	
FREE DROP-TOP	6c	.430E+04	.582E+04	.582E+04	.101E+05	
FREE DROP-SIDE, 0 MER	6a	.647E+04	.123E+05	.123E+05	.187E+05	
FREE DROP-SIDE, 0 MER	6b	.329E+04	.123E+05	.123E+05	.156E+05	
FREE DROP-SIDE, 0 MER	6c	.430E+04	.123E+05	.123E+05	.166E+05	
FREE DROP-SIDE, 45 MER	6a	.647E+04	.243E+04	.243E+04	.890E+04	
FREE DROP-SIDE, 45 MER	6b	.329E+04	.243E+04	.243E+04	.571E+04	
FREE DROP-SIDE, 45 MER	6c	.430E+04	.243E+04	.243E+04	.672E+04	
MAXIMUM STRESS INTENSITY			.123E+05	.123E+05	.187E+05	

NOTES:
1. Pm < Sm = 20.0 ksi
   Pm+Pb< 1.5*Sm = 30.0 ksi
   Pm+Pb+Q < 3.0*Sm = 60.0 ksi
2. See Table 2.10.9.42 for combination index identification.
3. For combinations with Salt not listed, the number of load cycles are few and therefore, the fatigue qualifications are met.
4. MER = Meridian, angle of orientation from the contact edge where stresses are given.
5. Stresses are given at the centroid of the element, therefore, the same stress value is used for Pm and Pm+Pb.

TABLE 2.10.9.78. SUMMARY OF STRESSES FOR LOAD COMBINATIONS, NORMAL CONDITIONS OF TRANSPORT, STRESS POINT 26

LOAD COMBINATION	COMBINATION INDEX	Q	Pm	Pm+Pb	Pm+Pb+Q	FATIGUE Salt
HOT ENVIRONMENT	1	.146E+04	.385E+02	.385E+02	.150E+04	
COLD ENVIRONMENT	2a	.595E+03	.385E+02	.385E+02	.634E+03	
COLD ENVIRONMENT	2b	.912E+03	.385E+02	.385E+02	.951E+03	
MINIMUM EXT. PRESS.	3a	.146E+04	.797E+02	.797E+02	.154E+04	
MINIMUM EXT. PRESS.	3b	.509E+03	.797E+02	.797E+02	.589E+03	
INCREASE EXT. PRESS.	4a	.146E+04	.310E+02	.310E+02	.149E+04	
INCREASE EXT. PRESS.	4b	.509E+03	.310E+02	.310E+02	.540E+03	
VIBRATION AND SHOCK	5a	.146E+04	.719E+03	.719E+03	.218E+04	.109E+04
VIBRATION AND SHOCK	5b	.509E+03	.719E+03	.719E+03	.123E+04	.614E+03
VIBRATION AND SHOCK	5c	.922E+03	.719E+03	.719E+03	.164E+04	.821E+03
FREE DROP-TOP	6a	.146E+04	.990E+03	.990E+03	.245E+04	
FREE DROP-TOP	6b	.509E+03	.990E+03	.990E+03	.150E+04	
FREE DROP-TOP	6c	.922E+03	.990E+03	.990E+03	.191E+04	
FREE DROP-SIDE, 0 MER	6a	.146E+04	.127E+04	.127E+04	.273E+04	
FREE DROP-SIDE, 0 MER	6b	.509E+03	.127E+04	.127E+04	.178E+04	
FREE DROP-SIDE, 0 MER	6c	.922E+03	.127E+04	.127E+04	.219E+04	
FREE DROP-SIDE, 45 MER	6a	.146E+04	.522E+03	.522E+03	.198E+04	
FREE DROP-SIDE, 45 MER	6b	.509E+03	.522E+03	.522E+03	.103E+04	
FREE DROP-SIDE, 45 MER	6c	.922E+03	.522E+03	.522E+03	.144E+04	
MAXIMUM STRESS INTENSITY			.127E+04	.127E+04	.273E+04	

NOTES:
1. Pm < Sm = 20.0 ksi
   Pm+Pb< 1.5*Sm = 30.0 ksi
   Pm+Pb+Q < 3.0*Sm = 60.0 ksi
2. See Table 2.10.9.42 for combination index identification.
3. For combinations with Salt not listed, the number of load cycles are few and therefore, the fatigue qualifications are met.
4. MER = Meridian, angle of orientation from the contact edge where stresses are given.
5. Stresses are given at the centroid of the element, therefore, the same stress value is used for Pm and Pm+Pb.

TABLE 2.10.9.78A. SUMMARY OF STRESSES FOR LOAD COMBINATIONS, NORMAL CONDITIONS OF TRANSPORT, STRESS POINT 26

LOAD	COMBINATION	STRESS INTENSITY CATEGORY				FATIGUE
COMBINATION	INDEX	Q	Pm	Pm+Pb	Pm+Pb+Q	Salt
HOT ENVIRONMENT	1	.146E+04	.385E+02	.385E+02	.150E+04	
COLD ENVIRONMENT	2a	.595E+03	.385E+02	.385E+02	.634E+03	
COLD ENVIRONMENT	2b	.912E+03	.385E+02	.385E+02	.951E+03	
MINIMUM EXT. PRESS.	3a	.146E+04	.797E+02	.797E+02	.154E+04	
MINIMUM EXT. PRESS.	3b	.509E+03	.797E+02	.797E+02	.589E+03	
INCREASE EXT. PRESS.	4a	.146E+04	.310E+02	.310E+02	.149E+04	
INCREASE EXT. PRESS.	4b	.509E+03	.310E+02	.310E+02	.540E+03	
VIBRATION AND SHOCK	5a	.146E+04	.719E+03	.719E+03	.218E+04	.109E+04
VIBRATION AND SHOCK	5b	.509E+03	.719E+03	.719E+03	.123E+04	.614E+03
VIBRATION AND SHOCK	5c	.922E+03	.719E+03	.719E+03	.164E+04	.821E+03
FREE DROP-TOP	6a	.146E+04	.416E+04	.416E+04	.562E+04	
FREE DROP-TOP	6b	.509E+03	.416E+04	.416E+04	.467E+04	
FREE DROP-TOP	6c	.922E+03	.416E+04	.416E+04	.508E+04	
FREE DROP-SIDE, 0 MER	6a	.146E+04	.461E+04	.461E+04	.607E+04	
FREE DROP-SIDE, 0 MER	6b	.509E+03	.461E+04	.461E+04	.512E+04	
FREE DROP-SIDE, 0 MER	6c	.922E+03	.461E+04	.461E+04	.553E+04	
FREE DROP-SIDE, 45 MER	6a	.146E+04	.183E+04	.183E+04	.329E+04	
FREE DROP-SIDE, 45 MER	6b	.509E+03	.183E+04	.183E+04	.234E+04	
FREE DROP-SIDE, 45 MER	6c	.922E+03	.183E+04	.183E+04	.276E+04	
MAXIMUM STRESS INTENSITY			.461E+04	.461E+04	.607E+04	

NOTES:

1. Pm < Sm = 20.0 ksi
   Pm+Pb< 1.5*Sm = 30.0 ksi
   Pm+Pb+Q < 3.0*Sm = 60.0 ksi
2. See Table 2.10.9.42" for combination index identification.
3. For combinations with Salt not listed, the number of load cycles are few and therefore, the fatigue qualifications are met.
4. MER = Meridian, angle of orientation from the contact edge where stresses are given.
5. Stresses are given at the centroid of the element, therefore, the same stress value is used for Pm and Pm+Pb.

TABLE 2.10.9.79. SUMMARY OF STRESSES FOR LOAD COMBINATIONS, NORMAL CONDITIONS OF TRANSPORT, STRESS POINT 27

LOAD	COMBINATION	STRESS INTENSITY CATEGORY				FATIGUE
COMBINATION	INDEX	Q	Pm	Pm+Pb	Pm+Pb+Q	Salt
HOT ENVIRONMENT	1	.128E+04	.698E+02	.698E+02	.135E+04	
COLD ENVIRONMENT	2a	.429E+03	.698E+02	.698E+02	.499E+03	
COLD ENVIRONMENT	2b	.668E+03	.698E+02	.698E+02	.738E+03	
MINIMUM EXT. PRESS.	3a	.128E+04	.721E+02	.721E+02	.135E+04	
MINIMUM EXT. PRESS.	3b	.349E+03	.721E+02	.721E+02	.421E+03	
INCREASE EXT. PRESS.	4a	.128E+04	.222E+02	.222E+02	.130E+04	
INCREASE EXT. PRESS.	4b	.349E+03	.222E+02	.222E+02	.371E+03	
VIBRATION AND SHOCK	5a	.128E+04	.584E+03	.584E+03	.186E+04	.931E+03
VIBRATION AND SHOCK	5b	.349E+03	.584E+03	.584E+03	.933E+03	.466E+03
VIBRATION AND SHOCK	5c	.649E+03	.584E+03	.584E+03	.123E+04	.616E+03
FREE DROP-TOP	6a	.128E+04	.569E+03	.569E+03	.185E+04	
FREE DROP-TOP	6b	.349E+03	.569E+03	.569E+03	.918E+03	
FREE DROP-TOP	6c	.649E+03	.569E+03	.569E+03	.122E+04	
FREE DROP-SIDE, 0 MER	6a	.128E+04	.141E+04	.141E+04	.269E+04	
FREE DROP-SIDE, 0 MER	6b	.349E+03	.141E+04	.141E+04	.176E+04	
FREE DROP-SIDE, 0 MER	6c	.649E+03	.141E+04	.141E+04	.206E+04	
FREE DROP-SIDE, 45 MER	6a	.128E+04	.578E+03	.578E+03	.186E+04	
FREE DROP-SIDE, 45 MER	6b	.349E+03	.578E+03	.578E+03	.927E+03	
FREE DROP-SIDE, 45 MER	6c	.649E+03	.578E+03	.578E+03	.123E+04	
MAXIMUM STRESS INTENSITY			.141E+04	.141E+04	.269E+04	

NOTES:
1. Pm < Sm = 20.0 ksi
   Pm+Pb< 1.5*Sm = 30.0 ksi
   Pm+Pb+Q < 3.0*Sm = 60.0 ksi
2. See Table 2.10.9.42 for combination index identification.
3. For combinations with Salt not listed, the number of load cycles are few and therefore, the fatigue qualifications are met.
4. MER = Meridian, angle of orientation from the contact edge where stresses are given.
5. Stresses are given at the centroid of the element, therefore, the same stress value is used for Pm and Pm+Pb.

TABLE 2.10.9.79A. SUMMARY OF STRESSES FOR LOAD COMBINATIONS, NORMAL CONDITIONS OF TRANSPORT, STRESS POINT 27

LOAD	COMBINATION	STRESS INTENSITY CATEGORY				FATIGUE
COMBINATION	INDEX	Q	Pm	Pm+Pb	Pm+Pb+Q	Salt
HOT ENVIRONMENT	1	.128E+04	.698E+02	.698E+02	.135E+04	
COLD ENVIRONMENT	2a	.429E+03	.698E+02	.698E+02	.499E+03	
COLD ENVIRONMENT	2b	.668E+03	.698E+02	.698E+02	.738E+03	
MINIMUM EXT. PRESS.	3a	.128E+04	.721E+02	.721E+02	.135E+04	
MINIMUM EXT. PRESS.	3b	.349E+03	.721E+02	.721E+02	.421E+03	
INCREASE EXT. PRESS.	4a	.128E+04	.222E+02	.222E+02	.130E+04	
INCREASE EXT. PRESS.	4b	.349E+03	.222E+02	.222E+02	.371E+03	
VIBRATION AND SHOCK	5a	.128E+04	.584E+03	.584E+03	.186E+04	.931E+03
VIBRATION AND SHOCK	5b	.349E+03	.584E+03	.584E+03	.933E+03	.466E+03
VIBRATION AND SHOCK	5c	.649E+03	.584E+03	.584E+03	.123E+04	.616E+03
FREE DROP-TOP	6a	.128E+04	.369E+04	.369E+04	.497E+04	
FREE DROP-TOP	6b	.349E+03	.369E+04	.369E+04	.404E+04	
FREE DROP-TOP	6c	.649E+03	.369E+04	.369E+04	.434E+04	
FREE DROP-SIDE, 0 MER	6a	.128E+04	.505E+04	.505E+04	.633E+04	
FREE DROP-SIDE, 0 MER	6b	.349E+03	.505E+04	.505E+04	.540E+04	
FREE DROP-SIDE, 0 MER	6c	.649E+03	.505E+04	.505E+04	.570E+04	
FREE DROP-SIDE, 45 MER	6a	.128E+04	.196E+04	.196E+04	.323E+04	
FREE DROP-SIDE, 45 MER	6b	.349E+03	.196E+04	.196E+04	.230E+04	
FREE DROP-SIDE, 45 MER	6c	.649E+03	.196E+04	.196E+04	.260E+04	
MAXIMUM STRESS INTENSITY			.505E+04	.505E+04	.633E+04	

NOTES:
1. Pm < Sm = 20.0 ksi
   Pm+Pb< 1.5*Sm = 30.0 ksi
   Pm+Pb+Q < 3.0*Sm = 60.0 ksi
2. See Table 2.10.9.42 for combination index identification.
3. For combinations with Salt not listed, the number of load cycles are few and therefore, the fatigue qualifications are met.
4. MER = Meridian, angle of orientation from the contact edge where stresses are given.
5. Stresses are given at the centroid of the element, therefore, the same stress value is used for Pm and Pm+Pb.

TABLE 2.10.9.80. SUMMARY OF STRESSES FOR LOAD COMBINATIONS, ACCIDENT CONDITIONS OF TRANSPORT, STRESS POINT 1

LOAD COMBINATION	COMBINATION INDEX	STRESS INTENSITY CATEGORY Pm	Pm+Pb
FREE DROP 30 FOOT - TOP	7a	.632E+03	.632E+03
FREE DROP 30 FOOT - TOP	7b	.632E+03	.632E+03
FREE DROP 30 FOOT - TOP	7c	.632E+03	.632E+03
FREE DROP 30 FOOT - BOTTOM	7a	.123E+04	.123E+04
FREE DROP 30 FOOT - BOTTOM	7b	.123E+04	.123E+04
FREE DROP 30 FOOT - BOTTOM	7c	.123E+04	.123E+04
FREE DROP 30 FOOT - SIDE	7a	.343E+03	.343E+03
FREE DROP 30 FOOT - SIDE	7b	.343E+03	.343E+03
FREE DROP 30 FOOT - SIDE	7c	.343E+03	.343E+03
FREE DROP 30 FOOT - CG	7a	.220E+02	.220E+02
FREE DROP 30 FOOT - CG	7b	.220E+02	.220E+02
FREE DROP 30 FOOT - CG	7c	.220E+02	.220E+02
PUNCTURE	8a	.343E+03	.343E+03
PUNCTURE	8b	.343E+03	.343E+03
PUNCTURE	8c	.343E+03	.343E+03
THERMAL FIRE - T=0.5 HR	9	.130E+02	.130E+02
THERMAL FIRE - T=1.0 HR	9	.130E+02	.130E+02
THERMAL FIRE - T=1.5 HR	9	.130E+02	.130E+02
THERMAL FIRE - T=2.0 HR	9	.130E+02	.130E+02
THERMAL FIRE - T=2.5 HR	9	.130E+02	.130E+02
THERMAL FIRE - T=3.0 HR	9	.130E+02	.130E+02
MAXIMUM STRESS INTENSITY		.123E+04	.123E+04

NOTES:
1. Pm < 2.4*Sm or 0.7*Su = 48.0 ksi
   Pm+Pb < 3.6*Sm or Su = 70.0 ksi
2. See Table 2.10.9.42 for combination index identification.
3. Stresses are given at the centroid of the element, therefore, the same stress value is used for Pm and Pm+Pb.

TABLE 2.10.9.80A. SUMMARY OF STRESSES FOR LOAD COMBINATIONS, ACCIDENT CONDITIONS OF TRANSPORT, STRESS POINT 1

LOAD COMBINATION	COMBINATION INDEX	STRESS INTENSITY CATEGORY Pm	Pm+Pb
FREE DROP 30 FOOT - TOP	7a	.536E+03	.536E+03
FREE DROP 30 FOOT - TOP	7b	.536E+03	.536E+03
FREE DROP 30 FOOT - TOP	7c	.536E+03	.536E+03
FREE DROP 30 FOOT - BOTTOM	7a	.160E+04	.160E+04
FREE DROP 30 FOOT - BOTTOM	7b	.160E+04	.160E+04
FREE DROP 30 FOOT - BOTTOM	7c	.160E+04	.160E+04
FREE DROP 30 FOOT - SIDE	7a	.442E+03	.442E+03
FREE DROP 30 FOOT - SIDE	7b	.442E+03	.442E+03
FREE DROP 30 FOOT - SIDE	7c	.442E+03	.442E+03
FREE DROP 30 FOOT - CG	7a	.276E+02	.276E+02
FREE DROP 30 FOOT - CG	7b	.276E+02	.276E+02
FREE DROP 30 FOOT - CG	7c	.276E+02	.276E+02
PUNCTURE	8a	.442E+03	.442E+03
PUNCTURE	8b	.442E+03	.442E+03
PUNCTURE	8c	.442E+03	.442E+03
THERMAL FIRE - T=0.5 HR	9	.130E+02	.130E+02
THERMAL FIRE - T=1.0 HR	9	.130E+02	.130E+02
THERMAL FIRE - T=1.5 HR	9	.130E+02	.130E+02
THERMAL FIRE - T=2.0 HR	9	.130E+02	.130E+02
THERMAL FIRE - T=2.5 HR	9	.130E+02	.130E+02
THERMAL FIRE - T=3.0 HR	9	.130E+02	.130E+02
MAXIMUM STRESS INTENSITY		.160E+04	.160E+04

NOTES:
1. Pm < 2.4*Sm or 0.7*Su = 48.0 ksi
   Pm+Pb < 3.6*Sm or Su = 70.0 ksi
2. See Table 2.10.9.42 for combination index identification.
3. Stresses are given at the centroid of the element, therefore, the same stress value is used for Pm and Pm+Pb.

TABLE 2.10.9.81. SUMMARY OF STRESSES FOR LOAD COMBINATIONS, ACCIDENT CONDITIONS OF TRANSPORT, STRESS POINT 2

LOAD COMBINATION	COMBINATION INDEX	STRESS INTENSITY CATEGORY Pm	Pm+Pb
FREE DROP 30 FOOT - TOP	7a	.593E+03	.593E+03
FREE DROP 30 FOOT - TOP	7b	.593E+03	.593E+03
FREE DROP 30 FOOT - TOP	7c	.593E+03	.593E+03
FREE DROP 30 FOOT - BOTTOM	7a	.120E+04	.120E+04
FREE DROP 30 FOOT - BOTTOM	7b	.120E+04	.120E+04
FREE DROP 30 FOOT - BOTTOM	7c	.120E+04	.120E+04
FREE DROP 30 FOOT - SIDE	7a	.497E+03	.497E+03
FREE DROP 30 FOOT - SIDE	7b	.497E+03	.497E+03
FREE DROP 30 FOOT - SIDE	7c	.497E+03	.497E+03
FREE DROP 30 FOOT - CG	7a	.416E+02	.416E+02
FREE DROP 30 FOOT - CG	7b	.416E+02	.416E+02
FREE DROP 30 FOOT - CG	7c	.416E+02	.416E+02
PUNCTURE	8a	.497E+03	.497E+03
PUNCTURE	8b	.497E+03	.497E+03
PUNCTURE	8c	.497E+03	.497E+03
THERMAL FIRE - T=0.5 HR	9	.137E+02	.137E+02
THERMAL FIRE - T=1.0 HR	9	.137E+02	.137E+02
THERMAL FIRE - T=1.5 HR	9	.137E+02	.137E+02
THERMAL FIRE - T=2.0 HR	9	.137E+02	.137E+02
THERMAL FIRE - T=2.5 HR	9	.137E+02	.137E+02
THERMAL FIRE - T=3.0 HR	9	.137E+02	.137E+02
MAXIMUM STRESS INTENSITY		.120E+04	.120E+04

NOTES:
1. Pm < 2.4*Sm or 0.7*Su = 48.0 ksi
   Pm+Pb < 3.6*Sm or Su = 70.0 ksi
2. See Table 2.10.9.42 for combination index identification.
3. Stresses are given at the centroid of the element, therefore, the same stress value is used for Pm and Pm+Pb.

TABLE 2.10.9.81A. SUMMARY OF STRESSES FOR LOAD COMBINATIONS, ACCIDENT CONDITIONS OF TRANSPORT, STRESS POINT 2

LOAD COMBINATION	COMBINATION INDEX	STRESS INTENSITY CATEGORY Pm	Pm+Pb
FREE DROP 30 FOOT - TOP	7a	.449E+03	.449E+03
FREE DROP 30 FOOT - TOP	7b	.449E+03	.449E+03
FREE DROP 30 FOOT - TOP	7c	.449E+03	.449E+03
FREE DROP 30 FOOT - BOTTOM	7a	.154E+04	.154E+04
FREE DROP 30 FOOT - BOTTOM	7b	.154E+04	.154E+04
FREE DROP 30 FOOT - BOTTOM	7c	.154E+04	.154E+04
FREE DROP 30 FOOT - SIDE	7a	.642E+03	.642E+03
FREE DROP 30 FOOT - SIDE	7b	.642E+03	.642E+03
FREE DROP 30 FOOT - SIDE	7c	.642E+03	.642E+03
FREE DROP 30 FOOT - CG	7a	.588E+02	.588E+02
FREE DROP 30 FOOT - CG	7b	.588E+02	.588E+02
FREE DROP 30 FOOT - CG	7c	.588E+02	.588E+02
PUNCTURE	8a	.642E+03	.642E+03
PUNCTURE	8b	.642E+03	.642E+03
PUNCTURE	8c	.642E+03	.642E+03
THERMAL FIRE - T=0.5 HR	9	.137E+02	.137E+02
THERMAL FIRE - T=1.0 HR	9	.137E+02	.137E+02
THERMAL FIRE - T=1.5 HR	9	.137E+02	.137E+02
THERMAL FIRE - T=2.0 HR	9	.137E+02	.137E+02
THERMAL FIRE - T=2.5 HR	9	.137E+02	.137E+02
THERMAL FIRE - T=3.0 HR	9	.137E+02	.137E+02
MAXIMUM STRESS INTENSITY		.154E+04	.154E+04

NOTES:
1. Pm < 2.4*Sm or 0.7*Su = 48.0 ksi
   Pm+Pb < 3.6*Sm or Su = 70.0 ksi
2. See Table 2.10.9.42 for combination index identification.
3. Stresses are given at the centroid of the element, therefore, the same stress value is used for Pm and Pm+Pb.

TABLE 2.10.9.82. SUMMARY OF STRESSES FOR LOAD COMBINATIONS, ACCIDENT CONDITIONS OF TRANSPORT, STRESS POINT 3

LOAD COMBINATION	COMBINATION INDEX	STRESS INTENSITY CATEGORY Pm	Pm+Pb
FREE DROP 30 FOOT - TOP	7a	.501E+03	.501E+03
FREE DROP 30 FOOT - TOP	7b	.501E+03	.501E+03
FREE DROP 30 FOOT - TOP	7c	.501E+03	.501E+03
FREE DROP 30 FOOT - BOTTOM	7a	.152E+04	.152E+04
FREE DROP 30 FOOT - BOTTOM	7b	.152E+04	.152E+04
FREE DROP 30 FOOT - BOTTOM	7c	.152E+04	.152E+04
FREE DROP 30 FOOT - SIDE	7a	.132E+05	.132E+05
FREE DROP 30 FOOT - SIDE	7b	.132E+05	.132E+05
FREE DROP 30 FOOT - SIDE	7c	.132E+05	.132E+05
FREE DROP 30 FOOT - CG	7a	.870E+03	.870E+03
FREE DROP 30 FOOT - CG	7b	.870E+03	.870E+03
FREE DROP 30 FOOT - CG	7c	.870E+03	.870E+03
PUNCTURE	8a	.132E+05	.132E+05
PUNCTURE	8b	.132E+05	.132E+05
PUNCTURE	8c	.132E+05	.132E+05
THERMAL FIRE - T=0.5 HR	9	.151E+02	.151E+02
THERMAL FIRE - T=1.0 HR	9	.151E+02	.151E+02
THERMAL FIRE - T=1.5 HR	9	.151E+02	.151E+02
THERMAL FIRE - T=2.0 HR	9	.151E+02	.151E+02
THERMAL FIRE - T=2.5 HR	9	.151E+02	.151E+02
THERMAL FIRE - T=3.0 HR	9	.151E+02	.151E+02
MAXIMUM STRESS INTENSITY		.132E+05	.132E+05

NOTES:
1. Pm < 2.4*Sm or 0.7*Su = 48.0 ksi
   Pm+Pb < 3.6*Sm or Su = 70.0 ksi
2. See Table 2.10.9.42 for combination index identification.
3. Stresses are given at the centroid of the element, therefore, the same stress value is used for Pm and Pm+Pb.

TABLE 2.10.9.82A. SUMMARY OF STRESSES FOR LOAD COMBINATIONS, ACCIDENT CONDITIONS OF TRANSPORT, STRESS POINT 3

LOAD COMBINATION	COMBINATION INDEX	STRESS INTENSITY CATEGORY Pm	Pm+Pb
FREE DROP 30 FOOT - TOP	7a	.375E+03	.375E+03
FREE DROP 30 FOOT - TOP	7b	.375E+03	.375E+03
FREE DROP 30 FOOT - TOP	7c	.375E+03	.375E+03
FREE DROP 30 FOOT - BOTTOM	7a	.198E+04	.198E+04
FREE DROP 30 FOOT - BOTTOM	7b	.198E+04	.198E+04
FREE DROP 30 FOOT - BOTTOM	7c	.198E+04	.198E+04
FREE DROP 30 FOOT - SIDE	7a	.172E+05	.172E+05
FREE DROP 30 FOOT - SIDE	7b	.172E+05	.172E+05
FREE DROP 30 FOOT - SIDE	7c	.172E+05	.172E+05
FREE DROP 30 FOOT - CG	7a	.140E+04	.140E+04
FREE DROP 30 FOOT - CG	7b	.140E+04	.140E+04
FREE DROP 30 FOOT - CG	7c	.140E+04	.140E+04
PUNCTURE	8a	.172E+05	.172E+05
PUNCTURE	8b	.172E+05	.172E+05
PUNCTURE	8c	.172E+05	.172E+05
THERMAL FIRE - T=0.5 HR	9	.151E+02	.151E+02
THERMAL FIRE - T=1.0 HR	9	.151E+02	.151E+02
THERMAL FIRE - T=1.5 HR	9	.151E+02	.151E+02
THERMAL FIRE - T=2.0 HR	9	.151E+02	.151E+02
THERMAL FIRE - T=2.5 HR	9	.151E+02	.151E+02
THERMAL FIRE - T=3.0 HR	9	.151E+02	.151E+02
MAXIMUM STRESS INTENSITY		.172E+05	.172E+05

NOTES:
1. Pm < 2.4*Sm or 0.7*Su = 48.0 ksi
   Pm+Pb < 3.6*Sm or Su = 70.0 ksi
2. See Table 2.10.9.42 for combination index identification.
3. Stresses are given at the centroid of the element, therefore, the same stress value is used for Pm and Pm+Pb.

TABLE 2.10.9.83. SUMMARY OF STRESSES FOR LOAD COMBINATIONS, ACCIDENT CONDITIONS OF TRANSPORT, STRESS POINT 4

LOAD COMBINATION	COMBINATION INDEX	STRESS INTENSITY CATEGORY Pm	Pm+Pb
FREE DROP 30 FOOT - TOP	7a	.462E+03	.462E+03
FREE DROP 30 FOOT - TOP	7b	.462E+03	.462E+03
FREE DROP 30 FOOT - TOP	7c	.462E+03	.462E+03
FREE DROP 30 FOOT - BOTTOM	7a	.135E+04	.135E+04
FREE DROP 30 FOOT - BOTTOM	7b	.135E+04	.135E+04
FREE DROP 30 FOOT - BOTTOM	7c	.135E+04	.135E+04
FREE DROP 30 FOOT - SIDE	7a	.412E+04	.412E+04
FREE DROP 30 FOOT - SIDE	7b	.412E+04	.412E+04
FREE DROP 30 FOOT - SIDE	7c	.412E+04	.412E+04
FREE DROP 30 FOOT - CG	7a	.100E+04	.100E+04
FREE DROP 30 FOOT - CG	7b	.100E+04	.100E+04
FREE DROP 30 FOOT - CG	7c	.100E+04	.100E+04
PUNCTURE	8a	.412E+04	.412E+04
PUNCTURE	8b	.412E+04	.412E+04
PUNCTURE	8c	.412E+04	.412E+04
THERMAL FIRE - T=0.5 HR	9	.176E+02	.176E+02
THERMAL FIRE - T=1.0 HR	9	.176E+02	.176E+02
THERMAL FIRE - T=1.5 HR	9	.176E+02	.176E+02
THERMAL FIRE - T=2.0 HR	9	.176E+02	.176E+02
THERMAL FIRE - T=2.5 HR	9	.176E+02	.176E+02
THERMAL FIRE - T=3.0 HR	9	.176E+02	.176E+02
MAXIMUM STRESS INTENSITY		.412E+04	.412E+04

NOTES:
1. Pm < 2.4*Sm or 0.7*Su = 48.0 ksi
   Pm+Pb < 3.6*Sm or Su = 70.0 ksi
2. See Table 2.10.9.42 for combination index identification.
3. Stresses are given at the centroid of the element, therefore, the same stress value is used for Pm and Pm+Pb.

TABLE 2.10.9.83A. SUMMARY OF STRESSES FOR LOAD COMBINATIONS, ACCIDENT CONDITIONS OF TRANSPORT, STRESS POINT 4

LOAD COMBINATION	COMBINATION INDEX	STRESS INTENSITY CATEGORY Pm	Pm+Pb
FREE DROP 30 FOOT - TOP	7a	.298E+03	.298E+03
FREE DROP 30 FOOT - TOP	7b	.298E+03	.298E+03
FREE DROP 30 FOOT - TOP	7c	.298E+03	.298E+03
FREE DROP 30 FOOT - BOTTOM	7a	.176E+04	.176E+04
FREE DROP 30 FOOT - BOTTOM	7b	.176E+04	.176E+04
FREE DROP 30 FOOT - BOTTOM	7c	.176E+04	.176E+04
FREE DROP 30 FOOT - SIDE	7a	.534E+04	.534E+04
FREE DROP 30 FOOT - SIDE	7b	.534E+04	.534E+04
FREE DROP 30 FOOT - SIDE	7c	.534E+04	.534E+04
FREE DROP 30 FOOT - CG	7a	.162E+04	.162E+04
FREE DROP 30 FOOT - CG	7b	.162E+04	.162E+04
FREE DROP 30 FOOT - CG	7c	.162E+04	.162E+04
PUNCTURE	8a	.534E+04	.534E+04
PUNCTURE	8b	.534E+04	.534E+04
PUNCTURE	8c	.534E+04	.534E+04
THERMAL FIRE - T=0.5 HR	9	.176E+02	.176E+02
THERMAL FIRE - T=1.0 HR	9	.176E+02	.176E+02
THERMAL FIRE - T=1.5 HR	9	.176E+02	.176E+02
THERMAL FIRE - T=2.0 HR	9	.176E+02	.176E+02
THERMAL FIRE - T=2.5 HR	9	.176E+02	.176E+02
THERMAL FIRE - T=3.0 HR	9	.176E+02	.176E+02
MAXIMUM STRESS INTENSITY		.534E+04	.534E+04

NOTES:
1. Pm < 2.4*Sm or 0.7*Su = 48.0 ksi
   Pm+Pb < 3.6*Sm or Su = 70.0 ksi
2. See Table 2.10.9.42 for combination index identification.
3. Stresses are given at the centroid of the element, therefore, the same stress value is used for Pm and Pm+Pb.

TABLE 2.10.9.84. SUMMARY OF STRESSES FOR LOAD COMBINATIONS, ACCIDENT CONDITIONS OF TRANSPORT, STRESS POINT 5

LOAD COMBINATION	COMBINATION INDEX	STRESS INTENSITY CATEGORY Pm	Pm+Pb
FREE DROP 30 FOOT - TOP	7a	.110E+03	.110E+03
FREE DROP 30 FOOT - TOP	7b	.110E+03	.110E+03
FREE DROP 30 FOOT - TOP	7c	.110E+03	.110E+03
FREE DROP 30 FOOT - BOTTOM	7a	.256E+04	.256E+04
FREE DROP 30 FOOT - BOTTOM	7b	.256E+04	.256E+04
FREE DROP 30 FOOT - BOTTOM	7c	.256E+04	.256E+04
FREE DROP 30 FOOT - SIDE	7a	.228E+04	.228E+04
FREE DROP 30 FOOT - SIDE	7b	.228E+04	.228E+04
FREE DROP 30 FOOT - SIDE	7c	.228E+04	.228E+04
FREE DROP 30 FOOT - CG	7a	.356E+03	.356E+03
FREE DROP 30 FOOT - CG	7b	.356E+03	.356E+03
FREE DROP 30 FOOT - CG	7c	.356E+03	.356E+03
PUNCTURE	8a	.228E+04	.228E+04
PUNCTURE	8b	.228E+04	.228E+04
PUNCTURE	8c	.228E+04	.228E+04
THERMAL FIRE - T=0.5 HR	9	.307E+01	.307E+01
THERMAL FIRE - T=1.0 HR	9	.307E+01	.307E+01
THERMAL FIRE - T=1.5 HR	9	.307E+01	.307E+01
THERMAL FIRE - T=2.0 HR	9	.307E+01	.307E+01
THERMAL FIRE - T=2.5 HR	9	.307E+01	.307E+01
THERMAL FIRE - T=3.0 HR	9	.307E+01	.307E+01
MAXIMUM STRESS INTENSITY		.256E+04	.256E+04

NOTES:

1. Pm < 2.4*Sm or 0.7*Su = 48.0 ksi
   Pm+Pb < 3.6*Sm or Su = 70.0 ksi
2. See Table 2.10.9.42 for combination index identification.
3. Stresses are given at the centroid of the element, therefore, the same stress value is used for Pm and Pm+Pb.

TABLE 2.10.9.84A. SUMMARY OF STRESSES FOR LOAD COMBINATIONS, ACCIDENT CONDITIONS OF TRANSPORT, STRESS POINT 5

LOAD COMBINATION	COMBINATION INDEX	STRESS INTENSITY CATEGORY Pm	Pm+Pb
FREE DROP 30 FOOT - TOP	7a	.130E+03	.130E+03
FREE DROP 30 FOOT - TOP	7b	.130E+03	.130E+03
FREE DROP 30 FOOT - TOP	7c	.130E+03	.130E+03
FREE DROP 30 FOOT - BOTTOM	7a	.324E+04	.324E+04
FREE DROP 30 FOOT - BOTTOM	7b	.324E+04	.324E+04
FREE DROP 30 FOOT - BOTTOM	7c	.324E+04	.324E+04
FREE DROP 30 FOOT - SIDE	7a	.296E+04	.296E+04
FREE DROP 30 FOOT - SIDE	7b	.296E+04	.296E+04
FREE DROP 30 FOOT - SIDE	7c	.296E+04	.296E+04
FREE DROP 30 FOOT - CG	7a	.575E+03	.575E+03
FREE DROP 30 FOOT - CG	7b	.575E+03	.575E+03
FREE DROP 30 FOOT - CG	7c	.575E+03	.575E+03
PUNCTURE	8a	.296E+04	.296E+04
PUNCTURE	8b	.296E+04	.296E+04
PUNCTURE	8c	.296E+04	.296E+04
THERMAL FIRE - T=0.5 HR	9	.307E+01	.307E+01
THERMAL FIRE - T=1.0 HR	9	.307E+01	.307E+01
THERMAL FIRE - T=1.5 HR	9	.307E+01	.307E+01
THERMAL FIRE - T=2.0 HR	9	.307E+01	.307E+01
THERMAL FIRE - T=2.5 HR	9	.307E+01	.307E+01
THERMAL FIRE - T=3.0 HR	9	.307E+01	.307E+01
MAXIMUM STRESS INTENSITY		.324E+04	.324E+04

NOTES:
1. Pm < 2.4*Sm or 0.7*Su = 48.0 ksi
   Pm+Pb < 3.6*Sm or Su = 70.0 ksi
2. See Table 2.10.9.42 for combination index identification.
3. Stresses are given at the centroid of the element, therefore, the same stress value is used for Pm and Pm+Pb.

TABLE 2.10.9.85. SUMMARY OF STRESSES FOR LOAD COMBINATIONS, ACCIDENT CONDITIONS OF TRANSPORT, STRESS POINT 6

LOAD COMBINATION	COMBINATION INDEX	STRESS INTENSITY CATEGORY Pm	Pm+Pb
FREE DROP 30 FOOT - TOP	7a	.536E+02	.536E+02
FREE DROP 30 FOOT - TOP	7b	.536E+02	.536E+02
FREE DROP 30 FOOT - TOP	7c	.536E+02	.536E+02
FREE DROP 30 FOOT - BOTTOM	7a	.314E+04	.314E+04
FREE DROP 30 FOOT - BOTTOM	7b	.314E+04	.314E+04
FREE DROP 30 FOOT - BOTTOM	7c	.314E+04	.314E+04
FREE DROP 30 FOOT - SIDE	7a	.219E+04	.219E+04
FREE DROP 30 FOOT - SIDE	7b	.219E+04	.219E+04
FREE DROP 30 FOOT - SIDE	7c	.219E+04	.219E+04
FREE DROP 30 FOOT - CG	7a	.393E+03	.393E+03
FREE DROP 30 FOOT - CG	7b	.393E+03	.393E+03
FREE DROP 30 FOOT - CG	7c	.393E+03	.393E+03
PUNCTURE	8a	.219E+04	.219E+04
PUNCTURE	8b	.219E+04	.219E+04
PUNCTURE	8c	.219E+04	.219E+04
THERMAL FIRE - T=0.5 HR	9	.786E+01	.786E+01
THERMAL FIRE - T=1.0 HR	9	.786E+01	.786E+01
THERMAL FIRE - T=1.5 HR	9	.786E+01	.786E+01
THERMAL FIRE - T=2.0 HR	9	.786E+01	.786E+01
THERMAL FIRE - T=2.5 HR	9	.786E+01	.786E+01
THERMAL FIRE - T=3.0 HR	9	.786E+01	.786E+01
MAXIMUM STRESS INTENSITY		.314E+04	.314E+04

NOTES:
1. Pm < 2.4*Sm or 0.7*Su = 48.0 ksi
   Pm+Pb < 3.6*Sm or Su = 70.0 ksi
2. See Table 2.10.9.42 for combination index identification.
3. Stresses are given at the centroid of the element, therefore, the same stress value is used for Pm and Pm+Pb.

TABLE 2.10.9.85A. SUMMARY OF STRESSES FOR LOAD COMBINATIONS, ACCIDENT CONDITIONS OF TRANSPORT, STRESS POINT 6

LOAD COMBINATION	COMBINATION INDEX	STRESS INTENSITY CATEGORY Pm	Pm+Pb
FREE DROP 30 FOOT - TOP	7a	.115E+03	.115E+03
FREE DROP 30 FOOT - TOP	7b	.115E+03	.115E+03
FREE DROP 30 FOOT - TOP	7c	.115E+03	.115E+03
FREE DROP 30 FOOT - BOTTOM	7a	.398E+04	.398E+04
FREE DROP 30 FOOT - BOTTOM	7b	.398E+04	.398E+04
FREE DROP 30 FOOT - BOTTOM	7c	.398E+04	.398E+04
FREE DROP 30 FOOT - SIDE	7a	.284E+04	.284E+04
FREE DROP 30 FOOT - SIDE	7b	.284E+04	.284E+04
FREE DROP 30 FOOT - SIDE	7c	.284E+04	.284E+04
FREE DROP 30 FOOT - CG	7a	.631E+03	.631E+03
FREE DROP 30 FOOT - CG	7b	.631E+03	.631E+03
FREE DROP 30 FOOT - CG	7c	.631E+03	.631E+03
PUNCTURE	8a	.284E+04	.284E+04
PUNCTURE	8b	.284E+04	.284E+04
PUNCTURE	8c	.284E+04	.284E+04
THERMAL FIRE - T=0.5 HR	9	.786E+01	.786E+01
THERMAL FIRE - T=1.0 HR	9	.786E+01	.786E+01
THERMAL FIRE - T=1.5 HR	9	.786E+01	.786E+01
THERMAL FIRE - T=2.0 HR	9	.786E+01	.786E+01
THERMAL FIRE - T=2.5 HR	9	.786E+01	.786E+01
THERMAL FIRE - T=3.0 HR	9	.786E+01	.786E+01
MAXIMUM STRESS INTENSITY		.398E+04	.398E+04

NOTES:
1. Pm < 2.4*Sm or 0.7*Su = 48.0 ksi
   Pm+Pb < 3.6*Sm or Su = 70.0 ksi
2. See Table 2.10.9.42 for combination index identification.
3. Stresses are given at the centroid of the element, therefore, the same stress value is used for Pm and Pm+Pb.

TABLE 2.10.9.86. SUMMARY OF STRESSES FOR LOAD COMBINATIONS, ACCIDENT CONDITIONS OF TRANSPORT, STRESS POINT 7A

LOAD COMBINATION	COMBINATION INDEX	STRESS INTENSITY CATEGORY Pm	Pm+Pb
FREE DROP 30 FOOT - TOP	7a	.210E+04	.201E+04
FREE DROP 30 FOOT - TOP	7b	.210E+04	.201E+04
FREE DROP 30 FOOT - TOP	7c	.210E+04	.201E+04
FREE DROP 30 FOOT - BOTTOM	7a	.816E+04	.149E+05
FREE DROP 30 FOOT - BOTTOM	7b	.816E+04	.149E+05
FREE DROP 30 FOOT - BOTTOM	7c	.816E+04	.149E+05
FREE DROP 30 FOOT - SIDE	7a	.746E+04	.137E+04
FREE DROP 30 FOOT - SIDE	7b	.746E+04	.137E+04
FREE DROP 30 FOOT - SIDE	7c	.746E+04	.137E+04
FREE DROP 30 FOOT - CG	7a	.646E+03	.149E+04
FREE DROP 30 FOOT - CG	7b	.646E+03	.149E+04
FREE DROP 30 FOOT - CG	7c	.646E+03	.149E+04
PUNCTURE	8a	.746E+04	.137E+04
PUNCTURE	8b	.746E+04	.137E+04
PUNCTURE	8c	.746E+04	.137E+04
THERMAL FIRE - T=0.5 HR	9	.100E+03	.622E+02
THERMAL FIRE - T=1.0 HR	9	.100E+03	.622E+02
THERMAL FIRE - T=1.5 HR	9	.622E+02	.100E+03
THERMAL FIRE - T=2.0 HR	9	.622E+02	.100E+03
THERMAL FIRE - T=2.5 HR	9	.622E+02	.100E+03
THERMAL FIRE - T=3.0 HR	9	.622E+02	.100E+03
MAXIMUM STRESS INTENSITY		.816E+04	.149E+05

NOTES:
1. Pm < 2.4*Sm or 0.7*Su = 48.0 ksi
   Pm+Pb < 3.6*Sm or Su = 70.0 ksi
2. See Table 2.10.9.42 for combination index identification.

TABLE 2.10.9.86A. SUMMARY OF STRESSES FOR LOAD COMBINATIONS, ACCIDENT CONDITIONS OF TRANSPORT, STRESS POINT 7A

LOAD COMBINATION	COMBINATION INDEX	STRESS INTENSITY CATEGORY Pm	Pm+Pb
FREE DROP 30 FOOT - TOP	7a	.344E+04	.316E+04
FREE DROP 30 FOOT - TOP	7b	.344E+04	.316E+04
FREE DROP 30 FOOT - TOP	7c	.344E+04	.316E+04
FREE DROP 30 FOOT - BOTTOM	7a	.114E+05	.174E+05
FREE DROP 30 FOOT - BOTTOM	7b	.114E+05	.174E+05
FREE DROP 30 FOOT - BOTTOM	7c	.114E+05	.174E+05
FREE DROP 30 FOOT - SIDE	7a	.967E+04	.175E+04
FREE DROP 30 FOOT - SIDE	7b	.967E+04	.175E+04
FREE DROP 30 FOOT - SIDE	7c	.967E+04	.175E+04
FREE DROP 30 FOOT - CG	7a	.101E+04	.235E+04
FREE DROP 30 FOOT - CG	7b	.101E+04	.235E+04
FREE DROP 30 FOOT - CG	7c	.101E+04	.235E+04
PUNCTURE	8a	.967E+04	.175E+04
PUNCTURE	8b	.967E+04	.175E+04
PUNCTURE	8c	.967E+04	.175E+04
THERMAL FIRE - T=0.5 HR	9	.100E+03	.622E+02
THERMAL FIRE - T=1.0 HR	9	.100E+03	.622E+02
THERMAL FIRE - T=1.5 HR	9	.622E+02	.100E+03
THERMAL FIRE - T=2.0 HR	9	.622E+02	.100E+03
THERMAL FIRE - T=2.5 HR	9	.622E+02	.100E+03
THERMAL FIRE - T=3.0 HR	9	.622E+02	.100E+03
MAXIMUM STRESS INTENSITY		.114E+05	.174E+05

NOTES:

1. Pm < 2.4*Sm or 0.7*Su = 48.0 ksi
   Pm+Pb < 3.6*Sm or Su = 70.0 ksi
2. See Table 2.10.9.42 for combination index identification.

TABLE 2.10.9.87. SUMMARY OF STRESSES FOR LOAD COMBINATIONS, ACCIDENT CONDITIONS OF TRANSPORT, STRESS POINT 7B

LOAD COMBINATION	COMBINATION INDEX	STRESS INTENSITY CATEGORY Pm	Pm+Pb
FREE DROP 30 FOOT - TOP	7a	.210E+04	.221E+04
FREE DROP 30 FOOT - TOP	7b	.210E+04	.221E+04
FREE DROP 30 FOOT - TOP	7c	.210E+04	.221E+04
FREE DROP 30 FOOT - BOTTOM	7a	.816E+04	.392E+04
FREE DROP 30 FOOT - BOTTOM	7b	.816E+04	.392E+04
FREE DROP 30 FOOT - BOTTOM	7c	.816E+04	.392E+04
FREE DROP 30 FOOT - SIDE	7a	.746E+04	.184E+05
FREE DROP 30 FOOT - SIDE	7b	.746E+04	.184E+05
FREE DROP 30 FOOT - SIDE	7c	.746E+04	.184E+05
FREE DROP 30 FOOT - CG	7a	.646E+03	.170E+04
FREE DROP 30 FOOT - CG	7b	.646E+03	.170E+04
FREE DROP 30 FOOT - CG	7c	.646E+03	.170E+04
PUNCTURE	8a	.746E+04	.184E+05
PUNCTURE	8b	.746E+04	.184E+05
PUNCTURE	8c	.746E+04	.184E+05
THERMAL FIRE - T=0.5 HR	9	.393E+02	.622E+02
THERMAL FIRE - T=1.0 HR	9	.393E+02	.622E+02
THERMAL FIRE - T=1.5 HR	9	.622E+02	.393E+02
THERMAL FIRE - T=2.0 HR	9	.622E+02	.393E+02
THERMAL FIRE - T=2.5 HR	9	.622E+02	.393E+02
THERMAL FIRE - T=3.0 HR	9	.622E+02	.393E+02
MAXIMUM STRESS INTENSITY		.816E+04	.184E+05

NOTES:
1. Pm < 2.4*Sm or 0.7*Su = 48.0 ksi
   Pm+Pb < 3.6*Sm or Su = 70.0 ksi
2. See Table 2.10.9.42 for combination index identification.

TABLE 2.10.9.87A. SUMMARY OF STRESSES FOR LOAD COMBINATIONS, ACCIDENT CONDITIONS OF TRANSPORT, STRESS POINT 7B

LOAD COMBINATION	COMBINATION INDEX	STRESS INTENSITY CATEGORY Pm	Pm+Pb
FREE DROP 30 FOOT - TOP	7a	.344E+04	.373E+04
FREE DROP 30 FOOT - TOP	7b	.344E+04	.373E+04
FREE DROP 30 FOOT - TOP	7c	.344E+04	.373E+04
FREE DROP 30 FOOT - BOTTOM	7a	.114E+05	.813E+04
FREE DROP 30 FOOT - BOTTOM	7b	.114E+05	.813E+04
FREE DROP 30 FOOT - BOTTOM	7c	.114E+05	.813E+04
FREE DROP 30 FOOT - SIDE	7a	.967E+04	.239E+05
FREE DROP 30 FOOT - SIDE	7b	.967E+04	.239E+05
FREE DROP 30 FOOT - SIDE	7c	.967E+04	.239E+05
FREE DROP 30 FOOT - CG	7a	.101E+04	.273E+04
FREE DROP 30 FOOT - CG	7b	.101E+04	.273E+04
FREE DROP 30 FOOT - CG	7c	.101E+04	.273E+04
PUNCTURE	8a	.967E+04	.239E+05
PUNCTURE	8b	.967E+04	.239E+05
PUNCTURE	8c	.967E+04	.239E+05
THERMAL FIRE - T=0.5 HR	9	.393E+02	.622E+02
THERMAL FIRE - T=1.0 HR	9	.393E+02	.622E+02
THERMAL FIRE - T=1.5 HR	9	.622E+02	.393E+02
THERMAL FIRE - T=2.0 HR	9	.622E+02	.393E+02
THERMAL FIRE - T=2.5 HR	9	.622E+02	.393E+02
THERMAL FIRE - T=3.0 HR	9	.622E+02	.393E+02
MAXIMUM STRESS INTENSITY		.114E+05	.239E+05

NOTES:
1. Pm < 2.4*Sm or 0.7*Su = 48.0 ksi
   Pm+Pb < 3.6*Sm or Su = 70.0 ksi
2. See Table 2.10.9.42 for combination index identification.

TABLE 2.10.9.88. SUMMARY OF STRESSES FOR LOAD COMBINATIONS, ACCIDENT CONDITIONS OF TRANSPORT, STRESS POINT 8A

LOAD COMBINATION	COMBINATION INDEX	STRESS INTENSITY CATEGORY Pm	Pm+Pb
FREE DROP 30 FOOT - TOP	7a	.446E+03	.391E+03
FREE DROP 30 FOOT - TOP	7b	.446E+03	.391E+03
FREE DROP 30 FOOT - TOP	7c	.446E+03	.391E+03
FREE DROP 30 FOOT - BOTTOM	7a	.903E+04	.658E+04
FREE DROP 30 FOOT - BOTTOM	7b	.903E+04	.658E+04
FREE DROP 30 FOOT - BOTTOM	7c	.903E+04	.658E+04
FREE DROP 30 FOOT - SIDE	7a	.464E+04	.124E+05
FREE DROP 30 FOOT - SIDE	7b	.464E+04	.124E+05
FREE DROP 30 FOOT - SIDE	7c	.464E+04	.124E+05
FREE DROP 30 FOOT - CG	7a	.183E+04	.364E+04
FREE DROP 30 FOOT - CG	7b	.183E+04	.364E+04
FREE DROP 30 FOOT - CG	7c	.183E+04	.364E+04
PUNCTURE	8a	.464E+04	.124E+05
PUNCTURE	8b	.464E+04	.124E+05
PUNCTURE	8c	.464E+04	.124E+05
THERMAL FIRE - T=0.5 HR	9	.432E+02	.301E+02
THERMAL FIRE - T=1.0 HR	9	.432E+02	.301E+02
THERMAL FIRE - T=1.5 HR	9	.301E+02	.432E+02
THERMAL FIRE - T=2.0 HR	9	.301E+02	.432E+02
THERMAL FIRE - T=2.5 HR	9	.301E+02	.432E+02
THERMAL FIRE - T=3.0 HR	9	.301E+02	.432E+02
MAXIMUM STRESS INTENSITY		.903E+04	.124E+05

NOTES:
1. Pm < 2.4*Sm or 0.7*Su = 48.0 ksi
   Pm+Pb < 3.6*Sm or Su = 70.0 ksi
2. See Table 2.10.9.42 for combination index identification.

TABLE 2.10.9.88A. SUMMARY OF STRESSES FOR LOAD COMBINATIONS, ACCIDENT CONDITIONS OF TRANSPORT, STRESS POINT 8A

LOAD COMBINATION	COMBINATION INDEX	STRESS INTENSITY CATEGORY Pm	Pm+Pb
FREE DROP 30 FOOT - TOP	7a	.358E+03	.478E+03
FREE DROP 30 FOOT - TOP	7b	.358E+03	.478E+03
FREE DROP 30 FOOT - TOP	7c	.358E+03	.478E+03
FREE DROP 30 FOOT - BOTTOM	7a	.128E+05	.207E+05
FREE DROP 30 FOOT - BOTTOM	7b	.128E+05	.207E+05
FREE DROP 30 FOOT - BOTTOM	7c	.128E+05	.207E+05
FREE DROP 30 FOOT - SIDE	7a	.603E+04	.161E+05
FREE DROP 30 FOOT - SIDE	7b	.603E+04	.161E+05
FREE DROP 30 FOOT - SIDE	7c	.603E+04	.161E+05
FREE DROP 30 FOOT - CG	7a	.294E+04	.588E+04
FREE DROP 30 FOOT - CG	7b	.294E+04	.588E+04
FREE DROP 30 FOOT - CG	7c	.294E+04	.588E+04
PUNCTURE	8a	.603E+04	.161E+05
PUNCTURE	8b	.603E+04	.161E+05
PUNCTURE	8c	.603E+04	.161E+05
THERMAL FIRE - T=0.5 HR	9	.432E+02	.301E+02
THERMAL FIRE - T=1.0 HR	9	.432E+02	.301E+02
THERMAL FIRE - T=1.5 HR	9	.301E+02	.432E+02
THERMAL FIRE - T=2.0 HR	9	.301E+02	.432E+02
THERMAL FIRE - T=2.5 HR	9	.301E+02	.432E+02
THERMAL FIRE - T=3.0 HR	9	.301E+02	.432E+02
MAXIMUM STRESS INTENSITY		.128E+05	.207E+05

NOTES:
1. Pm < 2.4*Sm or 0.7*Su = 48.0 ksi
   Pm+Pb < 3.6*Sm or Su = 70.0 ksi
2. See Table 2.10.9.42 for combination index identification.

TABLE 2.10.9.89. SUMMARY OF STRESSES FOR LOAD COMBINATIONS, ACCIDENT CONDITIONS OF TRANSPORT, STRESS POINT 8B

LOAD COMBINATION	COMBINATION INDEX	STRESS INTENSITY CATEGORY Pm	Pm+Pb
FREE DROP 30 FOOT - TOP	7a	.446E+03	.500E+03
FREE DROP 30 FOOT - TOP	7b	.446E+03	.500E+03
FREE DROP 30 FOOT - TOP	7c	.446E+03	.500E+03
FREE DROP 30 FOOT - BOTTOM	7a	.903E+04	.138E+05
FREE DROP 30 FOOT - BOTTOM	7b	.903E+04	.138E+05
FREE DROP 30 FOOT - BOTTOM	7c	.903E+04	.138E+05
FREE DROP 30 FOOT - SIDE	7a	.464E+04	.433E+04
FREE DROP 30 FOOT - SIDE	7b	.464E+04	.433E+04
FREE DROP 30 FOOT - SIDE	7c	.464E+04	.433E+04
FREE DROP 30 FOOT - CG	7a	.183E+04	.429E+03
FREE DROP 30 FOOT - CG	7b	.183E+04	.429E+03
FREE DROP 30 FOOT - CG	7c	.183E+04	.429E+03
PUNCTURE	8a	.464E+04	.433E+04
PUNCTURE	8b	.464E+04	.433E+04
PUNCTURE	8c	.464E+04	.433E+04
THERMAL FIRE - T=0.5 HR	9	.169E+02	.301E+02
THERMAL FIRE - T=1.0 HR	9	.169E+02	.301E+02
THERMAL FIRE - T=1.5 HR	9	.301E+02	.169E+02
THERMAL FIRE - T=2.0 HR	9	.301E+02	.169E+02
THERMAL FIRE - T=2.5 HR	9	.301E+02	.169E+02
THERMAL FIRE - T=3.0 HR	9	.301E+02	.169E+02
MAXIMUM STRESS INTENSITY		.903E+04	.138E+05

NOTES:
1. Pm < 2.4*Sm or 0.7*Su = 48.0 ksi
   Pm+Pb < 3.6*Sm or Su = 70.0 ksi
2. See Table 2.10.9.42 for combination index identification.

TABLE 2.10.9.89A. SUMMARY OF STRESSES FOR LOAD COMBINATIONS, ACCIDENT CONDITIONS OF TRANSPORT, STRESS POINT 8B

LOAD COMBINATION	COMBINATION INDEX	STRESS INTENSITY CATEGORY Pm	Pm+Pb
FREE DROP 30 FOOT - TOP	7a	.358E+03	.238E+03
FREE DROP 30 FOOT - TOP	7b	.358E+03	.238E+03
FREE DROP 30 FOOT - TOP	7c	.358E+03	.238E+03
FREE DROP 30 FOOT - BOTTOM	7a	.128E+05	.120E+05
FREE DROP 30 FOOT - BOTTOM	7b	.128E+05	.120E+05
FREE DROP 30 FOOT - BOTTOM	7c	.128E+05	.120E+05
FREE DROP 30 FOOT - SIDE	7a	.603E+04	.562E+04
FREE DROP 30 FOOT - SIDE	7b	.603E+04	.562E+04
FREE DROP 30 FOOT - SIDE	7c	.603E+04	.562E+04
FREE DROP 30 FOOT - CG	7a	.294E+04	.685E+03
FREE DROP 30 FOOT - CG	7b	.294E+04	.685E+03
FREE DROP 30 FOOT - CG	7c	.294E+04	.685E+03
PUNCTURE	8a	.603E+04	.562E+04
PUNCTURE	8b	.603E+04	.562E+04
PUNCTURE	8c	.603E+04	.562E+04
THERMAL FIRE - T=0.5 HR	9	.169E+02	.301E+02
THERMAL FIRE - T=1.0 HR	9	.169E+02	.301E+02
THERMAL FIRE - T=1.5 HR	9	.301E+02	.169E+02
THERMAL FIRE - T=2.0 HR	9	.301E+02	.169E+02
THERMAL FIRE - T=2.5 HR	9	.301E+02	.169E+02
THERMAL FIRE - T=3.0 HR	9	.301E+02	.169E+02
MAXIMUM STRESS INTENSITY		.128E+05	.120E+05

NOTES:
1. Pm < 2.4*Sm or 0.7*Su = 48.0 ksi
   Pm+Pb < 3.6*Sm or Su = 70.0 ksi
2. See Table 2.10.9.42 for combination index identification.

TABLE 2.10.9.90. SUMMARY OF STRESSES FOR LOAD COMBINATIONS, ACCIDENT CONDITIONS OF TRANSPORT, STRESS POINT 9A

LOAD COMBINATION	COMBINATION INDEX	STRESS INTENSITY CATEGORY Pm	Pm+Pb
FREE DROP 30 FOOT - TOP	7a	.262E+04	.315E+04
FREE DROP 30 FOOT - TOP	7b	.262E+04	.315E+04
FREE DROP 30 FOOT - TOP	7c	.262E+04	.315E+04
FREE DROP 30 FOOT - BOTTOM	7a	.110E+05	.118E+05
FREE DROP 30 FOOT - BOTTOM	7b	.110E+05	.118E+05
FREE DROP 30 FOOT - BOTTOM	7c	.110E+05	.118E+05
FREE DROP 30 FOOT - SIDE	7a	.346E+04	.512E+03
FREE DROP 30 FOOT - SIDE	7b	.346E+04	.512E+03
FREE DROP 30 FOOT - SIDE	7c	.346E+04	.512E+03
FREE DROP 30 FOOT - CG	7a	.159E+04	.115E+04
FREE DROP 30 FOOT - CG	7b	.159E+04	.115E+04
FREE DROP 30 FOOT - CG	7c	.159E+04	.115E+04
PUNCTURE	8a	.346E+04	.512E+03
PUNCTURE	8b	.346E+04	.512E+03
PUNCTURE	8c	.346E+04	.512E+03
THERMAL FIRE - T=0.5 HR	9	.144E+03	.133E+03
THERMAL FIRE - T=1.0 HR	9	.144E+03	.133E+03
THERMAL FIRE - T=1.5 HR	9	.133E+03	.144E+03
THERMAL FIRE - T=2.0 HR	9	.133E+03	.144E+03
THERMAL FIRE - T=2.5 HR	9	.133E+03	.144E+03
THERMAL FIRE - T=3.0 HR	9	.133E+03	.144E+03
MAXIMUM STRESS INTENSITY		.110E+05	.118E+05

NOTES:
1. Pm < 2.4*Sm or 0.7*Su = 48.0 ksi
   Pm+Pb < 3.6*Sm or Su = 70.0 ksi
2. See Table 2.10.9.42 for combination index identification.

TABLE 2.10.9.90A. SUMMARY OF STRESSES FOR LOAD COMBINATIONS, ACCIDENT CONDITIONS OF TRANSPORT, STRESS POINT 9A

LOAD COMBINATION	COMBINATION INDEX	STRESS INTENSITY CATEGORY Pm	Pm+Pb
FREE DROP 30 FOOT - TOP	7a	.404E+04	.409E+04
FREE DROP 30 FOOT - TOP	7b	.404E+04	.409E+04
FREE DROP 30 FOOT - TOP	7c	.404E+04	.409E+04
FREE DROP 30 FOOT - BOTTOM	7a	.161E+05	.166E+05
FREE DROP 30 FOOT - BOTTOM	7b	.161E+05	.166E+05
FREE DROP 30 FOOT - BOTTOM	7c	.161E+05	.166E+05
FREE DROP 30 FOOT - SIDE	7a	.446E+04	.622E+03
FREE DROP 30 FOOT - SIDE	7b	.446E+04	.622E+03
FREE DROP 30 FOOT - SIDE	7c	.446E+04	.622E+03
FREE DROP 30 FOOT - CG	7a	.250E+04	.178E+04
FREE DROP 30 FOOT - CG	7b	.250E+04	.178E+04
FREE DROP 30 FOOT - CG	7c	.250E+04	.178E+04
PUNCTURE	8a	.446E+04	.622E+03
PUNCTURE	8b	.446E+04	.622E+03
PUNCTURE	8c	.446E+04	.622E+03
THERMAL FIRE - T=0.5 HR	9	.144E+03	.133E+03
THERMAL FIRE - T=1.0 HR	9	.144E+03	.133E+03
THERMAL FIRE - T=1.5 HR	9	.133E+03	.144E+03
THERMAL FIRE - T=2.0 HR	9	.133E+03	.144E+03
THERMAL FIRE - T=2.5 HR	9	.133E+03	.144E+03
THERMAL FIRE - T=3.0 HR	9	.133E+03	.144E+03
MAXIMUM STRESS INTENSITY		.161E+05	.166E+05

NOTES:
1. Pm < 2.4*Sm or 0.7*Su = 48.0 ksi
   Pm+Pb < 3.6*Sm or Su = 70.0 ksi
2. See Table 2.10.9.42 for combination index identification.

TABLE 2.10.9.91. SUMMARY OF STRESSES FOR LOAD COMBINATIONS, ACCIDENT CONDITIONS OF TRANSPORT, STRESS POINT 9B

LOAD COMBINATION	COMBINATION INDEX	STRESS INTENSITY CATEGORY Pm	Pm+Pb
FREE DROP 30 FOOT - TOP	7a	.262E+04	.209E+04
FREE DROP 30 FOOT - TOP	7b	.262E+04	.209E+04
FREE DROP 30 FOOT - TOP	7c	.262E+04	.209E+04
FREE DROP 30 FOOT - BOTTOM	7a	.110E+05	.101E+05
FREE DROP 30 FOOT - BOTTOM	7b	.110E+05	.101E+05
FREE DROP 30 FOOT - BOTTOM	7c	.110E+05	.101E+05
FREE DROP 30 FOOT - SIDE	7a	.346E+04	.681E+04
FREE DROP 30 FOOT - SIDE	7b	.346E+04	.681E+04
FREE DROP 30 FOOT - SIDE	7c	.346E+04	.681E+04
FREE DROP 30 FOOT - CG	7a	.159E+04	.205E+04
FREE DROP 30 FOOT - CG	7b	.159E+04	.205E+04
FREE DROP 30 FOOT - CG	7c	.159E+04	.205E+04
PUNCTURE	8a	.346E+04	.681E+04
PUNCTURE	8b	.346E+04	.681E+04
PUNCTURE	8c	.346E+04	.681E+04
THERMAL FIRE - T=0.5 HR	9	.123E+03	.133E+03
THERMAL FIRE - T=1.0 HR	9	.123E+03	.133E+03
THERMAL FIRE - T=1.5 HR	9	.133E+03	.123E+03
THERMAL FIRE - T=2.0 HR	9	.133E+03	.123E+03
THERMAL FIRE - T=2.5 HR	9	.133E+03	.123E+03
THERMAL FIRE - T=3.0 HR	9	.133E+03	.123E+03
MAXIMUM STRESS INTENSITY		.110E+05	.101E+05

NOTES:
1. Pm < 2.4*Sm or 0.7*Su = 48.0 ksi
   Pm+Pb < 3.6*Sm or Su = 70.0 ksi
2. See Table 2.10.9.42 for combination index identification.

TABLE 2.10.9.91A. SUMMARY OF STRESSES FOR LOAD COMBINATIONS, ACCIDENT CONDITIONS OF TRANSPORT, STRESS POINT 9B

LOAD COMBINATION	COMBINATION INDEX	STRESS INTENSITY CATEGORY Pm	Pm+Pb
FREE DROP 30 FOOT - TOP	7a	.404E+04	.399E+04
FREE DROP 30 FOOT - TOP	7b	.404E+04	.399E+04
FREE DROP 30 FOOT - TOP	7c	.404E+04	.399E+04
FREE DROP 30 FOOT - BOTTOM	7a	.161E+05	.156E+05
FREE DROP 30 FOOT - BOTTOM	7b	.161E+05	.156E+05
FREE DROP 30 FOOT - BOTTOM	7c	.161E+05	.156E+05
FREE DROP 30 FOOT - SIDE	7a	.446E+04	.881E+04
FREE DROP 30 FOOT - SIDE	7b	.446E+04	.881E+04
FREE DROP 30 FOOT - SIDE	7c	.446E+04	.881E+04
FREE DROP 30 FOOT - CG	7a	.250E+04	.324E+04
FREE DROP 30 FOOT - CG	7b	.250E+04	.324E+04
FREE DROP 30 FOOT - CG	7c	.250E+04	.324E+04
PUNCTURE	8a	.446E+04	.881E+04
PUNCTURE	8b	.446E+04	.881E+04
PUNCTURE	8c	.446E+04	.881E+04
THERMAL FIRE - T=0.5 HR	9	.123E+03	.133E+03
THERMAL FIRE - T=1.0 HR	9	.123E+03	.133E+03
THERMAL FIRE - T=1.5 HR	9	.133E+03	.123E+03
THERMAL FIRE - T=2.0 HR	9	.133E+03	.123E+03
THERMAL FIRE - T=2.5 HR	9	.133E+03	.123E+03
THERMAL FIRE - T=3.0 HR	9	.133E+03	.123E+03
MAXIMUM STRESS INTENSITY		.161E+05	.156E+05

NOTES:
1. Pm < 2.4*Sm or 0.7*Su = 48.0 ksi
   Pm+Pb < 3.6*Sm or Su = 70.0 ksi
2. See Table 2.10.9.42 for combination index identification.

TABLE 2.10.9.92. SUMMARY OF STRESSES FOR LOAD COMBINATIONS, ACCIDENT CONDITIONS OF TRANSPORT, STRESS POINT 10A

LOAD COMBINATION	COMBINATION INDEX	STRESS INTENSITY CATEGORY Pm	Pm+Pb
FREE DROP 30 FOOT - TOP	7a	.200E+04	.167E+04
FREE DROP 30 FOOT - TOP	7b	.200E+04	.167E+04
FREE DROP 30 FOOT - TOP	7c	.200E+04	.167E+04
FREE DROP 30 FOOT - BOTTOM	7a	.182E+05	.189E+05
FREE DROP 30 FOOT - BOTTOM	7b	.182E+05	.189E+05
FREE DROP 30 FOOT - BOTTOM	7c	.182E+05	.189E+05
FREE DROP 30 FOOT - SIDE	7a	.755E+04	.574E+04
FREE DROP 30 FOOT - SIDE	7b	.755E+04	.574E+04
FREE DROP 30 FOOT - SIDE	7c	.755E+04	.574E+04
FREE DROP 30 FOOT - CG	7a	.265E+04	.240E+04
FREE DROP 30 FOOT - CG	7b	.265E+04	.240E+04
FREE DROP 30 FOOT - CG	7c	.265E+04	.240E+04
PUNCTURE	8a	.755E+04	.574E+04
PUNCTURE	8b	.755E+04	.574E+04
PUNCTURE	8c	.755E+04	.574E+04
THERMAL FIRE - T=0.5 HR	9	.632E+02	.606E+02
THERMAL FIRE - T=1.0 HR	9	.632E+02	.606E+02
THERMAL FIRE - T=1.5 HR	9	.606E+02	.632E+02
THERMAL FIRE - T=2.0 HR	9	.606E+02	.632E+02
THERMAL FIRE - T=2.5 HR	9	.606E+02	.632E+02
THERMAL FIRE - T=3.0 HR	9	.606E+02	.632E+02
MAXIMUM STRESS INTENSITY		.182E+05	.189E+05

NOTES:
1. Pm < 2.4*Sm or 0.7*Su = 48.0 ksi
   Pm+Pb < 3.6*Sm or Su = 70.0 ksi
2. See Table 2.10.9.42 for combination index identification.

TABLE 2.10.9.92A. SUMMARY OF STRESSES FOR LOAD COMBINATIONS, ACCIDENT CONDITIONS OF TRANSPORT, STRESS POINT 10A

LOAD COMBINATION	COMBINATION INDEX	STRESS INTENSITY CATEGORY Pm	Pm+Pb
FREE DROP 30 FOOT - TOP	7a	.380E+04	.316E+04
FREE DROP 30 FOOT - TOP	7b	.380E+04	.316E+04
FREE DROP 30 FOOT - TOP	7c	.380E+04	.316E+04
FREE DROP 30 FOOT - BOTTOM	7a	.257E+05	.266E+05
FREE DROP 30 FOOT - BOTTOM	7b	.257E+05	.266E+05
FREE DROP 30 FOOT - BOTTOM	7c	.257E+05	.266E+05
FREE DROP 30 FOOT - SIDE	7a	.979E+04	.744E+04
FREE DROP 30 FOOT - SIDE	7b	.979E+04	.744E+04
FREE DROP 30 FOOT - SIDE	7c	.979E+04	.744E+04
FREE DROP 30 FOOT - CG	7a	.425E+04	.384E+04
FREE DROP 30 FOOT - CG	7b	.425E+04	.384E+04
FREE DROP 30 FOOT - CG	7c	.425E+04	.384E+04
PUNCTURE	8a	.979E+04	.744E+04
PUNCTURE	8b	.979E+04	.744E+04
PUNCTURE	8c	.979E+04	.744E+04
THERMAL FIRE - T=0.5 HR	9	.632E+02	.606E+02
THERMAL FIRE - T=1.0 HR	9	.632E+02	.606E+02
THERMAL FIRE - T=1.5 HR	9	.606E+02	.632E+02
THERMAL FIRE - T=2.0 HR	9	.606E+02	.632E+02
THERMAL FIRE - T=2.5 HR	9	.606E+02	.632E+02
THERMAL FIRE - T=3.0 HR	9	.606E+02	.632E+02
MAXIMUM STRESS INTENSITY		.257E+05	.266E+05

NOTES:
1. Pm < 2.4*Sm or 0.7*Su = 48.0 ksi
   Pm+Pb < 3.6*Sm or Su = 70.0 ksi
2. See Table 2.10.9.42 for combination index identification.

TABLE 2.10.9.93. SUMMARY OF STRESSES FOR LOAD COMBINATIONS, ACCIDENT CONDITIONS OF TRANSPORT, STRESS POINT 10B

LOAD COMBINATION	COMBINATION INDEX	STRESS INTENSITY CATEGORY Pm	Pm+Pb
FREE DROP 30 FOOT - TOP	7a	.200E+04	.248E+04
FREE DROP 30 FOOT - TOP	7b	.200E+04	.248E+04
FREE DROP 30 FOOT - TOP	7c	.200E+04	.248E+04
FREE DROP 30 FOOT - BOTTOM	7a	.182E+05	.175E+05
FREE DROP 30 FOOT - BOTTOM	7b	.182E+05	.175E+05
FREE DROP 30 FOOT - BOTTOM	7c	.182E+05	.175E+05
FREE DROP 30 FOOT - SIDE	7a	.755E+04	.961E+04
FREE DROP 30 FOOT - SIDE	7b	.755E+04	.961E+04
FREE DROP 30 FOOT - SIDE	7c	.755E+04	.961E+04
FREE DROP 30 FOOT - CG	7a	.265E+04	.291E+04
FREE DROP 30 FOOT - CG	7b	.265E+04	.291E+04
FREE DROP 30 FOOT - CG	7c	.265E+04	.291E+04
PUNCTURE	8a	.755E+04	.961E+04
PUNCTURE	8b	.755E+04	.961E+04
PUNCTURE	8c	.755E+04	.961E+04
THERMAL FIRE - T=0.5 HR	9	.580E+02	.606E+02
THERMAL FIRE - T=1.0 HR	9	.580E+02	.606E+02
THERMAL FIRE - T=1.5 HR	9	.606E+02	.580E+02
THERMAL FIRE - T=2.0 HR	9	.606E+02	.580E+02
THERMAL FIRE - T=2.5 HR	9	.606E+02	.580E+02
THERMAL FIRE - T=3.0 HR	9	.606E+02	.580E+02
MAXIMUM STRESS INTENSITY		.182E+05	.175E+05

NOTES:
1. Pm < 2.4*Sm or 0.7*Su = 48.0 ksi
   Pm+Pb < 3.6*Sm or Su = 70.0 ksi
2. See Table 2.10.9.42 for combination index identification.

TABLE 2.10.9.93A. SUMMARY OF STRESSES FOR LOAD COMBINATIONS, ACCIDENT CONDITIONS OF TRANSPORT, STRESS POINT 10B

LOAD COMBINATION	COMBINATION INDEX	STRESS INTENSITY CATEGORY Pm	Pm+Pb
FREE DROP 30 FOOT - TOP	7a	.380E+04	.444E+04
FREE DROP 30 FOOT - TOP	7b	.380E+04	.444E+04
FREE DROP 30 FOOT - TOP	7c	.380E+04	.444E+04
FREE DROP 30 FOOT - BOTTOM	7a	.257E+05	.248E+05
FREE DROP 30 FOOT - BOTTOM	7b	.257E+05	.248E+05
FREE DROP 30 FOOT - BOTTOM	7c	.257E+05	.248E+05
FREE DROP 30 FOOT - SIDE	7a	.979E+04	.125E+05
FREE DROP 30 FOOT - SIDE	7b	.979E+04	.125E+05
FREE DROP 30 FOOT - SIDE	7c	.979E+04	.125E+05
FREE DROP 30 FOOT - CG	7a	.425E+04	.468E+04
FREE DROP 30 FOOT - CG	7b	.425E+04	.468E+04
FREE DROP 30 FOOT - CG	7c	.425E+04	.468E+04
PUNCTURE	8a	.979E+04	.125E+05
PUNCTURE	8b	.979E+04	.125E+05
PUNCTURE	8c	.979E+04	.125E+05
THERMAL FIRE - T=0.5 HR	9	.580E+02	.606E+02
THERMAL FIRE - T=1.0 HR	9	.580E+02	.606E+02
THERMAL FIRE - T=1.5 HR	9	.606E+02	.580E+02
THERMAL FIRE - T=2.0 HR	9	.606E+02	.580E+02
THERMAL FIRE - T=2.5 HR	9	.606E+02	.580E+02
THERMAL FIRE - T=3.0 HR	9	.606E+02	.580E+02
MAXIMUM STRESS INTENSITY		.257E+05	.248E+05

NOTES:
1. Pm < 2.4*Sm or 0.7*Su = 48.0 ksi
   Pm+Pb < 3.6*Sm or Su = 70.0 ksi
2. See Table 2.10.9.42 for combination index identification.

TABLE 2.10.9.94. STRESSES FOR LOAD COMBINATIONS, ACCIDENT CONDITIONS OF TRANSPORT, STRESS POINT 11A

LOAD COMBINATION	COMBINATION INDEX	STRESS INTENSITY CATEGORY Pm	Pm+Pb
FREE DROP 30 FOOT - TOP	7a	.516E+04	.554E+04
FREE DROP 30 FOOT - TOP	7b	.516E+04	.554E+04
FREE DROP 30 FOOT - TOP	7c	.516E+04	.554E+04
FREE DROP 30 FOOT - BOTTOM	7a	.524E+04	.562E+04
FREE DROP 30 FOOT - BOTTOM	7b	.524E+04	.562E+04
FREE DROP 30 FOOT - BOTTOM	7c	.524E+04	.562E+04
FREE DROP 30 FOOT - SIDE	7a	.442E+04	.147E+04
FREE DROP 30 FOOT - SIDE	7b	.442E+04	.147E+04
FREE DROP 30 FOOT - SIDE	7c	.442E+04	.147E+04
FREE DROP 30 FOOT - CG	7a	.189E+04	.144E+04
FREE DROP 30 FOOT - CG	7b	.189E+04	.144E+04
FREE DROP 30 FOOT - CG	7c	.189E+04	.144E+04
PUNCTURE	8a	.442E+04	.147E+04
PUNCTURE	8b	.442E+04	.147E+04
PUNCTURE	8c	.442E+04	.147E+04
THERMAL FIRE - T=0.5 HR	9	.142E+03	.131E+03
THERMAL FIRE - T=1.0 HR	9	.142E+03	.131E+03
THERMAL FIRE - T=1.5 HR	9	.131E+03	.142E+03
THERMAL FIRE - T=2.0 HR	9	.131E+03	.142E+03
THERMAL FIRE - T=2.5 HR	9	.131E+03	.142E+03
THERMAL FIRE - T=3.0 HR	9	.131E+03	.142E+03
MAXIMUM STRESS INTENSITY		.524E+04	.562E+04

NOTES:
1. Pm < 2.4*Sm or 0.7*Su = 48.0 ksi
   Pm+Pb < 3.6*Sm or Su = 70.0 ksi
2. See Table 2.10.9.42 for combination index identification.

TABLE 2.10.9.94A. SUMMARY OF STRESSES FOR LOAD COMBINATIONS, ACCIDENT CONDITIONS OF TRANSPORT, STRESS POINT 11A

LOAD COMBINATION	COMBINATION INDEX	STRESS INTENSITY CATEGORY Pm	Pm+Pb
FREE DROP 30 FOOT - TOP	7a	.965E+04	.917E+04
FREE DROP 30 FOOT - TOP	7b	.965E+04	.917E+04
FREE DROP 30 FOOT - TOP	7c	.965E+04	.917E+04
FREE DROP 30 FOOT - BOTTOM	7a	.867E+04	.918E+04
FREE DROP 30 FOOT - BOTTOM	7b	.867E+04	.918E+04
FREE DROP 30 FOOT - BOTTOM	7c	.867E+04	.918E+04
FREE DROP 30 FOOT - SIDE	7a	.571E+04	.187E+04
FREE DROP 30 FOOT - SIDE	7b	.571E+04	.187E+04
FREE DROP 30 FOOT - SIDE	7c	.571E+04	.187E+04
FREE DROP 30 FOOT - CG	7a	.297E+04	.224E+04
FREE DROP 30 FOOT - CG	7b	.297E+04	.224E+04
FREE DROP 30 FOOT - CG	7c	.297E+04	.224E+04
PUNCTURE	8a	.571E+04	.187E+04
PUNCTURE	8b	.571E+04	.187E+04
PUNCTURE	8c	.571E+04	.187E+04
THERMAL FIRE - T=0.5 HR	9	.142E+03	.131E+03
THERMAL FIRE - T=1.0 HR	9	.142E+03	.131E+03
THERMAL FIRE - T=1.5 HR	9	.131E+03	.142E+03
THERMAL FIRE - T=2.0 HR	9	.131E+03	.142E+03
THERMAL FIRE - T=2.5 HR	9	.131E+03	.142E+03
THERMAL FIRE - T=3.0 HR	9	.131E+03	.142E+03
MAXIMUM STRESS INTENSITY		.965E+04	.918E+04

NOTES:
1. Pm < 2.4*Sm or 0.7*Su = 48.0 ksi
   Pm+Pb < 3.6*Sm or Su = 70.0 ksi
2. See Table 2.10.9.42 for combination index identification.

TABLE 2.10.9.95. SUMMARY OF STRESSES FOR LOAD COMBINATIONS, ACCIDENT CONDITIONS OF TRANSPORT, STRESS POINT 11B

LOAD COMBINATION	COMBINATION INDEX	STRESS INTENSITY CATEGORY Pm	Pm+Pb
FREE DROP 30 FOOT - TOP	7a	.516E+04	.479E+04
FREE DROP 30 FOOT - TOP	7b	.516E+04	.479E+04
FREE DROP 30 FOOT - TOP	7c	.516E+04	.479E+04
FREE DROP 30 FOOT - BOTTOM	7a	.524E+04	.487E+04
FREE DROP 30 FOOT - BOTTOM	7b	.524E+04	.487E+04
FREE DROP 30 FOOT - BOTTOM	7c	.524E+04	.487E+04
FREE DROP 30 FOOT - SIDE	7a	.442E+04	.799E+04
FREE DROP 30 FOOT - SIDE	7b	.442E+04	.799E+04
FREE DROP 30 FOOT - SIDE	7c	.442E+04	.799E+04
FREE DROP 30 FOOT - CG	7a	.189E+04	.234E+04
FREE DROP 30 FOOT - CG	7b	.189E+04	.234E+04
FREE DROP 30 FOOT - CG	7c	.189E+04	.234E+04
PUNCTURE	8a	.442E+04	.799E+04
PUNCTURE	8b	.442E+04	.799E+04
PUNCTURE	8c	.442E+04	.799E+04
THERMAL FIRE - T=0.5 HR	9	.120E+03	.131E+03
THERMAL FIRE - T=1.0 HR	9	.120E+03	.131E+03
THERMAL FIRE - T=1.5 HR	9	.131E+03	.120E+03
THERMAL FIRE - T=2.0 HR	9	.131E+03	.120E+03
THERMAL FIRE - T=2.5 HR	9	.131E+03	.120E+03
THERMAL FIRE - T=3.0 HR	9	.131E+03	.120E+03
MAXIMUM STRESS INTENSITY		.524E+04	.799E+04

NOTES:
1. Pm < 2.4*Sm or 0.7*Su = 48.0 ksi
   Pm+Pb < 3.6*Sm or Su = 70.0 ksi
2. See Table 2.10.9.42 for combination index identification.

TABLE 2.10.9.95A. SUMMARY OF STRESSES FOR LOAD COMBINATIONS, ACCIDENT CONDITIONS OF TRANSPORT, STRESS POINT 11B

LOAD COMBINATION	COMBINATION INDEX	STRESS INTENSITY CATEGORY Pm	Pm+Pb
FREE DROP 30 FOOT - TOP	7a	.965E+04	.101E+05
FREE DROP 30 FOOT - TOP	7b	.965E+04	.101E+05
FREE DROP 30 FOOT - TOP	7c	.965E+04	.101E+05
FREE DROP 30 FOOT - BOTTOM	7a	.867E+04	.817E+04
FREE DROP 30 FOOT - BOTTOM	7b	.867E+04	.817E+04
FREE DROP 30 FOOT - BOTTOM	7c	.867E+04	.817E+04
FREE DROP 30 FOOT - SIDE	7a	.571E+04	.104E+05
FREE DROP 30 FOOT - SIDE	7b	.571E+04	.104E+05
FREE DROP 30 FOOT - SIDE	7c	.571E+04	.104E+05
FREE DROP 30 FOOT - CG	7a	.297E+04	.372E+04
FREE DROP 30 FOOT - CG	7b	.297E+04	.372E+04
FREE DROP 30 FOOT - CG	7c	.297E+04	.372E+04
PUNCTURE	8a	.571E+04	.104E+05
PUNCTURE	8b	.571E+04	.104E+05
PUNCTURE	8c	.571E+04	.104E+05
THERMAL FIRE - T=0.5 HR	9	.120E+03	.131E+03
THERMAL FIRE - T=1.0 HR	9	.120E+03	.131E+03
THERMAL FIRE - T=1.5 HR	9	.131E+03	.120E+03
THERMAL FIRE - T=2.0 HR	9	.131E+03	.120E+03
THERMAL FIRE - T=2.5 HR	9	.131E+03	.120E+03
THERMAL FIRE - T=3.0 HR	9	.131E+03	.120E+03
MAXIMUM STRESS INTENSITY		.965E+04	.104E+05

NOTES:
1. Pm < 2.4*Sm or 0.7*Su = 48.0 ksi
   Pm+Pb < 3.6*Sm or Su = 70.0 ksi
2. See Table 2.10.9.42 for combination index identification.

TABLE 2.10.9.96. SUMMARY OF STRESSES FOR LOAD COMBINATIONS, ACCIDENT CONDITIONS OF TRANSPORT, STRESS POINT 12A

LOAD COMBINATION	COMBINATION INDEX	STRESS INTENSITY CATEGORY Pm	Pm+Pb
FREE DROP 30 FOOT - TOP	7a	.902E+04	.927E+04
FREE DROP 30 FOOT - TOP	7b	.902E+04	.927E+04
FREE DROP 30 FOOT - TOP	7c	.902E+04	.927E+04
FREE DROP 30 FOOT - BOTTOM	7a	.943E+04	.983E+04
FREE DROP 30 FOOT - BOTTOM	7b	.943E+04	.983E+04
FREE DROP 30 FOOT - BOTTOM	7c	.943E+04	.983E+04
FREE DROP 30 FOOT - SIDE	7a	.817E+04.	.657E+04
FREE DROP 30 FOOT - SIDE	7b	.817E+04	.657E+04
FREE DROP 30 FOOT - SIDE	7c	.817E+04	.657E+04
FREE DROP 30 FOOT - CG	7a	.292E+04	.269E+04
FREE DROP 30 FOOT - CG	7b	.292E+04	.269E+04
FREE DROP 30 FOOT - CG	7c	.292E+04	.269E+04
PUNCTURE	8a	.817E+04	.657E+04
PUNCTURE	8b	.817E+04	.657E+04
PUNCTURE	8c	.817E+04	.657E+04
THERMAL FIRE - T=0.5 HR	9	.616E+02	.588E+02
THERMAL FIRE - T=1.0 HR	9	.616E+02	.588E+02
THERMAL FIRE - T=1.5 HR	9	.588E+02	.616E+02
THERMAL FIRE - T=2.0 HR	9	.588E+02	.616E+02
THERMAL FIRE - T=2.5 HR	9	.588E+02	.616E+02
THERMAL FIRE - T=3.0 HR	9	.588E+02	.616E+02
MAXIMUM STRESS INTENSITY		.943E+04	.983E+04

NOTES:

1. Pm < 2.4*Sm or 0.7*Su = 48.0 ksi
   Pm+Pb < 3.6*Sm or Su = 70.0 ksi
2. See Table 2.10.9.42 for combination index identification.

TABLE 2.10.9.96A. SUMMARY OF STRESSES FOR LOAD COMBINATIONS, ACCIDENT CONDITIONS OF TRANSPORT, STRESS POINT 12A

LOAD COMBINATION	COMBINATION INDEX	STRESS INTENSITY CATEGORY Pm	Pm+Pb
FREE DROP 30 FOOT - TOP	7a	.147E+05	.139E+05
FREE DROP 30 FOOT - TOP	7b	.147E+05	.139E+05
FREE DROP 30 FOOT - TOP	7c	.147E+05	.139E+05
FREE DROP 30 FOOT - BOTTOM	7a	.143E+05	.151E+05
FREE DROP 30 FOOT - BOTTOM	7b	.143E+05	.151E+05
FREE DROP 30 FOOT - BOTTOM	7c	.143E+05	.151E+05
FREE DROP 30 FOOT - SIDE	7a	.106E+05	.852E+04
FREE DROP 30 FOOT - SIDE	7b	.106E+05	.852E+04
FREE DROP 30 FOOT - SIDE	7c	.106E+05	.852E+04
FREE DROP 30 FOOT - CG	7a	.469E+04	.432E+04
FREE DROP 30 FOOT - CG	7b	.469E+04	.432E+04
FREE DROP 30 FOOT - CG	7c	.469E+04	.432E+04
PUNCTURE	8a	.106E+05	.852E+04
PUNCTURE	8b	.106E+05	.852E+04
PUNCTURE	8c	.106E+05	.852E+04
THERMAL FIRE - T=0.5 HR	9	.616E+02	.588E+02
THERMAL FIRE - T=1.0 HR	9	.616E+02	.588E+02
THERMAL FIRE - T=1.5 HR	9	.588E+02	.616E+02
THERMAL FIRE - T=2.0 HR	9	.588E+02	.616E+02
THERMAL FIRE - T=2.5 HR	9	.588E+02	.616E+02
THERMAL FIRE - T=3.0 HR	9	.588E+02	.616E+02
MAXIMUM STRESS INTENSITY		.147E+05	.151E+05

NOTES:

1. Pm < 2.4*Sm or 0.7*Su = 48.0 ksi
   Pm+Pb < 3.6*Sm or Su = 70.0 ksi
2. See Table 2.10.9.42 for combination index identification.

TABLE 2.10.9.97. SUMMARY OF STRESSES FOR LOAD COMBINATIONS, ACCIDENT CONDITIONS OF TRANSPORT, STRESS POINT 12B

LOAD COMBINATION	COMBINATION INDEX	STRESS INTENSITY CATEGORY Pm	Pm+Pb
FREE DROP 30 FOOT - TOP	7a	.902E+04	.876E+04
FREE DROP 30 FOOT - TOP	7b	.902E+04	.876E+04
FREE DROP 30 FOOT - TOP	7c	.902E+04	.876E+04
FREE DROP 30 FOOT - BOTTOM	7a	.943E+04	.903E+04
FREE DROP 30 FOOT - BOTTOM	7b	.943E+04	.903E+04
FREE DROP 30 FOOT - BOTTOM	7c	.943E+04	.903E+04
FREE DROP 30 FOOT - SIDE	7a	.817E+04	.100E+05
FREE DROP 30 FOOT - SIDE	7b	.817E+04	.100E+05
FREE DROP 30 FOOT - SIDE	7c	.817E+04	.100E+05
FREE DROP 30 FOOT - CG	7a	.292E+04	.316E+04
FREE DROP 30 FOOT - CG	7b	.292E+04	.316E+04
FREE DROP 30 FOOT - CG	7c	.292E+04	.316E+04
PUNCTURE	8a	.817E+04	.100E+05
PUNCTURE	8b	.817E+04	.100E+05
PUNCTURE	8c	.817E+04	.100E+05
THERMAL FIRE - T=0.5 HR	9	.559E+02	.588E+02
THERMAL FIRE - T=1.0 HR	9	.559E+02	.588E+02
THERMAL FIRE - T=1.5 HR	9	.588E+02	.559E+02
THERMAL FIRE - T=2.0 HR	9	.588E+02	.559E+02
THERMAL FIRE - T=2.5 HR	9	.588E+02	.559E+02
THERMAL FIRE - T=3.0 HR	9	.588E+02	.559E+02
MAXIMUM STRESS INTENSITY		.943E+04	.100E+05

NOTES:
1. Pm < 2.4*Sm or 0.7*Su = 48.0 ksi
   Pm+Pb < 3.6*Sm or Su = 70.0 ksi
2. See Table 2.10.9.42 for combination index identification.

TABLE 2.10.9.97A. SUMMARY OF STRESSES FOR LOAD COMBINATIONS, ACCIDENT CONDITIONS OF TRANSPORT, STRESS POINT 12B

LOAD COMBINATION	COMBINATION INDEX	STRESS INTENSITY CATEGORY Pm	Pm+Pb
FREE DROP 30 FOOT - TOP	7a	.147E+05	.154E+05
FREE DROP 30 FOOT - TOP	7b	.147E+05	.154E+05
FREE DROP 30 FOOT - TOP	7c	.147E+05	.154E+05
FREE DROP 30 FOOT - BOTTOM	7a	.143E+05	.136E+05
FREE DROP 30 FOOT - BOTTOM	7b	.143E+05	.136E+05
FREE DROP 30 FOOT - BOTTOM	7c	.143E+05	.136E+05
FREE DROP 30 FOOT - SIDE	7a	.106E+05	.130E+05
FREE DROP 30 FOOT - SIDE	7b	.106E+05	.130E+05
FREE DROP 30 FOOT - SIDE	7c	.106E+05	.130E+05
FREE DROP 30 FOOT - CG	7a	.469E+04	.509E+04
FREE DROP 30 FOOT - CG	7b	.469E+04	.509E+04
FREE DROP 30 FOOT - CG	7c	.469E+04	.509E+04
PUNCTURE	8a	.106E+05	.130E+05
PUNCTURE	8b	.106E+05	.130E+05
PUNCTURE	8c	.106E+05	.130E+05
THERMAL FIRE - T=0.5 HR	9	.559E+02	.588E+02
THERMAL FIRE - T=1.0 HR	9	.559E+02	.588E+02
THERMAL FIRE - T=1.5 HR	9	.588E+02	.559E+02
THERMAL FIRE - T=2.0 HR	9	.588E+02	.559E+02
THERMAL FIRE - T=2.5 HR	9	.588E+02	.559E+02
THERMAL FIRE - T=3.0 HR	9	.588E+02	.559E+02
MAXIMUM STRESS INTENSITY		.147E+05	.154E+05

NOTES:

1. Pm < 2.4*Sm or 0.7*Su = 48.0 ksi
   Pm+Pb < 3.6*Sm or Su = 70.0 ksi
2. See Table 2.10.9.42 for combination index identification.

TABLE 2.10.9.98. SUMMARY OF STRESSES FOR LOAD COMBINATIONS, ACCIDENT CONDITIONS OF TRANSPORT, STRESS POINT 13A

LOAD COMBINATION	COMBINATION INDEX	STRESS INTENSITY CATEGORY Pm	Pm+Pb
FREE DROP 30 FOOT - TOP	7a	.987E+04	.107E+05
FREE DROP 30 FOOT - TOP	7b	.987E+04	.107E+05
FREE DROP 30 FOOT - TOP	7c	.987E+04	.107E+05
FREE DROP 30 FOOT - BOTTOM	7a	.452E+04	.497E+04
FREE DROP 30 FOOT - BOTTOM	7b	.452E+04	.497E+04
FREE DROP 30 FOOT - BOTTOM	7c	.452E+04	.497E+04
FREE DROP 30 FOOT - SIDE	7a	.208E+04	.229E+04
FREE DROP 30 FOOT - SIDE	7b	.208E+04	.229E+04
FREE DROP 30 FOOT - SIDE	7c	.208E+04	.229E+04
FREE DROP 30 FOOT - CG	7a	.150E+04	.114E+04
FREE DROP 30 FOOT - CG	7b	.150E+04	.114E+04
FREE DROP 30 FOOT - CG	7c	.150E+04	.114E+04
PUNCTURE	8a	.208E+04	.229E+04
PUNCTURE	8b	.208E+04	.229E+04
PUNCTURE	8c	.208E+04	.229E+04
THERMAL FIRE - T=0.5 HR	9	.144E+03	.134E+03
THERMAL FIRE - T=1.0 HR	9	.144E+03	.134E+03
THERMAL FIRE - T=1.5 HR	9	.134E+03	.144E+03
THERMAL FIRE - T=2.0 HR	9	.134E+03	.144E+03
THERMAL FIRE - T=2.5 HR	9	.134E+03	.144E+03
THERMAL FIRE - T=3.0 HR	9	.134E+03	.144E+03
MAXIMUM STRESS INTENSITY		.987E+04	.107E+05

NOTES:
1. Pm < 2.4*Sm or 0.7*Su = 48.0 ksi
   Pm+Pb < 3.6*Sm or Su = 70.0 ksi
2. See Table 2.10.9.42 for combination index identification.

TABLE 2.10.9.98A. SUMMARY OF STRESSES FOR LOAD COMBINATIONS, ACCIDENT CONDITIONS OF TRANSPORT, STRESS POINT 13A

LOAD COMBINATION	COMBINATION INDEX	STRESS INTENSITY CATEGORY Pm	Pm+Pb
FREE DROP 30 FOOT - TOP	7a	.169E+05	.164E+05
FREE DROP 30 FOOT - TOP	7b	.169E+05	.164E+05
FREE DROP 30 FOOT - TOP	7c	.169E+05	.164E+05
FREE DROP 30 FOOT - BOTTOM	7a	.628E+04	.626E+04
FREE DROP 30 FOOT - BOTTOM	7b	.628E+04	.626E+04
FREE DROP 30 FOOT - BOTTOM	7c	.628E+04	.626E+04
FREE DROP 30 FOOT - SIDE	7a	.267E+04	.293E+04
FREE DROP 30 FOOT - SIDE	7b	.267E+04	.293E+04
FREE DROP 30 FOOT - SIDE	7c	.267E+04	.293E+04
FREE DROP 30 FOOT - CG	7a	.235E+04	.176E+04
FREE DROP 30 FOOT - CG	7b	.235E+04	.176E+04
FREE DROP 30 FOOT - CG	7c	.235E+04	.176E+04
PUNCTURE	8a	.267E+04	.293E+04
PUNCTURE	8b	.267E+04	.293E+04
PUNCTURE	8c	.267E+04	.293E+04
THERMAL FIRE - T=0.5 HR	9	.144E+03	.134E+03
THERMAL FIRE - T=1.0 HR	9	.144E+03	.134E+03
THERMAL FIRE - T=1.5 HR	9	.134E+03	.144E+03
THERMAL FIRE - T=2.0 HR	9	.134E+03	.144E+03
THERMAL FIRE - T=2.5 HR	9	.134E+03	.144E+03
THERMAL FIRE - T=3.0 HR	9	.134E+03	.144E+03
MAXIMUM STRESS INTENSITY		.169E+05	.164E+05

NOTES:

1. Pm < 2.4*Sm or 0.7*Su = 48.0 ksi
   Pm+Pb < 3.6*Sm or Su = 70.0 ksi
2. See Table 2.10.9.42 for combination index identification.

TABLE 2.10.9.99. SUMMARY OF STRESSES FOR LOAD COMBINATIONS, ACCIDENT CONDITIONS OF TRANSPORT, STRESS POINT 13B

LOAD COMBINATION	COMBINATION INDEX	STRESS INTENSITY CATEGORY Pm	Pm+Pb
FREE DROP 30 FOOT - TOP	7a	.987E+04	.905E+04
FREE DROP 30 FOOT - TOP	7b	.987E+04	.905E+04
FREE DROP 30 FOOT - TOP	7c	.987E+04	.905E+04
FREE DROP 30 FOOT - BOTTOM	7a	.452E+04	.406E+04
FREE DROP 30 FOOT - BOTTOM	7b	.452E+04	.406E+04
FREE DROP 30 FOOT - BOTTOM	7c	.452E+04	.406E+04
FREE DROP 30 FOOT - SIDE	7a	.208E+04	.365E+04
FREE DROP 30 FOOT - SIDE	7b	.208E+04	.365E+04
FREE DROP 30 FOOT - SIDE	7c	.208E+04	.365E+04
FREE DROP 30 FOOT - CG	7a	.150E+04	.188E+04
FREE DROP 30 FOOT - CG	7b	.150E+04	.188E+04
FREE DROP 30 FOOT - CG	7c	.150E+04	.188E+04
PUNCTURE	8a	.208E+04	.365E+04
PUNCTURE	8b	.208E+04	.365E+04
PUNCTURE	8c	.208E+04	.365E+04
THERMAL FIRE - T=0.5 HR	9	.125E+03	.134E+03
THERMAL FIRE - T=1.0 HR	9	.125E+03	.134E+03
THERMAL FIRE - T=1.5 HR	9	.134E+03	.125E+03
THERMAL FIRE - T=2.0 HR	9	.134E+03	.125E+03
THERMAL FIRE - T=2.5 HR	9	.134E+03	.125E+03
THERMAL FIRE - T=3.0 HR	9	.134E+03	.125E+03
MAXIMUM STRESS INTENSITY		.987E+04	.905E+04

NOTES:
1. Pm < 2.4*Sm or 0.7*Su = 48.0 ksi
   Pm+Pb < 3.6*Sm or Su = 70.0 ksi
2. See Table 2.10.9.42 for combination index identification.

TABLE 2.10.9.99A. SUMMARY OF STRESSES FOR LOAD COMBINATIONS, ACCIDENT CONDITIONS OF TRANSPORT, STRESS POINT 13B

LOAD COMBINATION	COMBINATION INDEX	STRESS INTENSITY CATEGORY Pm	Pm+Pb
FREE DROP 30 FOOT - TOP	7a	.169E+05	.174E+05
FREE DROP 30 FOOT - TOP	7b	.169E+05	.174E+05
FREE DROP 30 FOOT - TOP	7c	.169E+05	.174E+05
FREE DROP 30 FOOT - BOTTOM	7a	.628E+04	.629E+04
FREE DROP 30 FOOT - BOTTOM	7b	.628E+04	.629E+04
FREE DROP 30 FOOT - BOTTOM	7c	.628E+04	.629E+04
FREE DROP 30 FOOT - SIDE	7a	.267E+04	.470E+04
FREE DROP 30 FOOT - SIDE	7b	.267E+04	.470E+04
FREE DROP 30 FOOT - SIDE	7c	.267E+04	.470E+04
FREE DROP 30 FOOT - CG	7a	.235E+04	.296E+04
FREE DROP 30 FOOT - CG	7b	.235E+04	.296E+04
FREE DROP 30 FOOT - CG	7c	.235E+04	.296E+04
PUNCTURE	8a	.267E+04	.470E+04
PUNCTURE	8b	.267E+04	.470E+04
PUNCTURE	8c	.267E+04	.470E+04
THERMAL FIRE - T=0.5 HR	9	.125E+03	.134E+03
THERMAL FIRE - T=1.0 HR	9	.125E+03	.134E+03
THERMAL FIRE - T=1.5 HR	9	.134E+03	.125E+03
THERMAL FIRE - T=2.0 HR	9	.134E+03	.125E+03
THERMAL FIRE - T=2.5 HR	9	.134E+03	.125E+03
THERMAL FIRE - T=3.0 HR	9	.134E+03	.125E+03
MAXIMUM STRESS INTENSITY		.169E+05	.174E+05

NOTES:
1. Pm < 2.4*Sm or 0.7*Su = 48.0 ksi
   Pm+Pb < 3.6*Sm or Su = 70.0 ksi
2. See Table 2.10.9.42 for combination index identification.

TABLE 2.10.9.100. SUMMARY OF STRESSES FOR LOAD COMBINATIONS, ACCIDENT CONDITIONS OF TRANSPORT, STRESS POINT 14A

LOAD COMBINATION	COMBINATION INDEX	STRESS INTENSITY CATEGORY Pm	Pm+Pb
FREE DROP 30 FOOT - TOP	7a	.169E+05	.173E+05
FREE DROP 30 FOOT - TOP	7b	.169E+05	.173E+05
FREE DROP 30 FOOT - TOP	7c	.169E+05	.173E+05
FREE DROP 30 FOOT - BOTTOM	7a	.191E+04	.186E+04
FREE DROP 30 FOOT - BOTTOM	7b	.191E+04	.186E+04
FREE DROP 30 FOOT - BOTTOM	7c	.191E+04	.186E+04
FREE DROP 30 FOOT - SIDE	7a	.562E+04	.362E+04
FREE DROP 30 FOOT - SIDE	7b	.562E+04	.362E+04
FREE DROP 30 FOOT - SIDE	7c	.562E+04	.362E+04
FREE DROP 30 FOOT - CG	7a	.268E+04	.249E+04
FREE DROP 30 FOOT - CG	7b	.268E+04	.249E+04
FREE DROP 30 FOOT - CG	7c	.268E+04	.249E+04
PUNCTURE	8a	.562E+04	.362E+04
PUNCTURE	8b	.562E+04	.362E+04
PUNCTURE	8c	.562E+04	.362E+04
THERMAL FIRE - T=0.5 HR	9	.636E+02	.612E+02
THERMAL FIRE - T=1.0 HR	9	.636E+02	.612E+02
THERMAL FIRE - T=1.5 HR	9	.612E+02	.636E+02
THERMAL FIRE - T=2.0 HR	9	.612E+02	.636E+02
THERMAL FIRE - T=2.5 HR	9	.612E+02	.636E+02
THERMAL FIRE - T=3.0 HR	9	.612E+02	.636E+02
MAXIMUM STRESS INTENSITY		.169E+05	.173E+05

NOTES:

1. Pm < 2.4*Sm or 0.7*Su = 48.0 ksi
   Pm+Pb < 3.6*Sm or Su = 70.0 ksi
2. See Table 2.10.9.42 for combination index identification.

TABLE 2.10.9.100A. SUMMARY OF STRESSES FOR LOAD COMBINATIONS, ACCIDENT CONDITIONS OF TRANSPORT, STRESS POINT 14A

LOAD COMBINATION	COMBINATION INDEX	STRESS INTENSITY CATEGORY Pm	Pm+Pb
FREE DROP 30 FOOT - TOP	7a	.263E+05	.253E+05
FREE DROP 30 FOOT - TOP	7b	.263E+05	.253E+05
FREE DROP 30 FOOT - TOP	7c	.263E+05	.253E+05
FREE DROP 30 FOOT - BOTTOM	7a	.368E+04	.431E+04
FREE DROP 30 FOOT - BOTTOM	7b	.368E+04	.431E+04
FREE DROP 30 FOOT - BOTTOM	7c	.368E+04	.431E+04
FREE DROP 30 FOOT - SIDE	7a	.728E+04	.468E+04
FREE DROP 30 FOOT - SIDE	7b	.728E+04	.468E+04
FREE DROP 30 FOOT - SIDE	7c	.728E+04	.468E+04
FREE DROP 30 FOOT - CG	7a	.430E+04	.400E+04
FREE DROP 30 FOOT - CG	7b	.430E+04	.400E+04
FREE DROP 30 FOOT - CG	7c	.430E+04	.400E+04
PUNCTURE	8a	.728E+04	.468E+04
PUNCTURE	8b	.728E+04	.468E+04
PUNCTURE	8c	.728E+04	.468E+04
THERMAL FIRE - T=0.5 HR	9	.636E+02	.612E+02
THERMAL FIRE - T=1.0 HR	9	.636E+02	.612E+02
THERMAL FIRE - T=1.5 HR	9	.612E+02	.636E+02
THERMAL FIRE - T=2.0 HR	9	.612E+02	.636E+02
THERMAL FIRE - T=2.5 HR	9	.612E+02	.636E+02
THERMAL FIRE - T=3.0 HR	9	.612E+02	.636E+02
MAXIMUM STRESS INTENSITY		.263E+05	.253E+05

NOTES:
1. Pm < 2.4*Sm or 0.7*Su = 48.0 ksi
   Pm+Pb < 3.6*Sm or Su = 70.0 ksi
2. See Table 2.10.9.42 for combination index identification.

TABLE 2.10.9.101. SUMMARY OF STRESSES FOR LOAD COMBINATIONS, ACCIDENT CONDITIONS OF TRANSPORT, STRESS POINT 14B

LOAD COMBINATION	COMBINATION INDEX	STRESS INTENSITY CATEGORY Pm	Pm+Pb
FREE DROP 30 FOOT - TOP	7a	.169E+05	.164E+05
FREE DROP 30 FOOT - TOP	7b	.169E+05	.164E+05
FREE DROP 30 FOOT - TOP	7c	.169E+05	.164E+05
FREE DROP 30 FOOT - BOTTOM	7a	.191E+04	.196E+04
FREE DROP 30 FOOT - BOTTOM	7b	.191E+04	.196E+04
FREE DROP 30 FOOT - BOTTOM	7c	.191E+04	.196E+04
FREE DROP 30 FOOT - SIDE	7a	.562E+04	.797E+04
FREE DROP 30 FOOT - SIDE	7b	.562E+04	.797E+04
FREE DROP 30 FOOT - SIDE	7c	.562E+04	.797E+04
FREE DROP 30 FOOT - CG	7a	.268E+04	.287E+04
FREE DROP 30 FOOT - CG	7b	.268E+04	.287E+04
FREE DROP 30 FOOT - CG	7c	.268E+04	.287E+04
PUNCTURE	8a	.562E+04	.797E+04
PUNCTURE	8b	.562E+04	.797E+04
PUNCTURE	8c	.562E+04	.797E+04
THERMAL FIRE - T=0.5 HR	9	.588E+02	.612E+02
THERMAL FIRE - T=1.0 HR	9	.588E+02	.612E+02
THERMAL FIRE - T=1.5 HR	9	.612E+02	.588E+02
THERMAL FIRE - T=2.0 HR	9	.612E+02	.588E+02
THERMAL FIRE - T=2.5 HR	9	.612E+02	.588E+02
THERMAL FIRE - T=3.0 HR	9	.612E+02	.588E+02
MAXIMUM STRESS INTENSITY		.169E+05	.164E+05

NOTES:
1. Pm < 2.4*Sm or 0.7*Su = 48.0 ksi
   Pm+Pb < 3.6*Sm or Su = 70.0 ksi
2. See Table 2.10.9.42 for combination index identification.

TABLE 2.10.9.101A. SUMMARY OF STRESSES FOR LOAD COMBINATIONS, ACCIDENT CONDITIONS OF TRANSPORT, STRESS POINT 14B

LOAD COMBINATION	COMBINATION INDEX	STRESS INTENSITY CATEGORY Pm	Pm+Pb
FREE DROP 30 FOOT - TOP	7a	.263E+05	.273E+05
FREE DROP 30 FOOT - TOP	7b	.263E+05	.273E+05
FREE DROP 30 FOOT - TOP	7c	.263E+05	.273E+05
FREE DROP 30 FOOT - BOTTOM	7a	.368E+04	.304E+04
FREE DROP 30 FOOT - BOTTOM	7b	.368E+04	.304E+04
FREE DROP 30 FOOT - BOTTOM	7c	.368E+04	.304E+04
FREE DROP 30 FOOT - SIDE	7a	.728E+04	.103E+05
FREE DROP 30 FOOT - SIDE	7b	.728E+04	.103E+05
FREE DROP 30 FOOT - SIDE	7c	.728E+04	.103E+05
FREE DROP 30 FOOT - CG	7a	.430E+04	.462E+04
FREE DROP 30 FOOT - CG	7b	.430E+04	.462E+04
FREE DROP 30 FOOT - CG	7c	.430E+04	.462E+04
PUNCTURE	8a	.728E+04	.103E+05
PUNCTURE	8b	.728E+04	.103E+05
PUNCTURE	8c	.728E+04	.103E+05
THERMAL FIRE - T=0.5 HR	9	.588E+02	.612E+02
THERMAL FIRE - T=1.0 HR	9	.588E+02	.612E+02
THERMAL FIRE - T=1.5 HR	9	.612E+02	.588E+02
THERMAL FIRE - T=2.0 HR	9	.612E+02	.588E+02
THERMAL FIRE - T=2.5 HR	9	.612E+02	.588E+02
THERMAL FIRE - T=3.0 HR	9	.612E+02	.588E+02
MAXIMUM STRESS INTENSITY		.263E+05	.273E+05

NOTES:
1. Pm < 2.4*Sm or 0.7*Su = 48.0 ksi
   Pm+Pb < 3.6*Sm or Su = 70.0 ksi
2. See Table 2.10.9.42 for combination index identification.

TABLE 2.10.9.102. SUMMARY OF STRESSES FOR LOAD COMBINATIONS, ACCIDENT CONDITIONS OF TRANSPORT, STRESS POINT 15A

LOAD COMBINATION	COMBINATION INDEX	STRESS INTENSITY CATEGORY Pm	Pm+Pb
FREE DROP 30 FOOT - TOP	7a	.103E+05	.102E+05
FREE DROP 30 FOOT - TOP	7b	.103E+05	.102E+05
FREE DROP 30 FOOT - TOP	7c	.103E+05	.102E+05
FREE DROP 30 FOOT - BOTTOM	7a	.396E+04	.316E+04
FREE DROP 30 FOOT - BOTTOM	7b	.396E+04	.316E+04
FREE DROP 30 FOOT - BOTTOM	7c	.396E+04	.316E+04
FREE DROP 30 FOOT - SIDE	7a	.144E+05	.843E+04
FREE DROP 30 FOOT - SIDE	7b	.144E+05	.843E+04
FREE DROP 30 FOOT - SIDE	7c	.144E+05	.843E+04
FREE DROP 30 FOOT - CG	7a	.221E+04	.190E+04
FREE DROP 30 FOOT - CG	7b	.221E+04	.190E+04
FREE DROP 30 FOOT - CG	7c	.221E+04	.190E+04
PUNCTURE	8a	.144E+05	.843E+04
PUNCTURE	8b	.144E+05	.843E+04
PUNCTURE	8c	.144E+05	.843E+04
THERMAL FIRE - T=0.5 HR	9	.890E+02	.451E+02
THERMAL FIRE - T=1.0 HR	9	.890E+02	.451E+02
THERMAL FIRE - T=1.5 HR	9	.451E+02	.890E+02
THERMAL FIRE - T=2.0 HR	9	.451E+02	.890E+02
THERMAL FIRE - T=2.5 HR	9	.451E+02	.890E+02
THERMAL FIRE - T=3.0 HR	9	.451E+02	.890E+02
MAXIMUM STRESS INTENSITY		.144E+05	.102E+05

NOTES:
1. Pm < 2.4*Sm or 0.7*Su = 48.0 ksi
   Pm+Pb < 3.6*Sm or Su = 70.0 ksi
2. See Table 2.10.9.42 for combination index identification.

TABLE 2.10.9.102A. SUMMARY OF STRESSES FOR LOAD COMBINATIONS, ACCIDENT CONDITIONS OF TRANSPORT, STRESS POINT 15A

LOAD COMBINATION	COMBINATION INDEX	STRESS INTENSITY CATEGORY Pm	Pm+Pb
FREE DROP 30 FOOT - TOP	7a	.146E+05	.169E+05
FREE DROP 30 FOOT - TOP	7b	.146E+05	.169E+05
FREE DROP 30 FOOT - TOP	7c	.146E+05	.169E+05
FREE DROP 30 FOOT - BOTTOM	7a	.558E+04	.580E+04
FREE DROP 30 FOOT - BOTTOM	7b	.558E+04	.580E+04
FREE DROP 30 FOOT - BOTTOM	7c	.558E+04	.580E+04
FREE DROP 30 FOOT - SIDE	7a	.188E+05	.109E+05
FREE DROP 30 FOOT - SIDE	7b	.188E+05	.109E+05
FREE DROP 30 FOOT - SIDE	7c	.188E+05	.109E+05
FREE DROP 30 FOOT - CG	7a	.356E+04	.303E+04
FREE DROP 30 FOOT - CG	7b	.356E+04	.303E+04
FREE DROP 30 FOOT - CG	7c	.356E+04	.303E+04
PUNCTURE	8a	.188E+05	.109E+05
PUNCTURE	8b	.188E+05	.109E+05
PUNCTURE	8c	.188E+05	.109E+05
THERMAL FIRE - T=0.5 HR	9	.890E+02	.451E+02
THERMAL FIRE - T=1.0 HR	9	.890E+02	.451E+02
THERMAL FIRE - T=1.5 HR	9	.451E+02	.890E+02
THERMAL FIRE - T=2.0 HR	9	.451E+02	.890E+02
THERMAL FIRE - T=2.5 HR	9	.451E+02	.890E+02
THERMAL FIRE - T=3.0 HR	9	.451E+02	.890E+02
MAXIMUM STRESS INTENSITY		.188E+05	.169E+05

NOTES:
1. Pm < 2.4*Sm or 0.7*Su = 48.0 ksi
   Pm+Pb < 3.6*Sm or Su = 70.0 ksi
2. See Table 2.10.9.42 for combination index identification.

TABLE 2.10.9.103. SUMMARY OF STRESSES FOR LOAD COMBINATIONS, ACCIDENT CONDITIONS OF TRANSPORT, STRESS POINT 15B

LOAD COMBINATION	COMBINATION INDEX	STRESS INTENSITY CATEGORY Pm	Pm+Pb
FREE DROP 30 FOOT - TOP	7a	.103E+05	.103E+05
FREE DROP 30 FOOT - TOP	7b	.103E+05	.103E+05
FREE DROP 30 FOOT - TOP	7c	.103E+05	.103E+05
FREE DROP 30 FOOT - BOTTOM	7a	.396E+04	.477E+04
FREE DROP 30 FOOT - BOTTOM	7b	.396E+04	.477E+04
FREE DROP 30 FOOT - BOTTOM	7c	.396E+04	.477E+04
FREE DROP 30 FOOT - SIDE	7a	.144E+05	.272E+05
FREE DROP 30 FOOT - SIDE	7b	.144E+05	.272E+05
FREE DROP 30 FOOT - SIDE	7c	.144E+05	.272E+05
FREE DROP 30 FOOT - CG	7a	.221E+04	.382E+04
FREE DROP 30 FOOT - CG	7b	.221E+04	.382E+04
FREE DROP 30 FOOT - CG	7c	.221E+04	.382E+04
PUNCTURE	8a	.144E+05	.272E+05
PUNCTURE	8b	.144E+05	.272E+05
PUNCTURE	8c	.144E+05	.272E+05
THERMAL FIRE - T=0.5 HR	9	.125E+02	.451E+02
THERMAL FIRE - T=1.0 HR	9	.125E+02	.451E+02
THERMAL FIRE - T=1.5 HR	9	.451E+02	.125E+02
THERMAL FIRE - T=2.0 HR	9	.451E+02	.125E+02
THERMAL FIRE - T=2.5 HR	9	.451E+02	.125E+02
THERMAL FIRE - T=3.0 HR	9	.451E+02	.125E+02
MAXIMUM STRESS INTENSITY		.144E+05	.272E+05

NOTES:
1. Pm < 2.4*Sm or 0.7*Su = 48.0 ksi
   Pm+Pb < 3.6*Sm or Su = 70.0 ksi
2. See Table 2.10.9.42 for combination index identification.

TABLE 2.10.9.103A. SUMMARY OF STRESSES FOR LOAD COMBINATIONS, ACCIDENT CONDITIONS OF TRANSPORT, STRESS POINT 15B

LOAD COMBINATION	COMBINATION INDEX	STRESS INTENSITY CATEGORY Pm	Pm+Pb
FREE DROP 30 FOOT - TOP	7a	.146E+05	.122E+05
FREE DROP 30 FOOT - TOP	7b	.146E+05	.122E+05
FREE DROP 30 FOOT - TOP	7c	.146E+05	.122E+05
FREE DROP 30 FOOT - BOTTOM	7a	.558E+04	.538E+04
FREE DROP 30 FOOT - BOTTOM	7b	.558E+04	.538E+04
FREE DROP 30 FOOT - BOTTOM	7c	.558E+04	.538E+04
FREE DROP 30 FOOT - SIDE	7a	.188E+05	.354E+05
FREE DROP 30 FOOT - SIDE	7b	.188E+05	.354E+05
FREE DROP 30 FOOT - SIDE	7c	.188E+05	.354E+05
FREE DROP 30 FOOT - CG	7a	.356E+04	.618E+04
FREE DROP 30 FOOT - CG	7b	.356E+04	.618E+04
FREE DROP 30 FOOT - CG	7c	.356E+04	.618E+04
PUNCTURE	8a	.188E+05	.354E+05
PUNCTURE	8b	.188E+05	.354E+05
PUNCTURE	8c	.188E+05	.354E+05
THERMAL FIRE - T=0.5 HR	9	.125E+02	.451E+02
THERMAL FIRE - T=1.0 HR	9	.125E+02	.451E+02
THERMAL FIRE - T=1.5 HR	9	.451E+02	.125E+02
THERMAL FIRE - T=2.0 HR	9	.451E+02	.125E+02
THERMAL FIRE - T=2.5 HR	9	.451E+02	.125E+02
THERMAL FIRE - T=3.0 HR	9	.451E+02	.125E+02
MAXIMUM STRESS INTENSITY		.188E+05	.354E+05

NOTES:
1. Pm < 2.4*Sm or 0.7*Su = 48.0 ksi
   Pm+Pb < 3.6*Sm or Su = 70.0 ksi
2. See Table 2.10.9.42 for combination index identification.

TABLE 2.10.9.104. SUMMARY OF STRESSES FOR LOAD COMBINATIONS, ACCIDENT CONDITIONS OF TRANSPORT, STRESS POINT 16A

LOAD COMBINATION	COMBINATION INDEX	STRESS INTENSITY CATEGORY Pm	Pm+Pb
FREE DROP 30 FOOT - TOP	7a	.110E+05	.920E+04
FREE DROP 30 FOOT - TOP	7b	.110E+05	.920E+04
FREE DROP 30 FOOT - TOP	7c	.110E+05	.920E+04
FREE DROP 30 FOOT - BOTTOM	7a	.571E+03	.979E+03
FREE DROP 30 FOOT - BOTTOM	7b	.571E+03	.979E+03
FREE DROP 30 FOOT - BOTTOM	7c	.571E+03	.979E+03
FREE DROP 30 FOOT - SIDE	7a	.263E+04	.729E+04
FREE DROP 30 FOOT - SIDE	7b	.263E+04	.729E+04
FREE DROP 30 FOOT - SIDE	7c	.263E+04	.729E+04
FREE DROP 30 FOOT - CG	7a	.208E+04	.181E+04
FREE DROP 30 FOOT - CG	7b	.208E+04	.181E+04
FREE DROP 30 FOOT - CG	7c	.208E+04	.181E+04
PUNCTURE	8a	.263E+04	.729E+04
PUNCTURE	8b	.263E+04	.729E+04
PUNCTURE	8c	.263E+04	.729E+04
THERMAL FIRE - T=0.5 HR	9	.634E+02	.342E+02
THERMAL FIRE - T=1.0 HR	9	.634E+02	.342E+02
THERMAL FIRE - T=1.5 HR	9	.342E+02	.634E+02
THERMAL FIRE - T=2.0 HR	9	.342E+02	.634E+02
THERMAL FIRE - T=2.5 HR	9	.342E+02	.634E+02
THERMAL FIRE - T=3.0 HR	9	.342E+02	.634E+02
MAXIMUM STRESS INTENSITY		.110E+05	.920E+04

NOTES:
1. Pm < 2.4*Sm or 0.7*Su = 48.0 ksi
   Pm+Pb < 3.6*Sm or Su = 70.0 ksi
2. See Table 2.10.9.42 for combination index identification.

TABLE 2.10.9.104A. SUMMARY OF STRESSES FOR LOAD COMBINATIONS, ACCIDENT CONDITIONS OF TRANSPORT, STRESS POINT 16A

LOAD COMBINATION	COMBINATION INDEX	STRESS INTENSITY CATEGORY Pm	Pm+Pb
FREE DROP 30 FOOT - TOP	7a	.162E+05	.115E+05
FREE DROP 30 FOOT - TOP	7b	.162E+05	.115E+05
FREE DROP 30 FOOT - TOP	7c	.162E+05	.115E+05
FREE DROP 30 FOOT - BOTTOM	7a	.106E+04	.112E+04
FREE DROP 30 FOOT - BOTTOM	7b	.106E+04	.112E+04
FREE DROP 30 FOOT - BOTTOM	7c	.106E+04	.112E+04
FREE DROP 30 FOOT - SIDE	7a	.341E+04	.946E+04
FREE DROP 30 FOOT - SIDE	7b	.341E+04	.946E+04
FREE DROP 30 FOOT - SIDE	7c	.341E+04	.946E+04
FREE DROP 30 FOOT - CG	7a	.334E+04	.289E+04
FREE DROP 30 FOOT - CG	7b	.334E+04	.289E+04
FREE DROP 30 FOOT - CG	7c	.334E+04	.289E+04
PUNCTURE	8a	.341E+04	.946E+04
PUNCTURE	8b	.341E+04	.946E+04
PUNCTURE	3c	.341E+04	.946E+04
THERMAL FIRE - T=0.5 HR	9	.634E+02	.342E+02
THERMAL FIRE - T=1.0 HR	9	.634E+02	.342E+02
THERMAL FIRE - T=1.5 HR	9	.342E+02	.634E+02
THERMAL FIRE - T=2.0 HR	9	.342E+02	.634E+02
THERMAL FIRE - T=2.5 HR	9	.342E+02	.634E+02
THERMAL FIRE - T=3.0 HR	9	.342E+02	.634E+02
MAXIMUM STRESS INTENSITY		.162E+05	.115E+05

NOTES:
1. Pm < 2.4*Sm or 0.7*Su = 48.0 ksi
   Pm+Pb < 3.6*Sm or Su = 70.0 ksi
2. See Table 2.10.9.42 for combination index identification.

TABLE 2.10.9.105. SUMMARY OF STRESSES FOR LOAD COMBINATIONS, ACCIDENT CONDITIONS OF TRANSPORT, STRESS POINT 16B

LOAD COMBINATION	COMBINATION INDEX	STRESS INTENSITY CATEGORY Pm	Pm+Pb
FREE DROP 30 FOOT - TOP	7a	.110E+05	.128E+05
FREE DROP 30 FOOT - TOP	7b	.110E+05	.128E+05
FREE DROP 30 FOOT - TOP	7c	.110E+05	.128E+05
FREE DROP 30 FOOT - BOTTOM	7a	.571E+03	.315E+03
FREE DROP 30 FOOT - BOTTOM	7b	.571E+03	.315E+03
FREE DROP 30 FOOT - BOTTOM	7c	.571E+03	.315E+03
FREE DROP 30 FOOT - SIDE	7a	.263E+04	.495E+04
FREE DROP 30 FOOT - SIDE	7b	.263E+04	.495E+04
FREE DROP 30 FOOT - SIDE	7c	.263E+04	.495E+04
FREE DROP 30 FOOT - CG	7a	.208E+04	.297E+04
FREE DROP 30 FOOT - CG	7b	.208E+04	.297E+04
FREE DROP 30 FOOT - CG	7c	.208E+04	.297E+04
PUNCTURE	8a	.263E+04	.495E+04
PUNCTURE	8b	.263E+04	.495E+04
PUNCTURE	8c	.263E+04	.495E+04
THERMAL FIRE - T=0.5 HR	9	.692E+01	.342E+02
THERMAL FIRE - T=1.0 HR	9	.692E+01	.342E+02
THERMAL FIRE - T=1.5 HR	9	.342E+02	.692E+01
THERMAL FIRE - T=2.0 HR	9	.342E+02	.692E+01
THERMAL FIRE - T=2.5 HR	9	.342E+02	.692E+01
THERMAL FIRE - T=3.0 HR	9	.342E+02	.692E+01
MAXIMUM STRESS INTENSITY		.110E+05	.128E+05

NOTES:

1. Pm < 2.4*Sm or 0.7*Su = 48.0 ksi
   Pm+Pb < 3.6*Sm or Su = 70.0 ksi
2. See Table 2.10.9.42 for combination index identification.

TABLE 2.10.9.105A. SUMMARY OF STRESSES FOR LOAD COMBINATIONS, ACCIDENT CONDITIONS OF TRANSPORT, STRESS POINT 16B

LOAD COMBINATION	COMBINATION INDEX	STRESS INTENSITY CATEGORY Pm	Pm+Pb
FREE DROP 30 FOOT - TOP	7a	.162E+05	.278E+05
FREE DROP 30 FOOT - TOP	7b	.162E+05	.278E+05
FREE DROP 30 FOOT - TOP	7c	.162E+05	.278E+05
FREE DROP 30 FOOT - BOTTOM	7a	.106E+04	.995E+03
FREE DROP 30 FOOT - BOTTOM	7b	.106E+04	.995E+03
FREE DROP 30 FOOT - BOTTOM	7c	.106E+04	.995E+03
FREE DROP 30 FOOT - SIDE	7a	.341E+04	.643E+04
FREE DROP 30 FOOT - SIDE	7b	.341E+04	.643E+04
FREE DROP 30 FOOT - SIDE	7c	.341E+04	.643E+04
FREE DROP 30 FOOT - CG	7a	.334E+04	.481E+04
FREE DROP 30 FOOT - CG	7b	.334E+04	.481E+04
FREE DROP 30 FOOT - CG	7c	.334E+04	.481E+04
PUNCTURE	8a	.341E+04	.643E+04
PUNCTURE	8b	.341E+04	.643E+04
PUNCTURE	8c	.341E+04	.643E+04
THERMAL FIRE - T=0.5 HR	9	.692E+01	.342E+02
THERMAL FIRE - T=1.0 HR	9	.692E+01	.342E+02
THERMAL FIRE - T=1.5 HR	9	.342E+02	.692E+01
THERMAL FIRE - T=2.0 HR	9	.342E+02	.692E+01
THERMAL FIRE - T=2.5 HR	9	.342E+02	.692E+01
THERMAL FIRE - T=3.0 HR	9	.342E+02	.692E+01
MAXIMUM STRESS INTENSITY		.162E+05	.278E+05

NOTES:
1. Pm < 2.4*Sm or 0.7*Su = 48.0 ksi
   Pm+Pb < 3.6*Sm or Su = 70.0 ksi
2. See Table 2.10.9.42 for combination index identification.

TABLE 2.10.9.106. SUMMARY OF STRESSES FOR LOAD COMBINATIONS, ACCIDENT CONDITIONS OF TRANSPORT, STRESS POINT 17

LOAD COMBINATION	COMBINATION INDEX	STRESS INTENSITY CATEGORY Pm	Pm+Pb
FREE DROP 30 FOOT - TOP	7a	.844E+04	.844E+04
FREE DROP 30 FOOT - TOP	7b	.844E+04	.844E+04
FREE DROP 30 FOOT - TOP	7c	.844E+04	.844E+04
FREE DROP 30 FOOT - BOTTOM	7a	.511E+03	.511E+03
FREE DROP 30 FOOT - BOTTOM	7b	.511E+03	.511E+03
FREE DROP 30 FOOT - BOTTOM	7c	.511E+03	.511E+03
FREE DROP 30 FOOT - SIDE	7a	.258E+04	.258E+04
FREE DROP 30 FOOT - SIDE	7b	.258E+04	.258E+04
FREE DROP 30 FOOT - SIDE	7c	.258E+04	.258E+04
FREE DROP 30 FOOT - CG	7a	.256E+04	.256E+04
FREE DROP 30 FOOT - CG	7b	.256E+04	.256E+04
FREE DROP 30 FOOT - CG	7c	.256E+04	.256E+04
PUNCTURE	8a	.258E+04	.258E+04
PUNCTURE	8b	.258E+04	.258E+04
PUNCTURE	8c	.258E+04	.258E+04
THERMAL FIRE - T=0.5 HR	9	.728E+02	.728E+02
THERMAL FIRE - T=1.0 HR	9	.728E+02	.728E+02
THERMAL FIRE - T=1.5 HR	9	.728E+02	.728E+02
THERMAL FIRE - T=2.0 HR	9	.728E+02	.728E+02
THERMAL FIRE - T=2.5 HR	9	.728E+02	.728E+02
THERMAL FIRE - T=3.0 HR	9	.728E+02	.728E+02
MAXIMUM STRESS INTENSITY		.844E+04	.844E+04

NOTES:
1. Pm < 2.4*Sm or 0.7*Su = 48.0 ksi
   Pm+Pb < 3.6*Sm or Su = 70.0 ksi
2. See Table 2.10.9.42 for combination index identification.
3. Stresses are given at the centroid of the element, therefore, the same stress value is used for Pm and Pm+Pb.

TABLE 2.10.9.106A. SUMMARY OF STRESSES FOR LOAD COMBINATIONS, ACCIDENT CONDITIONS OF TRANSPORT, STRESS POINT 17

LOAD COMBINATION	COMBINATION INDEX	STRESS INTENSITY CATEGORY Pm	Pm+Pb
FREE DROP 30 FOOT - TOP	7a	.112E+05	.112E+05
FREE DROP 30 FOOT - TOP	7b	.112E+05	.112E+05
FREE DROP 30 FOOT - TOP	7c	.112E+05	.112E+05
FREE DROP 30 FOOT - BOTTOM	7a	.748E+03	.748E+03
FREE DROP 30 FOOT - BOTTOM	7b	.748E+03	.748E+03
FREE DROP 30 FOOT - BOTTOM	7c	.748E+03	.748E+03
FREE DROP 30 FOOT - SIDE	7a	.333E+04	.333E+04
FREE DROP 30 FOOT - SIDE	7b	.333E+04	.333E+04
FREE DROP 30 FOOT - SIDE	7c	.333E+04	.333E+04
FREE DROP 30 FOOT - CG	7a	.410E+04	.410E+04
FREE DROP 30 FOOT - CG	7b	.410E+04	.410E+04
FREE DROP 30 FOOT - CG	7c	.410E+04	.410E+04
PUNCTURE	8a	.333E+04	.333E+04
PUNCTURE	8b	.333E+04	.333E+04
PUNCTURE	8c	.333E+04	.333E+04
THERMAL FIRE - T=0.5 HR	9	.728E+02	.728E+02
THERMAL FIRE - T=1.0 HR	9	.728E+02	.728E+02
THERMAL FIRE - T=1.5 HR	9	.728E+02	.728E+02
THERMAL FIRE - T=2.0 HR	9	.728E+02	.728E+02
THERMAL FIRE - T=2.5 HR	9	.728E+02	.728E+02
THERMAL FIRE - T=3.0 HR	9	.728E+02	.728E+02
MAXIMUM STRESS INTENSITY		.112E+05	.112E+05

NOTES:
1. Pm < 2.4*Sm or 0.7*Su = 48.0 ksi
   Pm+Pb < 3.6*Sm or Su = 70.0 ksi
2. See Table 2.10.9.42 for combination index identification.
3. Stresses are given at the centroid of the element, therefore, the same stress value is used for Pm and Pm+Pb.

TABLE 2.10.9.107. SUMMARY OF STRESSES FOR LOAD COMBINATIONS, ACCIDENT CONDITIONS OF TRANSPORT, STRESS POINT 18

LOAD COMBINATION	COMBINATION INDEX	STRESS INTENSITY CATEGORY Pm	Pm+Pb
FREE DROP 30 FOOT - TOP	7a	.814E+04	.814E+04
FREE DROP 30 FOOT - TOP	7b	.814E+04	.814E+04
FREE DROP 30 FOOT - TOP	7c	.814E+04	.814E+04
FREE DROP 30 FOOT - BOTTOM	7a	.120E+03	.120E+03
FREE DROP 30 FOOT - BOTTOM	7b	.120E+03	.120E+03
FREE DROP 30 FOOT - BOTTOM	7c	.120E+03	.120E+03
FREE DROP 30 FOOT - SIDE	7a	.447E+04	.447E+04
FREE DROP 30 FOOT - SIDE	7b	.447E+04	.447E+04
FREE DROP 30 FOOT - SIDE	7c	.447E+04	.447E+04
FREE DROP 30 FOOT - CG	7a	.348E+04	.348E+04
FREE DROP 30 FOOT - CG	7b	.348E+04	.348E+04
FREE DROP 30 FOOT - CG	7c	.348E+04	.348E+04
PUNCTURE	8a	.447E+04	.447E+04
PUNCTURE	8b	.447E+04	.447E+04
PUNCTURE	8c	.447E+04	.447E+04
THERMAL FIRE - T=0.5 HR	9	.127E+02	.127E+02
THERMAL FIRE - T=1.0 HR	9	.127E+02	.127E+02
THERMAL FIRE - T=1.5 HR	9	.127E+02	.127E+02
THERMAL FIRE - T=2.0 HR	9	.127E+02	.127E+02
THERMAL FIRE - T=2.5 HR	9	.127E+02	.127E+02
THERMAL FIRE - T=3.0 HR	9	.127E+02	.127E+02
MAXIMUM STRESS INTENSITY		.814E+04	.814E+04

NOTES:
1. Pm < 2.4*Sm or 0.7*Su = 48.0 ksi
   Pm+Pb < 3.6*Sm or Su = 70.0 ksi
2. See Table 2.10.9.42 for combination index identification.
3. Stresses are given at the centroid of the element, therefore, the same stress value is used for Pm and Pm+Pb.

TABLE 2.10.9.107A. SUMMARY OF STRESSES FOR LOAD COMBINATIONS, ACCIDENT CONDITIONS OF TRANSPORT, STRESS POINT 18

LOAD COMBINATION	COMBINATION INDEX	STRESS INTENSITY CATEGORY Pm	Pm+Pb
FREE DROP 30 FOOT - TOP	7a	.105E+05	.105E+05
FREE DROP 30 FOOT - TOP	7b	.105E+05	.105E+05
FREE DROP 30 FOOT - TOP	7c	.105E+05	.105E+05
FREE DROP 30 FOOT - BOTTOM	7a	.202E+03	.202E+03
FREE DROP 30 FOOT - BOTTOM	7b	.202E+03	.202E+03
FREE DROP 30 FOOT - BOTTOM	7c	.202E+03	.202E+03
FREE DROP 30 FOOT - SIDE	7a	.580E+04	.580E+04
FREE DROP 30 FOOT - SIDE	7b	.580E+04	.580E+04
FREE DROP 30 FOOT - SIDE	7c	.580E+04	.580E+04
FREE DROP 30 FOOT - CG	7a	.563E+04	.563E+04
FREE DROP 30 FOOT - CG	7b	.563E+04	.563E+04
FREE DROP 30 FOOT - CG	7c	.563E+04	.563E+04
PUNCTURE	8a	.580E+04	.580E+04
PUNCTURE	8b	.580E+04	.580E+04
PUNCTURE	8c	.580E+04	.580E+04
THERMAL FIRE - T=0.5 HR	9	.127E+02	.127E+02
THERMAL FIRE - T=1.0 HR	9	.127E+02	.127E+02
THERMAL FIRE - T=1.5 HR	9	.127E+02	.127E+02
THERMAL FIRE - T=2.0 HR	9	.127E+02	.127E+02
THERMAL FIRE - T=2.5 HR	9	.127E+02	.127E+02
THERMAL FIRE - T=3.0 HR	9	.127E+02	.127E+02
MAXIMUM STRESS INTENSITY		.105E+05	.105E+05

NOTES:

1. Pm < 2.4*Sm or 0.7*Su = 48.0 ksi
   Pm+Pb < 3.6*Sm or Su = 70.0 ksi
2. See Table 2.10.9.42 for combination index identification.
3. Stresses are given at the centroid of the element, therefore, the same stress value is used for Pm and Pm+Pb.

TABLE 2.10.9.108. SUMMARY OF STRESSES FOR LOAD COMBINATIONS, ACCIDENT CONDITIONS OF TRANSPORT, STRESS POINT 19

LOAD COMBINATION	COMBINATION INDEX	STRESS INTENSITY CATEGORY Pm	Pm+Pb
FREE DROP 30 FOOT - TOP	7a	.103E+05	.103E+05
FREE DROP 30 FOOT - TOP	7b	.103E+05	.103E+05
FREE DROP 30 FOOT - TOP	7c	.103E+05	.103E+05
FREE DROP 30 FOOT - BOTTOM	7a	.746E+02	.746E+02
FREE DROP 30 FOOT - BOTTOM	7b	.746E+02	.746E+02
FREE DROP 30 FOOT - BOTTOM	7c	.746E+02	.746E+02
FREE DROP 30 FOOT - SIDE	7a	.215E+04	.215E+04
FREE DROP 30 FOOT - SIDE	7b	.215E+04	.215E+04
FREE DROP 30 FOOT - SIDE	7c	.215E+04	.215E+04
FREE DROP 30 FOOT - CG	7a	.586E+04	.586E+04
FREE DROP 30 FOOT - CG	7b	.586E+04	.586E+04
FREE DROP 30 FOOT - CG	7c	.586E+04	.586E+04
PUNCTURE	8a	.215E+04	.215E+04
PUNCTURE	8b	.215E+04	.215E+04
PUNCTURE	8c	.215E+04	.215E+04
THERMAL FIRE - T=0.5 HR	9	.145E+02	.145E+02
THERMAL FIRE - T=1.0 HR	9	.145E+02	.145E+02
THERMAL FIRE - T=1.5 HR	9	.145E+02	.145E+02
THERMAL FIRE - T=2.0 HR	9	.145E+02	.145E+02
THERMAL FIRE - T=2.5 HR	9	.145E+02	.145E+02
THERMAL FIRE - T=3.0 HR	9	.145E+02	.145E+02
MAXIMUM STRESS INTENSITY		.103E+05	.103E+05

NOTES:
1. Pm < 2.4*Sm or 0.7*Su = 48.0 ksi
   Pm+Pb < 3.6*Sm or Su = 70.0 ksi
2. See Table 2.10.9.42 for combination index identification.
3. Stresses are given at the centroid of the element, therefore, the same stress value is used for Pm and Pm+Pb.

TABLE 2.10.9.108A. SUMMARY OF STRESSES FOR LOAD COMBINATIONS, ACCIDENT CONDITIONS OF TRANSPORT, STRESS POINT 19

LOAD COMBINATION	COMBINATION INDEX	STRESS INTENSITY CATEGORY Pm	Pm+Pb
FREE DROP 30 FOOT - TOP	7a	.134E+05	.134E+05
FREE DROP 30 FOOT - TOP	7b	.134E+05	.134E+05
FREE DROP 30 FOOT - TOP	7c	.134E+05	.134E+05
FREE DROP 30 FOOT - BOTTOM	7a	.223E+03	.223E+03
FREE DROP 30 FOOT - BOTTOM	7b	.223E+03	.223E+03
FREE DROP 30 FOOT - BOTTOM	7c	.223E+03	.223E+03
FREE DROP 30 FOOT - SIDE	7a	.279E+04	.279E+04
FREE DROP 30 FOOT - SIDE	7b	.279E+04	.279E+04
FREE DROP 30 FOOT - SIDE	7c	.279E+04	.279E+04
FREE DROP 30 FOOT - CG	7a	.949E+04	.949E+04
FREE DROP 30 FOOT - CG	7b	.949E+04	.949E+04
FREE DROP 30 FOOT - CG	7c	.949E+04	.949E+04
PUNCTURE	8a	.279E+04	.279E+04
PUNCTURE	8b	.279E+04	.279E+04
PUNCTURE	8c	.279E+04	.279E+04
THERMAL FIRE - T=0.5 HR	9	.145E+02	.145E+02
THERMAL FIRE - T=1.0 HR	9	.145E+02	.145E+02
THERMAL FIRE - T=1.5 HR	9	.145E+02	.145E+02
THERMAL FIRE - T=2.0 HR	9	.145E+02	.145E+02
THERMAL FIRE - T=2.5 HR	9	.145E+02	.145E+02
THERMAL FIRE - T=3.0 HR	9	.145E+02	.145E+02
MAXIMUM STRESS INTENSITY		.134E+05	.134E+05

NOTES:
1. Pm < 2.4*Sm or 0.7*Su = 48.0 ksi
   Pm+Pb < 3.6*Sm or Su = 70.0 ksi
2. See Table 2.10.9.42 for combination index identification.
3. Stresses are given at the centroid of the element, therefore, the same stress value is used for Pm and Pm+Pb.

TABLE 2.10.9.109. SUMMARY OF STRESSES FOR LOAD COMBINATIONS, ACCIDENT CONDITIONS OF TRANSPORT, STRESS POINT 20

LOAD COMBINATION	COMBINATION INDEX	STRESS INTENSITY CATEGORY Pm	Pm+Pb
FREE DROP 30 FOOT - TOP	7a	.151E+05	.151E+05
FREE DROP 30 FOOT - TOP	7b	.151E+05	.151E+05
FREE DROP 30 FOOT - TOP	7c	.151E+05	.151E+05
FREE DROP 30 FOOT - BOTTOM	7a	.736E+02	.736E+02
FREE DROP 30 FOOT - BOTTOM	7b	.736E+02	.736E+02
FREE DROP 30 FOOT - BOTTOM	7c	.736E+02	.736E+02
FREE DROP 30 FOOT - SIDE	7a	.979E+03	.979E+03
FREE DROP 30 FOOT - SIDE	7b	.979E+03	.979E+03
FREE DROP 30 FOOT - SIDE	7c	.979E+03	.979E+03
FREE DROP 30 FOOT - CG	7a	.344E+04	.344E+04
FREE DROP 30 FOOT - CG	7b	.344E+04	.344E+04
FREE DROP 30 FOOT - CG	7c	.344E+04	.344E+04
PUNCTURE	8a	.979E+03	.979E+03
PUNCTURE	8b	.979E+03	.979E+03
PUNCTURE	8c	.979E+03	.979E+03
THERMAL FIRE - T=0.5 HR	9	.874E+01	.874E+01
THERMAL FIRE - T=1.0 HR	9	.874E+01	.874E+01
THERMAL FIRE - T=1.5 HR	9	.874E+01	.874E+01
THERMAL FIRE - T=2.0 HR	9	.874E+01	.874E+01
THERMAL FIRE - T=2.5 HR	9	.874E+01	.874E+01
THERMAL FIRE - T=3.0 HR	9	.874E+01	.874E+01
MAXIMUM STRESS INTENSITY		.151E+05	.151E+05

NOTES:
1. Pm < 2.4*Sm or 0.7*Su = 48.0 ksi
   Pm+Pb < 3.6*Sm or Su = 70.0 ksi
2. See Table 2.10.9.42 for combination index identification.
3. Stresses are given at the centroid of the element, therefore, the same stress value is used for Pm and Pm+Pb.

TABLE 2.10.9.109A. SUMMARY OF STRESSES FOR LOAD COMBINATIONS, ACCIDENT CONDITIONS OF TRANSPORT, STRESS POINT 20

LOAD COMBINATION	COMBINATION INDEX	STRESS INTENSITY CATEGORY Pm	Pm+Pb
FREE DROP 30 FOOT - TOP	7a	.197E+05	.197E+05
FREE DROP 30 FOOT - TOP	7b	.197E+05	.197E+05
FREE DROP 30 FOOT - TOP	7c	.197E+05	.197E+05
FREE DROP 30 FOOT - BOTTOM	7a	.237E+03	.237E+03
FREE DROP 30 FOOT - BOTTOM	7b	.237E+03	.237E+03
FREE DROP 30 FOOT - BOTTOM	7c	.237E+03	.237E+03
FREE DROP 30 FOOT - SIDE	7a	.127E+04	.127E+04
FREE DROP 30 FOOT - SIDE	7b	.127E+04	.127E+04
FREE DROP 30 FOOT - SIDE	7c	.127E+04	.127E+04
FREE DROP 30 FOOT - CG	7a	.556E+04	.556E+04
FREE DROP 30 FOOT - CG	7b	.556E+04	.556E+04
FREE DROP 30 FOOT - CG	7c	.556E+04	.556E+04
PUNCTURE	8a	.127E+04	.127E+04
PUNCTURE	8b	.127E+04	.127E+04
PUNCTURE	8c	.127E+04	.127E+04
THERMAL FIRE - T=0.5 HR	9	.874E+01	.874E+01
THERMAL FIRE - T=1.0 HR	9	.874E+01	.874E+01
THERMAL FIRE - T=1.5 HR	9	.874E+01	.874E+01
THERMAL FIRE - T=2.0 HR	9	.874E+01	.874E+01
THERMAL FIRE - T=2.5 HR	9	.874E+01	.874E+01
THERMAL FIRE - T=3.0 HR	9	.874E+01	.874E+01
MAXIMUM STRESS INTENSITY		.197E+05	.197E+05

NOTES:
1. Pm < 2.4*Sm or 0.7*Su = 48.0 ksi
   Pm+Pb < 3.6*Sm or Su = 70.0 ksi
2. See Table 2.10.9.42 for combination index identification.
3. Stresses are given at the centroid of the element, therefore, the same stress value is used for Pm and Pm+Pb.

TABLE 2.10.9.110. SUMMARY OF STRESSES FOR LOAD COMBINATIONS, ACCIDENT CONDITIONS OF TRANSPORT, STRESS POINT 21

LOAD COMBINATION	COMBINATION INDEX	STRESS INTENSITY CATEGORY Pm	Pm+Pb
FREE DROP 30 FOOT - TOP	7a	.173E+05	.173E+05
FREE DROP 30 FOOT - TOP	7b	.173E+05	.173E+05
FREE DROP 30 FOOT - TOP	7c	.173E+05	.173E+05
FREE DROP 30 FOOT - BOTTOM	7a	.100E+04	.100E+04
FREE DROP 30 FOOT - BOTTOM	7b	.100E+04	.100E+04
FREE DROP 30 FOOT - BOTTOM	7c	.100E+04	.100E+04
FREE DROP 30 FOOT - SIDE	7a	.245E+03	.245E+03
FREE DROP 30 FOOT - SIDE	7b	.245E+03	.245E+03
FREE DROP 30 FOOT - SIDE	7c	.245E+03	.245E+03
FREE DROP 30 FOOT - CG	7a	.235E+03	.235E+03
FREE DROP 30 FOOT - CG	7b	.235E+03	.235E+03
FREE DROP 30 FOOT - CG	7c	.235E+03	.235E+03
PUNCTURE	8a	.245E+03	.245E+03
PUNCTURE	8b	.245E+03	.245E+03
PUNCTURE	8c	.245E+03	.245E+03
THERMAL FIRE - T=0.5 HR	9	.108E+03	.108E+03
THERMAL FIRE - T=1.0 HR	9	.108E+03	.108E+03
THERMAL FIRE - T=1.5 HR	9	.108E+03	.108E+03
THERMAL FIRE - T=2.0 HR	9	.108E+03	.108E+03
THERMAL FIRE - T=2.5 HR	9	.108E+03	.108E+03
THERMAL FIRE - T=3.0 HR	9	.108E+03	.108E+03
MAXIMUM STRESS INTENSITY		.173E+05	.173E+05

NOTES:
1. Pm < 2.4*Sm or 0.7*Su = 48.0 ksi
   Pm+Pb < 3.6*Sm or Su = 70.0 ksi
2. See Table 2.10.9.42 for combination index identification.
3. Stresses are given at the centroid of the element, therefore, the same stress value is used for Pm and Pm+Pb.

TABLE 2.10.9.110A. SUMMARY OF STRESSES FOR LOAD COMBINATIONS, ACCIDENT CONDITIONS OF TRANSPORT, STRESS POINT 21

LOAD COMBINATION	COMBINATION INDEX	STRESS INTENSITY CATEGORY Pm	Pm+Pb
FREE DROP 30 FOOT - TOP	7a	.245E+05	.245E+05
FREE DROP 30 FOOT - TOP	7b	.245E+05	.245E+05
FREE DROP 30 FOOT - TOP	7c	.245E+05	.245E+05
FREE DROP 30 FOOT - BOTTOM	7a	.110E+04	.110E+04
FREE DROP 30 FOOT - BOTTOM	7b	.110E+04	.110E+04
FREE DROP 30 FOOT - BOTTOM	7c	.110E+04	.110E+04
FREE DROP 30 FOOT - SIDE	7a	.286E+03	.286E+03
FREE DROP 30 FOOT - SIDE	7b	.286E+03	.286E+03
FREE DROP 30 FOOT - SIDE	7c	.286E+03	.286E+03
FREE DROP 30 FOOT - CG	7a	.313E+03	.313E+03
FREE DROP 30 FOOT - CG	7b	.313E+03	.313E+03
FREE DROP 30 FOOT - CG	7c	.313E+03	.313E+03
PUNCTURE	8a	.286E+03	.286E+03
PUNCTURE	8b	.286E+03	.286E+03
PUNCTURE	8c	.286E+03	.286E+03
THERMAL FIRE - T=0.5 HR	9	.108E+03	.108E+03
THERMAL FIRE - T=1.0 HR	9	.108E+03	.108E+03
THERMAL FIRE - T=1.5 HR	9	.108E+03	.108E+03
THERMAL FIRE - T=2.0 HR	9	.108E+03	.108E+03
THERMAL FIRE - T=2.5 HR	9	.108E+03	.108E+03
THERMAL FIRE - T=3.0 HR	9	.108E+03	.108E+03
MAXIMUM STRESS INTENSITY		.245E+05	.245E+05

NOTES:
1. Pm < 2.4*Sm or 0.7*Su = 48.0 ksi
   Pm+Pb < 3.6*Sm or Su = 70.0 ksi
2. See Table 2.10.9.42 for combination index identification.
3. Stresses are given at the centroid of the element, therefore, the same stress value is used for Pm and Pm+Pb.

TABLE 2.10.9.111. SUMMARY OF STRESSES FOR LOAD COMBINATIONS, ACCIDENT CONDITIONS OF TRANSPORT, STRESS POINT 22

LOAD COMBINATION	COMBINATION INDEX	STRESS INTENSITY CATEGORY Pm	Pm+Pb
FREE DROP 30 FOOT - TOP	7a	.517E+04	.517E+04
FREE DROP 30 FOOT - TOP	7b	.517E+04	.517E+04
FREE DROP 30 FOOT - TOP	7c	.517E+04	.517E+04
FREE DROP 30 FOOT - BOTTOM	7a	.949E+03	.949E+03
FREE DROP 30 FOOT - BOTTOM	7b	.949E+03	.949E+03
FREE DROP 30 FOOT - BOTTOM	7c	.949E+03	.949E+03
FREE DROP 30 FOOT - SIDE	7a	.449E+03	.449E+03
FREE DROP 30 FOOT - SIDE	7b	.449E+03	.449E+03
FREE DROP 30 FOOT - SIDE	7c	.449E+03	.449E+03
FREE DROP 30 FOOT - CG	7a	.423E+03	.423E+03
FREE DROP 30 FOOT - CG	7b	.423E+03	.423E+03
FREE DROP 30 FOOT - CG	7c	.423E+03	.423E+03
PUNCTURE	8a	.449E+03	.449E+03
PUNCTURE	8b	.449E+03	.449E+03
PUNCTURE	8c	.449E+03	.449E+03
THERMAL FIRE - T=0.5 HR	9	.190E+03	.190E+03
THERMAL FIRE - T=1.0 HR	9	.190E+03	.190E+03
THERMAL FIRE - T=1.5 HR	9	.190E+03	.190E+03
THERMAL FIRE - T=2.0 HR	9	.190E+03	.190E+03
THERMAL FIRE - T=2.5 HR	9	.190E+03	.190E+03
THERMAL FIRE - T=3.0 HR	9	.190E+03	.190E+03
MAXIMUM STRESS INTENSITY		.517E+04	.517E+04

NOTES:
1. Pm < 2.4*Sm or 0.7*Su = 48.0 ksi
   Pm+Pb < 3.6*Sm or Su = 70.0 ksi
2. See Table 2.10.9.42 for combination index identification.
3. Stresses are given at the centroid of the element, therefore, the same stress value is used for Pm and Pm+Pb.

TABLE 2.10.9.111A. SUMMARY OF STRESSES FOR LOAD COMBINATIONS, ACCIDENT CONDITIONS OF TRANSPORT, STRESS POINT 22

LOAD COMBINATION	COMBINATION INDEX	STRESS INTENSITY CATEGORY Pm	Pm+Pb
FREE DROP 30 FOOT - TOP	7a	.772E+04	.772E+04
FREE DROP 30 FOOT - TOP	7b	.772E+04	.772E+04
FREE DROP 30 FOOT - TOP	7c	.772E+04	.772E+04
FREE DROP 30 FOOT - BOTTOM	7a	.129E+04	.129E+04
FREE DROP 30 FOOT - BOTTOM	7b	.129E+04	.129E+04
FREE DROP 30 FOOT - BOTTOM	7c	.129E+04	.129E+04
FREE DROP 30 FOOT - SIDE	7a	.527E+03	.527E+03
FREE DROP 30 FOOT - SIDE	7b	.527E+03	.527E+03
FREE DROP 30 FOOT - SIDE	7c	.527E+03	.527E+03
FREE DROP 30 FOOT - CG	7a	.567E+03	.567E+03
FREE DROP 30 FOOT - CG	7b	.567E+03	.567E+03
FREE DROP 30 FOOT - CG	7c	.567E+03	.567E+03
PUNCTURE	8a	.527E+03	.527E+03
PUNCTURE	8b	.527E+03	.527E+03
PUNCTURE	8c	.527E+03	.527E+03
THERMAL FIRE - T=0.5 HR	9	.190E+03	.190E+03
THERMAL FIRE - T=1.0 HR	9	.190E+03	.190E+03
THERMAL FIRE - T=1.5 HR	9	.190E+03	.190E+03
THERMAL FIRE - T=2.0 HR	9	.190E+03	.190E+03
THERMAL FIRE - T=2.5 HR	9	.190E+03	.190E+03
THERMAL FIRE - T=3.0 HR	9	.190E+03	.190E+03
MAXIMUM STRESS INTENSITY		.772E+04	.772E+04

NOTES:
1. Pm < 2.4*Sm or 0.7*Su = 48.0 ksi
   Pm+Pb < 3.6*Sm or Su = 70.0 ksi
2. See Table 2.10.9.42 for combination index identification.
3. Stresses are given at the centroid of the element, therefor the same stress value is used for Pm and Pm+Pb.

TABLE 2.10.9.112. SUMMARY OF STRESSES FOR LOAD COMBINATIONS, ACCIDENT CONDITIONS OF TRANSPORT, STRESS POINT 23

LOAD COMBINATION	COMBINATION INDEX	STRESS INTENSITY CATEGORY Pm	Pm+Pb
FREE DROP 30 FOOT - TOP	7a	.424E+04	.424E+04
FREE DROP 30 FOOT - TOP	7b	.424E+04	.424E+04
FREE DROP 30 FOOT - TOP	7c	.424E+04	.424E+04
FREE DROP 30 FOOT - BOTTOM	7a	.726E+03	.726E+03
FREE DROP 30 FOOT - BOTTOM	7b	.726E+03	.726E+03
FREE DROP 30 FOOT - BOTTOM	7c	.726E+03	.726E+03
FREE DROP 30 FOOT - SIDE	7a	.123E+03	.123E+03
FREE DROP 30 FOOT - SIDE	7b	.123E+03	.123E+03
FREE DROP 30 FOOT - SIDE	7c	.123E+03	.123E+03
FREE DROP 30 FOOT - CG	7a	.299E+03	.299E+03
FREE DROP 30 FOOT - CG	7b	.299E+03	.299E+03
FREE DROP 30 FOOT - CG	7c	.299E+03	.299E+03
PUNCTURE	8a	.123E+03	.123E+03
PUNCTURE	8b	.123E+03	.123E+03
PUNCTURE	8c	.123E+03	.123E+03
THERMAL FIRE - T=0.5 HR	9	.836E+01	.836E+01
THERMAL FIRE - T=1.0 HR	9	.836E+01	.836E+01
THERMAL FIRE - T=1.5 HR	9	.836E+01	.836E+01
THERMAL FIRE - T=2.0 HR	9	.836E+01	.836E+01
THERMAL FIRE - T=2.5 HR	9	.836E+01	.836E+01
THERMAL FIRE - T=3.0 HR	9	.836E+01	.836E+01
MAXIMUM STRESS INTENSITY		.424E+04	.424E+04

NOTES:
1. Pm < 2.4*Sm or 0.7*Su = 48.0 ksi
   Pm+Pb < 3.6*Sm or Su = 70.0 ksi
2. See Table 2.10.9.42 for combination index identification.
3. Stresses are given at the centroid of the element, therefore, the same stress value is used for Pm and Pm+Pb.

TABLE 2.10.9.112A. SUMMARY OF STRESSES FOR LOAD COMBINATIONS, ACCIDENT CONDITIONS OF TRANSPORT, STRESS POINT 23

LOAD COMBINATION	COMBINATION INDEX	STRESS INTENSITY CATEGORY Pm	Pm+Pb
FREE DROP 30 FOOT - TOP	7a	.626E+04	.626E+04
FREE DROP 30 FOOT - TOP	7b	.626E+04	.626E+04
FREE DROP 30 FOOT - TOP	7c	.626E+04	.626E+04
FREE DROP 30 FOOT - BOTTOM	7a	.906E+03	.906E+03
FREE DROP 30 FOOT - BOTTOM	7b	.906E+03	.906E+03
FREE DROP 30 FOOT - BOTTOM	7c	.906E+03	.906E+03
FREE DROP 30 FOOT - SIDE	7a	.158E+03	.158E+03
FREE DROP 30 FOOT - SIDE	7b	.158E+03	.158E+03
FREE DROP 30 FOOT - SIDE	7c	.158E+03	.158E+03
FREE DROP 30 FOOT - CG	7a	.479E+03	.479E+03
FREE DROP 30 FOOT - CG	7b	.479E+03	.479E+03
FREE DROP 30 FOOT - CG	7c	.479E+03	.479E+03
PUNCTURE	8a	.158E+03	.158E+03
PUNCTURE	8b	.158E+03	.158E+03
PUNCTURE	8c	.158E+03	.158E+03
THERMAL FIRE - T=0.5 HR	9	.836E+01	.836E+01
THERMAL FIRE - T=1.0 HR	9	.836E+01	.836E+01
THERMAL FIRE - T=1.5 HR	9	.836E+01	.836E+01
THERMAL FIRE - T=2.0 HR	9	.836E+01	.836E+01
THERMAL FIRE - T=2.5 HR	9	.836E+01	.836E+01
THERMAL FIRE - T=3.0 HR	9	.836E+01	.836E+01
MAXIMUM STRESS INTENSITY		.626E+04	.626E+04

NOTES:
1. Pm < 2.4*Sm or 0.7*Su = 48.0 ksi
   Pm+Pb < 3.6*Sm or Su = 70.0 ksi
2. See Table 2.10.9.42 for combination index identification.
3. Stresses are given at the centroid of the element, therefore, the same stress value is used for Pm and Pm+Pb.

TABLE 2.10.9.113. SUMMARY OF STRESSES FOR LOAD COMBINATIONS, ACCIDENT CONDITIONS OF TRANSPORT, STRESS POINT 24

LOAD COMBINATION	COMBINATION INDEX	STRESS INTENSITY CATEGORY Pm	Pm+Pb
FREE DROP 30 FOOT - TOP	7a	.857E+04	.857E+04
FREE DROP 30 FOOT - TOP	7b	.857E+04	.857E+04
FREE DROP 30 FOOT - TOP	7c	.857E+04	.857E+04
FREE DROP 30 FOOT - BOTTOM	7a	.172E+04	.172E+04
FREE DROP 30 FOOT - BOTTOM	7b	.172E+04	.172E+04
FREE DROP 30 FOOT - BOTTOM	7c	.172E+04	.172E+04
FREE DROP 30 FOOT - SIDE	7a	.249E+04	.249E+04
FREE DROP 30 FOOT - SIDE	7b	.249E+04	.249E+04
FREE DROP 30 FOOT - SIDE	7c	.249E+04	.249E+04
FREE DROP 30 FOOT - CG	7a	.340E+04	.340E+04
FREE DROP 30 FOOT - CG	7b	.340E+04	.340E+04
FREE DROP 30 FOOT - CG	7c	.340E+04	.340E+04
PUNCTURE	8a	.249E+04	.249E+04
PUNCTURE	8b	.249E+04	.249E+04
PUNCTURE	8c	.249E+04	.249E+04
THERMAL FIRE - T=0.5 HR	9	.857E+02	.857E+02
THERMAL FIRE - T=1.0 HR	9	.857E+02	.857E+02
THERMAL FIRE - T=1.5 HR	9	.857E+02	.857E+02
THERMAL FIRE - T=2.0 HR	9	.857E+02	.857E+02
THERMAL FIRE - T=2.5 HR	9	.857E+02	.857E+02
THERMAL FIRE - T=3.0 HR	9	.857E+02	.857E+02
MAXIMUM STRESS INTENSITY		.857E+04	.857E+04

NOTES:
1. Pm < 2.4*Sm or 0.7*Su = 48.0 ksi
   Pm+Pb < 3.6*Sm or Su = 70.0 ksi
2. See Table 2.10.9.42 for combination index identification.
3. Stresses are given at the centroid of the element, therefore, the same stress value is used for Pm and Pm+Pb.

TABLE 2.10.9.113A. SUMMARY OF STRESSES FOR LOAD COMBINATIONS, ACCIDENT CONDITIONS OF TRANSPORT, STRESS POINT 24

LOAD COMBINATION	COMBINATION INDEX	STRESS INTENSITY CATEGORY Pm	Pm+Pb
FREE DROP 30 FOOT - TOP	7a	.118E+05	.118E+05
FREE DROP 30 FOOT - TOP	7b	.118E+05	.118E+05
FREE DROP 30 FOOT - TOP	7c	.118E+05	.118E+05
FREE DROP 30 FOOT - BOTTOM	7a	.234E+04	.234E+04
FREE DROP 30 FOOT - BOTTOM	7b	.234E+04	.234E+04
FREE DROP 30 FOOT - BOTTOM	7c	.234E+04	.234E+04
FREE DROP 30 FOOT - SIDE	7a	.321E+04	.321E+04
FREE DROP 30 FOOT - SIDE	7b	.321E+04	.321E+04
FREE DROP 30 FOOT - SIDE	7c	.321E+04	.321E+04
FREE DROP 30 FOOT - CG	7a	.545E+04	.545E+04
FREE DROP 30 FOOT - CG	7b	.545E+04	.545E+04
FREE DROP 30 FOOT - CG	7c	.545E+04	.545E+04
PUNCTURE	3a	.321E+04	.321E+04
PUNCTURE	8b	.321E+04	.321E+04
PUNCTURE	8c	.321E+04	.321E+04
THERMAL FIRE - T=0.5 HR	9	.857E+02	.857E+02
THERMAL FIRE - T=1.0 HR	9	.857E+02	.857E+02
THERMAL FIRE - T=1.5 HR	9	.857E+02	.857E+02
THERMAL FIRE - T=2.0 HR	9	.857E+02	.857E+02
THERMAL FIRE - T=2.5 HR	9	.857E+02	.857E+02
THERMAL FIRE - T=3.0 HR	9	.857E+02	.857E+02
MAXIMUM STRESS INTENSITY		.118E+05	.118E+05

NOTES:
1. Pm < 2.4*Sm or 0.7*Su = 48.0 ksi
   Pm+Pb < 3.6*Sm or Su = 70.0 ksi
2. See Table 2.10.9.42 for combination index identification.
3. Stresses are given at the centroid of the element, therefore, the same stress value is used for Pm and Pm+Pb.

TABLE 2.10.9.114. SUMMARY OF STRESSES FOR LOAD COMBINATIONS, ACCIDENT CONDITIONS OF TRANSPORT, STRESS POINT 25

LOAD COMBINATION	COMBINATION INDEX	STRESS INTENSITY CATEGORY Pm	Pm+Pb
FREE DROP 30 FOOT - TOP	7a	.971E+04	.971E+04
FREE DROP 30 FOOT - TOP	7b	.971E+04	.971E+04
FREE DROP 30 FOOT - TOP	7c	.971E+04	.971E+04
FREE DROP 30 FOOT - BOTTOM	7a	.178E+04	.178E+04
FREE DROP 30 FOOT - BOTTOM	7b	.178E+04	.178E+04
FREE DROP 30 FOOT - BOTTOM	7c	.178E+04	.178E+04
FREE DROP 30 FOOT - SIDE	7a	.138E+05	.138E+05
FREE DROP 30 FOOT - SIDE	7b	.138E+05	.138E+05
FREE DROP 30 FOOT - SIDE	7c	.138E+05	.138E+05
FREE DROP 30 FOOT - CG	7a	.522E+04	.522E+04
FREE DROP 30 FOOT - CG	7b	.522E+04	.522E+04
FREE DROP 30 FOOT - CG	7c	.522E+04	.522E+04
PUNCTURE	8a	.138E+05	.138E+05
PUNCTURE	8b	.138E+05	.138E+05
PUNCTURE	8c	.138E+05	.138E+05
THERMAL FIRE - T=0.5 HR	9	.573E+02	.573E+02
THERMAL FIRE - T=1.0 HR	9	.573E+02	.573E+02
THERMAL FIRE - T=1.5 HR	9	.573E+02	.573E+02
THERMAL FIRE - T=2.0 HR	9	.573E+02	.573E+02
THERMAL FIRE - T=2.5 HR	9	.573E+02	.573E+02
THERMAL FIRE - T=3.0 HR	9	.573E+02	.573E+02
MAXIMUM STRESS INTENSITY		.138E+05	.138E+05

NOTES:
1. Pm < 2.4*Sm or 0.7*Su = 48.0 ksi
   Pm+Pb < 3.6*Sm or Su = 70.0 ksi
2. See Table 2.10.9.42 for combination index identification.
3. Stresses are given at the centroid of the element, therefore, the same stress value is used for Pm and Pm+Pb.

TABLE 2.10.9.114A. SUMMARY OF STRESSES FOR LOAD COMBINATIONS, ACCIDENT CONDITIONS OF TRANSPORT, STRESS POINT 25

LOAD COMBINATION	COMBINATION INDEX	STRESS INTENSITY CATEGORY Pm	Pm+Pb
FREE DROP 30 FOOT - TOP	7a	.135E+05	.135E+05
FREE DROP 30 FOOT - TOP	7b	.135E+05	.135E+05
FREE DROP 30 FOOT - TOP	7c	.135E+05	.135E+05
FREE DROP 30 FOOT - BOTTOM	7a	.259E+04	.259E+04
FREE DROP 30 FOOT - BOTTOM	7b	.259E+04	.259E+04
FREE DROP 30 FOOT - BOTTOM	7c	.259E+04	.259E+04
FREE DROP 30 FOOT - SIDE	7a	.180E+05	.180E+05
FREE DROP 30 FOOT - SIDE	7b	.180E+05	.180E+05
FREE DROP 30 FOOT - SIDE	7c	.180E+05	.180E+05
FREE DROP 30 FOOT - CG	7a	.843E+04	.843E+04
FREE DROP 30 FOOT - CG	7b	.843E+04	.843E+04
FREE DROP 30 FOOT - CG	7c	.843E+04	.843E+04
PUNCTURE	8a	.180E+05	.180E+05
PUNCTURE	8b	.180E+05	.180E+05
PUNCTURE	8c	.180E+05	.180E+05
THERMAL FIRE - T=0.5 HR	9	.573E+02	.573E+02
THERMAL FIRE - T=1.0 HR	9	.573E+02	.573E+02
THERMAL FIRE - T=1.5 HR	9	.573E+02	.573E+02
THERMAL FIRE - T=2.0 HR	9	.573E+02	.573E+02
THERMAL FIRE - T=2.5 HR	9	.573E+02	.573E+02
THERMAL FIRE - T=3.0 HR	9	.573E+02	.573E+02
MAXIMUM STRESS INTENSITY		.180E+05	.180E+05

NOTES:
1. Pm < 2.4*Sm or 0.7*Su = 48.0 ksi
   Pm+Pb < 3.6*Sm or Su = 70.0 ksi
2. See Table 2.10.9.42 for combination index identification.
3. Stresses are given at the centroid of the element, therefore, the same stress value is used for Pm and Pm+Pb.

TABLE 2.10.9.115. SUMMARY OF STRESSES FOR LOAD COMBINATIONS, ACCIDENT CONDITIONS OF TRANSPORT, STRESS POINT 26

LOAD COMBINATION	COMBINATION INDEX	STRESS INTENSITY CATEGORY Pm	Pm+Pb
FREE DROP 30 FOOT - TOP	7a	.616E+04	.616E+04
FREE DROP 30 FOOT - TOP	7b	.616E+04	.616E+04
FREE DROP 30 FOOT - TOP	7c	.616E+04	.616E+04
FREE DROP 30 FOOT - BOTTOM	7a	.595E+03	.595E+03
FREE DROP 30 FOOT - BOTTOM	7b	.595E+03	.595E+03
FREE DROP 30 FOOT - BOTTOM	7c	.595E+03	.595E+03
FREE DROP 30 FOOT - SIDE	7a	.589E+04	.589E+04
FREE DROP 30 FOOT - SIDE	7b	.589E+04	.589E+04
FREE DROP 30 FOOT - SIDE	7c	.589E+04	.589E+04
FREE DROP 30 FOOT - CG	7a	.109E+04	.109E+04
FREE DROP 30 FOOT - CG	7b	.109E+04	.109E+04
FREE DROP 30 FOOT - CG	7c	.109E+04	.109E+04
PUNCTURE	8a	.589E+04	.589E+04
PUNCTURE	8b	.589E+04	.589E+04
PUNCTURE	8c	.589E+04	.589E+04
THERMAL FIRE - T=0.5 HR	9	.385E+02	.385E+02
THERMAL FIRE - T=1.0 HR	9	.385E+02	.385E+02
THERMAL FIRE - T=1.5 HR	9	.385E+02	.385E+02
THERMAL FIRE - T=2.0 HR	9	.385E+02	.385E+02
THERMAL FIRE - T=2.5 HR	9	.385E+02	.385E+02
THERMAL FIRE - T=3.0 HR	9	.385E+02	.385E+02
MAXIMUM STRESS INTENSITY		.616E+04	.616E+04

NOTES:
1. Pm < 2.4*Sm or 0.7*Su = 48.0 ksi
   Pm+Pb < 3.6*Sm or Su = 70.0 ksi
2. See Table 2.10.9.42 for combination index identification.
3. Stresses are given at the centroid of the element, therefore, the same stress value is used for Pm and Pm+Pb.

TABLE 2.10.9.115A. SUMMARY OF STRESSES FOR LOAD COMBINATIONS, ACCIDENT CONDITIONS OF TRANSPORT, STRESS POINT 26

LOAD COMBINATION	COMBINATION INDEX	STRESS INTENSITY CATEGORY Pm	Pm+Pb
FREE DROP 30 FOOT - TOP	7a	.814E+04	.814E+04
FREE DROP 30 FOOT - TOP	7b	.814E+04	.814E+04
FREE DROP 30 FOOT - TOP	7c	.814E+04	.814E+04
FREE DROP 30 FOOT - BOTTOM	7a	.864E+03	.864E+03
FREE DROP 30 FOOT - BOTTOM	7b	.864E+03	.864E+03
FREE DROP 30 FOOT - BOTTOM	7c	.864E+03	.864E+03
FREE DROP 30 FOOT - SIDE	7a	.764E+04	.764E+04
FREE DROP 30 FOOT - SIDE	7b	.764E+04	.764E+04
FREE DROP 30 FOOT - SIDE	7c	.764E+04	.764E+04
FREE DROP 30 FOOT - CG	7a	.175E+04	.175E+04
FREE DROP 30 FOOT - CG	7b	.175E+04	.175E+04
FREE DROP 30 FOOT - CG	7c	.175E+04	.175E+04
PUNCTURE	8a	.764E+04	.764E+04
PUNCTURE	8b	.764E+04	.764E+04
PUNCTURE	8c	.764E+04	.764E+04
THERMAL FIRE - T=0.5 HR	9	.385E+02	.385E+02
THERMAL FIRE - T=1.0 HR	9	.385E+02	.385E+02
THERMAL FIRE - T=1.5 HR	9	.385E+02	.385E+02
THERMAL FIRE - T=2.0 HR	9	.385E+02	.385E+02
THERMAL FIRE - T=2.5 HR	9	.385E+02	.385E+02
THERMAL FIRE - T=3.0 HR	9	.385E+02	.385E+02
MAXIMUM STRESS INTENSITY		.814E+04	.814E+04

NOTES:
1. Pm < 2.4*Sm or 0.7*Su = 48.0 ksi
   Pm+Pb < 3.6*Sm or Su = 70.0 ksi
2. See Table 2.10.9.42 for combination index identification.
3. Stresses are given at the centroid of the element, therefore, the same stress value is used for Pm and Pm+Pb.

TABLE 2.10.9.116. SUMMARY OF STRESSES FOR LOAD COMBINATIONS, ACCIDENT CONDITIONS OF TRANSPORT, STRESS POINT 27

LOAD COMBINATION	COMBINATION INDEX	STRESS INTENSITY CATEGORY Pm	Pm+Pb
FREE DROP 30 FOOT - TOP	7a	.540E+04	.540E+04
FREE DROP 30 FOOT - TOP	7b	.540E+04	.540E+04
FREE DROP 30 FOOT - TOP	7c	.540E+04	.540E+04
FREE DROP 30 FOOT - BOTTOM	7a	.438E+03	.438E+03
FREE DROP 30 FOOT - BOTTOM	7b	.438E+03	.438E+03
FREE DROP 30 FOOT - BOTTOM	7c	.438E+03	.438E+03
FREE DROP 30 FOOT - SIDE	7a	.612E+04	.612E+04
FREE DROP 30 FOOT - SIDE	7b	.612E+04	.612E+04
FREE DROP 30 FOOT - SIDE	7c	.612E+04	.612E+04
FREE DROP 30 FOOT - CG	7a	.963E+03	.963E+03
FREE DROP 30 FOOT - CG	7b	.963E+03	.963E+03
FREE DROP 30 FOOT - CG	7c	.963E+03	.963E+03
PUNCTURE	8a	.612E+04	.612E+04
PUNCTURE	8b	.612E+04	.612E+04
PUNCTURE	8c	.612E+04	.612E+04
THERMAL FIRE - T=0.5 HR	9	.698E+02	.698E+02
THERMAL FIRE - T=1.0 HR	9	.698E+02	.698E+02
THERMAL FIRE - T=1.5 HR	9	.698E+02	.698E+02
THERMAL FIRE - T=2.0 HR	9	.698E+02	.698E+02
THERMAL FIRE - T=2.5 HR	9	.698E+02	.698E+02
THERMAL FIRE - T=3.0 HR	9	.698E+02	.698E+02
MAXIMUM STRESS INTENSITY		.612E+04	.612E+04

NOTES:
1. Pm < 2.4*Sm or 0.7*Su = 48.0 ksi
   Pm+Pb < 3.6*Sm or Su = 70.0 ksi
2. See Table 2.10.9.42 for combination index identification.
3. Stresses are given at the centroid of the element, therefore, the same stress value is used for Pm and Pm+Pb.

TABLE 2.10.9.116A. SUMMARY OF STRESSES FOR LOAD COMBINATIONS, ACCIDENT CONDITIONS OF TRANSPORT, STRESS POINT 27

LOAD COMBINATION	COMBINATION INDEX	STRESS INTENSITY CATEGORY Pm	Pm+Pb
FREE DROP 30 FOOT - TOP	7a	.710E+04	.710E+04
FREE DROP 30 FOOT - TOP	7b	.710E+04	.710E+04
FREE DROP 30 FOOT - TOP	7c	.710E+04	.710E+04
FREE DROP 30 FOOT - BOTTOM	7a	.624E+03	.624E+03
FREE DROP 30 FOOT - BOTTOM	7b	.624E+03	.624E+03
FREE DROP 30 FOOT - BOTTOM	7c	.624E+03	.624E+03
FREE DROP 30 FOOT - SIDE	7a	.794E+04	.794E+04
FREE DROP 30 FOOT - SIDE	7b	.794E+04	.794E+04
FREE DROP 30 FOOT - SIDE	7c	.794E+04	.794E+04
FREE DROP 30 FOOT - CG	7a	.152E+04	.152E+04
FREE DROP 30 FOOT - CG	7b	.152E+04	.152E+04
FREE DROP 30 FOOT - CG	7c	.152E+04	.152E+04
PUNCTURE	8a	.794E+04	.794E+04
PUNCTURE	8b	.794E+04	.794E+04
PUNCTURE	8c	.794E+04	.794E+04
THERMAL FIRE - T=0.5 HR	9	.698E+02	.698E+02
THERMAL FIRE - T=1.0 HR	9	.698E+02	.698E+02
THERMAL FIRE - T=1.5 HR	9	.698E+02	.698E+02
THERMAL FIRE - T=2.0 HR	9	.698E+02	.698E+02
THERMAL FIRE - T=2.5 HR	9	.698E+02	.698E+02
THERMAL FIRE - T=3.0 HR	9	.698E+02	.698E+02
MAXIMUM STRESS INTENSITY		.794E+04	.794E+04

NOTES:
1. Pm < 2.4*Sm or 0.7*Su = 48.0 ksi
   Pm+Pb < 3.6*Sm or Su = 70.0 ksi
2. See Table 2.10.9.42 for combination index identification.
3. Stresses are given at the centroid of the element, therefore, the same stress value is used for Pm and Pm+Pb.

2.10.10 Buckling Analysis Per ASME Code Case N-284

The Model 2000 cask shells, under normal and accidental conditions, are potentially subject to forces which could cause buckling instability (e.g., shrink-fit pressure of lead onto the inner shell, side drop event forces, etc.). Buckling is an unacceptable failure mode for the containment vessel per Reference 2.11.2. The buckling evaluation that follows is based upon the

ASME Code Case N-284.[3] It is performed for the effects of two toroid wall thickness sizes, 0.50 and 0.76 inch, for the drop environment. The evaluation shows that buckling is not a mode of failure for the Model 2000 cask under normal or accident conditions for both toroid wall thickness sizes.

Under the requirements of Code Case N-284 for a shell buckling evaluation of an unstiffened cylindrical shell, the following steps are required.

1. Stress Analysis Procedure. The governing factor in the buckling analysis of a containment shell is the compressive membrane stress zones. The internal stress field which controls the buckling of a cylindrical shell consists of the longitudinal membrane, circumferential membrane, and in-plane shear stresses. An axisymmetric finite model is used in the analyses of all applied loadings. Nonaxisymmetric loadings are considered by use of an adequate number of Fourier harmonics. Thermal stresses are treated the same as primary stresses. Axisymmetric applied load conditions consider the in-plane shear stress as 0.0. When combining the effects of different applied loads which act concurrently, each of the three stress components is summed algebraically. If the sum of the longitudinal or circumferential components is tension, then that stress component is set to zero.

   The evaluation presented within this section uses the maximum stress values for each component from all load combinations described in TABLE 2.10.9.42. The load combination selected and the resulting stresses are given in TABLE 2.10.10.1. Stresses are the average values through the entire length of the shell. Similar values can be obtained by averaging the component stress values given in Subsection 2.10.9 tables for the applicable load combination as follows.

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[3] Cases of ASME Boiler and Pressure Vessel Code, Case N-284, "Metal Containment Shell Buckling Design Methods", Section III, Division 1, Class MC; August, 1980.

For σ_θ (σ_3) normal conditions, inner shell:

LOCATION	LOADING CONDITION		
	100°F Temp. + D.H. + Solar + Fab. Stress (Table 2.10.9.2)	30 psi Internal Pressure (Table 2.10.9.13)	1-Foot Drop Top Orientation (Table 2.10.9.24)
7a	-11,000.0	45.3	- 62.9
7b	2,120.0	-9.2	- 35.3
9a	- 6,280.0	110.0	-208.0
9b	- 5,870.0	101.0	-207.0
11a	- 6,380.0	108.0	-208.0
11b	- 5,930.0	98.7	-208.0
13a	- 6,350.0	110.0	-229.0
13b	- 5,860.0	103.0	-187.0
15a	- 2,740.0	7.3	-223.0
15b	- 2,460.0	35.4	-136.0
Average Stress	- 5,075	71	-170

$\sigma_\theta = - 5{,}075 + 71 - 170 = \underline{\underline{5{,}174}}$

TABLE 2.10.10. CALCULATED MEMBRANE STRESS COMPONENT - PSI

STRESS COMPONENT	TOROID WALL THICKNESS, 0.5 IN.			
	NORMAL		ACCIDENT	
	Inner Load Combination	Outer Load Combination	Inner Load Combination	Outer Load Combination
σ_ϕ	5,277	2,219	9,448	6,483
	Free drop @ -20ºF temp. plus press., side orientation (45º meridian)	Free drop @ 100ºF temp. plus press., side orientation (45º meridian)	30-ft. drop @ -20ºF temp. plus press., BTM orientation	30-ft. drop @ 100ºF temp. plus press., side orientation (0º meridian)
σ_θ	6,014	322	11,861	1,421
	Free drop @ 100ºF temp. plus press., top orientation	Free drop @ -20ºF temp. plus press., side orientation (0º meridian)	30-ft. drop @ 100ºF temp. plus press., BTM orientation	30-ft. drop @ -20ºF temp. plus press., side orientation (0º meridian)
$\sigma_{\phi\theta}$	1,836	2,714	2,722	4,720
	Free drop @ 100ºF temp. plus press., side orientation (45º meridian)	Free drop @ 100ºF temp. plus press., side orientation (45º meridian)	30-ft. drop @ 100ºF temp. plus press., side orientation (0º meridian)	30-ft. drop @ 100ºF temp. plus press., side orientation (0º meridian)

TABLE 2.10.10.1A. CALCULATED MEMBRANE STRESS COMPONENT - PSI

STRESS COMPONENT	TOROID WALL THICKNESS, 0.76 IN.			
	NORMAL		ACCIDENT	
	Inner Load Combination	Outer Load Combination	Inner Load Combination	Outer Load Combination
σ_ϕ	7,274	7,057	11,408	8,300
	Free drop @ -20°F temp. plus press., side orientation (45° meridian)	Free drop @ 100°F temp. plus press., side orientation (45° meridian)	30-ft. drop @ -20°F temp. plus press., BTM orientation	30-ft. drop @ 100°F temp. plus press., side orientation (0° meridian)
σ_θ	8,806	1,348	15,574	1,865
	Free drop @ 100°F temp. plus press., top orientation	Free drop @ -20°F temp. plus press., side orientation (0° meridian)	30-ft. drop @ 100°F temp. plus press., BTM orientation	30-ft. drop @ -20°F temp. plus press., side orientation (0° meridian)
$\sigma_{\phi\theta}$	5,319	5,538	3,373	5,661
	Free drop @ 100°F temp. plus press., side orientation (45° meridian)	Free drop @ 100°F temp. plus press., side orientation (45° meridian)	30-ft. drop @ 100°F temp. plus press., side orientation (0° meridian)	30-ft. drop @ 100°F temp. plus press., side orientation (0° meridian)

where:

σ_ϕ = calculated meridianal membrane stress

σ_θ = calculated circumferential membrane stress

$\sigma_{\phi\theta}$ = = calculated in-plane shear stress component

2. **Application of Factors of Safety (FS).** These factors are applied to the calculated membrane stress components.

For Normal Transport Conditions, Level A Service Limits, FS = 2.0.

For Accident Conditions, Level D Service Limits, FS = 1.34.

3. **Application of Capacity Reduction Factors (α_i).** These factors are applied to the calculated membrane stress components to account for the difference between classical theory and predicted instability stresses for fabricated shells.

(a) Axial Compression
Use the larger of the values determined for α_ϕ from (i) and (ii).

(i) Effect of R/t, use the smaller value of:

$$\left.\begin{array}{l}\alpha_\phi = 1.52 - 0.473\log_{10}(R/t) \\ \alpha_\phi = 1.0 \times 10^{-5}\,\sigma_y - 0.033\end{array}\right) \quad \text{for } R/t < 600$$

(ii) Effect of length

$$\alpha_\phi = 0.207 \qquad \text{if } M \geq 10$$

where:

			Inner Shell	Outer Shell
R	=	shell radius (in.)	13.75	18.75
t	=	shell. thickness (in.)	1.0	1.0
ℓ_i	=	distance in i direction between lines of support (in.)	56.0	56.0
σ_y	=	yield stress of material at design temperature (ksi)		
		Normal conditions	24.5	24.5
		Accident conditions	22.5	22.5
Mi	=	$\ell_i / \sqrt{Rt}$	15.10	12.93

Results from (i) and (ii) define the capacity reduction factors for axial compression for:

Normal condition - inner shell: $\alpha_\phi = 0.212$

Normal condition - outer shell: $\alpha_\phi = 0.212$

Accident condition - inner shell: $\alpha_\phi = 0.207$

Accident condition - outer shell: $\alpha_\phi = 0.207$

(b) Hoop Compression

$$\alpha_\theta = 0.8 \quad \text{(for both inner and outer shells)}$$

(c) Shear (for R/t ≤ 250)

$$\alpha_{\phi\theta} = 0.8 \quad \text{(for both inner and outer shells)}$$

4. Application of Plasticity Reduction Factors (η_i). The elastic buckling stresses for fabricated shells are given by the product of the classical buckling stresses and the capacity reduction factors, i.e., $\sigma_{ie}\ \alpha_i$. When these values exceed the proportional limit of the fabricated material, plasticity reduction factors, η_i, are used to account for the non-linear material properties. The inelastic buckling stresses for fabricated shells are given by $\eta_i\ \sigma_{ie}\ \alpha_i$.

(a) Axial Compression

$$\eta_\phi = 1.0 \qquad \text{if } \frac{\sigma_\phi FS}{\sigma_y} < 0.55$$

$$\eta_\phi = \frac{0.18}{1 - \dfrac{0.45\ \sigma_y}{\sigma_\phi FS}} \qquad \text{if } 0.55 < \frac{\sigma_\phi FS}{\sigma_y} \le 0.738$$

$$\eta_\phi = 1.31 - 1.15\ \frac{\sigma_\phi FS}{\sigma_y} \qquad \text{if } 0.738 < \frac{\sigma_\phi FS}{\sigma_y} < 1.0$$

(b) Hoop Compression

$$\eta_\theta = 1.0 \qquad \text{if } \frac{\sigma_\theta FS}{\sigma_y} \le 0.67$$

$$\eta_\theta = 2.53 - 2.29\ \frac{\sigma_\theta FS}{\sigma_y} \qquad \text{if } 0.67 < \frac{\sigma_\theta FS}{\sigma_y} \le 1.0$$

(c) Shear

$$\eta_{\phi\theta} = 1.0 \qquad \text{if } \frac{\sigma_{\phi\theta}FS}{\sigma_y} \leq 0.48$$

$$\eta_{\phi\theta} = \frac{0.1}{1 - \frac{0.43\ \sigma_y}{\sigma_{\phi\theta}FS}} \qquad \text{if } 0.48 < \frac{\sigma_{\phi\theta}FS}{\sigma_y} \leq$$

0.6

Using the calculated stresses listed in Table 2.10.10.1 in the equations defined above gives the plasticity reduction factors shown in Table 2.10.10.2. Inelastic buckling relationship must be satisfied when any of the values of η_i is less than 1.0. Results show that the inner shell in accident conditions η_ϕ and η_θ is less than 1.0. Therefore, the inner shell is evaluated for inelastic buckling for the accident conditions.

TABLE 2.10.10.2. PLASTICITY REDUCTION FACTORS

Load Condition	Toroid, 0.5-in. wall Normal		Toroid, 0.5-in. wall Accident		Toroid, 0.76-in. wall Normal		Toroid, 0.76-in. wall Accident	
Shell	Inner	Outer	Inner	Outer	Inner	Outer	Inner	Outer
$\sigma_\phi FS/\sigma_y$	.431	.017	.563	.386	.594	.576	.679	.494
η_ϕ	1.0	1.0	.897	1.0	.74	.82	.53	1.0
$\sigma_\theta FS/\sigma_y$	.491	.026	.706	.085	.719	.110	.928	.1
η_θ	1.0	1.0	.913	1.0	.88	1.0	.41	1.0
$\sigma_{\phi\theta} FS/\sigma_y$	.150	.222	.162	.282	.434	.452	.201	.337
$\eta_{\phi\theta}$	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0

5. Determination of Theoretical Buckling Stress Values (σ_{ie}). The buckling stresses given by the following equations correspond to the minimum values determined from theoretical equations for shells with simple support boundary conditions under uniform stress fields. The equations are for unstiffened cylindrical shells.

(a) Axial Compression

$\sigma_{\phi e} =$ $C_\phi Et/R$

where:

C_ϕ = 0.605 if $M \geq 1.73$

E = Modulus of elasticity at design temperature

= 27.6×10^6 psi, Normal conditions

= 27.1×10^6 psi, Accident conditions

(b) External Pressure

(i) No End Pressure ($\sigma_\phi = 0$)

$$\sigma_{\theta e} = \sigma_{reL} = C_{\theta r} Et/R$$

where:

$$C_{\theta r} = \frac{0.92}{M_\phi - 1.17} \quad \text{if } 3.0 \leq M_\phi < 1.65\ R/t$$

(ii) End Pressure Included ($\sigma_\phi = 0.5\ \sigma_\theta$)

$$\sigma_{\theta e} = \sigma_{heL} = C_{\theta h} Et/R$$

where:

$$C_{\theta h} = \frac{0.92}{M_\phi - 0.636} \quad \text{if } 3.5 < M_\phi < 1.65\ R/t$$

(c) Shear

$$\sigma_{\phi\theta eL} = C_{\phi\theta} Et/R$$

where:

$$C_{\phi\theta} = \frac{4.82}{M_\phi^2}\left(1 - 0.0239\, M_\phi^3\right)^{1/2} \quad \text{if } 1.5 \leq M_\phi < 26$$

TABLE 2.10.10.3. THEORETICAL BUCKLING STRESSES - PSI

Load Condition	Normal		Accident	
Shell	Inner	Outer	Inner	Outer
$\sigma_{\phi eL}$	1214400	890600	1192400	874400
σ_{reL}	132480	114816	130080	112736
σ_{heL}	127663	110400	125350	108400
$\sigma_{\phi\theta eL}$	387404	307648	380385	302075

6. Interaction Equations and Evaluation for Local Buckling

(a) Elastic Buckling

In the equations which follow, amplified stress components are used and defined as:

$$\sigma_{\phi s} = \frac{\sigma_\phi FS}{\alpha_\phi}\ ;\ \sigma_{\theta s} = \frac{\sigma_\theta FS}{\alpha_\theta}\ ;\ \sigma_{\phi\theta s} = \frac{\sigma_{\phi\theta} FS}{\alpha_{\phi\theta}}$$

TABLE 2.10.10.4. AMPLIFIED STRESS COMPONENTS

Load Condition	Toroid, 0.5-in. wall				Toroid, 0.76-in. wall			
	Normal		Accident		Normal		Accident	
Shell	Inner	Outer	Inner	Outer	Inner	Outer	Inner	Outer
$\sigma_{\phi s}$	49780	20910	61163	41968	68620	66570	73847	53730
$\sigma_{\theta s}$	15030	808	19867	2390	22010	3378	26086	3135
$\sigma_{\phi\theta s}$	4590	6784	4559	7939	13300	13840	5650	9481

(i) Axial Compression Plus Hoop Compression; required if ($\sigma_{\phi s} < 0.5\ \sigma_{\theta s}$). No check is required if $\sigma_{\theta s} \leq a\ \sigma_{heL}$.

$$\frac{\sigma_{\theta s}}{\left(\sigma_{reL} - \sigma_{heL}\right)\left(1 - \frac{\sigma_{\theta s}}{0.5\ \sigma_{heL}}\right) + \sigma_{heL}} < 1.0$$

In review of results given in Table 2.10.10.4, for all conditions and both toroid wall thicknesses, $\sigma_{\phi s}$ is not less than 0.5 $\sigma_{\theta s}$. Therefore, calculations under this condition are not required.

(ii) Axial Compression Plus Hoop Compression; required if ($\sigma_{\phi s} > 0.5\ \sigma_{\theta s}$). No check is required if $\sigma_{\phi s} < 0.5\ \sigma_{heL}$.

$$\frac{\sigma_{\phi s} - 0.5\ \sigma_{heL}}{\sigma_{\phi eL} - 0.5\ \sigma_{heL}} + \left(\frac{\sigma_{\phi s}}{\sigma_{heL}}\right)^2 \leq 1.0$$

Comparing results for $\sigma_{\phi s}$ given in Table 2.10.10.4 against the tabulated values for σ_{heL} given in Table 2.10.10.3, shows in all cases for a toroid wall thickness of 0.5 in., $\sigma_{\phi s}$ is less than 0.5 σ_{heL}. Therefore, this check is not required for this toroid size. On the other hand, it is required for the toroid size of 0.76-in. wall.

Normal condition - inner shell:

$$\left(\frac{68620 - 0.5\,(127663)}{1214400 - 0.5\,(127663)}\right) + \left(\frac{68620}{127663}\right)^2 = .293 \leq 1.0$$

Normal condition - outer shell:

$$\left(\frac{66570 - 0.5\,(110400)}{890600 - 0.5\,(110400)}\right) + \left(\frac{66570}{110400}\right)^2 = .377 \leq 1.0$$

Accident condition - inner shell:

$$\left(\frac{73847 - 0.5\,(125350)}{1192400 - 0.5\,(125350)}\right) + \left(\frac{73847}{125350}\right)^2 = .357 \leq 1.0$$

Accident condition - outer shell:

53730 < 0.5 (108400)

Not required.

(iii) Axial Compression Plus Shear

$$\frac{\sigma_{\phi s}}{\sigma_{\phi eL}} + \left(\frac{\sigma_{\phi\theta s}}{\sigma_{\phi\theta eL}}\right)^2 \leq 1.0$$

From Tables 2.10.10.3 and 2.10.10.4, the interaction equation gives:

For a toroid wall thickness of 0.5 in.:

Normal condition - inner shell:

$$\frac{49780}{1214400} + \left(\frac{4590}{387404}\right)^2 = .041 \leq 1.0$$

Normal condition - outer shell:

$$\frac{20910}{890600} + \left(\frac{6784}{307648}\right)^2 = .024 \leq 1.0$$

Accident condition - inner shell:

$$\frac{61163}{1192400} + \left(\frac{4559}{380385}\right)^2 = .051 \leq 1.0$$

Accident condition - outer shell:

$$\frac{41968}{874400} + \left(\frac{7939}{302075}\right)^2 = .049 \leq 1.0$$

For a toroid wall thickness of 0.76 in.

Normal condition - inner shell:

$$\frac{68620}{1214400} + \left(\frac{13300}{387404}\right)^2 = .058 \leq 1.0$$

Normal condition - outer shell:

$$\frac{66570}{890600} + \left(\frac{13840}{307648}\right)^2 = .077 \leq 1.0$$

Accident condition - inner shell:

$$\frac{73847}{1192400} + \left(\frac{5650}{380385}\right)^2 = .062 \leq 1.0$$

Accident condition - outer shell:

$$\frac{53730}{874400} + \left(\frac{9481}{302075}\right)^2 = .062 \leq 1.0$$

(iv) Hoop Compression Plus Shear

$$\left(\frac{\sigma_{\theta s}}{\sigma_{reL}}\right) + \left(\frac{\sigma_{\phi\theta s}}{\sigma_{\phi\theta eL}}\right)^2 \leq 1.0$$

From Tables 2.10.10.3 and 2.10.10.4, the interaction equation gives:

For a toroid wall thickness of 0.5 in.:

Normal condition - inner shell:

$$\frac{15030}{132480}+\left(\frac{4590}{387404}\right)^2 = .114 \leq 1.0$$

Normal condition - outer shell:

$$\frac{808}{114816}+\left(\frac{6784}{307648}\right)^2 = .008 \leq 1.0$$

Accident condition - inner shell:

$$\frac{19867}{130080}+\left(\frac{4559}{380385}\right)^2 = .153 \leq 1.0$$

Accident condition - outer shell:

$$\frac{2390}{112736}+\left(\frac{7939}{302075}\right)^2 = .022 \leq 1.0$$

For a toroid wall thickness of 0.76 in

Normal condition - inner shell:

$$\frac{22010}{132480}+\left(\frac{13300}{387404}\right)^2 = .167 \leq 1.0$$

Normal condition - outer shell:

$$\frac{3378}{114816}+\left(\frac{13840}{307648}\right)^2 = .031 \leq 1.0$$

Accident condition - inner shell:

$$\frac{26086}{130080}+\left(\frac{5650}{380385}\right)^2 = .201 \leq 1.0$$

Accident condition - outer shell:

$$\frac{3135}{112736} + \left(\frac{9481}{302075}\right)^2 = .029 \leq 1.0$$

(v) Axial Compression Plus Hoop Compression Plus Shear

$$K = 1 - \left(\frac{\sigma_{\phi\theta s}}{\sigma_{\phi\theta eL}}\right)^2$$

Substitute the values $K\sigma_{\phi e}$, $K\sigma_{reL}$ and $K\sigma_{heL}$ for $\sigma_{\phi e}$, σ_{reL} and σ_{heL}, respectively, in the equations given in (i) and (ii) above.

For a toroid wall thickness of 0.5 in.:

Normal condition - inner shell:

$$K = 1 - \left(\frac{4590}{387404}\right)^2 = 1.00$$

Normal condition - outer shell:

$$K = 1 - \left(\frac{6784}{307648}\right)^2 = 1.00$$

Accident condition - inner shell:

$$K = 1 - \left(\frac{4559}{380385}\right)^2 = 1.00$$

Accident condition - outer shell:

$$K = 1 - \left(\frac{7939}{302075}\right)^2 = 1.00$$

For a toroid wall thickness of 0.76 in

Normal condition - inner shell:

$$K = 1 - \left(\frac{13300}{387404}\right)^2 = 1.0$$

Normal condition - outer shell:

$$K = 1 - \left(\frac{13840}{307648}\right)^2 = 1.0$$

Accident condition - inner shell:

$$K = 1 - \left(\frac{5650}{380385}\right)^2 = 1.0$$

Accident condition - outer shell:

$$K = 1 - \left(\frac{9481}{302075}\right)^2 = 1.0$$

When values for K equal 1.00, results for interaction equations (i) and (ii) are unchanged. Therefore, no further calculations are required in this section.

In summary, results of this elastic buckling evaluation show that there is no failure when the design uses any toroid wall thickness size from a minimum of 0.5 in. to a maximum of 0.76 in. and all criteria have been satisfied.

(b) Inelastic Buckling

The inelastic buckling relationships must be satisfied when any of the values of $\eta_i < 1$. In the equations which follow, amplified stress components are used and defined as:

$$\sigma_{\phi p} = \frac{\sigma_{\phi s}}{\eta_\phi}; \ \sigma_{\theta s} = \frac{\sigma_{\theta s}}{\eta_\theta}; \ \sigma_{\phi\theta} = \frac{\sigma_{\phi\theta}}{\eta_{\phi\theta}}$$

From Table 2.10.10.2, toroid 0.5-in. wall, only η_ϕ and η_θ are less than 1.0 for the accident condition on the inner shell. Their amplified stress components are:

Accident condition - inner shell

$$\sigma_{\phi p} = \frac{61163}{.897} = 68,186 \text{ psi}$$

$$\sigma_{\theta p} = \frac{19867}{.913} = 21,760 \text{ psi}$$

For a toroid 0.76-in. wall, η_ϕ is less than 1.0 for normal conditions on the inner and outer shell and for accident conditions on the inner shell. Similarly, η_θ is less than 1.0 on the inner shell for both normal and accident conditions.

Normal condition - inner shell:

$$\sigma_{\phi p} = \frac{68620}{.74} = 92,730 \text{ psi}$$

$$\sigma_{\theta p} = \frac{22010}{.88} = 25,011 \text{ psi}$$

Normal condition - outer shell:

$$\sigma_{\phi p} = \frac{66570}{.82} = 81,183 \text{ psi}$$

Accident condition - inner shell:

$$\sigma_{\phi p} = \frac{73847}{.53} = 139,334 \text{ psi}$$

$$\sigma_{\theta p} = \frac{26086}{.41} = 63,624 \text{ psi}$$

For a toroid wall thickness of 0.50 in.:

(i) Axial Compression Plus Shear

$$\left(\frac{\sigma_{\theta p}}{\sigma_{\phi eL}}\right)^2 + \left(\frac{\sigma_{\phi\theta p}}{\sigma_{\phi\theta eL}}\right)^2 \leq 1.0$$

For the accident condition - inner shell:

$$\left(\frac{68186}{1192400}\right)^2 + \left(\frac{2722}{380385}\right)^2 = .003 \leq 1.0$$

(ii) Hoop Compression Plus Shear

$$\left(\frac{\sigma_{\theta p}}{\sigma_{reL}}\right)^2 + \left(\frac{\sigma_{\phi\theta p}}{\sigma_{\phi\theta eL}}\right)^2 \leq 1.0$$

For the accident condition - inner shell:

$$\left(\frac{21760}{130080}\right)^2 + \left(\frac{2722}{380385}\right)^2 = .028 \leq 1.0$$

For a toroid wall thickness of 0.76 in.:

(i) Axial Compression Plus Shear

Normal condition - inner shell:

$$\left(\frac{92730}{1214400}\right)^2 + \left(\frac{13300}{387404}\right)^2 = .008 \leq 1.0$$

Normal condition - outer shell:

$$\left(\frac{81183}{890600}\right)^2 + \left(\frac{13840}{307648}\right)^2 = .010 \leq 1.0$$

Accident condition - inner shell:

$$\left(\frac{139334}{1192400}\right)^2 + \left(\frac{5650}{380385}\right)^2 = .014 \leq 1.0$$

(ii) Hoop Compression Plus Shear

Normal condition - inner shell:

$$\left(\frac{25011}{132480}\right)^2 + \left(\frac{13300}{387404}\right)^2 = .038 \leq 1.0$$

Accident condition - inner shell:

$$\left(\frac{63624}{130080}\right)^2 + \left(\frac{5650}{380385}\right)^2 = .239 \leq 1.0$$

In summary, results of this inelastic buckling evaluation show that there is no failure for a toroid wall thickness of 0.50 in. minimum to 0.76 in. maximum and all criteria have been satisfied.

2.10.11 Lid Bolt Holes

Problem:

Determine if a 1¼-7 UNC-2A screw threaded in a 1¼-7 UNC-1B tapped hole develops adequate joint strength.

Given:

- Screw material is ASTM A-540 Grade 22, Class 3 material.
  Tensile strength is 145 ksi
- Internal thread base material is ASME SA182, SS304.
  Tensile strength is 75 ksi
- Thread dimensions from Machinery's Handbook, 22 Ed. for 1¼-7 UNC:

External Thread, Class 2A	Min. pitch dia.	$(E_{s,\ min.}) = 1.1476$
	Min. major dia.	$(D_{s,\ min.}) = 1.2314$
Internal Thread, Class 2B	Max. pitch dia.	$(E_{n,\ max.}) = 1.1668$
	Max. major dia.	$(K_{n,\ max.}) = 1.123$
Internal Thread, Class 1B	Max. pitch dia.	$(E_{n,\ max.}) = 1.1716$
	Max. major dia.	$(K_{n,\ max.}) = 1.123$

- Formulas from Machinery's Handbook, 22 Ed., pages 1068-1069.

Approach:

Check that the screw will fail before either the external or internal threads strip. If so, the length of thread engagement is to be sufficient to carry the full breaking load of the screw without thread stripping. Therefore, following the approach given in Machinery's Handbook for calculating thread engagement, determine the minimum thread engagement for the following two cases.

Case 1: Class 2A ext. thd. with 2B int. thd.

Case 2: Class 2A ext. thd. with 1B int. thd.

Compare these two calculated thread engagements against the actual engagement of the cask/lid joint.

Case 1 Analysis: Class 2A into 2B threads. The required length of engagement Q to prevent internal thread stripping is given by:

$$Q = J\,L_e \qquad (4)$$

Equation 3 calculates the factor J for the relative strength of the external and internal threads.

$$J = \frac{A_s \times \text{tensile strength of ext. thd. material}}{A_n \times \text{tensile strength of ext. thd. material}} \qquad (3)$$

where $$A_s = \pi n L_e K_{n,max}\left[\frac{1}{2n} + .57735\left(E_{s,min} - K_{n,max}\right)\right] \qquad (5)$$

$$A_n = \pi n L_e D_{s,min}\left[\frac{1}{2n} + .57735\left(D_{s,min} - E_{n,max}\right)\right] \qquad (6)$$

$$L_e = \frac{2A_t}{\pi\left(K_{n,max}\right)\left[\frac{1}{2} + .57735(n)\left[E_{s,min} - K_{n,max}\right]\right]} \qquad (1)$$

n = 7 threads per inch

$$A_t = \text{screw thread tensile stress area} = \pi\left[\frac{E_{s,min}}{2} - \frac{0.16238}{n}\right]^2 \qquad (2b)$$

Plugging in values:

$$A_t = \pi\left[\frac{1.1476}{2} - \frac{0.16238}{7}\right]^2 = \underline{0.952} \qquad (2b)$$

$$L_e = \frac{2(.952)}{\pi(1.123)\left[\frac{1}{2} + .57735(7)\left[1.1476 - 1.123\right]\right]} = \underline{0.900} \qquad (1)$$

$$A_n = \pi(7)\,(.9)\,(1.2314)\left[\frac{1}{2(7)} + .57735\left(1.2314 - 1.1668\right)\right] = \underline{2.650} \qquad (6)$$

$$A_s = \pi(7)\,(.9)\,(1.123)\left[\frac{1}{2(7)} + .57735\left(1.1476 - 1.123\right)\right] = \underline{1.903} \qquad (5)$$

$$J = \frac{1.903(145)}{2.650(75)} = 1.389 \qquad (3)$$

Now, required engagement is:

$$Q = 1.389(0.900) = \underline{1.250"} \qquad (4)$$

∴ When using a Class 2A bolt in the Class 2B threads, a thread engagement length of 1.25" min. ensures the threads will not strip before the screw fails.

Case 2 Analysis: Class 2A threads into Class 1B hole. Determine the length of engagement Q to prevent the internal threads from stripping.

Note: The following parameters are unchanged from Case 1 Analysis:

A_s = 1.903

A_t = 0.952

L_e = 0.900

$$A_n = \pi(7)\,(.9)\,(1.2314)\left[\frac{1}{2(7)} + .57735\,(1.2314 - 1.1716)\right] = \underline{\underline{2.582}} \qquad (6)$$

$$J = \frac{1.903\,(145)}{2.650\,(75)} = \underline{\underline{1.425}} \qquad (3)$$

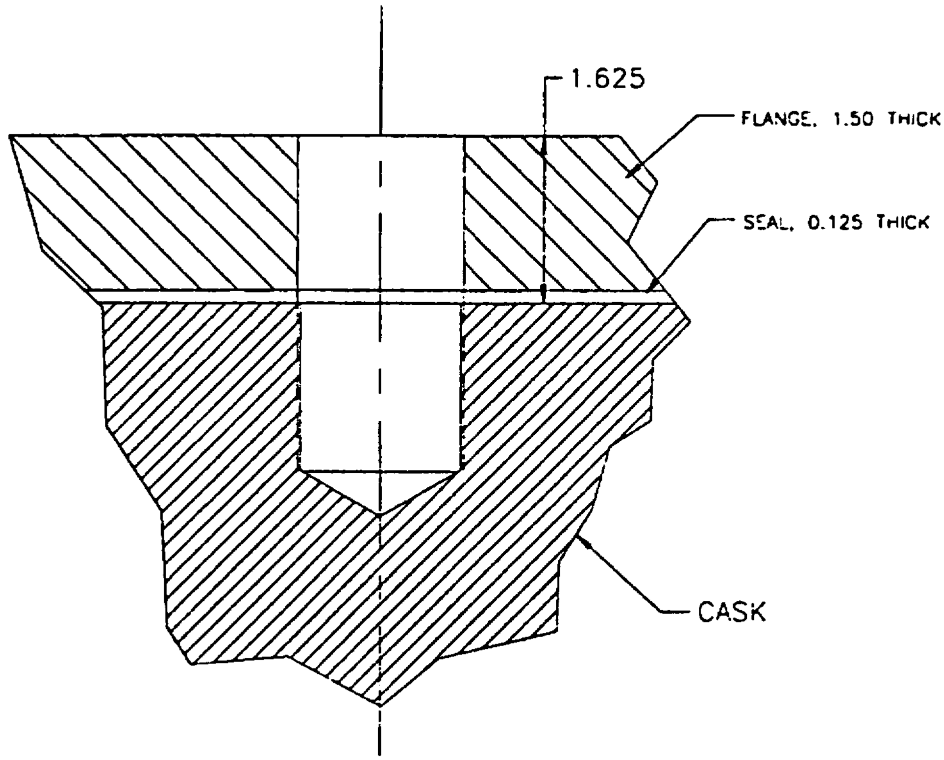
$$Q = 1.425(.900) = \underline{\underline{1.282}} \qquad (4)$$

∴ When using a Class 2A bolt in a Class 1B threaded hole, a thread engagement length of 1.282" min. ensures the threads will not strip before the screw fails.

Result:

To insure the internal threads of a 1¼-7 UNC-1B tapped hole do not strip before the engaging 1¼-7 UNC-2A bolt fails in tension, an additional 1.282 - 1.250 = 0.032" of engagement is required. This is about 1/5 to 1/4-turn of a 7-pitch screw.

<u>Actual Geometry</u> (Ref. Drawing 105E9520)



Lid Screws: 3.00 inches long

∴ Engagement = 3.00 - 1.625 = <u>1.375"</u>

Compare to required engagement of <u>1.282"</u>

<u>Applied Load Analyses</u>:

Determine maximum load for 1¼-7 UNC-2A screw.

$P_{max} = \sigma_u A_t$

$= (145,000)(.952)$

$P_{max} = \underline{138}$ kip

Note the pre-load developed by the 690 ft-lb torque applied to the screws is <u>82.8</u> kip (NEDO-31581, "Model 2000 Safety Analysis Report", Table 2.10.9.85A).

Determine minimum thread engagement of a Class 1B thread to react screw pre-load:

$P = \sigma A_n$ $\quad$ P = 82.8 kip, bolt pre-load

σ = tensile strength of internal thread

A_n = internal thread shear area [2A + 1B class]

$$P = \sigma \pi n L_e D_{s,min}\left[\frac{1}{2n} + .57735\left(D_{s,min} - E_{n,max}\right)\right]$$

$$L_e = \frac{P}{\sigma \pi n D_{s,min}\left[\frac{1}{2n} + .57735\left(D_{s,min} - E_{n,max}\right)\right]}$$

$$L_e = \frac{82.8\ kip}{(75ksi)(\pi)(7)(1.2314)\left[\frac{1}{14} + .57735\left(1.2314 - 1.1716\right)\right]}$$

$\Rightarrow$ L_e = 0.385 inch $\therefore$ Min. thread engagement to prevent internal 1B thread stripping. This is about 2.7 threads.

2.10.12 Model 2000 Cask, Screw Stress Analysis

2.10.12.1 Design and Criteria

The Model 2000 transport package cask and lid are fastened together with 15 equally spaced ASME SA 540, Grade B22, 1.25-7 UNC socket head screws or equivalent. To verify the adequacy of the closure screws to withstand the required loading conditions, the analytical procedure given in NUREG/CR-6007, "Stress Analysis of Closure Screws for Shipping Casks," April 1992, was performed. This procedure identifies all of the screw forces and moments generated by pressure, temperature, preload, gaskets, impact, puncture, vibration, and prying action loads, and gives the proper steps for combining the screw forces and moments resulting from these various loads. In the evaluation of the tensile screw force, the procedure takes into account the significant interactions between the preload and the temperature loads, between the preload and the applied loads, and between the non-prying and the prying screw force components. For acceptance criteria, the procedure requires that the resulting average stress due to tension and shear be less than the allowable stress (for tension) or a fraction of it (shear). Further, the square root of the sum of the tension and shear stress ratios squared must

be less than 1. In addition to the NUREG/CR-6007 calculations, the screw elongation due to the applied loads is determined to be less than the 0.003 inch separation criteria recommended by the seal manufacturer, Parker Gask-O-Seal.

This procedure was applied for various normal and accident load combinations, in all cases the resulting stresses due to tension and shear meets or exceeds the given criteria. In addition, the joint separation resulting from the load combinations never exceeded the recommended criteria. The specified preload of 690 ft-lbs is adequate to maintain the integrity of the joint.

Fatigue for the lid closure screws is evaluated by assigning to the screws a 10 years life expectancy with an assumed operating load of 75 cycles/year and 10^7 cycles per year for the vibration load. Using these cycles and Figure I-9.4, ASME Code, Section III, the allowable alternating stresses were identified. These allowable fatigue stress were combined to establish the allowable accumulative fatigue usage as recommended in Subsection NB 3232.3 of the ASME Code. It should be noted that typically these screws remain in service for a period of approximately 3 years. It is difficult and time consuming to decontaminate these screws for inspection. Therefore, the screws are removed from service.

2.10.12.2 Analysis Loading Conditions

The following tabulation presents the normal and accident loading conditions applicable to the screw analysis. The tabulation includes the pertinent information associated with each loading condition. A box is drawn around the loading combination that imposed the largest load on the screw. Only the boxed loading combinations are analyzed.

TABLE 2.10.12.2.1. LOADING COMBINATIONS AND INPUT PARAMETERS

NORMAL CONDITIONS (Analysis ID)	1.1	1.2	1.3	1.4	1.5	1.6	1.7	1.8
Pressure (out/in), psi	15/30	15/30	15/30	15/30	15/30	15/30	15/30	15/30
Temperature (out/in), °F (1)								
Max. Decay Heat + Solar + 100 °F	320/315	-	320/315	-	3201315	-	320/315	-
-20 °F + Max. Decay Heat	-	207/201	-	207/201	-	207/201	-	207/201
Preload, ft-lb	690	690	690	690	690	690	690	690
Vibration (axial/transverse), g's	2/5	2/5	-	-	-	-	-	-
Impact (4 ft Drop), g's (2)								
Head On	-	-	69	69	-	-	-	-
Side	-	-	-	-	20	20	-	-
CG-Over-Corner	-	-	-	-	-	-	14	14

ACCIDENT CONDITIONS (Analysis ID)	2.1	2.2	2.3	2.4	2.5	2.6	2.7	2.8
Pressure (out/in), psi	15/30	15/30	15/30	15/30	15/30	15/30	15/30	36.7/15
Temperature (out/in), °F (1)								
Max. Decay Heat + Solar + 100 °F	320/315	-	320/315	-	320/315	-	-	-
-20 °F + Max. Decay Heat	-	207/201	-	207/201	-	207/201	-	-
Preload, ft-lb	690	690	690	690	690	690	690	690
Impact (30 ft Drop), g's (3)								
Head On	133	133	-	-	-	-	-	-
Side	-	-	133	133	-	-	-	-
CG-Over-Corner	-	-	-	-	63	63	-	-
Puncture, g's (4)								
Fire (out/in), °F (5)	-	-	-	-	-	-	336/357	-
Submersion (pressure), psi	-	-	-	-	-	-	-	36.7

(1) Temperature taken from the "Cask Vent Port Area" and the "Cask Seal Area," Table 3.1, NEDO-32318, "Model 2000 Radioactive Material Transport Package, 2000 Watts Decay Heat Update Safety Analysis Report."

(2) Refer to Subsection 2.6.7, page 2-70.

(3) Refer to Subsection 2.7.1, page 2-102.

(4) Puncture load encompass by 30 ft. Drop.

(5) Temperature taken from Figure 3.18, NEDO-32318, "Model 2000 Radioactive Material Transport Package, 2000 Watts Decay Heat Update Safety Analysis Report."

Screws: 1.25-7 UNC-2A, ASME SA-540, Grade B22, Class 3 or lower

15 screws, equally spaced on 32.25-in. diameter bolt circle.

Gasket: Parker Gask-O-Seal No. 838240

Parker Compound #E1823-75 CL2 Bond

2 seals: 28.38 in. diameter and 30.13 in. diameter

Aluminum Retainer; 6061-T6, ASTM B209.

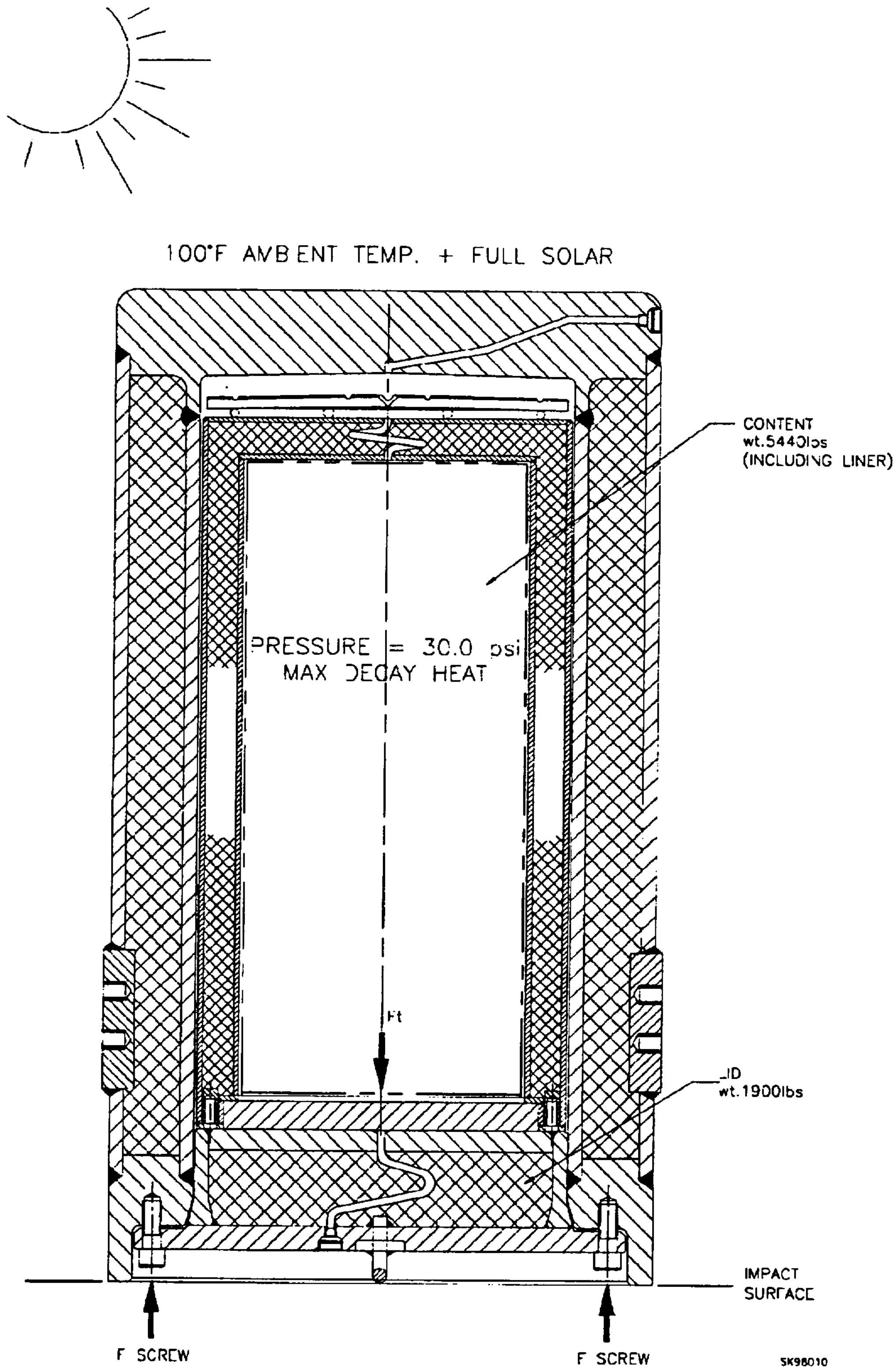
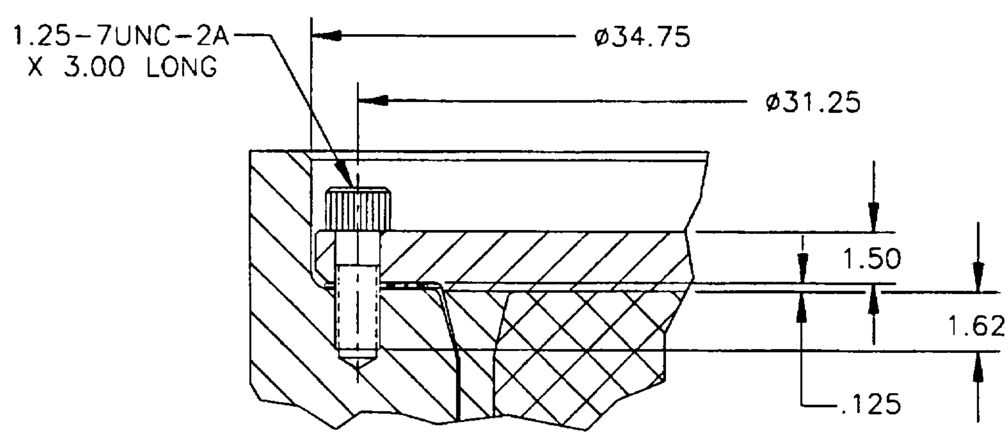


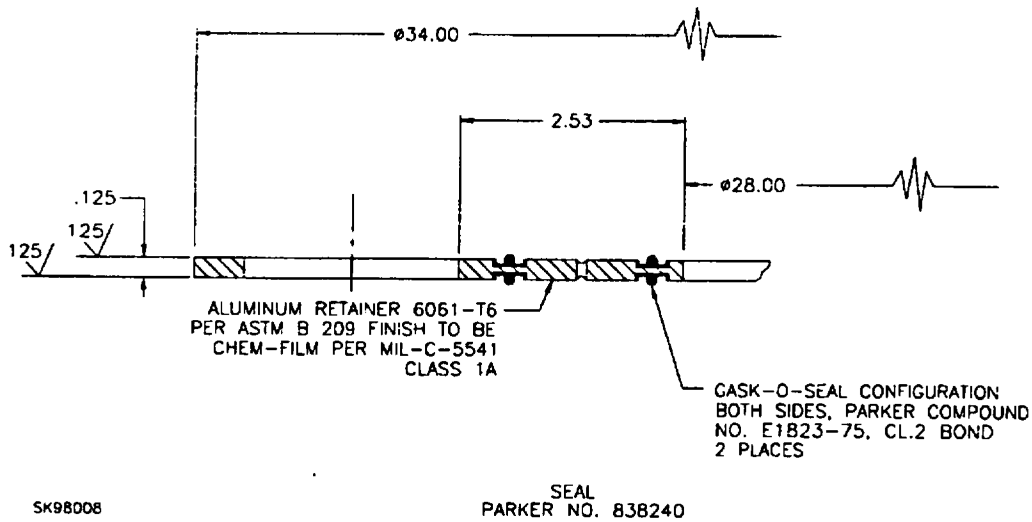
FIGURE 2.10.12.1. FORCE DIAGRAM, CLOSURE BOLTS ANALYSIS

2.10.12.3 Input Parameters

NUMBER OF BOLTS	(NB)	15
LID DIAMETER AT BOLT CIRCLE	(DLB)	.31250E+02
LID DIAMETER AT GASKET	(DLG)	.29250E+02
NOMINAL BOLT DIAMETER	(DB)	.12500E+01
LID DIAMETER AT INNER EDGE.	(DLI)	.28000E+02
LID DIAMETER AT OUTER EDGE	(DLO)	.34750E+02
THICKNESS OF LID (1)	(TL)	.78900E+01
THICKNESS OF LID FLANGE	(TLF)	.15000E+01
THICKNESS OF CASK WALL	(TC)	.60000E+01
BOLT ENGAGEMENT LENGTH	(BEL)	.16250E+01
BOLT MOMENT OF INERTIA/CIR (2)	(XIB)	.18000E+01
YOUNG'S MODULUS FOR LID	(EL)	.29500E+08
YOUNG'S MODULUS FOR CASK	(EC)	.29500E+08
YOUNG'S MODULUS FOR BOLT	(EB)	.28300E+08
POISSON'S RATIO FOR LID	(XNUL)	.30000E+00
POISSON'S RATIO FOR CASK	(XNUC)	.30000E+00
LID THERMAL EXPANSION COEFF	(AL)	.60000E-05
BOLT THERMAL EXPANSION COEFF	(AB)	.60000E-05
WALL THERMAL EXPANSION COEFF	(AC)	.60000E-05
FLANGE COEFFICIENT OF FRICTION	(FCF)	.90000E+00
WEIGHT OF CASK CONTENTS	(WC)	.54500E+04
WEIGHT OF CASK LID	(WL)	.19000E+04
DYNAMIC LOAD FACTOR	(DYLF)	.10000E+01
PRELOAD TORQUE (3)	(Q)	.82800E+04
NUT FACTOR FOR PRELOAD TORQUE (4)	(QK)	.18000E+00
GASKET SEATING WIDTH (5)	(GB)	.56200E+00
GASKET SEATING STRESS (6)	(GY)	.88030E+04
GASKET FACTOR (6)	(GM)	.40000E+01
Sm STRESS (7)	(SM)	.10000E+03
Sy STRESS (8)	(SY)	.15000E+03
Su STRESS (8)	(SU)	.16500E+03

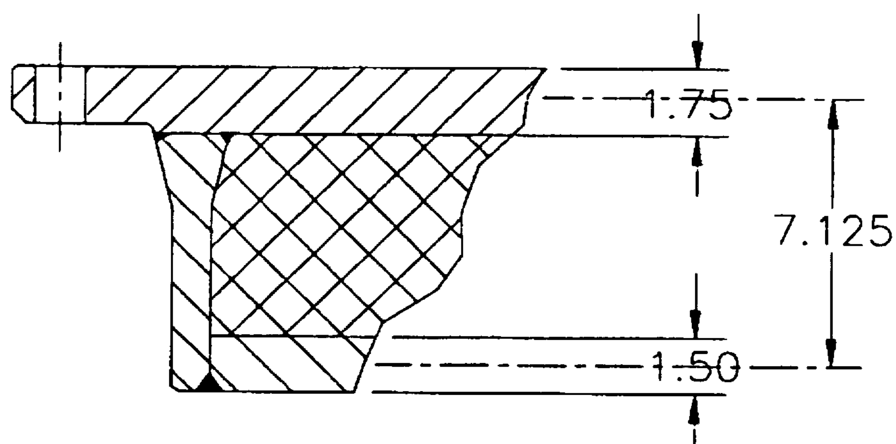


SK98009



(1) Thickness of Lid:

The effective lid thickness (TL) used in the analysis gives approximately the same cross-sectional moment of inertia as the lid.



SK98011

TL = (12 I) ^ 1/3

I = A_1 * Y^2 + A_2 (7.125 - Y)^2

I = 1.75 * 3.42 ^ 2 + 1.50 * 3.70 ^ 2 = 41.0 in.^3

TL = (12 * 41.0) ^ 1/3 = 7.89 in.

(2) Bolt Moment of Inertia / Circumference:

XIB = NB (π * DB ^ 4)/64) * (1/ (π * DLB))

XIB = 0.018 in.^3

(3) Preload Torque:

Q = 690 ft-lb. (12) = 8280 in-lb.

(4) Nut Factor for Preload Torque:

QK = 0.18 for nickel based nuclear grade anti-seize lubricant.

(5) Gasket Seating Width:

From Article E-1000, ASME Section III Appendices, the Effective Gasket Seating width, GB is:

GB = 0.5 $\sqrt{b_o}$ when b_o > 1/4 in.
b_o = 2.53/2 = 1.265 in.
GB = 0.562 in.

(6) Gasket Seating Stress (GY) and Gasket Factor (GM):

From Table E-1210-1, Article E-1000, ASME Section III Appendices for Solid flat metal, soft aluminum:

GY = 8,800 psi
GM = 4.00

(7) Basic Allowable Stress Limit (Sm):

Sm = (2/3) Sy

(8) Minimum Yield Strength (Sy) and Minimum Ultimate Strength (Su):

From ASME SA 540, Grade B22, Class 3.

2.10.12.4 Analytical Results

The input parameters are used in the formulation presented in the NUREG/CR-6007 Report. The following is the bolts loads and stresses obtained for the vibration load under normal condition, analysis ID 1.2 and the 30-FT. Drop for the head on orientation, ID 2.2.

NORMAL CONDITION, VIBRATION, 1.2

BOLT FORCES DUE TO PRESSURE, Table 4.3

AXIAL LOAD DUE TO PRESSURE	.67196E+03
SHEAR LOAD DUE TO PRESSURE	.29509E+01
EDGE LOAD DUE TO PRESSURE	.29509E+01
EDGE MOMENT DUE TO PRESSURE	.45776E+03

BOLT FORCES DUE TO TEMPERATURE, Table 4.4

AXIAL LOAD DUE TO TEMPERATURE	.00000E+00
SHEAR LOAD DUE TO TEMPERATURE	.00000E+00
EDGE LOAD DUE TO TEMPERATURE	.00000E+00
EDGE MOMENT DUE TEMPERATURE	.28446E+03

BOLT FORCES DUE TO VIBRATION, Table 4.8

AXIAL LOAD DUE TO VIBRATION	.25333E+03
SHEAR LOAD DUE TO VIBRATION	.63333E+03
EDGE LOAD DUE TO VIBRATION	.63333E+03
EDGE MOMENT DUE VIBRATION	.15120E+03

BOLT FORCES DUE TO PRELOAD, Table 4.1 & 4.2

AXIAL LOAD DUE TO PRELOAD	.36800E+05
AXIAL LOAD FOR GASKET SEATING	.30308E+05
AXIAL LOAD FOR GASKET OPERATION	.41314E+03
TORQUE DUE TO PRELOAD	.41400E+04
TORQUE DUE TO GASKET	.34096E+04

TOTAL NON-PRYING BOLT FORCES, Table 4.9

TOTAL NON-PRYING AXIAL LOAD	.92529E+03
TEMP & PRELOAD NON-PRYING AXIAL LD	.36800E+05
AXIAL LOAD LESS TEMP & PRELOAD	.92529E+03
TOTAL EDGE LOAD	.15589E+03
TOTAL EDGE MOMENT	.89343E+03

PRYING ACTION FORCES, Table 2.1 & 2.2

AXIAL LOAD DUE TO PRYING	-.43270E+04
BENDING MOMENT DUE TO PRYING	.32440E+01

TOTAL BOLT FORCES

TOTAL BOLT AXIAL LOAD	.32473E+05
TOTAL BOLT SHEAR LOAD	.63628E+03
TOTAL BOLT BENDING MOMENT	.89667E+03
TOTAL BOLT TORSIONAL MOMENT	.41400E+04

TOTAL BOLT STRESSES

TOTAL BOLT DIRECT STRESS (+MC/I)	.27630E+05
TOTAL BOLT DIRECT STRESS (-MC/I)	.25292E+05
AVE BOLT DIRECT STRESS	.26461E+05
TOTAL BOLT SHEAR STRESS	.11314E+05
AVE BOLT SHEAR STRESS	.59162E+04

CODE EVALUATION FOR NORMAL COND, Table 6.1

Rt (AXIAL_STRESS/Sm)	.26461E+00
Rs (SHEAR_STRESS/0.6Sm)	.18857E+00
√(Rtý^2 +RSý^2)	.32493E+00
VON MISES EQUIVALENT STRESS (Se)	.33874E+05
Se/1.35Sm	.25092E+00

FLANGE SEPARATION EVALUATION

BOLT CLAMPING FORCE	-.31548E+05
DISPLACEMENT ACROSS BOLT	-.14761E-02
ALLOWABLE FLANGE SEPARATION	.30000E-02
FLANGE FRICTION FORCE	-.28393E+05
TOTAL BOLT SHEAR FORCE	.63628E+03

ACCIDENT CONDITION, 30-FT. DROP, HEAD ON ORIENTATION, 2.2

BOLT FORCES DUE TO PRESSURE, Table 4.3

AXIAL LOAD DUE TO PRESSURE	.67196E+03
SHEAR LOAD DUE TO PRESSURE	.29509E+01
EDGE LOAD DUE TO PRESSURE	.29509E+01
EDGE MOMENT DUE TO PRESSURE	.45776E+03

BOLT FORCES DUE TO TEMPERATURE, Table 4.4

AXIAL LOAD DUE TO TEMPERATURE	.00000E+00
SHEAR LOAD DUE TO TEMPERATURE	.00000E+00
EDGE LOAD DUE TO TEMPERATURE	.00000E+00
EDGE MOMENT DUE TEMPERATURE	.28446E+03

BOLT FORCES DUE TO IMPACT, Table 4.5

AXIAL LOAD DUE TO IMPACT	.87328E+05
SHEAR LOAD DUE TO IMPACT	-.73639E-03
EDGE LOAD DUE TO IMPACT	-.73639E-03
EDGE MOMENT DUE IMPACT	.52120E+05

BOLT FORCES DUE TO PRELOAD, Table 4.1 & 4.2

AXIAL LOAD DUE TO PRELOAD	.36800E+05
AXIAL LOAD FOR GASKET SEATING	.30308E+05
AXIAL LOAD FOR GASKET OPERATION	.41314E+03
TORQUE DUE TO PRELOAD	.41400E+04
TORQUE DUE TO GASKET	.34096E+04

TOTAL NON-PRYING BOLT FORCES, Table 4.9

TOTAL NON-PRYING AXIAL LOAD	.88000E+05
TEMP & PRELOAD NON-PRYING AXIAL LD	.36800E+05
AXIAL LOAD LESS TEMP & PRELOAD	.88000E+05
TOTAL EDGE LOAD	.13460E+05
TOTAL EDGE MOMENT	.52862E+05

PRYING ACTION FORCES, Table 2.1 & 2.2

AXIAL LOAD DUE TO PRYING	.82230E+03
BENDING MOMENT DUE TO PRYING	.19194E+03

TOTAL BOLT FORCES

TOTAL BOLT AXIAL LOAD	.88822E+05
TOTAL BOLT SHEAR LOAD	.29501E+01
TOTAL BOLT BENDING MOMENT	.53054E+05
TOTAL BOLT TORSIONAL MOMENT	.41400E+04

TOTAL BOLT STRESSES

TOTAL BOLT DIRECT STRESS (+MC/1)	.14155E+06
TOTAL BOLT DIRECT STRESS (-MC/1)	.32069E+04
AVE BOLT DIRECT STRESS	.72379E+05
TOTAL BOLT SHEAR STRESS	.10798E+05
AVE BOLT SHEAR STRESS	.54001E+04

CODE EVALUAT. FOR ACCIDENT COND, Table 6.3

ALLOWABLE TENSILE STRESS (Sa)	.11550E+06
ALLOWABLE SHEAR STRESS (Ta)	.69300E+05
Rt (AVE AXIAL STRESS/Sa)	.62666E+00
Rs (AVE SHEAR_STRESS/Ta)	.77924E-01
√(Rtý^2+RSý^2)	.63148E+00

FLANGE SEPARATION EVALUATION

BOLT CLAMPING FORCE	.52022E+05
DISPLACEMENT ACROSS BOLT	.24341E-02
ALLOWABLE FLANGE SEPARATION	.30000E-02
FLANGE FRICTION FORCE	.46820E+05
TOTAL BOLT SHEAR FORCE	.29501E+01

TABLE 2.10.12.4.1. SUMMARY OF RESULTS

	LOADING CONDITIONS (ID)							
	1.2	1.4	1.6	1.8	2.2	2.4	2.7	2.8
TOTAL BOLT FORCES								
AXIAL LOAD	.325E+05	.443E+05	.330E+05	.327E+05	.888E+05	.617E+05	.324E+05	.323E+05
SHEAR LOAD	.635E+03	.295E+01	.180E+04	.165E+04	.295E+01	.119E+05	.295E+01	-.427E+01
BENDING MOMENT	.897E+03	.279E+05	.631E+04	.281E+04	.530E+05	.377E+05	-.540E+03	-.427E+03
BENDING MOMENT	.414E+04	.414E+04	.414E+04	.414E+04	.414E+04	.414E+04	.414E+04	.414E+04
TOTAL BOLT STRESSES								
DIRECT STRESS (+MC/I)	.276E+05	.725E+05	.351E+05	.303E+05	.141E+06	.995E+06	.257E+05	.258E+05
DIRECT STRESS (-MC/I)	.253E+05	-.243E+03	.187E+05	.229E+05	.321E+04	.111E+04	.271E+05	.269E+05
AVE. DIRECT STRESS	.265E+05	.361E+05	.269E+05	.266E+05	.724E+05	.503E+05	.264E+05	.263E+05
SHEAR STRESS	.113E+05	.108E+05	.122E+05	.121E+05	.108E+05	.205E+05	.108E+05	.108E+05
AVE. SHEAR STRESS	.592E+04	.540E+04	.686E+04	.674E+04	.540E+04	.151E+05	.540E+04	.540E+04
CODE EVALUATION FOR NORMAL CONDITIONS								
Rt (AXIAL_STRESS/Sm)	.265E+00	.361E+00	.269E+00	.266E+00				
Rs (SHEAR_STRESS/0.6Sm)	.188E+00	.180E+00	.204E+00	.202E+00				
$\sqrt{(Rty^2+Rsy^2)}$	.325E+00	.403E+00	.338E+00	.334E+00				
VON MISES EQ. STRESS (Se)	.339E+05	.748E+05	.410E+05	.368E+05				
Se/1.35Sm	.251E+00	.554E+00	.304E+00	.273E+00				
CODE EVALUATION FOR ACCIDENT CONDITIONS								
TENSILE STRESS (Sa)					.115E+06	.115E+06	.115E+06	.115E+06
SHEAR STRESS (Ta)					.693E+05	.693E+05	.693E+05	.693E+05
Rt (AVE AXIAL STRESS/Sa)					.627E+00	.435E+00	.228E+00	.228E+00
Rs (AVE SHEAR_STRESS/Ta)					.779E-01	.218E+00	.779E-01	.779E-01
$\sqrt{(Rty^2+Rsy^2)}$					.631E+00	.487E+00	.241E+00	.241E+00

TABLE 2.10.12.4.2. ADEQUACY OF PRELOAD (690 FT-LB)

Load Condition	Preload >Gasket Seating		Bolt Elongation < Parker Criteria		Friction Force >Shear Load[1]	
1.2	.3680E+05	.3031E+05	-.1476E-02	.3000E-02	-.2839E+05	.6362E+03
1.4	.3680E+05	.3031E+05	.5072E-03	.3000E-02	.9756E+04	.2950E+01
1.6	.3680E+05	.3031E+05	-.1078E-02	.3000E-02	-.2074E+05	.1794E+04
1.8	.3680E+05	.3031E+05	-.1335E-02	.3000E-02	-.2569E+05	.1647E+04
2.2	.3680E+05	.3031E+05	.2432E-02	.3000E-02	.4683E+05	.2950E+01
2.4	.3680E+05	.3031E+05	.1231E-02	.3000E-02	.2368E+05	.1191E+05
2.7	.3680E+05	.3031E+05	-.1483E-02	.3000E-02	-.2853E+05	.2950E+01
2.8	.3680E+05	.3031E+05	-.1468E-02	.3000E-02	-.2823E+05	-.4269E+01

(1) Note that the shear load is reacted by the friction force, therefore the bolts are loaded only axially.

2.10.12.5 Fatigue Analysis

The fatigue analysis considers two type of loading, vibration loads and operating loads. The operating loads includes the pressure, temperature, and preload loads. From the bolt analysis,

$S_{Vibration}$ = 0.21 ksi

$S_{Operating}$ = 26.5 ksi

Per ASME Code, Section III, NB3232.3, the applicable alternating stresses are them:

$S_{a\text{-}Vibration} = 4 * 0.21 * (30.0/29.4)^{(1)} = 0.85$ ksi,

$S_{a\text{-}Operating} = 4 * 26.5 * (30.0/29.4)^{(1)} = 107.8$ ksi

The fatigue limit for maximum nominal stress ≤ 2.7 Sm from ASME Section III, Figure I-9.4 for these loads are:

$N_{a\text{-}Vibration} = 10^{11}$ Cycles (Infinite Life),

$N_{a\text{-}Operating}$ = 950 Cycles

Assuming that the number of cycles for vibration load is 10^7 and that the operating loads is based on 75 transport per year for a 10 years

$N_{Operating} = 10 * 75 = 750$

The accumulative usage is then:

$R = 750/950 + 10^7/10^{11} = 0.79 < 1.0$

Therefore, a 10 years life expectancy for this bolts is adequate.

2.10.13 Stress Analysis of GE Model 2000 Shipping Package for Horizontal Transport

2.10.13.1 Introduction

This Appendix presents an analysis of the GE Model 2000 Shipping Package for transport loads when the package is in the horizontal transport mode. The configuration of the GE 2000 shipping package for horizontal transport is shown in Figure 2.10.13.1. When positioned in the cradle, the package is supported against longitudinal and lateral acceleration by contact with the overpack torroid reinforcing ribs, and is supported against upward acceleration by four tie-down rods. This Appendix demonstrates that the package in the horizontal transport mode meets applicable NRC regulatory requirements.

Most of the analyses presented in this Appendix utilize the Finite Element Method (FEM). Two FEM models are used, one for the overpack structure, and one for the rib structure. The overpack model is a comprehensive model of the overpack structure, including the energy absorbing torroids, the cylindrical outer shell, and the reinforced, rib sections. This model, shown in Figure 2.10.13.2, is composed of over 2500 triangular shell elements. The overpack model is used to assess the stresses in the package overpack due to the horizontal tie-down loads. The rib structure model, shown in Figure 2.10.13.6, is a detailed model of only the rib structure. This model IS used to assess the local Stress in the rib structure. The rib model is fixed at the points where the rib connects to the overpack. All FEM analyses use the Structural Mechanics Analysis Libra program.

This Appendix is comprised of six major paragraphs and one attachment. This introduction comprises Paragraph 2.10.13.1. The regulatory inertia loads applied in this analysis are presented in Paragraph 2.10.13.2. The package material properties and allowable stresses are presented in Paragraph 2.10.13.3. The analysis of the shell overpack structure is presented in Paragraph 2.10.13.4. Stress analysis of the reinforcing ribs is presented in Paragraph 2.10.13.5. A summary of stresses is presented in Paragraph 2.10.13.6. Attachment A contains the analysis for the loads acting on the package structure due to the specified accelerations.

2.10.13.2 Inertia Loads

The transport accelerations used in this analysis are those specified by NRC regulation 10CFR71.45, and consist of the following:

forward-aft	10g
sideward,	5g
vertical.	2g

In accordance with 10CFR71.45, these inertial loads are assumed to act simultaneously. When the 2g vertical acceleration is applied in the upward direction it is offset by a 1g downward acceleration, giving a net acceleration of 1g upward.

2.10.13.3 Material Properties and Allowables

The tie-down ribs are fabricated from 2-inch-thick, ASTM A240, type XM-19 plate machined to conform to the torroidal shell contour. The torroidal shell material is ASTM A403, type 304 stainless steel, and the overpack shell is fabricated from ASTM A240, type 394 stainless steel. The allowable mechanical properties are listed in Table 2.10.13.1. The properties in Table 2.10.13.1 are taken from ASME 1989 Code, Section III, Division 1, Table I-2.2, for a temperature of 220°F.

TABLE 2.10.13.1 MECHANICAL PROPERTIES AND ALLOWABLE STRESS

Material Property	A240, 304	XM-19, A240	A403, 304
Elastic Modulus (E, 10^6 psi)	27.7	27.7	27.7
Yield Stress (Sy, ksi)	30.0	55.0	30.0
Ultimate Stress (Su, ksi)	75.0	99.5	75.0
Design Stress (Sm, ksi)	20.0	36.6	20.0
Allowable Stress:	**A240, 304**	**XM-19, A240**	**A403, 304**
Primary Membrane Stress (ksi)	20.0	36.6	20.0
Primary Membrane + Bending (ksi)	30.0	55.0	30.0
Shear Membrane (ksi)	15.0	22.0	15.0
Shear Membrane + Bending (ksi)	18.0	33.0	18.0
Bearing (k-si)	30.0	55.0	30.0

2.10.13.4 Analysis of Overpack Shell

Three analyses are presented for the overpack structure. The first two analyses are for local stress at the torroid reinforcing ribs due to bearing and tie-down. Both of these are finite element analyses, and utilize the overpack model shown in Figure 2.10.13.2. Neither of these two analyses address the general stress distribution due to inertia and reaction forces. The general stress distribution due to inertia and reaction forces is determined analytically in a separate analysis. The analysis for maximum bearing force is presented in Subparagraph 2.10.13.4.1, the analysis for maximum tie-down force is presented in Subparagraph 2.10.13.4.2, and the general analysis for inertia and reaction forces is presented in Subparagraph 2.10.13.4.3.

The overpack model is a comprehensive model of the overpack structure, including the energy absorbing torroids, the cylindrical outer shell, and the reinforced, rib sections. This model, shown in Figure 2.10.13.2, is composed of 1407 nodes and 2544 triangular shell elements. The overpack model is used to assess the stresses due to the bearing and tie-down loads on the reinforcing ribs. The reinforcing ribs in the overpack model function only to supply a load path to the overpack shell for analysis of the shell structure. The stress analysis of the rib is accomplished by means of a detailed rib model presented in Paragraph 2.10.13.5.

The principal shear and equivalent stress values determined in the FEM analyses are used for the overpack stress evaluation. The equivalent stress is evaluated against the tension. The principal shear and equivalent stress values determined in the FEM analyses are used for the overpack stress evaluation. The equivalent stress is evaluated against the tension allowables in Table 2.10.13.1, and the principal shear stress is evaluated against the shear allowables in Table 2.10.13.1. The equivalent stress for shell analysis, which is the same as for plane stress analysis, is given by,

$$\sigma_e = \sqrt{\sigma_1^2 - \sigma_1\sigma_2 + \sigma_2^2} \quad \text{.......... Equation I}$$

where σ_1 and σ_2 are the minimum and maximum principal stresses. Stress values at the mid-plane are used to evaluate membrane stress, and stress values at the inner-surface and outer-surface are used to evaluate bending stress.

2.10.13.4.1 Analysis of Overpack Shell for Maximum Bearing Load

The maximum rib bearing load, developed in Attachment A, is:

$$Fn = 151.1 \text{ k}$$

The rib bearing loads in the x- and z-directions are applied to the overpack structure as shown in Figure 2.10.13.2. For bearing there is no loading in the y-direction. From the geometry of the reinforcing ribs, the load components in the x- and z-directions shown in Figure 2.10.13.2 are,

$$Fx = Fn \cdot \sin\theta = 151.1 \cdot 0.530 = 80.1 \text{ k}$$

$$Fz = Fn \cdot \cos\theta = 151.1 \cdot 0.848 = 128.1 \text{ k}$$

The maximum overpack principal shear and equivalent stresses determined in the FEM analysis for these loads are listed in Table 2.10.13.2. The distribution of overpack, outer surface, equivalent stress is shown in Figure 2.10.13.3. From Figure 2.10.13.3 it can be seen that the maximum stresses are at the reinforcing rib where the material is XM-19.

TABLE 2.10.13.2. MAXIMUM OVERPACK PRINCIPAL STRESSES DUE TO BEARING LOAD

Stress Component	Stress (ksi)
Tension, membrane	19.6
Shear, membrane	10.9
Tension, membrane+bending	26.5
Shear, membrane+bending	13.2

2.10.13.4.2 Analysis of Overpack Shell for Maximum Tie-Down Load

The rib tie-down loads in the x, y, and z directions are applied to the overpack structure as shown in Figure 2.10.13.2. The maximum tie-down loads are developed in Appendix A. The loads in Appendix A are in a different coordinate system then that used for the overpack model. With respect to the overpack model coordinate system, the maximum tie-down load components are,

$$Px = -17.7 \text{ k}$$

$$Py = -70.9 \text{ k}$$

$$Pz = 35.5 \text{ k}$$

The maximum overpack principal shear and equivalent stresses determined in the FEM analysis for these loads are listed in Table 2.10.13.3. The distribution of the overpack outer surface equivalent stress is shown in Figure 2.10.13.4. From Figure 2.10.13.4 it can be seen that the maximum stress occurs in both XM-19, and A240 materials.

TABLE 2.10.13.3. MAXIMUM OVERPACK PRINCIPAL STRESSES DUE TO TIE-DOWN LOAD

Stress Component	Stress (ksi)
Tension, membrane	13.4
Shear, membrane	7.46
Tension, membrane+bending	16.9
Shear, membrane+bending	9.25

2.10.13.3 General Bending Stress in Overpack Structure

The analyses presented in Subparagraph 2.10.13.4.1 and 2.10.13.4.2 are for local stresses in the area of the torroid reinforcing ribs. This section develops the maximum stress in the cylindrical overpack shell due to the inertia and reaction forces. The inertia and reaction forces acting on the overpack are shown in Figure 2.10.13.5. The forces in Figure 2.10.13.5 are developed in Attachment A. From Figure 2.10.13.5, the force and bending moment at Section a-a are,

$$P = 340 \text{ k}$$

$$M = 71.0 \cdot 78.0 = 5538 \text{ in-k}$$

The cross-sectional area and moment of inertia are,

$$A = 2\cdot\pi\cdot r\cdot t = 2\cdot\pi\cdot 24.0\cdot 0.5 = 75.4 \text{ in}^2$$

$$I = \pi\cdot r^3\cdot t = \pi\cdot 24^3\cdot 0.5 = 21{,}714 \text{ in}^4$$

The resulting maximum stress is,

$$\sigma = P/A + M\cdot c/I = 340/75.4 + 5538\cdot 24/21714 = 10.6 \text{ ksi}$$

The above stress is considered a membrane stress, and the material is A240.

2.10.13.5 Analysis of Reinforcing Rib

The overpack model does not accurately model the reinforcing ribs. The ribs in the overpack model primarily function to provide the proper load application to the shell structure. The rib stresses associated with both the maximum bearing and tie-down loads are determined by a detailed, FEM analyses of the rib alone. The FEM model based in the rib analyses is shown in Figure 2.10.13.6. The model shown in Figure 2.10.13.6 consists of 693 nodes, and 1151 triangular elements. The model is fixed at the points where the rib attaches to the overpack structure. For the bearing load analysis, the bearing load, P_{br}, shown in Figure 2.10.13.6 is applied in a plane stress analysis. For the tie-down load analysis, the components of the tie-down load, Px, Py, and Pz, shown in Figure 2.10.13.6, are applied in a shell bending analysis. These two loadings do not act together on any rib, and are therefore considered individually.

2.10.13.5.1 Rib Stress for Maximum Bearing Load

The bearing load is applied in the plane of the rib, normal to the free edge as shown in Figure 2.10.13.6. The bearing force is evenly distributed along the free edge. From Attachment A, the maximum bearing load on a single reinforcing rib is,

$$Fn = 151.1 \text{ k}$$

This maximum bearing load is applied in a plane stress, FEM analysis. The principal shear and equivalent stress values determined in the FEM analysis are used in the rib evaluation. The equivalent stress is evaluated against the tension allowables in Table 2.10.13.1, and the principal shear stress is evaluated against the shear allowables in Table 2.10.13.1. The equivalent stress for plane stress analysis is given by Equation 1. The stress values from the FEM analysis include both membrane and in-plane bending components. As a result, these values are used directly for the membrane+bending stress in the code evaluation, but not for the membrane stress. The membrane stress required for code evaluation is determined by averaging the stresses at the inside and outside elements of Section a-a shown in Figure 2.10.13.6. Section a-a is the minimum cross section for shear tear-out.

The maximum rib principal shear and equivalent stresses found in the FEM analysis are given in Table 2.10.13.4. The distribution of equivalent stress in the rib structure is shown in Figure 2.10.13.7.

TABLE 2.10.13.4. MAXIMUM RIB STRESS DUE TO BEARING LOAD

Stress Component	Stress (ksi)
Tension, membrane	16.9
Shear, membrane	7.65
Tension, membrane+bending	28.9
Shear, membrane+bending	13.8

2.10.13.5.2 Rib Stress for Maximum Tie-Down Load

The components of the applied tie-down load, Px, Py and Pz. Shown in Figure 2.10.13.6 are applied in a shell bending analysis of the rib structure. A shell bending analysis is mandated by the out-of-plane force, Pz. The force components Px and Py are applied in the plane of the rib, and the force component Pz is applied normal to the rib. The in-plane force components are distributed over a 180 degree segment of the bolt hole as a pressure distribution, centered on the resultant of Px and Py. The out-of-plane force component, Pz, is evenly distributed over the same 180 degree segment as the in-plane loading.

From Attachment A, the tie-down force components in the reference system shown in Figure 2.10.13.6 are,

Px = -35.5 k

Py = -70.9 k

Pz = 17.7 k

The principal shear and equivalent stress values determined in the FEM analysis are used in the rib evaluation. The equivalent stress is evaluated against the tension allowables in Table 2.10.13.1, and the principal shear stress evaluated against the shear allowables in Table 2.10.13.1. The equivalent stress for shell analysis is given by Equation 1. Midplane stress values from the FEM analysis are used to evaluate membrane stress, and stress values at the inner, and outer surfaces are used to evaluate bending stress. The mid-plane stresses from the FEM analysis are not used directly to evaluate

membrane stress, as these stresses include both membrane and in-plane bending components. As a result, the membrane stress required for code evaluation is determined by averaging the FEM mid-plane stresses at the inside and outside elements of Section a-a shown in Figure 2.10.13.6. Section a-a is the minimum cross-section for shear tear-out.

The maximum rib principal shear and equivalent stresses due to tie-down load are listed in Table 2.10.13.5. The distribution of outer fiber, equivalent stress throughout the rib structure is shown in Figure 2.10.13.8.

TABLE 2.10.13.5. MAXIMUM RIB STRESS DUE TO TIE-DOWN LOAD

Stress Component	Stress (ksi)
Tension, membrane	28.8
Shear, membrane	15.0
Tension, membrane+bending	54.2
Shear, membrane+bending	29.3

2.10.13.6 Stress Evaluation

The maximum stresses found in Paragraphs 2.10.13.4 and 2.10.13.5 are summarized in Table 2.10.13.6. This table also lists the applicable allowable stresses and margins of safety. In Table 2.10.13.6, all stresses are in ksi, and the margins of safety are calculated as,

$$M.S. = (\sigma_{allow}/\sigma) - 1$$

TABLE 2.10.13.6. MAXIMUM AND ALLOWABLE STRESSES

Component	Stress-Type	Load Cond	Stress	Allow	M.S
Overpack	tension, mem	bearing	19.6	36.6	+0.87
Overpack	tension, bend	bearing	26.5	55.0	+1.08
Overpack	shear, mem	bearing	10.9	22.0	+1.02
Overpack	shear, bend	bearing	13.2	33.0	+1.50
Overpack	tension, mem	tie-down	13.4	20.0	+0.49
Overpack	tension, bend	tie-down	16.9	30.0	+0.77
Overpack	shear, mem	tie-down	7.46	15.0	+1.01
Overpack	shear, bend	tie-down	9.25	18.0	+0.94
Overpack	tension, mem	general	10.6	20.0	+0.88
Rib	tension, mem	tie-down	28.2	36.6	+0.29
Rib	tension, bend	tie-down	54.2	55.0	+0.01
Rib	shear, mem	tie-down	15.0	22.0	+0.47
Rib	shear, bend	tie-down	29.3	33.0	+0.12

All margins of safety in Table 2.10.13.6 are positive, indicating that both the overpack and rib structures meet the requirements of 10CFR71.45 for horizontal transport. The minimum margins occur in the rib structure. The minimum margin in the rib is 0.01, however, this margin corresponds to a bending stress where the rib can carry up to 50% more moment in the inelastic range without appreciably affecting its structural integrity.

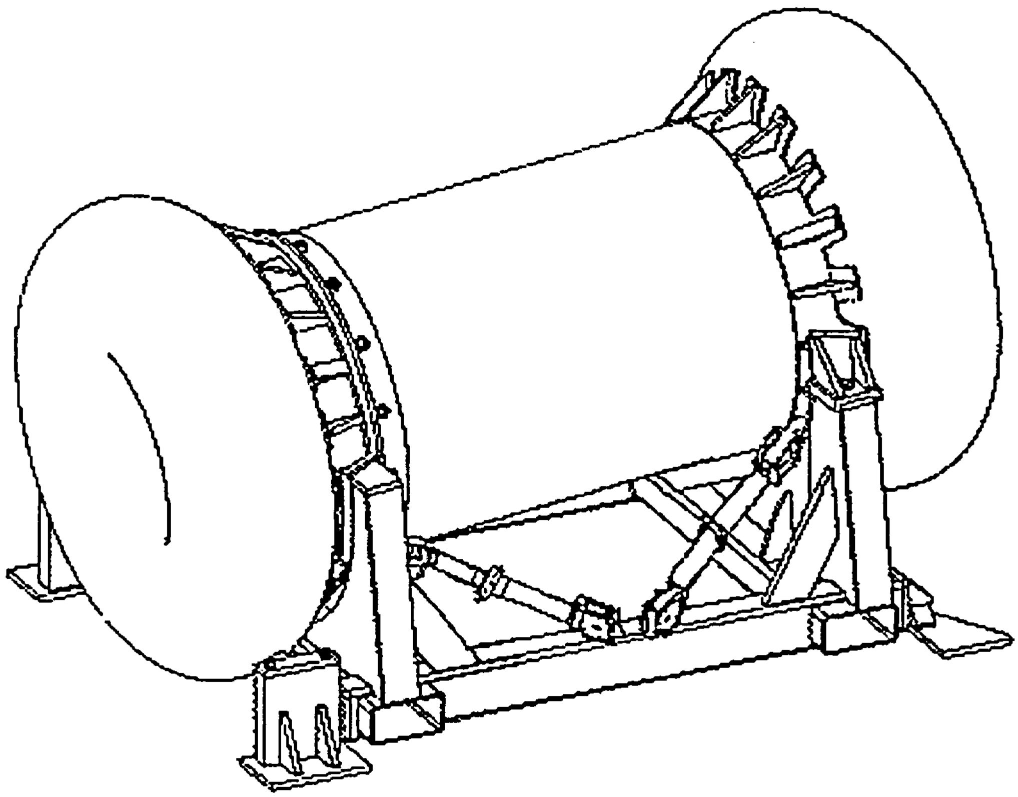


FIGURE 2.10.13.1. GE2000 SHIPPING PACKAGE IN HORIZONTAL TRANSPORT MODE

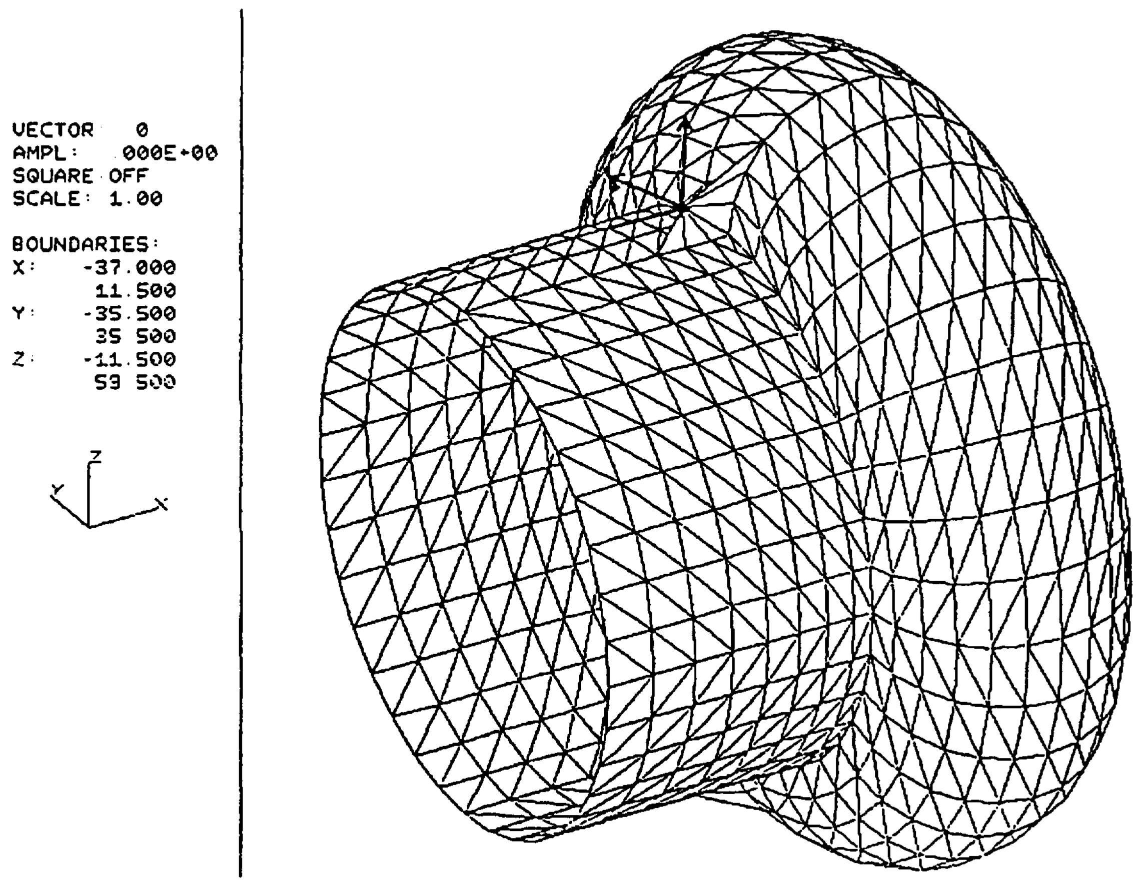


FIGURE 2.10.13.2. FEM MODEL OF OVERPACK STRUCTURE

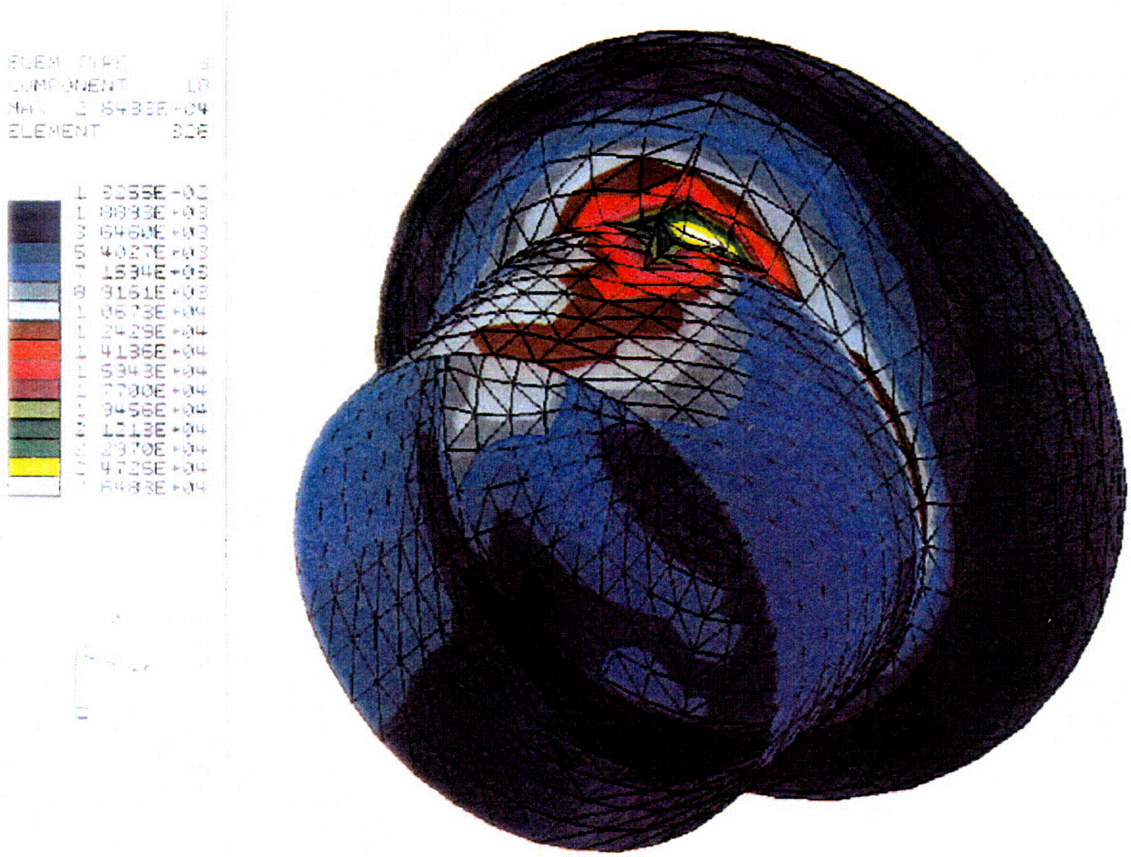


FIGURE 2.10.13.3. OVERPACK, OUTER SURFACE, EQUIVALENT STRESS
DUE TO BEARING LOAD

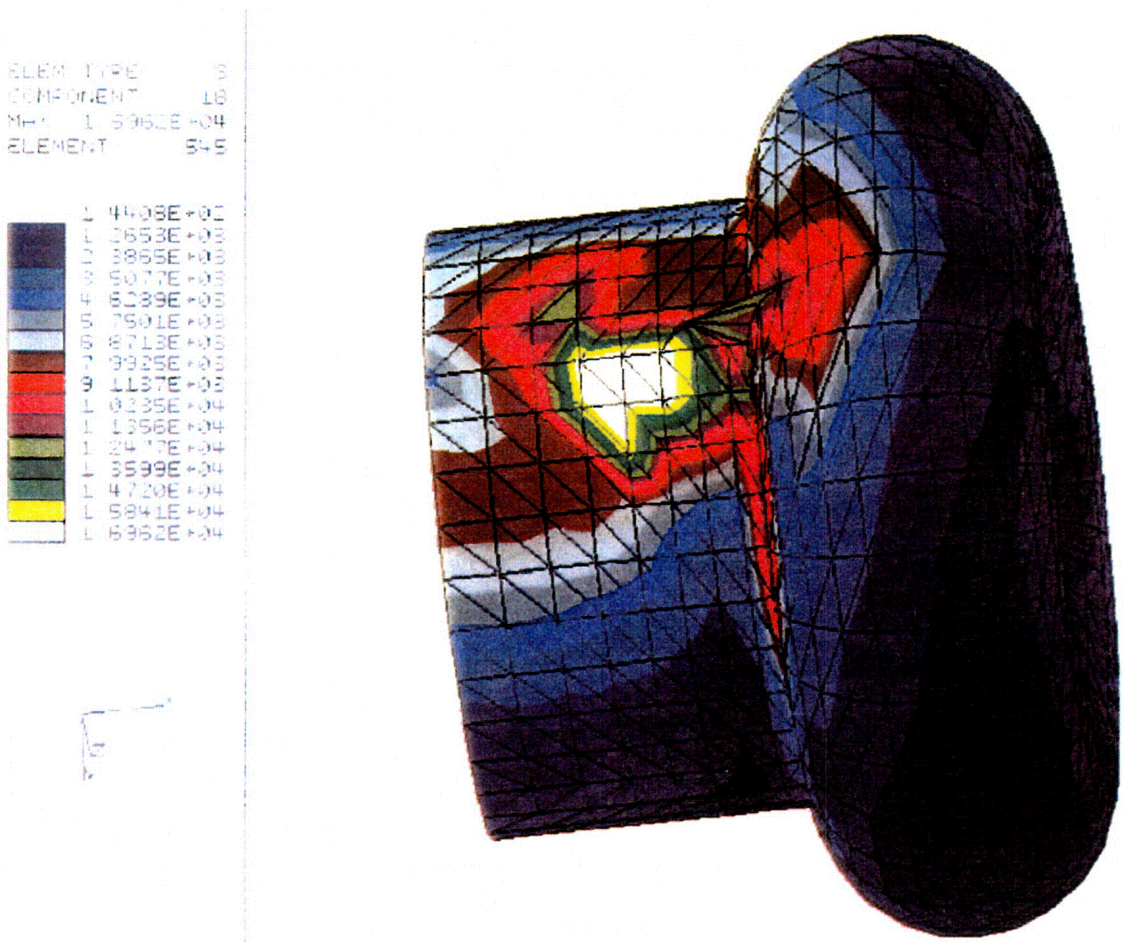


FIGURE 2.10.13.4. PACKAGE SHELL OUTER FIBER EQUIVALENT STRESS DISTRIBUTION DUE TO TIE-DOWN LOADS

C02

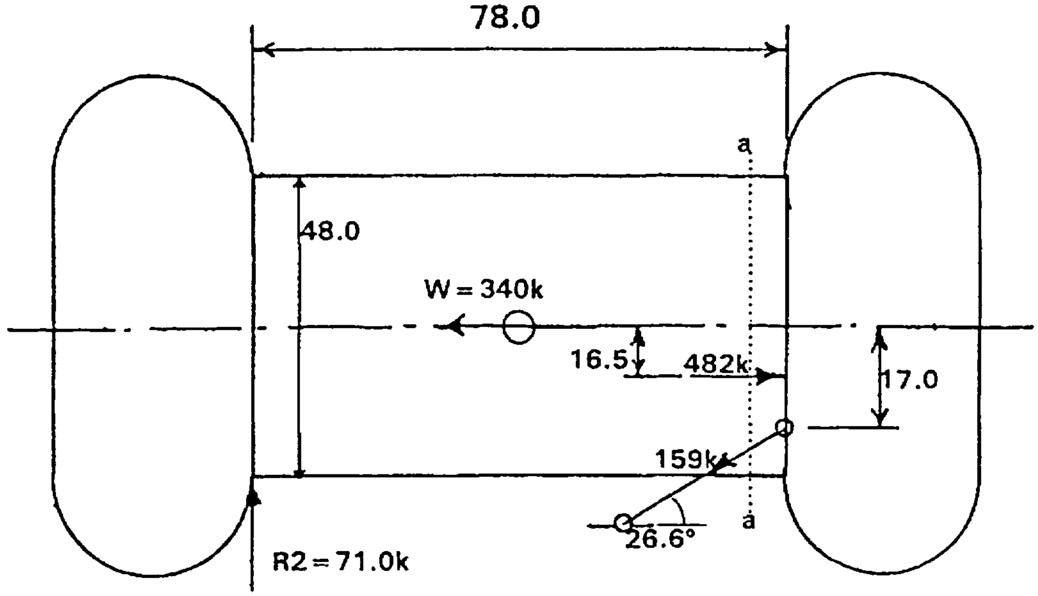


FIGURE 2.10.13.5. INERTIA AND REACTION FORCES ON OVERPACK

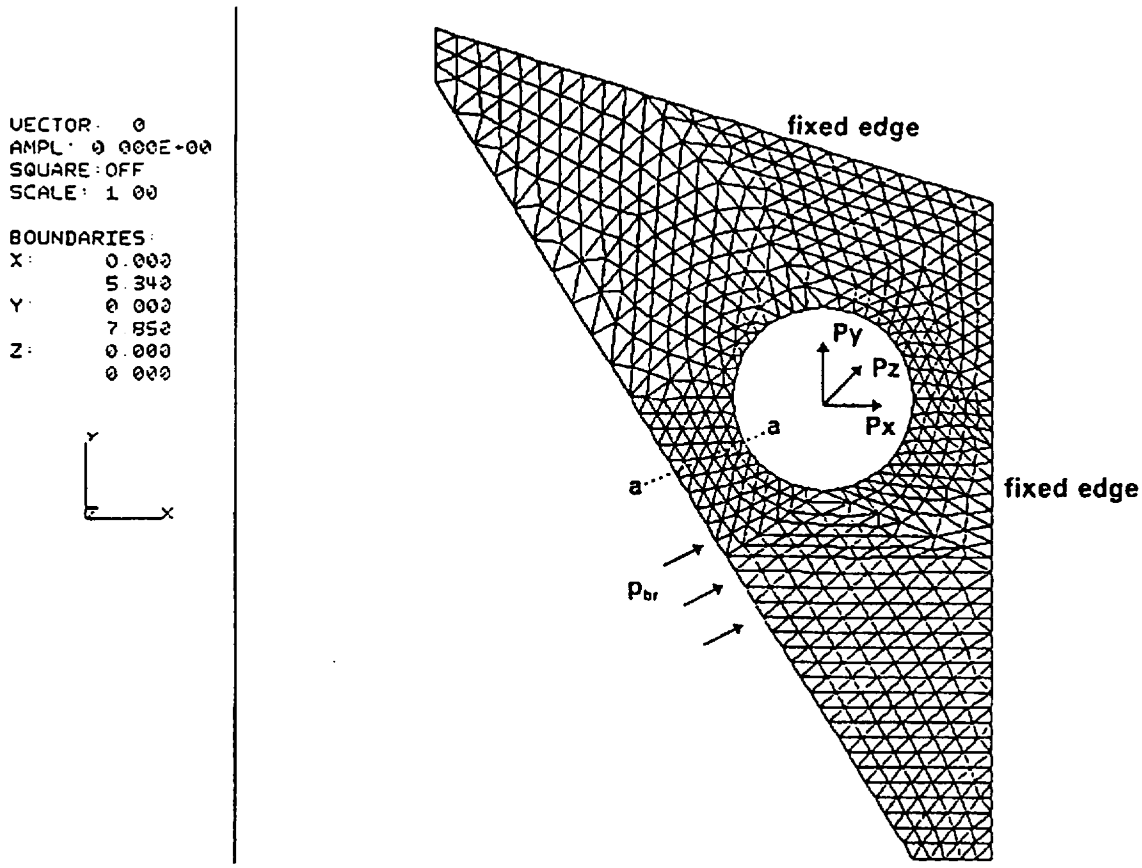


FIGURE 2.10.13.6. FEM MODEL OF RIB

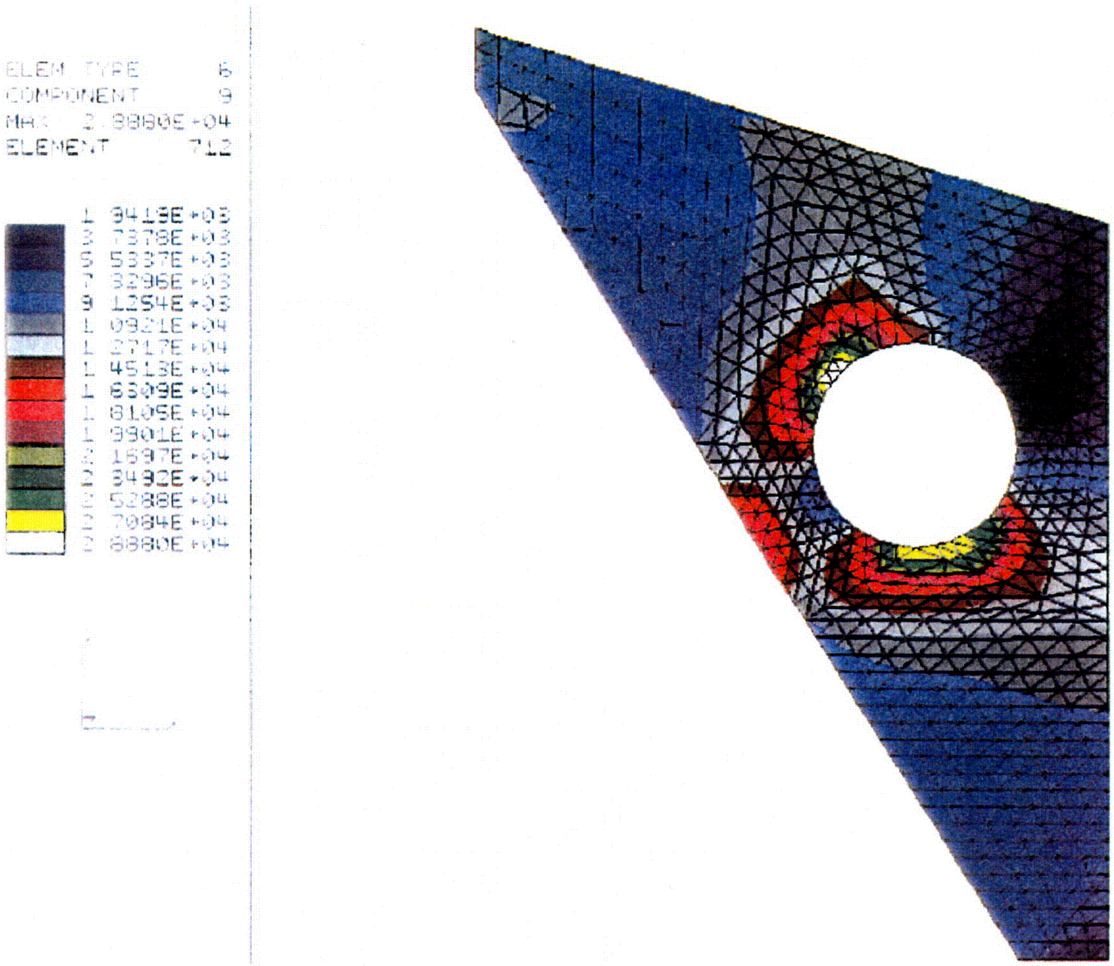


FIGURE 2.10.13.7. EQUIVALENT STRESS IN RIB DUE TO MAXIMUM BEARING LOAD

C03

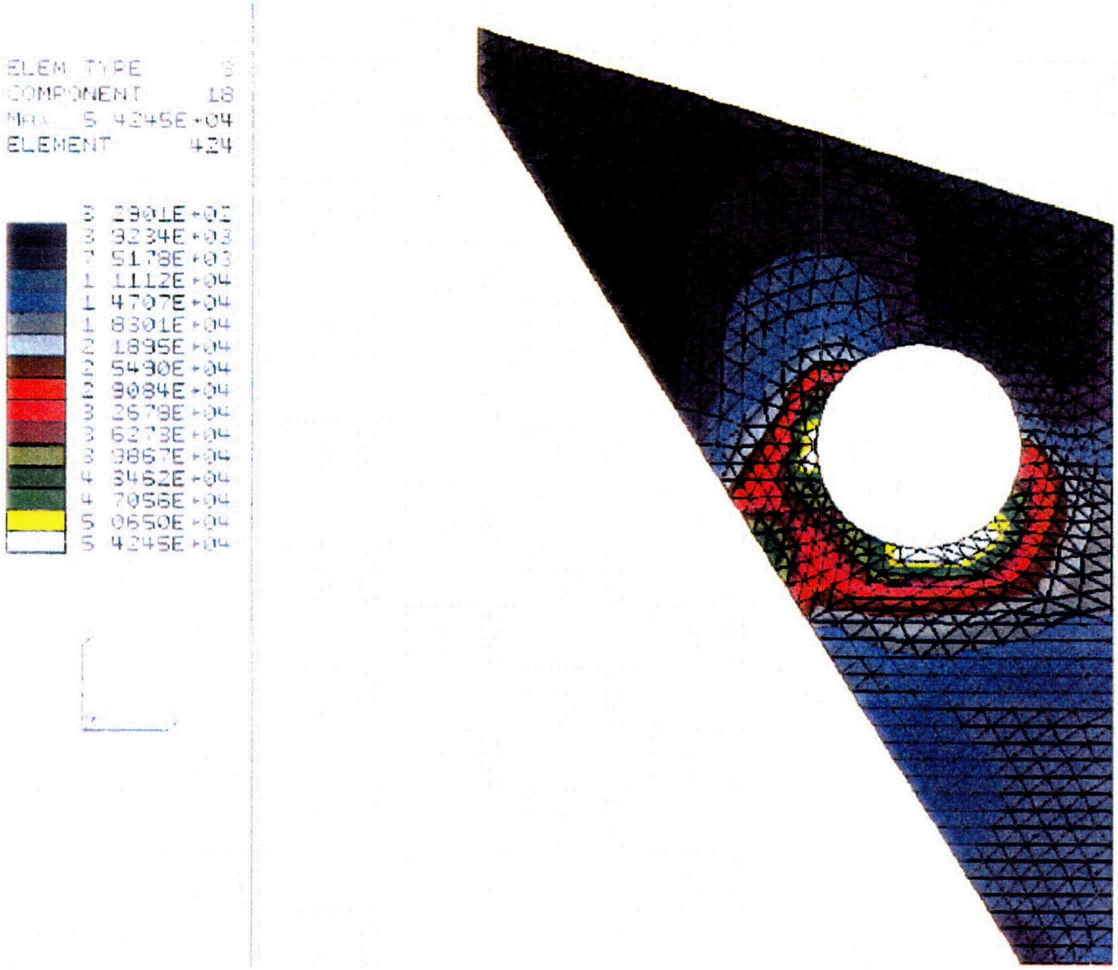


FIGURE 2.10.13.8. OUTER FIBER, EQUIVALENT STRESS IN RIB DUE TO MAXIMUM TIE-DOWN LOAD

C04

ATTACHMENT A - DERIVATION OF RIB BEARING AND TIE-DOWN FORCES

Introduction

The maximum bearing and tie down forces acting on any single torroid reinforcing rib are derived in this attachment. The bearing force derived here acts normal to the free edge of the rib, while the tie-down force has a global orientation which is also developed in this attachment. The tie-down cables are assumed to carry only tension load, under compression the turn-buckles will not carry any load. The bearing and tie-down forces developed in this attachment act on different reinforcing ribs, and are applied in independent FEM analyses of the rib and torroid structures.

Resultant Forces Acting on Cask

The longitudinal inertia and reaction forces acting on the cask in the horizontal transport mode are shown in Figure A1. Although the cask forces are three dimensional, and the cask has a 5º orientation w/r to the horizontal axis, the longitudinal forces on the cask may be determined from Figure A1. For longitudinal acceleration, the lateral forces are self-equilibrated and need not be considered, and the longitudinal inertia force can be resolved into the force W in Figure A1, and a vertical force that is considered separately,

In Figure A1, W is the inertia force, R1 and R2 the resultant horizontal and vertical reaction forces at the reinforcing ribs, and T the resultant cable tie-down force. Note that R1 and R2 act at different ribs. The resultant force, R1 is located a distance a from the resultant inertia load, W, the resultant tie-down force, T, is located a distance c from W, and T is oriented by the angle θ with the horizontal axis.

Considering equilibrium of horizontal forces, vertical forces, and moments, respectively,

$$W + T \cdot \cos\theta - R1 = 0 \qquad (1)$$

$$R2 - T \cdot \sin\theta = 0 \qquad (2)$$

$$R2 \cdot b/2 - R1 \cdot a + T \cdot \cos\theta \cdot c + T \cdot \sin\theta \cdot b/2 = 0 \qquad (3)$$

Equations 1-3 contain three unknowns, R1, R2, and T. Solving these equations for the three unknowns gives,

$$R1 = W \cdot (c \cdot \cos\theta + b \cdot \sin\theta)/(b \cdot \sin\theta + (c-a) \cdot \cos\theta) \quad (4)$$

$$T = R1 \cdot a/(b \cdot \sin\theta + c \cdot \cos\theta) \quad (5)$$

$$R2 = T \cdot \sin\theta \quad (6)$$

From the horizontal transport drawings, for a 10g longitudinal inertia force,

$a = 16.5$ in

$b = 78.0$ in

$c = 17.0$ in

$\theta = 21.8^{\circ}$

$W = 10 \cdot 34.0 = 340k$

Substituting into equations 4-6,

$R1 = 1.48 \cdot W = 503.2$ k

$T = 0.369 \cdot R1 = 185.7k$

$R2 = T \cdot \sin\theta = 69.0$ k

Maximum Force Acting on a Bearing Rib

The resultant force R1 acts on nine ribs, thus the horizontal force on a single rib is,

$$Fx = R1/9 = 503.2/9 = 55.9k \quad (7)$$

The resultant forces R1 and R2 act on different ribs, and would be considered separately. However, since R2 is much smaller than R1, only R1 need be considered in the analyses.

There are also lateral and vertical forces acting on the ribs due to lateral acceleration, vertical acceleration, and the vertical component of the longitudinal inertia due to the cask orientation. The cask orientation is 5° with the horizontal axis, thus the vertical component of the 10g horizontal acceleration is,

$Az' = 10 \cdot \sin(5^{\circ}) = 0.87g$

The total vertical acceleration and inertia force are then,

$$Az = 2.0 + Az' = 2.87g$$

$$R3 = 2.87 \cdot 34.0 = 97.6k$$

This vertical inertia force is assumed to be reacted by 10 ribs, 5 at each torroid. The vertical force on a single rib is then,

$$Fz = R3/10 = 97.6/10 = 9.8k \qquad (8)$$

The lateral acceleration force is 5g, thus resultant lateral force is,

$$R4 = 5.0 \cdot 34.0 = 170.0k$$

R4 is assumed reacted by 4 ribs, 2 at each torroid. Thus the lateral force on a single rib is,

$$Fy = 170.0/4 = 42.5k \qquad (9)$$

The forces Fx and Fz act on the same rib. With respect to Figure A2, noting that Fz and Fy have the same rib orientation, the resultant bearing force due to Fx and Fz is,

$$Fn' = Fx/\sin\theta + Fz/\cos\theta$$

$$\theta = 32^\circ$$

$$Fn' = 55.9/0.530 + 9.8/0.848 = 117.0k$$

The forces Fx and Fy can act on the same rib. With respect to Figure A2, the resultant bearing force due to Fx and FY is,

$$Fn'' = Fx/\sin\theta + Fy/\cos\theta$$

$$Fn'' = 55.9/0.530 + 42.5/0.848 = 155.5k$$

The maximum rib bearing force, Fn, is then Fn",

$$Fn = Fn'' = 155.5k$$

<u>Maximum Force Components Acting on a Tie-Down Rib</u>

The configuration of the tie down cable force is shown in Figure A3. In Figure A3, T is the tie-down force developed above, and is resisted by two cables. From Figure A3, the components of a single tie-down cable force are,

$Px = T \cdot \cos \theta/2 = 185.7 \cdot \cos 14.9^{\circ}/2 = 89.7k$

$Pz = T \cdot \sin \theta/2 = 185.7 \cdot \sin 14.9^{\circ}/2 = 23.9k$

$P = Px\ (d/\Delta x) = 89.7 \cdot 33.3/30.0 = 99.6k$

$Py = P\ (\Delta z/d) = 99.6 \cdot 12.0/33.3 = 36.2k$

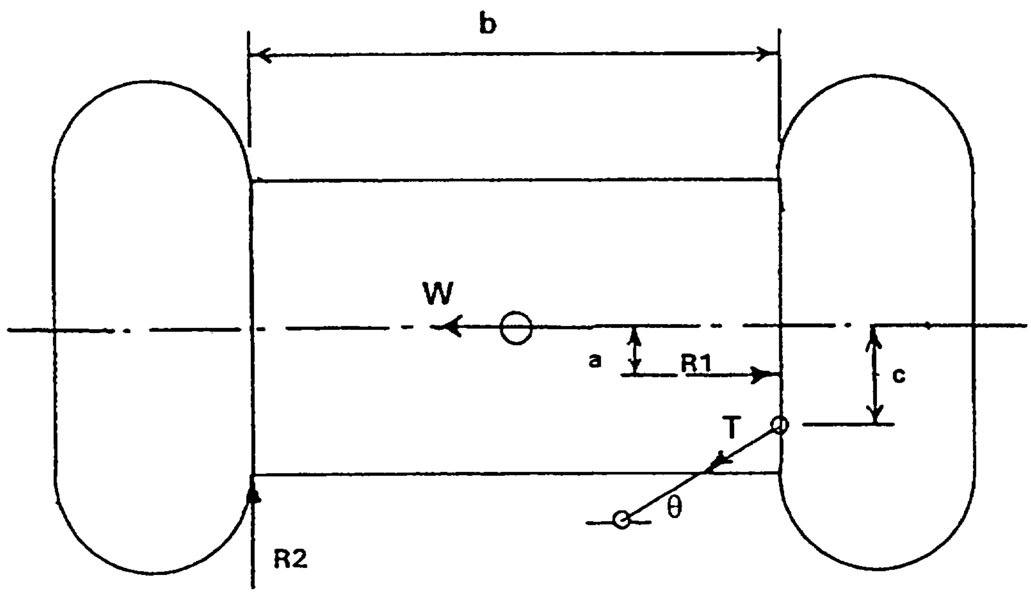


FIGURE A1. CONFIGURATION OF LONGITUDINAL INERTIA AND REACTION FORCES

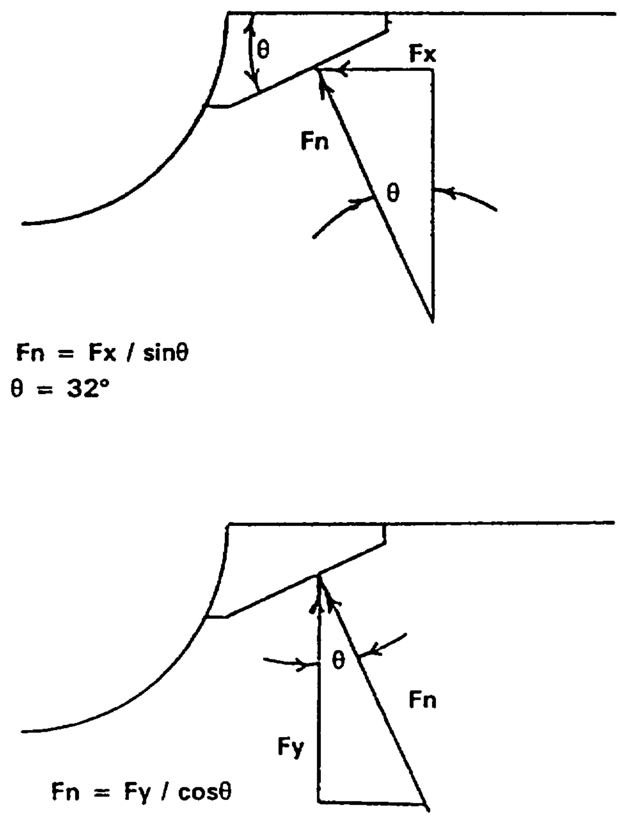
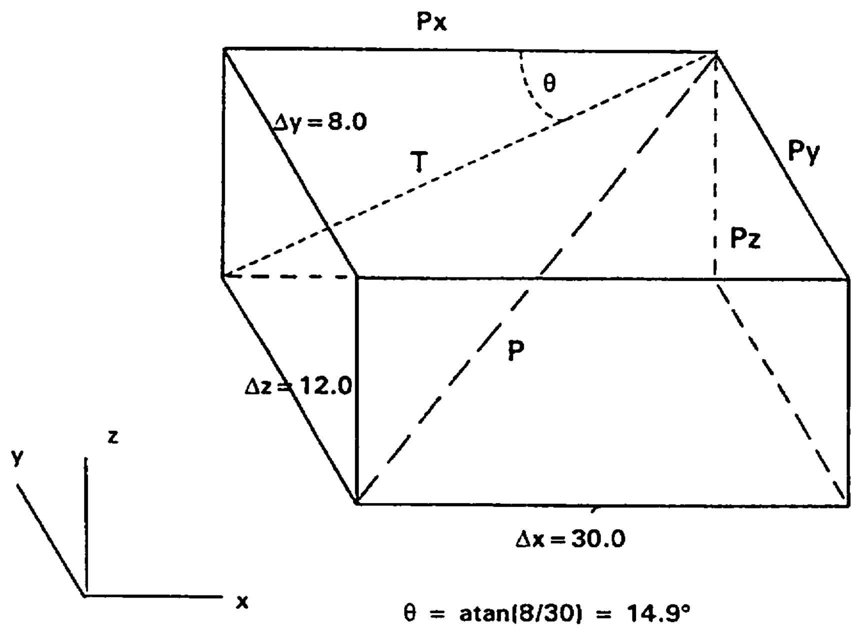


FIGURE A2. ORIENTATION OF RIB BEARING LOADS



$\theta = \text{atan}(8/30) = 14.9°$

$d = \sqrt{\Delta x^2 + \Delta y^2 + \Delta z^2} = 33.3$

FIGURE A3. CONFIGURATION OF TIE-DOWN CABLE LOAD

2.11 REFERENCES

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2. U.S. NRC Regulatory Guide 7.6, "Design Criteria for the Structural Analysis of Shipping Cask Containment Vessels".

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4. W. R. Holman and R. T. Langland, "Recommendations for Protecting Against Failure by Brittle Fracture in Ferritic Steel Shipping Containers Up to Four Inches Thick", Lawrence Livermore Laboratory; Livermore, California; August, 1981; NUREG/CR-1815.

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18. Draft American National Standard, "Design Basis for Resistance To Shock and Vibration of Radioactive Material Packages Greater Than One Ton In Truck Transport"; May, 1980.

19. L. B. Shappert, "Cask Designer's Guide", Oak Ridge National Laboratory, ORNL-NSIC-68; February, 1970; p. 17.

20. H. H. Beduar, "Pressure Vessel Design Handbook", 1st Ed Van Nostrand Reinhold Company, New York, 1981.

3. THERMAL EVALUATION

The objective of the thermal evaluation is to determine the temperature distribution in the transport package which occurs during normal and hypothetical accident conditions of the performance requirements of 10CFR71 and to establish temperature effects on the package components and their performance, as these effects relate to safety and compliance with the regulations.

3.1 DISCUSSION

The Model 2000 package is designed with a thermally passive system. The cask is enclosed by an overpack structure which acts as a fire shield. The overpack structure is designed to reduce heat flow from the fire environment into the cask structure by the use of enclosed air spaces. The overpack structure is composed of two concentric cylinders approximately 83 in. long with an OD of 48.5 in. and an ID of 40.5 in. The cylinders are separated radially by eight equally spaced tubes and horizontally by two tube sections to provide closed air spaces. A 24-inch tube diameter toroidal shell is attached to both ends of the external cylinder with a circular plate enclosing the inner regions of the torus. The internal cylinder is also closed at each end by a circular plate. All materials are 0.5-in.-thick Type 304 stainless steel except for the spacer tubes. The vertical tubes are 3 in. OD, 0.25 in. thick while the horizontal tube sections are 7.25 in. OD, 0.375 in. thick. Attached at both ends of the overpack inner surface there are aluminum honeycomb pads. The cask is placed within the overpack at assembly. A 1.0 in. radially and 1.5 in. at the top air gap separates the cask from the overpack inner surfaces. It is postulated that the air spaces within the overpack structure will not be affected in the 30-foot free drop accident condition. The results of the 1/4-scale test discussed in Subsection 2.7.5 of this document verified this assumption.

Temperature distributions in the Model 2000 cask are evaluated for the following thermal environments:

1. 100°F ambient with maximum decay heat and maximum solar load

2. 100°F ambient with maximum decay heat

3. Fire transient, t = 0 to 3.0 hours

4. -40°F ambient with maximum decay heat

5. -40°F ambient

6. -20°F ambient with maximum decay heat

7. -20°F ambient

All conditions are analyzed using the finite element program LIBRA with the exception of conditions 5 and 7, where uniform temperature fields of -40°F and -20°F are assigned. A description of the LIBRA finite element program heat transfer module is presented in Subsection 3.6.1. Subsection 3.6.1 also includes the qualification and verification program performed by GE to support modeling techniques and assumptions taken throughout the thermal evaluation. Condition 3, fire transient; the analysis is initiated at the steady-state condition 1 in which the maximum solar load is applied. A maximum decay heat of 600 watts is distributed onto the cavity surface of the cask. The maximum temperatures determined by the analyses and the regulatory and/or component thermal criteria are given in Table 3.1.1.

TABLE 3.1.1. SUMMARY OF TEMPERATURES

Package Component	Thermal Condition Temperatures °F							Regulatory/Component Criteria °F
	1	2	3(1)	4	5	6	7	
Cask Cavity	220	161	294	21	-40	41	-20	T ≤ 600
Lead Shield	220	161	237	20	-40	40	-20	T ≤ 620
Cask Seal Area	215	153	276	13	-40	33	-20	-65 < T < 400
Cask Test Port	214	152	284	12	-40	32	-20	-65 < T < 400
Cask Drain Port	204	151	350	10	-40	30	-20	-65 < T < 400
Cask Vent Port	217	155	244	15	-40	35	-20	-65 < T < 400
Cask Outer Surface	218	159	401	19	-40	39	-20	N/A
Overpack Inner Surface	199	131	774	-5	-40	15	-20	N/A
Overpack Accessible Outer Surface	173	112	1,153	-29	-40	-8	-20	For Thermal Cond. #1 T ≤ 180 For Thermal Cond. #2 T ≤ 122

(1) Values given are maximum temperatures obtained for each component throughout the 3 hours transient.

3.2 SUMMARY OF THERMAL PROPERTIES OF MATERIALS

The transport package model consists of four materials whose thermal properties are listed below. The curve fit functions which give the variation of the properties with temperature are also given. These property functions are used in the transient analysis to update the material properties as the temperature changes.

3.2.1 Lead

Thermophysical Properties

Temp.	k(Btu/hr-ft-°F) [3.7.1]	Cp(Btu lb-°F) [3.7.2]	ρ(lb in.^{3}) [3.7.3]
68.0	-	0.0305	0.4097
80.3	20.3	-	
158.0	-	0.0310	
170.3	20.1	-	
248.0	-	0.0316	
260.3	19.5	-	
338.0	-	0.0320	
428.0	-	0.0325	
440.3	18.8	-	
500.0	-	0.0329	
608.0	-	0.0334	
620.3	18.0	-	

Conductivity, K (Btu/hr-in.-°F)

$$K(T) \Big|_{68.0°F}^{620.3°F} = 1.7263 - 3.6418 \times 10^{-4}\ T$$

Specific Heat, Cp (Btu/lb-°F)

$$Cp(T) \Big|_{68.0°F}^{620.3°F} = 3.0177 \times 10^{-2} + 5.3924 \times 10^{-6}\ T$$

Density, ρ (lb/in.^{3})

$$\rho(T) \Big|_{68.0°F}^{620.3°F} = 0.41$$

3.2.2 Stainless Steel (304 Type)

TABLE 3.2.2.1. THERMOPHYSICAL PROPERTIES[3.7.4]

Temp.	k(Btu/hr-ft-°F)	α(ft^2/hr)
70	8.6	0.151
100	8.7	0.152
200	9.3	0.156
300	9.8	0.160
400	10.4	0.165
500	10.9	0.170
600	11.3	0.174
700	11.8	0.179
800	12.2	0.184
900	12.7	0.189
1,000	13.2	0.194
1,100	13.6	0.198
1,200	14.0	0.203
1,300	14.5	0.208
1,400	14.9	0.212
1,500	15.3	0.216

Conductivity, K (Btu/hr-in.-°F)

$$K(T) \Big|_{70°F}^{1,500°F} = 7.0287 \times 10^{-1} + 3.8987 \times 10^{-4}\ T$$

Thermal Diffusivity, α (in.^{2}/hr)

$$\alpha(T) \Big|_{70°F}^{1,500°F} = 21.110 + 6.7346 \times 10^{-3}\ T$$

Density, p (lb/in.^{3})

$$\rho(T) \Big|_{70°F}^{1,000°F} = 0.29$$

Specific Heat, Cp (Btu/lb-°F)

$$Cp(T) = K(T)/\alpha(T)(\rho)$$

$$Cp(T) \Big|_{70°F}^{1,000°F} = K(T)/(6.1219 + 1.953 \times 10^{-3}\ T)$$

3.2.3 Air

TABLE 3.2.3.1. THERMOPHYSICAL PROPERTIES[3.7.5]

Temp.	ρ(lb/ft^3)	Cp(Btu/lb-°F)	μx10^{-5}(lb/ft-sec)	K(Btu/hr-ft-°F)	Pr	(1/°F-ft^3)
32	0.081	0.200	1.165	0.0140	0.72	3.16x10^6
100	0.071	0.240	1.285	0.0154	0.72	1.76
200	0.060	0.241	1.440	0.0174	0.72	0.850
300	0.052	0.243	1.610	0.0193	0.71	0.444
400	0.046	0.245	1.750	0.0212	0.689	0.258
500	0.0412	0.247	1.890	0.0231	0.683	0.159
600	0.0373	0.250	2.000	0.0250	0.685	0.106
700	0.0341	0.253	2.140	0.0268	0.690	70.4x10^3
800	0.0314	0.256	2.250	0.0286	0.697	49.8
900	0.0291	0.259	2.360	0.0303	0.705	36.0
1,000	0.0271	0.262	2.470	0.0319	0.713	26.5
1,500	0.0202	0.276	3.000	0.0400	0.739	7.45
2,000	0.0161	0.286	3.450	0.0471	0.753	2.84

Conductivity, K (Btu/hr-in.-°F)

$$K(T) \Big|_{32°F}^{2,000°F} = 1.1138 \times 10^{-3} + 1.6988 \times 10^{-6}\, T - 1.4993 \times 10^{-10}\, T^2$$

Prandtl Number, Pr

$$Pr(T) \Big|_{32°F}^{200°F} = 0.72$$

$$Pr(T) \Big|_{200°F}^{500°F} = = 0.603 + 1.3017 \times 10^{-3}\, T - 4.450 \times 10^{-6}\, T^2 + 4.3333 \times 10^{-9}\, T^3$$

$$Pr(T) \Big|_{500°F}^{2,000°F} = 0.7793 - 4.6950 \times 10^{-4}\, T + 7.474 \times 10^{-7}\, T^2 - 4.2962 \times 10^{-10}\, T^3 + 8.5365 \times 10^{-19}\, T^4$$

Parameter, $\frac{g\beta\rho^2}{\mu^2}$ (1/°F-in.^{3})

$$\frac{g\beta\rho^2}{\mu^2}(T)\Bigg|_{0°F}^{200°F} = 2.4306 \times 10^{3} - 21.484\ T + 8.8318 \times 10^{-2}\ T^2 - 1.4682 \times 10^{-4}\ T^3$$

$$\frac{g\beta\rho^2}{\mu^2}(T)\Bigg|_{200°F}^{800°F} = 1.6610 \times 10^{3} - 9.2850\ T + 2.1356 \times 10^{-2}\ T^2 - 2.268 \times 10^{-5}\ T^3 + 9.1329 \times 10^{-9}\ T^4$$

$$\frac{g\beta\rho^2}{\mu^2}(T)\Bigg|_{400°F}^{2,000°F} = 1.8475 \times 10^{2} - 3.2975 \times 10^{-1}\ T + 2.0129 \times 10^{-4}\ T^2 - 4.1096 \times 10^{-8}\ T^3$$

Specific Heat, Cp (Btu/lb-°F)

$$Cp(T)\Bigg|_{100°F}^{2,000°F} = 0.2386 + 8.8082 \times 10^{-6}\ T + 2.1375 \times 10^{-8}\ T^2 - 6.9784 \times 10^{-12}\ T^3$$

Density, p (lb/in.^{3})

$$\rho(T)\Bigg|_{32°F}^{2,000°F} = 5.787 \times 10^{-4}/(11.6125 + 2.527 \times 10^{-2}\ T)$$

3.2.4 Aluminum

The thermophysical properties of Aluminum[3.7.6] were considered constant throughout the analysis with the following values:

K = 9.833 Btu/(hr-in.-°F)

Cp = 0.208 Btu/(lb-°F)

ρ = 0.0978 (lb/in.^{3})

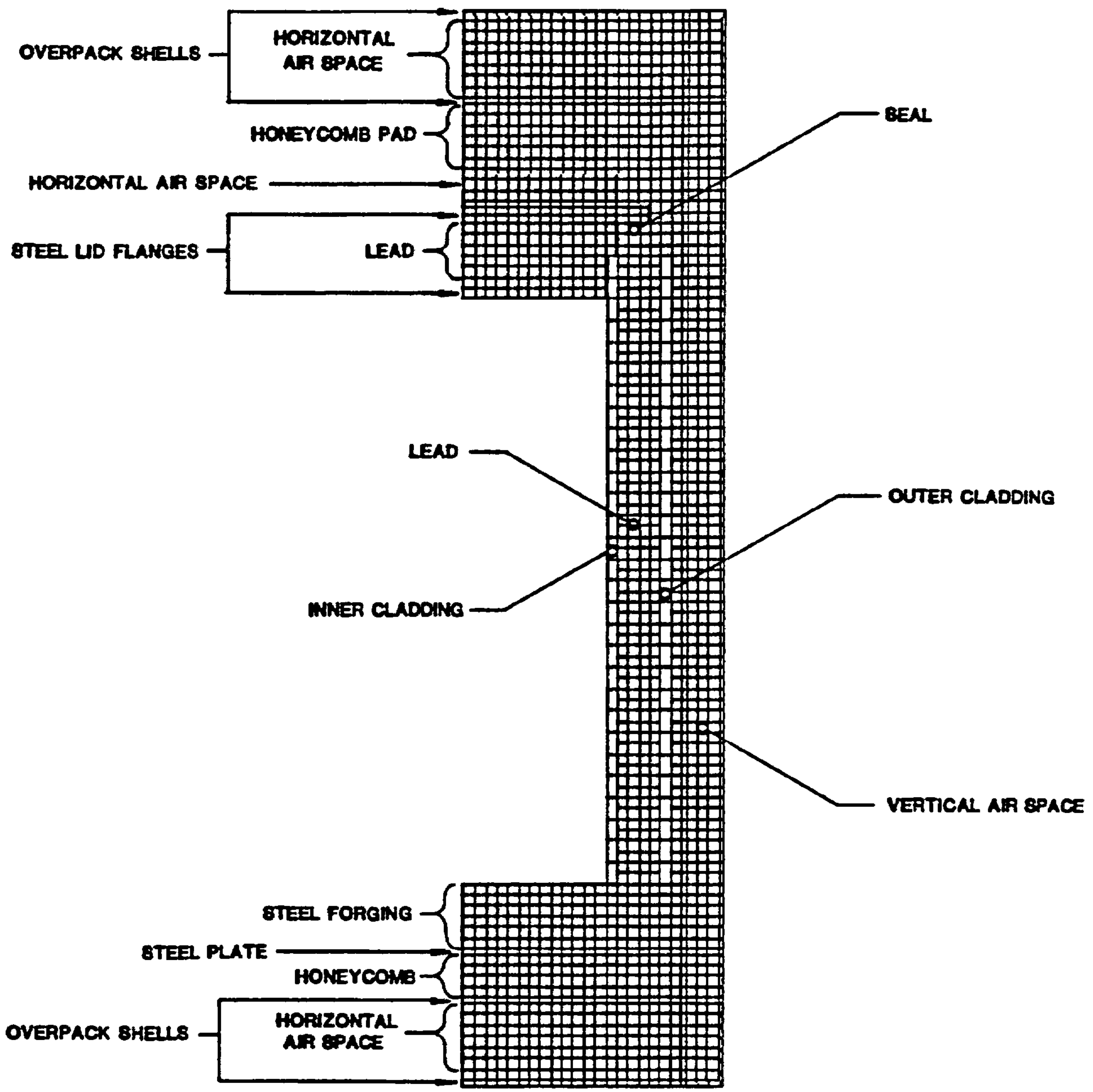
3.3 TECHNICAL SPECIFICATION OF COMPONENTS

The component material within the transport package, considered to be temperature sensitive, is the elastomeric material used in the cask seal and cask port plug O-rings. This material, an enhanced ethylene propylene rubber, was tested by GE to demonstrate the capacity of the material and design to maintain leak-tightness under low (-40°F), normal (70°F), and high (400°F) temperature environments. The elastomeric material successfully performed under all conditions. The test procedure and results are discussed in detail in Section 4.4 of this document.

Other package materials are stainless steel, lead and aluminum. The melting points of these materials are 2,600°F, 620°F and 900°F, respectively. The temperatures resulting from normal and accident thermal conditions fall within these temperatures.

3.4 THERMAL EVALUATION FOR NORMAL CONDITIONS OF TRANSPORT

The finite element model of the Model 2000 type transport package used for the thermal analyses consists of 2,201 nodes and 2,172 elements, as is shown in Figure 3.4.1. The model represents the lead casks and the overpack structure. Because an axisymmetric solution is used, only a cross section of the package need be modeled. The model includes both conductive two-node and four- and eight-node quadrilateral and boundary two-node element types. Each element is characterized by one of a total of 41 different element property sets. These many property sets allow a detailed representation of the four materials (steel, lead, aluminum and air) within the model. Several material property sets represent the same material (e.g., steel, material property sets 1, 2, 4, 5, 29, 30, etc.) but at different temperatures. This is because of their location within the model. Air is also represented by various property sets to account not only for temperature variation but also for different heat transfer modes. The mode of heat transfer across an air space varies if the air space is enclosed or open and also if it is horizontally or vertically oriented.



NUMBER OF ELEMENTS: 2,172, NUMBER OF NODES: 2,201

FIGURE 3.4.1. THERMAL FINITE ELEMENT MODEL

3.4.1 Analytical Model

The model closely represents the actual transport package with the exception of the overpack toroid shells. Figure 3.4.1.1 shows the finite element model overlaying the transport package drawing. The toroidal shells are not included in the model because they will collapse during the free-drop event, and their omission in the evaluation of normal condition is conservative.

The bulk of the cask is lead. The cask cavity and surface are lined with a 304 stainless steel cladding, 1.0 inch in thickness. This cladding is modeled with one-element thickness, eight-node quadrilateral elements. An air gap exists between the cask lead and the outer cladding. This air gap forms due to shrinkage of the lead relative to the stainless steel during the manufacturing process. The air gap is modeled by two-node conduction elements with conduction and radiation properties. The cask sits inside the overpack on a 4-inch-thick aluminum honeycomb material pad. A plate, 0.5-in.-thick, separates the bottom of the cask from the honeycomb pad. The plate is represented by one element while the honeycomb pad is represented by four elements in thickness.

Between the vertical cask surface and the inner overpack shell is an air space. This vertical air space is modeled by four-node conduction elements, one element in thickness. Air space followed by 6-in. honeycomb material pad exists between the top cask surface and the overpack inner top plate. This region is represented with four-node conduction elements with four- and six-element thickness for the horizontal air space and the honeycomb pad. The overpack consists of two concentric 0.5-in.-thick, 304 stainless steel cylindrical shells separated by an air space. Eight equally spaced 3-in. OD tubes vertically separate these shells, and two 7.25-in. OD tubes horizontally separate them at both ends. The overpack is modeled by one-element thickness on the steel and three-element thickness on the vertical air space. The top and bottom horizontal air spaces are represented by seven-element thickness. The presence of these tubes in the air spaces enhances the heat conduction across the air space. The model accounts for this effect by increasing the conductivity in the air space proportionally to the volume ratio of steel to the total space volume.

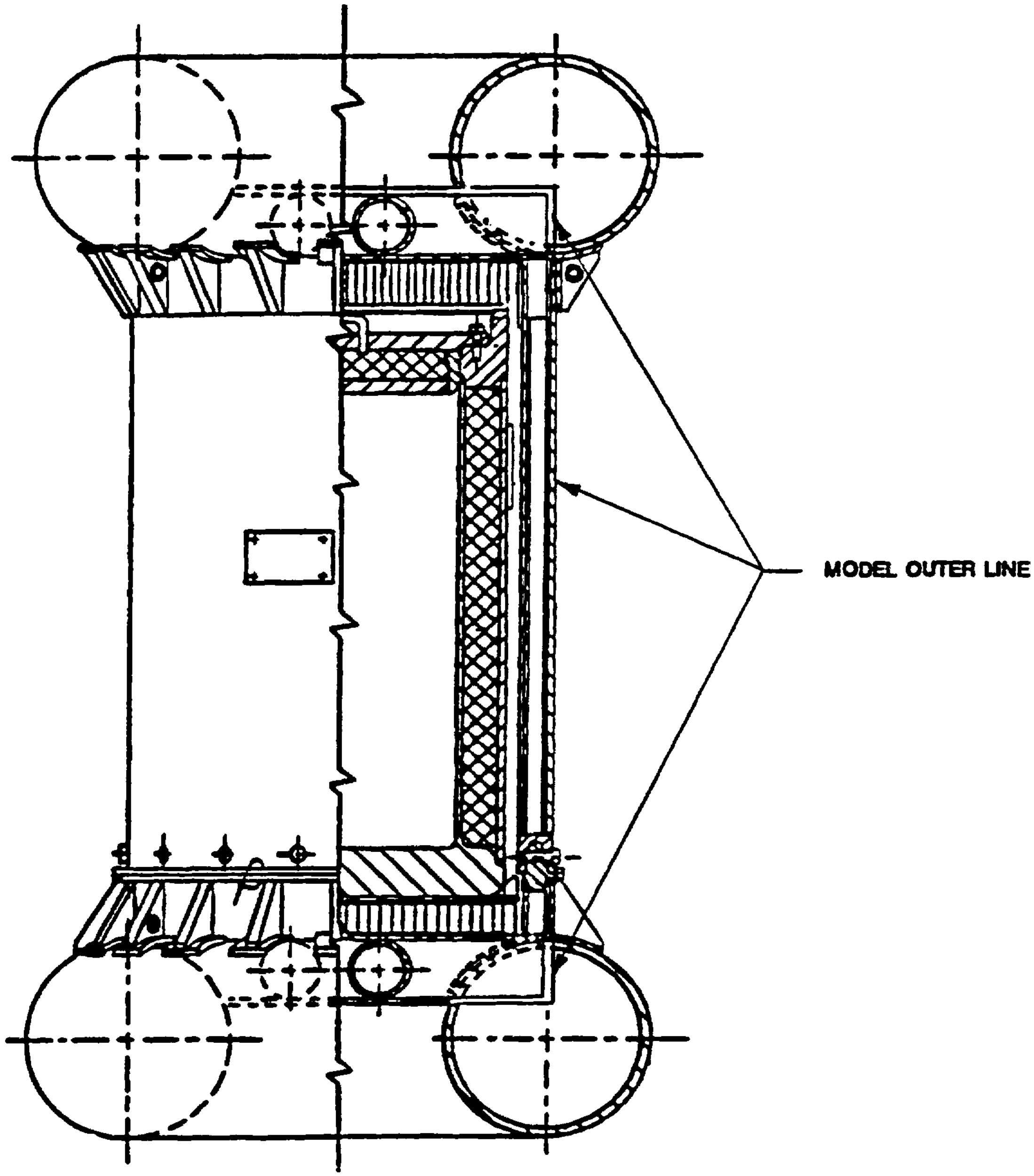


FIGURE 3.4.1.1. THERMAL FINITE ELEMENT MODEL, OVERLAID ON TRANSPORT PACKAGE

The decay heat of the cask contents is introduced in the model by boundary elements along the cask cavity wall. The maximum heat load for this transport package is designed to be 600 watts. In the model it is assumed that approximately 81% of the load is distributed radially while a corresponding 10% and 9% are applied axially to the cask cavity bottom and top, respectively. This assumption is based on the ratios of the top, bottom, and vertical areas to the total cavity area. Also, boundary elements manifest the convective and radiative interfaces between the overpack outer surface and the regulatory environments, as well as the solar heat flux.

3.4.1.1 Heat Flux Property Set

Element property sets 10 through 12 apply to convective boundary elements located in the cask cavity of the model. The only data these sets contain are the prescribed heat flux in Btu/hr-in. The maximum heat load for this transport package is 600 watts. As discussed in Subsection 3.4.1, this load is applied as a uniform surface heat flux to the entire cavity surface area. It was determined that the radial heat flux represents 81% of the total load; therefore, its value is calculated as follows:

$$q''_{(11)}{}^{1} \quad \frac{q}{A} = \frac{0.6\,\text{kW}(3.414\,\text{Btu / hr} - \text{kW})\,(0.81)}{2\pi(13.25\,\text{in.})\,(54.5\,\text{in.})}$$

$$= 0.369\ \text{Btu/hr-in.}^2$$

Similarly:

$q''_{(10)} = 0.371$ Btu/hr-in.^{2} and (Bottom of Cavity)

$q''_{(12)} = 0.340$ Btu/hr-in.^{2} (Top of Cavity)

---

[1]Denotes number of material property.

3.4.1.2 Enclosed Air Space Property Sets

Five-element property sets represent the enclosed air spaces. Set 24 is the vertical air space between the cask surface and the inner shell of the overpack structure. Property set 25 applies to the horizontal air space between the cask lid top surface and the upper honeycomb pad surface. Sets 31, 32 and 33 represent the horizontal, vertical and horizontal air spaces, respectively, between the inner and outer shell of the overpack structure.

For convective heat transfer in an enclosed vertical air space, Gebhart[3.7.7] gives the following:

$$Nu = 0.18 \sqrt[4]{Gr}\,(H / S)^{\left(-\frac{1}{9}\right)} \qquad 2 \text{ X}$$

$10^4 < Gr < 2 \times 10^5$

$$Nu = 0.065 \sqrt[3]{Gr}\,(H / S)^{\left(-\frac{1}{9}\right)} \qquad 2 \text{ x}$$

$10^5 < Gr < 11 \times 10^6$

Where: Nu = Nusselt Number
Gr = Grashof Number based on S
S = distance across enclosed space
H = height of enclosed space

For Gr less than 2,000 the process is simple conduction, Nu = 1.0. The Grashof Number is defined here as

$$Gr = \frac{\rho^2 g \beta S^3 \Delta T}{\mu^2}$$

Where: ρ = density, lb/ft^3
g = acceleration of gravity ($32.1\ ft/sec^2$)
β = coefficient of the thermal expansion ($°F^1$)
ΔT = temperature difference across enclosure (°F)
μ = viscosity (lb/ft-sec)

The correlation between Nu and Gr given above applies strictly to an air space enclosed between plates. In general, a curved surface may be considered flat without significant error, if according to Gebhart[3.7.8]

$$\frac{D}{L} \geq \frac{35}{\sqrt[4]{Gr}}$$

Where: D = diameter

L = height

Gr_L = Grashof Number based on height

For our problem, sets 18 and 26, values are:

Set No.	D	L	Gr	$\frac{D}{L} \geq \frac{35}{\sqrt[4]{Gr}}$
24	39.50	72.0	439.0	0.549 ≤ 2.432
32	44.50	82.0	8,500	0.543 ≤ 3.642

From the values shown above, this correlation should be adequate for this geometry.

The convective heat transfer in an enclosed horizontal air space depends on the temperature of the upper and lower plates. If the upper plate temperature is higher than the lower plate, the process is simple conduction; therefore:

$$Nu = 1.0$$

If vice versa, lower plate warmer, then

$$Nu = 1.0 \qquad Gr < 2 \times 10^4$$

$$Nu = 0.195 \sqrt[4]{Gr} \qquad 2 \times 10^4 < Gr < 4 \times 10^5$$

$$Nu = 0.068 \sqrt[3]{Gr} \qquad 4 \times 10^5 < Gr$$

These relations are given in Gebhart[3.7.9]. Properties are evaluated at the average of the two surface temperatures.

Once the Nu is known, convective heat transfer coefficient, h_c, can be found by the following expression in both cases, vertical and horizontal air spaces:

$$h_c = \frac{Nu \bullet k}{s}$$

Where: k = thermal conductivity (Btu/hr-in.-°F)

s = as before, distance across the space (in.)

For radiative heat transfer,

$$h_r = \sigma (T_1^2 + T_2^2)(T_1 + T_2)$$

Where: $T_1 T_2$ = temperatures on either side of air space (°R)

σ = 1.1944×10^{11} (Btu/hr-in.^{2}-°R^4)

F = gray body shape factor

The gray body shape factor, F, is defined as:

$$F = \frac{1}{\left(\frac{1}{\varepsilon_1} - 1\right) + \frac{A_1}{A_2}\left(\frac{1}{\varepsilon_2} - 1\right) + \frac{1}{F_{12}}}$$

Where: A_1 = area of smaller surface

A_2 = area of larger surface

$\varepsilon_1, \varepsilon_2$ = emissivities

F_{12} = shape factor

The shape factor, F, is purely a function of the geometry of the system. When body A, is completely enclosed by body A_2 and A_1 cannot see itself, $F_{12} = 1.0$[3.7.10]. This is the case here.

For oxidized 304 SS, $\varepsilon_1 = \varepsilon_2 = 0.52$[3.7.11] and assuming $A_1 = A_2$, then:

$$= 0.351$$

for all five material sets.

The finite element model represents these air spaces with conductive elements. The conversions from h to k are as follows:

$$k = h \times s$$

As before, s is the distance across the air space.

In general, the effective conductivity across the air space, k_a, is due to conduction plus radiation. However, a convective mode may arise depending upon the Gr and/or the plates' temperatures as discussed before. Therefore, the makeup of k_a may be as follows:

$$k_a = k + h_r \times s, \text{ or}$$

$$k_a = (h_c + h_r) \times s$$

In the perpendicular direction, along the air space, the effective conductivity, k_L, is assumed to be pure conduction.

$$k_L = k$$

The vertical air space between the inner and outer shells of the overpack structure, material set 32, contains eight evenly spaced tubes. These tubes are used as energy absorbing devices and spacers. The effect of these tubes as heat transfer mechanisms was neglected. This was based on the low value 0.03 of the ratio of total tube area to total air area.

3.4.1.3 Boundary Property Sets

There are three material property sets, numbers 39 through 41, surrounding the model. These sets link the model with the external environment. Each set contains the film coefficient, ambient temperature and solar heat flux value.

Property set 40 covers the vertical outside wall of the model, while sets 39 and 41 are along the bottom and top horizontal surfaces, respectively. For convection from a large diameter cylinder[3.7.12].

$$Nu = 0.59 \sqrt[4]{Ra} \qquad 10^4 < Ra < 10^8$$
$$Nu = 0.13 \sqrt[3]{Ra} \qquad 10^8 < Ra$$

Where the Rayleigh number, Ra, is defined as

$$Ra = Gr \bullet Pr$$

and the Gr is based upon L dimensions instead of A in the above equation. The fluid properties are determined at the average temperature between the wall (To) and film (Tf) temperatures.

For horizontal surfaces, the following relations apply[3.7.13]:

If the surface warmer than the surrounding medium is facing upward or the cooler surface is facing downward, then:

$$Nu = 0.54\ (GrPr)^{1/4} \qquad 10^5 < Gr \le 2 \times 10^7$$
$$Nu = 0.14\ (GrPr)^{1/3} \qquad 2 \times 10^7 < Gr \le 3 \times 10^{10}$$

However, for the warmer side facing downward and the cooler side facing upward,

$$Nu = 0.27\ (GrPr)^{1/4} \qquad 3 \times 10^5 < Gr < 3 \times 10^{10}$$

Here, also, the fluid properties are determined at the average temperature, 0.5(To + Tf); and the L dimension is replaced by 0.9 D, where D is the diameter of the disk.

After determining Nu, the convective heat transfer coefficient is calculated using the equation below. In this equation, S represents the cylinder diameter for material set 40 and 0.9 D for the other sets.

In addition to convection, the cask surface interacts radiatively with its surroundings. The radiative heat transfer coefficient, h_r, is calculated using the equations given in Paragraph 3.4.1.2. Regulatory environments place the transport package in an outside environment. Therefore, in evaluating the equation for the gray body shape factor, it was assumed that, (1) A_1 is negligible compared with A_2, and (2) $F_{12} = 1$.

The film coefficient, h (Btu/hr-in.^{2}-°F) is

$$h = h_c + h_r$$

The overpack structure of the transport package is basically cylindrical but does contain a toroidal shell at both ends. These shells substantially mitigate the effects of the thermal environment. However, their effects are local in relation with the cask structure because of the transport package geometry. The distance from the cask structure to the outside environment is shorter in the radial direction than through the toroidal shell. Therefore, the cask structure would not be affected by the surroundings of the toroidal shells. For this reason, the model does not account for their effects. These areas are treated in the model as an extension of the top and bottom horizontal plates and the vertical cylindrical wall, The only credit taken for their presence is during the solar load calculations. The solar input over the toroid shell area is calculated based on fraction of curve and horizontal surfaces to the total surface of the model.

3.4.1.3.1 Solar Heat Load

The solar load is represented in the model by the quantity "q", rate of heat transfer per unit area. The value of q was calculated as follows:

For flat surface transported horizontally,

Solar Load Value = 2,950 Btu per ft^2 per 12 hours[3.7.14]

$$q_F = \frac{2{,}950 \text{ Btu}}{\text{Actual}(144 \text{ in.}^2)12 \text{ hr}} = 1.707 \frac{\text{Btu}}{\text{hr} - \text{in.}^2}$$

For curved surface:

Solar Load Value = 1,475 Btu per ft^2 per 12 hours[3.7.14]

$$q_C = \frac{1.475 \text{ Btu}}{(144 \text{ in.}^2)12 \text{ hr}} = 0.853 \frac{\text{Btu}}{\text{hr} - \text{in.}^2}$$

Overpack outside shell, material set 40:

$$q_{(40)} = (q_C)\left(\frac{\text{actual overpack cylindrical shell height}}{\text{model overpack cylindrical shell height}}\right)$$

$$= 0.854\left(\frac{82.5}{99.38}\right) = 0.709 \text{ Btu/hr-in.}^2$$

Overpack top surface, material set 41:

$$q_{(41)} = q_F\left(\frac{\text{flat surface area}}{\text{total model area}}\right) + q_C\left(\frac{\text{curve surface area}}{\text{total model area}}\right)$$

$$= 1.707\left(\frac{471.43}{1{,}847.45}\right) + 1.854\left(\frac{1{,}376.02}{1{,}847.45}\right)$$

$$= 1.074 \text{ Btu/hr-in.}^2$$

3.4.1.3.2 Fire Effect

Fire effect is introduced to the model by a thermal radiation environment of 1,475°F for 30 minutes with an emissivity coefficient of 0.9 and a transport package surface absorption coefficient of 0.8. After the fire, the cask is cooled naturally for a total period of 3 hours in ambient air at 100°F.

During the fire the gray body shape factor, F, is given by:

$$F = \frac{1}{\frac{1}{\varepsilon^1} + \frac{1}{\varepsilon^2} - 1} = \frac{1}{\frac{1}{0.8} + \frac{1}{0.9} - 1}$$

$$= 0.7347$$

and the radiation coefficient is calculated by the equation given in Paragraph 3.4.1.2.

3.4.1.4 Overpack Outer Shell Elements Property Set

The overpack outer shell is represented in the model by three material property sets, sets 34 through 38. The model does not account for any effect given by the toroidal shells because they are smashed during the 30-foot free-drop event. The free-drop event precedes the fire event.

3.4.1.5 Aluminum-Air Conglomerate Property Sets (Honeycomb Material)

Property sets 26 and 28 represent the honeycomb pad installed at the bottom and top of the cask structure. The material is made of corrugated aluminum foil 0.002 in. gauge with a cell width of 0.125 in. The density of the material is listed by the manufacturer as 8.1 pcf nominal. Based on these data, the thermal properties were calculated as follows:

Pad Volume, V_p

$$V_p = \pi R^2 H$$

Where: R = pad radius

H = pad height

For property set 20

$$V_p = \pi(20.0)^2 r = 5{,}026.55 \text{ in.}^3$$

its weight,

$$Wt = V_p \rho = 5{,}026.55\ (8.1)/1{,}728$$
$$= 23.56 \text{ lbs.}$$

Next, the air and aluminum volume fractions were determined by solving the following equations,

$$\rho_{AL} \bullet V_{AL} + \rho_{Air} \bullet V_{Air} = Wt$$

$$V_{AL} + V_{Air} = V_p$$

$$V_{AL} = 241.64 \text{ in.}^3 \text{ and } V_{Air} = 4{,}784.91 \text{ in.}^3$$

Therefore, $\frac{V_{AL}}{V_P} = 0.048$ and $\frac{V_{Air}}{V_P} = 0.952$

$$K_X = \frac{V_{AL}}{V_P} \bullet K_{AL} + \frac{V_{Air}}{V_P} \bullet K_{Air}$$

$$0.048\ K_{AL} + 0.952\ K_{Air}$$

$$K_Y = \frac{b_1}{L} \bullet K_{AL} + \frac{b_2}{L} \bullet K_{Air}$$

where, b_1 = Aluminum foil thickness

b_2 = Air space thickness

L = Honeycomb pad thickness

$$= 0.0679 \bullet K_{AL} + 0.9321 \bullet K_{Air}$$

$$C_P = \frac{V_{AL}}{V_P} \bullet C_{P_{AL}} + \frac{V_{Air}}{V_P} \bullet C_{P_{Air}}$$

$$= 0.048\ C_{P_{AL}} + 0.952\ C_{P_{Air}}$$

$$\rho = 0.048\ \rho_{AL} + 0.952\ \rho_{Air}$$

3.4.2 Maximum Temperatures

Under the normal conditions of transport, the maximum temperature distribution in the Model 2000 occurs when the ambient temperature is 100°, there is maximum decay heat, and the maximum solar load is applied. Figures 3.4.2.1a through 3.4.2.1e present temperature values at several locations on the thermal model under normal conditions. Some of the elements within the thermal model on these figures have been erased for clarity. These values also included those values which are maximum. Figures 3.4.2.2a through 3.4.2.2d show the temperature contour plot for the normal conditions of transport.

3.4.3 Minimum Temperatures

The minimum temperature distribution is a result of an ambient temperature of -40°F. It is assumed that there is no heating effect from decay heat or solar insulation; therefore, the transport package is assigned a minimum temperature of -40°F throughout.

3.4.4 Maximum Internal Pressures

The design internal pressure is 30 psig. This value corresponds to atmospheric air heated up to 600°F at constant volume. The temperature within the cask cavity during the fire transient is less than 600°F and, therefore, the maximum internal pressure is below 30 psig.

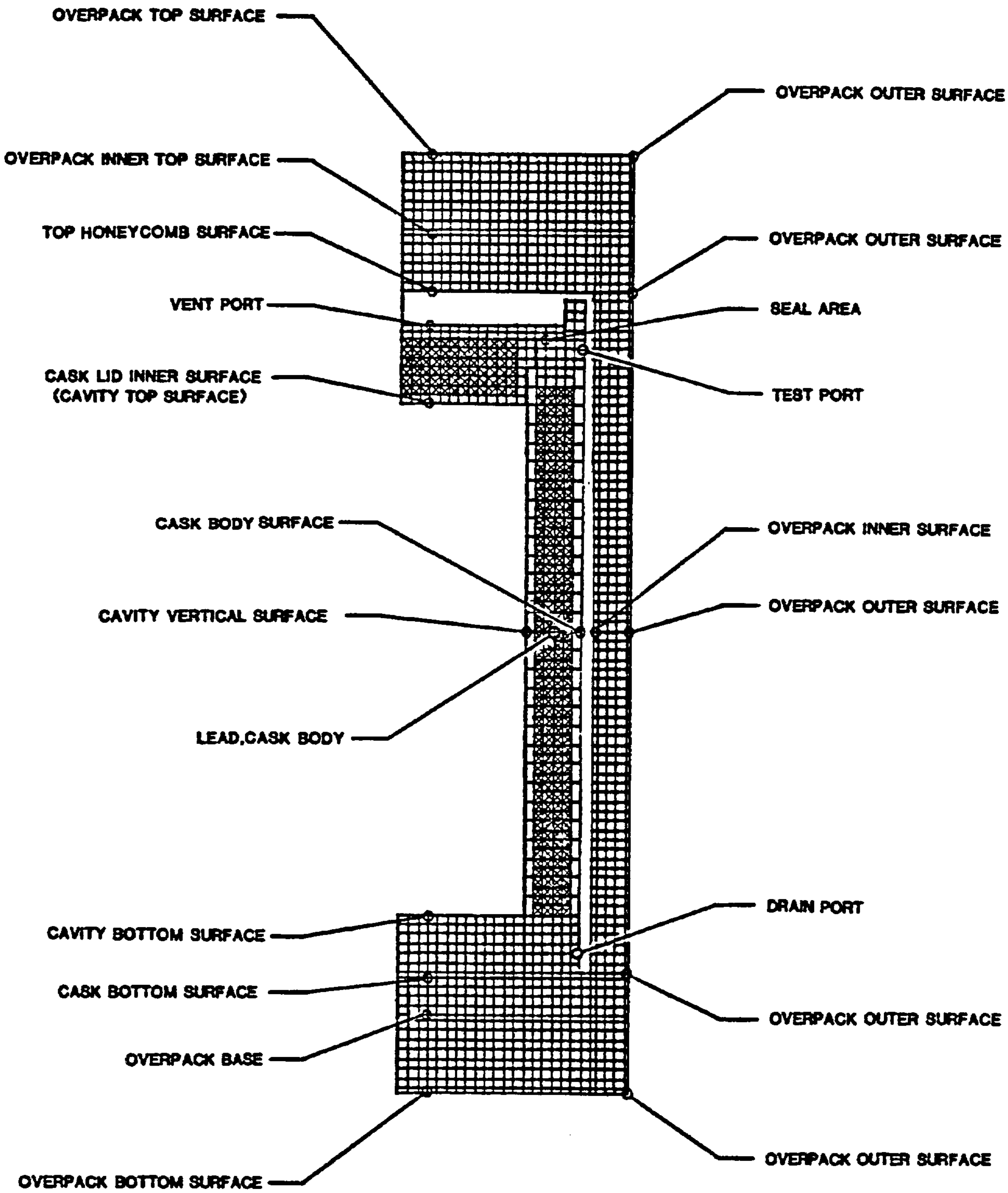


FIGURE 3.4.2.1A. KEY PLOT OF TEMPERATURE LOCATIONS

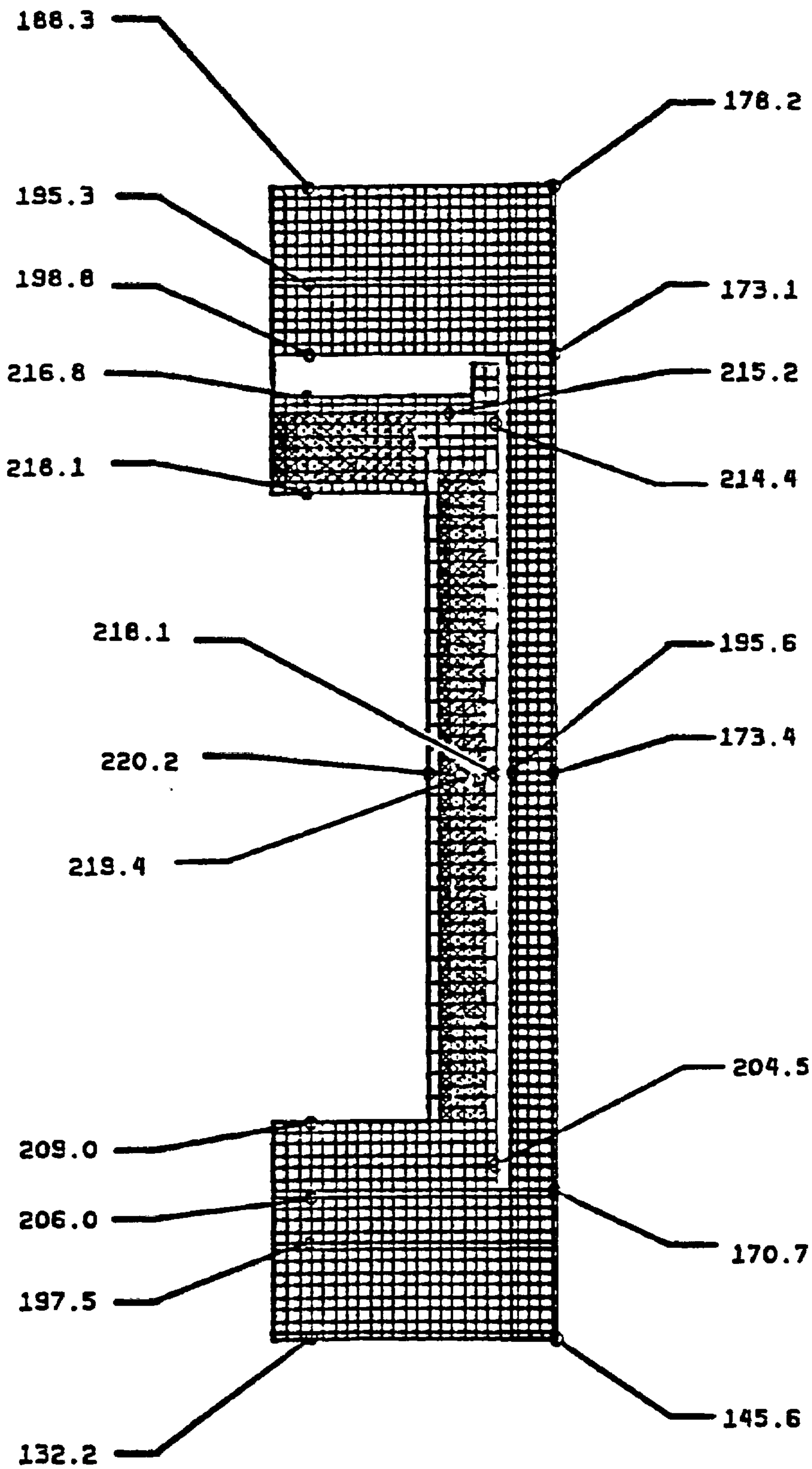


FIGURE 3.4.2.1B. MODEL 2000 TRANSPORT PACKAGE STEADY-STATE ANALYSIS
100°F AMBIENT TEMPERATURE, MAXIMUM DECAY HEAT AND MAXIMUM INSOLATION

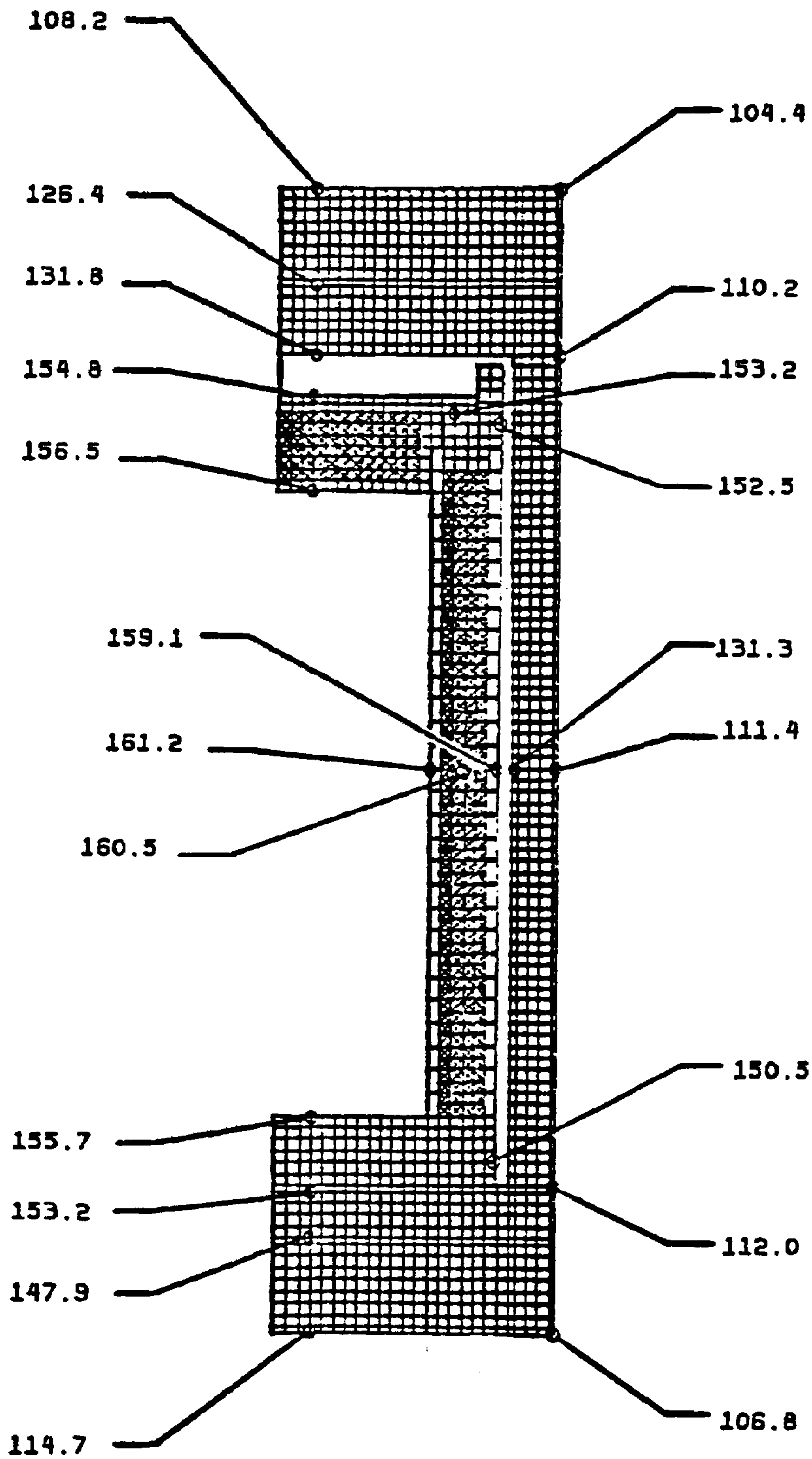


FIGURE 3.4.2.1C. MODEL 2000 TRANSPORT PACKAGE STEADY-STATE ANALYSIS 100°F AMBIENT TEMPERATURE AND MAXIMUM DECAY HEAT

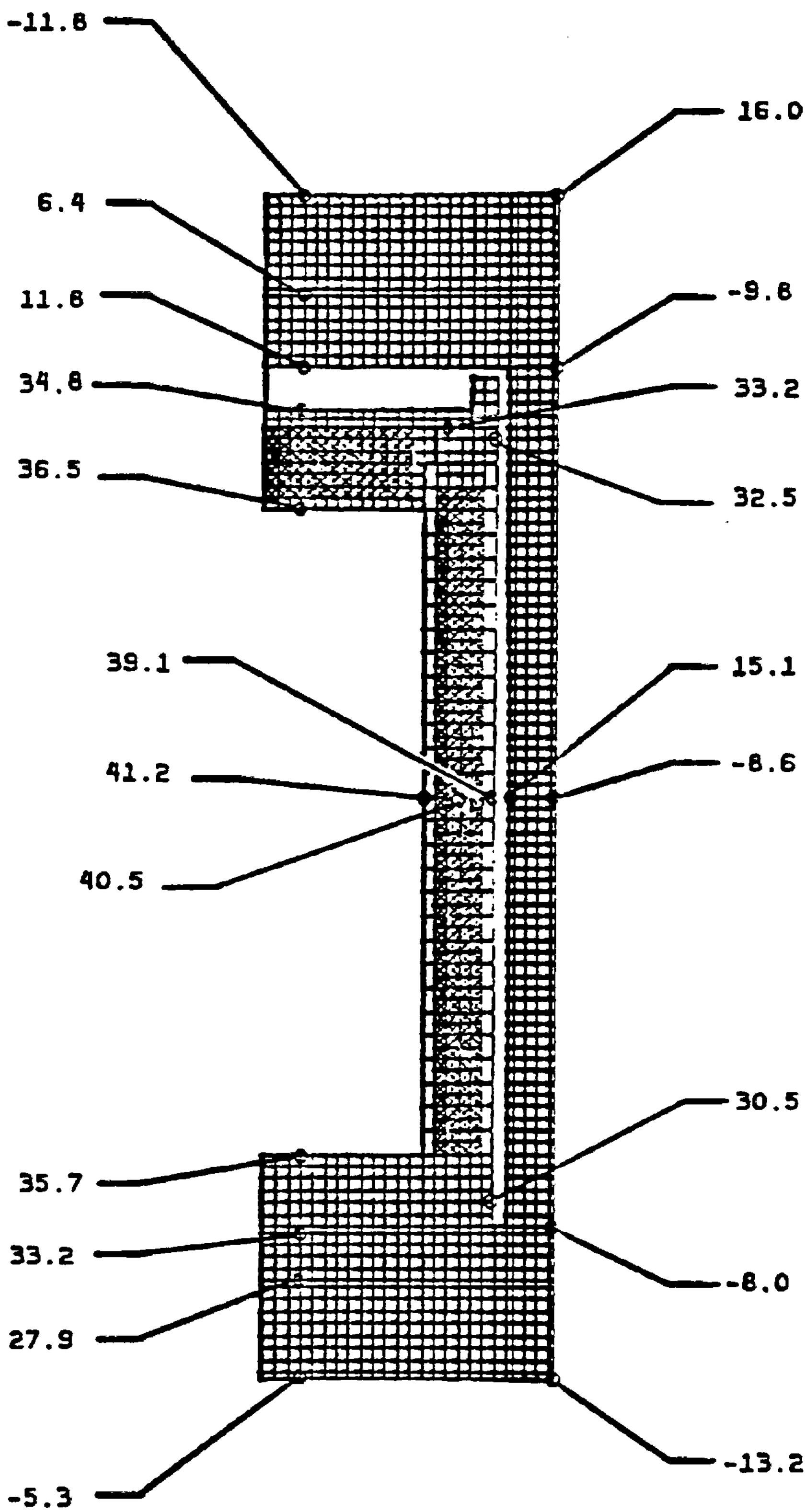


FIGURE 3.4.2.1D. MODEL 2000 TRANSPORT PACKAGE STEADY-STATE ANALYSIS - 20°F AMBIENT TEMPERATURE AND MAXIMUM DECAY HEAT

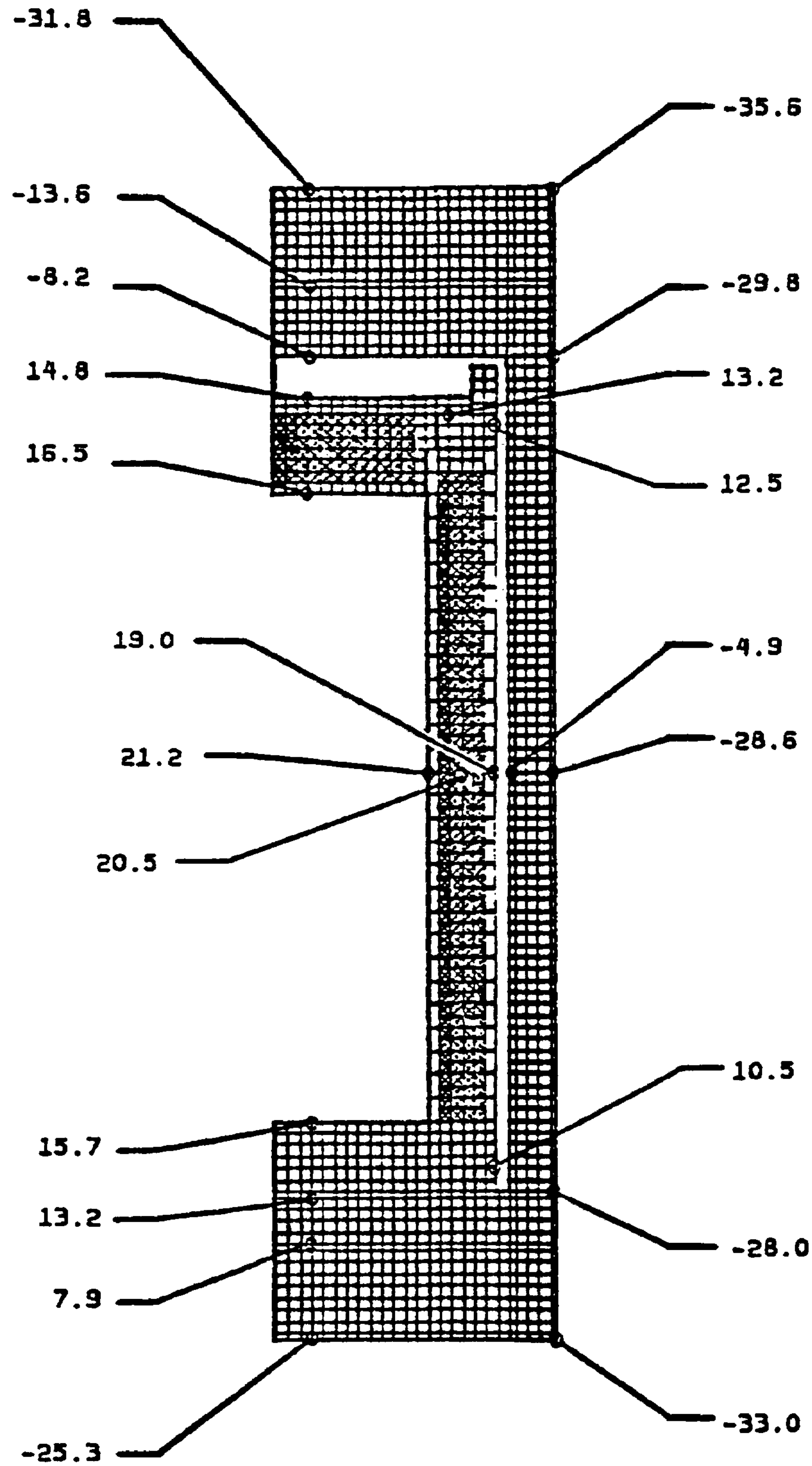


FIGURE 3.4.2.1E. MODEL 2000 TRANSPORT PACKAGE STEADY-STATE ANALYSIS - 40°F AMBIENT TEMPERATURE AND MAXIMUM DECAY HEAT

3.4.5 Maximum Thermal Stresses

The highest thermal stresses in the Model 2000 arise from an ambient temperature of 100°F, the maximum decay heat of 600W and the maximum solar load. Figures 3.4.5.1a through 3.4.5.1d give the thermal stress intensity values (P_m + P_b, ksi) throughout the cask for normal conditions of transport.

The lead-pouring operations will not produce a significant residual stress on the cask structure. The fabrication procedure calls for the cask body without the upper flange to be uniformly heated to a temperature range of 575 to 650°F. This temperature is maintained throughout the entire lead-pouring process. Lead is then poured through the top open end to the bottom of the annulus between the cladding shells. After the lead pouring is completed, the cask body is gradually cooled down from the bottom up.

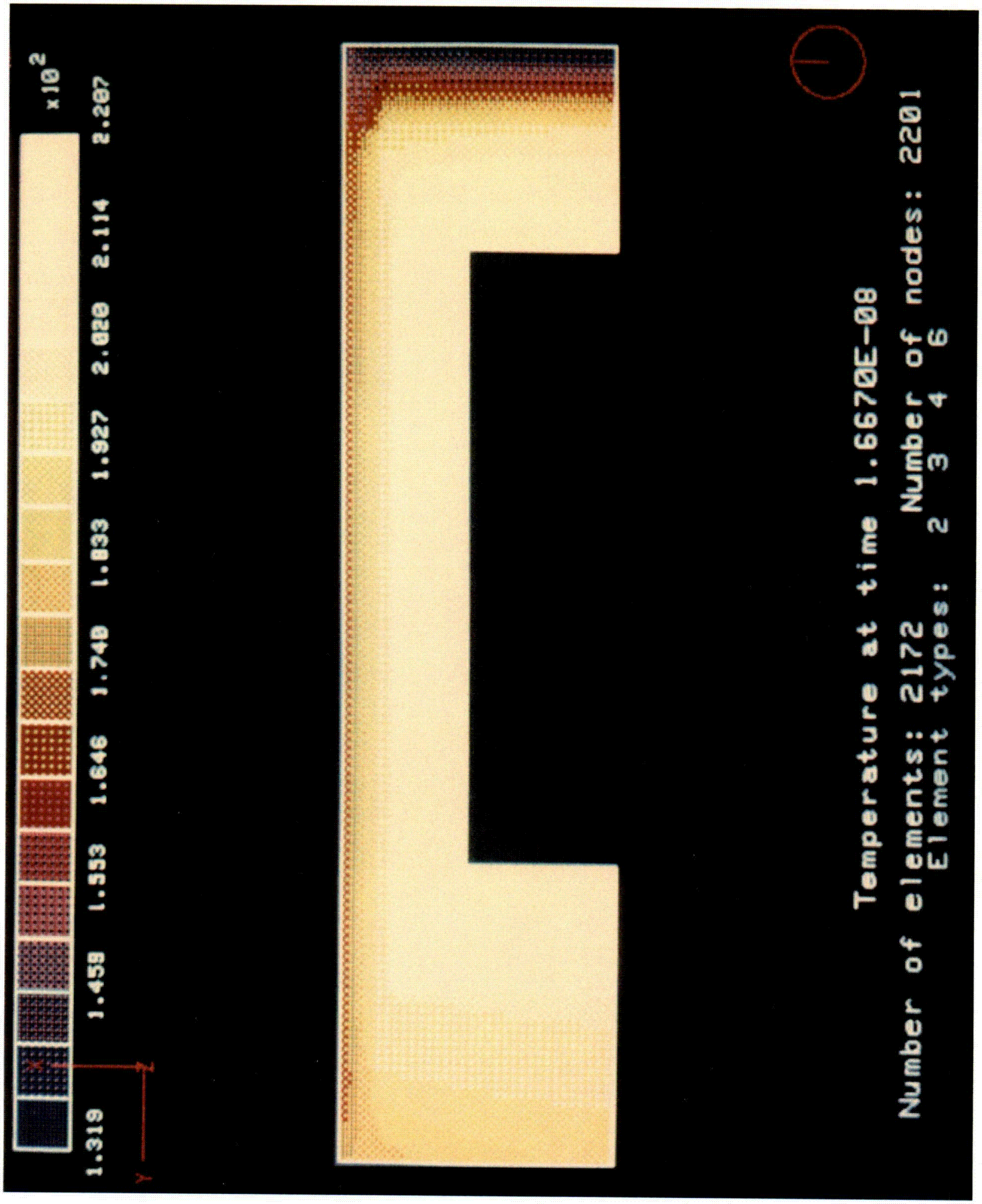


FIGURE 3.4.2.2A. TEMPERATURE CONTOUR STEADY-STATE: 100°F AMBIENT TEMPERATURE, MAXIMUM DECAY HEAT AND MAXIMUM INSOLATION

C05

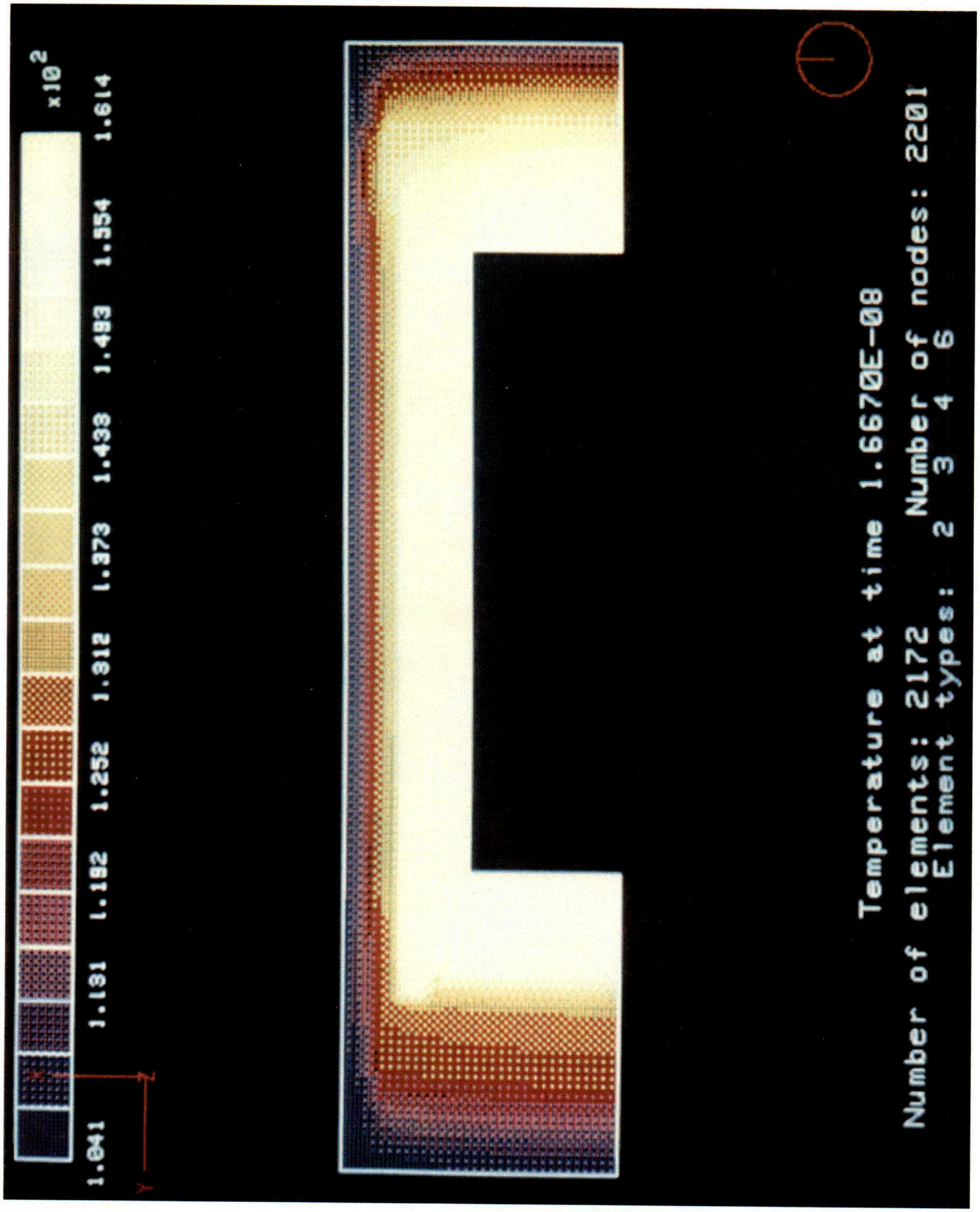


FIGURE 3.4.2.2B. TEMPERATURE CONTOUR STEADY-STATE: 100°F AMBIENT TEMPERATURE AND MAXIMUM DECAY HEAT

C06

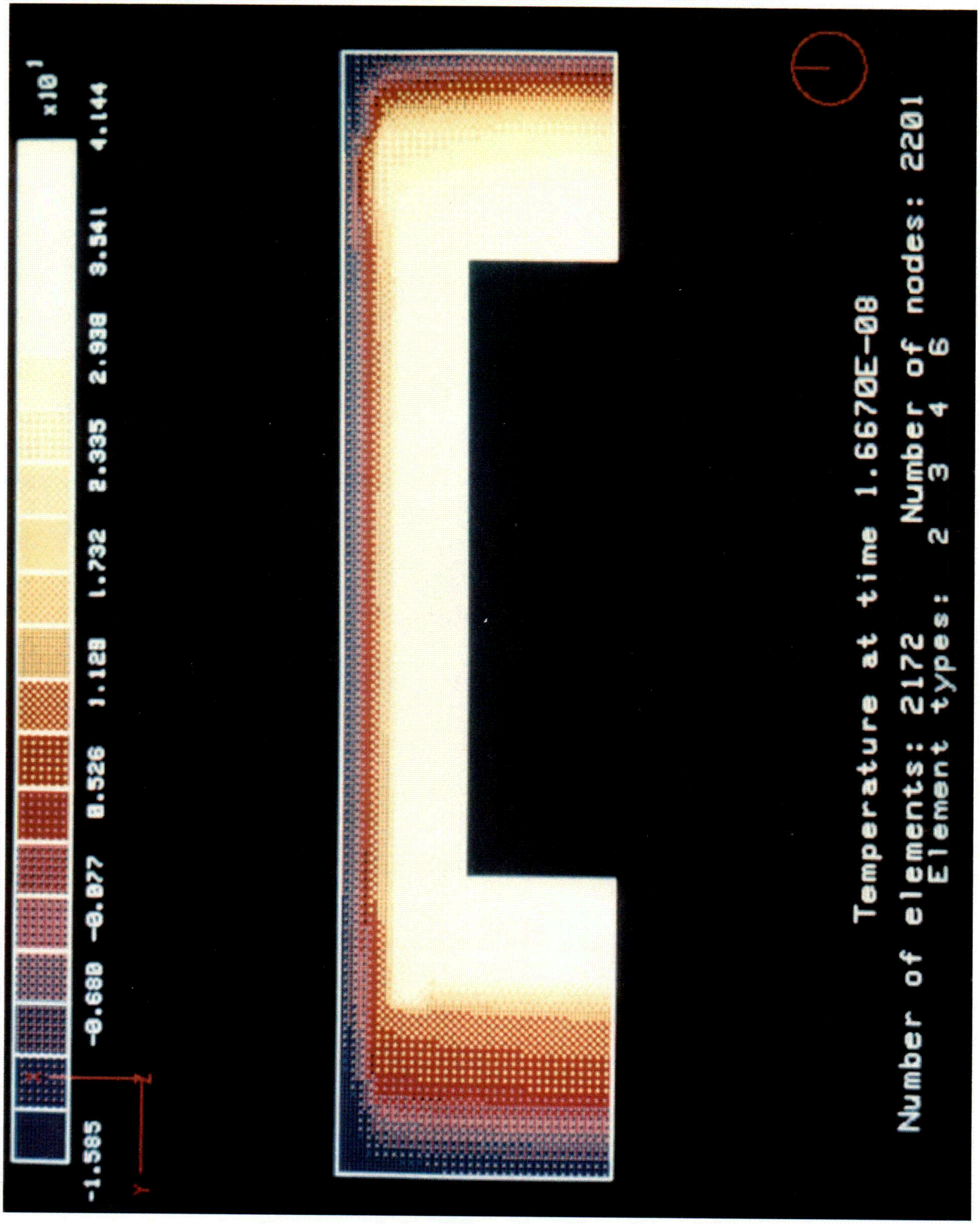


FIGURE 3.4.2.2C. TEMPERATURE CONTOUR STEADY-STATE: -20°F AMBIENT TEMPERATURE AND MAXIMUM DECAY HEAT

C07

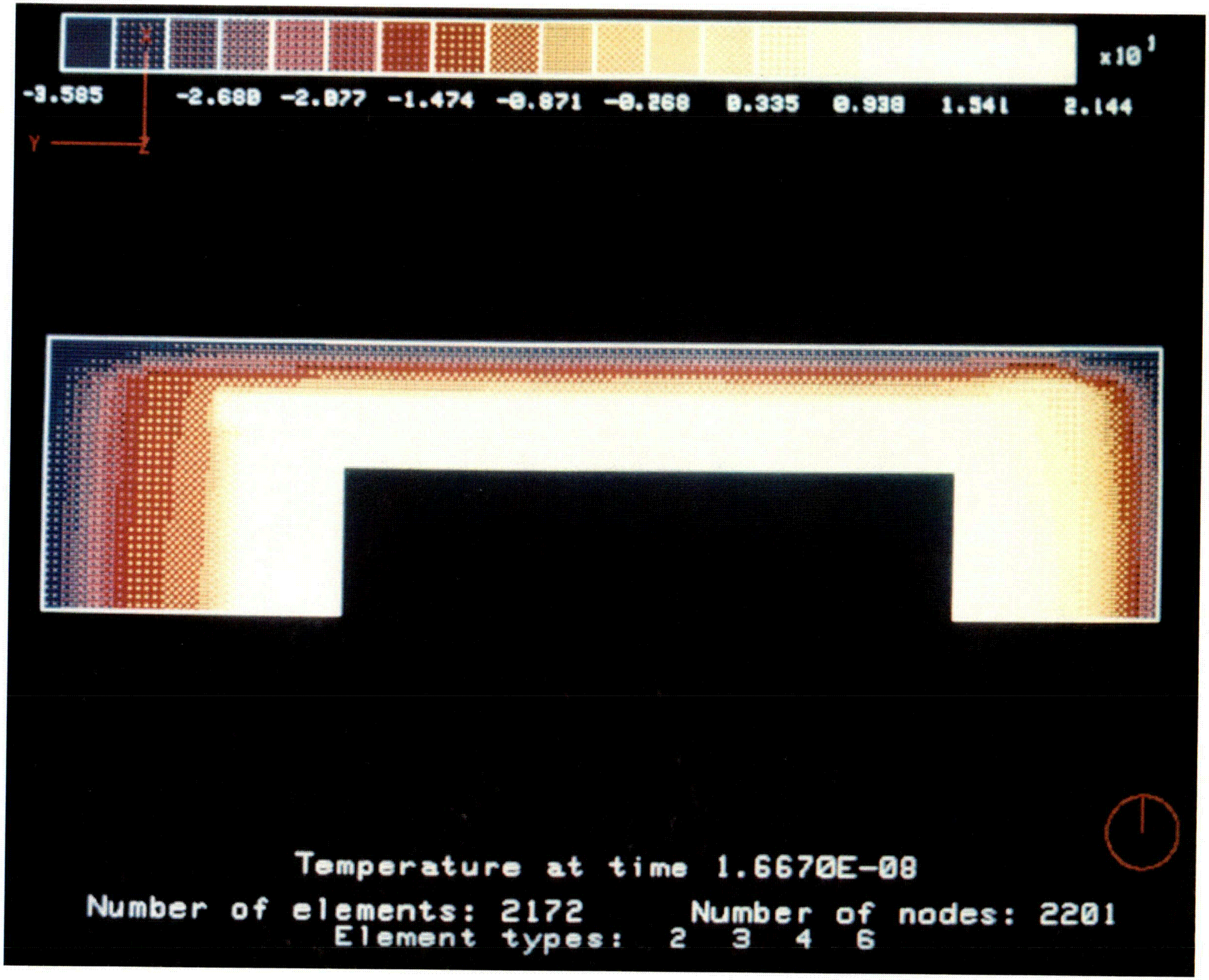


FIGURE 3.4.2.2D. TEMPERATURE CONTOUR STEADY-STATE: -40°F AMBIENT TEMPERATURE AND MAXIMUM DECAY HEAT

C08

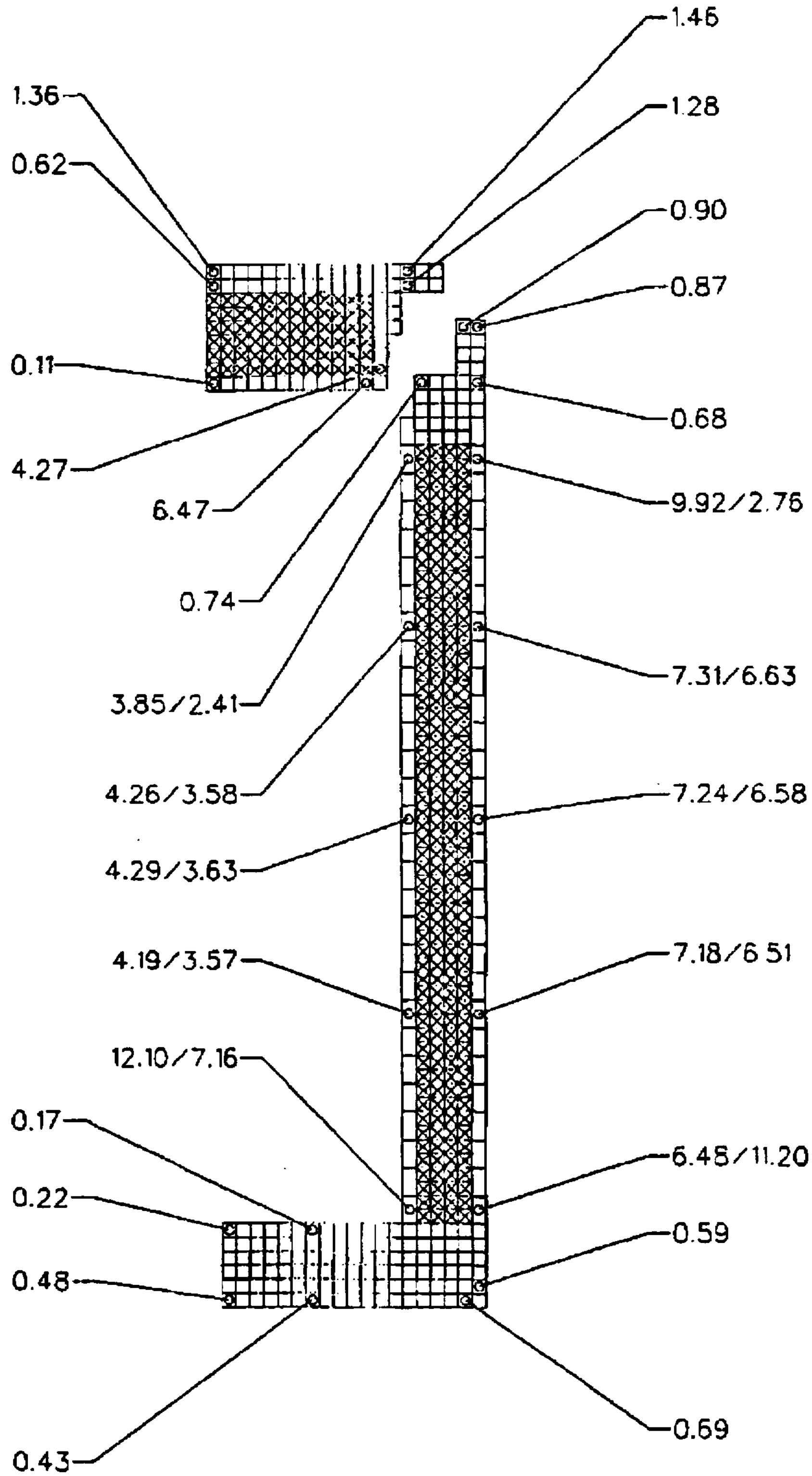


FIGURE 3.4.5.1A. MODEL 2000 CASK - THERMAL STRESS ANALYSIS ($P_M + P_B$ KSI) STEADY-STATE CONDITION; 100°F AMBIENT TEMPERATURE, MAXIMUM DECAY HEAT PLUS MAXIMUM INSOLATION

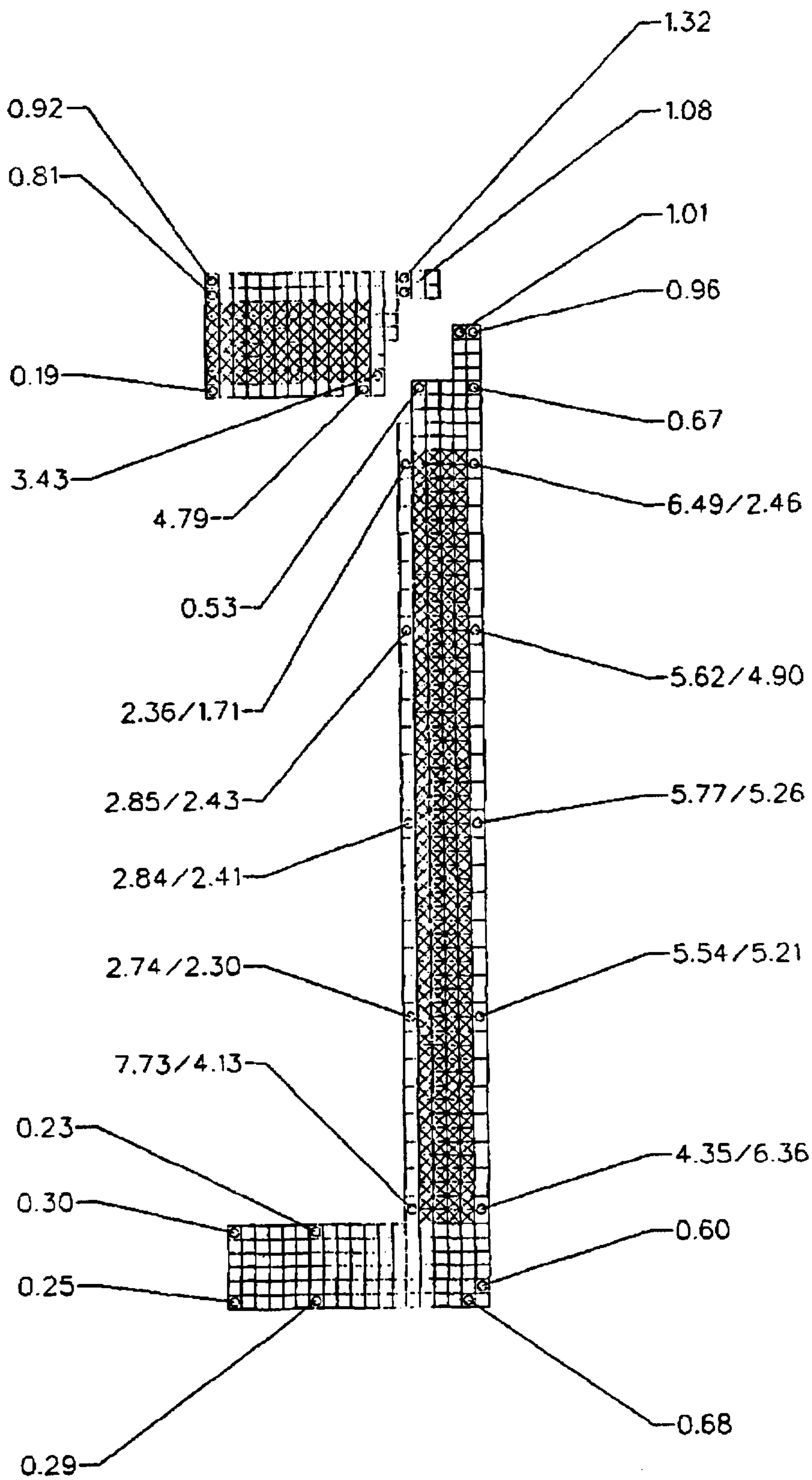


FIGURE 3.4.5.1B. MODEL 2000 CASK - THERMAL STRESS ANALYSIS (P_M + P_B KSI) STEADY-STATE CONDITION; 100°F AMBIENT TEMPERATURE AND MAXIMUM DECAY HEAT

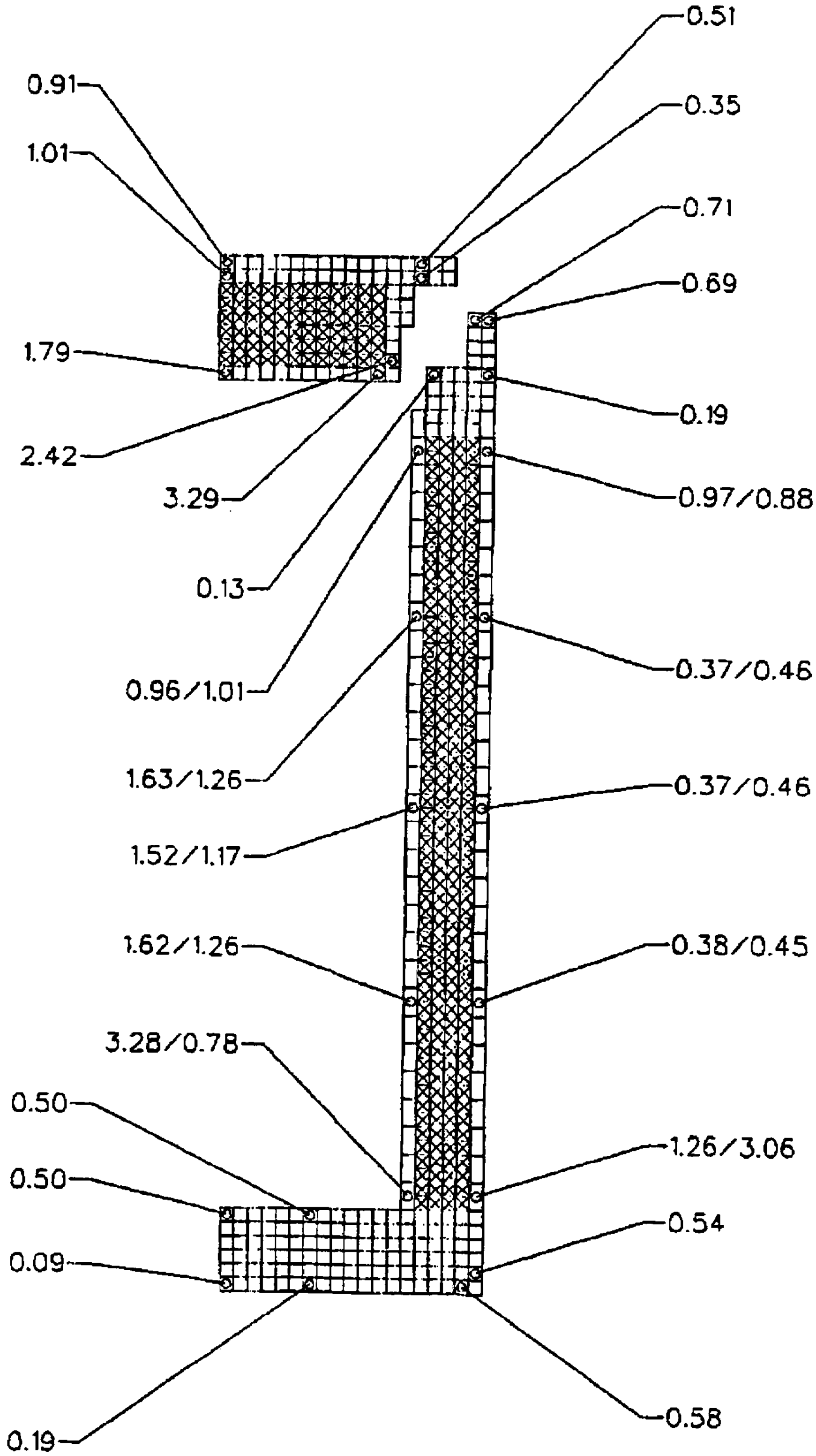


FIGURE 3.4.5.1C. MODEL 2000 CASK - THERMAL STRESS ANALYSIS (P_M + P_B KSI)
STEADY-STATE CONDITION; -20º AMBIENT TEMPERATURE AND MAXIMUM DECAY HEAT

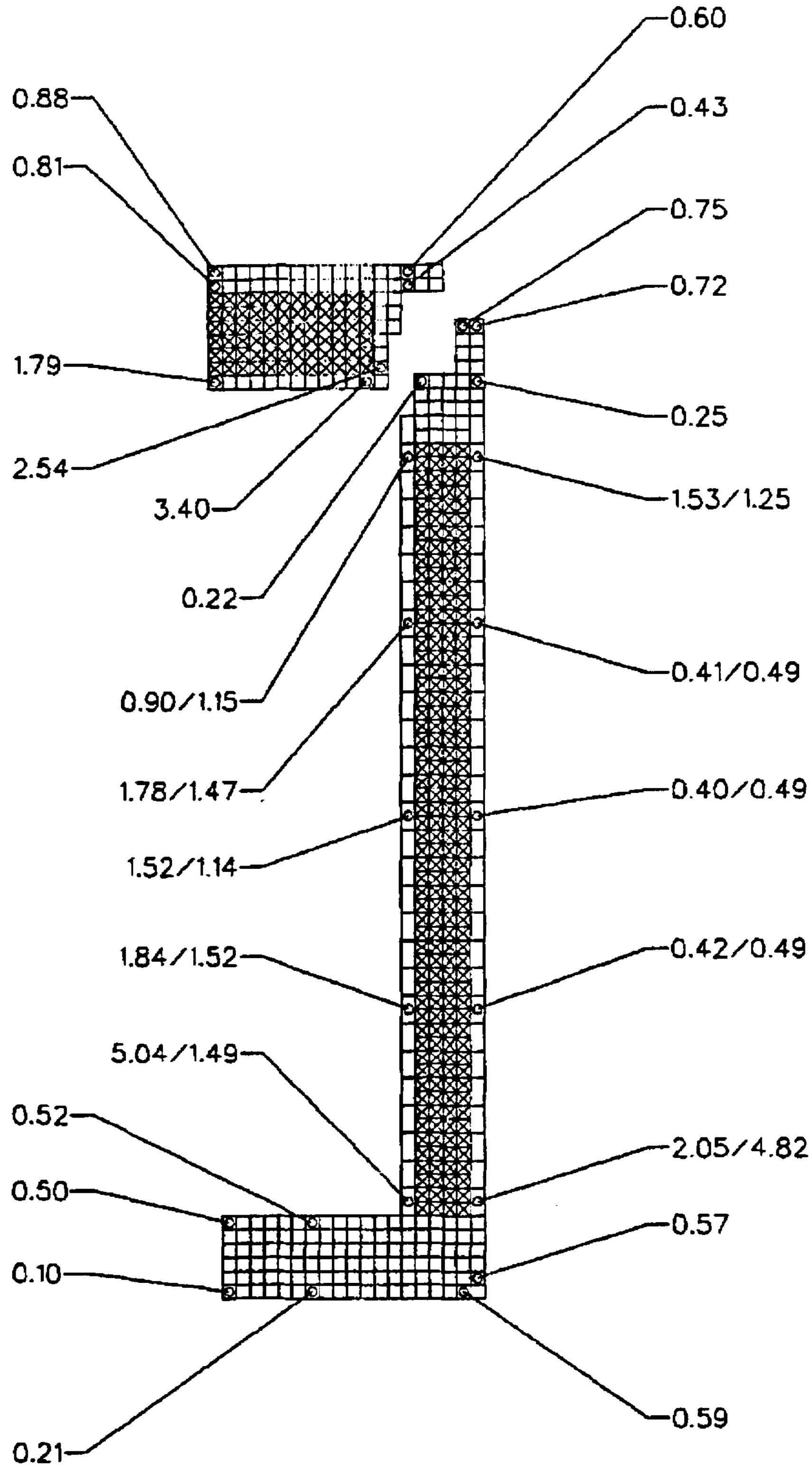


FIGURE 3.4.5.1D. MODEL 2000 CASK - THERMAL STRESS ANALYSIS (P_M +P_B KSI) STEADY-STATE CONDITION, -40º AMBIENT TEMPERATURE AND MAXIMUM DECAY HEAT

3.4.6 Evaluation of Package Performance for Normal Conditions of Transport

Temperature values throughout the package components associated with normal conditions of transport are all within the allowable limits for the respective materials (see Table 3.1.3). The design pressure of 30 psig is a higher value than the pressure value corresponding to the maximum cavity temperature of 220°F. A maximum temperature of 220°F and a minimum temperature of -40°F are used in selecting material properties for the structural evaluations presented in Section 2.

3.5 HYPOTHETICAL ACCIDENT THERMAL EVALUATION

After a free drop through 30 feet and a free drop through four feet onto a cylindrical punch, the package must be exposed to a fire transient. This thermal test consists of exposure of the whole package for not less than 30 minutes to a radiation environment of 800°C (1,475°F) with an emissivity coefficient of at least 0.9. The surface absorptivity of the package is taken as 0.8, and a convective heat input based on still ambient air at 800°C (1,475°F) is applied. The transient is then continued until maximum temperature values within the cask are obtained.

The thermal performance of the package during the fire transient is evaluated using the finite element program LIBRA. In this evaluation, the properties were updated every time step by the user-originated subroutine CHGPRP. This subroutine contains expressions relating element properties to temperature. Thermal properties as well as density and heat capacitance are updated periodically. A time limit of three hours is used in the analysis. The time step for the 0-1.5 hours range is set at 1 minute, while the time step for 1.5-3.0 hours is set at 3 minutes. The LIBRA program allows the user to select the time marching scheme. In this analysis, the backward difference scheme is selected.

3.5.1 Analytical Model

The analytical model used to evaluate the hypothetical accident condition is identical to that described in Subsection 3.4.1. The model accounted for accidental condition damage by not including the toroidal shells.

3.5.2 Package Conditions and Environment

During the drop events the toroidal shell of the overpack structure will collapse, absorbing the kinetic energy of the event. Therefore, the thermal models described in Subsection 3.3.1 does not include the toroidal shells.

3.5.3 Package Temperatures

Temperature values at several locations within the model are given in Figures 3.5.3.1a through 3.5.3.1f for different time steps during the fire transient. In addition, temperature contour plots at these time steps are presented in Figures 3.5.3.2a through 3.5.3.2f. Temperature versus time plot is given in Figure 3.5.3.3.

3.5.4 Maximum Internal Pressures

The maximum allowable cask cavity temperature is 600°F, which corresponds to when the cask cavity is filled with 100% humidity air at 30 psia. The temperature within the cask cavity remains below 600°F during the fire transient; therefore, the maximum internal pressure is below 30 psia.

3.5.5 Maximum Thermal Stresses

Thermal stresses in the Model 2000 are evaluated at 0.5, 1.0, 1.5, 2.0, 2.5 and 3.0 hours during the fire transient. Stress intensity values ($P_m + P_b$, ksi) at several locations within the model are given in Figures 3.5.5.1a through 3.5.5.1f. These stress values are included for information only. They are not included in Section 2, since there are no regulatory limits on secondary stresses because of accident conditions.

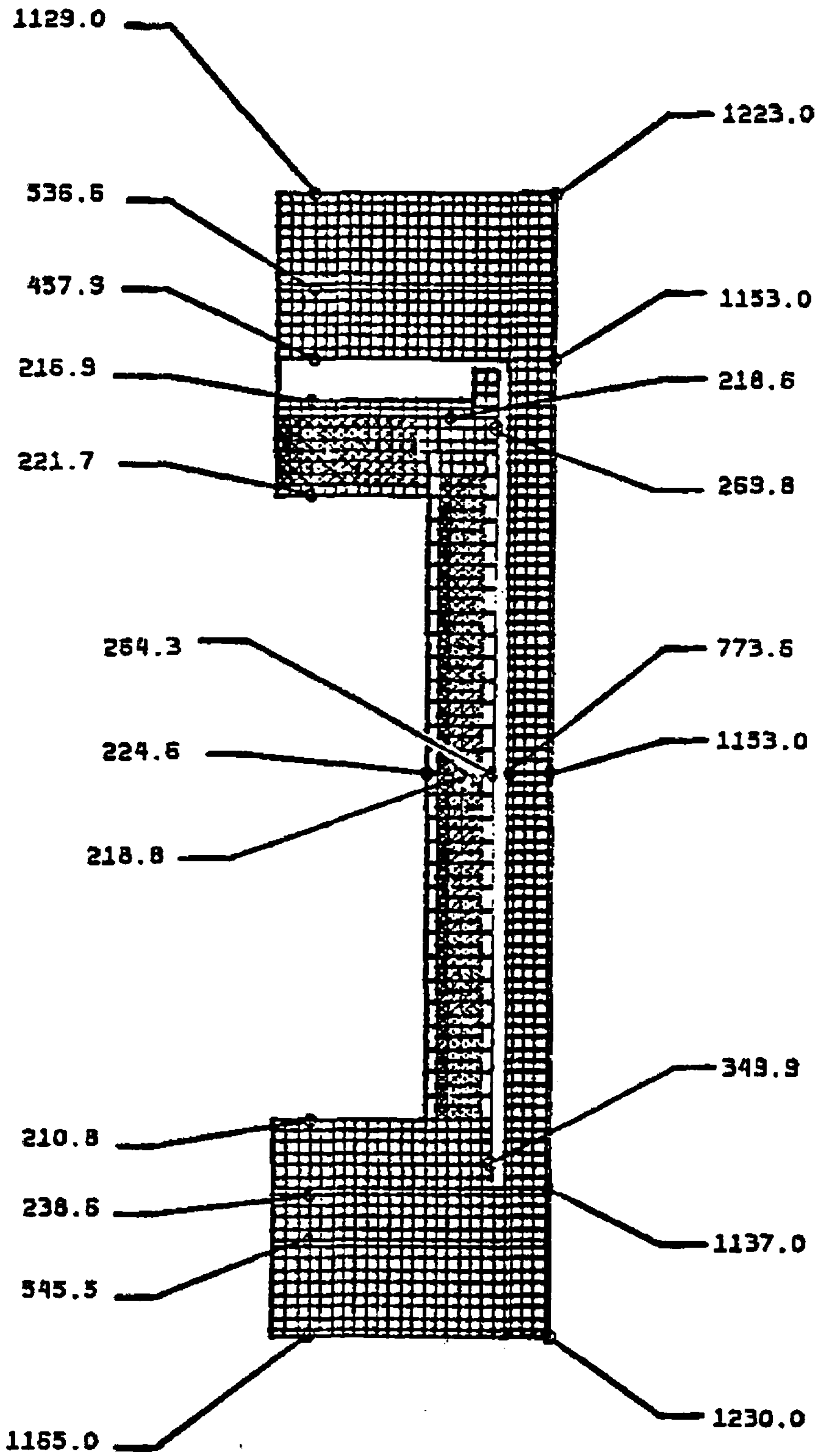


FIGURE 3.5.3.1A. MODEL 2000 TRANSPORT PACKAGE TRANSIENT ANALYSIS - FIRE PLUS 100°F AMBIENT TEMPERATURE, MAXIMUM DECAY HEAT AND MAXIMUM INSOLATION TIME: 0.5

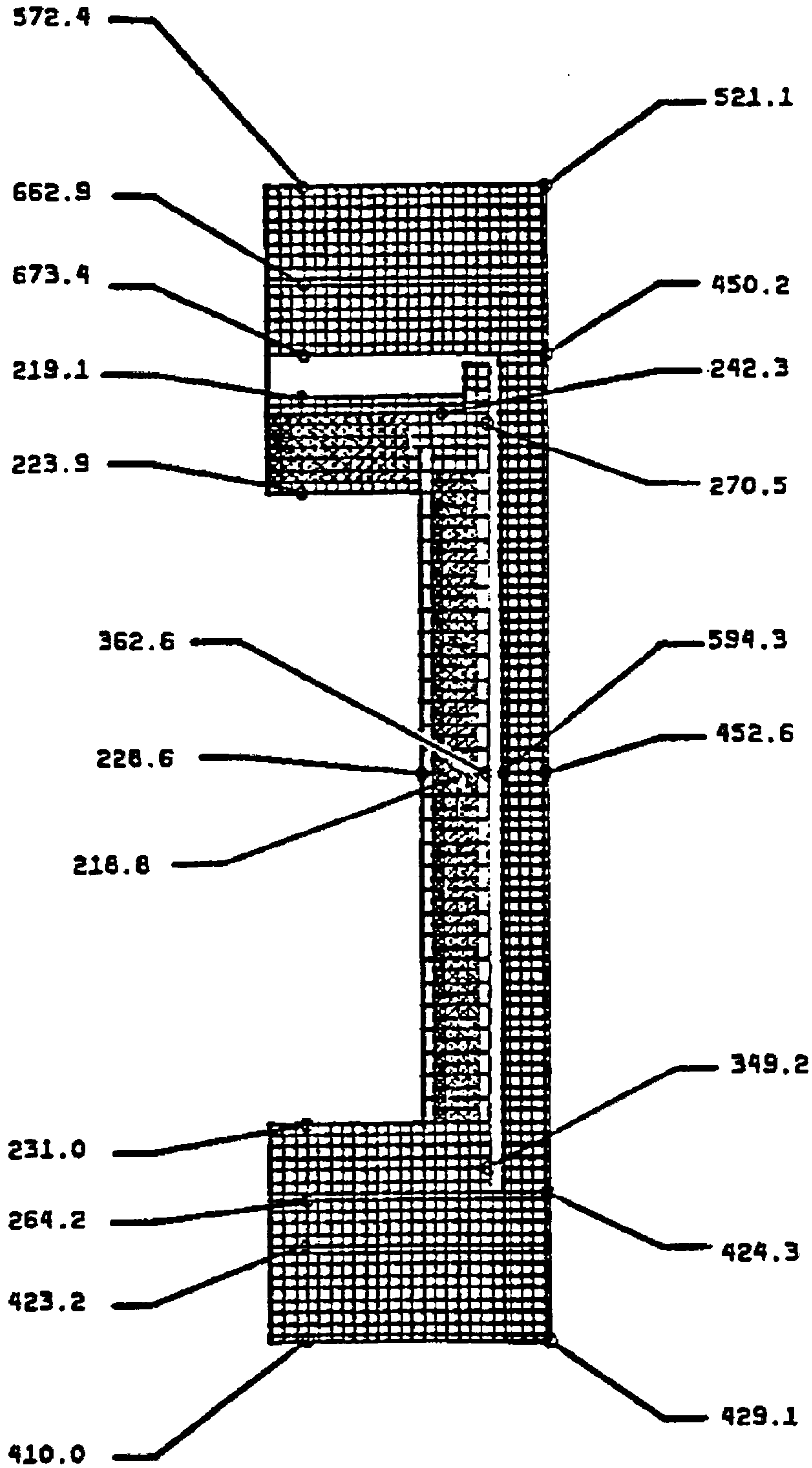


FIGURE 3.5.3.1B. MODEL 2000 TRANSPORT PACKAGE TRANSIENT ANALYSIS (T=0.5, 1.0 HRS.); FIRE PLUS 100°F AMBIENT TEMPERATURE, MAXIMUM DECAY HEAT AND MAXIMUM INSOLATION TIME: 1.00

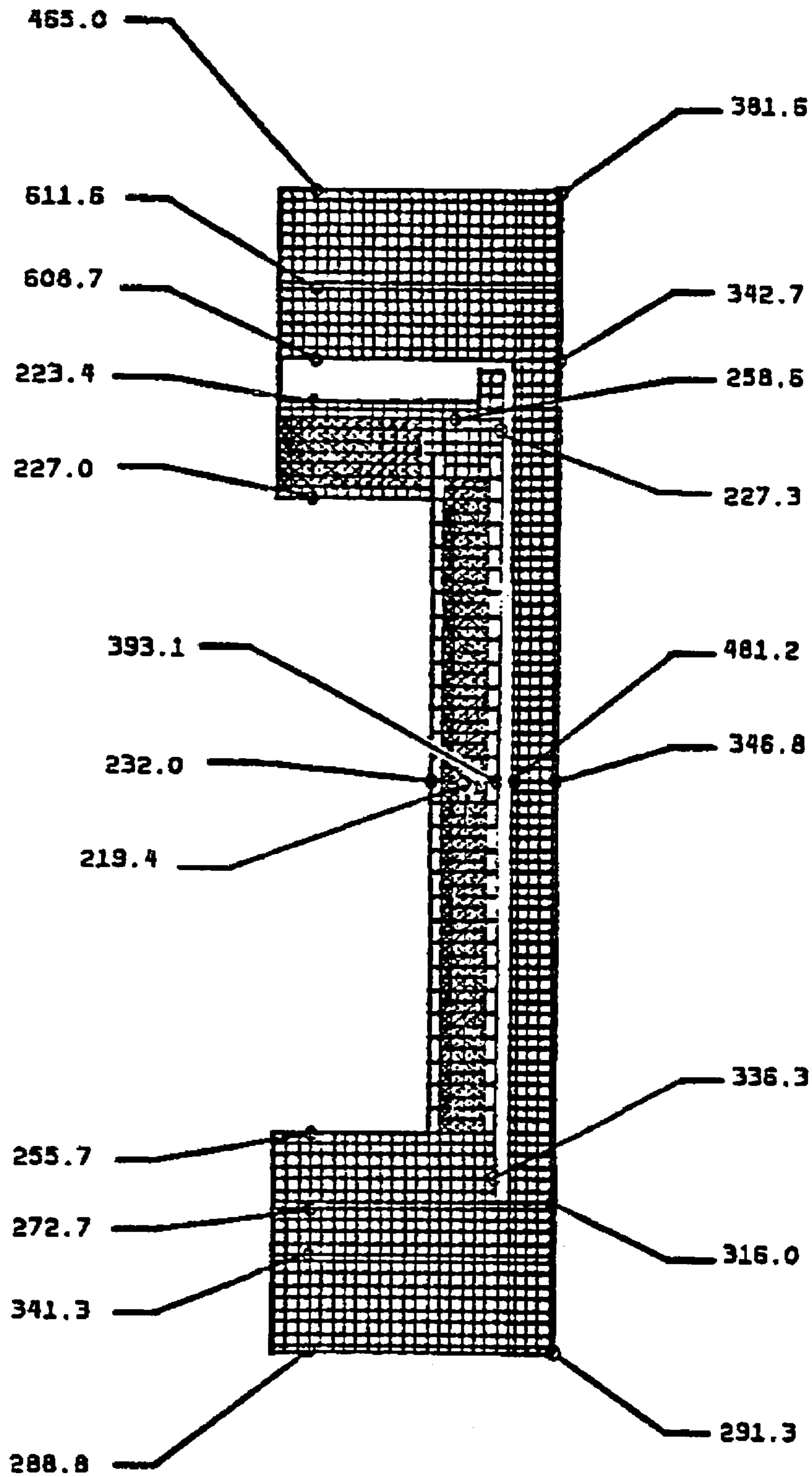


FIGURE 3.5.3.1C. MODEL 2000 TRANSPORT PACKAGE TRANSIENT ANALYSIS (T=1.01, 1.5 HRS.); FIRE PLUS 100°F AMBIENT TEMPERATURE, MAXIMUM DECAY HEAT AND MAXIMUM INSOLATION TIME: 1.50

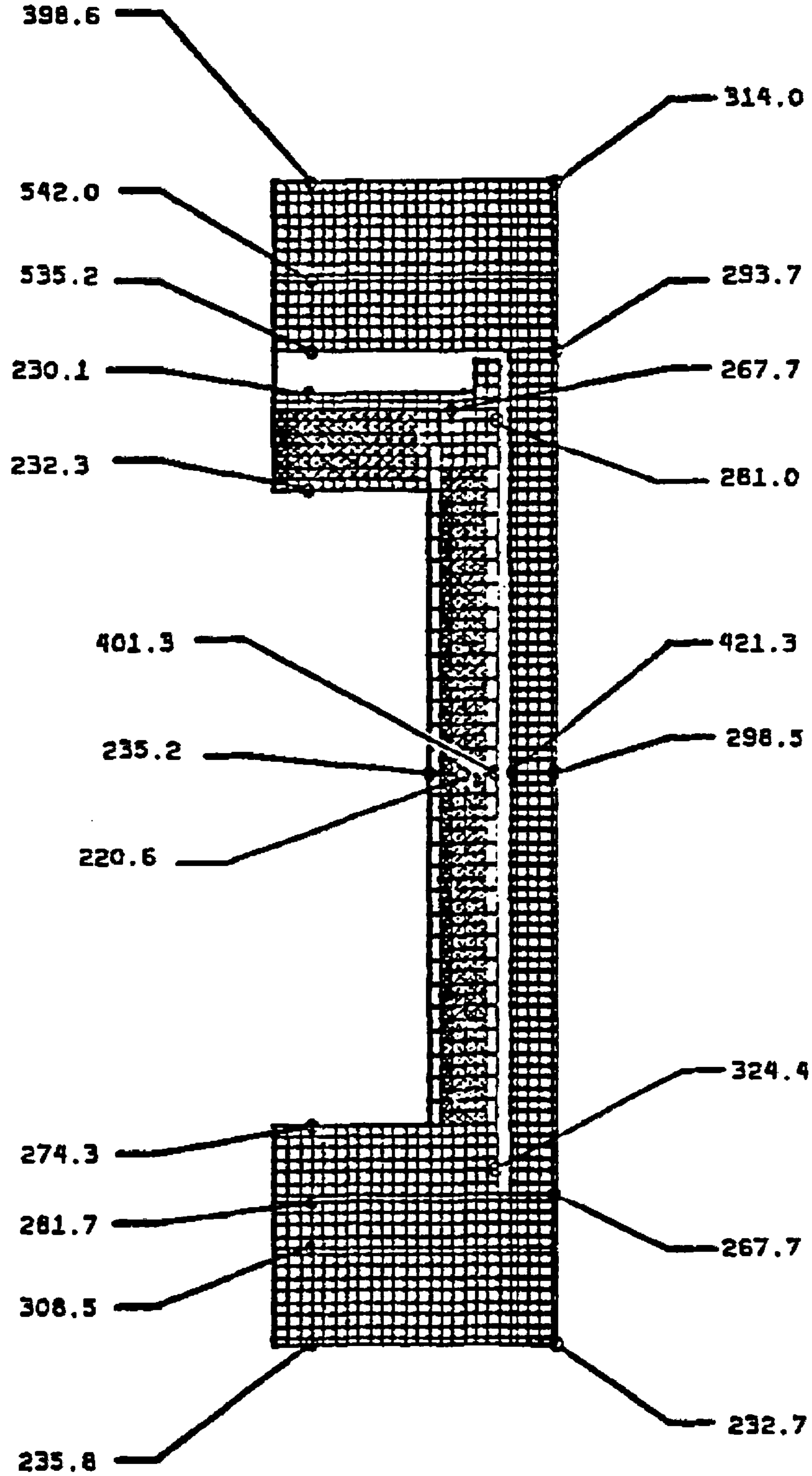


FIGURE 3.5.3.1D. MODEL 2000 TRANSPORT PACKAGE TRANSIENT ANALYSIS (T=1.51, 3.0 HRS.); FIRE PLUS 100°F AMBIENT TEMPERATURE, MAXIMUM DECAY HEAT AND MAXIMUM INSOLATION TIME: 2.0

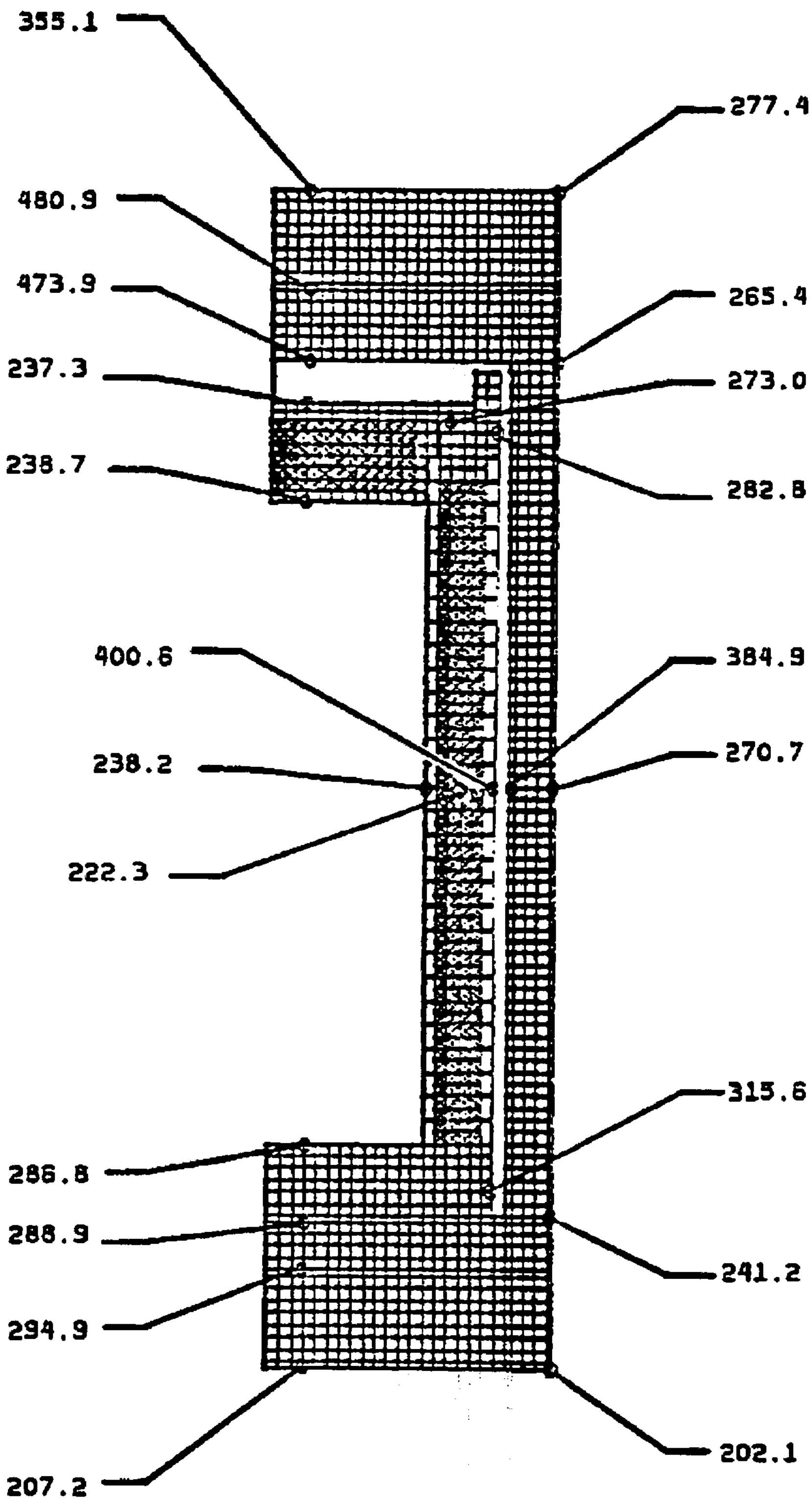


FIGURE 3.5.3.1E. MODEL 2000 TRANSPORT PACKAGE TRANSIENT ANALYSIS (T=1.51, 3.0 HRS.); FIRE PLUS 100°F AMBIENT TEMPERATURE, MAXIMUM DECAY HEAT AND MAXIMUM INSOLATION TIME: 2.50

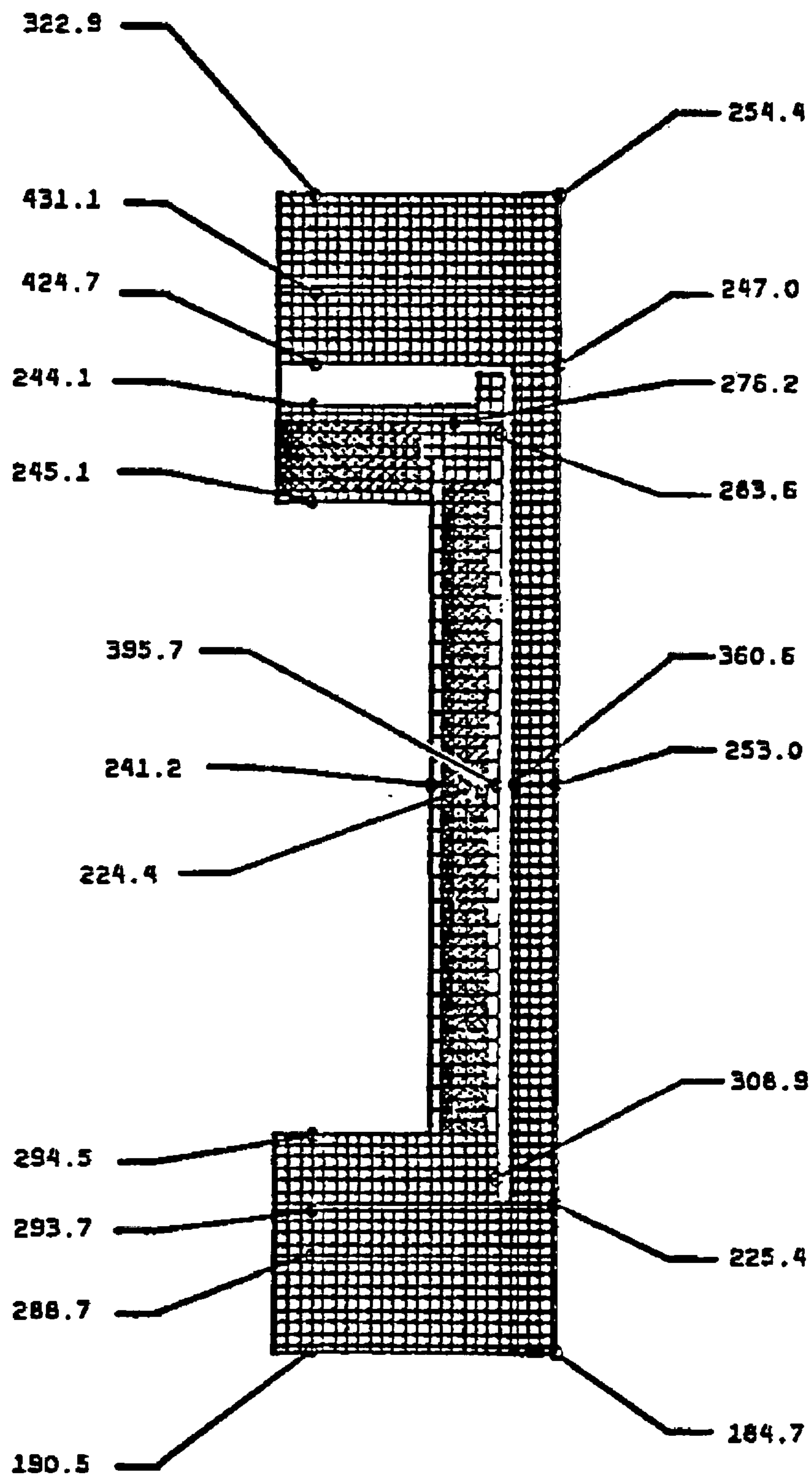


FIGURE 3.5.3.1F. MODEL 2000 TRANSPORT PACKAGE TRANSIENT ANALYSIS; FIRE PLUS 100°F AMBIENT TEMPERATURE, MAXIMUM DECAY HEAT AND MAXIMUM INSOLATION TIME: 3.0

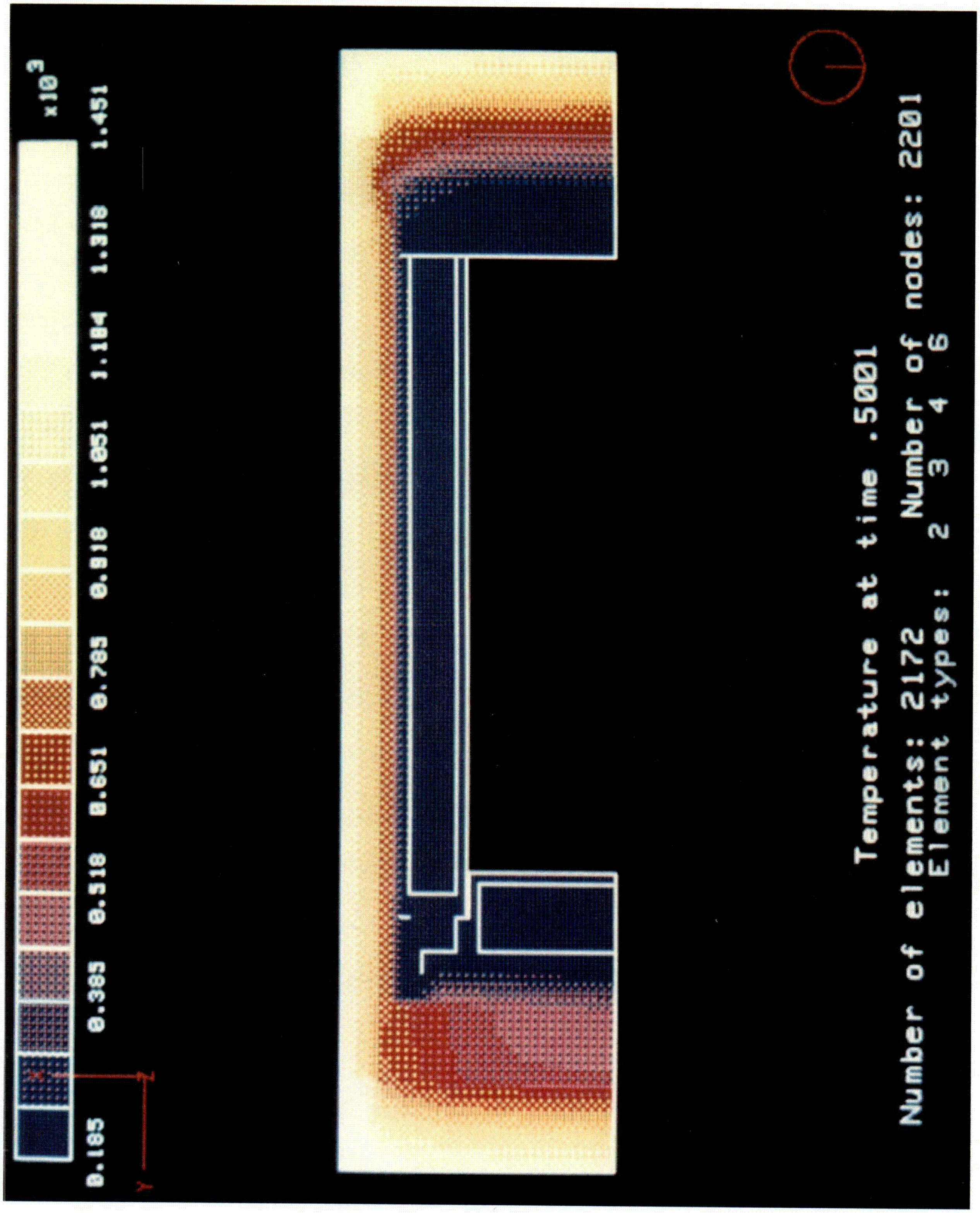


FIGURE 3.5.3.2A. TEMPERATURE CONTOUR, FIRE TRANSIENT: TIME, 0.5 HOUR

C09

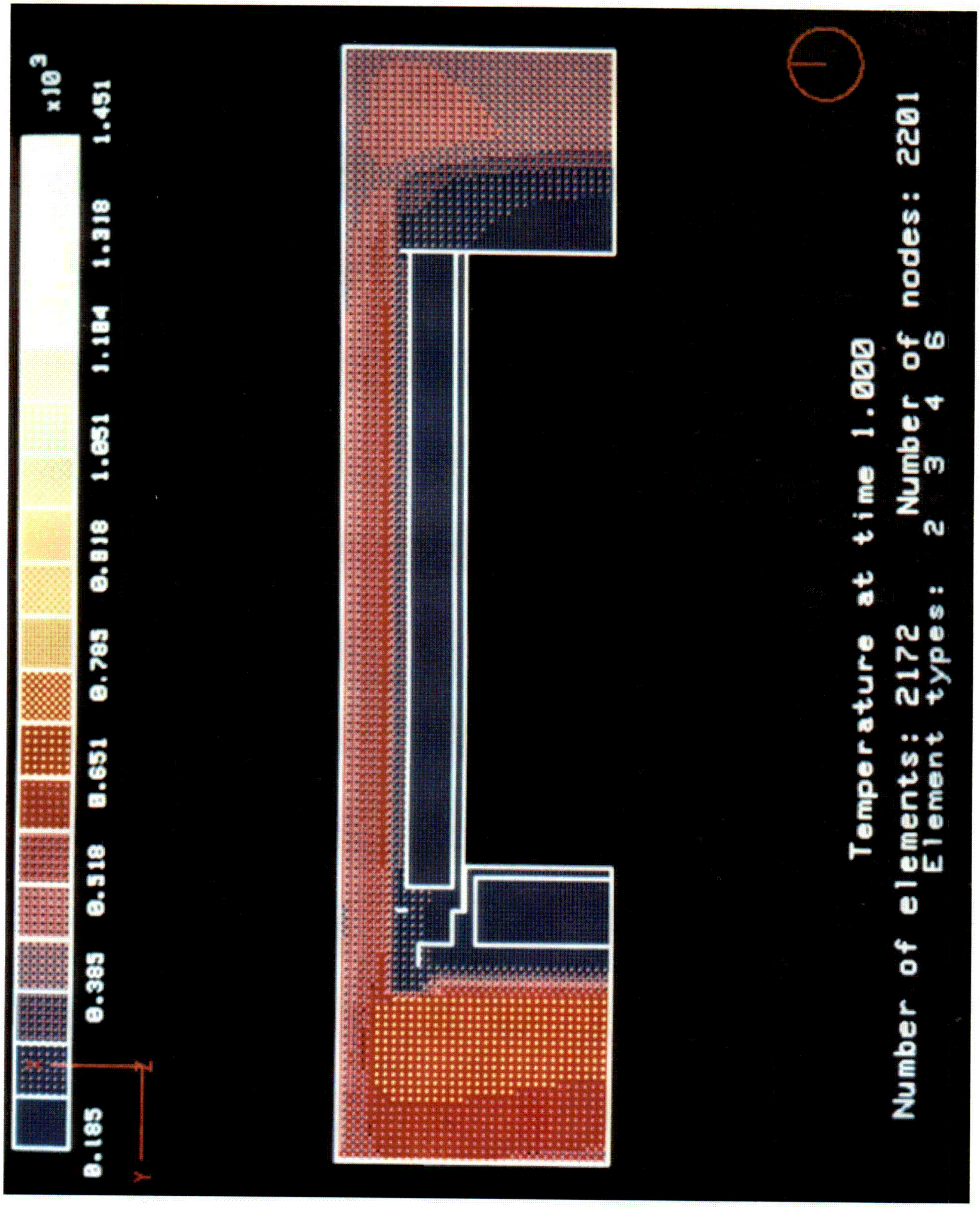


FIGURE 3.5.3.2B. TEMPERATURE CONTOUR, FIRE TRANSIENT: TIME, 1.0 HOUR

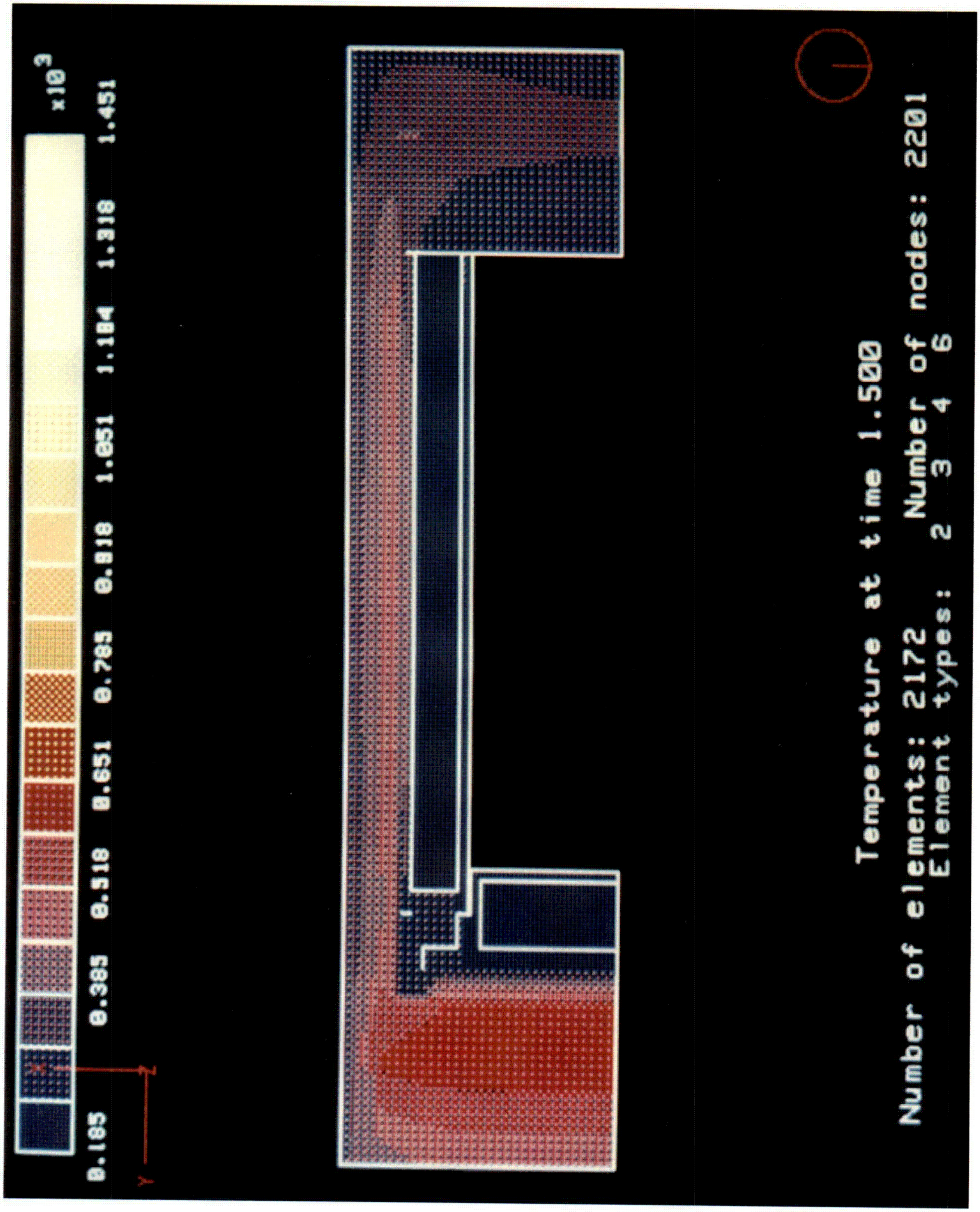


FIGURE 3.5.3.2C. TEMPERATURE CONTOUR, FIRE TRANSIENT: TIME, 1.5 HOURS

C11

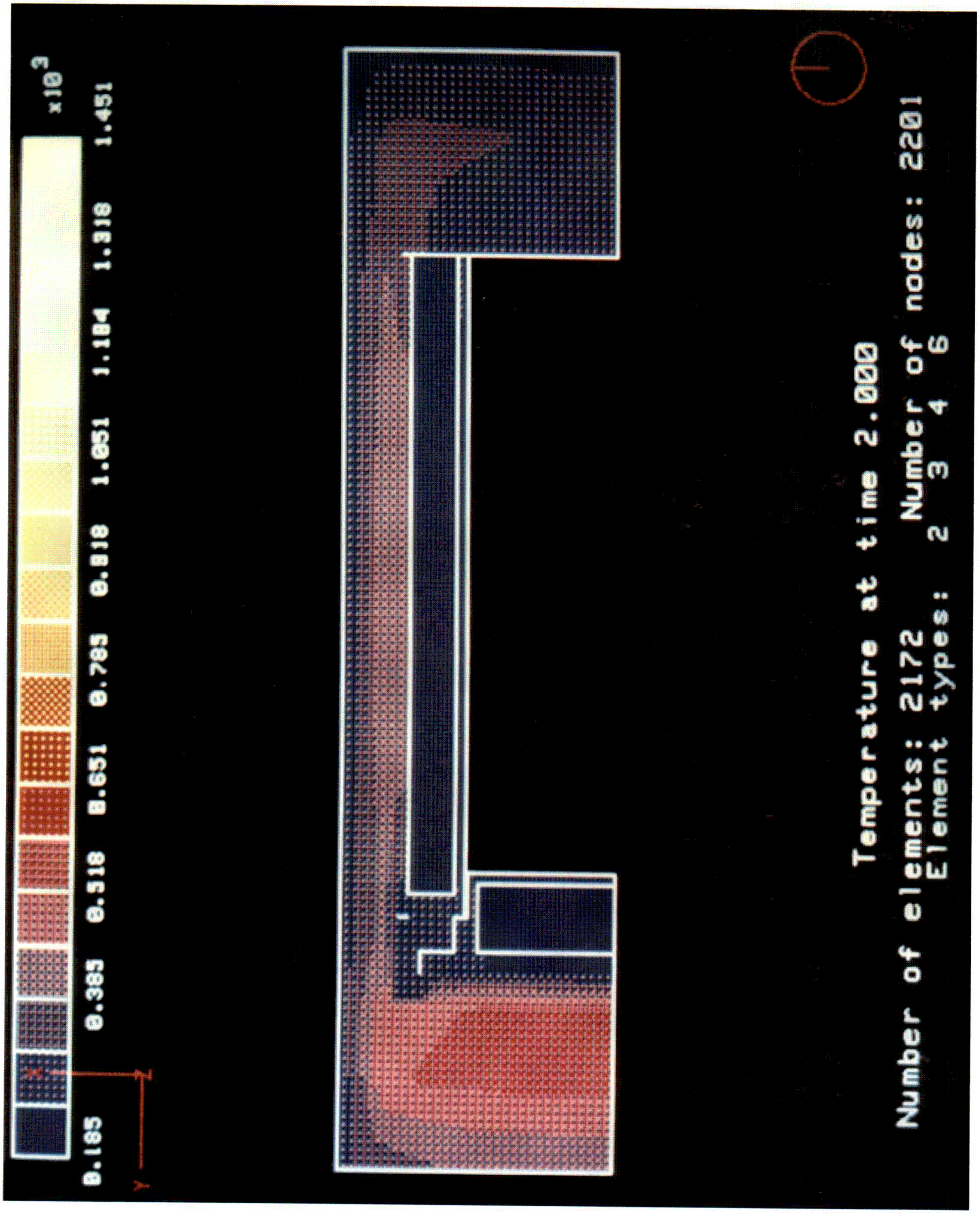


FIGURE 3.5.3.2D. TEMPERATURE CONTOUR, FIRE TRANSIENT: TIME, 2.0 HOURS

C12

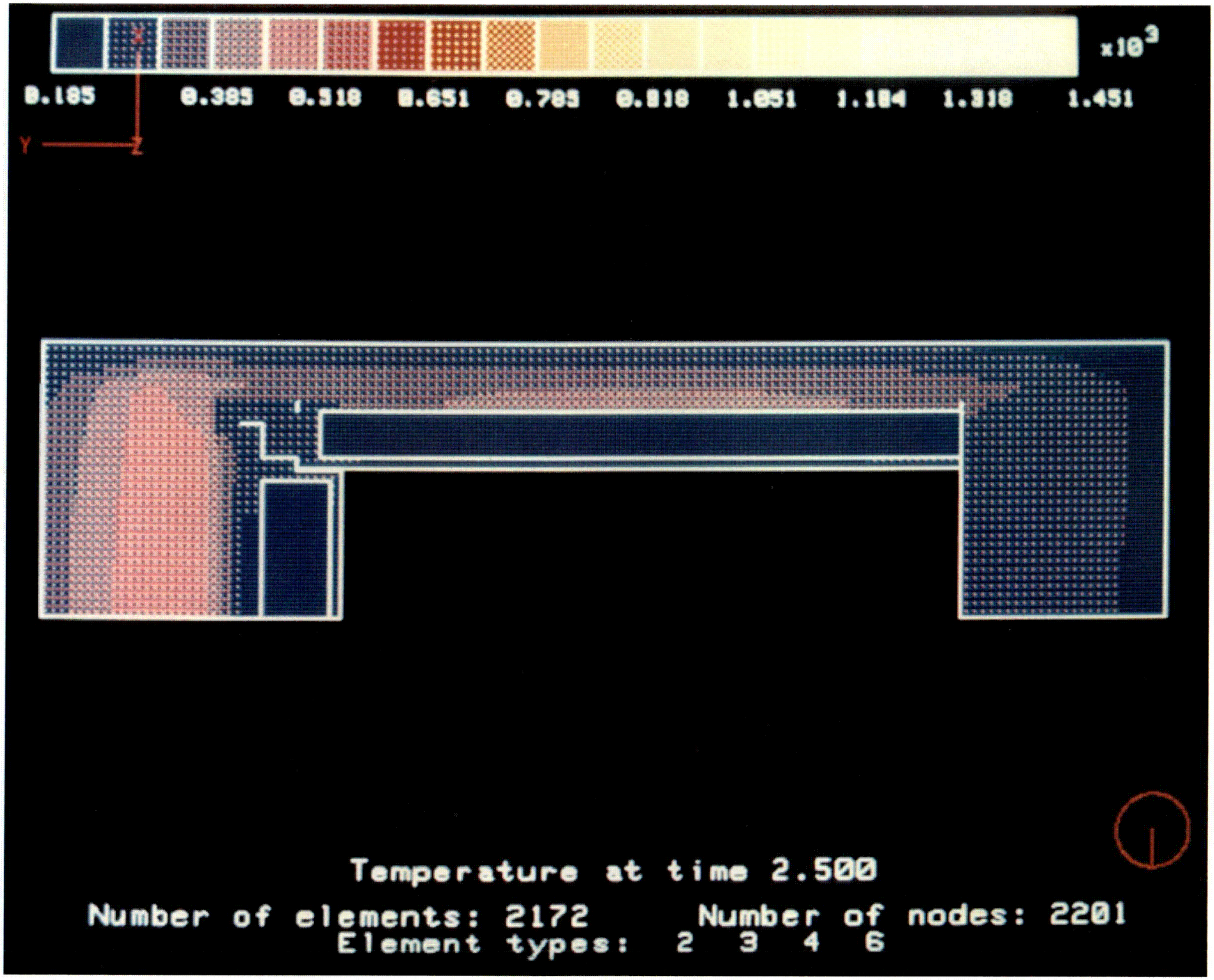


FIGURE 3.5.3.2E. TEMPERATURE CONTOUR, FIRE TRANSIENT: TIME, 2.5 HOURS

C13

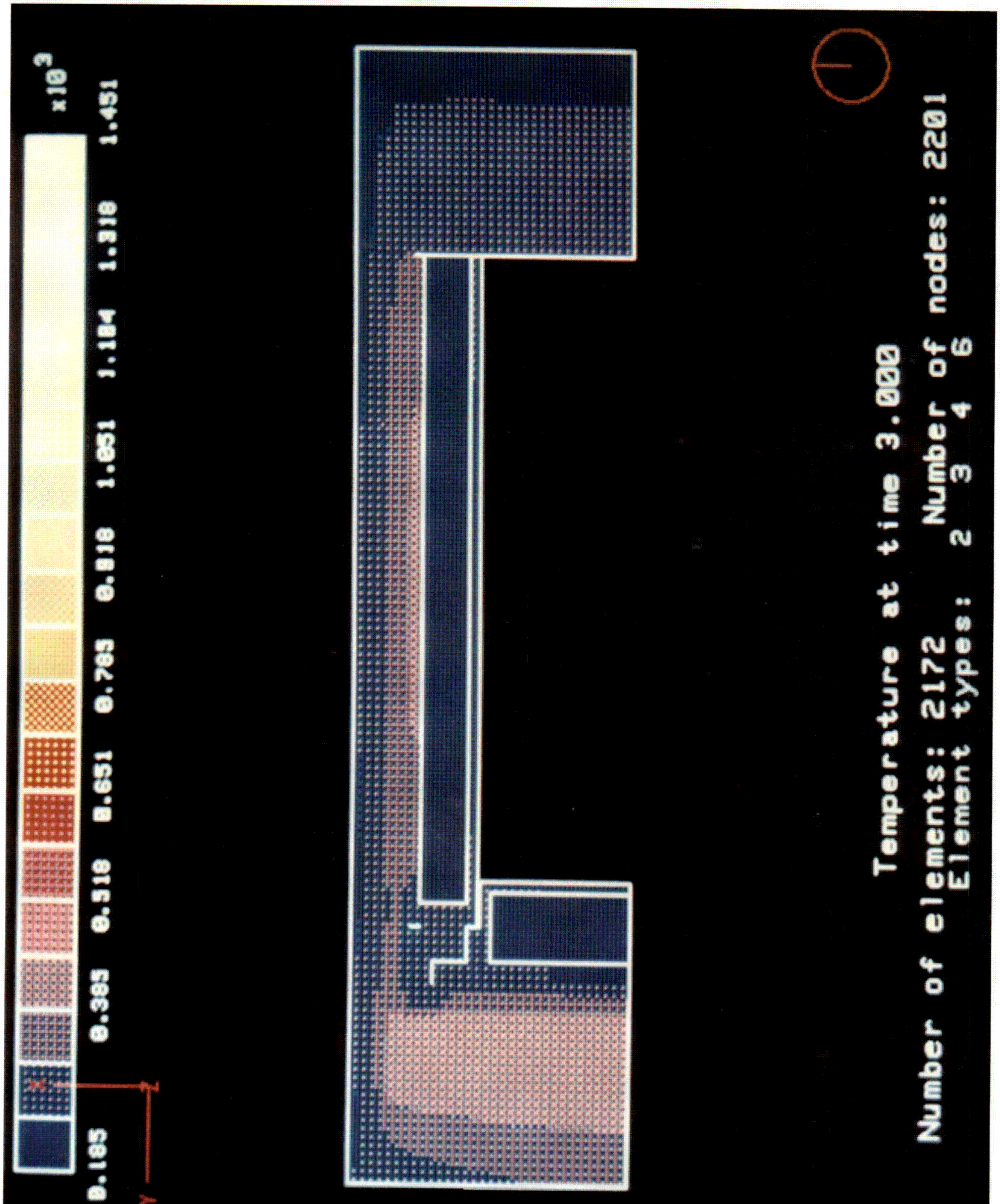


FIGURE 3.5.3.2F. TEMPERATURE CONTOUR, FIRE TRANSIENT: TIME, 3.0 HOURS

C14

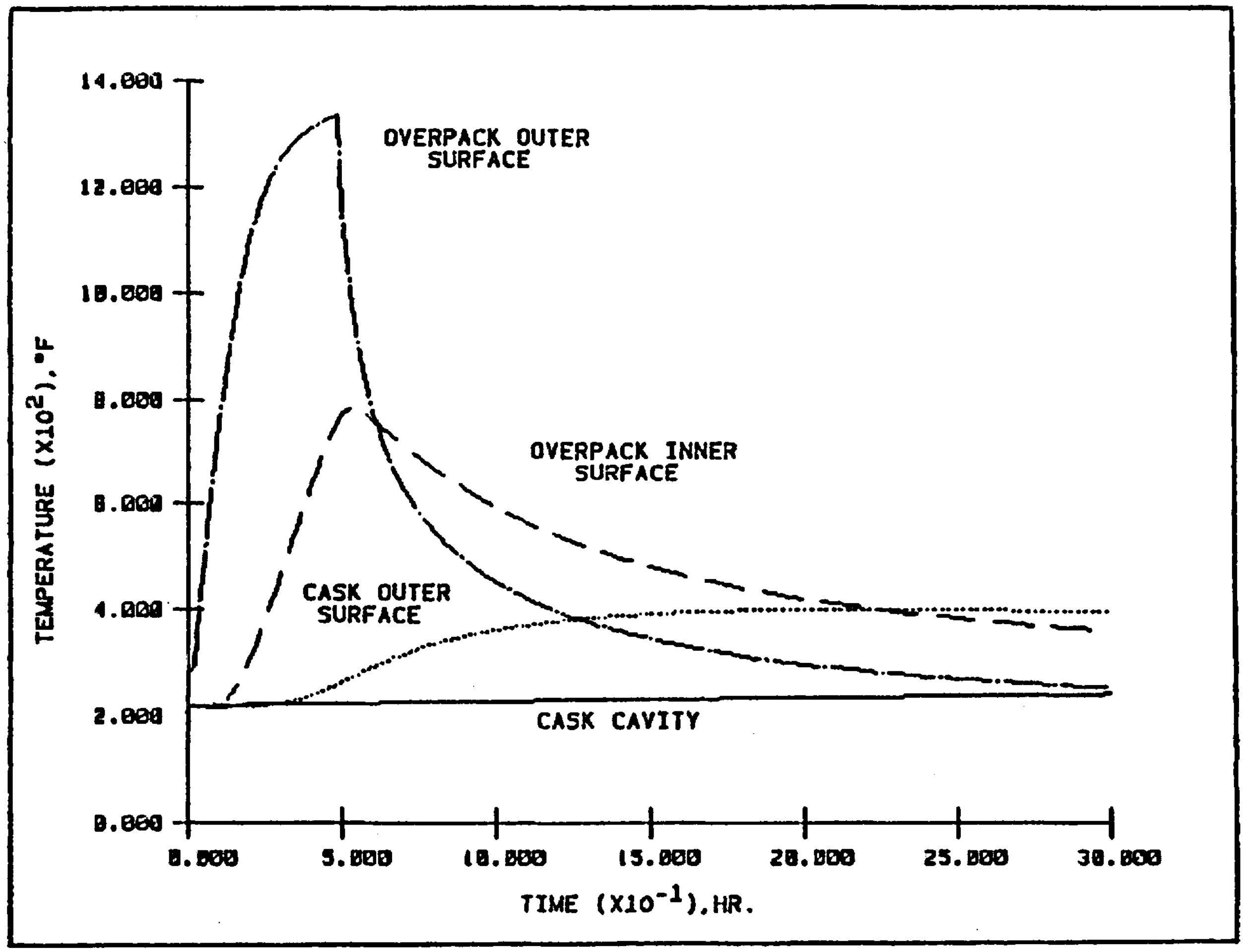


FIGURE 3.5.3.3. TEMPERATURE VS. TIME, ACCIDENT CONDITION

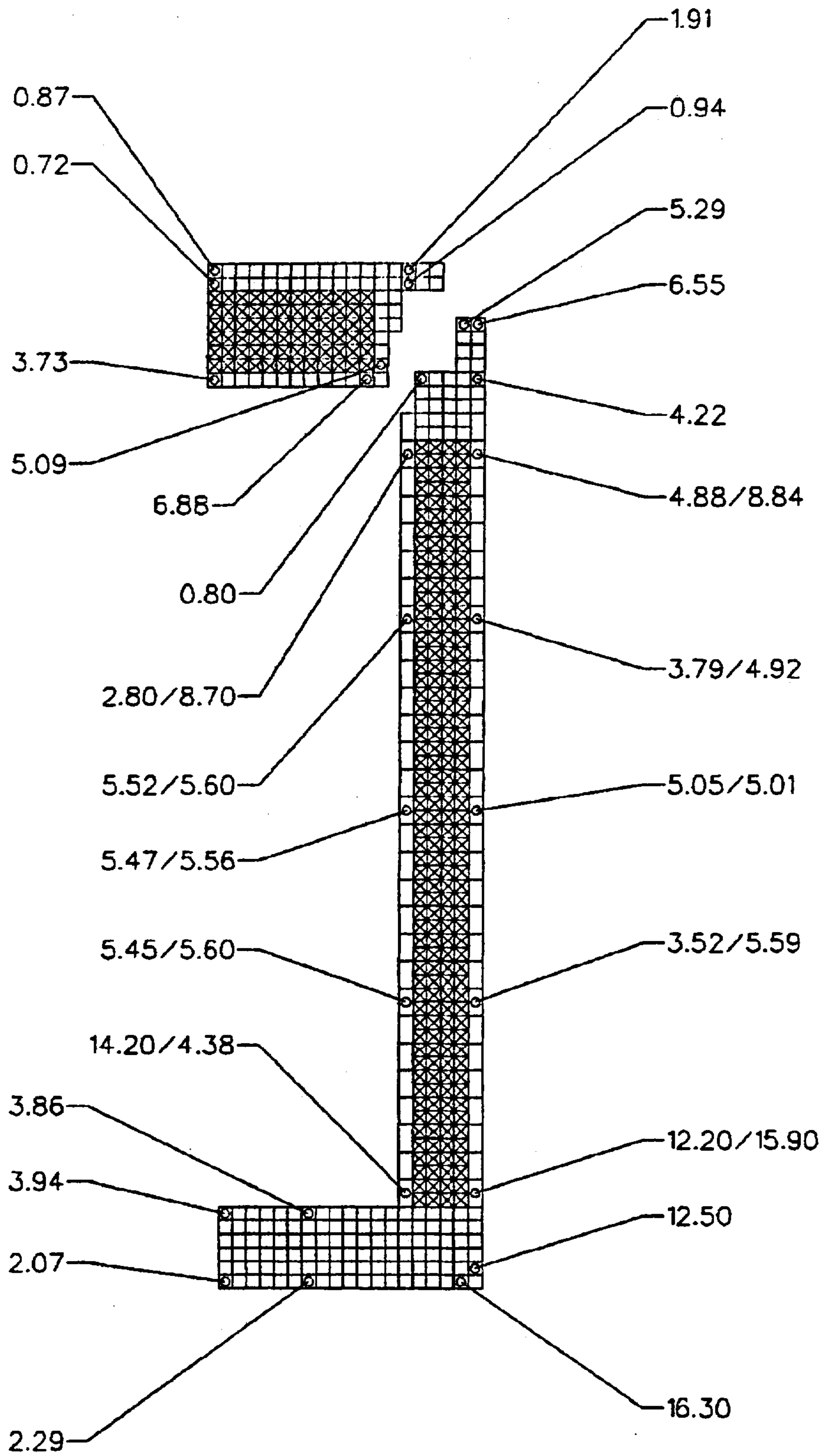


FIGURE 3.5.5.1A. MODEL 2000 CASK - THERMAL STRESS ANALYSIS ($P_M + P_B$ KSI)
TRANSIENT CONDITION (T = 0.5 HOURS)

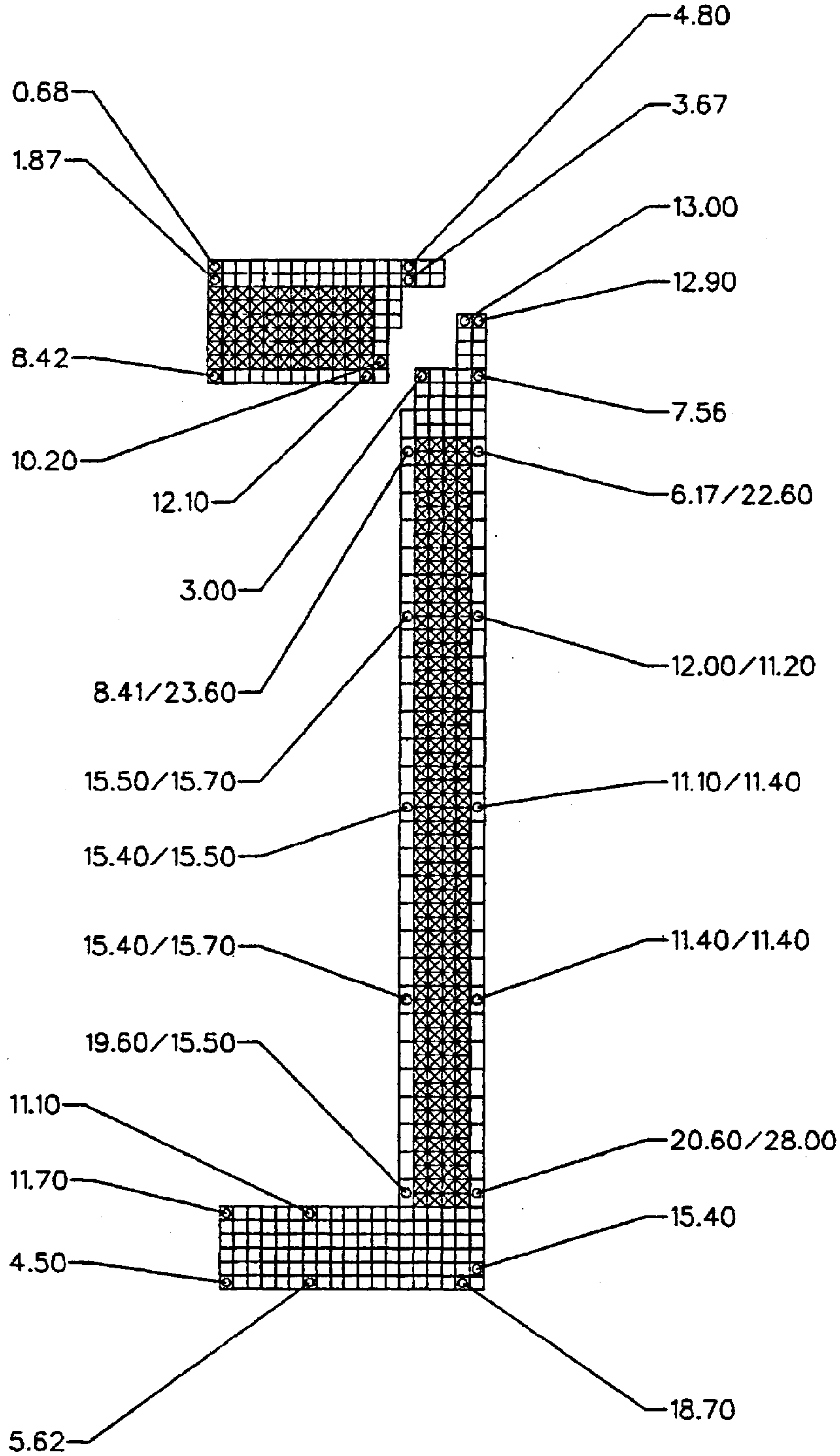


FIGURE 3.5.5.1B. MODEL 2000 CASK - THERMAL STRESS ANALYSIS ($P_M + P_B$ KSI) TRANSIENT CONDITION (T = 1.0 HOUR)

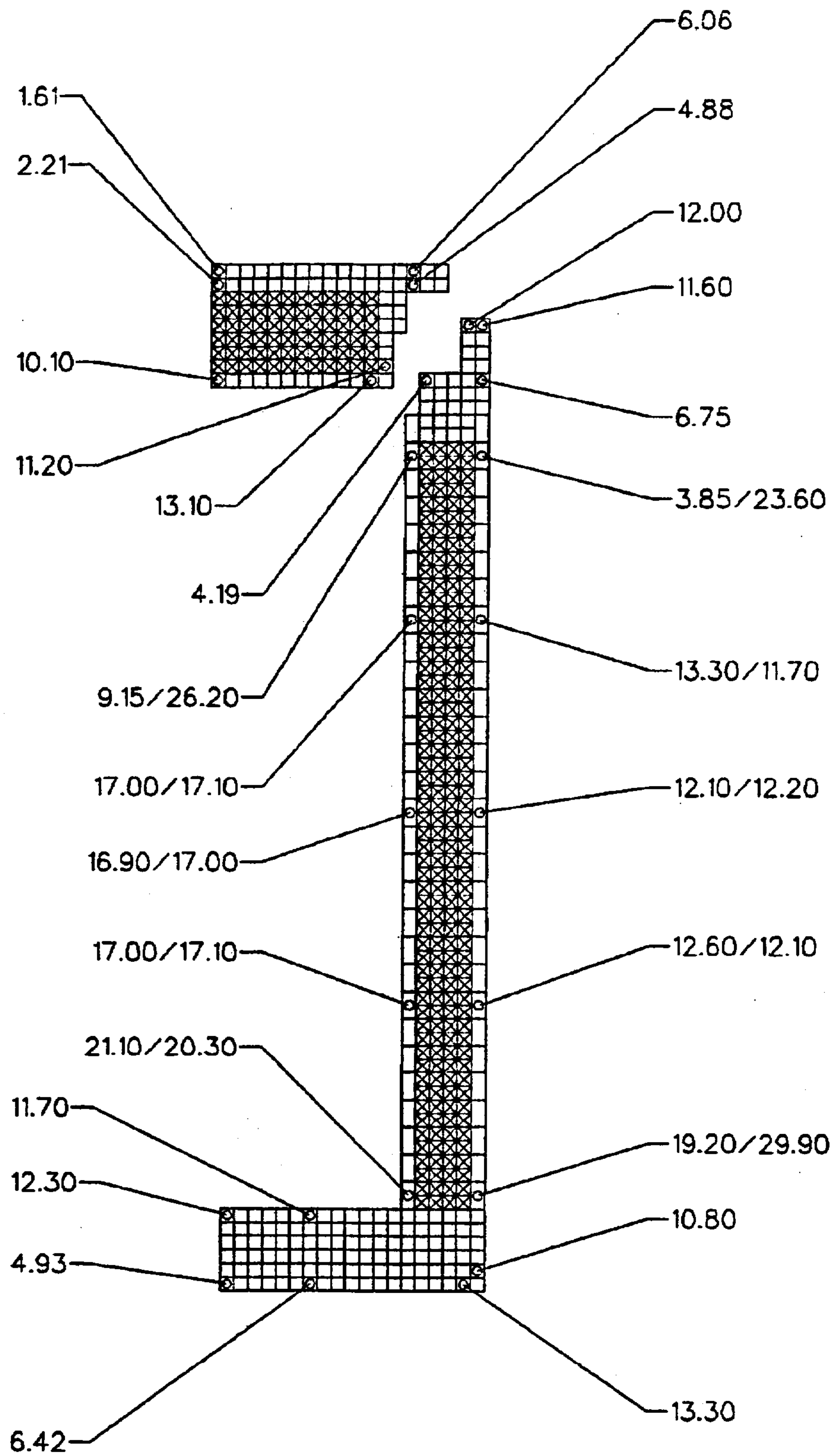


FIGURE 3.5.5.1C. MODEL 2000 CASK - THERMAL STRESS ANALYSIS (P_M +P_B KSI)
TRANSIENT CONDITION (T = 1.50 HOURS)

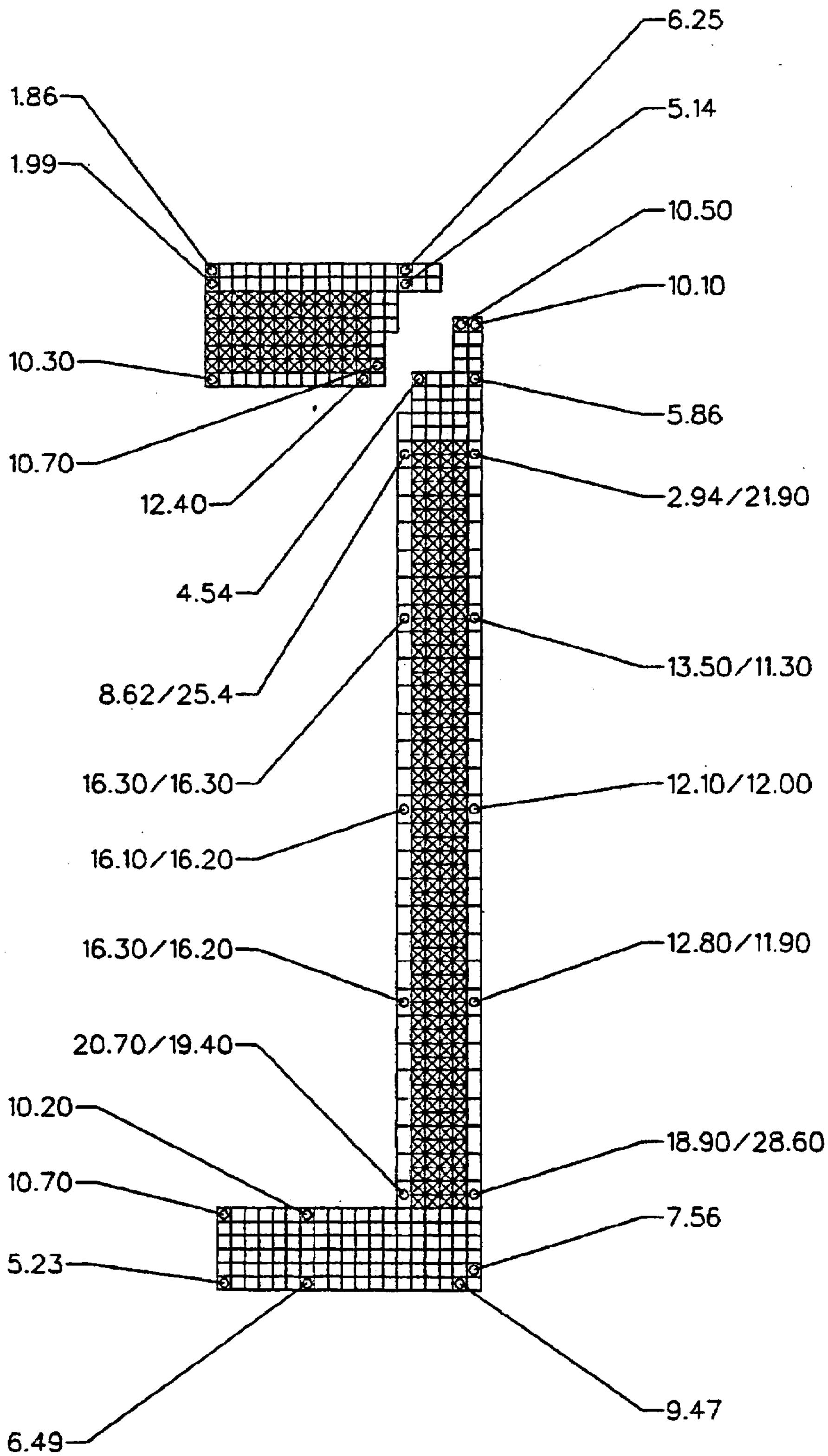


FIGURE 3.5.5.1D. MODEL 2000 CASK - THERMAL STRESS ANALYSIS (P_M + P_B KSI)
TRANSIENT CONDITION (T = 2.0 HOURS)

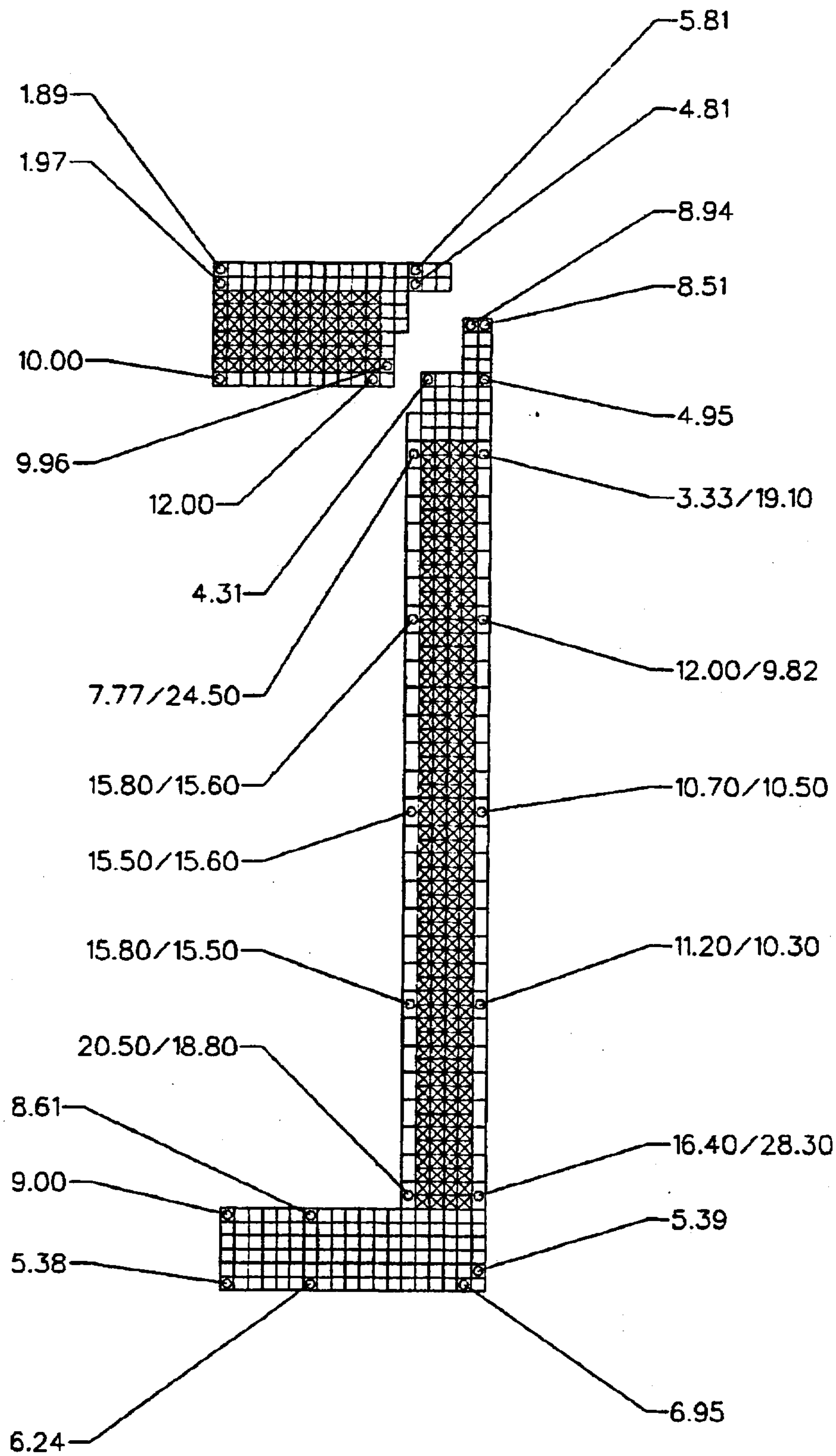


FIGURE 3.5.5.1E. MODEL 2000 CASK - THERMAL STRESS ANALYSIS (P_M + P_B KSI) TRANSIENT CONDITION (T = 2.50 HOURS)

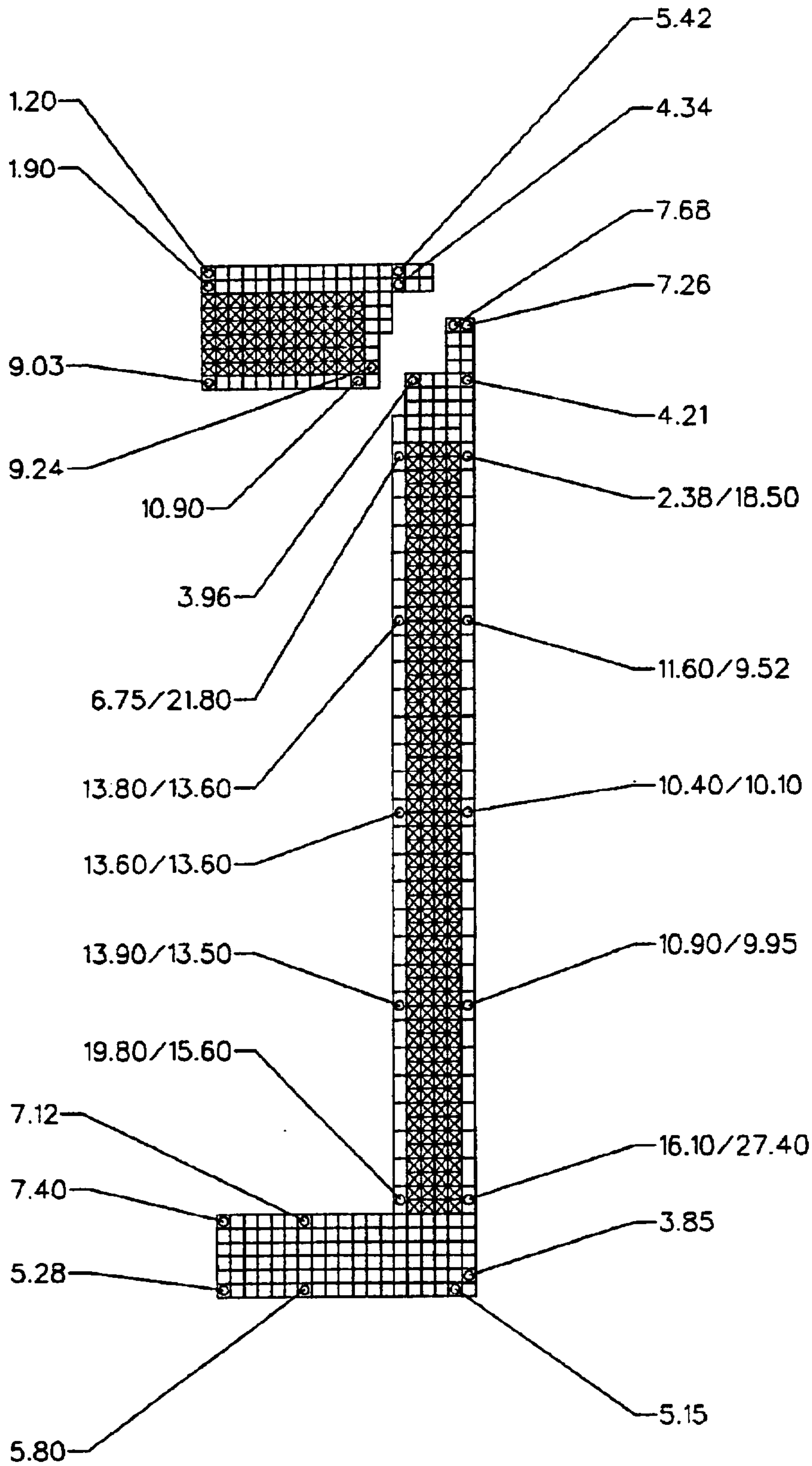


FIGURE 3.5.5.1F. MODEL 2000 CASK - THERMAL STRESS ANALYSIS ($P_M + P_B$ KSI)
TRANSIENT CONDITION (T = 3.0 HOURS)

3.5.6 Evaluation of Package Performance for the Hypothetical-Accident Thermal Conditions

The temperature values obtained within the model during the fire transient are presented in Subsection 3.5.3. The temperatures evaluated are below the thermal design criteria of the material for each component. The highest lead temperature noted is 236°F. This temperature is way below the melting point of lead. The maximum temperature of any elastomeric component is 350°F. This temperature is given around the cask drain port O-ring. The elastomeric material employed is capable of performing up to 400°F (see Subsection 4.4.1).

3.6 APPENDIX

3.6.1 LIBRA Finite Element Program Heat Transfer Module

3.6.1.1 Description of the LIBRA Heat Transfer Program

The LIBRA heat transfer program performs steady-state and transient analyses of two- and three-dimensional structures. The LIBRA heat transfer code is compatible with the structural code in that essentially the same model can be used for both structural and thermal analyses, and temperature fields determined in thermal analyses can be saved and applied in subsequent structural analyses.

For transient thermal problems the user can control the integration scheme by specifying the integration parameter. A zero value of this parameter gives an explicit integration scheme, while values between zero and one give implicit schemes. Usually, a value of one for the integration parameter was used, and this value corresponds to a backward difference integration technique.

The LIBRA user can specify property changes at user-directed intervals in transient problems. At such times, the LIBRA code passes control to a user-written subroutine which, allows the introduction of temperature-dependent properties. This program feature was widely used in the analysis of the transport package.

3.6.1.2 Qualification and Verification of LIBRA Program

To assess the accuracy of the LIBRA computer program, a qualification and verification program was conducted. The program included verification against exact solution type of problems and benchmarking in the thermal area. A thermal test was performed on a GE Model 1500 transport package to verify transient and steady-state analyses at various power levels. In all cases, verification against exact solutions and benchmarking, the agreement between theory or testing and analysis results were excellent.

3.6.1.3 Heat Transfer Problems With Exact Solution

Six example problems were solved analytically and by application of the LIBRA heat transfer program. The problems solved include plane and axisymmetric geometry and involve convective, radiative, and fixed temperature boundary conditions. In all problems solved, both steady-state and transient problems, agreement between the analytical solutions and the LIBRA program was within one percent. Table 3.6.1.3.1 summarizes these problems and the comparison of results.

3.6.1.4 Heat Transfer Benchmarking Test

A thermal test was performed on a GE Model 1500 transport package Radioactive contents heat load was simulated by electric heaters. Thermocouples were placed at strategic locations inside the cask cavity, on the outer cask surface, on the inside overpack surfaces, and exterior to overpack structure. Temperatures were periodically recorded as the heater power was varied from 0 to 3 kW. Steady-state temperatures were recorded for various heater powers from 1 kW to 3 kW.

A finite element model of the package was developed and it was applied to a thermal analysis using the LIBRA Heat Transfer Program. A comparison of heat test (HT) and LIBRA results are given in Table 3.6.1.4.1.

TABLE 3.6.1.3.1. SUMMARY OF HEAT TRANSFER EXACT SOLUTION PROPERTIES AND THEIR RESULTS

PROBLEM TYPE	PROBLEM STATEMENT	THEORY	LIBRA	REFERENCES
Transient conduction	Concrete wall at initial temperature (Ti), suddenly exposed on one side to hot gas at (Tg).	X/L T(°) 0 508.8 0.167 538.2 0.333 625.3 0.500 766.3 0.667 954.7 0.833 1,180.7 1.0 1,431.8	T(°F) 507 535 622 763 952 1,180 1,430	F. Kreith, "Principles of Heat Transfer", 2nd Ed., International Textbook Company, Scranton, 1965; Example 4-4.
Steady-state conduction	Concrete slab has its two surfaces maintained at T_1 and T_2. Obtain heat transfer rate.	120 Btu/h-ft^2	120 Btu/h-ft	B. Gebhart, "Heat Transfer", 2nd Ed., McGraw-Hill Book Company, New York, 1971; Example 2-1.
Internal heat generation/ steady-state	A uniformly heat generating plate of thickness t, subjected to a temperature T_1 on inside and T_2 on the other side.	X/L T(°F) 0 141 0.125 330 0.250 471 0.375 562 0.500 605 0.625 599 0.750 544 0.875 440 1.0 288	T(°F) 142 331 471 562 605 599 544 440 287	J. K. Garret, "THTD Verification Manual", General Electric Company, San Jose, 1980.
Conduction with radiation and convection boundaries	A plate has a heat flux on one side, and the other side radiates to two sinks.	Surface Temp. (°F) 659.7	Surface Temp. (°F) 659.7	Same as above.
Axisymmetric, transient conduction	An infinitely long rod of radius R having a uniform initial temperature T~ is plunged suddenly into a bath at Temperature ∞.	r/R T(°F) 0 86.6 0.1 87.0 0.2 87.6 0.3 88.5 0.4 89.7 0.5 91.2 0.6 92.8 0.7 94.6 0.8 96.5 0.9 98.3 1.0 100.0	T(°F) 86.6 87.0 87.6 88.5 89.7 91.2 92.9 94.7 96.5 98.3 100.0	
Axisymmetric, transient conduction with convective boundary	A rod having a uniform initial temperature Ti is quenched in an oil bath at T∞.	r/R T(°F) 0 490.0 0.1 489.0 0.2 485.7 0.3 480.2 0.4 472.6 0.5 462.9 0.6 451.3 0.7 437.8 0.8 422.5 0.9 405.6 1.0 387.2	T(°F) 490 488 485 479 472 462 450 437 421 404 386	Same as above. Example 5-13.

TABLE 3.6.1.4.1. COMPARISON OF HEAT TEST AND LIBRA RESULTS

Location	p = 1.1 kW		p = 2 kW		p = 3 kW	
	HT	LIBRA	HT	LIBRA	HT	LIBRA
Cavity	264	248	395	372	527	474
Cask Surface	166	179	243	256	319	308
Inner Jacket	101	99	139	138	168	158
Outer Jacket	80	82	98	107	102	111

3.6.2 Thermal Evaluation, Horizontal Transport Mode

The objective of the thermal evaluation presented in this Appendix is to show that the temperature distributions in the Model 2000 package are not significantly affected by the change in package transport orientation from vertical to horizontal.

The Model 2000 package has been thoroughly analyzed in the vertical mode of transport for decay heat values of 600, 1500, and 2000 watts in a variety of contents, which include spent fuels (BWR, MTR, and TRIGAS), irradiated materials, and radioisotope sources, for normal and accident regulatory conditions. This work has been reported in GE documents, NEDO-31581, -32318, and -32408. The finite element model employed in these evaluations closely represents the actual package with the exception of the overpack toroid shell. Refer to Figure 3.4.1.1 in this Chapter for a representation of the finite element model overlaying the package drawing and to Figure 3.4.1 for the finite element model representing the package.

To identify any difference in temperatures due to package orientation during transport, the thermal model of the package is modified to account for horizontal orientation and analyzed for the following thermal conditions:

1. 100°F ambient with maximum decay heat, 1500 watts

2. 100°F ambient with maximum decay heat, 1500 watts, and maximum solar load

3. Fire transient, t = 0 to 5.0 hours.

Modification to the analytical model for horizontal transport consists of the application of a boundary convective coefficient at the bottom surface of the package and different solar loads. For the vertical position, the boundary coefficient at the bottom of the package is set equal to zero (perfect Insulator) to simulate the package resting on the truck bed. No credit is taken for any conduction mechanism between the package bottom surface and the truck bed. In addition, the solar loads are changed because vertical and horizontal surfaces are interchanged with the change in orientation.

During the analysis, the thermophysical properties of the material, including, that of the surrounding air, are updated as function of temperature. For the vertical transport orientation, the boundary coefficients (convection and radiation) at the bottom surface are set to zero. For the horizontal transport mode, the analysis uses calculated, finite values for these coefficients.

The results of the analyses for horizontal mode of transport are compared with the results obtained for the vertical orientation. This comparison of results is shown in Table 3.6.2.1. Also, contour plots of these analyses for horizontal mode are presented in Figures 3.6.2.1 through 3.6.2.8.

A review of the data shows little variation between temperatures distributions for the two transport orientations. The temperature distributions for horizontal transport tend to be more uniform between the ends of the package.

Based on the data presented in the above table and attached figures, it can be concluded that horizontal transport of the Model 2000 package does not significantly change the package temperature distributions from those determined for vertical transport.

TABLE 3.6.2.1. COMPARISON RESULTING TEMPERATURE DISTRIBUTION BETWEEN VERTICAL AND HORIZONTAL TRANSPORT MODES

Condition:	1.0		2.0		3.0, t=0.5 hrs		3.0, t=up to 5 hrs		
Package Orientation(1)	Vert.	Hrz.	Vert.	Hrz.	Vert.(2)	Hrz.(3)	Vert.(2)	Hrz.(3)	Criteria (°F)
Cask Cavity Surface	261	259	304	299	306	272	383	336	T ≤ 600
Lead Shield	259	257	302	297	305	275	377	334	T ≤ 600
Cask Seat Area	238	239	285	280	289	247	351	283	T ≤ 400
Cask Test Port	236	238	283	279	312	269	349	285	T ≤ 400
Cask Drain Port	233	235	272	274	339	306	371	362	T ≤ 400
Cask Vent Port	242	243	289	284	293	252	338	285	T ≤ 400
Cask Outer Surface	242	256	288	296	338	289	406	333	NA
Overpack Inner Surface	185	197	240	245	851	793	859	793	NA
Overpack Outer Surface	130	137	187	191	1227	1375	1357	1375	T ≤ 180 for 1.0

(1) Values for Vertical orientation obtained from Table 3.1, NEDO-32408, "Model 2000 Radioactive Material Transport Package MTR-Type Fuel Divider and Tower Shielding Reactor Fuel Basket Safety Analysis Report," Rev. 1c.

(2) Temperature values include the effect of convection during the fire transient event for content with 1500 watts of decay heat.

(3) Temperature values updated by 3% to account for the effect of convection during the fire transient event.

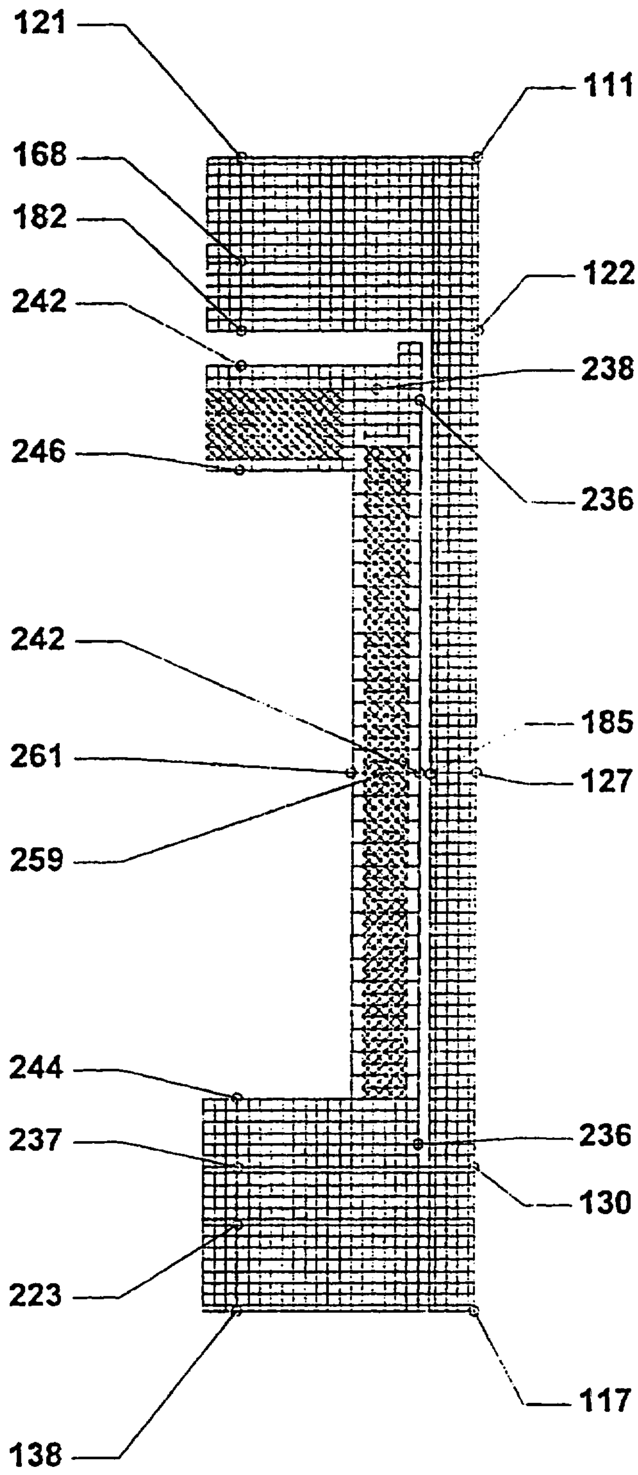


FIGURE 3.6.2.1. TEMPERATURE DISTRIBUTION, VERTICAL(1) TRANSPORTATION MODE, STEADY-STATE ANALYSIS 100°F AMBIENT TEMPERATURE AND MAXIMUM DECAY HEAT

(1) From Figure 3.5, NEDO-32408, "Model 2000 Radioactive Material Transport Package MTR-Type Fuel Divider and Tower Shielding Reactor Fuel Basket Safety Analysis Report," Rev. 1.

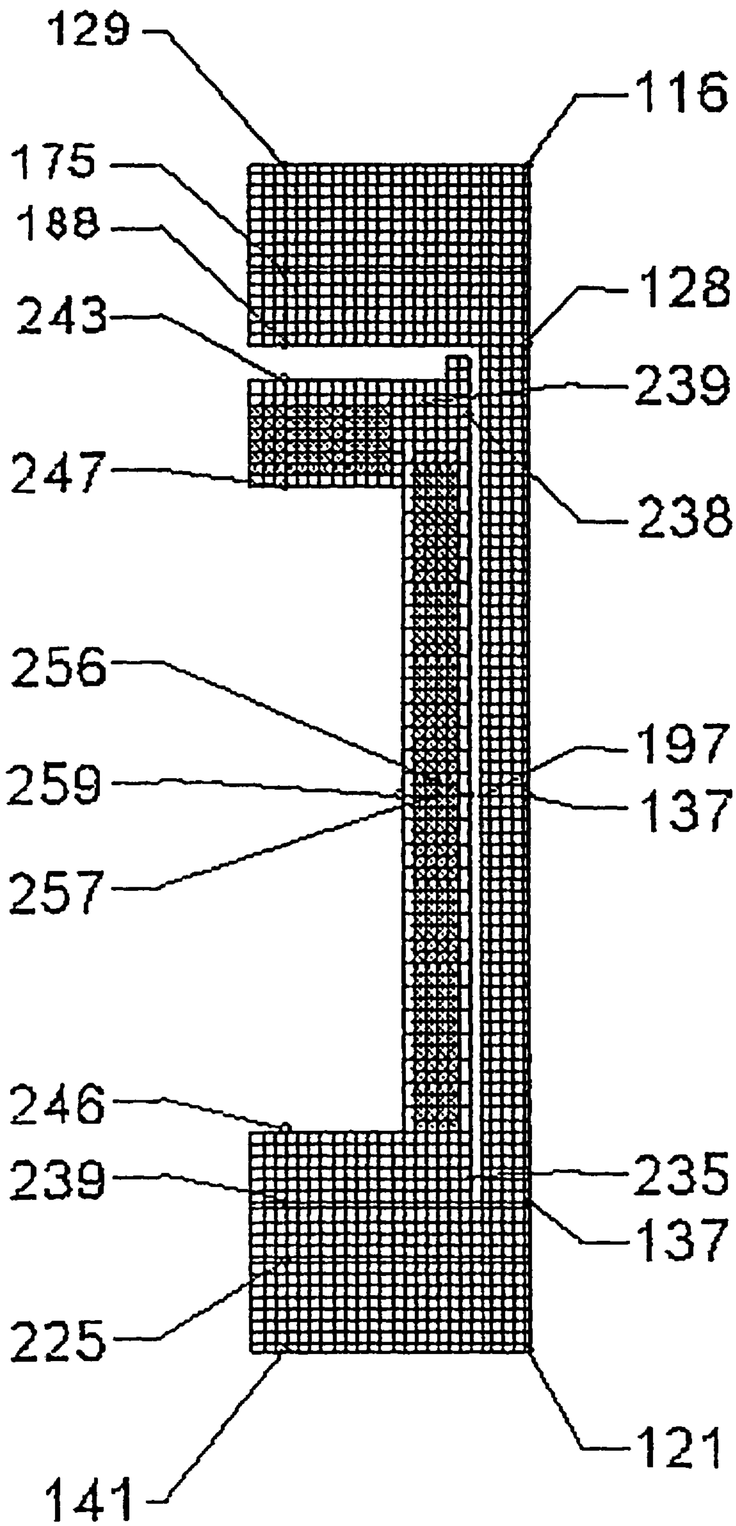


FIGURE 3.6.2.2. TEMPERATURE DISTRIBUTION, HORIZONTAL TRANSPORTATION MODE, STEADY-STATE ANALYSIS 100°F AMBIENT TEMPERATURE AND MAXIMUM DECAY HEAT

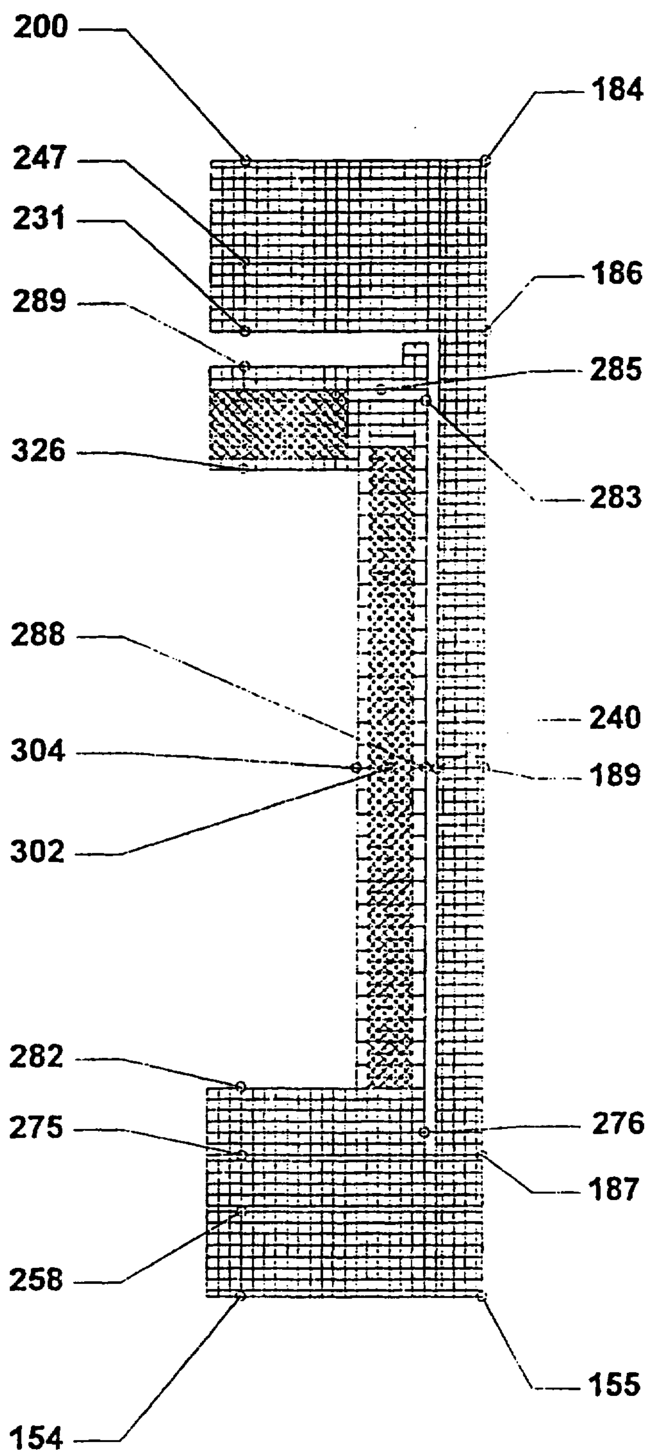


FIGURE 3.6.2.3. TEMPERATURE DISTRIBUTION, VERTICAL TRANSPORTATION MODE(1), STEADY-STATE ANALYSIS 100°F AMBIENT TEMPERATURE, MAXIMUM DECAY HEAT AND MAXIMUM INSOLATION

(1) From Figure 3.5, NEDO-32408, "Model 2000 Radioactive Material Transport Package MTR-Type Fuel Divider and Tower Shielding Reactor Fuel Basket Safety Analysis Report," Rev. 1.

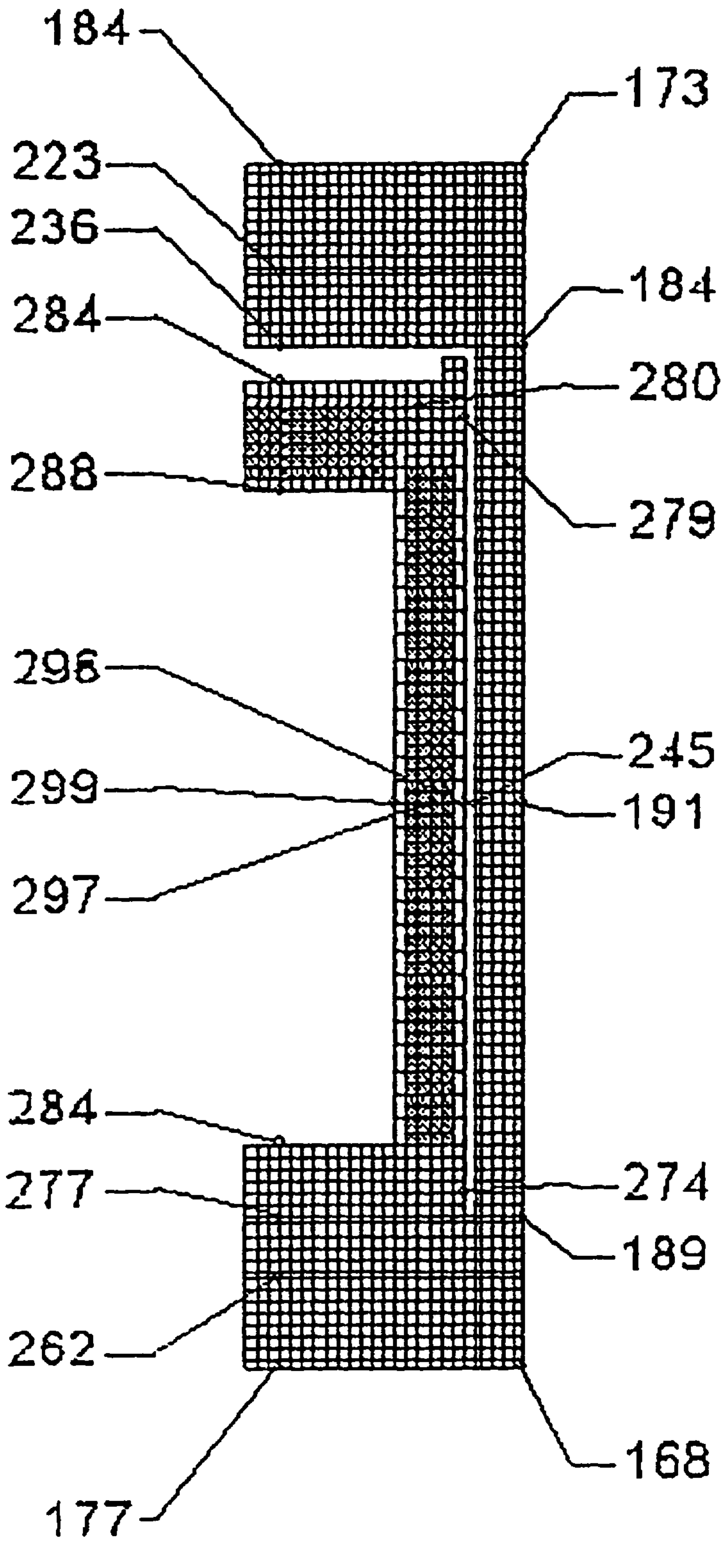


FIGURE 3.6.2.4. TEMPERATURE DISTRIBUTION, HORIZONTAL TRANSPORTATION MODE, STEADY-STATE ANALYSIS 100°F AMBIENT TEMPERATURE, MAXIMUM DECAY HEAT AND MAXIMUM INSOLATION

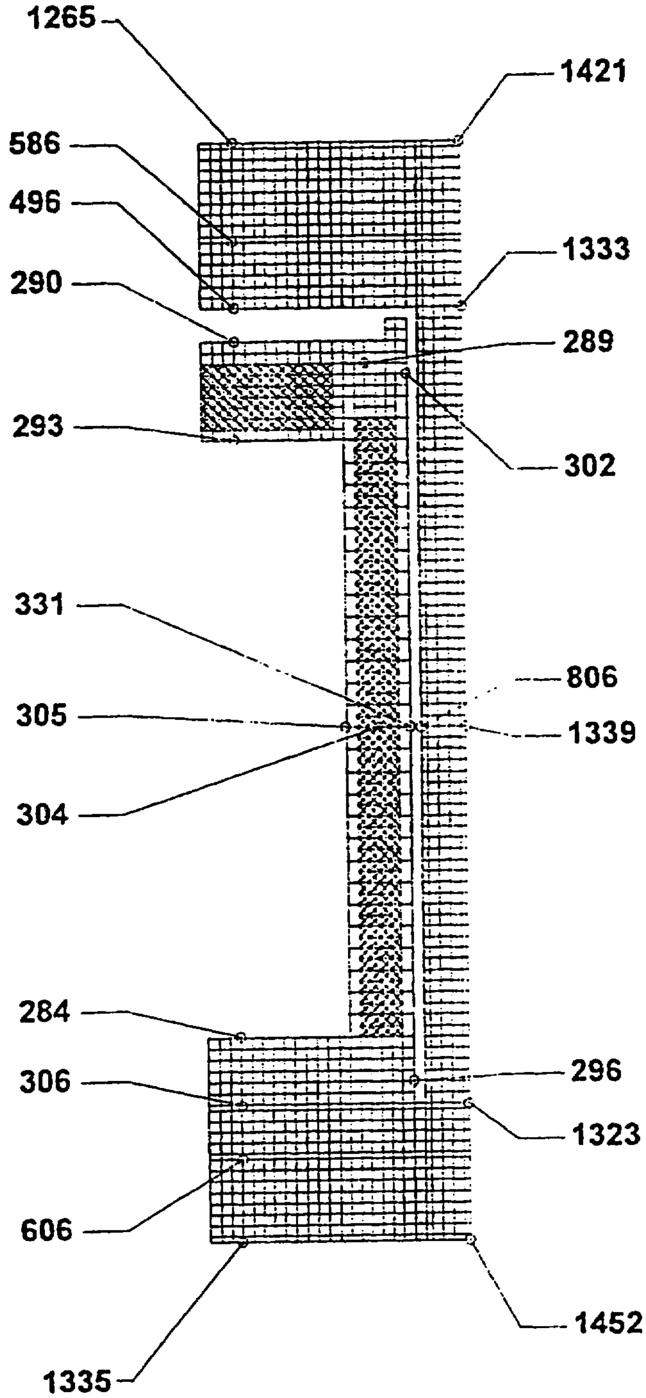


FIGURE 3.6.2.5. TEMPERATURE DISTRIBUTION, VERTICAL(1) TRANSPORTATION MODE, TRANSIENT ANALYSIS - FIRE ACCIDENT 100°F AMBIENT WITH MAXIMUM DECAY HEAT AND MAXIMUM INSOLATION, TIME: 0.5 HOUR

(1) From Figure 3.5, NEDO-32408, "Model 2000 Radioactive Material Transport Package MTR-Type Fuel Divider and Tower Shielding Reactor Fuel Basket Safety Analysis Report," Rev. 1.

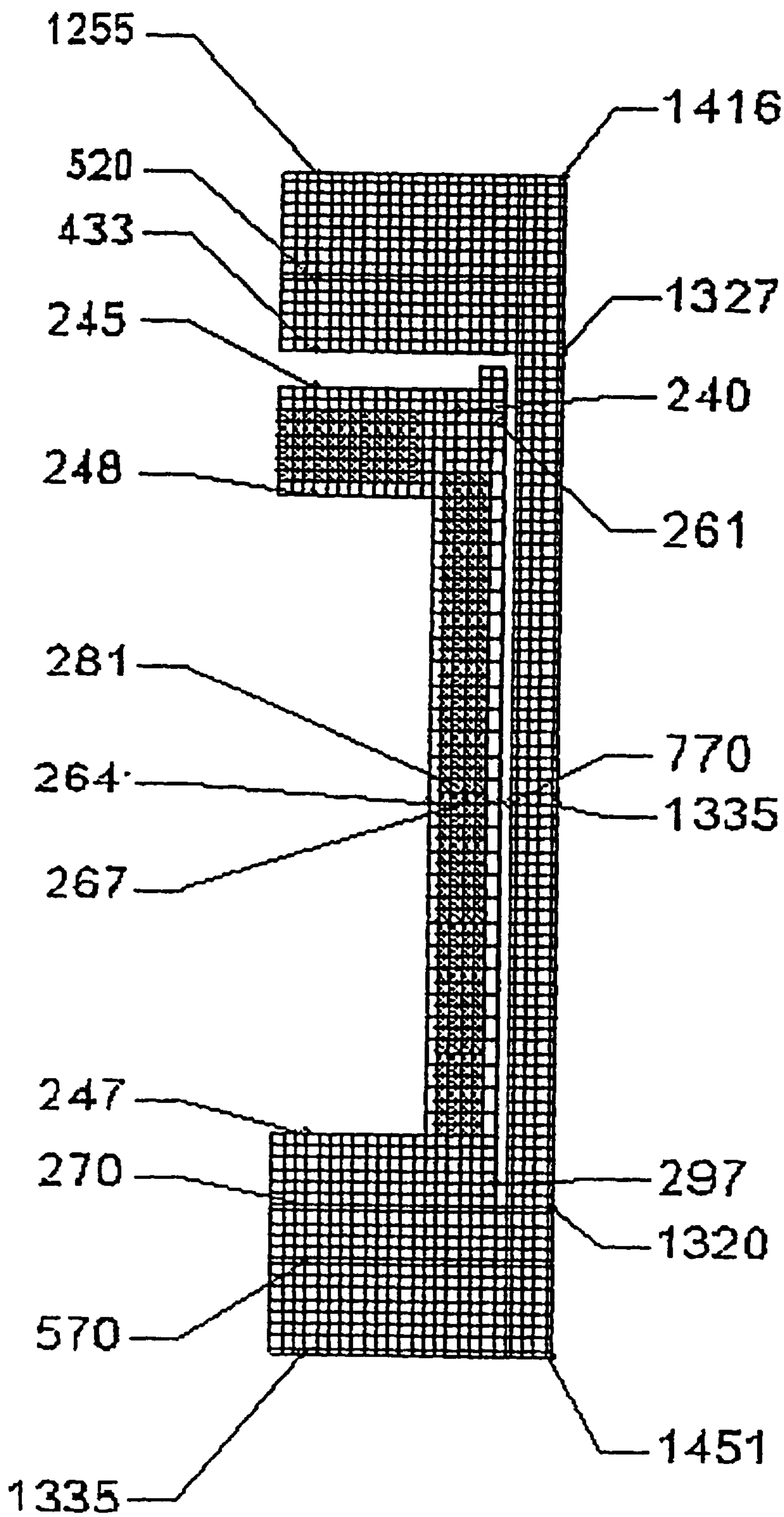


FIGURE 3.6.2.6. TEMPERATURE DISTRIBUTION, HORIZONTAL TRANSPORTATION MODE, TRANSIENT ANALYSIS - FIRE ACCIDENT 100°F AMBIENT WITH MAXIMUM DECAY HEAT AND MAXIMUM INSOLATION, TIME: 0.5 HOUR

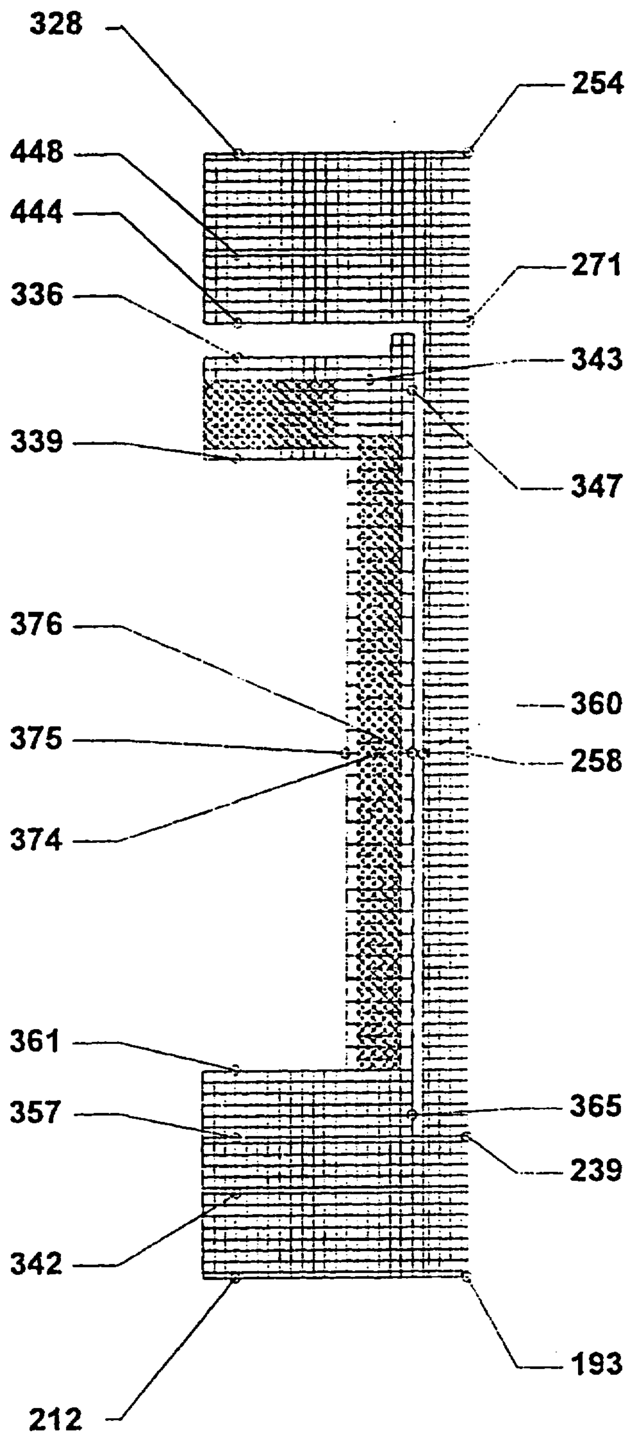


FIGURE 3.6.2.7. TEMPERATURE DISTRIBUTION, VERTICAL[1] TRANSPORTATION MODE, TRANSIENT ANALYSIS - FIRE ACCIDENT 100°F AMBIENT WITH MAXIMUM DECAY HEAT AND MAXIMUM INSOLATION, TIME: 3.0 HOURS

(1) From Figure 3.5, NEDO-32408, "Model 2000 Radioactive Material Transport Package MTR-Type Fuel Divider and Tower Shielding Reactor Fuel Basket Safety Analysis Report," Rev. 1.

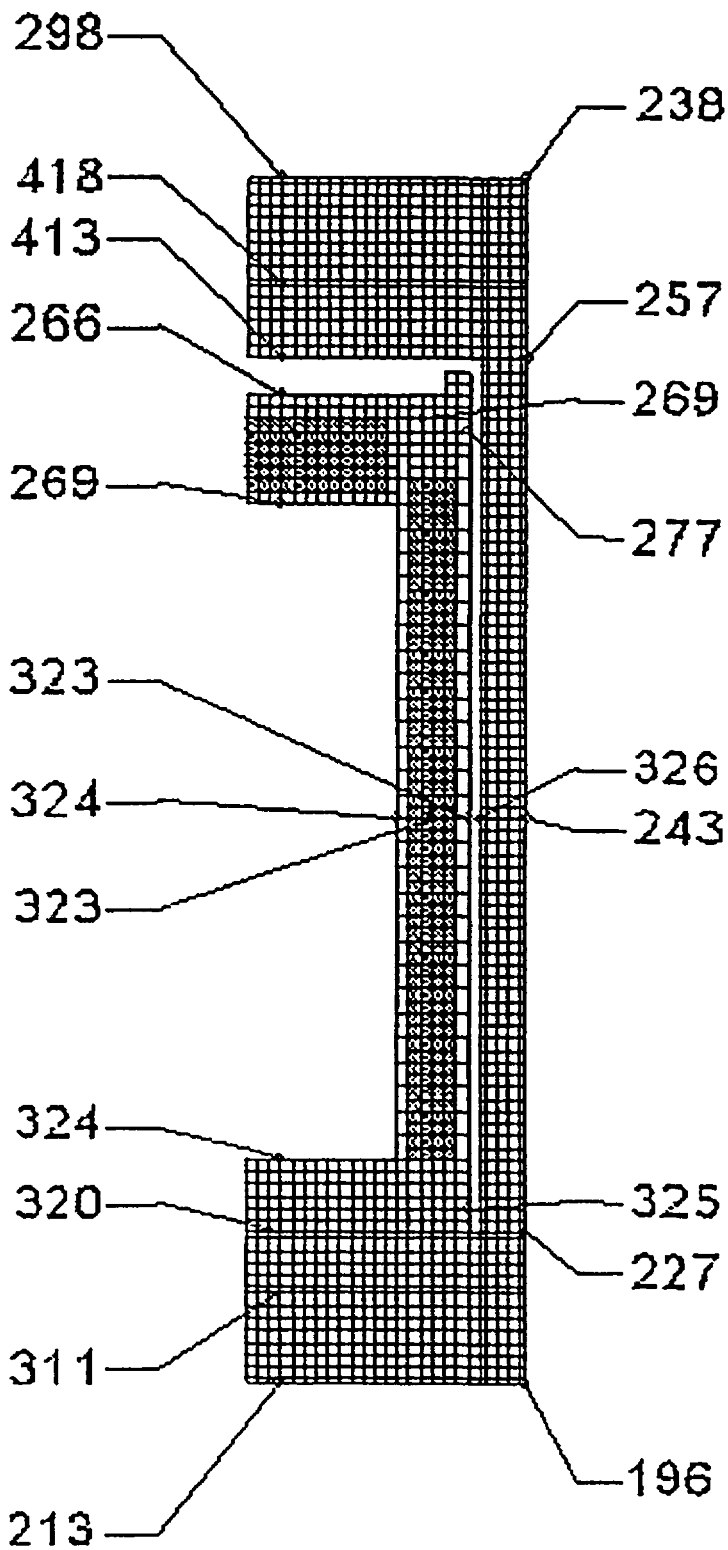


FIGURE 3.6.2.8. TEMPERATURE DISTRIBUTION, HORIZONTAL TRANSPORTATION MODE, TRANSIENT ANALYSIS - FIRE ACCIDENT 100°F AMBIENT WITH MAXIMUM DECAY HEAT AND MAXIMUM INSOLATION, TIME: 3.0 HOURS

3.7 REFERENCES

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2. Ibid, Vol. 4, p. 115.

3. Heat Transfer Data Book, D. A. Kaminski, Ed.; General Electric Company, New York, 1981, Sct. G515.29, p. 5.

4. ASME, Boiler and Pressure Vessel Code, Section III, Division I, Appendix 1, 1980.

5. Kreith, F., Principles of Heat Transfer, International Textbook Company, Pennsylvania, 2nd Ed., 1969, Table A-3.

6. Ibid, Table A-1.

7. Gebhart, B., Heat Transfer, McGraw-Hill Book Company, New York, 2nd Ed., 1971, p. 377.

8. Ibid, p. 355.

9. Ibid, p. 376.

10. Kreith, F., Principles of Heat Transfer, International Textbook Company, Pennsylvania, 2nd Ed., 1969, Table 5-2.

11. Heat Transfer Data Book, D. A. Kaminski, Ed.; General Electric Company, New York, 1981, Sct, G515.5, p. 13.

12. Gebhart, B., Heat Transfer, McGraw-Hill Book Company, New York, 2nd Ed., 1971, p. 371.

13. Kreith, F., Principles of Heat Transfer, International Textbook Company, Pennsylvania, 2nd Ed., 1969, p. 340.

14. Regulatory Guide 7.8, Load Combinations for Structural Analysis of Shipping Casks, U.S. Nuclear Regulatory Commission; May, 1977; Table 1.

15. D. R. Smith and R. H. Jones, "GE Model 1500 Shipping Package Heat Test for Thermal Benchmarking", GE Vallecitos Nuclear Center, NEDO-24899; April, 1981.

4. CONTAINMENT

The regulations require that packaging in which fissile or large quantities of radioactive materials are shipped must maintain containment of radioactive contents under the stipulated normal and accident conditions of transport. The containment boundaries and capabilities of the Model 2000 Packaging are discussed in this section.

4.1 CONTAINMENT BOUNDARY

4.1.1 Containment Vessel

Figure 4.1.1 shows the containment vessel (cask) for the Model 2000 Packaging. The cask is constructed of a steel-clad lead cylinder with a steel forging at each end. The cask lid is placed within the upper forging to protect the seal area during the accident conditions. The materials of construction of the cask meet the requirements of Federal Specification QQ-L-171e pig lead for the lead and ASTM A240 and ASTM A182 Type 304 stainless steel for the steels.

4.1.2 Containment Penetrations

The Model 2000 cask has three penetrations or ports. One port, located two inches from the bottom of the cask, serves as a drain for the cask cavity. This port is made by a series of offset 1/2-inch drilled holes through the 6-in.-thick steel forging. The second penetration is located approximately in the center of the cask lid. It is made of 3/8-inch diameter tubing spiraled through the lead and welded at both ends to the steel flanges that make up the lid. A combined use of these two ports provides means to eliminate water from the cask cavity collected during underwater operations. The third penetration or port is used to test the adequacy of the cask closure seal after each loading operation. A 1/2 NPT socket head pipe plug followed by 1-3/4-12 UNC cap close each of these penetrations. An elastomeric O-ring attached to the cap provides positive seal to these penetrations. This closure of pipe plug/cap with O-ring combination is designed for leaktightness as defined in ANSI 14.5-1977, Section 3.7. The elastomeric material is an enhanced ethylene

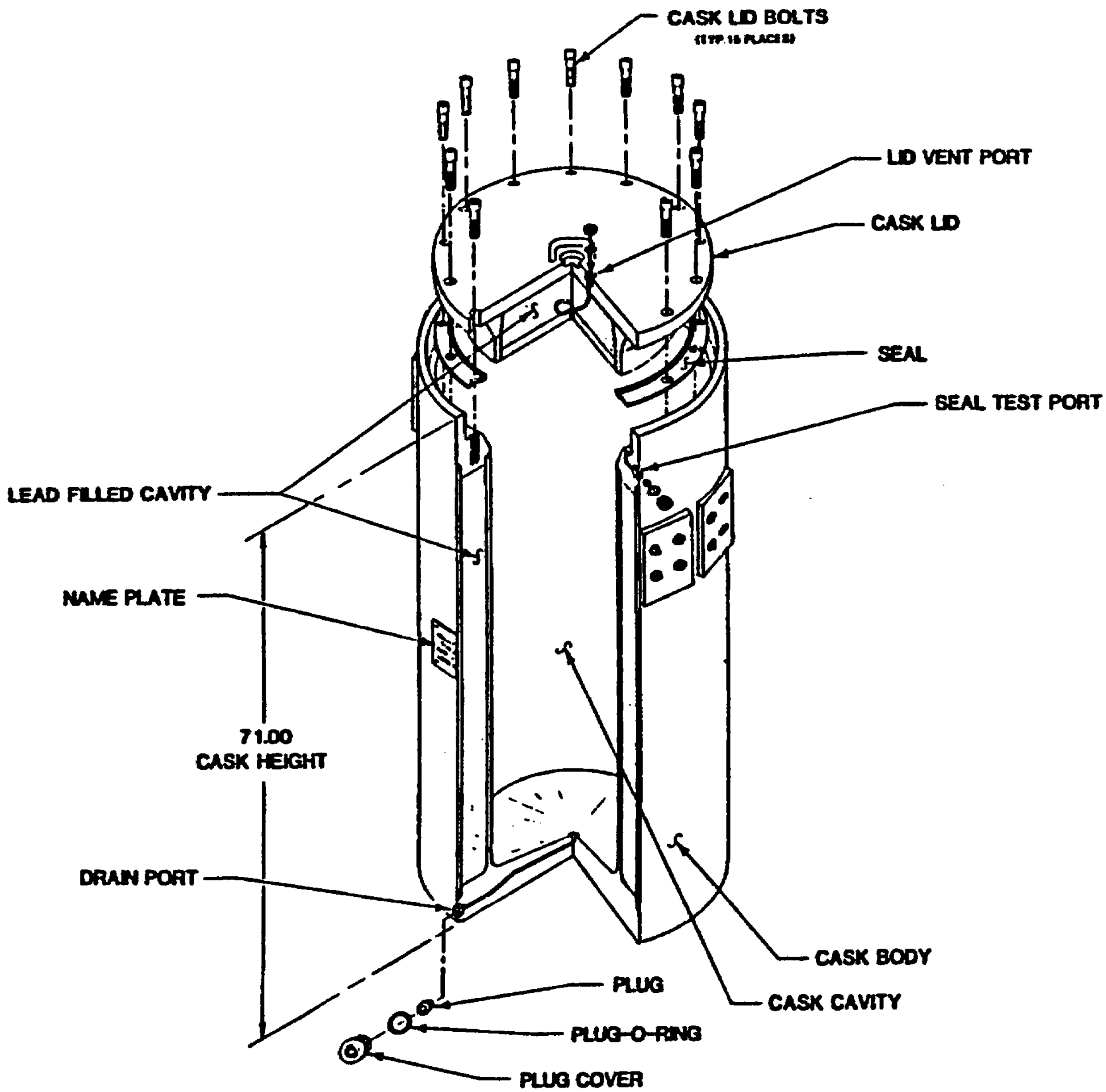


FIGURE 4.1.1. MODEL 2000 CONTAINMENT VESSEL

propylene compound for a temperature range of -70 to 400°F. A performance test of this material at -40°F and 400°F demonstrated the material capability to maintain leaktightness under these temperature conditions. A summary of test procedure and results is included in Subsection 4.4.1.

4.1.3 Seals and Welds

In addition to the elastomeric O-ring described above, the cask design includes a seal between the lid and the cask body. The cask seal is composed of four contoured elastomer cross sections bounded in a grooved metal retainer, two cross sections at each face. The elastomeric material is also an enhanced ethylene propylene material described above. The retainer ring is a 1/8-in.-thick 6066-T6 aluminum ring. Under the pressure of assembly, the elastomer cross sections deform to occupy the pre-established free volume of the groove. Tests conducted on a prototype seal demonstrated leaktightness under hot (400°F) and cold (-40°F) environments. A summary of test procedure and results is included in Subsection 4.4.1.

All cask welds are full penetration groove welds to ensure structural and containment integrity. Each weld is penetrant tested on the root and final passes. In addition, the welds are helium leak tested.

4.1.4 Closure

The cask lid connects to the cask body by fifteen 1.25-inch diameter ASTM A540, Grade B22 socket head screws. The screws are equally spaced on a 32.25-inch diameter bolt circle. The screws are tightened to 690 ft-lbs. torque each. The stress analysis of these screws is given in Section 2, Appendix 2.10.11. The maximum stress on the screws is produced by the head-on drop, and it has a magnitude of 112.0 ksi.

4.2 REQUIREMENTS FOR NORMAL CONDITIONS OF TRANSPORT

4.2.1 Containment of Radioactive Material

The Model 2000 cask containment is designed so that no release of radioactive materials will occur under the conditions of normal transport, nor will there be any significant increase in external radiation or reduction in package effectiveness. This conclusion is supported by the analyses in Chapters 2 and 3 and the various component qualification tests.

4.2.2 Pressurization of Containment Vessel

The cask will withstand pressures and temperatures in excess of those encountered in normal transport. The maximum normal operating pressure encountered in normal transport is 19 psia. This pressure corresponds to the maximum temperature of 220°F given in Chapter 3. This pressure value is based on air at 100% relative humidity occupying the entire cavity volume. The structural evaluation given in Chapter 2 shows low stress values throughout the cask structure, especially in the seal area under normal conditions of transport. In addition, the maximum temperatures are below the operational limits of 400°F for the seal material so this poses no threat to containment integrity.

4.2.3 Containment Criterion

The Model 2000 Transport Package is designed, and is verified by leaktesting, to meet the "leaktight" criteria established in ANSI N14.5-1977.

4.3 CONTAINMENT REQUIREMENTS FOR THE HYPOTHETICAL ACCIDENT CONDITIONS

Under accidental conditions, the temperature within the cask cavity is 294°F with a corresponding pressure of 21 psia. As before, this pressure is based on 100% relative humidity air occupying the entire cavity volume. This pressure does not exceed the design pressure of 30 psia for which the cask structure is analyzed. Temperatures at the seal region and penetration or port areas are below the 400°F withstood by the elastomeric material during the prototype testing. Table 4.3.1 gives a summary of the maximum temperatures obtained during the fire transient from 0.5 hours to 3.0 hours at 0.5-hour intervals on the seal and port regions. Figure 4.3.1 shows the

temperature versus time for the seal area region. The analytical evaluations under accident conditions presented in Chapter 2 show that the stresses throughout the cask structure are below the failure criteria for the material. This is also demonstrated by the results of the 1/4-scale model drop test presented in Subsection 2.10.5. During the test, the cask structure did not suffer any measurable deformation on its entire surface, despite the fact it was dropped three times.

TABLE 4.3.1. SUMMARY OF TEMPERATURES DURING FIRE TRANSIENT AT CASK CAVITY, SEAL AND PORT AREAS

LOCATION	TEMPERATURES (°F)					
	t=0.5 hrs.	t=1.0 hrs.	t=1.5 hrs.	t=2.0 hrs.	t=2.5 hrs.	t=3.0 hrs.
Cask Cavity	225	231	256	274	287	294
Cask Seal Area	219	242	259	268	273	276
Cask Test Port	270	270	277	281	283	284
Cask Drain Port	350	349	336	324	316	309
Cask Vent Port	217	219	223	230	238	244

4.3.1 Fission Gas Products

The Model 2000 Transport Package is used to ship various types of contents (e.g., hot cell waste, irradiated UO_2 fuel rods, irradiated reactor hardware, etc.). The decay heat of the contents shall not exceed 600 watts. For the purpose of the shielding evaluation given in Chapter 5, an irradiated fuel source which had cooled to approximately 600 watts (beta and gamma decay heat) is used. The fission gases inventory within the source is as follows:

Kr, 12.09 gm
Xe, 157.30 gm
I, 7.33 gm

If these gases could be released in the cask under the hypothetical accident conditions, the resulting pressure from these gases and the air at 100%

relative humidity would be 25.3 psia at a temperature of 300°F. This pressure is below the 30 psia pressure for which the cask has been analyzed.

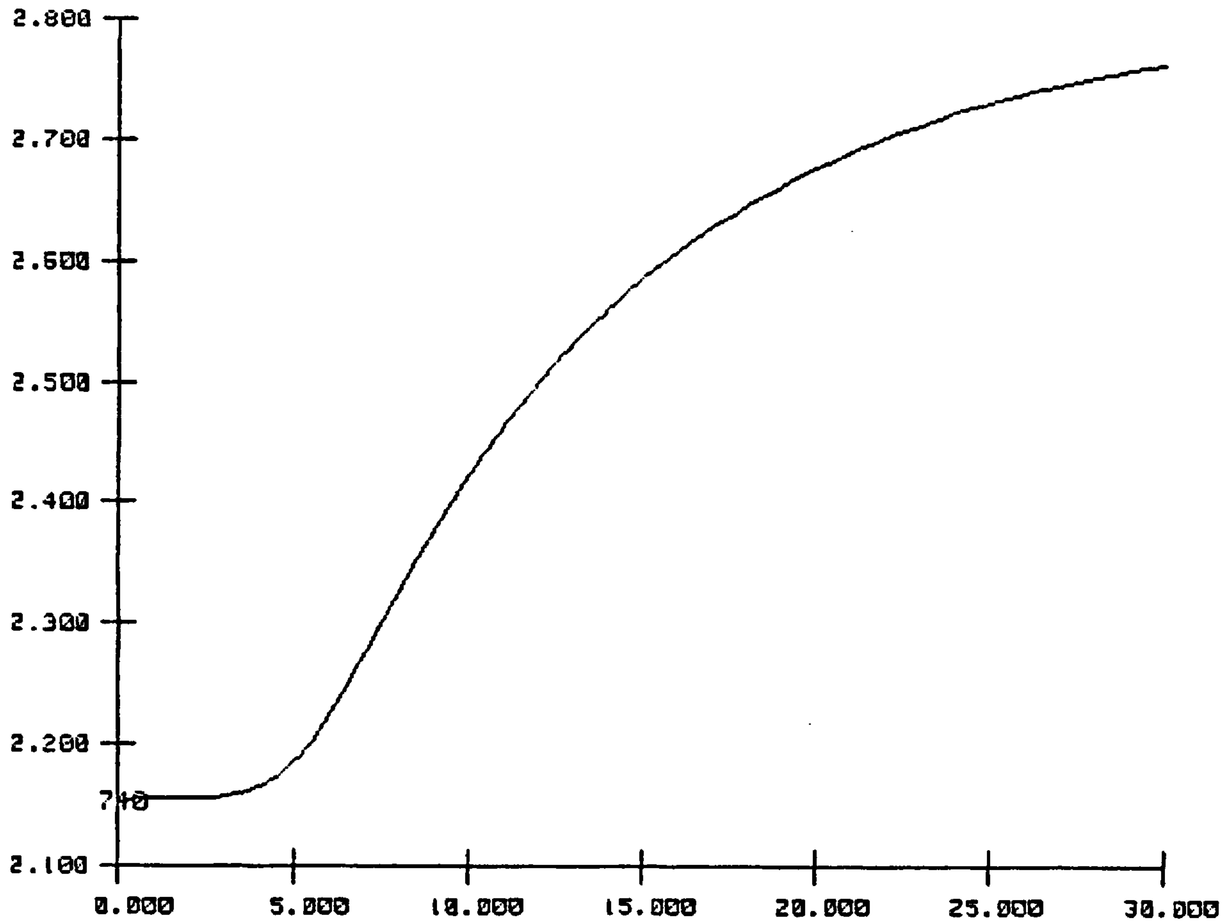


FIGURE 4.3.1. TEMPERATURE PROFILE SEAL REGION DURING FIRE CONDITION

4.3.2 Containment of Radioactive Material

The results of the structural and thermal analyses performed in Chapters 2 and 3, respectively, and the 1/4-scale model test results presented in Subsection 2.7.5 verify that the package is capable of withstanding the accident conditions without the release of radioactive materials.

4.3.3 Containment Criteria

The Model 2000 Transport Package is designed, and is verified by leak testing, to meet the "leaktight" criteria established in ANSI N14.5-1977.

4.4 APPENDIX

4.4.1 Prototype Seal Leaktight Testing

4.4.1.1 Scope

This section covers the testing and evaluation of the cask lid seal to be used in the Model 2000 transport packaging. Included is a description of the seal, a brief discussion of the containment criteria, a summary of the test plan and procedures, the results of the tests, and a discussion of these results. The test plan and procedures are given in detail in the original test specification (see Paragraph 4.4.1.3, Item 3).

4.4.1.2 Introduction

The purpose of the test was to demonstrate the capacity of the seal to maintain leaktightness under the normal and accident conditions of transport. Leaktightness is defined in ANSI 14.5 (Reference 1) as a leak rate of 10^{-7} atm cm^3/sec or less, based on dry air at 25°C for a pressure differential of 1 atm against a vacuum of 10^{-2} atm across the seal. Additionally, the test provides documentation to satisfy the applicable standards and quality assurance programs. These are listed in Paragraph 4.4.1.3 along with other specifications and documents pertaining to this report.

The seal used in the testing is a Parker Cask-O-Seal made of an ethylene propylene compound. This prototype seal is a scaled-down version of the actual cask seal which also will be an ethylene propylene Parker Gask-O-Seal or an equivalent seal. An equivalent seal is defined as a seal made of basic

ethylene propylene compound capable of withstanding the acceptance testing given in Chapter 8, Subsection 8.1.4.2. When the seal joint is scaled, two factors are considered: flange stiffness, and force per inch on the gasket. The force per inch will be the same for the cask as for the prototype seal. The flange stiffness, which determines the deflection between bolts, is also similar for the two configurations. Since the cask flanges are used for structural support, they are much stiffer than is required for sealing. Because of this, in scaling, the stiffness is not as important as the gasket loading force. The seal configurations for the prototype and cask are shown in Figure 4.4.1.1.

The test conditions are chosen to simulate the conditions of transport. Since the structural integrity of the seal area is demonstrated in the structural analysis of the cask, the primary parameters of concern are temperature and pressure. The maximum pressure differential across the seal is found to be 15 psi. This is based on results from the thermal analysis of the cask. The temperature range for the test is based on the temperature extremes that would occur in the cask seal area. These are found to be -40°F and 400°F. The low value would occur during the cold temperature condition and the high value during the thermal fire transient condition.

The leak testing is conducted by first assembling the seal between two flanges and placing the assembly in the temperature environment desired. Helium is then supplied to one side of the seal while a vacuum is drawn on the other. The vacuum is created by the vacuum system on the Helium Mass Spectrometer Leak Detector (MSLD) which, when properly calibrated, measures the leak rate of helium through the seal.

There are three basic test setups. These can be characterized by the range of temperatures covered and are referred to as the high, low, and ambient temperature tests. Schematics of each setup are shown in Figure 4.4.1.2. A new seal is used in each of these tests. This is done to eliminate the effects of the helium that is absorbed in the seal material after it has been tested.

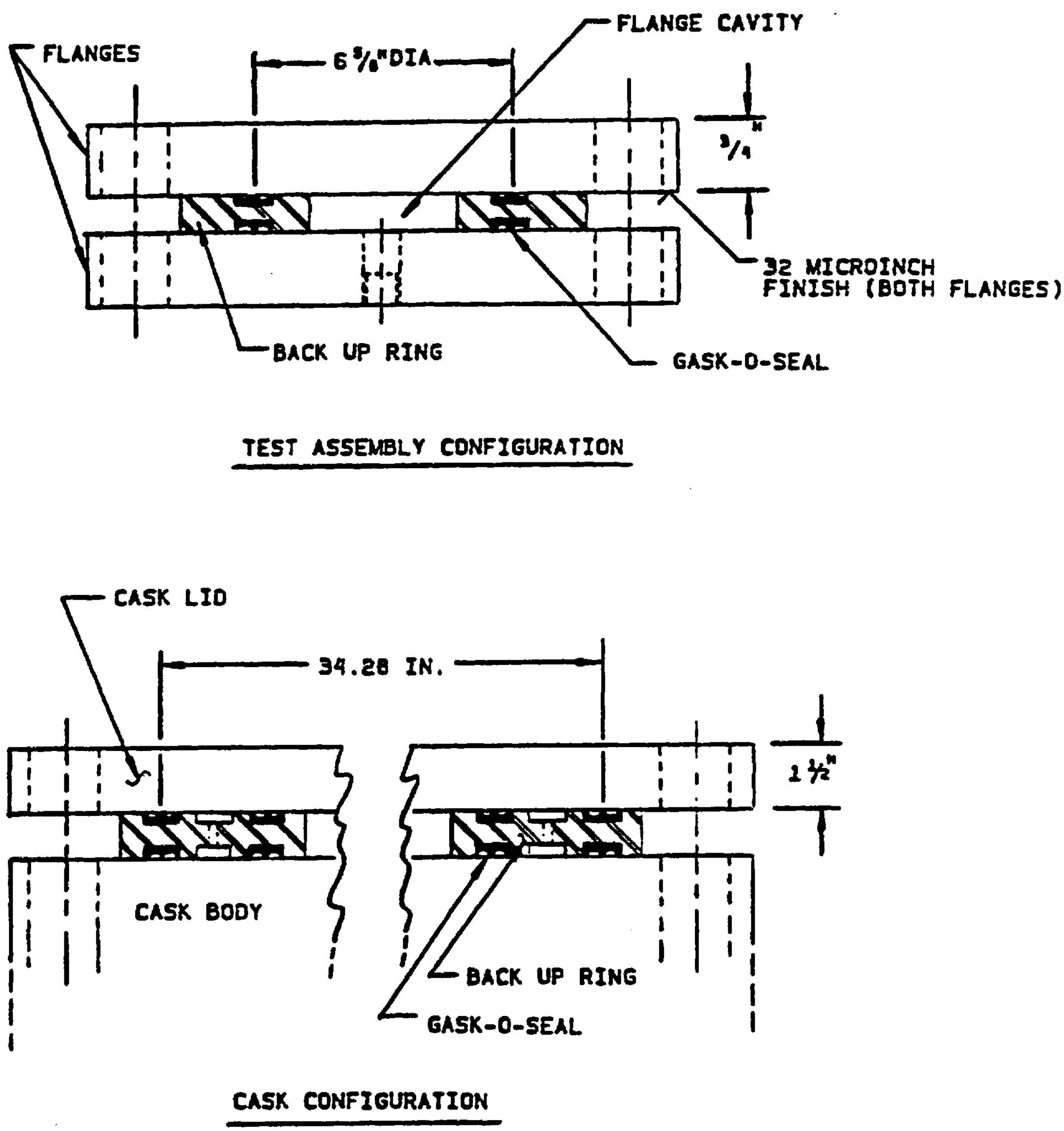
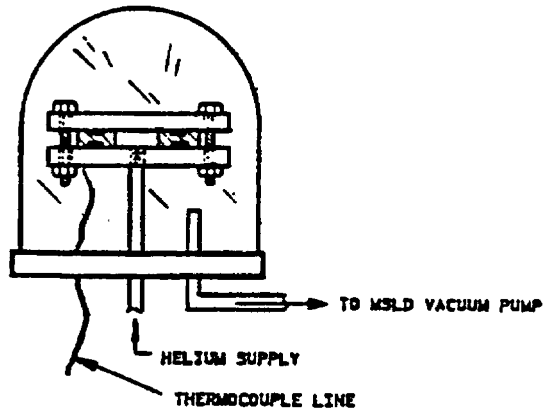


FIGURE 4.4.1.1. SEAL AREA CONFIGURATION

AMBIENT CONDITIONS

TEMP: 77°F (±5°F)

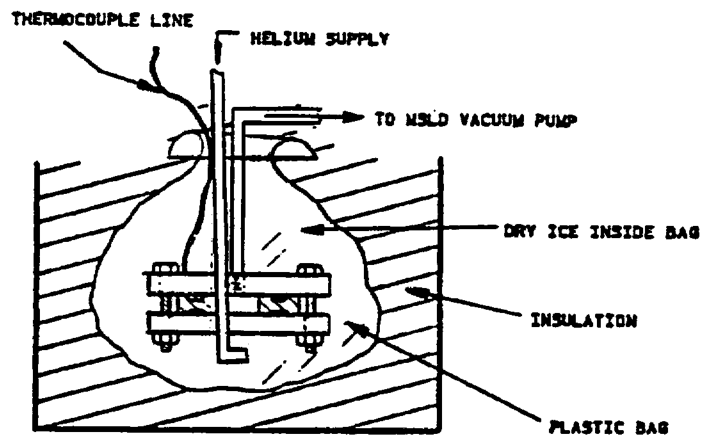
PRESSURE: 30.PSI (±1.PSI)
ACROSS SEAL



LOW TEMP CONDITIONS

TEMP: 77°F—-60°F

PRESSURE: 15.PSI (±1.PSI)
ACROSS SEAL



HIGH TEMP.CONDITIONS

TEMP: 400°F (+20,-0°F)

PRESSURE: 15.PSI (±1.PSI)
ACROSS SEAL

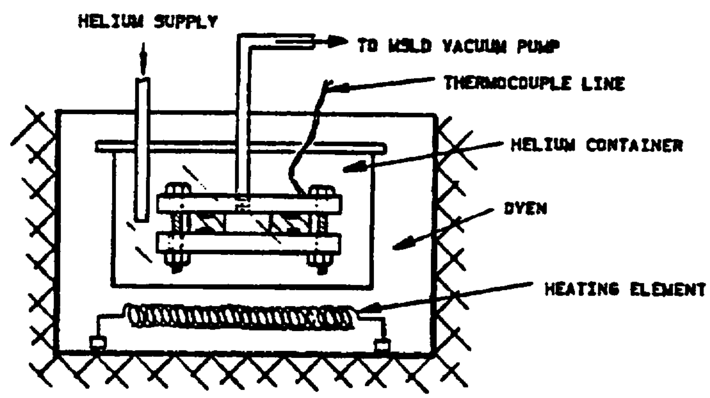


FIGURE 4.4.1.2. SEAL TEST SETUP SCHEMATICS

4.4.1.3 Applicable Documents

1. Quality Assurance Program for Shipping Packages for Radioactive Material, QAP-1, GE Vallecitos Nuclear Center, 1982.

2. American National Standard for Leakage Tests on Packages for Shipment of Radioactive Materials, ANSI N14.5-1977.

3. "Design Qualification of Gore-Tex Joint Sealant and Parker Gask-O-Seal As A Leaktight Seal", General Electric, Vallecitos Nuclear Center, Specification Number 22A9342.

4. Code of Federal Regulations, Title 10, Part 71; 1983.

5. RP&S Standard Operating Procedure, Chapter VII, Section BB, "Mass Spectrometer Leak Detector", or Quality Assurance Instruction 2025, "Helium Leak Detecting and Maintenance of Equipment".

4.4.1.4 Test Procedures

The ambient temperature testing is conducted with the flange and seal assembly in a vacuum bell jar. The helium is supplied to the flange cavity while the mass spectrometer leak detector (MSLD) draws a vacuum around the outside of the flange. The leak rate is then recorded at intervals until a steady-state value is approached.

To obtain the required conditions for the low temperature testing, the flange assembly, with a new seal, is packed in dry ice. The MSLD vacuum line is connected to the flange cavity.

The flange assembly is then placed in a plastic bag with a helium line in such a way that the helium flows under the flange. This method assures that, as long as the helium is left flowing, the seal area will be thoroughly surrounded with helium. The temperature is monitored with a thermocouple which is fastened to the flange body in such a manner that there is good metal-to-metal contact. The thermocouple line and immediate area of contact are also insulated from the dry ice to prevent inaccurate readings. Once the temperature drops to -40°, the plastic bag is flooded with helium. Leak rate measurements are then taken and recorded every few minutes for the duration of the test.

The high temperature testing is done by placing the flange assembly in a container with the MSLD vacuum line connected to the flange cavity. The helium line is placed so the helium would flow beneath and around the flange. The thermocouple is securely attached to the flange body and the entire assembly placed in an electric furnace. Once the flange reaches the test temperature and stabilizes, the container is flooded with helium. Leak rate measurements are then taken and recorded until a steady state value is approached.

4.4.1.5 Results

A summary of the results of the seal testing is presented in Table 4.4.1.1. From this it can be seen that a leaktight seal is maintained over the entire range of test conditions. The allowable leak rates shown are the corrected values based on the leak rate criteria given in ANSI 14.5 (Reference 1). In this standard, formulas are given to make corrections for different gases and temperatures. The correction for different gases accounts for the effects of molecular weight and size on leakage, and the correction for temperature accounts for the effects of kinetic energy on leakage. In all cases, the flow is assumed to be molecular.

TABLE 4.4.1.1. SUMMARY OF LEAK RATE RESULTS

	Helium Leak Rate (cc/sec)	
Test Condition	Measured	Allowable
High Temp. (400°F)	2.75×10^{-7}	3.3×10^{-7}
Ambient Temp. (77°F)	7.3×10^{-8}	5.5×10^{-7}
Low Temp. (-40°F)	1.2×10^{-9}	2.3×10^{-7}

In the seal testing it is found that with helium as the tracer gas, there is a significant amount of permeation through the seal. Since the molecular weight of any radioactive gases that would be in the cask is much greater than that of helium, permeation would not be a problem. For this reason, the permeation of helium is not considered leakage and must be eliminated from the measurements, or accounted for, to obtain actual leak rate values. The permeation can be evaluated in two ways. The first is to take the reading

within the first five minutes after the helium has been introduced (Reference 2). By doing this, the helium is not given time to permeate through the seal material. This approach is used to obtain the leak rates shown in Table 4.4.1.1 for the ambient and high temperature conditions. The ambient temperature value is recorded five minutes after the helium is introduced and the high temperature value at 3.5 minutes. The value shown for the low temperature includes the contribution from permeation. It is found that at the low temperatures the leak rate, even with steady-state permeation, is well below the allowable limit.

The second method of accounting for the permeation is to allow it to reach a steady state condition. The theoretical permeation rate is then calculated and subtracted from the measured leak rate. This approach is used to obtain an idea of the contribution from permeation; however, due to the empirical nature of the permeation constants and its strong dependence on seal material and geometry, the calculated results could only be used qualitatively. This is also due to the limited amount of permeation data available. The data and equations used are from the Parker Gask-O-Seal handbook (Reference 3). The results of these calculations are shown in Table 4.4.1.2. In general, they indicate that permeation does account for a large percentage of the measured leakage.

TABLE 4.4.1.2. PERMEATION EFFECTS

Test Condition	Measured Steady-State He Leak Rate	Calculated Steady-State Permeation	
High Temp. (400°F)	1.9×10^{-5}	1.2×10^{-4} (at 302°F)	cc/sec
Ambient Temp. (77°F)	3.2×10^{-6}	6.9×10^{-6}	cc/sec
Low Temp. (-40°F)	1.2×10^{-9}	N/A	cc/sec

4.4.1.6 Low Temperature Test Results

The results of the low temperature testing are plotted in Figure 4.4.1.3. It can be seen that the leak rate decreases with decreasing temperature. If the helium is leaking, it would be expected that the leak rate would increase as the temperature decreases. This is due to the seal material having a higher coefficient of thermal expansion than the flange material, which would increase the size of any leak paths as the temperature is reduced. If the leak rate readings are due to permeation, it would be expected to decrease as the temperature is reduced. This would be expected because permeation is a diffusion process. The rate of this process is proportional to the energy of the molecules involved, which is proportional to the temperature. This can be seen in the graphs of leak rate vs. temperature for diffusion processes in the Parker Gask-O-Seal handbook (Reference 3). Since the measured leak rate did decrease with decreasing temperature, it can be concluded that the primary mode of helium transfer across the seal is permeation. It also should be pointed out that the leak rate values obtained at the low temperatures are near the limits of sensitivity for MSLD's. Based on these arguments, it would appear that there is negligible, if not zero, leakage for this seal design at these temperatures.

4.4.1.7 Ambient Temperature Test Results

The results of the ambient temperature testing also indicate that permeation is the primary mode of transfer. The plot of leak rate against time (Figure 4.4.1.4) can be seen to climb rapidly at first and then level off to some steady state value. This value includes the effects of permeation and leakage.

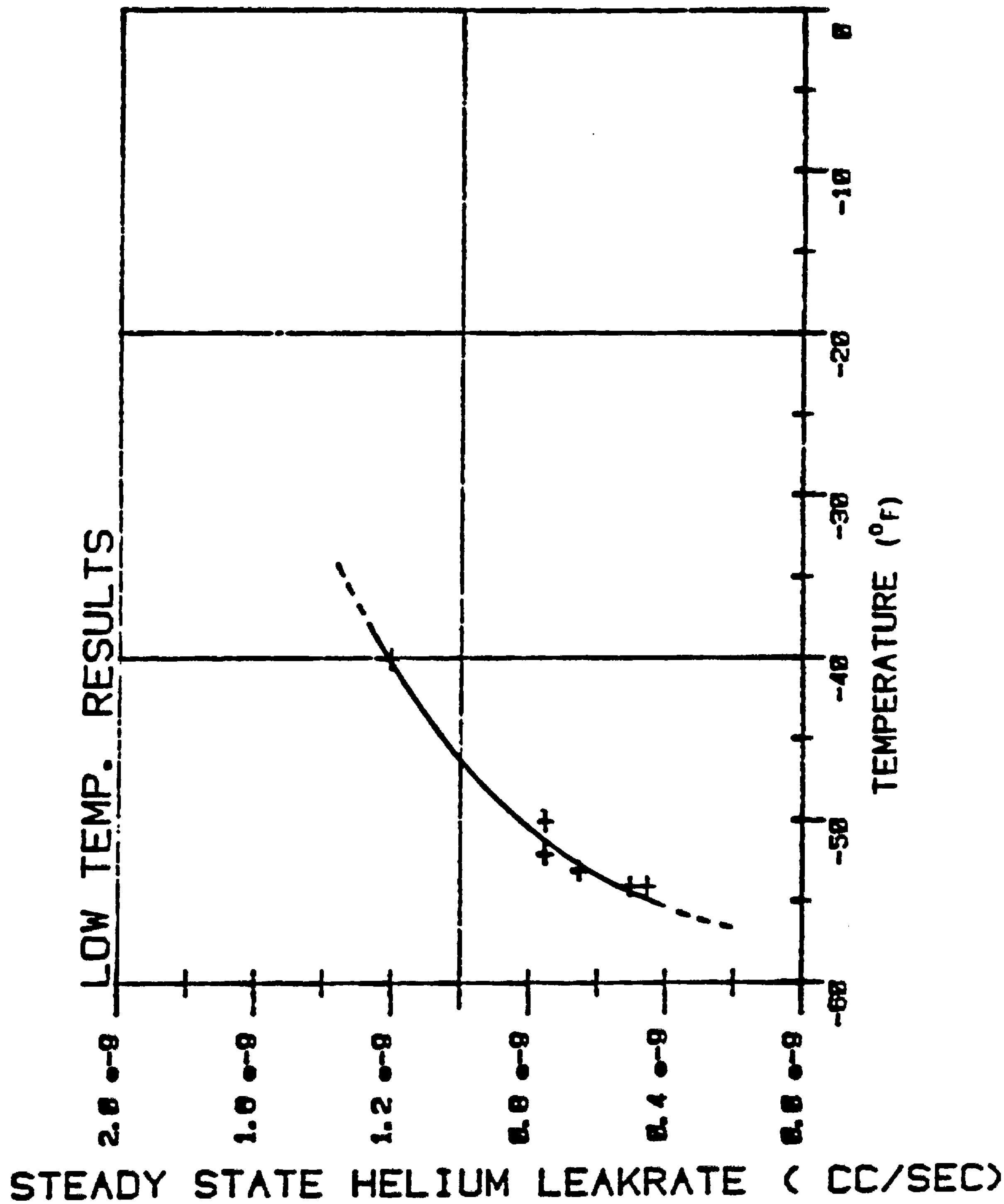


FIGURE 4.4.1.3. LOW TEMPERATURE SEAL TEST RESULTS

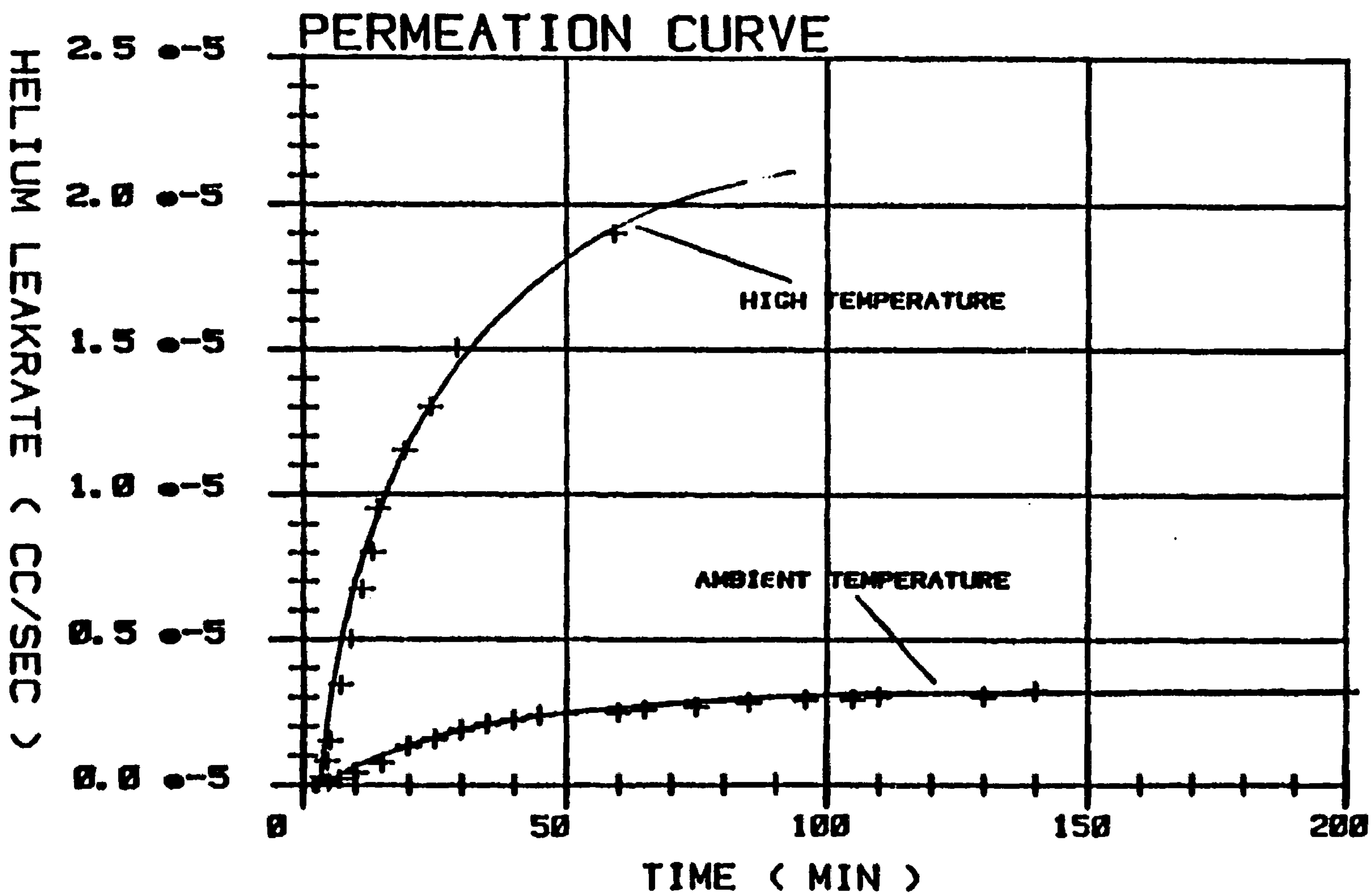


FIGURE 4.4.1.4. AMBIENT AND HIGH TEMPERATURE SEAL TEST RESULTS

During the testing, it is found that when the leak rate is measured before the seal had been exposed to any helium, there is a significant amount of helium outgassing from the seal material. This is from absorbed atmospheric helium. When this is compared to the measurements taken in the first few minutes after the helium is introduced, it is found that the outgassing accounts for most of the initial readings. This low initial leak rate measurement, along with the steady-state value being below the calculated permeation rate, indicates that permeation is again the primary mode of transfer through the seal. The value given in Table 4.4.1.1 is the actual recorded leak rate and includes the contribution from outgassing.

4.4.1.8 High Temperature Test Results

The plot in Figure 4.4.1.4 of leak rate against time for the high temperature test again shows that permeation is the primary mode of transfer. The rate of increase is much greater than for the ambient case as would be expected given the temperature dependence of the permeation process. In this test, also, the leak rate due to outgassing is determined. When compared to the leak rate measured immediately after the introduction of helium, it shows that the actual leakage is very low, though not as low as in the other tests.

4.4.1.9 Conclusions

Based on the results of these tests and the considerations of outgassing from the seal material and permeation of helium through the seal material, it is seen that the seal design is quite capable of maintaining a leaktight seal throughout the range of conditions that the seal would see in service.

4.4.1.10 References

1. American National Standard for Leakage Tests on Packages for Shipment of Radioactive Materials, ANSI N14.5-1977.

2. Leakage Testing Handbook, N69-38843, Contract NAS 7-396, S-69-1117; Schenectady, NY; General Electric Company; July, 1969; Section 6.

3. Gask-O-Seal Handbook G5411, Parker Seal Company, 1963, Section II.

4.4.2 Containment for Failed Fuel

The Model 2000 Transport Package is designed and verified by analysis and testing to meet the "leaktight" criteria established in ANSI N14.5. Supporting evidences are given in Chapters 2, 3 and 4 of this Safety Analysis Report. The structural, thermal, and containment evaluations as well as the test data presented in these Chapters demonstrate the capability of the package to prevent the release of radioactive materials under normal and accidental conditions of transport. Therefore the shipment of failed fuel does not present a threat to the general public.