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7. Abstract <i>V. Burkland 10/19/94</i> This document provides the structural analysis (static and thermal loads) of the 241SY101 tank to determine the maximum allowable temperature and rate of heating that could be applied to tank 241SY101 through annulus air heating without detrimental effects to the structural integrity of the concrete and steel liner of the tank.		
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INDEPENDENT REVIEW

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ANNULUS HEAT-UP

Authors T. N. Watts & A. Farahyar Report No. WHC-SD-WM-TI-633 EDT No. 608353
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The subject document has been reviewed by the undersigned. The reviewer reviewed and verified the following items as applicable [EP.4.1].

- Engineering Specification
- Design Input
- Basic Assumption
- Approach/Design Methodology
- Related Information
- Conclusion/Result Interpretation

L. J. Julyk

Reviewer

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CHECKLIST FOR INDEPENDENT REVIEW

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ANNULUS HEAT-UP

Authors T. N. Watts & A. Farahyar (Advent Engineering Services)

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☒	☐	☐	Problem completely defined.
☒	☐	☐	Necessary assumptions explicitly stated and supported.
☒	☐	☐	Computer codes and data files documented.
☒	☐	☐	Data used in calculations explicitly stated in document.
☒	☐	☐	Data checked for consistency with original source information as applicable.
☒	☐	☐	Mathematical derivations checked including dimensional consistency of results.
☒	☐	☐	Models appropriate and used within range of validity or use outside range of established validity justified.
☒	☐	☐	Hand calculations checked for errors.
☒	☐	☐	Code run streams correct and consistent with analysis documentation.
☒	☐	☐	Code output consistent with input and with results reported in analysis documentation.
☒	☐	☐	Acceptability limits on analytical results applicable and supported. Limits checked against sources.
☒	☐	☐	Safety margins consistent with good engineering practices.
☒	☐	☐	Conclusions consistent with analytical results and applicable limits.
☒	☐	☐	Results and conclusions address all points required in the problem statement.

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Neal Watts/Ayoub Farahyar

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ANALYST (PRINTED NAME)

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K. V. Scott

ANALYST'S MANAGER

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Keywords: PREP7; KAN,0; ET,1; ET,2; R; EX; DENS; N; FILL; NGEN; TYPE; REAL; E;
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CONTENTS

	<u>Page</u>
1.0 INTRODUCTION	1-1
2.0 PURPOSE AND SCOPE	2-1
2.1 PURPOSE	2-1
2.2 SCOPE OF THE ANALYSES	2-1
3.0 CONCLUSIONS AND DISCUSSION	3-1
4.0 ANALYTICAL MODELS	4-1
4.1 ABAQUS MODEL DESCRIPTION	4-1
4.1.1 Reinforced Concrete	4-1
4.1.2 Refractory Concrete	4-2
4.1.3 Steel Liners	4-2
4.1.4 Interfaces	4-2
4.1.5 Boundary Conditions	4-4
4.1.6 Model Material Properties	4-4
4.1.6.1 Steel	4-4
4.1.6.2 Concrete	4-4
4.1.7 Numerical Characterization of Reinforced Concrete	4-5
4.2 ANSYS MODEL DESCRIPTION	4-7
5.0 STRUCTURAL ANALYSIS AND CALCULATIONS	5-1
5.1 LOAD DESCRIPTION	5-1
5.1.1 Static Loads	5-1
5.1.1.1 Structural Component Body Forces	5-1
5.1.1.2 Soil Overburden	5-1
5.1.1.3 Lateral Soil Pressure	5-1
5.1.1.4 Waste Material Hydrostatic Pressure	5-1
5.1.2 Temperature Time Histories	5-2
5.2 SOLUTION PROCEDURES (ABAQUS)	5-2
5.3 STRUCTURAL RESPONSE (ABAQUS)	5-3
5.4 CRITERIA AND ALLOWABLES	5-4
5.5 STRUCTURAL INTEGRITY EVALUATION	5-5
5.5.1 Structural Integrity Evaluation Under Static Loads	5-6
5.5.2 Structural Integrity Evaluation Under Superimposed Thermal Loads	5-6
5.5.2.1 Liner	5-6
5.5.2.2 Studs	5-7
5.5.2.3 Reinforcement Steel Rebar.	5-8
5.6 SUMMARY OF ANALYSIS RESULTS	5-9
6.0 REFERENCES	6-1
APPENDIX A - ABAQUS COMPUTER INPUT AND OUTPUT FILES	
APPENDIX B - ANSYS COMPUTER INPUT AND OUTPUT FILES	

LIST OF FIGURES

<u>Figure</u>	<u>Page</u>
Figure 4.1-1. ABAQUS Over-all Finite Element Model	4-9
Figure 4.1-2. Element Numbering of the Dome Region, Detail A	4-10
Figure 4.1-3. Element Numbering of the Haunch Region, Detail B	4-11
Figure 4.1-4. Element Numbering of the Mid-wall Region, Detail C	4-12
Figure 4.1-5. Element Numbering of the Bottom Corner Region, Detail D	4-13
Figure 4.1-6. Global Illustration of Tank Rebar	4-14
Figure 4.1-7. Modeling of the Foundation and Bottom Corner Region	4-15
Figure 4.1-8. Axial Load-Displacement Curves for Embedded Nelson Studs	4-16
Figure 4.1-9. Shear Load-Displacement Curve for Embedded Nelson Studs	4-17
Figure 4.2-1. ANSYS Over-all Finite Element Model	4-18
Figure 4.2-2. ANSYS Model in Region of Lowest Stud	4-19
Figure 5.1-1. Lower Knuckle Region Temperature Time History for 200°F Inlet Air Temperature Condition	5-12
Figure 5.1-2. Lower Knuckle Region Temperature Time History for 140°F Inlet Air Temperature Condition	5-13
Figure 5.3-1. Deformed Shape for Static Loads - Tank	5-14
Figure 5.3-2. Deformed Shape for Static Loads - Liners	5-15
Figure 5.3-3. Deformed Shape for Combined Static and Thermal Loads - Tank (200 °F Annulus Air @ 3750 Hours)	5-16
Figure 5.3-4. Deformed Shape for Combined Static and Thermal Loads - Liners (200 °F Annulus Air @ 3750 Hours)	5-17
Figure 5.3-5. Smallest Principal Stress for Static Loads - Liners (Membrane + Bending @ Integration Point 1)	5-18
Figure 5.3-6. Smallest Principal Stress for Static Loads - Liners (Membrane + Bending @ Integration Point 3)	5-19
Figure 5.3-7. Intermediate Principal Stress for Static Loads - Liners (Membrane + Bending @ Integration Point 1)	5-20
Figure 5.3-8. Intermediate Principal Stress for Static Loads - Liners (Membrane + Bending @ Integration Point 3)	5-21

Figure 5.3-9.	Largest Principal Stress for Static Loads - Liners (Membrane + Bending @ Integration Point 1)	5-22
Figure 5.3-10.	Largest Principal Stress for Static Loads - Liners (Membrane + Bending @ Integration Point 3)	5-23
Figure 5.3-11.	Tresca Stress for Static Loads - Liners (Membrane + Bending @ Integration Point 1)	5-24
Figure 5.3-12.	Tresca Stress for Static Loads - Liners (Membrane + Bending @ Integration Point 3)	5-25
Figure 5.3-13.	Smallest Principal Stress for Combined Static and Thermal Loads for Liners (Membrane + Bending @ Integration Point 1)	5-26
Figure 5.3-14.	Smallest Principal Stress for Combined Static and Thermal Loads for Liners (Membrane + Bending @ Integration Point 3)	5-27
Figure 5.3-15.	Intermediate Prin. Stress for Combined Static and Thermal Loads for Liners (Membrane + Bending @ Integration Point 1)	5-28
Figure 5.3-16.	Intermediate Prin. Stress for Combined Static and Thermal Loads for Liners (Membrane + Bending @ Integration Point 3)	5-29
Figure 5.3-17.	Largest Principal Stress for Combined Static and Thermal Loads for Liners (Membrane + Bending @ Integration Point 1)	5-30
Figure 5.3-18.	Largest Principal Stress for Combined Static and Thermal Loads for Liners (Membrane + Bending @ Integration Point 3)	5-31
Figure 5.3-19.	Tresca Stress for Combined Static and Thermal Loads - Liners (Membrane + Bending @ Integration Point 1)	5-32
Figure 5.3-20.	Tresca Stress for Combined Static and Thermal Loads - Liners (Membrane + Bending @ Integration Point 3)	5-33
Figure 5.3-21.	Meridional Strain for Combined Static and Thermal Loads - Secondary Liner (Membrane + Bending @ Integration Point 1)	5-34
Figure 5.3-22.	Meridional Strain for Combined Static and Thermal Loads - Secondary Liner (Membrane + Bending @ Integration Point 3)	5-35
Figure 5.3-23.	Meridional Strain for Combined Static and Thermal Loads - Secondary Liner (Membrane)	5-36
Figure 5.3-24.	Axial Strain for Combined Static and Thermal Loads - Secondary Liner (Membrane + Bending @ Integration Pt. 1)	5-37

Figure 5.3-25. Axial Strain for Combined Static and Thermal Loads - Secondary Liner (Membrane + Bending @ Integration Pt. 3)	5-38
Figure 5.3-26. Axial Strain for Combined Static and Thermal Loads - Secondary Liner (Membrane)	5-39
Figure 5.3-27. Hoop Strain for Combined Static and Thermal Loads Secondary Liner (Membrane + Bending @ Integration Point 1)	5-40
Figure 5.3-28. Smallest Prin. Stress for Combined Static and Thermal Loads - for Concrete	5-41
Figure 5.3-29. Intermediate Prin. Stress for Trans. Thermal Loads - Concrete	5-42
Figure 5.3-30. Largest Prin. Stress for Combined Static and Thermal Loads for Concrete	5-43
Figure 5.3-31. Meridional Strain for Combined Static and Thermal Loads for Concrete	5-44
Figure 5.3-32. Axial Strain for Combined Static and Thermal Loads - Concrete	5-45
Figure 5.3-33. Hoop Strain for Combined Static and Thermal Loads - Concrete	5-46

LIST OF TABLES

<u>Table</u>	<u>Page</u>
Table 2.1-1. Annulus Air Temperature - Evaluated Conditions	2-2
Table 4.1-1. Coefficients of Thermal Expansion for Steel	4-20
Table 4.1-2. Concrete Parameters Used in ABAQUS Model	4-21
Table 4.2-1. Calculation of the Pseudo Value α_s'	4-22
Table 5.4-1. Limiting Allowables	5-48
Table 5.5-1. Tank 241SY101 Concrete Dome Rebar Reinforcement	5-49
Table 5.5-2. Tank 241SY101 Cylindrical Concrete Wall Rebar Reinforcement	5-50
Table 5.6-1. Summary of Limiting Margins to Allowable	5-51

STRUCTURAL ANALYSIS AND EVALUATION OF THE 241SY101 TANK ANNULUS HEAT-UP

1.0 INTRODUCTION

Waste temperatures in the 241SY101 waste tank continue to decrease as the radioactive heat source associated with the waste decreases. This decrease in temperature has accelerated over the last few years, apparently as the result of increases in the primary and annulus ventilation flow rates that were implemented in response to safety concerns related to episodic releases of flammable gas from within the waste.

Decreasing temperatures, lead to a concern that increases in viscosity and other changes in the physical properties of the waste may adversely affect the flammable gas problem by increasing the amount of gas released by the waste or may adversely affect the ability to predict the gas releases reliably.

Recently, in consideration of possible modifications, a feasibility study (Tuck 1993) assessed the capability of the existing ventilation system to support heating mitigation in the 241SY101 tank. With modifications to the ventilation system, the waste temperature could be maintained at 140 °F by increasing the annulus inlet air temperature. Subsequently, heat transfer analyses (WHC 1994) were performed for bounding temperatures and flow rates associated with probable ventilation system modifications. The resulting temperatures were mapped onto a structural finite-element model for use in structural evaluations that are provided herein.

2.0 PURPOSE AND SCOPE

2.1 PURPOSE

The purpose of the analysis reported herein is to determine the maximum allowable temperature and rate of heating that could be applied to tank 241SY101 through annulus air heating without detrimental effects to the structural integrity of the concrete and steel liner of the tank.

2.2 SCOPE OF THE ANALYSES

An existing axisymmetric tank model is modified for use in structural analyses to evaluate several possible heating conditions for their effect on the structural integrity of the steel liner and the concrete. In addition, a local detailed model is developed to determine the local stresses and strains in the vicinity of the studs caused by the thermal transient associated with annulus air heating. The local model is necessary because the axisymmetric tank model cannot account appropriately for these local effects. A maximum allowable temperature and rate of heating is recommended on the basis of analyses results.

The ABAQUS¹ (HKS 1989a) and ANSYS² (SASI 1989) finite-element computer programs are used to perform the structural integrity evaluation for annulus air heating of tank 241SY101. The ANSYS results are used only to evaluate the secondary liner and liner anchor studs in the vicinity of the bottom row of studs. The analysis addresses the effects on tank structural integrity of the thermal transient loads in combination with normal operating static loads.

The nodal-temperature time histories applied in the thermal stress analysis are obtained from a P/Thermal³ analysis (Beaver 1994) that envelops several operating conditions presented by Tuck et al. (1993). The incoming annulus air temperature is 200 °F. In addition, a lower-bound condition with an incoming air temperature of 140 °F is evaluated and provided for completeness. The conditions evaluated are presented in Table 2.1-1.

---

¹ ABAQUS is a trademark of Hibbit, Karlsson, and Sorensen, Inc.

² ANSYS is a registered trademark of Swanson Analysis Systems, Inc.

³ P/Thermal is a registered trademark of PDA Engineering.

Table 2.1-1. Annulus Air Temperature - Evaluated Conditions.

Cond.	Flow Rate Range (ft ³ /min)		Rate of Change in Flow Rate	Temperature Range		Rate of Change in Temperature
	Initial	Final		Initial	Final	
1	Initial	220	STEP	Initial	Ambient	STEP
	Final	800		Final	200 °F	
2	Initial	220	STEP	Initial	Ambient	STEP
	Final	800		Final	140 °F	

3.0 CONCLUSIONS AND DISCUSSION

The objective of this work is to evaluate the structural integrity of the 241SY101 tank under transient thermal loads resulting from proposed annulus heat-up to determine the maximum heat-up rate and maximum heat-up temperature.

To stay within the required structural limits, the maximum allowable temperature of the annulus air is restricted to 200 °F. This value conservatively assumes a rate of heating equivalent to a step change in temperature from the initial ambient conditions. The analyses are based on an annulus air flow rate of 800 ft³/min attained through an assumed step change in flow from an initial flow rate of 220 ft³/min.

Concrete strains and rebar stresses are significantly less than the corresponding allowables and hence are not the limiting consideration.

The liner strains are governed by the membrane strain at the lowest row of liner-anchor studs. The maximum membrane strain is approximately 0.00076 in/in and is less than the Code allowable of 0.002 in/in (ASME 1989a).

Evaluation of the liner-anchor studs is based on satisfying the allowable limit taken as 25% of the ultimate shear displacement (ASME 1989a). Available liner-anchor stud load-displacement data (Nelson Stud 1977) was used to include the local stiffness at the liner-anchor stud locations to establish the resulting displacements. From the analysis results, the shear displacement at the lowest stud is limiting and is strongly dependent on the slope of the linear portion of the assumed load-displacement curve. For an approximate linear stud stiffness of 1×10^6 lbf/in (3/4-in. Headed Nelson studs), the maximum shear displacement is approximately 0.016 in. Using a linear stud stiffness of 10^5 lbf/in (lower-bound "best estimate" for 1/2-in. non-Headed Nelson studs) results in a displacement of approximately 0.052 in. On the basis of data from the manufacturer, the ultimate shear displacement is approximately 0.22 in., which gives an allowable of 0.055 in.

Therefore, it is recommended that the inlet air temperature not exceed a maximum of 200 °F and the flow rate not exceed a maximum of 800 ft³/min.

4.0 ANALYTICAL MODELS

4.1 ABAQUS MODEL DESCRIPTION

The finite-element model used in the structural analysis is a modified version of the axisymmetric ABAQUS model of tank 241SY101 from WHC 1991. The model was revised to include the global effects of the secondary- liner anchor studs, to remove loading conditions not applicable to the evaluation herein, and to impose the temperature time history loading associated with annulus air heating.

The assumption of axisymmetry in the model is sufficient to account for the global tank response and is a reasonable representation of the axisymmetric thermal loading. Local effects due to structural discontinuities such as liner wall-thickness changes and penetrations are not explicitly modeled. The controlling local discontinuity location for evaluation purposes due to the thermal loading is at the anchor-stud locations where the differential growth between the secondary liner and the concrete results in relatively large liner and anchor-stud strains. A more detailed model, using ANSYS, is used for evaluating these locations and is described in Section 4.2.

Important features of the ABAQUS model are described below. The overall discretization is shown in Figure 4.1-1. The element numbering scheme for the detailed depictions is shown on Figures 4.1-2 through 4.1-5. The dome region, Detail "A" is shown on Figure 4.1-2. The haunch region, Detail "B" is shown in Figure 4.1-3. Note that in both of these figures, except where noted, the element numbering system is incremented by 200 in the meridional direction. Figure 4.1-4 illustrates the mid-wall region, Detail "C" for the primary and secondary liner, as well as the reinforced concrete wall. The most complicated region of this model, Detail "D", illustrated in Figure 4.1-5, is the bottom corner region. This region shows the primary and secondary liners, the refractory slab, the foundation slab, the reinforced concrete wall, and all of their interfaces. The rebar representation is shown in Figure 4.1-6 for the dome, haunch, wall and the foundation slab.

4.1.1 Reinforced Concrete

The reinforced concrete portions of the tank are modeled with four-node axisymmetric solid (CAX4) elements with bi-linear interpolation and 2x2 integration points using two elements through the thickness. ABAQUS allows the specification of the rebar placement within each element. The "rebar elements" use a one dimensional strain theory. These elements are superposed on the mesh of plain concrete elements and are used with standard metal plasticity models to describe the behavior of the rebar material (HKS 1989b). Rebar was specified in the meridional, hoop and through-thickness directions as appropriate. The material specification for the rebar and concrete are described in Section 4.1.6.

4.1.2 Refractory Concrete

The refractory concrete between the primary and secondary liners is unreinforced. To minimize the computational burden associated with the cracking of plain concrete, the refractory slab is modeled with soft elastic CAX4 elements. One layer of elements through the thickness is considered adequate for an appropriate stiffness representation. Stress results in this material are not considered to have an important bearing on the structural integrity of the tank. The soft representation simulates the expected cracked behavior. Specific material properties used are described in Section 4.1.6.

4.1.3 Steel Liners

Both the primary and secondary liners are modeled with two-node axisymmetric shell (SAX1) elements with 3 integration points through the thickness. This shell theory allows for finite strains and rotations of the shell, as well as changes in the shell thickness (HKS 1989b).

4.1.4 Interfaces

Wall/Basemat Slab

There are unique features of the SY101 tank that require the modeling of geometric nonlinearities (i.e., gaps or one-way stiffness). The most important of these is the reinforced concrete wall/basemat slab interface. The wall rests on the slab with no structural attachment. The wall and slab nodes, which are connected by axisymmetric interface elements (INTER2A), are free to separate. The horizontal sliding friction coefficient was taken as zero.

Basemat/Liners/Refractory Slab

Another important region is the bottom slab, especially at the corner where the primary and secondary liners turn upward parallel to the concrete wall. The primary liner rests on, but is not structurally connected to the concrete refractory slab. The refractory slab is sandwiched between the primary and secondary liners with no structural attachment. The secondary liner rests on, but is not structurally connected to the foundation basemat slab.

Figure 4.1-7 shows the modeling of this region. Nonlinear, single-degree-of-freedom (SPRING2) elements connect the primary liner to the refractory slab and the secondary liner to the foundation slab. The spring nonlinearity prescribes a compression-only (contact) interaction in the vertical direction. The interface is modeled as frictionless, which is typical for areas expected to experience small values of relative displacement in the horizontal direction. The secondary liner and the bottom of the refractory slab are modeled as fully coupled because separation is not expected to occur for the given loading conditions and the stiffness of the refractory slab is relatively small.

Secondary Liner/Concrete Wall and Studs

To model the interaction between the secondary steel liner and concrete wall, nonlinear spring elements (SPRING2) were used. The nonlinear spring elements simulate the inelastic behavior of the studs under shear and tension (pull out) loads. The mesh is constructed to have enough nodes between the concrete wall and liner to represent approximately the locations of the studs (Figure 4.1-7). The properties for the non-linear springs are derived from test data. A summary of test data is presented below.

Beginning in 1959, the Nelson Stud Welding Company (Nelson Stud 1977) conducted extensive tension and shear tests of studs embedded in concrete. The purpose of these tests was to determine the strength and structural behavior of embedded studs. Figures 4.1-8 and 4.1-9 present typical load-slip curves for normal weight concrete. Both tension and shear tests exhibited substantial inelastic deformation before failure. The failure characteristics of these tests are discussed further in Section 5.5, the structural integrity evaluation.

For the waste tank, lateral confinement due to the active soil pressure may increase the shear stiffness of the studs. Load deflection data in the shear direction for the 0.5-in. studs embedded in the concrete were not available. Therefore, stiffness data for 0.75-in. studs are used for the nonlinear spring elements. This results in a more realistic stiffness representation in consideration of the effects of lateral confinement and provides for larger stresses and strains in the steel liner and concrete wall.

There are 128 studs welded to the steel liner in the circumferential direction. In the ABAQUS axisymmetric analysis, the stiffness matrix calculations are performed for the entire circumference. Therefore, the nonlinear spring stiffnesses were multiplied by 128 to represent the stiffnesses for the entire circumference.

The stud spacing in the meridional direction is every 2 ft. In the finite element model, the locations of the element nodes vary from that of the actual stud locations (finer spatial discretization of nodes in finite element model). Therefore, the stiffnesses were modified to accommodate these differences.

Due to axisymmetry, there are no relative displacements in the circumferential direction and therefore, loading in the circumferential direction does not occur at the interface between the secondary liner and the concrete wall.

Primary/Secondary Liners

A 30-in. annulus exists between the primary and secondary liner in the vertical direction up to the haunch region. In this region the two liners gradually become tangent. INTER2A interface elements were provided between the primary and secondary liner in the haunch region. This allows the primary liner to expand freely to a point where contact is made with the secondary liner in this local region. However, contact between the primary and secondary liner is not expected for the thermal loading considered herein.

4.1.5 Boundary Conditions

Axisymmetric boundary conditions were applied enforcing zero radial displacement and zero rotations along the line of symmetry. The foundation basemat is constructed of reinforced concrete with a minimum thickness of 11.5-in. at its thinnest point. The soil beneath the foundation is highly confined and for simplicity, the stiffness of the soil is assumed rigid and zero displacement boundary conditions are applied in the vertical direction. Further, since the acceptability of the thermal expansion analysis results is governed by the relative displacements between the secondary steel liner and the concrete, the evaluation results and conclusions are not sensitive to variations in the foundation vertical boundary condition stiffnesses.

4.1.6 Model Material Properties

The material properties used in the analyses are described in the following sections.

4.1.6.1 Steel. Elastic-plastic constitutive models are used for the liners and rebar material. The constitutive models utilize a von Mises yield criteria with isotropic hardening.

Liners

Both the primary and secondary liners were constructed of ASTM A516, Grade 65 low carbon steel. Young's modulus and Poisson's ratio values of 29×10^6 lbf/in² and 0.3 were used, respectively. The post yield, nonlinear behavior is modeled explicitly in terms of the true-stress vs. true-strain diagram (see WHC 1991). The coefficient of thermal expansion, as a function of temperature, is presented in Table 4.1-1.

Rebar

The meridional and hoop rebar are made of ASTM A615-68, Grade 60 low carbon steel while the through-thickness tie rebar are made of ASTM A615-68, Grade 40. Young's modulus and Poisson's ratio were defined as 30×10^6 lbf/in² and 0.3, respectively. The post-yield nonlinear behavior was modeled explicitly in terms of the true-stress vs. true-strain diagram (see WHC 1991). The coefficient of thermal expansion, as a function of temperature, is presented in Table 4.1-1.

4.1.6.2 Concrete

Refractory Concrete

The insulating refractory slab is specified to have a 28-day minimum compressive strength of 130 lbf/in². Although it is unreinforced, it is highly confined. The slab was modeled elastically. Young's modulus was selected such that the bending stiffness of the slab does not significantly restrict the bottom knuckle region of the secondary liner from uplift. In addition, it must be sufficiently stiff to prevent significant downward deflection of the primary liner which would artificially create significant

residual liner stresses. The value chosen was 4×10^4 kip/ft². Poisson's ratio was chosen as 0.15, typical for concrete.

Structural Concrete

The concrete used to construct the foundation and containment structure has a specified minimum compressive strength of 4,500 lbf/in². Using a weight density of 150 lbf/ft³, Young's modulus was calculated to be 58.6×10^4 kip/ft². Poisson's ratio was again chosen as 0.15. ABAQUS provides a smeared-crack concrete constitutive model within its material library. This constitutive model provides a means to account for the inelastic behavior of concrete in both compression and tension. The effect of reinforcement is considered in the highly anisotropic behavior of reinforced concrete by the superposition of one dimensional rebar elements on the mesh of the plain concrete elements. The ABAQUS concrete constitutive model is intended for analyses involving fairly monotonic loading and low confining pressures. The structural analysis of the tank for thermal transient loading exhibits fairly monotonic behavior up to the peak response. On the basis of the data presented by Winkel (1994), the coefficient of thermal expansion is approximated as 4×10^{-6} in/in-°F. Although the referenced data does not explicitly address the 241SY101 tank concrete, it does provide data based on test samples from Hanford concrete of similar strength. The use of a single, non-varying value for the coefficient of thermal expansion for the temperature range of interest is consistent with the ACI Code and the value used herein is conservative relative to the thermal expansion of the steel when compared to the Code value of 5.5×10^{-6} in/(in-°F) for concrete.

4.1.7 Numerical Characterization of Reinforced Concrete

The nonlinear compressive behavior of concrete is represented by elastic-plastic theory using the yield surface determined by the equivalent pressure stress and the von Mises equivalent deviatoric stress. Typically the compressive stress-strain diagram is approximately linear up to one-half of the ultimate stress. It peaks at a strain approximately equal to two times the ultimate strain calculated elastically. That is,

$$\epsilon_o = 2 \frac{f'_c}{E} \quad (4.1.7-1)$$

where,

$$\begin{aligned} \epsilon_o &= \text{compressive strain at the peak compressive stress (in/in)} \\ f'_c &= \text{concrete compressive strength (lbf/in}^2\text{)} \\ E &= \text{Young's Modulus (initial tangent modulus for concrete)} \\ &\quad \text{(lbf/in}^2\text{)}. \end{aligned}$$

The compressive stress-strain diagram used in the analysis is prescribed by a bilinear curve with the control points as stated above. Although concrete characteristically exhibits post-ultimate-load softening, the prescribed stress-strain behavior assumes that the concrete is perfectly plastic at the ultimate compressive stress ($4,500$ lbf/in²).

The treatment of the tensile behavior of concrete is significantly more complicated than the compressive behavior. The shape of the tensile stress-strain diagram is well known but there is a wide disparity in the literature on the control points. It is accepted practice to use a linear stress-strain relationship with a slope equal to the compressive tangent modulus until the fracture stress is reached. The fracture stress for slowly applied loads ranges from 0.05 to 0.15 of the compressive strength and is higher for rapidly applied loads. Beyond the fracture strain the corresponding stress monotonically reduces to zero over a finite strain. This "tension stiffening" physically represents the transfer of load from the concrete to the rebar over a finite strain. The strain at which the tensile stress reaches zero, as reported in the literature, ranges from 2 to 20 times the fracture strain. The appropriate value is a function of reinforcement and possibly mesh size. A value of 2 would correspond to plain or lightly reinforced concrete while the value of 20 would correspond to heavily reinforced concrete. In addition to tensile load transfer, shear loads are transferred across cracks over a finite strain. This "shear retention" physically represents shear transfer as a result of aggregate interlock within rough cracks and dowel action of reinforcing bars.

The ABAQUS concrete model requires Young's modulus, Poisson's ratio, the compressive stress-strain diagram, parameters that address the tensile behavior, and parameters that address the shape of the triaxial yield surface. ABAQUS requires that the post-cracking tensile stress-strain diagram be input by the user. Similarly, the shear transfer across cracks is described by a linear reduction in the uncracked shear modulus to zero at a user specified strain. The fracture strain is computed based on Young's modulus, the compressive strength and the tensile-to-compressive strength ratio are required as input by the user. ABAQUS allows the user to have control over the key constitutive model parameters. The parameters for the nonlinear concrete material model are presented in Table 4.1-2. Using these parameters resulted in local instability and divergence, which is associated with tensile softening behavior of the concrete (negative modulus), for three sub-increments, after which global convergence occurred during mechanical load increments. Generally, under mechanical loads, the rebar structural stiffness takes over the local tensile softening behavior of the concrete. This would result in a positive stiffness matrix and global convergence. Thus, the convergence solution after 3 sub-increments of divergence is still accurate since the dissipated energy due to local tensile softening in the concrete finite element model is insignificant compared to the total strain energy in the rebar before the structure reaches its ultimate capability.

In contrast, during the initial thermal load increments using nonlinear concrete parameters, the local instability associated with tensile softening behavior of the concrete did not result in global convergence. This global divergence is associated with the mismatch of coefficients of thermal expansion and elastic moduli between the concrete and rebar. Generally, under thermal loads, the rebar structural stiffness aggravates the local tensile softening behavior and cracking of the concrete. Therefore, the divergence associated with the local softening behavior would not result in global convergence.

In order to avoid the global divergence, the concrete nonlinear model was modified by using a linear elastic model to avoid local tensile cracking. This modification resulted in higher induced stress and strain in the steel

liner, studs, and concrete wall. But it also resulted in lower induced stress and strain in the rebars. Therefore, the stress and strain for the rebar was recalculated assuming the concrete was fully cracked and the rebar was carrying all the tension forces. This assumption is consistent with the ACI-code recommendation based on the unified theory of reinforced concrete structures. Further details of these calculations are presented in Section 5.5, the structural integrity evaluation. The parameters for the linear concrete model are presented in Table 4.1-2. This model was used for structural response calculations under both mechanical and thermal loads.

4.2 ANSYS MODEL DESCRIPTION

A simplified, conservative ANSYS thermal structural analysis is performed to predict upper-bound local stresses and strains in the secondary liner in the vicinity of the anchor-stud locations. A vertical strip of the secondary steel liner including the lower knuckle area and a single vertical row of liner-anchor studs is modeled (See Figures 4.2-1 and 4.2-2) using ANSYS STIF63 shell elements. Symmetric boundary conditions are imposed at the edges of the model.

The analysis is based on a conservative representation of the maximum relative strain between the concrete and steel. The steel, with its higher temperature and higher coefficient of thermal expansion, expands more than the concrete causing significant local loading on the anchor studs and concrete. The friction between the steel and concrete surfaces is conservatively ignored. A conservative uniform temperature distribution is assumed with an initial reference temperature of 55 °F. The reference temperature is based on assumed average conditions that may have been present during construction and is also considered to be conservative.

The free expansion per unit length of the steel is given by,

$$\delta_s = \alpha_s(\Delta T_s) \quad \text{where, } \Delta T_s = T_s - 55 \text{ }^\circ\text{F} \quad (4.2-1)$$

and the expansion per unit length of the concrete is approximated by,

$$\delta_c = \alpha_c(\Delta T_c) \quad \text{where, } \Delta T_c = (T_{c, \text{inside}} + T_{c, \text{outside}})/2 - 55 \text{ }^\circ\text{F}. \quad (4.2-2)$$

Therefore, the relative expansion is given by,

$$\delta_s - \delta_c = \alpha_s(\Delta T_s) - \alpha_c(\Delta T_c) \quad (4.2-3)$$

A pseudo-expansion characteristic, α'_s is calculated for use in the ANSYS analysis by equating the difference in equation 4.2-3 with the factor α'_s times ΔT_s and solving for an upper bound value of α'_s :

$$\alpha'_s(\Delta T_s) = \alpha_s(\Delta T_s) - \alpha_c(\Delta T_c) \quad (4.2-4)$$

Because α_s is greater than α_c , larger values for ΔT_s and ΔT_c will result in a larger value for $\delta_s - \delta_c$, provided that the ratio of ΔT_s to ΔT_c does not decrease significantly with increasing temperatures.

From the nodal temperature time history data the maximum value for T_s is approximately 160 °F and the corresponding conservative values for the concrete are $T_{c,inside} = 160$ °F and $T_{c,outside} = 150$ °F, respectively. Therefore,

$$\Delta T_s = 160 \text{ °F} - 55 \text{ °F} = 105 \text{ °F} \text{ and}$$

$$\Delta T_c = (160 \text{ °F} + 150 \text{ °F})/2 - 55 \text{ °F} = 100 \text{ °F}.$$

Table 4.2-1 presents the calculation of $\alpha_s' = 1.94 \times 10^{-6} \text{ in}/(\text{in}\cdot\text{°F})$.

Because the thermal expansion forces are proportional to the moduli of elasticity and the structural cross-sectional area, a modified modulus of elasticity is calculated to account for the relative stiffness between the concrete wall and the steel liner. The free thermal expansion of the liner minus the decrease in its length due to the restraint of the concrete wall must equal the expansion of the concrete wall plus the increase in its length due to the secondary steel liner. This is represented by the following:

$$\alpha_s L(\Delta T_s) - \frac{FL}{E_s A_s} = \alpha_c L(\Delta T_c) + \frac{FL}{E_c A_c} \quad (4.2-7)$$

where,

- L = original length of expanding steel or concrete
- E_s = steel modulus of elasticity (lbf/in²)
- A_s = representative cross-sectional area of steel (in²)
- E_c = concrete linear modulus of elasticity (lbf/in²)
- A_c = representative cross-sectional area of concrete (in²)
- F = equilibrium force between steel and concrete (lbf)

Solving for F gives,

$$F = [\alpha_s \Delta T_s - \alpha_c \Delta T_c] \cdot \left[\frac{1}{\frac{1}{E_s A_s} + \frac{1}{E_c A_c}} \right] \quad (4.2-8)$$

The first term of this equation is equated to the product $\alpha_s'(\Delta T_s)$, as shown above, to calculate the expansion terms for the ANSYS model. Likewise, the second term of this equation is equated to the product E_s'/A_s to calculate a modified modulus of elasticity.

$$E_s' / A_s = \left[\frac{1}{\frac{1}{E_s A_s} + \frac{1}{E_c A_c}} \right] \quad (4.2-9)$$

This can be expressed in terms of the steel and concrete thicknesses as follows,

$$E'_s = \left[\frac{1}{\frac{1}{E_s t_s} + \frac{1}{E_c t_c}} \right] \frac{1}{t_s} \quad (4.2-10)$$

where,

$$\begin{aligned} E_s &= 29 \times 10^6 \text{ lbf/in}^2 \\ t_s &= 0.375 \text{ in} \\ E_c &= 4 \times 10^6 \text{ lbf/in}^2 \\ t_c &= 18 \text{ in} \end{aligned}$$

Therefore, E' is approximately $25 \times 10^6 \text{ lbf/in}^2$.

A liner-anchor stud stiffness value of 10^6 lbf/in is used in the analysis. This value is based on the Nelson Stud test data discussed in Section 4.1.4 and is conservative for predicting stresses and strains in the liner. An additional analysis was made using an anchor-stud stiffness value of 10^5 lbf/in to represent a lowerbound condition and is conservative for predicting displacements in the studs.

Figure 4.1-1. ABAQUS Over-all Finite Element Model

Figure 4.1-2. Element Numbering of the Dome Region, Detail A

Figure 4.1-3. Element Numbering of the Haunch Region, Detail B

241-SY-101 TANK Haunch Element Shrink 50%

Figure 4.1-4. Element Numbering of the Mid-wall Region, Detail C

Figure 4.1-5. Element Numbering of the Bottom Corner Region, Detail D

NOTE: Gaps, soil springs and fluid mass omitted for clarity.

Figure 4.1-6. Global Illustration of Tank Rebar

Figure 4.1-7. Modeling of the Foundation and Bottom Corner Region

Figure 4.1-8. Axial Load - Displacement Curves for Embedded Nelson Studs

Figure 4.1-9. Shear Load - Displacement Curve for Embedded Nelson Studs

Figure 4.2-1. ANSYS Over-all Finite Element Model

Figure 4.2-2. ANSYS Model in Region of Lowest Stud

Table 4.1-1. Coefficients of Thermal Expansion (10^{-6} in/in-°F) for Steel

Material	Temperature °F								
	100	150	200	250	300	350	400	450	500
A615-68 Carbon Steel (Group A) Rebar	6.50	6.57	6.67	6.77	6.87	6.98	7.07	7.15	7.25
SA-516 (Group C) Liners	5.53	5.71	5.89	6.09	6.26	6.43	6.61	6.77	6.91

Table 4.1-2 Concrete Parameters Used in ABAQUS Model

Parameters for Linear Material Model		
Parameters	Structural	Refractory (linear elastic only)
f'_c (lbf/in ²)	4,500	130
E^c (10 ⁴ kip/ft ²)	58.6	4
ν	0.15	0.15
α (10 ⁻⁶ in/in-°F)	4.0	N/A
γ (lbf/ft ³)	150	150*
Parameters for Non-Linear Material Model (Structural Only)		
<u>Yield and Plastic Modulus</u>		
Uniaxial Compress. Yield Strength at Zero Plastic Strain (lbf/in ²)		2,250
Uniaxial Compress. Ult. Strength at 0.11% Plastic Strain (lbf/in ²)		4,500
Ratio of Biaxial Compressive Yield Strength to Uniaxial Compressive Yield Strength		1.16
Ratio of Uniaxial Tensile Stress to Uniaxial Compressive Stress at Failure		0.072
<u>Tension Stiffening Data for Post-Cracking Behavior</u>		
Fraction of Remaining Stress to Stress at Cracking		0.0
Absolute Value of the Ultimate Strain Minus the Strain at Cracking		0.001
<u>Shear Retension Data for Post-Cracking Behavior</u>		
The Value of α for Dry Concrete		1.0
The Value of ϵ_{max} for Dry Concrete		1000.0

* Conservative, actual value is 30 lbf/ft³

Table 4.2-1 Calculation of the Pseudo Value α_s'

α_s (in/in-°F)	ΔT (°F)	α_c (in/in-°F)	ΔT (°F)	$\alpha_s(\Delta T_s)$	$\alpha_c(\Delta T_c)$	$\alpha_s'(\Delta T_s)$	α_s'
5.746×10^{-6}	105	4×10^{-6}	100	6.033×10^{-7}	4.0×10^{-4}	2.03×10^{-4}	1.94×10^{-6}

5.0 STRUCTURAL ANALYSIS AND CALCULATIONS

5.1 LOAD DESCRIPTION

Both static and transient thermal loads are imposed on the 241SY101 buried waste storage tank. The analysis is intended to represent effects of the static loads during normal operation combined with the superimposed transient thermal loads. The method of load application is described in the following sections.

5.1.1 Static Loads

Dead loads as well as the static pressure loads are described below. Live loads applied at the ground level are considered negligible.

5.1.1.1 Structural Component Body Forces. Each part of the structure is subject to a gravity body force. ABAQUS calculates these loads on the basis of the density of each component. The steel liners and rebar were modeled with a 480-lbf/ft³ weight density. As a conservative measure, both the insulating refractory concrete and the structural concrete were modeled with a 150-lbf/ft³ weight density although the refractory concrete weight density is on the order of 30-lbf/ft³.

5.1.1.2 Soil Overburden. The 241SY101 tank is buried with a minimum depth of approximately 6½ feet. The soil weight on the dome was applied with the hydrostatic loading option of ABAQUS and accounted for the changing soil depth with dome geometry. The thermal stress analysis is not sensitive to variations in soil parameters. For more specific information, see WHC 1991.

5.1.1.3 Lateral Soil Pressure. The soil covering the tank exerts a lateral pressure on the concrete wall. The pressure gradient is calculated for an average soil density of 110 lbf/ft³ with a Rankine coefficient of 0.35 and an angle of internal friction of 29 degrees based on WHC 1991. Although the sandy soil surrounding the tank has been documented as having an angle of internal friction ranging from 39° to 47° by test and more recent data may show other variations in soil properties, the thermal stress analysis is not sensitive to variations in soil properties and use of the existing model is considered acceptable. The soil pressure was applied with the hydrostatic loading option of ABAQUS.

5.1.1.4 Waste Material Hydrostatic Pressure. The weight of the waste fluid is modeled as lumped masses distributed along the bottom of the primary liner. Each single degree of freedom lumped mass element (MASS1) represents the tributary weight of the fluid above. Although the waste material consists of a mixture of fluid, slurry, and solids that cause a vertical density gradient, a constant conservative density, based on a specified maximum specific gravity of 1.7, is used for simplicity.

The horizontal hydrostatic pressure loads were imposed through equivalent nodal forces via the CLOAD option in ABAQUS. The option allows the load vectors to remain normal to the primary liner surface during analyses.

5.1.2 Temperature Time Histories

The nodal temperature time histories used for the thermal expansion analysis are based on a P/Thermal analysis (WHC 1994) that envelopes several operating conditions presented by WHC 1993. Incoming annulus air temperatures up to 200 °F were considered. The conditions evaluated herein are presented in Table 2.1-1. The temperature time history in the vicinity of the lower knuckle for the 200 °F upper bound case is shown in Figure 5.1-1 and for the 140 °F lower bound case in Figure 5.1-2. The lower knuckle region is the critical region for the annulus heat-up thermal stress analysis.

Heat transfer analyses were performed for the Table 2.1-1 conditions and the temperature time histories were mapped onto the revised ABAQUS model described in Section 4.1. The nodal temperature time histories were then used to perform thermal stress analyses. The temperature time histories include 33 steps for transient and steady-state temperature distributions. These temperature time histories are stored and input into the ABAQUS model to predict nonlinear structural response.

5.2 SOLUTION PROCEDURES (ABAQUS)

The temperature time histories and associated temperature field produce temperature gradients, especially in the region near the steel liner/concrete wall interface. These thermal gradients in conjunction with: 1) temperature-induced variations in the material properties, and 2) thermal and elastic property differences between the concrete wall and steel liner, result in stresses and stress gradients in these regions. The temperature histories for this analysis were chosen to produce accurate response calculations while minimizing the central processing unit (CPU) time required to perform the analysis. From 33 time steps in the temperature time histories only 7 time steps were chosen. The selection of these time steps was based on accurate representation of the initial transient thermal response (time steps with high temperature gradient and strong path dependency) and the maximum steady-state thermal response (time steps with the highest temperatures).

In the tank model, non-linearities arise from: 1) variations in contact surfaces, and 2) nonlinear material models for the steel liner, concrete wall, and studs. These effects necessitate that a nonlinear analysis be performed. In this analysis, deformations under the thermal environment are assumed to be infinitesimal and therefore geometric nonlinearity is not considered. The accuracy of this assumption has been verified in the response calculation section.

The following loading sequence was used. First, static loads were applied to predict the nonlinear response. The static loads include dead weight (waste, soil overburden, and structural member body forces), lateral soil pressure, and waste hydrostatic pressure. Then, the temperature histories were applied to the statically-loaded condition and a nonlinear transient thermal stress analysis was performed using the modified Newton

iterative procedure. This procedure, with tight convergence, results in accurate response calculations. Tight convergence (PTOL=100 lbf) was chosen because any error permitted in the incremental solution at a particular time directly affects accuracy and path dependence. In this procedure, the structural stiffness matrix is updated only at the beginning of each loading increment and constant stiffness iterations are performed within the increment to reduce the unbalanced force between the applied loads and the restoring forces of the structures. In the case of non-convergence, the structural stiffness is reassembled, accommodating the latest changes in element stiffness matrix formulation.

During the initial static load increments, nonlinear analysis did not satisfy the convergence criteria for unbalanced force (PTOL). The convergence difficulty was associated with the local tensile softening modulus in the concrete model which causes ill-conditioning of the structural stiffness matrix. In order to avoid this local instability and expand the global convergence, divergence was allowed only for three sub-increments. Generally, under mechanical load, the global convergence after three sub-increment divergences is associated with the fact that the rebar structural stiffness takes over the local tensile softening behavior of the concrete. Also, the dissipated energy due to local tensile softening in the concrete finite element model is insignificant compared to the total strain energy in the rebar before the structure reaches its ultimate capability.

During the initial thermal load increments in the nonlinear analysis, the local instability associated with tensile softening behavior of the concrete prevented global convergence. This global divergence is associated with the mismatch of coefficients of thermal expansion and elastic moduli between the concrete and rebar. Generally, under thermal load, the rebar structural stiffness aggravates the local tensile softening behavior and cracking of the concrete. Therefore, the divergence associated with the local softening behavior prevented global convergence. To avoid the global divergence, the concrete model was modified to avoid local tensile cracking (i.e., the concrete was not allowed to crack). This modification resulted in higher induced stresses and strains in the steel liner, studs, and concrete wall. But it also resulted in lower induced tensile stress and strain in the rebars. Therefore, the tensile stress and strain for the rebar was recalculated assuming the concrete was fully cracked and the rebar was carrying all the tension forces. This assumption is consistent with the ACI Code recommendation based on the unified theory of reinforced concrete structures. Further details of these calculations are presented in Section 5.5.2, the structural integrity evaluation.

5.3 STRUCTURAL RESPONSE (ABAQUS)

The results of the model simulations for the static and transient thermal loading are presented in Figures 5.3-1 through 5.3-33. Figures 5.3-1 through 5.3-4 show the displacement responses of the concrete wall with steel liner which indicates bending in the bottom knuckle region. The effects of this bending on the stress and strain in the meridional and axial directions at this location are presented in Figures 5.3-5 through 5.3-26.

Figures 5.3-5 through 5.3-20 show the principal stress and maximum shear stress (Tresca-Saint Venant criterion) for the primary and secondary steel

liners under static and transient thermal loads. These stress profiles are relatively continuous with the maximum value located at the bottom of the primary liner. The stresses in the primary liner are mainly induced by the static loads, whereas, the stresses in the secondary liner are mainly due to the transient thermal loads. Under the transient thermal loads, the secondary steel liner goes into compression as the surface temperature increases and it attempts to expand against the concrete wall while inducing tension in the concrete.

Figures 5.3-21 through 5.3-27 present the strain responses of the secondary steel liner. These strains are primarily induced by the transient thermal loads with the peak value occurring at the bottom haunch region.

The compression axial forces in the studs are due to lateral pressure of the soil. All the studs are under a compressive stress state except one, which is under tension. The tension stress state at the second stud is small and is due to the local bending effect near the unsupported section at the bottom of the concrete wall. As expected, the maximum shear force in the stud is located at the first stud near the bottom of the concrete wall and is due to the mismatch of the coefficients of thermal expansion, Poisson's ratios, and shear moduli between the concrete wall and the steel liner.

Figures 5.3-31 through 5.3-33 show the combined static plus transient thermal strain responses of the reinforced concrete. The concrete tensile strain failure threshold is about 0.0001. Below this strain threshold, uncracked concrete behavior prevails while above it cracked concrete with strain softening behavior is characteristic. In the axisymmetric model, radial strains are indicative of the cracks in the circumferential (normal to the stresses) direction. Hoop strains, however, are indicative of cracks that may run in either or both the vertical and radial directions. As indicated in these figures, the tension cracking in the concrete wall is predominantly located near the bottom of the vertical wall in the hoop, axial, and vertical directions. Tension cracking is increased under the thermal environment.

In the haunch region, cracks generally line up with the local element axes (surface and normal to surface). Therefore, strains reported in the axial and radial directions could be an indication that the direction of the cracks is skewed with respect to the global axes. The haunch region is moderately damaged by the cracks. There are planar cracks opening in the hoop direction initiated during static loads. In the dome region, concrete cracking was not evident.

It is important to note that the development of cracks in the reinforced concrete is expected. The existence of cracks in the tension region does not indicate a loss of structural integrity, but rather indicates that steel reinforcement rebar is being placed in tension. The structural integrity of the steel rebar under tension is discussed in Section 5.5.2.

5.4 CRITERIA AND ALLOWABLES

The reinforced concrete portion of the tank shall satisfy the criteria of ACI-349 1990. That portion of the secondary steel liner that is integrally connected to the concrete and the associated liner-anchorage shall satisfy the criteria of ASME Section III, Division 2, Subsection CC (ASME 1989a). That

portion of the secondary steel liner which is not integrally connected to the concrete wall shall satisfy the criteria of ASME Section III, Division 1, Subsection NC (ASME 1989b).

The results of the finite element structural analysis, in conjunction with the failure criteria based on either stress or strain capability, are used to evaluate structural integrity. Under static loads, failure is a load-controlled phenomenon whereas under thermal load, it is a displacement-controlled phenomenon. As indicated in Subsection CC of the Code, failure stress criteria based on maximum principal and maximum shear stresses (Tresca-Saint Venant criterion) are more appropriate for mechanical or primary loading, whereas for thermal, displacement-controlled or secondary loading, failure strain criteria are used.

The structural integrity of the reinforced steel rebar is examined based on failure modes characteristic of the rebar and the rebar-concrete interaction. Rebar failure occurs when the strain in the longitudinal direction reaches the rupture strain limit. Rebar splice and rebar-concrete bond failures, which are typically manifested by a concrete splitting failure is induced by radial pressure resulting from axial forces in the rebar. Due to the complexity of the failure mode, failure criterion for rebar splices are based on experimental data. The ACI Code specifies requirements for rebar development length to protect against bond failure.

The structural integrity of the studs is evaluated using the ultimate embedded-load strength and deflection. Under static load, the failure is controlled by the ultimate embedded-load strength whereas under the thermal load, failure is controlled by the ultimate deflection. The data for tension and shear strength of embedded studs was obtained from the Nelson Stud Welding Company (Nelson Stud 1977). Figures 4.1-8 and 4.1-9 present typical load-displacement (slip) curves for embedded studs in normal weight concrete. Both tension and shear behavior exhibit substantial inelastic deformation before failure. At the ultimate loads no sudden failure is evident. In the shear test, concrete cracks were visible just after the ultimate load was reached. Then the loading was continued until both slabs separated. There were basically two failure modes for the embedded studs (Ollgaard 1971) under shear forces which occur at large slip: 1) concrete failure in the wedge-shaped section caused by localized crushing at the head of the stud. In this failure mode, bending in the stud and crack extension from the stud head to the steel plate interface were evident; 2) complete stud shear failure at the steel plate interface in which the failed stud remained embedded in the slab.

In the tension test, the failure occurs in the concrete, and the geometry of the failed concrete section has a conical shape. Since the concrete has been subjected to diagonal shear force, the failure surface is termed a "shear cone."

Based on the above, the limiting allowables are provided in Table 5.4-1.

5.5 STRUCTURAL INTEGRITY EVALUATION

Both the ABAQUS results and the ANSYS results are used to perform the structural integrity evaluation. The ANSYS results are used only for the

evaluation of the secondary liner and liner-anchor studs in the vicinity of the bottom row of studs.

5.5.1 Structural Integrity Evaluation Under Static Loads

The liner principal stresses and maximum shear stresses (Tresca criterion) for the combined bending and membrane stress are presented in Figures 5.3-5 through 5.3-12. The maximum membrane and maximum combined membrane plus bending stresses are 15.5 and 20 kip/in², respectively. These stresses occur in the primary liner.

The structural integrity of the steel liner is evaluated using the ultimate and yield strength criteria with the following factors of safety: 1) for membrane stresses, 1.5 for the material yield strength (35 kip/in²), and 4.0 for the ultimate material strength (65 kip/in²), which result in an allowable stress of 16.25 kip/in², and 2) for the combined membrane and bending stresses, 1.0 for the material yield strength (35 kip/in²), and 2.67 for the ultimate material strength (65 kip/in²), which result in an allowable stress of 24.3 kip/in². These factors of safety for allowable strength are based on ASME recommendations (Section III, Division 1, Subsection NC).

The maximum membrane and combined membrane plus bending stresses given above do not exceed the corresponding allowable stresses.

5.5.2 Structural Integrity Evaluation Under Superimposed Thermal Loads

5.5.2.1 Liner

Based on ABAQUS Results

The meridional, axial, and hoop strains in the secondary liner for the membrane and the combined membrane plus bending due to the static loading plus the superimposed transient thermal loading are presented in Figures 5.3-21 through 5.3-27. For the secondary liner, the maximum membrane and maximum membrane plus bending strains are 0.0006 in/in and 0.0008 in/in, respectively. These strains are induced primarily by transient thermal loads with the peak value occurring at the bottom knuckle region.

The structural integrity of the steel liner is evaluated using the following strain allowables:

- 0.002 in/in for membrane strain, and
- 0.004 in/in for membrane plus bending strain.

These allowable strains are based on the ASME recommendation (Section III, Division 2, Subsection CC). The predicted maximum strains given above do not exceed the material strain allowables. The local strains in the vicinity of the liner-anchor studs are evaluate below based on the ANSYS results.

The structural integrity of the unsupported section of the secondary liner which is not integrally connected to the concrete wall, is evaluated using the maximum principal stress and maximum shear stress (Tresca-Saint

Venant) criteria. The maximum principal stress and maximum shear stress are 8.0 kip/in² and 9.0 kip/in², respectively. These stresses result from the compression stress state of the secondary liner. Under transient loads, the secondary steel liner goes into compression as the surface temperature increases and it attempts to expand against the concrete wall while inducing tension in the concrete.

Results using the above stresses with factors of safety based on the ASME recommendation, indicate adequate structural integrity for the unsupported section of the secondary liner.

Based on ANSYS Results

The ANSYS results, provided in Appendix B to this report, give the maximum unaveraged centroidal principal stresses (lbf/in²) as summarized below (see Figure 4.2-2 for element numbers):

Element Nos. 5513, 6013	Inside Principal. Stress 1	= 19,462
	Inside Principal. Stress 3	= -6,826
	Middle Principal. Stress 1	= 18,450
	Middle Principal. Stress 3	= -7,276
	Outside Principal. Stress 1	= 17,445
	Outside Principal. Stress 3	= -7,732
Element Nos. 5514, 6014	Inside Principal. Stress 1	= 0
	Inside Principal. Stress 3	= -21,078
	Middle Principal. Stress 1	= 0
	Middle Principal. Stress 3	= -21,914
	Outside Principal. Stress 1	= 0
	Outside Principal. Stress 3	= -22,761

Based on these values, membrane stresses and the corresponding strains govern the evaluation. The membrane stress (in the middle of the element) is converted to an equivalent strain as follows:

$$\epsilon_1 = \sigma_1/E - \mu\sigma_2/E, \text{ and}$$

$$\epsilon_2 = \sigma_2/E - \mu\sigma_1/E$$

$$\epsilon_1 = 0.00071 \text{ in/in}$$

$$\epsilon_2 = 0.00076 \text{ in/in}$$

Therefore, the maximum membrane strain is 0.00076 in/in and is less than the allowable strain of 0.002 in/in.

5.5.2.2 Studs

Based on ABAQUS Results

From the ABAQUS results, the maximum shear force and relative deflection are 14 kips and 0.01418 in., respectively. The maximum shear force and deflection occur at the lowest row of studs which is located near the bottom of the concrete wall. The maximum deflection (or deformation) due to the

tension force is 0.000028 in. The ultimate allowable deflections for embedded studs under shear and tension forces are approximately 0.22 and 0.20 in., respectively (Figures 4.1-8 and 4.1-9). Results using these data with a factor of safety of 4.0 for the ultimate deflections, based on the ASME recommendation, indicate adequate structural integrity for the embedded studs.

Based on ANSYS Results

The ANSYS results show that a maximum stud shear force of 16,255 lbf (conservative when compared to the ABAQUS result of 14 kips) occurs at the lowest stud (node 26014, Figure 4.2-2). Because the stud stiffness is 10^6 lbf/in, this represents a displacement of 0.0163 in. which is less than the allowable of 0.055 in. ($0.22/4$). Recognizing that the anchor-liner studs may be more flexible than that represented by the 10^6 lbf/in stiffness, an additional ANSYS run (See Appendix B, file stfpt5pl.out) was made using a stiffness value of 10^5 lbf/in. This results in a decrease in liner stresses and strains and an increase in the deflection at the studs. From this analysis the maximum stud shear force is 5,218 lbf which corresponds to a deflection of 0.052 in. but is still acceptable.

5.5.2.3 Reinforcement Steel Rebar. The material specification for the reinforcement steel rebar is ASTM A615 Grade 40 and Grade 60. Minimum strength properties are: 1) for grade 40 rebars, a yield strength of 40 kip/in² and an ultimate strength of 70 kip/in², and 2) for grade 60 rebars, a yield strength of 60 kip/in² and an ultimate strength of 90 kip/in². The minimum elongation for these rebars is 9 percent.

The concrete wall has a constant thickness of 18 in. up to the haunch region. The dome varies in thickness from 15 in. at the center to 30 in. in the haunch region. Tables 5.5-1 and 5.5-2 summarize the distribution of the reinforcing steel rebar in the wall and dome region. The ratio of the radial and the circumferential reinforcement steel area to the concrete area is also shown in these tables.

The results of the transient thermal analysis indicate that the maximum uniaxial stress in the steel bar is 7 kip/in². The maximum uniaxial stress is compressive. The compression stress state results from the higher thermal expansion of the steel rebar as it attempts to expand against the concrete while inducing tension in the concrete. Because the concrete model was modified to avoid local tensile cracking, the predicted compressive stress in the rebar is conservative.

The maximum predicted tension stress in the rebar is 1.5 kip/in² and is located in the haunch region. As mentioned before, in order to avoid global divergence, the concrete model was modified to avoid local cracking. This modification resulted in lower induced tensile stress in the rebar. Therefore, the tensile stress for the rebar is recalculated assuming the concrete is fully cracked and the rebar is carrying all the tension forces. The maximum tensile stress in the concrete is 500 lbf/in² (see Figure 5.3-30) and the maximum ratio of the concrete to the steel rebar is $1/0.49 = 2.04$ (Table 5.5-2). The maximum tensile stress in the rebar is conservatively calculated as:

$$\begin{aligned}\sigma = & (\text{principal tensile stress in the concrete})/(\text{modulus of concrete}) \\ & \times (\text{maximum ratio of the concrete to the steel}) \\ & \times (\text{modulus of the steel}) \\ & + (\text{maximum predicted tensile stress in the rebar})\end{aligned}$$

$$\sigma = (0.5/(4.066 \times 10^3))(2.04)(30 \times 10^6) + 1.5 \text{ kip/in}^2$$

$$\sigma = 9 \text{ kip/in}^2$$

This stress is significantly lower than the allowable stress of 20 kip/in².

The concrete bond strength under pull-out and push-in bar conditions is estimated using the ACI code. The ACI Code specifies requirements for rebar development length to protect against bond failure. Based on these requirements, the modified rebar stress of 9 kip/in² is at a level much lower than that which would result in rebar bond failure where the allowable is typically greater than the yield strength of the rebar.

5.6 SUMMARY OF ANALYSIS RESULTS

Non-linear finite-element analysis was performed using the modified Newton method to predict the behavior of the tank under static loads. This method, with tight convergence, resulted in accurate response calculations. The static loads included dead weight (waste, soil overburden, and structural member body force), lateral soil pressure, and waste hydrostatic pressure. This analysis provided the initial stress state of the tank from which thermal stresses are superimposed.

Nonlinear transient thermal stress analysis was performed to predict the response of the tank under thermal loads. The temperature field shows temperature gradients, especially in the region near the secondary liner/concrete wall interface. These thermal gradients in conjunction with: 1) temperature-induced variations in the material properties, and 2) thermal and elastic property differences in the concrete wall and steel liner, result in stresses and stress gradients in these regions. The secondary steel liner goes into compression as the surface temperature increases and it attempts to expand against the concrete wall while inducing tension in the concrete. The temperature histories for this analysis were chosen to produce accurate response calculations while minimizing the central processing unit (CPU) time required to perform the analysis. This selection was based on an accurate representation of the initial transient thermal response (time steps with high temperature gradient and strong path dependency) and the maximum steady-state thermal response (time steps with the highest temperatures).

In this study, the finite element static and transient analysis results, in conjunction with the failure criteria, based on either stress or strain limitations, as appropriate, were used to evaluate structural integrity. Under the static load, failure is a load-controlled phenomenon, whereas under the transient thermal load, it is a displacement-controlled phenomenon. In the former case, failure stress criteria based on maximum principal and maximum shear stresses (Tresca-Saint Venant criterion) with allowable yield and ultimate allowable strength were used to evaluate the structural integrity. In the latter case, failure strain criteria with appropriate

allowable strain were used. The factors of safety for allowable strength were established based on the ASME recommendation.

The structural integrity of the reinforced steel rebar was examined addressing failure modes in the rebar and rebar-concrete interaction. These failure modes include consideration of the rebars, rebar splices, and rebar-concrete bond development. Rebar failure is due to strain in the longitudinal direction when it reaches the rupture limit. Rebar development and splice failures, which are typically characterized by splitting failure, are induced by the radial pressure due to axial forces in the rebar.

The structural integrity of the studs was also evaluated using the material allowable based on the ultimate embedded load strength and deflection. Under static load, the failure is controlled by the ultimate embedded load strength whereas under the thermal load, failure is controlled by the ultimate deflection. The experimental data for the allowable tension and shear strength of the embedded studs were obtained from the Nelson Stud Welding Company.

The analytical results demonstrate structural integrity of the storage tank under the defined transient thermal and static loads. The stresses and strains do not exceed the corresponding allowables. In addition, since the relative displacements at the secondary liner and stud locations are small, local buckling and separation at the liner/concrete interface will not occur. A summary of the margins to allowable are shown in Table 5.6-1. The results are for an inlet temperature of 200 °F and a flow rate of 800 ft³/min (condition 1 in Table 2.1.1).

It is recommended that the inlet temperature not to exceed a maximum of 200 °F and the flow rate not to exceed a maximum of 800 ft³/min.

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Figure 5.1-1. Lower Knuckle Region Temperature Time History for 200°F Inlet Air Temperature Condition

Figure 5.1-2. Lower Knuckle Region Temperature Time History for 140°F Inlet Air Temperature Condition

Figure 5.3-1. Deformed Shape for Static Loads - Tank

Figure 5.3-2. Deformed Shape for Static Loads - Liners

U
MAG. FACTOR = +9.0E+01
SOLID LINES - DISPLACED MESH
DASHED LINES - ORIGINAL MESH

STEEL LINERS, DEFORMED SHAPE FOR STAIC LOADS

TIME COMPLETED IN THIS STEP +1.000E+00 TOTAL ACCUMULATED TIME +3.000E+00 STEP 3 INCREMENT 100
ABAQUS VERSION 4-9-1 DATE: 16-May-94 TIME: 09:41:17

Figure 5.3-3. Deformed Shape for Combined Static and Thermal Loads - Tank
(200°F Annulus Air @ TBD Hours)

U
MAG. FACTOR = 7.1E+01
SOLID LINES - DISPLACED MESH
DASHED LINES - ORIGINAL MESH

DEFORMED SHAPE FOR SEVENTH THERMAL LOAD STEP)

TIME COMPLETED IN THIS STEP +1.000E+00 TOTAL ACCUMULATED TIME +1.000E+01 STEP 11 INCREMENT 100
ABRQUS VERSION 4-9-1 DATE: 16-MAY-94 TIME: 09:41:17

Figure 5.3-4. Deformed Shape for Combined Static and Thermal Loads - Liners
(200°F Annulus Air @ TBD Hours)

U
MAX. FACTOR = +6.7E+01
SOLID LINES - DISPLACED MESH
DASHED LINES - ORIGINAL MESH

STEEL LINERS DEFORMED SHAPE FOR SEVENTH THERMAL LOAD

TIME COMPLETED IN THIS STEP +1.000E+00 TOTAL ACCUMULATED TIME +1.000E+01 STEP 11 INCREMENT 100
ABRAXUS VERSION 4-9-1 DATE: 16-10-94 TIME: 09:41:17

Figure 5.3-5. Smallest Principal Stress for Static Loads - Liners
(Membrane + Bending @ Integration Point 1)

Integration Point 1 = Inside
Integration Point 3 = Outside
Units are in lbf/in²

LINER PRIN1 STRESS (MEM+BEN1) FOR STATIC LOADS

TITLE COMPLETED IN THIS STEP +1.000E+00 TOTAL ACCUMULATED TIME +3.000E+00 STEP 3 INCREMENT 100
ABAQUS VERSION 4.9-1 DATE: 16-MAY-94 TIME: 09:41:17

Figure 5.3-6. Smallest Principal Stress for Static Loads - Liners
(Membrane + Bending @ Integration Point 3)

Integration Point 1 = Inside
Integration Point 3 = Outside
Units are in lbf/in²

PRIN1
SECTION
POINT 3
VALUE

-7.00E+03
-5.40E+03
-3.80E+03
-2.20E+03
-5.99E+02
+1.00E+03

LINER PRIN1 STRESS (MEM+BEN3) FOR STATIC LOADS

TIME COMPLETED IN THIS STEP +1.000E+00 . TOTAL ACCUMULATED TIME +3.000E+00 STEP 3 INCREMENT 100
ABRQUS VERSION 4-9-1 DATE: 16-10-94 TIME: 09:41:17

Figure 5.3-7. Intermediate Principal Stress for Static Loads - Liners
(Membrane + Bending @ Integration Point 1)

Integration Point 1 = Inside
Integration Point 3 = Outside
Units are in lbf/in²

LINER PRIN2 STRESS (MEM+BEN1) FOR STATIC LOADS

TIME COMPLETED IN THIS STEP +1.000E+00 TOTAL ACCUMULATED TIME +3.000E+00 STEP 3 INCREMENT 100
ABRIOUS VERSION 4-9-1 DATE: 16-May-94 TIME: 09:41:17

Figure 5.3-8. Intermediate Principal Stress for Static Loads - Liners
(Membrane + Bending @ Integration Point 3)

Integration Point 1 = Inside
Integration Point 3 = Outside
Units are in lbf/in²

Figure 5.3-9. Largest Principal Stress for Static Loads - Liners
(Membrane + Bending @ Integration Point 1)

Integration Point 1 = Inside
Integration Point 3 = Outside
Units are in lbf/in²

Figure 5.3-10. Largest Principal Stress for Static Loads - Liners
(Membrane + Bending @ Integration Point 3)
(Membrane)

Integration Point 1 = Inside
Integration Point 3 = Outside
Units are in lbf/in²

LINER PRIN3 STRESS (MEM+BEN3) FOR STATIC LOADS

TIME COMPLETED IN THIS STEP +1.000E+00 TOTAL ACCUMULATED TIME +3.000E+00 STEP 3 INCREMENT 100
ABAQUS VERSION 4-9-1 DATE: 16-MAY-94 TIME: 09:41:17

Figure 5.3-11. Tresca Stress for Static Loads - Liners
(Membrane + Bending @ Integration Point 1)

Integration Point 1 = Inside
Integration Point 3 = Outside
Units are in lbf/in²

LINER TRESCA STRESS (MEM+BEN1) FOR STATIC LOADS

TRESCA COMPLETED IN THIS STEP +1.000E+00 TOTAL ACCUMULATED TIME +3.000E+00 STEP 3 INCREMENT 100
RABOLUS VERSION 4-9-1 DATE: 16-Feb-94 TIME: 09:41:17

Figure 5.3-12. Tresca Stress for Static Loads - Liners
(Membrane + Bending @ Integration Point 3)

Integration Point 1 = Inside
Integration Point 3 = Outside
Units are in lbf/in²

TRESA
SECTION
POINT 3
VALUE

+4.00E+03
+4.00E+03
+8.00E+03
+1.00E+04
+1.00E+04
+2.00E+04

1
2

LINER TRESA STRESS (MEM+BEN3) FOR STATIC LOADS

TRE COMPLETED IN THIS STEP +1.00E+00 TOTAL ACCUMULATED TIME +3.00E+00 STEP 3 INCREMENT 100
ABRIOUS VERSION 4-9-1 DATE: 16-MAY-94 TIME: 09:41:17

Figure 5.3-13. Smallest Principal Stress for Combined Static and Thermal Loads for Liners
(Membrane + Bending @ Integration Point 1)

Integration Point 1 = Inside
Integration Point 3 = Outside
Units are in lbf/in²

PRIN1
SECTION POINT 1
VALUE

-1.10E+04
-8.80E+03
-6.60E+03
-4.40E+03
-2.19E+03
+2.20E-03

LINER PRIN1 STRESS (MEM+BEN1) FOR SEVENTH THERMAL
TIME COMPLETED IN THIS STEP +1.000E+00 TOTAL ACCUMULATED TIME +1.000E+01 STEP 11 INCREMENT 100
ABQUS VERSION 4-9-1 DATE: 16-FEB-94 TIME: 09:41:17

Figure 5.3-14. Smallest Principal Stress for Combined Static and Thermal Loads for Liners
(Membrane + Bending @ Integration Point 3)

Integration Point 1 = Inside
Integration Point 3 = Outside
Units are in lbf/in²

LINER PRIN1 STRESS (MEM+BEN3) FOR SEVENTH THERMAL
TIME COMPLETED IN THIS STEP +1.800E+08 TOTAL ACCUMULATED TIME +1.800E+01 STEP 11 INCREMENT 100
ABAQUS VERSION 4.9-1 DATE: 16-May-94 TIME: 09:41:17

Figure 5.3-15. Intermediate Prin. Stress for Combined Static and Thermal Loads for Liners
(Membrane + Bending @ Integration Point 1)

Integration Point 1 = Inside
Integration Point 3 = Outside
Units are in lbf/in^2

LINER PRIN2 STRESS (MEM+BEN1) FOR SEVENTH THERMAL
TIME COMPLETED IN THIS STEP +1.000E+00 TOTAL ACCUMULATED TIME +1.000E+01 STEP 11 INCREMENT 100
ABRIOUS VERSION 4-9-1 DATE: 16-May-94 TIME: 09:41:17

Figure 5.3-16. Intermediate Prin. Stress for Combined Static and Thermal Loads for Liners
(Membrane + Bending @ Integration Point 3)

Integration Point 1 = Inside
Integration Point 3 = Outside
Units are in lbf/in²

1
2

LINER PRIN1 STRESS (MEM+BEN3) FOR SEVENTH THERMAL
TIME COMPLETED IN THIS STEP +1.000E+00 TOTAL ACCUMULATED TIME +1.000E+01 STEP 11 INCREMENT 100
R00005 VERSION 4-9-1 DATE: 16-NOV-94 TIME: 09:41:17

Figure 5.3-17. Largest Principal Stress for Combined Static and Thermal Loads for Liners
(Membrane + Bending @ Integration Point 1)

Integration Point 1 = Inside
Integration Point 3 = Outside
Units are in lbf/in²

LINEAR PRINC STRESS (MEM+BEN1) FOR SEVENTH THERMAL
TIME COMPLETED IN THIS STEP +1.000E+00 TOTAL ACCUMULATED TIME +1.000E+01 STEP 11 INCREMENT 100
ABRADS VERSION 4-9-1 DATE: 16-MAY-94 TIME: 09:41:17

Figure 5.3-18. Largest Principal Stress for Combined Static and Thermal Loads for Liners
(Membrane + Bending @ Integration Point 3)

Integration Point 1 = Inside
Integration Point 3 = Outside
Units are in lbf/in^2

LINER PRINC STRESS (MEM+BEN3) FOR SEVENTH THERMAL
TIME COMPLETED IN THIS STEP +1.000E+00 TOTAL ACCUMULATED TIME +1.000E+01 STEP 11 INCREMENT 100
ABAQUS VERSION 4-9-1 DATE: 16-May-94 TIME: 09:41:17

Figure 5.3-19. Tresca Stress for Combined Static and Thermal Loads - Liners
(Membrane + Bending @ Integration Point 1)

Integration Point 1 = Inside
Integration Point 3 = Outside
Units are in lbf/in²

TRESCA
SECTION POINT 1
VALUE

+4.00E+03
+4.00E+03
+2.00E+03
+1.00E+04
+1.62E+04
+2.00E+04

1
2

LINER TRESCA STRESS (MEM+BEN1) FOR SEVENTH THERMAL
TIME COMPLETED IN THIS STEP +1.000E+00 TOTAL ACCUMULATED TIME +1.000E+01 STEP 11 INCREMENT 100
ABAQUS VERSION 4-9-1 DATE: 16-Feb-94 TIME: 09:41:17

Figure 5.3-20. Tresca Stress for Combined Static and Thermal Loads - Liners
(Membrane + Bending @ Integration Point 3)

Integration Point 1 = Inside
Integration Point 3 = Outside
Units are in lb/in^2

1
2

LINER TRESCA STRESS (MEM+BEN3) FOR SEVENTH THERMAL
TIME COMPLETED IN THIS STEP +1.000E+00 TOTAL ACCUMULATED TIME +1.000E+01 STEP 11 INCREMENT 100
ABAQUS VERSION 4.9-1 DATE: 16-May-94 TIME: 09:41:17

Figure 5.3-21. Meridional Strain for Combined Static and Thermal Loads
Secondary Liner
(Membrane + Bending @ Integration Point 1)

Integration Point 1 = Inside
Integration Point 3 = Outside

E11 STRAIN(MEM+BEN1)FOR SEVENTH THERMAL LOAD

TIME COMPLETED IN THIS STEP +1.000E+00 TOTAL ACCUMULATED TIME +1.000E+01 STEP 11 INCREMENT 100
ABRQUS VERSION 4-9-1 DATE: 16-May-94 TIME: 20:07:50

Figure 5.3-22. Meridional Strain for Combined Static and Thermal Loads
Secondary Liner
(Membrane + Bending @ Integration Point 3)

Integration Point 1 = Inside
Integration Point 3 = Outside

E11 STRAIN(MEM+BEN3)FOR SEVENTH THERMAL LOAD
TIME COMPLETED IN THIS STEP +1.000E+00 TOTAL ACCUMULATED TIME +1.000E+01 STEP 11 INCREMENT 100
ABAQUS VERSION 4-9-1 DATE: 16-Feb-94 TIME: 20:07:50

Figure 5.3-23. Meridional Strain for Combined Static and Thermal Loads
Secondary Liner
(Membrane)

Integration Point 1 = Inside
Integration Point 3 = Outside

E11 STRAIN(MEM)FOR SEVENTH THERMAL LOAD
TIME COMPLETED IN THIS STEP +1.000E+00 TOTAL ACCUMULATED TIME +1.000E+01 STEP 11 INCREMENT 100
ABAQUS VERSION 4.9-1 DATE: 16-FEB-94 TIME: 20:07:50

Figure 5.3-24. Axial Strain for Combined Static and Thermal Loads
Secondary Liner
(Membrane + Bending @ Integration Point 1)

Integration Point 1 = Inside
Integration Point 3 = Outside

E22 STRAIN(MEM+BEN1)FOR SEVENTH THERMAL LOAD
TIME COMPLETED IN THIS STEP +1.000E+00 TOTAL ACCUMULATED TIME +1.000E+01 STEP 11 INCREMENT 100
RADIUS VERSION 4-9-1 DATE: 16-Feb-94 TIME: 20:07:50

Figure 5.3-25. Axial Strain for Combined Static and Thermal Loads
Secondary Liner
(Membrane + Bending @ Integration Point 3)

Integration Point 1 = Inside
Integration Point 3 = Outside

E22 STRAIN(MEM+BEN3)FOR SEVENTH THERMAL LOAD

TITLE COMPLETED IN THIS STEP +1.000E+00 TOTAL ACCUMULATED TIME +1.000E+01 STEP 11 INCREMENT 100
ABAQUS VERSION 4-9-1 DATE: 16-Feb-94 TIME: 20:07:50

Figure 5.3-26. Axial Strain for Combined Static and Thermal Loads
Secondary Liner
(Membrane)

Integration Point 1 = Inside
Integration Point 3 = Outside

E22 STRAIN(MEM)FOR SEVENTH THERMAL LOAD

TIME COMPLETED IN THIS STEP +1.880E+08 TOTAL ACCUMULATED TIME +1.880E+08
ABRIOUS VERSION 4-9-1 DATE: 16-July-94 TIME: 20:07:50

STEP 11 INCREMENT 100

Figure 5.3-27. Hoop Strain for Combined Static and Thermal Loads
Secondary Liner
(Membrane + Bending @ Integration Point 1)

Integration Point 1 = Inside
Integration Point 3 = Outside

E33 STRAIN(MEM+BEN1)FOR SEVENTH THERMAL LOAD

TIME COMPLETED IN THIS STEP +1.000E+00 TOTAL ACCUMULATED TIME +1.000E+01 STEP 11 INCREMENT 100
ABR005 VERSION 4-9-1 DATE: 16-Feb-94 TIME: 20:07:50

Figure 5.3-28. Smallest Prin. Stress for Combined Static and Thermal Loads
for Concrete

Units are in lbf/in²

Figure 5.3-29. Intermediate Prin. Stress for Trans. Thermal Loads - Concrete

Units are in lbf/in²

Figure 5.3-30. Largest Prin. Stress for Combined Static and Thermal Loads for Concrete

Units are in lbf/in²

Figure 5.3-31. Meridional Strain for Combined Static and Thermal Loads for Concrete

CONCRETE STRAIN 1-DIR FOR SEVENTH THERMAL LOAD
TIME COMPLETED IN THIS STEP +1.000E+00 TOTAL ACCUMULATED TIME +1.000E+01 STEP 11 INCREMENT 100
ABRQUIS VERSION 4-9-1 DATE: 16-Feb-94 TIME: 09:41:17

Figure 5.3-32. Axial Strain for Combined Static and Thermal Loads - Concrete

Figure 5.3-33. Hoop Strain for Combined Static and Thermal Loads - Concrete

CONCRETE STRAIN 3-DIR FOR SEVENTH THERMAL LOAD

TIME COMPLETED IN THIS STEP +1.000E+00 TOTAL ACCUMULATED TIME +1.000E+01 STEP 11 INCREMENT 100
ABAQUS VERSION 4-9-1 DATE: 16-May-94 TIME: 09:41:17

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Table 5.4-1. Limiting Allowables

Item	Limiting Stress Type	Allowable
Primary Steel Liner	Predominantly Primary Stresses	Membrane Stress $\leq S_y$ $\leq 18.25 \text{ kip/in}^2$ Membr+Bending Stress $\leq 1.5 S_y$ $\leq 24.3 \text{ kip/in}^2$
Secondary Steel Liner	Predominantly Secondary Stresses and Strains	Membrane Strain $\leq 0.002 \text{ in/in}$ Membr.+Bending Strain $\leq 0.004 \text{ in/in}$
Structural Concrete*	Predominantly Primary Stresses	Compres. Stress $\leq 0.45 (4500) \text{ lbf/in}^2$ $\leq 2025 \text{ lbf/in}^2$
Rebar*	Predominantly Primary Stresses	Axial Stress $\leq 20,000 \text{ lbf/in}^2$
Liner-to-Concrete Nelson Studs	Predominantly Secondary Stresses and Strains	Disp. $\leq 0.25 \text{ Ultimate Disp.}$ $\leq 0.055 \text{ in (shear)}$ $\leq 0.050 \text{ in (axial)}$

* Using working stress approach.

Table 5.5-1. Tank 241SY101 Concrete Dome Rebar Reinforcement

Radial			Circumferential		
Radius	Distribution	% Rebar	Radius	Distribution	% Rebar
0 - 7'3"	#6 T/B @ 10" CC	0.60	0' - 20'	#6 @ 12" CC EF	0.87
7'3" - 12'-6"	#6 T/B @ 9" CC	0.60	20' - 23'	7 #8 @ 6" CC EF	0.87
12'6" - 26'-9"	#6 T/B @ 10" CC	0.60	23' - 26'	7 #9 @ 6" CC EF	1.10
26'9" - 41'-3"	#8 T/B @ 6"	1.91	26' - 30'	12 #9 @ 4" CC EF	1.66
32'0" - 41'-3"	#6 @ Middepth @ 18" CC }		30' - 41'	22 #9 @ 4½" CC EF }	4.42
			30' - 41'	23 #9 @ 4½" Mid }	

T/B = Top and Bottom
CC = Center-to-Center
EF = Each Face

Table 5.5-2. Tank 241SY101 Cylindrical Concrete Wall Rebar Reinforcement

Vertical				Circumferential					
Height	Distribution			% Rebar	Height	Distribution			% Rebar
0-10'	#6 @ 12"	CC	EF	0.49	0' - 17'	#8 @ 8"	CC	EF	1.31
10' - 23'	#6 @ 9"	CC	EF	0.65	17' - 32½'	#8 @ 12"	CC	EF	0.87
23' - 29'	#8 @ 12"	CC	EF	0.87					
29' - 32'-6"	#8 @ 6"	CC	EF	1.75					

T/B = Top and Bottom
CC = Center-to-Center
EF = Each Face

Table 5.6-1. Summary of Limiting Margins to Allowable

Item	Limiting Evaluation Quantity	Allowable
Primary Steel Liner ⁽¹⁾	Membrane Stress = 15.5 kip/in ² Membr+Bending Stress = 20 kip/in ²	16.25 kip/in ² 24.3 kip/in ²
Secondary Steel Liner ⁽²⁾	Membrane Strain = 0.00076 in/in	0.002 in/in
Structural Concrete ^(1, 3)	Maximum Stress = 500 lbf/in ²	2025 lbf/in ²
Rebar ^(1, 3)	Maximum Stress = 9000 lbf/in ²	20,000 lbf/in ²
Liner-to-Concrete Nelson Studs ⁽²⁾	Shear Displacement = 0.052 in Axial Displacement = 0.000028 in	0.055 in (shear) 0.050 in (axial)

Notes Table 5.6-1

1. Stresses due almost entirely to static (non-thermal) loading
2. Stresses due almost entirely to thermal loading
3. Using working stress approach.

6.0 REFERENCES

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APPENDIX A

ABAQUS COMPUTER INPUT AND OUTPUT FILES

Prepared by: ayoub Farahy 5,26,94
Date

Checked by: T. Neal Watts 5/26/94
Date

ABAQUS Input File: thermala.abdat

```

*HEADING
241-SY-101 TANK *** FILE thermala.abdat dated 5/16/94 ***
** This model is used to evaluate annulus heating.
**----- ABAQUS CONSTRUCTION OF WASTE TANK -----*
*NODE,NSET=TANK,SYSTEM=R
**-----
** Node number, x, y coordinates
**-----
100, 0., 0.
102, 18., 0.
104, 36., 0.
108, 76., 12.5
136, 329., 12.5
142, 417., 0.
150, 468., 0.
152, 476., 0.
154, 480., 0.
156, 489., 0.
158, 498., 0
300, 0., 12.
500, 0., 24.
502, 18., 24.
504, 36., 24.
506, 56., 24.
508, 76., 24.
536, 329., 24.
542, 417., 24.
550, 468., 24.
552, 476., 24.
554, 480., 24.
556, 489., 24.
558, 498., 24.
***** NODES OFFSET TO ENSURE GAP DIRECTION
700, 0., 24.00001
754, 480., 24.00001
756, 489., 24.00001
758, 498., 24.00001
*****
954, 480., 28.
956, 489., 28.
958, 498., 28.
1154, 480., 36.
1156, 489., 36.
1158, 498., 36.
1354, 480., 48.
1356, 489., 52.
1358, 498., 52.
1554, 480., 76.
1556, 489., 76.
1558, 498., 76.
***** NEW NODES
2952, 479.999, 220.
3152, 479.999, 228.
3352, 479.999, 245.75
4152, 479.999, 341.75
4352, 479.999, 365.75
4552, 479.999, 389.75
4752, 479.999, 413.75
4952, 478.799, 426.6
5152, 477.499, 432.0
5352, 475.899, 437.2
5552, 472.199, 446.2
*****
2954, 480., 220.
2956, 489., 220.
2958, 498., 220.
3154, 480., 228.
3156, 489., 228.
3158, 498., 228.
3354, 480., 245.75

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3356, 489., 245.75
3358, 498., 245.75
4154, 480., 341.75
4156, 489., 341.75
4158, 498., 341.75
4354, 480., 365.75
4356, 489., 365.75
4358, 498., 365.75
4554, 480., 389.75
4556, 489., 389.75
4558, 498., 389.75
4754, 480.0, 413.75
4954, 478.8, 426.6
5154, 477.5, 432.0
5354, 475.9, 437.2
5554, 472.2, 446.2

*****

*****

5754, 468.1, 453.5
5954, 458.1, 467.5
6154, 452.3, 474.0
6354, 446.0, 480.3
6554, 439.2, 486.4
6754, 432.1, 492.1
6954, 420.8, 500.3
7154, 409.0, 508.0
7354, 396.7, 515.1
7554, 384.5, 521.5
7754, 373.1, 527.0
7954, 361.5, 532.2
8154, 345.9, 538.5
8354, 328.4, 545.0
8554, 310.8, 550.9
8754, 293.4, 556.2
8954, 276.1, 561.0
9154, 259.0, 565.3
9354, 242.0, 569.2
9554, 225.2, 572.7
9754, 208.4, 575.9
9954, 191.8, 578.8
10154, 175.1, 581.4
10354, 158.3, 583.7
10554, 141.4, 585.8
10754, 124.3, 587.6
10954, 106.9, 589.2
11154, 89.04, 590.6
11354, 70.72, 591.8
11554, 51.82, 592.7
11754, 32.26, 593.4
11954, 11.95, 593.7
12154, 0.00, 593.8

***** NEW NODES ON TOP

5752, 468.099, 453.5
5952, 458.099, 467.5
6152, 452.299, 474.0
6352, 445.9990, 480.3
6552, 439.199, 486.4

*****

*****

4756, 489.0, 413.75
4758, 498.0, 413.75
4958, 498.0, 431.75
5158, 498.0, 441.75
5358, 498.0, 451.75
5558, 498.0, 463.75
5758, 498.0, 475.75
5858, 498.2, 484.1
5958, 487.9, 490.2
6158, 480.1, 494.6
6358, 472.2, 499.0
6558, 462.3, 504.4
6758, 452.3, 509.6
6958, 440.3, 515.7

7158, 428.2, 521.6
7358, 415.9, 527.3
7558, 403.6, 532.8
7758, 388.9, 539.0
7958, 374.0, 545.0
8158, 357.2, 551.3
8358, 340.2, 557.3
8558, 323.1, 562.9
8758, 305.9, 568.2
8958, 288.5, 573.0
9158, 269.2, 578.0
9358, 249.7, 582.5
9558, 230.5, 586.4
9758, 212.8, 589.7
9958, 195.0, 592.8
10158, 177.3, 595.6
10358, 159.4, 598.1
10558, 141.6, 600.4
10758, 123.7, 602.4
10958, 105.8, 604.1
11158, 87.84, 605.5
11358, 69.88, 606.7
11558, 51.9, 607.6
11758, 33.91, 608.3
11958, 13.92, 608.7
12158, 0.00, 608.8

***** projectile mass nodes *****
***** NODES OFFSET TO ENSURE GAP DIRECTION *****

5860, 498.2, 484.1001
5960, 487.9, 490.2001
6160, 480.1, 494.6001
6360, 472.2, 499.0001
6560, 462.3, 504.4001
6760, 452.3, 509.6001
6960, 440.3, 515.7001
7160, 428.2, 521.6001
7360, 415.9, 527.3001
7560, 403.6, 532.8001
7760, 388.9, 539.0001
7960, 374.0, 545.0001
8160, 357.2, 551.3001
8360, 340.2, 557.3001
8560, 323.1, 562.9001
8760, 305.9, 568.2001
8960, 288.5, 573.0001
9160, 269.2, 578.0001
9360, 249.7, 582.5001
9560, 230.5, 586.4001
9760, 212.8, 589.7001
9960, 195.0, 592.8001
10160, 177.3, 595.6001
10360, 159.4, 598.1001
10560, 141.6, 600.4001
10760, 123.7, 602.4001
10960, 105.8, 604.1001
11160, 87.84, 605.5001
11360, 69.88, 606.7001
11560, 51.9, 607.6001
11760, 33.91, 608.3001
11960, 13.92, 608.7001
12160, 0.00, 608.8001

***** NODES FOR SECONDARY CIRCULAR ARC *****

852, 472.6, 24.91
952, 476.5, 27.51
1052, 479.1, 31.41
1152, 480., 36.

***** NODES FOR PRIMARY LINER *****

900, 0., 32.25
902, 18., 32.25
904, 36., 32.25
906, 56., 32.25
908, 76., 32.25
936, 329., 32.25

```

942, 402., 32.25
944, 429.75, 32.25
946, 442.6, 33.16
948, 446.5, 35.8
950, 449.1, 39.66
1150, 450.0, 44.25
1350, 450.0, 52.0
1550, 450.0, 68.25
2950, 450.0, 220.
3150, 450.0, 228.
3350, 450.0, 245.75
4150, 450.0, 341.75
4350, 450.0, 365.75
4550, 450.0, 389.75
4750, 450.0, 413.75
4950, 450.0, 426.6
5150, 450.0, 432.0
5350, 450.0, 437.2
5550, 450.0, 446.2
5750, 450.0, 454.3
5950, 447.9, 468.3
6150, 445.3, 475.1
6350, 441.7, 481.3
6550, 437.3, 486.8
***** extra nodes for bottom wall sliner *****
***** NODES OFFSET TO ENSURE GAP DIRECTION
1152, 479.9999, 36.
1352, 479.9999, 48.0
1552, 479.9999, 76.0
*****NEW NODE SET FOR SHELL
*NGEN,NSET=NEW
1552,2952,200
***** GENERATION OF FLOOR *****
*NGEN,NSET=TANK
*****
** NGEN, starting node, last node, increments between
*****
104,108,2
108,136,2
136,142,2
142,150,2
508,536,2
536,542,2
542,550,2
*NSET,NSET=R100,GENERATE
*****
** NSET, beginning node, last node,increment
*****
102,158,2
*NSET,NSET=R500,GENERATE
502,558,2
*NFILL,NSET=TANK
*****
** NFILL, first boundary node set, last boundary node set, intervals
** along each line, increment in node number
*****
R100,R500,2,200
***** GENERATION FOR WALL OF TANK *****
*NGEN,NSET=TANK
1554,2954,200
1556,2956,200
1558,2958,200
3352,4152,200
3354,4154,200
3356,4156,200
3358,4158,200
*NSET,NSET=R54,GENERATE
754,4754,200
*NSET,NSET=R56,GENERATE
756,4756,200
*NFILL,NSET=TANK
R54,R56,2
*NSET,NSET=R58,GENERATE

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```

758,4758,200
*NFILL,NSET=TANK
R56,R58,2
**----- GENERATION OF HAUNCH -----*
*NGEN,NSET=TANK
4754,4758,2
4954,4958,2
5154,5158,2
5354,5358,2
5554,5558,2
5754,5758,2
*NSET,NSET=R4754,GENERATE
4754,5754,200
*NSET,NSET=R4758,GENERATE
4758,5758,200
*NFILL,NSET=TANK
R4754,R4758,2,2
**----- GENERATION OF PRIMARY LINER NODES -----*
*NGEN,NSET=TANK
908,936,2
936,942,2
1550,2950,200
3350,4150,200
*NSET,NSET=R5954,GENERATE
5954,12154,200
*NSET,NSET=R5958,GENERATE
5958,12158,200
*NFILL,NSET=TANK
R5954,R5958,2,2
**----- CREATING GAP FOR SECONDARY LINER -----*
*NSET,NSET=R502,GENERATE
502,550,2
*NCOPY,CHANGE NUMBER=200,OLD SET=R502,SHIFT,NEW SET=R702
**-----
** x,y,z translation to be applied
** x,y,z first rotation, x,y,z second rotaion
**-----
0.,0.00001,0.
0.,24.,0.,0.,24.00001,0.,0.
*NSET,NSET=RR58,GENERATE
758,5758,200
*NSET,NSET=RR58
5858
*NCOPY,CHANGE NUMBER=12,OLD SET=RR58,SHIFT,NEW SET=R70
12.,0.,0.
498.,0.,0.,498.,.0001,0.,0.
**----- DEFINING GAP NODES BETWEEN PLINER AND GROUT ----*
*NSET,NSET=R900,GENERATE
900,946,2
*NCOPY,CHANGE NUMBER=-100,OLD SET=R900,SHIFT,NEW SET=R800
0.,-.00001,0.
0.,24.,0.,0.,24.00001,0.,0.
**----- nodes added to avoid mass1/grav prob. ----*
*NSET,NSET=R950,GENERATE
900,950,2
*NCOPY,CHANGE NUMBER=100,OLD SET=R950,SHIFT,NEW SET=R1000
0.,0.,0.
0.,24.,0.,0.,24.00001,0.,0.
*NSET,NSET=TANK
R702
R70
R800
R1000
**----- DEFINING ELEMENT DATA FOR TANK -----*
*ELEMENT,TYPE=CAX4,ELSET=DOVE
**-----
** Element number,first,second,third,and forth nodes (CCW)
**-----
754,754,756,956,954
100,100,102,302,300
102,102,104,304,302
4754,4754,4756,4956,4954
5756,5756,5758,5858,5958

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5954,5954,5956,6156,6154
5754,5754,5756,5956,5954
*ELEMENT,TYPE=CAX3,ELSET=TRIANGLE
5958,5756,5958,5956
*ELGEN,ELSET=DOME
**-----
** Master element number, num elements in 1st row, incr. in node num,
** incr. in element num, number of row defined, incr. in node,
** incr. in element number
**-----
754,20,200,200,2,2,2
102,2,200,200,28,2,2
4754,5,200,200,2,2,2
5954,31,200,200,2,2,2
**----- DEFINING ELEMENT LINER DATA -----*
**----- DEFINING INTERFACE ELEMENTS -----*
*ELEMENT,TYPE=INTER2A,ELSET=GAP
**-----
** Master element number, 1st, 2nd, 3rd, 4th node numbers
**-----
554,554,556,754,756
556,556,558,756,758
**----- DEFINING NL SPRING GAPS BETWEEN GROUT AND SLINER2 ----*
*ELEMENT,TYPE=SPRING2,ELSET=NLSPRING
502,702,502
*ELGEN,ELSET=NLSPRING
502,25,2,2
**----- DEFINING ELEMENT LINER DATA -----*
**----- SECONDARY LINER -----*
*ELEMENT,TYPE=SAX1,ELSET=SLINER1
**-----
** Master element number, 1st and 2nd nodes
**-----
742,742,744
744,744,746
746,746,748
748,748,750
752,750,852
852,852,952
952,952,1052
1052,1052,1152
1152,1152,1352
***** NEW MODIFIED SHELL(NEW ELEMENTS 1552 AND 1752)
*ELEMENT,TYPE=SAX1,ELSET=SLINER2
700,700,702
1352,1352,1552
1552,1552,1752
1752,1752,1952
6552,6552,6754
*****
*ELGEN,ELSET=SLINER2
700,21,2,2
1752,24,200,200
*****adding studs(new elements)
*****STUDS FOR TENSIONS ARE STUD11,STUD22,STUD33, AND STUD44
*ELEMENT,ELSET=STUD11,TYPE=SPRING2
1151,1154,1152
*ELEMENT,ELSET=STUD22,TYPE=SPRING2
1351,1354,1352
*ELEMENT,ELSET=STUD33,TYPE=SPRING2
1551,1554,1552
*ELEMENT,ELSET=STUD44,TYPE=SPRING2
1751,1754,1752
*ELEMENT,ELSET=STUD44,TYPE=SPRING2
1951,1954,1952
*ELEMENT,ELSET=STUD44,TYPE=SPRING2
2151,2154,2152
*ELEMENT,ELSET=STUD44,TYPE=SPRING2
2351,2354,2352
*ELEMENT,ELSET=STUD44,TYPE=SPRING2
2551,2554,2552
*ELEMENT,ELSET=STUD44,TYPE=SPRING2
2751,2754,2752

```


*ELEMENT,ELSET=STUD44,TYPE=SPRING2
3151,3154,3152
*ELEMENT,ELSET=STUD44,TYPE=SPRING2
3351,3354,3352
*ELEMENT,ELSET=STUD44,TYPE=SPRING2
3551,3554,3552
*ELEMENT,ELSET=STUD44,TYPE=SPRING2
3751,3754,3752
*ELEMENT,ELSET=STUD44,TYPE=SPRING2
3951,3954,3952
*ELEMENT,ELSET=STUD44,TYPE=SPRING2
4151,4154,4152
*ELEMENT,ELSET=STUD44,TYPE=SPRING2
4351,4354,4352
*ELEMENT,ELSET=STUD44,TYPE=SPRING2
4551,4554,4552
*ELEMENT,ELSET=STUD44,TYPE=SPRING2
4751,4754,4752
*ELEMENT,ELSET=STUD44,TYPE=SPRING2
4951,4954,4952
*ELEMENT,ELSET=STUD44,TYPE=SPRING2
5151,5154,5152
*ELEMENT,ELSET=STUD44,TYPE=SPRING2
5351,5354,5352
*ELEMENT,ELSET=STUD44,TYPE=SPRING2
5551,5554,5552
*ELEMENT,ELSET=STUD44,TYPE=SPRING2
5751,5754,5752
*ELEMENT,ELSET=STUD44,TYPE=SPRING2
5951,5954,5952
*ELEMENT,ELSET=STUD44,TYPE=SPRING2
6151,6154,6152
*ELEMENT,ELSET=STUD44,TYPE=SPRING2
6351,6354,6352
*ELEMENT,ELSET=STUD44,TYPE=SPRING2
6551,6554,6552
*****STUDS FOR TENSIONS AND COMPRESSIONS ARE STUD12,STUD21,STUD31, AND STUD41
*ELEMENT,ELSET=STUD12,TYPE=SPRING2
1153,1154,1152
*ELEMENT,ELSET=STUD21,TYPE=SPRING2
1353,1354,1352
*ELEMENT,ELSET=STUD31,TYPE=SPRING2
1553,1554,1552
*ELEMENT,ELSET=STUD41,TYPE=SPRING2
1753,1754,1752
*ELEMENT,ELSET=STUD41,TYPE=SPRING2
1953,1954,1952
*ELEMENT,ELSET=STUD41,TYPE=SPRING2
2153,2154,2152
*ELEMENT,ELSET=STUD41,TYPE=SPRING2
2353,2354,2352
*ELEMENT,ELSET=STUD41,TYPE=SPRING2
2553,2554,2552
*ELEMENT,ELSET=STUD41,TYPE=SPRING2
2753,2754,2752
*ELEMENT,ELSET=STUD41,TYPE=SPRING2
2953,2954,2952
***
*ELEMENT,ELSET=STUD41,TYPE=SPRING2
3153,3154,3152
*ELEMENT,ELSET=STUD41,TYPE=SPRING2
3353,3354,3352
*ELEMENT,ELSET=STUD41,TYPE=SPRING2
3553,3554,3552
*ELEMENT,ELSET=STUD41,TYPE=SPRING2
3753,3754,3752
*ELEMENT,ELSET=STUD41,TYPE=SPRING2
3953,3954,3952
*ELEMENT,ELSET=STUD41,TYPE=SPRING2
4153,4154,4152
*ELEMENT,ELSET=STUD41,TYPE=SPRING2
4353,4354,4352
*ELEMENT,ELSET=STUD41,TYPE=SPRING2

```

4553,4554,4552
*ELEMENT,ELSET=STUD41,TYPE=SPRING2
4753,4754,4752
*ELEMENT,ELSET=STUD41,TYPE=SPRING2
4953,4954,4952
*ELEMENT,ELSET=STUD41,TYPE=SPRING2
5153,5154,5152
*ELEMENT,ELSET=STUD41,TYPE=SPRING2
5353,5354,5352
*ELEMENT,ELSET=STUD41,TYPE=SPRING2
5553,5554,5552
*ELEMENT,ELSET=STUD41,TYPE=SPRING2
5753,5754,5752
*ELEMENT,ELSET=STUD41,TYPE=SPRING2
5953,5954,5952
*ELEMENT,ELSET=STUD41,TYPE=SPRING2
6153,6154,6152
*ELEMENT,ELSET=STUD41,TYPE=SPRING2
6353,6354,6352
*ELEMENT,ELSET=STUD41,TYPE=SPRING2
6553,6554,6552
***** PRIMARY LINER *****
*ELEMENT,TYPE=SAX1,ELSET=PLINER1
900,900,902
*ELGEN,ELSET=PLINER1
900,22,2,2
*ELEMENT,TYPE=SAX1,ELSET=PLINER2
944,944,946
946,946,948
948,948,950
950,950,1150
1150,1150,1350
1350,1350,1550
*ELEMENT,TYPE=SAX1,ELSET=PLINER3
1550,1550,1750
*ELGEN,ELSET=PLINER3
1550,5,200,200
*ELEMENT,TYPE=SAX1,ELSET=PLINER4
2550,2550,2750
4550,4550,4750
*ELGEN,ELSET=PLINER4
2550,10,200,200
*ELEMENT,TYPE=SAX1,ELSET=PLINER5
4750,4750,4950
5750,5750,5950
5950,5950,6150
6150,6150,6350
6350,6350,6550
6550,6550,6754
6750,6754,6954
10950,10954,11154
11150,11154,11354
*ELGEN,ELSET=PLINER5
4750,5,200,200
6750,21,200,200
*ELEMENT,TYPE=SAX1,ELSET=PLINER6
11350,11354,11554
*ELGEN,ELSET=PLINER6
11350,4,200,200
***** CONCRETE BETWEEN PRIMARY AND SECONDARY LINER *****
*ELEMENT,TYPE=CAX4,ELSET=SLAB
800,700,702,802,800
*ELGEN,ELSET=SLAB
800,23,2,2
***** NL SPRING INTERFACE ELEMS. BETWEEN PLINER AND GROUT *****
*ELEMENT,TYPE=SPRING2,ELSET=NLSPRING
600,900,800
*ELGEN,ELSET=NLSPRING
600,24,2,2
***** MASS OF FLUID (VERTICAL DIRECTION) *****
*ELEMENT,TYPE=MASS,ELSET=M1000
1000,1000
*ELEMENT,TYPE=MASS,ELSET=M1002

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1002,1002
*ELEMENT,TYPE=MASS,ELSET=M1004
1004,1004
*ELEMENT,TYPE=MASS,ELSET=M1006
1006,1006
*ELEMENT,TYPE=MASS,ELSET=M1008
1008,1008
*ELEMENT,TYPE=MASS,ELSET=M1010
1010,1010
*ELEMENT,TYPE=MASS,ELSET=M1012
1012,1012
*ELEMENT,TYPE=MASS,ELSET=M1014
1014,1014
*ELEMENT,TYPE=MASS,ELSET=M1016
1016,1016
*ELEMENT,TYPE=MASS,ELSET=M1018
1018,1018
*ELEMENT,TYPE=MASS,ELSET=M1020
1020,1020
*ELEMENT,TYPE=MASS,ELSET=M1022
1022,1022
*ELEMENT,TYPE=MASS,ELSET=M1024
1024,1024
*ELEMENT,TYPE=MASS,ELSET=M1026
1026,1026
*ELEMENT,TYPE=MASS,ELSET=M1028
1028,1028
*ELEMENT,TYPE=MASS,ELSET=M1030
1030,1030
*ELEMENT,TYPE=MASS,ELSET=M1032
1032,1032
*ELEMENT,TYPE=MASS,ELSET=M1034
1034,1034
*ELEMENT,TYPE=MASS,ELSET=M1036
1036,1036
*ELEMENT,TYPE=MASS,ELSET=M1038
1038,1038
*ELEMENT,TYPE=MASS,ELSET=M1040
1040,1040
*ELEMENT,TYPE=MASS,ELSET=M1042
1042,1042
*ELEMENT,TYPE=MASS,ELSET=M1044
1044,1044
*ELEMENT,TYPE=MASS,ELSET=M1046
1046,1046
*ELEMENT,TYPE=MASS,ELSET=M1048
1048,1048
*ELEMENT,TYPE=MASS,ELSET=M1050
1050,1050
***** FLUID MASS HORIZONTAL DIRECTION *****
***** IMPULSIVE MASS ONLY SLOSHING NEGLECTED *****
*ELEMENT,TYPE=MASS1,ELSET=M4740
4740,4750
*ELEMENT,TYPE=MASS1,ELSET=M4540
4540,4550
*ELEMENT,TYPE=MASS1,ELSET=M4340
4340,4350
*ELEMENT,TYPE=MASS1,ELSET=M4140
4140,4150
*ELEMENT,TYPE=MASS1,ELSET=M3940
3940,3950
*ELEMENT,TYPE=MASS1,ELSET=M3740
3740,3750
*ELEMENT,TYPE=MASS1,ELSET=M3540
3540,3550
*ELEMENT,TYPE=MASS1,ELSET=M3340
3340,3350
*ELEMENT,TYPE=MASS1,ELSET=M3140
3140,3150
*ELEMENT,TYPE=MASS1,ELSET=M2940
2940,2950
*ELEMENT,TYPE=MASS1,ELSET=M2740
2740,2750

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*ELEMENT,TYPE=MASS1,ELSET=M2540
2540,2550
*ELEMENT,TYPE=MASS1,ELSET=M2340
2340,2350
*ELEMENT,TYPE=MASS1,ELSET=M2140
2140,2150
*ELEMENT,TYPE=MASS1,ELSET=M1940
1940,1950
*ELEMENT,TYPE=MASS1,ELSET=M1740
1740,1750
*ELEMENT,TYPE=MASS1,ELSET=M1540
1540,1550
*ELEMENT,TYPE=MASS1,ELSET=M1340
1340,1350
*ELEMENT,TYPE=MASS1,ELSET=M1130
1130,1150
*ELEMENT,TYPE=MASS1,ELSET=M1132
1132,950
*ELEMENT,TYPE=MASS1,ELSET=M1134
1134,948
**----- BOUNDARY CONDITIONS -----*
*NSET,NSET=GROUND
100
R100
*NSET,NSET=AXIS
100,300,500,700,800,900,12154,12156,12158
*NSET,NSET=CP700,GENERATE
702,706,2
*NSET,NSET=CP500,GENERATE
502,506,2
*NSET,NSET=N50,GENERATE
4350,6550,200
*NSET,NSET=N54,GENERATE
4354,6554,200
**MPC
**7,N50,N54
**----- MASS NODE SETS FOR BC CONTROL ----*
*NSET,NSET=VFLUID,GENERATE
1000,1050,2
*BOUNDARY
**-----
** Coordinate system x=1, y=2, z=3
**-----
GROUND,2,2
AXIS,1,1
R70,2,6
VFLUID,1,1
VFLUID,3,6
**----- COUPLE THE VERTICAL DOF'S OF VFLUID & PLINER ----*
*EQUATION
2
R950,2,1,R1000,2,-1
**----- SECTIONS OF TANK -----*
*ELSET,ELSET=ZOOM1,GENERATE
4754,5554,200
4756,5556,200
*ELSET,ELSET=ZOOM2,GENERATE
5754,6554,200
5756,6556,200
*ELSET,ELSET=ZOOM2
5958
*ELSET,ELSET=ZOOM3,GENERATE
6754,7754,200
6756,7756,200
*ELSET,ELSET=ZOOM4,GENERATE
7754,8354,200
7756,8356,200
*ELSET,ELSET=ZOOM5,GENERATE
8354,8954,200
8356,8956,300
*ELSET,ELSET=ZOOM6,GENERATE
8954,9554,200
8956,9556,200

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*ELSET,ELSET=ZOOM7,GENERATE
9554,10154,200
9556,10156,200
*ELSET,ELSET=ZOOM8,GENERATE
10154,12154,200
10156,12156,200
**----- DEFINING ELEMENT PROPERTY DATA -----*
*ELSET,ELSET=CONCRETE
DOME,TRIANGLE
*ELSET,ELSET=STEEL
SLINER1,SLINER2,PLINER1,PLINER2,
PLINER3,PLINER4,PLINER5,PLINER6
*ELSET,ELSET=VFLUID
M1000,M1002,M1004,M1006,M1008,M1010,M1012,M1014,M1016,
M1018,M1020,M1022,M1024,M1026,M1028,M1030,M1032,M1034,
M1036,M1038,M1040,M1042,M1044,M1046,M1048,M1050
*ELSET,ELSET=HFLUID
M4740,M4540,M4340,M4140,M3940,M3740,M3540,M3340,M3140,
M2940,M2740,M2540,M2340,M2140,M1940,M1740,M1540,M1340,
M1130,M1132,M1134
*ELSET,ELSET=ALL
CONCRETE,STEEL,SLAB,VFLUID
***** LINER MATERIAL DESCRIPTION *****
*MATERIAL,NAME=STEEL
*DENSITY
.0007324
*EXPANSION,TYPE=ISO
5.10E-6,55.,5.30E-6,70.0,5.53E-6,100.0,5.71E-6,150.0,5.89E-6,200.0
*ELASTIC
29.0E6,0.30
*PLASTIC
***** TRUE STRESS-STRAIN *****
44066.,0.
44541.,.008461
57770.,.056515
66330.,.093439
74750.,.137833
***** REBAR MATERIAL DESCRIPTION *****
*MATERIAL,NAME=REBARST
*DENSITY
.0007324
*EXPANSION,TYPE=ISO
5.10E-6,55.,6.410E-6,70.0,6.50E-6,100.0,6.57E-6,150.0,6.67E-6,200.0
*ELASTIC
30.0E6,0.30
***** TRUE STRESS-STRAIN *****
*PLASTIC
71170.,0.0
71626.,.004985
83130.,.017098
96460.,.036202
104728.,.055113
109080.,.073795
***** REBAR CROSS TIE MATERIAL DESCRIPTION *****
*MATERIAL,NAME=STEELTI
*DENSITY
.0007324
*EXPANSION,TYPE=ISO
5.10E-6,55.,6.410E-6,70.0,6.50E-6,100.0,6.57E-6,150.0,6.67E-6,200.0
*ELASTIC
30.0E6,0.30
***** TRUE STRESS-STRAIN *****
*PLASTIC
49078.4,0.0
50327.5,.023127
66780.,.056326
83050.,.093067
88144.,.111031
89270.,.119932
**----- REBAR DEFINITION -----*
**---Abbreviations: T-top B-bottom S-slab H-hoop #-zone number
*ELSET,ELSET=TS1,GENERATE
308,316,2

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*ELSET,ELSET=TS2,GENERATE
318,334,2
*ELSET,ELSET=TS3,GENERATE
342,356,2
*ELSET,ELSET=TS4,GENERATE
344,356,2
*ELSET,ELSET=BS1,GENERATE
108,116,2
*ELSET,ELSET=BS2,GENERATE
118,134,2
*ELSET,ELSET=BS3,GENERATE
144,156,2
*ELSET,ELSET=TOTSL,GENERATE
100,156,2
302,356,2
**----- B-BOTTOM T-TOP R-RADIAL SL-SLAB-----*
*REBAR,ELEMENT=CONTINUUM,MATERIAL=REBARST,GEOMETRY=ISOPARAMETRIC,NAME=SLBR
**
** ELSET,AREA,SPACING,ANGLE,%DIST,FACE#,,RADIUS @ SPACING
**-----
100 ,.31 ,12.85 ,0. ,.250 ,1 ,180.
102 ,.31 ,12.85 ,0. ,.250 ,1 ,180.
104 ,.31 ,12.85 ,0. ,.294 ,1 ,180.
106 ,.31 ,12.85 ,0. ,.430 ,1 ,180.
136 ,.6 ,6.0 ,0. ,.452 ,1 ,435.
138 ,.6 ,6.0 ,0. ,.343 ,1 ,435.
140 ,.6 ,6.0 ,0. ,.276 ,1 ,435.
142 ,.6 ,6.0 ,0. ,.250 ,1 ,435.
BS1 ,.31 ,12.85 ,0. ,.522 ,1 ,180.
BS2 ,.31 ,12.0 ,0. ,.522 ,1 ,336.
BS3 ,.6 ,4.5 ,0. ,.25 ,1 ,489.
*REBAR,ELEMENT=CONTINUUM,MATERIAL=REBARST,GEOMETRY=ISOPARAMETRIC,NAME=SLTR
302 ,.31 ,12.85 ,0. ,.333 ,3 ,180.
304 ,.31 ,12.85 ,0. ,.451 ,3 ,180.
306 ,.31 ,12.85 ,0. ,.451 ,3 ,180.
336 ,.44 ,8.0 ,0. ,.511 ,3 ,489.
338 ,.44 ,8.0 ,0. ,.403 ,3 ,489.
340 ,.44 ,8.0 ,0. ,.403 ,3 ,489.
TS1 ,.31 ,12.85 ,0. ,.696 ,3 ,180.
TS2 ,.31 ,12.0 ,0. ,.696 ,3 ,336.
TS3 ,.44 ,8.0 ,0. ,.333 ,3 ,489.
**----- H-HOOP rebar for slab -----*
*REBAR,ELEMENT=CONTINUUM,MATERIAL=REBARST,GEOMETRY=ISOPARAMETRIC,NAME=SLBH
100 ,.31 ,12.0 ,90. ,.250 ,1
102 ,.31 ,12.0 ,90. ,.250 ,1
104 ,.31 ,12.0 ,90. ,.294 ,1
106 ,.31 ,12.0 ,90. ,.430 ,1
136 ,.31 ,12.0 ,90. ,.452 ,1
138 ,.31 ,12.0 ,90. ,.343 ,1
140 ,.31 ,12.0 ,90. ,.276 ,1
142 ,.31 ,12.0 ,90. ,.250 ,1
144 ,.31 ,12.0 ,90. ,.250 ,1
BS1 ,.31 ,12.0 ,90. ,.522 ,1
BS2 ,.31 ,12.0 ,90. ,.522 ,1
BS3 ,.44 ,8.0 ,90. ,.250 ,1
*REBAR,ELEMENT=CONTINUUM,MATERIAL=REBARST,GEOMETRY=ISOPARAMETRIC,NAME=SLTH
302 ,.31 ,12.0 ,90. ,.333 ,3
304 ,.31 ,12.0 ,90. ,.451 ,3
306 ,.31 ,12.0 ,90. ,.451 ,3
336 ,.44 ,8.0 ,90. ,.511 ,3
338 ,.44 ,8.0 ,90. ,.403 ,3
340 ,.44 ,8.0 ,90. ,.403 ,3
342 ,.44 ,8.0 ,90. ,.403 ,3
TS1 ,.31 ,12.0 ,90. ,.696 ,3
TS2 ,.31 ,12.0 ,90. ,.696 ,3
TS4 ,.44 ,8.0 ,90. ,.333 ,3
**----- wall rebar definition -----*
**--Abbreviations: W-wall H-hoop M-meridional I-inside O-outside
*ELSET,ELSET=WHI1,GENERATE
954,3154,200
*ELSET,ELSET=WHI2,GENERATE
3354,4554,200
*ELSET,ELSET=WHO1,GENERATE

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956,3156,200
*ELSET,ELSET=WHO2,GENERATE
3356,4556,200
*ELSET,ELSET=WMI1,GENERATE
954,1954,200
*ELSET,ELSET=WMI2,GENERATE
2154,3554,200
*ELSET,ELSET=WMI3,GENERATE
3754,4154,200
*ELSET,ELSET=WMI4,GENERATE
4354,4554,200
*ELSET,ELSET=WMO1,GENERATE
956,1956,200
*ELSET,ELSET=WMO2,GENERATE
2156,3556,200
*ELSET,ELSET=WMO3,GENERATE
3756,4156,200
*ELSET,ELSET=WMO4,GENERATE
4356,4556,200
*ELSET,ELSET=TOTWL,GENERATE
954,4354,2
956,4356,2
*REBAR,ELEMENT=CONTINUUM,MATERIAL=REBARST,GEOMETRY=ISOPARAMETRIC,NAME=WLIH
**-----
** ELSET,AREA,SPACING,ANGLE,%DIST,FACE#,,RADIUS @ SPACING
**-----
WHI1 ,.79 ,8. ,90. ,.444 ,4
WHI2 ,.79 ,12. ,90. ,.444 ,4
*REBAR,ELEMENT=CONTINUUM,MATERIAL=REBARST,GEOMETRY=ISOPARAMETRIC,NAME=WLOH
WHO1 ,.79 ,8. ,90. ,.222 ,2
WHO2 ,.79 ,12. ,90. ,.222 ,2
*REBAR,ELEMENT=CONTINUUM,MATERIAL=REBARST,GEOMETRY=ISOPARAMETRIC,NAME=WLM
WMI1 ,.44 ,12. ,0. ,.444 ,4
WMI2 ,.44 ,9. ,0. ,.444 ,4
WMI3 ,.79 ,12. ,0. ,.444 ,4
WMI4 ,1.58 ,12. ,0. ,.444 ,4
*REBAR,ELEMENT=CONTINUUM,MATERIAL=REBARST,GEOMETRY=ISOPARAMETRIC,NAME=WLOM
WMO1 ,.44 ,12. ,0. ,.222 ,2
WMO2 ,.44 ,9. ,0. ,.223 ,2
WMO3 ,.79 ,12. ,0. ,.222 ,2
WMO4 ,1.23 ,6. ,0. ,.222 ,2
*REBAR,ELEMENT=CONTINUUM,MATERIAL=REBARST,GEOMETRY=ISOPARAMETRIC,NAME=WLR
WMO4 ,.2 ,18. ,0. ,0. ,3
WMI4 ,.2 ,18. ,0. ,0. ,3
3954 ,.2 ,18. ,0. ,0. ,3
3956 ,.2 ,18. ,0. ,0. ,3
754 ,.31 ,19. ,0. ,0. ,3
756 ,.31 ,19. ,0. ,0. ,3
**----- haunch region rebar definition -----*
**---- Abbreviations: HA-haunch R-radial
*ELSET,ELSET=HAR11,GENERATE
4754,5554,200
*ELSET,ELSET=HAR01,GENERATE
4756,5556,200
*ELSET,ELSET=HAR12,GENERATE
5754,6554,200
*ELSET,ELSET=HAR02,GENERATE
5756,6556,200
*ELSET,ELSET=HAR13,GENERATE
6754,7754,200
*ELSET,ELSET=HAR03,GENERATE
6756,7756,200
*ELSET,ELSET=TOTHA,GENERATE
4754,7754,2
4756,7756,2
*REBAR,ELEMENT=CONTINUUM,MATERIAL=REBARST,GEOMETRY=SKEW,NAME=HAIM
**-----
** ELSET,AREA,SPACING,ANGLE,RADIUS @ SPACING,ISOPARAMETRIC DIRECTION
** %DIST1,%DIST2,%DIST3,%DIST4
**-----
**---- MERIDIONAL REBAR INSIDE SURFACE
4754 ,.79 , 6. ,0. ,495.5
.555 ,.591

```

4954 ,.79 , 6. ,0. ,495.5
 .409 ,.670
 5154 ,.79 , 6. ,0. ,495.5
 .330 ,.758
 5354 ,.79 , 6. ,0. ,495.5
 .242 ,.821
 5554 ,.79 , 6. ,0. ,495.5
 .179 ,.875
 5754 ,.79 , 6. ,0. ,495.5
 .125 ,.833
 5954 ,.79 , 6. ,0. ,495.5
 .167 ,.783
 6154 ,.79 , 6. ,0. ,495.5
 .217 ,.728
 6354 ,.79 , 6. ,0. ,495.5
 .272 ,.659
 6554 ,.79 , 6. ,0. ,495.5
 .341 ,.625
 6754 ,.79 , 6. ,0. ,495.5
 .375 ,.638
 6954 ,.79 , 6. ,0. ,495.5
 .362 ,.660
 7154 ,.79 , 6. ,0. ,495.5
 .340 ,.693
 7354 ,.79 , 6. ,0. ,495.5
 .307 ,.729
 7554 ,.79 , 6. ,0. ,495.5
 .271 ,.748
 7754 ,.79 , 6. ,0. ,495.5
 .252 ,.721

***--- HOOP REBAR INSIDE SURFACE

*REBAR,ELEMENT=CONTINUUM,MATERIAL=REBARST,GEOMETRY=SKEW,NAME=HAIH

4754 ,.79 ,6. ,90. ,0.
 .555 ,.591
 4954 ,.79 ,6. ,90. ,0.
 .409 ,.670
 5154 ,.79 ,6. ,90. ,0.
 .330 ,.758
 5354 ,1.0 ,4.5 ,90. ,0.
 .242 ,.821
 5554 ,1.0 ,4.5 ,90. ,0.
 .179 ,.875
 5754 ,1.0 ,4.5 ,90. ,0.
 .125 ,.833
 5954 ,1.0 ,4.5 ,90. ,0.
 .167 ,.783
 6154 ,1.0 ,4.5 ,90. ,0.
 .217 ,.728
 6354 ,1.0 ,4.5 ,90. ,0.
 .272 ,.659
 6554 ,1.0 ,4.5 ,90. ,0.
 .341 ,.625
 6754 ,1.0 ,4.5 ,90. ,0.
 .375 ,.638
 6954 ,1.0 ,4.5 ,90. ,0.
 .362 ,.660
 7154 ,1.0 ,4.5 ,90. ,0.
 .340 ,.693
 7354 ,1.0 ,4.5 ,90. ,0.
 .307 ,.729
 7554 ,1.0 ,4.0 ,90. ,0.
 .271 ,.748
 7754 ,1.0 ,4.0 ,90. ,0.
 .252 ,.721

*REBAR,ELEMENT=CONTINUUM,MATERIAL=REBARST,GEOMETRY=SKEW,NAME=HAOM

***--- MERIDIONAL REBAR OUTSIDE SURFACE

4756 ,.79 , 6. ,0. ,495.5
 .667 ,.333
 4956 ,.79 , 6. ,0. ,495.5
 .667 ,.288
 5156 ,.79 , 6. ,0. ,495.5
 .712 ,.233
 5356 ,.79 , 6. ,0. ,495.5


```

.767 ,.208
5556 ,.79 , 6. ,0. ,495.5
.792 ,.195
5756 ,.79 , 6. ,0. ,495.5
.805 ,.151
5956 ,.79 , 6. ,0. ,495.5
.849 ,.160
6156 ,.79 , 6. ,0. ,495.5
.840 ,.173
6356 ,.79 , 6. ,0. ,495.5
.827 ,.185
6556 ,.79 , 6. ,0. ,495.5
.815 ,.204
6756 ,.79 , 6. ,0. ,495.5
.796 ,.225
6956 ,.79 , 6. ,0. ,495.5
.775 ,.242
7156 ,.79 , 6. ,0. ,495.5
.758 ,.255
7356 ,.79 , 6. ,0. ,495.5
.745 ,.263
7556 ,.79 , 6. ,0. ,495.5
.737 ,.271
7756 ,.79 , 6. ,0. ,495.5
.729 ,.302
*REBAR,ELEMENT=CONTINUUM,MATERIAL=REBARST,GEOMETRY=SKEW,NAME=HAOH
**-- HOOP REBAR OUTSIDE SURFACE
4756 ,.79 ,6. ,90. ,0.
.667 ,.333
4956 ,.79 ,6. ,90. ,0.
.667 ,.288
5156 ,1.0 ,4.0 ,90. ,0.
.712 ,.233
5356 ,1.0 ,4.0 ,90. ,0.
.767 ,.208
5556 ,1.0 ,4.0 ,90. ,0.
.792 ,.195
5756 ,1.0 ,4.0 ,90. ,0.
.805 ,.151
5956 ,1.0 ,4.5 ,90. ,0.
.849 ,.160
6156 ,1.0 ,4.5 ,90. ,0.
.840 ,.173
6356 ,1.0 ,4.5 ,90. ,0.
.827 ,.185
6556 ,1.0 ,4.5 ,90. ,0.
.815 ,.204
6756 ,1.0 ,4.5 ,90. ,0.
.796 ,.225
6956 ,1.0 ,4.5 ,90. ,0.
.775 ,.242
7156 ,1.0 ,4.5 ,90. ,0.
.758 ,.255
7356 ,1.0 ,4.5 ,90. ,0.
.745 ,.263
7556 ,1.0 ,4.0 ,90. ,0.
.737 ,.271
7756 ,1.0 ,4.0 ,90. ,0.
.729 ,.302
*REBAR,ELEMENT=CONTINUUM,MATERIAL=REBARST,GEOMETRY=ISOPARAMETRIC,NAME=HAMM
**-- MID-WALL MERIDIONAL
HARI1,.44 ,18. ,0. ,.222,2
7154 ,.44 ,18. ,0. ,.222,2,,487.
7354 ,.44 ,18. ,0. ,.222,2,,487.
*REBAR,ELEMENT=CONTINUUM,MATERIAL=REBARST,GEOMETRY=SKEW,NAME=HAMM
**--MERIDIONAL REBAR MID-WALL
5754 ,.44 ,18. ,0. ,487.
1.0 ,.200
5954 ,.44 ,18. ,0. ,487.
.80 ,.200
6154 ,.44 ,18. ,0. ,487.
.80 ,.197
6354 ,.44 ,18. ,0. ,487.

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.803 ,,,150
6554 ,.44 ,18. ,0. ,487.
.850 ,,,150
6754 ,.44 ,18. ,0. ,487.
.850 ,,,097
6954 ,.44 ,18. ,0. ,487.
.903 ,,,105
*REBAR,ELEMENT=CONTINUUM,MATERIAL=REBARST,GEOMETRY=ISOPARAMETRIC,NAME=HAMH
**--- HOOP REBAR MID-WALL
5354 ,1.0 ,8. ,0. ,.222,2
5554 ,1.0 ,8. ,0. ,.222,2
7154 ,1.0 ,4.5 ,0. ,.222,2
7354 ,1.0 ,4.5 ,0. ,.222,2
*REBAR,ELEMENT=CONTINUUM,MATERIAL=REBARST,GEOMETRY=SKEW,NAME=HAMH
**--- HOOP REBAR MID-WALL
5754 ,1.0 ,4.5 ,90. ,487.
1.0 ,,,200
5954 ,1.0 ,4.5 ,90. ,487.
.80 ,,,200
6154 ,1.0 ,4.5 ,90. ,487.
.80 ,,,197
6354 ,1.0 ,4.5 ,90. ,487.
.803 ,,,150
6554 ,1.0 ,4.5 ,90. ,487.
.850 ,,,150
6754 ,1.0 ,4.5 ,90. ,487.
.850 ,,,097
6954 ,1.0 ,4.5 ,90. ,487.
.903 ,,,105
*REBAR,ELEMENT=CONTINUUM,MATERIAL=REBARST,GEOMETRY=ISOPARAMETRIC,NAME=HAR
**--- RADIAL REBAR
4754 ,.20 ,18. ,0. ,0. ,1
4756 ,.20 ,18. ,0. ,0. ,1
4954 ,.20 ,18. ,0. ,0. ,1
4956 ,.20 ,18. ,0. ,0. ,1
5354 ,.20 ,18. ,0. ,0. ,1
5356 ,.20 ,18. ,0. ,0. ,1
5754 ,.20 ,18. ,0. ,0. ,1
5756 ,.20 ,18. ,0. ,0. ,1
5954 ,.20 ,18. ,0. ,0. ,1
5956 ,.20 ,18. ,0. ,0. ,1
6354 ,.20 ,18. ,0. ,0. ,1
6356 ,.20 ,18. ,0. ,0. ,1
5756 ,.20 ,18. ,0. ,0. ,4
HAR13 ,.20 ,18. ,0. ,0. ,1
HAR03 ,.20 ,18. ,0. ,0. ,1
**----- dome rebar definition -----*
**--- Abbreviations: D-dome
*ELSET,ELSET=DR11,GENERATE
9754,10354,200
*ELSET,ELSET=DR01,GENERATE
9756,10356,200
*ELSET,ELSET=DR12,GENERATE
10554,10954,200
*ELSET,ELSET=DR02,GENERATE
10556,10956,200
*ELSET,ELSET=DR13,GENERATE
11154,11554,200
*ELSET,ELSET=DR03,GENERATE
11156,11556,200
*ELSET,ELSET=DR,GENERATE
7954,11954,200
7956,11956,200
*REBAR,ELEMENT=CONTINUUM,MATERIAL=REBARST,GEOMETRY=ISOPARAMETRIC,NAME=DIM
**--- MERIDIONAL REBAR INSIDE SURFACE
7954 ,.79 , 6. ,0. ,.279,4,,495.5
8154 ,.79 , 6. ,0. ,.293,4,,495.5
8354 ,.79 , 6. ,0. ,.293,4,,495.5
8554 ,.44 ,10. ,0. ,.293,4,,321.0
8754 ,.44 ,10. ,0. ,.293,4,,321.0
8954 ,.44 ,10. ,0. ,.290,4,,321.0
9154 ,.44 ,10. ,0. ,.307,4,,321.0
9354 ,.44 ,10. ,0. ,.326,4,,321.0

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9554 ,.44 ,10. ,0. ,.341,4,,321.0
DR11 ,.44 ,10. ,0. ,.341,4,,321.0
DR12 ,.44 ,20. ,0. ,.341,4,,321.0
DR13 ,.44 ,40. ,0. ,.341,4,,321.0
11754 ,.44 ,80. ,0. ,.333,4,,321.0
11954 ,.44 ,80. ,0. ,.333,4,,321.0
*REBAR,ELEMENT=CONTINUUM,MATERIAL=REBARST,GEOMETRY=ISOPARAMETRIC,NAME=DIH
**---- HOOP REBAR INSIDE SURFACE
7954 ,1.0 ,4. ,90. ,.279,4
8154 ,1.0 ,6. ,90. ,.293,4
8354 ,1.0 ,6. ,90. ,.293,4
8554 ,.79 ,6. ,90. ,.293,4
8754 ,.79 ,6. ,90. ,.293,4
8954 ,.44 ,12. ,90. ,.290,4
9154 ,.44 ,12. ,90. ,.307,4
9354 ,.44 ,12. ,90. ,.326,4
9554 ,.44 ,12. ,90. ,.341,4
DR11 ,.44 ,12. ,90. ,.341,4
DR12 ,.44 ,12. ,90. ,.341,4
DR13 ,.44 ,12. ,90. ,.341,4
11754 ,.44 ,12. ,90. ,.333,4
11954 ,.44 ,12. ,90. ,.333,4
*---- RADIAL REBAR ( SHIFTED IN DOME FOR STABILITY CONCERNS )
*REBAR,ELEMENT=CONTINUUM,MATERIAL=STEELT1,GEOMETRY=ISOPARAMETRIC,NAME=DR
DR ,.20 ,18. ,0. ,.5 ,1
*REBAR,ELEMENT=CONTINUUM,MATERIAL=REBARST,GEOMETRY=ISOPARAMETRIC,NAME=DOM
**---- MERIDIONAL REBAR OUTSIDE SURFACE
7956 ,.79 ,6. ,0. ,.335,2,,495.5
8156 ,.79 ,6. ,0. ,.352,2,,495.5
8356 ,.79 ,6. ,0. ,.352,2,,495.5
8556 ,.44 ,10. ,0. ,.352,2,,321.0
8756 ,.44 ,10. ,0. ,.352,2,,321.0
8956 ,.44 ,10. ,0. ,.348,2,,321.0
9156 ,.44 ,10. ,0. ,.369,2,,321.0
9356 ,.44 ,10. ,0. ,.391,2,,321.0
9556 ,.44 ,10. ,0. ,.409,2,,321.0
DR01 ,.44 ,10. ,0. ,.409,2,,321.0
DR02 ,.44 ,20. ,0. ,.409,2,,321.0
DR03 ,.44 ,40. ,0. ,.409,2,,321.0
11756 ,.44 ,80. ,0. ,.400,2,,321.0
11956 ,.44 ,80. ,0. ,.400,2,,321.0
*REBAR,ELEMENT=CONTINUUM,MATERIAL=REBARST,GEOMETRY=ISOPARAMETRIC,NAME=DOH
**---- HOOP REBAR OUTSIDE SURFACE
7956 ,1.0 ,4. ,90. ,.335,2
8156 ,1.0 ,6. ,90. ,.352,2
8356 ,1.0 ,6. ,90. ,.352,2
8556 ,.79 ,6. ,90. ,.352,2
8756 ,.79 ,6. ,90. ,.352,2
8956 ,.44 ,12. ,90. ,.348,2
9156 ,.44 ,12. ,90. ,.369,2
9356 ,.44 ,12. ,90. ,.391,2
9556 ,.44 ,12. ,90. ,.409,2
DR01 ,.44 ,12. ,90. ,.409,2
DR02 ,.44 ,12. ,90. ,.409,2
DR03 ,.44 ,12. ,90. ,.409,2
11756 ,.44 ,12. ,90. ,.400,2
11956 ,.44 ,12. ,90. ,.400,2
**----- special soft material properties for the un-reinforced
**----- concrete slab between the primary and secondary liner.
*MATERIAL,NAME=SLAB
*DENSITY
.0002246
*EXPANSION,TYPE=ISO
4.0E-6,55.0,4.0E-6,200.0
*ELASTIC
2.8E5,.15
***** CONCRETE MATERIAL DESCRIPTION
*MATERIAL,NAME=CONCRETE
*DENSITY
.0002246
*EXPANSION,TYPE=ISO
4.0E-6,55.0,4.0E-6,200.0
*ELASTIC

```

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4.066E6,.15
***** ASSUME FY=.5*FMAX, EMAX=2*FMAX/E
***** the allowables are increased 10 times to avoid numerical
*****problems in thermal analysis
*CONCRETE
22500.,0.
45000.,.0011
*FAILURE RATIOS
1.16,.0722
*TENSION STIFFENING
0.00,1.E-3
*SHEAR RETENTION
1.,1000.
***** NON-LINEAR SPRING BEHAVIOR *****
*SPRING,ELSET=NLSPRING,NONLINEAR
2,2
-1.0E11,-100.
0.,0.
500.,1.
*****SIMULATES STUD FAILURE
***** NEW SIMULATES STUD ELASTIC BEHAVIOR
***** STUD1
*SPRING,ELSET=STUD11,NONLINEAR
1,1
-1.0E11,-100.
0.,0.
1.28E6,0.00625
2.56E6,0.025
3.45E6,0.05
4.48E6,0.10
4.73E6,0.25
5.10E6,2.0
*SPRING,ELSET=STUD12,NONLINEAR
2,2
-1.0E11,-100.
0.,0.
1.9E6,0.015
3.2E6,0.06
3.58E6,0.15
3.84E6,0.35
4.22E6,0.5
4.50E6,2.0
*****STUD2
*SPRING,ELSET=STUD22,NONLINEAR
1,1
-1.0E11,-100.
0.,0.
1.0E6,0.00625
2.12E6,0.025
2.86E6,0.05
3.72E6,0.10
3.93E6,0.25
5.10E6,2.0
*SPRING,ELSET=STUD21,NONLINEAR
2,2
-1.0E11,-100.
0.,0.
1.9E6,0.015
3.2E6,0.06
3.58E6,0.15
3.84E6,0.35
4.22E6,0.5
4.50E6,2.0
*****STUD3
*SPRING,ELSET=STUD33,NONLINEAR
1,1
-1.0E11,-100.
0.,0.
1.28E6,0.00625
2.56E6,0.025
3.45E6,0.05
4.48E6,0.10
4.73E6,0.25

```

```

5.10E6,2.0
*SPRING,ELSET=STUD31,NONLINEAR
2,2
-1.0E11,-100.
0.,0.
1.9E6,0.015
3.2E6,0.06
3.58E6,0.15
3.84E6,0.35
4.22E6,0.5
4.50E6,2.0
*****STUD4
*SPRING,ELSET=STUD44,NONLINEAR
1,1
-1.0E11,-100.
0.,0.
1.0E6,0.00625
2.12E6,0.025
2.86E6,0.05
3.72E6,0.10
3.93E6,0.25
5.10E6,2.0
*SPRING,ELSET=STUD41,NONLINEAR
2,2
-1.0E11,-100.
0.,0.
1.9E6,0.015
3.2E6,0.06
3.58E6,0.15
3.84E6,0.35
4.22E6,0.5
4.50E6,2.0
*****
*SHELL SECTION,ELSET=SLINER1,MATERIAL=STEEL
**-----
** Thickness, Number of integration pts.
** thickness includes .015 corrosion in primary liner
**-----
0.5,3
*SHELL SECTION,ELSET=SLINER2,MATERIAL=STEEL
0.375,3
*SHELL SECTION,ELSET=PLINER1,MATERIAL=STEEL
0.485,3
*SHELL SECTION,ELSET=PLINER2,MATERIAL=STEEL
0.860,3
*SHELL SECTION,ELSET=PLINER3,MATERIAL=STEEL
0.735,3
*SHELL SECTION,ELSET=PLINER4,MATERIAL=STEEL
0.485,3
*SHELL SECTION,ELSET=PLINER5,MATERIAL=STEEL
0.360,3
*SHELL SECTION,ELSET=PLINER6,MATERIAL=STEEL
0.485,3
*SOLID SECTION,ELSET=CONCRETE,MATERIAL=CONCRETE
1.0
*SOLID SECTION,ELSET=SLAB ,MATERIAL=SLAB
1.0
*INTERFACE,ELSET=GAP
**FRICTION
** .3,1.E7,0.
**----- MU=.6 MAY HAVE CONVERGENCE PROBS. ---*
**----- MAY HAVE TO ADD UNSYMM TO HEADING CARD --*
**----- DEFINING THE ITS,FRICTION, AND SPRINGS -----*
*ITS,ELSET=SPRING2
996.,1020.,0.,1.,0.,-1.,0.,0.
*FRICTION
0.57,1.5E7,0.
*SPRING
1
374968.75
**----- MASS OF FLUID -----*
*MASS,ELSET=M1000
2

```

29.405
*MASS,ELSET=M1002
2
117.619
*MASS,ELSET=M1004
2
255.204
*MASS,ELSET=M1006
2
406.584
*MASS,ELSET=M1008
2
518.517
*MASS,ELSET=M1010
2
617.079
*MASS,ELSET=M1012
2
735.598
*MASS,ELSET=M1014
2
854.419
*MASS,ELSET=M1016
2
972.988
*MASS,ELSET=M1018
2
1091.287
*MASS,ELSET=M1020
2
1209.822
*MASS,ELSET=M1022
2
1328.357
*MASS,ELSET=M1024
2
1446.893
*MASS,ELSET=M1026
2
1565.428
*MASS,ELSET=M1028
2
1684.468
*MASS,ELSET=M1030
2
1803.031
*MASS,ELSET=M1032
2
1921.1
*MASS,ELSET=M1034
2
2039.635
*MASS,ELSET=M1036
2
2879.022
*MASS,ELSET=M1038
2
3815.989
*MASS,ELSET=M1040
2
4128.33
*MASS,ELSET=M1042
2
3121.712
*MASS,ELSET=M1044
2
1997.138
*MASS,ELSET=M1046
2
1328.697
*MASS,ELSET=M1048
2
520.885

*MASS,ELSET=M1050
2
207.021
*MASS,ELSET=M4740
1
651.748
*MASS,ELSET=M4540
1
1259.203
*MASS,ELSET=M4340
1
1214.909
*MASS,ELSET=M4140
1
1214.909
*MASS,ELSET=M3940
1
1214.909
*MASS,ELSET=M3740
1
1214.909
*MASS,ELSET=M3540
1
1214.909
*MASS,ELSET=M3340
1
1056.718
*MASS,ELSET=M3140
1
651.748
*MASS,ELSET=M2940
1
723.124
*MASS,ELSET=M2740
1
1041.278
*MASS,ELSET=M2540
1
1041.278
*MASS,ELSET=M2340
1
1041.531
*MASS,ELSET=M2140
1
1041.531
*MASS,ELSET=M1940
1
1041.253
*MASS,ELSET=M1740
1
1041.278
*MASS,ELSET=M1540
1
1128.119
*MASS,ELSET=M1340
1
803.612
*MASS,ELSET=M1140
1
312.333
*MASS,ELSET=M1130
1
213.875
*MASS,ELSET=M1132
1
164.519
*MASS,ELSET=M1134
1
66.815
*NSET,NSET=NTEMP,GENERATE
100,12160,1
*INITIAL CONDITIONS,TYPE=TEMPERATURE
NTEMP,55.0

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*ELSET,ELSET=ESTUD1,GENERATE
1151,6551,200
*ELSET,ELSET=ESTUD2,GENERATE
1153,6553,200
*NSET,NSET=NSTUD,GENERATE
1154,6554,200
1152,6552,200
*ELSET,ELSET=PSOIL,GENERATE
756,5556,200
*ELSET,ELSET=DSOIL,GENERATE
5756,11956,200
*STEP,AMPLITUDE=RAMP,CYCL=3,INC=1000,SUBMAX
HYDROSTATIC LOAD ON 241-SY-101 TANK
*STATIC,PTOL=100.,DIRECT=NOSTOP
0.01,1.0,
*CLOAD,FOLLOWER
***** HYDROSTATIC LOADS ON WALL OF PRIMARY LINER
948 ,1, 203002.219
950 ,1, 261070.9
1150,1, 376338.357
1350,1,946929.099
1550,1,1236431.987
1750,1,1067773.936
1950,1,994277.359
2150,1,921049.344
2350,1,847519.744
2550,1,773837.775
2750,1,700361.764
2950,1, 435345.794
3150,1, 374488.975
3350,1, 542838.076
3550,1, 524078.354
3750,1, 424055.448
3950,1, 324032.541
4150,1, 224009.634
4350,1, 123986.728
4550,1, 11981.911
*NODE PRINT,NSET=NSTUD,FREQ=100
U
*ELPRINT,ELSET=ESTUD1,FREQ=100
S,E
*ELPRINT,ELSET=ESTUD2,FREQ=100
S,E
*END STEP
*STEP,AMPLITUDE=RAMP,CYCL=3,INC=5000,SUBMAX
DEAD LOAD ON 241-SY-101 TANK
*STATIC,PTOL=100.,DIRECT=NOSTOP
0.01,1.0,
*DLOAD
ALL,GRAV,386.4,0.,-1.,0.
*NODE PRINT,NSET=NSTUD,FREQ=100
U
*ELPRINT,ELSET=ESTUD1,FREQ=100
S,E
*ELPRINT,ELSET=ESTUD2,FREQ=100
S,E
*END STEP
*STEP,AMPLITUDE=RAMP,CYCL=3,INC=5000,SUBMAX
SOIL PRESSURE AND SOIL WEIGHT ON 241-SY-101 TANK
*STATIC,PTOL=100.,DIRECT=NOSTOP
0.01,1.0,
*DLOAD
PSOIL,HP2,14.7,878.0,24.00001
DSOIL,HP2,12.85,878.0,676.0
*NODE PRINT,NSET=NSTUD,FREQ=100
U
*ELPRINT,ELSET=ESTUD1,FREQ=100
S,E
*ELPRINT,ELSET=ESTUD2,FREQ=100
S,E
*****----- DISPLACEMENT & CONTOUR PLOTS -----*
*PLOT,COLORS=8,OUTPUT=BINARY,FREQ=100
DEFORMED SHAPE FOR STATIC LOADS

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```

*DISPLACED
U
*PLOT,COLORS=8,OUTPUT=BINARY,FREQ=100
SECONDARY STEEL LINERS DEFORMED SHAPE FOR STAIC LOADS
*DETAIL,ELSET=STEEL
*DISPLACED
U
*PLOT,COLORS=8,OUTPUT=BINARY,FREQ=100
LINER TRESCA STRESS (MEM+BEN1) FOR STATIC LOADS
*DETAIL,ELSET=STEEL
*CONTOUR
TRESC,6, , , ,1
*PLOT,COLORS=8,OUTPUT=BINARY,FREQ=100
LINER TRESCA STRESS (MEM+BEN3) FOR STATIC LOADS
*DETAIL,ELSET=STEEL
*CONTOUR
TRESC,6, , , ,3
*PLOT,COLORS=8,OUTPUT=BINARY,FREQ=100
LINER PRIN1 STRESS (MEM+BEN1) FOR STATIC LOADS
*DETAIL,ELSET=STEEL
*CONTOUR
PRIN1,6, , , ,1
*PLOT,COLORS=8,OUTPUT=BINARY,FREQ=100
LINER PRIN1 STRESS (MEM+BEN3) FOR STATIC LOADS
*DETAIL,ELSET=STEEL
*CONTOUR
PRIN1,6, , , ,3
*PLOT,COLORS=8,OUTPUT=BINARY,FREQ=100
LINER PRIN2 STRESS (MEM+BEN1) FOR STATIC LOADS
*DETAIL,ELSET=STEEL
*CONTOUR
PRIN2,6, , , ,1
*PLOT,COLORS=8,OUTPUT=BINARY,FREQ=100
LINER PRIN1 STRESS (MEM+BEN3) FOR STATIC LOADS
*DETAIL,ELSET=STEEL
*CONTOUR
PRIN2,6, , , ,3
*PLOT,COLORS=8,OUTPUT=BINARY,FREQ=100
LINER PRIN3 STRESS (MEM+BEN1) FOR STATIC LOADS
*DETAIL,ELSET=STEEL
*CONTOUR
PRIN3,6, , , ,1
*PLOT,COLORS=8,OUTPUT=BINARY,FREQ=100
LINER PRIN3 STRESS (MEM+BEN3) FOR STATIC LOADS
*DETAIL,ELSET=STEEL
*CONTOUR
PRIN3,6, , , ,3
*END STEP
*****FIRST THERMAL LOAD
*STEP,AMPLITUDE=RAMP,CYCL=3,INC=5000,SUBMAX
FIRST THERMAL LOAD STEP ON 241-SY-101 TANK
*STATIC,PTOL=100.,DIRECT=NOSTOP
0.0001,0.0099,
*TEMPERATURE, OP=MOD
100, 117.273903
102, 117.082779
104, 116.891655
106, 117.052666
108, 117.226410
110, 116.948586
112, 116.486755
114, 116.024925
116, 115.563095
118, 115.037849
120, 114.261513
122, 113.485176
124, 112.708847
126, 111.676224
128, 110.555031
130, 109.433838
132, 107.991837
134, 106.486404
136, 104.808830

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138,	101.485931
140,	97.5147171
142,	92.9693375
144,	91.3166733
146,	90.0299835
148,	89.6216202
150,	89.7164154
152,	89.9481125
154,	90.0639420
156,	90.3741760
158,	90.6459274
300,	118.008148
302,	117.815552
304,	117.622955
306,	117.605652
308,	117.595078
310,	117.316566
312,	116.853233
314,	116.389893
316,	115.926552
318,	115.399300
320,	114.619011
322,	113.838730
324,	113.058441
326,	112.018890
328,	110.889740
330,	109.760582
332,	108.305161
334,	106.785233
336,	105.090767
338,	101.791977
340,	97.7753983
342,	92.8331146
344,	90.4470901
346,	88.7535019
348,	88.7217636
350,	89.1910019
352,	89.6568985
354,	89.8898163
356,	90.3287888
358,	90.6459961
502,	118.597061
504,	118.404022
506,	118.189537
508,	117.975060
510,	117.696152
512,	117.231728
514,	116.767303
516,	116.302879
518,	115.774063
520,	114.990303
522,	114.206551
524,	113.422791
526,	112.377373
528,	111.241524
530,	110.105675
532,	108.637016
534,	107.102577
536,	105.395187
538,	102.183670
540,	98.0433502
542,	93.3750305
544,	88.6928711
546,	85.8279877
548,	87.3245773
550,	88.6200104
552,	89.3640213
554,	89.7359695
556,	90.4729080
558,	90.8736801
700,	118.790154
702,	118.597115
704,	118.404076

706,	118.189590
708,	117.975105
710,	117.696198
712,	117.231773
714,	116.767349
716,	116.302925
718,	115.774117
720,	114.990356
722,	114.206596
724,	113.422844
726,	112.377419
728,	111.241570
730,	110.105721
732,	108.637062
734,	107.102615
736,	105.395226
738,	102.183708
740,	98.0433884
742,	93.3750381
744,	88.6929245
746,	85.8279953
748,	87.3244324
750,	88.6199036
754,	89.7359238
756,	90.4729156
758,	90.8736877
800,	122.300812
802,	122.108742
804,	121.916672
806,	121.703209
808,	121.489876
810,	121.209885
812,	120.737946
814,	120.265984
816,	119.794022
818,	119.255249
820,	118.445221
822,	117.635170
824,	116.825104
826,	115.731796
828,	114.537659
830,	113.343475
832,	111.786118
834,	110.153183
836,	108.323807
838,	105.431137
840,	101.880096
842,	97.5458603
844,	91.1372681
846,	87.9794312
852,	88.5030289
900,	122.300842
902,	122.108772
904,	121.916702
906,	121.703247
908,	121.489914
910,	121.209923
912,	120.737976
914,	120.266022
916,	119.794060
918,	119.255280
920,	118.445251
922,	117.635208
924,	116.825134
926,	115.731827
928,	114.537689
930,	113.343506
932,	111.786148
934,	110.153214
936,	108.323837
938,	105.431168
940,	101.880127
942,	97.5458908

944,	91.1373291
946,	87.9795532
948,	88.8445206
950,	89.0871964
952,	88.7806702
954,	89.8590393
956,	90.6733932
958,	91.0563812
1000,	122.300842
1002,	122.108772
1004,	121.916702
1006,	121.703247
1008,	121.489914
1010,	121.209923
1012,	120.737976
1014,	120.266022
1016,	119.794060
1018,	119.255280
1020,	118.445251
1022,	117.635208
1024,	116.825134
1026,	115.731827
1028,	114.537689
1030,	113.343506
1032,	111.786148
1034,	110.153214
1036,	108.323837
1038,	105.431168
1040,	101.880127
1042,	97.5458908
1044,	91.1373291
1046,	87.9795532
1048,	88.8445206
1050,	89.0871964
1052,	89.8523636
1150,	90.3180771
1152,	90.4245453
1154,	90.4275589
1156,	91.0749588
1158,	91.4223175
1350,	91.8123093
1352,	91.5012360
1354,	91.5036011
1356,	92.2946548
1358,	92.5100555
1550,	94.7269974
1552,	94.4102325
1554,	94.4115067
1556,	94.5189056
1558,	94.5439987
1750,	97.4511642
1752,	96.3955002
1754,	96.3955002
1756,	96.3505325
1758,	96.2658463
1950,	99.4093857
1952,	98.0832672
1954,	98.0832672
1956,	97.9706497
1958,	97.8137894
2150,	100.998482
2152,	99.5057831
2154,	99.5057831
2156,	99.3279037
2158,	99.1200104
2350,	102.297005
2352,	100.686623
2354,	100.686623
2356,	100.475029
2358,	100.227455
2550,	103.343102
2552,	101.643227
2554,	101.643227

2556,	101.388428
2558,	101.108589
2750,	104.152924
2752,	102.413445
2754,	102.413445
2756,	102.125481
2758,	101.816864
2950,	104.796516
2952,	102.984688
2954,	102.984688
2956,	102.658157
2958,	102.321869
3150,	105.018661
3152,	103.165688
3154,	103.165688
3156,	102.819046
3158,	102.472321
3350,	105.462578
3352,	103.431938
3354,	103.431938
3356,	103.049515
3358,	102.680702
3550,	105.570389
3554,	103.526543
3556,	103.089851
3558,	102.696419
3750,	105.189445
3752,	103.242920
3754,	103.242920
3756,	102.768181
3758,	102.360405
3950,	104.376633
3952,	102.530510
3954,	102.530510
3956,	102.035851
3958,	101.623520
4150,	103.103539
4152,	101.389084
4154,	101.389084
4156,	100.864639
4158,	100.454117
4350,	101.368706
4352,	99.7508698
4354,	99.7508698
4356,	99.2001572
4358,	98.8037872
4550,	99.0280685
4552,	97.4927979
4554,	97.4927979
4556,	96.9563675
4558,	96.6113281
4750,	94.1679916
4752,	94.5108261
4754,	94.5108261
4756,	94.1421204
4758,	93.9167709
4950,	89.4995499
4952,	92.7199173
4954,	92.7199173
4956,	92.1880722
4958,	91.7182693
5150,	87.3848114
5152,	92.0065231
5154,	92.0065231
5156,	91.2187881
5158,	90.5312958
5350,	86.8107224
5352,	91.2884216
5354,	91.2884216
5356,	90.2709274
5358,	89.3806458
5550,	85.6459579
5552,	90.0715637

5554,	90.0715637
5556,	89.0031128
5558,	88.0825500
5750,	84.7156372
5752,	88.7496490
5754,	88.7496490
5756,	87.9471054
5758,	86.9641342
5858,	86.1973190
5950,	83.8248978
5952,	86.8131943
5954,	86.8131943
5956,	86.2912674
5958,	85.7300110
6150,	83.4464188
6152,	85.8151627
6154,	85.8151627
6156,	85.5436554
6158,	85.2675171
6350,	83.2604141
6352,	84.5226974
6354,	84.5226974
6356,	84.7605591
6358,	84.7068634
6550,	82.9276352
6552,	83.0965347
6554,	83.0965347
6556,	83.8147736
6558,	83.9425125
6754,	82.3692169
6756,	82.9813004
6758,	83.1544189
6954,	81.2714386
6956,	81.9907761
6958,	82.3237305
7154,	80.9539490
7156,	81.3220367
7158,	81.5359650
7354,	80.6499634
7356,	80.8712616
7358,	81.0696716
7554,	80.5100174
7556,	80.5786057
7558,	80.6078949
7754,	80.3809433
7756,	80.3822784
7758,	80.3572540
7954,	80.3034286
7956,	80.2205734
7958,	80.1110229
8154,	80.2130432
8156,	80.0907898
8158,	79.9471207
8354,	80.1287231
8356,	79.9664764
8358,	79.7904892
8554,	80.0596008
8556,	79.8602600
8558,	79.6521835
8754,	79.9906769
8756,	79.7599258
8758,	79.5196228
8954,	79.9298859
8956,	79.6572495
8958,	79.3823700
9154,	79.8737488
9156,	79.5638733
9158,	79.2329941
9354,	79.8111954
9356,	79.4509277
9358,	79.0803146
9554,	79.7678909
9556,	79.3593903

9558,	78.9366226
9754,	79.7060852
9756,	79.2687607
9758,	78.8142014
9954,	79.6509399
9956,	79.1684341
9958,	78.6671982
10154,	79.6170654
10156,	79.0875778
10158,	78.5383606
10354,	79.5609131
10356,	78.9998932
10358,	78.4144745
10554,	79.5134354
10556,	78.9094315
10558,	78.2726364
10754,	79.4933395
10756,	78.8442764
10758,	78.1563187
10954,	79.4507599
10956,	78.7733536
10958,	78.0333328
11154,	79.4110031
11156,	78.7059631
11158,	77.9006348
11354,	79.3931122
11356,	78.6583633
11358,	77.8269501
11554,	79.3706741
11556,	78.6197128
11558,	77.7718124
11754,	79.3366470
11756,	78.5741959
11758,	77.6482544
11954,	79.3440475
11956,	78.5671616
11958,	77.6407089
12154,	79.3569489
12156,	78.5762787
12158,	77.6968155

*NODE PRINT,NSET=NSTUD,FREQ=99

U

*ELPRINT,ELSET=ESTUD1,FREQ=99

S,E

*ELPRINT,ELSET=ESTUD2,FREQ=99

S,E

*END STEP

*****FIRST THERMAL LOAD STEP IS CONTINUED

*STEP,AMPLITUDE=RAMP,CYCL=3,INC=50000,SUBMAX

FIRST THERMAL LOAD STEP IS CONTINUED ON 241-SY-101 TANK

*STATIC,PTOL=100.,DIRECT=NOSTOP

0.01,1.0,

*TEMPERATURE, OP=MOD

100,	117.273903
102,	117.082779
104,	116.891655
106,	117.052666
108,	117.226410
110,	116.948586
112,	116.486755
114,	116.024925
116,	115.563095
118,	115.037849
120,	114.261513
122,	113.485176
124,	112.708847
126,	111.676224
128,	110.555031
130,	109.433838
132,	107.991837
134,	106.486404
136,	104.808830
138,	101.485931

140,	97.5147171
142,	92.9693375
144,	91.3166733
146,	90.0299835
148,	89.6216202
150,	89.7164154
152,	89.9481125
154,	90.0639420
156,	90.3741760
158,	90.6459274
300,	118.008148
302,	117.815552
304,	117.622955
306,	117.605652
308,	117.595078
310,	117.316566
312,	116.853233
314,	116.389893
316,	115.926552
318,	115.399300
320,	114.619011
322,	113.838730
324,	113.058441
326,	112.018890
328,	110.889740
330,	109.760582
332,	108.305161
334,	106.785233
336,	105.090767
338,	101.791977
340,	97.7753983
342,	92.8331146
344,	90.4470901
346,	88.7535019
348,	88.7217636
350,	89.1910019
352,	89.6568985
354,	89.8898163
356,	90.3287888
358,	90.6459961
502,	118.597061
504,	118.404022
506,	118.189537
508,	117.975060
510,	117.696152
512,	117.231728
514,	116.767303
516,	116.302879
518,	115.774063
520,	114.990303
522,	114.206551
524,	113.422791
526,	112.377373
528,	111.241524
530,	110.105675
532,	108.637016
534,	107.102577
536,	105.395187
538,	102.183670
540,	98.0433502
542,	93.3750305
544,	88.6928711
546,	85.8279877
548,	87.3245773
550,	88.6200104
552,	89.3640213
554,	89.7359695
556,	90.4729080
558,	90.8736801
700,	118.790154
702,	118.597115
704,	118.404076
706,	118.189590

708,	117.975105
710,	117.696198
712,	117.231773
714,	116.767349
716,	116.302925
718,	115.774117
720,	114.990356
722,	114.206596
724,	113.422844
726,	112.377419
728,	111.241570
730,	110.105721
732,	108.637062
734,	107.102615
736,	105.395226
738,	102.183708
740,	98.0433884
742,	93.3750381
744,	88.6929245
746,	85.8279953
748,	87.3244324
750,	88.6199036
754,	89.7359238
756,	90.4729156
758,	90.8736877
800,	122.300812
802,	122.108742
804,	121.916672
806,	121.703209
808,	121.489876
810,	121.209885
812,	120.737946
814,	120.265984
816,	119.794022
818,	119.255249
820,	118.445221
822,	117.635170
824,	116.825104
826,	115.731796
828,	114.537659
830,	113.343475
832,	111.786118
834,	110.153183
836,	108.323807
838,	105.431137
840,	101.880096
842,	97.5458603
844,	91.1372681
846,	87.9794312
852,	88.5030289
900,	122.300842
902,	122.108772
904,	121.916702
906,	121.703247
908,	121.489914
910,	121.209923
912,	120.737976
914,	120.266022
916,	119.794060
918,	119.255280
920,	118.445251
922,	117.635208
924,	116.825134
926,	115.731827
928,	114.537689
930,	113.343506
932,	111.786148
934,	110.153214
936,	108.323837
938,	105.431168
940,	101.880127
942,	97.5458908
944,	91.1373291

946,	87.9795532
948,	88.8445206
950,	89.0871964
952,	88.7806702
954,	89.8590393
956,	90.6733932
958,	91.0563812
1000,	122.300842
1002,	122.108772
1004,	121.916702
1006,	121.703247
1008,	121.489914
1010,	121.209923
1012,	120.737976
1014,	120.266022
1016,	119.794060
1018,	119.255280
1020,	118.445251
1022,	117.635208
1024,	116.825134
1026,	115.731827
1028,	114.537689
1030,	113.343506
1032,	111.786148
1034,	110.153214
1036,	108.323837
1038,	105.431168
1040,	101.880127
1042,	97.5458908
1044,	91.1373291
1046,	87.9795532
1048,	88.8445206
1050,	89.0871964
1052,	89.8523636
1150,	90.3180771
1152,	90.4245453
1154,	90.4275589
1156,	91.0749588
1158,	91.4223175
1350,	91.8123093
1352,	91.5012360
1354,	91.5036011
1356,	92.2946548
1358,	92.5100555
1550,	94.7269974
1552,	94.4102325
1554,	94.4115067
1556,	94.5189056
1558,	94.5439987
1750,	97.4511642
1752,	96.3955002
1754,	96.3955002
1756,	96.3505325
1758,	96.2658463
1950,	99.4093857
1952,	98.0832672
1954,	98.0832672
1956,	97.9706497
1958,	97.8137894
2150,	100.998482
2152,	99.5057831
2154,	99.5057831
2156,	99.3279037
2158,	99.1200104
2350,	102.297005
2352,	100.686623
2354,	100.686623
2356,	100.475029
2358,	100.227455
2550,	103.343102
2552,	101.643227
2554,	101.643227
2556,	101.388428

2558,	101.108589
2750,	104.152924
2752,	102.413445
2754,	102.413445
2756,	102.125481
2758,	101.816864
2950,	104.796516
2952,	102.984688
2954,	102.984688
2956,	102.658157
2958,	102.321869
3150,	105.018661
3152,	103.165688
3154,	103.165688
3156,	102.819046
3158,	102.472321
3350,	105.462578
3352,	103.431938
3354,	103.431938
3356,	103.049515
3358,	102.680702
3550,	105.570389
3554,	103.526543
3556,	103.089851
3558,	102.696419
3750,	105.189445
3752,	103.242920
3754,	103.242920
3756,	102.768181
3758,	102.360405
3950,	104.376633
3952,	102.530510
3954,	102.530510
3956,	102.035851
3958,	101.623520
4150,	103.103539
4152,	101.389084
4154,	101.389084
4156,	100.864639
4158,	100.454117
4350,	101.368706
4352,	99.7508698
4354,	99.7508698
4356,	99.2001572
4358,	98.8037872
4550,	99.0280685
4552,	97.4927979
4554,	97.4927979
4556,	96.9563675
4558,	96.6113281
4750,	94.1679916
4752,	94.5108261
4754,	94.5108261
4756,	94.1421204
4758,	93.9167709
4950,	89.4995499
4952,	92.7199173
4954,	92.7199173
4956,	92.1880722
4958,	91.7182693
5150,	87.3848114
5152,	92.0065231
5154,	92.0065231
5156,	91.2187881
5158,	90.5312958
5350,	86.8107224
5352,	91.2884216
5354,	91.2884216
5356,	90.2709274
5358,	89.3806458
5550,	85.6459579
5552,	90.0715637
5554,	90.0715637

5556,	89.0031128
5558,	88.0825500
5750,	84.7156372
5752,	88.7496490
5754,	88.7496490
5756,	87.9471054
5758,	86.9641342
5858,	86.1973190
5950,	83.8248978
5952,	86.8131943
5954,	86.8131943
5956,	86.2912674
5958,	85.7300110
6150,	83.4464188
6152,	85.8151627
6154,	85.8151627
6156,	85.5436554
6158,	85.2675171
6350,	83.2604141
6352,	84.5226974
6354,	84.5226974
6356,	84.7605591
6358,	84.7068634
6550,	82.9276352
6552,	83.0965347
6554,	83.0965347
6556,	83.8147736
6558,	83.9425125
6754,	82.3692169
6756,	82.9813004
6758,	83.1544189
6954,	81.2714386
6956,	81.9907761
6958,	82.3237305
7154,	80.9539490
7156,	81.3220367
7158,	81.5359650
7354,	80.6499634
7356,	80.8712616
7358,	81.0696716
7554,	80.5100174
7556,	80.5786057
7558,	80.6078949
7754,	80.3809433
7756,	80.3822784
7758,	80.3572540
7954,	80.3034286
7956,	80.2205734
7958,	80.1110229
8154,	80.2130432
8156,	80.0907898
8158,	79.9471207
8354,	80.1287231
8356,	79.9664764
8358,	79.7904892
8554,	80.0596008
8556,	79.8602600
8558,	79.6521835
8754,	79.9906769
8756,	79.7599258
8758,	79.5196228
8954,	79.9298859
8956,	79.6572495
8958,	79.3823700
9154,	79.8737488
9156,	79.5638733
9158,	79.2329941
9354,	79.8111954
9356,	79.4509277
9358,	79.0803146
9554,	79.7678909
9556,	79.3593903
9558,	78.9366226

9754,	79.7060852
9756,	79.2687607
9758,	78.8142014
9954,	79.6509399
9956,	79.1684341
9958,	78.6671982
10154,	79.6170654
10156,	79.0875778
10158,	78.5383606
10354,	79.5609131
10356,	78.9998932
10358,	78.4144745
10554,	79.5134354
10556,	78.9094315
10558,	78.2726364
10754,	79.4933395
10756,	78.8442764
10758,	78.1563187
10954,	79.4507599
10956,	78.7733536
10958,	78.0333328
11154,	79.4110031
11156,	78.7059631
11158,	77.9006348
11354,	79.3931122
11356,	78.6583633
11358,	77.8269501
11554,	79.3706741
11556,	78.6197128
11558,	77.7718124
11754,	79.3366470
11756,	78.5741959
11758,	77.6482544
11954,	79.3440475
11956,	78.5671616
11958,	77.6407089
12154,	79.3569489
12156,	78.5762787
12158,	77.6968155

*NODE PRINT,NSET=NSTUD,FREQ=100

U

*ELPRINT,ELSET=ESTUD1,FREQ=100

S,E

*ELPRINT,ELSET=ESTUD2,FREQ=100

S,E

*END STEP

*****SECOND THERMAL LOAD STEP

*STEP,AMPLITUDE=RAMP,CYCL=3,INC=1000,SUBMAX

SECOND THERMAL LOAD STEP ON 241-SY-101 TANK

*STATIC,PTOL=100.,DIRECT=NOSTOP

0.01,1.0,

*TEMPERATURE, OP=MOD

100,	117.278122
102,	117.086807
104,	116.895485
106,	117.058067
108,	117.237968
110,	116.959877
112,	116.497597
114,	116.035324
116,	115.573051
118,	115.047272
120,	114.270073
122,	113.492882
124,	112.715683
126,	111.681763
128,	110.559120
130,	109.436478
132,	107.991386
134,	106.482552
136,	104.804657
138,	101.465790
140,	97.4974518

142,	93.0516357
144,	91.4874344
146,	90.2689819
148,	89.8803253
150,	89.9522705
152,	90.1550522
154,	90.2564316
156,	90.4516144
158,	90.6343994
300,	118.019859
302,	117.827072
304,	117.634277
306,	117.620834
308,	117.621689
310,	117.342934
312,	116.879173
314,	116.415413
316,	115.951660
318,	115.423904
320,	114.642776
322,	113.861641
324,	113.080513
326,	112.039650
328,	110.909019
330,	109.778389
332,	108.320335
334,	106.797546
336,	105.101250
338,	101.813736
340,	97.6697006
342,	94.1333237
344,	95.0629730
346,	95.8331223
348,	96.2204819
350,	95.6209869
352,	94.9070587
354,	94.5501404
356,	92.5214691
358,	90.9399948
502,	118.650841
504,	118.457687
506,	118.243080
508,	118.028481
510,	117.749374
512,	117.284569
514,	116.819763
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12158,	77.6073151

*NODE PRINT,NSET=NSTUD,FREQ=100

U

*ELPRINT,ELSET=ESTUD1,FREQ=100

S,E

*ELPRINT,ELSET=ESTUD2,FREQ=100

S,E

*END STEP

*****THIRD THERMAL LOAD

*STEP,AMPLITUDE=RAMP,CYCL=3,INC=1000,SUBMAX

THIRD THERMAL LOAD STEP ON 241-SY-101 TANK

*STATIC,PTOL=100.,DIRECT=NOSTOP

0.01,1.0,

*TEMPERATURE, OP=MOD

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136,	104.841995
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140,	97.5316467

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11156, 78.6504898
11158, 77.7651062
11354, 79.4573517
11356, 78.6031723
11358, 77.6909027
11554, 79.4340134
11556, 78.5640182
11558, 77.6353912
11754, 79.3958206
11756, 78.5148773
11758, 77.5093689
11954, 79.4063797
11956, 78.5093460
11958, 77.5021667
12154, 79.4225769
12156, 78.5211258
12158, 77.5599365

*NODE PRINT,NSET=NSTUD,FREQ=100

U

*ELPRINT,ELSET=ESTUD1,FREQ=100

S,E

*ELPRINT,ELSET=ESTUD2,FREQ=100

S,E

*****----- DISPLACEMENT & CONTOUR PLOTS -----*

*PLOT,COLORS=8,OUTPUT=BINARY,FREQ=100

DEFORMED SHAPE FOR THIRD THERMAL LOAD STEP)

*DISPLACED

U

*PLOT,COLORS=8,OUTPUT=BINARY,FREQ=100

SECONDARY STEEL LINERS DEFORMED SHAPE FOR THIRD THERMAL LOAD

*DETAIL,ELSET=STEEL

*DISPLACED

U

*PLOT,COLORS=8,OUTPUT=BINARY,FREQ=100

E11 STRAIN(MEM+BEN1)FOR THIRD THERMAL LOAD

*DETAIL,ELSET=STEEL

*CONTOUR

E11,6,

*PLOT,COLORS=8,OUTPUT=BINARY,FREQ=100

E11 STRAIN(MEM+BEN3)FOR THIRD THERMAL LOAD

*DETAIL,ELSET=STEEL

*CONTOUR

E11,6, , , 3

*PLOT,COLORS=8,OUTPUT=BINARY,FREQ=100

E22 STRAIN(MEM+BEN1)FOR THIRD THERMAL LOAD

*DETAIL,ELSET=STEEL

*CONTOUR

E22,6,

*PLOT,COLORS=8,OUTPUT=BINARY,FREQ=100

E22 STRAIN(MEM+BEN3)FOR THIRD THERMAL LOAD

*DETAIL,ELSET=STEEL

```

*CONTOUR
E22,6, , , ,3
*PLOT,COLORS=8,OUTPUT=BINARY,FREQ=100
E33 STRAIN(MEM+BEN1)FOR THIRD THERMAL LOAD
*DETAIL,ELSET=STEEL
*CONTOUR
E33,6,
*PLOT,COLORS=8,OUTPUT=BINARY,FREQ=100
E33 STRAIN(MEM+BEN3)FOR THIRD THERMAL LOAD
*DETAIL,ELSET=STEEL
*CONTOUR
E33,6, , , ,3
*END STEP
***** FOURTH THERMAL LOAD STEP
*STEP,AMPLITUDE=RAMP,CYCL=3,INC=1000,SUBMAX
FOURTH THERMAL LOAD STEP ON 241-SY-101 TANK
*STATIC,PTOL=100.,DIRECT=NOSTOP
0.01,1.0,
*TEMPERATURE, OP=MOD
100, 117.374672
102, 117.182632
104, 116.990593
106, 117.250755
108, 117.547089
110, 117.267891
112, 116.803680
114, 116.339470
116, 115.875259
118, 115.347130
120, 114.565910
122, 113.784691
124, 113.003471
126, 111.963997
128, 110.835266
130, 109.706535
132, 108.251404
134, 106.731735
136, 105.064323
138, 101.707520
140, 98.2158661
142, 96.4641037
144, 97.4263992
146, 98.1952896
148, 98.4999924
150, 97.8268967
152, 97.0698853
154, 96.6914291
156, 94.5895233
158, 92.1534729
300, 118.322037
302, 118.128532
304, 117.935028
306, 117.983063
308, 118.054604
310, 117.774628
312, 117.308685
314, 116.842751
316, 116.376808
318, 115.846451
320, 115.061012
322, 114.275581
324, 113.490150
326, 112.442932
328, 111.305252
330, 110.167564
332, 108.701096
334, 107.169632
336, 105.484634
338, 102.223083
340, 98.8885498
342, 99.9021606
344, 105.774651
346, 110.327637

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348,	111.713814
350,	109.675224
352,	107.223877
354,	105.998383
356,	101.240845
358,	96.5658417
502,	119.224716
504,	119.030716
506,	118.815147
508,	118.599594
510,	118.319069
512,	117.851631
514,	117.384193
516,	116.916748
518,	116.384506
520,	115.595680
522,	114.806854
524,	114.018036
526,	112.962807
528,	111.815506
530,	110.668205
532,	109.197052
534,	107.661865
536,	105.952309
538,	102.733612
540,	100.071327
542,	100.336929
544,	116.679443
546,	128.512802
548,	129.524231
550,	126.422142
552,	123.067741
554,	121.390785
556,	108.311012
558,	100.400322
700,	119.418800
702,	119.224792
704,	119.030792
706,	118.815224
708,	118.599670
710,	118.319145
712,	117.851707
714,	117.384270
716,	116.916824
718,	116.384583
720,	115.595757
722,	114.806931
724,	114.018112
726,	112.962875
728,	111.815582
730,	110.668282
732,	109.197121
734,	107.661942
736,	105.952377
738,	102.733681
740,	100.071388
742,	100.337074
744,	116.679398
746,	128.514221
748,	129.525116
750,	126.422562
754,	121.391029
756,	108.311035
758,	100.400345
800,	124.786560
802,	124.591530
804,	124.396492
806,	124.179726
808,	123.963089
810,	123.678734
812,	123.199402
814,	122.720062
816,	122.240700

818,	121.693565
820,	120.871254
822,	120.048920
824,	119.226555
826,	118.117676
828,	116.906799
830,	115.695877
832,	114.122704
834,	112.474152
836,	110.669151
838,	107.896759
840,	105.547112
842,	106.026733
844,	117.935188
846,	132.862106
852,	126.878365
900,	124.786583
902,	124.591553
904,	124.396507
906,	124.179749
908,	123.963104
910,	123.678757
912,	123.199425
914,	122.720078
916,	122.240723
918,	121.693588
920,	120.871277
922,	120.048935
924,	119.226578
926,	118.117699
928,	116.906815
930,	115.695892
932,	114.122719
934,	112.474167
936,	110.669167
938,	107.896767
940,	105.547112
942,	106.026695
944,	117.935051
946,	132.860931
948,	126.812798
950,	127.704308
952,	126.893494
954,	121.809830
956,	109.008972
958,	101.021515
1000,	124.786583
1002,	124.591553
1004,	124.396507
1006,	124.179749
1008,	123.963104
1010,	123.678757
1012,	123.199425
1014,	122.720078
1016,	122.240723
1018,	121.693588
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1024,	119.226578
1026,	118.117699
1028,	116.906815
1030,	115.695892
1032,	114.122719
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1036,	110.669167
1038,	107.896767
1040,	105.547112
1042,	106.026695
1044,	117.935051
1046,	132.860931
1048,	126.812798
1050,	127.704308
1052,	122.813477

1150,	124.773415
1152,	121.137169
1154,	121.119812
1156,	110.406998
1158,	102.265770
1350,	121.902473
1352,	119.496384
1354,	119.479752
1356,	109.859741
1358,	102.850761
1550,	116.996918
1552,	114.720490
1554,	114.708237
1556,	107.790405
1558,	102.389992
1750,	112.838524
1752,	111.847725
1754,	111.847725
1756,	106.387093
1758,	102.162910
1950,	110.443954
1952,	109.808670
1954,	109.808670
1956,	105.463303
1958,	102.185646
2150,	109.001511
2152,	108.400314
2154,	108.400314
2156,	104.960098
2158,	102.394936
2350,	108.061668
2352,	107.436127
2354,	107.436127
2356,	104.682907
2358,	102.680984
2550,	107.491707
2552,	106.780319
2554,	106.780319
2556,	104.543076
2558,	102.900330
2750,	107.178032
2752,	106.319893
2754,	106.319893
2756,	104.476234
2758,	103.120483
2950,	106.997330
2952,	105.989365
2954,	105.989365
2956,	104.436516
2958,	103.287231
3150,	106.955498
3152,	105.874100
3154,	105.874100
3156,	104.414284
3158,	103.330879
3350,	106.904892
3352,	105.619011
3354,	105.619011
3356,	104.322571
3358,	103.354179
3550,	106.619415
3552,	105.202171
3554,	105.202171
3556,	104.057083
3558,	103.198822
3750,	106.013550
3752,	104.612083
3754,	104.612083
3756,	103.552162
3758,	102.754753
3950,	105.135605
3952,	103.768402
3954,	103.768402

3956,	102.742935
3958,	101.971260
4150,	103.889824
4152,	102.629837
4154,	102.629837
4156,	101.584335
4158,	100.809967
4350,	102.299553
4352,	101.120163
4354,	101.120163
4356,	100.013603
4358,	99.2142487
4550,	100.237556
4552,	99.1291428
4554,	99.1291428
4556,	97.9483871
4558,	97.1211777
4750,	96.0652695
4752,	99.1291428
4754,	99.1291428
4756,	95.3701859
4758,	94.5426559
4950,	91.5770416
4952,	95.0115738
4954,	95.0115738
4956,	93.4992065
4958,	92.3477631
5150,	89.4965591
5152,	94.4484177
5154,	94.4484177
5156,	92.5776901
5158,	91.1205444
5350,	89.0652542
5352,	93.8269806
5354,	93.8269806
5356,	91.6663361
5358,	89.8889389
5550,	87.9736786
5552,	93.1376572
5554,	93.1376572
5556,	90.4317474
5558,	88.4607925
5750,	86.9365768
5752,	92.6422729
5754,	92.6422729
5756,	89.2278214
5758,	87.1438065
5858,	86.2245712
5950,	85.8893661
5952,	89.8730469
5954,	89.8730469
5956,	87.5488205
5958,	85.9212723
6150,	85.3764496
6152,	88.2545700
6154,	88.2545700
6156,	86.7034302
6158,	85.5328217
6350,	84.9661942
6352,	86.4587250
6354,	86.4587250
6356,	85.7540512
6358,	84.9925842
6550,	84.3853226
6552,	84.5773926
6554,	84.5773926
6556,	84.6020584
6558,	84.1939163
6754,	83.5004196
6756,	83.5869675
6758,	83.3425598
6954,	81.9117279
6956,	82.3732452

6958,	82.4291763
7154,	81.4841614
7156,	81.5696259
7158,	81.5633316
7354,	81.0978088
7356,	81.0509109
7358,	81.0591125
7554,	80.9193039
7556,	80.7212219
7558,	80.5624390
7754,	80.7682114
7756,	80.5118256
7758,	80.3015289
7954,	80.6661835
7956,	80.3395996
7958,	80.0497742
8154,	80.5615845
8156,	80.1995850
8158,	79.8780594
8354,	80.4557190
8356,	80.0665665
8358,	79.7197342
8554,	80.3762894
8556,	79.9497986
8558,	79.5708084
8754,	80.2921066
8756,	79.8430557
8758,	79.4330826
8954,	80.2223816
8956,	79.7296753
8958,	79.2873459
9154,	80.1601486
9156,	79.6347275
9158,	79.1308594
9354,	80.0871811
9356,	79.5094757
9358,	78.9711227
9554,	80.0446625
9556,	79.4164658
9558,	78.8235626
9754,	79.9728012
9756,	79.3221817
9758,	78.7008972
9954,	79.9112854
9956,	79.2137680
9958,	78.5445404
10154,	79.8806763
10156,	79.1325302
10158,	78.4123611
10354,	79.8161697
10356,	79.0397263
10358,	78.2850647
10554,	79.7641525
10556,	78.9422836
10558,	78.1344147
10754,	79.7498627
10756,	78.8784485
10758,	78.0158386
10954,	79.7018433
10956,	78.8032990
10958,	77.8887024
11154,	79.6571579
11156,	78.7307281
11158,	77.7497177
11354,	79.6419220
11356,	78.6836929
11358,	77.6750793
11554,	79.6179352
11556,	78.6441422
11558,	77.6193008
11754,	79.5765381
11756,	78.5915604
11758,	77.4871750

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11954,      79.5897751
11956,      78.5878296
11958,      77.4812851
12154,      79.6086960
12156,      78.6025009
12158,      77.5437393
*NODE PRINT,NSET=NSTUD,FREQ=100
U
*ELPRINT,ELSET=ESTUD1,FREQ=100
S,E
*ELPRINT,ELSET=ESTUD2,FREQ=100
S,E
*END STEP
*****5TH THERMAL LOAD STEP
*STEP,AMPLITUDE=RAMP,CYCL=3,INC=1000,SUBMAX
5TH THERMAL LOAD STEP ON 241-SY-101 TANK
*STATIC,PTOL=100.,DIRECT=NOSTOP
0.01,1.0,
*TEMPERATURE, OP=MOD
100,      117.763489
102,      117.569969
104,      117.376457
106,      117.713768
108,      118.089722
110,      117.807465
112,      117.338448
114,      116.869431
116,      116.400414
118,      115.866875
120,      115.077866
122,      114.288857
124,      113.499847
126,      112.451050
128,      111.312462
130,      110.173882
132,      108.732552
134,      107.231369
136,      105.679909
138,      102.657822
140,      100.831497
142,      103.108337
144,      106.406662
146,      109.010025
148,      109.945473
150,      108.478500
152,      106.735741
154,      105.864487
156,      102.203773
158,      97.5271988
300,      118.867371
302,      118.671654
304,      118.475929
306,      118.563217
308,      118.671776
310,      118.388245
312,      117.916809
314,      117.445374
316,      116.973938
318,      116.437454
320,      115.643448
322,      114.849434
324,      114.055420
326,      112.998352
328,      111.850380
330,      110.702400
332,      109.251701
334,      107.741158
336,      106.184586
338,      103.363487
340,      102.077545
342,      106.994743
344,      114.023216
346,      119.492607

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348,	121.220177
350,	119.028824
352,	116.312485
354,	114.954514
356,	109.793877
358,	104.739151
502,	119.923744
504,	119.726616
506,	119.507584
508,	119.288567
510,	119.003944
512,	118.530296
514,	118.056641
516,	117.582985
518,	117.043884
520,	116.245644
522,	115.447395
524,	114.649155
526,	113.583649
528,	112.425774
530,	111.267899
532,	109.813034
534,	108.299461
536,	106.728065
538,	104.030273
540,	103.556664
542,	108.034286
544,	123.921860
546,	135.471176
548,	136.608719
550,	133.918716
552,	130.920776
554,	129.422028
556,	117.587082
558,	110.370735
700,	120.120949
702,	119.923828
704,	119.726707
706,	119.507675
708,	119.288658
710,	119.004036
712,	118.530380
714,	118.056725
716,	117.583076
718,	117.043968
720,	116.245728
722,	115.447479
724,	114.649239
726,	113.583725
728,	112.425858
730,	111.267982
732,	109.813110
734,	108.299538
736,	106.728142
738,	104.030350
740,	103.556740
742,	108.034439
744,	123.921837
746,	135.472473
748,	136.609543
750,	133.919113
754,	129.422256
756,	117.587112
758,	110.370758
800,	126.013145
802,	125.810524
804,	125.607895
806,	125.382706
808,	125.157639
810,	124.864258
812,	124.372787
814,	123.881310
816,	123.389816

818,	122.829903
820,	121.992233
822,	121.154541
824,	120.316826
826,	119.192993
828,	117.967300
830,	116.741570
832,	115.197029
834,	113.586136
836,	111.966881
838,	109.768402
840,	109.186913
842,	112.373619
844,	126.098976
846,	140.127228
852,	134.411652
900,	126.013161
902,	125.810539
904,	125.607910
906,	125.382721
908,	125.157654
910,	124.864281
912,	124.372803
914,	123.881325
916,	123.389832
918,	122.829918
920,	121.992249
922,	121.154556
924,	120.316841
926,	119.193008
928,	117.967316
930,	116.741585
932,	115.197037
934,	113.586143
936,	111.966888
938,	109.768410
940,	109.186905
942,	112.373573
944,	126.098862
946,	140.126190
948,	134.792694
950,	135.614120
952,	134.550171
954,	129.911087
956,	118.479889
958,	111.336479
1000,	126.013161
1002,	125.810539
1004,	125.607910
1006,	125.382721
1008,	125.157654
1010,	124.864281
1012,	124.372803
1014,	123.881325
1016,	123.389832
1018,	122.829918
1020,	121.992249
1022,	121.154556
1024,	120.316841
1026,	119.193008
1028,	117.967316
1030,	116.741585
1032,	115.197037
1034,	113.586143
1036,	111.966888
1038,	109.768410
1040,	109.186905
1042,	112.373573
1044,	126.098862
1046,	140.126190
1048,	134.792694
1050,	135.614120
1052,	130.915527

1150,	133.045685
1152,	129.494873
1154,	129.478958
1156,	120.268181
1158,	113.270874
1350,	130.423294
1352,	128.124054
1354,	128.108688
1356,	120.018448
1358,	114.083885
1550,	125.433067
1552,	123.318085
1554,	123.306412
1556,	117.302017
1558,	112.440178
1750,	120.820282
1752,	119.928215
1754,	119.928215
1756,	114.874939
1758,	110.763687
1950,	117.730675
1952,	117.162567
1954,	117.162567
1956,	112.841988
1958,	109.373627
2150,	115.398560
2152,	114.949883
2154,	114.949883
2156,	111.282135
2158,	108.352692
2350,	113.566864
2352,	113.174835
2354,	113.174835
2356,	110.037399
2358,	107.587151
2550,	112.149635
2552,	111.746460
2554,	111.746460
2556,	109.043060
2558,	106.915504
2750,	111.067177
2752,	110.570770
2754,	110.570770
2756,	108.224426
2758,	106.387573
2950,	110.194809
2952,	109.603905
2954,	109.603905
2956,	107.551697
2958,	105.949150
3150,	109.912437
3152,	109.258026
3154,	109.258026
3156,	107.308014
3158,	105.785667
3350,	109.354187
3352,	108.545708
3354,	108.545708
3356,	106.786758
3358,	105.416801
3550,	108.579315
3552,	107.609886
3554,	107.609886
3556,	106.053879
3558,	104.847900
3750,	107.638634
3752,	106.617706
3754,	106.617706
3756,	105.197266
3758,	104.097626
3950,	106.524078
3952,	105.476746
3954,	105.476746

3956,	104.139313
3958,	103.107468
4150,	105.121666
4152,	104.123474
4154,	104.123474
4156,	102.819733
4158,	101.826294
4350,	103.433357
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4354,	102.467575
4356,	101.159187
4358,	100.183578
4550,	101.326500
4552,	100.382751
4554,	100.382751
4556,	99.0585403
4558,	98.1016617
4750,	97.1663513
4752,	97.7584686
4754,	97.7584686
4756,	96.4662018
4758,	95.5524597
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4952,	97.7584686
4954,	97.7584686
4956,	94.5695343
4958,	93.3449020
5150,	90.3973541
5152,	95.5880432
5154,	95.5880432
5156,	93.6189499
5158,	92.0717468
5350,	89.9528732
5352,	94.9472504
5354,	94.9472504
5356,	92.6627045
5358,	90.7562943
5550,	88.8178024
5552,	94.2342529
5554,	94.2342529
5556,	91.3584976
5558,	89.1914673
5750,	87.7338943
5752,	93.7042084
5754,	93.7042084
5756,	90.0600967
5758,	87.6591492
5858,	86.5916672
5950,	86.6379089
5952,	90.8252792
5954,	90.8252792
5956,	88.2975082
5958,	86.4140167
6150,	86.0989075
6152,	89.1291046
6154,	89.1291046
6156,	87.4245300
6158,	86.0718994
6350,	85.6632462
6352,	87.2364502
6354,	87.2364502
6356,	86.4400558
6358,	85.5407715
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6756,	84.1368637
6758,	83.8080139
6954,	82.4078598
6956,	82.8267975

6958,	82.8114243
7154,	81.9379730
7156,	81.9555893
7158,	81.8691711
7354,	81.5164795
7356,	81.3906021
7358,	81.3214722
7554,	81.3180008
7556,	81.0327148
7558,	80.7835159
7754,	81.1527405
7756,	80.8080368
7758,	80.5080872
7954,	81.0393524
7956,	80.6243286
7958,	80.2447739
8154,	80.9263000
8156,	80.4766846
8158,	80.0663452
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8356,	80.3369827
8358,	79.9050293
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8556,	80.2133484
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8758,	79.6054001
8954,	80.5588379
8956,	79.9808884
8958,	79.4521484
9154,	80.4925919
9156,	79.8827209
9158,	79.2884674
9354,	80.4140396
9356,	79.7491455
9358,	79.1213531
9554,	80.3701248
9556,	79.6529007
9558,	78.9682388
9754,	80.2929993
9756,	79.5546341
9758,	78.8424759
9954,	80.2276459
9956,	79.4402466
9958,	78.6779251
10154,	80.1969299
10156,	79.3567581
10158,	78.5411224
10354,	80.1281052
10356,	79.2597275
10358,	78.4094162
10554,	80.0732803
10556,	79.1573257
10558,	78.2506714
10754,	80.0602951
10756,	79.0926361
10758,	78.1282196
10954,	80.0094147
10956,	79.0142059
10958,	77.9948654
11154,	79.9621353
11156,	78.9380798
11158,	77.8470535
11354,	79.9473572
11356,	78.8903656
11358,	77.7709808
11554,	79.9224091
11556,	78.8498688
11558,	77.7143326
11754,	79.8779297
11756,	78.7937546
11758,	77.5707474

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11956,      78.7917709
11958,      77.5674210
12154,      79.9147568
12156,      78.8093033
12158,      77.6387253
*NODE PRINT,NSET=NSTUD,FREQ=100
U
*ELPRINT,ELSET=ESTUD1,FREQ=100
S,E
*ELPRINT,ELSET=ESTUD2,FREQ=100
S,E
*END STEP
***** SIXTH THERMAL LOAD STEP*****
*STEP,AMPLITUDE=RAMP,CYCL=3,INC=1000,SUBMAX
SIXTH THERMAL LOAD STEP ON 241-SY-101 TANK
*STATIC,PTOL=100.,DIRECT=NOSTOP
0.01,1.0,
*TEMPERATURE,OP=MOD
100,      118.158516
102,      117.963379
104,      117.768234
106,      118.129234
108,      118.528519
110,      118.243553
112,      117.770355
114,      117.297165
116,      116.823967
118,      116.285851
120,      115.490707
122,      114.695557
124,      113.900414
126,      112.848633
128,      111.708153
130,      110.567673
132,      109.176132
134,      107.734955
136,      106.357582
138,      103.849907
140,      103.470467
142,      108.051254
144,      112.185013
146,      115.445656
148,      116.610817
150,      114.915985
152,      112.873642
154,      111.852615
156,      107.781372
158,      102.469879
300,      119.312660
302,      119.114929
304,      118.917191
306,      119.015053
308,      119.133186
310,      118.846718
312,      118.370857
314,      117.894997
316,      117.419128
318,      116.877831
320,      116.077454
322,      115.277077
324,      114.476700
326,      113.416916
328,      112.267479
330,      111.118042
332,      109.721130
334,      108.275291
336,      106.902855
338,      104.664818
340,      104.934128
342,      111.829987
344,      119.182961
346,      124.911293
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348,	126.740517
350,	124.573814
352,	121.846588
354,	120.483170
356,	115.328171
358,	110.263145
502,	120.414413
504,	120.214851
506,	119.993111
508,	119.771378
510,	119.483604
512,	119.005295
514,	118.526993
516,	118.048683
518,	117.504524
520,	116.699684
522,	115.894844
524,	115.089996
526,	114.022011
528,	112.863091
530,	111.704163
532,	110.305328
534,	108.859070
536,	107.478729
538,	105.405945
540,	106.502686
542,	112.957962
544,	128.328812
546,	139.526398
548,	140.708115
550,	138.231461
552,	135.425278
554,	134.022385
556,	122.982140
558,	116.175728
700,	120.614075
702,	120.414505
704,	120.214943
706,	119.993195
708,	119.771461
710,	119.483696
712,	119.005386
714,	118.527077
716,	118.048767
718,	117.504616
720,	116.699776
722,	115.894928
724,	115.090080
726,	114.022095
728,	112.863167
730,	111.704247
732,	110.305412
734,	108.859154
736,	107.478813
738,	105.406029
740,	106.502762
742,	112.958115
744,	128.328812
746,	139.527618
748,	140.708893
750,	138.231827
754,	134.022614
756,	122.982162
758,	116.175758
800,	126.663567
802,	126.457054
804,	126.250534
806,	126.021019
808,	125.791634
810,	125.493614
812,	124.995880
814,	124.498138
816,	124.000381

818,	123.433899
820,	122.588364
822,	121.742813
824,	120.897232
826,	119.771957
828,	118.547104
830,	117.322212
832,	115.850861
834,	114.328201
836,	112.927605
838,	111.308800
840,	111.866524
842,	116.364136
844,	130.577682
846,	143.990875
852,	138.723877
900,	126.663589
902,	126.457069
904,	126.250549
906,	126.021034
908,	125.791649
910,	125.493629
912,	124.995895
914,	124.498154
916,	124.000404
918,	123.433914
920,	122.588387
922,	121.742828
924,	120.897247
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928,	118.547119
930,	117.322227
932,	115.850876
934,	114.328217
936,	112.927612
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952,	138.896606
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956,	123.887718
958,	117.206886
1000,	126.663589
1002,	126.457069
1004,	126.250549
1006,	126.021034
1008,	125.791649
1010,	125.493629
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1016,	124.000404
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1022,	121.742828
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1032,	115.850876
1034,	114.328217
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1040,	111.866508
1042,	116.364098
1044,	130.577576
1046,	143.989899
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1052,	135.472015

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1152,	134.144379
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1352,	132.877380
1354,	132.862717
1356,	125.550171
1358,	120.168961
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1552,	128.188339
1554,	128.177063
1556,	122.729446
1558,	118.253197
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1952,	121.690147
1954,	121.690147
1956,	117.548103
1958,	114.137535
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2154,	119.166679
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2754,	113.707169
2756,	111.180130
2758,	109.146416
2950,	112.746391
2952,	112.386314
2954,	112.386314
2956,	110.129524
2958,	108.321823
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3354,	110.913307
3356,	108.940559
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3554,	109.636536
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3754,	108.358345
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4954,	97.0791321
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5752,	94.5116806
5754,	94.5116806
5756,	90.6945343
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6154,	89.7571640
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6958,	83.1189651

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8956,	80.1198502
8958,	79.5523605
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9158,	79.3791733
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9358,	79.2034302
9554,	80.5325470
9556,	79.7733994
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9756,	79.6705704
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10158,	78.5999832
10354,	80.2784576
10356,	79.3640900
10358,	78.4641495
10554,	80.2213898
10556,	79.2581024
10558,	78.2998428
10754,	80.2082214
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11156,	79.0326538
11158,	77.8827896
11354,	80.0914154
11356,	78.9841080
11358,	77.8055420
11554,	80.0657272
11556,	78.9428406
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11758,	77.5977325
11954,	80.0361252

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11958,      77.5960541
12154,      80.0585709
12156,      78.9026947
12158,      77.6727982
*NODE PRINT,NSET=NSTUD,FREQ=100
U
*ELPRINT,ELSET=ESTUD1,FREQ=100
S,E
*ELPRINT,ELSET=ESTUD2,FREQ=100
S,E
*END STEP
***** SEVENTH THERMAL LOAD STEP*****
*STEP,AMPLITUDE=RAMP,CYCL=3,INC=1000,SUBMAX
SEVENTH THERMAL LOAD STEP ON 241-SY-101 TANK
*STATIC,PTOL=100.,DIRECT=NOSTOP
0.01,1.0,
*TEMPERATURE,OP=MOD
100,      124.937752
102,      124.778816
104,      124.619873
106,      125.053581
108,      125.511726
110,      125.327576
112,      125.083252
114,      124.838936
116,      124.594612
118,      124.384209
120,      124.308083
122,      124.231964
124,      124.155838
126,      124.470825
128,      124.920975
130,      125.371124
132,      126.532364
134,      127.834175
136,      129.563477
138,      132.876236
140,      138.029037
142,      145.086014
144,      148.409515
146,      150.997025
148,      151.818207
150,      150.473129
152,      148.887695
154,      148.095078
156,      144.865372
158,      140.364807
300,      126.119194
302,      125.963165
304,      125.807137
306,      125.953568
308,      126.111786
310,      125.929634
312,      125.689407
314,      125.449181
316,      125.208954
318,      125.003700
320,      124.936928
322,      124.870148
324,      124.803375
326,      125.131004
328,      125.594933
330,      126.058861
332,      127.236771
334,      128.555817
336,      130.301697
338,      133.967514
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342,      147.619995
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346,      156.150742
348,      157.322708

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504,	127.070290
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510,	126.547401
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514,	126.073257
516,	125.836189
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520,	125.575371
522,	125.515823
524,	125.456284
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536,	131.014145
538,	134.923325
540,	141.025131
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544,	157.440002
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548,	164.644196
550,	163.366989
552,	161.837418
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556,	154.709915
558,	150.475815
700,	127.378456
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706,	126.899208
708,	126.728058
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712,	126.310417
714,	126.073341
716,	125.836273
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720,	125.575455
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726,	125.792686
728,	126.265816
730,	126.738945
732,	127.929832
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736,	131.014236
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748,	164.644684
750,	163.367249
754,	161.072876
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758,	150.475830
800,	132.967636
802,	132.819962
804,	132.672272
806,	132.508148
808,	132.344116
810,	132.175446
812,	131.961853
814,	131.748260
816,	131.534653
818,	131.361099

820,	131.350174
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824,	131.328339
826,	131.719910
828,	132.254745
830,	132.789612
832,	134.019669
834,	135.394348
836,	137.171204
838,	140.443146
840,	144.990982
842,	150.940155
844,	160.115555
846,	167.587296
852,	163.927200
900,	132.967651
902,	132.819962
904,	132.672287
906,	132.508163
908,	132.344131
910,	132.175461
912,	131.961868
914,	131.748276
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924,	131.328354
926,	131.719925
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930,	132.789627
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934,	135.394363
936,	137.171204
938,	140.443146
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942,	150.940155
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946,	167.586716
948,	164.572815
950,	165.104050
952,	164.341156
954,	161.512329
956,	155.339935
958,	151.220078
1000,	132.967651
1002,	132.819962
1004,	132.672287
1006,	132.508163
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10558,	92.2526169
10754,	95.4599075
10756,	93.8127213
10758,	92.2188263
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10956,	93.7724228
10958,	92.1473770
11154,	95.3767624
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11158,	92.0345001
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12158, 92.0441132

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*ELPRINT,ELSET=ESTUD1,FREQ=100

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*ELPRINT,ELSET=ESTUD2,FREQ=100

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PE

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PE

*EL FILE,ELSET=CONCRETE,FREQ=100,REBAR=SLTH

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PE

*EL FILE,ELSET=CONCRETE,FREQ=100,REBAR=SLTM

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*EL FILE,ELSET=CONCRETE,FREQ=100,REBAR=WLIH

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PE

*EL FILE,ELSET=CONCRETE,FREQ=100,REBAR=W LIM

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*EL FILE,ELSET=CONCRETE,FREQ=100,REBAR=WLOM

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PE

*EL FILE,ELSET=CONCRETE,FREQ=100,REBAR=WLR

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*EL FILE,ELSET=CONCRETE,FREQ=100,REBAR=HAIM

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*EL FILE,ELSET=CONCRETE,FREQ=100,REBAR=HAOM

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*EL FILE,ELSET=CONCRETE,FREQ=100,REBAR=HAMH

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E

PE

*EL FILE,ELSET=CONCRETE,FREQ=100,REBAR=HAMM

S

E

PE

*EL FILE,ELSET=CONCRETE,FREQ=100,REBAR=HAR

S

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E
PE
*EL FILE,ELSET=CONCRETE,FREQ=100,REBAR=DIH
S
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PE
*EL FILE,ELSET=CONCRETE,FREQ=100,REBAR=DIM
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PE
*EL FILE,ELSET=CONCRETE,FREQ=100,REBAR=DOH
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*EL FILE,ELSET=CONCRETE,FREQ=100,REBAR=DOM
S
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PE
*EL FILE,ELSET=CONCRETE,FREQ=100,REBAR=DR
S
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PE

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SLINER1, SLINER2
*****----- DISPLACEMENT & CONTOUR PLOTS -----*
*PLOT,COLORS=8,OUTPUT=BINARY,FREQ=100
DEFORMED SHAPE FOR SEVENTH THERMAL LOAD STEP)
*DISPLACED
U
*PLOT,COLORS=8,OUTPUT=BINARY,FREQ=100
SECONDARY STEEL LINERS DEFORMED SHAPE FOR SEVENTH THERMAL LOAD
*DETAIL,ELSET=STEEL
*DISPLACED
U
*PLOT,COLORS=8,OUTPUT=BINARY,FREQ=100
E11 STRAIN(MEM+BEN1)FOR SEVENTH THERMAL LOAD
*DETAIL,ELSET=STEEL
*CONTOUR
E11,6,
*PLOT,COLORS=8,OUTPUT=BINARY,FREQ=100
E11 STRAIN(MEM+BEN3)FOR SEVENTH THERMAL LOAD
*DETAIL,ELSET=STEEL
*CONTOUR
E11,6, , , ,3
*PLOT,COLORS=8,OUTPUT=BINARY,FREQ=100
E11 STRAIN(MEM)FOR SEVENTH THERMAL LOAD
*DETAIL,ELSET=STEEL
*CONTOUR
E11,6, , , ,2
*PLOT,COLORS=8,OUTPUT=BINARY,FREQ=100
E22 STRAIN(MEM+BEN1)FOR SEVENTH THERMAL LOAD
*DETAIL,ELSET=STEEL
*CONTOUR
E22,6,
*PLOT,COLORS=8,OUTPUT=BINARY,FREQ=100
E22 STRAIN(MEM)FOR SEVENTH THERMAL LOAD
*DETAIL,ELSET=STEEL
*CONTOUR
E22,6, , , ,2
*PLOT,COLORS=8,OUTPUT=BINARY,FREQ=100
E22 STRAIN(MEM+BEN3)FOR SEVENTH THERMAL LOAD
*DETAIL,ELSET=STEEL
*CONTOUR
E22,6, , , ,3
*PLOT,COLORS=8,OUTPUT=BINARY,FREQ=100
E33 STRAIN(MEM+BEN1)FOR SEVENTH THERMAL LOAD
*DETAIL,ELSET=STEEL
*CONTOUR
E33,6,
*PLOT,COLORS=8,OUTPUT=BINARY,FREQ=100
E33 STRAIN(MEM)FOR SEVENTH THERMAL LOAD
*DETAIL,ELSET=STEEL

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*CONTOUR
E33,6, , , ,2
*PLOT,COLORS=8,OUTPUT=BINARY,FREQ=100
E33 STRAIN(MEM+BEN3) FOR SEVENTH THERMAL LOAD
*DETAIL,ELSET=STEEL
*CONTOUR
E33,6, , , ,3
*PLOT,COLORS=8,OUTPUT=BINARY,FREQ=100
LINER EQUIV. PL. STRAIN(BEND+BEN1) FOR SEVENTH THERMAL
*DETAIL,ELSET=STEEL
*CONTOUR
PEMAG,6, , , ,
*PLOT,COLORS=8,OUTPUT=BINARY,FREQ=100
LINER EQUIV. PL. STRAIN(BEND+BEN3) FOR SEVENTH THERMAL
*DETAIL,ELSET=STEEL
*CONTOUR
PEMAG,6, , , ,3
*PLOT,COLORS=8,OUTPUT=BINARY,FREQ=100
CONCRETE PRIN3 FOR SEVENTH THERMAL LOAD
*DETAIL,ELSET=CONCRETE
*CONTOUR
PRIN3,6, , , ,2
*PLOT,COLORS=8,OUTPUT=BINARY,FREQ=100
CONCRETE PRIN2 FOR SEVENTH THERMAL LOAD
*DETAIL,ELSET=CONCRETE
*CONTOUR
PRIN2,6, , , ,2
*PLOT,COLORS=8,OUTPUT=BINARY,FREQ=100
CONCRETE PRIN1 FOR SEVENTH THERMAL LOAD
*DETAIL,ELSET=CONCRETE
*CONTOUR
PRIN1,6, , , ,2
*PLOT,COLORS=8,OUTPUT=BINARY,FREQ=100
CONCRETE MISES STRESS FOR SEVENTH THERMAL LOAD
*DETAIL,ELSET=CONCRETE
*CONTOUR,DEFORMED
MISES,6
*PLOT,COLORS=8,OUTPUT=BINARY,FREQ=100
CONCRETE STRAIN 1-DIR FOR SEVENTH THERMAL LOAD
*DETAIL,ELSET=CONCRETE
*CONTOUR,DEFORMED
E11,6
*PLOT,COLORS=8,OUTPUT=BINARY,FREQ=100
CONCRETE STRAIN 2-DIR FOR SEVENTH THERMAL LOAD
*DETAIL,ELSET=CONCRETE
*CONTOUR,DEFORMED
E22,6
*PLOT,COLORS=8,OUTPUT=BINARY,FREQ=100
CONCRETE STRAIN 3-DIR FOR SEVENTH THERMAL LOAD
*DETAIL,ELSET=CONCRETE
*CONTOUR,DEFORMED
E33,6
*PLOT,COLORS=8,OUTPUT=BINARY,FREQ=100
LINER TRESCA STRESS (MEM+BEN1) FOR SEVENTH THERMAL
*DETAIL,ELSET=STEEL
*CONTOUR
TRESC,6, , , ,1
*PLOT,COLORS=8,OUTPUT=BINARY,FREQ=100
LINER TRESCA STRESS (MEM+BEN3) FOR SEVENTH THERMAL
*DETAIL,ELSET=STEEL
*CONTOUR
TRESC,6, , , ,3
*PLOT,COLORS=8,OUTPUT=BINARY,FREQ=100
LINER PRIN1 STRESS (MEM+BEN1) FOR SEVENTH THERMAL
*DETAIL,ELSET=STEEL
*CONTOUR
PRIN1,6, , , ,1
*PLOT,COLORS=8,OUTPUT=BINARY,FREQ=100
LINER PRIN1 STRESS (MEM+BEN3) FOR SEVENTH THERMAL
*DETAIL,ELSET=STEEL
*CONTOUR
PRIN1,6, , , ,3
*PLOT,COLORS=8,OUTPUT=BINARY,FREQ=100

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LINER PRIN2 STRESS (MEM+BEN1) FOR SEVENTH THERMAL
*DETAIL,ELSET=STEEL
*CONTOUR
PRIN2,6, , , ,1
*PLOT,COLORS=8,OUTPUT=BINARY,FREQ=100
LINER PRIN1 STRESS (MEM+BEN3) FOR SEVENTH THERMAL
*DETAIL,ELSET=STEEL
*CONTOUR
PRIN2,6, , , ,3
*PLOT,COLORS=8,OUTPUT=BINARY,FREQ=100
LINER PRIN3 STRESS (MEM+BEN1)FOR SEVENTH THERMAL
*DETAIL,ELSET=STEEL
*CONTOUR
PRIN3,6, , , ,1
*PLOT,COLORS=8,OUTPUT=BINARY,FREQ=100
LINER PRIN3 STRESS (MEM+BEN3) FOR SEVENTH THERMAL
*DETAIL,ELSET=STEEL
*CONTOUR
PRIN3,6, , , ,3
*PLOT,COLORS=8,OUTPUT=BINARY,FREQ=100
E11 STRAIN(MEM+BEN1)FOR SEVENTH THERMAL LOAD
*DETAIL,ELSET=SLINER
*CONTOUR
E11,6,
*PLOT,COLORS=8,OUTPUT=BINARY,FREQ=100
E11 STRAIN(MEM+BEN3)FOR SEVENTH THERMAL LOAD
*DETAIL,ELSET=SLINER
*CONTOUR
E11,6, , , ,3
*PLOT,COLORS=8,OUTPUT=BINARY,FREQ=100
E11 STRAIN(MEM)FOR SEVENTH THERMAL LOAD
*DETAIL,ELSET=SLINER
*CONTOUR
E11,6, , , ,2
*PLOT,COLORS=8,OUTPUT=BINARY,FREQ=100
E22 STRAIN(MEM+BEN1)FOR SEVENTH THERMAL LOAD
*DETAIL,ELSET=SLINER
*CONTOUR
E22,6,
*PLOT,COLORS=8,OUTPUT=BINARY,FREQ=100
E22 STRAIN(MEM)FOR SEVENTH THERMAL LOAD
*DETAIL,ELSET=SLINER
*CONTOUR
E22,6, , , ,2
*PLOT,COLORS=8,OUTPUT=BINARY,FREQ=100
E22 STRAIN(MEM+BEN3)FOR SEVENTH THERMAL LOAD
*DETAIL,ELSET=SLINER
*CONTOUR
E22,6, , , ,3
*PLOT,COLORS=8,OUTPUT=BINARY,FREQ=100
E33 STRAIN(MEM+BEN1)FOR SEVENTH THERMAL LOAD
*DETAIL,ELSET=SLINER
*CONTOUR
E33,6,
*PLOT,COLORS=8,OUTPUT=BINARY,FREQ=100
E33 STRAIN(MEM)FOR SEVENTH THERMAL LOAD
*DETAIL,ELSET=SLINER
*CONTOUR
E33,6, , , ,2
*PLOT,COLORS=8,OUTPUT=BINARY,FREQ=100
E33 STRAIN(MEM+BEN3)FOR SEVENTH THERMAL LOAD
*DETAIL,ELSET=SLINER
*CONTOUR
E33,6, , , ,3
*PLOT,COLORS=8,OUTPUT=BINARY,FREQ=100
LINER TRESCA STRESS (MEM+BEN1) FOR SEVENTH THERMAL
*DETAIL,ELSET=SLINER
*CONTOUR
TRES,6, , , ,1
*PLOT,COLORS=8,OUTPUT=BINARY,FREQ=100
LINER TRESCA STRESS (MEM+BEN3) FOR SEVENTH THERMAL
*DETAIL,ELSET=SLINER
*CONTOUR

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TRESC,6, , , ,3
*PLOT,COLORS=8,OUTPUT=BINARY,FREQ=100
LINER PRIN1 STRESS (MEM+BEN1) FOR SEVENTH THERMAL
*DETAIL,ELSET=SLINER
*CONTOUR
PRIN1,6, , , ,1
*PLOT,COLORS=8,OUTPUT=BINARY,FREQ=100
LINER PRIN1 STRESS (MEM+BEN3) FOR SEVENTH THERMAL
*DETAIL,ELSET=SLINER
*CONTOUR
PRIN1,6, , , ,3
*PLOT,COLORS=8,OUTPUT=BINARY,FREQ=100
LINER PRIN2 STRESS (MEM+BEN1) FOR SEVENTH THERMAL
*DETAIL,ELSET=SLINER
*CONTOUR
PRIN2,6, , , ,1
*PLOT,COLORS=8,OUTPUT=BINARY,FREQ=100
LINER PRIN1 STRESS (MEM+BEN3) FOR SEVENTH THERMAL
*DETAIL,ELSET=SLINER
*CONTOUR
PRIN2,6, , , ,3
*PLOT,COLORS=8,OUTPUT=BINARY,FREQ=100
LINER PRIN3 STRESS (MEM+BEN1)FOR SEVENTH THERMAL
*DETAIL,ELSET=SLINER
*CONTOUR
PRIN3,6, , , ,1
*PLOT,COLORS=8,OUTPUT=BINARY,FREQ=100
LINER PRIN3 STRESS (MEM+BEN3) FOR SEVENTH THERMAL
*DETAIL,ELSET=SLINER
*CONTOUR
PRIN3,6, , , ,3
*END STEP
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ABAQUS Output File: thermala.abou (Excerpted pages 636 thru 704)

1

ABAQUS PRODUCTION VERSION 4-9-1 DATE 18-May-94 TIME 08:28:47 PAGE
636
FOR USE BY WESTINGHOUSE HANFORD COMPANY UNDER LICENSE FROM HKS, INC.

241-SY-101 TANK *** FILE thermala.abdat dated 5/16/94 *** STEP 11
INCREMENT 100
SEVENTH THERMAL LOAD STEP ON 241-SY-101 TANK TIME COMPLETED IN
THIS STEP 1.00

ELEMENT OUTPUT

THE FOLLOWING TABLE IS PRINTED FOR ELSET ESTUD1 AND ELEMENT TYPE SPRING2 AT THE INTEGRATION POINTS

ELEMENT	PT	FOOT- NOTE	S11	E11
1151	1		-8.9664E+05	-8.9664E-04
1351	1		4619.	2.8869E-05
1551	1		-4.9005E+05	-4.9005E-04
1751	1		-1.2010E+05	-1.2010E-04
1951	1		-4.4027E+05	-4.4027E-04
2151	1		-1.5239E+05	-1.5239E-04
2351	1		-4.1924E+05	-4.1924E-04
2551	1		-1.6545E+05	-1.6545E-04
2751	1		-3.9984E+05	-3.9984E-04
3151	1		-3.5148E+05	-3.5148E-04
3351	1		-1.8456E+05	-1.8456E-04
3551	1		-3.4796E+05	-3.4796E-04
3751	1		-2.1016E+05	-2.1016E-04
3951	1		-2.8032E+05	-2.8032E-04
4151	1		-1.5248E+05	-1.5248E-04
4351	1		-1.9310E+05	-1.9310E-04
4551	1		-7.5105E+04	-7.5105E-05
4751	1		-7.6265E+05	-7.6265E-04
4951	1		-9.9341E+05	-9.9341E-04
5151	1		-6.0829E+05	-6.0829E-04
5351	1		-6.2377E+05	-6.2377E-04
5551	1		-7.2189E+05	-7.2189E-04
5751	1		-4.2973E+05	-4.2973E-04
5951	1		-4.1062E+05	-4.1062E-04
6151	1		-1.5176E+05	-1.5176E-04
6351	1		-1.8252E+05	-1.8252E-04
6551	1		-1.5655E+05	-1.5655E-04

1

ABAQUS PRODUCTION VERSION 4-9-1 DATE 18-May-94 TIME 08:28:47 PAGE
637
FOR USE BY WESTINGHOUSE HANFORD COMPANY UNDER LICENSE FROM HKS, INC.

241-SY-101 TANK *** FILE thermala.abdat dated 5/16/94 *** STEP 11
INCREMENT 100
SEVENTH THERMAL LOAD STEP ON 241-SY-101 TANK TIME COMPLETED IN
THIS STEP 1.00

ELEMENT	PT	FOOT- NOTE	S11	E11

MAXIMUM	4619.	2.8869E-05
ELEMENT	1351	1351
MINIMUM	-9.9341E+05	-9.9341E-04
ELEMENT	4951	4951

THE FOLLOWING TABLE IS PRINTED FOR ELSET ESTUD2 AND ELEMENT TYPE SPRING2 AT THE INTEGRATION POINTS

ELEMENT	PT	FOOT- NOTE	S11	E11
1153	1		1.7962E+06	1.4180E-02
1353	1		1.4262E+06	1.1260E-02
1553	1		8.9525E+05	7.0678E-03
1753	1		6.1026E+05	4.8179E-03
1953	1		4.0576E+05	3.2034E-03
2153	1		2.5620E+05	2.0227E-03
2353	1		1.5002E+05	1.1844E-03
2553	1		7.3150E+04	5.7750E-04
2753	1		2.0558E+04	1.6230E-04
2953	1		-5.6252E+04	-5.6252E-05
3153	1		-4.1185E+04	-4.1185E-05
3353	1		-5.5998E+04	-5.5998E-05
3553	1		-5745.	-5.7453E-06
3753	1		3.7251E+04	2.9409E-04
3953	1		1.0743E+05	8.4813E-04
4153	1		1.9525E+05	1.5414E-03
4353	1		2.7734E+05	2.1895E-03
4553	1		3.3074E+05	2.6111E-03
4753	1		2.8359E+05	2.2389E-03
4953	1		1.2944E+05	1.0219E-03
5153	1		5.1697E+04	4.0814E-04
5353	1		-1.8884E+05	-1.8884E-04
5553	1		-6.7248E+05	-6.7248E-04
5753	1		-7.6050E+05	-7.6050E-04
5953	1		-6.8949E+05	-6.8949E-04
6153	1		-3.6021E+05	-3.6021E-04
6353	1		-3.3145E+05	-3.3145E-04

1

ABAQUS PRODUCTION VERSION 4-9-1 DATE 18-May-94 TIME 08:28:47 PAGE 638
FOR USE BY WESTINGHOUSE HANFORD COMPANY UNDER LICENSE FROM HKS, INC.

241-SY-101 TANK *** FILE thermala.abdat dated 5/16/94 ***
INCREMENT 100
SEVENTH THERMAL LOAD STEP ON 241-SY-101 TANK
THIS STEP 1.00

STEP 11

TIME COMPLETED IN

ELEMENT	PT	FOOT- NOTE	S11	E11
6553	1		-2.8318E+05	-2.8318E-04
MAXIMUM			1.7962E+06	1.4180E-02
ELEMENT			1153	1153
MINIMUM			-7.6050E+05	-7.6050E-04
ELEMENT			5753	5753

THE FOLLOWING TABLE IS PRINTED FOR REBARS NAMED SLBH IN ELSET CONCRETE AND ELEMENT TYPE CAX4 AT
INTEGRATION POINTS

ELEMENT	REBAR	PT	FOOT- NOTE	S11
100	SLBH	1		-1739.
102	SLBH	1		-1872.
104	SLBH	1		-1811.
106	SLBH	1		-1549.
108	SLBH	1		-1373.
110	SLBH	1		-1288.
112	SLBH	1		-1241.
114	SLBH	1		-1202.
116	SLBH	1		-1170.
118	SLBH	1		-1151.
120	SLBH	1		-1142.
122	SLBH	1		-1133.
124	SLBH	1		-1154.
126	SLBH	1		-1213.
128	SLBH	1		-1278.
130	SLBH	1		-1393.
132	SLBH	1		-1567.
134	SLBH	1		-1774.
136	SLBH	1		-2105.
138	SLBH	1		-2666.
140	SLBH	1		-3511.
142	SLBH	1		-4261.
144	SLBH	1		-4700.
144	SLBH	1		-4700.
146	SLBH	1		-4916.
148	SLBH	1		-4811.

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ABAQUS PRODUCTION VERSION 4-9-1 DATE 18-May-94 TIME 08:28:47 PAGE
639 FOR USE BY WESTINGHOUSE HANFORD COMPANY UNDER LICENSE FROM HKS, INC.

241-SY-101 TANK *** FILE thermala.abdat dated 5/16/94 *** STEP 11
INCREMENT 100
SEVENTH THERMAL LOAD STEP ON 241-SY-101 TANK TIME COMPLETED IN
THIS STEP 1.00

ELEMENT	REBAR	PT	FOOT- NOTE	S11
150	SLBH	1		-4529.
152	SLBH	1		-4313.
154	SLBH	1		-3971.
156	SLBH	1		-3362.
MAXIMUM				-1133.
ELEMENT				122
MINIMUM				-4916.
ELEMENT				146

THE FOLLOWING TABLE IS PRINTED FOR REBARS NAMED SLBH IN ELSET CONCRETE AND ELEMENT TYPE CAX3 AT
INTEGRATION POINTS

ELEMENT	REBAR	PT	FOOT- NOTE	S11

ALL VALUES IN THIS TABLE ARE ZERO

THE FOLLOWING TABLE IS PRINTED FOR REBARS NAMED SLBH IN ELSET CONCRETE AND ELEMENT TYPE CAX4 AT
INTEGRATION POINTS

ELEMENT REBAR	PT	FOOT- NOTE	E11
100 SLBH	1		2.9980E-04
102 SLBH	1		2.9455E-04
104 SLBH	1		2.9734E-04
106 SLBH	1		3.0846E-04
108 SLBH	1		3.1498E-04
110 SLBH	1		3.1672E-04
112 SLBH	1		3.1706E-04
114 SLBH	1		3.1712E-04
116 SLBH	1		3.1705E-04
118 SLBH	1		3.1696E-04
120 SLBH	1		3.1690E-04
122 SLBH	1		3.1682E-04

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ABAQUS PRODUCTION VERSION 4-9-1
640

DATE 18-May-94

TIME 08:28:47

PAGE

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241-SY-101 TANK *** FILE thermala.abdat dated 5/16/94 ***
INCREMENT 100
SEVENTH THERMAL LOAD STEP ON 241-SY-101 TANK
THIS STEP 1.00

STEP 11

TIME COMPLETED IN

ELEMENT REBAR	PT	FOOT- NOTE	E11
124 SLBH	1		3.1676E-04
126 SLBH	1		3.1679E-04
128 SLBH	1		3.1695E-04
130 SLBH	1		3.1724E-04
132 SLBH	1		3.1776E-04
134 SLBH	1		3.1866E-04
136 SLBH	1		3.2067E-04
138 SLBH	1		3.2371E-04
140 SLBH	1		3.2728E-04
142 SLBH	1		3.3006E-04
144 SLBH	1		3.3217E-04
144 SLBH	1		3.3217E-04
146 SLBH	1		3.3461E-04
148 SLBH	1		3.3697E-04
150 SLBH	1		3.3876E-04
152 SLBH	1		3.3975E-04
154 SLBH	1		3.4069E-04
156 SLBH	1		3.4172E-04

MAXIMUM 3.4172E-04

ELEMENT 156

MINIMUM 2.9455E-04

ELEMENT 102

THE FOLLOWING TABLE IS PRINTED FOR REBARS NAMED SLBH IN ELSET CONCRETE AND ELEMENT TYPE CAX3 AT
INTEGRATION POINTS

ELEMENT REBAR PT FOOT- E11
NOTE

ALL VALUES IN THIS TABLE ARE ZERO

1

ABAQUS PRODUCTION VERSION 4-9-1 DATE 18-May-94 TIME 08:28:47 PAGE
641
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241-SY-101 TANK *** FILE thermala.abdat dated 5/16/94 *** STEP 11
INCREMENT 100
SEVENTH THERMAL LOAD STEP ON 241-SY-101 TANK TIME COMPLETED IN
THIS STEP 1.00

THE FOLLOWING TABLE IS PRINTED FOR REBARS NAMED SLBH IN ELSET CONCRETE AND ELEMENT TYPE CAX4 AT
INTEGRATION POINTS

ELEMENT REBAR	PT FOOT- NOTE	PE11	PEEQ	AC YIELD	PEMAG

ALL VALUES IN THIS TABLE ARE ZERO

THE FOLLOWING TABLE IS PRINTED FOR REBARS NAMED SLBH IN ELSET CONCRETE AND ELEMENT TYPE CAX3 AT
INTEGRATION POINTS

ELEMENT REBAR	PT FOOT- NOTE	PE11	PEEQ	AC YIELD	PEMAG

ALL VALUES IN THIS TABLE ARE ZERO

THE FOLLOWING TABLE IS PRINTED FOR REBARS NAMED SLBM IN ELSET CONCRETE AND ELEMENT TYPE CAX4 AT
INTEGRATION POINTS

ELEMENT REBAR	PT FOOT- NOTE	S11

ALL VALUES IN THIS TABLE ARE ZERO

THE FOLLOWING TABLE IS PRINTED FOR REBARS NAMED SLBM IN ELSET CONCRETE AND ELEMENT TYPE CAX3 AT
INTEGRATION POINTS

ELEMENT REBAR	PT FOOT- NOTE	S11

ALL VALUES IN THIS TABLE ARE ZERO

1

ABAQUS PRODUCTION VERSION 4-9-1 DATE 18-May-94 TIME 08:28:47 PAGE
642
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241-SY-101 TANK *** FILE thermala.abdat dated 5/16/94 *** STEP 11
INCREMENT 100

SEVENTH THERMAL LOAD STEP ON 241-SY-101 TANK
THIS STEP 1.00

TIME COMPLETED IN

THE FOLLOWING TABLE IS PRINTED FOR REBARS NAMED SLBM IN ELSET CONCRETE AND ELEMENT TYPE CAX4 AT
INTEGRATION POINTS

ELEMENT REBAR PT FOOT- E11
NOTE

ALL VALUES IN THIS TABLE ARE ZERO

THE FOLLOWING TABLE IS PRINTED FOR REBARS NAMED SLBM IN ELSET CONCRETE AND ELEMENT TYPE CAX3 AT
INTEGRATION POINTS

ELEMENT REBAR PT FOOT- E11
NOTE

ALL VALUES IN THIS TABLE ARE ZERO

THE FOLLOWING TABLE IS PRINTED FOR REBARS NAMED SLBM IN ELSET CONCRETE AND ELEMENT TYPE CAX4 AT
INTEGRATION POINTS

ELEMENT REBAR PT FOOT- PE11 PEEQ AC YIELD PEMAG
NOTE

ALL VALUES IN THIS TABLE ARE ZERO

THE FOLLOWING TABLE IS PRINTED FOR REBARS NAMED SLBM IN ELSET CONCRETE AND ELEMENT TYPE CAX3 AT
INTEGRATION POINTS

ELEMENT REBAR PT FOOT- PE11 PEEQ AC YIELD PEMAG
NOTE

ALL VALUES IN THIS TABLE ARE ZERO
1

ABAQUS PRODUCTION VERSION 4-9-1 DATE 18-May-94 TIME 08:28:47 PAGE
643

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241-SY-101 TANK *** FILE thermala.abdat dated 5/16/94 *** STEP 11
INCREMENT 100
SEVENTH THERMAL LOAD STEP ON 241-SY-101 TANK TIME COMPLETED IN
THIS STEP 1.00

THE FOLLOWING TABLE IS PRINTED FOR REBARS NAMED SLTH IN ELSET CONCRETE AND ELEMENT TYPE CAX4 AT
INTEGRATION POINTS

ELEMENT REBAR PT FOOT- S11
NOTE

302 SLTH 1 -1303.
304 SLTH 1 -1393.

306 SLTH	1	-1404.
308 SLTH	1	-1410.
310 SLTH	1	-1364.
312 SLTH	1	-1314.
314 SLTH	1	-1275.
316 SLTH	1	-1244.
318 SLTH	1	-1226.
320 SLTH	1	-1218.
322 SLTH	1	-1211.
324 SLTH	1	-1233.
326 SLTH	1	-1293.
328 SLTH	1	-1360.
330 SLTH	1	-1477.
332 SLTH	1	-1653.
334 SLTH	1	-1867.
336 SLTH	1	-2272.
338 SLTH	1	-2964.
340 SLTH	1	-3914.
342 SLTH	1	-4960.
344 SLTH	1	-5894.
346 SLTH	1	-6294.
348 SLTH	1	-6174.
350 SLTH	1	-5882.
352 SLTH	1	-5663.
354 SLTH	1	-5161.
356 SLTH	1	-4411.

MAXIMUM -1211.

ELEMENT 322

MINIMUM -6294.

ELEMENT 346

1

ABAQUS PRODUCTION VERSION 4-9-1
644

DATE 18-May-94 TIME 08:28:47 PAGE

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241-SY-101 TANK *** FILE thermala.abdat dated 5/16/94 ***
INCREMENT 100
SEVENTH THERMAL LOAD STEP ON 241-SY-101 TANK
THIS STEP 1.00

STEP 11

TIME COMPLETED IN

THE FOLLOWING TABLE IS PRINTED FOR REBARS NAMED SLTH IN ELSET CONCRETE AND ELEMENT TYPE CAX3 AT
INTEGRATION POINTS

ELEMENT REBAR PT FOOT- S11
NOTE

ALL VALUES IN THIS TABLE ARE ZERO

THE FOLLOWING TABLE IS PRINTED FOR REBARS NAMED SLTH IN ELSET CONCRETE AND ELEMENT TYPE CAX4 AT
INTEGRATION POINTS

ELEMENT REBAR PT FOOT- E11
NOTE

302 SLTH	1	3.2238E-04
304 SLTH	1	3.1814E-04
306 SLTH	1	3.1765E-04
308 SLTH	1	3.1617E-04

310 SLTH	1	3.1662E-04
312 SLTH	1	3.1707E-04
314 SLTH	1	3.1714E-04
316 SLTH	1	3.1706E-04
318 SLTH	1	3.1697E-04
320 SLTH	1	3.1690E-04
322 SLTH	1	3.1682E-04
324 SLTH	1	3.1675E-04
326 SLTH	1	3.1678E-04
328 SLTH	1	3.1693E-04
330 SLTH	1	3.1722E-04
332 SLTH	1	3.1775E-04
334 SLTH	1	3.1846E-04
336 SLTH	1	3.1973E-04
338 SLTH	1	3.2189E-04
340 SLTH	1	3.2534E-04
342 SLTH	1	3.2868E-04
344 SLTH	1	3.3142E-04
346 SLTH	1	3.3452E-04
348 SLTH	1	3.3759E-04
350 SLTH	1	3.3989E-04
352 SLTH	1	3.4104E-04

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ABAQUS PRODUCTION VERSION 4-9-1   DATE 18-May-94   TIME 08:28:47   PAGE 645
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241-SY-101 TANK *** FILE thermala.abdat dated 5/16/94 ***   STEP 11
INCREMENT 100
SEVENTH THERMAL LOAD STEP ON 241-SY-101 TANK   TIME COMPLETED IN
THIS STEP 1.00

ELEMENT REBAR	PT	FOOT- NOTE	E11
354 SLTH	1		3.4198E-04
356 SLTH	1		3.4301E-04
MAXIMUM			3.4301E-04
ELEMENT			356
MINIMUM			3.1617E-04
ELEMENT			308

THE FOLLOWING TABLE IS PRINTED FOR REBARS NAMED SLTH   IN ELSET CONCRETE AND ELEMENT TYPE CAX3   AT
INTEGRATION POINTS

ELEMENT REBAR	PT	FOOT- NOTE	E11

ALL VALUES IN THIS TABLE ARE ZERO

THE FOLLOWING TABLE IS PRINTED FOR REBARS NAMED SLTH   IN ELSET CONCRETE AND ELEMENT TYPE CAX4   AT
INTEGRATION POINTS

ELEMENT REBAR	PT	FOOT- NOTE	PE11	PEEQ	AC YIELD	PEMAG

ALL VALUES IN THIS TABLE ARE ZERO

THE FOLLOWING TABLE IS PRINTED FOR REBARS NAMED SLTH IN ELSET CONCRETE AND ELEMENT TYPE CAX3 AT
INTEGRATION POINTS

ELEMENT REBAR	PT FOOT- NOTE	PE11	PEEQ	AC YIELD	PEMAG

ALL VALUES IN THIS TABLE ARE ZERO

1

ABAQUS PRODUCTION VERSION 4-9-1 DATE 18-May-94 TIME 08:28:47 PAGE
646
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241-SY-101 TANK *** FILE thermala.abdat dated 5/16/94 *** STEP 11
INCREMENT 100
SEVENTH THERMAL LOAD STEP ON 241-SY-101 TANK TIME COMPLETED IN
THIS STEP 1.00

THE FOLLOWING TABLE IS PRINTED FOR REBARS NAMED SLTM IN ELSET CONCRETE AND ELEMENT TYPE CAX4 AT
INTEGRATION POINTS

ELEMENT REBAR	PT FOOT- NOTE	S11

ALL VALUES IN THIS TABLE ARE ZERO

THE FOLLOWING TABLE IS PRINTED FOR REBARS NAMED SLTM IN ELSET CONCRETE AND ELEMENT TYPE CAX3 AT
INTEGRATION POINTS

ELEMENT REBAR	PT FOOT- NOTE	S11

ALL VALUES IN THIS TABLE ARE ZERO

THE FOLLOWING TABLE IS PRINTED FOR REBARS NAMED SLTM IN ELSET CONCRETE AND ELEMENT TYPE CAX4 AT
INTEGRATION POINTS

ELEMENT REBAR	PT FOOT- NOTE	E11

ALL VALUES IN THIS TABLE ARE ZERO

THE FOLLOWING TABLE IS PRINTED FOR REBARS NAMED SLTM IN ELSET CONCRETE AND ELEMENT TYPE CAX3 AT
INTEGRATION POINTS

ELEMENT REBAR	PT FOOT- NOTE	E11

ALL VALUES IN THIS TABLE ARE ZERO

1

ABAQUS PRODUCTION VERSION 4-9-1
647

DATE 18-May-94

TIME 08:28:47

PAGE

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241-SY-101 TANK *** FILE thermala.abdat dated 5/16/94 ***
INCREMENT 100
SEVENTH THERMAL LOAD STEP ON 241-SY-101 TANK
THIS STEP 1.00

STEP 11

TIME COMPLETED IN

THE FOLLOWING TABLE IS PRINTED FOR REBARS NAMED SLTM IN ELSET CONCRETE AND ELEMENT TYPE CAX4 AT
INTEGRATION POINTS

ELEMENT REBAR	PT FOOT- NOTE	PE11	PEEQ	AC YIELD	PEMAG

ALL VALUES IN THIS TABLE ARE ZERO

THE FOLLOWING TABLE IS PRINTED FOR REBARS NAMED SLTM IN ELSET CONCRETE AND ELEMENT TYPE CAX3 AT
INTEGRATION POINTS

ELEMENT REBAR	PT FOOT- NOTE	PE11	PEEQ	AC YIELD	PEMAG

ALL VALUES IN THIS TABLE ARE ZERO

THE FOLLOWING TABLE IS PRINTED FOR REBARS NAMED WLIH IN ELSET CONCRETE AND ELEMENT TYPE CAX4 AT
INTEGRATION POINTS

ELEMENT REBAR	PT FOOT- NOTE	S11

954 WLIH	1	-4604.
1154 WLIH	1	-4691.
1354 WLIH	1	-4697.
1554 WLIH	1	-4633.
1754 WLIH	1	-4570.
1954 WLIH	1	-4514.
2154 WLIH	1	-4460.
2354 WLIH	1	-4397.
2554 WLIH	1	-4316.
2754 WLIH	1	-4205.
2954 WLIH	1	-4109.
3154 WLIH	1	-3985.
3354 WLIH	1	-3729.
3554 WLIH	1	-3342.
3754 WLIH	1	-2832.

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ABAQUS PRODUCTION VERSION 4-9-1
648

DATE 18-May-94

TIME 08:28:47

PAGE

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241-SY-101 TANK *** FILE thermala.abdat dated 5/16/94 ***
INCREMENT 100
SEVENTH THERMAL LOAD STEP ON 241-SY-101 TANK
THIS STEP 1.00

STEP 11

TIME COMPLETED IN

ELEMENT REBAR	PT FOOT- NOTE	S11

3954 WLIH	1	-2183.
4154 WLIH	1	-1405.
4354 WLIH	1	-540.9
4554 WLIH	1	301.4
MAXIMUM		301.4
ELEMENT		4554
MINIMUM		-4697.
ELEMENT		1354

THE FOLLOWING TABLE IS PRINTED FOR REBARS NAMED WLIH IN ELSET CONCRETE AND ELEMENT TYPE CAX3 AT INTEGRATION POINTS

ELEMENT REBAR	PT FOOT- NOTE	S11

ALL VALUES IN THIS TABLE ARE ZERO

THE FOLLOWING TABLE IS PRINTED FOR REBARS NAMED WLIH IN ELSET CONCRETE AND ELEMENT TYPE CAX4 AT INTEGRATION POINTS

ELEMENT REBAR	PT FOOT- NOTE	E11
954 WLIH	1	3.7716E-04
1154 WLIH	1	3.7514E-04
1354 WLIH	1	3.6911E-04
1554 WLIH	1	3.6056E-04
1754 WLIH	1	3.5189E-04
1954 WLIH	1	3.4287E-04
2154 WLIH	1	3.3392E-04
2354 WLIH	1	3.2538E-04
2554 WLIH	1	3.1753E-04
2754 WLIH	1	3.1072E-04
2954 WLIH	1	3.0666E-04
3154 WLIH	1	3.0420E-04

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ABAQUS PRODUCTION VERSION 4-9-1 DATE 18-May-94 TIME 08:28:47 PAGE 649

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241-SY-101 TANK *** FILE thermala.abdat dated 5/16/94 ***
INCREMENT 100
SEVENTH THERMAL LOAD STEP ON 241-SY-101 TANK
THIS STEP 1.00

STEP 11
TIME COMPLETED IN

ELEMENT REBAR	PT FOOT- NOTE	E11
3354 WLIH	1	3.0204E-04
3554 WLIH	1	3.0253E-04
3754 WLIH	1	3.0686E-04
3954 WLIH	1	3.1523E-04
4154 WLIH	1	3.2699E-04
4354 WLIH	1	3.3998E-04
4554 WLIH	1	3.4977E-04
MAXIMUM		3.7716E-04

ELEMENT 954
MINIMUM 3.0204E-04
ELEMENT 3354

THE FOLLOWING TABLE IS PRINTED FOR REBARS NAMED WLIH IN ELSET CONCRETE AND ELEMENT TYPE CAX3 AT INTEGRATION POINTS

ELEMENT REBAR PT FOOT- E11
NOTE

ALL VALUES IN THIS TABLE ARE ZERO

THE FOLLOWING TABLE IS PRINTED FOR REBARS NAMED WLIH IN ELSET CONCRETE AND ELEMENT TYPE CAX4 AT INTEGRATION POINTS

ELEMENT REBAR PT FOOT- PE11 PEEQ AC YIELD PEMAG
NOTE

ALL VALUES IN THIS TABLE ARE ZERO

1

ABAQUS PRODUCTION VERSION 4-9-1 DATE 18-May-94 TIME 08:28:47 PAGE 650

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241-SY-101 TANK *** FILE thermala.abdat dated 5/16/94 *** STEP 11
INCREMENT 100
SEVENTH THERMAL LOAD STEP ON 241-SY-101 TANK TIME COMPLETED IN
THIS STEP 1.00

THE FOLLOWING TABLE IS PRINTED FOR REBARS NAMED WLIH IN ELSET CONCRETE AND ELEMENT TYPE CAX3 AT INTEGRATION POINTS

ELEMENT REBAR PT FOOT- PE11 PEEQ AC YIELD PEMAG
NOTE

ALL VALUES IN THIS TABLE ARE ZERO

THE FOLLOWING TABLE IS PRINTED FOR REBARS NAMED WLIH IN ELSET CONCRETE AND ELEMENT TYPE CAX4 AT INTEGRATION POINTS

ELEMENT REBAR PT FOOT- S11
NOTE

954 WLIH	1	-7230.
1154 WLIH	1	-6228.
1354 WLIH	1	-5597.
1554 WLIH	1	-5242.
1754 WLIH	1	-4961.
1954 WLIH	1	-4739.
2154 WLIH	1	-4522.
2354 WLIH	1	-4366.
2554 WLIH	1	-4217.

2754 WLIM	1	-4068.
2954 WLIM	1	-3829.
3154 WLIM	1	-3840.
3354 WLIM	1	-3790.
3554 WLIM	1	-3652.
3754 WLIM	1	-3538.
3954 WLIM	1	-3584.
4154 WLIM	1	-3816.
4354 WLIM	1	-4125.
4554 WLIM	1	-4981.

MAXIMUM -3538.

ELEMENT 3754

MINIMUM -7230.

ELEMENT 954

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ABAQUS PRODUCTION VERSION 4-9-1 DATE 18-May-94 TIME 08:28:47 PAGE 651

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241-SY-101 TANK *** FILE thermala.abdat dated 5/16/94 *** STEP 11
INCREMENT 100
SEVENTH THERMAL LOAD STEP ON 241-SY-101 TANK TIME COMPLETED IN
THIS STEP 1.00

THE FOLLOWING TABLE IS PRINTED FOR REBARS NAMED WLIM IN ELSET CONCRETE AND ELEMENT TYPE CAX3 AT
INTEGRATION POINTS

ELEMENT REBAR	PT	FOOT- NOTE	S11

ALL VALUES IN THIS TABLE ARE ZERO

THE FOLLOWING TABLE IS PRINTED FOR REBARS NAMED WLIM IN ELSET CONCRETE AND ELEMENT TYPE CAX4 AT
INTEGRATION POINTS

ELEMENT REBAR	PT	FOOT- NOTE	E11
954 WLIM	1		2.8962E-04
1154 WLIM	1		3.2392E-04
1354 WLIM	1		3.3909E-04
1554 WLIM	1		3.4024E-04
1754 WLIM	1		3.3885E-04
1954 WLIM	1		3.3539E-04
2154 WLIM	1		3.3185E-04
2354 WLIM	1		3.2640E-04
2554 WLIM	1		3.2082E-04
2754 WLIM	1		3.1528E-04
2954 WLIM	1		3.1597E-04
3154 WLIM	1		3.0903E-04
3354 WLIM	1		3.0001E-04
3554 WLIM	1		2.9219E-04
3754 WLIM	1		2.8333E-04
3954 WLIM	1		2.6854E-04
4154 WLIM	1		2.4663E-04
4354 WLIM	1		2.2049E-04
4554 WLIM	1		1.7370E-04

MAXIMUM 3.4024E-04
ELEMENT 1554
MINIMUM 1.7370E-04
ELEMENT 4554

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ABAQUS PRODUCTION VERSION 4-9-1 DATE 18-May-94 TIME 08:28:47 PAGE 652
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241-SY-101 TANK *** FILE thermala.abdat dated 5/16/94 *** STEP 11
INCREMENT 100
SEVENTH THERMAL LOAD STEP ON 241-SY-101 TANK TIME COMPLETED IN
THIS STEP 1.00

THE FOLLOWING TABLE IS PRINTED FOR REBARS NAMED WLIM IN ELSET CONCRETE AND ELEMENT TYPE CAX3 AT
INTEGRATION POINTS

ELEMENT REBAR PT FOOT- E11
NOTE

ALL VALUES IN THIS TABLE ARE ZERO

THE FOLLOWING TABLE IS PRINTED FOR REBARS NAMED WLIM IN ELSET CONCRETE AND ELEMENT TYPE CAX4 AT
INTEGRATION POINTS

ELEMENT REBAR PT FOOT- PE11 PEEQ AC YIELD PEMAG
NOTE

ALL VALUES IN THIS TABLE ARE ZERO

THE FOLLOWING TABLE IS PRINTED FOR REBARS NAMED WLIM IN ELSET CONCRETE AND ELEMENT TYPE CAX3 AT
INTEGRATION POINTS

ELEMENT REBAR PT FOOT- PE11 PEEQ AC YIELD PEMAG
NOTE

ALL VALUES IN THIS TABLE ARE ZERO

THE FOLLOWING TABLE IS PRINTED FOR REBARS NAMED WLOH IN ELSET CONCRETE AND ELEMENT TYPE CAX4 AT
INTEGRATION POINTS

ELEMENT REBAR PT FOOT- S11
NOTE

956 WLOH	1	-3630.
1156 WLOH	1	-3861.
1356 WLOH	1	-4005.
1556 WLOH	1	-4029.

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ABAQUS PRODUCTION VERSION 4-9-1
653

DATE 18-May-94

TIME 08:28:47

PAGE

FOR USE BY WESTINGHOUSE HANFORD COMPANY UNDER LICENSE FROM HKS, INC.

241-SY-101 TANK *** FILE thermala.abdat dated 5/16/94 ***
INCREMENT 100
SEVENTH THERMAL LOAD STEP ON 241-SY-101 TANK
THIS STEP 1.00

STEP 11

TIME COMPLETED IN

ELEMENT REBAR	PT	FOOT- NOTE	S11

1756 WLOH	1		-4007.
1956 WLOH	1		-3979.
2156 WLOH	1		-3944.
2356 WLOH	1		-3896.
2556 WLOH	1		-3827.
2756 WLOH	1		-3728.
2956 WLOH	1		-3640.
3156 WLOH	1		-3525.
3356 WLOH	1		-3281.
3556 WLOH	1		-2912.
3756 WLOH	1		-2420.
3956 WLOH	1		-1791.
4156 WLOH	1		-1033.
4356 WLOH	1		-191.0
4556 WLOH	1		633.4

MAXIMUM 633.4

ELEMENT 4556

MINIMUM -4029.

ELEMENT 1556

THE FOLLOWING TABLE IS PRINTED FOR REBARS NAMED WLOH IN ELSET CONCRETE AND ELEMENT TYPE CAX3 AT
INTEGRATION POINTS

ELEMENT REBAR	PT	FOOT- NOTE	S11

ALL VALUES IN THIS TABLE ARE ZERO

THE FOLLOWING TABLE IS PRINTED FOR REBARS NAMED WLOH IN ELSET CONCRETE AND ELEMENT TYPE CAX4 AT
INTEGRATION POINTS

ELEMENT REBAR	PT	FOOT- NOTE	E11

956 WLOH	1		3.7807E-04

ABAQUS PRODUCTION VERSION 4-9-1
654

DATE 18-May-94

TIME 08:28:47

PAGE

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241-SY-101 TANK *** FILE thermala.abdat dated 5/16/94 ***
INCREMENT 100
SEVENTH THERMAL LOAD STEP ON 241-SY-101 TANK
THIS STEP 1.00

STEP 11

TIME COMPLETED IN

ELEMENT REBAR	PT FOOT- NOTE	E11
1156 WLOH	1	3.7588E-04
1356 WLOH	1	3.6995E-04
1556 WLOH	1	3.6172E-04
1756 WLOH	1	3.5309E-04
1956 WLOH	1	3.4408E-04
2156 WLOH	1	3.3515E-04
2356 WLOH	1	3.2661E-04
2556 WLOH	1	3.1875E-04
2756 WLOH	1	3.1192E-04
2956 WLOH	1	3.0782E-04
3156 WLOH	1	3.0527E-04
3356 WLOH	1	3.0295E-04
3556 WLOH	1	3.0317E-04
3756 WLOH	1	3.0709E-04
3956 WLOH	1	3.1494E-04
4156 WLOH	1	3.2605E-04
4356 WLOH	1	3.3828E-04
4556 WLOH	1	3.4744E-04

MAXIMUM 3.7807E-04

ELEMENT 956

MINIMUM 3.0295E-04

ELEMENT 3356

THE FOLLOWING TABLE IS PRINTED FOR REBARS NAMED WLOH IN ELSET CONCRETE AND ELEMENT TYPE CAX3 AT
INTEGRATION POINTS

ELEMENT REBAR	PT FOOT- NOTE	E11

ALL VALUES IN THIS TABLE ARE ZERO

1

ABAQUS PRODUCTION VERSION 4-9-1

DATE 18-May-94

TIME 08:28:47

PAGE

655

FOR USE BY WESTINGHOUSE HANFORD COMPANY UNDER LICENSE FROM HKS, INC.

241-SY-101 TANK *** FILE thermala.abdat dated 5/16/94 ***
INCREMENT 100

STEP 11

SEVENTH THERMAL LOAD STEP ON 241-SY-101 TANK
THIS STEP 1.00

TIME COMPLETED IN

THE FOLLOWING TABLE IS PRINTED FOR REBARS NAMED WLOH IN ELSET CONCRETE AND ELEMENT TYPE CAX4 AT
INTEGRATION POINTS

ELEMENT REBAR	PT FOOT- NOTE	PE11	PEEQ	AC YIELD	PEMAG

ALL VALUES IN THIS TABLE ARE ZERO

THE FOLLOWING TABLE IS PRINTED FOR REBARS NAMED WLOH IN ELSET CONCRETE AND ELEMENT TYPE CAX3 AT
INTEGRATION POINTS

ELEMENT REBAR	PT FOOT- NOTE	PE11	PEEQ	AC YIELD	PEMAG

ALL VALUES IN THIS TABLE ARE ZERO

THE FOLLOWING TABLE IS PRINTED FOR REBARS NAMED WLOM IN ELSET CONCRETE AND ELEMENT TYPE CAX4 AT INTEGRATION POINTS

ELEMENT REBAR	PT FOOT- NOTE	S11
956 WLOM	1	-3304.
1156 WLOM	1	-3841.
1356 WLOM	1	-4286.
1556 WLOM	1	-4279.
1756 WLOM	1	-4295.
1956 WLOM	1	-4287.
2156 WLOM	1	-4212.
2356 WLOM	1	-4195.
2556 WLOM	1	-4198.
2756 WLOM	1	-4229.
2956 WLOM	1	-4459.
3156 WLOM	1	-4367.
3356 WLOM	1	-4330.
3556 WLOM	1	-4411.
3756 WLOM	1	-4357.

1

ABAQUS PRODUCTION VERSION 4-9-1 DATE 18-May-94 TIME 08:28:47 PAGE 656
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241-SY-101 TANK *** FILE thermala.abdat dated 5/16/94 *** STEP 11
INCREMENT 100 SEVENTH THERMAL LOAD STEP ON 241-SY-101 TANK TIME COMPLETED IN
THIS STEP 1.00

ELEMENT REBAR	PT FOOT- NOTE	S11
3956 WLOM	1	-4228.
4156 WLOM	1	-3854.
4356 WLOM	1	-2744.
4556 WLOM	1	-1550.
MAXIMUM		-1550.
ELEMENT		4556
MINIMUM		-4459.
ELEMENT		2956

THE FOLLOWING TABLE IS PRINTED FOR REBARS NAMED WLOM IN ELSET CONCRETE AND ELEMENT TYPE CAX3 AT INTEGRATION POINTS

ELEMENT REBAR	PT FOOT- NOTE	S11

ALL VALUES IN THIS TABLE ARE ZERO

THE FOLLOWING TABLE IS PRINTED FOR REBARS NAMED WLOM IN ELSET CONCRETE AND ELEMENT TYPE CAX4 AT
INTEGRATION POINTS

ELEMENT REBAR	PT	FOOT- NOTE	E11
956 WLOM	1		3.8893E-04
1156 WLOM	1		3.7656E-04
1356 WLOM	1		3.6057E-04
1556 WLOM	1		3.5338E-04
1756 WLOM	1		3.4350E-04
1956 WLOM	1		3.3382E-04
2156 WLOM	1		3.2622E-04
2356 WLOM	1		3.1664E-04
2556 WLOM	1		3.0640E-04
2756 WLOM	1		2.9524E-04
2956 WLOM	1		2.8052E-04
3156 WLOM	1		2.7720E-04

1

ABAQUS PRODUCTION VERSION 4-9-1 DATE 18-May-94 TIME 08:28:47 PAGE
657
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241-SY-101 TANK *** FILE thermala.abdat dated 5/16/94 *** STEP 11
INCREMENT 100
SEVENTH THERMAL LOAD STEP ON 241-SY-101 TANK TIME COMPLETED IN
THIS STEP 1.00

ELEMENT REBAR	PT	FOOT- NOTE	E11
3356 WLOM	1		2.6799E-04
3556 WLOM	1		2.5322E-04
3756 WLOM	1		2.4251E-04
3956 WLOM	1		2.3372E-04
4156 WLOM	1		2.3201E-04
4356 WLOM	1		2.5319E-04
4556 WLOM	1		2.7465E-04

MAXIMUM 3.8893E-04

ELEMENT 956

MINIMUM 2.3201E-04

ELEMENT 4156

THE FOLLOWING TABLE IS PRINTED FOR REBARS NAMED WLOM IN ELSET CONCRETE AND ELEMENT TYPE CAX3 AT
INTEGRATION POINTS

ELEMENT REBAR	PT	FOOT- NOTE	E11

ALL VALUES IN THIS TABLE ARE ZERO

THE FOLLOWING TABLE IS PRINTED FOR REBARS NAMED WLOM IN ELSET CONCRETE AND ELEMENT TYPE CAX4 AT
INTEGRATION POINTS

ELEMENT REBAR	PT	FOOT- NOTE	PE11	PEEQ	AC YIELD	PEMAG

ALL VALUES IN THIS TABLE ARE ZERO

1

ABAQUS PRODUCTION VERSION 4-9-1 DATE 18-May-94 TIME 08:28:47 PAGE 658

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241-SY-101 TANK *** FILE thermala.abdat dated 5/16/94 *** STEP 11
INCREMENT 100
SEVENTH THERMAL LOAD STEP ON 241-SY-101 TANK TIME COMPLETED IN
THIS STEP 1.00

THE FOLLOWING TABLE IS PRINTED FOR REBARS NAMED WLOM IN ELSET CONCRETE AND ELEMENT TYPE CAX3 AT
INTEGRATION POINTS

ELEMENT REBAR	PT FOOT- NOTE	PE11	PEEQ	AC YIELD	PEMAG

ALL VALUES IN THIS TABLE ARE ZERO

THE FOLLOWING TABLE IS PRINTED FOR REBARS NAMED WLR IN ELSET CONCRETE AND ELEMENT TYPE CAX4 AT
INTEGRATION POINTS

ELEMENT REBAR	PT FOOT- NOTE	S11
754 WLR	1	-2598.
756 WLR	1	-3139.
3954 WLR	1	-2366.
3956 WLR	1	-2305.
4354 WLR	1	-2308.
4356 WLR	1	-2623.
4554 WLR	1	-1964.
4556 WLR	1	-2495.
MAXIMUM		-1964.
ELEMENT		4554
MINIMUM		-3139.
ELEMENT		756

THE FOLLOWING TABLE IS PRINTED FOR REBARS NAMED WLR IN ELSET CONCRETE AND ELEMENT TYPE CAX3 AT
INTEGRATION POINTS

ELEMENT REBAR	PT FOOT- NOTE	S11

ALL VALUES IN THIS TABLE ARE ZERO

1

ABAQUS PRODUCTION VERSION 4-9-1 DATE 18-May-94 TIME 08:28:47 PAGE 659

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241-SY-101 TANK *** FILE thermala.abdat dated 5/16/94 *** STEP 11
INCREMENT 100

SEVENTH THERMAL LOAD STEP ON 241-SY-101 TANK
THIS STEP 1.00

TIME COMPLETED IN

THE FOLLOWING TABLE IS PRINTED FOR REBARS NAMED WLR IN ELSET CONCRETE AND ELEMENT TYPE CAX4 AT
INTEGRATION POINTS

ELEMENT REBAR	PT FOOT- NOTE	E11
754 WLR	1	4.4087E-04
756 WLR	1	3.9659E-04
3954 WLR	1	3.0175E-04
3956 WLR	1	2.9365E-04
4354 WLR	1	2.7202E-04
4356 WLR	1	2.5134E-04
4554 WLR	1	2.6374E-04
4556 WLR	1	2.3580E-04
MAXIMUM		4.4087E-04
ELEMENT		754
MINIMUM		2.3580E-04
ELEMENT		4556

THE FOLLOWING TABLE IS PRINTED FOR REBARS NAMED WLR IN ELSET CONCRETE AND ELEMENT TYPE CAX3 AT
INTEGRATION POINTS

ELEMENT REBAR	PT FOOT- NOTE	E11

ALL VALUES IN THIS TABLE ARE ZERO

THE FOLLOWING TABLE IS PRINTED FOR REBARS NAMED WLR IN ELSET CONCRETE AND ELEMENT TYPE CAX4 AT
INTEGRATION POINTS

ELEMENT REBAR	PT FOOT- NOTE	PE11	PEEQ	AC YIELD	PEMAG

ALL VALUES IN THIS TABLE ARE ZERO

1

ABAQUS PRODUCTION VERSION 4-9-1 DATE 18-May-94 TIME 08:28:47 PAGE 660
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241-SY-101 TANK *** FILE thermala.abdat dated 5/16/94 *** STEP 11
INCREMENT 100
SEVENTH THERMAL LOAD STEP ON 241-SY-101 TANK TIME COMPLETED IN
THIS STEP 1.00

THE FOLLOWING TABLE IS PRINTED FOR REBARS NAMED WLR IN ELSET CONCRETE AND ELEMENT TYPE CAX3 AT
INTEGRATION POINTS

ELEMENT REBAR	PT FOOT- NOTE	PE11	PEEQ	AC YIELD	PEMAG

NOTE

ALL VALUES IN THIS TABLE ARE ZERO

THE FOLLOWING TABLE IS PRINTED FOR REBARS NAMED HAIH IN ELSET CONCRETE AND ELEMENT TYPE CAX4 AT
INTEGRATION POINTS

ELEMENT REBAR	PT FOOT- NOTE	S11
4754 HAIH	1	873.0
4954 HAIH	1	1033.
5154 HAIH	1	1059.
5354 HAIH	1	1023.
5554 HAIH	1	919.9
5754 HAIH	1	924.6
5954 HAIH	1	1037.
6154 HAIH	1	1151.
6354 HAIH	1	1263.
6554 HAIH	1	1312.
6754 HAIH	1	1298.
6954 HAIH	1	1170.
7154 HAIH	1	906.7
7354 HAIH	1	591.8
7554 HAIH	1	251.7
7754 HAIH	1	-105.0

MAXIMUM 1312.

ELEMENT 6554

MINIMUM -105.0

ELEMENT 7754

1

ABAQUS PRODUCTION VERSION 4-9-1 DATE 18-May-94 TIME 08:28:47 PAGE
661
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241-SY-101 TANK *** FILE thermala.abdat dated 5/16/94 *** STEP 11
INCREMENT 100
SEVENTH THERMAL LOAD STEP ON 241-SY-101 TANK TIME COMPLETED IN
THIS STEP 1.00

THE FOLLOWING TABLE IS PRINTED FOR REBARS NAMED HAIH IN ELSET CONCRETE AND ELEMENT TYPE CAX3 AT
INTEGRATION POINTS

ELEMENT REBAR	PT FOOT- NOTE	S11

ALL VALUES IN THIS TABLE ARE ZERO

THE FOLLOWING TABLE IS PRINTED FOR REBARS NAMED HAIH IN ELSET CONCRETE AND ELEMENT TYPE CAX4 AT
INTEGRATION POINTS

ELEMENT REBAR	PT FOOT- NOTE	E11

4754 HAIH	1	3.5192E-04
4954 HAIH	1	3.4953E-04
5154 HAIH	1	3.4633E-04
5354 HAIH	1	3.4072E-04
5554 HAIH	1	3.3323E-04
5754 HAIH	1	3.2124E-04
5954 HAIH	1	3.0834E-04
6154 HAIH	1	2.9978E-04
6354 HAIH	1	2.9093E-04
6554 HAIH	1	2.8206E-04
6754 HAIH	1	2.7188E-04
6954 HAIH	1	2.5969E-04
7154 HAIH	1	2.4687E-04
7354 HAIH	1	2.3372E-04
7554 HAIH	1	2.2077E-04
7754 HAIH	1	2.0748E-04

MAXIMUM 3.5192E-04

ELEMENT 4754

MINIMUM 2.0748E-04

ELEMENT 7754

1

ABAQUS PRODUCTION VERSION 4-9-1
662

DATE 18-May-94

TIME 08:28:47

PAGE

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241-SY-101 TANK *** FILE thermala.abdat dated 5/16/94 ***
INCREMENT 100
SEVENTH THERMAL LOAD STEP ON 241-SY-101 TANK
THIS STEP 1.00

STEP 11

TIME COMPLETED IN

THE FOLLOWING TABLE IS PRINTED FOR REBARS NAMED HAIH IN ELSET CONCRETE AND ELEMENT TYPE CAX3 AT
INTEGRATION POINTS

ELEMENT REBAR	PT FOOT- NOTE	E11

ALL VALUES IN THIS TABLE ARE ZERO

THE FOLLOWING TABLE IS PRINTED FOR REBARS NAMED HAIH IN ELSET CONCRETE AND ELEMENT TYPE CAX4 AT
INTEGRATION POINTS

ELEMENT REBAR	PT FOOT- NOTE	PE11	PEEQ	AC YIELD	PEMAG

ALL VALUES IN THIS TABLE ARE ZERO

THE FOLLOWING TABLE IS PRINTED FOR REBARS NAMED HAIH IN ELSET CONCRETE AND ELEMENT TYPE CAX3 AT
INTEGRATION POINTS

ELEMENT REBAR	PT FOOT- NOTE	PE11	PEEQ	AC YIELD	PEMAG

ALL VALUES IN THIS TABLE ARE ZERO

THE FOLLOWING TABLE IS PRINTED FOR REBARS NAMED HAIM IN ELSET CONCRETE AND ELEMENT TYPE CAX4 AT
INTEGRATION POINTS

ELEMENT REBAR	PT FOOT- NOTE	S11

4754 HAIM	1	-5965.
4954 HAIM	1	-7091.
5154 HAIM	1	-7180.
5354 HAIM	1	-6613.

1

ABAQUS PRODUCTION VERSION 4-9-1 DATE 18-May-94 TIME 08:28:47 PAGE
663
FOR USE BY WESTINGHOUSE HANFORD COMPANY UNDER LICENSE FROM HKS, INC.

241-SY-101 TANK *** FILE thermala.abdat dated 5/16/94 *** STEP 11
INCREMENT 100
SEVENTH THERMAL LOAD STEP ON 241-SY-101 TANK TIME COMPLETED IN
THIS STEP 1.00

ELEMENT REBAR	PT FOOT- NOTE	S11

5554 HAIM	1	-6256.
5754 HAIM	1	-5473.
5954 HAIM	1	-5145.
6154 HAIM	1	-5070.
6354 HAIM	1	-4941.
6554 HAIM	1	-4775.
6754 HAIM	1	-4779.
6954 HAIM	1	-4725.
7154 HAIM	1	-4416.
7354 HAIM	1	-4369.
7554 HAIM	1	-4564.
7754 HAIM	1	-4490.

MAXIMUM -4369.

ELEMENT 7354

MINIMUM -7180.

ELEMENT 5154

THE FOLLOWING TABLE IS PRINTED FOR REBARS NAMED HAIM IN ELSET CONCRETE AND ELEMENT TYPE CAX3 AT
INTEGRATION POINTS

ELEMENT REBAR	PT FOOT- NOTE	S11

ALL VALUES IN THIS TABLE ARE ZERO

THE FOLLOWING TABLE IS PRINTED FOR REBARS NAMED HAIM IN ELSET CONCRETE AND ELEMENT TYPE CAX4 AT
INTEGRATION POINTS

ELEMENT REBAR	PT FOOT- NOTE	E11

4754 HAIM	1	1.2399E-04

4954 HAIM 1 7.8749E-05
5154 HAIM 1 7.1706E-05
5354 HAIM 1 8.6201E-05

1

ABAQUS PRODUCTION VERSION 4-9-1 DATE 18-May-94 TIME 08:28:47 PAGE
664
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241-SY-101 TANK *** FILE thermala.abdat dated 5/16/94 *** STEP 11
INCREMENT 100
SEVENTH THERMAL LOAD STEP ON 241-SY-101 TANK TIME COMPLETED IN
THIS STEP 1.00

ELEMENT	REBAR	PT	FOOT- NOTE	E11
5554	HAIM	1		9.4019E-05
5754	HAIM	1		1.0798E-04
5954	HAIM	1		1.0225E-04
6154	HAIM	1		9.2410E-05
6354	HAIM	1		8.4106E-05
6554	HAIM	1		7.9175E-05
6754	HAIM	1		6.9330E-05
6954	HAIM	1		6.3197E-05
7154	HAIM	1		6.9440E-05
7354	HAIM	1		6.8377E-05
7554	HAIM	1		6.0233E-05
7754	HAIM	1		6.1308E-05

MAXIMUM 1.2399E-04

ELEMENT 4754

MINIMUM 6.0233E-05

ELEMENT 7554

THE FOLLOWING TABLE IS PRINTED FOR REBARS NAMED HAIM IN ELSET CONCRETE AND ELEMENT TYPE CAX3 AT
INTEGRATION POINTS

ELEMENT	REBAR	PT	FOOT- NOTE	E11

ALL VALUES IN THIS TABLE ARE ZERO

THE FOLLOWING TABLE IS PRINTED FOR REBARS NAMED HAIM IN ELSET CONCRETE AND ELEMENT TYPE CAX4 AT
INTEGRATION POINTS

ELEMENT	REBAR	PT	FOOT- NOTE	PE11	PEEQ	AC YIELD	PEMAG

ALL VALUES IN THIS TABLE ARE ZERO

1

ABAQUS PRODUCTION VERSION 4-9-1 DATE 18-May-94 TIME 08:28:47 PAGE
665
FOR USE BY WESTINGHOUSE HANFORD COMPANY UNDER LICENSE FROM HKS, INC.

241-SY-101 TANK *** FILE thermala.abdat dated 5/16/94 *** STEP 11
INCREMENT 100

SEVENTH THERMAL LOAD STEP ON 241-SY-101 TANK
THIS STEP 1.00

TIME COMPLETED IN

THE FOLLOWING TABLE IS PRINTED FOR REBARS NAMED HAIM IN ELSET CONCRETE AND ELEMENT TYPE CAX3 AT
INTEGRATION POINTS

ELEMENT REBAR	PT FOOT- NOTE	PE11	PEEQ	AC YIELD	PEMAG

ALL VALUES IN THIS TABLE ARE ZERO

THE FOLLOWING TABLE IS PRINTED FOR REBARS NAMED HAOH IN ELSET CONCRETE AND ELEMENT TYPE CAX4 AT
INTEGRATION POINTS

ELEMENT REBAR	PT FOOT- NOTE	S11
4756 HAOH	1	1189.
4956 HAOH	1	1426.
5156 HAOH	1	1498.
5356 HAOH	1	1513.
5556 HAOH	1	1486.
5756 HAOH	1	1454.
5956 HAOH	1	1147.
6156 HAOH	1	1031.
6356 HAOH	1	937.2
6556 HAOH	1	848.9
6756 HAOH	1	741.2
6956 HAOH	1	584.0
7156 HAOH	1	353.5
7356 HAOH	1	58.21
7556 HAOH	1	-304.2
7756 HAOH	1	-723.6

MAXIMUM 1513.

ELEMENT 5356

MINIMUM -723.6

ELEMENT 7756

1

ABAQUS PRODUCTION VERSION 4-9-1
666

DATE 18-May-94

TIME 08:28:47

PAGE

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241-SY-101 TANK *** FILE thermala.abdat dated 5/16/94 ***
INCREMENT 100
SEVENTH THERMAL LOAD STEP ON 241-SY-101 TANK
THIS STEP 1.00

STEP 11

TIME COMPLETED IN

THE FOLLOWING TABLE IS PRINTED FOR REBARS NAMED HAOH IN ELSET CONCRETE AND ELEMENT TYPE CAX3 AT
INTEGRATION POINTS

ELEMENT REBAR	PT FOOT- NOTE	S11

ALL VALUES IN THIS TABLE ARE ZERO

THE FOLLOWING TABLE IS PRINTED FOR REBARS NAMED HAOH IN ELSET CONCRETE AND ELEMENT TYPE CAX4 AT
INTEGRATION POINTS

ELEMENT REBAR	PT FOOT- NOTE	E11
4756 HAOH	1	3.4865E-04
4956 HAOH	1	3.4286E-04
5156 HAOH	1	3.3406E-04
5356 HAOH	1	3.2139E-04
5556 HAOH	1	3.0571E-04
5756 HAOH	1	2.8883E-04
5956 HAOH	1	2.7516E-04
6156 HAOH	1	2.6918E-04
6356 HAOH	1	2.6198E-04
6556 HAOH	1	2.5361E-04
6756 HAOH	1	2.4368E-04
6956 HAOH	1	2.3184E-04
7156 HAOH	1	2.1917E-04
7356 HAOH	1	2.0581E-04
7556 HAOH	1	1.9120E-04
7756 HAOH	1	1.7566E-04

MAXIMUM 3.4865E-04

ELEMENT 4756

MINIMUM 1.7566E-04

ELEMENT 7756

1

ABAQUS PRODUCTION VERSION 4-9-1 DATE 18-May-94 TIME 08:28:47 PAGE
667 FOR USE BY WESTINGHOUSE HANFORD COMPANY UNDER LICENSE FROM HKS, INC.

241-SY-101 TANK *** FILE thermal.abdat dated 5/16/94 *** STEP 11
INCREMENT 100
SEVENTH THERMAL LOAD STEP ON 241-SY-101 TANK TIME COMPLETED IN
THIS STEP 1.00

THE FOLLOWING TABLE IS PRINTED FOR REBARS NAMED HAOH IN ELSET CONCRETE AND ELEMENT TYPE CAX3 AT
INTEGRATION POINTS

ELEMENT REBAR	PT FOOT- NOTE	E11

ALL VALUES IN THIS TABLE ARE ZERO

THE FOLLOWING TABLE IS PRINTED FOR REBARS NAMED HAOH IN ELSET CONCRETE AND ELEMENT TYPE CAX4 AT
INTEGRATION POINTS

ELEMENT REBAR	PT FOOT- NOTE	PE11	PEEQ	AC YIELD	PEMAG

ALL VALUES IN THIS TABLE ARE ZERO

THE FOLLOWING TABLE IS PRINTED FOR REBARS NAMED HAOM IN ELSET CONCRETE AND ELEMENT TYPE CAX3 AT
INTEGRATION POINTS

ELEMENT REBAR	PT FOOT- NOTE	PE11	PEEQ	AC YIELD	PEMAG

ALL VALUES IN THIS TABLE ARE ZERO

THE FOLLOWING TABLE IS PRINTED FOR REBARS NAMED HAOM IN ELSET CONCRETE AND ELEMENT TYPE CAX4 AT
INTEGRATION POINTS

ELEMENT REBAR	PT FOOT- NOTE	S11
4756 HAOM	1	49.22
4956 HAOM	1	793.0
5156 HAOM	1	442.4
5356 HAOM	1	-60.25

1

ABAQUS PRODUCTION VERSION 4-9-1 DATE 18-May-94 TIME 08:28:47 PAGE
668
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241-SY-101 TANK *** FILE thermala.abdat dated 5/16/94 *** STEP 11
INCREMENT 100
SEVENTH THERMAL LOAD STEP ON 241-SY-101 TANK TIME COMPLETED IN
THIS STEP 1.00

ELEMENT REBAR	PT FOOT- NOTE	S11
5556 HAOM	1	-781.6
5756 HAOM	1	-1339.
5956 HAOM	1	-486.7
6156 HAOM	1	-447.7
6356 HAOM	1	-531.9
6556 HAOM	1	-658.7
6756 HAOM	1	-986.7
6956 HAOM	1	-1359.
7156 HAOM	1	-1746.
7356 HAOM	1	-2150.
7556 HAOM	1	-2781.
7756 HAOM	1	-3332.

MAXIMUM 793.0

ELEMENT 4956

MINIMUM -3332.

ELEMENT 7756

THE FOLLOWING TABLE IS PRINTED FOR REBARS NAMED HAOM IN ELSET CONCRETE AND ELEMENT TYPE CAX3 AT
INTEGRATION POINTS

ELEMENT REBAR	PT FOOT- NOTE	S11

ALL VALUES IN THIS TABLE ARE ZERO

THE FOLLOWING TABLE IS PRINTED FOR REBARS NAMED HAOM IN ELSET CONCRETE AND ELEMENT TYPE CAX4 AT
INTEGRATION POINTS

ELEMENT REBAR	PT FOOT- NOTE	E11
4756 HAOM	1	3.1065E-04
4956 HAOM	1	3.2175E-04
5156 HAOM	1	2.9887E-04
5356 HAOM	1	2.6894E-04

1

ABAQUS PRODUCTION VERSION 4-9-1 DATE 18-May-94 TIME 08:28:47 PAGE
669
FOR USE BY WESTINGHOUSE HANFORD COMPANY UNDER LICENSE FROM HKS, INC.

241-SY-101 TANK *** FILE thermala.abdat dated 5/16/94 *** STEP 11
INCREMENT 100
SEVENTH THERMAL LOAD STEP ON 241-SY-101 TANK TIME COMPLETED IN
THIS STEP 1.00

ELEMENT REBAR	PT FOOT- NOTE	E11
5556 HAOM	1	2.3012E-04
5756 HAOM	1	1.9571E-04
5956 HAOM	1	2.2069E-04
6156 HAOM	1	2.1987E-04
6356 HAOM	1	2.1301E-04
6556 HAOM	1	2.0335E-04
6756 HAOM	1	1.8608E-04
6956 HAOM	1	1.6707E-04
7156 HAOM	1	1.4918E-04
7356 HAOM	1	1.3221E-04
7556 HAOM	1	1.0866E-04
7756 HAOM	1	8.8722E-05

MAXIMUM 3.2175E-04

ELEMENT 4956

MINIMUM 8.8722E-05

ELEMENT 7756

THE FOLLOWING TABLE IS PRINTED FOR REBARS NAMED HAOM IN ELSET CONCRETE AND ELEMENT TYPE CAX3 AT
INTEGRATION POINTS

ELEMENT REBAR	PT FOOT- NOTE	E11

ALL VALUES IN THIS TABLE ARE ZERO

THE FOLLOWING TABLE IS PRINTED FOR REBARS NAMED HAOM IN ELSET CONCRETE AND ELEMENT TYPE CAX4 AT
INTEGRATION POINTS

ELEMENT REBAR	PT FOOT- NOTE	PE11	PEEQ	AC YIELD	PEMAG

ALL VALUES IN THIS TABLE ARE ZERO

1

ABAQUS PRODUCTION VERSION 4-9-1
670

DATE 18-May-94

TIME 08:28:47

PAGE

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241-SY-101 TANK *** FILE thermala.abdat dated 5/16/94 ***
INCREMENT 100
SEVENTH THERMAL LOAD STEP ON 241-SY-101 TANK
THIS STEP 1.00

STEP 11

TIME COMPLETED IN

THE FOLLOWING TABLE IS PRINTED FOR REBARS NAMED HAOM IN ELSET CONCRETE AND ELEMENT TYPE CAX3 AT
INTEGRATION POINTS

ELEMENT	REBAR	PT	FOOT- NOTE	PE11	PEEQ	AC YIELD	PEMAG

ALL VALUES IN THIS TABLE ARE ZERO

THE FOLLOWING TABLE IS PRINTED FOR REBARS NAMED HAMH IN ELSET CONCRETE AND ELEMENT TYPE CAX4 AT
INTEGRATION POINTS

ELEMENT	REBAR	PT	FOOT- NOTE	S11
	5354	HAMH	1	-3478.
	5554	HAMH	1	-3081.
	5754	HAMH	1	1187.
	5954	HAMH	1	1101.
	6154	HAMH	1	1108.
	6354	HAMH	1	1128.
	6554	HAMH	1	1127.
	6754	HAMH	1	1070.
	6954	HAMH	1	919.7
	7154	HAMH	1	-3529.
	7354	HAMH	1	-3598.
MAXIMUM				1187.
ELEMENT				5754
MINIMUM				-3598.
ELEMENT				7354

1

ABAQUS PRODUCTION VERSION 4-9-1
671

DATE 18-May-94

TIME 08:28:47

PAGE

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241-SY-101 TANK *** FILE thermala.abdat dated 5/16/94 ***
INCREMENT 100
SEVENTH THERMAL LOAD STEP ON 241-SY-101 TANK
THIS STEP 1.00

STEP 11

TIME COMPLETED IN

THE FOLLOWING TABLE IS PRINTED FOR REBARS NAMED HAMH IN ELSET CONCRETE AND ELEMENT TYPE CAX3 AT
INTEGRATION POINTS

ELEMENT	REBAR	PT	FOOT- NOTE	S11

NOTE

ALL VALUES IN THIS TABLE ARE ZERO

THE FOLLOWING TABLE IS PRINTED FOR REBARS NAMED HAMH IN ELSET CONCRETE AND ELEMENT TYPE CAX4 AT INTEGRATION POINTS

ELEMENT REBAR	PT	FOOT- NOTE	E11
5354 HAMH	1		1.7684E-04
5554 HAMH	1		1.8031E-04
5754 HAMH	1		3.0640E-04
5954 HAMH	1		2.9578E-04
6154 HAMH	1		2.8867E-04
6354 HAMH	1		2.8059E-04
6554 HAMH	1		2.7204E-04
6754 HAMH	1		2.6141E-04
6954 HAMH	1		2.4851E-04
7154 HAMH	1		9.5999E-05
7354 HAMH	1		9.0457E-05
MAXIMUM			3.0640E-04
ELEMENT			5754
MINIMUM			9.0457E-05
ELEMENT			7354

1

ABAQUS PRODUCTION VERSION 4-9-1 DATE 18-May-94 TIME 08:28:47 PAGE 672
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241-SY-101 TANK *** FILE thermala.abdat dated 5/16/94 *** STEP 11
INCREMENT 100 SEVENTH THERMAL LOAD STEP ON 241-SY-101 TANK TIME COMPLETED IN
THIS STEP 1.00

THE FOLLOWING TABLE IS PRINTED FOR REBARS NAMED HAMH IN ELSET CONCRETE AND ELEMENT TYPE CAX3 AT INTEGRATION POINTS

ELEMENT REBAR	PT	FOOT- NOTE	E11

ALL VALUES IN THIS TABLE ARE ZERO

THE FOLLOWING TABLE IS PRINTED FOR REBARS NAMED HAMH IN ELSET CONCRETE AND ELEMENT TYPE CAX4 AT INTEGRATION POINTS

ELEMENT REBAR	PT	FOOT- NOTE	PE11	PEEQ	AC YIELD	PEMAG

ALL VALUES IN THIS TABLE ARE ZERO

THE FOLLOWING TABLE IS PRINTED FOR REBARS NAMED HAMM IN ELSET CONCRETE AND ELEMENT TYPE CAX3 AT
INTEGRATION POINTS

ELEMENT	REBAR	PT	FOOT- NOTE	PE11	PEEQ	AC YIELD	PEMAG

ALL VALUES IN THIS TABLE ARE ZERO

THE FOLLOWING TABLE IS PRINTED FOR REBARS NAMED HAMM IN ELSET CONCRETE AND ELEMENT TYPE CAX4 AT
INTEGRATION POINTS

ELEMENT	REBAR	PT	FOOT- NOTE	S11

4754	HAMM	1		-4357.
4954	HAMM	1		-4551.
5154	HAMM	1		-4054.
5354	HAMM	1		-3478.

1

ABAQUS PRODUCTION VERSION 4-9-1 DATE 18-May-94 TIME 08:28:47 PAGE
673
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241-SY-101 TANK *** FILE thermala.abdat dated 5/16/94 *** STEP 11
INCREMENT 100
SEVENTH THERMAL LOAD STEP ON 241-SY-101 TANK TIME COMPLETED IN
THIS STEP 1.00

ELEMENT	REBAR	PT	FOOT- NOTE	S11

5554	HAMM	1		-3081.
5754	HAMM	1		-2272.
5954	HAMM	1		-3182.
6154	HAMM	1		-3286.
6354	HAMM	1		-3272.
6554	HAMM	1		-3317.
6754	HAMM	1		-3361.
6954	HAMM	1		-3527.
7154	HAMM	1		-3529.
7354	HAMM	1		-3598.

MAXIMUM -2272.

ELEMENT 5754

MINIMUM -4551.

ELEMENT 4954

THE FOLLOWING TABLE IS PRINTED FOR REBARS NAMED HAMM IN ELSET CONCRETE AND ELEMENT TYPE CAX3 AT
INTEGRATION POINTS

ELEMENT	REBAR	PT	FOOT- NOTE	S11

ALL VALUES IN THIS TABLE ARE ZERO

THE FOLLOWING TABLE IS PRINTED FOR REBARS NAMED HAMM IN ELSET CONCRETE AND ELEMENT TYPE CAX4 AT
INTEGRATION POINTS

ELEMENT	REBAR	PT	FOOT- NOTE	E11
4754	HAMM	1		1.7375E-04
4954	HAMM	1		1.5675E-04
5154	HAMM	1		1.6618E-04
5354	HAMM	1		1.7684E-04
5554	HAMM	1		1.8031E-04
5754	HAMM	1		1.9108E-04

ABAQUS PRODUCTION VERSION 4-9-1 DATE 18-May-94 TIME 08:28:47 PAGE
674
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241-SY-101 TANK *** FILE thermal.abdat dated 5/16/94 *** STEP 11
INCREMENT 100
SEVENTH THERMAL LOAD STEP ON 241-SY-101 TANK TIME COMPLETED IN
THIS STEP 1.00

ELEMENT	REBAR	PT	FOOT- NOTE	E11
5954	HAMM	1		1.5300E-04
6154	HAMM	1		1.4217E-04
6354	HAMM	1		1.3393E-04
6554	HAMM	1		1.2392E-04
6754	HAMM	1		1.1369E-04
6954	HAMM	1		1.0028E-04
7154	HAMM	1		9.5999E-05
7354	HAMM	1		9.0457E-05
MAXIMUM				1.9108E-04
ELEMENT				5754
MINIMUM				9.0457E-05
ELEMENT				7354

THE FOLLOWING TABLE IS PRINTED FOR REBARS NAMED HAMM IN ELSET CONCRETE AND ELEMENT TYPE CAX3 AT
INTEGRATION POINTS

ELEMENT	REBAR	PT	FOOT- NOTE	E11

ALL VALUES IN THIS TABLE ARE ZERO

THE FOLLOWING TABLE IS PRINTED FOR REBARS NAMED HAMM IN ELSET CONCRETE AND ELEMENT TYPE CAX4 AT
INTEGRATION POINTS

ELEMENT	REBAR	PT	FOOT- NOTE	PE11	PEEQ	AC YIELD	PEMAG

ALL VALUES IN THIS TABLE ARE ZERO

ABAQUS PRODUCTION VERSION 4-9-1
675

DATE 18-May-94 TIME 08:28:47 PAGE

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241-SY-101 TANK *** FILE thermala.abdat dated 5/16/94 ***
INCREMENT 100
SEVENTH THERMAL LOAD STEP ON 241-SY-101 TANK
THIS STEP 1.00

STEP 11

TIME COMPLETED IN

THE FOLLOWING TABLE IS PRINTED FOR REBARS NAMED HAMM IN ELSET CONCRETE AND ELEMENT TYPE CAX3 AT
INTEGRATION POINTS

ELEMENT REBAR	PT FOOT- NOTE	PE11	PEEQ	AC YIELD	PEMAG

ALL VALUES IN THIS TABLE ARE ZERO

THE FOLLOWING TABLE IS PRINTED FOR REBARS NAMED HAR IN ELSET CONCRETE AND ELEMENT TYPE CAX4 AT
INTEGRATION POINTS

ELEMENT REBAR	PT FOOT- NOTE	S11
4754 HAR	1	-1964.
4756 HAR	1	-2495.
4954 HAR	1	-1898.
4956 HAR	1	-2473.
5354 HAR	1	-2622.
5356 HAR	1	-2308.
5754 HAR	1	-2450.
5756 HAR	1	-2695.
5756 HAR	1	-2132.
5954 HAR	1	-2196.
5956 HAR	1	-2287.
6354 HAR	1	-1892.
6356 HAR	1	-1998.
6754 HAR	1	-1662.
6756 HAR	1	-1855.
6954 HAR	1	-1621.
6956 HAR	1	-1708.
7154 HAR	1	-1696.
7156 HAR	1	-1733.
7354 HAR	1	-1857.
7356 HAR	1	-1673.
7554 HAR	1	-2036.
7556 HAR	1	-1573.
7754 HAR	1	-1667.
7756 HAR	1	-1593.

1

ABAQUS PRODUCTION VERSION 4-9-1
676

DATE 18-May-94 TIME 08:28:47 PAGE

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241-SY-101 TANK *** FILE thermala.abdat dated 5/16/94 ***
INCREMENT 100
SEVENTH THERMAL LOAD STEP ON 241-SY-101 TANK
THIS STEP 1.00

STEP 11

TIME COMPLETED IN

ELEMENT REBAR	PT FOOT- NOTE	S11

MAXIMUM -1573.
ELEMENT 7556
MINIMUM -2695.
ELEMENT 5756

THE FOLLOWING TABLE IS PRINTED FOR REBARS NAMED HAR IN ELSET CONCRETE AND ELEMENT TYPE CAX3 AT
INTEGRATION POINTS

ELEMENT REBAR PT FOOT- S11
NOTE

ALL VALUES IN THIS TABLE ARE ZERO

THE FOLLOWING TABLE IS PRINTED FOR REBARS NAMED HAR IN ELSET CONCRETE AND ELEMENT TYPE CAX4 AT
INTEGRATION POINTS

ELEMENT REBAR PT FOOT- E11
NOTE

4754 HAR	1	2.6374E-04
4756 HAR	1	2.3580E-04
4954 HAR	1	2.5271E-04
4956 HAR	1	2.2015E-04
5354 HAR	1	2.1620E-04
5356 HAR	1	2.0632E-04
5754 HAR	1	2.0622E-04
5756 HAR	1	1.6699E-04
5756 HAR	1	1.8115E-04
5954 HAR	1	1.9759E-04
5956 HAR	1	1.6932E-04
6354 HAR	1	1.8902E-04
6356 HAR	1	1.7137E-04
6754 HAR	1	1.7786E-04
6756 HAR	1	1.6327E-04
6954 HAR	1	1.6846E-04

ABAQUS PRODUCTION VERSION 4-9-1
677

DATE 18-May-94 TIME 08:28:47 PAGE

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241-SY-101 TANK *** FILE thermala.abdat dated 5/16/94 ***
INCREMENT 100
SEVENTH THERMAL LOAD STEP ON 241-SY-101 TANK
THIS STEP 1.00

STEP 11
TIME COMPLETED IN

ELEMENT REBAR PT FOOT- E11
NOTE

6956 HAR	1	1.6028E-04
7154 HAR	1	1.6082E-04
7156 HAR	1	1.5322E-04
7354 HAR	1	1.5165E-04
7356 HAR	1	1.5127E-04
7554 HAR	1	1.4341E-04
7556 HAR	1	1.5146E-04
7754 HAR	1	1.5420E-04
7756 HAR	1	1.4895E-04

MAXIMUM 2.6374E-04
ELEMENT 4754
MINIMUM 1.4341E-04
ELEMENT 7554

THE FOLLOWING TABLE IS PRINTED FOR REBARS NAMED HAR IN ELSET CONCRETE AND ELEMENT TYPE CAX3 AT
INTEGRATION POINTS

ELEMENT REBAR PT FOOT- E11
NOTE

ALL VALUES IN THIS TABLE ARE ZERO

THE FOLLOWING TABLE IS PRINTED FOR REBARS NAMED HAR IN ELSET CONCRETE AND ELEMENT TYPE CAX4 AT
INTEGRATION POINTS

ELEMENT REBAR PT FOOT- PE11 PEEQ AC YIELD PEMAG
NOTE

ALL VALUES IN THIS TABLE ARE ZERO

1
ABAQUS PRODUCTION VERSION 4-9-1 DATE 18-May-94 TIME 08:28:47 PAGE
678
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241-SY-101 TANK *** FILE thermala.abdat dated 5/16/94 *** STEP 11
INCREMENT 100
SEVENTH THERMAL LOAD STEP ON 241-SY-101 TANK TIME COMPLETED IN
THIS STEP 1.00

THE FOLLOWING TABLE IS PRINTED FOR REBARS NAMED HAR IN ELSET CONCRETE AND ELEMENT TYPE CAX3 AT
INTEGRATION POINTS

ELEMENT REBAR PT FOOT- PE11 PEEQ AC YIELD PEMAG
NOTE

ALL VALUES IN THIS TABLE ARE ZERO

THE FOLLOWING TABLE IS PRINTED FOR REBARS NAMED DIH IN ELSET CONCRETE AND ELEMENT TYPE CAX4 AT
INTEGRATION POINTS

ELEMENT REBAR PT FOOT- S11
NOTE

7954 DIH 1 -526.6
8154 DIH 1 -1029.
8354 DIH 1 -1540.
8554 DIH 1 -2011.
8754 DIH 1 -2429.
8954 DIH 1 -2812.
9154 DIH 1 -3172.

9354 DIH	1	-3498.
9554 DIH	1	-3786.
9754 DIH	1	-4028.
9954 DIH	1	-4242.
10154 DIH	1	-4424.
10354 DIH	1	-4576.
10554 DIH	1	-4702.
10754 DIH	1	-4791.
10954 DIH	1	-4850.
11154 DIH	1	-4860.
11354 DIH	1	-4865.
11554 DIH	1	-4912.
11754 DIH	1	-4897.
11954 DIH	1	-4788.

MAXIMUM -526.6

ELEMENT 7954

MINIMUM -4912.

ELEMENT 11554

1

ABAQUS PRODUCTION VERSION 4-9-1
679

DATE 18-May-94

TIME 08:28:47

PAGE

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241-SY-101 TANK *** FILE thermal.abdat dated 5/16/94 ***
INCREMENT 100
SEVENTH THERMAL LOAD STEP ON 241-SY-101 TANK
THIS STEP 1.00

STEP 11

TIME COMPLETED IN

THE FOLLOWING TABLE IS PRINTED FOR REBARS NAMED DIH
INTEGRATION POINTS

IN ELSET CONCRETE AND ELEMENT TYPE CAX3 AT

ELEMENT REBAR	PT	FOOT- NOTE	S11

ALL VALUES IN THIS TABLE ARE ZERO

THE FOLLOWING TABLE IS PRINTED FOR REBARS NAMED DIH
INTEGRATION POINTS

IN ELSET CONCRETE AND ELEMENT TYPE CAX4 AT

ELEMENT REBAR	PT	FOOT- NOTE	E11

7954 DIH	1	1.9213E-04
8154 DIH	1	1.7422E-04
8354 DIH	1	1.5630E-04
8554 DIH	1	1.3992E-04
8754 DIH	1	1.2536E-04
8954 DIH	1	1.1212E-04
9154 DIH	1	9.9563E-05
9354 DIH	1	8.8223E-05
9554 DIH	1	7.8254E-05
9754 DIH	1	6.9816E-05
9954 DIH	1	6.2523E-05
10154 DIH	1	5.6316E-05
10354 DIH	1	5.0951E-05
10554 DIH	1	4.6694E-05
10754 DIH	1	4.3671E-05
10954 DIH	1	4.1502E-05

11154 DIH	1	4.1074E-05
11354 DIH	1	4.0916E-05
11554 DIH	1	3.9174E-05
11754 DIH	1	3.9721E-05
11954 DIH	1	4.3563E-05

MAXIMUM 1.9213E-04

ELEMENT 7954

MINIMUM 3.9174E-05

ELEMENT 11554

1.

ABAQUS PRODUCTION VERSION 4-9-1

DATE 18-May-94

TIME 08:28:47

PAGE

680

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241-SY-101 TANK *** FILE thermala.abdat dated 5/16/94 ***
INCREMENT 100

STEP 11

SEVENTH THERMAL LOAD STEP ON 241-SY-101 TANK
THIS STEP 1.00

TIME COMPLETED IN

THE FOLLOWING TABLE IS PRINTED FOR REBARS NAMED DIH IN ELSET CONCRETE AND ELEMENT TYPE CAX3 AT
INTEGRATION POINTS

ELEMENT REBAR	PT FOOT- NOTE	E11

ALL VALUES IN THIS TABLE ARE ZERO

THE FOLLOWING TABLE IS PRINTED FOR REBARS NAMED DIH IN ELSET CONCRETE AND ELEMENT TYPE CAX4 AT
INTEGRATION POINTS

ELEMENT REBAR	PT FOOT- NOTE	PE11	PEEQ	AC YIELD	PEMAG

ALL VALUES IN THIS TABLE ARE ZERO

THE FOLLOWING TABLE IS PRINTED FOR REBARS NAMED DIH IN ELSET CONCRETE AND ELEMENT TYPE CAX3 AT
INTEGRATION POINTS

ELEMENT REBAR	PT FOOT- NOTE	PE11	PEEQ	AC YIELD	PEMAG

ALL VALUES IN THIS TABLE ARE ZERO

THE FOLLOWING TABLE IS PRINTED FOR REBARS NAMED DIM IN ELSET CONCRETE AND ELEMENT TYPE CAX4 AT
INTEGRATION POINTS

ELEMENT REBAR	PT FOOT- NOTE	S11

7954 DIM	1	-4348.

8154 DIM 1 -4250.
8354 DIM 1 -4187.
8554 DIM 1 -4650.

1

ABAQUS PRODUCTION VERSION 4-9-1 DATE 18-May-94 TIME 08:28:47 PAGE
681
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241-SY-101 TANK *** FILE thermala.abdat dated 5/16/94 *** STEP 11
INCREMENT 100
SEVENTH THERMAL LOAD STEP ON 241-SY-101 TANK TIME COMPLETED IN
THIS STEP 1.00

ELEMENT	REBAR	PT	FOOT- NOTE	S11
8754	DIM	1		-4669.
8954	DIM	1		-4691.
9154	DIM	1		-4703.
9354	DIM	1		-4716.
9554	DIM	1		-4721.
9754	DIM	1		-4776.
9954	DIM	1		-4830.
10154	DIM	1		-4874.
10354	DIM	1		-4914.
10554	DIM	1		-5142.
10754	DIM	1		-5187.
10954	DIM	1		-5246.
11154	DIM	1		-5493.
11354	DIM	1		-4985.
11554	DIM	1		-4957.
11754	DIM	1		-5078.
11954	DIM	1		-4794.
MAXIMUM				-4187.
ELEMENT				8354
MINIMUM				-5493.
ELEMENT				11154

THE FOLLOWING TABLE IS PRINTED FOR REBARS NAMED DIM IN ELSET CONCRETE AND ELEMENT TYPE CAX3 AT
INTEGRATION POINTS

ELEMENT	REBAR	PT	FOOT- NOTE	S11

ALL VALUES IN THIS TABLE ARE ZERO

1

ABAQUS PRODUCTION VERSION 4-9-1 DATE 18-May-94 TIME 08:28:47 PAGE
682
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241-SY-101 TANK *** FILE thermala.abdat dated 5/16/94 *** STEP 11
INCREMENT 100
SEVENTH THERMAL LOAD STEP ON 241-SY-101 TANK TIME COMPLETED IN
THIS STEP 1.00

THE FOLLOWING TABLE IS PRINTED FOR REBARS NAMED DIM IN ELSET CONCRETE AND ELEMENT TYPE CAX4 AT
INTEGRATION POINTS

ELEMENT REBAR	PT FOOT- NOTE	E11
7954 DIM	1	6.4761E-05
8154 DIM	1	6.6864E-05
8354 DIM	1	6.8081E-05
8554 DIM	1	5.1959E-05
8754 DIM	1	5.0699E-05
8954 DIM	1	4.9509E-05
9154 DIM	1	4.8538E-05
9354 DIM	1	4.7608E-05
9554 DIM	1	4.7082E-05
9754 DIM	1	4.4906E-05
9954 DIM	1	4.2941E-05
10154 DIM	1	4.1315E-05
10354 DIM	1	3.9705E-05
10554 DIM	1	3.2027E-05
10754 DIM	1	3.0488E-05
10954 DIM	1	2.8300E-05
11154 DIM	1	1.9972E-05
11354 DIM	1	3.6887E-05
11554 DIM	1	3.7681E-05
11754 DIM	1	3.3677E-05
11954 DIM	1	4.3342E-05
MAXIMUM		6.8081E-05
ELEMENT		8354
MINIMUM		1.9972E-05
ELEMENT		11154

THE FOLLOWING TABLE IS PRINTED FOR REBARS NAMED DIM IN ELSET CONCRETE AND ELEMENT TYPE CAX3 AT INTEGRATION POINTS

ELEMENT REBAR	PT FOOT- NOTE	E11

ALL VALUES IN THIS TABLE ARE ZERO
1

ABAQUS PRODUCTION VERSION 4-9-1 DATE 18-May-94 TIME 08:28:47 PAGE 683
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241-SY-101 TANK *** FILE thermala.abdat dated 5/16/94 *** STEP 11
INCREMENT 100
SEVENTH THERMAL LOAD STEP ON 241-SY-101 TANK TIME COMPLETED IN
THIS STEP 1.00

THE FOLLOWING TABLE IS PRINTED FOR REBARS NAMED DIM IN ELSET CONCRETE AND ELEMENT TYPE CAX4 AT INTEGRATION POINTS

ELEMENT REBAR	PT FOOT- NOTE	PE11	PEEQ	AC YIELD	PEMAG

ALL VALUES IN THIS TABLE ARE ZERO

THE FOLLOWING TABLE IS PRINTED FOR REBARS NAMED DIM IN ELSET CONCRETE AND ELEMENT TYPE CAX3 AT
INTEGRATION POINTS

ELEMENT REBAR	PT FOOT- NOTE	PE11	PEEQ	AC YIELD	PEMAG

ALL VALUES IN THIS TABLE ARE ZERO

THE FOLLOWING TABLE IS PRINTED FOR REBARS NAMED DOH IN ELSET CONCRETE AND ELEMENT TYPE CAX4 AT
INTEGRATION POINTS

ELEMENT REBAR	PT FOOT- NOTE	S11
7956 DOH	1	-1171.
8156 DOH	1	-1674.
8356 DOH	1	-2179.
8556 DOH	1	-2647.
8756 DOH	1	-3063.
8956 DOH	1	-3461.
9156 DOH	1	-3825.
9356 DOH	1	-4132.
9556 DOH	1	-4382.
9756 DOH	1	-4589.
9956 DOH	1	-4766.
10156 DOH	1	-4916.
10356 DOH	1	-5044.
10556 DOH	1	-5150.
10756 DOH	1	-5234.

1

ABAQUS PRODUCTION VERSION 4-9-1 DATE 18-May-94 TIME 08:28:47 PAGE
684
FOR USE BY WESTINGHOUSE HANFORD COMPANY UNDER LICENSE FROM HKS, INC.

241-SY-101 TANK *** FILE thermala.abdat dated 5/16/94 *** STEP 11
INCREMENT 100
SEVENTH THERMAL LOAD STEP ON 241-SY-101 TANK TIME COMPLETED IN
THIS STEP 1.00

ELEMENT REBAR	PT FOOT- NOTE	S11
10956 DOH	1	-5310.
11156 DOH	1	-5380.
11356 DOH	1	-5442.
11556 DOH	1	-5518.
11756 DOH	1	-5624.
11956 DOH	1	-5719.
MAXIMUM		-1171.
ELEMENT		7956
MINIMUM		-5719.
ELEMENT		11956

THE FOLLOWING TABLE IS PRINTED FOR REBARS NAMED DOH IN ELSET CONCRETE AND ELEMENT TYPE CAX3 AT
INTEGRATION POINTS

ELEMENT REBAR	PT FOOT-	S11

NOTE

ALL VALUES IN THIS TABLE ARE ZERO

THE FOLLOWING TABLE IS PRINTED FOR REBARS NAMED DOH IN ELSET CONCRETE AND ELEMENT TYPE CAX4 AT
INTEGRATION POINTS

ELEMENT REBAR	PT FOOT- NOTE	E11
7956 DOH	1	1.5975E-04
8156 DOH	1	1.4214E-04
8356 DOH	1	1.2444E-04
8556 DOH	1	1.0812E-04
8756 DOH	1	9.3638E-05
8956 DOH	1	7.9815E-05
9156 DOH	1	6.7349E-05
9356 DOH	1	5.6907E-05
9556 DOH	1	4.8517E-05
9756 DOH	1	4.1294E-05

1

ABAQUS PRODUCTION VERSION 4-9-1 DATE 18-May-94 TIME 08:28:47 PAGE
685
FOR USE BY WESTINGHOUSE HANFORD COMPANY UNDER LICENSE FROM HKS, INC.

241-SY-101 TANK *** FILE thermala.abdat dated 5/16/94 *** STEP 11
INCREMENT 100
SEVENTH THERMAL LOAD STEP ON 241-SY-101 TANK TIME COMPLETED IN
THIS STEP 1.00

ELEMENT REBAR	PT FOOT- NOTE	E11
9956 DOH	1	3.5117E-05
10156 DOH	1	2.9913E-05
10356 DOH	1	2.5316E-05
10556 DOH	1	2.1507E-05
10756 DOH	1	1.8525E-05
10956 DOH	1	1.5627E-05
11156 DOH	1	1.3068E-05
11356 DOH	1	1.0959E-05
11556 DOH	1	8.1353E-06
11756 DOH	1	4.3465E-06
11956 DOH	1	1.5051E-06

MAXIMUM 1.5975E-04

ELEMENT 7956

MINIMUM 1.5051E-06

ELEMENT 11956

THE FOLLOWING TABLE IS PRINTED FOR REBARS NAMED DOH IN ELSET CONCRETE AND ELEMENT TYPE CAX3 AT
INTEGRATION POINTS

ELEMENT REBAR	PT FOOT- NOTE	E11

ALL VALUES IN THIS TABLE ARE ZERO

THE FOLLOWING TABLE IS PRINTED FOR REBARS NAMED DOM IN ELSET CONCRETE AND ELEMENT TYPE CAX4 AT
INTEGRATION POINTS

ELEMENT REBAR	PT FOOT- NOTE	PE11	PEEQ	AC YIELD	PEMAG

ALL VALUES IN THIS TABLE ARE ZERO

1

ABAQUS PRODUCTION VERSION 4-9-1 DATE 18-May-94 TIME 08:28:47 PAGE
686
FOR USE BY WESTINGHOUSE HANFORD COMPANY UNDER LICENSE FROM HKS, INC.

241-SY-101 TANK *** FILE thermala.abdat dated 5/16/94 *** STEP 11
INCREMENT 100
SEVENTH THERMAL LOAD STEP ON 241-SY-101 TANK TIME COMPLETED IN
THIS STEP 1.00

THE FOLLOWING TABLE IS PRINTED FOR REBARS NAMED DOM IN ELSET CONCRETE AND ELEMENT TYPE CAX3 AT
INTEGRATION POINTS

ELEMENT REBAR	PT FOOT- NOTE	PE11	PEEQ	AC YIELD	PEMAG

ALL VALUES IN THIS TABLE ARE ZERO

THE FOLLOWING TABLE IS PRINTED FOR REBARS NAMED DOM IN ELSET CONCRETE AND ELEMENT TYPE CAX4 AT
INTEGRATION POINTS

ELEMENT REBAR	PT FOOT- NOTE	S11
7956 DOM	1	-3814.
8156 DOM	1	-4175.
8356 DOM	1	-4408.
8556 DOM	1	-5237.
8756 DOM	1	-5367.
8956 DOM	1	-5495.
9156 DOM	1	-5611.
9356 DOM	1	-5740.
9556 DOM	1	-5837.
9756 DOM	1	-5846.
9956 DOM	1	-5781.
10156 DOM	1	-5708.
10356 DOM	1	-5596.
10556 DOM	1	-5709.
10756 DOM	1	-5598.
10956 DOM	1	-5489.
11156 DOM	1	-5598.
11356 DOM	1	-5526.
11556 DOM	1	-5419.
11756 DOM	1	-5560.
11956 DOM	1	-5727.
MAXIMUM		-3814.
ELEMENT		7956
MINIMUM		-5846.

ELEMENT 9756

1

ABAQUS PRODUCTION VERSION 4-9-1 DATE 18-May-94 TIME 08:28:47 PAGE
687

FOR USE BY WESTINGHOUSE HANFORD COMPANY UNDER LICENSE FROM HKS, INC.

241-SY-101 TANK *** FILE thermala.abdat dated 5/16/94 *** STEP 11
INCREMENT 100
SEVENTH THERMAL LOAD STEP ON 241-SY-101 TANK TIME COMPLETED IN
THIS STEP 1.00

THE FOLLOWING TABLE IS PRINTED FOR REBARS NAMED DOM IN ELSET CONCRETE AND ELEMENT TYPE CAX3 AT
INTEGRATION POINTS

ELEMENT REBAR PT FOOT- S11
NOTE

ALL VALUES IN THIS TABLE ARE ZERO

THE FOLLOWING TABLE IS PRINTED FOR REBARS NAMED DOM IN ELSET CONCRETE AND ELEMENT TYPE CAX4 AT
INTEGRATION POINTS

ELEMENT REBAR PT FOOT- E11
NOTE

7956 DOM	1	7.1656E-05
8156 DOM	1	5.8795E-05
8356 DOM	1	5.0138E-05
8556 DOM	1	2.1782E-05
8756 DOM	1	1.6823E-05
8956 DOM	1	1.2007E-05
9156 DOM	1	7.8224E-06
9356 DOM	1	3.2823E-06
9556 DOM	1	1.8940E-08
9756 DOM	1	-5.9964E-07
9956 DOM	1	1.2587E-06
10156 DOM	1	3.5047E-06
10356 DOM	1	6.9219E-06
10556 DOM	1	2.8883E-06
10756 DOM	1	6.3995E-06
10956 DOM	1	9.6517E-06
11156 DOM	1	5.8062E-06
11356 DOM	1	8.1606E-06
11556 DOM	1	1.1446E-05
11756 DOM	1	6.4632E-06
11956 DOM	1	1.2604E-06

MAXIMUM 7.1656E-05

ELEMENT 7956

MINIMUM -5.9964E-07

ELEMENT 9756

1

ABAQUS PRODUCTION VERSION 4-9-1 DATE 18-May-94 TIME 08:28:47 PAGE
688

FOR USE BY WESTINGHOUSE HANFORD COMPANY UNDER LICENSE FROM HKS, INC.

241-SY-101 TANK *** FILE thermala.abdat dated 5/16/94 ***
INCREMENT 100
SEVENTH THERMAL LOAD STEP ON 241-SY-101 TANK
THIS STEP 1.00

STEP 11
TIME COMPLETED IN

THE FOLLOWING TABLE IS PRINTED FOR REBARS NAMED DOM IN ELSET CONCRETE AND ELEMENT TYPE CAX3 AT
INTEGRATION POINTS

ELEMENT REBAR PT FOOT- E11
NOTE

ALL VALUES IN THIS TABLE ARE ZERO

THE FOLLOWING TABLE IS PRINTED FOR REBARS NAMED DOM IN ELSET CONCRETE AND ELEMENT TYPE CAX4 AT
INTEGRATION POINTS

ELEMENT REBAR PT FOOT- PEEQ AC YIELD PEMAG
NOTE

ALL VALUES IN THIS TABLE ARE ZERO

THE FOLLOWING TABLE IS PRINTED FOR REBARS NAMED DOM IN ELSET CONCRETE AND ELEMENT TYPE CAX3 AT
INTEGRATION POINTS

ELEMENT REBAR PT FOOT- PEEQ AC YIELD PEMAG
NOTE

ALL VALUES IN THIS TABLE ARE ZERO

THE FOLLOWING TABLE IS PRINTED FOR REBARS NAMED DR IN ELSET CONCRETE AND ELEMENT TYPE CAX4 AT
INTEGRATION POINTS

ELEMENT REBAR PT FOOT- S11
NOTE

7954 DR 1 -1355.
7956 DR 1 -1324.
8154 DR 1 -1337.
8156 DR 1 -1279.

1

ABAQUS PRODUCTION VERSION 4-9-1 DATE 18-May-94 TIME 08:28:47 PAGE
689
FOR USE BY WESTINGHOUSE HANFORD COMPANY UNDER LICENSE FROM HKS, INC.

241-SY-101 TANK *** FILE thermala.abdat dated 5/16/94 ***
INCREMENT 100
SEVENTH THERMAL LOAD STEP ON 241-SY-101 TANK
THIS STEP 1.00

STEP 11
TIME COMPLETED IN

ELEMENT REBAR PT FOOT- S11
NOTE

8354 DR 1 -1450.
8356 DR 1 -1423.
8554 DR 1 -1565.
8556 DR 1 -1561.

8754 DR	1	-1644.
8756 DR	1	-1618.
8954 DR	1	-1411.
8956 DR	1	-1374.
9154 DR	1	-980.2
9156 DR	1	-878.0
9354 DR	1	-570.7
9356 DR	1	-394.9
9554 DR	1	-402.2
9556 DR	1	-175.4
9754 DR	1	-268.7
9756 DR	1	-28.09
9954 DR	1	-198.5
9956 DR	1	32.83
10154 DR	1	-142.7
10156 DR	1	61.50
10354 DR	1	-132.5
10356 DR	1	45.96
10554 DR	1	-126.3
10556 DR	1	27.80
10754 DR	1	-133.9
10756 DR	1	-5.285
10954 DR	1	-131.3
10956 DR	1	-15.13
11154 DR	1	-71.29
11156 DR	1	32.47
11354 DR	1	-50.82
11356 DR	1	109.4
11554 DR	1	-71.86
11556 DR	1	121.5
11754 DR	1	-69.44
11756 DR	1	119.1
11954 DR	1	-63.31
11956 DR	1	212.5

1

ABAQUS PRODUCTION VERSION 4-9-1   DATE 18-May-94   TIME 08:28:47   PAGE 690
FOR USE BY WESTINGHOUSE HANFORD COMPANY UNDER LICENSE FROM HKS, INC.

241-SY-101 TANK *** FILE thermala.abdat dated 5/16/94 ***   STEP 11
INCREMENT 100   SEVENTH THERMAL LOAD STEP ON 241-SY-101 TANK   TIME COMPLETED IN
THIS STEP 1.00

ELEMENT REBAR	PT FOOT- NOTE	S11
MAXIMUM		212.5
ELEMENT		11956
MINIMUM		-1644.
ELEMENT		8754

THE FOLLOWING TABLE IS PRINTED FOR REBARS NAMED DR   IN ELSET CONCRETE AND ELEMENT TYPE CAX3   AT
INTEGRATION POINTS

ELEMENT REBAR	PT FOOT- NOTE	S11

ALL VALUES IN THIS TABLE ARE ZERO

THE FOLLOWING TABLE IS PRINTED FOR REBARS NAMED DR
INTEGRATION POINTS

IN ELSET CONCRETE AND ELEMENT TYPE CAX4 AT

ELEMENT REBAR	PT	FOOT- NOTE	E11
7954 DR	1		1.6276E-04
7956 DR	1		1.5589E-04
8154 DR	1		1.6231E-04
8156 DR	1		1.5638E-04
8354 DR	1		1.5765E-04
8356 DR	1		1.5074E-04
8554 DR	1		1.5309E-04
8556 DR	1		1.4546E-04
8754 DR	1		1.4983E-04
8756 DR	1		1.4296E-04
8954 DR	1		1.5715E-04
8956 DR	1		1.5057E-04
9154 DR	1		1.7107E-04
9156 DR	1		1.6659E-04
9354 DR	1		1.8437E-04
9356 DR	1		1.8231E-04

1

ABAQUS PRODUCTION VERSION 4-9-1

DATE 18-May-94

TIME 08:28:47

PAGE

691

FOR USE BY WESTINGHOUSE HANFORD COMPANY UNDER LICENSE FROM HKS, INC.

241-SY-101 TANK *** FILE thermala.abdat dated 5/16/94 ***
INCREMENT 100

STEP 11

SEVENTH THERMAL LOAD STEP ON 241-SY-101 TANK
THIS STEP 1.00

TIME COMPLETED IN

ELEMENT REBAR	PT	FOOT- NOTE	E11
9554 DR	1		1.8975E-04
9556 DR	1		1.8943E-04
9754 DR	1		1.9386E-04
9756 DR	1		1.9404E-04
9954 DR	1		1.9602E-04
9956 DR	1		1.9577E-04
10154 DR	1		1.9772E-04
10156 DR	1		1.9654E-04
10354 DR	1		1.9777E-04
10356 DR	1		1.9570E-04
10554 DR	1		1.9789E-04
10556 DR	1		1.9485E-04
10754 DR	1		1.9757E-04
10756 DR	1		1.9356E-04
10954 DR	1		1.9744E-04
10956 DR	1		1.9289E-04
11154 DR	1		1.9935E-04
11156 DR	1		1.9426E-04
11354 DR	1		2.0003E-04
11356 DR	1		1.9680E-04
11554 DR	1		1.9917E-04
11556 DR	1		1.9693E-04
11754 DR	1		1.9921E-04
11756 DR	1		1.9668E-04
11954 DR	1		1.9962E-04
11956 DR	1		2.0012E-04

MAXIMUM 2.0012E-04

ELEMENT 11956

MINIMUM 1.4296E-04

ELEMENT 8756

THE FOLLOWING TABLE IS PRINTED FOR REBARS NAMED DR IN ELSET CONCRETE AND ELEMENT TYPE CAX3 AT
INTEGRATION POINTS

ELEMENT REBAR PT FOOT- E11
NOTE

ALL VALUES IN THIS TABLE ARE ZERO

1

ABAQUS PRODUCTION VERSION 4-9-1 DATE 18-May-94 TIME 08:28:47 PAGE 692

FOR USE BY WESTINGHOUSE HANFORD COMPANY UNDER LICENSE FROM HKS, INC.

241-SY-101 TANK *** FILE thermala.abdat dated 5/16/94 *** STEP 11
INCREMENT 100
SEVENTH THERMAL LOAD STEP ON 241-SY-101 TANK TIME COMPLETED IN
THIS STEP 1.00

THE FOLLOWING TABLE IS PRINTED FOR REBARS NAMED DR IN ELSET CONCRETE AND ELEMENT TYPE CAX4 AT
INTEGRATION POINTS

ELEMENT REBAR PT FOOT- PE11 PEEQ AC YIELD PEMAG
NOTE

ALL VALUES IN THIS TABLE ARE ZERO

THE FOLLOWING TABLE IS PRINTED FOR REBARS NAMED DR IN ELSET CONCRETE AND ELEMENT TYPE CAX3 AT
INTEGRATION POINTS

ELEMENT REBAR PT FOOT- PE11 PEEQ AC YIELD PEMAG
NOTE

ALL VALUES IN THIS TABLE ARE ZERO

N O D E O U T P U T

THE FOLLOWING TABLE IS PRINTED FOR NODESET NSTUD

NODE	FOOT- NOTE	U1	U2	U3	UR3
1152	.1815	-3.2221E-03	.0000E+00	2.0451E-03	
1154	.1807	1.0958E-02	.0000E+00	.0000E+00	
1352	.1792	3.3289E-03	.0000E+00	-1.4565E-03	
1354	.1792	1.4588E-02	.0000E+00	.0000E+00	
1552	.1754	1.6849E-02	.0000E+00	1.5149E-03	
1554	.1749	2.3916E-02	.0000E+00	.0000E+00	
1752	.1709	2.6003E-02	.0000E+00	-8.8095E-04	
1754	.1708	3.0821E-02	.0000E+00	.0000E+00	
1952	.1670	3.4564E-02	.0000E+00	1.0818E-03	

1

ABAQUS PRODUCTION VERSION 4-9-1

DATE 18-May-94

TIME 08:28:47

PAGE

693

FOR USE BY WESTINGHOUSE HANFORD COMPANY UNDER LICENSE FROM HKS, INC.

241-SY-101 TANK *** FILE thermala.abdat dated 5/16/94 ***

STEP 11

INCREMENT 100

SEVENTH THERMAL LOAD STEP ON 241-SY-101 TANK

TIME COMPLETED IN

THIS STEP 1.00

NODE	FOOT- NOTE	U1	U2	U3	UR3
1954	.1665	3.7767E-02	.0000E+00	.0000E+00	
2152	.1623	4.2652E-02	.0000E+00	-4.6139E-04	
2154	.1621	4.4675E-02	.0000E+00	.0000E+00	
2352	.1584	5.0360E-02	.0000E+00	6.9083E-04	
2354	.1580	5.1544E-02	.0000E+00	.0000E+00	
2552	.1541	5.7748E-02	.0000E+00	-1.3321E-04	
2554	.1539	5.8326E-02	.0000E+00	.0000E+00	
2752	.1508	6.4862E-02	.0000E+00	3.1505E-04	
2754	.1504	6.5024E-02	.0000E+00	.0000E+00	
2952	.1505	7.1706E-02	.0000E+00	-1.5097E-04	
2954	.1474	7.1650E-02	.0000E+00	.0000E+00	
3152	.1469	7.4314E-02	.0000E+00	9.1915E-04	
3154	.1465	7.4273E-02	.0000E+00	.0000E+00	
3352	.1453	8.0000E-02	.0000E+00	-6.3734E-04	
3354	.1451	7.9944E-02	.0000E+00	.0000E+00	
3552	.1449	8.7407E-02	.0000E+00	5.8713E-04	
3554	.1445	8.7402E-02	.0000E+00	.0000E+00	
3752	.1459	9.4430E-02	.0000E+00	-5.9612E-04	
3754	.1457	9.4724E-02	.0000E+00	.0000E+00	
3952	.1491	.1010	.0000E+00	2.6118E-04	
3954	.1488	.1019	.0000E+00	.0000E+00	
4152	.1540	.1070	.0000E+00	-6.1122E-04	
4154	.1539	.1086	.0000E+00	.0000E+00	
4352	.1605	.1124	.0000E+00	1.6603E-05	
4354	.1603	.1146	.0000E+00	.0000E+00	
4552	.1666	.1170	.0000E+00	-4.7774E-04	
4554	.1666	.1196	.0000E+00	.0000E+00	
4752	.1706	.1208	.0000E+00	9.1091E-05	
4754	.1699	.1230	.0000E+00	.0000E+00	
4952	.1696	.1223	.0000E+00	8.2170E-05	
4954	.1687	.1234	.0000E+00	.0000E+00	
5152	.1678	.1225	.0000E+00	5.1414E-04	
5154	.1672	.1229	.0000E+00	.0000E+00	
5352	.1657	.1224	.0000E+00	2.4860E-04	
5354	.1651	.1222	.0000E+00	.0000E+00	
5552	.1610	.1214	.0000E+00	7.1372E-04	
5554	.1603	.1207	.0000E+00	.0000E+00	
5752	.1558	.1194	.0000E+00	6.0130E-04	
5754	.1554	.1187	.0000E+00	.0000E+00	
5952	.1453	.1138	.0000E+00	7.7160E-04	
5954	.1449	.1131	.0000E+00	.0000E+00	

1

ABAQUS PRODUCTION VERSION 4-9-1

DATE 18-May-94

TIME 08:28:47

PAGE

694

FOR USE BY WESTINGHOUSE HANFORD COMPANY UNDER LICENSE FROM HKS, INC.

241-SY-101 TANK *** FILE thermala.abdat dated 5/16/94 ***

STEP 11

INCREMENT 100

SEVENTH THERMAL LOAD STEP ON 241-SY-101 TANK

TIME COMPLETED IN

THIS STEP 1.00

NODE	FOOT- NOTE	U1	U2	U3	UR3
6152	.1397	.1097	.0000E+00	8.1099E-04	
6154	.1396	.1094	.0000E+00	.0000E+00	
6352	.1344	.1053	.0000E+00	7.3023E-04	
6354	.1342	.1049	.0000E+00	.0000E+00	

6552	.1290	9.9915E-02	.0000E+00	9.4748E-04
6554	.1288	9.9632E-02	.0000E+00	.0000E+00
MAXIMUM	.1815	.1234	.0000E+00	2.0451E-03
AT NODE	1152	4954	1152	1152
MINIMUM	.1288	-3.2221E-03	.0000E+00	-1.4565E-03
AT NODE	6554	1152	1152	1352

APPENDIX B

ANSYS COMPUTER INPUT AND OUTPUT FILES

Prepared by:

T. Neal Watts

5/26/94
Date

Checked by:

David P. Ming

5/26/94
Date

ANSYS PREP7 Input File: stfpt4p7.in

```
/PREP7
/TITLE, SY-101 ANNULUS HEAT-UP STUD STIFFNESS CHECK
/COM Input File: stfpt4p7.in
KAN,0
ET,1,63,,,1          *QUADRILATERAL PLATE
ET,2,14,,,2          *1-DOF LONG. SPRING (UY DOF)
R,1,0.375            *PL .375"
R,2,0.5              *PL .5"
R,3,1000000.         *K1=1E6
EX,1,25000000.       *STEEL WITH NO MASS
DENS,1,0.
/COM
/COM CURVED BOTTOM
/COM
N,1,0.,0.,12.
N,2,0.,.5873,8.2918
N,3,0.,2.2918,4.9466
N,4,0.,4.9466,2.2918
N,5,0.,8.2918,.5873
N,6,0.,12.,0.
N,22,0.,20.,0.
FILL,6,22
/COM
/COM TOP CORNER NODE
/COM
N,242,0.,460.,0.
/COM
/COM FILL FOR EDGE
/COM
FILL,22,242
/COM
/COM GENERATE ALL PLATE NODES
/COM
NGEN,5,500,1,242,1,2.
NGEN,17,500,2001,2242,1,.5
NGEN,5,500,10001,10242,1,2.
/COM
/COM GENERATE VERT. ROW OF STUD SPRING NODES
/COM
NGEN,2,20000,6014,6214,1,0.,0.,0.
NGEN,2,20000,6032,6236,12,0.,0.,0.
/COM
/COM GENERATE PLATE ELEMENTS
/COM
TYPE,1 $MAT,1
REAL,2
E,1,501,502,2
EGEN,23,1,-1
REAL,1
E,24,524,523,23
EGEN,219,1,-1
ENGEN,500,24,500,ALL
/COM
/COM VERT. ROW OF STUD SPRING ELEMENTS
/COM
TYPE,2
REAL,3
EN,26014,6014,26014
EN,26032,6032,26032
ENGEN,12,18,12,26032
WSORT,Y
/COM
KTEMP
TREF,55
TUNIF,160
MP,EX,1,25.0E6
MP,ALPX,1,1.94E-6
MPLIST
D,1,ALL,0.,,12001,12000
D,501,UY,0.,,11501,500,UZ,ROTX,ROTY,ROTZ
```

D,2,UX,0.,,5,1,ROTY,ROTZ
D,12002,UX,0.,,12005,1,ROTY,ROTZ
D,6,UX,0.,,241,1,UZ,ROTY,ROTZ
D,12006,UX,0.,,12241,1,UZ,ROTY,ROTZ
D,242,ALL,0.,,12242,12000
D,742,UY,0.,,11742,500,UZ,ROTX,ROTY,ROTZ
D,26014,UY,0.
D,26032,UY,0.,,26236,12
ITER,1,,1
LWRITE
AFWRITE
FINISH
/EOF
/EOF

ANSYS PREP7 Output File: stfpt4p7.out

ANSYS-PC/LINEAR REV.4.4A1
COPYRIGHT(C) 1971, '78, '82, '83, '85, '86, '87, '89, '90, '91
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IS PROHIBITED. ALL RIGHTS RESERVED.

IF RUNNING INTERACTIVELY, ENTER /INTER

***** ANSYS INPUT DATA LISTING (FILE18) *****

```
1 /PREP7
2 /TITLE, SY-101 ANNULUS HEAT-UP STUD STIFFNESS CHECK
3 /COM Input File: stfpt4p7.in
4 KAN,0
5 ET,1,63,,,1 *QUADRILATERAL PLATE
6 ET,2,14,,2 *1-DOF LONG. SPRING (UY DOF)
7 R,1,0.375 *PL .375"
8 R,2,0.5 *PL .5"
9 R,3,1000000. *K1=1E6
10 EX,1,25000000. *STEEL WITH NO MASS
11 DENS,1,0.
12 /COM
13 /COM CURVED BOTTOM
14 /COM
15 N,1,0.,0.,12.
16 N,2,0.,.5873,8.2918
17 N,3,0.,2.2918,4.9466
18 N,4,0.,4.9466,2.2918
19 N,5,0.,8.2918,.5873
20 N,6,0.,12.,0.
21 N,22,0.,20.,0.
22 FILL,6,22
23 /COM
24 /COM TOP CORNER NODE
25 /COM
26 N,242,0.,460.,0.
27 /COM
28 /COM FILL FOR EDGE
29 /COM
30 FILL,22,242
31 /COM
32 /COM GENERATE ALL PLATE NODES
33 /COM
34 NGEN,5,500,1,242,1,2.
35 NGEN,17,500,2001,2242,1,.5
36 NGEN,5,500,10001,10242,1,2.
37 /COM
38 /COM GENERATE VERT. ROW OF STUD SPRING NODES
39 /COM
40 NGEN,2,20000,6014,6214,1,0.,0.,0.
41 NGEN,2,20000,6032,6236,12,0.,0.,0.
42 /COM
43 /COM GENERATE PLATE ELEMENTS
44 /COM
45 TYPE,1 $MAT,1
46 REAL,2
47 E,1,501,502,2
48 EGEN,23,1,-1
49 REAL,1
50 E,24,524,523,23
51 EGEN,219,1,-1
52 ENGEN,500,24,500,ALL
53 /COM
54 /COM VERT. ROW OF STUD SPRING ELEMENTS
55 /COM
56 TYPE,2
57 REAL,3
58 EN,26014,6014,26014
59 EN,26032,6032,26032
60 ENGEN,12,18,12,26032
```

```
61 WSORT,Y
62 /COM
63 KTEMP
64 TREF,55
65 TUNIF,160
66 MP,EX,1,25.0E6
67 MP,ALPX,1,1.94E-6
68 MPLIST
69 D,1,ALL,0.,,12001,12000
70 D,501,UY,0.,,11501,500,UZ,ROTX,ROTY,ROTZ
71 D,2,UX,0.,,5,1,ROTY,ROTZ
72 D,12002,UX,0.,,12005,1,ROTY,ROTZ
73 D,6,UX,0.,,241,1,UZ,ROTY,ROTZ
74 D,12006,UX,0.,,12241,1,UZ,ROTY,ROTZ
75 D,242,ALL,0.,,12242,12000
76 D,742,UY,0.,,11742,500,UZ,ROTX,ROTY,ROTZ
77 D,26014,UY,0.
78 D,26032,UY,0.,,26236,12
79 ITER,1,,1
80 LWRITE
81 AFWRITE
82 FINISH
83 /EOF
84 /EOF
```

ANSYS - ENGINEERING ANALYSIS SYSTEM REVISION 4.4 A 1 38280-PC/L1-4.4A MAY 1,1990
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TITLE
 4.060

11.0892 MAY 20,1994 CP=

***** ANSYS ANALYSIS DEFINITION (PREP7) *****

NEW TITLE= SY-101 ANNULUS HEAT-UP STUD STIFFNESS CHECK

Input File: stfpt4p7.in

ANALYSIS TYPE= 0 (STATIC ANALYSIS)

ELEMENT TYPE 1 USES STIF 63

KEYOPT(1-9)= 0 0 1 0 0 0 0 0 0

INOPR= 0 NUMBER OF NODES= 4

QUAD. FLAT SHELL

CURRENT NODAL DOF SET IS UX UY UZ ROTX ROTY ROTZ
 THREE-DIMENSIONAL STRUCTURE

ELEMENT TYPE 2 USES STIF 14

KEYOPT(1-9)= 0 2 0 0 0 0 0 0 0

INOPR= 0 NUMBER OF NODES= 2

SPRING-DAMPER

CURRENT NODAL DOF SET IS UX UY UZ ROTX ROTY ROTZ
 THREE-DIMENSIONAL STRUCTURE

REAL CONSTANT SET 1 ITEMS 1 TO 6

0.37500 0.00000E+00 0.00000E+00 0.00000E+00 0.00000E+00 0.00000E+00

REAL CONSTANT SET 2 ITEMS 1 TO 6

0.50000 0.00000E+00 0.00000E+00 0.00000E+00 0.00000E+00 0.00000E+00

REAL CONSTANT SET 3 ITEMS 1 TO 6

0.10000E+07 0.00000E+00 0.00000E+00 0.00000E+00 0.00000E+00 0.00000E+00

MATERIAL 1 COEFFICIENTS OF EX VS. TEMP EQUATION
 CO = 0.250000E+08

PROPERTY TABLE EX MAT= 1 NUM. POINTS= 2
 TEMPERATURE DATA TEMPERATURE DATA
 -9999.0 0.25000E+08 9999.0 0.25000E+08

MATERIAL 1 COEFFICIENTS OF DENS VS. TEMP EQUATION
 CO = 0.000000E+00

PROPERTY TABLE DENS MAT= 1 NUM. POINTS= 2
 TEMPERATURE DATA TEMPERATURE DATA
 -9999.0 0.00000E+00 9999.0 0.00000E+00

CURVED BOTTOM

NODE 1 KCS= 0 X,Y,Z= 0.00000E+00 0.00000E+00 12.000
 NODE 2 KCS= 0 X,Y,Z= 0.00000E+00 0.58730 8.2918
 NODE 3 KCS= 0 X,Y,Z= 0.00000E+00 2.2918 4.9466
 NODE 4 KCS= 0 X,Y,Z= 0.00000E+00 4.9466 2.2918
 NODE 5 KCS= 0 X,Y,Z= 0.00000E+00 8.2918 0.58730
 NODE 6 KCS= 0 X,Y,Z= 0.00000E+00 12.000 0.00000E+00

NODE 22 KCS= 0 X,Y,Z= 0.00000E+00 20.000 0.00000E+00

FILL 15 POINTS BETWEEN NODE 6 AND NODE 22
START WITH NODE 7 AND INCREMENT BY 1

TOP CORNER NODE

NODE 242 KCS= 0 X,Y,Z= 0.00000E+00 460.00 0.00000E+00

FILL FOR EDGE

FILL 219 POINTS BETWEEN NODE 22 AND NODE 242
START WITH NODE 23 AND INCREMENT BY 1

GENERATE ALL PLATE NODES

GENERATE 5 TOTAL SETS OF NODES WITH INCREMENT 500
SET IS SELECTED NODES IN RANGE 1 TO 242 IN STEPS OF 1
GEOMETRY INCREMENTS ARE 2.0000 0.00000E+00 0.00000E+00

GENERATE 17 TOTAL SETS OF NODES WITH INCREMENT 500
SET IS SELECTED NODES IN RANGE 2001 TO 2242 IN STEPS OF 1
GEOMETRY INCREMENTS ARE 0.50000 0.00000E+00 0.00000E+00

GENERATE 5 TOTAL SETS OF NODES WITH INCREMENT 500
SET IS SELECTED NODES IN RANGE 10001 TO 10242 IN STEPS OF 1
GEOMETRY INCREMENTS ARE 2.0000 0.00000E+00 0.00000E+00

GENERATE VERT. ROW OF STUD SPRING NODES

GENERATE 2 TOTAL SETS OF NODES WITH INCREMENT 20000
SET IS SELECTED NODES IN RANGE 6014 TO 6214 IN STEPS OF 1
GEOMETRY INCREMENTS ARE 0.00000E+00 0.00000E+00 0.00000E+00

GENERATE 2 TOTAL SETS OF NODES WITH INCREMENT 20000
SET IS SELECTED NODES IN RANGE 6032 TO 6236 IN STEPS OF 12
GEOMETRY INCREMENTS ARE 0.00000E+00 0.00000E+00 0.00000E+00

GENERATE PLATE ELEMENTS

ELEMENT TYPE SET TO 1

MATERIAL NUMBER SET TO 1

REAL CONSTANT NUMBER= 2
ELEMENT 1 1 501 502 2

GENERATE 23 TOTAL SETS OF ELEMENTS WITH NODE INCREMENT OF 1
SET IS SELECTED ELEMENTS IN RANGE 1 TO 1 IN STEPS OF 1
NUMBER OF ELEMENTS= 23

REAL CONSTANT NUMBER= 1
ELEMENT 24 24 524 523 23

GENERATE 219 TOTAL SETS OF ELEMENTS WITH NODE INCREMENT OF 1
SET IS SELECTED ELEMENTS IN RANGE 24 TO 24 IN STEPS OF 1
NUMBER OF ELEMENTS= 242

NEXT ELEMENT GENERATION SETS INCREMENTED BY 500

GENERATE 24 TOTAL SETS OF ELEMENTS WITH NODE INCREMENT OF 500
SET IS SELECTED ELEMENTS IN RANGE 1 TO 242 IN STEPS OF 1
NUMBER OF ELEMENTS= 11742

VERT. ROW OF STUD SPRING ELEMENTS

ELEMENT TYPE SET TO 2

REAL CONSTANT NUMBER= 3
 ELEMENT 26014 6014 26014
 ELEMENT 26032 6032 26032

NEXT ELEMENT GENERATION SETS INCREMENTED BY 12

GENERATE 18 TOTAL SETS OF ELEMENTS WITH NODE INCREMENT OF 12
 SET IS SELECTED ELEMENTS IN RANGE 26032 TO 26032 IN STEPS OF 1
 NUMBER OF ELEMENTS= 26236

REORDER SELECTED ELEMENTS BY SORTING ON CENTROID Y LOCATION.

ELEMENTS ARE SORTED IN ASCENDING ORDER
 IN COORDINATE SYSTEM 0

REORDERED ELEMENTS ARE STORED AFTER PREVIOUS (IF ANY) REORDERED ELEMENTS.

KEEP NEW ORDERING BASED ON MAX WAVEFRONT

*** NOTE ***

NEW MAX WF(DOF)= 162. PREVIOUS MAX= 1578.
 NEW RMS WF(DOF)= 162. PREVIOUS MAX= 1002.

ALL TEMPERATURES SET TO TUNIF= 0.000

REFERENCE TEMPERATURE= 55.000 (TUNIF= 55.000)

UNIFORM TEMPERATURE= 160.000 (TREF= 55.000)

MATERIAL 1 COEFFICIENTS OF EX VS. TEMP EQUATION
 CO = 0.250000E+08

PROPERTY TABLE EX		MAT= 1 NUM. POINTS= 2	
TEMPERATURE	DATA	TEMPERATURE	DATA
-9999.0	0.25000E+08	9999.0	0.25000E+08

MATERIAL 1 COEFFICIENTS OF ALPX VS. TEMP EQUATION
 CO = 0.194000E-05

PROPERTY TABLE ALPX		MAT= 1 NUM. POINTS= 2	
TEMPERATURE	DATA	TEMPERATURE	DATA
-9999.0	0.19400E-05	9999.0	0.19400E-05

LIST ALL MATERIALS PROPERTY= ALL

PROPERTY TABLE EX		MAT= 1 NUM. POINTS= 2	
TEMPERATURE	DATA	TEMPERATURE	DATA
-9999.0	0.25000E+08	9999.0	0.25000E+08

PROPERTY TABLE DENS		MAT= 1 NUM. POINTS= 2	
TEMPERATURE	DATA	TEMPERATURE	DATA
-9999.0	0.00000E+00	9999.0	0.00000E+00

PROPERTY TABLE ALPX		MAT= 1 NUM. POINTS= 2	
TEMPERATURE	DATA	TEMPERATURE	DATA
-9999.0	0.19400E-05	9999.0	0.19400E-05

SPECIFIED DISP ALL FOR SELECTED NODES IN RANGE 1 TO 12001 BY 12000
 VALUES= 0.00000E+00 0.00000E+00 ADDITIONAL DOFS=

SPECIFIED DISP UY FOR SELECTED NODES IN RANGE 501 TO 11501 BY 500
 VALUES= 0.00000E+00 0.00000E+00 ADDITIONAL DOFS= UZ ROTX ROTY ROTZ

SPECIFIED DISP UX FOR SELECTED NODES IN RANGE 2 TO 5 BY 1
 VALUES= 0.00000E+00 0.00000E+00 ADDITIONAL DOFS= ROTY ROTZ

SPECIFIED DISP UX FOR SELECTED NODES IN RANGE 12002 TO 12005 BY 1
 VALUES= 0.00000E+00 0.00000E+00 ADDITIONAL DOFS= ROTY ROTZ

SPECIFIED DISP UX FOR SELECTED NODES IN RANGE 6 TO 241 BY 1
 VALUES= 0.00000E+00 0.00000E+00 ADDITIONAL DOFS= UZ ROTY ROTZ

SPECIFIED DISP UX FOR SELECTED NODES IN RANGE 12006 TO 12241 BY 1
VALUES= 0.00000E+00 0.00000E+00 ADDITIONAL DOFS= UZ ROTY ROTZ

SPECIFIED DISP ALL FOR SELECTED NODES IN RANGE 242 TO 12242 BY 12000
VALUES= 0.00000E+00 0.00000E+00 ADDITIONAL DOFS=

SPECIFIED DISP UY FOR SELECTED NODES IN RANGE 742 TO 11742 BY 500
VALUES= 0.00000E+00 0.00000E+00 ADDITIONAL DOFS= UZ ROTX ROTY ROTZ

SPECIFIED DISP UY FOR SELECTED NODES IN RANGE 26014 TO 26014 BY 1
VALUES= 0.00000E+00 0.00000E+00 ADDITIONAL DOFS=

SPECIFIED DISP UY FOR SELECTED NODES IN RANGE 26032 TO 26236 BY 12
VALUES= 0.00000E+00 0.00000E+00 ADDITIONAL DOFS=

NITTER= 1 NPRINT= 99900 NPOST= 1

ALL PRINT CONTROLS RESET TO 99900
ALL POST DATA FILE CONTROLS RESET TO 1

LOAD STEP 1 WRITTEN ON FILE23

*** NOTE ***
DATA CHECKED - NO FATAL ERRORS FOUND.
CHECK OUTPUT FOR POSSIBLE WARNING MESSAGES.

LOADS DATA READ FROM FILE23

*** PREP7 GLOBAL STATUS ***

TITLE= SY-101 ANNULUS HEAT-UP STUD STIFFNESS CHECK
ANALYSIS TYPE= 0
NUMBER OF ELEMENT TYPES= 2
5827 ELEMENTS CURRENTLY SELECTED. MAX ELEMENT NUMBER = 26236
6253 NODES CURRENTLY SELECTED. MAX NODE NUMBER = 26236
MAXIMUM LINEAR PROPERTY NUMBER= 1
MAXIMUM REAL CONSTANT SET NUMBER= 3
ACTIVE COORDINATE SYSTEM= 0 (CARTESIAN)
NUMBER OF IMPOSED DISPLACEMENTS= 2185

ANALYSIS DATA WRITTEN ON FILE27

ALL CURRENT PREP7 DATA WRITTEN TO FILE16 NAME= FILE16.DAT
FOR POSSIBLE RESUME FROM THIS POINT

***** ROUTINE COMPLETED ***** CP = 230.520

/EOF ENCOUNTERED ON FILE18

***** RUN COMPLETED ***** CP= 231.0100 TIME= 11.1522

ANSYS POST1 Input File: stfpt4p1.in

```
/CORE,,,9.E7
/POST1
STORE,STRESS,RFORCE
STRESS,TSG1,63,129
STRESS,TSG3,63,131
STRESS,MSG1,63,134
STRESS,MSG3,63,136
STRESS,BSG1,63,139
STRESS,BSG3,63,141
NLINE,9999
SET,1,1
ESORT,TSG1,0,1,10
PRSTRS,TSG1,TSG3,MSG1,MSG3,BSG1,BSG3
EUSORT
ESORT,TSG3,0,1,10
PRSTRS,TSG1,TSG3,MSG1,MSG3,BSG1,BSG3
EUSORT
ESORT,MSG1,0,1,10
PRSTRS,TSG1,TSG3,MSG1,MSG3,BSG1,BSG3
EUSORT
ESORT,MSG3,0,1,10
PRSTRS,TSG1,TSG3,MSG1,MSG3,BSG1,BSG3
EUSORT
ESORT,BSG1,0,1,10
PRSTRS,TSG1,TSG3,MSG1,MSG3,BSG1,BSG3
EUSORT
ESORT,BSG3,0,1,10
PRSTRS,TSG1,TSG3,MSG1,MSG3,BSG1,BSG3
EUSORT
PRRF
FINISH
/EOF
```

ANSYS POST1 Output File: stfpt4p1.out

The following output file provides reaction forces at the stud and boundary locations and provides unaveraged, centroidal, principal stresses at the top, middle and bottom of the shell elements. The following label definitions are provided to assist the reader in interpreting the results:

TSG1 = Top of Element - Principal Stress 1
TSG3 = Top of Element - Principal Stress 3
MSG1 = Middle of Element - Principal Stress 1
MSG3 = Middle of Element - Principal Stress 3
BSG1 = Bottom of Element - Principal Stress 1
BSG3 = Bottom of Element - Principal Stress 3

In addition, stud locations are identified by the following node numbers:

26014 (Lowermost)
26032
26044
26056
26068
26080
26092
26104
26116
26128
26140
26152
26164
26176
26188
26200
26212
26224
26236 (Uppermost)

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IF RUNNING INTERACTIVELY, ENTER /INTER

***** ANSYS INPUT DATA LISTING (FILE18) *****

```
1 /CORE,,9.E7
2 /POST1
3 STORE,STRESS,RFORCE
4 STRESS,TSG1,63,129
5 STRESS,TSG3,63,131
6 STRESS,MSG1,63,134
7 STRESS,MSG3,63,136
8 STRESS,BSG1,63,139
9 STRESS,BSG3,63,141
10 NLINE,9999
11 SET,1,1
12 ESORT,TSG1,0,1,10
13 PRSTRS,TSG1,TSG3,MSG1,MSG3,BSG1,BSG3
14 EUSORT
```

```
15  ESORT,TSG3,0,1,10
16  PRSTRS,TSG1,TSG3,MSG1,MSG3,BSG1,BSG3
17  EUSORT
18  ESORT,MSG1,0,1,10
19  PRSTRS,TSG1,TSG3,MSG1,MSG3,BSG1,BSG3
20  EUSORT
21  ESORT,MSG3,0,1,10
22  PRSTRS,TSG1,TSG3,MSG1,MSG3,BSG1,BSG3
23  EUSORT
24  ESORT,BSG1,0,1,10
25  PRSTRS,TSG1,TSG3,MSG1,MSG3,BSG1,BSG3
26  EUSORT
27  ESORT,BSG3,0,1,10
28  PRSTRS,TSG1,TSG3,MSG1,MSG3,BSG1,BSG3
29  EUSORT
30  PRRF
31  FINISH
32  /EOF
```

***** MEMORY REQUEST FROM /CORE *****

```
MAXIMUM FIXED = 0
MAXIMUM TEMP = 0
MAXIMUM VIRTUAL=90000000
```

***** MEMORY OBTAINED *****

```
FIXED = 2251500
TEMP = 0
VIRTUAL= 5000000
```

3.630

11.5981 MAY 20,1994 CP=

***** ANSYS RESULTS INTERPRETATION (POST1) *****

STORE STRESSES
STORE REACTION FORCES

```
STORE TSG1 FOR ELEMENT TYPE STIF 63 FROM ITEM 129
STORE TSG3 FOR ELEMENT TYPE STIF 63 FROM ITEM 131
STORE MSG1 FOR ELEMENT TYPE STIF 63 FROM ITEM 134
STORE MSG3 FOR ELEMENT TYPE STIF 63 FROM ITEM 136
STORE BSG1 FOR ELEMENT TYPE STIF 63 FROM ITEM 139
STORE BSG3 FOR ELEMENT TYPE STIF 63 FROM ITEM 141
```

NUMBER OF LINES PER PAGE=9999

USE LOAD STEP 1 ITERATION 1 SECTION 1 FOR LOAD CASE 1

*** NOTE ***

ALL STRESSES ARE IN GLOBAL COORDINATES UNLESS
THE COMMAND -- GLOBAL,0 -- IS ENTERED

GEOMETRY STORED FOR 6069 NODES 5827 ELEMENTS
TITLE= SY-101 ANNULUS HEAT-UP STUD STIFFNESS CHECK

***WARNING *** CP= 231.240 TIME= 11.66129

DATA FOR STRESS LABEL TSG1 HAS NOT BEEN STORED FOR ALL ELEMENTS.
TSG1 DATA FOR TYPE 2. STIF 14. ELEMENTS WILL BE SET TO ZERO

***WARNING *** CP= 231.460 TIME= 11.66135

DATA FOR STRESS LABEL TSG3 HAS NOT BEEN STORED FOR ALL ELEMENTS.
TSG3 DATA FOR TYPE 2. STIF 14. ELEMENTS WILL BE SET TO ZERO

***WARNING *** CP= 231.510 TIME= 11.66136

DATA FOR STRESS LABEL MSG1 HAS NOT BEEN STORED FOR ALL ELEMENTS.
MSG1 DATA FOR TYPE 2. STIF 14. ELEMENTS WILL BE SET TO ZERO

***WARNING *** CP= 231.510 TIME= 11.66136

DATA FOR STRESS LABEL MSG3 HAS NOT BEEN STORED FOR ALL ELEMENTS.
MSG3 DATA FOR TYPE 2. STIF 14. ELEMENTS WILL BE SET TO ZERO

***WARNING *** CP= 231.510 TIME= 11.66136
DATA FOR STRESS LABEL BSG1 HAS NOT BEEN STORED FOR ALL ELEMENTS.
BSG1 DATA FOR TYPE 2. STIF 14. ELEMENTS WILL BE SET TO ZERO

***WARNING *** CP= 231.510 TIME= 11.66136
DATA FOR STRESS LABEL BSG3 HAS NOT BEEN STORED FOR ALL ELEMENTS.
BSG3 DATA FOR TYPE 2. STIF 14. ELEMENTS WILL BE SET TO ZERO

STRESSES STORED FOR 10 SELECTED ITEMS

NODAL STRESSES AND TEMPS. STORED FOR 5808 ELEMENTS

ITERATION SUMMARY INFORMATION STORED

*** NOTE ***
LOAD STEP 1. ITER 1. NODAL FORCES (GROUP 4.) NOT ON FILE12.

REACTIONS STORED FOR 2185 REACTIONS

FOR LOAD STEP= 1 ITERATION= 1 SECTION= 1
TIME= 0.000000E+00 LOAD CASE= 1
TITLE= SY-101 ANNULUS HEAT-UP STUD STIFFNESS CHECK

SORT ON TSG1 ORDER= 0 KABS= 1 NMAX= 10

SORT COMPLETED FOR 10 VALUES.

PRINT ELEMENT STRESS ITEMS PER ELEMENT

*** NOTE ***

SHELL STRESSES SET TO TOP FOR ERROR CALCULATIONS

SY-101 ANNULUS HEAT-UP STUD STIFFNESS CHECK
382.670

11.7034 MAY 20,1994 CP=

***** POST1 ELEMENT STRESS LISTING *****

LOAD STEP 1 ITERATION= 1 SECTION= 1
TIME= 0.00000E+00 LOAD CASE= 1

ELEM	TSG1	TSG3	MSG1	MSG3	BSG1	BSG3
5513	19461.826	-6826.2541	18450.338	-7275.9124	17445.079	-7731.7998
6013	19461.826	-6826.2541	18450.338	-7275.9124	17445.079	-7731.7998
5512	10117.658	-7047.9851	8945.9414	-7444.7662	7776.9224	-7844.2454
6012	10117.658	-7047.9851	8945.9414	-7444.7662	7776.9224	-7844.2454
11506	8556.0003	-1004.3307	0.00000000E+00	-5989.4194	0.00000000E+00	-14794.966
6	8556.0003	-1004.3307	0.00000000E+00	-5989.4194	0.00000000E+00	-14794.966
5511	6769.6460	-6033.7293	5502.5505	-6456.8501	4236.3865	-6880.9025
6011	6769.6460	-6033.7293	5502.5505	-6456.8501	4236.3865	-6880.9025
8001	6526.4936	-3103.9523	0.00000000E+00	-5134.4136	0.00000000E+00	-7170.4933
3501	6526.4936	-3103.9523	0.00000000E+00	-5134.4136	0.00000000E+00	-7170.4933

MINIMUMS ELEMENT	3501	5512	11506	6012	11506	6
VALUE	6526.4936	-7047.9851	0.00000000E+00	-7444.7662	0.00000000E+00	-14794.966

MAXIMUMS ELEMENT	5513	6	5513	3501	6013	5511
VALUE	19461.826	-1004.3307	18450.338	-5134.4136	17445.079	-6880.9025

ELEMENT SORT REMOVED

SORT ON TSG3 ORDER= 0 KABS= 1 NMAX= 10

SORT COMPLETED FOR 10 VALUES.

PRINT ELEMENT STRESS ITEMS PER ELEMENT

SY-101 ANNULUS HEAT-UP STUD STIFFNESS CHECK
439.020

11.7190 MAY 20,1994 CP=

***** POST1 ELEMENT STRESS LISTING *****

LOAD STEP 1 ITERATION= 1 SECTION= 1
TIME= 0.00000E+00 LOAD CASE= 1

ELEM	TSG1	TSG3	MSG1	MSG3	BSG1	BSG3
5514	0.00000000E+00	-21077.746	0.00000000E+00	-21913.878	0.00000000E+00	-22761.337
6014	0.00000000E+00	-21077.746	0.00000000E+00	-21913.878	0.00000000E+00	-22761.337
5533	0.00000000E+00	-13010.176	0.00000000E+00	-13019.495	0.00000000E+00	-13028.863
6033	0.00000000E+00	-13010.176	0.00000000E+00	-13019.495	0.00000000E+00	-13028.863
5545	0.00000000E+00	-11550.358	0.00000000E+00	-11550.457	0.00000000E+00	-11550.557
6045	0.00000000E+00	-11550.358	0.00000000E+00	-11550.457	0.00000000E+00	-11550.557
5557	0.00000000E+00	-10455.863	0.00000000E+00	-10455.859	0.00000000E+00	-10455.855
6057	0.00000000E+00	-10455.863	0.00000000E+00	-10455.859	0.00000000E+00	-10455.855
5515	0.00000000E+00	-10288.627	0.00000000E+00	-11169.914	0.00000000E+00	-12065.504
6015	0.00000000E+00	-10288.627	0.00000000E+00	-11169.914	0.00000000E+00	-12065.504

MINIMUMS ELEMENT	5514	5514	5514	6014	5514	6014
VALUE	0.00000000E+00	-21077.746	0.00000000E+00	-21913.878	0.00000000E+00	-22761.337

MAXIMUMS ELEMENT	5514	6015	5514	6057	5514	6057
VALUE	0.00000000E+00	-10288.627	0.00000000E+00	-10455.859	0.00000000E+00	-10455.855

ELEMENT SORT REMOVED

SORT ON MSG1 ORDER= 0 KABS= 1 NMAX= 10

SORT COMPLETED FOR 10 VALUES.

PRINT ELEMENT STRESS ITEMS PER ELEMENT

SY-101 ANNULUS HEAT-UP STUD STIFFNESS CHECK
492.960

11.7340 MAY 20, 1994 CP=

***** POST1 ELEMENT STRESS LISTING *****

LOAD STEP 1 ITERATION= 1 SECTION= 1
TIME= 0.00000E+00 LOAD CASE= 1

ELEM	TSG1	TSG3	MSG1	MSG3	BSG1	BSG3
5513	19461.826	-6826.2541	18450.338	-7275.9124	17445.079	-7731.7998
6013	19461.826	-6826.2541	18450.338	-7275.9124	17445.079	-7731.7998
5512	10117.658	-7047.9851	8945.9414	-7444.7662	7776.9224	-7844.2454
6012	10117.658	-7047.9851	8945.9414	-7444.7662	7776.9224	-7844.2454
5532	6348.0056	-6517.4864	6333.1794	-6497.6041	6318.3869	-6477.7555
6032	6348.0056	-6517.4864	6333.1794	-6497.6041	6318.3869	-6477.7555
5511	6769.6460	-6033.7293	5502.5505	-6456.8501	4236.3865	-6880.9025
6011	6769.6460	-6033.7293	5502.5505	-6456.8501	4236.3865	-6880.9025
5012	5982.1643	-4964.0997	4896.5759	-5432.7259	3828.5190	-5918.8836
6512	5982.1643	-4964.0997	4896.5759	-5432.7259	3828.5190	-5918.8836

MINIMUMS	ELEMENT	VALUE	5512	5512	6512	6012	5012	6012
			5982.1643	-7047.9851	4896.5759	-7444.7662	3828.5190	-7844.2454

MAXIMUMS	ELEMENT	VALUE	5513	6512	5513	5012	6013	5012
			19461.826	-4964.0997	18450.338	-5432.7259	17445.079	-5918.8836

ELEMENT SORT REMOVED

SORT ON MSG3 ORDER= 0 KABS= 1 NMAX= 10

SORT COMPLETED FOR 10 VALUES.

PRINT ELEMENT STRESS ITEMS PER ELEMENT

SY-101 ANNULUS HEAT-UP STUD STIFFNESS CHECK
546.840

11.7490 MAY 20, 1994 CP=

***** POST1 ELEMENT STRESS LISTING *****

LOAD STEP 1 ITERATION= 1 SECTION= 1
TIME= 0.00000E+00 LOAD CASE= 1

ELEM	TSG1	TSG3	MSG1	MSG3	BSG1	BSG3
5514	0.00000000E+00	-21077.746	0.00000000E+00	-21913.878	0.00000000E+00	-22761.337
6014	0.00000000E+00	-21077.746	0.00000000E+00	-21913.878	0.00000000E+00	-22761.337
5533	0.00000000E+00	-13010.176	0.00000000E+00	-13019.495	0.00000000E+00	-13028.863
6033	0.00000000E+00	-13010.176	0.00000000E+00	-13019.495	0.00000000E+00	-13028.863
5545	0.00000000E+00	-11550.358	0.00000000E+00	-11550.457	0.00000000E+00	-11550.557
6045	0.00000000E+00	-11550.358	0.00000000E+00	-11550.457	0.00000000E+00	-11550.557
5515	0.00000000E+00	-10288.627	0.00000000E+00	-11169.914	0.00000000E+00	-12065.504
6015	0.00000000E+00	-10288.627	0.00000000E+00	-11169.914	0.00000000E+00	-12065.504
5557	0.00000000E+00	-10455.863	0.00000000E+00	-10455.859	0.00000000E+00	-10455.855
6057	0.00000000E+00	-10455.863	0.00000000E+00	-10455.859	0.00000000E+00	-10455.855

MINIMUMS	ELEMENT	VALUE	5514	5514	6014	5514	6014
			0.00000000E+00	-21077.746	0.00000000E+00	-21913.878	0.00000000E+00

MAXIMUMS	ELEMENT	VALUE	5514	6015	5514	6057	5514	6057
			0.00000000E+00	-10288.627	0.00000000E+00	-10455.859	0.00000000E+00	-10455.855

ELEMENT SORT REMOVED

SORT ON BSG1 ORDER= 0 KABS= 1 NMAX= 10

SORT COMPLETED FOR 10 VALUES.

PRINT ELEMENT STRESS ITEMS PER ELEMENT

SY-101 ANNULUS HEAT-UP STUD STIFFNESS CHECK
600.830

11.7640 MAY 20, 1994 CP=

***** POST1 ELEMENT STRESS LISTING *****

LOAD STEP 1 ITERATION= 1 SECTION= 1
TIME= 0.00000E+00 LOAD CASE= 1

ELEM	TSG1	TSG3	MSG1	MSG3	BSG1	BSG3
5513	19461.826	-6826.2541	18450.338	-7275.9124	17445.079	-7731.7998
6013	19461.826	-6826.2541	18450.338	-7275.9124	17445.079	-7731.7998
5512	10117.658	-7047.9851	8945.9414	-7444.7662	7776.9224	-7844.2454
6012	10117.658	-7047.9851	8945.9414	-7444.7662	7776.9224	-7844.2454
5532	6348.0056	-6517.4864	6333.1794	-6497.6041	6318.3869	-6477.7555
6032	6348.0056	-6517.4864	6333.1794	-6497.6041	6318.3869	-6477.7555
4	0.00000000E+00	-7188.6745	0.00000000E+00	-4842.0464	4961.6866	-3163.7925
11504	0.00000000E+00	-7188.6745	0.00000000E+00	-4842.0464	4961.6866	-3163.7925
11503	0.00000000E+00	-6533.9149	0.00000000E+00	-4776.6259	4777.6474	-3019.9991
3	0.00000000E+00	-6533.9149	0.00000000E+00	-4776.6259	4777.6474	-3019.9991

MINIMUMS

ELEMENT	4	4	4	6012	3	6012
VALUE	0.00000000E+00	-7188.6745	0.00000000E+00	-7444.7662	4777.6474	-7844.2454

MAXIMUMS

ELEMENT	5513	6032	5513	11503	6013	11503
VALUE	19461.826	-6517.4864	18450.338	-4776.6259	17445.079	-3019.9991

ELEMENT SORT REMOVED

SORT ON BSG3 ORDER= 0 KABS= 1 NMAX= 10

SORT COMPLETED FOR 10 VALUES.

PRINT ELEMENT STRESS ITEMS PER ELEMENT

SY-101 ANNULUS HEAT-UP STUD STIFFNESS CHECK
653.400

11.7786 MAY 20, 1994 CP=

***** POST1 ELEMENT STRESS LISTING *****

LOAD STEP 1 ITERATION= 1 SECTION= 1
TIME= 0.00000E+00 LOAD CASE= 1

ELEM	TSG1	TSG3	MSG1	MSG3	BSG1	BSG3
5514	0.00000000E+00	-21077.746	0.00000000E+00	-21913.878	0.00000000E+00	-22761.337
6014	0.00000000E+00	-21077.746	0.00000000E+00	-21913.878	0.00000000E+00	-22761.337
11506	8556.0003	-1004.3307	0.00000000E+00	-5989.4194	0.00000000E+00	-14794.966
6	8556.0003	-1004.3307	0.00000000E+00	-5989.4194	0.00000000E+00	-14794.966
5533	0.00000000E+00	-13010.176	0.00000000E+00	-13019.495	0.00000000E+00	-13028.863
6033	0.00000000E+00	-13010.176	0.00000000E+00	-13019.495	0.00000000E+00	-13028.863
5515	0.00000000E+00	-10288.627	0.00000000E+00	-11169.914	0.00000000E+00	-12065.504
6015	0.00000000E+00	-10288.627	0.00000000E+00	-11169.914	0.00000000E+00	-12065.504
5545	0.00000000E+00	-11550.358	0.00000000E+00	-11550.457	0.00000000E+00	-11550.557
6045	0.00000000E+00	-11550.358	0.00000000E+00	-11550.457	0.00000000E+00	-11550.557

MINIMUMS

ELEMENT	5514	5514	5514	6014	5514	6014
VALUE	0.00000000E+00	-21077.746	0.00000000E+00	-21913.878	0.00000000E+00	-22761.337

MAXIMUMS

ELEMENT	6	6	5514	6	5514	5545
VALUE	8556.0003	-1004.3307	0.00000000E+00	-5989.4194	0.00000000E+00	-11550.557

ELEMENT SORT REMOVED

PRINT REACTION FORCES PER NODE

SY-101 ANNULUS HEAT-UP STUD STIFFNESS CHECK
653.780

11.7787 MAY 20, 1994 CP=

***** POST1 REACTION FORCE LISTING *****

LOAD STEP 1 ITERATION= 1 SECTION= 1
TIME= 0.00000E+00 LOAD CASE= 1

THE FOLLOWING X,Y,Z FORCES ARE IN GLOBAL COORDINATES

NODE	FX	FY	FZ	MX	MY	MZ
1	4882.0572	113.21641	-78.617773	465.17238	-19.669974	124.19961
2	9731.1701	0.00000000E+00	0.00000000E+00	0.00000000E+00	-14.077044	156.92953
3	9309.5004	0.00000000E+00	0.00000000E+00	0.00000000E+00	96.589595	-99.475137
4	8725.6821	0.00000000E+00	0.00000000E+00	0.00000000E+00	264.33462	-186.12936
5	9665.2432	0.00000000E+00	0.00000000E+00	0.00000000E+00	-239.32458	21.009973
6	6606.1327	0.00000000E+00	3386.2572	0.00000000E+00	-1023.8697	127.85927
7	1410.7430	0.00000000E+00	-2138.8549	0.00000000E+00	-203.57452	-0.30419011E-02
8	1342.2029	0.00000000E+00	259.92556	0.00000000E+00	-131.57156	0.15454553E-02
9	1309.0336	0.00000000E+00	-49.509563	0.00000000E+00	-66.880086	0.11906139E-02
10	1294.4636	0.00000000E+00	-30.009260	0.00000000E+00	-33.951725	0.75002652E-03
11	1290.3612	0.00000000E+00	-32.268531	0.00000000E+00	-15.590759	0.46863488E-03
12	1292.4281	0.00000000E+00	-27.547732	0.00000000E+00	-5.8056423	0.29668242E-03
13	1298.2077	0.00000000E+00	-22.540099	0.00000000E+00	-0.54008249	0.19034836E-03
14	1306.1938	0.00000000E+00	-18.074676	0.00000000E+00	2.4694867	0.12349278E-03
15	1315.4018	0.00000000E+00	-14.549584	0.00000000E+00	4.4096543	0.80844016E-04
16	1325.1527	0.00000000E+00	-11.916489	0.00000000E+00	5.8388545	0.53288614E-04
17	1334.9586	0.00000000E+00	-9.9912417	0.00000000E+00	6.9893332	0.35261482E-04
18	1344.4633	0.00000000E+00	-8.5844361	0.00000000E+00	7.9458562	0.23296656E-04
19	1353.4122	0.00000000E+00	-7.5001609	0.00000000E+00	8.7406388	0.15195587E-04
20	1361.6407	0.00000000E+00	-7.1712093	0.00000000E+00	9.4188987	0.95334740E-05
21	1369.0762	0.00000000E+00	-3.4302382	0.00000000E+00	10.028542	0.53566092E-05
22	3450.5334	0.00000000E+00	-13.030248	0.00000000E+00	23.260430	0.49734986E-05
23	7522.0425	0.00000000E+00	-19.975197	0.00000000E+00	48.683691	0.72783427E-05
24	6974.4106	0.00000000E+00	-10.207602	0.00000000E+00	36.879799	0.54165624E-05
25	4338.9159	0.00000000E+00	-3.2417002	0.00000000E+00	15.431421	0.22861097E-05
26	4297.9792	0.00000000E+00	-3.2845430	0.00000000E+00	13.054653	0.16155724E-05
27	4259.7279	0.00000000E+00	-2.0437746	0.00000000E+00	10.258712	0.11464989E-05
28	4233.4932	0.00000000E+00	-1.2662117	0.00000000E+00	7.6259622	0.81668508E-06
29	4231.8359	0.00000000E+00	-0.71554571	0.00000000E+00	5.4345734	0.58370523E-06
30	4267.4919	0.00000000E+00	-0.36470034	0.00000000E+00	3.7280036	0.41843252E-06
31	4344.4930	0.00000000E+00	-0.14971969	0.00000000E+00	2.4594041	0.30074417E-06
32	4449.6943	0.00000000E+00	-0.26608972E-01	0.00000000E+00	1.5525255	0.21665513E-06
33	4555.1002	0.00000000E+00	0.37286435E-01	0.00000000E+00	0.92771889	0.15639182E-06
34	4632.7674	0.00000000E+00	0.64691184E-01	0.00000000E+00	0.51333816	0.11308857E-06
35	4669.7149	0.00000000E+00	0.70957682E-01	0.00000000E+00	0.25002760	0.81899614E-07
36	4670.2639	0.00000000E+00	0.66055765E-01	0.00000000E+00	0.91299766E-01	0.59390106E-07
37	4647.5797	0.00000000E+00	0.56176596E-01	0.00000000E+00	0.23126522E-02	0.43115846E-07
38	4614.8076	0.00000000E+00	0.44945925E-01	0.00000000E+00	-0.42068744E-01	0.31331533E-07
39	4582.0712	0.00000000E+00	0.34311847E-01	0.00000000E+00	-0.59332947E-01	0.22787074E-07
40	4558.3296	0.00000000E+00	0.25172315E-01	0.00000000E+00	-0.61206557E-01	0.16584633E-07
41	4553.6217	0.00000000E+00	0.17803883E-01	0.00000000E+00	-0.55238058E-01	0.12077827E-07
42	4577.5245	0.00000000E+00	0.12144008E-01	0.00000000E+00	-0.46053832E-01	0.88003258E-08
43	4632.9253	0.00000000E+00	0.79691153E-02	0.00000000E+00	-0.36310127E-01	0.64150868E-08
44	4709.8806	0.00000000E+00	0.50010025E-02	0.00000000E+00	-0.27387035E-01	0.46781234E-08
45	4787.4087	0.00000000E+00	0.29657334E-02	0.00000000E+00	-0.19876378E-01	0.34125715E-08
46	4844.5964	0.00000000E+00	0.16223581E-02	0.00000000E+00	-0.13912434E-01	0.24900721E-08
47	4871.6931	0.00000000E+00	0.77343565E-03	0.00000000E+00	-0.93874860E-02	0.18173739E-08
48	4871.8470	0.00000000E+00	0.26534730E-03	0.00000000E+00	-0.60859635E-02	0.13266723E-08
49	4854.8063	0.00000000E+00	-0.16485545E-04	0.00000000E+00	-0.37631112E-02	0.96862798E-09
50	4830.3195	0.00000000E+00	-0.15437214E-03	0.00000000E+00	-0.21872839E-02	0.70731568E-09
51	4805.8974	0.00000000E+00	-0.20534594E-03	0.00000000E+00	-0.11594408E-02	0.51656270E-09
52	4788.1920	0.00000000E+00	-0.20748062E-03	0.00000000E+00	-0.51913754E-03	0.37729258E-09
53	4784.6634	0.00000000E+00	-0.18515829E-03	0.00000000E+00	-0.14314768E-03	0.27559549E-09
54	4802.4316	0.00000000E+00	-0.15322465E-03	0.00000000E+00	0.59414781E-04	0.20132549E-09
55	4843.6411	0.00000000E+00	-0.12012390E-03	0.00000000E+00	0.15315821E-03	0.14707989E-09
56	4900.8915	0.00000000E+00	-0.90174536E-04	0.00000000E+00	0.18238082E-03	0.10745621E-09
57	4958.5704	0.00000000E+00	-0.65162724E-04	0.00000000E+00	0.17631828E-03	0.78510875E-10
58	5001.1171	0.00000000E+00	-0.45417712E-04	0.00000000E+00	0.15344308E-03	0.57364762E-10
59	5021.2764	0.00000000E+00	-0.30509243E-04	0.00000000E+00	0.12480926E-03	0.41915541E-10

60	5021.3902	0.00000000E+00	-0.19678952E-04	0.00000000E+00	0.96546801E-04	0.30627902E-10
61	5008.7112	0.00000000E+00	-0.12091245E-04	0.00000000E+00	0.71653341E-04	0.22380505E-10
62	4990.4924	0.00000000E+00	-0.69663957E-05	0.00000000E+00	0.51235591E-04	0.16354278E-10
63	4972.3218	0.00000000E+00	-0.36402479E-05	0.00000000E+00	0.35337939E-04	0.11950894E-10
64	4959.1486	0.00000000E+00	-0.15807906E-05	0.00000000E+00	0.23473030E-04	0.87332483E-11
65	4956.5231	0.00000000E+00	-0.38148897E-06	0.00000000E+00	0.14944765E-04	0.63819978E-11
66	4969.7424	0.00000000E+00	0.25616388E-06	0.00000000E+00	0.90319886E-05	0.46638233E-11
67	5000.4019	0.00000000E+00	0.54347160E-06	0.00000000E+00	0.50823841E-05	0.34082500E-11
68	5042.9959	0.00000000E+00	0.62468734E-06	0.00000000E+00	0.25512783E-05	0.24907154E-11
69	5085.9088	0.00000000E+00	0.59456204E-06	0.00000000E+00	0.10087506E-05	0.18202020E-11
70	5117.5634	0.00000000E+00	0.51262405E-06	0.00000000E+00	0.13022657E-06	0.13302016E-11
71	5132.5620	0.00000000E+00	0.41422871E-06	0.00000000E+00	-0.32005698E-06	0.97211439E-12
72	5132.6469	0.00000000E+00	0.31876121E-06	0.00000000E+00	-0.50725922E-06	0.71042625E-12
73	5123.2141	0.00000000E+00	0.23550359E-06	0.00000000E+00	-0.54291927E-06	0.51918494E-12
74	5109.6598	0.00000000E+00	0.16768236E-06	0.00000000E+00	-0.49941995E-06	0.37942541E-12
75	5096.1414	0.00000000E+00	0.11515783E-06	0.00000000E+00	-0.42157204E-06	0.27728845E-12
76	5086.3408	0.00000000E+00	0.76136982E-07	0.00000000E+00	-0.33546529E-06	0.20264601E-12
77	5084.3873	0.00000000E+00	0.48209031E-07	0.00000000E+00	-0.25496675E-06	0.14809660E-12
78	5094.2215	0.00000000E+00	0.28928572E-07	0.00000000E+00	-0.18632030E-06	0.10823127E-12
79	5117.0304	0.00000000E+00	0.16108593E-07	0.00000000E+00	-0.13128631E-06	0.79097176E-13
80	5148.7179	0.00000000E+00	0.79366562E-08	0.00000000E+00	-0.89203653E-07	0.57805567E-13
81	5180.6428	0.00000000E+00	0.29902989E-08	0.00000000E+00	-0.58285065E-07	0.42245333E-13
82	5204.1922	0.00000000E+00	0.20071701E-09	0.00000000E+00	-0.36386267E-07	0.30873663E-13
83	5215.3505	0.00000000E+00	-0.12050914E-08	0.00000000E+00	-0.21427606E-07	0.22563052E-13
84	5215.4140	0.00000000E+00	-0.17663486E-08	0.00000000E+00	-0.11595828E-07	0.16489511E-13
85	5208.3969	0.00000000E+00	-0.18455949E-08	0.00000000E+00	-0.54141050E-08	0.12050857E-13
86	5198.3138	0.00000000E+00	-0.16769102E-08	0.00000000E+00	-0.17388413E-08	0.88070049E-14
87	5188.2574	0.00000000E+00	-0.14043000E-08	0.00000000E+00	0.27945437E-09	0.64363359E-14
88	5180.9666	0.00000000E+00	-0.11108794E-08	0.00000000E+00	0.12487172E-08	0.47038048E-14
89	5179.5130	0.00000000E+00	-0.84020546E-09	0.00000000E+00	0.15886009E-08	0.34376367E-14
90	5186.8280	0.00000000E+00	-0.61131221E-09	0.00000000E+00	0.15781114E-08	0.25122958E-14
91	5203.7943	0.00000000E+00	-0.42892931E-09	0.00000000E+00	0.13950745E-08	0.18360379E-14
92	5227.3652	0.00000000E+00	-0.29016072E-09	0.00000000E+00	0.11471076E-08	0.13418148E-14
93	5251.1126	0.00000000E+00	-0.18865560E-09	0.00000000E+00	0.89488893E-09	0.98062633E-15
94	5268.6301	0.00000000E+00	-0.11706575E-09	0.00000000E+00	0.66898436E-09	0.71666234E-15
95	5276.9305	0.00000000E+00	-0.68376503E-10	0.00000000E+00	0.48158435E-09	0.52375196E-15
96	5276.9781	0.00000000E+00	-0.36529119E-10	0.00000000E+00	0.33439443E-09	0.38276901E-15
97	5271.7591	0.00000000E+00	-0.16621429E-10	0.00000000E+00	0.22372901E-09	0.27973572E-15
98	5264.2594	0.00000000E+00	-0.48773216E-11	0.00000000E+00	0.14364472E-09	0.20443681E-15
99	5256.7796	0.00000000E+00	0.14955117E-11	0.00000000E+00	0.87748443E-10	0.14940677E-15
100	5251.3568	0.00000000E+00	0.44868976E-11	0.00000000E+00	0.50144477E-10	0.10918966E-15
101	5250.2752	0.00000000E+00	0.54645260E-11	0.00000000E+00	0.25848146E-10	0.79798137E-16
102	5255.7149	0.00000000E+00	0.53334823E-11	0.00000000E+00	0.10888221E-10	0.58318186E-16
103	5268.3323	0.00000000E+00	0.46674805E-11	0.00000000E+00	0.22434898E-11	0.4262011E-16
104	5285.8616	0.00000000E+00	0.38112755E-11	0.00000000E+00	-0.22957412E-11	0.31147743E-16
105	5303.5224	0.00000000E+00	0.29572448E-11	0.00000000E+00	-0.42877743E-11	0.22763440E-16
106	5316.5502	0.00000000E+00	0.22005321E-11	0.00000000E+00	-0.47923214E-11	0.16636012E-16
107	5322.7235	0.00000000E+00	0.15773469E-11	0.00000000E+00	-0.45024546E-11	0.12157956E-16
108	5322.7594	0.00000000E+00	0.10905963E-11	0.00000000E+00	-0.38513494E-11	0.88852969E-17
109	5318.8788	0.00000000E+00	0.72634700E-12	0.00000000E+00	-0.30944998E-11	0.64935672E-17
110	5313.3023	0.00000000E+00	0.46388584E-12	0.00000000E+00	-0.23705063E-11	0.47456396E-17
111	5307.7407	0.00000000E+00	0.28147193E-12	0.00000000E+00	-0.17443905E-11	0.34682164E-17
112	5303.7084	0.00000000E+00	0.15930479E-12	0.00000000E+00	-0.12373627E-11	0.25346480E-17
113	5302.9036	0.00000000E+00	0.80777378E-13	0.00000000E+00	-0.84652024E-12	0.18523761E-17
114	5306.9469	0.00000000E+00	0.32737524E-13	0.00000000E+00	-0.55733087E-12	0.13537570E-17
115	5316.3263	0.00000000E+00	0.52282230E-14	0.00000000E+00	-0.35113378E-12	0.98935531E-18
116	5329.3573	0.00000000E+00	-0.90011866E-14	0.00000000E+00	-0.20932383E-12	0.72304266E-18
117	5342.4863	0.00000000E+00	-0.15042380E-13	0.00000000E+00	-0.11542010E-12	0.52841558E-18
118	5352.1712	0.00000000E+00	-0.16342741E-13	0.00000000E+00	-0.55852186E-13	0.38617785E-18
119	5356.7609	0.00000000E+00	-0.15145867E-13	0.00000000E+00	-0.20022026E-13	0.28222741E-18
120	5356.7883	0.00000000E+00	-0.12845634E-13	0.00000000E+00	0.30771729E-18	0.20625814E-18
121	5353.9046	0.00000000E+00	-0.10257521E-13	0.00000000E+00	0.99281722E-14	0.15073812E-18
122	5349.7603	0.00000000E+00	-0.78183184E-14	0.00000000E+00	0.13732021E-13	0.11016287E-18
123	5345.6272	0.00000000E+00	-0.57278222E-14	0.00000000E+00	0.14070678E-13	0.80509564E-19
124	5342.6304	0.00000000E+00	-0.40458052E-14	0.00000000E+00	0.12652987E-13	0.58838267E-19
125	5342.0316	0.00000000E+00	-0.27558739E-14	0.00000000E+00	0.10524184E-13	0.43000395E-19
126	5345.0345	0.00000000E+00	-0.18057160E-14	0.00000000E+00	0.82826761E-14	0.31425718E-19
127	5352.0016	0.00000000E+00	-0.11311042E-14	0.00000000E+00	0.62378772E-14	0.22966679E-19
128	5361.6815	0.00000000E+00	-0.66914075E-15	0.00000000E+00	0.45210412E-14	0.16784618E-19
129	5371.4345	0.00000000E+00	-0.36467541E-15	0.00000000E+00	0.31602913E-14	0.12266623E-19
130	5378.6293	0.00000000E+00	-0.17261401E-15	0.00000000E+00	0.21294452E-14	0.89647650E-20
131	5382.0394	0.00000000E+00	-0.57930342E-16	0.00000000E+00	0.13783441E-14	0.65516881E-20
132	5382.0608	0.00000000E+00	0.54626654E-17	0.00000000E+00	0.85059292E-15	0.47881526E-20

133	5379.9200	0.00000000E+00	0.36279951E-16	0.00000000E+00	0.49305962E-15	0.34993169E-20
134	5376.8431	0.00000000E+00	0.47472080E-16	0.00000000E+00	0.26021745E-15	0.25574031E-20
135	5373.7745	0.00000000E+00	0.47672016E-16	0.00000000E+00	0.11544105E-15	0.18690280E-20
136	5371.5495	0.00000000E+00	0.42399040E-16	0.00000000E+00	0.30645995E-16	0.13659451E-20
137	5371.1039	0.00000000E+00	0.35006574E-16	0.00000000E+00	-0.14852357E-16	0.99827826E-21
138	5373.3307	0.00000000E+00	0.27396228E-16	0.00000000E+00	-0.35738620E-16	0.72957689E-21
139	5378.4989	0.00000000E+00	0.20535449E-16	0.00000000E+00	-0.42067540E-16	0.53320201E-21
140	5385.6800	0.00000000E+00	0.14819473E-16	0.00000000E+00	-0.40465129E-16	0.38968520E-21
141	5392.9156	0.00000000E+00	0.10315264E-16	0.00000000E+00	-0.35110612E-16	0.28479851E-21
142	5398.2537	0.00000000E+00	0.69194741E-17	0.00000000E+00	-0.28499040E-16	0.20814378E-21
143	5400.7844	0.00000000E+00	0.44559526E-17	0.00000000E+00	-0.22009221E-16	0.15212176E-21
144	5400.8017	0.00000000E+00	0.27323001E-17	0.00000000E+00	-0.16311103E-16	0.11117875E-21
145	5399.2153	0.00000000E+00	0.15697418E-17	0.00000000E+00	-0.11647659E-16	0.81255952E-22
146	5396.9350	0.00000000E+00	0.81640479E-18	0.00000000E+00	-0.80227676E-17	0.59387076E-22
147	5394.6609	0.00000000E+00	0.35086935E-18	0.00000000E+00	-0.53213190E-17	0.43404283E-22
148	5393.0116	0.00000000E+00	0.80498544E-19	0.00000000E+00	-0.33821751E-17	0.31723253E-22
149	5392.6800	0.00000000E+00	-0.62633756E-19	0.00000000E+00	-0.20395335E-17	0.23186116E-22
150	5394.3269	0.00000000E+00	-0.12654652E-18	0.00000000E+00	-0.11439634E-17	0.16946665E-22
151	5398.1512	0.00000000E+00	-0.14397670E-18	0.00000000E+00	-0.57099062E-18	0.12386464E-22
152	5403.4656	0.00000000E+00	-0.13639470E-18	0.00000000E+00	-0.22254272E-18	0.90535385E-23
153	5408.8208	0.00000000E+00	-0.11726505E-18	0.00000000E+00	-0.24689756E-19	0.66175689E-23
154	5412.7722	0.00000000E+00	-0.94565297E-19	0.00000000E+00	0.76196170E-19	0.48371448E-23
155	5414.6464	0.00000000E+00	-0.72653350E-19	0.00000000E+00	0.11763310E-18	0.35358335E-23
156	5414.6610	0.00000000E+00	-0.53601267E-19	0.00000000E+00	0.12492328E-18	0.25846900E-23
157	5413.4894	0.00000000E+00	-0.38114184E-19	0.00000000E+00	0.11446057E-18	0.18894751E-23
158	5411.8049	0.00000000E+00	-0.26139999E-19	0.00000000E+00	0.96374275E-19	0.13813139E-23
159	5410.1250	0.00000000E+00	-0.17257013E-19	0.00000000E+00	0.76546020E-19	0.10098687E-23
160	5408.9063	0.00000000E+00	-0.10907786E-19	0.00000000E+00	0.58088457E-19	0.73834948E-24
161	5408.6595	0.00000000E+00	-0.65303893E-20	0.00000000E+00	0.42390504E-19	0.53986767E-24
162	5409.8714	0.00000000E+00	-0.36239924E-20	0.00000000E+00	0.29829866E-19	0.39477098E-24
163	5412.6884	0.00000000E+00	-0.17744967E-20	0.00000000E+00	0.20240285E-19	0.28869589E-24
164	5416.6042	0.00000000E+00	-0.65747410E-21	0.00000000E+00	0.13204517E-19	0.21114420E-24
165	5420.5505	0.00000000E+00	-0.29518116E-22	0.00000000E+00	0.82278892E-20	0.15444269E-24
166	5423.4630	0.00000000E+00	0.28517473E-21	0.00000000E+00	0.48330788E-20	0.11298290E-24
167	5424.8456	0.00000000E+00	0.40907636E-21	0.00000000E+00	0.26051568E-20	0.82665410E-25
168	5424.8588	0.00000000E+00	0.42441349E-21	0.00000000E+00	0.12068885E-20	0.60493755E-25
169	5423.9990	0.00000000E+00	0.38419152E-21	0.00000000E+00	0.37756637E-21	0.44277612E-25
170	5422.7619	0.00000000E+00	0.32095364E-21	0.00000000E+00	-0.76193354E-22	0.32415874E-25
171	5421.5283	0.00000000E+00	0.25342973E-21	0.00000000E+00	-0.29259999E-21	0.23738103E-25
172	5420.6329	0.00000000E+00	0.19138985E-21	0.00000000E+00	-0.36693052E-21	0.17388656E-25
173	5420.4492	0.00000000E+00	0.13906037E-21	0.00000000E+00	-0.36243761E-21	0.12741987E-25
174	5421.3328	0.00000000E+00	0.97442685E-22	0.00000000E+00	-0.31936710E-21	0.93407467E-26
175	5423.3906	0.00000000E+00	0.65826196E-22	0.00000000E+00	-0.26202180E-21	0.6805357E-26
176	5426.2523	0.00000000E+00	0.42731546E-22	0.00000000E+00	-0.20406065E-21	0.50268357E-26
177	5429.1372	0.00000000E+00	0.26464890E-22	0.00000000E+00	-0.15232572E-21	0.36908350E-26
178	5431.2672	0.00000000E+00	0.15416908E-22	0.00000000E+00	-0.10950798E-21	0.27117600E-26
179	5432.2800	0.00000000E+00	0.82015462E-23	0.00000000E+00	-0.75936822E-22	0.19939588E-26
180	5432.2930	0.00000000E+00	0.36996480E-23	0.00000000E+00	-0.50733612E-22	0.14674603E-26
181	5431.6691	0.00000000E+00	0.10505114E-23	0.00000000E+00	-0.32519700E-22	0.10810715E-26
182	5430.7706	0.00000000E+00	-0.38142094E-24	0.00000000E+00	-0.19823877E-22	0.79733192E-27
183	5429.8748	0.00000000E+00	-0.10484501E-23	0.00000000E+00	-0.11294831E-22	0.58882464E-27
184	5429.2239	0.00000000E+00	-0.12610418E-23	0.00000000E+00	-0.57929746E-23	0.43547908E-27
185	5429.0870	0.00000000E+00	-0.12243480E-23	0.00000000E+00	-0.24121225E-23	0.32259878E-27
186	5429.7201	0.00000000E+00	-0.10681831E-23	0.00000000E+00	-0.46393689E-24	0.23941933E-27
187	5431.1999	0.00000000E+00	-0.87037759E-24	0.00000000E+00	0.55433453E-24	0.17805369E-27
188	5433.2595	0.00000000E+00	-0.67421545E-24	0.00000000E+00	0.99676808E-24	0.13272088E-27
189	5435.3369	0.00000000E+00	-0.50097348E-24	0.00000000E+00	0.11038201E-23	0.99181701E-28
190	5436.8720	0.00000000E+00	-0.35861875E-24	0.00000000E+00	0.10325124E-23	0.74326011E-28
191	5437.6041	0.00000000E+00	-0.24762100E-24	0.00000000E+00	0.88080234E-24	0.55870693E-28
192	5437.6180	0.00000000E+00	-0.16467957E-24	0.00000000E+00	0.70632146E-24	0.42138641E-28
193	5437.1752	0.00000000E+00	-0.10499621E-24	0.00000000E+00	0.54021196E-24	0.31896984E-28
194	5436.5362	0.00000000E+00	-0.63570812E-25	0.00000000E+00	0.39697206E-24	0.24238640E-28
195	5435.8992	0.00000000E+00	-0.35866659E-25	0.00000000E+00	0.28121341E-24	0.18495580E-28
196	5435.4354	0.00000000E+00	-0.18088018E-25	0.00000000E+00	0.19212583E-24	0.14175285E-28
197	5435.3334	0.00000000E+00	-0.72343135E-26	0.00000000E+00	0.12630206E-24	0.10914183E-28
198	5435.7718	0.00000000E+00	-0.10373712E-26	0.00000000E+00	0.79431061E-25	0.84435088E-29
199	5436.8038	0.00000000E+00	0.21522287E-26	0.00000000E+00	0.47239478E-25	0.65642670E-29
200	5438.2427	0.00000000E+00	0.34912314E-26	0.00000000E+00	0.25954192E-25	0.51288578E-29
201	5439.6954	0.00000000E+00	0.37617407E-26	0.00000000E+00	0.12475317E-25	0.40275839E-29
202	5440.7708	0.00000000E+00	0.34719634E-26	0.00000000E+00	0.43861029E-26	0.31787363E-29
203	5441.2867	0.00000000E+00	0.29370277E-26	0.00000000E+00	-0.11912864E-27	0.25213026E-29
204	5441.3028	0.00000000E+00	0.23408137E-26	0.00000000E+00	-0.23395838E-26	0.20096011E-29
205	5441.0020	0.00000000E+00	0.17814022E-26	0.00000000E+00	-0.31769317E-26	0.16093257E-29

206	5440.5662	0.00000000E+00	0.13032784E-26	0.00000000E+00	-0.32341179E-26	0.12946292E-29
207	5440.1319	0.00000000E+00	0.91933973E-27	0.00000000E+00	-0.28980236E-26	0.10459685E-29
208	5439.8145	0.00000000E+00	0.62536759E-27	0.00000000E+00	-0.24047987E-26	0.84851081E-30
209	5439.7384	0.00000000E+00	0.40913201E-27	0.00000000E+00	-0.18892430E-26	0.69095211E-30
210	5440.0206	0.00000000E+00	0.25580880E-27	0.00000000E+00	-0.14207123E-26	0.56464064E-30
211	5440.6956	0.00000000E+00	0.15095798E-27	0.00000000E+00	-0.10282967E-26	0.46292440E-30
212	5441.6404	0.00000000E+00	0.81957312E-28	0.00000000E+00	-0.71784315E-27	0.38066476E-30
213	5442.5965	0.00000000E+00	0.38508244E-28	0.00000000E+00	-0.48301441E-27	0.31387274E-30
214	5443.3068	0.00000000E+00	0.12624947E-28	0.00000000E+00	-0.31214620E-27	0.25943635E-30
215	5443.6519	0.00000000E+00	-0.16317526E-29	0.00000000E+00	-0.19224725E-27	0.21491552E-30
216	5443.6715	0.00000000E+00	-0.85169316E-29	0.00000000E+00	-0.11113225E-27	0.17838737E-30
217	5443.4864	0.00000000E+00	-0.10971122E-28	0.00000000E+00	-0.58388699E-28	0.14832895E-30
218	5443.2153	0.00000000E+00	-0.10951686E-28	0.00000000E+00	-0.25656509E-28	0.12352813E-30
219	5442.9456	0.00000000E+00	-0.97079132E-29	0.00000000E+00	-0.65353362E-29	0.10301555E-30
220	5442.7467	0.00000000E+00	-0.79972230E-29	0.00000000E+00	0.36821857E-29	0.86012382E-31
221	5442.6897	0.00000000E+00	-0.62477914E-29	0.00000000E+00	0.83335056E-29	0.71890152E-31
222	5442.8405	0.00000000E+00	-0.46762911E-29	0.00000000E+00	0.97007182E-29	0.60139558E-31
223	5443.2181	0.00000000E+00	-0.33701063E-29	0.00000000E+00	0.92854634E-29	0.50346247E-31
224	5443.7520	0.00000000E+00	-0.23426671E-29	0.00000000E+00	0.80331812E-29	0.42171861E-31
225	5444.2956	0.00000000E+00	-0.15692208E-29	0.00000000E+00	0.65069851E-29	0.35339136E-31
226	5444.7032	0.00000000E+00	-0.10088716E-29	0.00000000E+00	0.50169601E-29	0.29620130E-31
227	5444.9079	0.00000000E+00	-0.61732765E-30	0.00000000E+00	0.37127882E-29	0.24826873E-31
228	5444.9329	0.00000000E+00	-0.35360514E-30	0.00000000E+00	0.26477531E-29	0.20803902E-31
229	5444.8470	0.00000000E+00	-0.18297944E-30	0.00000000E+00	0.18213403E-29	0.17422275E-31
230	5444.7170	0.00000000E+00	-0.77743810E-31	0.00000000E+00	0.12064250E-29	0.14574741E-31
231	5444.5881	0.00000000E+00	-0.16795442E-31	0.00000000E+00	0.76575333E-30	0.12171832E-31
232	5444.4900	0.00000000E+00	0.15312947E-31	0.00000000E+00	0.46125884E-30	0.10138671E-31
233	5444.4471	0.00000000E+00	0.29479250E-31	0.00000000E+00	0.25877583E-30	0.84123686E-32
234	5444.4800	0.00000000E+00	0.33111148E-31	0.00000000E+00	0.12993871E-30	0.69398757E-32
235	5444.5933	0.00000000E+00	0.31042017E-31	0.00000000E+00	0.52470096E-31	0.56762020E-32
236	5444.7633	0.00000000E+00	0.26271821E-31	0.00000000E+00	0.96334921E-32	0.45829352E-32
237	5444.9422	0.00000000E+00	0.20536679E-31	0.00000000E+00	-0.10674792E-31	0.36269924E-32
238	5445.0832	0.00000000E+00	0.14728798E-31	0.00000000E+00	-0.16927728E-31	0.27795603E-32
239	5445.1655	0.00000000E+00	0.91997625E-32	0.00000000E+00	-0.14951488E-31	0.20151826E-32
240	5445.1979	0.00000000E+00	0.40333205E-32	0.00000000E+00	-0.89214066E-32	0.13109624E-32
241	5445.2038	0.00000000E+00	-0.39351987E-33	0.00000000E+00	-0.25866598E-32	0.64585136E-33
242	2722.6016	-2709.1141	-0.87132294E-33	0.13044609E-33	0.37341694E-34	0.16026825E-33
501	0.00000000E+00	229.22334	-161.82006	933.66710	0.73074240E-01	-0.44598378
742	0.00000000E+00	-5418.2742	-0.32027810E-33	-0.24119131E-32	-0.56195893E-33	0.63633566E-33
1001	0.00000000E+00	236.80934	-175.99640	942.18658	0.11015289	-0.67772148
1242	0.00000000E+00	-5418.4071	0.31124751E-32	-0.80352149E-32	-0.47698617E-33	0.12538655E-32
1501	0.00000000E+00	244.74035	-198.39811	950.19159	0.11968756	-0.69941076
1742	0.00000000E+00	-5418.6066	0.56439236E-32	-0.12600974E-31	-0.19663792E-33	0.18343534E-32
2001	0.00000000E+00	159.38411	-138.68277	604.86133	5.3638554	-33.805644
2242	0.00000000E+00	-3386.7408	0.42589861E-32	-0.93772917E-32	0.64881971E-33	0.14754272E-32
2501	0.00000000E+00	70.592120	-54.146016	254.31685	-0.32942059	2.0904628
2742	0.00000000E+00	-1354.7217	0.20000396E-32	-0.42139309E-32	-0.66096299E-34	0.10729770E-32
3001	0.00000000E+00	69.943790	-59.801019	253.32597	-0.11361295	0.71714337
3242	0.00000000E+00	-1354.7339	0.18911092E-32	-0.41414486E-32	-0.41595580E-35	0.15242034E-32
3501	0.00000000E+00	69.722206	-60.422164	252.92341	-0.22838302E-01	0.14577595
3742	0.00000000E+00	-1354.7447	0.18557890E-32	-0.41409953E-32	-0.19306240E-32	0.19306240E-32
4001	0.00000000E+00	69.815617	-61.498287	252.96291	0.27624040E-02	-0.15984032E-01
4242	0.00000000E+00	-1354.7536	0.18337888E-32	-0.41386069E-32	-0.14245527E-36	0.22803466E-32
4501	0.00000000E+00	69.977065	-62.418326	253.08179	0.88797245E-02	-0.54868446E-01
4742	0.00000000E+00	-1354.7608	0.18191896E-32	-0.41344447E-32	0.23112973E-36	0.25631620E-32
5001	0.00000000E+00	70.126363	-63.131426	253.19289	0.79630619E-02	-0.49448174E-01
5242	0.00000000E+00	-1354.7675	0.18098874E-32	-0.41303250E-32	0.34662374E-36	0.27708410E-32
5501	0.00000000E+00	70.226552	-63.578215	253.26582	0.44399479E-02	-0.27610963E-01
5742	0.00000000E+00	-1354.7697	0.18047207E-32	-0.41274446E-32	0.23779188E-36	0.28973712E-32
6001	0.00000000E+00	70.261499	-63.730095	253.29089	-0.39257486E-12	0.24442670E-11
6242	0.00000000E+00	-1354.7711	0.18030640E-32	-0.41264214E-32	-0.13171384E-46	0.29391272E-32
6501	0.00000000E+00	70.226552	-63.578215	253.26582	-0.44399479E-02	0.27610963E-01
6742	0.00000000E+00	-1354.7697	0.18047207E-32	-0.41274446E-32	-0.23779188E-36	0.28949694E-32
7001	0.00000000E+00	70.126363	-63.131426	253.19289	-0.79630619E-02	0.49448175E-01
7242	0.00000000E+00	-1354.7675	0.18098874E-32	-0.41303250E-32	-0.34662374E-36	0.27662697E-32
7501	0.00000000E+00	69.977065	-62.418326	253.08179	-0.88797245E-02	0.54868446E-01
7742	0.00000000E+00	-1354.7608	0.18191896E-32	-0.41344447E-32	-0.23112973E-36	0.25568633E-32
8001	0.00000000E+00	69.815617	-61.498287	252.96291	-0.27624040E-02	0.15984032E-01
8242	0.00000000E+00	-1354.7536	0.18337888E-32	-0.41386069E-32	0.14245527E-36	0.22729296E-32
8501	0.00000000E+00	69.722206	-60.422164	252.92341	0.22838302E-01	-0.14577595
8742	0.00000000E+00	-1354.7447	0.18557890E-32	-0.41409953E-32	0.91243122E-36	0.19228062E-32
9001	0.00000000E+00	69.943790	-59.801019	253.32597	0.11361295	-0.71714337
9242	0.00000000E+00	-1354.7339	0.18911092E-32	-0.41414486E-32	0.41595580E-35	0.15167409E-32

9501	0.00000000E+00	70.592120	-54.146016	254.31685	0.32942059	-2.0904628
9742	0.00000000E+00	-1354.7217	0.20000396E-32	-0.42139309E-32	0.66096299E-34	0.10665915E-32
10001	0.00000000E+00	159.38411	-138.68277	604.86133	-5.3638554	33.805644
10242	0.00000000E+00	-3386.7408	0.42589861E-32	-0.93772917E-32	-0.64881971E-33	0.14637000E-32
10501	0.00000000E+00	244.74035	-198.39811	950.19159	-0.11968756	0.69941076
10742	0.00000000E+00	-5418.6066	0.56439236E-32	-0.12600974E-31	0.19663792E-33	0.18184187E-32
11001	0.00000000E+00	236.80934	-175.99640	942.18658	-0.11015289	0.67772148
11242	0.00000000E+00	-5418.4071	0.31124751E-32	-0.80352149E-32	0.47698617E-33	0.12423008E-32
11501	0.00000000E+00	229.22334	-161.82006	933.66710	-0.73074240E-01	0.44598378
11742	0.00000000E+00	-5418.2742	-0.32027810E-33	-0.24119131E-32	0.56195893E-33	0.63025948E-33
12001	-4882.0572	113.21641	-78.617773	465.17238	19.669974	-124.19961
12002	-9731.1701	0.00000000E+00	0.00000000E+00	0.00000000E+00	14.077044	-156.92953
12003	-9309.5004	0.00000000E+00	0.00000000E+00	0.00000000E+00	-96.589595	99.475137
12004	-8725.6821	0.00000000E+00	0.00000000E+00	0.00000000E+00	-264.33462	186.12936
12005	-9665.2432	0.00000000E+00	0.00000000E+00	0.00000000E+00	239.32458	-21.009973
12006	-6606.1327	0.00000000E+00	3386.2572	0.00000000E+00	1023.8697	-127.85927
12007	-1410.7430	0.00000000E+00	-2138.8549	0.00000000E+00	203.57452	0.30419011E-02
12008	-1342.2029	0.00000000E+00	259.92556	0.00000000E+00	131.57156	-0.15654553E-02
12009	-1309.0336	0.00000000E+00	-49.509563	0.00000000E+00	66.880086	-0.11906139E-02
12010	-1294.4636	0.00000000E+00	-30.009260	0.00000000E+00	33.951725	-0.75002652E-03
12011	-1290.3612	0.00000000E+00	-32.268531	0.00000000E+00	15.590759	-0.46863488E-03
12012	-1292.4281	0.00000000E+00	-27.547732	0.00000000E+00	5.8056423	-0.29668242E-03
12013	-1298.2077	0.00000000E+00	-22.540099	0.00000000E+00	0.54008249	-0.19034836E-03
12014	-1306.1938	0.00000000E+00	-18.074676	0.00000000E+00	-2.4694867	-0.12349278E-03
12015	-1315.4018	0.00000000E+00	-14.549584	0.00000000E+00	-4.4096543	-0.80844016E-04
12016	-1325.1527	0.00000000E+00	-11.916489	0.00000000E+00	-5.8388545	-0.53288614E-04
12017	-1334.9586	0.00000000E+00	-9.9912417	0.00000000E+00	-6.9893332	-0.35261482E-04
12018	-1344.4633	0.00000000E+00	-8.5844361	0.00000000E+00	-7.9458562	-0.23296656E-04
12019	-1353.4122	0.00000000E+00	-7.5001609	0.00000000E+00	-8.7406388	-0.15195587E-04
12020	-1361.6407	0.00000000E+00	-7.1712093	0.00000000E+00	-9.4188987	-0.95334740E-05
12021	-1369.0762	0.00000000E+00	-3.4302382	0.00000000E+00	-10.028542	-0.53566092E-05
12022	-3450.5334	0.00000000E+00	-13.030248	0.00000000E+00	-23.260430	-0.49734986E-05
12023	-7522.0425	0.00000000E+00	-19.975197	0.00000000E+00	-48.683691	-0.72783427E-05
12024	-6974.4106	0.00000000E+00	-10.207602	0.00000000E+00	-36.879799	-0.54165624E-05
12025	-4338.9159	0.00000000E+00	-3.2417002	0.00000000E+00	-15.431421	-0.22861097E-05
12026	-4297.9792	0.00000000E+00	-3.2845430	0.00000000E+00	-13.054653	-0.16155724E-05
12027	-4259.7279	0.00000000E+00	-2.0437746	0.00000000E+00	-10.258712	-0.11464989E-05
12028	-4233.4932	0.00000000E+00	-1.2662117	0.00000000E+00	-7.6259622	-0.81668508E-06
12029	-4231.8359	0.00000000E+00	-0.71554571	0.00000000E+00	-5.4345734	-0.58370523E-06
12030	-4267.4919	0.00000000E+00	-0.36470034	0.00000000E+00	-3.7280036	-0.41843252E-06
12031	-4344.4930	0.00000000E+00	-0.14971969	0.00000000E+00	-2.4594041	-0.30074417E-06
12032	-4449.6943	0.00000000E+00	-0.26608972E-01	0.00000000E+00	-1.5525255	-0.21665513E-06
12033	-4555.1002	0.00000000E+00	0.37286435E-01	0.00000000E+00	-0.92771889	-0.15639182E-06
12034	-4632.7674	0.00000000E+00	0.64691184E-01	0.00000000E+00	-0.51333816	-0.11308857E-06
12035	-4669.7149	0.00000000E+00	0.70957682E-01	0.00000000E+00	-0.25002760	-0.81899614E-07
12036	-4670.2639	0.00000000E+00	0.66055765E-01	0.00000000E+00	-0.91299766E-01	-0.59390106E-07
12037	-4647.5797	0.00000000E+00	0.56176596E-01	0.00000000E+00	-0.23126522E-02	-0.43115846E-07
12038	-4614.8076	0.00000000E+00	0.44945925E-01	0.00000000E+00	0.42068744E-01	-0.31331533E-07
12039	-4582.0712	0.00000000E+00	0.34311847E-01	0.00000000E+00	0.59332947E-01	-0.22787074E-07
12040	-4558.3296	0.00000000E+00	0.25172315E-01	0.00000000E+00	0.61206557E-01	-0.16584633E-07
12041	-4553.6217	0.00000000E+00	0.17803883E-01	0.00000000E+00	0.55238058E-01	-0.12077827E-07
12042	-4577.5245	0.00000000E+00	0.12144008E-01	0.00000000E+00	0.46053832E-01	-0.88003258E-08
12043	-4632.9253	0.00000000E+00	0.79691153E-02	0.00000000E+00	0.36310127E-01	-0.64150868E-08
12044	-4709.8806	0.00000000E+00	0.50010025E-02	0.00000000E+00	0.27387035E-01	-0.46781234E-08
12045	-4787.4087	0.00000000E+00	0.29657334E-02	0.00000000E+00	0.19876378E-01	-0.34125715E-08
12046	-4844.5964	0.00000000E+00	0.16223581E-02	0.00000000E+00	0.13912434E-01	-0.24900721E-08
12047	-4871.6931	0.00000000E+00	0.77343565E-03	0.00000000E+00	0.93874860E-02	-0.18173739E-08
12048	-4871.8470	0.00000000E+00	0.26534730E-03	0.00000000E+00	0.60859635E-02	-0.13266723E-08
12049	-4854.8063	0.00000000E+00	-0.16485545E-04	0.00000000E+00	0.37631112E-02	-0.96862798E-09
12050	-4830.3195	0.00000000E+00	-0.15437214E-03	0.00000000E+00	0.21872839E-02	-0.70731568E-09
12051	-4805.8974	0.00000000E+00	-0.20534594E-03	0.00000000E+00	0.11594408E-02	-0.51656270E-09
12052	-4788.1920	0.00000000E+00	-0.20748062E-03	0.00000000E+00	0.51913754E-03	-0.37729258E-09
12053	-4784.6634	0.00000000E+00	-0.18515829E-03	0.00000000E+00	0.14314768E-03	-0.27559549E-09
12054	-4802.4316	0.00000000E+00	-0.15322465E-03	0.00000000E+00	-0.59414781E-04	-0.20132549E-09
12055	-4843.6411	0.00000000E+00	-0.12012390E-03	0.00000000E+00	-0.15315821E-03	-0.14707989E-09
12056	-4900.8915	0.00000000E+00	-0.90174536E-04	0.00000000E+00	-0.18238082E-03	-0.10745621E-09
12057	-4958.5704	0.00000000E+00	-0.65162724E-04	0.00000000E+00	-0.17631828E-03	-0.78510875E-10
12058	-5001.1171	0.00000000E+00	-0.45417712E-04	0.00000000E+00	-0.15344308E-03	-0.57364762E-10
12059	-5021.2764	0.00000000E+00	-0.30509243E-04	0.00000000E+00	-0.12480926E-03	-0.41915540E-10
12060	-5021.3902	0.00000000E+00	-0.19678952E-04	0.00000000E+00	-0.96546801E-04	-0.30627902E-10
12061	-5008.7112	0.00000000E+00	-0.12091245E-04	0.00000000E+00	-0.71653341E-04	-0.22380505E-10
12062	-4990.4924	0.00000000E+00	-0.69663957E-05	0.00000000E+00	-0.51235591E-04	-0.16354278E-10
12063	-4972.3218	0.00000000E+00	-0.36402479E-05	0.00000000E+00	-0.35337939E-04	-0.11950894E-10

12064	-4959.1486	0.00000000E+00	-0.15807906E-05	0.00000000E+00	-0.23473030E-04	-0.87332483E-11
12065	-4956.5231	0.00000000E+00	-0.38148897E-06	0.00000000E+00	-0.14944765E-04	-0.63819977E-11
12066	-4969.7424	0.00000000E+00	0.25616388E-06	0.00000000E+00	-0.90319886E-05	-0.46638233E-11
12067	-5000.4019	0.00000000E+00	0.54347160E-06	0.00000000E+00	-0.50823841E-05	-0.34082500E-11
12068	-5042.9959	0.00000000E+00	0.62468734E-06	0.00000000E+00	-0.25512783E-05	-0.24907154E-11
12069	-5085.9088	0.00000000E+00	0.59456204E-06	0.00000000E+00	-0.10087506E-05	-0.18202020E-11
12070	-5117.5634	0.00000000E+00	0.51262405E-06	0.00000000E+00	-0.13022657E-06	-0.13302016E-11
12071	-5132.5620	0.00000000E+00	0.41422871E-06	0.00000000E+00	0.32005698E-06	-0.97211437E-12
12072	-5132.6469	0.00000000E+00	0.31876121E-06	0.00000000E+00	0.50725922E-06	-0.71042623E-12
12073	-5123.2141	0.00000000E+00	0.23550359E-06	0.00000000E+00	0.54291927E-06	-0.51918492E-12
12074	-5109.6598	0.00000000E+00	0.16768236E-06	0.00000000E+00	0.49941995E-06	-0.37942539E-12
12075	-5096.1414	0.00000000E+00	0.11515783E-06	0.00000000E+00	0.42157204E-06	-0.27728844E-12
12076	-5086.3408	0.00000000E+00	0.76136982E-07	0.00000000E+00	0.33546529E-06	-0.20264600E-12
12077	-5084.3873	0.00000000E+00	0.48209031E-07	0.00000000E+00	0.25496675E-06	-0.18205305E-12
12078	-5094.2215	0.00000000E+00	0.28928572E-07	0.00000000E+00	0.18632030E-06	-0.10823127E-12
12079	-5117.0304	0.00000000E+00	0.16108593E-07	0.00000000E+00	0.13128631E-06	-0.79097171E-13
12080	-5148.7179	0.00000000E+00	0.79366562E-08	0.00000000E+00	0.89203653E-07	-0.57805563E-13
12081	-5180.6428	0.00000000E+00	0.29902989E-08	0.00000000E+00	0.58285065E-07	-0.42245330E-13
12082	-5204.1922	0.00000000E+00	0.20071701E-09	0.00000000E+00	0.36386267E-07	-0.30873659E-13
12083	-5215.3505	0.00000000E+00	-0.12050914E-08	0.00000000E+00	0.21427606E-07	-0.22563050E-13
12084	-5215.4140	0.00000000E+00	-0.17663486E-08	0.00000000E+00	0.11595828E-07	-0.16489509E-13
12085	-5208.3969	0.00000000E+00	-0.18455949E-08	0.00000000E+00	0.54141050E-08	-0.12508555E-13
12086	-5198.3138	0.00000000E+00	-0.16769102E-08	0.00000000E+00	0.17388413E-08	-0.88070034E-14
12087	-5188.2574	0.00000000E+00	-0.14043000E-08	0.00000000E+00	-0.27945437E-09	-0.64363346E-14
12088	-5180.9666	0.00000000E+00	-0.11108794E-08	0.00000000E+00	-0.12487172E-08	-0.47038037E-14
12089	-5179.5130	0.00000000E+00	-0.84020546E-09	0.00000000E+00	-0.15886009E-08	-0.34376358E-14
12090	-5186.8280	0.00000000E+00	-0.61131221E-09	0.00000000E+00	-0.15781114E-08	-0.25122950E-14
12091	-5203.7943	0.00000000E+00	-0.42892931E-09	0.00000000E+00	-0.13950745E-08	-0.18360372E-14
12092	-5227.3652	0.00000000E+00	-0.29016072E-09	0.00000000E+00	-0.11471076E-08	-0.13418142E-14
12093	-5251.1126	0.00000000E+00	-0.18865560E-09	0.00000000E+00	-0.89488893E-09	-0.98062586E-15
12094	-5268.6301	0.00000000E+00	-0.11706575E-09	0.00000000E+00	-0.66898436E-09	-0.71666195E-15
12095	-5276.9305	0.00000000E+00	-0.68376530E-10	0.00000000E+00	-0.48158435E-09	-0.52375163E-15
12096	-5276.9781	0.00000000E+00	-0.36529119E-10	0.00000000E+00	-0.33439443E-09	-0.38276874E-15
12097	-5271.7591	0.00000000E+00	-0.16621429E-10	0.00000000E+00	-0.22372901E-09	-0.27973548E-15
12098	-5264.2594	0.00000000E+00	-0.48773216E-11	0.00000000E+00	-0.14364472E-09	-0.20443661E-15
12099	-5256.7796	0.00000000E+00	0.14955117E-11	0.00000000E+00	-0.87748443E-10	-0.14940661E-15
12100	-5251.3568	0.00000000E+00	0.44868976E-11	0.00000000E+00	-0.50144477E-10	-0.10918952E-15
12101	-5250.2752	0.00000000E+00	0.54645260E-11	0.00000000E+00	-0.25848146E-10	-0.79798018E-16
12102	-5255.7149	0.00000000E+00	0.53334823E-11	0.00000000E+00	-0.10888221E-10	-0.58318087E-16
12103	-5268.3323	0.00000000E+00	0.46674805E-11	0.00000000E+00	-0.22434898E-11	-0.42620097E-16
12104	-5285.8616	0.00000000E+00	0.38112755E-11	0.00000000E+00	0.22957412E-11	-0.31147672E-16
12105	-5303.5224	0.00000000E+00	0.29572448E-11	0.00000000E+00	0.42877743E-11	-0.22763381E-16
12106	-5316.5502	0.00000000E+00	0.22005321E-11	0.00000000E+00	0.47923214E-11	-0.16635962E-16
12107	-5322.7235	0.00000000E+00	0.15773469E-11	0.00000000E+00	0.45024546E-11	-0.12157914E-16
12108	-5322.7594	0.00000000E+00	0.10905963E-11	0.00000000E+00	0.38513494E-11	-0.88852614E-17
12109	-5318.8788	0.00000000E+00	0.72634700E-12	0.00000000E+00	0.30944998E-11	-0.64935372E-17
12110	-5313.3023	0.00000000E+00	0.46388584E-12	0.00000000E+00	0.23705063E-11	-0.47456143E-17
12111	-5307.7407	0.00000000E+00	0.28147193E-12	0.00000000E+00	0.17443905E-11	-0.34681952E-17
12112	-5303.7084	0.00000000E+00	0.15930479E-12	0.00000000E+00	0.12373627E-11	-0.25346301E-17
12113	-5302.9036	0.00000000E+00	0.80777378E-13	0.00000000E+00	0.84652024E-12	-0.18523610E-17
12114	-5306.9469	0.00000000E+00	0.32737524E-13	0.00000000E+00	0.55733087E-12	-0.13537443E-17
12115	-5316.3263	0.00000000E+00	0.52282230E-14	0.00000000E+00	0.35113378E-12	-0.98934461E-18
12116	-5329.3573	0.00000000E+00	-0.90011866E-14	0.00000000E+00	0.20932383E-12	-0.72303365E-18
12117	-5342.4863	0.00000000E+00	-0.15042380E-13	0.00000000E+00	0.11542010E-12	-0.52840798E-18
12118	-5352.1712	0.00000000E+00	-0.16342741E-13	0.00000000E+00	0.55852186E-13	-0.38617145E-18
12119	-5356.7609	0.00000000E+00	-0.15145867E-13	0.00000000E+00	0.20022026E-13	-0.28222202E-18
12120	-5356.7883	0.00000000E+00	-0.12845634E-13	0.00000000E+00	-0.30771729E-18	-0.20625360E-18
12121	-5353.9046	0.00000000E+00	-0.10257521E-13	0.00000000E+00	-0.99281722E-14	-0.15073430E-18
12122	-5349.7603	0.00000000E+00	-0.78183184E-14	0.00000000E+00	-0.13732021E-13	-0.11015964E-18
12123	-5345.6272	0.00000000E+00	-0.57278222E-14	0.00000000E+00	-0.14070678E-13	-0.80506849E-19
12124	-5342.6304	0.00000000E+00	-0.40458052E-14	0.00000000E+00	-0.12652987E-13	-0.58835980E-19
12125	-5342.0316	0.00000000E+00	-0.27558739E-14	0.00000000E+00	-0.10524184E-13	-0.42998468E-19
12126	-5345.0345	0.00000000E+00	-0.18057160E-14	0.00000000E+00	-0.8282671E-14	-0.31424095E-19
12127	-5352.0016	0.00000000E+00	-0.11311042E-14	0.00000000E+00	-0.62378772E-14	-0.22965312E-19
12128	-5361.6815	0.00000000E+00	-0.66914075E-15	0.00000000E+00	-0.45210412E-14	-0.16783466E-19
12129	-5371.4345	0.00000000E+00	-0.36467541E-15	0.00000000E+00	-0.31602913E-14	-0.12265652E-19
12130	-5378.6293	0.00000000E+00	-0.17261401E-15	0.00000000E+00	-0.21294452E-14	-0.89639476E-20
12131	-5382.0394	0.00000000E+00	-0.57930342E-16	0.00000000E+00	-0.13783441E-14	-0.65509995E-20
12132	-5382.0608	0.00000000E+00	0.54626654E-17	0.00000000E+00	-0.85059292E-15	-0.47875725E-20
12133	-5379.9200	0.00000000E+00	0.36279951E-16	0.00000000E+00	-0.49305962E-15	-0.34988282E-20
12134	-5376.8431	0.00000000E+00	0.47472080E-16	0.00000000E+00	-0.26021745E-15	-0.25569914E-20
12135	-5373.7745	0.00000000E+00	0.47672016E-16	0.00000000E+00	-0.11544105E-15	-0.18686812E-20
12136	-5371.5495	0.00000000E+00	0.42399040E-16	0.00000000E+00	-0.30645995E-16	-0.13656529E-20

12137	-5371.1039	0.00000000E+00	0.35006574E-16	0.00000000E+00	0.14852357E-16	-0.99803214E-21
12138	-5373.3307	0.00000000E+00	0.27396228E-16	0.00000000E+00	0.35738620E-16	-0.72936955E-21
12139	-5378.4989	0.00000000E+00	0.20535449E-16	0.00000000E+00	0.42067540E-16	-0.53302734E-21
12140	-5385.6800	0.00000000E+00	0.14819473E-16	0.00000000E+00	0.40465129E-16	-0.38953806E-21
12141	-5392.9156	0.00000000E+00	0.10315264E-16	0.00000000E+00	0.35110612E-16	-0.28467456E-21
12142	-5398.2537	0.00000000E+00	0.69194741E-17	0.00000000E+00	0.28499040E-16	-0.20803935E-21
12143	-5400.7844	0.00000000E+00	0.44559526E-17	0.00000000E+00	0.22009221E-16	-0.15203379E-21
12144	-5400.8017	0.00000000E+00	0.27323001E-17	0.00000000E+00	0.16311103E-16	-0.11110465E-21
12145	-5399.2153	0.00000000E+00	0.15697418E-17	0.00000000E+00	0.11647659E-16	-0.81193524E-22
12146	-5396.9350	0.00000000E+00	0.81640479E-18	0.00000000E+00	0.80227676E-17	-0.59334485E-22
12147	-5394.6609	0.00000000E+00	0.35086935E-18	0.00000000E+00	0.53213190E-17	-0.43359979E-22
12148	-5393.0116	0.00000000E+00	0.80498544E-19	0.00000000E+00	0.33821751E-17	-0.31685930E-22
12149	-5392.6800	0.00000000E+00	-0.62633756E-19	0.00000000E+00	0.20395335E-17	-0.23154675E-22
12150	-5394.3269	0.00000000E+00	-0.12654652E-18	0.00000000E+00	0.11439634E-17	-0.16920178E-22
12151	-5398.1512	0.00000000E+00	-0.14397670E-18	0.00000000E+00	0.57099062E-18	-0.12364151E-22
12152	-5403.4656	0.00000000E+00	-0.13639470E-18	0.00000000E+00	0.22254272E-18	-0.90347418E-23
12153	-5408.8208	0.00000000E+00	-0.11726505E-18	0.00000000E+00	0.24689756E-19	-0.66017342E-23
12154	-5412.7722	0.00000000E+00	-0.94565297E-19	0.00000000E+00	-0.76196170E-19	-0.48238053E-23
12155	-5414.6464	0.00000000E+00	-0.72653350E-19	0.00000000E+00	-0.11763310E-18	-0.35245960E-23
12156	-5414.6610	0.00000000E+00	-0.53601267E-19	0.00000000E+00	-0.12492328E-18	-0.25752233E-23
12157	-5413.4894	0.00000000E+00	-0.38114184E-19	0.00000000E+00	-0.11446057E-18	-0.18815002E-23
12158	-5411.8049	0.00000000E+00	-0.26139999E-19	0.00000000E+00	-0.96374275E-19	-0.13745957E-23
12159	-5410.1250	0.00000000E+00	-0.17257013E-19	0.00000000E+00	-0.76546020E-19	-0.10042091E-23
12160	-5408.9063	0.00000000E+00	-0.10907786E-19	0.00000000E+00	-0.58088457E-19	-0.73358177E-24
12161	-5408.6595	0.00000000E+00	-0.65303893E-20	0.00000000E+00	-0.42390504E-19	-0.53585125E-24
12162	-5409.8714	0.00000000E+00	-0.36239924E-20	0.00000000E+00	-0.29829866E-19	-0.39138747E-24
12163	-5412.6884	0.00000000E+00	-0.17744967E-20	0.00000000E+00	-0.20240285E-19	-0.28584556E-24
12164	-5416.6042	0.00000000E+00	-0.65747410E-21	0.00000000E+00	-0.13204517E-19	-0.20874302E-24
12165	-5420.5505	0.00000000E+00	-0.29518116E-22	0.00000000E+00	-0.82278892E-20	-0.15241989E-24
12166	-5423.4630	0.00000000E+00	0.28517473E-21	0.00000000E+00	-0.48330788E-20	-0.11127885E-24
12167	-5424.8456	0.00000000E+00	0.40907636E-21	0.00000000E+00	-0.26051568E-20	-0.81229887E-25
12168	-5424.8588	0.00000000E+00	0.42441349E-21	0.00000000E+00	-0.12068885E-20	-0.59284442E-25
12169	-5423.9990	0.00000000E+00	0.38419152E-21	0.00000000E+00	-0.37756637E-21	-0.43258863E-25
12170	-5422.7619	0.00000000E+00	0.32095364E-21	0.00000000E+00	0.76193354E-22	-0.31557659E-25
12171	-5421.5283	0.00000000E+00	0.25342973E-21	0.00000000E+00	0.29259999E-21	-0.23015126E-25
12172	-5420.6329	0.00000000E+00	0.19138985E-21	0.00000000E+00	0.36693052E-21	-0.16779606E-25
12173	-5420.4492	0.00000000E+00	0.13906037E-21	0.00000000E+00	0.36243761E-21	-0.12228912E-25
12174	-5421.3328	0.00000000E+00	0.97442685E-22	0.00000000E+00	0.31936710E-21	-0.89085217E-26
12175	-5423.3906	0.00000000E+00	0.65826196E-22	0.00000000E+00	0.26202180E-21	-0.64864209E-26
12176	-5426.2523	0.00000000E+00	0.42731546E-22	0.00000000E+00	0.20406065E-21	-0.47200982E-26
12177	-5429.1372	0.00000000E+00	0.26464890E-22	0.00000000E+00	0.15232572E-21	-0.34324332E-26
12178	-5431.2672	0.00000000E+00	0.15416908E-22	0.00000000E+00	0.10950798E-21	-0.24940772E-26
12179	-5432.2800	0.00000000E+00	0.82015462E-23	0.00000000E+00	0.75936822E-22	-0.18105786E-26
12180	-5432.2930	0.00000000E+00	0.36996480E-23	0.00000000E+00	0.50733612E-22	-0.13129772E-26
12181	-5431.6691	0.00000000E+00	0.10505114E-23	0.00000000E+00	0.32519700E-22	-0.95093186E-27
12182	-5430.7706	0.00000000E+00	-0.38142094E-24	0.00000000E+00	0.19823877E-22	-0.68769971E-27
12183	-5429.8748	0.00000000E+00	-0.10484501E-23	0.00000000E+00	0.11294831E-22	-0.49646831E-27
12184	-5429.2239	0.00000000E+00	-0.12610418E-23	0.00000000E+00	0.57929746E-23	-0.35767628E-27
12185	-5429.0870	0.00000000E+00	-0.12243480E-23	0.00000000E+00	0.24121225E-23	-0.25705617E-27
12186	-5429.7201	0.00000000E+00	-0.10681831E-23	0.00000000E+00	0.46393689E-24	-0.18420494E-27
12187	-5431.1999	0.00000000E+00	-0.87037759E-24	0.00000000E+00	-0.55433453E-24	-0.13154000E-27
12188	-5433.2595	0.00000000E+00	-0.67421545E-24	0.00000000E+00	-0.99676808E-24	-0.93536831E-28
12189	-5435.3369	0.00000000E+00	-0.50097348E-24	0.00000000E+00	-0.11038201E-23	-0.66172285E-28
12190	-5436.8720	0.00000000E+00	-0.35861875E-24	0.00000000E+00	-0.10325124E-23	-0.46518228E-28
12191	-5437.6041	0.00000000E+00	-0.24762100E-24	0.00000000E+00	-0.88080234E-24	-0.32444868E-28
12192	-5437.6180	0.00000000E+00	-0.16467957E-24	0.00000000E+00	-0.70632146E-24	-0.22404264E-28
12193	-5437.1752	0.00000000E+00	-0.10499621E-24	0.00000000E+00	-0.54021196E-24	-0.15272355E-28
12194	-5436.5362	0.00000000E+00	-0.63570812E-25	0.00000000E+00	-0.39697206E-24	-0.10233725E-28
12195	-5435.8992	0.00000000E+00	-0.35866659E-25	0.00000000E+00	-0.28121341E-24	-0.66975635E-29
12196	-5435.4354	0.00000000E+00	-0.18088018E-25	0.00000000E+00	-0.19212583E-24	-0.42364040E-29
12197	-5435.3334	0.00000000E+00	-0.72343135E-26	0.00000000E+00	-0.12630206E-24	-0.25414741E-29
12198	-5435.7718	0.00000000E+00	-0.10373712E-26	0.00000000E+00	-0.79431061E-25	-0.13901740E-29
12199	-5436.8038	0.00000000E+00	0.21522287E-26	0.00000000E+00	-0.47239478E-25	-0.62239930E-30
12200	-5438.2427	0.00000000E+00	0.34912314E-26	0.00000000E+00	-0.25954192E-25	-0.12331203E-30
12201	-5439.6954	0.00000000E+00	0.37617407E-26	0.00000000E+00	-0.12475317E-25	0.18918562E-30
12202	-5440.7708	0.00000000E+00	0.34719634E-26	0.00000000E+00	-0.43861029E-26	0.37355247E-30
12203	-5441.2867	0.00000000E+00	0.29370277E-26	0.00000000E+00	0.11912864E-27	0.47121415E-30
12204	-5441.3028	0.00000000E+00	0.23408137E-26	0.00000000E+00	0.23395838E-26	0.51135248E-30
12205	-5441.0020	0.00000000E+00	0.17814022E-26	0.00000000E+00	0.31769317E-26	0.51437346E-30
12206	-5440.5662	0.00000000E+00	0.13032784E-26	0.00000000E+00	0.32341179E-26	0.49441462E-30
12207	-5440.1319	0.00000000E+00	0.91933973E-27	0.00000000E+00	0.28980236E-26	0.46115457E-30
12208	-5439.8145	0.00000000E+00	0.62536759E-27	0.00000000E+00	0.24047987E-26	0.42111624E-30
12209	-5439.7384	0.00000000E+00	0.40913201E-27	0.00000000E+00	0.18892430E-26	0.37860299E-30

12210	-5440.0206	0.00000000E+00	0.25580880E-27	0.00000000E+00	0.14207123E-26	0.33636920E-30
12211	-5440.6956	0.00000000E+00	0.15095798E-27	0.00000000E+00	0.10282967E-26	0.29609875E-30
12212	-5441.6404	0.00000000E+00	0.81957312E-28	0.00000000E+00	0.71784315E-27	0.25874500E-30
12213	-5442.5965	0.00000000E+00	0.38508244E-28	0.00000000E+00	0.48301441E-27	0.22477116E-30
12214	-5443.3068	0.00000000E+00	0.12624947E-28	0.00000000E+00	0.31214620E-27	0.19431900E-30
12215	-5443.6519	0.00000000E+00	-0.16317526E-29	0.00000000E+00	0.19224725E-27	0.16732637E-30
12216	-5443.6715	0.00000000E+00	-0.85169316E-29	0.00000000E+00	0.11113225E-27	0.14360820E-30
12217	-5443.4864	0.00000000E+00	-0.10971122E-28	0.00000000E+00	0.58388699E-28	0.12291159E-30
12218	-5443.2153	0.00000000E+00	-0.10951686E-28	0.00000000E+00	0.25656509E-28	0.10495258E-30
12219	-5442.9456	0.00000000E+00	-0.97079132E-29	0.00000000E+00	0.65353362E-29	0.89440140E-31
12220	-5442.7467	0.00000000E+00	-0.79972230E-29	0.00000000E+00	-0.36821857E-29	0.76091188E-31
12221	-5442.6897	0.00000000E+00	-0.62477914E-29	0.00000000E+00	-0.83350566E-29	0.64639538E-31
12222	-5442.8405	0.00000000E+00	-0.46762911E-29	0.00000000E+00	-0.97007182E-29	0.54840662E-31
12223	-5443.2181	0.00000000E+00	-0.33701063E-29	0.00000000E+00	-0.92854634E-29	0.46473712E-31
12224	-5443.7520	0.00000000E+00	-0.23426671E-29	0.00000000E+00	-0.80331812E-29	0.39341746E-31
12225	-5444.2956	0.00000000E+00	-0.15692208E-29	0.00000000E+00	-0.65069851E-29	0.33270850E-31
12226	-5444.7032	0.00000000E+00	-0.10088716E-29	0.00000000E+00	-0.50169601E-29	0.28108613E-31
12227	-5444.9079	0.00000000E+00	-0.61732765E-30	0.00000000E+00	-0.37127882E-29	0.23722267E-31
12228	-5444.9329	0.00000000E+00	-0.35360514E-30	0.00000000E+00	-0.26477531E-29	0.19996690E-31
12229	-5444.8470	0.00000000E+00	-0.18297944E-30	0.00000000E+00	-0.18213403E-29	0.16832426E-31
12230	-5444.7170	0.00000000E+00	-0.77743810E-31	0.00000000E+00	-0.12064250E-29	0.14143775E-31
12231	-5444.5881	0.00000000E+00	-0.16795442E-31	0.00000000E+00	-0.76575333E-30	0.11857021E-31
12232	-5444.4900	0.00000000E+00	0.15312947E-31	0.00000000E+00	-0.46125884E-30	0.99088025E-32
12233	-5444.4471	0.00000000E+00	0.29479250E-31	0.00000000E+00	-0.25877583E-30	0.82446535E-32
12234	-5444.4800	0.00000000E+00	0.33111148E-31	0.00000000E+00	-0.12993871E-30	0.68176853E-32
12235	-5444.5933	0.00000000E+00	0.31042017E-31	0.00000000E+00	-0.52470096E-31	0.55874220E-32
12236	-5444.7633	0.00000000E+00	0.26271821E-31	0.00000000E+00	-0.96334921E-32	0.45187634E-32
12237	-5444.9422	0.00000000E+00	0.20536679E-31	0.00000000E+00	0.10674792E-31	0.35810665E-32
12238	-5445.0832	0.00000000E+00	0.14728798E-31	0.00000000E+00	0.16927728E-31	0.27473269E-32
12239	-5445.1655	0.00000000E+00	0.91997625E-32	0.00000000E+00	0.14951488E-31	0.19934460E-32
12240	-5445.1979	0.00000000E+00	0.40333205E-32	0.00000000E+00	0.89214066E-32	0.12975676E-32
12241	-5445.2038	0.00000000E+00	-0.39351987E-33	0.00000000E+00	0.25866598E-32	0.63947028E-33
12242	-2722.6016	-2709.1141	-0.87132294E-33	0.13044609E-33	-0.37341694E-34	0.15871156E-33
26014	0.00000000E+00	16254.827	0.00000000E+00	0.00000000E+00	0.00000000E+00	0.00000000E+00
26032	0.00000000E+00	11825.346	0.00000000E+00	0.00000000E+00	0.00000000E+00	0.00000000E+00
26044	0.00000000E+00	8797.6174	0.00000000E+00	0.00000000E+00	0.00000000E+00	0.00000000E+00
26056	0.00000000E+00	6545.6334	0.00000000E+00	0.00000000E+00	0.00000000E+00	0.00000000E+00
26068	0.00000000E+00	4869.9231	0.00000000E+00	0.00000000E+00	0.00000000E+00	0.00000000E+00
26080	0.00000000E+00	3622.9552	0.00000000E+00	0.00000000E+00	0.00000000E+00	0.00000000E+00
26092	0.00000000E+00	2694.9481	0.00000000E+00	0.00000000E+00	0.00000000E+00	0.00000000E+00
26104	0.00000000E+00	2004.2012	0.00000000E+00	0.00000000E+00	0.00000000E+00	0.00000000E+00
26116	0.00000000E+00	1489.9017	0.00000000E+00	0.00000000E+00	0.00000000E+00	0.00000000E+00
26128	0.00000000E+00	1106.7716	0.00000000E+00	0.00000000E+00	0.00000000E+00	0.00000000E+00
26140	0.00000000E+00	821.08025	0.00000000E+00	0.00000000E+00	0.00000000E+00	0.00000000E+00
26152	0.00000000E+00	607.67591	0.00000000E+00	0.00000000E+00	0.00000000E+00	0.00000000E+00
26164	0.00000000E+00	447.77066	0.00000000E+00	0.00000000E+00	0.00000000E+00	0.00000000E+00
26176	0.00000000E+00	327.28661	0.00000000E+00	0.00000000E+00	0.00000000E+00	0.00000000E+00
26188	0.00000000E+00	235.61650	0.00000000E+00	0.00000000E+00	0.00000000E+00	0.00000000E+00
26200	0.00000000E+00	164.68980	0.00000000E+00	0.00000000E+00	0.00000000E+00	0.00000000E+00
26212	0.00000000E+00	108.26219	0.00000000E+00	0.00000000E+00	0.00000000E+00	0.00000000E+00
26224	0.00000000E+00	61.365863	0.00000000E+00	0.00000000E+00	0.00000000E+00	0.00000000E+00
26236	0.00000000E+00	19.872115	0.00000000E+00	0.00000000E+00	0.00000000E+00	0.00000000E+00

TOTAL -0.65047061E-08 0.49509758E-07 -0.14568322E-08 11591.588 -0.27256904E-09 0.16149023E-10

***** ROUTINE COMPLETED ***** CP = 661.800

/EOF ENCOUNTERED ON FILE18

***** RUN COMPLETED ***** CP= 662.1300 TIME= 11.7810

ANSYS PREP7 Input File: stfpt5p7.in - (stud stiffness reduced to 1E5)

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/PREP7
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/COM Input File: stfpt5p7.in
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ET,2,14,,,2          *1-DOF LONG. SPRING (UY DOF)
R,1,0.375             *PL .375"
R,2,0.5               *PL .5"
R,3,100000.           *K1=1E5
EX,1,25000000.        *STEEL WITH NO MASS
DENS,1,0.
/COM
/COM CURVED BOTTOM
/COM
N,1,0.,0.,12.
N,2,0.,.5873,8.2918
N,3,0.,2.2918,4.9466
N,4,0.,4.9466,2.2918
N,5,0.,8.2918,.5873
N,6,0.,12.,0.
N,22,0.,20.,0.
FILL,6,22
/COM
/COM TOP CORNER NODE
/COM
N,242,0.,460.,0.
/COM
/COM FILL FOR EDGE
/COM
FILL,22,242
/COM
/COM GENERATE ALL PLATE NODES
/COM
NGEN,5,500,1,242,1,2.
NGEN,17,500,2001,2242,1,.5
NGEN,5,500,10001,10242,1,2.
/COM
/COM GENERATE VERT. ROW OF STUD SPRING NODES
/COM
NGEN,2,20000,6014,6214,1,0.,0.,0.
NGEN,2,20000,6032,6236,12,0.,0.,0.
/COM
/COM GENERATE PLATE ELEMENTS
/COM
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E,1,501,502,2
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REAL,1
E,24,524,523,23
EGEN,219,1,-1
ENGEN,500,24,500,ALL
/COM
/COM VERT. ROW OF STUD SPRING ELEMENTS
/COM
TYPE,2
REAL,3
EN,26014,6014,26014
EN,26032,6032,26032
ENGEN,12,18,12,26032
WSORT,Y
/COM
KTEMP
TREF,55
TUNIF,160
MP,EX,1,25.0E6
MP,ALPX,1,1.94E-6
MPLIST

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D,1,ALL,0.,,12001,12000
D,501,UY,0.,,11501,500,UZ,ROTX,ROTY,ROTZ
D,2,UX,0.,,5,1,ROTY,ROTZ
D,12002,UX,0.,,12005,1,ROTY,ROTZ
D,6,UX,0.,,241,1,UZ,ROTY,ROTZ
D,12006,UX,0.,,12241,1,UZ,ROTY,ROTZ
D,242,ALL,0.,,12242,12000
D,742,UY,0.,,11742,500,UZ,ROTX,ROTY,ROTZ
D,26014,UY,0.
D,26032,UY,0.,,26236,12
ITER,1,,1
LWRITE
AFWRITE
FINISH
/EOF
/EOF

ANSYS PREP7 Output File: stfpt5p7.out - (stud stiffness reduced to 1E5)

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***** ANSYS INPUT DATA LISTING (FILE18) *****

```

1  /PREP7
2  /TITLE, SY-101 ANNULUS HEAT-UP STUD STIFFNESS CHECK
3  /COM Input File: stfpt5p7.in
4  KAN,0
5  ET,1,63,,,1          *QUADRILATERAL PLATE
6  ET,2,14,,2          *1-DOF LONG. SPRING (UY DOF)
7  R,1,0.375           *PL .375"
8  R,2,0.5             *PL .5"
9  R,3,100000.         *K1=1E5
10 EX,1,25000000.      *STEEL WITH NO MASS
11 DENS,1,0.
12 /COM
13 /COM CURVED BOTTOM
14 /COM
15 N,1,0.,0.,12.
16 N,2,0.,.5873,8.2918
17 N,3,0.,2.2918,4.9466
18 N,4,0.,4.9466,2.2918
19 N,5,0.,8.2918,.5873
20 N,6,0.,12.,0.
21 N,22,0.,20.,0.
22 FILL,6,22
23 /COM
24 /COM TOP CORNER NODE
25 /COM
26 N,242,0.,460.,0.
27 /COM
28 /COM FILL FOR EDGE
29 /COM
30 FILL,22,242
31 /COM
32 /COM GENERATE ALL PLATE NODES
33 /COM
34 NGEN,5,500,1,242,1,2.
35 NGEN,17,500,2001,2242,1,.5
36 NGEN,5,500,10001,10242,1,2.
37 /COM
38 /COM GENERATE VERT. ROW OF STUD SPRING NODES
39 /COM
40 NGEN,2,20000,6014,6214,1,0.,0.,0.
41 NGEN,2,20000,6032,6236,12,0.,0.,0.
42 /COM
43 /COM GENERATE PLATE ELEMENTS
44 /COM
45 TYPE,1 $MAT,1
46 REAL,2
47 E,1,501,502,2
48 EGEN,23,1,-1
49 REAL,1
50 E,24,524,523,23
51 EGEN,219,1,-1
52 ENGEN,500,24,500,ALL
53 /COM
54 /COM VERT. ROW OF STUD SPRING ELEMENTS
55 /COM
56 TYPE,2
57 REAL,3
58 EN,26014,6014,26014

```

59 EN,26032,6032,26032
60 ENGEN,12,18,12,26032
61 WSORT,Y
62 /COM
63 KTEMP
64 TREF,55
65 TUNIF,160
66 MP,EX,1,25.0E6
67 MP,ALPX,1,1.94E-6
68 MPLIST
69 D,1,ALL,0.,,12001,12000
70 D,501,UY,0.,,11501,500,UZ,ROTX,ROTY,ROTZ
71 D,2,UX,0.,,5,1,ROTY,ROTZ
72 D,12002,UX,0.,,12005,1,ROTY,ROTZ
73 D,6,UX,0.,,241,1,UZ,ROTY,ROTZ
74 D,12006,UX,0.,,12241,1,UZ,ROTY,ROTZ
75 D,242,ALL,0.,,12242,12000
76 D,742,UY,0.,,11742,500,UZ,ROTX,ROTY,ROTZ
77 D,26014,UY,0.
78 D,26032,UY,0.,,26236,12
79 ITER,1,,1
80 LWRITE
81 AFWRITE
82 FINISH
83 /EOF
84 /EOF

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TITLE
8.510

14.6210 MAY 26,1994 CP=

***** ANSYS ANALYSIS DEFINITION (PREP7) *****

NEW TITLE= SY-101 ANNULUS HEAT-UP STUD STIFFNESS CHECK

Input File: stfpt5p7.in

ANALYSIS TYPE= 0 (STATIC ANALYSIS)

ELEMENT TYPE 1 USES STIF 63

KEYOPT(1-9)= 0 0 1 0 0 0 0 0 0

INOPR= 0 NUMBER OF NODES= 4

QUAD. FLAT SHELL

CURRENT NODAL DOF SET IS UX UY UZ ROTX ROTY ROTZ
THREE-DIMENSIONAL STRUCTURE

ELEMENT TYPE 2 USES STIF 14

KEYOPT(1-9)= 0 2 0 0 0 0 0 0 0

INOPR= 0 NUMBER OF NODES= 2

SPRING-DAMPER

CURRENT NODAL DOF SET IS UX UY UZ ROTX ROTY ROTZ
THREE-DIMENSIONAL STRUCTURE

REAL CONSTANT SET 1 ITEMS 1 TO 6

0.37500 0.00000E+00 0.00000E+00 0.00000E+00 0.00000E+00 0.00000E+00

REAL CONSTANT SET 2 ITEMS 1 TO 6

0.50000 0.00000E+00 0.00000E+00 0.00000E+00 0.00000E+00 0.00000E+00

REAL CONSTANT SET 3 ITEMS 1 TO 6

0.10000E+06 0.00000E+00 0.00000E+00 0.00000E+00 0.00000E+00 0.00000E+00

MATERIAL 1 COEFFICIENTS OF EX VS. TEMP EQUATION

C0 = 0.2500000E+08

PROPERTY TABLE EX MAT= 1 NUM. POINTS= 2

TEMPERATURE	DATA	TEMPERATURE	DATA
-9999.0	0.25000E+08	9999.0	0.25000E+08

MATERIAL 1 COEFFICIENTS OF DENS VS. TEMP EQUATION

C0 = 0.0000000E+00

PROPERTY TABLE DENS MAT= 1 NUM. POINTS= 2

TEMPERATURE	DATA	TEMPERATURE	DATA
-9999.0	0.00000E+00	9999.0	0.00000E+00

CURVED BOTTOM

NODE	1	KCS= 0	X,Y,Z= 0.00000E+00 0.00000E+00 12.000
NODE	2	KCS= 0	X,Y,Z= 0.00000E+00 0.58730 8.2918
NODE	3	KCS= 0	X,Y,Z= 0.00000E+00 2.2918 4.9466
NODE	4	KCS= 0	X,Y,Z= 0.00000E+00 4.9466 2.2918
NODE	5	KCS= 0	X,Y,Z= 0.00000E+00 8.2918 0.58730
NODE	6	KCS= 0	X,Y,Z= 0.00000E+00 12.000 0.00000E+00

NODE 22 KCS= 0 X,Y,Z= 0.00000E+00 20.000 0.00000E+00

FILL 15 POINTS BETWEEN NODE 6 AND NODE 22
START WITH NODE 7 AND INCREMENT BY 1

TOP CORNER NODE

NODE 242 KCS= 0 X,Y,Z= 0.00000E+00 460.00 0.00000E+00

FILL FOR EDGE

FILL 219 POINTS BETWEEN NODE 22 AND NODE 242
START WITH NODE 23 AND INCREMENT BY 1

GENERATE ALL PLATE NODES

GENERATE 5 TOTAL SETS OF NODES WITH INCREMENT 500
SET IS SELECTED NODES IN RANGE 1 TO 242 IN STEPS OF 1
GEOMETRY INCREMENTS ARE 2.0000 0.00000E+00 0.00000E+00

GENERATE 17 TOTAL SETS OF NODES WITH INCREMENT 500
SET IS SELECTED NODES IN RANGE 2001 TO 2242 IN STEPS OF 1
GEOMETRY INCREMENTS ARE 0.50000 0.00000E+00 0.00000E+00

GENERATE 5 TOTAL SETS OF NODES WITH INCREMENT 500
SET IS SELECTED NODES IN RANGE 10001 TO 10242 IN STEPS OF 1
GEOMETRY INCREMENTS ARE 2.0000 0.00000E+00 0.00000E+00

GENERATE VERT. ROW OF STUD SPRING NODES

GENERATE 2 TOTAL SETS OF NODES WITH INCREMENT 20000
SET IS SELECTED NODES IN RANGE 6014 TO 6214 IN STEPS OF 1
GEOMETRY INCREMENTS ARE 0.00000E+00 0.00000E+00 0.00000E+00

GENERATE 2 TOTAL SETS OF NODES WITH INCREMENT 20000
SET IS SELECTED NODES IN RANGE 6032 TO 6236 IN STEPS OF 12
GEOMETRY INCREMENTS ARE 0.00000E+00 0.00000E+00 0.00000E+00

GENERATE PLATE ELEMENTS

ELEMENT TYPE SET TO 1

MATERIAL NUMBER SET TO 1

REAL CONSTANT NUMBER= 2
ELEMENT 1 1 501 502 2

GENERATE 23 TOTAL SETS OF ELEMENTS WITH NODE INCREMENT OF 1
SET IS SELECTED ELEMENTS IN RANGE 1 TO 1 IN STEPS OF 1
NUMBER OF ELEMENTS= 23

REAL CONSTANT NUMBER= 1
ELEMENT 24 24 524 523 23

GENERATE 219 TOTAL SETS OF ELEMENTS WITH NODE INCREMENT OF 1
SET IS SELECTED ELEMENTS IN RANGE 24 TO 24 IN STEPS OF 1
NUMBER OF ELEMENTS= 242

NEXT ELEMENT GENERATION SETS INCREMENTED BY 500

GENERATE 24 TOTAL SETS OF ELEMENTS WITH NODE INCREMENT OF 500
SET IS SELECTED ELEMENTS IN RANGE 1 TO 242 IN STEPS OF 1
NUMBER OF ELEMENTS= 11742

VERT. ROW OF STUD SPRING ELEMENTS

ELEMENT TYPE SET TO 2

REAL CONSTANT NUMBER= 3
ELEMENT 26014 6014 26014
ELEMENT 26032 6032 26032

NEXT ELEMENT GENERATION SETS INCREMENTED BY 12

GENERATE 18 TOTAL SETS OF ELEMENTS WITH NODE INCREMENT OF 12
SET IS SELECTED ELEMENTS IN RANGE 26032 TO 26032 IN STEPS OF 1
NUMBER OF ELEMENTS= 26236

REORDER SELECTED ELEMENTS BY SORTING ON CENTROID Y LOCATION.

ELEMENTS ARE SORTED IN ASCENDING ORDER
IN COORDINATE SYSTEM 0

REORDERED ELEMENTS ARE STORED AFTER PREVIOUS (IF ANY) REORDERED ELEMENTS.

KEEP NEW ORDERING BASED ON MAX WAVEFRONT

*** NOTE ***

NEW MAX WF(DOF)= 162. PREVIOUS MAX= 1578.
NEW RMS WF(DOF)= 162. PREVIOUS MAX= 1002.

ALL TEMPERATURES SET TO TUNIF= 0.000

REFERENCE TEMPERATURE= 55.000 (TUNIF= 55.000)

UNIFORM TEMPERATURE= 160.000 (TREF= 55.000)

MATERIAL 1 COEFFICIENTS OF EX VS. TEMP EQUATION
CO = 0.2500000E+08

PROPERTY TABLE EX MAT= 1 NUM. POINTS= 2
TEMPERATURE DATA TEMPERATURE DATA
-9999.0 0.25000E+08 9999.0 0.25000E+08

MATERIAL 1 COEFFICIENTS OF ALPX VS. TEMP EQUATION
CO = 0.1940000E-05

PROPERTY TABLE ALPX MAT= 1 NUM. POINTS= 2
TEMPERATURE DATA TEMPERATURE DATA
-9999.0 0.19400E-05 9999.0 0.19400E-05

LIST ALL MATERIALS PROPERTY= ALL

PROPERTY TABLE EX MAT= 1 NUM. POINTS= 2
TEMPERATURE DATA TEMPERATURE DATA
-9999.0 0.25000E+08 9999.0 0.25000E+08

PROPERTY TABLE DENS MAT= 1 NUM. POINTS= 2
TEMPERATURE DATA TEMPERATURE DATA
-9999.0 0.00000E+00 9999.0 0.00000E+00

PROPERTY TABLE ALPX MAT= 1 NUM. POINTS= 2
TEMPERATURE DATA TEMPERATURE DATA
-9999.0 0.19400E-05 9999.0 0.19400E-05

SPECIFIED DISP ALL FOR SELECTED NODES IN RANGE 1 TO 12001 BY 12000
VALUES= 0.00000E+00 0.00000E+00 ADDITIONAL DOFS=

SPECIFIED DISP UY FOR SELECTED NODES IN RANGE 501 TO 11501 BY 500
VALUES= 0.00000E+00 0.00000E+00 ADDITIONAL DOFS= UZ ROTX ROTY ROTZ

SPECIFIED DISP UX FOR SELECTED NODES IN RANGE 2 TO 5 BY 1
VALUES= 0.00000E+00 0.00000E+00 ADDITIONAL DOFS= ROTY ROTZ

SPECIFIED DISP UX FOR SELECTED NODES IN RANGE 12002 TO 12005 BY 1
VALUES= 0.00000E+00 0.00000E+00 ADDITIONAL DOFS= ROTY ROTZ

SPECIFIED DISP UX FOR SELECTED NODES IN RANGE 6 TO 241 BY 1
VALUES= 0.00000E+00 0.00000E+00 ADDITIONAL DOFS= UZ ROTY ROTZ

SPECIFIED DISP UX FOR SELECTED NODES IN RANGE 12006 TO 12241 BY 1
VALUES= 0.00000E+00 0.00000E+00 ADDITIONAL DOFS= UZ ROTY ROTZ

SPECIFIED DISP ALL FOR SELECTED NODES IN RANGE 242 TO 12242 BY 12000
VALUES= 0.00000E+00 0.00000E+00 ADDITIONAL DOFS=

SPECIFIED DISP UY FOR SELECTED NODES IN RANGE 742 TO 11742 BY 500
VALUES= 0.00000E+00 0.00000E+00 ADDITIONAL DOFS= UZ ROTX ROTY ROTZ

SPECIFIED DISP UY FOR SELECTED NODES IN RANGE 26014 TO 26014 BY 1
VALUES= 0.00000E+00 0.00000E+00 ADDITIONAL DOFS=

SPECIFIED DISP UY FOR SELECTED NODES IN RANGE 26032 TO 26236 BY 12
VALUES= 0.00000E+00 0.00000E+00 ADDITIONAL DOFS=

NITTER= 1 NPRINT= 99900 NPOST= 1

ALL PRINT CONTROLS RESET TO 99900
ALL POST DATA FILE CONTROLS RESET TO 1

LOAD STEP 1 WRITTEN ON FILE23

*** NOTE ***
DATA CHECKED - NO FATAL ERRORS FOUND.
CHECK OUTPUT FOR POSSIBLE WARNING MESSAGES.

LOADS DATA READ FROM FILE23

*** PREP7 GLOBAL STATUS ***

TITLE= SY-101 ANNULUS HEAT-UP STUD STIFFNESS CHECK
ANALYSIS TYPE= 0
NUMBER OF ELEMENT TYPES= 2
5827 ELEMENTS CURRENTLY SELECTED. MAX ELEMENT NUMBER = 26236
6253 NODES CURRENTLY SELECTED. MAX NODE NUMBER = 26236
MAXIMUM LINEAR PROPERTY NUMBER= 1
MAXIMUM REAL CONSTANT SET NUMBER= 3
ACTIVE COORDINATE SYSTEM= 0 (CARTESIAN)
NUMBER OF IMPOSED DISPLACEMENTS= 2185

ANALYSIS DATA WRITTEN ON FILE27

ALL CURRENT PREP7 DATA WRITTEN TO FILE16 NAME= FILE16.DAT
FOR POSSIBLE RESUME FROM THIS POINT

***** ROUTINE COMPLETED ***** CP = 210.580

/EOF ENCOUNTERED ON FILE18

***** RUN COMPLETED ***** CP= 210.7500 TIME= 14.6771

ANSYS POST1 Input File: stfpt5p1.in - (stud stiffness reduced to 1E5)

```
/CORE,,,9.E7
/POST1
STORE,STRESS,RFORCE
STRESS,TSG1,63,129
STRESS,TSG3,63,131
STRESS,MSG1,63,134
STRESS,MSG3,63,136
STRESS,BSG1,63,139
STRESS,BSG3,63,141
NLINES,9999
SET,1,1
ESORT,TSG1,0,1,10
PRSTRS,TSG1,TSG3,MSG1,MSG3,BSG1,BSG3
EUSORT
ESORT,TSG3,0,1,10
PRSTRS,TSG1,TSG3,MSG1,MSG3,BSG1,BSG3
EUSORT
ESORT,MSG1,0,1,10
PRSTRS,TSG1,TSG3,MSG1,MSG3,BSG1,BSG3
EUSORT
ESORT,MSG3,0,1,10
PRSTRS,TSG1,TSG3,MSG1,MSG3,BSG1,BSG3
EUSORT
ESORT,BSG1,0,1,10
PRSTRS,TSG1,TSG3,MSG1,MSG3,BSG1,BSG3
EUSORT
ESORT,BSG3,0,1,10
PRSTRS,TSG1,TSG3,MSG1,MSG3,BSG1,BSG3
EUSORT
PRRF
FINISH
/EOF
```


ANSYS POST1 Output File: stfpt5p1.out - (stud stiffness reduced to 1E5)

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***** ANSYS INPUT DATA LISTING (FILE18) *****

```

1  /CORE,,,9.E7
2  /POST1
3  STORE,STRESS,RFORCE
4  STRESS,TSG1,63,129
5  STRESS,TSG3,63,131
6  STRESS,MSG1,63,134
7  STRESS,MSG3,63,136
8  STRESS,BSG1,63,139
9  STRESS,BSG3,63,141
10 NLines,9999
11 SET,1,1
12 ESORT,TSG1,0,1,10
13 PRSTRS,TSG1,TSG3,MSG1,MSG3,BSG1,BSG3
14 EUSORT
15 ESORT,TSG3,0,1,10
16 PRSTRS,TSG1,TSG3,MSG1,MSG3,BSG1,BSG3
17 EUSORT
18 ESORT,MSG1,0,1,10
19 PRSTRS,TSG1,TSG3,MSG1,MSG3,BSG1,BSG3
20 EUSORT
21 ESORT,MSG3,0,1,10
22 PRSTRS,TSG1,TSG3,MSG1,MSG3,BSG1,BSG3
23 EUSORT
24 ESORT,BSG1,0,1,10
25 PRSTRS,TSG1,TSG3,MSG1,MSG3,BSG1,BSG3
26 EUSORT
27 ESORT,BSG3,0,1,10
28 PRSTRS,TSG1,TSG3,MSG1,MSG3,BSG1,BSG3
29 EUSORT
30 PRRF
31 FINISH
32 /EOF

```

***** MEMORY REQUEST FROM /CORE *****

```

MAXIMUM FIXED = 0
MAXIMUM TEMP = 0
MAXIMUM VIRTUAL=90000000

```

***** MEMORY OBTAINED *****

```

FIXED = 4002000
TEMP = 0
VIRTUAL=16000000

```

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15.3609 MAY 26,1994 CP=

7.960

***** ANSYS RESULTS INTERPRETATION (POST1) *****

STORE STRESSES
STORE REACTION FORCES

STORE TSG1 FOR ELEMENT TYPE STIF 63 FROM ITEM 129
STORE TSG3 FOR ELEMENT TYPE STIF 63 FROM ITEM 131
STORE MSG1 FOR ELEMENT TYPE STIF 63 FROM ITEM 134
STORE MSG3 FOR ELEMENT TYPE STIF 63 FROM ITEM 136
STORE BSG1 FOR ELEMENT TYPE STIF 63 FROM ITEM 139
STORE BSG3 FOR ELEMENT TYPE STIF 63 FROM ITEM 141

NUMBER OF LINES PER PAGE=9999

USE LOAD STEP 1 ITERATION 1 SECTION 1 FOR LOAD CASE 1

*** NOTE ***

ALL STRESSES ARE IN GLOBAL COORDINATES UNLESS
THE COMMAND -- GLOBAL,0 -- IS ENTERED

GEOMETRY STORED FOR 6069 NODES 5827 ELEMENTS
TITLE= SY-101 ANNULUS HEAT-UP STUD STIFFNESS CHECK

***WARNING *** CP= 100.180 TIME= 15.38656
DATA FOR STRESS LABEL TSG1 HAS NOT BEEN STORED FOR ALL ELEMENTS.
TSG1 DATA FOR TYPE 2. STIF 14. ELEMENTS WILL BE SET TO ZERO

***WARNING *** CP= 100.350 TIME= 15.38661
DATA FOR STRESS LABEL TSG3 HAS NOT BEEN STORED FOR ALL ELEMENTS.
TSG3 DATA FOR TYPE 2. STIF 14. ELEMENTS WILL BE SET TO ZERO

***WARNING *** CP= 100.400 TIME= 15.38662
DATA FOR STRESS LABEL MSG1 HAS NOT BEEN STORED FOR ALL ELEMENTS.
MSG1 DATA FOR TYPE 2. STIF 14. ELEMENTS WILL BE SET TO ZERO

***WARNING *** CP= 100.400 TIME= 15.38662
DATA FOR STRESS LABEL MSG3 HAS NOT BEEN STORED FOR ALL ELEMENTS.
MSG3 DATA FOR TYPE 2. STIF 14. ELEMENTS WILL BE SET TO ZERO

***WARNING *** CP= 100.400 TIME= 15.38662
DATA FOR STRESS LABEL BSG1 HAS NOT BEEN STORED FOR ALL ELEMENTS.
BSG1 DATA FOR TYPE 2. STIF 14. ELEMENTS WILL BE SET TO ZERO

***WARNING *** CP= 100.460 TIME= 15.38664
DATA FOR STRESS LABEL BSG3 HAS NOT BEEN STORED FOR ALL ELEMENTS.
BSG3 DATA FOR TYPE 2. STIF 14. ELEMENTS WILL BE SET TO ZERO

STRESSES STORED FOR 10 SELECTED ITEMS

NODAL STRESSES AND TEMPS. STORED FOR 5808 ELEMENTS

ITERATION SUMMARY INFORMATION STORED

*** NOTE ***

LOAD STEP 1. ITER 1. NODAL FORCES (GROUP 4.) NOT ON FILE12.

REACTIONS STORED FOR 2185 REACTIONS

FOR LOAD STEP= 1 ITERATION= 1 SECTION= 1
TIME= 0.000000E+00 LOAD CASE= 1
TITLE= SY-101 ANNULUS HEAT-UP STUD STIFFNESS CHECK

SORT ON TSG1 ORDER= 0 KABS= 1 NMAX= 10

SORT COMPLETED FOR 10 VALUES.

PRINT ELEMENT STRESS ITEMS PER ELEMENT

*** NOTE ***

SHELL STRESSES SET TO TOP FOR ERROR CALCULATIONS

SY-101 ANNULUS HEAT-UP STUD STIFFNESS CHECK
333.610

15.4514 MAY 26,1994 CP=

***** POST1 ELEMENT STRESS LISTING *****

LOAD STEP 1 ITERATION= 1 SECTION= 1
TIME= 0.00000E+00 LOAD CASE= 1

ELEM	TSG1	TSG3	MSG1	MSG3	BSG1	BSG3
6	21735.624	0.00000000E+00	0.00000000E+00	-7843.7127	0.00000000E+00	-30951.729
11506	21735.624	0.00000000E+00	0.00000000E+00	-7843.7127	0.00000000E+00	-30951.729
8001	15893.321	-254.27726	0.00000000E+00	-5205.6952	0.00000000E+00	-17298.515
3501	15893.321	-254.27726	0.00000000E+00	-5205.6952	0.00000000E+00	-17298.515
8501	15892.407	-270.36102	0.00000000E+00	-5208.7906	0.00000000E+00	-17266.738
3001	15892.407	-270.36102	0.00000000E+00	-5208.7906	0.00000000E+00	-17266.738
11501	15889.461	-398.60711	0.00000000E+00	-5328.6530	0.00000000E+00	-16672.469
1	15889.461	-398.60711	0.00000000E+00	-5328.6530	0.00000000E+00	-16672.469
7501	15886.676	-246.18011	0.00000000E+00	-5203.2075	0.00000000E+00	-17318.149
4001	15886.676	-246.18011	0.00000000E+00	-5203.2075	0.00000000E+00	-17318.149

MINIMUMS
ELEMENT 4001 1 6 11506 6 6
VALUE 15886.676 -398.60711 0.00000000E+00 -7843.7127 0.00000000E+00 -30951.729

MAXIMUMS
ELEMENT 6 6 6 4001 6 11501
VALUE 21735.624 0.00000000E+00 0.00000000E+00 -5203.2075 0.00000000E+00 -16672.469

ELEMENT SORT REMOVED

SORT ON TSG3 ORDER= 0 KABS= 1 NMAX= 10

SORT COMPLETED FOR 10 VALUES.

PRINT ELEMENT STRESS ITEMS PER ELEMENT

SY-101 ANNULUS HEAT-UP STUD STIFFNESS CHECK
432.700

15.4789 MAY 26,1994 CP=

***** POST1 ELEMENT STRESS LISTING *****

LOAD STEP 1 ITERATION= 1 SECTION= 1
TIME= 0.00000E+00 LOAD CASE= 1

ELEM	TSG1	TSG3	MSG1	MSG3	BSG1	BSG3
11504	0.00000000E+00	-16501.999	0.00000000E+00	-5024.4179	12018.193	-982.98921
4	0.00000000E+00	-16501.999	0.00000000E+00	-5024.4179	12018.193	-982.98921
504	0.00000000E+00	-14710.603	0.00000000E+00	-5677.6615	11000.957	-1181.3729
11004	0.00000000E+00	-14710.603	0.00000000E+00	-5677.6615	11000.957	-1181.3729
11503	0.00000000E+00	-12931.410	0.00000000E+00	-4383.5768	11357.235	-172.64484
3	0.00000000E+00	-12931.410	0.00000000E+00	-4383.5768	11357.235	-172.64484
11003	0.00000000E+00	-12737.886	0.00000000E+00	-4789.6501	11236.543	-874.49746
503	0.00000000E+00	-12737.886	0.00000000E+00	-4789.6501	11236.543	-874.49746
1003	0.00000000E+00	-12380.463	0.00000000E+00	-5309.6266	10941.466	-1833.2529
10503	0.00000000E+00	-12380.463	0.00000000E+00	-5309.6266	10941.466	-1833.2529

MINIMUMS
ELEMENT 11504 11504 11504 504 1003 1003
VALUE 0.00000000E+00 -16501.999 0.00000000E+00 -5677.6615 10941.466 -1833.2529

MAXIMUMS
ELEMENT 11504 1003 11504 11503 11504 11503
VALUE 0.00000000E+00 -12380.463 0.00000000E+00 -4383.5768 12018.193 -172.64484

ELEMENT SORT REMOVED

SORT ON MSG1 ORDER= 0 KABS= 1 NMAX= 10

SORT COMPLETED FOR 10 VALUES.

PRINT ELEMENT STRESS ITEMS PER ELEMENT

SY-101 ANNULUS HEAT-UP STUD STIFFNESS CHECK
533.270

15.5069 MAY 26,1994 CP=

***** POST1 ELEMENT STRESS LISTING *****

LOAD STEP 1 ITERATION= 1 SECTION= 1
TIME= 0.00000E+00 LOAD CASE= 1

ELEM	TSG1	TSG3	MSG1	MSG3	BSG1	BSG3
5513	7838.8867	-5582.5666	5929.8549	-5402.1801	4096.3370	-5297.3077
6013	7838.8867	-5582.5666	5929.8549	-5402.1801	4096.3370	-5297.3077
5512	5332.9067	-6059.4601	3253.8228	-5715.8956	1194.0550	-5391.6470
6012	5332.9067	-6059.4601	3253.8228	-5715.8956	1194.0550	-5391.6470
5511	4356.0439	-5748.4167	2235.0571	-5360.4840	119.26757	-4977.7486
6011	4356.0439	-5748.4167	2235.0571	-5360.4840	119.26757	-4977.7486
5532	1819.8258	-5676.4160	1795.6414	-5626.7998	1771.5541	-5577.2806
6032	1819.8258	-5676.4160	1795.6414	-5626.7998	1771.5541	-5577.2806
6010	3854.4279	-5538.0193	1727.8503	-5133.3305	0.00000000E+00	-4730.6706
5510	3854.4279	-5538.0193	1727.8503	-5133.3305	0.00000000E+00	-4730.6706

MINIMUMS	ELEMENT	5532	6012	5510	6012	6010	6032
VALUE		1819.8258	-6059.4601	1727.8503	-5715.8956	0.00000000E+00	-5577.2806

MAXIMUMS	ELEMENT	5513	5510	6013	5510	6013	6010
VALUE		7838.8867	-5538.0193	5929.8549	-5133.3305	4096.3370	-4730.6706

ELEMENT SORT REMOVED

SORT ON MSG3 ORDER= 0 KABS= 1 NMAX= 10

SORT COMPLETED FOR 10 VALUES.

PRINT ELEMENT STRESS ITEMS PER ELEMENT

SY-101 ANNULUS HEAT-UP STUD STIFFNESS CHECK
631.530

15.5342 MAY 26,1994 CP=

***** POST1 ELEMENT STRESS LISTING *****

LOAD STEP 1 ITERATION= 1 SECTION= 1
TIME= 0.00000E+00 LOAD CASE= 1

ELEM	TSG1	TSG3	MSG1	MSG3	BSG1	BSG3
6014	0.00000000E+00	-7876.9297	0.00000000E+00	-8339.1971	0.00000000E+00	-9217.1502
5514	0.00000000E+00	-7876.9297	0.00000000E+00	-8339.1971	0.00000000E+00	-9217.1502
6	21735.624	0.00000000E+00	0.00000000E+00	-7843.7127	0.00000000E+00	-30951.729
11506	21735.624	0.00000000E+00	0.00000000E+00	-7843.7127	0.00000000E+00	-30951.729
11505	7154.8480	-742.00091	0.00000000E+00	-7079.6715	0.00000000E+00	-16369.998
5	7154.8480	-742.00091	0.00000000E+00	-7079.6715	0.00000000E+00	-16369.998
11507	9223.7689	-3069.6620	0.00000000E+00	-6966.6269	0.00000000E+00	-18964.792
7	9223.7689	-3069.6620	0.00000000E+00	-6966.6269	0.00000000E+00	-18964.792
6033	0.00000000E+00	-6959.7167	0.00000000E+00	-6945.7399	0.00000000E+00	-6932.3362
5533	0.00000000E+00	-6959.7167	0.00000000E+00	-6945.7399	0.00000000E+00	-6932.3362

MINIMUMS	ELEMENT	6014	6014	6014	6014	6014	6
VALUE		0.00000000E+00	-7876.9297	0.00000000E+00	-8339.1971	0.00000000E+00	-30951.729

MAXIMUMS	ELEMENT	6	6	6014	5533	6014	5533
VALUE		21735.624	0.00000000E+00	0.00000000E+00	-6945.7399	0.00000000E+00	-6932.3362

ELEMENT SORT REMOVED

SORT ON BSG1 ORDER= 0 KABS= 1 NMAX= 10

SORT COMPLETED FOR 10 VALUES.

PRINT ELEMENT STRESS ITEMS PER ELEMENT

SY-101 ANNULUS HEAT-UP STUD STIFFNESS CHECK
732.210

15.5621 MAY 26, 1994 CP=

***** POST1 ELEMENT STRESS LISTING *****

LOAD STEP 1 ITERATION= 1 SECTION= 1
TIME= 0.00000E+00 LOAD CASE= 1

ELEM	TSG1	TSG3	MSG1	MSG3	BSG1	BSG3
4	0.00000000E+00	-16501.999	0.00000000E+00	-5024.4179	12018.193	-982.98921
11504	0.00000000E+00	-16501.999	0.00000000E+00	-5024.4179	12018.193	-982.98921
11503	0.00000000E+00	-12931.410	0.00000000E+00	-4383.5768	11357.235	-172.64484
3	0.00000000E+00	-12931.410	0.00000000E+00	-4383.5768	11357.235	-172.64484
11003	0.00000000E+00	-12737.886	0.00000000E+00	-4789.6501	11236.543	-874.49746
503	0.00000000E+00	-12737.886	0.00000000E+00	-4789.6501	11236.543	-874.49746
11004	0.00000000E+00	-14710.603	0.00000000E+00	-5677.6615	11000.957	-1181.3729
504	0.00000000E+00	-14710.603	0.00000000E+00	-5677.6615	11000.957	-1181.3729
10503	0.00000000E+00	-12380.463	0.00000000E+00	-5309.6266	10941.466	-1833.2529
1003	0.00000000E+00	-12380.463	0.00000000E+00	-5309.6266	10941.466	-1833.2529

MINIMUMS	ELEMENT	4	11504	4	504	1003	1003
VALUE		0.00000000E+00	-16501.999	0.00000000E+00	-5677.6615	10941.466	-1833.2529

MAXIMUMS	ELEMENT	4	1003	4	11503	11504	11503
VALUE		0.00000000E+00	-12380.463	0.00000000E+00	-4383.5768	12018.193	-172.64484

ELEMENT SORT REMOVED

SORT ON BSG3 ORDER= 0 KABS= 1 NMAX= 10

SORT COMPLETED FOR 10 VALUES.

PRINT ELEMENT STRESS ITEMS PER ELEMENT

SY-101 ANNULUS HEAT-UP STUD STIFFNESS CHECK
831.790

15.5898 MAY 26, 1994 CP=

***** POST1 ELEMENT STRESS LISTING *****

LOAD STEP 1 ITERATION= 1 SECTION= 1
TIME= 0.00000E+00 LOAD CASE= 1

ELEM	TSG1	TSG3	MSG1	MSG3	BSG1	BSG3
6	21735.624	0.00000000E+00	0.00000000E+00	-7843.7127	0.00000000E+00	-30951.729
11506	21735.624	0.00000000E+00	0.00000000E+00	-7843.7127	0.00000000E+00	-30951.729
7	9223.7689	-3069.6620	0.00000000E+00	-6966.6269	0.00000000E+00	-18964.792
11507	9223.7689	-3069.6620	0.00000000E+00	-6966.6269	0.00000000E+00	-18964.792
6001	15869.847	-238.93284	0.00000000E+00	-5199.4809	0.00000000E+00	-17342.884
5501	15869.847	-238.93284	0.00000000E+00	-5199.4809	0.00000000E+00	-17342.884
6501	15873.069	-239.75844	0.00000000E+00	-5200.1002	0.00000000E+00	-17339.031
5001	15873.069	-239.75844	0.00000000E+00	-5200.1002	0.00000000E+00	-17339.031
7001	15879.064	-241.85037	0.00000000E+00	-5201.3414	0.00000000E+00	-17331.040
4501	15879.064	-241.85037	0.00000000E+00	-5201.3414	0.00000000E+00	-17331.040

MINIMUMS	ELEMENT	11507	11507	6	11506	6	6
VALUE		9223.7689	-3069.6620	0.00000000E+00	-7843.7127	0.00000000E+00	-30951.729

MAXIMUMS	ELEMENT	6	6	6	5501	6	4501
VALUE		21735.624	0.00000000E+00	0.00000000E+00	-5199.4809	0.00000000E+00	-17331.040

ELEMENT SORT REMOVED

PRINT REACTION FORCES PER NODE

SY-101 ANNULUS HEAT-UP STUD STIFFNESS CHECK
832.450

15.5900 MAY 26, 1994 CP=

***** POST1 REACTION FORCE LISTING *****

LOAD STEP 1 ITERATION= 1 SECTION= 1
TIME= 0.00000E+00 LOAD CASE= 1

THE FOLLOWING X,Y,Z FORCES ARE IN GLOBAL COORDINATES

NODE	FX	FY	FZ	MX	MY	MZ
1	5003.9715	262.86449	-160.93572	1121.6739	-48.675481	307.34520
2	9881.4897	0.00000000E+00	0.00000000E+00	0.00000000E+00	-38.324976	388.84691
3	8881.3322	0.00000000E+00	0.00000000E+00	0.00000000E+00	233.67277	-238.35065
4	7971.0325	0.00000000E+00	0.00000000E+00	0.00000000E+00	629.22241	-441.80091
5	10896.729	0.00000000E+00	0.00000000E+00	0.00000000E+00	-574.94842	54.032037
6	8809.9440	0.00000000E+00	7779.6497	0.00000000E+00	-2385.2428	298.30335
7	1693.3870	0.00000000E+00	-4943.9052	0.00000000E+00	-476.29801	-0.34962265E-02
8	1501.4867	0.00000000E+00	597.11231	0.00000000E+00	-311.93160	0.59928541E-02
9	1392.1954	0.00000000E+00	-115.38034	0.00000000E+00	-164.66895	0.44846904E-02
10	1327.1276	0.00000000E+00	-68.715767	0.00000000E+00	-90.625630	0.29735647E-02
11	1287.6759	0.00000000E+00	-72.689532	0.00000000E+00	-49.928813	0.19700502E-02
12	1264.0257	0.00000000E+00	-60.904353	0.00000000E+00	-28.680472	0.13207657E-02
13	1250.6060	0.00000000E+00	-48.754706	0.00000000E+00	-17.509497	0.89542204E-03
14	1244.0515	0.00000000E+00	-38.092009	0.00000000E+00	-11.214476	0.61255750E-03
15	1242.2223	0.00000000E+00	-29.778941	0.00000000E+00	-7.0943123	0.42192013E-03
16	1243.7002	0.00000000E+00	-23.656228	0.00000000E+00	-3.9026513	0.29187493E-03
17	1247.5173	0.00000000E+00	-19.259821	0.00000000E+00	-1.1459031	0.20206952E-03
18	1253.0036	0.00000000E+00	-16.118536	0.00000000E+00	1.3316856	0.13915104E-03
19	1259.6993	0.00000000E+00	-13.767183	0.00000000E+00	3.5685557	0.94186492E-04
20	1267.3055	0.00000000E+00	-13.001113	0.00000000E+00	5.6303047	0.61057963E-04
21	1275.6593	0.00000000E+00	-4.7909887	0.00000000E+00	7.4995763	0.35431095E-04
22	3226.8718	0.00000000E+00	-24.878720	0.00000000E+00	17.340789	0.35161056E-04
23	7081.7990	0.00000000E+00	-30.316933	0.00000000E+00	56.705958	0.53543132E-04
24	6430.8466	0.00000000E+00	-27.702511	0.00000000E+00	58.713624	0.40601500E-04
25	4027.4427	0.00000000E+00	-9.0531957	0.00000000E+00	27.403265	0.17564292E-04
26	4045.7014	0.00000000E+00	-7.2576532	0.00000000E+00	24.131059	0.12688121E-04
27	4056.0940	0.00000000E+00	-4.6506228	0.00000000E+00	19.500447	0.91808530E-05
28	4063.8865	0.00000000E+00	-2.9579958	0.00000000E+00	14.929884	0.66525867E-05
29	4075.7685	0.00000000E+00	-1.7801472	0.00000000E+00	10.972606	0.48265226E-05
30	4098.2828	0.00000000E+00	-1.0045330	0.00000000E+00	7.7762806	0.35054169E-05
31	4134.2176	0.00000000E+00	-0.50863274	0.00000000E+00	5.3173682	0.25482467E-05
32	4179.2714	0.00000000E+00	-0.20627211	0.00000000E+00	3.5001595	0.18538868E-05
33	4223.0212	0.00000000E+00	-0.33339487E-01	0.00000000E+00	2.2052610	0.13496342E-05
34	4254.8579	0.00000000E+00	0.56096010E-01	0.00000000E+00	1.3149358	0.98310030E-06
35	4269.9184	0.00000000E+00	0.94107249E-01	0.00000000E+00	0.72539508	0.71646048E-06
36	4270.0567	0.00000000E+00	0.10235000	0.00000000E+00	0.35136850	0.52235784E-06
37	4260.5612	0.00000000E+00	0.94905482E-01	0.00000000E+00	0.12632755	0.38097698E-06
38	4246.7330	0.00000000E+00	0.80520928E-01	0.00000000E+00	0.51096731E-03	0.27794650E-06
39	4232.8124	0.00000000E+00	0.64315496E-01	0.00000000E+00	-0.61930704E-01	0.20283177E-06
40	4222.8401	0.00000000E+00	0.49032925E-01	0.00000000E+00	-0.85912791E-01	0.14804929E-06
41	4221.5748	0.00000000E+00	0.35929897E-01	0.00000000E+00	-0.88122695E-01	0.10808315E-06
42	4233.6333	0.00000000E+00	0.25384039E-01	0.00000000E+00	-0.79288038E-01	0.78918499E-07
43	4260.4554	0.00000000E+00	0.17294491E-01	0.00000000E+00	-0.65972586E-01	0.57631305E-07
44	4297.3478	0.00000000E+00	0.11334469E-01	0.00000000E+00	-0.51935863E-01	0.42090886E-07
45	4334.3311	0.00000000E+00	0.71019765E-02	0.00000000E+00	-0.39123282E-01	0.30743985E-07
46	4361.4361	0.00000000E+00	0.42030183E-02	0.00000000E+00	-0.28361513E-01	0.22457858E-07
47	4373.9978	0.00000000E+00	0.22919613E-02	0.00000000E+00	-0.19829354E-01	0.16406169E-07
48	4373.4917	0.00000000E+00	0.10861015E-02	0.00000000E+00	-0.13364208E-01	0.11985939E-07
49	4364.5496	0.00000000E+00	0.36579476E-03	0.00000000E+00	-0.86525217E-02	0.87570744E-08
50	4351.8586	0.00000000E+00	-0.32584116E-04	0.00000000E+00	-0.53412293E-02	0.63983030E-08
51	4339.1793	0.00000000E+00	-0.22644493E-03	0.00000000E+00	-0.30974559E-02	0.46750528E-08
52	4330.1097	0.00000000E+00	-0.29705127E-03	0.00000000E+00	-0.16358512E-02	0.34160307E-08
53	4328.9043	0.00000000E+00	-0.29858638E-03	0.00000000E+00	-0.72678485E-03	0.24961375E-08
54	4339.6975	0.00000000E+00	-0.26570015E-03	0.00000000E+00	-0.19413156E-03	0.18240007E-08
55	4363.7739	0.00000000E+00	-0.21945230E-03	0.00000000E+00	0.91856413E-04	0.13328761E-08
56	4396.9103	0.00000000E+00	-0.17179085E-03	0.00000000E+00	0.22330984E-03	0.97400595E-09
57	4430.1355	0.00000000E+00	-0.12879939E-03	0.00000000E+00	0.26332530E-03	0.71176953E-09
58	4454.4891	0.00000000E+00	-0.92968171E-04	0.00000000E+00	0.25349274E-03	0.52014238E-09
59	4465.7779	0.00000000E+00	-0.64725082E-04	0.00000000E+00	0.22005150E-03	0.38011009E-09
60	4465.3274	0.00000000E+00	-0.43427187E-04	0.00000000E+00	0.17867257E-03	0.27777950E-09

61	4457.2996	0.00000000E+00	-0.27973044E-04	0.00000000E+00	0.13802075E-03	0.20299909E-09
62	4445.9054	0.00000000E+00	-0.17157988E-04	0.00000000E+00	0.10231047E-03	0.14835105E-09
63	4434.5222	0.00000000E+00	-0.98619194E-05	0.00000000E+00	0.73074577E-04	0.10841500E-09
64	4426.3788	0.00000000E+00	-0.51328977E-05	0.00000000E+00	0.50343511E-04	0.79230069E-10
65	4425.2904	0.00000000E+00	-0.22096324E-05	0.00000000E+00	0.33399349E-04	0.57901831E-10
66	4434.9648	0.00000000E+00	-0.51115556E-06	0.00000000E+00	0.21233995E-04	0.42315154E-10
67	4456.5533	0.00000000E+00	0.38862096E-06	0.00000000E+00	0.12809072E-04	0.30924359E-10
68	4486.2684	0.00000000E+00	0.79097395E-06	0.00000000E+00	0.71882057E-05	0.22599898E-10
69	4516.0649	0.00000000E+00	0.90134308E-06	0.00000000E+00	0.35911164E-05	0.16516312E-10
70	4537.9072	0.00000000E+00	0.85449716E-06	0.00000000E+00	0.14028518E-05	0.12070365E-10
71	4548.0355	0.00000000E+00	0.73497657E-06	0.00000000E+00	0.15973387E-06	0.88212128E-11
72	4547.6386	0.00000000E+00	0.59288953E-06	0.00000000E+00	-0.47465552E-06	0.64466890E-11
73	4540.4492	0.00000000E+00	0.45562477E-06	0.00000000E+00	-0.73572347E-06	0.47113522E-11
74	4530.2433	0.00000000E+00	0.33621933E-06	0.00000000E+00	-0.78226377E-06	0.34431409E-11
75	4520.0475	0.00000000E+00	0.23912495E-06	0.00000000E+00	-0.71718782E-06	0.25163111E-11
76	4512.7521	0.00000000E+00	0.16403480E-06	0.00000000E+00	-0.60410128E-06	0.18389678E-11
77	4511.7707	0.00000000E+00	0.10831708E-06	0.00000000E+00	-0.47995272E-06	0.13439982E-11
78	4520.4192	0.00000000E+00	0.68483788E-07	0.00000000E+00	-0.36430934E-06	0.98218740E-12
79	4539.7273	0.00000000E+00	0.41015428E-07	0.00000000E+00	-0.26591491E-06	0.71780211E-12
80	4566.3067	0.00000000E+00	0.22773494E-07	0.00000000E+00	-0.18716120E-06	0.52458424E-12
81	4592.9607	0.00000000E+00	0.11162067E-07	0.00000000E+00	-0.12702085E-06	0.38337684E-12
82	4612.5017	0.00000000E+00	0.41468001E-08	0.00000000E+00	-0.82886928E-07	0.28017966E-12
83	4621.5667	0.00000000E+00	0.20104250E-09	0.00000000E+00	-0.51663060E-07	0.20476108E-12
84	4621.2196	0.00000000E+00	-0.17780821E-08	0.00000000E+00	-0.30359118E-07	0.14964365E-12
85	4614.7997	0.00000000E+00	-0.25590434E-08	0.00000000E+00	-0.16374606E-07	0.10936270E-12
86	4605.6840	0.00000000E+00	-0.26579001E-08	0.00000000E+00	-0.75952690E-08	0.79924556E-13
87	4596.5775	0.00000000E+00	-0.24074012E-08	0.00000000E+00	-0.23862082E-08	0.58410546E-13
88	4590.0602	0.00000000E+00	-0.20119057E-08	0.00000000E+00	0.46555855E-09	0.42687660E-13
89	4589.1762	0.00000000E+00	-0.15890831E-08	0.00000000E+00	0.18271188E-08	0.31197045E-13
90	4596.8820	0.00000000E+00	-0.12003579E-08	0.00000000E+00	0.22963403E-08	0.22799461E-13
91	4614.0952	0.00000000E+00	-0.87234481E-09	0.00000000E+00	0.22702273E-08	0.16662331E-13
92	4637.7943	0.00000000E+00	-0.61139868E-09	0.00000000E+00	0.20014497E-08	0.12177186E-13
93	4661.5619	0.00000000E+00	-0.41311290E-09	0.00000000E+00	0.16426372E-08	0.88993465E-14
94	4678.9894	0.00000000E+00	-0.26824133E-09	0.00000000E+00	0.12796160E-08	0.65038322E-14
95	4687.0782	0.00000000E+00	-0.16618018E-09	0.00000000E+00	0.95541643E-09	0.47531394E-14
96	4686.7776	0.00000000E+00	-0.96847369E-10	0.00000000E+00	0.68699996E-09	0.34736958E-14
97	4681.0653	0.00000000E+00	-0.51555664E-10	0.00000000E+00	0.47649064E-09	0.25386511E-14
98	4672.9523	0.00000000E+00	-0.23288411E-10	0.00000000E+00	0.31841616E-09	0.18553006E-14
99	4664.8477	0.00000000E+00	-0.66479921E-11	0.00000000E+00	0.20415431E-09	0.13558934E-14
100	4659.0458	0.00000000E+00	0.23521697E-11	0.00000000E+00	0.12449262E-09	0.99091590E-15
101	4658.2507	0.00000000E+00	0.65497575E-11	0.00000000E+00	0.70964115E-10	0.72418257E-15
102	4665.0879	0.00000000E+00	0.78930088E-11	0.00000000E+00	0.36425596E-10	0.52924815E-15
103	4680.3716	0.00000000E+00	0.76695927E-11	0.00000000E+00	0.15195209E-10	0.38678590E-15
104	4701.4180	0.00000000E+00	0.66945348E-11	0.00000000E+00	0.29559740E-11	0.28267143E-15
105	4722.5277	0.00000000E+00	0.54566603E-11	0.00000000E+00	-0.34458495E-11	0.20658235E-15
106	4738.0090	0.00000000E+00	0.42279653E-11	0.00000000E+00	-0.62318283E-11	0.15097482E-15
107	4745.1994	0.00000000E+00	0.31422823E-11	0.00000000E+00	-0.69109728E-11	0.11033564E-15
108	4744.9424	0.00000000E+00	0.22498551E-11	0.00000000E+00	-0.64689298E-11	0.80635660E-16
109	4739.8829	0.00000000E+00	0.15538189E-11	0.00000000E+00	-0.55207692E-11	0.58930275E-16
110	4732.6945	0.00000000E+00	0.10335971E-11	0.00000000E+00	-0.44285020E-11	0.43067513E-16
111	4725.5139	0.00000000E+00	0.65917464E-12	0.00000000E+00	-0.33878672E-11	0.31474667E-16
112	4720.3717	0.00000000E+00	0.39923878E-12	0.00000000E+00	-0.24901021E-11	0.23002365E-16
113	4719.6580	0.00000000E+00	0.22536202E-12	0.00000000E+00	-0.17643459E-11	0.16810625E-16
114	4725.6921	0.00000000E+00	0.11375093E-12	0.00000000E+00	-0.12056637E-11	0.12285568E-16
115	4739.1932	0.00000000E+00	0.45591059E-13	0.00000000E+00	-0.79278088E-12	0.89785586E-17
116	4757.7892	0.00000000E+00	0.66569734E-14	0.00000000E+00	-0.49871885E-12	0.65617251E-17
117	4776.4437	0.00000000E+00	-0.13398320E-13	0.00000000E+00	-0.29671062E-12	0.47954511E-17
118	4790.1276	0.00000000E+00	-0.21832719E-13	0.00000000E+00	-0.16311058E-12	0.35046199E-17
119	4796.4886	0.00000000E+00	-0.23554533E-13	0.00000000E+00	-0.78485392E-13	0.25612525E-17
120	4796.2727	0.00000000E+00	-0.21753942E-13	0.00000000E+00	-0.27680291E-13	0.18718193E-17
121	4791.8176	0.00000000E+00	-0.18409705E-13	0.00000000E+00	0.63023870E-15	0.13679665E-17
122	4785.4847	0.00000000E+00	-0.14676922E-13	0.00000000E+00	0.14596746E-13	0.99973995E-18
123	4779.1592	0.00000000E+00	-0.11172126E-13	0.00000000E+00	0.19877024E-13	0.73063199E-18
124	4774.6272	0.00000000E+00	-0.81753276E-14	0.00000000E+00	0.20255280E-13	0.53396203E-18
125	4773.9879	0.00000000E+00	-0.57681216E-14	0.00000000E+00	0.18160288E-13	0.39023132E-18
126	4779.2771	0.00000000E+00	-0.39245255E-14	0.00000000E+00	0.15075039E-13	0.28518978E-18
127	4791.1252	0.00000000E+00	-0.25681436E-14	0.00000000E+00	0.11846454E-13	0.20842310E-18
128	4807.4494	0.00000000E+00	-0.16061918E-14	0.00000000E+00	0.89106225E-14	0.15232033E-18
129	4823.8281	0.00000000E+00	-0.94821629E-15	0.00000000E+00	0.64507870E-14	0.11131918E-18
130	4835.8460	0.00000000E+00	-0.51511130E-15	0.00000000E+00	0.45041661E-14	0.81354620E-19
131	4841.4388	0.00000000E+00	-0.24231258E-15	0.00000000E+00	0.30313810E-14	0.59455853E-19
132	4841.2620	0.00000000E+00	-0.79741755E-16	0.00000000E+00	0.19595101E-14	0.43451704E-19
133	4837.3682	0.00000000E+00	0.98535872E-17	0.00000000E+00	0.12072169E-14	0.31755571E-19

134	4831.8301	0.00000000E+00	0.53168263E-16	0.00000000E+00	0.69815887E-15	0.23207743E-19
135	4826.2988	0.00000000E+00	0.68653986E-16	0.00000000E+00	0.36707203E-15	0.16960793E-19
136	4822.3336	0.00000000E+00	0.68595895E-16	0.00000000E+00	0.16154053E-15	0.12395375E-19
137	4821.7626	0.00000000E+00	0.60837086E-16	0.00000000E+00	0.41425684E-16	0.90588604E-20
138	4826.3575	0.00000000E+00	0.50134276E-16	0.00000000E+00	-0.22800430E-16	0.66204551E-20
139	4836.6666	0.00000000E+00	0.39177799E-16	0.00000000E+00	-0.52077028E-16	0.48384091E-20
140	4850.8759	0.00000000E+00	0.29330217E-16	0.00000000E+00	-0.60725063E-16	0.35360455E-20
141	4865.1360	0.00000000E+00	0.21142186E-16	0.00000000E+00	-0.58170068E-16	0.25842452E-20
142	4875.6035	0.00000000E+00	0.14699730E-16	0.00000000E+00	-0.50348067E-16	0.18886449E-20
143	4880.4818	0.00000000E+00	0.98487965E-17	0.00000000E+00	-0.40795921E-16	0.13802816E-20
144	4880.3423	0.00000000E+00	0.63336521E-17	0.00000000E+00	-0.31462321E-16	0.10087557E-20
145	4876.9725	0.00000000E+00	0.38769654E-17	0.00000000E+00	-0.23288878E-16	0.73723406E-21
146	4872.1760	0.00000000E+00	0.22219473E-17	0.00000000E+00	-0.16611747E-16	0.53879805E-21
147	4867.3858	0.00000000E+00	0.11509320E-17	0.00000000E+00	-0.11428988E-16	0.39377494E-21
148	4863.9492	0.00000000E+00	0.49018099E-18	0.00000000E+00	-0.75712411E-17	0.28778740E-21
149	4863.4410	0.00000000E+00	0.10731537E-18	0.00000000E+00	-0.48052151E-17	0.21032813E-21
150	4867.3859	0.00000000E+00	-0.94618456E-19	0.00000000E+00	-0.28922103E-17	0.15371815E-21
151	4876.2550	0.00000000E+00	-0.18408312E-18	0.00000000E+00	-0.16177432E-17	0.11234544E-21
152	4888.4859	0.00000000E+00	-0.20769924E-18	0.00000000E+00	-0.80350795E-18	0.82108602E-22
153	4900.7644	0.00000000E+00	-0.19600366E-18	0.00000000E+00	-0.30922999E-18	0.60010218E-22
154	4909.7820	0.00000000E+00	-0.16811705E-18	0.00000000E+00	-0.29299759E-19	0.43859696E-22
155	4913.9927	0.00000000E+00	-0.13534477E-18	0.00000000E+00	0.11280296E-18	0.32056084E-22
156	4913.8892	0.00000000E+00	-0.10384305E-18	0.00000000E+00	0.17055169E-18	0.23429361E-22
157	4911.0111	0.00000000E+00	-0.76521224E-19	0.00000000E+00	0.17996659E-18	0.17124438E-22
158	4906.9100	0.00000000E+00	-0.54350834E-19	0.00000000E+00	0.16435463E-18	0.12516388E-22
159	4902.8148	0.00000000E+00	-0.37233097E-19	0.00000000E+00	0.13809261E-18	0.91484926E-23
160	4899.8738	0.00000000E+00	-0.24549656E-19	0.00000000E+00	0.10950929E-18	0.66869659E-23
161	4899.4236	0.00000000E+00	-0.15494205E-19	0.00000000E+00	0.82996009E-19	0.48878637E-23
162	4902.7564	0.00000000E+00	-0.92581125E-20	0.00000000E+00	0.60496890E-19	0.35729017E-23
163	4910.2706	0.00000000E+00	-0.51227127E-20	0.00000000E+00	0.42523563E-19	0.26117817E-23
164	4920.6407	0.00000000E+00	-0.24949373E-20	0.00000000E+00	0.28819707E-19	0.19092755E-23
165	4931.0556	0.00000000E+00	-0.91082586E-21	0.00000000E+00	0.18777105E-19	0.13957855E-23
166	4938.7100	0.00000000E+00	-0.22717963E-22	0.00000000E+00	0.11681595E-19	0.10204458E-23
167	4942.2935	0.00000000E+00	0.42020263E-21	0.00000000E+00	0.68469607E-20	0.74608018E-24
168	4942.2250	0.00000000E+00	0.59246871E-21	0.00000000E+00	0.36781723E-20	0.54551805E-24
169	4939.8109	0.00000000E+00	0.61112061E-21	0.00000000E+00	0.16924666E-20	0.39890093E-24
170	4936.3658	0.00000000E+00	0.55150240E-21	0.00000000E+00	0.51714938E-21	0.29171460E-24
171	4932.9264	0.00000000E+00	0.45979297E-21	0.00000000E+00	-0.12389844E-21	0.21335070E-24
172	4930.4528	0.00000000E+00	0.36250602E-21	0.00000000E+00	-0.42779439E-21	0.15605557E-24
173	4930.0561	0.00000000E+00	0.27341669E-21	0.00000000E+00	-0.53027081E-21	0.11416189E-24
174	4932.8088	0.00000000E+00	0.19843146E-21	0.00000000E+00	-0.52132714E-21	0.83527268E-25
175	4939.0404	0.00000000E+00	0.13888964E-21	0.00000000E+00	-0.45814465E-21	0.61123808E-25
176	4947.6492	0.00000000E+00	0.93715014E-22	0.00000000E+00	-0.37518829E-21	0.44738227E-25
177	4956.3007	0.00000000E+00	0.60754915E-22	0.00000000E+00	-0.29177550E-21	0.32752635E-25
178	4962.6654	0.00000000E+00	0.37565526E-22	0.00000000E+00	-0.21753610E-21	0.23984329E-25
179	4965.6561	0.00000000E+00	0.21834048E-22	0.00000000E+00	-0.15621121E-21	0.17568698E-25
180	4965.6220	0.00000000E+00	0.11573274E-22	0.00000000E+00	-0.10820051E-21	0.12873646E-25
181	4963.6487	0.00000000E+00	0.51813786E-23	0.00000000E+00	-0.72201814E-22	0.94370334E-26
182	4960.8265	0.00000000E+00	0.14281284E-23	0.00000000E+00	-0.46215823E-22	0.69209610E-26
183	4958.0098	0.00000000E+00	-0.59382228E-24	0.00000000E+00	-0.28122881E-22	0.50783520E-26
184	4955.9797	0.00000000E+00	-0.15294716E-23	0.00000000E+00	-0.15982513E-22	0.37285246E-26
185	4955.6329	0.00000000E+00	-0.18210504E-23	0.00000000E+00	-0.81617644E-23	0.27393383E-26
186	4957.8319	0.00000000E+00	-0.17604148E-23	0.00000000E+00	-0.33641732E-23	0.20141424E-26
187	4962.8408	0.00000000E+00	-0.15319698E-23	0.00000000E+00	-0.60622417E-24	0.14822350E-26
188	4969.7711	0.00000000E+00	-0.12460611E-23	0.00000000E+00	0.82959554E-24	0.10918895E-26
189	4976.7422	0.00000000E+00	-0.96387836E-24	0.00000000E+00	0.14480479E-23	0.80525507E-27
190	4981.8784	0.00000000E+00	-0.71534200E-24	0.00000000E+00	0.15915229E-23	0.59462949E-27
191	4984.3051	0.00000000E+00	-0.51149623E-24	0.00000000E+00	0.14833166E-23	0.43973354E-27
192	4984.3050	0.00000000E+00	-0.35278107E-24	0.00000000E+00	0.12625099E-23	0.32571827E-27
193	4982.7534	0.00000000E+00	-0.23432899E-24	0.00000000E+00	0.10107539E-23	0.24170775E-27
194	4980.5272	0.00000000E+00	-0.14918926E-24	0.00000000E+00	0.77202195E-24	0.17973339E-27
195	4978.3060	0.00000000E+00	-0.90161473E-25	0.00000000E+00	0.56665041E-24	0.13395456E-27
196	4976.7000	0.00000000E+00	-0.50732853E-25	0.00000000E+00	0.40096344E-24	0.10008846E-27
197	4976.3996	0.00000000E+00	-0.25465481E-25	0.00000000E+00	0.27362483E-24	0.74993035E-28
198	4978.0661	0.00000000E+00	-0.10067195E-25	0.00000000E+00	0.17965057E-24	0.56361828E-28
199	4981.9004	0.00000000E+00	-0.12976276E-26	0.00000000E+00	0.11280961E-24	0.42500656E-28
200	4987.2188	0.00000000E+00	0.31969143E-26	0.00000000E+00	0.66954702E-25	0.32164148E-28
201	4992.5765	0.00000000E+00	0.50652364E-26	0.00000000E+00	0.36672885E-25	0.24436076E-28
202	4996.5335	0.00000000E+00	0.54208309E-26	0.00000000E+00	0.17525279E-25	0.18641712E-28
203	4998.4195	0.00000000E+00	0.49862812E-26	0.00000000E+00	0.60561993E-26	0.14283652E-28
204	4998.4534	0.00000000E+00	0.42089143E-26	0.00000000E+00	-0.31311065E-27	0.10994671E-28
205	4997.3088	0.00000000E+00	0.33491653E-26	0.00000000E+00	-0.34359931E-26	0.85034294E-29
206	4995.6569	0.00000000E+00	0.25454521E-26	0.00000000E+00	-0.45972484E-26	0.66089823E-29

207	4994.0101	0.00000000E+00	0.18600934E-26	0.00000000E+00	-0.46549871E-26	0.51623136E-29
208	4992.8127	0.00000000E+00	0.13106521E-26	0.00000000E+00	-0.41590504E-26	0.40526868E-29
209	4992.5559	0.00000000E+00	0.89052039E-27	0.00000000E+00	-0.34444652E-26	0.31976295E-29
210	4993.7059	0.00000000E+00	0.58184986E-27	0.00000000E+00	-0.27019909E-26	0.25355689E-29
211	4996.4024	0.00000000E+00	0.36323018E-27	0.00000000E+00	-0.20293568E-26	0.20204105E-29
212	5000.1599	0.00000000E+00	0.21389747E-27	0.00000000E+00	-0.14671508E-26	0.16175447E-29
213	5003.9557	0.00000000E+00	0.11574825E-27	0.00000000E+00	-0.10230541E-26	0.13009003E-29
214	5006.7716	0.00000000E+00	0.54038264E-28	0.00000000E+00	-0.68756563E-27	0.10507693E-29
215	5008.1350	0.00000000E+00	0.17350387E-28	0.00000000E+00	-0.44373552E-27	0.85219659E-30
216	5008.2033	0.00000000E+00	-0.27961749E-29	0.00000000E+00	-0.27283037E-27	0.69378777E-30
217	5007.4546	0.00000000E+00	-0.12470573E-28	0.00000000E+00	-0.15734356E-27	0.56682396E-30
218	5006.3613	0.00000000E+00	-0.15862241E-28	0.00000000E+00	-0.82349542E-28	0.46460322E-30
219	5005.2729	0.00000000E+00	-0.15756469E-28	0.00000000E+00	-0.35884531E-28	0.38194956E-30
220	5004.4727	0.00000000E+00	-0.13928440E-28	0.00000000E+00	-0.88014772E-29	0.31484595E-30
221	5004.2570	0.00000000E+00	-0.11452444E-28	0.00000000E+00	0.56192379E-29	0.26015925E-30
222	5004.9015	0.00000000E+00	-0.89341742E-29	0.00000000E+00	0.12136384E-28	0.21543322E-30
223	5006.4861	0.00000000E+00	-0.66787242E-29	0.00000000E+00	0.14000200E-28	0.17873252E-30
224	5008.7189	0.00000000E+00	-0.48077531E-29	0.00000000E+00	0.13346669E-28	0.14852443E-30
225	5010.9893	0.00000000E+00	-0.33382578E-29	0.00000000E+00	0.11518580E-28	0.12358899E-30
226	5012.6910	0.00000000E+00	-0.22334236E-29	0.00000000E+00	0.93141043E-29	0.10295035E-30
227	5013.5449	0.00000000E+00	-0.14339027E-29	0.00000000E+00	0.71714319E-29	0.85824157E-31
228	5013.6483	0.00000000E+00	-0.87586257E-30	0.00000000E+00	0.53008817E-29	0.71576948E-31
229	5013.2882	0.00000000E+00	-0.50044140E-30	0.00000000E+00	0.37760923E-29	0.59694755E-31
230	5012.7430	0.00000000E+00	-0.25787653E-30	0.00000000E+00	0.25946414E-29	0.49758618E-31
231	5012.2026	0.00000000E+00	-0.10852742E-30	0.00000000E+00	0.17166791E-29	0.41425428E-31
232	5011.7919	0.00000000E+00	-0.22243639E-31	0.00000000E+00	0.10883051E-29	0.34412833E-31
233	5011.6152	0.00000000E+00	0.23015950E-31	0.00000000E+00	0.65474728E-30	0.2848728E-31
234	5011.7604	0.00000000E+00	0.42778779E-31	0.00000000E+00	0.36699940E-30	0.23454436E-31
235	5012.2484	0.00000000E+00	0.47579804E-31	0.00000000E+00	0.18446411E-30	0.19151580E-31
236	5012.9779	0.00000000E+00	0.44272467E-31	0.00000000E+00	0.75316120E-31	0.15441311E-31
237	5013.7447	0.00000000E+00	0.37083111E-31	0.00000000E+00	0.15687209E-31	0.12206483E-31
238	5014.3486	0.00000000E+00	0.28412210E-31	0.00000000E+00	-0.11654564E-31	0.93459769E-32
239	5014.7013	0.00000000E+00	0.19390149E-31	0.00000000E+00	-0.18781557E-31	0.67711470E-32
240	5014.8406	0.00000000E+00	0.10368601E-31	0.00000000E+00	-0.14201509E-31	0.44027780E-32
241	5014.8659	0.00000000E+00	0.13574792E-32	0.00000000E+00	-0.51785057E-32	0.21684217E-32
242	2507.4317	-1989.9165	-0.12971626E-32	0.12360582E-33	-0.66583470E-34	0.53801769E-33
501	0.00000000E+00	533.38616	-337.94794	2251.2089	0.21364828	-1.3114295
742	0.00000000E+00	-3980.0299	0.12310676E-32	-0.48014310E-32	-0.10047068E-32	0.2135672E-32
1001	0.00000000E+00	554.27943	-385.84025	2271.4471	0.33347370	-2.0610182
1242	0.00000000E+00	-3980.5985	0.77677819E-32	-0.12495762E-31	-0.39144132E-33	0.42074402E-32
1501	0.00000000E+00	577.17509	-458.40477	2290.6268	0.36981646	-2.1982499
1742	0.00000000E+00	-3981.4517	0.11035929E-31	-0.15565191E-31	0.26736757E-33	0.61524838E-32
2001	0.00000000E+00	378.05035	-330.61346	1457.3845	12.770181	-80.482328
2242	0.00000000E+00	-2488.8848	0.76858217E-32	-0.87176832E-32	0.13488332E-32	0.49455027E-32
2501	0.00000000E+00	167.96315	-131.47175	612.68065	-0.76334876	4.8456417
2742	0.00000000E+00	-995.66247	0.32413358E-32	-0.40153086E-32	0.15362003E-33	0.35903682E-32
3001	0.00000000E+00	166.66341	-145.87920	610.39139	-0.25446811	1.6070968
3242	0.00000000E+00	-995.71451	0.29408817E-32	-0.35613751E-32	-0.33806749E-34	0.50956298E-32
3501	0.00000000E+00	166.34591	-148.22833	609.49123	-0.40542214E-01	0.26043628
3742	0.00000000E+00	-995.76071	0.27876720E-32	-0.32829090E-32	-0.24332353E-34	0.64496566E-32
4001	0.00000000E+00	166.74590	-151.50927	609.63599	0.18484981E-01	-0.11267630
4242	0.00000000E+00	-995.79912	0.26728145E-32	-0.30446026E-32	-0.18619124E-34	0.76127572E-32
4501	0.00000000E+00	167.27276	-154.26862	609.96344	0.30580787E-01	-0.18980483
4742	0.00000000E+00	-995.82967	0.25869727E-32	-0.28510931E-32	-0.13498523E-34	0.85510587E-32
5001	0.00000000E+00	167.73232	-156.37905	610.26246	0.25475704E-01	-0.15858683
5242	0.00000000E+00	-995.85848	0.25270517E-32	-0.27085876E-32	-0.87403481E-35	0.92374751E-32
5501	0.00000000E+00	168.03424	-157.69333	610.45782	0.13890680E-01	-0.86553427E-01
5742	0.00000000E+00	-995.86764	0.24915605E-32	-0.26214278E-32	-0.42852409E-35	0.96524706E-32
6001	0.00000000E+00	168.13872	-158.13898	610.52494	-0.10089707E-11	0.64801498E-11
6242	0.00000000E+00	-995.87392	0.24797973E-32	-0.25921036E-32	-0.30277079E-46	0.97845788E-32
6501	0.00000000E+00	168.03424	-157.69333	610.45782	-0.13890680E-01	0.86553427E-01
6742	0.00000000E+00	-995.86764	0.24915605E-32	-0.26214278E-32	0.42852409E-35	0.96306736E-32
7001	0.00000000E+00	167.73232	-156.37905	610.26246	-0.25475704E-01	0.15858683
7242	0.00000000E+00	-995.85848	0.25270517E-32	-0.27085876E-32	0.87403481E-35	0.91959892E-32
7501	0.00000000E+00	167.27276	-154.26862	609.96344	-0.30580787E-01	0.18980483
7742	0.00000000E+00	-995.82967	0.25869727E-32	-0.28510931E-32	0.13498523E-34	0.84938965E-32
8001	0.00000000E+00	166.74590	-151.50927	609.63599	-0.18484981E-01	0.11267630
8242	0.00000000E+00	-995.79912	0.26728145E-32	-0.30446026E-32	0.18619124E-34	0.75454471E-32
8501	0.00000000E+00	166.34591	-148.22833	609.49123	-0.40542214E-01	-0.26043628
8742	0.00000000E+00	-995.76071	0.27876720E-32	-0.32829090E-32	0.24332353E-34	0.63787077E-32
9001	0.00000000E+00	166.66341	-145.87920	610.39139	0.25446811	-1.6070968
9242	0.00000000E+00	-995.71451	0.29408817E-32	-0.35613751E-32	0.33806749E-34	0.50279060E-32
9501	0.00000000E+00	167.96315	-131.47175	612.68065	0.76334876	-4.8456417

9742	0.00000000E+00	-995.66247	0.32413358E-32	-0.40153086E-32	0.15362003E-33	0.35324187E-32
10001	0.00000000E+00	378.05035	-330.61346	1457.3845	-12.770181	80.482328
10242	0.00000000E+00	-2488.8848	0.76858217E-32	-0.87176832E-32	-0.13488332E-32	0.48390761E-32
10501	0.00000000E+00	577.17509	-458.40477	2290.6268	-0.36981646	2.1982499
10742	0.00000000E+00	-3981.4517	0.11035929E-31	-0.15565191E-31	-0.26736757E-33	0.60078734E-32
11001	0.00000000E+00	554.27943	-385.84025	2271.4471	-0.33347370	2.0610182
11242	0.00000000E+00	-3980.5985	0.77677819E-32	-0.12495762E-31	0.39144132E-33	0.41024884E-32
11501	0.00000000E+00	533.38616	-337.94794	2251.2089	-0.21364828	1.3114295
11742	0.00000000E+00	-3980.0299	0.12310676E-32	-0.48014310E-32	0.10047068E-32	0.20807247E-32
12001	-5003.9715	262.86449	-160.93572	1121.6739	48.675481	-307.34520
12002	-9881.4897	0.00000000E+00	0.00000000E+00	0.00000000E+00	38.324976	-388.84691
12003	-8881.3322	0.00000000E+00	0.00000000E+00	0.00000000E+00	-233.67277	238.35065
12004	-7971.0325	0.00000000E+00	0.00000000E+00	0.00000000E+00	-629.22241	441.80091
12005	-10896.729	0.00000000E+00	0.00000000E+00	0.00000000E+00	574.94842	-54.032037
12006	-8809.9440	0.00000000E+00	7779.6497	0.00000000E+00	2385.2428	-298.30335
12007	-1693.3870	0.00000000E+00	-4943.9052	0.00000000E+00	476.29801	0.34962265E-02
12008	-1501.4867	0.00000000E+00	597.11231	0.00000000E+00	311.93160	-0.59928541E-02
12009	-1392.1954	0.00000000E+00	-115.38034	0.00000000E+00	164.66895	-0.44846904E-02
12010	-1327.1276	0.00000000E+00	-68.715767	0.00000000E+00	90.625630	-0.29735647E-02
12011	-1287.6759	0.00000000E+00	-72.689532	0.00000000E+00	49.928813	-0.19700502E-02
12012	-1264.0257	0.00000000E+00	-60.904353	0.00000000E+00	28.680472	-0.13207693E-02
12013	-1250.6060	0.00000000E+00	-48.754706	0.00000000E+00	17.509497	-0.89542204E-03
12014	-1244.0515	0.00000000E+00	-38.092009	0.00000000E+00	11.214476	-0.61255750E-03
12015	-1242.2223	0.00000000E+00	-29.778941	0.00000000E+00	7.0943123	-0.42192013E-03
12016	-1243.7002	0.00000000E+00	-23.656228	0.00000000E+00	3.9026513	-0.29187493E-03
12017	-1247.5173	0.00000000E+00	-19.259821	0.00000000E+00	1.1459031	-0.20206952E-03
12018	-1253.0036	0.00000000E+00	-16.118536	0.00000000E+00	-1.3316856	-0.13915104E-03
12019	-1259.6993	0.00000000E+00	-13.767183	0.00000000E+00	-3.5685557	-0.94186492E-04
12020	-1267.3055	0.00000000E+00	-13.001113	0.00000000E+00	-5.6303047	-0.61057963E-04
12021	-1275.6593	0.00000000E+00	-4.7909887	0.00000000E+00	-7.4995763	-0.35431095E-04
12022	-3226.8718	0.00000000E+00	-24.878720	0.00000000E+00	-17.340789	-0.35161056E-04
12023	-7081.7990	0.00000000E+00	-30.316933	0.00000000E+00	-56.705958	-0.53543132E-04
12024	-6430.8466	0.00000000E+00	-27.702511	0.00000000E+00	-58.713624	-0.40601500E-04
12025	-4027.4427	0.00000000E+00	-9.0531957	0.00000000E+00	-27.403265	-0.17564292E-04
12026	-4045.7014	0.00000000E+00	-7.2576532	0.00000000E+00	-24.131059	-0.12688121E-04
12027	-4056.0940	0.00000000E+00	-4.6506228	0.00000000E+00	-19.500447	-0.91808530E-05
12028	-4063.8865	0.00000000E+00	-2.9579958	0.00000000E+00	-14.929884	-0.66525867E-05
12029	-4075.7685	0.00000000E+00	-1.7801472	0.00000000E+00	-10.972606	-0.48265226E-05
12030	-4098.2828	0.00000000E+00	-1.0045330	0.00000000E+00	-7.7762806	-0.35054169E-05
12031	-4134.2176	0.00000000E+00	-0.50863274	0.00000000E+00	-5.3173682	-0.25482467E-05
12032	-4179.2714	0.00000000E+00	-0.20627211	0.00000000E+00	-3.5001595	-0.18538868E-05
12033	-4223.0212	0.00000000E+00	-0.33339487E-01	0.00000000E+00	-2.2052610	-0.13496342E-05
12034	-4254.8579	0.00000000E+00	0.56096010E-01	0.00000000E+00	-1.3149358	-0.98310030E-06
12035	-4269.9184	0.00000000E+00	0.94107249E-01	0.00000000E+00	-0.72539508	-0.71646048E-06
12036	-4270.0567	0.00000000E+00	0.10235000	0.00000000E+00	-0.35136850	-0.52235784E-06
12037	-4260.5612	0.00000000E+00	0.94905482E-01	0.00000000E+00	-0.12632755	-0.38097698E-06
12038	-4246.7330	0.00000000E+00	0.80520928E-01	0.00000000E+00	-0.51096731E-03	-0.27794650E-06
12039	-4232.8124	0.00000000E+00	0.64315496E-01	0.00000000E+00	0.61930704E-01	-0.20283177E-06
12040	-4222.8401	0.00000000E+00	0.49032925E-01	0.00000000E+00	0.85912791E-01	-0.14804929E-06
12041	-4221.5748	0.00000000E+00	0.35929897E-01	0.00000000E+00	0.88122695E-01	-0.10808315E-06
12042	-4233.6333	0.00000000E+00	0.25384039E-01	0.00000000E+00	0.79288038E-01	-0.78918499E-07
12043	-4260.4554	0.00000000E+00	0.17294491E-01	0.00000000E+00	0.65972586E-01	-0.57631305E-07
12044	-4297.3478	0.00000000E+00	0.11334469E-01	0.00000000E+00	0.51935863E-01	-0.42090886E-07
12045	-4334.3311	0.00000000E+00	0.71019765E-02	0.00000000E+00	0.39123282E-01	-0.30743985E-07
12046	-4361.4361	0.00000000E+00	0.42030183E-02	0.00000000E+00	0.28361513E-01	-0.22457858E-07
12047	-4373.9978	0.00000000E+00	0.22919613E-02	0.00000000E+00	0.19829354E-01	-0.16406169E-07
12048	-4373.4917	0.00000000E+00	0.10861015E-02	0.00000000E+00	0.13364208E-01	-0.11985939E-07
12049	-4364.5496	0.00000000E+00	0.36579476E-03	0.00000000E+00	0.86525217E-02	-0.87570744E-08
12050	-4351.8586	0.00000000E+00	-0.32584116E-04	0.00000000E+00	0.53412293E-02	-0.63983030E-08
12051	-4339.1793	0.00000000E+00	-0.22644493E-03	0.00000000E+00	0.30974559E-02	-0.46750527E-08
12052	-4330.1097	0.00000000E+00	-0.29705127E-03	0.00000000E+00	0.16358512E-02	-0.34160307E-08
12053	-4328.9043	0.00000000E+00	-0.29858638E-03	0.00000000E+00	0.72678485E-03	-0.24961375E-08
12054	-4339.6975	0.00000000E+00	-0.26570015E-03	0.00000000E+00	0.19413156E-03	-0.18240007E-08
12055	-4363.7739	0.00000000E+00	-0.21945230E-03	0.00000000E+00	-0.91856413E-04	-0.13328761E-08
12056	-4396.9103	0.00000000E+00	-0.17179085E-03	0.00000000E+00	-0.22330984E-03	-0.97400595E-09
12057	-4430.1355	0.00000000E+00	-0.12879939E-03	0.00000000E+00	-0.26332530E-03	-0.71176953E-09
12058	-4454.4891	0.00000000E+00	-0.92968171E-04	0.00000000E+00	-0.25349274E-03	-0.52014238E-09
12059	-4465.7779	0.00000000E+00	-0.64725082E-04	0.00000000E+00	-0.22005150E-03	-0.38011009E-09
12060	-4465.3274	0.00000000E+00	-0.43427187E-04	0.00000000E+00	-0.17867257E-03	-0.27777950E-09
12061	-4457.2996	0.00000000E+00	-0.27973044E-04	0.00000000E+00	-0.13802075E-03	-0.20299909E-09
12062	-4445.9054	0.00000000E+00	-0.17157988E-04	0.00000000E+00	-0.10231047E-03	-0.14835105E-09
12063	-4434.5222	0.00000000E+00	-0.98619194E-05	0.00000000E+00	-0.73074577E-04	-0.10841500E-09
12064	-4426.3788	0.00000000E+00	-0.51328977E-05	0.00000000E+00	-0.50343511E-04	-0.79230069E-10

12065	-4425.2904	0.00000000E+00	-0.22096324E-05	0.00000000E+00	-0.33399349E-04	-0.57901831E-10
12066	-4434.9648	0.00000000E+00	-0.51115556E-06	0.00000000E+00	-0.21233995E-04	-0.42315154E-10
12067	-4456.5533	0.00000000E+00	0.38862096E-06	0.00000000E+00	-0.12809072E-04	-0.30924359E-10
12068	-4486.2684	0.00000000E+00	0.79097395E-06	0.00000000E+00	-0.71882057E-05	-0.22599898E-10
12069	-4516.0649	0.00000000E+00	0.90134308E-06	0.00000000E+00	-0.35911164E-05	-0.16516312E-10
12070	-4537.9072	0.00000000E+00	0.85449716E-06	0.00000000E+00	-0.14028518E-05	-0.12070364E-10
12071	-4548.0355	0.00000000E+00	0.73497657E-06	0.00000000E+00	-0.15973387E-06	-0.88212127E-11
12072	-4547.6386	0.00000000E+00	0.59288953E-06	0.00000000E+00	0.47465552E-06	-0.64466889E-11
12073	-4540.4492	0.00000000E+00	0.45562477E-06	0.00000000E+00	0.73572347E-06	-0.47113522E-11
12074	-4530.2433	0.00000000E+00	0.33621933E-06	0.00000000E+00	0.78226377E-06	-0.34431408E-11
12075	-4520.0475	0.00000000E+00	0.23912495E-06	0.00000000E+00	0.71718782E-06	-0.25163110E-11
12076	-4512.7521	0.00000000E+00	0.16403480E-06	0.00000000E+00	0.60410128E-06	-0.18389678E-11
12077	-4511.7707	0.00000000E+00	0.10831708E-06	0.00000000E+00	0.47995272E-06	-0.13439532E-11
12078	-4520.4192	0.00000000E+00	0.68483788E-07	0.00000000E+00	0.36430934E-06	-0.98218738E-12
12079	-4539.7273	0.00000000E+00	0.41015428E-07	0.00000000E+00	0.26591491E-06	-0.71780209E-12
12080	-4566.3067	0.00000000E+00	0.22773494E-07	0.00000000E+00	0.18716120E-06	-0.52458423E-12
12081	-4592.9607	0.00000000E+00	0.11162067E-07	0.00000000E+00	0.12702085E-06	-0.38337683E-12
12082	-4612.5017	0.00000000E+00	0.41468001E-08	0.00000000E+00	0.82886928E-07	-0.28017965E-12
12083	-4621.5667	0.00000000E+00	0.20104250E-09	0.00000000E+00	0.51663060E-07	-0.20476107E-12
12084	-4621.2196	0.00000000E+00	-0.17780821E-08	0.00000000E+00	0.30359118E-07	-0.14964364E-12
12085	-4614.7997	0.00000000E+00	-0.25590434E-08	0.00000000E+00	0.16374606E-07	-0.10936270E-12
12086	-4605.6840	0.00000000E+00	-0.26579001E-08	0.00000000E+00	0.75952690E-08	-0.79924551E-13
12087	-4596.5775	0.00000000E+00	-0.24074012E-08	0.00000000E+00	0.23862082E-08	-0.58410542E-13
12088	-4590.0602	0.00000000E+00	-0.20119057E-08	0.00000000E+00	-0.46555855E-09	-0.42687656E-13
12089	-4589.1762	0.00000000E+00	-0.15890831E-08	0.00000000E+00	-0.18271188E-08	-0.31197041E-13
12090	-4596.8820	0.00000000E+00	-0.12003579E-08	0.00000000E+00	-0.22963403E-08	-0.22799459E-13
12091	-4614.0952	0.00000000E+00	-0.87234481E-09	0.00000000E+00	-0.22702273E-08	-0.16662328E-13
12092	-4637.7943	0.00000000E+00	-0.61139868E-09	0.00000000E+00	-0.20014497E-08	-0.12177184E-13
12093	-4661.5619	0.00000000E+00	-0.41311290E-09	0.00000000E+00	-0.16426372E-08	-0.88993450E-14
12094	-4678.9894	0.00000000E+00	-0.26824133E-09	0.00000000E+00	-0.12796160E-08	-0.65038309E-14
12095	-4687.0782	0.00000000E+00	-0.16618018E-09	0.00000000E+00	-0.95541643E-09	-0.47531383E-14
12096	-4686.7776	0.00000000E+00	-0.96847369E-10	0.00000000E+00	-0.68699996E-09	-0.34736949E-14
12097	-4681.0653	0.00000000E+00	-0.51555664E-10	0.00000000E+00	-0.47649064E-09	-0.25386504E-14
12098	-4672.9523	0.00000000E+00	-0.23288411E-10	0.00000000E+00	-0.31841616E-09	-0.18552999E-14
12099	-4664.8477	0.00000000E+00	-0.66479921E-11	0.00000000E+00	-0.20415431E-09	-0.13558928E-14
12100	-4659.0458	0.00000000E+00	0.23521697E-11	0.00000000E+00	-0.12449262E-09	-0.99091544E-15
12101	-4658.2507	0.00000000E+00	0.65497575E-11	0.00000000E+00	-0.70964115E-10	-0.72418218E-15
12102	-4665.0879	0.00000000E+00	0.78930088E-11	0.00000000E+00	-0.36425596E-10	-0.52924782E-15
12103	-4680.3716	0.00000000E+00	0.76695927E-11	0.00000000E+00	-0.15195209E-10	-0.38678562E-15
12104	-4701.4180	0.00000000E+00	0.66945348E-11	0.00000000E+00	-0.28559740E-11	-0.28627120E-15
12105	-4722.5277	0.00000000E+00	0.54566603E-11	0.00000000E+00	0.34458495E-11	-0.20658215E-15
12106	-4738.0090	0.00000000E+00	0.42279653E-11	0.00000000E+00	0.62318283E-11	-0.15097465E-15
12107	-4745.1994	0.00000000E+00	0.31422823E-11	0.00000000E+00	0.69109728E-11	-0.11033550E-15
12108	-4744.9424	0.00000000E+00	0.22498551E-11	0.00000000E+00	0.64689298E-11	-0.80635541E-16
12109	-4739.8829	0.00000000E+00	0.15538189E-11	0.00000000E+00	0.55207692E-11	-0.58930175E-16
12110	-4732.6945	0.00000000E+00	0.10335971E-11	0.00000000E+00	0.44285020E-11	-0.43067429E-16
12111	-4725.5139	0.00000000E+00	0.65917464E-12	0.00000000E+00	0.33878672E-11	-0.31474596E-16
12112	-4720.3717	0.00000000E+00	0.39923878E-12	0.00000000E+00	0.24901021E-11	-0.23002305E-16
12113	-4719.6580	0.00000000E+00	0.22536202E-12	0.00000000E+00	0.17643459E-11	-0.16810574E-16
12114	-4725.6921	0.00000000E+00	0.11375093E-12	0.00000000E+00	0.12056637E-11	-0.12285525E-16
12115	-4739.1932	0.00000000E+00	0.45591059E-13	0.00000000E+00	0.79278088E-12	-0.89785230E-17
12116	-4757.7892	0.00000000E+00	0.66569734E-14	0.00000000E+00	0.49871885E-12	-0.65616951E-17
12117	-4776.4437	0.00000000E+00	-0.13398320E-13	0.00000000E+00	0.29671062E-12	-0.47954258E-17
12118	-4790.1276	0.00000000E+00	-0.21832719E-13	0.00000000E+00	0.16311105E-12	-0.35045986E-17
12119	-4796.4886	0.00000000E+00	-0.23554533E-13	0.00000000E+00	0.78485392E-13	-0.25612346E-17
12120	-4796.2727	0.00000000E+00	-0.21753942E-13	0.00000000E+00	0.27680291E-13	-0.18718041E-17
12121	-4791.8176	0.00000000E+00	-0.18409705E-13	0.00000000E+00	-0.63023870E-15	-0.13679538E-17
12122	-4785.4847	0.00000000E+00	-0.14676922E-13	0.00000000E+00	-0.14596746E-13	-0.99972922E-18
12123	-4779.1592	0.00000000E+00	-0.11172126E-13	0.00000000E+00	-0.19877024E-13	-0.73062295E-18
12124	-4774.6272	0.00000000E+00	-0.81753276E-14	0.00000000E+00	-0.20255280E-13	-0.53395441E-18
12125	-4773.9879	0.00000000E+00	-0.57681216E-14	0.00000000E+00	-0.18160288E-13	-0.39022491E-18
12126	-4779.2771	0.00000000E+00	-0.39245255E-14	0.00000000E+00	-0.15075039E-13	-0.28518437E-18
12127	-4791.1252	0.00000000E+00	-0.25681436E-14	0.00000000E+00	-0.11846454E-13	-0.20841855E-18
12128	-4807.4494	0.00000000E+00	-0.16061918E-14	0.00000000E+00	-0.89106225E-14	-0.15231649E-18
12129	-4823.8281	0.00000000E+00	-0.94821629E-15	0.00000000E+00	-0.64507870E-14	-0.11131594E-18
12130	-4835.8460	0.00000000E+00	-0.51511130E-15	0.00000000E+00	-0.45041661E-14	-0.81351899E-19
12131	-4841.4388	0.00000000E+00	-0.24231258E-15	0.00000000E+00	-0.30313810E-14	-0.59453560E-19
12132	-4841.2620	0.00000000E+00	-0.79741755E-16	0.00000000E+00	-0.19595101E-14	-0.43449809E-19
12133	-4837.3682	0.00000000E+00	0.98535872E-17	0.00000000E+00	-0.12072169E-14	-0.31753944E-19
12134	-4831.8301	0.00000000E+00	0.53168263E-16	0.00000000E+00	-0.69815887E-15	-0.23206372E-19
12135	-4826.2988	0.00000000E+00	0.68653986E-16	0.00000000E+00	-0.36707203E-15	-0.16959638E-19
12136	-4822.3336	0.00000000E+00	0.68595895E-16	0.00000000E+00	-0.16154053E-15	-0.12394403E-19
12137	-4821.7626	0.00000000E+00	0.60837086E-16	0.00000000E+00	-0.41425684E-16	-0.90580410E-20

12138	-4826.3575	0.00000000E+00	0.50134276E-16	0.00000000E+00	0.22800430E-16	-0.66197649E-20
12139	-4836.6666	0.00000000E+00	0.39177799E-16	0.00000000E+00	0.52077028E-16	-0.48378276E-20
12140	-4850.8759	0.00000000E+00	0.29330217E-16	0.00000000E+00	0.60725063E-16	-0.35355557E-20
12141	-4865.1360	0.00000000E+00	0.21142186E-16	0.00000000E+00	0.58170068E-16	-0.25838326E-20
12142	-4875.6035	0.00000000E+00	0.14699730E-16	0.00000000E+00	0.50348067E-16	-0.18882972E-20
12143	-4880.4818	0.00000000E+00	0.98487965E-17	0.00000000E+00	0.40795921E-16	-0.13799887E-20
12144	-4880.3423	0.00000000E+00	0.63336521E-17	0.00000000E+00	0.31462321E-16	-0.10085090E-20
12145	-4876.9725	0.00000000E+00	0.38769654E-17	0.00000000E+00	0.23288878E-16	-0.73702623E-21
12146	-4872.1760	0.00000000E+00	0.22219473E-17	0.00000000E+00	0.16611747E-16	-0.53862297E-21
12147	-4867.3858	0.00000000E+00	0.11509320E-17	0.00000000E+00	0.11428988E-16	-0.39362745E-21
12148	-4863.9492	0.00000000E+00	0.49018099E-18	0.00000000E+00	0.75712411E-17	-0.28766315E-21
12149	-4863.4410	0.00000000E+00	0.10731537E-18	0.00000000E+00	0.48052151E-17	-0.21022346E-21
12150	-4867.3859	0.00000000E+00	-0.94618456E-19	0.00000000E+00	0.28922103E-17	-0.15362998E-21
12151	-4876.2550	0.00000000E+00	-0.18408312E-18	0.00000000E+00	0.16177432E-17	-0.11227116E-21
12152	-4888.4859	0.00000000E+00	-0.20769924E-18	0.00000000E+00	0.80350795E-18	-0.82046026E-22
12153	-4900.7644	0.00000000E+00	-0.19600366E-18	0.00000000E+00	0.30922999E-18	-0.59957503E-22
12154	-4909.7820	0.00000000E+00	-0.16811705E-18	0.00000000E+00	0.29299759E-19	-0.43815288E-22
12155	-4913.9927	0.00000000E+00	-0.13534477E-18	0.00000000E+00	-0.11280296E-18	-0.32018674E-22
12156	-4913.8892	0.00000000E+00	-0.10384305E-18	0.00000000E+00	-0.17055169E-18	-0.23397846E-22
12157	-4911.0111	0.00000000E+00	-0.76521224E-19	0.00000000E+00	-0.17996659E-18	-0.17097889E-22
12158	-4906.9100	0.00000000E+00	-0.54350834E-19	0.00000000E+00	-0.16435463E-18	-0.12494022E-22
12159	-4902.8148	0.00000000E+00	-0.37233097E-19	0.00000000E+00	-0.13809261E-18	-0.91296515E-23
12160	-4899.8738	0.00000000E+00	-0.24549656E-19	0.00000000E+00	-0.10950929E-18	-0.66710937E-23
12161	-4899.4236	0.00000000E+00	-0.15494205E-19	0.00000000E+00	-0.82996009E-19	-0.48744927E-23
12162	-4902.7564	0.00000000E+00	-0.92581125E-20	0.00000000E+00	-0.60496890E-19	-0.35616377E-23
12163	-4910.2706	0.00000000E+00	-0.51227127E-20	0.00000000E+00	-0.42523563E-19	-0.26022927E-23
12164	-4920.6407	0.00000000E+00	-0.24949373E-20	0.00000000E+00	-0.28819707E-19	-0.19012818E-23
12165	-4931.0556	0.00000000E+00	-0.91082586E-21	0.00000000E+00	-0.18777105E-19	-0.13890515E-23
12166	-4938.7100	0.00000000E+00	-0.22717963E-22	0.00000000E+00	-0.11681595E-19	-0.10147728E-23
12167	-4942.2935	0.00000000E+00	0.42020263E-21	0.00000000E+00	-0.68469607E-20	-0.74130121E-24
12168	-4942.2250	0.00000000E+00	0.59246871E-21	0.00000000E+00	-0.36781723E-20	-0.54149216E-24
12169	-4939.8109	0.00000000E+00	0.61112061E-21	0.00000000E+00	-0.16924666E-20	-0.39550944E-24
12170	-4936.3658	0.00000000E+00	0.55150240E-21	0.00000000E+00	-0.51714938E-21	-0.28885754E-24
12171	-4932.9264	0.00000000E+00	0.45979297E-21	0.00000000E+00	0.12389844E-21	-0.21094386E-24
12172	-4930.4528	0.00000000E+00	0.36250602E-21	0.00000000E+00	0.42779439E-21	-0.15402800E-24
12173	-4930.0561	0.00000000E+00	0.27341669E-21	0.00000000E+00	0.53027081E-21	-0.11245382E-24
12174	-4932.8088	0.00000000E+00	0.19843146E-21	0.00000000E+00	0.52132714E-21	-0.82088358E-25
12175	-4939.0404	0.00000000E+00	0.13888964E-21	0.00000000E+00	0.45814465E-21	-0.59911642E-25
12176	-4947.6692	0.00000000E+00	0.93715014E-22	0.00000000E+00	0.37518829E-21	-0.43717075E-25
12177	-4956.3007	0.00000000E+00	0.60754915E-22	0.00000000E+00	0.29177550E-21	-0.31892396E-25
12178	-4962.6654	0.00000000E+00	0.37565526E-22	0.00000000E+00	0.21753610E-21	-0.23259646E-25
12179	-4965.6561	0.00000000E+00	0.21834048E-22	0.00000000E+00	0.15621121E-21	-0.16958212E-25
12180	-4965.6220	0.00000000E+00	0.11573274E-22	0.00000000E+00	0.10820051E-21	-0.12539360E-25
12181	-4963.6487	0.00000000E+00	0.51813786E-23	0.00000000E+00	0.72201814E-22	-0.90037886E-26
12182	-4960.8265	0.00000000E+00	0.14281284E-23	0.00000000E+00	0.46215823E-22	-0.65559871E-26
12183	-4958.0098	0.00000000E+00	-0.59382228E-24	0.00000000E+00	0.28122881E-22	-0.47708907E-26
12184	-4955.9797	0.00000000E+00	-0.15294716E-23	0.00000000E+00	0.15982513E-22	-0.34695131E-26
12185	-4955.6329	0.00000000E+00	-0.18210504E-23	0.00000000E+00	0.81617644E-23	-0.25211420E-26
12186	-4957.8319	0.00000000E+00	-0.17604148E-23	0.00000000E+00	0.33641732E-23	-0.18303294E-26
12187	-4962.8408	0.00000000E+00	-0.15319698E-23	0.00000000E+00	0.60622417E-24	-0.13273874E-26
12188	-4969.7711	0.00000000E+00	-0.12460611E-23	0.00000000E+00	-0.82959554E-24	-0.96144281E-27
12189	-4976.7422	0.00000000E+00	-0.96387836E-24	0.00000000E+00	-0.14480479E-23	-0.69536420E-27
12190	-4981.8784	0.00000000E+00	-0.71534200E-24	0.00000000E+00	-0.15915229E-23	-0.50205525E-27
12191	-4984.3051	0.00000000E+00	-0.51149623E-24	0.00000000E+00	-0.14833166E-23	-0.36174718E-27
12192	-4984.3050	0.00000000E+00	-0.35278107E-24	0.00000000E+00	-0.12625099E-23	-0.26002103E-27
12193	-4982.7534	0.00000000E+00	-0.23432899E-24	0.00000000E+00	-0.10107539E-23	-0.18636309E-27
12194	-4980.5272	0.00000000E+00	-0.14918926E-24	0.00000000E+00	-0.77202195E-24	-0.13310996E-27
12195	-4978.3060	0.00000000E+00	-0.90161473E-25	0.00000000E+00	-0.56665041E-24	-0.94678065E-28
12196	-4976.7000	0.00000000E+00	-0.50732853E-25	0.00000000E+00	-0.40096344E-24	-0.67001166E-28
12197	-4976.3996	0.00000000E+00	-0.25465481E-25	0.00000000E+00	-0.27362483E-24	-0.47119647E-28
12198	-4978.0661	0.00000000E+00	-0.10067195E-25	0.00000000E+00	-0.17965057E-24	-0.32880738E-28
12199	-4981.9004	0.00000000E+00	-0.12976276E-26	0.00000000E+00	-0.11280961E-24	-0.22719725E-28
12200	-4987.2188	0.00000000E+00	0.31969143E-26	0.00000000E+00	-0.66954702E-25	-0.15500304E-28
12201	-4992.5765	0.00000000E+00	0.50652364E-26	0.00000000E+00	-0.36672885E-25	-0.10398128E-28
12202	-4996.5335	0.00000000E+00	0.54208309E-26	0.00000000E+00	-0.17525279E-25	-0.68158713E-29
12203	-4998.4195	0.00000000E+00	0.49862812E-26	0.00000000E+00	-0.60561993E-26	-0.43213154E-29
12204	-4998.4534	0.00000000E+00	0.42089143E-26	0.00000000E+00	0.31311065E-27	-0.26022239E-29
12205	-4997.3088	0.00000000E+00	0.33491653E-26	0.00000000E+00	0.34359931E-26	-0.14334728E-29
12206	-4995.6569	0.00000000E+00	0.25454521E-26	0.00000000E+00	0.45972484E-26	-0.65311889E-30
12207	-4994.0101	0.00000000E+00	0.18600934E-26	0.00000000E+00	0.46549871E-26	-0.14498567E-30
12208	-4992.8127	0.00000000E+00	0.13106521E-26	0.00000000E+00	0.41590504E-26	0.17399868E-30
12209	-4992.5559	0.00000000E+00	0.89052039E-27	0.00000000E+00	0.34444652E-26	0.36300111E-30
12210	-4993.7059	0.00000000E+00	0.58184986E-27	0.00000000E+00	0.27019909E-26	0.46396168E-30

12211	-4996.4024	0.00000000E+00	0.36323018E-27	0.00000000E+00	0.20293568E-26	0.50643553E-30
12212	-5000.1599	0.00000000E+00	0.21389747E-27	0.00000000E+00	0.14671508E-26	0.51109928E-30
12213	-5003.9557	0.00000000E+00	0.11574825E-27	0.00000000E+00	0.10230541E-26	0.49228635E-30
12214	-5006.7716	0.00000000E+00	0.54038264E-28	0.00000000E+00	0.68756563E-27	0.45981689E-30
12215	-5008.1350	0.00000000E+00	0.17350387E-28	0.00000000E+00	0.44373552E-27	0.42031588E-30
12216	-5008.2033	0.00000000E+00	-0.27961749E-29	0.00000000E+00	0.27283037E-27	0.37816010E-30
12217	-5007.4546	0.00000000E+00	-0.12470573E-28	0.00000000E+00	0.15734356E-27	0.33615651E-30
12218	-5006.3613	0.00000000E+00	-0.15862241E-28	0.00000000E+00	0.82349542E-28	0.29602653E-30
12219	-5005.2729	0.00000000E+00	-0.15756469E-28	0.00000000E+00	0.35884531E-28	0.25875012E-30
12220	-5004.4727	0.00000000E+00	-0.13928440E-28	0.00000000E+00	0.88014772E-29	0.22480921E-30
12221	-5004.2570	0.00000000E+00	-0.11452444E-28	0.00000000E+00	-0.56192379E-29	0.19435852E-30
12222	-5004.9015	0.00000000E+00	-0.89341742E-29	0.00000000E+00	-0.12136384E-28	0.16734472E-30
12223	-5006.4861	0.00000000E+00	-0.66787242E-29	0.00000000E+00	-0.14000200E-28	0.14358852E-30
12224	-5008.7189	0.00000000E+00	-0.48077531E-29	0.00000000E+00	-0.13346669E-28	0.12284059E-30
12225	-5010.9893	0.00000000E+00	-0.33382578E-29	0.00000000E+00	-0.11518580E-28	0.10481889E-30
12226	-5012.6910	0.00000000E+00	-0.22334236E-29	0.00000000E+00	-0.93141043E-29	0.89233045E-31
12227	-5013.5449	0.00000000E+00	-0.14339027E-29	0.00000000E+00	-0.71714319E-29	0.75799638E-31
12228	-5013.6483	0.00000000E+00	-0.87586257E-30	0.00000000E+00	-0.53008817E-29	0.64251339E-31
12229	-5013.2882	0.00000000E+00	-0.50044140E-30	0.00000000E+00	-0.37760923E-29	0.54341761E-31
12230	-5012.7430	0.00000000E+00	-0.25787653E-30	0.00000000E+00	-0.25946414E-29	0.45847518E-31
12231	-5012.2026	0.00000000E+00	-0.10852742E-30	0.00000000E+00	-0.17166791E-29	0.38568456E-31
12232	-5011.7919	0.00000000E+00	-0.22243639E-31	0.00000000E+00	-0.10883051E-29	0.32326736E-31
12233	-5011.6152	0.00000000E+00	0.23015950E-31	0.00000000E+00	-0.65474728E-30	0.26965226E-31
12234	-5011.7604	0.00000000E+00	0.42778779E-31	0.00000000E+00	-0.36699940E-30	0.22345535E-31
12235	-5012.2484	0.00000000E+00	0.47579804E-31	0.00000000E+00	-0.18446411E-30	0.18345884E-31
12236	-5012.9779	0.00000000E+00	0.44272467E-31	0.00000000E+00	-0.75316120E-31	0.14858939E-31
12237	-5013.7447	0.00000000E+00	0.37083111E-31	0.00000000E+00	-0.15687209E-31	0.11789696E-31
12238	-5014.3486	0.00000000E+00	0.28412210E-31	0.00000000E+00	0.11654564E-31	0.90534528E-32
12239	-5014.7013	0.00000000E+00	0.19390149E-31	0.00000000E+00	0.18781557E-31	0.65738836E-32
12240	-5014.8406	0.00000000E+00	0.10368601E-31	0.00000000E+00	0.14201509E-31	0.42812176E-32
12241	-5014.8659	0.00000000E+00	0.13574792E-32	0.00000000E+00	0.51785057E-32	0.21105122E-32
12242	-2507.4317	-1989.9165	-0.12971626E-32	0.12360582E-33	0.66583470E-34	0.52389047E-33
26014	0.00000000E+00	5217.9162	0.00000000E+00	0.00000000E+00	0.00000000E+00	0.00000000E+00
26032	0.00000000E+00	4661.9736	0.00000000E+00	0.00000000E+00	0.00000000E+00	0.00000000E+00
26044	0.00000000E+00	4195.9660	0.00000000E+00	0.00000000E+00	0.00000000E+00	0.00000000E+00
26056	0.00000000E+00	3770.5355	0.00000000E+00	0.00000000E+00	0.00000000E+00	0.00000000E+00
26068	0.00000000E+00	3381.3336	0.00000000E+00	0.00000000E+00	0.00000000E+00	0.00000000E+00
26080	0.00000000E+00	3024.6201	0.00000000E+00	0.00000000E+00	0.00000000E+00	0.00000000E+00
26092	0.00000000E+00	2696.9676	0.00000000E+00	0.00000000E+00	0.00000000E+00	0.00000000E+00
26104	0.00000000E+00	2395.2280	0.00000000E+00	0.00000000E+00	0.00000000E+00	0.00000000E+00
26116	0.00000000E+00	2116.5022	0.00000000E+00	0.00000000E+00	0.00000000E+00	0.00000000E+00
26128	0.00000000E+00	1858.1120	0.00000000E+00	0.00000000E+00	0.00000000E+00	0.00000000E+00
26140	0.00000000E+00	1617.5748	0.00000000E+00	0.00000000E+00	0.00000000E+00	0.00000000E+00
26152	0.00000000E+00	1392.5796	0.00000000E+00	0.00000000E+00	0.00000000E+00	0.00000000E+00
26164	0.00000000E+00	1180.9645	0.00000000E+00	0.00000000E+00	0.00000000E+00	0.00000000E+00
26176	0.00000000E+00	980.69629	0.00000000E+00	0.00000000E+00	0.00000000E+00	0.00000000E+00
26188	0.00000000E+00	789.85076	0.00000000E+00	0.00000000E+00	0.00000000E+00	0.00000000E+00
26200	0.00000000E+00	606.59424	0.00000000E+00	0.00000000E+00	0.00000000E+00	0.00000000E+00
26212	0.00000000E+00	429.16598	0.00000000E+00	0.00000000E+00	0.00000000E+00	0.00000000E+00
26224	0.00000000E+00	255.86121	0.00000000E+00	0.00000000E+00	0.00000000E+00	0.00000000E+00
26236	0.00000000E+00	85.014791	0.00000000E+00	0.00000000E+00	0.00000000E+00	0.00000000E+00
TOTAL	-0.16863396E-07	0.20343991E-06	-0.26321367E-08	27940.973	-0.12403700E-08	0.29638399E-10

***** ROUTINE COMPLETED ***** CP = 839.370

/EOF ENCOUNTERED ON FILE18

***** RUN COMPLETED ***** CP= 839.8600 TIME= 15.5920