APS

Palo Verde Nuclear
Generating Station

David Mauldin
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EA-03-009

102-05123-CDM/SAB/RMW
July 01, 2004

ATTN: Document Control Desk
U.S. Nuclear Regulatory Commission
Washington, DC 20555-0001

References:

1. APS letter 102-05075-CDM/SAB/RJR, "Relief Request No. 25 – Request for Relaxation of First Revised NRC Order EA-03-009, Section IV.C.(5)(b) Requirements for CEDM Nozzles", dated March 19, 2004.

2. APS letter 102-05086-CDM/SAB/RJR, "Response to Request for Additional Information – Request for Relaxation of First revised NRC Order EA-03-009, Section IV.C.(5)(b) Requirements for CEDM Nozzles", dated April 16, 2004.

3. APS letter 102-05094-CDM/SAB/RJR, "Second Request for Additional Information – Request for Relaxation of First revised NRC Order EA-03-009, Section IV.C.(5)(b) Requirements for CEDM Nozzles – Relief Request No. 25", dated April 22, 2004.

4. APS letter 102-05099-CDM/SAB/RJR, "APS' Commitment for CEDM Nozzle Inspections for First Revised NRC Order EA-03-009", dated April 28, 2004.

5. APS letter 102-05100-CDM/TNW/RJR, "Additional Information Request for CEDM Nozzle Inspections for First Revised NRC Order EA-03-009", dated April 29, 2004.

6. APS letter 102-05101-CDM/TNW/RJR, "Revised Analysis Information for CEDM Nozzle Inspections for First Revised NRC Order EA-03-009", dated May 03, 2004.

Dear Sirs:

Subject: **Palo Verde Nuclear Generating Station (PVNGS)**
Units 1, 2 and 3
Docket No.s STN 50-528, 50-529 and 50-530
First Revised NRC Order EA-03-009 – Additional Analysis Information for Control Element Drive Mechanism (CEDM) Nozzles

A101

In Reference 1, Arizona Public Service Company (APS) requested relaxation of the requirements of First Revised Order EA-03-009, Section IV.C.(5)(b). In References 2, 3, 4, and 5, APS provided responses to NRC questions regarding the relaxation request for the CEDM nozzles. In a telephone call on April 30, 2004, the NRC requested that an analysis be performed to substantiate that the distances inspected for Unit 1 CEDM nozzles 84, 87, and 93 were acceptable. The results of, and a description of the methodology that was used to perform this analysis were provided to the NRC in Reference 6.

Westinghouse Electric Corporation, on behalf of APS, has completed an additional finite element stress analysis for Unit 1 CEDM nozzles 84, 87, and 93 using the as-built J-groove weld configuration for these nozzles. In addition, this analysis compared the stresses for the as-built configuration to the as-designed configuration. The results of the analysis indicate that the magnitude of the hoop stresses at the outside and inside diameters of the nozzle is significantly lower than the as-designed values. In addition, the extent of the tensile stress area below the weld is also much smaller than the as-designed values. Therefore, for the as-built J-groove weld configuration, none of the postulated through-wall flaws in the regions not inspected for Unit 1 CEDM nozzles 84, 87, and 93 would propagate in size. The results of this analysis are provided in the enclosure to this letter.

APS has completed an engineering review of the CEDM nozzle inspection data that was acquired for Unit 3 during a previous reactor head penetration inspection campaign that was performed prior to the issuance of the First Revised Order. This review was undertaken to ensure that the as-built CEDM nozzle J-groove weld configuration for Unit 3 does not invalidate the data that was provided in Table 2 of Reference 2 for Unit 3. The results of this review indicate that the minimum required inspection distance identified in Table 2 of Reference 2 is expected to be achievable.

Similar to the engineering review performed for Unit 3, APS is currently evaluating the CEDM nozzle inspection data that was acquired for Unit 2 during previous reactor head penetration inspection campaigns that were performed prior to the issuance of the First Revised Order. The table provided in Reference 2 for Unit 2 may need to be revised if APS determines that the minimum inspection coverage for the CEDM nozzles can not be obtained due to the as-built configuration of the CEDM nozzle J-groove welds for this unit. The results of this review will be provided to the NRC when this engineering review has been completed.

The tables provided in Reference 2 have been revised based on the results of the latest analysis performed for Unit 1 and the review of previous CEDM nozzle inspection data for Unit 3. The revised table for Unit 1 includes the new minimum examination distance and time for crack propagation for the affected CEDM nozzles. The title of the Unit 3 table has been revised to make the table unit-specific – no other changes have been made to this table. The revised tables for Unit 1 and Unit 3 are provided below. Revision bars indicate the areas of change.

Palo Verde Unit 1 CEDM Nozzle Minimum Required Inspection Coverage Required by Westinghouse Letters LTR-PAFM-04-23 and CVER-04-32

Nozzle Angle (°)	Penetration No. Applicability	Minimum Inspection Coverage Required Below the Weld on the Downhill Side (in)[NOTE 1]	EFPY for Upper Crack Tip to Reach the Bottom of Weld
0	1	0.45	1.7
7.5	2-21	0.45	1.7
28.0	22-45	0.45	1.8
35.7	46-83,85, 90-92, 94-97	0.40	1.7
35.7	84	0.24	No Propagation Predicted
35.7	93	0.32	No Propagation Predicted
51.5	86, 88, 89	0.35	1.9
51.5	87	0.16	No Propagation Predicted

Palo Verde Unit 3 CEDM Nozzle Minimum Required Inspection Coverage Required by Westinghouse Letter LTR-PAFM-04-23

Nozzle Angle (°)	Penetration No. Applicability	Minimum Inspection Coverage Required Below the Weld on the Downhill Side (in)[NOTE 1]	EFPY for Upper Crack Tip to Reach the Bottom of Weld
0	1-29	0.40	1.7
31.5	30-81	0.35	2.0
47.6	82-85	0.30	2.4
49.5	90-97	0.30	3.4
51.5	86-89	0.20	2.4

NOTE 1: Nozzles receiving the minimum inspection coverage, but less than 1-inch inspection coverage, will be reported in accordance with First Revised Order EA-03-009, Section IV.E.

APS respectfully requests that your review and approval of the relaxation request submitted to you in Reference 1, as supplemented by References 2, 3, 4, 5, 6, and this letter, be completed for Units 1 and 3 by August 31, 2004. Your review and approval is required by this date to support the Unit 3 fall refueling outage and to remove the current 7.7 effective full power month operating restriction that has been placed on Unit 1.

APS understands that you can not complete your review for Unit 2 until APS has completed the engineering review of the CEDM nozzle inspection data for Unit 2. APS anticipates submitting the results of this review, and a revised CEDM nozzle minimum required inspection coverage table for Unit 2, if required, by September 30, 2004.

No commitments are being made to the NRC in this letter. Should you have any questions, please contact Thomas N. Weber at (623) 393-5764.

Sincerely,

David Mauldin

Enclosure Westinghouse letter CVER-04-32, Palo Verde Unit 1 Hoop Stress Distribution for As-Built J-Weld Configuration.

CDM/SAB/RMW

cc: J. E. Dyer
B. S. Mallett
M. B. Fields
N. L. Salgado

Enclosure

Westinghouse Letter CVER-04-32
Palo Verde Unit 1 Hoop Stress Distribution for As-Built J-Weld Configuration

Westinghouse

Westinghouse Electric Company
Nuclear Services
P.O. Box 355
Pittsburgh, Pennsylvania 15230-0355
USA

Mr. Mike Melton
Arizona Public Service
Palo Verde Nuclear Generating Station
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Direct tel: 412-374-4403
Direct fax: 412-374-5408
e-mail: Olszewjs@westinghouse.com

Your ref:
Our ref: CVER-04-32

June 17, 2004

Subject: Palo Verde Unit 1Hoop Stress Distribution for As-Built J-Weld Configuration, Rev. 1

Reference: CVER-04-30

Dear Mr. Melton:

This serves as formal transmittal of Rev. 1 of the non-proprietary version of the subject report entitled *Palo Verde Unit 1Hoop Stress Distribution for As-Built J-Weld Configuration.* This revision corrects the typographic error in the titles of Figures 6 and 7 in Revision 0 of LTR-PAFM-04-39, which was transmitted via CVER-04-30.

If you have any questions, please contact the undersigned. Thank you.

Best regards,

James S. Olszewski
Customer Project Manager
Palo Verde & SONGS

Cc: Mike Powell – APS
Cc: Jim Compas – Westinghouse
Cc: Darrell Weber – Westinghouse
Cc: Tony Dietrich – Westinghouse
Cc: Chris Ng – Westinghouse

Westinghouse

To: Jim Olszewski
cc: Seth Swamy, Jim Compas

Date: June 16, 2004

From:
Ext: 724-722-6030
Fax: 724-722-5597
Your ref:
Our ref: LTR-PAFM-04-39 Rev. 1

Subject: Palo Verde Unit 1 Hoop Stress Distribution for As-Built J-Weld Configuration

Finite element stress analyses were performed for Control Element Drive Mechanism (CEDM) with penetration nozzle angles of 35.7° and 51.5° using the Palo Verde Unit 1 as-built J-weld configurations obtained from Penetration Nozzle No. 84, 87 and 93. The as-built J-weld depths determined from the Ultrasonic Testing (UT) examination data for these penetrations are as follows:

	Penetration Nozzle No.		
	84	87	93
As-Built J-Weld Depth (in)	2.24	2.62	1.76

The resulting hoop stress distributions are compared with that obtained based on the as-designed J-weld configuration and shown in Figures 1 to 4. As shown in the figures, with the lower hoop stress magnitudes and the smaller tensile stress zone for the as-built J-weld configuration, none of the postulated through-wall flaws in the regions not inspected for Penetration No. 84, 87 and 93 would grow at all. The initial through-wall flaw size is postulated based on the same methodology as used in the earlier relaxation request submittal. The end of the inspection zones for Penetration No. 84, 87 and 93 are 0.24", 0.16" and 0.32" below the weld respectively after taking into account of instrumentation measurement uncertainty of ± 0.040". In addition, the uphill side hoop stress distributions are not significantly affected by the longer fillet weld leg on the downhill side. Figures 5 to 7 show the finite element stress contour plots for penetration nozzle angles of 35.7° and 51.5° using the Palo Verde Unit 1 as-built J-weld configuration.

This revision corrects the typographic error in the titles of Figures 6 and 7 in Revision 0 of LTR-PAFM-04-39. Please transmit the attached information (page 1 to 8) to APS in a project letter.

Author: _____

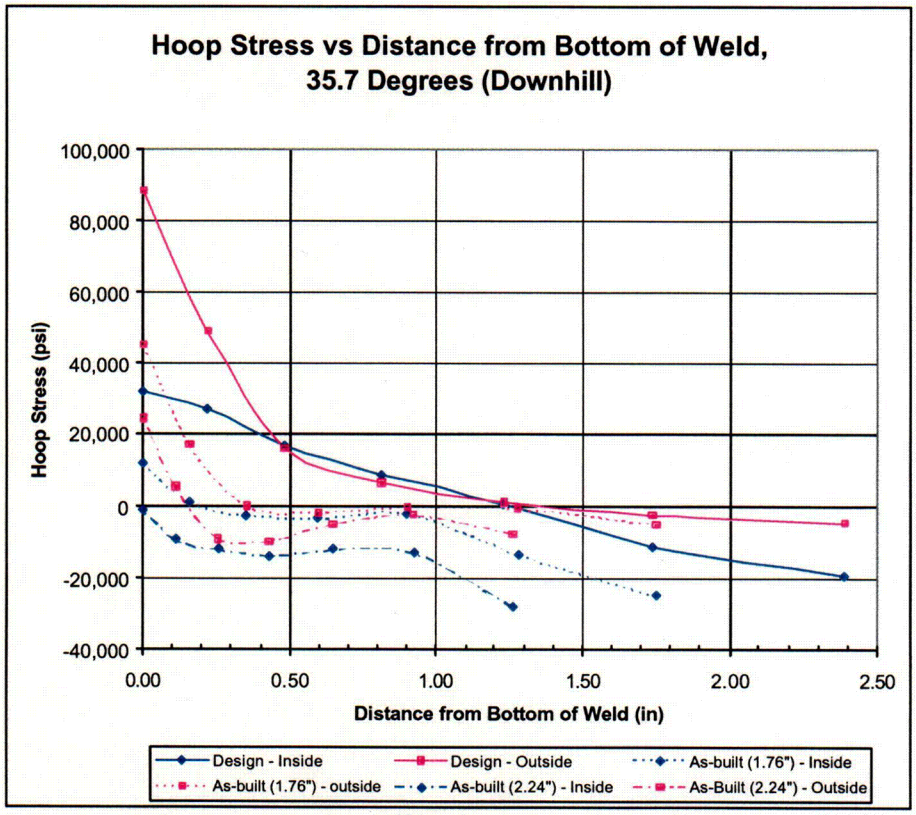
C. K. Ng[1], Piping Analysis & Fracture Mechanics

Verifier: _____

Santit Jirawongkraisorn[1], Piping Analysis & Fracture Mechanics

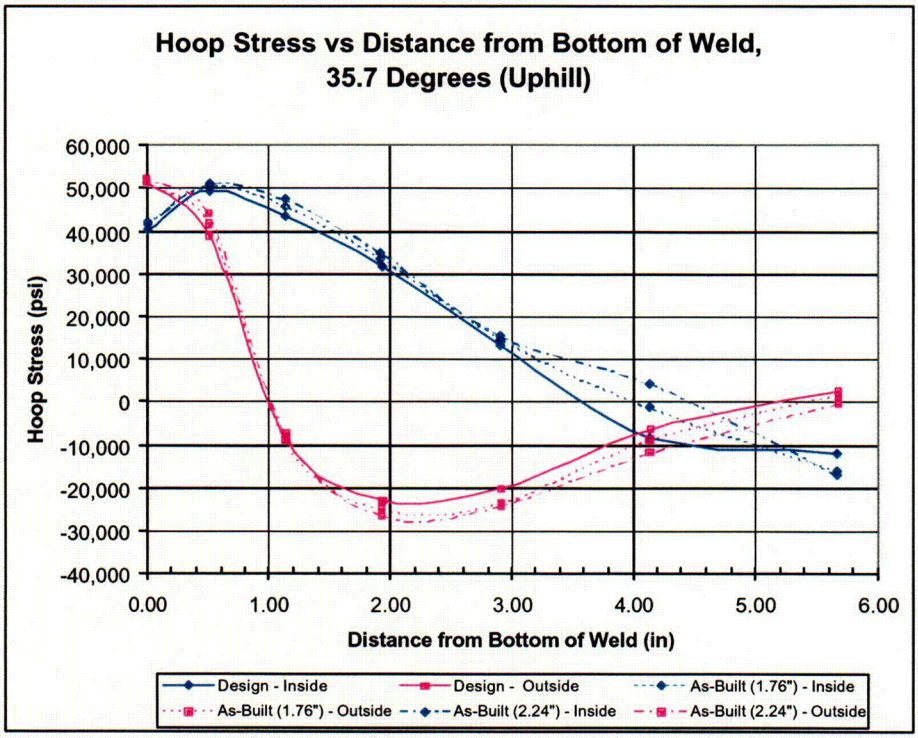
[1] Official Record Electronically Approved in EDMS 2000

Figure 1


Hoop Stress vs Distance from Bottom of Weld,
35.7 Degrees (Downhill)
Hoop Stress (psi)
100,000
80,000
60,000
40,000
20,000
0
-20,000
-40,000
0.00
0.50
1.00
1.50
2.00
2.50
Distance from Bottom of Weld (in)
Design - Inside
Design - Outside
As-built (1.76") - Inside
As-built (1.76") - outside
As-built (2.24") - Inside
As-Built (2.24") - Outside

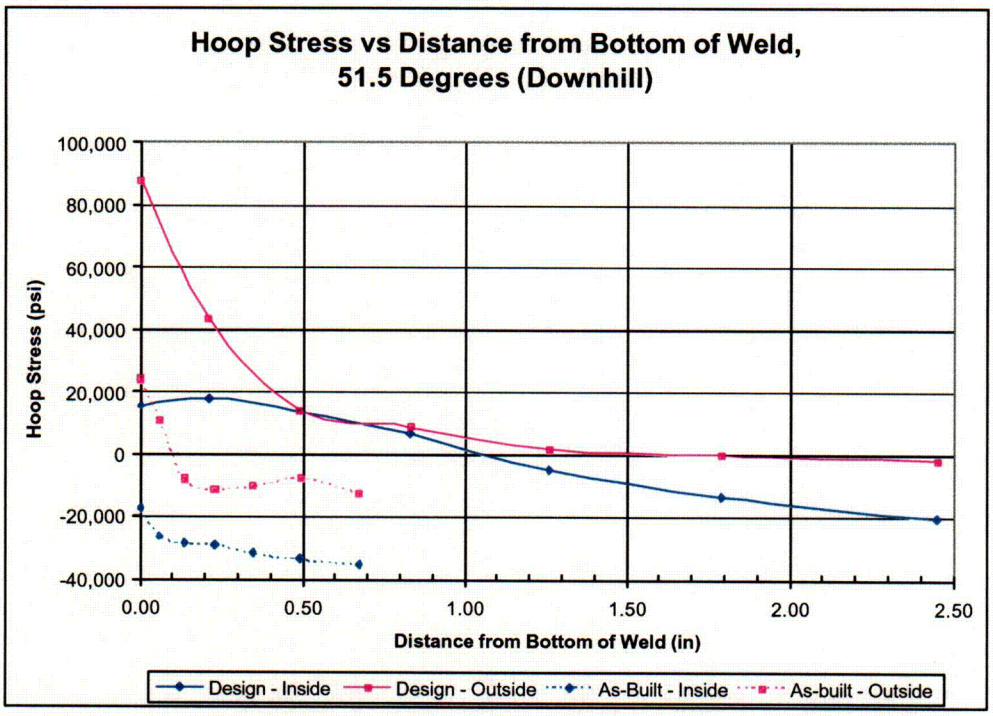
C01

Figure 2


Hoop Stress vs Distance from Bottom of Weld,
35.7 Degrees (Uphill)
Hoop Stress (psi)
60,000
50,000
40,000
30,000
20,000
10,000
0
-10,000
-20,000
-30,000
-40,000
0.00
1.00
2.00
3.00
4.00
5.00
6.00
Distance from Bottom of Weld (in)
Design - Inside
Design - Outside
As-Built (1.76") - Inside
As-Built (1.76") - Outside
As-Built (2.24") - Inside
As-Built (2.24") - Outside

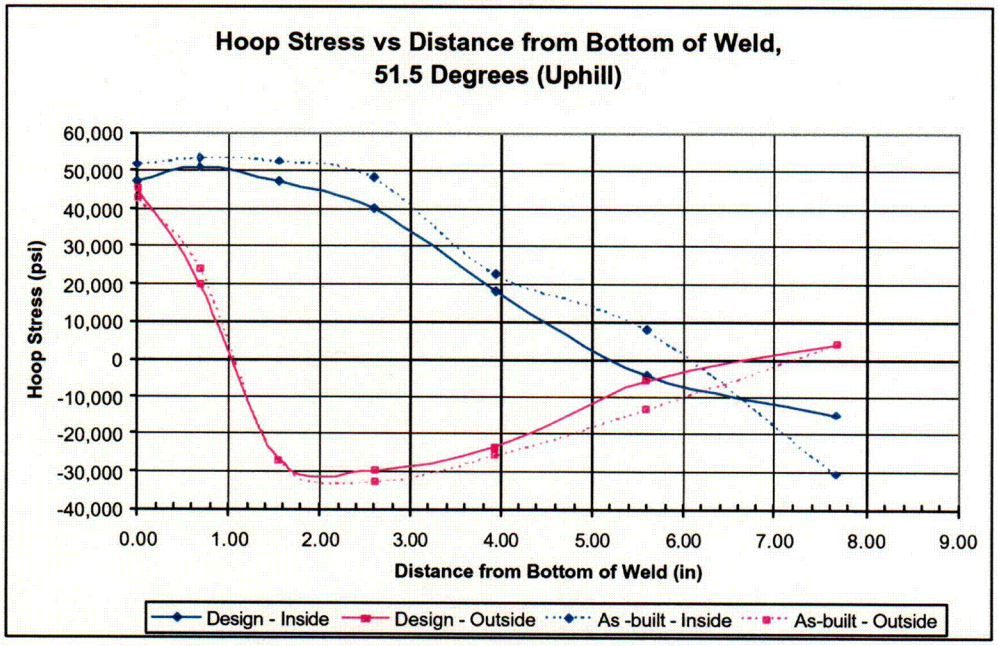
C02

Figure 3


Hoop Stress vs Distance from Bottom of Weld,
51.5 Degrees (Downhill)
Hoop Stress (psi)
100,000
80,000
60,000
40,000
20,000
0
-20,000
-40,000
0.00
0.50
1.00
1.50
2.00
2.50
Distance from Bottom of Weld (in)
Design - Inside
Design - Outside
As-Built - Inside
As-built - Outside

C 03

Figure 4

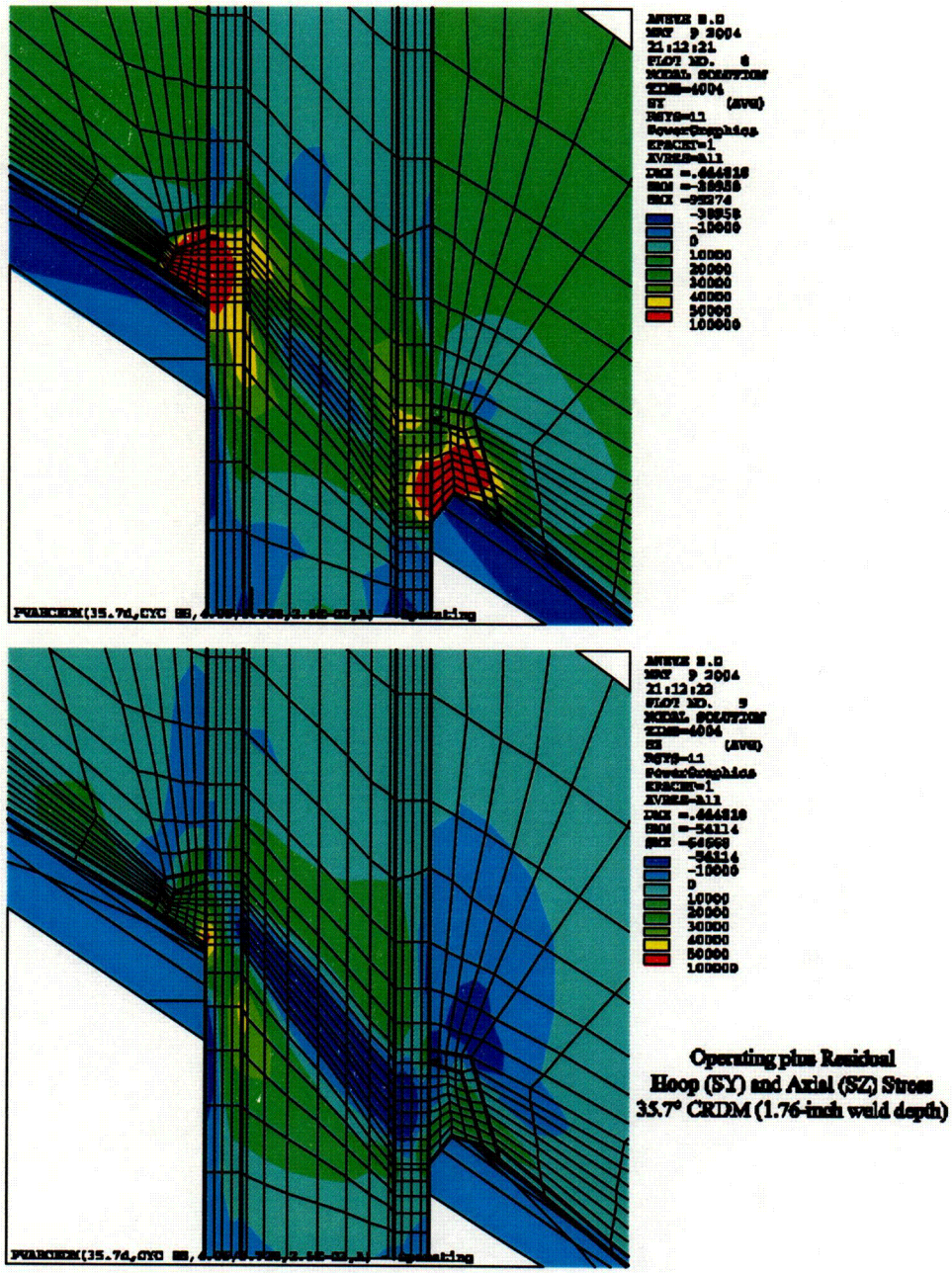

Hoop Stress vs Distance from Bottom of Weld,
51.5 Degrees (Uphill)
Hoop Stress (psi)
60,000
50,000
40,000
30,000
20,000
10,000
0
-10,000
-20,000
-30,000
-40,000
0.00
1.00
2.00
3.00
4.00
5.00
6.00
7.00
8.00
9.00
Distance from Bottom of Weld (in)
Design - Inside
Design - Outside
As -built - Inside
As-built - Outside

C04

Figure 5

Stress Contour Plots for Penetration Nozzle Angle (35.7°)

with As-Built Weld Depth of 1.76"

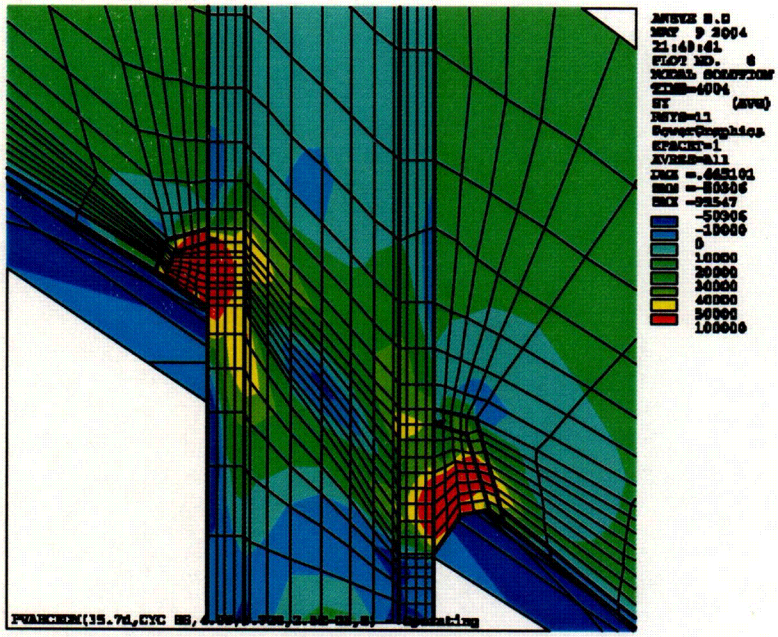


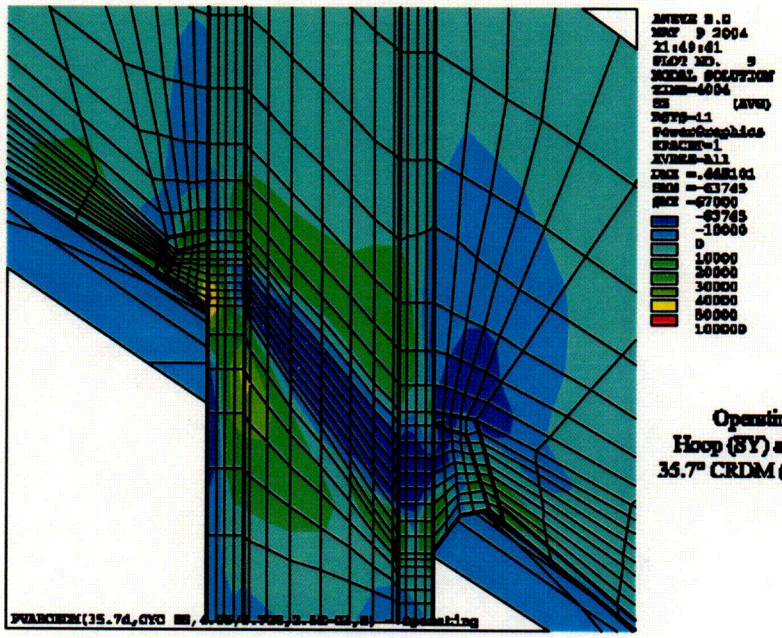
C05

Figure 6

Stress Contour Plots for Penetration Nozzle Angle (35.7°)

with As-Built Weld Depth of 2.24"





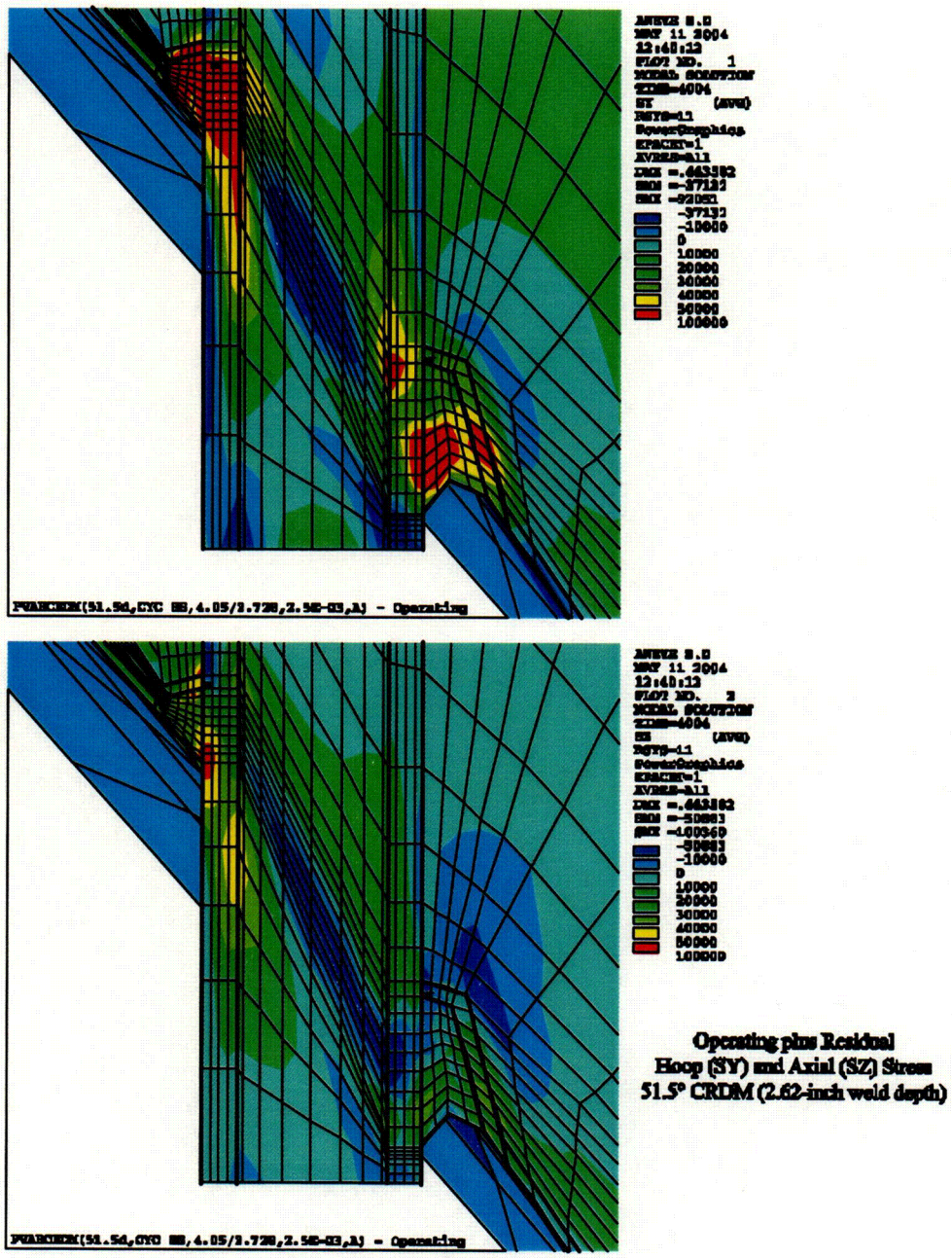
Operating plus Residual
Hoop (SY) and Axial (SZ) Stress
35.7° CRDM (2.24-inch weld depth)

C06

Figure 7

Stress Contour Plots for Penetration Nozzle Angle (51.5°)

with As-Built Weld Depth of 2.62"



C07