Attachment 2

"The Evaluation of Indications in Peach Bottom Unit 2 Vessel Closure Head For Continued Operation,"

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THE EVALUATION OF INDICATIONS IN PEACH BOTTOM UNIT 2 VESSEL CLOSURE HEAD FOR CONTINUED OPERATION

September 2002

Prepared for

Exelon Corp.
Peach Bottom Atomic Power Station, Unit 2

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Prepared by: Shaun A. Kleinsmith
S. Kleinsmith, Engineer
Structural Mechanics & Materials

Verified by: Matthew C. O'Connor for H. Mehta Matthew O'Connor
H.S. Mehta, Engineering Fellow
Structural Mechanics & Materials

Approved by:
R.M. Horn, Manager
Structural Mechanics & Materials

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1. EXECUTIVE SUMMARY

The reactor pressure vessel closure head at Peach Bottom Atomic Power Station, Unit 2 (PBAPS-2) was ultrasonically examined during refueling outage fourteen (2R-14). Each of the six meridional welds was examined. Several indications were noted at these welds. Other than the CH-MB weld, the detected indications at the other meridional welds were acceptable as-is by the acceptance standards IWB-3510 of ASME Section XI (1989 Edition without Addenda). At the CH-MB weld numerous recordable indications were noted out of which eighteen (18) indications/flaws displayed tip signals and possessed a through-wall dimension. Sixteen (16) of these flaws did not meet the acceptance standards. The Section XI Code allows for the acceptance of such flaws for continued service if they meet the requirements of Paragraph IWB-3600, Analytical Evaluation of Flaws. The analysis involves the use of fracture mechanics procedures in accordance with Appendix A of Section XI. The objective of this report is to document the results of such evaluation.

The use of surface proximity rules of Section XI indicated that all sixteen (16) indications need to be characterized as surface flaws for the purposes of fracture mechanics evaluation. Two conditions were determined to be governing: bolt-up and system pressure test. The bounding membrane and bending stress values for the fracture mechanics evaluation for the two conditions were obtained through a review of previous stress analyses of the closure heads. The bolt-up temperature was assumed as 70°F [1-1 & 1-2] at a pressure of 0 psi and the pressure test temperature was assumed as 169°F [1-1] with a pressure of 1050 psi [1-1]. The stress intensity factors for the characterized surface flaws were calculated for various flaw depth (a) to flaw length (l) ratios (or, aspect ratios). It was determined that the pressure-test condition was governing. The limiting flaw was found to be acceptable per ASME Section XI Code even after accounting for projected crack growth for the life of the plant including license renewal (60 total years).

Based on this evaluation it is concluded that all of the indications found in PBAPS-2 vessel closure head during Refueling Outage (2R-14) are acceptable by the flaw acceptance criteria of the ASME Section XI Code.

1.1. REFERENCE

[1-1] Exelon Nuclear, Peach Bottom Unit 2, Surveillance Test Specification ST-O-080-680-2, Rev. 6: Reactor Pressure Vessel (Class 1) Hydrostatic Pressure Test.

[1-2] PECO Energy Company, Peach Bottom Unit 2, Surveillance Test Specification ST-O-080-500-2, Rev. 7: Recording and Monitoring Reactor Vessel Temperature and Pressure.

2. INTRODUCTION AND REPORT OUTLINE

The reactor pressure vessel closure head at Peach Bottom, Unit 2 (PBAPS-2) was ultrasonically examined during the 2R14 refueling outage. Figure 2-1 shows the geometry of the vessel head. The inside radius of the head is 125.69 inches and the minimum specified thickness is 4.00 inches [2-1]. However, the measured thickness reported during the UT examination is 4.25 inches, the value used in the evaluations conducted for this report [2-2]. The inside surface of the closure head is unclad. Meridional welds were examined. Several flaws were noted in the meridional weld CH-MB. All of the flaws are not ID connected (i.e. sub surface) as confirmed by surface examination conducted at the ID surface. However, portions of the flaws are less than 0.4d from the ID surface, thus they were classified as surface flaws for fracture mechanics analysis. The observed flaws were first characterized and compared with the acceptance standards provided in Table IWB-3500-1 of Section XI, ASME Code [2-3]. Some of the flaws did not meet the acceptance standards. Section XI, subparagraph IWB-3132.4 allows for the acceptance of such flaws for continued service if they meet the requirements of Paragraph IWB-3600, Analytical Evaluation of Flaws. The analysis involves the use of fracture mechanics procedures in accordance with Appendix A of Reference 2-3. The objective of this report is to document the results of such evaluation.

Section 3 of this report summarizes UT inspection results and describes the flaw geometries considered in the evaluation. The results of the fracture mechanics evaluation are presented in Section 4. A comparison with the allowable flaw values is presented. Finally, summary and conclusions are presented in Section 5.

2.1. REFERENCE

[2-1] Babcock & Wilcox CO. Pressure Boundary Drawing, "Closure Head Assembly" for Peach Bottom Unit 2, Drawing # 129392 E R7, GE VPF# 1896-67-8.

[2-2] GE Nuclear Energy, Peach Bottom Unit 2 – 2R14 UT Examination Report # 008900 for Weld ID – CH-MB Meridional Weld @ 60 Degrees. September 27, 2002.

[2-3] ASME Boiler and Pressure Vessel Code, Section XI, Rules for In-Service Inspection of Nuclear Power Plant Components, ASME, 1989 Edition without Addenda.

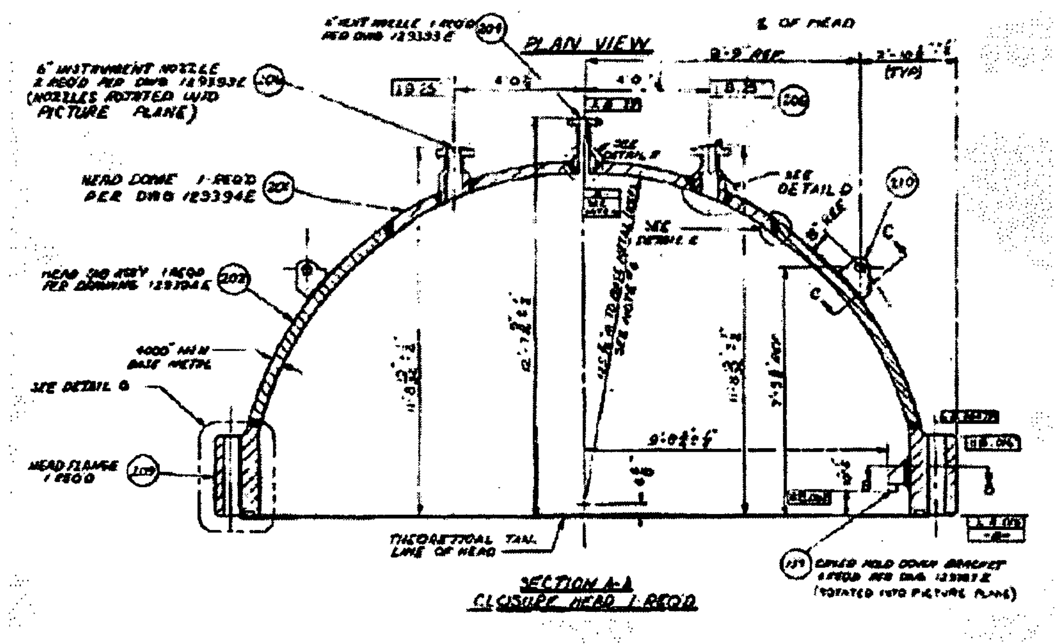

Figure 2-1 PBAPS 2 Vessel Closure Head Geometry

3. UT INSPECTION RESULTS & FLAW GEOMETRY FOR EVALUATION

This section discusses the UT results and the flaw geometries considered in the subsequent fracture mechanics evaluation. Appendix B shows the evaluation sheets for the limiting/bounding case flaws that were found to exceed acceptance standards and required fracture mechanics evaluation. A brief discussion on the origin of the indications is also provided.

3.1. UT INSPECTION RESULTS

Automated 0°L, 2.25 MHz, 45°S, 1.0 MHz, 60°L, 2.0 MHz, 70°L, 2.0 MHz scans were performed on the closure head meridional weld CH-MB. The scans and calibrations were performed in accordance with procedure GE-UT-704 Version 4 DRR# P3-001, that is qualified to the Performance Demolition Initiative (PDI). All of the detected flaws were sub-surface but in close proximity to the surface, thus they were classified as surface flaws for the analysis [Appendix A & B].

There were sixty-five (65) recordable indications detected in the CH-MB weld. Eighteen (18) indications displayed tip signals and possessed a through wall dimension. Forty-seven (47) indications without through wall dimension have been evaluated as being acceptable to the requirements of Table IWB-3510-1 [2-3]. Of the eighteen (18) remaining separate flaws, two (2) of the recorded flaws have been evaluated as being acceptable to the requirements of Table IWB-3510-1 [2-3]. Sixteen (16) of flaws have been evaluated as being rejectable to the requirements of Table IWB-3510-1. These Sixteen (16) flaws are characterized in Table 3-2. The GERIS 2000 Indication Data Sheets for each indication can be found in the Appendix A. The GERIS 2000 Indication Evaluation Data Sheets for each flaw can be found in the Appendix B.

Figures 3-1-1 thru 3-1-3 shows the approximate locations of the indications relative to the CH-MB weld centerline.

3.2. FLAW GEOMETRIES CONSIDERED IN EVALUATION

Table 3-2 shows the criteria used to determine if the indications that are to be evaluated need to be characterized as surface or sub-surface type flaws for the purpose of fracture mechanics analysis. The guidance for this characterization is provided in Article IWA-3000 [2-3]. Figure 3-2 shows the parameters used for surface proximity evaluation. It is seen in Table 3-2 that all of the indications are to be characterized as surface. In view of the varying aspect ratio (a/l), the stress intensity factors in the next section were calculated for different a/l values: 0.0, 0.1, 0.2, 0.3, .0.4, and 0.5.

3.3. FABRICATION REVIEW

All the indications in question are sub surface, in close proximity to the surface and are not service induced, but were considered as surface flaws for the fracture mechanics evaluation. A fabrication review (Reference 3-1) concluded the following:

- The flaws detected during 2R14 have existed since the closure head was fabricated.
- These flaws do not indicate "abnormal degradation of the pressure boundary" as defined by the USNRC.
- These flaws should be considered newly discovered flaws, rather than newly developed flaws.

Indications at vessel welds of the type seen in the Peach Bottom Unit 2 top head welds are not uncommon and have been found in other reactor pressure vessel welds in other plants. In most cases, the new finding is attributed to the ability of current UT techniques to detect flaws that would have been undetectable using inspection techniques available during the time of fabrication of the Peach Bottom vessel. Thus, as long as the required fracture margins are demonstrated, the indications are judged to be benign and have no impact on structural integrity.

3.4. REFERENCES

[3-1] Miller, W.F., "Investigation into the Origin of Ultrasonic Indications in RPV Closure Head Welds for the Peach Bottom 2R14 Outage," GE Report No. GENE-955-004-0902 Rev. 1, September 2002.

Table 3-1 Listing of Ultrasonic Indications in RPV Closure Head Weld CH-MB at Peach Bottom Unit 2

Weld ID	Location	Number of Recordable Indications	Number of Indications / flaws with through wall dimension	Acceptable per Table IWB-3510-1
CH-MB	**60° Azimuth**	**65**	**18 (See description below)**	**2 (#10 & #39)**

CH-MB

IND # 5 Flaw length = 0.75" Flaw depth (a) = 0.17" S = 0"

IND # 6 Flaw length = 1.00" Flaw depth (a) = 0.20" S = 0"

IND # 10 Flaw length = 0.75" Flaw depth (a) = 0.10" S = 0"

IND # 14 Flaw length = 1.75" Flaw depth (a) = 0.16" S = 0"

IND # 16 Flaw length = 3.75" Flaw depth (a) = 0.25" S = 0"

IND # 20 Flaw length = 1.25" Flaw depth (a) = 0.17" S = 0"

IND # 24 Flaw length = 1.00" Flaw depth (a) = 0.17" S = 0"

IND # 34 Flaw length = 0.75" Flaw depth (a) = 0.16" S = 0"

IND # 38 Flaw length = 0.75" Flaw depth (a) = 0.19" S = 0"

IND # 39 Flaw length = 0.40" Flaw depth (a) = 0.16" S = 0"

IND # 42 Flaw length = 1.75" Flaw depth (a) = 0.19" S = 0"

IND # 44 Flaw length = 0.75" Flaw depth (a) = 0.17" S = 0"

IND # 50 Flaw length = 1.00" Flaw depth (a) = 0.12" S = 0"

IND # 53 Flaw length = 0.75" Flaw depth (a) = 0.14" S = 0"

IND # 56 Flaw length = 1.00" Flaw depth (a) = 0.17" S = 0"

IND # 57 Flaw length = 1.00" Flaw depth (a) = 0.17" S = 0"

IND # 61 Flaw length = 1.00" Flaw depth (a) = 0.12" S = 0"

IND # 63 Flaw length = 1.50" Flaw depth (a) = 0.17" S = 0"

Note: Values reported are taken directly from Appendix A & B.

Table 3-2 Characterization of Flaws

Weld ID	IND #	l (in.)	a (in.)	S (in.)	S<0.4a*	a/l
CH-MB	5	0.75	0.17	0.0	Yes	0.2267
CH-MB	6	1.00	0.20	0.0	Yes	0.2
CH-MB	10	0.75	0.10	0.0	Yes	0.1334
CH-MB	14	1.75	0.16	0.0	Yes	0.0914
CH-MB	**16**	**3.75**	**0.25**	**0.0**	**Yes**	**0.0667**
CH-MB	20	1.25	0.17	0.0	Yes	0.136
CH-MB	24	1.00	0.17	0.0	Yes	0.17
CH-MB	34	0.75	0.16	0.0	Yes	0.2133
CH-MB	38	0.75	0.19	0.0	Yes	0.2534
CH-MB	39	0.40	0.16	0.0	Yes	0.4
CH-MB	42	1.75	0.19	0.0	Yes	0.1086
CH-MB	44	0.75	0.17	0.0	Yes	0.2267
CH-MB	50	1.00	0.12	0.0	Yes	0.12
CH-MB	53	0.75	0.14	0.0	Yes	0.1867
CH-MB	56	1.00	0.17	0.0	Yes	0.17
CH-MB	57	1.00	0.17	0.0	Yes	0.17
CH-MB	61	1.00	0.12	0.0	Yes	0.12
CH-MB	63	1.50	0.17	0.0	Yes	0.1134

* Flaw characterized as surface flaw if S < 0.4a.

Figure 3-1-1 Plot displaying Approx. Location of Indications with No Throughwall Dimension

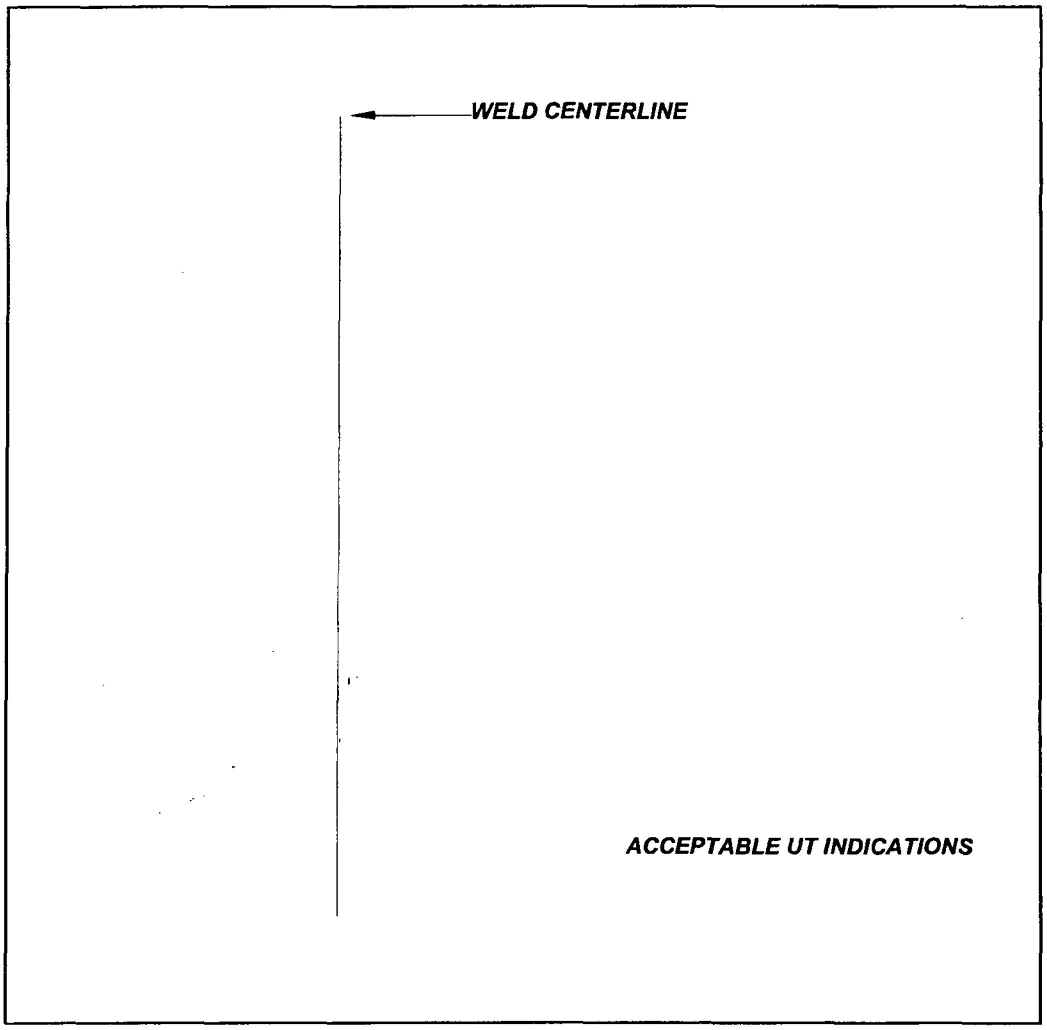

Figure 3-1-2 Plot displaying Approx. Location of Acceptable Indications with Throughwall Dimension

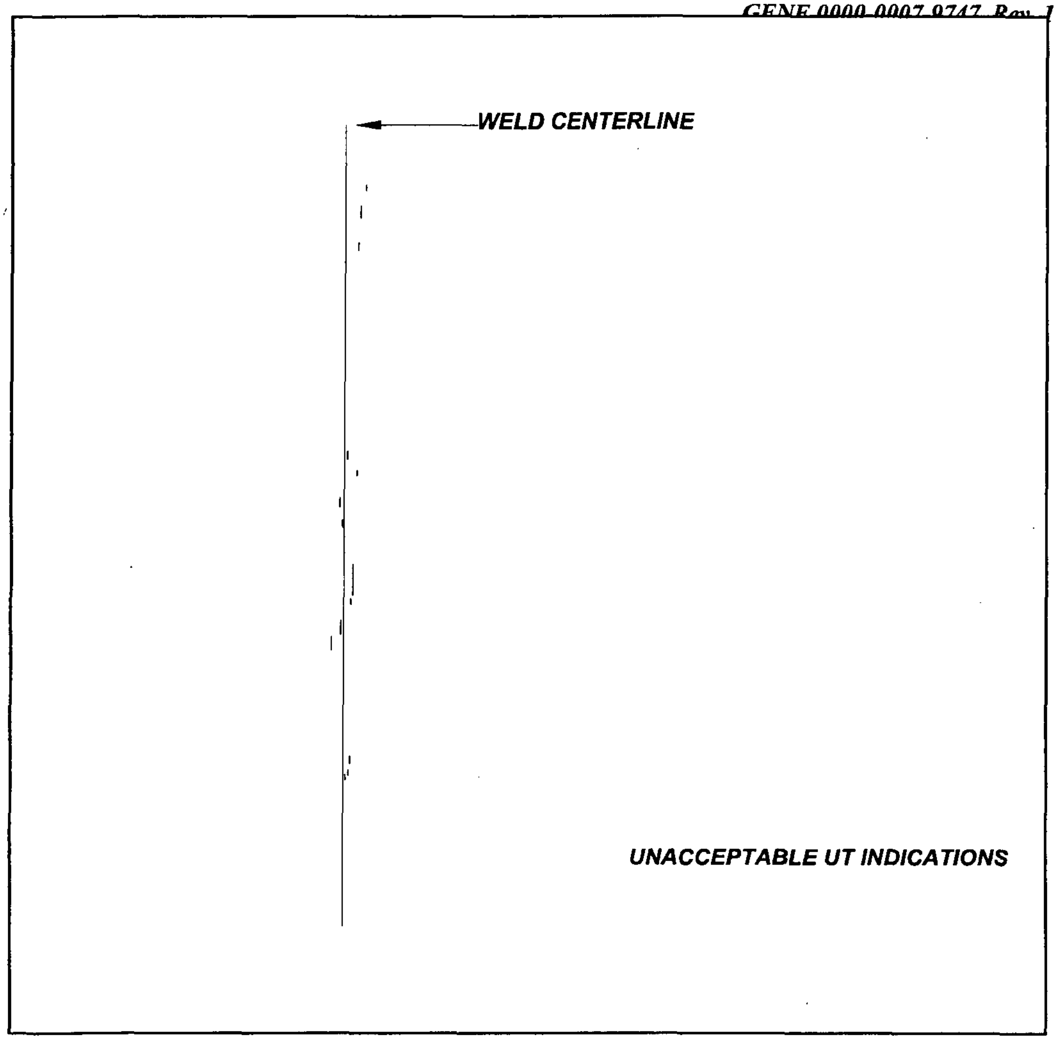

Figure 3-1-3 Plot displaying Approx. Location of Unacceptable UT Indications with Throughwall Dimension

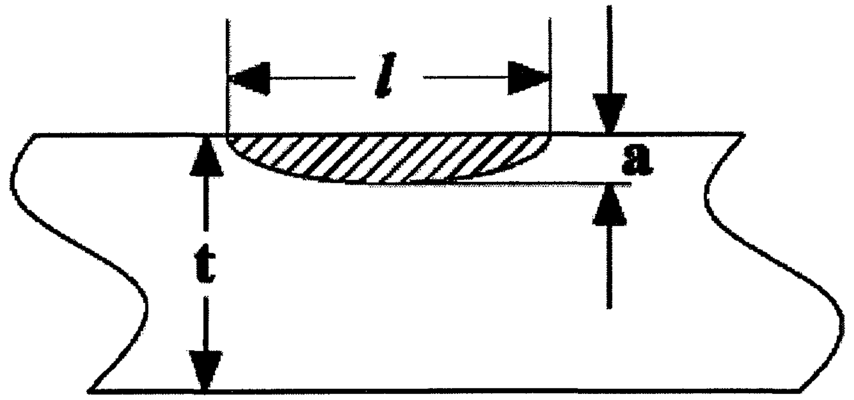

Figure 3-2 Parameters for Surface Proximity Evaluation

4. FRACTURE MECHANICS EVALUATION

The fracture mechanics evaluation was conducted for several surface flaw shape geometries using the procedures outlined in Appendix A of Section XI [4-1]. Two conditions were found to be limiting for the determination of allowable flaw sizes: (1) bolt-up, and (2) system pressure test.

4.1. ASSUMPTIONS

The following values were used for the pressure and temperature conditions during the bolt-up and system pressure test conditions. These values remain unchanged for power uprate conditions, but can change when new PT curves are licensed.

- The bolt-up temperature is 70°F [4-2 & 4-3].
- The pressure test pressure and temperature are 1050 psi and 169°F [4-4].
- The limiting RT_{NDT} value for the closure head side plate (torus) region is 10°F. [4-3]

The number of bolt-up, pressure test and start up-shut down events assumed in the fatigue crack growth calculation was based on [Reference 4-5], and is discussed in Subsection 4.4.

4.2. APPLIED AND WELD RESIDUAL STRESSES

The applied stresses in the vessel closure head to flange region are primarily from the following sources: bolt preload, internal pressure and weld residual stress. The internal pressure is zero during the bolt-up. Since all of the flaws are in the meridional direction welds, the circumferential or hoop stress is of interest for the purpose of this evaluation. Due to the complex geometry of the flange region, only a detailed finite element analysis of PBAPS Unit 2 closure head geometry can provide a complete picture of the stress distribution due to bolt-up and internal pressure. Since such an analysis was unavailable, the results from finite element analyses conducted for other BWR vessels of similar size on file with GENE were reviewed to conservatively determine a set of membrane and bending stresses. The determination took into account the differences in the R/t ratios between the available finite element model geometry and the PBAPS, Unit 2 closure head geometry.

During bolt-up large hoop bending stresses are introduced in the head near the flange junction but they attenuate rapidly as one moves away from the flange meridionally. These bending stresses are compressive at the ID surface near the flange junction. The hoop membrane stress is tensile but attenuates less rapidly. The longest flaw extends 3.75 inches in the meridional direction beginning approximately 41 inches above the top surface of the flange. Therefore, the hoop membrane and bending stress distributions corresponding to the meridional length of this indication were reviewed to determine the following conservative values for hoop membrane and bending stresses:

$\sigma_m =$ 14.0 ksi
$\sigma_b =$ -8.0 ksi

During the pressure test, the internal pressure stresses are superimposed over those induced by the bolt-up condition. Since some of the discontinuity related internal pressure stresses cancel those due to bolt-up, the overall stress level is lower than the simple addition of the bolt-up and the nominal pressure stresses in the vessel head. The same approach as that used for bolt-up case was also used to determine the following set of conservative membrane and bending stress values for the pressure test case:

$\sigma_m =$ 25.0 ksi
$\sigma_b =$ 0 ksi

It should be noted that the nominal value of hoop or meridional stress from an internal pressure of 1050 psi is 15.5 ksi. Thus, the difference between this value and the 25.0 ksi reported above represents the discontinuity effects from bolt-up and pressurization.

After the torus section plates are welded together, residual stresses remain due to thermal expansion and contraction. The post-weld heat treatment effectively reduces these residual stresses. A bending stress of 8.0 ksi was assumed in this analysis to model the remaining residual stresses. This bending stress closely approximates the measured cosine stress distribution for welds with PWHT reported in [Reference 4-6]. The 8 ksi magnitude was added algebraically to the calculated bending stresses due to bolt-up and pressure. Figures 4-1 and 4-2 graphically show the stress distributions used for the bolt-up and pressure test cases, respectively.

4.3. K CALCULATION METHODOLOGY

Since all of the analyzed indications have been characterized as surface flaws (Table 3-2), the stress intensity factor (K) calculation procedures specified for surface flaws in Appendix A of Section XI [4-1] were used. Table 4-1 shows the calculated values of K as a function of 'a' values for the pressure test cases for an assumed aspect ratio of 0.0. Similar calculations were also conducted for aspect ratios of 0.1, 0.2, 0.3, 0.4 and 0.5.

4.4. FATIGUE CRACK GROWTH

Since all the flaws are characterized as surface flaws, they are assumed as being exposed to the reactor water environment. Thus, the crack growth analysis was performed using the Section XI fatigue crack growth rates for water environment.

The current analyzed reactor pressure vessel cycles for the 40-year design life are listed in [Reference 4-5]. Only the bolt-up (66), hydrostatic test (130) and heatup-cooldown (161) events are significant from the perspective of fatigue crack growth in the vessel closure head. The stress range for the heatup-cooldown cycle is bounded by that for the pressure test, and therefore, the cycles for the two events were lumped together for the fatigue crack growth calculation purposes. The number of cycles for these events were increased by 50% to account for operation during the license renewal period. Thus, the number of events assumed for the bolt-up were 66x1.5 or 100. The number of events assumed for the pressure test were {(130+161)x1.5} or ~ 440. This approach is conservative since it does not take any credit for the number of cycles already used so far. The highest applied K values listed in Tables 4-2 and 4-3 were used for the fatigue crack growth calculations. The predicted crack growth was calculated as 56.2 micro inches per cycle. Which results in a crack growth of 0.025" for 440 cycles.

4.5. ALLOWABLE K VALUES

The first step in the allowable flaw calculation is to determine the K_{Ia} value at the temperature appropriate for the operating condition being analyzed. The 1989 version of Section XI [4-1] does not provide an explicit mathematical equation for the calculation of K_{Ia} at a given temperature and RT_{NDT}. However, Reference 4-7 gives the following equation that was used to calculate the K_{Ia} curve given in Figure A-4200-1[4-1]:

$$K_{Ia} = 26.78 + 1.233 * \text{Exp}\,(0.0145 * (T - RT_{NDT} + 160))$$

where, T and RT_{NDT} are in °F and K_{Ia} is in ksi$\sqrt{\text{in}}$.

Paragraph IWB-3613 of Section XI [4-1] also indicates that for flange region a safety factor of $\sqrt{2}$ can be used for bolt-up condition. Thus, a safety factor of $\sqrt{2}$ was used for the bolt-up condition to obtain K_{Ia} allowable. For the pressure test condition, a safety factor of $\sqrt{10}$ was used as specified in IWB-3613[4-1]. The following summarizes the numerical values:

Bolt-up

Applied K =	14.3	(ksi $\sqrt{in}$) at 0 (psi) and 70 (°F)
Allowable K =	40.1	(ksi $\sqrt{in}$)

Pressure test

Applied K =	34.8	(ksi $\sqrt{in}$) at 1050 (psi) and 169 (°F)
Allowable K =	48.3	(ksi $\sqrt{in}$) at 1050 (psi) and 169 (°F)

4.6. DISPOSITION OF INDICATIONS

Tables 4-2 and 4-3 show comparisons of the K values for the limiting flaw being evaluated and the allowable values for bolt-up and pressure test conditions, respectively. It is seen that the calculated K values for all of the indications are less than the allowable values.

The calculated primary stresses after subtracting the area lost to indications, satisfied the primary stress limits specified in the original Code of construction for the reactor vessel.

Based on the preceding, it is concluded that the subject flaws are acceptable for continued operation in as-is condition.

4.7. REFERENCES

[4-1] ASME Boiler and Pressure Vessel Code, Section XI, Rules for In-Service Inspection of Nuclear Power Plant Components, ASME, 1989 Edition without Addenda.

[4-2] PECO Energy Company, Peach Bottom Unit 2, Surveillance Test Specification ST-O-080-500-2, Rev. 7: Recording and Monitoring Reactor Vessel Temperature and Pressure.

[4-3] L. Tilly, "Pressure-Temperature Curves for Exelon Peach Bottom Unit 2" GE Nuclear Energy, San Jose, CA, GE-NE-B13-02118-00-01 Rev. 0, September 2002.

[4-4] Exelon Nuclear, Peach Bottom Unit 2, Surveillance Test Specification ST-O-080-680-2, Rev. 6: Reactor Pressure Vessel (Class 1) Hydrostatic Pressure Test.

[4-5] PECO Energy Company, Peach Bottom Unit 2, Surveillance Test Specification ST-O-080-940-2, Rev. 6: Reactor Pressure Vessel Transients Cycles Record.

[4-6] D.A. Ferrill, et al, "Measurement of Residual Stresses in Heavy Weldment," Welding Journal Research Supplement, Vol 45, Nov. 1966.

[4-7] EPRI Report No. NP-719-SR, "Flaw Evaluation Procedures: ASME Section XI," August 1978.

Table 4-1 Calculated K values for Pressure test Cases

Calculation of Stress Intensities (ksi-sqrt[in])

a =	0.25	(in)	t =	4.25	(in)
l =	3.75	(in)	σ_{YS} =	45.0	(ksi)
σ_m =	25.0	(ksi)	σ_b =	8.0	(ksi)

A_P (psi)	a / l	Q	M_m	M_b	Km (ksi)	Kb (ksi)	K_{TOTAL} (ksi)	Δ K (ksi)
1050	0.0	0.879	1.147	1.057	27.100	7.991	35.091	27.100
1050	0.1	0.989	1.117	1.016	24.889	7.242	32.131	24.889
1050	0.2	1.212	1.105	0.985	22.236	6.340	28.577	22.236
1050	0.3	1.521	1.10	0.963	19.740	5.538	25.277	19.740
1050	0.4	1.904	1.10	0.953	17.660	4.896	22.556	17.660
1050	0.5	2.356	1.10	0.937	15.880	4.329	20.209	15.880

Table 4-2 Comparison of Calculated and Allowable K values for bolt-up

Weld ID: CH-MB
IND # : 16

a (initial) =		0.25 (in)	$t =$		4.25	(in)
$l =$	3.75	(in)	$\sigma_{YS} =$	45.0	(ksi)	
$\sigma_m =$	14.0	(ksi)	$\sigma_b =$	0.0	(ksi)	
TEMP =	70	(°F)	$A_P =$	0	(psi)	
$a / l =$	0.067					

Applied K =	13.6	(ksi $\sqrt{in}$)	Assumes no crack growth
Applied K =	**14.3**	**(ksi $\sqrt{in}$)**	Includes an increase of 5% to account for fatigue crack growth
Allowable K =	40.1	(ksi $\sqrt{in}$)	

Table 4-3 Comparison of Calculated and Allowable K values for pressure tests

Weld ID: CH-MB
IND # : 16

A (initial) =		0.25 (in)	$t =$		4.25	(in)
$l =$	3.75	(in)	$\sigma_{YS} =$	45.0	(ksi)	
$\sigma_m =$	25.0	(ksi)	$\sigma_b =$	8.0	(ksi)	
TEMP =	169	(°F)	$A_P =$	1050	(psi)	
$a / l =$	0.067					

Applied K =	33.2	(ksi $\sqrt{in}$)	Assumes no crack growth
Applied K =	**34.8**	**(ksi $\sqrt{in}$)**	Includes an increase of 5% to account for fatigue crack growth
Allowable K =	48.3	(ksi $\sqrt{in}$)	

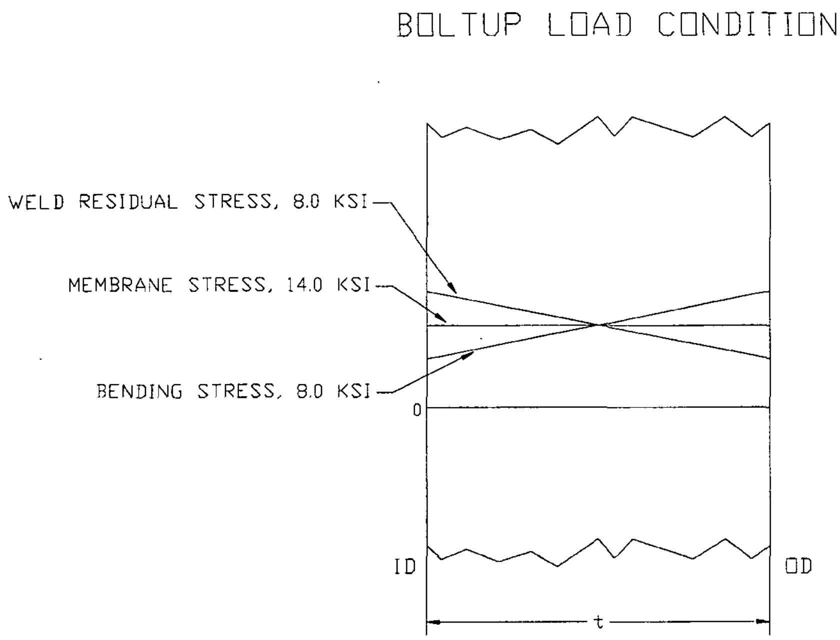

Figure 4-1 Through-Wall Stress Distribution Assumed for Bolt-up Condition

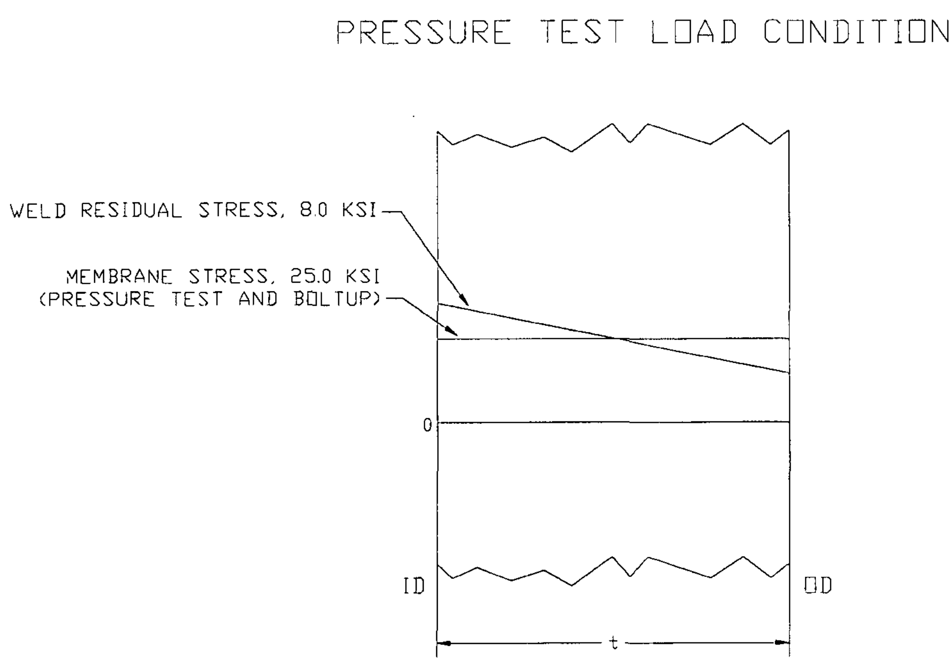

Figure 4-2 Through-Wall Stress Distribution Assumed for Pressure Test Condition

5. SUMMARY AND CONCLUSIONS

The reactor pressure vessel closure head at Peach Bottom Atomic Power Station, Unit 2 (PBAPS-2) was ultrasonically examined during refueling outage fourteen (2R-14). Each of the six meridional welds was examined. Several indications were noted at these welds. Other than the CH-MB weld, the detected indications at the other meridional welds were acceptable as-is by the acceptance standards IWB-3510 of ASME Section XI (1989 Edition without Addenda). At the CH-MB weld numerous recordable indications were noted out of which eighteen (18) indications/flaws displayed tip signals and possessed a through-wall dimension. Sixteen (16) of these flaws did not meet the acceptance standards. The Section XI Code allows for the acceptance of such flaws for continued service if they meet the requirements of Paragraph IWB-3600, Analytical Evaluation of Flaws. The analysis involves the use of fracture mechanics procedures in accordance with Appendix A of Section XI. The objective of this report is to document the results of such evaluation.

The use of surface proximity rules of Section XI indicated that all sixteen (16) indications need to be characterized as surface flaws for the purposes of fracture mechanics evaluation. Two conditions were determined to be governing: bolt-up and system pressure test. The bounding membrane and bending stress values for the fracture mechanics evaluation for the two conditions were obtained through a review of previous stress analyses of the closure heads. The bolt-up temperature was assumed as 70°F at a pressure of 0 psi and the pressure test temperature was assumed as 169°F with a pressure of 1050 psi. The stress intensity factors for the characterized surface flaws were calculated for various flaw depth (a) to flaw length (l) ratios (or, aspect ratios). It was determined that the pressure-test condition was governing. The limiting flaw was found to be acceptable per ASME Section XI Code even after accounting for projected crack growth for the life of the plant including license renewal (60 total years).

Based on this evaluation it is concluded that all of the indications found in PBAPS-2 vessel closure head during Refueling Outage (2R-14) are acceptable by the flaw acceptance criteria of the ASME Section XI Code.

APPENDIX A

GERIS 2000 Indication Data Sheets

Rev 1
September 2002
(Includes 2 Appended Pages September 27, 2002)

GE NUCLEAR ENERGY
UT EXAMINATION SUMMARY SHEET — Report No: 008900

PROJECT	Peach Bottom Unit 2 - 2R14
WELD ID:	CH-MB Meridional Weld @ 60 Degrees
SYSTEM:	RPV – Closure Head

INITIAL CALIBRATION:	VES.IN.1
FINAL CALIBRATION:	VES.OUT.1
GERIS DATA:	mbl.1, mbl.2, mbl.3. mbl.4, mbr.1, mbr.2
EXAMINERS:	CE Frakes Lv II, Shane Gauthier Lv II, Mark Hilborn Lv II
MANUAL DATA:	RPV-024, RPV-026
EXAMINERS:	C. Minor Lv. III.
MAGNETIC PARTICLE:	MT-016
EXAMINERS:	Steve Woodward Lv II

Ultrasonic examination results were unacceptable to the requirements of ASME B&PVC Section XI, 1989 Edition No Addenda, Category B-A Welds.

Automated 0°L, 45°S, 60°RL, and 70°RL scans and calibrations were performed in accordance with procedure GE-UT-704 Version 4.

Automated scanning was performed from the OD surface, examining the top and bottom sides of weld H9 for a

There were sixty five (65) recordable indications. The indications are located intermittently along the weld length and are aligned with the fusion line.

Eighteen (18) indications displayed tip signals and possessed a through wall dimension. Sixteen (16) of the recorded indications have been evaluated as being unacceptable to the requirements of Table IWB-3510-1. Two (2) of the recorded indications have been evaluated as being acceptable to the requirements of Table IWB-3510-1.

The remaining forty seven (47) indications without through wall dimension have been evaluated as being acceptable to the requirements of Table IWB-3510-1.

Baseline examination results were reviewed, the number and lengths of indications changed but the location did not.

Magnetic particle examinations were performed on the weld CH-MB inside surface in accordance with GE-MT-100 Revision V3. No recordable indications were found.

A visual VT-3 examination was performed on the weld CH-MB inside surface in accordance with MAG-CG-407 Rev. 7. No recordable indications were found.

Supplemental manual ultrasonic examination of selected areas of the internal surface of weld CH-MB was performed in accordance with PDI-UT-7 Rev. E Addenda-01. PDI-UT-7 used for information only, not qualified for ID detection or sizing. No near surface indications were found.

Due to scan limitations it not possible to examine 100% of the ASME code required area.

Auto UT composite coverage = 93.1%

Mark Tool III	[signature] II		
PREPARED BY	REVIEWED BY	UTILITY REVIEW	ANII REVIEW
DATE 9/26/02	DATE 9/27/02	DATE	DATE

GE Nuclear Energy

GERIS 2000 Indication Data Sheet

Project : Peach Bottom 2 - 2R14
Weld ID : CH-MB

Exam Data Sheet : mbl.3
Patch ID : mbl.3

Channel : 2 **Angle :** 45 **Direction :** 270

Ind #	Amp.	Search Unit X	Search Unit Y	ThruWall	Length	S	Comments
			9.64				
1	12%	135.28	9.89	N/A	0.50	0.00	
			10.14				
			11.64				
2	15%	135.53	12.14	N/A	1.00	0.00	
			12.64				
			12.39				
3	13%	137.28	12.39	N/A	0.25	0.00	
			12.64				
			12.64				
4	13%	137.03	12.64	N/A	0.25	0.00	
			12.89				
			18.89				
5	64%	136.78	19.14	0.17	0.75	0.00	
			19.64				
			20.39				
35	20%	137.03	20.89	N/A	0.75	0.00	
			21.14				

Comments :

Analyst: Philip Shanski
Level: III Date: 9-22-02

Reviewed By: Mark Trask
Level: III Date: 9/25/02

GE Nuclear Energy

GERIS 2000 Indication Data Sheet

Project : Peach Bottom 2 - 2R14
Weld ID : CH-MB

Exam Data Sheet : mbl.1
Patch ID : mbl.1

Channel : 2 **Angle :** 45 **Direction :** 270

Ind #	Amp.	Search Unit X	Search Unit Y	ThruWall	Length	S	Comments
			20.39				
6	84%	137.28	20.89	0.20	1.00	0.00	
			21.39				
			22.39				
7	13%	137.53	22.90	N/A	0.75	0.00	
			23.14				
			24.14				
8	26%	137.28	24.14	N/A	0.75	0.00	
			24.89				
			28.14				
9	18%	136.28	28.29	N/A	0.75	0.00	
			28.89				
			29.14				
10	12%	137.53	29.64	0.10	0.75	0.00	
			29.89				
			30.14				
11	12%	139.29	30.14	N/A	0.50	0.00	
			30.64				
			32.14				
12	11%	138.29	32.14	N/A	0.50	0.00	
			32.64				

Comments :

Analyst: Philip Shanahan
Level: III Date: 9-22-02

Reviewed By: Mark Toral
Level: III Date: 9/25/02

GE Nuclear Energy

GERIS 2000 Indication Data Sheet

Project : Peach Bottom 2 - 2R14
Weld ID : CH-MB
Exam Data Sheet : mbl.1
Patch ID : mbl.1

Channel : 2 **Angle :** 45 **Direction :** 270

Ind #	Amp.	Search Unit X	Y	ThruWall	Length	S	Comments
			34.89				
13	17%	136.03	35.14	N/A	0.75	0.00	
			35.64				
			36.64				
14	24%	136.53	37.64	0.16	1.75	0.00	
			38.39				
			40.14				
15	14%	137.78	40.64	N/A	0.75	0.00	
			40.89				
			41.64				
16	76%	137.28	44.14	0.25	3.75	0.00	
			45.39				
			45.14				
17	13%	133.03	45.39	N/A	0.75	0.00	
			45.89				
			48.14				
18	34%	137.53	48.39	N/A	0.75	0.00	
			48.89				
			50.64				
19	187%	137.78	52.14	N/A	2.50	0.00	
			53.14				

Comments :

Analyst: Philip Shaw

Level: III Date: 9-22-02

Reviewed By: Mark Turk

Level: III Date: 9/25/02

GE Nuclear Energy

GERIS 2000 Indication Data Sheet

Project : Peach Bottom 2 - 2R14
Weld ID : CH-MB
Exam Data Sheet : mbl.1
Patch ID : mbl.1

Channel : 2 **Angle :** 45 **Direction :** 270

Ind #	Amp.	Search Unit X	Search Unit Y	ThruWall	Length	S	Comments
			52.39				
20	22%	135.78	53.39	0.17	1.25	0.00	
			53.64				
			55.14				
21	131%	137.28	56.14	N/A	1.50	0.00	
			56.64				
			55.14				
22	17%	135.78	55.30	N/A	0.50	0.00	
			55.64				
			57.89				
23	31%	135.53	58.39	N/A	1.00		
			58.89				
			58.39				
24	41%	137.07	58.89	0.17	1.00	0.00	
			59.39				
			58.89				
25	18%	137.28	60.14	N/A	1.75	0.00	
			60.64				

Comments :

Analyst: Philip Shanahi Level: III Date: 9-22-02

Reviewed By: Mark Trask Level: III Date: 9/25/02

GE Nuclear Energy

GERIS 2000 Indication Data Sheet

Project : Peach Bottom 2 - 2R14
Weld ID : CH-MB

Exam Data Sheet : mbl.2
Patch ID : mbl.2

Channel : 2 **Angle :** 45 **Direction :** 270

Ind #	Amp.	Search Unit X	Y	ThruWall	Length	S	Comments
			63.64				
26	20%	137.78	63.89	N/A	0.25	0.00	
			63.89				
			67.89				
27	12%	139.04	68.39	N/A	0.75	0.00	
			68.64				
			73.14				
28	15%	138.04	73.39	N/A	0.75	0.00	
			73.89				
			74.89				
29	76%	138.04	75.14	N/A	0.75	0.00	
			75.64				
			76.89				
30	143%	138.04	77.39	N/A	1.25	0.00	
			78.14				
			82.64				
31	91%	138.54	83.14	N/A	2.25	0.00	
			84.89				
			87.14				
32	156%	138.79	87.89	N/A	1.00	0.00	
			88.14				

Comments :

Analyst: Philip Shanbi Level: III Date: 9-22-02

Reviewed By: Mark Tonk Level: III Date: 9/25/02

GE Nuclear Energy

GERIS 2000 Indication Data Sheet

Project : Peach Bottom 2 - 2R14
Weld ID : CH-M B

Exam Data Sheet : mbl.2
Patch ID : mbl.2

Channel : 2 **Angle :** 45 **Direction :** 270

Ind #	Amp.	Search Unit X	Search Unit Y	ThruWall	Length	S	Comments
			89.89				
33	64%	139.29	90.14	N/A	2.05	0.00	
			91.94				
			91.89				
34	53%	139.04	92.14	0.16	0.75	0.00	
			92.64				

Comments :

Analyst:
Level: III Date: 9-22-02

Reviewed By:
Level: III Date: 9/25/02

GE Nuclear Energy

GERIS 2000 Indication Data Sheet

Project : Peach Bottom 2 - 2R14
Weld ID : CH-MB

Exam Data Sheet : mbl.4
Patch ID : mbl.4

Channel : 2 **Angle :** 45 **Direction :** 270

Ind #	Amp.	Search Unit X	Search Unit Y	ThruWall	Length	S	Comments
			5.39				
36	18%	137.03	5.64	N/A	0.50	0.00	
			5.89				

Comments :

Analyst: Philip Shanks
Level: III Date: 9-22-02

Reviewed By: Mark Tonak
Level: III Date: 9/25/02

GE Nuclear Energy

GERIS 2000 Indication Data Sheet

Project : Peach Bottom 2 - 2R14 **Exam Data Sheet :** mbr.2
Weld ID : CH-MB **Patch ID :** mbr.2

Channel : 2 **Angle :** 45 **Direction :** 270

Ind #	Amp.	Search Unit X	Search Unit Y	ThruWall	Length	S	Comments
			11.11				
37	15%	125.96	11.36	N/A	0.50	0.00	
			11.61				
			18.36				
38	45%	127.96	18.61	0.19	0.75	0.00	
			19.11				
			21.86				
39	31%	127.46	22.11	0.16	0.40	0.00	
			22.26				
			25.36				
40	31%	125.71	25.61	N/A	0.50	0.00	
			25.86				
			31.61				
41	31%	126.21	32.61	N/A	1.50	0.00	
			33.11				
			34.61				
42	29%	125.96	35.11	0.19	1.75	0.00	
			36.36				
			39.11				
43	20%	127.21	39.11	N/A	0.25	0.00	
			39.36				

Comments :

Analyst: [signature] Reviewed By: Mark Trok

Level: II Date: 9/21/02 Level: III Date: 9/25/02

GE Nuclear Energy

GERIS 2000 Indication Data Sheet

Project : Peach Bottom 2 - 2R14
Weld ID : CH-MB

Exam Data Sheet : mbr.2
Patch ID : mbr.2

Channel : 2 **Angle :** 45 **Direction :** 270

Ind #	Amp.	Search Unit X	Search Unit Y	ThruWall	Length	S	Comments
			40.36				
44	45%	128.22	40.61	0.17	0.75	0.00	
			41.11				
			41.36				
45	41%	128.22	41.86	N/A	1.00	0.00	
			42.36				
			42.86				
46	20%	128.47	42.86	N/A	0.50	0.00	
			43.36				
			45.86				
47	34%	28.22	46.11	N/A	0.75	0.00	
			46.61				

Comments :

Analyst: [illegible]
Level: II Date: 9/21/02

Reviewed By: [illegible]
Level: III Date: 9/25/02

GE Nuclear Energy

GERIS 2000 Indication Data Sheet

Project: Peach Bottom 2 - 2R14
Weld ID:

Exam Data Sheet: mbr.1
Patch ID: mbr.1

Channel: 2 **Angle:** 45 **Direction:** 270

Ind #	Amp.	Search Unit X	Search Unit Y	ThruWall	Length	S	Comments
			48.11				
48	131%	128.97	48.61	N/A	0.75	0.00	
			48.86				
			49.36				
49	143%	128.72	49.61	N/A	1.00	0.00	
			50.36				
			49.86				
50	37%	126.96	50.61	0.12	1.00	0.00	
			50.86				
			53.61				
51	143%	128.47	53.86	N/A	0.75	0.00	
			54.36				
			56.11				
52	45%	127.21	56.61	N/A	0.75	0.00	
			56.86				
			56.36				
53	37%	128.97	56.61	0.14	0.75	0.00	
			57.11				
			60.11				
54	18%	127.46	60.86	N/A	1.00	0.00	
			61.11				

Comments:

Analyst: [signature]
Level: II Date: 9/21/02

Reviewed By: [signature]
Level: III Date: 9/25/02

PB2-CH-MB-Data 2R14.xls

GE Nuclear Energy

GERIS 2000 Indication Data Sheet

Project : Peach Bottom 2 - 2R14
Weld ID : CH-MB

Exam Data Sheet : mbr.1
Patch ID : mbr.1

Channel : 2 **Angle :** 45 **Direction :** 270

Ind #	Amp.	Search Unit X	Y	ThruWall	Length	S	Comments
			61.10				
55	22%	129.47	61.36	N/A	0.51	0.00	
			61.61				
			72.61				
56	100%	129.71	73.10	0.17	1.00	0.00	
			73.61				
			74.61				
57	109%	129.47	75.11	0.17	1.00	0.00	
			75.61				
			80.11				
58	70%	129.22	80.61	N/A	1.25	0.00	
			81.36				
			81.61				
59	45%	129.72	82.11	N/A	0.75	0.00	
			82.36				
			84.11				
60	45%	129.47	84.11	N/A	0.50	0.00	
			84.61				
			84.61				
61	171%	128.97	85.11	0.12	1.00	0.00	
			85.61				

Comments : None

Analyst: CA MT
Level: III Date: 9/26/02

Reviewed By: Mark Trel
Level: III Date: 9/26/02

GE Nuclear Energy

GERIS 2000 Indication Data Sheet

Project : Peach Bottom 2 - 2R14
Weld ID : CH-MB

Exam Data Sheet : mbr.1
Patch ID : mbr.1

Channel : 2 **Angle :** 45 **Direction :** 270

Ind #	Amp.	Search Unit X	Search Unit Y	ThruWall	Length	S	Comments
			87.61				
62	84%	129.22	87.86	N/A	0.50	0.00	
			88.11				
			88.61				
63	26%	128.72	89.36	0.17	1.50	0.00	
			90.11				
			92.86				
64	24%	127.46	93.36	N/A	0.75	0.00	
			93.61				

Comments :

Analyst: [signature] Level: II Date: 9/2/02

Reviewed By: Mark T[signature] Level: III Date: 9/25/02

GE Nuclear Energy

GERIS 2000 Indication Data Sheet

Project : Peach Bottom 2 - 2R14
Weld ID : CH-MB

Exam Data Sheet : mbr.1
Patch ID : mbr.1

Channel : 4 **Angle :** 45 **Direction :** 270

Ind #	Amp.	Search Unit X	Y	ThruWall	Length	S	Comments
		127.51					
65	26%	128.02	92.25	N/A	1.00	0.00	
		128.52					

Comments :

Analyst: [illegible]
Level: III Date: 9/21/02

Reviewed By: [illegible]
Level: III Date: 9/25/02

APPENDIX B

GERIS 2000 Indication
Evaluation Data Sheets

Rev 1
September 2002
(Includes 2 New Pages September 27, 2002)

GE Nuclear Energy

GERIS 2000 Indication Evaluation Data Sheet

Project : Peach Bottom, Unit-2
Weld ID : CH-MB

Exam Data Sheet : mbl.3
Sizing Data Sheet : n/a
Indication : 5

Flaw Throughwall Dimension = 0.170
Flaw Length "l" = 0.75
Surface Separation "S" = 0.00

"T" nominal = 4.25
"T" measured = 4.30
Clad "T" nominal = N/A

ASME Section XI, 1989 Edition, No Addenda
TABLE IWB-3510-1 for 4" to 12"

a/l	Surface %	Subsurface %	Surface %	Subsurface %
0.00	1.9	2.0	~	~
0.05	2.0	2.2	~	~
0.10	2.2	2.5	~	~
0.15	2.5	2.9	~	~
0.20	2.8	3.3	3.07	3.57 Y
0.25	3.3	3.8	~	~
0.30	3.8	4.4	~	~
0.35	4.4	5.1	~	~
0.40	5.0	5.8	~	~
0.45	5.1	6.7	~	~
0.50	5.2	7.6	~	~
			Allowed	Allowed
			3.07	0.00

a = 0.170
a/l value = 0.227
Y = 0.000

Flaw is Surface

Allowed a/t = 3.07%
a/t = 3.95%

Flaw is unacceptable by Table IWB-3510-1.

Comments : None.

Data Review By: Philip Shanski
Level: III Date: 9-22-02

Reviewed By: Mark Turk
Level: III Date: 9/25/02

GE Nuclear Energy

GERIS 2000 Indication Evaluation Data Sheet

Project : Peach Bottom, Unit-2
Weld ID : CH-MB

Exam Data Sheet : mbl.1
Sizing Data Sheet : n/a
Indication : 6

Flaw Throughwall Dimension = 0.200
Flaw Length "l" = 1.00
Surface Separation "S" = 0.00

"T" nominal = 4.25
"T" measured = 4.30
Clad "T" nominal = N/A

ASME Section XI, 1989 Edition, No Addenda
TABLE IWB-3510-1 for 4" to 12"

a/l	Surface %	Subsurface %	Surface %	Subsurface %
0.00	1.9	2.0	~	~
0.05	2.0	2.2	~	~
0.10	2.2	2.5	~	~
0.15	2.5	2.9	~	~
0.20	2.8	3.3	2.80	3.30 Y
0.25	3.3	3.8	~	~
0.30	3.8	4.4	~	~
0.35	4.4	5.1	~	~
0.40	5.0	5.8	~	~
0.45	5.1	6.7	~	~
0.50	5.2	7.6	~	~
			Allowed	Allowed
			2.80	0.00

a = 0.200
a/l value = 0.200
Y = 0.000

Flaw is Surface

Allowed a/t = 2.80%
a/t = 4.65%

Flaw is unacceptable by Table IWB-3510-1.

Comments : None.

Data Review By: Philip Shaeli
Level: III Date: 9-22-02

Reviewed By: [signature]
Level: III Date: 9/25/02

GE Nuclear Energy

GERIS 2000 Indication Evaluation Data Sheet

Project : Peach Bottom, Unit-2
Weld ID : CH-MB

Exam Data Sheet : mbl.1
Sizing Data Sheet : n/a
Indication : 14

Flaw Throughwall Dimension = 0.160
Flaw Length "l" = 1.75
Surface Separation "S" = 0.00

"T" nominal = 4.25
"T" measured = 4.30
Clad "T" nominal = N/A

ASME Section XI, 1989 Edition, No Addenda
TABLE IWB-3510-1 for 4" to 12"

a/l	Surface %	Subsurface %	Surface %	Subsurface %
0.00	1.9	2.0	-	-
0.05	2.0	2.2	2.17	2.45 Y
0.10	2.2	2.5	-	-
0.15	2.5	2.9	-	-
0.20	2.8	3.3	-	-
0.25	3.3	3.8	-	-
0.30	3.8	4.4	-	-
0.35	4.4	5.1	-	-
0.40	5.0	5.8	-	-
0.45	5.1	6.7	-	-
0.50	5.2	7.6	-	-
			Allowed	Allowed
			2.17	0.00

a = 0.160
a/l value = 0.091
Y = 0.000

Flaw is Surface

Allowed a/t = 2.17%
a/t = 3.72%

Flaw is unacceptable by Table IWB-3510-1.

Comments : None.

Data Review By: Philip Hamblin
Level: III Date: 9-22-02

Reviewed By: Mark Trask
Level: III Date: 9/25/02

GE Nuclear Energy

GERIS 2000 Indication Evaluation Data Sheet

Project : Peach Bottom, Unit-2
Weld ID : CH-MB

Exam Data Sheet : mbl.1
Sizing Data Sheet : n/a
Indication : 10

Flaw Throughwall Dimension = 0.100
Flaw Length "l" = 0.75
Surface Separation "S" = 0.00

"T" nominal = 4.25
"T" measured = 4.30
Clad "T" nominal = N/A

ASME Section XI, 1989 Edition, No Addenda
TABLE IWB-3510-1 for 4" to 12"

a/l	Surface %	Subsurface %	Surface %	Subsurface %
0.00	1.9	2.0	~	~
0.05	2.0	2.2	~	~
0.10	2.2	2.5	2.40	2.77 Y
0.15	2.5	2.9	~	~
0.20	2.8	3.3	~	~
0.25	3.3	3.8	~	~
0.30	3.8	4.4	~	~
0.35	4.4	5.1	~	~
0.40	5.0	5.8	~	~
0.45	5.1	6.7	~	~
0.50	5.2	7.6	~	~
			Allowed	Allowed
			2.40	0.00

a = 0.100
a/l value = 0.133
Y = 0.000

Flaw is Surface

Allowed a/t = 2.40%
a/t = 2.33%

Flaw is acceptable by Table IWB-3510-1.

Comments : None.

Data Review By: Philip Shambaia
Level: III
Date: 9-22-02

Reviewed By: Merle Trail
Level: III
Date: 9/25/02

GE Nuclear Energy

GERIS 2000 Indication Evaluation Data Sheet

Project : Peach Bottom, Unit-2
Weld ID : CH-MB

Exam Data Sheet : mbl.1
Sizing Data Sheet : n/a
Indication : 16

Flaw Throughwall Dimension = 0.250
Flaw Length "l" = 3.75
Surface Separation "S" = 0.00

"T" nominal = 4.25
"T" measured = 4.30
Clad "T" nominal = N/A

ASME Section XI, 1989 Edition, No Addenda
TABLE IWB-3510-1 for 4" to 12"

a/l	Surface %	Subsurface %	Surface %	Subsurface %
0.00	1.9	2.0	~	~
0.05	2.0	2.2	2.07	2.30 Y
0.10	2.2	2.5	~	~
0.15	2.5	2.9	~	~
0.20	2.8	3.3	~	~
0.25	3.3	3.8	~	~
0.30	3.8	4.4	~	~
0.35	4.4	5.1	~	~
0.40	5.0	5.8	~	~
0.45	5.1	6.7	~	~
0.50	5.2	7.6	~	~
			Allowed	Allowed
			2.07	0.00

a = 0.250
a/l value = 0.067
Y = 0.000

Flaw is Surface

Allowed a/t = 2.07%
a/t = 5.81%

Flaw is unacceptable by Table IWB-3510-1.

Comments : None.

Data Review By: Philip Shambli
Level: III Date: 9-22-02

Reviewed By: Mark Trle
Level: III Date: 9/25/02

GE Nuclear Energy

GERIS 2000 Indication Evaluation Data Sheet

Project : Peach Bottom, Unit-2
Weld ID : CH-MB

Exam Data Sheet : mbl.1
Sizing Data Sheet : n/a
Indication : 20

Flaw Throughwall Dimension = 0.170
Flaw Length "l" = 1.25
Surface Separation "S" = 0.00

"T" nominal = 4.25
"T" measured = 4.30
Clad "T" nominal = N/A

ASME Section XI, 1989 Edition, No Addenda
TABLE IWB-3510-1 for 4" to 12"

a/l	Surface %	Subsurface %	Surface %	Subsurface %
0.00	1.9	2.0	~	~
0.05	2.0	2.2	~	~
0.10	2.2	2.5	2.42	2.79 Y
0.15	2.5	2.9	~	~
0.20	2.8	3.3	~	~
0.25	3.3	3.8	~	~
0.30	3.8	4.4	~	~
0.35	4.4	5.1	~	~
0.40	5.0	5.8	~	~
0.45	5.1	6.7	~	~
0.50	5.2	7.6	~	~
			Allowed	Allowed
			2.42	0.00

a = 0.170
a/l value = 0.136
Y = 0.000

Flaw is Surface

Allowed a/t = 2.42%
a/t = 3.95%

Flaw is unacceptable by Table IWB-3510-1.

Comments : None.

Data Review By: Philip Shaw
Level: III Date: 9-22-02

Reviewed By: Mark Trask
Level: III Date: 9/25/02

GE Nuclear Energy

GERIS 2000 Indication Evaluation Data Sheet

Project: Peach Bottom, Unit-2
Weld ID: CH-MB
Exam Data Sheet: mbl.1
Sizing Data Sheet: n/a
Indication: 24

Flaw Throughwall Dimension = 0.170
Flaw Length "l" = 1.00
Surface Separation "S" = 0.00
"T" nominal = 4.25
"T" measured = 4.30
Clad "T" nominal = N/A

ASME Section XI, 1989 Edition, No Addenda
TABLE IWB-3510-1 for 4" to 12"

a/l	Surface %	Subsurface %	Surface %	Subsurface %
0.00	1.9	2.0	~	~
0.05	2.0	2.2	~	~
0.10	2.2	2.5	~	~
0.15	2.5	2.9	2.62	3.06 Y
0.20	2.8	3.3	~	~
0.25	3.3	3.8	~	~
0.30	3.8	4.4	~	~
0.35	4.4	5.1	~	~
0.40	5.0	5.8	~	~
0.45	5.1	6.7	~	~
0.50	5.2	7.6	~	~
			Allowed	Allowed
			2.62	0.00

a = 0.170
a/l value = 0.170
Y = 0.000

Flaw is Surface

Allowed a/t = 2.62%
a/t = 3.95%

Flaw is unacceptable by Table IWB-3510-1.

Comments: None.

Data Review By: Philip Shamblin
Level: III Date: 9-22-02

Reviewed By: Mark Trnka
Level: III Date: 9/25/02

GE Nuclear Energy

GERIS 2000 Indication Evaluation Data Sheet

Project : Peach Bottom, Unit-2
Weld ID : CH-MB

Exam Data Sheet : mbl.2
Sizing Data Sheet : n/a
Indication : 34

Flaw Throughwall Dimension = 0.160
Flaw Length "l" = 0.75
Surface Separation "S" = 0.00

"T" nominal = 4.25
"T" measured = 4.30
Clad "T" nominal = N/A

ASME Section XI, 1989 Edition, No Addenda
TABLE IWB-3510-1 for 4" to 12"

a/l	Surface %	Subsurface %	Surface %	Subsurface %
0.00	1.9	2.0	~	~
0.05	2.0	2.2	~	~
0.10	2.2	2.5	~	~
0.15	2.5	2.9	~	~
0.20	2.8	3.3	2.93	3.43 Y
0.25	3.3	3.8	~	~
0.30	3.8	4.4	~	~
0.35	4.4	5.1	~	~
0.40	5.0	5.8	~	~
0.45	5.1	6.7	~	~
0.50	5.2	7.6	~	~
			Allowed	Allowed
			2.93	0.00

a = 0.160
a/l value = 0.213
Y = 0.000

Flaw is Surface

Allowed a/t = 2.93%
a/t = 3.72%

Flaw is unacceptable by Table IWB-3510-1.

Comments : None.

Data Review By: Philip Shaffer
Level: III Date: 9-22-02

Reviewed By: Mark Tozak
Level: III Date: 9/25/02

GE Nuclear Energy

GERIS 2000 Indication Evaluation Data Sheet

Project : Peach Bottom, Unit-2
Weld ID : CH-MB

Exam Data Sheet : mbr.2
Sizing Data Sheet : n/a
Indication : 38

Flaw Throughwall Dimension = 0.190
Flaw Length "l" = 0.75
Surface Separation "S" = 0.00

"T" nominal = 4.25
"T" measured = 4.30
Clad "T" nominal = N/A

ASME Section XI, 1989 Edition, No Addenda
TABLE IWB-3510-1 for 4" to 12"

a/l	Surface %	Subsurface %	Surface %	Subsurface %
0.00	1.9	2.0	~	~
0.05	2.0	2.2	~	~
0.10	2.2	2.5	~	~
0.15	2.5	2.9	~	~
0.20	2.8	3.3	~	~
0.25	3.3	3.8	3.33	3.84 Y
0.30	3.8	4.4	~	~
0.35	4.4	5.1	~	~
0.40	5.0	5.8	~	~
0.45	5.1	6.7	~	~
0.50	5.2	7.6	~	~
			Allowed	Allowed
			3.33	0.00

a = 0.190
a/l value = 0.253
Y = 0.000

Flaw is Surface

Allowed a/t = 3.33%
a/t = 4.42%

Flaw is unacceptable by Table IWB-3510-1.

Comments : None.

Data Review By: CB M
Level: III Date: 9/21/02

Reviewed By: Mark Tozak
Level: III Date: 9/25/02

GE Nuclear Energy

GERIS 2000 Indication Evaluation Data Sheet

Project : Peach Bottom, Unit-2
Weld ID : CH-MA

Exam Data Sheet : mbr.2
Sizing Data Sheet : n/a
Indication : 39

Flaw Throughwall Dimension = 0.160
Flaw Length "l" = 0.40
Surface Separation "S" = 0.00

"T" nominal = 4.25
"T" measured = 4.30
Clad "T" nominal = N/A

ASME Section XI, 1989 Edition, No Addenda
TABLE IWB-3510-1 for 4" to 12"

a/l	Surface %	Subsurface %	Surface %	Subsurface %
0.00	1.9	2.0	-	-
0.05	2.0	2.2	-	-
0.10	2.2	2.5	-	-
0.15	2.5	2.9	-	-
0.20	2.8	3.3	-	-
0.25	3.3	3.8	-	-
0.30	3.8	4.4	-	-
0.35	4.4	5.1	-	-
0.40	5.0	5.8	5.00	5.80 Y
0.45	5.1	6.7	-	-
0.50	5.2	7.6	-	-
			Allowed	Allowed
			5.00	0.00

a = 0.160
a/l value = 0.400
Y = 0.000

Flaw is Surface

Allowed a/t = 5.00%
a/t = 3.72%

Flaw is acceptable by Table IWB-3510-1.

Comments : None.

Data Review By: CP B
Level: III
Date: 9/25/02

Reviewed By: Mark Trak
Level: III
Date: 9/25/02

GE Nuclear Energy

GERIS 2000 Indication Evaluation Data Sheet

Project : Peach Bottom, Unit-2
Weld ID : CH-MB
Exam Data Sheet : mbr.2
Sizing Data Sheet : n/a
Indication : 42

Flaw Throughwall Dimension = 0.190
Flaw Length "l" = 1.75
Surface Separation "S" = 0.00
"T" nominal = 4.25
"T" measured = 4.30
Clad "T" nominal = N/A

ASME Section XI, 1989 Edition, No Addenda
TABLE IWB-3510-1 for 4" to 12"

a/l	Surface %	Subsurface %	Surface %	Subsurface %
0.00	1.9	2.0	~	~
0.05	2.0	2.2	~	~
0.10	2.2	2.5	2.25	2.57 Y
0.15	2.5	2.9	~	~
0.20	2.8	3.3	~	~
0.25	3.3	3.8	~	~
0.30	3.8	4.4	~	~
0.35	4.4	5.1	~	~
0.40	5.0	5.8	~	~
0.45	5.1	6.7	~	~
0.50	5.2	7.6	~	~
			Allowed	Allowed
			2.25	0.00

a = 0.190
a/l value = 0.109
Y = 0.000

Flaw is Surface

Allowed a/t = 2.25%
a/t = 4.42%

Flaw is unacceptable by Table IWB-3510-1.

Comments : None.

Data Review By: CB MT
Level: II
Date: 9/21/02

Reviewed By: Mark Tr[illegible]
Level: III
Date: 9/25/02

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Indication 42 xls

GE Nuclear Energy

GERIS 2000 Indication Evaluation Data Sheet

Project : Peach Bottom, Unit-2
Weld ID : CH-MB

Exam Data Sheet : mbr.2
Sizing Data Sheet : n/a
Indication : 44

Flaw Throughwall Dimension = 0.170
Flaw Length "l" = 0.75
Surface Separation "S" = 0.00

"T" nominal = 4.25
"T" measured = 4.30
Clad "T" nominal = N/A

ASME Section XI, 1989 Edition, No Addenda
TABLE IWB-3510-1 for 4" to 12"

a/l	Surface %	Subsurface %	Surface %	Subsurface %
0.00	1.9	2.0	~	~
0.05	2.0	2.2	~	~
0.10	2.2	2.5	~	~
0.15	2.5	2.9	~	~
0.20	2.8	3.3	3.07	3.57 Y
0.25	3.3	3.8	~	~
0.30	3.8	4.4	~	~
0.35	4.4	5.1	~	~
0.40	5.0	5.8	~	~
0.45	5.1	6.7	~	~
0.50	5.2	7.6	~	~
			Allowed	Allowed
			3.07	0.00

a = 0.170
a/l value = 0.227
Y = 0.000

Flaw is Surface

Allowed a/t = 3.07%
a/t = 3.95%

Flaw is unacceptable by Table IWB-3510-1.

Comments : None.

Data Review By: CP MT
Level: III
Date: 9/21/02

Reviewed By: Mark Tvzok
Level: III
Date: 9/25/02

GE Nuclear Energy

GERIS 2000 Indication Evaluation Data Sheet

Project : Peach Bottom, Unit-2
Weld ID : CH-MB

Exam Data Sheet : mbr.1
Sizing Data Sheet : n/a
Indication : 50

Flaw Throughwall Dimension = 0.120
Flaw Length "l" = 1.00
Surface Separation "S" = 0.00

"T" nominal = 4.25
"T" measured = 4.30
Clad "T" nominal = N/A

ASME Section XI, 1989 Edition, No Addenda
TABLE IWB-3510-1 for 4" to 12"

a/l	Surface %	Subsurface %	Surface %	Subsurface %
0.00	1.9	2.0	~	~
0.05	2.0	2.2	~	~
0.10	2.2	2.5	2.32	2.66 Y
0.15	2.5	2.9	~	~
0.20	2.8	3.3	~	~
0.25	3.3	3.8	~	~
0.30	3.8	4.4	~	~
0.35	4.4	5.1	~	~
0.40	5.0	5.8	~	~
0.45	5.1	6.7	~	~
0.50	5.2	7.6	~	~
			Allowed	Allowed
			2.32	0.00

a = 0.120
a/l value = 0.120
Y = 0.000

Flaw is Surface

Allowed a/t = 2.32%
a/t = 2.79%

Flaw is unacceptable by Table IWB-3510-1.

Comments : None.

Data Review By: CPM Level: II Date: 9/21/02

Reviewed By: Mark Torok Level: III Date: 9/25/02

GE Nuclear Energy

GERIS 2000 Indication Evaluation Data Sheet

Project : Peach Bottom, Unit-2
Weld ID : CH-MB

Exam Data Sheet : mbr.1
Sizing Data Sheet : n/a
Indication : 53

Flaw Throughwall Dimension = 0.140
Flaw Length "l" = 0.75
Surface Separation "S" = 0.00

"T" nominal = 4.25
"T" measured = 4.30
Clad "T" nominal = N/A

ASME Section XI, 1989 Edition, No Addenda
TABLE IWB-3510-1 for 4" to 12"

a/l	Surface %	Subsurface %	Surface %	Subsurface %
0.00	1.9	2.0	~	~
0.05	2.0	2.2	~	~
0.10	2.2	2.5	~	~
0.15	2.5	2.9	2.72	3.19 Y
0.20	2.8	3.3	~	~
0.25	3.3	3.8	~	~
0.30	3.8	4.4	~	~
0.35	4.4	5.1	~	~
0.40	5.0	5.8	~	~
0.45	5.1	6.7	~	~
0.50	5.2	7.6	~	~
			Allowed	Allowed
			2.72	0.00

a = 0.140
a/l value = 0.187
Y = 0.000

Flaw is Surface

Allowed a/t = 2.72%
a/t = 3.26%

Flaw is unacceptable by Table IWB-3510-1.

Comments : None.

Data Review By: CP MT
Level: II Date: 9/2/02

Reviewed By: Mark Trask
Level: III Date: 9/25/02

GE Nuclear Energy

GERIS 2000 Indication Evaluation Data Sheet

Project : Peach Bottom, Unit-2
Weld ID : CH-MB

Exam Data Sheet : mbr.1
Sizing Data Sheet : n/a
Indication : 56

Flaw Throughwall Dimension = 0.170
Flaw Length "l" = 1.00
Surface Separation "S" = 0.00

"T" nominal = 4.25
"T" measured = 4.30
Clad "T" nominal = N/A

ASME Section XI, 1989 Edition, No Addenda
TABLE IWB-3510-1 for 4" to 12"

a/l	Surface %	Subsurface %	Surface %	Subsurface %
0.00	1.9	2.0	~	~
0.05	2.0	2.2	~	~
0.10	2.2	2.5	~	~
0.15	2.5	2.9	2.62	3.06 Y
0.20	2.8	3.3	~	~
0.25	3.3	3.8	~	~
0.30	3.8	4.4	~	~
0.35	4.4	5.1	~	~
0.40	5.0	5.8	~	~
0.45	5.1	6.7	~	~
0.50	5.2	7.6	~	~
			Allowed	Allowed
			2.62	0.00

a = 0.170
a/l value = 0.170
Y = 0.000

Flaw is Surface

Allowed a/t = 2.62%
a/t = 3.95%

Flaw is unacceptable by Table IWB-3510-1.

Comments : None.

Data Review By: CP M
Level: III Date: 9/26/02

Reviewed By: Mark Tml
Level: III Date: 9/26/02

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PEACH BOTTOM
2 R 14
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GERIS 2000 Indication Evaluation Data Sheet

Project : Peach Bottom, Unit-2
Weld ID : CH-MB

Exam Data Sheet : mbr.1
Sizing Data Sheet : n/a
Indication : 57

Flaw Throughwall Dimension = 0.170
Flaw Length "l" = 1.00
Surface Separation "S" = 0.00

"T" nominal = 4.25
"T" measured = 4.30
Clad "T" nominal = N/A

ASME Section XI, 1989 Edition, No Addenda
TABLE IWB-3510-1 for 4" to 12"

a/l	Surface %	Subsurface %	Surface %	Subsurface %
0.00	1.9	2.0	-	-
0.05	2.0	2.2	-	-
0.10	2.2	2.5	-	-
0.15	2.5	2.9	2.62	3.06 Y
0.20	2.8	3.3	-	-
0.25	3.3	3.8	-	-
0.30	3.8	4.4	-	-
0.35	4.4	5.1	-	-
0.40	5.0	5.8	-	-
0.45	5.1	6.7	-	-
0.50	5.2	7.8	-	-
			Allowed	Allowed
			2.62	0.00

a = 0.170
a/l value = 0.170
Y = 0.000

Flaw is Surface

Allowed a/t = 2.62%
a/t = 3.95%

Flaw is unacceptable by Table IWB-3510-1.

Comments : None.

Data Review By: CJ RS
Level: II Date: 9/26/02

Reviewed By: Mark Trah
Level: III Date: 9/26/02

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GE Nuclear Energy

GERIS 2000 Indication Evaluation Data Sheet

Project : Peach Bottom, Unit-2
Weld ID : CH-MB

Exam Data Sheet : mbr.1
Sizing Data Sheet : n/a
Indication : 61

Flaw Throughwall Dimension = 0.120
Flaw Length "l" = 1.00
Surface Separation "S" = 0.00

"T" nominal = 4.25
"T" measured = 4.30
Clad "T" nominal = N/A

ASME Section XI, 1989 Edition, No Addenda
TABLE IWB-3510-1 for 4" to 12"

a/l	Surface %	Subsurface %	Surface %	Subsurface %
0.00	1.9	2.0	~	~
0.05	2.0	2.2	~	~
0.10	2.2	2.5	2.32	2.66 Y
0.15	2.5	2.9	~	~
0.20	2.8	3.3	~	~
0.25	3.3	3.8	~	~
0.30	3.8	4.4	~	~
0.35	4.4	5.1	~	~
0.40	5.0	5.8	~	~
0.45	5.1	6.7	~	~
0.50	5.2	7.6	~	~
			Allowed	Allowed
			2.32	0.00

a = 0.120
a/l value = 0.120
Y = 0.000

Flaw is Surface

Allowed a/t = 2.32%
a/t = 2.79%

Flaw is unacceptable by Table IWB-3510-1.

Comments : None.

Data Review By: CPM
Level: II
Date: 9/2/02

Reviewed By: Mark Track
Level: III
Date: 9/25/02

GE Nuclear Energy

GERIS 2000 Indication Evaluation Data Sheet

Project: Peach Bottom, Unit-2
Weld ID: CH-MB

Exam Data Sheet: mbr.1
Sizing Data Sheet: n/a
Indication: 63

Flaw Throughwall Dimension = 0.170
Flaw Length "l" = 1.50
Surface Separation "S" = 0.00

"T" nominal = 4.25
"T" measured = 4.30
Clad "T" nominal = N/A

ASME Section XI, 1989 Edition, No Addenda
TABLE IWB-3510-1 for 4" to 12"

a/l	Surface %	Subsurface %	Surface %	Subsurface %
0.00	1.9	2.0	~	~
0.05	2.0	2.2	~	~
0.10	2.2	2.5	2.28	2.61 Y
0.15	2.5	2.9	~	~
0.20	2.8	3.3	~	~
0.25	3.3	3.8	~	~
0.30	3.8	4.4	~	~
0.35	4.4	5.1	~	~
0.40	5.0	5.8	~	~
0.45	5.1	6.7	~	~
0.50	5.2	7.6	~	~
			Allowed	Allowed
			2.28	0.00

a = 0.170
a/l value = 0.113
Y = 0.000

Flaw is Surface

Allowed a/t = 2.28%
a/t = 3.95%

Flaw is unacceptable by Table IWB-3510-1.

Comments: None.

Data Review By: [signature] Level: III Date: 9/6/02

Reviewed By: [signature] Level: III Date: 9/25/02