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THE EVALUATION OF INDICATIONS IN PEACH BOTTOM UNIT 3 VESSEL CLOSURE HEAD FOR CONTINUED OPERATION

October 2001

Prepared for

Exelon Corp.
Peach Bottom Atomic Power Station, Unit 3

THE EVALUATION OF INDICATIONS IN PEACH BOTTOM UNIT 3 VESSEL CLOSURE HEAD FOR CONTINUED OPERATION

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1. EXECUTIVE SUMMARY

The reactor pressure vessel closure head at Peach Bottom Atomic Power Station, Unit 3 (PBAPS-3) was ultrasonically examined during refueling outage thirteen (3R-13). Each of the six meridional welds was examined. Several indications were noted at welds CH-MA, CH-MC, and CH-MF. All of the indications were sub-surface, and not service induced. The observed indications were first characterized and compared with the acceptance standards provided in Section XI, ASME Code (1989 Edition without Addenda). Some of the indications did not meet the acceptance standards. The Section XI Code allows for the acceptance of such indications 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 proximity rules of Section XI indicated that all five indications to be evaluated by fracture mechanics could be characterized as sub-surface. 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 and the pressure test temperature was assumed as 180°F. The stress intensity factors for the sub-surface flaws were calculated for various half-flaw depth (a) to flaw length (l) ratios (or, aspect ratios). It was determined that the hydro-test condition was governing. The limiting flaw was found to be acceptable per Section XI ASME 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-3 vessel closure head during RF13 outage are acceptable by the flaw acceptance criteria of Section XI of the ASME Code.

2. INTRODUCTION AND REPORT OUTLINE

The reactor pressure vessel closure head at Peach Bottom, Unit 3 (PBAPS-3) was ultrasonically examined during the 3R13 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 inches. However, the measured thickness reported during the UT examination is 4.25 inches, the value used in the evaluations conducted for this report. The inside surface of the closure head is unclad. Meridional welds CH-MA through CH-MF were examined. Several indications were noted in CH-MA, CH-MC and CH-MF welds. All of the indications were sub-surface. The observed indications were first characterized and compared with the acceptance standards provided in Table IWB-3500-1 of Section XI, ASME Code [2-1]. Some of the indications did not meet the acceptance standards. Section XI, subparagraph IWB-3132.4 allows for the acceptance of such indications 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 2-1. 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] ASME Boiler and Pressure Vessel Code, Section XI, Rules for In-Service Inspection of Nuclear Power Plant Components, ASME, 1989 Edition without Addenda.

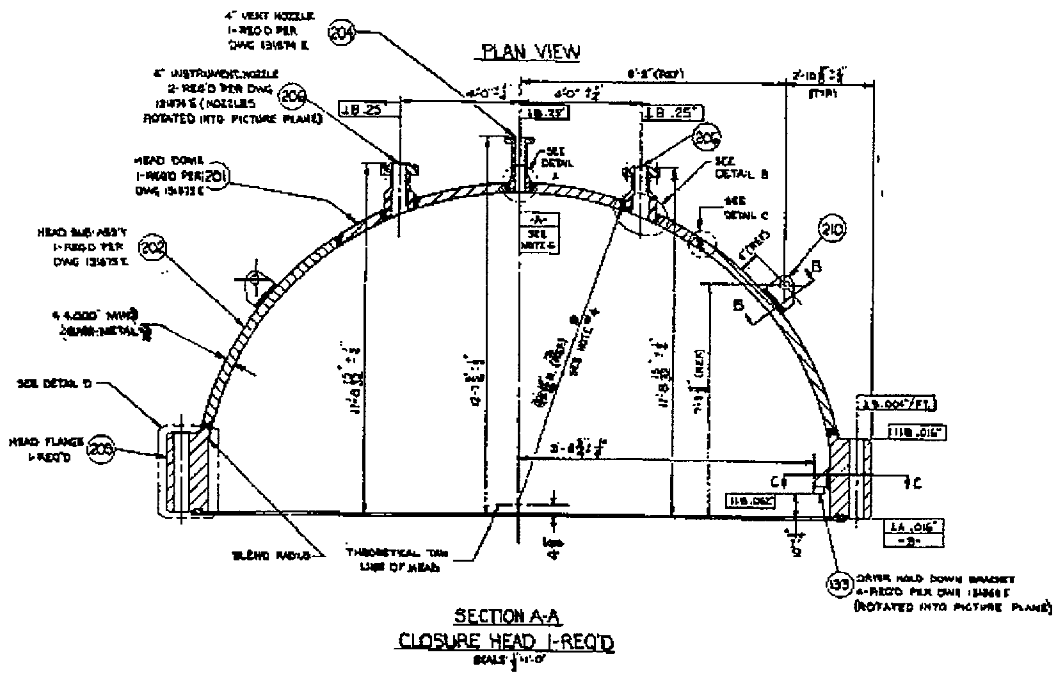

Figure 2-1 PBAS 3 Vessel Closure Head Geometry

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 shows the evaluation sheets for the indications that were found to exceed acceptance standards and require fracture mechanics evaluation. A brief discussion on the origin of these indications is also provided.

3.1. UT INSPECTION RESULTS

Manual 60°RL Zone 1 and Zone 2 Transverse and parallel scans were performed on the closure head meridional welds CH-MA, CH-MC and CH-MF. The scans were performed in accordance with procedure PDI-UT-6, Revision E as modified by GENE document, "Discussion of the Effect of Using Procedure PDI-UT-6 on Closure Head Welds at Peach Bottom Unit 3, Including the Modifications Made to Accommodate the Unclad Material." All of the detected indications were sub-surface.

There were twelve recordable indications at the CH-MA weld. Five of the recorded indications are attributed to a single flaw that was evaluated as being unacceptable to the requirements of Table IWB-3510-1 of Reference 2-1. The characterized dimensions of this indication are shown in Table 3-1. The remaining seven indications were found to be acceptable when evaluated per Table IWB-3510-1.

There were 27 recordable indications at the CH-MC weld. Ten of the recordable indications were determined to have a through-thickness dimension and are attributed to seven separate flaws. The remaining 17 indications had no determinable through-thickness dimension and were acceptable to the requirements of Table IWB-3510-1 of Reference 2-1. Of the seven separate flaws, three were evaluated to be unacceptable to the requirements of Table IWB-3510-1. These three flaws are characterized in Table 3-1.

There were 24 recordable indications at the CH-MF weld. Fifteen of the recordable indications were determined to have a through-thickness dimension and are attributed to 8 separate flaws. The remaining 9 indications had no determinable through-thickness dimension and were acceptable to the requirements of Table IWB-3510-1 of Reference 2-1. Of the 8 separate flaws, only one indication did not meet the acceptance standards of Table IWB-3510-1. The characterized dimensions of this indication are shown in Table 3-1.

Figure 3-1 shows the closure head meridional welds and approximate locations of the indications.

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. 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 sub-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.

3.3. FABRICATION REVIEW

All the indications in question are subsurface and are not service induced. A fabrication review (Reference 3-2) shows that the subject welds were made utilizing a dual SMAW/SAW (SMAW – Shielded Metal Arc weld, SAW- Submerged Arc Weld) process. The root pass was SMAW with a backing ring and the remaining thickness was welded using the SAW process. The backing ring was back-gouged and rewelded using the SMAW process. The resulting configuration is shown schematically in Fig 3-3. Indications due to slag or fusion flaws are not uncommon. These welds are examined by radiography following the fabrication. The radiographs of the Peach Bottom closure head welds were of good quality and showed no rejectable indications. However, considering the state-of the-art in the inspection techniques 30 years ago and now, it is not surprising that flaws detectable using current UT techniques would not have been detected during the time of fabrication.

Subsurface indications at vessel welds of the type seen in the Peach Bottom Unit 3 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. However, since they are not service induced and are not exposed to the BWR environment, crack growth during subsequent operation is negligible. 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] UT data Sheets on Welds CH-MA, CH-MC and CH-MF.

[3-2] Miller, W.F., "Investigation of Ultrasonic Indications in RPV Closure Head Welds CH-MA, CH-MC, and CH-MF at Peach Bottom Unit 3," GE Report No. PB-R13-001, October 2001.

Table 3-1 Listing of Ultrasonic Indications in RPV Closure Head Welds CH-MA, CH-MC, and CH-MF at Peach Bottom Unit 3

Weld ID	Location	**Number of Recordable Indications**	**Acceptable per Table IWB-3510-1**	**Unacceptable per Table IWB-3510-1**	Remarks
CH-MA	**0° Azimuth**	**12**	**7**	**5 indications combined to form 1 flaw**	**IWB-3600 analysis**
CH-MC	**120° Azimuth**	**27 (17 had no measurable depth)**	**7**	**3**	**CH-MA to bound these flaws**
CH-MF	**300° Azimuth**	**15 combined to form 8 flaws**	**7**	**1**	**CH-MA to bound these flaws**

CH-MA Flaw length = 42.0" Flaw depth (2a) =0.311" a = 0.156" S = 0.10"

CH-MC Flaw 1 Flaw length = 1.40" Flaw depth (2a) = 0.424" a = 0.212" S = 0.25"

Flaw 2 Flaw length = 1.70" Flaw depth (2a) = 0.495" a = 0.248" S = 0.22"

Flaw 3 Flaw length = 1.30" Flaw depth (2a) = 0.564 a = 0.282" S = 0.25"

CH-MF Flaw 1 Flaw length = 1.50" Flaw depth (2a) =0.560" a = 0.280" S = 1.07"

Table 3-2 Characterization of Indications

Weld ID	Flaw No.	*l* (in.)	2a (in.)	S (in.)	S>0.4a*	a/*l*
CH-MA	1	42.0	0.311	0.10	Yes	0.004
CH-MC	1	1.4	0.424	0.25	Yes	0.15
CH-MC	2	1.7	0.495	0.22	Yes	0.15
CH-MC	3	1.3	0.564	0.25	Yes	0.22
CH-MF	1	1.5	0.560	1.07	Yes	0.19

* Flaw sub-surface if S > 0.4a.

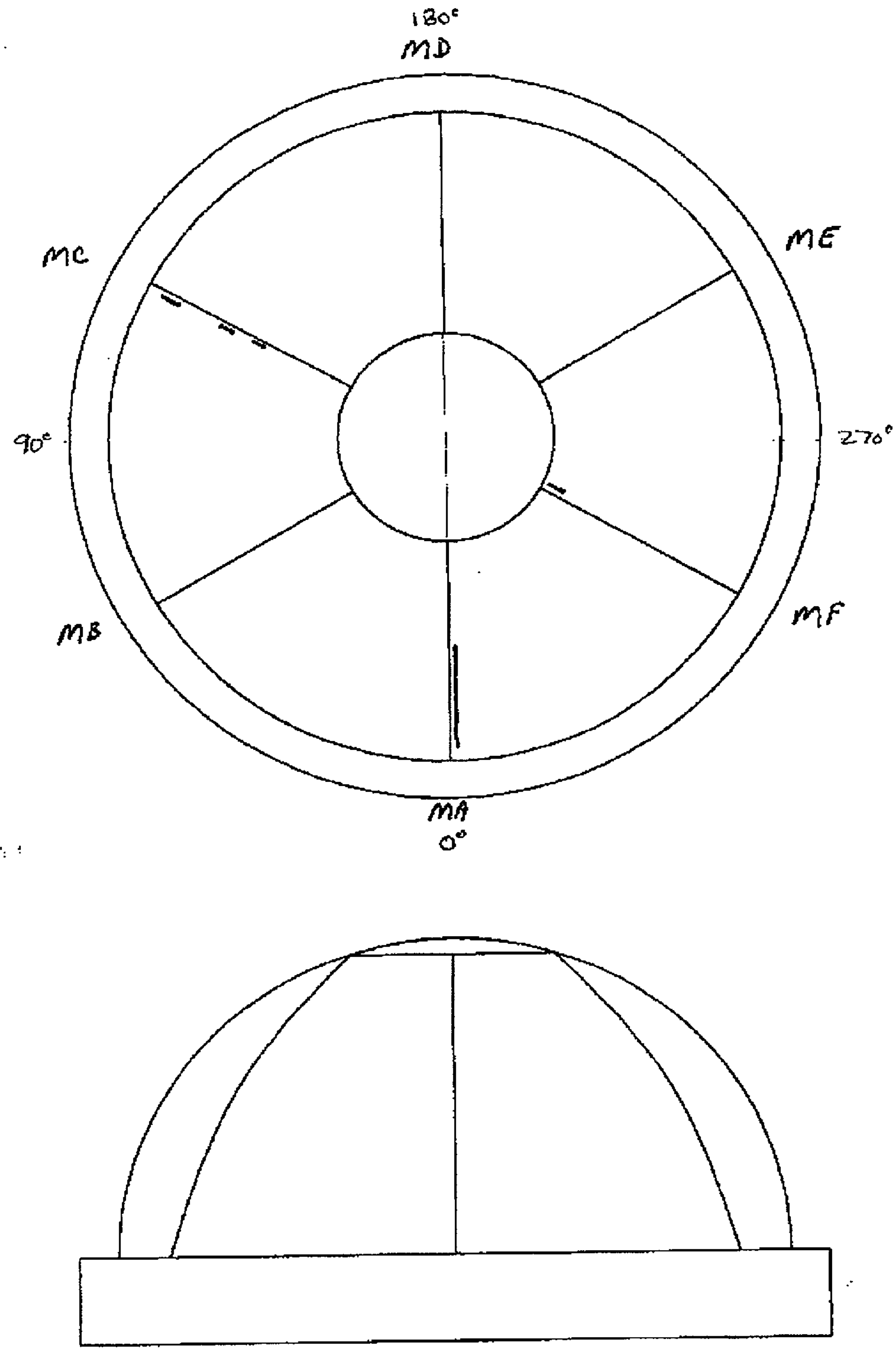

Figure 3-1 Geometry of Meridional Welds and Approx. Location of Indications

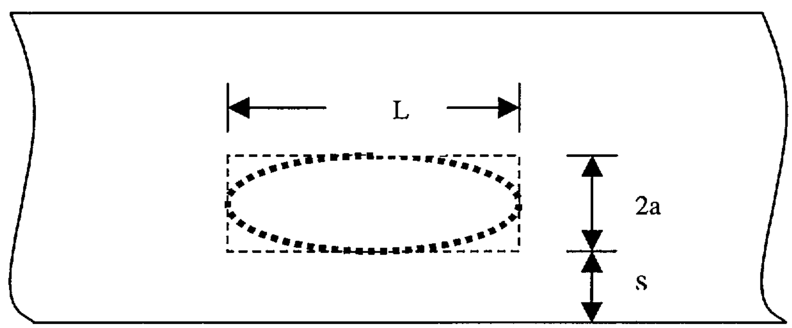

Figure 3-2 Parameters for Surface Proximity Evaluation

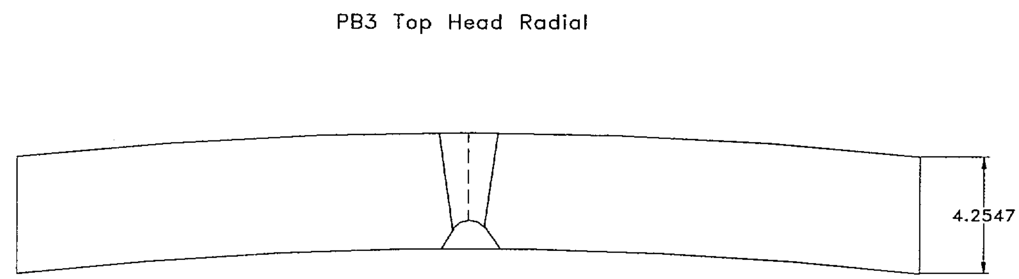

Figure 3-3 PB3 Closure Head Meridional Weld Geometry

4. FRACTURE MECHANICS EVALUATION

The fracture mechanics evaluation was conducted for several sub-surface flaw shape geometries using the procedures outlined in Appendix A of Section XI (Reference 2-1). 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 assumptions were made regarding the pressure and temperature conditions during the bolt-up and system pressure test conditions.

- The bolt-up temperature is 70°F (Reference 4-1).
- The pressure test pressure and temperature are 1050 psi and 180°F, respectively (References 4-1 and 4-2).
- The limiting RT_{NDT} value for the closure head side plate (torus) region is 10°F (Reference 4-3).

The selection of number of bolt-up, pressure test and start up-shut down events assumed in the fatigue crack growth calculation was based on Reference 4-4, and is discussed in Subsection 4.3.

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 indications 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 PBAS Unit 3 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 3 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 42 inches in the meridional direction beginning approximately 7 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 4-5. 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 sub-surface (Table 3-2), the stress intensity factor (K) calculation procedures specified for sub-surface flaws in Appendix A of Section XI were used. Table 4-1 shows the calculated values of K as a function of '2a' values for the pressure test case 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 indications are sub-surface flaws, they are not exposed to the reactor water environment. Thus, the crack growth analysis was performed using the Section XI fatigue crack growth rates for air environment. Other mechanisms such as stress corrosion cracking (SCC) are not applicable since the flaws are not exposed to the water environment.

The current analyzed reactor pressure vessel cycles for the 40-year design life are listed in Reference 4-4. 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 0.009 inch.

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 does not provide an explicit mathematical equation for the calculation of K_{Ia} at a given temperature and RT_{NDT}. However, Reference 4-6 gives the following equation that was used to calculate the K_{Ia} curve given in Figure A-4200-1:

$$K_{Ia} = 26.78 + 1.233x\mathrm{Exp}\{0.0145x(T-RT_{NDT}+160)\}$$

where, T and RT_{NDT} are in °F and K_{Ia} is in ksi√in.

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

<u>Bolt-up</u>

K_{Ia} = 56.7 ksi√in at 70°F

$K_{Ia,\,allow} = 39.9\ ksi\sqrt{in}$

<u>Pressure test</u>

$K_{Ia} = 174.4\ ksi\sqrt{in}$ at 180°F
$K_{Ia,\,allow} = 55.2\ ksi\sqrt{in}$

4.6. DISPOSITION OF INDICATIONS

Tables 4-2 and 4-3 show comparisons of the K values for the indications 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. Also, all of the indications satisfy the sub-surface criterion specified in Table 3-2 even after the addition of projected fatigue crack growth.

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

4.7. REFERENCES

[4-1] PBAPS, Unit 3 Technical Specification Section 3.4.9 (Amendment 214): RCS Pressure and Temperature (P/T) Limits.

[4-2] Surveillance Test Specification ST-O-080-680-3, Rev. 4: Reactor Pressure Vessel (Class 1) Hydrostatic Pressure Test.

[4-3] "Peach Bottom Atomic Power Station, Unit 3 Vessel Surveillance Materials Testing and Fracture Toughness Analysis," GE Report No. SASR 90-50, Revision 1, DRF No. B11-00494, July 1995.

[4-4] Surveillance Test Specification ST-O-080-940-3, Rev. 4: Reactor Pressure Vessel Transients Cycles Record.

[4-5] D.A. Ferrill, et al, "Measurement of Residual Stresses in Heavy Weldment," Welding Journal Research Supplement, Vol 45, Nov. 1966.

[4-6] EPRI Report No. NP-719-SR, "Flaw Evaluation Procedures: ASME Section XI," August 1978.

Table 4-1 Calculated K values for Pressure test Case with a/*l* = 0.0

FLAW EVALUATION FOR a/l = 0
Flaw Shape Parameter, Q = 0.909
Calculation of Stress Intensities (ksi-sqrt[in])

2a (in)	(2a / t)	Mm	Mb	Km	Kb	Kclad	Ktotal
0.255	0.060	1.050	1.000	17.427	3.983	0.000	21.410
0.340	0.080	1.050	1.000	20.123	4.599	0.000	24.722
0.425	0.100	1.050	1.000	22.498	5.142	0.000	27.640
0.510	0.120	1.050	1.030	24.645	5.615	0.000	30.260
0.595	0.140	1.050	1.050	26.620	6.104	0.000	32.724
0.680	0.160	1.057	1.080	28.647	6.505	0.000	35.152
0.765	0.180	1.071	1.110	30.788	6.878	0.000	37.666

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

Weld ID	Flaw No.	l (in.)	2a (in.)	a/l	Applied K ksi√in	Allowable K ksi√in
CH-MA	1	42.0	0.311	0.004	10.7	39.9
CH-MC	1	1.4	0.424	0.15	11.0	39.9
CH-MC	2	1.7	0.495	0.15	12.0	39.9
CH-MC	3	1.3	0.564	0.22	12.4	39.9
CH-MF	1	1.5	0.560	0.19	12.1	39.9

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

Weld ID	Flaw No.	l (in.)	2a (in.)	a/l	Applied K ksi√in	Allowable K ksi√in
CH-MA	1	42.0	0.311	0.004	26.2	55.2
CH-MC	1	1.4	0.424	0.15	26.4	55.2
CH-MC	2	1.7	0.495	0.15	29.1	55.2
CH-MC	3	1.3	0.564	0.22	30.2	55.2
CH-MF	1	1.5	0.560	0.19	30.1	55.2

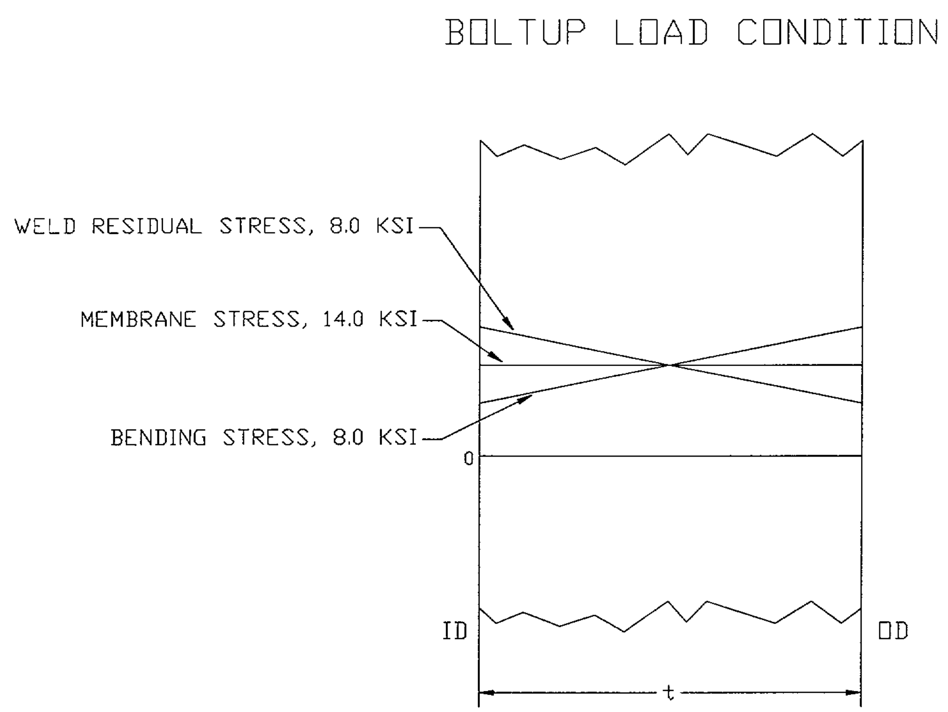

Figure 4-1 Through-Wall Stress Distribution Assumed for Bolt-up Condition

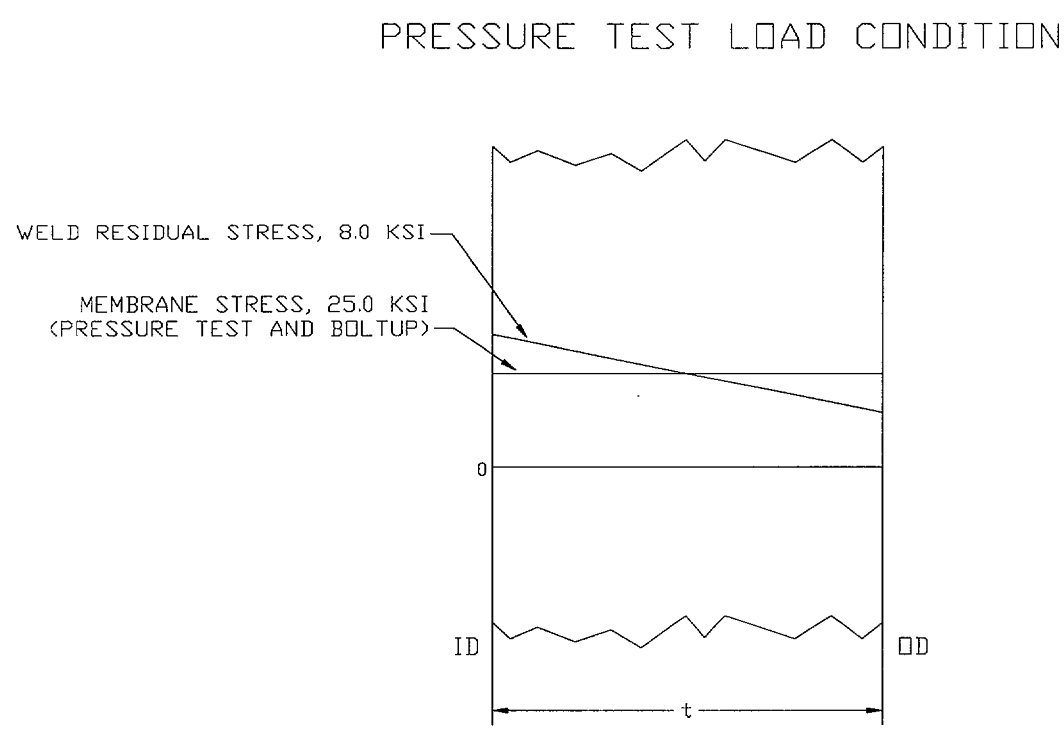

Figure 4-2 Through-Wall Stress Distribution Assumed for Pressure Test Condition

5. SUMMARY AND CONCLUSIONS

The reactor pressure vessel closure head at Peach Bottom Atomic Power Station, Unit 3 (PBAPS-3) was ultrasonically examined during refueling outage thirteen (3R-13). Each of the six meridional welds was examined. Several indications were noted at welds CH-MA, CH-MC, and CH-MF. All of the indications were sub-surface, and not service induced. The observed indications were first characterized and compared with the acceptance standards provided in Section XI, ASME Code (1989 Edition without Addenda). Some of the indications did not meet the acceptance standards. The Section XI Code allows for the acceptance of such indications 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 proximity rules of Section XI indicated that all five indications to be evaluated by fracture mechanics could be characterized as sub-surface. 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 and the pressure test temperature was assumed as 180°F. The stress intensity factors for the sub-surface flaws were calculated for various half-flaw depth (a) to flaw length (*l*) ratios (or, aspect ratios). It was determined that the hydro-test condition was governing. The limiting flaw was found to be acceptable per Section XI ASME 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-3 vessel closure head during RF13 outage are acceptable by the flaw acceptance criteria of Section XI of the ASME Code.

APPENDIX

Manual UT Data Sheets

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GERIS 2000 Indication Evaluation Data Sheet

Project : Peach Bottom, Unit-3
Weld ID : CH-MA

Exam Data Sheet : PB-VES-058
Sizing Data Sheet : PB-VES-101
Indication : Note 1

Flaw Throughwall Dimension = 0.311
Flaw Length "l" = 42.00
Surface Separation "S" = 0.10

"T" nominal = 4.00
"T" measured = 4.25
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	1.91	2.01 Y
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	~	~
0.45	5.1	6.7	~	~
0.50	5.2	7.6	~	~
			Allowed	Allowed
			1.91	1.30

a = 0.156
a/l value = 0.004
Y = 0.643

Flaw is Subsurface

Allowed a/t = 1.30%
a/t = 3.66%

Flaw is unacceptable by Table IWB-3510-1.

Comments : Note 1 - Indications 6, 7, 8, 9, and 10 combined.
Due to poor correlation of the detection and sizing lengths the combined detection length (largest) used for evaluation.
The signal characteristics indicate the flaw consists of numerous aligned smaller flaws.

Data Review By: [signature]
Level: III Date: 10/1/01

Reviewed By: [signature]
Level: III Date: 10-01-01

REVIEWED PECO NUCLEAR NDE SERVICES BRANCH [signature] OCT 0 4 '01

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PEACH BOTTOM 3 Flaw Evals
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GERIS 2000 Indication Evaluation Data Sheet

Project : Peach Bottom, Unit-3
Weld ID : CH-MC

Exam Data Sheet : PB-VES-072
Sizing Data Sheet : PB-VES-128
Indication : 1

Flaw Throughwall Dimension = 0.424
Flaw Length "l" = 1.40
Surface Separation "S" = 0.25

"T" nominal = 4.00
"T" measured = 4.25
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	2.51	2.91 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
			2.51	2.91

a = 0.212
a/l value = 0.151
Y = 1.000

Flaw is Subsurface

Allowed a/t = 2.91%
a/t = 4.99%

Flaw is unacceptable by Table IWB-3510-1.

Comments : None.

Data Review By: CA MT
Level: III Date: 10/2/01

Reviewed By: [signature]
Level: III Date: 10-02-01

REVIEWED PECO NUCLEAR NDE SERVICES BRANCH [signature] OCT 0 4 '01

[signature] 10/5/01

PEACH BOTTOM 3
R13 Flaw Eval.xls
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GERIS 2000 Indication Evaluation Data Sheet

Project : Peach Bottom, Unit-3
Weld ID : CH-MC

Exam Data Sheet : PB-VES-072
Sizing Data Sheet : PB-VES-128
Indication : 4 and 5

Flaw Throughwall Dimension = 0.495
Flaw Length "l" = 1.70
Surface Separation "S" = 0.22

"T" nominal = 4.00
"T" measured = 4.25
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	2.47	2.86 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
			2.47	2.55

a = 0.248
a/l value = 0.146
Y = 0.889

Flaw is Subsurface

Allowed a/t = 2.55%
a/t = 5.82%

Flaw is unacceptable by Table IWB-3510-1.

Comments : None.

Data Review By: [signature]
Level: III Date: 10/1/01

Reviewed By: [signature]
Level: III Date: 10-01-01

REVIEWED PECO NUCLEAR NDE SERVICES BRANCH [signature] OCT 0 4 '01

[signature] 10/3/01

EXAM-DS4 V.7 7/5/00

PEACH BOTTOM 3 Flaw Eval.xls
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GE Nuclear Energy

GERIS 2000 Indication Evaluation Data Sheet

Project : Peach Bottom, Unit-3
Weld ID : CH-MC

Exam Data Sheet : PB-VES-072
Sizing Data Sheet : PB-VES-128
Indication : 8

Flaw Throughwall Dimension = 0.564
Flaw Length "l" = 1.30
Surface Separation "S" = 0.25

"T" nominal = 4.00
"T" measured = 4.25
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	2.97	3.47 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
			2.97	3.08

a = 0.282
a/l value = 0.217
Y = 0.887

Flaw is Subsurface

Allowed a/t = 3.08%
a/t = 6.64%

Flaw is unacceptable by Table IWB-3510-1.

Comments : None.

Data Review By: CF MT
Level: III
Date: 10/1/01

Reviewed By: J. C. [signature]
Level: III
Date: 10-01-01

REVIEWED PECO NUCLEAR NDE SERVICES BRANCH [signature] OCT 04 '01

[signature] 10/5/01

EXAM-DS4 V.7 7/5/00

PEACH BOTTOM 3 Flaw Evals
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GE Nuclear Energy

GERIS 2000 Indication Evaluation Data Sheet

Project : Peach Bottom, Unit-3
Weld ID : CH-MF

Exam Data Sheet : PB-VES-020
Sizing Data Sheet : PB-VES-122
Indication : 17 and 19

Flaw Throughwall Dimension = 0.560
Flaw Length "l" = 1.50
Surface Separation "S" = 1.07

"T" nominal = 4.00
"T" measured = 4.25
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	3.19

a = 0.280
a/l value = 0.187
Y = 1.000

Flaw is Subsurface

Allowed a/t = 3.19%
a/t = 6.59%

Flaw is unacceptable by Table IWB-3510-1.

Comments : None.

Data Review By: [signature]
Level: III Date: 10/4/01

Reviewed By: [signature]
Level: III Date: 10-04-01

REVIEWED PECO NUCLEAR NDE SERVICES BRANCH [signature] OCT 05 '01

[signature] 10/5/01

EXAM-DS4 V.7 7/5/00

PEACH BOTTOM 3 Flaw Evals
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