Ref.

IR 0553792-02, Drywell Structural Integrity Basis from 1R21 Inspections

Reasons for Evaluation/Scope

The purpose of this Technical Evaluation is to present current and projected (until 1R22) margin in Drywell Vessel Thicknesses and the bases to further confirm that the drywell structural integrity continues to maintain design basis requirements as established in references 1 through 3. The intent of this evaluation is to demonstrate that the Drywell Vessel thicknesses are adequate to satisfy current licensing and design bases requirements.

This Technical Evaluation was developed in accordance with CC-AA-309-101, Revision 7.

A prejob brief for this Technical Evaluation was performed by Howie Ray in accordance with HU-AA-1212 Rev 1. The risk rank of this Technical Evaluation was concluded to be a "4", since the acceptance criteria have already been established and approved through existing design analysis. Therefore a third party review is not required.

Background

In the 1R21 Outage a series of UT thickness measurements were performed of various elevations of the Drywell Vessel in accordance with specification OC-IS -328277-004. The purpose of these UT inspections is to measure corrosion rates of the Drywell Vessel and further confirm that the vessel meets the design basis.

This is accomplished by inspecting the same locations over time.

In the mid 1980's a survey was performed of the Drywell Vessel at the Sandbed elevation (11' 3"). As a minimum at least one inspection location (also referred to as a grid) was selected in each of the 10 Drywell Bays and permanently marked. These were then selected for repeat inspection and entered into the Drywell Thickness Monitoring Program.

UT Inspection of locations with the most thinning consisted of obtaining 49 individual UT thickness readings in a 7 by 7 pattern spaced on 1 inch centers. These measurements were taken using a stainless steel template. The template was designed to ensure that the 7 by 7 grid is located in the same area with repeatability of a 1/16".

The program then performed UT inspections over time at these same locations from 1987 to 1996.

The corrosion rates were developed using a standard regression analysis and establishment of the 95% confidence intervals to capture increasing variance depending on the projection of ongoing corrosion and the number of inspections. This methodology is based on the following references:

1) Applied Regression Analysis, Second Edition, N.R. Draper & H. Smith, John Wiley and Sons 1981
2) Statistical Concept and Methods, G.K. Bhattacharyya & R.A. Johnson, John Wiley and Sons 1977,

3) Experimental Statistics, Mary Gobbons Natrella, John Wiley and Sons 1966 (Reprint National Bureau of Standards Handbook 91)
4) Fundamental Concepts in the Design of Experiments, Charles C Hicks, Saunders College Publishing, Fort Worth, 1982

Each time UT inspections are performed the distribution of the individual readings is checked to confirm the original distribution evaluation.

Inspections of the Drywell above the sandbed have been performed up to 2006. Corrosion rates have been calculated in calculation C-1302-187-E310-037 Revision 2 and ECR 05-00575.

Corrosion in the sand bed region was addressed by removing sand, water, and corrosion byproduct in the sandbed and applying a coating on the exterior of the vessel in 1992.

Comparison of UT inspections performed in 1992 and 1994 as documented in C-1302-187-5300-030 shows that the sandbed region continues to meet design basis requirements.

This Technical Evaluation will compare the 2006 UT inspection data to these earlier calculations to further confirm conclusion that the drywell vessel continues to meet design basis.

Detailed Evaluation

Methodology
C-1302-187-E310-037 Revision 2 and C-1302-187-5300-030 identify the locations which are the most critical with respect to thinning (see table 1). These are located at five different elevations 11' 3, 50' 2", 51' 10", 60' 10", and 87' 5".

These calculations developed corrosion rate projections for these critical locations. The mean of the 2006 inspection of the same critical locations plotted on the earlier projections to determine if those projections are still valid and bound the current inspection results.

Elevation 11' 3
Refer to the data in attachment 3 and the projection curve for location 19A in attachment 2.

Calculation C-1302-187-5300-030 identified location 19A as the most critical since it was the thinnest area in the sandbed. However the calculation concluded with 95% confidence that this location and the other sandbed region locations were not experiencing corrosion. Figure 1 provides a trend of the mean values for this location. Figure 1 also provides curves showing the calculated standard error of plus or minus 0.0034 inches for the means. The 2006 mean is also plotted on figure 1 and shows that this value is well within the standard error band.

Table 1 provides a breakdown of the mean thickness measured in 2006 and associated current margin.

Elevation 50' 2"
Refer to the data in attachment 3 and the projection curves for locations 5-5 and 15-23 in attachment 2.

The 2004 calculation identified locations 5-5HI and 15-23HI as the most critical since they were the thinnest at this elevation. The calculation concluded that these locations are experiencing corrosion rates of 0.0003 and 0.0004 inches per year with 95% confidence. Figure 2 and Figure 3 provide trends of the means of data collected from 1987 through 2004 for these locations taken from calculation C-1302-187-E310-037 Revision 2. The 2006 means for each location are plotted on these figures. These show that the 2006 means are consistent with and are bounded by the 2004 projections. Therefore the margins and projections from 2004 remain valid and bounding. Table 1 provides the means and margin calculated in 2004.

Table 1 provides a breakdown of the mean thickness measured in 2004 and associated current margin for these two locations.

Elevation 51' 10"
Refer to the data in attachment 3 and the projection curve for location 13-32 in attachment 2.

The 2004 calculation identified location 13-32 as the most critical since it was the thinnest at this elevation. However the calculation concluded with 95% confidence that the location was not experiencing corrosion. Figure 4 provides a trend of the means of data collected from 1987 through 2004 for this location taken from calculation C-1302-187-E310-037 Revision 2. The 2006 mean for this location is plotted on this figure. Figure 4 also provides curves showing the 2004 calculated standard error of -/+ 0.0053 inches for the data from 1987 to 2004. The 2006 mean is well within the 2004 standard error band.

This shows that the 2006 mean is consistent with and bounded by the 2004 projection, which concluded that this location is not corroding. Therefore the margin and projection from 2004 remains valid and bounding. Table 1 provides the means and margin calculated in 2004.

Table 1 provides a breakdown of the mean thickness measured in 2004 and associated current margin.

Elevation 60' ' 10"
Refer to the data in attachment 3 and the projection curve for location 5-22 in attachment 2.

The 2004 calculation identified location 5-22 as the most critical since it was the thinnest at this elevation. However the calculation concluded with 95% confidence that the location was not experiencing corrosion. Figure 5 provides a trend of the means of data collected from 1992 through 2004 for these locations taken from calculation C-1302-187-E310-037 Revision 2. The

2006 mean for this location is plotted on this figure and shows that this value has virtually not changed since 2004.

Figure 4 also provides curves showing the 2004 calculated standard error of the data from 1987 to 2004. The 2006 mean is well within the 2004 standard error band.

Table 1 provides a breakdown of the mean thickness measured in 2004 and associated current margin

Elevation 87' 5"
Refer to the data in attachment 3 and the projection curve for location 9-20 in attachment 2.

The 2004 calculation identified location 9-20 as the most critical since it was the thinnest at this elevation. The calculation concluded that this location was experiencing a corrosion rate of 0.00075 inches per year with 95% confidence. Figure 6 provides the trend of the means of data collected from 1987 through 2004 for these locations taken from calculation C-1302-187-E310-037 Revision 2. The 2006 mean for this location is plotted on this figure. This shows that the 2006 mean is consistent with and is bounded by the 2004 projection. Therefore the margin and projection from 2004 remain valid and bounding. Table 1 provides the means and margin calculated in 2004.

Table 1 in attachment 1 provides a breakdown of the mean thickness measured in 2004 and associated current margin for these two locations.

Bay 15 Grid at Elevation 71' 6"
In 1R21 Oyster Creek performed first time inspections of two 6" by 6" areas above the transition weld at elevation 71' 6". The results of the 6" by 6" area in bay 15 showed several local readings less than the inspection specification acceptance criteria (ref. 4). The intent of the criteria in the specification was to provide a low threshold for inspection results so that unexpected readings would be evaluated. As a result IR 00556049 was issued. Review of the inspection results showed that the thinnest local reading was 0.449 inches.

The inspection specification criteria were purposefully set well above the design basis criteria. The minimum required design basis local thickness for this elevation is 0.300 inches (reference 2). Therefore the as found thickness at this location meets the design basis requirements. In addition even when assuming a .001 inches per year corrosion rate, this location will continue to meet design basis until well past 2008. Comparison of this new location to an existing monitored location that has been determined to be the most critical for the plates at this elevation (location 9-20) shows that the projections for the previously monitored location are bounding (refer to attachment 3 page 11).

Bay 17 Grid at Elevation 23' 76"
In 1R21 Oyster Creek performed first time inspections of two 6" by 6" areas above the transition weld at elevation 23' 6". The results of the 6" by 6" area in bay 17 showed several local readings

less than the inspection specification acceptance criteria (ref. 4). The intent of the criteria in the specification was to provide a low threshold for the inspection results so that unexpected readings would be evaluated. As a result IR 00548459 was issued. Review of the inspection results showed that the thinnest local reading was 0.628 inches.

The inspection specification criteria were purposefully set well above the design basis criteria. The minimum required design basis local thickness for this elevation is 0.360 inches (reference 2). Therefore the as found thickness at this location meets the design basis requirements. In addition even when assuming a .001 inches per year corrosion rate, this location will continue to meet design basis until well past 2008. Comparison of this new location to an existing monitored location that has been determined to be the most critical for the plates at this elevation (location 15-23) shows that the projections for the previously monitored location are bounding (refer to attachment 3 page 14).

Conclusions

Table 1 demonstrates that current and projected margin in critical Drywell Vessel locations based on the comparison of recently obtained 2006 UT data and previously approved calculations remain adequate to continue to satisfy design bases requirements until 1R22. Comparison of the 2006 data to previously approved calculations, demonstrates that the conclusions in the previous calculations are still bounding the current data.

References

1) C-1302-187-E310-037 Revision 2
2) ECR 05-00575
3) C-1302-187-5300-030 Revision 1
4) Specification IS-328227-004 Rev. 13

Attachments

1) Margin Table - 1 page
2) Review of 2006 means value to previous projections - 6 pages
3) Drywell UT Inspection Data - 16 pages

Prepared by Pete Tamburro Pete Tamburro 11/6/06

I have performed an independent technical review of this technical evaluation in accordance with Section 4.3 of CC-AA-309-101, Revision 7. I have confirmed the correctness of the inputs, mathematics, and outputs. I have verified the methodology and compliance with design bases criteria are appropriate. The results accomplish the stated purpose.

Independent Review By Frank Stulb Date: 11/06/06 Frank J. Stulb, Jr.

Manager Comments:
This technical evaluation was prepared and reviewed by qualified personnel to provide a summary of the 1R21 Drywell Inspection results performed in 2006. The conclusions demonstrate that the structural integrity of the drywell shell, based on its measured thickness at representative locations, remains acceptable based on the previously approved methodologies and acceptance criteria.

Approved for Use: Ray, F.H. 11/6/2006.
F. Hank Ray 11/6/2006

Summary of Oyster Creek Drywell Corrosion Monitoring Program Controlling Locations

Elevation/ Plate (Nominal Thickness Inches)	Location with Mean thinnest	Measurement (inches) (Mean)	When	Criteria Min. Req'd Buckling	Margin in 2006	Percent	Measured Corrosion Rate. Inches/ year	Preliminary Projected margin in 2029 based on 95% confidence interval ~~around the corrosion rate~~ Slope/ Intercept	Reference
11' 3" (1.154")	19A	0.8066	10/2006	0.736	0.0706	9.6%	None	9.6%	C-1302-187-5300-030
50' 2" (0.770")	Bay 5 Location 5-HI	0.7556	10/2004	0.541	0.2146	39.7%	0.0003	36.5%	C-1302-187-E310-037 Rev 2
50' 2" (0.770")	Bay 15 Location 23-HI	0.7573	10/2004	0.541	0.2163	40%	0.0004	36.4%	C-1302-187-E310-037 Rev 2
51 10" (0.772")	Bay 13 Location 32 Lo	0.6872	10/2004	0.518	0.1692	32.7%	None	32.7%	C-1302-187-E310-037 Rev 2
60' 10" (0.722")	Bay 5 Location 22	0.6928	10/2004	0.518	0.1748	33.7%	None	33.7%	C-1302-187-E310-037 Rev 2
87 ' 5" (0.640")	Bay 9 location 20	0.6123	10/2004	0.452	0.1603	35.4%	0.00075	33.6%	C-1302-187-E310-037 Rev 2

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From

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$F_{actaul} := \frac{MSR}{MSE}$

$\alpha := 0.05$

$F_{critical} := qF(1-\alpha, DegreeFree_{reg}, DegreeFree_{ss})$

$F_{ratio} := \frac{F_{actaul}}{F_{critical}}$

$F_{ratio} = 1.715 \cdot 10^{-3}$

Therefore the curve fit of the means does not have a slope and the grandmean is an accurate measure of the thickness at this location

$i := 0..Total_{means} - 1$

$\mu grand_{measured_i} := mean(\mu_{measured})$

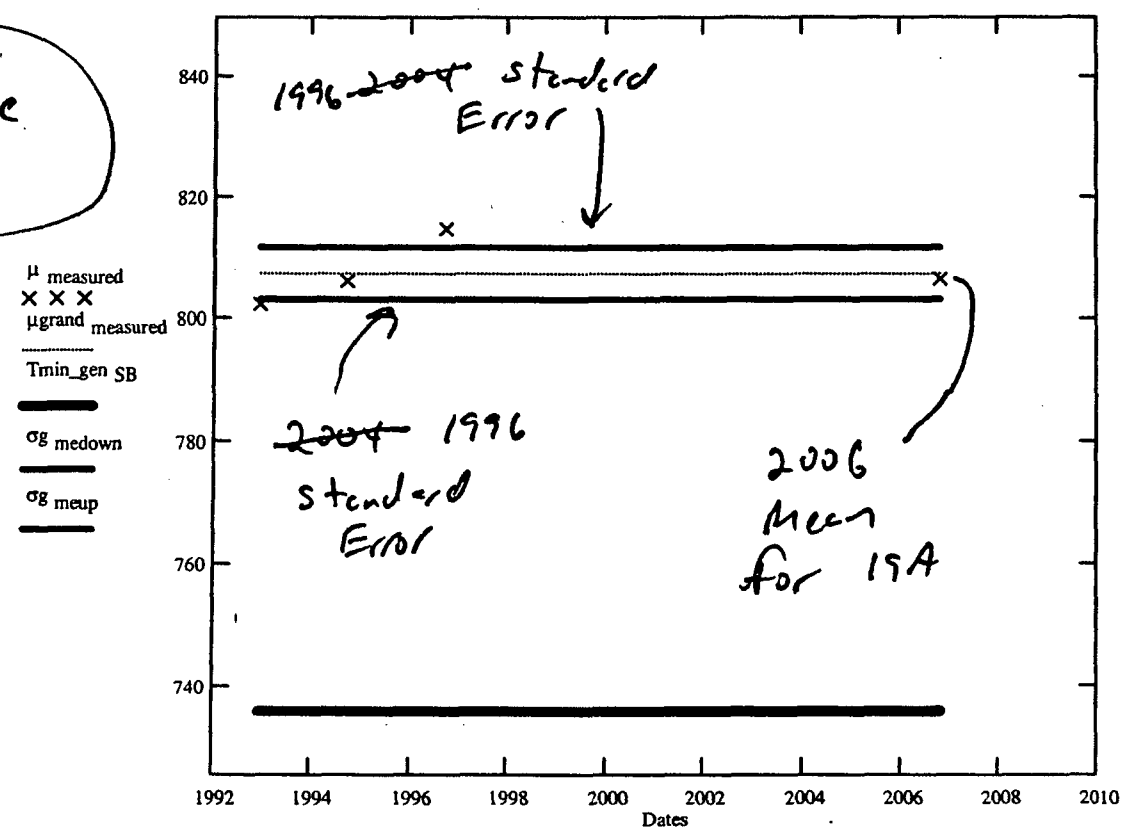
$\sigma grand_{measured} := Stdev(\mu_{measured})$

$GrandStandard_{error_0} := \frac{\sigma grand_{measured}}{\sqrt{Total_{means}}}$

The minimum required thickness at this elevation is $Tmin_gen_{SB_i} := 736$ (Ref. Calc. SE-000243-002)

Plot of the grand mean and the actual means over time

Figure 1



From

$$upper_f := Thick_{predict_f} \cdots + qt\left(1 - \frac{\alpha_t}{2}, Total_{means} - 2\right) \cdot Standard_{error} \cdot \sqrt{1 + \frac{1}{(d+1)} + \frac{\left(year_{predict_f} - Thick_{actualmean}\right)^2}{sum}}$$

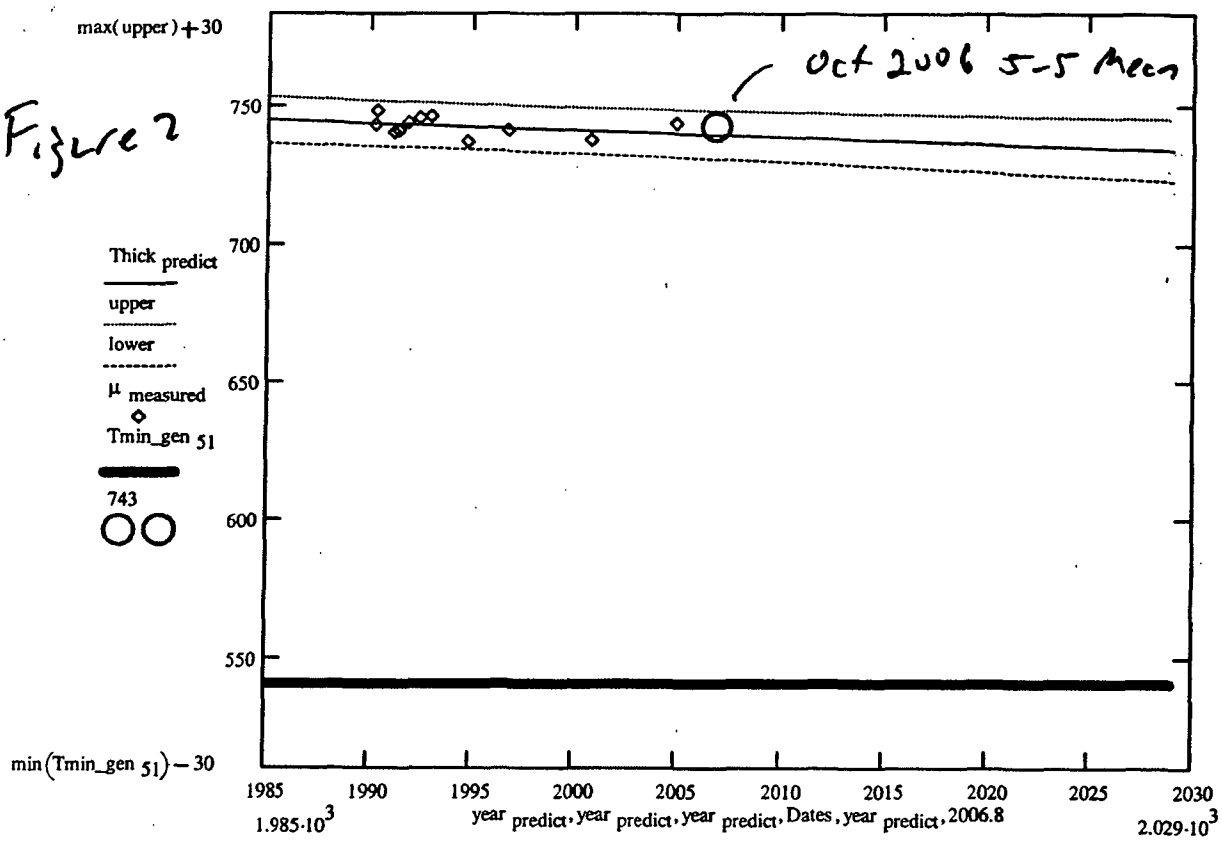
$$lower_f := Thick_{predict_f} \cdots + -\left[qt\left(1 - \frac{\alpha_t}{2}, Total_{means} - 2\right) \cdot Standard_{error} \cdot \sqrt{1 + \frac{1}{(d+1)} + \frac{\left(year_{predict_f} - Thick_{actualmean}\right)^2}{sum}}\right]$$

General area Tmin for this elevation in the Drywell

$Tmin_gen_{51_f} := 541$ (Ref. Calc. SE-000243-002)

$m_s = -0.246$

Figure 2



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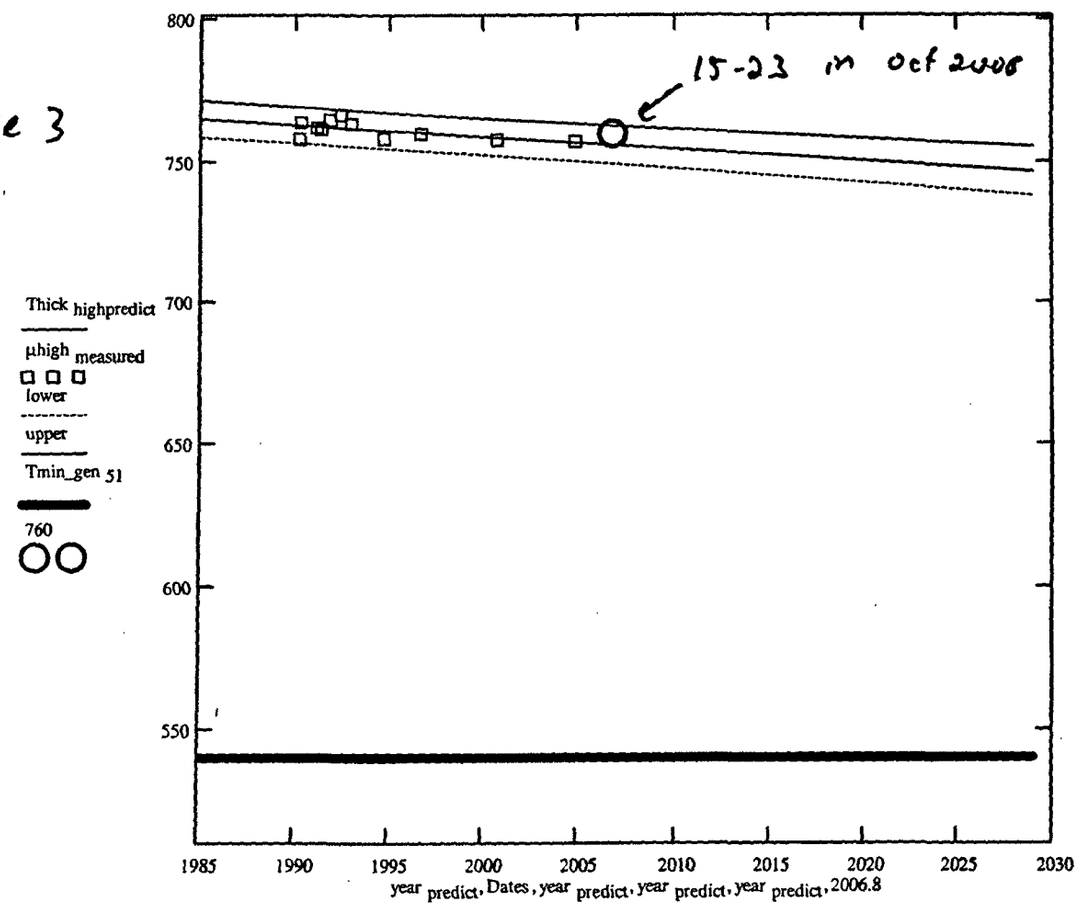
For the thicker points

$$upper_f := Thick_{highpredict_f} + qt\left(1-\frac{\alpha_t}{2}, Total_{means}-2\right)\cdot Standard_{higherror}\sqrt{1+\frac{1}{(d+1)}+\frac{\left(year_{predict_f}-Thick_{actualmean}\right)^2}{sum}}$$

$$lower_f := Thick_{highpredict_f} + -\left[qt\left(1-\frac{\alpha_t}{2}, Total_{means}-2\right)\cdot Standard_{higherror}\sqrt{1+\frac{1}{(d+1)}+\frac{\left(year_{predict_f}-Thick_{actualmean}\right)^2}{sum}}\right]$$

$m_{highs} = -0.418$

Figure 3



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Standard error

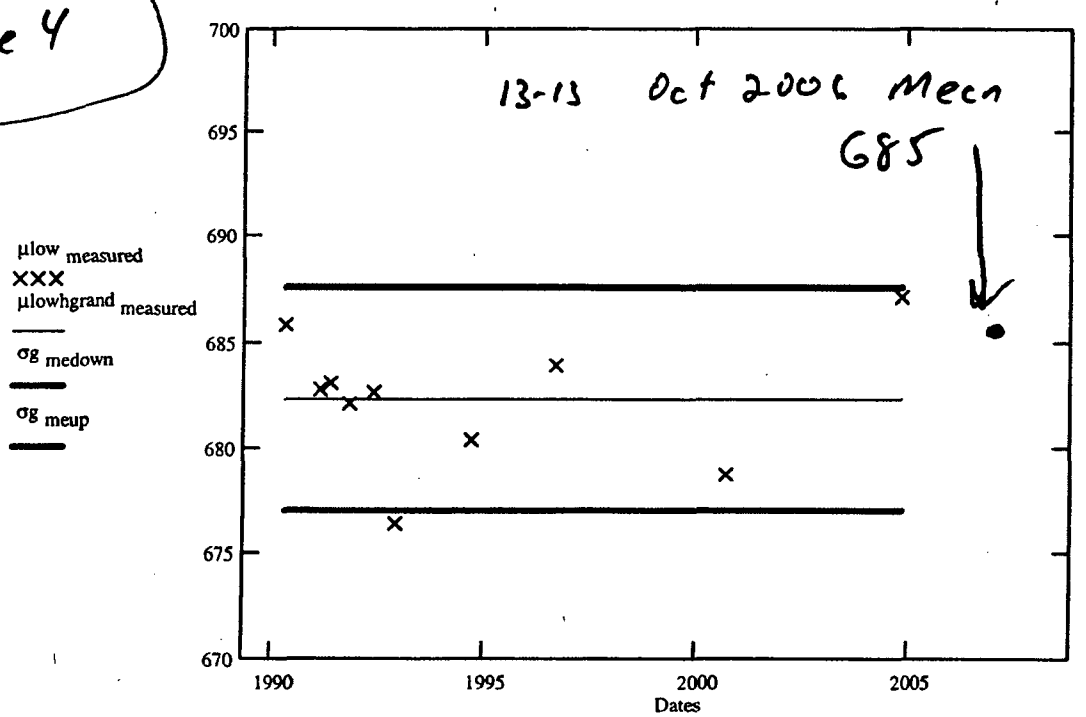
$$\frac{\text{mean}(\sigma\text{low}_{\text{measured}})}{\sqrt{\text{Total}_{\text{means}}}} = 5.291$$

$$\sigma g_{\text{medown}} := \mu\text{lowhgrand}_{\text{measured}} - \frac{\text{mean}(\sigma\text{low}_{\text{measured}})}{\sqrt{\text{Total}_{\text{means}}}}$$

$$\sigma g_{\text{meup}} := \mu\text{lowhgrand}_{\text{measured}} + \frac{\text{mean}(\sigma\text{low}_{\text{measured}})}{\sqrt{\text{Total}_{\text{means}}}}$$

Figure 4

Location 13-13



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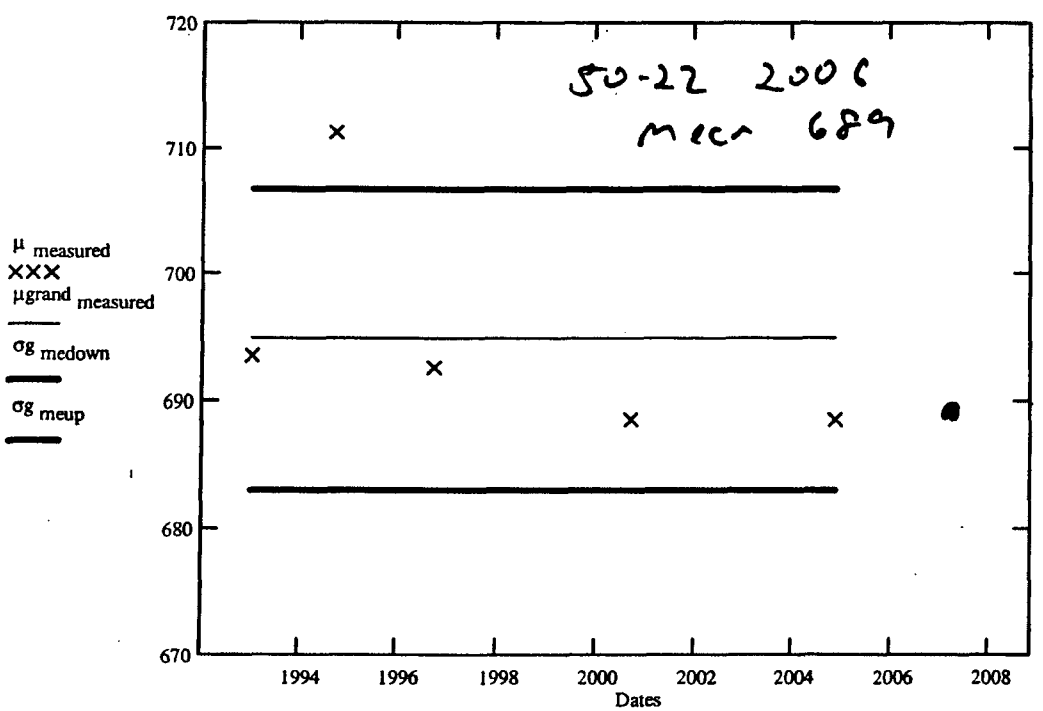
Standard error

$$\frac{\text{mean}(\sigma_{\text{measured}})}{\sqrt{\text{Total}_{\text{means}}}} = 11.865$$

$$\sigma g_{\text{medown}} := \mu\text{grand}_{\text{measured}} - \frac{\text{mean}(\sigma_{\text{measured}})}{\sqrt{\text{Total}_{\text{means}}}}$$

$$\sigma g_{\text{meup}} := \mu\text{grand}_{\text{measured}} + \frac{\text{mean}(\sigma_{\text{measured}})}{\sqrt{\text{Total}_{\text{means}}}}$$

Figure 5



From

The minimum required ~~thickness at this elevation is~~ $Tmin_gen_{86_f} := 452$ (Ref. Calc. SE-000243-002)

Location Curve Fit Projected to Plant End Of Life

$m_s = -0.754$

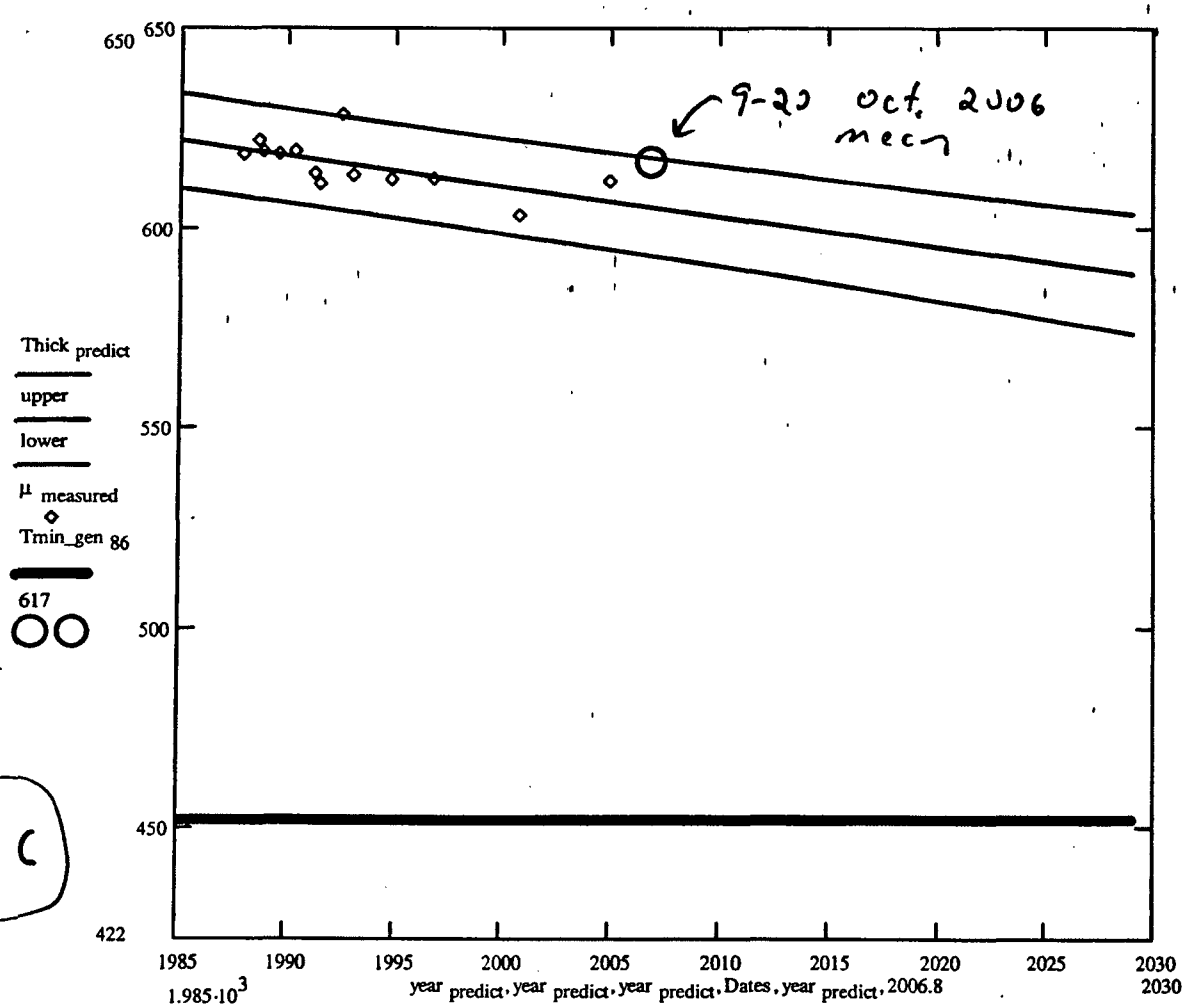


Figure C

$year_{predict_{12}} = 2.009 \cdot 10^3$ $Thick_{predict_{12}} = 604.115$

Therefore the regression model shows that even at the lower 95% confidence band this location will not corrode to below Drywell Vessel Minimum required thickness by the plant end of life.

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No Pits have been identified for this location

General Electric	**Ultrasonic Thickness Measurement Data Sheet**	File Name:	N/A
Oyster Creek		Date:	10/18/2006
Refueling Outage - 1R21		UT Procedure:	ER-AA-335-004
Page 1 of 5		Specification:	IS-328227-004

Examiner: Matt Wilson		Level: II	Instrument Type:	Panametrics 37DL Plus	
Examiner: Leslie Richter		Level: II	Instrument No:	031125409	
Transducer Type: DV 506	Serial #: 072561	Size: 0.438"	Freq: 5 Mhz		Angle: 0°
Transducer Cable Type: Panametrics	Length: 5'	Couplant: Soundsafe		Batch No:	19620
Calibration Block Type: C/S Step Wedge		Block Number: CAL-STEP-088			

SYSTEM CALIBRATION

INSTRUMENT SETTINGS		Initial Cal. Time	Calibration Checks		Final Cal. Time	
Coarse Range:	2.0"	10:00	See Data	See Data	14:32	
Coarse Delay:	N/A	Calibrated Sweep Range = 0.300"		Inches to	1.500"	Inches
Delay Calib:	N/A	Thermometer: 246647		Comp. Temp: 72°		Block Temp: 81°
Range Calib:	N/A	W/O Number: R2090917				
Instrument Freq.	N/A	Total Crew Dose 254 mr	Drywell Containment Vessel Thickness Examination. Internal UT Inspections.			
Gain:	67 db					
Damping:	N/A					
Reject:	N/A					
Filter:	N/A					

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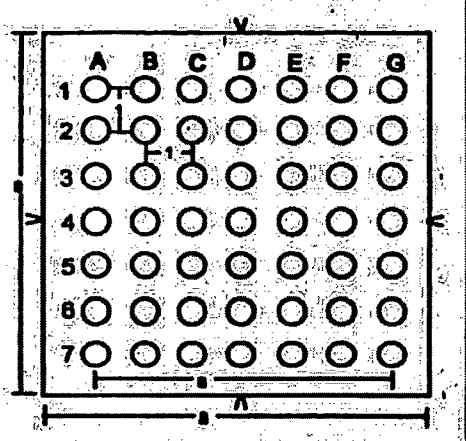
AH3

Template aligned to V Stamps.

Thickness readings taken at holes located in template.



Location ID	9D			Bay	9	Elev.	11' 3"
	A	B	C	D	E	F	G
1	1.005	1.056	0.985	1.133	1.132	1.136	1.101
2	0.896	0.927	1.067	1.037	0.974	1.077	1.069
3	0.751	0.883	0.975	1.071	1.033	1.105	1.123
4	0.885	0.993	0.949	0.984	0.995	1.022	1.041
5	0.980	0.968	0.936	0.942	0.880	0.927	0.998
6	0.960	0.869	0.976	0.987	0.967	0.965	0.949
7	0.968	0.967	0.963	1.004	0.947	0.892	0.943

Calibration Check: 10:15	
Tscr.	AVG.
.628	0.988

Location ID	11A			Bay	11	Elev.	11' 3"
	A	B	C	D	E	F	G
1	0.905	0.832	0.829	0.803	0.830	0.812	0.737
2	0.797	0.828	0.834	0.822	0.858	0.783	0.795
3	0.720	0.766	0.868	0.731	0.762	0.669	0.764
4	0.739	1.047	1.057	0.806	0.761	0.821	0.849
5	0.843	1.090	1.104	0.879	0.879	0.854	0.817
6	0.741	0.897	0.818	0.890	0.907	0.833	0.826
7	0.875	0.869	0.923	0.886	0.871	0.810	0.842

Calibration Check: 10:32	
Tscr.	AVG.
.628	0.848

COMMENTS:
Core Plug located at C04, C05, B04, B05.

COMMENTS: File Specific Comments located to right of readings.

Location ID 11C: The following template holes were painted onto the plate using the template. The readings were then taken with the template removed. This was done due to the Drywell Vent Attachment weld obstructing the template. Row 1 A through G, Row 2 A through C, Row 7 C through D.

EXAMINER LEVEL II 10-20-06

Reviewed by: Lee Stone Level II Date 10/18/2006

General Electric		Ultrasonic Thickness Measurement Data Sheet	File Name:	N/A
Oyster Creek			Date:	10/18/2006
Refueling Outage -	1R21		UT Procedure:	ER-AA-335-004
Page 2 of	5		Grid Procedure:	IS-328227-004

Location ID	11C			Bay	11	Elev.	11' 3"	Calibration Check: 10:46	
	A	B	C	D	E	F	G		
1	OBST.	0.771	0.803	0.912	0.767	0.858	0.886		
2	1.056	1.046	0.984	1.094	1.036	1.118	1.029		
3	1.073	1.113	1.002	0.935	0.942	0.888	0.853		
4	0.837	0.836	0.790	0.874	0.834	0.846	0.838		
5	0.850	0.825	0.869	0.889	0.833	0.866	0.875		
6	0.856	0.840	0.864	0.829	0.872	0.876	0.844	Tscr.	AVG.
7	0.861	0.877	0.879	0.885	0.880	0.849	0.876	.628	0.898

COMMENTS: A01 obstructed due to D.W Vent attachment weld. B01 reading taken adjacent to D.W. attachment weld. See Comments above.

Location ID	13A			Bay	13	Elev.	11' 3"	Calibration Check: 11:02	
	A	B	C	D	E	F	G		
1	0.887	0.833	0.887	0.908	1.046	0.951	0.922		
2	0.823	0.883	0.774	0.826	0.897	0.870	0.783		
3	0.760	0.913	0.798	0.823	0.746	0.759	0.768		
4	0.845	0.895	0.875	0.848	0.788	0.799	0.852		
5	0.880	0.811	0.861	0.869	0.798	0.846	0.840		
6	0.816	0.813	0.869	0.924	0.824	0.785	0.870	Tscr.	AVG.
7	0.801	0.834	0.763	0.838	0.895	0.885	0.863	.628	0.848

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Location ID	13D			Bay	13	Elev.	11' 3"	Calibration Check: 11:16	
	A	B	C	D	E	F	G		
1	1.114	1.117	1.132	1.083	1.068	1.106	1.119		
2	0.950	1.041	0.999	1.061	1.007	1.117	1.100		
3	0.986	0.950	0.837	0.833	0.949	1.088	1.085		
4	1.005	0.977	0.878	0.851	0.911	0.958	0.997		
5	0.960	0.907	0.874	0.874	0.915	0.916	0.905		
6	0.944	0.947	0.897	0.887	0.920	0.865	0.892	Tscr.	AVG.
7	0.996	0.939	0.929	0.958	0.944	0.832	0.821	.628	0.968

Location ID	15D			Bay	15	Elev.	11' 3"	Calibration Check: 11:30	
	A	B	C	D	E	F	G		
1	1.133	1.133	1.133	1.141	1.145	1.145	1.144		
2	1.094	1.109	1.087	1.142	1.129	1.119	1.131		
3	1.040	1.026	1.043	1.081	1.095	1.085	1.096		
4	0.978	0.948	0.975	1.029	1.030	1.096	1.068		
5	0.976	0.969	0.977	1.069	1.013	1.067	1.041		
6	0.930	0.979	1.031	1.037	1.017	1.059	1.051	Tscr.	AVG.
7	0.922	0.972	0.998	1.031	1.005	1.033	1.052	.628	1.054

Location ID	17A			Bay	17	Elev.	11' 3"	Calibration Check: 11:43	
	A	B	C	D	E	F	G		
1	1.110	1.149	1.154	1.138	1.130	1.170	1.169		
2	1.121	1.159	1.114	1.144	1.134	1.148	1.123		
3	1.068	1.073	1.111	1.114	1.094	1.083	1.053		
4	0.976	0.991	0.980	1.030	1.046	0.994	0.950		
5	0.962	0.926	0.909	0.950	0.869	0.938	0.967		
6	0.903	0.956	0.891	0.835	0.802	0.950	0.963	Tscr.	AVG.
7	0.954	0.972	0.877	0.890	0.876	0.891	0.945	.628	1.015

MW 10-20-06

Examined by	Matt Wilson	Level	II	Date	10/18/2006
Examined by	Leslie Richter	Level	II	Date	10/18/2006
Reviewed by:	Lee Stone	Level	II	Date	10/18/2006

General Electric		Ultrasonic Thickness Measurement Data Sheet	File Name:	N/A
Oyster Creek			Date:	10/18/2006
Refueling Outage -	1R21		UT Procedure:	ER-AA-335-004
Page 3 of	5		Specification:	IS-328227-004

Location ID	17D			Bay	17	Elev.	11' 3"	Calibration Check: 11:59	
	A	B	C	D	E	F	G		
1	0.849	0.828	0.861	0.884	0.930	0.888	0.702		
2	0.806	0.802	0.717	0.806	0.736	0.756	0.648		
3	0.998	0.823	0.752	0.733	0.822	0.730	0.667		
4	1.072	1.074	0.742	0.812	0.812	0.803	0.791		
5	0.814	0.841	0.850	0.816	0.852	0.856	0.869		
6	0.792	0.829	0.888	0.846	0.888	0.855	0.800	Tscr.	AVG.
7	0.824	0.897	0.837	0.887	0.891	0.935	0.886	.628	0.833

COMMENTS:
Core Plug located at A03, A04 and B03, B04.

Location ID	17/19			Bay	17	Elev.	11' 3"	Calibration Check: 12:12	
	A	B	C	D	E	F	G		
1	0.969	0.962	0.945	0.931	0.965	0.960	0.928		
2	0.972	0.977	0.959	0.991	0.967	0.955	0.937		
3	0.968	0.974	1.004	0.987	0.982	0.998	0.924		
4	1.022	0.969	0.963	0.974	0.993	0.985	0.952		
5	0.960	0.962	0.951	0.950	0.943	0.982	0.901		
6	1.001	0.994	0.952	0.929	0.917	0.962	1.001	Tscr.	AVG.
7	0.995	1.019	1.012	0.995	1.009	0.948	1.000	.628	0.969

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Location ID	19A			Bay	19	Elev.	11' 3"	Calibration Check: 12:26	
	A	B	C	D	E	F	G		
1	0.692	0.788	0.743	0.648	0.699	0.702	0.735		
2	0.807	0.774	0.845	0.736	0.747	0.724	0.773		
3	0.813	0.812	0.892	0.885	0.861	0.792	0.806		
4	0.916	0.883	0.805	1.179	0.808	0.777	0.766		
5	0.873	0.904	0.842	1.160	0.801	0.752	0.878		
6	0.844	0.768	0.834	0.858	0.851	0.834	0.867	Tscr.	AVG.
7	0.865	0.803	0.793	0.844	0.878	0.817	0.808	.628	0.822

COMMENTS:
Core Plug located at D04, D05, and C04, C05.
not includ

Location ID	19B			Bay	19	Elev.	11' 3"	Calibration Check: 12:39	
	A	B	C	D	E	F	G		
1	0.865	0.862	0.872	0.932	0.947	0.992	0.802		
2	0.842	0.883	0.780	0.840	0.915	0.778	0.866		
3	0.861	0.906	0.838	0.898	0.974	0.930	0.834		
4	0.869	0.883	0.807	0.801	0.766	0.834	0.774		
5	0.811	0.770	0.785	0.788	0.799	0.731	0.778		
6	0.828	0.787	0.885	0.891	0.934	0.834	0.738	Tscr.	AVG.
7	0.872	0.822	0.904	0.828	0.843	0.876	0.871	.628	0.847

Location ID	19C			Bay	19	Elev.	11' 3"	Calibration Check: 12:53	
	A	B	C	D	E	F	G		
1	0.809	0.768	0.862	1.059	0.968	0.961	0.920		
2	0.679	0.745	0.695	0.814	0.766	0.865	0.845		
3	0.816	0.775	0.870	0.871	0.863	Obst.	0.896		
4	0.791	0.660	0.715	0.793	1.151	1.164	0.918		
5	0.851	0.781	0.733	0.762	0.862	0.787	0.796		
6	0.866	0.830	0.880	0.757	0.867	0.750	0.753	Tscr.	AVG.
7	0.801	0.794	0.852	0.841	0.901	0.906	0.840	.628	0.839

COMMENTS:
Core Plug located at F03, F04, G03, G04. F03 obstructed due to surface condition.
A01-A07 taken on Vertical Weld.

MAH 10-20-06

Examined by	Matt Wilson	Level	II	Date	10/18/2006
Examined by	Leslie Richter	Level	II	Date	10/18/2006
Reviewed by:	Lee Stone	Level	II	Date	10/18/2006

General Electric	Ultrasonic Thickness Measurement Data Sheet	File Name:	N/A
Oyster Creek		Date:	10/18/2006
Refueling Outage - 1R21		UT Procedure:	ER-AA-335-004
Page 4 of 5		Specification:	IS-328227-004

Location ID	1D			Bay	1	Elev.	11' 3"	Calibration Check: 13:05
	A	B	C	D	E	F	G	
1	0.881	1.156	1.104	1.124	1.134	1.093	1.122	

Tscr.	AVG.
.628	1.088

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AHD

Location ID	3D			Bay	3	Elev.	11' 3"	Calibration Check: 13:14
	A	B	C	D	E	F	G	
1	1.199	1.189	1.187	1.173	1.166	1.187	1.166	

Tscr.	AVG.
.628	1.180

Location ID	5D			Bay		Elev.	11' 3"	Calibration Check: 13:23
	A	B	C	D	E	F	G	
1	1.174	1.191	1.186	1.187	1.187	1.184	1.184	

Tscr.	AVG.
.628	1.186

Location ID	7D			Bay	7	Elev.	11' 3"	Calibration Check: 13:31
	A	B	C	D	E	F	G	
1	1.144	1.147	1.147	1.138	1.102	1.136	1.116	

Tscr.	AVG.
.628	1.133

Location ID	9A			Bay	9	Elev.	11' 3"	Calibration Check: 13:40
	A	B	C	D	E	F	G	
1	1.158	1.159	1.162	1.159	1.159	1.163	1.130	

Tscr.	AVG.
.628	1.154

MW 10-20-06

Examined by	Matt Wilson	Level	II	Date	10/18/2006
Examined by	Leslie Richter	Level	II	Date	10/18/2006
Reviewed by:	Lee Stone	Level	II	Date	10/18/2006

General Electric		Ultrasonic Thickness Measurement Data Sheet	File Name:	N/A
Oyster Creek			Date:	10/18/2006
Refueling Outage -	1R21		UT Procedure:	ER-AA-335-004
Page 5 of	5		Specification:	IS-328227-004

Location ID	13C			Bay	13	Elev.	11' 3"	Calibration Check: 13:48
	A	B	C	D	E	F	G	
1	1.146	1.148	1.148	1.149	1.144	1.128	1.134	

Tscr.	AVG.
.628	1.142

Location ID	15A			Bay	15	Elev.		Calibration Check: 14:00
	A	B	C	D	E	F	G	
1	1.180	1.129	1.136	1.129	1.146	1.077	1.049	

Tscr.	AVG.
.628	1.121

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MW 10-20-06

Examined by Matt Wilson — Level II — Date 10/18/2006
Examined by Leslie Richter — Level II — Date 10/18/2006
Reviewed by: Lee Stone — Level II — Date 10/18/2006

Calc. NRR Calc.

IR 553792-03, Torus Structural Integrity Basis from 1R21 Inspections

This Technical Evaluation was prepared in accordance with CC-AA-309-101, Revision 7.

A technical task pre-job briefing was conducted in accordance with HU-AA-1212, Revision 1. As a result of this briefing the risk rank was determined to be 4, since the acceptance criteria had already been challenged and approved, therefore a third party review this document is not required.

Reason for Evaluation/Scope:

There is minor pitting of the Torus shell below the waterline known as the immersion area. The coating has been blistered since its application in 1984 and the shell in this area is a wetted surface (i.e. underwater). Some of the blisters become fractured during desludging and other torus monitoring activities in preparation of the inspections. Prior to recoating activities in 1984, weld repairs were performed to repair significant pit corrosion that was identified, however some minor pit depths of less than 0.040 inches were allowed to remain. These blisters and the substrate condition underneath continue to be monitored. The concern with this pitting is minor because the Torus is inerted by a nitrogen atmosphere during the normal operating cycle and since there is a lack of oxygen present, corrosion is minimal. Due to the pitting some local shell thicknesses fall below the nominal wall thickness and because there was no corrosion allowance considered in the original design thickness these pit locations must be evaluated to ensure they meet the allowable membrane stresses in the ASME B&PV Code Section III, 1977.

During the underwater inspections performed in 1R21 per ASME B&PV Code Section XI, Subsection IWE, 1992; seven pits were discovered that were deeper than the previously evaluated acceptance criteria of .040 inches. These were entered into the Corrective Action Process and Condition Reports IR 548227 and IR 550462 were created in Passport and were evaluated by Engineering. These are being evaluated in this technical evaluation to ensure they meet the allowable membrane stresses in the ASME B&PV Code Section III, 1977.

Effect of include pits —

This technical evaluation will evaluate the condition of the Torus coating and the minor pitting discovered during the 1R21 inspections and demonstrates that the Torus structural integrity continues to satisfy all Licensing and Design Bases requirements.

Detailed Evaluation:

Visual inspections performed in 1R21 revealed the condition of the coating in all 20 bays of the Torus was consistent with inspections performed in previous outages. There was no significant change and a similar amount of fractured and cracked blisters were found.

Seven pits were discovered that were deeper than the .040 inch preliminary acceptance criteria. These were evaluated in AR A2143995 Evaluations 3 and 4 in PIMS as

acceptable to meet the allowable membrane stresses in the ASME B&PV Code Section III, 1977.

Reference 1, evaluated the Torus shell thickness margin and established a general area acceptance criteria of 0.040 inch based on maximum depth of corrosion left in the Torus shell after the 1983 repairs. Since a few pits have been discovered that were deeper than .040 inches, a new design analysis had been created to provide a refined local area acceptance criteria (Reference 2) for pitting based on the allowable membrane stresses in the ASME B&PV Code. Finite element analyses of the Torus shell and conservative engineering assumptions were used to determine the acceptance criteria for localized pitting.

The pit depth, diameter, and spacing (edge to edge distance) from Table 3-1 of Reference 2 are used in this technical evaluation to evaluate the pits discovered in 1R21. The criteria from Table 3-1 are tabulated below:

Pit Diameter (inches)	Pit Depth (inches)	Minimum Edge to Edge Spacing (inches)
.25	.173	.55
.50	.173	.84
.75	.173	1.15
1.00	.173	1.45
2.00	.173	2.85
3.00	.173	4.60
4.00	.173	6.70

Conclusions/Findings:

Since all of the seven pits discovered during the underwater inspections performed in 1R21 met these criteria, the Torus shell is acceptable and meets the allowable membrane stresses in the ASME B&PV Code Section III, 1977. The condition of the coating has not significantly degraded since the last inspection four years ago and the number of pits has not increased significantly. Therefore, the Torus shell and associated coating acceptable and continue to satisfy all Licensing and Design Bases requirements. The coating continues to perform is required function until the next scheduled inspections.

accounted adjacent pits

83 Uncovered pits MPR

References:

1) MPR-953, Oyster Creek Nuclear Generating Station Torus Shell Thickness Margin.
2) MPR-2974, Oyster Creek Nuclear Generating Station Torus Pitting Inspection Evaluation Criteria.

Margin only — 40 mils > weld overlay

Supp. 1977 Mark I Ring 2002 Locating Pit

Strictly code >48

.280 Nominal

Closing 550 → Submerged/Inaccessible

Attachments:

1) UCC Preliminary Inspection Report for 1R21
2) UCC Preliminary Inspection Data Sheets
3) AR 548227
4) AR 550462
5) AR 2143995 Eval 03
6) AR 2143995 Eval 04

Note: The UCC inspection reports are considered preliminary since the Exelon NDE group are processing the final paperwork for administrative requirements. The NDE group provided oversight and approval of the UCC work. The NDE department will process the final inspection sheets. An Industry Coatings SME (Jon Cavallo of Corrosion Control Consultants & Labs) contracted by engineering to perform as an Independent Third Party Reviewer, also provided oversight of the inspections, coating and substrate conditions, and evaluated the results to ensure all specification requirements were followed. He concluded the coating and associate blisters that exist to be sufficient until the next scheduled inspections in 1R23.

Preparer: Frank Stulb **Date:** 11/05/06

Independent Reviewer: Pete Tamburro **Date:** 11/6/06

I have reviewed this Tech Eval and find it meets the requirements of CC-AA-309-101, Rev. 7. All inputs are accurate. The results are reasonable and meet the design basis for the Oyster Creek Torus. I have also reviewed manager comments and find them acceptable.

Approved for use by: Ray, F.H. **Date:** 11/06/2006

"Attachment 1 - UCC Preliminary Inspectio

"Attachment 2 - UCC Preliminary Inspectio

"Attachment 3 - AR 548227.pdf"

"Attachment 4 - AR 550462.pdf"

"Attachment 5 - AR A2143995 EVAL 03.p

"Attachment 6 - AR A2143995 EVAL 04.p

SECTION 3: INSPECTION FINDINGS

FINAL REPORT – TORUS IMMERSION AREA

OYSTER CREEK NUCLEAR GENERATING STATION

BACKGROUND

The interior torus surfaces were coated in 1982 with Mobil 78 Hi-Build epoxy. In some areas, the Mobil 78 was applied over a Mobil 46X16 Epoxy Filler. Since then, immersion and vapor area inspections have been periodically performed by divers.

The 1R12 and subsequent inspection reports document mechanical damage to substrate, blistering (both intact and fractured, some to substrate), pinpoint rusting, and pitting corrosion. Pit depths reportedly ranged from less than 5 mils to slightly more than 40 mils.

SCOPE & PURPOSE

Inspections were performed in accordance with AmerGen Specification SP-1302-52-120, Revision 3. Inspections consisted of a qualitative coating inspection and a qualitative and quantitative assessment of pitting corrosion of the submerged internal surfaces of the torus in all 20 torus bays. Inspection efforts focused primarily on pressure boundary (Shell) surfaces.

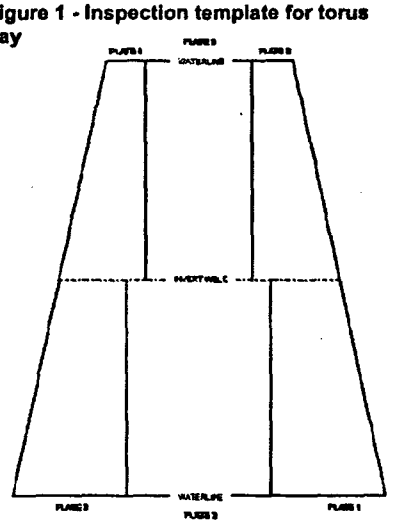
The purpose of the qualitative coating inspection was to assess coating degradation and evaluate any affect on pressure boundary base metal corrosion and the emergency core cooling system (ECCS). Qualitative pit assessment was performed to assess corrosion rates and to document any pitting exceeding pit depth acceptance criteria established by the Licensee. Data gathered during the qualitative inspection was also used to assist in defining the scope of coating repair. Quantitative pit depth measurements were reported to the Licensee.

A VT-3 IWE inspection of the submerged catwalk bracing, downcomers, downcomer bracing, and vent header support columns was conducted and documented in accordance with Exelon Procedure ER-AA-335-016, Revision 3. Results of these inspections were submitted to Martin McAllister, site NDE Level III.

APPROACH

The internal surfaces of the torus suppression pool are a nuclear safety related Service Level 1 area. As such, all inspections were performed in accordance with the Underwater Construction Corporation Quality Assurance Program under the provisions of *10 CFR 50 Appendix B, 10 CFR part 21*. Inspections were performed by ASNT/ASME VT-1 and VT-3 certified Level II and Level III coating inspectors in accordance with approved procedures.

Figure 1 - Inspection template for torus bay



TORUS IMMERSION AREA

ASME Section XI Level II and Level III inspectors performed all inspections. A Level III inspector reviewed and checked all critical findings. Underwater visibility during inspections was acceptable. The areas being inspected were lit by high intensity video lights.

For documentation purposes, the shell area in each bay was broken into six segments (see Figure 1) so that relevant indications could be accurately recorded. This system was also used to aid in identifying the location of video sequences. Inspection records are attached.

The qualitative inspection focused on the torus shell. Sample areas of the ring girders, downcomers and

structural members were also inspected for coating deterioration, corrosion, or damage. High resolution video was used to document representative conditions. Video footage is annotated and includes audio description.

QUALITATIVE & QUANTITATIVE COATING & CORROSION INSPECTION

QUALITATIVE INSPECTION FINDINGS

Torus Pressure Boundary (Immersion Area)

Extensive blistering of the pressure boundary can be seen throughout the torus immersion area particularly in areas where Mobil 46X16 Epoxy Repair Compound was applied under Mobil 78 Series Epoxy. The extent of blistering corresponds generally to the amount of 46 X 16 present.

Figure 2 depicts the typical distribution of areas of blistered coating with heaviest blistering near the torus invert. Blister size is No. 2 to No. 6. Degree of frequency is medium to medium dense as rated in accordance with ASTM D 714 "Standard Test Method of Evaluating Degree of Blistering of Paints". Fractured blisters appear to expose 46 X 16 filler or substrate. Blister size in these areas randomly exceeds ASTM rating (1/2" to 1-1/4" diameter).

The blistered conditions shown in Figure 3 and Figure 4 are typical. Blistering is also found in areas where Mobil 46 X 16 was not applied. Blister size is No. 2 to No. 4 and degree of frequency is medium to dense. Attachment * contains coating inspection reports documenting the visual inspection.

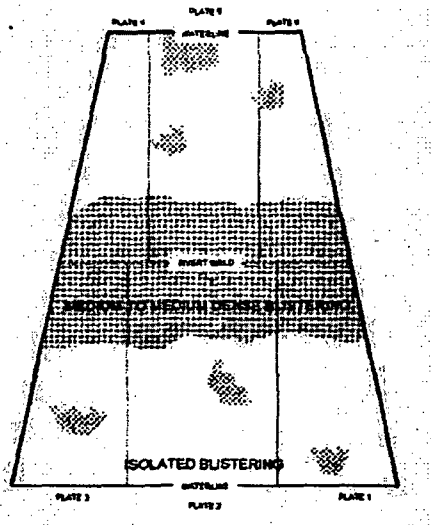


Figure 2 - Typical blister distribution by torus bay

Figure 3 - Typical blister density at invert

The majority of blisters (90% to 95%) appear to be intact.

Intact blisters examined by removing the blister cap expose the substrate. Corrosion attack under non-fractured blisters appears minimal and is generally limited to surface discoloration. Examination of the substrate typically reveals slight discoloration and pitting with pit depths of less than 1 thousandth of an inch.

Fractured blisters were observed during the general visual inspection. No accurate determination can be made when a given fracture occurred. Nevertheless, it can be assumed that some fractures are recent while others date to 12R. The condition of fractured blisters varies as has been seen during previous inspections. Some blisters exhibit hairline cracking across the blister cap but appear otherwise undisturbed. There is generally no sign of significant corrosion activity (see Figure 19). A small percentage (less than 1% to 2%) of blisters exhibit open fractures. Substrate beneath fractured blisters exhibits a slightly heavier magnetite (Fe_3O_4) oxide layer and minor pitting (less than 10 thousandths) of the substrate. The presence of Fe3O4 suggests that oxygen concentration in the water in contact with exposed substrate has remained low. A higher oxygen content would likely have produced Fe_2O_3 causing a red oxide.

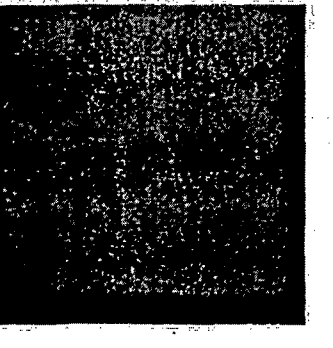


Figure 4 - typical intact blisters

To characterize changes in blister condition, the one foot test squares established during 1R12 in Bays 6 and 7 were reinspected. In addition, twenty, one foot square sample areas were established to assess substrate condition beneath cracked blisters. The results of these inspections are summarized beginning on page 6 and detailed in Attachment 1.

Figure 5 – Dense blistering in invert area

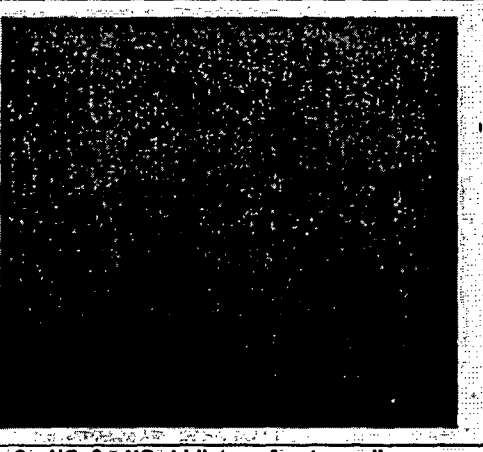


Figure 6 – NO. 2 – NO. 4 blisters; few to medium

Figure 7 – Typical blister conditions showing fractured, cracked (circled) and intact blisters

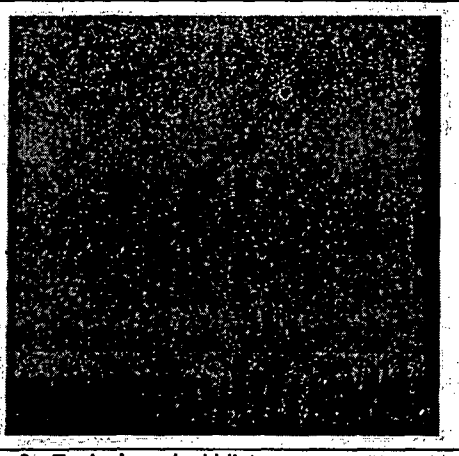


Figure 8 – Typical cracked blister

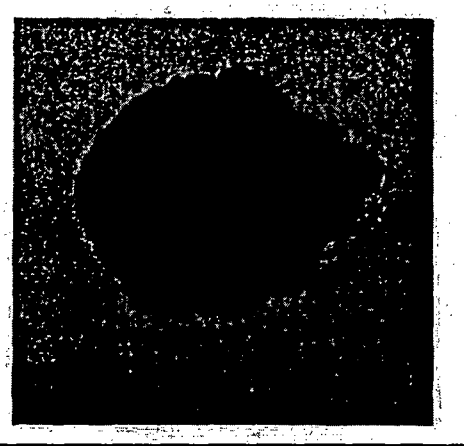


Figure 9 – Substrate beneath cracked blister

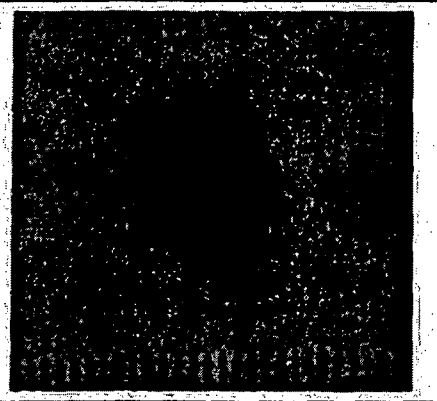


Figure 10 – Fractured blister / exposed substrate

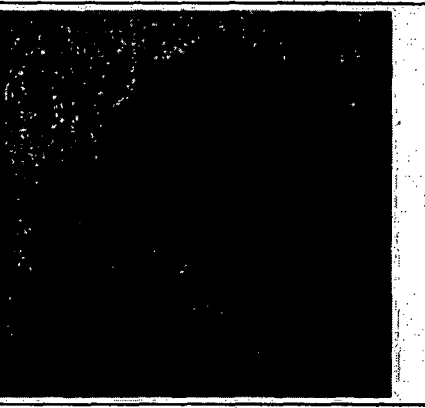


Figure 11 – Minor pitting, < 40 mils

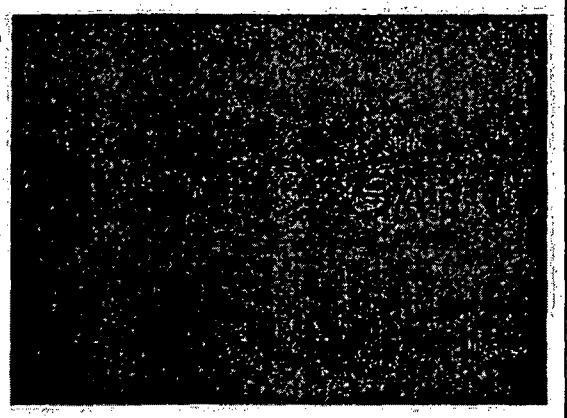


Figure 12 – Typical minor staining and pinpoint rusting

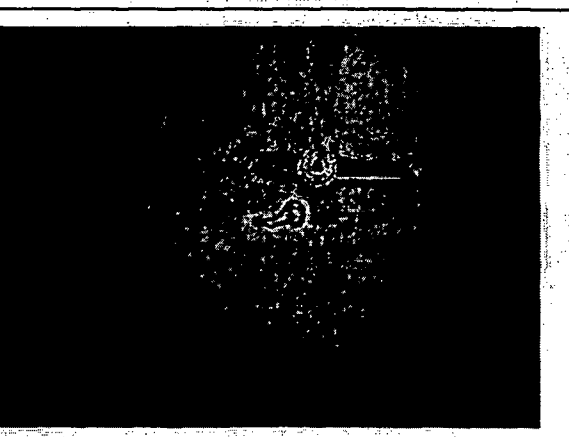


Figure 13 – Worst case staining and pinpoint rusting

Other Coating Deficiencies (Immersion Area)

Other coating deficiencies consisted primarily of spot rust, pinpoint rusting, and minor mechanical damage (**Figure 12** and **Figure 13**). Random deficiencies that exposed base metal were identified. They ranged in size from $^{1}/_{16}$" to ½" diameter. Some areas contained multiple deficiencies. Pitting in these areas ranged from less than 10 mils to slightly more than 40 mils in a few isolated cases.

Pinpoint rusting mixed with small areas of mechanical damage was typically found in the invert area in most bays. In many cases, mechanical damage is not to substrate. Areas such as this are randomly distributed on the pressure boundary. Surface staining of the coating was also noted in some areas on the invert but is not affecting coating integrity. It appears to have been caused by steel grit remaining from previous coating operations.

Coating on the upper portion of the torus shell (below the waterline) appears to be in good condition. Few deficiencies were noted and staining is minimal. Occasional small random patches of No. 2 to No. 8 few to medium blisters were found (see Figure 6). Less than 1% were fractured.

Qualitative assessment of a sample of the pitting corrosion on the exposed base metal indicates that pit depths overall do not exceed 0.040". Pit diameters ranged from $^{1}/_{16}$" to ½". Additional information is contained in the attachments.

Corrosion Evaluation Test Areas

It was confirmed that the two bare metal areas previously established as corrosion evaluation test areas had been coated. Area I was located-in Bay 6--in the transition region between the heavily blistered coating system of Mobil 46 X 16 and Mobil 78 and the non-blistered coating system of Mobil 78, and Area 2 was located on the Bay 6/7 ring girder in the non-blistered coating system of Mobil 78.

Torus Components (Immersion Area)

Coating conditions on ring girders, downcomers, down comer bracing, vent header support columns, catwalk bracing, and ECCS penetrations are generally consistent with coating conditions found on the pressure boundary. No significant corrosion or evidence of section loss was identified.

Ring Girders: The coating is generally in good condition. Blistering and minor mechanical damage with isolated shallow pitting is found on the flange and web. Most is in the form of edge rusting. There are no visual indications of significant corrosion or loss of section in the flange, web or gusset base metal. A representative sample was inspected.

Catwalk Bracing: A VT-3 inspection of the catwalk bracing was conducted in accordance with Exelon procedure ER-AA-335-016, Revision 3. Additional information is contained in the attachments. Additional information is contained in the attachments.

Vent Header Support Columns: A VT-3 inspection of the Vent Header Support Columns was conducted in accordance with Exelon procedure ER-AA-335-016, Revision 3. Additional information is contained in the attachments.

Downcomers: A VT-3 inspection of the downcomers and downcomer bracing was conducted in accordance with Exelon procedure ER-AA-335-016, Revision 3. The coating is generally in good condition. Minor mechanical damage with isolated shallow pitting is found on the structural members and downcomer surfaces. There are no visual indications of significant corrosion or loss of section in the structural members or downcomer base metal. Additional information is contained in the attachments.

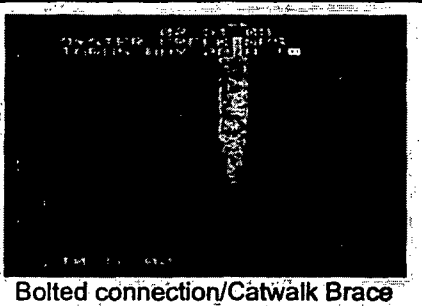
Suction Strainers: ECCS Suction Strainers in Bay 4 (at Penetration X-69), Bay 11 (at Penetration X-68B), and Bay 18 (at Penetration X-68A). There was no visual evidence of fibrous debris or foreign material in contact with the strainers that could potentially cause blockage or plugging of the strainer inlets. A trivial accumulation of fine particulate covered the body of the strainers but does not appear to block or plug any of the strainer inlets.

The strainers exhibit no obvious mechanical damage. There are no apparent loose or missing flange bolts. The carbon steel torus-side of the strainer flanges was also visually inspected. The flange areas exhibit minor coating deficiencies, surface rusting, and shallow pitting. There are no visual indications of significant corrosion or loss of section in the flange base metal.

Structural bracing

Bolted connection

T-Quencher


Bolted connection/Catwalk Brace

Ring Girder @ VH Support

Downcomer & Bracing

QUANTITATIVE INSPECTION FINDINGS

Quantitative Blister Evaluation – Torus Pressure Boundary in Immersion

The one square foot test areas are designated as Test Patch 1, 2, and 3 respectively. The test areas are outlined with an epoxy coating and identified by bay and quadrant number. An arrow adjacent to each square indicates the direction of the reactor. Vertical and horizontal centerlines divide each test square into four quadrants.

Overall condition of the blisters in each square was assessed. Blisters that fell on the bisecting vertical or horizontal centerlines were numbered, measured, and documented. Blister counts indicate a general increase in the formation of new and blisters and the occurrence of fractured blisters. The rates of increase appear to be decreasing with the exception new blisters recorded on the bisecting lines. Blister diameter measurements also suggest that only a few blisters have increased in size. The tables and charts that follow summarize the change in blisters over time.

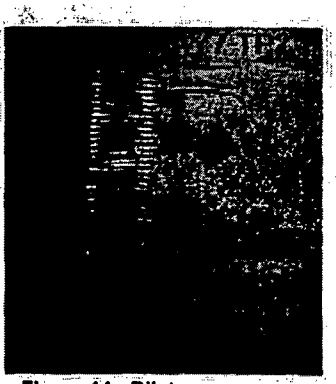


Figure 14 - Blister evaluation in test patch

	SUMMARY TP-1, 2, & 3			
	Patch(Total)	Patch(Frac)	Line(Total)	Line(Frac)
13R	882	143	59	11
16R	902	215	64	31
19R	910	259	74	40
21R	935	267	77	45

Table 1 – Summary of blister condition in test patch.

	PERCENT INCREASE TP-1, 2, & 3			
	Patch(Total)	Patch(Frac)	Line(Total)	Line(Frac)
13R				
16R	2%	50%	8%	182%
19R	1%	20%	16%	29%
21R	3%	3%	4%	13%

Table 2 – Increase in total and fractured blisters.

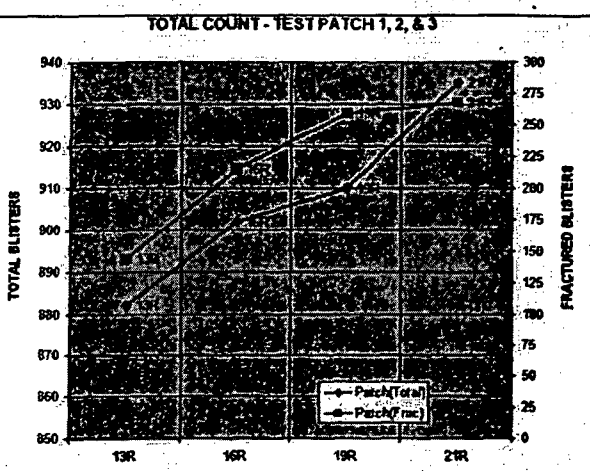


Figure 15 – Total count of all blisters in test patch.

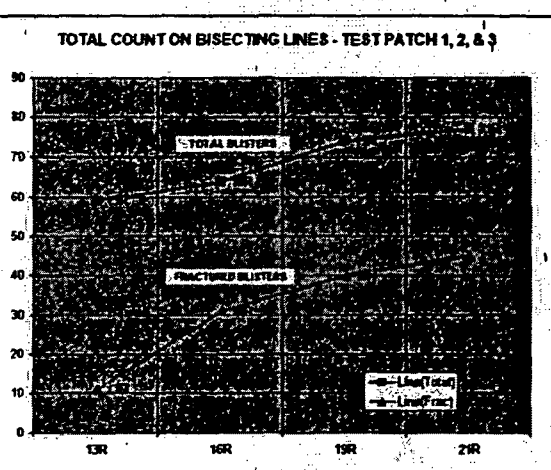


Figure 16 – Count of blisters falling on bisecting lines.

	% Fractured	
	Patch(%Frac)	Line(%Frac)
13R	16%	19%
16R	24%	48%
19R	28%	54%
21R	29%	58%

Table 3 - % fractured; total patch Vs bisecting line

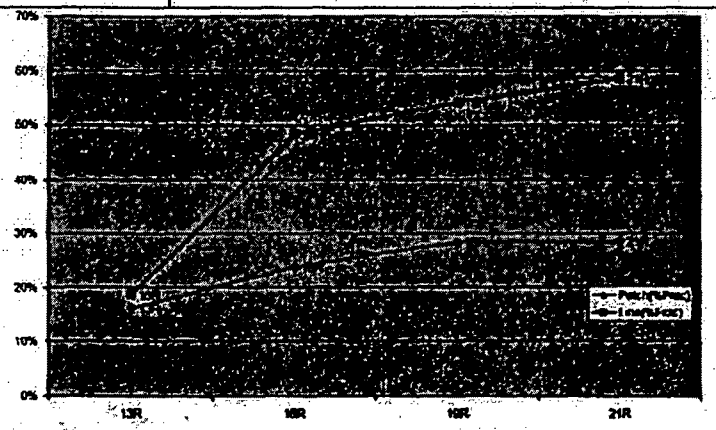


Figure 17 – Graph of percentage of fractured blisters from Table 3

The cumulative percentage of fractured blisters in the test patches ranges from 16% in 1990 (1R13) 24% in 1996 (1R16), 28% in 2002 (1R19), to 29% in 2006 (1R21). This is consistent with the rate of change in occurrence of fracturing but appears to be higher than the percentage of fractured blisters observed overall.

Investigation of the test areas is documented in Attachment * and on video tape number *. Images in Attachment * are a composite view of each test square and include the numbered blisters. These blisters correlate with the numbered blisters photographed during previous inspections. Drawings that document the location and condition of blisters are also found in Attachment *.

Blister Evaluation – Torus Pressure Boundary in Immersion

The licensee provided the criteria for evaluation and disposition of blisters on the torus immersion coating. The blisters were categorized into three groups as shown in Figure 18.

1. **Intact Blisters**: Blisters indicated by green arrows which, when viewed with the naked eye, are intact, and exhibit no cracking and/or staining due to corrosion of the underlying substrate.

2. **Cracked Blisters**: Blisters indicated by yellow arrows which, when viewed with the naked eye, exhibit cracking and/or light surface staining due to corrosion of the underlying substrate. Although cracked, the cap of a cracked blister remains in place.

3. **Fractured Blisters**: Blisters indicated by red arrows which, when viewed with the naked eye, exhibit disbondment of the blister cap and active corrosion of the underlying substrate.

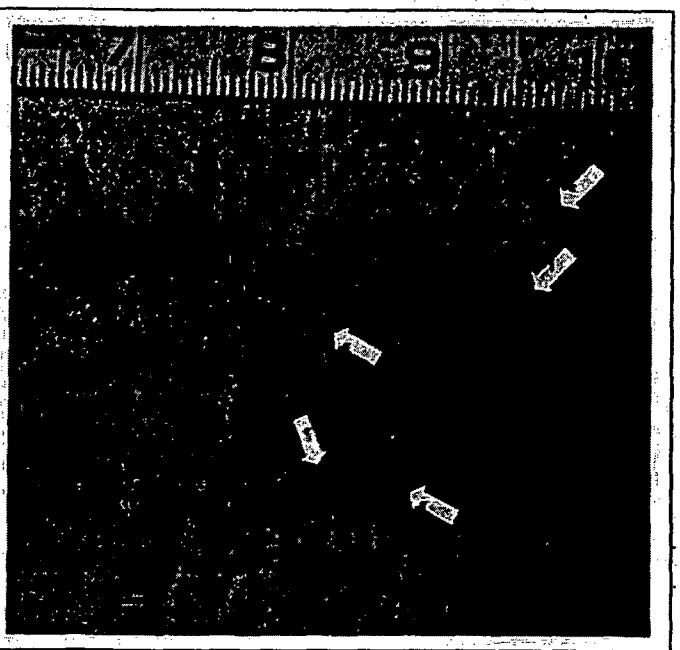
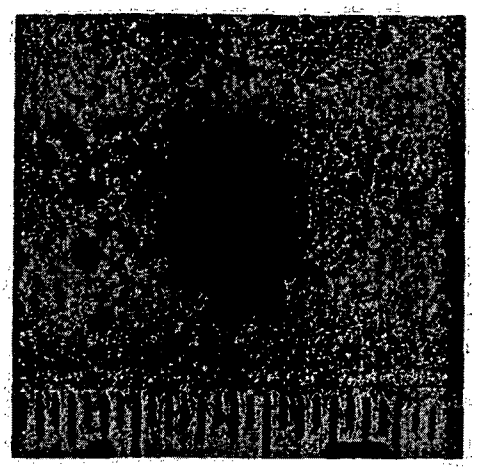


Figure 18 – Categorization of blister conditions on the torus shell.

Fractured Blisters

Fractured blisters, by definition, exposed the steel substrate and were designated for coating repair. Figure 19 illustrates the typical condition at fractured blister sites before and after the substrate was cleaned for inspection. Each of the areas was inspected for pitting. With the exception of pits 18-P2-01, 15-P2-01, 05-P1-01, 05-P5-01, and 05-P5-02 (see Table 4), all other pitting was less than 0.040". Approximately **400 fractured blisters were identified. Blister diameters generally range from less than ¼" to 1-1/2". They represent less than 1% of the total submerged surface area of the torus shell. All fractured blister sites were repaired by the application of underwater coating.



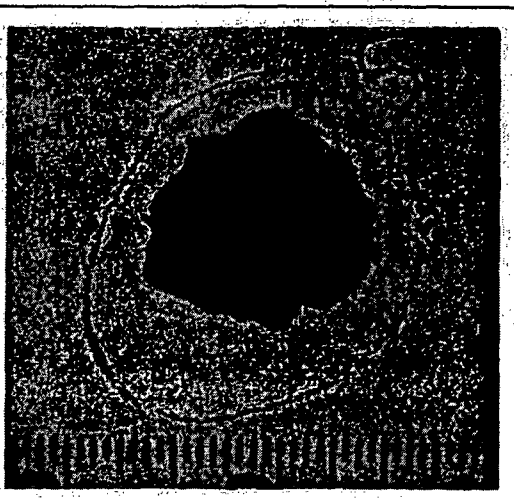


Figure 19 – Typical condition of substrate at site of fractured blisters. Pitting is typically <40 mils.

Cracked Blisters

The substrate condition beneath cracked blisters was evaluated by sampling a one foot square, area in each bay. Sample areas were selected based on worst case condition of cracked blisters. Blister caps were removed from 10% (or a minimum of 10) of the cracked blisters and the substrate was evaluated for pitting.

Typical worst case conditions (see Figure 20) were chosen for evaluation of substrate beneath cracked blisters (yellow arrows). Intact blisters in the sample area are indicated by green arrows. Blister size and distribution is typical. Coating in the sample areas exhibits medium to dense blistering with a high ratio of cracked blisters. When blister caps are removed from cracked blisters (blue arrows), the substrate typically exhibits light surface rusting with minor (<40 mil) pitting. Coating adjacent to blisters appears to have good adhesion except in areas where epoxy was applied over the 46x16 surfacer.

Three pits exceeding 0.040" were identified and reported. No other pits greater than or equal to 0.040" were found. Sample photographs depicting typical condition of the cracked blisters and underlying substrate are shown in Figure 20. A map of blister locations can be found in Attachment *.

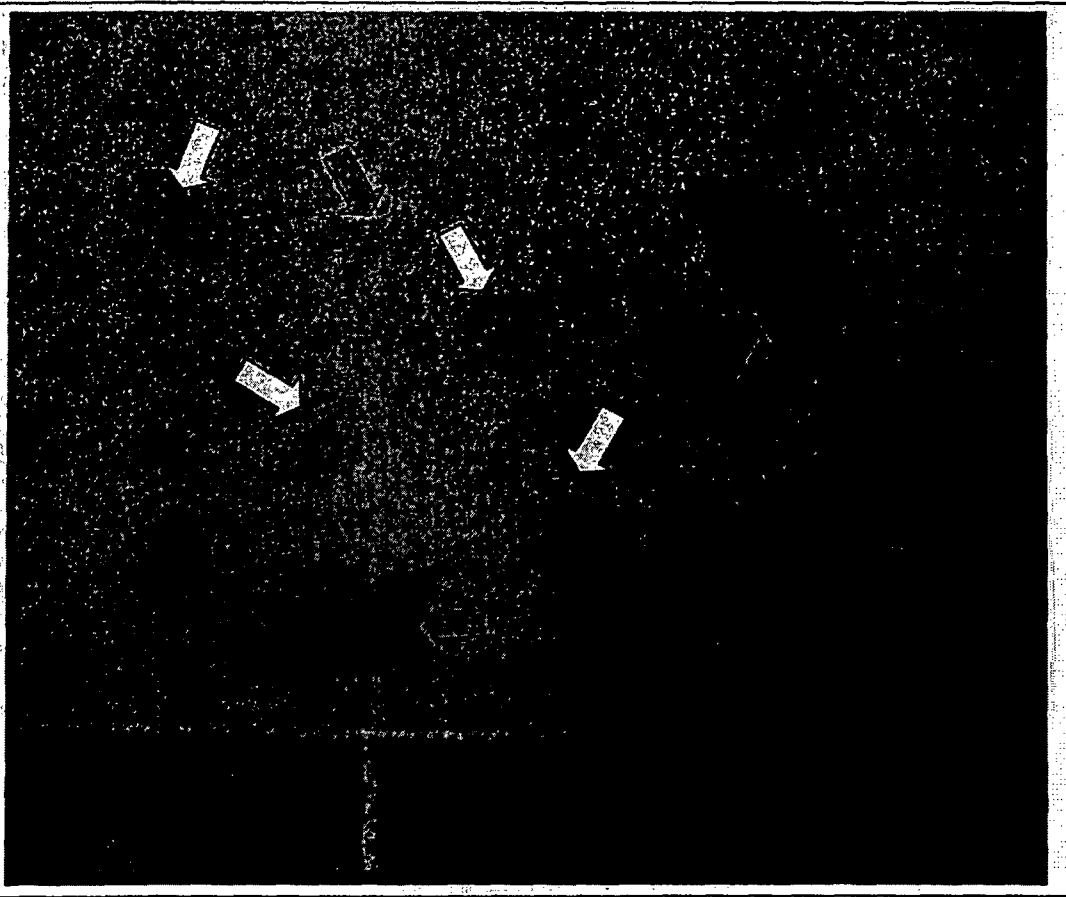


Figure 20 – Typical conditions in cracked blister sample areas.

Quantitative Corrosion Evaluation – Torus Pressure Boundary in Immersion

Oyster Creek specification SP-1302-52-120, Revision 3 established guidelines for pitting considered reportable. The majority pitting and general corrosion appeared to fall well inside the guidelines for pits requiring quantitative evaluation.

Localized general corrosion and surface rusting was found in randomly scatter areas on torus internal structures and components below the waterline. Visual assessment and selected confirming measurements show no indication that any significant metal loss has occurred. Minimal corrosion was noted on structures in the vapor area.

Seven reportable pit depth measurements were documented on the immersion area of the torus pressure boundary. Pit depths at these sites are documented in Attachment *.

The following table summarizes the quantitative pit depth measurements.

Table 4 – Reportable pitting indications

Pit ID	Pit Group	Metal Loss (In)	Pit Dia (In)	X Coordinate or Azimuth	Units (In or Deg)	Y Coord or Dist from Ref (In)	Adjacent Pits / Pit Groups
18-P2-01	N/A	0.041	0.250	28" from P3 WS	in	56" from IWS	N/A
15-P2-01	N/A	0.044	0.250	48" from P2/3 WS	in	6" from IWS	N/A
05-P1-01	N/A	0.041	0.038	46" from 4/5 RG	in	50" from IWS	N/A
05-P5-01	N/A	0.076	0.025	27" from P4/5 WS	in	36" from IWS	N/A
05-P5-02	N/A	0.039	0.025	22" from P5/6 WS	in	34" from IWS	N/A
07-P5-01	N/A	0.050	0.025	20" from P4/5 WS	in	52.5" from IWS	N/A
04-P5-01	1	0.041	0.125	10.5" from P4/5 WS	in	67" from IWS	Pit 01-G1
04-P5-02	1	0.044	0.125	10" from P4/5 WS	in	61" from IWS	Pit 02-G1

ATTACHMENT 1

QUALITATIVE INSPECTION RECORD

PRESERVICE [ ] INSERVICE [X] WORK ORDER NO. R2077340
VT-1 [ ] VT-3 [X] GENERAL VISUAL [ ] RECORD NO.: 1 Page 1 of 4
DIRECT [X] REMOTE [ ]
ILLUMINATION CHECK (TIME): START NA STOP NA ILLUMINATION CHECK: SAT [X] UNSAT [ ]
Client: Exelon/AmerGen Facility Location: Oyster Creek Nuclear Gen. Station Project No.: 01-02260.56
Date: 10/28/06 Description of Vessel: G.E. BWR /Mark I Containment–Torus Location: Bays No. 1 – 20 (Shell)

INSPECTION INFORMATION: Submerged Torus Shell (Pressure Boundary)
Principal Torus Coating: Mobil 78 + Mobil 46 x 16 Surfacer

Classification of Coating Deficiencies:

TYPE	DESCRIPTION		
Cracking	In Top Coat None To Substrate N/A	Location N/A	Area: N/A
Delamination	In Top Coat None To Substrate N/A	Location N/A	Area: N/A
Blistering	Per D714: No. 2 to 6 Med to Dense	Location Invert & near waterline	Area: 1 to 10 sqft typ.
Flaking or Peeling	Frac blisters/low adhesion	Location Associated with Blistering	Area: 1 to 2 sqft typ.
Mech. Damage	Random to med dense	Location primarily at invert	Area: 1 to 2 sqft typ.
Tiger Striping	N/A	Location N/A	Area: N/A
Discoloration	Surface staining	Location primarily at invert	Area: 1 to 10 sqft typ.

Classification of Substrate Deficiencies:

Pinpoint Rusting	Random	Location various locations	Area: <1 sqft typ.
Uniform Rusting	Minor	Location various locations	Area: <1 sqft typ.
Pitting Corrosion (< threshold values)	2 to 39 mils	Location primarily at invert	Area: <1 sqft typ.
Corrosion with loss of section	N/A	Location N/A	Area: N/A
Other Surface Indications*	None	Location N/A	Area: N/A

Note 1: *Document surface indications such as discoloration, arc strikes, gouges, dents, pitting, cracks, wear, excessive corrosion, erosion, or other signs of surface irregularities on the part or component.
Note 2: Show references to continuation sheets when entering data on this sheet.

Measuring and Testing Equipment: RB 10.28.06

Dry Film Thickness Gauge:	SN 181771	SN ~~178919~~ 173919	SN EJ018[1]	SN EJ024[1]
NIST Cal. Plates:	SN K-84487	SN K-75160		
Dial Depth Gauge:	SN D-24	SN 177857		
Calibration Flat:	SN 05002			
Go/No-Go Pit Gauge:	SN PB-15			

1 – Gauges disposed of on site.

Level II NDE Inspector	Date	Level III NDE Inspector	Date	ISI Engineer Review	Date
	10/28/06		10/28/06		

ANII Review	Date

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ATTACHMENT 1 (CONTINUED)

QUALITATIVE INSPECTION RECORD

PRESERVICE [ ] INSERVICE [X] WORK ORDER NO. R2077340
VT-1 [ ] VT-3 [X] GENERAL VISUAL [ ] RECORD NO.: 1 Page 2 of 4
DIRECT [X] REMOTE [ ]
Client: Exelon/AmerGen Facility Location: Oyster Creek Nuclear Gen. Station Project No.: 01-02260.56
Date: 10/15/02 Description of Vessel: G.E. BWR /Mark I Containment–Torus Location: Bays No. 1 – 20 (Shell)

GENERAL ASSESSMENT

Torus Shell: 100% of the submerged torus shell (pressure boundary) was inspected in all 20 bays. The surface of the torus shell is coated, however, there are numerous small coating deficiencies that expose base metal. These consist primarily of fractured blisters with minor mechanical damage and spot rusting and typically measure 1/16" to ½" in diameter. Pitting of the base metal was qualitatively assessed and typically ranged from 2 to approximately 40 mils.

Blistering of the pressure boundary coating is found in all 20 bays. The heaviest blistering is generally near the invert. Blister size is No. 2 to No. 6. Degree of frequency is medium to medium dense as rated in accordance with ASTM D 714 "Standard Test Method of Evaluating Degree of Blistering of Paints". Fractured blisters appear to expose undercoat or substrate. Blister size in these areas randomly exceeds ASTM rating (1/2" to 1-1/4" diameter).

The balance of the coating in the inspected areas exhibits random moderate to heavy surface straining (not to substrate), mechanical damage, and pinpoint rusting.

REPORTABLE INDICATIONS

Coated Surfaces: Coating deficiency indications consist primarily of blistering, discoloration, and minor mechanical coating damage in all 20 torus bays. Frequency and distribution of these conditions is as described above. Photographs of typical conditions can be found in the final report. Coating deficiencies exposing base metal were identified and repaired by the application of an underwater coating.

Uncoated Surfaces: Reportable Pitting indications are recorded on the attached quantitative data sheets (attachment 2). Photographs of typical pitting conditions can be found in the final report. Other localized areas of exposed base metal exhibit only minor corrosion and surface rusting. There are no indications of discoloration, arc strikes, gouges, dents, pitting, cracks, wear, excessive corrosion, erosion, or other signs of surface irregularities.

Level II NDE Inspector	10/28/06 Date	Level II NDE Inspector	10-28-06 Date	Level II NDE Inspector	10/28/06 Date
Level II NDE Inspector	10/28/06 Date	Level II NDE Inspector	10-28-06 Date	Level II NDE Inspector	10-28-06 Date
N/A Level II NDE Inspector	Date	Level III NDE Inspector	10/28/06 Date	ISI Engineer Review	Date
ANII Review	Date				

AR 553792-03
Attachment 2
Page 2

ATTACHMENT 2

QUANTITATIVE EVALUATION OF METAL LOSS RECORD

PRESERVICE [ ] INSERVICE [X]
VT-1 [X] VT-3 [ ] GENERAL VISUAL [ ]
DIRECT [X] REMOTE [ ]
ILLUMINATION CHECK (TIME): START NA STOP NA
ILLUMINATION CHECK: SAT [X] UNSAT [ ]
Client Exelon/AmerGen
Date: 10/28/06 Description of Vessel: G.E. BWR Four/Mark I Containment - Torus

WORK ORDER NO: R2077340
RECORD NO.: 1 Page 3 of 4
Project No.: 01-02260.56
Facility Location: Oyster Creek Nuclear Generating Station
Location: Bay No. 4, 5, 7, & 15

Measure and Test Equipment:

173919 JCB 10-28-06

Dry Film Thickness Gauge: SN 181771 SN ~~178919~~ SN EJ018[1] SN EJ024[1]

NIST Cal. Plates: SN K-84487 SN K-75160

Dial Depth Gauge: SN D-24 SN 177857

Calibration Flat: SN 05002

Go/No-Go Pit Gauge: SN PB-15

1 – Gauges disposed of on site.

Procedure for Determining Metal Loss:

Metal loss values have a higher degree of accuracy when the protective coating is removed. Since it is not practical to remove the coating at all measured sites, it is generally performed when the metal loss values (obtained with coating in place) approach or exceed the maximum value (MAV) established by the Owner. Metal loss values (MLV) are obtained by subtracting the sum of the average dry film thickness (ADFT) value and the dial depth gauge adjusted to zero value (AZV) from the pit depth value (PDV). Thus, MLV = PDV (ADFT + AZV)

LEGEND FOR METAL LOSS RECORD

Pit ID = Bay#, Plate(P)#, Pit# *Examples:* 16-2P-023 = Bay 16, shell plate 2, pit # 023	**Pit Group** = N/A if not present	**Isolated Pit (ISO)** = N/A if not present	**Pit Depth** = Uncorrected for surface roughness or DFT
	Adj. Zero = Surface roughness measured near pit	**Avg DFT** = Average dry film thickness near pit	
Metal Loss = Pit Depth – (Adj, Zero + Avg. DFT)	**Pit Diameter** = Diameter of pit or pit group across longest dimension)	**Coordinate** = Location measured as an X / Y distance from a structural feature (such as a Ring Girder) or azimuth & distance from a penetration.	
Pit Coordinate = X / Y coordinate or azimuth & distance.	**Adjacent Pits** = Enter Pit ID#'s of adjacent pits or pit groups	**Video Ref.** = reference from VCR counter	**UT Thickness** = Wall thickness per Owner
Rep. Eng. = Report to Owner's Engineer (Yes / No)	**Note: Record all measurements in mils. 1 mil = one thousandths of an inch (0.001)**		

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Attachment 2
Page 3

ATTACHMENT 2 (CONTINUED) – DATA SHEET

QUANTITATIVE EVALUATION OF METAL LOSS RECORD

Work Order No.: R2077340 Project No.: 01-02260.56 Record No.: 1 Page 4

Pit ID	Pit Group	ISO	Pit Depth (in)	Adj. Zero (in)	Avg. DFT (in)	Metal Loss (in)	Pit Dia (in)	Coordinates X or Angular	Units (in or Deg)	Y Coord or Dist. from Bot Cir	Adjacent Pits / Pit Groups	Video Ref.	Rep. Eng.	UT Thickness	Comments
18-P2-01	N/A	X	0.052	0.008	0.011	0.041	0.250	28" from P3 WS	in	56" from IWS	N/A	N/A	X	N/A	Adj Zero not used in metal loss calc
15-P2-01	N/A	X	0.073	0.026	0.029	0.044	0.250	48" from P2/3 WS	in	6" from IWS	N/A	N/A	X	N/A	Adj Zero not used in metal loss calc
05-P1-01	N/A	X	0.062	0.010	0.021	0.041	0.038	46" from 4/5 RG	in	50" from IWS	N/A	N/A	X	N/A	Adj Zero not used in metal loss calc
05-P5-01	N/A	X	0.090	0.006	0.014	0.076	0.025	27" from P4/5 WS	in	36" from IWS	N/A	N/A	X	N/A	Adj Zero not used in metal loss calc
05-P5-02	N/A	X	0.055	0.000	0.016	0.039	0.025	22" from P5/6 WS	in	34" from IWS	N/A	N/A	X	N/A	Adj Zero not used in metal loss calc
07-P5-01	N/A	X	0.070	0.000	0.020	0.050	0.025	20" from P4/5 WS	in	52.5" from IWS	N/A	N/A	X	N/A	Adj Zero not used in metal loss calc
04-P5-01	1	NA	0.058	0.000	0.018	0.041	0.125	10.5" from P4/5 WS	in	67" from IWS	Pit 01-G1	N/A	X	N/A	Adj Zero not used in metal loss calc
04-P5-02	1	NA	0.062	0.000	0.018	0.044	0.125	10" from P4/5 WS	in	61" from IWS	Pit 02-G1	N/A	X	N/A	Adj Zero not used in metal loss calc

Level II NDE Inspector	10/28/06 Date	Level II NDE Inspector	10.28.06 Date	Level II NDE Inspector	10/28/06 Date	Level II NDE Inspector	10.28.06 Date		
Level II NDE Inspector	10/28/06 Date	Level III NDE Inspector	10/28/06 Date	ISI Engineer Review	Date				
ANII Review	Date								

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Attachment 2
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AR 00548227 Report

Aff Fac:	Oyster Creek	**AR Type:**	CR	**Status:**	APPROVED
Aff Unit:	NA	**Owed To:**	ACAPALL	**Due Date:**	11/23/2006
Aff System:	187			**Event Date:**	10/24/2006
CR Level/Class:	4/D			**Disc Date:**	10/24/2006
How Discovered:	H02			**Orig Date:**	10/24/2006
WR/PIMS AR:		**Component #:**	187		

Action Request Details

Subject: PITS IN TORUS BAYS 5, 15, AND 18

Description: Originator: PETER TAMBURRO Supv Contacted: Howie Ray

Condition Description:
Inspection of the Torus per specification SP-1302-32-120 Revision 3 has found 4 pits which are greater than 40 mils deep. Per the requirements SP-1302-32-120 Revision 3 these pits shall be evaluated by Engineering. Data for each pit is as follows

Pit 18-P2-01 Data - Bay 18
Metal Loss -- 0.041 inches
Pit Diameter -- 0.25 inches

Pit 15-P2-01 Data - Bay 15
Metal Loss -- 0.044 inches
Pit Diameter -- 0.25 inches

Pit 05-P1-01 Data - Bay 05
Metal Loss -- 0.041 inches
Pit Diameter -- 0.038 inches

Pit 05-P5-01 Data - Bay 05
Metal Loss -- 0.076 inches
Pit Diameter -- 0.025 inches

Operability
Preliminary Evaluation of these four pits indicates that they are well within design basis acceptance criteria.

Immediate actions taken:
Informed Howie Ray and THe Engineering Control Center

Recommended Actions:
Perform a Technical Evaluation to disposistion these pits

Operable Basis:
REB Pits appear to be minor and this will be confirmed by the engineering evaluation. Primary containment is not currently required to be operable.
Structural integrity of the Torus is evaluated as acceptable per this eval. JJS

Reportable Basis:
N/A

AR 553792-03
Attachment 3
Page 1 of 2

SOC Reviewed by: THOMAS A POWELL 10/26/2006 08:17:51 CDT
SOC Comments:
10/26/06 TAP - Created PIMS TEch EVAL A2143995 02 to disposition the issue. Close to PIMS AR A2143995

Trend Codes

TC1	TC2	TC3	Proc	Org	Rank
EQM	VSL	5CNA	ER	*	P

Assignments

Assign #:	01	**Assigned To:**		**Status:**	COMPLETE
Aff Fac:	Oyster Creek	**Prim Grp:**	ACAPALL	**Due Date:**	10/29/2006
Assign Type:	TRKG	**Sec Grp:**		**Orig Due Date:**	µµ/µµ/µµµµ
Priority:					
Schedule Ref:					
Unit Condition:					
Subject/Description:	PITS IN TORUS BAYS 5, 15, AND 18				

AR 553792-03
Attachment 3
Page 2 of 2

AR 00550462 Report

Aff Fac:	Oyster Creek	**AR Type:**	CR	**Status:**	APPROVED
Aff Unit:	01	**Owed To:**	A5352CAP	**Due Date:**	11/28/2006
Aff System:	187			**Event Date:**	10/26/2006
CR Level/Class:	4/D			**Disc Date:**	10/26/2006
How Discovered:	H02			**Orig Date:**	10/29/2006
WR/PIMS AR:		**Component #:**	TORUS		

Action Request Details

Subject: THREE PITS FOUND DURING UNDERWATER INSPECTION OF TORUS.

Description: Originator: FRANK STULB Supv Contacted: Howie Ray

Condition Description:
During underwater inspection of the Torus in accordance with SP-1302-52-120, Revision 3, three pits were discovered which are greater than .040 inches deep. SP-1302-52-120, Revision 3, requires all pits greater than .040 inches deep be entered into the Corrective Action Program (IR) and shall be evaluated by Engineering. The following are inspection data for each pit:

Bay 7, Plate 5

Pit ID: 07-P5-01
Metal Loss - .050 inches
Pit Diameter - .025 inches
Adjacent Pits - None

Bay 4, Plate 5

Pit ID: 04-P5-01
Metal Loss - .041 inches
Pit Diameter - .125 inches
Adjacent Pits - 6 inches to 04-P5-02

Pit ID: 04-P5-02
Metal Loss - .044 inches
Pit Diameter - .125 inches
Adjacent Pits - 6 inches to 04-P5-01

Immediate actions taken:
Created Tech Eval AR A2143995 Eval 03 to evaluate the pits against design basis acceptance criteria. Wrote this IR.

Preliminary evaluation of the three pits indicates they meet the acceptance criteria in MPR-2974 to meet the membrane stress limits in the B&PV Code.

Recommended Actions:
Perform Technical Evaluation of pits with AR A2143995 Eval 03. Prep surface and repair coating.

What activities, processes, or procedures were involved?
Torus underwater inspection per SP-1302-52-120, Revision 3.

List of knowledgeable individuals:

AR 553792-03
Attachment 4
Page 1 of 2

Howie Ray

Repeat or similar condition?
A similar condition was reported in IR 548227 and evaluated in AR A2143995 Eval 02.

Operable Basis:
REB Preliminary evaluation of the three pits indicates they meet the acceptance criteria in MPR-2974 to meet the membrane stress limits in the B&PV Code. Torus is operable pending completion of engineering's evaluation.

Reportable Basis:
N/A

SOC Reviewed by: STEVEN E GANSS 10/29/2006 10:00:39 CST
SOC Comments:
close to actions taken

Trend Codes

TC1	TC2	TC3	Proc	Org	Rank
EQM	VSL	5CNA	ER100	*	P

Assignments

Assign #:	01	**Assigned To:**		**Status:**	COMPLETE
Aff Fac:	Oyster Creek	**Prim Grp:**	ACAPALL	**Due Date:**	11/03/2006
Assign Type:	TRKG	**Sec Grp:**		**Orig Due Date:**	µµ/µµ/µµµµ
Priority:					
Schedule Ref:					
Unit Condition:					
Subject/Description:	THREE PITS FOUND DURING UNDERWATER INSPECTION OF TORUS.				

AR 553792-03
Attachment 4
Page 2 of 2

*** ACTION REQUEST ***

A/R TYPE : EC ECR
REQUEST ORG : OEDM
REQUEST DATE: 09JUN06
REQUESTED BY: TAMBURRO, PETE

A/R NUMBER : A2143995
A/R STATUS : ROUTED
STATUS DATE: 12JUN06
LAST UPDATE: 04NOV06
PRINT DATE : 06NOV06

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EVALUATION NBR: 03
EVALUATING ORG: OEDM
EVAL ASIGND TO: STULB
EVAL REQUEST ORG: OEDM
EVAL REQUESTOR: STULB, F
EVAL RETURNED BY: RETURN

ORIG DATE ASSIGNED:
EVAL DUE DATE: 03NOV06
DATE ASSIGNED: 28OCT06
EVAL STATUS : RETURN

IMPORTANCE CODE:___ OEAP:___ SCHEDULE CODE:_____ DATE FIXED:___

EVAL DESC: EVALUATE PITS IN BAYS 4 AND 7 OF THE TORUS
REASON FOR EVALUATION / SCOPE: FJS2 26OCT06
. FJS2 26OCT06
INSPECTION OF THE TORUS PER SPECIFICATION SP-1302-52- FJS2 26OCT06
120, REVISION 3 HAS FOUND 3 PITS WHICH ARE GREATER THAN FJS2 27OCT06
40 MILS DEEP. PER THE REQUIREMENTS SP-1302-52-120, FJS2 26OCT06
REVISION 3 THESE PITS SHALL BE EVALUATED BY FJS2 26OCT06
ENGINEERING. THIS TECH EVAL. WILL EVALUATE THESE PITS FJS2 26OCT06
IN ACCORDANCE WITH MPR-2974, REVISION 0. FJS2 26OCT06
. FJS2 26OCT06
THIS TECH EVAL WAS DEVELOPED IN ACCORDANCE WITH CC-AA- FJS2 26OCT06
309-101 REVISION 7. FJS2 26OCT06
. FJS2 26OCT06
THE DEVELOPMENT OF THIS TECHNICAL EVALUATION WAS REVIEWED FJS2 29OCT06
WITH HOWIE RAY IN ACCORDANCE WITH HU-AA-1212. RISK RANK FJS2 29OCT06
WAS ASSESSED AS 4. THEREFORE A THIRD PARTY REVIEW IS NOT FJS2 29OCT06
REQUIRED. FJS2 29OCT06
. FJS2 26OCT06
BACKGROUND: FJS2 26OCT06
. FJS2 26OCT06
INSPECTION RESULTS FROM TORUS BAYS 4 AND 7 (ATTACHED) FJS2 26OCT06
INDICATE 3 SMALL PITS WHICH MEET THE FURTHER DISPOSITION FJS2 27OCT06
THRESHOLD IN SECTION 4.3.2 OF SPECIFICATION FJS2 27OCT06
SP-1302-52-120, REVISION 3. FJS2 27OCT06
. FJS2 26OCT06
THIS TECH EVAL IS CONSIDERED "NUCLEAR SAFETY RELATED" FJS2 26OCT06
. FJS2 26OCT06
DETAILED EVALUATION: FJS2 26OCT06
INSPECTION RESULTS ARE PROVIDED IN ATTACHMENT 1. SHOWN FJS2 26OCT06
BELOW IS THE SPECIFIC EVALUATION FOR EACH PIT. FJS2 26OCT06
. FJS2 26OCT06
ACCEPTANCE CRITERIA FJS2 26OCT06
. FJS2 26OCT06
PER MPR-2974, REVISION 0, PAGE 3-2, TABLE 3.1 AN FJS2 26OCT06
ACCEPTABLE PIT WITH A DIAMETER UP TO 0.25 INCHES MAY HAVE FJS2 27OCT06
A DEPTH UP TO 0.173" AS LONG AS THE EDGE TO EDGE DISTANCE FJS2 27OCT06
TO THE NEXT PIT IS NOT LESS THAN 0.55 INCHES IT WILL MEET FJS2 29OCT06
THE MEMBRANE STRESS LIMITS IN THE ASME B&PV CODE. FJS2 29OCT06
. FJS2 26OCT06
PIT 07-P5-01 DATA
.
DEPTH WITH COATING 0.070 INCHES
METAL LOSS 0.050 INCHES

AR 553792-03
Attachment 5
Page 1 of 4

A/R TYPE : EC ECR
REQUEST ORG : OEDM
REQUEST DATE: 09JUN06
REQUESTED BY: TAMBURRO, PETE

A/R NUMBER : A2143995
A/R STATUS : ROUTED
STATUS DATE: 12JUN06
LAST UPDATE: 04NOV06
PRINT DATE : 06NOV06

PIT DIAMETER	0.025 INCHES	FJS2 27OCT06
MINIMUM EDGE DISTANCE TO NEXT PIT - NO OTHER PITS.		FJS2 27OCT06
.		FJS2 27OCT06
THIS PIT MEETS THE ACCEPTANCE CRITERIA IN MPR-2974 TO		FJS2 27OCT06
MEET THE MEMBRANE STRESS LIMITS IN THE ASME B&PV CODE.		FJS2 27OCT06
.		FJS2 27OCT06
PIT 04-P5-01 DATA		FJS2 27OCT06
.		FJS2 27OCT06
DEPTH WITH COATING	0.058 INCHES	FJS2 27OCT06
METAL LOSS	0.041 INCHES	FJS2 27OCT06
PIT DIAMETER	0.125 INCHES	FJS2 27OCT06
MINIMUM EDGE DISTANCE TO NEXT PIT - 6 INCHES TO 04-P5-02		FJS2 27OCT06
.		FJS2 27OCT06
THIS PIT MEETS THE ACCEPTANCE CRITERIA IN MPR-2974 TO		FJS2 27OCT06
MEET THE MEMBRANE STRESS LIMITS IN THE ASME B&PV CODE.		FJS2 27OCT06
.		FJS2 27OCT06
PIT 04-P5-02 DATA		FJS2 27OCT06
.		FJS2 27OCT06
DEPTH WITH COATING	0.062 INCHES	FJS2 27OCT06
METAL LOSS	0.044 INCHES	FJS2 27OCT06
PIT DIAMETER	0.125 INCHES	FJS2 27OCT06
MINIMUM EDGE DISTANCE TO NEXT PIT - 6 INCHES TO 04-P5-01		FJS2 27OCT06
.		FJS2 27OCT06
THIS PIT MEETS THE ACCEPTANCE CRITERIA IN MPR-2974 TO		FJS2 27OCT06
MEET THE MEMBRANE STRESS LIMITS IN THE ASME B&PV CODE.		FJS2 27OCT06
.		FJS2 27OCT06
CONCLUSION:		FJS2 27OCT06
.		FJS2 27OCT06
THE THREE PITS HAVE BEEN EVALUATED IN ACCORDANCE WITH		FJS2 27OCT06
MPR-2974, REVISION 0 AND WERE FOUND TO MEET THE DESIGN		FJS2 27OCT06
BASIS ACCEPTANCE CRITERIA. COATING REPAIRS CAN BE		FJS2 27OCT06
PERFORMED FOR THESE PITS IN ACCORDANCE WITH		FJS2 27OCT06
SP-1302-52-120.		FJS2 27OCT06
.		FJS2 27OCT06
REFERENCES:		FJS2 27OCT06
.		FJS2 27OCT06
1) MPR-2974, REVISION 0 - OYSTER CREEK GENERATING STATION		FJS2 27OCT06
TORUS PITTING INSPECTION EVALUATION CRITERIA		FJS2 27OCT06
2) SPECIFICATION SP-1302-52-120, REVISION 3 - INSPECTION		FJS2 27OCT06
AND LOCALIZED REPAIR OF THE TORUS AND VENT SYSTEM COATING		FJS2 27OCT06
.		FJS2 27OCT06
ATTACHMENT 1 - INSPECTION DATA (1 PAGE)		FJS2 27OCT06
**********		CAS7 29OCT06
INDEPENDENT REVIEW		CAS7 29OCT06
.		CAS7 29OCT06
I HAVE REVIEWED THIS EVALUATION IN ACCORDANCE WITH		CAS7 29OCT06
CC-AA-309-101 REV 7. THE EVALUATION MEETS EXISTING		CAS7 29OCT06
DESIGN AND CONFIGURATION CONTROL REQUIREMENTS.		CAS7 29OCT06
INPUTS AND THE METHOD USED ARE APPROPRIATE. THE		
REFERENCES AND ACCEPTANCE CRITERIA ARE CLEARLY		
DEFINED. THE RESULTS ARE CLEARLY STATED AND THE		
FOLLOWUP ACTION IS CLEARLY DEFINED.		

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Attachment 5
Page 2

*** ACTION REQUEST ***

A/R TYPE : EC ECR
REQUEST ORG : OEDM
REQUEST DATE: 09JUN06
REQUESTED BY: TAMBURRO, PETE

A/R NUMBER : A2143995
A/R STATUS : ROUTED
STATUS DATE: 12JUN06
LAST UPDATE: 04NOV06
PRINT DATE : 06NOV06

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THIS EVAL IS ACCEPTABLE TO BE RETURNED.	CAS7 29OCT06
.	CAS7 29OCT06
INDEPENDENT REVIEW PERFORMED BY C. SCHILLING	CAS7 29OCT06
**********	CAS7 29OCT06
.	RCL4 01NOV06
REVIEWED AND APPROVED: R. LARZO	RCL4 01NOV06

==========END OF ACTION REQUEST==========

AR 553792-03
Attachment 5
Page 3

ATTACHMENT 2 (CONTINUED) – DATA SHEET (Typical)
QUANTITATIVE EVALUATION OF METAL LOSS RECORD

Pit ID	Pit Group	ISO	Pit Depth (in)	Adj. Zero (in)	Avg. DFT (in)	Metal Loss (in)	Pit Dia (in)	Coordinate X or Azimuth	Units (in or Deg)	Y Coord or Dist. from Pen (in)	Adjacent Pits / Pit Groups	Video Ref.	Rep Eng.	UT Thickness	Comments
07-P5-01	N/A	X	0.070	0.000	0.020	0.050	0.025	20" from P4/5 WS	in	52.5" from IWS	N/A	N/A	X	N/A	Adj Zero not used in metal loss calc
04-P5-01	1	NA	0.058	0.000	0.018	0.041	0.125	10.5" from P4/5 WS	in	67" from IWS	Pit 01-G1	N/A	X	N/A	Adj Zero not used in metal loss calc
04-P5-02	1	NA	0.062	0.000	0.018	0.044	0.125	10" from P4/5 WS	in	61" from IWS	Pit 02-G1	N/A	X	N/A	Adj Zero not used in metal loss calc

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Attachment 5
Page 4 of 4

AR A2143995-E03
ATTACHMENT 1
PAGE 1 OF 1

*** ACTION REQUEST ***

A/R TYPE : EC ECR
REQUEST ORG : OEDM
REQUEST DATE: 09JUN06
REQUESTED BY: TAMBURRO, PETE

A/R NUMBER : A2143995
A/R STATUS : ROUTED
STATUS DATE: 12JUN06
LAST UPDATE: 04NOV06
PRINT DATE : 06NOV06

EVALUATION NBR: 04
EVALUATING ORG: OEDM
EVAL ASIGND TO: TAMBURRO, PETE
EVAL REQUEST ORG: OEDM
EVAL REQUESTOR: TAMBURRO
EVAL RETURNED BY: LARZO, R

ORIG DATE ASSIGNED:
EVAL DUE DATE: 01NOV06
DATE ASSIGNED: 31OCT06
EVAL STATUS : RETURN

IMPORTANCE CODE: OEAP: SCHEDULE CODE: DATE FIXED:

EVAL DESC: EVALUATE PITS IN BAYS 5, 15, AND 18 OF THE TORUS

THIS EVAL WAS PREPARED BY PETER TAMBURRO. HOWEVER	PXT0 30OCT06
IT WAS ENTERED INTO PIMS BY FRANK STULB	PXT0 30OCT06
.	PXT0 30OCT06
REASON FOR EVALUATION / SCOPE:	FJS2 30OCT06
.	FJS2 30OCT06
THIS TECHNICAL EVALUATION SUPERCEDES AR A2143995 EVAL 02	FJS2 30OCT06
TO CORRECT A TYPOGRAPHICAL ERROR THAT AFFECTED THE	FJS2 30OCT06
TECHNICAL CONTENT OF THE EVALUATION.	FJS2 30OCT06
.	FJS2 30OCT06
INSPECTION OF THE TORUS PER SPECIFICATION SP-1302-52-	FJS2 30OCT06
120, REVISION 3 HAS FOUND 4 PITS WHICH ARE GREATER THAN	FJS2 30OCT06
40 MILS DEEP. PER THE REQUIREMENTS SP-1302-52-120,	FJS2 30OCT06
REVISION 3 THESE PITS SHALL BE EVALUATED BY	FJS2 30OCT06
ENGINEERING. THIS TECH EVAL. WILL EVALUATE THESE PITS	FJS2 30OCT06
IN ACCORDANCE WITH MPR-2974, REVISION 0.	FJS2 30OCT06
.	FJS2 30OCT06
THIS TECH EVAL WAS DEVELOPED IN ACCORDANCE WITH CC-AA-	FJS2 30OCT06
309-101 REVISION 7.	FJS2 30OCT06
.	FJS2 30OCT06
THE DEVELOPMENT OF THIS TECH EVAL WAS REVIEWED WITH DAN	FJS2 30OCT06
THOMAS IN ACCORDANCE WITH HU-AA-1212. THE RISK RANK WAS	FJS2 30OCT06
ASSESSED AT A "4". THEREFORE A THIRD PARTY REVIEW IS	FJS2 30OCT06
NOT REQUIRED.	FJS2 30OCT06
.	FJS2 30OCT06
BACKGROUND:	FJS2 30OCT06
.	FJS2 30OCT06
INSPECTION RESULTS FROM TORUS BAYS 5, 15, AND 18	FJS2 30OCT06
(ATTACHED) INDICATE FOUR SMALL PITS WHICH MEET THE	FJS2 30OCT06
"FURTHER DISPOSITION" THRESHOLD IN SECTION 4.3.2 OF	FJS2 30OCT06
SPECIFICATION SP-1302-52-120, REVISION 3.	FJS2 30OCT06
.	FJS2 30OCT06
THIS TECH EVAL IS CONSIDERED "NUCLEAR SAFETY RELATED""	FJS2 30OCT06
.	FJS2 30OCT06
DETAILED EVALUATION:	FJS2 30OCT06
INSPECTION RESULTS ARE PROVIDED IN ATTACHMENT 1. SHOWN	FJS2 30OCT06
BELOW IS THE SPECIFIC EVALUATION FOR EACH PIT.	FJS2 30OCT06
.	FJS2 30OCT06
ACCEPTANCE CRITERIA	
.	
PER MPR-2974, REVISION 0, PAGE 3-2, TABLE 3.1 AN	
ACCEPTABLE PIT WITH A DIAMETER UP TO 0.5 INCHES MAY HAVE	
A DEPTH UP 0.173" AS LONG AS THE EDGE TO EDGE DISTANCE	

AR 553792-03
Attachment B
Page 1 of 4

A/R TYPE : EC ECR
REQUEST ORG : OEDM
REQUEST DATE: 09JUN06
REQUESTED BY: TAMBURRO, PETE

A/R NUMBER : A2143995
A/R STATUS : ROUTED
STATUS DATE: 12JUN06
LAST UPDATE: 04NOV06
PRINT DATE : 06NOV06

TO THE NEXT PIT IS NOT LESS THAN 0.84 INCHES IT WILL MEET FJS2 30OCT06
THE MEMBRANE STRESS LIMITS IN THE ASME B&PV CODE. FJS2 30OCT06
. FJS2 30OCT06
PIT 18-P2-01 DATA FJS2 30OCT06
. FJS2 30OCT06
DEPTH WITH COATING -- 0.052 INCHES FJS2 30OCT06
METAL LOSS -- 0.041 INCHES FJS2 30OCT06
PIT DIAMETER -- 0.25 INCHES FJS2 30OCT06
MINIMUM EDGE DISTANCE TO NEXT PIT. -- NO OTHER FJS2 30OCT06
PITS ON THIS PLATE. FJS2 30OCT06
. FJS2 30OCT06
THEREFORE THIS PIT IS ACCEPTABLE. FJS2 30OCT06
. FJS2 30OCT06
PIT 15-P2-01 DATA FJS2 30OCT06
. FJS2 30OCT06
DEPTH WITH COATING -- 0.073 INCHES FJS2 30OCT06
METAL LOSS -- 0.044 INCHES FJS2 30OCT06
PIT DIAMETER -- 0.25 INCHES FJS2 30OCT06
MINIMUM EDGE DISTANCE TO NEXT PIT. -- NO OTHER FJS2 30OCT06
PITS ON THIS PLATE. FJS2 30OCT06
. FJS2 30OCT06
THEREFORE THIS PIT IS ACCEPTABLE. FJS2 30OCT06
. FJS2 30OCT06
PIT 05-P1-01 DATA FJS2 30OCT06
. FJS2 30OCT06
DEPTH WITH COATING -- 0.062 INCHES FJS2 30OCT06
METAL LOSS -- 0.041 INCHES FJS2 30OCT06
PIT DIAMETER -- 0.038 INCHES FJS2 30OCT06
MINIMUM EDGE DISTANCE TO NEXT PIT. -- NO OTHER FJS2 30OCT06
PITS ON THIS PLATE. FJS2 30OCT06
. FJS2 30OCT06
THEREFORE THIS PIT IS ACCEPTABLE. FJS2 30OCT06
. FJS2 30OCT06
PIT 05-P5-01 DATA FJS2 30OCT06
. FJS2 30OCT06
DEPTH WITH COATING -- 0.090 INCHES FJS2 30OCT06
METAL LOSS -- 0.076 INCHES FJS2 30OCT06
PIT DIAMETER -- 0.025 INCHES FJS2 30OCT06
MINIMUM EDGE DISTANCE TO NEXT PIT. -- THERE FJS2 30OCT06
ARE NO ADJACENT PITS AS NOTED ON ATTACHMENT 1. FJS2 30OCT06
. FJS2 30OCT06
THEREFORE THIS PIT IS ACCEPTABLE. FJS2 30OCT06
. FJS2 30OCT06
CONCLUSION: FJS2 30OCT06
THE FOUR PITS HAVE BEEN EVALUATED IN ACCORDANCE WITH FJS2 30OCT06
MPR-2974, REVISION 0 AND WERE FOUND TO MEET THE DESIGN FJS2 30OCT06
BASIS ACCEPTANCE CRITERIA. COATING REPAIRS CAN BE FJS2 30OCT06
PERFORMED FOR THESE PITS IN ACCORDANCE WITH
SP-1302-52-120.
.
REFERENCES:
.

AR 553792-03
Attachment 6
Page 2

A/R TYPE : EC ECR
REQUEST ORG : OEDM
REQUEST DATE: 09JUN06
REQUESTED BY: TAMBURRO, PETE

A/R NUMBER : A2143995
A/R STATUS : ROUTED
STATUS DATE: 12JUN06
LAST UPDATE: 04NOV06
PRINT DATE : 06NOV06

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1) MPR-2974, REVISION 0 - OYSTER CREEK GENERATING	FJS2 30OCT06
STATION TORUS PITTING INSPECTION EVALUATION CRITERIA	FJS2 30OCT06
2) SPECIFICATION SP-1302-52-120, REVISION 3 - INSPECTION	FJS2 30OCT06
AND LOCALIZED REPAIR OF THE TORUS AND VENT SYSTEM	FJS2 30OCT06
COATING	FJS2 30OCT06
.	FJS2 30OCT06
ATTACHMENT 1 - INSPECTION DATA (1 PAGE)	FJS2 30OCT06
.	FJS2 31OCT06
**********	FJS2 31OCT06
I HAVE PERFORMED AN INDEPENDENT TECHNICAL REVIEW OF THIS	FJS2 31OCT06
TECHNICAL EVALUATION IN ACCORDANCE WITH SECTION 4.3 OF	FJS2 31OCT06
CC-AA-309-101. THE INPUTS WERE CORRECT. THE METHOD AND	FJS2 31OCT06
JUDGEMENT, COMPLIANCE WITH DESIGN BASES/CRITERIA, AND	FJS2 31OCT06
COMPLIANCE WITH CODE REQUIREMENTS ARE APPROPRIATE. THE	FJS2 31OCT06
RESULTS ACCOMPLISH THE STATED PURPOSE. THIS TECHNICAL	FJS2 31OCT06
EVALUATION IS ACCEPTABLE FOR APPROVAL.	FJS2 31OCT06
.	FJS2 31OCT06
INDEPENDENT REVIEWER: FRANK STULB 10/31/06	FJS2 31OCT06
**********	FJS2 31OCT06
.	RCL4 01NOV06
REVIEWED AND APPROVED: R. LARZO	RCL4 01NOV06

==========END OF ACTION REQUEST==========

AR 553792-03
Attachment 6
Page 3

AR A2143995-E04
ATTACHMENT 1
PAGE 1 OF 1

ATTACHMENT 2 (CONTINUED) – DATA SHEET (Typical)
QUANTITATIVE EVALUATION OF METAL LOSS RECORD

Pit ID	Pit Group	ISO	Pit Depth (in)	Adj. Zero (in)	Avg. DFT (in)	Metal Loss (in)	Pit Dia (in)	Coordinate X or Angle	Units (in or Deg)	Y Coordinate or Angle from Ref. Pt.	Adjusted Time (Yrs. Operation)	Tubed Pipe	Rep. Elbow	UT Thickness	Comments
18-P2-01	N/A	X	0.052	0.006	0.011	0.041	0.250	28" from P3 WS	in	56" from IWS	N/A	N/A	X	N/A	Adj Zero not used in metal loss calc
15-P2-01	N/A	X	0.073	0.026	0.029	0.044	0.250	48" from P2/3 WS	in	6" from IWS	N/A	N/A	X	N/A	Adj Zero not used in metal loss calc
05-P1-01	N/A	X	0.062	0.010	0.021	0.041	0.038	46" from 4/5 RG	in	50" from IWS	N/A	N/A	X	N/A	Adj Zero not used in metal loss calc
05-P5-01	N/A	X	0.090	0.006	0.014	0.076	0.025	27" from P4/5 WS	in	36" from IWS	N/A	N/A	X	N/A	Adj Zero not used in metal loss calc
05-P5-02	N/A	X	0.055	0.000	0.016	0.039	0.025	22" from P5/6 WS	in	34" from IWS	N/A	N/A	X	N/A	Adj Zero not used in metal loss calc
				0.000		0.000									
				0.000		0.000									
				0.000		0.000									
				0.000		0.000									
				0.000		0.000									
				0.000		0.000									
				0.000		0.000									
				0.000		0.000									
				0.000		0.000									
				0.000		0.000									
				0.000		0.000									

AR 553792-03
Attachment 6
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