BVPS Unit No. 1

Containment Liner Corrosion Report March, 2006

First Energy, Beaver Valley Power Station Unit 1

Containment Liner Corrosion Report

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Project Lead: _____
Gene Ebeck

Structural Mechanics: _____
Steve Buffington

Structural: _____
Tom Westbrook

Materials: _____
Dennis Weakland

Regulatory Compliance: _____
Brian Sepelak

System Engineer: _____
John Patterson

IWE Program Owner: _____
Dave Grabski

Reviewed By: _____
Carmen Mancuso - Supervisor, Mechanical/Structural

Approved By: _____ 3-14-06
Mark Manoleras - Manager, Design Engineering

Design Engineering Section

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Executive Summary

During the creation of a temporary construction opening in the Beaver Valley Power Station Unit 1 containment structure for the replacement of the steam generators and reactor vessel head in 1R17, three areas of corrosion were identified on the containment liner plate. These areas are on the outside of the liner, i.e. on the side in contact with the concrete. Loss of material was identified for all three areas of corrosion. Ultrasonic Testing (UT) measurements were performed at each location. Test results indicated spots below nominal wall thickness for the liner plate on two of the three areas. The same two areas also contained evidence of pitting. The third area evidenced minor material loss but remained at or above the nominal plate thickness with minimal pitting.

Laboratory examination was performed on the two areas with significant material loss. The laboratory examination characterized the corrosion as general pitting corrosion (rusting). Laboratory examination was also performed on concrete samples removed from the construction opening. The lab analysis did not identify a probable cause for the corrosion.

The sections of the liner removed for analysis were replaced with new plate material. The process and procedures, including inspection and NDE, were the same as those used for reinstallation of the liner plate cut from the construction opening.

A structural evaluation of the liner has been prepared by Stone & Webster Engineering, the original Architect / Engineering firm for the containment structure. The Stone and Webster Report has concluded that the design basis for the containment liner is not adversely affected by the as-found conditions. The thickness of the remaining sound metal is adequate to maintain the design safety function of the liner as a leak tight membrane.

Since there is reasonable assurance that the corrosion occurred early in plant life and has likely abated, monitoring the liner surface in accordance with the ASME Section XI program ensures the leak tight function of the liner.

The Containment Structural Integrity Test, 1BVT 1.47.1, was revised to formalize current practice. The procedure was augmented to include follow up examinations by VT-3 qualified inspector for potentially flawed areas discovered during inspection.
The 1R17 inspection was completed and the results are documented in the corrective action program. Follow up inspections of suspect areas by a qualified inspector is on going and will be completed during 1R17. Areas identified as requiring repair will be repaired 1R17.
Included in the restoration of the construction opening is a scheduled Type "A" Integrated Leak Rate Test following restoration. The Type "A" test will prove the integrity of the containment liner plate as a gas membrane.

It is therefore concluded that the as-found condition is acceptable and that the liner plate remains capable of performing its design basis function.

I Issue Description

A temporary opening was cut in the side of the Beaver Valley Power Station (BVPS) Unit 1 containment building to enable replacement of the Steam Generators and Reactor Vessel Head. Removal of the concrete and rebar from the SGRP equipment opening exposed an area of the containment liner plate approximately 20.5 wide by 23 feet tall. A large doorway opening, approximately 17.5 feet wide by 20 feet tall, was cut in the liner plate to permit equipment replacement.

After completion of the hydro demolition of the concrete and removal of the reinforcing steel from the temporary Steam Generator Replacement Project (SGRP) equipment opening, examination of the outside surface (formerly against the concrete) of the liner plate was performed. Localized corrosion was found at three locations on the liner plate.

The SGRP doorway plate includes portions of three of the sectional construction plates used to form the greater containment liner. A photograph of the section of the liner plate where the doorway was cut is included in Attachment 1. Attachment 3 sketches show the construction plates and weld locations. For the balance of the report, the term plate shall be used to refer to the SGRP doorway plate.

The BVPS Unit 1 reactor containment structure as described in the UFSAR Section 5.2.1 is a reinforced concrete, steel lined vessel with a flat base, cylindrical walls, and a hemispherical dome. The concrete foundation mat, cylinder wall and dome are the structural members of the containment structure. The steel liner acts as a gastight membrane and was used during construction as the inside form for the reinforced concrete wall and dome. The containment structure does not require participation of the liner as a structural component.

The liner is a continuous steel membrane, supported by and anchored to the inside of the containment structure. The wall and dome plate are continuously anchored to the reinforced concrete with concrete anchor studs. The cylindrical portion of the liner is 3/8 inch thick, the hemispherical dome liner is ½ inch thick, and the flat bottom liner is ¼ inch thick, with the exception of areas where the transfer of loads through it requires a reinforced thickness. The bottom mat liner plate with the exception of the keyway area is covered with a two foot thick layer of reinforced concrete.

Condition Description

Three areas of corrosion were identified on the concrete side of the steel containment liner. The areas of corrosion were contained on the removed doorway plate section. The remaining exposed area of liner plate exhibited no corrosion areas. The corrosion consisted of general surface corrosion and pitting corrosion. These as-found conditions were documented in CR 06-01122.

The general descriptions of the location of the three areas of corrosion are as follows:
Area 1 is approximately circular in shape and is about 12 inches in diameter. The center of area 1 is located approximately 6 feet from the left edge of the plate and 7.5 feet above the bottom of the plate.
Area 2 is approximately 16" high by 20" long and located approximately 5.5 feet above the bottom of the plate and 3 feet from the right side of the plate.
Area 3 is approximately 7" tall by 23" long and the center of which is located 18.5" down from the top and 39" from the left edge of the liner plate. Refer to the photographs of Attachments 1 & 2.
Areas 1 and 2 are located on field plate number B6-11. Area 3 is located on field plate B7-7.

Ultrasonic Testing (UT) was performed at all three locations with the following results.

Affected Area	Nominal Plate Thickness	Plate Thickness Outside Area	General Affected Area Plate Thickness	Plate Thickness at Deepest Pit
Area 1	0.375"	0.380" to 0.390"	0.283" to 0.300"	0.225"
Area 2	0.375"	0.378" to 0.391"	> 0.194"	0.151"
Area 3	0.375"	> 0.375"	0.375" to 0.395"	0.330"

The UT reports are included as Attachment 6.

Area 1 exhibited general thinning that resulted in a liner thickness range of 0.283" to 0.300". Isolated pitting was evident in Area 1 with a minimum liner thickness of 0.225 inch at a small isolated pit. Minimum UT thickness measurement in Area 2 was 0.151 inch at a visible deep pit. The long area visible in Attachment 2 photos was determined as having a 0.194 inch minimum thickness. The thickness of the Area 2 general area was measured as 0.30 inch. Corrosion Area 3 as described has a liner thickness of 0.375" or greater. Six pits were identified in Area 3, the liner thickness at the deepest being 0.330 inch. The deepest pit therefore was 45 mils less than the nominal plate thickness of 0.375 inch.

II Investigation

A. Field Investigation

Foreign Material Embedded in Concrete

As detailed in INPO OE reports (refer to Section IV) a significant contributor to through liner corrosion was FME, primarily wood and cloth, embedded in concrete in contact with the liner plate. As it was not practical to search the tons of debris generated by the hydro demolition, a search of the top of the debris pile generated by the hydro demolition was performed for evidence of foreign material such wood or cloth. No evidence of foreign material was found on the debris pile. Due to the turbulent nature of the hydro demolition foreign material if present was probably destroyed. Therefore it is inconclusive if foreign material was present and a contributor to the corrosion.

Inspection of Reinforcing Steel

The reinforcing steel in the concrete experiences the same environment as the liner plate. The rebar may exhibit similar corrosion if some aspect of the concrete environment contributed to the corrosion. Therefore the rebar removed from the opening was examined for similar corrosion or pitting. Since the rebar was stacked for storage a best effort was made to view the accessible parts of the rebar. The rebar was visually checked by a NDE qualified inspector and a structural engineer from Design Engineering. The rebar was found to be clean and in good condition. A single rebar was found to have a nine inch long area of damage and pitting. The cause of this condition is indeterminate. However, mechanical damage was evident in the area of corrosion.

The rebar was tagged 8-D4B and is a #14 bar size. The tag identifies the bar as a diagonal from the eighth layer of reinforcing. The eighth layer of reinforcing is the layer closest to the outside surface of the concrete. Attachment 7 sketch shows the general location of the bar in the wall. The results of this examination are documented in NDE Report BOP-VT-06-040 and CA 06-0122-04. CR 06-01519 was written to document and disposition the rebar condition. The NDE report is included in Attachment 5 and CR 06-01519 included in Attachment 7.

Except for the single rebar identified, the remainder of the rebar viewed showed no visible signs of corrosion or damage. Therefore, it is concluded that the corrosion mechanism that caused the liner corrosion was not present on the reinforcing steel.

Visual Exam of Interior Surface of Liner

Visual examination of the inside surface of the doorway liner plate opposite the affected areas was performed. A visual VT-3 examination was performed for areas 1 and 2. The inspection was performed prior to the removal of paint and documented in NDE Report BOP-VT-06-041. The NDE report is included as Attachment 5. Some minor coating damage with no substrate damage was observed. The observed damage appeared to have been caused by handling during removal and transport. No other degradation was observed.

It was concluded that the observed corrosion on the concrete side of the liner was confined to that side of the plate. The pitting did not extend through the plate to the inside surface. The UT thickness measurements confirmed the visual inspection that the depth of pitting did not extend through the plate.

B. Initial Investigation of Corrosion Areas

A detailed evaluation plan to identify potential corrosion mechanisms was developed. Aspects of this plan included visual and ultrasonic inspection, laboratory analysis and an assessment of the affected area by an outside subject matter expert in corrosion.

Visual examination of the affected areas observed typical general corrosion with pitted areas. After removal of the liner plate from the construction opening the areas were visually examined and photographed.

The three areas of corrosion were examined by ultrasonic methods to determine the extent of material loss and the pitting depth. Areas one and two were examined by auto-scan UT methods to characterize the plate thickness in the areas. The third area was examined with manual UT methods. Area three was found to have a thickness greater than nominal plate thickness except for a few shallow pits. Based on these results this area was not examined further.

C. Historical Documentation Review

Construction Documentation

The original construction documentation for the liner plate was reviewed. The search was limited to support the disposition of the areas of the Reactor Containment liner that displayed pitting and corrosion. The boundaries of the affected area, for records search purposes, were as follows: fifteen (15) degrees east and west of the south centerline of containment, from elevation 771'-4" to elevation 792'-2". The intent was to verify whether the affected areas found on the exposed liner were identified in any previous inspection, performed during Unit 1's initial construction.

Unique identifications for the liner plate sections involved were made. Graver Tank & Mfg. Co. (original material supplier) drawings and field sketches provided the ability to identify each plate of the shell liner with a unique number.

The majority of the exposed area of the liner plate consists of three individual plates. Two of the plates are in the ninth (9th) ring of plates, with a bottom of plate elevation of 771'-4" and a top of plate elevation of 781'-9". In the ninth ring, the two plates straddle the south centerline of Containment. Plate number B6-11 is situated immediately west of the south centerline, and plate number B6-12 is situated immediately to the east. A third plate is located in the tenth (10th) ring of plates, with a bottom of plate elevation of 781'-9" and a top of plate elevation of 792'-2". This plate is identified as B7-7, and is centered on the south centerline of Containment. The plates are ASTM A516 Gr 60, with a nominal size of 3/8" x 10'-5" x 32'-11 3/4".

Original construction records such as purchase order and job book documentation provided plate material certifications, weld material certifications, welding, cleaning, and painting procedures and inspection reports. Plate inspections included ultrasonic, dye penetrant, and radiographic tests. Records found also showed information relative to weld radiographs and shell testing. No radiographs were taken near the affected areas of the plates. None of these reports indicated that there were any deviations with any of the plates through fabrication and installation.

Plate material certifications, weld material certifications, and fly ash, concrete, and water analysis reports were retrieved for use in the laboratory evaluation. Additional records provided included fabrication, testing, and weld procedures.

Concrete pour cards, N&Ds, QC Inspection Reports, and Interoffice Correspondences were reviewed for the purpose of trying to determine if there were any other deviations identified during construction of the Containment liner and concrete wall. None were identified.

In summary, no historical records were found to indicate any issues or non-conformances with these liner plates or concrete local to the affected areas. A summary of the records search is included in CA 06-01122-014.

Type A Documentation

The past results of the Type "A" Containment Integrated Leak Rate Tests (ILRT) performed for Beaver Valley Unit 1 since 1978 were reviewed. The review is documented in CA 06-01122-013. All ILRT leakage results were well below the acceptance criteria. The linear trend line indicates a decreasing trend in the leakage results of the ILRTs. The amount of leakage observed during the ILRT has decreased over time.
Based on the low leakage rate and decreasing trend it is concluded that the liner plate is intact.

After the restoration of the temporary construction opening a Type A (ILRT) test will be performed. The ILRT is the final proof of the opening restoration. The results of this ILRT will be compared to and trended with the past results.

Documentation of Structural Integrity Visual Examinations

The results of previous Containment Structural Integrity Tests, 1BVT 1.47.1, were reviewed to determine if detrimental liner conditions were found and addressed. The results of the review are documented in CA 06-01122-012.
All deficiencies were minor in nature consisting of lifted and abraded paint and a few rust spots. These spots were cleaned and the paint repaired. In all cases the rust was surface rust and no material loss was noted. With the exception of two spots identified on the dome surface of the liner at the previous BVT inspection in 1R15 all identified deficiencies have been corrected. Additional areas of lifted paint were identified on the dome during the BVT inspection during 1R17. All spots on the dome are scheduled for disposition during 1R17 and tracked by CR 03-3893 and 06-01722.
The Containment Structural Integrity Test is being performed during 1R17 in preparation for the Type A test. The findings of the visual inspection are being captured in CR 06-01722.

III Analysis

Laboratory Analysis

Areas 1 and 2 were cut from the plate and sent to Beta Labs for examination. These two affected areas were selected, since they involved the greatest material loss and deepest pitting, and therefore bound the conditions found on the exposed liner plate. The scope of the examinations attempted to determine the cause of the corrosion, the age of the corrosion and if the corrosion is active or inactive.

Corrosion Evaluation Summary

The areas of pitting corrosion identified in Section I of this report were analyzed by Beta Laboratory and documented in Beta Report M06074 (Reference 28). Additional insights into concrete/steel corrosion interactions were provided by Sargent & Lundy corrosion expert Eldon Dille. These inputs were used as part of the Corrosion Evaluation Report (Reference 30). The following summary of the Corrosion Evaluation Report, Attachment 10, is provided.

The corrosion areas appear to be pitting in the carbon steel liner plate on the surface adjacent to the concrete. Due to the lack of corrosion product following the concrete removal process and the condition of the surface of the liner plate, it can not be conclusively proven when the corrosion occurred nor can it be determined for how long the corrosion process was active.

Beta Laboratory report, M06074, provided the following test result data upon which engineering insights were based upon:

- No unusual materials/contaminates were present in the corrosion product trapped in pits which were believed to be protected from the water blasting concrete removal process.
- The concrete did exhibit small void spaces (1/16" to 1/8" deep) at the concrete to liner interface on the piece examined.
- The concrete pH was alkaline – in excess of 10.5.
- The chemistry of the Steel liner plate was within the specification values for ASTM A516, which is the specified material for the liner plate section examined. (Reference 2)
- Observed hardness testing results were consistent with that expected for hot rolled plate and normal fabrication processing.
- Cold work observed on the containment side of the liner is attributed to the mechanical process used to remove the paint and the slight cold work (one to two grains deep) on the opposite side is attributed to the water blasting process.
- Very low levels of chlorides (less than 1 ppm) were found on the pieces examined.
- Pit depths of nearly 7/32 inch were identified in a liner plate with a nominal thickness of 3/8 inch. Therefore the pit depth was slightly over 50% thru wall.
- A weld was identified in the area of pitting corrosion exhibited corrosion across the weld, thus dating the corrosion to a time after the weld was made during construction.
- No preferential corrosive attack was observed in the weld location, heat affected zone (HAZ) or on the weld prep area adjacent to the weld.

Corrosion Evaluation Insights

Based upon the investigation data provided in Beta report M06074, the information on concrete/steel corrosion provided in the report provided by Eldon Dille and construction practices during the fabrication of the containment building, the following engineering conclusions are drawn concerning the corrosion activities:

- The corrosion is general pitting corrosion and no evidence of stress corrosion or micro-biological attack was identified.
- The corrosion occurred after welding and construction of the liner plate.
- The necessary elements for corrosion (oxygen and water) were present throughout the construction phase which lasted for nearly a year.
- Access to these necessary elements for corrosion activity is believed to have become limited once the concrete structure was completed due to encapsulation by the completion of the dome. The routine exposure to water sources ceased during the construction process and the concrete/steel interface was no longer exposed to the atmosphere for re-oxygenation.
- The corrosion process consumes oxygen and once it is depleted corrosion can not be sustained.
- No corrosive agents could be identified on or in either the steel liner plate or the concrete materials tested. Since only 1% of the observable liner plate contained corroded areas and a smaller percentage of the rebar surface area had evidence of possible corrosion, it is reasonable to assume that the concrete did not contain catalytic corrosive agents and that corrosive elements (water and oxygen) were not present in abundant amounts.
- The corrosion is localized for reasons that can not be determined with certainty.
- The concrete did contain small void areas at the concrete/steel interface. These voids most likely trap aerated water during the construction timeframe.
- Post-construction periodic re-wetting with aerated water is considered highly unlikely since the rebar which would be closest to the source of the water has not displayed evidence of corrosion distress consistent with that phenomenon.
- It is possible that during the construction process contaminates could have been introduced at random locations. Organic material such as gloves, wood, paper, food product and waste may have been introduced during the work activity since strict Foreign Material control was not part of the normal work practice of the day. These types of products have been identified by other power plants during their investigation of liner corrosion events.

Conclusion:

The corrosion initiation timing and duration are not known with certainty, however, it is reasonable to conclude that the process initiated during the construction phase when the necessary corrosion elements (water and oxygen) were available. It is also reasonable to conclude that the corrosion process continued once initiated for whatever reason until the available oxygen and water were consumed by the corrosion process at which time the corrosion stopped. Based upon the condition of the rebar and the general condition of nearly 98% of the exposed liner plate surface area, rewetting from the exterior environment is improbable. If rewetting is assumed, one would expect the rebar in the area of rewetting to be a leading indicator of corrosion activity. A telltale inspection attribute of corrosion of the rebar would be surface spalling of the concrete near the area of rebar corrosion due to corrosion product push between the rebar and the concrete. Past concrete visual inspections have not shown the type of spalling expected from rusting rebar. Based upon the information available, active corrosion is considered to be unlikely and if present it would be expected to occur at a slow rate of degradation due to the low level of oxygen and limited aqueous environment expected to be present at the concrete to liner interface.

Therefore recommended follow-on actions would be to continue the IWE inspection activities looking for discontinuities (staining, paint blisters, etc.) in the painted interior surface of containment and thoroughly investigating.

Additional ultrasonic thickness sampling would be of very limited benefit since the probability of finding another area of pitting is approximately 1 in 100 based upon the exposed liner plate sample. If found,

pitting corrosion is a relatively slow process and with the instrument uncertainties associated with the testing process, a corrosion degradation rate would be difficult to detect.

Structural Integrity Evaluation

Shaw Stone and Webster, Inc. was contracted to evaluate the impact of the affected areas on the containment liner and issued an Evaluation Report (Reference 31). The Report includes an evaluation of the effect of the thinner areas on the structural stability of the liner under design basis events. The evaluation report is included as Attachment 11 to this report.

The conclusion of the Stone and Webster Report is repeated here:

> "This evaluation concludes that the design basis for the containment liner was not adversely affected by the degraded conditions observed on the containment liner. The thickness of the remaining sound metal is adequate to maintain the design safety function of the liner as a leaktight membrane. In addition, the capacity of the concrete containment structure to withstand the Design Basis Accident pressure is not adversely affected by the degraded conditions of the containment liner."

Two specific conditions were evaluated in the Stone and Webster Report. The first condition was general thinning associated with the areas described in CR 06-01122 and CR 06-01061. The second condition was a local evaluation of corrosion pitting as described in the various NDE Reports. The following load cases were included in the evaluation:

Load Case	Pressure	Temperature
Sub-atmospheric operation	-6.7 psig	75 to 105 deg F
Atmospheric operation	12.8 - 14.2 psia	70 to 105 deg F
Test (ILRT)	43.3 psig	75 to 105 deg F
Design Basis Accident	45 psig	270 deg F
Test (SIT)	52 psig	75 to 105 deg F

The ILRT test governs for in-plane tensile load and the DBA case governs for in-plane compressive load.

General thinning of the liner plates was found to be acceptable by comparison with existing analysis for Unit 1. The analysis describes that a uniform plate thickness of 0.278" has been qualified for the test conditions and DBA accident conditions at mid height of the liner shell. There are no extended areas identified that approach this level of thinning. From a liner buckling perspective, a 12" x 12" plate section (the area bounded by liner anchor studs) could be as thin as 0.147 inches on the cylinder away from the base.

Liner pitting is addressed by treating the liner over the pitted area to be a circular plate clamped at the edges and subjected to transverse pressure (ILRT or DBA conditions) and to an in-plane compression due to the thermal expansion of the liner during accident temperatures. No credit was taken for a typical corrosion profile, where only the center portion is actually at the measured depth. See the typical pit profile shown in Attachment 8 (Beta Labs Report) pages 40-43.

Since it cannot be stated that we have found the only locations of corrosion nor can it be stated that we have found the deepest pit, a bounding evaluation has been performed to identify the available margin from the as-found condition. It is recognized that thermal compressive loading of the liner plate contributes to the combined stress in the remaining thickness. This is particularly true in the plate sections of the cylinder near the junction with the mat plate since the mat and restrained concrete wall act to restrict free thermal expansion during DBA temperatures. Higher elevations of the liner cylinder have

reduced thermal stress levels. Therefore, the local stress evaluation included local thermal loading from the DBA temperatures and is dependant on the elevation where the postulated pit is located.

The Stone and Webster evaluation selected several combinations of postulated pit radius and remaining plate thickness for assessment. Iteration was required to increase the calculated stress near the standard $3S_m$ allowable stress limit (normal design allowable). For the bottom 3 rings of liner plate, A-537 Grade B plate material was used, $3S_m$ = 66,000psi. Above the third ring, A-516 Grade 60 plate material was used, $3S_m$ = 45,000psi.

Selected results from the Stone and Webster evaluations are presented below:

Postulated Pit Radius (inches)	Postulated Plate Thickness (inches)	Stress in Plate due to DBA Loading (psi) Note 1	Stress in Plate due to DBA Loading (psi) Note 2
0.15	0.0277	30,864	1,711
0.19	0.0321	30,454	1,962
0.19	0.0478	703	-
0.25	0.0390	28,779	2,337
0.30	0.0441	30,188	2,619
0.35	0.0489	30,820	2,883
0.40	0.0540	30,039	3,125
0.45	0.0580	30,702	3,363
0.50	0.0630	30,211	3,449
0.75	0.0830	30,307	4,414

Note 1 The 3rd column in the above table represents the most limiting case, where the liner thermal expansion is constrained by the containment mat. The target for this iteration was 30,000 psi stress. The plate allowable limit $3S_m$ is 66,000 psi for the lower plate sections. The thermal compressive stress is on the order of 36,000 psi, leaving approximately 30,000 psi for the above evaluation.

Note 2 The 4th column in above table represents the stress levels in higher elevations, away from the mat. For comparison, the same values of pit radius and plate thickness were used. The target point for this comparison is 25,000 psi stress. The plate allowable limit $3S_m$ is 45,000 psi for plate sections above the third row. The thermal compressive stress is on the order of 20,000 psi, leaving 25,000 psi for the above evaluation.

Example: As an example, the deepest pit (0.151" thickness remaining) was identified as having an approximate diameter of 3/8". From the above table, a pit with a 0.19" radius and a remaining thickness of 0.0478" (less than 1/3 of the as-found condition) produces a stress of only 703 psi for the DBA loading case, including thermal expansion. This is compared to an allowable stress limit of 25,000 psi. As can be seen, there is significant margin (by over a factor of 30) to where the calculated stress would challenge the stress limit.

Conclusions:

Restated, the Stone and Webster Report has concluded that the design basis for the containment liner is not adversely affected by the as-found conditions. The thickness of the remaining sound metal is adequate to maintain the design safety function of the liner as a leak tight membrane.

The measure of margin in the Stone and Webster evaluation is significant for several reasons. First, it provides reasonable assurance that other locations on the liner that might have similar corrosion induced pits would be acceptable.

Second, it shows that small diameter pitting can be quite deep and not be expected to fail during the DBA conditions.

Finally, the Report shows that the spacing of adjacent pits is of little significance. Closely spaced pits can be enveloped into the larger radius pits described in the above table.

Recommendations:

The Shaw Stone and Webster, Inc. Report makes the following recommendations:

- Perform periodic reexamination of Area 3 in accordance with the requirements of Table IWE-2500-1, Examination Category E-C.

  This examination is planned as described in Section VI of this Report.

- Perform UT examination on any location of a suspected area of corrosion, such as where paint is lifted and where corrosion is evident.

  In the context of the Stone and Webster recommendation, only locations where the primer coat of paint is lifted or corrosion is present may require UT examination.

Postulated Through Wall Flaw

Potential consequence of liner degradation resulting in a through wall flaw is the postulated release through the liner at a point that penetrates the entire thickness of the liner. A release through such a hole would also have to escape through the 4.5 feet of concrete on the cylinder walls or the 2.5 feet of concrete on the dome. The concrete will reduce the amount and rate of any such release.

The deepest pit in the affected areas did not penetrate full thickness of the liner plate. At the deepest pit the liner thickness was 0.151" at this individual point. Therefore the liner remained a gastight membrane at all times. As shown by the analysis by Stone & Webster the liner may be much thinner at localized spots such as a corrosive pit to maintain leak tightness of the liner.

A through liner hole caused by pitting corrosion reveals itself by paint blistering and/or rust staining. Pitting corrosion would start as a tiny through plate hole and grow from the initial perforation. Since the liner is visually inspected every other outage such conditions are found and investigated. Any through hole in the liner plate would be identified and repaired.

Discussion of the Possibility of Periodic Wetting of the Containment Liner

A required element for corrosion is the presence of an aqueous environment (moisture).
The containment structure is a reinforced concrete structure with a steel liner. The cylindrical walls of the structure are 4.5 feet thick with a 3/8" steel liner. The dome of the structure is 2.5 feet thick with 1/2" thick liner plate. The below grade portion of the containment structure is protected against water seepage by a continuous waterproofing membrane up to the Probable Maximum Flood level.

The containment structure was cracked during the original construction Structural Integrity Test due to the strain induced by the pressurization. The concrete cracks opened up to 0.02 inches in width at test pressure. Subsequent Integrated Leak Rate Tests resulted in the reopening and closing of these cracks.

When the interior pressure is reduced to normal atmospheric pressure these cracks close and become fine to hairline in width. While these cracks may extend completely through the concrete section to the liner, the crack path is random and torturous.

Concrete is a dense material and is often used to stop water in dams, cutoff walls and settling basins in water and waste water treatment facilities. The density of concrete prevents water flow through it. For water to penetrate the thick layer of concrete a driving force is required to force the water through the pores and cracks in the concrete. The cracked concrete provides a hypothetical route for moisture to make its way through the concrete to the liner.

The exterior of the concrete containment structure is exposed to the weather. No significant driving force or head of water exists to drive the water through the concrete. Rain fall would run down the vertical concrete walls of the structure and would also run over and down the dome of the structure. The presence of cracks in the concrete could permit a path for moisture to permeate through the concrete to the liner. Gravity will draw the water through any cracks on the dome portion of the structure. During prolonged periods of precipitation, moisture may percolate through the cracks in the concrete and reach the liner. Since the cracks are fine in width and follow a torturous path any moisture reaching the liner plate is expected to be minimal. Such moisture would be absorbed by the concrete before it made its way through the concrete thickness to the liner. Such moisture would be absorbed by the concrete before it made its way through the concrete thickness to the liner. Additionally it is expected that if the liner plate were periodically wetted the exposed liner plate would demonstrate uniform corrosion instead of localized corrosion. No streaking,signs of wetting or generalized corrosion were evident on the exposed liner plate.

During normal plant operation the liner temperature may rise to between 90 and 100°F, according to Technical Specifications. This temperature has the effect of driving the water in the concrete pores away from the heated liner surface to the cooler exterior concrete surface, reducing the supply of moisture required for corrosion. This process would be accelerated in winter when cooler temperatures and lower vapor pressure (humidity) creates a higher stimulus for moisture migration.

Additionally as discussed in the Section III the reinforcing steel would be exposed to similar conditions should moisture penetrate the concrete. The reinforcing steel is closer to the concrete surface and therefore water would reach it first. Examination of the rebar removed from the construction opening found no pitting corrosion with the exception of a single bar. The corrosion corresponded to mechanical damage that may have initiated the corrosion.

It is concluded that no significant amount of water reaches the liner surface and therefore presence of moisture required for continued corrosion of the liner surface is considered unlikely.

Overlay and Insert Plates

Supports for various systems are attached to the liner plate. Where supports are attached an overlay or insert plate is used. An overlay plate is welded overtop of the existing liner plate. Overlay plates were 3/8 inch to 5/8 inch in thickness. Insert plates replace the liner plate at their location. Insert plates are between 5/8 inch to 1-1/2 inch in thickness. Nelson studs are welded to the back of the insert plate. A minimum of four studs were used and arranged in the same pattern as the liner plate Nelson studs. The liner plate is welded to the insert plate. Insert plates are part of the liner and perform the same function. The insert plates are thicker than the liner plate.
Overlay plates add additional thickness to the 3/8 inch thick liner plate and insert plates are thicker than the liner plate in the area they replace the liner plate. Therefore corrosion occurring from the outside of the liner to the inside would have more material to penetrate. As with the liner plate the overlay and insert plates are included in the scope of the 1BVT 1.47.1 and IWE inspections.

Safety Significance

The as-found minimum plate thickness was 0.151" at a single deep pit in the surface. The liner plate remained intact and was able to perform its design function as a gastight membrane.
Evaluation of the structural significance determined that local thin spots of the liner plate do not affect structural stability or capability. Local evaluation of the liner determined that a very small thickness is necessary to withstand design basis loads including pressure. The as-found liner plate therefore remained within its design basis.

The design function of the liner, as described in BVPS-1 UFSAR Section 5.2.1 is to act as a gas membrane. It does not act as a structural component. Therefore, although two portions of the area inspected had pitting that reduced the liner thickness to less than the stated requirement of 0.278 inches at the corrosion locations identified in Calculation 8700-DSC-156W, the design function was not impacted. The minimum thickness specified would be a uniform thickness for the liner cylinder assuming a constant uniform stress across the entire surface. The liner would only have to withstand peak DBA LOCA stresses for a very limited amount of time, and only has to maintain integrity such that the leakage requirements at the peak LOCA pressure (Pa) are not exceeded. The peak value of Pa is actually 43.3 psig (rather then the 45 conservatively assumed) and only limited portions of the liner are below the minimum thickness. Since most of the liner exceeds the minimum thickness, and that thicker portion would assume the bulk of the uniform loading, it is not credible to assume the thinner portions would fail. Therefore the criterion for the liner to preserve its gas leak tight function is simply to have no through wall penetration. Furthermore, some penetration can actually be assumed as long of the leakage allowance is not exceeded.

For all of these reasons, considering the liner indications under NRC GL 91-18 (RIS 2005-20) leads to the conclusion the containment liner is not be considered degraded or nonconforming with its stated licensing bases.

Title 10 of the Code of Federal Regulations (10 CFR) Section 50.55a "Codes and Standards," incorporates by reference Subsections IWE and IWL of Section XI of the American Society of Mechanical Engineers Boiler and Pressure Vessel Code (ASME Code) for inspection of steel and concrete containments with certain modifications and limitations. These subsections require licensees to inspect the pressure-retaining components of containments at periodic intervals. Subsection IWE of the ASME Code is applicable to the inspection of the Beaver Valley Power Station containment liner.

The NRC also requires licensees to perform leak rate testing of the containment pressure-retaining components and isolation valves according to 10 CFR Part 50, Appendix J, "Primary Reactor Containment Leakage Testing for Water-Cooled Power Reactors." Option B of Appendix J is a performance-based regulation permitting licensees to set test frequencies based on the performance of the components. The pertinent testing requirement is the containment integrated leakage rate test (ILRT) requirement (Type A test). Based on the results of the earlier Type A tests and using the risk-informed methodology described in Regulatory Guide 1.174, "An Approach for Using Probabilistic Risk Assessment in Risk-Informed Decisions on Plant-Specific Changes to the Licensing Basis," BVPS Unit 1 has been granted a license amendment to use a 15-year interval for the ILRT, with the next test to be performed by May 28, 2008. This ILRT is scheduled to be performed during 1R17.

10 CFR Part 50, Appendix J, Option B, III.A, requires that a general visual inspection of the accessible interior and exterior surfaces of the containment system for structural deterioration which may affect the containment leak-tight integrity must be conducted prior to each test, and at a periodic interval between tests based on the performance of the containment systems. These test requirements provide for periodic verification of the structural integrity of the primary reactor containment.

Containment Liner Corrosion Report

The concrete reactor building is required for structural integrity of the containment under Design Basis Accident (DBA) conditions. The steel liner and its penetrations establish the leakage limiting boundary of the containment. Maintaining the containment OPERABLE limits the leakage of fission product radioactivity from the containment to the environment. Surveillance Requirement 4.6.1.2.a leakage rate requirements comply with 10 CFR 50, Appendix J, Option B, as modified by approved exemptions.

The safety design basis for the containment is that the containment must withstand the pressures and temperatures of the limiting Design Basis Accident (DBA) without exceeding the design leakage rate.

The DBAs that result in a challenge to containment OPERABILITY from high pressures and temperatures are a LOCA, a steam line break, and a rod ejection accident (REA). In addition, release of significant fission product radioactivity within containment can occur from a LOCA or REA. In the DBA analyses, it is assumed that the containment is OPERABLE such that, for the DBAs involving release of fission product radioactivity, release to the environment is controlled by the rate of containment leakage. A main steam line break inside containment is not evaluated as the dose consequences are bounded by a main steam line break outside containment. The containment was designed with an allowable leakage rate of 0.1% of containment air weight per day. This leakage rate, used to evaluate offsite doses resulting from accidents, is defined in 10 CFR 50, Appendix J, Option B, as: the maximum allowable containment leakage rate at the calculated peak containment internal pressure (Pa) resulting from the limiting design basis LOCA. The allowable leakage rate represented by La forms the basis for the acceptance criteria imposed on all containment leakage rate testing. La is assumed to be 0.1% per day in the safety analysis at Pa = 43.3 psig for Unit 1. Satisfactory leakage rate test results are a requirement for the establishment of containment OPERABILITY.

BVPS Unit 1 Technical Specification 3.6.1.2 requires that containment leakage rates be limited in accordance with Specification 6.17 titled "Containment Leakage Rate Testing Program." Surveillance requirement 4.6.1.2.a requires Types A, B, and C (overall integrated and local combined leakage rate) testing shall be conducted in accordance with the Containment Leakage Rate Testing Program. Prior to entering Mode 4 during the 1R17 refueling outage, a Type A test will be completed in accordance with this surveillance requirement, as modified by the recently approved BVPS Unit 1 license amendment 271, which approved the new containment design. Amendment 271 will be implemented during 1R17. The last test was performed in 1993 at a lower test pressure, in accordance with the prior Pa value (40.0 psig). Thus, a Type A test with the new Pa value (43.3 psig) must be completed prior to reaching Mode 4 in 1R17. This Type A testing is performed per 1BVT 1.47.2, "Containment Type A Leak Test." 1BVT 1.47.2 verifies by testing of the leak-tight integrity of the primary reactor containment and measures the overall integrated containment leakage to assure this leakage is within the limits specified by Technical Specification Surveillance Requirements 4.6.1.2. This test will meet the Technical Specification requirements for containment leakage rates with the new design peak pressure.

1BVT 1.47.1, "Containment Structural Integrity Test" was performed during 1R17 with results documented in Condition Report 06-01722. This test performs a general observation of the accessible interior and exterior surfaces of the containment structure in order to identify evidence of deterioration which may affect the containment structural integrity or leak tightness in accordance with Technical Specification 4.6.1.6.1. This test also satisfies the ASME XI, Subsection IWE, General Visual Examination Requirements for Examination of Class MC (Metal Containment) Surfaces. The results were entered into the Correction Action Program and is classified as a Mode Restraint which must be adequately resolved prior to entering Mode 4.

Performance of 1BVT 1.47.1, including resolution of any identified deficiencies, and satisfactory performance of the 1BVT 1.47.2, Type "A" test, verifies that the current containment liner is performing its safety function.

IV Operating Experience

A review of industry Operating Experience (OE) concerning liner corrosion show that the liner should be examined on a regular basis to find degraded conditions before they become serious. Multiple occurrences of liner corrosion exist in the OE. The corrosion events ranged from surface rust with no thickness loss to through wall penetration of the liner plate.
Many of the liner corrosion events reported dealt with the interior liner surface at the interface with the concrete slab in the bottom of the containment structure. The sealant material at this joint was found to be degraded or missing allowing moisture to collect between the liner and concrete. Corrosion was found at this interface sometimes with loss of material thickness.
Three cases of through wall holes in the liner plate were reported. In all three events, foreign material such as wood or a glove were found embedded in the concrete in contact with the liner plate at the point of the through wall corrosion. The most significant of these events occurred at North Anna 2 where a large piece of wood was found behind the liner plate at the through wall hole location. The design of the containment structure for Beaver Valley and North Anna are the same.

Industry Operating Experience (OE)

A search of industry OE found examples of three through wall corrosion events at three separate plants. The three plants are of differing construction details however, one is similar to Beaver Valley. North Anna Unit 2 discovered a 4"x4" by 6 foot long timber in contact with the liner and embedded in the concrete after cleaning of rust spots on the liner revealed a through wall corrosion. North Anna containment design is the same as Beaver Valley.
DC Cook discovered a wooden handled wire brush behind the liner at the location of a through wall corrosion spot. DC Cook plant is an ice condenser design with a containment design that has similarities to Beaver Valley.
The Brunswick power station discovered a cloth glove behind the drywell liner after cleaning of rust spots found through wall penetrations. Brunswick is a Boiling Water Reactor and the containment design is very different from Beaver Valley.

Several OEs dealt with corrosion at the interface between the liner and concrete floor. In all cases the sealant at the interface was degraded or nonexistent. Inspection of the sealant at this interface is part of the BVPS inspection criteria for the structural integrity test. The sealant at this location is repaired or replaced at the first sign of degradation.

The associated NRC inspection reports and other information are located on the shared drive used for investigation of this event. The following is a summary of OE searches for containment corrosion.

In fall 2003, at the Surry Power Station, Unit 2, NRC inspectors found degraded coatings and rust on the containment liner at the junction of the metal liner and interior concrete floor. The inspectors also discovered that the moisture barrier at the junction between the metal liner plate and interior concrete floor was degraded.

In July of 2002, at the Davis-Besse Nuclear Power Station, the NRC identified corrosion where the containment meets the floor. Davis Besse subsequently performed ultrasonic examinations to confirm that the freestanding metal containment had not been corroded below the minimum design thickness. Davis Besse subsequently installed a moisture barrier at the containment-to-floor junction to prevent moisture intrusion.

In May of 2002, at the Sequoyah Nuclear Plant, Unit 2, the NRC identified areas of the steel containment vessel with degraded coatings and rust. One of the floor drains was clogged in the annulus area (5 feet wide) between the containment vessel and the reinforced concrete shield building. Localized water

ponding at the clogged drain had come in contact with a section of the SCV, causing deterioration of the SCV coatings and rusting of the containment vessel.

In November of 2001, the Dresden Unit 2 Nuclear Power Station identified an area of missing coating and primer encircling the drywell shell adjacent to the basement floor. The area was 5-10 cm (2-4 inches) wide. In this area, the base metal of the drywell shell was found to be corroded. However, based on ultrasonic and visual examinations, the degraded area was found to be within the corrosion allowance for the drywell shell. The shell coating was repaired in this area to prevent further degradation.

In March of 2001, the D. C. Cook Nuclear Power Plant, discovered a through-wall hole in the containment liner plate. Surface preparation for further inspection of a weld repair of the liner plate dislodged the repair material, leaving a hole. The hole was repaired. However, further examination of the repair area indicated corrosion of the liner from the embedded side of the liner. The cause of this corrosion was found to be a wire brush handle lodged in the concrete at the interface with the liner. DC Cook replaced an area about 12 inches square in the liner plate and performed a local leak rate test.

In October of 1999, the Palisades Plant discovered that a floor-to-liner moisture barrier seal had never been installed and used a thin metal blade as a probe, confirming the presence of moisture in the crevice (OE 10464). Subsequently, they used a borescope to identify areas of liner corrosion. They determined that the corrosion had not yet appreciably degraded the liner in this area and installed a new liner-to-floor moisture barrier seal.

In September of 1999, North Anna Unit 2 discovered a through wall hole in the containment liner during investigation of a rusted spot on the liner (OE 10288 & OE 12772). Removal of the liner plate in the area of the through wall hole revealed a piece of wood 4 inches square by about six feet long. The wood was apparently left in the concrete during original construction. The wood was removed, the void grouted and the liner plate replaced with nominal wall thickness plate. A Type "A" Integrated Leak Rate Test was performed following repairs. The repaired area was to be re-examined by UT thickness in future outages in accordance with ASME XI Section IWE.

In May of 1999, at the Brunswick Steam Electric Plant, Unit 2, they identified three areas in the drywell liner where corrosion had penetrated the liner. These areas were at the 5.5, 16, and 21 m (18, 52, and 70 feet) elevations. At the 16 m elevation, the wall had corroded from the outside to the inside surface. At the 21 m elevation, the wall had corroded from the inside to the outside surface. At the 5.5 m elevation, the direction of the through-wall corrosion could not be determined. The liner corrosion was a result of foreign materials embedded in the concrete containment adjacent to the liner. One hole in the liner was adjacent to a leather work glove found buried in the concrete, while the other two hole locations were adjacent to wood found buried in the concrete.

In February and March of 1998, D. C. Cook identified corrosion (pitting) of the containment liner at the moisture barrier seal areas of both units. At Unit 1, the licensee identified more than 60 areas in which the thickness (1 cm [3/8 inch] nominally) of the steel liner plate had been reduced below the minimum design thickness value of (0.6 cm [0.25 inch]).

In December, 1996, at the H.B. Robinson Steam Electric Plant, Unit 2, an NRC inspector identified degraded caulking and insulation sheathing panels during a containment walkdown. The vertical portion of the containment liner at Robinson is protected by Vinylcel insulation, a polyvinyl chloride material, and a metal sheathing material. H. B. Robinson determined that a portion of this insulation sheathing material was loose and that some of the caulking between the sheathing panels was deteriorated. After examination during subsequent refueling outages, they determined that the protective coating for the containment liner was degraded and that while some corrosion of the containment liner had occurred the liner met design requirements.

Information Notices

In 2004 the NRC issued Information Notice (IN) 04-09 Corrosion of Steel Containment and Containment Liner. The U.S. Nuclear Regulatory Commission (NRC) issued this information notice to alert addressees to occurrences of corrosion in freestanding metallic containments and in liner plates of reinforced and pre-stressed concrete containments. Previously the NRC issued IN 97-10, "Liner Plate Corrosion in Concrete Containments".

NRC Information Notice 97-10 alerted the industry to occurrences of corrosion of the liner plates of reinforced and pre-stressed concrete containments, emphasizing the detrimental effects such corrosion could have on containment reliability and availability under design-basis and beyond-design-basis events. Inside surfaces of concrete containments are lined with thin metallic plates, generally between 1/4 and 3/8 inch thick. Normal loads, such as from concrete shrinkage, creep and thermal changes, imposed on the concrete containment structure are transferred to the liner plates through the anchorage system. Internal pressure and temperature loads are directly applied to the liner plate. Thus, under design basis conditions, the liner plate could experience significant strains. Any corrosion (metal thinning) of the liner plate could change the failure threshold of the liner plate under a challenging environmental or accident condition. This may reduce the design margin of safety against postulated accident and environmental loads. Beaver Valley Unit 1 was listed in this IN as a plant reporting spots of liner corrosion. The reported conditions were found to be benign from the standpoint of safety.

IN 2004-09 continued with the discussion contained in Information Notice 97-10, "Liner Plate Corrosion in Concrete Containments," the containment liners have safety factors well above the theoretically calculated strains. Any corrosion (metal thinning) of the liner plate or freestanding metallic containment could change the failure threshold of the containment under a challenging environmental or accident condition. Thinning changes the geometry of the containment shell or liner plate, which may reduce the design margin of safety against postulated accident and environmental loads.

BVPS response to IN 2004-09 is documented in CR 04-03791. The response noted that BVPS has an inspection program that satisfies NRC rulemaking contained in 10CFR50.55a. Inspections carried out to date had noted minor deficiencies that were repaired. No deficiency resulting in degradation of the liner plate had been discovered.

BVPS OE - Condition Report (CR) Research

A search of past CRs found several CRs for abraded or peeling paint on the liner. The majority of the identified spots were found when performing 1BVT 1.47.1 for the Containment Structural Integrity Test. Rust was present in a small number of these locations. The rust was determined to be surface rust in all cases upon cleaning of the area prior to touch up painting. None of the observed conditions were indicative of corrosion emanating from the outside surface of the liner. All previously identified conditions have been dispositioned except for areas on the dome. These areas are being investigated and dispositioned 1R17. A summary of the results of past performances of 1BVT 1.47.1 is documented in CA 06-01122-012.

The CR search noted the results of Containment Structural Integrity Test examination of the liner were documented and dispositioned. All instances of deficient or suspect areas on the liner plate were examined and determined to not affect the liner plate function. Areas of lifted or damaged paint were repaired. Corrosion spots were examined by a qualified VT-3 inspector, cleaned and repainted. No loss of material was reported at any identified corrosion spots.

V Extent of Condition

The exterior or outer surface of the liner plate is not accessible for examination as the surface is in contact with the concrete shell. The interior surface of the liner for the most part is accessible. The dome and cylinder walls can be examined and have been per plant procedures previously outlined. The bottom of the liner on top of the base mat is covered by two feet of concrete with the exception of the keyway and is not accessible.
Since the outside surface of the liner is not available for inspection any inspection must be performed from the interior side of the liner.

Current Liner Inspections:

The "Containment Structural Integrity Test", 1BVT 1.47.1 is performed every other refueling outage to comply with Technical Specifications 4.6.1.6.1 and 4.6.1.6.2. This test is to verify the structural integrity of the containment liner plate, containment liner test channels and exterior concrete surface by a general visual inspection of the accessible surfaces per Tech Spec requirements.

The current liner examination is performed under 1BVT 1.47.1, "Containment Structural Integrity Test". This procedure is performed every other refueling outage and covers 100% of the accessible areas of the liner. The procedure consists of a visual check of the liner. Any areas of deterioration and rust are further examined by a qualified VT-3 inspector and documented. All deficient or suspect areas are documented in the corrective action program for disposition.

The inspection frequency for 1BVT 1.47.1 is based on the requirements of Appendix J, "Containment Testing". Appendix J requires inspections be performed three times in a ten year period and prior to each Type A test. The summary of past test results from 1BVT 1.47.1 are included in CA 06-01122-012.

Based on Nuclear Regulatory Commission (NRC) final rule amending 10CFR50.55a, Codes and Standards, effective September 9, 1996, Beaver Valley developed an IWE and IWL examination program in accordance with ASME Section XI, 1992 Edition, 1992 Addenda. This program uses the visual examination of the liner, performed in accordance with 1BVT 1.47.1, to satisfy the 40-month Period general visual examination requirement specified in the rulemaking (10CFR50.55a(b)(2)(ix)(E). Per ASME Section XI, Paragraph IWE-3510.1, the General Visual Examination shall be performed by, or under the direction of, a Registered Professional Engineer or other individual knowledgeable in the requirements for design, in-service inspection, and testing of Class MC and metallic liners of Class CC components. The Containment System Engineer fulfills the specified requirement for the individual performing this examination.

The concrete examination preformed in 1BVT-1.47.1 is not used by the IWE / IWL examination program. Per Table IWL-2500-1, a VT-3C is required on all areas. This examination is completed by utility NDE personnel certified through the NDE Center in Charlotte, NC. Per IWL-2410, the examination frequency for the containment exterior concrete examination is once every 5 years.

The requirements of 1BVT 1.47.1 were submitted to Perry and Davis-Besse for a peer review and recommended enhancements. Feedback inputs received from the sister FENOC plants were incorporated into revision 7 of the BVT by the program owner. See CA 06-01122-011 for details.

VI Conclusions

The corrosion initiation timing and duration are not known with certainty, however, it is reasonable to conclude that the process initiated during the construction phase when the necessary corrosion elements (water and oxygen) were available. It is also reasonable to conclude that the corrosion process continued once initiated for whatever reason until the available oxygen and water were consumed by the corrosion process at which time the corrosion stopped. Based upon the condition of the rebar and the general condition of nearly 98% of the exposed liner plate surface area, rewetting from the exterior environment is improbable. If rewetting is assumed, one would expect the rebar in the area of rewetting to be a leading indicator of corrosion activity. A telltale inspection attribute of corrosion of the rebar would be surface spalling of the concrete near the area of rebar corrosion due to corrosion product push between the rebar and the concrete. Based upon the information available, active corrosion is considered to be unlikely and if present it would be expected to occur at a slow rate of degradation due to the low level of oxygen and limited aqueous environment expected to be present at the concrete to liner interface.

Recommended follow-on actions would be to continue the IWE inspection activities looking for discontinuities (staining, paint blisters, etc.) in the painted interior surface of containment and thoroughly investigating.

Ultrasonic thickness sampling would be of very limited benefit since the probability of finding another area of pitting is remote due to the random nature of the observed corroded areas. If found pitting corrosion is a relatively slow process and with the instrument uncertainties associated with the testing process, a corrosion degradation rate would be difficult to detect.

The Stone and Webster Report concluded that the design basis for the containment liner is not adversely affected by the as-found conditions. The thickness of the remaining sound metal is adequate to maintain the design safety function of the liner as a leak tight membrane.

Since the reinforced concrete supports all design basis loads, the liner plate stresses are relatively small. Reduced thickness of local areas of the liner does not affect the structural capability of the liner. The structural evaluation shows there is a significant margin between the conditions of the as-found pit, to a condition where local stress would challenge the gas membrane function of the liner. Closely spaced pits can be enveloped into larger radius pits as noted in the evaluation.

Areas 1 and 2 removed from the liner plate for laboratory examination were replaced with new plate material. Area 3 of the liner plate has been dispositioned to be acceptable as-is based upon the laboratory and analytical analysis. UT thickness measurements of Area 3 will be performed during future outages.

Performance of 1BVT 1.47.1, including resolution of any identified deficiencies, and satisfactory performance of 1BVT 1.47.2 Type A test verifies that the containment liner is performing its safety function. Augmentation of 1BVT 1.47.1 includes requiring a qualified VT-3 inspector to examine any liner deficiencies noted.

The recommended follow on action is the continuation of the structural integrity and IWE inspection activities backed up by the Type "A" test every 10 years. Observed discontinuities in the painted interior surface of the containment liner will be examined by a qualified VT-3 inspector when corrosion is evident. Based upon the VT-3 observations additional examinations, such as UT measurements, may be requested.

VII Corrective Actions

Corrective Action 1

Areas 1 and 2 were removed from the liner plate in their entirety for laboratory examination. The removed areas of plate were restored using new plate as part of the SGRP restoration of the containment liner plate in the temporary containment opening. The replacement follows the same installation and test requirements specified for the reinstallation of the liner plate removed for the SGRP temporary opening. The scope of work is controlled by ECP 03-0199, Bechtel NCR-044 and Bechtel work procedures

Corrective Action 2

In accordance with the requirements of ASME XI Section IWE Area 3 will be UT examined for the next three inspection periods. The area will be defined on the interior surface of the liner plate and a baseline UT thickness measurement performed during 1R17 after the liner plate is restored.
Area 3 was acceptable as-is based upon the laboratory and analytical results. The laboratory results determined that the corrosion initiation timing and duration are not known with certainty, but, can be reasonably concluded that the process initiated during the construction phase.
The thinnest spot at the deepest pit is 0.330" or 45 mils less than the nominal wall. This thickness is greater than the minimum uniform wall thickness of 0.304" determined in calculation 8700-DSC-0156W. This minimum uniform wall thickness was determined for the most critical area of the liner at the cylinder to base junction. Since the location of Area 3 is above elevation 770' the minimum uniform liner thickness calculated for the cylinder wall 30 feet above the bottom of the containment cylinder (about elev. 721') is 0.278" per calculation 8700-DSC-156W. Given the slow rate of pitting corrosion the thickness measurements will note pitting approaching this value.

Corrective Action 3

Augment the inspection procedure used for the containment liner interior surface. The Containment Structural Integrity Test, 1BVT 1.47.1 and IWE program perform a general visual inspection of 100% of the containment liner every other outage. Any deficiencies identified during the inspection are documented and addressed in the corrective action program. When degraded conditions are found a qualified VT-3 inspector defines the condition and corrective actions are implemented as necessary. In order to strengthen the program the procedure was revised to emphasize this requirement and specify when the qualified VT-3 inspector is required.
Revision 8 to 1BVT 1.47.1 was completed and is being implemented during 1R17.

VIII References:

1. BVPS Unit 1 UFSAR, Rev. 23, Sections 5.2.1, 5.2.2, 5.2.3 and 5.2.4
2. BVS-136 Specification for Shop Fabrication and Field Erection of Reactor Containment Steel Plate Liner, Rev. 4, dated March 14, 1973
3. BVS-158 Specification for Mixing and Delivering Fly Ash Concrete for BVPS Unit 1, Rev. 6, dated March 29,1971
4. Calculation 8700-DSC-0156W, Liner Minimum Wall Thickness, Rev. 0, dated February 26, 1991
5. Calculation EA-41, Reactor Containment Liner – Stress Analysis, Rev. 0, dated 11-3-71
6. Calculation EA-50, Reactor Containment Liner Buckling Analysis, Rev. 0, dated 11-6-71
7. Calculation 8700-UR(B)-217, Impact of Long Term Post LOCA Containment Leakage following Atmospheric Conversion and Core Uprate on Iodine Loading in the SCLRS, Control Room and ERF Charcoal Filters Using Alternate Source Terms Methodology, Rev. 0
8. Drawing 8700-RV-0001F, Reactor Containment Liner Details - Sh 1, Rev. 10
9. 1BVT 1.47.1, Rev. 6, 7 & 8, "Containment Structural Integrity Test"
10. ASME Section XI, 1992 Edition through 1992 addenda, Section IWE
11. 1OST-53.F, Severe Accident Management Guideline CA-4
12. ES-M-012, Environmental Conditions for Equipment Qualification Requirements - BVPS Unit No. 1, Rev. 2
13. Bechtel – Beaver Valley Unit 1 SGR Project – Job No. 24928, Nonconformance Report, NCR No. 044
14. CR 06-01122, Degraded Liner Plate Surface in Area of SGRP Access Opening, dated 2/20/06
15. CR 06-01519, Degraded Reinforcing Bar From SGRP Access Opening, dated 3/1/06
16. CR 04-03791, NRC Information Notice 2004-09, dated 5/3/04
17. CR 03-03893, Containment Steel Liner Deficiencies Identified by 1BVT 1.47.1
18. CR 992673, OE #10288 Containment Liner Defect Due to Imbedded Foreign Material, dated 10/7/99
19. Technical Specification 4.6.1.6.1
20. Technical Specification 4.6.1.6.2
21. Information Notice 97-10: Liner Plate Corrosion in Concrete Containments, dated March 13, 1997
22. Information Notice 2004-09, Corrosion of Steel Containment and Containment Liner, dated April 27, 2004
23. OE10288 – Containment Liner Defect Due to Imbedded Foreign Material
24. OE10361 – (Update to OE10288) Containment Liner Defect Due to Imbedded Foreign Material

VIII References continued:

25. OE12772 – Inspection of North Anna Containment Concrete Structures Identifies Embedded Wood
26. NUREG/CR-6706, Capacity of Steel and Concrete Containment Vessels With Corrosion Damage, dated February, 2001
27. NDE Reports
    a. NDE Report No. BOP-VT-06-040, VT of removed reinforcing bars
    b. NDE Report No. BOP-UT-06-035, Containment liner plate area #3
    c. NDE Report No. BOP-UT-06-027, 0.375 Containment liner plate
    d. NDE Report No. BOP-UT-06-026, Rusted Cont. Liner Plate Area
    e. NDE Report No. BOP-UT-06-025, Rusted Cont. Liner Plate Area
    f. NDE Report No. BOP-UT-06-024, 0.375 Containment liner plate
    g. NDE Report No. BOP-VT-06-041, Areas #1 & #2 prior to paint removal for auto scans
28. Beta Labs Report M06074, dated March 9, 2006
29. Beaver Valley Unit 1 Engineering Assessment Report 1R17 Exterior Containment Liner Corrosion, by Eldon R. Dille, dated March 2006
30. Corrosion Evaluation Report by D. Weakland, dated March 2006
31. Shaw Stone & Webster Report – "Containment Liner Degradation, First Energy Nuclear Operating Company, Beaver Valley Unit 1", Rev. 0, dated March 13, 2006

IX Attachments:

1 Photographs of SGRP Temporary Opening and Liner Plate

2 Photographs of Corrosion found on Liner Plate

3 Location Sketches

4 CR 06-01122 – Degraded Liner Plate Surface in area of SGRO Access Opening

5 NDE VT Reports

6 NDE UT Reports

7 CR 06-01519 – Degraded Reinforcing Bar from SGRP Access Opening

8 Beta Labs Report M06074

9 Sargent & Lundy Corrosion Expert Report - Beaver Valley Unit 1 Engineering Assessment Report 1R17 Exterior Containment Liner Corrosion

10 1R17 Corrosion Evaluation Report

11 Shaw Stone & Webster Report - Containment Liner Degradation, First Energy Nuclear Operating Company, Beaver Valley Unit 1

12 MPR Associates Independent Review

Attachment 1

Photographs of SGRP Temporary Opening and Liner Plate

(1 page)

SGRP Temporary Construction Opening Liner Plate

Attachment 2

Photographs of Corrosion found on Liner Plate

(11 pages)

Location Area 1

Area 1

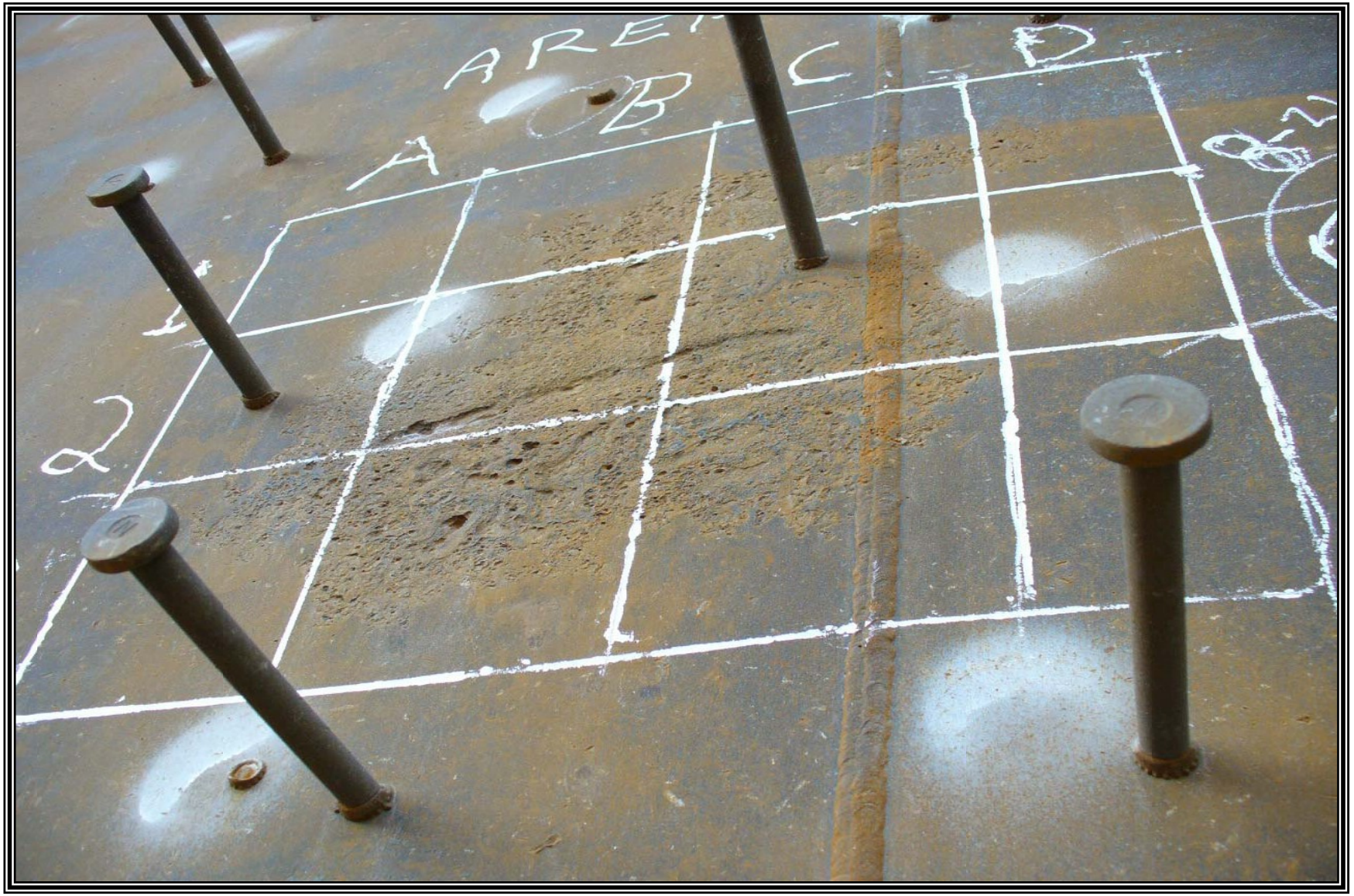
Area 1 Close Up

Location Area 2

Area 2

Area 2

Area 2

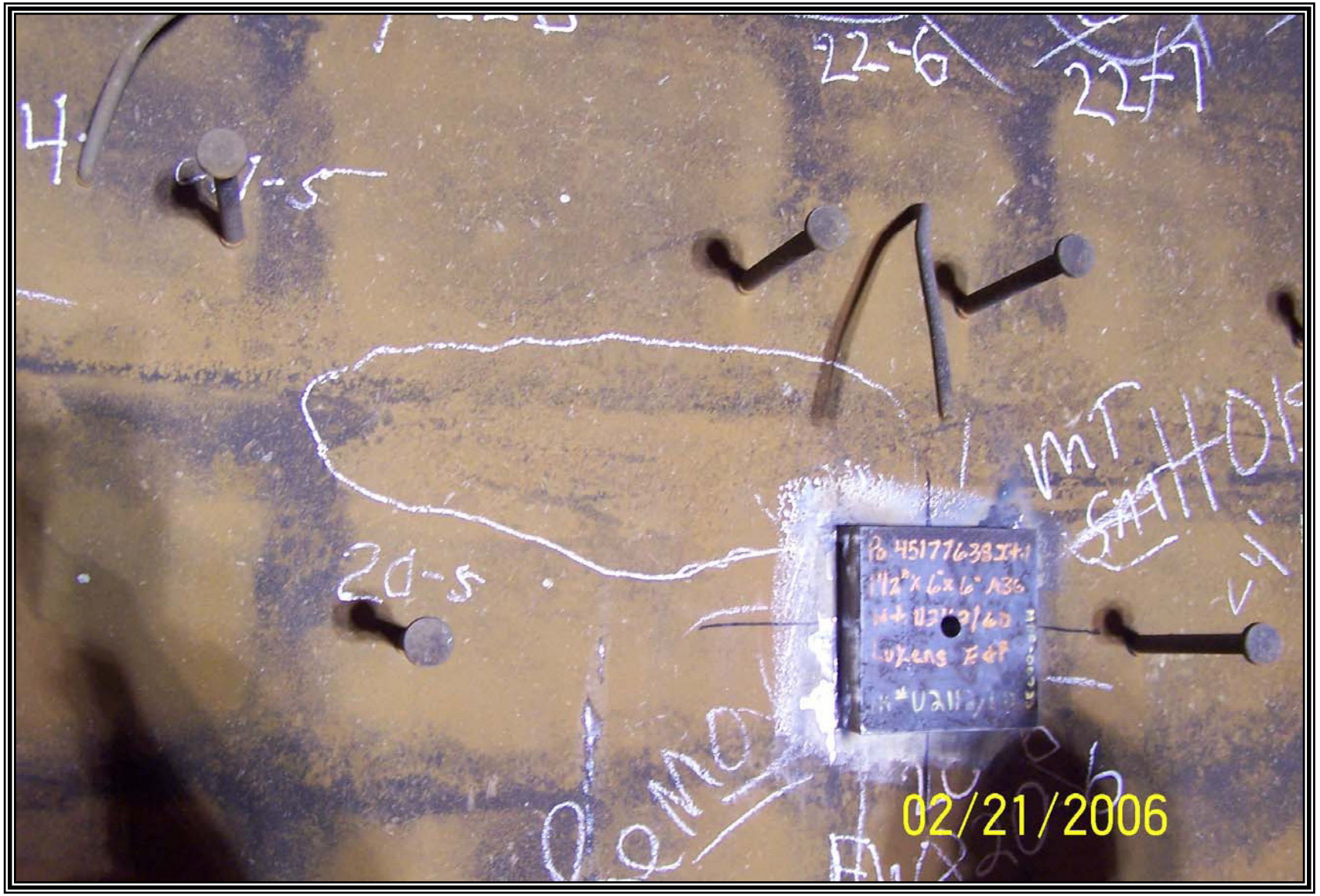


Area 2 Close Up 1

Area 2 Close Up 2

Area 3

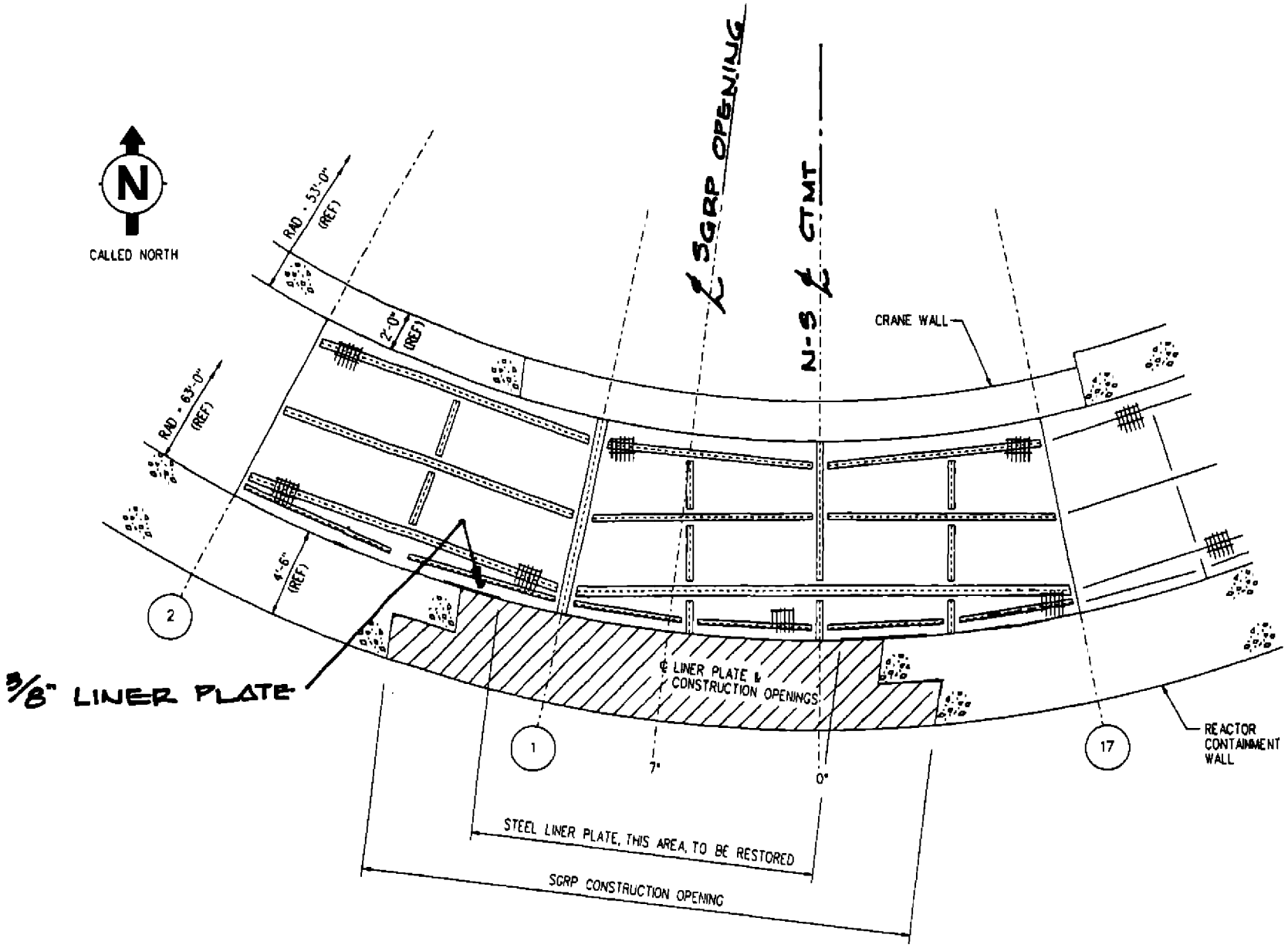
Area 3 and Lift Lug Attachment



Attachment 3

Location Sketches

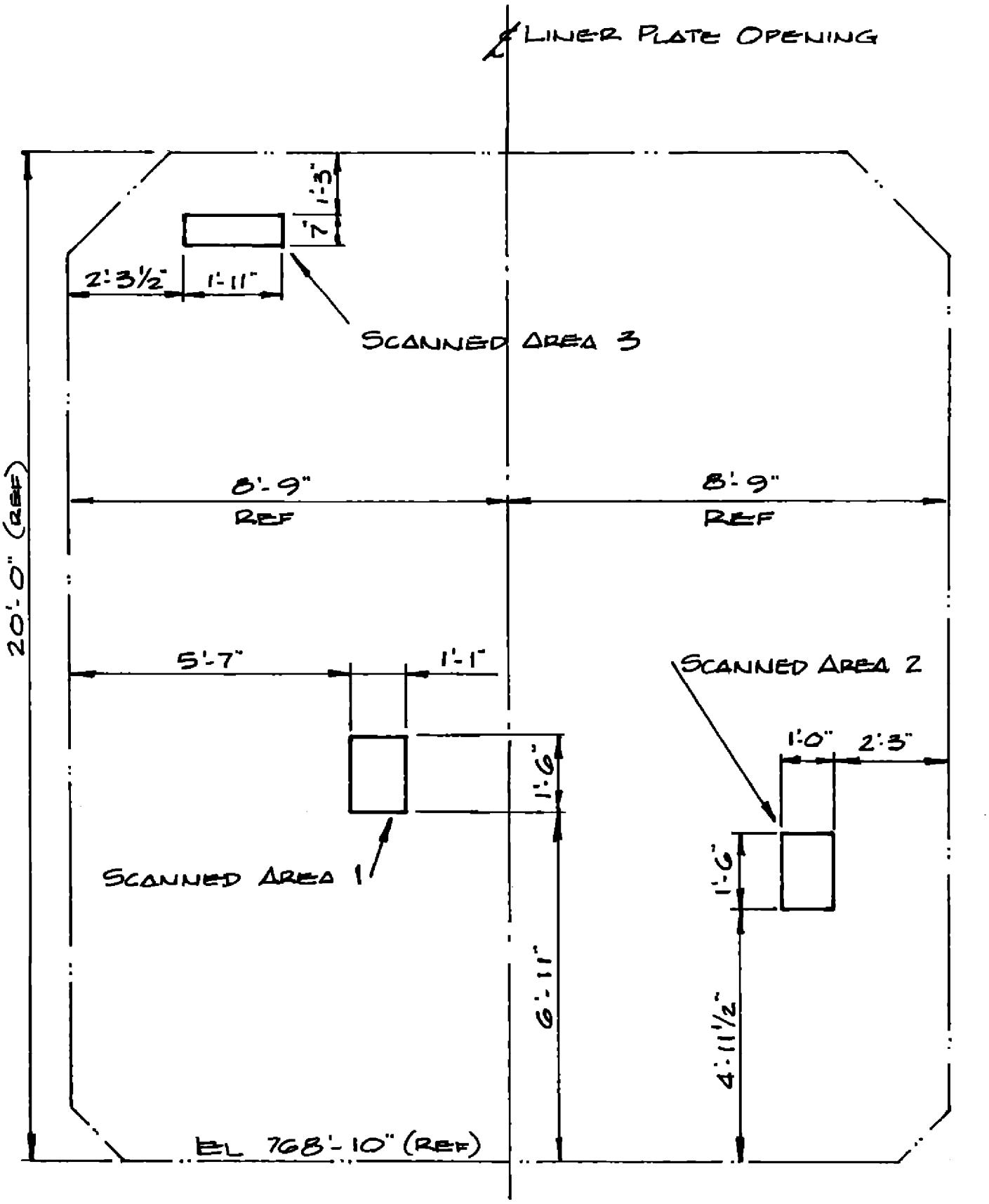
(3 pages)



PARTIAL PLAN - EL 767'-10"

(BETWEEN CONTAINMENT WALL AND CRANE WALL)

LOCATION OF SGRP OPENING

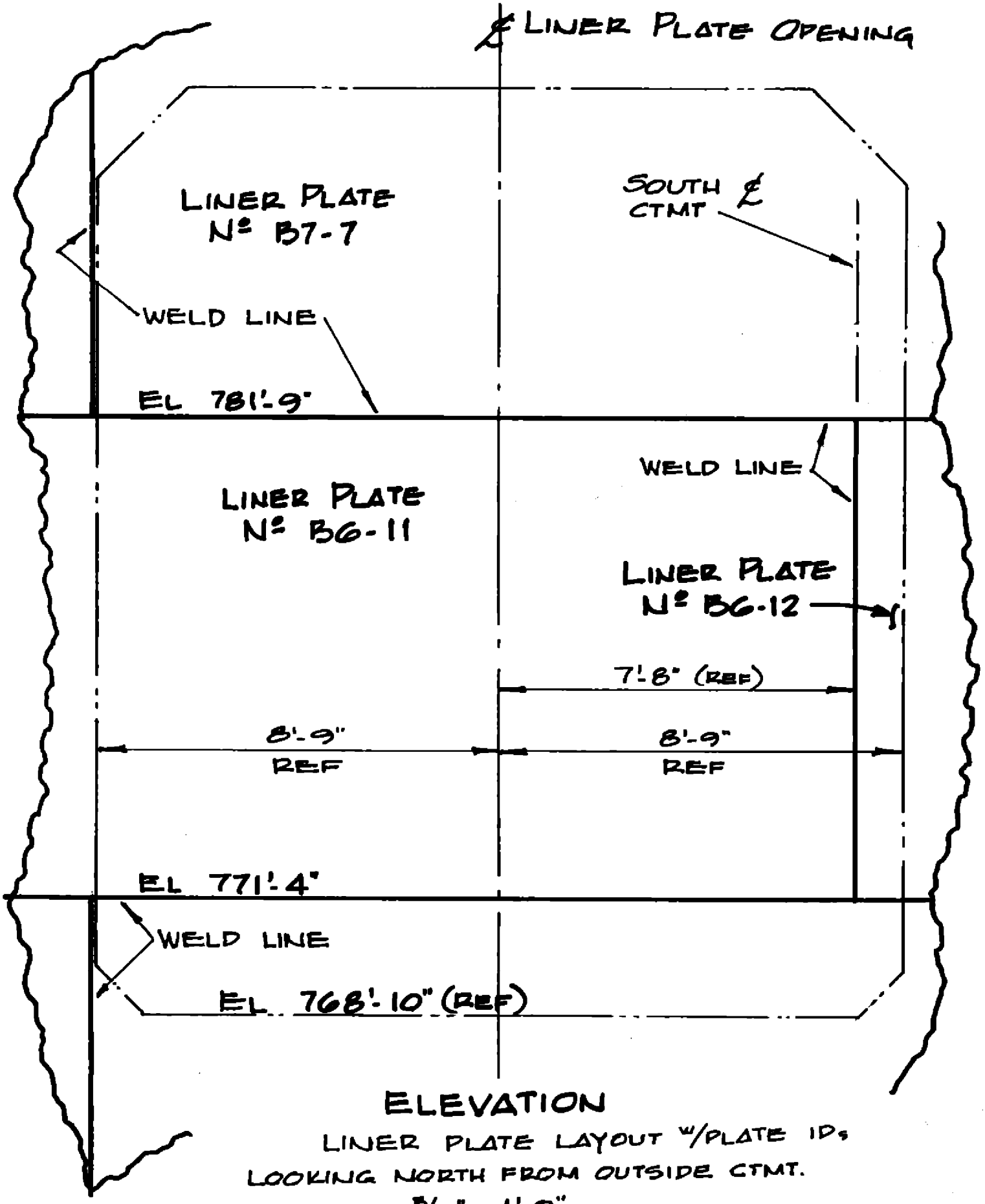


ELEVATION

LOOKING NORTH FROM OUTSIDE CTMT.

3/8" = 1'-0"

LOCATIONS OF CORROSION AREAS



ELEVATION

LINER PLATE LAYOUT W/PLATE IDs

LOOKING NORTH FROM OUTSIDE CTMT.

3/8" = 1'-0"

Attachment 4

CR 06-01122 – Degraded Liner Plate Surface in area of SGRO Access Opening

(63 pages)

CONDITION REPORT

CR Number 06-01122

TITLE: DEGRADED LINER PLATE SURFACE IN AREA OF SGRO ACCESS OPENING

ORIGINATION

DISCOVERY DATE	TIME	EVENT DATE	TIME	SYSTEM / ASSET#
2/20/2006	1430	N/A	N/A	47 BV-1-RCBX

EQUIPMENT DESCRIPTION Concrete-side surface of the containment liner plate

DESCRIPTION OF CONDITION and PROBABLE CAUSE (If known) Summarize any attachments. Identify what, when, where, why, how.

Observation of the exposed backside of the containment liner plate following hydrolasing revealed two areas of degradation. The degradation comprised general surface pitting that varied in depth and diameter over each of the areas (approximately 16 in. by 18 in. each). Additionally, one area exhibited a continuous depression of approximately 7 – 9 in. length and ½ - ¾ in. width. The areas were approximately 15 feet distant from one another, and approximately 10 feet above the work platform surface (El 765+). No measurements were possible, but photos were taken by both Bechtel and FENOC that can be found at S:\AII\1R17 SGRP Photos\20Feb06 Photos. The cause mechanism is not known, but it is concluded that the condition was pre-existent and did not result from concrete removal. It is also concluded that the pitting is not thru-wall since no seepage on the inside surface of the liner was reported during the hydrolasing. Seepage would almost certainly have occurred due to the high-pressure water stream. Consequently, the liner is considered to remain leaktight and structurally sound for both fuel movement and completion of liner removal. Assessment of the degradation for cause and extent of condition will commence when the liner is removed and safely accessible in storage. No evidence will be lost due to the removal process, since the surface has already been cleaned by water impingement.

This condition report is to be categorized "SR", but will be down-gradable if determined not to be reportable.

Resolution of this CR shall be a Mode 4 HOLD.

SPECIAL INSTRUCTIONS - THIS ISSUE IS A MODE RESTRAINT. A MODE HOLD RESOLUTION FORM IS REQUIRED TO BE COMPLETED.

IMMEDIATE ACTIONS TAKEN / SUPV COMMENTS (Discuss CORRECTIVE ACTIONS completed, basis for closure.)

Notified and discussed with the Design Engineering Section Manager. Design Engineering will lead the investigation with "resource support" from the SGRP.
Notified FENOC NDE (VT-3) personnel of the need to accompany SGRP/Bechtel inspectors during any near-term inspections of the liner performed before removal.
Need to review the BVPS response to NRC Information Notice 2004-09.

QUALITY ORGANIZATION USE ONLY	IDENTIFIED BY (Check one)	ATTACHMENTS
Quality Org. Initiated ☐ Yes	☑ Individual/Work Group ☐ Self-Revealed	☑ Yes ☐ No
Quality Org. Follow-up ☐ Yes ☐ No	☐ Supervision/Management ☐ Internal Oversight ☐ External Oversight	

ORIGINATOR	ORGANIZATION	DATE	SUPERVISOR	DATE	PHONE EXT.
RITZ, G	SGRP	2/20/2006	HALLIDAY, KE	2/20/2006	5072

CONDITION REPORT

CR Number 06-01122

TITLE: DEGRADED LINER PLATE SURFACE IN AREA OF SGRO ACCESS OPENING

PLANT OPERATIONS

SRO REVIEW	EQUIPMENT OPERABLE	OPERABILITY ASSESSMENT REQUIRED	ORG. NOTIFIED	IMMEDIATE INVESTIGATION REQUIRED	ORG. NOTIFIED	MODE CHANGE RESTRAINT
☑ Yes ☐ No	☑ Yes ☐ No ☐ N/	☐ Yes ☑ No		☐ Yes ☑ No		☑ Yes ☐ No

MODE	ASSOCIATED TECH SPEC NUMBER(S)	ASSOCIATED LCO ACTION STATEMENT(S)
		#2

DECLARED INOPERABLE (Date / Time)	REPORTABLE?	One Hour N/A	APPLICABLE UNIT(S)
N/A	☐ Yes ☑ No ☐ Eval Required	Eight Hour N/A	☑ U1 ☐ U2 ☐ Both

COMMENTS

Resolution required prior to MODE 4.

Current Mode - Unit 1	Power Level - Unit 1	Current Mode - Unit 2	Power Level - Unit 2
6	0%	N/A	N/A

SRO - UNIT 1	SRO - UNIT 2	DATE
Mouser, M	N/A	2/21/2006

CRPA / SUPV / MRB

CATEGORY / EVAL	ASSIGNED ORGANIZATION	DUE DATE
SR	BVDM	3/22/2006

TREND CODES

Process / Activity / Cause Code(s)			Comp Type / ID (If Cause T or W)		Cause Org
HDW	0575	T19			

REGULATORY

REPORTABLE? ☐ Yes ☐ No ☐ LER No. _____

REPORTABILITY REVIEWER

DATE

INVESTIGATION OPTIONS ☐ Maint.Rule ☐ OE Evaluation

CLOSED BY

DATE

CORRECTIVE ACTION

NOP-LP-2001-05

CR Number: 06-01122

ORIGINATOR

CR Category:	Action Type:	Schedule Type:	CA Number:
SR	(G) Engineering Evaluation	(A) Normal Work Management	1

Corrective Action Type:	Cause Code:	Resp Org:
(ES) Evaluation Support	(T19) Corrosion	SGRP

Description:

Investigate the debris pile beneath the RCBX SGRO access opening for evidence of organic material that may have been inadvertently embedded in the wall concrete when poured during plant construction. IN 2004-09 identifies such material at other plants as the cause of corrosion of liner exterior surfaces. If found, such material will be evaluated for this possibility regarding the current liner degradation.

Completed By:	Organization:	Date:	Phone:	Attachments:
RITZ, G	SGRP	2/24/2006	5556	☐ Yes ☑ No

ACCEPT

If a Refueling Outage is required, Enter the Refueling Outage number:	Other Tracking #	Corrective Action Due Date:
1R17	N/A	2/24/2006

Approval: (Enter Name and Sign)	Section:	Date:
SOCKACI, T	SGRP	2/24/2006

QUALITY

Quality Organization Approval:	Date:

IMPLEMENTING ORG

Response:

Investigation of the debris on 02-22-06, identified several pieces of wood that showed evidence of water jet damage. The material is in the possession of G. S. Ritz. However, the wood did not appear to have been embedded, since it did not exhibit much concrete residue (cement paste should fill surface voids). While embedded wood would have been dislodged and transported by the cutting water, it was judged that the discovered material was simply too clean as-found to have been embedded. Furthermore, the nature of the removal process (20,000 psi water jets) makes the survival of such material highly unlikely. The IN 2004-09 plants discovered such material by removing liner plate from the inside of their RCBX after thru-wall holes developed. Consequently, the source material was found intact in those instances.

Corrective Action Implementation Date: 2/22/2006

■ Signature Indicates Corrective Action complete:
Completed By: RITZ, G Date: 2/24/2006

■ Signature Indicates verification for SCAQ CRs:
Verified By: Date:

■ Enter Name and Sign:
Implementing Organization Approval: SOCKACI, T Date: 2/24/2006

QUALITY VERIFIER

Comments:

Approval: **Date:**

CORRECTIVE ACTION

NOP-LP-2001-05

CR Number: 06-01122

ORIGINATOR

CR Category:	Action Type:	Schedule Type:	CA Number:
SR	(U) Other Evaluation	(C) Refuel Outage Required for Implementatio	2

Corrective Action Type:	Cause Code:	Resp Org:
(ES) Evaluation Support	(T19) Corrosion	BVTS

Description:

Perform ultrasonic (UT) examination of removed containment liner plate at accessible painted locaton to enable an evaluation of the effect of the paint on the accuracy of subsequent UT thickness measurements that may be performed for extent of condition determination. Record the measured thickness on the appropriate NDE report. Following paint removal at the specified location, repeat the UT thickness measurement and record the results on the appropriate NDE report.

Completed By:	Organization:	Date:	Phone:	Attachments:
HEIMEL, T	BVTS	2/28/2006	7656	☐ Yes ☑ No

ACCEPT

If a Refueling Outage is required, Enter the Refueling Outage number:	Other Tracking #	Corrective Action Due Date:
1R17	N/A	3/29/2006

Approval: (Enter Name and Sign)	Section:	Date:
REEVES, D	BVTS	2/27/2006

QUALITY

Quality Organization Approval:	Date:

IMPLEMENTING ORG

Response:

Manual UT thickness measurements were obtained on 2/24/2006 and documented on NDE report BOP-UT-06-024. The measured thickness at the painted location was 0.383" when measured from the painted side and 0.386" when measured from the bare (exterior) side.

Following Paint removal, the location was re-examined on 2/25/2006 using the same manual examination instrument and calibration parameters. The second examination was documented on NDE report BOP-UT-06-027. The measured thickness of the plate at the location was 0.386 inches when measured from either side of the plate.

Based on the results of both manual examinations, it appears that the paint thickness at the location examined had negligible influence on the accuracy of the recorded thickness measurement. The UT procedural requirement for accuracy of UT calibration for material less than 2 inches thickness is =/- .005".

It may be concluded that manual UT measurements for the purpose of extent of condition examinations may be performed without removal of paint on the existing containment liner. The results of those scans will then be evaluated on a case-by-case basis to determine if paint removal will be required in the event that potential externally corroded areas are identified.

Corrective Action Implementation Date: 2/27/2006

■ Signature indicates Corrective Action complete:
Completed By: HEIMEL, T Date: 2/27/2006

■ Signature indicates verification for SCAQ CRs:
Verified By: Date:

■ Enter Name and Sign:
Implementing Organization Approval: REEVES, D Date: 2/27/2006

CORRECTIVE ACTION

NOP-LP-2001-06

CR Number: 06-01122

QUALITY VERIFIER

Comments:

Approval: Date:

CORRECTIVE ACTION

NOP-LP-2001-05

CR Number: 06-01122

ORIGINATOR

CR Category:	Action Type:	Schedule Type:	CA Number:
SR	(U) Other Evaluation	(C) Refuel Outage Required for Implementatio	3

Corrective Action Type:	Cause Code:	Resp Org:
(ES) Evaluation Support	(T19) Corrosion	BVTS

Description:

Following removal of paint from the containment liner cut out location designated as Area #1 and Area #2, perform ultrasonic (UT) autoscans to provide detailed UT thickness measurements of the remaining plate thickness. Report the results of the examinations on appropriate NDE Report forms and provide appropriate detailed information required by the Design Engineering Department to assist in the analytical evaluation of the observed corrosion.

Completed By:	Organization:	Date:	Phone:	Attachments:
HEIMEL, T	BVTS	2/28/2006	7658	☐ Yes ☑ No

ACCEPT

If a Refueling Outage is required, Enter the Refueling Outage number:	Other Tracking #	Corrective Action Due Date:
1R17	N/A	3/29/2006

Approval: (Enter Name and Sign)	Section:	Date:
REEVES, D	BVTS	2/27/2006

QUALITY

Quality Organization Approval:	Date:

IMPLEMENTING ORG

Response:

UT autoscans of areas #1 and #2 were performed on 2/25/2006 and documented on NDE Reports BOP-UT-06-025 and BOP-UT-06-026.

SUMMARY OF RESULTS

Area 1 - Lowest UT thickness found was 0.225" - very small isolated pit.

Area 2 - Lowest UT thickness found was 0.151 - which was at the visible deep pit. An additional thin area in the long diagonal area of corrosion was measured at 0.194" - the remainder of the corroded area was greater than 0.194" - nominal thickness in the unaffected areas was observed to be 0.378" - 0.391".

Results are documented on reports BOP-UT-06-025 and BOP-UT-06-026 in greater detail.

Scanned color .pdf copies of these reports have been placed in the following folder for acess:

S:\AI\ENG\1R17 CONT LINER CORROSION\Autoscan Report Images

Corrective Action Implementation Date: 2/27/2006

■ **Signature Indicates Corrective Action complete:**
Completed By: HEIMEL, T **Date:** 2/27/2006

■ **Signature Indicates verification for SCAQ CRs:**
Verified By: **Date:**

■ **Enter Name and Sign:**
Implementing Organization Approval: REEVES, D **Date:** 2/27/2006

CORRECTIVE ACTION

NOP-LP-2001-05

CR Number: 06-01122

QUALITY VERIFIER

Comments:

Approval: Date:

CORRECTIVE ACTION

NOP-LP-2001-05

CR Number: 06-01122

ORIGINATOR

CR Category:	Action Type:	Schedule Type:	CA Number:
SR	(U) Other Evaluation	(C) Refuel Outage Required for Implementatio	4

Corrective Action Type:	Cause Code:	Resp Org:
(ES) Evaluation Support	(NA) Not a Deficiency	BVTS

Description:

Perform general visual examination of exposed Reinforcing bars at the temporary containment opening to determine if there are any degraded or thinned bars. Document the results on a Visual Examination Report.

Completed By:	Organization:	Date:	Phone:	Attachments:
HEIMEL, T	BVTS	2/27/2006	7658	☐ Yes ☑ No

ACCEPT

If a Refueling Outage is required, Enter the Refueling Outage number:	Other Tracking #	Corrective Action Due Date:
1R17	N/A	3/29/2006

Approval: (Enter Name and Sign)	Section:	Date:
REEVES, D	BVTS	2/27/2006

QUALITY

Quality Organization Approval:	Date:

IMPLEMENTING ORG

Response:

Note - when this corrective action was generated, it was thought that the scope of the inspection was the rebar stubs around the temporary construction opening. It was later determined that the intent of the inspection was to examine the removed rebar rather than the remaining stubs. The initial inspection was performed on 2/25/2006 as described below:

A general Visual Inspection of the reinforcing bars that were removed from the temporary containment opening was performed by a VT Level III on February 25, 2006. The removed bars are being stored on flatbed trailers under plastic in the PAF parking lot. Due to the storage conditions and physical size of the rebar, the visual examination encompassed approximately 50% of the surface areas of the bars.

Of the exposed rebar surfaces examined, only one rebar showed appreciable pitting - Rebar #8-D4B had one area of corrosion and pitting 89 inches from the end of the rebar to the centerline of the pitted area. The pitted area is approximately 9 inches long x 1-1/2" wide. A photograph of the condition is attached to NDE report BOP-VT-06-040.

The examination was documented on Visual Examination Report BOP-VT-06-040. A scanned color copy of the completed report has been placed in the following location:

S:\AI\ENG\1R17 CONT LINER CORROSION\REBAR VISUAL REPORTS

Corrective Action Implementation Date: 2/28/2006

■ **Signature Indicates Corrective Action complete:**

Completed By: HEIMEL, T **Date:** 2/28/2006

■ **Signature Indicates verification for SCAQ CRs:**

CORRECTIVE ACTION

NOP-LP-2001-05

CR Number: 06-01122

Verified By: Date:

Enter Name and Sign:

Implementing Organization Approval: REEVES, D Date: 2/28/2006

QUALITY VERIFIER

Comments:

Approval: Date:

CORRECTIVE ACTION

NOP-LP-2001-05

CR Number: 06-01122

ORIGINATOR

CR Category:	Action Type:	Schedule Type:	CA Number:
SR	(Z) Rollover	(A) Normal Work Management	6

Corrective Action Type:	Cause Code:	Resp Org:
(ES) Evaluation Support	(NA) Not a Deficiency	BVDM

Description:

Condition Report 06-01229 is being categorized as CC and being rolled over to Condition Report 06-01122. Please ensure that all issues specific to Condition Report 06-01229 are addressed in the response/corrective actions to Condition Report 06-01122.

Completed By:	Organization:	Date:	Phone:	Attachments:
ROLLOVER,	BVRC	2/27/2006	0000	☐ Yes ☑ No

ACCEPT

If a Refueling Outage is required, Enter the Refueling Outage number:	Other Tracking #	Corrective Action Due Date:
N/A	N/A	3/22/2006

Approval: (Enter Name and Sign)	Section:	Date:
ROLLOVER,	BVDM	2/27/2006

QUALITY

Quality Organization Approval:	Date:

IMPLEMENTING ORG

Response:

Corrective Action Implementation Date:

■ **Signature indicates Corrective Action complete:**

Completed By: **Date:**

■ **Signature indicates verification for SCAQ CRs:**

Verified By: **Date:**

■ **Enter Name and Sign:**

Implementing Organization Approval: **Date:**

QUALITY VERIFIER

Comments:

Approval: **Date:**

CORRECTIVE ACTION

NOP-LP-2001-05

CR Number: 06-01122

ORIGINATOR

CR Category:	Action Type:	Schedule Type:	CA Number:
SR	(G) Engineering Evaluation	(C) Refuel Outage Required for Implementatio	6

Corrective Action Type:	Cause Code:	Resp Org:
(ES) Evaluation Support	(T19) Corrosion	SGRP

Description:

Obtain two (2) samples of BV-1 RCBX SGR access opening concrete for chemical analysis by BETA Labs. The samples should be taken from the exposed concrete near the liner and at mid-wall. Size should be a minimum of several cubic inches.

Completed By:	Organization:	Date:	Phone:	Attachments:
RITZ, G	SGRP	2/27/2006	5556	☐ Yes ☑ No

ACCEPT

If a Refueling Outage is required, Enter the Refueling Outage number:	Other Tracking #	Corrective Action Due Date:
1R17	N/A	2/27/2006

Approval: (Enter Name and Sign)	Section:	Date:
SOCKACI, T	SGRP	2/27/2006

QUALITY

Quality Organization Approval:	Date:

IMPLEMENTING ORG

Response:

The two (2) concrete samples were taken 2-25-06 as specified. One was provided directly to Dennis Wealdand for transport to BETA Labs. The second was held by Rad Pro due to higher-than-allowable natural occurring radioactivity. The specimen was sent to the BVPS lab and determined to contain Thorium as expected. It was subsequently released 2-26-06, to Warehouse "A" for shipment to BETA.

This activity is considered CLOSED.

Corrective Action Implementation Date: 2/28/2006

■ Signature indicates Corrective Action complete:
Completed By: RITZ, G Date: 2/27/2006

■ Signature indicates verification for SCAQ CRs:
Verified By: Date:

■ Enter Name and Sign:
Implementing Organization Approval: SOCKACI, T Date: 2/27/2006

QUALITY VERIFIER

Comments:

Approval: Date:

CORRECTIVE ACTION

NOP-LP-2001-05

CR Number: 06-01122

ORIGINATOR

CR Category:	Action Type:	Schedule Type:	CA Number:
SR	(E) Modifications Implementation	(C) Refuel Outage Required for Implementatio	7

Corrective Action Type:	Cause Code:	Resp Org:
(RA) Remedial Action	(T08) Abnormal wear	SGRP

Description:

Repair the two areas on the containment liner plate (which were removed and sent to Beta Labs for evaluation). The two areas (identified as Areas 1 and 2) shall be repaired in accordance with Code requirements as set forth in ECP 03-0199. Reference: Bechtel NCR 044

Completed By:	Organization:	Date:	Phone:	Attachments:
MANCUSO, C	BVDM	2/28/2006	7740	☐ Yes ☑ No

ACCEPT

If a Refueling Outage is required, Enter the Refueling Outage number:	Other Tracking #	Corrective Action Due Date:
1R17	NA	3/8/2006

Approval: (Enter Name and Sign)	Section:	Date:
SOCKACI, T	SGRP	3/3/2006

QUALITY

Quality Organization Approval:	Date:

IMPLEMENTING ORG

Response:

Bechtel Partial NCR No. 044 identified three areas of corrosion on the outside surface of the containment liner, where it was in contact with the concrete. Each corroded area was assigned an identity, and its location was marked with white paint markers on the OD surface of the containment liner prior removal of the plate from the containment opening. All three areas were included in the section of plate that was removed. The removed section was moved to the paint shop for further evaluation and repairs.

Visual examinations and wall thickness measurement of the three areas revealed the following conditions.

Area 1 was approximately 2 ft. by 2 ft. and was located near the center of the plate. The area was within a grid marked with white paint on OD surface of the liner. The corroded area had an irregular surface with isolated pits. Ultrasonic wall thickness measurements were made using the "Autoscan" process. The examination was documented in Report BOP UT 06 025. The report included a color-coded map of the degraded area that illustrated the thinning patterns. The minimum reported thickness in the corroded area was 0.225 inches at a pit.

Area 2 was approximately 1 ft. 6 in. by 2 ft. and was located near the right edge of the plate approximately one third of the way up the plate. The area was within a grid marked with white paint on OD surface of the liner. The corroded area had an irregular surface with isolated pits. The corroded area spanned portions of two liner plates and the weld joining them. There was a long, narrow, valley-like thinned area in one of the plates. Ultrasonic wall thickness measurements were made using the "Autoscan" process. The examination was documented in Report BOP UT 06 026. The report included a color-coded map of the degraded area that illustrated the thinning patterns. The minimum reported thickness in the corroded area was 0.151 inches at a pit away from the "valley". Because of the presence of a "leak chase" behind the weld, the Autoscan could

CORRECTIVE ACTION

NOP-LP-2001-05

CR Number: 06-01122

not measure the thickness at the weld or on the second plate. However, the degree of pitting observed visually on the weld and adjacent plate appeared to be less than on the scanned plate.

Area 3 was approximately 8 in. by 1 ft. and was located near the upper left corner of the plate. There is a lifting lug welded to the plate to aid in removal, and the lug encroaches on one end of the corroded area. The degree of corrosion observed in Area 3 is much less than what was seen in the two other areas. Area 3 was not selected for laboratory analysis, since the relatively shallow corrosion was unlikely to shed light on the corrosion mechanism. A manual ultrasonic examination performed on this area at a later date (Report BOP UT 06 035) confirmed the lesser degree of thinning. The plate was essentially at nominal thickness with six small pits (minimum thickness of 0.330 inches) reported.

Areas 1 and 2 were selected for laboratory analysis because of the greater degree of degradation. The size of each removed sample was based on the following considerations. The entire degraded area and the Autoscan reference starting point needed to be within the boundary. The cut line was not to be closer than two inches of the corroded area. The cut was to be made to facilitate sample removal and subsequent restoration of the plate. The samples included any studs and lugs welded to the plate.

NCR-044 has been dispositioned to repair the two areas cut out of the plate. Action is complete.

Corrective Action Implementation Date: 3/3/2006

■ Signature indicates Corrective Action complete:			
Completed By:	SIKORSKI, W	Date:	3/3/2006
■ Signature indicates verification for SCAQ CRs:			
Verified By:	SOCKACI, T	Date:	3/3/2006
■ Enter Name and Sign:			
Implementing Organization Approval:	Halliday, K	Date:	3/4/2006

QUALITY VERIFIER

Comments:

Approval: Date:

CORRECTIVE ACTION

NOP-LP-2001-05

CR Number: 06-01122

ORIGINATOR

CR Category:	Action Type:	Schedule Type:	CA Number:
SR	(U) Other Evaluation	(C) Refuel Outage Required for Implementatio	9

Corrective Action Type:	Cause Code:	Resp Org:
(ES) Evaluation Support	(NA) Not a Deficiency	BVTS

Description:

Perform a visual inspection of the painted areas of the removed containment liner at the two locations that will have paint removed to facilitate ultrasonic autoscan examinations. Document the results of the visual examination on a visual examination report.

Completed By:	Organization:	Date:	Phone:	Attachments:
HEIMEL, T	BVTS	2/28/2006	7658	☐ Yes ☑ No

ACCEPT

If a Refueling Outage is required, Enter the Refueling Outage number:	Other Tracking #	Corrective Action Due Date:
1R17	N/A	3/28/2006

Approval: (Enter Name and Sign)	Section:	Date:
REEVES, D	BVTS	3/2/2006

QUALITY

Quality Organization Approval:	Date:

IMPLEMENTING ORG

Response:

A visual VT-3 examination of the two paint removal areas designated as "Area 1" and "Area 2" was performed on February 25, 2006 prior to the removal of paint. The examination is documented on report BOP-VT-06-041. The extent of the examination was limited to the identified two paint removal areas.

The inspector observed some minor coating damage, with no substrate damage. The observed damage appears to have been caused by handling during removal and transport. No other degradation was observed on the painted areas.

A scanned color copy of Report BOP-VT-06-041 has been placed in the following location:

S:\AllENG\1R17 CONT LINER CORROSION\Removed Liner Visual Reports

Corrective Action Implementation Date: 2/28/2006

■ **Signature indicates Corrective Action complete:**
Completed By: HEIMEL, T **Date:** 2/28/2006

■ **Signature indicates verification for SCAQ CRs:**
Verified By: **Date:**

■ **Enter Name and Sign:**
Implementing Organization Approval: REEVES, D **Date:** 3/2/2006

CORRECTIVE ACTION

NOP-LP-2001-05

CR Number: 06-01122

QUALITY VERIFIER

Comments:

Approval: Date:

CORRECTIVE ACTION

NOP-LP-2001-05

CR Number: 06-01122

ORIGINATOR

CR Category:	Action Type:	Schedule Type:	CA Number:
SR	(U) Other Evaluation	(A) Normal Work Management	8

Corrective Action Type:	Cause Code:	Resp Org:
(ES) Evaluation Support	(NA) Not a Deficiency	BVRC

Description:

Perform an Industry Search of Operating Experience and summarize applicable information.

Completed By:	Organization:	Date:	Phone:	Attachments:
MICKINAC, D	BVRC	3/1/2006	4225	☐ Yes ☑ No

ACCEPT

If a Refueling Outage is required, Enter the Refueling Outage number:	Other Tracking #	Corrective Action Due Date:
N/A	N/A	3/2/2006

Approval: (Enter Name and Sign)	Section:	Date:
MICKINAC, D	BVRC	3/1/2006

QUALITY

Quality Organization Approval:	Date:

IMPLEMENTING ORG

Response:

Summary of Operating Experience for Containment Corrosion

The following is a summary of OE searches for containment corrosion. The associated NRC inspection reports and other information are located on the shared drive used for investigation of this event.

In 2004 the NRC issued Information Notice (IN) 04-09 Corrosion of Steel Containment and Containment Liner. The U.S. Nuclear Regulatory Commission (NRC) issued this information notice to alert addressees to occurrences of corrosion in freestanding metallic containments and in liner plates of reinforced and pre-stressed concrete containments. Previously the NRC issued IN 97-10, "Liner Plate Corrosion in Concrete Containments".

NRC Information Notice 97-10 alerted the industry to occurrences of corrosion of the liner plates of reinforced and pre-stressed concrete containments and to detrimental effects such corrosion could have on containment reliability and availability under design-basis and beyond-design-basis events. Inside surfaces of concrete containments are lined with thin metallic plates, generally between 1/4 and 3/8 inch thick. Normal loads, such as from concrete shrinkage, creep and thermal changes, imposed on the concrete containment structure are transferred to the liner plates through the anchorage system. Internal pressure and temperature loads are directly applied to the liner plate. Thus, under design basis conditions, the liner plate could experience significant strains. Any corrosion (metal thinning) of the liner plate could change the failure threshold of the liner plate under a challenging environmental or accident condition. This may reduce the design margin of safety against postulated accident and environmental loads. Beaver Valley Unit 1 was listed in this IN; however, Beaver Valley Unit 1 was found to be benign from the standpoint of safety.

IN 2004-09 continued with the discussion contained in Information Notice 97-10, "Liner Plate

Corrosion in Concrete Containments," the containment liners have safety factors well above the theoretically calculated strains. Any corrosion (metal thinning) of the liner plate or freestanding metallic containment could change the failure threshold of the containment under a challenging environmental or accident condition. Thinning changes the geometry of the containment shell or liner plate, which may reduce the design margin of safety against postulated accident and environmental loads.

In July of 2002, at the Davis-Besse Nuclear Power Station, the NRC identified corrosion where the containment meets the floor. Davis Besse subsequently performed ultrasonic examinations to confirm that the freestanding metal containment had not been corroded below the minimum design thickness. Davis Besse subsequently installed a moisture barrier at the containment-to-floor junction to prevent moisture intrusion.

In May of 2002, at the Sequoyah Nuclear Plant, Unit 2, the NRC identified areas of the steel containment vessel with degraded coatings and rust One of the floor drains was clogged in the annulus area (1.5 m [5 feet] wide) between the containment vessel and the reinforced concrete shield building. Localized water ponding at the clogged drain had come in contact with a section of the SCV, causing deterioration of the SCV coatings and rusting of the containment vessel.

In November of 2001, the Dresden Unit 2 Nuclear Power Station identified an area of missing coating and primer encircling the drywell shell adjacent to the basement floor. The area was 5-10 cm (2-4 inches) wide. In this area, the base metal of the drywell shell was found to be corroded. However, based on ultrasonic and visual examinations, the degraded area was found to be within the corrosion allowance for the drywell shell. The shell coating was repaired in this area to prevent further degradation

In March of 2001, the D. C. Cook Nuclear Power Plant, discovered a through-wall hole in the containment liner plate. Surface preparation for further inspection of a weld repair of the liner plate dislodged the repair material, leaving a hole. The hole was repaired. However, further examination of the repair area indicated corrosion of the liner from the embedded side of the liner. The cause of this corrosion was found to be a wire brush handle lodged in the concrete at the interface with the liner. DC Cook replaced an area about 30 cm (12 inches) square in the liner plate and performed a local leak rate test.

In February and March of 1998, D. C. Cook identified corrosion (pitting) of the containment liner at the moisture barrier seal areas of both units. At Unit 1, the licensee identified more than 60 areas in which the thickness (1 cm [3/8 inch] nominally) of the steel liner plate had been reduced below the minimum design thickness value of (0.6 cm [0.25 inch]).

In fall 2003, at the Surry Power Station, Unit 2, NRC inspectors found degraded coatings and rust on the containment liner at the junction of the metal liner and interior concrete floor. The inspectors also discovered that the moisture barrier at the junction between the metal liner plate and interior concrete floor was degraded.

In October of 1999, the Palisades Plant discovered that a floor-to-liner moisture barrier seal had never been installed and used a thin metal blade as a probe, confirming the presence of moisture in the crevice. Subsequently, they used a borescope to identify areas of liner corrosion. They determined that the corrosion had not yet appreciably degraded the liner in this area and installed a new liner-to-floor moisture barrier seal.

CORRECTIVE ACTION

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CR Number: 06-01122

In May of 1999, at the Brunswick Steam Electric Plant, Unit 2, they identified three areas in the drywell liner where corrosion had penetrated the liner. These areas were at the 5.5, 16, and 21 m (18, 52, and 70 feet) elevations. At the 16 m elevation, the wall had corroded from the outside to the inside surface. At the 21 m elevation, the wall had corroded from the inside to the outside surface. At the 5.5 m elevation, the direction of the through-wall corrosion could not be determined. The liner corrosion was a result of foreign materials embedded in the concrete containment adjacent to the liner. One hole in the liner was adjacent to a leather work glove found buried in the concrete, while the other two hole locations were adjacent to wood found buried in the concrete.

In December, 1996, at the H.B. Robinson Steam Electric Plant, Unit 2, an NRC inspector identified degraded caulking and insulation sheathing panels during a containment walkdown. The vertical portion of the containment liner at Robinson is protected by Vinylcel insulation, a polyvinyl chloride material, and a metal sheathing material. H. B. Robinson determined that a portion of this insulation sheathing material was loose and that some of the caulking between the sheathing panels was deteriorated. After examination during subsequent refueling outages, they determined that the protective coating for the containment liner was degraded and that while some corrosion of the containment liner had
occurred, the liner met design requirements.

Corrective Action Implementation Date: 3/1/2006

■ Signature indicates Corrective Action complete:
Completed By: MICKINAC, D Date: 3/1/2006

■ Signature indicates verification for SCAQ CRs:
Verified By: Date:

■ Enter Name and Sign:
Implementing Organization Approval: EBECK, E Date: 3/2/2006

QUALITY VERIFIER

Comments:

Approval: Date:

CORRECTIVE ACTION

NOP-LP-2001-05

CR Number: 06-01122

ORIGINATOR

CR Category:	Action Type:	Schedule Type:	CA Number:
SR	(G) Engineering Evaluation	(A) Normal Work Management	10

Corrective Action Type:	Cause Code:	Resp Org:
(ES) Evaluation Support	(T19) Corrosion	SGRP

Description:

Contact D.C.Cook regarding their liner corrosion issues. Determine circumstances, investigation extent / techniques, reportability, repair and continuing monitoring.

Completed By:	Organization:	Date:	Phone:	Attachments:
RITZ, G	SGRP	3/1/2006	5556	☐ Yes ☑ No

ACCEPT

If a Refueling Outage is required, Enter the Refueling Outage number:	Other Tracking #	Corrective Action Due Date:
1R17	N/A	3/2/2006

Approval: (Enter Name and Sign)	Section:	Date:
SOCKACI, T	SGRP	3/1/2006

QUALITY

Quality Organization Approval:	Date:

IMPLEMENTING ORG

Response:

Mr. Jim Fitchunk (IWE owner) at D.C. Cook was contacted and provided the following information:

1. D. C. Cook (DCC) had three fundamentally distinct liner problems - (a) Water penetrated the wall-to-slab seal (caulk) at the RCBX floor level and caused corrosion at approximately 60 locations (some below min. wall); (b) surface rust existed in the ice condenser area; (c) a man-made hole (3/8 in.+/- dia., filled with an unknown material) behind which was a void and wire brush. The conditions were submitted as LER's.

2. The item (a) condition resulted from water intrusion behind the liner at the floor level, due to failure of the seal (caulking) between the concrete wall and foundation slab. The liner was removed and concrete excavated. The liner was thinned below minimum acceptable wall thickness at numerous locations. However, a structural evaluation demonstrated that the liner had sufficient strength as-found. The concrete was found to have low "pH", which is considered to be beneficial.

3.Item (b) involved rust on the interior surface of the liner due to condensate near a curtain section at the ice condenser unit. The rust was easily removed and NDE identified no liner thinning. The area was then repainted. The area was monitored throughout the cycle.

4. Item (c) exhibited some rust/blackening around a circular area (3/8 in. dia.); which when removed, resulted in the filler being lost and the hole becoming obvious. Subsequently, an 8" X 8" section of plate was removed, which revealed a void and a wire brush. It was obvious that some work during plant construction had been done around the hole on the outside, and that the hole was man-made. Consequently, no extent-of-condition was performed, and a section of the liner was simply replaced.

Conclusion - None of the conditions found at DCC directly parallel BVPS's degraded liner situation.

CORRECTIVE ACTION

NOP-LP-2001-05

CR Number: 06-01122

BVPS has general corrosion at higher elevations without an apparent abundance of water. The debris at DCC did not cause the discovered hole, although it may have contributed to minor rusting. At BVPS, no debris was found that could have been behind the corroded areas - although this cannot be entirely discounted because of the destructive nature of the hydrolasing concrete removal process. Lastly, no interior surface rust was found at BVPS that could be associated with the corroded areas on the exterior.

Corrective Action Implementation Date: 3/1/2006

■ Signature indicates Corrective Action complete:

Completed By: RITZ, G Date: 3/2/2006

■ Signature indicates verification for SCAQ CRs:

Verified By: Date:

■ Enter Name and Sign:

Implementing Organization Approval: HALLIDAY, KE Date: 3/2/2006

QUALITY VERIFIER

Comments:

Approval: Date:

CORRECTIVE ACTION

NOP-LP-2001-05

CR Number: 06-01122

ORIGINATOR

CR Category:	Action Type:	Schedule Type:	CA Number:
SR	(P) Procedure - New / Revision	(A) Normal Work Management	11

Corrective Action Type:	Cause Code:	Resp Org:
(ES) Evaluation Support	(NA) Not a Deficiency	BVPE

Description:

Review 1BVT 1.47.1, "Containment Structural Integrity Test" and determine if additional steps are needed to augment the procedure. This review should solicit responses from the containment program owners at Perry and Davis Besse.

Completed By:	Organization:	Date:	Phone:	Attachments:
PATTERSON, JS	BVPE	3/1/2006	4992	☑ Yes ☐ No

ACCEPT

If a Refueling Outage is required, Enter the Refueling Outage number:	Other Tracking #	Corrective Action Due Date:
N/A	N/A	3/15/2006

Approval: (Enter Name and Sign)	Section:	Date:
LIEB, R	BVPE	3/2/2006

QUALITY

Quality Organization Approval:	Date:

IMPLEMENTING ORG

Response:

1BVT 1.47.1, "Containment Structural Integrity Test" was revised with an effective date of 3/10/06. Comments were solicited from the containment program owners at Perry Nuclear Plant and Davis Besse Nuclear Plant. The comments included: qualifications of the inspectors, how deficiencies are addressed, additional references, and minor editorial changes.

The existing procedure (Revision 6) will be replaced with the revised procedure (Revision 7) and will be completed during 1R17.

Corrective Action Implementation Date: 3/10/2006

■ Signature Indicates Corrective Action complete:
Completed By: PATTERSON, JS Date: 3/10/2006

■ Signature Indicates verification for SCAQ CRs:
Verified By: Date:

■ Enter Name and Sign:
Implementing Organization Approval: HOVANEC, S Date: 3/11/2006

QUALITY VERIFIER

Comments:

Approval: Date:

CORRECTIVE ACTION

NOP-LP-2001-05

CR Number: 06-01122

ORIGINATOR

CR Category:	Action Type:	Schedule Type:	CA Number:
SR	(G) Engineering Evaluation	(A) Normal Work Management	12

Corrective Action Type:	Cause Code:	Resp Org:
(ES) Evaluation Support	(NA) Not a Deficiency	BVPE

Description:

Review the past performances of 1BVT 1.47.1, "Containment Structural Integrity Test" and summarize the results of past inspections. This review should include as a minimum: Condition Reports, Corrective Actions, Engineering Memorandums, and Work Orders.

Note: Corrective Action 03-03893-03 and associated Order 200020421 which identified two rust spots on the BVPS-1 Containment Dome is still open and currently scheduled for 1R17.

Completed By:	Organization:	Date:	Phone:	Attachments:
PATTERSON, JS	BVPE	3/1/2006	4992	☐ Yes ☑ No

ACCEPT

If a Refueling Outage is required, Enter the Refueling Outage number:	Other Tracking #	Corrective Action Due Date:
N/A	N/A	3/10/2006

Approval: (Enter Name and Sign)	Section:	Date:
LIEB, R	BVPE	3/2/2006

QUALITY

Quality Organization Approval:	Date:

IMPLEMENTING ORG

Response:

Summary of test results from 1BVT 01.47.01

The Containment Structural Integrity Test is performed every other outage to comply with Technical Specifications 4.6.1.6.1 and 4.6.1.6.2. This test is to verify the structural integrity of the containment liner plate, containment liner test channels and external concrete surface by a general visual inspection of the accessible surfaces per Tech Spec requirements. The following is a history of the overall results for 1BVT 01.47.01 from 1R15 to 1R01 (since Unit 1 has been performing this test).

1R15 and 1M02 (Test Completed 04/21/03)

1BVT 01.47.01 was split between 1R15 and 1M02. The exterior concrete surface inspection was performed during 1M02 and the interior steel liner inspection was performed during 1R15. All deficiencies were minor in nature and would not affect containment structural integrity. The exterior concrete surface deficiencies were evaluated per CR 02-10412. The interior steel liner deficiencies were repaired per Work Orders 03-005035 and 03-005042. Four deficiencies were not repaired; two small rust spots on the containment dome, a steel cable attached to the center of the containment dome and numerous scratches on all elevations caused by equipment staging were not repaired. These deficiencies were considered cosmetic in nature and were addressed by CR 03-03893. CA 03-03893-003 tracks SAP order 200020421 to complete the repair of a small rust spot on the weld to the right of the H2 recombiner suction piping (cnmt dome), a small rust spot on weld attachment for recirc spray piping support (cnmt dome) and removal of a steel cable that is attached at the top of the containment dome liner.

1R13 (Test Completed 04/05/00)

Several deficiencies were identified for the exterior concrete surface, which were not previously identified. These deficiencies were minor in nature and would not affect the structural integrity of Containment. Several deficiencies were identified for the steel liner, primarily involving peeling or damaged paint. Work Orders 00-004640 and 00-005099 cleaned and repainted these areas. Except for the extremely high areas where scaffolding was required. All deficiencies were evaluated by Engineering per EM #200460 and determined not to affect the containment structural integrity.

1R11 (Test Completed 04/26/96)

All deficiencies identified during the inspection of the containment steel liner and concrete with the exception of peeling paint were previously identified and evaluated during prior performances. The peeling paint was repaired per MWR #51503 and re-verified acceptable.

1R09 (Test Completed 05/13/93)

Two areas were noted with drilled holes into the concrete. One area was exterior by the equipment hatch and the other interior in the Safeguards deep pit. EM 105213 was initiated to verify that these holes would not affect the performance of the containment structure during the Type A Test and to re-verify the concerns identified in the last performance of the this test (1R07) would not affect containment performance. EM 105213 was answered that the containment structure would not be affected by the items identified. MWR 19394 was initiated to repair the peeling paint around an electrical penetration which is considered a cosmetic concern. A rusting vent plug was identified on the interior dome surface but it was also considered cosmetic by EM 105213.

1R07 (Test Completed 10/28/89).

EM 22614 was used to identify deficiencies cited on the Reactor Building Containment concrete. The response to EM 22614 was no corrective actions were needed.

1R05 (Test Completed 7/18/86)

The inspection noted deficiencies pertaining to the exterior concrete surface, interior steel liner and dome and interior concrete surface most of which were identified in earlier performances of 1BVT 01.47.01. There were five deficiencies including the two gouges which were not recorded in earlier exams. There was minor separation of concrete at the transition region between the dome and cylinder, peeling paint on the exterior concrete surface in the safeguard's pipe chase and a rust spot on the interior dome liner. An MWR was issued to repaint the exterior concrete surface per PMM-S7 and the separation was deemed acceptable per EM 61846.

1R03 (Test Completed 4/15/82)

The inspection of the reactor containment structure revealed no major or gross deterioration of either the outer concrete structure or inside steel liner which would affect is structural integrity. The dome steel liner had one unfilled construction anchor which had a rust streak from it. Two major rust spots were discover on the containment linear along with three minor areas of point peeling. A maintenance work request corrected and these areas.

1R01 (Test Completed 10/20/78)

The inspection of the Reactor Containment structural integrity revealed no major or gross structural deterioration on the outer concrete surface or the inside steel liner which would present a hazard to

CORRECTIVE ACTION

NOP-LP-2001-05

CR Number: 06-01122

the outer concrete structure which could affect the structural integrity of the containment.

No further action is required for this corrective action.

Corrective Action Implementation Date: 3/3/2006

■ Signature indicates Corrective Action complete:

Completed By: STRAZISAR, K Date: 3/3/2006

■ Signature indicates verification for SCAQ CRs:

Verified By: Date:

■ Enter Name and Sign:

Implementing Organization Approval: HOVANEC, S Date: 3/3/2006

QUALITY VERIFIER

Comments:

Approval: Date:

CORRECTIVE ACTION

NOP-LP-2001-05

CR Number: 06-01122

ORIGINATOR

CR Category:	Action Type:	Schedule Type:	CA Number:
SR	(G) Engineering Evaluation	(A) Normal Work Management	13

Corrective Action Type:	Cause Code:	Resp Org:
(ES) Evaluation Support	(NA) Not a Deficiency	BVTS

Description:

Review past performances of 1BVT 1.47.2, "Containment Type A Leak Test" for any degrading trends or issues.

Completed By:	Organization:	Date:	Phone:	Attachments:
GALLAGHER, J	BVTS	3/1/2006	7605	☑ Yes ☐ No

ACCEPT

If a Refueling Outage is required, Enter the Refueling Outage number:	Other Tracking #	Corrective Action Due Date:
N/A	N/A	4/2/2006

Approval: (Enter Name and Sign)	Section:	Date:
REEVES, D	BVTS	3/2/2006

QUALITY

Quality Organization Approval:	Date:

IMPLEMENTING ORG

Response:

Below is a tabulation of the results of the Type "A" Containment Integrated Leakage Rate Tests (ILRT) performed at Beaver Valley Unit 1 since 1978.

The Acceptance Criteria for the ILRT is < 0.75 La or < 0.075 %/day in accordance with Appendix J to 10CFR50.

Test Date	Results (%/day)
5/29/1993	0.014957
12/14/1989	0.031672
8/3/1986	0.014257
6/10/1982	0.0376
11/23/1978	0.0406

All ILRT leakage results were well below the Acceptance Criteria of < 0.075 %/day. Based on the results of these ILRTs, there is no indication of any increased leakage trend. In fact, the linear trend line in the graphical representation (See attachment) clearly indicates a "decreasing" trend in the results of the leakage results of the ILRTs.

The intent of the ILRT is to verify the leak-tight integrity of the primary reactor containment and to measure the total reactor containment leakage to assure this leakage is within the limits set by the plant's Technical Specifications in accordance with Appendix J to 10CFR50

Corrective Action Implementation Date: 3/2/2006

■ Signature indicates Corrective Action complete:

CORRECTIVE ACTION

NOP-LP-2001-05

CR Number: 06-01122

Completed By: GALLAGHER, J Date: 3/2/2006

■ Signature indicates verification for SCAQ CRs:

Verified By: Date:

■ Enter Name and Sign:

Implementing Organization Approval: REEVES, D Date: 3/2/2006

QUALITY VERIFIER

Comments:

Approval: Date:

CORRECTIVE ACTION

NOP-LP-2001-05

CR Number: 06-01122

ORIGINATOR

CR Category:	Action Type:	Schedule Type:	CA Number:
SR	(G) Engineering Evaluation	(A) Normal Work Management	14

Corrective Action Type:	Cause Code:	Resp Org:
(ES) Evaluation Support	(NA) Not a Deficiency	BVDM

Description:

Perform historical search for initial installation and inspection documents for the Containment Liner and the Containment concrete wall in the general area of the new construction opening.

Completed By:	Organization:	Date:	Phone:	Attachments:
SPAMPINATO, M	BVDM	3/2/2006	5530	☐ Yes ☑ No

ACCEPT

If a Refueling Outage is required, Enter the Refueling Outage number:	Other Tracking #	Corrective Action Due Date:
N/A	N/A	3/10/2006

Approval: (Enter Name and Sign)	Section:	Date:
EBECK, E	BVDM	3/4/2006

QUALITY

Quality Organization Approval:	Date:

IMPLEMENTING ORG

Response:

This search was initiated to support the disposition of the areas of the Reactor Containment liner that displayed pitting and corrosion. These pitted areas were revealed when the concrete was removed as part of the effort to create a construction opening in the Containment wall for the Steam Generator Replacement Project. The bounderies of the affected area, for records search purposes, were as follows: fifteen (15) degrees east and west of the south centerline of containment, from elevation 771'-4" to elevation 792'-2". The goal was to verify whether the pitted areas found on the exposed liner were identified in any previous inspection, especially during Unit 1's initial construction phase. * The search included documents related to both interior and exterior surfaces of the liner plate. (* E.E. Ebeck)

Focus areas were:

1. "Shop Fabrication and Field Erection of Reactor Containment Steel Liner Plate", specification number BVS-136, purchase order BVC-65,
2. "Mixing and Delivering Fly Ash Concrete for Beaver Valley Power Station-Unit No. 1", specification number BVS-158, purchase order BVC-1155,
3. "Fly Ash Concrete Testing", specification number BVS-195, and
4. "Placing Fly Ash Reinforced Concrete for Beaver Valley Power Station-Unit No. 1", specification number BVS-197.

Within each of these focus areas, the following records were reviewed:

1. Project Specifications
2. Purchase Order documentation
3. Material Certifications for the liner plates (physical and chemical properties)
4. Records of welding materials

5. Physical and chemical properties of fly ash
6. Physical and chemical properties of concrete
7. Chemical analysis of water used in mixing concrete
8. Design drawings (08700-RV-001 series)
9. Graver Tank & Mfg. Co. drawings (08700-03.012 series - liner fabricator and installer)
10. Graver Tank & Mfg. Co. field sketches (rollouts)
11. Graver Tank & Mfg. Co. Non-Destructive Testing procedures
12. Graver Tank & Mfg. Co. Shop & Field Cleaning and Painting procedure
13. Graver Tank & Mfg. Co. procedure for Shop Fabricating Tolerances for Field Erected Material
14. Graver Tank & Mfg. Co. procedure number 206 (Automatic Submerged Arc Welding - applies to horizontal welds of liner plates)
15. Graver Tank & Mfg. Co. procedure number 205 (Manual Metal Arc Welding - applies to vertical welds of liner plates)
16. Graver Tank & Mfg. Co. QC Manual
17. Job books
18. Concrete Pour Cards
19. Non-Conformance and Disposition Reports (N&Ds)
20. QC Inspection Reports
21. Radiographic Examination Reports
22. Interoffice Correspondence

The Project Specifications gave direction as to the types of records required to be provided to Stone & Webster Quality Control. From this information, and using historical documentation from purchase orders and test and installation documents, many of the records listed above were able to be retrieved. Relative to the liner plates, positive unique identifications of the plates that showed pitting have been made. The plates are ASTM A516 Gr 60, with a nominal size of 3/8" x 10'-5" x 32'-11 3/4". Two of the plates are in the ninth (9th) ring of plates, with a bottom of plate elevation of 771'-4" and a top of plate elevation of 781'-9". In the ninth ring, the two plates straddle the south centerline of Containment. Plate number B6-11 is situated immediately west of the south centerline (looking from inside Containment), and plate number B6-12 is situated immediately to the east (looking from inside Containment). Additionally, one plate is located in the tenth (10th) ring of plates, with a bottom of plate elevation of 781'-9" and a top of plate elevation of 792'-2". This plate is identified as B7-7, and is centered on the south centerline of Containment. Purchase order and job book documentation searches concentrating on these plates provided plate material certifications, weld material certifications, welding, cleaning, and painting procedures and inspection reports. Plate inspections included ultrasonic, dye penetrant, and radiographic. None of these reports indicated that there were any problems with any of the plates through fabrication and installation.

Graver Tank & Mfg. Co. drawings and field sketches provided the ability to identify each plate of the shell liner with a unique number. They also showed information relative to radiographs and shell testing. No radiographs were taken near the pitted areas of the plates.

Concrete pour cards, N&Ds, QC Inspection Reports, and Interoffice Correspondences were reviewed for the purpose of trying to determine if there were any other problems identified during construction of the Containment liner and concrete wall. No problems were identified.

Plate material certifications, weld material certifications, and fly ash, concrete, and water analysis reports were retrieved for use in helping to determine a cause for the pitting. Fabrication, testing, and weld procedures were also provided for this reason.

In summary and pending evaluation of the concrete and plate chemical analyses, no historical records were found to indicate any problems with these liner plates or concrete local to the pitted

CORRECTIVE ACTION

NOP-LP-2001-05

CR Number: 06-01122

areas.

Corrective Action Implementation Date: 3/5/2006

■ Signature Indicates Corrective Action complete:

Completed By: SPAMPINATO, M Date: 3/5/2006

■ Signature Indicates verification for SCAQ CRs:

Verified By: Date:

■ Enter Name and Sign:

Implementing Organization Approval: EBECK, E Date: 3/9/2006

QUALITY VERIFIER

Comments:

Approval: Date:

CORRECTIVE ACTION

NOP-LP-2001-05

CR Number: 06-01122

ORIGINATOR

CR Category:	Action Type:	Schedule Type:	CA Number:
SR	(U) Other Evaluation	(C) Refuel Outage Required for Implementatio	16

Corrective Action Type:	Cause Code:	Resp Org:
(ES) Evaluation Support	(NA) Not a Deficiency	BVTS

Description:

Perform a manual UT thickness scan on the third rusted area of the removed containment liner plate (designated as area 3). This area at the upper left corner of the removed plate is approximately 23 inches wide x 7 inches high.
Document the results of the UT thickness examination on an appropriate NDE Examination report, noting the thinnest area(s) observed.

Completed By:	Organization:	Date:	Phone:	Attachments:
HEIMEL, T	BVTS	3/2/2006	7658	☐ Yes ☑ No

ACCEPT

If a Refueling Outage is required, Enter the Refueling Outage number:	Other Tracking #	Corrective Action Due Date:
1R17	N/A	3/23/2006

Approval: (Enter Name and Sign)	Section:	Date:
REEVES, D	BVTS	3/2/2006

QUALITY

Quality Organization Approval:	Date:

IMPLEMENTING ORG

Response:

Manual UT thickness examination was performed on 3/1/2006 and documented on report BOP-UT-06-035. The examination was performed using a DMS2E A-scan digital thickness instrument. In summary, the examination showed the area to be .375" - .395" in thickness. The lowest observed value in the area of pitting was 0.330", with several other pits ranging in thickness from .335" to .353". Additional detail may be found in the NDE examination report. A color scanned image of the report is in the following location:

S:\All\ENG\1R17 CONT LINER CORROSION\Manual UT Reports

Corrective Action Implementation Date: 3/2/2006

■ Signature indicates Corrective Action complete:
Completed By: HEIMEL, T Date: 3/2/2006

■ Signature indicates verification for SCAQ CRs:
Verified By: Date:

■ Enter Name and Sign:
Implementing Organization Approval: REEVES, D Date: 3/2/2006

QUALITY VERIFIER

Comments:

Approval: Date:

CORRECTIVE ACTION

NOP-LP-2001-05

CR Number: 06-01122

ORIGINATOR

CR Category:	Action Type:	Schedule Type:	CA Number:
SR	(G) Engineering Evaluation	(A) Normal Work Management	16

Corrective Action Type:	Cause Code:	Resp Org:
(ES) Evaluation Support	(T19) Corrosion	SGRP

Description:

Determine and identify how many sample(s) for lab analysis and document justification and thought process.

Completed By:	Organization:	Date:	Phone:	Attachments:
SIKORSKI, W	SGRP	3/3/2006	5875	☐ Yes ☑ No

ACCEPT

If a Refueling Outage is required, Enter the Refueling Outage number:	Other Tracking #	Corrective Action Due Date:
1R17	N/A	3/3/2006

Approval: (Enter Name and Sign)	Section:	Date:
SOCKACI, T	SGRP	3/3/2006

QUALITY

Quality Organization Approval:	Date:

IMPLEMENTING ORG

Response:

Bechtel Partial NCR No. 044 identified three areas of corrosion on the outside surface of the containment liner, where it was in contact with the concrete. Each corroded area was assigned an identity, and its location was marked with white paint markers on the OD surface of the containment liner prior removal of the plate from the containment opening. All three areas were included in the section of plate that was removed. The removed section was moved to the paint shop for further evaluation and repairs.

Visual examinations and wall thickness measurement of the three areas revealed the following conditions.

Area 1 was approximately 2 ft. by 2 ft. and was located near the center of the plate. The area was within a grid marked with white paint on OD surface of the liner. The corroded area had an irregular surface with isolated pits. Ultrasonic wall thickness measurements were made using the "Autoscan" process. The examination was documented in Report BOP UT 06 025. The report included a color-coded map of the degraded area that illustrated the thinning patterns. The minimum reported thickness in the corroded area was 0.225 inches at a pit.

Area 2 was approximately 1 ft. 6 in. by 2 ft. and was located near the right edge of the plate approximately one third of the way up the plate. The area was within a grid marked with white paint on OD surface of the liner. The corroded area had an irregular surface with isolated pits. The corroded area spanned portions of two liner plates and the weld joining them. There was a long, narrow, valley-like thinned area in one of the plates. Ultrasonic wall thickness measurements were made using the "Autoscan" process. The examination was documented in Report BOP UT 06 026. The report included a color-coded map of the degraded area that illustrated the thinning patterns. The minimum reported thickness in the corroded area was 0.151 inches at a pit away from the "valley". Because of the presence of a "leak chase" behind the weld, the Autoscan could

not measure the thickness at the weld or on the second plate. However, the degree of pitting observed visually on the weld and adjacent plate appeared to be less than on the scanned plate.

Area 3 was approximately 8 in. by 1 ft. and was located near the upper left corner of the plate. There is a lifting lug welded to the plate to aid in removal, and the lug encroaches on one end of the corroded area. The degree of corrosion observed in Area 3 is much less than what was seen in the two other areas. Area 3was not selected for laboratory analysis, since the relatively shallow corrosion was unlikely to shed light on the corrosion mechanism. A manual ultrasonic examination performed on this area at a later date (Report BOP UT 06 035) confirmed the lesser degree of thinning. The plate was essentially at nominal thickness with six small pits (minimum thickness of 0.330 inches) reported.

Areas 1 and 2 were selected for laboratory analysis because of the greater degree of degradation. The size of each removed sample was based on the following considerations. The entire degraded area and the Autoscan reference starting point needed to be within the boundary. The cut line was not to be closer than two inches of the corroded area. The cut was to be made to facilitate sample removal and subsequent restoration of the plate. The samples included any studs and lugs welded to the plate.

Corrective Action Implementation Date: 3/3/2006

■ Signature indicates Corrective Action complete:
Completed By: SIKORSKI, W Date: 3/3/2006

■ Signature indicates verification for SCAQ CRs:
Verified By: Date:

■ Enter Name and Sign:
Implementing Organization Approval: SOCKACI, T Date: 3/3/2006

QUALITY VERIFIER

Comments:

Approval: Date:

CORRECTIVE ACTION

NOP-LP-2001-05

CR Number: 06-01122

ORIGINATOR

CR Category:	Action Type:	Schedule Type:	CA Number:
SR	(G) Engineering Evaluation	(C) Refuel Outage Required for Implementatio	17

Corrective Action Type:	Cause Code:	Resp Org:
(ES) Evaluation Support	(NA) Not a Deficiency	BVPE

Description:

During the performance of 1BVT 1.47.1, "Containment Structural Integrity Test" during 1R15 the following deficiencies were noted on the Unit #1 Reactor Containment Building steel liner:

1. Small rust spot on the weld to the right of the H2 recombiner suction piping (cnmt dome).
2. Small rust spot on weld attachment for recirc spray piping support (cnmt dome).
3. A steel cable is attached at the top of the containment dome liner and is hanging approximately 15' down from the dome. This cable serves no purpose and should be removed.

These items were identified on SAP Order 200020421 and is currently scheduled for performance during 1R17. The Containment System Engineer should ensure that these items are satisfactorily resolved prior to closing out the containment building at the completion of 1R17.

Assign to Patterson

Completed By:	Organization:	Date:	Phone:	Attachments:
STRAZISAR, K	BVPE	3/3/2006	7371	☐ Yes ☑ No

ACCEPT

If a Refueling Outage is required, Enter the Refueling Outage number:	Other Tracking #	Corrective Action Due Date:
1R17	N/A	4/15/2006

Approval: (Enter Name and Sign)	Section:	Date:
HOVANEC, S	BVPE	3/8/2006

CORRECTIVE ACTION

NOP-LP-2001-05

CR Number: 06-01122

QUALITY	Quality Organization Approval:	Date:

IMPLEMENTING ORG

Response:

Corrective Action Implementation Date:

■ Signature indicates Corrective Action complete:
Completed By: Date:

■ Signature indicates verification for SCAQ CRs:
Verified By: Date:

■ Enter Name and Sign:
Implementing Organization Approval: Date:

QUALITY VERIFIER

Comments:

Approval: Date:

CORRECTIVE ACTION

NOP-LP-2001-05

CR Number: 06-01122

ORIGINATOR

CR Category:	Action Type:	Schedule Type:	CA Number:
SR	(G) Engineering Evaluation	(C) Refuel Outage Required for Implementatio	18

Corrective Action Type:	Cause Code:	Resp Org:
(ES) Evaluation Support	(NA) Not a Deficiency	FMEN

Description:

Report by vendor (Eldon Dilie) assessing the as-found condition of the liner plate, the data from Beta Laboratory of the corrosion area and of the concrete. This report should provide technical assessment of the data and provide documented basis for the conclusions provided to FENOC Engineering.

Completed By:	Organization:	Date:	Phone:	Attachments:
WEAKLAND, D	FMEN	3/6/2006	825-3749	☐ Yes ☑ No

ACCEPT

If a Refueling Outage is required, Enter the Refueling Outage number:	Other Tracking #	Corrective Action Due Date:
N/A	N/A	4/4/2006

Approval: (Enter Name and Sign)	Section:	Date:
ROGERS, J	FMEN	3/6/2006

QUALITY

Quality Organization Approval:	Date:

IMPLEMENTING ORG

Response:

Corrective Action Implementation Date:

■ Signature Indicates Corrective Action complete:
Completed By: Date:

■ Signature Indicates verification for SCAQ CRs:
Verified By: Date:

■ Enter Name and Sign:
Implementing Organization Approval: Date:

QUALITY VERIFIER

Comments:

Approval: Date:

CORRECTIVE ACTION

NOP-LP-2001-05

CR Number: 06-01122

ORIGINATOR

CR Category:	Action Type:	Schedule Type:	CA Number:
SR	(G) Engineering Evaluation	(C) Refuel Outage Required for Implementatio	18

Corrective Action Type:	Cause Code:	Resp Org:
(ES) Evaluation Support	(NA) Not a Deficiency	FMEN

Description:

Utilize the report identified in CA 06-01122-18, along with the Beta Laboratory Report to provide a review of the information. Conclusions and evaluation assessment to be documented in this CA as to a potential cause of pitting observed.

Completed By:	Organization:	Date:	Phone:	Attachments:
WEAKLAND, D	FMEN	3/6/2006	625-3749	☐ Yes ☑ No

ACCEPT

If a Refueling Outage is required, Enter the Refueling Outage number:	Other Tracking #	Corrective Action Due Date:
N/A	N/A	4/4/2006

Approval: (Enter Name and Sign)	Section:	Date:
ROGERS, J	FMEN	3/9/2006

QUALITY

Quality Organization Approval:	Date:

IMPLEMENTING ORG

Response:

A summary report of the conditions, data and Industry Expert was completed on March 13, 2006 and is included as Attachment 10 to overall CR 06-01122 response. This response is located at S:/All/ENG/1R17 CONT LINER CORROSION/Draft Position Paper/Attachment 10

Corrective Action Implementation Date:

■ Signature indicates Corrective Action complete:
Completed By: WEAKLAND, D Date: 3/14/2006

■ Signature indicates verification for SCAQ CRs:
Verified By: Date:

■ Enter Name and Sign:
Implementing Organization Approval: Date:

QUALITY VERIFIER

Comments:

Approval: Date:

CORRECTIVE ACTION

NOP-LP-2001-05

CR Number: 06-01122

ORIGINATOR

CR Category:	Action Type:	Schedule Type:	CA Number:
SR	(G) Engineering Evaluation	(A) Normal Work Management	20

Corrective Action Type:	Cause Code:	Resp Org:
(ES) Evaluation Support	(T19) Corrosion	BVDM

Description:

Contact Dominion Power regarding their liner corrosion issues. Determine circumstances, investigation, extent/ techniques, reportability, repair and continued monitoring.

Completed By:	Organization:	Date:	Phone:	Attachments:
WESTBROOK, GT	BVDM	3/4/2006	7894	☐ Yes ☑ No

ACCEPT

If a Refueling Outage is required, Enter the Refueling Outage number:	Other Tracking #	Corrective Action Due Date:
N/A	N/A	3/4/2006

Approval: (Enter Name and Sign)	Section:	Date:
MANCUSO, C	BVDM	3/4/2006

QUALITY

Quality Organization Approval:	Date:

IMPLEMENTING ORG

Response:

Mr. Bob Pavlik (IWL owner) and Mr. Alex McNeil (IWE owner) at Dominion's corporate office were contacted.

Mr. Pavlik provided the following information:

Dominion has had two events involving wood embedded in the concrete of the containment structure. The first instance was a 4"x4" x 6 foot long timber embedded in the concrete against the liner at North Anna #2. The wood was discovered during investigation of a through liner hole. The wood was immediately behind the liner at the location of the through liner hole. The areas of the liner in the vicinity of the wood were less than minimum required thickness were replaced.
At North Anna #1 several pieces of wood were found embedded in the surface of the concrete. Most were determined to have shallow embedment. However, the worst instance was a 2"x 2" piece of wood that ran from the concrete surface to the liner. The wood was found during the IWL visual inspection of the exterior concrete. The wood was removed and the liner thickness checked. No section loss was found on the liner at this location. The liner thickness was equal to or greater than the nominal plate thickness.
Both events were treated as individual conditions dating back to original construction. Investigation and repair was done for the local area where the wood was found.

Mr. McNeil provided the following information:

The North Anna #2 through wall corrosion event occurred in was discovered in September, 1999. The wood was removed from behind the liner. Areas of the liner determined to have degraded thickness were removed. Areas where headed studs were attached were left in place. The void left by the removed wood was grouted. The areas where the plate was removed were replaced.
A Type A test was previously scheduled during the outage the through liner hole and wood was

CORRECTIVE ACTION

NOP-LP-2001-05

CR Number: 06-01122

discovered. The successful Type A test provided high confidence that the liner membrane and repairs remains intact.
The repaired area has been subject to augmented inspection each outage since the completion of repairs. The augmented inspection involves a VT-3 inspection of the area and UT measurements. No changes have been noted in any of the augmented inspections.

Conclusion: The issues at the Dominion plants involved wood that was left in the concrete pours during original construction. The cause was inadequate work practices and quality control during the original concrete pour. In the case of the through plate occlusion the wood created a point of active corrosion influenced by the moisture in the wood. Additionally the wood interfered with the concrete's alkalinity to inhibit corrosion in embedded steel.
At BVPS no wood or debris was found that may have been in contact with the liner at the corroded areas. This contributor cannot entirely be ruled out due to the destructive nature of the hydro demolition process. Additionally, no interior surface rust was found at BVPS that could be associated with the corroded areas on the concrete side of the liner.

Corrective Action Implementation Date: 3/4/2006

■ Signature indicates Corrective Action complete:
Completed By: WESTBROOK, GT Date: 3/4/2006

■ Signature indicates verification for SCAQ CRs:
Verified By: Date:

■ Enter Name and Sign:
Implementing Organization Approval: MANCUSO, C Date: 3/4/2006

QUALITY VERIFIER

Comments:

Approval: Date:

CORRECTIVE ACTION

NOP-LP-2001-05

CR Number: 06-01122

ORIGINATOR

CR Category:	Action Type:	Schedule Type:	CA Number:
SR	(G) Engineering Evaluation	(C) Refuel Outage Required for Implementatio	21

Corrective Action Type:	Cause Code:	Resp Org:
(RA) Remedial Action	(U) Unknown	SGRP

Description:

Since the outside of the liner plate cut out was water blasted at approximately 20,000 psi water pressure, evaluate the need to repassivate this carbon steel material.

Completed By:	Organization:	Date:	Phone:	Attachments:
KAMMERDEINER, G	SGRP	3/6/2006	4403	☐ Yes ☑ No

ACCEPT

If a Refueling Outage is required, Enter the Refueling Outage number:	Other Tracking #	Corrective Action Due Date:
1R17	N/A	3/24/2006

Approval: (Enter Name and Sign)	Section:	Date:
SOCKACI, T	SGRP	3/13/2006

QUALITY

Quality Organization Approval:	Date:

IMPLEMENTING ORG

Response:

Although the protective mill scale on the liner plate has been potentially compromised by the concrete removal process, re-passivation of the liner plate is not necessary. Restoration of the liner plate cut out will result in a condition for that portion of the liner plate affected by hydro-demolition similar to that established during original construction for the seam welds and areas where nelson studs were "shot" onto the plate. The liner plate was prepared for seam welding by mechanically beveling the plate edges to bare metal. This process would have removed the protective mill scale. Areas were nelson studs were installed would have been prepared in some manner to in order to effect a sound stud weld. The original fabrication specification (BVS-135) specifically required that all exterior surfaces in contact with concrete not be coated. There is no requirement in the original specification to passivate the weld seam or nelson stud areas.

From visual observation and work performed at BETA labs on the areas of the liner plate removed to investigate corrosion, preferential degradation of the weld seams was not identified. This observation, along with the fact that the restored liner plate and re-bar will be in contact with concrete which, in the absence of water and oxygen, creates an corrosion resistant environment supports the conclusion that re-passivation is not necessary.

Corrective Action Implementation Date: 3/15/2006

■ Signature indicates Corrective Action complete:
Completed By: KAMMERDEINER, G Date: 3/15/2006

■ Signature indicates verification for SCAQ CRs:
Verified By: SOCKACI, T Date: 3/15/2006

■ Enter Name and Sign:
Implementing Organization Approval: Date:

CORRECTIVE ACTION

NOP-LP-2001-05

CR Number: 06-01122

QUALITY VERIFIER

Comments:

Approval: Date:

CORRECTIVE ACTION

NOP-LP-2001-05

CR Number: 06-01122

ORIGINATOR

CR Category:	Action Type:	Schedule Type:	CA Number:
SR	(G) Engineering Evaluation	(A) Normal Work Management	22

Corrective Action Type:	Cause Code:	Resp Org:
(ES) Evaluation Support	(NA) Not a Deficiency	BVPE

Description:

For tracking purpose, identify the condition report which reported the Containment steel liner deficiencies found during 1R17 via 1BVT 1.47.01.

Completed By:	Organization:	Date:	Phone:	Attachments:
STRAZISAR, K	BVPE	3/9/2006	7371	☐ Yes ☑ No

ACCEPT

If a Refueling Outage is required, Enter the Refueling Outage number:	Other Tracking #	Corrective Action Due Date:
N/A	N/A	3/9/2006

Approval: (Enter Name and Sign)	Section:	Date:
HOVANEC, S	BVPE	3/9/2006

QUALITY

Quality Organization Approval:	Date:

IMPLEMENTING ORG

Response:

Condition Report 06-01722 was initiated to identified deficiencies for the BV1 containment steel liner during 1R17 performance of 1BVT 1.47.1, "Containment Structural Integrity Test."

No further action is required for this corrective action.

Corrective Action Implementation Date: 3/9/2006

■ Signature Indicates Corrective Action complete:
Completed By: STRAZISAR, K Date: 3/9/2006

■ Signature Indicates verification for SCAQ CRs:
Verified By: Date:

■ Enter Name and Sign:
Implementing Organization Approval: HOVANEC, S Date: 3/9/2006

QUALITY VERIFIER

Comments:

Approval: Date:

CORRECTIVE ACTION

NOP-LP-2001-05

CR Number: 06-01122

ORIGINATOR

CR Category:	Action Type:	Schedule Type:	CA Number:
SR	(V) Other	(A) Normal Work Management	23

Corrective Action Type:	Cause Code:	Resp Org:
(ES) Evaluation Support	(NA) Not a Deficiency	BVRC

Description:

Issue an Operating Experience to the Industry. If this is issued as a preliminary OE then write another CA to issue the final version.

Completed By:	Organization:	Date:	Phone:	Attachments:
MICKINAC, D	BVRC	3/10/2006	4225	☐ Yes ☑ No

ACCEPT

If a Refueling Outage is required, Enter the Refueling Outage number:	Other Tracking #	Corrective Action Due Date:
N/A	N/A	4/10/2006

Approval: (Enter Name and Sign)	Section:	Date:
MICKINAC, D	BVRC	3/10/2006

QUALITY

Quality Organization Approval:	Date:

IMPLEMENTING ORG

Response:

Corrective Action Implementation Date:

■ Signature Indicates Corrective Action complete:
Completed By: Date:

■ Signature Indicates verification for SCAQ CRs:
Verified By: Date:

■ Enter Name and Sign:
Implementing Organization Approval: Date:

QUALITY VERIFIER

Comments:

Approval: **Date:**

CORRECTIVE ACTION

NOP-LP-2001-05

CR Number: 06-01122

ORIGINATOR

CR Category:	Action Type:	Schedule Type:	CA Number:
SR	(G) Engineering Evaluation	(C) Refuel Outage Required for Implementatio	24

Corrective Action Type:	Cause Code:	Resp Org:
(ES) Evaluation Support	(T19) Corrosion	SGRP

Description:

Provide a disposition for corrosion described as "Area 3" in Bechtel NCR No. 44.

Completed By:	Organization:	Date:	Phone:	Attachments:
SIKORSKI, W	SGRP	3/12/2006	5675	☐ Yes ☑ No

ACCEPT

If a Refueling Outage is required, Enter the Refueling Outage number:	Other Tracking #	Corrective Action Due Date:
1R17	N/A	3/24/2006

Approval: (Enter Name and Sign)	Section:	Date:
SOCKACI, T	SGRP	3/13/2006

QUALITY

Quality Organization Approval:	Date:

IMPLEMENTING ORG

Response:

As described in Corrective Action 16, "Area 3 was approximately 6 inches by 1 foot and was located near the upper corner of the plate . There is a lifting lug welded to the plate to aid in removal, and the lug encroaches on one end of the corroded area.The degree of corrosion observed in Area 3 is much less than what was seen in the two other areas. Area 3 was not selected for laboratory analysis , since the relatively shallow corrosion was unlikely to shed light on the corrosion mechanism. A manual ultrasonic examination performed on this area at a later date (Report BOP UT 06-035) confirmed the degree of thinning . The plate was essentially at nominal thickness with six small pits (minimum thickness of 0.330 inches) reported."

The disposition of Area 3 is "Accept as- is " . The remaining wall thickness is greater than the minimum plate thickness of 0.278 inches (minimum "uniform " plate thickness) per calculation 8700-DSC-156W . This is a conservative value since the Shaw Stone & Webster report "Containment Liner Degradation First Energy Nuclear Operating Company Beaver Valley Unit 1, dated March 8, 2006 " demonstrates that the required thickness for localized thinning could be much less. With a pit with a radius of 0.75 inches, a plate thickness of 0.090 inches would withstand design accident conditions.

Corrective Action Implementation Date: 3/15/2006

■ Signature Indicates Corrective Action complete:
Completed By: SIKORSKI, W Date: 3/15/2006

■ Signature Indicates verification for SCAQ CRs:
Verified By: Date:

■ Enter Name and Sign:
Implementing Organization Approval: SOCKACI, T Date: 3/15/2006

CORRECTIVE ACTION

NOP-LP-2001-05

CR Number:
06-01122

QUALITY VERIFIER

Comments:

Approval:

Date:

CORRECTIVE ACTION

NOP-LP-2001-05

CR Number: 06-01122

ORIGINATOR

CR Category:	Action Type:	Schedule Type:	CA Number:
SR	(P) Procedure - New / Revision	(A) Normal Work Management	25

Corrective Action Type:	Cause Code:	Resp Org:
(ES) Evaluation Support	(NA) Not a Deficiency	BVPE

Description:

Revise 2BVT 1.47.1, "Containment Structural Integrity Test" to include the same revisions made to 1BVT 1.47.1 (Corrective Action 06-01122-11 & 30). These revisions shall be incorporated prior to the next performance of the procedure during 2R12.

Assign to Patterson

Completed By:	Organization:	Date:	Phone:	Attachments:
PATTERSON, JS	BVPE	3/13/2006	4992	☐ Yes ☑ No

ACCEPT

If a Refueling Outage is required, Enter the Refueling Outage number:	Other Tracking #	Corrective Action Due Date:
N/A	N/A	8/31/2006

Approval: (Enter Name and Sign)	Section:	Date:
HOVANEC, S	BVPE	3/15/2006

QUALITY

Quality Organization Approval: | Date:

IMPLEMENTING ORG

Response:

Corrective Action Implementation Date:

■ Signature Indicates Corrective Action complete:
Completed By: | Date:

■ Signature Indicates verification for SCAQ CRs:
Verified By: | Date:

■ Enter Name and Sign:
Implementing Organization Approval: | Date:

QUALITY VERIFIER

Comments:

Approval: | Date:

CORRECTIVE ACTION

NOP-LP-2001-05

CR Number: 06-01122

ORIGINATOR

CR Category:	Action Type:	Schedule Type:	CA Number:
SR	(G) Engineering Evaluation	(A) Normal Work Management	28

Corrective Action Type:	Cause Code:	Resp Org:
(ES) Evaluation Support	(NA) Not a Deficiency	BVPE

Description:

Review the past performances of 2BVT 1.47.1, "Containment Structural Integrity Test" and summarize the results of past inspections. This review should include as a minimum: Condition Reports, Corrective Actions, Engineering Memorandums, and Work Orders.

Assign to Stazisar

Completed By:	Organization:	Date:	Phone:	Attachments:
PATTERSON, JS	BVPE	3/13/2006	4992	☐ Yes ☑ No

ACCEPT

If a Refueling Outage is required, Enter the Refueling Outage number:	Other Tracking #	Corrective Action Due Date:
N/A	N/A	3/17/2006

Approval: (Enter Name and Sign)	Section:	Date:
HOVANEC, S	BVPE	3/15/2006

QUALITY

Quality Organization Approval:	Date:

IMPLEMENTING ORG

Response:

Summary of test results from 2BVT 01.47.01

The Containment Structural Integrity Test is performed every other outage to comply with Technical Specifications 4.6.1.6.1, 4.6.1.6.2 and 6.17. This test is to verify the structural integrity of the containment liner plate, containment liner test channels and external concrete surface by a general visual inspection of the accessible surfaces per Tech Spec requirements. The following is a history of the overall results for 2BVT 01.47.01 from 2R10 to Startup.

2R10 (Test Completed 10/6/03)

2BVT 1.47.1 was completed for both the exterior concrete surfaces and interior steel liner of the Unit 2 Containment Building. All deficiencies were minor in nature and would not affect containment structural integrity. The exterior concrete surface deficiencies were evaluated per Corrective Action 03-09852-01. The interior steel liner deficiencies were repaired (painted) per Order 200059243 and evaluated per Corrective Action 03-09852-02.

2R08 (Test Completed 10/17/00)

Several deficiencies were identified for the exterior concrete surfaces and the interior steel liner. These deficiencies were minor in nature and would not affect containment structural integrity. Work Order 00-005180 cleaned and repainted the areas identified on the interior steel liner. All the deficiencies were formally evaluated by Engineering per EM 201016 and determined not to compromise containment structural integrity.

2R06 (Test Completed 09/30/96)

CORRECTIVE ACTION

CR Number: 06-01122

NOP-LP-2001-05

Several deficiencies related to the interior steel liner and exterior concrete surface of the BV2 Reactor Containment Building. Some of these deficiencies were identified during 2R04. These deficiencies were evaluated during 2R04 per EM 106825. The new deficiencies were evaluated by Engineering per EM 112982. Engineering responded by stating the deficiencies were typical of age and a pressure tested structure and pose not risk to the Reactor Containment Building structural integrity.

2R04 (Test Completed 11/03/93)

The performance of 2BVT 1.47.01 noted several deficiencies related to the interior steel liner and exterior concrete surface of the BV2 Reactor Containment Building. Some of these deficiencies were identified during 2R02 and were evaluated then. The new deficiencies were evaluated by Engineering per EM 106825. Engineering responded by stating the deficiencies were minor and would not effect the performance of 2BVT 1.47.2, "Containment Type A Leak Test."

2R02 (Test Completed 11/03/90).

Inspection of the accessible exterior containment surfaces found several minor deficiencies. These deficiencies were evaluated by EM 22766. It was concluded these deficiencies were superficial and did not affect containment structural integrity. No repairs were required.

Inspection of the accessible interior containment liner surfaces found several deficiencies. The deficiencies were evaluated and determined not to effect containment structural integrity. (Note: the EM number was not stated in the Test Results Report for this test.)

Startup (Test Completed 02/01/87)

The original performance of Technical Specification Surveillances 4.6.1.6.1a-c and 4.6.1.6.2 were satisfied by PO-2.47.06 "Containment Structural Integrity Test". All problems encountered, corrective actions taken or recommendations made were identified in the Test Results Report of PO-2.47.06.

No further action is required for this corrective action.

Corrective Action Implementation Date: 3/14/2006

Signature Indicates Corrective Action complete:
Completed By: STRAZISAR, K Date: 3/14/2006

Signature Indicates verification for SCAQ CRs:
Verified By: Date:

Enter Name and Sign:
Implementing Organization Approval: HOVANEC, S Date: 3/15/2006

QUALITY VERIFIER

Comments:

Approval: Date:

CORRECTIVE ACTION

NOP-LP-2001-05

CR Number: 06-01122

ORIGINATOR

CR Category:	Action Type:	Schedule Type:	CA Number:
SR	(G) Engineering Evaluation	(A) Normal Work Management	27

Corrective Action Type:	Cause Code:	Resp Org:
(ES) Evaluation Support	(NA) Not a Deficiency	BVDM

Description:

Document the Containment Liner Plate evaluation performed by Stone & Webster .

Completed By:	Organization:	Date:	Phone:	Attachments:
BUFFINGTON, S	BVDM	3/14/2006	7742	☑ Yes ☐ No

ACCEPT

If a Refueling Outage is required, Enter the Refueling Outage number:	Other Tracking #	Corrective Action Due Date:
N/A	N/A	3/20/2006

Approval: (Enter Name and Sign)	Section:	Date:
MANCUSO, C	BVDM	3/14/2006

QUALITY

Quality Organization Approval:	Date:

IMPLEMENTING ORG

Response:

Shaw Stone & Webster, Inc. has completed their evaluation titled:

"Containment Liner Degradation - First Energy Nuclear Operating Company - Beaver Valley Unit 1", revision 0 dated 3/13/06.

The evaluation was transmitted under Stone & Webster Letter SW-BV-0632 and is scanned as an attachment to this CA.

The report has been reviewed and accepted by FENOC. Two insignificant typographical errors were identified as described below. Since the errors are minor, of a non-technical nature and do not greatly affect the readability of the evaluation, a correction has not been requested.

1) On page 5, in the last sentence of the 5th paragraph, the word "than" should have been written as "then".

2) On page 13, in the first paragraph, the phrase "immediate contact" was inserted in 2 locations as clarification. In both locations, supplemental words should have been removed. Corrected wording would be:

First sentence; change "The bond immediate contact or bond ..." to "The immediate contact or bond ..."
Second sentence; change "The loss of bond immediate contact or during construction ..." to "The loss of immediate contact during construction ..."

Corrective Action Implementation Date: 3/14/2006

■ **Signature Indicates Corrective Action complete:**

CORRECTIVE ACTION

NOP-LP-2001-05

CR Number: 06-01122

Completed by: [illegible] Date: 3/14/2006

■ Signature indicates verification for SCAQ CRs:

Verified By: Date:

■ Enter Name and Sign:

Implementing Organization Approval: MANCUSO, C Date: 3/14/2006

QUALITY VERIFIER

Comments:

Approval: Date:

CORRECTIVE ACTION

NOP-LP-2001-05

CR Number: 06-01122

ORIGINATOR

CR Category:	Action Type:	Schedule Type:	CA Number:
SR	(U) Other Evaluation	(A) Normal Work Management	29

Corrective Action Type:	Cause Code:	Resp Org:
(ES) Evaluation Support	(NA) Not a Deficiency	BVTS

Description:

Area 3 was accepted as found as documented in CA xx. The area shall be inspected for the next three consecutive 40 month periods. Establish baseline thickness measurements by UT after liner plate has been restored and the interior surface painted. Establish markings on the liner for repeatability of the UT measurements over the required intervals. The measured area shall envelope the area scanned by UT report BOP-UT-06-035. The individual pits identified in BOP-UT-06-035 shall also be marked on the surface.
Upon completion of the scan provide a copy of the report to design engineering and the system engineer.

Completed By:	Organization:	Date:	Phone:	Attachments:
WESTBROOK, GT	BVDM	3/14/2006	7894	☐ Yes ☑ No

ACCEPT

If a Refueling Outage is required, Enter the Refueling Outage number:	Other Tracking #	Corrective Action Due Date:
1R17	N/A	

Approval: (Enter Name and Sign)	Section:	Date:
	BVTS	

QUALITY

Quality Organization Approval: **Date:**

IMPLEMENTING ORG

Response:

Corrective Action Implementation Date:

■ **Signature Indicates Corrective Action complete:**
Completed By: **Date:**

■ **Signature Indicates verification for SCAQ CRs:**
Verified By: **Date:**

■ **Enter Name and Sign:**
Implementing Organization Approval: **Date:**

QUALITY VERIFIER

Comments:

Approval: **Date:**

CORRECTIVE ACTION

NOP-LP-2001-05

CR Number: 06-01122

ORIGINATOR

CR Category:	Action Type:	Schedule Type:	CA Number:
SR	(P) Procedure - New / Revision	(A) Normal Work Management	28

Corrective Action Type:	Cause Code:	Resp Org:
(ES) Evaluation Support	(NA) Not a Deficiency	BVTS

Description:

Revise the ISI 10 year plan to include UT thickness measurements of Area 3 for the next three consecutive 40 month periods. Baseline UT measurements for Area 3 were established and documented under CA 06-01122-028.

Completed By:	Organization:	Date:	Phone:	Attachments:
WESTBROOK, GT	BVDM	3/14/2006	7894	☐ Yes ☑ No

ACCEPT

If a Refueling Outage is required, Enter the Refueling Outage number:	Other Tracking #	Corrective Action Due Date:
N/A	N/A	

Approval: (Enter Name and Sign)	Section:	Date:
	BVTS	

QUALITY

Quality Organization Approval:	Date:

IMPLEMENTING ORG

Response:

Corrective Action Implementation Date:

■ Signature Indicates Corrective Action complete:
Completed By: Date:

■ Signature Indicates verification for SCAQ CRs:
Verified By: Date:

■ Enter Name and Sign:
Implementing Organization Approval: Date:

QUALITY VERIFIER

Comments:

Approval: Date:

CORRECTIVE ACTION

NOP-LP-2001-05

CR Number: 06-01122

ORIGINATOR

CR Category:	Action Type:	Schedule Type:	CA Number:
SR	(P) Procedure - New / Revision	(A) Normal Work Management	38

Corrective Action Type:	Cause Code:	Resp Org:
(ES) Evaluation Support	(NA) Not a Deficiency	BVPE

Description:

Change 1BVT 1.47.1, Revision 7, "Containment Structural Integrity Test", Section VIII.A.4 from, "When paint or coatings are to be removed for further inspection, the paint or coatings shall be visually examined in accordance with Table IWE-2500-1 prior to removal" to, "When paint or coatings are to be removed for further inspection, the paint or coatings shall be visually examined by a qualified VT-3 inspector prior to removal".

Per Table IWE-2500-1, a Visual VT-3 Inspection of a deficiency is only required at the end of an inspection interval. A General Visual Inspection may be performed for a repair of a deficiency noted prior to a Type A Leak Test. Since 1BVT 1.47.1 is being performed to support the 1R17 Type A Leak Test, any deficiencies noted during 1R17 would only require a General Visual Inspection prior to a repair. To provide more rigor to these inspections, the procedure will be revised to require a Visual VT-3 Inspection to be performed prior to a repair, no matter what point in the inspection interval the deficiency is detected.

Assign to Patterson

Completed By:	Organization:	Date:	Phone:	Attachments:
PATTERSON, JS	BVPE	3/14/2006	4982	☐ Yes ☑ No

ACCEPT

If a Refueling Outage is required, Enter the Refueling Outage number:	Other Tracking #	Corrective Action Due Date:
N/A	N/A	3/24/2006

Approval: (Enter Name and Sign)	Section:	Date:
HOVANEC, S	BVPE	3/15/2006

CORRECTIVE ACTION

NOP-LP-2001-05

CR Number: 06-01122

QUALITY

Quality Organization Approval: | Date:

IMPLEMENTING ORG

Response:

Corrective Action Implementation Date:

■ Signature indicates Corrective Action complete:
Completed By: | Date:

■ Signature indicates verification for SCAQ CRs:
Verified By: | Date:

■ Enter Name and Sign:
Implementing Organization Approval: | Date:

QUALITY VERIFIER

Comments:

Approval: | Date:

CONDITION REPORT

CR Number 06-01122

TITLE: DEGRADED LINER PLATE SURFACE IN AREA OF SGRP ACCESS OPENING

ORIGINATION

DISCOVERY DATE	TIME	EVENT DATE	TIME	SYSTEM / ASSET#
2/20/2006	1430	N/A	N/A	47 BV-1-RCBX

EQUIPMENT DESCRIPTION Concrete-side surface of the containment liner plate

DESCRIPTION OF CONDITION and PROBABLE CAUSE (if known) Summarize any attachments. Identify what, when, where, why, how.

Observation of the exposed backside of the containment liner plate following hydrolasing revealed two areas of degradation. The degradation comprised general surface pitting that varied in depth and diameter over each of the areas (approximately 16 in. by 16 in. each). Additionally, one area exhibited a continuous depression of approximately 7 – 9 in. length and ½ - ¾ in. width. The areas were approximately 15 feet distant from one another, and approximately 10 feet above the work platform surface (El 765+). No measurements were possible, but photos were taken by both Bechtel and FENOC that can be found at S:\AII\1R17 SGRP Photos\20Feb06 Photos. The cause mechanism is not known, but it is concluded that the condition was pre-existent and did not result from concrete removal. It is also concluded that the pitting is not thru-wall since no seepage on the inside surface of the liner was reported during the hydrolasing. Seepage would almost certainly have occurred due to the high-pressure water stream. Consequently, the liner is considered to remain leaktight and structurally sound for both fuel movement and completion of liner removal. Assessment of the degradation for cause and extent of condition will commence when the liner is removed and safely accessible in storage. No evidence will be lost due to the removal process, since the surface has already been cleaned by water impingement.

This condition report is to be categorized "SR", but will be down-gradable if determined not to be reportable.

Resolution of this CR shall be a Mode 4 HOLD.

SPECIAL INSTRUCTIONS - THIS ISSUE IS A MODE RESTRAINT. A MODE HOLD RESOLUTION FORM IS REQUIRED TO BE COMPLETED.

IMMEDIATE ACTIONS TAKEN / SUPV COMMENTS (Discuss CORRECTIVE ACTIONS completed, basis for closure.)

Notified and discussed with the Design Engineering Section Manager. Design Engineering will lead the investigation with "resource support" from the SGRP.
Notified FENOC NDE (VT-3) personnel of the need to accompany SGRP/Bechtel inspectors during any near-term inspections of the liner performed before removal.
Need to review the BVPS response to NRC Information Notice 2004-09.

QUALITY ORGANIZATION USE ONLY	IDENTIFIED BY (Check one)	ATTACHMENTS
Quality Org. Initiated ☐ Yes	☑ Individual/Work Group ☐ Self-Revealed	☑ Yes ☐ No
Quality Org. Follow-up ☐ Yes ☐ No	☐ Supervision/Management ☐ Internal Oversight ☐ External Oversight	

ORIGINATOR	ORGANIZATION	DATE	SUPERVISOR	DATE	PHONE EXT.
RITZ, G	SGRP	2/20/2006	HALLIDAY, KE	2/20/2006	5072

CONDITION REPORT

CR Number 06-01122

TITLE: DEGRADED LINER PLATE SURFACE IN AREA OF SGRP ACCESS OPENING

PLANT OPERATIONS

SRO REVIEW	EQUIPMENT OPERABLE	OPERABILITY ASSESSMENT REQUIRED	ORG. NOTIFIED	IMMEDIATE INVESTIGATION REQUIRED	ORG. NOTIFIED	MODE CHANGE RESTRAINT
☑ Yes ☐ No	☑ Yes ☐ No ☐ N/	☐ Yes ☑ No		☐ Yes ☑ No		☑ Yes ☐ No

MODE	ASSOCIATED TECH SPEC NUMBER(S)	ASSOCIATED LCO ACTION STATEMENT(S)
		#2

DECLARED INOPERABLE (Date / Time)	REPORTABLE?	One Hour N/A	APPLICABLE UNIT(S)
N/A	☐ Yes ☑ No ☐ Eval Required	Eight Hour N/A	☑ U1 ☐ U2 ☐ Both

COMMENTS

Resolution required prior to MODE 4.

Current Mode - Unit 1	Power Level - Unit 1	Current Mode - Unit 2	Power Level - Unit 2
6	0%	N/A	N/A

SRO - UNIT 1	SRO - UNIT 2	DATE
Mouser, M	N/A	2/21/2006

CRPA / SUPV / MRB

CATEGORY / EVAL	ASSIGNED ORGANIZATION	DUE DATE
SR	BVDM	3/22/2006

TREND CODES

Process / Activity / Cause Code(s)			Comp Type / ID (If Cause T or W)		Cause Org
HDW	0575	T19			

REGULATORY

REPORTABLE? ☐ Yes ☐ No ☐ LER No.

REPORTABILITY REVIEWER

DATE

INVESTIGATION OPTIONS ☐ Maint.Rule ☐ OE Evaluation

CLOSED BY

DATE

10CFR21 Decision Applicability Checklist

NOP-LP-2001-04

CR Number 06-01122

Does the Condition Report involve:

Information obtained or an observation made of a BASIC COMPONENT that could compromise safety. ☑ Yes ☐ No

(See logic flow diagram defining terms and applicability information on the next page.)

If the answer is No, Stop here (sign and date on the Originator Signature Tab)

If the answer is Yes, Items A & B must be answered. (Parts A & B tab)

A. Does the Condition Report involve a:

BASIC COMPONENT of a plant structure, system, component, or part thereof necessary to assure:

1. The integrity of the reactor coolant pressure boundary. ☐ Yes ☑ No
2. The capability to shutdown the reactor and maintain it in safe shutdown condition. ☐ Yes ☑ No
3. The capability to prevent or mitigate the consequences of accidents which could result in potential offsite exposures comparable to those referred to in 10CFR100.11. ☑ Yes ☐ No

B. Does the potential issue or defect involve:

1. A deviation in a delivered component? ☐ Yes ☑ No
2. Deviation in a portion of a facility offered for acceptance? ☐ Yes ☑ No
3. Design installation test, use, or operation of a defective structure, system or component? ☐ Yes ☑ No
4. A condition or circumstance that could contribute to exceeding a Technical Specification safety limit? ☐ Yes ☑ No

If any items in A are marked 'Yes' AND any items in B are marked 'Yes', contact Regulatory Personnel immediately to discuss and determine if a SUBSTANTIAL SAFETY HAZARD may exist, or if the issue is reportable.

Based on discussions with Regulatory Personnel that a SUBSTANTIAL SAFETY HAZARD or reportability issue does not exist, provide explanation / justification below:

All items in "B" are marked "NO" therefore no further action is required.

Based on the determination that a SUBSTANTIAL SAFETY HAZARD or reportability issue may exist, draft a Corrective Action Form (CAF) to be accepted by the Regulatory Personnel to complete the 10CFR Part 21 requirements for the CR.

CAF Generated? ☐ Yes ☑ No (If no, provide explanation / justification above)

If Yes, CAF# _____

Completed By:	DATE:
MORGAN, M	3/15/2006