


Oconee Nuclear Station, Unit 1
Class MC ISI Summary Report for
Refueling Outage EOC18

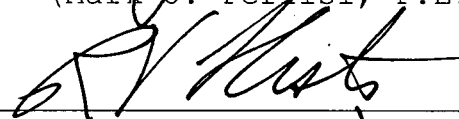
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Date:

9/29/99

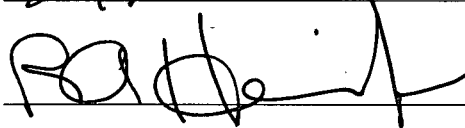
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**A. ASME Code and Regulatory Requirements for Class MC ISI
Summary Reports**

In accordance with 10 CFR 50.55a (g) (4) (v) (B), metallic shell and penetration liners which are pressure retaining components and their integral attachments in concrete containments must meet the inservice inspection, repair, and replacement requirements applicable to components which are classified as ASME Code Class MC. This inservice inspection summary report addresses requirements of 10 CFR 50.55a (b) (2) (x) for the metallic shell and penetration liners and their integral attachments of the Oconee Unit 1 concrete containment.

Inservice inspections of Class MC components are performed in accordance with the ASME Boiler and Pressure Vessel Code, Section XI, Subsection IWE, 1992 Edition with the 1992 Addenda. Article IWA-6000, Records And Reports, paragraph IWA-6210, requires the Owner to prepare inservice inspection summary reports of inservice inspections performed on Class 1 and 2 pressure retaining components and their supports.

IWA-6000 does not address inservice inspection summary reports for Class MC pressure retaining components and their supports, and the Code does not require preparation and submittal of summary reports for Class MC components. As such, this Class MC ISI Summary Report does not contain information specified in IWA-6220 or IWA-6230. Duke Energy Corporation is maintaining a separate Inservice Inspection Program for Class MC pressure retaining components and their integral attachments. Therefore, this Class MC ISI Summary Report contains only that inservice inspection information applicable to Code Class MC components. ISI Summary Reports for other Code Class components are to be submitted separately.

This Class MC ISI Summary Report includes all applicable information required by 10 CFR 50.55a(b) (2) (x) (A), which states:

(A) For Class MC applications, the licensee shall evaluate the acceptability of inaccessible areas when conditions exist in accessible areas that could indicate the presence of or result in degradation to such inaccessible areas. For each inaccessible area identified, the licensee shall provide the following in the ISI Summary Report required by IWA-6000:

- (1) A description of the type and estimated extent of degradation, and the conditions that led to the degradation;
- (2) An evaluation of each area, and the result of the evaluation, and;
- (3) A description of necessary corrective actions.

In addition, this Class MC ISI Summary Report also includes applicable information required by 10 CFR 50.55a

(b) (2) (x) (D), which states:

(D) The following may be used as an alternative to the requirements of IWE-2430.

(1) If the examinations reveal flaws or areas of degradation exceeding the acceptance standards of Table IWE-3410-1, an evaluation shall be performed to determine whether additional component examinations are required. For each flaw or area of degradation identified which exceeds acceptance standards, the licensee shall provide the following in the ISI Summary Report required by IWA-6000:

- (i) A description of each flaw or area, including the extent of degradation, and the conditions that led to the degradation.

- (ii) The acceptability of each flaw or area, and the need for additional examinations to verify that similar degradation does not exist in similar components, and;
 - (iii) A description of necessary corrective actions.
- (2) The number and type of additional examinations to ensure detection of similar degradation in similar components.

B. Discussion of Examinations and Conditions Requiring Evaluation

Conditions were observed during refueling outage EOC18 that warrant inclusion in this Class MC ISI Summary Report, as required by 10 CFR 50.55a (b) (2) (x) (A) and 10 CFR 50.55a (b) (2) (x) (D). These conditions were identified during the performance of ASME Code, Section XI, IWE Examinations in accordance with Table IWE-2500-1, Category E-D, Item E5.30.

Please note that IWE examinations (other than those addressed in this report) were performed during refueling outage EOC18 and that no other conditions were found during the performance of these examinations that required evaluation in accordance with 10 CFR 50.55a (b) (2) (x) (A). Except for items identified in this report, the condition of all other items examined in accordance with IWE met the acceptance standards of Table IWE-3410-1, and the provisions of 10 CFR 50.55a (b) (2) (x) (D) were not utilized.

Observed Conditions

Degraded Moisture barriers were observed at various locations around the liner plate at the basement concrete floor embedment zone. As a result, the moisture barriers at these locations were considered unacceptable and failed to meet the acceptance standards of IWE-3500. Containment metallic liner

surfaces beneath affected moisture barriers were exposed after portions of the affected moisture barriers were removed. Exposed metallic surfaces exhibited staining with some possible corrosion.

The provisions of 10 CFR 50.55a (b)(2)(x)(A) were deemed applicable, and the provisions of 10 CFR 50.55a (b)(2)(x)(D) were used as an alternative to the requirements of IWE-2430 for additional examination of moisture barriers.

**C. Description of Degradation, Evaluations, Corrective Actions,
and Additional Examinations Required**

**(1) Description Of Type And Estimated Extent Of Degradation,
And The Conditions That Led To The Degradation**

Description of Degradation:

Moisture barrier (sealant) materials along the interface between the Reactor Building basement concrete floor and the containment metallic liner were observed to be degraded. Degradation included separation from attached surfaces at the expansion joints and missing sealant at some locations. These conditions were identified during the performance of ASME Code, Section XI, IWE Examinations in accordance with Table IWE-2500-1, Category E-D, Item E5.30 (Duke Items #E05.30.0001 and #E05.30.0005, as specified in the Containment Inservice Inspection Plan, File #O-62-CISI-0001). Problem Investigation Process Report #1-O99-2317 was generated to document the observed conditions. At locations where portions of the affected moisture barriers were removed, exposed metallic surfaces of the containment liner exhibited staining with possible corrosion.

Note: The above conditions are similar to those identified in the Oconee Nuclear Station Unit 3 Inservice Inspection Summary Report for

Class MC Component Examinations, approved March 16, 1999, and submitted to the Nuclear Regulatory Commission by letter dated March 18, 1999. Concerns with containment liner embedment zone areas at Oconee Units 1, 2, and 3 have also been previously identified in Problem Investigation Report #0-096-2414. Oconee calculation File #OSC-6749 documents the evaluation performed on these areas as a result of Problem Investigation Report #0-096-2414.

General Location Description:

The above conditions were observed at the Unit 1 Reactor Building basement floor/containment metallic liner interface (embedment zone) at elevation 777' + 6" (nominal). Moisture barrier materials at these locations cover the expansion joint material between the basement concrete floor and the containment metallic liner.

Estimated Extent of Degradation:

Based on the results of evaluations conducted in accordance with Problem Investigation Report #0-096-2414 and additional examinations conducted during refueling outage EOC18, the estimated extent of degradation is as follows:

1. Moisture barrier materials at all of the containment metallic liner embedment zones have aged and degraded. Although some sealant repairs have been made, sealant materials continue to require periodic inspection and preventive maintenance to prevent premature degradation. Based on examinations conducted during the Unit 1 refueling outage EOC18, it can be concluded that these materials have not been completely effective in preventing potential moisture intrusion to

inaccessible embedded surfaces of the containment metallic liner.

2. Because of moisture barrier degradation, lack of moisture barrier materials at some locations, and conditions observed during previous inspections, it is believed that all, or portions, of the periphery of the liner plate beneath the embedment zone have been exposed to moisture that cannot drain because of the geometry of the liner plate and Reactor Building basement floor configuration. Other locations that are not submerged may have been, or may continue to be, exposed to periodic wetting and drying. Visual and ultrasonic thickness examinations conducted on similar locations at Unit 3 have detected no significant wall thickness loss.

Description of Conditions That Led to the Degradation

Based on operating experience from previous examinations conducted in accordance with 10CFR50, Appendix J, the following conclusions were drawn about conditions that led to the degradation:

1. Maintenance activities (decontamination operations) inside the Reactor Building continue to create a source of moisture which has contacted the embedment zone moisture barriers at the interface between the containment metallic liner and Reactor Building concrete floor.
2. Degradation of sealant materials at embedment zones may have allowed moisture to gain access to inaccessible surfaces of the containment metallic shell. Possible reasons for sealant degradation include the following:
 - i. Older sealant material is an epoxy that hardens with age. Aging results in loss of flexibility, shrinking and cracking. Alternative materials with better performance

characteristics were not available when these materials were originally installed.

- ii. Inadequate preventive maintenance of expansion joint and embedment zone sealant materials. Please note that these materials have no specified service life and that replacement or repair of these materials is typically performed only after inspections have detected degradation.

(2) Evaluation of the Affected Area and Evaluation Results

Oconee Nuclear Station Problem Investigation Report #1-099-2317 was initiated to address moisture barrier degradation at embedment zone areas and to document the evaluation of these conditions. This report also contains corrective actions necessary for damaged moisture barrier materials at these locations.

The following actions were taken to assess the extent and significance of the observed degradation:

- i. Portions of affected moisture barrier materials were removed, and exposed surfaces of the liner plate were inspected by Engineering for potential degradation. Conditions of the exposed liner plate are similar to those seen during previous inspections on Unit 3. UT examinations were conducted at one location based on the apparent relative severity of the degradation observed, and the results indicated no detectable wall thickness loss.

These examination results are consistent with those obtained during previous containment inspections, as documented in Problem Investigation Report #0-096-2414 and Oconee calculation File #OSC-6749.

(3) Description of Necessary Corrective Actions

Immediate Corrective Actions

1. Portions of the affected moisture barriers were repaired during this refueling outage (1EOC18).
2. The Containment ISI Plan has been revised to require that accessible surfaces of the Unit 1 metallic liner (at the embedment zone) be examined in accordance with IWE-2500, Table IWE-2500-1, Examination Category E-C, Item E4.11, as required by IWE-3122.4(b) and IWE-2420(b) and (c). Because this condition is potentially applicable to Oconee Units 2 and 3, the Containment ISI Plan has also been revised to require examination of similar areas in all three units in accordance with IWE-2500, Table IWE-2500-1, Examination Category E-C, Item E4.11.

Long-Term Corrective Actions

1. Remaining portions of affected moisture barriers that have not been repaired during refueling outage 1EOC18 are to be repaired during the next scheduled refueling outage (1EOC19), as specified in Problem Investigation Process Report #1-099-2317.
2. A Work Order has been initiated to implement Minor Modification #MM ONOE-11398. This modification will install permanent inspection ports at three locations around the Reactor Building embedment zone to permit future visual and ultrasonic thickness examination of portions of the embedded liner in accordance with the ASME Code, Section XI, IWE-2500, Table IWE-2500-1, Examination Category E-C. These inspection ports are to extend from the basement floor surface down to the horizontal embedded liner plate beneath the slab, as specified in Problem Investigation Process Report #0-096-2414. The Containment ISI Plan shall be revised to add examination of these areas after completion of these plant modifications.

**D. Discussion of Alternative to the Requirements of IWE-2430
Utilized During 1EOC18**

The provisions of 10 CFR 50.55a (b) (2) (x) (D) were used as an alternative to the requirements of IWE-2430 for additional examination of moisture barriers during Oconee Unit 1 refueling outage EOC18.

1. Description of each flaw or area, including the extent of degradation, and the conditions that led to the degradation.

Degradation of moisture barrier Items #E05.30.0001 and #E05.30.0005 were detected during the visual, VT-3 examination performed during refueling outage EOC18. This degradation, which was described previously in this report, included separation from attached surfaces at the expansion joints, and missing moisture barrier material at some locations. Both of these conditions may permit moisture intrusion.

Items #E05.30.0001 and #E05.30.0005 are two of three moisture barriers installed at the interior embedment zone between the shell metallic liner and the Reactor Building interior concrete basement floor. All other moisture barriers are installed at locations on the liner interior surface above the embedment zone, and do not protect the metallic liner from moisture resulting from possible standing water at the basement floor elevation.

Moisture barrier degradation on Items #E05.30.0001 and #E05.30.0005 were found at various locations along the entire length of these items. Rather than documenting all of the discrete locations where degradation was observed, the entire length of each item was rejected and was determined not to meet the acceptance standards of IWE-3513.

The conditions that led to the degradation of these moisture barriers were described previously in this Class MC ISI Summary Report.

2. Evaluation of the acceptability of each flaw or area, and the need for additional examinations to verify that similar degradation does not exist in similar components.

Degradation of moisture barriers is an indicator that there is potential for moisture to access portions of the metallic shell which are inaccessible. The acceptability of the metallic shell surfaces has been addressed previously in this Class MC ISI Summary Report and these surfaces have been evaluated to be acceptable. As such, the observed conditions on moisture barrier Items #E05.30.0001 and #E05.30.0005 have been evaluated to determine their impact on the acceptability of the component (metallic shell).

Please note that, although moisture barrier degradation and moisture intrusion has been identified at embedment zones in all three Oconee units, these conditions have not resulted in unacceptable degradation of the embedded containment metallic shell.

Because the risk of moisture intrusion is greatest at the Reactor Building interior basement concrete floor and metallic shell interface, it was determined that additional examinations need be performed only on the remaining moisture barrier at this embedment zone. The remaining embedment zone moisture barrier is Item E05.30.0010, as indicated in the Containment ISI Plan.

3. Description of necessary corrective actions.

All of the degraded moisture barriers at the Unit 1 embedment zone shall be restored to acceptable condition during refueling outage 1EOC19 in 2000.

4. The number and type of additional examinations performed to ensure detection of similar degradation in similar components.

Additional visual, VT-3 examinations were performed during Unit 1 refueling outage 1EOC18 on moisture barrier Item E05.30.0010 that seals the embedment zone between the containment metallic shell and the Reactor Building interior basement concrete floor. Similar conditions were observed on this item.

Based on examinations performed on all units as a result of Problem Investigation Process Report #0-096-2414 (December, 1996), it is estimated that similar moisture barrier degradation could also be occurring at various locations on embedment zone moisture barriers installed in Unit 2. Examination of embedment zone moisture barriers was completed at Unit 3 during refueling outage EOC17, and is scheduled for Unit 2 during refueling outage EOC17 in 1999. During future inspections on all units at Oconee, the moisture barriers at the containment liner embedment zone at the basement floor elevation shall be examined in accordance with IWE-2500, Table IWE-2500-1, Examination Category E-C, Item E4.11, as required by IWE-3122.4(b) and IWE-2420(b) and (c).