

**UNITED STATES OF AMERICA
NUCLEAR REGULATORY COMMISSION**

Before the Atomic Safety and Licensing Board

In the Matter of)	Docket No. 50-346-LR
First Energy Nuclear Operating Company)	
(Davis-Besse Nuclear Power Station, Unit 1))	August 17, 2012
.)	

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**INTERVENORS' FIFTH MOTION TO AMEND AND/OR SUPPLEMENT PROPOSED
CONTENTION NO. 5 (SHIELD BUILDING CRACKING)**

*APPENDIX VII: NRC FOIA RESPONSES
NRC FOIA RESPONSES (B-44
THROUGH B-48)*

44

Erickson, Alice

From: Galloway, Melanie *mark*
Sent: Tuesday, December 13, 2011 8:39 AM
To: Sheikh, Abdul; Lehman, Bryce; Erickson, Alice
Cc: Manoly, Kamal; Hiser, Allen; Delligatti, Mark; Auluck, Rajender; Sakai, Stacie
Subject: RE: Davis Bessee Shield Building

Thanks much, Abdul.

This will be useful information as part of the comparison presentation on the 22nd.

From: Sheikh, Abdul *mark*
Sent: Thursday, December 08, 2011 8:09 AM
To: Lehman, Bryce; Erickson, Alice
Cc: Manoly, Kamal; Galloway, Melanie; Hiser, Allen; Delligatti, Mark; Auluck, Rajender; Sakai, Stacie
Subject: Davis Bessee Shield Building

During the briefing on December 6, 2011, there was a question about the similarity between Crystal River and Davis Bessee laminar cracking. The facts are:

- Davis Bessee shield building laminar crack widths are between 0.005 to 0.01 inch (5-10 mils)
- Crystal River containment laminar crack widths were between 0.5 to 4 inch (500 mil to 4000 mils)
- Ratio of crack widths between two structures: 50 to 400
- Crystal River cracking occurred 8-9 inches from the outside face of concrete
- Crystal River cracking is due to prestressing forces, lack of transverse shear reinforcement, and weak aggregate
- Davis Bessee shield building cracking is about 2-3 inches from outside face concrete
- Davis Bessee shield building is not prestressed
- Davis Bessee shield building has not been designed for containment accident pressure and temperature.
- Davis Bessee has a steel containment

All the above information indicates that laminar cracking at both structures are not similar.

Abdul

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CuadradoDeJesus, Samuel

From: Sheikh, Abdul *mar*
Sent: Tuesday, December 13, 2011 5:09 PM
To: Lehman, Bryce; Auluck, Rajender
Cc: CuadradoDeJesus, Samuel
Subject: RE: Davis Besse Shield Building RAI
Attachments: DB Containment Crack RAI-abdul.DOC

I have added request for some specific information on the attached file. Some of the information I have requested is the gray area of part 50/54. However, I feel it is better to ask it since such information has not been formally requested previously by the NRC.

From: Lehman, Bryce *mar*
Sent: Tuesday, December 13, 2011 3:52 PM
To: Sheikh, Abdul; Auluck, Rajender
Cc: CuadradoDeJesus, Samuel
Subject: FW: Davis Besse Shield Building RAI

Can you please review the attached RAI and forward it to Samuel once you have concurred?

Thanks,
Bryce

From: CuadradoDeJesus, Samuel *mar*
Sent: Tuesday, December 13, 2011 1:31 PM
To: Lehman, Bryce
Cc: Davis-BesseHearingFile Resource
Subject: Davis Besse Shield Building RAI

Bryce,

With all the parties and frequent interruptions I almost forgot to get in touch with you on the issue with the shield building RAI. Can you let me know when I'll get your final draft?

Thanks

Samuel Cuadrado de Jesús

Project Manager

Projects Branch 1

Division of License Renewal

U.S. Nuclear Regulatory Commission

Phone: 301-415-2946

Samuel.CuadradoDeJesus@nrc.gov

RAI B.2.39-X

Background:

In order to perform a scheduled reactor head replacement, a construction opening was made in the concrete shield building. During hydro-demolition of the concrete shield building, cracks were identified in the 'architectural shoulders' of the shield building. While investigating the extent of the cracking, additional cracks were identified around the shield building. The additional cracks were identified using an Impulse Response (IR) technique and core bores were used to verify the IR results.

Issue:

Extensive cracking in the shield building could affect the structural integrity of the shield building and may impact its ability to perform its intended function during the period of extended operation.

Request:

1. Summarize the shield building degradation, the root cause, and the expected corrective actions.
2. Explain how the recent plant-specific operating experience impacts the Shield Building's ability to perform its intended functions during the period of extended operation. Include a list of any additional aging effects that may require management based on this operating experience.
3. Explain how the recent plant-specific operating experience will be incorporated into the Structures Monitoring Program AMP, and if the current program will be adequate to manage aging of the shield building during the period of extended operation, based on this operating experience. Specifically address the following:
 - i. Details of tests planned to determine the long term effect of the concrete cracks on the ability of the rebars to carry design loads.
 - ii. Plans, if any, to repair the crack or reinforce the shield building concrete
 - iii. Detailed plans to monitor the extent and thickness of cracks, and corrosion of the rebars over the long term.
 - iv. Plans, if any, to perform detailed structural analysis, with explicit modeling of rebars, cracks, and concrete, to demonstrate that the shield building will perform its intended design function over the long term. This analysis should also consider the effect of shrinkage and environment on the concrete and rebar during the period of extended operation.
4. Identify and explain any changes to the license renewal application based on the recent plant specific operating experience.

Deleted: whether or not

Deleted: whether or not a plant-specific program is necessary to

Deleted:

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Hernandez, Pete

From: Hernandez, Pete *MR*
Sent: Wednesday, December 14, 2011 7:18 AM
To: Sanchez Santiago, Elba; Briley, Thomas; Hills, David; Neurauter, James
Cc: Mahoney, Michael
Subject: FW: ET/LT Brief 12-22-11 - Containment Delamination Davis-Besse / CR-3
Attachments: ET-LT Containment Delamination Brief 12-22-11.pptx

Good morning yall,

We had a request come in from DLR to provide comments on the attached slides (see email below). Are yall able to help with this? They are asking for a quick turnaround. If you have any comments please send them to me or Mike.

Thanks,

Pete

From: Lehman, Bryce *MR*
Sent: Tuesday, December 13, 2011 4:28 PM
To: Mahoney, Michael; Hernandez, Pete; Lingam, Siva; Thomas, George; Manoly, Kamal; Murphy, Martin
Cc: Erickson, Alice; Sheikh, Abdul; Auluck, Rajender
Subject: ET/LT Brief 12-22-11 - Containment Delamination Davis-Besse / CR-3

To All,

DLR is presenting to the ET/LT team on December 22 regarding the cracking in the Crystal River containment and the Davis-Besse shield building. The purpose of the briefing is to provide a summary/status on Davis-Besse and CR-3.

I have prepared the attached presentation and am requesting that you review the portions that apply to you, or let me know if there is someone else I should send the presentation to. Please provide comments to me and cc Alice Erickson by COB Thursday (12/15) so we can incorporate them and provide a copy to our division management. Please comment on what is in the presentation as well as anything you think is missing.

Davis-Besse portions are slides 3-13 and 20-22. I need help filling out slides 11 & 12, especially explaining why the CAL did not address questions regarding code compliance.

The CR-3 portions are slides 14-22.

DORL PMs, if you have a regional POC please forward the slides to get their comments as well. I want to make sure we present accurate information and that the staff is in alignment.

Thanks in advance for your help.

Bryce Lehman
O-11F10
(301) 415-1626
Bryce.Lehman@nrc.gov

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Hernandez, Pete

From: Hernandez, Pete *mark*
Sent: Thursday, December 15, 2011 7:18 AM
To: Erickson, Alice
Subject: FW: ET/LT Brief 12-22-11 - Containment Delamination Davis-Besse / CR-3
Attachments: 12142011 ET-LT Containment Delamination Brief 12-22-11.pptx

Hi Alice,

Bryce had you listed as his back up for this briefing. Let me know if I can do anything else.

Thanks,

Pete

From: Hernandez, Pete
Sent: Thursday, December 15, 2011 7:16 AM
To: Lehman, Bryce
Cc: Mahoney, Michael
Subject: FW: ET/LT Brief 12-22-11 - Containment Delamination Davis-Besse / CR-3

Good morning Bryce,

Attached is the ppt. with comments from the region. Let me know if you need anything else.

Thanks,

Pete

CONTAINMENT DELAMINATION: DAVIS-BESSE & CRYSTAL RIVER

BRYCE LEHMAN

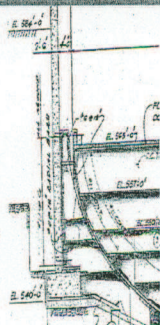
December 27, 2011

Agenda

- Davis-Besse Condition & Licensee's Position
- NRC's Position on Davis-Besse
- Impact on License Renewal
- Status Update on Crystal River
- Impact on License Renewal
- Similarities & Differences Between Plants

Davis-Besse Shield Building

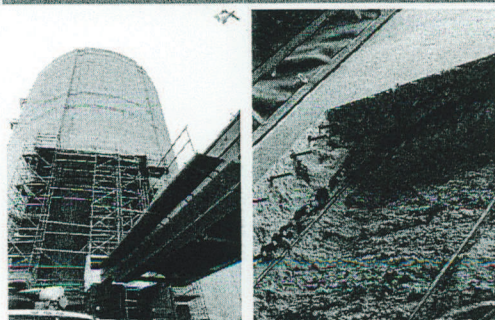
- Free-standing steel containment vessel surrounded by reinforced concrete shield building
- Shield Building Functions:
 - Environmental & external missile protection for containment vessel
 - Biological shielding during normal operation and accident conditions
 - Means for collection and filtration of fission product leakage following accident



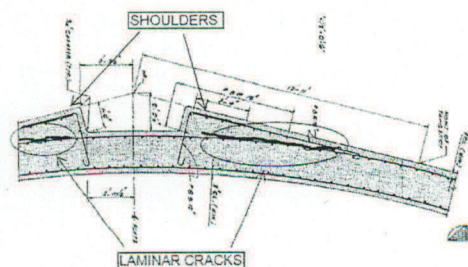
Initial Condition

- Laminar crack identified in architectural flute shoulder area during hydro-demolition for replacement of reactor vessel closure head (October 10th)
- Crack found on the vertical side of the opening (left side, looking from the outside), generally along main reinforcing steel, and extends ~6' across the top and ~4' across the bottom

Construction Opening



Flute/Shoulder Geometry



Condition Assessment

Initial Investigation

- ❑ "Chipping back" along cracked areas revealed crack extended beyond construction opening
- ❑ Impulse Response (IR) methodology employed to investigate extent of crack
- ❑ IR testing indicated crack extended ~38' above construction opening
- ❑ (4) core bores taken to validate IR results
 - ❑ Indicated crack existed near outer reinforcement mat

Flute Shoulders

- ❑ IR testing performed on 15 of 16 flute shoulders
 - ❑ Based on results, licensee assumed cracking throughout all shoulders
- ❑ Core bores taken on 12 shoulders to confirm crack boundaries
- ❑ Core bores inspected using boroscope to identify crack depths and widths
 - ❑ Very tight, less than 0.01"

Condition Assessment

Flute Areas

- ❑ IR testing performed on 4 of 8 flute areas
- ❑ Core bores taken from 6 of 8 flute areas
- ❑ IR testing and core bores confirmed laminar cracking not present in flute areas
 - ❑ One flute did have a vertical crack, but determined to be isolated condition

Main Shell Areas

- ❑ IR testing performed in 7 of 8 areas between flute shoulders
- ❑ Two small regions adjacent to Main Steam Line penetration blockouts are cracked
 - ❑ Extent of cracking unique to penetrations
- ❑ Cracking regions exist at top 20' of Shield Building wall outside shoulder area
- ❑ Spring line area appears to have little or no cracking (top 5')

Condition Assessment Summary

- ❑ Cracking is generic to all flute shoulder regions
- ❑ Cracks are confined to flute shoulder regions with exception of top 20' of Shield Building wall and two small regions near MSL penetrations
- ❑ Cracking exists at top 20' of Shield Building wall outside shoulder region [delete (investigation ongoing)]
- ❑ Cracks are very tight, <0.01", and located near the outer reinforcing mat

Licensee's Position

- ❑ Believe sampling method of IR testing and core bores has characterized the extent of cracking in the structure
- ❑ Primary concern is ability of outside rebar to perform its intended function. Observations of construction opening and testing indicate concrete is attached to rebar mat
- ❑ Based on structural evaluation, cracking does not impact ability of structure to perform its intended safety functions
- ❑ Root cause is underway

NRC's Position

- ❑ NRC informed licensee they could restart (12/2)
 - ❑ Licensee developed a model with reasonable assumptions which demonstrated adequate margin for operability
- ❑ Staff continues to evaluate whether the shield building conforms to the design code requirements in the CLB
 - ❑ This requires a 50.59 review and is currently being addressed by Region III in inspection space
 - ❑ IS THERE A DUE DATE OR TIME LIMIT ON THIS? WHAT IS DRIVING THIS REVIEW?
 - ❑ The ongoing inspection is continuing and the focus has shifted to resolving the question regarding compliance with the design and licensing basis. Region III is developing a plan/timeline for resolution and issuance of the inspection report.

NRC's Position

- ❑ NRC issued CAL which included commitments to:
 - ❑ Determine root cause and develop a long-term monitoring program (due 2/28/12)
 - ❑ Select multiple un-cracked areas to investigate to verify the cracking is not spreading (due 90 days)
 - ❑ Analyze known cracked areas to verify the cracks are not growing
- ❑ Decision was made to leave code compliance questions out of the CAL and to focus on confirming assumptions made in the operability calculations
 - ❑ Focus on continued operability going forward
 - ❑ Address design through ongoing inspection

License Renewal Impact

- ❑ The degraded shield building is a Part 50 issue affecting license renewal
- ❑ DLR needs to understand if the degradation is age-related, and if so how it will be managed
- ❑ DLR will issue an RAI asking the applicant to explain how the unique OE will be addressed by its AMPs
 - ❑ This will be tracked as an Open Item in the SER

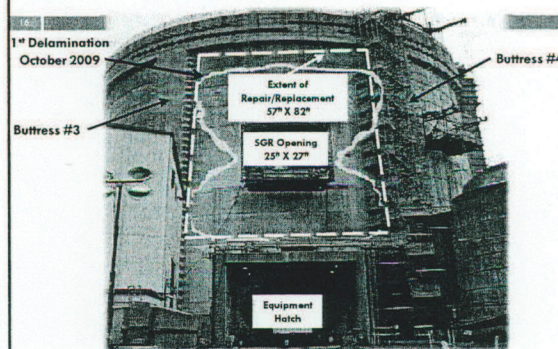
CR-3 Update: Timeline

- ❑ **Dec. 2008:** License Renewal Application (LRA) submitted.
- ❑ **Oct. 2009:** Delamination of containment concrete in Bay 3-4.
- ❑ **Nov. 2009:** Applicant starts repair of concrete in Bay 3-4.
- ❑ **Dec. 2010:** SER issued with open item for containment repair.
- ❑ **Jan. 2011:** ACRS Subcommittee meeting.
 - * Committee requested additional meeting after closeout of open item for containment repair.
- ❑ **Mar. 2011:** New delamination identified in containment Bay 5-6.
- ❑ **Jun. 2011:** NRC informs the applicant that a revised schedule for LRA review will be established after information on the containment repair plan is submitted.
- ❑ **Jul. 2011:** Spalling identified in Bay 1-2.
 - * Concrete sections (approx. 1.5" X 12' X 3' & 5') fell on Intermediate Building

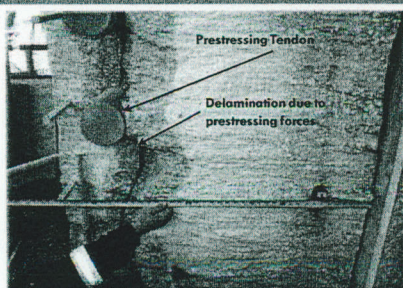
CR-3 Update: Recent Activities

- ❑ Licensee reviewing repair proposals from Bechtel and URS
 - ❑ Anticipate contracts to be in place by Jan. 31
 - ❑ Repairs expected to require 2 to 3 years to complete
- ❑ Licensee continues to install temporary anchors to limit propagation of delaminations and prevent future delaminations
- ❑ Licensee preparing to detension the containment building tendons in preparation for the repair
- ❑ Staff expects licensee to submit a license amendment but that is not certain at this point

CR-3 Update: Original Delamination

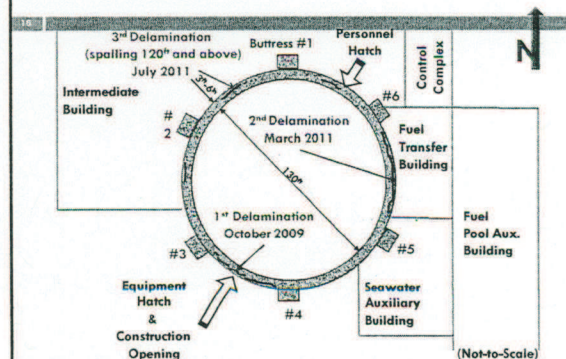


CR-3 Update: Original Delamination



Delamination between buttress 3 & 4

CR-3 Update: Plant View



CR-3 Update: Possible Impacts on LR-AMPs

Program	Impact
IWL	Concrete and prestressing tendons: Enhanced inspection and surveillance frequency; additional devices such as strain gauges to monitor cracks; and scanning of concrete at different locations.
10 CFR 50 App. J	Containment Leakage Type A, B, and C tests: Test frequency.
TLAA	Tendons: Revision to the program and data since most of the vertical and hoop tendons will be re-tensioned.
Containment Tendon Prestress	Tendons: Major revision to the program to identify sample size, frequency; new regression analysis based on re-tensioned data.

Comparison of Davis-Besse & CR-3

- Similar crack geometry
 - Laminar cracking around circumference of building
- Similarities end there

Differences Between Davis-Besse and CR-3

Davis-Besse	Crystal River
<ul style="list-style-type: none"> □ Cracking in the reinforced concrete shield building □ Crack widths between 5 – 10 mils □ Cracking along outer reinforcement mat (2-3" from exterior face) □ Root cause still under investigation <ul style="list-style-type: none"> □ Potential causes: thermal loading and structural discontinuities □ OK for <u>examples</u> of likely causes if HRC internal presentation. Licensee likely will investigate other potential causes in their root cause evaluation. 	<ul style="list-style-type: none"> □ Cracking in the prestressed concrete containment building □ Crack widths between 500 – 4000 mils □ Cracking along post-tension tendons (8-9" from exterior face) □ Cracking due to prestressing forces, lack of transverse shear reinforcement and weak aggregate

Summary

- Although similar at first glance, Davis-Besse and Crystal River are different issues
 - Acceptance of one has no bearing on the other.
- Both issues are Part 50 concerns which have an impact on license renewal
- The Regions and Headquarters will continue to work together to ensure continued functionality (Part 50) and to ensure aging is properly managed (Part 54)

SHIELD BUILDING / CONTAINMENT DELAMINATION: DAVIS-BESSE & CRYSTAL RIVER

BRYCE LEHMAN – NRR/DLR
JIM NEURAUTER – REGION III/DRS
DANIEL RICH – REGION II/DRP

December 22, 2011

Agenda

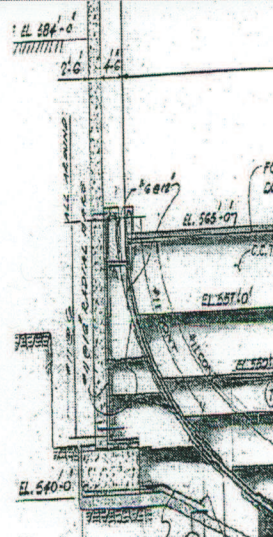
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B/49

Davis-Besse Shield Building

- Free-standing steel containment vessel surrounded by reinforced concrete shield building
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