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INDIANA MICHIGAN POWER

June 28, 2000

United States Nuclear Regulatory Commission
Document Control Desk
Washington, DC 20555

Operating License DPR-74
Docket No. 50-316

Document Control Manager:

In accordance with the criteria established by 10 CFR 50.73 entitled Licensee Event Report System, the following report is being submitted:

LER 316/2000-003-00, "Containment Internal Concrete Structures Do Not Meet Design Load Margins."

The following commitments were identified in this submittal:

- A review of containment internal structures will be performed prior to Unit 1 startup to determine extent of condition, repairs to structural elements will be made where applicable, and critical calculations will be reconstituted or evaluations performed to document operability of the Unit 1 structures.
- The final course and schedule for long-term corrective and preventive actions to restore and maintain the design pressure load factors for the internal containment concrete structural elements in both units will be determined prior to Unit 1 startup.

Should you have any questions regarding this correspondence, please contact Mr. Robert C. Godley, Director, Regulatory Affairs, at 616/465-5901, extension 2698.

Sincerely,

Daniel J. Garner for

M. W. Rencheck
Vice President – Nuclear Engineering

/srd
Attachment

c: J. E. Dyer, Region III
R. C. Godley
D. Hahn
W. J. Kropp
R. P. Powers
R. Whale
Records Center, INPO
NRC Resident Inspector

6-B

NRC Form 366 (6-1998) U.S. NUCLEAR REGULATORY COMMISSION

LICENSEE EVENT REPORT (LER)

(See reverse for required number of digits/characters for each block)

FACILITY NAME (1)	DOCKET NUMBER (2)	PAGE (3)
Donald C. Cook Nuclear Plant Unit 2	05000-316	1 of 3

TITLE (4)

Containment Internal Concrete Structures Do Not Meet Design Load Margins

EVENT DATE (5)			LER NUMBER (6)			REPORT DATE (7)			OTHER FACILITIES INVOLVED (8)	
MONTH	DAY	YEAR	YEAR	SEQUENTIAL NUMBER	REVISION NUMBER	MONTH	DAY	YEAR	FACILITY NAME	DOCKET NUMBER
05	29	2000	2000	– 003 –	00	06	28	2000	FACILITY NAME	DOCKET NUMBER

OPERATING MODE (9)	5	THIS REPORT IS SUBMITTED PURSUANT TO THE REQUIREMENTS OF 10 CFR §: (Check one or more) (11)						
			20.2201 (b)		20.2203(a)(2)(v)		50.73(a)(2)(i)	50.73(a)(2)(viii)
POWER LEVEL (10)	–		20.2203(a)(1)		20.2203(a)(3)(i)	X	50.73(a)(2)(ii)	50.73(a)(2)(x)
			20.2203(a)(2)(i)		20.2203(a)(3)(ii)		50.73(a)(2)(iii)	73.71
			20.2203(a)(2)(ii)		20.2203(a)(4)		50.73(a)(2)(iv)	OTHER
			20.2203(a)(2)(iii)		50.36(c)(1)		50.73(a)(2)(v)	Specify in Abstract below or in NRC Form 366A
			20.2203(a)(2)(iv)		50.36(c)(2)		50.73(a)(2)(vii)	

LICENSEE CONTACT FOR THIS LER (12)

NAME	TELEPHONE NUMBER (Include Area Code)
M. B. Depuydt, Regulatory Affairs	616 / 465-5901, x1589

COMPLETE ONE LINE FOR EACH COMPONENT FAILURE DESCRIBED IN THIS REPORT (13)

CAUSE	SYSTEM	COMPONENT	MANUFACTURER	REPORTABLE TO EPIX	CAUSE	SYSTEM	COMPONENT	MANUFACTURER	REPORTABLE TO EPIX

SUPPLEMENTAL REPORT EXPECTED (14)				EXPECTED SUBMISSION DATE (15)	MONTH	DAY	YEAR
	YES (If Yes, complete EXPECTED SUBMISSION DATE).	X	NO				

Abstract (Limit to 1400 spaces, i.e., approximately 15 single-spaced typewritten lines) (16)

On May 29, 2000, during an evaluation of concrete structures inside the Donald C. Cook Nuclear Plant (CNP) Unit 2 containment, it was determined that a condition outside the design basis of the plant existed in that some containment internal concrete sub-compartment structural elements, specifically walls and floors, did not meet the design pressure load factor margin of 1.5 as described in the CNP Updated Final Safety Analysis Report (UFSAR). A revised Nuclear Steam Supply System (NSSS) vendor transient mass distribution (TMD) containment analysis prompted new calculations which showed that a number of containment internal concrete structural elements did not meet the 1.5 design pressure load factor margin, contrary to UFSAR design requirements. This LER is submitted in accordance with 10 CFR 50.73(a)(2)(ii)(B) for a condition outside the design basis of the plant.

The apparent cause for this event was the failure to adequately control design basis calculations and supporting documentation. For Unit 2, critical calculations have been reconstituted or evaluations performed for the subject concrete structural elements, and some structural grout repairs made on a wall with noted degradation. A review of containment internal concrete structural elements will be performed prior to Unit 1 startup to determine extent of condition, repairs will be made where applicable, and critical calculations will be reconstituted or evaluations performed to document operability of the Unit 1 structures. A plan and schedule for long-term corrective and preventive actions for both units will be 'eveloped prior to Unit 1 startup.

The results of Unit 2 calculations and evaluations show that the internal containment concrete structural elements were capable of withstanding the revised TMD accident pressures without loss of function. There is minimal safety significance associated with the failure to maintain a 1.5 design pressure load factor margin for internal containment structures.

FACILITY NAME (1)	DOCKET NUMBER(2)	LER NUMBER (6)					PAGE (3)
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Donald C. Cook Nuclear Plant Unit 2	05000-316	2000	–	003	–	00	2 of 3

TEXT *(If more space is required, use additional copies of NRC Form (366A)* **(17)**

Conditions Prior to Event
Unit 2 was in Mode 5, Cold Shutdown

Description of Event
On May 29, 2000, during an evaluation of concrete structures inside the Donald C. Cook Nuclear Plant (CNP) Unit 2 containment (EIIS: NH), it was determined that a condition outside the design basis of the plant existed in that some containment internal concrete sub-compartment structural elements did not meet the design pressure load factor margin of 1.5 as described in the CNP Updated Final Safety Analysis Report (UFSAR). A revised Nuclear Steam Supply System (NSSS) vendor transient mass distribution (TMD) containment analysis prompted new calculations which showed that a number of containment internal concrete structural elements did not meet the 1.5 design pressure load factor margin, contrary to UFSAR design requirements. Additionally, some physical degradation and non-conforming conditions existed on isolated areas of four accumulator room end walls, which contributed to the reduction in structural capacity for these walls.

The reduction in design pressure load margin for containment internal concrete sub-compartment structural elements was determined to be reportable, and this LER is submitted in accordance with 10 CFR 50.73(a)(2)(ii)(B) for a condition outside the design basis of the plant.

Cause of Event
The apparent cause for this condition was the failure to adequately control design basis calculations and supporting documentation. Specifically, documentation and calculations supporting the plant configuration related to containment concrete structure load conditions could not be located, or did not meet current standards for technical or administrative attributes.

These issues are symptoms of the larger generic issue of inadequate design and licensing basis control that had been previously identified and confirmed during the Expanded System Readiness Reviews.

Analysis of Event
The design of the containment structures is based upon limiting load factors, which are the ratios by which loads are multiplied to assure that the loading deformation behavior of the structure is one of elastic, tolerable strain behavior. The UFSAR requires an evaluation of the loads utilized in the design of reinforced concrete containment structures, and includes a design pressure load factor margin of 1.5 to ensure that the structures were capable of withstanding a 50 percent increase in pressure load above the worst-case expected load in a given area. The pressure load is one of a number of loads considered in the design of the containment structural elements.

Critical calculations have been reconstituted or evaluations performed for the subject concrete structural elements using the new TMD accident pressures. These new calculations and evaluations utilized reduced pressure load factors, less than the 1.5 pressure load factor specified in the UFSAR, but always greater than 1.0, and also took credit for the actual as-installed physical configuration and strength of materials. The results of the calculations and evaluations show that the internal containment concrete structures were capable of withstanding the revised TMD accident pressures without loss of function. Based on the above, there is minimal safety significance associated with the failure to maintain a 1.5 design pressure load factor margin for containment concrete structures.

Corrective Actions
There were no immediate corrective actions associated with the failure to maintain a 1.5 design pressure load factor margin for containment concrete structures, because Unit 2 was in a cold shutdown condition.

FACILITY NAME (1)	DOCKET NUMBER(2)	LER NUMBER (6)					PAGE (3)
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TEXT *(If more space is required, use additional copies of NRC Form (366A)* (17)

Critical calculations have been reconstituted or evaluations performed for the subject concrete structural elements using the new TMD accident pressures to document operability of the Unit 2 structures. Limited structural grout repairs were completed on one accumulator room wall with noted degradation.

A presentation was made to the NRC on June 1, 2000, to provide information related to the design and licensing basis for the concrete structures, the current configuration of the structures including which structures were degraded, and a justification to operate the units while the structures were considered to be in a degraded or non-conforming condition. Reference NRC letter to Indiana Michigan Power Company, "Donald C. Cook - Summary of June 1, 2000, Public Meeting Regarding Containment Subcompartment Walls," dated June 12, 2000.

A similar condition is expected on CNP Unit 1. A review of containment internal structures will be performed prior to Unit 1 startup to determine extent of condition, repairs to structural elements will be made where applicable, and critical calculations will be reconstituted or evaluations performed to document operability of the Unit 1 structures.

The final course and schedule for long-term corrective and preventive actions to restore and maintain the design pressure load factors for the internal containment concrete structural elements in both units will be determined prior to Unit 1 startup.

The corrective actions to prevent recurrence for the root cause of the generic inadequacies of the design control process are being addressed through the CNP Corrective Action Program. The root cause evaluation identified numerous corrective actions to address management, organizational, and programmatic issues in the Engineering organization. Actions specific to restart of the CNP units have been tracked and completed as part of the CNP Restart Plan.

Previous Similar Events

315/1999-026-00	315/1999-022-01
315/1999-019-00	315/1999-012-00
315/1999-007-00	315/1998-056-01
315/1998-037-01	315/1998-029-01

Cook Nuclear Plant's Commitment Management System

Custom Search Results using 'And' Logic Report

Commitment No.: 7805

Document Information: **Date:** 06/28/2000 **Submittal Number:** 2000019

Document Type: Correspondence **From:** AEP **To:** NRC

Document Number: 2981

Document Title: LER 316/2000-003-00, Containment Internal Concrete Structures do not Meet Design Load Margins

Commitment Information: **Status:** Closed **Organization:** NESD

Commitment No.: 7805 **Due Date:** 11/26/2000 **Assigned to:** Ron Smith

Contact: M. B Depuydt **Date Type:** FE-A **CR Number:** 00-2506

Category: Design **Timing:** Single Action **LER Number:** 316/2000-003-0

Agency: NRC **Frequency:** **CC Number:**

System: CNTMT **NEI Guide:**

Event Related: Restart 1 - Mode 4 **Event Related Source:** See Comments

SIDS Related Information: **Last Updated in CMP on 09/06/01 @ 08:28**

Mode Related	System	Overall / Final Status		Final Review
Restart 1 - Mode 2	Containment	CLOSED	CONCURRED	Final SM Approval

Commitment: **Page/Section:** Page/Sect.1/ **Title:** Containment Internal Structures

The final course and schedule for long-term corrective and preventive actions to restore and maintain the design pressure load factors for the internal containment concrete structural elements in both units will be determined prior to Unit 1 startup.

Comments/ Implementation: See "Disposition Information" section for closure information. SBH 11/1/00

Event Related assigned 'Restart 1 - Mode 4' based on data input form due date. Source document stated prior to Unit 1 startup (Mode 2). SBH 06/29/00

Background:

Disposition Information: **Biennial Date:** **Last Updated:** 11/01/2000

Classification: Completed **Previous Commitment No.:**

Completion Date: 10/15/2000 **Superseding Commitment No.:**

Closure Note: Closure Information: AEP (C1000-05), "Resolution of Containment Structural Issues," dated October 15, 2000 provided a description of the extensive reviews of containment internal structures that have been completed and documented the final course and schedule for long-term corrective and preventive actions.

Cook Nuclear Plant's Commitment Management System

Custom Search Results using 'And' Logic Report

Document Information: **Date:** 06/28/2000 **Submittal Number:** 2000019

Document Type: Correspondence **From:** AEP **To:** NRC

Document Number: 2981

Document Title: LER 316/2000-003-00, Containment Internal Concrete Structures do not Meet Design Load Margins

Commitment Information: **Status:** Closed **Organization:** NESD

Commitment No.: 7806 **Due Date:** 11/26/2000 **Assigned to:** Ron Smith

Contact: M. B. Depuydt **Date Type:** FE-A **CR Number:** 00-2506

Category: Design **Timing:** Single Action **LER Number:** 316/2000-003-0

Agency: NRC **Frequency:** **CC Number:**

System: CNTMT **NEI Guide:**

Event Related: Restart 1 - Mode 4 **Event Related Source:** See Comments

SIDS Related Information: **Last Updated in CMP on 09/06/01 @ 08:28**

Mode Related	System	Overall / Final Status		Final Review
Restart 1 - Mode 4	Containment	CLOSED	CONCURRED	Final SM Approval

Commitment: **Page/Section:** Sect. 1/Cvr L **Title:** Containment Internal Structures

A review of containment internal structures will be performed prior to Unit 1 startup to determine extent of condition, repairs to structural elements will be made where applicable, and critical calculations will be reconstituted or evaluations performed to document operability of the Unit 1 structures.

Comments/ Implementation: Operability of the Unit 1 Containment Structures is provided with the Operability Determination Evaluations (ODE) contained within Condition Reports (CR -00-299044 and 00-264095). Matrix page is provided to facilitate the structural elements contained within the ODEs as closure to this commitment.

Closure Information: Based on the evaluations contained in calculation SD-00810-001, Revision 0, the Unit 1 Fan/Accumulator Room Walls at Azimuths 54 degrees, 126 degrees, 234 degrees and 307 degrees meet the newly calculated values for blowdown loading without exceeding allowable stress limits. The degraded condition, which creates the need for this evaluation, is that these walls are subjected to the loading from newly calculated Transient Mass Distribution (TMD) analyses and the physical conditions unique to the azimuth 54 degrees, 126 degrees, 234 degrees, and 307 degrees walls have resulted in a reduction in UFSAR design basis load factors needed to meet allowable stresses. Since these conditions, in the aggregate do not result in a reduction in margin below operability acceptance limits, the Unit 1 Fan/Accumulator Room Walls at Azimuths 54 degrees, 126 degrees, 234 degrees, and 307 degrees are considered OPERABLE But Degraded.

Referenced Documents: CR 00-299044 and 00-264095.

Background: Reference Document: NRC Letter (A1000-08), dated October 13, 2000, "Summary of September 27, 2000 Public Meeting Regarding Update on Containment Structures" Commitment No. 7806.

Disposition Information: **Biennial Date:** **Last Updated:** 11/21/2000

Classification: Completed **Previous Commitment No.:**

Completion Date: 11/15/2000 **Superseding Commitment No.:**

Closure Note: Closure Information: Based on the evaluations contained in calculation SD-00810-001, Revision 0, the Unit 1 Fan/Accumulator Room Walls at Azimuths 54 degrees, 126 degrees, 234 degrees and 307 degrees meet the newly calculated values for blowdown loading without exceeding allowable stress limits. The degraded condition, which creates the need for this evaluation, is that these walls are subjected to the loading from newly calculated Transient Mass Distribution (TMD) analyses and the physical conditions unique to the azimuth 54 degrees, 126 degrees, 234 degrees, and 307 degrees walls have resulted in a reduction in UFSAR design basis load factors needed to meet allowable stresses. Since these conditions, in the aggregate do not result in a reduction in margin below operability acceptance limits, the Unit 1 Fan/Accumulator Room Walls at Azimuths 54 degrees, 126 degrees, 234 degrees, and 307 degrees are considered OPERABLE But Degraded

October 15, 2000 C1000-05

Docket Nos.: 50-315
50-316

U. S. Nuclear Regulatory Commission
ATTN: Document Control Desk
Mail Stop O-P1-17
Washington, D.C. 20555-0001

Donald C. Cook Nuclear Plant Units 1 and 2
RESOLUTION OF CONTAINMENT STRUCTURAL ISSUES

Reference: Letter from M. W. Rencheck (I&M) to NRC Document Control Desk, transmitting Licensee Event Report 316/2000-003-00, "Containment Internal Concrete Structures Do Not Meet Design Load Margins," dated June 28, 2000.

Indiana Michigan Power Company (I&M), the Licensee for Donald C. Cook Nuclear Plant (CNP) Units 1 and 2, is providing a description of actions taken and planned to address a condition in which certain internal containment structural elements did not meet the design load margins as described in the plant's licensing basis, as a result of completing simplistic conservative evaluations of these structures. This condition was discussed with the Nuclear Regulatory Commission (NRC) Staff in two public meetings and reported to the NRC in the referenced letter, which includes commitments for I&M to take certain actions specific to Unit 1 and establish a plan and schedule for long-term corrective and preventive actions.

This letter describes the extensive reviews of containment internal structures that have been completed and documents the final course and schedule for long-term corrective and preventive actions, consistent with the commitments contained in the referenced letter and as described in public meetings. This letter summarizes the actions taken to ensure operability of containment structures prior to restart of either CNP unit. Prior to the restart of CNP Unit 2, conservative, simplified evaluations were performed to demonstrate that the Unit 2 containment structures were operable. Additional conservative evaluations, analyses, and calculations are being performed to demonstrate the Unit 1 containment structures are operable prior to the restart of Unit 1.

I&M is currently performing refined analyses of the containment structures in parallel with the Unit 1 operability evaluations to obtain a timely and final resolution of these issues. In addition to documenting actions completed to date, this letter contains I&M's commitments to complete actions needed to bring these issues to final resolution, i.e., to demonstrate that these structures conform with their licensing basis. Attachment 1 to this letter addresses I&M's commitments made in the referenced letter. Attachment 2 contains a list of additional commitments contained in this letter.

Should you have any questions, please contact Mr. Wayne J. Kropp, Director of Regulatory Affairs, at (616) 697-5056.

Sincerely,

M. W. Rencheck
Vice President Nuclear Engineering

/jen

Attachments

c: J. E. Dyer
MDEQ – DW & RPD, w/o attachments
NRC Resident Inspector
R. Whale, w/o attachments

bc: R. W. Gaston, w/o attachments
R. J. Grumbir
S. B. Haggerty
D. W. Jenkins, w/o attachments
M. W. Rencheck/S. A. Greenlee, w/o attachments
R. J. Smith
J. F. Stang, Jr., NRC - Washington, DC
R. K. Temple, Hopkins & Sutter

ATTACHMENT 1 TO C1000-05

RESOLUTION OF CONTAINMENT ISSUES

A. Background

As described during the June 1, 2000, and September 27, 2000, public meetings, significant reviews of Donald C. Cook Nuclear Plant (CNP) Unit 2 and Unit 1 containment internal structures have been completed. These reviews identified deficient or missing calculations, which are needed to demonstrate conformance with Updated Final Safety Analysis Report (UFSAR) design requirements, and physical deficiencies with certain containment subcompartment walls. The majority of these issues were initially identified and placed in the CNP corrective action process during the Expanded System Readiness Review (ESRR) that was performed in early 1999. The remainder of these issues were identified through resolution of these items using the corrective action process. Initially, transient mass distribution (TMD) analyses and bounding structural evaluations were performed to address deficient or missing design basis calculations. The TMD analyses, using the design basis methodology, were re-performed with reconstituted and revised input parameters, which yielded revised TMD output pressure loads. The revised TMD analyses outputs were then reviewed to determine their impact on the structural evaluations. It was as a result of reviewing the TMD analysis outputs, in May 2000, that Indiana Michigan Power Company (I&M) personnel identified design pressures impacting certain internal structures inconsistent with design basis margins, that raised an unreviewed safety question regarding the increases in postulated pressure loads.

On May 29, 2000, during an evaluation of concrete structures in the CNP Unit 2 containment, I&M determined that a condition outside the design basis of the plant existed. I&M determined, based upon conservative simplified evaluations, that some containment internal concrete subcompartment structural elements, specifically, certain walls and floors, did not meet the design pressure load factor margin of 1.5 as described in the CNP UFSAR. As explained in the UFSAR, having a design pressure load factor margin of 1.5 means that these structures are expected to be able to withstand, without failure, a fifty percent increase in pressure load above the worst-case pressure postulated in an area. The conservative simplified structural evaluations included the results of revised postulated pressure loads derived from the containment TMD analysis. The input parameters to the TMD analysis, principally related to the physical configuration of the containment, had been conservatively changed yielding revised TMD output pressure loads.

Tracing the reviews of the ice condenser support structure, as an example of the reviews conducted on containment structures generally, demonstrates the process by which specific containment structural issues have been identified. Completing the initial simplified evaluation resulted in marginal capacity in the Unit 2 ice condenser support structure and in less than design basis capacity in the Unit 1 ice condenser support structure. In response to these results, I&M performed a calculation for the Unit 2 ice condenser support structure. This calculation demonstrated that the Unit 2 ice condenser support structure met the design basis capacity requirements with the exception of the steel support columns. Three steel support columns appeared less than design basis capacity for one load combination, but maintained operability. This simplified calculation demonstrated operability of the Unit 2 ice condenser support structure, so, in parallel, I&M started a highly detailed analysis to determine whether the Unit 1 ice condenser support structure would demonstrate an adequate design basis capacity. In addition, I&M undertook a finite element analysis of the ice condenser floor for independent validation of the analytical results. Both the detailed analysis and the finite element analysis demonstrated the Unit 1 ice condenser floor support structure conformed to its design basis capacity. Although the above example depicts separate calculations being performed for each unit, the majority of the evaluations and/or calculations performed have bounded conditions for both units.

In a public meeting held on June 1, 2000, I&M described its findings related to Unit 2 containment subcompartment walls to members of the Nuclear Regulatory Commission (NRC) Staff. During this meeting, I&M also presented information related to the design and licensing basis for these structures, the current configuration of the structures, including which structures were degraded, and justification for operating the units while the structures were considered to be degraded.

On June 28, 2000, I&M submitted Licensee Event Report (LER) 316/2000-003-00, "Containment Internal Concrete Structures Do Not Meet Design Load Margins," to document the condition in accordance with 10 CFR 50.73(a)(2)(ii)(B) (Reference 1). The LER contains the following two commitments as part of the corrective action:

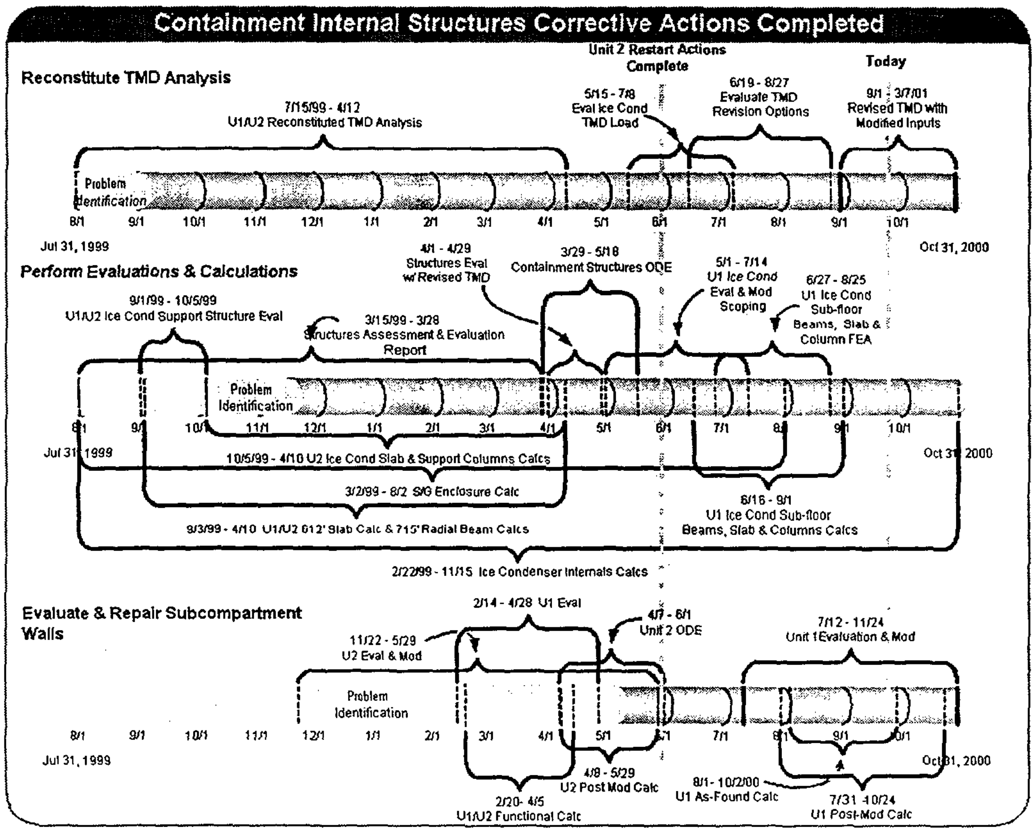
- "A review of containment internal structures will be performed prior to Unit 1 startup to determine the extent of condition, repairs to structural elements will be made where applicable, and critical calculations will be reconstituted or evaluations performed to document operability of the Unit 1 structures."

- "The final course and schedule for long-term corrective and preventive actions to restore and maintain the design pressure loads factors for the internal containment concrete structure elements in both units will be determined prior to Unit 1 startup."

On September 27, 2000, in a public meeting on containment structures, I&M provided the NRC Staff with a comprehensive description of the containment structural issues found in Units 1 and 2, an update on the status of these issues, including resolution strategies, and the corrective actions implemented and planned. During this meeting, I&M described the activities completed to date for resolution of these issues, including creation of revised inputs to the TMD analyses, bounding structural evaluations, and extensive supporting calculations. Discovery and repair efforts for the Unit 1 containment subcompartment walls were also reviewed. Figure 1, below, a slide used during the September 27th public meeting, shows the extensive nature of the corrective actions undertaken to resolve these issues and depicts the numerous parallel analytical efforts being performed.

To ensure timely resolution of these issues, I&M engaged three vendor organizations with expertise in this type of structural analysis, including the reactor vendor, to complete corrective actions in parallel. Actions undertaken to resolve these containment structural issues include reconstituting the existing TMD analyses with new input parameters, using the new analyses results, as they were produced, to complete conservative simplified containment structural evaluations. Since the Unit 1 and Unit 2 containment structures are similar, the majority of the results from containment analyses and evaluations are bounding for both Unit 1 and Unit 2. In the case of the ice condenser floor support structure and the subcompartment walls, these structures are physically different between the units and therefore must be individually evaluated. A summary of this activity is depicted in Figure 1.

Figure 1



As explained below, calculations and evaluations needed to demonstrate that containment structures meet their design basis are scheduled to be completed in May 2001. This letter documents the reviews of containment internal structures that have been completed and describes the final course and schedule for long-term corrective and preventive actions, consistent with the commitments contained in Reference 1. Contained within the subsequent sections of this attachment is a description of the conservative simplified evaluations that have been performed to demonstrate operability of the Unit 2 containment structure and that will be completed to demonstrate operability of the Unit 1 containment structure. Additionally, the following sections also describe the ongoing parallel activities being performed to facilitate timely final resolution of the remaining containment nonconformance issues.

B. Description of Current Conditions

As described during the June 1, 2000, and September 27, 2000, public meetings, significant reviews of Unit 2 and Unit 1 containment internal structures have been completed. These reviews identified deficient or missing calculations, which are needed to demonstrate conformance with UFSAR design requirements, and physical deficiencies with certain containment subcompartment walls. The majority of these issues were initially identified and placed in the CNP corrective action process during the Expanded System Readiness Review (ESRR) that was performed in early 1999. The remainder of these issues were identified through resolution of these items using the corrective action process. Initially, TMD analyses and bounding structural evaluations were performed to address deficient or missing design basis calculations. The TMD analyses, using the design basis methodology, were re-performed with reconstituted and revised input parameters, which yielded revised TMD output pressure loads. The revised TMD analyses outputs were then reviewed to determine their impact on the structural evaluations. It was as a result of reviewing the TMD analysis outputs, in May 2000, that I&M identified design pressures impacting certain internal structures inconsistent with design basis margins, that raised an unreviewed safety question regarding the increases in postulated pressure loads.

Since this time, as displayed in Figure 1 above, I&M has continued to refine the TMD analyses inputs, to perform bounding structural evaluations, and to perform new structural calculations. Continued refinements to TMD analyses inputs and bounding evaluations either demonstrate design basis conformance or help demonstrate that containment internal structures are operable, e.g., design margin of greater than 1.0.

Prior to Unit 2 restart, repairs of the physical deficiencies in certain Unit 2 subcompartment walls were completed. In addition, I&M completed two operability evaluations which address use of revised TMD analyses results, bounding evaluations and calculations, and where applicable, the design pressure load factor margins for specific containment structures. The first Unit 2 operability evaluation broadly addresses the aggregate effects of changes to the analyses and evaluations underlying the majority of containment structures. The second Unit 2 operability evaluation focuses specifically on the operability of certain containment subcompartment walls (walls at Azimuths 54, 126, 234, and 307 that extend horizontally from the crane wall to the containment shell, and vertically from the 612' elevation to the 638' elevation). These operability evaluations, based upon simplified conservative evaluations, conclude that: (1) containment structures are capable of withstanding the predicted pressure loading on structural components without a loss of function; and (2) the containment subcompartment walls have sufficient margin to withstand an increase in pressure load above the worst-case pressure

postulated in the affected areas. As a result, I&M demonstrated operability of the Unit 2 containment structures and subcompartment walls prior to restart of Unit 2.
Subsequent to Unit 2 restart, certain additional bounding evaluations and calculations for both units have been completed, confirming that additional Unit 1 structures meet design basis capacity requirements. Several of the simplified conservative evaluations performed for Unit 2 also bound Unit 1 containment structural elements. Since work remains to assure conformance of certain other structures with their design bases and Unit 1 results now rely on revised TMD outputs, two Unit 1 operability evaluations are being performed. The Unit 1 operability evaluations will be similar to those performed for Unit 2, but will reflect the additional work accomplished during the Unit 1 outage, including more finalized analyses and evaluations.

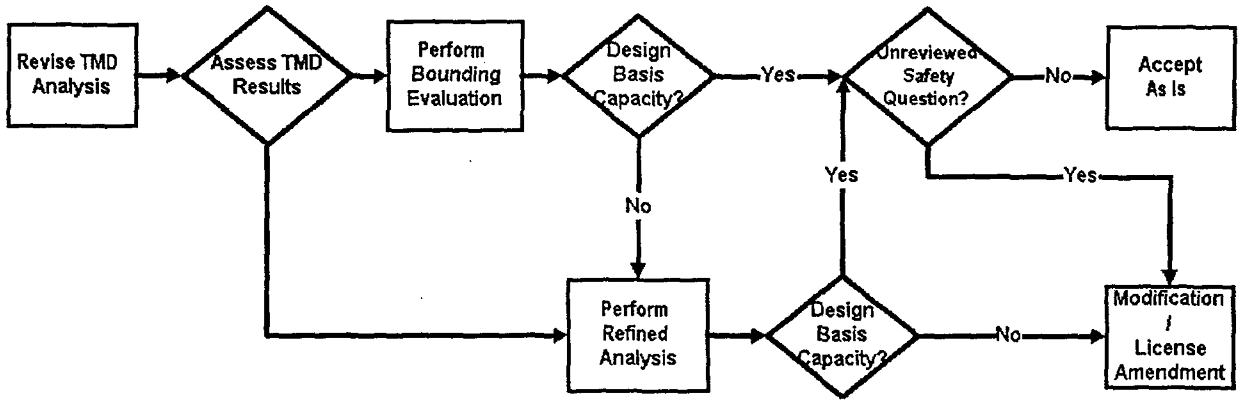
One of these Unit 1 operability evaluations will address the analytical work performed to demonstrate that the majority of the structures are operable despite missing or deficient calculations and TMD loading increases, and physical differences between the units. This operability evaluation will be able to rely on additional owner-accepted calculations and refined analyses completed since the Unit 2 operability evaluation. The second Unit 1 operability evaluation will address both the physical deficiencies identified in certain subcompartment walls and the calculations that are required to demonstrate that design margins for these walls are adequate. Significantly, initial reviews indicate that the Unit 1 walls have more margin than Unit 2 subcompartment walls.

Extent-of-condition reviews to bound the scope of identified deficiencies will be completed prior to restart of Unit 1. These extent-of-condition reviews will consider the scope of physical defects and implications of design deficiencies identified within the CNP containments. Completion of the Unit 1 operability evaluations, which will be finalized once the extent-of-condition reviews are done, is the final action needed to address the commitment in Reference 1 to document operability of the Unit 1 containment internal structures prior to Unit 1 startup.

C. Plan and Schedule

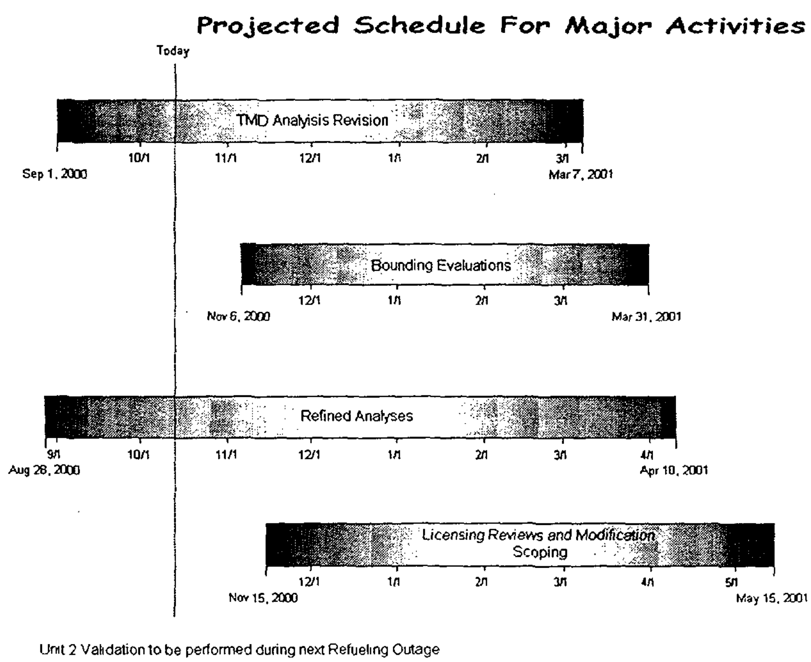
I&M has been taking a series of comprehensive iterative actions to address its findings in containment structures. To put the results achieved, and displayed in Figure 1, into perspective, we have reduced our problem resolution process to a flowchart shown in Figure 2, below. It is important to note that each of these steps has been or is being performed on the containment internal structures in parallel as shown in Figure 3. For example, the finite element analyses for the Unit 1 subcompartment walls and the Unit 2 subcompartment walls are currently being performed. The preliminary results from both of these finite element analyses indicate additional capacity is resident within the current configuration of the walls and preliminarily indicating the subcompartment walls in both units will achieve design basis capacity. Additionally, the TMD input parameters for these subcompartments are being validated through the performance of as-built walkdowns. The walkdown results will be used to refine the conservative inputs previously used.

Figure 2



As stated during the September 27th public meeting, I&M has developed a plan containing a final course and schedule for long-term corrective and preventive actions to resolve the containment structure issues for both CNP units, and actions to confirm that the structures meet UFSAR design basis requirements, including design pressure load factors for the internal containment concrete structural elements. As shown in Figure 3 below, the plan includes four major steps (categories of related activities), which are depicted following the figure.

Figure 3



TMD Analyses Revision Confirmation

The primary TMD analyses inputs are containment structure physical parameters (subcompartment volumes, flow areas, and flow paths) and mass/energy release information. During the recent dual-unit outage, selected inputs were conservatively reconstituted and the TMD analyses were revised to reflect the reconstituted inputs. This plan step is to develop realistic TMD inputs for cases where over-conservatism may have caused over-prediction of certain subcompartment pressures. In other cases, the conservative input assumptions will preclude the need for additional validation. Prior to completing the evaluation of the containment structures against design basis requirements, additional TMD inputs will be reconfirmed or refined, as required.

Bounding Structural Evaluations

The subcompartment pressures obtained from the revised TMD analyses described above will be assessed following confirmation, using bounding structural evaluations to determine whether containment internal structures conform with design basis requirements. The bounding evaluations will use conservative, simplified analysis techniques. If the bounding evaluations do not confirm consistency with the design basis, a refined analysis will be performed as described below, or a physical plant modification or appropriate licensing action will be implemented.

Refined Structural Analyses

Refined structural analyses will be performed for those portions of the structure impacted by increased subcompartment pressures and, as necessary, those portions of the structure that are determined to be inconsistent with the design basis using bounding evaluations. These refined structural analyses will use more sophisticated modeling tools to evaluate the containment structures against design basis requirements.

Licensing Actions and Modifications

I&M anticipates that confirmation of the TMD analyses, bounding evaluations, and the refined analyses will confirm that the structures meet design basis requirements. If the structures do not meet design basis requirements, physical plant modifications or license amendments will be pursued as appropriate. I&M will develop appropriate licensing submittals for any new analytical techniques or reductions in margin that require NRC approval and are needed to demonstrate design basis conformance.

The steps in this plan are scheduled to be completed by May 15, 2001, with the exception of validating Unit 2 physical parameters that are inaccessible until the next scheduled Unit 2 refueling outage.

D. Conclusion

I&M conservatively demonstrated, using simplified structural evaluations, that containment structures had margin for safe operation before restarting Unit 2. I&M is using results from Unit 2 and additional refined analyses to ensure that the containment structures have margin for safe operation before restarting Unit 1. The actions described in this section complete the commitment in Reference 1 to determine the plan and schedule for long-term corrective and preventive actions. The actions under way will ensure design basis conformance is restored and the extent-of-condition is addressed.

Reference: 1. Letter from M. W. Rencheck (I&M) to NRC Document Control Desk, Licensee Event Report 316/2000-003-00, "Containment Internal Concrete Structures Do Not Meet Design Load Margins," dated June 28, 2000.

ATTACHMENT 2 TO C1000-05

COMMITMENTS

The following identifies those actions committed to by Indiana Michigan Power Company (I&M) in this submittal. Other actions discussed in this submittal represent intended or planned actions by I&M. They are described to the Nuclear Regulatory Commission (NRC) for the NRC's information and are not regulatory commitments.

Commitment	Due Date
I&M will complete calculations and evaluations to demonstrate that Unit 1 containment structures meet their design basis requirements as described in Attachment 1 to this letter.	May 15, 2001
I&M will complete calculations and evaluations to demonstrate that Unit 2 containment structures meet their design basis requirements as described in Attachment 1 to this letter, subject to validation of design inputs.	May 15, 2001
Unit 2 design inputs will be validated during the next scheduled Unit 2 refueling outage as described in Attachment 1 to this letter.	Prior to Completion of Next Scheduled Unit 2 Refueling Outage
Physical plant modifications or licensing actions, if required, will be identified as described in Attachment 1 to this letter.	May 15, 2001

D.C. Cook
Electronic Corrective Action Program

Condition Report: 00264095
Current Status: Closed
Action Category: 3

I. Problem ID

Discovered Time/Date: 16:30 09/20/2000 Occurred Time/Date: __/__/____

Unit Affected: 1

Status at Time Discovered	Unit 1	Unit 2
Mode	Defueled	
% Power		

Unit Status Remarks:

System(s) Affected: CNTMT CONTAINMENT BUILDING STRUCTURE

Affected Equipment

Equipment ID No.	Comp. Code	Manufacturer

Location of Problem - Bldg: Column Line: Elev:

Location Remarks:

Brief Condition Description:
Physical non-conformances found on the #4 accumulator room end wall.

Detailed Condition Description:
- DESCRIPTION OF CONDITION
In performance of the extent of condition review in Unit 1 as described within CR 00-2506 the following non-conformances were discovered relating to the #4 accumulator room end wall located at azimuth 307°.

1. Low strength grout material in the top ~8" of wall
2. The penetration in the wall for the hydrogen skimmer lines has wooden form boards still in place.
3.The containment spray header pipe anchorage at the pentration has two loose anchor bolt nuts (can be turned by hand) and one anchor bolt hole with no bolt installed
4. The horizontal reinforcing bar within the wall was spliced with cadwelds during initial construction. Drawing 1-2-3207D shows the reinforcing bar to have lap spices in lieu of cadweld splices.

- IMPACT STATEMENT

The physical condition of the wall is different than the design configuration.
Preliminary evaluations of the structural capcity of the wall inidcates the wall would have performed its intended function in the as-found condition.

For the as-found condition of the CTS support, it is indeterminate at this time if the field condition affects the operability of the system.

- REQUIREMENT NOT COMPLIED WITH OR REGULATORY REPORTING REQUIREMENT

The wall is in a physically non-conformaing condition. The 307° wall is a lower containment wall which separates the accumulator room from the instrument room. As such this wall is not a portion of the divider barrier and its only function is to maintain structural capacity.

- SUSPECTED CAUSE OR SOURCE OF THE CONDITION

The non-conformances in the wall are related to the initial construction of the plant.

- CORRECTIVE ACTIONS TAKEN

No immediate corrective actions taken. The conditions described within this CR were discovered during the performance of an extent of condition review.

- RECOMMENDED CLASSIFICATION AND OWNER

Recommend assignment to NESD as a Cat 4.

Method Used to Discover Problem
Unit 1 extent of condition review as required by CR 00-2506

Restart Code: Restart 1 - M4 Restart Approved: Yes

Other Components/Systems and Areas Affected: N

Industry Impacted N

Immediate Corrective Actions:

No immediate corrective actions taken. The conditions described within this CR were discovered during the performance of an extent of condition review.
The ongoing extent of condition review and structural analysis of all accumulator room end walls will determnine full extent of required corrective action to restor the walls to design basis.

Problem Found While Working with Document No. :
CR-00-2506

Action Request No:

D.C. Cook
Electronic Corrective Action Program

Condition Report: 00264095
Current Status: Closed
Action Category: 3

Phone Extension: 1444

	Indiv	Team	Group	Date:
Problem Identified By:	KOVARIKB	CHAKRABARTIS2	NED	09/20/2000
Problem Entered By:	KOVARIKB	CHAKRABARTIS2	NED	09/20/2000

Supervisor Approval

Approved: Yes

Detection Code: Self-Identified

Supervisor Comments:

	Indiv	Team	Group	Date:
Reviewed By:	KOVARIKB	CHAKRABARTIS2	NED	09/20/2000

II. Operations Review

Add'l Info. Required: No

SR/OD Equipment Affected: Yes

Reportability: Potential

SSC Reqd In Current Mode: No

Past Operability Concern: Yes

T.S.A.S. Entered: No

SSC Affected
Containment

T.S.A.S. Reference

T.S.A.S. Reference #	Unit

Status: Closed

	Indiv or Due Date	Team	Group	Date
Ready For Approval:	BRUCKD	TILLYJ	OPS	11/10/2000
Approved By:	BRUCKD	TILLYJ	OPS	11/10/2000

D.C. Cook

Electronic Corrective Action Program

Condition Report: 00264095
Current Status: Closed
Action Category: 3

SSC Operability - For Identified Condition: Inoperable

Engineering Support Requested: Yes
Open Items Log Entry Completed: Yes
Mode Constraint: Yes

Mode	Mode Constraint Description	Unit Affected
4	Mode 4, 350 <Tavg> 200	1

Code	Systems Description
CSI	Containment Structural Integrity

Operations Reviewer Comments:

1. If OPERABLE, state basis for reasonable assurance for SSC to perform its specified function (if necessary consult OPR procedure, T.S. bases, SAR, surveillance tests etc.):

Update on 10/24/00: ODE requested for the affected #4 Accumulator end wall. The structural capability is less than design basis requirements but preliminary evaluation shows the wall's structural capability is sufficient to perform the intended function. Did not release the Mode 4 constraint or reverse the original call of Inoperable for the wall. This can be done once the evaluation and ODE are completed to show Operability. WDE 10/24/00

2. If INOPERABLE, state what is inoperable and why, justify mode constraint assigned, state notifications and actions performed:

This condition is considered a Mode 4 constraint for Unit 1 related to the integrity of the accumulator wall and material it supports. The description indicates preliminary calculations show the wall is capable, so at this time this condition does not appear to be a past operability issue such that immediate reporting is necessary. The condition needs to be investigated and a rigorous determination made if the wall should or should not be considered inoperable in the past. If the wall had been inoperable in the past, reporting to the NRC would be warranted. This CR and condition has been entered in the Unit 1 Control Room Open Items log under TS 3.6.1.6. --SJ Cherba 9-22-00

3. If recommending past operability evaluation for reportability determination, discuss basis for recommendation:N/A

4. If additional engineering support is requested briefly describe here what and why support is needed and basis for time determination (provide detailed specifics in operability notification section): N/A

5. If additional information was gathered to perform operability determination state by whom provided (by title) and by what method: N/A

6. Comments: additional information, updates and revisions should be placed

in chronological order: N/A

Operability Type: ODE

Responsible Group: ESY

Significance:

Due Date: 11/13/2000

Operability Concerns / Questions:

Prepare an ODE to provide reasonable assurance of Operability with the affected #4 Accumulator end wall not meeting design basis structural capability.

Changed the due date from 11-10-00 to 11-13-00 per request. Approved by SM JTilly. DABruck 11-10-00.

Operability Notification Comments:

Prompt Reportable: No

NRC ENS Notification:

Non-ENS Notification:

Licensing Contact Made:

Licensing Contact:

	Personnel Contact	Contacted By	Date	Time
NRC				
OPS Duty Supervisor				
Plant Manager				
State of Michigan				
NRC Resident Insp.				

Prompt Reportability Comments:

Mode Constraint Released

No: No
Unit 1: No
Unit 2: No
Overall Released: Yes

OD Issue Complete

No: No
Unit 1: No
Unit 2: No
Overall Released: Yes

Comments:

1. If only one unit is ready for mode constraint release state basis here and do not release mode constraint (unit/time/date/initials):
N/A

2. State basis for release of mode constraint and provide initials/date (ensure both units can be released before checking the yes field for release)
All restart/Mode actions complete. KCP 11/20/00

3. If only one unit is ready for OD release state basis here and do not release od (unit/time/date/initials):
N/A

4. State basis for release of OD and provide initials/date (ensure both units can be released before checking the yes field for release)

This ODE is for U-1 only. Ensure CR 00-2506 CRA-06 is complete prior to releasing this ODE. This CRA was generated as part of the U-2 CR to evaluate and update the issue for U-1. WDE 12/1/00

Update on 12/12/01:

Calculation SD-010412-001 Revision 1 evaluates the design basis adequacy of Unit 1 and Unit 2 Fan-Accumulator Room end walls in the Containment Structure. This calculation retires the operability determinations performed under Unit 1 CR 00264095 and Unit 2 CR 00-02506. In addition, this calculation supersedes SD-000810-001 and SD-00510-003, performed in support of the operability determinations.

SD-010412-001 Revision 1 completes CR Actions 00-02506-05 and 00-02506-06 to restore the Unit 2 and Unit 1 CEQ fan walls, respectively, to full qualification. This calculation is based on the requirements of Engineering Specification ES-CIVIL-0432-QCN Revision 1. The evaluation of the subject walls incorporates the final Main Steam Line Break pressures inside the fan-accumulator rooms, updates as-built material strength, and recalculates allowable shear stress for all walls using more refined equations from ACI 318-63.

As stated in the Purpose/Objectives of the calculation, the calculation considers conditions noted in the Non-Conformance Evaluation for CR 00264095 and CR 00-02506.

Condition Report: 00264095
Current Status: Closed
Action Category: 3

Based upon the approval of calculation SD-010412-001, revision1

and CR 00264095 Use-As-Is Evaluation the Unit 1 Fan-Accumulator Room Walls have been restored to Full qulaification. ODE released on 12/12/01. WDE

III. Screening

Is the Problem Significant? N   Action Category: 3

Other Comments: RCL_UP

Other Report Nos: LIR

Event Codes: E3w Structure (walls, floors, etc.)
E8b4 Other

Screening Remarks:

RCL needs to review ODEP.

S. Dort identified this CR is required to be upgraded to a Cat 2 with CARB and NSDRC force concurrence. This issue is reportable and is covered under a root cause performed for similar problems in Unit 2. An evaluation due date of 11/9/00 was requested. S. Dort discussed this with B. Kovarik. MWK 10/26/00

B.G. Kovarik, S.A. Greenlee, P.J. Ganey and S.R. Dort determined that this CR can be downgraded from a CAT 2 to a CAT 3. MWK 11/9/00

Assignments

Activity	Req.	Grp	Status	Due Date	Concur
Condition Evaluation	Yes	DES	Closed	11/09/2000	
Current Operability	Yes	ESY	Closed	11/13/2000	
Past Operability	Yes	DES	Closed	10/25/2000	
Reportability	Yes	RCL	Closed	10/26/2000	
Approval	Yes	DES	Closed		
Maintenance Rule	No				
PII	Yes	CAP	Closed		
Non-Conformance	Yes	DES		10/15/2000	

Indiv or Due Date		Team	Group	Date
Screened By:	KENNEDYM	NADEAUJ	CAP	11/10/2000

IV. Operability

Operability:

Responsible Group: ESY   Status: Closed

Operable: D

ODE Appl. Unit: 1

ODE Appl. Mode:1-4

Operability Type:

Executive Summary:
EXECUTIVE SUMMARY:

Based on the evaluations contained in calculation SD-000810-001, Revision 0, the Unit 1 Fan/Accumulator Room Walls at Azimuths 54°, 126°, 234°, and 307° meet the newly calculated values for blowdown loading without exceeding allowable stress limits. The degraded condition, which creates the need for this evaluation, is that these walls are subjected to the loadings from newly calculated Transient Mass Distribution (TMD) analyses and the physical conditions unique to the azimuth 54°, 126°, 234° and 307° walls have resulted in a reduction in UFSAR design basis load factors needed to meet allowable stresses. Since these conditions, in the aggregate do not result in a reduction in margin below operability acceptance limits, the Unit 1 Fan/Accumulator Room Walls at Azimuths 54°, 126°, 234°, and 307° are considered OPERABLE But Degraded.

Comments:

TITLE: Degraded Fan/Accumulator Room Walls

REFERENCES:

CR 00264095: Non-conforming conditions in the containment sub-compartment walls.
CR 00273069: Reinforcement drawing discrepancy in the containment sub-compartment walls vertical dowel length.
CR00293037: One horizontal dowel in the azimuth 307 wall apparently mispositioned.
CR-00-02506: Low quality grout exists in containment sub-compartment walls.
CR-00-03544: As-built walls may not meet the load requirements stated in the UFSAR.

SECTION 1, DESCRIPTION:

The Unit 1 Containment has four sub-compartment walls in the lower levels of containment (between elevation

612' and 638') that extend radially from the outer containment wall to the crane wall inside containment. These four walls are at the 54°, 126°, 234°, and 307° azimuths (relative, using a clockwise rotation) in the containment. Two of the walls, at 234° and 307°, form the ends of the instrumentation room, which is principally a dead-ended volume in the containment lower compartment. The other two walls, at 54° and 126°, are part of the Containment Equalization (CEQ) fan room, which is part of the containment upper compartment.

As a result of degraded and non-conforming conditions discovered on the Unit 2 containment subcompartment walls as identified within CR 00-2506, an extent of condition review was undertaken for the Unit 1 containment subcompartment walls. A structural evaluation of the as-built structural capacity of the containment subcompartment walls was performed. Additionally, an exploratory excavation was performed at the top of the 307° walls to assess the quality of the grout material at the top of the wall.

SECTION 2, AFFECTED SSC(s):

System: Unit 1 Containment Building Structure
Structure: Containment Building Internal Wall Structures
Component: Fan/Accumulator Room Radial Walls between elevations 612' and 638' at azimuths 54(, 126, 234 and 307 degrees in Unit 1 Containment

SECTION 3,

EXTENT OF CONDITION:

A review of ECAP determined the extent of condition is limited to those Condition Reports identified in the REFERENCES Section above, with the exception of the following:

PR-92-1606 Spalled area on exterior of Unit 1 Containment Structure. This was determined to also apply to the Unit I containment exterior. A small void was discovered at the construction opening area and was subsequently filled with high strength epoxy grout.

A review of the Open Items Log was also conducted and one item was identified as CNTMT (1-2000-0169). This Open Item applies to this Operability Evaluation as it deals with deficiencies in the Azimuth 307 wall. This Open Item is within the scope of this Operability Evaluation.

SECTION 4, AFFECTED SAFETY FUNCTIONS:

Safety Function:

The Containment Structure is classified as a safety-related, seismic class 1 structure and is part of the Engineered Safety Features (ESF) incorporated in the design of the plant. The Containment Structure functions to limit the radioactive fission product release to less than 10CFR100 limits under conditions resulting from Large and Small Break Loss of Coolant Accidents, Rod Control Cluster Assembly Ejection, and fuel handling accidents. The containment internal divider barrier separating the lower and upper compartments is designed to withstand the differential pressure between the upper and lower compartments during postulated accident conditions.

Non-Safety Function with Augmented Requirements

The Containment Structure wall and penetrations are classified as an equivalent 3-hour fire barrier for Fire Hazard Analysis and Appendix R requirements.

Non-Safety Functions

The Containment Structure provides weather protection for systems and equipment located therein.

Description of Walls

There are four walls designated as:

* Wall at Azimuth 54 (Wall 54 or Accumulator 1 wall) adjacent to Accumulator 1 on one side and CEQ fan wall on the other.
* Wall

at Azimuth 126 (Wall 126 or Accumulator 2 wall) adjacent to Accumulator 2 on one side and CEQ fan wall on the other.
* Wall at Azimuth 234 (Wall 234 or Accumulator 3 wall) adjacent to Accumulator 3 on one side and Instrument room on the other.
* Wall at Azimuth 307 (Wall 307 or Accumulator 4 wall) adjacent to Accumulator 4 on one side and Instrument room on the other.

Each wall extends from Elevation 612 feet to the bottom of Ice Condenser slab at Elevation 638 feet. Each of these walls also spans out from the crane wall towards the containment wall and stops short of this wall at a distance of 6 inches. As designed, the wall is monolithically connected along three sides, vertically with the crane wall and horizontally with the floor at El. 612 feet and at the roof, along the bottom of the Ice Condenser slab at Elevation 638 feet.

The nominal thickness of each wall is 18 inches with a haunch extending to a depth of 24 inches at the crane wall. The additional exception applicable to Wall 126 only is a 6-inch offset at the free end of the wall to accommodate an ice condenser column.

The design reinforcement details, in general, can be summarized as follows:

* Horizontal Bars
#11 @ 6" on center on the accumulator room side.
#11 @ 12" on center on the instrument room or CEQ fan side.
The cover for the horizontal bars is 2-3/4".

* Vertical Bars
#9 at 12" on center both faces of the wall. The bars are on the inside of the horizontal bars.
Based on this, the cover is calculated to be 4-1/8".

Primary Function(s)/Support Function(s)

The primary function of the concrete fan/accumulator room radial walls (at the CEQ Fan Room interface) is to provide a divider barrier between lower and upper compartments of the Containment in addition to providing structural support. In this application the walls function to direct steam flow into the ice condenser and therefore form a portion of the divider barrier. These walls also act as a fire

barrier and provides radiation shielding between the accumulator and CEQ fan rooms.

SECTION 5, TECHNICAL SPECIFICATION REQUIREMENTS IMPACTED

* Technical Specification 3.6.5.9 - Requires that the divider barrier seal shall be OPERABLE in Modes 1, 2, 3, and 4.
* Technical Specification 5.2.2 - Requires that containment be designed and maintained in accordance with the original design provisions contained in Section 5.2.2 of the FSAR.

SECTION 6, OTHER DESIGN/LICENSING BASIS REQUIREMENTS IMPACTED

The most critical loading on these walls is the pressure load resulting from a main steam line pipe break. UFSAR Section 5.2.2.3 requires use of a 1.5 load factor for this pressure (i.e. these structures are expected to be able to withstand, without failure, a fifty percent increase in pressure load above the worst-case pressure postulated in an area). Structural evaluations have indicated that, absent further analysis, even with no deficiencies the walls would not meet these loading requirements.

SECTON 7, OPERABILITY RECOMMENDATION:

The Fan/Accumulator Room Walls at Azimuth 54°, 126°, 234°, and 307° should be considered OPERABLE But Degraded for all operational Modes. The walls are considered degraded due to their failure to meet the UFSAR-required load factor of 1.5 that is applied to the pressure component of the design load combination in Section 5.2.2.3., and the use of as-poured concrete strengths. Failure to meet these design basis requirements represents a loss of functional capability as described in PMP 7030.OPR.001. (See definition under "Non-conforming Item" on Page 5 of the referenced procedure).

No compensatory measures are required to support this operability conclusion. A corrective action has been initiated to this effect in accordance with Step 2.1.7 of OPR.001, Rev. 4, Attachment 5.

SECTION 8, BASIS FOR OPERABILITY CONCLUSION:

BACKGROUND:

The Unit 1 Containment has four subcompartment walls in the lower levels of

containment (between elevation 612' and 638') that extend radially from the outer containment wall to the crane wall inside containment. These four walls are at the 54°, 126°, 234°, and 307° azimuths (relative, using a clockwise rotation) in the containment. Two of the walls, at 234° and 307°, form the ends of the instrumentation room, which is a "dead ended" space in the lower containment. The other two walls, at 54° and 126°, are part of the CEQ fan room, which is part of the upper containment.

As a result of degraded and non-conforming conditions discovered on the Unit 2 containment subcompartment walls as identified within CR 00-2506 an extent of condition review was undertaken for the Unit 1 containment subcompartment walls. A structural evaluation of the as-built structural capacity of the containment subcompartment walls was performed. Additionally, an exploratory excavation was performed at the top of the 307° walls to assess the quality of the grout material at the top of the wall.

EVALUATION:

Calculation SD-000810-001, Revision 0 has been prepared to assess the functionality (operability) of the subject walls. The calculation utilized reduced load factors (less than the 1.5 load factor specified in the UFSAR, but always greater than 1.0) and it also takes credit for the actual "as-poured" strength of concrete (5262 psi) rather than the minimum strength required by the current design basis (3500 psi). The calculation concludes that the Unit 1 walls at azimuth 54, 126, 234, and 307 are capable of performing their intended function even when considering the physical concrete/grout/rebar deficiencies.

This calculation assessed each wall utilizing two specific methods: Simplified (Shear and Moment), and Yield Line. The minimum margin that was determined to exist for all walls was 1.23 for simplified analysis, and 1.35 for yield line analysis. These results are above the minimum margin of 1.0 required for operability. The wall with the

least margin is the azimuth 126 wall.

The reduction in safety margin in the calculation resulting from the use of the reduced load factor results in a discrepancy between the design requirements specified in the UFSAR and the current plant condition. However, the calculation does provide reasonable assurance that the subject walls will remain functional and will not fail under any of the postulated load conditions. Use of the reduced load factor and the as-poured concrete strength is consistent with the methodology used by Sargent & Lundy in similar functionality evaluations of other containment structures (reference the Operability Determination Evaluation [ODE] for CR00299044). Additionally, Amendment No. 126 To Facility Operating License No. DPR-58 Safety Evaluation Report dated June 9, 1989 introduced the use of increased or as-built concrete strength beyond the minimum design strengths.

The following sections are excerpted from Calculation SD-000810-001, Revision 0. This provides the overview of technical information necessary to support the conclusion of Operable but Degraded for all four walls in Unit 1 Containment. However, the calculation has not been reproduced in its entirety. The references quoted within the following excerpts are from the calculation and do not appear in the reference section of this ODE. Grammar and tense changes have been made in some locations for improved readability.

1.0 PURPOSE/OBJECTIVE

1.1 Background
There are two fan-accumulator rooms at elevation 612'-0" in the Unit 1 Containment Building of the Cook Nuclear Plant (CNP). Each room has two radial walls between elevations 612'-0" and 638'-0". These four radial walls of the two rooms are located at azimuths 54o, 126o, 234o, and 307o of the Containment Building.
Deficiencies associated with the quality of concrete and/or grout in the fan-accumulator room radial walls near elevation 638'-0" are reported in Condition Report (CR) Nos. P-00-02506

(ref. 3), P-99-06845 (ref 16), P-99-10162 (ref. 17), & P-99-22312 (ref. 18), and Action Request (AR) Nos. 00264095 (ref. 30) and 00273069 (ref 31).
A deficient area of the wall at azimuth 54, and a portion of the wall at azimuth 307 which was excavated, described in the above CRs, were grouted under Design Change Package (DCP) No. 1-LDCP-4807.

Condition Report: 00264095
Current Status: Closed
Action Category: 3

1.2 Purpose/Objective

The purpose of this calculation is to evaluate the capability of these four radial walls to perform their intended functions, considering the deficiencies noted in the above CRs.

The walls will be evaluated for the applicable load combinations specified in Sections 5.2.2.3 and 5.2.2.4 of the UFSAR (Ref. 8), except that the maximum permissible load factor (factor of safety) applied to the pressure loads will be determined in this calculation.

A the request of AEP, the format and evaluation methods used in this calculation are to be similar to the format and evaluation methods used in the functionality calculation for the Unit 2 accumulator room walls, SD-000510-003 (ref 1).

This calculation is a safety-related calculation to evaluate the functionality of the concrete walls. This calculation partially superseded calculation SD-000221-005.

This is not a design basis calculation.

2.0 DESIGN INPUTS

1.The layout of the fan-accumulator rooms, radial wall dimensions, design reinforcing, and opening sizes are obtained from refs. 9 through 12. See item 7 below.

2.The applicable design loads and load combinations are as identified in Sections 5.2.2.3 and 5.2.2.4 of the UFSAR (ref. 8).

3.The subcompartmental pressure due to a main steam line break in a fan-accumulator room and due to LOCA is as determined by Westinghouse from a TMD analysis, per reference 22 (time histories per reference 15).

4.The seismic response spectra are obtained from ref. 7.

5. The dynamic increase factors used to determine the increase in material strength for impulse loading are obtained from Appendix

C of the ACI 349-97 Code (ref. 6). Although the licensing basis is the ACI 318-63 Code (ref. 5), the dynamic increase factors are not contained in the ACI 318-63 Code. Therefore, use of the latest edition of the concrete code for nuclear safety related structures, ACI 349-97, is acceptable.

6. The design concrete compressive strength for these walls is obtained from actual compressive strength data for the walls in Ref 23.

7. The walkdown information, showing wall attachments, penetrations and concrete pockets and joints is presented in Attachment A and CR P-00-02506 (Ref. 3).

8. The vertical tensile and compressive forces imposed on these radial walls from the slab above, if any, are obtained from Calculation No. SD-000403-001 (Ref 21). Since this calculation is currently restricted, it was reviewed for use in determining the adequacy of these walls and this review is documented in Attachment 2.

9. The results of re-bar mapping (spacing and cover) is obtained from Ref 26 & 29 and presented in Attachment B.

4.0 METHODOLOGY

The methodology for this calculation is outlined below:
4.1 Layout/Configuration

References 9 through 12 give the layout/configuration, radial wall dimensions, reinforcing, and sizes of openings in the walls of the accumulator rooms in the Containment Building. These are reproduced in Attachment D. Attachment A and CR P-00-02506 for the 'as-built' information was gathered through field walkdowns. Attachment B contains the rebar in-situ spacing and cover.

4.2 Loads

Review UFSAR Sections 5.2.2.3 and 5.2.2.4 and determine the loads and load combinations applicable for the structural functionality evaluation of the fan-accumulator room radial walls.

a. Dead Load

The effects of the dead load (and vertical seismic excitation) of the wall are ignored in this evaluation since the critical bending moments and shear forces in the radial walls are due to loads in the horizontal direction such as

pressure and horizontal seismic excitation. The dead load contribution to these shear forces and moments will be negligible.
b. Accident Pressure
The pressure load on the fan-accumulator room walls due to a main steam line break will be based on the pressure loads from the subcompartment pressure time-histories in the fan-accumulator room from the recent Westinghouse TMD analysis (ref. 15 & 22) for a main steam line break. The time-history of the differential pressure on the accumulator room radial walls and the corresponding dynamic load factor (DLF) will be considered to compute the equivalent static differential pressure on the walls.
The pressure load on the accumulator room walls due to LOCA will be based on Reference 22. The peak differential pressure is 6.5 psi, and the differential pressure is always acting from the accumulator rooms outward per Reference 22. Thus it is conservative to use the pressure identified in UFSAR Section 5.2.2.3 as the differential pressures across these walls. These UFSAR pressures are: for LOCA P = 12 psi, and for unsymmetrical LOCA pressure U. P. = 8 psi.
The evaluation of the ice condenser columns at EL. 640'-0" has not considered any of these walls to support part of the vertical load from the slab, due to the design basis accident (LOCA) and MSLB.
The pressure load on the crane wall causes tension in these walls. The effect of this tension on the wall will be conservatively calculated neglecting the membrane effect of the crane wall. These loads will be considered.
c. Thermal Load
The effects of thermal load on the fan-accumulator room walls are not considered in this evaluation for the reasons explained below:
These walls are not lined with a steel plate; therefore, restrained liner thermal expansion loads (T" and TL") do not apply.
The thermal conductivity of concrete is low and by the time the concrete heats up, the accident pressure reduces substantially. Therefore, only normal operating

thermal gradient across the wall is concurrent with the accident pressure load. Per ref. 15, the peak differential pressure across the wall is reached prior to 0.2 sec, and the differential pressure is less than 75% of the peak at all times after 0.6 sec. For further discussion of the thermal load combinations, see Section 5.2.2.3 of the UFSAR. Note that for MSLB pressure only temperature gradient for operating conditions is combined. For the accumulator room walls, the operating condition temperature gradient is insignificant.
d. Pipe Rupture Loads

Per ref. 25, it was identified that no jet impingement or pipe whip loads on the accumulator room walls will result from the postulated Unit 1 High Energy Line Breaks (HELB). Therefore, no pipe rupture or jet impingement loads are postulated on these walls.

e. Earthquake
The following considerations apply with respect to the seismic load effects on the fan-accumulator room walls:
- For the reason explained in Step 2.a above, the effects of wall vertical self-weight seismic excitation will be ignored in this evaluation.
- The horizontal seismic acceleration response spectra at elevation 651'-0" of the crane wall from pages 268 and 308 ref. 7 will be used for the fan-accumulator room walls, which is conservative.
- Per UFSAR Table 5.2-4 (ref. 8), 2% damping for OBE and 5% damping for SSE are applicable for reinforced concrete structures and will be used. Use of these values is conservative because the UFSAR allows 4% and 7% damping for earthquake loads when combined with accident loads.
- To determine the appropriate horizontal seismic acceleration of the walls, the frequency of the walls will be computed using the average of the gross cross-section and cracked-section moments of inertia.
- To account for additional weight from wall attachments, a load of 100 psf will be considered along with the self-weight excitation of the wall.
- For structural evaluation, the enveloping force of the individual

seismic forces computed for the walls at azimuths 54o, 126o, 234o, and 307o will be conservatively used for all the walls.

4.3. Load Combinations
Based on the above considerations, the load combinations of UFSAR Section 5.2.2.3 that are applicable for this evaluation are as follows. These load combinations have been simplified to omit loads which do not apply or have a negligible effect on these walls. It should be noted that although these combinations are developed for the Containment (pressure boundary), the same combinations will be used for these walls, as the walls at azimuths 54 and 126 degrees are considered to be a part of the divider barrier:

(a).	1.5 P	P = pressure due to DBA (LOCA)
(b).	1.25 P + 1.25 E	E = loads due to OBE
(d).	1.0 P + 1.0 E'	E' = loads due to DBE
(g).	U. P. + E'	U.P. = unsymmetrical LOCA press.
(i).	1.5 P1	P1 = pressure due to MSLB

For load cases (a) and (i), the maximum permissible load factor will be determined in the calculation. The calculation will determine the governing load combination. This governing load combination will be used to check the walls.

4.4. Material Properties
a. Reinforcing Steel
Yield strength, fy = 40 ksi.
b. Concrete and Grout Strength

In-Situ Concrete
Except for the localized weaker concrete/grout near elevation 638'-0" for the wall at azimuth 307, the design concrete compressive strength will be based on the compressive cylinder test data for the four accumulator room walls. The 28 -day test data will be ratioed up to a 90-day strength by using a ratio determined from the 28-day and 90-day test data for pours where 90-day test data is available.
- The concrete cylinder test data for the concrete pours from 28-day and 90-day test data is available per ref. 24, and is used to back calculate the corresponding compressive strengths of the concrete (28-day and 90-day). Equations 5-1 & 5-2 of ACI 318-99(ref.4) are used for this purpose after obtaining the required

average strength of the concrete and the standard deviation for the 28-day and the 90-day tests. This will give a 90-day to 28-day strength ratio.
- For the Unit 1 accumulator room walls, 20 cylinders tests were performed (ref. 23). This accumulator room wall specific test data will be used to back calculate a 28-day compressive strength (see section 7.2). This value will be adjusted to a 90-day strength based on the Unit 1 28-day and 90-day test data.
- UFSAR change 99-UFSAR-1271 (ref. 28) has been initiated to document the use of the 90-day test results in determining the design compressive strength.

Grout at Top of Azimuth 307 Wall

The walkdown performed for CR P-00-02506 (ref. 3) identified localized areas of the concrete near elevation 638'-0" that are different than the in-situ concrete. Although this area was excavated and was be regrouted with high strength grout via 1-LDCP-4807, the joint at the top of the all at azimuth 307 will be conservatively considered free, and hence the strength of the grout is not relevant. Also, the walkdown of the excavated area (Attachment A) and AR 00264095 (ref. 30) provides information on the horizontal reinforcing bars. This information will be evaluated for its effect on the wall capacity.

Hole at Top of Azimuth 54 Wall

As shown in Attachment A, page A4, a 20" wide x 12" high area of concrete at the top of the wall on the crane wall side was left excavated. See CR Nos. P-99-06845 (ref. 16), P-99-10162 (ref. 17), and P-99-22312 (ref. 18). The excavation was done to install the ice condenser anchorage bolts. This area was filled with high strength grout via 1-LDCP-4807. However, this area will be considered open for this analysis.

4.5. 4.5 Analysis/Evaluation

a. Analysis of actual location and depth of mapped reinforcing bars

The location and depth of the reinforcing bars was determined using a detection device in critical areas of the wall which were accessible. A summary of the bar

spacing and depth determined using the detection device will be provided and the effects of variance in bar spacing and depth with the design dimensions will be evaluated.

The covers determined using the detection device were only obtained in certain areas of the wall due to accessibility and interferences. The covers to be used in the calculation for the horizontal and vertical bars on each face will be determined using engineering judgement based on the limited locations measured. In general, the average cover of the bars in the more critical areas of the wall will be determined and the cover to be used will be based on this average and increased using engineering judgement depending on the variation of the data.

Because the reinforcing in the tapered portion of the wall (haunch) on the side of the taper was placed at a different time (during the crane wall construction) and at a different angle to the reinforcing in the constant thickness section, separate values will be calculated for the bars in the tapered and constant thickness sections if they vary significantly.

In some instances, the vertical bars on the side closer to the compression concrete, when in tension were used in the calculation of the moment capacity. Because an increased cover will increase moment capacity and because of the large effect of small changes in this cover on the moment capacity, conservatively the minimum cover will generally be used. In instances where the cover varies considerably, a cover close to the minimum cover, but determined by engineering judgement will be used. For simplicity in the calculation, the same value for this cover will be considered on both faces of the wall.

A sensitivity study will be performed to determine the effect of the 3/8" margin of error (ref. 26) on the results.

b. Boundary conditions

The walls are rigidly tied to the crane wall and the slab below, and free on the containment wall side. Because of the discrepancies

identified in the walkdowns, the connection to the slab above can not be considered to transfer forces and moments across the connection for wall at azimuth 307. Therefore, the connection of the wall to the slab above for the azimuth 307 wall will be considered free. The top joint for the other three walls will conservatively be considered to be pinned and only be checked to transfer shear across the connection. Based on this, the development length of the vertical reinforcing is not critical (ref. AR 00273069).

c. Wall Span and Load Path

1. Simplified Analysis

The walls have the capability to span in the horizontal direction as a cantilever and in the vertical direction with varying boundary conditions (fixed-pinned beam at azimuths 54 & 126). The walls will conservatively be analyzed to span only in the horizontal direction as a cantilever. The moment will be checked at the crane wall and at the thickness change and the shear will be checked at a distance 'd' away from the crane wall and the thickness change. However, because of the discontinuity in the horizontal direction due to the opening near the top of the walls at azimuths 54 & 126 degrees, the portion of the wall pressure between the opening and the free edge (towards the containment wall) for these walls will be considered to be supported by the vertical span as a fixed-pinned beam. The moment will be checked in the vertical span and the shear will conservatively be checked at the top and bottom slabs.

2. Wall Flexural Analysis Using Yield-Line Method

The yield-line method is used to determine the capability of the wall to resist the pressure in flexure. For walls at azimuths 54, 126, and 307, the flexure analysis of the wall using this method conservatively considers no support at the top of the wall (free edge). The yield-line method is consistent with Section 14.4.2 of the UFSAR for pressure loads resulting from pipe rupture.

3. Wall Shear Resistance

The shear

analysis of the wall considers no shear support from the continuous bars extending into the slab above for the wall at azimuth 307. The wall construction at wall to crane wall and wall to slab at the 612' slab junction for all the walls is monolithic. Similarly, for the walls at azimuths 54, 126, and 234, the wall to slab construction at the 638' elevation is monolithic. Shear transfer through concrete is considered at these boundaries. The shear will be checked at the critical shear failure planes defined in Figures 7.4.2-1, 7.5.2-1, 7.6.2-1, and 7.7.2-1.

5.0 ACCEPTANCE CRITERIA

The walls will be evaluated per the acceptance criteria contained in the ACI 318-63 (ref. 5) concrete code where applicable. Criteria which is not contained in the ACI 318-63 code will be obtained from the latest edition of the concrete codes, ACI 318-99 (ref. 4) or ACI 349-97 (ref. 6). The load combinations and load factors shall be those determined in the Methodology Section 4.0 of this calculation.

For impulsive and impactive loads, such as those resulting from a main steam line break, it is appropriate to apply a dynamic strength increase factor. Because these are not given in the ACI 318-63 code (ref. 5), these are obtained from the ACI 349-97 concrete code (ref. 6, Appendix C).

The intended function of the walls is to direct steam flow into the ice condenser during a design basis accident. The walls will be considered adequate if the calculated shears and moments are less than the wall capacities with a load factor (factor of safety) of at least 1.2 applied to the pressure load considered in this calculation.

Note that for operability, the factor of safety is usually 1.0. However, per AEP request, the walls were checked for a factor of 1.2 applied to the pressure load.

7.1. Wall Rebar Cover and Spacing

The reinforcement design spacing and cover are shown on drawings 1-2-3207C & 1-2-3207D (References 11 & 12). Attachment D pages reproduce this

information for easy reference. The reinforcement details, in general, can be summarized as follows:

* Horizontal Bars

#11 @ 6" on center on the accumulator room side
#11 @ 12" on center on the instrument room or CEQ fan side

The cover for the horizontal bars is 2-3/4"

* Vertical Bars

#9 at 12" on center both faces of the wall. The bars are on the inside of the horizontal bars. Based on this, the cover is calculated to be 4-1/8".

* Openings

Diagonal bars and additional horizontal bars are provided around openings at locations shown.

Condition Report P-0-02506 documents the condition of each of the Unit 1 and Unit 2 walls, specifically the quality of the concrete/grout in the walls. As a part of the same of extent of condition investigation, rebar mapping (cover and spacing) was conducted on the four accumulator room walls for Unit 2 and Unit 1. Construction Technology Laboratories performed the mapping of bar location and cover. This information is summarized in Attachment B. DIT No. DIT-B-01627-00 (Ref. 26) & DIT-B-01627-01 (Ref. 29) transmits the CTL Report and validates the data in the report. The rebar mapping (spacing and cover) information presented in Attachment B documents variations in the as-found covers and spacing from those shown on the design drawing. Note that all the covers meet the ACI-318-63 minimum cover of 3/4".

The following is a brief description of the as-built information obtained on bars location and cover. This information, together with the design drawings (Reference 12) is used to determine the bars spacing and cover that will be used to evaluate the walls. It is to be noted, in general, that for irregular bar spacing and/or cover judged as not meeting the requirements of the specifications, the average of the as-built measurements will be used to evaluate the walls. This is justified since the wall strength is a function of the average cover and spacing and not individual ones.

In addition,

engineering judgement is used in the consideration of both the bar spacing and cover as they relate to the critical sections of the wall. The engineering judgement is developed from specific experience in analyzing and assessing the walls for Unit 2 (ref. 1) as well as analyzing these Unit 1 walls.

Wall at Azimuth 54 - Accumulator No. 1

* Accumulator Room Side

The measurements for the spacing and cover are available in the areas at the top of the wall and on the bottom half of the wall near the crane wall (see page B11).

Horizontal Bars

Spacing:

The bars are spaced at approximately 6", except in the area on the crane wall side of the 3' x 4' backdraft dampener opening and on the containment wall side of the opening. The spacing in the area on the crane wall side of the opening averages about 8" to 9"." Note that the mapping indicates many pipes/conduits are running horizontally in this same location. Therefore, it would not be possible to detect the bar location since it is directly behind the pipe. Also, the bars in this area are not required to support the entire wall, and are thus subjected to much smaller moments (4'-0" cantilever vs. 12'-8" cantilever). Based on the provided rebar spacing compared with the postulated moments in the area, this reinforcement does not govern wall design. The spacing on the containment wall side of the opening averages about 9". Similarly, the horizontal bars in this area are required to resist less than the 5'-8" cantilever compared to the 8'-8" cantilever that the critical bars in the constant thickness section are required to resist. Based on the provided rebar spacing compared with the postulated moments in this area, this reinforcement does not govern the wall design. Therefore, the 6" c/c design spacing will be used in this evaluation for the critical areas.

Cover:

The bars cover in the tapered section (first 4' from the crane wall) varies between 5.4" - 8.5" (29 measurements) with

an average of 6.74". This is much larger than the design cover of 2.75". Hence, 7" will be used for the cover in the tapered section. The bar cover in the constant thickness section (>4' from the crane wall) varies between 1.7" - 2.2" (5 measurements) near the top of the wall, with an average of 2.0", and between 3.1" to 3.3" (5 measurements) near the mid-height of the wall with an average of 3.2". Because the average 3.2" is larger than the design cover of 2.75", 3.2" will be used for the cover in the constant thickness section.

Vertical Bars

Spacing:

In general, the average spacing is less than or equal to 12", which is consistent with the design drawing.

Cover:

Based on 10 measurements, the cover in the constant thickness section varies from 2.2" - 6.7", with an average of 3.34". Based on the fact that the highest (6.7") reading does not appear consistent with the rest of the data, and that the second highest (4.8") reading is at the thickness change to the tapered section, use of the design cover of 4 1/8" is reasonable.

The cover in the tapered section varies from 7.4" - 9.6" (8 measurements), with an average of 8.3". Based on the variation, 9" is a reasonably high enough value to use as the cover in the tapered section.

The calculation of the moment capacity in the vertical direction considers bars on the side closer to the compression concrete to be effective. For these bars, it is conservative to consider a smaller cover than for the bars on the tension side. The minimum cover found during mapping was 2.2".

* CEQ Fan Room Side

The measurements are available at the base of the wall on the crane and containment wall sides. At the top of the wall, measurements are only available on the containment wall side of the opening (see page B11).

Horizontal Bars

Spacing:

The bars are spaced at less than 12" and in some areas close to 6". The reinforcement provided meets or exceeds that specified on the design drawing (12"

spacing).

Cover:

The bar cover varies between 2.0"- 4.2" (15 measurements) with only four measurements above 3". The average of all the 15 readings is 2.67". The average of the six readings at the lower part of the wall near the crane wall, which has the four highest readings, is 3.45". On this basis, 3.5" will be used as the cover for the horizontal reinforcing bars.

Vertical Bars

Spacing:

On average the bar spacing is approximately 12". This is consistent with the design drawing. Thus 12" spacing will be used for this evaluation.

Cover:

Out of a total of 14 measurements, the cover varies between 3.1 - 4.4", with an average cover of 3.74". This is less than design value of 4-1/8". Hence, the design value of 4-1/8" will be used in the analysis.

For the bars on the side closer to the compression concrete, there are no bars with a cover below the 2.2" minimum cover found on the accumulator room side of the wall. Therefore, 2.2" will conservatively used as the minimum cover on this side.

Condition Report: 00264095
Current Status: Closed
Action Category: 3

Wall at Azimuth 126 - Accumulator No. 2

* Accumulator Room Side

The measurements for the spacing and cover are available in the areas at the top and bottom parts of the wall (See page B12).

Horizontal Bars

Spacing:

The wall was poured in three separate lifts. The bars are spaced at approximately 6" on the bottom lift of the wall. This is consistent with the design drawing. Measurements are not available for the middle lift. However, based on the results of the bottom lift for this wall, the spacing for the middle lift can be considered to be 6" as well. On the top lift of the wall, the spacing varies from under 6" to slightly over 12", most likely due to the large number of penetrations and openings. However, the bars in this area are not required to support the entire wall (see discussion for the wall at azimuth 54), and thus this area is subjected to much smaller moments and shears. Based on the provided rebar spacing

compared to the postulated moments and shears in this area, this reinforcement does not govern the wall design. The design spacing of 6" will be used.

Cover:

The bar cover in the tapered portion of the wall (first 4' from the crane wall) of the bottom lift of the wall at 13 locations varies between 3.9"- 5.3", with an average of 4.3". The bar cover in the tapered portion of the top lift of the wall at four locations varies between 4.3" - 6.7", with an average of 5.9". As described for the spacing in this area, the values for these bars are not critical. Therefore, use 4.5" for the cover in the evaluation of the tapered portion of the wall.

The bar cover in the constant thickness portion of the bottom lift of the wall at 16 locations varies between 3.0"- 4.5", with the lower readings tending to be towards the area of maximum moment and shear. The average of these measurements is approximately 3.8". The bar cover in the constant thickness portion of the top lift of the wall at 7 locations varies between 2.4" - 5.4", with an average of 4.0". Therefore, a 4" cover will be used for the constant thickness portion of the wall.

As shown on drawing 1-2-3207D (Ref. 12), in the tapered portion of the wall, the dowels out of the crane wall will govern the cover. Thus, using a different cover for the tapered and the straight portion of the wall is justified.

Vertical Bars

Spacing:

In general, the average spacing for mapped bars is approximately 12" which is consistent with the design drawing.

Cover:

The bar cover varies in the constant thickness section between 3.8" - 6.3" (8 measurements), with an average of 5.2". Based on the large difference between the measurements, a cover of 6" will be used in the constant thickness section.

In the tapered section, the bar cover varies between 4.9" - 8.1" (13 measurements), averaging approximately 6.7", with some of the lower covers occurring near the crane wall. Because of the varying

measurements, 7.0" will be used as the cover in the tapered section.

The calculation of the moment capacity in the vertical direction considers bars on the side closer to the compression concrete to be effective. For these bars, it is conservative to consider a smaller cover than for the bars on the tension side. The minimum cover that was found during mapping of this face of the wall was 3.8". However, 3.3" will conservatively be used for these bars for consistency with the opposite face of the wall.

* CEQ Fan Room Side

The measurements are available in two areas of the wall. One set is near the upper right corner of the wall and the second set is in the bottom portion of the wall (see page B12), both areas are closer to the crane wall.

Horizontal Bars

Spacing:

On average, the bar spacing is approximately 12". This is consistent with the design drawing (Ref. 12). 12" spacing will be used for the wall evaluation.

Cover:

The bars cover varies between 1.9"-3.4" (25 measurements), with an average cover of 2.5". Based on the relatively close measurements and significant number of readings, the design cover of 2.75" will be used in the wall evaluation.

Vertical Bars

Spacing:

On average, the bar spacing is less than 12" specified on the design drawing (Ref. 12). 12" spacing will be used in the wall evaluation.

Cover:

All of the 16 measurements are less than the 4-1/8" cover specified on the design drawing (Ref. 12). Therefore, the design cover of 4-1/8" will conservatively be used in the evaluation.

The calculation of the moment capacity in the vertical direction considers bars on the side closer to the compression concrete to be effective. For these bars, it is conservative to consider a smaller cover than the bars on the tension side. The minimum cover found during the mapping of 3.3" will be used for these bars, which is less than the design cover of 4-1/8".

Wall at Azimuth 234 - Accumulator No. 3

*

Accumulator Room Side

The measurements for the spacing and cover are available in the areas at the top and bottom on the crane wall side (see page B13).

Horizontal Bars

Spacing:

The bars are spaced at approximately 6". This is consistent with the design drawing. The design spacing of 6" will be used in the wall evaluation.

Cover:

The 6 measurements for the cover in the constant thickness area are between 2.0" - 2.6", all of which are less than the design cover of 2-3/4". Therefore, the design cover of 2.75" will be used in the wall evaluation.

In the tapered section near the crane wall, the 17 cover measurements are between 4.1" - 6.2", with an average cover of 5.3". A cover of 5.5" (slightly larger than the average) will be used for the wall evaluation.

Vertical Bars

Spacing:

Near the top, the bar spacing is approximately 16". Near the bottom, the spacing is less than 12". This is consistent with the design drawing. For the rebar at the base of the wall, 12" spacing will be used. For all other areas of the wall above the base, a 16" spacing will be considered in the wall evaluation.

Cover:

There are five readings taken within the constant thickness section of the wall, varying between 2.9" - 4.4", with an average of approximately 3.6". Since the vertical cover is generally less than the design cover for the vertical reinforcing of 4-1/8", the design cover of 4-1/8" will be used in the constant thickness area of the wall.

In the tapered section near the crane wall, there are only 3 measurements and they vary considerably from 4.8" - 8.0". The cover for the horizontal bars in this are was taken as 5.5". If the vertical bars were directly behind the horizontal bars as designed, the cover would be approximately 6-7/8". Based on this and the actual cover measurements, a 7" cover will be used for the vertical bars in the tapered section of the wall.

The calculation of the moment capacity in the vertical direction

considers bars on the side closer to the compression concrete to be effective. For these bars, it is conservative to consider a smaller cover that for the bars on the tension side. The minimum cover found during the mapping was 2.9" for these bars, which is less than the design cover of 4-1/8". However, 2.5" will conservatively be used as the minimum cover for these bars for consistency with the opposite face of the wall.

* Instrument Room Side

The measurements are available in two areas near the top of the wall (see page B13). Other areas are not available for mapping due to the attachments to the wall or due to inaccessibility.

Horizontal Bars

Spacing:

On average, the bar spacing is somewhat less than 12", compared to the design spacing of 12". Therefore, the design spacing of 12" will be used for the wall evaluation.

Cover:

For the 10 readings available, the bar cover varies between 1.6" - 3.1", with an average of 2.3". This average is less than the design cover of 2.75". Therefore, the design cover of 2.75" will be used.

Vertical Bars

Spacing:

On average, the bar spacing is less than 12". As this is consistent with the design, a 12" spacing will be used in this evaluation.

Cover:

The bars cover varies considerably between 1.9"-6.3" (11 measurements). The only two readings over 5" are near the fixed corner of the wall and in the tapered portion. Since the average of the rest of the readings is about 3.8", a cover of 5.0", which is the maximum cover measurement excluding the two highest, will be used in this evaluation.

The calculation of the moment capacity in the vertical direction considers bars on the side closer to the compression concrete to be effective. For these bars, it is conservative to consider a smaller cover than for the bars on the tension side. Because the cover varies considerably, use of the minimum cover of 1.9" is too conservative. Based on the measurements, a cover of 2.5" would still be

conservative compared to the average cover, and hence will be used for these bars. This is less than the design cover of 4-1/8".

Wall at Azimuth 307 - Accumulator No. 4

* Accumulator Room Side

The measurements for the spacing and cover are available in the areas at the top and bottom portions wall (see page B14 & B20). This wall was poured in two sections. The first was up to the underside of the slab at elevation 624'-41/2" and the second above elevation 626'-101/2".

Horizontal Bars

Spacing:

The bars are spaced at approximately 6". This is consistent with the design drawing. The design spacing of 6" on center will be used in the wall evaluation.

Cover:

In the area above the slab at elevation 626'-101/2", the 29 measurements of cover vary between 1.2"-3.1", with an average of 2.3". This average is less than the design cover of 2.75". Therefore, the design cover of 2.75" is used in the wall evaluation.

In the area below the slab at elevation 626'-101/2", measurements are provided along three vertical strips. The measurements vary between 3.0"-4.2" (17 measurements), with an average cover of approximately 3.6. Therefore, a 4" cover will be used in the evaluation.

Vertical Bars

Spacing:

On the areas of the wall above and below the slab, the average bar spacing is less than 12". Conservatively, thé design spacing of 12" on centers will be used in the wall evaluation.

Cover:

In the top area of the wall, the cover measurements vary between 3.5" - 7.3", with the average of the 12 measurements being 5.2". In the bottom area of the wall, the cover measurements vary between 4.7" - 6.0", with the average of the 11 measurements being 5.2". Based on these ranges and averages, 6" will conservatively be used for the cover in the evaluation.

The calculation of the moment capacity in the vertical direction considers bars on the side closer to the compression concrete to be effective. For these bars, it is conservative to

consider a smaller cover than for the bars on the tension side. The minimum cover found during the mapping was 3.5" for these bars, which is less than the design cover of 4-1/8". However, 2.5 will be used for these bars for consistency with the opposite face of the wall.

* Instrument Room Side

The measurements are only available in the top portion of the wall. Other portion of the wall could not be mapped because of attachments or accessibility problems.

Horizontal Bars

Spacing:

On average, the bar spacing is less than 12". The design spacing of 12" will be conservatively used in the wall evaluation.

Cover:

The bar cover varies considerably between 1.5"-6.1" (16 measurements), with an average of 3.6". Based on the large variance in the cover dimensions and the lack of readings in the lower half of the wall, a 5" cover is used for the entire height of the wall. Note that there were only two readings out of 16 greater than 5".

Vertical Bars

Spacing:

On average, the bar spacing is less than 12". The design spacing of 12" on center will be used for the evaluation.

Cover:

The bars cover varies between 2.1"-4.9" (22 measurements), with an average of 3.4". Based on the variance in cover dimensions and the lack of readings in the lower half of the wall, a 4.5" cover is conservatively used for the entire height of the wall.

The calculation of the moment capacity in the vertical direction considers bars on the side closer to the compression concrete to be effective. For these bars, it is conservative to consider a smaller cover than for the bars on the tension side. Because the cover varies considerably, use of the minimum cover of 2.1" is too conservative. Based on the measurements, a cover of 2.5" would still be conservative compared to the average cover, and hence will be used for these bars. This is less than the design cover of 4-1/8".

Exposed Rebar at the Top of Azimuth 307 Wall

The rebars that were exposed

after excavation of the grout were mapped. This information is contained within Attachment A.

Horizontal Bars

Based on the design drawings, it would be expected to find three #11 horizontal bars on each face. The walkdown shows that these bars exist. Based upon the design spacing of the bars, it would also be expected to see a dowel coming out of the crane wall within the excavated area. This dowel was not located in the walkdown observations. The horizontal bars were observed to turn downward into the solid concrete portion of the wall adjacent to the crane wall.

During the period of initial construction, specification DC-CE-103-QCN governed placement and inspection of concrete. Within specification DCC-CE-103-QCN are provisions to make minor adjustments to the reinforcement in the areas of penetrations based upon the approval of the field engineer. The pour records for these walls were retrieved and reviewed to prepare DIT-B-01588-00, contained within Attachment C of this calculation. During the development of input data for this calculation, radar mapping was performed to locate reinforcement within the walls as described within DIT-B-01627, contained within Attachment B of this calculation. Included within the pour records are QC-9 forms which document the inspection of the placement of the concrete forms, reinforcement, and embedments prior to the placement of the concrete. The QC-9 forms indicate the reinforcement was placed within the walls in accordance with the drawings and specification prior to placement of the concrete. Additionally, the radar mapping data generally indicates the required reinforcement is in place within the thickness of the walls. Based upon the above, there is reasonable assurance that the horizontal dowels between the crane wall and the CEQ/accumulator room end walls exist in the quantity shown on the reinforcement drawings. As such, the existence of the horizontal dowels between the crane wall and the

CEQ/accumulator room end walls is not considered to be an unverified assumption that required later verification.

Some of the horizontal reinforcing is spliced using mechanical splices of the cadweld variety. Although the design drawings generally show lap splices, the mechanical connectors are permitted by ACI 318-63 code (ref. 5) and provide a splice equal to or better than a lap splice. As such no strength reduction will considered due to the alternate splices.

Vertical Bars

Based upon the design drawings, it would be expected to find vertical bars at 12" spacing on each face except above the openings. Additionally, #6 "U"-spaced bars are expected to be above the openings. Walkdowns confirmed the vertical spacing is approximately 12" on average and the #6 "U"-shaped bars are in the wall. The walkdowns showed that all vertical bars in this area are continuous from the wall into the slab. In the areas around the openings, additional vertical bars were noted. These bars are substitutes for the diagonal bars around the openings as shown on the design drawings.

7.3.2 Calculate Maximum Differential Pressure from TMD Analysis

As stated in the Westinghouse TMD Analysis (ref. 15, see E), the maximum differential pressure is obtained from Figures 5 through 7 of ref. 15. Table 1 on the following page summarizes the pressure in each of the four compartments, and the maximum differential pressure between compartments. Per ref. 22 (see Attachment C), the maximum differential pressure is 13.1 psi across the walls at azimuths 54 and 126 degrees and 12.6 psi across the walls at azimuths 234 and 307 degrees.

However, a dynamic load factor associated with the differential pressure from the TMD analysis must be calculated. This is done using the S&L RSG program by inputting the time history of the calculated differential pressure. The RSG input files [dlfrsg., dlfarsg.] and input time histories [dlf.acc, dlfa.acc] are shown on the following

pages, along with the plots of the time history and dynamic load factor. The RSG output files [dlf., dlfa.] are included in Attachment F. It should be noted that although the maximum differential pressure obtained from the time histories is 13.0 psi and 12.5 psi, which are slightly lower than those given in ref. 22, this slight difference does not affect the calculation of the dynamic load factor. This difference is due to digitization (for RSG run) of the plotted data from Reference 15.

The dynamic load factors are obtained from the plot by considering that the frequency of the walls is approximately 25 Hz, as calculated in Attachment G. Considering 5% damping per UFSAR Table 5.2-4, the maximum dynamic load factor for azimuths 54 & 126 is 1.04 and the maximum dynamic load factor for azimuths 234 & 307 is 1.05. The maximum differential pressure load in the fan-accumulator rooms calculated from the TMD analysis would then be:

(13.1 psi)(1.04) = 13.6 psi, for the walls at azimuths 54 & 126 degrees, and
(12.6 psi)(1.05) = 13.2 psi, for the walls at azimuths 234 & 307 degrees.

Also, Section C.3.2 of Appendix C in ref. 6 requires that the resistance available for impulsive loading be 20% greater than the magnitude of any portion of the loading which is approximately constant for a time equal to or greater than the first fundamental structural period. Per the following page, the magnitude of this differential pressure is 9.4 psi (walls at azimuths 54 & 126 control). Increasing by 20% gives:

(9.4 psi)(1.20) = 11.28 psi $<$ 12.6 psi or 13.1 psi.

Therefore, this does not control.

8.0 CONCLUSION

The fan accumulator walls, which exist between elevations 612' and 638' of the Unit 1 Containment Building at azimuths 54, 126, 234, & 307, have been determined to be adequate to perform their intended functions, when considering the deficiencies noted in CRs P-00-02506, P-00-06845, P-99-10162, and P-99-22312, and as repaired/reworked by 1-

LDCP-4807 and ARs 00264095 and 00273069.

The controlling accident pressure in the fan-accumulator rooms used in this analysis is the pressure load for the main steam line break per the Westinghouse TMD analysis (Reference 22).

Based on the reinforcing bars located by field investigation summarized in Attachment B, it can be concluded that:

1. The walls at azimuth 54, 126, 234, and 307 are functional.

2. For the wall at azimuth 54, the load factor for the MSLB pressure load was determined to be 1.31 by a conservative simplified analysis and 1.43 by the yield line methodology.

3. For the wall at azimuth 126, the load factor for the MSLB pressure load was determined to be 1.23 by a conservative simplified analysis and 1.35 by the yield line methodology.

4. For the wall at azimuth 234, the load factor for the MSLB pressure load was determined to be 1.39 by a conservative simplified analysis and 1.75 by the yield line methodology.

5. For the wall at azimuth 307, the load factor for the MSLB pressure load was determined to be 1.60 by a conservative simplified analysis and 2.19 by the yield line methodology.

6. Review of rebar cover measurements by radar equipment against pilot hole physical measurements determined that the radar cover measurements are accurate to within (3/8". A sensitivity analysis performed showed that this 3/8" deviation would result in a 3.3% reduction in margin.

The minimum load factor based on a simplified conservative analysis is 1.23 and based on yield line methodology is 1.35; thus, the fan-accumulator room walls are functional.

SUMMARY

Calculation SD-000810-001, Revision 0 provides the technical basis for establishing reasonable assurance of the operability of the subject walls under all design load conditions by taking credit for reduced load factors and as-built material strengths. All Unit 1 walls are determined to be OPERABLE but Degraded in all Operational Modes. Restoration of the fully OPERABLE

status of the subject walls will rely on the resolution of the discrepancy between the license/design basis requirements specified in the UFSAR and the current plant condition.

CONCLUSION:

Based on the results of the above referenced calculation and the additional arguments provided, the Unit 1 Fan/Accumulator Walls at Azimuths 54, 126, 234, and 307 degrees are determined to be OPERABLE But Degraded in all operational Modes.

SECTION 9, RECOMMENDED CORRECTIVE ACTION:

A corrective action for the degraded condition is already addressed as Corrective Action 6 in the actions section of condition report CR 00-02506. Corrective Action 6 is flagged as ODE related to appropriately track the degraded condition to closure. The action is to resolve the discrepancy between UFSAR license/design requirements and as-built condition of the fan/accumulator room walls in Unit 1.

The restoration of full qualification will be accomplished by updating the UFSAR to reflect the new design basis, or performing modifications of the walls to restore full compliance with existing design basis requirements.

SECTION 10, SUPPORTING DOCUMENTATION:

Calculation SD-000810-001 (Evaluation of Unit 1 Fan/Accumulator Room Walls)
Technical Specification 3.6.5.9 (Divider Barrier Seal)
UFSAR Section 5.2.2 (Divider Barrier)
UFSAR Chapter 14
Design Basis Documents DB-12-CNTS and DB-12-CNTT
UCR 99-UFSAR-0850, Westinghouse Supplemental Transient Mass Distribution Analyses

System(s):

	Indiv or Due Date	Team	Group	Date
Accepted By:	GOTTLIEBT	THORNSBERRYL	ESY	10/24/2000
Ready for Checked By:	LEONARDP	NAUGHTOND	ESY	11/10/2000
Approval Assigned To:	NAUGHTOND	NAUGHTOND	ESY	11/10/2000
Assigned To:	KOVARIKB	THORNSBERRYL	ESY	11/10/2000
Checked By:	KOVARIKB	CHAKRABARTIS2	DES	11/10/2000
Due Date:	11/13/2000			
Cross Discipline Rev By:	NAUGHTOND	VAZQUEZS	ESY	11/11/2000
Approved By:	ETHERIDGEW	ETHERIDGEW	OPS	11/12/2000
Evaluated By:	DORTSS	NRAC	RCL	11/12/2000

Past Operability:

D.C. Cook
Electronic Corrective Action Program

Condition Report: 00264095
Current Status: Closed
Action Category: 3

Responsible Group: DES   Status: Closed

Operable: N

Operability Type:

Comments:

PAST OPERABILITY EVALUATION (UNIT 1 ONLY)

CR 00-02506 identified suspect quality grout/concrete material at the top of the accumulator room end walls. The extent of the Unit 2 condition was addressed within CR 00-02506 and prescribed actions to perform an extent of condition review for Unit 1. This CR was generated as a result of the Unit 1 extent of condition review. The condition of the Unit 2 walls was reported within LER 316/2000-003.

The Unit 1 #4 accumulator room end wall located at azimuth 307°was found to have low strength grout material in the top 8" of the wall. In fact, all four accumulator end walls are associated with this condition. The walls are located adjacent to the Unit 1 accumulators and form the end walls of the Accumulator Room compartment. The walls adjacent to accumulator #1 (Azimuth 54) and accumulator #2 (azimuth 126) separate the accumulator rooms from the Containment Equalization (CEQ) fan rooms and as such are a portion of the divider barrier. The walls adjacent to accumulator #3 (Azimuth 234) and accumulator #4 (azimuth 307) separate the accumulator rooms from the instrument room and as such are lower containment sub-compartment boundary walls.

Calculation SD-000810-001 has been prepared to assess the functionality (operability) of the subject walls. The calculation eliminates several sources of conservatism in the analysis for the sake of determining operability, which are listed below.

1) the calculation utilizes reduced load factors from those specified in the UFSAR (though always greater than 1.0)
2) credit is taken for actual "as-poured" strength of concrete (5262 psi) rather than the minimum design strength required by the current design basis (3500 psi)
3) actual pressure load applied to the wall is considered in lieu of the 16 psi design pressure

The calculation concludes that the Unit 1 walls at azimuth 54, azimuth 126, azimuth 234, and azimuth 307 are capable of performing their intended function (have a

load capacity greater than 1.0), even when considering the found deficiencies in sections of wall material discussed in this CR.

This calculation evaluated each wall using two different methods: The Conservative Simplified Method, and The Yield Line Method. The minimum margin that was determined to exist for any of the four walls was significantly above the minimum margin of 1.0 required for operability (wall at azimuth 126 was determined to have the lowest factor of safety at 1.23 using the conservative simplified analysis).

The reduced load factor used for analysis purposes in this calculation does not satisfy the design requirements specified in sections 5.2.2.3 and 5.2.2.4 of the UFSAR. In fact, the calculation shows that the as found condition of the wall was outside the design bases as stated within the appropriate sections of the UFSAR due to a lower than specified factor of safety. As contained within the UFSAR Sections 5.2.2.3 and 5.2.2.4, the governing load combination requires a load factor of 1.5 applied to a 16.0 psi design pressure internal to the accumulator room. However, the calculation does provide assurance that the subject walls would remain functional under any of the postulated load conditions in the UFSAR. The use of the reduced load factor and the as-poured concrete strength is consistent with the functionality assessments performed for other containment structures (reference the ODE for CR 99-06123 & CR 00-02506).

Conclusion:
Past operability of the walls at azimuth 54, azimuth 126, azimuth 234, and azimuth 307 has been demonstrated by calculation SD-000810-001. The walls were outside design bases in the as-found condition due to a lower factor of safety than currently specified in the UFSAR.

	Indiv or Due Date	Team	Group	Date
Accepted By:	YOUNGA	SENA	DES	09/27/2000
Assigned To:	GODFREYJ	CHAKRABARTIS2	DES	10/24/2000
Ready for Checked By:	STAMANDJ	STAMANDJ2	DES	10/24/2000
Approval Assigned To:	STAMANDJ	STAMANDJ2	DES	10/24/2000
Checked By Assigned To:	KOVARIKB	CHAKRABARTIS2	DES	10/24/2000
Checked By:	KOVARIKB	CHAKRABARTIS2	DES	10/26/2000
Cross Discipline Rev By:	KOVARIKB	CHAKRABARTIS2	DES	10/26/2000
Approved By:	KOVARIKB	CHAKRABARTIS2	DES	10/26/2000
Evaluated By:	DORTSS	NRAC	RCL	10/26/2000
Due Date:	10/25/2000			

V. Reportability/Investigation

Responsible Group: RCL   Status: Closed

Problem Reportable: Y

Reportable Per: 10 CFR 50.73(a)(2)(ii)(B)

Comments:

Engineering performed a Past Operability Evaluation on the four accumulator end walls associated with the condition of poor quality grout found in the walls. A calculation was performed that evaluated each wall, and the conclusion was reached that the walls would have performed their intended function of maintaining structural integrity. However, a reduced load factor was used to verify operability of the walls. The reduction in safety margin in the calculation resulting from the use of the reduced load factor results is a discrepancy between the design requirements specified in the UFSAR and the current plant condition.

UFSAR Section 5.2.2.3 provides the design bases for the subject walls. The governing load combination requires the use of a 1.5 load factor applied to a 16 psi pressure load internal to the accumulator room as a result of a main steam line break within the room. Calculation SD-000810-001 has been prepared using reduced load factors (less than 1.5) applied to the actual differential pressure produced as a result of a main steam line break. The results of the calculation indicate the walls are not capable of withstanding design pressure loading, but are capable of performing their intended function (have a load capacity greater than 1.0), even when considering the as-found deficiencies in sections of wall material discussed in this CR. As such, the as-found condition of the wall was outside the design bases due to a lower factor of safety as stated in UFSAR Section 5.2.2.3, equation (i).

The CR information was reviewed against reporting requirements for 10 CFR 50.72, 10 CFR 50.73, and plant reporting procedures, PMP 7030.001.001, "Prompt NRC Notification," and PMP 7030.001.002, "Licensee Event Reports, Special and Routine Reporting."

The condition of the four accumulator end walls in Unit 1 containment not being capable of meeting the design pressure loading is a condition outside the design basis of the plant and is reportable

under 10 CFR 50.73(a)(2)(ii)(B).

See LER 315/2000-008-00, and Unit 2 LER 316/2000-003-00.

The Root Cause for this condition appears to be the same as that for Unit 2, specifically a loss of design control, as identified in CR 99-0594.

Steven Dort
October 26, 2000

	Indiv or Due Date	Team	Group	Date
Assigned To:	DortSS	NRAC	RCL	10/03/2000
Ready For Approval:	DORTSS	NRAC	RCL	10/27/2000
Approval Assigned To:	GASTONR	NRAC	RCL	10/27/2000
Approved By:	GASTONR	NRAC	RCL	10/28/2000
Due Date:	10/26/2000			

Investigation Report:

Responsible Group: DES

Investigator: KOVARIKB

Investigation Report Due:	DE69/2000
Event Notification Due:	__/__/____
Internal Report Due:	__/__/____
Detailed Report to Station Mgr:	__/__/____
Detailed Report to Regulator:	11/27/2000

Reportability Requirement:

X2 Possible Design / Construction / Installation Deficiency

VI. Non-Conformance Evaluation

Condition Report: 00264095
Current Status: Closed
Action Category: 3

Responsible Group: DES

Status: Closed

Non-Conformance Eval Required: Yes

Non-Conformance Exists: Yes

Non-Conformance Disposition: Repair

Interim Disp.: Yes

Comments:

Condition report CR 00-2506 identified apparent deficiencies related to the accumulator room/ CEQ room end walls. The condition evaluation within CR 00-2506 includes an apparent cause evaluation for the Unit 2 walls and examination and observation results for the Unit 1 walls. CR 00-2506 action 3 was generated to capture an extent of condition review for the Unit 1 walls. Included within this document is the extent of condition review for the Unit 1 walls and apparent causes for the identified issues. CR 00264095 was generated to address additional non-conformances related to the Unit 1 walls discovered during this extent of condition review.

DESCRIPTION OF CONDITION

There are four walls associated with this condition. The walls are located adjacent to the Unit 1 accumulators and form the end walls of the accumulator room compartment. The walls adjacent to accumulator #1 (azimuth 54°) and accumulator #2 (azimuth 126°) separate the accumulator rooms from the CEQ fan rooms and as such are a portion of the divider barrier. The walls adjacent to accumulator #3 (Azimuth 234°) and accumulator #4 (azimuth 307°) separate the accumulator rooms from the instrument room and as such are lower containment subcompartment boundary walls.

The four walls are approximately 13' wide, 18" deep and 26' tall reinforced concrete walls. The bottom of the walls are an integral structural element with the 612' elevation concrete slab. One side of the walls are an integral structural element with the crane wall. The top of the walls are attached to the underside of the ice condenser concrete floor slab at elevation 638'. The fourth side of the walls are adjacent to but not structurally attached to the containment wall. The gap between the walls and the containment wall is closed by a flexible seal. For the 54° wall and the 126° wall, the flexible seal is the divider barrier seal, which prevents bypass of the ice condenser. For the 234° wall and the 307° wall, the

flexible seal is a ventilation boundary. (Reference drawing 1-2-3207)

As identified within the evaluation section of CR 00-2506 the following issues were associated with the Unit 2 walls;

	Unit 2 WALL			
Condition	54	126	234	307
Grout Strength		x		x
Open Pockets		x		
Cut Rebar		x		
Asbestos		x		
Rebar Location	x	x	x	x
Rebar Cover	x	x	x	x

Each of the above captioned issued will be addressed in relationship to the Unit 1 walls. The following issues are associated with the Unit 1 walls;

Condition Report: 00264095
Current Status: Closed
Action Category: 3

Condition	Unit 1 WALL 54	126	234	307
Grout Strength				x
Open Pockets	x			
Cut Rebar	x		x	x
Rebar Location	x	x	x	x
Rebar Cover	x	x	x	x

In addition to the specific issues contained within the above captioned table, the following issues were identified during the performance of the extent of condition review for the

Unit 1 walls;

CR 00264095 Non-conformances related to the 307° wall including low strength grout at the top of the wall, penetration form boards not removed during initial construction, horizontal reinforcing bars at the top of the wall have cadweld splices, containment spray piping supports with loose anchor bolt nuts and apparent missing anchor bolts.

CR 00273069 Reinforcement drawing discrepancy which shows vertical dowels being embedded into the ice condenser slab 1'-9". However, the ice condenser slab above the Unit 1 walls is 12" thick and as such a straight vertical dowel can not be 1'-9" long.

CR00293037 One horizontal dowel from the crane wall into the 307° wall apparently mis-positioned.

BACKGROUND

The construction sequences of the ice condenser related internal structure elements of containment are different when comparing Unit 1 and Unit 2. The four accumulator/ CEQ room end walls frame into the underside of the ice condenser floor slab. During the erection of the Unit 1 ice condenser in 1972, a significant design concern was identified that resulted in an extensive redesign of the ice condenser structure. Since the construction of the Unit 1 concrete ice condenser support structures had been completed at this time and significant progress had been made on the installation of the ice condenser internals, the redesign was approached as a retrofit design. By contrast, the Unit 2 concrete ice condenser support structures had not yet started. As such, the Unit 2 ice condenser was redesigned in lieu of being retrofitted. This design configuration difference is most pronounced in the ice condenser floor structure. The accumulator/CEQ walls frame into the underside of the ice condenser floor and were impacted by the ice condenser redesign and/or retrofit.

GROUT STRENGTH

Observations and examinations of the four walls revealed concrete patches had previously installed. Hammer testing and visual examinations indicate the

concrete patches on the 54°, 126° and the 234° wall are solid structural concrete. Visual examination of the top portion of the 307° wall revealed a horizontal crack like indication on both sides of the wall. Hammer testing of the material above and below the horizontal crack indicates the material in the two regions is different. Work request A0206630 excavated the top region of the 307° wall to further assess the material and its condition. The excavation revealed the top approximate eight inches of the wall to be an apparent low strength grout in lieu of concrete. The dry pack type of grout is readily placed but develops low strength.

The difference in the material at the top of the 307° wall is related to the initial construction sequence that required the wall to be poured after the ice condenser slab above the wall was poured. This physical arrangement would have necessitated pouring the 307° wall to a point just below the ice condenser floor slab, followed by grouting to close the open gap at the top of the wall. The 307° wall was poured well after the ice condenser slab to maintain a construction opening access to the lower portions of containment.

Grout strength is related to the 307° wall.

OPEN POCKETS

Open pockets are located at the top of 54°, 126° and 234° walls. The pockets in the 126° and the 234° walls are partial depth pockets. The 54° wall contains partial depth pockets and one full depth pocket that creates an opening in the wall. The pockets at the top of these walls were created to accommodate installation of the retrofitted ice condenser support structures and floor drains. The ice condenser structural steel sub-floor is attached to the top of the ice condenser concrete slab by groups of through bolts. The configuration of the ice condenser steel sub-floor resulted in pockets required to be created within the 54°, 126° and the 234°walls. These pockets are shown on the accumulator/CEQ wall drawing, 1-2-3207A-24.

Additionally, the drawings for the steel sub-floor provide direction not core drill the anchor bolt holes through the slab after the creation of the pockets in the 54°, 126° and the 234°walls (Reference 1-3208J-10). As-built dimensions of the pockets created for the through bolts are consistent with the pockets shown on the masonry drawing. The 234° has one additional pocket that was created to eliminate an interference with an ice condenser floor drain pipe. The pocket for the 12 " diameter floor drain pipe is approximately 4" deep with no exposed rebar. This pocket for the floor drain pipe was not previously shown on the masonry drawings for the walls.

The anchorage configuration for the steel sub-floor is different in Unit 1 than Unit 2. As described within the Unit 2 evaluation the anchorage base plates installed within the thickness of the Unit 2 126° wall was to have a metallic shear lug welded to the base plate then the open pockets grouted closed to provide effective capacity to the shear lug (Reference 2-3208A). In Unit 1, the anchorage of the steel sub-floor included plate washers and standard high strength washers and nuts (Reference 1-3208K-10), but did not include shear lugs or grouting the pockets closed. As such the open pockets on the 54°, 126° and the 234°walls did not have a negative impact on the structural capacity of the walls. However, since the 54° wall is a portion of the divider barrier, the full depth pocket created an open bypass. The full depth pocket in the 54° wall had a cover plate installed under design change 1-RFC-1225 following pre-op leakage testing of the ice condenser CEQ system. Condition reports CR 99-6845 and CR 99-10162 had previously been generated and evaluated in relationship to the adequacy the cover plate design and installation to eliminate the divider barrier bypass.

Open pockets are related to the 54°, 126°, and 234° walls.

CUT REBAR

The creation of the pockets in the 54°, 126° and the

234°walls resulted in reinforcing bar being cut in the 54° and 234° walls. The pockets created within the 126° wall did not result in any reinforcing bars being cut. The design of the flexible ventilation seal attachment at the 307°/containment wall/floor slab interface resulted in cut reinforcing bars. The cutting of both vertical and horizontal reinforcing bars in the 54° and 234° walls were a portion of the ice condenser floor retrofit design to create pockets large enough to accommodate the steel sub-floor anchorage. The steel attachements for the flexible seal at the corner of the 307° wall required vertical reinforcing bar to be cut resulting in the bar not extending into the ice condenser floor slab. The arrangement of these pockets and interferences are shown on the drawings for the wall and as such the removal of portions of the rebar is not considered to be a non-conformance.

Rebar mapping was performed for accessible portions of both faces of the walls using radar to determine the extent to which the rebar relied upon in the calculations is in place. The excavation performed at the top of the 307 wall permitted confirmation of intact vertical rebar extended from the wall into the ice condenser floor slab. The configuration of the rebar within the excavated area at the top of the 307° wall was documented through the performance of as-built sketches and incorporated into the structural analysis of the walls. The radar mapping also revealed that the cover and spacing of some rebar varied from the design specifications. Additional rebar cover and spacing issues were identified and then subsequently evaluated.

There is no evidence of rebars outside the dimensions of the created pockets has been cut. The structural evaluations of the walls accommodate removal of the rebars in the area of the pockets. Cut rebar is related to the 54°, 234°, and the 307° walls.

ASBESTOS

Asbestos material was found at the top of Unit 2 126° wall. The

asbestos blanket was attributed to the welding activities required to complete the installation of the steel sub-floor anchorage and then not removed prior to the placement of the grout at the top of the wall. The Unit 1 anchorage is a different design configuration. As such, welding was not required to be performed within the dimensions of the wall and grouting was not performed on the 54°, 126° or 234° walls. There is no indication of similar circumstances within the construction of the Unit 1 walls that would have resulted in asbestos blankets being used and potentially left within the wall. The top portion of the 307° was excavated and no asbestos was discovered during the excavation.

There is no evidence of asbestos embedded within the Unit 1 CEQ/accumulator room end walls.

REBAR LOCATION

As a result of the anomalies associated with rebar location and cover in Unit 2, radar mapping of accessible critical portions of both faces of the four walls was performed in Unit 1. The critical areas of rebars were determined based upon a review of the wall structural calculations. The result of this mapping is similar to the findings in Unit 2.

The design of the walls is for
#9 rebars at 12" centers (vertical rebars)
#11 rebars at 6" centers (horizontal rebars on accumulator side)
#11 rebars at 12" centers (horizontal rebars on instrument/CEQ fan room side)

Excavation and radar mapping revealed the average rebar spacing is
Hortizontal rebars in most areas per design with increased spacing in areas of congested penetrations
Vertical rebars in most areas are per design with up to 16" spacing in limited areas of congested penetrations. The radar mapping rebar locations are being incorporated into the structural analysis of the walls.

The top portion of the 307° wall was excavated to determine the extent of the apparent low strength grout. The excavation removed the majority of the top of the 307° wall and exposed the reinforcement. Based upon the drawings for the walls and the adjacent crane wall, horizontal dowels were placed to provide an attachment between the CEQ/accumulator room end walls and the crane wall. Drawings indicate the horizontal dowels were placed on each face of the CEQ/accumulator room end walls. Based upon the dimensions shown on the drawings, the upper most horizontal dowel on the accumulator face of the 307° wall should have been exposed within the excavated area.

Visual examination of the horizontal dowels at the top of the 307° wall revealed the upper most horizontal dowels on the accumulator face of the wall were bent downward into the thickness of the wall and did not enter straight horizontally into the crane wall. During the period of initial construction, specification DC-CE-103-QCN governed the placement and inspection of concrete. Within specification DCC-CE-103-QCN are provision to make minor adjustments to the reinforcement in the areas of penetrations based upon the approval of the field engineer. The pour records for these walls were retrieved and reviewed to prepare DIT-B-01588-00, contained within Attachment C of calculation SD-000810-001. During the development of input data for this calculation, radar mapping was performed to locate reinforcement within the walls as described within DIT-B-01627, contained within Attachment B of the calculation. Included within the pour records are QC-9 forms which document the inspection of the placement of the concrete forms, reinforcement, and embedments prior to the placement of the concrete. The QC-9 forms indicate the reinforcement was placed within the walls in accordance with the drawings and specification prior to placement of the concrete. Additionally, the radar mapping data generally indicates the required reinforcement is in place within the thickness of the walls. Based upon the above, there is reasonable assurance that the horizontal dowels between the crane wall and the CEQ/accumulator room end

walls exist in the quantity shown on the reinforcement drawings. This condition was reported in CR 00293037

CR 00273069 describes an apparent drawing discrepancy on drawing 1-2-3207D. This drawing shows the reinforcement configuration within the CEQ/accumulator room walls. Shown on this drawing are the vertical dowels from the walls and their embedment length into the floor slab above the walls. The dimension shown on the drawing indicates the vertical dowels are embedded 1'-9" into the floor slab. However, drawing 1-2-3208B shows the floor slab above these walls to be 12" thick. As such, 1'-9" of embedment is not possible for a straight vertical dowel. The findings of this condition report were considered during the development of this calculation. The analysis of the walls does not use added structural strength from the 1'-9" vertical dowel length.

Rebar location is related to the 54, 126, 234, and the 307 walls.

REBAR COVER

Rebar cover describes the depth of concrete from the face of the wall to the rebar.
The design of the walls is for
Horizontal rebars with 2 3/4" cover
Vertical rebars located behind the horizontal rebars with a resultant cover of 4 1/8"

Radar mapping revealed the minimum ACI cover requirements are met. The rebar mapping data provided for the development of the average maximum depth to be developed for both the horizontal and vertical rebars. The radar mapping rebar locations are being incorporated into the structural analysis of the walls.

Rebar cover is related to the 54, 126, 234, and the 307 walls.

FORM BOARDS

The 307° wall has two oval pipe penetrations. The penetration sleeve is 12" and the wall is 18" thick. The remaining 6" of the pipe penetration has a rectangular recess. The rectangular recess was formed with 1"x6" wood to prevent the concrete from entering the penetration area. These form boards were not removed prior to the installation of the piping through one penetration in the 307°

wall. The form boards remaining in the periphery of the penetration does not impact the structural capacity of the wall. The wood does create a minimal increase in the combustible material inside containment. However, the specifications and procedures required the removal of the form boards following the completion of the construction of the wall. The form boards have been removed from the 307° wall. The apparent cause of the wooden form boards is considered to be an oversight during initial construction. The location of the form boards within the penetration resulted in the boards being obscured from view.

Form boards are related to the 307° wall.

REINFORCING BAR SPLICES

Within the top portion of the 307° wall, an excavation was performed. Within the excavated area, the horizontal reinforcing bars were found to have cadweld splices. The reinforcing drawings for the walls, 1-2-3207D, do not show cadweld splices for the reinforcement. Typically, reinforcing bars are spliced with lap splices, where the ends of the individual bars are overlapped and tieed together with tie-wire. Cadwelds are mechanical splices of reinforcing bars. Cadwelds are typically utilized for large diameter bars are areas of congestion where adequate room is not available to provide adequate development length within the lap splice. Additionally, cadwelds are shown on the reinforcing drawings. A review of the reinforcement drawings for the walls revealed extra reinforcing was included within the design of the walls around the areas of the large penetrations. The extra reinforcing in the area of the penetrations resulted in a congested area. To facilitate the installation of the reinforcing, cadwelds were used to splice the horizontal bars. Visual examination of the cadwelds revealed indications of adequate fusion of the bars. The cadwelds would have been placed during the initial construction of the wall prior to the placement of the concrete. During the initial

construction of the containment structures, cadweld splicing of reinforcing bars was performed within many areas of the structures in accordance with specifications and procedures. The alternate reinforcing bar splices do not detract from the structural capability of the wall. Without excavation of the concrete, the exact number of alternate cadweld reinforcing bar splices cannot be determined. The use of alternate cadweld reinforcing bar spices has been considered within the analysis of the walls.

Cadweld splices are related to the 307° wall.

CONTAINMENT SPRAY PIPE SUPPORTS

Visual examination of the 307 wall revealed piping supports were partially installed adjacent to the area of low quality grout within the 307 wall. Although not directly associated with the structural capacity of the 307 wall, pipe anchorage plate was evaluated as a portion of the extent of condition. The lower containment spray (CTS) ring header piping penetrates the 307° wall. The CTS pipe is anchored to the wall on both faces of the wall. The pipe support is comprised of vertical plates mounted to the faces of the wall at the pipe penetration. The anchorage plates are held in place by both expansion anchors and through-bolts located horizontally on the top and bottom of the anchorage plates. During the course of the excavation of the low quality grout material at the top of the 307° wall, two through-bolts and the wedges of two expansion anchors were exposed at the top of the CTS anchorage plates. A comparison of the design drawings for the CTS supports revealed the open bolt hole in the anchorage plates was not required to have an anchor bolt installed. Further examination of the excavated area revealed an internal interference within the wall from the reinforcing bars that would have prevented the installation of an anchor bolts in the open hole in the CTS anchorage plate. The open bolt hole on the CTS anchorage plates does not degrade the capacity of the CTS support.

To evaluate the potential impact of the as-found condition of the CTS anchorage plates, a field verification of the configuration of the CTS anchorage plates was performed. The CTS anchorage plates are depicted on isometric drawings 1-GCTS-19 sheet 3 and 1-GCTS-20 sheet 4 and individually identified as support 1-GCTS-R517. The field verification of the CTS anchorage plates included a comparison of the anchor bolts, dimensions of the anchorage plates and the weld attachment between the CTS pipes and the anchorage plates. The field verification confirmed the quantity of anchor bolts and the weld attachment size between the anchorage plate and the CTS pipe were different than those shown on the CTS piping drawings. The as-found condition of the CTS anchorage plates, 1-GCTS-R517 were evaluated within calculation DC-D-12-MSC-76, revision 0, LBPRP Analysis of Containment Spray Piping Inside Containment. The conclusion of this calculation relating to CTS anchorage, 1-GCTS-R517, is that the stress values within the anchorage plate are low and the existing condition is acceptable as-is.

The CTS anchorage non-conformances are associated with the low quality grout in the 307 wall.

Each of the above listed issues, grout strength, open pockets, cut rebar, rebar splicing, rebar location and rebar cover, are non-conformances between the physical plant and the design configuration. The collective of these issues resulted in the accumulator room end walls having a structural capacity less than the design bases capacity based upon structural evaluations. The design bases capacity of the walls is based upon the ability of the walls to withstand the effects of a main steam line break within the accumulator room. Structural evaluations of the as-found condition of the walls concluded the walls would have functioned although the walls are outside the design bases. The as-found evaluation of the structural capacity of the walls is contained within calculation SD-000810-

001, revision 0, Evaluation of the Unit 1 Fan-Accumulator Room Walls.

There are four walls associated with this condition. The four wall are a portion of the internal structure of containment. The walls are located adjacent to the Unit 1 accumulators and form the end walls of the accumulator room compartment. The walls adjacent to accumulator #1 (Azimuth 54°) and accumulator #2 (azimuth 126°) separate the accumulator rooms from the CEQ fan rooms and as such are a portion of the divider barrier. The walls adjacent to accumulator #3 (Azimuth 234°) and accumulator #4 (azimuth 307°) separate the accumulator rooms from the instrument room and as such are lower containment subcompartment boundary walls. These walls do not have specific FDB identification numbers

The non-conformances associated with the 54°, 126°, 234°, and the 307° walls are related to original construction of the Unit 1 containment and the retrofitting of the redesigned ice condenser structure. The 54°, 126°, 234°, and 307° walls in Unit 1 containment were not constructed in accordance with the configuration control documents for rebar cover and location. Additionally, material substitution was made in the 307 wall resulting in the wall not being constructed in accordance with the configuration control documents. The apparent cause of these conditions is considered to be failure to comply with the design configuration. Contributing to this apparent cause is the apparent lack of oversight and quality control during grouting activities during the initial construction of the Unit 1 containment. The organization responsible for these activities would have been the plant construction department. The plant construction department no longer exists within the plant organization. The plant construction department had the responsibility for oversight and quality control at the time of the Unit 1 containment construction to provide assurance that the physical plant configuration was assembled in

conformance with the design configuration control documents including drawings and specifications.

The 54°, 126°, 234°, and 307° walls in Unit 1 containment were constructed in accordance with the configuration control documents for cut rebar and open pockets. The majority of the open pockets and the cut rebar do not have significant impact upon the structural capacity of the walls. However, the full depth pocket in the 54° wall does impact the maximum permissible divider barrier bypass. The apparent cause of these conditions is considered to be design error and/or oversight. Contributing to this cause is the apparent lack of design interface control during the design phase of the ice condenser retrofit. The full depth pocket was considered to be structurally acceptable but did not consider the impact to the divider barrier. The redesign and retrofit of the Unit 1 ice condenser occurred during the initial design of the facility prior to the initiation of the design change process.

During the initial design and retrofit of the ice condenser the subcompartment pressure loads used as inputs to the structural analysis were lower than current subcompartment pressure loads. Changes in the subcompartment pressure loads over the life of the facility were not adequately evaluated for their impact to the structural design basis.

Disposition on Non-conforming conditions associated with the Unit 1 fan accumulator room walls.

Grout Strength
The low strength grout at the top of the 307 wall was repaired as a portion of the scope contained within design change 1-LDCP-4807. 1-LDCP-4807 has been completed through RTO.

Open Pockets
The through wall pocket at the top of the 54 wall has been repaired to eliminate the divider barrier bypass as a portion of the scope contained within design change 1-LDCP-4807. 1-LDCP-4807 has been completed through RTO.
The partial depth pocket on the 234 wall that is associated with the ice condenser floor drain

interference has no detrimental impact to the functional capability of the wall and as such will be accepted as-is.
The remainder of the partial depth pockets on the 54, 126 and the 234 walls are in conformance with the design drawings and as such are not considered to be non-conforming conditions.

Cut Rebar
The cut rebar associated with the 54, 126 and the 234 walls is in conformance with the design drawings and as such are not considered to be non-conforming conditions.

Rebar Location
Rebar location is associated with the 54, 126, 234 and the 307 wall. Variances exist with the rebar spacing in both the vertical and horizontal direction. Variances also exist in the dimension of the cover of the rebar. As such the location and cover of the rebar are considered to be non-conforming conditions. The postion of the rebar has been considered in the determination of the structural capacity of the walls as contained within calculation SD-000810-001, revision 0 and the ODE contained within this condition report. As such the non-conformances related to rebar spacing and cover have been accepted on an interim bases. CR 00064095 action 2 will track the restoration the design basis capacity of the walls.

Form Boards
The forms boards found within the penetrations of the top of the 307 wall have been removed within the work performed under Job Order C206630. As such the form boards are no longer considered to be a non-conforming condition.

Reinforcing Bar Splices
The use of cadweld rebar splices in lieu of lap splices is associated with the 307 wall. Cadweld splices are not shown on the deisgn drawings and are therefore considered to be a non-conforming condition. The use of cadweld splices in lieu of lap splices was considered within the structural evaluation of the walls within calculation SD-000810-001 and determined to not be detrimental to the function and/or capacity of the walls. As such the use of cadwelds in lieu of lap splices will be accepted

as-is.

Containment Spray Pipe Supports.
The containment spray pipe supports are associated with the 307 wall. The as-found physical configuration of the CTS pipe supports, 1-GCTS-517, had non-conformances relating to the support anchorage and the weld size attachment between the support and the CTS pipe. The embedment of the CTS support anchorage has been repaired as a portion of the work scope contained within 1-LDCP-4807. The restoration of the top of the 307 wall with high strength structural grout also restored the embedment of the CTS support anchorage. 1-LDCP-4807 has been completed through RTO. The quantity and location of the CTS anchorage as well as the weld size between the supports and the CTS pipe have been evaluated within calculation DC-D-12-MSC-76, revision 0. The conclusion of this calculation relating to CTS anchorage, 1-GCTS-R517, is that the stress values within the anchorage plate are low and the existing condition is acceptable as-is.

The current status of the fan accumulator room walls has ben evaluated within the ODE for CR 00264095. The conclusion of this ODE is
Based on the results of the above referenced calculation and the additional arguments provided, the Unit 1 Fan/Accumulator Walls at Azimuths 54, 126, 234, and 307 degrees are determined to be OPERABLE But Degraded in all operational Modes.

CR 00264095 action 2 is tracking the restoration of the design basis capcaity of the Unit 1 fan accumulator room walls.

	Indiv or Due Date	Team	Group	Date
Accepted By:	YOUNGA	SENA	DES	09/27/2000
Due Date:	10/15/2000			
Assigned To:	AL-NAKIBH	CHAKRABARTIS2	DES	11/19/2000
Ready For Approval:	KOVARIKB	CHAKRABARTIS2	DES	11/20/2000
Approved By:	KOVARIKB	CHAKRABARTIS2	DES	11/20/2000

VII. Condition Evaluation

Responsible Group: DES Status: Closed

Rework Required N
System(s) Affected: CNTMT CONTAINMENT BUILDING STRUCTURE

Affected Equipment

Equipment ID No.	Comp. Code	Manufacturer

Event	Cause	Primary	Cause Description	Group(s)

Condition Evaluation:

Condition report CR 00-2506 identified apparent deficiencies related to the accumulator room/ CEQ room end walls. The condition evaluation within CR 00-2506 includes an apparent cause evaluation for the Unit 2 walls and examination and observation results for the Unit 1 walls. CR 00-2506 action 3 was generated to capture an extent of condition review for the Unit 1 walls. Included within this document is the extent of condition review for the Unit 1 walls and apparent causes for the identified issues. CR 00264095 was generated to address additional non-conformances related to the Unit 1 walls discovered during this extent of condition review.

DESCRIPTION OF CONDITION

There are four walls associated with this condition. The walls are located adjacent to the Unit 1 accumulators and form the end walls of the accumulator room compartment. The walls adjacent to accumulator #1 (azimuth 54°) and accumulator #2 (azimuth 126°) separate the accumulator rooms from the CEQ fan rooms and as such are a portion of the divider barrier. The walls adjacent to accumulator #3 (Azimuth 234°) and accumulator #4 (azimuth 307°) separate the accumulator rooms from the instrument room and as such are lower containment subcompartment boundary walls.

The four walls are approximately 13' wide, 18" deep and 26' tall reinforced concrete walls. The bottom of the walls are an integral structural element with the 612' elevation concrete slab. One side of the walls are an integral structural element with the crane wall. The top of the walls are attached to the underside of the ice condenser concrete floor slab at elevation 638'. The fourth side of the walls are adjacent to but not structurally attached to the containment wall. The gap between the walls and the containment wall is closed by a flexible seal. For the 54° wall and the 126° wall, the flexible seal is the divider barrier seal, which prevents bypass of the ice condenser. For the 234° wall and the 307° wall, the

flexible seal is a ventilation boundary. (Reference drawing 1-2-3207)

As identified within the evaluation section of CR 00-2506 the following issues were associated with the Unit 2 walls;

	Unit 2 WALL			
Condition	54	126	234	307
Grout Strength		x		x
Open Pockets		x		
Cut Rebar		x		
Asbestos		x		
Rebar Location	x	x	x	x
Rebar Cover	x	x	x	x

Each of the above captioned issued will be addressed in relationship to the Unit 1 walls. The following issues are associated with the Unit 1 walls;

	Unit 1 WALL			
Condition	54	126	234	307

Grout Strength				x
Open Pockets	x			
Cut Rebar	x		x	x
Rebar Location	x	x	x	x
Rebar Cover	x	x	x	x

In addition to the specific issues contained within the above captioned table, the following issues were identified during the performance of the extent of condition review for the

Unit 1 walls;

CR 00264095 Non-conformances related to the 307° wall including low strength grout at the top of the wall, penetration form boards not removed during initial construction, horizontal reinforcing bars at the top of the wall have cadweld splices, containment spray piping supports with loose anchor bolt nuts and apparent missing anchor bolts.

CR 00273069 Reinforcement drawing discrepancy which shows vertical dowels being embedded into the ice condenser slab 1'-9". However, the ice condenser slab above the Unit 1 walls is 12" thick and as such a straight vertical dowel can not be 1'-9" long.

CR00293037 One horizontal dowel from the crane wall into the 307° wall apparently mis-positioned.

BACKGROUND

The construction sequences of the ice condenser related internal structure elements of containment are different when comparing Unit 1 and Unit 2. The four accumulator/ CEQ room end walls frame into the underside of the ice condenser floor slab. During the erection of the Unit 1 ice condenser in 1972, a significant design concern was identified that resulted in an extensive redesign of the ice condenser structure. Since the construction of the Unit 1 concrete ice condenser support structures had been completed at this time and significant progress had been made on the installation of the ice condenser internals, the redesign was approached as a retrofit design. By contrast, the Unit 2 concrete ice condenser support structures had not yet started. As such, the Unit 2 ice condenser was redesigned in lieu of being retrofitted. This design configuration difference is most pronounced in the ice condenser floor structure. The accumulator/CEQ walls frame into the underside of the ice condenser floor and were impacted by the ice condenser redesign and/or retrofit.

GROUT STRENGTH

Observations and examinations of the four walls revealed concrete patches had previously installed. Hammer testing and visual examinations indicate the

concrete patches on the 54°, 126° and the 234° wall are solid structural concrete. Visual examination of the top portion of the 307° wall revealed a horizontal crack like indication on both sides of the wall. Hammer testing of the material above and below the horizontal crack indicates the material in the two regions is different. Work request A0206630 excavated the top region of the 307° wall to further assess the material and its condition. The excavation revealed the top approximate eight inches of the wall to be an apparent low strength grout in lieu of concrete. The dry pack type of grout is readily placed but develops low strength.

The difference in the material at the top of the 307° wall is related to the initial construction sequence that required the wall to be poured after the ice condenser slab above the wall was poured. This physical arrangement would have necessitated pouring the 307° wall to a point just below the ice condenser floor slab, followed by grouting to close the open gap at the top of the wall. The 307° wall was poured well after the ice condenser slab to maintain a construction opening access to the lower portions of containment.

Grout strength is related to the 307° wall.

OPEN POCKETS

Open pockets are located at the top of 54°, 126° and 234° walls. The pockets in the 126° and the 234° walls are partial depth pockets. The 54° wall contains partial depth pockets and one full depth pocket that creates an opening in the wall. The pockets at the top of these walls were created to accommodate installation of the retrofitted ice condenser support structures and floor drains. The ice condenser structural steel sub-floor is attached to the top of the ice condenser concrete slab by groups of through bolts. The configuration of the ice condenser steel sub-floor resulted in pockets required to be created within the 54°, 126° and the 234°walls. These pockets are shown on the accumulator/CEQ wall drawing, 1-2-3207A-24.

Additionally, the drawings for the steel sub-floor provide direction not core drill the anchor bolt holes through the slab after the creation of the pockets in the 54°, 126° and the 234°walls (Reference 1-3208J-10). As-built dimensions of the pockets created for the through bolts are consistent with the pockets shown on the masonry drawing. The 234° has one additional pocket that was created to eliminate an interference with an ice condenser floor drain pipe. The pocket for the 12 " diameter floor drain pipe is approximately 4" deep with no exposed rebar. This pocket for the floor drain pipe was not previously shown on the masonry drawings for the walls.

The anchorage configuration for the steel sub-floor is different in Unit 1 than Unit 2. As described within the Unit 2 evaluation the anchorage base plates installed within the thickness of the Unit 2 126° wall was to have a metallic shear lug welded to the base plate then the open pockets grouted closed to provide effective capacity to the shear lug (Reference 2-3208A). In Unit 1, the anchorage of the steel sub-floor included plate washers and standard high strength washers and nuts (Reference 1-3208K-10), but did not include shear lugs or grouting the pockets closed. As such the open pockets on the 54°, 126° and the 234°walls did not have a negative impact on the structural capacity of the walls. However, since the 54° wall is a portion of the divider barrier, the full depth pocket created an open bypass. The full depth pocket in the 54° wall had a cover plate installed under design change 1-RFC-1225 following pre-op leakage testing of the ice condenser CEQ system. Condition reports CR 99-6845 and CR 99-10162 had previously been generated and evaluated in relationship to the adequacy the cover plate design and installation to eliminate the divider barrier bypass.

Open pockets are related to the 54°, 126°, and 234° walls.

CUT REBAR

The creation of the pockets in the 54°, 126° and the

234°walls resulted in reinforcing bar being cut in the 54° and 234° walls. The pockets created within the 126° wall did not result in any reinforcing bars being cut. The design of the flexible ventilation seal attachment at the 307°/containment wall/floor slab interface resulted in cut reinforcing bars. The cutting of both vertical and horizontal reinforcing bars in the 54° and 234° walls were a portion of the ice condenser floor retrofit design to create pockets large enough to accommodate the steel sub-floor anchorage. The steel attachements for the flexible seal at the corner of the 307° wall required vertical reinforcing bar to be cut resulting in the bar not extending into the ice condenser floor slab. The arrangement of these pockets and interferences are shown on the drawings for the wall and as such the removal of portions of the rebar is not considered to be a non-conformance.

Rebar mapping was performed for accessible portions of both faces of the walls using radar to determine the extent to which the rebar relied upon in the calculations is in place. The excavation performed at the top of the 307 wall permitted confirmation of intact vertical rebar extended from the wall into the ice condenser floor slab. The configuration of the rebar within the excavated area at the top of the 307° wall was documented through the performance of as-built sketches and incorporated into the structural analysis of the walls. The radar mapping also revealed that the cover and spacing of some rebar varied from the design specifications. Additional rebar cover and spacing issues were identified and then subsequently evaluated.

There is no evidence of rebars outside the dimensions of the created pockets has been cut. The structural evaluations of the walls accommodate removal of the rebars in the area of the pockets. Cut rebar is related to the 54°, 234°, and the 307° walls.

ASBESTOS

Asbestos material was found at the top of Unit 2 126° wall. The

asbestos blanket was attributed to the welding activities required to complete the installation of the steel sub-floor anchorage and then not removed prior to the placement of the grout at the top of the wall. The Unit 1 anchorage is a different design configuration. As such, welding was not required to be performed within the dimensions of the wall and grouting was not performed on the 54°, 126° or 234° walls. There is no indication of similar circumstances within the construction of the Unit 1 walls that would have resulted in asbestos blankets being used and potentially left within the wall. The top portion of the 307° was excavated and no asbestos was discovered during the excavation.

There is no evidence of asbestos embedded within the Unit 1 CEQ/accumulator room end walls.

REBAR LOCATION

As a result of the anomalies associated with rebar location and cover in Unit 2, radar mapping of accessible critical portions of both faces of the four walls was performed in Unit 1. The critical areas of rebars were determined based upon a review of the wall structural calculations. The result of this mapping is similar to the findings in Unit 2.

The design of the walls is for
#9 rebars at 12" centers (vertical rebars)
#11 rebars at 6" centers (horizontal rebars on accumulator side)
#11 rebars at 12" centers (horizontal rebars on instrument/CEQ fan room side)

Excavation and radar mapping revealed the average rebar spacing is
Hortizontal rebars in most areas per design with increased spacing in areas of congested penetrations
Vertical rebars in most areas are per design with up to 16" spacing in limited areas of congested penetrations. The radar mapping rebar locations are being incorporated into the structural analysis of the walls.

The top portion of the 307° wall was excavated to determine the extent of the apparent low strength grout. The excavation removed the majority of the top of the 307° wall and exposed the reinforcement. Based upon the drawings for the walls and the adjacent crane wall, horizontal dowels were placed to provide an attachment between the CEQ/accumulator room end walls and the crane wall. Drawings indicate the horizontal dowels were placed on each face of the CEQ/accumulator room end walls. Based upon the dimensions shown on the drawings, the upper most horizontal dowel on the accumulator face of the 307° wall should have been exposed within the excavated area.

Visual examination of the horizontal dowels at the top of the 307° wall revealed the upper most horizontal dowels on the accumulator face of the wall were bent downward into the thickness of the wall and did not enter straight horizontally into the crane wall. During the period of initial construction, specification DC-CE-103-QCN governed the placement and inspection of concrete. Within specification DCC-CE-103-QCN are provision to make minor adjustments to the reinforcement in the areas of penetrations based upon the approval of the field engineer. The pour records for these walls were retrieved and reviewed to prepare DIT-B-01588-00, contained within Attachment C of calculation SD-000810-001. During the development of input data for this calculation, radar mapping was performed to locate reinforcement within the walls as described within DIT-B-01627, contained within Attachment B of the calculation. Included within the pour records are QC-9 forms which document the inspection of the placement of the concrete forms, reinforcement, and embedments prior to the placement of the concrete. The QC-9 forms indicate the reinforcement was placed within the walls in accordance with the drawings and specification prior to placement of the concrete. Additionally, the radar mapping data generally indicates the required reinforcement is in place within the thickness of the walls. Based upon the above, there is reasonable assurance that the horizontal dowels between the crane wall and the CEQ/accumulator room end

walls exist in the quantity shown on the reinforcement drawings. This condition was reported in CR 00293037

CR 00273069 describes an apparent drawing discrepancy on drawing 1-2-3207D. This drawing shows the reinforcement configuration within the CEQ/accumulator room walls. Shown on this drawing are the vertical dowels from the walls and their embedment length into the floor slab above the walls. The dimension shown on the drawing indicates the vertical dowels are embedded 1'-9" into the floor slab. However, drawing 1-2-3208B shows the floor slab above these walls to be 12" thick. As such, 1'-9" of embedment is not possible for a straight vertical dowel. The findings of this condition report were considered during the development of this calculation. The analysis of the walls does not use added structural strength from the 1'-9" vertical dowel length.

Rebar location is related to the 54, 126, 234, and the 307 walls.

REBAR COVER

Rebar cover describes the depth of concrete from the face of the wall to the rebar.
The design of the walls is for
Horizontal rebars with 2 3/4" cover
Vertical rebars located behind the horizontal rebars with a resultant cover of 4 1/8"

Radar mapping revealed the minimum ACI cover requirements are met. The rebar mapping data provided for the development of the average maximum depth to be developed for both the horizontal and vertical rebars. The radar mapping rebar locations are being incorporated into the structural analysis of the walls.

Rebar cover is related to the 54, 126, 234, and the 307 walls.

FORM BOARDS

The 307° wall has two oval pipe penetrations. The penetration sleeve is 12" and the wall is 18" thick. The remaining 6" of the pipe penetration has a rectangular recess. The rectangular recess was formed with 1"x6" wood to prevent the concrete from entering the penetration area. These form boards were not removed prior to the installation of the piping through one penetration in the 307°

wall. The form boards remaining in the periphery of the penetration does not impact the structural capacity of the wall. The wood does create a minimal increase in the combustible material inside containment. However, the specifications and procedures required the removal of the form boards following the completion of the construction of the wall. The form boards have been removed from the 307° wall. The apparent cause of the wooden form boards is considered to be an oversight during initial construction. The location of the form boards within the penetration resulted in the boards being obscured from view.

Form boards are related to the 307° wall.

REINFORCING BAR SPLICES

Within the top portion of the 307° wall, an excavation was performed. Within the excavated area, the horizontal reinforcing bars were found to have cadweld splices. The reinforcing drawings for the walls, 1-2-3207D, do not show cadweld splices for the reinforcement. Typically, reinforcing bars are spliced with lap splices, where the ends of the individual bars are overlapped and tieed together with tie-wire. Cadwelds are mechanical splices of reinforcing bars. Cadwelds are typically utilized for large diameter bars are areas of congestion where adequate room is not available to provide adequate development length within the lap splice. Additionally, cadwelds are shown on the reinforcing drawings. A review of the reinforcement drawings for the walls revealed extra reinforcing was included within the design of the walls around the areas of the large penetrations. The extra reinforcing in the area of the penetrations resulted in a congested area. To facilitate the installation of the reinforcing, cadwelds were used to splice the horizontal bars. Visual examination of the cadwelds revealed indications of adequate fusion of the bars. The cadwelds would have been placed during the initial construction of the wall prior to the placement of the concrete. During the initial

construction of the containment structures, cadweld splicing of reinforcing bars was performed within many areas of the structures in accordance with specifications and procedures. The alternate reinforcing bar splices do not detract from the structural capability of the wall. Without excavation of the concrete, the exact number of alternate cadweld reinforcing bar splices cannot be determined. The use of alternate cadweld reinforcing bar spices has been considered within the analysis of the walls.

Cadweld splices are related to the 307° wall.

CONTAINMENT SPRAY PIPE SUPPORTS

Visual examination of the 307 wall revealed piping supports were partially installed adjacent to the area of low quality grout within the 307 wall. Although not directly associated with the structural capacity of the 307 wall, pipe anchorage plate was evaluated as a portion of the extent of condition. The lower containment spray (CTS) ring header piping penetrates the 307° wall. The CTS pipe is anchored to the wall on both faces of the wall. The pipe support is comprised of vertical plates mounted to the faces of the wall at the pipe penetration. The anchorage plates are held in place by both expansion anchors and through-bolts located horizontally on the top and bottom of the anchorage plates. During the course of the excavation of the low quality grout material at the top of the 307° wall, two through-bolts and the wedges of two expansion anchors were exposed at the top of the CTS anchorage plates. A comparison of the design drawings for the CTS supports revealed the open bolt hole in the anchorage plates was not required to have an anchor bolt installed. Further examination of the excavated area revealed an internal interference within the wall from the reinforcing bars that would have prevented the installation of an anchor bolts in the open hole in the CTS anchorage plate. The open bolt hole on the CTS anchorage plates does not degrade the capacity of the CTS support.

To evaluate the potential impact of the as-found condition of the CTS anchorage plates, a field verification of the configuration of the CTS anchorage plates was performed. The CTS anchorage plates are depicted on isometric drawings 1-GCTS-19 sheet 3 and 1-GCTS-20 sheet 4 and individually identified as support 1-GCTS-R517. The field verification of the CTS anchorage plates included a comparison of the anchor bolts, dimensions of the anchorage plates and the weld attachment between the CTS pipes and the anchorage plates. The field verification confirmed the quantity of anchor bolts and the weld attachment size between the anchorage plate and the CTS pipe were different than those shown on the CTS piping drawings. The as-found condition of the CTS anchorage plates, 1-GCTS-R517 were evaluated within calculation DC-D-12-MSC-76, revision 0, LBPRP Analysis of Containment Spray Piping Inside Containment. The conclusion of this calculation relating to CTS anchorage, 1-GCTS-R517, is that the stress values within the anchorage plate are low and the existing condition is acceptable as-is.

The CTS anchorage non-conformances are associated with the low quality grout in the 307 wall.

Each of the above listed issues, grout strength, open pockets, cut rebar, rebar splicing, rebar location and rebar cover, are non-conformances between the physical plant and the design configuration. The collective of these issues resulted in the accumulator room end walls having a structural capacity less than the design bases capacity based upon structural evaluations. The design bases capacity of the walls is based upon the ability of the walls to withstand the effects of a main steam line break within the accumulator room. Structural evaluations of the as-found condition of the walls concluded the walls would have functioned although the walls are outside the design bases. The as-found evaluation of the structural capacity of the walls is contained within calculation SD-000810-

001, revision 0, Evaluation of the Unit 1 Fan-Accumulator Room Walls.

There are four walls associated with this condition. The four wall are a portion of the internal structure of containment. The walls are located adjacent to the Unit 1 accumulators and form the end walls of the accumulator room compartment. The walls adjacent to accumulator #1 (Azimuth 54°) and accumulator #2 (azimuth 126°) separate the accumulator rooms from the CEQ fan rooms and as such are a portion of the divider barrier. The walls adjacent to accumulator #3 (Azimuth 234°) and accumulator #4 (azimuth 307°) separate the accumulator rooms from the instrument room and as such are lower containment subcompartment boundary walls. These walls do not have specific FDB identification numbers

The non-conformances associated with the 54°, 126°, 234°, and the 307° walls are related to original construction of the Unit 1 containment and the retrofitting of the redesigned ice condenser structure. The 54°, 126°, 234°, and 307° walls in Unit 1 containment were not constructed in accordance with the configuration control documents for rebar cover and location. Additionally, matérial substitution was made in the 307 wall resulting in the wall not being constructed in accordance with the configuration control documents. The apparent cause of these conditions is considered to be failure to comply with the design configuration. Contributing to this apparent cause is the apparent lack of oversight and quality control during grouting activities during the initial construction of the Unit 1 containment. The organization responsible for these activities would have been the plant construction department. The plant construction department no longer exists within the plant organization. The plant construction department had the responsibility for oversight and quality control at the time of the Unit 1 containment construction to provide assurance that the physical plant configuration was assembled in

conformance with the design configuration control documents including drawings and specifications.

The 54°, 126°, 234°, and 307° walls in Unit 1 containment were constructed in accordance with the configuration control documents for cut rebar and open pockets. The majority of the open pockets and the cut rebar do not have significant impact upon the structural capacity of the walls. However, the full depth pocket in the 54° wall does impact the maximum permissible divider barrier bypass. The apparent cause of these conditions is considered to be design error and/or oversight. Contributing to this cause is the apparent lack of design interface control during the design phase of the ice condenser retrofit. The full depth pocket was considered to be structurally acceptable but did not consider the impact to the divider barrier. The redesign and retrofit of the Unit 1 ice condenser occurred during the initial design of the facility prior to the initiation of the design change process.

During the initial design and retrofit of the ice condenser the subcompartment pressure loads used as inputs to the structural analysis were lower than current subcompartment pressure loads. Changes in the subcompartment pressure loads over the life of the facility were not adequately evaluated for their impact to the structural design basis.

EXTENT OF CONDITION

An extent of condition review for the remainder of the containment structures was undertaken based upon the apparent cause conclusions of the individual non-conforming conditions. This extent of condition review is for Unit 1. An extent of condition review for the Unit 2 containment structure is contained within CR 00-02506 action 2.

Open Pockets

Open pockets are related to the 54°, 126°, and 234° walls. This issue is associated with the physical configuration of the walls and the ice condenser floor slab embedments and through bolts. As-built dimensions of the

pockets created for the ice condenser floor through bolts are consistent with the pockets shown on the masonry drawing. The 234° has one additional pocket that was created to eliminate an interference with an ice condenser floor drain pipe. The pocket for the 12 " diameter floor drain pipe is approximately 4" deep with no exposed rebar. This pocket for the floor drain pipe was not previously shown on the masonry drawings for the walls.

The anchorage configuration for the steel sub-floor is different in Unit 1 than Unit 2. As described within the Unit 2 evaluation the anchorage base plates installed within the thickness of the Unit 2 126° wall was to have a metallic shear lug welded to the base plate then the open pockets grouted closed to provide effective capacity to the shear lug (Reference 2-3208A). In Unit 1, the anchorage of the steel sub-floor included plate washers and standard high strength washers and nuts (Reference 1-3208K-10), but did not include shear lugs or grouting the pockets closed. As such the open pockets on the 54°, 126° and the 234°walls did not have a negative impact on the structural capacity of the walls. However, since the 54° wall is a portion of the divider barrier, the full depth pocket created an open bypass. The full depth pocket in the 54° wall had a cover plate installed under design change 1-RFC-1225 following pre-op leakage testing of the ice condenser CEQ system. Condition reports CR 99-6845 and CR 99-10162 had previously been generated and evaluated in relationship to the adequacy the cover plate design and installation to eliminate the divider barrier bypass.

As such detrimental open pockets are only associated with the 54 wall.

LOW GROUT STRENGTH

The low grout strength is associated with the 307 wall. The low grout strength at the top of the 307 wall is associated with the construction sequence of the 307 wall. Review of the concrete pouring sequence for the four accumulator room walls in Unit 1 revealed that the walls located at azimuths 54, 126 and 234 were poured concurrent with the pouring of the ice condenser floor slabs, which are immediately above the four walls. However, the concrete for the azimuth 307 wall was poured significantly after the ice condenser floor slab in order to provide for construction access to the lower volume of containment well into construction. This construction sequence resulted in limited access to place the concrete at the top of the azimuth 307 wall. This limited access apparently resulted in the top of the wall being filled with a grout in lieu of concrete. Thus, the cause of the poor quality grout is considered to be due to limited access for grout installation coupled with poor grout installation technique. The concrete pouring sequence was reviewed for the remainder of the containment structure to identify other areas where the construction sequence would have resulted in placement of a vertical concrete section after installation of an adjacent overlying structure. In addition to the azimuth 307 wall, this type of concrete pouring sequence occurred at the construction openings in the crane wall and the containment shell.

In 1989, a surface spall was identified on the Unit 1 containment exterior in the area of the fill for the construction opening. This discovery was documented in Problem Report 89-1108 and Inspection Report N89020, and led to the identification of localized areas of concrete degradation in both Units, in the construction opening fill area. The degraded areas were restored with expansive grout, and the containment shells of both Units have been visually examined at approximately two year intervals since 1989. The results of these ongoing biennial inspections have indicated no further detrimental surface spalls or deterioration of the concrete in the vicinity of the containment construction openings. The construction opening in the Unit 1 crane wall has been visually examined including the top of

the construction opening. The results of this visual examination indicated monolithic concrete within the crane wall construction opening. The cold joint between the top of the construction opening concrete and the remainder of the crane wall contains a hair-line crack in the coating applied to the crane wall over approximately 50% of the length of the top of the construction opening. The periphery of the crane wall construction opening would contain a cold joint due to the lengthy period of time between the placement the majority of the crane wall and the closing of the construction opening. There is no indication of lack of consolidation of the concrete at the top of the construction opening. Additionally, there is no visual indication of a grout layer at the top of the construction opening.

During visual examinations of the four accumulator room walls, a surface irregularity was observed on the crane wall adjacent to the lower portion of the ice condenser end wall. This surface irregularity is located approximately at elevation 639' and is approximately 10" high and 4' long. The surface irregularity and hammer testing indicated the material could be grout in lieu of concrete. CR 00-11732 was generated to address this condition. The area was excavated. The excavation was performed for an area of 5'-6 3/4" long by 10 1/2" high and about 4" deep. The bottom elevation of the excavated area is 638'-0", which matches the bottom elevation of the ice condenser concrete floor (off column line 25). There are total 8-#6 rebars (1 each top & bottom @ 16" apart 4 places) exist in the excavated area. Seven rebars were bent along the crane wall and one was cut. Investigation determined the apparent cause of this crane wall grout pocket was that during original construction the keyway and dowels for the ice condenser floor slab were placed beyond the dimensions shown on the drawings. The design configuration of the ice condenser floor slab to crane wall

interface includes a keyway formed in the crane wall and horizontal dowels extending from the crane wall into the floor slab. The corrective action performed during original construction of the containment was to bend the horizontal dowel rebars into the keyway and grout the keyway closed. The grout pocket created by the over-extension of the ice condenser floor slab keyway does not impact the structural capability of the crane wall but is considered to be a non-conformance. The keyway was restored as rework by the installation of structural grout into the keyway. The crane wall in the vicinity of both ice condenser end walls was visually examined for indications of similar occurrences. The results of this examination did not reveal any indications of similar grout pockets within the crane wall.

In summary, the low strength grout is associated with the physical configuration of the 307 wall.

REINFORCING BAR PLACEMENT AND CONTINUITY

The condition of cut reinforcing bar (rebar) has been determined to not be a non-conforming condition for the walls. This determination was based on a review of design details and the construction sequence for the walls.

The condition of variations in rebar placement is conservatively considered to be present in each of the accumulator room walls. This approach was taken based on a combination of information obtained during excavations, radar mapping and confirmatory drilling of the walls.

Investigations have included both intrusive and non-destructive verification of rebar locations in each of the four accumulator room walls. While the intrusive activities have been localized along the top edge of the azimuth 307 wall, significant areas of the accessible portions both sides of the four walls were also examined using non-destructive impulse radar testing methods.

Deviations in rebar placement were identified in each of the four accumulator room walls. However, cut rebars were identified only in the

azimuth 54, 234, and 307 walls. A review of the structural drawings (Drawing No. 1-3208 and 1-2-3207A) for the walls indicates that the cut reinforcing was within the dimensions and configurations shown on the design drawings. Excavations performed at the top of the 307 wall did not reveal any additional cut rebar with the wall. Radar mapping of other accumulator room walls did not reveal evidence of additional discontinuous rebar. Additional evaluations completed to determine the extent of condition include extensive reviews of construction photographs, diagrams, and quality control reports. The analysis for the four accumulator room walls includes the structural impact of the mispositioned reinforcing identified as a result of these review efforts.

The physical orientation of the forming and the construction process for concrete walls creates an increased potential for variations in the placement of the reinforcing. The spacing and cover for the reinforcing bars is significant in the structural analysis of relatively thin walls that are subjected to differential pressures. Horizontal concrete elements are inherently easier to install and verify placement of reinforcing bars.

The other containment structural elements which are similar to the four accumulator room walls are the steam generator enclosure walls, the pressurizer enclosure walls, the primary shield wall, and the crane wall. Each of these structures is significantly thicker than the four accumulator room walls. This increased thickness reduces the significance of mispositioned reinforcing. Any reduction in structural strength from mispositioned reinforcing bars in these structures would be offset by the inherent conservatism in the associated construction and analyses techniques. This has been confirmed in the case of the steam generator enclosures. During the Unit 2 steam generator replacement misplaced rebars were identified. An evaluation of the as-found condition was completed

and the results are presented in calculation DC-D-3195-185-SC. The evaluation determined that the enclosures were adequate, and the results of this evaluation were accepted by the NRC. During the Unit 1 steam generator replacement misplaced rebars were again identified within the steam generator enclosures. An evaluation of the reinforcement position was completed and the results are presented in calculation SD-000724-002. The evaluation determined that the enclosures were not significantly reduced in strength by the position of the reinforcing and had an adequate structural capacity.

In summary, instances of cut rebar have been determined to not be a non-conforming condition. Inspections, walkdowns and radar mapping provide assurance regarding the extent of condition regarding rebar misplacement, and variations have been accounted for in the affected structural calculations that demonstrates operability.

ADDITIONAL CONSIDERATIONS

As part of this extent of condition report, additional reviews were performed to provide a perspective on the quality of structural construction activities. These included:

Concrete design requirements and construction methodology

Reviews of data on concrete mixes and their strengths

Applicable design codes and specifications requirements

Relevant correspondence between the NRC and AEP

Containment system readiness reviews

The design of reinforced concrete for Cook Plant utilized the requirements of ACI 318-63 (Building Code Requirements for Reinforced Concrete). Structural Steel designs utilized AISC-63 (Manual of Steel Construction). Therefore, the plant design employed appropriate codes applicable to the period in which the plant was designed and constructed. These design requirements were implemented through specifications and procedures.

Construction records pertinent to the four accumulator room walls were reviewed. Specifically concrete pour records indicated that compressive strength

exceeded specified strength requirements for the concrete.

A review was conducted of licensing correspondence related to concrete structures from the plant construction period. This included review of inspection reports and SERs. These reviews indicated that the quality control system for mixing, placement and control of concrete materials were adequate and properly implemented.

Finally, a re-review of issues pertaining to concrete, which were examined during the recent system readiness reviews, was conducted. This included review of Work Requests and Condition Reports which included key words "concrete" and "grout". Additional reviews of Work Requests and Condition Reports that included the keywords relating to foreign material located within concrete structures were performed. These supplemental reviews indicated that in the past, there have been select, isolated instances of damaged or degraded concrete as well as localized instances of foreign material, principally wood, discovered within concrete structures. However, these conditions taken collectively, do not indicate a generic issue with the quality of concrete structures.

In summary, the findings from these supplemental evaluations did not reveal generic concerns relating to non-conformances with or the integrity of containment structures.

CONCLUSIONS OF UNIT 1 EXTENT OF CONDITION REVIEW

1. Based on a combination of visual inspection, testing and review of design details and construction sequence for

accumulator room walls and for other portions of containment, the issues related to missing and low strength grout are concluded to be locally confined to the conditions observed at the top of the azimuth 307 wall and an isolated location on the crane wall. Corrective actions have been implemented for these walls.

2. Instances of cut rebar have been determined to not be a non-conforming condition. Inspections, walkdowns and radar mapping provide assurance regarding the extent of

condition regarding rebar misplacement, and variations have been accounted for in the affected structural calculations which demonstrate operability.

3. The apparent causal factors for each of the individual conditions contained within this condition report were utilized to review the remainder of the containment structure. Reviews of information related to structural design requirements, construction practices and results support a conclusion that containment structures were designed and installed to appropriate requirements, and structures are capable of performing their intended functions.

The extent of condition review for the Unit 2 fan accumulator room walls is contained within CR 00-2506. The results of the Unit 1 extent of condition review for the fan accumulator room walls did not impact the content of the Unit 2 extent of condition review.

The issues contained within this condition report is associated with maintenance of the design basis of the containment structure. Root cause investigation of the maintenance of the integrity of the design basis has previously been performed within CR 99-00594 as summarized below.

Condition Report 99-00594 (Root Cause) was initiated to investigate why the Design Basis integrity was not universally controlled, maintained and respected by the Cook Team. The Design Basis ownership was not recognized as a vital functional area and was dependent on a non-structured collaboration between numerous groups. Design Authority functions that currently exist within System Engineering are incompatible with the view of their roles and responsibilities envisioned for the future as established in the System Engineer Handbook.

Based upon the above captioned association with a previously completed root cause evaluation, CR 00264095 has been evaluated as an Action Category 3, Apparent Cause. The performance of an apparent cause evaluation for CR 00264095 will provide adequate assurance that the extent of condition

relating to the containment structure design basis capacity is captured within the corrective action system.

SAFETY SIGNIFICANCE

The structural capacity of the fan accumulator room walls in the "as-found" condition was evaluated within calculation SD-000810-001, revision 0. The results of this calculation indicated that the walls were functional but did not demonstrate the design margin contained within UFSAR Section 5.2. The operability of the Unit 1 fan accumulator room walls is contained within the ODE of CR 00264095.

The conclusion of the ODE is as follows;

Based on the evaluations contained in calculation SD-000810-001, Revision 0, the Unit 1 Fan/Accumulator Room Walls at Azimuths 54°, 126°, 234°, and 307° meet the newly calculated values for blowdown loading without exceeding allowable stress limits. The degraded condition, which creates the need for this evaluation, is that these walls are subjected to the loadings from newly calculated Transient Mass Distribution (TMD) analyses and the physical conditions unique to the azimuth 54°, 126°, 234° and 307° walls have resulted in a reduction in UFSAR design basis load factors needed to meet allowable stresses. Since these conditions, in the aggregrate do not result in a reduction in margin below operability acceptance limits, the Unit 1 Fan/Accumulator Room Walls at Azimuths 54°, 126°, 234°, and 307° are considered OPERABLE But Degraded.

Based upon the conclusions of calculation SD-000810-001, revision 0 and CR 00264095 ODE, there is minimal safety significance as a result of the non-conforming and degraded condition of the Unit 1 fan accumulator room walls.

APPARENT CAUSE

The non-conformances associated with the 54°, 126°, 234°, and the 307° walls are related to original construction of the Unit 1 containment and the retrofitting of the redesigned ice condenser structure. The 54°, 126°, 234°, and 307° walls in Unit 1 containment were not constructed in accordance with the configuration

control documents for rebar cover and location. Additionally, material substitution was made in the 307 wall resulting in the wall not being constructed in accordance with the configuration control documents. The apparent cause of these conditions is considered to be failure to comply with the design configuration. Contributing to this apparent cause is the apparent lack of oversight and quality control during grouting activities during the initial construction of the Unit 1 containment. The organization responsible for these activities would have been the plant construction department. The plant construction department no longer exists within the plant organization. The plant construction department had the responsibility for oversight and quality control at the time of the Unit 1 containment construction to provide assurance that the physical plant configuration was assembled in conformance with the design configuration control documents including drawings and specifications.

The issues contained within this condition report is associated with maintenance of the design basis of the containment structure. Root cause investigation of the maintenance of the integrity of the design basis has previously been performed within CR 99-00594 as summarized below.

Condition Report 99-00594 (Root Cause) was initiated to investigate why the Design Basis integrity was not universally controlled, maintained and respected by the Cook Team. The Design Basis ownership was not recognized as a vital functional area and was dependent on a non-structured collaboration between numerous groups. Design Authority functions that currently exist within System Engineering are incompatible with the view of their roles and responsibilities envisioned for the future as established in the System Engineer Handbook.

CORRECTIVE ACTIONS

Grout Strength

The low strength grout at the top of the 307 has been excavated and replaced with high strength structural grout. The

replacement of the grout at the top of the 307 wall was included within the scope of design change 1-LDCP-4807. The work scope within 1-LDCP-4807 has been completed and the design change is currently in the Return To Operation (RTO) status. As such, corrective actions related to the low strength grout at the top of the 307 wall are complete and no further corrective actions are required.

Open Pockets

The through wall pocket in the top of the 54 wall has been grouted closed with high strength structural grout. The closure of the through wall pocket at the top of the 54 wall eliminates the divider barrier bypass created by the pocket. Additionally, the use of high strength grout to close this through wall pocket provides a minimal structural enhancement of the wall. The grout closure of the through wall pocket in the 54 wall was included within the scope of design change 1-LDCP-4807. The work scope within 1-LDCP-4807 has been completed and the design change is currently in the Return To Operation (RTO) status. As such, corrective actions related to the through wall pocket at the top of the 54 wall are complete. The remainder of the open pockets located to the top of the 54, 126, and the 234 walls with the exception of one pocket on the 234 wall conform to the pockets depicted on the design drawings. The one open pocket on the 234 wall created as a result of an interference with the ice condenser floor drain pipe is considered to be a non-conforming condition. Although this pocket is not detrimental to the structural capacity of the wall it is a non-conforming condition because it is not shown on the design drawings of the wall. This open pocket will be accepted as "Use-As-Is". Corrective action 3 of condition report CR 00264095 wall track the completion of the "Use-As-Is" including updating of the configuration control documents.

Cut Rebars

The cut rebars associated with the 54, 234 and the 307 walls conform to the design documents.

Additionally, the cut rebars have been included within the structural evaluation of the walls. As such, no further corrective actions are warranted or required for the walls.

Rebar Location

The results of the radar mapping and visual examinations of rebar within excavations revealed discrepancies from the design drawings. The location of the rebar including the cover and the spacing are considered to be non-conforming conditions for the 54, 126, 234 and the 307 walls. The as-found spacing and cover of the rebar was utilized as an input to the structural evaluation of the walls. The structural evaluation of the walls is contained within calculation SD-000810-001, revision 0. The results of calculation indicated the walls are functional, but do not comply with the design margins contained within UFSAR Section 5.2. The operability of the walls is contained within the Operability Determination Evaluation (ODE) section of CR 00264095. Corrective Action 2 related to this ODE captures actions to restore the design and licensing basis of the walls.

The corrective actions related to the embedment length of the vertical rebar dowels located between the top of the walls and the ice condenser floor slab are captured within CR 00273069.
Form Boards

Form boards are associated with the 307 wall. The form boards were removed from the wall during the performance of the excavation of the top of the 307 wall. Since the form boards have been removed no further corrective actions are required.

Reinforcing Bar Splices

Cadweld splices are related to the 307 wall. The cadweld splices located within the 307 wall are considered to be non-conformances because the design drawings do not show cadweld splices. The cadweld splices were considered within the structural evaluation of the walls contained within calculation SD-000810-001, revision 0. The use of cadweld splices in lieu of lap splices are not detrimental to the structural capacity of the walls. The

cadweld splices will be accepted as "Use-As-Is". Corrective action 3 of condition report CR 00264095 wall track the completion of the "Use-As-Is" including updating of the configuration control documents.

Containment Spray Pipe Supports

The quantity of anchor bolts and the weld size on the CTS supports are considered to be non-conforming conditions due to the discrepancies between the drawings and the physical configuration of the supports. The embedment of the support anchorage that was located within the extent of the low quality grout has been restored through the installation of the high strength grout at the top of the 307 wall as a portion of the work scope within design change 1-LDCP-4807. The work scope within 1-LDCP-4807 has been completed and the design change is currently in the Return To Operation (RTO) status. As such, corrective actions related to the embedment of the CTS anchorage into low strength grout at the top of the 307 wall are complete and no further corrective actions are required. The non-conformances related to the CTS support anchor bolts and the support to pipe weld size have been evaluated within calculation DC-D-12-MSC-76, revision 0. The results of this analysis concluded the as-found condition of the CTS anchorage at the 307 wall as acceptable as-is. The CTS supports at the 307 wall will be accepted as "Use-As-Is". Corrective action 3 of condition report CR 00264095 wall track the completion of the "Use-As-Is" including updating of the configuration control documents.

	Indiv or Due Date	Team	Group	Date
Accepted By:	YOUNGA	SENA	DES	09/27/2000
Due Date:	11/09/2000			
Assigned To:	AL-NAKIBH	CHAKRABARTIS2	DES	11/19/2000
Ready For Approval:	KOVARIKB	CHAKRABARTIS2	DES	11/20/2000
Approval Assigned To:	KOVARIKB	CHAKRABARTIS2	DES	11/20/2000
Approved By:	KOVARIKB	CHAKRABARTIS2	DES	11/20/2000
Evaluated By:	PHILLIPSK	ETHERIDGEW	OPS	11/20/2000
Concurrence Assigned To:	DortSS	NRAC	RCL	11/21/2000
Concurrence By:	KENNEDYM	NADEAUJ	CAP	11/24/2000

VIII. Actions

Action: 1

Resp Group:	ESY	Status:	Closed
Orig Group:	ESY	Event Code:	E3w
Prop CAC:	B3a	Cause Code:	YYY

Prescribed Action:

DESCRIPTION OF CORRECTIVE ACTION:

This action is entered to document that no compensatory actions are required to support the conclusions of the operability evaluation. This CRA is entered in accordance with step 2.1.7 of OPR.001, Rev. 4, Attachment 5.

CONCURRENCE RECEIVED FROM: Paul Leonard

D.C. Cook

Electronic Corrective Action Program

Condition Report: 00264095
Current Status: Closed
Action Category: 3

NEGOTIATED DUE DATE: n/a

	Indiv or Due Date	Team	Group	Date
Ready For Approval:	LEONARDP	NAUGHTOND	ESY	11/10/2000
Approval Assigned To:	NAUGHTOND	NAUGHTOND	ESY	11/10/2000
Approved By:	LEONARDP	NAUGHTOND	ESY	11/10/2000

General:

Outage: N/A - NM

Other Tracking Processes

Type	Number	Text	Revision No.	Status

System(s)/Document(s)

System(s)/Document(s)	Decsription
CNTMT	CONTAINMENT BUILDING STRUCTURE

Action Taken:

Actual CAC: B3a
Due Date: 12/19/2000
Status: Closed

This action is an administrative item that is complete.

	Indiv or Due Date	Team	Group	Date
Due Date:	12/19/2000			
Accepted By:	LEONARDP	NAUGHTOND	ESY	11/10/2000
Assigned To:	LEONARDP	NAUGHTOND	ESY	11/10/2000
Ready For Approval:	LEONARDP	NAUGHTOND	ESY	11/12/2000
Approval Assigned To:	NAUGHTOND	NAUGHTOND	ESY	11/12/2000
Approved By:	LEONARDP	NAUGHTOND	ESY	11/12/2000
Evaluated By:	PHILLIPSK	ETHERIDGEW	OPS	11/13/2000

NPM Reference

AR # JO # JOA #

AR Associated: No

OD Related: Yes Mode Constraint:

D.C. Cook

Electronic Corrective Action Program

Condition Report: 00264095
Current Status: Closed
Action Category: 3

Unit Affected: 1

Action: 2

Resp Group:	DES	Status:	Closed
Orig Group:	ESY	Event Code:	E3w
Prop CAC:	B3a	Cause Code:	YYY

Prescribed Action:

DESCRIPTION OF CORRECTIVE ACTION:

Track CRA CR-00-02506-06 to closure. That CRA contains the specifics of restoration to design and licensing basis of the Fan/Accumulator Walls

CONCURRENCE RECEIVED FROM: Brenda Kovarik, NESD

NEGOTIATED DUE DATE: May 15, 2001

****
CRRP has approved the following changes to the prescribed corrective action. These changes reflect the closure of one item to another per PMP-7030.CAP-001. Rev. 9.

Corrective action 00-3544-01 is being transferred, combined and closed to this corrective action 00264095-02.

Prescribed action revised by kmn 10/19/01.

	Indiv or Due Date	Team	Group	Date
Approval Assigned To:	NAUGHTOND	NAUGHTOND	ESY	11/10/2000
Ready For Approval:	TAYLORA	ECAPMGMT	ESY	10/19/2001
Approved By:	TAYLORA	ECAPMGMT	ESY	10/19/2001

General:

Outage: U1C18

Other Tracking Processes

Type	Number	Text	Revision No.	Status
CRA	00-02506-06			

Condition Report: 00264095
Current Status: Closed
Action Category: 3

System(s)/Document(s)

System(s)/Document(s)	Decsription
CNTMT	CONTAINMENT BUILDING STRUCTURE

Action Taken: Actual CAC: B3a Due Date: 01/30/2002 Status: Closed

DESCRIPTION OF CORRECTIVE ACTION:

Track CRA CR-00-02506-06 to closure. That CRA contains the specifics of restoration to design and licensing basis of the Fan/Accumulator Walls

Corrective action 00-3544-01 is being transferred, combined and closed to this corrective action 00264095-02.

ACTIONS TAKEN

Condition Report CR 00264095 identified non-conformances related to the Unit 1 accumulator room end walls. This Unit 1 CR documents low strength grout was found in the wall at azimuth 307°, a through-wall pocket exists in the azimuth 54° wall, the creation of pockets in walls at azimuths 54° and 234° resulted in cut rebar at the top of the walls , cut rebar was also found at the top corner of wall 307° due to the flexible seal attachment, and reinforcing bar placement anomalies exist in all four walls at azimuths 54°, 126°, 234° and 307°. In addition, it was identified at the azimuth 307° wall that there are penetration form boards not removed during initial construction, horizontal reinforcing bars at the top of the wall with Cadweld splices, and containment spray (CTS) piping supports with loose anchor bolt nuts and apparent missing anchor bolts.

Design Change 1-LDCP-4807 replaced the low strength grout at the top of azimuth 307° wall and filled the open pocket in the wall at azimuth 54°. Therefore, these conditions relating to Unit 1 azimuth 54° and azimuth 307° walls are repaired.

The form boards found within the penetrations of the top of the 307 wall have been removed within the work performed under Job Order C206630.

Although the containment spray (CTS) piping supports are not directly associated with the structural capacity of the wall, the pipe anchorage plate was evaluated as a portion of the Extent of Condition. The anchorage of CTS piping plates 1-GCTS-R517 is therefore included within the scope of the Use-As-Is Evaluation.

CR 00273069 was written against a Unit 1 reinforcement drawing discrepancy relating to the Containment

Sub-Compartment Wall Vertical Dowel Length. This condition was identified during Extent of Condition review for CR 00264095, and is therefore considered in this Use-As-Is Determination. Drawing 1-2-3207D identifies 1'-9" vertical reinforcing bars extending from the accumulator room end walls into the concrete above. Unit 1 drawing 1-3208J-10 identifies the floor as from 638'-0" to 639'-0", which makes the thickness only 12". The walls below the slab do not coincide with a thickened floor beam, this minimum thickness will not accommodate the 1'-9" dowel length shown on 1-2-3207D. The drawing revision to correct the dowel length is currently identified in Document Change Request (DCR) 01-0227, which is being tracked by CRA 00-00078-126.

In summary, the Use-As-Is evaluation addresses several minor conditions on Unit 1 and Unit 2 fan/accumulator room end walls that have not been reworked to restore the concrete to existing design requirements. Design change packages and other job orders have installed concrete/grout repairs to fill open pockets and areas of low strength grout that have been excavated along the top of the specified walls. Therefore, conditions evaluated to remain as-is include:

- Cut Rebar
- Rebar Placement
- Cadweld Splices
- Rebar Dowel Length
- CTS Pipe Support Anchors

In addition, CR 00-03544 was written to report that the initial wall investigations suggested that the 18" thick end walls may not meet the design basis requirements of the UFSAR even if there was no grout problem. The loading combination in Section 5.2.2.3 of the UFSAR requires use of a 1.5 load factor for the pressure loads from main steam line break. Based on preliminary evaluation, it seems that the original design may not meet this load requirements. The prescribed CR actions required a review of the design basis requirements and a non conformance evaluation. CR 00-03544 was closed based on transfer of the prescribed action resolution to Unit 2 CR 00-

02506 Action 5 and CR 00264095 Acton 2. Therefore, the concerns described within CR 00-03544 was also addressed within the scope of this Use-As-Is Determination.

Calculation SD-010412-001 Revision 1 evaluates the design basis adequacy of Unit 1 and Unit 2 Fan-Accumulator Room end walls in the Containment Structure. This calculation retires the operability determinations performed under Unit 1 CR 00264095 and Unit 2 CR 00-02506. In addition, this calculation supersedes SD-000810-001 and SD-00510-003, performed in support of the operability determinations.

SD-010412-001 Revision 1 completes CR Actions 00-02506-05 and 00-02506-06 to restore the Unit 2 and Unit 1 CEQ fan walls, respectively, to full qualification. This calculation is based on the requirements of Engineering Specification ES-CIVIL-0432-QCN Revision 1. The evaluation of the subject walls incorporates the final Main Steam Line Break pressures inside the fan-accumulator rooms, updates as-built material strength, and recalculates allowable shear stress for all walls using more refined equations from ACI 318-63.

As stated in the Purpose/Objectives of the calculation, the calculation considers conditions noted in the Non-Conformance Evaluation for CR 00264095 and CR 00-02506.

Based upon the approval of calculation SD-010412-001, revisionl and CR 00264095 Use-As-Is Evaluation the Unit 1 Fan-Accumulator Room Walls have been restored to Full qulaification.

	Indiv or Due Date	Team	Group	Date
Due Date:	01/30/2002			
Accepted By:	KOVARIKB	CHAKRABARTIS2	DES	10/19/2001
Assigned To:	KOVARIKB	CHAKRABARTIS	DES	11/07/2001
Ready For Approval:	KOVARIKB	SCHOEPFP1	DES	12/05/2001
Approval Assigned To:	SCHOEPFP1	SCHOEPFP1	DES	12/05/2001
Approved By:	SCHOEPFP	SCHOEPFP1	DES	12/05/2001

D.C. Cook

Electronic Corrective Action Program

Condition Report: 00264095
Current Status: Closed
Action Category: 3

Evaluated By:	ETHERIDGEW	MOULD	OPS	12/12/2001

NPM Reference

AR #	JO #	JOA #

AR Associated: No

OD Related: Yes   Mode Constraint:

Unit Affected: 1

Action: 3

Resp Group:	DES	Status:	Closed
Orig Group:	DES	Event Code:	E3w
Prop CAC:	B	Cause Code:	YYY

Prescribed Action:

DESCRIPTION OF CORRECTIVE ACTION:
Perform formal Use-As-Is process including configuration control document updates for indiviudal non-conformances accepted as is within the Non-conformance Evaluation portion of this condition report. These items include

Open partial depth pocket on the 234 wall associated with the ice condenser floor drain interference.
Cadweld rebar splices
CTS pipe support anchorage and weld attachment between the support and CTS pipe size.

CONCURRENCE RECEIVED FROM: NESD B. Kovarik

NEGOTIATED DUE DATE: May 1, 2001

	Indiv or Due Date	Team	Group	Date
Ready For Approval:	KOVARIKB	CHAKRABARTIS2	DES	11/20/2000
Approval Assigned To:	KOVARIKB	CHAKRABARTIS2	DES	11/20/2000
Approved By:	KOVARIKB	CHAKRABARTIS2	DES	11/20/2000

General:

Outage: U1C18

D.C. Cook
Electronic Corrective Action Program

Condition Report: 00264095
Current Status: Closed
Action Category: 3

Other Tracking Processes

Type	Number	Text	Revision No.	Status

System(s)/Document(s)

System(s)/Document(s)	Decsription

Action Taken: Actual CAC: B3a Status: Closed
Due Date: 01/30/2002

DESCRIPTION OF CORRECTIVE ACTION:
Perform formal Use-As-Is process including configuration control document updates for indiviudal non-conformances accepted as is within the Non-conformance Evaluation portion of this condition report. These items include

Open partial depth pocket on the 234 wall associated with the ice condenser floor drain interference.
Cadweld rebar splices
CTS pipe support anchorage and weld attachment between the support and CTS pipe size.

ACTIONS TAKEN

The restoration of the walls has been accomplished through the performance of corrective maintenance, implemented design change and a Use-As-Is Evaluation.
This Use-As-Is evaluation addresses several minor conditions on Unit 1 and Unit 2 fan/accumulator room end walls that have not been reworked to restore the concrete to existing design requirements. Design change packages and other job orders have installed concrete/grout repairs to fill open pockets and areas of low strength grout that have been excavated along the top of the specified walls. Therefore, conditions to be evaluated to remain as-is include:

- Cut Rebar
- Rebar Placement
- Cadweld Splices
- Rebar Dowel Length
- CTS Pipe Support Anchors

In addition, CR 00-03544 was written to report that the initial wall investigations suggested that the 18" thick end walls may not meet the design basis requirements of the UFSAR even if there was no grout problem. The loading combination in Section 5.2.2.3 of the UFSAR requires use of a 1.5 load factor for the pressure loads from main steam line break. Based on preliminary evaluation, it seems that the original design may not meet this load requirements. The prescribed CR actions required a review of the design basis requirements and a non conformance evaluation. CR 00-03544 was closed based on transfer of the prescribed action resolution to Unit 2 CR 00-02506 Action 5 and CR 00264095 Acton 2. Therefore, the concerns described within CR 00-03544 was addressed

within the scope of this Use-As-Is Determination.

Condition Report: 00264095
Current Status: Closed
Action Category: 3

Calculation SD-010412-001 Revision 1 evaluates the design basis adequacy of Unit 1 and Unit 2 Fan-Accumulator Room end walls in the Containment Structure. This calculation retires the operability determinations performed under Unit 1 CR 00264095 and Unit 2 CR 00-02506. In addition, this calculation supersedes SD-000810-001 and SD-00510-003, performed in support of the operability determinations.

SD-010412-001 Revision 1 completes CR Actions 00-02506-05 and 00-02506-06 to restore the Unit 2 and Unit 1 CEQ fan walls, respectively, to full qualification. This calculation is based on the requirements of Engineering Specification ES-CIVIL-0432-QCN Revision 1. The evaluation of the subject walls incorporates the final Main Steam Line Break pressures inside the fan-accumulator rooms, updates as-built material strength, and recalculates allowable shear stress for all walls using more refined equations from ACI 318-63.

As stated in the Purpose/Objectives of the calculation, the calculation considers conditions noted in the Non-Conformance Evaluation for CR 00264095 and CR 00-02506 including open partial depth pockets within the concrete wall that were not restored.

CONCLUSION of Use-As-Is Evaluation

This Use-As-Is evaluation addresses specific reinforced concrete conditions on the fan/accumulator room end walls as reported in Unit 2 CR 00-02506 and Unit 1 CR 00264095. Two of the walls, at 234° and 307°, form the ends of the instrumentation room for the two accumulator rooms. The other two walls, 54° and 126°, close the other end of the two accumulator rooms and separate the accumulator rooms from the CEQ fan room, which is part of the containment upper compartment.

Certain conditions have been restored to their design condition through 1-LDCP-4807 and 2-LDCP-4621. The remaining conditions of cut rebar, rebar placement, Cadweld splices, rebar dowel length and CTS pipe support anchors are

approved to Use-As-Is.

Safety Screening 2001-1467 was performed for the Use-As-Is.

Based upon the approval of the Use-As-Is Evaluation for CR 00-2506 and CR 00264095 this action is complete.

	Indiv or Due Date	Team	Group	Date
Accepted By:	KOVARIKB	CHAKRABARTIS2	DES	11/20/2000
Due Date:	01/30/2002			
Assigned To:	KOVARIKB	CHAKRABARTIS	DES	11/07/2001
Ready For Approval:	KOVARIKB	SCHOEPFP1	DES	12/05/2001
Approval Assigned To:	SCHOEPFP1	SCHOEPFP1	DES	12/05/2001
Approved By:	SCHOEPFP	SCHOEPFP1	DES	12/05/2001
Evaluated By:	ETHERIDGEW	MOULD	OPS	12/12/2001

NPM Reference

AR # JO # JOA #

AR Associated: No

OD Related: Yes Mode Constraint:

Unit Affected: 1

IX. Overall Approval

Responsible Group: DES Status: Closed

	Indiv or Due Date	Team	Group	Date
Assigned To:			DES	09/26/2000
Approved By:	SCHOEPFP	SCHOEPFP1	DES	12/12/2001
Concurrence By:	GRUBBT	NADEAUJ	CAP	12/20/2001

Closure Document Type	Closure Document No
5220	01-15-02
ATT	Memo
ATT	Reclass.Request
ATT	Use-As-Is Evaluation
ATT	SS/SE 2001-1467-00

Supplemental Concurrences - These do not affect ECAP closure.

Concurrences Associated with External Committments:

	Indiv	Team	Group	Date
Concurred By:	MEISTERR	RIDGELL	RCL	12/13/2001
	WALTOND	GANEYP	CRB	12/18/2001
	WALTOND	GANEYP	NDC	12/18/2001
	GRUBBT	NADEAUJ	CAP	12/20/2001

X. Attachments

Maintenance Rule

No Maintenance Rule for this ECAP

Performance Improvement International

Quality of CA: Quality of Cause: Resp. Group: CAP Status: Closed

	Event	Inapp. Action #
1)	E3w	001

Description:
Original construction issue. No coding performed.

Process:	Process:
Group:	Group:
Sub-Group:	Sub-Group:

O and P Failure Mode:
HE Failure Mode:
HE Type:
Key Activity:

Associated Actions: None

Comments

	Indiv or Due Date	Team	Group	Date
Assigned To:			CAP	10/26/2000
Due Date:	12/24/2000			
Ready For Approval:	SPENCERD	GANEYP	CAP	12/15/2000
Approval Assigned To:	GANEYP	GANEYP	CAP	12/15/2000
Approved By:	SPENCERD	GANEYP	CAP	12/15/2000

Remarks

No Remarks for this ECAP

Condition Report: 00264095
Current Status: Closed
Action Category: 3

End of the Document for ECAP No:	00264095
The status of this ECAP is:	Closed
The duration of this ECAP was:	448 days

NRC SUBMITTAL
SUMMARY AND CONCURRENCE FORM

THE PURPOSE OF THIS CONCURRENCE FORM IS TO ASSURE THE ACCURACY AND COMPLETENESS OF DC COOK SUBMITTALS TO THE NRC

DATE: 06/21/00 NRC DUE DATE: 06/28/00

SUBMITTAL PREPARED BY: Steven R. Dort / St R Dort
Print/Sign Name

TITLE: **LER 50-316/2000-003-00:**
SUMMARY: **Containment Concrete Structures Do Not Meet Design Load Margin Requirements**

On May 29, 2000, during an evaluation of concrete structures inside the Donald C. Cook Nuclear Plant (CNP) Unit 2 containment, it was determined that a condition outside the design basis of the plant existed in that some containment internal concrete walls, sub-compartment structures, and supports did not meet the design load factor margin of 1.5 as described in the CNP Updated Final Safety Analysis Report (UFSAR). A revised Nuclear Steam Supply System (NSSS) vendor transient mass distribution (TMD) containment analysis prompted new calculations which showed that a number of containment internal concrete walls, sub-compartment structures, and supports did not meet the 1.5 design load factor margin, contrary to UFSAR design requirements. This LER is submitted in accordance with 10 CFR 50.73(a)(2)(ii) for a condition outside the design basis of the plant.

PORC Approval [X] Yes [ ] No Meeting No: 3941

PORC Chairman Signature: [signature] Date: 6-23-00

NEW COMMITMENT(S) IDENTIFIED IN COVER LETTER:

- See Cover Letter

CONCURRENCE: LRT approved w/comment 6/21/00 SRDort

A concurrence signature reflects that the signatory has assured that the submittal is technically accurate, appropriate and consistent with DC Cook Policy, applicable commitments are approved for implementation, and validation package for submittal completeness and accuracy has been prepared.

NAME	ORGANIZATION	SIGNATURE	DATE
R. Smith	Mgr., Struct. Design	[signature]	6-21-00
S. Greenlee	Director, Design Engr.	[signature]	6/22/00
M. B. Depuydt	Lead, Compliance	MB Depuydt	6-22-00
R. Gaston	Mgr., Compliance Licng.	[signature]	6-23-00
R. Godley	Director, NRAF	[signature] for	6-23-00

Note: LERs/NOV responses related to technical issues are signed-off by VP, Engineering.
LERs/NOV responses related to operational/plant issues are signed-off by Site VP.
NOV responses related to EA/CP actions are signed-off by Senior VP.

Plant Operations Review Committee
PORC Review Cover Sheet (Typical)

Originating Document No. LER 316/2000-003-00 Revision No. ________

TITLE: Containment Structures Do Not Meet Design Basis Requirements

PORC has reviewed this item and has determined that (check as appropriate):

It ____ does ✓ does NOT involve an UNREVIEWED SAFETY QUESTION.

It ____ does ✓ does NOT adversely impact plant nuclear safety.

It ____ does ✓ does NOT adversely impact the health and safety of plant personnel or the public.

It ✓ does ____ does NOT require further review by the Plant Manager, the NSDRC, or other Individuals/groups.

✓ Plant Manager ____ NSDRC ____ Other (specify below)

REMARKS Comment

PORC recommends this item for:

✓ APPROVAL ____ DISAPPROVAL ____ OTHER ________ PORC MEETING NO. 3741

COMPLETED BY Tanya Pillow, PORC Coordinator DATE 6/23/00

This Attachment, when completed, is retained in accordance with the retention requirements of the originating document.

Sent to NDM 9/3/02

Agenda

PORC
FRIDAY
06/23/00
11:15 a.m.
North Basement Classroom

Coordinator:

Tanya Pillow

Members RED TEAM
T. Noonan (Chair)
D. Baker (Eng.)
M. Stark (MT)
J. Giessner (OPS)
J. LaPlante (PA)
S. Watkins (RP)
J. Carlson (Chem)
R. Gaston (Lic)

NRC
V. J. Vincent
T. L. Mottl
T. C. George
G. Caldwell
R. Twist
J. LaPlatney
T. Noonan
M. Turner
N. Bernard
A. Munson
J. Mateychick
D. Schrader
B. Berry
J. Felder
A. Smith
D. Hewitt

The Plant Operations Review Committee **will be the Final Safety & Quality Barrier**
The Plant Operations Review Committee **will not do staff work for the Presenter(s)**
The Plant Operations Review Committee **will treat all Presenter(s) professionally**

The Plant Operations Review Committee recognizes that we do not know how long each document will need for presentation. For this reason, we recommend all Presenter(s) be present at the meeting at least 10 minutes before your presentation time listed below. Presenters will stage in the Plant cafeteria to minimize interruptions during ongoing PORC presentations.

Guidelines For Successful Presentation To The PORC

- Provide brief overview of the item presented for approval
- Make sure safety and regulatory impact are presented
  – Regulatory items presented by the line owner of the item
- Be able to speak to technical, safety and regulatory details
- Be prepared to represent the position of cognizant management on the item being presented.

Agenda topics

30	**11:15 a.m. PMP-2291.FOT.001 Revision 0 Work Management Forced Outage Process**	**D. Crouch**
45	**11:45 a.m. LER 316/2000-003-00 Containment Structures Do Not Meet Design Basis Requirements**	**S. Dort**
30	**12:30 p.m. 12-DCP-887 Revision 3a**	**P. Schoepf**

NRC Form 366 (6-1998) U.S. NUCLEAR REGULATORY COMMISSION

APPROVED BY OMB NO. 3150-0104 EXPIRES 06/30/2001

ESTIMATED BURDEN PER RESPONSE TO COMPLY WITH THIS MANDATORY INFORMATION COLLECTION REQUEST: 50.0 HRS. REPORTED LESSONS LEARNED ARE INCORPORATED INTO THE LICENSING PROCESS AND FED BACK TO INDUSTRY. FORWARD COMMENTS REGARDING BURDEN ESTIMATE TO THE INFORMATION AND RECORDS MANAGEMENT BRANCH (T-6 F33), U.S. NUCLEAR REGULATORY COMMISSION, WASHINGTON, DC 20555-0001, AND TO THE PAPERWORK REDUCTION PROJECT (3150-0104), OFFICE OF MANAGEMENT AND BUDGET, WASHINGTON, DC 20503

LICENSEE EVENT REPORT (LER)

(See reverse for required number of digits/characters for each block)

VALIDATION COPY

FACILITY NAME (1)	DOCKET NUMBER (2)	PAGE (3)
Donald C. Cook Nuclear Plant Unit 2	05000-316	1 of 3

TITLE (4)

Containment Internal Concrete Structures Do Not Meet Design Load Margins

EVENT DATE (5)			LER NUMBER (6)			REPORT DATE (7)			OTHER FACILITIES INVOLVED (8)	
MONTH	DAY	YEAR	YEAR	SEQUENTIAL NUMBER	REVISION NUMBER	MONTH	DAY	YEAR	FACILITY NAME	DOCKET NUMBER
05	29	2000	2000	– 003 –	00	06	28	2000	FACILITY NAME	DOCKET NUMBER

OPERATING MODE (9): 5

POWER LEVEL (10): --

THIS REPORT IS SUBMITTED PURSUANT TO THE REQUIREMENTS OF 10 CFR §: (Check one or more) (11)

	20.2201 (b)		20.2203(a)(2)(v)		50.73(a)(2)(i)		50.73(a)(2)(viii)
	20.2203(a)(1)		20.2203(a)(3)(i)	X	50.73(a)(2)(ii)		50.73(a)(2)(x)
	20.2203(a)(2)(i)		20.2203(a)(3)(ii)		50.73(a)(2)(iii)		73.71
	20.2203(a)(2)(ii)		20.2203(a)(4)		50.73(a)(2)(iv)		OTHER
	20.2203(a)(2)(iii)		50.36(c)(1)		50.73(a)(2)(v)		Specify in Abstract below or in NRC Form 366A
	20.2203(a)(2)(iv)		50.36(c)(2)		50.73(a)(2)(vii)		

LICENSEE CONTACT FOR THIS LER (12)

NAME	TELEPHONE NUMBER (Include Area Code)
M. B. Depuydt, Regulatory Affairs	616 / 465-5901, x1589

COMPLETE ONE LINE FOR EACH COMPONENT FAILURE DESCRIBED IN THIS REPORT (13)

CAUSE	SYSTEM	COMPONENT	MANUFACTURER	REPORTABLE TO EPIX	CAUSE	SYSTEM	COMPONENT	MANUFACTURER	REPORTABLE TO EPIX

SUPPLEMENTAL REPORT EXPECTED (14)				EXPECTED SUBMISSION DATE (15)	MONTH	DAY	YEAR
	YES (If Yes, complete EXPECTED SUBMISSION DATE).	X	NO				

Abstract (Limit to 1400 spaces, i.e., approximately 15 single-spaced typewritten lines) (16)

On May 29, 2000, during an evaluation of concrete structures inside the Donald C. Cook Nuclear Plant (CNP) Unit 2 containment, it was determined that a condition outside the design basis of the plant existed in that some containment internal concrete sub-compartment structural elements, specifically walls and floors, did not meet the design pressure load factor margin of 1.5 as described in the CNP Updated Final Safety Analysis Report (UFSAR). A revised Nuclear Steam Supply System (NSSS) vendor transient mass distribution (TMD) containment analysis prompted new calculations which showed that a number of containment internal concrete structural elements did not meet the 1.5 design pressure load factor margin, contrary to UFSAR design requirements. This LER is submitted in accordance with 10 CFR 50.73(a)(2)(ii) for a condition outside the design basis of the plant.

The apparent cause for this event was the failure to adequately control design basis calculations and supporting documentation. For Unit 2, critical calculations have been reconstituted or evaluations performed for the subject concrete structural elements, and some structural grout repairs made on a wall with noted degradation. A review of containment internal concrete structural elements will be performed prior to Unit 1 startup to determine extent of condition, repairs will be made where applicable, and critical calculations will be reconstituted or evaluations performed to document operability of the Unit 1 structures. A plan and schedule for long-term corrective and preventive actions for both units will be developed prior to Unit 1 startup.

The results of Unit 2 calculations and evaluations show that the internal containment concrete structural elements were capable of withstanding the revised TMD accident pressures without loss of function. There is minimal safety significance associated with the failure to maintain a 1.5 design pressure load factor margin for internal containment structures.

FACILITY NAME (1)	DOCKET NUMBER(2)	LER NUMBER (6)			PAGE (3)
		YEAR	SEQUENTIAL NUMBER	REVISION NUMBER	
Donald C. Cook Nuclear Plant Unit 2	05000-316	2000	– 003 –	00	2 of 3

TEXT *(If more space is required, use additional copies of NRC Form (366A)* **(17)**

Conditions Prior to Event
Unit 2 was in Mode 5, Cold Shutdown

Description of Event
On May 29, 2000, during an evaluation of concrete structures inside the Donald C. Cook Nuclear Plant (CNP) Unit 2 containment it was determined that a condition outside the design basis of the plant existed in that some containment internal concrete sub-compartment structural elements did not meet the design pressure load factor margin of 1.5 as described in the CNP Updated Final Safety Analysis Report (UFSAR). A revised Nuclear Steam Supply System (NSSS) vendor transient mass distribution (TMD) containment analysis prompted new calculations which showed that a number of containment internal concrete structural elements did not meet the 1.5 design pressure load factor margin, contrary to UFSAR design requirements. Additionally, some physical degradation and non-conforming conditions existed on isolated areas of accumulator room end walls, which contributed to the reduction in structural capacity for these four walls.

The reduction in design pressure load margin for containment internal concrete sub-compartment structural elements was determined to be reportable, and this LER is submitted in accordance with 10 CFR 50.73(a)(2)(ii) for a condition outside the design basis of the plant.

Cause of Event
The apparent cause for this condition was the failure to adequately control design basis calculations and supporting documentation. Specifically, documentation and calculations supporting the plant configuration related to containment concrete structure load conditions could not be located, or did not meet current standards for technical or administrative attributes.

These issues are symptoms of the larger generic issue of inadequate design and licensing basis control that had been previously identified and confirmed during the Expanded System Readiness Reviews.

Analysis of Event
The design of the containment structures is based upon limiting load factors, which are the ratios by which loads are multiplied to assure that the loading deformation behavior of the structure is one of elastic, tolerable strain behavior. The UFSAR requires an evaluation of the loads utilized in the design of reinforced concrete containment structures, and includes a design pressure load factor margin of 1.5 to ensure that the structures were capable of withstanding a 50 percent increase in pressure load above the worst-case expected load in a given area. The pressure load is one of a number of loads considered in the design of the containment structural elements.

Critical calculations have been reconstituted or evaluations performed for the subject concrete structural elements using the new TMD accident pressures. These new calculations and evaluations utilized reduced pressure load factors, less than the 1.5 pressure load factor specified in the UFSAR, but always greater than 1.0, and also took credit for the actual as-installed physical configuration and strength of materials. The results of the calculations and evaluations show that the internal containment concrete structures were capable of withstanding the revised TMD accident pressures without loss of function. Based on the above, there is minimal safety significance associated with the failure to maintain a 1.5 design pressure load factor margin for containment concrete structures.

Corrective Actions
There were no immediate corrective actions associated with the failure to maintain a 1.5 design pressure load factor margin for containment concrete structures, because Unit 2 was in a cold shutdown condition.

LICENSEE EVENT REPORT (LER)
TEXT CONTINUATION

FACILITY NAME (1)	DOCKET NUMBER(2)	LER NUMBER (6)			PAGE (3)
		YEAR	SEQUENTIAL NUMBER	REVISION NUMBER	
Donald C. Cook Nuclear Plant Unit 2	05000-316	2000	-- 003 --	00	3 of 3

TEXT *(If more space is required, use additional copies of NRC Form (366A)* **(17)**

Critical calculations have been reconstituted or evaluations performed for the subject concrete structural elements using the new TMD accident pressures to document operability of the Unit 2 structures. Limited structural grout repairs were completed on one accumulator room wall with noted degradation.

A presentation was made to the NRC on June 1, 2000, to provide information related to the design and licensing basis for the concrete structures, the current configuration of the structures including which structures were degraded, and a justification to operate the units while the structures were considered to be in a degraded or non-conforming condition. The NRC agreed that the analysis performed by CNP demonstrated that each structure in question was operable with some amount of margin.

A similar condition is expected on CNP Unit 1. A review of containment internal structures will be performed prior to Unit 1 startup to determine extent of condition, repairs to structural elements will be made where applicable, and critical calculations will be reconstituted or evaluations performed to document operability of the Unit 1 structures.

The final course and schedule for long-term corrective and preventive actions to restore and maintain the design pressure load factors for the internal containment concrete structural elements in both units will be determined prior to Unit 1 startup.

The corrective actions to prevent recurrence for the root cause of the generic inadequacies of the design control process are being addressed through the CNP Corrective Action Program. The root cause evaluation identified numerous corrective actions to address management, organizational, and programmatic issues in the Engineering organization. Actions specific to restart of the CNP units have been tracked and completed as part of the CNP Restart Plan.

<u>Previous Similar Events</u>

315/1999-022-01
315/1999-016-00
315/1999-012-00
315/1998-037-01
315/1998-056-01

CONTAINMENT

Subject	Evaluated Load Combinations	Governing Load Combination	Expected Margin	Expected Margin for New TMD	DLF for Pressure
Containment Shell & Dome	Combinations (a) through (i) of Section 5.2.2.3 of UFSAR	Load Combination (a)	Design Basis (NED-2000-518-REP)	Design Basis (NED-2000-527-REP)	NA
Equipment & Personnel Hatches	Evaluated for pressure plus DBE	Pressure plus DBE	Design Basis (NED-2000-518-REP)	Not affected by new TMD pressures	NA
Penetration Anchorage	3 emergency load cases of Section 5.2.4 of UFSAR	Pipe Rupture Loads	Design Basis (NED-2000-518-REP)	Not affected by new TMD pressures	NA
Containment Basemat	Combinations (a) through (i) of Section 5.2.2.3 of UFSAR	Load Combination (d)	Design Basis (NED-2000-518-REP)	Not affected by new TMD pressures	NA
Containment Overall Stability	Checked overturning, sliding, and flotation considering DBE and flooded conditions	Sliding	Design Basis (NED-2000-518-REP)	Not affected by new TMD pressures	NA
Containment Spary Framing Support	Specific Findings Against Calculation DC-D-3198-504-SC were addressed	NA	Design Basis (NED-2000-518-REP)	Not affected by new TMD pressures	NA
Operating Deck:					
Missile Shield Cover over Reactor Cavity	Combinations (a) through (i) of Section 5.2.2.3 of UFSAR	Load Combination (a)	Design Basis (NED-2000-518-REP)	1.05 (DIF & compression rebars not used) (PTMD = 79.2 psi)	1.0 (Based on pressure time histories of AEP-00-139)
Operating Deck Slab	Combinations (a) through (i) of Section 5.2.2.3 of UFSAR	Combinations (a), (b), and (d) are critical combinations	Design Basis (NED-2000-518-REP)	21.67/20.2 = 1.07 (Conservatively slab evaluated as a cantilever beam, DIF & Ductility not used) (PTMD = 20.2 psi)	~1.1 (Based on pressure time histories of AEP-00-139) (PTMD = 20.2 psi)
Lead Trays over Hatches	Combinations (a) through (i) of Section 5.2.2.3 of UFSAR	Combinations (a), (b), and (d) are critical combinations	Design Basis (NED-2000-518-REP)	Not affected by new TMD pressures	NA
Concrete Filled Frames over Hatches	Combinations (a) through (i) of Section 5.2.2.3 of UFSAR	Combinations (a), (b), and (d) are critical combinations	Design Basis (NED-2000-518-REP)	Design Basis (NED-2000-527-REP)	~1.1 (Based on pressure time histories of AEP-00-139) (PTMD = 20.2 psi)
Primary Shield Wall, Reactor Cavity, & Refueling Canal	Combinations (a) through (i) of Section 5.2.2.3 of UFSAR	Load Combination (a)	Design Basis (NED-2000-518-REP)	1.13 (DIF & Ductility not used) (PTMD = 79.2 psi)	1.0 (Based on pressure time histories of AEP-00-139)
Bulkhead Between Reactor Cavity and Refueling Canal	Combinations (a) through (i) of Section 5.2.2.3 of UFSAR	Load Combination (a)	Design Basis (NED-2000-518-REP)	1.15 (DIF & plastic section modulus not used) (PTMD = 79.2 psi)	1.0 (Based on pressure time histories of AEP-00-139)

CONTAINMENT

Subject	Evaluated Load Combinations	Governing Load Combination	Expected Margin	Expected Margin for New TMD	DLF for Pressure
Lower Reactor Cavity Walls	Combinations (a) through (i) of Section 5.2.2.3 of UFSAR	Load Combination (a)	Design Basis (DC-D-3195-195-SC)	Design Basis (NED-2000-527-REP)	1.0 (Based on pressure time histories of AEP-00-139)
Slab between Lower Reactor Cavity & Loop Compartment	Combinations (a) through (i) of Section 5.2.2.3 of UFSAR	Load Combination (a)	Design Basis (DC-D-3195-195-SC)	Design Basis (NED-2000-527-REP)	1.0 (Based on pressure time histories of AEP-00-139)
Steam generator Enclosure (Chapter 5)	Combinations (a) through (i) of Section 5.2.2.3, 20 psi pressure per section 5.2.2.4, and load combinations (1) and (2) of section 5.2.2.7 of the UFSAR	Load combination (1) of section 5.2.2.7 of the UFSAR	Design Basis (NED-2000-527-REP)	>1.5 (NED-2000-527-REP)	NA
Steam generator Enclosure (Chapter 14)	DL+1.0PTMD+DBE	DL+1.0PTMD+DBE	Design Basis (DC D-3195-130-SC)	1.8 (S&A Calculation 99Q4092-C002)	1.0 to 1.44 (S&A Calculation 99Q4092-C002)
Pressurizer Enclosure	Combinations (a) through (i) of Section 5.2.2.3 of UFSAR	Load combination (a)	Design Basis (NED-2000-518-REP)	Design Basis (NED-2000-527-REP)	Considered a DLF of 1.5
Pressurizer Slab @ El. 625'	DL+DBE+Pipe Whip (note: this slab is not part of divider barrier)	DL+DBE+Pipe Whip	Design Basis (NED-2000-518-REP)	Not affected by new TMD pressures	NA
Crane Wall (Except SGE)	Combinations (a) through (i) of Section 5.2.2.3 of UFSAR	Load combinations (a), and (d)	Approximately 1.5 (NED-2000-518-REP)	Approximately 1.5 (NED-2000-527-REP)	< 1.2 (Based on pressure time histories of AEP-00-139)
Divider Barrier Seals	1.0PTMD (note: in the UFSAR, it is stated that the seals are designed for 24 psi)	1.0PTMD	18.4/16 = 1.15	18.4/15.3 = 1.2 (SD-990720-001 & AEP-00-139)	NA
Unit 2 Ice Condenser Support Slab @ El. 640'	Combinations (a) through (i) of Section 5.2.2.3 of UFSAR	Combinations (a), (b), and (d) are critical combinations	Design Basis (SD-990909-003)	Design Basis (NED-2000-527-REP)	1.2 for LOCA 1.15 for MSLB (SD-990909-003)
Unit 2 Fan-Accumulator Room Slab @ El. 612'	Combinations (a) through (i) of Section 5.2.2.3 of UFSAR	Load combinations (a), (b), and (d)	Design Basis (SD-990909-005)	Design Basis (SD-990909-005 & NED-2000-527-REP)	1.0 (SD-990909-005)
Unit 2 Fan-Accumulator Room Slab support beams @ El. 612'	(1)DL+LL, (2)DL+LL+OBE, (3)DL+LL+T+DBE, (4)P+DL+LL+T, and (5)P+DL+LL+T+DBE	P+DL+LL+T+DBE	Design Basis (SD-990909-005)	Design Basis (SD-990909-005 & NED-2000-527-REP)	1.0 (SD-990909-005)
Unit 2 Support Columns for slabs @ elevations 640' and 612'	(1)DL+LL+OBE, (2)DL+LL+OBE+DBA, (3)DL+LL+DBE+DBA, (4)DL+LL+DBE+MSLB, and (5)DL+LL+T(Accident)	DL+LL+OBE	7% overstress for OBE (SD-990909-008) Design Basis for other loadings	~7% overstress for OBE (SD-990909-008 & NED-2000-527-REP) Design Basis for other loadings	1.0 to 1.2 (SD-990909-003) (SD-990903-005) (SD-990909-008)

CONTAINMENT

Subject	Evaluated Load Combinations	Governing Load Combination	Expected Margin	Expected Margin for New TMD	DLF for Pressure
Unit 2 Anchorage of Support Cols. for slabs @ 640' and 612'	(1)DL+LL+OBE, (2)DL+LL+OBE+DBA, (3)DL+LL+DBE+DBA, (4)DL+LL+DBE+MSLB, and (5)DL+LL+T(Accident)	DL+LL+DBE+DBA	RAI	RAI	1.0 to 1.2 (SD-990909-003) (SD-990903-005) (SD-990909-008)

The following load combinations (a) through (i) are from Section 5.2.2.3 of the UFSAR:

a)	1.5P + DL + 0.05DL + (T' + TL')	(USD)
b)	1.25P + DL + 0.05DL + (T" + TL") + 1.25E	(USD)
c)	1.25P + DL + 0.05DL + (T" + TL") + 1.25W	(USD)
d)	1.0P + DL + 0.05DL + (T'" + TL'") + 1.0E'	(USD)
e)	DL + 0.05DL + T + W' + 1.0(p)	(USD)
f)	DL + 0.05DL + T	(WSD)
g)	U.P. + DL + 0.05DL + T + E'	(USD)
h)	0.95DL + 1.34P + TT	(USD)
i)	DL + 1.5P1 + T + TL	(USD)

Where:

DL	= Dead load
P	= Accident design pressure of 12 psi
P1	= 16 psi (in fan-accumulator room due to main steam line break)
T	= Temperature gradient through the concrete and liner under operating condition
T'	= Temperature gradient through the concrete wall associated with 1.5 times the design pressure (18 psi)
T"	= Temperature gradient through the concrete wall associated with 1.25 times the design pressure (15 psi)
T'"	= Temperature gradient through the concrete wall associated with 1.0 times the design pressure (12 psi)
TL'	= Temperature in the liner associated with an accident pressure of 1.5 times the design pressure (18 psi)
TL"	= Temperature in the liner associated with an accident pressure of 1.25 times the design pressure (15 psi)
TL'"	= Temperature in the liner associated with an accident pressure of 1.0 times the design pressure (12 psi)
TL	= Temperature in the liner (320oF) associated with 1.5 times main steam design pressure (1.5 x 16 psi) due to fan-accumulator room main steam line break
TT	= Temperature gradient through the concrete and liner under test conditions
E	= operating basis earthquake
E'	= design basis earthquake
W	= Wind load
W'	= Tornado load
(p)	= Tornado pressure = 3 psi
U.P.	= Unsymmetrical pressure of 8 psi
USD	= Ultimate strength design
WSD	= Working stress design

D. C. COOK NUCLEAR PLANT

Bridgman, Michigan

Plant Status Report

As of: 6/20/00 12:45:30 PM

Unit: 1 Shift Date: 5/29/00 6:53:00 AM Shift: E

Reactor Mode: 6N Power: 0 TAVG: 90 Electical Power MW 0

Control Rod Bank: D Control Rod Steps: 0 RCS Boron Sample: 0

Unit: 2 Shift Date: 5/29/00 6:47:00 AM Shift: E

Reactor Mode: 5A Power: 0 TAVG: 170 Electical Power MW 0

Control Rod Bank: D Control Rod Steps: 0 RCS Boron Sample: 2555

Unit: 1 Shift Date: 5/29/00 6:41:00 PM Shift: D

Reactor Mode: 6N Power: 0 TAVG: 0 Electical Power MW 0

Control Rod Bank: D Control Rod Steps: 0 RCS Boron Sample: 0

Unit: 2 Shift Date: 5/29/00 6:48:00 PM Shift: D

Reactor Mode: 5A Power: 0 TAVG: 180 Electical Power MW 0

Control Rod Bank: D Control Rod Steps: 0 RCS Boron Sample: 2555

D.C. Cook
Electronic Corrective Action Program

Condition Report: P-00-02506
Current Status: Screened
Action Category: 3

I. Problem ID

Discovered Time/Date: 06:00 02/10/2000 Occurred Time/Date: __/__/____

Unit Affected: 2

Status at Time Discovered	Unit 1	Unit 2
Mode	N/A	6C
% Power		

Unit Status Remarks:

System(s) Affected: CNTMT CONTAINMENT BUILDING STRUCTURE

Affected Equipment

Equipment ID No.	Comp. Code	Manufacturer

Location of Problem - Bldg: CB Column Line: Elev:

Location Remarks:

Brief Condition Description:

Poor quality of grout/concrete found near the top at the 18" thick concrete wall between the Accumulator #22 room and the CEQ Fan roon.

Detailed Condition Description:

- DESCRIPTION OF CONDITION

This CR is initiated to document poor quality concrete in various location near the top of the Accumulator room wall.

The subject wall is located inside containment along azimuth 126 degrees and extends between elevations 612' and 638' (18" thick wall between Accumulator #22 and Hydrogen Skimmer Fan 2-HV-CEQ-2 in Unit 2 Containment).

Note: Earlier CR 99-27755 documented poor quality of concrete at a specific location on the wall. Another CR 00-00610 documented the condition of insufficient grout. This CR is initiated because during repaires for resolution of the above CRs, it was found that the poor quality of concrete extended beyond the limits noted in those CRs.

Based on observations for CRs 99-27755 and 00-00610, it is judged that the extent of condition is limited to this wall only.

- IMPACT STATEMENT

The poor quality concrete/grout degrades the connection between the wall and the slab above. The most significant load on the wall is the one resulting from a pipe break in the accumulator room. Consequently the condition is not very critical during the current plant mode.

Condition should be fixed prior to restart.

- REQUIREMENT NOT COMPLIED WITH OR REGULATORY REPORTING REQUIREMENT

None.

- SUSPECTED CAUSE OR SOURCE OF THE CONDITION

Not known.

- CORRECTIVE ACTIONS TAKEN

Wrote this CR.

- RECOMMENDED CLASSIFICATION AND CR OWNER

4, Amiya Sen of NESD.

Method Used to Discover Problem

Restart Code: Restart 2 - M4 Restart Approved: Yes

Other Components/Systems and Areas Affected: N

Industry Impacted N

Immediate Corrective Actions:

Problem Found While Working with Document No. :

Action Request No:

D.C. Cook
Electronic Corrective Action Program

Condition Report: P-00-02506
Current Status: Screened
Action Category: 3

Phone Extension:

	Indiv	Team	Group	Date:
Problem Identified By:	MEGHANIV	SENA	NED	02/11/2000
Problem Entered By:	MEGHANIV	SENA	NED	02/11/2000

Supervisor Approval

Approved: Yes

Detection Code: Self-Identified

Supervisor Comments:

	Indiv	Team	Group	Date:
Reviewed By:	SENA	HOSKINSM	NED	02/11/2000

II. Operations Review

Add'l Info. Required: No

SR/OD Equipment Affected: Yes

Reportability: No

SSC Reqd In Current Mode: No

Past Operability Concern: No

T.S.A.S. Entered: No

SSC Affected
Containment structure

T.S.A.S. Reference

T.S.A.S. Reference #	Unit

Status: Closed

	Indiv	Team	Group	Date
Ready For Approval:	MCCOOLT	MOULD	OPS	05/17/2000
Approved By:	MCCOOLT	MOULD	OPS	05/17/2000

D.C. Cook
Electronic Corrective Action Program

Condition Report: P-00-02506
Current Status: Screened
Action Category: 3

SSC Operability - For Identified Condition: Inoperable

Engineering Support Requested: Yes
Open Items Log Entry Completed: Yes
Mode Constraint: Yes

Mode	Mode Constraint Description
4	Mode 4, 350 <Tavg> 200

Code	Systems Description
CNTMT	Containment

Operations Reviewer Comments:

1. If OPERABLE, state basis for reasonable assurance for SSC to perform its specified function (if necessary consult OPR procedure, T.S. bases, SAR, surveillance tests etc.):

Discussed this issue with the originating supervisor (NESD). Based on engineering judgement, this deficiency would not have resulted in a catastrophic failure of the wall. No operability issues are deemed to exist. However, a structural analysis is expected to be performed to evaluate the structural integrity of the wall. In addition, new concrete will be poured in place of that portion that has been excavated. These items will be completed prior to restart. REB 2/12/00

2. If INOPERABLE, state what is inoperable and why, justify mode constraint assigned, state notifications and actions performed:

System is currently inoperable and was in the process of being repaired, there is more unstable concrete than previously identified. Talked with Mr Hooks of structural and an OSR is being generated for S&L to do an evaluation of the material problems. After the base material is evaluated the structure will be repaired/ reworked to bring into compliance for operability. No ODE required at this time. Rod Foster 2/14/00

3. If recommending past operability evaluation for reportability determination, discuss basis for recommendation:
NA

4. If additional engineering support is requested briefly describe here what and why support is needed and basis for time determination (provide detailed specifics in operability notification section):
NA

5. If additional information was gathered to perform operability determination state by whom provided (by title)

and by what method:
NA

6. Comments: additional information, updates and revisions should be placed in chronological order:

System is currently inoperable and was in the process of being repaired, there is more unstable concrete than previously identified. Talked with Mr Hooks of structural and an OSR is being generated for

S&L to do an evaluation of the material problems. After the base material is evaluated the structure will be repaired/ reworked to bring into compliance for operability. No ODE required at this time. Rod Foster 2/14/00

The Operability Evaluation is requested to allow documentation of engineering work performed on the issue. The operability conclusion is not changed. Clayton Cha 4/7/00.

The Operability Evaluation is completed and approved per Shift Manager Strasser. All walls under evaluation are operable but degraded. One exception is that wall in azimuth 126 is inoperable due to DCP-4621 in progress. This CR already has Mode 4 constraint associated with the condition and the condition report is in open items log. Thus, no new CR is needed to track the inoperable wall to closure. There is no change in operability conclusion as a result of the operability evaluation. Clayton Cha 4/15/00.

UPADATE 5/5/2000
Re-Opened to turn ON the MC flag. The Mode 4 was previously entered, however, the selector was switched to "No". I have changed it to Yes.
J. Ross 5/5/2000

UPDATE 5/14/00: Opened to turn off ODE, as this item required core samples taken from the walls and NED (K. Green) reports that the actual calculations are not yet complete. The original ODE may still be valid but in light of possible new calculations being required, this ODE is turned OFF. The issue remaining will be addressed in CR 99-6321 which captures all TMD issues and Containment blowdown loading concerns. Concurred with by D. Etheridge. TPM 5/14/00

UPDATE 5/16/00: Decision made to turn on ODE again to address this issue adequately for the CEQ and Accumulator Fan Room Walls. Concurred with by D. Etheridge. 5/16/00

Operability Type: ODE

Responsible Group: ESY

Significance: Priority

Due Date: 05/21/2000

Operability Concerns / Questions:

Please evaluate the structural/seismic quality of the affected wall due to the poor quality of the concrete. Sufficient assurance exists that the concrete will not catastrophically fail. However, it is based solely on engineering judgement. In order to substantiate the judgement, an ODE is being requested. According to the initiating group, a structural analysis on the wall is planned by S&L. Clayton Cha 2/12/00.

D.C. Cook
Electronic Corrective Action Program

Condition Report: P-00-02506
Current Status: Screened
Action Category: 3

System is currently inoperable and was in the process of being repaired, there is more unstable concrete than previously identified. Talked with Mr Hooks of structural and an OSR is being generated for S&L to do an evaluation of the material problems. After the base material is evaluated the structure will be repaired/ reworked to bring into compliance for operability. No ODE required at this time. Rod Foster 2/14/00

UPDATE 5/14/00: Opened to turn off ODE, as this item required core samples taken from the walls and NED (K. Green) reports that the actual calculations are not yet complete. The original ODE may still be valid but in light of possible new calculations being required, this ODE is turned OFF. The issue remaining will be addressed in CR 99-6321 which captures all TMD issues and Containment blowdown loading concerns. Concurred with by D. Etheridge. TPM 5/14/00

UPDATE 5/16/00: Opened to turn ODE back on as decision made to have this CR cover the ODE. Aspects of the wall degradation and blowdown loading effects should be addressed. K. Green will provide the technical writeup by 5/21/00. Additional information: Please consider CR 00-7064 in the ODE performance. This CR documents additional deficiencies previously not identified in the 126 degree wall. TPM 5/17/00

Operability Notification Comments:

Prompt Reportable:

NRC ENS Notification:

Non-ENS Notification:

Licensing Contact Made:

Licensing Contact:

	Personnel Contact	Contacted By	Date	Time
NRC				
OPS Duty Supervisor				
Plant Manager				
State of Michigan				
NRC Resident Insp.				

Prompt Reportability Comments:

Mode Constraint Released: Yes

OD Issue Complete: No

Comments:

1. If only one unit is ready for mode constraint release state basis here and do not release mode constraint

(unit/time/date/initials):

UNIT 1: Mode 4 constraint for action 3.
UNIT 2: Actions complete. Released mode constraint. P Avery 5-31-00.
Full Release

2. State basis for release of mode constraint and provide initials/date (ensure both units can be released before checking the yes field for release)
The ODE determined Operable but Degraded in all modes

3. If only one unit is ready for OD release state basis here and do not release od (unit/time/date/initials):

4. State basis for release of OD and provide initials/date (ensure both units can be released before checking the yes field for release)

ENSURE action #1 in CR00-03544 has been completed prior to OD flag release of THIS CR. TPM 4/30/00
UPDATE 5/14/00: Opened to turn off ODE, as this item required core samples taken from the walls and NED (K. Green) reports that the actual calculations are not yet complete. The original ODE may still be valid but in light of possible new calculations being required, this ODE is turned OFF. The issue remaining will be addressed in CR 99-6321 which captures all TMD issues and Containment blowdown loading concerns. Concurred with by D. Etheridge. TPM 5/14/00

III. Screening

Is the Problem Significant? N   Action Category: 3

Other Comments:

Other Report Nos: LIR

Event Codes: E3w Structure (walls, floors, etc.)
E8b4 Other

Screening Remarks:
RCL to consider upgrade if reportable. RCL needs to review ODE.

Condition Report: P-00-02506
Current Status: Screened
Action Category: 3

Past Operability assigned to NED per S. Nance 02/26/00 bdn

Opened NCE and assigned to NED per a request from Meghani/NED. kmh 4-13-00

Re-opened reportability and POD due to newly identified extent of condtion in CR 00-7391. B. Kovarik, NESD, has requested that the POD now be assigned to her.
MBDepuydt
5/24/00

Re-opened to upgrade CR level to 3, as the condition has been determined to be reportable since the walls did not meet the design criteria stipulated in the SAR. A level 2 root cause is not necessary for this condition, as all information that is likely to be found has already been found and documented in the condition eval and the actions.
MBDepuyd
6/2/00

Assignments

Activity	Req.	Grp	Status	Due Date	Concur
Condition Evaluation	Yes	NED	Closed	03/08/2000	
Current Operability	Yes	ESY	Closed	05/21/2000	
Past Operability	Yes	NED	Closed	03/27/2000	
Reportability	Yes	RCL	Open	06/01/2000	
Approval	Yes	NED	Screened		
Maintenance Rule	No				
PII	No				
Non-Conformance	Yes	NED		06/11/2000	

	Indiv	Team	Group	Date
Screened By:	DEPUYDTM	DEPUYDTM	RCL	06/02/2000

IV. Operability

Operability:

Responsible Group: ESY Status: Closed

D.C. Cook
Electronic Corrective Action Program

Condition Report: P-00-02506
Current Status: Screened
Action Category: 3

Operable: D

ODE Appl. Mode1-4

Operability Type:

Executive Summary:
Revision 1 to ODE for CR00-02506

Based on the evaluations contained in calculation SD-000510-003, Revision 0, the Unit 2 Fan/Accumulator Room Walls at Azimuths 54, 126, 234, and 307 degrees meet the newly calculated values for blowdown loading without exceeding allowable stress limits. The degraded condition is that these walls are subjected to the loadings from the newly calculated Transient Mass Distribution (TMD) analysis and the as-found condition of the subject walls have resulted in a required reduction of UFSAR design basis load factors to meet allowable stresses. Therefore, the Unit 2 Fan/Accumulator Room Walls at Azimuths 54, 126, 234, and 307 degrees are considered OPERABLE But Degraded.

Comments:
Revision 1 to ODE for CR00-02506

TITLE: Unit 2 Degraded Fan/Accumulator Room Walls

REFERENCES:

CR-00-02506: Low quality grout exists in containment sub-compartment walls.
CR-99-27755: Scope of 126-degree wall repair is not cosmetic, and "structural" repairs are needed.
CR-00-00610: Pockets exist in the concrete at the top of the 126-degree accumulator room wall.
CR-00-03544: As-built walls may not meet the load requirements stated in the UFSAR.
CR-00-06586: Fire blanket material containing asbestos at the top of the 126-degree wall.
CR-00-07064: Cut rebar found at the top of Fan Accumulator Room wall at azimuth 126 degrees.
CR-00-07254: Low strength grout encountered during excavation for rebar on 307-degree wall.
CR-00-07391: Low strength grout confirmed to exist in the 307-degree wall.

SECTION 1, DESCRIPTION:

NOTE: Rev. 1 supercedes Rev. 0 in its entirety and introduces new information concerning the extent of condition found as a result of field evaluations of as-built conditions. Although these conditions may also exist to some extent in Unit 1, the scope of this evaluation is limited to Unit 2.

The Unit 2 Containment has four sub-compartment walls in the lower levels of containment (between elevation 612' and 638') that extend radially inward from the outer containment wall to the crane wall. These four walls are at the 54-degree, 126-degree, 234-degree, and 307-degree containment azimuths (measured counter-clockwise from a zero degree azimuth aligned with "plant" East). Two of the walls, at 234-degree and 307-degree, form the ends of the instrumentation room, which is basically a dead ended volume in the containment lower compartment, and separate the instrument room from the two accumlator rooms. The other two walls, at 54-degree and 126-degree, close the other end of the two accumulator rooms and separate the accumulator rooms from the CEQ fan room, which is part of the containment upper compartment.

Condition Report: P-00-02506
Current Status: Screened
Action Category: 3

Blemishes in

concrete at top of the 126-degree accumulator room wall were identified in 1998. and AR A-0156971 was issued to repair what was originally believed to be surface damage in a localized area of the wall. The original work scope under AR A-0156971 was to excavate the affected area of the wall up to 3" deep and make repairs. However, at the 3" depth solid concrete was not found. A concrete chipping permit was added to the work package allowing the excavation to go as deep as 14" in this 18-inch thick wall. At the 14" depth solid concrete had still not been found and physical work stopped. An Engineering walkdown was performed on November 20, 1999. Engineering documented their findings, in CR 99-27755, that the scope of wall repairs is not merely cosmetic, and "structural" repairs are needed.

As documented in CR 00-0610, pockets existed in the concrete at the top of the Unit 2 126-degree accumulator room wall to facilitate installation of tie-down bolts onto anchor plates for the ice condenser lower support structure. During a walkdown conducted for AR A-0156971 E02, Engineering noted that some of these pockets were left ungrouted. The 126-degree accumulator room wall is an 18" thick concrete wall located between Accumulator #22 and Hydrogen Skimmer Fan 2-HV-CEQ-2 in Unit 2 Containment (along azimuth 126 between elevation 612' and 638'). These pockets are shown in sections M-5, M-6 and the associated sections on drawing 2-3208A-4. According to this drawing, these pockets were supposed to be grouted.

As introduced above, CR 99-27755 documented poor quality of concrete at a specific location on the 126-degree accumulator room wall and CR 00-00610 documented the absence of grout in pockets on the same wall. An additional condition report, CR 00-2506, was initiated to document the problems with low quality concrete in containment subcompartment walls that extend beyond the limits noted in the previously drafted CRs and the results of investigatory

walkdowns conducted in all subcompartments of Unit 1 and 2 containments. This walkdown confirmed the known grout deficiencies and identified examples of misplaced rebar.

During evaluation of the poor quality grout at the top of 126-degree accumulator room wall, as reported in CR-00-2506, Engineering performed a preliminary evaluation to determine whether the wall is in conformance with certain UFSAR requirements for structural strength of the wall. Engineering suspected that the 18" thick wall might not meet the design basis requirements of the UFSAR even if there was no grout problem. Specifically, Engineering determined that the loading combination in Section 5.2.2.3 of the UFSAR requires use of a 1.5 load factor for the pressure loads from main steam line break. Based on a preliminary evaluation, it seemed that the original design may not meet the load requirements. (CR-00-3544)

Deficiencies including poor quality grout at the top of the fan accumulator room end wall at 126-degree azimuth and questions regarding wall operability were documented in earlier Condition Reports CR 99-27755, 00-00610, 00-02506, and 00-03544. During follow-on investigations, additional deficiencies were found. Excavations in the top 7 or 8 inches of the 126-degree accumulator room wall identified that 2 vertical rebar were cut (CR-00-7064) and that there was a fire blanket material containing asbestos at the top of the wall. CR 00-6586 was initiated to address the asbestos containing material. CR 00-7254 was also generated as a result of encountering low strength grout during excavation for rebar. (CR-00-6586, CR-00-7064, and CR-00-7254)

During the extent of condition investigations performed following the discovery of poor quality grout on the 126-degree wall, core samples were taken from the grout at the top of the 307-degree wall. Engineering expected the compressive strength of the grout to be equal to or greater than 3,500 psi design strength of the concrete

specified. Initial testing of the grout core samples indicated the actual compressive grout strength of the core samples ranged from 4,300 psi to 1,200 psi. As a result, CR 00-07391 was generated to document the low strength grout in the 307-

degree wall.

SECTION 2, AFFECTED SSC(s):

System: Unit 2 Containment
Structure: Containment Interior and Divider Barrier Wall Structures
Component: Fan/Accumulator Room Radial Walls between elevations 612' and 638' at azimuths 54, 126, 234 and 307 degrees in Unit 2 Containment

SECTION 3, EXTENT OF CONDITION:

A review of ECAP determined the extent of condition is limited to those Condition Reports identified in the REFERENCES Section above, with the exception of the following:

PR-92-1606 Spalled area on exterior of Unit 1 Containment Structure. This was determined to also apply to the Unit 2 containment exterior. A small void was discovered at the construction opening area and was subsequently filled with high strength epoxy grout.

A review of the Open Items Log was also conducted and two items were identified as either CNTMT (2-2000-0163) or Containment Structure (2-2000-0116). Both of these Open Items apply to this Operability Evaluation as they deal with deficiencies in both the Azimuth 126 and 307-degree walls. These Open Items are within the scope of this Operability Evaluation.

Note: The scope of this ODE will address only the issues associated with the Unit 2 Fan/Accumulator Room Radial Walls. An additional ODE may be required to address similar issues for the Unit 1 Fan/Accumulator Room Radial Walls.

SECTION 4, AFFECTED SAFETY FUNCTIONS:

Safety Function:

The Containment Structure is classified as a safety-related, seismic class 1 structure and is part of the Engineered Safety Features (ESF) incorporated in the design of the plant. The Containment Structure functions to limit the radioactive fission product release to less than 10CFR100 limits under conditions resulting from

Large and Small Break Loss of Coolant Accidents, Rod Control Cluster Assembly Ejection, and fuel handling accidents. The containment internal divider barrier separating the lower and upper compartments is designed to withstand the differential pressure between the upper and lower compartments during postulated accident conditions.

Description of Walls

There are four walls designated as:

* Wall at Azimuth 54 (Wall 54 or Accumulator 1 wall) adjacent to Accumulator 1 on one side and CEQ fan wall on the other.
* Wall at Azimuth 126 (Wall 126 or Accumulator 2 wall) adjacent to Accumulator 2 on one side and CEQ fan wall on the other.

* Wall at Azimuth 234 (Wall 234 or Accumulator 3 wall) adjacent to Accumulator 3 on one side and Instrument room on the other.
* Wall at Azimuth 307 (Wall 307 or Accumulator 4 wall) adjacent to Accumulator 4 on one side and Instrument room on the other.

Each wall extends from Elevation 612 feet to the bottom of Ice Condenser slab at Elevation 638 feet. Each of these walls also extends radially outward from the crane wall towards the containment wall, stopping 4 inches short of it. As designed, the wall is monolithically connected along three sides, vertically with the crane wall and horizontally with the floor at El. 612 feet and at roof, along the bottom of the Ice Condenser slab at 638 feet.

The nominal thickness of each wall is 18 inches with a haunch extending to a depth of 30 inches at the crane wall. The additional exception, which is applicable only to Wall 126 only is a 6-inch offset at the free end of the wall to accommodate an ice condenser column.

The reinforcement details, in general, can be summarized as follows:

* Horizontal Bars
#11 @ 6" on center on the accumulator room side.
#11 @ 12" on center on the instrument room or CEQ fan side.
The cover for the horizontal bars is 2-3/4".

* Vertical Bars
#9 at 12" on center both faces of the wall. The bars are on the inside of the horizontal bars.

Based on this, the cover is calculated to be 4-1/8".

Primary Function(s)/Support Function(s)

The primary function of the concrete fan/accumulator room radial walls (at the CEQ Fan Room interface) is to provide a divider barrier between lower and upper compartments of the Containment in addition to providing structural support. In this application the walls function to direct steam flow into the ice condenser and therefore form a portion of the divider barrier. These walls also act as a fire barrier and provides radiation shielding between the accumulator and CEQ fan rooms.

SECTION 5, TECHNICAL SPECIFICATION REQUIREMENTS IMPACTED:

Technical Specification 3.6.5.9 - Requires that the divider barrier seal shall be OPERABLE in Modes 1, 2, 3, and 4.

SECTION 6, OTHER DESIGN/LICENSING BASIS REQUIREMENTS IMPACTED:

The most critical loading on these walls is the pressure resulting from a main steam line pipe break. The UFSAR Section 5.2.2.3 requires use of a 1.5 load factor for this pressure. Structural evaluations have indicated that even with no deficiencies the walls would not meet these loading requirements.

SECTON 7, OPERABILITY RECOMMENDATION:

Condition Report: P-00-02506
Current Status: Screened
Action Category: 3

The Fan/Accumulator Room Walls at Azimuth 54, 126, 234, and 307 should be considered OPERABLE But Degraded for all operational Modes. The walls are considered degraded due to their failure to meet the UFSAR-required load factor of 1.5 that is applied to the pressure component of the design load combination in Section 5.2.2.3., and the reliance on the use of as-poured concrete strengths rather than the 3500 psi concrete strengths as specified in section 5.2.2.5 of the UFSAR. Failure to meet these design basis requirements represents a loss of functional capability as described in PMP 7030.OPR.001. (See definition under "Non-conforming Item" on Page 5 of the referenced procedure).

No compensatory measures are required to support this operability conclusion. A corrective action has

been initiated to this effect in accordance with Step 2.1.7 of PMP 7030.OPR.001, Rev. 4, Attachment 5.

SECTION 8, BASIS FOR OPERABILITY CONCLUSION:

EVALUATION:

Calculation SD-000510-003, Revision 0 has been prepared to assess the functionality (operability) of the subject walls. The calculation utilized reduced load factors (less than the 1.5 load factor specified in the UFSAR, but always greater than 1.0) and it also takes credit for the actual "as-poured" strength of concrete (5300 psi) rather than the minimum strength required by the current design basis (3500 psi). The calculation concludes that the Unit 2 walls at azimuth 54, 126, 234, and 307 are capable of performing their intended function even when considering the concrete/grout/rebar deficiencies.

This calculation evaluated each wall using two different methods: The Conservative Simplified Method, and The Yield Line Method. The minimum margin that was determined to exist for all walls was 1.21 for the conservative simplified method, and 1.34 for the yield line method. These results are above the minimum margin of 1.0 required for operability. The wall with the least margin is the azimuth 126 wall.

The reduction in safety margin in the calculation resulting from the use of the reduced load factor results is a discrepancy between the design requirements specified in the UFSAR and the current plant condition. However, the calculation does provide reasonable assurance that the subject walls will remain functional and will not fail under any of the postulated load conditions. The use of the reduced load factor and the as-poured concrete strength is consistent with the methodology used by Sargent & Lundy in similar functionality evaluations of other containment structures (reference the ODE for CR-99-06123).

The following is excerpted from Calculation SD-000510-003, Revision 0. This provides the overview of technical information necessary to support the conclusion of Operable but

Degraded for all four walls in Unit 2 Containment. The references quoted are from the above referenced calculation.

Beginning of material excerpted from Calculation SD-000510-003, Revision 0

Note: Sections of calculation that have been omitted from the ODE for sake of space are noted accordingly

1.0 PURPOSE/OBJECTIVE

Condition Report: P-00-02506
Current Status: Screened
Action Category: 3

1.1 Background

There are two fan-accumulator rooms at elevation 612'-0" in the Unit 2 Containment Building of the Cook Nuclear Plant (CNP). Each room has two radial walls between elevations 612'-0" and 638'-0". These four radial walls of the two rooms are located at the 54, 126, 234, and 307 degree azimuths of the Containment Building.

Deficiencies associated with the quality of concrete and/or grout in the fan-accumulator room radial walls near elevation 638'-0" are reported in Condition Report (CR) Nos. P-99-27755, P-00-00610, & P-00-02506 (ref. 1-3), P-00-06586 & P-00-07064 (ref. 18), P-00-07211 (ref. 16), and P-00-07391 (ref. 29).
The deficient areas of the wall at azimuth 126, described in the above CRs, were grouted under Design Change Package (DCP) No. 2-LDCP-4621. Additional grouting on the same wall was done per AR A0201632 using specific grouting requirements in DIT B-01166-02.

1.2 Purpose/Objective

The purpose of this calculation is to evaluate the capability of these four radial walls to perform their intended functions, considering the deficiencies noted in the above CRs as repaired/reworked per 2-LDCP-4621 (ref. 20) and AR A0201632.

The walls will be evaluated for the applicable load combinations specified in Sections 5.2.2.3 and 5.2.2.4 of the UFSAR (Ref. 8), except that the maximum permissible load factor (factor of safety) applied to the pressure loads will be determined in this calculation.

This calculation is a safety-related calculation to evaluate the functionality of the concrete walls. This calculation supersedes

Calculation No. SD-000221-005.

This is not a design basis calculation.

2.0 DESIGN INPUTS

1. The layout of the fan-accumulator rooms, radial wall dimensions, design reinforcing, and opening sizes are obtained from refs. 9 through 12. See item 7 below.

2. The applicable design loads and load combinations are as identified in Sections 5.2.2.3 and 5.2.2.4 of the UFSAR (ref. 8).

3. The subcompartmental pressure due to a main steam line break in a fan-accumulator room and due to LOCA is as determined by Westinghouse from a TMD analysis, as shown in Attachment B per ref. 15 and in given in ref. 27.

4. The seismic response spectra are obtained from ref. 7.

5. Requirements for the evaluation of shear-friction capacity at elevation 638'-0" of the walls are obtained from Section 11.7.4.3 of ACI 349-97 Code (ref. 6). Although the licensing basis is the ACI 318-63 Code (ref. 5), the shear friction approach to transfer shear loads across planes of dissimilar materials is not contained in the ACI 318-63 Code (ref. 5). Therefore, use of the latest edition of the concrete code, ACI 349-97 (ref. 6), is acceptable.

6. The design concrete compressive strength for the concrete structures adjacent to these walls is obtained from Calculation No. SD-990513-004 (ref. 13) and Calculation No. SD-990909-003 (ref. 14). Although these calculations are currently restricted, they were reviewed for use in determining the adequacy of these walls and this review is documented in Attachment 2.

7. The walkdown information, showing wall attachments, penetrations and concrete pockets and joints is presented in Attachment A and CR P-00-02506 (Ref. 3).

8. The vertical tensile and compressive forces imposed on these radial walls from the slab above is obtained from Calculation No. SD-990909-008. This calculation is currently restricted because the required modification has not yet been performed. The calculation was reviewed and it was found that the

restriction does not affect the forces imposed on these radial walls. This is documented in Attachment 2.

9. The results of re-bar mapping (spacing and cover) is presented in Attachment E. CR P-00-02506 provides information for bars at the top of the wall at azimuth 126-degree.

3.0 REFERENCES - Omitted - Refer to reference calculation for these details

4.0 METHODOLOGY

The methodology for this calculation is outlined below:

4.1. Layout/Configuration

Review refs. 9 through 12 to determine the layout/configuration, radial wall dimensions, reinforcing, and sizes of openings in the walls of the fan accumulator rooms in the Containment Building. Review Attachment A and CR P-00-02506 for the 'as-built' information gathered through field walkdown. Review Attachment E for rebar in-situ spacing and cover. Additional as-built data is included in DITs DIT-B-01198-00 & DIT-B-01198-01.

4.2. Loads

Review UFSAR Sections 5.2.2.3 and 5.2.2.4 and determine the loads and load combinations applicable for the structural functionality evaluation of the fan-accumulator room radial walls.

a. Dead Load

The effects of the dead load (and vertical seismic excitation) of the wall are ignored in this evaluation since the critical bending moments and shear forces in the radial walls are due to loads in the horizontal direction such as pressure and horizontal seismic excitation. The dead load contribution to these shear forces and moments will be negligible.

b. Accident Pressure

- The pressure load on the fan-accumulator room walls due to a main steam line break will be based on the pressure loads from the subcompartment pressure time-histories in the fan-accumulator room from the recent Westinghouse TMD analysis (ref. 15 & 27) for a main steam line break. The time-history of the differential pressure on the fan-accumulator room radial walls and the corresponding dynamic load factor (DLF) will be considered to compute the equivalent

static differential pressure on the walls.
- The pressure load on the fan-accumulator room walls due to LOCA will be based on Reference 30. The peak differential pressure is 6.5 psi, and the differential pressure is always acting from the fan-accumulator rooms per Reference 30. Thus it is conservative to use the pressure identified in UFSAR Section 5.2.2.3 as the differential pressures across these walls. These UFSAR pressures are: for LOCA P = 12 psi, and for unsymmetrical LOCA pressure U. P. = 8 psi.
- The evaluation of the ice condenser slab above this wall at EL. 640'-0" has considered some of these walls to support part of the vertical load from the slab, due to the design basis accident (LOCA) and MSLB, which would act as a compressive or tensile force on these walls. Because the compressive forces in the walls due to this load are relatively small compared to the size of the wall, these compressive forces would increase the moment capacity of the vertical span of the walls and the capacity of the top joint to carry loads through shear-friction. Therefore, these compressive forces will be conservatively ignored. However, the effect of the tensile forces, which reduces the capacity of the wall, will be considered in this calculation.
- The pressure load on the crane wall causes tension in these walls. The effect of this tension on the wall will be conservatively calculated neglecting the membrane effect of the crane wall to show that they are small.

c. Thermal Load

The effects of thermal load on the fan-accumulator room walls are not considered in this evaluation for the reasons explained below:

- These walls are not lined with a steel plate; therefore, restrained liner thermal expansion loads (T' and TL') do not apply.
- The thermal conductivity of concrete is low and by the time the concrete heats up, the accident pressure reduces substantially. Therefore, only normal operating thermal gradient across the wall is concurrent

with the accident pressure load. Per ref. 15, the peak differential pressure across the wall is reached at 0.2 sec, and the differential pressure is less than 75% of the peak at all times after 0.6 sec.
- For further discussion of the thermal load combinations, see Section 5.2.2.3 of the UFSAR. Note that for MSLB pressure only temperature gradient for operating conditions is combined. For the accumulator room walls, the operating condition temperature gradient is insignificant.

d. Pipe Rupture Loads

Per ref. 17, there are no whip restraints for the main steam lines that are attached to or in the vicinity of these walls. In addition, per ref. 25, it was identified that no jet impingement or pipe whip loads on the fan-accumulator room walls will result from the postulated Unit 2 High Energy Line Breaks (HELB). Therefore, no pipe rupture or jet impingement loads are postulated on these walls.

e. Earthquake

The following considerations apply with respect to the seismic load effects on the fan-accumulator room walls:
- For the reason explained in Step 2.a above, the effects of wall vertical self-weight seismic excitation will be ignored in this evaluation.
- The horizontal seismic acceleration response spectra at elevation 651'-0" of the crane wall from pages 268 and 308 ref. 7 will be used for the fan-accumulator room walls, which is conservative.
- Per UFSAR Table 5.2-4 (ref. 8), 2% damping for OBE and 5% damping for SSE applicable for reinforced concrete structures will be used. Use of these values is conservative because the UFSAR allows 4% and 7% damping for earthquake

loads when combined with accident loads.
- To determine the appropriate horizontal seismic acceleration of the walls, the frequency of the walls will be computed using the average of the gross-section and cracked-section moments of inertia.
- To account for additional weight from wall attachments, a load of 100 psf will be considered along with the self-weight

excitation of the wall.
- For structural evaluation, the envelop of the seismic forces computed for the walls at azimuths 54-degree, 126-degree, 234-degree, and 307-degree will be conservatively used for all the walls.

4.3 Load Combinations

Based on the above considerations, the load combinations of UFSAR Section 5.2.2.3 that are applicable for this evaluation are as follows. These load combinations have been simplified to omit loads which do not apply or have a negligible effect on these walls. It should be noted that although these combinations are developed for the Containment (pressure boundary), the same combinations will be used for these walls, as the walls at azimuths 54 and 126 degrees are considered to be a part of the divider barrier:

(a).	1.5 P	P = pressure due to DBA (LOCA)
(b).	1.25 P + 1.25 E	E = loads due to OBE
(d).	1.0 P + 1.0 E'	E' = loads due to DBE
(g).	U. P. + E'	U.P. = unsymmetrical LOCA press.
(i).	1.5 P1	P1 = pressure due to MSLB

For load cases (a) and (i), the maximum permissible load factor will be determined in the calculation.

4.4 Material Properties

a. Reinforcing Steel

Yield strength, fy = 40 ksi. Per ref. 5, this is the minimum yield strength for reinforcing steel allowed by the code. Note that 40 ksi will be used in this calculation even though reference 13, based on actual CMTRs for Unit 1 and Unit 2, shows that the actual yield strength is greater than 44 ksi with a 99% confidence level.

b. Concrete and Grout Strength

(i) In-Situ Concrete

Except for the localized weaker concrete/grout near elevation 638'-0" for walls at azimuth 126 and 307, concrete compressive strength of 5,300 psi will be used. This 5,300 psi value is based on cylinder test data for the Unit 1 and Unit 2 crane wall, slab at elevation 640' and for the four accumulator room walls. The minimum specified 28-day compressive strength of the concrete is 3,500 psi. The justification for the use of 5,300

psi is as follows:

- A concrete compressive strength of 3,500 psi was used during the design stage of the walls prior to actual construction. The concrete cylinder test data for the upper crane wall for Unit 1 yields an actual 28-day strength of 4,385 psi based on ACI 318-95 (ref. 4) methodology to compute design strength from cylinder test data. The ratio of the 28-day and 90-day test data based on 4 cylinder tests was determined to be 1.22 (ref. 13). For Unit 2, the computed 28-day design compressive strength was 4,346 psi (ref. 13). No 90-day test data is available for Unit 2. This 4,346 psi 28-day strength when adjusted to 90-day data based on the Unit 1 90-day to 28-day ratio yields a 90-day design strength of 5,298 psi for Unit 2 (ref. 13). The corresponding design compressive strength based on the cylinder tests for slab at elevation 640'-0" (the ice condenser support slab) was computed as 5,800 psi (ref. 14). The accumulator room walls are attached to the crane wall and the slab at Elevation 640'-0".

- For the Unit 2 accumulator room walls, 20 cylinders tests were performed (ref. 23). This accumulator room wall specific test data yields a 28-day compressive strength of 4,867 psi (see section 7.2). This value, when adjusted to the 90-day strength based on the Unit 1 28-day and 90-day test data, results in a 90-day strength of 5,930 psi.
- UFSAR change 99-UFSAR-1271 (ref. 28) has been initiated to document the use of the 90-day test results in determining the design compressive strength.
- The ultrasonic wave velocity measured in the in-situ concrete for wall at azimuth 307 was approximately 14,000 ft/second. The corresponding concrete strength has been estimated to be in the 3,700 psi to 7,000 psi range (see attachment E). The 3,700 psi value is for concrete with river run gravel as the coarse aggregate and the 7,000 psi value is for high strength concrete with crushed stone aggregate. The coarse aggregate used for the accumulator

room wall is 1" Dolomite (ref. 23). Therefore, the 5,300 psi value is consistent with the ultrasound data.

(ii) Grout at Top of Azimuth 307 Wall

The walkdown (ref. 3) identified localized areas of the concrete near elevation 638'-0" that are different than the in-situ concrete. The examination of these areas (ref. 3) revealed grout that was placed subsequent to the original concrete pours. Three core samples and subsequent tests (ref. 24) yield compressive strengths of 1280 psi, 1770 psi and 4380 psi. Reference 24 also notes the locations of the core samples. Thus, 1000 psi compressive strength will be conservatively used in this calculation.

(iii) Grout at Top of Azimuth 126 Wall

As stated in CR P-00-00610, pockets of concrete at the top of the wall along azimuth 126 degrees were left ungrouted. Condition Report P-00-02506 documents poor quality of grout/concrete near the top of the wall in addition to the concrete pockets identified in the CR P-00-00610. Design Change Package 2-LDCP-4621 and AR A0201632 were issued to grout the pockets and the excavated portions of the grout. The extent of the repair with the new grout is shown in Attachment A (page A13). The minimum strength of the new grout is conservatively considered to be 2500 psi. Based on ref. 24, the minimum 28 day strength of the new grout is in excess of 8000 psi. The previously existing grout is not used to resist any load.

4.5 Analysis/Evaluation

a. Analysis of actual location and depth of mapped reinforcing bars

The location and depth of the reinforcing bars was determined using a detection device in critical areas of the wall which were accessible. A summary of the bar spacing and depth determined using the detection device will be provided and the effects of variance in bar spacing and depth with the design dimensions will be evaluated.

b. Boundary conditions

The walls are rigidly tied to the crane wall and the slab below, and free on the containment

wall side. Because of the discrepancies identified in the CRs, the connection to the slab above can not be considered to transfer moments across the connection for walls at azimuth 126 and 307. Therefore, the connection of the wall to the slab above will be considered pinned and only be checked to transfer shear across the connection. Per ref. 12, the vertical reinforcing through this connection extends 1'-9" into the concrete above and is continuous through the wall below. Any reductions due to insufficient development length of the reinforcing will be considered.

c. Wall Span and Load Path

1. Simplified Analysis

The walls have the capability to span in the horizontal direction as a cantilever and in the vertical direction with varying boundary conditions (fixed-fixed beam at azimuths 54 & 234, and as fixed-pinned beam (at azimuth 126 & 307). For azimuths 54, 126, & 234, the wall will conservatively be analyzed to span only in the horizontal direction as a cantilever. For azimuth 307, the wall will conservatively be analyzed to span only in the vertical direction as a fixed-pinned beam. However, because of the discontinuity in the horizontal direction due to the opening near the top of the walls at azimuths 54 & 126 degrees, the portion of the wall next to the opening (towards the containment wall) for these walls will be considered to be supported by the span in the vertical direction as a fixed-pinned beam.

2. Wall Flexural Analysis Using Yield-Line Method

The yield-line method is used to determine the wall capability to resist the pressure in flexure. For walls at azimuths 54, 126, and 307, the flexure analysis of the wall using this method conservatively considers no support at the top of the wall (free edge). The yield-line method is consistent with Section 14.4.2 of the UFSAR for pressure loads resulting from pipe rupture.

3. Wall Shear Resistance

The shear analysis of the wall considers shear support from the continuous bars

extending into the slab above using the shear-friction approach for walls at azimuths 126 and 307. The wall construction at wall to crane wall and wall to slab at the 612' slab junction for all walls is monolithic. Similarly, for walls at azimuths 54 and 234, the wall to slab construction at the 640' elevation is monolithic. Shear transfer through concrete is considered at these boundaries.

4.6 Computer Programs - Omitted - refer to referenced calculation for these details

5.0 ACCEPTANCE CRITERIA

The walls will be evaluated per the acceptance criteria contained in the ACI 318-63 (ref. 5) concrete code where applicable. Criteria which is not contained in the ACI 318-63 code, such as shear friction approach to transfer shear loads across planes of dissimilar materials, will be obtained from the latest edition of the concrete code, ACI 318-95 (ref. 4) or ACI 349-97 (ref. 6). The load combinations and load factors shall be those determined in the Methodology Section 4.0 of this calculation.

For impulsive and impactive loads, such as those resulting from a main steam line break, it is appropriate to apply a dynamic strength increase factor. Because these are not given in the ACI 318-63 code (ref. 5), these are obtained from the ACI 349-97 concrete code (ref. 6, Appendix C).

The intended function of the walls is to direct steam flow into the ice condenser during a design basis accident. The walls will be considered adequate if the calculated shears and moments are less than the wall capacities with a load factor (factor of safety) of at least 1.2 applied to the pressure load considered in this calculation.

6.0 ASSUMPTIONS AND LIMITATIONS

None

7.0 CALCULATION

7.1. Wall Rebar Cover and Spacing

The reinforcement design spacing and cover are shown on drawings 1-2-3207C & 1-2-3207D (References 11 & 12). Attachment A pages reproduce this information for easy reference. The reinforcement details, in general, can be summarized as

follows:

* Horizontal Bars

#11 @ 6" on center on the accumulator room side

#11 @ 12" on center on the instrument room or CEQ fan side

The cover for the horizontal bars is 2-3/4"

* Vertical Bars

#9 at 12" on center both faces of the wall. The bars are on the inside of the horizontal bars. Based on this, the cover is calculated to be 4-1/8".

* Openings

Diagonal bars and additional horizontal bars are provided around openings at locations shown.

CR P-99-27755 documents the discrepant concrete (grout) at the top of the accumulator room wall at azimuth 126. Condition Report P-00-02506 documents the cut bars near the wall/slab junction at the top of the wall at azimuth 126 degrees. CR 00-06586 describes the asbestos found at the wall/slab junction for the same wall. CR 00-07064 documents additional cut rebars near the containment end of the same wall. Both the cut rebar and the asbestos were found as a result of the concrete chipping to remove the discrepant concrete and to determine the location and the continuity of the rebars that extend from the wall into the slab above.

As part of the extent of condition investigation, core samples were taken from the grout at the top of wall at azimuth 307. Tests determined that the compressive strength of the grout is less than the design strength of 3,500 psi. CR 00-07391 documents this condition. The test results for the grout cores and the strength values used in this calculation are discussed in section 4.4(b) of this calculation.

As part of the same extent of condition investigation, rebar mapping (cover and spacing) was conducted on all of the 4 accumulator room walls. This mapping is summarized in attachment E (Reference 26). DIT No. DIT-B-01266-00

(Reference 33) validates the data in the report. The concrete in the grout portion of the 307 azimuth wall was chipped out at 4 locations to verify that the bars located through rebar mapping extend from the wall into the slab and that

no asbestos is present at the slab and the wall joint. No asbestos was found. In addition, all 4 bars extend from the wall into the floor. However, the concrete cover for the two bars on the accumulator side of the wall was found to be well in excess of the design basis covers (Reference 24). The rebar mapping (spacing and cover) information presented in Attachment E also documents variations in the as found covers and spacing from those shown on the design drawing.

The following is a brief description of the as-built information obtained on bars location and cover. This information, together with the design drawings (Reference 12) is used to determine the bars spacing and cover that will be used to evaluate the walls. The as-built information on bar location and cover was obtained by Construction Technology Laboratories. This information is summarized in Attachment E (Reference 26). It is to be noted, in general, that where the bar spacing and cover exceed the design values, the average of the as-built measurements will be used to evaluate the walls. This is justified since the wall strength is a function of the average cover and spacing and not individual ones.

Wall at Azimuth 54 - Accumulator No. 1

* Accumulator Room Side

The measurements for the spacing and cover are available in the areas at the top corner on the containment wall side and near the bottom corner on the crane wall side (see Attachment E).

Horizontal Bars

Spacing:

The bars are spaced at approximately 6". This is consistent with the design drawing. The 6" c/c design spacing will be used in this evaluation.

Cover:

The bars cover varies between 1.8"- 2.60" (16 measurements) with an average of 2.26". This is less than the design cover of 2.75". The cover meets the minimum 3/4" cover specified by ACI 318-63 (Reference 5). The design cover of 2.75" will be used to evaluate the wall.

Vertical Bars

Spacing:

In general, the average spacing is

approximately 12" (see Attachment E) which is consistent with the design drawing. However, in the area near the upper corner on the containment wall side of this wall, the two bars mapped are spaced at approximately 20". Due to limited accessibility, additional mapping of bars was not practical. The top of the wall is considered pinned in the analysis. Based on the wall support configuration, these bars are not in tension and the vertical bar spacing in this area of the wall is not critical. Per Reference 23, the wall was poured in three sections, the bottom 8', then 11.5' and then the top 6.5'. The top section of the walls has many penetrations (see Attachment A) and that could have contributed to the missing vertical bar.

Cover:

Based on 15 measurements, except for one reading, the maximum bar cover near the bottom left corner is 3.6". At one location, the measurement is 4.2". The average of all readings shows the cover is less than 3.5". This is less than the design cover of 4-1/8".

Based on the vertical bar spacing and cover on the CEQ fan side of this wall a spacing of 14"and a cover of 5" is used in this evaluation. This is conservative compared to the mapped information as well as the design value of 12" and 4-1/8" respectively.

* CEQ Fan Room Side

The measurements are available in three areas on the crane wall side (see Attachment E).

Horizontal Bars

Spacing:

The bars are spaced at less than 12" and in some areas close to 6". The reinforcement provided exceeds that specified on the design drawing (12" spacing).

Cover:

The bars cover varies between 1.8"- 2.60" (23 measurements) with an average of ~2.0". This is less than the design cover of 2.75". The cover meets the minimum 3/4" cover specified by ACI 318-63 (Reference 5).

For both the spacing and cover, the design value of 12" and 2.75", respectively, will be used to evaluate the wall.

Vertical Bars

Spacing:

On average, in the bottom half of the

wall, the bar spacing is approximately 12". This is consistent with the design drawing. As for the top half of the wall, the spacing is approximately 13" based on mapped information at elevation 629'-0". The wall was poured in three pours (Reference 23). Thus 14" spacing will be used for this evaluation.

Cover:

For 13 out of 17 measurements, the maximum cover is 3.6". This is less than design value of 4-1/8". In the bottom area near the crane wall, the cover measurements are 4.8", 4.8", 4.8" and 5.3". These measurements are in the tapered portion of the wall. The average cover is approximately 4.93". Based on the above, an average cover of 5.0" will be conservatively used in the analysis. In the calculation of the moment capacity at the base of the wall for the yield line analysis, the reinforcement on both sides of the wall will be utilized. It is conservative to use the minimum cover for the reinforcement on the compression side of the wall. Therefore, based on the as-built information, the minimum cover of 2.8" will be used for determining the wall moment capacity.

Wall at Azimuth 126 - Accumulator No. 2

* Accumulator Room Side

The measurements for the spacing and cover are available in the areas at the top and near the middle part of the wall on the crane wall side (See Attachment E). Attachments and accessibility limited the ability to perform mapping in additional areas for the walls.

Horizontal Bars

Spacing:

The bars are spaced at approximately 6". This is consistent with the design drawing.

Cover:

The bar cover in the tapered portion of the wall (first 4' from the crane wall) at 11 locations varies between 5.6"- 6.4". The average of these measurements is approximately 6.1". Conservatively use 6.25" for the tapered portion of the wall evaluation.

The bar cover in the straight portion of the wall at 10 locations varies between 4.1"- 5.8". The average of these measurements is approximately 4.6". This value

exceeds the design value and will be used in the wall evaluation.

As shown on drawing 1-2-3207D (Ref. 12), in the tapered portion of the wall, the dowels out of the crane wall will govern the cover. Thus, using a different cover for the tapered and the straight portion of the wall is justified.

Vertical Bars

Spacing:

In general, the average spacing for mapped bars is approximately 12" which is consistent with the design drawing.

Cover:

The maximum cover is 4.6". This is greater than the design cover of 4-1/8". A cover of 4.6" will be conservatively used in the wall evaluation.

* CEQ Fan Room Side

The measurements are available in two areas of the wall. One set is near the upper right corner and covers the top 1/3 of the wall (pour #3) and the second set covers the bottom 2/3 of the wall (pours 1 & 2).

Horizontal Bars

Spacing:

On average, the bar spacing is less than 12". This is consistent with the design drawing (Ref. 12). 12" spacing will be used for the wall evaluations.

Cover:

The bars cover varies between 1.5"-2.0" (22 measurements) in the bottom 2/3 of the wall and 2.3"-3.7" (4 measurements) for the top 1/3. The design cover is 2.75". The lower covers are within ACI 318-63 provisions. Based on the measurements on the accumulator side, conservatively, a 4.6" cover will be used in the wall evaluation.

Vertical Bars

Spacing:

On average, the bar spacing is less than 12" specified on the design drawing (Ref. 12). 12" spacing will be used in the wall evaluation.

Cover:

On average, the bars cover is less than 3". This is less than the 4-1/8" cover specified on the design drawing (Ref. 12). Based on the measurements on the accumulator side of the wall, conservatively, a 4.6" cover will be used in the wall evaluation. In the calculation of the moment capacity for the bottom half of the wall for the yield line analysis, the reinforcement on both sides of the wall will be utilized. It is

conservative to use the minimum cover for the reinforcement on the compression side of the wall. Therefore, based on the as-built information, the minimum cover of 2.5" will be used for determining the wall moment capacity.

Wall at Azimuth 234 - Accumulator No. 3

* Accumulator Room Side

The measurements for the spacing and cover are available in the areas at the top and bottom corners on the containment and crane wall sides respectively (see Attachment E).

Horizontal Bars

Spacing:

The bars are spaced at approximately 6" or less. This is consistent with the design drawing. The design spacing of 6" will be used in the wall evaluation.

Cover:

The cover in the area near the upper right corner of the wall (< 2' from the containment wall) varies between 4.2"-7.8". This area is located far from the critical section of the wall. For the near face bars, the critical areas are along the crane wall and along the bottom boundary. Thus this cover is not critical.

Near the crane wall, the cover measurements are 4.6" and 5.1" at the top and 3.8", 3.9" and 4.0" at the bottom. The average cover in the two areas is 4.3". The average cover of 4.3" will be used for the wall evaluation.

Vertical Bars

Spacing:

Near the top, the bar spacing is less than 15". Near the bottom, the spacing is less than 12". This is consistent with the design drawing. A 15" spacing will conservatively be considered in the wall evaluation.

Cover:

The cover near the top varies between 4.4"-6.6" (7 measurements). The average is approximately 5.2". Near the bottom, the cover varies between 2.1"-4.7" (9 measurements). The average is approximately 3.33". Conservatively use 5.2" cover for vertical bars for the wall evaluation.

* Instrument Room Side

The measurements are available in two areas near the top and bottom of the wall (Attachment E). Other areas are not available for mapping due to the attachments to the wall or due to accessibility.

Horizontal Bars

Spacing:

On average, the bar spacing at the top is approximately 6". This is significantly smaller than the design spacing of 12". Near the bottom of the wall, on average, the spacing is approximately 12". The design spacing of 12" will be used for the wall evaluation.

Cover:

Near the top, the bars cover varies between 1.9"-2.3". This is less than the design cover of 2.75". The cover meets the minimum 3/4" cover specified by ACI 318-63 (Reference 5). Near the bottom, the cover varies between 2.9"-4.3" (7 measurements) with an average of 3.7". This exceeds the design value. Based on the mapping of the rebars on the accumulator side of the wall, a cover of 4.3" will be used in this evaluation.

Vertical Bars

Spacing:

On average, the bar spacing is less than 12". This is consistent with the design. However, based on the spacing on the accumulator side of the wall, a 15" spacing will be used in this evaluation.

Cover:

The bars cover varies between 1.1"-2.3". This is less than the design cover of 4-1/8". The cover meets the minimum 3/4" cover specified by ACI 318-63 (Reference 5). Based on the spacing on the accumulator side of the wall, a 4.3" cover will be used in this evaluation.

Wall at Azimuth 307 - Accumulator No. 4

* Accumulator Room Side

The measurements for the spacing and cover are available in the areas at the top and bottom corners on the crane wall side (see Attachment E). This wall was poured in two sections. First up to the slab at elevation 626-101/2" and the second above elevation 626'-101/2".

Horizontal Bars

Spacing:

The bars are spaced at approximately 6". This is consistent with the design drawing. The design spacing of 6" c/c will be used in the wall evaluation.

Cover:

In the area above the slab at elevation 626'-101/2", the cover in the top three feet varies between 5.3"-6.5" (4 measurements). The average cover is approximately 5.7". For the remaining height

above elevation 626'-101/2", the cover varies between 2.2"-3.3" (12 measurements). The average cover is 2.74". The 5.7" average cover will be conservatively used in the wall evaluation.

In the area below the slab at elevation 626'-101/2", measurements are provided along three vertical strips. The strip farthest from the crane wall has the smallest cover. The middle strip measurements vary between 2.7"-4.2" (14 measurements). The average cover is approximately 3.1". The strip closest to the crane wall measurements vary between 2.5"-3.1" (5 measurements). The average cover is approximately 2.96".

The average 5.7" cover for the top half will be conservatively used in the wall evaluation for the entire height.

Vertical Bars

Spacing:

Near the top, the bar spacing is less than 15". Near the bottom, the spacing is less than 12". Conservatively, 15" spacing will be used in the wall evaluation.

Cover:

In the top area, two sets of measurements are provided. Six measurements within the top 30" vary between 3.7"-6.9". These measurements are in the tapered portion of the wall. In addition, the chipping in the grouted top of the wall covers of 8" and 10" for the two exposed vertical bars were noted. This significant variation in the cover at the top of the wall is attributed to the vertical bars being bent to accommodate slab reinforcement at the top. These bars are only considered to resist the shear in shear-friction. The cover is not critical. The second set of measurements is located between 4'-7' from the top of the wall. The measurements vary between 4.4"-4.6" (6 measurements). An average of 4.5" will be used in the wall evaluation.

In the bottom area of the wall, the cover measurements vary between 2.0"-2.6" and one measurement of 3.7" (total of 7 measurements). The 4.5" average computed for the top of the wall will be conservatively used in the wall evaluation. In the calculation of the moment capacity of the wall, the

reinforcement on both sides of the wall will be utilized. It is conservative to use the minimum cover for the reinforcement on the compression side of the wall. Therefore, based on the as-built information, an average cover of 2.0" will be used for determining the wall moment capacity.

* Instrument Room Side

The measurements are available in only the top portion of the wall. Other portion of the wall could not be mapped because of attachments or accessibility problems.

Horizontal Bars

Spacing:

On average, the bar spacing is less than 12". In some areas the spacing is close to 6". The design spacing of 12" will be conservatively used in the wall evaluation.

Cover:

The bar cover varies between 1.5"-2.4". This is less than the design cover of 2.75. The cover meets the minimum 3/4" cover specified by ACI 318-63 (Reference 5). Based on the mapping information for the accumulator side of this wall conservatively, 5.7" cover is used.

Vertical Bars

Spacing:

On average, the bar spacing is less than 12". The design spacing of 12" c/c will be used for evaluation.

Cover:

The bars cover varies between 1.5"-3.1" (16 measurements). The cover meets the minimum 3/4" cover specified by ACI 318-63 (Reference 5). Based on the mapping information for the accumulator side of this wall conservatively, 4.5" cover is used.

7.2 Determination of Design Concrete Strength Using Cylinder Test Data

Omitted - see referenced calculation for these details.

This section of the calculation provides justification for use of a design concrete strength of 5300 psi in the evaluation of the CEQ fan walls

7,3 Determination of Wall Loading

7.3.1 Determination of Wall Frequency and Seismic Loading

Omitted - see referenced calculation for these details.

This section of the calculations determines the minimum frequency of the walls and corresponding OBE and DBE accelerations.

7.3.2 Calculate Maximum Differential Pressure from TMD

Analysis

As stated in the Westinghouse TMD Analysis (ref. 15, see Attachment B), the maximum differential pressure is obtained from Figures 5 through 7 of ref. 15. Table 1 on the following page summarizes the pressure in each of the four compartments, and the maximum differential pressure between compartments. Per ref. 27 (see Attachment F), the maximum differential pressure is 13.1 psi across the walls at azimuths 54 and 126 degrees and 12.6 psi across the walls at azimuths 234 and 307 degrees.

However, a dynamic load factor associated with the differential pressure from the TMD analysis must be calculated. This is done using the S&L RSG program by inputting the time history of the calculated differential pressure. The RSG input files [dlfrsg., dlfarsg.] and input time histories [dlf.acc, dlfa.acc] are shown on the following pages, along with the plots of the time history and dynamic load factor. The RSG output files [dlf., dlfa.] are included in Attachment C. It should be noted that although the maximum differential pressure obtained from the time histories is 13.0 psi and 12.5 psi, which are slightly lower than those given in ref. 27, this slight difference does not affect the calculation of the dynamic load factor. This difference is due to digitization (for RSG run) of the plotted data from Reference 15.

The dynamic load factors are obtained from the plot by considering that the frequency of the walls is 21 Hz or greater, as calculated in Section 7.3.1. Considering 5% damping per UFSAR Table 5.2-4, the maximum dynamic load factor for azimuths 54 & 126 is 1.07 and the maximum dynamic load factor for azimuths 234 & 307 is 1.1. The maximum differential pressure load in the fan-accumulator rooms calculated from the TMD analysis would then be:

(13.1 psi)(1.07) = 14.0 psi, for the walls at azimuths 54 & 126 degrees, and
(12.6 psi)(1.1) = 13.9 psi, for the walls at azimuths 234 & 307 degrees.

Also, Section C.3.2 of Appendix C in ref. 6

requires that the resistance available for impulsive loading be 20% greater than the magnitude of any portion of the loading which is approximately constant for a time equal to or greater than the first fundamental structural period. Per the following page, the magnitude of this differential pressure is 9.4 psi (walls at azimuths 54 & 126 control). Increasing by 20% gives:

(9.4 psi)(1.20) = 11.28 psi < 12.6 psi or 13.1 psi.

Therefore, this does not control.

7.3.3 Controlling Load Combination

Omitted - see referenced calculation for these details.

This section establishes load combination (i) as the controlling (limiting) load case.

The following sections of the referenced calculation are omitted = see the referenced calculation for these details

7.3.4 Calculation of tension on wall due to pressure on the crane wall:
7.3.5 Evaluation of tension loads on walls from slab
7.3.6 Applicable Dynamic Increase Factors (DIF) per ACI 349
7.4 Analysis of accumulator wall at azimuth 54 degrees
7.4.1 Simlified Analysis
7.4.2 Analysis of Wall at Azimuth 54 Using the Yield-Line Method
7.5 Analysis of accumulator wall as azimuth 126 degress (by Accumulator #2)
7.5.1 Simplified analsysis
7.5.2 Analysis of Wall at Azimuth 126 Using the Yield-Line Method
7.6 Analysis of accumulator wall as azimuth 234 degress
7.6.1 Simplified analsysis
7.6.2 Analysis of Wall at Azimuth 234 Using the Yield-Line Method
7.7 Analysis of accumulator wall as azimuth 307 degress
7.7.1 Simplified analsysis
7.7.2 Analysis of Wall at Azimuth 307 Using the Yield-Line Method
7.8 Sensitivity of calculated load factors to rebar 'as built' depth measurements
(This section demonstrates that the maximum negative effect of an increase in bar depth by 1/2" is a 0.04 reduction in the calculated load factor. Field measurements of bar depth were determined to be accurate to within 1/2" as documented elsewhere in the calculation package)

8.0

CONCLUSION

The fan accumulator walls, which exist between elevations 612' and 638' of the Unit 2 Containment Building at azimuths 54, 126, 234, & 307, have been determined to be adequate to perform their intended functions, when considering the deficiencies noted in CRs P-99-27755, P-00-00610, P-00-02506, P-00-06586, P-00-07064, P-00-07211 and P-00-07391, and as repaired/reworked by 2-LDCP-4621 and AR A0201632.

The controlling accident pressure in the fan-accumulator rooms used in this analysis is the pressure load for the main steam line break per the Westinghouse TMD analysis (Reference 30).

Based on the reinforcing bars located by field investigation summarized in Attachment E and the 1000 psi in-situ grout strength for the wall at azimuth 307 per Ref. 24, it can be concluded that:

1) The wall at azimuth 126 is functional considering the repair/rework in 2-LDCP-4621 and AR A0201632. The load factor for MSLB pressure load was determined to be 1.21 by a conservative simplified analysis and 1.34 by the yield line methodology.

2) Based on the in-situ grout strength and in-situ rebar mapping of in the wall at azimuth 307, the wall at azimuth 307 is

functional. The load factor for MSLB pressure load was determined to be 1.29 by a conservative simplified analysis and 2.83 by the yield line methodology.

3) The walls at azimuths 54 & 234 are functional based on the in-situ rebar mapping. For the wall at azimuth 54, the load factor for MSLB pressure load was determined to be 1.36 by a conservative simplified analysis and 1.48 by the yield line methodology. For the wall at azimuth 234, the load factors are 1.25 for a conservative simplified analysis and 1.54 by the yield line methodology.

4) Review of rebar cover measurements by radar equipment against pilot hole physical measurements determined that the radar cover measurements are accurate to within 1/2". A sensitivity analysis performed showed that this 1/2" deviation would result in a 4%

reduction in margin.

The minimum load factor based on a simplified conservative analysis is 1.21 and based on yield line methodology is 1.34; thus, the fan-accumulator room walls are functional as repaired/reworked by 2-LDCP-4621 and AR A0201632.

9.0 RECOMMENDATIONS

Omitted - see referenced calculation for these details.

End of material excerpted from calculation SD-000510-003, Revision 0

SUMMARY

Calculation SD-000510-003, Revision 0 provides the technical support for establishing reasonable assurance of the operability of the subject walls under all design load conditions by taking credit for reduced load factors and as-built material strengths. All Unit 2 walls are determined to be OPERABLE but Degraded in all Operational Modes. Restoration of the fully OPERABLE status of the subject walls will rely on the resolution of the discrepancy between the license/design basis requirements specified in the UFSAR and the current plant condition.

CONCLUSION:

Based on the results of the above referenced calculation and the additional arguments provided, the Unit 2 Fan/Accumulator Walls at Azimuths 54, 126, 234, and 307 degrees are determined to be OPERABLE But Degraded in all operational Modes.

SECTION 9, RECOMMENDED CORRECTIVE ACTION:

A corrective action for the degraded condition is already addressed as Corrective Action 1 in the actions section of this condition report. Corrective Action 1 is flagged as ODE related to appropriately track the degraded condition to closure. The action is to resolve the discrepancy between UFSAR license/design requirements and as built condition of the fan/accumulator room walls in Unit 1 and Unit 2. This item has been included as CRA-01 in CR-00-03544.

The restoration of full qualification will be accomplished by updating the UFSAR to reflect the new design basis, or performing modifications of the walls to restore

full compliance with existing design basis requirements.

SECTION 10, SUPPORTING DOCUMENTATION:

Calculation SD-000510-003 (Evaluation of Fan/Accumulator Room Walls)
Technical Specification 3.6.5.9 (Divider Barrier Seal)
UFSAR Section 5.2.2 (Divider Barrier)
UFSAR Chapter 14
Design Basis Documents DB-12-CNTS and DB-12-CNTT
UCR 99-UFSAR-0850, Westinghouse Supplemental Transient Mass Distribution Analyses

END of Revision 1 to ODE for CR00-02506

System(s):

	Indiv	Team	Group	Date
Approval Assigned To:	SYLVIAA	SYLVIAA	ESY	04/13/2000
Evaluation Assigned To:	MEISTERR	DEPUYDTM	RCL	04/16/2000
Accepted By:	SYLVIAA	SYLVIAA	ESY	05/17/2000
Assigned To:	LEONARDP	SYLVIAA	ESY	05/25/2000
Ready For CDR:	WEBERG	RENCHECKM	ESY	06/01/2000
Cross Discipline Rev By:	WEBERG	RENCHECKM	ESY	06/01/2000
Approved By:	CHAC	WOODSV	OPS	06/01/2000
Evaluated By:	DEPUYDTM	DEPUYDTM	RCL	06/01/2000
Due Date:	05/21/2000			

Past Operability:

Responsible Group: NED Status: Closed

Operable: O

Operability Type:

Comments:

Calculation SD-000221-005 Revision 0 has been prepared to assess the functionality of the wall with the intent to provide a technical justification to support an operability determination. This calculation uses a reduced load factor of 1.0 (in lieu 1.5 specified in the UFSAR) and it also takes credit for the higher strength of concrete based on as-poured concrete strengths. Use of a 1.0 load factor ensures that the wall will maintain its structural integrity under the design basis loading. The calculation concludes that the subject wall is capable of performing its intended function (which is to act as a divider barrier between the Fan Compartment and the Upper Containment) even when considering the grout deficiencies. The calculation further concluded that the other 7 fan accumulator walls that do not have the grout deficiencies are also capable of performing their intended functions.

Based on results of the above calculation, it is concluded that the subject wall is acceptable for past operability.

REVISED PAST OPERABILITY EVALUATION (UNIT 2 ONLY)

There are four walls associated with this condition. The walls are located adjacent to the Unit 2 accumulators and form the end walls of the accumulator room compartment. The walls adjacent to accumulator #1 (Azimuth 54) and accumulator #2 (azimuth 126) separate the accumulator rooms from the CEQ fan rooms and as such are a portion of the divider barrier. The walls adjacent to accumulator #3 (Azimuth 234) and accumulator #4 (azimuth 307) separate the accumulator rooms from the instrument room and as such are lower containment subcompartment boundary walls.

Calculation SD-000510-003, Revision 0 has been prepared to assess the functionality (operability) of the subject walls (this calculation supersedes the previous functionality evaluation calculation SD-000221-005). Calculation utilizes reduced load factors (less than the 1.5 load factor specified in the UFSAR, but always greater than 1.0) and it

also takes credit for the actual "as-poured" strength of concrete (5300 psi) rather than the minimum strength required by the current design basis (3500 psi). The calculation concludes that the Unit 2 walls at azimuth 54, 126, 234, and 307 are capable of performing their intended function even when considering the concrete/grout/rebar deficiencies.

7a

This calculation evaluated each wall using two different methods: The Conservative Simplified Method, and The Yield Line Method. The minimum margin that was determined to exist for all walls was 1.21 for the conservative simplified method, and 1.34 for the yield line method. These results are above the minimum margin of 1.0 required for operability. The wall with the least margin is the azimuth 126 wall.

The reduction in safety margin in the calculation resulting from the use of the reduced load factor results is a discrepancy between the design requirements specified in the UFSAR and the current plant condition. However, the calculation does provide reasonable assurance that the subject walls will remain functional and will not fail under any of the postulated load conditions. The use of the reduced load factor and the as-poured concrete strength is consistent with the functionality assessments performed for other containment structures (reference the ODE for CR-99-06123).

Note that the above functionality evaluation took credit for the higher strength grout recently installed through implementation of 2-LDCP-4621 and Action Request AR A0201632 at the 126 degree wall. Consequently, the functionality of the 126 degree wall prior to the repair is not covered by the above calculation. No repair / rework was performed on the other three walls.

Evaluations based upon the as-found condition of the 126 wall indicate the wall would have performed its intended function (maintain structural integrity). The evaluation has been documented within DIT-B-01200-00, As-Found Operability Determination Related to CR-00-

2506. The wall should therefore be considered operable in the as-found condition. The conclusion of the evaluation of the as-found condition indicates the wall would have performed its intended function. The evaluation concluded the margin factor available on the load carriying capability of the wall was 1.1 in the as-found condition.

UFSAR Section 5.2.2.3 provides the design bases for the subject walls. The governing load combination is equation (i) which requires the use of a 1.5 load factor applied to a 16 psi pressure load internal to the accumulator room as a result of a main steam line break within the room. Calculation SD-000510-003, Revision 0, has been prepared using a load factor of 1.0 applied to the actual differential pressure produced as a result of a main steam line break (13.1 psi). The results of the calculation indicate the walls are not capable of withstanding a 24 psi pressure loading (1.5 x 16 psi). As such the as found condition of the wall was outside the design bases as stated within UFSAR Section 5.2.2.3, equation (i). (1)

Conclusion:
Past operability of the walls at 54, 234, and 307 degrees has been demonstrated by calculation SD-000510-003 Revision 0.

Preliminary evaluations of the as-found condition of the 126 degree wall indicates the wall was functional. The wall should therefore be considered operable in the as-found condition. The evaluation has been documented within DIT-B-01200-00, As-Found Operability Determination Related to CR-00-2506.
The 54, 126, 234, & 307 were outside their design bases in the as-found condition.

	Indiv	Team	Group	Date
Accepted By:	SENA	GLASSJ	NED	03/02/2000
Assigned To:	KOVARIKB	SENA	NED	06/02/2000
Due Date:	03/27/2000			
Ready For Approval:	KOVARIKB	SENA	NED	06/21/2000
Approved By:	KOVARIKB	SENA	NED	06/21/2000
Evaluation Assigned To:	DortSS	DEPUYDTM	RCL	06/22/2000
Evaluated By:	DORTSS	DEPUYDTM	RCL	06/22/2000

V. Reportability/Investigation

Responsible Group: RCL Status: Open

Problem Reportable: Y

Reportable Per: 10 CFR 50.73(a)(2)(ii)(B)

Comments:

REVISION 1 TO REPORTABILITY REVIEW

Engineering performed a Past Operability Evaluation on the four walls associated with the condition of poor quality grout found in the walls. Calculations were performed that evaluated each wall, and the conclusion was reached that the walls would have performed their intended function of maintaining structural integrity. However, a reduced load factor was used to verify operability of the walls. The reduction in safety margin in the calculation resulting from the use of the reduced load factor results is a discrepancy between the design requirements specified in the UFSAR and the current plant condition.

UFSAR Section 5.2.2.3 provides the design bases for the subject walls. The governing load combination requires the use of a 1.5 load factor applied to a 16 psi pressure load internal to the accumulator room as a result of a main steam line break within the room. Calculation SD-000510-003, Revision 0, has been prepared using a load factor of 1.0 applied to the actual differential pressure produced as a result of a main steam line break (13.1 psi). The results of the calculation indicate the walls are not capable of withstanding a 24 psi pressure loading (1.5 x 16 psi). As such the as found condition of the wall was outside the design bases as stated within UFSAR Section 5.2.2.3, equation (i).

The CR information was reviewed against reporting requirements for 10 CFR 50.72, 10 CFR 50.73, and plant reporting procedures, PMP 7030.001.001, "Prompt NRC Notification," and PMP 7030.001.002, "Licensee Event Reports, Special and Routine Reporting."

The condition of the four walls in containment not being capable of meeting the design pressure loading is a condition outside the design basis of the plant and is reportable under 10 CFR 50.73(a)(2)(ii)(B). This condition is specific to Unit 2. An evaluation of Unit 1 walls is planned (see CRA #3). LER 316/2000-003-00.

Steven Dort
June 2, 2000

END OF REVISION 1 TO

REPORTABILITY REVIEW

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REVISION 0 TO REPORTABILITY REVIEW

During a concrete/grouting inspection, a portion of barrier wall between the accumulator and CEQ fan rooms was found to have degraded grouting at the top portion of the wall. The extent of this degradation was such that a structural examination was necessary to determine if the wall was capable of performing its design function of separating upper and lower containment regions during certain DBA conditions.

Evaluated Criteria: 10CFR50.73(A)(2)(vi)(B) (Fabrication issue that could have prevented a safety function)
10CFR50.73(a)(2)(ii)(B) (Outside design - Subcompartment analysis)

A review of the as-found condition was conducted by Structural Engineering to determine if the wall was capable of functionally withstanding DBA conditions. For the purposes of this evaluation, a calculation was prepared which considered pressure retaining capability using a load factor of 1.0. The current license basis requires these walls to perform at a level considerably more conservative (Load factor 1.5), however, for the purposes of past operability it is acceptable to demonstrate functional capability using actual load values and as-built structural criteria.

The resulting Calculation (SD-000221-005 Rev. 0) assessed the functionality of the wall in order to provide a technical justification to support the determination of past operability. This calculation uses a reduced load factor of 1.0 and takes credit for the higher strength of concrete based on as-poured concrete strengths. The calculation concludes that the subject wall is capable of performing its intended function and that it will maintain its structural integrity under the DBA loading, even when considering the grout deficiencies. This conclusion was also applicable to the other fan accumulator walls that were potentially affected by this condition, though they do not have the same level

of grouting deficiencies.

Based on results of this calculation, it is concluded that the subject walls are capable of performing their intended functions, and can adequately preserve the safety function of the divider barrier system. As such, the threshold for reporting under the above listed criteria is not met by this deficiency.

Eval. by S. Nance 4/14/00

END OF REVISION 0 TO REPORTABILITY REVIEW

	Indiv	Team	Group	Date
Assigned To:	DortSS	DEPUYDTM	RCL	05/24/2000
Due Date:	06/01/2000			
Approval Assigned To:	DEPUYDTM	DEPUYDTM	RCL	06/02/2000
Ready For Approval:	DEPUYDTM	DEPUYDTM	RCL	06/02/2000
Approved By:	DEPUYDTM	DEPUYDTM	RCL	06/02/2000

Investigation Report:

Responsible Group: NED

Investigator: KOVARIKB

Investigation Report Due:	NED2/2000
Event Notification Due:	__/__/____
Internal Report Due:	__/__/____
Detailed Report to Station Mgr:	__/__/____
Detailed Report to Regulator:	06/28/2000

Reportability Requirement:

VI. Non-Conformance Evaluation

Responsible Group: NED

Status: Closed

Non-Conformance Eval Required: Yes

Non-Conformance Exists: Yes

Condition Report: P-00-02506
Current Status: Screened
Action Category: 3

Non-Conformance Disposition: UAI   Interim Disp.: Yes

Comments:

The Unit 2 Fan/Accumulator Room walls at Azimuths 54, 126, 234, and 307 degrees are considered OPERABLE But Degraded (see Section IV, "Operability"). Based on the evaluations contained in calculation SD-000510-003, Revision 0, the Unit 2 Fan/Accumulator Room Walls at Azimuths 54, 126, 234, and 307 degrees meet the newly calculated values for blowdown loading without exceeding allowable stress limits. The degraded condition is that these walls are subjected to the loadings from the newly calculated Transient Mass Distribution (TMD) analysis and the as-found condition of the subject walls have resulted in a required reduction of UFSAR design basis load factors to meet allowable stresses.

The evaluation in calculation took into consideration the following discrepancies:

· Poor quality grout, empty pockets that should have been grouted, and cut rebars were found in the 126 degree wall(CR 99-27755, CR00-0610, CR 00-2506). Note that the grout discrepancies at this wall have been partially repaired / reworked via implementation of 2-LDCP-4621 (see corrective action 1) and AR A0201632.

· Asbestos containing material found at the top of 126 degree wall (CR 00-6586).

· Additional cut rebars found at the top of the 126 degree wall near containment end (CR 00-7064).

· Low strength grout at the top on 307 degree wall (CR 00-7391)

· Rebar placement discrepancies found during investigations involving concrete chipping and rebar mapping efforts

The interim Use-As-Is disposition is justified based on the results of the operability evaluation and the structural calculation SD-000510-003.

Action 7 has been initiated for performance of a Use-As-Is evaluation for the discrepant conditions, as required, upon completion of design basis calculations.

	Indiv	Team	Group	Date
Accepted By:	SENA	HOSKINSM	NED	06/01/2000
Assigned To:	MEGHANIV	SENA	NED	06/01/2000
Ready For Approval:	MEGHANIV	SENA	NED	06/01/2000
Approved By:	SENA	HOSKINSM	NED	06/01/2000
Due Date:	06/11/2000			

VII. Condition Evaluation

D.C. Cook
Electronic Corrective Action Program

Condition Report: P-00-02506
Current Status: Screened
Action Category: 3

Responsible Group: NED Status: Closed

Rework Required Y
System(s) Affected: CNTMT CONTAINMENT BUILDING STRUCTURE

Affected Equipment

Equipment ID No.	Comp. Code	Manufacturer

Event	Cause	Primary	Cause Description	Group(s)

Condition Evaluation:

DESCRIPTION OF CONDITION:
This CR is initiated to document poor quality concrete in various locations near the top of the Accumulator room wall.

The subject wall is located inside containment along azimuth 126 degrees and extends between elevations 612' and 638' (18" thick wall between Accumulator #22 and Hydrogen Skimmer Fan 2-HV-CEQ-2 in Unit 2 Containment).

Note: Earlier CR 99-27755 documented poor quality of concrete at a specific location on the wall. CR 00-00610 documented the condition of insufficient grout. This CR is initiated because during repairs for resolution of the above

CRs, it was found that the poor quality of concrete extended beyond the limits noted in those CRs.

SCREENING COMMENTS:
The condition is a non conformance.

INVESTIGATIONS / COMMENTS:
An assessment of the grout / concrete quality is required in order to perform a structural evaluation of the discrepant condition. Services of Dr. James M. Doyle, a concrete expert, were sought for this purpose. Dr. Doyle is a former Sargent & Lundy (S&L) employee. During his employment at S&L Dr. Doyle earned a Level III Concrete Inspector certification in accordance with the ASME Boiler and Pressure Vessel Code Section III Division 2 requirements. In order to assess the extent of condition, the subject wall as well as 7 other walls (radial walls adjacent to the accumulators, there are 4 accumulators in each Unit) were walked down by Vijay Meghani and Dr. Doyle. The Examination Report prepared by Dr. Doyle based on the walkdown findings is included at the end of this section of the CR. From the walkdowns it was concluded that the concrete / grout deficiencies are limited to the one wall where the deficiencies were initially identified.

Pressure from a main steam line break was determined to be the most critical loading on the subject wall. Load combinations given in the UFSAR Section 5.2.2.3 require use of a load factor of 1.5 on this pressure loading. Preliminary

evaluations showed that the wall may not meet the design criteria with the specified 1.5 load factor. A new Condition Report CR 00-3544 has been initiated to investigate wall adequacy for the design basis loads.

Calculation SD-000221-005 Revision 0 has been prepared to assess the functionality of the wall with the intent to provide a technical justification to support an operability determination. This calculation uses a reduced load factor of 1.0 (in lieu 1.5 specified in the UFSAR) and it also takes credit for the higher strength of concrete based on as-poured concrete strengths. Use of a 1.0 load factor ensures that the wall will maintain its structural integrity under the design basis loading. The calculation concludes that the subject wall is capable of performing its intended function (which is to act as a divider barrier between the Fan Compartment and the Upper Containment) even when considering the grout deficiencies. For the poor quality grout in place, a very conservatively estimated strength of 1000 psi was used in the calculation as commonly used structural grouts have a significantly higher strengths of 4000 psi or more. The calculation further concluded that the other 7 fan accumulator walls that do not have the grout deficiencies are also capable of performing their intended functions.

2-LDCP-4621 has been issued for implementation for repair of the wall with deficiencies. The repair work will involve grouting the empty pockets and the chipped out areas of the wall identified under this CR as well as CR 00-0610, and CR 99-27755.

Recommended Actions
Implementation of 2-LDCP-4621 must be completed prior to Mode 4. See Action 1.

Following is the Examination Report prepared by Dr. Doyle based on the walkdown findings.

EXAMINATION OF RADIAL

WALLS

BETWEEN THE CRANE WALL AND THE CONTAINMENT WALL

AT ELEVATION 638'

I. INTRODUCTION

The four accumulator tanks in each Unit are located in the annular space between the crane wall and the outer containment wall. Next to each accumulator there is an 18" concrete wall that extends from Elevation 612" to the bottom of the Ice Condenser support slab at Elevation 638'. The walls are supported at the top and bottom edges and at the edge that joins the crane wall. The fourth edge is separated from the outer containment wall by a few inches. The gap is closed by a seal consisting of rubber strips and steel plates. The structural support condition of the edge is unrestrained. (Dwg. 1-2-3207-23, 1-2-3207A-23 and 1-2-3207D-9).

Under Job Order C-45329-01, repairs were to be made to apparently degraded concrete at the top edge of the wall between the No. 2 accumulator and the 2-HV-CEQ-2 fan room in Unit 2. The wall is located on Azimuth 126°, near Column 25. While making the repair, the in-place material was excavated to a depth of 14" without encountering sound structural concrete. Condition Report 99-27755 was written to document the anomaly. Subsequent investigations, as reported in Condition Report 00-0610, revealed that a previous modification of the top of the wall had not been completed according to Dwg. 2-3208A-3. In particular, pockets had been boxed out around the anchor bolts extending from the Ice Condenser and were thus not grouted per Sections M-5 and M-6 of the drawing. The most recent Condition Report addressing the top of the wall in question, 00-2506, was generated to document the fact that inferior quality grout/concrete exists in other areas of the top of the wall than the specific area addressed in CR 99-27755.

In order to obtain configuration details for use in evaluation of the structural capacity of the wall near the No. 2 accumulator in Unit 2 and to verify the extent of condition, the present examination was

initiated. In addition to examining the top of that wall, the top few feet of the three remaining walls near Unit 2 accumulators No. 1, 3 and 4 and the top portion of all four walls near the four accumulators in Unit 1 were examined. The examinations were conducted on February 23 and 24, 2000. The examinations were performed by V. Meghani and J. M. Doyle.

II. EXAMINATION METHODS

As stated previously, portions of the upper few inches of the wall near the Unit 2 accumulator were excavated as part of a repair Job Order. The excavation was performed on the 2-HV-CEQ-2 fan room side of the wall. Due to the excavation, more detailed information was available in that location than elsewhere.
For the remaining locations, the top 3-4 feet of each wall was visually examined on both sides of the wall. Access was provided by scaffolding, where possible, and from the tops of equipment items. In some cases, various obstructions prevented viewing at close range. In all cases, observation was possible within 15 feet of the surface of interest. Dimensions of items noted were estimated.

Where close range visual observations were possible, the surfaces were also tapped with a hammer and the sounds and rebound characteristics were utilized to support judgments regarding uniformity or variability in wall material properties.

Photographs were taken at each observation location. The photographs are included as Attachments to CR 00-2506 as follows:

Attachment A -	Unit 1 Accumulator Rooms 1, 2, 3, 4;	Date 2/24/00
Attachment B -	Unit 2 Accumulator Rooms 1, 3, 4;	Date 2/24/00
Attachment C -	Unit 2 Accumulator Rooms 2;	Date 2/23/00
Attachment D -	Unit 2 Accumulator Rooms 2;	Date 2/17/00

III. EXAMINATION OBSERVATIONS

Except as noted in the specific observations following, the top portions of the walls appeared to be in good structural condition. A condition that was found on each wall was the removal of a small portion of the upper corner, near the

containment wall. It appears that the removal was necessary to facilitate the installation of the rubber and steel barrier seal.

The following is a compilation of the items observed during the examination of the eight walls.

EXAMINATION OBSERVATION DETAILS

Unit 1

Accumulator No. 1

Fan Room Side (Col. 1-2 Sector): (Photos 32-36, Attachment A)

1. There is a steel plate, approximately 18" x 24", attached to the upper corner of the wall adjacent to the crane wall. The plate is secured by expansion anchor bolts. (See CR 99-6845).

2. There is no visual evidence of a cold joint in the in the region immediately below the bottom of the support slab.

3. When struck with a hammer, the sounds produced in the top 18" of the wall are uniform and indicate solid structural concrete.

4. There are no pockets, for anchor bolts from the Ice Condenser, visible in the wall face.

5. A small area of the wall, in the upper corner near the containment wall, appears to have been patched.

Accumulator Room Side (Col. 2-3 Sector): (Photos 11-14, Attachment A)

1. There are two pockets, for anchor bolts from the Ice Condenser, in the top 12" of the wall. One pocket is adjacent to the crane wall and appears to extend through the entire wall thickness. Cut reinforcing bars are visible at the cut surfaces of the opening. The steel plate, described in No. 1 above, is visible at the back of the pocket. (Photos 11 & 12).

2. The second pocket is near the containment wall and is approximately 6 " x 6" x 10" deep. Cut horizontal reinforcing bars are also visible on the vertical sides of the pocket. (Photo 13).

3. There is no visual evidence of a cold joint in the region immediately below the bottom of the support slab.

4. When struck with a hammer, the sounds produced in the top 18" of the wall are uniform and indicate solid structural concrete.

Accumulator No. 2

Fan Room Side (Col. 25-26 Sector): (Photos 27-31, Attachment A)

1. Three

isolated spots, that exhibit rougher texture than the remainder of the wall, appear to have about 1/2" of surface chiseled off. One spot, in the upper corner near the crane wall is painted. (Photo 28). A second spot, on the sloped section of the wall near the containment wall, is not painted. The third spot, about 8" square, is located near the containment wall and is painted. (Photo 31).

2. There are no pockets, for anchor bolts from the Ice Condenser, visible in the wall face.

3. There is no visual evidence of a cold joint in the in the region immediately below the bottom of the support slab.

4. No hammer sounding was performed due to inaccessibility.

Accumulator Room Side (Col. 24-25 Sector): (Photos 18-21, Attachment A)

1. There is a pocket for anchor bolts from the Ice Condenser, located adjacent to the crane wall. Dimensions of the pocket are approximately 10" x 12" x 4" deep. (Photo 21).

2. There is no visual evidence of a cold joint in the in the region immediately below the bottom of the support slab.

3. When struck with a hammer, the sounds produced in the top 18" of the wall are uniform and indicate solid structural concrete.

4. A light gauge channel is attached to the wall along the bottom of the support slab. The purpose of the channel is, apparently, to support a small diameter copper pipe or electrical ground line. (Photo 20).

Accumulator No. 3

Instrument Room Side (Col. 15-16 Sector): (Photos 1-3, Attachment A)

1. There is no visual evidence of a cold joint in the in the region immediately below the bottom of the support slab.

2. There is a pocket for anchor bolts from the Ice Condenser, located adjacent to the crane wall. Dimensions of the pocket are approximately 8" x 12" x 4" deep. (Photo 1).

Condition Report: P-00-02506
Current Status: Screened
Action Category: 3

Accumulator Room Side (Col. 16-17 Sector): (Photos 22-26, Attachment A)

1. There appears to be an approximately 2' x 2' patch in the wall in the upper corner on the containment wall side.

(Photos 24, 25 & 26). It appears that the patched area has not been painted.

2. In the remainder of the wall, there is no evidence of a cold joint in the wall and sounding is uniform and indicative of solid structural concrete.

3. A volume of the wall surface, approximately 15" x 18" x 1½" deep has been chiseled out to provide space for a large diameter pipe flange. (Photos 22 & 23).

4. Two large diameter pipes pass through an oval pipe sleeve. The space between the pipes and the inside of the sleeve is open all the way through the wall.

Accumulator No. 4

Instrument Room Side (Col. 10-11 Sector): (Photos 4-10, Attachment A)

1. A horizontal crack like indication is visible approximately 8" below the top of the wall.

2. Hammer strikes in the material above and below the horizontal crack indicate that the materials in the two regions are different.

3. Two large diameter pipes pass through an oval pipe sleeve. The space between the pipes and the inside of the sleeve is open all the way through the wall.

4. There appears to be an approximately 2' x 2' patch in the wall in the upper corner on the containment wall side. (Photos 4 & 5). It appears that the patched area has not been painted

Accumulator Room Side (Col. 9-10 Sector): (Photos 15-17, Attachment A)

1. A horizontal crack like indication is visible approximately 8" below the top of the wall.

2. A small portion of the wall area was cut-out apparently to facilitate seal installation.

3. There are no pockets, for anchor bolts from the Ice Condenser, visible in the wall face.

5. No hammer sounding was performed due to inaccessibility.

Unit 2

Accumulator No. 1

Fan Room Side (Col. 1-2 Sector) (Photos 1-3, Attachment B)
Accumulator Room Side (Col. 2-3 Sector): (Photos 4-6, Attachment B)

1. There is no visual evidence of a cold joint in the in the region immediately below the bottom of the support slab.

2. When struck with a hammer, the sounds

produced in the top 18" of the wall are uniform and indicate solid structural concrete.

****
Accumulator No. 2 (See Attachments C and D for photos)

Fan Room Side (Col. 25-26 Sector):

1. The top 7" of the wall does not appear to be monolithic with the Ice Condenser support slab. It appears to have been grout filled subsequent to placement of structural concrete in the remaining portion of the wall and in the slab above. Evidence of this type of construction includes:

· There is a fairly well defined line between the two materials, approximately 7" below the wall/slab interface.

· Texture of the material in the top 7" is different than in the remainder of the wall.

· The material in the top 7" contains no coarse aggregate.

2. There were several reinforcing bars exposed in the excavated areas of the top 7" of the wall:

· 2-#9 bars and 1 #6 bar, located between 12" and 30" from the crane wall are cut off 2 or 3 inches above the top of the structural concrete portion of the wall. The #9 bars are located 3 to 4 inches from the front face of the wall. The #6 bar is located approximately 8 inches from the front face of the wall.

· 2-#9 bars that appear to be continuous from the structural concrete portion of the wall into the Ice Condenser support slab. Those bars are located about 3 feet from the crane wall, have about 5" of cover and are separated by approximately 3".

· 2-#9 vertical bars and 2 #6 45o bars that are partially exposed but appear to be cut off above the structural concrete portion of the wall. Those bars are about 10" from the front face of the wall and at approximately 2 to 3 feet from the crane wall.

· 2- #6 bars, inclined at approximately 45°, extending upward to the right, are cut off just below the bottom of the support slab. The bars are located about 10" from the front face.

· 2-#11 horizontal bars extend from the crane wall across the top of the wall (7" below the bottom of the support

slab). One bar is painted.

3. In the interval from approximately 7 feet to approximately 10 feet from the crane wall, there are 6 or 7 conduits (2" or 3" in diameter) extending through the top 7" of the wall. In that region, 2-#9 reinforcing bars extend from the structural concrete portion of the wall into the bottom of the support slab. In both cases the clearance between the bars and the closest conduit is less than 1". There is no evidence of damage, such as would be expected if excavation of surrounding structural concrete had occurred, to any of the conduits.

4. Steel rectangular bar sections, approximately matching the dimensions of the shear bars shown in Sections N-7 and N-8 on Drawing 2-3208A-3 are welded to the front edges of the bottom of the two plates embedded in the bottom of the support slab near the crane wall. Plates of approximately equal width are welded normal to the ends of the rectangular section bars and extend approximately 12" into the wall. A fourth steel bar, of approximately the same width as the others is welded between the ends of the two normal bars. The assembly forms a rectangular box, which encloses the lower ends and nuts of the anchor bolts that bear against the embedded plates. The enclosed areas contained no grout.

The edge of the box located nearest to the crane wall is about 10" from the crane wall. The inner side, parallel to the wall face, extends all the way to the crane wall. There is no grout between the crane wall and the edge of the box from the front face back to the box side extension plate, a distance of about 10". In that ungrouted region, the thread end and the nut of an anchor bolt from the Ice Condenser is visible. (Photos 1-3, Attachment D).

Accumulator Room Side (Col. 24-25 Sector):

1. There appears to be a horizontal joint in the wall about 7" below the bottom of the slab. The line of demarcation is similar to that observed on the other side of the wall.

2. Sounding with a

hammer indicated a difference of material above and below the joint.

3. There is a steel plate, apparently to cover an opening, located at the top of the wall approximately in line with the inner flange of Column 25.

4. A volume of the upper 7" is blocked out with steel plates to form a pocket for 2 anchor bolts from the Ice Condenser. The pocket is about 12" in length and approximately 4" deep. It is located at the crane wall edge of the wall. (Photo 19 of Attachment C, and photos 14-15 of Attachment D).

5. No grout material had been removed on this side, therefore no other details could be observed.

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Accumulator No. 3

Instrument Room Side (Col. 15-16 Sector): (Photos 18-22, Attachment B)

1. There is no visual evidence of a cold joint in the in the region immediately below the bottom of the support slab.

2. No hammer sounding was performed due to inaccessibility.

Accumulator Room Side (Col. 16-17 Sector): (Photos 14-17, Attachment B)

1. There appears to be an approximately 2' x 2' patch in the wall in the upper corner on the containment wall side. (Photo 15). A crack like indication extends from the oval shaped pipe sleeve to the edge of the wall. Sounding with a hammer indicates different material in the patch than in the remainder of the wall.

2. In the remainder of the wall, there is no evidence of a cold joint in the wall and sounding is uniform and indicative of solid structural concrete.

3. A volume of the wall surface, approximately 18" square by 1½" deep has been chiseled out to provide space for a large diameter pipe flange. (Photos 16 & 17).

4. Two large diameter pipes pass through an oval pipe sleeve. The space between the pipes and the inside of the sleeve is open all the way through the wall.

Accumulator No. 4

Instrument Room Side (Col. 10-11 Sector): (Photos 23-25, Attachment B)
Accumulator Room Side (Col. 9-10 Sector): (Photos 7-14, Attachment B)

1. A horizontal crack

like indication is visible approximately 9" to 10" below the top of the wall.

2. Hammer strikes in the material above and below the horizontal crack indicate that the materials in the two regions are different.

3. Two large diameter pipes pass through an oval pipe sleeve. The space between the pipes and the inside of the sleeve is open all the way through the wall.

IV. CONCLUSIONS

Based on the observations made during the wall examination, the following conclusions are reached:

1. The overall structural condition of the walls is good. Deficiencies are limited in their extent as summarized in the remaining conclusions.

2. Small areas of the full thickness of the concrete walls have been removed at the upper corners, on the containment wall edge. It appears that the removal was performed in order to install the rubber and steel barrier seals. In general, the size and location of the removals near the free edge should not significantly affect the structural capacity of the walls.

In the walls near Accumulators No. 3 and 4 of Unit 1, it appears that repair patches of approximately 2' x 2' area were placed in upper corner near the containment wall. Those areas are not painted. The lack of painting implies that the patches were placed subsequent to initial construction.

3. The top few inches (from 7" to 12") of the walls near Accumulator No. 4 in Unit 1 and Accumulators No.2 and No.4, in Unit 2 were not placed monolithic with the remainder of the wall. It appears that these areas were grouted after placement of both the walls, up to the grout area, and the Ice Condenser support slab.

4. Pockets have been excavated to allow installation of through anchor bolts from the Ice Condenser. Specifically, pockets were observed in the tops of the walls near Accumulators No. 1, 2 and 3 in Unit 1 and Accumulator 2 in Unit 2.

5. A relatively small area has been excavated from the top of the wall near Accumulator No. 3 in both units. It

appears that the reason for the excavation is to allow for the installation of the flange of a large diameter pipe elbow that is located close to the face of the wall. In each case the depth of the excavation is approximately 1½". It is not likely that these removals have any significant effect on the structural capacity of the walls.

6. The walls next to Accumulators No. 3 and 4 in both units are not pressure retaining. This fact is apparent because the area between the pipes and sleeve in a pipe penetration for two large diameter pipes is completely open in each wall.

7. For purpose of structural analysis, the cross section area of grout at the top of wall near the Unit 2 Accumulator No.2, in the portion of the wall between the boxout for the center set of anchor bolts to the containment wall, is estimated to be at least 6 square feet. A conservative estimate for the compressive strength for the in-place grout is 1000 psi. According to Dwg. 1-2-3207D-9, the number of #9 vertical reinforcing bars in the same region should be 7 in each face for a total of 14. Two bars were observed in the excavated portion of that region, which is the number that would be expected based on the drawing.

ADDITIONAL INVESTIGATION / EVALUATION (ENTERED BY V MEGHANI, 5/30/00)

INVESTIGATIONS

In response to some questions raised by the NRC, additional investigation was initiated that identified further discrepancies. This Condition Evaluation was reopened to document the results of the additional investigations and evaluation.

The following is a summary of all the discrepancies identified related to the fan accumulator end walls:

· Poor quality grout, empty pockets that should have been grouted, and cut rebars were found in the 126 degree wall (CR 99-27755, CR00-0610, CR 00-2506).

These discrepancies have been described in detail above.

· Asbestos containing material found at the top of 126 degree wall (CR 00-6586).

· Additional cut rebars found at the top of the 126 degreewall near containment end (CR 00-7064).

· Low strength grout at the top on 307 degree wall (CR 00-7391 & CR 00-7254)

· Rebar placement discrepancies found during investigations involving concrete chipping and rebar mapping efforts

- Containment wall top corner of the azimuth 54 wall was chipped back resulting in the exposure of a stud for the divider barrier seal support. (CR 00-7211)

The above discrepancies were found during a very detailed investigation of the four wall in Unit 2. A detailed extent of condition evaluation is documented under Corrective Action 2. This evaluation concludes that the extent of condition in Unit 2 is limited to the discrepancies already identified above.

Corrective Action 3 has been initiated for a similar evaluation to cover Unit 1.

Condition Report: P-00-02506
Current Status: Screened
Action Category: 3

EVALUATION

Calculation SD-000510-003, Revision 0 has been prepared to assess the functionality (operability) of the subject walls. The calculation utilized reduced load factors (less than the 1.5 load factor specified in the UFSAR, but always greater than 1.0) and it also takes credit for the actual "as-poured" strength of concrete (5300 psi) rather than the minimum strength required by the current design basis (3500 psi). The calculation concludes that the Unit 2 walls at azimuth 54, 126, 234, and 307 are capable of performing their intended function even when considering the concrete/grout/rebar deficiencies.

This calculation evaluated each wall using two different methods: The Conservative Simplified Method, and The Yield Line Method. The minimum margin that was determined to exist for all walls was 1.21 for the conservative simplified method, and 1.34 for the yield line method. These results are above the minimum margin of 1.0 required for operability. The wall with the

least margin is the azimuth 126 wall.

The reduction in safety margin in the calculation resulting from the use of the reduced load factor results is a discrepancy between the design requirements specified in the UFSAR and the current plant condition. However, the calculation does provide reasonable assurance that the subject walls will remain functional and will not fail under any of the postulated load conditions. The use of the reduced load factor and the as-poured concrete strength is consistent with the methodology used in similar functionality evaluations of other containment structures (reference the ODE for CR-99-06123).

CORRECTIVE ACTIONS

· Action 1 to implement grout repair at 126 degree wall has been completed.

· Action 2 to perform an extent of condition evaluation for Unit 2 has been completed.

· Action 3 has been initiated to perform an extent of condition evaluation for Unit 1, (U1 Restart).

- Action 5 has been intiated to perform actions necessary to restore the Unit 2 walls to design bases.

- Action 6 has been intiated to perform actions necessary to restore the Unit 1 walls to design bases, (U1 Restart)

- Action 7 has been intiated to perform the Evaluation of Descrepant Condition following the completion of Action 5.

APPARENT CAUSE (Entered by B. Kovarik 6/2/00)

This apparent cause evaluation is specific to Unit 2 only.

DESCRIPTION OF CONDITION

There are four walls associated with this condition. The walls are located adjacent to the Unit 2 accumulators and form the end walls of the accumulator room compartment. The walls adjacent to accumulator #1 (Azimuth 54) and accumulator #2 (azimuth 126) separate the accumulator rooms from the CEQ fan rooms and as such are a portion of the divider barrier. The walls adjacent to accumulator #3 (Azimuth 234) and accumulator #4 (azimuth 307) separate the accumulator rooms

from the instrument room and as such are lower containment subcompartment boundary walls.

The four walls are approximately 13' wide, 18" deep and 26' tall reinforced concrete walls. The bottom of the walls are an integral structural element with the 612' elevation concrete slab. One side of the walls are an integral structural element with the crane wall. The top of the walls are attached to the underside of the ice condenser concrete floor slab at elevation 638'. The fourth side of the walls are adjacent to but not structurally attached to the containment wall. The gap between the walls and the containment wall is closed by a flexible seal. For the 54 wall and the 126 wall, the flexible seal is the divider barrier seal, which prevents bypass of the ice condenser. For the 234 wall and the 307 wall, the flexible seal is a ventilation boundary. (Reference drawing 1-2-3207)

Various issues are associated with each of the subcompartment walls as follows

	WALL			
Condition	54	126	234	307
Grout Strength		x		x
Open Pockets		x		
Cut Rebar		x		
Asbestos		x		
Rebar Location	x	x	x	x
Rebar Cover	x	x	x	x

GROUT STRENGTH

During the cosmetic repair of an apparent surface spall on the top of the 126 wall, sound concrete material could

not be found following excavation to a depth of three inches. The depth of the excavation was increase to 14" without finding solid concrete. At this point CR 99-27755 was written and an engineering review of the condition began.

It was then determined the entire top of the 126 wall was grout in lieu of concrete. Hammer testing and visual examination of the remaining Unit 2 walls identified a similiar condition in the 307 wall. In addition, to finding grout at the top of the 126 wall and the 307 wall, the grout strength was low strength. In the 126 wall, the grout strength was estimated to be approximately 1000 psi compressive strength. In the 307 wall, three core samples were taken and tested which showed strengths ranging from approximately 1280 psi to 4380 psi compressive strength. Concrete design strength is at least 3500 psi compressive strength at 28 days.

The ice condenser support structure is attached to the top of the ice condenser floor slab by groups of through bolts. The physical arrangement of the 126 wall and the ice condenser support structure resulted in these through bolts physically being located within the depth of the 126 wall. The ice condenser support through bolting is not physically located within the thickness of the 54 wall, 234 wall, or the 307 wall. This arrangement required open pockets to be created within the top of the 126 wall to physically permit installation of the through bolts. Design drawings show the open pockets to be created within the top of the 126 wall. Concrete was removed from the top of the 126 wall outside of the drawing dimensions for pockets and these open areas created within the top of the 126 wall were partially filled with apparent dry pack grout.

The 307 wall was grouted at the top due to the initial construction sequence that required the wall to be poured after the ice condenser floor slab above the wall was poured. This physical arrangement would have necessitated pouring the 307 wall

concrete to point just below the ice condenser floor slab, followed by grouting to close up the open gap between the wall and the slab. The 307 wall was poured well after the ice condenser slab to maintain a construction opening access to the lower portion of containment. The low strength of the grout is related to the use of an apparent dry pack type of grout mix. This type of grout mix makes it easy to install, but provides only limited strength.

Low strength grout is limited to the 126 wall and the 307 wall.

OPEN POCKETS

The pockets at the top of the 126 wall were created for the installation of the ice condenser support structure through bolts. The ice condenser support structure is attached to the top of the ice condenser floor slab by groups of through bolts. The physical arrangement of the 126 wall and the ice condenser support structure resulted in these through bolts physically being located within the depth of the 126 wall. The ice condenser support through bolting is not physically located within the thickness of the 54 wall, 234 wall, or the 307 wall. This arrangement required open pockets to be created within the top of the 126 wall to physically permit installation of the through bolts. Design drawings (drawing 2-3208A) show the installation of shear lugs within the pockets and then the pockets are to filled filled with grout following the installation of the through bolts. Examination of the pockets in the top of the 126 wall indicate the pockets were left open from original construction. Open pockets are limited to the 126 wall.

CUT REBAR

Vertical reinforcing bar at the top of the 126 wall was found to be cut. The cur rebars were identified near the wall to ice condenser floor slab junction. The vertical rebars found cut were physically loacted within the open pockets. These vertical rebar would have required to be cut to physically permit the installation of the ice condenser support anchorage. The vertical rebars at the

top of the walls extend into the ice condenser slab to prove structural attachment between the two elements. Excavations have been performed on both sides of the 126 wall to expose intact vertical rebars which extend into the ice condenser floor slab. The ice condenser support through bolting is not physically located within the thickness of the 54 wall, 234 wall, or the 307 wall.

Rebar mapping was performed using radar to determine the extent to which the rebar relied upon in the calculations is in place. Excavations were performed on the top of the 307 wall to confirm intact vertical rebar extended from the wall into the ice condenser floor slab. As part of the investigation of the rebar discrepancies, rebar mapping using radar was performed. Through this methodology, rebar was confirmed within the 307 wall. However, this methodology also revealed that the cover for at least two rebars is in excess of the design specified cover. Additional rebar cover and spacing issues were identified and then subsequently evaluated.

Cut rebar is limited to the 126 wall.

ASBESTOS

Asbestos blanket material was found at the top of the 126 wall during excavation of the low strength grout. The asbestos blanket material was found within the thickness of the wall at the wall to ice condenser floor slab interface over several locations along the width of the wall. Asbestos blanket material was commonly used as a fire blanket to provide protection during cutting, welding, and grinding activities during the originial construction of the plant. Visual examination of the rebar found to be cut at the top of the 126 indicates the rebar was flame cut. The shear lugs intalled within the pockets in the 126 wall were welded to the anchorage plates located within the underside of the ice condenser floor slab. The open pockets had metal plates around the periphery of the pockets to apparently function as forms during the placment of the grout. During these cutting and

welding activities, asbestos blanket would have been placed within the open pockets to protect adjacent rebars, grout and concrete. The cutting and welding of embedments within the thickness of the walls is limited to the 126 wall. Apparently, the asbestos balnket material was not removed prior to the placment of grout in the top of the 126 wall. During excavation within the 307 wall no asbestos blanket material was discovered.

Asbestos balnekt material at the wall to ice condenser floor slab interface is limited to the 126 wall.

REBAR LOCATION

During the initial excavations and radar mapping of the 126 wall, it was discovered that some of the rebars were located deeper within the wall than expected. The accessible areas at the top of the 126 wall on the CEQ fan room side were excavated to remove the low strength grout. This excavation permitted visual confirmation of the location of the rebars including the vertical bar which extends into the ice condenser floor slab. The grout was excavated at four locations on the 307 wall to confirm the vertical rebar penetrated into the ice condenser floor slab. During the intial rebar mapping, indiviudal discrepancies in the rebar location were discovered. Radar mapping to locate both vertical and horizontal rebars and their depth was performed on both sides of all four walls. The critical accessible areas of both side of all four wall were mapped. The critical areas of rebars were determined based upon review of the wall structural analysis.

The design of the walls is for
#9 rebars at 12" centers (vertical rebars)
#11 rebars at 6" centers (horizontal rebars on accumulator side)
#11 rebars at 12" centers (horizontal rebars on instrument/CEQ fan room side)

Excavation and radar mapping revealed the average rebar spacing is
Hortizontal rebars per design
Vertical rebars in most areas are per design with up to 15" spacing in limited areas.

Rebar location is related to the 54, 126, 234, and the

307 walls.
REBAR COVER

Rebar cover describes the depth of concrete from the face of the wall to the rebar.
The design of the walls is for
Horizontal rebars with 2 3/4" cover
Vertical rebars located behind the horizontal rebars with a resultant cover of 4 1/8"

Excavation and radar mapping revealed the minimum ACI cover requirements are met. The rebar mapping data provided for the development of the average maximum depth to be developed for both the horizontal and vertical rebars.

Rebar cover is related to the 54, 126, 234, and the 307 walls.

Each of the above listed issues, grout strength, open pockets, cut rebar, asbestos, rebar location and rebar cover, are non-conformances between the physical plant and the design configuration. The collective of these issues resulted in the accumulator room end walls having a structural capacity less than the design bases capacity. The design bases capacity of the walls is based upon the ability of the walls to withstand the effects of a main steam line break within the accumulator room. Evaluations of the as-found condition of the walls concluded the walls would have functioned although the walls are outside the design bases.

There are four walls associated with this condition. The four wall are a portion of the internal structure of containment. The walls are located adjacent to the Unit 2 accumulators and form the end walls of the accumulator room compartment. The walls adjacent to accumulator #1 (Azimuth 54) and accumulator #2 (azimuth 126) separate the accumulator rooms from the CEQ fan rooms and as such are a portion of the divider barrier. The walls adjacent to accumulator #3 (Azimuth 234) and accumulator #4 (azimuth 307) separate the accumulator rooms from the instrument room and as such are lower containment subcompartment boundary walls. These walls do not have specific FDB identification numbers

The non-conformances associated with the 54, 126, 234, and the 307 walls are all related to

originial construction of the Unit 2 containment. The 54, 126, 234, and 307 walls in Unit 2 containment were not constructed in accordance with the configuration control documents. The apparent cause of this condition is considered to be failure to comply with the design configuration. Contributing to this apparent cause is the apparent lack of oversight and quality control during grouting activities during the initial construction of the Unit 2 containment. The organization responsible for these activities would have been the plant construction deptarment. The plant construction department no longer exists within the plant organization. The plant construction department had the responsibility for oversight and quality control at the time of the Unit 2 containment construction to provide assurance that the physical plant configuration was assembled in conformance with the design configuration control documents including drawings and specifications.

EXTENT OF CONDITION

This extent of condition is for Unit 2. The following repesents a summary of the information provided within action 2 of this condition report.

LOW GROUT STRENGTH

The open pockets, cut rebar, asbestos blanket are only associated with the 126 wall. These issues are all associated with the physical configuration of the wall and the ice condenser floor slab embedments and through bolts. A review of the physical configuration of the remainder of the walls which interface with the under side of the ice condenser slab was conducted. The 126 wall is the only occurance of the ice condenser support structure through bolting being physically located within the thickness of a wall which interfaces with the underside of the ice condenser slab. As such the open pockets, cut rebar, asbestos blanket are only associated with the 126 wall.

The low grout strength is associated with the 126 wall and the 307 wall. Concrete at the top of the 126 wall was removed for the installation of the ice condenser support attachments. The 126 wall is the only occurance of the ice condenser support structure through bolting being physically located within the thickness of a wall which interfaces with the underside of the ice condenser slab. As such the low grout strength in the 126 wall is a result of the physical configuration of the wall.

The low grout strength at the top of the 307 wall is associated with the construction sequence of the 307 wall. Review of the concrete pouring sequence for the four accumulator room walls in Unit 2 revealed that the walls located at azimuths 54, 126 and 234 were poured prior to the pouring of the ice condenser floor slabs, which are immediately above the four walls. However, the concrete for the azimuth 307 wall was poured significantly after the ice condenser floor slab in order to provide for construction access to the lower volume of containment well into construction. This construction sequence resulted in limited access to place the concrete at the top of the azimuth 307 wall. This limited access apparently resulted in the top of the wall being filled with a grout in lieu of concrete. Thus, the cause of the poor quality grout is considered to be due to limited access for grout installation coupled with poor grout installation technique. The concrete pouring sequence was reviewed for the remainder of the containment structure to identify other areas where the construction sequence would have resulted in placement of a vertical concrete section after installation of an adjacent overlying structure. In addition to the azimuth 307 wall, this type of concrete pouring sequence occurred at the construction openings in the crane wall and the containment shell.

In 1989, a surface spall was identified on the Unit 1 containment exterior in the area of the fill for the construction opening. This discovery was documented in Problem Report 89-1108 and Inspection Report N89020, and

led to the identification of localized areas of concrete degradation in both Units, in the construction opening fill area. The degraded areas were restored with expansive grout, and the containment shells of both Units have been visually examined at approximately two year intervals since 1989. The results of these ongoing biennial inspections have indicated no further detrimental surface spalls or deterioration of the concrete in the vicinity of the containment construction openings. The construction opening in the Unit 2 crane wall has been visually examined including the top of the construction opening. The results of this visual examination indicated monolithic concrete within the crane wall construction opening. The cold joint between the top of the construction opening concrete and the remainder of the crane wall contains a hair-line crack in the coating applied to the crane wall over approximately 75% of the length of the top of the construction opening. The periphery of the crane wall construction opening would contain a cold joint due to the lengthy period of time between the placement the majority of the crane wall and the closing of the construction opening. There is no indication of lack of consolidation of the concrete at the top of the construction opening. Additionally, there is no visual indication of a grout layer at the top of the construction opening.

In summary, the low strength grout is associated with the physical configuration of the 126 wall and the 307 wall.

REINFORCING BAR PLACEMENT AND CONTINUITY

The condition of cut reinforcing bar (rebar) has been determined to be limited to the azimuth 126 wall. This determination was based on a review of design details and the construction sequence for the walls.

The condition of variations in rebar placement is conservatively considered to be present in each of the accumulator room walls. This approach was taken based on a combination of information obtained during

excavations, radar mapping and confirmatory drilling of the walls.

Investigations have included both intrusive and non-destructive verification of rebar locations in each of the four accumulator room walls. While the intrusive activities have been localized along the top edges of the azimuth 126 and

307 walls, significant areas of the accessible portions both sides of the four walls were also examined using non-destructive impulse radar testing methods.

Deviations in rebar placement were identified in each of the four accumulator room walls. However, cut rebars were identified only in the azimuth 126 wall. A review of the structural drawing (Drawing No. 2-3208A) for the walls indicates that the azimuth 126 wall configuration is the only location where the ice condenser lower support structure is located directly on the top of the wall. The bottom of the ice condenser support has a base plate with several anchor bolts. The installation of these anchor bolts required pockets to be excavated and also required vertical rebar to be cut. The remaining walls do not have an interference issue and thus cut rebars would not be expected in these walls. Radar mapping of other accumulator room walls did not reveal evidence of additional discontinuous rebar. Additional evaluations completed to determine the extent of condition include extensive reviews of construction photographs, diagrams, and quality control reports. The analysis for the four accumulator room walls includes the structural impact of the mispositioned reinforcing identified as a result of these review efforts.

The physical orientation of the forming and the construction process for concrete walls creates an increased potential for variations in the placement of the reinforcing. The spacing and cover for the reinforcing bars is significant in the structural analysis of relatively thin walls which are subjected to differential pressures. Horizontal concrete elements are inherently easier to

install and verify placement of reinforcing bars.

The other containment structural elements which are similar to the four accumulator room walls are the steam generator enclosure walls, the pressurizer enclosure walls, the primary shield wall, and the crane wall. Each of these structures is significantly thicker than the four accumulator room walls. This increased thickness reduces the significance of mispositioned reinforcing. Any reduction in structural strength from mispositioned reinforcing bars in these structures would be offset by the inherent conservatism in the associated construction and analyses techniques. This has been confirmed in the case of the steam generator enclosures. During the Unit 2 steam generator replacement misplaced rebars were identified. An evaluation of the as-found condition was completed and the results are presented in calculation DC-D-3195-185-SC. The evaluation determined that the enclosures were adequate, and the results of this evaluation were accepted by the NRC.

In summary, instances of cut rebar have been determined to be associated with an unusual interference problem that appears only with the azimuth 126 wall. Inspections, walkdowns and radar mapping provide assurance regarding the extent of condition regarding rebar misplacement, and variations have been accounted for in the affected structural calculations which demonstrate operability.

ADDITIONAL CONSIDERATIONS

As part of this extent of condition report, additional reviews were performed to provide a perspective on the quality of structural construction activities. These included:

Concrete design requirements and construction methodology

Reviews of data on concrete mixes and their strengths

Applicable design codes and specifications requirements

Relevant correspondence between the NRC and AEP

Containment system readiness reviews

The design of reinforced concrete for Cook Plant utilized the requirements of ACI 318-63

(Building Code Requirements for Reinforced Concrete). Structural Steel designs utilized AISC-63 (Manual of Steel Construction). Therefore, the plant design employed appropriate codes applicable to the period in which the plant was designed and constructed. These design requirements were implemented through specifications and procedures.

Construction records pertinent to the four accumulator room walls were reviewed. Specifically concrete pour records indicated that compressive strength exceeded specified strength requirements for the concrete.

A review was conducted of licensing correspondence related to concrete structures from the plant construction period. This included review of inspection reports and SERs. These reviews indicated that the quality control system for mixing, placement and control of concrete materials were adequate and properly implemented.

Finally, a re-review of issues pertaining to concrete, which were examined during the recent system readiness reviews, was conducted. This included review of Action Requests and Condition Reports which included key words "concrete" and "grout". This supplemental review indicated that in the past, there have been select, isolated instances of damaged or degraded concrete. However, these conditions taken collectively, do not indicate a generic issue with the quality of concrete structures.

In summary, the findings from these supplemental evaluations did not reveal generic concerns relating to non-conformances with or the integrity of containment structures.

CONCLUSIONS OF UNIT 2 EXTENT OF CONDITION REVIEW

1. Based on a combination of visual inspection, testing and review of design details and construction sequence for accumulator room walls and for other portions of containment, the issues related to missing and low strength grout are concluded to be locally confined to the conditions observed at the top of the azimuth 126 and azimuth 307 walls. Corrective actions have been

implemented for these walls.

2. Instances of cut rebar have been determined to be associated with the unusual interference problem that appears only with the azimuth 126 wall. Inspections, walkdowns and radar mapping provide assurance regarding the extent of condition regarding rebar misplacement, and variations have been accounted for in the affected structural calculations which demonstrate operability.

3. Based on the unique cutting and grinding operations for the azimuth 126 wall, and on the normal construction practices which did not include the use of asbestos blankets other than as a fire blanket, the condition of a blanket at the top of the wall is considered to be limited to the azimuth 126 wall. The mat material has been removed from the azimuth 126 wall, which resolves this condition.

4. Reviews of information related to structural design requirements, construction practices and results support a conclusion that containment structures were designed and installed to appropriate requirements, and structures are capable of performing their intended functions.

UNIT 1 EXTENT OF CONDITION REVIEW

The Unit 1 extent of condition review is being tracked by condition report CR 00-02506 Action 3.

SAFETY SIGNIFICANCE

The past operability review of this condition resulted in the conclusion of the accumulator room end walls at azimuth 54, 126, 234, and 307 would have performed their intended function. However, the the accumulator room end walls at azimuth 54, 126, 234, and 307 were outside their structural design bases in the as-found condition. The as-found condition of the accumulator room end walls at azimuth 54, 126, 234, and 307 did not impact radiological, industrial, or personnel safety. The as-found condition of the the accumulator room end walls at azimuth 54, 126, 234, and 307 is not considered to be a maintenance rule functional failure based upon the conclusions of the past-operability review.

The regulatory significance and

potential for outside agency notification is contained within the reportability review section of this condition report.

APPARENT CAUSE

The non-conformances associated with the 54, 126, 234, and the 307 walls are all related to originial construction of the Unit 2 containment. The 54, 126, 234, and 307 walls in Unit 2 containment were not constructed in accordance with the configuration control documents. The apparent cause of this condition is considered to be failure to comply with the design configuration. Contributing to this apparent cause is the apparent lack of oversight and quality control during grouting activities during the initial construction of the Unit 2 containment. The organization responsible for these activities would have been the plant construction deptarment. The plant construction department no longer exists within the plant organization. The plant construction department had the responsibility for oversight and quality control at the time of the Unit 2 containment construction to provide assurance that the physical plant configuration was assembled in conformance with the design configuration control documents including drawings and specifications.

Based upon discussions with personnel who were in the Unit 2 plant construction staff, grout was not routinely used as structural grout during the construction period of Unit 2 containment. Grout was typically used for cosmetic or non-structural repairs of concrete elements during the Unit 2 plant construction period. As such, the level of oversight and quality control associated with grout placment would have been significantly less rigorous than for placment of concrete structural elements.

CORRECTIVE ACTIONS

Physical Corrective Actions Completed

2-LDCP-4621 has been completed to fill the open pockets and low grout strength excavation areas with high strength grout in the 126 wall. The excavation areas and core bore areas in the 307 wall have been filled with high

strength grout. 2-LDCP-4621 is currently in the Returned To Operations status. This physical work was completed with Job Orders C57018 and C45329 which are currently in the HISTORY status.

Analytical Corrective Actions Completed

Structural Analysis, SD-000510-003, revision 0, Evaluation of Fan-Accumulator Room Walls has been completed and approved. This calculation demonstrates adequate structural function of the 54, 126, 234, and 307 Unit 2 accumulator room walls. The current physical configuration of the 54, 126, 234, and 307 Unit 2 accumulator room walls was used as input to this analysis. SD-000510-003, revision 0, provides the basis of the Operability Determination Evaluation ODE contained within this condition report. The ODE for the 54, 126, 234, and 307 Unit 2 accumulator room walls has been approved.

Corrective Actions Planned

Extent of condition evaluation for Unit 1 is tracked by action 3 of this condition report. Action 3 is the responsibility of NESD and will be completed prior to Unit 1 Restart. (CR 00-02506 Action 3)

Restoration of the 54, 126, 234, and 307 Unit 2 accumulator room walls to design bases is tracked by action 5 of this condition report. Action 5 is the responsibility of NESD and will be completed prior to the completion of the next refueling outage for Unit 2. (CR 00-02506 Action 5)

Restoration of the 54, 126, 234, and 307 Unit 1 accumulator room walls to design bases is tracked by action 6 of this condition report. Action 6 is the responsibility of NESD and will be completed prior to the restart of Unit 1. (CR 00-02506 Action 6)

Perform the Evaluation of Discrepant Condition following the completion of Action 5 is being tracked by action 7 of this condition report. Action 7 is the responsibility of NESD and will be completed prior to the completion of the next refueling outage for Unit 2. (CR 00-02506 Action 7)

	Indiv	Team	Group	Date
Accepted By:	PIERRE	ARMSTRONGR	NED	02/16/2000
Approval Assigned To:	SENA	SENA	NED	04/17/2000
Assigned To:	KOVARIKB	SENA	NED	06/02/2000
Due Date:	03/08/2000			
Ready For Approval:	KOVARIKB	SENA	NED	06/03/2000
Approved By:	LEONARDP	SCHOEPFP	NED	06/03/2000
Evaluated By:	ROSSJ	MOULD	OPS	06/03/2000
Concurrence By:	WOODST	GASTONR	RCL	06/03/2000

VIII. Actions

Action: 1

Resp Group:	EMT	Status:	Closed
Orig Group:	NED	Event Code:	E3w

D.C. Cook
Electronic Corrective Action Program

Condition Report: P-00-02506
Current Status: Screened
Action Category: 3

Prop CAC: J Cause Code: YYY

Prescribed Action:

- DESCRIPTION OF CORRECTIVE ACTION:
Implement 2-LDCP-4621 for grout repair at the top edge of the Fan Accumulator Room wall located near #2 accumulator in Unit 2. The wall is located at azimuth 126 degrees. The repair under this LDCP bounds the rework / repair required for resolution of CR 00-00610, and CR 99-27755 also.

- CONCURRENCE RECEIVED FROM:
A.Sen, NESD

- NEGOTIATED DUE DATE:
U2 Restart, Mode 4

Action reassigned from NED to EPP per agreement between Dewain Forbis/NESD and Stan Thomas (J. Broadwater)/EPP. kmh 4-19-00

	Indiv	Team	Group	Date
Approval Assigned To:	SENA	SENA	NED	04/13/2000
Ready For Approval:	THOMASS	ECAPMGMT	NED	05/20/2000
Approved By:	THOMASS	ECAPMGMT	NED	05/20/2000

General:

Outage: Restart 2 - M4

Other Tracking Processes

Type	Number	Text

Documents/Devices

Document/Device	Decsription

Action Taken: Actual CAC: B4d Status: Closed
Due Date: 05/10/2000

All physical work required by 2-LDCP-4621 is complete and the associated equipment was Returned to Operations (RTO) on 5/29/2000.

D.C. Cook
Electronic Corrective Action Program

Condition Report: P-00-02506
Current Status: Screened
Action Category: 3

Indiv		Team	Group	Date
Due Date:	05/10/2000			
Accepted By:	THOMASS	BROADWATERJ	EMT	05/20/2000
Assigned To:	RUSSELLR	BROADWATERJ	EMT	05/20/2000
Ready For Approval:	THOMASS	BROADWATERJ	EMT	05/30/2000
Approval Assigned To:	BroadwaterJ	BROADWATERJ	EMT	05/30/2000
Approved By:	BROADWATERJ	BROADWATERJ	EMT	05/30/2000
Evaluated By:	AVERYP	MOULD	OPS	05/30/2000

NPM Reference

AR # JO # JOA #

AR Associated: No

OD Related: Yes Mode Constraint: 4

Unit Affected: 0

Action: 2

Resp Group:	NED	Status:	Closed
Orig Group:	NED	Event Code:	E3w
Prop CAC:	B3	Cause Code:	YYY

Prescribed Action:

DESCRIPTION OF CORRECTIVE ACTION:

Perform extent of condition review relating to the non-conformances identified within the Unit 2 accumulator room walls within CRs 99-27755, 00-02506, 00-0610, 00-3544, 00-6586, 00-7064, 00-7254, & 00-7391.

CONCURRENCE RECEIVED FROM: NESD B. Kovarik

NEGOTIATED DUE DATE: 6/02/00

	Indiv	Team	Group	Date
Ready For Approval:	KOVARIKB	SENA	NED	05/29/2000
Approval Assigned To:	SENA	SENA	NED	05/29/2000
Approved By:	KOVARIKB	SENA	NED	05/29/2000

D.C. Cook

Electronic Corrective Action Program

Condition Report: P-00-02506
Current Status: Screened
Action Category: 3

General:

Outage:

Other Tracking Processes

Type	Number	Text

Documents/Devices

Document/Device	Decsription

Action Taken:

Actual CAC: B3
Due Date: 06/07/2000

Status: Closed

ACCUMULATOR ROOM WALL
EXTENT OF CONDITION REVIEW

PROBLEM STATEMENT

Perform an extent of condition review relating to the non-conformances identified for the accumulator room walls within the Unit 2 containment, which are documented in Condition Reports (CRs) 99-27755, 00-02506, 00-00610, 00-03544, 00-06586, 00-07064, 00-07254 and 00-07391.

PROBLEM DESCRIPTION

The above listed condition reports identified the following conditions related to radial walls in the fan/accumulator rooms of the Unit 2 containment:

Grout was not present in "pockets" at the top of the wall azimuth 126° wall ("Missing Grout");

Grout strength was lower than the 3,500 psi design strength at the top of the azimuth 126° and 307° walls ("Low Strength Grout");

Reinforcing bar was found to be mispositioned within the walls and cut in one wall ("Reinforcing bar placement and continuity"), and;

Fire blanket material containing asbestos was found at the construction joint at the top of the azimuth 126° wall ("Asbestos Blanket").

DESCRIPTIONS OF THE WALLS

There are four walls designated as:

Wall at azimuth 54° (azimuth 54 wall) - This wall is adjacent to accumulator no. 1 on one side and the Containment Equalization/Hydrogen Skimmer (CEQ) Fan area (upper containment) on the other side.

Wall at azimuth 126 - This wall is adjacent to accumulator no. 2 on one side and the CEQ fan area on the other side.

Wall at azimuth 234 - This wall is adjacent to accumulator no. 3 on one side and the instrument room on the other side.

Wall at azimuth 307 - This wall is adjacent to accumulator no. 4 on one side and the instrument room on the other side.

Each of these four walls extends upward from elevation 612 feet to the bottom of the ice condenser slab at elevation 638 feet. Each of these walls also spans out radially from the crane wall toward the containment wall and stops approximately 6" short of the containment wall. As designed, each wall is

monolithically connected along three sides: (1) vertically with the crane wall; (2) horizontally with the floor slab at elevation 612 feet; and (3) horizontally at the bottom of the ice condenser slab at elevation 638 feet. The nominal thickness of each wall is 18 inches.

EVALUATION OF EXTENT OF CONDITION FOR UNIT 2

The evaluation is presented under the following three sections:

Missing and Low Strength Grout

Reinforcing Bar Placement and Continuity

Asbestos Blanket

MISSING AND LOW STRENGTH GROUT

The condition of missing and low strength grout was determined to be limited to the top of the azimuth 126 and 307 radial walls. This determination was based on a combination of visual inspection, testing and review of design details and construction sequence for the walls and for other portions of containment.

Missing and low strength grout was initially identified at the top of the azimuth 126 wall. Review of design information for the azimuth 126 wall in Unit 2 indicates that this wall was intended to be completely poured with concrete, except for areas at the top of the wall where pockets were required to facilitate installation of anchor bolts for the ice condenser lower support structure. The design drawings provided instructions to fill these pockets with grout after the installation of the anchor bolts. However, the pockets were left ungrouted. Additionally, approximately the top eight inches of the wall was filled with poor quality grout vice concrete. The apparent cause for the use of grout in place of concrete is associated with a construction requirement to accommodate installation of anchor bolts for the ice condenser lower support structure. This specific consideration is associated only with the azimuth 126 wall. Although the other three azimuthal walls had minor pockets in the top of the concrete by design to accommodate ice condenser slab support columns and divider barrier seal assembly hardware, these pockets were relatively minor and localized compared to the pockets for the anchor bolts. The cause of the poor quality grout is considered to be due to limited access for grout installation coupled with poor grout installation technique.

Low strength grout was subsequently discovered at the top of the azimuth 307 wall during reviews to determine the extent of the condition initially found at the top of the azimuth 126 wall. Review of the concrete pouring sequence for the four accumulator room walls in Unit 2 revealed that the walls located at azimuths 54, 126 and 234 were poured prior to the pouring of the ice condenser floor slabs, which are immediately above the four walls. However, the concrete for the azimuth 307 wall was poured significantly after the ice condenser floor slab in order to provide for construction access to the lower volume of containment well into construction. This construction sequence resulted in limited access to place the concrete at the top of the azimuth 307 wall. This limited access apparently resulted in the top of the wall being filled with a grout in lieu of concrete. Thus, the cause of the poor quality grout is considered to be due to limited access for grout installation coupled with poor grout installation technique. The concrete pouring sequence was reviewed for the remainder of the containment structure to identify other areas where the construction sequence would have resulted in placement of a vertical concrete section after installation of an adjacent overlying structure. In addition to the azimuth 307 wall, this type of concrete pouring sequence occurred at the construction openings in the crane wall and the containment shell.

In 1989, a surface spall was identified on the Unit 1 containment exterior in the area of the fill for the construction opening. This discovery was documented in Problem Report 89-1108 and Inspection Report N89020, and led to the identification of localized areas of concrete degradation in both

Units, in the construction opening fill area. The degraded areas were restored with expansive grout, and the containment shells of both Units have been visually examined at approximately two year intervals since 1989. The results of these ongoing biennial inspections have indicated no further detrimental surface spalls or deterioration of the concrete in the vicinity of the containment construction openings.

The construction opening in the Unit 2 crane wall has been visually examined including the top of the construction opening. The results of this visual examination indicated monolithic concrete within the crane wall construction opening. The cold joint between the top of the construction opening concrete and the remainder of the crane wall contains a hair-line crack in the coating applied to the crane wall over approximately 75% of the length of the top of the construction opening. The periphery of the crane wall construction opening would contain a cold joint due to the lengthy period of time between the placement the majority of the crane wall and the closing of the construction opening. There is no indication of lack of consolidation of the concrete at the top of the construction opening. Additionally, there is no visual indication of a grout layer at the top of the construction opening.

In summary, based on a combination of visual inspection, testing and review of design details and construction sequence for accumulator room walls and for other portions of containment, the issues related to the grout are concluded to be locally confined to the conditions observed at the top of the azimuth 126 and azimuth 307 walls. Corrective actions have been implemented for these two walls.

REINFORCING BAR PLACEMENT AND CONTINUITY

The condition of cut reinforcing bar (rebar) has been determined to be limited to the azimuth 126 wall. This determination was based on a review of design details and the construction sequence for the walls.

The

condition of variations in rebar placement is conservatively considered to be present in each of the accumulator room walls. This approach was taken based on a combination of information obtained during excavations, radar mapping and confirmatory drilling of the walls.

Investigations have included both intrusive and non-destructive verification of rebar locations in each of the four accumulator room walls. While the intrusive activities have been localized along the top edges of the azimuth 126 and 307 walls, significant areas of the accessible portions both sides of the four walls were also examined using non-destructive impulse radar testing methods.

Deviations in rebar placement were identified in each of the four accumulator room walls. However, cut rebars were identified only in the azimuth 126 wall. A review of the structural drawing (Drawing No. 2-3208A) for the walls indicates that the azimuth 126 wall configuration is the only location where the ice condenser lower support structure is located directly on the top of the wall. The bottom of the ice condenser support has a base plate with several anchor bolts. The installation of these anchor bolts required pockets to be excavated and also required vertical rebar to be cut. The remaining walls do not have an interference issue and thus cut rebars would not be expected in these walls. Radar mapping of other accumulator room walls did not reveal evidence of additional discontinuous rebar. Additional evaluations completed to determine the extent of condition include extensive reviews of construction photographs, diagrams, and quality control reports. The analysis for the four accumulator room walls includes the structural impact of the mispositioned reinforcing identified as a result of these review efforts.

The physical orientation of the forming and the construction process for concrete walls creates an increased potential for variations in the placement of the reinforcing. The spacing and

cover for the reinforcing bars is significant in the structural analysis of relatively thin walls which are subjected to differential pressures. Horizontal concrete elements are inherently easier to install and verify placement of reinforcing bars.

The other containment structural elements which are similar to the four accumulator room walls are the steam generator enclosure walls, the pressurizer enclosure walls, the primary shield wall, and the crane wall. Each of these structures is significantly thicker than the four accumulator room walls. This increased thickness reduces the significance of mispositioned reinforcing. Any reduction in structural strength from mispositioned reinforcing bars in these structures would be offset by the inherent conservatism in the associated construction and analyses techniques. This has been confirmed in the case of the steam generator enclosures. During the Unit 2 steam generator replacement misplaced rebars were identified. An evaluation of the as-found condition was completed and the results are presented in calculation DC-D-3195-185-SC. The evaluation determined that the enclosures were adequate, and the results of this evaluation were accepted by the NRC.

In summary, instances of cut rebar have been determined to be associated with an unusual interference problem that appears only with the azimuth 126 wall. Inspections, walkdowns and radar mapping provide assurance regarding the extent of condition regarding rebar misplacement, and variations have been accounted for in the affected structural calculations which demonstrate operability.

ASBESTOS BLANKET

The condition of an asbestos blanket, found at the top of the azimuth 126 wall was determined to be limited to that specific wall. This determination was based on a review of design details, construction sequence and construction records for the walls, testing of the blanket material and discussion with personnel involved with the plant construction.

Asbestos containing mat material was encountered during exploratory excavation of concrete at the junction between the azimuth 126 wall and the ice condenser floor slab. The material was confirmed to contain asbestos via testing, indicating the material was most likely a fire blanket. As discussed above, the top of the azimuth 126 wall was unique in that it required placement of pockets in the concrete, and cutting of rebar to accommodate installation of anchor bolts for the ice condenser lower support structure. Therefore, the fire blanket was apparently placed at the top of the 126 wall during cutting and grinding operations for the installation of these anchor bolts. The blanket was apparently not removed prior to the grouting activities which followed installation of the anchor bolts.

The potential that the blanket was in place for other reasons was considered and discounted. The other plausible reason for placement of a blanket at this location would be to retain moisture following pouring of concrete. Discussion with personnel involved in plant construction activities determined that burlap was typically utilized for this purpose.

Excavation performed at several points at the top of the 307° wall revealed no indications of blanket material.

A condition report analysis search was performed to locate any Condition Reports related to finding asbestos material inside structural components. There were no CRs found which identified a similar condition.

Therefore, based on the unique cutting and grinding operations for the azimuth 126 wall, and on the normal construction practices which did not include the use of asbestos blankets other than as a fire blanket, the condition of a blanket at the top of the wall is considered to be limited to the azimuth 126 wall.

ADDITIONAL CONSIDERATIONS

As part of this extent of condition report, additional reviews were performed to provide a perspective on the quality of structural

construction activities. These included:

Concrete design requirements and construction methodology

Reviews of data on concrete mixes and their strengths

Applicable design codes and specifications requirements

Relevant correspondence between the NRC and AEP

Containment system readiness reviews

The design of reinforced concrete for Cook Plant utilized the requirements of ACI 318-63 (Building Code Requirements for Reinforced Concrete). Structural Steel designs utilized AISC-63 (Manual of Steel Construction). Therefore, the plant design employed appropriate codes applicable to the period in which the plant was designed and constructed. These design requirements were implemented through specifications and procedures.

Construction records pertinent to the four accumulator room walls were reviewed. Specifically concrete pour records indicated that compressive strength exceeded specified strength requirements for the concrete.

A review was conducted of licensing correspondence related to concrete structures from the plant construction period. This included review of inspection reports and SERs. These reviews indicated that the quality control system for mixing, placement and control of concrete materials were adequate and properly implemented.

Finally, a re-review of issues pertaining to concrete, which were examined during the recent system readiness reviews, was conducted. This included review of Action Requests and Condition Reports which included key words "concrete" and "grout". This supplemental review indicated that in the past, there have been select, isolated instances of damaged or degraded concrete. However, these conditions taken collectively, do not indicate a generic issue with the quality of concrete structures.

In summary, the findings from these supplemental evaluations did not reveal generic concerns relating to non-conformances with or the integrity of containment structures.

CONCLUSIONS

1. Based on

a combination of visual inspection, testing and review of design details and construction sequence for accumulator room walls and for other portions of containment, the issues related to missing and low strength grout are concluded to be locally confined to the conditions observed at the top of the azimuth 126 and azimuth 307 walls. Corrective actions have been implemented for these walls.

2. Instances of cut rebar have been determined to be associated with the unusual interference problem that appears only with the azimuth 126 wall. Inspections, walkdowns and radar mapping provide assurance regarding the extent of condition regarding rebar misplacement, and variations have been accounted for in the affected structural calculations which demonstrate operability.

3. Based on the unique cutting and grinding operations for the azimuth 126 wall, and on the normal construction practices which did not include the use of asbestos blankets other than as a fire blanket, the condition of a blanket at the top of the wall is considered to be limited to the azimuth 126 wall. The mat material has been removed from the azimuth 126 wall, which resolves this condition.

4. Reviews of information related to structural design requirements, construction practices and results support a conclusion that containment structures were designed and installed to appropriate requirements, and structures are capable of performing their intended functions.

	Indiv	Team	Group	Date
Due Date:	06/07/2000			
Accepted By:	SCHOEPFP	HAFERD	NED	05/31/2000
Assigned To:	KOVARIKB	SCHOEPFP	NED	05/31/2000
Ready For Approval:	SCHOEPFP	HAFERD	NED	05/31/2000

D.C. Cook
Electronic Corrective Action Program

Condition Report: P-00-02506
Current Status: Screened
Action Category: 3

Approval Assigned To:	HAFERD	HAFERD	NED	05/31/2000
Approved By:	SCHOEPFP	HAFERD	NED	05/31/2000
Evaluated By:	AVERYP	MOULD	OPS	05/31/2000

NPM Reference

AR # JO # JOA #

AR Associated: No

OD Related: Yes Mode Constraint: 4

Unit Affected: 2

Action: 3

Resp Group:	NED	Status:	Closed
Orig Group:	NED	Event Code:	E3w
Prop CAC:	B3	Cause Code:	YYY

Prescribed Action:

DESCRIPTION OF CORRECTIVE ACTION:

Perform extent of condition review for Unit 1 relating to the non-conformances identified within the Unit 2 accumulator room walls within CRs 99-27755, 00-02506, 00-0610, 00-3544, 00-6586, 00-7064, 00-7254, & 00-7391. (9)

CONCURRENCE RECEIVED FROM: NESD R. Smith

NEGOTIATED DUE DATE: Prior to Unit 1 restart July 15,2000

See also Pg 69

	Indiv	Team	Group	Date
Ready For Approval:	KOVARIKB	SENA	NED	05/29/2000
Approval Assigned To:	SENA	SENA	NED	05/29/2000
Approved By:	KOVARIKB	SENA	NED	05/29/2000

General:

Outage: Restart 1 - M4

D.C. Cook
Electronic Corrective Action Program

Condition Report: P-00-02506
Current Status: Screened
Action Category: 3

Other Tracking Processes

Type	Number	Text

Documents/Devices

Document/Device	Decsription

Action Taken:

Actual CAC:
Due Date: 06/12/2000
Status: Open

	Indiv	Team	Group	Date
Due Date:	06/12/2000			
Accepted By:	KOVARIKB	SENA	NED	05/29/2000
Assigned To:		KOVARIKB	NED	06/14/2000

NPM Reference

AR #	JO #	JOA #

AR Associated: No

OD Related: No

Mode Constraint:

Unit Affected: 1

Action: 4

Resp Group:	ESY	Status:	Closed
Orig Group:	ESY	Event Code:	E3w
Prop CAC:	E	Cause Code:	YYY

Prescribed Action:

DESCRIPTION OF CORRECTIVE ACTION:
The ODE for this CR recommends OBD status. However, no compensatory actions are required to support this recommendation. Therefore, in accordance with PMP 7030.OPR.001, Revision 4, Section 2.1.7 of Attachment 5, this CRA is entered for tracking purposes only. No action is required.

CONCURRENCE RECEIVED FROM: Gary Weber

D.C. Cook
Electronic Corrective Action Program

Condition Report: P-00-02506
Current Status: Screened
Action Category: 3

NEGOTIATED DUE DATE: Not Applicable

	Indiv	Team	Group	Date
Approval Assigned To:	SYLVIAA	SYLVIAA	ESY	05/31/2000
Ready For Approval:	WEBERG	RENCHECKM	ESY	06/01/2000
Approved By:	WEBERG	RENCHECKM	ESY	06/01/2000

General:

Outage:

Other Tracking Processes

Type	Number	Text

Documents/Devices

Document/Device	Decsription

Action Taken:

Actual CAC: E
Due Date: 06/14/2000
Status: Closed

No action required. See prescribed action for details.

	Indiv	Team	Group	Date
Assigned To:			ESY	05/31/2000
Due Date:	06/14/2000			
Approval Assigned To:	RENCHECKM	RENCHECKM	ESY	06/01/2000
Accepted By:	WEBERG	RENCHECKM	ESY	06/01/2000
Ready For Approval:	WEBERG	RENCHECKM	ESY	06/01/2000
Approved By:	WEBERG	RENCHECKM	ESY	06/01/2000
Evaluated By:	ROSSJ	MOULD	OPS	06/01/2000

NPM Reference

AR # JO # JOA #

AR Associated: No

D.C. Cook
Electronic Corrective Action Program

Condition Report: P-00-02506
Current Status: Screened
Action Category: 3

OD Related: Yes   Mode Constraint:

Unit Affected: 2

Action: 5

Resp Group:	NED	Status:	Closed
Orig Group:	ESY	Event Code:	E3w
Prop CAC:	B3a	Cause Code:	YYY

Prescribed Action:

DESCRIPTION OF CORRECTIVE ACTION:

Complete actions as required to restore the Unit 2 CEQ Fan Walls to full qualification. This is a tracking action required to provide a mechanism for closing this Operabilty Issue.

CONCURRENCE RECEIVED FROM: Gary Weber for Ron Smith (NESD)

NEGOTIATED DUE DATE: TBD, Post-restart.

	Indiv	Team	Group	Date
Ready For Approval:	WEBERG	RENCHECKM	ESY	06/01/2000
Approval Assigned To:	RENCHECKM	RENCHECKM	ESY	06/01/2000
Approved By:	WEBERG	RENCHECKM	ESY	06/01/2000

General:

Outage:

Other Tracking Processes

Type	Number	Text

Documents/Devices

Document/Device	Decsription

Action Taken: Actual CAC: Status: Open
Due Date: 06/15/2000

D.C. Cook
Electronic Corrective Action Program

Condition Report: P-00-02506
Current Status: Screened
Action Category: 3

Indiv		Team	Group	Date
Due Date:	06/15/2000			
Accepted By:	SENA	HOSKINSM	NED	06/01/2000
Assigned To:	SEKARANJ	SENA	NED	06/01/2000

NPM Reference

AR # JO # JOA #

AR Associated: No

OD Related: Yes Mode Constraint:

Unit Affected: 2

Action: 6

Resp Group:	NED	Status:	Closed
Orig Group:	ESY	Event Code:	E3w
Prop CAC:	B3a	Cause Code:	YYY

Prescribed Action:

DESCRIPTION OF CORRECTIVE ACTION:

Complete actions as required to restore the Unit 1 CEQ Fan Walls to full qualification. This is a tracking action required to provide a mechanism for closing this Operabilty Issue.

CONCURRENCE RECEIVED FROM: Gary Weber for Ron Smith (NESD)

NEGOTIATED DUE DATE: TBD, Post-restart.

	Indiv	Team	Group	Date
Ready For Approval:	WEBERG	RENCHECKM	ESY	06/01/2000
Approval Assigned To:	RENCHECKM	RENCHECKM	ESY	06/01/2000
Approved By:	WEBERG	RENCHECKM	ESY	06/01/2000

D.C. Cook
Electronic Corrective Action Program

Condition Report: P-00-02506
Current Status: Screened
Action Category: 3

General:

Outage: Restart 1 - M4

Other Tracking Processes

Type	Number	Text

Documents/Devices

Document/Device	Decsription

Action Taken:

Actual CAC:
Due Date: 06/15/2000

Status: Open

	Indiv	Team	Group	Date
Due Date:	06/15/2000			
Accepted By:	SENA	HOSKINSM	NED	06/01/2000
Assigned To:	SEKARANJ	KOVARIKB	NED	06/15/2000

NPM Reference

AR #	JO #	JOA #

AR Associated: No

OD Related: Yes   Mode Constraint:

Unit Affected: 1

Action: 7

Resp Group:	NED	Status:	Closed
Orig Group:	NED	Event Code:	E3w
Prop CAC:	J	Cause Code:	YYY

Prescribed Action:

DESCRIPTION OF CORRECTIVE ACTION:
NESD to perform a Use-As-Is evaluation as necessary to address the discrepancies documented in Condition

Condition Report: P-00-02506
Current Status: Screened
Action Category: 3

Evaluation section of this CR, after completion of the design basis calculation. (Post Unit 2 Restart)

CONCURRENCE RECEIVED FROM:
Amiya Sen, NESD

NEGOTIATED DUE DATE:
Post Unit 2 Restart

	Indiv	Team	Group	Date
Ready For Approval:	SENA	HOSKINSM	NED	06/01/2000
Approval Assigned To:	HOSKINSM	HOSKINSM	NED	06/01/2000
Approved By:	SENA	HOSKINSM	NED	06/01/2000

General:

Outage:

Other Tracking Processes

Type	Number	Text

Documents/Devices

Document/Device	Decsription

Action Taken:

Actual CAC:
Due Date: 06/15/2000

Status: Open

	Indiv	Team	Group	Date
Due Date:	06/15/2000			
Accepted By:	SENA	HOSKINSM	NED	06/01/2000
Assigned To:	SEKARANJ	KOVARIKB	NED	06/15/2000

NPM Reference

AR # JO # JOA #

D.C. Cook
Electronic Corrective Action Program

Condition Report: P-00-02506
Current Status: Screened
Action Category: 3

AR Associated: No

OD Related: Yes   Mode Constraint:

Unit Affected: 2

IX. Overall Approval

Responsible Group: NED   Status: Screened

	Indiv	Team	Group	Date
Assigned To:			NED	02/15/2000

Closure Document Type	Closure Document No
ATT	A-D photos U1&U2

Supplemental Concurrences - These do not affect ECAP closure.

Concurrences Associated with External Committments:

	Indiv	Team	Group	Date
Concurred By:				

X. Attachments

Maintenance Rule

No Maintenance Rule for this ECAP

Performance Improvement International:

No PII for this ECAP.

Remarks

No Remarks for this ECAP

D.C. Cook
Electronic Corrective Action Program

Condition Report: P-00-02506
Current Status: Screened
Action Category: 3

End of the Document for ECAP No:	P-00-02506
The status of this ECAP is:	Screened
The duration of this ECAP was:	113 days

D.C. Cook
Electronic Corrective Action Program

Condition Report: P-99-06123
Current Status: Screened
Action Category: 4

I. Problem ID

Discovered Time/Date: 12:00 03/20/1999 Occurred Time/Date: __/__/____

Unit Affected: 0

Status at Time Discovered	Unit 1	Unit 2
Mode	5	5
% Power		

Unit Status Remarks:

System(s) Affected: BLDG MISC BUILDINGS

Affected Equipment

Equipment ID No.	Comp. Code	Manufacturer

Location of Problem - Bldg: Column Line: Elev:

Location Remarks:

Brief Condition Description:
R-NED ESRR - Certain structural calculations are apparently missing.

Detailed Condition Description:
ESRR - Certain structural calculations are apparently missing.

Discussions were recently held with Licensing and Structural Design personnel to determine the location of the 1978 Containment Analyses, which were performed by Structural Design. The analyses themselves consisted of cover memoranda, hand calculations, and computer output. A search in the calculation indices was unsuccessful. A gap of approximately nine years (between 1973 to 1982) was discovered in the Containment calculation index. It was postulated by a former structural designer that Cook Plant calculations were not indexed until 1973, because it appears these calculations were numbered and entered (typed) in the index at the same time. After 1973, subsequent calculations were not entered in the index until 1982, when new calculations were numbered and entered by hand. It is not clear where the 1973-1982 calculations (including the Containment Analyses) are presently. They could have been filed elsewhere, or they could have been thrown away. Some or all of these missing calculations may need to be regenerated to establish the structural integrity of plant structures.

ESRR discrepancy #DSUD003D09

Last Updated By: SUDHOFFD: SUDHOFF DAVID M Team: GEBBIEJ Group: ESY Date: 03/20/1999

D.C. Cook
Electronic Corrective Action Program

Condition Report: P-99-06123
Current Status: Screened
Action Category: 4

Method Used to Discover Problem
Review of Containment structural calculation index

Restart Code: Restart 2 - M5 | Restart Approved: Yes

Other Components/Systems and Areas Affected: Unknown

Industry Impacted: Unknown

Immediate Corrective Actions:

Programmatic issue. No immediate corrective actions can be performed for this condition.

Last Updated By: SUDHOFFD: SUDHOFF DAVID M Team: GEBBIEJ Group: ESY Date: 03/20/1999

Problem Found While Working with Document No. :

Action Request No:

Phone Extension:

	Indiv	Team	Group	Date:
Problem Identified By:	SUDHOFFD	VAZQUEZS	ESY	03/20/1999
Problem Entered By:	SUDHOFFD	VAZQUEZS	ESY	03/20/1999

Supervisor Approval

Approved: Yes | Detection Code:

Supervisor Comments:

	Indiv	Team	Group	Date:
Reviewed By:	ECAPConv	ECAPCONV	CAP	07/02/1999

II. Operations Review

Add'l Info. Required: No | SR/OD Equipment Affected: Yes

D.C. Cook

Electronic Corrective Action Program

Condition Report: P-99-06123
Current Status: Screened
Action Category: 4

Reportability: No

SSC Reqd In Current Mode: No

Past Operability Concern: No

T.S.A.S. Entered: No

SSC Affected
Containment

T.S.A.S. Reference

T.S.A.S. Reference #	Unit

Status: Closed

	Indiv	Team	Group	Date
Approval Assigned To:	FOSTERR	BUSHL	OPS	03/29/2000
Ready For Approval:	MCCOOLT	MOULD	OPS	05/16/2000
Approved By:	MCCOOLT	MOULD	OPS	05/16/2000

SSC Operability - For Identified Condition: Operable

Engineering Support Requested: Yes
Open Items Log Entry Completed: No
Mode Constraint: Yes

Mode Constraint

Mode	Description
4	Mode 4, 350 <Tavg> 200

Systems

Code	Description
CIP	Containment Internal Pressure

D.C. Cook
Electronic Corrective Action Program

Condition Report: P-99-06123
Current Status: Screened
Action Category: 4

Operations Reviewer Comments:

1. If OPERABLE, state basis for reasonable assurance for SSC to perform its specified function (if necessary consult OPR procedure, T.S. bases, SAR, surveillance tests etc.):
At this time all of the calculations and analysis appear to meet some type of interim operability criteria although it is sometimes difficult to put all the pieces of the puzzle together. This section has been opened to request an ODE so that the subcompartment analysis for the as built conditions are assured to be meeting the Chapter 5 and 14 analysis. A mode 4 constraint has been assigned as the appendix B criteria is in question and ODE needs complete along with any additional required actions. TPM 3/29/00

2. If INOPERABLE, state what is inoperable and why, justify mode constraint assigned, state notifications and actions performed:
na
3. If recommending past operability evaluation for reportability determination, discuss basis for recommendation:
na

4. If additional engineering support is requested briefly describe here what and why support is needed and basis for time determination (provide detailed specifics in operability notification section): See ODE section.

5. If additional information was gathered to perform operability determination state by whom provided (by title) and by what method:
Additional information gathered from K. Green of design engineering for subcompartment analysis.

6. Comments: additional information, updates and revisions should be placed in chronological order:

UPDATE: OPS review section opened to clarify the ODE request section to what is actually needed to be addressed by this ODE. Concurred with by D. Etheridge. TPM 5/14/00

UPDATE: OPS review section opened to adjust the ODE request section again. CR 00-2506 to be opened again to address the degraded CEQ and ACCUM Fan Wall. Concurred by D. Etheridge TPM 5/16/00

Operability Type: ODE

Responsible Group: ESY

Significance: Priority

Due Date: 05/10/2000

Operability Concerns / Questions:

The ODE requested to ensure ice condenser, containment and associated aux. bldg components are fully operable and evaluated any significance to degradation. This CR chosen as some calculations are missing as listed in the identification section and additional information has come available as listed below from K. Green.
Review of the subcompartment structural analysis has identified the following potential deficiencies:
1. Reconstruction of missing input to W subcompartment pressurization (TMD) calculations resulted in different areas and volumes and a different pressure transient from TMD. (CR 99-2638, 2647, 2648, 2649, 2650)
2. The original structural calculations for the Steam Generator Enclosure (SGE) roof did not include pipe whip

restraint loading. (CR 98-6049, LER 99-007)
3. UFSAR Chapter 5 and Chapter 14 do not have the same structural load combinations. Different loads, load multipliers and acceptance criteria result in the load cases being different and not directly comparable. (CR 99-2726)
We require a detailed review via the ODE process for above listed item to include the following:
S&L report 5364
TMD (Transient Mass Distribution) calculations
SD-104 calculation for RC system support
SA-199-011-NED rev 1 (The criteria for post restart revision/reconstitution of critical
calculations is stated on page 17 of the calculation assessment report
SA-199-011-NED revision 1. One of these criterion is "... revision or
reconstitution can be delayed until after restart if system
operability can be deduced in the absence of the calculation".)
Additionally, ODEs are being prepared under CR 99-27607 and CR 00-3544 which should be referenced for impact.
Revised due date to 4/25/00 as group requires deliverable from NED. This has been concurred with by D. Etheridge and R. Foster. TPM 4/14/00
S&L Letter report on containment structural analysis via DIT
Stevenson & Associates Letter report on SG Enclosure blowdown loads via

DIT
S&L Report on Aux Bldg. structural analysis via DIT
****
****
****
****
UPDATE 5/14/00: The following describes what is needed to be addressed by the ODE. Additionally, the reasonable assurance for Aux. Bldg calculations should be briefly discussed.
Issue: Changes in Input Assumptions and the UFSAR for Transient Mass Distribution (TMD) Analysis: Reconstitution of Sub-Compartment Blowdown Analysis and Assumptions Resulted in Differential Pressures Higher than in the UFSAR. Specifically, a reconstitution of the TMD analysis assumptions has been completed. This code calculates the short-term peak pressures and pressure differentials for the containment sub-compartments within the first few seconds of a design basis accident. In most cases, the results predict higher sub-compartment pressures in the Reactor Cavity, Steam Generator, and Loop Sub-compartments than those in the current UFSAR and the SER acceptance limits.

USQ: The Safety Evaluation concluded that the increases in peak pressures and pressure differentials in the above-listed sub-compartments was a reduction in margin, could increase the consequences of an accident, and could result in an accident of a different type than those analyzed in the UFSAR. This reduction in margin is a USQ. Other related containment structural issues are still under evaluation and need to be included within this ODE.

ODE, 99-6123, should address containment structural elements:
Open USQ impacts (TMD USQs) - the lack of calculations for TMD pressures
Divider barrier penetrations
Pressurizer enclosure calculation deficiencies
Floor slab

uplift & effect on Ice Condenser
Column degradation/qualification
Vertical bulkhead - Rx cavity wall
Missile shield over the bulkhead

Operating deck
Fan accumulator end walls
Ice condenser lower support structural elements
This ODE should also include CR00-2506 for the degraded CEQ and Accumulator Fan Room wall as ODE in CR 00-2506 has been turned off.

Divider Barrier Seal will be run as a separate ODE in CR 00-2184
This clarification concurred with by D. Etheridge. TPM 5/14/00

UPDATE 5/16/00: This ODE will not cover 00-2506, CR 00-2506 will be opened and assigned. Issue is not directly related to this ODE. Concurred by D. Etheridge. TPM 5/16/00

Operability Notification Comments:

Prompt Reportable:

NRC ENS Notification:

Non-ENS Notification:

Licensing Contact Made:

Licensing Contact:

	Personnel Contact	Contacted By	Date	Time
NRC				
OPS Duty Supervisor				
Plant Manager				
State of Michigan				
NRC Resident Insp.				

Prompt Reportability Comments:

Mode Constraint Released: Yes

OD Issue Complete: No

Comments:

1. If only one unit is ready for mode constraint release state basis here and do not release mode constraint (unit/time/date/initials):

2. State basis for release of mode constraint and provide initials/date (ensure both units can be released before checking the yes field for release)

Actions complete. Released mode constraint. P Avery 5-12-00.

3. If only one unit is ready for OD release state basis here and do not release od (unit/time/date/initials):

4. State basis for release of OD and provide initials/date (ensure both units can be released before checking the yes field for release)

III. Screening

Is the Problem Significant? N   Action Category: 4

Other Comments:

Other Report Nos:

Event Codes: C1c   Calculation

Screening Remarks:
CAQ-RESOLVE

Originated By: FLEENOR: FLEENOR BRYAN R Team: SCHLIMPERTC Group: CAP Date: 03/24/1999

Assignments

Activity	**Req.**	**Grp**	**Status**	**Due Date**	**Concur**
Condition Evaluation	Yes	NED	Closed	09/30/1999	
Current Operability	Yes	ESY	Closed	05/10/2000	
Past Operability	No		Closed		
Reportability	No				
Approval	Yes	NED	Screened		
Maintenance Rule	No				
PII	No				

D.C. Cook
Electronic Corrective Action Program

Condition Report: P-99-06123
Current Status: Screened
Action Category: 4

Non-Conformance	Yes	NED	05/30/2000

	Indiv	Team	Group	Date
Screened By:	FLEENOR	FLEENORB	CAP	05/05/1999

IV. Operability

Operability:

Responsible Group: ESY Status: Closed

Operable: D

ODE Appl. Mode1-4

Operability Type:

Executive Summary:
EXECUTIVE SUMMARY:

The Calculation Assessment Report (SA-1999-011-NED) determined that certain containment structural calculations could not be located and other calculations did not meet current standards for technical and/or administrative attributes. Report NED-2000-518-REP (Justification for Post Restart Revision of Select Auxiliary and Containment Building Calculations) established reasonable assurance that the affected structures would perform their required design functions. Subsequent to this evaluation, a revision to the Westinghouse Transient Mass Distribution (TMD) analysis resulted in an increase in predicted pressure loading on some structural components.
Since the TMD analysis load changes impact a variety of containment structures, CNP management determined that an operability evaluation of the Unit 2 containment structures that takes into account the aggregate effects of the revised TMD analysis be completed. This operability evaluation concludes that, based on the evaluations contained in References 3, 4, 13, 14, 15, 17, and 18, the containment structures are capable of withstanding the new accident pressures without loss of function. (2)

Comments:
TITLE:

Operability Evaluation for Unit 2 Containment Structures

REFERENCES:

1. CR 99-06123 (Certain structural calculations are apparently missing)
2. CR 99-27607 (Evaluation determined changes to structural loads for the interior structures of the ice condenser result in changes to the design bases of the ice condenser)

Condition Report: P-99-06123
Current Status: Screened
Action Category: 4

SECTION 1, DESCRIPTION:

(For references listed in the report, refer to Section 10 of this ODE, Supporting Documentation)

The Expanded System Readiness Review (ESRR) determined that some structural calculations could not be located (Reference 5). The Calculation Assessment Program (Reference 1) also determined that the calculations for portions of the containment structure either could not be located or did not technically or administratively meet current standards for calculations. Twenty-Six (26) Condition Reports were written as result of the review of the containment and ice condenser structural calculations (Table 1). An evaluation (Reference 2) was completed to confirm that the containment structure was capable of meeting its safety related and accident mitigation functions even though the design basis documentation was not complete.

During the current steam generator replacement project on Unit 1, it was determined that the pressures and methodologies used to evaluate pressurization of the steam generator enclosure sub-compartment in UFSAR Chapters 5 and 14 were not consistent (Reference 11). Although a licensing review determined that the two chapters utilized different methods which were not required to be reconciled or enveloped, it was subsequently determined that the input for the Westinghouse Transient Mass Distribution (TMD) analysis of containment sub-compartment pressurization could not be recovered (References 6, 7, 8, 9 and 10). This condition was subsequently found to affect Unit 2 as well.

Reference 19 documents that the changes to the combined seismic and blowdown loads

(including increased blowdown loads from the new TMD analysis) resulted in increased loads on interior structures of the ice condenser. This changed the ice condenser structural design basis from that currently presented in the UFSAR.

During the current outage, the volumes and flow path characteristics in sub-compartments were reconstituted with new calculations. The resulting data was not clearly bounded by the original input data. The TMD calculations were then repeated and it was found that the pressure loads increased in many of the sub-compartments. This increase was evaluated by a series of evaluations and calculations (References 3, 4, 13, 14, 15, 18). These evaluations and calculations demonstrate that the current design has adequate
capacity to support performance of the containment's design function. Based on the results of the evaluations and calculations, it was also concluded that most of the structures are adequate for the design basis loads with minor changes in the analytical basis (such as use of as-built concrete and reinforcement steel strength). The exceptions are several support columns for the ice condenser lower support structure which may require modification to meet the design basis (Reference 12). However, these columns, as currently found in the plant, meet the operability criteria established in this evaluation.

Therefore, this Operability Evaluation addresses the increase in containment compartment pressures which resulted from the regeneration of the TMD inputs, and re-performance of the TMD analysis, and also considers the lack of or deficiencies in some calculations that pertain to the containment structures.

Table 1 - Calculation Assessment

System	Calculation	Rating**	CR	Action
CNTMT - Struc	DC-D-3195-90-SC	T4 / A1	P-99-12194	Post Restart
CNTMT - Struc	DC-D-3195-92-SC	T1 / A4	P-99-12195	Post Restart
CNTMT - Struc	DC-D-3195-93-SC	T4 / A4	P-99-12202	Post Restart
Ice - Struc	DC-D-3195-117-			

SC	T4 / A4	P-99-12209	Closed	
Ice - Struc	DC-D-3195-80-SC	T2 / A4	P-99-12214	Post Restart
Ice - Struc	DC-D-3195-81-SC	T3 / A4	P-99-12222	Post Restart
CNTMT	DC-D-3195-129-SC	T3 / A3	P-99-12239	Closed
CNTMT	DCC-NECP-12-MC05-N	T3 / A3	P-99-12242	Closed
Ice Condenser	DC-D-3195-66-SC	T4 / A4	P-99-12531	Post Restart
Ice Condenser	DC-D-3195-63-SC	T3 / A3	P-99-12535	Closed
Containment Bldg	DC-D-3195-91-SC	T4 / A4	P-99-12545	Post Restart
Ice Condenser	DC-D-3195-120	T4 / A3	P-99-12552	Closed
Ice Condenser	DC-D-3195-122-SC	T4 / A4	P-99-12580	Post Restart
Ice Condenser	DC-D-3195-79-SC	T4 / A3	P-99-12581	Closed
Ice Condenser	DC-D-3195-133-SC	T4 / A3	P-99-12584	Post Restart
Ice Condenser	3195-67-SC	T3 / A4	P-99-12651	Post Restart
Ice Condenser	3195-99-SC	T4 / A3	P-99-12654	Post Restart
Ice Condenser	3195-104-SC	T3 / A2	P-99-12656	Post Restart
Ice Condenser	3195-119-SC	T3 / A3	P-99-12659	Post Restart
Ice Condenser	3195-68-SC	T3 / A2	P-99-12662	Post Restart
Ice Condenser	3195-87-SC	T3 / A2	P-99-12664	Post Restart
Ice Condenser	3195-119A-SC	T3 / A3	P-99-12671	Post Restart
Ice Condenser	3195-113-SC	T4 / A1	P-99-12680	Post Restart
Ice Condenser	3195-85-SC	T4 / A3	P-99-12683	Post Restart
Ice Condenser	3195-86-SC	T4 / A3	P-99-12685	Post Restart
Containment - System - Structural			P-99-12753	Post Restart

** These ratings are defined in Reference 1, SA-1999-011-NED (Calculation Assessment Report)

SECTION 2, AFFECTED SSC(s):

System: Unit 2 Containment
Unit 2 Ice Condenser

Containment Structures:
- Containment Shell
- Crane Wall
- Steam Generator Enclosures
- Pressurizer Enclosure
- Operating Deck
- Primary Shield Wall
- Missile Shield Cover over the Reactor Cavity
- Bulkhead between the Reactor Cavity and Refueling Canal
- Lower Reactor Cavity
- Slab between the Lower Reactor Cavity and Loop Compartment
- Ice Condenser Support Slab at El.

640'

Fan-accumulator Room Slab at El. 612' (including steel beams and their connections)
Support Columns for Ice Condenser Slab at El. 640' and Slab at El. 612' including their Anchorage
Steam Generator Supports

Ice Condenser Internal Structures:
Floor Wear Slab
Lower Support Structure
Lower Inlet Doors
Lower Personnel Access Door
Lattice Frames, Support Columns, Crane Wall Cradles and Crane Wall Embedments
Wall Panel Air Ducts and Supports
Intermediate Deck and Doors
Top Deck and Doors

Components: None

SECTION 3, EXTENT OF CONDITION:

The general issue of missing or substandard safety-related structural calculations applies to the Unit 1 and Unit 2 containment and auxiliary buildings. This was established by the Calculation Assessment Report (Reference 1). Evaluation of the auxiliary building structure determined that the calculations, if revised or reconstituted, would be expected to demonstrate the structure meets the original design and licensing basis (Reference 2). Therefor the issue of missing auxiliary building calculations is being addressed as a non-conformance in design documentation and not as an issue of operability. Further evaluation of the Auxiliary Building Structure will not be included within this operability determination evaluation.

The more specific issue of revised input (seismic and blowdown) loads is restricted to the sub-compartments inside containment, the steam generator supports and the ice condenser internal structures (not including the ice baskets, lower inlet door shock absorbers, equipment access doors, and the air handler unit enclosures). The affected structures are as identified in Section 2.

To confirm the extent-of-condition, in addition to reviewing the listed references, the following Condition Reports were reviewed:

CR 99-11703 (Different editions of structural codes are being used)
CR 99-10942 (Lack of adequate documentation and analysis to support the divider

barrier design basis as described in the UFSAR Section 5.2.2.4)
CR 00-2648 (Containment Integrity Analysis contains data from an unapproved calculation)
CR 00-4284 (Calculation SD 99000221-005 uses unverified assumption [preliminary TMD inputs])

The following Condition Reports pertain to the walls separating the CEQ fan room, instrument room, and accumulator rooms. The issues for these walls include discrepancies in as built configuration, materiel degradation, as well as unavailable original design documentation. As a result, a separate operability evaluation is being prepared under CR-00-02506 and are not addressed in this evaluation.

CRs 99-27755 and 00-2506 (Poor quality grout/concrete found near top of #22 accumulator room wall)

Condition Report: P-99-06123
Current Status: Screened
Action Category: 4

CR 00-3544 (During investigation of poor quality grout at top of #22 accumulator room wall, initial investigations suggest that the 18" thick wall may not meet the design requirements for the UFSAR).
CR-00-07064 (Additional discrepancies (cut rebars) found in the grouted joint at the top of the Fan Accumulator Room wall at azimuth 126 degrees.)

In addition to these condition reports, a search of ECAP was performed with the search criteria of "containment", "structur", and "calculation". This search yielded 114 "hits". The second search was performed using "3195" and "calculation". This search yielded 144 "hits". The third search was performed using "sub" and "compartment". This search yielded 48 "hits". The final search was performed using "blowdown" and "load". This search yielded 40 "hits". These condition reports were reviewed for their
applicability and the following list resulted.

P-99-05961 R-NED ESRR - Calculation DC-C-3195-195-SC calculated load factors via ACI-349-85 instead of ACI-318-63.
**P-99-06123 R-NED ESRR - Certain structural calculations are apparently missing
P-99-07168 ESRR Item Divider barrier Hatches/Access Doors in CEQ Fan #1 & 2 Rooms may exceed their design basis pressure

during a LOCA
*P-99-12194 Discrepancy with calculation DC-C-3195-90-SC, Rev.0.
*P-99-12202 Discrepancy with calculation DC-D-3195-93-SC, Rev.0.
*P-99-12753 Discrepancy with Containment calculations.
P-99-13204 Input parameters for the earthquake floor response spectra require additional evaluation
P-99-13908 Seismic Response Spectra have been revised but are not controlled documents
P-99-15502 Seismic analyses performed for Containment Building Structure and it's internal components (including Ice
Condenser) utilized unwidened response spectra.
P-99-15549 Justification of seismic acceleration values used in the qualification of platforms in Containment
P-99-16933 ESRR- Sufficient information relating to structural analysis of the containment structural design is not retrievable to
provide reasonable assurance of the containment structural/design integrity
P-99-16944 Discrepancies noted in design of Containment Shell and Dome
P-99-17251 Discrepancies found in design of Equipment and Personnel Hatches
P-99-25195 Partial review of the restricted calc No. DC-D-3195-185-SC Rev. 0 has been completed
P-99-25879 FO-99-K-026 noted that numerous calculation packages did not contain sufficient information to determine if the
calculations had the appropriate technical classification rating and restart classification.
*P-99-12195 Discrepancy with calculation DC-D-3195-92-SC, Rev.0.
*P-99-12214 Discrepancy with calculation DC-D-3195-80-SC.
*P-99-12222 Discrepancy with calculation DC-D-3195-81-SC, Rev.0.
*P-99-12239 Discrepancy with calculation DC-D-3195-129-SC, Rev.0.
*P-99-12531 Discrepancy with calculation DC-D-3196-66-SC, Rev.0.
*P-99-12535 Discrepancy with calculation DC-D-3195-63-SC, Rev.0.
*P-99-12545 Discrepancy with calculation DC-D-3195-91-SC, Rev.0.
*P-99-12580 Discrepancy with calculation DC-D-

3195-122-SC, Rev.0.

*P-99-12581 Discrepancy with DC-D-3195-79-SC, Rev.0.
*P-99-12584 Discrepancy with calculation DC-D-3195-133-SC, Rev.0.
*P-99-12654 Discrepancy with calculation 3195-99-SC, Rev.0.
*P-99-12683 Discrepancies with Calculation DC-D-3195-85-SC.
*P-99-12685 Discrepancies with Calculation DC-D-3195-86-SC, Rev.0.
P-99-16552 Inadequate calculations to support internal missile shielding.
P-99-27506 Tracking CR - Preliminary Main Steam Line Break pressure, response spectra from restricted calculation, and data from unapproved calculations are used in calculation SD-990909-003, Rev.0.
P-99-27507 Unverified inputs and assumptions used in calculation SD-990909-008, Rev.0 and columns and connection stresses per this calculation exceeded the allowable stresses.
P-99-28061 Tracking CR for unverified inputs that are used in calculation DC-D-3195-421- SC, Rev. 0
P-99-28583 Verify Loads on Steam Generator Lower Lateral Restraint
P-99-29157 Potential Steam Generator Lower Lateral Restraint Structural Overload
P-00-02808 Tracking CR for unverified inputs that are used in calculation DC-D-3195-421- SC, Rev. 0
P-00-03115 Tracking CR for limitations in calc DC-D-3195-421-SC, Rev. 0
P-00-05048 This is a tracking CR to initiate Post Restart action on UCR Number 99-UFSAR-1271.
P-99-25705 This CR is being written to address specific licensing issues related to the Ice Condenser. Recent structural evaluations have shown that the existing design margins in the FSAR can not be maintained.
P-99-29552 This CR is issued to track the verification of unverified DIT-B-00545-00. Restricted calculations are being used for the Pressurizer Sub-compartment TMD Analysis as transmitted to Westinghouse in DIT-B-00545-00.
P-99-08992 Blowdown loads used as input into structural analyses for components inside the containment may not have been updated following the 1988 rerating and reduced temperature and pressure projects.
P-99-20631 Westinghouse has stated that the peak differential pressure in the lower ice condenser is 13.59 psi.
P-99-21594 Westinghouse Calculation, " Donald C. Cook - Revised Ice Condenser Blowdown Forces" Received by AEP and Needs to be Reviewed for Impact on Other Documents
**P-99-27607 Westinghouse Summary Report EDRE-EMT-1287, rev. 1, "Evaluation of Ice Condenser Components for Updated Seismic and Blowdown Loads", has identified several required UFSAR clarifications and changes.
P-99-05980 R-NED ESRR - The source of FSAR allowable stresses for RCP/CRDM hatch cover anchorages is unclear.
P-99-05976 R-NED ESRR - Actual tested strengths of concrete were used in calculation DC-C-3195-195-SC to establish structural adequacy. These strengths are beyond FSAR limits.

* - denotes CR(s) generated and addressed in Calculation Reconstitution Program
** - denotes those CR(s) being addressed by this condition report operability evaluation

SECTION 4, AFFECTED SAFETY FUNCTIONS:

The containment system is designed to ensure that acceptable limits for leakage to the environment of radioactive materials are not exceeded even in the improbable event of a gross rupture of a reactor coolant system pipe. In addition, the concrete walls of the containment serve as a biological radiation shield for both normal and accident conditions.

The steel-lined, reinforced concrete containment structure, including foundations, access hatches, and penetrations is designed and constructed to maintain full containment integrity when subjected to accident temperatures and pressure, and the postulated earthquake conditions. The structure is designed for no loss of function under tornado or accident conditions.

The containment interior is divided into three volumes, a lower volume which houses the reactor and

Reactor Coolant System, an intermediate volume housing the energy absorbing ice bed in which steam is condensed and an upper volume which accommodates the air displaced from the other two volumes during a loss of coolant accident. The interior structures which form the boundaries between the upper and lower volumes are referred to as the divider barrier. The divider barrier is required to be intact to ensure the mass and energy released from a line break in the lower volume is directed through the ice condenser and that bypass of the ice condenser (from the lower compartment to the upper compartment) is limited to analyzed values.

The ice condenser internal structures provide support for the lower inlet doors, turning vanes, ice baskets, and the intermediate doors which function to direct the steam through the ice condenser to limit the pressure rise inside containment to less than the containment design pressure.

SECTION 5, TECHNICAL SPECIFICATION REQUIREMENTS IMPACTED

Technical Specification 3.6.1.1 requires that Primary CONTAINMENT INTEGRITY be maintained in Modes 1 through 4.

Technical Specification 3.6.1.6 requires that the structural integrity of the containment shall be maintained at a level consistent with the acceptance criteria in Specification 4.6.1.6. Specification 4.6.1.6 states that the structural integrity of the containment structure and steel liner shall be determined in accordance with 1-CFR50 Appendix J Option B and Regulatory Guide 1.163, dated
September, 1995.

Technical Specifications 3.6.5.5 requires that the personnel access doors and equipment hatches between the upper and lower compartments be operable in Modes 1 through 4.

Technical Specification 3.6.5 requires that the ICE CONDENSER be maintained OPERABLE in Modes 1 through 4

TS Section 3 /4.6.5 is related to the ice condenser. Within this section are items for the Ice Bed, Temperature Monitoring, Inlet Doors, Intermediate Deck Doors, Top Deck Doors, Inlet Door

Position Monitoring, and Floor Drains. Within TS 3 /4.6.5 are the Limiting Conditions for Operation and Surveillance Requirements all of which assume the structural integrity of the components are intact.

BASES 3/4.6.1.6 (Containment Vessel Structural Integrity) states that the limitation ensures that the structural integrity of the containment steel vessel will be maintained comparable to the original design standards for the life of the facility. Structural integrity is required to ensure that (1) the steel liner remains leak tight and (2) the concrete surrounding the steel liner remains capable of providing external missile protection for the steel liner and radiation shielding in the event of a LOCA. A visual inspection in conjunction with Type A leakage tests is sufficient to demonstrate this capability.

BASES 3 /4.6.5.1, (ICE BED) states that the OPERABILITY of the Ice Bed ensures that the required ice inventory will 1) be distributed evenly through the containment bays, 2) contain sufficient boron to preclude dilution of the containment sump following the LOCA, 3) contain sufficient heat removal capability to condense the reactor system volume released during a LOCA, 4) contain sufficient water to maintain adequate sump inventory, and 5) result in a post-LOCA sump pH within the allowed range. These
conditions are consistent with the assumptions used in the accident analyses.

BASES 3 /4.6.5.3, (ICE CONDENSER DOORS) states the OPERABILITY of the ice condenser doors and the requirement that they be maintained closed ensures 1) that the reactor coolant system fluid released during a LOCA will be diverted through the ice condenser bays for heat removal and 3) that excessive sublimation of the ice bed will not occur because of warm air intrusion.

Section 5.2 of the Technical Specifications describes that the reactor containment building is a steel lined, reinforced concrete building of cylindrical shape, with a dome roof and having the

following design features:

Nominal inside diameter = 115 feet
Nominal inside height = 160 feet
Minimum thickness of concrete walls = 3'6"
Minimum thickness of concrete roof = 2'6"
Minimum thickness of concrete floor pad = 10 feet
Nominal thickness of steel liner, sides and dome = 3/8 inch
Nominal thickness of steel liner, bottom = ¼ inch
Net free volume = 1,240,000 cubic feet

Section 5.2.2 of the Technical Specifications states that the reactor containment building is designed and shall be maintained in accordance with the original design provisions contained in Section 5.2.2 of the FSAR.

Section 5.2.3 of the Technical Specifications states that the penetrations through the reactor containment building are designed and shall be maintained in accordance with the original design provisions contained in Section 5.4 of the FSAR with allowance for normal degradation pursuant to the applicable Surveillance Requirements.

Based on the discussion in Section 8 of this operability evaluation, the above referenced Technical Specifications and Bases will not be impacted by the identified conditions.

SECTION 6, OTHER DESIGN/LICENSING BASIS IMPACTED

Chapters 5 and 14 of the UFSAR describe the containment functions.

Chapter 5, "Containment System" defines the functional requirements for the containment and it's physical construction. Section 5.2.1 contains the design criteria for containment. The loads applied are identified in 5.2.2, "Design Load Criteria". This section also identifies the design basis load combinations and describes the function of the divider barrier. It also describes the analysis methodology used for some of the structures. Section 5.2.2.5, "Structural Materials" identifies the concrete compressive design strength as 3500 psi and the reinforcing steel tensile strength as 40,000 psi. Section 5.3 "Ice

Condenser" describes the design basis and methodology for the ice condenser.

Chapter 14 addresses the containment performance

and integrity (Section 14.3.4) and the sub-compartment (TMD) analyses (Section 14.3.4.2). The results of the TMD analyses and the impact on the sub-compartment structures are described. The ice condenser performance is also addressed in Section 14.3.4 but the loading is not.

The evaluations performed in support of this operability determination evaluation differ from the bases described in Chapter 5 and 14 in several ways. For certain structures, the evaluations utilize conservative values for as-built material strength. These strengths were defined in accordance with ACI-318-63 and are documented in an approved calculation (Reference 16). It is important to note, the use of as-built strength for materials for specific sub-compartments has been previously reviewed and approved by the NRC as part of the license amendment for Reduced Temperature and Pressure (Reference 17). Additionally, the upper steam generator enclosures in both units were re-built after steam generator replacement using 60 ksi reinforcing steel instead of the original 40 ksi material. This change is included in the new evaluation.

The material strength changes are expected to be utilized for future design basis calculations for some structures not previously identified as utilizing as built strengths. This may require a change to the UFSAR. Design basis calculations will include the full set of load combinations defined in the UFSAR.

The analytical evaluations performed in support of this ODE did not address all design basis load combinations or always utilize the same design load factors as those originally employed. The approach taken to establish reasonable assurance of operability and the load combinations selected for evaluation are discussed in detail in Section 8.

The evaluation of selected load combinations and load factors used in the analytical evaluation permitted the use of a less complex, but conservative evaluation approach. At this time, the methodologies identified

in the UFSAR are not expected to change with the revised design basis calculations. If more sophisticated methods are required, this could require a change to the UFSAR.

The current design bases of the ice condenser interior structures is depicted within the UFSAR. UFSAR Section 5.3, as amended by pending UFSAR Change UCR 98-UFSAR-0115 depict the DBA pressure and load factor used as input parameters to the ice condenser structural component design analyses. Additionally shown are numerous tables which depict the actual calculated stress values within the structural element. The new analyses of the ice condenser structural components results in a change to the design bases of these components.

Current Licensing Basis

UFSAR Appendix M, Section 3 depicts the structural design criteria for the ice condenser system. Within Appendix M, Section 3, the loads, load combinations, and behavior criteria for the design of the ice condenser structural elements are described. Four specific load combinations (also referred to as load cases) are defined and are used as inputs for the design of the structural elements of the ice condenser. The design of the ice condenser structural steel elements is governed by the American Institute of Steel Construction Specification, 1969 edition (AISC-69). AISC-69 provides maximum allowable stress limitations for the individual elements of the structure. The design of the ice condenser floor concrete wear slab is governed by the American Concrete Institute (ACI 318-71). Neither the AISC-69, ACI 318-71, or Appendix M, Section 3 provide load factors to be applied to the individual loads within the load cases. However, the AISC-69, ACI 318-71, and Appendix M, Section 3 provide for the use of simultaneously acting loads in the form of load combinations or load cases.

The primary Safety Evaluation Report for the internal structures of the containment including the ice condenser is Safety Evaluation Report for the Donald C.

Cook Nuclear Plant Units 1&2, dated September 10, 1973, (N73051). SER N73051 Section 3.8.2, Concrete and Structural Steel Internal Structures of Containment, describes the review of the internal structures of containment including the ice condenser as depicted within Appendix M. SER N73051 Section 3.8.2 describes the use of load cases and the AISC-69 for the design of the structural steel elements and the use of ACI 318 for the concrete elements.

SER N73051, Section 3.8.2 provides the following conclusion statement:
"The interior structure is designed in accordance with pertinent codes, as indicated above, following well established design methods, and checked by adequate tests in critical structural elements, as described in Appendix M of the FSAR. The computed stresses are below the code allowables."

Subsequent to the issuance of SER N73051, there are several pieces of correspondence relating to the design of ice condenser structural components. These correspondence documents did not alter or amend the acceptance criteria stated in SER N73051. Because these or other documents did not alter the methodology or acceptance criteria as stated within SER N73051, the acceptance criteria and methodology stated within SER N73051 remain intact and valid.

SECTION 7, OPERABILITY RECOMMENDATION

The containment structures identified in SECTION 2 are determined to be OPERABLE but Degraded for all operational modes. The containment structures are considered degraded due to their failure to fully meet the load combinations, with all factors of safety (design allowances) included, as currently described in the UFSAR. At no time however, did the analytical evaluation result in a load factor decreasing to less than 1.0. This ensures that the stresses in the SSCs will always remain within allowable limits of the applicable codes and standards. Failure to demonstrate compliance with all factored load cases represents a loss of functional capability as described

in PMP 7030.OPR.001. (See definition under "Non-Conforming Item" on Page 5 of the referenced procedure.)
Selected containment structures should also be considered non-conforming based on the maximum sub-compartment pressures exceeding those previously accepted by the NRC.

No compensatory measures are required to support this operability conclusion. A corrective action has been initiated to this effect in accordance with Step 2.1.7 of OPR.001, Rev.4, Attachment 5.

SECTION 8, BASIS FOR OPERABILITY CONCLUSION:

BACKGROUND:

The need for an Operability Determination Evaluation on the containment and ice condenser interior structures originated from several sources including the Expanded System Readiness Review. However the Calculation Reconstitution Program and the Ice Condenser design basis reconstitution project bound the issues.

In the Calculation Reconstitution Program, current design basis calculations are reviewed for adequacy. In the case of the structural design, calculations could not be located for a number of structures, both inside and outside of containment. The calculations that are available and were reviewed did not reveal generic technical inadequacies. However, some of the calculations did contain technical and/or administrative deficiencies that may require correction. In the nuclear industry structural design methods include large margins and conservative approaches. Structures are unlikely to fail under design basis loads or even loads that significantly exceed the design basis. Therefore, it was reasonable to conclude the structure is adequate. However, the missing or substandard documentation must be addressed.

In support of the Cook Plant restart effort, a comprehensive update of the ice condenser internal structural analyses was undertaken to address recognized changes in loads imposed upon the structural elements of the ice condenser. Condition reports written in early 1999 identified changes which had previously been

performed to the containment sub-compartment analysis and previous ice basket modifications which had been performed without comprehensive revision of the ice condenser structural component analyses and
design bases. Additionally, condition reports identified non-conformances relating to phasing link bolt spacing and lattice frame supports. During the current outage, the volumes and flow path characteristics in the sub-compartments were revised. The resulting data indicated the pressure loads imposed on the structural elements of the ice condenser increased.

The goal of this ODE is to demonstrate that the Safety Functions described in Section 4 will be met. This includes maintaining containment integrity when exposed to post-accident conditions, providing adequate support capacity for components attached to/supported by the containment structures, and ensuring that containment sub-compartment structural integrity is maintained. The sub-compartment structure ensures that the mass and energy released by design basis accidents is directed through the ice bed, where it is condensed.

EVALUATION:

The basis for determination of operability is divided into two subsections. The first subsection (SUBSECTION I) will address the containment and sub-compartment concrete structures and the steam generator supports. The second subsection (SUBSECTION II) will address the ice condenser internal structures. This division is used to simplify the evaluation since the design bases, design methodology, and evaluation methodology is different for the two areas of design.

Approach to Demonstrate Functionality of Concrete Structures and Steam Generator Supports

The functionality of the structures evaluated in this ODE take advantage of design allowances (load factors) that were part of the original design analysis, and of the margin that exists in the as-built design configuration.

Design margin above the original design basis loads exists for a number of

reasons. In some cases the proportioning of the structure resulted in a much greater capacity than actually required. Conservative approaches were also taken in the original design due to the recognized potential for changes and load increases. For example, in the original design, the pressurizer and steam generator enclosures were designed assuming a reactor coolant main loop break would pressurize the area even though this exceeded the maximum actual break which could be postulated in these areas. In some cases, the design basis requirement for the structure included issues other than structural support and pressure loading. For example, radiation shielding may have been the governing parameter for assignment of thickness to a concrete structural unit. Finally, the original structures were designed on the basis of specified minimum strengths. The actual material properties are substantially higher than the minimum strengths specified.

The current design basis analysis includes significant margins through the specification of load factors for specific components of the loads. For a structure to be considered operable, it is unnecessary to consider additional conservatisms above those required by current licensing basis codes and standards, unless specifically required in the current licensing basis (CLB). Thus, the functionality of the structure can be shown by simplified methods when the loads are applied without the original design basis load factors.

The systematic approach to this evaluation was initiated by reviewing the current design basis calculations for adequacy (Calculation Reconstitution Program). In the case of the structural design, some of the calculations could not be located for a number of structures, both inside and outside of containment. The calculations that are available and were reviewed did not reveal generic technical inadequacies. However, some of the calculations did contain technical and/or administrative deficiencies that

required correction. This correction was implemented through the evaluation of the functional capacities of the critical structures.

AEP Report No. NED-2000-518-REP, Revision 0 (Justification for Post Restart Revision of Select Auxiliary and Containment Building Calculations) documents the evaluation of the functional capacity of the structures, as identified in the Calculation Assessment, for relevant licensing basis loads and load combinations. At the time of issuance of this report, because the revisions to the sub-compartment pressure evaluations (TMD analyses) for various energy releases within the containment were ongoing, the
evaluations utilized results of existing TMD Analyses for the Containment Building and its sub-compartments. Consequently, following completion of the newly revised TMD analyses, several evaluations were completed to determine the impact on structures. AEP Report No. NED-2000-527-REP, Rev 0 (Structural Adequacy Evaluation of Containment Structures Affected By New Westinghouse TMD Analyses) was prepared to supplement the earlier report and document the effects of new pressures from the TMD analyses. An evaluation (Reference 13) was prepared to show the structural adequacy of the limiting case - the loading of the steam generator enclosure (SGE) roof. References 14 and 15 were prepared to evaluate the impact of the new TMD loads on the steam generator supports. These reports typically used one of the following methods for establishing the functionality of the structures:

1. Review/evaluate existing D. C. Cook Design Basis Calculations.
2. Compare new TMD pressures documented in AEP Report NED-2000-527-REP, Revision 0, to those used in AEP Report

   NED-2000-518-REP, Revision 0.
3. Perform calculations to determine induced forces and structural capabilities.
4. Review of specific documents other than those noted above.

The acceptance criterion for evaluations utilizing working stress design (e.g., steel structures) is to

demonstrate that the stresses in the structural elements are less than the licensing basis allowable stresses for the abnormal/extreme environmental loading combinations. The acceptance criterion for concrete ultimate strength design (USD) is to demonstrate that the computed ultimate capacities of the structural elements based on the code of record (ACI-318-63) are greater than the combined loading with load factors of 1.0 for each of its load components.

When evaluations were performed, conservative approaches were used to simplify the structural capability evaluation. These simplifications resulted in the following differences from the original design bases.

Load Combinations

The evaluations were not performed by reviewing the structural capacity in comparison to a reduced design criteria.

Instead, one load combination case within the design basis was selected as the primary case which provided the most general consideration of the loads that are postulated within the design basis. This load combination can be shown to provide an adequate representation of the loads expected on the structure and provides assurance that the structure will fulfill its design function.

The UFSAR describes an analytical method which is based on the load factor approach to ultimate strength design in ACI 318-1963. The ACI addresses classic structural loading of dead loads and live loads and provides a methodology to address wind and earthquake loads. However, it does not specifically address nuclear plant issues such as accident (i.e., blowdown) loads, OBE vs. SSE, etc. As a result, the load factors in the UFSAR do not directly correspond to factors in the ACI code. There are a number of structural load combinations defined in the UFSAR but three accident load combinations generally provide a bounding set.

These combinations are:

(LC1) 1.5 P + DL + T
(LC2) 1.25 P + 1.25 OBE + DL + T
(LC3) 1.0 P + 1.0 SSE + DL + T

Where P = Accident

Pressurization Loading
DL = Dead Load
T = Temperature Load
OBE = Operating Basis Earthquake
SSE = Safe Shutdown Earthquake

For the purposes of the evaluation, Load Combination 3 (LC3) was typically considered the bounding case. This load combination includes the full magnitude of each load component but does not utilize additional load factors. LC1 and LC2 increase the magnitude of the individual load components but do not include all potential loads. Any of the three equations may be limiting depending on which load component is dominant. However, only LC3 utilizes inputs from all considered loads. Therefore, it was the load combination that was utilized for most of the evaluations.

LC1 provides the maximum loading in many cases due to the dominance of the applied pressure load factor. However, the methodology used to demonstrate operability (evaluation using LC3) does not result in a force that would require the pressure load factor in LC1 to be reduced to a value less than 1.0. This is because the SSE term in Load Combination 3 will offset some of the 0.5 difference in the pressure load factor between LC1 and LC3.

Load Definitions

The pressurization loads were developed using a conservative methodology that will result in over-prediction of pressures. The mass release assumptions and pressure response models are industry standard approaches which are acknowledged to provide a conservative overprediction of pressures.

Material Properties

For certain evaluations where the structural design did not have large calculated margins, an actual (but conservative) as-built strength for concrete and reinforcing steel was used instead of the original minimum design values.

Methodology

The evaluation was done with simplified (but conservative) modeling. With the exception of specific design basis calculations such as the steam generator enclosure, a linear elastic evaluation was used. The UFSAR includes in the design basis for specific

sub-compartment application, more sophisticated methods such as Yield Line and Ductility. These methods could be used in new design basis calculations to establish the capability of the structure. However, these methods were not used in the evaluations to determine
functionality.

Results of Systematic Evaluation for Operability

The following structures were evaluated to ensure an overall operability of the containment:

Containment Shell *
Crane Wall *
Steam Generator Enclosures
Pressurizer Enclosure
Operating Deck *
Primary Shield Wall
Missile Shield Cover over the Reactor Cavity
Bulkhead between the Reactor Cavity and Refueling Canal
Lower Reactor Cavity
Slab between the Lower Reactor Cavity and Loop Compartment *
Ice Condenser Support Slab at El. 640' *
Fan-accumulator Room Slab at El. 612' (including steel beams and their connections)
Steam Generator Supports
Support Columns for Ice Condenser Slab at El. 640' and Slab at El. 612' including
their Anchorage *

* Forms part of Loop Sub-compartment boundary

The results of this evaluation are presented below in a systematic format wherein the primary functionality requirements for each of the SSCs are reviewed with the results of analyses to ensure operability. The structures were found to either meet the design basis, which includes the limiting load combination with the load factors as defined in the UFSAR, or to be operable by meeting the load combination (LC3) which includes the pressure load (with a load factor of 1.0) combined with the seismic load. This is noted in the
conclusion for each structure.

SUBSECTION I: Containment Structures and SG Supports

Containment Shell

The containment shell is comprised of the steel liner backed by the reinforced concrete shell. The requirement for leak tight integrity of the steel liner is achieved through the design basis specification of a maximum strain limit. AEP report, NED-1999-00001, Revision 1 demonstrates its conformance to its design basis. The new TMD pressures do not affect the results of this report.

The discussion below pertains to the reinforced concrete shell including penetrations and hatch openings.

Functionality Requirements: The concrete shell maintains its integrity under internal pressure and from external loads such as missiles and tornadoes.

Evaluation: The evaluation of the containment shell (contained in Reports NED-2000-518-REP and 527-REP) consisted of:

1) Review of UFSAR loads and load combinations to determine the controlling load combinations for structural adequacy. In general, the load combination considering a load factor of 1.5 times the accident design pressure was found to be the limiting load combination.

2) The methodology and analysis presented in the UFSAR for determining controlling load combinations were also reviewed for consistency with industry practice and found acceptable.

3) The comparison of the Structural Integrity Test (SIT) with the existing analytical predictions was reviewed to assess adequacy of the analytical methodology used in the calculations. The SIT included pressurizing the containment to a pressure 1.34 times the design pressure (1.34 x 12 psi = 16.1 psi). Displacement and strain measurements indicated that the SIT test results were in line with predicted results.

4) The containment shell was evaluated for tornado winds and found adequate. Analyses for tornado missiles confirmed adequate energy absorption capacity within the structure.

5) Local regions of the containment which bound sub-compartments are predicted to exceed the general containment design pressure of 12 psi. The local pressure increases exist for both the original and new TMD loads. In the limiting case, the new TMD evaluations indicate a localized increase in pressure from a design value of 12 psi to 14.8 psi. The evaluation in Report NED-2000-527-REP

indicates that this will result in a five percent increase in reinforcing steel stresses. Considering that the governing load combination has a load factor of 1.5, this increase is acceptable. Additionally, during the RTP amendment, the SER for Amendment No. 126 accepted a value of 14 psi for pressure on the shell on a localized basis. Structural adequacy of the containment shell has been demonstrated through appropriate evaluation.

Conclusion: Based upon the above evaluation, it is reasonable to conclude the structure is within its design basis requirements.

Crane Wall

Functionality Requirements: The crane wall is a multi-functional unit and is related to the proper functionality of the polar crane, steam generators, pressurizer and the ice condenser. The unit must be capable to withstand the dead, seismic, LOCA and reaction loads from attached units, e.g., steam generator walls.

Evaluation: Report NED-2000-518-REP presents a detailed evaluation of the crane wall utilizing a finite element model. The limiting load combination used was 1.5 times the pressure along with dead and Design Basis Earthquake loads. The crane wall evaluation included a peak differential pressure of 12 psi (i.e., peak pressure of 8 psi and load factor of 1.5) inward in the upper containment and 18 psi (1.5 times 12 psi) outward in the lower compartment. The structural unit was found adequate to carry the postulated load combinations.

The new TMD analyses (NED-2000-527-REP) specify the latest peak differential (TMD) pressure to be 11.8 psi between TMD elements 25 and 7, 8, and 9. This differential affects the crane wall. Since the latest peak TMD pressure of 11.8 psi is less than the minimum 12 psi pressure evaluated by Report NED-2000-518-REP, structural adequacy is considered acceptable for the crane wall. Additional conservatism exists in that design basis strength of materials is used which is about 50 percent lower than the as-built strengths. Even though the

model results indicate localized over stresses, this is conservative since the adjacent stiffening slabs are not included in the analysis. The crane wall has been analyzed for the load combinations expected to produce the largest stresses and it has been found adequate.

Conclusion: Based upon the above evaluation, it is reasonable to conclude the crane wall is within its design basis requirements.

Steam Generator Enclosures

Functionality Requirements: The steam generator enclosure (SGE) comprises a portion of the divider barrier between upper and lower containment. Due to a steam line break in the steam generator enclosure, the pressure inside will increase and the enclosure must withstand this loading along with other credible loads to prevent leakage of steam into the upper containment.

Evaluation: At the time of licensing, the structural capability of the enclosure was evaluated using a calculated pressure as a basis. Initially, this calculated pressure was 16.7 psi, and the enclosure was evaluated for a uniform pressure of 20 psi. This pressure was used in conjunction with other appropriate loads as specified in the Chapter 5 of the FSAR.

When unit 2 was licensed, a TMD model was used to evaluate pressure. The predicted pressure varies at the nodes modeled in the SGE volume with a maximum differential pressure exceeding 30 psid. The load combination used to verify structural integrity was to combine pressure with dead and seismic loads. The evaluation indicated a safety margin of 1.5 through comparisons of ultimate capacity available versus required. This is documented in Chapter 14 (Safety Analysis) of the UFSAR.

Critical load combinations in UFSAR Chapter 5 are determined to be those in which pipe whip restraint loads are included as one of the components. This is because in the earlier analyses, the effects of the pipe whip restraint loads on the unit were not evaluated.

The following two load combinations in UFSAR Section 5.2.

2.7 envelope other load combinations that are provided in Section 5.2.2.4:

(1+0.05)DL+ 1.0 FI + 1.0T'
(1+0.05)DL + 1.25P + 1.0FS + 1.0T'

where:	DL =	Dead Load
	P =	Pressure (20 psi)

FI = equivalent static jet load effects at the initiation of the break.
FS = equivalent static jet load effects during the saturated pressure phase.
T' = Thermal load

Report NED-2000-527-REP reports the results of the above analyses and concludes that adequate capacity is available to withstand this load.

Chapter 14 of the UFSAR requires that the steam generator enclosures be evaluated for the following load combination:

(1+0.05)DL + 1.0 PTMD +E'

where: PTMD = the accident pressure per the TMD analysis results
E' = seismic DBE loads.

The latest TMD analysis of the Steam Generator Enclosure indicates a pressure rise of approximately 50 to 60 percent higher than the original TMD analysis results. A calculation for this load combination including these higher TMD pressures has been performed by Stevenson and Associates and is summarized in Report NED-2000-527-REP. A finite element analysis was used that included the enclosure walls and the roof slab. This analysis also utilized as-built strength data for the concrete and reinforcing steel. The finite
element model shows that the ultimate pressure capacity under axial and bending is approximately 1.8x the specified pressure load. However, the shear requirements reduce the ultimate pressure capacity to approximately 1.6x the specified pressure load. This is still higher than the 1.5 minimum factor required. Based on these evaluations, it is concluded that the steam generator enclosures are structurally adequate for the loads and load combinations of UFSAR Chapter 5.

Conclusion: The Steam Generator Enclosure will retain its pressure boundaries under the design load combinations specified.

Pressurizer Enclosure

Functionality Requirements:

Similar to the Steam Generator Enclosure, the Pressurizer is a pressure boundary between the upper and lower containments. The critical loads are due to pipe breaks within the enclosure.

Evaluation: Pressurizer Enclosures are designed for loads and load combinations stated within Chapter 5 of the UFSAR. UFSAR Figure 5.2.2-11 lists the LOCA pressure for this compartment as 15 psi. According to the latest TMD analysis, a peak differential pressure of 8.82 psi across the pressurizer enclosure walls (excluding crane wall and roof slab) has been calculated.

AEP Report No. NED-2000-518-REP, Revision 0, identifies the pressurizer roof slab at Elevation 695'-0" and enclosure walls are not affected by jet impingement or whip restraint loads. Existing calculation DC-D-3195-108-SC appropriately addresses the slab and its reinforcement for a static pressure of 175 psi. Calculation DC-D-3195-113-SC for the enclosure wall does not agree with reinforcement information on the drawings, however, it is still capable with a 87 psi uniform pressure. The slab at Elevation 695'-0" and enclosure wall are therefore considered structurally adequate.

Report NED-2000-518-REP also identifies the slab at Elevation 625'-0" is subjected to vertical loads from the pressurizer. The jet impingement load of break #14 in UFSAR Table 5.2-5 will oppose the vertical loads and therefore this case is not limiting.

This slab is also subjected to significant whip restraint reactions/vertical impact. Calculation DC-D-3195-86-SC contains a calculation of load affects on the Elevation 625' slab due to uniform loading and an 800-kip patch load that accounts for whip restraint reactions statically. The pipe whip reactions are consistent with UFSAR methodology. Whip restraints modified by 2-DCP-4260 are qualified by calculation SD-990825-001. The slab at Elevation 625'-0" is therefore considered structurally adequate.

Conclusion: Based upon the above evaluation, it is reasonable

to conclude the Pressurizer Enclosure is within its design basis requirements.

Operating Deck

Functionality Requirements: The operating deck is part of the divider barrier that separates the upper and lower compartments. During a LOCA, its function is to force the steam and air flow in the lower compartment into the ice condenser. As such, in addition to gravity and seismic inertia forces, this unit must be capable of withstanding differential pressures and jet impingement due to LOCA loads.

Evaluation: The operating deck is supported by the crane wall, primary shield wall and refueling canal walls and includes a number of hatches for equipment and personnel access, reactor missile shield, and openings for steam generator and the pressurizer. Evaluations have been performed for the operating deck and the missile shield cover in Report NED-2000-518-REP.

The results from the latest TMD analysis specify peak differential pressures of 20.2 psi and 14.0 psi at specified deck segments. Other portions of the operating deck will remain below the original design pressure of 12.0 psi.

Report NED-2000-518-REP evaluated the operating deck slab for a 12 psi upward differential pressure between the lower and upper containment compartments. The conclusion of this assessment is that the deck slab is structurally adequate for 1.5 times 12 psi differential pressure combined with design basis earthquake and dead loads.

Report NED-2000-527-REP identified the most critical section of the operating deck is the area adjacent to the hatches over the RCP pumps. Interpolating the maximum allowable pressure from equations used in Report NED-2000-518-REP, the deck slab is determined to be capable of resisting a 21.67 psi uplift pressure. This allowable exceeds the maximum peak differential of 20.2 psi, from the new TMD analysis, and therefore the operating deck slab is considered structurally adequate.

Conclusion: Based upon the above evaluation, it is

reasonable to conclude the Operating Deck is within its design basis requirements.

Primary Shield Wall

Functionality Requirements: The primary shield wall is a cylindrical concrete structure around the reactor with an inside diameter of 14 feet. In the event of a LOCA due to a pipe break at the reactor nozzle, steam rises through the upper reactor cavity and vents through the openings in the primary shield wall into lower containment compartment. This structure must thus be able to resist high pressures due to a LOCA.

Evaluation: Existing calculation DC-D-3195-195-SC qualifies the primary shield wall for a peak differential pressure of 48.5 psi with a calculated design margin of 1.41. Using actual Unit 2 concrete strength in excess of 5000 psi, the revised design margin is determined to be 1.685.

The latest peak differential (TMD) pressures for the reactor cavity that includes the primary shield wall is 72.4 psi. Report NED-2000-527-NED has determined this margin to be 1.685/(72.4psi/48.52psi) = 1.13 through use of interpolation to establish a new design margin for the latest TMD pressure. Therefore, it is concluded that the primary shield wall is structurally adequate for the new TMD accident pressures.

Conclusion: The Primary Shield Wall is capable of meeting its design function.

Missile Shield Cover over the Reactor Cavity

Functionality Requirements: The Missile Shield Cover over the Reactor Cavity consists of four 4 feet thick reinforced concrete removable blocks that during operation of the plant is tied down to the operating deck with 36 bolts. It may also be defined as the part of the operating deck that is directly above the reactor cavity, and, as such, has functionality requirements similar to that of the operating deck.

Evaluation: As in the case of the primary shield wall, the critical load on this structure is the differential pressure due to a pipe break in the reactor cavity. The latest peak differential (TMD)

pressures for the reactor cavity, including the peak missile shield cover differential pressure is 79.2 psi. Existing calculation DC-D-3195-195-SC qualifies the missile shield cover for a peak differential pressure of 54.3 psi with a calculated design margin of 1.53. This design margin is for flexural capacity, and is calculated considering the actual rebar yield strength of 60 ksi.

Using interpolation to establish a new design margin for the latest TMD pressure, Report NED-2000-527-NED has determined this margin to be 1.53/(79.2psi/54.3psi) = 1.05. Therefore, it is concluded that the missile shield cover over the reactor cavity is structurally adequate for the new TMD accident pressures.

Conclusion: The Missile Shield Cover over the Reactor Cavity is capable of meeting its design function.

Bulkhead between the Reactor Cavity and Refueling Canal

Functionality Requirements: This bulkhead is also a divider barrier that, with the refueling (reactor) cavity walls and the missile shield covers, acts as a divider barrier between the upper and lower compartments. As for the others, the functionality requirement for this unit is to maintain this barrier.

Evaluation: As with the Primary Shield wall and the Missile Shield Covers, the governing load is that of differential pressures. The latest peak differential (TMD) pressures for the reactor cavity, including a peak differential pressure is 79.2 psi for the bulkhead separating the reactor cavity from the refueling canal. Existing calculation DC-D-3195-195-SC qualifies the bulkhead for a peak differential pressure of 54.3 psi with a calculated design margin of 1.67. This design margin is for the flexural capacity of the bulkhead, and is calculated considering an elastic section modulus.

To determine the new design margin for the latest TMD pressure, Report NED-2000-527-NED has interpolated this margin to be 1.67/(79.2psi/54.3psi) = 1.145. Therefore, it is concluded that the bulkhead separating the

reactor cavity and refueling canal is structurally adequate for the new TMD accident pressures.

Conclusion: The Bulkhead between the Reactor Cavity and Refueling Canal is capable of meeting its design function.

Lower Reactor Cavity

Functionality Requirements: The reactor cavity consists of upper and lower Reactor Cavity areas. The lower compartment ventilation system runs through the lower reactor cavity located below the reactor. This operation prevents heat buildup at the top of the enclosure. The cavity, therefore, like the others is a pressure boundary.

Evaluation: As in the case of the primary shield wall, the critical load on this structure is the differential pressure due to a pipe break in the reactor cavity. The latest peak differential (TMD) pressures for the reactor cavity is 20.8 psi for the lower cavity walls. Existing calculation DC-D-3195-195-SC qualifies the lower cavity walls for a peak differential pressure of 21.0 psi with a calculated design margin of 1.96. As the new TMD pressure of 20.8 psi is less than the 21.0 psi qualified by DC-D-3195-SC, it is concluded that the
lower reactor cavity walls are structurally adequate for the new TMD accident pressures.

Conclusion: Based upon the above evaluation, it is reasonable to conclude the Lower Reactor Cavity is within its design basis requirements.

Slab between the Lower Reactor Cavity and Loop Compartment

Functionality Requirements: Same as Lower Reactor Cavity.

Evaluation: The latest peak differential (TMD) pressures for the reactor cavity include a peak accident pressure of 13.7 psi (upward) for the slab between the lower reactor cavity and loop compartment. In comparison to the lower reactor cavity walls, the slab between the lower reactor cavity and loop compartment is thicker, has smaller spans and more reinforcing and, its dead load opposes the accident pressure. The new TMD pressure of 13.7 psi is less than the 21.0 psi qualified for the lower reactor cavity

walls. Therefore, it is concluded that the slab between the lower reactor cavity and loop compartment are structurally adequate for the new TMD accident pressures.

Conclusion: The Slab between the Lower Reactor Cavity and Loop Compartment is capable of meeting its design function.

Ice Condenser Support Slab at El. 640'

Functionality Requirements: The slab at the bottom of the Ice Condenser forms part of the divider barrier, and additionally provides support for the internal structure of the Ice Condenser.

Evaluation: The reconstitution of the design basis calculations for the Unit 2 ice condenser support slab is documented in SD-990909-003. The ice condenser support slab was found adequate for a peak pressure of 21.11 psi due to a Main Steam

Line Break (MSLB) within the fan-accumulator rooms. This peak pressure is calculated assuming a peak pressure of 15.3 psi, design margin of 1.20 and Dynamic Load Factor (DLF) of 1.15.

The new peak accident pressure within the fan-accumulator rooms was assumed to be 15.8 psi per Westinghouse Letter AEP-99-397. The DLF for this slab is actually 1.0 based on frequency. There is also no need to consider any additional design margin for the reported accident pressures. Thus, the latest peak pressure is bounded by the calculated peak pressure of 21.11 psi and the ice condenser support slab at Elevation 640' is considered structurally adequate.

Conclusion: The Ice Condenser support slab at elevation 640' is capable of meeting its design function.

Fan-accumulator Room Slab at El. 612' (including steel beams and their connections)

Functionality Requirements: The floor consists of a two foot thick slab supported at the crane wall and by steel framing. This area is pressurized by ventilation openings through the crane wall. The primary function of this slab is to support the accumulator tanks.

Evaluation: The reconstitution of the slab at elevation 612' and its supporting steel beams is

documented in calculation
SD-990909-005. The calculation indicates that the governing load condition dictates that the slab must be able to withstand its differential pressure loading. The initial slab design was based on a peak pressure of 15.3 psi, design margin of 1.20 and conservative DLF of 1.53 which results in an equivalent pressure of 28.1 psi.

The new peak accident pressure within the fan-accumulator rooms is is 15.8 psi per Westinghouse Letter AEP-99-397. The DLF for this slab is actually 1.0 based on frequency. Thus, the latest peak pressure of 15.8 psi is bounded by the original design value of 28.1 psi and Fan-Accumulator Room Slab at Elevation 612' is considered structurally adequate.

Conclusion: The Fan-accumulator Room Slab at El. 612' (including steel beams and their connections) is capable of meeting its design function.

Support Columns for Ice Condenser Slab at El. 640' and Slab at El. 612' including their Anchorage

Functionality Requirements: The columns provide support for the ice condenser slab and the fan/accumulator room slab at elevation 612'.

Evaluation: The evaluation of the support columns for slabs elevation 640' and 612' is documented in calculation SD-990909-008. The loading considered for evaluation of these columns are based on the pressure loading of ice condenser slabs as determined by calculation SD-990909-003 and SD-990909-005. Therefore, applicable design loads and load combinations are as determined for the Ice Condenser Support Slab at El. 640' and Fan-accumulator Room Slab at El. 612'.

Calculation SD-990909-008 concluded the stresses for DBE, DBA, and MSLB load cases are within the design allowables for all columns. The stresses for OBE load cases are within the design allowables except at columns 9,13, and 15. However, the OBE stresses meet DBE allowables thereby ensuring operability of the columns for all load combinations. This demonstrates the columns are not predicted to fail under

OBE conditions. However, the margin to failure is less than the OBE design basis criteria. The support columns for slab elevations 640' and 612' are therefore considered adequate.

Conclusion: The support columns are capable of meeting their design function.

Steam Generator Supports

Functionality Requirements: The supports shall be capable of withstanding all credible loads including loads from a pipe break.

Evaluation: The calculations SD-00513-001 and –002 have been performed by Westinghouse to evaluate the loads on the steam generator supports due to Main Steam and Feedwater line breaks within the Steam Generator Enclosure. This loading includes pressure loading with the new TMD results as well as impingement and reaction loads. The impingement and reaction loads were calculated using pressures of 820 psia for main steam and 925 psig for feedwater (102% power values). Because the UFSAR does not define the design basis pipe break pressure, the pressure at 102 percent power in accordance with ANSI/ANS 58.2 was specified for this input.

Westinghouse practice and industrial standard are to use the hot standby pressure for MS break and pressure at maximum power for FW break for all subcompartment pressure analyses per ANSI-56.10. Westinghouse uses normal operation >(100% power) pressure for jet loads and thrust loads generation per ANSI-58.2 for MS and FW breaks. ANSI-58.2 explicitly requires the use of normal operating (100% power) pressure for jet and thrust loads generation. The reason for this position is based on the design requirement
of all load combinations. For structural analysis, the loads at faulted condition require the combination of pipe break and SSE loads. The creditable design SSE loads are at normal operation (100% power) condition. Therefore, one should not expect to combine the pipe break loads from hot standby condition and the SSE loads from the normal operating condition. Because use of hot standby pressures for

line breaks is also an accepted procedure at Cook, additional review for these pressure specifications is currently ongoing. For the pressures assumed in the calculations, the steam generator supports have been found to be adequate to resist the design basis loading. However, the calculation can not be considered a design basis calculation until the licensing basis is confirmed.

Conclusion: The steam generator supports are capable of meeting their design function.

SUBSECTION II: Ice Condenser Internal Structure

The need for an Operability Determination Evaluation on the interior ice condenser structures originated from evaluation of the effects of increased loads imposed on the structural elements of the ice condenser, as a result of the new TMD analysis.

Approach to Demonstrate Functionality of Structures

An approach was developed which would demonstrate, using simplified conservative methodology, that the ice condenser structure was functional and operable. This was possible because the existing design basis includes significant margins in the form of the load factors that were applied to specific components of the structural loads. The operability and functionality of the structure can be shown by conservative methods when the loads are applied with reduced load factors. In no case was it found necessary to reduce any load factor to a value less than 1.0.

Plant specific design analyses have been performed for Cook Plant and documented within Westinghouse Report EDRE-EMT-1287, Revision 3, Evaluation of Ice Condenser Components For Updated Seismic and Blowdown Loads. The impact assessment of this report found that the conclusions of report EDRE-EMT-1287 resulted in impacts to the design bases as depicted within the UFSAR. CR 99-27607 was generated to address the UFSAR impacts identified within report EDRE-EMT-1287. These newly calculated design
loads and combinations are changes to the design loads and combinations currently included

in the Cook Plant structural ice condenser component basis as described in UFSAR Appendix M, UFSAR Section 5.3 or pending UFSAR change UCR 98-UFSAR-0115. UCR 98-UFSAR-0115 is a comprehensive update to the UFSAR for the ice condenser.

The ice condenser components included within the evaluation include:
Floor Wear Slab
Lower Support Structure
Lower Inlet Doors
Lower Inlet Door Shock Absorbers
Lower Personnel Access Door
Ice Baskets
Lattice Frames, Support Columns, Crane Wall Cradles and Crane Wall Embedments
Wall Panel Air Ducts and Supports
Intermediate Deck and Doors
Top Deck and Doors
Equipment Access Doors
Air Handler Unit Enclosures (AHU)

Additional non-conformances related to the ice basket structural analysis were identified in Condition Report 99-22123. A separate Use-As-Is Evaluation for the updated ice basket analysis has been prepared and is included in CR 99-22123. The ice basket UAI has been approved by PORC and the Plant Manager (SS/SE #2000-0265-00). The evaluation of the effects of the revised TMD analysis revealed the lower inlet door shock absorbers, equipment access doors and the air handler unit enclosures were not impacted by the
change. As such, the ice baskets, the lower inlet door shock absorbers, equipment access doors and air handler unit enclosures are not included within this ODE.

The effects of the updated ice basket analysis on the interfacing ice condenser components are included within this evaluation. Non-conforming conditions relating to the phasing link configuration were previously reported and evaluated within CR 99-0261. The effects of the changes in the lengths of the phasing links have been included in the evaluations behind Report EDRE-EMT-1287. Non-conforming conditions relating to the connection configuration of the lattice frames was previously reported and evaluated within CR 99-1906. The effects of the changes in the lattice frame connection details have been

included in the evaluation behind Report EDRE-EMT-1287.

The new Structural Qualification of the Cook Plant Ice Condenser Structural Components has been documented in Westinghouse report EDRE-EMT-1287, Revision 3. This report provides the results of the evaluation of the ice condenser structural components. The existing structural analyses for each ice condenser component were evaluated relative to the new loading conditions. Where higher loads and/or stresses were identified, they were compared to the allowable values contained within Ice Condenser
General Design Criteria, Revision 0, April 24, 1974, and UFSAR Appendix M Section 3.1.

Condition Report: P-99-06123
Current Status: Screened
Action Category: 4

The Ice Condenser Structure Design Criteria as depicted within the UFSAR is summarized below.

The Ice Condenser Structure design criteria is based upon the use of four load combinations or cases. The individual loads are identified as follows:

D Dead Load (Weight)
OBE Operational Based Earthquake
DBE Design Bases Earthquake
DBA Design Bases Accident

The load combinations are identified as follows:

Case I (D + OBE)

Case II (D + DBA)

Case III (D + DBE)

Case IV (D + DBE + DBA)

The allowable stress limits are as follows:

ICE CONDENSER ALLOWABLE LIMITS (3)

	Elastic Analysis						
Load Combination Factors)	Mechanical(2)		Mechanical and Thermal	Fatigue	Limit Analysis (1) (Load Factors)		Test (Loading)
D + OBE	S		3S	AISC-69 Part I	1.43	1.87	
D + DBA	1.33 S	N.A.	N.A.	1.3		1.87	
D + DBE	1.33 S	N.A.	N.A.	1.3		1.43	
D + DBE + DBA	1.65 S	N.A.	N.A.	1.18	1.3		

NOTES:

(1) For mechanical loads only. Mechanical plus thermal expansion, combination and fatigue shall satisfy the elastic analysis limits.
(2) Membrane (direct) stresses shall be no larger than 0.7 Su (70% of ultimate

stress).
(3) For particular components that do not meet these limits specific justification shall be provided on a case by case basis.
S = Allowable stresses and defined in Sections 1.5 and 1.6 of the AISC-69 Part I Specification.

The stress limits for the ice condenser structural components were previously defined within UFSAR Appendix M as stress limits defined with the AISC Specifications (1969 edition) and the ACI-318 Code (1971 edition). The stress limits for the lower support structure were reduced by application of a 0.9 factor to the allowable stress limits. The same stress limits are utilized for the acceptance criteria within the new ice condenser component analyses with the exception of the lower support structure. The stress limits provide the maximum allowable stress in the individual structural elements of the ice condenser. The allowable stress limit is presented in a percentage of the yield strength of the steel or percentage of the compressive strength of the concrete. Yield strength of steel is well below the ultimate strength of the steel. The compressive strength of concrete used within the design analysis is well below the ultimate strength of the concrete structure. The allowable stress limitations within the ice condenser structural components as described above have not changed.

Appendix M of the UFSAR describes the ice condenser structural component structural analyses. The approaches for qualification of the ice condenser structural components are similar between the original and the new analyses. The one main difference is the application of the load factor to the Design Bases Accident (DBA) loads. DBA loads are derived from the effects of the blowdown which occurs following an accident (LOCA or MSLB). In the previous ice condenser structural component analyses a portion of the
component analyses included a 1.4 load factor on the DBA loads while the remainder of the component analyses included a 1.2 load factor on the

DBA loads. The Previous DBA Load Factor represents the information currently presented in UFSAR Appendix M, UCR 98-UFSAR-0115 or supporting analyses.

Component	Previous DBA Load Factor	New DBA Load Factor
Floor Wear Slab	1.4	1.2
Lower Support Structure	1.2	1.2
Lower Inlet Doors	1.4	1.2
Lower Personnel Access Door	1.2	1.2
Lattice Frames, Support Columns, Crane Wall Cradles and Crane Wall Embedments	1.2	1.2
Wall Panel Air Ducts and Supports	1.2	1.2
Intermediate Deck Structure	1.2	1.2
Intermediate Deck Doors	1.4	1.2
Top Deck Structure	1.2	1.2
Top Deck Doors	1.4	1.2
Equipment Access Doors	1.2	1.2
Air Handler Unit Support & Enclosures	1.2	1.2

The individual loads utilized as input parameters to the ice condenser component structural analyses were also individually revised. The analyses for individual ice condenser components are contained within individual Westinghouse proprietary analysis. The results of the individual Westinghouse component analyses was reported with Westinghouse Report EDRE-EMT-1287, Revision 3 and summarized below.

Floor Wear Slab

The wear slab was evaluated with respect to increased pressure loads that occur during blowdown using a 1.2 load factor on the DBA loads. Seismic loads are unchanged. The acceptance criteria within the evaluation are the same as currently

contained within the UFSAR. The results of the evaluation are documented within Westinghouse calculation CN-CSE-99-70, Revision 2, November 1999, Evaluation of Ice Condenser Wear Slab. This calculation confirms the structural adequacy of the wear slab for the new design
conditions.

Lower Support Structure

The lower support structure was evaluated relative to revised dead, seismic, and blowdown loads. The

acceptance criteria within the evaluation are the same as currently contained within the UFSAR with one exception. For the lower support structure The UFSAR currently states the allowable stress limits were reduced with a 0.9 factor applied. For the evaluation of the new loading conditions, the acceptance criteria was used without the 0.9 reduction factor applied to the allowable stress limits. Results of the evaluation are
documented within Westinghouse calculation CN-EMT-99-196, Revision 2, November 1999, D.C. Cook Units 1 and 2 "Ice Condenser Lower Support Structure Structural Evaluations Due to Revised Loads and Plant Upratings". This calculation confirms the adequacy of the lower support structure for the new design conditions.

Lower Inlet Doors

The lower inlet doors were evaluated relative to increased blowdown loads using a 1.2 load factor. Seismic loads are unchanged from the previous analysis. The acceptance criteria within the evaluation are the same as currently contained within the UFSAR Results of the evaluation are documented within Westinghouse calculation CN-EMT-99-200, Revision 2, November 1999, Evaluation of Ice Condenser Lower Inlet Doors Under Effects of Plant Uprating. This calculation confirms the adequacy of the lower inlet doors for the new design conditions.

Personnel Access Door

The personnel access door was evaluated relative to the increases blowdown loads. Seismic loads remained unchanged. The acceptance criteria within the evaluation are the same as currently contained within the UFSAR. Results of the evaluation are documented within Westinghouse calculation CN-EMT-99-211, Revision 1, October 1999, Evaluation of Ice Condenser Personnel Access Door under Effects of Plant Uprating. This calculation confirms the adequacy of the personnel access door for the new design conditions.

Lattice Frames, Support Columns, Crane Wall Cradles and Crane Wall Embedments These components were evaluated relative to the increased

seismic and blowdown loads. Results of the evaluation are documented within Westinghouse calculation CN-EMT-99-150, Revision 2, November 1999, Evaluation of Ice Condenser Lattice Frames, Support Columns, Crane Wall Cradles, and Crane Wall Embedments Under Effects of Plant Uprating. This calculation confirms the adequacy of the components for the new design
conditions.

Wall Panel Air Ducts and Supports

Wall panel air ducts and their supports were evaluated relative to the increased blowdown loads. Seismic loads remained unchanged. The acceptance criteria within the evaluation are the same as currently contained within the UFSAR with one exception. For the duct supports, the higher mill certified yield strength was used to determine the maximum allowable bending stress. Results of the evaluation are documented within Westinghouse calculation CN-EMT-99-199, Revision 1, October 1999, Evaluation of Ice Condenser Wall Panel Air Ducts and Supports Under the Effects of Plant Uprating. This calculation confirms the adequacy of the wall panel air ducts and supports for the new design conditions.

Intermediate Deck Structure and Doors

Using a 1.2 load factor on the DBA loads, direct pressure loads acting on the intermediate deck and doors are significantly reduced, resulting in lower door hinge loads and reduced overall loads on the intermediate deck. Blowdown drag loads on the door members increased and seismic loads remained unchanged. The acceptance criteria within the evaluation are the same as currently contained within the UFSAR. Results of the evaluation are documented within Westinghouse calculation CN-EMT-99-210, Revision 1, November 1999, Evaluation of Ice Condenser Intermediate Deck and Doors Under Effects of Plant Uprating. This calculation confirms the adequacy of the intermediate deck structure and doors for the new design conditions.

Top Deck Doors

The blowdown loads on the top deck doors are reduced and the seismic loads remain

unchanged. The top deck doors were evaluated relative to blowdown loads using a 1.2 load factor. As such, the existing analysis, Westinghouse Calculation #005-Revised, 11-24-1976, Loads and Stresses on Ice condenser Containment Top Deck Blanket Doors, remains valid. This calculation confirms the adequacy of the top deck doors for the new design conditions.

Top Deck Structure

The blowdown and seismic loads on the top deck structure and the air handler unit supports remain unchanged as a result of the changes within the revised TMD analyses. As such, the analyses, (Westinghouse Calculation CN-EMT-99-36, Revision 0, February 1999, Evaluation of Air Handler Unit (AHU) supports for Final Drain Line Loading and Support Member Notching, and Westinghouse calculation CN-EMT-99-239, Revision 0, October 1999, Review of Stress in Ice Condenser Top Deck Structure), remain valid for both Unit 1 and Unit 2. This calculation confirms the adequacy of the top deck structure for the new design conditions.

Justification of Reduced DBA Load Factor

Although the Cook Plant was constructed before the issuance of the Standard Review Plans by the NRC and therefore NUREG-0800 is not part of the Cook licensing basis, the following discussion is illustrative of the basis that generally allows a reduction in load factors between the initial design of an SSC and a reanalysis of that SSC during or after construction.

The original blowdown load factor of 1.4 was a conservatism applied in consideration of the use of preliminary blowdown load values in original design efforts, to account for changes that may occur during plant construction. The original use of 40% load factor in containment design pressure is consistent with the approach for treatment of design pressure loads endorsed by NUREG-0800 Standard Review Plan for the Review of Safety Analysis Reports for Nuclear Power Plants. From Section 6.2.1.1.B, Ice Condenser
Containments; "For plants being reviewed for

construction permits, the design differential pressures for all ice condenser control volumes or sub-compartments, and system components (e.g., reactor vessel, pressurizer, steam generators) and supports, should provide at least a 40% margin above the highest calculated differential pressures."

The new DBA loads resulted from a 1999 post-LOCA loop sub-compartment analysis performed by Westinghouse (published within WCAP-15302) as a part of the overall Cook calculation reconstitution effort. This calculation used revised, up-to-date input parameters, some of which were generated from plant walkdown information. Since these newly calculated DBA loads are based on verified inputs regenerated during the current outage, the use of a load factor of 1.4 is no longer considered necessary. This is also
consistent with NUREG-0800, Section 6.2.1.1.B that further states: "For plants being reviewed for operating licenses, the highest calculated differential pressures for all ice condenser control volumes or sub-compartments should not exceed the corresponding design differential pressures."

Thus, the use of a DBA load factor of 1.2 (20% increase over calculated loads) continues to provide substantial design margin for the re-analysis of the ice condenser structural components.

CONCLUSION

Based on the results of this evaluation, and the above referenced evaluations and calculations, the Unit 2 Containment Structures are determined to be OPERABLE but Degraded in all operational modes based on either the failure of these structures and elements to meet the design basis criteria and values currently depicted in the UFSAR, or non-conforming due to the unavailability of the supporting calculations.

SECTION 9, RECOMMENDED CORRECTIVE ACTION:

1. A corrective action for the degraded condition has been generated as Corrective Action 4 in the actions section of this condition report. Corrective Action 4 is flagged as OD related to appropriately track the

implementation of UCR 99-UFSAR-0850 (USQ) into the licensing basis. This will form the licensing basis for the remaining restoration corrective actions.

2. A corrective action for the degraded condition has been generated as Corrective Action 5 in the actions section of this condition report. Corrective Action 5 is flagged as OD related to appropriately track the update of the design and licensing basis to reflect the changes in methodology, margins, and strengths of structural elements. This action will allow for the full restoration of qualification for the containment structures following reconstitution of the supporting calculations.

3. A corrective action for the degraded condition has been generated as Corrective Action 6 in the actions section of this condition report. Corrective Action 6 is flagged as OD related to appropriately track the implementation of 2-DCP-4481, Restoration of Ice Condenser Support Columns. Upon completion of this modification, the columns will be restored to full qualification.

4. A corrective action for the degraded condition has been generated as Corrective Action 7 in the actions section of this condition report. Corrective Action 7 is flagged as OD related to appropriately track the revision/reconstitution of the supporting calculations for containment structures. Completion of these calculations, together with the other identified corrective actions will restore the containment structures to their full qualification.

D.C. Cook

Electronic Corrective Action Program

Condition Report: P-99-06123
Current Status: Screened
Action Category: 4

SECTION 10, SUPPORTING DOCUMENTATION:

1. SA-1999-011-NED (Calculation Assessment Report)
2. NED-2000-518-REP (Justification for Post Restart Revision of Select Auxiliary and Containment Building Calculations)
3. NED-2000-527-REP (Structural Adequacy Evaluation of Containment Structures Affected by New Westinghouse TMD Analysis)
4. Calculation SD-990909-008 (Unit 2 Ice Condenser Columns and Anchorage)
5. CR 99-6123 (Certain structural calculations are apparently missing)
6. CR 99-2638

(Calculation which determined inputs for steam generator compartment analysis is not available)

7. CR 99-2647 (Calculation which determined inputs for fan/accumulator sub-compartment analysis is not available)
8. CR 99-2648 (Calculation which determined inputs for pressurizer sub-compartment analysis is not available)
9. CR 99-2649 (Calculation which determined inputs for reactor cavity sub-compartment analysis is not available)
10. CR 99-2650 (Calculation which determined inputs for loop sub-compartment analysis is not available)
11. CR 99-02726 (UFSAR Chapter 5 steam generator enclosure evaluation pressure is not consistent with Chapter 14 evaluation)
12. CR 99-27507 (Calc SD-990909-008 has restricted inputs and indicates certain Ice Condenser structures are overstressed)
13. Stevenson & Associates Calculation, Analysis of the Steam Generator Enclosure (SGE) for Pressure Load, Attached to Report
    NED-2000-527-REP, Rev.0
14. Westinghouse Calculation for Steam Generator Supports - MS Break (Pending incorporation into DC-D-3195-368-SC "Structural
    Analysis of Reactor Coolant Loop Piping for Replacement of Steam Generators on D. C. Cook Units 1 & 2")
15. Westinghouse Calculation for Steam Generator Supports. - FW Break (Pending incorporation into DC-D-3195-368-SC "Structural
    Analysis of Reactor Coolant Loop Piping for Replacement of Steam Generators on D. C. Cook Units 1 & 2")
16. Calculation SD-990513-004 (As-built Material Strength for SGE)
17. SER for Amendment No. 126 (6/09/89)
18. Report EDRE-EMT-1287, Revision 3 (Evaluation of Ice Condenser Components for Uprated Seismic and Blowdown Loads)
19. CR 99-27607 (Evaluation determined changes to structural loads for the interior structures of the ice condenser result in changes
    to the design bases of the ice condenser)
20. UFSAR change request 99-UFSAR-0850 (SS/SE 2000-0853-00) "Changes for Input Assumptions and UFSAR for the Transient
    Mass Distribution (TMD)

Analysis"

21. Calculation SD-990618-003 (Containment Net Free Volume)
22. Calculation SD-990826-002 (Ice Condenser Blowdown Loads)
23. Calculation TH-99-05 (Steam generator compartment flowpath and volume data for the TMD
24. Calculation SD-000221-005 (Functionality Evaluation of Fan Accumulator Room Walls) code analysis of steam generator
    compartment pressure distribution)

7b

Condition Report: P-99-06123
Current Status: Screened
Action Category: 4

System(s):

	Indiv	Team	Group	Date
Accepted By:	SYLVIAA	SYLVIAA	ESY	03/29/2000
Due Date:	05/10/2000			
Approval Assigned To:	VAZQUEZS	VAZQUEZS	ESY	05/17/2000
Ready for Checked By:	LEONARDP	VAZQUEZS	ESY	05/18/2000
Assigned To:	KrinerJ	SYLVIAA	ESY	05/18/2000
Checked By:	KRINERJ	SYLVIAA	ESY	05/18/2000
Cross Discipline Rev By:	WEBERG	RENCHECKM	ESY	05/18/2000
Approved By:	CHERBAS	MUTZB	OPS	05/20/2000
Evaluation Assigned To:	SNODGRASSD	DEPUYDTM	RCL	05/21/2000
Evaluated By:	SNODGRASSD	DEPUYDTM	RCL	05/21/2000

Past Operability:

Responsible Group: Status:

Operable:

Operability Type:

Comments:

Indiv	Team	Group	Date
No current Signatures for this section.			

V. Reportability/Investigation

Responsible Group: Status:

Problem Reportable:

Reportable Per:

Comments:

Indiv	Team	Group	Date
No current Signatures for this section.			

Investigation Report:

Condition Report: P-99-06123
Current Status: Screened
Action Category: 4

Responsible Group:

Investigator:

Investigation Report Due: __/__/____
Event Notification Due: __/__/____
Internal Report Due: __/__/____
Detailed Report to Station Mgr: __/__/____
Detailed Report to Regulator: __/__/____

Reportability Requirement:

VI. Non-Conformance Evaluation

Responsible Group: NED

Status: Closed

Non-Conformance Eval Required: Yes

Non-Conformance Exists: Yes

Non-Conformance Disposition: Rework

Interim Disp.: No

Comments:

Scope of NCE

The general issue of missing or substandard safety-related structural calculations applies to the Unit 1 and Unit 2 containment and auxiliary buildings. This was established by the Calculation Assessment Report (Reference 2). Evaluation of the auxiliary building structure determined that the calculations, if revised or reconstituted, would be expected to demonstrate the structure meets the original design and licensing basis (Reference 1). This NCE cover the issue of missing containment and auxiliary building calculations.

The more specific issue of revised input (seismic and blowdown) loads is restricted to the sub-compartments inside containment, the steam generator supports and the ice condenser internal structures (not including the ice baskets, lower inlet door shock absorbers, equipment access doors, and the air handler unit enclosures). The affected structures are as identified in Section 2 of the operability evaluation in Section IV of CR 99-06123.

Note that the scope on this NCE does not include issues related to poor quality of grout/concrete found near the top at the 18" thick concrete wall between the Accumulator #22 room and the CEQ Fan room. A separate evaluation is being prepared under CR-00-02506. Therefore, this condition is not addressed in this evaluation. A number of other CRs have been written and will be addressed under CR 00-02506. They include CRs 99-27755 and 00-2506 (Poor quality grout/concrete found near top of #22 accumulator room wall), CR 00-3544 (During investigation of poor quality grout at top of #22 accumulator room wall, initial investigations suggest that the 18" thick wall may not meet the design requirements for the UFSAR) and CR-00-07064 (Additional discrepancies (cut rebars) found in the grouted joint at the top of the Fan Accumulator Room wall at azimuth 126 degrees.)

This NCE does not evaluate nonconformance issues related to Westinghouse Summary Report EDRE-EMT-1287, rev. 1, "Evaluation of Ice

Condenser Components for Updated Seismic and Blowdown Loads." This report identified several required UFSAR clarifications and changes. The NCE for this condition is provided in Section VI of CR 99-27607.

The ice condenser components included within the evaluation in Section VI of CR 99-27607 include:
Floor Wear Slab
Lower Support Structure
Lower Inlet Doors
Lower Inlet Door Shock Absorbers
Lower Personnel Access Door
Ice Baskets
Lattice Frames, Support Columns, Crane Wall Cradles and Crane Wall Embedments
Wall Panel Air Ducts and Supports
Intermediate Deck and Doors
Top Deck and Doors
Equipment Access Doors
Air Handler Unit Enclosures (AHU)

The following CRs are also excluded from the scope of this NCE. The following list denotes CRs that been generated and addressed by the Calculation Reconstitution Program

*P-99-12194	Discrepancy with calculation DC-C-3195-90-SC, Rev. 0.
*P-99-12202	Discrepancy with calculation DC-D-3195-93-SC, Rev. 0.
*P-99-12753	Discrepancy with Containment calculations.
*P-99-12195	Discrepancy with calculation DC-D-3195-92-SC, Rev. 0.
*P-99-12214	Discrepancy with calculation DC-D-3195-80-SC.
*P-99-12222	Discrepancy with calculation DC-D-3195-81-SC, Rev. 0.
*P-99-12239	Discrepancy with calculation DC-D-3195-129-SC, Rev. 0.
*P-99-12531	Discrepancy with calculation DC-D-3196-66-SC, Rev. 0.
*P-99-12535	Discrepancy with calculation DC-D-3195-63-SC, Rev. 0.
*P-99-12545	Discrepancy with calculation DC-D-3195-91-SC, Rev. 0.
*P-99-12580	Discrepancy with calculation DC-D-3195-122-SC, Rev. 0.
*P-99-12581	Discrepancy with DC-D-3195-79-SC, Rev. 0.
*P-99-12584	Discrepancy with calculation DC-D-3195-133-SC, Rev. 0.
*P-99-12654	Discrepancy with calculation 3195-99-SC, Rev. 0.
*P-99-12683	Discrepancies with Calculation DC-D-3195-85-SC.
*P-99-12685	Discrepancies with Calculation DC-D-3195-86-SC, Rev. 0.

The general issue of missing or substandard safety-related

structural calculations applies to the Unit 1 and Unit 2 containment and auxiliary buildings. This was established by the Calculation Assessment Report (Reference 1).

EVALUATION
Specific deficiencies associated with missing containment calculations include the following:

* Evaluation of Containment Shell and Dome, including tornado wind and missiles:
Found structurally acceptable per Reference 1, Section A. Resolution of documentation issues associated with local design

of the shell is being tracked by Condition Reports 99-12194, 99-12545, 99-12202 and 99-12753.
Required Action: Reconstitute missing calculations for global design of the Containment shell and dome including design for tornado wind and missiles. This action is addressed by CRA 99-16933-01.

* Penetration Sleeve Anchorage:
Found structurally acceptable per Reference 1, Section C. Resolution of documentation issues is being tracked by Condition Reports 99-12673 and 99-12676. A containment shell calculation is required to address adequacy of the shell around the penetrations. This action is addressed by CRA 99-12753-01.

* Liner Design:
Appendix D of Reference 3 performs a structural evaluation of the Containment liner to evaluate the structural integrity for the conditions reported in Condition Reports 98-00443, 98-0836, 98-5925, 98-06010, 98-05926, and 99-12223. The conclusion of the evaluation is that the existing liner thickness is adequate to maintain the design safety function of the liner as a leak-tight membrane, and all of the condition reports except CR 99-12223 have been closed. Therefore, reconstitution of the design basis liner calculations may be performed as a post-restart activity. Note that CR 99-12223 remains open to perform a similar evaluation of the Unit 1 Containment liner.
Required Action: Reconstitute the missing liner design basis calculation. This action is addressed by CRA 99-16933-02.

* Basemat Design:
Found structurally acceptable per

Reference 1, Section D.
Required Action: Reconstitute missing calculations for analysis and design of the Containment basemat. This action is addressed by CRA 99-16933-03.

* Stability:
Found structurally acceptable per Reference 1, Section E.
Required Action: Reconstitute missing calculations for the Containment stability analysis. This action is addressed by CRA 99-16933-04.

* Containment Spray Framing and Support:
Found structurally acceptable per Reference 1, Section F. Documentation issue is being tracked per CR 99-12719.

* Polar Crane Design:
An evaluation performed in response to the Condition Report 99-12853 concluded that the crane is operable. CR 99-12853 is tracking resolution of documentation issues.

* Polar Crane Supports:
Calculation SD-990910-001 determined the polar crane reactions on the crane wall. This calculation will be used to evaluate the crane wall and the steam generator enclosure. These structures are addressed below. SD-990910-001 is restricted. CRs 99-27538 and 99-28807 have been written to track this item.

* NSSS Supports:
These are designed by S&L and verified by Westinghouse. No further evaluation required. (References DC-D 3195-362-SC, DC-D 3195-363-SC, DC-D 3195-364-SC, and CR 99-28583.)

* Primary Shield Wall / Reactor Cavity / Refueling Canal:
Found structurally acceptable per Reference 1, Section H. Unit 1 Calculation DC-D-3195-195-SC, Rev. 1 (restricted) has

been reviewed and found acceptable. Unit 2 is acceptable based on similarity.
Required Action: Resolve calculation deficiencies associated with the design basis calculations for the Primary Shield Wall, Reactor Cavity and the Refueling Canal. Refer to AEP Report No. NED-2000-518-REP and CR 99-16509. This action is addressed by CRA 99-16933-05.

* HELB (pipe whip restraints, jet barriers, sub-compartment pressures, and flooding):
A general review of whip restraint calculations has been performed. New calculations were performed as

required (Refer to HELB Program Report NED-2000-515-REP for a list of the new calculations). The majority of the whip restraints were found to be acceptable. The whip restraints for the surge line were modified to accept the design-basis loads (Ref. 2-DCP-4260).

The effects of jet impingement on specific SSEL targets were reviewed (Ref. HELB SSEL). All targets were determined to be acceptable. Overall, the program revised the break locations to eliminate breaks. The remaining breaks (mainly at penetrations and terminal ends) had previously been reviewed for jet impingement on structures. The reviews were acceptable, and no new calculations were required. The elimination of break locations is addressed in Calculation SD-990825-003, Rev. 0. The target evaluations are discussed in report NED-2000-514-REP.

Sub-compartment pressurization is addressed in AEP Report No. NED-2000-527-REP, Rev. 0. This report evaluates structural components subjected to differential pressures in the five major sub-compartments: pressurizer enclosure, steam generator enclosure, reactor cavity, loop sub-compartment, and the fan-accumulator rooms. The report concludes that the structural components which comprise the five major sub-compartments are structural adequate for the peak differential pressures that have been determined from the new Westinghouse TMD analyses. Based on the conclusions of Report NED-2000-527-REP, revision of the design basis calculations to incorporate the new TMD sub-compartment pressures will be performed post-restart. Resolution of this issue is included as part of the actions to reconstitute critical design-basis calculations associated with the pressurizer enclosure, steam generator enclosure, reactor cavity, loop sub-compartments, and the fan-accumulator rooms sub listed in Section 5 to resolve deficiencies and/or reconstitute critical containment design-basis calculations.

CR-99-11773 is the parent CR, which tracks the resolution of the

primary issues associated with High Energy Line Breaks (HELB) both inside and outside of the Containment.

* HVAC Ducts and Supports:
HVAC ducting was reviewed and numerous concerns were identified as part of ESRR. These concerns were reported through various Condition Reports (e.g., CR 99-06603). Calculation SD-990607-003, Revision 1 analyzed the ductwork (the calculation status is restricted for Unit 1 only, and the applicable condition reports are listed in Section 1 of the calculation). Modifications, where required for Unit 2, have been implemented through 2-DCP-4322. Modifications required for Unit 1 will be issued under a separate DCP (1-DCP-4618) and shall be installed prior to Unit 1 restart.

* Steam Generator Enclosure:
AEP Report No. NED-2000-527-REP, Revision 0, was issued and approved on 4/28/00. This report concludes that the Steam Generator Enclosures are structurally adequate for the loads and load combinations of Chapter 5 of the UFSAR as well as for pressure conditions defined in Chapter 14. This report performs an assessment of containment internal structures affected by sub-compartment pressure loads from the new Westinghouse Transient Mass Distribution (TMD) analyses (Ref. CR 00-05889).
Required Action: Reconstitute calculations for the analysis and design of the Steam Generator Enclosure. This action is addressed by CRA 99-16933-08.

* Pressurizer Enclosure:
Found structurally acceptable per Reference 1, Section I. Documentation issues are being tracked by Condition Reports 99-12680, 99-12683 and 99-12685.

* Crane Wall:
Found structurally acceptable per Reference 1, Section J. Documentation issue is being tracked by CR 99-12531.

* Operating Deck Slab, Hatches in the Operating Deck and the Missile Shield Covers above the Reactor Cavity: Found structurally acceptable per Reference 1, Section G. Documentation issues are being tracked per Condition Reports 99-12651, 99-12654, 99-12656, 99-12659, 99-12662, 99-12664 and

99-12671.

The issue of missing auxiliary building calculations is documented in Refs 1 and 2. Resolution of this non-conformance (missing design documentation) is discussed below:

* Seismic Gap Evaluation (between adjacent buildings): S&L has performed a conservative analysis based on Calculations SD-991008-001, Rev. 0 and DC-D-3050-11-SC, Rev. 1 to determine the maximum relative displacement between the Containment and Aux. Building. This analysis and results were transmitted to AEP in DIT No. DIT-B-00779-00, dated 4/27/00. The maximum relative dynamic displacement (based on the worst dynamic displacement for each building, conservative) is 1.44" which is less than the available 6" seismic gap between the Containment and Auxiliary building. Therefore, the available 6" gap is enough to prevent any structural interaction between the two building. The seismic gap analysis should be formalized to update UFSAR Tables 5.2-6 and 5.2-7. Resolution of this issue is being tracked through CR 99-16280, CR 99-29207 and CR 99-12753.

* Tornado Missile Protection
With regard to the tornado missile protection of openings in the roof and exterior walls, walkdowns of Aux. Building areas/opening have been performed to assure that D.C. Cook meets all UFSAR commitments regarding missile protection. Compensatory measures have been implemented for three openings in the switchgear building roof to assure proper ventilation in the event of tornado missile damage to fans or hoods. The following corrective actions have been established:

CRA 99-12757-03: License Amendment Report No. C0300-01 will be submitted to revise the UFSAR to include the probabilistic tornado missile analysis included in Calculation No. SD-990930-004, Rev 1.

CRA 99-12757-04: DCP-4324 will be completed to install barriers which protect the Unit 2 Emergency Diesel Generator external equipment from tornado missiles and assure that UFSAR requirements for this equipment is met. 2-DCP-4324 was taken to

RTO on 5/26/2000, no further action required.

* Blast Evaluation, Aircraft Impact Evaluation, and External Floods:
These items have been addressed in The Individual Plant Examination Of External Events (IPEEE) Summary Report, April 1992 (see AEP-to-NRC Letter 1082E). Per Section 8 (page 8-3), no vulnerabilities were identified that required detailed quantification of any accident events. No further action required.

* Basemat Design:
Operability is ensured based on the design configuration of the structure per Reference 2, Table 9.

CR Action #11: Reconstitute missing calculations for analysis and design of the Aux. Building basemat.

* Stability:
Operability is ensured based on the design configuration of the structure per Reference 2, Table 9.
CR Action #12: Reconstitute missing calculations for the Auxiliary Building stability analysis.

* Shear Wall Design
Operability is ensured based on the design configuration of the structure per Reference 2, Table 9.
CR Action #13: Reconstitute missing calculations for the Auxiliary Building shear wall design.

* Slab Shear Diaphragms
Operability is ensured based on the design configuration of the structure per Reference 2, Table 9.
CR Action #14: Reconstitute missing calculations for the Auxiliary Building slab shear diaphragms.

* Heavy Load Drops / Paths:
As stated in Section K of Reference 1, the control of the heavy loads program has been assessed in report RST-1999-002-NED (June 1999). This report concludes that CNP commitments for control of heavy loads, as stated in NRC SER of N83095, are being met. The necessary documentation is being tracked under CR 99-22773.

* Seismic II/I:
Seismic II/I review at the component level is considered as part of the component design. As stated in Reference 2, Table 9, the SQUG program at D.C. Cook evaluated the seismic II/I concerns for equipment on the Safe Shutdown Equipment List (SSEL). The SQUG program also evaluated the seismic II/I qualification

of cable trays and conduits. No further evaluation required.

* HELB (pipe whip restraints, jet barriers, sub-compartment pressures, and flooding):
CR-99-11773 is the parent CR, which tracks the resolution of the primary issues associated with High Energy Line Breaks (HELB) both inside and outside of the Containment.

During the course of the High Energy Line Break recovery program, several items were identified which constituted non-conformances with the licensing bases. These items resulted in modifications that were performed to bring the plant into compliance with the licensing basis.

The modifications related to the Aux. Bldg. are:
Eliminate breaks and cracks in SGBD piping to the normal SGBD flash tank room (633' Aux. Bldg.).
Install Back-draft damper at the door to the 4 kV switchgear room.
Modify the doors to the CCW pump room.

In these instances, the non-conformance was not properly protecting equipment required to ensure safe shutdown of the plant in the event of a HELB. In all cases, the modification restores conformance with the licensing basis. The licensing basis for HELB has also been modified to bring the plant into HELB compliance. The completion of the program activities as identified in the actions created under CR-99-11773 ensures compliance with the existing and revised HELB licensing bases. No additional corrective actions are required.

* HVAC Ducts and Supports:
HVAC ducting was reviewed and numerous concerns were identified as part of ESRR. These concerns were reported through various Condition Reports (e.g., CR 99-06181). Calculation SD-990607-002, Revision 1 addresses the seismic

qualification of HVAC ductwork in the Auxiliary Building (the applicable condition reports are listed on Page 4 of the calculation). Modifications, where required for Unit 2, have been implemented through 2-DCP-4323. Modifications required for Unit 1 will be issued under a separate DCP (1-DCP-4597) and shall be installed prior to

Unit 1 restart.

* Mechanical and Electrical Component Supports:
Mechanical and Electrical Supports for critical equipment on the SSEL are covered under the SQUG program. No further review is required to resolve the issues described in this CR.

Summary:
The documents noted above collectively provide sufficient evidence that Unit 2 containment structural elements are capable of performing their required safety functions. The requirements for document completion and/or other actions are being tracked by the identified post restart corrective actions.

Evaluation of the auxiliary building structure determined that the calculations, if revised or reconstituted, would be expected to demonstrate the structure meets the original design and licensing basis (Reference 1).
Corrective actions required to reconstitute the missing calculations are described below.

References:
Ref. 1: AEP Report No. NED-2000-518-REP, Revision 0 (S&L Report No. SL-5364 Rev. 0a), titled, "Justification for Post Restart Revision of Select Auxiliary and Containment Building Calculations", D. C. Cook Nuclear Plant Units 1 & 2.

The report is a compilation of 'white papers' to justify post-restart revision of select containment and auxiliary structural calculations by demonstrating that the affected structural elements are structurally capable of withstanding the abnormal / extreme environmental loads, with a minimum factor of safety of 1.0.

Ref. 2: Calculation Assessment Report, D. C. Cook Nuclear Plant Units 1 & 2, Assessment No. SA-1999-11-NED Revision 1, November 23, 1999.

A comprehensive review of the structural calculations covering all the critical parameters has been performed. The results and recommendations are presented in Table 9 of the report (Reference 2). The above listed parameters are included in the assessment report.

Ref. 3: AEP Report No. NED-1999-00001, Revision 1 (SL-5311), "Engineering Corrosion Investigation and Structural Evaluation of

Containment Liner Corrosion," December 17, 1999.

5. Corrective Actions

The following are the corrective actions required to track actions related to the reconstitution of critical design-basis calculations associated with the Auxiliary Building.

CRA-11. Reconstitute missing calculations for analysis and design of the Aux. Building basemat. (Post Restart)

CRA-12. Reconstitute missing calculations for the Auxiliary Building stability analysis. (Post Restart)

CRA-13. Reconstitute missing calculations for the Auxiliary Building shear wall design. (Post Restart)

CRA-14. Reconstitute missing calculations for the Auxiliary Building slab shear diaphragms. (Post Restart)

	Indiv	Team	Group	Date
Due Date:	05/30/2000			
Accepted By:	PIERRE	ARMSTRONGR	NED	05/22/2000
Assigned To:	EBERHARDTA	SENA	NED	05/29/2000
Ready For Approval:	EBERHARDTA	SENA	NED	06/01/2000
Approved By:	SENA	HOSKINSM	NED	06/01/2000

VII. Condition Evaluation

Responsible Group: NED Status: Closed

Rework Required N
System(s) Affected: BLDG MISC BUILDINGS

Affected Equipment

Equipment ID No.	Comp. Code	Manufacturer

Event	Cause	Primary	Cause Description	Group(s)

Condition Evaluation:

Description of condition:

Certain structural calculations are apparently missing.

D.C. Cook

Electronic Corrective Action Program

Condition Report: P-99-06123
Current Status: Screened
Action Category: 4

Discussions were recently held with Licensing and Structural Design personnel to determine the location of the 1978 Containment Analyses, which were performed by Structural Design. The analyses themselves consisted of cover memoranda, hand calculations, and computer output. A search in the calculation indices was unsuccessful. A gap of approximately nine years (between 1973 to 1982) was discovered in the Containment calculation index. It was postulated by a former structural designer that Cook Plant calculations were not indexed until 1973, because it appears these calculations were numbered and entered (typed) in the index at the same time. After 1973, subsequent calculations were not entered in the index until 1982, when new calculations were numbered and entered by hand. It is not clear where the 1973-1982 calculations (including the Containment Analyses) are presently. They could have been filed elsewhere, or they could have been thrown away. Some or all of these missing calculations may need to be regenerated to establish the structural integrity of plant structures.

(5)

Inappropriate Action:

Unable to locate structural calculations for Containment Analyses

Extent of Condition:

The issues identified affect both Unit 1 & Unit 2. As such, the extent of condition is captured within the evaluation.

ESC Comments:

None

Resolution of ESC Comments:

N/A

Regulatory Significance:

No additional information was discovered during the investigation which would alter the regulatory significance determination established during CR screening process. Additionally, the investigation results do not alter the Operability / Reportability determinations made during the screening process.

Industry Experience:

N/A

Human Performance

This issue relates to human performance. However, recent changes to the procedures that control the design change process at the D. C. Cook Plant should minimize these types of errors in the future.

Results of Investigation:

During the investigation process, the investigator had discussions with structural department personnel and NRM personnel and found out the following:

1. The 1973-1982 calculations (including the Containment Analyses) were available with the structural department, in the form of "micro film rolls". Later on, those rolls were given to NRM. But, structural department does not have a list of documents given to NRM.

2. Per Ms. K. Mc.Laughlin (x2118) of NRM at plant site, NRM will be preparing a list of documents in the "micro film rolls" and also will be including them in the NRM index of calculations.

Informed Mr. A. Sen (x5527) of structural depart, about the availability situation of Containment calculations.

Recommended Corrective Action:

NRM to prepare a list of documents in the "micro film rolls" and also include them in the NRM index of calculations.

NESD to review Containment Calculations in to ensure technical adequacy and procedural adherence.

	Indiv	Team	Group	Date
Accepted By:	WALLISJ	GLASSJ	NED	05/05/1999
Approval Assigned To:	SENA	SENA	NED	05/12/1999
Due Date:	09/30/1999			
Assigned To:	VALATHUR	AL-NAKIBH	NED	07/27/1999
Ready For Approval:	CARRA	CARRA	NED	08/03/1999
Approved By:	SENA	GLASSJ	NED	09/14/1999

VIII. Actions

Action: 1

Resp Group:	NED	Status:	Delete
Orig Group:	CAP	Event Code:	C1c
Prop CAC:	B1	Cause Code:	YYY

Prescribed Action:

ESRR - Certain structural calculations are apparently missing.
TAKE THE APPROPRIATE ACTION TO RESOLVE THIS ISSUE

Originated By: FLEENOR: FLEENOR BRYAN R Team: SCHLIMPERTC Group: CAP Date: 03/24/1999

Reason for Delete:-

Conversion Error. See Condition Evaluation for summary of resolution to issue.

D.C. Cook

Electronic Corrective Action Program

Condition Report: P-99-06123
Current Status: Screened
Action Category: 4

Last Updated By: WALLISJ: Wallis Jim Team: GLASSJ Group: NED Date: 05/05/1999

	Indiv	Team	Group	Date
Ready For Approval:	FLEENOR	SCHLIMPERTC	CAP	03/24/1999
Approval Assigned To:	SCHLIMPERTC	SCHLIMPERTC	CAP	03/24/1999
Approved By:	FLEENOR	SCHLIMPERTC	CAP	03/24/1999

General:

Outage:

Other Tracking Processes

Type	Number	Text

Documents/Devices

Document/Device	Decsription

Action Taken:

Actual CAC: Status: Delete
Due Date: 06/24/1999

	Indiv	Team	Group	Date
Assigned To:			NED	03/24/1999
Due Date:	06/24/1999			

NPM Reference

AR #	JO #	JOA #

AR Associated:

OD Related: Mode Constraint:

Unit Affected:

Action: 2

D.C. Cook
Electronic Corrective Action Program

Condition Report: P-99-06123
Current Status: Screened
Action Category: 4

Resp Group:		NED	Status:	Closed
	Orig Group:	NED	Event Code:	C1c
	Prop CAC:	J	Cause Code:	YYY

Prescribed Action:

- DESCRIPTION OF CORRECTIVE ACTION:

- Original Prescribed Action:

NRM to prepare a list of documents in the "micro film rolls" (in the custody of Ms. K. Mc.Laughlin (x2118)) and include them in the NRM index of calculations.
Informed Mr. A. Sen (x5527) of NED Structural Depart of the availability of the list of documents in the "micro film rolls".

- Revised Prescribed Action:

Subsequent to the completion of the Condition Evaluation, it was determined that there is not sufficient information to locate the missing containment analyses. Critical structural calculations for the containment were included in the Calculation Reconstitution Program. Those which could be located were accepted or revised as documented in the Calculation Assessment Report, SA-1999-011-NED, Revision 1. Justification for Post Restart revision or reconstitution of those not addressed prior to Restart is given in AEP report NED-2000-518-REP, "Justification for Post Restart Revision of Select Auxiliary and Containment Building Calculations" (S&L Report SL-5364, Revision 0A). Both of these reports will be placed in NDM, and will be traceable through NDIS.

The only action required for this CR is to ensure that these reports are properly in NDM and appear in NDIS. When that is accomplished, this CRA can be closed.

Revised by GMAult, 3/31/00.
Reference to 99-28470-01 changed to 99-25879-04. GMAult, 4/17/00.
Reference to CR 99-25879 deleted. This action stands alone. GMAult, 4/18/00.

- CONCURRENCE RECEIVED FROM: GMAult, 3/31/00.

- NEGOTIATED DUE DATE: Post-Restart 2

	Indiv	Team	Group	Date
Approval Assigned To:	CARRA	AL-NAKIBH	NED	08/03/1999
Assigned To:	CARRA	AL-NAKIBH	NED	11/15/1999
Ready For Approval:	AULTG	FARLOWS	NED	04/18/2000
Approved By:	AULTG	FARLOWS	NED	04/18/2000

General:

D.C. Cook

Electronic Corrective Action Program

Condition Report: P-99-06123
Current Status: Screened
Action Category: 4

Outage: Post Restart-2 - NM

Other Tracking Processes

Type	Number	Text

Documents/Devices

Document/Device	Decsription

Action Taken:

Actual CAC: J
Due Date: 03/17/2000
Status: Closed

The Calculation Assessment Report, SA-1999-011-NED, Revision 1; and AEP report NED-2000-518-REP, "Justification for Post Restart Revision of Select Auxiliary and Containment Building Calculations" (S&L Report SL-5364, Revision 0A) were verified as being in NDIS. GMAult, 4/26/00.

	Indiv	Team	Group	Date
Accepted By:	MARSHC	NELSONE	BDC	02/17/2000
Due Date:	03/17/2000			
Assigned To:	AULTG	FARLOWS	NED	03/11/2000
Ready For Approval:	AULTG	FARLOWS	NED	04/26/2000
Approved By:	AULTG	FARLOWS	NED	04/26/2000

NPM Reference

AR #	JO #	JOA #

AR Associated: No

OD Related: No

Mode Constraint:

Unit Affected:

Action: 3

Resp Group: NED
Orig Group: NED
Prop CAC: J

Status: Closed
Event Code: C1c
Cause Code: YYY

Prescribed Action:

D.C. Cook
Electronic Corrective Action Program

Condition Report: P-99-06123
Current Status: Screened
Action Category: 4

NESD to review Containment Calculations in to ensure technical adequacy and procedural adherence.

	Indiv	Team	Group	Date
Ready For Approval:	SENA	GLASSJ	NED	09/14/1999
Approval Assigned To:	GLASSJ	HOSKINSM	NED	09/14/1999
Approved By:	SENA	GLASSJ	NED	09/14/1999

General:

Outage: Restart 2 - M4

Other Tracking Processes

Type	Number	Text

Documents/Devices

Document/Device	Decsription

Action Taken:

Actual CAC: J Status: Closed
Due Date: 02/25/2000

As noted in the revised Prescribed Action section of Action 2, a list of containment structural calculations deemed necessary to demonstrate compliance with Cook Plant design and licensing basis was developed and documented in the Calculation Assessment Report, SA-1999-011-NED. Those calculations were reviewed for technical and procedural adequacy, and those requiring revision or reconstitution prior to Restart have been completed. Justification for Post Restart revision or reconstitution of those not addressed prior to Restart is given in AEP report NED-2000-518-REP, "Justification for Post Restart Revision of Select Auxiliary and Containment Building Calculations" (S&L Report SL-5364, Revision 0A). Both of these reports will be placed in NDM, and will be traceable through NDIS. Action 2 of this CR tracks both reports to NDM/NDIS.

Other calculatinos were determined to be not critical. Nothing further is required for this action.

	Indiv	Team	Group	Date
Due Date:	02/25/2000			
Assigned To:	AULTG	FARLOWS	NED	03/31/2000
Ready For Approval:	AULTG	FARLOWS	NED	03/31/2000
Approval Assigned To:	SENA	HOSKINSM	NED	03/31/2000
Approved By:	SENA	HOSKINSM	NED	03/31/2000

Condition Report: P-99-06123
Current Status: Screened
Action Category: 4

NPM Reference

AR # JO # JOA #

AR Associated: No

OD Related: No Mode Constraint:

Unit Affected:

Action: 4

Resp Group:	ESY	Status:	Closed
Orig Group:	ESY	Event Code:	C1c
Prop CAC:	J	Cause Code:	YYY

Prescribed Action:

DESCRIPTION OF CORRECTIVE ACTION:

A corrective action for the degraded condition has been generated as Corrective Action 4 in the actions section of this condition report. Corrective Action 4 is flagged as ODE related to appropriately track the implementation of UCR 99-UFSAR-0850 (USQ) into the licensing basis. This will form the licensing basis for the remaining restoration corrective actions.

CONCURRENCE RECEIVED FROM:

NEGOTIATED DUE DATE:

Concurrence received from: Paul Leonard

Negotiated Due Date: TBD, Post-restart 2

	Indiv	Team	Group	Date
Approval Assigned To:	VAZQUEZS	VAZQUEZS	ESY	05/15/2000
Ready For Approval:	WEBERG	RENCHECKM	ESY	05/18/2000
Approved By:	LEONARDP	VAZQUEZS	ESY	05/18/2000

General:

D.C. Cook
Electronic Corrective Action Program

Condition Report: P-99-06123
Current Status: Screened
Action Category: 4

Outage:

Other Tracking Processes

Type	Number	Text

Documents/Devices

Document/Device	Decsription

Action Taken:

Actual CAC:
Due Date: 10/27/2000

Status: Open

	Indiv	Team	Group	Date
Accepted By:	LEONARDP	VAZQUEZS	ESY	05/18/2000
Assigned To:	LEONARDP	VAZQUEZS	ESY	05/18/2000
Due Date:	10/27/2000			

NPM Reference

AR #	JO #	JOA #

AR Associated: No

OD Related: Yes

Mode Constraint:

Unit Affected: 2

Action: 5

Resp Group:	NED	Status:	Closed
Orig Group:	ESY	Event Code:	C1c
Prop CAC:	J	Cause Code:	YYY

Prescribed Action:

DESCRIPTION OF CORRECTIVE ACTION:

A corrective action for the degraded condition has been generated as Corrective Action 5 in the actions section of this condition report. Corrective Action 5 is flagged as ODE related to appropriately track the update of the design and licensing basis to reflect the changes in methodology, margins, and strengths of structural elements. This action will allow for the full restoration of qualification for the containment structures following reconstitution of the supporting calculations.

CONCURRENCE RECEIVED FROM:

NEGOTIATED DUE DATE:

	Indiv	Team	Group	Date
Ready For Approval:	LEONARDP	VAZQUEZS	ESY	05/15/2000
Approval Assigned To:	VAZQUEZS	VAZQUEZS	ESY	05/15/2000
Approved By:	LEONARDP	VAZQUEZS	ESY	05/15/2000

General:

Outage: WCP - NM

Other Tracking Processes

Type	Number	Text

Documents/Devices

Document/Device	Decsription

Action Taken:

Actual CAC:
Due Date: 05/29/2000
Status: Open

	Indiv	Team	Group	Date
Due Date:	05/29/2000			
Accepted By:	ARMSTRONGR	ARMSTRONGR	NED	05/19/2000
Assigned To:		SMITHRJ	NED	05/19/2000

NPM Reference

AR #　　JO #　　JOA #

AR Associated: No

D.C. Cook

Electronic Corrective Action Program

Condition Report: P-99-06123
Current Status: Screened
Action Category: 4

OD Related: Yes   Mode Constraint:

Unit Affected: 2

Action: 6

Resp Group:	NED	Status:	Closed
Orig Group:	ESY	Event Code:	C1c
Prop CAC:	B	Cause Code:	YYY

Prescribed Action:

DESCRIPTION OF CORRECTIVE ACTION:

A corrective action for the degraded condition has been generated as Corrective Action 6 in the actions section of this condition report. Corrective Action 6 is flagged as ODE related to appropriately track the implementation of 2-DCP-4481, Restoration of Ice Condenser Support Columns. Upon completion of this modification, the columns will be restored to full qualification.

CONCURRENCE RECEIVED FROM:

NEGOTIATED DUE DATE:

	Indiv	Team	Group	Date
Ready For Approval:	LEONARDP	VAZQUEZS	ESY	05/15/2000
Approval Assigned To:	VAZQUEZS	VAZQUEZS	ESY	05/15/2000
Approved By:	LEONARDP	VAZQUEZS	ESY	05/15/2000

General:

Outage: Post Restart-2 - NM

Other Tracking Processes

Type	Number	Text

Documents/Devices

Document/Device	Decsription

Action Taken:

Actual CAC: Status: Open

D.C. Cook
Electronic Corrective Action Program

Condition Report: P-99-06123
Current Status: Screened
Action Category: 4

Due Date: 03/31/2001

	Indiv	Team	Group	Date
Accepted By:	SCHOEPFP	HAFERD	NED	05/16/2000
Assigned To:		SCHOEPFP	NED	05/16/2000
Due Date:	03/31/2001			

NPM Reference

AR # JO # JOA #

AR Associated: No

OD Related: Yes Mode Constraint:

Unit Affected: 2

Action: 7

Resp Group:	NED	Status:	Closed
Orig Group:	ESY	Event Code:	C1c
Prop CAC:	B	Cause Code:	YYY

Prescribed Action:

DESCRIPTION OF CORRECTIVE ACTION:

A corrective action for the degraded condition has been generated as Corrective Action 7 in the actions section of this condition report. Corrective Action 7 is flagged as ODE related to appropriately track the revision/reconstitution of the supporting calculations for containment structures. Completion of these calculations, together with the other identified corrective actions will restore the containment structures to their full qualification.

CONCURRENCE RECEIVED FROM:

NEGOTIATED DUE DATE:

	Indiv	Team	Group	Date
Ready For Approval:	LEONARDP	VAZQUEZS	ESY	05/15/2000
Approval Assigned To:	VAZQUEZS	VAZQUEZS	ESY	05/15/2000
Approved By:	LEONARDP	VAZQUEZS	ESY	05/15/2000

D.C. Cook
Electronic Corrective Action Program

Condition Report: P-99-06123
Current Status: Screened
Action Category: 4

General:

Outage: WCP - NM

Other Tracking Processes

Type	Number	Text

Documents/Devices

Document/Device	Decsription

Action Taken:

Actual CAC: Status: Open
Due Date: 05/29/2000

	Indiv	Team	Group	Date
Due Date:	05/29/2000			
Accepted By:	ARMSTRONGR	ARMSTRONGR	NED	05/19/2000
Assigned To:		SMITHRJ	NED	05/19/2000

NPM Reference

AR #	JO #	JOA #

AR Associated: No

OD Related: Yes Mode Constraint:

Unit Affected: 2

Action: 8

Resp Group:	ESY	Status:	Closed
Orig Group:	ESY	Event Code:	C1c
Prop CAC:	B3a	Cause Code:	YYY

Prescribed Action:

DESCRIPTION OF CORRECTIVE ACTION:

D.C. Cook
Electronic Corrective Action Program

Condition Report: P-99-06123
Current Status: Screened
Action Category: 4

This action is enterered to document that no compesatory actions are required to support the conclusions of the operability evaluation. This CRA is entered in accordance with step 2.1.7 of OPR.001, Rev. 4, Attachment 5.

CONCURRENCE RECEIVED FROM: Paul Leonard

NEGOTIATED DUE DATE: N/A

	Indiv	Team	Group	Date
Ready For Approval:	LEONARDP	VAZQUEZS	ESY	05/16/2000
Approval Assigned To:	VAZQUEZS	VAZQUEZS	ESY	05/16/2000
Approved By:	LEONARDP	VAZQUEZS	ESY	05/16/2000

General:

Outage: N/A - NM

Other Tracking Processes

Type	Number	Text

Documents/Devices

Document/Device	Decsription

Action Taken:

Actual CAC: B3a   Status: Closed
Due Date: 05/30/2000

No action required. See prescribed action for details.

	Indiv	Team	Group	Date
Assigned To:			ESY	05/16/2000
Due Date:	05/30/2000			
Accepted By:	LEONARDP	VAZQUEZS	ESY	05/16/2000
Ready For Approval:	LEONARDP	VAZQUEZS	ESY	05/16/2000
Approval Assigned To:	VAZQUEZS	VAZQUEZS	ESY	05/16/2000
Approved By:	LEONARDP	VAZQUEZS	ESY	05/16/2000
Evaluated By:	AVERYP	MOULD	OPS	05/16/2000

NPM Reference

Condition Report: P-99-06123
Current Status: Screened
Action Category: 4

AR # JO # JOA #

AR Associated: No

OD Related: Yes Mode Constraint:

Unit Affected: 2

Action: 9

Resp Group:	NED	Status:	Closed
Orig Group:	ESY	Event Code:	C1c
Prop CAC:	B3a	Cause Code:	YYY

Prescribed Action:

DESCRIPTION OF CORRECTIVE ACTION:

This action is required to verify a statement made in the operability evaluation:

Under section 8 of the ODE, in the section discussing Steam Generator Support operability, it states:

"The calculations SD-00513-001 and -002 have been performed by Westinghouse to evaluate the loads on the steam generator supports due to Main Steam and Feedwater line breaks within the Steam Generator Enclosure. This loading includes pressure loading with the new TMD results as well as impingement and reaction loads. The impingement and reaction loads were calculated using pressures of 820 psia for main steam and 925 psig for feedwater (102% power values). Because the UFSAR does not define the design basis pipe break pressure, the pressure at 102 percent power in accordance with ANSI/ANS 58.2 was specified for this input.

Westinghouse practice and industrial standard are to use the hot standby pressure for MS break and pressure at maximum power for FW break for all subcompartment pressure analyses per ANSI-56.10. Westinghouse uses normal operation >(100% power) pressure for jet loads and thrust loads generation per ANSI-58.2 for MS and FW breaks. ANSI-58.2 explicitly requires the use of normal operating (100% power) pressure for jet and thrust loads generation. The reason for this position is based on the design requirement
of all load combinations. For structural analysis, the loads at faulted condition require the combination of pipe break and SSE loads. The creditable design SSE loads are at normal operation (100% power) condition. Therefore, one should not expect to combine the pipe break loads from hot standby condition and the SSE loads from the normal operating condition. BECAUSE USE OF HOT STANDBY PRESSURES FOR LINE BREAKS IS ALSO AN ACCEPTED PROCEDURE AT COOK, ADDITIONAL REVIEW FOR THESE PRESSURE SPECIFICATIONS IS CURRENTLY ON-GOING.

FOR THE PRESSURES ASSUMED IN THE CALCULATIONS, THE STEAM GENERATOR SUPPORTS HAVE

BEEN FOUND TO BE ADEQUATE TO RESIST THE DESIGN BASIS LOADING. HOWEVER, THE

CALCULATION CAN NOT BE CONSIDERED A DESIGN BASIS CACLULATION UNTIL THE LICENSING BASIS IS CONFIRMED."

These statements were discussed with NED personnel familiar with this issue (K. Green - S&L; J. Smetters - SGRP; P. Leonard - System Mgr.) to confirm that the analysis assumptions for initial system pressures, although possibly non-conforming with respect to DCCook Licensing Basis, do provide an adequate basis for establishing OPERABILITY of the steam generator support structure. The consensus is that OPERABILITY is established by the analysis in that the method conforms to applicable ANSI standards as well as the practice of the NSSS supplier.

The action to be taken is to report the results of the on-going review of these pressure specifications and the impact on the operability conclusion.

If analysis is performed consistent with the licensing basis, then results may be considered conforming with respect to these analysis assumptions. If analysis assumptions are non-conforming to licensing basis assumptions, then the conclusion would be operable but non-conforming. In the unlikely event that resolution of the issue leads to the conclusion of inoperable, then the Shift Manager shall be promptly notified.

CONCURRENCE RECEIVED FROM:

NEGOTIATED DUE DATE:

This action was concurred with by Amiya Sen of NESD on 5/20/00.

Negotiated Due Date:

Post Restart Unit 2

	Indiv	Team	Group	Date
Approval Assigned To:	VAZQUEZS	VAZQUEZS	ESY	05/20/2000
Ready For Approval:	LEONARDP	VAZQUEZS	ESY	05/20/2000
Approved By:	LEONARDP	VAZQUEZS	ESY	05/20/2000

General:

Outage: Restart 1 - M4

Other Tracking Processes

Type	Number	Text

D.C. Cook
Electronic Corrective Action Program

Condition Report: P-99-06123
Current Status: Screened
Action Category: 4

Documents/Devices

Document/Device	Decsription

Action Taken:

Actual CAC: Status: Open
Due Date: 08/10/2000

	Indiv	Team	Group	Date
Accepted By:	LEONARDP	SCHOEPFP	NED	05/20/2000
Assigned To:		KOVARIKB	NED	06/14/2000
Due Date:	08/10/2000			

NPM Reference

AR # JO # JOA #

AR Associated: No

OD Related: Yes Mode Constraint:

Unit Affected: 0

Action: 10

Resp Group:	NSA	Status:	Closed
Orig Group:	NED	Event Code:	C1c
Prop CAC:	B3a	Cause Code:	YYY

Prescribed Action:

DESCRIPTION OF CORRECTIVE ACTION:

Perform an evaluation of the latest TMD analysis for Unit 2 to demonstrate:

1) Provide reasonable assurance that the TMD analysis produces bounding results for subcompartment pressures and differential pressures.

2) Provide reasonable assurance that the output of the TMD analysis is conservative, for application in structural design calculations and evaluations. This includes ensuring the inputs to the analysis have not reduced the level of conservatism as was originally evaluated by the NRC.

CONCURRENCE RECEIVED FROM:

Condition Report: P-99-06123
Current Status: Screened
Action Category: 4

Jeb Kingseed

NEGOTIATED DUE DATE:

6/2/00

	Indiv	Team	Group	Date
Ready For Approval:	LEONARDP	SCHOEPFP	NED	05/25/2000
Approval Assigned To:	SCHOEPFP	SCHOEPFP	NED	05/25/2000
Approved By:	LEONARDP	SCHOEPFP	NED	05/25/2000

General:

Outage:

Other Tracking Processes

Type	Number	Text

Documents/Devices

Document/Device	Decsription

Action Taken:

Actual CAC: J
Due Date: 06/02/2000
Status: Closed

The Prescribed Action was to perform an evaluation of the latest TMD analysis for Unit 2 to demonstrate that the analysis is bounding for calculated pressures and that it is conservative. The following White Paper was written to describe the analysis that was performed and to address the issues of analysis sensitivity and conservatism. This Paper was also the subject of a discussion with the Nuclear Regulatory Commission in White Flint, MD on May 30, 2000. Issues associated with the use of the TMD analysis methodology were adequately addressed at that meeting per discussion with Brenda Kovarik, who attended the meeting. Brenda concurred that there is no reason to hold this Corrective Action open now that the NRC meeting is over.

TMD SUBCOMPARTMENT PRESSURIZATION ANALYSIS

EXECUTIVE SUMMARY

Transient Mass Distribution (TMD) analysis has reevaluated the pressure response of key containment subcompartments to determine the maximum dynamic pressure loads that could act on the structures forming subcompartment enclosure boundaries, and equipment supports.

The recently revised subcompartment TMD analyses were performed to incorporate newly reconstituted input assumptions to calculate the short-term containment response during the first few seconds of a design basis event. The changes to the TMD input assumptions are, in general, due to new plant walkdowns and data collections that resulted in changes to input values for subcompartment net free volumes, flow paths, flow areas, and initial temperatures. The recent data collection and plant walkdowns generated detailed drawings of compartment structures, major components, piping, and vent areas to permit conservative calculation of inputs to the present containment TMD analysis. To maintain conservative input parameters, gross compartment volumes were under-estimated or minimized, and the volumes of equipment, piping, and other items that are subtracted from gross volumes

to determine the net free volumes were over estimated or maximized (SD-990618-003, Rev.1 page 8 of 107 and TH 99-02, page 22 of 179). For purposes of the TMD analysis, which calculates transient pressure distribution, a bounding value is one which minimizes the compartment net free volume or which minimizes the flow path cross-sectional area.

Revised TMD analyses yielded peak pressures and differential pressures for the steam generator, fan accumulator, pressurizer, reactor cavity and loop subcompartments in containment that increased those currently described in the UFSAR (section 14.3.4).

An evaluation of the containment structural integrity has been prepared (NED-2000-527-REP, Rev. 0), which establishes the functional capability of the subcompartment structures as the result of the new TMD load pressures.

D. C COOK CONTAINMENT TMD ANALYSIS OVERVIEW

The Transient Mass Distribution (TMD) computer code is used to calculate the peak pressure differences in various containment subcompartments that occur within the first few seconds of a design basis accident. The TMD code was developed by Westinghouse to simulate pressure transients for ice condenser containments. The TMD code can calculate pressures, temperatures, heat transfer rates, and mass flow rates as a function of time and location throughout the containment. The performance of the TMD code was evaluated by using TMD simulations to reproduce the test results from the Waltz Mill test. WCAP-8077 (proprietary) and WCAP-8078 (non-proprietary) provide a detailed description of the TMD code and the validation performed against the Waltz Mill Test. The Atomic Energy Commission reviewed these Westinghouse topical reports and concluded that the TMD program is acceptable for containment pressure response calculations (reference letter from Mr. D. B. Vassallo to Mr. Romano Salvatori, December 19, 1973). The use of the TMD code has been well documented in the licensing basis for calculation of

various D. C. Cook containment subcompartments responses within the first few seconds of a design basis accident. Applicable references include 1) the Safety Evaluation Report for the Issuance of Amendment No. 2 - Donald C. Cook Nuclear Plant, Unit No. 2, 3/8/78, which indicated that TMD is an acceptable methodology for performing containment pressure response analysis, and 2) UFSAR Section 14.3.4.

During the Enhanced System Readiness Review conducted for Cook plant restart, it was discovered that the analysis input assumptions for the Transient Mass Distribution analysis for the following subcompartments could not be verified or located. In response to this condition, AEP reconstituted the plant-specific input assumptions for the TMD analysis and re-performed the analysis for the following subcompartments:

1. Steam Generator Subcompartment

2. Fan Accumulator (Annulus) Subcompartment
3. Pressurizer Subcompartment
4. Reactor Cavity Subcompartment
5. Loop Subcompartments

The calculations which re-generated the TMD input values were conservatively performed by appropriately biasing values and assumptions. Additionally, the TMD code itself also has inherent conservatisms. These conservatisms are described in the next sections.

TRANSIENT MASS DISTRIBUTION (TMD) CONSERVATIVE MODELING APPROACH

There are a number of theoretical conservatisms in the TMD analyses (Westinghouse to AEP Letter, AEP-00-172). These include:

1. The basis for the TMD critical flow is a homogeneous mixture with isentropic expansion. The homogeneous mixture (no slip) provides a lower bound to the critical mass flow rate. At low containment pressures there will be slip between the vapor and liquid phases of the flowing fluid through the restrictions. The no slip condition results in lower flow rate and higher calculated pressure. Test data has indicated that this flow could be augmented by as much as 20% in the lower quality region.

2. 100% moisture entrainment is

assumed. All of the water in the break compartment is available for flow into adjacent compartments. No fluid, nor the energy in the fluid, is assumed to fall to the floor. This is a conservative assumption as illustrated by sensitivities shown in Table 14.3.4-21 of the Cook UFSAR (Attachment 1).

3. Other than in the ice condenser, there is no assumed heat loss from the fluid by condensation or any other mechanism, such as heat transfer to the heat sinks. Any energy dissipation would reduce the internal energy content of the atmosphere and reduce the pressurization.

4. The temperature flash method is used. The temperature flash method, which is also used in the CONTEMPT code, is valid for the following reasons:

The liquid release from the broken pipe enters the containment building at a very high velocity and tends to break into droplets and form a fine mist that has been observed in semi scale blowdown experiments. This mist tends to float in the containment environment and has the opportunity to approach thermal equilibrium with the vapor region. The use of the temperature flash method results in a slightly higher calculated containment pressure than the actual pressure.

D. C. COOK TMD ANALYSIS INPUT ASSUMPTIONS

The TMD analysis input values were developed as follows. First, walkdowns were performed to visually verify flow path areas and lengths, and compartment and equipment volumes. Design information was then obtained from plant drawings, walkdown observations, and other engineering references. Flow path areas and volumes were then calculated to produce bounding values. The calculations were then verified and transmitted to Westinghouse in the form of Design Information Transmittals (DITs). The results of the TMD analyses were transmitted back to AEP in the form of Westinghouse letters. These letters were reviewed within AEP by a multidisciplined Design Review Board and subjected to Owner's Acceptance Review. The following is

the summary of referenced inputs, outputs and calculations used for each of the D. C. Cook containment TMD Analyses.

Containment Location	Calculations used to support the DITs	DIT # Used	Westinghouse Letter to AEP
Steam Generator	TH-99-05	B-00217	AEP-99-225 AND AEP-99-447
Fan Room	SD-990618-003 AND TH-99-02	B-00216, B-00036 AND B-00217	AEP-99-183 AND AEP-99-397
Pressurizer	SD-990618-003 AND TH-91-01	B-00545	AEP-99-162, AEP-99-349 AND AEP-00-026
Reactor Cavity	SD-990618-003 AND TH-99-02	B-00668	AEP-00-058 AND AEP-00-063
Loop Compartment	SD-990618-003 AND TH-99-02	B-00216, B-00036 AND B-00217	AEP-99-224 AND AEP-99-369

There are also general practices that are conservative in the calculation and developments of critical input data. The directions of conservatism have been determined through analysis sensitivities. For example, the following input items will cause a maximum pressure to be calculated in a compartment with minimal vent area with maximum resistance to relief pressure.

a. The critical subcompartment volumes are biased low.
b. The flow areas between volumes are biased low.
c. The unrecoverable losses (k & fL/D) are biased low.

For the purpose of generating conservative revised subcompartment TMD Analysis input assumptions, the methodology used in calculating volumes and flow areas is such that these values are biased low (SD-990618-003, Rev. 1 Attachment A.2 and TH-99-02 Rev. 0, page15). For example, recent walkdowns of the Fan-Accumulator rooms confirmed that equipment volumes (accumulators) were over

estimated and flow areas to adjacent compartments were underestimated. These inputs are then used directly as provided as input to TMD. UFSAR Section 14.3.4-21 includes the results of Westinghouse input assumption sensitivity studies, including compartment volume, flow area, and entrainment level.

In addition, detailed sketches of key compartment's structure, major components, piping and vent areas have been constructed, which permitted calculation of net subcompartment volumes, flow paths, and flow areas, as a part of TMD analysis input generation efforts.

SUMMARY OF D. C COOK SUBCOMPARTMENT TMD ANALYSIS

Steam Generator Subcompartment

The revalidation and reconstitution of the input assumptions for the steam generator subcompartments resulted in changes to the differential pressures, and the maximum calculated pressures for the subcompartment. The steam generator enclosures are divided into nine nodes in the TMD code. Two accidents are analyzed: a break at the steam generator outlet nozzle and a break at the side of the steam generator vessel. The maximum differential pressures are evaluated for locations inside the enclosure to the upper cavity, as well as the differential pressure inside the enclosure from one side to the other. These values are contained in UFSAR Tables 14.3.4-22 for the break at the steam generator outlet nozzle, and 14.3.4-23 for the break at the side of the Steam Generator vessel.

	Upper Enclosure Outlet Break Max. DP	Mid Enclosure Outlet Break Max. DP	Lower Enclosure Outlet Break Max. DP Outlet Break Max. DP	Lower Break Max DP	Wall Between S/G's Max. DP	SG Vessel Max. DP	Maximum Enclosure Pressure
Current UFSAR	32 psid	26 psid	11 psid	38.8 psid	38.8 psid	38 psid	26.4 psig
New TMD Results	53.87 psid	47.43 psid	10.60 psid	46.33 psid	46.28 psid	44.46 psid	57.0 psig

The input values, for the steam line break at the top, the flow path data along the side of the Steam Generator vessel past the upper support have changed the most to reflect the as-built configuration of the plant. Even though all data has changed somewhat, Westinghouse Letter (AEP-00-172) indicates that, this specific change results in the biggest impact on the pressurization near the top of the steam generator, since as-built information results in higher flow restriction along the side of the steam generator. The input value for total flow area of paths 47-51, 48-52, 49-53, and 50-54 was reduced based on as built information, from 171.72 ft2 to 121.43 ft2. This is an approximate reduction of 40%. The corresponding loss factors also increased significantly. For flow out of the enclosure to the loop compartments for paths 51-2, 52-2, 53-1, and 54-1, the loss factors increased by about a factor of two. This change has the biggest effect on the break at the side.

Fan Accumulator (Annulus) Subcompartment

During the reconstitution of the input assumptions for the fan accumulator subcompartment, the application of new conservatisms resulted in a slight increase in the calculated pressure. An evaluation of the containment structural integrity has been prepared (NED-2000-527-REP, Rev. 0), which establishes the functional capability of the subcompartment structures as the result of the new TMD load pressures.

Pressurizer Subcompartment TMD

The revalidation of the TMD input assumptions for the pressurizer subcompartment revealed that flow path and temperature inputs for the pressurizer enclosure needed to be revised. In addition, the net free volume of the pressurizer enclosure was reduced based on as-built data. These

changes increased the maximum calculated differential pressure across the subcompartment from 8.10 psid to 8.82 psid. This is well within the structural design differential pressure of 80.0 psid as documented in UFSAR section 14.3.4.2. In addition, the peak differential pressure across the pressurizer vessel was calculated to increase from the current value of 0.38 be 0.45 psid, which is well within the design limit of 1.30 psid for the pressurizer as delineated in UFSAR Section 14.3.4.2.

Reactor Cavity Subcompartment TMD

The revalidation and reconstitution of the input assumptions for the reactor cavity resulted in increases to the differential pressures, and the maximum calculated pressures for the subcompartment. The UFSAR changes for the pressure parameters in UFSAR section 14.3.4.2 are as follows:

	Peak Missile Shield DP	Peak Cavity Wall DP	Peak Lower Cavity Pressure	Loop-Lower Cavity Peak DP
Current UFSAR	54.3 psid	48.4 psid	18.5 psig	8 psid
New TMD Results	79.2 psid	72.4 psid	20.8 psig	13.7 psid

The input value for the flow area out of the upper reactor cavity was decreased from 175 ft2 to 128.3 ft2 based on as-built data. Westinghouse Letter AEP-00-172 indicates that, this reduction in flow area results in the largest impact on the upper reactor cavity pressurization, the peak missile shield differential pressure, and the peak cavity wall differential pressure.

Loop Subcompartment TMD

The revised Loop Subcompartment volumes and flow path input values resulted in changes to the differential pressures between the loop subcompartment and the upper containment, as well as the peak containment shell pressure. The changes for the pressure parameters in UFSAR section 14.3.4.2 due to re-analysis are as follows:

	Peak Differential Pressure (psid) DP1-25(nodes) or DP6-25(nodes))	Peak Differential Pressure (psid) DP1-25(nodes) or DP6-25(nodes)	Peak Differential Pressure (psid) DP2-25(nodes) or DP5-25(nodes)	Shell Peak Pressure (psid) DP7, 8, 9-25 (nodes)	Base Differential Pressure (psig) P40(nodes), P45(nodes)
Current UFSAR	16.8 psid	18.7 psid	13 psid	11.2 psid	14 psig
New TMD Results	18.2 psid	20.2 psid	14 psid	11.8 psid	14.8 psig

There are six loop subcompartment nodes (1-6) around the lower containment (layout of containment shell indicating TMD model nodes, calculation TH-99-02 Rev 0, page 17 of 179). Two, elements 1 and 6, end in a "corner" shape against the reactor cavity. The other two annotated here are fairly trapezoidal-shaped, elements 2 and 5, and border elements 1 and 6. Element 25 represents upper containment, and elements 7, 8, and 9 are vertically "stacked" nodes in the ice condenser. Elements 40 and 41 are two, small nodes just below the ice condenser. The other elements at this elevation, elements 41, 42, 43 and 44, all have peak calculated pressures below the 12 psig structural design value and are not annotated in UFSAR section 14.3.4.2.

CONCLUSION

For the purpose of containment TMD analyses, the methodology used in calculating the TMD input assumptions has conservatively under-estimated gross compartment volumes, and over-estimated the volumes of equipment, and piping and other items that are subtracted from gross volumes to

determine the net free volumes (SD-990618-003, Rev.1 page 8 of 107). Detailed drawings of compartment structures, major components, piping and vent areas have been constructed for AEP. These permitted calculations of net free subcompartment volumes, flow paths, and flow areas, as a part of TMD analysis input generation efforts. Recent walkdowns by personnel from Design Engineering who are familiar with the containment structure, validated that these calculations utilized a conservative approach. The impact of these conservative input parameters has been demonstrated in Cook specific sensitivity studies that are listed in Table 14.3.4-21 of the UFSAR.

In addition, the TMD computer program applies conservatisms in calculating the peak and differential pressures. These include use of the temperature flash method, no heat loss (except to the ice condenser), homogenous mixture with isentropic expansion, and 100% moisture entrainment.

Calculations used to revise TMD Analysis input assumptions have been owner accepted by AEP and independently reviewed and approved by a panel of outside technical experts, who serve on the Design Review Board.

The results of the revised TMD analyses yielded peak pressures and differential pressures for the steam generator, fan accumulator, pressurizer, reactor cavity and loop subcompartments in containment higher than those currently described in the UFSAR (section 14.3.4). The functional capability of the containment subcompartments as the result of the revised TMD load pressure have been established by Structural Design Engineering (NED-2000-527-REP, Rev. 0).

	Indiv	Team	Group	Date
Due Date:	06/02/2000			
Accepted By:	APPIGNANIP	KINGSEEDJ	NSA	05/26/2000
Assigned To:	KINGSEEDJ	KINGSEEDJ	NSA	05/29/2000
Approval Assigned To:	KINGSEEDJ	KINGSEEDJ	NSA	05/29/2000
Ready For Approval:	KINGSEEDJ	KINGSEEDJ	NSA	05/31/2000
Approved By:	KINGSEEDJ	KINGSEEDJ	NSA	05/31/2000

NPM Reference

AR # JO # JOA #

AR Associated: No

OD Related: No Mode Constraint:

Unit Affected: 2

Condition Report: P-99-06123
Current Status: Screened
Action Category: 4

Action: 11

Resp Group:	NED	Status:	Closed
Orig Group:	NED	Event Code:	C1c
Prop CAC:	B	Cause Code:	YYY

Prescribed Action:

DESCRIPTION OF CORRECTIVE ACTION: Reconstitute missing calculations for analysis and design of the Aux. Building basemat.

CONCURRENCE RECEIVED FROM: A. P. Sen

NEGOTIATED DUE DATE: Post Restart

	Indiv	Team	Group	Date
Ready For Approval:	EBERHARDTA	SENA	NED	06/01/2000
Approval Assigned To:	SENA	SENA	NED	06/01/2000
Approved By:	SENA	HOSKINSM	NED	06/01/2000

General:

Outage: Restart 1 - M4

Other Tracking Processes

Type	Number	Text

Documents/Devices

Document/Device	Decsription

Action Taken:

Actual CAC: Status: Open
Due Date: 08/17/2000

	Indiv	Team	Group	Date
Accepted By:	SENA	HOSKINSM	NED	06/01/2000
Assigned To:		KOVARIKB	NED	06/14/2000
Due Date:	08/17/2000			

D.C. Cook
Electronic Corrective Action Program

Condition Report: P-99-06123
Current Status: Screened
Action Category: 4

NPM Reference

AR #	JO #	JOA #

AR Associated: No

OD Related: No   Mode Constraint:

Unit Affected: 0

Action: 12

Resp Group:	NED	Status:	Closed
Orig Group:	NED	Event Code:	C1c
Prop CAC:	B	Cause Code:	YYY

Prescribed Action:

DESCRIPTION OF CORRECTIVE ACTION: Reconstitute missing calculations for the Auxiliary Building stability analysis.

CONCURRENCE RECEIVED FROM: A. P. Sen

NEGOTIATED DUE DATE: Post Restart

	Indiv	Team	Group	Date
Ready For Approval:	EBERHARDTA	SENA	NED	06/01/2000
Approval Assigned To:	SENA	SENA	NED	06/01/2000
Approved By:	SENA	HOSKINSM	NED	06/01/2000

General:

Outage: Restart 1 - M4

Other Tracking Processes

Type	Number	Text

Condition Report: P-99-06123
Current Status: Screened
Action Category: 4

Documents/Devices

Document/Device	Decsription

Action Taken:

Actual CAC:
Due Date: 08/14/2000

Status: Open

	Indiv	Team	Group	Date
Accepted By:	SENA	HOSKINSM	NED	06/01/2000
Assigned To:		KOVARIKB	NED	06/14/2000
Due Date:	08/14/2000			

NPM Reference

AR #	JO #	JOA #

AR Associated: No

OD Related: No   Mode Constraint:

Unit Affected: 0

Action: 13

Resp Group:	NED	Status:	Closed
Orig Group:	NED	Event Code:	C1c
Prop CAC:	B	Cause Code:	YYY

Prescribed Action:

DESCRIPTION OF CORRECTIVE ACTION: Reconstitute missing calculations for the Auxiliary Building shear wall design.

CONCURRENCE RECEIVED FROM: A. P. Sen

NEGOTIATED DUE DATE: Post Restart

Indiv	Team	Group	Date

D.C. Cook
Electronic Corrective Action Program

Condition Report: P-99-06123
Current Status: Screened
Action Category: 4

Ready For Approval:	EBERHARDTA	SENA	NED	06/01/2000
Approval Assigned To:	SENA	SENA	NED	06/01/2000
Approved By:	SENA	HOSKINSM	NED	06/01/2000

General:

Outage: Restart 1 - M4

Other Tracking Processes

Type	Number	Text

Documents/Devices

Document/Device	Decsription

Action Taken:

Actual CAC: Status: Open
Due Date: 09/14/2000

	Indiv	Team	Group	Date
Accepted By:	SENA	HOSKINSM	NED	06/01/2000
Assigned To:		KOVARIKB	NED	06/14/2000
Due Date:	09/14/2000			

NPM Reference

AR # JO # JOA #

AR Associated: No

OD Related: No Mode Constraint:

Unit Affected: 0

Action: 14

Resp Group:	NED	Status:	Closed
Orig Group:	NED	Event Code:	C1c
Prop CAC:	B	Cause Code:	YYY

D.C. Cook
Electronic Corrective Action Program

Condition Report: P-99-06123
Current Status: Screened
Action Category: 4

Prescribed Action:

DESCRIPTION OF CORRECTIVE ACTION: Reconstitute missing calculations for the Auxiliary Building slab shear diaphragms.

CONCURRENCE RECEIVED FROM: A. P. Sen

NEGOTIATED DUE DATE: Post Restart

	Indiv	Team	Group	Date
Ready For Approval:	EBERHARDTA	SENA	NED	06/01/2000
Approval Assigned To:	SENA	SENA	NED	06/01/2000
Approved By:	SENA	HOSKINSM	NED	06/01/2000

General:

Outage: Restart 1 - M4

Other Tracking Processes

Type	Number	Text

Documents/Devices

Document/Device	Decsription

Action Taken:

Actual CAC:
Due Date: 10/08/2000

Status: Open

	Indiv	Team	Group	Date
Accepted By:	SENA	HOSKINSM	NED	06/01/2000
Assigned To:		KOVARIKB	NED	06/14/2000
Due Date:	10/08/2000			

NPM Reference

AR # JO # JOA #

D.C. Cook
Electronic Corrective Action Program

Condition Report: P-99-06123
Current Status: Screened
Action Category: 4

AR Associated: No

OD Related: No   Mode Constraint:

Unit Affected: 0

IX. Overall Approval

Responsible Group: NED   Status: Screened

	Indiv	Team	Group	Date
Assigned To:			NED	03/24/1999

Closure Document Type	Closure Document No

Supplemental Concurrences - These do not affect ECAP closure.

Concurrences Associated with External Committments:

	Indiv	Team	Group	Date
Concurred By:				

X. Attachments

Maintenance Rule

No Maintenance Rule for this ECAP

Performance Improvement International:

No PII for this ECAP.

Remarks

SUPPLEMENT REQUIRED - Portions of this CR were sent to the NRM on 03-31-99

D.C. Cook

Electronic Corrective Action Program

Condition Report: P-99-06123
Current Status: Screened
Action Category: 4

End of the Document for ECAP No:	P-99-06123
The status of this ECAP is:	Screened
The duration of this ECAP was:	46 days

COMMITMENT MANAGEMENT PROGRAM DATA INPUT FORM

Commitment # 7806 Prepared By: Steven R. Dort

DOCUMENT INFORMATION:	Date: 6/28/00	Submittal Number:
Document Title: **Containment Internal Concrete Structures Do Not Meet Design Load Margins**		
COMMITMENT INFORMATION:	Status: OP	Organization: NED
	Due Date: U1 Mode 4	Assigned To: R. Smith
Category: DE	Timing: SA	CR Number: 00-2506
Frequency/Event:	System: CNTMT	LER Number: 316/2000-003-00
COMMITMENT:	Page/Section: 1 / Cover Ltr	Title: Containment Internal Structures

Commitment: Clearly circle or highlight applicable commitment in document and attach to this sheet.

A review of containment internal structures will be performed prior to Unit 1 startup to determine extent of condition, repairs to structural elements will be made where applicable, and critical calculations will be reconstituted or evaluations performed to document operability of the Unit 1 structures.

Comments: Additional information about commitment, if needed. Attach to this sheet.

COMMITMENT DISPOSITION:

Closure Note: If commitment is closed, provide closure information (e.g.,

Document/dates, etc.) (attach a copy of PMP 7100 CMP.001, Attachment 1).

If commitment is ongoing and has already been implemented,

Provide implementation information (attach a copy of PMP 7100 CMP.001, Attachment 1).

Additionally, list any applicable procedure numbers. Attach information to this sheet.

Verification Information:

R. Smith / S R Dort for Brenda Kovarik per telecon 0840 — 6/29/00
Name/Signature of manager of Responsible Group or designee — Date
SR Dort

R. Gaston / MB Depuydt for R. Gaston — 6/29/00
Name/Signature manager Nuclear Licensing or designee — Date
MB Depuydt

Indiana Michigan
Power Company
Cook Nuclear Plant
One Cook Place
Bridgman, MI 49106
616-465-5901

INDIANA
MICHIGAN
POWER

June 28, 2000

United States Nuclear Regulatory Commission
Document Control Desk
Washington, DC 20555

Operating License DPR-74
Docket No. 50-316

Document Control Manager:

In accordance with the criteria established by 10 CFR 50.73 entitled Licensee Event Report System, the following report is being submitted:

LER 316/2000-003-00, "Containment Internal Concrete Structures Do Not Meet Design Load Margins."

The following commitments were identified in this submittal:

- A review of containment internal structures will be performed prior to Unit 1 startup to determine extent of condition, repairs to structural elements will be made where applicable, and critical calculations will be reconstituted or evaluations performed to document operability of the Unit 1 structures.
- The final course and schedule for long-term corrective and preventive actions to restore and maintain the design pressure load factors for the internal containment concrete structural elements in both units will be determined prior to Unit 1 startup.

Should you have any questions regarding this correspondence, please contact Mr. Robert C. Godley, Director, Regulatory Affairs, at 616/465-5901, extension 2698.

Sincerely,

for Daniel J. Garner

M. W. Rencheck
Vice President – Nuclear Engineering

/srd
Attachment

c: J. E. Dyer, Region III
R. C. Godley
D. Hahn
W. J. Kropp
R. P. Powers
R. Whale
Records Center, INPO
NRC Resident Inspector

COMMITMENT MANAGEMENT PROGRAM DATA INPUT FORM

Commitment # 7805 Prepared By: Steven R. Dort

DOCUMENT INFORMATION:	Date: 6/28/00	Submittal Number:
Document Title: **Containment Internal Concrete Structures Do Not Meet Design Load Margins**		
COMMITMENT INFORMATION:	Status: OP	Organization: NED
	Due Date: U1 Mode 4	Assigned To: R. Smith
Category: DE	Timing: SA	CR Number: 00-2506
Frequency/Event:	System: CNTMT	LER Number: 316/2000-003-00
COMMITMENT:	Page/Section: 1 / Cover Ltr	Title: Containment Internal Structures

Commitment: Clearly circle or highlight applicable commitment in document and attach to this sheet.

The final course and schedule for long-term corrective and preventive actions to restore and maintain the design pressure load factors for the internal containment concrete structural elements in both units will be determined prior to Unit 1 startup.

Comments: Additional information about commitment, if needed. Attach to this sheet.

COMMITMENT DISPOSITION:

Closure Note: If commitment is closed, provide closure information (e.g.,

Document/dates, etc.) (attach a copy of PMP 7100 CMP.001, Attachment 1).

If commitment is ongoing and has already been implemented,

Provide implementation information (attach a copy of PMP 7100 CMP.001, Attachment 1).

Additionally, list any applicable procedure numbers. Attach information to this sheet.

Verification Information:

R. Smith / Steven R. Dort for Brenda Kovarik per telecon — 6/29/00
Name/Signature of manager of Responsible Group or designee 0840 SR DORT — Date

R. Gaston / MB Depuydt for R. Gaston — 6/29/00
Name/Signature manager Nuclear Licensing or designee — Date
MB DEPUYDT

Indiana Michigan
Power Company
Cook Nuclear Plant
One Cook Place
Bridgman, MI 49106
616-465-5901

INDIANA MICHIGAN POWER

June 28, 2000

United States Nuclear Regulatory Commission
Document Control Desk
Washington, DC 20555

Operating License DPR-74
Docket No. 50-316

Document Control Manager:

In accordance with the criteria established by 10 CFR 50.73 entitled Licensee Event Report System, the following report is being submitted:

LER 316/2000-003-00, "Containment Internal Concrete Structures Do Not Meet Design Load Margins."

The following commitments were identified in this submittal:

- A review of containment internal structures will be performed prior to Unit 1 startup to determine extent of condition, repairs to structural elements will be made where applicable, and critical calculations will be reconstituted or evaluations performed to document operability of the Unit 1 structures.
- The final course and schedule for long-term corrective and preventive actions to restore and maintain the design pressure load factors for the internal containment concrete structural elements in both units will be determined prior to Unit 1 startup.

Should you have any questions regarding this correspondence, please contact Mr. Robert C. Godley, Director, Regulatory Affairs, at 616/465-5901, extension 2698.

Sincerely,

Daniel J Garner for

M. W. Rencheck
Vice President – Nuclear Engineering

/srd
Attachment

c: J. E. Dyer, Region III
R. C. Godley
D. Hahn
W. J. Kropp
R. P. Powers
R. Whale
Records Center, INPO
NRC Resident Inspector

AEP DESIGN INFORMATION TRANSMITTAL (DIT)

DIT Form, Part 1

☒SAFETY-RELATED ☐NON-SAFETY-RELATED	Originating Organization ☐AEP ☒Other (specify) S&L	DIT No DIT-B-01200-00
D.C Cook Unit: ☐1 ☒2 ☐BOTH System Designation: BLDG		Page 1 of 14 To: B. Kovarik / AEP

Subject: Input for As-found Operability Determination Related to CR P-00-02506

Name	Signature	Position	Date
J McLean (Preparer)	[signature] (Preparer's Signature)	Senior Engineer (Position)	6/13/00 (Date)
A. Al-Dabbagh (Reviewer)	[signature] (Reviewer's Signature)	SPE (Position)	6/13/00 (Date)
A K. Singh (Approver)	[signature] (Approver's Signature)	Project Manager (Position)	6/13/00 (Date)

Status of Information: ☒Approved for Use ☐Unverified

Method and Schedule of Verification for Unverified DIT. N/A

CR # N/A

Holds Associated with Unverified DITs. N/A

Description of Information:

Calculation No. SD-000510-003 has evaluated the Fan-Accumulator Room walls and determined them to be functional considering the grout repairs performed on the wall at azimuth 126. The evaluation on the following pages determines the wall at azimuth 126 to have been functional in the as-found condition (without the grout repairs).

Purpose of Issuance (Including any Precautions or Limitations):

The purpose of this DIT is to address the as-found conditions of the Fan-Accumulator Room walls identified in CR P-00-02506. This may be used as input to the as-found operability evaluation for the Fan-Accumulator Room Wall at Azimuth 126 degrees

Source of Information. Engineering Judgement Used? ☐Yes ☒No

1. Calculation No. SD-000510-003, Rev 0

Distribution: Copy to A.K Singh;
Copy to DIT Administrator File
Original to NRM (Transmitted by DIT Administrator)
T. Slay- 23 / File

AEP DESIGN INFORMATION TRANSMITTAL (DIT)

DIT Form, Part 2

AEP Design Information Transmittal	DIT No. DIT-B-01200-00 Page 2 of 14 .

Past Operability Evaluation for Fan-Accumulator Room Wall at Azimuth 126

1.0 PURPOSE/OBJECTIVE

1.1 Background

There are two fan-accumulator rooms at elevation 612'-0" in the Unit 2 Containment Building of the Cook Nuclear Plant (CNP). Each room has two radial walls between elevations 612'-0" and 638'-0". These four radial walls of the two rooms are located at azimuths 54°, 126°, 234°, and 307° of the Containment Building.

Deficiencies associated with the quality of concrete and/or grout in the fan-accumulator room radial walls near elevation 638'-0" are reported in Condition Report (CR) Nos. P-99-27755 (ref. 1), P-00-00610 (ref. 2), P-00-02506 (ref. 3), P-00-06586 (ref. 8), P-00-07064 (ref. 9), P-00-07211 (ref. 10), and P-00-07391 (ref. 11). The items of concern which are documented in these CRs are as follows:

1. The top 7" of the walls was poured with grout, which has been determined to be deficient (ref. 3, estimated strength of 1000 psi per ref. 14).
2. Excavation of the grout revealed that only 3 vertical reinforcing bars are continuous from the wall into the slab in the width of the wall between the opening and the containment wall (ref. 3 & 12).
3. During excavation of the grout, an asbestos blanket was found between the top of the wall and the bottom of the slab (ref. 8). (3)

Calculation No. SD-000510-003 (ref. 13) evaluated the walls for the effect of these CRs, based on the grouting of the wall at azimuth 126 by 2-LDCP-4621 and AR A0201632. No repairs were made to the other walls that have affected their capacities.

1.2 Purpose/Objective

The purpose of this evaluation is to determine the capability of the wall at azimuth 126, based on its as-found condition, to perform its intended function, considering the deficiencies noted in the above CRs.

This wall will be evaluated for the applicable load combinations specified in Sections 5.2.2.3 and 5.2.2.4 of the UFSAR (Ref. 7), except that the maximum permissible load factor (factor of safety) applied to the pressure loads will be determined.

This is not a design basis calculation.

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2.0 DESIGN INPUTS

1. The layout and dimensions of this radial wall, applicable design loads and load combinations based on Sections 5.2.2.3 and 5.2.2.4 of the UFSAR, are obtained from ref. 13.

2. Requirements for the evaluation of shear-friction capacity at elevation 638'-0" of the walls are obtained from Section 11.7.4.3 of ACI 349-97 Code (ref. 6). Although the licensing basis is the ACI 318-63 Code (ref. 5), the shear friction approach to transfer shear loads across planes of dissimilar materials is not contained in the ACI 318-63 Code (ref. 5). Therefore, use of the latest edition of the concrete code, ACI 349-97 (ref. 6), is acceptable.

3. The design concrete compressive strength for this wall will be obtained from Calculation No. SD-000510-003 (ref. 13).

4. CR P-00-02506 (ref. 3) and DIT-B-01198-01 (ref. 12) provide information for bars at the top of the wall at azimuth 126°.

3.0 REFERENCES

1. Condition Report (CR) No. P-99-27755
2. Condition Report (CR) No. P-00-00610
3. Condition Report (CR) No. P-00-02506
4. ACI 318-95, "Building Code Requirements for Structural Concrete"
5. ACI 318-63, "Building Code Requirements for Reinforced Concrete"
6. ACI 349-97, "Code Requirements for Nuclear Safety Related Structures"
7. Donald C. Cook UFSAR, Chapter 5.2, Rev. 16.2
8. Condition Report (CR) No. P-00-06586
9. Condition Report (CR) No. P-00-07064
10. Condition Report (CR) No. P-00-07211
11. Condition Report (CR) No. P-00-07391
12. DIT No. DIT-B-01198-01, dated 5/26/00
13. Calculation No. SD-000510-003, "Evaluation Of Fan-Accumulator Room Walls", Rev. 0
14. DIT No. DIT-B-00940-00, dated 3/23/00
15. "American Institute of Physics Handbook", Dwight E. Gray, Third Edition
16. S&L Structural Design Standard SDS-E5.4.1, Rev. 2

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4.0 METHODOLOGY

The methodology for this calculation is outlined below:

4.1. Layout/Configuration

The design and as-built layout, dimensions, and reinforcement configuration are given in ref. 13.

4.2. Loads and Load Combinations

The loads and load combinations are given in ref. 13. Based on ref. 13, the controlling load combination is load combination (i) of the UFSAR, which is due to the Main Steam Line Break.

(i). 1.5 P1 P1 = pressure due to MSLB

For this load case (i), the maximum permissible load factor will be determined in the calculation.

4.3. Material Properties

a. Reinforcing Steel

Yield strength, f_y = 44 ksi, per reference 13. This is based on actual CMTRs for Unit 1 and Unit 2, and shows that the actual yield strength is greater than 44 ksi with a 99% confidence level.

b. Concrete and Grout Strength

(i). In-Situ Concrete

Except for the localized weaker concrete/grout near elevation 638'-0", concrete compressive strength of 5,300 psi will be used. This 5,300 psi value is based on cylinder test data for the Unit 1 and Unit 2 crane wall, slab at elevation 640' and for the four accumulator room walls. The justification for the use of 5,300 psi is given in ref. 13.

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(ii) Grout at Top of Azimuth 126 Wall

As stated in CR P-00-00610, pockets of concrete at the top of the wall along azimuth 126 degrees were left ungrouted. Condition Report P-00-02506 documents poor quality of grout/concrete near the top of the wall in addition to the concrete pockets identified in the CR P-00-00610. The minimum strength of the previously existing grout is considered to be 1000 psi based on ref. 14.

4.4. Analysis/Evaluation

a. Boundary conditions

The wall is rigidly tied to the crane wall and the slab below, and free on the containment wall side. Because of the discrepancies identified in the CRs, the connection to the slab above can not be considered to transfer moments across the connection. Therefore, the connection of the wall to the slab above will be considered pinned and only be checked to transfer shear across the connection. Per ref. 13, the vertical reinforcing through this connection extends 1'-9" into the concrete above and is continuous through the wall below. Any reductions due to insufficient development length of the reinforcing will be considered.

The shear analysis of the wall considers shear support from the continuous bars extending into the slab above using the shear-friction approach for wall. The wall construction at wall to crane wall and wall to slab at the 612' slab junction for all walls is monolithic. Shear transfer through concrete is considered at these boundaries.

4.5. Computer Programs

a. Mathcad

Some of the analyses in this calculation will be done using Mathcad software (S&L Program No. 03.7.548-6.0), which is a calculation shell. The functions of Mathcad used in this calculation have been verified and validated and approved for use under the S&L QA Program. All formulae are clearly defined on each page and therefore may be verified by the reviewer. The preparer and reviewer will verify the adequacy of the calculations performed by the Mathcad program.

5.0 ACCEPTANCE CRITERIA

The wall will be evaluated per the acceptance criteria contained in the ACI 318-63 (ref. 5) concrete code where applicable. Criteria which is not contained in the ACI 318-63 code, such as shear friction approach to transfer shear loads across planes of dissimilar materials, will be obtained from the latest edition of the concrete code, ACI 318-95 (ref. 4) or ACI 349-97 (ref. 6). The load combinations and load factors shall be those determined in ref. 13.

For impulsive and impactive loads, such as those resulting from a main steam line break, it is appropriate to apply a dynamic strength increase factor. Because these are not given in the ACI 318-63 code (ref. 5), these are obtained from the ACI 349-97 concrete code (ref. 6, Appendix C).

The intended function of the wall is to direct steam flow into the ice condenser during a design basis accident. The wall will be considered adequate if the calculated shears and moments are less than the wall capacities with a load factor of at least 1.0 applied to the pressure load considered in this calculation.

6.0 ASSUMPTIONS AND LIMITATIONS

None

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7.0 CALCULATIONS:

Units: $kip \equiv 1000 \cdot lb$ $ksi \equiv \frac{kip}{in^2}$ $psi \equiv \frac{lb}{in^2}$ $psf \equiv \frac{lb}{ft^2}$

7.1 Simplified Analysis of Accumulator wall at azimuth 126 degrees

This wall spans 26' vertically and 12'-8" horizontally, with no connectivity to the containment wall. In addition, due to the deficiencies in the concrete at the top of the wall per the CRs, the connection at the top of the wall will not be considered to have any moment capacity. Therefore, the boundary conditions are fixed at the base and at the crane wall, pinned at the top, and free at the containment wall. Because of the large vertical span, the wall was conservatively analyzed in ref. 13 as a horizontal cantilever, supported off the crane wall. Support for the concrete next to the rectangular opening, on the side towards the containment wall, was considered to be provided by the vertical reinforcing and the additional reinforcing around the opening. Considering that the horizontal reinforcing will support all but this area next to the opening, the shear capacity at the connection of the wall to the slab will be evaluated to support the load from pressure and seismic loads on this area only.

The actual bar cover and spacing, as given in Section 7.1 of ref. 13, was considered. Also, near the top of the wall, the number of vertical reinforcing bars extending into the slab is substantially smaller than the design. Based on ref. 3 and ref. 12, there are three bars extending into the bottom of the slab at elevation 638' on the width of the wall between the containment wall and the opening.

This wall was determined to be functional in ref. 13. However, in ref. 13, the wall was analyzed considering the new grout placed at the joint between the wall and the slab per 2-LDCP-4621 and AR A0201632. This additional evaluation will be performed using the capacity of the previously existing grout (without any repair/rework). The condition of this grout is documented in CR P-00-02506. Also, based on CR P-00-06586, asbestos was found in the joint between the wall and the slab, which affects the shear friction capacity of the joint. It is not known if this asbestos extends across the full area of the joint. Based on the possibility of this asbestos extending across the full area, the coefficient of friction between the wall and slab will be reduced below the concrete-to-concrete values given in ref. 6.

The exact sliding coefficient of friction for asbestos on concrete/grout is not readily available. Therefore, coefficients of other material interfaces will be used to determine a reasonable value for the coefficient of friction for asbestos on concrete/grout. Based on ref. 15, the following coefficients of friction are obtained for blanket-like materials on cast iron & steel:

Leather on cast iron	0.56
Nylon 6.6 (w/ fibers) on mild steel	0.35

Based on sliding (resisting) coefficients of friction for steel on steel of 0.35 and concrete on steel of 0.70 per ref. 16, it can be concluded that the coefficient of these items on concrete is larger than for steel. From this information, a reasonable coefficient of friction for asbestos on concrete/grout is 0.3.

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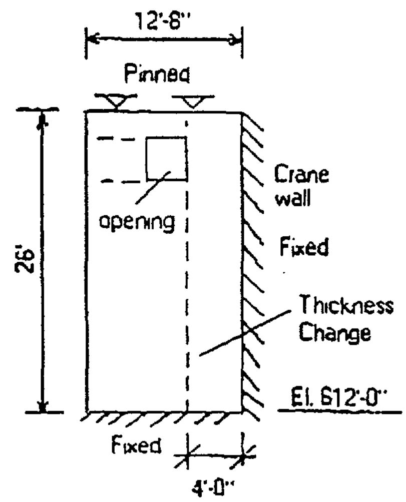
Diagram of wall support conditions:



Calculate 'd' dimensions for the constant thickness section and for the variable thickness section at a distance 'd' from the supporting crane wall. Based on the conclusions in Section 7.1 of ref. 13, this cover is to be taken as 6.25" for the horizontal bars in the tapered section, 4.6" for the horizontal bars in the thickness change, and 4.6" for the vertical bars.

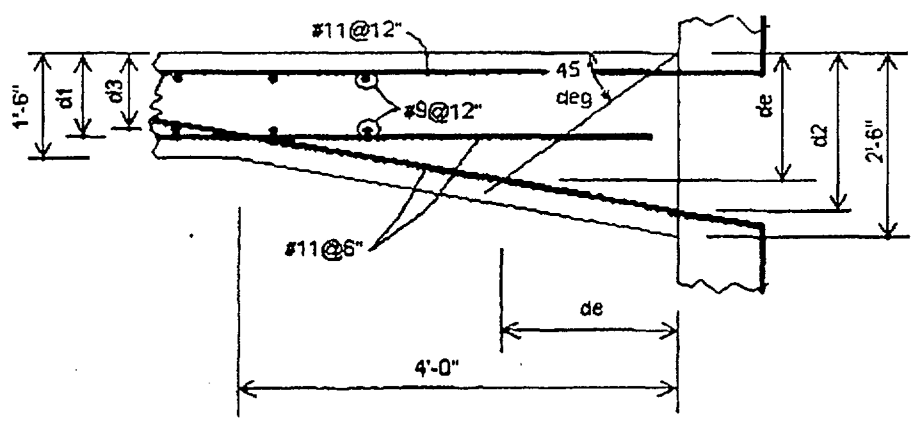
$c_{ht} := 6.25 \cdot in$ $\quad c_h := 4.6 \cdot in$ $\quad c_v := 4.6 \cdot in$

$d_1 := 18 \cdot in - \left(c_h + \frac{1}{2} \cdot \frac{11}{8} \cdot in \right)$ $\quad d_1 = 12.71 \cdot in$ (horizontal bars for 18" thick portion of wall)

$d_2 := 30 \cdot in - \left(c_{ht} + \frac{1}{2} \cdot \frac{11}{8} \cdot in \right)$ $\quad d_2 = 23.06 \cdot in$ (horizontal bars at face of crane wall)

$d_3 := 18 \cdot in - \left(c_v + \frac{1}{2} \cdot \frac{9}{8} \cdot in \right)$ $\quad d_3 = 12.84 \cdot in$ (vertical bars)

The effective distance from the support 'd_e' is calculated in ref. 13 as:



$d_e := 1.58 \cdot ft$

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Check shear-friction capacity between wall & slab at azimuth 126:

Use a Dynamic Increase Factor of 1.20 for the steel reinforcing per ref. 13, Section 7.3.6.

$f_c := 5300 \cdot psi$ (see methodology) $\phi := 0.85$ $DIF_s := 1.20$

$f_y := 44 \cdot ksi \cdot DIF_s$ $f_y = 52.8 \cdot ksi$

$V_{u3} := 51.4 \cdot kip$ (factored shear force per ref. 13)

The shear transfer between the wall at azimuth 126 and the slab will be done using the shear friction approach in Section 11.7.4 of ref. 6, using shear friction reinforcing of only (3) #9 bars Because of concerns identified in CR P-00-06586 regarding asbestos found between the grout and the concrete slab, the coefficient of friction will be reduced to 0.3, which is less than values given in ref. 6. To account for any decreased capacity associated with the development length of 1'-9" into the concrete above the joint (Required development length per ref. 5 is 20d = 22.5"), the yield strength will be decreased accordingly. Because of the limited amount of grout available, this connection will also be limited by the capacity of the grout per Section 11.7.5. Using a grout strength of 1000 psi for the previously existing grout per ref. 14, and a conservative effective area of grout of 2 sq. ft., the capacities are:

$A_{vf} := 1.00 \cdot in^2 \cdot (3)$ $A_{vf} = 3 \cdot in^2$ $f_{yf} := f_y \cdot \frac{21 \cdot in}{22.5 \cdot in}$

Based on the previous discussion, the coefficient of friction will be considered to be:

$\mu := 0.3$

$\phi V_{nf} := \phi \cdot A_{vf} f_{yf} \mu$ $\phi V_{nf} = 37.7 \cdot kip$ $<$ $V_{u3} = 51.4 \cdot kip$

$\phi V_{nf1} := \phi \cdot 0.2 \cdot (1000 \cdot psi) \cdot (2 \cdot ft^2)$ $\phi V_{nf1} = 48.96 \cdot kip$ $<$ $V_{u3} = 51.4 \cdot kip$

$\phi V_{nf2} := \phi \cdot (800 \cdot psi) \cdot (2 \cdot ft^2)$ $\phi V_{nf2} = 195.84 \cdot kip$ $>$ $V_{u3} = 51.4 \cdot kip$

Therefore, the load factor for the shear capacity at the top of the wall is:

$LF_{vf} := \frac{\phi V_{nf}}{V_{u3}} \cdot 1.5$ $LF_{vf} = 1.1$

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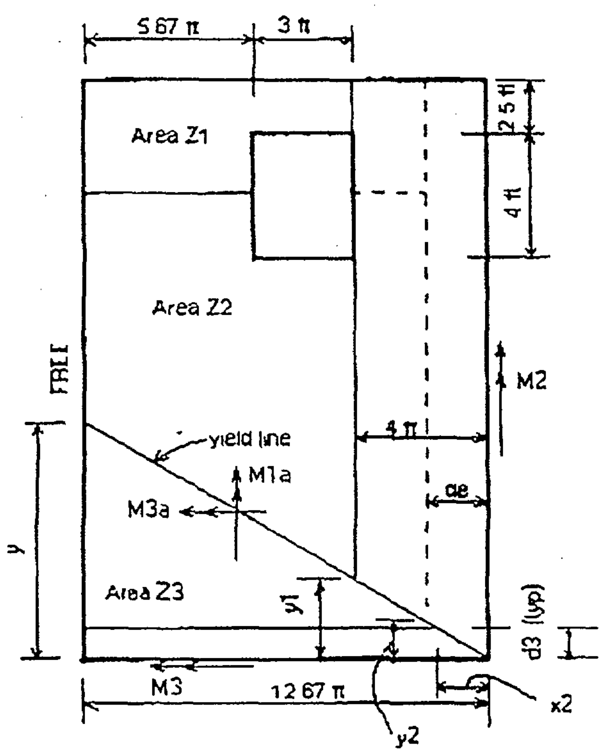
7.2 Analysis of Wall at Azimuth 126 Using the Yield-Line Method

Here the yield line theory will be used to determine the pressure load factor for the wall. Because the only difference between the as-found condition of the wall and the present condition of the wall is the repair/rework of the grout at the top of the wall, the yield line and flexural capacity of the wall will remain unchanged from the values determined in ref. 13. Similarly, only the shear resistance capacity of area Z1 has changed. Therefore, only the load factor for area Z1 will be calculated.



Elevation of wall at azimuth 126 showing yield line

Figure 7.5.2-1

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<u>Shear Capability of the wall at azimuth 126 degrees for accidental pressure loads:</u>

For the shear in the wall, the yield line will be considered to be the same as for the moment in the wall. The pressure on the area below the yield line will be taken as shear on the horizontal section and the pressure on the area above the yield line will be taken as shear on the vertical section and through shear friction at the top joint of the wall.

Due to the opening on this wall, the loading from the containment side of the opening will be resisted by shear surfaces on each side of the opening as shown on Figure 7.5.2-1. Therefore, the area above the yield line will be split into two areas, Z1 & Z2. The area below the yield line will be considered area Z3.

The change in the shear capacity of the joint at the top of the wall only affects area Z1 The permissible load factors for Area Z2 and Area Z3 were calculated in ref. 13, which gave a minimum load factor of 1.34. Therefore, only the load factor for area Z1 (and modified area Z1) will be calculated.

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Check shear at thickness change (4' away from crane wall):

$L_h := 12.67 \cdot ft - 4 \cdot ft$ $\qquad L_h = 8.67 \cdot ft$

Capacity (horizontal and vertical lines, respectively):

$d_3 = 12.84 \cdot in$ $\qquad d_1 = 12.71 \cdot in$

Use a Dynamic Increase Factor of 1.1 for the concrete in shear per ref. 13, Section 7.3

$DIF_v := 1.1$

$\phi V_{nh} := 2 \cdot \phi \cdot \sqrt{5300} \cdot psi \cdot d_3 \cdot DIF_v$ $\qquad \phi V_{nh} = 20.97 \cdot \frac{kip}{ft}$

$\phi V_{nv} := 2 \cdot \phi \cdot \sqrt{5300} \cdot psi \cdot d_1 \cdot DIF_v$ $\qquad \phi V_{nv} = 20.77 \cdot \frac{kip}{ft}$

$\phi V_{nf} = 37.7 \cdot kip$

$P1 := 14.0 \cdot psi$ (ref. 13)

Area Z1:

$A_{Z1} := (2 \cdot ft \cdot (5.67 \cdot ft)) + 2.5 \cdot ft \cdot (8.67 \cdot ft)$ $\qquad A_{Z1} = 33.02 \cdot ft^2$

The shear in this area will be resisted by the 2.5' long vertical segment at the thickness change and the shear-friction at the top of the wall. The maximum pressure load capacity is:

$$P_{vZ1} := \frac{\phi V_{nv} \cdot (2.5 \cdot ft) + \phi V_{nf}}{A_{Z1}} \qquad P_{vZ1} = 18.85 \cdot psi$$

Load factor for which shear surface is capable of resisting pressure load from area Z1

$$LF_{vZ1} := \frac{P_{vZ1}}{P1} \qquad LF_{vZ1} = 1.35$$

Therefore, the pressure in the Z1 area can be adequately resisted in shear.

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Check the shear line at a distance 'd' from the crane wall:

$d_e = 1.58 \cdot ft$

$L_h := 12.67 \cdot ft - d_e \qquad L_h = 11.09 \cdot ft$

$\phi V_{ne} := 2 \cdot \phi \cdot \sqrt{5300} \cdot psi \cdot d_e \cdot DIF_v \qquad \phi V_{ne} = 30.97 \cdot \frac{kip}{ft}$

Modified Area Z1:

$A_{mZ1} := L_h \cdot (2.5 \cdot ft) + (5.67 \cdot ft + 4 \cdot ft - d_e) \cdot (2 \cdot ft) \qquad A_{mZ1} = 43.9 \cdot ft^2$

The shear in this area will be resisted by a minimum of a 3.0' long (conservative) vertical segment at a distance 'd' from the crane wall and the bars into the slab through shear friction. The maximum pressure load capacity is:

$P_{vmZ1} := \frac{\phi V_{ne} \cdot (3.0 \cdot ft) + \phi V_{nf}}{A_{mZ1}} \qquad P_{vmZ1} = 20.66 \cdot psi$

Load factor for which shear surface is capable of resisting pressure load from modified area Z1:

$LF_{vmZ1} := \frac{P_{vmZ1}}{P1} \qquad LF_{vmZ1} = 1.48$

Therefore the pressure in the modified Z1 area can be adequately resisted in shear.

$LF_{min} := \min([LF_{vZ1} \;\; LF_{vmZ1}]) \qquad LF_{min} = 1.35 \quad > \quad 1.2$

The load factor for area Z2 still controls over the load factor for area Z1. Therefore, the minimum load factor is still 1.34.

Because the permissible load factor is larger than 1.2, this wall is considered to be functional.

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8.0 CONCLUSION

The fan accumulator wall, which exists between elevations 612' and 638' of the Unit 2 Containment Building at azimuths 126, has been determined to be adequate to have performed its intended functions, when considering the deficiencies noted in CRs P-99-27755, P-00-00610, P-00-02506, P-00-06586, P-00-07064, P-00-07211 and P-00-07391.

The wall at azimuth 126 was functional in its as-found condition, based on the reinforcing bars located by field investigation. The load factor for MSLB pressure load was determined to be 1.1 using the conservative simplified analysis and 1.34 using the yield-line method.

7c

9.0 RECOMMENDATIONS

None.

3.2.4 Operating Plant Found in Degraded or Unanalyzed Condition

§50.72(b)(1)(ii)	§50.73(a)(2)(ii)
Licensees shall report: "Any event or condition during operation that results in the condition of the nuclear power plant, including its principal safety barriers, being seriously degraded; or results in the nuclear power plant being: (A) In an unanalyzed condition that significantly compromises plant safety; (B) In a condition that is outside the design basis of the plant; or (C) In a condition not covered by the plant's operating and emergency procedures."	Licensees shall report: "Any event or condition that resulted in the condition of the nuclear power plant, including its principal safety barriers, being seriously degraded; or that resulted in the nuclear power plant being: (A) In an unanalyzed condition that significantly compromised plant safety; (B) In a condition that was outside the design basis of the plant; or (C) In a condition not covered by the plant's operating and emergency procedures."

If not reported as an emergency under §50.72(a), licensees are required to report operation under such a condition to the NRC via the ENS as soon as practical and in all cases within 1 hour. Licensees are required to submit an LER within 30 days.

Discussion

Reporting at the component, system, and structure level is required under 10 CFR 50.72(b)(1)(ii) and 50.73(a)(2)(ii) if the event or condition resulted in the plant being seriously degraded, in an unanalyzed condition that significantly compromises plant safety, outside the plant design basis, or in a condition not covered by the plant's procedures, as described in the rule.

The discussions below provide further guidance on reportability under these criteria.

(1) The condition of the nuclear power plant, including its principal safety barriers, being seriously degraded.

As indicated in the Statements of Considerations, this paragraph includes material (e.g., metallurgical or chemical) problems that cause abnormal degradation of the principal safety barriers (i.e., the fuel cladding, reactor coolant system pressure boundary, or the containment). Examples of this type of situation include:

(a) Fuel cladding failures in the reactor, or in the storage pool, that exceed expected values, or that are unique or widespread, or that are caused by unexpected factors, and would involve a release of significant quantities of fission products.

(b) Cracks and breaks in the piping or reactor vessel (steel or prestressed concrete) or major components in the primary coolant circuit that have safety relevance (steam generators, reactor coolant pumps, valves, etc).

(c) Significant welding or material defects in the primary coolant system.

(d) Serious temperature or pressure transients.

(e) Loss of relief and/or safety valve functions during operation.

(f) Loss of containment function or integrity including:

(i) Containment leakage rates exceeding the authorized limits.

(ii) Loss of containment isolation valve function during tests or operation.

(iii) Loss of main steam isolation valve function during test or operation, or

(iv) Loss of containment cooling capability.

Examples of events that the staff would consider reportable as significant reactor coolant system welding or material defects include items which cannot be found acceptable under ASME Section XI, IWB-3600, "Analytical Evaluation of Flaws" or ASME Section XI, Table IWB-3410-1, "Acceptance Standards."

Examples of events that the staff would consider reportable as serious temperature or pressure transients include low temperature over pressure transients where the pressure-temperature relationship violates pressure-temperature limits derived from Appendix G to 10 CFR Part 50 (e.g., TS pressure-temperature curves).

Examples of events the staff would consider reportable as containment leakage rates exceeding authorized limits include containment leak rate tests where the total containment as-found, minimum-pathway leak rate exceeds the LCO in the facility's TS.[1],[1]

(2) The nuclear power plant being in an unanalyzed condition that significantly compromises plant safety.

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[8] The LCO typically employs La, which is defined in Appendix J to 10 CFR Part 50 as the maximum allowable containment leak rate at pressure Pa, the calculated peak containment internal pressure related to the design basis accident. Minimum-pathway leak rate means the minimum leak rate that can be attributed to a penetration leakage path; for example, the smaller of either the inboard or outboard valve's individual leak rates.

[9] For such a condition, an LER is generally required under 10 CFR 50.73(a)(2)(ii). If the condition existed during operation, an ENS notification would also be required by §50.72(b)(1)(ii) if found during operation or by §50.72(b)(2)(i) if found while shutdown.

As indicated in the Statements of Consideration:

"The Commission recognizes that the licensee may use engineering judgment and experience to determine whether an unanalyzed condition existed. It is not intended that this paragraph apply to minor variations in individual parameters, or to problems concerning single pieces of equipment. For example, at any time, one or more safety-related components may be out of service due to testing, maintenance, or a fault that has not yet been repaired. Any trivial single failure or minor error in performing surveillance tests could produce a situation in which two or more often unrelated, safety-grade components are out-of-service. Technically, this is an unanalyzed condition. However, these events should be reported only if they involve functionally related components or if they significantly compromise plant safety."[1]

"When applying engineering judgment, and there is a doubt regarding whether to report or not, the Commission's policy is that licensees should make the report."[1]

"For example, small voids in systems designed to remove heat from the reactor core which have been previously shown through analysis not to be safety significant need not be reported. However, the accumulation of voids that could inhibit the ability to adequately remove heat from the reactor core, particularly under natural circulation conditions, would constitute an unanalyzed condition and would be reportable."[1]

"In addition, voiding in instrument lines that results in an erroneous indication causing the operator to misunderstand the true condition of the plant is also an unanalyzed condition and should be reported."[1]

(3) *The nuclear power plant being in a condition that is outside the design basis of the plant.*

As indicated in 10 CFR 50.2, "Design bases means that information which identifies the specific functions to be performed by a structure, system, or component of a facility, and the specific values or ranges of values chosen for controlling parameters as reference bounds for design. These values may be (1) restraints derived from generally accepted 'state of the art' practices for achieving functional goals, or (2) requirements derived from analysis (based on calculation and/or experiments) of the effects of a postulated accident for which a structure, system, or component must meet its functional goals."

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[10] 48 FR 39042, August 29, 1983 and 48 FR 33856, July 26, 1983.

[11] 48 FR 39042, August 29, 1983.

[12] 48 FR 39042, August 29, 1983 and 48 FR 33856, July 26, 1983.

[13] 48 FR 39042, August 29, 1983 and 48 FR 33856, July 26, 1983.

(Emphasis added.)

Examples of events or conditions the staff considers reportable include errors in the actual design, such as discovery that an ECCS design does not meet the single failure criterion. They also include hardware problems such as discovery that high energy line break restraints are not installed.

With regard to ECCS calculations, detailed reporting criteria are given in 10 CFR 50.46(a). That rule provides that a change or error correction that results in calculated ECCS performance that does not meet the acceptance criteria {peak cladding temperature, cladding oxidation, etc.} is a reportable event as described in 10 CFR 50.55(e), 50.72 and 50.73. Lesser changes or error corrections are the subject of other, separate reports.

Violation of fire protection commitments regarding safe shutdown capability may indicate that the plant is outside of its design basis. For example, if fire barriers are found to be missing, such that the required degree of separation for redundant safe shutdown trains is lacking, the plant would be outside of the design basis with respect to Appendix R to 10 CFR Part 50. On the other hand, if a fire wrap, to which the licensee has committed, is missing from a safe shutdown train but another safe shutdown train is available in a different fire area, protected such that the required separation for safe shutdown trains is still provided, the plant would not be outside of its design basis with respect to Appendix R.[1]

Another example of an event or condition that the staff considers reportable is discovery that one train of a required two train safety system has been incapable of performing its design function (intended safety function) for an extended period of time during operation. For example, in a two-train ECCS system, one train might be found with a design flaw or with a component that would never have functioned because it was installed incorrectly and a test that would reveal the problem was not performed, such that the train was incapable of performing its design function. This would be considered outside the design basis because the system did not have suitable redundancy.[1]

It should be noted that these discussions concern events or conditions that actually place the plant outside its design basis. They are not intended to capture minor

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{14} The design basis with respect to Appendix R for protection of safe shutdown capability is essentially the same as the required protection features. This is discussed in the Statement of Considerations for Appendix R, Federal Register, November 19, 1980 (45 FR 76606). In particular, it is stated that "Because it is not possible to predict the specific conditions under which fires may occur and propagate, the design basis protective features are specified rather than the design basis fire."

{15} A minimum design feature is suitable redundancy meeting the single-failure criterion as indicated in: (1) 10 CFR Part 50, Appendix A, Introduction and 10 CFR 50, Appendix A, Criterion 35; (2) 10 CFR 50, Appendix K, Item I.D.1; AND (3) FSAR commitments.

problems such as: (1) cases of administrative inoperability, where a component is declared inoperable because a surveillance test is overdue but the equipment is still capable of performing its design function, or (2) cases where the LCO allowed outage time is exceeded by a modest amount (e.g., less than 25 percent). Such conditions may, however, be reportable as conditions prohibited by the Technical Specifications, 10 CFR 50.73(a)(2)(i)(B).

(4) *The nuclear power plant being in a condition not covered by the plant's operating and emergency procedures.*

This criterion points to events where the plant is in a condition outside the coverage of its operating and emergency procedures. A straightforward example of this type of event was the accident at Three Mile Island.

Examples

(1) Design Problem (ECCS Single Failure Vulnerability)

A minimum design feature for ECCS is suitable redundancy meeting the single-failure criterion. Sources include: (1) 10 CFR Part 50, Appendix A, Introduction and 10 CFR 50, Appendix A, Criterion 35; (2) 10 CFR 50, Appendix K, Item I.D.1; and (3) FSAR commitments. During an engineering review following an event, it was found that a coil shorting in one of several supervisory relays, in conjunction with an accident, could lead to a premature recirculation actuation signal. This could result in loss of water to the ECCS pumps due to realignment of suction to the containment sump. It was also found that such coil shorting could cause closure of pump recirculation isolation valves, potentially dead heading and possibly damaging the HPSI pumps.

The licensee determined that each of these concerns represented a condition outside of the design bases. When each determination was made, an ENS notification was made and immediate actions were taken to fix the single failure problem. Subsequently, an LER was submitted.

The event is reportable because the ECCS failed to meet its design bases.

(2) Design/Hardware Problem (Turbine Missile Protection)

The original design criteria, as stated in the UFSAR, required that ESFs be protected from turbine generated missiles by means of shielding or separation. As a result of a service water upgrade project it was found that portions of the low pressure service water system (LPSW) did not meet the plant's separation criteria for high trajectory turbine missiles. The licensee provided an ENS notification under 10 CFR 50.72(b)(1)(ii)(B) and submitted an LER under 10 CFR 50.73(a)(2)(ii)(B), outside design basis.

The corrective action included submitting a UFSAR amendment, which was approved by the NRC staff, to allow using current NRC and industry guidance. When applying this guidance, the LPSW piping in question provides an acceptably low probability target.

This event is reportable because the turbine missile protection did not meet the design basis as stated in the FSAR.

(3) ECCS Analysis

The large break LOCA analysis, as documented in the FSAR, assumed that high and low head safety injection systems can deliver full flow in 5 and 10 seconds, respectively. A new analysis was performed, which accounted conservatively for (1) SI signal processing, (2) sequencer delay time uncertainty, and (3) increased time for pump acceleration to full speed due to degraded voltage. This indicated that it could take as much as 8 and 24 seconds, respectively, for the high and low head safety injection systems to deliver full flow.

As a result of the new analysis, calculated peak clad temperature was increased by about 44F. However, peak clad temperature remained below 2200F and other ECCS acceptance criteria continued to be met as well. Although licensee reported the event as outside design bases, staff does not consider the event reportable under that criterion because the provisions of §50.46(a) apply. Under those provisions, the events reportable pursuant to §50.72 and §50.73 are those where the ECCS acceptance criteria are exceeded.

The event is not reportable because the provisions of §50.46(a) apply and the ECCS acceptance criteria were not exceeded.

(4) Fire Protection (Separation of Safe Shutdown Trains)

The design for a fire area had been approved on the basis of several specific features including: automatic sprinklers; remote annunciation; and circuit separation via 2-hour rated fire barriers for redundant safe shutdown circuits. During a design basis review it was found that redundant diesel generator field circuits, located in a common fire area, were not protected or separated by 2-hour rated fire barriers.

An ENS notification was made under 10 CFR 50.72(b)(1)(ii)(B), outside design basis, and subsequently an LER was submitted under 10 CFR 50.73(a)(2)(ii)(B), outside design basis.

The condition was reportable under this criterion because the required design basis protective features for safe shutdown trains, as described in 10 CFR 50, Appendix R and the FSAR, were lacking.

(5) Hardware Problem (Suitable Redundancy and Seismic Qualification)

During an NRC evaluation, it was found that an exciter panel for one diesel generator had lacked appropriate seismic restraints since the plant was constructed. The licensee did not initially believe the condition was reportable under 10 CFR 50.72(b)(1)(ii)(B) and

10 CFR 50.73(a)(2)(ii)(B), outside the design basis. However, the staff determined that the condition was reportable under this criterion because the onsite power system lacked suitable redundancy (seismically qualified) as described in GDC 2, GDC 17 and the SAR.[1]

[16] The single failure criterion is discussed in 10 CFR 50 Appendix A, Criterion 17 - Electric Power Systems and the seismic design bases are discussed in 10 CFR 50, Appendix A, Criterion 2 - Design Bases for Protection Against Natural Phenomena, as well as in the FSAR.

Uplift due to buoyant forces created by the displacement of ground water by the structure is considered. Computations are based on the ground water being two feet below ground elevation. This is one foot above the highest water level on record. No credit is taken for the restraint offered by the saturated soil. The effect on the structure of the lateral forces is considered.

10. Internal Negative Pressure

Loading due to an internal negative pressure of 2 psig is considered in the design. A pressure of this magnitude could result from the effects of cooling of the containment volume about 80°F below the temperature at which the containment was sealed.

11. Dynamic Effects Resulting From Plant Equipment Failures

The approach taken in designing against the dynamic effects of equipment failures is discussed under Section 1.4 "Missile Protection Criteria".

Containment Design Pressures and Temperatures

The stated containment shell design pressure is 12 psig. Analysis of LOCA accidents shows that the compartments of the ice condenser containment can be subjected to localized pressures and temperatures varying from the stated value.

Figures 5.2.2-11 and 5.2.2-11A show in general these design pressure and temperature conditions. The design of the containment outer shell and the interior structures have included these conditions with similar margins as design basis. The radial and vertical steady-state thermal gradients used in the design of the containment structure are indicated for a typical summer day on Figure 5.2.2-12 and for a typical winter day on Figure 5.2.2-12A. Construction temperature is taken as 60°F for both the liner and the cylinder and dome concrete.

The worst unsymmetrical load conditions (pressure and temperature) on the containment shell occurs during a main steam line break in one fan-accumulator compartment.
The load plots (Figures 5.2.2-13, to 5.2.2-50) of Section 5.2.2.3 include the unsymmetrical loading conditions for which D. C. Cook Plant is designed.

5.2.2.3 Design Stress Criteria

The design of the containment structure is based upon limiting load factors, which are the ratios by which loads are multiplied to assure that the loading deformation behavior of the structure is one of elastic, tolerable strain behavior. The load factor approach is used in this design for making a rational evaluation of the isolated factors which must be considered in assuring an adequate safety margin for the structure. This approach permits the designer to place a greater conservatism on those loads subject to variation and which most directly control the overall integrity of the structure. Furthermore this approach places minimum emphasis on the fixed gravity loads and maximum emphasis on accident and earthquake or wind loads.

The loads utilized in the design of the reinforced concrete containment structure are computed in accordance with the following equations:

(a) $C = 1.5P + DL \pm .05\ DL + (T' + TL')$

(b) $C = 1.25P + DL \pm .05\ DL + (T'' + TL'') + 1.25E$

(c) $C = 1.25P + DL \pm .05\ DL + (T'' + TL'') + 1.25W$

(d) $C = 1.0P + DL \pm .05\ DL + (T''' + TL''') + 1.0E'$

(e) $C = DL \pm .05\ DL + (T) + W' + 1.0\ (p)$

(f) $C = DL \pm .05\ DL + T$

(g) $C = U.\ P. + DL \pm .05\ DL + T + E'$

(h) $C = 0.95\ DL + 1.34\ P + TT$

(i) $C = DL + 1.5P1 + T + TL$

The buoyancy forces due to ground water were considered. Where they aid the design they were omitted, and where they were a factor in the design they were added.

The structure is designed in accordance with Ultimate Strength Design Criteria for equations (a), (b), (c), (d), (e), (g) and (i) and to Working Stress Design Criteria for equation (f).

The structure is analyzed for stresses and deflections for the structural integrity test condition, equation (h). The effects of buoyancy are not considered for equation (h).

The symbols used in the above equations are as follows:

Required load capacity of section

Dead load of structure and equipment loads.

Accident design pressure load (12 psi)

16 psi (in fan-accumulator room due to main steam break)

Temperature gradient through the concrete and liner under operating conditions

Temperature gradient through the concrete wall associated with 1.5 times design pressure (18 psi)

Temperature gradient through the concrete wall associated with 1.25 times design pressure (15 psi)

Temperature gradient through the concrete wall associated with 1.0 times design pressure (12 psi)

Temperature in the liner associated with an accident pressure of 1.5 times design pressure (18 psi)

Temperature in the liner associated with an accident pressure of 1.25 times design pressure (15 psi)

Temperature in the liner associated with a pressure of 1.0 times design pressure (12 psi)

Temperature in the liner (320°F) associated with 1.5 times main steam break design pressure (1.5 x 16 psi) due to fan-accumulator room main steam line break.

Temperature gradient through the concrete and liner under test conditions

Operating basis earthquake

Design basis earthquake

Wind load

Tornado Load

3 psi differential due to ambient pressure drop due to tornado

Unsymmetrical pressure of 8 psi

Load condition (a) indicates that the containment has the capacity to remain elastic and withstand loads at least 50 percent greater than those calculated for the postulated loss-of-coolant accident alone.

Results of the analysis using load conditions (b) and (c) indicate that the containment has the capacity to remain elastic and withstand loadings at least 25 percent greater than those calculated for the postulated loss-of-coolant accident with a coincident operating basis earthquake or wind loading.

Load condition (d) indicates that the containment has the capacity to remain elastic and withstand loadings at least as great as those calculated for the postulated loss-of-coolant accident with a coincident design basis earthquake, as defined in Chapter 2.

Load condition (e) indicates that the containment has the capacity to remain elastic and withstand loadings at least as great as those calculated for operating load and temperature with a coincident design tornado.

Load condition (f) indicates that the containment has the capacity to remain elastic and withstand loadings at least as great as those calculated for operating conditions.

Load condition (g) indicates that the containment has the capacity to remain elastic and withstand loadings at least as great as that of an unsymmetrical pressure of 8 psi in the ice condenser area coincident with a design basis earthquake.

Load condition (h) is for proof testing.

Load condition (i) indicates that the containment has the capacity to remain elastic and withstand local loadings at least 50 percent greater than that due to a steam line break in the fan-accumulator room.

Scaled load plots for moments, shears, deflection, longitudinal forces, and hoop tension, are shown in Figures 5.2.2-14 to 5.2.2-50. The legend for these plots is shown in Figure 5.2.2-13.

The temperature gradient through the wall is essentially linear, and is a function of the operating temperature internally and the average ambient temperature externally. Peak accident temperatures mainly affect the liner, rather than the concrete and reinforcing bars, due to the insulating properties of the concrete and the short duration of the accident temperature. By the time the temperature of the concrete within the interior of the concrete shell begins to rise significantly, the internal pressure and temperature in the containment shell due to maximum thermal gradient does not influence the capacity of the structure to resist the other forces. Temperature gradient effects induce stresses in the structure which are internal in nature; that is, tension outside and compression in the inside of the shell. The resultant force is zero. Loading combinations concurrent with these temperature effects may cause local stresses in the outside horizontal and vertical bars to reach yield, however, as local yielding is reached, any further load is transferred to the unyielded elements. At the full yield condition, the magnitude of the final load resisted across a horizontal and vertical section remains identical to that which is carried if the temperature effects were not considered. Thus the overall carrying capacity of the structure and the factor of safety of the structural elements are not affected.

The mat is analyzed utilizing load conditions (a), (b), (d), (e) and (f) with the inclusion of buoyant forces where they result in more severe conditions. It is also analyzed for loads occurring only at operating conditions.

If the loads resulting from wind on any portion of the structure exceed those resulting from earthquake, the wind load "W" is used in lieu of the "E" in the appropriate load condition. A check is made to determine the maximum wind pressure that is tolerable under condition (d).

A study was made to determine the significance of "lobar motion" on the containment structure.

The result of this evaluation is that for a concrete containment the beam modes of vibration predominate response. The lobar effects are very low and therefore do not have a significant effect on design stresses in concrete shells, these stresses have, therefore, not been considered in design.

The initial determination of the required reinforcing was made by means of manual computations. After the initial determination of the required rebars, the containment was modeled for the "GENSHL 5 PROGRAM" and a computer analysis was made.

Since the criteria for the design states that the concrete does not carry tension, all layers of concrete in which tension was indicated to exist were then assumed to be cracked, by setting the values of E_c and u_c (for tension carrying layers) equal to zero where E_c and u_c are modulus of elasticity and poisson's ratio respectively.

A succession of computer runs, for all factored load conditions was made with modification to the rebar design and assumed cracked concrete layers until the final rebar design was achieved. The evaluation of stresses in individual layers was conservatively determined based on elastic analysis which assumed linear triangular compressive stress distribution in the concrete and tensile stress in the reinforcement based on transformed areas.

Stresses in the structure due to thermal changes were determined by the "GENSHL 5 PROGRAM". Thermal gradients are applied to the structural sections as part of the program loading data.

A "Finite Element Method" was used to analyze the personnel hatch opening and the equipment hatch opening. The boundary conditions used for this analysis were determined from the results of the "GENSHL 5 PROGRAM". For all loading combinations, the stresses in the rebars were maintained below the yield, and the compressive stresses in the concrete were kept below the ultimate, therefore plastic deformation does not occur.

Shrinkage induces cracking in the concrete and an initial compressive stress in the rebar and liner.

Design criteria requires that the concrete carry none of the tensile stresses. Therefore, in the analysis, the concrete that is in tension was considered as being cracked. Where, by analysis, the concrete was shown to have compressive stresses, the effects of the initial shrinkage induced tension would be to reduce the compressive stresses. This effect was not taken into account in the calculations.

The initial compression in the rebars, due to the concrete shrinkage, has not been considered as reducing the rebar tensile stress.

Concrete shrinkage does introduce initial compressive stress in the liner, and this initial stress has been considered to be additive to the liner compression stress due to operating and accident conditions.

The auxiliary building concrete was analyzed by conventional structural analysis techniques (i.e., by structural computer programs or manual computations). If the sections assumed in the analysis were satisfactory, reinforcing was determined in accordance with the design method in ACI-318-63. If the section assumed was not satisfactory, a new section was assumed and the procedure was repeated until the assumed section was found to be satisfactory in the analysis. The effects of temperature stresses were added directly when determining the section capacities.

Equilibrium checks of internal stresses and external loads were made. The computer program used for the analysis and design of the containment structure shell was "The GENSH 5 Multi-Layer Static Shell Program: of the Franklin Institute Research Laboratory in Philadelphia, Pa." The output of this program lists the external loads at the section desired and the internal stresses at both surfaces of each layer of the section being analyzed. The equilibrium of the external loads and the internal stresses was checked at various points by manual computations to spot-check the computer output.

All structural components were designed to have the capacity required by the most severe loading combination. The loads resulting from the use of these equations are hereafter termed "factored loads".

The design includes consideration of primary and secondary stresses. The design limit for tension members (i.e., the capacity required for the design load) is based upon the yield stress of the reinforcing steel.

No steel reinforcement experiences average strains beyond the yield point at the factored load. The load capacity of the structure, so determined, is reduced by a capacity reduction factor "ϕ" which provides for the possibility that small adverse variations in material strengths, workmanship, dimensions and control, while individually within required tolerances and the limits of good practice, occasionally may combine to result in an actual capacity lower than the determined value.

The factor "ϕ" is 0.95 for tension members, 0.90 for flexure and 0.85 for bond and anchorage. A factor "ϕ" of 0.75 was used for all Class I structural members carrying loads in shear which were produced by earthquake alone. For Class I structural members carrying loads in shear produced by combinations of earthquake and LOCA loads, a factor "ϕ" of 0.85 was used. The capacity reduction factor of 0.75 for shear, which is more conservative than that required by the ACI code, was used here in recognition of the fact that the potentially large component of shear load associated with an earthquake can be considered to be dynamically applied thereby justifying some additional conservatism.

The load factors used in the equations of Section 5.2.2.3 to provide for the integrity of the containment structure are based on the same philosophy used in the ultimate strength procedure of ACI 318-63.

Because of the refinement of analysis and the restrictions on construction procedures, the load factors in the design primarily provide for a safety margin on the load assumptions. The load factors utilized in this criterion are based upon the load factor concept employed in Part IV-B of "Structural Analysis and Proportioning of Members-Ultimate Strength Design" of ACI 318-63. The load factor applied to earthquake or wind load is consistent with that utilized in ACI 318-63. The reduction in the load factor applied to the pressure and thermal loads, when the design earthquake or maximum wind velocity is experienced is also consistent with ACI 318-63. Therefore applicable provisions of "Building Code Requirements for Reinforced Concrete" ACI 318-63 are utilized.

5.2.2.4 Divider Barrier

It is an essential requirement of the ice condenser containment that the steam and air flowing from the lower containment compartment in the event of a failure of a pipe in the Reactor Coolant System be routed to the upper compartment via the ice bed. To accomplish this, a structural barrier within the containment vessel separates the lower and upper containment compartments. This divider barrier includes the walls of the ice compartment, the upper deck, the compartments enclosing the upper portion of the steam generators and pressurizer, the gate separating the reactor cavity from the refueling canal, and portions of the walls of the refueling canal. The interior wall of the ice compartment also serves as the crane support wall.

It is not necessary to apply a vapor barrier to the exterior surface of the containment wall for the height of the ice condenser compartment. The exterior wall of the ice condenser is separated from the structural concrete and is composed of insulated wall panels which form a complete sheet metal vapor barrier for the refrigerated ice condenser compartment. This vapor barrier is the exterior surface of the insulation and is the warm side.

The operating deck portion of this barrier is supported at its outer radius by short reinforced concrete columns extending above the lower crane wall. The deck is supported at its inner radius by the reinforced concrete primary shielding wall around the reactor. The removable central

UNITED STATES
NUCLEAR REGULATORY COMMISSION
WASHINGTON, D.C. 20555-0001

June 12, 2000

Mr. Robert P. Powers, Senior Vice President
Indiana Michigan Power Company
Nuclear Generation Group
500 Circle Drive
Buchanan, MI 49107

SUBJECT: DONALD C. COOK - SUMMARY OF JUNE 1, 2000, PUBLIC MEETING REGARDING CONTAINMENT SUBCOMPARTMENT WALLS

Dear Mr. Powers:

This letter summarizes the meeting held on June 1, 2000 between members of your staff and the Nuclear Regulatory Commission (NRC) related to subcompartment walls in the Unit 2 containment at the Donald C. Cook (D. C. Cook) nuclear plant. The meeting was held at the NRC headquarters in Rockville, Maryland. This meeting was open for public observation. Enclosure 1 provides a list of meeting attendees.

(8) See also next page

Your staff presented information related to the design and licensing basis for the subject walls, the current configuration of the walls including walls which were degraded, along with a justification to operate while the walls were considered to be in a degraded or nonconforming condition. A copy of the handouts used by your staff is provided in Enclosure 2. Prior to the meeting, the NRC staff issued questions to be addressed during the meeting. The questions were formulated by members of the NRR Mechanical Engineering Branch and NRC Region III staff. The questions, provided by facsimile to your staff on May 31, 2000, are provided as Enclosure 3.

Your staff presented background information regarding the design and licensing basis and current as-built configuration of the subcompartment walls. In particular, your staff discussed grout and concrete strength in the walls, open pockets in the walls, inappropriate cutting of reinforcing rods, and the location of reinforcing rods in the walls. The staff raised a number of questions during this section of the presentation.

The next portion of the presentation related to the analysis used to demonstrate the operability of the walls. Your staff presented a summary of the inputs used in the analysis, including grout strength, concrete strength, reinforcing bar location, and pressure loading on the walls. The staff raised specific questions concerning the concrete strength and dynamic loading. The results of the operability analysis were also presented. Your staff discussed the criteria used for declaring the walls operable and showed that the analysis demonstrated that the walls in question meet operability criteria established with more than 20 percent margin. The staff questioned portions of operability determination and also questioned the amount of margin determined in the analysis.

In the next portion of the presentation, your staff presented the reviews and inspections used to determine the extent of the condition of other walls in the containment. Your staff presented construction photographs showing the location of reinforcing bars in the containment and the results from radar mapping of the subject walls to located reinforcing bars in the walls. Your staff also described the results of inspections of the as-built containment for other similar configurations. The staff asked several questions about the extent of the condition of the containment and concluded that there was reasonable basis to conclude no other similar deficiencies existed.

Your staff concluded the presentation by describing the corrective actions to be performed on the subject walls prior to entering MODE 4 for Unit 2 and also the long-term corrective actions. Your staff stated that the final resolution and schedule for both Unit 1 and Unit 2 containment wall issues would be completed prior to restart of D. C. Cook Unit 1. The NRC staff reinforced expectations, as stated in Generic Letter 91-18, "Information to Licensees Regarding NRC Inspection Manual Section on Resolution of Degraded and Nonconforming Conditions," that the corrective actions to remedy the deficiencies in the walls be undertaken as soon as practical commensurate with the safety significance of the deficiency, but not later than the next refueling outage for Unit 2.

Following completion of your staff's presentation, discussion of the six questions contained in Enclosure 3 took place. The NRC staff asked several followup questions. While the NRC staff did not fully agree in the total amount of margin each wall demonstrated, the NRC staff did agree that the analysis performed by your staff demonstrated that each wall in question was operable with some amount of margin. (8)

In accordance with 10 CFR 2.790 of the NRC's "Rules of Practice," a copy of this letter and the enclosures will be available for public inspection at the Commission's Public Document Room, the Gelman Building, 2120 L Street, NW., Washington, DC, and accessible electronically through the ADAMS Public Electronic Reading Room link at the NRC Web site (http://www.nrc.gov).

If you have any questions regarding this matter, please contact me at 301-415-1345.

Sincerely,

John F. Stang

John F. Stang, Senior Project Manager, Section 1
Project Directorate III
Division of Licensing Project Management
Office of Nuclear Reactor Regulation

Docket Nos. 50-315 and 50-316

Enclosures: 1. Attendee List
2. Licensee's Slide Presentation
3. NRC Questions

cc w/encls: See next page

Donald C. Cook Nuclear Plant, Units 1 and 2

cc:

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ATTENDANCE LIST FOR JUNE 1, 2000, MEETING

NAME	ORGANIZATION
John Stang	NRC
Jack Grobe	NRC
Suzanne Black	NRC
Gene Imbro	NRC
B.P. Jain	NRC
R.B. Landsman	NRC
Tony Vegel	NRC
Bill Reckley	NRC
Hans Asher	NRC
Claudia Craig	NRC
John Zwolinski	NRC
Rich Lobel	NRC
Kamal Lobel	NRC
Robert Godley	AEP
B.G. Kavarik	AEP
S.A. Greenlee	AEP
Paul Leonard	AEP
Mike Rencheck	AEP
Jerry Burford	AEP
Bob Temple	Hopkins & Sutter
A.K. Singh	Sargent & Lundry
Jenny Weil	McGraw Hill
John Stevenson	S&A

Enclosure 1

American Electric Power

Meeting with

Nuclear Regulatory Commission

Discussion of Containment Subcompartment Walls

Restarting D. C. Cook
June 1, 2000

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Agenda

■ Introduction/Agenda	Mike Rencheck
■ Background	Scot Greenlee
■ Description of the Issues, Analysis, Extent of Condition, Corrective Actions	Scot Greenlee & Brenda Kovarik
■ Conclusion	Mike Rencheck

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Background: Diagram of Containment Subcompartment Walls

- **Containment**

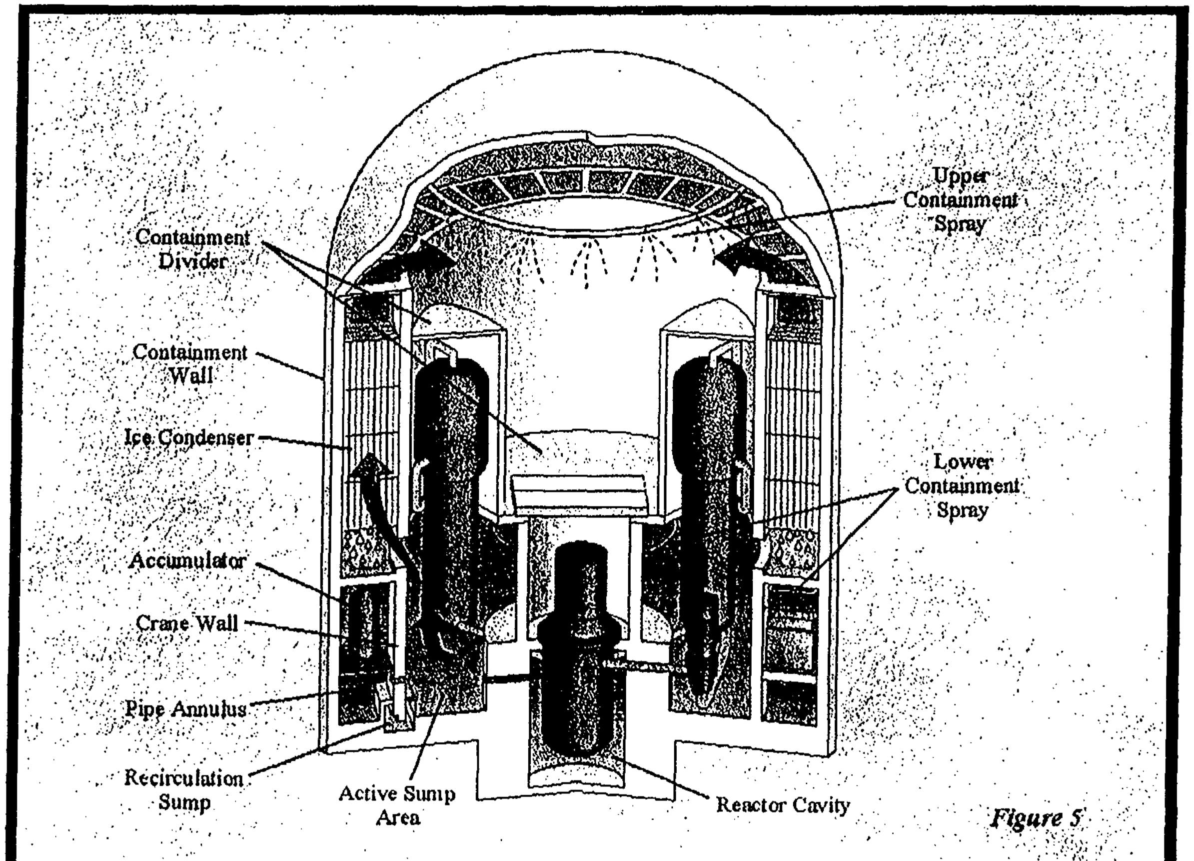
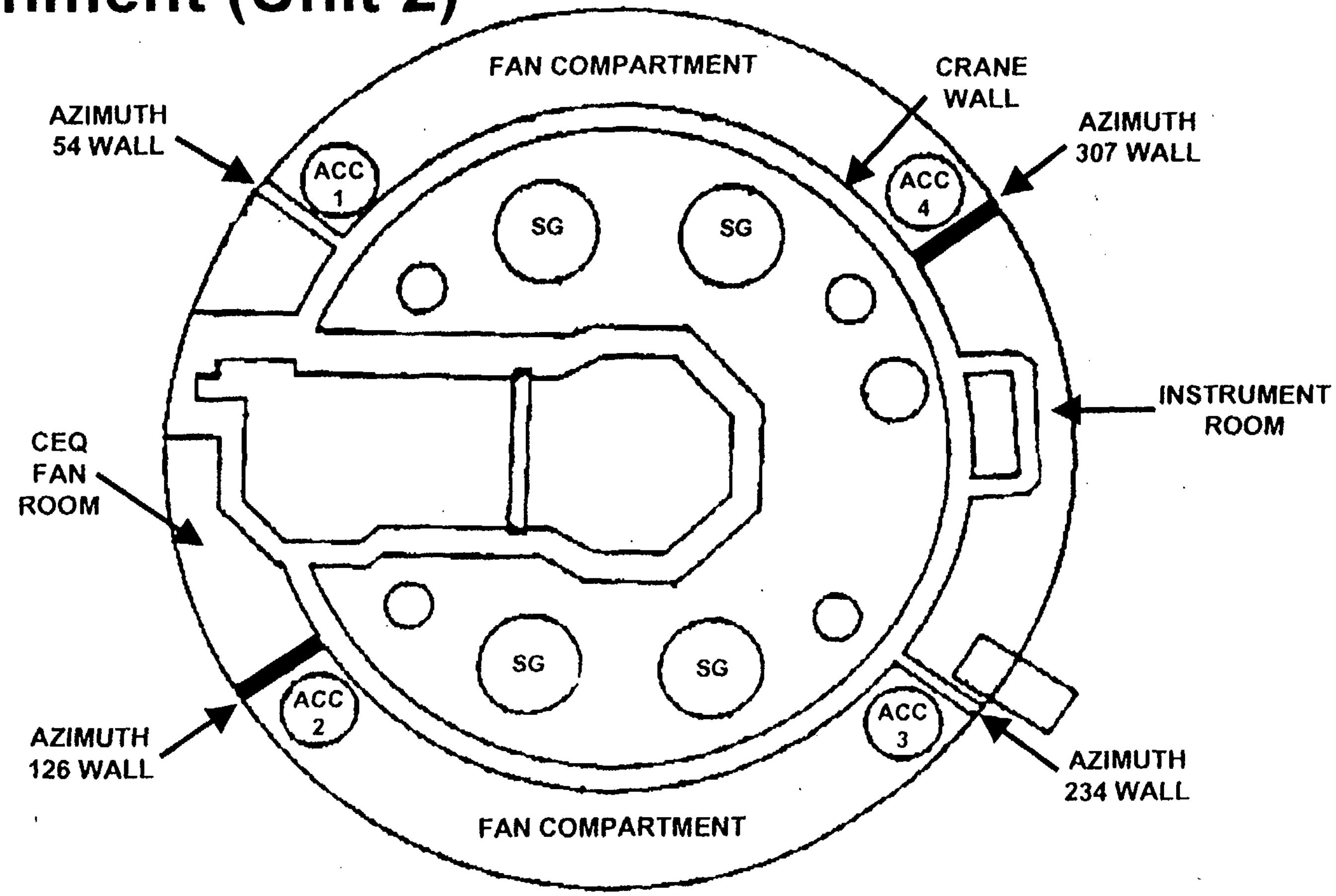


Figure 5

Background: Diagram of Containment Subcompartment Walls

- Containment (Unit 2)



Background: Description of Subcompartment Walls

- Four Walls in Each Unit

- Focus on Unit 2:
  - Two end walls of CEQ Fan Room (Upper Compartment)
  - Two end walls of Instrument Room (Lower Compartment)
  - All walls restrained at three sides

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Summary of the Issues: As-found Unit 2 Subcompartment Walls

	54°	126°	234°	307°
Grout Strength		x		x
Open Pockets		x		
Cut Rebar		x		
Asbestos		x		
Rebar Location	x	x	x	x
Rebar Cover	x	x	x	x

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Description of the Issues: Grout Strength

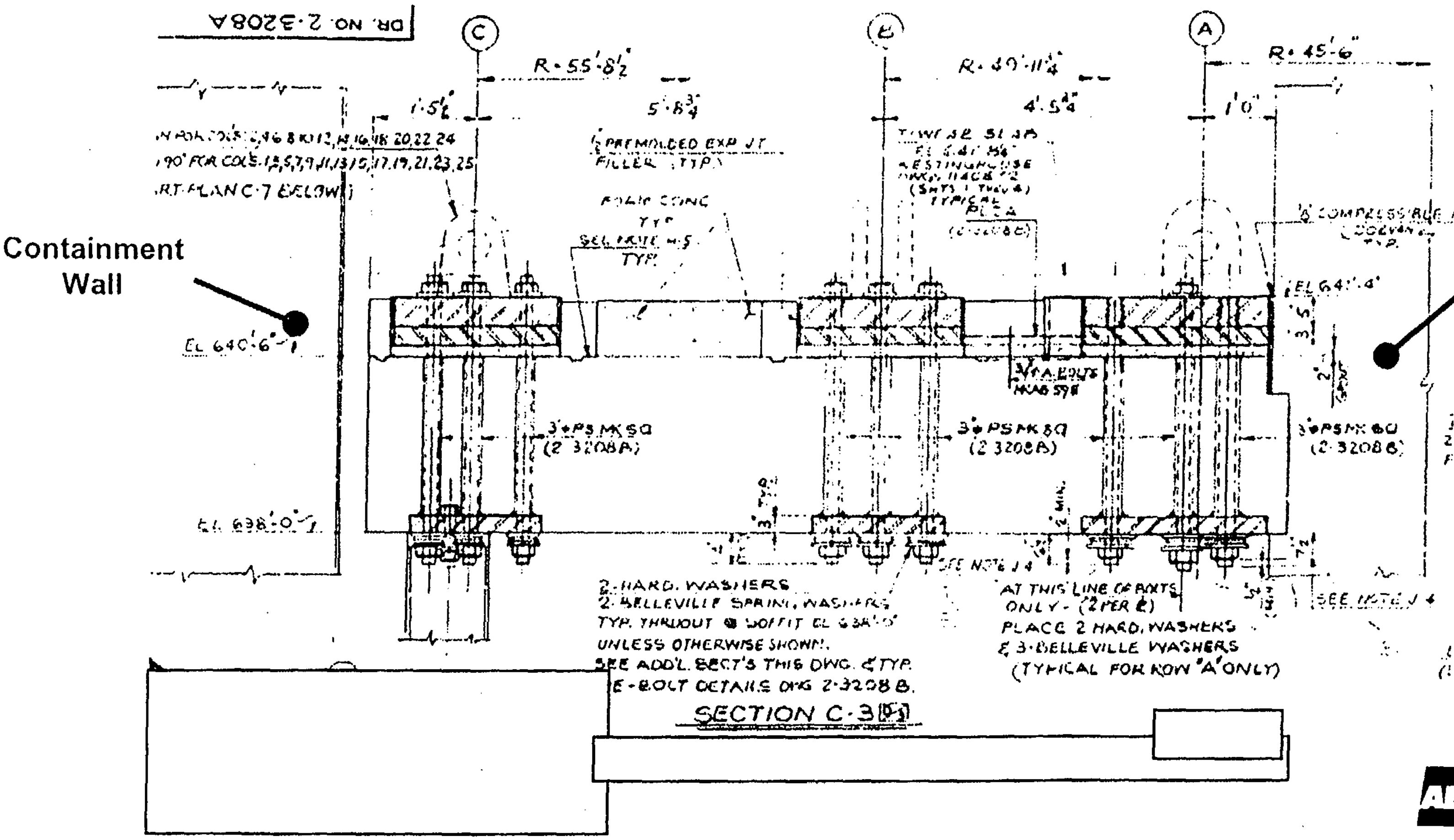
- Spalling Discovered During System Readiness Reviews
  - Grout discovered during repair
- Top of 126° and 307° Walls Grouted
  - 126° wall due to ice condenser structure interference
  - 307° wall due to construction sequence - installed after ice condenser slab poured
- Grout Strength
  - Estimated as 1000 psi in 126° wall
  - Tested in 307° wall: 1,280, 1,770, and 4,380 psi

Description of the Issues: Open Pockets

- Pockets at Top of 126° Wall for Bolting
- Design Required Pockets to be Grouted
- Pockets Left Open From Original Construction

Description of the Issues: Open Pockets -
Configuration of Unit 2 Ice Condenser Column Anchorage

- **Typical Slab/Column Connection (Unit 2 Only)**



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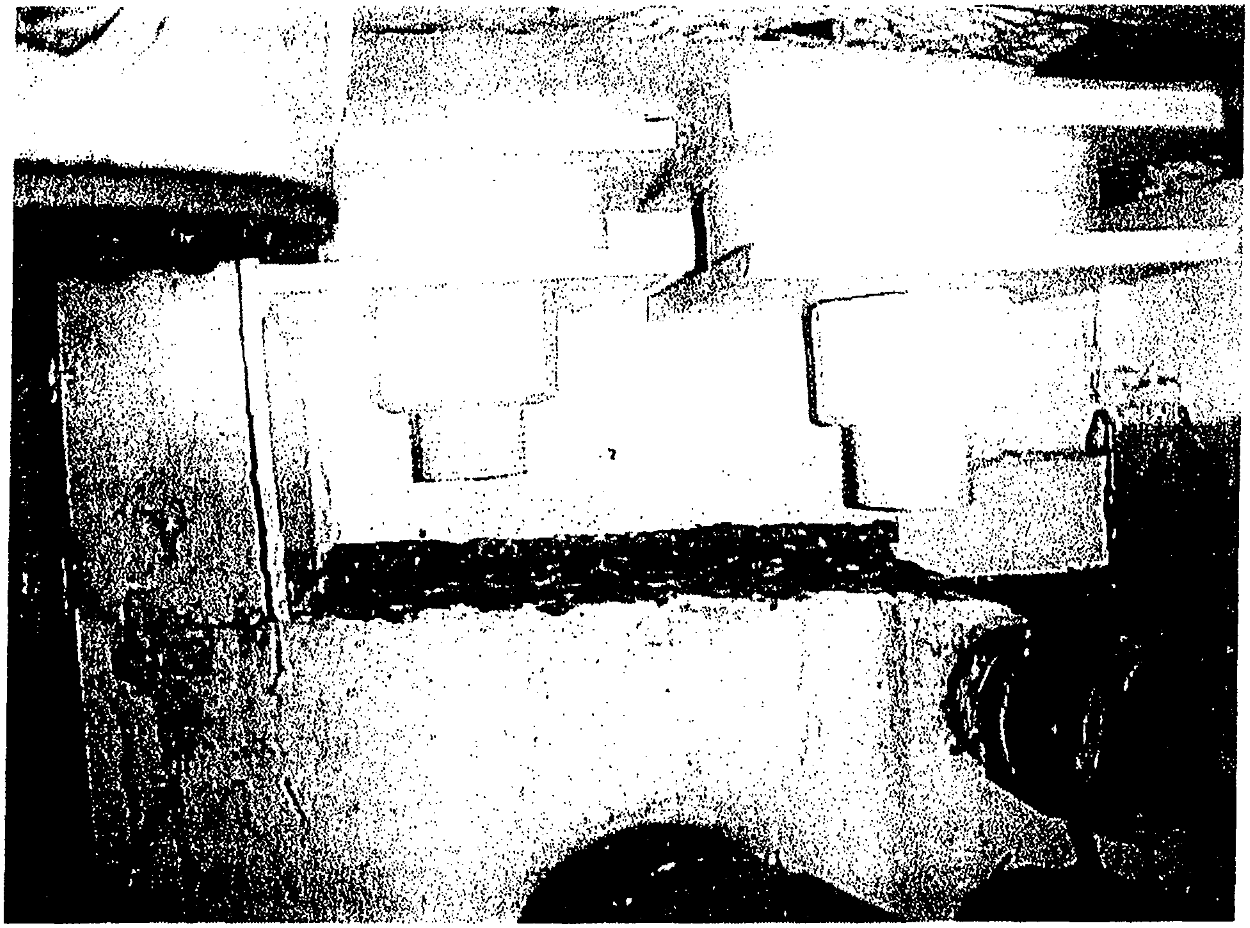
Description of the Issues: Open Pockets -
Configuration of Unit 2 Ice Condenser Column Anchorage

- **Detail Showing Pocket for Anchorage Through Bolts**



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Description of the Issues: Cut Rebar

- Vertical Rebar Cut at Top of 126° Wall
- Cuts Required for Installation of Ice Condenser Anchorage
- Excavation Determined Extent of Condition on 126° Wall
- Issue Limited to 126° Wall

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Description of the Issues: Cut Rebar

- Detail Showing Chipped Grout

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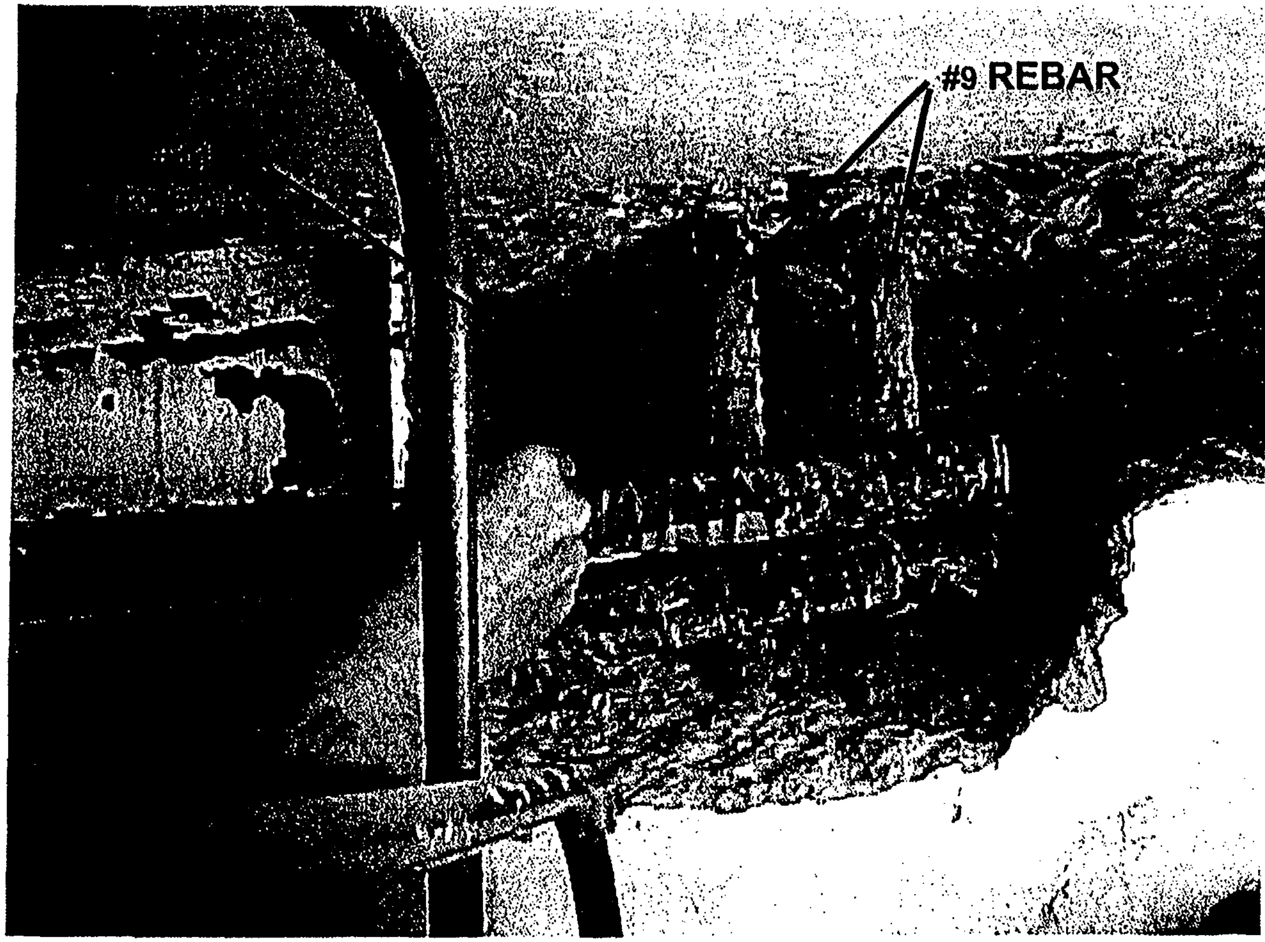
Description of the Issues: Cut Rebar

- Detail Showing Excavation and Rebar



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Description of the Issues: Asbestos

- Asbestos Blanket Found at Top of 126° Wall During Excavation
- Likely Used for Cutting of Embedments - Then Left Behind
- Embedment Cutting Limited to 126° Wall
- No Asbestos Found in 307° Wall

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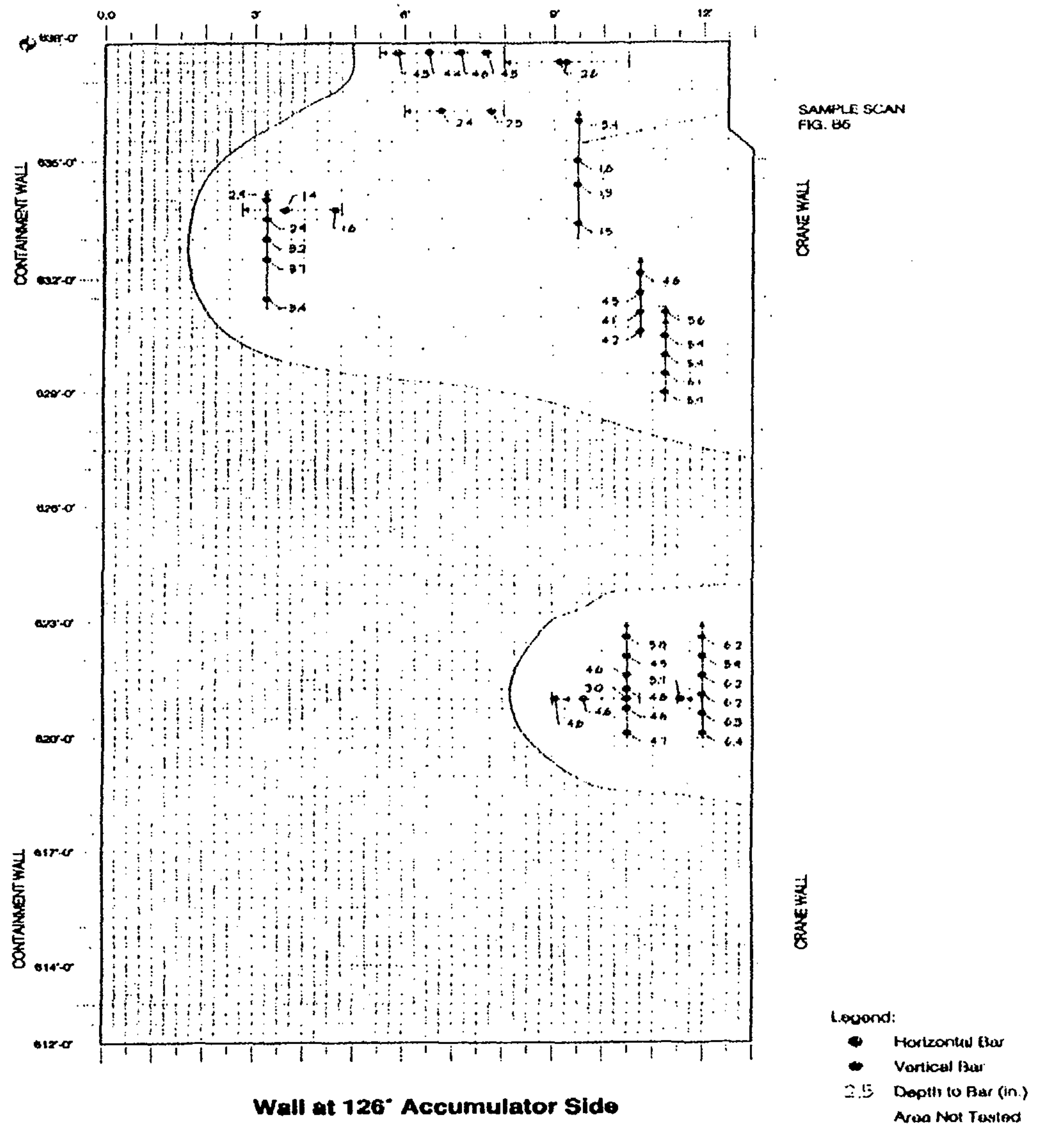
Evaluation: Mapping and Excavation

- 126° Wall Grout Excavated - Accessible Areas at Top on CEQ Fan Room Side
- 307° Wall Grout Excavated - Four Locations to Verify Bar Penetration Into Ice Condenser Slab
- Radar Mapping - All Four Walls
  - Critical accessible areas
  - Both sides of each wall

Description of the Issues: Wall Radar Mapping



Wall at 126' Accumulator Side

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Description of the Issues: Rebar Location

- Design
  - #9 rebars at 12 inch centers (vertical)
  - #11 rebars at 6 inch centers (horizontal - accumulator side)
  - #11 rebars at 12 inch centers (horizontal - instrument/CEQ fan room side)

- Excavation and Radar Mapping - Average Spacing:
  - Horizontal bars per design
  - Vertical bars
    - » Most areas per design
    - » Up to 15 inch spacing in limited areas

Description of the Issues: Rebar Cover

- Design
  - Horizontal bars - 2¾ inch cover
  - Vertical bars - behind horizontal (4 1/8 inch cover)

- Excavation and Radar Mapping:
  - Minimum ACI cover requirements met
  - Average maximum depth developed for horizontal bars and vertical bars

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Wall Analysis: Overview

- Given Issues, All Walls Analyzed to Ensure Operability
- In-situ Parameters Used
  - Grout strength
  - Concrete strength
  - Rebar location
  - Rebar cover
- All Walls Operable With Margin

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Wall Analysis: Design Inputs

- Grout Strength
  - 307° wall - 1,000 psi
  - 126° wall
    - » Filled pockets and excavation with new grout
    - » 2,500 psi new grout (conservative)
    - » No credit for old grout
- Concrete Strength
  - 5,300 psi design strength concrete based on cylinder test data
- Rebar Locations From Mapping and Excavation Data
- New Transient Mass Distribution (Pressure) Loads

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Wall Analysis: Acceptance Criteria

- Limiting Design Load Combination
  - UFSAR Eq. (i): C = 1.5 P1 + DL + T + TL
    - » C = Wall capacity
    - » P1 = Pressure load due MSLB
    - » DL = Dead load
    - » T = Operating thermal gradient load
    - » TL = Liner temperature load (not applicable to walls)
  - DL and T loads are negligible
- Operability Criteria: C > 1.0 P1

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Analysis: Results

- Conservative Analysis
- All Four Walls Operable
- Margin Available (C > 1.0 P1)

Wall	Simplified	Yield Line
54°	1.36	1.48
126°	1.21	1.34
234°	1.25	1.54
307°	1.29	2.83

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Extent of Condition: Other Unit 2 Structures

- Ice Condenser Support Interference and Asbestos Limited to 126° Wall
- Grout Deficiencies Limited to the 307° Instrument Room and 126° CEQ Fan Room Walls
- Other Construction Openings Evaluated
  - Containment
  - Crane Wall

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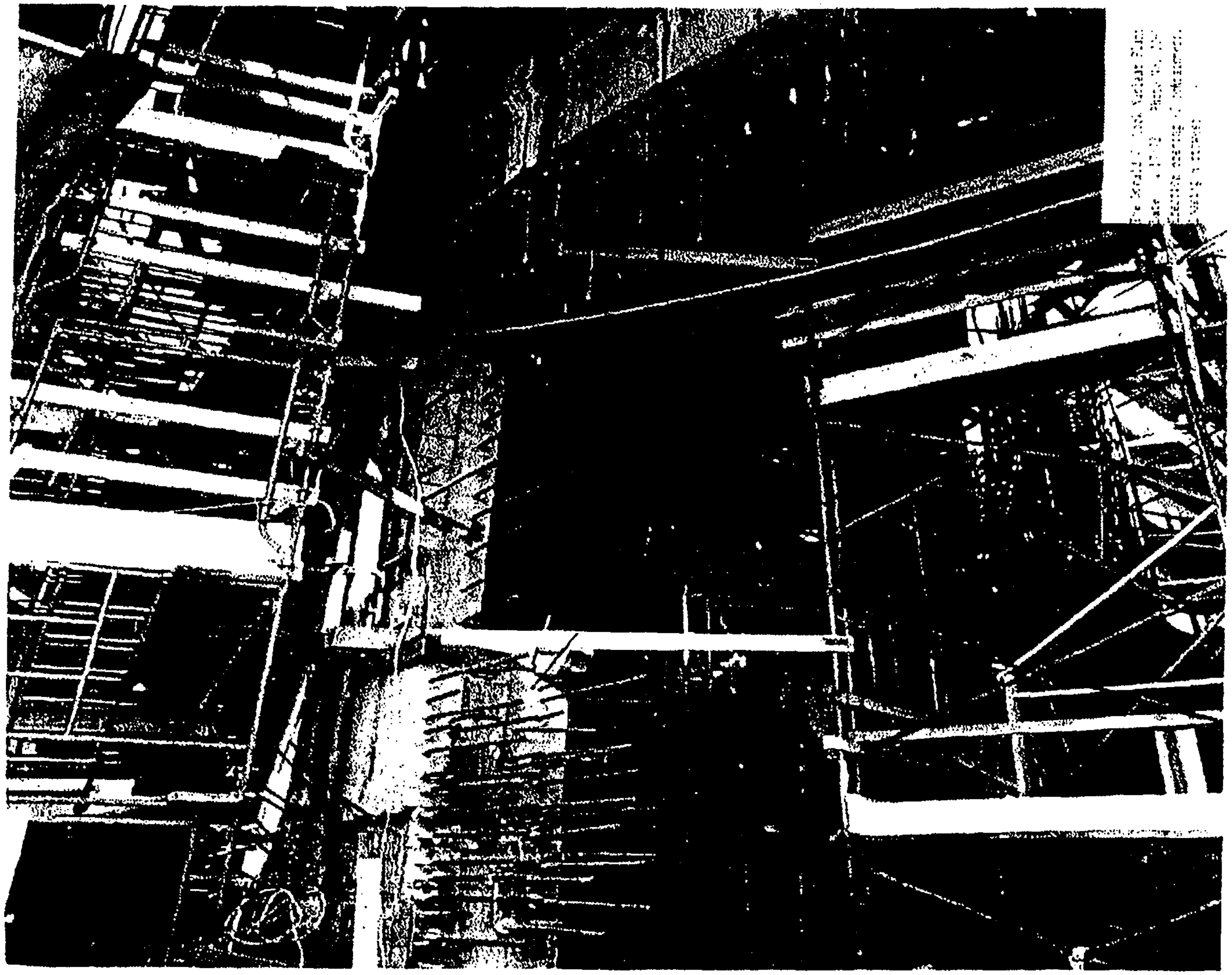
Extent of Condition: Crane Wall Construction Opening



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Extent of Condition: Other Unit 2 Structures

- Rebar Placement
  - Structural elements similar to accumulator walls
    - » Steam Generator Enclosure
    - » Pressurizer Enclosure
    - » Primary Shield Wall
    - » Crane Wall
  - Similar structural elements significantly thicker (less limiting)
  - Variations offset by conservatism in design
    - » Confirmed by Steam Generator and wall evaluations
  - No generic issues from review of construction records

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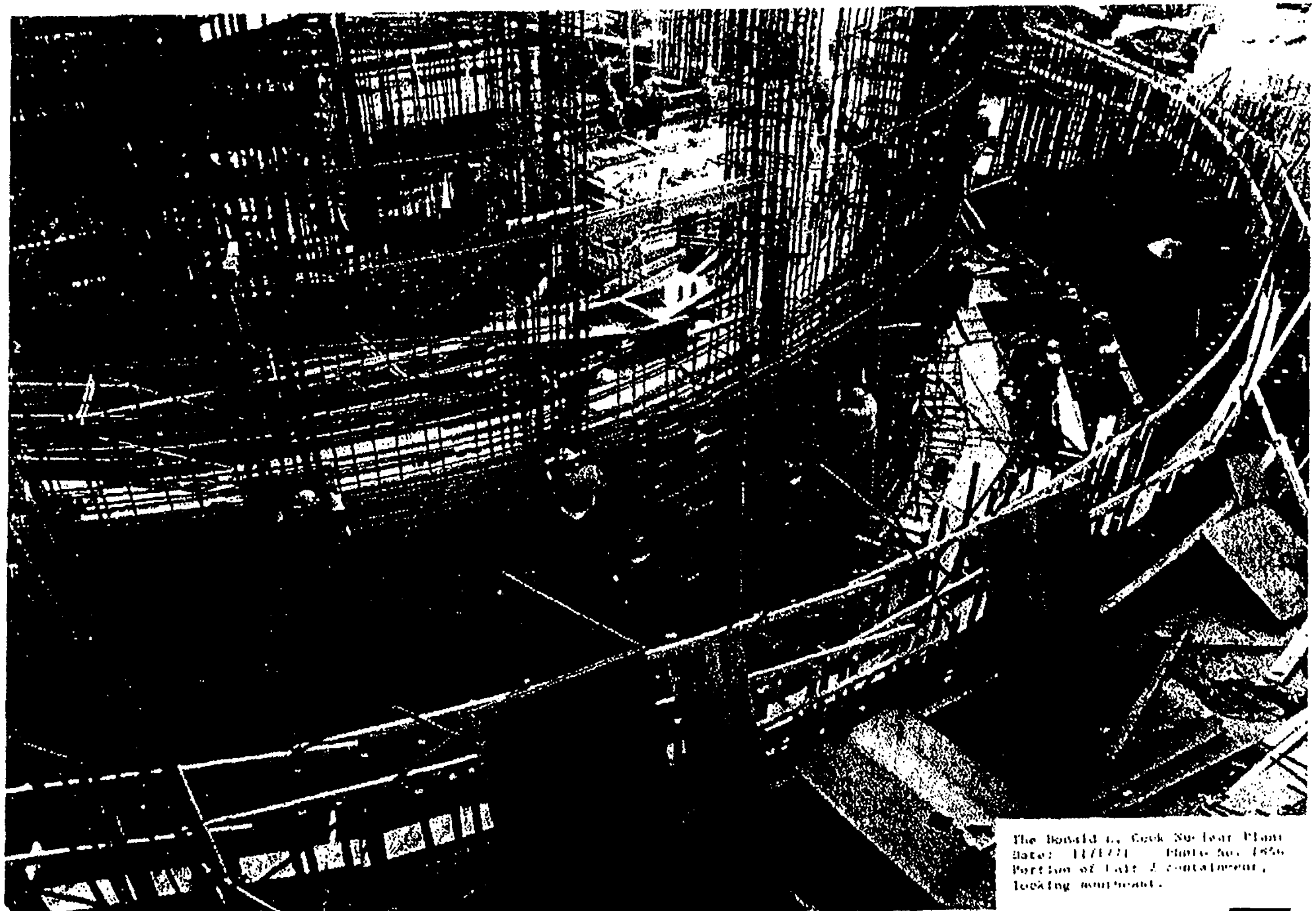
Unit 2 Containment Under Construction



The Donald C. Cook Nuclear Plant
Date: [illegible] Photo No. [illegible]
Portion of Unit 2 containment,
looking [illegible].

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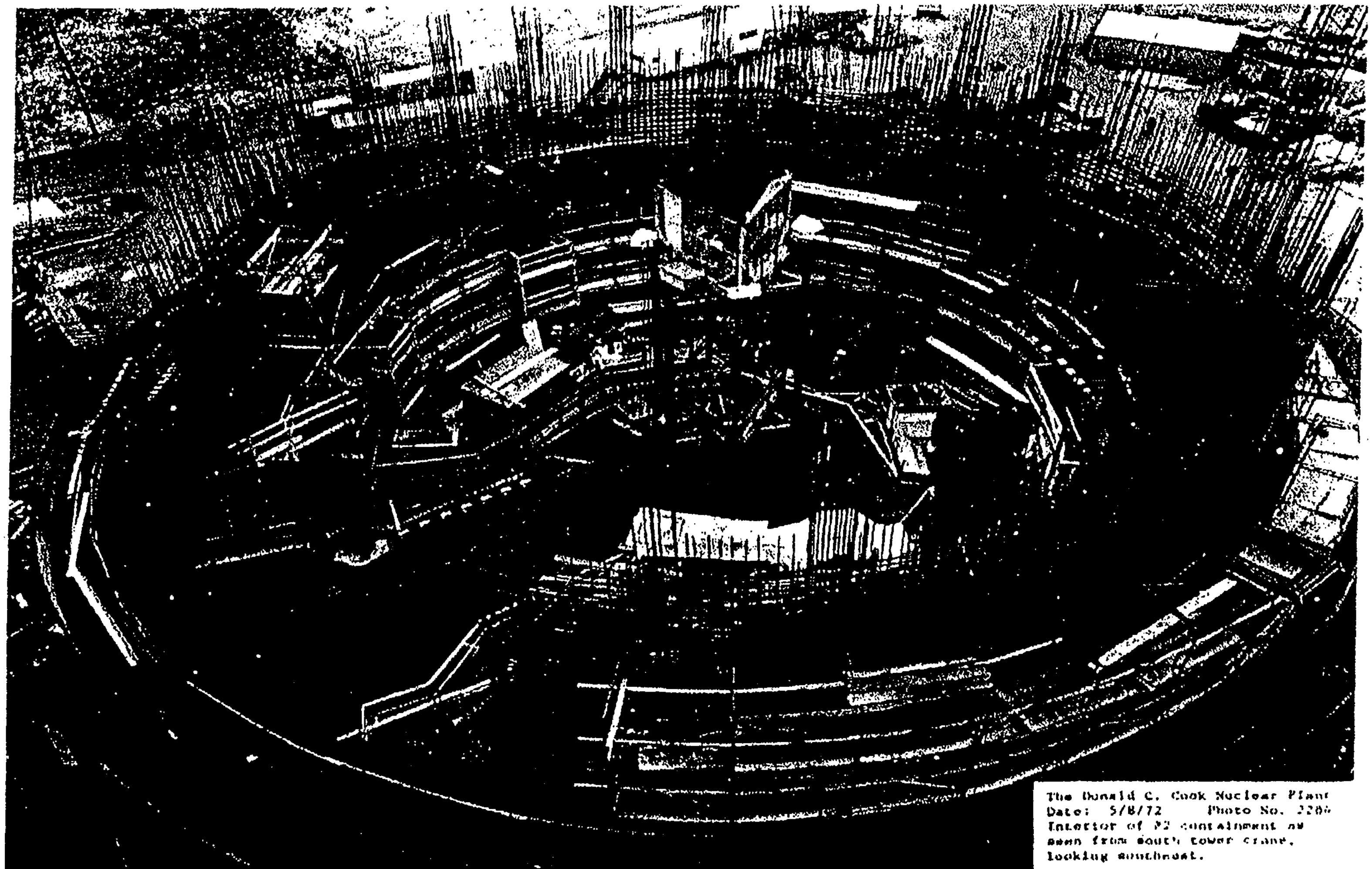
Unit 2 Containment Under Construction



The Donald C. Cook Nuclear Plant
Date: 5/8/72 Photo No. 22[illegible]
Interior of #2 containment as seen from south tower crane, looking southeast.

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Corrective Actions - Completed

- Performed Field Investigation and Confirmation of Rebar Depth and Location
- Tested Cores of Existing Grout (Unit 2 Wall at 307°)
- Excavated/Missing Grout Replaced with High Strength Grout
- Verified Concrete Strength from Construction Records
- Determined Wall Structural Capabilities
- Assessed Extent of Condition

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Corrective Actions - Post Restart

- Develop Schedule for Permanent Resolution during Unit 1 Restart Preparations
  - Review with NRC prior to restart of Unit 1

- Achieve Agreement on Final Course and Schedule by Unit 1 Restart

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Conclusion: Unit 2 Walls

- Walls Safe for Restart
- Reasonable Assurance that Other Structures Not Impacted

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NRC STAFF QUESTIONS CONCERNING OPERABILITY OF

SUBCOMPARTMENT WALLS - D. C. COOK UNIT 2

1. Provide the frequency calculation of the missile shield cover. Also provide the differential pressure time histories constructed based on Figures 1 and 2, reported in the letter from Westinghouse to the licensee (AEP-00-139, dated April 27, 2000) to demonstrate the adequacy of using a dynamic load factor (DLF) of 1.0.

2. In response to question No. 1 in Westinghouse's letter AEP-00-139, confirm that the input data to the TMD pressure calculations are verified to be the as built data.

3. For Unit 2, based on 4800 psi from cylinder break tests and FSAR compressive strength of 3500 psi, provide the basis for using a concrete strength of 5300 psi in concrete design calculations.

4. When the dynamic load factor used for calculating the effective pressure loads on the concrete members is close to unity, we conclude that the load is not dynamic in nature. In that case, dynamic increase factor per Appendix C-ACI349 may not be applicable. Please explain this discrepancy.

5. Justify the use of the 3 vertical bars in determining shear capacity at the top of wall 126.

6. Provide the long term plan for wall 126 with regard to its conformance with design basis requirements.