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.

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.

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

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.

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,

/RA/

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

DISTRIBUTION

PUBLIC	PDIII-1 Reading	JZwolinski/SBlack	MCase, EDO
OGC	CCraig	THarris	JStang
ACRS	GGrant, RIII	JGrobe, RIII	

OFFICE	PM:PDIII-1	LA:PDIII-1	REGIII	SC:PDIII-1
NAME	JStang	THarris	JGrobe	CCraig
DATE	06/ 12 /00	06/ 12 /00	06/ 12 /00	06/ 12 /00

DOCUMENT NAME: G:\PDIII-1\DCCOOK\MTNSUMwall.wpd
OFFICIAL RECORD COPY

Donald C. Cook Nuclear Plant, Units 1 and 2

cc:

Regional Administrator, Region III
U.S. Nuclear Regulatory Commission
801 Warrenville Road
Lisle, IL 60532-4351

Attorney General
Department of Attorney General
525 West Ottawa Street
Lansing, MI 48913

Township Supervisor
Lake Township Hall
P.O. Box 818
Bridgman, MI 49106

U.S. Nuclear Regulatory Commission
Resident Inspector's Office
7700 Red Arrow Highway
Stevensville, MI 49127

David W. Jenkins, Esquire
Indiana Michigan Power Company
Nuclear Generation Group
One Cook Place
Bridgman, MI 49106

Mayor, City of Bridgman
P.O. Box 366
Bridgman, MI 49106

Special Assistant to the Governor
Room 1 - State Capitol
Lansing, MI 48909

Drinking Water and Radiological
Protection Division
Michigan Department of
Environmental Quality
3423 N. Martin Luther King Jr Blvd
P.O. Box 30630, CPH Mailroom
Lansing, MI 48909-8130

Robert C. Godley
Director, Regulatory Affairs
Indiana Michigan Power Company
Nuclear Generation Group
One Cook Place
Bridgman, MI 49106

David A. Lochbaum
Union of Concerned Scientists
1616 P Street NW, Suite 310
Washington, DC 20036-1495

A. Christopher Bakken, Site Vice President
Indiana Michigan Power Company
Nuclear Generation Group
One Cook Place
Bridgman, MI 49106

Michael W. Rencheck
Vice President, Nuclear Engineering
Indiana Michigan Power Company
Nuclear Generation Group
500 Circle Drive
Buchanan, MI 49107

Robert P. Powers, Senior Vice President
Indiana Michigan Power Company
Nuclear Generation Group
500 Circle Drive
Buchanan, MI 49107

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

Doing it right ...
Every step of the way.
COOK NUCLEAR PLANT

Enclosure 2

American Electric Power

Meeting with

Nuclear Regulatory Commission

Discussion of Containment Subcompartment Walls

Restarting D. C. Cook
June 1, 2000

AEP AMERICAN ELECTRIC POWER

Doing it right ...
Every step of the way.
COOK NUCLEAR PLANT

Agenda

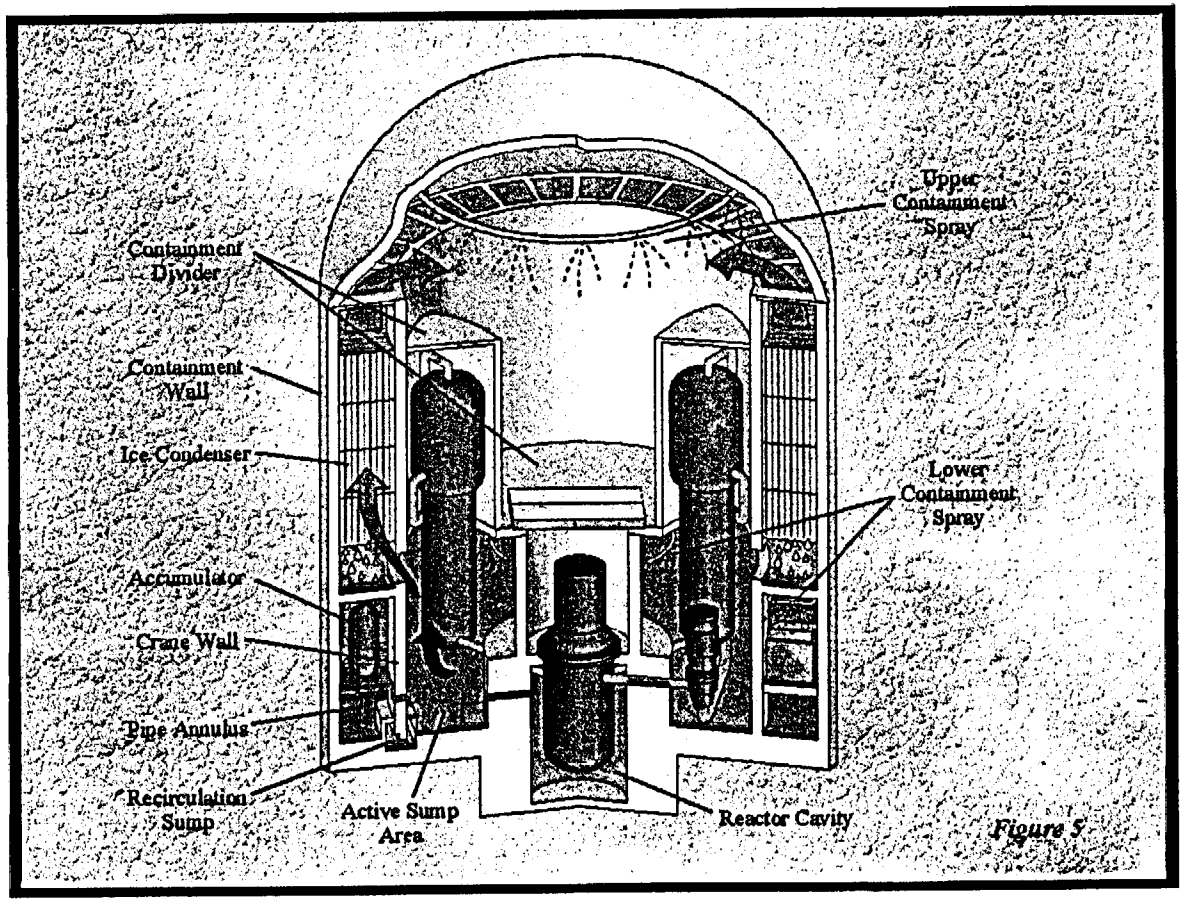
■ Introduction/Agenda	Mike Rencheck
■ Background	Scot Greenlee
■ Description of the Issues, Analysis, Extent of Condition, Corrective Actions	Scot Greenlee & Brenda Kovarik
■ Conclusion	Mike Rencheck

AEP AMERICAN ELECTRIC POWER

Doing it right ...
Every step of the way.
COOK NUCLEAR PLANT

Background: Diagram of Containment Subcompartment Walls

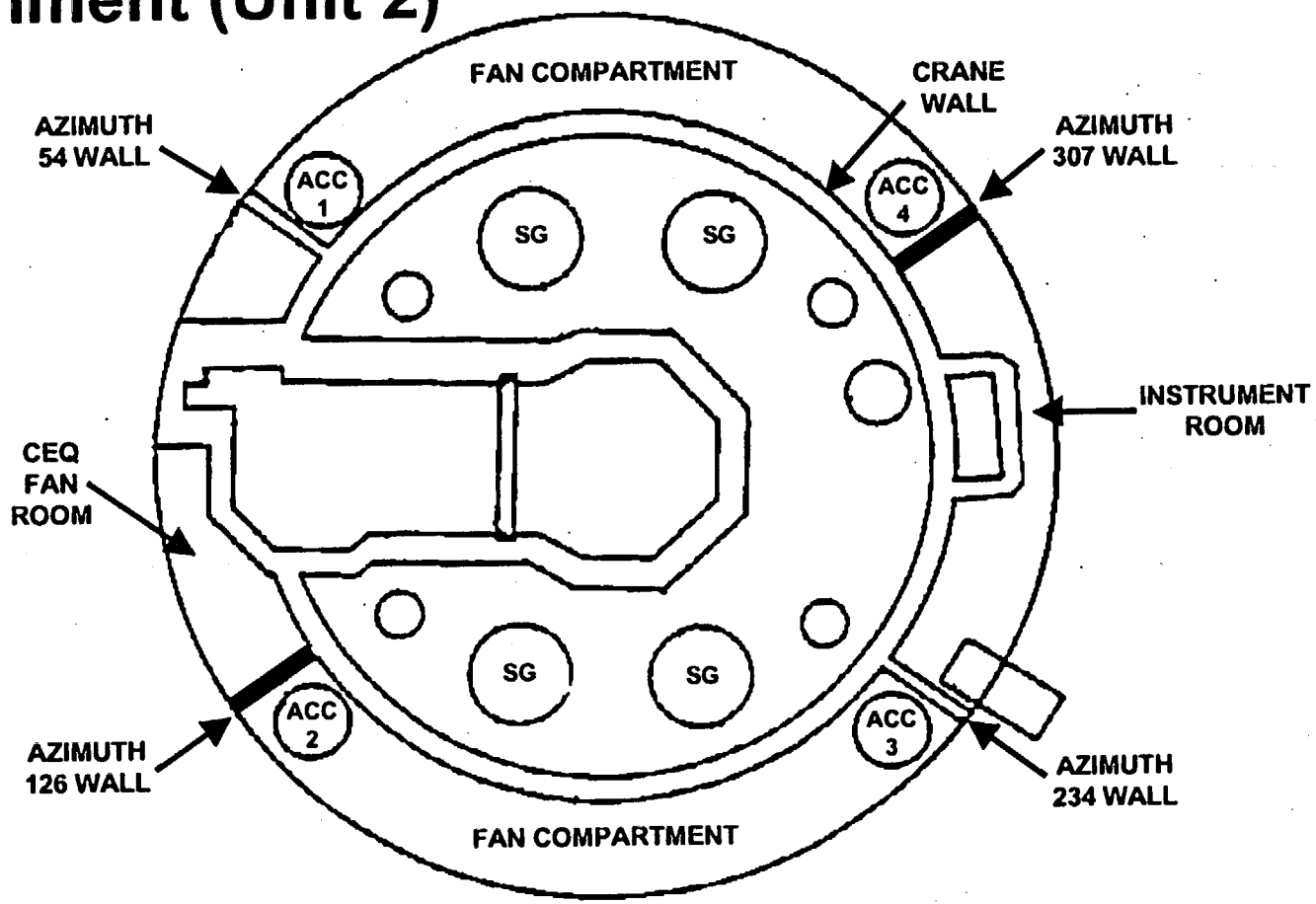
■ Containment



AEP AMERICAN ELECTRIC POWER

Background: Diagram of Containment Subcompartment Walls

- Containment (Unit 2)



AEP AMERICAN ELECTRIC POWER

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

Doing it right ...
Every step of the way.
COOK NUCLEAR PLANT

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

AEP AMERICAN ELECTRIC POWER

Doing it right ...
Every step of the way.
COOK NUCLEAR PLANT

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

AEP AMERICAN ELECTRIC POWER

Doing it right ...
Every step of the way.
COOK NUCLEAR PLANT

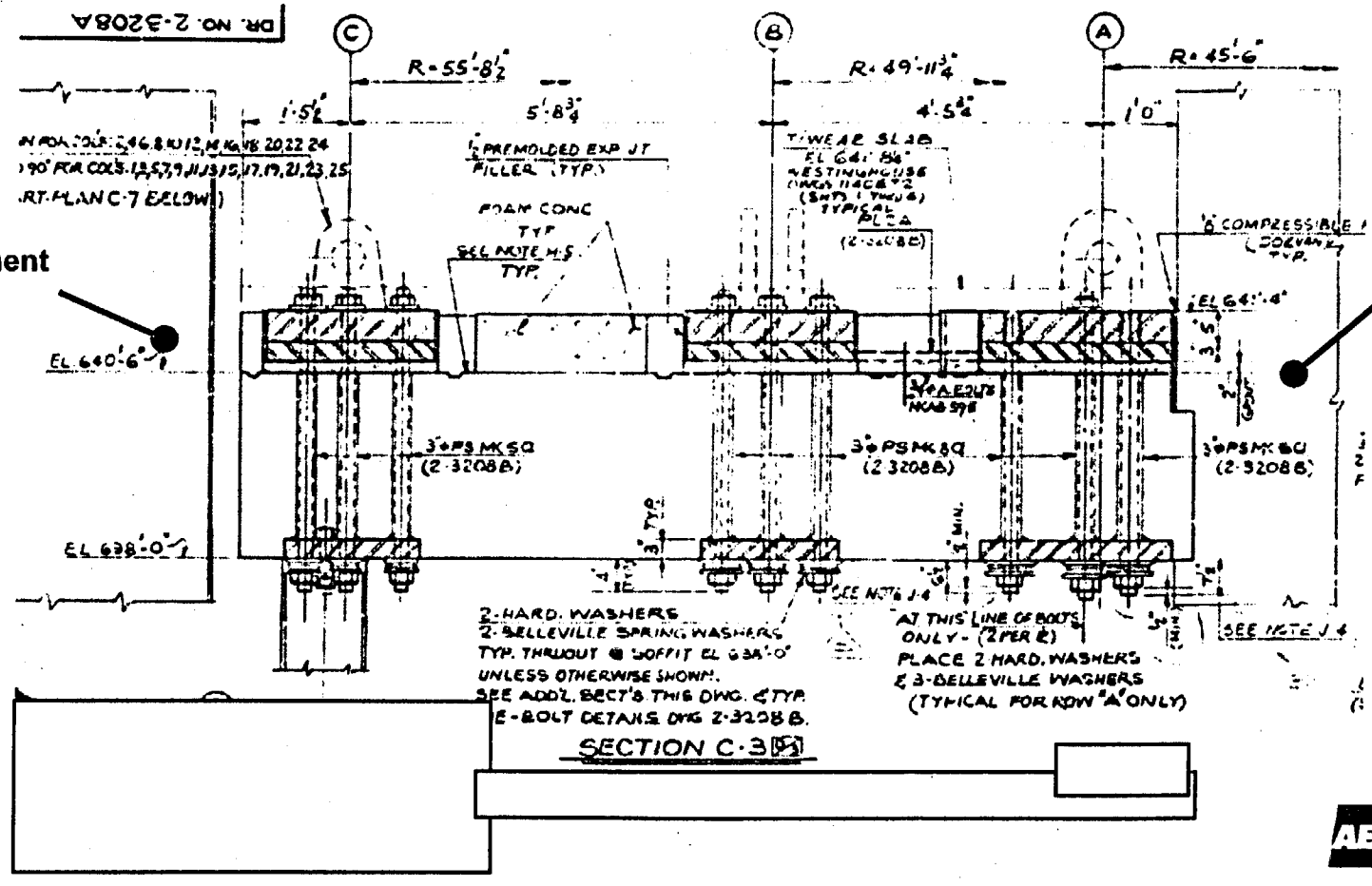
Description of the Issues: Open Pockets

- Pockets at Top of 126° Wall for Bolting
- Design Required Pockets to be Grouted
- Pockets Left Open From Original Construction

AEP AMERICAN ELECTRIC POWER

Description of the Issues: Open Pockets - Configuration of Unit 2 Ice Condenser Column Anchorage

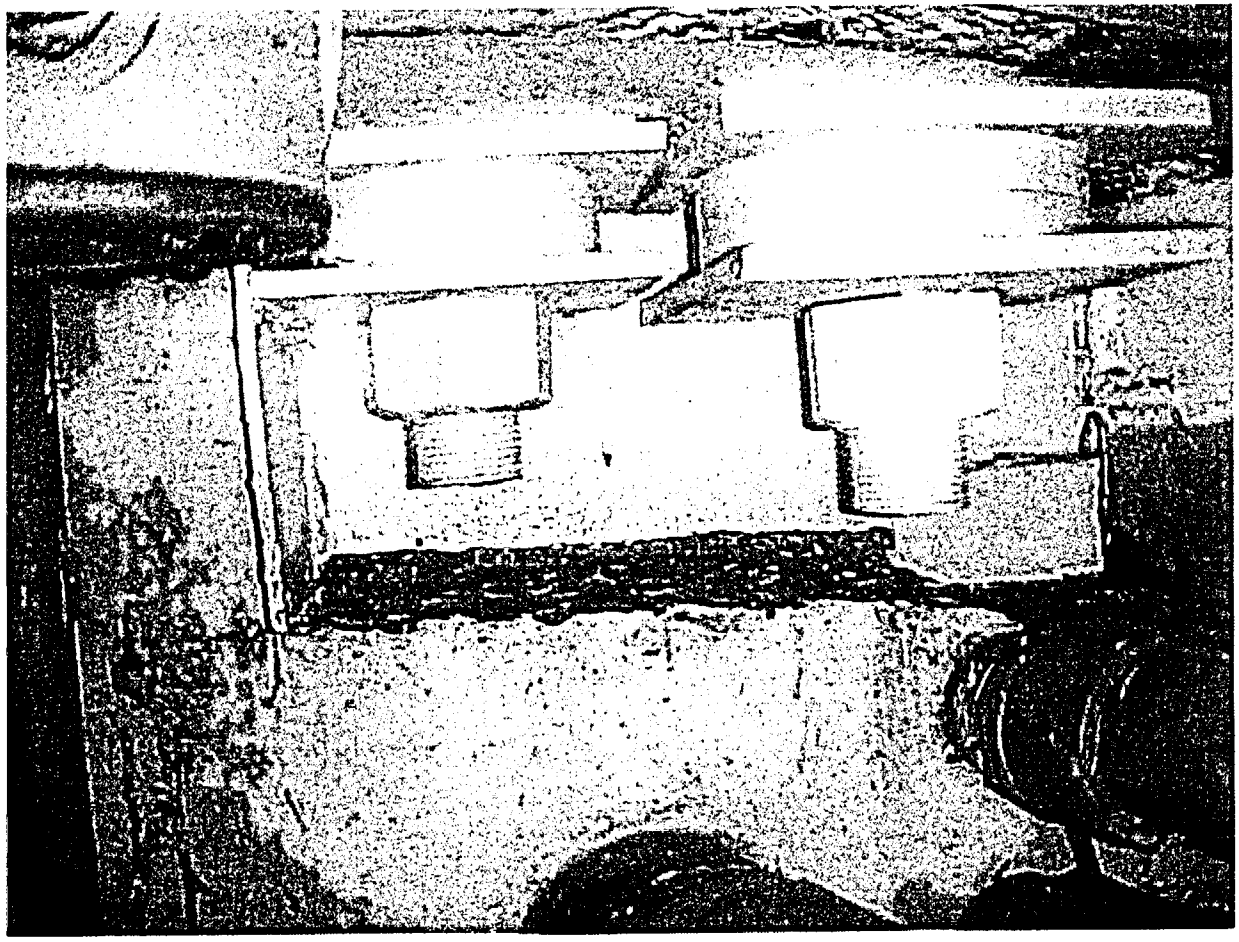
■ Typical Slab/Column Connection (Unit 2 Only)



AEP AMERICAN ELECTRIC POWER

Description of the Issues: Open Pockets - Configuration of Unit 2 Ice Condenser Column Anchorage

- **Detail Showing Pocket for Anchorage Through Bolts**



AEP AMERICAN ELECTRIC POWER

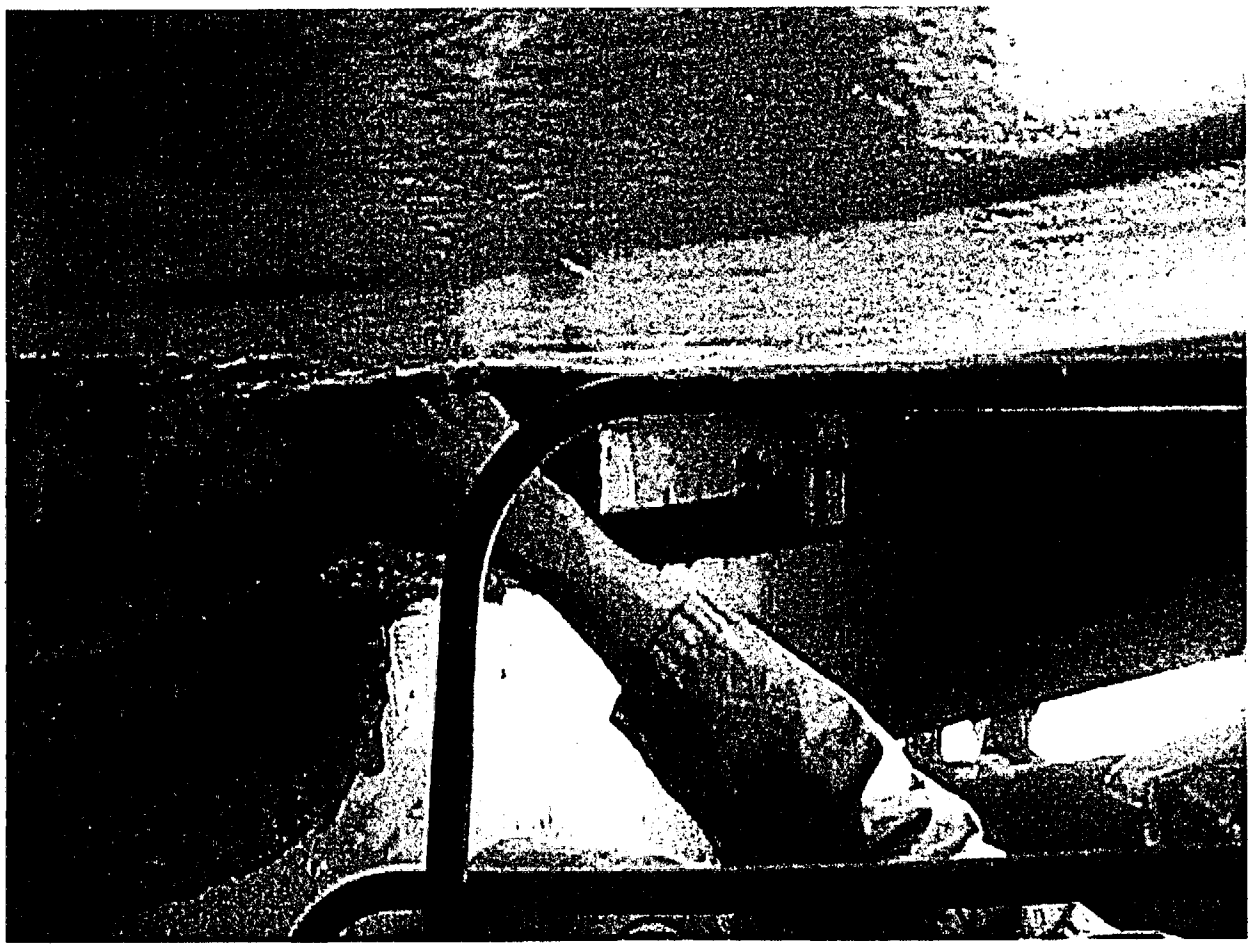
Description of the Issues: Cut Rebar

- 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

Doing it right ...
Every step of the way.
COOK NUCLEAR PLANT

Description of the Issues: Cut Rebar

- Detail Showing Chipped Grout

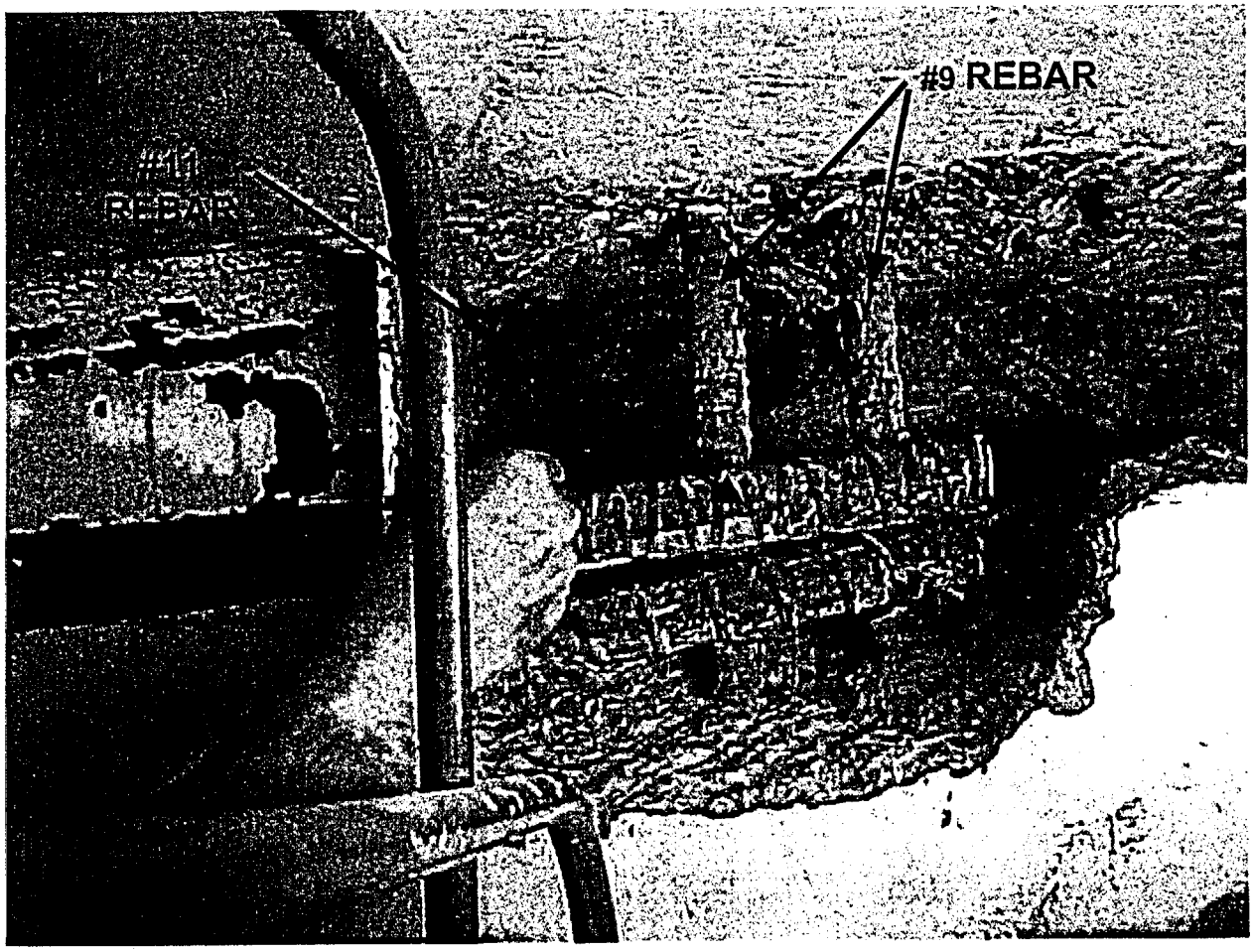


AEP AMERICAN ELECTRIC POWER

Doing it right ...
Every step of the way.
COOK NUCLEAR PLANT

Description of the Issues: Cut Rebar

- Detail Showing Excavation and Rebar



AEP AMERICAN ELECTRIC POWER

Doing it right ...
Every step of the way.
COOK NUCLEAR PLANT

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

AEP AMERICAN ELECTRIC POWER

Doing it right ...
Every step of the way.
COOK NUCLEAR PLANT

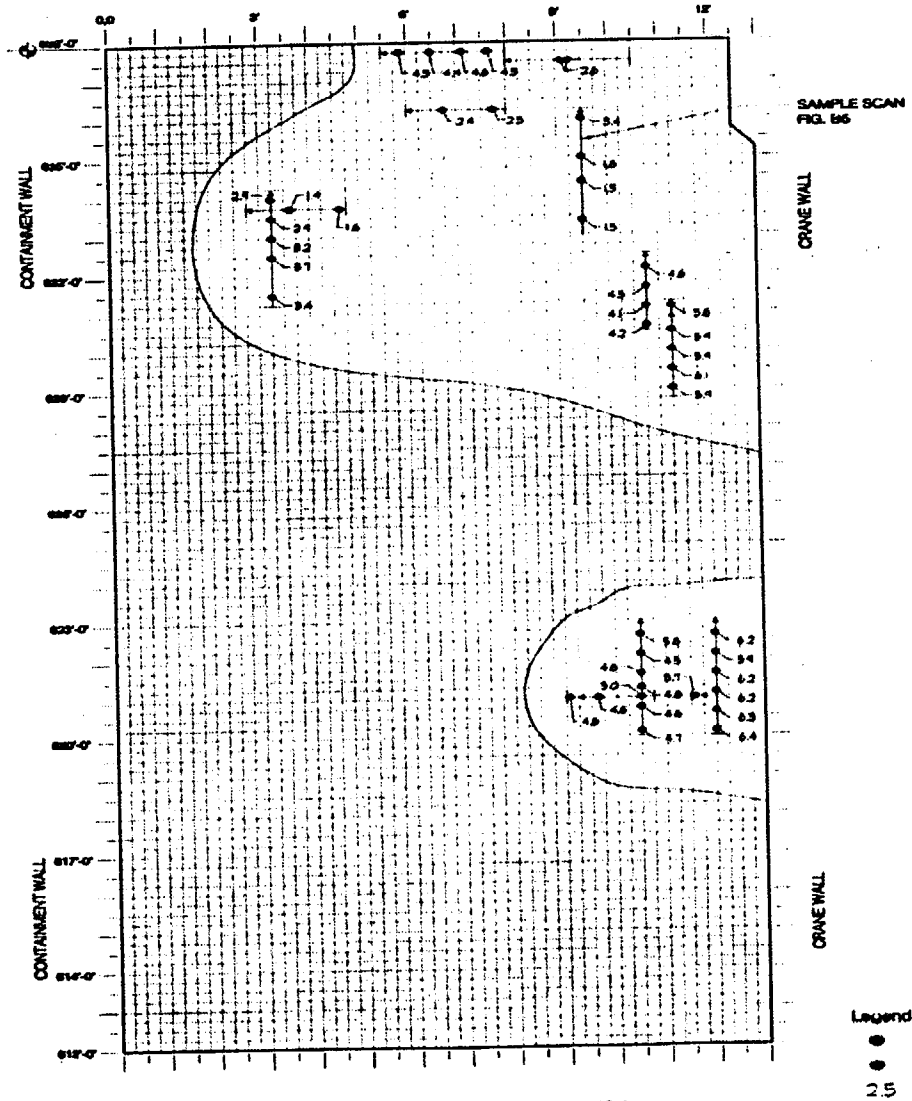
Evaluation: Mapping and Excavation

- 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

AEP AMERICAN ELECTRIC POWER

Doing it right ...
Every step of the way.
COOK NUCLEAR PLANT

Description of the Issues: Wall Radar Mapping



Wall at 126° Accumulator Side

Legend:
- Horizontal Bar
- Vertical Bar
- 2.5 Depth to Bar (in.)
- Area Not Tested

AEP AMERICAN ELECTRIC POWER

Doing it right ...
Every step of the way.
COOK NUCLEAR PLANT

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

AEP AMERICAN ELECTRIC POWER

Doing it right ...
Every step of the way.
COOK NUCLEAR PLANT

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

AEP AMERICAN ELECTRIC POWER

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

AEP AMERICAN ELECTRIC POWER

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

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

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

AEP AMERICAN ELECTRIC POWER

Doing it right ...
Every step of the way.
COOK NUCLEAR PLANT

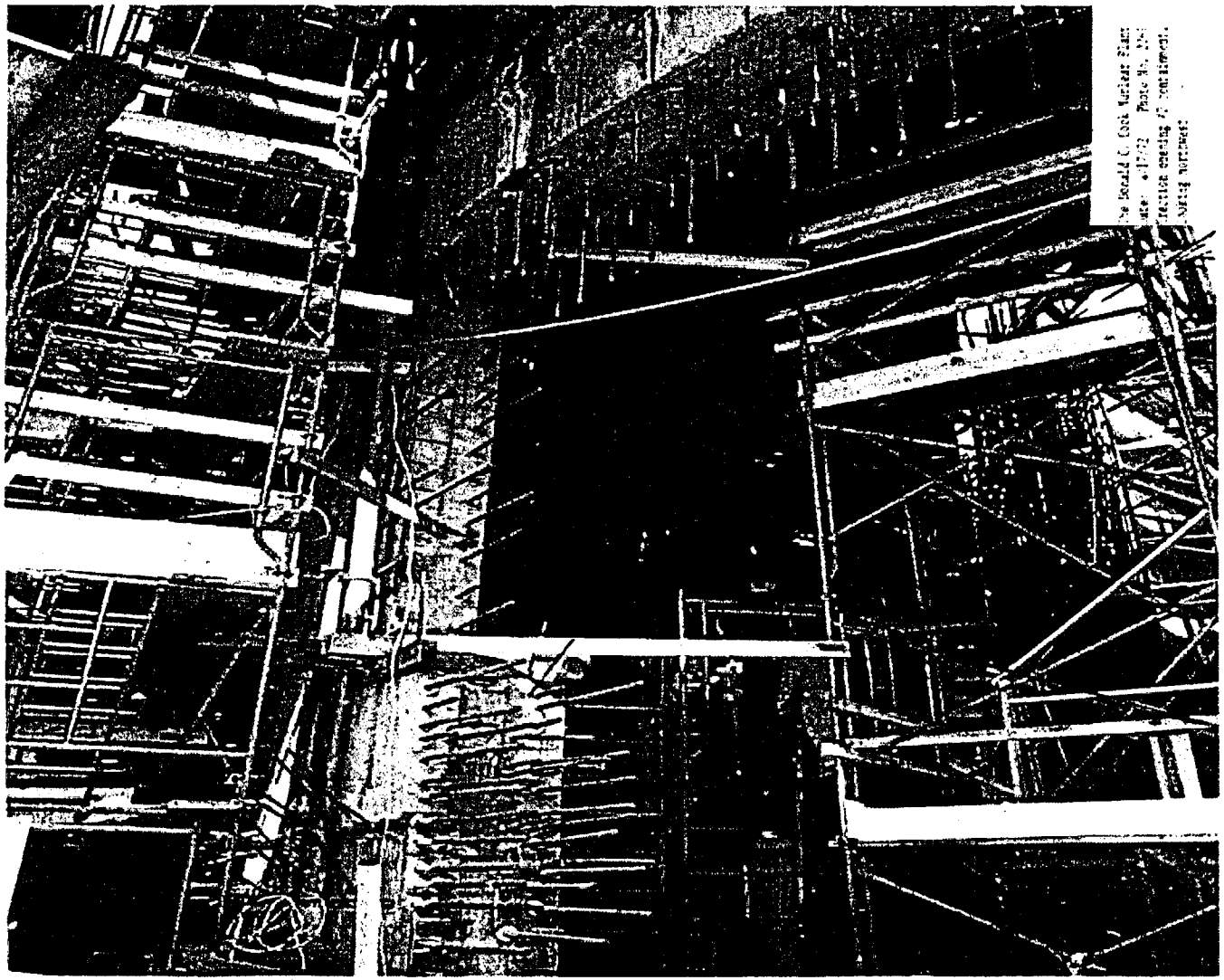
Extent of Condition: Other Unit 2 Structures

- 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

AEP AMERICAN ELECTRIC POWER

Doing it right ...
Every step of the way.
COOK NUCLEAR PLANT

Extent of Condition: Crane Wall Construction Opening



AEP AMERICAN ELECTRIC POWER

Doing it right ...
Every step of the way.
COOK NUCLEAR PLANT

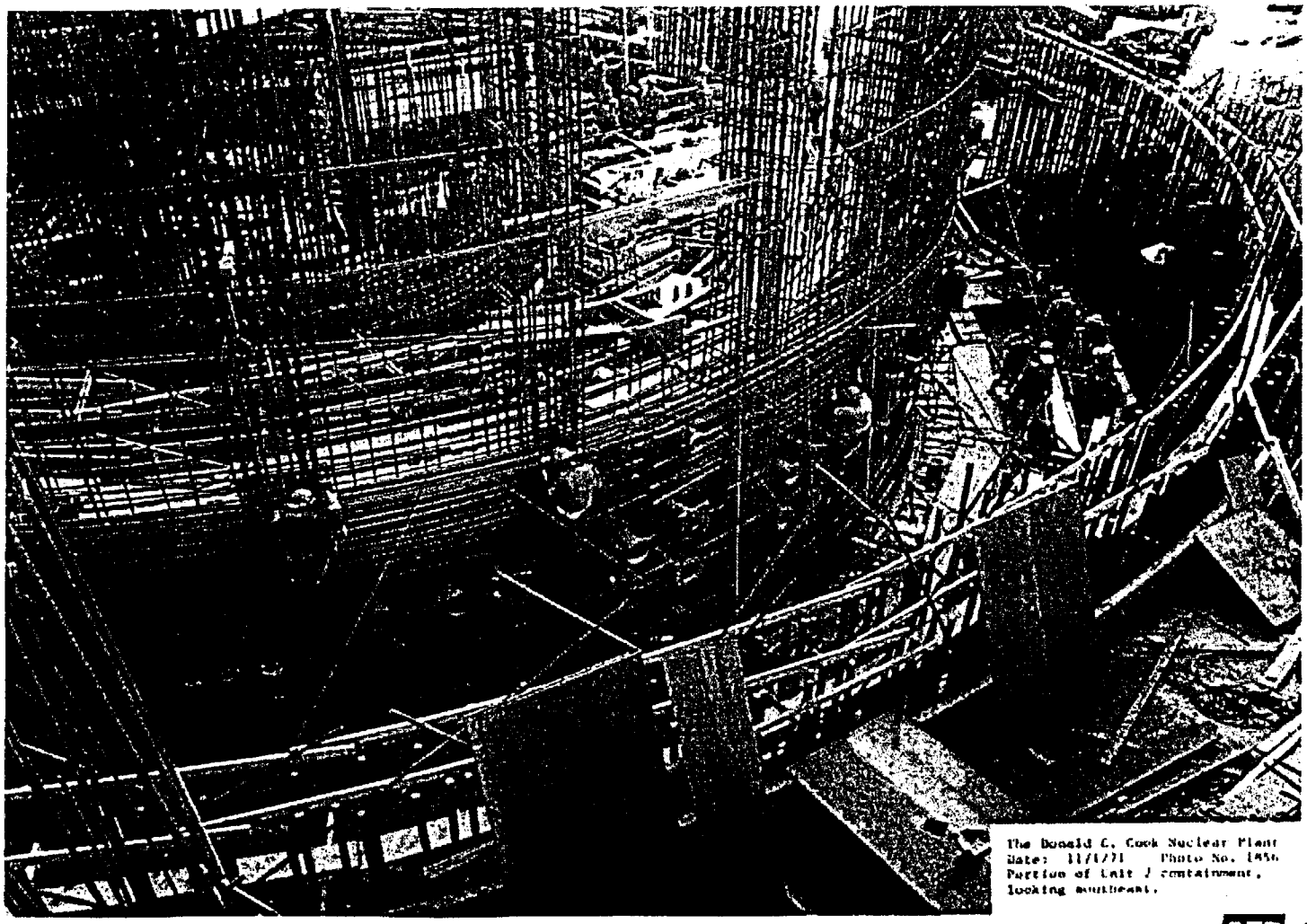
Extent of Condition: Other Unit 2 Structures

- 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

AEP AMERICAN ELECTRIC POWER

Doing it right ...
Every step of the way.
COOK NUCLEAR PLANT

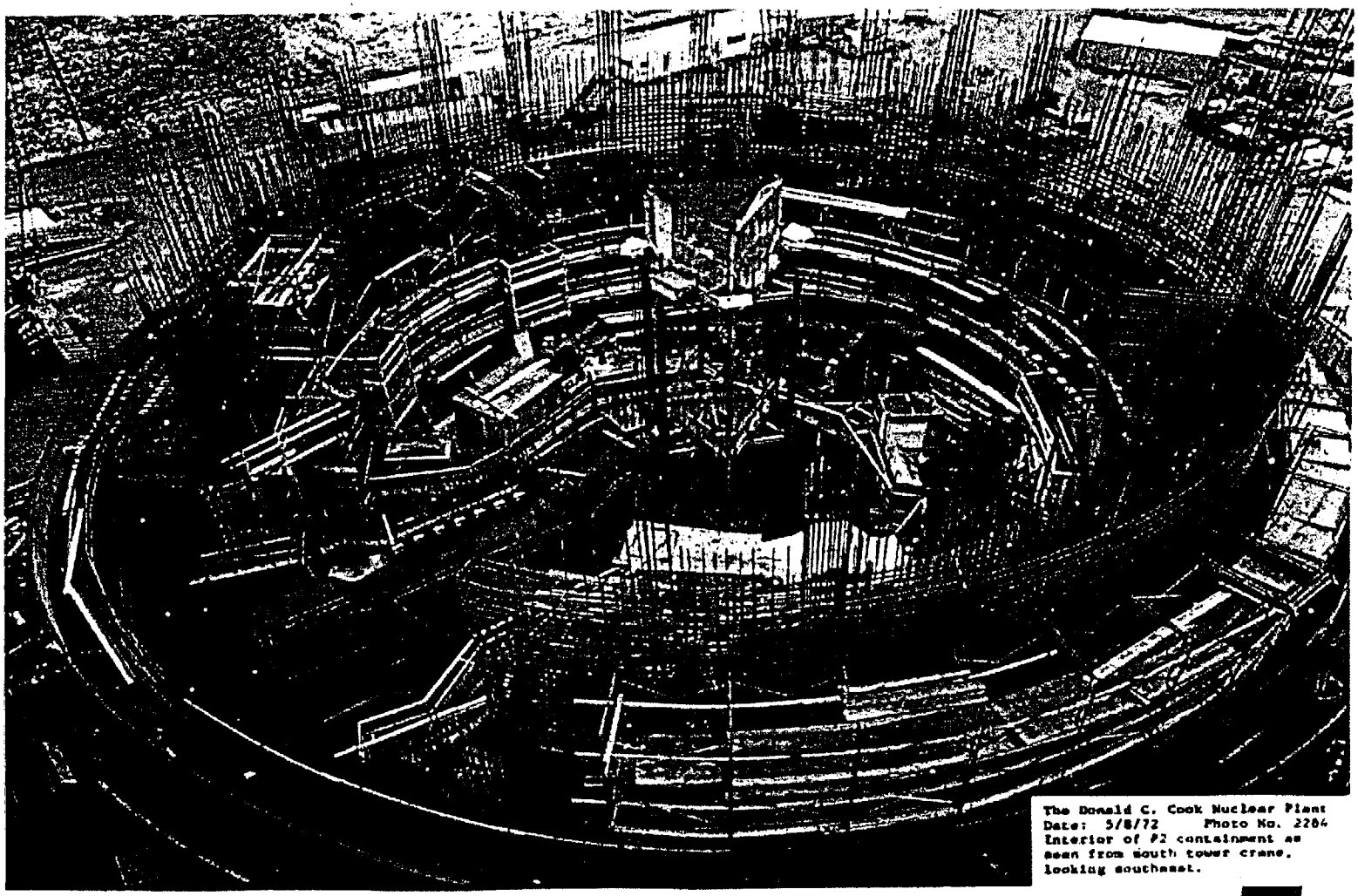
Unit 2 Containment Under Construction



AEP AMERICAN ELECTRIC POWER

Doing it right ...
Every step of the way.
COOK NUCLEAR PLANT

Unit 2 Containment Under Construction



AEP AMERICAN ELECTRIC POWER

Doing it right ...
Every step of the way.
COOK NUCLEAR PLANT

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

AEP AMERICAN ELECTRIC POWER

Doing it right ...
Every step of the way.
COOK NUCLEAR PLANT

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

AEP AMERICAN ELECTRIC POWER

Conclusion: Unit 2 Walls

- Walls Safe for Restart
- Reasonable Assurance that Other Structures Not Impacted

Doing it right ...
Every step of the way.
COOK NUCLEAR PLANT

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.