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American Electric Power

Meeting with

Nuclear Regulatory Commission

Discussion of Containment Subcompartment Walls

Restarting D. C. Cook
June 1, 2000

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Enclosure 2

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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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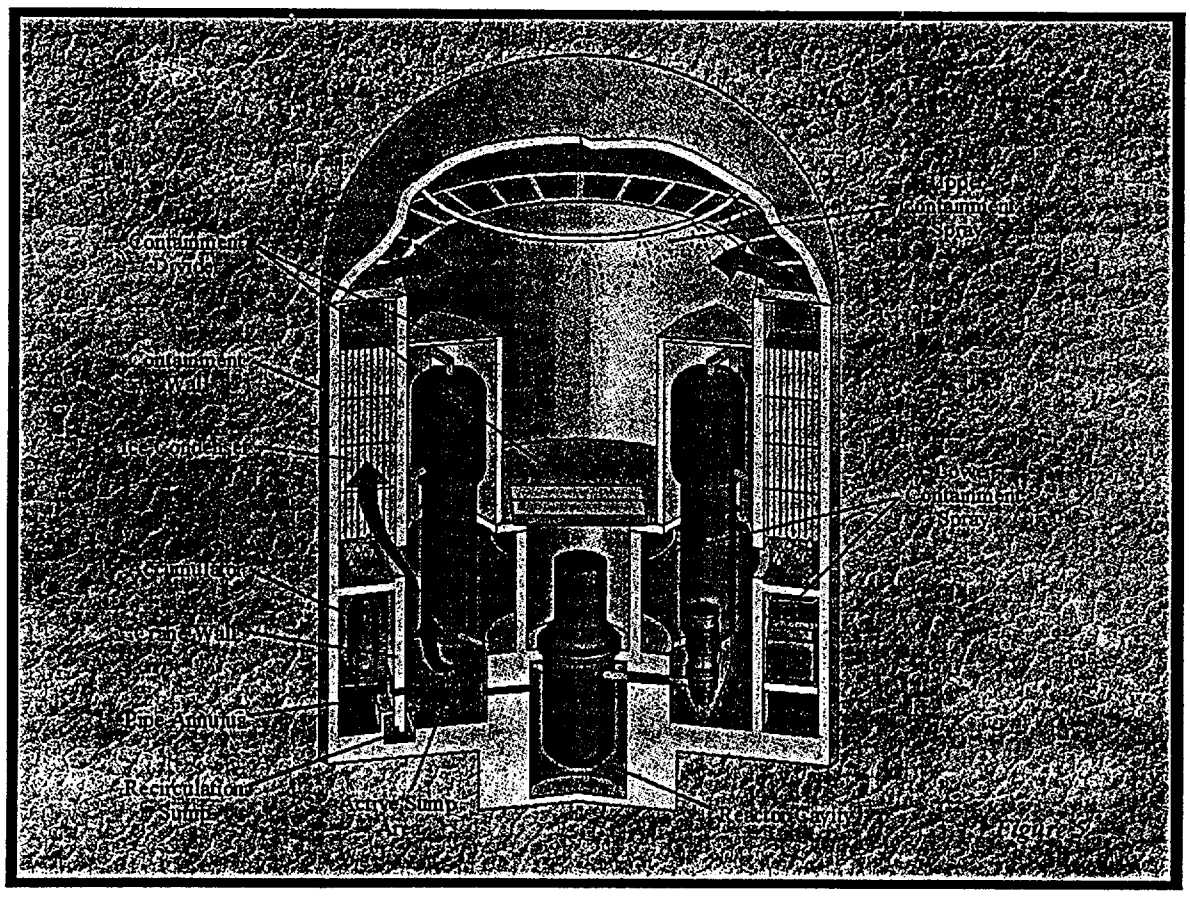
Background: Diagram of Containment Subcompartment Walls

■ Containment



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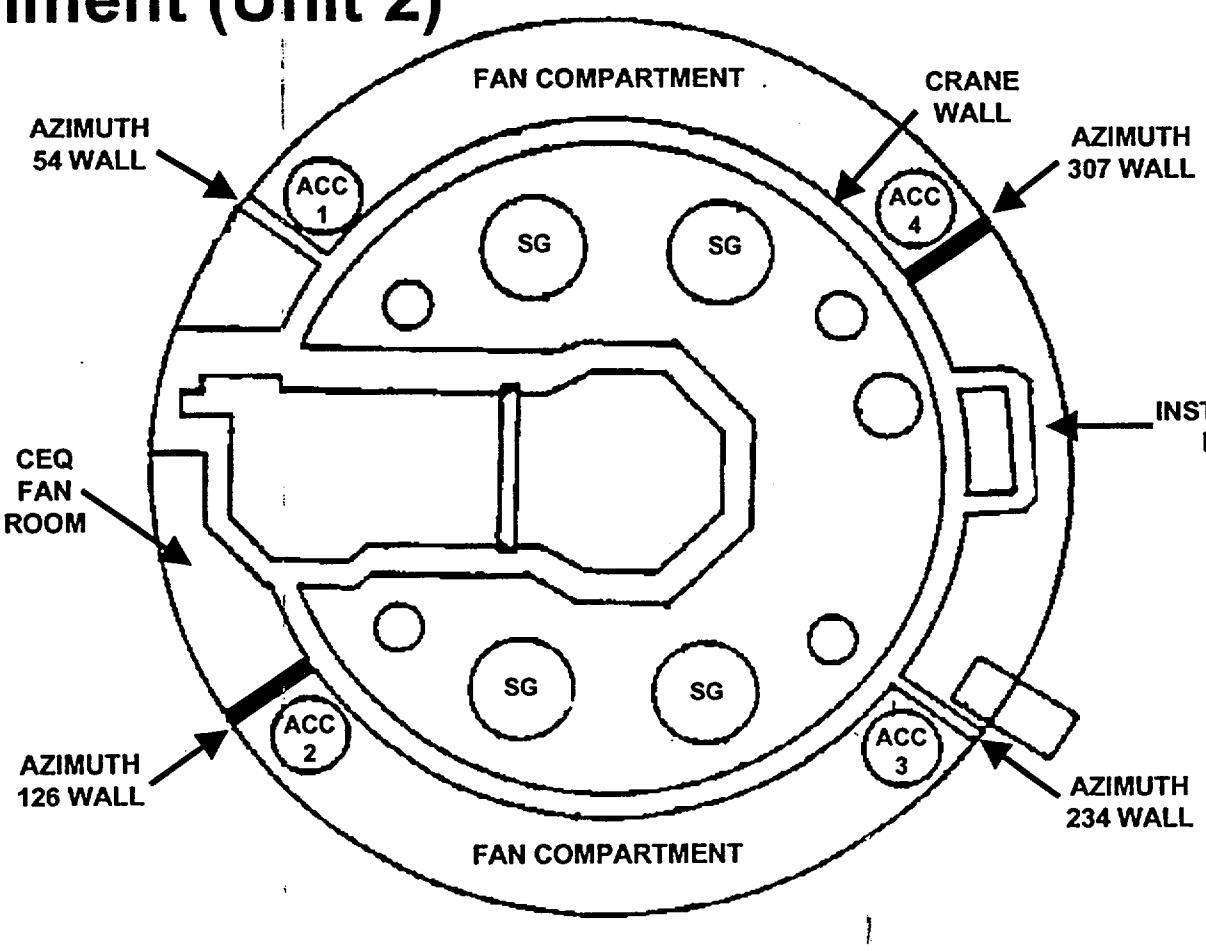
Background: Diagram of Containment Subcompartment Walls

■ Containment (Unit 2)



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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

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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

Good QC ?
How about No QC

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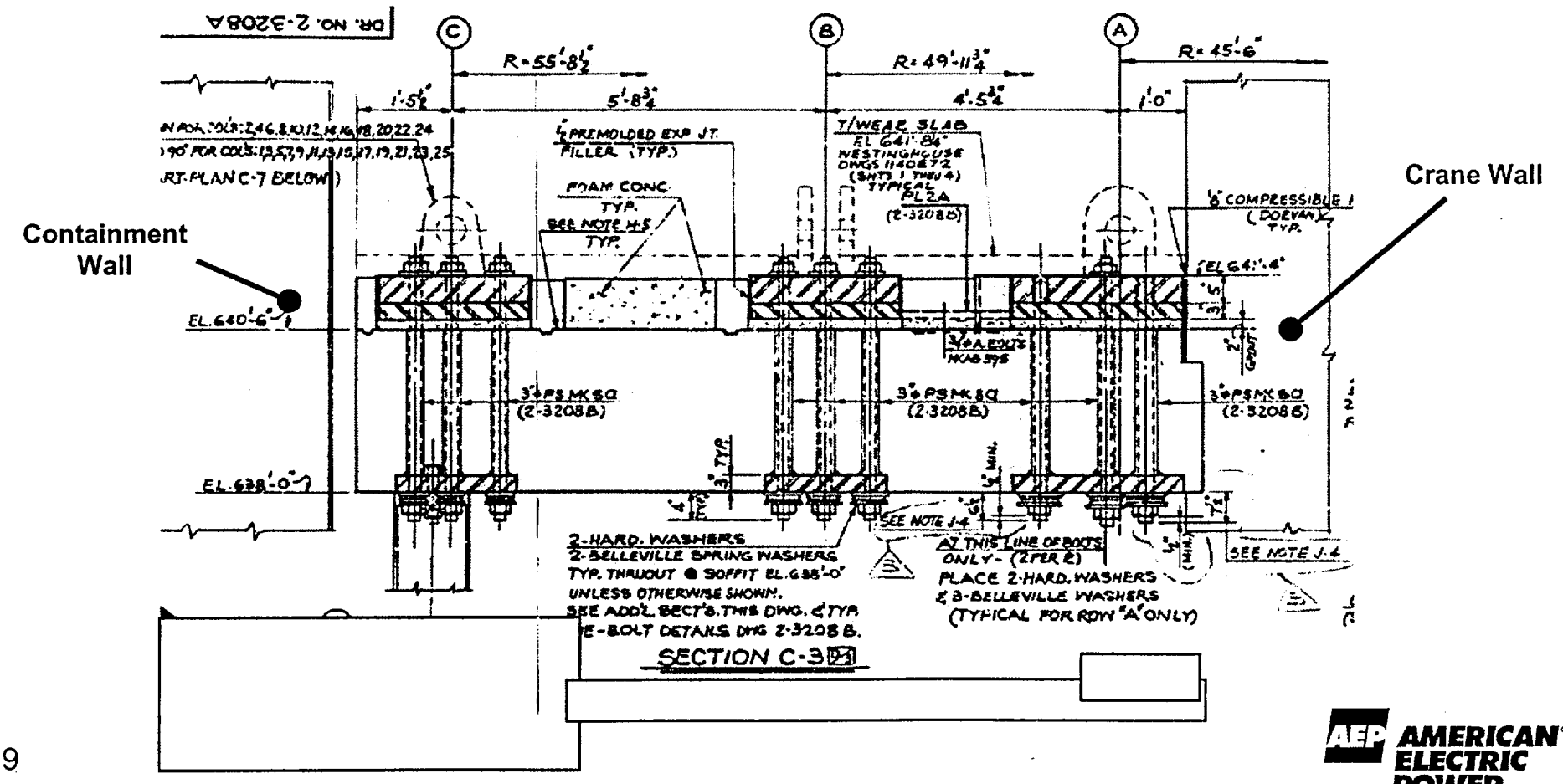
Description of the Issues: Open Pockets -
Configuration of Unit 2 Ice Condenser Column Anchorage

■ Typical Slab/Column Connection (Unit 2 Only)



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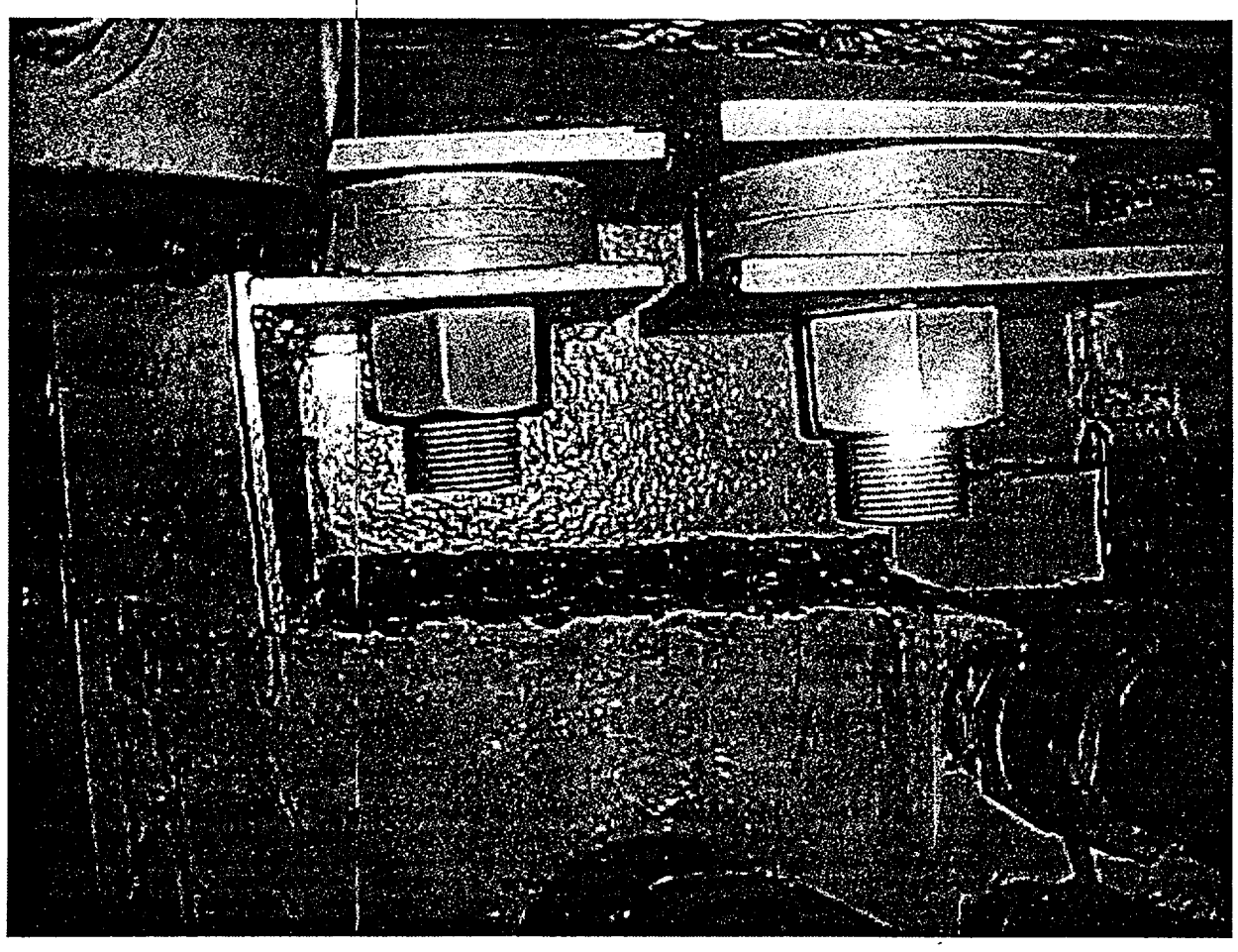
Description of the Issues: Open Pockets - Configuration of Unit 2 Ice Condenser Column Anchorage

■ 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

BUT NOT ON DRAWINGS

- Excavation Determined Extent of Condition on 126° Wall
- Issue Limited to 126° Wall

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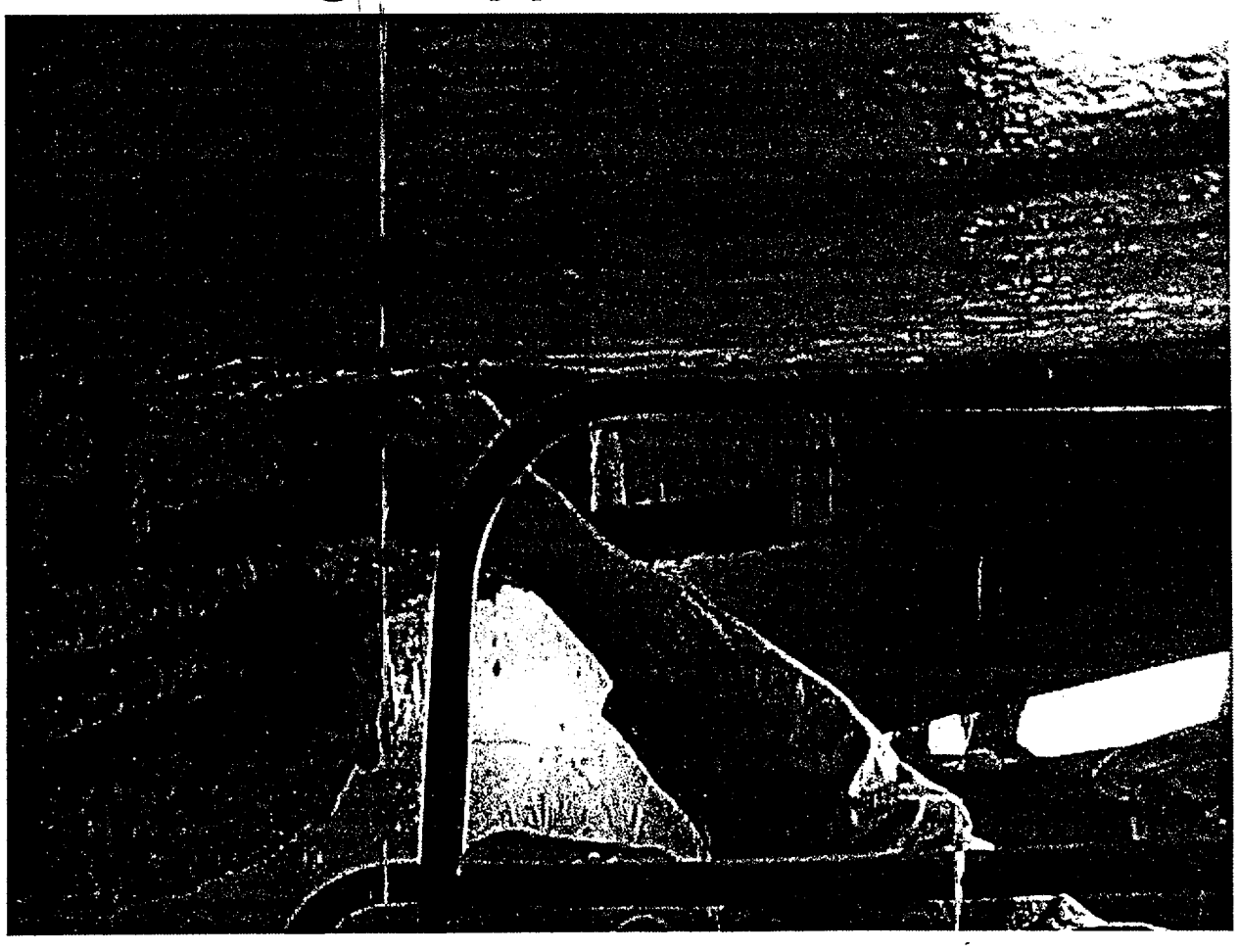
Description of the Issues: Cut Rebar

■ 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

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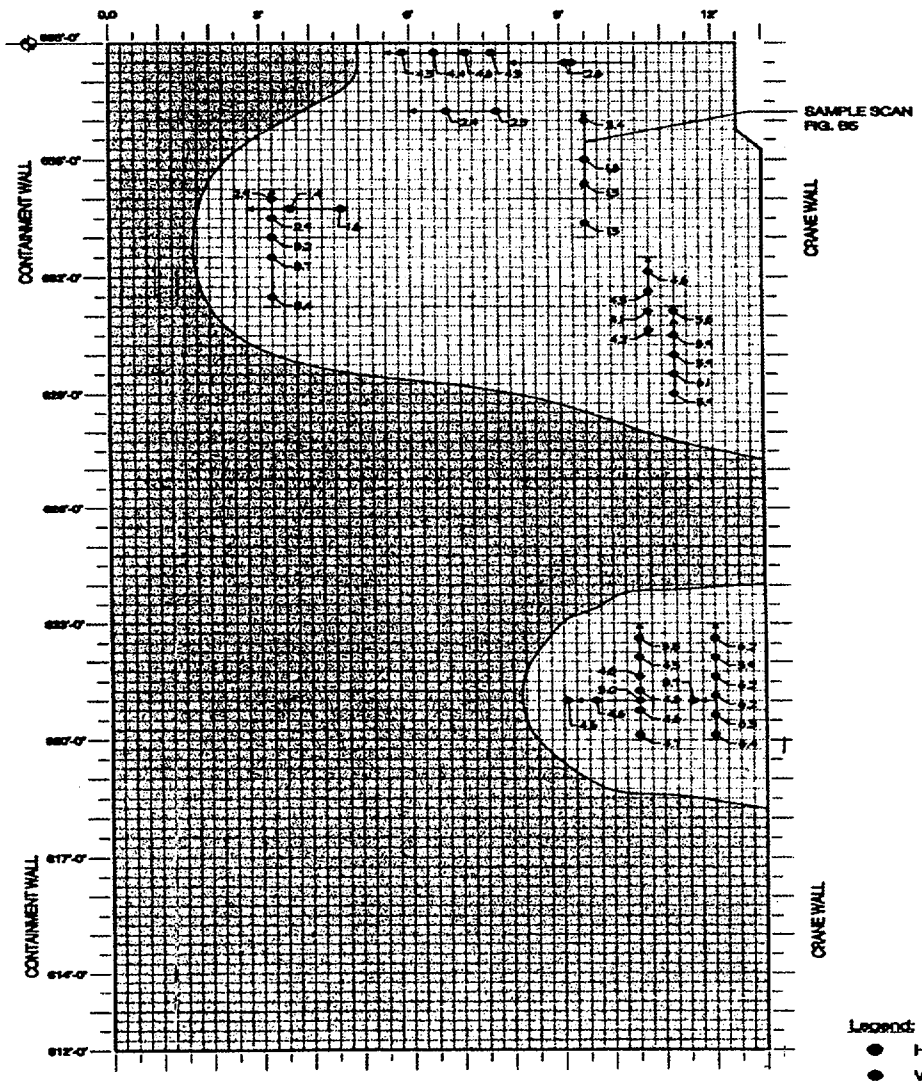
Description of the Issues: Wall Radar Mapping



Wall at 126° Accumulator Side

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

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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)**

MORE PRESSURE

- **Excavation and Radar Mapping - Average Spacing:**
  - **Horizontal bars per design**
  - **Vertical bars**
    - » **Most areas per design**
    - » **Up to 15 inch spacing in limited areas**

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Description of the Issues: Rebar Cover

- **Design**
  - Horizontal bars - 2¾ inch cover
  - Vertical bars - behind horizontal (4⅛ 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

BULL

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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) — what area
    - » 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

NOT ALLOWED
WE NEED TO KNOW where bars are exactly

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Extent of Condition: Other Unit 2 Structures

? Without chipping any other wall

- Ice Condenser Support Interference and Asbestos Limited to 126° Wall

Second time telling us this, hope this time its correct

- 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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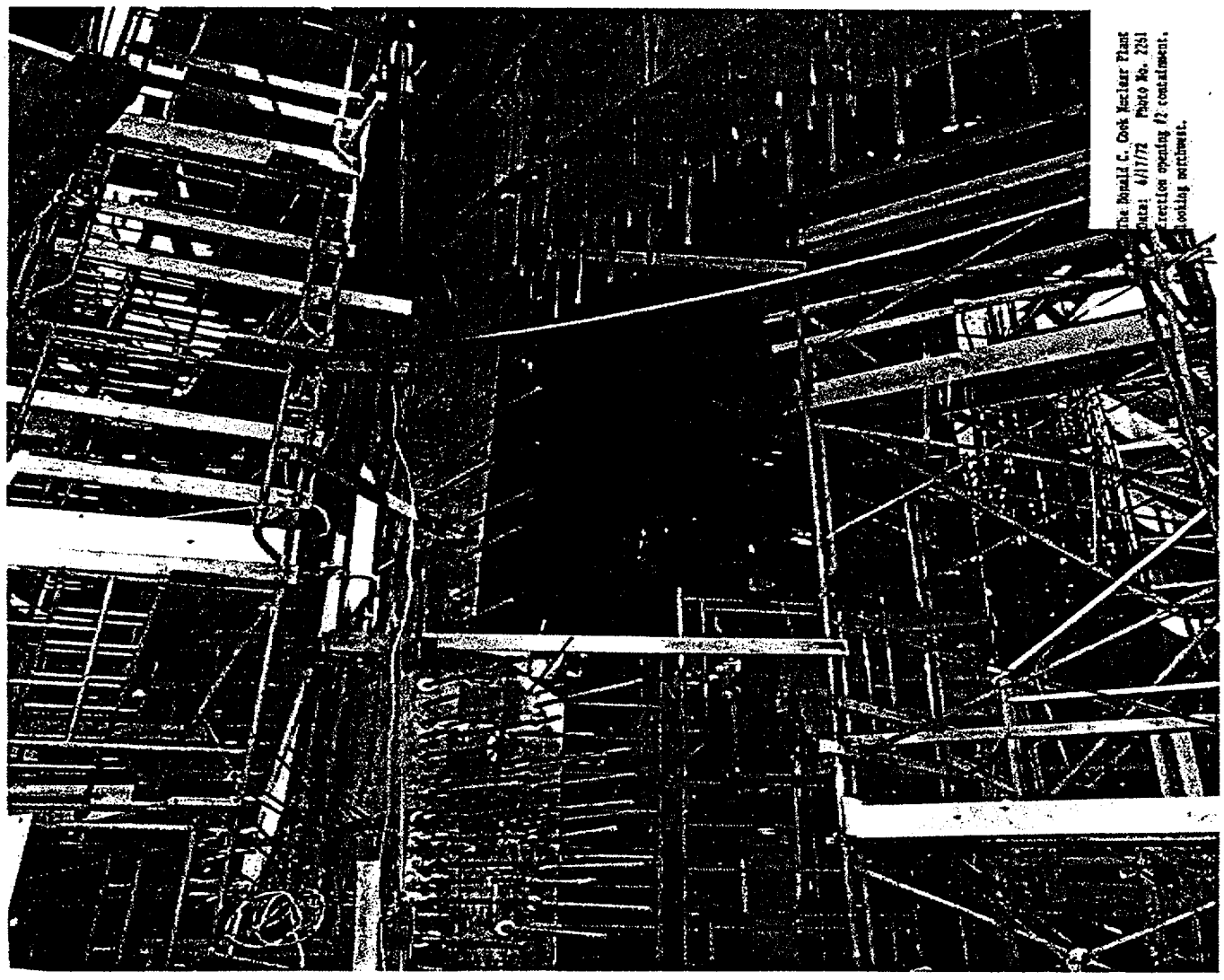
Extent of Condition: Crane Wall Construction Opening



The Donald C. Cook Nuclear Plant
Date: 4/11/72 Photo No. 2261
Erection opening #2 containment.
Looking northwest.

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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**

Similar discrepancies

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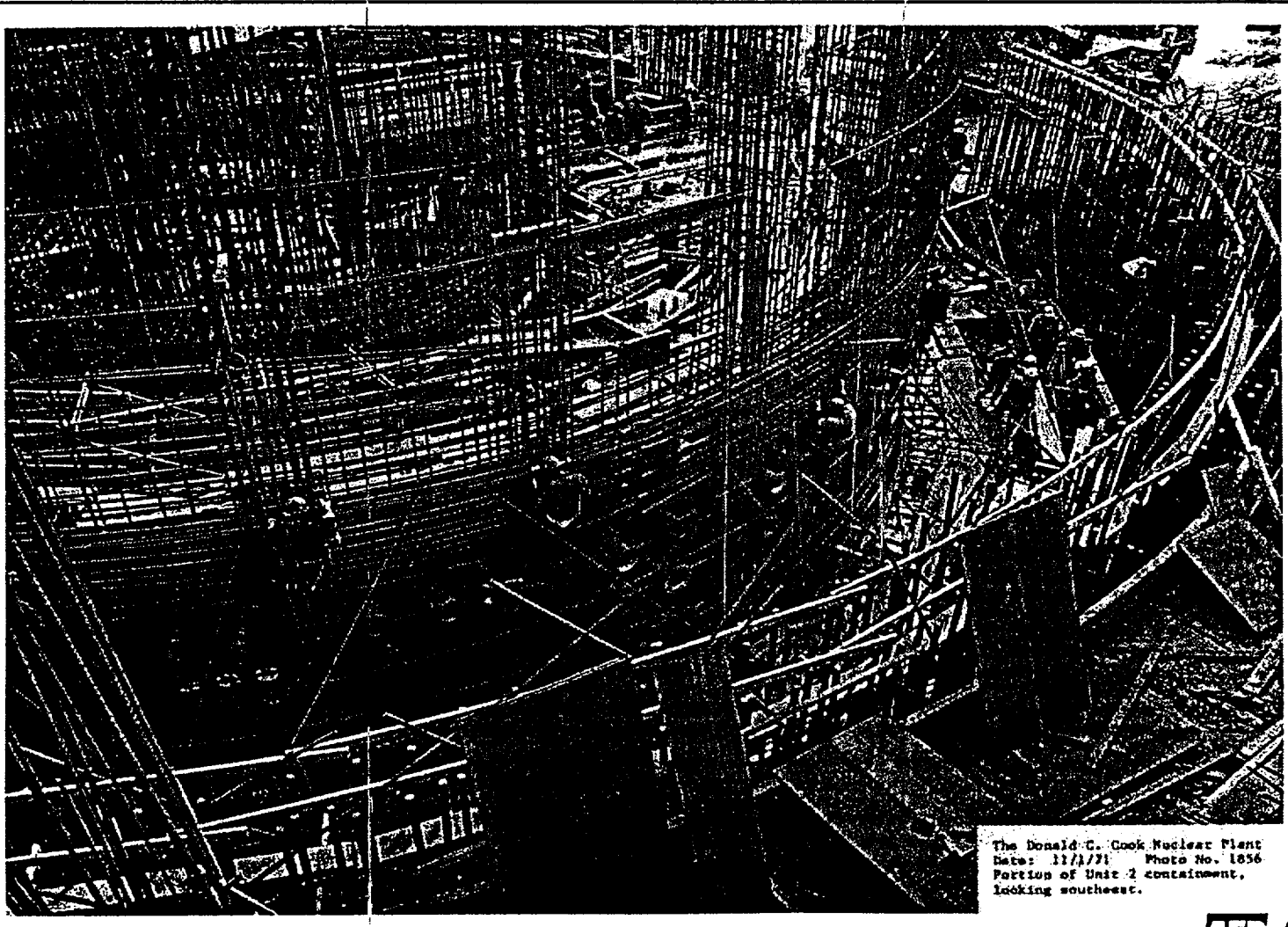
Unit 2 Containment Under Construction



The Donald C. Cook Nuclear Plant
Date: 11/1/71 Photo No. 1856
Portion of Unit 2 containment, looking southeast.

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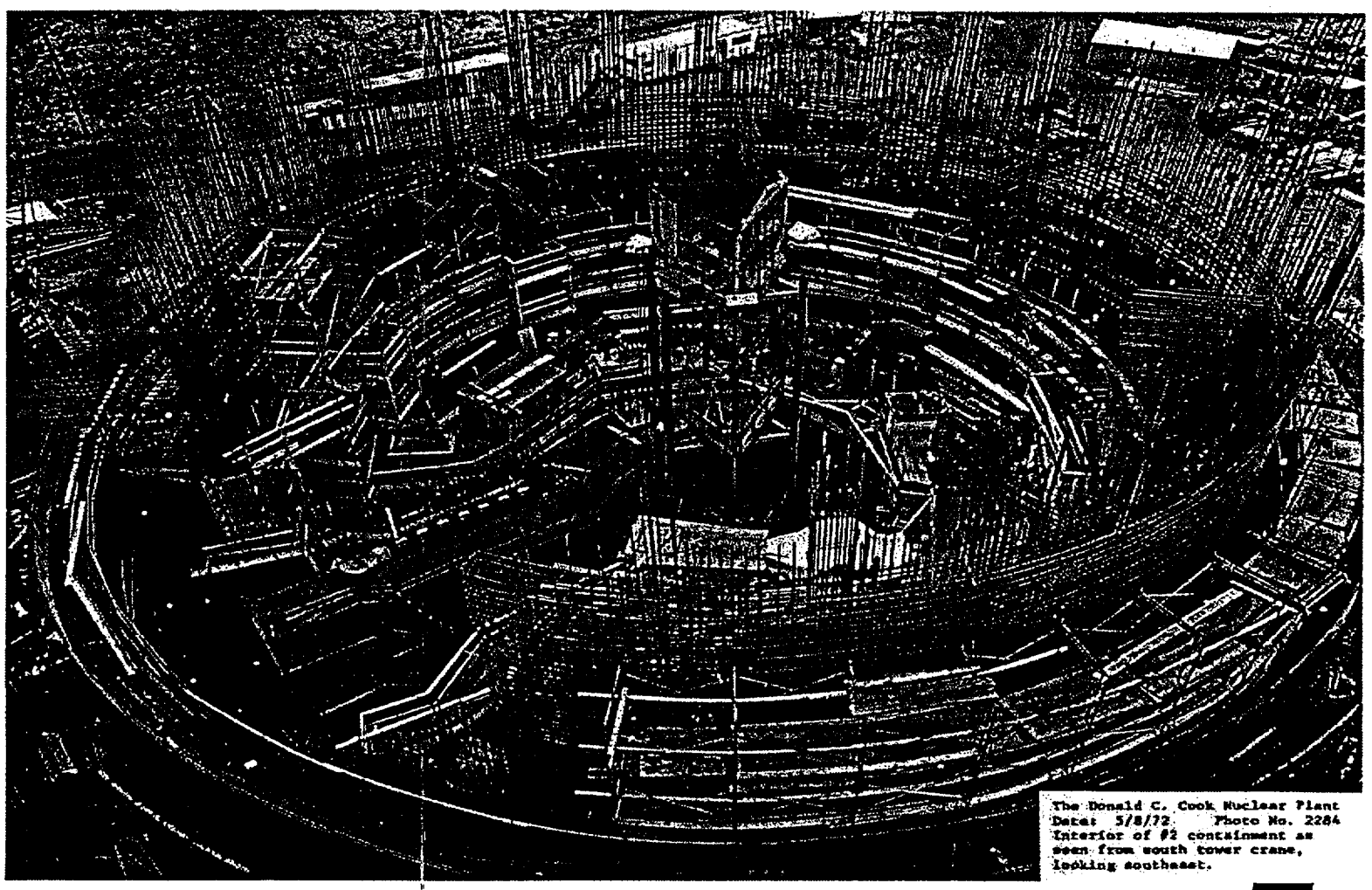
Unit 2 Containment Under Construction



The Donald C. Cook Nuclear Plant
Date: 5/8/72 Photo No. 2284
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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