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Enclosure 2

# American Electric Power

## Meeting with

# Nuclear Regulatory Commission

## Discussion of Containment Subcompartment Walls

**Restarting D. C. Cook**
**May 4, 2000**

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# Agenda

| | |
|---|---|
| ■ Agenda/Background | Mike Rencheck |
| ■ Description of the Problem | Scot Greenlee |
| ■ Corrective Action Prior to Restart and the Long-Term Plan | Scot Greenlee |
| ■ Operability of Subcompartment Wall at Restart | Scot Greenlee |
| ■ Closing Remarks | Mike Rencheck |



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# Containment Subcompartment Walls: Diagram

## ■ Containment

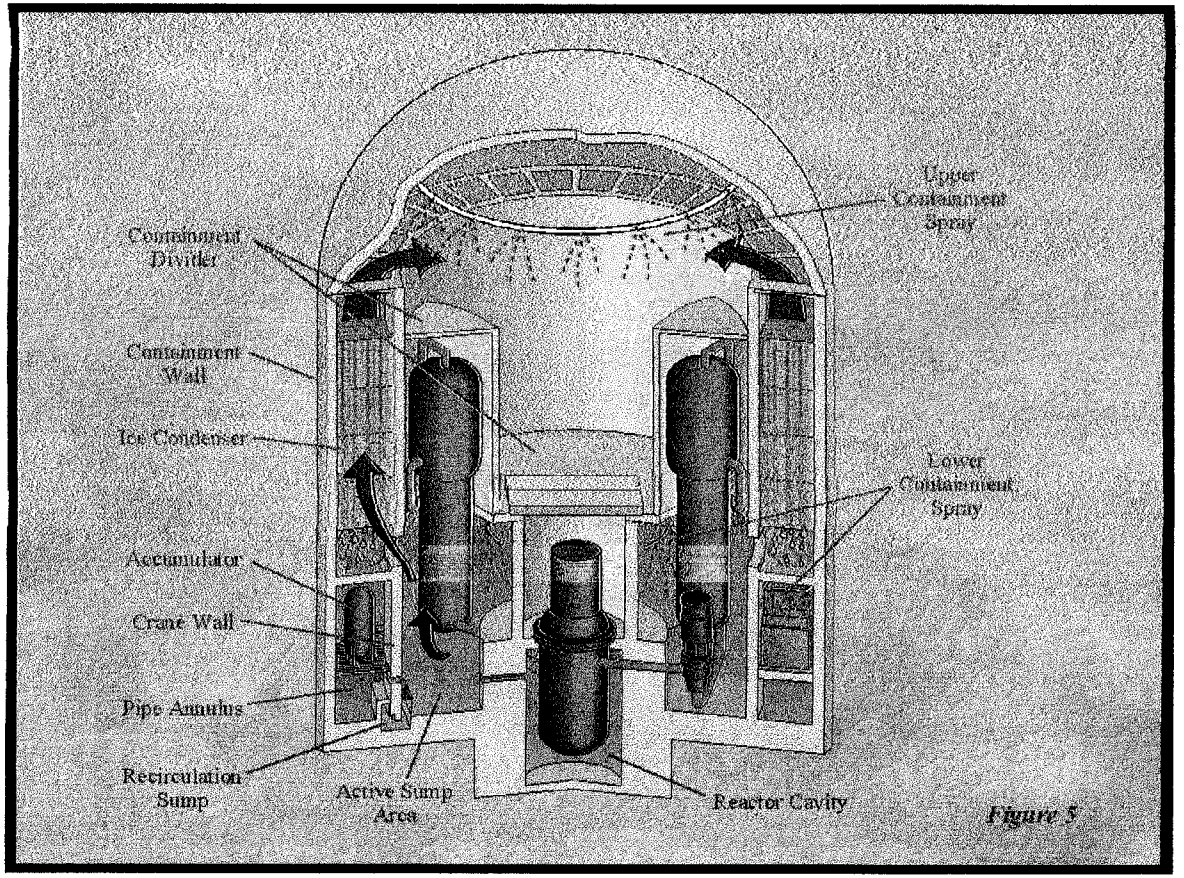


*Figure 5*



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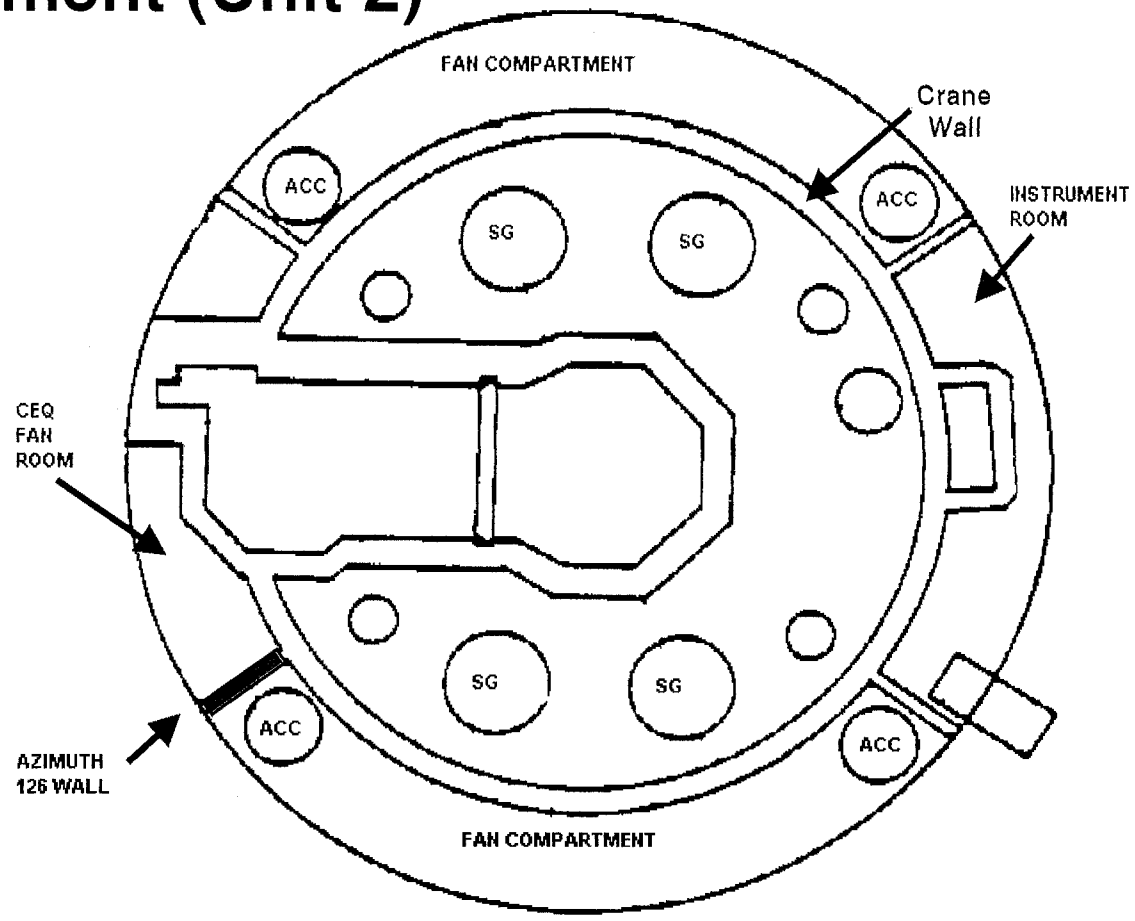
# Containment Subcompartment Walls: Diagram

## ■ Containment (Unit 2)



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# Fan/Accumulator Walls: Description

- Four Walls in Each Unit
  - Two form end walls of CEQ Fan Room (Upper Containment)
  - Two form end walls of Instrument Room (Lower Containment "dead ended room")
  - All walls fixed at base and crane wall; free (gap) at containment wall
    - » 6 Walls fixed at top (ice condenser slab)
    - » 2 Walls (Unit 1 - 307$^{O}$ Instrument Room, Unit 2 - 126$^{O}$ CEQ Fan Room) pinned at top with rebar and grout fill

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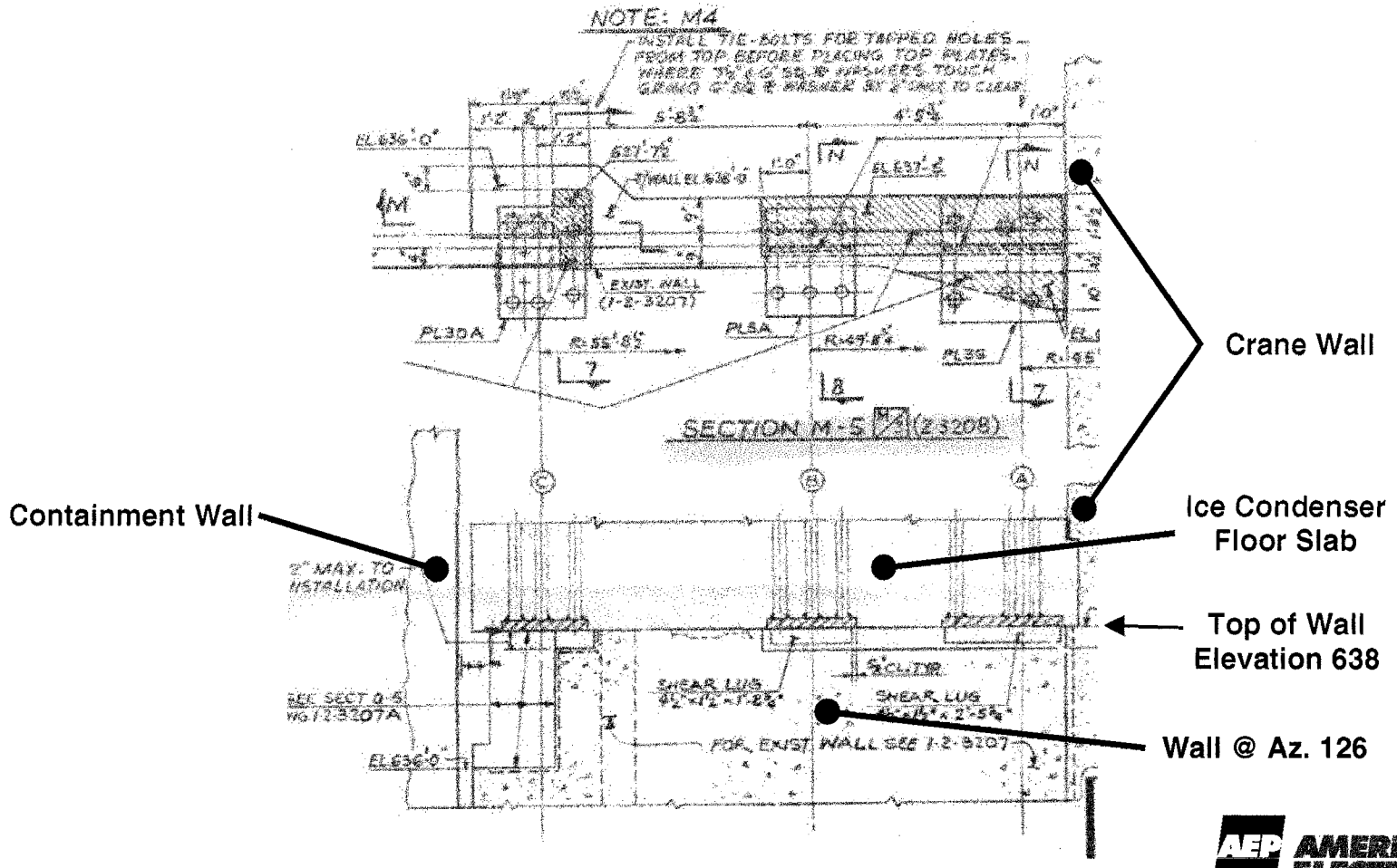
# Fan/Accumulator Wall: Unit 2 Configuration

## ■ Azimuth 126 Wall



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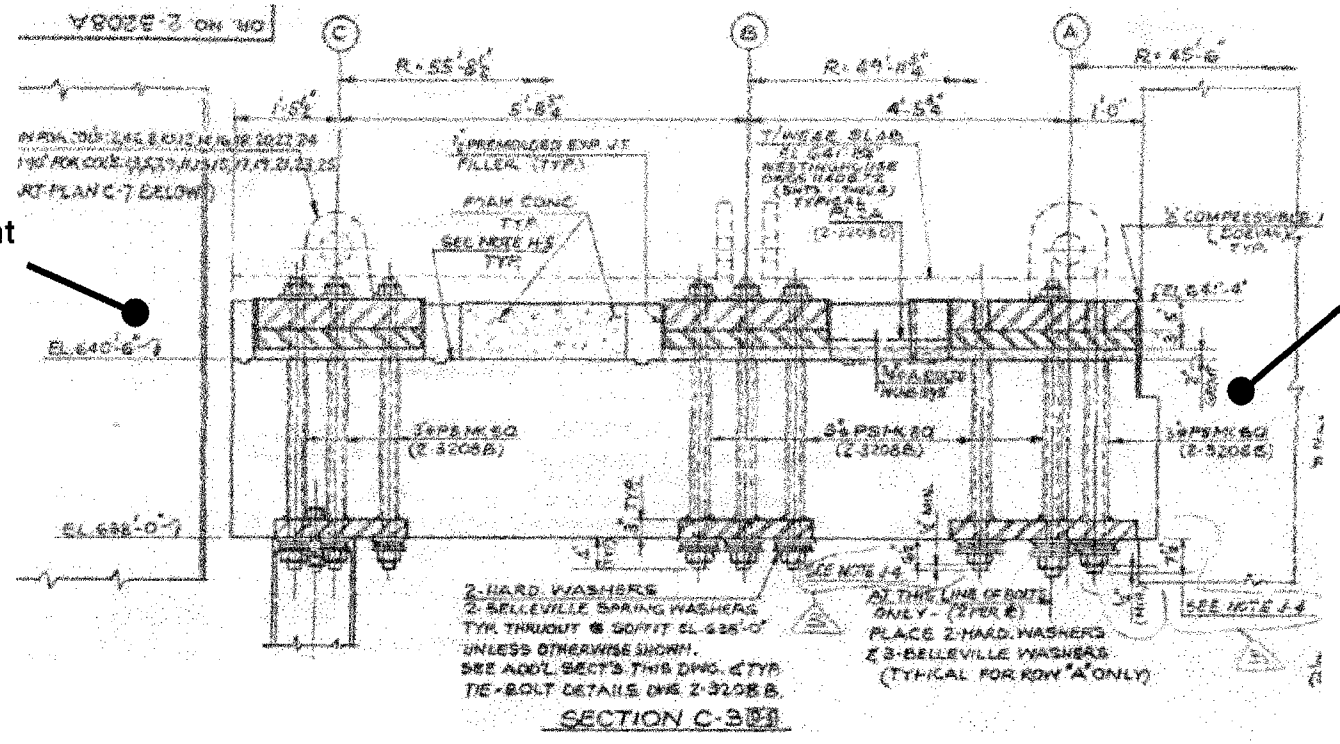
# Fan/Accumulator Wall: Unit 2 Configuration

## ■ Typical Slab/Column Connection (Unit 2 Only)



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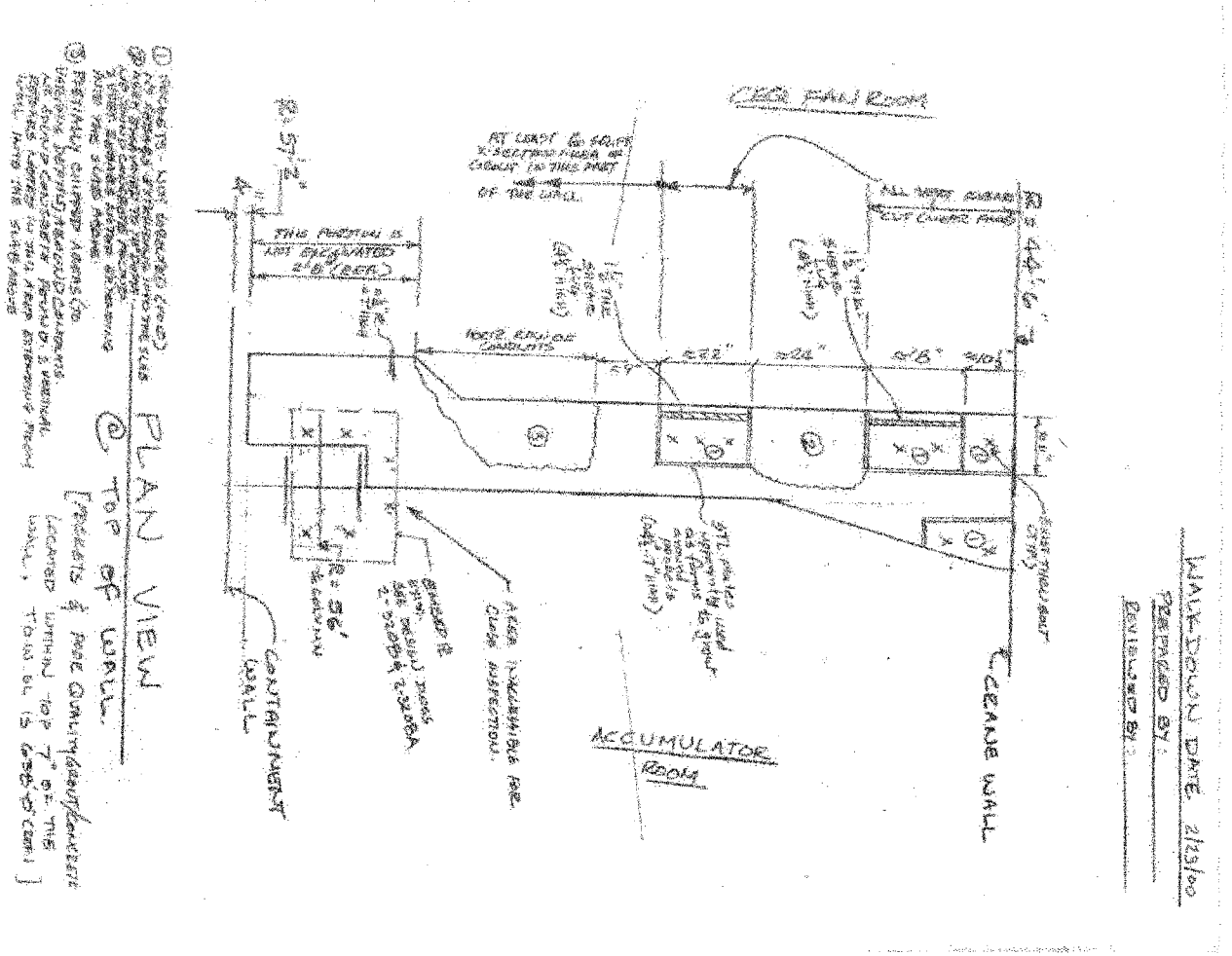
# Fan/Accumulator Wall: Unit 2 Configuration

## ■ Azimuth 126 Wall Walkdown



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# Fan/Accumulator Wall: As Found

- Unit 2 Azimuth 126° Wall
  - Grout not present in "pockets" at top of wall
  - Existing grout low strength
  - Rebar cut in interference areas

- Extent of Condition - Other Seven Walls
  - Monolithic concrete in all but one
  - Low strength, intact grout on top seven inches of one Unit 1 Instrument Room wall
  - No interference points in other walls - intact rebar



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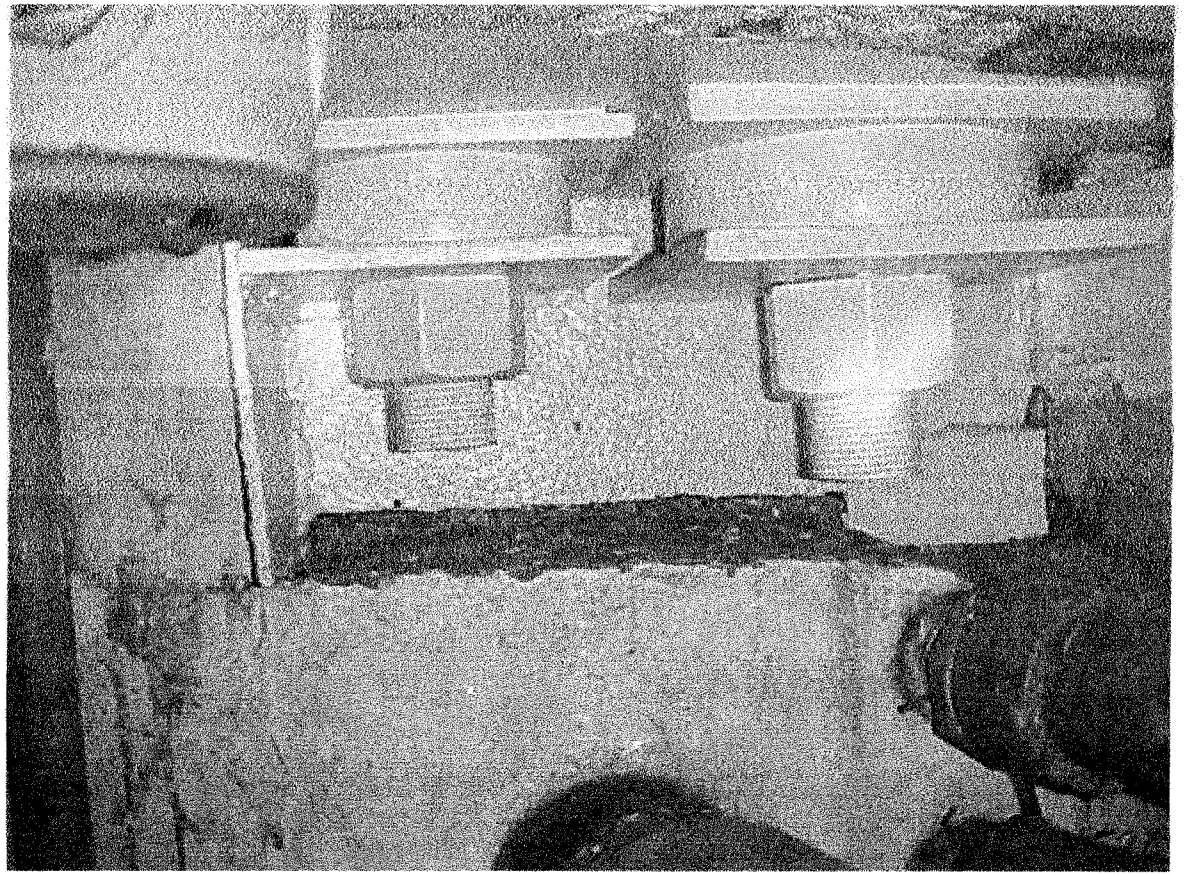
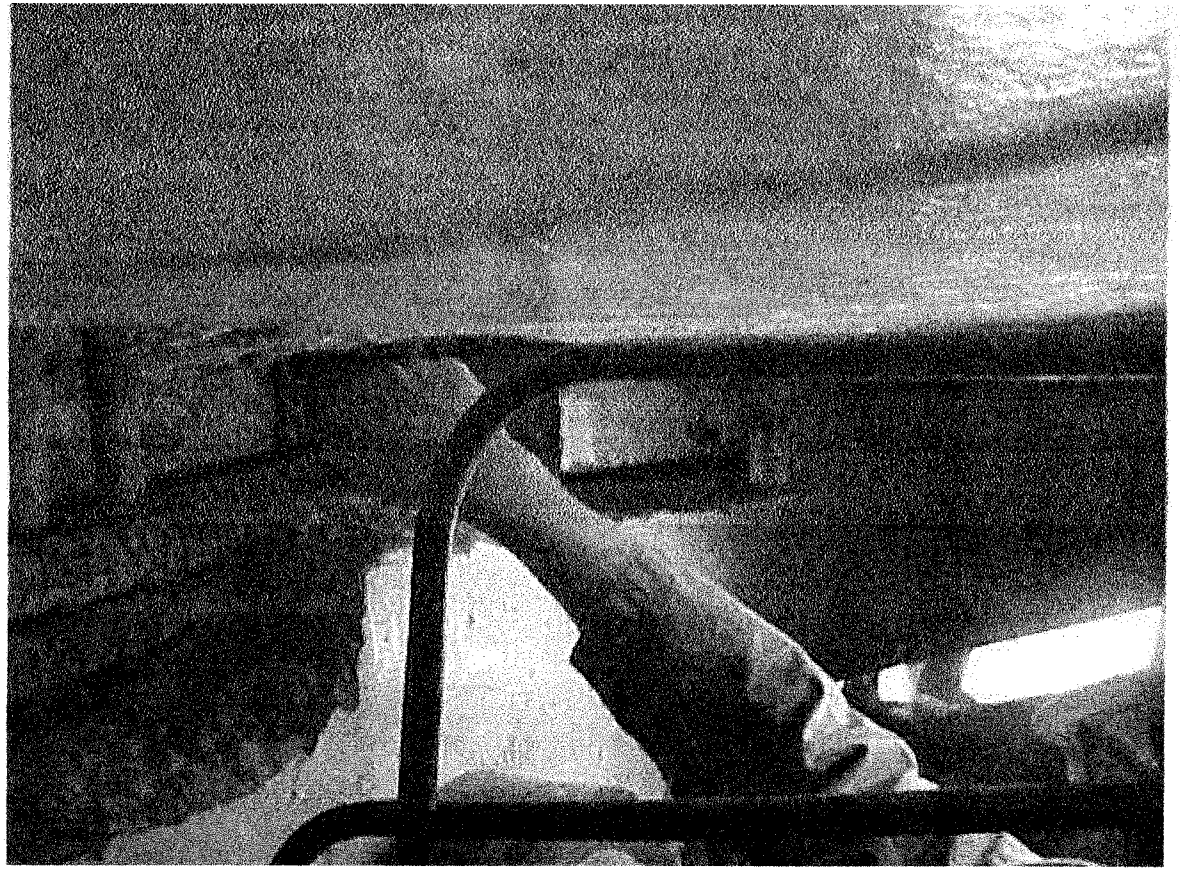
# Fan/Accumulator Wall

- **Detail Showing Shear Lug, Pocket, Through Bolts**



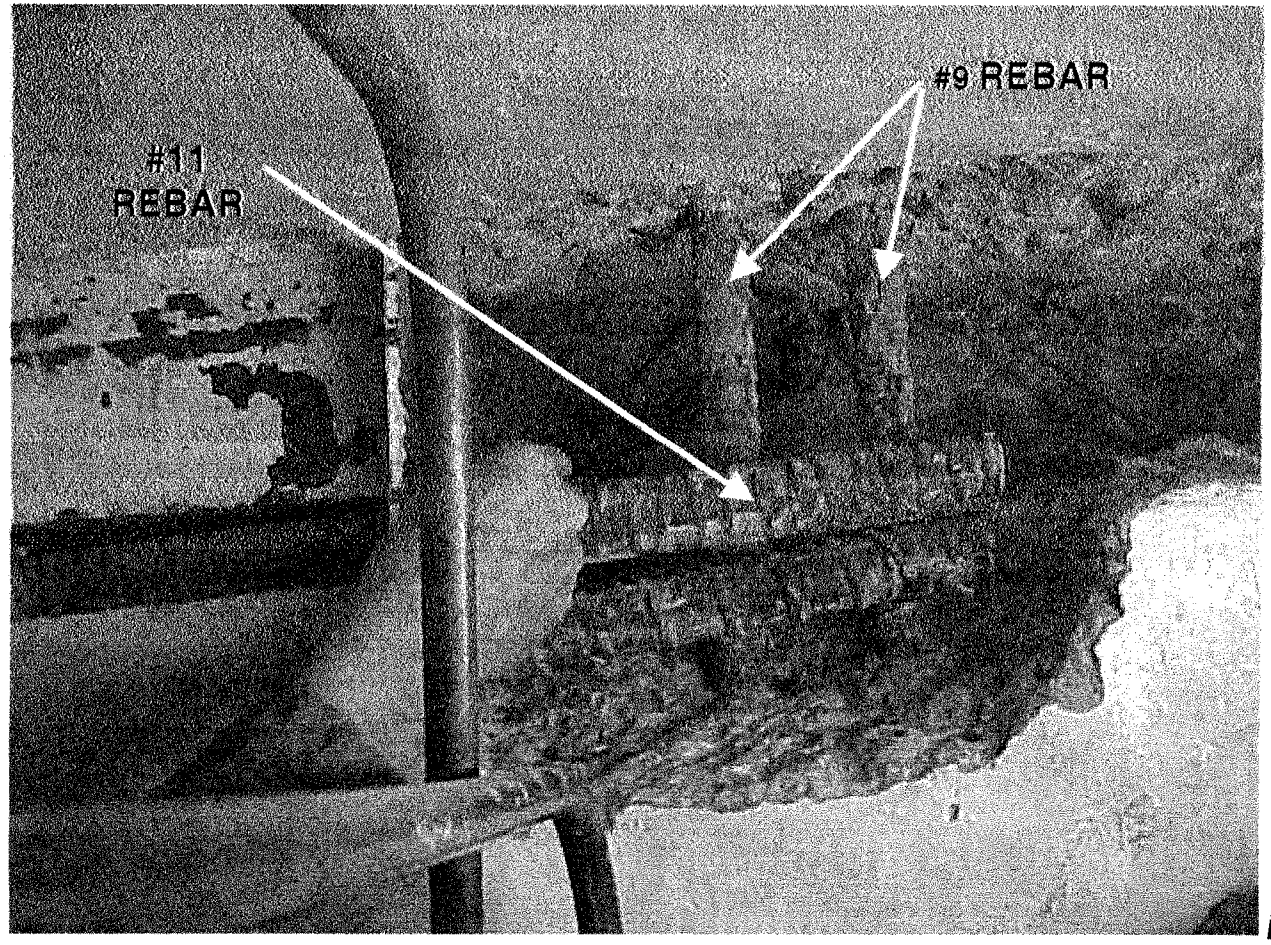
# Fan/Accumulator Wall

- **Detail Showing Excavation**



# Fan/Accumulator Wall

- **Detail Showing Excavation and Rebar**



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# Wall Evaluation

- **Loads**
  - **Pressure load**
    - » **Original design - 16 psig**
    - » **New TMD load - 13 psid**
    - » **Dynamic load factor - 1.22**
    - » **Use 16 psid**
  - **OBE or DBE**
  - **Dead Load (DL) and Thermal Load (Th) not significant**



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# Wall Evaluation

## Load Combinations

- Governing UFSAR combinations
  - » 1.5 P + DL + Th — UFSAR Eq. (i)
  - » 1.25 P + OBE + DL + Th — UFSAR Eq. (b)
  - » 1.0 P + DBE + DL + Th — UFSAR Eq. (d)
- For evaluation use (d) to demonstrate operability for pressure plus DBE
- Load factor approach based on ACI 318-63 ultimate strength design method
  - » ACI does not address specific nuclear plant case (i.e. accident loads, OBE/DBE, etc.)
  - » Factors included to add margin for uncertainty in loads



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# Wall Evaluation

- **Evaluation Methodology (Assumptions)**
  - Simplified elastic analysis assuming a cantilever
  - 5,300 psi concrete (90 day strength)
    - » Compare: 3,500 psi (28 day strength)
  - 1,000 psi grout (reduced area)
  - Top of wall pinned with five #9 rebar



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# Wall Evaluation: Results

- Evaluation Load Combination Acceptable (1.0P + SSE + DL + Th) [UFSAR Eq. (d)]

- 1.5 P + DL + Th Combination Not Acceptable Using Conservative Simplified Analysis [UFSAR Eq. (l)]



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# Wall Evaluation: Conservatism

- Conservatism in Evaluation
  - TMD pressure load assumes initial pressure in CEQ room of -1.5 psig
  - Concrete strength, grout strength, rebar configuration conservative
  - Simplified methodology



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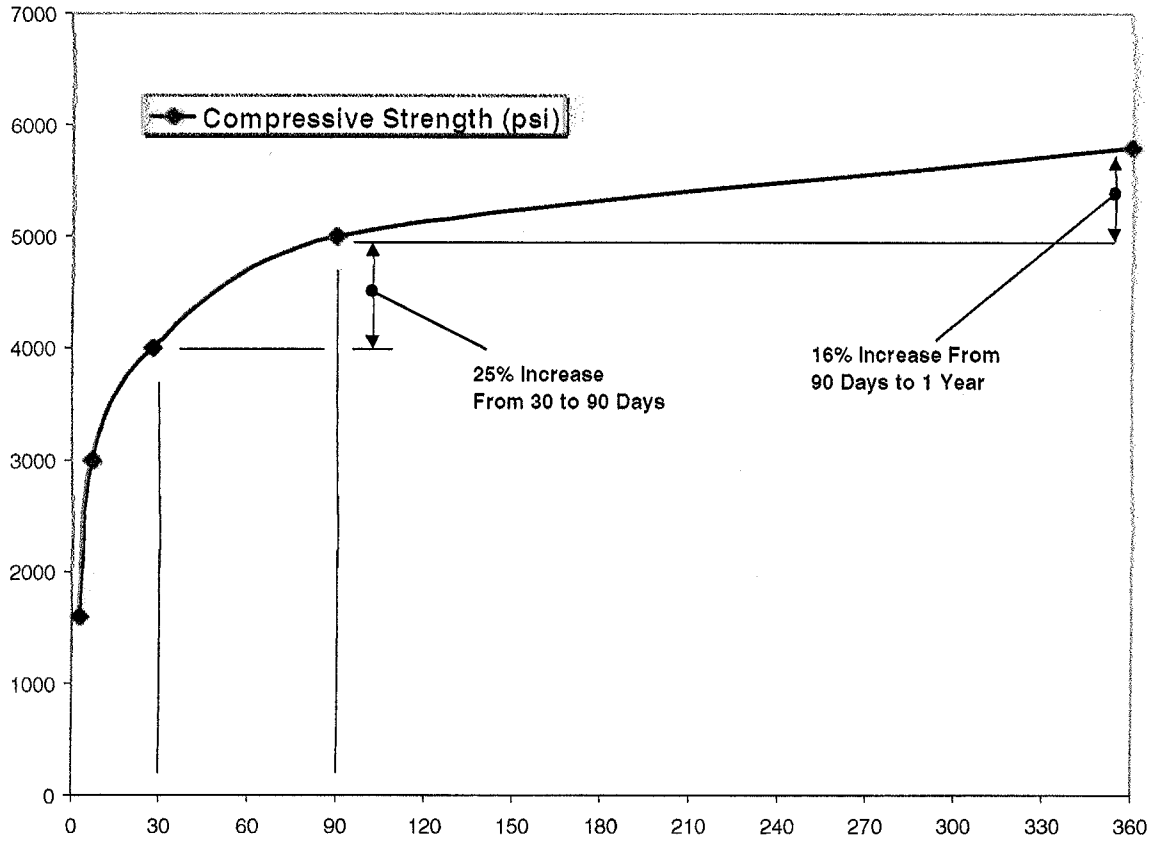
# Wall Evaluation: Typical Concrete Strength Increase with Age



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# Wall Evaluation: Potential Improvements

- **Potential Analytical Improvements**
  - Non-linear analysis
  - Increase in capacity due to impulsive load (ACI 349)
  - Ductility limit of 3.0 for moment and 1.3 for shear (UFSAR Section 5)
  - Use TMD differential pressure (13.0 psid) with DLF = 1.0 (based on ductile analysis)
  - Final as-built configuration
    - » Continuous grout in void pockets (1000 psi)



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# Wall Evaluation: Expected Results of Detailed Analysis

- 7 Intact Walls - Meet All Design Basis Load Combinations
- Repaired Wall - Meets All Design Basis Load Combinations



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# Corrective Actions

- All Walls Shown to Be Functional with Design Basis Load Combination Equation (d)
  - No credit for grout repair
- Replace Excavated/Missing Grout with High Strength Grout (Unit 2 Wall at 126°)
- Finalize Design Basis Calculations to Document Wall Capacity

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# Conclusion

- Containment Walls Safe at Restart
- UFSAR Change Submittal Following Completion of Detailed Analysis



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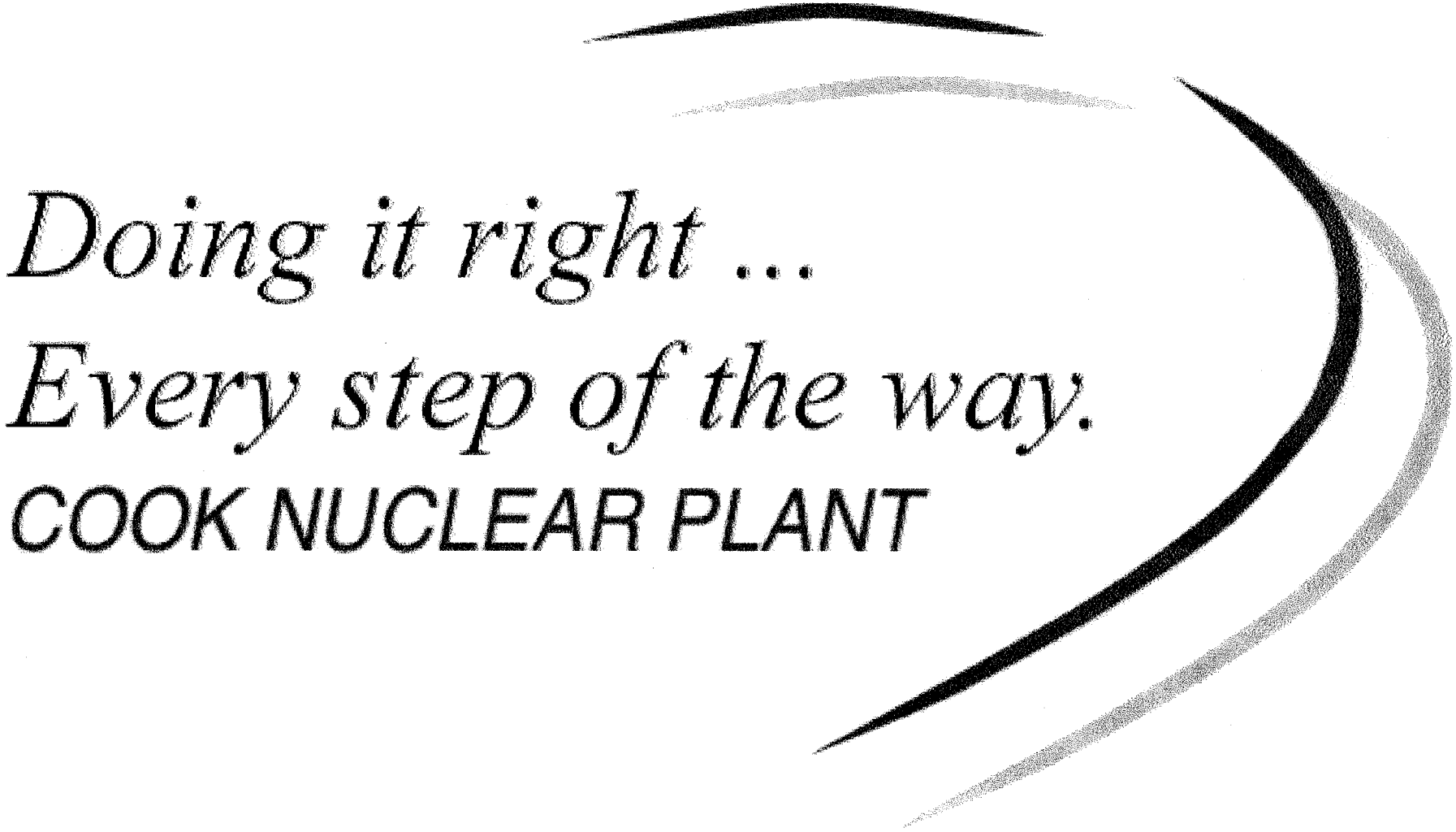
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