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SUBJECT: CONCRETE FAILURE AT CINTICHEM

This is to outline the need for follow-up on the apparent through-wall leakage from the unlined reinforced concrete gamma pit at the Cintichem facility. The occurrence, I believe, presents a unique opportunity for us to gain some knowledge on the performance of concrete in nuclear applications after approximately 30 years of service. This of course is only one point on a curve of performance vs. time, but if we cannot explain this event logically we should not attempt to speak to 300 or 500 years for concrete service. I see this event as an excellent opportunity to obtain some real data.

I have reviewed the information Starmer and Ross obtained while they were on site at Cintichem and have talked to B. Bores in RI. I have summarized the relevant facts below.

1. Drawings were made in summer of 1957 and the facility was built shortly afterwards making it 30 + years old.
2. Design was by The Osborne Company, Architects & Engineers, Cleveland, Ohio for the Union Carbide Company.
3. Four classes of concrete were used and all had a 28-day strength of 3000 psi except for the 2000 psi fill concrete.
 - a. Normal
 - b. High Density
 - c. Hot Lab
 - d. Fill Concrete

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4. All construction joints were specified to have waterstops.
5. The gamma pit is approximately 12' by 27 1/2' with 12" reinforced concrete walls. Pit wall is approximately 12-14' high and was placed in two lifts (there is a horizontal construction joint).

Based on these limited facts and the site layout, I have outlined the possible causes that should be considered when the additional facts become available. These possible causes are listed below:

I. External to facility structure (acids, sulfates, chlorides, other)

- 0 Aggressive groundwater chemistry
- 0 Soil/rock constituents
- 0 Soil contaminants
- 0 Freeze-thaw attack

II. Inherent in the Reinforced Concrete Structure

- 0 Faulty or poor materials
 - cement
 - reactive aggregate
 - additives
 - contaminants (like in mix water)
- 0 Low air content
- 0 Initial void from poor construction 30 years ago
- 0 Poor consolidation/high permeability
- 0 Steel corrosion

III. Internal to the Gamma Pit/Transfer Canal

- 0 Contaminants/Aggressors
- 0 Temperature
- 0 Radiation

I believe, based on my experience, that Cintichem has hired some excellent firms who will be able to address most all the issues if there are no major constraints placed on them. The contractors are as follows.

Repair Contractor - Structural Preservation Systems
NDE (Impact-Echo) - Olson-Wright, Inc.
Destructive Testing/Analysis - Construction Tech. Labs

