

DEFENSE NUCLEAR FACILITIES SAFETY BOARD

April 28, 1994

**MEMORANDUM
FOR:**

G. W. Cunningham, Technical Director

COPIES:

Board Members

FROM:

Dermot M. Winters

SUBJECT:

Review of Idaho Chemical Processing Plant High Level Waste
Tank Farm Activities - March 29, 1994

1. **Purpose:** This report documents a DNFSB staff review conducted on March 29, 1994, of activities being conducted at the Idaho Chemical Processing Plant (ICPP) high level waste tank farm.
2. **Summary:** The high level waste tank farm upgrade project at the ICPP is intended to bring transfer systems, including underground piping and ventilation lines associated with the high level waste tanks, into compliance with standards for high hazard underground storage tanks. During the early March monitoring of corrective actions resulting from a December 1993 radiation exposure incident, the staff became concerned that the upgrade project was being initiated without proper design and readiness reviews of the activities planned for this major radiological work effort. The staff was also concerned about the approach to construction as then formulated by DOE and Westinghouse (WINCO). Subsequently, during a follow-up visit on March 29 the staff reviewed the overall system analyses for the tank farm, the details of the upgrade project including its safety bases, and some of the associated analyses. The staff also toured the tank farms and observed limited work in-progress. Based on this review, the DNFSB staff believes the systems engineering analysis approach taken by DOE and WINCO is reasonable and represents an improvement in the overall methodology towards determining what and when activities need to be undertaken, and what fundamental requirements need to be specified. The balance of the March 29 review focused on the upgrade efforts. As a result of their review efforts conducted during mid to late March, WINCO and DOE made significant changes and improvements in the construction approach and methods.
3. **Background:** At the Idaho Chemical Processing Plant (ICPP), DOE is having Westinghouse Idaho Nuclear Company complete several upgrades to the high level waste tank farms. The main purpose of this work is to bring transfer systems, including underground piping and ventilation lines associated with the high level waste tanks, into compliance with legal (Resource Conservation and Recovery Act) and technical standards for high hazard underground storage tanks.

Field work for the upgrades was scheduled to begin in early March 1994. The work entails excavating several large areas around valve boxes and along buried piping runs to inspect and replace tile-encased lines, installing a new large valve box and associated piping, replacing essentially all transfer valves with an improved ball valve design, replacing the pressure and vacuum relief line interconnected to all waste tanks,

and removing or capping old contaminated lines where encountered.

The DNFSB staff has been following the response of DOE and WINCO to an occurrence last year (ID-WINC-WASTEMNGT-1993-0014/Initial Notification 12/12/93) involving workers who were contaminated during maintenance activities in one of the ICPP tank farm's valve boxes. The staff has been monitoring the corrective actions resulting from this incident as part of an ongoing topical area review on radiation protection. During a review of these issues in early March 1994, the staff also observed a review activity related to the upgrade project work. The staff became concerned that the upgrade project was being undertaken without proper design and readiness reviews of the activities planned for this major radiological work effort. This issue is closely tied to the corrective actions from the occurrence. The lessons learned and corrective actions identified as a result of analysis of the occurrence have been incorporated in conduct of construction requirements for this project.

4. **Discussion/Observations:** The DNFSB staff reviewed the overall system analyses for the tank farm and the details of the upgrade project including its safety bases and some of the associated analyses. Also, the staff toured the tank farms and observed limited work in-progress. Key items are noted as follows:

- a. Tank Farm Systems Analyses: To provide an overall perspective of the tank farm and the relationship of the upgrade work being performed, WINCO presented the results of their ICPP tank farm systems analyses. WINCO used a systems engineering based approach which followed some of the early steps of a typical systems engineering process: problem definition (needs analysis), functional requirements definition, alternatives assessment, system definition, and evaluation and optimization. The latter three steps typically are part of the conceptual design phase of an overall systems engineering life cycle. The analyses have been documented in WINCO-1192, "ICPP Tank Farm Systems Analysis," dated January 1994.

The systems analyses included the effect of regulatory requirements that are associated with the upgrade effort and the consent order milestones to cease use of certain tank types starting in 1999 with capacity only in one to two tanks available for use as of 2013. The analyses assumed that the current consent order upgrade requirements would be met to allow continued use of all of the existing tanks through 1999 according to the current cease use schedule. They also evaluated whether there was a need for new waste tank capacity at ICPP as a result of potential future waste processing activities. This effort resulted in the following major recommendations by the systems engineering team:

1. Install and operate a high level liquid waste evaporator by 1997-1998.
2. Minimize liquid waste generation within operational safety and environmental constraints.
3. By 2008 start operation of a waste immobilization facility (potentially a vitrification plant or other technology for treating wastes for long-term

storage).

4. Operate the new waste calciner as needed to eliminate the need for new tank farm capacity.
5. Maximize the sodium and potassium concentration in the calcine to minimize the amount of waste to be immobilized.
6. Avoid using Bin Set 7 for calcine storage, if possible, to reduce calcine retrieval activities and decommissioning costs.
7. Use waste tank WM-190 for liquid waste storage and one of the pillar and panel vault tanks as a spare.
8. Renegotiate the consent order and amended court orders to revise cease use dates for tanks and specific requirements on certain tanks which would eliminate the need for new tanks or extended calciner operations.

The DNFSB staff believes the systems engineering analysis approach taken by DOE and WINCO to be reasonable and represents an improvement in the overall methodology towards determining what and when activities need to be undertaken, and what fundamental requirements need to be used. Based on staff reviews of the systems approach efforts at other sites, the DNFSB staff believes the WINCO analysis could be used as an initial benchmark by others in conducting similar analyses to determine what the appropriate option(s) might be at their sites. While WINCO's "system" used in this analysis encompassed the ICPP tank farm, some related facilities, and interfaces between the tank farms and these facilities, WINCO senior management noted that further analyses would be pursued that would broaden the system to include the entire ICPP and consider its ultimate end-state.

- b. Tank Farm Upgrade Project: The balance of the staff review focused on the upgrade efforts. WINCO provided a historical review of the project and the detailed scope of the current efforts. Also, the current plan for conducting the excavations was reviewed. It was apparent that WINCO and DOE-ID had taken a second look at the initial approach of drilling large diameter holes for pilings to support bracing beams. WINCO identified several concerns that had been raised by the internal readiness review group including accident conditions that would arise. One such concern noted was that due to the uncertainties in locating buried piping, during drilling one of the large borings, the auger could grab hold of a small piping line that might be attached to a waste tank. This could result in a loss of tank integrity.

As a result of the review efforts conducted during mid to late March by WINCO and DOE, significant changes in the approach were made from the methods that the staff reviewed in early March. The major change will be that instead of the

large borings, the earth fill around the valve boxes and buried lines will be removed in "phases" using an open cut slope approach. Each phase will remove a layer about five feet in depth. After a layer is removed further geotechnical surveys will be performed to provide better subsurface information concerning the location of buried systems. The area to be excavated has been increased to provide for the sloped excavation technique, and to minimize the use of pilings and associated drilling. The excavation by layers will use mechanical equipment and where needed hand excavation. WINCO indicated that during excavation work monitoring for radiation fields and contaminated areas of soil would be nearly continuous.

The layer removal approach would be continued to about 20-25 feet in depth. WINCO indicated that most of critical buried systems would have been located by the time this depth is reached. At this depth, WINCO expects to be able to drill smaller diameter borings, and use pilings and bracing beams for the additional 10- 15 feet of depth required to begin building the new valve box.

- c. Tank Farm Tour: After the WINCO briefings, the DNFSB staff toured the tank farm where work was in progress using the new excavation approach. Radiological containment techniques that were employed appeared to be fairly well engineered. Work activities are being tightly controlled through "plan of the day" meetings held each morning with those specific individuals who will perform the planned work on that day.

Radiation work permits are issued only for one day and are specific to the activities being performed that day. Several of them are issued with only specific individuals allowed to perform the particular work. While the staff toured the farm area not much excavating was occurring. There was some activity in a few radiological containment huts set up over valve boxes. The design of these huts appeared to be well thought out. They included ample windows for observing work, and enclosed "foyers" used as buffer areas for staging tools and equipment, and for removing soil and old equipment.

- 5. **Future Actions:** The staff will continue to observe work practices and planning activities as the project progresses. Specific follow-up reviews related to monitor work activities in the areas of conduct of operations, radiological protection and work control are planned for April, May, and June, 1994. The DNFSB staff anticipates monthly reviews of this effort as a minimum. The staff plans to follow-up on the systems engineering efforts. Based on current DOE-ID plans, it is anticipated that the DNFSB systems engineering follow-up review will occur in September.