

DEFENSE NUCLEAR FACILITIES SAFETY BOARD

July 25, 1995

MEMORANDUM FOR: G. W. Cunningham, Technical Director

COPIES: Board Members

FROM: Daniel G. Ogg

SUBJECT: Tank Farm Radiological Protection, Idaho National Engineering Laboratory, Idaho Chemical Processing Plant, Report of Site Visit, June 27-29, 1995

1. **Purpose:** This memorandum documents the results of the Defense Nuclear Facilities Safety Board's (Board) staff visit to the Idaho National Engineering Laboratory (INEL). The review focused on radiological protection at the Idaho Chemical Processing Plant (ICPP), High Level Waste Tank Farm Replacement (HLWTFR) Upgrades Project. The review team included staff members Daniel Ogg and Lester Clemons, and outside expert Richard Thompson.
2. **Summary:** The radiological protection program at the HLWTFR Upgrades Project has improved noticeably in the last year. Radiation workers, supervisors, and radiological controls technicians displayed improved understanding of the radiological conditions in the work areas and knew their radiation exposures. Some past deficiencies noted by the Board's staff appear to have been corrected--including the procedure for frisking out of the buffer area and the timeliness of frisking subsequent to exiting a contamination or high contamination area.

Although improvements were noted, several deficiencies remain that indicate less than full compliance with the Radiological Controls Manual (Radcon Manual). These deficiencies include improper marking and control of temporary shielding and lack of procedural control of stay times for radiation workers. Stay-time control is of particular concern because many tank farm workers are being exposed to high levels of radiation that could easily result in exceeding administrative exposure levels, and possibly DOE exposure limits if not adequately controlled. Contributing to this problem is the lack of specific stay time control in the Radiation Work Permit (RWP) or in another documented procedure. Additionally, the staff believes more attention to conduct of operations discipline, including the quality of pre-job briefings, is necessary on the part of contractor upper-level management.

3. **Background:** The HLWTFR Upgrades Project was initiated as the result of a Notice of Noncompliance Consent Order signed with the state of Idaho in 1992. The upgrade portion of the project includes the replacement of High Level Radioactive Waste (HLW) transfer piping and associated valves, vent and pressure relief piping for the HLW tanks, and the valve box adjacent to the CPP-604 building. Construction began in 1993 and is approximately 75 percent complete. Due to residual HLW in the valve bodies and piping, and because of

previous spills of HLW in the surrounding soils, exposure levels are very high, with general area radiation levels approaching 1 rem per hour in some valve boxes. The Board's staff and outside experts previously reviewed the HLWTFR Upgrades Project three times in 1994 and in March of 1995.

4. Discussion:

- a. Temporary shielding: Valve and piping replacement work presents the highest radiological threat to the tank farm workers. Prior to the removal of highly contaminated valves and piping, radiation levels in some valve boxes were measured to be several hundred Roentgens per hour. Valves and piping from the most highly contaminated valve boxes were removed remotely and additional decontamination conducted. Nonetheless, some valve boxes still contain very high levels of radiation due to residual HLW in the remaining sections of piping and due to previous spills of HLW into the surrounding soil. Two of these valve boxes, A-5 and A-6, currently contain hot spots of 10 rem per hour or more, and general area radiation levels ranging from a few hundred mrem to a few rem per hour.

In order to allow worker access to the valve boxes and to reduce worker exposure, temporary shielding is used in nearly every valve box. The Board's staff observed a pre-job briefing for a valve box job that called for the removal of some temporary shielding to allow construction measurements to be taken. The temporary shielding sketch provided to the workers was not definitive as to the number and size of the shielding to be moved. The sketch was generated during the pre-job brief from memory. Although the work crew had previously been in the valve box and had a visual memory of what was there, no formal record of the temporary shielding appeared to exist. When the Board's staff inquired about the condition of the temporary lead shielding, workers who had worked in the valve box stated that some shielding was covered with Herculite and some, but not all, was marked with the words "Temporary shielding - do not remove." The Radcon manual requires that the marking, use, and movement of temporary shielding be controlled by procedure or equivalent means (Article 314 and 113).

- b. Stay Times: Tank Farm workers were noted to be familiar with the use of new electronic dosimeters. It was noted that workers paid close attention to the readings on their electronic dosimeters while in the radiation and high radiation areas. During actual stay times of 10 to 20 minutes, workers indicated they had looked at their dosimeters four to five times. The radiological controls supervisor noted that frequently checking the electronic dosimeter is the primary means of stay-time control at the tank farm upgrades project.

The RWP form in use contains a blank for denoting the requirement for stay times (yes/no), but the RWPs reviewed in the field and other RWPs on file did not specify stay time controls as suggested in Article 321 of the Radcon Manual. Although this standard is non-mandatory, equivalent alternate solutions shall be documented as required by

Article 113 of the Radcon Manual. The practice of relying on electronic dosimeters for stay times, while possibly a sufficient means of controlling exposure, is not documented. Without a formal documented program for exposure control, the consistency of the current system's implementation is questioned by the staff, particularly in light of the fact that many new and untrained radiological workers will soon be hired for the tank farm upgrades project.

- c. Work Force Exposure: Based on the radiation exposures being accumulated by the tank farm workers and the remaining work to be done, many workers will reach allowable administrative levels for exposure before the HLWTFR Upgrades Project is complete. Some workers are already at 75% of the authorized administrative limit for the calendar year.

Project management stated that initial efforts to bring in additional skill crafts (welders and pipe fitters) were unsuccessful as the contracted union did not have available resources. It is noted that a delay in getting new workers will obviate the opportunity for the new workers to learn "on the job" skills from the experienced workers who will be removed as they reach their exposure limits. New workers must be given up to 120 hours of core training followed by job specific training and qualification. Then, a largely new work force will be put in place and a new team learning curve will have to be achieved. This scenario presents a probability for higher total worker exposure than a scenario where a gradual infusion of new personnel with experienced personnel is used.

- d. Pre-job Briefings: The Board's staff observed a pre-job briefing held in preparation for taking construction measurements in the B-2 valve box. Dose rates were expected to increase significantly (over 300 percent, by actual measurements) when the temporary shielding was removed to provide access to the pipes. The supervisor conducting the pre-job briefing discussed at length the various measurements required for the construction work, but only briefly mentioned the expected radiation hazard to the workers. It was pointed out that radiological issues would be discussed a second time at the job site inside the radiological buffer area after the radiological control technician completed a survey of the valve box.

The two-phase pre-job briefing process observed by the Board's staff appeared to have been in compliance with the Radcon Manual, Article 324, Pre-job Briefings. However, the as-low-as-reasonably-achievable (ALARA) principle appeared to have been violated by holding the second briefing in the radiological buffer area with workers partially dressed in their anti-contamination clothing. In addition, line management did not participate fully in discussions of the unshielded radiological hazard to the workers at the job site. Although the task was completed successfully, it is not clear how effective the two-phase pre-job briefing process would be with less experienced workers, i.e., workers who are expected to be hired to replace personnel with high radiation exposures.

The Board's staff has monitored other events in which the quality of pre-job briefings was identified as a root cause of the incident. Included are occurrences ID--WINC-WASTEMNGT-1993-0014, of December 11, 1993, in which two workers exceeded the weekly exposure limit of 300 mrem by 150 and 70 percent, respectively, and ID--LITC-WASTEMNGT-1995-0012, which is discussed below. Based on these events and other observations, the Board's staff believes that radiological work planning and work practices at the HLWTFR project could be significantly improved by conducting more formal pre-job briefings.

- e. Occurrence ID--LITCO-WASTEMNGT-1995-0012: On April 13, 1995, Lockheed Martin Idaho Technologies Company (LMIT) reported an unusual occurrence in which the New Waste Calcining Facility (NWCF) Make-up Room Decontamination Manifold was inadvertently contaminated with HLW. During the performance of a special procedure to flush HLW transfer lines between the NWCF and the tank farm, the supervisor in charge deviated from the procedure when the initial flush was unsuccessful. When further efforts to establish a clear flow path were also unsuccessful, the lines were vented back to the NWCF decontamination manifold and HLW was forced into a previously uncontaminated portion of the header.

The Board's staff received a briefing on the identified causes of the occurrence and the corrective action taken. LMIT identified the direct cause as personnel error--inattention to detail, and the root cause as personnel error--violation of a requirement or procedure. Specifically identified was the lack of a pre-job briefing for the second flush procedure. These causes reflect the inappropriate behavior of the shift supervisor. However, the Board's staff observed other factors that may indicate a broader management contribution to the root cause. During the course of the evolution, it was observed that no one in the operations crew questioned the supervisor's deviation from the written procedure. Additionally, in post-event corrective action, LMIT management assigned the shift supervisor at fault to conduct the investigation.

These observations lead the Board's staff to believe that the root cause lies beyond the "personnel error" of one shift supervisor. Based on discussions with LMIT management and with DOE facility management, it is apparent to the Board's staff that more attention to conduct of operations discipline is necessary by contractor upper-level management. DOE-ID management can also affect the necessary change by taking a more active role in bringing identified conduct of operations weaknesses to the attention of senior M&O management.