DEFENSE NUCLEAR FACILITIES SAFETY BOARD

August 22, 1994

MEMORANDUM FOR: G. W. Cunningham, Technical Director

COPIES: Board Members

FROM: C. H. Keilers

SUBJECT: Idaho National Engineering Laboratory - Structural and Seismic Review of CPP-603 Spent Fuel Storage Basins

1. **Purpose:** This report documents the status of on-going reviews by the Defense Nuclear Facilities Safety Board (DNFSB) staff and outside experts of a structural scoping study for the Chemical Processing Plant (CPP)-603 spent fuel storage basins at Idaho National Engineering Laboratory (INEL). The DNFSB staff will separately report the status of a concurrent series of structural reviews of the CPP-666 basins.

2. **Summary:** The DNFSB staff and outside experts have reviewed a scoping study on the structural adequacy of the CPP-603 spent fuel storage basins and have several observations discussed below. The study identifies a large number of structural deficiencies and, furthermore, provides little justification for accepting them. The Department of Energy (DOE) contractor, Westinghouse Idaho Nuclear Co. (WINCO), is preparing a recommendation to DOE on the disposition of these deficiencies. WINCO has done a value engineering study on possible resolution options, but more effort may be warranted that considers quick, low-cost structural upgrades that improve safety without impacting the fuel removal schedule. The DNFSB staff will review the recommendation when it becomes available.

3. **Background:** CPP-603 is a 1950's era facility consisting primarily of three unlined concrete basins, all covered by a steel frame superstructure with asbestos shingle siding. By court order, all spent fuel must be removed from two of the basins by the end of 1996 and from the third basin by the end of 2000. As of June 6, 1994, about one-fifth of the fuel had been removed, meeting the schedule.

   In 1991, WINCO contracted Advanced Engineering Consultants (AEC) to perform a scoping study on the basin structural adequacy for use beyond the year 2000. Since then, the DNFSB staff and outside experts have been reviewing progress on this study. The most recent review was performed on June 6-7, 1994, by DNFSB staff members A. Hadjian and C. Keilers, and by outside experts J. Haltiwanger and J. Stevenson.

4. **Discussion:** DOE, WINCO, and AEC briefed the DNFSB staff and outside experts on the purpose of AEC's analyses for the CPP-603 basins, as well as on the models, load combinations, geotechnical evaluations, and final analysis and results[1] [2] [3]. WINCO stated that the primary purpose of the scoping study was to identify major structural deficiencies that could affect continued use of these basins beyond the year 2000. However, such use is no longer an option, and fuel is being removed expeditiously.

   AEC identified several areas that are inadequate for seismic or high wind loads such as: the South Truck Bay crane, the North and Middle Basin walkway support frames, some South Basin superstructure truss webs, and the asbestos shingle siding. AEC, through a subcontractor (R. Cloud and Associates), also evaluated mechanical and electrical distribution systems and components and determined that they would require significant upgrades to be seismically qualified. AEC is separately evaluating a newer dry storage vault that is also part of this facility, contains irradiated graphite-based fuel, and will be used beyond the year 2000.

   WINCO is preparing a recommendation to DOE on the disposition of these deficiencies. WINCO indicated that it intends to administratively control the crane to park it in a position that avoids a seismic hazard. WINCO may propose no action be taken for the other deficiencies since installing structural upgrades could slow down fuel removal. Furthermore, WINCO expects that effective upgrades may be difficult to design and install in the remaining service life of the basins (three to six years).

   Observations: The DNFSB staff and its outside experts have the following observations:

   a. The scoping study identified a large number of structural deficiencies. It did not prioritize the deficiencies. It also did not provide justification for accepting the deficiencies, other than stating that many of these are expected to show ductile, non-catastrophic behavior.

   b. The DNFSB staff believes that, given the large number of deficiencies, a more detailed structural evaluation may ensure that all major weaknesses have really been identified that could warrant near-term resolution, such as quick, low-cost structural upgrades discussed below.

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[1] Advanced Engineering Consultants, "Structural Appraisal of Underwater Fuel Receiving and Storage Facility, CPP-603, Idaho Chemical Processing Plant, Phase I," December 1992.

[2] Advanced Engineering Consultants, "Structural Appraisal of Underwater Fuel Receiving and Storage Facility, CPP-603, Idaho Chemical Processing Plant, Phase II," December 1993.

[3] Advanced Engineering Consultants, "Structural Appraisal of Underwater Fuel Receiving and Storage Facility, CPP-603, Idaho Chemical Processing Plant, Phase III," March 1994.

c. The assumed seismic and high wind loads in the CPP-603 scoping study are lower than those assumed in recent CPP-666 basin evaluations. The DNFSB staff believes that an adequate review of safety of the CPP-603 basin would require that these discrepancies be explicitly recognized and resolved.

d. The AEC documentation does not specify how the demand and capacity values cited were determined. Several other documentation deficiencies that are discussed in the DNFSB staff report on CPP-666 are also applicable to the CPP-603 reports.

e. WINCO has done a value engineering study on possible resolution options. However, the DNFSB staff believes that more effort may be warranted that considers quick, low-cost structural upgrades that enhance safety without impacting the fuel removal schedule. To be worthwhile, the DNFSB staff also believes that such an investigation would need to be conducted expeditiously by highly experienced personnel applying sound technical judgement and would need to include the following:

   1. Identifying effective structural upgrades or other measures that would remediate each identified weakness.

   2. Estimating the level of effort, the time required, and the cost to implement each remedial measure and to design and install each potential modification.

   3. Determining for each measure if it would delay fuel removal, and if so, by how much.

   4. Estimating for each deficiency or group of possibly interacting deficiencies what the consequences of an extreme loading event would be if no action is taken and whether recovery actions would be feasible.

   5. Weighing the advantages and disadvantages of each remedial measure using a systems engineering approach and implementing those actions needed to enhance safety, considering the remaining service life of the facility.

   6. Prioritize possible mechanical and electrical system and component upgrades to assure necessary safety-related function during or following an evaluation basis seismic event.

5. **Future Planned Activities:** The DNFSB staff intends to review the WINCO recommendation for the CPP-603 wet basins when it becomes available. The DNFSB staff will also evaluate the trade-offs that are being made between structural upgrades in the CPP-603 basins and the remaining service life of the facility.