

**[DNFSB LETTERHEAD]**

March 4, 1993

The Honorable Paul D. Grimm  
Acting Assistant Secretary Environmental  
Restoration and Waste Management  
Department of Energy  
1000 Independence Avenue, S.W.  
Washington, DC 20585

Dear Mr. Grimm:

A group comprised of four DNFSB staff and four outside experts recently reviewed various safety issues at the Idaho Chemical Processing Plant (ICPP). Areas covered included Criticality Safety and Structural and Seismic capability at the ICPP's fuel storage basins and Conduct of Operations for restart of the ICPP's New Waste Calcining Facility. A copy of their report is enclosed.

This report is being provided to you for whatever actions you may deem necessary.

Sincerely,

***John T. Conway***  
***Chairman***

Enclosure

c:  
Mark Whitaker, Acting DOE/DR-1  
Dr. S. Acharya, Acting DOE/NS-1

## DEFENSE NUCLEAR FACILITIES SAFETY BOARD

February 26, 1993

**MEMORANDUM FOR:** G. W. Cunningham, Technical Director

**COPIES:** Board Members

**FROM:** D. M. Winters, Program Manager, INEL/WIPP Programs

**THROUGH:** A. G. Stadnik, Assistant Director, Materials Processing and Environmental Restoration

**SUBJECT:** Idaho Chemical Processing Plant - DNFSB Staff and Outside Experts Review of Issues at the Fuel Storage Basins and the New Waste Calcining Facility

1. Purpose: This report documents DNFSB staff and outside expert efforts in reviewing several areas at the Idaho National Engineering Laboratory's (INEL's) Idaho Chemical Processing Plant (ICPP) during the week of January 11-15, 1993.
2. Summary: On January 12-14, 1993, the DNFSB staff (Dermot Winters, Joe Roarty, and Andy De La Paz) and outside experts (John Haltiwanger, Paul Rizzo, and John Stevenson) reviewed several safety issues related to the ICPP CPP 603 and CPP-666 fuel storage basins. The issues included criticality safety, safety envelope, and the seismic and structural capabilities of the basins. In addition, on January 13-14 outside expert David Boyd, assisted by Andrew Stadnik of the DNFSB staff, conducted a review of New Waste Calcining Facility (NWCF) restart issues, particularly in the area of Conduct of Operations. This report highlights DNFSB staff and outside expert observations and concerns in these areas.
3. Background: DNFSB staff and outside experts had previously conducted a general review of the ICPP in May, 1992, followed by a series of NWCF restart readiness oversight reviews in October, November, and December, 1992.

During the time of the May review, one area of focus was the fuel storage basins. Of particular interest was the proposed CPP-666 re-racking project and fuel movements which were planned to take place in view of the curtailment of highly-enriched uranium recovery operations. In addition, several unusual occurrence reports applicable to the older CPP-603 fuel storage basins were issued in 1992. These occurrences were related to technical specification/standard violations involving improper fuel configurations and the degradation of a criticality safety barrier used in the criticality safety analyses.

The October, November, and December reviews of NWCF restart activities were initiated by concern over the adequacy of planned restart readiness reviews. This initial concern

subsequently evolved into a further, and continuing, concern over the quality of Conduct of Operations at the NWCF.

4. Discussion/Comments: The following discussion reflects the results of the January 1993 reviews:
  - a. Fuel Storage Basins:
    1. Safety Envelope: In certain areas there is less apparent conservatism than is customary in commercial practice.
      - (a) The CPP-666 and CPP-603 basins have been classified as moderate rather than high hazard facilities. This is inconsistent with commercial practice.
      - (b) The original fuel basin design basis evaluation for extreme wind hazards (175 mph wind and associated differential pressure and tornado borne missile) has been replaced by a 95 mph wind (without differential pressure and tornado missile considerations) as the design basis extreme wind event.
      - (c) The relevant design basis earthquake motion is defined on the rock outcrop as a time history whose response spectrum would envelope the seven percent damped Nuclear Regulatory Commission Regulatory Guide 1.60 (R.G. 1.60) Spectrum. This is a departure from the common practice of using the five percent damped R.G. 1.60 spectrum for this purpose.
    2. Criticality Safety:
      - (a) There are 31 monorail positions in CPP-603 containing deteriorating fuel and/or fuel containers.
      - (b) Seventeen of the 31 deteriorated monorail positions in CPP-603 contain stored fuel for which adequate inspection and characterization of the container contents does not exist to demonstrate that the local effective multiplication factor is less than 0.95 (1.0 being a critical configuration).
      - (c) Because both the CPP-603 and CPP-666 fuel storage basins are well shielded facilities without detection instrumentation at the bottom of the pools, it is unlikely existing detection instrumentation would recognize a criticality event if one did occur.
      - (d) EG&G's "independent" validations of Westinghouse Idaho Nuclear

Company (WINCO) nuclear Criticality Safety Evaluations (CSEs) are not fully independent because EG&G uses the same computer code and methodology as WINCO.

- (e) The CSE practice used by WINCO criticality analysts does not include a fully traceable record of all input assumptions and data.
- (f) The Fuel Receipt Criteria required to be completed by each shipper of nuclear fuel for each component sent for storage have not been reviewed in response to the changed storage mission.
- (g) Considering the reduced criticality safety margins inherent in the reracking project, CSE confidence levels are not as high as they would be if additional data on the fuel were provided to WINCO by Naval Reactors.

3. Seismic and Structural Capabilities:

- (a) Information provided to the DNFSB staff and outside experts to date on the seismic and structural analyses performed by Advanced Engineering Consultants, Inc. (AEC) on the CPP 666 basins has proven inadequate for formulation of an informed opinion on those analyses. A report by EQE Engineering Consultants (EQE), when available, may provide the information needed to formulate an informed opinion of the AEC analyses.
- (b) EQE is now reviewing the AEC analyses for WINCO. The scope and detail of the EQE review as described to the DNFSB staff and outside experts is encouraging. EQE reports their independent analyses using a simplified model gave results in good agreement with and somewhat less conservative than the comparable results produced by the AEC analyses.
- (c) Although the DNFSB staff and outside experts have had insufficient information to formulate an informed opinion on the CPP-666 Building analyses performed by AEC, there is enough information available to identify the following concerns.
  - (1) AEC has not confirmed by simpler, more approximate, calculations the general validity of results produced by analyses employing a structural model of great complexity (644,000 finite element nodes).
  - (2) The analyses do not include an evaluation of the effect of the reracking process on the ultimate bearing capacity and

settlement evaluation of the CPP-666 structure.

- (3) The structural analysis has assumed full joint fixity in some cases; but moment capacity of joint reinforcement details has not been checked to determine that capacity can be developed without yield or slippage of the reinforcement.
- (4) In computing rotational capacity in the base slab of CPP-666 Pool No. 2, a steel strain of 0.06 was assumed. This assumption is not consistent with standard engineering practice. A strain of 0.06 is well into the strain hardening range, approaching fracture and, thus, appears excessive and not sufficiently conservative as a basis for computing the rotational capacity of a major structural element in so vital a structure.
- (5) The structural analysis did not consider cracked section properties even though computed moments and axial forces can cause cracking in the members and changes in the concrete member stiffness which can cause redistribution of resultant moments and forces, hence change computed demand/capacity ratios.
- (6) Re-racking plans for the CPP-666 facility propose that the new racks be free-standing on the base of the pool, with a six-inch clearance between the outside racks and the wall of the pool. To date there has been no analysis to confirm whether or not the rack-wall clearance is adequate.

(d) CPP-603 Fuel Basins concerns.

- (1) Because the CPP-603 Building is expected to fail under the design tornado loading, concerns exist in regard to the possible vulnerability of the pools and the fuel stored in them due to missile damage.
- (2) An inspection by Wiss-Janney-Elstner (WJE) did not detect any indication of deterioration of the reinforcing steel as a result of historically high basin Chloride concentrations. WJE plans to perform corings at selected locations to provide the evidence required for a final determination.

b. New Waste Calcining Facility Restart:

1. ORR Process:

- (a) The DOE process used at the NWCF for approving close out of the readiness review findings and granting startup approval is not consistent with DOE practices at other sites such as Savannah River and Rocky Flats.
- (b) WINCO does not have a readiness review standard for the process or a disciplined process established to close out readiness review findings for restart.

2. Calciner Fire Investigation:

- (a) The conclusion of the investigation cites a design problem as the root cause. The DNFSB technical staff and outside expert do not agree with the conclusion because it fails to recognize fully that had specifications, procedures, training, and Conduct of Operations practices which adequately support the design been in place they probably could have prevented the occurrence.
- (b) An extensive list of similar events in Waste Processing areas (i.e., whenever an action is taken and something unexpected occurs) was produced as part of the post-fire recovery plan. The length of the list produced strongly suggests existing routine deficiency reporting and correcting systems are not functioning effectively.

3. Management Overview of Restart:

- (a) The restart Management Overview function is not given appropriate recognition of its importance. Individuals performing these duties were not selected based on their qualifications to effectively carry out their responsibilities and did not receive an indoctrination. Most important, they have not been reassigned on a recurring basis to line management positions where they can apply lessons learned from their overview role.
- (b) Guidance for Management Overview provided by Manager NWCF memos reflects a lack of ownership for the need to conduct Management Overview. A policy or other directive reflective of management "ownership" which defines the role, responsibilities and authority of the Management Overview function was not found.
- (c) Management Overview logbooks kept by overview participants are not being utilized to full potential. No formal system is in place to evaluate comments and questions, provide responses, assign responsibility for actions, track results, and close out those

significant comments and questions which cannot be acted on and resolved at the time of entry.

4. Operator Interviews: Operators were interviewed individually and asked about processes, procedures, administrative requirements, organizational relationships, and theory fundamentals. Knowledge deficiencies were noted (and observed by DOE and NWCF management) in the following areas:
  - (a) Operations chain of command above shift supervisor;
  - (b) NWCF Manager interactions with operations organization;
  - (c) Conduct of Operations lessons learned from fire;
  - (d) KVAR meter reading when picking up load;
  - (e) Specific training and operations activities which prepared operators to startup the calciner;
  - (f) Conversion to relate degrees F to degrees C (both are used at the NWCF); and
  - (g) Imposition, administration and release of Distributive Control System "locks."
5. The organization of the WINCO ICPP Operations Department relative to the NWCF does not provide clear cut control of NWCF by the Manager NWCF. There appeared not to be a clear delineation, or understanding, of functions and responsibilities of the facility manager for NWCF versus the ICPP operations manager.
6. Concerns remain that changes resulting from readiness review findings, DNFSB Staff observations and the NWCF fire investigation and recovery plan may not become institutionalized and imbedded in the culture of the WINCO organization or the site.