Department of Energy
National Nuclear Security Administration
Washington, DC 20585

JUN 2 8 2011

The Honorable Peter S. Winokur
Chairman
Defense Nuclear Facilities Safety Board
625 Indiana Avenue, NW, Suite 700
Washington, DC 20004

Dear Mr. Chairman:

The Department of Energy has completed Deliverables 5.2.2 and 5.3.2 of the Department's Implementation Plan (IP) for Recommendation 2009-2, *Los Alamos National Laboratory [LANL] Plutonium Facility Seismic Safety*. On June 8, 2011, NNSA requested a thirty day extension to complete these two deliverables by June 30, 2011. The enclosure references LANL documentation of a refined accident analysis and control selection for seismically-induced events (Deliverable 5.2.2). This safety basis update is currently being reviewed by the National Nuclear Security Administration's (NNSA) Los Alamos Site Office (LASO). The enclosure also addresses the final LANL reports documenting the seismic performance level and whether Plutonium Facility safety-class structures, systems, and components meet the target performance goals from DOE-STD-1020, *Natural Phenomena Hazards Design and Evaluation Criteria for Department of Energy Facilities* (Deliverable 5.3.2). LASO is currently reviewing these reports.

If you have any questions, please contact me at [redacted].

Sincerely,

James J. McConnell
Assistant Deputy Administrator
for Nuclear Safety, Nuclear Operations,
and Governance Reform
Office of Defense Programs

Enclosure

cc: M. Campagnone, HS-1.1
K. Smith, LASO

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UNITED STATES GOVERNMENT DEPARTMENT OF ENERGY

memorandum

National Nuclear Security Administration
Los Alamos Site Office
Los Alamos, New Mexico 87544

DATE: JUN 24 2011
REPLY TO
ATTN OF: Kevin W. Smith
SUBJECT: Plutonium Facility Seismic Safety – Recommendation 2009-2, Deliverables 5.2.2 and 5.3.2

TO: James J. McConnell, Assistant Deputy Administrator for Nuclear Safety, Nuclear Operations and Governance Reform, National Nuclear Security Administration, NA-17, HQ/FORS

References:

1. U.S. Department of Energy, "*Implementation Plan for Defense Nuclear Facilities Safety Board Recommendation 2009-2, Los Alamos National Laboratory Plutonium Facility Seismic Safety*", dated July 2010 (LASO COR-SO-3.9.2011-328833)
2. LANS letter AD-NHHO:11-141, from R. McQuinn, AD-NHHO, LANS, to C. Keilers, AMSO, LASO, *"Transmittal of TA-55 2011 Documented Safety Analysis and Technical Safety Requirements Annual Update for Approval"*, dated May 31, 2011 (LASO COR-SO-5.31.2011-351904)
3. LANS letter AD-NHHO:11-143, from R. McQuinn, AD-NHHO, LANS, to C. Keilers, AMSO, LASO, Subject: *"Submittal of Evidence for Completion of Milestone 5.2.2 and 5.3.2 of DOE Implementation Plan for DNFSB 2009-02, FY11 PBI 7.4.2, 7.4.3, and 18.4A"*, dated May 31, 2011 (LASO COR-SO-6.2.2011-352892)
4. LASO memorandum SO:21CK-351448 from K. Smith, OOM, LASO, to J. McConnell, NA-17, *"Plutonium Facility Seismic Safety – Recommendation 2009-2, Deliverables 5.2.2 and 5.3.2"*, June 7, 2011

Deliverables 5.2.2 and 5.3.2 of Reference (1) are completed. Reference (2) submitted an updated safety basis, including refined seismic accident analysis and control selection for the Plutonium Facility. Reference (3) submitted final reports documenting this facility's seismic performance and whether safety-class structures and systems meet the Department of Energy seismic performance goals. A summary is attached. This letter supersedes Reference (4).

Contact C. H. Keilers at [redacted] if you have any questions regarding this matter.

Kevin W. Smith
Manager

Attachment

cc:
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Records Center, LASO
Official Contract File, LASO

SO:32CK-357285

Attachment: Status of Plutonium Facility Seismic and Safety Basis Analyses

Background: The Los Alamos National Laboratory (LANL) Plutonium Facility (PF-4) was designed in the 1970's to the requirements of that time and began operations in 1978. PF-4 consists of a basement with utilities and a main-floor with laboratory rooms. It has a square layout, divided into quarters by shear walls. One main-floor shear wall extends partially through the building, with a major roof support member – the roof drag strut – extending the remaining distance. The main-floor and roof are supported by columns, the shear walls, and (for the roof only) the drag strut.

Updated analyses indicate an increased seismic hazard across the site. Since 2007, the Seismic Analysis of Facilities and Evaluation of Risk (SAFER) Project has been evaluating acceptability of continued operations for all LANL nuclear facilities. PF-4 is the last facility to be evaluated.

In April 2011, Los Alamos National Security, LLC, (LANS) reported a potential inadequacy in safety analysis (PISA) based on higher predicted probability of PF-4 structural damage. The primary concern was potential failure of the glove-box exhaust (Zone 1) filter plenum rooms in the basement. The immediate action was to prepare a seismic emergency procedure that would isolate potential unfiltered releases if exhaust pathways were damaged. The National Nuclear Security Administration (NNSA) reviewed and approved the LANS evaluation of the safety of the situation and is currently reviewing a LANS proposed justification for continued operation (JCO), effective through December 9, 2011.

Status: On May 31, 2011, LANS submitted PF-4 seismic analyses and an updated safety basis, including refined seismic accident analyses and proposed new controls. NNSA is reviewing these and will take action in accordance with commitments made to the Defense Nuclear Facilities Safety Board (DNFSB) in response to Recommendation 2009-2. NNSA and LANS also conducted an Integrated Nuclear Planning workshop on June 9, 2011 to refine the path-forward.

Safety Basis: The proposed updated safety basis calculates mitigated consequences less than the 25 rem Evaluation Guideline for the post-seismic fire, assuming no major building collapse; restrictive material-at-risk controls; and limitations on the assumed progression and size of a main-floor fire. These results are more than two orders of magnitude lower than the 2008 safety basis, which formed the basis for Recommendation 2009-2. Proposed future improvements include fire-rated containers, seismically qualified fire suppression, and seismically qualified portions of the confinement ventilation system. Seismically upgrading fire suppression would reduce calculated off-site consequences to that for the seismically induced spill without fire, which is 9 rem.

The building structural analysis indicates a low-probability building collapse mode associated with the roof drag strut, discussed below. LANS has proposed compensatory measures and a JCO that should eliminate the building collapse mode by December 2011; NNSA action is imminent. The JCO addresses the safety of continued operations during the period prior to completion of structural upgrades that would protect the assumptions in the proposed safety basis.

Structural Analysis: Key points from the structural analysis are as follows:

- The roof drag strut needs to be expeditiously upgraded to sustain seismic loads. Drag strut failure could initiate a collapse with potential to affect both the main-floor and the basement; the estimated annual probability of seismic induced failure of the drag strut is $3x10^{-4}$, which is three times larger than the Performance Category 3 (PC-3) goal. Under the JCO, the site will address this issue by December by installing a reinforced concrete plate integrally connected to the roof.

- LANS is currently installing steel supports that will address the issue with the Zone 1 filter plenum rooms and the potential for their failure to cause an unfiltered release pathway.
- Five main-floor mezzanines need lateral strengthening. LANS has removed material-at-risk that could be affected by mezzanine failure and restricted personnel access to the most seismically vulnerable mezzanine until a modification can be designed and installed.
- Top connections for four main-floor shield walls need strengthening; Modification is in progress.
- Main-floor corridor columns and some basement columns are susceptible to localized shear failure. All the columns should retain vertical load carrying capacity after the roof drag strut upgrade is implemented, based on the small predicted lateral displacements (i.e., 3/8 inch or less single-story drifts, less than half the code specified drift limits). This will be further evaluated after the drag strut modification is better defined. Basement column modifications are in design.
- The steel beam framework that supports the lab-room ceilings is susceptible to torsional buckling and needs to be braced. Also, the ceiling is suspended by wires that may be vulnerable. Ceiling failure would impact glove-boxes and the safety-class fire suppression.
- The exterior cement silo needs to be operationally restricted until additional bracing is installed.

System and Component Analysis: LANS is evaluating seismic issues identified with key systems and components. Key points are as follows:

- About one-quarter of the seismically credited glove-box support stands need larger anchorage to the floor; another one-tenth of the support stands have marginal anchorage. Glove-box stand upgrades are under evaluation via on-going programmatic operations and activities.
- Acceptable seismic performance of the active confinement ventilation system requires many electrical distribution and control system upgrades, primarily to anchorage. The glove-box exhaust and the recirculation systems are inadequate, and the basement exhaust is marginal.
- The fire suppression system requires addressing the lab-room ceiling issue and requires additional lateral supports for piping. LANS is pursuing design of lateral support upgrades. Fire pump control panels require additional top-bracing.
- Glove-box exhaust ventilation fans and plenums are anchored to concrete pads, but the pads are not anchored to the basement floor; this can be addressed by doweling the pads to the floor.
- One basement material shelving system has marginal connection to the ceiling.

Other Issues: NNSA is aware that the DNFSB staff has taken issue with the LANS soil structure interaction (SSI) analysis used to develop the seismic loads. LANS performed both deterministic and probabilistic SSI analyses. The 80% nonexceedance response from the probabilistic analysis, supplemented by other analyses, was used to develop the final loads. The deterministic analysis provided an order-of-magnitude check on the probabilistic results.

In general, accelerations from the probabilistic analysis are larger than those from the deterministic analysis, and they range from 10 % less to 20 % larger than for the deterministic. Using the deterministic analysis to generate loads appears unlikely to affect any conclusions. NNSA will continue to constructively engage the DNFSB staff on resolution of their concerns.

Conclusions: LANS has submitted the PF-4 seismic performance analyses and an updated safety basis, including refined accident analysis and controls. NNSA will evaluate these and take action on the safety basis in the coming weeks. In September 2011, NNSA and LANS will issue a project execution plan that includes strategy, cost, scope, schedule, and identified funding sources to complete PF-4 upgrades that ensure mitigated consequences no longer challenge the 25 rem Evaluation Guideline for seismically induced events.