National Nuclear Security Administration

Department of Energy
National Nuclear Security Administration
Washington, DC 20585

September 29, 2011

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

Dear Mr. Chairman:

This letter is to inform you that the Department of Energy (DOE) needs until November 15, 2011, to complete Deliverable 5.2.3 of the Department's Implementation Plan (IP) for Recommendation 2009-2, *Los Alamos National Laboratory [LANL] Plutonium Facility [PF-4] Seismic Safety*. Deliverable 5.2.3 is approval by the National Nuclear Security Administration (NNSA) of the refined accident analysis and control selection submitted by LANL on May 31, 2011. This additional time is needed by LANL to revise the accident analysis and control selection to address NNSA comments, and for NNSA to complete its review of the revised LANL submittal and issue a safety evaluation report.

Deliverable 5.4.5, *Project execution plan [PEP] for SSC upgrades,* has been completed and is enclosed. The enclosed PEP includes an initial strategy, cost, scope, schedule, and identified funding sources to complete a set of upgrades that ensure mitigated consequences no longer challenge the DOE 25 rem Evaluation Guideline for seismically-induced events. Please note that the Fiscal Year 2020 timeframe to complete the Active Confinement Ventilation (ACV) Upgrade Project is conservative. NNSA and LANL are reviewing this project to determine if the completion date can be accelerated. By January 31, 2012, NNSA will transmit a revised PEP to the Defense Nuclear Facilities Safety Board that addresses any needed input from the ongoing PF-4 Seismic Analysis of Facilities and Evaluation of Risk Project work. This revised PEP will also include an updated scope, cost, schedule and prioritization of the subprojects for Phase III of the TA-55 Reinvestment Project, including the ACV Upgrade Project.

In my July 20, 2011, letter to you, I stated that NNSA would address the path forward for Deliverable 5.4.4, *Glove-box stand seismic upgrades,* with the submittal of Deliverable 5.4.5. However, the path forward for these upgrades will not be finalized until completion of Deliverable 5.2.3. Therefore, DOE will also report on the path forward for Deliverable 5.4.4 by November 15, 2011.

If you have any questions, please contact me at (202) 586-4379.

Sincerely,

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

Enclosure

cc: D. Nichols, NA-SH-1
M. Campagnone, HS-1.1
K. Smith, LASO

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Date: August 11, 2011
Refer To: AD-NHHO-11-197

Mr. Charles Keilers
National Nuclear Security Administration
Los Alamos Site Office
Los Alamos, NM 87544

Subject: Submittal of Evidence for Early Completion of Milestone 5.4.5 of DOE Implementation Plan for DNFSB 2009-02, FY11 PBI 7.4.2, 7.4.3 and 18.4A

Dear Mr. Keilers:

LANS has committed to address DNFSB Recommendation 2009-2, *Los Alamos National Laboratory Plutonium Facility Seismic Safety,* by completing the LANS FY2011 commitments described in the 2009-2 Implementation Plan (IP), as transmitted to the DNFSB on July 13, 2010. FY11 PBI 7.4.2 deliverables are based on completing nine FY11 commitments by the IP due dates, 7.4.3 deliverables are based on completing eight FY11 commitments at least 60 days early, on average, and PBI 18.4A requires completion of the nine IP milestones in FY11. Attached is the Project Execution Plan for seismic upgrades, milestone 5.4.5, originally due July 30, 2012. As a result of the Las Conchas fire and evacuation, a request (AD-NHHO-11-174) was submitted to extend the early completion date to August 12, 2011.

If you have any questions concerning the conceptual design please contact Derek Gordon at 667-9451.

Sincerely,

Charlie Anderson
Associate Director
Nuclear & High Hazards Operations

CEA:KNS:meg

Attachment:
1. TA-55-PES-11-001, Rev. 0

'11 AUG 2:15P

Cys:
J. Krepps, DOE-LASO, A316
C. Keilers, DOE-LASO, A316
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D. Branch, PCM-DO, M722
ADNHHO File, K778
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TA55-PES-11-001, Rev. 0

TA-55 Project Execution Strategy

August 2011

Preparer	Signature	Date
Derek Gordon TA-55 Engineering Manager		8-11-11

Reviewer	Signature	Date
Steve Schreiber Deputy Associate Director		8/12/2011

Approved By	Signature	Date
Robert C. Mason TA-55 Facility Operations Director		8-11-11

Derivative Classifier	Date	
Signature: T. W. McNaughton Printed Name: T. W. McNaughton	8/12/11	☒ Unclassified ☐ UCNI ☐ Confidential

Abstract

This Project Execution Strategy describes the strategy, cost, scope, schedule, and identified funding sources which will be used to complete a set of upgrades at the Plutonium Facility (TA-55, Building PF-4) at Los Alamos National Laboratory. These upgrades are necessary to ensure that PF-4 mitigated consequences no longer challenge the U.S. Department of Energy (DOE) 25-rem Evaluation Guideline for seismically-induced events.

In addition, this Project Execution Strategy defines several other projects that must be completed to meet current requirements for nuclear facilities and support the ongoing mission of the facility. A summary of the results is presented in the table below.

Upgrade Project	Cost	Completion Schedule	Funding Source
Seismic Structural Upgrades	$15-20M	FY12	Operating Funds†
Fire-Rated Containers	$0.5M	Ongoing	Operating Funds†
Glovebox Support Stands	$10M*	FY14	Line Item Funding/ Program Funds
Fire Suppression Seismic Upgrades	$6M	FY13	Operating Funds†
Active Confinement Ventilation	$60-145M	FY20	Line Item Funding
Fire Alarm System Replacement	$25-60M	FY18	Line Item Funding
Glovebox Fire Suppression	$5-10M	FY14	Operating Funds†
Laboratory Fire Barriers	$5M	FY15	Operating Funds†
Remove Non-Seismically Qualified Buildings from Fire Water Yard Main	$20-40M	FY22	Line Item Funding

† Unknown budget situations for Fiscal Year (FY) 12 and beyond may require a balanced approach between funding and institutional demands.

*Program funding for Glovebox Stand Upgrades not included in this cost estimate.

Project Execution Strategy

1. Purpose

This Project Execution Strategy describes the strategy, cost, scope, schedule, and identified funding sources which will be used to complete a set of upgrades at the Plutonium Facility (TA-55 Building PF-4) at Los Alamos National Laboratory. These upgrades are necessary to ensure that PF-4 mitigated consequences no longer challenge the DOE 25 rem Evaluation Guideline for seismically-induced events. This document addresses Milestone 5.4.5 in the US Department of Energy *Implementation Plan for Defense Nuclear Facilities Safety Board Recommendation 2009-02* (Ref. 1).

2. Strategy

The *2011 TA-55 Documented Safety Analysis* (DSA) was submitted to the Los Alamos Site Office on May 31, 2011 (Ref. 2). With revised material-at-risk (MAR) limits, revised airborne release fraction (ARF) and release factor (RF) values, and a lower leak-path factor (LPF) value derived from new post-seismic event ignition modeling and enhanced fire modeling, the conservatively calculated mitigated dose to the maximally exposed offsite individual is approximately 23 rem. The mitigated dose of 23 rem is not well below the DOE 25 rem Evaluation Guideline. Results from the *Seismic Analysis of Facilities and Evaluation of Risk* (SAFER) project (Ref. 3) also add a set of structural upgrades that must be executed in order to reduce offsite doses.

Over the past several years, the facility has implemented a wide variety of safety improvements that have significantly improved the safety posture of the facility. These include, upgrade of the fire suppression system to safety class, installation of seismic switches to shutdown power to programmatic operations following an earthquake, implementation of a MAR Tracker control of nuclear material inventory, fire rated safes, fire rated containers, and many others. The TA-55 Reinvestment Project I was completed which replaced the chillers and cooling towers. TA-55 Reinvestment Project II will start construction in FY12. This will include upgrades to glovebox stands, a new uninterruptable power supply, a new criticality alarm system, confinement door replacement, vault water bath upgrades, stack monitoring upgrades and new air dyers.

In addition to the aforementioned upgrades, the facility has completed conceptual designs for several safety system upgrades during the last year. Based on the upgrades completed to date, the conceptual designs completed to date, and the results of the SAFER analysis and the 2011 DSA Update, the following upgrades are necessary to reduce the mitigated dose well below the DOE 25 rem Evaluation Guideline:

- Upgrade structural deficiencies identified by the SAFER project to enable the PF-4 confinement system to meet current performance category (PC)-3 seismic requirements. These upgrades are required to support the 23 rem mitigated dose

in the 2011 DSA.

- Credit analyzed and approved fire-rated containers with protecting MAR that is not being actively processed. Currently analyzed containers have a defensible Damage Ratio of 0.01 in both a seismically-induced spill and a fire scenario. As demonstrated in the May 2011 DSA submittal (Ref. 2), assuming 50% of the ball-milled heat-source plutonium in such containers reduces the mitigated consequences to approximately 20 rem. Additional fire-rated containers would further reduce potential offsite doses.

- Upgrade the glovebox support stand on all gloveboxes that contain furnace(s) used to intentionally process plutonium in a molten state to meet PC-3 seismic requirements. This would effectively prevent multiple room fires in PF-4 following a seismic event, based on a detailed probabilistic study. Elimination of multiple room fires would allow the fire suppression system to effectively prevent large post-seismic fires in PF-4.

- Upgrade of the Fire Suppression System to PC-3 seismic standards. This will effectively mitigate any release from the postulated seismically-induced fire scenario. Thus the mitigated offsite dose would be that from the seismically-induced spill, i.e., 9 rem.

- Upgrade portions of the ventilation system and supporting systems to meet safety-class and PC-3 seismic requirements, in order to provide active confinement ventilation. This would reduce the LPF associated with a seismically-induced spill approximately 5 orders of magnitude, thus reducing the offsite dose from 9 rem to a much lower value.

In addition to the projects discussed above, there are several other projects that must be completed to meet current requirements for nuclear facilities and support the ongoing mission of the facility. All upgrades contained on the TA-55 Integrated Project List were evaluated and risk ranked. The following projects are considered the most important upgrades to be implemented based on this evaluation:

- Replace the Fire Alarm System to comply with National Fire Protection Association (NFPA) 72 (Ref. 4). The existing system is not code compliant, is exhibiting age-related failures, and replacement components are no longer available from manufacturers. Where possible, replacement parts have been cannibalized from used systems. The system must be modernized and brought up to current standards to support the ongoing mission of the facility.

- Install automatic fire suppression inside of gloveboxes to provide both NFPA code compliance and a safety-significant defense-in-depth function to prevent operational and post-seismic fires. While this upgrade will not quantifiably reduce mitigated offsite doses, it will provide an additional layer of defense for the fire suppression system and the large number of gloveboxes that do not meet current PC-3 requirements.

- Upgrade the walls separating the four laboratory areas from the corridors to provide a 2-hr fire-rated barrier. This not only provides a robust fire barrier to limit the potential spread of fire, but it would also allow the corridors to be credited as safe havens in accordance with National Fire Protection Association standards. This would allow personnel to exit from the opposite side of the facility, alleviating the need to crash out the west doors during a fire. The net effect would be a reduced Leak Path Factor.

- Remove non-seismically qualified buildings from the underground Fire Suppression Yard Main. This upgrade will not further reduce offsite dose; however, it is required to maintain safety-class redundant fire water supply tanks/pumps during a seismic event. Without this upgrade, the facility will continue to rely on operator response to close ten valves on the fire water supply lines to the non-seismically qualified buildings following a seismic event.

3. Cost

Cost estimates have been developed for each of the proposed upgrades. The cost estimates and their bases are presented in the table below.

Upgrade Project	Cost Estimate	Basis
Seismic Structural Upgrades	$5M FY11 $10-15M FY12	Project Cost Estimates
Fire-Rated Containers	$0.5M	$70K per container for Fire Tests
Glovebox Support Stands	$10M*	TRP II Cost Estimates
Fire Suppression Seismic Upgrades	$600K FY11 $5.4M FY12/13	2010 Conceptual Design and Level 5 Cost Estimate
Active Confinement Ventilation	$60-145M	TRP III Pre-decisional Rough Order of Magnitude (ROM) Range
Fire Alarm System Replacement	$25-60M	TRP III Pre-decisional ROM Range
Glovebox Fire Suppression	$5-10M	FY11 Plan
Laboratory Fire Barriers	$5M	2010 Conceptual Design and Level 5 Cost Estimate
Remove Non-Seismically Qualified Buildings from Fire Water Yard Main	$20-40M	TRP III Pre-decisional ROM Range

*Program funding for Glovebox Stand Upgrades not included in this cost estimate.

4. Schedule

Schedules have been developed for each of the proposed upgrades. The proposed schedules and their bases are presented in the table below.

Upgrade Project	Schedule	Basis
Seismic Structural Upgrades	FY11/FY12	Project Schedules
Fire-Rated Containers	Ongoing	Assume three container fire tests per year
Glovebox Support Stands	FY14 Complete	TRP II Schedules for eight Glovebox Stands and four Glovebox Stands upgraded by programs
Fire Suppression Seismic Upgrades	FY11 Design FY12/13 Construction	2010 Conceptual Design and Schedule
Active Confinement Ventilation	FY20 Complete	TRP III Pre-Conceptual Schedule
Fire Alarm System Replacement	FY18 Complete	TRP III Pre-Conceptual Schedule
Glovebox Fire Suppression	FY12 Design and Studies FY14 Construction	FY11 Plan
Laboratory Fire Barriers	FY14 Start FY 15 Complete	2010 Conceptual Design and Schedule (start delayed until fire suppression upgrades are complete)
Remove Non-Seismically Qualified Buildings from Fire Water Yard Main	FY22 Complete	TRP III Pre-Conceptual Schedule (Project start delayed based on priority of ventilation upgrades)

5. Funding Source

Funding sources have been developed for each of the proposed projects. The proposed funding sources and their bases are presented in the table below. For projects that will use Operating Funds, it must be recognized that unknown budget situations for Fiscal Year 2012 and beyond may require a balanced approach between funding and institutional demands.

Upgrade Project	Funding Source	Basis
Seismic Structural Upgrades	Operating Funds	Approved Funding Determinations
Fire-Rated Containers	Operating Funds	Cost well below Line Item threshold
Glovebox Support Stands	Line Item Funding/ Program Funds	Cost to back-fit Glovebox Stands exceeds $10M Line Item threshold. Four Glovebox Stands are new installations by programs.
Fire Suppression Seismic Upgrades	Operating Funds	Cost below Line Item threshold
Active Confinement Ventilation	Line Item Funding	Cost exceeds $10M Line Item threshold
Fire Alarm System Replacement	Line Item Funding	Cost exceeds $10M Line Item threshold
Glovebox Fire Suppression	Operating Funds	Cost below Line Item threshold
Laboratory Fire Barriers	Operating Funds	Cost below Line Item threshold
Remove Non-Seismically Qualified Buildings from Fire Water Yard Main	Line Item Funding	Cost exceeds $10M Line Item threshold

6. Summary

The following table summarizes the cost, schedule, and funding sources for each project. The scope for each project is described in Attachment 1.

Upgrade Project	Cost	Completion Schedule	Funding Source
Seismic Structural Upgrades	$15-20M	FY12	Operating Funds†
Fire-Rated Containers	$0.5M	Ongoing	Operating Funds†
Glovebox Support Stands	$10M*	FY14	Line Item Funding/ Program Funds
Fire Suppression Seismic Upgrades	$6M	FY13	Operating Funds†
Active Confinement Ventilation	$60-145M	FY20	Line Item Funding
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Glovebox Fire Suppression	$5-10M	FY14	Operating Funds†
Laboratory Fire Barriers	$5M	FY15	Operating Funds†
Remove Non-Seismically Qualified Buildings from Fire Water Yard Main	$20-40M	FY22	Line Item Funding

† Unknown budget situations for FY12 and beyond may require a balanced approach between funding and institutional demands.

*Program funding for Glovebox Stand Upgrades not included in this cost estimate.

Attachment 1 - Project Scope

This attachment describes the scope for each of the projects discussed in the Project Execution Strategy.

1. Seismic Upgrades

There are a number of seismic structural deficiencies identified in the PF-4 structural evaluation to the new Seismic Hazard. The scope to correct each deficiency is described below.

1.1 Zone 1 Plenum Room Column to Beam Connections

The Zone-1 filter plenum rooms have beam/column connections that are likely to fail in a seismic event because the anchorage of the beams to the columns is outside the column rebar cage. Correction includes installation of a steel column that transfers loads to the floor. The activity started in mid-April 2011 and was completed in July 2011 (see Figure 1).

Figure 1. New Steel Column Supporting Steel Beam

1.2 Concrete Shield Walls

The concrete shield walls in the 200 Area (9-in.-thick reinforced concrete between ^{238}Pu operations areas) have insufficient anchorage to the roof and are of concern for falling over onto ^{238}Pu gloveboxes. The walls are connected with angle-iron clips to the ceiling. Additional perpendicular angle-iron supports are being installed to prevent shearing of angle-iron bolts with wall movement. These upgrades were completed in July 2011 for seven of the eight sides of the walls (see Figure 2). A separate design effort is in development to correct the last side of one wall because it requires an alternative fix due to limited accessibility.

Figure 2. New Anchor for Shield Wall

1.3 Drag Strut

There is no shear wall on the laboratory level of the south side of PF-4 (column line 8). This results in overstress of roof girders, which could result in roof collapse. The current plan is to access the roof from the outside, remove 20 ft (width) of the roof, and to use concrete and rebar to correct the issue (see Figure 3). This action would require reinforced concrete added to the top of the roof about 236 ft in length, 8 ft in width, and 1 ft in depth. The drag strut would be tied into the roof via dowels into the roof concrete. The same contractor who improved the roof will perform this work, which will maintain the roof warranty. Construction started in August 2011.

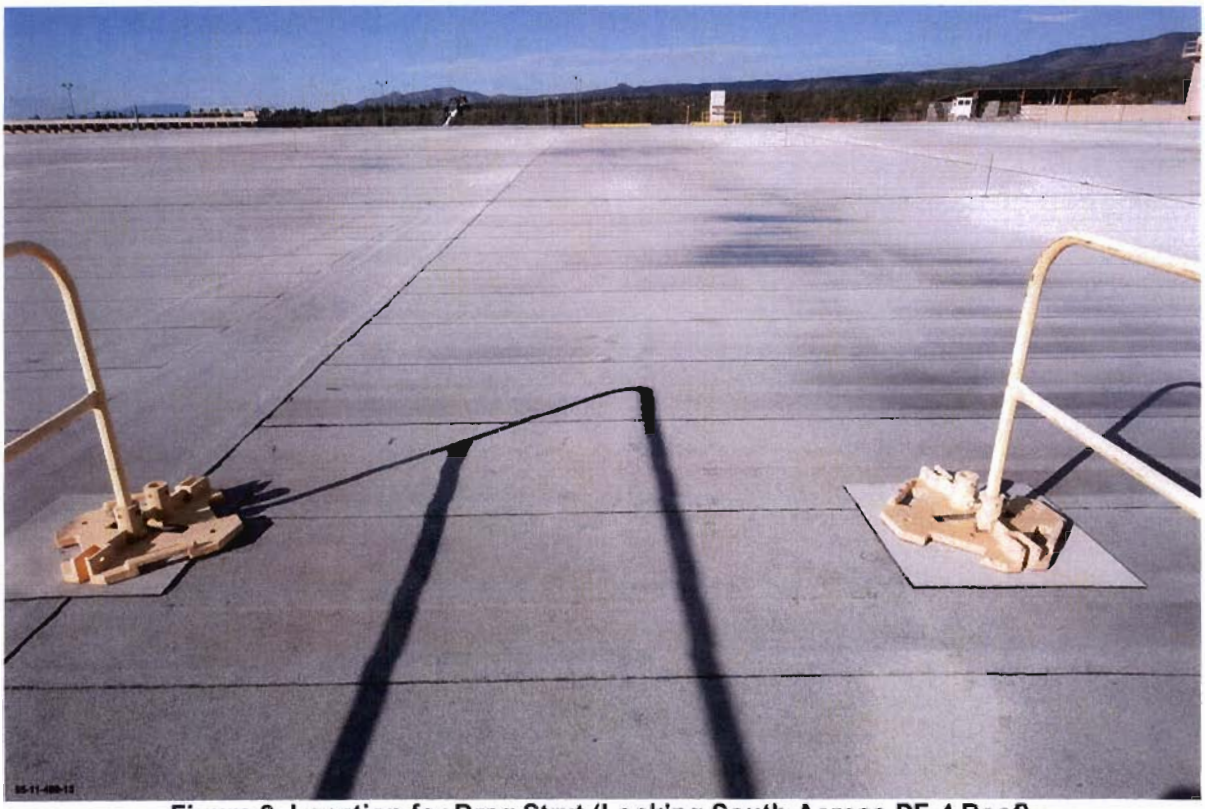

Figure 3. Location for Drag Strut (Looking South Across PF-4 Roof)

1.4 Zone 1 Plenum Room Captured Columns

In the basement there are columns that support the main floor. Some columns have structures built next to them, and, with motion, the column is constrained from moving, which can ultimately cause a shear failure (thus they are referred to as "captured" columns). The correction is to cut a gap between the adjacent structure and the column to decouple the structural motion (see Figure 4).

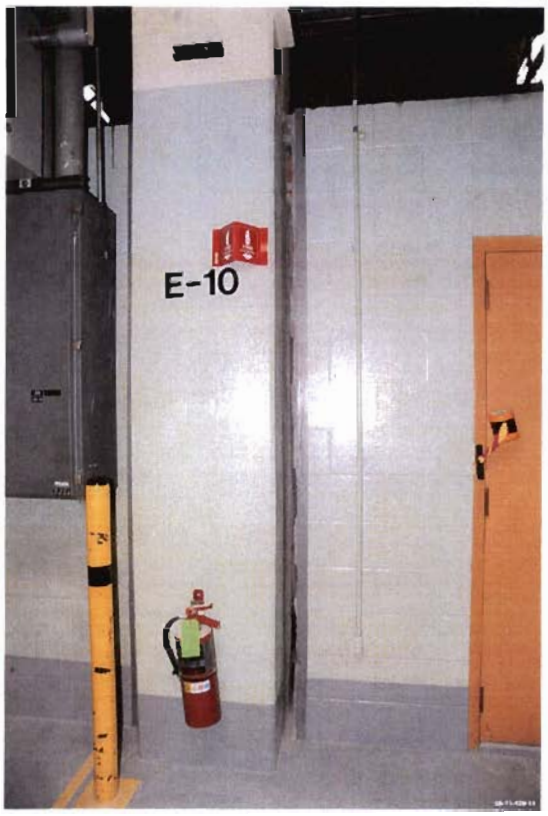

Figure 4. Captured Column in Zone 1 Plenum Room (Wall Cut Back 1.5 in.)

1.5 Mezzanines

There are nine mezzanines in PF-4, five of which have issues related to lateral and longitudinal capacity and associated collapse. Mezzanine 6 has a higher failure probability, so it is being corrected first. The issue is the connections of the horizontal wall to the laboratory floor and the stiffness of the mezzanine floor near openings for stairways and ductwork such that the mezzanine could fall. The upgrade includes additional anchorage to the laboratory floor and the addition of beams under the mezzanine floor (see Figure 5).

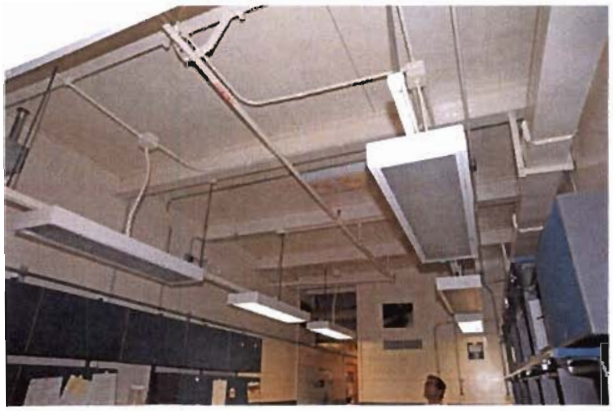

Figure 5. View of Bottom of Mezzanine (Beams to be installed for additional support)

1.6 Ceiling Beams

Ceiling beams have an issue in nine bays, each of which has five beams. The failure mechanism is torsional buckling. The corrective action is to connect the tops of the I-beams to the C-channel beams to provide additional stiffness. In addition, the C-channel beams need to be stiffened. Finally, the twisted-wire connection of the laboratory ceiling to the beams supports need to be strengthened (see Figure 6).

Figure 6. Ceiling Beams (I Beam, top right of photo; C Channel, right center of photo)

1.7 Glovebox Exhaust Fan Concrete Pads

The glovebox exhaust fans are anchored to a 6-in. thick concrete pad. This pad is not adequately anchored to the basement floor, resulting in the potential for ductwork connections to the fan to breach in a seismic event. There are eight of these concrete pads. The fix involves anchoring angle iron around the perimeter of the pads (see Figure 7).

Figure 7. Glovebox Exhaust Fan and Concrete Base Pad

1.8 Vault and Corridor Captured Columns

There are also captured columns in the vault and the corridors. Some columns (10 in the vault) are connected to adjacent structures with reinforced concrete, which is not amenable to cutting (see Figure 8). There are 52 columns in the corridors connected to laboratory walls. There is significant equipment connected to the columns or adjacent to the columns, which makes accessibility for upgrades costly (see Figure 9). The actual number of these columns that require upgrade will be determined through facility modeling with the drag strut correction in place. If some or all of the vault columns require upgrade, the expected solution is to reinforce the columns above the vault with fiberglass and resin coating to prevent failure and subsequent failure of the main floor.

Figure 8. Vault Captured Column

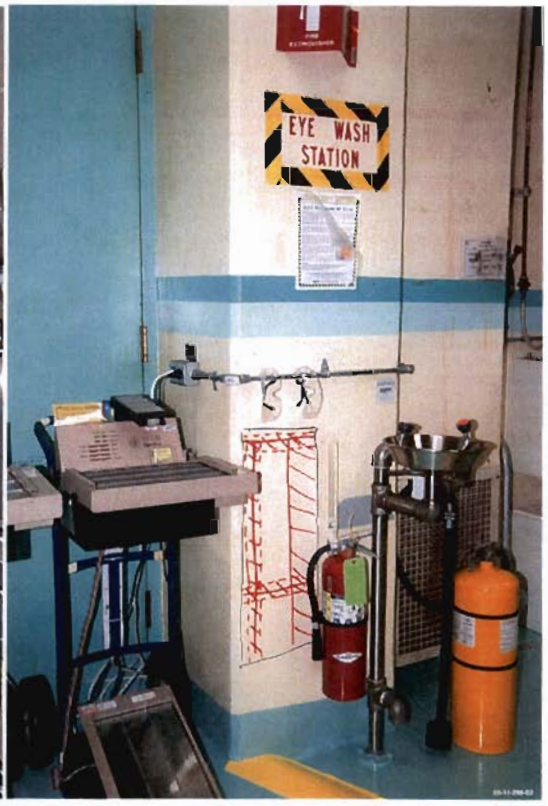

Figure 9. Corridor Captured Column

2. Fire-Rated Containers

A standard test has been developed to establish a basis for crediting containers with a Damage Ratio of less than 1.0 in Safety Basis documents (see Figure 10). For each type of container, the test requires 20 test specimens filled with cerium oxide as a surrogate for plutonium oxide. The test containers are subjected to one of two pre-defined fires and then drop tested. The material remaining in the containers after the drop test is then measured and compared to the inventory before the test. The difference is used to establish the credited Damage Ratio using a statistical method. Two containers have been tested thus far, and additional containers will continue to be tested. Testing will be paid for by the upgrade projects; however, procurement of containers for use in the facility will be paid for by programs.

Figure 10. New Vault Storage Container

3. Glovebox Support Stands

This work involves seismic upgrades to eight glovebox stands that support gloveboxes housing operations that involve molten plutonium. The work requires replacement of the existing stand with more robust structural members and stronger anchorage. To gain access to these components, all services below the glovebox must be removed (see Figure 11). The glovebox will be temporarily supported and the existing stand removed. The new stand members will then be installed with increased anchorage to the floor and diagonal members for support. All services will then be rerouted to the glovebox.

Figure 11. Glovebox Support Stand (Gray) and Glovebox Services

4. Fire Suppression Seismic Upgrades

A conceptual design has been prepared based on SAFER structural reviews of the system. Additional pipe hangers are required on fire suppression branch lines supporting both the first floor and basement of PF-4, as well as additional hangers in the pump houses. The conceptual design defines the fix as requiring 236 additional pipe hangers (see Figure 12). The fire water tanks and underground fire water line do not require upgrades.

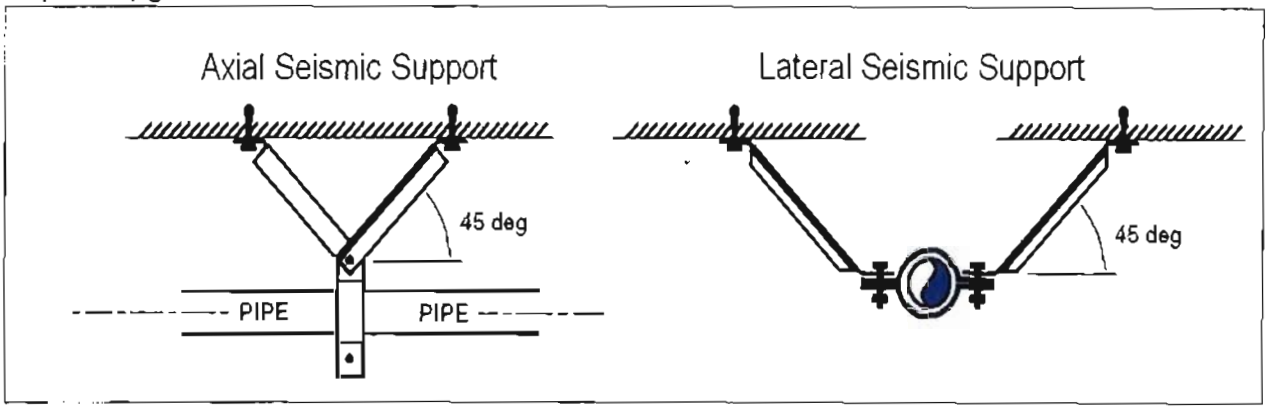

Figure 12. Typical Piping Support

5. Active Confinement Ventilation

A conceptual design was prepared for the Active Confinement Ventilation System safety-class upgrades based on extensive computer modeling. Since this design was submitted, it was determined the motor flywheel alternator to provide bump-less power to the ventilation system is not required. A summary of the upgrades required is provided below. For more detailed information, refer to the Conceptual Design (Ref. 5).

1. Upgrade the Bleed-Off system to safety-class
2. Upgrade the glovebox exhaust fans to safety-class
3. Install new safety-class Control System
4. Upgrade the recirculation system ductwork to PC-3 for Seismic Events
5. Install one new safety-class Diesel Generator
6. Upgrade the existing Cummins Diesel Generator to safety-class
7. Install new safety-class electrical switchgear

6. Fire Alarm System Replacement

The purpose of the Fire Alarm System Replacement (FASR) Project is to replace the aging Fire Alarm Control Panel (FACP) 3225, which services Plutonium Facility (PF)-4 and 14 other structures at Technical Area (TA)-55. In addition to aging and maintenance issues, the existing detection, control, and evacuation devices are not NFPA or Americans with Disabilities Act (ADA) compliant, are not Underwriters Laboratory (UL) listed, and do not meet the current Los Alamos National Laboratory (LANL) standards (see Figure 13).

The new system is to be NFPA compliant, with all new active components "listed" for their intended fire protection functions. A major element of improved compliance will be installation of dedicated fire notification circuits, which do not exist in the affected facilities today.

The scope of this project is to replace Supervisory Panel (FACP) 3225 and all associated functions with new NFPA 72 compliant digital addressable fire alarm system(s) and to provide new fire alarm notification capability. This includes the following:

1. New FACPs (one new panel shall be dedicated to PF-4 service).
2. To accomplish the system replacement, the project will provide completely new conduit and wiring networks for the notification circuits and digital signaling line circuits.
3. Add NFPA 72 compliant notification circuitry and devices (speakers and strobes with mass notification voice capability).
4. Provide new addressable capability for detection and control via new addressable signaling line circuits to all existing heat and smoke detectors, pull stations, sprinkler systems flow/pressure switches, hose rack flow switches, fire door operators, monitoring of existing clean agent panels, and fire door controls.
5. The existing devices will be replaced with addressable devices or cut over to addressable modules.
6. The new system will interface with the TA-64 Central Alarm Station and the TA-55 Operations Center via digital communications.
7. A fire alarm system monitor will be provided in the Operations Center and networked to the new FACPs.
8. The Project will be responsible for decommissioning and removing the existing systems after successful start-up, cutovers, and acceptance testing are complete. Existing panels, devices, conduit, and wiring that are made excess by the replacement efforts shall be removed.

9. Additional specialty fire alarm and interlock devices related to the glovebox alarm systems, elevator controls, and Heating, Ventilation and Air Conditioning (HVAC) controls will be addressed independently after the new system is in operation.

Figure 13. Fire Alarm Control Panels

7. Glovebox Fire Suppression

DOE Standards and NFPA 801 (Ref. 6) require gloveboxes that contain combustible material to be equipped with an inert atmosphere or fire suppression system. A promising fire suppression alternative is being developed that makes use of a passive, commercially-available product with a material cost of approximately $1K per glovebox. This product is called the Fire Foe Tube®, which is a nylon tube that can be attached inside the glovebox. The tubes are filled with dry chemical and pressurized gaseous clean-agent fire suppressants that are released to the glovebox by weakening of the nylon during a fire (see Figure 14).

The tubes have been tested at a nationally recognized test laboratory in a glovebox mock-up. The test report is now complete, which makes the tubes approved for use in PF-4 gloveboxes. Material compatibility studies are being conducted to fully understand the effect PF-4 glovebox environments have on the nylon tubes. Additional fire studies are also being conducted to gain a better understanding of reaction times for various sizes and type of fires. This work will be complete in FY12. Construction involves installation of the tubes on the ceiling of the gloveboxes and routing a wire from the tubes to the existing fire alarm system connection on the top of each glovebox for monitoring of the device.

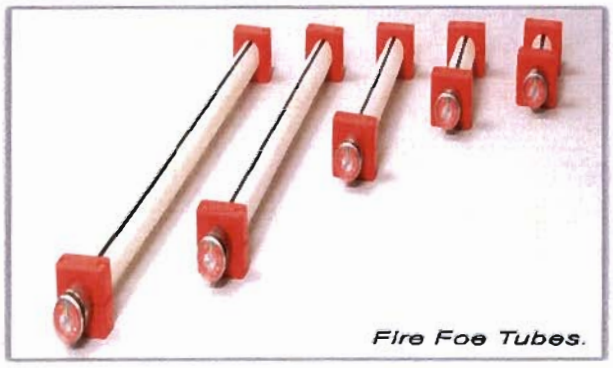

Figure 14. Fire Foe Tubes

8. Laboratory Fire Barriers

The walls that separate the laboratory rooms from the corridors in PF-4 were originally intended to provide a 2-hr-rated barrier. Ventilation ducts penetrate these walls above the laboratory spaces and there is a gap in the fire-rated drywall on one side of each wall. These two deficiencies prevent these walls from being credited as 2-hr fire barriers. A conceptual design has been developed to correct these deficiencies. The fix involves wrapping the ventilation ductwork with fire-rated blankets at 84 ductwork penetrations. The fix also requires cutting drywall from the corridors to access the gap in the wall and installing 2 layers of fire-rated drywall to close the gap. There are four walls with this gap and each wall is approximately 285 ft long.

9. Remove Non-Seismically Qualified Buildings from Fire Water Yard Main

The scope of this project is to physically separate the non-seismically-qualified buildings from the Safety-Class Fire Water Yard Main required to support PF-4 nuclear operations. A requirements document is being prepared for this project, as currently defined. The scope includes the following:

1. Install domestic water-booster pumping system with dual source capability; system shall be operable from electric and diesel sources. Provide pumping system with integral weather-resistant enclosure; the pumping system capacity shall be 1000 GPM at 110 PSI.

2. Install 10-in. domestic water line underground from building TA-55-6 to TA-55-2.

3. Install new laterals, one each from new 10-in. domestic water line to TA-55 buildings.
    a. 10 in. lateral to PF-5
    b. 8 in. lateral to PF-2, 3, 28, and 39
    c. 6 in. lateral to PF-1, 6, and 114

4. The new domestic water line will not tie into PF-4, PF-8, or the new UPS building; the fire protection loop will service PF-4, PF-8, and the new UPS building.

5. Replace existing check valve in each of the two fire protection valve vaults with a solid-spool section of pipe (see Figure 15).

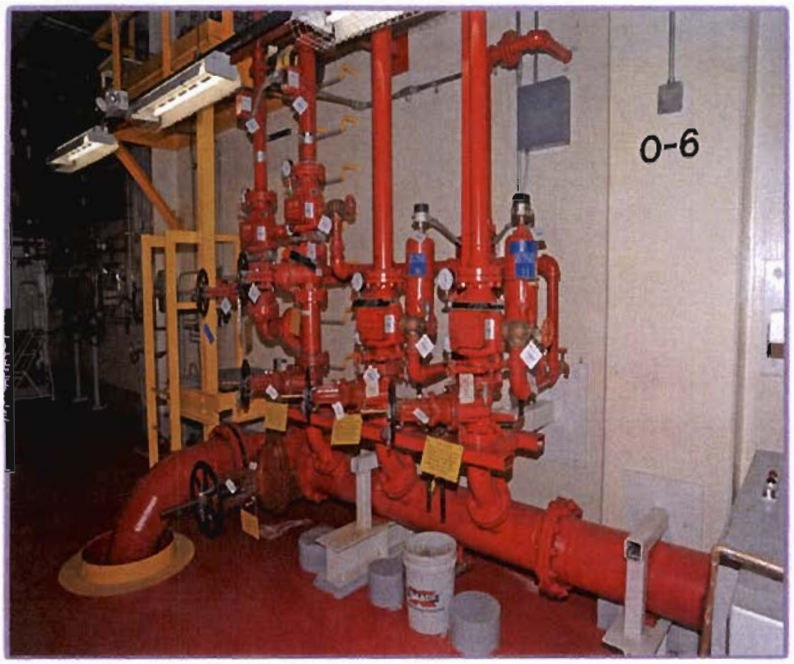

Figure 15. Fire-Suppression Risers

References

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3 *Seismic Analysis of Facilities and Evaluation of Risk (SAFER), Summary of PF-4 System and Component Performance*, P. Baughman, L. Goen, and M. Salmon, Los Alamos National Laboratory, Los Alamos NM, May 19, 2011.

4 **NFPA 72**, *National Fire Alarm and Signaling Code*, National Fire Protection Association, Quincy MA, 2010.

5 **AD-NHHO: 11-032**, *Submittal of Evidence for Early Completion of Milestone 5.4.2 of DOE Implementation Plan for DNFSB 2009-02, FY11 PBI 7.4.2, 7.4.3 and 18.4A*, Los Alamos National Laboratory, Los Alamos NM, January 31. 2011.

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