



Department of Energy

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December 7, 1998

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DNF SAFETY BOARD

The Honorable John T. Conway
Chairman
Defense Nuclear Facilities Safety Board
625 Indiana Avenue, N.W.
Suite 700
Washington, D.C. 20004

Dear Mr. Chairman:

Enclosed is the Department's quarterly progress report on implementation of your Recommendation 94-3, which addresses seismic and safety upgrades to Rocky Flats Building 371. Also enclosed is the report of the Department's review of work packages associated with those upgrades, as requested by your letter of August 13, 1998.

Twelve of the nineteen upgrades required for full compliance with the Basis of Interim Operation for Building 371 have been completed. Six were finished within this quarter. This report projects that the remaining upgrades will be completed by the end of February 1999, a slip of two months from the previously reported schedule. Modification of the currently approved Justification for Continued Operations will be required if this delay cannot be recovered.

The Department's independent review of upgrade work packages determined that the work to effect intended safety margin upgrades was, "...substantially complete and effective...with some questions yet to be resolved." The contractor has been tasked to resolve uncertainties based on documentation. Progress will be addressed in the next quarterly report.

Sincerely,

James M. Owendoff
Acting Assistant Secretary for
Environmental Management

Enclosures

cc: M. Whitaker, S-3.1



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98-RF-05413
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U. S. DEPARTMENT OF ENERGY

**DEFENSE NUCLEAR FACILITIES SAFETY BOARD
RECOMMENDATION 94-3
INTEGRATED PROGRAM PLAN**

**EIGHTH QUARTERLY REPORT
JULY - SEPTMEBER 1998
REVISION 1**

Reviewed for Classification By

Lawrence Kwoz, DE/RFO (U/WU)

Date : 11/03/98

EXECUTIVE SUMMARY

This periodic report provides an update on progress with implementation of the Defense Nuclear Facilities Safety Board (DNFSB) Recommendation 94-3. Recommendation 94-3 involves seismic and safety upgrades to the Rocky Flats plutonium storage facility. The Department of Energy formally submitted in June a revised Integrated Program Plan (IPP, designated "Revision 1, April 28, 1998") which made commitments for actions and decisions. Progress on those actions and results of decisions are reported in this eighth quarterly report.

Building 371 completed a successful initial three months of operation in accordance with its updated Authorization Basis, the Building 371/374 Complex Basis for Interim Operation (BIO). A single Technical Safety Requirements (TSR) violation occurred involving performance of a required LCO surveillance; the implementing procedure was strengthened to prevent recurrence. Facility management reports a high degree of satisfaction with operations in accordance with the BIO, citing significantly improved understanding and tracking of maintenance priorities and only four hours of shutdown time (facility unavailability for risk reduction work) due to AB considerations.

Substantial progress was made in this quarter toward closure of the BIO Implementation issues that are open in the Justification for Continued Operations (JCO). Completed activities include construction of the final priority upgrade, construction of six BIO-driven upgrades, and preparation and submittal of the BIO and TSR changes required to close the JCO. Three BIO-driven upgrades and ongoing fire damper testing and repair will extend beyond the December 4, 1998, JCO expiration date, necessitating a limited scope extension of the JCO through February 1999.

Overall, the facility continues to realize a substantial and steadily increasing fraction of the intended safety benefit from the authorization basis update. Completion of the few remaining upgrades and experience with operation under the BIO are expected to ensure continuing improvement throughout 1998.

As reported in the Seventh Quarterly Report, construction of all Building 371 priority safety upgrades specified in Table 3-1 of the IPP was completed in August. Of the twenty-one BIO-required upgrades presented in Table 3-1 of this report, twelve are complete and two have been cancelled as of the October 1998 milestone for their completion. In the current quarter specifically, six more of the BIO-driven upgrades have been completed and the life safety upgrades remain nearly complete (7 of 8 sub-tasks are complete). The remaining seven BIO-required upgrades are being managed to a schedule for earliest practical completion that is coordinated with the JCO and JCO extension closure schedule (February 1999).

Following up on the DNFSB Staff questions from their June review of the operability confirmation for the plenum deluge upgrade and HVAC seismic support packages, DOE-RFFO convened an evaluation team to assess safety function operability assurance afforded by the entire upgrade design and construction program. The team generally found the implementation of priority safety upgrades to be substantially complete and effective. The assessment is complete with several process improvement recommendations identified and the identification of a number of specific issues to be addressed. The report is finalized and has been transmitted to the contractors for formal response.

The Site is continuing to evaluate alternatives to accelerate successful completion of integrated Pu consolidation and management scheduled for 2002. Work is underway to prepare Room 3701 in Building 371 for installation of the packaging portion of the prototype plutonium stabilization and packaging system (PuSPS). Repackaging of materials for "pipe-and-go" is underway for selected residue types. Numerous decisions regarding residue programs remain pending, dependent upon the ongoing environmental review of the Residue Environmental Impact Statement (EIS) for shipments to the Waste Isolation Pilot Plant (WIPP). These activities are more fully reported as addressing DNFSB Recommendation 94-1.

Progress was made across the DOE complex in preparing for timely off-Site shipment of RFETS SNM, including:

- NEPA evaluation of the K-area option at the Savannah River Site (SRS) was completed and initial strip out work was approved and initiated to prepare for storage of RFETS SNM in K-area as an alternative to the Actinide Processing and Storage Facility (APSF).
- Rocky Flats pit shipments to Pantex continued in this quarter with more than 60% of the pit shipments now completed. Pit shipments are on schedule for completion in FY-99.
- An initial shipment of plutonium-bearing sand, slag, and crucible samples and standards to SRS was completed in FY-98. Packaging of sand, slag and crucible residues for production scale shipment is continuing, but actual shipment is dependent upon issuance of the residue EIS Record of Decision scheduled for November 6.
- The APSF received supplemental funding authorization at the end of FY-98 and is proceeding with construction procurement, anticipating a contract award in November. Meanwhile, Site preparation is being completed, including grading and digging of the foundation.

Overall, the Department believes progress is being made to support timely off-site shipment of RFETS SNM.

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1.0 PROGRAM ORGANIZATION

This section corresponds to section one of the IPP. It addresses key changes to the organization identified in that section. There were no changes to the organization presented in Revision 1 of the IPP during this quarter. As BIO implementation and upgrades approach completion, organizational changes are anticipated but have not yet been determined.

2.0 COMPLETION OF DNFSB 94-3 SUB-RECOMMENDATIONS

The corresponding section of the IPP commits to: further updating of the facility Safety Analysis Report should the interim storage mission revert to Building 371 (Sub-Recommendation 2); supplemental actions addressing those risk-dominant accident scenarios which exceed the public Evaluation Guideline of 5 rem (Sub-Recommendation 6); and validation of interim storage upgrades to complete final definition of required upgrades (Sub-Recommendation 8).

Supplemental actions to address risk-dominant accident scenarios are in progress for inclusion in the annual update to the BIO. To reduce dock fire risks, a BIO change requiring that drums with more than 200 g of Pu be continuously attended has been issued. This change reduces the risk-dominant scenario frequency to *extremely unlikely*, thereby reducing the Risk Class from I to II. Further a new calculation of potential fires on the dock (either Rooms 3187A and 3187B or the new dock 21T) is being completed to show that actual suppression system response will limit the number of impacted drums to at most four, reducing the potential public dose below the 5 Rem guideline value. A second BIO change to reduce the risk of hydrogen explosion occurring in a drum staged on the dock is being prepared, adding an Administrative Control for sampling-based functional testing of the installed drum vents. This change will eliminate the prior risk dominant drum explosion scenarios. Seismic walkdowns were performed to identify areas where the potential releases within the facility might practically be reduced (e.g., by preventing drum failure caused by impact from unqualified, ceiling-mounted equipment) and the identified issues ("capable sources") are being evaluated for practical mitigation. Seismic risk reduction is being focussed on the Support Facility which contributes 3.4 of the 8.6 Rem public dose in the NPH-2 (EBE) BIO scenario. Efforts to determine the as-built seismic capacity of the Room 3189 storage racks and effective strategies for upgrading them are nearing completion. A letter summarizing the overall contractor recommendations will be submitted to RFFO for their consideration in the next quarter.

The validation activity is addressed in Section 6 of this report.

3.0 BUILDING 371

The corresponding section of the IPP focuses on "Goal 1: Establish safe operation of Building 371 in conformance with an updated Authorization Basis (AB)." The following Goal 1 Objectives are specifically addressed: "Provide an updated Building 371 AB, complete definition and implementation of necessary upgrades in Building 371, and establish building operations in conformance with the updated AB."

3.1 Accomplishments and Status Summary

3.1.1 Building 371 Authorization Basis (AB)

Building 371 completed a successful initial three months of operation in accordance with its updated Authorization Basis, the Building 371/374 Complex Basis for Interim Operation (BIO). A single TSR violation occurred involving performance of a required LCO surveillance; the implementing procedure was strengthened to prevent recurrence. Facility management reports a high degree of satisfaction with operations in accordance with the BIO, citing significantly improved understanding and tracking of maintenance priorities and only four hours of shutdown time (facility unavailability for risk reduction work) due to AB considerations. The new BIO TSR Administrative Controls for Inventory Management and Combustible Control, in particular, are being considered as models for graded implementation in other Site facilities.

Substantial progress was made in this quarter toward closure of the BIO Implementation issues that are open in the Justification for Continued Operations (JCO). The current status of each of the seven original and one new JCO issues includes:

- Issue 2.1, Non-Compliant Storage of Combustible Materials – a change to the BIO and TSRs was prepared and submitted for RFFO approval; the changes establish conditions for acceptance of as-is combustibles pending their future removal to be coordinated with planned entry into the affected high contamination areas and provide new scenario analyses demonstrating that risk guidelines are not exceeded if these combustibles burn. The Room 2327 wall will become a credited fire barrier and penetration repairs in this wall are being completed in November.
- Issue 2.2, Fire Barrier Deficiencies – about 80% of the identified deficiencies have been or are being closed in November. The remaining deficiencies involving more complex procurement and construction are being closed as BIO-required 94-3 upgrades to be complete by February 1999.
- Issue 2.3, HVAC Supply Fan Interlock – design and construction of the upgrades to these interlocks was completed. A revised LCO, responsive to RFFO's earlier direction was prepared and submitted for approval.
- Issue 2.4, Rooms 3189/3187 and 3187/18T Roll-up Door Interlock – The planned BIO and TSR change to place primary reliance on Administrative Control of the roll-up door configuration was submitted and approved. The change is being issued and implemented in November to close this issue.
- Issue 2.5, SNM Storage Racks Seismic Capacity – Work in one of the three vault rooms was completed in October. The other two are scheduled for November and schedule coordination with the International Atomic Energy Agency has been confirmed. Closure in November is expected.
- Issue 2.6, Tertiary Boundary Confinement Deficiencies – Repairs to correct all six of the identified deficiencies have been completed and this issue is closed.

- Issue 2.7, HVAC Supply Isolation Valves and Backdraft Dampers – Installation and testing of the new HVAC supply HEPA filters was completed in August. A change to the BIO and TSRs was prepared and submitted to RFFO for approval.
- Issue 2.8, Active Design Features to Prevent Unsafe Failures – The seismic isolation valve for the process water attic piping and the attic leak detection system were completed and placed in service. Construction of the seismic isolation valve for the nitrogen supply is scheduled for completion in January 1999.

Three of the 94-3 upgrades (discussed in Section 3.1.2 below) that are included in JCO Issues 2.2 and 2.8 will be completed after the scheduled December 4, 1998, expiration of the JCO. Fire damper testing and repair is also continuing beyond December 4, 1998, as planned in the original JCO submittal. Accordingly Kaiser-Hill is requesting an extension of the JCO from RFFO at a reduced scope.

Overall, the facility continues to realize a substantial and steadily increasing fraction of the intended safety benefit from the authorization basis update. Completion of the few remaining upgrades and experience with operation under the BIO are expected to ensure continuing improvement throughout 1998.

3.1.2 Building 371 Safety Upgrades

As reported in the Seventh Quarterly Report, construction of all Building 371 priority safety upgrades specified in Table 3-1 of the IPP was completed in August. Progress was made in facility implementation of the final two of these upgrades with the Process Water seismic isolation valve being formally placed in service and the BIO/TSR page change for the supply HEPA filters (deleting the inlet isolation valves and backdraft dampers from the TSRs) completed and submitted to RFFO for approval.

Of the twenty-one BIO-required upgrades presented in Table 3-1 of this report, twelve are complete and two have been cancelled as of the October 1998 milestone for their completion. In this quarter, six more of the BIO-driven upgrades have been completed and the life safety upgrades remain nearly complete (7 of 8 sub-tasks are complete). As of the end of October:

1. New emergency lighting that is battery powered and seismically supported has been installed to support egress in an earthquake.
2. Required stiffening of HVAC exhaust and supply ductwork to accommodate the PC3 tornado atmospheric pressure change for the Site was completed;
3. HVAC interlocks and associated fan motor breakers were upgraded and/or seismically hardened to ensure that supply fans would not pressurize Building 371 during or after an earthquake up to EBE magnitude and to lessen the potential for transient differential pressure reversals within the Building during upset conditions;
4. Counterfeit bolts with the potential to affect the integrity of the Building 371 tertiary boundary were replaced;

5. The new attic leak detection system was installed and placed in service to ensure that leakage which may occur during normal operation would not jeopardize the integrity of the structure; and
6. HVAC ΔP sensor lines on credited (SC-1/2) plenums were upgraded to prevent failure in seismic events.

The remaining seven BIO-required upgrades are being managed to a schedule for earliest practical completion that is coordinated with the JCO and JCO extension closure schedule. The status and safety significance of these upgrades are assessed as follows (in order of scheduled completion):

1. The Special Nuclear Material (SNM) storage rack seismic upgrades are complete in one of three rooms with the remaining two scheduled for November. The need to coordinate with the International Atomic Energy Agency annual visit drove the schedule for the last room to late November. These upgrades are included in the JCO.
2. The upgrade to reestablish code compliance for the lightning protection system will be completed in December. It has had a lower priority since the existing configuration suffices to ensure facility safety.
3. The last component of the life safety code upgrades to provide more complete suppression system coverage in a stairway will be completed in December. This is a lower hazard issue not explicitly driven by the BIO.
4. The seismic isolation for the main Building 371 nitrogen supply will be completed in January. The trigger procurement cycle is driving the schedule. This upgrade is included in the JCO.
5. The installation of redundant Zone III HVAC controllers will be completed in January. This upgrade is to enhance facility availability while ensuring the BIO LCO requirements are met; it is not required to ensure safety.
6. (and 7) Fire barrier upgrades for vaults and SC-3 interior barriers will be completed in February. These issues are included in the JCO. The initial tasks for these BIO upgrade projects were inspections that identified deficiencies for evaluation and upgrade design as necessary. Construction for the more complex repairs extends into February.

Following up on the DNFSB Staff questions from their June review of the operability confirmation for the plenum deluge upgrade and HVAC seismic support packages, DOE-RFFO convened an evaluation team to assess safety function operability assurance afforded by the entire upgrade design and construction program. The team generally found the implementation of priority safety upgrades to be substantially complete and effective. The assessment is complete with several process improvement recommendations identified and the identification of a number of specific issues to be addressed. The report is finalized and has been transmitted to the contractors for formal response.

3.2 Deliverables

IPP Milestone 3-2 Report completion of priority safety upgrades specified in Table 3-1 [IPP] by the end of 1997. **11 of 15 COMPLETED ON SCHEDULE**; remaining four will be completed by July 1998.

This milestone was completed in August 1998 for the last of the four remaining projects. The other three were all complete as of May 1998.

IPP Milestone 3-3 Establish and document operation of Building 371 in conformance with an updated Authorization Basis by August 1, 1998.

This milestone was completed on schedule.

IPP Milestone 3-4 Issue schedule (implementation plan) for further Building 371 upgrades identified during the initial AB development by November 1996. **COMPLETED AUGUST 1997**; upgrade completion no later than October 1998 being managed to a schedule coordinated with the BIO-IP.

This milestone was met for 14 of the 21 upgrades. The remaining seven are scheduled for completion in November through February as discussed above and shown in Table 3-1.

3.3 Schedule of Activities

3.3.1 Building 371 Authorization Basis

The BIO implementation JCO will be extended for a limited scope through February 1999 to accommodate delayed completion of the last BIO-driven upgrades. Planned progress in the next quarter (through January) includes:

- Issue and implement BIO change packages needed to resolve JCO issues as they are approved by RFFO.

3.3.2 Building 371 Safety Upgrades

Table 3-1 provides the schedule for additional upgrades to be completed in FY-98 and FY-99. Five more are scheduled for completion by the end of January 1999.

Table 3-1: BIO-Driven Upgrades and Schedule

	UPGRADE ITEM	SCOPE	COMPLETION SCHEDULE
1	Install Emergency Lights	Provide seismically qualified egress emergency lighting (SC-3 function in Administrative Control [AC] 5.9)	Complete
2	Evaluate/Reinforce HVAC Ducting	Ensure ducts credited for tertiary confinement have adequate pressure capacity for tornado atmospheric pressure transient or abnormal ventilation lineups	Complete
3	Ensure Lightning Protection	Ensure that security systems to prevent helicopter intrusion do not compromise lightning protection for Building 371	DEC 98
4	Inspect/Repair SC-3 Fire Barriers	Apply lessons learned from Room 3206 evaluation as necessary to ensure one-hour capability of fire barriers that are SC-3 in AC 5.9	FEB 99
5	SNM Storage Rack Repairs	Ensure adequate seismic capacity for storage racks used in vault-type material storage rooms (SC-1/2 SNM Storage Racks in AC 5.9)	NOV 98
6	HVAC Interlock Modifications	Ensure safe failure mode (credited as Passive Design Feature in BIO) in EBE for the supply fan trip function and upgrade interlock to trip return fans as well as supply	Complete
7	Extend Roof Drains	Improve runoff during extreme weather conditions	Canceled ¹
8	N2 Failure Prevention Mods	Ensure nitrogen shutoff credited as Passive Design Feature in BIO to prevent Central Storage Vault pressurization after earthquake	JAN 99
9	Counterfeit Bolt Inspection	Review usage of counterfeit bolts and replace any whose capacity will not meet BIO requirements for SC-1/2 systems (94-3 low cost issue)	Complete
10	Redundant Zone 3 HVAC Controllers	Provide redundant ΔP controllers in Zone 3/Zone 4 areas for reliable implementation of LCO 3.1, item 6	JAN 99
11	Drain Chemical Storage Tanks	Reduce inventories of KOH and HNO ₃ in outdoor storage tanks to meet requirements of AC 5.2.2, items e and f	Complete
12	Upgrade Vault Penetrations for Fire where Practical	Upgrade central storage vault boundaries to SC-1/2 (2-hour) fire barrier requirements where practical (BIO-IP will otherwise ensure that appropriate combustible control limits are established per AC 5.4.2, item 4c)	FEB 99
13	Repair Attic Beam	Compensate for omitted negative reinforcement at the junction of beams	Complete

¹ Existing foundation drains suffice to assure safety; the drain extensions were intended as a good practice to decrease water penetration near the foundation, but the proposed cost was judged to be too high for the low marginal benefit.

	UPGRADE ITEM	SCOPE	COMPLETION SCHEDULE
		B55 and B56	
14	Install Attic Leak Detection	Provide capability to detect and alarm if significant attic flooding occurs	Complete
15	Miscellaneous BIO Upgrades	a) Install Dock 18T Roll-up Door Interlock b) Verify Seismic Capacity of SC-1/2 HVAC ΔP Sensor Lines c) Provide Lab Propane Tank Seismic Supports d) Complete Any Additional SQUG Walkdowns e) Determine HVAC Scrubber Disposition f) Provide Seismic Restraint for Flammable Liquid Cabinets	Complete Complete Canceled ¹ Complete ² Complete Complete
16	Life safety Code Upgrades	Correct Deficiencies in B371 (Material Access Area) per Updated Facility Fire Hazards Analysis	DEC 98 (7 of 8 Complete)

1 Building 371 has determined that propane will not be used in the laboratory so restraints will not be required.

2 SQUG walkdowns supporting BIO implementation are complete; additional walkdowns may be performed early in FY-99 to identify additional cost-effective measures to reduce the EBE public dose below 5 rem (see Section 2 of this report).

4.0 INTEGRATED Pu CONSOLIDATION AND MANAGEMENT

The corresponding section of the IPP states that, "The insights gained from the Recommendation 94-3 studies in Phases I and II needed to be integrated with the actions committed to the Board under Recommendation 94-1 to an integrated Site plan for safe plutonium and uranium management and storage. These insights included the contribution to overall Site risk from residues, the improved safety of Building 371 with Priority upgrades and a new BIO, and the commitment to provide an assured facility (on- or off-site) for interim storage of Site SNM. Systems engineering principles were applied to develop and select a strategic approach for residue storage and shipment that incorporates timely consideration of contingencies, such as possible delays in Waste Isolation Pilot Plant (WIPP) opening. The approach that was selected is being implemented through the Site's 94-1 Program. The 94-1 Program is also reducing the risk of SNM storage by stabilizing and repackaging the material; the DOE-STD-3013 compliant packages and the POCs [pipe overpack containers] afford defense-in-depth for current storage and enable the longer term storage plans to be realized."

4.1 Accomplishments and Status Summary

The Site is actively investigating options with varying reliance on support from other sites in the DOE complex to accelerate 94-1 commitments in a manner that would support Rocky Flats Site closure by 2006. Some of these options are noted as contingencies in the revised IPP. Any that are chosen for implementation will be incorporated in future revisions to the Site Integrated Stabilization and Management Plan (SISMP).

In February, Kaiser-Hill evaluated the impact of delayed delivery of the prototype PuSPS to the Site and recommended that it not be installed in Building 707 as originally planned. The least cost Site option was to prepare material for off-Site shipment without packaging in DOE-STD-3013 containers, while packaging in Building 371 was the next most favorable option. The Department decided to install the packaging system from the prototype in Building 371 as there were too many uncertainties that could not readily be resolved affecting the complex-wide acceptability of not packaging the material to the DOE-STD-3013 standard at RFETS.

Kaiser-Hill has completed and begun to implement the plan for installation of the packaging portion of the prototype PuSPS in Building 371. The plan provides for installation in Room 3701 of separate ovens for oxide stabilization to complement the adjacent packaging system. Detailed design is being completed in phases to support construction, scheduled to permit initial metal packaging in December 1999 and oxide packaging beginning in April of 2000. Modifications to HVAC ductwork to support PuSPS have now been completed in conjunction with an ongoing project for wet combustible residues with overlapping requirements.

4.2 Deliverables

All current activities related to this task are governed by the SISMP and 94-1. There are no near-term milestones for the 94-3 program.

5.0 INTEGRATION OF SITE PLANS WITH DOE COMPLEX PLANS

The corresponding section of the revised IPP provides the Department's baseline plan to prepare for and complete the shipment of the Site's uranium and plutonium metal and oxide beginning no later than 2002. The baseline plan is a commitment that will be executed as planned unless sufficient impediments to off-site shipment emerge to cause the Department to abandon this strategy. The Department would then rely on Building 371 for safe onsite interim storage (Section 6). Significant Departmental plans which have the potential to impact Rocky Flats' implementation of this IPP are not formally completed, but include the draft *Accelerated Cleanup: Focus on 2006* plan, the Surplus Plutonium Disposition EIS, and the completed documents described below. The uncertainties associated with these interrelated plans are acknowledged, and are the subject of management actions by several managers outside the organization structure described in Section 1. This section of the IPP describes a mechanism for integrating and coordinating Departmental actions contributing to resolution of programmatic uncertainties, and shows the dependence of Site plans on the rest of the complex.

5.1 Accomplishments and Status Summary

Progress was made across the DOE complex in preparing for timely off-Site shipment of RFETS SNM, including:

- Progress continues to be made on preparing the K-area at the Savannah River Site (SRS) as the Department's preferred alternative to the Actinide Processing and Storage Facility (APSF) for receipt and storage of Rocky Flats SNM. NEPA evaluation was completed with a revision to the applicable Record of Decision issued in August. CD-3 approval for the initial construction phases has been obtained and work is underway on removal of old equipment and security upgrades. Overall design and construction efforts are on schedule to support initial shipments and material receipt in January of 2000.
- Rocky Flats pit shipments to Pantex continued in this quarter with more than 60% of the pit shipments now completed. Pit shipments are on schedule for completion in FY-99.
- An initial shipment of plutonium-bearing sand, slag, and crucible samples and standards to SRS was completed in FY-98. Packaging of sand, slag and crucible residues for production scale shipment is continuing, but actual shipment is dependent upon issuance of the residue EIS Record of Decision scheduled for November 6.
- The APSF received supplemental funding authorization at the end of FY-98 and is proceeding with construction procurement, anticipating a contract award in November. Meanwhile, Site preparation is being completed, including grading and digging of the foundation.

Overall, the Department believes progress is being made to support timely off-Site shipment of RFETS SNM.

5.2 Deliverables

IPP Milestone 5-1 Issue ROD selecting the plutonium immobilization site by February 1999.

The Surplus Plutonium Disposition EIS is now scheduled to support issuance of a Record of Decision by March 1999.

IPP Milestone 5-2 Prepare APSF, or alternate facility, at SRS for Rocky Flats SNM.

- a. Complete APSF design by August 1998.

APSF design has been completed, meeting this milestone.

- b. Initiate APSF construction in October 1998 with sufficient capacity to accommodate both SRS and Rocky Flats material, or begin modification of alternate facility to receive the RFETS plutonium.

Modification of the K-area at SRS to receive RFETS plutonium has been initiated. Start of APSF construction has been delayed approximately one month, although Site preparation has begun. Construction completion is still expected to support startup testing by December 2001; the schedule will be confirmed during the contract award process.

IPP Milestone 5-3 Prepare for and transport SNM off-site.

- a. Complete off-site shipment of pits to Pantex by FY99.

Over 60% of RFETS pits have been shipped to Pantex and shipments are on schedule for completion in FY-99

- b. Ship plutonium-bearing materials (sand, slag and crucible) from Rocky Flats to SRS in SSTs in June 1998.

An initial shipment of plutonium-bearing sand, slag, and crucible samples and standards to SRS was completed in FY-98. Packaging of sand, slag and crucible residues for production scale shipment is continuing, but actual shipment is dependent upon issuance of the residue EIS Record of Decision scheduled for November 6. The use of SSTs, when shipments are initiated, will depend upon plutonium content. Completing a shipment of plutonium bearing materials in an SST is scheduled in FY-99.

- c. Procure approved shipping containers (9975s) for metal and oxide shipment.

Just-in-time procurement of 9975's by SRS for transport of RFETS oxides to SRS for storage in K-area is planned to begin in the Spring of 1999.

5.3 Schedule of Activities

Kaiser-Hill has completed and begun to implement the plan for installation of the packaging portion of the prototype PuSPS in Building 371. The plan provides for installation in Room 3701 of separate ovens for oxide stabilization to complement the adjacent packaging system. Detailed design is being completed in phases to support construction, scheduled to permit initial metal packaging in December 1999 and oxide packaging beginning in April of 2000.

6.0 INTERIM STORAGE MISSION CONTINGENCY – BUILDING 371

This section corresponds with Section 6 of the revised IPP and addresses the following mission need for the Building 371 contingency option: "provide safe and secure interim storage of the Site's non-pit plutonium metal and oxide inventory, including any oxide generated due to residue and solution stabilization activities, if off-site shipment is not realized in a timely manner. The interim storage mission is to begin in 2002 and continue until the inventory is finally shipped off-site (no later than 2015)." Chapter 6 focuses on plans to validate and define specific scopes for upgrades in FY-98 to prepare Building 371 for the interim storage mission, to design validated upgrades in FY-99, and to implement them in the facility no later than 2002.

6.1 Accomplishments and Status Summary

The Validation Study to identify upgrades selected to prepare Building 371 for storage of the Rocky Flats Environmental Technology Site's non-pit Pu metals and oxides from 2002-2015 (interim storage) was completed and submitted to DOE RFFO in August as committed. The Department transmitted the completed study to the DNFSB after concurring with the conclusions and recommendations, including:

- The Safety Margin upgrades for relocating dispersible material (plutonium oxide) storage to the sub-basement was validated as significant to facility and Site risk reduction in 2002 although these upgrades are not required to meet the 5 Rem Site boundary dose validation criterion applicable for design basis events. Sub-projects for hardening of the vault ceilings to survive seismically-induced collapse of the main floor and basement (not expected for earthquakes with return periods less than ~40,000 years) and to equip the vaults with adequate capacity for storage of ten-gallon cans will be designed in FY-99 for installation by 2002.
- A new upgrade to replace credited HEPA filter stages that have experienced uncertain loss of tensile strength from wetting during prior deluge system testing was identified, validated, and scheduled for accelerated implementation in FY-99 to realize immediate risk-reduction benefits.
- The engineering study of the hazard posed by inactive scrubber tanks in the Building 371 exhaust systems that contain combustible pall rings concluded that spark or ember ignition of the polypropylene pall rings was not mechanistically credible but that HEPA filter plugging was possible should they be ignited. Moreover, removal of the pall rings (versus the entire scrubber tanks) was found to be practical with respect to cost and facility operating impact. Consequently, pall ring removal was validated as a defense in depth risk reduction measure, a Work Package for removal will be prepared in FY-99, and a removal schedule coordinated with D&D activities will be established when the package is complete.
- The Safety Margin upgrade for emergency plan and procedure upgrades was validated for additional effort in the form of ongoing annual updates. Recently developed seismic response and HEPA filter challenge strategies are addressing many of the original concerns, but details warranting ongoing attention were identified.
- A new upgrade to study the potential for further reducing seismic risk in Building 371 by accelerating D&D holdup removal in specific areas was the final upgrade validated. Holdup removal has only limited potential impact on facility and Site risk, but it has the

advantage of supporting Site closure directly with some risk benefit. While accelerated holdup removal is not mandatory, an evaluation will be completed in FY-99 to determine whether otherwise necessary D&D activities can be scheduled for completion prior to 2002 to achieve reduction in seismic risk.

The balance of the studied upgrades were not validated, principally because insights from the BIO development process and risk reductions already afforded by the priority and BIO-required upgrades had reduced their potential risk-reduction benefits to insignificant levels not commensurate with the costs involved. In addition, ongoing pit shipments to Pantex obviated the need to relocate this stored material within the facility. Security upgrades were not within the defined scope of the study which focussed on nuclear safety. None of the potential nuclear safety upgrades were required to ensure that future Safety Analysis Report accident doses for the interim storage mission would meet established guidelines.

6.2 Deliverables

Milestone 6-1 Complete validation assessments for the Interim Storage upgrades (those that are not "Priority" in Appendix C), including a schedule for design engineering to be performed in FY99, documented, and reported by August 1998. Provide the plan for the validation effort to the Board by March 1998.

The plan was completed and issued in March of 1998 as committed. The validation effort was completed in August of 1998 as committed and formally transmitted to the DNFSB by the Department on October 20, 1998.

Milestone 6-2 Complete design of validated upgrades by September 1999, including a construction/implementation schedule which ensures completion by 2002.

Statements of Work were completed in October and design contracts are scheduled to be awarded in December. Design and construction/implementation schedule completion are targeted for July 1999 for the construction upgrades. The two others involving D&D activities are being separately addressed to ensure a planning status equivalent to design completion by September 1999.

Milestone 6-5 Assess the following "Go/No Go" criteria for assured success of off-site shipment in Section 5 and report when they are satisfied:

1. APSF construction is funded and underway with sufficient storage capacity committed to RFETS material or alternate acceptable storage off-site is authorized, funded, committed for storing RFETS material, and construction is underway.
2. The ROD for a plutonium disposition site is issued and identifies SRS as a disposition site or the MD PEIS ROD is amended to delete this condition as a requirement for receipt of RFETS material and any alternative NEPA requirements are fulfilled.
3. The PuSPS at Rocky Flats is operational and authorized to begin material stabilization and packaging or the Department has established firm plans for packaging to be performed off-site.
4. A shipment of plutonium-bearing materials from RFETS to SRS in SSTs has been successfully completed; specific plans are in place to provide for future shipments.
5. Adequate assurance is provided that off-site pit shipments are on schedule for completion by the end of FY99.

When the Go/No Go criteria are satisfied, all remaining work (including design, construction, or other implementation) on the validated upgrades and the SAR to establish the Building 371 interim storage option may be discontinued by the Department. The Department will formally notify the Board before the upgrades are discontinued.

Section 5.0 of this report addresses the status of complex-wide activities supporting fulfillment of these criteria. Based on the progress reported in Section 5, the Department concludes that criterion 5 above has been nearly satisfied and will soon be met resulting in a "Go" conclusion. Criterion 1 has nearly been satisfied for APSF or the K-Area option and progress is expected to afford a definitive conclusion in the coming quarter. Criterion 4 (demonstration shipment) may be met in the coming quarter and will be met no later than the Jan.-Mar. quarter when criterion 2 (material disposition site ROD) is also expected to be satisfied. Thus, criterion 3 (PuSPS operational) is forecast to control the schedule for a final decision. Efforts are currently judged to be on track to support a favorable, "Go", judgment in calendar 1999.

6.3 Schedule of Activities

Intermediate milestones due in the coming quarter supporting the completion of Interim Storage Mission deliverables for FY-99 include:

- Award Design Contract for Sub-Basement Vaults December 1998
- Complete evaluation of Go/No Go Criterion 1 December 1998

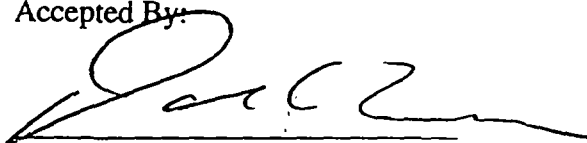
**DOE EVALUATION OF WORK PACKAGE ADEQUACY
TO ENSURE THAT FUNCTIONAL REQUIREMENTS OF
BUILDING 371 94-3 UPGRADES HAVE BEEN
SATISFACTORILY MET**



**Assessment ID #98-139-ENG-371
October 27, 1998**

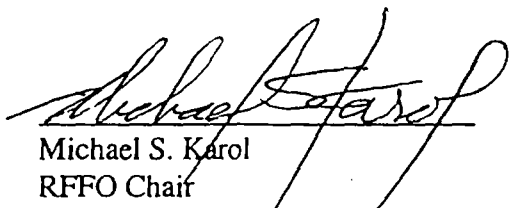
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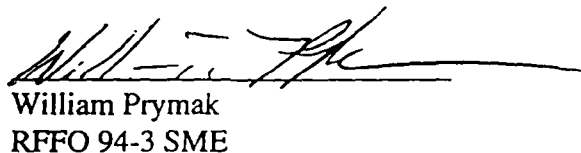


David C. Lowe
Assistant Manager of Engineering

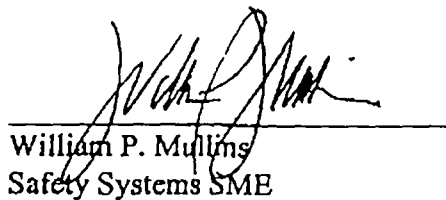
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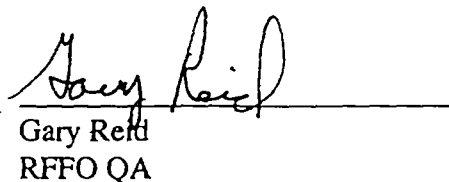
Michael S. Karol
RFFO Chair



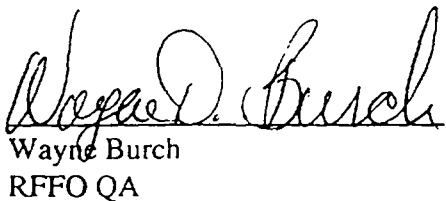
William Prymak
RFFO 94-3 SME



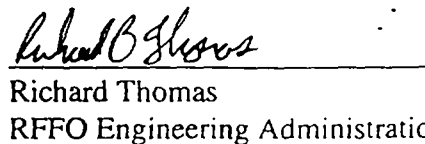
William P. Mullins
Safety Systems SME



Gary Reff
RFFO QA



Wayne Burch
RFFO QA



Richard Thomas
RFFO Engineering Administration

ASSESSMENT REPORT

DOE Evaluation of Work Package Adequacy to Ensure That Functional Requirements of Bldg. 371 Upgrades Have Been Satisfactorily Met

Assessment ID Number: 98-139-ENG-371

Summary:

DNFSB staff has raised questions about the effectiveness of two Bldg. 371 Priority Upgrade work packages in satisfying the functional objectives established in the Recommendation 94-3 Implementation Program Plan (IPP). A DOE-led independent team with extensive experience in engineering, quality assurance, facility oversight, and authorization/safety basis development and management, conducted a detailed review of the design and construction work packages for the Priority Upgrades and a sample of remaining 94-3 IPP upgrades (See Appendix A for complete listing). The assessment team was assisted by representatives of Kaiser-Hill and its associated sub-contractors from whom the team received timely and supportive cooperation. That fact enabled a significant number of apparent questions and issues to be resolved during the course of the review. The following are the observations of the assessment team regarding the extent to which functional requirements called for by the Upgrades have been satisfied.

- 1. The team found that the work to achieve the safety margin enhancement called for by the Recommendation 94-3 Integrated Program Plan Priority Upgrades (IPP Table 3.1) is substantially complete and effective. The functional requirements were properly incorporated in the work packages (design and IWCP construction packages) with some questions yet to be resolved. (See Appendix B for items requiring contractor response)*
- 2. A selection of the BIO Upgrade (IPP Table 3.2) work packages were sampled by the assessment team. Only the design and applicable testing portions of these packages was assessed. The team found that for the upgrades examined, that the designs adequately reflected applicable functional requirements. Routine self-assessment and oversight practices can provide adequate assurance that implementation of the work packages will achieve the intended functional requirements of the upgrades. (see observation #4 regarding testing adequacy)*
- 3. The assessment team determined that the design objectives, as described in the engineering design packages for the Priority Upgrades, were consistently incorporated in the IWCP work packages for construction.*
- 4. The assessment team determined that testing to confirm achievement of functionality in upgraded systems and components was acceptable for method, conduct and results evaluation with the exception of one instance where this review could not confirm that the tests and inspections performed met the design acceptance criteria (See Appendix B for item requiring contractor response).*

5. *No imminent safety issues have been identified by the assessment team. However, the assessment team was left with questions regarding the effectiveness of corrective actions for previously noted deficiencies as well as potential weaknesses in project scoping and trace-ability of BIO/SER functional requirements. The adequacy of design reviews, processes for confirmation of upgrade operability, and integrated assessment of large scale corrective action situations are also areas that warrant further assessment by Kaiser-Hill and its subcontractors. (Note: project scoping for the BIO upgrades is improved relative to Priority upgrades)*
6. *The team observed numerous documentation completion deficiencies during examination of work packages that still existed after the majority of physical work had been completed. These led the team to question the effectiveness of the criteria for the normal project milestone of Beneficial Occupancy to provide a sufficient measure of completeness for declaring operability under the requirements of the BIO/SER. The team concluded that Kaiser-Hill should confirm with its Bldg. 371 facility operating contractor that documentation requirements in work packages fully support BIO administrative control requirements for declaration of SSC operability and also assure timely administrative closeout of completed work packages. (this item requires contractor response)*
7. *Bldg. 371 management needs to assure that subcontractor designers fully understand the functional requirements as expressed in the approved BIO/SER. The quality of Bldg. 371 design reviews should be sufficient to confirm that designs satisfy the applicable functional requirements. A self-assessment should be conducted to verify these competencies. (this item requires contractor response)*
8. *Kaiser-Hill needs to ensure that suppliers of design and construction services are functionally competent in key procedures of site infrastructure (e.g. BIO, SER, DES 210, IWCP manual, etc) prior to contract performance, or establish appropriate compensatory measures until site specific authorization basis proficiency is confirmed. (this item requires contractor response)*
9. *Kaiser-Hill integration of the feedback and improvement actions resulting from the CURE notice issued to its subcontractor, did not appear to involve all parties affected by the underlying challenge to the authorization basis posed by major subcontractor QA deficiencies. DOE RFFO should ensure that the integration issues, of potential sitewide significance, raised in the RFEC corrective action plan are fully resolved prior to acceptance of the associated Price Anderson Amendment Act closeout action. (this item requires contractor response)*

Background:

This DOE Rocky Flats Field Office (RFFO) assessment was initiated in response to a suggestion from the DNFSB in a letter dated August 13, 1998. The letter transmitted the results of a DNFSB Staff Issue Report on implementation of Recommendation 94-3 at the Rocky Flats Environmental Technology Site. In this report, the Board staff reported extreme difficulty in reviewing the work packages for completed Priority Upgrade

modifications and identified several technical errors in the data that they reviewed. The Board staff commented that there appeared to be adequate margin in the designs reviewed such that these errors should not affect the upgrade's ability to perform the intended safety function.

In transmitting the staff review to DOE, the DNFSB concluded that it would be prudent for DOE to evaluate the Priority Upgrade work packages independently to ensure that the functional requirements intended to be achieved with the upgrades have been met. In a letter of August 28, 1998, the RFFO informed the Acting Assistant Secretary, Environmental Management, that it intended to adopt the DNFSB suggestion.

As the Board staff recognizes, the hazards control basis for Building 371 is described in the recently implemented Basis for Interim Operation (BIO). The BIO is an integrated set of technical and management system functional requirements that, when satisfied, provide adequate protection for workers, the public and the environment against the hazards of currently authorized work. The collective margin of safety for operations in Building 371 is tailored to the specifics of missions defined by the overall RFETS retirement strategy. The Priority Upgrades identified in Table 3-1 of the Recommendation 94-3 Implementation Program Plan (IPP) are intended to enhance the baseline margin of safety for the facility.

The safety significance of the individual Priority Upgrades varies; from projects that enhance widely applicable hazard controls (e.g. emergency egress routes) to those that are narrowly targeted at low frequency, high consequence accident scenarios (e.g. facility protection following earthquakes). Some of the functions delivered by the upgrades provide continuing, relatively active, defenses (e.g. plenum deluge system); others are relatively passive elements (e.g. attic piping supports) of the authorization basis. The success of each Priority Upgrade depends upon the designer having an effective understanding of how the functional requirements addressed by the specific upgrade are credited in the BIO and its accompanying System Evaluation Reports.

Within the Kaiser-Hill Management and Integrating contract structure, several different organizations, within several different independent companies, must integrate their efforts to ensure that expected functional requirements, identified by each upgrade project are satisfied. The Kaiser-Hill Integrated Safety Management System contains commitments to site common infrastructure mechanisms intended to achieve a satisfactory degree of integration for safety significant work. For the Priority Upgrades, project management was coordinated by Kaiser-Hill staff responsible for the overall Recommendation 94-3 implementation. Operational responsibility for definition and maintenance of the Bldg. 371 safety basis is assigned by Kaiser-Hill to Safe Sites of Colorado. Most of the work of design and construction was assigned to a Kaiser-Hill master task subcontractor, Rocky Flats Engineers and Constructors.

The objective of the DOE assessment was to confirm that the safety margin enhancements, identified as outcomes of the Recommendation 94-3 IPP Priority Upgrades, were fully achieved. The assessment team received briefings from Kaiser-Hill

project management staff at the commencement of its review. From this information it was determined that for the Priority Upgrades the “work packages”, as identified by the DNFSB staff, consist of the combination of the design description and approval package¹ and the Integrated Work Control Program construction work package². Review of each work package was accomplished by validating that:

- 1) Applicable functional requirements are properly included in the design,
- 2) The approved design will perform its intended function, and
- 3) Completion of the approved work package satisfies quality documentation requirements for the future integrated safety management of the modified facility safety envelope and authorization basis.

Method of Confirming Functional Requirements:

The DOE assessment team established lines of inquiry for each major project stage (Table 1). These were used to confirm that Priority Upgrade functional requirements were faithfully handed down at each stage of the project implementation. DOE reviewers, with extensive experience in engineering, quality assurance, facility oversight, and authorization/safety basis management, conducted interviews, documentation reviews, facility walk-downs, and team review and deliberation. In recognition of the importance of this assessment to the objectives of the Recommendation 94-3 IPP, Kaiser-Hill provided the DOE assessment team the assistance of an engineering manager and arranged for independent design reviewers familiar with site practices.

Functional requirements for the design process are found in the Bldg. 371 BIO and the associated System Evaluation Reports. Design reviewers were selected with civil/structural (i.e. seismic), fire protection, and mechanical systems expertise to cover the range of safety functions addressed by the Priority Upgrades. The engineering subject matter experts examined the work packages of each Priority Upgrade and shared questions and issues with team members who were reviewing the post-design features of the work packages. The result was an integrated assessment that could confirm that the functional requirements of each upgrade (developed 18 months ago) reflect the current approved authorization basis.

This integration step was necessary because the assessment was directed at only one aspect of the Recommendation 94-3 IPP process, to define and implement an enhanced safety envelope for Bldg. 371. The assessment team focused on the Priority Upgrades (IPP Table 3.1), because they were begun before the BIO was finalized, and thus had the greatest vulnerability to errors in specification of functional requirements. The team noted that the BIO Upgrades (IPP Table 3.2) comprised a second set of work packages that were begun closer to BIO approval, and as a result were likely to be less susceptible to confusion about what functional requirements were implicated in the Upgrade. The assessment team sampled the design packages for BIO upgrades (Appendix A).

¹ I-V51-COEM-DES 210, Design Process Requirements

² MAN-071-IWCP, Integrated Work Control Manual

TABLE 1

FUNCTIONAL REQUIREMENT FLOW	INSTRUMENT	SCOPE
BIO/SER/DESIGN PACKAGE	Design Review: <ul style="list-style-type: none"> • 1 Siesmic/Structural expert • 1 HVAC-Mechanical Engineer • 1 Fire Protection Engineer • DOE oversight 	<ul style="list-style-type: none"> • Are functional requirements properly included in the design? • Are tests(or inspections as applicable) adequately defined by the design package? • Will the design perform it's intended function? • Are SERS procedures updated as required? Has the Baseline Document Control Form (BCDF) been properly filled out and executed?
WORK PACKAGE/CONSTRUCT	QA Validation: <ul style="list-style-type: none"> • 2 DOE QA Engineer 	<ul style="list-style-type: none"> • Close-out of Fraudulent QA issue (Attic seismic piping) • Are the design objectives as described in the engineering design package achieved in the construction IWCP work package? • Are Design Acceptance Criteria properly integrated into work packages? • Is there documented evidence of Acceptance Criteria completion? • Are inspection results properly dispositioned? e.g. NCR's rework/accept as is • Are QA records collected per QA requirements?
TEST/INSPECT	Test Audit as well as QA validation and Design Review: <ul style="list-style-type: none"> • 1 DOE Test Engineer • 94-3 SME 	<ul style="list-style-type: none"> • Are Design Acceptance Criteria properly integrated into tests/inspections? • Are tests properly conducted? • Are test results evaluated and dispositioned?
OPERATION	IVR	Completed by others

Observations of the Assessment Team

1. The team found that the work to achieve the safety margin enhancement called for by the Recommendation 94-3 Integrated Program Plan Priority Upgrades (IPP Table 3.1) is substantially complete and effective. The functional requirements were properly incorporated in the work packages (design and IWCP construction packages) with some questions yet to be resolved. (See Appendix B)

During its review of completed work, including the work packages the team found generally that the enhanced functional requirements expected from each upgrade were recognized, understood, and translated effectively by responsible designers for each of the work packages. Appendix A to this report indicates what design discipline reviews were applied to the different Priority Upgrades. Appendix B indicates outstanding questions at the completion of the assessment.

Several upgrades involved calculations performed to confirm the seismic adequacy of existing configurations in the HVAC system for the building. Other upgrades also involved calculations. Assessment team reviewers checked calculations for method and adequacy. Unless noted in the Summary of Questions/Issues (Appendix B) the results of these independent checks were satisfactory. The team concludes that further technical review of these work packages is not needed.

The Priority Upgrade work packages comprise a large and diverse population of specific technical objectives; the assessment team reviewers generated a large number of questions owing to the often disordered condition of the documentation and the fact that some packages have not received their administrative closeout review. The large majority of these questions were resolved by presentation of supplemental information by contractor staff. Some issues were resolved by direct observation of construction results in the facility.

The team did observe a relatively small number of specific instances where understanding of Upgrade intent may not always have been accurately translated into expected work package (i.e. design or construction) product. An example of this was specification of fire retardant sealing materials for room 3206. The design and the IWCP work package were unclear about use of the proper sealant even though 3M fire retardant was clearly intended to be used in the walls, floor and ceiling penetrations. The assessment team was able to verify use of the correct material (and fully resolve the issue) by a direct on site inspection of a sample of the penetrations as well as by examination of installation records specifying material inventories. There is no particular pattern of cause for the items noted. Appendix B details the unresolved exceptions/questions and indicates action that is likely to remedy each condition. It is the DOE team's judgement that resolution of these issues can bring the work on the Priority Upgrades to timely completion.

The team did confirm that the documentation of the upgrades is more difficult to review than it reasonably should be and also concluded that final closeout of work packages (including final updates to authorization basis documentation) has not been accomplished in a timely manner. The team noted that some actions to improve some of these conditions have been promised. Later conclusions in this report address further actions the team believes may be needed to reach an acceptable state of documentation for safety basis upgrade work packages in the future.

2. A selection of the BIO Upgrade (IPP Table 3.2) work packages were sampled by the assessment team. Only the design and applicable testing portions of these packages were assessed. The team found that for the upgrades examined that the designs adequately reflected applicable functional requirements. Routine self-assessment and oversight practices can provide adequate assurance that the work packages will achieve the intended functional requirements of the upgrades. (see observation # 4 regarding testing adequacy)

The team examined work packages for design of eight of the BIO Upgrades. In each case the team found that the functional requirements of the upgrade had been translated into adequate design work packages. In light of the other team conclusions regarding the effective flow-down of design requirements into construction work packages, the assessment team recommends that added, independent scrutiny of work package development and implementation for the remaining upgrades is not needed.

3. The assessment team determined that the design objectives, as described in the engineering design packages for the Priority Upgrades, were consistently incorporated in the IWCP work packages for construction.

During the conduct of this aspect of work package adequacy, the assessment team examined the effectiveness of inspection practices for ensuring satisfaction of design functional requirements. The assessment team QA Engineers confirmed the translation of acceptance criteria from the design package into inspection points of the IWCP package. Subsequently they examined documentation of work completion to confirm that expected inspections were performed. The engineering judgement of the assessors was used to validate that the construction tasks described in the IWCP work packages did in fact describe an installation procedure that accomplished the engineer's intended design.

In course of this evaluation the assessment team was aware that the responsible design and construct sub-contractor (RFEC) had experienced a significant Price Anderson Amendment Act (PAAA) non-compliance event with its Quality Assurance Program in the area of inspection of completed work. This fact originally came to light (November 1997) during as built confirmation of one of the Priority Upgrades – Attic Piping Seismic Bracing. The impact of this deficiency on the overall adequacy of the Priority Upgrades is discussed in subsequent sections of this report. The direct result of this condition was substantial re-inspection and some rework of the added piping supports installed by this

Upgrade. The assessment team reviewed the records of this rework and found it adequate.

The assessors noted that very few work packages had gone through Final Closeout although work had been complete for some time (June 1998 or earlier). In general closed-out work packages were more complete and accurately assembled, a factor that enhances the ease of any subsequent independent review. This issue is addressed in later conclusions of this report.

4. The assessment team determined that testing to confirm achievement of functionality in upgraded systems and components was acceptable for method, conduct and results evaluation with the exception of one instances where this review could not confirm that the tests and inspections performed met the design acceptance criteria (See Appendix B).

Eight Priority Upgrade and three BIO Upgrade work packages that included system or component testing requirements were examined. In general testing requirements were determined to be adequately specified and carried out. In the course of this review one issue was identified regarding the adequacy of completed testing (See Appendix B). A test of the nitrogen system for the deluge system (System 2) failed because of excessive leakage. No records could be located that show the system was repaired and retested satisfactorily. Also, interviews with Kaiser-Hill and SSOC engineers revealed that a complete retest of the system had not been performed. The deluge system has been declared inoperable until these issues are resolved. Numerous errors were also noted in system diagrams contained in the System Evaluation Reports (SER's). However, test and system operating procedures reflect accurate valve lineups.

Additionally, DNSFB staff raised questions about whether the design and testing of the Plenum Deluge modifications adequately demonstrate the intended functional requirements for the backup nitrogen supply for the system. Assessment team reviewers examined the design and IWCP work packages for mechanical adequacy and testing effectiveness. Reviewers also examined responses, developed by contractor engineers, to specific questions from Board staff about the design adequacy. These revised results were found acceptable.

5. No imminent safety issues have been identified by the assessment team. However, the assessment team was left with questions regarding the effectiveness of corrective actions for previously noted deficiencies as well as potential weaknesses in project scoping and trace-ability of BIO/SER functional requirements. The adequacy of design reviews, processes for confirmation of upgrade operability, and integrated assessment of large scale corrective action situations are also areas that warrant further assessment by Kaiser-Hill and its subcontractors. (Note: project scoping for the BIO upgrades has improved relative to the Priority upgrades)

The assessment team observed that the exceptions noted in Appendix B involve the enhancement of protection against low frequency events and believes that none of the conditions noted represents an imminent safety hazard. That is not to say that the

technical issues raised are not safety significant. None of the conditions was perceived by the assessment team to have urgent priority, however the team made a practice of informing the Kaiser-Hill representatives to the assessment, as the items were identified, so that they could initiate timely action to resolve them.

As an example of effective response, following the assessment team's inquiry about evaluation of the status of corrective actions for RFEC Quality Assurance deficiencies, the Kaiser-Hill contract technical representatives determined that a number of Nonconformance Reports originated by RFEC had not received safety screens by Bldg. 371 staff. These NCRs were promptly forwarded to the facility operating organization for their review. In each instance the assessment team has deferred ultimately to the normal evaluation and tracking processes of the contractors to determine what, if any, specific compensatory or corrective action is required for Appendix B questions/issues based upon BIO requirements.

The DOE team also assessed the extent to which the reported difficulty in review of two Priority Upgrade work packages (i.e. by the DNFSB staff) might be an indicator of systemic problems that would impact the remaining 94-3 Upgrades. As a general observation review of the design packages and associated IWCP packages was difficult and very time consuming. Too often with the Priority Upgrades, attention to detail was substandard for implementation of the site procedures for preparing and executing the work packages. These observations call into question the ability of the personnel responsible to properly control IWCP packages as a key record documenting installation of these safety upgrades.

The DOE team learned that the design and construction work packages for most of the design-related Priority Upgrades were performed by Rocky Flats Engineers and Constructors (RFEC) a master task subcontractor to Kaiser-Hill. The team was aware that Kaiser-Hill had previously (November, 1997) issued RFEC a contract Cure Notice about significant Quality Assurance Program defects that were found to exist during the period when the Priority Upgrade work was being done. The Cure Notice is significant contract enforcement action, one that would be expected to produce widespread feedback and improvement actions among the Kaiser-Hill team.

During this review DOE assessment team members questioned Kaiser-Hill project managers and examined a large body of documentation regarding the corrective action plans for the nonconforming RFEC Quality Assurance condition. The DOE team sought to determine if the exceptions noted in the present review (Appendix B) stemmed from the same causes being addressed in these corrective actions. The assessment team found the extent of the RFEC causal analysis and the scope of proposed corrective actions³ to be comprehensive. However, the team noted that a number of interface and integration problems with the site infrastructure were identified by the RFEC causal analysis. This suggested that action is needed by Kaiser-Hill and other site contractors, in addition to

³ Corrective Action Plan / Causal Analysis Resubmittal, Task 63, Subtask 12, B371 Attic Piping Seismic Supports: Rocky Flats Engineers & Constructors, LLC (RFEC) – Master Task Subcontract No. 603331MG; RFEC Ltr. No. S-AECCM-1819 of February 4, 1998

oversight of RFEC corrective actions. Team members reviewed key implementing actions^{4, 5, 6} and summary reports of effectiveness, including one evaluation conducted by Kaiser-Hill QA⁷. Little evidence of such action by non-RFEC parties could be found.

The team developed a positive impression of the actions taken by RFEC to increase construction quality assurance and quality control. For example, actions to increase the questioning attitude among all levels of the construction organization were forceful and well-directed as indicated by the RFEC effectiveness assessment (footnote 6) conducted approximately six months after the corrective actions were put in place. In addition, action is now taken to ensure that administrative review of completed IWCP packages is conducted by QA personnel prior to issuance of the Beneficial Occupancy Notice; this practice appears to exceed the conditions established in the governing site procedure. The importance of this action had been arrived at independently by the DOE assessment team and is addressed further in a subsequent conclusion item.

The assessment team noted that RFEC actions were dominated by the construction (i.e. IWCP-controlled) aspects of its previous quality assurance problems. While the DOE assessment team focused its functional reviews on design and IWCP work packages, both document reviews and interviews raised further questions. Questions about the effectiveness of management processes both upstream (task scoping and design review) and downstream (contractor integration, beneficial occupancy and project closeout) of the critical IWCP preparation step where RFEC focused its efforts. The majority of specific defects noted by the assessment team fall outside the construction process. The assessment team has developed four distinct concerns related to the effectiveness of corrective action for the conditions noted in the Priority Upgrade work packages. These are related in the remaining conclusions of this report.

6. The team observed numerous documentation completion deficiencies during examination of work packages that still existed even after the majority of physical work had been completed. These led the team to question the effectiveness of the criteria for the normal project milestone of Beneficial Occupancy to provide a sufficient measure of completeness for declaring operability under the requirements of the BIO/SER. The team concluded that Kaiser-Hill should confirm with its Bldg. 371 facility operating contractor that documentation requirements in work packages fully support BIO administrative control requirements for declaration of SSC operability and also assure timely administrative closeout of completed work packages.

⁴ Extent of Condition Review and Validation Plan for Construction Tasks Completed by RFEC, Revision 1, March 1998

⁵ CURE Notice Response – Extent of Condition Review and Validation Plan (EOCP), Final Report Submittal: Rocky Flats Engineers & Constructors, LLC (RFEC) – Master Task Subcontract No. 603332MG, May 12, 1998

⁶ Submittal of Corrective Action Effectiveness Assessment Report for NTS-RFO-KHLL-371OPS-1997-0002 Corrective Action Plan Item 16, July 30, 1998

⁷ Kaiser-Hill Quality Program Verification of Rocky Flats Engineers and Constructors (RFEC) CURE Notice Response – LCS-065-98, May 27, 1998

The assessment team considers the number of deficiencies, noted in work packages and during post-Beneficial Occupancy Notice walk-down, to be too high. Some of these (attic piping seismic hanger construction and installation defects and QA deficiencies; testing failures in plenum deluge modifications) directly impact the operability (i.e. functionality) of the affected structures, systems and components. These conditions were not discovered before the Beneficial Occupancy Notice had been completed by the facility.

The difficulty the DOE assessment team faced in tracing functional requirements suggests that it would be difficult for facility personnel to conduct such a comprehensive review, at the time of the Beneficial Occupancy Notice, unless the packages were of good completion quality and provided for clear trace-ability of functional requirements. Under the new BIO, administrative controls for configuration management contain requirements that are intended to ensure that the safety basis documentation for credited functional requirements is maintained accurate and in pace with declarations of operability against equipment or design feature Technical Safety Requirements.

7. Bldg. 371 management needs to assure that subcontractor designers fully understand the functional requirements as expressed in the approved BIO/SER. The quality of Bldg. 371 design reviews should be sufficient to confirm that designs satisfy the applicable functional requirements. A self assessment should be conducted to verify these competencies.

Although no recurring technical errors were found during the assessment team reviews, the team still concluded that the number and in some cases the potential significance of the technical questions raised were a basis for further inquiry. The assessment team concluded that the overall record of upgrade performance indicates that extensive supplemental inspection and design review as well as considerable corrective action resulting from RFEC QA deficiencies has been required to ultimately permit the DOE assessment team to conclude that the functional requirements of the upgrades have been satisfied. Much of this added work was accomplished after the reported "completion" of the upgrade.

The assessment team also noted that in many cases the difficulty observed in tracing the implementation of authorization basis functional requirements was made difficult by the fact that designers did not appear to develop their design problem and solution statements in terms that reflected full understanding of how functions were credited in the BIO. It was understood that much of the Priority Upgrades work was in progress at the same time the BIO was being written. Kaiser-Hill project managers indicated they had taken steps to improve this condition in writing their initial statements of work for the BIO Upgrades. The assessment team wishes to take note that the Bldg. 371 management has the primary line management responsibility for implementation of the BIO.

While the facility management is directly involved at each major step in the implementation of design and construction, it was not evident what criteria building reviewers were using to confirm the adequacy of functional requirement incorporation in

the first step of design definition. In light of the range of technical issues noted by the DNFSB staff and by the assessment team, it was concluded that attention should be drawn to the unique role and opportunity afforded to the facility during the review of the design to confirm that there is effective agreement among Bldg. 371 management, Kaiser-Hill, any third party designer, and if necessary DOE/RFEO, that the design will in fact satisfy the BIO assumptions. Some improvement in the thoroughness of design approval stage reviews may be influential in improving the previously observed rate of project oversight and field rework.

Because of the diverse nature of backfits to systems, structures and components that sometimes do not have complete design basis information, or for which future use differs from past expectations, it is incumbent on the owner of the BIO/SER to ensure that third party designers are familiar with the assumptions of the safety basis. Designers accustomed to more conventional situations need particularly to understand any accepted risks associated with facility "as is condition" and the relatively short remaining mission that have driven decisions not to restore all facility conditions to contemporary design standards. The assessment team believes attention to the tailored attributes of the BIO must be reflected in the design approval packages if the difficulties with tracking functional requirements are to be reduced.

8. Kaiser-Hill needs to ensure that suppliers of design and construction services are fully qualified in key procedures of site infrastructure (e.g. BIO, SER, DES 210, IWCP manual, etc) prior to contract performance or establish appropriate compensatory measures until site specific authorization basis proficiency is confirmed.

The assessment team was unable to gain assurances that the magnitude of deficiencies in the RFEC implementation of applicable Quality Assurance requirements have been examined by Kaiser-Hill for potential root causes in K-H process for the selection and qualification of engineering and/or construction contractors. It is recognized that under the performance-based contract, with standards-based integrated safety management, there are many incentives to refine or even restructure key work planning mechanisms to increase their effectiveness and efficiency. With projectization each new contractor must be an efficient study of RFETS site-unique features and mechanisms, particularly as regards definition and maintenance of facility authorization bases. The use of fixed price contracts for design/construct packages would appear to place a further premium on site specific knowledge, perhaps as early as being placed on an authorized bidders list.

The assessment team noted that the RFEC corrective action plans identified a significant number of issues (e.g. see footnote 3:EI1, IR1.1, IR1.2, RR1.1, etc) that required Kaiser-Hill response to resolve. These issues appear to be ones involving practices for achieving effective integration as called for in the approved Integrated Safety Management Plan. The team was unable to find evidence of Kaiser-Hill action to assess the functional effectiveness of the RFEC actions, until after its inquiry. In light of the potential generic applicability of some questions raised by RFEC, the assessment team believes that some documented evaluation of the non-RFEC contributors to the breakdown in design/construct subcontractor effectiveness is warranted.

The team learned that several of the key infrastructure procedures implicated in these events (DES 210 and IWCP) are in the midst of significant revisions that are related increasing the ability to projectize work planning toward site closure. Major changes in these systems can represent moments of vulnerability similar to that which led, by way of RFEC's inadequate capacity to implement site infrastructure requirements, to most of the deficiencies noted in this report. This assessment team recommends that an effort be made to confirm incorporation of the RFEC lessons learned into the forthcoming changes to key infrastructure mechanisms and the that procurement standards for site-specific knowledge of design and/or construct contractors be examined to determine the part these might have played in conditions that ultimately led to the Cure Notice.

9. Kaiser-Hill integration of the feedback and improvement actions resulting from the CURE notice issued to its subcontractor, did not appear to involve all parties affected by the underlying challenge to the authorization basis posed by major subcontractor QA deficiencies. DOE RFFO should ensure that the integration issues, of potential sitewide significance, raised in the RFEC corrective action plan are fully resolved prior to acceptance of the associated Price Anderson Amendment Act closeout action.

The team concluded that, while there is evidence that RFEC has made progress in correcting its construction shortcomings, that effort may not represent a sufficient resolution to a problem of the magnitude characterized in response to the Cure Notice. The team observed that there appeared to be a lack of facility (i.e. Bldg 371 or any other) involvement in reaching agreement on the adequacy of the corrective action plan or in the review of such critical documents as the "Extent of Condition Report" which directly addresses work in more than one facility. In light of the considerable variability in the authorization basis documentation from facility to facility, the assessment team questions if review within Kaiser-Hill provides sufficient visibility to the details of corrective actions. The team believes that, because functional requirements flow directly from the facility responsible Bldg. 371 BIO/SER, the facility management team should have a more prominent role in disposition of such significant conditions.

The team has been told that Kaiser-Hill has in progress a multi-disciplinary evaluation of RFEC effectiveness of corrective action. It is recommended that Bldg. 371 representatives participate in this effort.

APPENDIX A, Priority / BIO Upgrade Review Summary

DA - Design is adequate
 TA - Testing is adequate
 CA - Construction is adequate
 ACR - Awaiting Comment Resolution
 TBR - To Be Reviewed
 IR - In Review

Reviewers	Design				Testing	Constr. & QA	Status of DOE Review/open issues
	Seismic	Fire Prot.	HVAC/ Mech.	Other		*	
George Antaki	Brian Olson	John Sur	Seismic	Bill Prymak	Gary Reid	Wayne Burch	
94-3 IPP, Table 3-1, Priority Upgrades							
Repair of Construction Line 'T' joint & Seismic supports for HVAC bypass valves				Loceff DA			
HEPA filter Plenum Demister Analysis and Inspections			DA				
Penetrations for Room 3206 Fire walls		DA			TA	CA	
Combustible Loading Control Program (CLCP)							No design/administrative
Seismic HVAC upgrades, Plenum & fan seismic structural supports upgrade	ACR				TA	CA	Seismic evaluation of HVAC duct Pittsburgh-lock joint seam
Fire Doors - Repair and/or Replace		DA			TA	CA	
Subsurface Drain System Upgrades				Peregoy DA	TA	CA	
HVAC supply isolation capability (supply side HEPA filters)	ACR		DA		TA		Verification of seismic capacity-vs-demand of the intake HEPA filter bank tube steel framework, anchorage
Plenum deluge system modifications, backup N ₂ supply & valve redesign	ACR	DA	DA		ACR	CA	Verify as-built of deluge mods, leak-test N ₂ supply check valve, Missing inspection reports
Egress route upgrades	DA	DA				CA	KH committed to perform supplemental walkdown to resolve potential egress path interferences in the event of EBE
Life Safety Code exemption request							Exemption request Approved (12/03/97) DOE memo's AME:SPD:SB:04926 & AME:SPD:SB:04900
Upgrade basement level firewalls		DA			TA	CA	
Seismic bracing for Attic Water Pipes	DA				TA	CA	Additional protection of seismic trigger suggested, missing IWCP Documentation
Relocate high risk residues in room 3189							No design
Implement S/R Load Limits				Loceff DA			
Cooling Tower Replacement							No review needed SCW item
Final design for firewater circulation to the sub-basement levels							Project cancelled (see 10/27/98)

* QA closeout for ALL workpackages not yet complete

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Reviewers	Design				Testing	Constr. & QA	Status of DOE Review/open issues
	Seismic	Fire Prot.	HVAC/ Mech.	Other		*	
George Antaki	Brian Olson	John Sur	Seismic	Bill Prymak	Gary Reid	Wayne Burch	
94-3 IPP, Table 3-2, BIO Upgrades							
Install Emergency Lights	DA	DA					Installation ongoing
Evaluate/reinforce HVAC ducting							Exhaust duct stiffeners under construction
Ensure Lightning Protection		DA					
Inspect/repair SC-3 Fire Barriers, Inspect/upgrade exterior & CSV walls							Inspection completed - Design & Const. scheduled for FY99
SNM storage rack repairs - vault upgrades							
HVAC Interlock Modifications	DA		DA		TA		
Repair Roof Drains							
Nitrogen System failure prevention modifications	DA						
Counterfeit bolt inspection						Insp. Adeq.	KH Report T-CLC-G-00104, RFETS ESP 47623, EWP-317-FPS-500
Redundant Zone 3 HVAC Controller Modes							Design being finalized, Const. scheduled for FY99
Drain chemical storage tanks							No design
Upgrade Vault Penetration for Fire Where Practical							See above/ Inspect/repair SC-3 Fire Barriers, Inspect/upgrade exterior CSV walls
Repair Attic Beam				Loceff	ACR		Reconcile the basis for attic and roof members that do not meet the specified design code factor of 1.4 for concrete
Install Leak Detection			DA		TA		
Miscellaneous BIO Upgrades							
Install dock 18T roll-up door interlock, rms 3187 & 3189			DA		TA		
Verify seismic capacity of SC-1/2 HVAC ΔP sensor lines							
Complete any additional SQUG walk-downs						Insp. Adeq.	
Determine HVAC Scrubber disposition							Report completed (see KH's Bldg. 371 Interim Storage Upgrades Validation Project, pg. 58-60 of 91)
Provide seismic restraint for flammable liquid cabinet							
Life Safety Code Upgrades							
Reverse Fire Door Swing		DA					
Repair Stairway Sprinklers		DA					
Inspect Fire Doors (not in BIO, added to inspections)							No design - Inspection comp.

Appendix B

Listing of Outstanding Questions and Issues

- The seismic integrity of the system-2 duct to by-pass isolation damper 6936A requires the evaluation of the Pittsburgh-lock seam joint. (Antaki)
- Seismic capacity vs. demand of the intake HEPA filter bank tube steel and anchorage needs to be verified. (Antaki)
- The deluge system design calculations must be reconciled to the as-built condition. In particular: the water tank bolts are shorter than assumed in the initial calculation (calc 362); the span calculation (calc 369) should reconcile elbows and axial supports. (Antaki)
- The egress routes must be inspected to verify that they are free of fallen equipment that could block the exit path. (Antaki)
- Reconcile the basis for attic and roof members that do not meet the specified design code factor of 1.4 for concrete. (Loceff)
- There is evidence that the conduct of nitrogen subsystem testing (for Plenum Deluge Modifications, System 2) failed to meet acceptance criteria and that additional testing will be required (Prymak)
- The DOE-EM approved exemption to DOE requirements for Life Safety has not been incorporated explicitly as a component of the Bldg. 371 BIO as would be appropriate.

Other items in the form of recommendations/suggestions have been provided to KH 94-3 program manager for consideration. These were not related to functional requirements being satisfactorily met (e.g. timeliness of BIO, SER update).