Job No. 22192
Written Response Required: YES
Due Date: July 11, 2000
Actionee: H. E. BILSON
Closes CCN: N/A
OU: N/A
TSD: N/A
ERA: N/A
Subject Code: 8300

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U.S. Department of Energy
Richland Operations Office
H. E. Bilson, Assistant Manager
Environmental Restoration and Waste Management
P.O. Box 550, MSIN S7-41
Richland, Washington 99352

Subject: Contract No. DE-AC06-93RL12367
ELIMINATION OF ADMINISTRATIVE TECHNICAL SAFETY REQUIREMENTS ON EF-8 FAN AND HIGH EFFICIENCY PARTICULATE AIR FILTERS IN THE REDUCTION OXIDATION BUILDING

Reference:
1. BHI-01142, Rev. 1, *REDOX Facility Safety Analysis Report*
2. BHI-01299, Rev. 0, *Alternative Evaluation for the REDOX (202-S) Plutonium Loadout Hood.*

Dear Ms. Bilson:

Bechtel Hanford, Inc. (BHI) is completing decontamination and stabilization of the Plutonium (Pu) Loadout Hood (a.k.a., PR Cage) in the Reduction and Oxidation (REDOX) Facility. One of the last steps for the planned activities is the shutdown (deactivation) of the EF-8 Exhaust System that currently exhausts the Pu Loadout Hood (Technical Safety Requirement (TSR) E4.3, Appendix E of Reference 1 applies to the EF-8 Exhaust System). We are requesting that the U.S. Department of Energy, Richland Operations Office (DOE-RL) approve the elimination of this TSR to allow completion of the decontamination and stabilization work scope.

The TSR E4.3, Appendix E of Reference 1, provides the administrative requirements and basis for the EF-8 Exhaust System. The EF-8 Exhaust System has been maintained to minimize the potential of contamination spread from the Pu Loadout Hood into the North Sample Gallery of REDOX (the 202-S building). During the past 2½ years, BHI has taken actions to characterize the contamination in the Pu Loadout Hood and North Sample Gallery and determine the alternative action to minimize the threat of further contamination spreads in the North Sample Gallery. The characterization and planning resulted in the selection of a stabilization alternative (Reference 2).

Objectives of the selected alternative include:

- Minimize the potential of radiological airborne contamination from areas within the North Sample Gallery

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- Minimize the threat of internal contamination spread from the Pu Loadout Hood
- Reduce the need for surveillance and maintenance personnel entries into the sample galleries
- Shut down the EF-8 Exhaust System that ventilates the Pu Loadout Hood and other retired features of the North Sample Gallery.

The activities and modifications associated with the selected alternatives are addressed in a safety evaluation compliant with the requirements of the Unreviewed Safety Questions (USQ) process (attached). The safety evaluation identified that the surface contamination within the Pu Loadout Hood was found to be a relatively minor risk of future contamination and concluded that the EF-8 Exhaust System would no longer be needed to control this hazard. Therefore, the following activities are required to support the subsequent shutdown of EF-8 Exhaust System:

- The sump in the floor of the Pu Loadout Hood contains residual waste sludge that will be stabilized by the placement of an absorbent over the residual waste.
- The enclosure of the Pu Loadout Hood will be sealed to eliminate potential pathways of contamination into the North Sample Gallery of REDOX.
- Sampler hoods in the North Sample Gallery that are connected to the EF-8 Exhaust System, will be isolated with physical barriers to secure these potential pathways.

Once these isolation activities are completed, the EF-8 Exhaust System will be shut down. With the approval by DOE-RL to eliminate the TSR E4.3, the final filters, the exhaust fan and exhaust stack will then be isolated to complete the required shutdown (deactivation) of the EF-8 Exhaust System.

Your approval to eliminate TSR E4.3 is requested on or before July 11, 2000 to maintain the current DOE approved schedule. Please feel free to contact Mr. R. G. (Bob) Egge, 373-2774, for technical support or Mr. J. J. (Jerry) McGuire for any other assistance in this matter.

Sincerely,

T. E. Logan
Vice President, Operations

SPK:ajk

Attachment: 0200W-US-N0156-02, Rev. 2, USQ Safety Evaluation, *Pu Loadout Hood Stabilization*

cc: C. A. Ashley (RL) H0-12, w/a
T. W. Ferns (RL) H0-12, w/a
DOE Record Copy H0-12
R. E. Gerton (RL) H0-12, w/a
J. P. Sands (RL) H0-12, w/a

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bcc: MAY 17 2000
V. J. Cuneo H0-18, w/o
A. G. Dada H0-02, w/o
J. W. Darby H0-18, w/o
R. G. Egge S3-21, w/o
S. C. Foelber H0-18, w/o
N. R. Kerr S3-21, w/o
S. P. Kretzschmar S3-21, w/o
T. E. Logan H0-14, w/o
J. J. McGuire S2-20, w/o
S/M&T Project Files S3-20, w/a
Document Information Services H0-09 w/a

CONCURRENCES

DATE	5-11-00	5-11-00	5/11/00	5/16/00
INITIALS	PJW	RGE	JJM	SCF

UNREVIEWED SAFETY QUESTION SAFETY EVALUATION FORM
PU LOADOUT HOOD STABILIZATION
DIS #: 0200W-US-N0156-02, Rev. 2*

Documents Reviewed:

BHI-DIS APR 2 5 2000

- Attachment 1, *Safety Evaluation for the REDOX Pu Loadout Hood Stabilization*
- BHI-00994, *In-Situ Non-Destructive Radiological Characterization of Selected 202-S Reduction Oxidation (REDOX) Facility Sample Gallery Pipes and Vessels*, Rev. 0
- BHI-01255, *Interim Characterization Report for the REDOX Plutonium Loadout Hood*, Rev. 0
- BHI-01299, *Alternative Evaluation for REDOX (202-S) Plutonium Loadout Hood*

Authorization Basis:

- BHI-01142, *REDOX Facility Safety Analysis Report*, Rev. 1 (SAR)
- Letter, J. D. Goodenough, RL, to S. D. Liedle, BHI, "Approval of REDOX Safety Analysis Plan (SAP)," dated July 7, 1998, CCN 059818,
- 0200W-US-N0144-02, Rev 1, *Safety Evaluation for the Hexone Tanks*
- 0200W-US-N0154-02, Rev 0, *Safety Evaluation for the 2708-S Building*
- 0200W-US-N0156-02, Rev 1, *Safety Evaluation for the Pu Loadout Hood Stabilization*
- 0200W-US-N0166-02, Rev 0, *Safety Evaluation for the Demolition of 2706-S*
- 0200W-US-N0175-02, Rev. 0, USQ Safety Evaluation, *REDOX Seismic Update.*

Originator: S. P. Kretzschmar

Purpose: Revision 2 of this USQ Safety Evaluation evaluates the revised scope of work to stabilize the Pu Loadout Hood (a.k.a., Product Receiver Cage, PR Cage and Plutonium Loadout Hood). Revisions 0 and 1 evaluated the preliminary scope of work, the resultant configuration and additional sample data taken in the North Sample Gallery and Pu Loadout Hood. Evaluation of the seismic event, which was included in Revisions 0 and 1, is addressed separately in USQ, 0200W-US-N0175-02. Applicable changes to the SAR are included in this USQ and will be issued in a subsequent annual update.

Work Definition: This evaluation summarizes the impacts of 1999 characterization data (BHI-01255) collected to: (1) provide information about the types and quantities of hazardous materials within the Plutonium Loadout Hood and (2) verify the nondestructive assay results from an earlier in-situ nondestructive radiological characterization (BHI-00994). The characterization was performed in support of selecting the stabilization alternatives (BHI-01299) and to verify the assumptions used to prepare the inventory estimates of the Pu Loadout Hood as described in the SAR.

*This is a total rewrite; therefore, no revision bars are used to indicate changes.

- The objectives of the stabilization work include: (a) minimize the potential of radiological airborne contamination from areas within the North Sample Gallery, (b) minimize the threat of internal contamination spread from the PR Cage, (c) reduce the need for S&M personnel entries into the sample galleries and (d) shut down the EF-8 ventilation system that exhausts the PR Cage and other retired hoods of the North Sample Gallery.

Revision 2 compares the Material at Risk (MAR) of the PR Cage Fire Hazards analyzed in the Safety Analysis Report (SAR) to the probable MAR based on sample data. The sample indicates that the inventory is likely to be less than assumed in the SAR; however, no reduction is taken in Revision 2. The remainder of the changes deal with stabilization details for the Pu Loadout Hood which include:

- Elimination of a grout cap over the sump in the hood. D&D staff advised against the grout cap because of potential complications with future D&D work scope.
- Product reviews of sealant and fixative materials concluded that exterior stabilization is the better alternative (ALARA). Permanent fixatives to the interior of the hood require preparation that is prohibitive.
- Remove the plastic from the "false wall." This will provide less restrictive flow path from the Pu Loadout area to the main canyon area after the Pu Loadout area has been sealed.

A more detailed description of the stabilization work and hazard analysis is provided in Attachment 1.

Summary: Attachment 1 provides the impact of this change to the hazard analysis of the SAR. Review of the sample data concluded that there is likely to be less activity at risk within the Pu Loadout Hood (3.6E-01 Ci, ^{239}Pu assumed versus 2.49E-02 Ci, 239Pu and 2.98E-03 Ci, 241Am by sample). No reduction is taken under Revision 2; the dose consequences of the approved SAR are retained. The worst case dose consequences that are related to the hood are due to the potential fire hazard (an event with a likelihood of 1E-04/yr). Other hazards analyzed relate to worker hazards that are implemented by BHI's Safety and Health programs and Work Control Process. Revision 2 work scope simplifies the stabilization of the Pu Loadout Hood (e.g., eliminates the grout cap over the sump and eliminates other stabilization work inside of the hood). Consequently, worker hazards are similar to those previously analyzed in support of previous decontamination, gallery stabilization and characterization work. No accident analysis of the SAR is changed by this USQ.

Questions:

1. Could the proposed temporary or permanent change (or discovery) increase the probability of occurrence of an accident previously evaluated in the safety analyses?

No X **Yes** ____

Basis: Of the hazards analyzed in the SAR four events were evaluated: *Seismic Event, Loss of Ventilation* (291-S Canyon Exhaust), *Product Receiver Cage Fire and Nuclear Criticality*. In addition, USQ Safety Evaluation 0200W-US-N0144-02 documents the evaluation of a combustion event in the REDOX hexone storage tanks. The evaluation in Attachment 1, does not change the likelihood of any of the events (or accidents) analyzed. Therefore, the stabilization of the Pu Loadout Hood does not increase the probability of occurrence of an accident previously evaluated in the safety authorization basis.

2. Could the proposed temporary or permanent change (or discovery) increase the consequences of an accident previously evaluated in the safety analyses?

No __X__ **Yes** _____

Basis: Chapter 3.0 of BHI-01142 and amended by USQ Safety Evaluations, defines the consequences of a seismic event, a loss of ventilation, a fire involving the PR Cage (a.k.a., Plutonium Loadout Hood) and release due to a combustion event in the hexone storage tanks and dismisses consequences of accidental criticality. The material at risk under this Safety Evaluation is inventory in the Pu Loadout Hood. Attachment 1 concludes, based on sample data obtained since the preparation of the SAR, that the potential consequences of the postulated fire are likely lower than concluded in the SAR. Consequences of other applicable hazards (dominantly worker hazards) remain as previously analyzed. It is therefore concluded that radiological dose consequences are not increased by the changes evaluated.

3. Could the proposed temporary or permanent change (or discovery) increase the probability of occurrence of a malfunction of equipment important to safety previously evaluated in the safety analyses?

No __X__ **Yes** _____

Basis: The stabilization activities include sealing the gallery sample boxes and PR Cage, sealing the inlet ducting to the PR Cage, stabilizing the work area on the back side of the PR Cage, absorbing free liquid in the PR Cage sump, and encapsulating selected valves on process piping. Section 4.5.1 of BHI-01142 identifies the EF-8 exhaust fan, HEPA filters, 296-S-2 Stack, instrumentation and controls (including monitors and alarms), and stack effluent monitoring equipment as equipment important to safety for the 296-S-2 system. During the stabilization activities, flows may increase through the existing openings as the others are being sealed. In addition, as more of the openings are sealed the total flowrate through the exhaust fan may slightly decrease due to the decreased inlet opening area. However, other in-leakage pathways in the exhaust ductwork will continue to provide a source of supply air to the 296-S-2 system and all of the important to safety equipment will remain operable until the deactivation activities are started on the EF-8 fan system. The EF-8 fan will be immediately shutdown and the personnel evacuated from the North Sample Gallery per the TSR E4.3 of BHI-01142 when the last opening is sealed (inlet roughing filter). Attachment 1 addresses worker safety for any entry into the gallery areas after the fan is shut down. The stabilization activities will have no impact on any other equipment identified as important to safety in Section 4.0 of BHI-01142.

Therefore, the stabilization activities and resultant stabilized condition will not increase the probability of occurrence of a malfunction of equipment important to safety previously evaluated.

4. Could the proposed temporary or permanent change (or discovery) increase the consequences of a malfunction of equipment important to safety previously evaluated in the safety analyses?

No __X__ **Yes** _____

Basis: The stabilization activities include sealing the gallery sample boxes and PR Cage, sealing inlet ducting to the PR Cage, stabilizing the work area on the back side of the PR Cage, absorbing free liquid in the PR Cage sump, and encapsulating selected valves on process piping. The stabilization activities will reduce the potential for release of hazardous materials from the North Sample Gallery, including the PR Cage. The activities will not affect the operation, reliability, or the consequences of malfunction of any equipment important to safety. Therefore, the stabilization activities and resultant stabilized condition will not increase the consequences of a malfunction of equipment important to safety previously evaluated.

5. Could the proposed temporary or permanent change (or discovery) create the possibility of an accident of a different type than any previously evaluated in the safety analyses?

No __x__ **Yes** _____

Basis: The stabilization activities include sealing the gallery sample boxes and PR Cage, sealing inlet ducting to the PR Cage, stabilizing the work area on the back side of the PR Cage, absorbing free liquid in the PR Cage sump, and encapsulating selected valves on process piping. Sealing the sample boxes, PR Cage, and inlet ducting to the PR Cage, and stabilizing the work area on the back side of the PR Cage involve activities that are addressed in Sections 2.5.6, 2.5.9, and 2.5.10 of BHI-01142. The hazards associated with these activities are analyzed in Section 3.0 and Appendix A of BHI-01142. Hazards related to the stabilization work are analyzed in Attachment 1. Hazards with release potential are the radiological contaminants within the Pu Loadout Hood and North Sample Gallery. This evaluation concludes that the levels of activity inside the hood are likely to be less than analyzed in the SAR. The activity levels outside the hood are greatest on the back side of the hood and over sample cave #146. However, these levels are insignificant and they are somewhat lower than the contamination was first discovered and analyzed in the SAR. The safety systems that protect the environment from the release are the exhaust systems EF-8 and the 291-S canyon exhaust. During the stabilization these systems will operate as analyzed in the SAR. Upon the completion of the preparatory work and after DOE's approval to eliminate the administrative TSR (E4.3) for the EF-8 exhaust system, the EF-8 exhaust system will be deactivated and the 296-S-2 stack capped. However, the hazards and initiators are the same as analyzed and the dose consequences that are analyzed in Attachment 1 are within the bounds of the SAR. Therefore, the stabilization activities and resultant stabilized conditions do not create the possibility of an accident of a different type than any previously evaluated in the safety analysis.

6. Could the proposed temporary or permanent change (or discovery) create the possibility of a malfunction of equipment important to safety of a different type than any previously evaluated in the safety analyses?

No __X__ **Yes** _____

Basis: The proposed stabilization activities include sealing the gallery sample boxes and PR Cage, sealing inlet ducting to the PR Cage, stabilizing the work area on the back side of the PR Cage, absorbing free liquid in the PR Cage sump, and encapsulating selected valves on process piping. Section 4.5.1 of BHI-01142 identifies the EF-8 exhaust fan, HEPA filters, 296-S-2 Stack, instrumentation and controls (including monitors and alarms), and stack effluent monitoring equipment as equipment important to safety for the 296-S-2 system. Isolating the sample boxes and PR Cage from the exhaust will decrease the inlet airflow in the exhaust system. In the event of loss of airflow, existing TSRs (E4.3) require the evacuation of personnel from the north gallery area. The stabilization activities have no impact to any other equipment identified as important to safety in Section 4.0 of BHI-01142. Therefore, the stabilization activities and resultant stabilized condition do not create the possibility of a malfunction of equipment important to safety of a different type than any previously evaluated.

7. Does the proposed temporary or permanent change (or discovery) reduce the margin of safety as defined in the basis for any technical safety requirement?

No __X__ **Yes** _____

Basis: The proposed stabilization activities include sealing the gallery sample boxes and PR Cage, sealing inlet ducting to the PR Cage, stabilizing the work area on the back side of the PR Cage, absorbing free liquid in the PR Cage sump, and encapsulating selected valves on process piping. There is an administrative TSR for the EF-8 fan and HEPA filter (BHI-01142, Appendix E, Section E4.3). The TSR requires that, for worker entry into the sample galleries during normal operations, the fan is operating and that air is flowing through the HEPA filter. The basis for the TSR is to ensure that a slight, negative differential pressure (relative to the sample galleries) exists in the Pu Loadout Hood and the remainder of the system. The safety evaluation in Attachment 1 supports the shutdown of the EF-8 exhaust system. The contamination that has been the cause of past spreads is from the residuals and degraded flanges on deactivated process lines that are outside the Pu Loadout Hood. Surface contamination within the Pu Loadout Hood will not be a source of future spreads once the isolation of the hood is complete. The safety evaluation concludes that the environmental protection provided by the stabilization work scope will improve the overall safety of the plant. Although there are process margins of safety defined in the basis of any TSR for the REDOX Facility (Appendix E, BHI-01142) the stabilization activities significantly reduce the potential migration of airborne contamination into the galleries. Therefore, the stabilization activities and resultant stabilized condition of the REDOX Facility will not reduce the margin of safety as defined in the basis for any TSR.

It is noted that (separate to this USQ) DOE approval to delete the EF-8 TSR (E4.3) is required before deactivation of the 296-S-2 exhaust system.

USQ Evaluator 1 Stuart Kretzschmar **Date:** 4-25-00
S. P. Kretzschmar

USQ Evaluator 2 N. R. Kerr **Date:** 04.25.00
N. R. Kerr

DES Concurrence Required (indicate)? **No**

If "YES," then DES signature required.

DES NA **Date:**__________

Redline markup of affected pages attached? **No** _____ **Yes** X

Below are changes to the BHI-01142, Rev. 1, that will be made following the completion of the stabilization work.

1. **Executive Summary, 202-S Canyon Building Exhaust Ventilation Systems.** Replace the section with the following:

These systems ensure that (1) the 202-S Canyon Building is maintained at a negative air pressure relative to the environment; (2) the process cells, Product Receiver (PR) Cage, and the silo tower shaft are maintained at a negative air pressure relative to adjacent operating areas; and (3) exhaust air is filtered.

2. **Section 2.4.1.2 Galleries.** Replace with the following:

Piping, operating, and sample galleries exist on the north and south side of the canyon. A storage gallery is located under the South Sample Gallery. The Product Receiver Cage, which served as the plutonium loadout hood, is located in the North Sample Gallery. The Product Receiver Cage (a.k.a., PR Cage, Pu Loadout Hood, and, Plutonium Loadout Hood) and selected areas of the North Sample Gallery were further stabilized with actions initiated in 1999 (BHI 1999a and BHI 2000a). The EF-8 exhaust system that serviced the Product Receiver Cage was deactivated under the stabilization that was initiated in 1999. These stabilization activities were performed to eliminate known and suspected sources of radiological contamination, and to eliminate the need for routine surveillance of the North Sample Gallery.

3. **Section 2.6.1, second paragraph.** Replace with the following:

The current ventilation system relies on the operation of one 20,000 ft^3/m exhaust fan (EF-1 or EF-2) and a 800 ft^3/m exhaust fan (EF-8) to maintain appropriate negative differential pressures. All supply fans have been deactivated.

4. **Section 2.6.2, last paragraph.** Delete the paragraph entirely.

5. **Section 2.6.2.2.** Delete the paragraph entirely.

6. **Section 2.6.2.3.2.6.3.2** Delete the paragraph entirely.

7. **Section 2.9.2 291-S-1 and 296-A-2 Operating Stacks, second and third paragraphs.** Replace with the following:

The 291-S-1 and 296-S-2 stacks are is currently included in the State of Washington DOH Radioactive Air Emissions Permit – Permit No. FF01. Because normal operating emissions do not exceed 0.1 mrem/yr in accordance with 40 CFR 61, these two this stacks are is **not** classified as a "designated" or "major" stacks.

The 291-S-1 and 296-S-2 stacks have has been included in the 1997 initial issuance of Hanford Site Air Operating Permit for 40 CFR 70 and WAC 173-401. Under the proposed Hanford Site Air Operating Permit, Ecology and the DOH share responsibilities for oversight and compliance, with Ecology responsible for nonradioactive airborne emissions and the DOH responsible for radioactive airborne emissions.

8. **Figure 2-26.** Shade PR Cage, EF-8 and Stack indicating areas as deactivated.

9. **Section 3.3.2.1.1 Inventory of Radioactive Materials, third paragraph.** Replace with the following:

In general, detailed radionuclide characterization data (i.e., form, quantity, and location) for the 202-S Building does not exist. The values listed in Table 3-1 are based on best available information. Recent surveys (BHI 1997b) have identified significant accumulations of residual materials in the North

Sample Gallery, located primarily in PR Cage processing equipment (see Table 3-2). Evaluation (BHI 2000a) of characterization (BHI 1999b) of the PR Cage confirmed the plutonium inventory estimates presented in BHI 1997b, and showed that nearly all the inventory is contained within the processing equipment. BHI 1999c also confirmed earlier indications (BHI 1997b) that ^{241}Am and ^{237}Np are present in the PR Cage. Evaluation of the sample data and other technical references (BHI 2000a) indicates that the residual waste in the vessels and piping of the PR Cage is likely to having an activity ratio of approximately 3 to 1, $^{239/240}$ Pu to ^{241}Am. The summary of fissionable material listed in Table 3-2 is based upon limited features of the PR Cage; however, the likelihood that other vessels and piping associated with the PR Cage contain significant fissionable inventories is low. Because of the extensive chemical cleaning of the process vessels and piping followed by weekly flushing with water (Foster 1977), the radioactive material remaining in these confinement systems are likely encrusted and fixed to the internal surfaces and not easily dislodged. The balance of the radioactive material is assumed to be loose surface contamination distributed throughout the structure in a manner represented in Appendix B.

10. **Section 3.3.2.3 Hazard Evaluation Results, Loss of Ventilation, fourth paragraph.** Delete entirely.

11. **Section 3.3.2.3 Hazard Evaluation Results, Product Receiver Cage Fire.** Replace with the following:

A fire involving the combustible loading of the PR Cage was evaluated in the preliminary hazard evaluation of Appendix A. The potential fire event assigned consequence rank is III-2 (unplanned release, releases resulting in minor environmental contamination) and the likelihood rank is D (remote, 10^{-4} per year).

A fire involving all combustible loading of the PR Cage was postulated to determine if a significant release of radioactive contaminants would occur as a result of vessel or piping damage, or HEPA filter failure. Appendix C describes the propagation of the unmitigated postulated fire and concludes that the HEPA filters would not fail as a result of the postulated fire, nor would vessel or piping damage occur. Accordingly, the amount of contaminants that would be subject to release as a result of the postulated fire is limited to the surface contaminants present on the vessels, piping, and polymethyl methacrylate (PMMA) panels of the PR Cage.

As shown in Table 3-2, greater than 99% (i.e., 2,149.1 g out of 2,155 g) of the plutonium is confined in lines and vessels. The ^{90}Sr in the PR Cage is assumed to be similarly distributed. This activity is not subject to release, because the fire does not compromise the integrity of the lines and vessels.

The remaining inventory, 5.9 g of plutonium and 2.5 Ci of ^{90}Sr, is located within the PR Cage sump. The sump inventory is also not subject to release during the fire. The temperature near the floor of the cage is 200 °F (see Appendix C). Such temperatures are well below the range of temperatures found to cause significant suspension of particles from a heated, noncombustible surface (DOE 1994b). Thus, the sump inventory would not be subject to release during the fire.

The only inventory subject to release during a fire in the PR Cage is surface contamination present on the PMMA panels and equipment. Characterization data for the PR Cage reported in BHI 1999c~~b~~ were evaluated in 0200W-US-N0156-02 (BHI 2000c). These data indicate that the alpha activity is not comprised of ^{239}Pu only. A laboratory analysis of smear sample data for PR Cage interior surfaces showed that the highest concentration of $^{239/240}$Pu is 1.62μCi/100cm2, while the concentrations of other isotopes (e.g., ^{241}Am) are, at most, about an order of magnitude less than this value. BHI 2000e~~b~~ determined that the maximum surface contamination inventory of $^{239/240}$Pu based on the BHI 1999b data is approximately 0.025 Ci (0.4g), while the inventories of other isotopes are, at most, about an order of magnitude less than this value. The evaluation in BHI 2000c indicates that ^{239}Pu, ^{238}Pu, and ^{241}Am are the only isotopes that could significantly contribute to the dose consequences of a fire involving the PR Cage.

For the purposes of this evaluation, it is conservatively assumed that an amount of ^{239}Pu oxide equal to the amount of plutonium in the PR Cage sump is present as surface contamination inside the cage and is equally split between the equipment and PMMA panels. The equal split is conservative because the panels are a vertical surface for collection of contamination while equipment and piping have significant horizontal surface areas. The horizontal surface areas would be expected to collect and retain more contamination than the vertical surfaces, so the bulk of the surface contamination would be expected to be present on equipment and piping.

To better understand the conservatism of the surface contamination inventory assumption, the characterization data and inhalation DCFs of the identified isotopes were evaluated in BHI 2000a. The consequences of the PR Cage fire event are dependent on the product of the appropriate DCF and the isotopic inventory. While no isotopes of plutonium, including ^{238}Pu, have a larger inhalation DCF than ^{239}Pu, the inhalation DCF for ^{241}Am is about 1.6 times larger than the inhalation DCF for the oxide form of ^{239}Pu (520 rem/μCi vs. 330 rem/μCi). Therefore, assuming all of the surface contamination is ^{239}Pu (oxide) underestimates the consequences of the event for that fraction of the material that is ^{241}Am. However, the assumed inventory (5.9 g of ^{239}Pu) is more than an order of magnitude larger than the calculated amount of surface contamination based on the data evaluated in BHI 2000a. Considering the inventory and DCF information qualitatively, it is apparent that it is conservative to use a surface contamination inventory of 5.9 g (0.36 Ci) of ^{239}Pu oxide to determine the consequences of a fire involving the PR Cage.

Bulk material, which might still be present in nitrate form, is present in equipment, piping, and possibly the PR Cage sump. However, none of this bulk material is impacted by this event. The material impacted is surface contamination present in the PR Cage and on other surfaces throughout the facility. Because of the length of time the facility has been in a quiescent state, the surface contamination would have already converted to oxide form due to prolonged exposure to air.

The inhalation DCF for ^{90}Sr (0.23 rem/μCi) is approximately three orders of magnitude less than that for ^{239}Pu (330 rem/μCi). Thus, the 2.5 Ci of ^{90}Sr are negligible compared to the 0.36 Ci of ^{239}Pu, and is neglected for the remainder of this evaluation. Thus, the surface contamination inventory subject to release during the fire is 0.36 Ci of ^{239}Pu, with one-half (0.18 Ci) on the PMMA panels and one-half on equipment and piping.

~~Thus, the sump would reasonably contain significantly more activity than is present as surface contamination within the PR Cage. The equal split is conservative because the panels are a vertical surface for collection of contamination while equipment and piping have significant horizontal surface areas. The horizontal surface areas would be expected to collect and retain more contamination than the vertical surfaces, so the bulk of the surface contamination would be expected to be present on equipment and piping.~~

~~To better understand the magnitude of the activity potentially released as a result of the fire, the radiological inventory can be simplified. The isotopic composition of the plutonium is unknown, so for the purposes of evaluating potential accident dose consequences, the plutonium is assumed to be entirely ^{239}Pu. This assumption is conservative because ^{239}Pu has a greater inhalation DCF than any other isotope of plutonium and is only slightly less than ^{241}Am. This assumption results in an inventory of~~

~~surface contamination in the PR Cage of 0.36 Ci of ^{239}Pu. The inhalation dose concentration factor used is for plutonium oxide. Bulk material, which might still be present in nitrate form, is present in equipment, piping, and possibly the PR Cage sump. However, none of this bulk material is impacted by this event. The material impacted is surface contamination present in the PR Cage and on other surfaces throughout the facility. Because of the length of time the facility has been in a quiescent state, the surface contamination would have already converted to oxide form due to prolonged exposure to air.~~

~~The inhalation DCF for ^{90}Sr (0.23 rem/μCi) is approximately three orders of magnitude less than that for ^{239}Pu (330 rem/μCi). Thus, the 2.5 Ci of ^{90}Sr are negligible compared to the 0.36 Ci of ^{239}Pu, and is neglected for the remainder of this evaluation. Thus, the surface contamination inventory subject to release during the fire is 0.36 Ci of ^{239}Pu, with one-half (0.18 Ci) on the PMMA panels and one-half on equipment and piping.~~

The release mechanisms for the contamination assumed present on the PMMA panels is different than that for the surface contamination on equipment and piping. The contamination on the panels would become airborne as the fire consumes the panels. DOE (1994b) indicates that the bounding release fraction combined with the bounding respirable fraction (RF) for this type of release is 5 E-02. Thus, 9.0 E-03 Ci of ^{239}Pu would be released from the PMMA panels.

The contamination present on equipment and piping would be subject to release due to heating of contaminated, noncombustible, unyielding surfaces in a cross-wind. The upper portions of the PR Cage are calculated to reach temperatures for which DOE (1994b) indicates that a bounding release fraction combined with a bounding RF for nonreactive compounds is 6 E-05. If the plutonium were assumed to be a reactive compound (e.g., as a nitrate) that oxidizes, the fraction would drop to 1 E-05. Applying the higher fraction, 6 E-05, to the assumed inventory of contamination on equipment and piping results in a release of 1.1 E-05 Ci ^{239}Pu. This result is nearly three orders of magnitude less than ~~800 times~~ the release assumed from the PMMA panels, and is neglected for the remainder of this evaluation.

Although fire modeling (Appendix C) concludes ~~that an airflow reversal occurs approximately 10 minutes into the fire (which effectively negates the EF-8 flowpath) for the duration of the fire event, for dose consequence purposes, it is conservative to assume the PR Cage exhaust ventilation continues to function. Although fire modeling also concludes~~ the majority of combustion products would plate out on the cooler internal surfaces of the sample gallery, the dose consequence calculation assumes all contamination made airborne would be released from the REDOX Facility to the atmosphere. This results in a bounding dose consequence of 2.4 rem at 100 m and 5.4 E-2 rem at Highway 240. ~~drawn into the ventilation exhaust and be filtered by the HEPA filters.~~

~~Assuming a decontamination factor of 3,000 for the HEPA filters results in a hypothetical release from the building of 3.0 E-06 Ci ^{239}Pu. This release results in a bounding dose consequence of 8.0 E-04 rem at 100 m and 1.8 E-05 rem at Highway 240 (BHI 1998a). These doses are far below any applicable criteria, including those for the declaration of a Site Area Emergency (1 rem at 100 m) and General Emergency (1 rem at the Site Boundary). Increasing these consequences by a factor of 3,000 to account for HEPA filter failure provides 2.4 rem at 100 m and 5.4 E-2 rem at Highway 240 which are overly conservative consequences.~~

Inside the building, the 9.0 E-03 Ci ^{239}Pu would create an airborne radiation hazard, in addition to the spread of nonrespirable contamination. The potential doses to facility workers, however, would be low because of the following reasons:

- The initial contamination spread would likely be contained within the PR Cage and, ~~exhaust ventilation ductwork and HEPA filter (initially), and~~ once burn-though ~~and flow~~

~~reversal~~ occurs, the combustion products would plate out on the cooler surfaces of the North Sample Gallery, with lesser spread down the sample passage and even less reaching the regulated shop, decontamination room, and remote shop.

- ~~The EF-8 and~~ 291-S ventilation systems would continue to ventilate the North Sample Gallery, reducing the airborne concentration over time.

- Re-entry to the building following the fire would fall under the radiation control program that would specify personal protection requirements for workers entering suspected contamination areas.

As noted in the REDOX FHA (Appendix D), heat detectors are located in portions of the 202-S Canyon Building; however, these sensors would not detect the presence of the postulated fire because of the distances involved. It is extremely unlikely that a personnel entry would be planned for the North Sample Gallery, decontamination room, remote shop, or the canyon during or shortly after the fire. The active ventilation systems would continue to operate, reducing the airborne concentrations of contamination. Although extremely unlikely, if the fire were not detected and a facility worker did enter the North Sample Gallery without proper protective equipment, 9.0 E-03 Ci ^{239}Pu spread out over the North Sample Gallery volume does not represent the threat of serious injury or death.

Because the release from the facility is minor and the potential consequences to a facility worker are small, no additional analysis of this event is warranted. The programmatic controls relied upon to provide radiation protection for facility workers are adequate to control this hazard.

12. **Section 3.3.2.3 Hazard Evaluation Results, Nuclear Criticality, PR Cage and Sample Galleries.** Replace "BHI 1997e" with "BHI 2000d" in the first and last sentences.

13. **Section 4.5.1 System, Structures and Components Important to Safety:** Delete 6th bullet "EF-8 exhaust…"

14. **Section 5.5.1 202-S Canyon Building Exhaust Ventilation System, 2nd paragraph.** Replace the word "three" with the word "four."

15. **Section 5.5.1 202-S Canyon Building Exhaust Ventilation System, 3rd paragraph.** Replace with the following:

The hazards evaluation credits operation of one 291-S exhauster with maintaining the negative air pressure differential. A second 291-S exhaust fan is credited as a backup. The 291-S sand filter ~~and 296-S-2 HEPA filters are~~ is credited with filtering exhaust air prior to release to the environment.

~~15.~~ 16. **Section 5.5.3 Product Receiver Cage Exhaust System.** Delete this section entirely.

~~16.~~ 17. **Section 18.0 References.** Add the following:

BHI, 1999a, *Alternative Evaluation for the REDOX (202-S) Plutonium Loadout Hood*, BHI-01299, Rev. 0 , BHI-01299, Rev. 0, Bechtel Hanford, Inc., Richland, Washington.

BHI, 1999b, *Interim Characterization Report for the REDOX Plutonium Loadout Hood*, BHI-01255, Rev. 0, Bechtel Hanford, Inc., Richland, Washington.

BHI, 2000a, *Safety Evaluation for the Plutonium Loadout Hood Stabilization*, 0200W-US-N0156-02, Rev. 2, Bechtel Hanford, Inc., Richland, Washington.

BHI, 2000b, *REDOX Stabilization and S&M - PR Cage and External Pipes & Valves in the North Sample Gallery*, 0200W-CE-N0012, Bechtel Hanford, Inc., Richland, Washington.

WHC, 1996/1997, *Probabilistic Seismic Hazard Analysis DOE Hanford Site, Washington*, WHC-SD-W236A-TI-002, Geomatrix Consultants, Inc.

18. **Appendix C, PR Cage Fire Evaluation.** Replace with the following:

C1.0 GENERAL DISCUSSION

To determine if a fire in the product receiver (PR) cage would result in a significant release of contaminants, a PR cage fire was postulated. The PR cage is known to contain substantial amounts of contaminants and is constructed of combustible materials in the form of polymethyl methacralate (PMMA) panels. With the exception of the PMMA panels, there is no combustible loading of significance in, or adjacent to, the PR cage or contained within the North Sample Gallery.

~~A slight negative pressure (with respect to surrounding North Sample Gallery area) is normally maintained in the PR cage by operation of the EF-8 exhaust ventilation system. Of the 800 ft^3 per minute (cfm) flow of the EF-8 ventilation system, approximately 125 cfm is normally drawn from the PR cage, with the balance of EF-8 flow coming from inleakage around the sample hoods and ductwork located in the North and South Sample Galleries.~~

~~The PR cage exhaust airflows first through a roughing filter (which is located within a few feet of the PR cage) and then through approximately 180 ft of ductwork before being filtered by one of two parallel high-efficiency particulate air (HEPA) filter banks. There are no fire screens between the PR cage and the HEPA filters. The HEPA filters are situated in a horizontal configuration, with the bottom of the lowest filter located 9 in. above the floor, and the top of the upper HEPA filter located 46 in. above the floor. After HEPA filtration, the air is discharged to the environment through the EF-8 fan and associated 296-S-2 stack. The EF-8 fan and stack are located outside of the 202-S Building.~~

Actions initiated in 1999 further stabilized the PR Cage and deactivated its exhaust system (i.e., EF-8 HEPA filter bank, EF-8 exhaust fan and 296-S-2 stack). A layer of absorbent was placed over the waste in the sump of the PR Cage and the exterior of the PR Cage was sealed to ensure that contaminants cannot migrate into the North Sample Gallery. Once the stabilization of the PR Cage was completed, the EF-8 exhaust filter and the stack was shutdown and isolated.

~~C2.0 FILTER RATINGS~~

~~According to published data (DOE 1993), HEPA filters are rated for 275°F continuous service with a 5-minute excursion rating of 750°F. Continuous operation rating is typically limited primarily by the~~

~~filter sealant, with typical ranges for urethane seals at 250°F and silicone seals at 500°F. Roughing filters are typically rated at 250°F continuous operation with a 5-minute excursion temperature of 500°F.~~

C~~3~~2.0 POTENTIAL FOR UNFILTERED RELEASE

~~Because the PR cage is located in the North Sample Gallery, which is a massive noncombustible structure with low-combustible loading, the immediate concern related to a PR cage fire is the survivability of the HEPA filters. A PR cage fire that would create enough heat to destroy the HEPA filters would effectively result in an unfiltered release of contaminants to the environment. Similarly, a fire that would result in clogging of the filters (and subsequent breach of the filter media from increased differential pressure) could also result in an unfiltered release of contaminants.~~

Although there is no ignition source in the area of the PR cage that is adequate to achieve the minimum radiant flux (18 KW/m^2) and auto ignition temperature (885°F) of the PMMA, a postulated fire was modeled using the CFAST zone model (NISTIR 1997). A list of inputs and assumptions is provided in the calculation package, but for illustrative purposes, the initiation and spread of the postulated fire is described in Section C4.0.

The PR Cage is located in the west end of the North Sample Gallery. Also near and to the northwest of the PR Cage is the elevator shaft No. 2. This shaft is part of the process silo of REDOX and terminates approximately 40 meters above the North Sample Gallery. Although the North Sample Gallery is exhausted by the 291-S exhaust system, it is assumed that should the postulated fire occur, an unfiltered release could occur through the elevator No. 2 shaft. Consequently, the scope of work for the stabilization of the PR Cage will include sealing the potential leak points. Cracks around the doors of the elevator on the silo shaft and the dump waiter will be sealed with a sealant with a life of 10 years or greater.

C~~4~~3.0 FIRE PROPAGATION DESCRIPTION

The postulated fire is an unmitigated fire that consumes the approximately 400 ft^2 of 0.375-in.-thick PMMA panels that form the PR cage walls, as well as an assumed additional combustible loading of 400 British thermal units (Btu)/ft^2 (approximately 20 lb of Class A combustibles) to account for other combustible materials such as wiring, insulation, and sisal craft paper. For modeling purposes, all combustible materials were normalized to the Btu loading of PMMA.

To maximize the effects of heat and smoke~~ on the HEPA filters,~~, the fire is assumed to start inside the PR cage at floor level with an unlimited supply of oxygen. The fire burns unabated, consuming the PMMA and other combustible materials that remain in the PR Cage. As the fire continues to burn the PMMA panels will burn through, opening a direct ventilation path to the North Sample Gallery. Although it is likely that the 291-S exhaust system would continue to run the capacity of the exhaust system is likely to be minimal in the area of the PR Cage. The smoke is anticipated to slowly spread from the North Sample Gallery into the corridor and eventually, would be influenced by the 291-S exhaust air flow. Exhaust from the North Sample Gallery exists the through the corridor to the North and South Sample Galleries. then down through the Remote Shop and then into the building exhaust tunnel (the wind tunnel). ~~(revise to reflect sealing of the shaft) Initially, the products of combustion are exhausted through the roughing filter (with an assumed nominal flow of 125 cfm), where the combustion products are intermixed with cooler air (which is assumed at 675 cfm) before entering the HEPA filter banks. The 675 cfm of cooler air is pulled through various inleakage paths around the sample hoods and ductwork.~~

~~The intermixing of hot exhaust air with cooler (ambient temperature) inleakage air, the relatively low flow velocity through the ductwork, and the 180 ft of ductwork between the PR cage and HEPA filters all contribute to the plateout of products of combustion on the interior surfaces of the ductwork.~~

~~As the fire continues to burn, the roughing filter will fail (due to its close proximity to the PR cage), and the PMMA panels will burn through, opening a direct ventilation path to the North Sample Gallery.~~

~~C5.0 ROUGHING FILTER FAILURE~~

~~Failure as a Result of Elevated Temperature~~

~~Because roughing filter failure would tend to increase the amount of hot exhaust airflow from the PR cage (and decrease the amount of cooler air from other areas), the time when roughing filter failure would occur is of interest. By CFAST calculation (BHI 1998), at time = 5 minutes into the fire, the upper layer temperature (ULT) reaches 250°F, with peak temperatures (of less than 750°F) achieved at time (T) = 15 minutes. Because the roughing filter can withstand an excursion temperature of 500°F for 5 minutes, it is judged that neither the filter media nor seals will fail for at least 10 minutes into the fire (T = 5 minutes below continuous 250°F rating, plus 5 additional minutes of escalating temperatures).~~

~~Failure as a Result of Increased Differential Pressure (Particulate Clogging)~~

~~The roughing filter may be exposed to a significant loading of combustion products due to its proximity to the fire. Failure due to clogging and increased differential pressures before airflow reversal is possible, but is difficult to predict. During the first 40% of weight loss, the PMMA surface burns and releases mostly gaseous products of combustion. These gaseous products would not substantially contribute to loading of the filter media nor increase differential pressures.~~

~~It is not until 40 to 85% of weight loss that a significant amount of particulate is released. Although it is not likely that substantial filter loading will occur until the fire is well developed, filter failure would tend to increase the amount of hot exhaust airflow from the PR cage and decrease the amount of cooler mixing air. The amount of flow increase is also difficult to predict, but would result in increased air temperatures at the inlet of the HEPA filters.~~

C~~6~~4.0 PMMA BURN-THROUGH

After the PMMA panels burn through, a direct ventilation path to the North Sample Gallery would open. ~~, and airflow would reverse and effectively negate the roughing filter to HEPA filter flowpath.~~ After burn-through occurs, the products of combustion would flow into the North Sample Gallery. ~~, mix with the larger volume of cooler air in the gallery, and then be drawn through various sample hood and ductwork inleakage paths to the HEPA filters.~~

It is possible that some of the air may flow down the North Sample Gallery, through the corridor, and down through the regulated shop, decontamination room, and remote shop into the wind tunnel as a result of the operation of the 291-S-1 ventilation system. When airflow reverses, the impact of the fire on the HEPA filters changes to more of an indirect and distanced exposure fire concern.

C7.0 HEPA EXPOSURES

Failure as a Result of Elevated Temperatures

Until roughing filter failure or PMMA burn-through, 125 cfm of PR cage exhaust air is mixed with 675 cfm of ambient air before entering the HEPA filters. By CFAST calculation, peak temperatures are achieved at 15 minutes into the fire (ULT = 725°F). To determine the air temperature entering the HEPA filters under initial flow conditions, the PR cage flow and temperature are averaged with the ambient airflow and temperature. Even using the very conservative assumption that the maximum ULT existed at this time (and it is not achieved until 15 minutes into the fire), air entering the HEPA filters does not exceed 181°F.

This averaging method did not account for heat transfer along the ductwork, which would significantly reduce the air temperature entering the HEPA filters. As noted in LLNL (1980), the heat transfer along ducts whose length is greater than 10 times the duct diameter (which is applicable to this duct arrangement) is substantial. LLNL (1980) concludes that for gases of somewhat less than 1,000 C (as in this case), the heat transfer is sufficient to reduce the gas temperature at the HEPA to acceptable temperatures. Accordingly, it is concluded that neither the HEPA filter media nor seals will fail as a result of elevated temperatures under the initial airflow and fire conditions.

As noted above, roughing filter failure is expected to result in some increased flow of hot air to the HEPA filters and a reduction in flow of cooler mixing air. This will increase the inlet air temperature to the HEPA filters. However, the increase in airflow and inlet air temperature are expected to be relatively insignificant, and it is judged that the HEPA filters would not fail as a result of increased temperatures due to roughing filter failure.

Failure as a Result of Increased Differential Pressures (Particulate Clogging)

The impact of particulate loading leading to filter failure was considered. The products of combustion will initially be captured by the roughing filter. Should the roughing filter fail, the products of combustion will be directed through the ductwork to the HEPA filters until such time that burn-through of the PMMA occurs. As noted above, the products of combustion will be intermixed with substantially larger amounts of cooler air while moving through the 180 ft of cooler ductwork at relatively low velocity. Although it is likely that some of the products of combustion may reach the HEPA filter media, it is judged that the bulk of the products of combustion will plateout on the interior surfaces of the ductwork, and the HEPA filters will not fail due to particulate clogging.

After PMMA burn-through and ventilation flow reversal occurs, the combustion products would mix with all of the ambient air in the sample galleries. This would provide further cooling and increase the plateout in the sample gallery areas. It is likely that some of the sample gallery air would be drawn into the EF-8 exhaust system (via various infiltration pathways) to the HEPA filters. However, the intermixing with ambient air will further reduce the air temperature and quantity of combustion products that reach the HEPA filters.

HEPA filters are qualified to withstand 10 in. water gage (WG) of pressure differential without failure. The maximum static pressure that can be developed by the EF-8 fan is approximately 5 in. WG. Even if

~~some of the products of combustion reach the HEPA filters, the exhaust fan is not capable of failing the HEPA filters by suction.~~

C5.0 CONSERVATISMS USED IN CFAST CALCULATION

- The actual mass of combustible material in the PR cage is 460 kg (approximately 900 lb of PMMA and 400 Btu/ft^2 [approximately 20 lb of combustibles]) of additional combustible materials normalized to the Btu loading of PMMA.

- Thermal absorption and convection into concrete, steel, and air mass were ignored, which results in higher than actual temperatures.

- The assumed fire growth rate was greater than the actual growth rate for PMMA, as cited in published test data.

- The height of compartment was set to zero to maximize compartment volume and, therefore, create the highest possible temperature output.

- There are no ignition sources inside the PR cage. A fire originating inside the PR cage will be oxygen-limited. The limited oxygen will control a fire until a PMMA panel fails. After a panel fails, the majority of smoke and hot gas will be vented to the North Sample Gallery.

~~The gas temperature inside the ductwork will be substantially less than assumed due to the significant heat transfer along the duct (LLNL 1980).~~

C6.0 CONCLUSIONS BASED ON CFAST CALCULATION

- Peak Upper Layer temperature ULT = 725°F is significantly less than flashover temperatures (900 to 1,100°F); therefore, flashover will not occur.

~~Failure of the HEPA filters will not occur for the following reasons:~~

~~Until burn-through of the PMMA panels occurs, the PR cage exhaust air will be mixed with approximately six times the PR cage exhaust volume, which will decrease air temperatures seen at the HEPA filters.~~

~~Airflow rates in the exhaust duct from the PR cage is not high enough to carry large burning embers to the HEPA filters. Small embers will burn out and cool before they get to the filters, and large embers will drop out of the air stream.~~

When burn-through of the PMMA panels occur, the PR cage will be exhausted directly to the North Sample Gallery and will mix with the large volume of cooler air in the gallery before being drawn through the 291-S exhaust system.

~~(delete leakage to elevator shaft)sample hoods and inleakage paths, into the ductwork, and to the HEPA filters.~~

~~Plateout of the bulk of the combustion products will occur initially on the internal surfaces of the exhaust ductwork.~~ After burn-through of the PMMA panels~~occurs~~, the ventilation flow reversal will result in ~~increased~~plateout of combustion products due to ~~intermixing with the large volume of gallery air with~~ cooler temperatures of the building structures. ~~, lower velocity, and increased travel distance to the HEPA filters.~~

- Peak temperatures are not expected to cause structural failure of the sample gallery (e.g., concrete walls, floor, and ceiling), the stainless-steel ion exchange vessels and piping within the PR cage, or the stainless-steel ductwork (NFPA 1997).

C7.0 REFERENCES

BHI, 1998, *PR Cage Fire Evaluation*, Calculation 0200W-CA-N0008 (2REDOXPRHOOD), Bechtel Hanford, Inc., Richland, Washington.

~~DOE, 1993, *Department of Energy Filter Plenum Fire Protection Standard*, Draft, Rev. 4, U.S. Department of Energy, Washington, D.C.~~

~~LLNL, 1980, *Fire Protection Countermeasures for Containment Ventilation*, UCID-18781, Lawrence Livermore National Laboratory, Livermore, California.~~

NISTIR, 1997, *CFAST Zone Model 4985*, December 1992, revised January 1997, National Institute of Standards and Technology, Gaithersburg, Maryland.

NFPA 1997, Fire Protection Handbook, *Section 7, Chapter 4, Structural Integrity During Fire*, Eighteenth Edition, National Fire Protection Association, One Batterymarch Park, Quincy, Ma.

. ~~Section 7, Chapter 4, Structural Integrity During Fire~~

18. **Appendix E, Administrative TSR for the EF-8 Fan and High Efficiency Particulate Filter, Section E4.3.** Delete entirely upon approval by Department of Energy, which will be provided separately.

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SAFETY EVALUATION FOR THE REDOX PU LOADOUT HOOD STABILIZATION

S/M&T Project
Bechtel Hanford, Inc

April 2000

Revision 2 of this USQ Safety Evaluation evaluates the revised scope of work to stabilize the Pu Loadout Hood (a.k.a., Product Receiver Cage, PR Cage, and Plutonium Loadout Hood) and the resultant stabilized configuration. Evaluation of the low level seismic impact that was included in Revision 1 is now addressed in 0200W-US-N0175-02.

Revision 2 compares the Material at Risk (MAR) of the PR Cage Fire Hazards analyzed in the Safety Analysis Report (SAR) to the probable MAR based on sample data. The sample indicates that the inventory is likely to be less than assumed in the SAR; however, no dose reduction is taken in Revision 2. The remaining changes deal with stabilization details for the Pu Loadout Hood and North Sample Gallery, which include:

- Elimination of a grout cap over the sump in the hood. D&D staff advised against the grout cap because of potential complications with future D&D work scope.

- Product reviews of sealant and fixative materials concluded that exterior stabilization is the better alternative (ALARA). Permanent fixatives to the interior of the hood require preparation that is prohibitive.

- Remove the plastic from the "false wall." This will provide less restrictive flow path from the Pu Loadout area to the air tunnel after the Pu Loadout area has been sealed.

- Seal potential air leaks around the Silo elevator and dumbwaiter door.

Applicable changes to the SAR that will be issued in a subsequent annual update are also provided.

This evaluation analyzes 1999 characterization data taken to verify prior Non-Destructive Analysis (NDA) and to support the planning for stabilization of the North Sample Gallery and Pu Loadout Hood in the Reduction-Oxidation (REDOX) facility. Three stabilization alternatives were evaluated in BHI-01299: (1) No Action, (2) Surface Stabilization and (3) Hood Removal. The alternative selected is stabilization alternative with objectives to:

(a) Minimize the potential of radiological airborne contamination from areas within the North Sample Gallery

*This is a complete rewrite; therefore, no revision bars are used to indicate changes.

(b) Minimize the threat of contamination spread from inside the Pu Loadout Hood into the North Sample Gallery.

(c) Reduce the need for S&M personnel entries into the sample galleries, and

(d) Shut down the EF-8 ventilation system that exhausts the Pu Loadout Hood and other inactive features of the North Sample Gallery.

The scope of work that is required before the EF-8 exhaust system is shutdown is summarized below:

- Isolate sampler hoods that are over sampler boxes (approximately 23) that are located in the North Sample Gallery of the 202-S Building. The boots will be removed and the ventilation hoods and exhaust duct work plugged.

- Work areas will be decontaminated and/or stabilized and a fixative applied to minimize the potential for airborne contamination. Contamination of concern is on the floor, walls, and sample box area on the back side of the Pu Loadout Hood.

- Decontaminate the exterior of the Pu Loadout Hood and seal the joints (frame to PMMA panels and frames to stainless steel panels) using such materials as fire retardant sealant (RTV) and metal tape, and seal the east side of the hood by installing a new sheet metal plate overpanel.

- Stabilize the sump by adding an absorbent (Aquaset II™[1]) to absorb free liquid.

- Isolate the air inlet filter to the Pu Loadout Hood by installing an overpanel.

- Encapsulation of flanges (~10) and valves (~5) on the L-16 to E-3 product return line. L-16 to H-4 neptunium transfer line, and 301-1/2"-M21-P acid supply line. Encapsulation materials will be insoluble to the suspected waste residuals and will not adsorb residual plutonium contaminated solutions in the piping systems.

Upon completion of the stabilization work, DOE approval will be required to proceed with the deactivation of, the EF-8 exhaust system. Approval to proceed will be provided through official correspondence to DOE. The correspondence will identify the following:

- BHI will not begin deactivation activities on the EF-8 fan until all of the above stabilization activities are completed
- BHI will assure worker safety for any work in the sample gallery area through the implementation of controls for worker protection as follows:
  - Air monitoring as directed by Industrial Health
  - Radiological surveys of work areas consistent with Radiological Control Program.

[1] Product of Fluid Tech, Inc., Las Vegas Nevada

  - Personnel protection clothing and equipment (PPE) will be used consistent with Industrial Health and Radiological Control Program
  - Task planning and Pre-job briefings
  - Worker protection programs requirements defined by the work flow process that is the core of the BHI Integrated Safety Management System and is required by the BHI Project Management procedures.
- The USQ process will be implemented by BHI Engineering procedures to ensure compliance with DOE nuclear facility requirements

Upon approval from DOE to proceed the following deactivation activities will be completed

  - Ductwork downstream of the EF-8 exhaust filters will be isolated by metal closure.
  - Cap and isolate the 296-S-2 stack.
  - Deactivate stack sampler and EF-8 fan (i.e., electrical supply).

In addition, the following work will be completed in the north sample gallery to provide air flow consistent with this analysis:

- Seal the elevator shaft and dumbwaiter doors in the North Sample Gallery using fire retardant RTVor similar sealant ($\geq$10 year life expectancy) and metal tape.
- Remove the plastic from the "false wall."

This safety evaluation provides the technical basis required for the Unreviewed Safety Questions process and defines related safety requirements for the proposed stabilization alternative.

DOCUMENTS REVIEWED

0200W-CA-C0156, *Evaluation of REDOX North Gallery Structure for Pu Loadout Hood Protection*, September 1999, Bechtel Hanford, Inc., Richland, Washington

0200W-CA-V0007, *Air Emission Calculation for Clean Out of the 202-S Plutonium Loadout Hood*, October 1999, Bechtel Hanford, Inc, Richland Washington

0200W-UE-N0005, Rev.1, *Pu Loadout Hood Ventilation Modification*, July 1, 1998, Bechtel Hanford, Inc., Richland, Washington

BHI-00994, Rev.0, *In-Situ Non-Destructive Radiological Characterization of Selected 202-S Reduction Oxidation (REDOX) Facility Sample Gallery Pipes and Vessels*, February 1997, Bechtel Hanford, Inc., Richland, Washington

BHI-01142, Rev. 1, *REDOX Facility Safety Analysis Report (SAR)*, June 1999, Bechtel Hanford, Inc., Richland, Washington

BHI-01255, Rev. 0, Interim Characterization Report for the REDOX Plutonium Loadout Hood, March 1999, Bechtel Hanford, Inc., Richland, Washington

BHI-01299, Rev. 0, Alternative Evaluation for the REDOX (202-S) Plutonium Loadout Hood, Bechtel Hanford, Inc., Richland, Washington

DOE-RL-97-75, Rev.0, Sampling and Analysis Plan for the REDOX Plutonium Loadout Hood, U.S. Department of Energy, Richland Operations Office, Richland, Washington

Gonsky 1999, Letter Report, John P. Gonsky, Jr., to Noel Kerr (FWRD-BHI/2177-L-9902), *Assessment of REDOX Loadout Hood Sample Analysis Data*, July 15, 1999, Foster Wheeler Environmental Corporation,

RL--BHI-DND-1996-0006, Off Normal Occurrence Report, *Contamination Discovered in a Radiological Controlled Area*, June 1996 (final), Bechtel Hanford, Inc, Richland, Washington

PNL-6866, Rev.1, *Technical Basis for Internal Dosimetry at Hanford*, July 1991, Pacific Northwest National Laboratory, Richland, Washington

0200W-CE-N0012, Rev. 2, *REDOX Stabilization and S&M, (PR Cage and External Pipes & Valves in the North Sample Gallery)*, March 30, 2000, Bechtel Hanford, Inc., Richland, Washington.

RSR-IFSM-98-1386, ERC Radiological Survey Record, "202-S/Sample Gallery," August 11, 1998

EXHIBITS

1. Figure 2-2 of BHI-01142, *Plan View Sample Gallery Level*
2. Figure 2-12 of BHI-01142, *Canyon Emergency Exit*
3. Figure 3 of BHI-01299, *Top View of the 202-S Plutonium Loadout Hood*
4. *Walkdown for PR Cage Stabilization*, October 27, 1999
5. Evaluation of Radiological Characteristics of the PR Cage Sump.

BACKGROUND

The Pu Loadout Hood (a.k.a., PR Cage) is located at the west end of the North Sample Gallery of the REDOX canyon building, 202-S. The North Sample Gallery structure is partially below grade and is the lower of three stories that are on the North side of the building. Figures 2-3 and 2-12 of BHI-01142 (Exhibits 1 and 2) provide information relative to the location of the Pu Loadout Hood within the 202-S building.

The Pu Loadout Hood operated from 1951 to 1955. During operation, plutonium solutions from separation activities within the 202-S building were piped to the hood for concentration and loadout of the liquid plutonium nitrate product. In 1955, operations in the hood ceased because improved capabilities were provided in the 233-S building, Plutonium Concentration Facility. Upon cessation of operations in the Pu Loadout Hood, the system was deactivated. Records and process knowledge indicates that deactivation included removal of the product removal can section components that were installed in the 233-S building and flushing the piping and vessels of the Pu Loadout Hood. Flushing was accomplished using nitric acid to decontaminate the internals of the hood and ancillary equipment followed by water rinse.

REDOX continued to operate until 1967. Deactivation of REDOX was initiated in 1967 and completed in August 1969. Since 1969, surveillance and maintenance (S&M) activities have been performed to ensure that the residual contamination is adequately controlled. In July of 1994, Bechtel Hanford, Inc. assumed the management of the REDOX facility for the U.S. Department of Energy.

In 1994 BHI initiated risk and mortgage reduction activities that were targeted to reduce S&M costs. The proposed actions for the REDOX building included decontamination/stabilization of the North Sample Gallery, deactivation of the EF-8 exhaust ventilation system and elimination of the surveillance entries into the North Sample Gallery. Observations during the initial entries of the risk reduction activities indicated a potential spread of alpha contamination in the area of the Pu Loadout Hood. Alpha contamination levels were significantly higher at the west end of the North Sample Gallery than the east end of the North Sample Gallery or anywhere in the South Sample Gallery. A “false wall” east of the waste transfer lines (a.k.a. “the hump”) was erected to help confine the contamination to the west end of the North Sample Gallery. Because of the high radiological contamination and unknown sources, plans to deactivate the EF-8 ventilation system and 296-S-2 stack were deferred. It was thought that the Pu Loadout Hood could be a source for the contamination spread.

In 1996 dark amber residual from pipe leakage was found on a flange in the sample gallery. The flange [part of a sample line (L-16 to E-3) for recycled product from the 233-S facility] is located over a sample cave (#146) that is located on the south side of the Pu Loadout Hood. Initial smear surveys of the residual contamination indicated 10,000,000 disintegrations per minute (dpm), alpha. It was concluded that the source of the contamination was legacy that remained from the deactivation of 1969. (Additional detail may be found in RL--BHI-DND-1996-0006.)

There was evidence that the valve above the #146 sample cave had leaked in the past. It appears that is was a past practice to cover the sample box with plastic to collect the leaking material. Additional pieces of contaminated plastic were found inside the sample box. In 1998, a survey of relatively new plastic (over the sample box and under the suspected leaking flange) indicated smearable alpha contamination of up to 3.000.000 dpm (RSR-IFSM-98-1386, page 2 of 2).

Non-destructive assay (NDA) of the selected piping systems and selected components of the Pu Loadout Hood was completed in 1997 (BHI-00994). The NDA concluded that significant inventories remain in the piping and vessels of the Pu Loadout Hood. The inventory is probably a tightly bound thin film on the interior surfaces in areas of elbows, valves, flanges and unique process surfaces (e.g., Raschig Rings). The NDA concluded that no significant quantities of process liquids are anticipated in the remaining vessels of the Pu Loadout Hood. However, small quantities of liquids from deactivation are assumed to remain.

A Sampling and Analysis Plan (SAP) (DOE-RL-97-75) was prepared to validate the assumptions and to potentially reduce the uncertainties of the 1997 NDA. Samples taken in 1998 were analyzed and later published in BHI-01255. Evaluation of the sample data concluded that the assumptions of the NDA were reasonable however, no significant reduction of uncertainty (vessel and piping inventory) could be made (Gonsky 1999).

During preparation for sampling the Pu Loadout Hood in 1998, the HEPA filtered exhaust leg (roughing filter) from the hood to the 296-S-2 fan was discovered to be plugged. A new piece of ducting was installed to by-pass the plugged filter downstream of the Pu Loadout Hood (0200W-UE-N0005). Review with former operations staff and BHI staff concluded that the system could have been plugged as early as 1993.

FACILITY DESCRIPTION

The North and South Sample Galleries are below grade at the mid elevation of the canyon cells (See Exhibits 1 and 2). The North and South Sample Galleries run east-west and sandwich the canyon and canyon cells. A relatively narrow passage at the east end connects the North and South Sample Galleries. The 291-S main canyon exhaust system provides ventilation of the sample galleries via air flow into the Regulated Shops. Make up fresh air is drawn through the inactive supply ducts in the South Sample Gallery and around the perimeter of the elevator door in the North Gallery. (See Section 2.6.2.2 of BHI-01142, Rev. 1 for additional information.) Airflow from the galleries has not been measured or calculated. It is assumed that typically, there is approximately 2,000 cfm exhausted from the galleries, that flows through cracks in the "false wall" (plastic and wood studs) down the stairwells, through the Regulated Shop and then into the wind tunnel. Based on observations and process knowledge, the staff assumes that the airflow is near evenly split between the North and South Sample Galleries.

The Pu Loadout Hood enclosure is located in the west end of the North Sample Gallery. The hood provides a confinement barrier between the North Sample Gallery and the process vessels inside the Pu Loadout Hood. The EF-8 ventilation system pulls air (~125 cfm) from the Pu Loadout Hood and (~850 cfm) from ducting over the sample caves and fume hood, and exhausts the filtered air through the 296-S-2 stack. The EF-8 system maintains the hood at slight negative with respect to the gallery.

Review of the REDOX technical manual indicates that the Pu Loadout Hood is connected to the vessel vent head via the concentrator and tower (E-17). From the concentrator the vessel vent header connects to J cell, which in turn is connected to the wind tunnel. Assuming that the vessel vent header independently provides some negative pull on the process components, the EF-8 system provides a minimal confinement for contamination on the interior surfaces of the Pu Loadout Hood.

The Pu Loadout Hood (see figure in Attachment 3) is composed of a metal frame supporting a series of polymethyl methacrylate (PMMA) panels. This enclosure isolates the process vessels and piping from the North Sample Gallery. The panel structure is approximately 8 ft.6 in. high and sits on a raised concrete curb 6 in. high. The topmost 2 ft. of the hood is enclosed by stainless steel panels. The hood is configured in an "L" shape with the base leg 11 ft. long and 5 ft. wide and the other leg 17 ft. long and 5 ft. wide. Originally, this section of the hood was 21 ft. long, but the product removal section of the frame and paneling at the east end was moved to 233-S, along with the equipment associated with the product removal can, at the completion of loadout hood operations in 1955. A metal panel was used to cover the opening left by removing the east end section. The two stainless steel pipes that were originally connected delivered the product to the product container, (a fill line from the E-17 concentrator and a vacuum return line to the E-21 plutonium transfer trap tank). These lines were cut and extended outside the enclosure approximately 4 in. from the surface of the metal panel. The end of the fill line was removed for a representative sample of the piping system as part of the 1999 sampling effect.

The floor of the hood area was built at two different levels to accommodate several large process vessels. On the base end of the "L," the floor is depressed 4 ft. 6 in. deeper than the floor level in the North Sample Gallery and forms what is called the pit. The E-16 pre-concentrator and E-17 concentrator are located in this depression. A 6 in. cubical sump, equipped with a vacuum transfer jet, is located at the northwest corner of this depression. The sump also received drain overflow from the 233-S pipe trenches. (These drains have been plugged at the north wall of the 202-S exterior by a grout plug installed in 1999.)

The major vessels located inside the hood that were used to concentrate plutonium nitrate solutions are described below. A number of pipes connect the vessels or provide access from utility services such as the steam, vacuum transfer, or cooling water systems.

MAJOR PU LOADOUT HOOD PROCESS VESSELS

Vessel Designation'	Vessel Use
E-16, Pre-Concentrator and Tower	First-step concentration of plutonium nitrate solution from E-cell
E-15, Pre-Concentrator Condenser	Condense E-16 vapors
E-14, Pre-Concentrator Condenser Receiver Tank	Receives condensed E-16 vapors from the E-15 condenser

E-17, Concentrator and Tower	Second-step concentration of plutonium nitrate solution from E-16 for loadout to the product removal cans
E-18, Plutonium Concentrator Condenser	Condense E-17 vapors
E-19, Plutonium Concentrate Condenser Receiver Tank	Collect E-18 condensed E-17 vapors
E-21, Plutonium Transfer Trap Tank	Collect vacuum transfer plutonium nitrate solutions for rework

HAZARD ANALYSIS

Radiological Inventory of the Hood

The REDOX SAR bases inventory assumptions of the Pu Loadout Hood on the NDA completed in 1997 (BHI-00994). It was concluded that the significant inventory resides in the Pre-Concentrator, E-16 (<1,500 grams of ^{239}Pu) and the Concentrator E-17 (<700 grams of ^{239}Pu). The inventory contained in the piping and vessels is assumed to have an isotopic distribution from processing of weapons grade fuel. While there may be small quantities of liquid wastes in the bottoms of vessels or other areas of hold up, the significant inventory is anticipated to tightly hold to the piping components near turns and welds and critical areas of the process vessels (e.g., Raschig Rings). Additional detail regarding the distribution of contamination may be found in BHI-00994.

The SAR assumed that the radiological content in the sump (216 in^3) of the Pu Loadout Hood to be 5.9 grams (Section 3.3.2.3) which is based on the NDA of 1997 (BHI-00994). BHI-01255 published sample results of the waste that remains in the sump. The contents of the sump were found to be a gritty, semi-pumpable liquid with a pH of < 2. An evaluation (Gonsky 1999) of the data concluded that estimated content of ^{239}Pu in sump could be reduced to ~2.5 grams.

The SAR conservatively assumed that the interior surfaces of the Pu Loadout Hood (e.g., piping, vessels, floor surfaces and panels) were contaminated with activity equal to the contents assumed for the sump, 5.9 grams of ^{239}Pu.

Various field smears were taken during the sampling of the Pu Loadout Hood. Smears on the exterior surfaces of the process vessels and interior surfaces of the hood enclosure were found to vary from 1.5E+04 dpm to 5.2E+06 dpm alpha (BHI-01255). Examples of the field smear readings (alpha) are:

- Wall surfaces of the hood interior:15,000 to 30,000 dpm
- Floor surfaces in the hood : 360,000 to 870,000 dpm
- Top of E-16: 5,200,000 dpm
- Side of E-16: 270,000 dpm
- Top of E-19: 60,000 dpm
- Top of E-17: 600,000 dpm

- Side of E-17: 300,000 dpm
- Side of E-21: 180,000 dpm.

The 1998 sample analysis (BHI-01255) published sample data taken from selected technical smears from the inside of the Pu Loadout Hood. Twelve smear samples were taken from the inside of the hood. Two smears were taken, one from the top and one from the side of tanks E19, E16, E21 and E17; and four smears were taken on the floor between E19 and E21. The highest concentration of $^{239/240}$ Pu was found on tank E16 at 3.24E+00 μCi/100 cm^2. The average concentration of $^{239/240}$ Pu taken from the smears analyzed in the lab is 5.90E-01 μCi/100 cm^2.

Evaluation of sample data of the waste in the sump of the Pu Loadout Hood (BHI-01255) indicates an activity ratio, $^{239/240}$Pu to ^{241}Am, of 3.2 to 1 (See Exhibit 5). Comparing this ratio with information in PNL-6866 finds the ratio indicative of ^{241}Am ingrowth of 6% fuel that has aged between 20 to 24 years. Considering time since cessation of processing a ratio of ~3 to 1 should be a reasonably conservative assumption for the ingrowth in the residual waste that remains in the vessels of the Pu Loadout Hood. Because there is no total NDA of the vessels and piping related to the Pu Loadout Hood and because the inventory internal to the piping and vessels is not at risk under accidents analyzed in the SAR, no further evaluation is necessary.

Lines not having NDA or other estimates of hold up are assumed to contain residual inventory of a thin film similar to the characterized lines. Below is a summary of the suspected characteristics and considerations given to other lines in the proximity of the Pu Loadout Hood. (See Exhibit 4, *Walkdown for PR Cage Stabilization* for additional information.)

- The L-16 to E-3 line runs to the sample cave (#146) behind the Pu Loadout Hood. This line is associated with past leaks (RL--BHI-DND-1996-0006). In 1996 the stabilization crew found a leak at a flange above the sample box. A small quantity of residual waste was collected in containment placed below the flange. It is anticipated that some small quantities of residual liquids that relate to recycle product remain in the piping. In 1996, smear samples on and about the sample cave ranged from 700 to 300,000,000 dpm alpha. The semi-solid material on the flange (1996) read 700,000,000 dpm alpha. In addition the material contained approximately 2% nitric acid concentration (FT-6077-1A through 1D). This concentration is assumed in all potential leak paths, which are being encapsulated. There are no estimates of liquid holdup due to the lack of detailed deactivation records and as-built drawings. A UT evaluation of these lines in 1995 concluded that no significant volume of liquid remains in these lines. However, small quantities of free liquids are assumed to remain in this piping. A small quantity of liquid waste was found in a similar use piping (product return line) during the decommissioning of the 233-S pipe trench. Samples of the liquid indicated that gross alpha was 2.51E-01 μCi/ml and gross beta was 1.82E-02 μCi/ml (BOTW29).

- Residual liquids were also found in the nitric acid supply lines during the decommissioning of the 233-S building. The lines are common with lines in the North Sample Gallery consequently is suspected that there may be small quantities of fluids which may contain acids (~2%) left in these lines. Approximately 10 liters of contaminated fluid was removed from the acid supply line that passes through the North Sample Gallery to what was the clean pipe trench to 233-S. Gross alpha was <1.2 pCi/g and gross beta was <11 pCi/g (BOTLB5). A continuation of this line contains a flanged valve that is in the North Sample Gallery. The flange, on the south side of the Pu Loadout Hood, has leaked in the past. Residual waste from past leaks was captured inside plastic containment. A survey taken after failure of the plastic containment found no detectable radiological contamination. Therefore, the leak potential from fittings on this line is not suspected to be a source of radiological contamination in the North Sample Gallery.

- During the decommissioning of 233-S, another nitric acid supply, one through the neptunium pipe trench was also found to contain liquids (approximately 2.5 liters). Gross alpha was reported as 3.61E+02 μCi/ml and gross beta was reported as 1.94E+01 μCi/ml (BOVCW3). However, there are no suspected fittings that pose a potential release point. No stabilization is anticipated with this piping system.

- Special processing for Neptunium was carried on in the REDOX canyon and 233-S building. Transfer piping goes through the North Sample Gallery to the below grade piping trenches that went to 233-S. During the deactivation of 233-S pipe trenches small quantities of contaminated liquids were recovered. Gross alpha contamination was found to range from 3.29E-04 μCi/ml to 2.97E-01 μCi/ml. It is assumed that small quantities of contaminated liquids may reside in the neptunium piping within REDOX and the North Sample Gallery. No known leaks associated with the Neptunium piping are known or anticipated.

Chemical Hazard

The waste in the sump of the Pu Loadout Hood is a relatively thick, granular liquid waste (~ 75% liquid @ 1.53 g/ml and 25% solid at 1.55 g/ml) with a pH less than 2.0 (BHI-01255). Stabilization of the sump is limited to placement of an adsorbent over the residual waste, which fills the sump. The adsorbent material, a powdery material, will turn putty-like on adsorption of any free liquids that remain in the sump of the Pu Loadout Hood. A small amount of bubbling (CO_2 effervescence) may occur due to reaction of carbonate ion with the nitric acid. However, quantity generated is expected to be insignificant. A temporary glove bag installed in the framework of the Pu Loadout Hood will function as a barrier to protect worker during the placement of the adsorbent. Personnel protective clothing and equipment (PPE) and procedural controls defined by the BHI Safety and Health program will provide additional lines of worker protection during the placement.

A two part polymer (NuKote or equivalent) will be used to encapsulate of the selected piping and valves. This type of polymer is potentially hazardous to the workers during application. Personnel protection equipment and clothing will protect the workers as required by the BHI Safety and Health program. A fire retardant sealant (RTV or equivalent) will be used to seal the elevator doors, sample hood and other potential leak points. This sealant does not contain potentially hazardous ingredients; however, equipment and clothing will be provided as specified by the BHI Safety and Health program. Implementation of the safety and health requirements is provided by the work control process described in the SAR, Chapters 11.0 and 12.0.

Radiological Airborne Hazard

The North Sample Gallery is a High Contamination Area (HCA) and Airborne Radioactivity Area (ARA). Review of radiation survey records and discussions with facility staff conclude that the highest contamination is near the Pu Loadout Hood. As discussed in the BACKGROUND section, surfaces on and near the #146 sample cave have the most significant recorded surface contamination. Alpha activity from the surface smears in the proximity but external to the Pu Loadout Hood were generally orders of magnitude higher (i.e., ~7.0E+02 dpm, alpha, to ~7.0E+09 dpm, alpha) than the interior surfaces of the Pu Loadout Hood (1.5E+04 dpm, alpha to 5.2E+06 dpm, alpha). Consequently, periodic surveillance of the contamination areas within the North Sample Gallery, Pu Loadout Hood, and its exhaust air system (EF-8) requires workers to be placed at risk to contamination and inhalation of alpha particulate. Process knowledge and surveys conclude that past airborne readings have been relatively high in areas on the backside of the Pu Loadout Hood.

Threat of airborne radiological hazards within the North Sample Gallery will be reduced by the following actions:

- Stabilize and/or decontaminate the surface radiological contamination on the backside of the Pu Loadout Hood to minimize the potential spread of airborne contamination.

- Encapsulate valves (~5) and flanges (~10) associated with the former product line, L-16 to E-3, and acid supply line, 301-1/2"-M21-P, that are known or suspected leakers.

The Pu Loadout Hood will be isolated to minimize the threat of contamination spread into the North Sample Gallery during the remainder of S&M operations. Requirements for the isolation of the Pu Loadout Hood are summarized below.

- Exterior panel sections (frame to PMMA panels and frame to stainless steel panels) will be sealed using such materials as fire retardant sealant and metal tape.

- The east end (previous location of product loadout) will be closed with the installation of a sheet metal overpanel and sealed with fire retardant sealant and / or metal tape as required.

- The inlet air filter will be closed with a metal overpanel and sealed.

The system, although specific inventory is unavailable, contains radiological contamination from past operations of the Pu Loadout Hood, sampler hoods over the sample caves and a fume hood in the North Sample Gallery. Actions required to ensure minimal contamination spread from the deactivated EF-8 exhaust system are defined below.

- Completed before shutdown and deactivation of the EF-8 fan:
  - Isolate the sampler hoods (~20) that are above the sample caves on the south wall of the North Sample Gallery.

- Completed after shutdown and supports deactivation of the EF-8 fan:
  - The elevator and dumbwaiter doors will be sealed closed to eliminate the potential flow path into those areas in the event of a fire in the PU Loadout Hood.

  - The plastic on the "false wall" will be removed to provide better air flow to the area for performing entries.

  - Isolate the EF-8 exhaust filters by installing metal blanks between the ducting and the outlet of the filter housing.

  - Deactivate the power supply to the EF-8 exhaust fan.

  - Deactivate the EF-8 exhaust sampler components and cap the 296-S-2 stack.

Upon completion of the stabilization of the North Sample Gallery and isolation of the Pu Loadout Hood, the EF-8 exhaust system will be shutdown, personnel will be evacuated from the North Sample Gallery per TSR E4.3.5a of BHI-01142. Prior to starting any deactivation work after the shutdown, DOE approval to eliminate the TSR requirements will be secured. However, personnel will be allowed into the gallery area with a special RWP and approval through an auditable record by the S&M manager per TSR E4.3.5c of BHI-01142. Upon sign-off of the hold point indicating that the stabilization activities have been completed and authorization to eliminate the TSR has been approved, deactivation work identified above may continue on the EF-8 fan and the 296-S-2 stack.

The following work will be completed in the north sample gallery after the EF-8 fan is shut down to minimize the spread of airborne contamination and to provide better air quality consistent with this analysis. However, routine entries into the sample galleries will be reduced (up to discontinuation) as the minimization of further spreads of contamination is confirmed. NOTE: Oxygen levels will be monitored as determined by the BHI Safety and Health program to ensure adequate air quality for personnel entering air space:

- The elevator and dumbwaiter doors will be sealed closed to eliminate the potential flow path into those areas.
- The plastic on the "false wall" will be removed to provide better air qualityto the area for performing entries.

Fissionable Material Hazard

Stabilization of the L-16 to E-3 line will involve encapsulating potential leak points (valves and flanges). Earlier investigation using UT detection technology was inconclusive in the attempt to confirm the presence of liquid. However because leaks have occurred at fittings on this line and because contaminated liquids were found on a connecting line during the decommissioning of 233-S , it is assumed that small quantities of liquids remain in the piping. Sample data of contamination below the fitting that leaked confirms the presence of plutonium. Also, the decommissioned line was found to contain plutonium. The criticality safety evaluation, 0200W-CE-N0012, Rev. 2, concluded that there is no credible accidental criticality potential. No additional criticality controls are required to perform the stabilization work.

Fire Hazard

Following the stabilization of the Pu Loadout Hood and isolation of the EF-8 exhaust, the material at risk (MAR) will be limited to the general surface contamination inside the hood (e.g., piping, vessels and interior surface of the enclosure). The fire hazard evaluation for the Pu Loadout Hood, Appendix C of BHI-01142, concluded that the material in the sump is not at risk from the postulated fire. The energy at the lower elevation of the hood is insufficient to cause resuspension of the waste in the sump. The SAR concludes that the material at risk is the surface contamination on the PMMA panels and metal surfaces of the piping, vessels, panel structure and stainless steel liner, Section 3.3.2.3 of BHI-01142. This is based on the determination that the fire does not compromise the integrity of the lines and vessels within the Pu Loadout Hood, and that the temperature increase at the Pu Loadout Hood floor level, due to the fire, is insufficient to release material from the sump.

The quantity of surface contamination assumed in BHI-01142 is equal to the sump inventory, or 5.9 g of plutonium and 2.5 Ci of ^{90}Sr. Half the inventory is assumed to be on the PMMA panel and the remainder on the other surfaces (i.e., piping, vessels, frames and floors). For the purposes of evaluating the potential dose consequences of the Pu Loadout Hood fire, all of the plutonium is assumed to be ^{239}Pu in oxide form. Based on the relative quantities and dose conversion factors (DCFs) of ^{239}Pu and ^{90}Sr, the analysis neglects the dose contribution from ^{90}Sr and determines the consequences based on 3.6E-01 Ci (5.9 g) of ^{239}Pu in oxide form.

BHI-01255, Table 6, reports surface contamination concentration data for the Pu Loadout Hood. These data show that radionuclides other than ^{239}Pu are present on surfaces within the Pu Loadout Hood. Based on the reported laboratory analysis, the nuclides that could contribute significantly to the Pu Loadout Hood fire dose consequences are ^{238}Pu, $^{239/240}Pu$, and ^{241}Am. The data show that the highest concentration of these three nuclides is 1.62 μCi/100 cm^2 of $^{239/240}Pu$. The concentrations of ^{238}Pu and ^{241}Am are approximately an order of magnitude less than this value. Using a total interior surface area of 1.54E+02 m^2 for the Pu Loadout Hood (based on calculation 0200W-CA-V0007), the maximum surface contamination inventory of $^{239/240}Pu$ is calculated to be 2.50E-02 Ci. The maximum surface contamination inventories of ^{238}Pu and ^{241}Am are approximately an order of magnitude less than this value. Therefore, the calculated surface contamination inventory for the Pu Loadout Hood based on characterization data is more than an order of magnitude smaller than what is evaluated in the safety analysis.

Section 3.3.2.3 of the safety analysis assumes that the ^{239}Pu is present as an oxide material. While no isotopes of plutonium, including ^{238}Pu, have a larger DCF than ^{239}Pu, ^{241}Am does have a DCF that is approximately 1.58 times greater than the DCF for ^{239}Pu oxide. Therefore, using the ^{239}Pu oxide DCF for all of the material at risk in the Pu Loadout Hood is non-conservative relative to the fractional component of the material that characterization data has shown to be ^{241}Am. However, the Pu Loadout Hood surface contamination inventory assumed in the safety analysis is more than an order of magnitude larger than the calculated value based on characterization data. Considering these two competing factors qualitatively, it is evident that the inventory conservatism far outweighs the non-consideration of a fraction of the inventory being ^{241}Am, and, consequently, the dose consequence in the safety analysis bounds that which would be determined using the characterization data.

The potential release evaluated in the SAR assumes the release emanates from the discharge through the EF-8 exhaust system. The SAR defined both a filtered release and an unfiltered release. Potential leak points will be sealed to minimize the potential for release from the fire postulated in the Pu Loadout Hood. Prior to the deactivation of the EF-8 exhaust system, the door to silo elevator and the door to the dumb waiter that are in the northwest corner of the North Sample Gallery will be sealed and the plastic on the "false wall" will be removed. With these doors sealed and the flow path opened up from the Pu Loadout Hood area to the main canyon system, a release from a fire in the hood would be confined within the canyon building and drawn by main canyon exhaust system, 291-S. Sealing the leak point and shutting off EF-8 could significantly reduce the air circulation within the west end of the North Sample Gallery (between the west wall and the "false wall"). Therefore, once the EF-8 exhaust is shutdown, oxygen levels will be monitored as determined by the BHI Safety and Health program to ensure adequate air quality for personnel entering the air space.

UNCERTAINTIES and RECOMMENDATIONS

Between 1994 and 1996 work of patching, decontaminating and generally stabilizing the EF-8 exhaust ductwork was performed. A walkdown in October 1999 supports the basis that no additional duct repairs are required (Exhibit 4). Shutdown of the EF-8 exhaust system, isolation of the EF-8 filter bank and the isolation of the 296-S-2 exhaust stack will provide adequate deactivation of the system once the Pu Loadout Hood is stabilized. Final inspection and radiological survey will confirm this assumption prior to the elimination of surveillance activities in the Sample Galleries.

CONCLUSIONS

The most significant radiological hazard is associated with the airborne potential in the west end of the North Sample Gallery. Workers entering the North Sample Gallery are at risk due to the potential contamination spread within the North Sample Gallery. The L-16 to E-3 line and the Pu Loadout Hood are the two most significant features of airborne potential. The existing surface contamination and the potential for further piping leaks have the potential to release repeated relatively high levels of radioactivity. The airflow in the sample galleries exasperates the hazard because the air flows from higher contamination areas to areas of relatively low contamination. Unless additional stabilization is implemented, workers will continue to be unnecessarily at risk during and because of surveillance activities. Stabilization as recommended in BHI-01299 will minimize the radiological release risk and eliminate risk to workers with the reduction or eventual elimination of entry requirements into the North Sample Gallery.

Implementation of the recommendation in BHI-01299 will bring REDOX to a state that is anticipated by current deactivation guidance. Decontamination and stabilization of the contamination to the backside of the Pu Loadout Hood will eliminate the most significant threat of airborne contamination that currently exist in the North Sample Gallery. Isolation of the Pu Loadout Hood will reduce the risk that the surface contamination within the hood will become an unwanted release during the remaining period of S&M operations. Isolation of the Pu Loadout Hood will also permit the deactivation of the EF-8 exhaust and 296-S-2 stack. Upon completion of the work the threat of further contamination incidents as has occurred may be avoided and routine entries by S&M personnel may be eliminated. With the safety improvement provided by the stabilization work scope, the REDOX Sample Galleries will have commensurate requirements as the Sample Galleries in the Plutonium Uranium Extraction (PUREX) facility. PUREX, which completed deactivation in 1998, has a similar Sample Gallery as REDOX. The interior surfaces in the PUREX Sample Gallery are relatively free of loose radioactivity and there are no known or suspected leak sources. Respiratory protection was not required for entry during the later schedule of the facility deactivation. Significant loose surface contamination was absent, piping was drained and flushed, and closures such as sample caves had minimal internal contamination and were sealed to prevent contaminant migration. Once the deactivation end points were verified, the PUREX Sample Gallery was closed and no further entry under long term S&M was required. Stabilization of the

North Sample Gallery at REDOX will provide a commensurate level of protection as provided under PUREX deactivation.

Requirements of the BHI Safety and Health program will be used to define the radiological control and air monitoring requirements necessary to ensure worker safety. Once stabilization and grouting are complete, the EF-8 is no longer needed and will be deactivated. Qualified personnel, radiological controls (e.g., glove bags, decontamination and fixation applications), personnel protection clothing and equipment (PPE) and task planning are the primary lines of defense required to ensure the required safety of the stabilization activities. Implementation of these program requirements will be defined by the work flow process that is the core of the BHI Integrated Safety Management System and is required by the BHI Project Management procedures. The USQ process will be implemented by BHI Engineering procedures to ensure compliance with DOE nuclear facility requirements.

Safety benefits resulting from the proposed stabilization include:

- Minimize worker contamination from the potential release and contamination spread in the North Sample Gallery,

- Minimize contamination spreads that would exasperate future decommissioning/closure activities, and

- Reduce S&M mortgage requirements but eliminating surveillance in the North Sample Gallery and maintenance required for the EF-8 exhaust system.

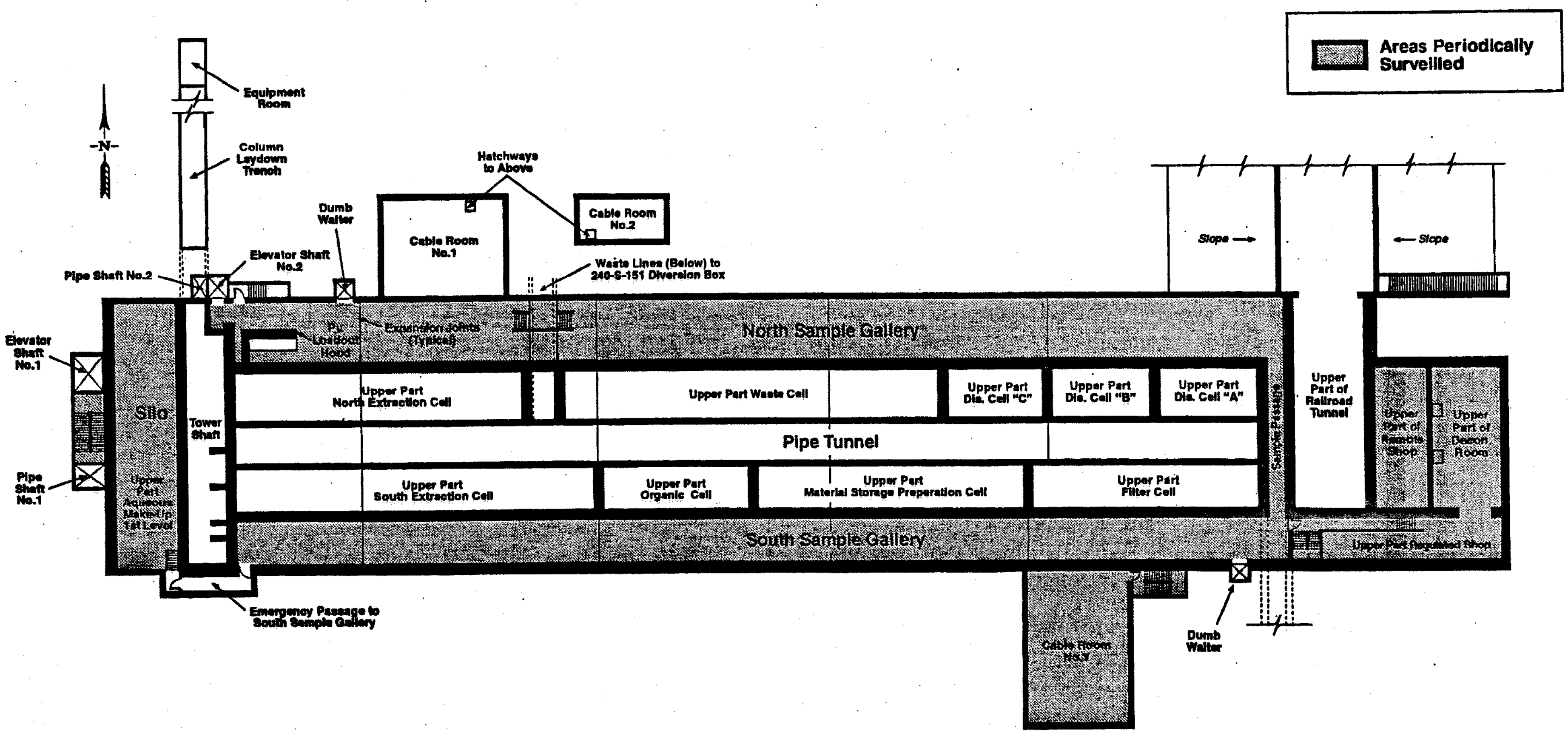
The REDOX Safety Authorization Basis will be revised with approval of the USQ Safety Evaluation, 0200W-US-N0156-02, Rev. 2. Stabilization work package will be managed compliant with USQ requirements implemented under the requirements defined under the BHI Engineering program. A formal request to eliminate the EF-8 Technical Safety Requirement (E4.3 of BHI-01142, Rev. 1) will be transmitted for DOE approval prior to the shutdown of the EF-8 exhaust system. Facility S&M procedures will be revised to reduce routine entries into the REDOX Sample Galleries following completion of the stabilization work.

EXHIBIT 1

FIGURE 2-2 OF BHI-01142

PLAN VIEW OF THE SAMPLE GALLERY

Figure 2-3. Plan View Sample Gallery Level.



FOR ILLUSTRATIVE PURPOSES ONLY.

Ref. HW-18700 / Figure XI-5a / From DWG. H-2-7402

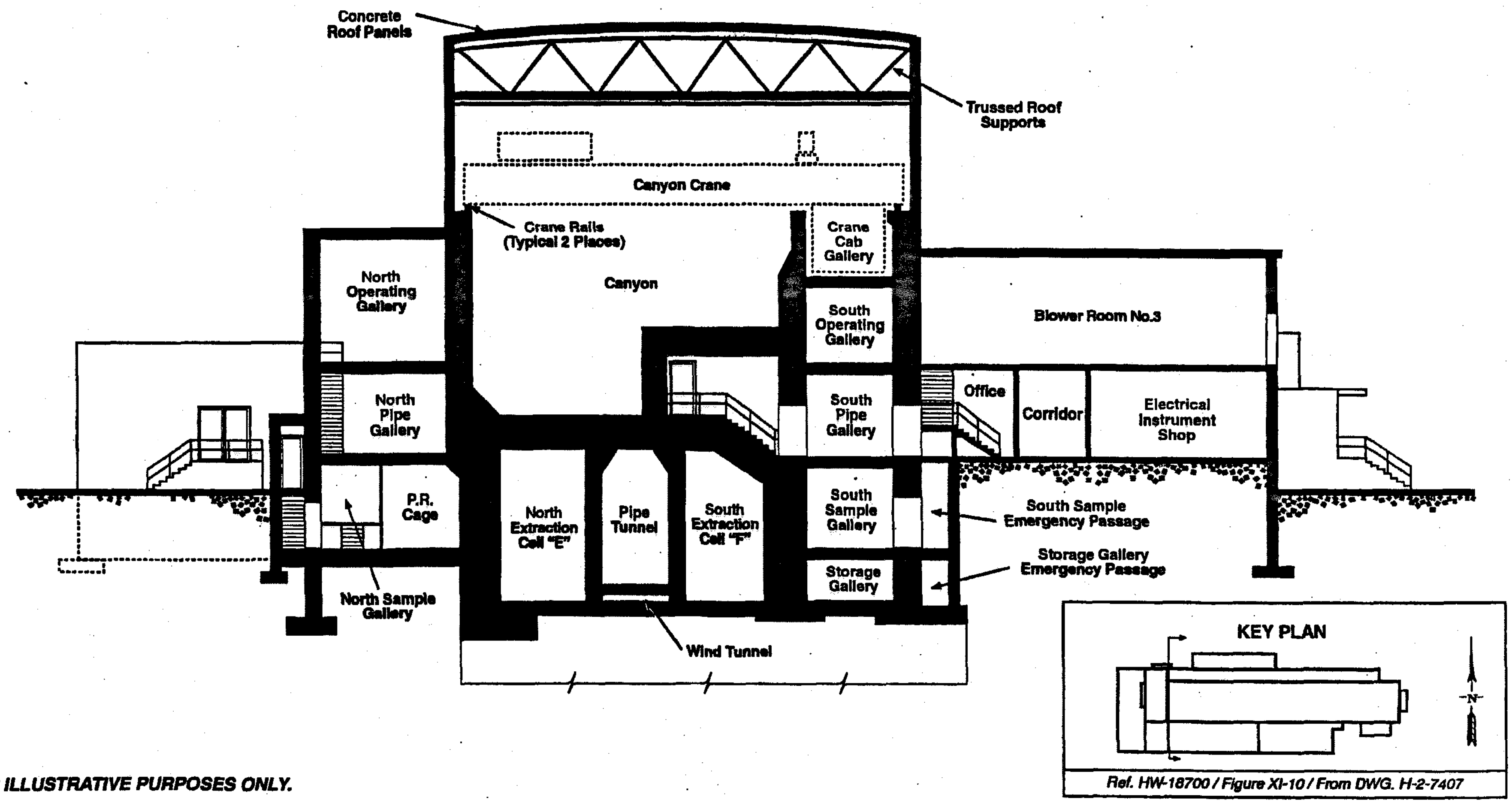
E9909121.14

EXHIBIT 2

FIGURE 2-12 OF BHI-01142

CANYON EMERGENCY EXIT

Figure 2-12. Canyon Emergency Exit.



FOR ILLUSTRATIVE PURPOSES ONLY.

EXHIBIT 3

FIGURE 3 OF BHI-01299

TOP VIEW OF THE PLUTONIUM LOADOUT HOOD

Planned Sampling Locations as Identified in Table 2

1	Sump	BOPC 23
2	Tank E-17 Process Piping	BOPC 22
3	Pu Hood Floor Sample Between Tank E-19 and E-21	BOPC 27
4	Tank E-16 Surface	BOPC 25
5	Tank E-17 Surface	BOPC 28
6	Tank E-19 Surface	BOPC 24
7	Tank E-21 Surface	BOPC 26

Added Sampling Location

8	Sampler Box 146	BOPK 78

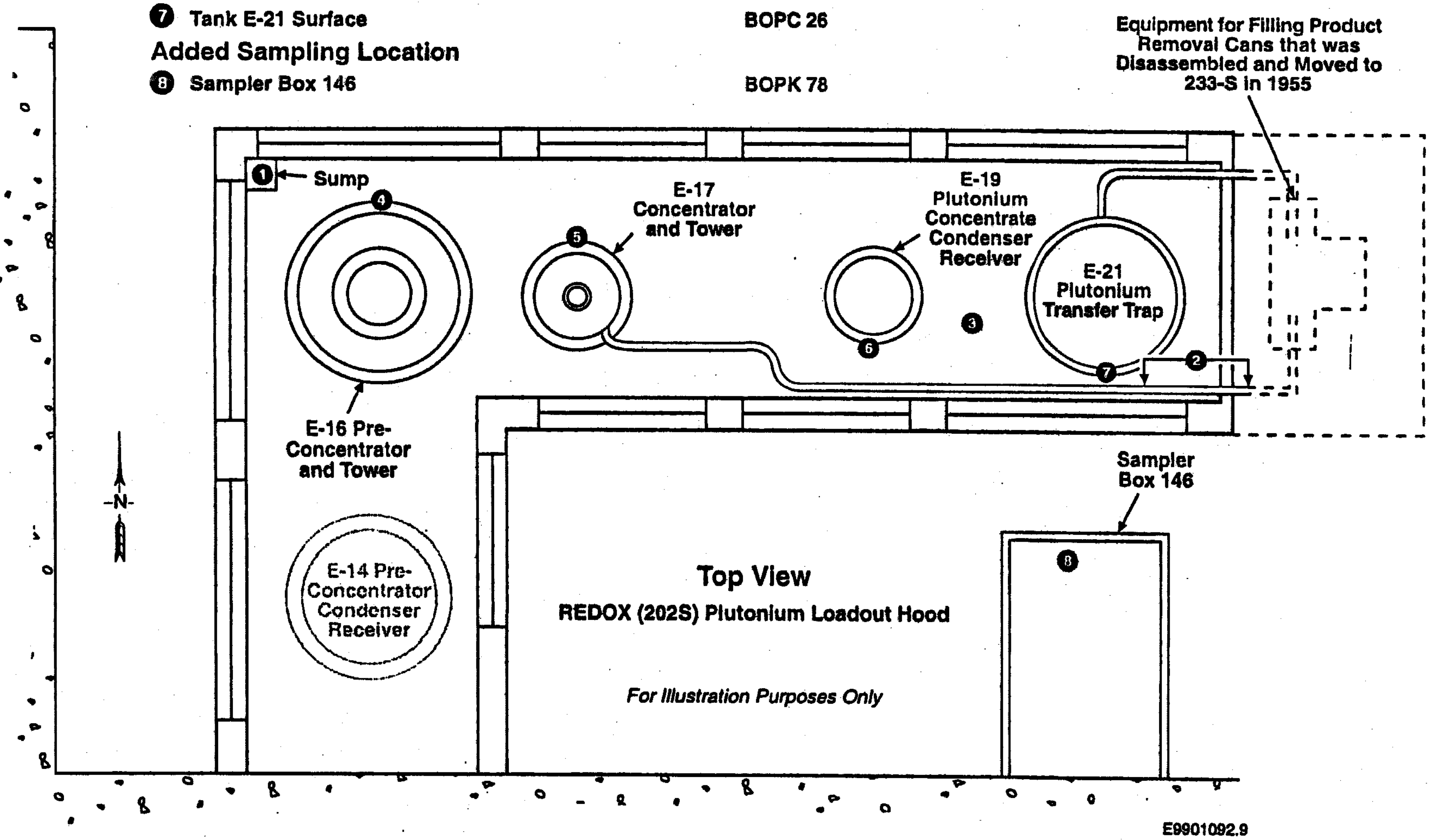


Figure 3. Top View of the 202-S Plutonium Loadout Hood.

EXHIBIT 4

WALKDOWN FOR PR CAGE STABILIZATION

October 27, 1999

FROM THE DESK OF: N. R. Kerr
Nuclear/Facility Safety
373-4865, S3-21

TO: R. G. Egge, S3-21 **DATE:** November 3, 1999

SUBJECT: WALKDOWN FOR PR CAGE STABILIZATION

On Wednesday, October 27, 1999 a walkdown was conducted in the North and South Sample Galleries of REDOX. The purpose of the walkdown is to support the proposed stabilization of the PR Cage (a.k.a., Plutonium Loadout Hood, Pu Loadout Hood, & Product Receiver Cage). Focus for these observations are to support the scope definition and USQ Safety Evaluation for the proposed stabilization work.

Observations in the North Sample Gallery from the false wall east to the corridor walkway follow.

- A flanged fitting (valve) in the acid header above the D-7 sample cave is wrapped with multiple plastic bags. There is visible residue with dose rate measured as high as 11mR/hr on contact. No obvious low spots or drain points were observed. While it is not currently in scope of the Detailed Work Plan (DWP), consideration should be given to sample the residual to determine if stabilization should be made to this line/fitting.

- A flanged fitting on the steam condensate line, midway on the south wall (between L-9 and D-14) also is wrapped in plastic containment. The radiological tag indicates 25 mRad at contact and 700 dpm alpha. Again while out of scope of the current DWP, consideration for additional stabilization should be given.

- Inspection of the EF-8 vent header found no obvious points that require additional stabilization. Downstream of the stainless connection of the fume hood a patch on the EF-8 vent header was observed as well as corrosion on the seams of the painted steel ducting. The small plastic hoods over the sample boxes have small leak points below hoods and over the sample caves. Radiological survey should confirm that there is no significant loose/smearable contamination in these areas. It seems reasonable that since the EF-8 has been operational since shutdown (~1969) and with no humidity conditioning since 1994 that the interior surfaces should be well stabilized by now.

- The HEPA filter bank and ducting to the EF-8 fan and 296-S-2 stack was found to have a configuration that should support the eventual isolation inside the North Sample Gallery. Consideration should be given to install blanks immediately downstream of the upper and lower filter banks. Current air balance records (3/20/99) indicated flow through the lower bank at 650 cfm and flow through the upper bank at 635 cfm. (See Attached Sketch)

- On the face of E-12 just west of the western sample door these is a temporary cover over contamination around a UNH pipe (~1/2" dim.) that penetrates the cave. The radiological tag indicates 15,000 beta and 42,000 dpm alpha. As this is not a significant source potential, the contamination may be left as-is pending confirmation with RadCon.

Observations from the false wall to the PR Cage follow. (See Attached Sketch)

- The NDA documented in BHI-00994 concluded some hold up in four pipe systems, the trench drains of the "hot trench" and "neptunium trench", the H-4 product return line, and the E-3 to L-12 process supply line. Inspection confirmed earlier record of BHI-00994 that there are no obvious flanges or other leak sources associated with these lines except for the connection with the L-16 to E-3 line that terminates at the #146 sample cave. This line does not appear to contribute to the high contamination in the area of the PR Cage.

- The L-16 to H-4 line enters the North Sample Gallery from the hot pipe trench from the north wall of the gallery. The line runs east along the north wall to about 18" to 24" from the door of the dumb waiter. There the line turns north-south and runs across the North Sample Gallery where it continues around the south wall and eventually into H-Cell in the South Sample Gallery. Approximately midway across the North Sample Gallery there is a 2 X 1 X 2 tee where the L-16 to E-3 line connects. Just south of that tee is a 2" air operated valve which would block the flow between 233-S and the H-4 line. This is a suspect fittings in scope of the stabilization effort.

- North of the 2" air operated valve there is a tee that connects the L-16 to E-3 line. Just west of that tee (towards the PR Cage) is a 1" air operated valve, from there the line runs to the east end of the PR Cage then turns south along the east end. At the southeast corner the line turns to the west until turning left to go to the sample cave. Over the sample cave there is a tee to a vertically installed, manual valve that provides a pipe (~1/2" diam.) and is labeled RC to E-3. This line is routed to the east and into the sample cave that is approximately perpendicular to the centerline of the E-21 tank in the PR Cage. To the south of the vertically installed valve is horizontally installed valve that is looped with two drops going into the (#146 or spare) sample cave. Just prior to the loop line, there is a tee that drops a pipe into the sample cave. The loop (between 9" to 12" diam.) is a U shape and provides a second drop into the sample cave. These two manual valves over the sample box are the known leak sources that have contributed to the contamination on the backside of the PR Cage and require additional stabilization. During this entry access into the back side of the PR Cage was prohibited because of high contamination.

- On the front face of the hood there are three connections to the supply ventilation ductwork. Bolted transition pieces provide for a relatively easy installation of isolation blanks to isolate potential infiltration sources into the hood.

- The east end of the PR Cage may be adequately isolated with a covering that is mounted to the frame work of the cage and to the floor. The bottom connection needs to consider a seal at the floor line because there is no curbing as there is around the remainder of the hood. The covering need only be a high as the lower frame work which is approximately 3 foot from the floor surface and is just below the air gage. The upper section of the east end appears to be equivalent to the remainder of the PR Cage.

- The floor and horizontal surfaces in the PR Cage appeared to have a fairly heavy layer of dust on the surfaces. Various smear samples taken during the sampling (BHI-01255) indicate that the gross contamination is relatively moderate when compared the top of the #146 sample cave and the exterior surfaces of the backside of the PR Cage. Additionally there are a couple of small jumpers, what appears to be an internal vessel component, a stool, two wrenches and miscellaneous bolts on the floor. These do not appear to cause and threat of release especially, if a general fixative can be used to stabilize the dust matrix. Radiological Engineering should be able to select a fixatives for the sort of heavy dust in the cage.

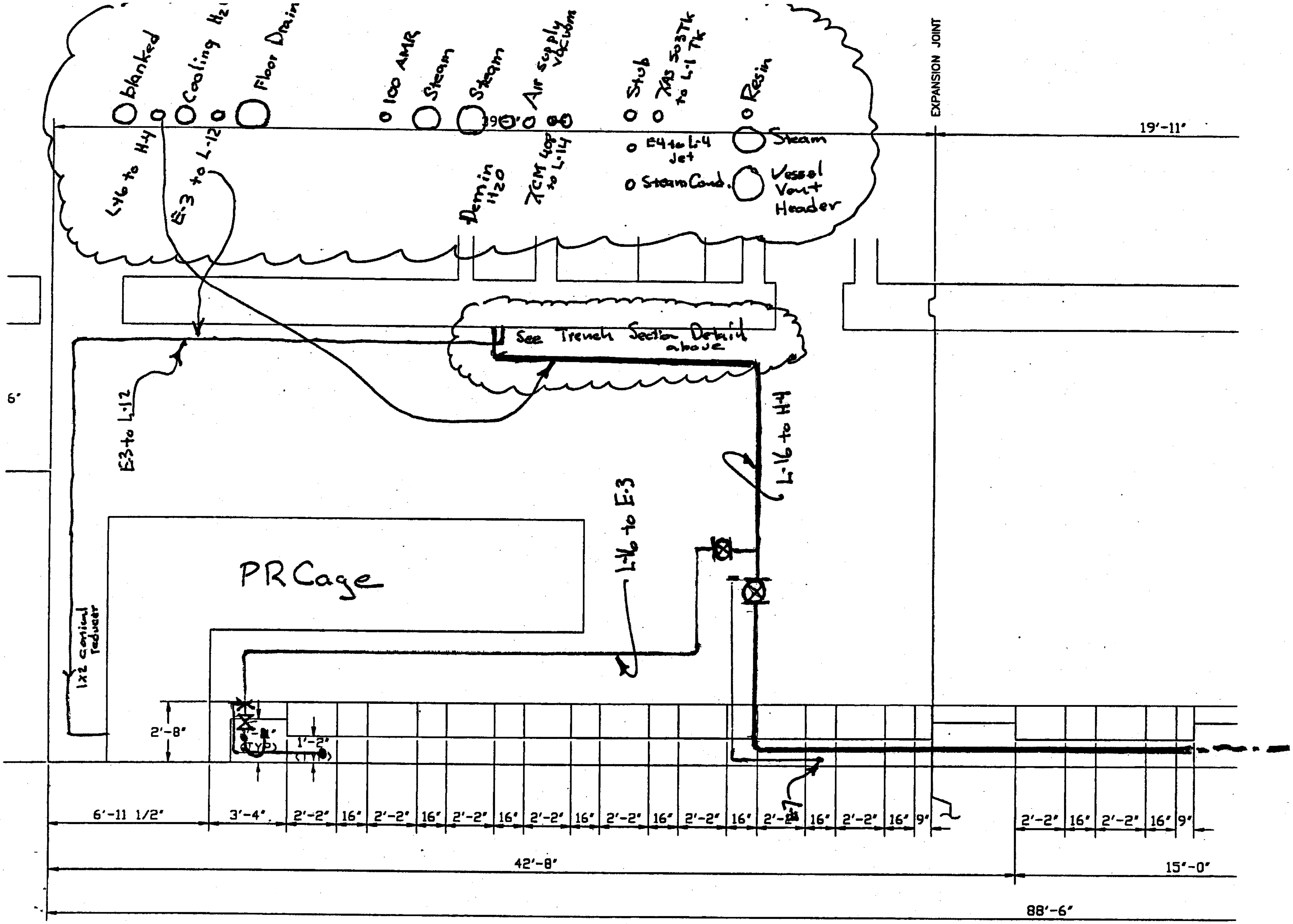
- Access to stabilize the sump in the PR Cage is pretty much as discussed at the POD. The lower two panels on the northwest corner would provide the only reasonable access. For ALARA reasons selection of the stabilization alternative that requires no entry but typical glove box reach is necessary. A grout matrix that can be installed without direct contact by workers is needed because there is no practical way to gain direct access and because of acid waste concerns in the sump. This also means the medium will need to flow around the piping configuration. A mock up and test procedure would be advantageous in selecting the work procedure.

Observations from the South Sample Gallery follow.

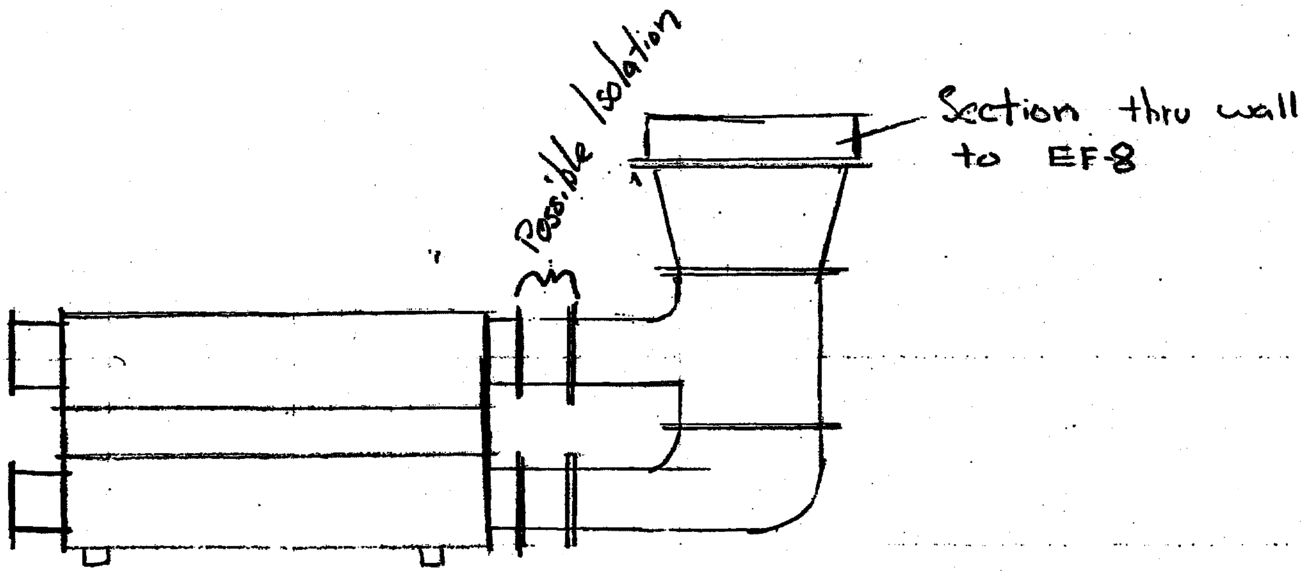
- Followed the H-4 line around the north-south corridor from the North Sample Gallery into the South Sample Gallery. At the corner entering the South Sample Gallery the pipe dips and consequently could contain hold up. However, there are no fittings that would be suspect leak points.

- The valve on the H-4 line that is located just outside H cell is enclosed rigid plastic enclosure. A small quantity of residual waste inside the enclosure is apparent. No significant contamination in the area of the enclosed valve was found during the inspection nor has contamination been found in the recent history.

Distribution: T. A. Edwards
S. P. Kretzschmar
R. J. Lewis
SM&T Project File S3-20



blanked
Cooling H2
Floor Drain
100 AMR
Steam
Steam
Air supply vacuum
Stub
XAS 503 Tk to L-1 Tk
Resin
EXPANSION JOINT
19'-11"
L-16 to H-4
E-3 to L-12
Demin H2O
XCM 400 to L-14
E4 to L-4 Jet
Steam Cond.
Steam
Vessel Vent Header
See Trench Section Detail above
6'
E3 to L-12
L-16 to H-4
L-16 to E-3
PR Cage
1x2 conical reducer
2'-8"
1'-2" (TYP)
6'-11 1/2"
3'-4"
2'-2"
16"
9"
42'-8"
15'-0"
88'-6"



EF-8 HEPA BANK
NORTH Sample Gallery

Assume: 1) Cap over 296-S-2
2) Isolatie EF-8 duct on outside transition

EXHIBIT 5

EVALUATION OF RADIOLOGICAL CHARACTERISTICS

OF THE

PR CAGE SUMP

Radiological Characteristics of the sump in the Pu Loadout Hood of REDOX are based on the data found in Table 4 of BHI-01255.

Assumptions

1. Total volume of sump (6"X6"X6")	3.54E+03	cm^3
2. Liquid density	1.53	g/ml
3. % Liquid volume	74.3	%
4. Total liquid volume	2.63E+03	ml
5. Total liquid mass	4.02E+03	g
4. Solid density	1.55	g/ml
5. % Solid volume	25.7	%
6. Total solid volume	9.10E+02	ml
7. Total solid mass	1.41E+03	g

8. Plutonium is assumed to be all 239.
9. Considers only dectectible isotopes as significant.
10. Used GEA results for ^{241}Am because it is more accurate than the extraction data of BHI-01255 as reported by data staff.

Liquid Sump Characteristics

Isotope	Specific Activity (Ci/g)	μCi/ml	Ci/ml	Activity (Ci)	Isotopic Mass (grams)
^{90}Sr	1.50E+02	2.92E-04	2.92E-10	7.68E-07	5.12E-09
^{137}Cs	9.80E+01	1.38E-03	1.38E-09	3.63E-06	3.70E-08
^{239}Pu	6.22E-02	1.29E+01	1.29E-05	3.39E-02	5.45E-01
^{241}Am	3.43E+00	1.24E+01	1.24E-05	3.26E-02	9.51E-03

Liquid Activity (Ci) = Concentration (Ci/ml) X Liquid Volume (ml)

Isotopic Mass (Ci) = Activity (Ci) / SpA (Ci/g)

Solid Sump Characteristics

Isotope	Specific Activity (Ci/g)	μCi/g	Ci/g	Activity (Ci)	Mass (grams)
^{90}Sr	1.50E+02	3.47E-04	3.47E-10	4.89E-07	3.26E-09
^{137}Cs	9.80E+01	2.82E-03	2.82E-09	3.98E-06	4.06E-08
^{237}Np	7.05E-04	2.02E-02	2.02E-08	2.85E-05	4.04E-02
^{239}Pu	6.22E-02	7.71E+01	7.71E-05	1.09E-01	1.75E+00
^{241}Am	3.43E+00	8.93E+00	8.93E-06	1.26E-02	3.67E-03

Solids Activity (Ci) = Concentration(Ci/g) X Solids Mass (g)

Isotopic Mass (g) = Activity (Ci) / SpA (Ci/g)

Sump Characteristics

Isotope	Liquid Activity (Ci)	Solids Activity (Ci)	Total Activity (Ci)	Liquid Mass (grams)	Solids Mass (grams)	Total Mass (grams)
^{90}Sr	7.68E-07	4.89E-07	1.26E-06	5.12E-09	3.26E-09	8.38E-09
^{137}Cs	3.63E-06	3.98E-06	7.61E-06	3.70E-08	4.06E-08	7.76E-08
^{237}Np	0.00E+00	2.85E-05	2.85E-05	0.00E+00	4.04E-02	4.04E-02
^{239}Pu	3.39E-02	1.09E-01	1.43E-01	5.45E-01	1.75E+00	2.29E+00
^{241}Am	3.26E-02	1.26E-02	4.52E-02	9.51E-03	3.67E-03	1.32E-02

Total Pu/Am (activity)	3.16E+00
Total Pu/Am (mass)	1.74E+02

Mr. M. C. Hughes, President
Bechtel Hanford, Inc.
3350 George Washington Way, H0-09
Richland, Washington 99352

Dear Mr. Hughes:

CONTRACT NO: DE-AC06-93RL12367
DIRECTION TO BECHTEL HANFORD, INC. (BHI) ON THE ELIMINATION OF ADMINISTRATIVE TECHNICAL SAFETY REQUIREMENT (TSR) E4.3 FOR THE EF-8 FAN AND HIGH EFFICIENCY PARTICULATE AIR (HEPA) FILTER IN THE REDUCTION OXIDATION (REDOX) BUILDING

References:
(1) Unreviewed Safety Question Safety Evaluation, "REDOX Pu Loadout Hood Stabilization," 0200W-US-N0156-02, Rev. 2, April 2000
(2) REDOX Facility Safety Analysis Report, BHI-01142, Rev. 1, September 30, 1999
(3) Letter, J. D. Goodenough, RL, to S. D. Liedle, BHI, "Approval of REDOX Safety Analysis Plan," CCN 059818, dated July 7, 1998.

DOE/RL has approved the elimination of the Administrative Technical Safety Requirements for the EF-8 Fan and High Efficiency Particulate Air filter in the Reduction Oxidation (REDOX) Building. Item E4.3 in Appendix E of the Safety Analysis Report (Reference 2) provides an administrative TSR to establish a limiting condition for operations for personnel entry into the sample galleries of the 202-S Building. In addition, this Administrative TSR also has an objective to provide defense in depth for protection of the environment. This letter provides direction to BHI, with AMEW concurrence and technical justification, to eliminate this Administrative TSR when the sequence of interim stabilization activities as described in the USQ Safety Evaluation 0200W-US-N0156-02, Rev. 2 (Reference 1) have been accomplished.

If you have any questions, please contact John Sands of my staff at 373-2822.

Sincerely,

XXX:XXX

X. X. Xxxxxxxx, Title
Department/Division

cc:
J. P. Sands

CCN # 079121

Customer To Complete:

- ☐ Please call me for pick up/hand delivery ______________________
- ☐ This meets a Milestone or PBCI
- ☐ This closes CCN ______________
- ☒ This has action

Any Special Directions (i.e., added distribution, reproduction instructions, colored items, extra attachments) Please add name / telephone # for DIS questions:

DIS TO COMPLETE:

RECORD TYPE LTR

DATA ENTRY BY dmc

REPRO BY LP/53

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