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March 7, 2000

Mr. George J. Malosh
Brookhaven Group Manager
U.S. Department of Energy
Building 464
Upton, New York 11973

SUBJECT: Unreviewed Safety Issue Determination/Safety Evaluation (USID/SE) for the Instrument House (Building 708) Components Removal and Isolation for BGRR Decommissioning Project

Dear Mr. Malosh:

Attached for your information is the subject document (BGRR-SE-00-01, Rev. 0, dated 02/03/00, covering WBS 1.04 – Instrument House (708) Components Removal and Isolation. This document has already been submitted informally to the DOE Project Manager for the BGRR Decommissioning Project for his information. As the analysis indicates, the activities covered do not constitute an Unreviewed Safety Issue, and prior approval by DOE is not required for work to begin.

If you have any questions regarding the contents or analysis of BGRR-SE-00-01, please do not hesitate to call Steven Moss (ext. 7639) or Stephen Pulsford (ext. 2394).

Sincerely,

Michael H. Schlender
Assistant Laboratory Director
Environmental Management

SM:ljt
Enclosure: BGRR-SE-00-01, Rev. 0

cc (w/Enclosure):
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cc (w/o Enclosure):

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M. Holland, DOE/BHG	S. Moss, BGRR	File A414

Safety Evaluation Number: **BGRR – SE – 00 – 01** **Revision Number:** 0

Prepared by: S. H. Moss SHMoss 3/2/00 **Date:** 02/03/00

Description of proposed activity: WBS 1.04, Instrument House (708) Components Removal & Isolation

The Instrument House is a steel, concrete, and brick structure, approximately 45 feet long, 14 feet wide, and 10 feet high. It was built over the underground primary air-cooling ductwork and contained airflow monitoring instrumentation, primary air-exhaust water-cooling piping, and valves for the coolers' operation.

The activities within the Instrument House will be accomplished separately from the Above Ground Duct Removal, which is also covered under WBS 1.04, but with a separate USID/SE, namely BGRR-SE-99-04. The work to be accomplished in Building 708 will be in accordance with the Technical Work Document [ERD-BGRR-TP-00-01] covering Instrument House (708) Components Removal & Isolation [Ref. 11], copy attached and the Job Safety Analysis [Ref. 10], copy attached.

The activities to be performed here include:

1) Survey the building's interior for radiological and non-radiological hazards.*
2) Seal duct openings.
3) Remove instrumentation, including mercury and water piping to the cooler that contains asbestos.
4) Cut and seal cooling-water piping penetrations to the underground duct work.
5) Dispose of the low-level radwaste and non-radwaste materials.

***N.B.** Characterization activities are already covered by the BGRR-ASA, have no pre-established limits (beyond RWP requirements), and strictly speaking are outside the scope of this USI evaluation. However, the work activities contemplated under this USI evaluation are based on any discovered contamination not exceeding the limits of the BNL Rad Con Manual Table 2-2, Definition of Removable and Fixed Contamination Levels. Should characterization related activities yield results which indicates hidden contamination levels above the Table 2-2 limits, this USI evaluation must be revised or replaced with another that adequately addresses the risks associated with contaminated work, before the contaminated work activities can proceed.

Purpose:

The purpose of WBS 1.04 for the BGRR Decommissioning Project includes Preparing for Removal the Above-grade Instrument House Building 708 that is constructed over portions of the underground duct work. It specifically consists of: 1) isolation & removal of equipment and components; 2) decontamination of components to minimize exposure to personnel; 3) packaging and disposal of components; 4) Radiological Control activities; and 5) Final cleanup of work area.

The purpose of this USID/SE is to cover the completion of the Instrument House (708) work activities associated with WBS 1.04, namely, the removal of components from and isolation of Building 708.

References:

(1) Procedure No. BGRR-SOP-0902, "Safety Evaluations for Unreviewed Safety Issue Determinations", Rev.0 dated 7/12/99.
(2) BGRR-002, "Hazard Classification and Auditable Safety Analysis for Brookhaven Graphite Research Reactor (BGRR) Decommissioning Project", Rev. 2 dated September 8, 1999, as approved by DOE 12/07/99.
(3) BGRR-001, "Brookhaven Graphite Research Reactor (BGRR) Project Management Plan", Rev.0 dated May 26, 1999, as concurred with by DOE.
(4) BNL ES&H Manual Standard 1.3.3, "Safety Analysis Reports / Safety Assessment Documents", Rev.1 dated 7/28/92. [URL= https:sbms.bnl.gov/ld/ld08/ld08d081.htm]
(5) DOE-STD-1027-92, "Hazard Categorization and Accident Analysis Techniques for Compliance with DOE Order 5480.23, Nuclear Safety Analysis Reports" Change Notice No. 1 dated September 1997.
(6) LA-12846-MS, "Specific Activities and DOE-STD-1027-92 Hazard Category 2 Thresholds", LANL Fact Sheet issued November 1994.
(7) LA-12981-MS, "Table of DOE-STD-1027-92 Hazard Category 3 Threshold Quantities for the ICRP-30 List of 757 Radionuclides", LANL Fact Sheet issued August 1995.
(8) BNL Memorandum of Agreement (MOA) between BGRR Project Office and HFBR regarding ownership and control of Fan House Building 704 and Associated Equipment, Systems and Structures, dated 12/11/98.
(9) BNL RadCon Manual, <https://sbms.bnl.gov/program/pd01/pd01t011.htm>

(10) BGRR-019, BGRR Decommissioning Project Job Safety Analysis for Instrument House (708) Components Removal & Isolation (Copy included as Attachment No. 1).
(11) ERD-BGRR-TP-00-01 Technical Work Documents covering Instrument House (708) Components Removal & Isolation (Copy included as Attachment No. 2).
(12) BGRR Decommissioning Project – Environment, Health and Safety Plan, Rev. 0 dated September 16, 1999.
(13) NUREG/CR-0672, "Technology, Safety and Costs of Decommissioning a Reference Boiling Water Reactor Power Station", June 1980.
(14) Long Island Power Authority – Shoreham Nuclear Power Station – NRC Docket No. 50-322, "Updated Decommissioning Plan", February 1993.
(15) Instrument House (708) Radiological Survey/Sampling/Analyses (copy included as Attachment 3).
(16) DOE Safety Evaluation Report (SER), Brookhaven Graphite Research Reactor Decommissioning Project, Final Rev.7, dated October 15, 1999.

SCREENING CRITERIA

Safety Function(s) of Systems Affected

1. Will the proposed activity affect the safety function(s) or failure mode(s) of the equipment/facility? Y (N) N/A

Because of its defunct status and defueled state, the BGRR has no current requirements for redundant systems and/or safety class or safety significant SSCs (Systems, Structures and Components). Therefore, no safety functions exist that are directly associated with current components or equipment considered part of the scope of the BGRR Decommissioning Project. Where no safety functions exist, there can be NO effect on the safety function by the proposed activity.

All Reactor Air-Cooling Equipment was shutdown as part of the general BGRR shutdown in 1969. These may already be considered as failed.

The proposed activity will not affect the safety function(s) of the facility [as there are none]. It will not affect the failure mode(s) of the equipment/facility, as the equipment was previously and permanently shutdown. The answer to Question 1 of Safety Function(s) of System Affected is '**NO**'.

2. Will any new failure modes be introduced by the proposed activity? Y (N) N/A

BGRR-002, "Hazard Classification and Auditable Safety Analysis for the BGRR Decommissioning Project", Rev. 2 dated September 8, 1999 [Ref. 2], was formally approved by DOE, as of 12/07/99. The BGRR-ASA specifically excludes the removals from Building 708 from being considered a part of its scope and declares that such activities require evaluation for Unreviewed Safety Issue (USI) Determination.

However, the BGRR-ASA specifically includes under its Authorization Basis umbrella: (1) routine monitoring of the physical plant for radiological- and non radiological- hazards; (2) characterization sampling for ES&H concerns, waste management, and USI-analyses for various decommissioning tasks; and (3) undertaking routine facility maintenance and upkeep (including stabilization tasks, e.g., enhancing the isolation of Building 702, as necessary).

The proposed activity includes all three of the above covered activities, with stabilization represented by the isolation of Building 708 and mechanical removal of previously deactivated components associated with the Reactor Air Cooling System. In consideration of the results of the radiological surveys of Building 708 to date (see Attachment 3) and the absence of any known reservoirs of radiological material being associated with the proposed activity, no new failure modes of a radiological nature are being introduced by the proposed activity. [This holds true as long as no discovered levels of potential contamination exceed the limits of Table 2-2, Definition of Removable and Fixed Contamination Levels, contained within the BNL RadCon Manual [Ref.9]. For non-radiological hazardous material, which may be present and exposed during the proposed activity, BGRR-ASA Section 3.2.9 already provides a discussion of the accident/failure mode associated with that potentiality.

Therefore, the proposed activity will not introduce any new failure modes [as long as the radiological limits are observed, via a limiting condition in the RWP used for coverage of the proposed activity. If radiological material in the form of contamination is discovered above the allowable limits defined above, then the removal work will be halted while a revision of the USID/SE is completed and circulated for sign-off]. The answer to Question 2 of Safety Function(s) of System Affected is a qualified '**NO**'.

Effects on Safety

1. Could the proposed activity increase the probability of occurrence of an accident previously evaluated in the Authorization Basis Documentation (ABD)? Y (N) N/A

In the DOE Safety Evaluation Report (SER) for the BGRR-DP [Ref.16], it lists the set of documents that constitute the BGRR-DP Authorization Basis Manual, which is kept under a configuration management system. These documents include; the BGRR-ASA as approved by DOE, the DOE SER, the BGRR-DP Health and Safety Plan, the BGRR-DP Quality Assurance Project Plan, and every USID/SE approved by DOE. Of all these documents, the only ones that speak to probability of occurrence of accidents are; BGRR-ASA, DOE-SER (which reiterates the salient points within the BGRR-ASA and amplifies on them), and the USID/SEs submitted to and approved by DOE.

First, the BGRR-ASA must be reviewed for the potential impact of the proposed activity on the probability of occurrences for the accident scenarios contained within the BGRR-ASA. Because of the "Routine Risk" nature of the defueled BGRR (classified as a "Radiological Facility"), a rigorous probabilistic risk assessment was not required as part of the Auditable Safety Analysis. Instead, using a graded approach and the guidance offered in BNL ES&H Standard 1.3.3, {https:sbms.bnl.gov/ld/ld08/ld08d081.htm}[Ref. 4], the Risk Assessment Tables of Section 3.2 of the BGRR-ASA were developed.

Among the events analyzed in BGRR-ASA Section 3.2 – Risk Assessment are; Seismic Event, High Winds, Graphite Dust Detonation, Loss of Pile Negative Pressure System Ventilation, Loss of Pile Negative Pressure System Filtration, Crane Load Drop, Fire, Facility Worker Exposure to Toxic Material.

The proposed activity has no capability to impact the probability of occurrence of Seismic Events or High Winds (which are natural phenomena). Additionally, as the proposed activity is limited to the removal of deactivated Reactor Air Cooling components from the Instrument House (Bldg. 708); it has no potential to impact the probability of events occurring at other local buildings e.g., Buildings 701 & 702. This eliminates from further consideration; Graphite Dust Detonation, Loss of Pile Negative Pressure System Ventilation, Loss of Pile Negative Pressure System Filtration, and Building 701 Crane Load Drop. The only remaining accident scenarios from the BGRR-ASA to be considered are: Risk Assessment No. 007, covering Fire; and Risk Assessment No. 008, covering Facility Workers Exposure to Toxic / Hazardous Materials.

The proposed activity involves removal of metal components. There are minimal amounts of combustible materials involved and only mechanical means used for separation (no flame cutting is required or permitted based on the current Technical Work Document [Ref.11]. While the event of a fire cannot be ruled out, the proposed activity clearly represents no increase in the probability of fire as defined in BGRR-ASA Risk Assessment No.7. At worst, it merely reflects one of the potential initiators of the event. The proposed activity represents no increase in the probability of occurrence of the event as defined in BGRR-ASA Risk Assessment No. 007.

Finally, as 'Potential Initiators' under Risk Assessment No. 008 covering Facility Worker Exposure to Toxic/Hazardous Materials are; natural phenomenon, operator error, or equipment failure causing breach of deactivated piping or equipment containing residual hazardous/toxic material. The only BGRR-DP facility workers are those directly involved in the decommissioning process, including the performance of the proposed activity. Therefore, the proposed activity does not increase the probability of occurrence of this event. It merely reflects one of the potential initiators of this event. The proposed activity represents no increase in the probability of occurrence of the event as defined in BGRR-ASA Risk Assessment No. 008.

As the DOE SER presents no new accident scenarios beyond those already discussed in the BGRR-ASA, what is true for the BGRR-ASA is also true for the DOE-SER. The proposed activity does not increase the probability of any accident evaluated in the DOE-SER.

At the present time, the only USID/SEs that have been submitted to and approved by DOE for the BGRR-DP include: BGRR-SE-99-01, Removal of Pile Fan #5 (Completed); BGRR-SE-99-02, Removal of Pile Fan Sump (Currently Underway); BGRR-SE-99-03, Removal of Residual Pile Fans (Completed). Of these three USID/SEs the only one not yet completed is the Removal of the Pile Fan Sump (with associated piping and contaminated soil). The proposed activity, being limited to actions defined above, within the confines of the Instrument House (Bldg. 708), located remotely from the vicinity of the Pile Fan Sump, clearly has no impact on the probability of occurrence of any accident evaluated in BGRR-SE-99-02.

The proposed activity does not increase the probability of any accident evaluated in the BGRR-DP Authorization Basis Manual, so the answer to 'Effects on Safety' Question 1 is '**NO**'.

2. Could the proposed activity increase the probability of occurrence of a malfunction of equipment, systems, or components that are Important-to-Safety? Y (N) N/A

As was already discussed in response to Screening Criterion No. 1 under 'Safety Function(s) of Systems Affected'; the BGRR has no current requirements for redundant systems and/or safety class or safety significant SSCs (Systems, Structures and Components) due to its defunct status and defueled state. Therefore, no safety functions exist that are directly associated with the proposed activity covered by this USID/SE. Without equipment, systems or components that are Important-to-Safety, there can be no probability of occurrence of a malfunction of equipment, systems or components that are Important-to-Safety; nor any increase in same.

The proposed activity could not increase the probability of occurrence of a malfunction of equipment, systems or components that are Important-to-Safety. The answer to 'Effects on Safety' Question 2 is '**NO**'.

3. Could the proposed activity create the possibility of an accident of a different type than those previously evaluated in the ABD? Y (N) N/A

As already discussed in the response to Screening Criterion No. 2 under 'Safety Function(s) of Systems Affected', the answer to this question is a qualified '**NO**'. The proposed activity should be a radiologically clean one (i.e., falling under the limits of BNL RadCon Manual Table 2.2, Definition of Removable and Fixed Contamination Levels), and covered under the routine industrial risks and accident analysis associated with the BGRR-ASA.

4. Could the proposed activity create the possibility of an equipment, system, or component malfunction of a different type than those previously evaluated in the ABD? Y (N) N/A

As already discussed in the response to Screening Criterion No. 2 under 'Safety Function(s) of Systems Affected', the answer to this question is a qualified '**NO**'. However, even if an equipment , system or component malfunction of a different type than those previously evaluated in the ABD did occur as a result of the proposed activity, it would have no consequence, based on the limitations of the hazards.

5. Does the proposed activity reduce the Margin-of-Safety as defined in the basis for any ABD? Y (N) N/A

In BGRR-SOP-0902 [Ref. 1], the procedure states "In the context of this procedure a Margin-of-Safety is reduced if the Safety Limit or Limiting Condition of Operation or Administrative Control as defined in the Authorization Basis Document(s) is violated". As this USID/SE is based upon the guidance provided in the above referenced procedure, that definition of Margin-of-Safety compels the answer 'NO'.

The proposed activity DOES NOT reduce the Margin-of-Safety as defined in the BGRR-ASA because the work is being reviewed under the USI process prior to authorization and will not violate any of the Administrative Controls already contained in the BGRR-ASA as long as the work is performed as described in the task specific technical work documents [Refs. 9, 10, 11 and 12]

Authorization Basis Document(s) Changes

1. Is a change to the facility ABD(s) being made? Y (N) N/A

The BGRR-ASA refers to the proposed activity ("removals from Building 708") as requiring evaluation for Unreviewed Safety Issue Determination. The process for conducting such an evaluation is covered by BGRR-SOP-0902, Safety Evaluations for Unreviewed Safety Issue Determination. This approved procedure has been endorsed not only by the BGRR-ASA, but also within the DOE SER. In Section 3.0 - DEFINITIONS of BGRR-SOP-0902, it states, "**Unreviewed Safety**

Issue (USI). A proposed activity shall be deemed to involve a USI when any of the responses to the questions on the Safety Evaluation Form for USI Determination results in a '**YES**' answer".

With the absence of any '**YES**' answers in response to questions addressed above, no USI exists and so no change to the facility ABD is contemplated by the performance of the proposed activity.

The answer to 'Authorization Basis Document(s) Changes' Question 1 is '**NO**'. In accordance with BGRR-SOP-0902, and upon BGRR-DP signoff for approval of this document, it will be forwarded to DOE for information only.

SAFETY EVALUATION CONCLUSION

Based on the evaluation of the evidence cited above, the issue --

__✓__ Does NOT constitute an Unreviewed Safety Issue.

_____ Does constitute an Unreviewed Safety Issue.

**** IF ANY OF THE ABOVE ARE <u>YES</u>, THEN A USI EXISTS. ****

Cheryl T. Heermann 3/2/00
BGRR-DP Project Engineer Signature/ Date

Stephen V. Musolino 3/2/00
BGRR-DP Manager for ESH&Q Signature/ Date

Stephen F. Pulsifer 3/6/00
BGRR-DP Project Manager Signature/ Date

[illegible] 3-2-00
BGRR-DP Quality Representative Signature/ Date

ATTACHMENT 1

BGRR-DP Job Safety Analysis (JSA) for

Instrument House (708) Component Removal & Isolation

ERD-BGRR TASK-SPECIFIC

JOB SAFETY ANALYSIS

Project Task: **BGRR BUILDING 708, INSTRUMENT HOUSE COMPONENTS REMOVAL AND ISOLATION**

Walk-thru Participants: T. Jernigan
D. Mergen
R. Suga

Date: March 1, 2000

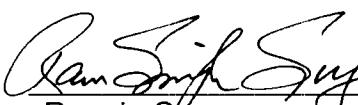
Reference Documentation:

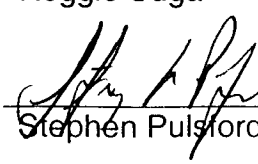
1. Technical Work Document, ERD-BGRR-TP-00-01
2. Work Permit No. _____

Attachments:

A. Emergency Call-out List
B. Health Hazard Analysis for Lead
C. Health Hazard Analysis for Asbestos
D. Health Hazard Analysis for Mercury
E. Health Hazard Analysis for PCBs

Reviewed by: Hank Bachner
Thomas Jernigan
Stephen Musolino
Steven Moss
Clyde Newson

Prepared by:  3-2-00
Reggie Suga Date

Approved by:  3/6/00
Stephen Pulsford Date

BGRR BUILDING 708, INSTRUMENT HOUSE COMPONENTS REMOVAL AND ISOLATION				
Task	**Steps/Activity**	**Hazards**	**Mitigation/Reduction**	**Comments**
1.0 General	1. Clean up the work area	1. Trips and slips	1. Remove unnecessary equipment and materials.	
1.1 Mobilization	2. Stage necessary equipment	2. Trips and slips	2. Since this is a small area, stage the equipment and tools in a separate area. Consult Construction Manager.	
	3. Personnel training	3. Untrained workers cause workplace injuries	3. Ensure that the workers are properly trained for the job.	
	4. Temporary lights	4. Insufficient lighting can cause trips and slips	4. Install or make additional lights available.	
1.2 General	Use of Heavy Equipment	1. Failure of equipment	1. Inspect all equipment daily and document findings	
		2. Accidents caused by movement of equipment in a small area	2. Use only equipment that fits the task. Remove unnecessary materials	

BGRR BUILDING 708, INSTRUMENT HOUSE COMPONENTS REMOVAL AND ISOLATION				
Task	**Steps/Activity**	**Hazards**	**Mitigation/Reduction**	**Comments**
1.2 (cont.)	Use of Rigging Equipment	1. Failure of chokers, slings, and other rigging equipment	1. Inspect before their use	
		2. Failure of chain falls	2. Do not exceed the recommended tested load	
		3. Failure of crane/boom truck	3. Do not exceed rated capacity. A qualified person must approve platform.	
		4. Traffic hazards	4. A watch person must control the traffic. Use caution tape within work area.	
		5. Overhead utility lines	5. Develop a safe work site route and watch for the overhead lines.	
		6. Critical lift	6. Follow BNL ES&H 1.6.0 and 1.6.1	
	Confined entry (Class I)	1. Atmospheric hazards	1. Monitor atmospheric hazards before entry. Follow BNL ES&H 2.2.4.	
		2. Slips and trips	2. Work on sturdy footing	

BGRR BUILDING 708, INSTRUMENT HOUSE COMPONENTS REMOVAL AND ISOLATION				
Task	**Steps/Activity**	**Hazards**	**Mitigation/Reduction**	**Comments**
1.3 General	Cutting the pipes (1) Use of reciprocating saw such as a Sawzall or hand-held hacksaw.	1. Equipment failure 2. Electrical shock 3. Breakage of cutting blade 4. Slips and trips in small areas 5. Inhalation hazards	1. Check equipment before use 2. Use GFCI at all times 3. Wear face shield while cutting pipes 4. Work on sturdy footing 5. Monitor atmospheric hazards as a cut is made through the pipe	No flame cutting or abrasive cutting is allowed Consult Industrial Hygienist for explanation of hazards.
1.4 General	Removal of pipes from the room	1. Trips and falls 2. Failure of rigging equipment 3. Manual handling (ergonomics concern) 4. Oversize pipes	1. Clear the area of passage for pipes removal 2. Do not exceed the recommended load 3. Avoid excessive manual pushing and pulling. Use mechanical means, if possible. 4. Cut to size to go through doors	Also follow instructions in task #1.2

BGRR BUILDING 708, INSTRUMENT HOUSE COMPONENTS REMOVAL AND ISOLATION				
Task	**Steps/Activity**	**Hazards**	**Mitigation/Reduction**	**Comments**
1.5 General		Lead-based paint hazards – inhalation	1. Either abate the lead-based paint using: a. A "Peel-Away"-type compound to remove paint layer, or b. If there is a generation of dust, respiratory protection and personal monitoring is necessary c. Stabilize cut line by applying non-leaded sealant such as duct tape.	See Attachment B, Health Hazards Analysis for Lead Consult Industrial Hygienist if any other method of lead abatement is used
		Asbestos – Insulation	1. Pre-abate asbestos from areas of work on insulation pipes using qualified asbestos-handling workers. 2. Any damaged ACM needs to be repaired before removal 3. Follow disposal instructions and oversight from Waste Management Representative	See Attachment C, Health Hazard Analysis for Asbestos
		Mercury vapors: 1. Inhalation 2. Skin contact	1. Use mercury analyzer during related activities. 2. Avoid skin/eye contact. Use proper PPE	See Attachment D, Health Hazards Analysis on Mercury. Consult Industrial Hygienist for explanation of hazards.

BGRR BUILDING 708, INSTRUMENT HOUSE COMPONENTS REMOVAL AND ISOLATION				
Task	**Steps/Activity**	**Hazards**	**Mitigation/Reduction**	**Comments**
1.5 (cont.)		Polychlorinated biphenyl (PCBs) – skin contact	1. Avoid skin contact using proper PPE. 2. Ingestion has carcinogenic effect 3. Inhalation hazards are minimal for this task	See Attachment E, Health Hazard Analysis for PCBs
	Radiological monitoring	Radiological hazards (both inhalation and skin contamination)	Follow instructions on RWP	Consult RCT for all radiological monitoring activities.
1.6	Breach of systems during cutting	Atmospheric hazards O_2, LEL, and CO.	When the first cut is made, check with the 4-gas monitor	Consult Industrial Hygienist for explanation of hazards.
	4.4 Refer to ERD-BGRR-TP-00-01 for all activities)	Energized system/equipment	De-energize the system using Lock-out/Tag-out (BNL ES&H 1.5.1)	
	5.1.1 Miscellaneous components (e.g., DP cell recorders)	Mercury hazard	1. Use mercury analyzer before breaking lines 2. Ensure that mercury does not spill, if present, from the equipment to be removed 3. Use a secondary container to catch any spill	Consult Industrial Hygienist for explanation of hazards.
	5.2 Cooling water supply and return piping	Cutting and removal of various lines	1. Follow instructions in task 1.2. 2. Follow instructions in task 1.3. 3. Follow instructions in task 1.4.	

BGRR BUILDING 708, INSTRUMENT HOUSE COMPONENTS REMOVAL AND ISOLATION				
Task	**Steps/Activity**	**Hazards**	**Mitigation/Reduction**	**Comments**
1.6 (cont.)	5.3 Secondary air piping	Same as tasks 1.3 and 1.4	Same as task 1.3 and 1.4	Caution: These pipes are heavier than other pipes; so sectioning these pipes into manageable pieces will be optimal to remove out of Building 708 safely.
	5.4 Unit heaters and steam pipes	1. Asbestos hazard 2. Condensate in the lines 3. Fall from ceiling – pinch feet and hands	1. Ensure that asbestos has been abated around the area of cuts. After the cuts are made, this pipe is handled in a way as not to cause airborne fibers. Do not cut the asbestos gaskets. 2. Check for presence of condensate. If present, collect in a container using proper PPE and dispose of per direction of Waste Management Representative. 3. Carefully engage/hold firmly to bring to the floor.	

BGRR BUILDING 708, INSTRUMENT HOUSE COMPONENTS REMOVAL AND ISOLATION				
Task	**Steps/Activity**	**Hazards**	**Mitigation/Reduction**	**Comments**
1.6 (cont.)	5.5 Drain piping	1. Skin contamination 2. Inhalation hazards 3. Collection of the fluids 4. Cutting hazards 5. Removal pipes	1. Use PPE to avoid skin contact 2. Monitor for rad and toxic gases O_2 when first cut is made. 3. Collect in a sealable container for proper disposal if contaminated fluids are present. 4. Follow instructions in task 1.3. 5. Follow instructions in task 1.4.	Consult Industrial Hygienist and RCT for explanation of hazards.
	5.6 Air Piping	1. Inhalation hazards 2. Cutting 3. Removal	1. Check for rad and toxic gases when first cut is made 2. Follow instructions in task 1.3 3. Follow instructions in task 1.4	Consult Industrial Hygienist for explanation of hazards.
	5.7 Flow transmitter	1. Mercury vapors 2. Spill hazards 3. Disposal of mercury-containing equipment	1. Use mercury analyzer during removal of this unit. Respiratory protection may be necessary. 2. Pre-engineer a secondary container to control any spill 3. Consult Waste Management Representative	Consult Industrial Hygienist for explanation of hazards.
	Other instruments (manometer, recorders, and gauges)	1. Presence of mercury and its vapors 2. Spill hazards	1. Use mercury analyzer if visual check cannot be made 2. Use secondary container during the removal	Consult Industrial Hygienist for explanation of hazards.

BGRR BUILDING 708, INSTRUMENT HOUSE COMPONENTS REMOVAL AND ISOLATION				
Task	**Steps/Activity**	**Hazards**	**Mitigation/Reduction**	**Comments**
1.6 (cont.)	5.8 General	1. Trips, falls, and slips 2. Spill hazards	1. Cover all gratings when working above grates 2. Comply with PPE requirements when exiting that area	
	5.10 Various other activities, such as installing covers and capping/plugging lines and/or wall penetrations	1. Hand injuries 2. Walls/line pluggings	1. Use pre-engineered covers so that they fit properly 2. Have an MSDS available for each chemical foam or cement, if used.	Consult Industrial Hygienist for explanation of hazards
1.7 Emergency Response	General	Emergency Environments	Follow attached emergency call out	See Attachment A
1.8	General clean-up and demobilization	Trips, slips, and falls	Removal all unnecessary materials and equipment	

Attachment A

Emergency Response

First Aid/Medical Assistance **2222 or 911 or 344-2222 cellular**

	Voice	Pager
Project Manager (Stephen Pulsford)	344-2394	554-7028
Project ES&H/Q Manager (Stephen Musolino)	344-4211	441-8136
Construction/Facility Manager (Hank Bachner)	344-8246	554-4062
ES&H Coordinator (Reggie Suga)	344-8248	554-4313
Local Emergency Coordinator (Kevin Corbett)	344-2431	554-3923
DOE BGRR Project Manager (James Goodenough)	344-2423	
DOE Facility Representative for BGRR (Maria Dikeakos)	344-3950	800-796-7363 pin 1066603

Preliminary MEDICAL CARE is provided through Fire/Rescue and Occupational Medicine Clinic.

Attachment B

HEALTH HAZARD ANALYSIS

INORGANIC LEAD

INTRODUCTION

Inorganic lead is defined as lead oxides, metallic lead, and lead salts, including organic salts. This Hazard Analysis of inorganic lead summarizes pertinent information about inorganic lead for workers, employers, and occupational safety and health professionals.

CHEMICAL AND PHYSICAL PROPERTIES

- **Physical data**
  Molecular weight: 207.19; Boiling point (at 760 mmHg): 1,740^{0}C; Specific gravity (water = 1): 11.34, Melting point; 327.5^{0}C; Insoluble in water.
- **Reactivity**
  1. Incompatibilities: Lead reacts vigorously with oxidizing materials. Contact with hydrogen peroxide or active metals such as sodium or potassium may cause fires or explosions.
  2. Hazardous decomposition products: Toxic fumes (e.g., lead oxide) may be released in a fire involving inorganic lead.

  Caution: 1. Lead is combustible in powder form when exposed to heat or flame.
  2. Lead has poor warming properties.
- **Warning properties**
  Evaluations of warning properties for respirator selection: Based on lack of information on odor threshold and eye irritation levels, inorganic lead should be treated as a chemical with poor warning properties.

EXPOSURE LIMITS

The current Occupational Safety and Health Administration (OSHA) permissible exposure limit (PEL), for inorganic lead is 50 micrograms of lead per cubic meter of air (50ug/m^3) as a time-weighted average (TWA) concentration over an 8-hour workshift IDLH = 100 mg/m^3. Action level is 30 ug/m^3.

HEALTH AND HAZARD INFORMATION

- **Routes of exposure**
  Inhalation or ingestion of inorganic lead has caused peripheral neuropathy with paralysis of the muscles of the wrists and ankles, encephalopathy, anemia (due to decreased red blood cell life and impaired heme synthesis), proximal kidney tubule damage, decreased kidney function, and chronic kidney disease. Lead can accumulate in the soft tissues and bones, with the highest accumulation in the liver and kidneys, and elimination is slow. Lead can penetrate the placental barrier, resulting in neurologic disorders in infants.

- **Signs and symptoms of exposure**
  1. *Short-term (acute):* Exposure to inorganic lead can cause decreased appetite, insomnia, headache, muscle and joint pain, colic, and constipation.
  2. *Long-term (chronic):* Exposure to inorganic lead can cause weakness, weight loss, nausea, vomiting, constipation, blue or blue-black dot-like pigmentation on the gums ("lead line"), severe

headache and abdominal cramps, delirium, convulsions.

- **Medical surveillance program**
  Workers with potential exposures to lead hazards should be monitored in a systematic program of medical surveillance intended to prevent or control occupational injury and disease. Consult a certified Industrial Hygienist.

MONITORING AND MEASUREMENT PROCEDURES

- **TWA exposure evaluation**
  Measurement to determine worker exposure to inorganic lead should be taken so that the TWA exposure is based on a single entire workshift sample or an appropriate number of consecutive samples collected during the entire workshift. Under certain conditions, it may be appropriate to collect several short-term interval samples (up to 30 minutes each) to determine the average exposure level. Air samples should be taken in the worker's breathing zone (air that most nearly represents that inhaled by the worker).

- **Method**
  Sampling and analysis may be performed by collecting inorganic lead with cellulose membrane filters followed by acid digestion and analysis by atomic absorption. A detailed sampling and analytical method for inorganic lead can be found in the NIOSH Method #7082 is recommended.

- Bulk samples may be analyzed for inorganic lead content.

PERSONAL PROTECTIVE EQUIPMENT

Chemical protective clothing (CPC) should be selected by a certified Industrial Hygienist. Workers will be provided with proper CPC, gloves and eye protection.

SANITATION

Clothing which is contaminated with inorganic lead should be removed immediately and placed in closed containers for storage until it can be discarded or until provision is made for the removal of inorganic lead from the clothing. If the clothing is to be laundered or cleaned, the person performing the operation should be informed of inorganic lead's hazardous properties.

Skin that becomes contaminated with inorganic lead should be promptly washed with soap and water.

No consumption of food or no smoking is allowed in work area.

Workers who handle inorganic lead should wash their faces, hands, and forearms thoroughly with soap and water before eating, smoking, or using toilet facilities.

COMMON OPERATIONS AND CONTROLS

Common operations in which exposure to inorganic lead may occur and control methods which may be effective in each case are listed in Table 1.

Table 1. Operations and methods of control for inorganic lead

Operations	Controls
During soldering in the fabrication of metal articles	Process enclosure, local exhaust ventilation, personal protective equipment
During melting and pouring of lead and alloys containing lead; during welding, burning, and cutting of metal structures containing lead or painted with lead containing surface coatings	Local exhaust ventilation, personal protective equipment
During the use of lead in the manufacture of surface coatings, including paints and varnishes; during the manufacture of ceramics and glass	Local exhaust ventilation, personal protective equipment

EMERGENCY FIRST AID PROCEDURES

In the event of an emergency, remove the victim from further exposure, send for medical assistance, and initiate emergency procedures.

- **Eye exposure**
  Where there is any possibility of a worker's eyes being exposed to inorganic lead, an eye-wash solution should be provided within the immediate work area for emergency use.

  If inorganic lead gets into the eyes, flush them immediately with large amounts of water for 15 minutes, lifting the lower and upper lids occasionally. Get medical attention as soon as possible. Contact lenses should not be worn when working with this compound.

- **Skin exposure**
  If inorganic lead gets on the skin, wash immediately with soap and water. If inorganic lead penetrates the clothing, remove the clothing immediately and wash the skin with soap and water. Get medical attention promptly.

- **Rescue**
  If a worker has been incapacitated, move the affected worker from the hazardous exposure. Put into effect the established emergency rescue procedures. Follow BNL emergency rescue procedures and know the locations of rescue equipment before the need arises.

SPILLS AND LEAKS

Workers not wearing protective equipment and clothing should be restricted from areas of spills or leaks until cleanup has been completed.

If inorganic lead is spilled or leaked, the following steps should be taken:

1. Remove all ignition sources.
2. Ventilate area of spill or leak.
3. For small quantities of liquids containing inorganic lead, absorb on paper towels and place in an appropriate container.
4. Large quantities of liquids containing inorganic lead may be absorbed in vermiculite, fry sand, earth, or a similar material and placed in an appropriate container.
5. If in solid form, inorganic lead may be collected and placed in an appropriate container.
6. Inorganic lead may be collected by vacuuming with an appropriate system.

7. If there is a white "oxide" layer of lead (e.g., lead brick storage), use HEPA vacuum and cosult an Industrial Hygienist.

WASTE REMOVAL AND DISPOSAL

U.S. Environmental Protection Agency, Department of Transportation, and/or state and local regulations shall be followed to assure that removal, transport, and disposal are in accordance with existing regulations.

RESPIRATORY PROTECTION

It must be stressed that the use of respirators is the least preferred method of controlling worker exposure and should not normally be used as the only means of preventing or minimizing exposure during routine operations. However, there are some exceptions for which respirators may be used to control exposure: when engineering and work practice controls are not technically feasible, when engineering controls are in the process of being installed, or during emergencies and certain maintenance operations including those requiring confined-space entry (Table 2). Consult a certified Industrial Hygienist.

Only respirators that have been approved by the Mine Safety and Health Administration (MSHA, formerly Mining Enforcement and Safety Administration) and by NIOSH should be used. Remember! Air-purifying respirators will not protect from oxygen-deficient atmospheres.

For each level of respirator protection, only those respirators that have the minimum required protection factor and meet other use restrictions are listed. All respirators that have higher protection factors may also be used.

Table 2. Respiratory protection for inorganic lead

Conditions	Minimum respiratory protection
Concentration:	
Less than or equal to 0.5 mg/m^3	Any supplied air respirator
Less than or equal to 1.25 mg/m^3	Any air-purifying respirator with a high-efficiency particulate filter Any self-contained breathing apparatus
Less than or equal to2.5 mg/m^3	Any air-purifying full facepiece respirator with a high-efficiency particulate filter
	Any powered air-purifying respirator with a tight-fitting facepiece and a high-efficiency particulate filter
	Any self-contained breathing apparatus with a full facepiece
	Any supplied-air respirator with a full facepiece
	Any supplied-air respirator with a tight-fitting facepiece and operated in a continuous flow mode
Less than or equal to 50 mg/m^3	Any supplied-air respirator with a half-mask and operated in a pressure-demand or other positive pressure mode
Less than or equal to 100 mg/m^3	Any supplied-air respirator with a full facepiece and operated in a pressure-demand or other positive pressure mode
Planned or emergency entry into environments containing unknown concentrations or levels above 100 mg/m^3	Any self-contained breathing apparatus with a full facepiece and operated in a pressure-demand or other positive pressure mode
	Any supplied-air respirator with a full facepiece and operated in a pressure-demand or other positive pressure mode in combination with an auxiliary self-contained breathing apparatus operated in a pressure demand or other positive pressure mode
Escape only	Any air-purifying full facepiece respirator with a high-efficiency particulate filter
	Any appropriate escape-type self-contained breathing apparatus

Attachment C

HEALTH HAZARD ANALYSIS
ASBESTOS
(A POTENTIAL HUMAN CARCINOGEN)

INTRODUCTION

This Hazard Analysis of asbestos summarizes pertinent information about asbestos for workers, employers, and occupational safety and health professionals.

Note: At BNL, work related asbestos is done by PE qualified and trained personnel.

TYPES OF ASBESTOS

(1) Asbestos (mixed forms)
(2) Chrysotile (Mostly present in North America)
(3) Amosite
(4) Crocidolite
(5) Tremolite
(6) Anthophyllite
(7) Actinolite

- **Appearance and odor:** A fiber or filament, asbestos may have a "fluffy" appearance. Colors may vary from white, gray, blue, brown, green or yellow. Positive identification requires microscopic examination. No odor.

CHEMICAL AND PHYSICAL PROPERTIES

- **Physical data**
  Molecular weight: 277.13; Specific gravity (water = 1): 2.5-3.0; Noncombustible solid.

EXPOSURE LIMITS

Only asbestos fibers greater than 5 micrometers (μ)m in length are considered for the following exposure limits. The current Occupational Safety and Health Administration (OSHA) permissible exposure limit (PEL) for asbestos is 0.2 fiber per cubic centimeter (cc) of air as a time-weighted average (TWA) concentration over an 8-hour workshift with an action level of 0.1 fiber/cc as an hour TWA.

HEALTH HAZARD INFORMATION

1. Routes of exposure: Inhalation; Ingestion.

2. Effects on humans: Exposure to asbestos has been found to significantly increase the risks of contracting asbestosis, lung cancer, and mesothelioma (all asbestos related diseases).

3. Signs and symptoms of exposure:
   - *Short-term (acute):* Exposure to asbestos can cause shortness of breath, chest or abdominal pain, and irritation of the skin and mucous membranes.

- *Long-term (chronic):* Exposure to asbestos can cause reduced pulmonary function, breathing difficulty, dry cough, broadening and thickening of the ends of the fingers, bluish discoloration of the skin and mucous membrane.

RECOMMENDED MEDICAL PRACTICES

- **Medical surveillance program**
  Workers with potential exposures to chemical hazards should be monitored in a systematic program of medical surveillance intended to prevent or control occupational injury and disease. Consult a certified Industrial Hygienist.

MONITORING AND MEASUREMENT PROCEDURES

- **TWA exposure evaluation**
  Measurements to determine worker exposure to asbestos should be taken so that the TWA exposure is based on a single entire workshift sample or an appropriate number of consecutive samples collected during the entire workshift. Under certain conditions, it may be appropriate to collect several short-term interval samples (up to 30 minutes each) to determine the average exposure level. Air samples should be taken in the worker's breathing zone (air that most nearly represents that inhaled by the worker).

- **Method**
  Sampling and analysis for airborne asbestos may be performed by collecting asbestos fibers with membrane fibers and analyzing by phase contrast microscopy. A detailed sampling and analytical method for asbestos, *NIOSH M*ethod #7400 is recommended.

PERSONAL PROTECTIVE EQUIPMENT

Chemical protective clothing (CPC) should be selected by an Industrial Hygienist.

Workers will be provided with and required to use CPC, gloves, and other appropriate protective clothing necessary to prevent skin contact with asbestos.

SANITATION

Clothing which is contaminated with asbestos should be removed at the end of the work period and placed in nonreusable, impermeable containers for storage, transport, and disposal until it can be discarded or until provision is made for the removal of asbestos from the clothing. These containers should be marked "Asbestos-Contaminated Clothing" in easy-to-read letters. If the clothing is to be laundered or cleaned, the person performing the operation should be informed of asbestos's hazardous properties. Reusable clothing and equipment should be checked for residual contamination before reuse or storage.

A change room with showers, washing facilities, and lockers that permit separation of street and work clothes is recommended. Skin that becomes contaminated with asbestos should be promptly washed with soap and water.

No consumption of food or beverages and no smoking allowed in work area.

Workers who handle asbestos should wash their faces, hands and forearms thoroughly with soap and water before eating, smoking, or using toilet facilities.

COMMON OPERATIONS AND CONTROLS

Common operations in which exposure to asbestos may occur and control methods which may be effective in each case are listed in Table 1.

Table 1. Operations and methods of control for asbestos

Operations	Controls
During asbestos removal	Process enclosure, wet process (when possible), personal protective equipment
During the demolition of buildings	Water spray, personal protective equipment

EMERGENCY FIRST AID PROCEDURES

In the event of an emergency, remove the victim from further exposure, send for medical assistance, and initiate emergency procedures.

- **Eye exposure**
  Where there is any possibility of a worker's eyes being exposed to asbestos, an eye-wash fountain should be provided within the immediate work area for emergency use.

  If asbestos gets into the eyes, flush them immediately with large amounts of water for 15 minutes, lifting the lower and upper lids occasionally. Get medical attention as soon as possible. Contact lenses should not be worn when working with this compound.

- **Skin exposure**
  If asbestos gets on the skin, wash immediately with soap and water.

- **Rescue**
  If a worker has been incapacitated, move the affected worker from the hazardous exposure. Put into effect the established emergency rescue procedures. Understand the facility's emergency rescue procedures and know the locations of rescue equipment before the need arises.

SPILLS

Workers not wearing protective equipment and clothing should be restricted from areas of spills or leaks until cleanup has been completed.

If asbestos is spilled, the following steps should be taken: Asbestos dust may be collected by vacuuming with an appropriate high-efficiency (HEPA) filtration system or by using wet methods and placed in an appropriate container.

WASTE REMOVAL AND DISPOSAL

U.S. Environmental Protection Agency, Department of Transportation, and/or state and local regulations shall be followed to assure that removal, transport, and disposal are in accordance with existing regulations.

RESPIRATORY PROTECTION

It must be stressed that the use of respirators is the least preferred method of controlling worker exposure and should not normally be used as the only means of preventing or minimizing exposure during routine operations. However, there are some exceptions for which respirators may be used to control exposure: when engineering and work practice controls are not technically feasible, when engineering controls are in the process of being installed, or during emergencies and certain maintenance operations including those requiring confined-space entry (Table 2). Consult a certified Industrial Hygienist.

Only respirators that have been approved by the Mine Safety and Health Administration (MSHA, formerly Mining Enforcement and Safety Administration) and by NIOSH should be used. **Remember! Air-purifying respirators will not protect from oxygen-deficient atmospheres.**

For each level of respirator protection, only those respirators that have the minimum required protection factor and meet other use restrictions are listed. All respirators that have higher protection factors may also be used.

Table 2. Respiratory protection for asbestos

Conditions	Minimum respiratory protection
Any detectable concentration	Any self-contained breathing apparatus with a full facepiece and operated in a pressure-demand or other positive pressure mode
	Any supplied-air respirator with a full facepiece and operated in a pressure-demand or other positive pressure mode in combination with an auxiliary self-contained breathing apparatus operated in a pressure-demand or other positive pressure mode
Planned or emergency entry into environments containing unknown or any detectable concentration	Any self-contained breathing apparatus with a full facepiece and operated in a pressure-demand or other positive pressure mode
	Any supplied-air respirator with a full facepiece and operated in a pressure-demand or other positive pressure mode in combination with an auxiliary self-contained breathing apparatus operated in a pressure-demand or other positive pressure mode
Escape only	Any air-purifying full facepiece respirator with a high-efficiency particulate filter
	Any appropriate escape-type self-contained breathing apparatus

Appendix D

HEALTH HAZARD ANALYSIS
MERCURY

INTRODUCTION

Mercury exists in many forms. Mercury compounds vary from alkyl, aryl including organic alkyl. The Hazard Analysis of mercury summarizes information regarding mercury compounds for workers, employers, and safety & health professionals.

CHEMICAL AND PHYSICAL PROPERTIES

Molecular weight = 2006; Boiling point = 674°F; Insoluable in water; Specific gravity = 13.6; Noncombustible liquid; Incompatible with acetylene, ammonia, oxides, sodium carbide.

Caution:
1. Organic alkyl mercury compounds are strong oxidizers.
2. Mercury metal is silver white and odorless.

EXPOSURE LIMITS

- OSHA PEL = 0.01 ug/m^3; Ceiling limit = 0.04 ug/m^3; IDLH = 2 ug/m^3.

HEALTH HAZARD INFORMATION

- **Routes of exposure:** Inhalation; Skin absorption; Ingestion; Skin/Eye contact.
  Major health effects on the body are ataxia, paresthesia, blurred vision, spasticity, jerking limbs, dizziness, nausea, vomiting, constipation, kidney injury.

- **Signs and symptoms of exposure:**
  - *Short-term (acute):* No immediate effect unless organic mercury compounds are inhaled.
  - *Long-term (chronic):* Mercury poisoning.

- **Target organs:** Eyes, skin, central nervous system, peripheral nervous system, kidneys, and fetus.

RECOMMENDED MEDICAL PRACTICES

Workers with potential exposures to mercury and its compounds should be monitored by an Occupational Physician.

MONITORING AND MEASUREMENT PROCEDURES

- **TWA exposure evaluation**
  Measurements to determine worker exposure to mercury and its compounds should be taken so that the TWA exposure is based on a single entire workshift sample or an appropriate number of consecutive samples collected during the entire workshift. Under certain conditions, it may be appropriate to collect several short-term interval samples (up to 30 minutes each) to determine the average exposure level. Air samples should be taken in the worker's breathing zone (air that most nearly represents that inhaled by the worker).

- **Method**
  Samples are collected by hydrare sorbent tube and analyzed by atomic absorption method using hydride Method #6009.

PERSONAL PROTECTIVE EQUIPMENT

Chemical protective clothing (CPC) should be selected by an Industrial Hygienist. Workers will be provided with proper CPC, gloves and eye protection.

SANITATION

Clothing which is contaminated with mercury should be removed immediately and placed in closed containers for storage until it can be discarded or until provision is made for the removal of mercury from the clothing. If the clothing is to be laundered or cleaned, the person performing the operation should be informed of mercury's hazardous properties.

Skin that becomes contaminated with mercury should be promptly washed with soap and water.

No consumption of food or no smoking is allowed in work area.

Workers who handle mercury should wash their faces, hands, and forearms thoroughly with soap and water before eating, smoking, or using toilet facilities.

EMERGENCY FIRST AID PROCEDURES

In the event of an emergency, remove the victim from further exposure, send for medical assistance, and initiate emergency procedures.

- **Eye exposure**
  Where there is any possibility of a worker's eyes being exposed to mercury, an eye-wash solution should be provided within the immediate work area for emergency use. If mercury gets into the eyes, flush them immediately with large amounts of water for 15 minutes, lifting the lower and upper lids occasionally. Get medical attention as soon as possible. Contact lenses should not be worn when working with this compound.

- **Skin exposure**
  If mercury gets on the skin, wash immediately with soap and water.

- **Rescue**
  If a worker has been incapacitated, move the affected worker from the hazardous exposure. Put into effect the established emergency rescue procedures. Follow BNL emergency rescue procedures and know the locations of rescue equipment before the need arises.

SPILLS AND LEAKS; WASTE REMOVAL AND DISPOSAL

Workers not wearing protective equipment and clothing should be restricted from areas of spills or leaks until clean-up has be completed.

Consult BNL Waste Management if there are any spills or leaks.

RESPIRATORY PROTECTION

An Industrial Hygienist will recommend proper respiratory protection.

Use of respirators is the least preferred method of controlling worker exposure and should not normally be used as the only means of preventing or minimizing exposure during routine operations. However, there are some exceptions for which respirators may be used to control exposure: when engineering and work practice controls are not technically feasible, when engineering controls are in the process of being installed, or during emergencies and certain maintenance operations including those requiring confined-space entry.

Attachment E

HEALTH HAZARD ANALYSIS POLYCHLORINATED BIPHENYLS (PCBs) KNOWN CARCINOGEN

INTRODUCTION

(These compounds are also known as chlorinated biphenyl; Arochlor; Hydrogenated Waxes; and Polychloropolyphenyls. These synonyms depend on the degree of chlorination of diphenyloxide.) There are 209 PCB isomers.

CHEMICAL AND PHYSICAL PROPERTIES

Both chemical and physical properties vary depending on the specific compound. Appearance and odor also vary depending upon the specific compound. These isomers are non-flammable, chemical stable, low electrical conductance and highly lipophilicity. Usually oily to crystalline solids.

USES

These PCBs are used as dielectric fluids, heat transfer fluids, hydraulic fluids, oils, solvents, paints, and coatings.

EXPOSURE LIMITS

PEL = 0.5 ug/m^3; IDLH = 5 ug/m^3.

HEALTH HAZARD INFORMATION

Routes of exposure: Inhalation; Ingestion; and Skin Absorption.

Inhalation causes skin irritation, eye irritation and effects the respiratory system. Absorption causes nausea and vomiting, chronic toxicity causes chromosomal abnormalities. Skin contact may cause irritation.

Ingestion has carcinogenic effect.

Target organs: Skin, eyes, liver, reproductive system.

MONITORING AND MEASUREMENT PROCEDURES

- **Method**
  Samples are collected on Florisil filter, desorbed in hexane and analyzed by using electron capture detector (Method #5503 for PCBs).

PERSONAL PROTECTIVE EQUIPMENT

Chemical protective clothing (CPC) should be selected by an Industrial Hygienist. Non-porous chemical protective and chemical resistant gloves are necessary. Respiratory protection will be recommended by a certified Industrial Hygienist.

Workers will be provided with and required to use CPC, gloves, and other appropriate protective clothing necessary to prevent skin contact with PCBs.

SANITATION

Clothing which is contaminated with PCBs should be removed at the end of the work period and placed in nonreusable, impermeable containers for storage, transport, and disposal until it can be discarded or until provision is made for the removal of PCBs from the clothing. These containers should be marked "PCB-Contaminated Clothing" in easy-to-read letters. If the clothing is to be laundered or cleaned, the person performing the operation should be informed of PCBs hazardous properties. Reusable clothing and equipment should be checked for residual contamination before reuse or storage.

A change room with showers, washing facilities, and lockers that permit separation of street and work clothes is recommended. Skin that becomes contaminated with PCBs should be promptly washed with soap and water.

No consumption of food or beverages and no smoking allowed in work area.

Workers who handle PCBs should wash their faces, hands and forearms thoroughly with soap and water before eating, smoking, or using toilet facilities.

EMERGENCY FIRST AID PROCEDURES

In the event of an emergency, remove the victim from further exposure, send for medical assistance, and initiate emergency procedures.

- **Eye exposure**
  Where there is any possibility of a worker's eyes being exposed to PCBs, an eye-wash fountain should be provided within the immediate work area for emergency use.

  If PCB gets into the eyes, flush them immediately with large amounts of water for 15 minutes, lifting the lower and upper lids occasionally. Get medical attention as soon as possible. Contact lenses should not be worn when working with this compound.

- **Skin exposure**
  If PCBs get on the skin, wash immediately with soap and water.

- **Rescue**
  If a worker has been incapacitated, move the affected worker from the hazardous exposure. Put into effect the established emergency rescue procedures. Understand the facility's emergency rescue procedures and know the locations of rescue equipment before the need arises.

RCD WASTE

PCBs are regulated under 40CFR761.3 and disposal should be per Subpart D of 40CFR761. Concentrations >50 ppm constitute disposal and materials on which PCB is spilled is PCB waste.

ATTACHMENT 2

BGRR-DP Technical Work Document covering

Instrument House (708) Components Removal & Isolation

ERD Procedures Manual

TECHNICAL WORK DOCUMENT
INSTRUMENT HOUSE (708) COMPONENTS REMOVAL & ISOLATION

Text Pages 1 through 8
Attachment(s) 8.1 and 8.2

Temporary Procedure

Approved: Stephen K. Pulsford Date: 2/28/00

Stephen K. Pulsford, Manager
BGRR Decommissioning Project

Preparer: **T. Jernigan**

Expiration Date: **July 31, 2000**

ERD OPM No.: **ERD-BGRR-TP-00-01**

TECHNICAL WORK DOCUMENT
INSTRUMENT HOUSE (708) COMPONENTS
REMOVAL & ISOLATION

1.0 PURPOSE AND SCOPE

1.1 To provide the detailed work instructions for the removal of selected components within the BGRR Instrument House (Bldg. 708) to prepare for the decommissioning activities associated with the below grade ducting.

1.2 This work document covers the removal of deactivated equipment (valves, instruments, piping, etc.) located within the Instrument House (Bldg. 708) structure, specific activities covered in this document are:

- Isolation & removal of equipment and components
- Decontamination of components to minimize exposure to personnel
- Packaging and disposal of components
- Radiological Control activities
- Final cleanup of work area

1.3 This procedure covers the removal of only those previously deactivated components associated with the Reactor Air Cooling System.

2.0 RESPONSIBILITIES

2.1 The BGRR-DP Construction Manager or designee is responsible for the proper execution of this Work Document.

2.2 The BGRR-DP Project Engineer or designee is responsible for the technical content of this Work Document.

2.3 The BGRR-DP ESH&Q Manager or designee is responsible for all environment, safety and health issues associated with the work activities delineated herein.

3.0 PREQUISITES

3.1 The Task-specific Environmental, Health and Safety Plan (TEHASP) for this work activity has been approved and reviewed by all personnel involved with these work activities.

Initial: _____ Date: _____

3.2 A Radiological Survey has been performed on the interior and exterior of the Instrument House and the work area has been released as an Uncontrolled Area for Unrestricted use.

Initial: _____ Date: _____

3.3 Prior to identification of components for removal in the following step, the BGRR-DP Project Engineer/designee shall verify that all components to be identified for removal have been electrically de-energized and the electrical power PERMANENTLY disconnected at the source (e.g. breaker panel).

Initial: _____ Date: _____

3.4 Prior to commencement of removal activities, the BGRR-DP Project Engineer/designee shall perform a walkdown of the Instrument House and identify all of the items which are to be removed with a tag, GREEN construction marking paint, or GREEN/WHITE striped marking tape, and/or other appropriate means. Supplementary instructions may be added for clarification. Any items not listed in Attachment 8.2 shall be added therein, and incorporated into this procedure as a minor revision.

All components and equipment to be removed have been identified.

Initial: _____ Date: _____

3.5 Asbestos abatement has been performed in the work area. This is performed under a separate Work Permit.

Initial: _____ Date: _____ Work Permit No: _____

3.6 In addition to the asbestos abatement identified in Prerequisite 3.5 above, an inspection of the Instrument House has been performed to identify hazardous substances such as mercury (known to be present), lead, and PCB's, and the action has been taken to remove, stabilize, or isolate such substances to ensure a safe working environment.

Initial: _____ Date: _____

4.0 PRECAUTIONS AND LIMITATIONS

4.1 This document is a TEMPORARY procedure valid only for the specific work activities delineated in **Section 5.0**, and may only be implemented in conjunction with an approved Work Permit, and other approved appropriate documents and permits (e.g. Radiation Work Permit)

4.2 The internal surfaces of the systems to which certain instruments and components are connected are known to be contaminated with radionuclides such as Co-60, Cs-137, Am-241, Pu-239 and others. Observe the requirements of the RWP when breaching system boundaries.

4.3 The Work Instructions delineated in **Section 5.0** shall be performed in the best and safest sequence as determined by the BGRR-DP Construction Manager or designee.

4.4 The lighting system is energized. Do not remove any conduit, cable or pipe unless it has been identified for removal as required in Section 5.0.

5.0 PROCEDURE

NOTE: *Refer to **Attachments 8.1** and **8.2** for a pictorial outline of the work activities and inventory of components to be removed.*

5.1 Instruments and Miscellaneous Components

5.1.1 Referring to **Attachment 8.1** for guidance, REMOVE the selected components identified in **Attachment 8.2**.

5.2 Cooling Water Supply & Return Piping

5.2.1 CUT the 14" Cooling Water supply and return lines at the north wall penetration.

5.2.2 CUT the 4" individual Cooling Water supply and return lines at the west wall penetrations.

5.2.3 REMOVE the Cooling Water supply and return piping in its entirety including all pipe, fittings, valves, hangers and hardware between the cuts performed in steps 5.2.1 and 5.2.2.

5.2.4 CAP the cooling water supply and return lines on the north wall at the wall penetrations with a plastic pipe cover or similar method.

5.2.5 PLUG the cooling water supply and return lines at the west wall penetrations with expandable pipe plugs or equivalent device.

5.3 Secondary Air Piping

5.3.1 CUT the 16" and 20" Secondary Air lines at the north and south wall penetrations respectively.

5.3.2 REMOVE the 16" and 20" Secondary Air lines from the wall cuts to their respective plenums.

5.3.3 REMOVE the north and south plenums.

5.3.4 INSTALL covers over the north and south Secondary Air plenum exterior grilles.

5.3.5 CAP the 16" and 20" Secondary Air lines at the wall penetrations.

5.4 Unit Heaters and Steam Piping

NOTE: *The 2" steam supply piping to the Instrument House heaters has been removed up to the east exterior wall.*

5.4.1 VERIFY the electrical power to the north and south unit heaters electrically disconnected.

5.4.3 CUT the steam and condensate lines at the wall penetrations.

5.4.4 DISCONNECT the steam supply and condensate lines at the north and south unit heaters.

5.4.5 REMOVE the steam and condensate piping in its entirety including all pipe, fittings, valves, traps, hangers and hardware from the wall penetrations to the unit heaters.

5.4.6 CAP the steam and condensate lines at the wall penetrations with plastic pipe caps or equivalent.

5.4.7 REMOVE the north and south unit heaters including controls, hangers, and hardware.

5.5 Drain Piping

5.5.1 CUT the drain piping at the wall penetrations.

5.5.2 REMOVE the drain piping in its entirety including fittings, hangars, and funnels.

5.6 Air Piping

5.6.1 CUT the air supply line at the wall penetration

5.6.2 REMOVE the air supply piping in its entirety including all pipe, fittings, valves, hangers and hardware.

5.6.2 CAP the air supply line at the wall penetration.

5.7 Flow Transmitter FT-3A

CAUTION: Flow Transmitter FT-3A is a differential pressure cell that contains mercury. Strictly adhere to the TEHASP for precautions in removing this instrument.

5.7.1 CUT the (2) pressure sensing lines near the connections to the transmitter FT-3A.

5.7.2 DISCONNECT the instrument cable and REMOVE FT-3A and place in the proper container for disposal.

5.7.3 REMOVE the remaining instrument lines back to the system connections.

5.8 General

5.8.1 COVER all tripping/falling hazards in the floor grating created by removal of piping and REINSTALL all floor grating removed.

5.8.2 PERFORM a final cleanup and survey of the interior of the Instrument House.

6.0 RECORDS

None

7.0 REFERENCES

7.1 Drawing BM 708-1A, Instrument Layout - Cooling Water & Secondary Air Flow, Instrument House No. 1

7.2 Drawing BM 708-39A, Coolers - General Arrangement & Piping

7.3 Drawing M-708-64A, Steam Heating - Instrument House, Bldg. 708

7.4 ERD OPM 1.0, Procedure Development Requirements.

8.0 ATTACHMENTS

8.1 Pictorial Outline - Instrument House D&D Scope of Work

8.2 Inventory Checklist - Instrument House Removed Components

Attachment 8.1

Pictorial Outline
Instrument House D&D Scope of Work
Page 1 of 18

REMOVE HEADER, ALL HANGERS, FASTENERS AND BRACKETS

REMOVE HEADER BACK TO NORTH WALL PENETRATION

CUT LINES AND REMOVE DOWN TO WALL PENETRATIONS

Attachment 8.1

Pictorial Outline
Instrument House D&D Scope of Work
Page 2 of 18

REMOVE HEADER BACK TO NORTH WALL PENETRATION

REMOVE PIPING & VALVE DOWN TO WALL PENETRATIONS

Attachment 8.1

Pictorial Outline
Instrument House D&D Scope of Work
Page 3 of 18

INSTALL COVER ON GRILLE
(TYPICAL FOR NORTH & SOUTH)

Attachment 8.1

Pictorial Outline
Instrument House D&D Scope of Work
Page 4 of 18

INSTALL COVER ON GRILLE (TYPICAL FOR NORTH & SOUTH GRILLES)

Attachment 8.1

Pictorial Outline
Instrument House D&D Scope of Work
Page 5 of 18

AIR PLENUM - REMOVE ENTIRELY (TYPICAL FOR NORTH & SOUTH PLENUMS)

Attachment 8.1

Pictorial Outline
Instrument House D&D Scope of Work
Page 6 of 18

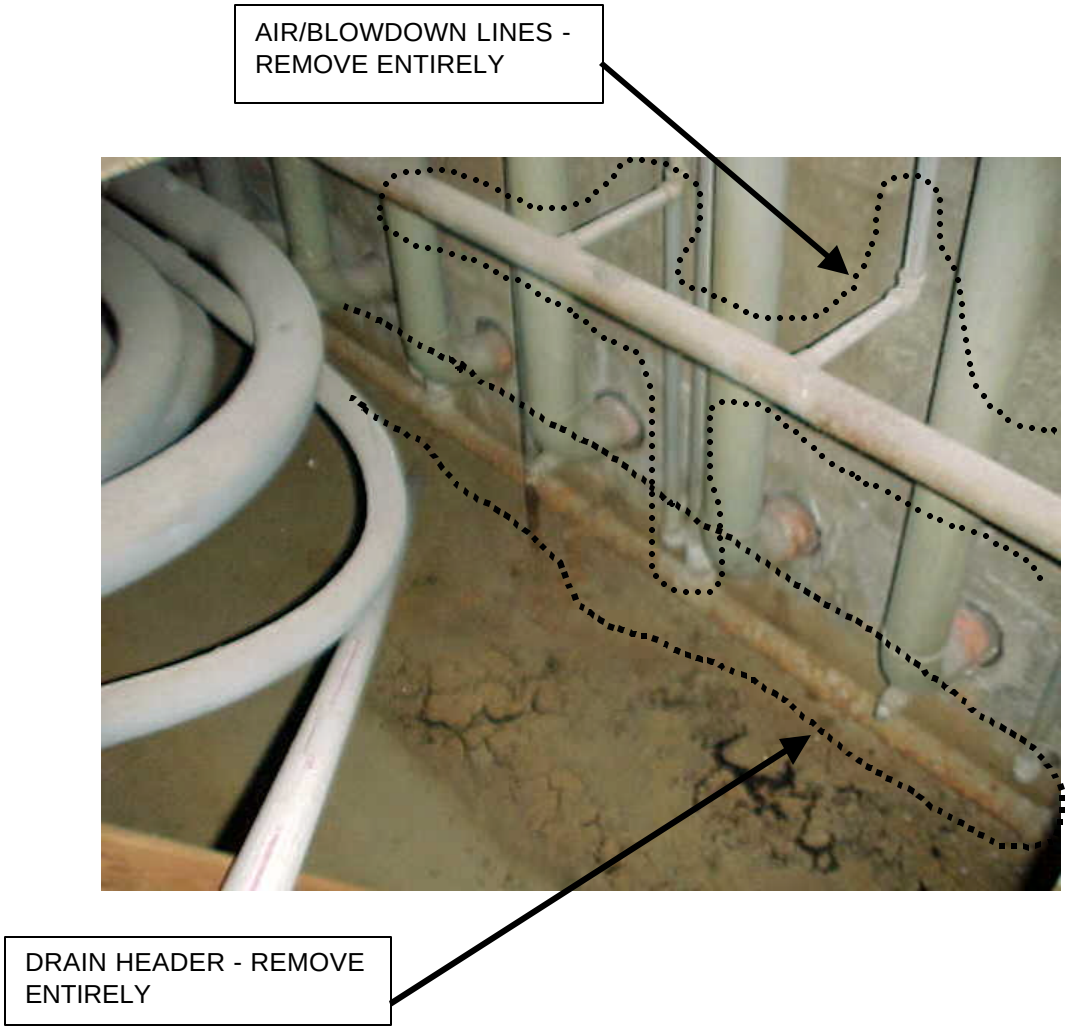
Attachment 8.1

Pictorial Outline
Instrument House D&D Scope of Work
Page 7 of 18

CUT LINES AT WALL & REMOVE BACK TO ISOLATION VALVE AT CHILLED WATER MANIFOLD
(TYPICAL FOR ALL 4" COOLING WATER SUPPLY & RETURN LINES)

Attachment 8.1

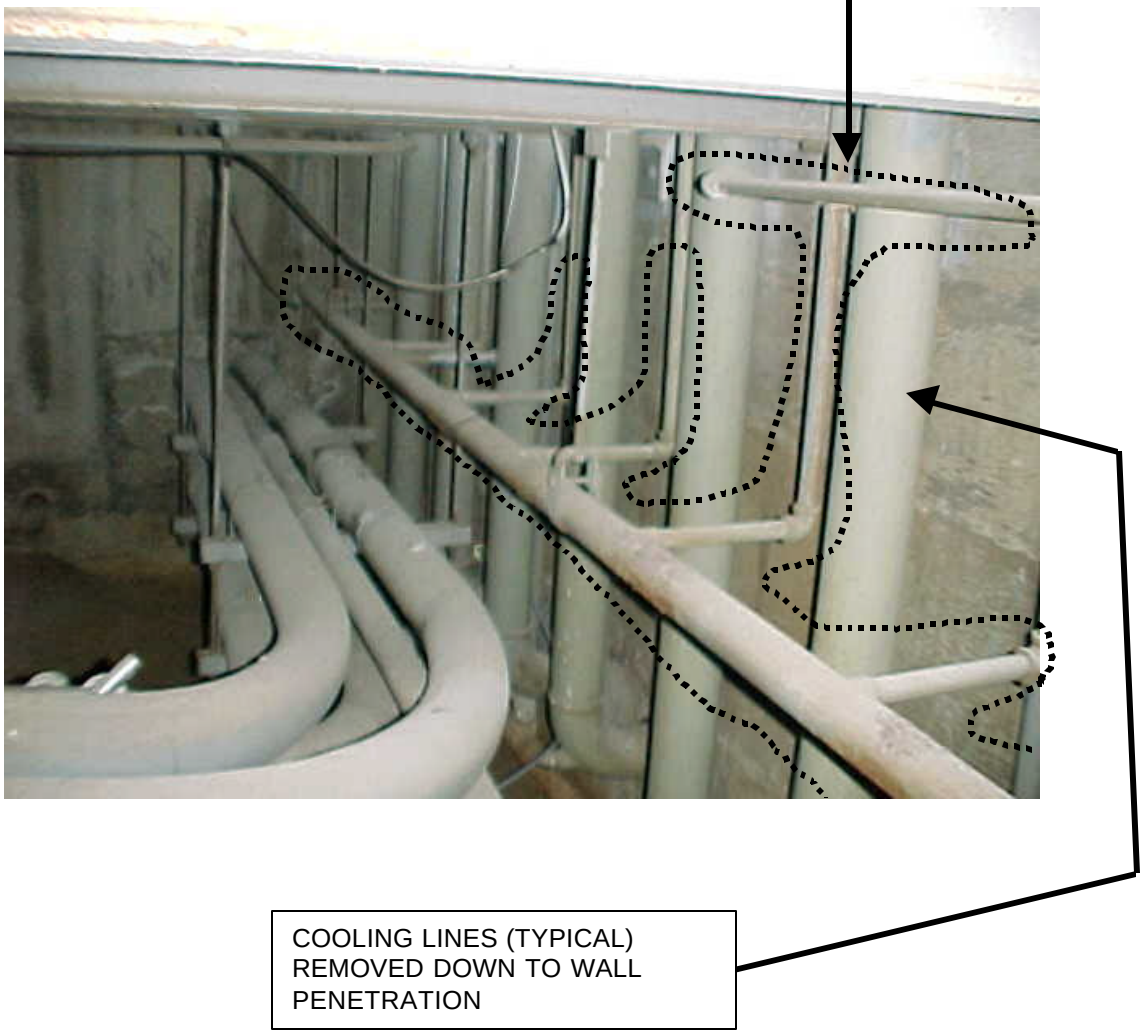
Pictorial Outline
Instrument House D&D Scope of Work
Page 8 of 18



Attachment 8.1

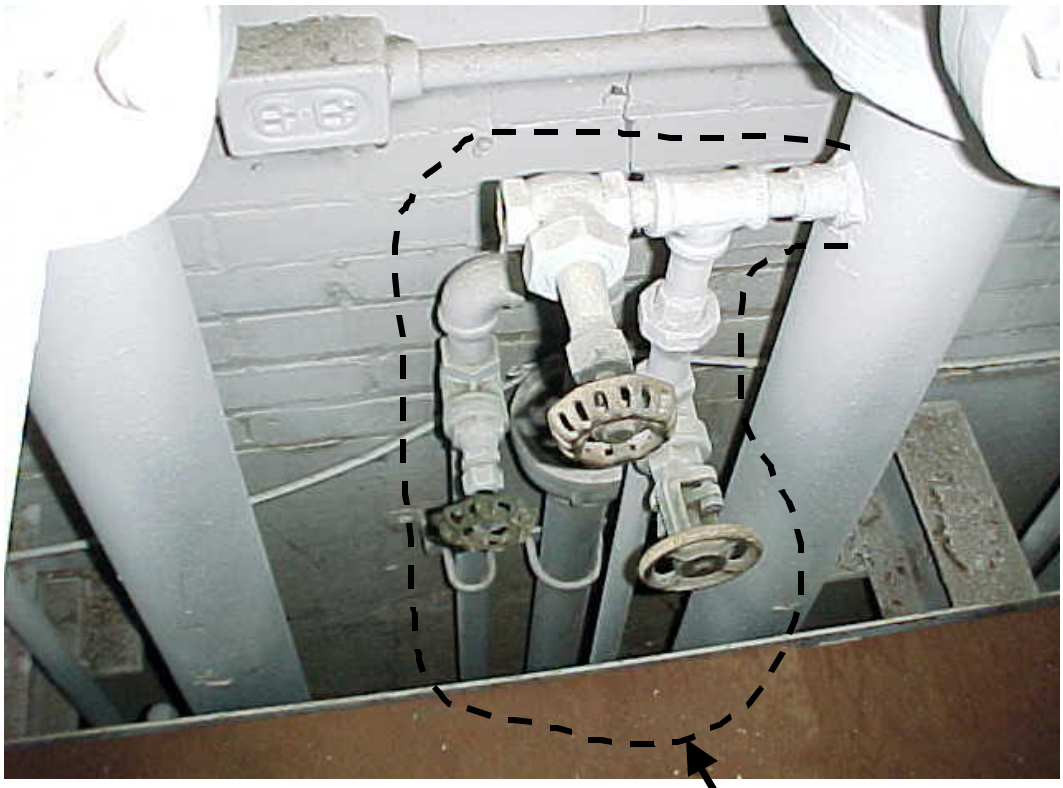
Pictorial Outline
Instrument House D&D Scope of Work
Page 9 of 18

South Cooling/Drain/Air Lines
(North Side Similar)



Attachment 8.1

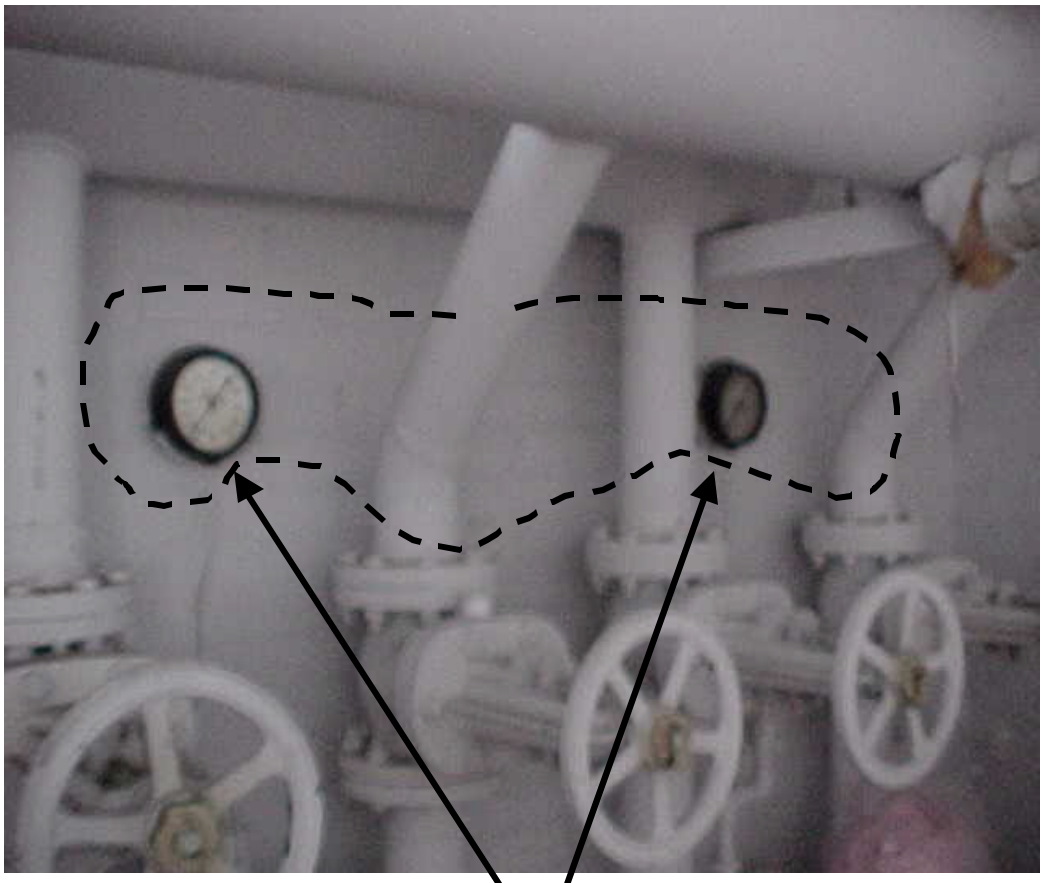
Pictorial Outline
Instrument House D&D Scope of Work
Page 10 of 18



REMOVE BLOWDOWN LINES BACK TO HEADER - REMOVE HEADER BACK TO WALL PENETRATION

Attachment 8.1

Pictorial Outline
Instrument House D&D Scope of Work
Page 11 of 18



REMOVE GAUGES & TUBING BACK TO ROOT VALVE

Attachment 8.1

Pictorial Outline
Instrument House D&D Scope of Work
Page 12 of 18

FLOW TRANSMITTER FT-3A

CAUTION: INSTRUMENT CONTAINS MERCURY

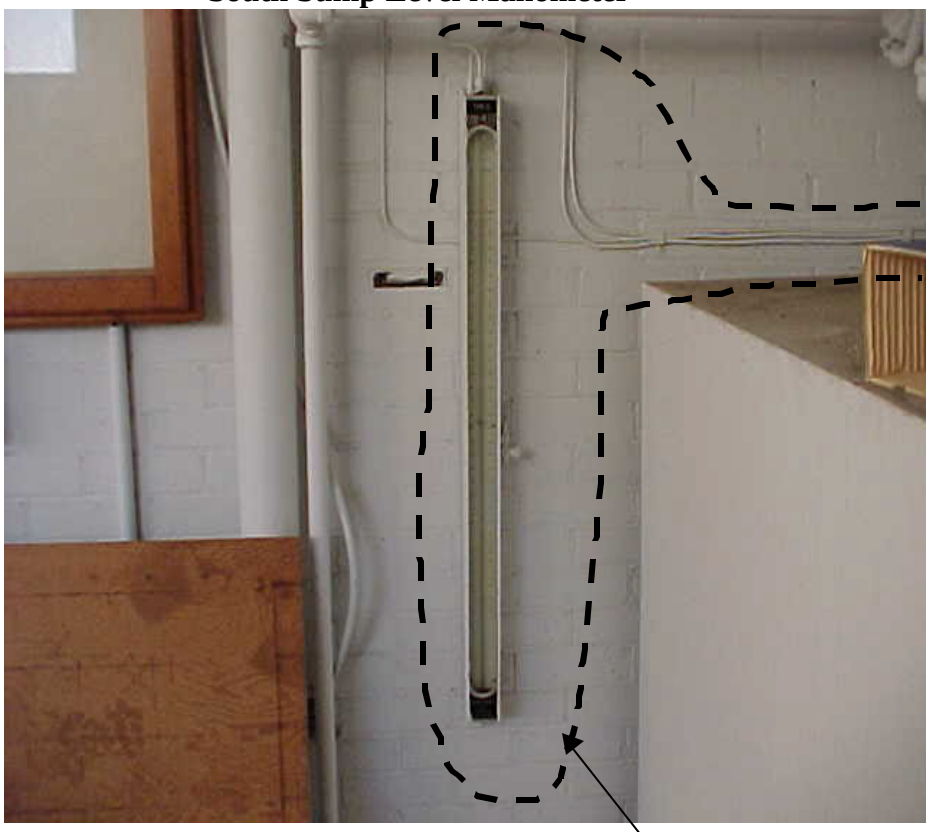
REMOVE FLOW TRANSMITTER, FASTENERS & BRACKETS - REMOVE TUBING BACK TO WALL PENETRATION & CAP TUBING AT SOUTH WALL PENETRATION

CAUTION: INSTRUMENT CONTAINS MERCURY

Attachment 8.1

Pictorial Outline
Instrument House D&D Scope of Work
Page 13 of 18

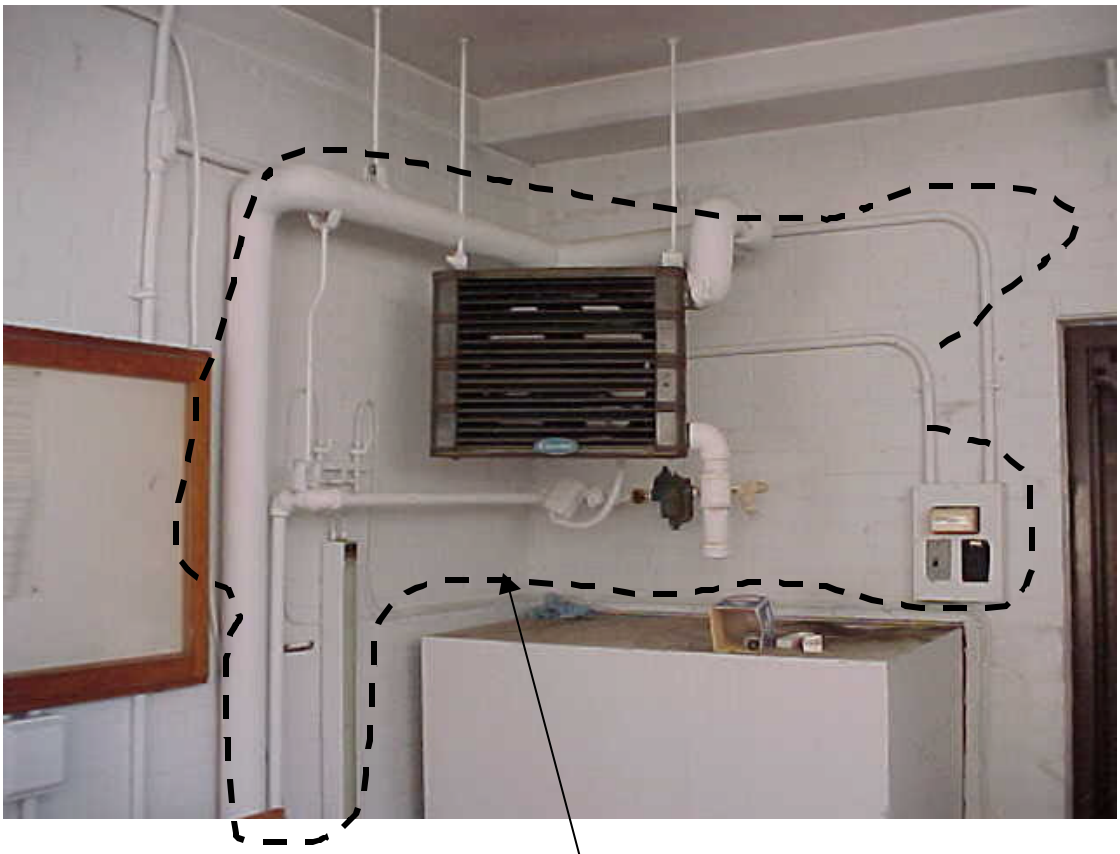
South Sump Level Manometer



Attachment 8.1

Pictorial Outline
Instrument House D&D Scope of Work
Page 14 of 18

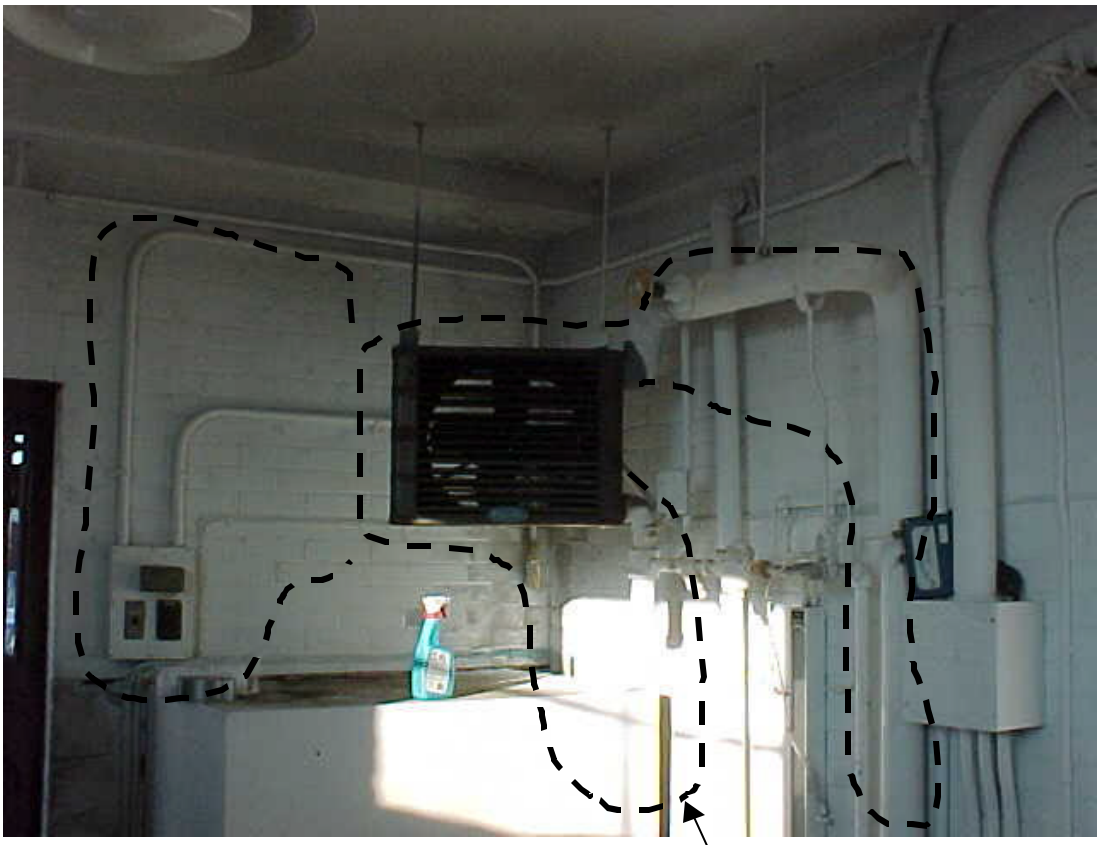
South Unit Heater



Attachment 8.1

Pictorial Outline
Instrument House D&D Scope of Work
Page 15 of 18

North Unit Heater



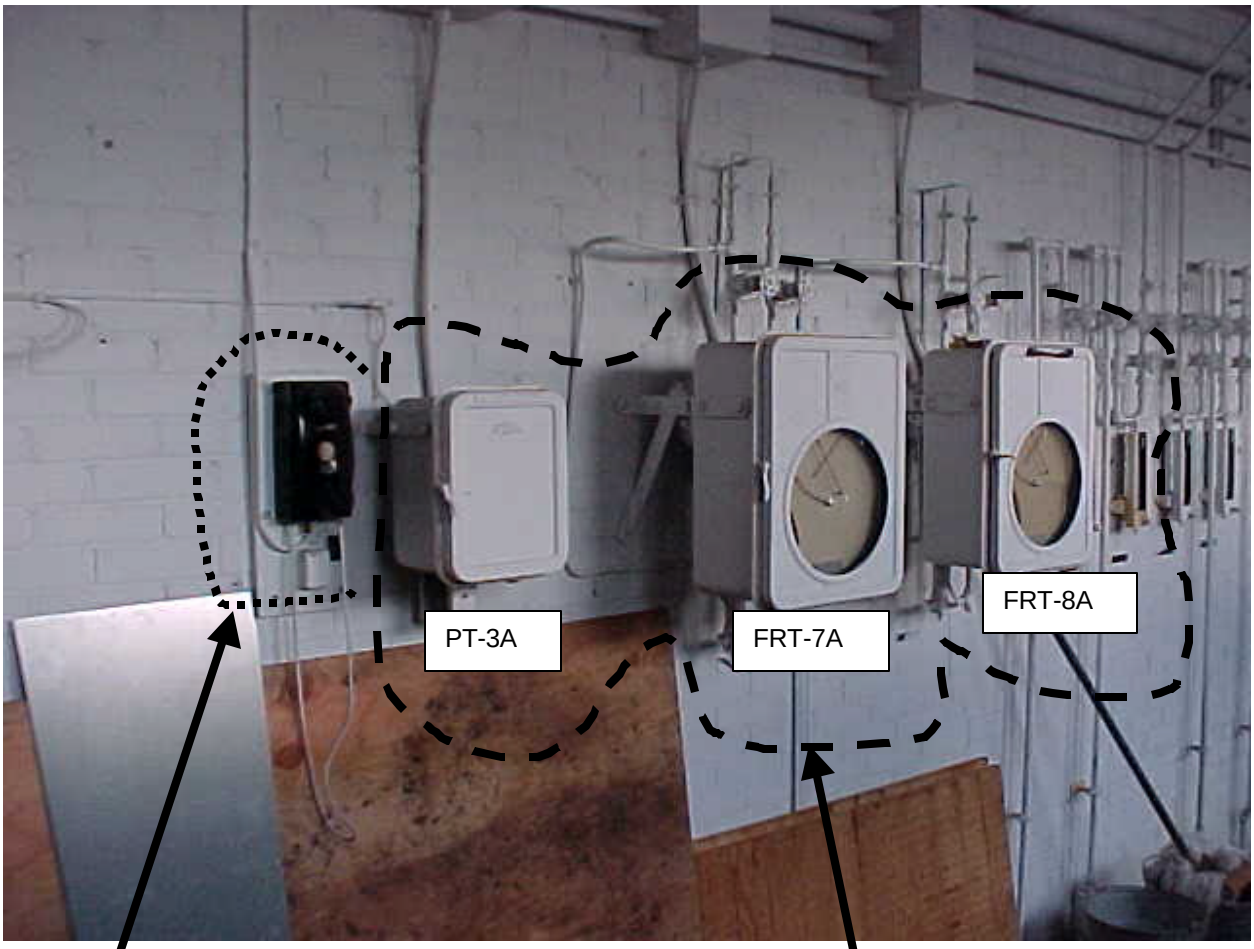
REMOVE UNIT HEATER, SUPPLY AND RETURN LINES, TEMPERATURE CONTROLS, ALL HARDWARE, FASTENERS AND BRACKETS

Attachment 8.1

Pictorial Outline
Instrument House D&D Scope of Work
Page 16 of 18

Attachment 8.1

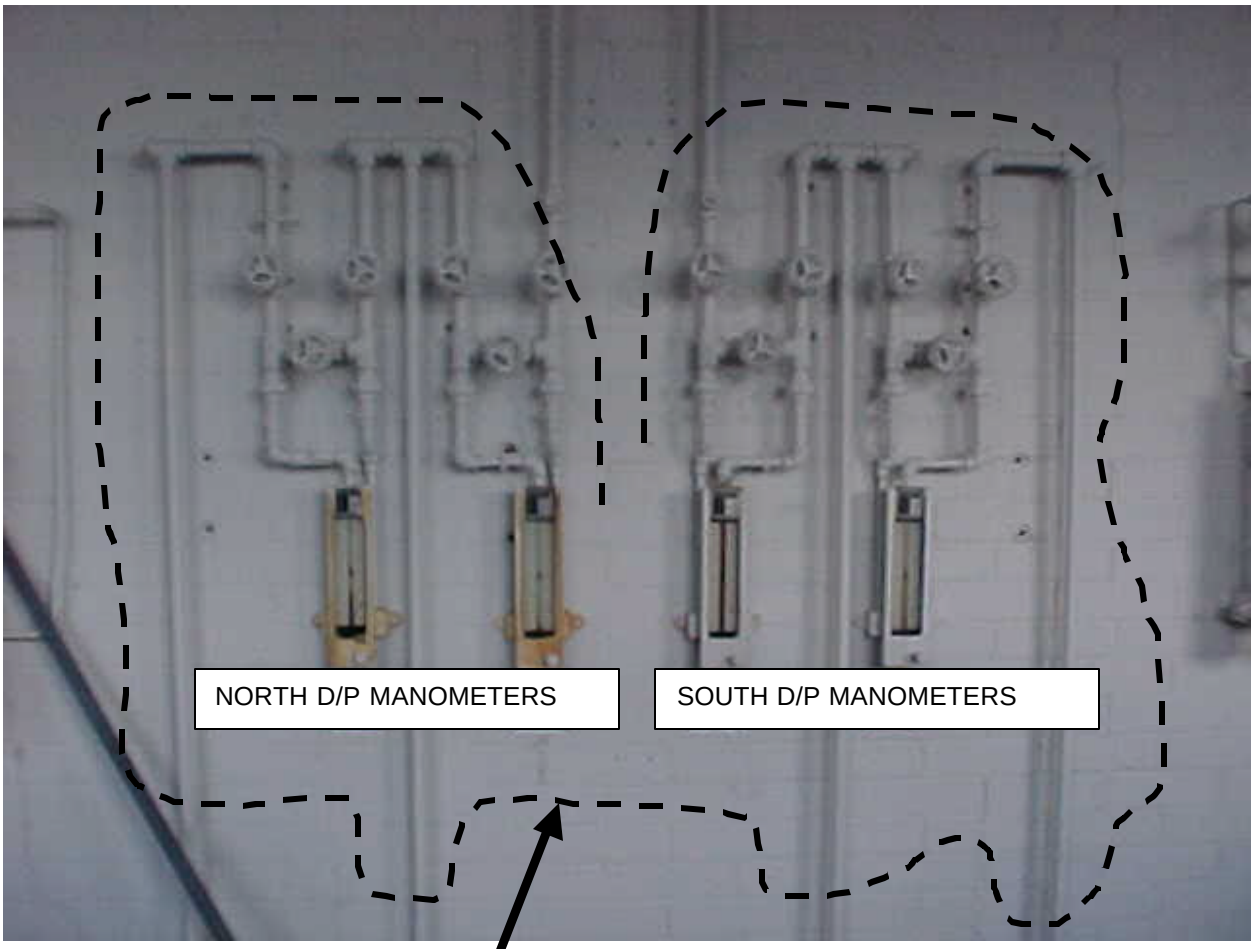
Pictorial Outline
Instrument House D&D Scope of Work
Page 17 of 18



Attachment 8.1

Pictorial Outline
Instrument House D&D Scope of Work
Page 18 of 18

Filter Differential Pressure Manometers



Attachment 8.2
Inventory Checklist - Instrument House Removed Components
Page 1 of 2

ATTACHMENT 8.1 I.D. NUMBER	COMPONENT DESCRIPTION	INITIALS	DATE
1	THR-8A, TEMPERATURE RECORDER		
2	PT-3A, PRESSURE XMTR		
3	FRT-7A/PR-3A, FLOW RECORDER/PRESSURE RECORDER		
4	FRT-8A, FLOW RECORDING XMTR		
5	FILTER D/P MANOMETERS (N)		
6	FILTER D/P MANOMETERS (S)		
7	TELEPHONE		
8	FT-3A, FLOW XMTR		
9	FI-7&8, DRAFT GAUGE		
10	STEAM/CONDENSATE PIPING		
11	UNIT HEATER (N)		
12	UNIT HEATER (S)		
13	COOLING WATER SUPPLY LINES & ISOLATION VALVES (12)		
14	COOLING WATER RETURN LINES & ISOLATION VALVES (12)		
15	COOLING WATER SUPPLY & RETURN HEADERS		
16	SECONDARY AIR LINES (16" & 20")		
17	DRAIN HEADER		
18	AIR HEADER		
19	SECONDARY AIR PLENUMS (2)		

Attachment 8.2
Inventory Checklist - Instrument House Removed Components
Page 2 of 2

ATTACHMENT 8.1 I.D. NUMBER	COMPONENT DESCRIPTION	INITIALS	DATE

ATTACHMENT 3

Instrument House (708)

Radiological Surveys / Sampling / Analysis

BNL RADIOLOGICAL SURVEY FORM

Survey # 00-084

☐ ROUTINE
☐ SPECIAL
☐ RWP#

BLDG#: 708 LOCATION: Instrument Room DATE/TIME: 2-14-00/0800

MODEL	Bicron	LB5100				
SERIAL#	C0886	092206				
Cal Due Date	3-24-00	2-11-01				
Source Check OK (Yes or No)	yes	C/68				

DOSE RATES (HIGHEST)		AIRBORNE CONTAMINATION		
CONTACT	30-40	TIME	%CAc	%DAC
GENERAL AREA	30-70			

LEGEND: O SMEAR SURVEY LOCATION ◻ MASSLINN SURVEY LOCATION

XXX Y
ZZZ

XXX = CONTACT READING
ZZZ = READING @ 30 CM
Y = RADIATION TYPE

SMEAR SURVEY RESULTS (DPM/100 cm²)
β/γ α

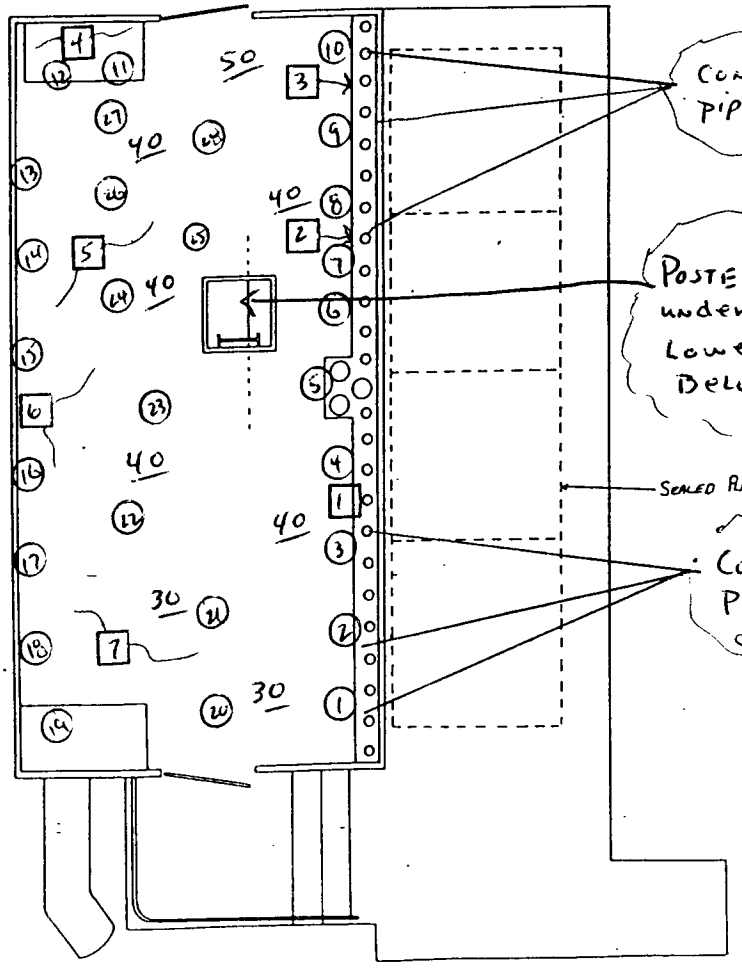
- ☒ All Dose Rates are in ~~mR/hr~~ microRem/hr and taken at waist level unless otherwise noted.
- ☒ All Masslinn wipes are <1,000 dpm/LAS
- ☐ Frisk various areas – all were less than 100cpm
- ☒ See Attachment for smear survey results

MASSLINN SURVEY RESULTS (DPM/LAS)

1.	VALVES	See Attach	8.	VALVES	See Attach	15.	INST. PANEL	See Attach	22.	GRATING	See Attach
2.	↓	↓	9.	↓	↓	16.	WALL	↓	23.	↓	↓
3.			10.	VALVES		17.	INST PANEL		24.		
4.			11.	Cover		18.	WALL		25.		
5.			12.	Cover		19.	Cover		26.		
6.			13.	INST PANEL		20.	GRATING		27.		
7.	VALVES		14.	WALL		21.	GRATING		28.	GRATING	

1.	<1K	8.	
2.	↓	9.	
3.		10.	
4.		11.	
5.		12.	NA
6.		13.	
7.	<1K	14.	

*ALL Readings in micro Rem/hr



Contact on valves + piping 30-40 microRem/hr

Posted Confine Space under grating Lowered Meter to floor Below grating 70 microRem/hr

Contact on valves + piping 30-40 microRem/hr

Mark Blaucik
SURVEYED BY: 2-14-00
Signature/date

REVIEWED BY: 8/15/00
Signature/date

Activity Report

INSTRUMENT ROOM

3:20:49PM

Batch Name:	24	**Acquisition Date:**	2/14/00
Batch ID:	Wipes Sample Counts - 200002141420	**Acquisition Time: (minutes)**	1.0
Group:	A		
Device:	LASP	**Operating Voltage: (volts)**	1,290.0

Selected Geometry: 1/8" Stainless Steel

Efficiency Factors

Alpha Efficiency: (%)	0.31	±	0.00	**Beta Efficiency: (%)**	0.19	±	0.00

Sample ID	Quantity	Alpha (DPM)	2σ	Alpha MDA (DPM)	Beta Activity (DPM)	2σ	Beta MDA (DPM)
20000214142001-A1	0.00	-0.49	0.56	13.02	8.86	18.14	33.93
20000214144704-A2	0.00	-0.50	0.56	13.02	24.40	25.52	33.93
20000214144814-A3	0.00	-0.49	0.56	13.02	3.67	14.89	33.93
20000214144934-A4	0.00	-0.49	0.56	13.02	3.67	14.89	33.93
20000214145044-A5	0.00	-0.49	0.56	13.02	8.86	18.14	33.93
20000214145204-A6	0.00	-0.49	0.56	13.02	-1.51	10.69	33.93
20000214145315-A7	0.00	-0.49	0.56	13.02	-1.51	10.69	33.93
20000214145435-A8	0.00	-0.49	0.56	13.02	19.22	23.32	33.93
20000214145545-A9	0.00	2.76	6.52	13.02	-1.82	10.71	33.93
20000214145705-A10	0.00	-0.49	0.56	13.02	14.04	20.89	33.93
20000214145815-A11	0.00	-0.49	0.56	13.02	14.04	20.89	33.93
[redacted]0214145936-A12	0.00	-0.49	0.56	13.02	8.86	18.14	33.93
[redacted]0214150046-A13	0.00	-0.49	0.56	13.02	3.67	14.89	33.93
20000214150206-A14	0.00	-0.49	0.56	13.02	8.86	18.14	33.93
20000214150316-A95	0.00	-0.49	0.56	13.02	3.67	14.89	33.93
20000214150436-A16	0.00	2.75	6.52	13.02	18.90	23.33	33.93
20000214150546-A17	0.00	-0.49	0.56	13.02	3.67	14.89	33.93
20000214150706-A18	0.00	-0.49	0.56	13.02	14.04	20.89	33.93
20000214150816-A19	0.00	2.76	6.52	13.02	-1.82	10.71	33.93
20000214150936-A20	0.00	2.76	6.52	13.02	3.36	14.90	33.93
20000214151046-A21	0.00	-0.49	0.56	13.02	3.67	14.89	33.93
20000214151206-A22	0.00	-0.49	0.56	13.02	-1.51	10.69	33.93
20000214151317-A23	0.00	-0.49	0.56	13.02	19.22	23.32	33.93
20000214151437-A24	0.00	-0.49	0.56	13.02	8.86	18.14	33.93
20000214151547-A25	0.00	-0.49	0.56	13.02	3.67	14.89	33.93
20000214151707-A26	0.00	-0.49	0.56	13.02	19.22	23.32	33.93
20000214151817-A27	0.00	-0.49	0.56	13.02	8.86	18.14	33.93
20000214151937-A28	0.00	2.76	6.52	13.02	8.54	18.15	33.93

[redacted]viewed by: 2-15-00

BNL RADIOLOGICAL SURVEY FORM

BLDG #: 708 LOCATION: upper level SUMPS DATE/TIME: 3/3/98 1100

REASON FOR SURVEY: [X] ROUTINE [ ] SPECIAL RWP# NA

INSTRUMENT MODEL/SERIAL #: L4D3 / 50613 BICRON / B306W TENV / 092286

RADIATION	(Highest) uR/HR
CONTACT	N/A
GENERAL AREA	6

AIRBORNE △		
TIME	uCi/cc	% DAC
←	N/A	→

LEGEND: ○ Smear Survey Location; □ Masslinn Survey Location; XXX = Contact Reading; XXX / ZZZ: Y = Radiation Type, ZZZ = Reading @ 30cm

SMEAR SURVEY RESULTS (DPM/100 CM²) ^{3}H (β,γ) (α)

	α	β⁻		α	β⁻		α	β⁻		α	β⁻
1.	<MDA	<MDA	8.	<MDA	<MDA	15.	<MDA	<MDA	22.		
2.			9.			16.			23.		
3.			10.			17.			24.		
4.			11.			18.			25.	N/A	
5.			12.			19.			26.		
6.			13.			20.	"	"	27.		
7.			14.			21.	N/A	N/A	28.		

MASSLINN SURVEY RESULTS (IN DPM)

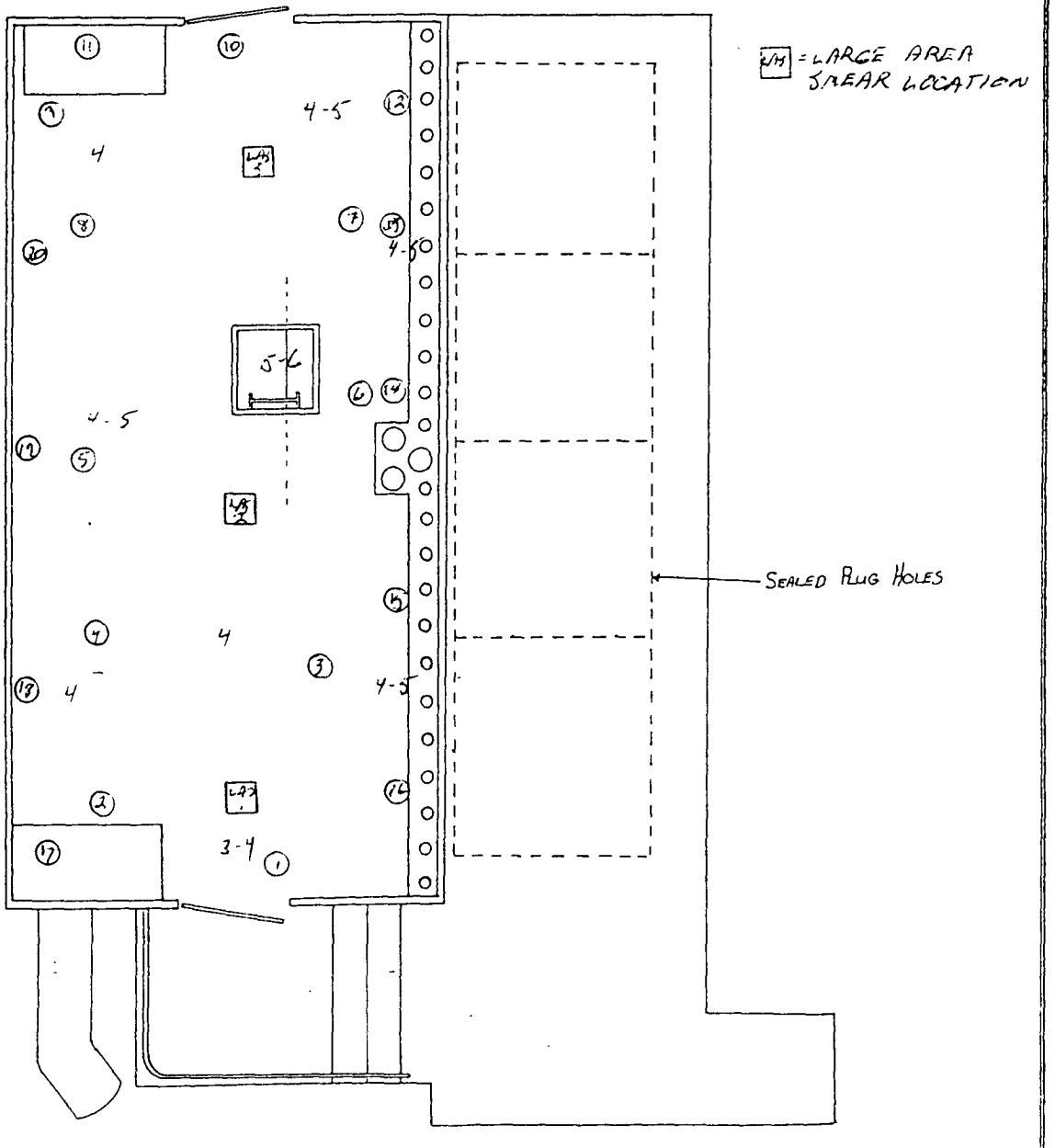
1.	<1K	8.	
2.	<1K	9.	
3.	<1K	10.	
4.		11.	N/A
5.	N/A	12.	
6.		13.	
7.		14.	

α MDA = 20 dpm
β⁻ MDA = 18 dpm

ALL READINGS IN uR/HR AT WAIST LEVEL UNLESS NOTED.

PERFORMED DIRECT FRISK AT VARIOUS LOCATION, NO DETECTABLE ACTIVITY.

NOTED: NO ENTRY MADE TO BOTTOM SECTION OF BLDG DUE TO WATER.



SURVEYED: [signature] 3-4-98
signature/date

REVIEWED: A. Epp 3/6/98
signature/date

File Code: HP312C

LB5100-W Low Background Counting System -- Smear Analysis

Date: 3/3/98
Counting Unit id: 1
Data file name: C:\LBXL\UNIT1\SME1C006.XLD
Batch Ended: 3/3/98 11:51
Crosstalk Correction: Not Applied

Alpha activity action level (DPM): 10.00
Beta activity action level (DPM): 500.00
Certainty level for MDA and flags: 95.00%
High Voltage Setting: 1440

Application Revision: 3
Application Version: Standard

Alpha efficiency log file: PU239IC
Alpha Efficiency: 18.74%
Alpha to Beta Crosstalk: 5.23%
Alpha Background (CPM): 0.7
Alpha Correction Factor: 1.000

Beta efficiency log file: TC99IC
Beta Efficiency: 24.19%
Beta into Alpha Crosstalk: 4.45%
Beta Background (CPM): 1.1
Beta Correction Factor: 1.000

Batch ID: BLDG 708

	Alpha Activity				Beta Activity				Count	Alpha	Beta	Completion
Carrier	DPM	σ	flags	MDA	DPM	σ	flags	MDA	time (min)	CPM	CPM	Date - Time
21	-3.736	3.28	<MDA	19.92	0.05	3.53	<MDA	17.76	1.80	-0.700	0.01	3/3/98 11:13
22	-3.736	3.28	<MDA	19.92	9.23	5.79	<AL	17.76	1.80	-0.700	2.23	3/3/98 11:15
23	-3.736	3.28	<MDA	19.92	9.23	5.79	<AL	17.76	1.80	-0.700	2.23	3/3/98 11:17
24	-3.736	3.28	<MDA	19.92	4.64	4.79	<MDA	17.76	1.80	-0.700	1.12	3/3/98 11:19
25	2.194	4.43	<MDA	19.92	2 34	4.21	<MDA	17.76	1.80	0.411	0 57	3/3/98 11:21
26	-0.771	3.28	<MDA	19.92	4.64	4.79	<MDA	17.76	1.80	-0.144	1.12	3/3/98 11:23
27	2.194	4.43	<MDA	19.92	16.12	7.03	<AL	17.76	1.80	0.411	3 90	3/3/98 11:25
28	2 194	4.43	<MDA	19.92	4.64	4.79	<MDA	17.76	1.80	0.411	1.12	3/3/98 11:27
29	-3.736	3.28	<MDA	19 92	16 12	7.03	<AL	17 76	1.80	-0.700	3 90	3/3/98 11:29
30	-3.736	3.28	<MDA	19.92	6 94	5.32	<AL	17.76	1 80	-0.700	1.63	3/3/98 11.31
31	-3.736	3.28	<MDA	19.92	2 34	4.21	<MDA	17.76	1.80	-0.700	0.57	3/3/98 11:33
32	-3.736	3.28	<MDA	19.92	0.05	3.53	<MDA	17.76	1.80	-0.700	0.01	3/3/98 11:35
33	-3 736	3.28	<MDA	19.92	0 05	3.53	<MDA	17 76	1.80	-0.700	0.01	3/3/98 11:37
34	-0.771	3.28	<MDA	19.92	4 64	4.79	<MDA	17.76	1.80	-0.144	1.12	3/3/98 11.39
35	-3.736	3.28	<MDA	19.92	4.64	4.79	<MDA	17.76	1.80	-0.700	1.12	3/3/98 11:41
36	-0.771	3.28	<MDA	19.92	0 05	3.53	<MDA	17.76	1.80	-0.144	0.01	3/3/98 11:43
37	-3 736	3.28	<MDA	19.92	9 23	5 79	<AL	17 76	1.80	-0.700	2.23	3/3/98 11:45
38	-3.736	3.28	<MDA	19.92	6 94	5.32	<AL	17.76	1.80	-0.700	1 68	3/3/98 11:47
39	-3.736	3.28	<MDA	19.92	0 05	3.53	<MDA	17.76	1.80	-0.700	0.01	3/3/98 11:49
40	2.194	4 43	<MDA	19.92	4.64	4.79	<MDA	17.76	1.80	0 411	1 12	3/3/98 11:51