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Summary of Surface Swipe Sampling for Beryllium on Lead Bricks and Shielding

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Interdepartmental letterhead

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July 28, 2011

MEMORANDUM

To: Kimberly Dremalas

From: Samuel Paik and David Barron

Subject: *Summary of Surface Swipe Sampling for Beryllium on Lead Bricks and Shielding*

Executive Summary

Approximately 25,000 lbs of lead bricks at Site 300 were assessed by the Site 300 Industrial Hygienist and Health Physicist for potential contamination of beryllium and radiation for reuse. These lead bricks and shielding had been used as shielding material during explosives tests that included beryllium and depleted uranium. Based on surface swipe sampling that was performed between July 26 and October 11, 2010, specifically for beryllium, the use of a spray encapsulant was found to be an effective means to limit removable surface contamination to levels below the DOE release limit for beryllium, which is 0.2 mcg/100 cm^2. All the surface swipe sampling data for beryllium and a timeline of when the samples were collected (and a brief description) are presented in this report. On December 15, 2010, the lead bricks and shielding were surveyed with an ion chamber and indicated dose rates less than 0.05 mrem per hour on contact. This represents a dose rate consistent with natural background. An additional survey was performed on February 8, 2011, using a GM survey instrument to estimate total activity on the lead bricks and shielding, confirming safe levels of radioactivity. The vendor is licensed to possess and work with radioactive material (Texas Department of State Health Services License Number L00775).

The information regarding release of contaminated metals is detailed in a memo from Kathy Shingleton to the team Health Physicists. Volumetrically and surface contaminated metals are allowed to be (with restricted release) reused and or recycled as listed in Table 1 of the memo. As the surfaces of the lead bricks and shielding are encapsulated to mitigate potential issues associated with beryllium, any radioactive material on the surface of the lead bricks and shielding should be considered as fixed and not removable. Therefore, it is the Industrial Hygienist's and Health Physicist's determination that the lead bricks and shielding may have a restricted release for reuse purposes based on the information reflected within this memo.

Timeline of Sampling Performed

The ES&H Team 1, Site 300 Industrial Hygienist and Health Physicist were contacted in July 2010 to perform an assessment of the condition of lead bricks and shielding that were being considered for reuse. A series of both total beryllium (metal + oxide) and radioactive contamination surveys were performed through February 2011 to complete the requested assessment. The results and sampling description is contained below to address the process behind the conclusions reflected in this report.

Lead Brick and shielding Sampling Results - July 26, 2010

29 surface swipe samples were collected from the lead bricks and shielding located at Building 804. The samples were analyzed for Total Beryllium based on their use during experiments containing beryllium. Samples were collected from lead bricks and shielding that were stored in two boxes and four pallets. Nine out of the 29 samples that were collected indicated beryllium levels in excess of the DOE release limit for beryllium. The results are shown in the table below.

Table 1. Results for Total Beryllium surface swipe samples on July 26, 2010

Sample No.	Analyte	Results (mcg/100 cm^2)	Release limit (mcg/100 cm^2)	Release limit exceeded? (Y/N)
883442	Total Be	1.6	0.2	Y
883443	Total Be	1.4	0.2	Y
883444	Total Be	0.99	0.2	Y
883445	Total Be	1.6	0.2	Y
883446	Total Be	2.2	0.2	Y
883447	Total Be	0.028	0.2	N
883448	Total Be	< 0.02	0.2	N
883449	Total Be	0.053	0.2	N
883450	Total Be	< 0.02	0.2	N
883451	Total Be	< 0.02	0.2	N
883452	Total Be	< 0.02	0.2	N
883453	Total Be	< 0.02	0.2	N
883454	Total Be	0.033	0.2	N
883455	Total Be	< 0.02	0.2	N
883456	Total Be	< 0.02	0.2	N
883457	Total Be	0.94	0.2	Y
883458	Total Be	0.063	0.2	N
883459	Total Be	< 0.02	0.2	N
883460	Total Be	0.44	0.2	Y
883461	Total Be	0.44	0.2	Y
883462	Total Be	< 0.02	0.2	N
883463	Total Be	0.03	0.2	N
883464	Total Be	0.057	0.2	N
883465	Total Be	0.073	0.2	N
883466	Total Be	0.31	0.2	Y
883467	Total Be	< 0.02	0.2	N
883468	Total Be	< 0.02	0.2	N
883469	Total Be	< 0.02	0.2	N
883470	Total Be	< 0.02	0.2	N

August 3, 2010

In an effort to remove the beryllium contamination from the lead bricks and shielding, two employees used wet wiping methods to clean the lead bricks and shielding on two pallets which had previously shown levels of beryllium above the release limit. The lead bricks and shielding were submerged in water and wiped with a wet rag. These lead bricks and shielding were re-swiped after cleaning was completed to assess if there was a reduction in the levels of beryllium contamination. Nine out of ten samples that were collected indicated beryllium levels in excess of the DOE release limit for beryllium, indicating that wet wiping was not sufficient to remove the contamination. The results are shown in the table below.

Table 2. Results for Total Beryllium surface swipe samples on August 3, 2010

Sample No.	Analyte	Results (mcg/100 cm^2)	Release limit (mcg/100 cm^2)	Release limit exceeded? (Y/N)
6050000	Total Be	0.25	0.2	Y
6050001	Total Be	0.18	0.2	N
6050002	Total Be	0.2	0.2	Y
6050003	Total Be	0.92	0.2	Y
6050004	Total Be	0.54	0.2	Y
6050005	Total Be	0.47	0.2	Y
6050006	Total Be	0.73	0.2	Y
6050007	Total Be	0.99	0.2	Y
6050008	Total Be	0.49	0.2	Y
6050009	Total Be	0.32	0.2	Y

August 18, 2010

As wet wiping techniques were not sufficient to remove beryllium contamination, a decision was made to encapsulate the lead bricks and shielding after wiping them using a spray encapsulant (Fiberset PM) to fix the beryllium contamination onto the surface of the lead bricks and shielding. A Hudson Sprayer was used for this purpose. Surface swipe samples were collected from the two pallets that had indicated beryllium levels in excess of the DOE release limit for beryllium. This time, all of the samples indicated beryllium levels below the release limit, suggesting that encapsulating the lead bricks and shielding was an effective way to prevent removable beryllium contamination. The results are shown in the table below.

Table 3. Results for Total Beryllium surface swipe samples on August 18, 2010

Sample No.	Analyte	Results (mcg/100 cm^2)	Release limit (mcg/100 cm^2)	Release limit exceeded? (Y/N)
883683	Total Be	< 0.02	0.2	N
883684	Total Be	< 0.02	0.2	N
883685	Total Be	< 0.02	0.2	N
883686	Total Be	< 0.02	0.2	N
883687	Total Be	< 0.02	0.2	N
883688	Total Be	0.039	0.2	N
883689	Total Be	< 0.02	0.2	N
883690	Total Be	0.03	0.2	N
883691	Total Be	< 0.02	0.2	N
883692	Total Be	< 0.02	0.2	N

October 4 and October 11, 2010

All the remaining lead bricks and shielding were encapsulated and composite (samples taken from several lead bricks and shielding) surface swipe samples were collected from the remaining lead bricks and shielding. All of the samples indicated beryllium levels below the DOE release limit, further confirming that encapsulation was an effective way to prevent removable beryllium contamination. The results are shown in the table below.

Table 4. Results for Total Beryllium surface swipe samples on October 4 and 11, 2010

Sample No.	Analyte	Results (mcg/100 cm^2)	Release limit (mcg/100 cm^2)	Release limit exceeded? (Y/N)
883905	Total Be	< 0.02	0.2	N
883906	Total Be	0.023	0.2	N
6051250	Total Be	< 0.02	0.2	N
6051251	Total Be	< 0.02	0.2	N
6051252	Total Be	< 0.02	0.2	N
6051253	Total Be	< 0.02	0.2	N

February 8, 2011

The lead bricks and shielding were surveyed directly with a hand held GM survey instrument. This information was used to estimate the total activity on the lead bricks and shielding as shown in Table 5. Values were between 60 to 180 net counts/minute (ncpm). Massilin swipes of the lead bricks and shielding did not indicate any removable contamination. The value of 180 ncpm was used in estimating the aggregate activity of the lead bricks and shielding. The surface of a lead brick and shielding was calculated as 722.5 cm^2. The average activity per lead brick and shielding was approximately 50,000 dpm or 2.2 E-02 μcuries.

Table 5. Results for Radioactive Contamination

Contamination (dpm/100 cm^2)	Surface Area of Lead Brick and Shielding (cm^2)	Number of Lead Bricks and shielding	Average Activity/brick (μCuries)	Total Activity (μCuries)
6830	722.5	465	2.2E-02	10.4

Conclusion

All the lead bricks and shielding were encapsulated to fix any surface contamination that was present on the lead bricks and shielding. The surface sampling results showed that this was an effective means to prevent removable surface contamination. The lead bricks and shielding, therefore, may have a restricted release for reuse purposes.

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