February 8, 2010

CCN 219898

Mr. Raymond Furstenau
Contracting Officer's Representative
U.S. Department of Energy
Idaho Operations Office (DOE-ID)
1955 Fremont Avenue
Idaho Falls, ID 83415-1203

SUBJECT: Contract No. DE-AC07-05ID14517 - Response to DOE-ID Request for Beryllium Exposure Assess~~ment~~ and Monitoring Data

Reference: Request for Beryllium Exposure Assessment and Monitoring Data (OS-QSD-09-082).

Dear Mr. Furstenau:

In response to the referenced DOE-ID request, the BEA Industrial Hygiene Organization has performed a historical review of exposure assessment records and has compiled in the attached report associated personal, area and surface smear results for beryllium within the Advanced Test Reactor (TRA-670) and the Storage & Receiving Machine Shop (TRA-662).

Additional characterization of potential beryllium contamination at these locations was needed to more fully address the potential for unrecognized airborne exposure to beryllium by current workers. Surface contamination and airborne sampling was subsequently performed on January 13-14, 2010. Data collected during this recent study are also included within the attached report along with BEA's overall evaluation and conclusions.

If you have any questions regarding the compiled data and overall evaluation and conclusions feel free to contact Troy Bodily, BEA Industrial Hygiene Program Lead, at 526-7964 or email Troy.Bodily@INL.gov.

Sincerely,

Karen M Downer

Karen M. Downer, Director
Environmental, Safety and Health

TWB:CW

Attachment

cc: J. Alvarez, INL, MS 3695
R. R. Chase, INL, MS 6146
A. Clark, INL, MS 3695
R. L. Dickson, DOE-ID, MS 1216
J. J. Grossenbacher, INL, MS 3695
D. P. Johnson, INL, MS, 7117
A. J. Kraupp, DOE-ID, MS 1226
S. M. Olson, DOE-ID, MS 1240
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bcc: C. S. Mascareñas, MS 3402
K. M. Downer Letter File (KMD-06-10)
INL Correspondence Control, MS 3108

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Summary Report:
Beryllium Exposure Characterization, TRA-670 and TRA-662.

Prepared by:
BEA Industrial Hygiene Program Office
February 1, 2010

Background

The following report is provided in response to DOE-ID correspondence OS-QSD-09-082 transmitted on January 4, 2010 from Raymond Furstenau, DOE Contracting Officer Representative, to Carol Mascareñas, Director of Occupational Safety and Health, Battelle Energy Alliance. This correspondence requested that BEA provide DOE-ID with recent exposure assessment and associated personal, area, and surface smear results for beryllium at the Advanced Test Reactor, TRA-670, and the TRA Machine Shop, believed to be TRA-662. Additionally, the correspondence requests BEA's overall evaluation and conclusions regarding the potential for current airborne exposures to beryllium in these work places. This request was explained to be in response to allegations from a former Idaho National Laboratory (INL) Site worker suggesting the possibility of unrecognized airborne exposures of beryllium to current workers at these locations.

TRA-670 Process Description and Exposure Potentials

The Advanced Test Reactor, housed within TRA-670, contains beryllium reflector shields (and outer shim control cylinders) configured as part of the reactor core and used as neutron moderators. Beryllium reflector shields are received at the INL fully machined and ready for installation. Replacement of these shields during core internal change-out (CIC) evolutions occur remotely without direct contact or disturbance by employees, other than the initial unpackaging and rigging to the overhead crane. Irradiated reflector shields removed during CIC undergo a free air transfer for long term storage within the underwater storage canal. The free air transfer from the core to the storage canal occurs within minutes and reflector shields remain wet during the entire transfer. The water surrounding the reactor core and underwater storage canal, not only provides radiation shielding and cooling to the reactor core, but also provides containment to the free release of beryllium particles to the air.

In addition to CIC evolutions, irradiated reflector shields have undergone miscellaneous activities in past years to support such processes as the retrieval of samples for analysis. All of these activities have been performed underwater in the fuel storage canal. Industrial Hygiene evaluations of activities associated with the CIC of beryllium reflector shields and these miscellaneous activities have determined exposure potentials to be extremely low due to the underwater locations providing containment to the potential release of free beryllium particles. Handling tools that come in contact

with these irradiated shields, and then removed from the water, are also surveyed by Radiological Control Technicians to identify and control any potential release of any radioactive contamination.

It should be noted that newly manufactured beryllium shields provided during CIC evolutions are classified as a "Beryllium article" by definition of 10 CFR 850 "Chronic Beryllium Disease Prevention Program" and are therefore exempt from the requirements of the beryllium standard (10 CFR 850.2 and 3). This exemption is based on an understanding that the reflector shields are manufactured outside the INL to a specific shape and design, and end use by the INL is not anticipated to release beryllium or otherwise result in exposure to airborne concentrations of beryllium under normal conditions of use.

TRA-662 Process Description and Exposure Potentials

TRA-662 was originally designed as a receiving and storage building in 1961. It now serves as the "ATR Sponsors Warehouse" dedicated to ATR parts and supplies storage and receiving and large component machine shop. Interviews with management and employees (1 maintenance staff, 1 retired ATR Complex operator, 1 ATR operations engineer, 1shop foreman, and 2 machinists), familiar with past activities within this building, all confirm that beryllium was never machined within this facility. Historical machining of beryllium, if in fact any occurred, would have occurred within TRA-635, a building previously characterized for beryllium contamination as outlined in INL Report, RPT-107, INEEL Site Legacy Beryllium Contamination Survey Results" completed in 2004.

During the operation of the Engineering Test Reactor (ETR) it is likely that beryllium reflector shields used for the internal core were stored within this facility prior to core internal change-outs. These reflector shields were transported and stored within enclosed wooden crates and, consistent with current practices, are believed to have been sealed with plastic wrapping. The storage of these shields in this configuration would not be expected to generate any plausible release of airborne beryllium particulate.

Industrial Hygiene Exposure Assessment and Beryllium Characterization Activities

Industrial Hygiene reviews and evaluations of beryllium associated activities within TRA-670 and TRA-662 have previously determined that established containment processes and control measures used during these activities would eliminate or control beryllium exposure potentials to levels well below established limits. As a result, these formal exposure assessment processes have required a limited number of industrial hygiene sampling events over the past years. Table 1 summarizes the sampling data that has been collected and is retrievable through the Industrial Hygiene Hazard Assessment and Sampling System (HASS) database and pre-HASS database. In all cases sampling results found beryllium levels to be below regulatory limits; 2.0 ug/m^3 Permissible Exposure Limit (PEL) for airborne exposures, 0.2 ug/m^3 Action Limit for airborne exposures, and 0.2 ug/100cm^2 limit for surface contamination (release criteria of equipment to the general public).

Table 1
Historical Sampling Data

LOCATION	ACTIVITY	AGENT	SAMPLE TYPE	MEASURED RESULTS	DATE
TRA-670	Hydraulic chisel used to remove sample of Be reflector block stored in ATR canal	Be	Personal	<0.02 ug/m^3 (below detectable limits)	2/22/2000
TRA-670	Hydraulic chisel used to remove sample of Be reflector block stored in ATR canal	Be	Personal	<0.02 ug/m^3 (below detectable limits)	2/22/2000
TRA-670	Hydraulic chisel used to remove sample of Be reflector block stored in ATR canal	Be	Personal	<0.02 ug/m^3 (below detectable limits)	2/28/2000
TRA-670	Dismantling of ATR Crane	Be	Wipe	<0.10 ug/100cm^2 (below detectable limits)	5/7/2007
TRA-670	Be Blocks in ATR canal repositioned/moved	Be	Personal	<.11 ug/m^3 (below detectable limits)	5/19/2004
TRA-670	Shipping boxes containing Beryllium parts for ATR.	Be	Surface "vacuuming"	.055 ug/100cm^2	4/14/1986
TRA-670	Shipping boxes containing Beryllium parts for ATR.	Be	Surface "vacuuming"	.016 ug/100cm^2	4/14/1986
TRA-670	Underwater arc-saw cutting operation on beryllium in ATR canal	Be	Area (sample 1)	<0.02 ug/m^3 (below detectable limits)	1/26/1982
TRA-670	Underwater arc-saw cutting operation on beryllium in ATR canal	Be	Area (sample 2)	<0.02 ug/m^3 (below detectable limits)	1/26/1982

In response to the allegation of possible unrecognized exposure of workers to beryllium at these two locations, BEA performed additional sampling and characterization to ensure employee health and safety. On January 13th and 14th, 2010, the BEA Industrial Hygiene organization collected additional surface wipe (smear) and airborne contamination samples within building TRA-670 and TRA-662.

Surface contamination samples were collected in accordance with BEA sampling and analysis plan PLN-1747 "INL Site Beryllium Contamination Sampling and Analysis Plan". This plan establishes sample collection methods and analysis required to identify and characterize beryllium contamination levels within buildings where beryllium or beryllium-containing compounds where historically

handled, used, or stored. Non-random biased sampling was conducted in order to sample areas with the highest likelihood of contamination such as un-cleaned horizontal surfaces on cabinets, electrical panels, and air duct grills. These sample collection and analysis methods were also used to develop RPT-107.

Table 2 summarizes the data collected on January 13th and 14th, 2010. This data also found surface contamination and airborne levels of beryllium to be below regulatory limits. Forty four surface wipe samples and four airborne samples were collected during this assessment. Thirty seven of the forty four wipe samples found no detectable levels of beryllium, when analyzed against a detection limit of 0.023 ug. The remaining seven samples detected beryllium at levels well below the established surface contamination limit of .2ug/100cm^2. The seven samples with trace detectable levels of beryllium are believed to be from naturally occurring levels of beryllium found in INL soil. This conclusion is supported by elevated levels of barium and copper detected at these same sample sites which provide source markers for comparison against naturally occurring ratios of these metals within INL soil (ref. RPT-107, PLN-1747).

Table 2
Sampling Data Collected January 2010

LOCATION	ACTIVITY	AGENT	SAMPLE TYPE	MEASURED RESULTS	DATE
TRA-662, Eyeglass holder, top	Sampling of building surfaces for Be Contamination.	Be	Wipe	<0.023 ug/100cm^2	1/13/2010
TRA-662, Electrical Box, (South East roll-up door)	Sampling of building surfaces for Be Contamination.	Be	Wipe	<0.023 ug/100cm^2	1/13/2010
TRA-662, Blue air hose reel, South Wall	Sampling of building surfaces for Be Contamination.	Be	Wipe	0.034 ug/100cm^2	1/13/2010
TRA-662, South side of crane	Sampling of building surfaces for Be Contamination.	Be	Wipe	<0.023 ug/100cm^2	1/13/2010
TRA-662, Top of the King, B7L	Sampling of building surfaces for Be Contamination.	Be	Wipe	<0.023 ug/100cm^2	1/13/2010
TRA-662, Back of Shear – SHR-MA-151	Sampling of building surfaces for Be Contamination.	Be	Wipe	0.025 ug/100cm^2	1/13/2010
TRA-662, Floor by large shear	Sampling of building surfaces for Be Contamination.	Be	Wipe	<0.023 ug/100cm^2	1/13/2010
TRA-662, Top of HEAR HERE	Sampling of building surfaces for Be	Be	Wipe	<0.023 ug/100cm^2	1/13/2010

LOCATION	ACTIVITY	AGENT	SAMPLE TYPE	MEASURED RESULTS	DATE
(Box by Phone)	Contamination.				
TRA-662, Horizontal lathe	Sampling of building surfaces for Be Contamination.	Be	Wipe	<0.023 ug/100cm^2	1/13/2010
TRA-662, Behind beam and outer wall on floor	Sampling of building surfaces for Be Contamination.	Be	Wipe	<0.023 ug/100cm^2	1/13/2010
TRA-662, Floor between beam and floor	Sampling of building surfaces for Be Contamination.	Be	Wipe	<0.023 ug/100cm^2	1/13/2010
TRA-662, Large milling machine on west end	Sampling of building surfaces for Be Contamination.	Be	Wipe	<0.023 ug/100cm^2	1/13/2010
TRA-662, Floor by fence and fire extinguisher	Sampling of building surfaces for Be Contamination.	Be	Wipe	<0.023 ug/100cm^2	1/13/2010
TRA-662, Counter weights for sliding door	Sampling of building surfaces for Be Contamination.	Be	Wipe	<0.023 ug/100cm^2	1/13/2010
TRA-662, Floor	Sampling of building surfaces for Be Contamination.	Be	Wipe	<0.023 ug/100cm^2	1/13/2010
TRA-662, Electrical Box by rollup door	Sampling of building surfaces for Be Contamination.	Be	Wipe	0.067 ug/100cm^2	1/13/2010
TRA-662, Old shelf in bathroom	Sampling of building surfaces for Be Contamination.	Be	Wipe	<0.023 ug/100cm^2	1/13/2010
TRA-662, Ducting grill in resin storage	Sampling of building surfaces for Be Contamination.	Be	Wipe	<0.023 ug/100cm^2	1/13/2010
TRA-662, Top of electrical panel	Sampling of building surfaces for Be Contamination.	Be	Wipe	<0.023 ug/100cm^2	1/13/2010
TRA-662, Floor by steam lines	Sampling of building surfaces for Be Contamination.	Be	Wipe	0.039 ug/100cm^2	1/13/2010
TRA-662, Top of transformer	Sampling of building surfaces for Be Contamination.	Be	Wipe	0.025 ug/100cm^2	1/13/2010
TRA-662, Top of electrical panel	Sampling of building surfaces for Be Contamination.	Be	Wipe	<0.023 ug/100cm^2	1/13/2010
TRA-670, Top of fire riser flange SE corner	Sampling of building surfaces for Be Contamination.	Be	Wipe	<0.023 ug/100cm^2	1/14/2010

LOCATION	ACTIVITY	AGENT	SAMPLE TYPE	MEASURED RESULTS	DATE
TRA-670, Top of Electrical Box by elevator	Sampling of building surfaces for Be Contamination.	Be	Wipe	0.029 ug/100cm^2	1/14/2010
TRA-670, Top of beam by south tool storage area	Sampling of building surfaces for Be Contamination.	Be	Wipe	<0.023 ug/100cm^2	1/14/2010
TRA-670, Top of drain pipe (roof) SW corner	Sampling of building surfaces for Be Contamination.	Be	Wipe	<0.023 ug/100cm^2	1/14/2010
TRA-670, Leak rate control box, West wall	Sampling of building surfaces for Be Contamination.	Be	Wipe	<0.023 ug/100cm^2	1/14/2010
TRA-670, NE corner under overhead ladder to crane	Sampling of building surfaces for Be Contamination.	Be	Wipe	<0.023 ug/100cm^2	1/14/2010
TRA-670, Top of Ram analog read out	Sampling of building surfaces for Be Contamination.	Be	Wipe	<0.023 ug/100cm^2	1/14/2010
TRA-670, Top of electrical junction box below phone	Sampling of building surfaces for Be Contamination.	Be	Wipe	<0.023 ug/100cm^2	1/14/2010
TRA-670, Flat surface above blue air hose reel	Sampling of building surfaces for Be Contamination.	Be	Wipe	<0.023 ug/100cm^2	1/14/2010
TRA-670, East parapet wall top	Sampling of building surfaces for Be Contamination.	Be	Wipe	<0.023 ug/100cm^2	1/14/2010
TRA-670, Cinder block wall by east rollup door (top)	Sampling of building surfaces for Be Contamination.	Be	Wipe	0.028 ug/100cm^2	1/14/2010
TRA-670, Top of roll up window	Sampling of building surfaces for Be Contamination.	Be	Wipe	<0.023 ug/100cm^2	1/14/2010
TRA-670, Diagonal support beam	Sampling of building surfaces for Be Contamination.	Be	Wipe	<0.023 ug/100cm^2	1/14/2010
TRA-670, Floor by canal	Sampling of building surfaces for Be Contamination.	Be	Wipe	<0.023 ug/100cm^2	1/14/2010
TRA-670, West wall, cinderblock West rollup door drainpipe	Sampling of building surfaces for Be Contamination.	Be	Wipe	<0.023 ug/100cm^2	1/14/2010
TRA-670, Horizontal beam	Sampling of building surfaces for Be	Be	Wipe	<0.023 ug/100cm^2	1/14/2010

LOCATION	ACTIVITY	AGENT	SAMPLE TYPE	MEASURED RESULTS	DATE
south wall under stairs	Contamination.				
TRA-670, Top of old radiation monitor, near top of stairs	Sampling of building surfaces for Be Contamination.	Be	Wipe	<0.023 ug/100cm^2	1/14/2010
TRA-670, HVAC ducting	Sampling of building surfaces for Be Contamination.	Be	Wipe	<0.023 ug/100cm^2	1/14/2010
TRA-670, Electrical junction box, West wall	Sampling of building surfaces for Be Contamination.	Be	Wipe	<0.023 ug/100cm^2	1/14/2010
TRA-670, Diagonal beam, West wall	Sampling of building surfaces for Be Contamination.	Be	Wipe	<0.023 ug/100cm^2	1/14/2010
TRA-670, Electrical control cabinet, East wall	Sampling of building surfaces for Be Contamination.	Be	Wipe	<0.023 ug/100cm^2	1/14/2010
TRA-670, Diagonal beam, East wall	Sampling of building surfaces for Be Contamination.	Be	Wipe	<0.023 ug/100cm^2	1/14/2010
TRA-662, Center of building, on storage rack	Sampling building air for presence of Be.	Be	Area	<0.050 ug/m^3	1/13/2010
TRA-662, SW corner of building, on machine shop side, on work bench	Sampling building air for presence of Be.	Be	Area	<0.048 ug/m^3	1/13/2010
TRA-670, South side of reactor top	Sampling building air for presence of Be.	Be	Area	<0.038 ug/m^3	1/14/2010
TRA-670, South side of canal, above beryllium storage	Sampling building air for presence of Be.	Be	Area	<0.036 ug/m^3	1/14/2010

Evaluation and Conclusions

It is the conclusion of the BEA Industrial Hygiene organization that workers performing activities within TRA-670 and TRA-662 are not being exposed to "unrecognized" airborne beryllium alleged to be the result of historic and on-going operations associated with the use of beryllium in the ATR reflector shields. These allegations could not be substantiated through comprehensive industrial hygiene sampling activities. In all cases, sampling results conducted using personal, area, and surface

wipe methods found levels of beryllium to be well below regulatory limits. Comprehensive industrial hygiene exposure assessments, evaluating beryllium handling and control practices within these locations, were also unable to identify likely beryllium exposure potentials.

While BEA's review could not substantiate these claims, BEA welcomes any additional information that may provide further insight into to these allegations. BEA remains vigilant in its desire to identify potential beryllium contamination resulting from legacy operations and is committed to ensuring INL employees are provided with a workplace free of uncontrolled exposures to beryllium or other recognized hazards.