40-07102

SHIELDALLOY METALLURGICAL CORPORATION

WEST BOULEVARD
P.O. BOX 768
NEWFIELD, NJ 08344
TELEPHONE (609) 692-4200
FAX (609) 692-4017

DAVID R. SMITH
Environmental Manager
NEWFIELD OPERATIONS

September 26, 1997

Mr. Michael Weber
Chief, Licensing Branch
Division of Fuel Cycle Safety and Safeguards, NMSS
U. S. Nuclear Regulatory Commission
Washington, D.C. 20555-0001

Re: Supplemental Information for Application for Renewal of Source Material License No. SMB-743 (TAC No. L21474)

Dear Mr. Weber:

On September 26, 1997, a telephone conference that included Ms. Heather Astwood of your office and representatives of Shieldalloy Metallurgical Corporation (SMC) was held. During that conference, SMC agreed to provide additional information and commitments to the USNRC in regard to a number of license-related issues. The following should be considered supplemental information to our August 25, 1995 license renewal application:

Periodic Review of Radiation Safety Procedures
Section 5.14, "Documentation", of Radiation Safety Procedure No. RSP-001, "Radiation Protection Program Plan" will be modified to include the following commitment:

5.14.3 Radiation Safety Procedures shall be reviewed by the RSC for continued applicability, effectiveness and compliance with RSP-001 at least once per year.

Fire and Chemical Safety
Section 3, "References", of RSP-001 will be modified to include the following:

3.7 Title 29, Code of Federal Regulations, Part 1910, "Occupational Safety and Health Standards".

3.8 Title 40, Code of Federal Regulations, Part 68, "Chemical Accident Prevention Provisions".

Section 5.2, "Facilities and Equipment", of RSP-001 will be modified to include the following commitment:

5.2.4 In restricted areas, all pertinent general industry regulations in 29 CFR 1910, including those that pertain to chemical and fire safety, shall apply. In addition, the facility will comply, as appropriate, with all substantive requirements in 40 CFR 68.

5.2.4.1 The number of charges used to initiate the aluminothermic process shall be minimized, with the majority of the inventory stored in unrestricted areas.

5.2.4.2 Hazardous materials storage locations and practices shall be subject to planned and periodic inspection by in-house safety personnel and by state/federal inspectors.

In addition, the general employee training topics listed in the attachment to RSP-007, "Radiation Safety Training" will be modified to specifically include a discussion on hazardous materials storage/use in restricted areas.

Exposure Monitoring/Assessment During Maintenance on Baghouses

In our telephone conference, Ms. Astwood inquired as to the monitoring requirements for a specific baghouse maintenance activity. The activity of interest is the emptying of silos and transfer of baghouse dust to the storage yard. As required in sections 5.4.2 and 5.4.3 of RSP-001, if this or any other activity has the potential to cause an employee to exceed 500 millirem per year Total Effective Dose Equivalent (TEDE), individual monitoring will be performed.[1]

The last transfer of baghouse dust to the Storage Yard occurred on March 12, 1997. For the duration of this operation, health and safety coverage of workers was provided by a contract health physics technician. In addition, each worker wore breathing zone samplers, stationary air monitors were positioned in locations that exhibited visible dust, and contamination surveys of all equipment, personnel and work areas were performed at the end of the job. The results of filter analysis from the air sampling devices were negative for detectable radioactivity (see Quarter 1, 1997 Surveillance Report).[2] Contamination survey results were negative for removable contamination above the release criteria shown in RSP-009, "Contamination Control". Because members of the general public are located a much greater distance from the work location than the workers, it is reasonable to assume that the exposure potential for members of the public during silo emptying operations is less than the exposure potential of workers.

---

[1] Almost all baghouse maintenance activities are considered to be non-routine in nature. Therefore, this work is generally performed under the provisions of a Radiation Work Permit (RWP). As described in RSP-012, "Control of Work", RWP preparation requires a preliminary assessment of the exposure potential for the job in question in order to specify applicable monitoring and control methods.

[2] In the USNRC's September 24, 1997 Inspection Report (No. 040-07102/97-001), reference is made to measured airborne concentrations in the area near the baghouse during the Quarter 1, 1997 silo emptying. The concentration referenced by the USNRC was reported in the surveillance report for that effort as being a detection limit (i.e., MDA), not a statistically positive value.

DAC Adjustment for Uranium/Thorium Progeny Based on Particle Size

In SMC's March 14 and May 12, 1995 letters to the USNRC, the results of particle size measurements in the work areas of D111 were presented. The data acquired indicated mean particle sizes of 2.03 micrometers Activity Median Aerodynamic Diameter (AMAD) in the vicinity of the pyrochlore mixing process, and 1.79 micrometers AMAD on the second floor of D.111. (The data presentation shown in attachments to the letters show a cut point for Stage 6 of 1.8 micrometers, when the cut point is actually 0.8 micrometers. This typographical error in the attachments does not impact the analytical results.)

In a July 21, 1995 letter, the USNRC requested the following additional information in regard to the particle size adjustment:

> "Please provide assurances that the air sampling data, particularly the particle size distribution data, is representative of the type of aerosols that workers are exposed to at each work location. Although some information was provided, it was insufficient to provide this assurance."

SMC responded to this request in a September 22, 1997 letter to Dr. Mohamed M. Shanbaky, wherein it stated:

> "The Graseby/Anderson sampler was placed in the vicinity of the mixing/blending operation and the tapping operation, as close as possible to where personnel were likely to be positioned.[3] The mixing/blending operations themselves do not fractionate by particle size or in any other way distort the physical and chemical properties of the airborne radioactive constituents produced. Furthermore, the density and deposition velocity of the materials in use are not conducive to wide dispersion as a result of unusual airflow patterns.
>
> The data acquired for the particle size assessment are as representative as the conventional stationary air sampling data that have been acquired in these work areas over the years, and that are typically used throughout the nuclear industry.[4] Therefore, SMC is confident that the measurements of particle size adequately and conservatively reflect the particle sizes in the breathing zone of workers."

---

[3] Because of the physical size of the sampling device and our desire to not impede the movements of the worker, it was not possible to place the sampling head as close to the source of emissions as the worker (e.g., within 30 cm. of the head of the worker, as recommended in Section 3.1, of NUREG-1400, "Air Sampling in the Work Place"). Consequently, the data from this assessment reflect significantly smaller particle sizes than would be expected if the collection locations were closer to the source due to the increased proximal deposition of larger particles over smaller particles. As a result, the internal doses, as calculated using the modified DAC, will be conservative (e.g., overestimated).

[4] Hickey, E. E., G. A. Stoetzel, D. J. Strom, C. R. Cicotte, C. M. Wiblin and S. A. McGuire, "Air Sampling in the Workplace", NUREG-1400, Section 3.0, September, 1993.

However, it is important to note that SMC only wishes to incorporate a particle size adjustment in the DACs and ALIs for ^{232}Th and ^{238}U. All dose assessment results for the progeny in the uranium and thorium decay chains will assume a nominal particle size of one (1) micrometer AMAD, with DACs and ALIs taken directly from 10 CFR 20, Appendix B. To that end, SMC will modify Section 5.4.3 of RSP-001 to include the following:

> 5.4.3.8 For dose assessment purposes, the Annual Limit on Intake (ALI) for ^{232}Th and ^{238}U shall be 4×10^3 pCi and 4×10^8 pCi, respectively.
>
> **Note: These values of ALI are based upon a measured particle size of two (2) micrometers (AMAD) in the workplace as described in SMC's response to Confirmatory Action Letter No. 1-95-004, May 12, 1995.**

Uranium- and Thorium-to-Gross Alpha Ratios for Air Sample Analysis

In SMC's March 14 and May 12, 1997 letters to the USNRC, the results of an isotopic analysis were reported that demonstrated a mean ratio for ^{232}Th of 0.076 ± 0.011 and a mean ratio for ^{238}U of 0.061 ± 0.007.

In a July 21, 1995 letter, the USNRC requested the following additional information in regard to the issue of isotopic ratios:

> "You used isotopic ratios to calculate the thorium and uranium activity from the results of gross alpha counting. This value is the ratio of the concentration of thorium and uranium activity to the total activity of alpha emitters in materials used at your facility, and was determined by isotopic analysis. You did not provide assurances that this ratio will reflect the ratio of emissions from the various alpha emitters in an air sample. This latter ratio may differ from that obtained by isotopic analysis because of the inaccuracies in determining counting efficiency such as self-absorption, geometry and detector efficiency. Please provide a justification for using this scaling method based upon evidence that this ratio will reflect the ratio of emission in an air sample."

SMC responded to this request in a September 22, 1997 letter to Dr. Mohamed M. Shanbaky, wherein it stated:

> "The following is the methodology SMC uses to convert gross alpha activity in/on a sample (e.g., air filter or smear) into ^{232}Th activity in/on that sample:
>
> $$A_{Th}(Bq) = A_{\alpha}(Bq) \times 0.076$$
>
> where A_{Th} = the ^{232}Th activity in/on the sample and A_{α} = the measured gross alpha activity in/on the sample. For ^{238}U, the following methodology is used:

$$A_U(Bq) = A_\alpha(Bq) \times 0.061$$

where A_U = the ^{238}U activity in/on the sample. In the unlikely event of a systematic error in the procedure for determining A_α for a filter (i.e., efficiency, geometry, etc.), the A_{Th} or A_U for that filter will, depending upon the error type, be greater or less than the true ^{232}Th activity on the filter. However, the ratio of A_{Th} to A_α, or A_U to A_α, will not change since the uranium, thorium, and their daughters are intimately combined (e.g., on an atomic level) in the material and thus are immune from fractionation. Aside from heating, which only occurs during a single stage of ferrocolumbium processing (e.g., during a heat), SMC cannot envision a physical mechanism that would preferentially diminish detection of certain of the alpha-emitting daughters in the thorium series without doing the same for the remainder.[5]

The counting procedure SMC uses to obtain gross alpha activity on an air filter is consistent with industry standards. An alpha source that is traceable to the National Institute of Standards and Technology (NIST), with the same geometry (e.g., size and surface area) as the air filters to be counted, is used to determine the efficiency of a zinc sulfide detector. Corrections are made for background contribution to the gross counting results. Corrections for self-absorption of alphas during the counting process are not necessary since there is negligible dust loading and surface deposition on the filters. Based upon confidence in the counting procedure and confidence in the assessment of the thorium-to-gross alpha and uranium-to-gross alpha ratios, SMC is confident that the "scaling method" results in an acceptable means of estimating airborne thorium and uranium in the workplace."

Because of the high linear energy transfer of alpha particles, as long as the sample to detector distance is less than the alpha particle range, and if the alpha particle interacts with the zinc sulfide detector, a count will be registered, regardless of whether the alpha energy is four (4) MeV, five (5) MeV, or eight (8) MeV. Interaction losses as are observed with gamma rays in sodium iodide detectors do not occur.

To ensure the isotopic ratios are used appropriately in SMC's dose control program, the following will be added to section 5.4.3 of RSP-001:

5.4.3.7 For the purposes of assessing internal radiation doses from source material using gross alpha measurements of air sample filters, a ^{232}Th-

[5] During a heat, the gaseous daughters of thorium and uranium are emitted. However, this action serves to reduce the thorium- or uranium-to-gross alpha ratio when the emissions are collected. Consequently, use of the above thorium-to-gross alpha and uranium-to-gross alpha ratios for all measurement conditions results in a conservative assessment of dose.

to-gross alpha ratio of 0.076 and a ^{238}U-to-gross alpha ratio of 0.061 shall be used

Note: The basis for this value can be found in SMC's response to Confirmatory Action Letter No. 1-95-004, March 14, 1995.

Since the August 25, 1995 application, a number of programmatic changes have been identified in response to verbal and written communications between the USNRC and SMC, and to different operational conditions that have occurred since that date. Therefore, to avoid a lengthy list of provision references in our license when it is renewed, SMC wishes to transmit an updated renewal application that incorporates all commitments and changes, including those in this letter, and that supersedes all other submissions. The updated renewal application (along with a redline/strikeout version) will be delivered to you by October 3, 1997.

If you have any questions, please contact me at (609) 692-4200.

Sincerely,

David R. Smith
Radiation Safety Officer

cc: N. Morrison
M. Higgins
J. Valenti
C. Berger - IEM
H. Astwood - USNRC Licensing Section 2
P. Lanzisera - USNRC Region 1