DCS

AUG 18 1994

Docket No. 040-07102
License No. SMB-743

New Jersey Department of Environmental Protection and Energy
Division of Responsible Party Site Remediation
Bureau of Federal Case Management
ATTN: Ms. Donna Gaffigan
Case Manager
CN 028
Trenton, New Jersey 08625-0028

Dear Ms. Gaffigan:

Subject: Shieldalloy Metallurgical Corporation

We have been reviewing the fact that slag which may have contained radioactive material had been removed from the Shieldalloy Metallurgical Corporation (SMC) site and used for construction and road fill. We conducted an inspection of SMC on March 22 and April 21, 1994. The report of our inspection (Inspection Report No. 040-07102/94-01) is enclosed.

During this inspection, we concluded that the individual's concerns relate to ferro-vanadium (FeV) slag which is not licensed material and is not regulated by the NRC. We evaluated SMC's records and interviewed SMC staff to determine if any licensed material was crushed and shipped off-site with the FeV slag. We determined that some licensed material (ferro-columbium (FeCb) slag) may have been shipped off-site from 1985 to 1987 when SMC sold the FeV slag to a local contractor as construction fill. Although some licensed material may have been present in the FeV slag, we determined that the resulting concentration of uranium and thorium would have been not more than 0.031% by weight and, therefore, that the crushed slag did not meet the definition of source material and is not subject to NRC requirements. Furthermore, we evaluated the potential radiological impact from the slag in unrestricted areas and concluded that an individual was not likely to receive an effective dose in excess of 30 millirem in a year. The presence of FeCb slag contributes no more than 20% of the effective dose. SMC is continuing the practice of crushing FeV slag and shipping it offsite. However, the crushed material is no longer used for construction purposes and the present sorting procedures in effect since 1988 appear effective in preventing inclusion of FeCb slag.

Although the NRC concluded that FeV slag is not source material, it is our understanding that the New Jersey Department of Environmental Protection and Energy (NJDEPE) is likely to be interested in this matter. The inspection report is provided for your review and for such action as you deem appropriate.

If you have any questions regarding the inspection report, please contact Duncan White of my staff at (610) 337-5042.

Sincerely,

Original Signed By:
John D. Kinneman

John D. Kinneman, Chief
Site Decommissioning Section

Enclosure:
NRC Inspection Report No. 040-07102/94-01

cc w/encl:
R. Stern, NJDEPE

Shieldalloy Metallurgical Corporation
ATTN: C. Scott Eves
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West Boulevard, P.O. Box 768
Newfield, New Jersey 08344

bcc w/encl:
Region I Docket Room (w/concurrences)
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RI:DRSS	RI:DRSS	RI:DRSS	RI:SLO
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U.S. NUCLEAR REGULATORY COMMISSION
REGION I

Report No. 040-07102/94-001

Docket No. 040-07102

License No. SMB-743

Licensee: Shieldalloy Metallurgical Corporation
West Boulevard
Newfield, New Jersey 08344

Facility Name: Shieldalloy Metallurgical Corporation

Inspection at: West Boulevard
Newfield, New Jersey 08344

Inspection Conducted: March 22 and April 21, 1994

Inspector: Duncan White — 8/4/94
Duncan White, Health Physicist — date

Approved: John D. Kinneman — 8/4/94
John D. Kinneman, Chief — date
Site Decommissioning Section

Inspection Summary: Limited announced inspection conducted on March 22 and April 21, 1994 (Inspection No. 040-07102/94-001).

Areas Inspected: Training and instruction of contractors; disposal of ferro-vanadium slags; evaluation of ferro-columbium slag possibly released to unrestricted areas.

Results: One non-cited violation was identified regarding the failure to survey for licensed material during the sorting and crushing of ferro-vanadium slags from 1985 to 1987 (Section 3). This item was not cited because the licensee identified and corrected the violation.

DETAILS

1. Persons Contacted

* Scott Eves - Vice President of Environmental Services
* Mary Higgins - Vice President of Human Resources
Bill Grabus - Safety, Training and Personnel Manager
James Valenti - Environmental Manager and Acting Radiation Safety Officer
David Smith - Director of Environmental Services

* indicate those present during exit interview

2. Training and Instructions of Contractors

The inspector reviewed Shieldalloy Metallurgical Corporation's (SMC) program for training and instruction of contractors and their employees who work on the licensee's property. The licensee routinely has contractors at their facility to provide such services as security, welding and environmental monitoring.

The procedures used by the licensee during 1989-90 included a safety orientation where the potential radiological hazards from the use of source material were discussed. The inspector reviewed the hazard communication checklist used by the licensee as part of this safety orientation. The checklist included Department 111, which processes pyrochlore ore with licensed quantities of source material. In addition to safety training specific to each department, the licensee also required workers who frequented Department 111 to read and sign a form describing the radiological hazards.

Current procedures followed by the licensee require contractors and their employees to attend a safety orientation review and sign a statement that outlines general work procedures at the Newfield facility. Paragraph 6 of this statement informs the contractor employees that they must receive further instruction on the hazards that they may encounter and any special safety precautions that need to be taken prior to working for the first time in any department at the facility. With regard to areas where licensed material is used and stored (Department 111 and the storage yard), individuals who frequent such areas are required to attend general employee training which includes a description of the radioactive materials used on site, the potential hazards and rules for working with radioactive material are used and stored.

The inspector determined that contractor access to different departments is limited by the licensee. For example, security guards are stationed at an office near the front gate and are not allowed to enter the various production areas unless there is a medical emergency. Radiation technicians screening slag in the waste storage area do not have access to other departments of the facility.

The inspector reviewed selected training records of contractor employees from 1989 to 1993 and determined that the level of training provided was commensurate with the potential radiological hazards in the restricted area as required by 10 CFR 19.12.

No safety concerns were identified.

3. Disposal of Ferro-Vanadium Slag

The licensee has been processing raw ores for the production of metals and metal alloys at this site since 1955. Ferro-columbium (FeCb) ores, or pyrochlore, contain licensable quantities of source material. SMC currently obtains pyrochlore from two sources, the Niobec Mine in Quebec and from Gfe/Leusche in Germany. Niobec pyrochlore, which currently makes up more than 90% of the ore used by the licensee, contains approximately 0.85% to 0.90% thorium by weight and approximately 0.11% uranium by weight. The slag produced by processing this ore is approximately 0.55% thorium and uranium by weight and, therefore, is source material. Some ferro-vanadium (FeV) ores once processed at this facility also contained thorium and uranium, but in concentrations that do not meet the definition of source material (greater than 0.05% source material by weight). The FeV slag produced by processing these ores contains approximately 0.006% uranium by weight and approximately 0.02% thorium by weight and, therefore, is not source material. The slags produced by processing all ores have been trucked from the processing area to the waste storage yard located on the north end of the licensee's property waste and stored in separate piles.

The licensee is currently selling FeV slag to steel companies in Indiana as an additive in the steel manufacturing process. Prior to crushing and piling this slag for shipment, the licensee screens the slag using 5 centimeter by 5 centimeter NaI(Tl) detectors to ensure that only FeV slag is crushed and sold. It is necessary to screen the slag due to some commingling of FeCb and FeV slags from past storage practices at the site. The slag is removed from the existing FeV pile with a backhoe, screened to remove soil and laid out on the ground in a single layer for radiological and metallic screening. The gamma radiation levels from the FeCb slag are significantly higher than those from the FeV which permits rapid identification of any licensed material. Any FeCb slag identified is placed in the existing FeCb slag storage pile while the remaining FeV is crushed and sorted into 1,000 ton lots for shipment. Four samples are then taken from each lot for radionuclide and metal analyses. A licensee representative stated that less than 1% of the slag removed from the FeV slag pile and sorted in last few years was identified as FeCb.

The sorting process described above has been utilized by the licensee since 1991. The inspector reviewed the annual summary reports of the FeV disposition program for 1991 through 1993. The reports included the work plan, analyses of the slag, personnel monitoring results, bioassay results, contamination and release survey logs,

area air monitoring results and instrumentation calibration and daily check source logs. In December 1993, the inspector observed the radiological monitoring of the slag during the sorting process.

Prior to 1991, the licensee also sorted and crushed FeV slag for local off-site use. According to records reviewed by the inspector, SMC signed a four year contract with Patony Stone Company in September 1984 to sell them the FeV slag. Patony Stone in turn was permitted to install and operate crushing equipment on SMC property. The licensee was not able to provide any records at the time of the inspection to verify that radiological monitoring was performed as part of the FeV crushing process to ensure that no licensed material was crushed and disposed off-site during the term of the contract. The inspector could not determine if the licensee monitored the slag because SMC employees responsible for the operation were no longer employed by the company. The inspector reviewed correspondence dated November 1, 1988 that indicated that Patony Stone initiated slag crushing in early 1985 and by July 1987 had crushed and removed 45,112 tons of FeV slag from SMC. Based on a letter dated July 14, 1986 to SMC from their attorney, Patony Stone used the crushed slag for construction purposes such as road beds and fill. A licensee representative stated that some of the FeV slag was used around Vineland Fire Department Station on Oak Street during its construction in 1986, but that the material was subsequently removed and returned to the site because of public concern. No other specific off-site locations where the FeV slag was used during that period were identified.

After the original contract with Patony Stone expired, SMC entered into a contract with Eagle Stone and Recycling in March 1988 to continue the crushing and removal of FeV slag. The contract between the licensee and Eagle included a condition that required SMC to provide radiological monitoring equipment. The inspector reviewed correspondence between the licensee and their radiological contractor that discussed the design and purchase of new equipment for monitoring of the FeV slag during sorting and crushing activities. The equipment was purchased and put into use during 1989. During 1988 other monitoring equipment was used.

According to a licensee representative, radiological measurements from 1988 through 1990 were performed with the slag placed in buckets with capacities of approximately 5 cubic yards. The bucket was scanned with radiation monitors to determine the average and maximum reading. If the radiation reading was greater than 10 times local background, the bucket was rejected and sorted to separate the licensed material from the FeV. The inspector reviewed the licensee's data for the last two weeks of August 1989 and determined that 68 of 850 buckets exceeded the radiological screening level. It could not be determined from the licensee's records how much FeCb slag was in the buckets which exceeded the screening levels. The inspector concluded that most likely one or more pieces of FeCb slag would be present with the majority of the material being FeV slag. The inspector further concluded that

although 8% of the buckets exceeded the screening level, the amount of licensed material present in the FeV slag appears to be consistent with the current reject rate of 1%.

The inspector concluded that the licensee's radiological monitoring of the FeV slag from 1988 to present provided adequate assurance that any licensed material present was identified and segregated prior to crushing and removal of FeV slag. Although the screening protocol used by the licensee from 1988 to 1990 was not as sensitive as current procedures, the inspector concluded that the screening level used was consistent with the radiological characteristics of the FeCb and FeV slags and the rejection rate indicates adequate sensitivity for the presence of licensed material.

The licensee was unable to provide the inspector with records or procedures to demonstrate that the FeV slag released from the site from 1985 through 1988 was surveyed to identify the presence of FeCb. Failure to make surveys to evaluate the FeV slag for the presence of licensed material is a violation of 10 CFR 20.1501(a). This violation will not be subject to enforcement action because the licensee's efforts in identifying and correcting the violation meets the criteria specified in Section VII.B.2 of 10 CFR 2, Appendix C.

4. Evaluation of Ferro-columbian Slag Possibly Released to Unrestricted Areas

A. Quantity of Licensed Material Potentially Released

As described in the previous section, the licensee is unable to provide records or describe procedures to demonstrate that the FeV slag crushed and removed from their facility from 1985 to 1988 was screened to identify the presence of FeCb slags (licensed material). In order to estimate the concentration of uranium and thorium that may have been removed with the crushed FeV slag, the inspector assumed that 1% of the total slag crushed was FeCb. Based on the licensee's records, at least 45,112 tons of slag were removed from SMC from early 1985 to July 1987. As indicated above, the licensee maintained records that indicate the FeV slag pile was screened for slag beginning during 1988. Since additional slag was probably removed from the licensee's property between July 1987 and March 1988, a total of 50,000,000 kilograms (50,000 tons) of slag was assumed to be removed.

The total amount of uranium and thorium shipped off the licensee's property from 1985 to early 1988 if slag from the FeV pile contained 1% FeCb would be approximately 3,300 and 12,400 kilograms, respectively. The quantities of uranium and thorium in the crushed FeV slag as a result of the FeCb would be 300 and 2,400 kilograms, respectively and the total concentration of uranium and thorium in the crushed slags would be 0.031% by weight.

Since the concentration of uranium and thorium in the slag shipped off-site does not meet the definition of source material in 10 CFR 40.4, the inspector concluded that this material is not subject to NRC requirements.

B. Radiological Impact

The inspector assumed that the predominant exposure pathway for an individual to the crushed slag would be direct gamma radiation exposure. The effective dose from exposure to the slag in an unrestricted area was determined by calculating the exposure rate for crushed slag spread on the ground to a depth of 20 centimeters (Harold L. Beck 1972, *The Physics of Environmental Gamma Radiation Fields in the Natural Radiation Environment II,* pp. 101-133). The radiation levels at a distance of one meter from the crushed material which contained only FeV would be approximately 100 microroentgens per hour (μR/hr). If the crushed slag contained 1% FeCb slag, the exposure rate would be approximately 130 μR/hr. For comparison, natural background gamma radiation levels in the vicinity of the licensee's facility are 6 to 10 μR/hr. If an individual stood on the crushed material continuously for one year (24 hours a day for 365 days), the effective dose would be approximately 800 millirem (mrem) from slag containing only FeV and 1,050 mrem from slag containing 1% FeCb.

However, it is unlikely that an individual would stay in a location where the slag was used continuously for one year. Also, since the slag was used as road bed and fill, an individual would not be directly exposed to the slag, but the radiation field would probably be decreased by the presence of concrete, asphalt or soil. If an individual spent 2.5 hours per day for 365 days at a distance of one meter from the slag which contained 1% FeCb with a 3 inch layer of concrete between the person and the slag, the effective dose for one year would be about 30 mrem. This is still likely an over estimate of the dose to any one individual. Only about 6 mrem of this 30 mrem is due to the FeCb slag.

An individual member of the public is limited to an effective dose of 100 mrem in a year as specified by 10 CFR 20.1301(a)(1) (which was not in effect until January 1, 1994). The presence of licensed material in the crushed slag used in unrestricted areas as roadbeds and fill is not likely to result in an annual effective dose of 100 mrem. In fact, any dose resulting from this material is likely to be a small fraction of 100 mrem.

5. Exit Interview

The inspection findings were discussed at the conclusion of the inspection with those licensee representatives identified in Section 1 of this report.