U. S. NUCLEAR REGULATORY COMMISSION
REGION I

Report Nos. 040-00672/90-001
040-08866/90-001
030-19394/90-001

Docket Nos. 040-00672
040-08866
030-19394

License Nos. SMB-179 Priority 1 Category B
SUB-1452 3 E
20-02217-05 7 K

Licensee: Nuclear Metals, Inc
2229 Main Street
Concord, Massachusetts 01742

Facility Name: Nuclear Metals, Inc.

Inspection At: Concord, Massachusetts

Inspection Conducted: September 12-13, 1990

Inspector: Francis M. Costello 11/13/90
Francis M. Costello, Senior Health Physicist date

Approved by: John D. Kinneman 11/15/90
John D. Kinneman, Chief date
Nuclear Materials Safety Section B

Inspection Summary: Routine, unannounced inspection of the radiation safety prog on September 12-13, 1990 (Report Nos. 040-00672/90-001, 040-08866/90-001, and 0 -19394/90-001

Areas Inspected: Organization and staffing, scope of licensed activities, tour of facilities, licensee internal audits, training, exposure control-external and internal, radioactive effluents, review and observation of waste handling procedures, and posting of notices.

Results: One violation was identified. Failure to ship radioactive materials in accordance with the requirements of the U.S. Department of Transportation.

DETAILS

1. Persons Contacted

*W. Tuffin, President
*A. Gilman, Vice President, Health and Safety
*F. Vumbaco, Manager, Health and Radiation Safety Officer
A. Carpenito, Supervisor, Data Management
*R. Kruszkowski, Training Officer
*D. Barbour, Manager, Waste Processing and Packaging

The inspectors also interviewed other licensee employees during the inspection.

*Denotes those present at exit interview.

2. Scope of Licensed Activities

Depleted uranium derbies are received from the licensee's facility in South Carolina and are processed into kinetic energy penetrators to fill purchase orders which relate to Defense Department contracts. The process requires melting and pouring of the uranium derbies in the foundry, and the extrusion, turning, cutting, drilling, and grinding of depleted uranium shapes. The licensee also manufactures aircraft counter-weights and shielding for radiography exposure devices and teletherapy units from depleted uranium. The licensee possesses a large amount of uranium in a lagoon which was used until 1985 for the discharge of neutralized uranium and copper waste. The licensee plans to begin the removal of this uranium in 1991 for disposal as radioactive waste or for recycling. The licensee plans to complete the excavation of the lagoon by December 1992.

No violations were identified.

3. Organization and Staffing

Waste processing, industrial hygiene and health physics activities fall under the control of the Manager, Health and Radiation Safety. This manager reports to the Vice President, Health and Safety who is responsible to the President. Under the Manager of Health and Radiation Safety is the Manager of Waste Processing and Packaging, who has a Supervisor who directs four Group Leadmen, who in turn directly supervise a total of seventeen technicians. One technician vacancy is open. Also under the Manager of Health and Radiation Safety is the Supervisor of Health Physics (currently vacant) who supervises a Health Physicist and a Leadman who directly supervises the activities of five technicians. These technicians do routine audits and compliance-related activities. Closely related to this last group, the Supervisor, Data Management has four technicians and one Leadman to perform personnel monitoring and laboratory analysis activities.

No violations were identified.

4. Licensee Action on Licensee Event Report

In a letter dated June 16, 1989, the licensee informed NRC Region I that a shipment of radioactive waste shipped by the licensee to the Chem-Nuclear Systems, Inc. burial facility in Barnwell, South Carolina had been found in violation of state and federal regulations by the South Carolina Department of Health and Environmental Control. Specifically, on May 30, 1990, a shipment of compacted depleted uranium turnings received at the Barnwell site experienced a thermal reaction in three of the boxes in the shipment, resulting in swelling and discoloration of the boxes and smoke being released. On June 5, 1989, the State of South Carolina assessed a $5,000 civil penalty and prohibited the licensee from shipping additional waste until corrective actions were taken. The basis for the State of South Carolina enforcement action was that the shipment "contained improperly processed pyrophoric material which resulted in a thermal reaction causing potential for a serious radiological hazard and fire within the transport vehicle."

The inspector reviewed the incident and the licensee's subsequent corrective actions. The licensee concluded that the problem was caused by insufficient drying of uranium turnings prior to packaging. Retaining moisture reacted with the uranium turnings and caused the heat and smoke. The licensee has changed its waste handling procedures for these turnings so that they are now shipped encased in concrete. The inspector verified that the new procedures and corrective actions have been implemented. No problems have occurred subsequent to the changes and the State of South Carolina now permits the licensee to ship its waste to the Barnwell site.

10 CFR 71.5(a) requires that licensees who transport licensed material outside the confines of their plants or deliver licensed material to a carrier for transport comply with the applicable requirements of the regulations appropriate to the mode of transport of the Department of Transportation (DOT) in 49 CFR Part 170-189.

49 CFR 173.418 requires that the contents of packages of pyrophoric radioactive materials be free of water and any contaminants which would increase the reactivity of the material.

The finding that the licensee made a shipment of pyrophoric radioactive material (depleted uranium turnings) which contained sufficient water to cause a reaction resulting in heat and smoke is an apparent violation of 10 CFR 71.5(a).

5. Tour of Facility

The inspector toured the facility and observed work in progress during various stages of production, waste processing and packaging on September 12, 1990. He observed that workers wore required dosimetry, that contamination control procedures were being followed, and that other required radiation safety requirements were met.

No violations were identified.

6. Licensee Internal Audits

The health physics staff stated that they conduct monthly surveys of the entire facility, which consist of measurements of radiation and contamination levels, interviews with personnel, and inspection of records. Records of these surveys, and actions taken as a result of survey findings, were reviewed.

No violations were identified.

7. Training

The inspector reviewed the licensee training program and discussed the program with the Training Officer. The licensee stated that all employees are given a minimum radiation safety indoctrination as required by 10 CFR 19.12 at the start of employment. At that time the employee fills out a form with the information required by Form NRC-4, and a certification that the employee has received the indoctrination. These certifications were reviewed. Employees working in specialized areas where hazards are greater are given additional training stressing safety and are under close supervision during initial employment. The majority of training is provided with videotapes followed by a question-and-answer period and finally a written test. The inspector viewed an indoctrination videotape and noted that it covered appropriate topics for the training of new employees.

No violations were identified.

8. Exposure Control-External

The licensee maintains personnel dosimetry records equivalent to NRC Form 5. The inspector reviewed these records for the period through July, 1990. All whole body, skin, and extremity doses reviewed were within limits specified in 10 CFR 20.101.

The inspector reviewed the licensee's ongoing evaluation of an individual's skin dose during the third quarter of 1989. The individual's film badge recorded 7.01 rem to his skin for the quarter. This individual's job is to mark serial numbers on depleted uranium rods which requires that he sit among stacks of these rods for most of the working day. The licensee has instituted the use of local plastic shields to reduce the beta radiation dose rate in the individual's work location since identifying the high skin dose. The licensee is evaluating the response of the film badge to the beta energy spectrum at the work location to determine whether a correction factor needs to be applied and to determine whether this worker's dose during the third quarter of 1989 exceeded the regulatory limit of 7.5 rem.

This item is unresolved pending the completion of licensee's evaluation. The licensee stated an intention to determine whether it exceeded the 10 CFR 20.101 regulatory limit during a calendar quarter as part of this evaluation. The licensee stated that the evaluation will be completed and the results submitted to NRC Region I by November 15, 1990.

9. Exposure Control-Internal

The licensee's restricted area air monitoring program involves general area sampling and breathing zone sampling. For routine work, personnel air monitors (PAM'S) are rotated through the workers in each area, and the MPC-hrs derived from the PAM'S are assigned to the individuals in that area. During non-routine work, all workers directly involved with a task are issued individual PAM'S and full face or half face respirators. No protection factors are taken for the respirators. The licensee maintains a bioassay program which consists of urinanalysis at a weekly or monthly frequence, dependent upon work area. The urinanalysis is performed by a subsidiary of the licensee, Carolina Metals in Barnwell, South Carolina. Grinding operations require weekly sampling. Action levels for urinalysis results are 50 micrograms of uranium per liter and 100 micrograms of uranium per liter, corresponding to investigative and restrictive actions, respectively. The inspectors reviewed urinalysis records for the period since the previous inspection and noted that several had exceeded the action levels. These results prompted the health physics staff to investigate the cause and remove individuals from work areas until subsequent bioassays indicated that uranium levels in the urine approached normal.

The inspector reviewed the licensee's ongoing evaluation of the uptake of a foundry worker who had elevated concentrations of uranium measured in his urine during the last quarter of 1989 and the first two quarters of 1990. The measurements during these three quarters were as follows:

Concentration of Uranium in Urine (micrograms/liter)

Date	µ/l	Date	µ/l	Date	µ/l
10/02/89	5	1/03/90	2,012*	4/04/90	1
10/13/89	65	1/18/90	5	5/14/90	1
10/18/89	16	1/22/90	1	6/04/90	1,324
10/23/89	2	1/23/90	1	6/06/90	96
11/21/89	2	2/20/90	5	6/07/90	47
12/04/89	4	3/16/90	1	6/07/90**	17
12/14/89	178	3/29/90	8	6/12/90	10
12/14/89**	17	3/29/90	3	6/12/90**	80
12/22/89	1			6/13/90	304
				6/14/90	28

*net ash determination of concentration = 1704 micrograms per liter
**repeat sample on same date

The individual wore a breathing-zone air sampler on several days in each quarter. The measured concentrations are assessed to the concentrations to which the individual was exposed on days when the breathing-zone sampler was not worn. Using this method of evaluating airborne concentrations, the licensee determined that the foundry worker with the elevated urinanalysis results was exposed to 132 MPC-hours during the fourth quarter of 1989, 32 MPC-hours during the first quarter of 1990, and 68 MPC-hours during the second quarter of 1990. The licensee has placed him on work restriction in June, 1990 while the elevated urine concentrations are being evaluated.

The licensee is performing an evaluation to determine whether this foundry worker had an intake of uranium which exceeded the limits of 10 CFR 20.103 and plans to complete its evaluation by November 15 and to submit the results to NRC Region at that time.

10. Radioactive Effluents

The inspector discussed the current environmental monitoring program with licensee representatives and reviewed records of air sampling results and the sample results from surrounding wells and ponds.

He reviewed the results of an analysis of the site performed for the Commonwealth of Massachusetts by a consultant and an evaluation of the analysis by the licensee's consultant. The inspector noted that the Commonwealth's consultant stated in its report that "the on-site water supply well has shown levels of over 100 pCi/l," of uranium and that "this can lead to excessive exposure to uranium to employees who may drink water drawn from on-site supply wells." The licensee and its consultant stated that their records indicated that there were no on-site supply wells with a concentration this high and, further, that drinking water comes from the Town of Concord rather than from on-site wells.

The inspector reviewed the results of the licensee's environmental samples and noted that all results indicated concentrations which are well within regulatory limits for unrestricted areas.

No violations were identified.

11. Waste Handling Procedures

The licensee processes its liquid wastes with an evaporation system which was placed into operation in the late fall of 1985. All airborne effluents from this system are monitored by the licensee. Solid radioactive waste is compacted and uranium scraps are solidified in concrete. Radioactive waste is shipped to burial sites as "exclusive use" shipments.

No violations were identified.

12. Posting of Notices

Required notices, such as form NRC-3 and the results of the previous NRC inspection were posted.

No violations were identified.

13. Exit Interview

The inspectors met with licensee representatives (denoted in paragraph 1) at the conclusion of the inspection on September 13, 1990. The inspectors summarized the purpose and scope of the inspection and findings.