40-7102

SHIELDALLOY METALLURGICAL CORPORATION

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May 15, 1995

Mr. Thomas T. Martin, Regional Administrator
United States Nuclear Regulatory Commission
475 Allendale Road
King of Prussia, Pennsylvania 19406

Re: Confirmatory Action Letter No. 1-95-004

Dear Mr. Martin:

As set forth in the Confirmatory Action Letter No. 1-95-004 (CAL-1-95-004), the purpose of this letter is to transmit a status report on Shieldalloy Metallurgical Corporation's (SMC) actions in response to CAL-1-95-004. Attached is a summary of agreed-upon items and the action taken to date. Changes since the March 14, 1995 status report are indicated by margin bars.

All of the actions addressed in CAL-1-95-004 are now complete. Please contact me or Mr. Eves at (609) 692-4200 if you have any questions or if we can provide you with additional information.

Sincerely,

H. Nils Schooley
President

C. Scott Eves, RSO
Vice President, Environmental Services

cc: Ken Pugh

SHIELDALLOY METALLURGICAL CORPORATION
STATUS REPORT FOR
CONFIRMATORY ACTION LETTER NO. 1-95-0048

May 12, 1995

Item 1: Perform an evaluation of workers' intakes of thorium and uranium and determine the occupational doses for all potentially exposed workers, as required by 10 CFR 20.1501. These dose assessments will be based on accurate and validated thorium to alpha ratios, exposure times and air sampling data.

Action (Determination of Isotope-to-Gross Alpha Ratios): As part of the inventory control program, the concentration of all radioactive materials in pyrochlore (the feed material for ferrocolumbium production) is measured on a quarterly basis.[1] Also, as part of the CANAL processing operation, the concentration of the parent and daughter radionuclides in ferrocolumbium slag was measured.[2] All of the measurement results confirm that the parents and the daughters in the pyrochlore and in the slag are in equilibrium. Therefore, the yield-corrected alpha activities of each daughter present in the sample during analysis can be used to determine the thorium-to-gross alpha ratio in the materials. This analysis reveals a mean ratio of 0.076 $\pm$ 0.011. Likewise, the mean uranium-to-gross alpha ratio is 0.061 $\pm$ 0.007. Attachment 1 of the March 14, 1995 status report showed the data from which this ratio was determined.

Action (Evaluation of Worker Stay Time for 1994): An evaluation of each ferrocolumbium production worker's "stay time" was performed.[3] This evaluation, which included a review of time card information and production logs, revealed that the mean stay time for ferrocolumbium production personnel is 939 $\pm$ 917 hours per year. The maximum value was 2478 hours, and the minimum value was 12 hours. A review of the production logs revealed that ferrocolumbium was produced for 236 shifts in 1994. Cleanup and furnace repairs involving source material were performed for an additional 33 shifts. However, some of those activities, which are

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1 See TMA/E Report of Analysis dated 9/19/94, Teledyne Report of Analysis dated 6/14/94, Teledyne Report of Analysis dated 6/30/94, and TMA/E Report of Analysis dated 10/17/94.

2 See letter from C. D. Berger, Integrated Environmental Management, Inc., to C. Scott Eves, Shieldalloy Metallurgical Corporation, "Slag Sampling Program Summary", October 3, 1994.

3 See memo from David R. Smith, Shieldalloy Metallurgical Corporation, to Carol D. Berger, Integrated Environmental Management, "D.111 Employee Work Hours for CY 94", February 28, 1995, and memo from David R. Smith, Shieldalloy Metallurgical Corporation, to Carol D. Berger, Integrated Environmental Management, Inc., "D.111 Job Assignment and Duration for (employee name) and (employee name)", March 9, 1995.

normally performed during the night shift, occurred during the day shift for a brief period in 1994.

Action (Dose Assessment for 1994): Based upon area air monitoring, individual breathing zone sampling, individual time card data, and personnel dosimetry results, the Committed Dose Equivalent (CDE) to the Bone Surfaces and the Total Effective Dose Equivalent (TEDE) for the entire year was determined for all monitored personnel. Attachment 2 of the March 14, 1995 status report contained a listing of results.[4] In this attachment, the "Quarterly Work Hrs in D.111" were determined by dividing the annual work hours from time card data by four (4). The "Clock No." shown on the attachment is SMC's designation for Employee Number. The "Mean BZA" results shown on the attachment were determined by:

$$Mean\ BZA = \frac{\sum_i M_i}{n}$$

where M = gross alpha activity on filter "I" for the individual, and n = the total number of measurements performed over the quarter for that individual.[5] Finally, the DAC-hours shown on the attachment were determined by:

$$DAC\text{-}hrs = \sum_i \left[\frac{Mean\ BZA \times R_i}{DAC_i} \times T \right]$$

where "Mean BZA" is as described above, R = the isotopic ratio for isotope "I" (e.g., ^{232}Th or ^{238}U), and DAC = the Derived Air Concentration for isotope "I", taken from 10 CFR 20, Appendix B. For those employees spending time in D.111 during a particular quarter, who were not monitored during that quarter, the "Mean BZA" value for the quarter in question was taken to be the average "Mean BZA" value for 1994 (i.e., 1.66×10^{-12} μCi gross α per ml).

Current Status: Closed.

Item 2: Perform an evaluation of doses for potentially exposed members of the public that may receive the highest whole body exposure in the unrestricted area surrounding your facility, as required by 10 CFR 20.1501.

Action (Evaluation of Emissions from D.111): A consultant has been retained to evaluate the means by which emissions from the two baghouses in D.111 can be

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[4] The values listed in Attachment 2 of the March 14, 1995 status report are still considered to be over-estimates of the true doses incurred by these individuals for the reasons listed in therein.

[5] With only two exceptions, the monitored employees had only one or two measurement points per quarter. The two exceptions, Clock No. 1717 and 1257, had 10 and seven (7) measurement points, respectively, for Quarter 1.

effectively measured.[6] The consultant's on-site assessment took place on Thursday, March 9, 1995. The consultant's draft report was received on March 28, 1995, and reviewed by SMC. A request for additional information was forwarded to the consultant on April 19, 1995, and a second draft of the report was delivered on May 3, 1995. This document is currently under review. The final report from the air consultant regarding specific measurement locations for the two baghouses is anticipated by May 16, 1994. The Radiation Safety Committee will meet after receipt of the consultant's report to evaluate the findings and implement applicable recommendations.

Action (Off-site Population Dose Estimation for 1994): In 1993, Shieldalloy evaluated the airborne emissions from the Newfield plant in a report entitled "Radiation Dose Estimates for Members of the General Public at the Newfield New Jersey Facility".[7] In that report, emissions from the D.111 baghouses and radon emanation rates from the materials in the Storage Yard were estimated. From this information, the maximum individual off-site dose was calculated using the CAP88-PC computer code. Conservative assumptions were made as input to the code when site-specific information was not available. This analysis demonstrated that the maximum annual radiation dose from particulate emissions (0.22 millirem CEDE) occurred 300 meters East Southeast of the D.111 stack. Likewise, the maximum annual radiation dose from radon (0.009 millirem CEDE) occurred 50 meters East Southeast of the Storage Yard.[8]

As part of its radiation protection program, Shieldalloy deploys environmental dosimeters (TLDs) at various locations on the perimeter fence of the Newfield facility. These are used to estimate the external component of the off-site population dose. In 1994, each TLD remained in place for approximately one quarter, at which time they were retrieved, processed, and the doses were recorded. New dosimeter assemblies were deployed at the time of collection of those that were previously deployed.

The 1994 TLD data demonstrate that the maximum measured perimeter exposure rate occurred due north of the Storage Yard, at a distance of about 30 feet from the slag piles (Station 6).[9] However, ambient exposure rates measured during an

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6 APEX Environmental, Inc., Oak Ridge, Tennessee provided the consultant.

7 IT Corporation, "Radiation Dose Estimates for Members of the General Public at the Newfield, New Jersey Facility", IT Corporation Report No. IT/NS-93-107, February 16, 1993.

8 Ferrocolumbium production procedures in 1994 did not differ from those of 1993. Therefore, the findings of this 1993 analysis are assumed to be representative, and were used to determine 1994 population doses pursuant to 10 CFR 20.1301.

9 A closed municipal landfill abuts the north boundary of the Shieldalloy property at this location.

environmental assessment indicated that this exposure rate drops by a factor of five at a distance of about 30 feet from the boundary fence.[10] The other area where the TLD data show elevated exposure rates is directly south of the slag piles on the fence line (Stations 10, 11, and 12). To the south of the slag piles, the closest residence is over 85 feet south of the property line. This, in turn, is approximately 250 feet south of the location of the TLDs. The ambient gamma exposure rate at this location is not discernible from background.

There are only three potential exposure scenarios for members of the general public. They involve (1) constant and continuous presence at the south fenceline; (2) periodic presence (e.g., less than one hour per week) at any randomly-selected location around the perimeter fence; or (3) periodic presence (e.g., less than one hour per month) only at Station 6, which is the location of maximum measured exposure.[11] Since the perimeter fence line is patrolled regularly by a security guard, these scenarios are unlikely. Nonetheless, the maximum possible annual exposure of a member of the general public for each of these scenarios, including the maximum dose contribution from particulate and radon emissions, is 0.23, 2.15 and 3.43 millirem, respectively. These values, which over-estimate the true dose that may be incurred by any single individual, are well-below the 100 millirem per year limit specified in 10 CFR 20.

Current Status: Closed.

Item 3: Immediately following the completion of the above dose assessments, implement interim ALARA measures to minimize workers' thorium and uranium intakes. A comprehensive ALARA program showing your long term plans with documented procedures, equipment, engineering controls, and personnel training will be submitted.

Action Taken: A standard operating procedure entitled "ALARA Program" was drafted and has been reviewed by the Radiation Safety Committee. This procedure, which describes the Shieldalloy ALARA program, is enclosed as Attachment 1.

Action Taken: Ferrocolumbium and CANAL production operations are presumed to generate primarily large (e.g., greater than one micrometer AMAD) particles. To improve interpretation of air sampling results in the vicinity of these operations, the particle size distribution was measured using a Graseby/Andersen Model Mark III

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10 IT Corporation, "Assessment of Environmental Radiological Conditions at the Newfield Facility", IT Corporation Report No. IT/NS-92-106, April 1, 1992.

11 A stay-time of one hour per month at this location is conservative in that there is no physical evidence that individuals frequent this area. Furthermore, monitored Shieldalloy employees who frequent the area for durations greatly in excess of one hour per month, incurred exposures that were only slightly above the detection limits of the dosimetry system.

Particle Fractionating Sampler. Three samples were collected during the trial CANAL crushing operation. The results of these analyses, shown in Attachment 3 of the March 14, 1995 status report, indicated mean particle sizes of 8.65, 7.90 and 8.04 micrometers AMAD.

Action Taken: Cascade impactor samples were collected during ferrocolumbium production (second floor of D.111) beginning on February 16, 1995. Sample collection in the vicinity of the pyrochlore mixing process (first floor of D.111) began on March 5, 1995. These filters were forwarded to the laboratory for analysis and the results, shown in Attachment 2, indicate mean particle sizes of 2.03 micrometers AMAD in the vicinity of the pyrochlore mixing process, and 1.79 micrometers AMAD on the second floor of D.111.

Action Taken: From the particle size analysis of ferrocolumbium production operations, and using the methodologies promulgated by the International Commission on Radiological Protection (ICRP 30), the Derived Air Concentrations used to assess personnel exposures for Item 1, above, may be adjusted to account for site-specific particle size information. Attachment 3 shows the results of this re-evaluation.

From ICRP Publication 30, the following equation expresses the adjustment to the committed dose equivalent in terms of the changed deposition in the different lung compartments as a results of particle size changes:

$$\frac{H_{50}(2\ \mu m)}{H_{50}(1\ \mu m)} = f_{N\text{-}P}\frac{D_{N\text{-}P}(2\ \mu m)}{D_{N\text{-}P}(1\ \mu m)} + f_{T\text{-}B}\frac{D_{T\text{-}B}(2\ \mu m)}{D_{T\text{-}B}(1\ \mu m)} + f_P\frac{D_P(2\ \mu m)}{D_P(1\ \mu m)}$$

where $f_{N\text{-}P}$, $f_{T\text{-}B}$, and f_P are fractions of the committed dose equivalents in the reference tissues resulting from deposition in the nasal passages (N-P), trachea and bronchial tree (T-B) and pulmonary parenchyma (P) regions, and $D_{N\text{-}P}$, $D_{T\text{-}B}$, and D_P are the fractions of inhaled material initially deposited in the three compartments of the lung. These fractions can be found in ICRP Publication 30 and in computer codes like DFINT.[12]

From the adjusted committed dose equivalent per unit intake, an adjusted Annual Limit on Intake (ALI) is determined by:

$$ALI\ (2\ \mu m) = \frac{0.5\ Sv}{H_{50,T}\frac{Sv}{Bq}}$$

From the ALI, the adjusted DAC is determined by:

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12 Eckerman, K. F., DFINT, Version 4.0, June 19, 1993, Oak Ridge, Tennessee.

$$DAC\ (2\ \mu m) = \frac{ALI}{2.4 \times 10^3}\ Bq/m^3$$

Action Taken: The first quarter, 1995 surveillance results, including the results of breathing zone sampling and external exposure rate measurements, were reviewed by the Radiation Safety Committee on May 10, 1995. As an initial ALARA measure, it was determined that CANAL crushing/packaging operations would henceforth be performed inside of D.111 in order to take advantage of its dust handling system. These operations began on April 12, 1995.[13]

Action Taken: A written statement indicating senior management commitment to the ALARA concept was finalized, signed, and posted in appropriate locations within the plant on May 15, 1995 (See Attachment 4). Personnel training in the provisions of the ALARA program was completed on February 20, 1995.

Current Status: Closed.

[13] In light of changes in the ferrocolumbium production schedule, and a pending increase in CANAL sales, the SMC Radiation Protection Program Plan is scheduled for review and modification to ensure applicability to anticipated operational demands. Once finalized, the Radiation Safety Committee and the RSO will issue approved standard operating procedures for radiation protection.

ATTACHMENT 1
DESCRIPTION OF THE ALARA PROGRAM

STANDARD OPERATING PROCEDURES

ALARA PROGRAM

Minor change
Number:
By:
Date: / / /
Approved by RSC 5/12/95

SOP NO:
Rev No: 001
Date: 4-12-95
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1 PURPOSE

1.1 This procedure describes the Shieldalloy ALARA (as low as reasonably achievable) program regarding exposure to ionizing radiation and radioactive material. This procedure is applicable to all Shieldalloy operations, activities, and personnel at the Newfield Site.

1.2 Responsibilities:

1.2.1 The Director Shall:

1.2.1.1 Ensure that plant personnel are aware and supportive of management's commitment to keep occupational radiation exposures ALARA.

1.2.1.2 Review program audit findings in order to determine how exposures might be reduced.

1.2.1.3 Ensure that workers are trained in radiation protection practices.

1.2.1.4 Ensure that revisions to operating and maintenance procedures, and modifications to plant equipment and facilities are made if they will substantially reduce exposure at a reasonable cost.

1.2.1.5 Ensure that the authority for providing procedures designed to meet ALARA goals is properly delegated.

1.2.1.6 Ensure that the resources needed to achieve ALARA goal are made available to the RSO and RSC.

1.2.2 The Radiation Safety Officer (RSO) Shall:

1.2.2.1 Perform radiological surveys in order to provide comprehensive and current information on the radiological status of Shieldalloy facilities and equipment.

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1.2.2.2 Ensure that posting and labeling is appropriate and commensurate with the hazards.

1.2.2.3 Provide appropriate radiation protection information when required.

1.2.2.4 Ensure that radiation monitoring and surveillance instruments are functional, calibrated, and available in adequate quantities to perform both routine and emergency tasks.

1.2.2.5 Provide the listing of ALARA goals to the Radiation Safety Committee for consideration.

1.2.3 The Radiation Safety Committee (RSC) shall review, recommend, and approve ALARA goals at a frequency of not less than once per calendar year.

1.2.4 Shieldalloy personnel shall:

1.2.4.1 Plan work in controlled and restricted areas in order to minimize exposures.

1.2.4.2 Follow the basic radiation protection principles of "time", "distance" and "shielding" whenever possible.

1.2.4.3 Comply with the instructions given by the RSO.

1.2.4.4 Obtain special briefings when advised by the RSO.

1.2.4.5 Comply with the listing of individual worker responsibility for ALARA as contained in Attachment 1.

2. SCOPE

2.1 This procedure applies to all Shieldalloy employees, visitors, and contractors at the Newfield Site.

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3. REFERENCES

3.1. Title 10, Code of Federal Regulations, Part 20, "Standards for Protection against Radiation"

3.2 U.S. Nuclear Regulatory Commission Licensc No:SMB-743

3.3 USNRC Regulatory Guide 8.8, "Information Relevant to Ensuring that Occupational Radiation Exposure's at Nuclear Power Stations will be as Low as Reasonably Achievable," June 1978.

4. DEFINITIONS

4.1. ALARA -Acronym for "As Low As Reasonably Achievable", a basic concept of radiation protection that specifies that radiation exposures should be maintained as low as is reasonably achievable taking into account technological, economical, and societal considerations.

4.2 Approval- An act of endorsing or adding positive authorization or both.

4.3 Authorized User - Employee who supervises the use of radioactive material; and who supervise individual's who work with radioactive materials. Authorized users are qualified, by training and experience, to ensure radioactive materials are used for their intended purpose and in a manner that protects health and minimizes danger to life or property.

4.4 Contamination Area - Any area accessible to personnel where there exists fixed and/or removable source material contamination in excess of the limits established for unrestricted access.

4.5 Controlled Area - Any area to which access is controlled in order to protect individual's from exposure to radiation and radioactive materials. (The controlled area at Shieldalloy consists of the entire area within the fence line.)

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4.6 Director - Designated senior manager of Shieldalloy Metallurgical Corporation with the authority to commit Shieldalloy resources for radiation protection purposes.

4.7 May - The word *may* is used to denote permission.

4.8 Pocket Ionization Chambers (PIC) - A self indicating, dose integrating device which is considered to be a "secondary" dosimetry device.

4.9 Radiation Safety Officer (RSO) - An individual who, by virtue of qualifications and experience, has been given the authority to implement the Shieldalloy Radiation Protection Program Plan. The RSO is qualified to use source material for its intended purpose in a manner that protects health and minimizes danger to life and property. The RSO is responsible for recognizing potential radiological hazards, developing a radiation safety program to protect against these hazards, training workers in safe work practices, and supervising day-to-day radiation safety operations.

4.10 Restricted Area - An area within the controlled area to which access is limited for the purpose of protecting individuals against undue risks from exposure to radiation and radioactive materials.

4.11 Shall - The word *shall* is to be understood as a requirement.

4.12 Should - The word *should* is to be understood as a recommendation.

4.13 Thermoluminescent Dosimeter (TLD) - The thermoluminescense phosphor(s) used for determining external radiation exposure to beta, gamma, x-rays, and neutrons. The word TLD and dosimeter are used interchangeably throughout this procedure.

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5. PROCEDURES

5.1 ALARA Objectives

5.1.1 To establish a program for maintaining occupational radiation doses ALARA;

5.1.2 To design facilities and select equipment using ALARA concepts;

5.1.3 To establish radiation controls in the program, plans and procedures, and;

5.1.4 To make available supporting equipment, instrumentation, and facilities.

5.2. Program for Maintaining Personnel Radiation Doses ALARA

5.2.1 A formal management policy and commitment to ALARA shall be established.

5.2.2 Responsibility and authority for the programs shall be clearly delegated by the Director.

5.2.3 A training program in the fundamentals of radiation protection and ALARA procedures shall be established. (Shieldalloy has established an effective program which addresses these topics.)

5.3 Designing Facilities and Selecting Equipment using ALARA Concepts

5.3.1 Whenever applicable, the design of facilities and selection of equipment shall be based upon ALARA concepts.

5.3.2 These reviews shall be conducted by the RSC.

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5.3.3 Reviews shall be based upon the work using the guidance of Regulatory Guide 8.8, Section 2.

5.4 Establishing Radiation Controls

5.4.1 Radiation controls shall be established for work operations to ensure radiation exposures are ALARA, and should be included in:

5.4.1.1 Work planning and preparation,

5.4.1.2 Actual work operations, and

5.4.1.3 Post operation reviews.

5.4.2 The specific requirements for implementing radiation controls shall be described in job procedures and/or work plans.

5.5 Supporting Equipment, Instrumentation, and Facilities

5.5.1 Appropriate support equipment, instrumentation , and facilities shall be provided for all Shieldalloy work involving ionizing radiation.

5.5.2 Support may include:

A. A radiation counting area

B. Radiation Survey instrumentation (portable and nonportable)

C. Personnel monitoring devices

D. Protective clothing

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E. Decontamination areas for personnel and equipment

F. Dedicated change rooms

G. Communication equipment

H. Office Space and equipment

5.6 ALARA Goals

5.6.1. The RSC shall establish radiological goals to direct all levels of management and workers at Shieldalloy toward improvement in radiological performance.

5.6.2 ALARA goals shall be established, reviewed, and documented at a frequency of no less than once per calendar year.

5.6.3. Typical quantitative goals may include reducing, as applicable:

5.6.3.1 Maximum dose to on-site and off-site individuals.

5.6.3.2 Number of individuals with confirmed intakes of radioactive material.

5.6.3.3 Number of individuals that become externally contaminated.

5.6.3.4 Number of contamination incidents.

5.6.3.5 Square footage of contaminated areas.

5.6.3.6 Number of radiological incident reports.

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5.6.4 The following steps for establishing ALARA goal shall be included in the goal-setting process:

5.6.4.1 The RSC, with input from the RSO, and outside expertise as required shall review existing data to determine where establishing specific goals is appropriate.

5.6.4.2 The RSC shall evaluate the existing condition(s), root cause(s), and corrective action(s).

5.6.4.3 The RSC shall determine the improvement needed and propose the goal.

5.6.4.4 The RSC shall assign and implement action plans.

5.6.4.5 The RSC shall periodically review performance in archieving the goal and modify the action plan, if necessary.

5.6.4.6 The RSO shall document radiological goals, their status, and performance, and shall present them to the RSC at planned and periodic meetings.

6. DOCUMENTATION

6.1 All records pertinent to this procedure shall be maintained by the RSO.

6.2 The minutes of the RSC meetings shall reflect RSC action in establishing and monitoring ALARA goals.

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7. ATTACHMENTS

7.1 Attachment 1: Individual Worker's Responsibilities for ALARA

ATTACHMENT 1

INDIVIDUAL WORKER'S RESPONSIBILITIES FOR ALARA

1. Obey promptly "stop work" and "evacuate" instructions of RSO.

2. Follow all procedures and instructions.

3. Wear TLD's and pocket ionization chambers (PIC) as required by procedures and instructions, signs, or the RSO.

4. Maintain an awareness of your own radiation dose status through requesting records from the RSO, and avoid exceeding dose control levels and limits.

5. Remain in as low a radiation area as practical to accomplish work.

6. Leave radiation areas or airborne radioactivity areas when not working, and use "wait areas" when designated.

7. **DO NOT** smoke, eat, drink, or chew in radiologically restricted areas, or bring smoking, eating, drinking, or chewing materials into such area.

8. Wear approved protective clothing (Tyvek) and respirators properly whenever required.

9. Remove protective clothing and respirators properly to minimize contamination.

10. Under unusual circumstances be frisked for contamination as directed when leaving contamination zones and radiologically controlled areas.

11. Minimize the spread of a known or possible radioactive spill and notify radiation protection personnel promptly.

12. Avoid unnecessary contact with contaminated surfaces, including your protective clothing, tools and other equipment.

13. Control the amount of tools, equipment and personal belongings brought into radiologically controlled area.

continued

14. Limit the amount of material that has to be decontaminated or disposed of as radioactive waste.

15. Report the presence of treated or open wounds to the RSO before work in areas where radioactive contamination exists; and exit promptly if a wound occurs while in such area.

16. Report promptly unsafe or noncompliance situations to the RSO or Authorized User.

17. Report prior or concurrent occupational radiation exposure to the RSO.

18 Report pregnancy in accordance with Shieldalloy procedures and instructions.

ATTACHMENT 2
PARTICLE SIZE DATA FROM D.111 OPERATIONS

Location	Stage	Effective Cut Diameter (microns)	Total Activity (pCi)	Percent of Total Activity	Cumulative (Percent Less Than)
Vicinity of scale, 10 feet from hopper	0	13.6 and above	5.90	8.81	91.19
	1	8.6	3.76	5.61	85.58
	2	5.6	2.94	4.39	81.19
	3	4.0	5.5	8.21	72.98
	4	2.5	11.0	16.42	56.55
	5	1.3	10.6	15.83	40.73
	6	1.8	17.7	26.43	14.3
	7	.54	6.1	9.11	5.2
	Final	Less than 0.54	3.48	5.2	0
		TOTAL	66.98		
Vicinity of scale, 10 feet from hopper	0	13.6 and above	3.37	9.2	90.80
	1	8.6	3.17	8.65	82.15
	2	5.6	2.21	6.03	76.11
	3	4.0	2.48	6.77	69.34
	4	2.5	3.00	8.19	61.15
	5	1.3	5.20	14.20	46.96
	6	1.8	5.50	15.02	31.94
	7	.54	5.70	15.56	16.38
	Final	Less than 0.54	6.00	16.38	0
		TOTAL	36.63		
Vicinity of scale, 10 feet from hopper	0	13.6 and above	3.93	13.18	86.82

Location	Stage	Effective Cut Diameter (microns)	Total Activity (pCi)	Percent of Total Activity	Cumulative (Percent Less Than)
	1	8.6	2.71	9.09	77.73
	2	5.6	3.42	11.47	66.25
	3	4.0	2.76	9.26	56.99
	4	2.5	2.34	7.85	49.14
	5	1.3	3.26	10.94	38.21
	6	1.8	2.66	8.92	29.29
	7	.54	3.03	10.16	19.12
	Final	Less than 0.54	5.70	19.12	0
		TOTAL	29.81		
Outside entrance to control room on second floor.	0	13.6 and above	4.60	9.21	90.79
	1	8.6	5.70	11.41	79.38
	2	5.6	3.02	6.05	73.33
	3	4.0	4.10	8.21	65.13
	4	2.5	3.47	6.95	58.18
	5	1.3	5.40	10.81	47.37
	6	1.8	3.09	6.19	41.18
	7	.54	3.47	6.95	34.23
	Final	Less than 0.54	17.1	34.23	0
		TOTAL	49.95		
Outside entrance to control room on second floor.	0	13.6 and above	190.0	39.6	60.4
	1	8.6	13.6	2.83	57.57
	2	5.6	9	1.88	55.69
	3	4.0	12.4	2.58	53.11

Location	Stage	Effective Cut Diameter (microns)	Total Activity (pCi)	Percent of Total Activity	Cumulative (Percent Less Than)
	4	2.5	8.3	1.73	51.38
	5	1.3	19.8	4.13	47.25
	6	1.8	32.5	6.77	40.48
	7	.54	42.2	8.8	31.68
	Final	Less than 0.54	152.0	21.68	0
		TOTAL	479.8		

ATTACHMENT 3
REVISED 1994 TEDE REPORT

SHIELDALLOY METALLURGICAL CORPORATION - 1994 TEDE REPORT

straight data gross α

Th/gross α adj DAC

Clock No.	Quarterly Work Hrs in DE11	Mean BZA (uCi/ml)				TLD mr				Th-232 DAC-hrs (NS)				Th-232 DAC-hrs (S)				U-238 DAC-hrs (S)				CDE(BS)	TEDE
		Q1	Q2	Q3	Q4	Q1	Q2	Q3	Q4	Q1	Q2	Q3	Q4	Q1	Q2	Q3	Q4	Q1	Q2	Q3	Q4	Rem	Rem
1448	3	1.90E-12								0.32	0.28	0.28	0.28	0.22	0.19	0.19	0.19	0.02	0.02	0.02	0.02	0.029	0.002
1717	539.25	2.32E-12				16	17	17	14.5	70.96	50.90	50.90	60.90	47.30	33.93	33.93	33.93	3.82	2.74	2.74	2.74	9.619	0.469
1689	433.75	1.03E-12	1.15E-12		1.10E-12			12	0	25.27	40.94	40.94	27.06	16.86	18.86	27.29	18.04	1.36	1.52	2.20	1.46	5.545	0.231
1257	526.75	1.10E-12	1.20E-12		8.40E-13	0	0	14	0	32.86	35.85	49.72	25.10	21.91	23.90	33.15	16.73	1.77	1.93	2.67	1.35	8.173	0.273
1935	11	1.55E-12								0.97	1.04	1.04	1.04	0.64	0.69	0.69	0.69	0.05	0.06	0.06	0.06	0.176	0.007
1569	112.25		1.10E-12			0	0	0	0	10.59	7.00	10.59	10.59	7.06	4.67	7.06	7.06	0.57	0.38	0.57	0.57	1.668	0.070
1737	80.25				2.33E-12			0	0	7.57	7.57	7.57	10.59	5.05	5.05	5.05	7.06	0.41	0.41	0.41	0.57	1.433	0.060
1800	121.25				1.75E-12			0	5.5	11.44	11.44	11.44	12.85	7.63	7.63	7.63	8.03	0.62	0.62	0.62	0.65	1.995	0.090
1727	157.75				1.80E-12	0	0	0	0	14.89	14.89	14.89	16.10	9.93	9.93	9.93	10.74	0.80	0.80	0.80	0.87	2.614	0.109
1985	10				5.80E-12					0.94	0.94	0.94	3.29	0.63	0.63	0.63	2.19	0.05	0.05	0.05	0.18	0.263	0.011
1841	203.5				1.00E-12			0	0	19.21	19.21	19.21	11.54	12.81	12.81	12.81	7.69	1.03	1.03	1.03	0.62	2.975	0.125
1548	619.5				6.60E-13	19	0	10	10	58.47	58.47	58.47	23.19	38.98	38.98	38.98	15.46	3.14	3.14	3.14	1.25	8.542	0.397
0760	0					0	0	0	0	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.000	0.000
1473	0									0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.000	0.000
1092	0					0	0	0	0	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.000	0.000
1083	0						0	0	0	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.000	0.000
6508	0					0	0	0	0	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.000	0.000
1985	0							0	0	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.000	0.000
1700	0							0	0	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.000	0.000

ATTACHMENT 4
MANAGEMENT POLICY STATEMENT ON RADIATION PROTECTION

MANAGEMENT POLICY STATEMENT ON RADIATION PROTECTION

Shieldalloy Metallurgical Corporation (SMC) has the responsibility for providing a work-place environment in which employees, visitors and contractors are adequately protected from hazards, including the hazards associated with exposure to radiation and radioactive material. At SMC, some individuals, by nature of their work, will be exposed to these hazards to varying degrees.

While the majority of occupational radiation exposures are low, all exposures are assumed to entail some risk to the employee. Therefore, SMC has adopted the following three principles to govern all work activities with the potential for exposure to radiation or radioactive materials:

1. No activity or operation will be conducted unless its performance will produce a net positive benefit.

2. All radiation exposures will be kept as low as reasonably achievable (ALARA) considering economic and societal costs.

3. No individual will receive radiation doses in excess of federal limits.

The first principle is self-explanatory. SMC personnel will not be exposed to radiological hazards unless there is some benefit to be gained from the activity involving the exposure. The third principle is also self-explanatory. Federal authorities and SMC management have identified an upper limit on radiation doses to which workers may be exposed without incurring unacceptable risks. The second principle, ALARA, is the basis for much of our radiation protection program, other than demonstrating compliance with regulations. ALARA is an operating policy that is integrated into each of our Radiation Safety Procedures.

Incorporated into the SMC radiation protection policy are the following goals:

1. Individual exposures will be ALARA.

2. Collective exposures will be ALARA.

3. Measures to keep radiation exposures ALARA will not result in an increased total risk to workers from other hazards.

The objective of these goals is to minimize the <u>total</u> risk to our employees. Working at SMC should not expose our workers to greater risk than is incurred by workers in other "safe" industries of occupations., These risks should also be no greater than those commonly accepted by each of us in our daily lives.

In support of the employees and supervisors, SMC will maintain an effective radiation protection program designed to comply with our three principles, and a radiation protection staff of qualified personnel. Each SMC employee should become familiar with the procedures for radiation safety to ensure that all of our workday activities are conducted according to the three radiation protection principles in order to meet our ALARA goals.

H. Nils Schooley
President