40-07102

IEM
Integrated Environmental Management, Inc.

5040 Executive Park Drive, Suite 205
Knoxville, TN 37923
Phone: (423) 531-9140
Fax: (423) 531-9130

1680 East Gude Drive, Suite 305
Rockville, MD 20850
Phone: (301) 762-0502
Fax: (301) 762-0638

March 11, 1997

Mr. Gary Comfort
Division of Industrial & Medical Nuclear Safety
U. S. Nuclear Regulatory Commission
1 White Flint North
11555 Rockville Pike
Rockville, Maryland 20852

Re: USNRC License No. SMB-743

Dear Mr. Comfort:

On behalf of the Shieldalloy Metallurgical Corporation Radiation Safety Officer, Mr. C. Scott Eves, enclosed is Report No. 94005/G-6131 entitled "Radiation Dose Estimates from Atmospheric Emissions from the Newfield Facility". Kindly direct any comments or questions regarding the report to Mr. Eves at (609) 692-4200.

Sincerely,

Carol D. Berger, C.H.P.

cc: C. Scott Eves (w/enc)
File 94005.06

9703180209 970311
PDR ADOCK 04007102
B PDR

180069

RADIATION DOSE ESTIMATES FROM ATMOSPHERIC EMISSIONS FROM THE NEWFIELD FACILITY

Submitted to:

Shieldalloy Metallurgical Corporation
West Boulevard, Post Office Box 768
Newfield, New Jersey 08344
(609) 692-4200

by:

Integrated Environmental Management, Inc.
1680 East Gude Drive, Suite 305
Rockville, Maryland 20850
(301) 762-0502

Report No. 94005/G-6131
March 11, 1997

9703180213 970311
PDR ADOCK 04007102
B PDR

TABLE OF CONTENTS

INTRODUCTION 1

APPROACH 3

PRODUCTION AREA (D-111) EMISSIONS 6
- Description of Air Handling System in D111 6
- Emission Estimate Based on Baghouse Efficiency 7
- Emission Estimate Based on 1988 Stack Sampling Data 7
- Emission Estimate Based on 1996 Stack Sampling Data 8

STORAGE AREA EMISSIONS 9

OFFSITE DOSE ESTIMATE 11
- Dose Estimates from Elevated Stack Emissions 11
- Dose Estimates from Elevated Flex-Kleen and Ground-Level AAF Emissions 12
- Dose Estimates from the Storage Yard 13

CONCLUSIONS 15

TABLES 16
- Table 1 - Average Radionuclide Emissions from the Shieldalloy Stacks 17
- Table 2 - Summary of Maximum Possible Dose Estimates from Atmospheric Emissions 18

APPENDICES 19
- Appendix A - CAP88-PC Summary Reports for Elevated Stack Releases 20
- Appendix B - CAP88-PC Summary Report for Elevated Flex-Kleen and Ground-Level AAF 21
- Appendix C - CAP88-PC Summary Synopsis Report for the Storage Yard 22
- Appendix D - Williard Report No. IER-14058-01 23

INTRODUCTION

Shieldalloy Metallurgical Corporation (Shieldalloy) operates a manufacturing facility located in Newfield, New Jersey. This facility manufactures or has manufactured specialty steel and super alloy additives, primary aluminum master alloys, metal carbides, powdered metals, and optical surfacing products. Raw materials currently used at the facility include ores which contain oxides of columbium (niobium), vanadium, aluminum metal, titanium metal, strontium metal, zirconium metal, and fluoride (titanium and boron) salts. During the manufacturing process, the facility generates slag, dross, and bag house dust, among other waste streams.

One of the materials received, used and stored by Shieldalloy contains radioactive material which is classified as "source material" pursuant to Title 10, Code of Federal Regulations, Part 40.[1] This feed material, called pyrochlore, is a concentrated ore containing columbium (niobium). It also contains greater than 0.05% (by weight) of natural uranium and natural thorium.

Shieldalloy currently holds a U. S. Nuclear Regulatory Commission (USNRC) License (No. SMB-743) allowing possession, use, and storage of source material. The most recent renewal of SMB-743 was granted in July, 1980. Prior to its expiration in July, 1985, Shieldalloy submitted an application for renewal, thus extending SMB-743 until the USNRC acts upon the renewal application. A revised renewal application was submitted on July 18, 1988, again on June 2, 1992, and again on August 25, 1995.

On December 15, 1992, the USNRC requested that Shieldalloy provide an analysis of the routine annual average atmospheric releases of radioactivity from the Newfield facility. They also advised that the source term should include releases of radon and thoron from storage and process areas in addition to the routine radioactivity releases from the baghouses.[2] On February 16, 1993, a report was submitted to the USNRC that contained an evaluation of emission rates and off-site radiation doses in response to the USNRC's request.[3]

---

[1] Title 10, Code of Federal Regulations, Part 40 states that materials containing greater than 0.05% of uranium and thorium by weight require specific licensing as "source material".

[2] Hickey, John W. N., U. S. Nuclear Regulatory Commission, letter to Mr. David R. Smith, Shieldalloy Metallurgical Corporation, January 14, 1993.

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

Subsequent to that submission, the USNRC requested additional sampling data from the baghouses and incorporation of the result into revised off-site dose assessments.[4] This document, which is intended to satisfy the request, contains a description of the approach used to evaluate the radiological impact of atmospheric releases, a summary of all data acquired to date, and an estimate of radiation doses to a maximally-exposed member of the general public, from atmospheric emissions. This document also serves as the regulatory/technical basis for Shieldalloy's atmospheric emissions surveillance and compliance program.

[4] Miller, M. T., U. S. Nuclear Regulatory Commission, written communication to C. Scott Eves, Shieldalloy Metallurgical Corporation, November 23, 1994.

APPROACH

There are a number of license criteria and regulations which must be considered in design of the Shieldalloy emissions monitoring program. For example, the August, 1995 application for renewal of Source Material License No. SMB-743 contains a description of the Shieldalloy radiation protection program in the form of a Radiation Protection Program Plan. In that document, a commitment is made that radiation doses shall be consistent with those established by the USNRC Title 10, Code of Federal Regulations, Part 20.[5] Title 10, Code of Federal Regulations, Part 20.1301 states that: "Each licensee shall conduct operations so that -- (1) The total effective dose equivalent to individual members of the public from the licensed operation does not exceed 0.1 rem in a year".[6] It also states in 10 CFR 20.1302 that:

> "The licensee shall make or cause to be made, as appropriate, surveys of radiation levels in unrestricted and controlled areas and radioactive materials in effluents released to unrestricted and controlled areas to demonstrate compliance with the dose limits for individual members of the public in §20.1301";

and that:

> "A licensee shall show compliance with the annual dose limit in § 20.1301 by -- (1) demonstrating by measurement or calculation that the total effective dose equivalent to the individual likely to receive the highest dose from the licensed operation does not exceed the annual dose limit".

In addition to USNRC requirements, The U. S. Environmental Protection Agency (USEPA) promulgates regulations pertaining to atmospheric emissions. Title 40, Code of Federal Regulations, Part 61, Subpart I, National Emission Standards for Radionuclide Emissions from Facilities Licensed by the Nuclear Regulatory Commission and Federal Facilities Not Covered by Subpart H" requires that emissions of radionuclides to the ambient air from facilities regulated under Subpart I must remain below those amounts that would cause any member of the public to receive an effective dose equivalent of 10 millirem per year. Section 61.104(b) further provides that facilities emitting radionuclides in an amount that would cause a member of the public to

---

[5] Shieldalloy Metallurgical Corporation, Radiation Safety Procedure No. RSP-001, "Radiation Protection Program Plan".

[6] U. S. Nuclear Regulatory Commission, Title 10, Code of Federal Regulations, Part 20, "Standards for Protection Against Radiation".

receive less than one (1) millirem per year are exempt from the reporting requirements of §61.104(a). Also, §61.107(b)(4) states that measurements to demonstrate conformance with the regulation are required at all release points that have the potential to cause an effective dose equivalent in excess of 0.1 millirem per year. Therefore, if licensees are able to demonstrate off-site population doses of less than 0.1 millirem per year from airborne emissions, they are exempt from the requirements of 40 CFR 61. However, the facility must make a new determination each year in order to ensure continued exemption.

In order to establish whether Shieldalloy meets the § 20.1301(a)(1) annual dose limit for members of the general public, the compliance methodology described in §20.1302(b)(1) was used. The following is a description of the general approach:

- The quantity of airborne emissions from production buildings was estimated from the known efficiency of the dust collection system for ferrocolumbium operations, from emission measurements performed by Oak Ridge Associated Universities (ORAU) during a 1988 radiological survey of the Newfield site,[7] and from a 1996 sampling effort wherein improved measurement methods were implemented.[8,9]

- The estimated quantity of airborne emissions from the Storage Yard was estimated from known concentrations of radioactive materials deposited in that area, referenced ratios of radon emission to ^{226}Ra concentration, and measurements of radon flux performed in 1995.[10]

- The estimated quantity of airborne emissions was used as input to the CAP88-PC computer model, which is a set of computer programs, databases, and associated utility programs for estimation of dose from radionuclide emissions to air as a demonstration of compliance under the National Emission Standards for Hazardous Air Pollutants.[11]

---

[7] Berger, J. D. and A. D. Luck, "Radiological Survey of the Shieldalloy Corporation, Newfield, New Jersey", ORAU Report No. 88/G-75, July, 1988.

[8] Apex Environmental, Inc., "Demonstration of Compliance Plan", May, 1995.

[9] Williard, Inc., "Sampling of Particulate Emissions from Filtered Exhaust Systems Involved with the Smelting of Pyrochlore in the Production of Columbium", Report No. IER-14058-01, 1996.

[10] Berger, C. D., Integrated Environmental Management, Inc., written communication to C. Scott Eves, Shieldalloy Metallurgical Corporation, May 16, 1995.

[11] U. S. Environmental Protection Agency, Title 40, Code of Federal Regulations, Part 61, "National Emission Standards for Hazardous Air Pollutants", January, 1992.

The dose estimates from the CAP88-PC model, summed for all emission sources, is taken to be the maximum possible off-site radiation dose from major atmospheric emissions of licensed material from the Newfield site. Other sources of emissions at the Newfield plant (e.g., fugitive emissions from doors, duct work, and dust transfer activities from the baghouses to the Storage Yard) are not considered since they contribute less than 30% of the total emission inventory.[12,13]

[12] U. S. Nuclear Regulatory Commission, Regulatory Guide 8.37, "ALARA Levels for Effluents from Materials Facilities", July, 1993.

[13] Routine surveys performed in the vicinity of these emission locations are negative for the presence of contamination above the applicable release criteria. Therefore, emissions of significance are considered to be unlikely.

PRODUCTION AREA (D-111) EMISSIONS

Description of Air Handling System in D111

Ferrocolumbium production, using pyrochlore as the feed material, is performed within a single building, called D-111. This building is equipped with two interconnected emission control systems using high-efficiency baghouses.[14]

The first is an AAF No. 90 Amertherm Baghouse (AAF). This baghouse holds Dacron bags that are 12 inches in diameter by 32 feet long. It is comprised of two sections: the dust collector and controls; and the dust handling and disposal system. The AAF accepts effluent air from the furnaces at pressure. The air enters the collector through the inlet air valves. Air passes up through the Dacron filter tubes where particulates are filtered out. The air leaving the tubes passes through a clean air plenum and is discharged to the atmosphere through a roof vent that runs the full length of the baghouse. Bag cleaning is performed by reverse air flow through the tubes which dislodges the dust cake.[15]

The second baghouse is a Flex-Kleen pulsed jet unit (Flex-Kleen) that operates in a similar manner as the AAF. In the Flex-Kleen, dust-laden air enters the "dirty air" plenum and hopper, where heavier dust particles drop out. The air that carries residual dust passes up and around the bag surfaces. As the air moves to the inside of the bags, dust particles are captured on the outer surface and within the bag material. The clean air passes through the inside of the bags into a "clean air" plenum, and subsequently vents to the atmosphere. A pneumatic pulse-jet system provides continuous and automatic bag cleaning by directing a burst of compressed air (e.g., shock wave) through a venturi at the top of the bag on a timed cycle.[16]

---

[14] The baghouses contain filters comprised of cloth (or similar material) arranged in a tubular fashion in an enclosed housing. The effluent stream from the production area is blown through the filter bags which trap the particulates on the collected material which builds up on the bags. As the buildup of material on the bags increases, resistance to flow increases. Thus the baghouse filters are equipped with shaking/vibrating devices to remove the collected dust and re-condition the bags. The rated efficiency of the filters used in the D-111 baghouses is over 99%.

[15] In the AAF, the reverse flow period is followed by a null period to allow the dislodged dust to fall onto screw conveyors that carry the dust to the storage silo.

[16] In the Flex-Kleen, the airflow through the bag is momentarily stopped when the pneumatic shock wave is introduced and the bag is firmly flexed. This causes the accumulated dust particles to drop off the bag into a hopper. Since only one row of bags is cleaned at a time, no interruption of air flow through the filters occurs.

Emission Estimate Based on Baghouse Efficiency

As part of the quality control program for production operations, Shieldalloy determined the total quantity (by weight) of feed material that goes into the ferrocolumbium production process in Building D-111. In general, 34% is returned as product (ferrocolumbium alloy), and 58% is returned as slag. The remainder of approximately 8% can be conservatively assumed to enter the dust collection system. This results in approximately 4.01×10^2 pounds, or 1.82×10^0 kg, of material entering the dust collection systems per hour of operation.[17]

Pursuant to vendor specifications, the efficiency of the filters in the AAF and Flex-Kleen is at least 99% under routine operating conditions. If it is conservatively assumed that 1% of all of the material that enters the baghouse is released to the atmosphere, this results in an emission rate of 1.82 kg of dust per hour of operation.[18]

In 1988 and again in 1991, samples of baghouse dust were collected from the baghouses and analyzed for their radiological constituents. The results of these analyses indicated that the maximum measured concentrations of ^{232}Th and ^{238}U in baghouse dust are 76.5 pCi/g and 20 pCi/g, respectively.[19,20] If it is conservatively assumed that these maximum concentrations apply to all baghouse dust released from D-111, this results in a release of approximately 1.39×10^{7} Ci of ^{232}Th (plus progeny), and 3.64×10^{-8} Ci of ^{238}U (plus progeny) per hour of operation.

Emission Estimate Based on 1988 Stack Sampling Data

During a 1988 survey, ORAU performed stack effluent sampling in the Flex-Kleen system in D-111.[21] The results of that sampling effort were negative for air emissions above the detection

---

[17] Rieman, Craig, R., Shieldalloy Metallurgical Corporation, written communication to Dale Hoffmeyer, U. S. Environmental Protection Agency, "Radionuclide Air Emissions Survey Form", December 17, 1991.

[18] A 1989 particle size study on D-111 bag house dust indicates that greater than 90% consists of particles greater than 45 μm in diameter (United States Testing Company, Inc., Report of Test, Number 032243, March 15, 1989). Referenced efficiency graphs for fabric filters comparable to those in use in the D-111 bag houses show a 100% collection efficiency for particles with diameters greater than 5 μm (American Society of Heating, Refrigerating and Air Conditioning Engineers, Handbook, "Typical Fractional Efficiency Curves for Dry Collectors", 1989). Therefore, the assumption that 1% of all material that enters the D-111 bag house is released to the atmosphere is conservative.

[19] Berger, J. D. and A. D. Luck, "Radiological Survey of the Shieldalloy Corporation, Newfield, New Jersey", ORAU Report No. 88/G-75, July, 1988.

[20] Teledyne Isotopes, Inc., "Report of Analysis", September 18, 1991.

[21] ORAU survey team was unable to devise a sampling protocol for the ridge vent in the AAF system. Therefore, the emissions from this location were not measured at that time.

sensitivity of the measurement/analysis methodology.[22] If the average of the reported detection limits are conservatively assumed to be equivalent to the maximum emission rate, then the 1988 data show annual emissions of 3.16×10^{-14} Ci of ^{232}Th, and 6.70×10^{-11} Ci of ^{238}U per hour of operation from the Flex-Kleen system only.[23]

Emission Estimate Based on 1996 Stack Sampling Data

Shieldalloy contracted the services of an air quality consultant to assist in optimizing the methodology for testing the D-111 emission control systems and filters to determine their net efficiency and maximum potential release rate. The consultant was asked to recommend the appropriate monitoring methodology to permit demonstration of compliance with 10 CFR 20.1301 and 40 CFR Part 61. This information was provided to Shieldalloy in a report wherein the methodology described in ASTM D-4535-91, with some site-specific modifications, was recommended.[24,25]

A stack testing service was contracted to implement the recommendations contained in the air quality consultant's report. This work was performed in March of 1996, and the findings were summarized in a report (see Appendix D).[26] Table 1 shows the mean annual emission rate from the AAF and the Flex-Kleen emission points based upon the 1996 stack testing results. These data are most representative of actual conditions and were thus used as input to the dose assessment.[27]

---

[22] Berger, J. D. and A. D. Luck, "Radiological Survey of the Shieldalloy Corporation, Newfield, New Jersey", ORAU Report No. 88/G-75, July, 1988.

[23] A 2,000-hour production year was used to normalize the sampling results.

[24] Apex Environmental, Inc., "Demonstration of Compliance Plan", submitted to Shieldalloy Metallurgical Corporation, May, 1995.

[25] American Society of Testing and Materials, "Standard Test Method for Particulate Matter and Determination of Particulate Emissions", ASTM D 4536-91, 1991.

[26] Williard, Inc., "Sampling of Particulate Emissions from Filtered Exhaust Systems Involved with the Smelting of Pyrochlore in the Production of Columbium", Report No. IER-14058-01, 1996.

[27] In the case of the AAF test results, a single sample served to bias the mean inordinately high. Although this result is not consistent with the others, the analytical laboratory was unable to identify a failing in either the analytical method or the laboratory's quality control procedures. It is suspected that sample handling by the stack tester may have caused the anomalous finding. Nonetheless, since no clear reason for invalidating that data point could be identified, it was included in the assessment.

STORAGE AREA EMISSIONS

In the Shieldalloy Storage Yard, there are two slag piles which contain source material and one pile of baghouse dust. Each of these are considered to be separate sources of radon (^{222}Rn) emissions.

Since few measurements of airborne emissions from the slag piles have been completed to date, they were estimated from the known concentration of radium in the piles, and a referenced ratio of radon emission to ^{226}Ra concentration.[28] For this assessment, the following equation was used: [29]

$$R = \lambda_{Rn} F_r C_{soil,Ra} \rho_{soil} L_{Rn}$$

where R = the area radon exhalation rate in Bq m^{-2} s^{-1}, λ_{Rn} = the decay constant of ^{222}Rn (2.1×10^{-6} s^{-1}), F_R = the emanating power, $C_{soil,Ra}$ = the activity mass concentration of ^{226}Ra in soil (Bq kg^{-1}), ρ_{soil} = the soil density (kg m^{-3}), and L_{rn} = is the diffusion length of radon in soil (m), which can be expressed mathematically as:

$$L_{Rn} = \sqrt{\frac{\Delta_{eff}}{\lambda_{Rn} \rho_{soil\ porosity}}}$$

where Δ_{eff} = the effective bulk diffusion coefficient (m^2 sec^{-1}), and $\rho_{soil\ porosity}$ = the soil porosity. Using default values for all of the coefficients if soil is assumed to be the media of interest, the ratio of radon emission to radium concentration is 4.59×10^{-1} Ci of ^{222} Rn/m^2-s per Ci of ^{226}Ra/gram.[30] The concentration of ^{226}Ra in the slag piles is 3.5×10^{-10} Ci/g.[31] The surface areas of the High-Ratio and the Standard slag piles are approximately 2,500 m^2 and 10,000 m^2,

---

[28] Isolated measurements of emanation rate using methodologies that were similar to those recommended by the EPA revealed radon emanation rates that ranged from "background" to a high of 20 pCi/m^2-sec (Kelly, B. A., Integrated Environmental Management, Inc. written communication to C. S. Eves, Shieldalloy Metallurgical Corporation, January 12, 1995). However, because the form of the slag did not permit full compliance with the EPA-recommended method, these data were not used for this assessment.

[29] United Nations Scientific Committee on the Effects of Atomic Radiation, "Sources, Effects and Risks of Ionizing Radiation", Annex A, ¶88, United Nations, 1988.

[30] The emission-to-concentration ratio is dependent upon soil density, water content, and a number of other factors. To retain an element of conservatism in this assessment, the referenced ratio used was for radium concentrations in soil, even though the physical properties of the slag in the piles resemble vitrified rock (a much less porous medium).

[31] Berger, C.D., Integrated Environmental Management, Inc., written communication to C. S. Eves, Shieldalloy Metallurgical Corporation, October 6, 1994.

respectively. Therefore, the Storage Yard has an annual ^{222}Rn release rate of 4.02×10^{-7} Ci/y from the Hi-Ratio pile and 1.61×10^{-6} Ci/y from the Standard pile.

Radon flux measurements were made on the baghouse dust pile using Large Area Activated Charcoal Canisters (LAACC). These data, which were collected between April 13, 1995 and April 21, 1995, demonstrated a mean radon flux over the pile of 2.9310 ± 5.1020 pCi/(m^2-s), with a range of 0.1571 to 21.9238 pCi/(m^2-s).[32] Using the maximum measured flux, an estimated surface area of 2,500 m^2 for the pile, and a continuous release scenario, the mean annual ^{222}Rn release rate is 6.62×10^{-4} Ci/y.[33]

---

[32] Berger, C. D., Integrated Environmental Management, Inc., written communication to C. Scott Eves, Shieldalloy Metallurgical Corporation, May 16, 1995.

[33] Berger, J.D., and A. D. Luck, "Radiological Survey of the Shieldalloy Corporation, Newfield, New Jersey", ORAU Report No. 88/G-75, July, 1988, forms the basis for the surface area estimate.

OFFSITE DOSE ESTIMATE

The CAP88-PC (Clean Air Act Assessment Package-1988) computer model permits assessments of both collective population dose, and maximally exposed individual dose.[34] CAP88-PC uses a modified Gaussian plume equation to estimate the average dispersion of radionuclides released from up to six sources, which may be either elevated stacks, such as at D-111, or uniform area sources, such as the piles of slag and baghouse dust in the Shieldalloy storage yard.

The program computes radionuclide concentrations in air, rates of deposition on ground surfaces, concentrations in food, and intake rates to people from ingestion of food produced in the assessment area. Estimates of the radionuclide concentrations in produce, leafy vegetables, milk and meat consumed by humans are made by coupling the output of the atmospheric transport models with the USNRC Regulatory Guide 1.109 Terrestrial food chain models.[35] A library of meteorological data for most major cities is supplied with the code.

Dose Estimates from Elevated Stack Emissions

The following assumptions were used as input to the code for estimating off-site doses from production area (D111) emissions at the Newfield Plant:

- Wind data from Wilmington, Delaware (Wilmington International Airport) were deemed applicable to conditions at Newfield.
- The annual average rainfall amount is 111.8 cm per year.[36]
- The annual average temperature is 12°C.[37]

---

[34] U. S. Environmental Protection Agency, "User's Guide for CAP88-PC, Version 1.0", by Barry S. Parks, Report No. 402-B-92-001, Office of Radiation Programs, March, 1992.

[35] U. S. Nuclear Regulatory Commission, Regulatory Guide No. 1.109, "Calculation of Annual Doses to Man from Routine Releases of Reactor Effluents for the Purpose of Evaluating Compliance with 10 CFR Part 50, Appendix I", Revision 1, October, 1977.

[36] IT Corporation, Applicant's Environmental Report for the Newfield, New Jersey Facility", by C. D. Berger, A. Chance, and B. Kelly, IT Corporation Report No. IT/NS-92-118.

[37] IT Corporation, Applicant's Environmental Report for the Newfield, New Jersey Facility", by C. D. Berger, A. Chance, and B. Kelly, IT Corporation Report No. IT/NS-92-118.

- The height and diameter of the Flex-Kleen stack are 9.1 and 2.4 meters, respectively.[38]

- The height and equivalent diameter of the AAF are 18.3 and 9.8 meters, respectively.[39]

- A momentum plume rise was assumed, with a stack emission rate of 17.01 and 3.2 meters per second, respectively, for the Flex-Kleen and the AAF.

- Agricultural usage was assumed to fit an "Urban" scenario, wherein over 90% of the milk, meat, and vegetables consumed are from the assessment area.

- The radionuclide release rates were taken from the 1996 stack test results, normalized over a 450-hour production year (see Table 1).[40]

The results of this assessment indicate an annual radiation dose of 0.06 millirem to the maximally-exposed individual, which the computer code indicates is located 250 meters East Southeast of D-111.[41] Appendix A contains the CAP88-PC Synopsis Report for this assessment.

The closest residence to the Newfield plant is over 85 feet south of the property line. The maximum dose at this location is 0.06 millirem, which is less than the 40 CFR 61 criterion of 0.1 mrem per year. Appendix A also contains the CAP88-PC Synopsis Report for this assessment.

Dose Estimates from Elevated Flex-Kleen and Ground-Level AAF Emissions

The AAF emission point is a ridge vent rather than a stack. As such, the plume may be subject to building wake effects prior to dispersion off-site. Therefore, the impact of a ground-level release from the AAF was also determined. For this assessment, all input parameters were equivalent to those used for elevated stacks except for the release height of the AAF. This was conservatively assumed to be zero (0).

---

[38] Kozak, M., Williard, Inc., personal communication to D. Jarvis, Integrated Environmental Management, August 19, 1996.

[39] Kozak, M., Williard, Inc., personal communication to D. Jarvis, Integrated Environmental Management, August 19, 1996.

[40] The ferrocolumbium production schedule for 1994, 1995 and 1996 was 1092, 172 and 28 hours, respectively. Therefore, an average production year for this period is 431 $\pm$ 577 hours.

[41] For gaussian plume models like CAP88-PC, linear scaling of dose, based upon the annual release rate is permissible. Therefore, the results may be adjusted for production durations that are different from 2,000 hours per year.

The results of this assessment indicate an annual radiation dose of 0.14 millirem to the maximally-exposed individual, which the computer code indicates is 100 meters East Southeast of D-111. Appendix B contains the CAP88-PC Synopsis Report for this assessment.

The maximum dose at the location of the closest residence (e.g., 85 feet south of the property line) is 0.06 millirem, which is less than the 40 CFR 61 criterion of 0.1 mrem per year. Appendix B also contains the CAP88-PC Synopsis Report for this assessment.

Dose Estimates from the Storage Yard

The following assumptions were used as input to the CAP88-PC code for estimating off-site doses from Storage Yard emissions at the Newfield site:

- Wind data from Wilmington, Delaware (Wilmington International Airport) were deemed applicable to conditions at Newfield.
- The annual average rainfall amount is 111.8 cm per year.[42]
- The annual average temperature is 12°C.[43]
- The area of the three sources of emissions are 2,500 m^2 for the Hi-Ratio slag pile, 10,000 m^2 for the Standard slag pile, and 2,500 m^2 for the lime pile.[44]
- A momentum plume rise was assumed.
- Agricultural usage was assumed to fit an "Urban" scenario.
- The annual average ^{222}Rn release rate is conservatively assumed to be 4.02×10^{-7} Ci/y from the Hi-Ratio pile, 1.61×10^{6} Ci/y from the Standard pile, and 6.62×10^{-4} Ci/y from the baghouse dust pile.
- The dose contribution from radon daughters was included in the calculation.

---

[42] IT Corporation, Applicant's Environmental Report for the Newfield, New Jersey Facility", by C. D. Berger, A. Chance, and B. Kelly, IT Corporation Report No. IT/NS-92-118.

[43] IT Corporation, Applicant's Environmental Report for the Newfield, New Jersey Facility", by C. D. Berger, A. Chance, and B. Kelly, IT Corporation Report No. IT/NS-92-118.

[44] Berger, J. D. and A. D. Luck, "Radiological Survey of the Shieldalloy Corporation, Newfield, New Jersey", ORAU Report No. 88/G-75, July, 1988.

The results of this assessment indicate an annual radiation dose of 0.00003 millirem to the maximally-exposed member of the general public, which the computer code indicates is located 50 meters East Southeast of the Storage Yard. Appendix C contains the CAP88-PC Synopsis Report from this assessment.

CONCLUSIONS

Title 10, Code of Federal Regulations, Sections 20.1301(a) states that licensees shall conduct their operations such that the total effective dose equivalent (TEDE) to individual members of the public from the licensed operation does not exceed 100 millirem in a year. In addition, the U. S. Environmental Protection Agency's (USEPA's) standards for hazardous air pollutants (40 CFR 61) are also applicable.

In §20.1302, the USNRC requires licensees to perform surveys to measure effluents released to unrestricted areas. Section 20.1302 requires licensees to demonstrate compliance with the §20.1301 dose limit in one of two ways. First, the licensee may demonstrate (by measurement or calculation) that the TEDE to the individual likely to receive the highest dose from the licensed operation does not exceed 100 millirem. The second method to demonstrate compliance with the dose limits contained in §20.1301 is by showing that the annual average concentration of radioactive material released in gaseous effluents at the boundary of the unrestricted areas do not exceed the values specified in Appendix B to 10 CFR 20 (for ^{232}Th, this value is 4×10^{-15} μCi/ml, and for ^{238}U, the value is 6×10^{-14} μCi/ml) and by demonstrating that if an individual were continually present in an unrestricted area, the dose from external sources (ambient gamma exposure) would not exceed two (2) millirem in an hour and 50 millirem in a year.

Table 2 contains a summary of the maximum off-site population doses attributed to radon emissions from the Storage Yard, and to the emissions from the baghouses and other material handling operations associated with ferrocolumbium production in D-111. Based upon assumptions that were selected to maximize the dose, the maximally exposed member of the general population in the vicinity of Shieldalloy has the potential to incur a radiation dose of less than one (1) millirem (total effective dose equivalent) from all emission points. Since this value is less than the 100 millirem limit in 10 CFR 20.1301 Shieldalloy is well-within compliance with applicable regulations. Furthermore, routine emission measurements are not necessary unless operational conditions or feed-material characteristics change.

TABLES

Table 1 - Average Radionuclide Emissions from the Shieldalloy Stacks

Stack Descriptor	Sample Location	Average Annual Emission Rate (Ci per 450-hour Production Year)					
		U-238	U-234	Th-230	U-235	Th-232	Th-228
FlexKleen	J-12	4.95e-04	7.49e-05	1.93e-05	5.92e-06	4.12e-06	2.06e-06
	H-12	3.02e-05	2.32e-05	2.12e-05	5.58e-07	4.19e-06	8.37e-07
	K-12	2.16e-05	2.53e-05	1.50e-05	3.69e-06	5.00e-06	3.96e-06
	Ave.	**1.82e-04**	**4.11e-05**	**1.85e-05**	**3.39e-06**	**4.43e-06**	**2.29e-06**
	SD	2.71e-04	2.93e-05	3.18e-06	2.69e-06	4.88e-07	1.57e-06
AAF	B-1	4.63e-04	6.91e-05	7.11e-06	1.02e-05	2.68e-06	7.38e-07
	D-1	8.92e-05	2.08e-05	6.48e-06	2.84e-06	2.19e-06	1.37e-06
	E-1	9.85e-06	9.18e-06	6.64e-06	1.99e-06	2.36e-06	2.84e-07
	G-3	9.53e-06	9.25e-06	6.14e-06	1.04e-06	1.60e-06	1.32e-06
	H-1	9.69e-06	1.02e-05	6.37e-06	2.30e-06	2.41e-06	2.30e-06
	A-10	8.47e-06	8.27e-06	5.38e-06	6.73e-07	2.12e-06	4.14e-06
	C-8	1.00e-05	5.59e-06	7.07e-06	1.96e-08	2.75e-06	1.96e-06
	D-8	7.95e-06	8.23e-06	7.94e-06	5.15e-07	2.15e-06	1.96e-06
	E-8	6.18e-06	9.26e-06	5.90e-06	1.31e-06	1.68e-06	4.68e-07
	Ave.	**6.82e-05**	**1.67e-05**	**6.56e-06**	**2.32e-06**	**2.22e-06**	**1.62e-06**
	SD	1.50e-04	2.01e-05	7.53e-07	3.10e-06	3.91e-07	5.23e-06

Table 2 - Summary of Maximum Possible Dose Estimates from Atmospheric Emissions

Emission Point	Emission Scenario	Annual Dose Estimate to Maximally-Exposed Individual (millirem)	Location of Maximum Annual Dose Rate
D-111 Baghouse	Elevated Stacks	5.66e-2	250 meters ESE
D-111 Baghouse	Elevated Flex-Kleen and Ground-Level AAF	1.36e-1	100 meters ESE
Storage Yard	Area Source	3.21e-5	50 meters SSW

APPENDICES

Appendix A - CAP88-PC Summary Reports for Elevated Stack Releases

C A P 8 8 - P C

Version 1.00

Clean Air Act Assessment Package - 1988

S Y N O P S I S R E P O R T

Non-Radon Individual Assessment
Feb 28, 1997 4:47 pm

Facility: Shieldalloy Metallurgical Corporation
Address: West Boulevard
Post Office Box 768
City: Newfield
State: NJ Zip: 08344

Effective Dose Equivalent
(mrem/year)

5.66E-02

At This Location: 250 Meters East Southeast

Source Category: Ferrocolumbium Emissions from Stacks
Source Type: Stack
Emission Year: 1996

Comments: *Stack Test Results from IER-14058-01*

Dataset Name: SMC-1996
Dataset Date: Feb 28, 1997 4:47 pm
Wind File: WNDFILES\ILG1058.WND

MAXIMALLY EXPOSED INDIVIDUAL
(RN-222 Working Level Calculations Excluded)

Location Of The Individual: 250 Meters East Southeast
Lifetime Fatal Cancer Risk: 8.04E-07

ORGAN DOSE EQUIVALENT SUMMARY
(RN-222 Working Level Calculations Excluded)

Organ	Dose Equivalent (mrem/y)
GONADS	1.27E-02
BREAST	1.20E-02
R MAR	2.08E-02
LUNGS	3.29E-01
THYROID	1.21E-02
ENDOST	1.57E-01
RMNDR	1.51E-02
EFFEC	5.66E-02

RADIONUCLIDE EMISSIONS DURING THE YEAR 1996

Nuclide	Class	Size	Source #1 Ci/y	Source #2 Ci/y	TOTAL Ci/y
U-238	Y	1.00	1.8E-04	6.8E-05	2.5E-04
TH-234	Y	1.00	1.8E-04	6.8E-05	2.5E-04
PA-234	Y	1.00	1.8E-05	6.8E-05	8.6E-05
U-234	Y	1.00	4.0E-05	1.7E-05	5.7E-05
TH-230	Y	1.00	1.9E-05	6.6E-06	2.5E-05
RA-226	W	1.00	1.9E-05	6.6E-06	2.5E-05
RN-222	*	0.00	1.9E-05	6.6E-06	2.5E-05
PO-218	W	1.00	1.9E-05	6.5E-06	2.5E-05
PB-214	D	1.00	1.9E-05	6.5E-06	2.5E-05
BI-214	W	1.00	1.9E-05	6.5E-06	2.5E-05
PO-214	W	1.00	1.9E-05	6.5E-06	2.5E-05
PB-210	D	1.00	1.9E-05	6.5E-06	2.5E-05
BI-210	W	1.00	1.9E-05	6.5E-06	2.5E-05
PO-210	W	1.00	1.9E-05	6.5E-06	2.5E-05
TH-232	Y	1.00	4.4E-06	2.2E-06	6.6E-06
RA-228	W	1.00	4.4E-06	2.2E-06	6.6E-06
AC-228	Y	1.00	4.4E-06	2.2E-06	6.6E-06
TH-228	Y	1.00	2.3E-06	1.6E-06	3.9E-06
RA-224	W	1.00	2.3E-06	1.6E-06	3.9E-06
RN-220	*	0.00	2.3E-06	1.6E-06	3.9E-06
PO-216	W	1.00	2.3E-06	1.6E-06	3.9E-06
PB-212	D	1.00	2.3E-06	1.6E-06	3.9E-06
BI-212	W	1.00	2.3E-06	1.6E-06	3.9E-06
TL-208	D	1.00	2.3E-06	1.6E-05	1.8E-05
U-235	Y	1.00	3.4E-06	2.3E-06	5.7E-06

SITE INFORMATION

Temperature: 12 degrees C
Precipitation: 112 cm/y
Mixing Height: 1000 m

SOURCE INFORMATION

Source Number:	1	2
Stack Height (m):	9.10	18.30
Diameter (m):	2.40	9.80
Plume Rise Momentum (m/s): (Exit Velocity)	1.70E+01	3.15E+00

AGRICULTURAL DATA

	Vegetable	Milk	Meat
Fraction Home Produced:	0.076	0.000	0.008
Fraction From Assessment Area:	0.924	1.000	0.992
Fraction Imported:	0.000	0.000	0.000

Food Arrays were not generated for this run.
Default Values used.

DISTANCES USED FOR MAXIMUM INDIVIDUAL ASSESSMENT

50	100	150	200	250	300	350	400	450	500

C A P 8 8 - P C

Version 1.00

Clean Air Act Assessment Package - 1988

S Y N O P S I S R E P O R T

Non-Radon Individual Assessment
Feb 28, 1997 5:04 pm

Facility: Shieldalloy Metallurgical Corporation
Address: West Boulevard
Post Office Box 768
City: Newfield
State: NJ Zip: 08344

Effective Dose Equivalent
(mrem/year)

6.19E-02

At This Location: 26 Meters East Southeast

Source Category: Ferrocolumbium Emissions from Stacks
Source Type: Stack
Emission Year: 1996

Comments: Stack Test Results from IER-14058-01
Dose to Nearest Resident

Dataset Name: smc-max
Dataset Date: Feb 28, 1997 5:04 pm
Wind File: WNDFILES\ILG1058.WND

MAXIMALLY EXPOSED INDIVIDUAL
(RN-222 Working Level Calculations Excluded)

Location Of The Individual: 26 Meters East Southeast
Lifetime Fatal Cancer Risk: 1.20E-06

ORGAN DOSE EQUIVALENT SUMMARY
(RN-222 Working Level Calculations Excluded)

Organ	Dose Equivalent (mrem/y)
GONADS	5.53E-02
BREAST	5.20E-02
R MAR	5.78E-02
LUNGS	4.17E-02
THYROID	5.24E-02
ENDOST	2.72E-01
RMNDR	6.19E-02
EFFEC	6.19E-02

RADIONUCLIDE EMISSIONS DURING THE YEAR 1996

Nuclide	Class	Size	Source #1 Ci/y	Source #2 Ci/y	TOTAL Ci/y
U-238	Y	1.00	1.8E-04	6.8E-05	2.5E-04
TH-234	Y	1.00	1.8E-04	6.8E-05	2.5E-04
PA-234	Y	1.00	1.8E-04	6.8E-05	2.5E-04
U-234	Y	1.00	4.1E-05	1.7E-05	5.8E-05
TH-230	Y	1.00	1.9E-05	6.6E-06	2.5E-05
RA-226	W	1.00	1.9E-05	6.6E-06	2.5E-05
RN-222	*	0.00	1.9E-05	6.6E-06	2.5E-05
PO-218	W	1.00	1.9E-05	6.6E-06	2.5E-05
PB-214	D	1.00	1.9E-05	6.6E-06	2.5E-05
BI-214	W	1.00	1.9E-05	6.6E-06	2.5E-05
PO-214	W	1.00	1.9E-05	6.6E-06	2.5E-05
PB-210	D	1.00	1.9E-05	6.6E-06	2.5E-05
BI-210	W	1.00	1.9E-05	6.6E-06	2.5E-05
PO-210	W	1.00	1.9E-05	6.6E-06	2.5E-05
TH-232	Y	1.00	4.4E-06	2.2E-06	6.6E-06
RA-228	W	1.00	4.4E-06	2.2E-06	6.6E-06
AC-228	Y	1.00	4.4E-06	2.2E-06	6.6E-06
TH-228	Y	1.00	2.3E-06	1.6E-06	3.9E-06
RA-224	W	1.00	2.3E-06	1.6E-06	3.9E-06
RN-220	*	0.00	2.3E-06	1.6E-06	3.9E-06
PO-216	W	1.00	2.3E-06	1.6E-06	3.9E-06
PB-212	D	1.00	2.3E-06	1.6E-06	3.9E-06
BI-212	W	1.00	2.3E-06	1.6E-06	3.9E-06
TL-208	D	1.00	2.3E-06	1.6E-06	3.9E-06
U-235	Y	1.00	3.4E-06	2.3E-06	5.7E-06

SITE INFORMATION

Temperature: 12 degrees C
Precipitation: 112 cm/y
Mixing Height: 1000 m

SOURCE INFORMATION

Source Number:	1	2
Stack Height (m):	9.10	18.30
Diameter (m):	2.40	9.80
Plume Rise Momentum (m/s): (Exit Velocity)	1.70E+01	3.15E+00

AGRICULTURAL DATA

	Vegetable	Milk	Meat
Fraction Home Produced:	0.076	0.000	0.008
Fraction From Assessment Area:	0.924	1.000	0.992
Fraction Imported:	0.000	0.000	0.000

Food Arrays were not generated for this run.
Default Values used.

DISTANCES USED FOR MAXIMUM INDIVIDUAL ASSESSMENT

26

Appendix B - CAP88-PC Summary Report for Elevated Flex-Kleen and Ground-Level AAF

C A P 8 8 - P C

Version 1.00

Clean Air Act Assessment Package - 1988

S Y N O P S I S R E P O R T

Non-Radon Individual Assessment
Feb 28, 1997 4:57 pm

Facility: Shieldalloy Metallurgical Corporation
Address: West Boulevard
Post Office Box 768
City: Newfield
State: NJ Zip: 08344

Effective Dose Equivalent
(mrem/year)

1.36E-01

At This Location: 100 Meters East Southeast

Source Category: Ferrocolumbium Emissions from Stacks
Source Type: Stack
Emission Year: 1996

Comments: Stack Test Results from IER-14058-01
AAF Assumed to Exhibit Ground-level Release

Dataset Name: SMC-1996-GrndAAF
Dataset Date: Feb 28, 1997 4:56 pm
Wind File: WNDFILES\ILG1058.WND

MAXIMALLY EXPOSED INDIVIDUAL
(RN-222 Working Level Calculations Excluded)

Location Of The Individual: 100 Meters East Southeast
Lifetime Fatal Cancer Risk: 1.96E-06

ORGAN DOSE EQUIVALENT SUMMARY
(RN-222 Working Level Calculations Excluded)

Organ	Dose Equivalent (mrem/y)
GONADS	3.08E-02
BREAST	2.89E-02
R MAR	4.71E-02
LUNGS	8.12E-01
THYROID	2.92E-02
ENDOST	3.35E-01
RMNDR	3.23E-02
EFFEC	1.36E-01

RADIONUCLIDE EMISSIONS DURING THE YEAR 1996

Nuclide	Class	Size	Source #1 Ci/y	Source #2 Ci/y	TOTAL Ci/y
U-238	Y	1.00	1.8E-04	6.8E-05	2.5E-04
TH-234	Y	1.00	1.8E-04	6.8E-05	2.5E-04
PA-234	Y	1.00	1.8E-04	6.8E-05	2.5E-04
U-234	Y	1.00	4.1E-05	1.7E-05	5.8E-05
TH-230	Y	1.00	1.9E-05	6.6E-06	2.5E-05
RA-226	W	1.00	1.9E-05	6.6E-06	2.5E-05
RN-222	*	0.00	1.9E-05	6.6E-06	2.5E-05
PO-218	W	1.00	1.9E-05	6.6E-06	2.5E-05
PB-214	D	1.00	1.9E-05	6.6E-06	2.5E-05
BI-214	W	1.00	1.9E-05	6.6E-06	2.5E-05
PO-214	W	1.00	1.9E-05	6.6E-06	2.5E-05
PB-210	D	1.00	1.9E-05	6.6E-06	2.5E-05
BI-210	W	1.00	1.9E-05	6.6E-06	2.5E-05
PO-210	W	1.00	1.9E-05	6.6E-06	2.5E-05
TH-232	Y	1.00	4.4E-06	2.2E-06	6.6E-06
RA-228	W	1.00	4.4E-06	2.2E-06	6.6E-06
AC-228	Y	1.00	4.4E-06	2.2E-06	6.6E-06
TH-228	Y	1.00	2.3E-06	1.6E-06	3.9E-06
RA-224	W	1.00	2.3E-06	1.6E-06	3.9E-06
RN-220	*	0.00	2.3E-06	1.6E-06	3.9E-06
PO-216	W	1.00	2.3E-06	1.6E-06	3.9E-06
PB-212	D	1.00	2.3E-06	1.6E-06	3.9E-06
BI-212	W	1.00	2.3E-06	1.6E-06	3.9E-06
TL-208	D	1.00	2.3E-06	1.6E-06	3.9E-06
U-235	Y	1.00	3.4E-06	2.3E-06	5.7E-06

SITE INFORMATION

Temperature: 12 degrees C
Precipitation: 112 cm/y
Mixing Height: 1000 m

SOURCE INFORMATION

Source Number:	1	2
Stack Height (m):	9.10	0.00
Diameter (m):	2.40	9.80
Plume Rise Momentum (m/s): (Exit Velocity)	1.70E+01	3.15E+00

AGRICULTURAL DATA

	Vegetable	Milk	Meat
Fraction Home Produced:	0.076	0.000	0.008
Fraction From Assessment Area:	0.924	1.000	0.992
Fraction Imported:	0.000	0.000	0.000

Food Arrays were not generated for this run.
Default Values used.

DISTANCES USED FOR MAXIMUM INDIVIDUAL ASSESSMENT

50	100	150	200	250	300	350	400	450	500

C A P 8 8 - P C

Version 1.00

Clean Air Act Assessment Package - 1988

S Y N O P S I S R E P O R T

Non-Radon Individual Assessment
Feb 28, 1997 5:00 pm

Facility: Shieldalloy Metallurgical Corporation
Address: West Boulevard
Post Office Box 768
City: Newfield
State: NJ Zip: 08344

Effective Dose Equivalent
(mrem/year)

6.38E-02

At This Location: 26 Meters East Southeast

Source Category: FeCb Emissions-Dose to nearest resident
Source Type: Stack
Emission Year: 1996

Comments: Stack Test Results from IER-14058-01
Stacks Assumed to Exhibit Ground-level Release

Dataset Name: smc-grnd-max
Dataset Date: Feb 28, 1997 5:00 pm
Wind File: WNDFILES\ILG1058.WND

MAXIMALLY EXPOSED INDIVIDUAL
(RN-222 Working Level Calculations Excluded)

Location Of The Individual: 26 Meters East Southeast
Lifetime Fatal Cancer Risk: 1.22E-06

ORGAN DOSE EQUIVALENT SUMMARY
(RN-222 Working Level Calculations Excluded)

Organ	Dose Equivalent (mrem/y)
GONADS	5.56E-02
BREAST	5.22E-02
R MAR	5.83E-02
LUNGS	5.44E-02
THYROID	5.26E-02
ENDOST	2.77E-01
RMNDR	6.21E-02
EFFEC	6.38E-02

RADIONUCLIDE EMISSIONS DURING THE YEAR 1996

Nuclide	Class	Size	Source #1 Ci/y	Source #2 Ci/y	TOTAL Ci/y
U-238	Y	1.00	1.8E-04	6.8E-05	2.5E-04
TH-234	Y	1.00	1.8E-04	6.8E-05	2.5E-04
PA-234	Y	1.00	1.8E-04	6.8E-05	2.5E-04
U-234	Y	1.00	4.1E-05	1.7E-05	5.8E-05
TH-230	Y	1.00	1.9E-05	6.6E-06	2.5E-05
RA-226	W	1.00	1.9E-05	6.6E-06	2.5E-05
RN-222	*	0.00	1.9E-05	6.6E-06	2.5E-05
PO-218	W	1.00	1.9E-05	6.6E-06	2.5E-05
PB-214	D	1.00	1.9E-05	6.6E-06	2.5E-05
BI-214	W	1.00	1.9E-05	6.6E-06	2.5E-05
PO-214	W	1.00	1.9E-05	6.6E-06	2.5E-05
PB-210	D	1.00	1.9E-05	6.6E-06	2.5E-05
BI-210	W	1.00	1.9E-05	6.6E-06	2.5E-05
PO-210	W	1.00	1.9E-05	6.6E-06	2.5E-05
TH-232	Y	1.00	4.4E-06	2.2E-06	6.6E-06
RA-228	W	1.00	4.4E-06	2.2E-06	6.6E-06
AC-228	Y	1.00	4.4E-06	2.2E-06	6.6E-06
TH-228	Y	1.00	2.3E-06	1.6E-06	3.9E-06
RA-224	W	1.00	2.3E-06	1.6E-06	3.9E-06
RN-220	*	0.00	2.3E-06	1.6E-06	3.9E-06
PO-216	W	1.00	2.3E-06	1.6E-06	3.9E-06
PB-212	D	1.00	2.3E-06	1.6E-06	3.9E-06
BI-212	W	1.00	2.3E-06	1.6E-06	3.9E-06
TL-208	D	1.00	2.3E-06	1.6E-06	3.9E-06
U-235	Y	1.00	3.4E-06	2.3E-06	5.7E-06

SITE INFORMATION

Temperature: 12 degrees C
Precipitation: 112 cm/y
Mixing Height: 1000 m

SOURCE INFORMATION

Source Number:	1	2
Stack Height (m):	0.00	0.00
Diameter (m):	2.40	9.80
Plume Rise Momentum (m/s): (Exit Velocity)	1.70E+01	3.15E+00

AGRICULTURAL DATA

	Vegetable	Milk	Meat
Fraction Home Produced:	0.076	0.000	0.008
Fraction From Assessment Area:	0.924	1.000	0.992
Fraction Imported:	0.000	0.000	0.000

Food Arrays were not generated for this run.
Default Values used.

DISTANCES USED FOR MAXIMUM INDIVIDUAL ASSESSMENT

26

Appendix C - CAP88-PC Summary Synopsis Report for the Storage Yard

C A P 8 8 - P C

Version 1.00

Clean Air Act Assessment Package - 1988

S Y N O P S I S R E P O R T

Radon Individual Assessment
Feb 28, 1997 4:49 pm

Facility: Shieldalloy Metallurgical Corporation
Address: West Boulevard
Post Office Box 768
City: Newfield
State: NJ Zip: 08344

Effective Dose Equivalent
(mrem/year)

3.21E-05

At This Location: 50 Meters South Southwest

Source Category: Radon Emissions from Storage Yard
Source Type: Area
Emission Year: 1996

Comments: Includes High-Ratio Slag, Standard-Ratio Slag and Baghouse Dust Piles

Dataset Name: SMC-1996-Radon
Dataset Date: Sep 20, 1996 2:05 pm
Wind File: WNDFILES\ILG1058.WND

RN-222 MAXIMALLY EXPOSED INDIVIDUAL

Location Of The Individual: 50 Meters South Southwest
Radon Concentration (pCi/l): 1.50E-06
Decay Product Concentration (WL): 4.00E-09
Lifetime Fatal Cancer Risk: 5.63E-09

RADIONUCLIDE EMISSIONS DURING THE YEAR 1996

Nuclide	Class	Size	Source #1 Ci/y	Source #2 Ci/y	Source #3 Ci/y	TOTAL Ci/y
RN-222	*	0.00	1.6E-06	4.0E-07	6.6E-04	6.6E-04

SITE INFORMATION

Temperature: 12 degrees C
Precipitation: 112 cm/y
Mixing Height: 1000 m

SOURCE INFORMATION

Source Number:	1	2	3
Source Height (m):	5.00	5.00	5.00
Area (sq m):	1.00E+04	2.50E+03	2.50E+03
Plume Rise Buoyant (cal/s): (Heat Release Rate)	0.00E+00	0.00E+00	0.00E+00

DISTANCES USED FOR MAXIMUM INDIVIDUAL ASSESSMENT

50 100 150 200 250 300 350 400 450 500

Appendix D - Williard Report No. IER-14058-01

RECEIVED 8/12/96

SAMPLING OF PARTICULATE EMISSIONS FROM FILTERED EXHAUST SYSTEMS INVOLVED WITH THE SMELTING OF PYROCHLORE IN THE PRODUCTION OF FERROCOLUMBIUM

REPORT NO.: IER-14058-01

CUSTOMER: INTEGRATED ENVIRONMENTAL MANAGEMENT, INC.

LOCATION: SHIELDALLOY METALLURGICAL CORPORATION
NEWFIELD, NEW JERSEY

CUSTOMER P.O.: 94005.06

WILLIARD JOB NO.: IER-14058

Test Report IER-14058-01
August 12, 1995

TABLE OF CONTENTS

INTRODUCTION	Page 1
ASSUMPTIONS	Page 1
SUMMARY OF RESULTS AND CONCLUSIONS	Page 1 - 2
DESCRIPTION OF SOURCES	Page 3
DEVIATION FROM PROCEDURE	Page 4 - 5
REFERENCES	Page 5
PLOT/PROCESS FLOW DIAGRAM	Page 6
SAMPLING LOCATION DATA TABLE	Page 7 - 10
FLOW DATA SUMMARY TABLE	Page 11
PRE-SURVEY FLOWS AND TEST SAMPLE LOCATIONS	Page 12 - 14
PARTICLE EMISSION SUMMARY TABLE	Page 15
TEST BLANK DATA	Page 16-18
SAMPLE DATA AND FILTER ANALYSIS FOR FLEXKLEEN STACK	Page 19-21
SAMPLE DATA AND FILTER ANALYSIS FOR AAF BAGHOUSE RIDGEVENT	Page 22-31

ATTACHMENT

LOCKHEED ANALYTICAL SERVICES, ANALYTICAL REPORT FOR THORIUM ISOTOPIC, URANIUM ISOTOPIC, GAMMA SPECTROMETRY, AND GROSS ALPHA/BETA

Test Report IER-14058-01
August 12, 1996

INTRODUCTION

Williard Inc. was contracted by Integrated Environmental Management, Inc. to perform sampling of particulate emissions from two high-efficiency filter baghouses involved with the smelting of pyrochlore used for the production of columbium, at Shieldalloy Metallurgical Corporation's facility in Newfield, New Jersey. The subject systems consist of a capture hood above an electric furnace which is ducted to the two baghouses. Particulate sampling was performed using ASTM Standard D-4535-91 as recommended in the Demonstration of Compliance Plan prepared by Apex Environmental, Inc. in May of 1995.

ASSUMPTIONS

No acceptance/rejection criteria exist for this test. Results of particulate sampling by Williard Inc. and the radiological assay of those particulate samples tested by Lockheed Analytical Services shall be evaluated by Integrated Environmental Management, Inc. (IEM) to determine regulatory compliance.

SUMMARY OF RESULTS & CONCLUSIONS

The following system(s) were tested for particulate emissions:

AAF Baghouse	- Department 111 Building
FlexKleen Baghouse	- Department 111 Building

Each system was tested in its normal operating configuration during the smelting of pyrochlore ore. Nine samples were obtained from the AAF Baghouse and three samples were obtained from the FlexKleen Baghouse. Originally ten samples were scheduled to be taken from the AAF Baghouse but due to mechanical problems with lift equipment being used for access to the ridgevent on the baghouse roof the final sample was not able to be collected.

Results are as follows:

AAF Baghouse

Particulate Emission Concentration	6.53×10^{-5} g/ft^3
Particulate Emission Rate	4.27×10^{-1} kg/hr

FlexKleen Baghouse

Particulate Emission Concentration	1.57×10^{-7} g/ft^3
Particulate Emission Rate	1.97×10^{-3} kg/hr

It should be noted that one reading for the AAF Baghouse, Point ID "D-8", tends to skew results of the test. The particulate collected at Point ID "D-8" accounted for 58.6% of the total from this source. Comparing the amount of discharge at this location to others along the ridgevent may indicate that a bag near this location is damaged or improperly installed. Installation of bags in the vicinity of Point ID "D-8" should be verified to minimize discharge of particulate.

Flow rates were constantly monitored during tests to assure isokinetic sampling rates.

DESCRIPTION OF SOURCES

Equipment involved in the process of smelting pyrochlore at this site consist of an electric furnace with an exhaust system which is used to collect all dust, smoke and fumes generated during operation of the furnace. The exhaust system is comprised of an exhaust hood, positioned above the furnace, which is ducted to two high-efficiency baghouses.

The AAF Baghouse is also ducted from the Dept. 111 Building. It consists of two 100 HP direct drive exhaust fans and one baghouse that is divided internally into three sections which discharge through a ridgevent on the baghouse roof.

The FlexKleen Baghouse is ducted from the Dept. 111 Building. It consists of two 200 HP direct drive exhaust fans and two dust collector housings which discharge through a 94" x 94" stack.

Normal system configuration during operation for the system is as follows:

AAF System

During operation of the AAF system both the exhaust fans for it and the FlexKleen system are in operation. Discharge dampers at the AAF fans are open. Discharge dampers at the FlexKleen fans are closed.

FlexKleen System

During operation of the FlexKleen system both the exhaust fans for it and the AAF system are in operation. Discharge dampers at the FlexKleen fans are open. Discharge dampers at the AAF fans are closed.

Reference Plot/Process Flow Diagram (p. 6).

DEVIATION FROM PROCEDURE

Testing was based upon the recommendations of the Apex Environmental, Inc. Demonstration of Compliance Plan dated May, 1995 for the subject systems using ASTM D-4536-91, *Standard Test Method for High-Volume Sampling for Solid Particulate Matter and Determination of Particulate Emissions.* The following are deviations from those procedures:

1. Only nine of ten samples recommended for the AAF Baghouse could be obtained. This was due to mechanical problems with lift equipment used by technicians to access sample points for the AAF Baghouse ridgevent and the limited run time of the process using the pyrochlore. It is assumed that the quantity of samples obtained is sufficient for IEM to perform emission calculations required.

2. Filter weights were corrected for weight losses due to usage and handling of the filter(s) for those filters which exhibited a post-test weight less their pre-test weight, unless noted otherwise.

3. Moisture trap was not required due to nature of the process. The entire process is electric and no moisture is generated nor is it added or removed during the process. Data collected during the test was used to convert obtained flows to standard conditions.

4. Due to filter efficiency, it was not possible to obtain samples of 100 mg or greater. Sample collection times were selected to allow collection of sufficient sample for radiological dose calculations.

5. Orifice calibrated per ACGIH Industrial Ventilation, A Manual of Recommended Practice, 22nd Edition.

6. Velocity readings taken per National Environmental Balancing Bureau, Procedural Standards for Testing Adjusting Balancing of Environmental Systems, Fifth Edition, 1991.

7. Leak testing of sampling train performed after testing only. It is assumed that since leak test performed after sampling was acceptable that isokinetic samples are valid.

8. Due to weather conditions and short run duration of process no field weights of samples could be collected.

REFERENCES

1. ASTM D 4536-91, Standard Test Method for Particulate Matter and Determination of Particulate Emissions

2. Demonstration of Compliance Plan, Apex Environmental, May 1995

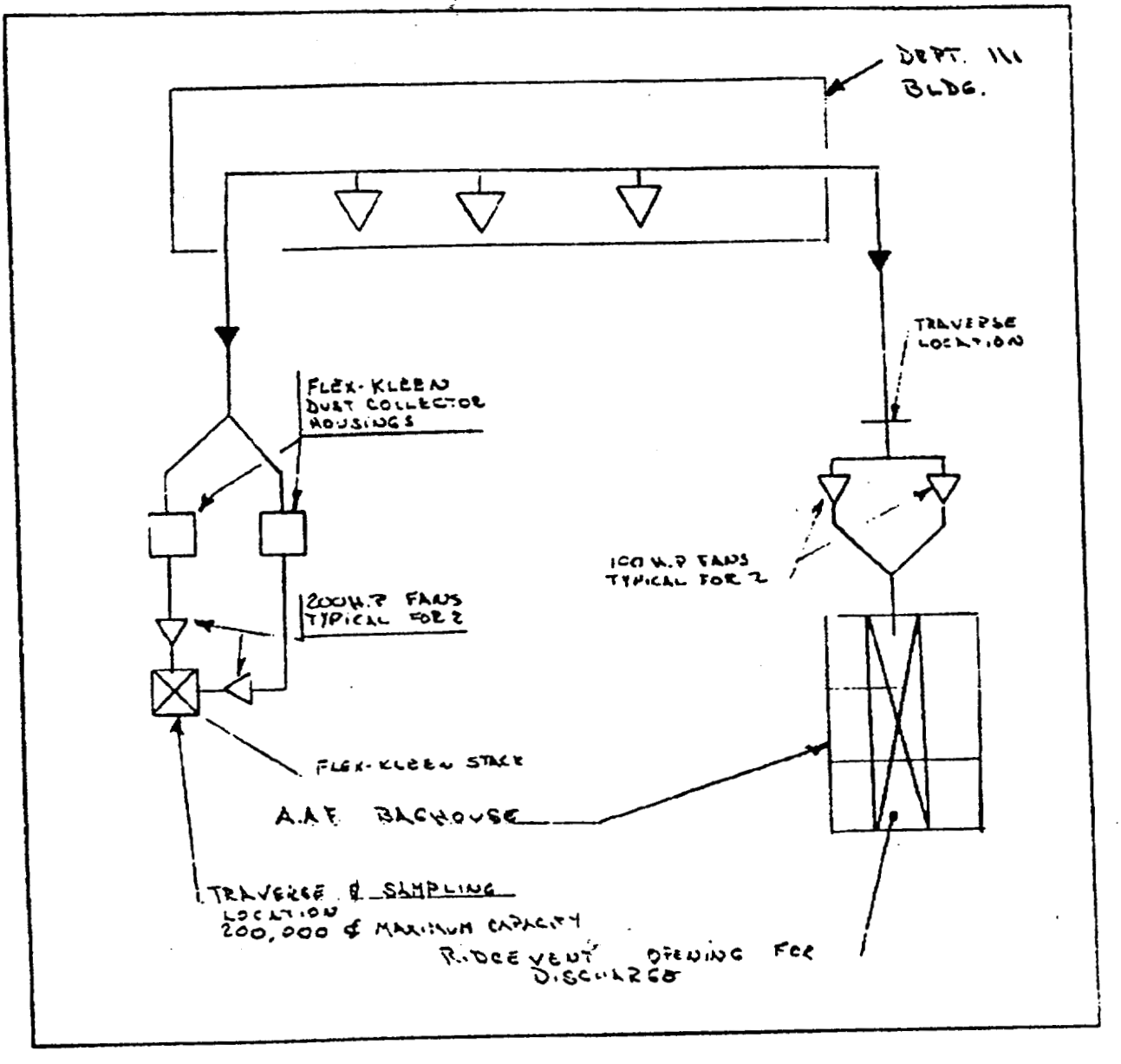
3. National Environmental Balancing Bureau, Procedural Standards for Testing Adjusting Balancing of Environmental Systems, Fifth Edition, 1991

4. ACGIH Industrial Ventilation, A Manual of Recommended Practice, 22nd Edition, ACGIH

PLOT / PROCESS FLOW DIAGRAM

Plant: Shieldalloy Metalurgical Corporation
Location: Dept. 111
Stack Identifiaction: Plant System Layout

Date: 3/19/96 By TERRY MOONAN



WILLIARD INC. NHB CFRT - 2035
Form - PPFD-001

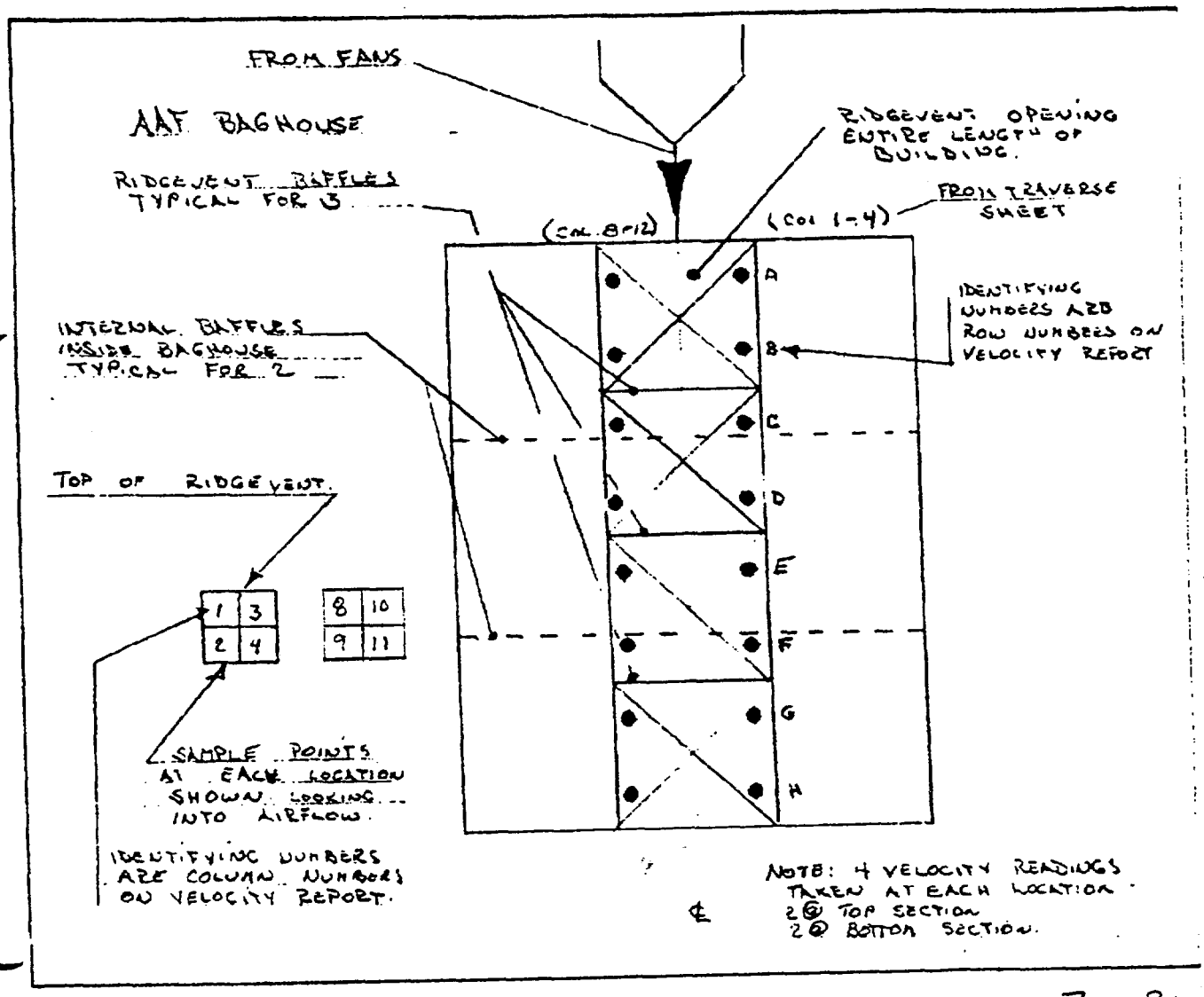
SAMPLING LOCATION DATA TABLE

Plant: Shieldalloy Metalurgical corporation
Location: Dept. 111
Stack Identification: AAF Baghouse - Ridgevent Discharge

SAMPLE POINT ID. RIDGEVENT DISCHARGE SAMPLING POINTS

Date 3/19/96 By: TERRY MOONAD.

Sketch Sampling Locations - Show dimensions from bend, fan, etc, and cross-section of duct showing numbered traverse points.



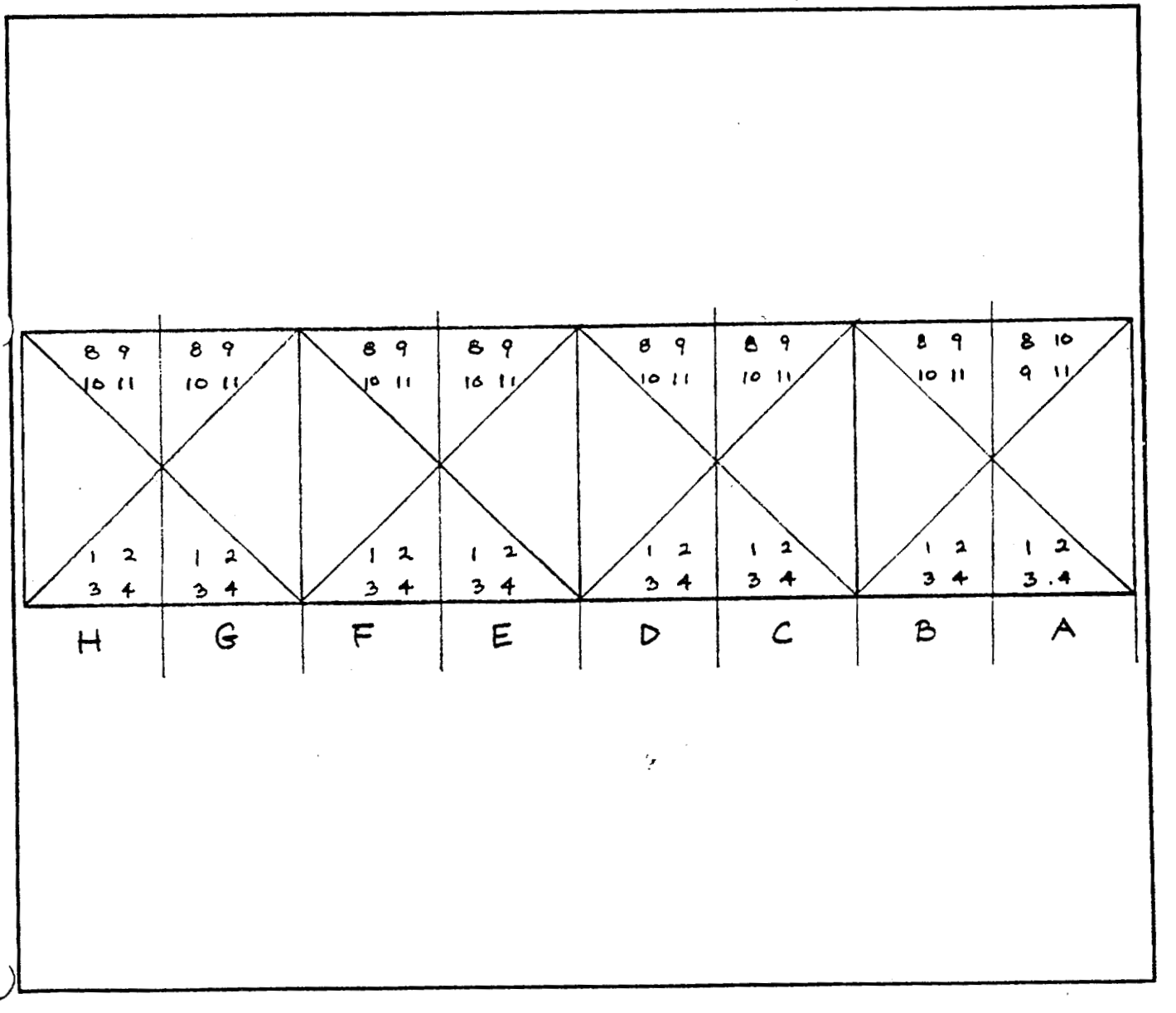
SAMPLING LOCATION DATA TABLE

Plant: SHIELDALLOY METALLURGICAL CORPORATION
Location: DEPT. 111
Stack Identifiaction: AAF BAGHOUSE -RIDGEVENT DISCHARGE

SAMPLE POINT ID. RIDGEVENT DISCHARGE SAMPLING POINTS

Date: 8/12/96 By: MARK KOZAK

Sketch Sampling Locations - Show dimensions from bend, fan, etc, and cross-section of duct showing numbered traverse points.



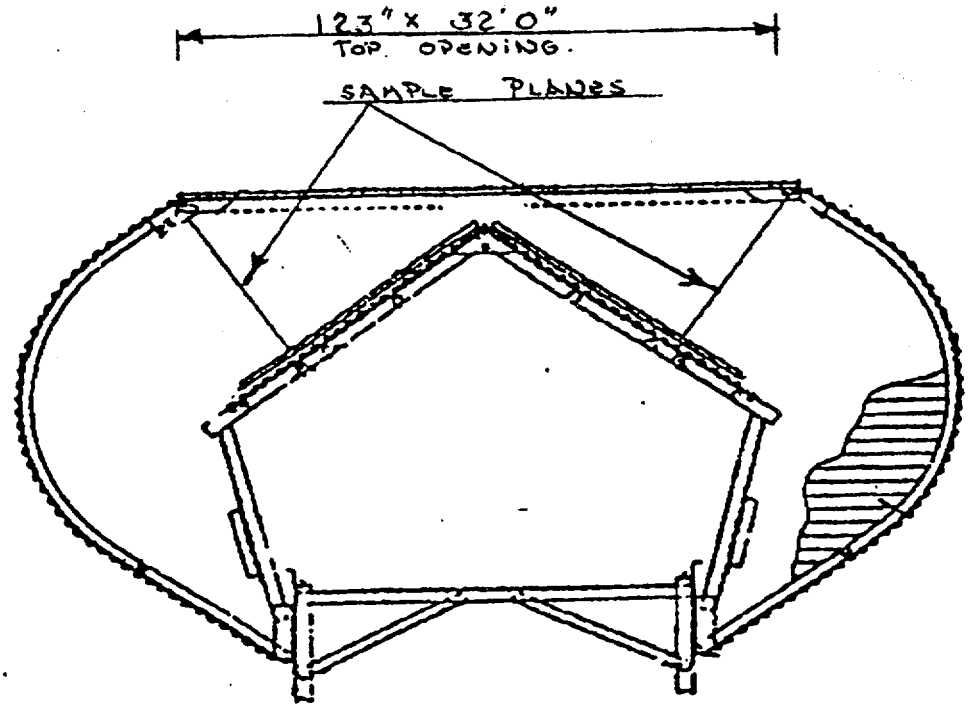
SAMPLING LOCATION DATA TABLE

Plant: Shieldalloy Metalurgical corporation
Location: Dept. III
Stack Identifiaction AAF BAghouse - Ridge Vent

SAMPLE POINT ID. SECTIONAL VIEW OF RIDGEVENT SHOWING SAMPLING PLANES

Date: 3/19/96 By: TERRY NOONAN

Sketch Sampling Locations - Show dimensions from bend, fan, etc. and cross-section of duct showing numbered traverse points.



CROSS SECTION VIEW OF RIDGE VENT

WILLIARD INC. NEBB CERT - 2635
Form - SLDT-001

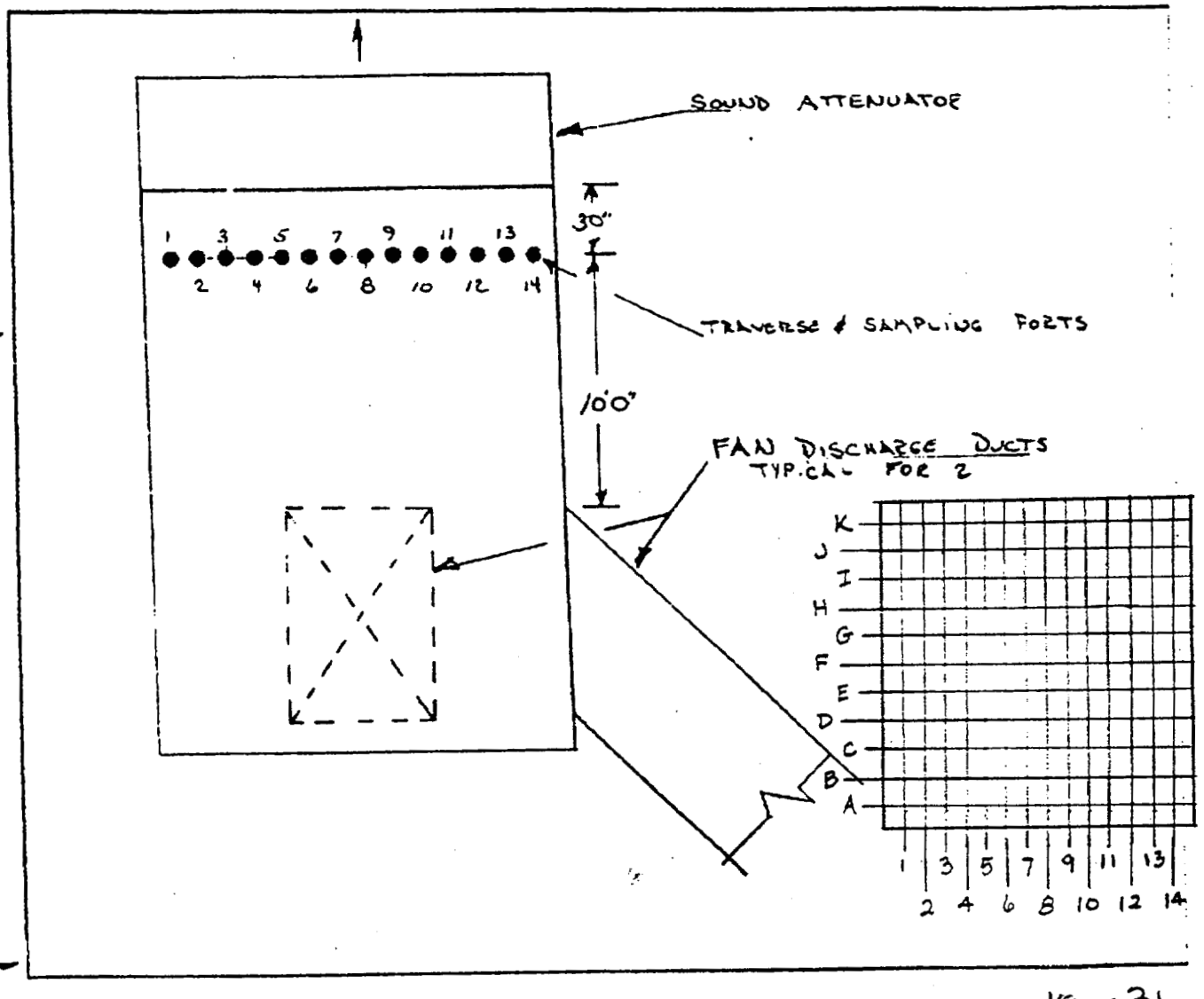
SAMPLING LOCATION DATA TABLE

Plant: Shieldalloy Metalurgical corporation
Location: Dept 111
Stack Identifiaction: Flex-Kleen Baghouse - Stack

SAMPLE POINT ID: DISCHARGE STACK

Date: 3/19/96 By: TERRY NOONAN

Sketch Sampling Locations - Show dimensions from bend, fan, etc, and cross-section of duct showing numbered traverse points



FLOW DATA SUMMARY TABLE

Filter ID. No.	Location	Point ID.	Probe Size (In. Dia.)	Probe Area (sq. Ft.)	Flow Rate Actual		Duration (Min.)	Total Volume Sampled (ACFM)	WB	DB	BP	Density	Correction Factor	Total Volume Sampled (SCFM)	Converted SCFM to SFPM	% Isokinetic Sample (Individual)	Design Flow FPM	Stack Actual Flow
					FPM	CFM												
1	Flex-Kleen Stack	J - 12	0.8516	0.004	3,650	14.60	15	219.00	57.1	70.7	30.3	0.076	1.0066	220.96	3,683	4.92%	3,479	208,747
2	Flex-Kleen Stack	H - 12	0.8516	0.004	3,363	13.45	15	201.78	57.4	72.1	30.3	0.075	1.0000	203.03	3,384	0.75%	3,338	208,747
3	Flex-Kleen Stack	K - 13	0.8516	0.004	3,568	14.27	15	214.08	58.8	69.0	30.3	0.076	1.0066	216.72	3,612	3.30%	3,454	208,747
	Total Volume Sampled					42.32		634.86						640.71				
5	AAF Baghouse	B - 1	2.141	0.025	850	21.25	15	318.75	74.1	87.3	30.3	0.073	0.9866	311.62	831	1.31%	839	108,896
6	AAF Baghouse	D - 1	2.141	0.025	860	21.50	15	322.50	83.7	93.8	30.3	0.072	0.9798	311.57	831	5.52%	815	108,896
7	AAF Baghouse	E - 1	2.141	0.025	828	20.70	15	310.50	76.8	99.0	30.3	0.072	0.9798	296.80	791	1.97%	812	108,896
8	AAF Baghouse	G - 3	2.141	0.025	831	20.78	15	311.63	61.8	76.5	30.2	0.075	1.0000	309.90	826	2.09%	814	108,896
9	AAF Baghouse	H - 1	2.141	0.025	850	21.25	15	318.75	62.2	79.9	30.2	0.074	0.9933	314.91	840	0.59%	845	108,896
10	AAF Baghouse	A - 10	2.141	0.025	815	20.38	15	305.63	62.0	73.2	30.2	0.075	1.0000	305.90	816	2.00%	799	108,896
11	AAF Baghouse	C - 8	2.141	0.025	799	19.98	15	299.63	62.9	70.1	30.2	0.076	1.0066	301.74	805	2.83%	777	108,896
12	AAF Baghouse	D - 8	2.141	0.025	838	20.95	15	314.25	60.0	72.0	30.2	0.075	1.0000	315.24	841	1.09%	829	108,896
14	AAF Baghouse	E - 8	2.141	0.025	838	20.95	15	314.25	61.0	77.6	30.3	0.075	1.0000	312.87	834	0.84%	831	108,896
	Total Volume Sampled					187.73		2,815.88						2,780.55				

RECTANGULAR DUCT TRAVERSE TEST REPORT

PROJECT: Shieldalloy Metallurgical Corp. Department 111

SYSTEM / UNIT: AAF Baghouse Fans

ZONE: Total Flow

Width: 84.00 " Height: 54.00 "	Duct Area	Required	Actual
	31.50 Sq Ft	Vel 3968 CFM 125000	Vel. 3457 CFM 108896

Position	1	2	3	4	5	6	7	8	9	10	11	12	13	14
1 >>>	3577	3477	3523	3229	3313	3339	3209	3329	2945					
2 >>>	3863	3729	3661	3795	3815	3624	3595	3527	3357					
3 >>>	3063	3564	3478	3661	3722	3537	3805	3647	3469					
4 >>>	2721	3261	3314	3517	3629	3637	3615	3696	3476					
5 >>>	2753	3461	3386	3577	3489	3475	3655	3707	3422					
6 >>>	2941	3320	3438	3381	3415	3661	3615	3783	3327					
7 >>>	3281	3177	3353	3527	3393	3753	3547	3782	3316					
8 >>>	3093	2959	3115	3476	3575	3639	3700	3501	3161					
9 >>>														
10 >>>														
11 >>>														
12 >>>														
13 >>>														
14 >>>														
15 >>>														
Subtotal	25292	26948	27268	28163	28351	28665	28744	28972	26473	0	0	0	0	0

Total FPM		Number of Readings	-	Average Velocity	x	Duct Area	-	CFM	Final SP
248873		72		3457		31.50		108896	-2.1910

Remarks: Flows taken with both fans operating on this duct run to baghouse. Also had two fans operating on Fleekleen stack.

Filename: IER14058-A See comments regarding fan operation on other system.

Test Date: Mar. 14, 1996

REV: 0

TAB REP-C-9-87

Readings by: TN / KE

RECTANGULAR DUCT TRAVERSE TEST REPORT

PROJECT: Shieldalloy Metallurgical Corp. Dept. 111

SYSTEM / UNIT: AAF Baghouse Fans

ZONE: Total Flow

Width: ____ " Height: ____ "	Duct Area	Required	Actual
	0.00 Sq Ft	Vel. 0 CFM ____	Vel. 630 CFM 0

Position	1	2	3	4	5	6	7	8	9	10	11	12	13	14
A >>>	593	528	905	423				1007	337	799	504			
B >>>	839	316	777	201				707	257	668	195			
C >>>	847	360	804	283				777	300	789	633			
D >>>	815	539	888	509				829	598	678	405			
E >>>	812	489	820	510				831	380	920	467			
F >>>	769	619	697	630				755	572	924	454			
G >>>	734	416	814	513				858	669	868	619			
H >>>	845	375	897	405				845	375	897	405			
J >>>														
K >>>														
L >>>														
M >>>														
N >>>														
P >>>														
Q >>>														
Subtotal	6254	3642	6602	3474	0	0	0	6609	3488	6543	3682	0	0	0

Total FPM	/	Number of Readings	=	Average Velocity	x	Duct Area	=	CFM	Final SP
40294		64		630		0.00		0	

Remarks: Flows taken with both fans operating on this baghouse. Also had two fans operating on FlexKleen stack.

Filename: IER140587-E

NOTE that the inlet dampers on FlexKleen Stack fans were not oper at time of readings.

Test Date: Mar. 18, 1996

Sample locations are outlined.

REV: 0

Readings by: ____

WILLIARD INC. NEBB CERT. - 2635
Form - STTR-001

RECTANGULAR DUCT TRAVERSE TEST REPORT

PROJECT: Shieldalloy Metallurgical Corp. Dept. 111 SYSTEM / UNIT: FlexKleen Stack ZONE: Total Flow

Width: 94.00 " Height: 94.00 "	Duct Area					Required					Actual			
	61.36 Sq Ft					Vel. 3259 CFM 200000					Vel. 3402 CFM 208747			
Position	1	2	3	4	5	6	7	8	9	10	11	12	13	14
A >>>	3089	3556	3115	3147	3169	2867	2779	2558	2792	2570	2639	1811	688	843
B >>>	3785	3201	3143	3568	3464	2989	2654	2584	2567	2846	2826	2423	1991	232
C >>>	3936	3523	3705	3681	3789	3283	3015	2602	2781	2932	2557	2281	1906	798
D >>>	4105	3535	4062	3878	3996	3870	3839	3423	2843	2266	2975	2092	1501	992
E >>>	4241	3872	3969	4282	4205	3824	3920	3428	3241	3027	2918	2496	2128	1799
F >>>	4288	4352	4318	4361	4034	3832	3986	3497	3232	3423	3299	2753	2033	2048
G >>>	4571	4293	4354	4373	4258	4141	3972	3836	3781	3258	3518	2872	2923	2092
H >>>	5005	4448	4488	4300	4246	3979	3976	4107	3749	3643	3582	3338	3025	2471
J >>>	4468	4676	4673	4581	4198	3812	4150	3785	3645	3672	3649	3479	3260	3247
K >>>	4458	4686	4873	4686	4609	4372	4522	4388	4198	3965	3963	3980	3454	3395
L >>>														
M >>>														
N >>>														
P >>>														
Q >>>														
Subtotal	41946	40142	40700	40857	39968	36969	36813	34208	32829	31602	31926	27525	22909	17917

Total FPM	/	Number of Readings	=	Average Velocity	x	Duct Area	=	CFM	Final SP
476311		140		3402		61.36		208747	0.9116

Remarks: Flows taken with both fans operating on this duct run fron FlexKleen stack. Also had two fnas operating on AAF Baghouse Ridgevent.

Filename: IER14058-C Inlet dampers open on both fans.

Test Date: Mar. 18, 1996 Sample points are outlined.

REV: 0 Readings by:

WILLIARD INC. NEBB CERT. - 2635
Form - STTR-001

PARTICLE EMISSION SUMMARY TABLE

Filter ID No.	Location	Point ID.	Lab Test Weights		Actual Weight Diff. (mg.)	Corrected* Weight Difference (mg.)	Prorated Washing Test Weignt (mg.)	Total Particle Concentration (mg.)	Particle Concentration (mg / CFM)	Total Particle Emission (mg / CFM)	Total Particle Emission (gr / Hr)
			Pre-test (mg.)	Post-test (mg.)							
1	Flex-Kleen Stack	J - 12	3,614.90	3,538.80	(76.10)	3,614.900	0.033	0.033	0.0002	41.750	2.51
2	Flex-Kleen Stack	H - 12	3,561.50	3,542.10	(19.40)	3,561.500	0.033	0.033	0.0002	41.750	2.51
3	Flex-Kleen Stack	K - 13	3,700.20	3,679.80	(20.40)	3,700.200	0.033	0.033	0.0002	41.750	2.51
4	NOT USED	--	3,688.80								
5	AAF Baghouse	B - 1	3,605.80	3,592.70	(13.10)	3,605.800	2.870	2.870	0.0090	980.060	58.8
6	AAF Baghouse	D - 1	3,601.00	3,592.00	(9.00)	3,601.000	2.870	2.870	0.0089	969.170	58.15
7	AAF Baghouse	E - 1	3,684.00	3,675.50	(8.50)	3,684.000	2.870	2.870	0.0092	1,001.840	60.11
8	AAF Baghouse	G - 3	3,621.70	3,614.20	(7.50)	3,621.700	0.417	0.834	0.0027	294.020	17.64
9	AAF Baghouse	H - 1	3,568.00	3,544.10	(23.90)	3,568.000	0.417	0.834	0.0026	283.130	16.99
10	AAF Baghouse	A - 10	3,683.40	3,679.40	(4.00)	3,683.400	0.417	0.834	0.0027	294.020	17.64
11	AAF Baghouse	C - 8	3,663.00	3,665.80	2.80	3,676.800	3.217	3.634	0.0121	1,317.640	79.06
12	AAF Baghouse	D - 8	3,637.50	3,660.80	23.30	3,671.800	23.717	24.134	0.0768	8,363.210	501.79
13	NOT USED	--									
14	AAF Baghouse	E - 8	3,653.54	3,655.00	1.46	3,666.000	1.877	2.294	0.0073	794.940	47.7
15	NOT USED	--	3,610.80	3,609.70	(1.10)						
16	NOT USED	--	3,645.80	3,643.70	(2.10)						
17	NOT USED	--	3,701.10	3,700.70	(0.40)						
18	Test Blank TB - 1	--	3,604.00	3,598.70	(5.30)						
19	Test Blank TB - 2	--	3,622.00	3,612.00	(10.00)						
20	Test Blank TB - 3	--	3,668.80	3,655.90	(12.90)						
Jar #1	Filters # 1 - 3	--	81,626.00	81,627.30	1.30	0.100					
Jar #2	Blank	--	83,458.10	83,459.30	1.20						
Jar #4	Filters # 5 - 7	--	82,477.90	82,487.70	9.80	8.600					
Jar #5	Filters # 8 - 14	--	81,087.40	81,091.10	3.70	2.500					

* - Corrected Weight = Actual Weight + Average Weight lost through filters 1 through 3 and filters 5 through 10

WILLIARD INC. NEBB CERT. - 2635
Form - PEST-001

SAMPLE TEST POINT DATA

SAMPLE POINT LOCATION		Test Blank	
SAMPLE POINT ID.		None	(TB - 1)
TEST DATE		March 26, 1996	
Sample tube size (In. dia.)		2.1410	" I.D.
Area of tube - (sq. ft.)		0.0250	sq. ft.
FLOW RATE -	Required	830	(FPM)
	Actual	831	(FPM)
Sample duration - Minutes		15	
Orfice Tube Diff. Pressure	Required	1.305	(In. W.C.)
	Actual	1.310	(In. W.C.)
	Dry Bulb	68.3	(deg. F.)
	Wet Bulb	65.4	(deg. F.)
Barometric Pressure		30.2	(In. Hg..)
Filter ID. No.		# 18	
Pre-test Weight - Lab		3,604.0	(mg.)
Pre-test Weight - Field		*	(mg.)
Post-test Weight - Field		*	(mg.)
Solvent Washings ID. No.		None	
Amount		None	(ml.)

Remarks Test for filter only - No samples taken.
Test run in electrical room near Flex-Kleen stack with open probe

* - Field weights not available due to wind and environmental conditions.

SAMPLE TEST POINT DATA

SAMPLE POINT LOCATION		Test Blank	
SAMPLE POINT ID.		None	(TB - 2)
TEST DATE		March 26, 1996	
Sample tube size (In. dia.)		2.1410	" I.D.
Area of tube - (sq. ft.)		0.0250	sq. ft.
FLOW RATE -	Required	–	(FPM)
	Actual	1.35	(CFM)
Sample duration - Minutes		5	
Orfice Tube Diff. Pressure	Required	–	(In. W.C.)
	Actual	0.0096	(In. W.C.)
	Dry Bulb	–	(deg. F.)
	Wet Bulb	–	(deg. F.)
Barometric Pressure		–	(In. Hg..)
Filter ID. No.		# 19	
Pre-test Weight - Lab		3,622.0	(mg.)
Pre-test Weight - Field		*	(mg.)
Post-test Weight - Field		*	(mg.)
Solvent Washings ID. No.		None	
Amount		None	(ml.)

Remarks Test run for filter blank & leakage check per ASTM - D 4536-91 Step # 10.8.3
Tube capped to prevent flow
Leakage rate is 1.35 CFM at - 28.5" W.C. pressure in housing/nozzle assembly.
* - Field weights not available due to wind and environmental conditions.

SAMPLE TEST POINT DATA

SAMPLE POINT LOCATION		Test Blank	
SAMPLE POINT ID.		None	(TB - 3)
TEST DATE		March 26, 1996	
Sample tube size (In. dia.)		0.8516	" I.D.
Area of tube - (sq. ft.)		0.0040	sq. ft.
FLOW RATE -	Required	--	(FPM)
	Actual	1.33	(CFM)
Sample duration - Minutes		5	
Orfice Tube Diff. Pressure	Required	--	(In. W.C.)
	Actual	0.0093	(In. W.C.)
	Dry Bulb	--	(deg. F.)
	Wet Bulb	--	(deg. F.)
Barometric Pressure		--	(In. Hg..)
Filter ID. No.		# 20	
Pre-test Weight - Lab		3,668.8	(mg.)
Pre-test Weight - Field		*	(mg.)
Post-test Weight - Field		*	(mg.)
Solvent Washings ID. No.		None	
Amount		None	(ml.)

Remarks Test run for filter blank & leakage check per ASTM - D 4536-91 Step # 10.8.3
Tube capped to prevent flow
Leakage rate = 1.33 CFM at - 27.43" W.C. in housing/nozzle assembly.
* - Field weights not available due to wind and environmental conditions.

SAMPLE TEST POINT DATA

SAMPLE POINT LOCATION		Flex-Kleen Stack	
SAMPLE POINT ID.		Stack J - 12 - #1	
TEST DATE		March 25, 1996	
Sample tube size (In. dia.)		0.8516	" I.D.
Area of tube - (sq. ft.)		0.0040	sq. ft.
FLOW RATE -	Required	3,479	(FPM)
	Actual	3,650	(FPM)
Sample duration - Minutes		15	
Orfice Tube Diff. Pressure	Required	1.015	(In. W.C.)
	Actual	1.120	(In. W.C.)
	Dry Bulb	70.7	(deg. F.)
	Wet Bulb	57.1	(deg. F.)
Barometric Pressure		30.3	(In. Hg..)
Filter ID. No.		#1	
Pre-test Weight - Lab		3,614.9	(mg.)
Pre-test Weight - Field		*	(mg.)
Post-test Weight - Field		*	(mg.)
Solvent Washings ID. No.		Jar #1	
Amount		60	(ml.)

Remarks Process in furnace with heat applied.
Total volume sampled = 14.60 CFM x 15 min. = 219.00 ACFM (220.96 SCFM)
* - Field weights not available due to wind and environmental conditions.

SAMPLE TEST POINT DATA

SAMPLE POINT LOCATION		Flex-Kleen Stack	
SAMPLE POINT ID.		Stack H - 12 - #2	
TEST DATE		March 25, 1996	
Sample tube size (In. dia.)		0.8516	" I.D.
Area of tube - (sq. ft.)		0.0040	sq. ft.
FLOW RATE -	Required	3,338	(FPM)
	Actual	3,363	(FPM)
Sample duration - Minutes		15	
Orfice Tube Diff. Pressure	Required	0.935	(In. W.C.)
	Actual	0.950	(In. W.C.)
	Dry Bulb	72.1	(deg. F.)
	Wet Bulb	57.4	(deg. F.)
Barometric Pressure		30.3	(In. Hg..)
Filter ID. No.		#2	
Pre-test Weight - Lab		3,561.5	(mg.)
Pre-test Weight - Field		*	(mg.)
Post-test Weight - Field		*	(mg.)
Solvent Washings ID. No.		Jar #1	
Amount		60	(ml.)

Remarks Process in furnace with heat applied.
Total volume sampled = 13.45 CFM x 15 min. = 201.78 ACFM - (203.03 SCFM)
* - Field weights not available due to wind and environmental conditions.

SAMPLE TEST POINT DATA

SAMPLE POINT LOCATION		Flex-Kleen Stack	
SAMPLE POINT ID.		Stack K - 13 - #3	
TEST DATE		March 25, 1996	
Sample tube size (In. dia.)		0.8516	" I.D.
Area of tube - (sq. ft.)		0.0040	sq. ft.
FLOW RATE -	Required	3,454	(FPM)
	Actual	3,568	(FPM)
Sample duration - Minutes		15	
Orfice Tube Diff. Pressure	Required	1.005	(In. W.C.)
	Actual	1.070	(In. W.C.)
	Dry Bulb	69.0	(deg. F.)
	Wet Bulb	58.8	(deg. F.)
Barometric Pressure		30.3	(In. Hg..)
Filter ID. No.		#3	
Pre-test Weight - Lab		3,700.2	(mg.)
Pre-test Weight - Field		*	(mg.)
Post-test Weight - Field		*	(mg.)
Solvent Washings ID. No.		Jar #1	
Amount		60	(ml.)

Remarks Process in furnace with heat applied (at end of heating process)
Total volume sampled = 14.27 CFM x 15 min. = 214.08 ACFM (216.72 SCFM)
* - Field weights not available due to wind and environmental conditions.

SAMPLE TEST POINT DATA

SAMPLE POINT LOCATION		AAF Baghouse - Ridgevent	
SAMPLE POINT ID.		Ridgevent - B - 1 (# 1)	
TEST DATE		March 25, 1996	
Sample tube size (In. dia.)		2.1410	" I.D.
Area of tube - (sq. ft.)		0.0250	sq. ft.
FLOW RATE -	Required	839	(FPM)
	Actual	850	(FPM)
Sample duration - Minutes		15	
Orfice Tube Diff. Pressure	Required	2.310	(In. W.C.)
	Actual	2.370	(In. W.C.)
	Dry Bulb	87.3	(deg. F.)
	Wet Bulb	74.1	(deg. F.)
Barometric Pressure		30.3	(In. Hg..)
Filter ID. No.		# 5	
Pre-test Weight - Lab		3,605.8	(mg.)
Pre-test Weight - Field		*	(mg.)
Post-test Weight - Field		*	(mg.)
Solvent Washings ID. No.		Jar # 4	
Amount		60	(ml.)

Remarks Process in furnace prior to heat being applied.
Total volume sampled = 21.25 CFM x 15 min. = 318.75 ACFM (311.62 SCFM)
* - Field weights not available due to wind and environmental conditions.

SAMPLE TEST POINT DATA

SAMPLE POINT LOCATION		AAF Baghouse - Ridgevent	
SAMPLE POINT ID.		Ridgevent - D - 1 (# 2)	
TEST DATE		March 25, 1996	
Sample tube size (In. dia.)		2.1410	" I.D.
Area of tube - (sq. ft.)		0.0250	sq. ft.
FLOW RATE -	Required	815	(FPM)
	Actual	860	(FPM)
Sample duration - Minutes		15	
Orfice Tube Diff. Pressure	Required	2.180	(In. W.C.)
	Actual	2.430	(In. W.C.)
	Dry Bulb	93.8	(deg. F.)
	Wet Bulb	83.7	(deg. F.)
Barometric Pressure		30.3	(In. Hg..)
Filter ID. No.		# 6	
Pre-test Weight - Lab		3,601.0	(mg.)
Pre-test Weight - Field		*	(mg.)
Post-test Weight - Field		*	(mg.)
Solvent Washings ID. No.		Jar # 4	
Amount		60	(ml.)

Remarks Process being fired during sampling process.
Total volume sampled = 21.5 CFM x 15 min = 322.5 ACFM (311.57 SCFM)
* - Field weights not available due to wind and environmental conditions.

SAMPLE TEST POINT DATA

SAMPLE POINT LOCATION		AAF Baghouse - Ridgevent	
SAMPLE POINT ID.		Ridgevent - E - 1 (# 3)	
TEST DATE		March 25, 1996	
Sample tube size (In. dia.)		2.1410	" I.D.
Area of tube - (sq. ft.)		0.0250	sq. ft.
FLOW RATE -	Required	812	(FPM)
	Actual	828	(FPM)
Sample duration - Minutes		15	
Orfice Tube Diff. Pressure	Required	2.170	(In. W.C.)
	Actual	2.250	(In. W.C.)
	Dry Bulb	99.0	(deg. F.)
	Wet Bulb	76.8	(deg. F.)
Barometric Pressure		30.3	(In. Hg..)
Filter ID. No.		# 7	
Pre-test Weight - Lab		3,684.0	(mg.)
Pre-test Weight - Field		*	(mg.)
Post-test Weight - Field		*	(mg.)
Solvent Washings ID. No.		Jar # 4	
Amount		60	(ml.)

Remarks Process beuing fired during sampling

Total volume sampled = 20.7 CFM x 15 min. = 310.5 ACFM (296.8 SCFM)

* - Field weights not available due to wind and environmental conditions.

SAMPLE TEST POINT DATA

SAMPLE POINT LOCATION		AAF Baghouse - Ridgevent	
SAMPLE POINT ID.		Ridgevent - G - 3 (#4)	
TEST DATE		March 26, 1996	
Sample tube size (In. dia.)		2.1410	" I.D.
Area of tube - (sq. ft.)		0.0250	sq. ft.
FLOW RATE -	Required	814	(FPM)
	Actual	831	(FPM)
Sample duration - Minutes		15	
Orfice Tube Diff. Pressure	Required	2.175	(In. W.C.)
	Actual	2.265	(In. W.C.)
	Dry Bulb	76.5	(deg. F.)
	Wet Bulb	61.8	(deg. F.)
Barometric Pressure		30.2	(In. Hg..)
Filter ID. No.		#8	
Pre-test Weight - Lab		3,621.7	(mg.)
Pre-test Weight - Field		*	(mg.)
Post-test Weight - Field		*	(mg.)
Solvent Washings ID. No.			
Amount			(ml.)

Remarks

Total volume sampled =

* - Field weights not available due to wind and environmental conditions.

SAMPLE TEST POINT DATA

SAMPLE POINT LOCATION		AAF Baghouse - Ridgevent	
SAMPLE POINT ID.		Ridgevent - H - 1 (# 5)	
TEST DATE		March 26, 1996	
Sample tube size (In. dia.)		2.1410	" I.D.
Area of tube - (sq. ft.)		0.0250	sq. ft.
FLOW RATE -	Required	845	(FPM)
	Actual	850	(FPM)
Sample duration - Minutes		15	
Orfice Tube Diff. Pressure	Required	2.345	(In. W.C.)
	Actual	2.370	(In. W.C.)
	Dry Bulb	79.9	(deg. F.)
	Wet Bulb	62.2	(deg. F.)
Barometric Pressure		30.2	(In. Hg..)
Filter ID. No.		# 9	
Pre-test Weight - Lab		3,568.6	(mg.)
Pre-test Weight - Field		*	(mg.)
Post-test Weight - Field		*	(mg.)
Solvent Washings ID. No.		Jar # 5	
Amount		60	(ml.)

Remarks Process in furnace - no heat applied during sampling.
Total volume sampled = 21.25 CFM x 15 min. = 318.75 ACFM (314.91 SCFM)
* - Field weights not available due to wind and environmental conditions.

SAMPLE TEST POINT DATA

SAMPLE POINT LOCATION		AAF Baghouse - Ridgevent	
SAMPLE POINT ID.		Ridgevent - A - 10 (#6)	
TEST DATE		March 26, 1996	
Sample tube size (In. dia.)		2.1410	" I.D.
Area of tube - (sq. ft.)		0.0250	sq. ft.
FLOW RATE -	Required	799	(FPM)
	Actual	815	(FPM)
Sample duration - Minutes		15	
Orfice Tube Diff. Pressure	Required	2.095	(In. W.C.)
	Actual	2.180	(In. W.C.)
	Dry Bulb	73.2	(deg. F.)
	Wet Bulb	62.0	(deg. F.)
Barometric Pressure		30.2	(In. Hg..)
Filter ID. No.		# 10	
Pre-test Weight - Lab		3,683.4	(mg.)
Pre-test Weight - Field		*	(mg.)
Post-test Weight - Field		*	(mg.)
Solvent Washings ID. No.		Jar # 5	
Amount		60	(ml.)

Remarks Process in furnace with heat applied during sampling.
Total volume sampled = 20.38 CFM x 15 min. = 305.68 ACFM (305.9 SCFM)
* - Field weights not available due to wind and environmental conditions.

SAMPLE TEST POINT DATA

SAMPLE POINT LOCATION		AAF Baghouse - Ridgevent	
SAMPLE POINT ID.		Ridgevent - C - 8 (# 7)	
TEST DATE		March 26, 1996	
Sample tube size (In. dia.)		2.1410	" I.D.
Area of tube - (sq. ft.)		0.0250	sq. ft.
FLOW RATE -	Required	777	(FPM)
	Actual	799	(FPM)
Sample duration - Minutes		15	
Orfice Tube Diff. Pressure	Required	1.980	(In. W.C.)
	Actual	2.095	(In. W.C.)
	Dry Bulb	70.1	(deg. F.)
	Wet Bulb	62.9	(deg. F.)
Barometric Pressure		30.2	(In. Hg..)
Filter ID. No.		# 11	
Pre-test Weight - Lab		3,663.0	(mg.)
Pre-test Weight - Field		*	(mg.)
Post-test Weight - Field		*	(mg.)
Solvent Washings ID. No.		Jar # 5	
Amount		60	(ml.)

Remarks Process in furnace with heat applied during sampling.
Total volume sampled = 19.98 CFM x 15 min. = 299.63 ACFM (301.74 SCFM)
* - Field weights not available due to wind and environmental conditions.

SAMPLE TEST POINT DATA

SAMPLE POINT LOCATION		AAF Baghouse - Ridgevent	
SAMPLE POINT ID.		Ridgevent - D - 8 (# 8)	
TEST DATE		March 26, 1996	
Sample tube size (In. dia.)		2.1410	" I.D.
Area of tube - (sq. ft.)		0.0250	sq. ft.
FLOW RATE -	Required	829	(FPM)
	Actual	838	(FPM)
Sample duration - Minutes		15	
Orfice Tube Diff. Pressure	Required	2.255	(In. W.C.)
	Actual	2.305	(In. W.C.)
	Dry Bulb	72.0	(deg. F.)
	Wet Bulb	60.0	(deg. F.)
Barometric Pressure		30.2	(In. Hg..)
Filter ID. No.		# 12	
Pre-test Weight - Lab		3,637.5	(mg.)
Pre-test Weight - Field		*	(mg.)
Post-test Weight - Field		*	(mg.)
Solvent Washings ID. No.		Jar # 5	
Amount		60	(ml.)

Remarks Process in furnace with heat applied during sampling.
Total volume sampled = 20.95 CFM x 15 min. = 314.25 ACFM (315.24 SCFM)
* - Field weights not available due to wind and environmental conditions.

SAMPLE TEST POINT DATA

SAMPLE POINT LOCATION		AAF Baghouse - Ridgevent	
SAMPLE POINT ID.		Ridgevent - E - 8 (# 9)	
TEST DATE		March 26, 1996	
Sample tube size (In. dia.)		2.1410	" I.D.
Area of tube - (sq. ft.)		0.0250	sq. ft.
FLOW RATE -	Required	831	(FPM)
	Actual	838	(FPM)
Sample duration - Minutes		15	
Orfice Tube Diff. Pressure	Required	2.265	(In. W.C.)
	Actual	2.305	(In. W.C.)
	Dry Bulb	77.6	(deg. F.)
	Wet Bulb	61.0	(deg. F.)
Barometric Pressure		30.2	(In. Hg..)
Filter ID. No.		# 14	
Pre-test Weight - Lab		3,653.5	(mg.)
Pre-test Weight - Field		*	(mg.)
Post-test Weight - Field		*	(mg.)
Solvent Washings ID. No.		Jar # 5	
Amount		60	(ml.)

Remarks Process in furnace with heat applied durnig sampling.
Total volume sampled = 20.95 CFM x 15 min. = 314.25 ACFM (312.87 SCFM)
* - Field weights not available due to wind and environmental conditions.

SAMPLE TEST POINT DATA

SAMPLE POINT LOCATION		AAF Baghouse - Ridgevent	
SAMPLE POINT ID.		Ridgevent - H - 8 (# 10)	
TEST DATE		March 26, 1996	
Sample tube size (In. dia.)		2.1410	" I.D.
Area of tube - (sq. ft.)		0.0250	sq. ft.
FLOW RATE -	Required	845	(FPM)
	Actual	--	(FPM)
Sample duration - Minutes		15	
Orfice Tube Diff. Pressure	Required	2.345	(In. W.C.)
	Actual	--	(In. W.C.)
	Dry Bulb	--	(deg. F.)
	Wet Bulb	--	(deg. F.)
Barometric Pressure		--	(In. Hg..)
Filter ID. No.		No Filter	
Pre-test Weight - Lab		--	(mg.)
Pre-test Weight - Field		*	(mg.)
Post-test Weight - Field		*	(mg.)
Solvent Washings ID. No.		--	
Amount		--	(ml.)

Remarks No sample taken at this point
Hydaulic leak developed in lift preventing access to this test point.
Process run completed before repairs could be accomplished.
* - Field weights not available due to wind and environmental conditions.

LOCKHEED MARTIN

Lockheed Analytical Services

IEM, INC.

ANALYTICAL DATA REPORT

FOR

THORIUM ISOTOPIC, URANIUM ISOTOPIC,
GAMMA SPECTROMETRY, AND
GROSS ALPHA/BETA

LOG-IN NUMBER: L6871

QUOTATION NUMBER: Q610751

DOCUMENT FILE NUMBER: 0422574A

COPY

Lockheed Environmental Systems & Technologies Co.
Lockheed Analytical Services
975 Kelly Johnson Drive Las Vegas, Nevada 89119-3705
Telephone 702-361-0220 800-582-7605 Facsimile 702-361-8146

LOCKHEED MARTIN

May 20, 1996

Ms. Carol Berger
IEM, Inc.
1680 East Gude Dr., Suite 305
Rockville, MD 20850

RE: Log-in No: L6871
Quotation No: Q610751
Document File No: 0422574A

The attached data report contains the analytical results of samples that were submitted to Lockheed Analytical Services on 22 April 1996. The temperature of the box upon receipt was 20°C. The sample containers agreed with the chain-of-custody documentation. All sample containers were received intact. Samples were received in time to meet the analytical holding time requirements. All discrepancies (if applicable) identified upon receipt of the samples have been forwarded to the client and are documented in the enclosed chain-of-custody records. (See attached Sample Receiving Checklist for details).

The case narratives included in the following attachments provide a detailed description of all events that occurred during sample preparation, analysis, and data review specific to the samples and analytical methods requested.

A list of data qualifiers, chain-of-custody forms, sample receiving checklist, and log-in report are also enclosed representing the samples received within this group.

If you have any questions concerning the analysis or the data please call Karen Germann at (702) 361-3955, ext 289. If you are unable to contact the Client Services Representative, please call Mary B. Ford, Client Services Manager, at extension 326.

Release of this data report has been authorized by the Laboratory Director or the Director's designee as evidenced by the following signature.

Sincerely,

Karen Germann

Karen Germann
Client Services Representative

cc: Client Services
Document Control

CASE NARRATIVE
RADIOCHEMICAL ANALYSES

The routine calibration and quality control (QC) analyses performed for this batch include as applicable: instrument calibration, initial and continuing calibration verification, quench monitoring standards, instrument background analysis, method blanks, yield tracer, laboratory control samples, matrix spike samples, and duplicate samples.

Holding Time Requirements

All holding time requirements were met.

Alpha Spectrometry 1

Analytical Method Thorium Isotopic

The thorium isotopic analysis was performed using standard operating procedure (SOP), LAL-91-SOP-0108. The samples were analyzed in workgroup 36346. The instrument calibration verification met criteria. The method blank was within QC criteria. The yield tracer recoveries were within QC criteria for all associated samples. The laboratory control sample (LCS) recovery was within QC criteria. The duplicate (DUP) recoveries were within QC criteria. The minimum detectable activity (MDA) of sample F-11 (L6871-10) for Th-228 was slightly greater than the reporting detection limit (RDL) of 0.5 pCi/smp. Data quality is not believed to be adversely affected. No re-analyses were performed.

Analytical Method Uranium Isotopic

The uranium isotopic analysis was performed using SOP, LAL-91-SOP-0108. The samples were analyzed in workgroups 36347, 36812, and 37009.

Workgroup 36347: The instrument calibration verification met criteria. The method blank was within QC criteria. The yield tracer recoveries were within QC criteria for all associated samples, with the exception of the method blank (36347MBB1), and samples F-6, F-7 and F-14 (L6871-5, 6, and 12). Since the method blank activity was well below the RDL, data quality is not believed to be adversely affected. The sample was flagged with a "Y" qualifier. Samples F-6, F-7 and F-14 (L6871-5, 6, and 12) were re-analyzed in workgroup 36812 due to the elevated chemical yields. The LCS recoveries were within QC criteria. The DUP recoveries were within QC criteria. No other re-analyses were performed.

Workgroup 36812: The samples were re-analyzed with workgroup 37009 due to out-of-limits DUP recoveries. No results from workgroup 36812 were reported.

Workgroup 37009: The instrument calibration verification met criteria. The method blank was within QC criteria. The uranium-233/4 and uranium-238 method blank results were greater than the MDA; since the method blank was within QC criteria, data quality is not believed to be adversely affected. The yield tracer recoveries were within QC criteria for all associated samples. The LCS recoveries were within QC criteria. Please note that no DUP was performed in this workgroup with the client samples. Data quality is not believed to be adversely affected. No re-analyses were performed.

Gamma Spectrometry

Analytical Method Gamma Spectrometry

The gamma spectrometry analysis was performed using SOP, LAL-91-SOP-0064. The samples were analyzed in workgroup 36344. The instrument calibration verification met criteria. The method blank was within QC criteria. The cobalt-60 (Co-60) LCS recovery was within QC criteria. The cesium-137 LCS recovery was out of QC criteria. Since the Co-60 LCS recovery was within limits, and since the sample results at worst would be only slightly biased, and because the daily calibration verification was acceptable, data quality is not believed to be adversely affected. Please note that no DUP was performed in this workgroup with the client samples. No re-analyses were performed.

Gas Proportional Counter

Analytical Method Gross Alpha/Beta

The gross alpha/beta analysis was performed using SOP, LAL-91-SOP-0061. The samples were analyzed in workgroup 36345. The instrument calibration verification met criteria. The method blank was within QC criteria. The LCS recoveries were within QC criteria. The DUP recoveries were within QC criteria. The MDA exceeded the RDL due to the residue weight limitations forcing a volume reduction. The associated samples were flagged with a "C" qualifier. No re-analyses were performed.

Yvonne M. Jacoby
Prepared By

May 20, 1996
Date

Lockheed Analytical Services

DATA QUALIFIERS FOR RADIOCHEMICAL ANALYSES

[Revised 04/05/96]

For Use on the Analytical Data Reporting Forms	
B	Any constituent that was detected in the associated method blank at a concentration was greater than the reporting detection limit (RDL).
C	The minimum detectable activity exceeded the RDL due to the residue weight limitations forcing a volume reduction.
D	Constituent detected in the diluted sample.
E	Constituent concentration exceeded the calibration or attenuation curve range.
F	*For Alpha Spectrometry Only--* Full width half max exceeded the acceptance limits.
H	Sample analysis performed outside of method-specified maximum holding time requirement.
Y	Chemical yield exceeded acceptance limits.
For Use on the QC Data Reporting Forms	
*	QC data (i.e., percent recovery data for laboratory control standard and matrix spike; and RPD for replicate analyses) exceeded acceptance limits.
a[1]	The spike recovery and/or RPD for matrix spike and duplicates cannot be evaluated due to insufficient spiking level compared to the elevated sample analyte concentration.
b[1]	The RPD cannot be computed because the sample and/or duplicate concentration was below the MDA.

[1] Used as foot note designations on the QC summary form.

LOCKHEED ANALYTICAL SERVICES
LOGIN CHAIN OF CUSTODY REPORT (ln01)
Apr 22 1996, 10:35 am

Login Number: L6871
Account: 574 IEM, Inc.
Project: IEM-FILTERS filters for rad analyses

Laboratory Sample Number	Client Sample Number	Collect Date	Receive Date	PR	Due Date
L6871-1	F-1	26-MAR-96	22-APR-96		13-MAY-96
temp 20					
Location: 157					
Filter 10 S GR ALP/BETA LAL-0061 Hold:22-SEP-96					
Filter 10 S TH-ISOTOPIC LAL-0108 Hold:22-SEP-96					
Filter 10 S U-ISOTOPIC LAL-0108 Hold:22-SEP-96					
L6871-2	F-2	26-MAR-96	22-APR-96		13-MAY-96
temp 20					
Location: 157					
Filter 10 S GR ALP/BETA LAL-0061 Hold:22-SEP-96					
Filter 10 S TH-ISOTOPIC LAL-0108 Hold:22-SEP-96					
Filter 10 S U-ISOTOPIC LAL-0108 Hold:22-SEP-96					
L6871-3	F-3	26-MAR-96	22-APR-96		13-MAY-96
temp 20					
Location: 157					
Filter 10 S GR ALP/BETA LAL-0061 Hold:22-SEP-96					
Filter 10 S TH-ISOTOPIC LAL-0108 Hold:22-SEP-96					
Filter 10 S U-ISOTOPIC LAL-0108 Hold:22-SEP-96					
L6871-4	F-5	26-MAR-96	22-APR-96		13-MAY-96
temp 20					
Location: 157					
Filter 10 S GR ALP/BETA LAL-0061 Hold:22-SEP-96					
Filter 10 S TH-ISOTOPIC LAL-0108 Hold:22-SEP-96					
Filter 10 S U-ISOTOPIC LAL-0108 Hold:22-SEP-96					
L6871-5	F-6	26-MAR-96	22-APR-96		13-MAY-96
temp 20					
Location: 157					
Filter 10 S GR ALP/BETA LAL-0061 Hold:22-SEP-96					
Filter 10 S TH-ISOTOPIC LAL-0108 Hold:22-SEP-96					
Filter 10 S U-ISOTOPIC LAL-0108 Hold:22-SEP-96					
L6871-6	F-7	26-MAR-96	22-APR-96		13-MAY-96
temp 20					
Location: 157					
Filter 10 S GR ALP/BETA LAL-0061 Hold:22-SEP-96					
Filter 10 S TH-ISOTOPIC LAL-0108 Hold:22-SEP-96					
Filter 10 S U-ISOTOPIC LAL-0108 Hold:22-SEP-96					

(40) 574A

LOCKHEED ANALYTICAL SERVICES
LOGIN CHAIN OF CUSTODY REPORT (ln01)
Apr 22 1996, 10:35 am

Login Number: L6871
Account: 574 IEM, Inc.
Project: IEM-FILTERS filters for rad analyses

Laboratory Sample Number	Client Sample Number	Collect Date	Receive Date	PR	Due Date
L6871-7	F-8	26-MAR-96	22-APR-96		13-MAY-96
temp 20					
Location: 157					
Filter 10 S GR ALP/BETA LAL-0061 Hold:22-SEP-96					
Filter 10 S TH-ISOTOPIC LAL-0108 Hold:22-SEP-96					
Filter 10 S U-ISOTOPIC LAL-0108 Hold:22-SEP-96					
L6871-8	F-9	26-MAR-96	22-APR-96		13-MAY-96
temp 20					
Location: 157					
Filter 10 S GR ALP/BETA LAL-0061 Hold:22-SEP-96					
Filter 10 S TH-ISOTOPIC LAL-0108 Hold:22-SEP-96					
Filter 10 S U-ISOTOPIC LAL-0108 Hold:22-SEP-96					
L6871-9	F-10	26-MAR-96	22-APR-96		13-MAY-96
temp 20					
Location: 157					
Filter 10 S GR ALP/BETA LAL-0061 Hold:22-SEP-96					
Filter 10 S TH-ISOTOPIC LAL-0108 Hold:22-SEP-96					
Filter 10 S U-ISOTOPIC LAL-0108 Hold:22-SEP-96					
L6871-10	F-11	26-MAR-96	22-APR-96		13-MAY-9
temp 20					
Location: 157					
Filter 10 S GR ALP/BETA LAL-0061 Hold:22-SEP-96					
Filter 10 S TH-ISOTOPIC LAL-0108 Hold:22-SEP-96					
Filter 10 S U-ISOTOPIC LAL-0108 Hold:22-SEP-96					
L6871-11	F-12	26-MAR-96	22-APR-96		13-MAY-9
temp 20					
Location: 157					
Filter 10 S GR ALP/BETA LAL-0061 Hold:22-SEP-96					
Filter 10 S TH-ISOTOPIC LAL-0108 Hold:22-SEP-96					
Filter 10 S U-ISOTOPIC LAL-0108 Hold:22-SEP-96					
L6871-12	F-14	26-MAR-96	22-APR-96		13-MAY-9
temp 20					
Location: 157					
Filter 10 S GR ALP/BETA LAL-0061 Hold:22-SEP-96					
Filter 10 S TH-ISOTOPIC LAL-0108 Hold:22-SEP-96					
Filter 10 S U-ISOTOPIC LAL-0108 Hold:22-SEP-96					

(+1) 3.74

LOCKHEED ANALYTICAL SERVICES
LOGIN CHAIN OF CUSTODY REPORT (ln01)
Apr 22 1996, 10:35 am

Login Number: L6871
Account: 574 IEM, Inc.
Project: IEM-FILTERS filters for rad analyses

Laboratory Sample Number	Client Sample Number	Collect Date	Receive Date	PR	Due Date
L6871-13	JAR#1	26-MAR-96	22-APR-96		13-MAY-96
temp 20					
Location: 157					
SolidWaste 8	S GAMMA SPEC LAL-0064	Hold:22-SEP-96			
L6871-14	JAR#4	26-MAR-96	22-APR-96		13-MAY-96
temp 20					
Location: 157					
SolidWaste 8	S GAMMA SPEC LAL-0064	Hold:22-SEP-96			
L6871-15	JAR#5	26-MAR-96	22-APR-96		13-MAY-96
temp 20					
Location: 157					
SolidWaste 8	S GAMMA SPEC LAL-0064	Hold:22-SEP-96			
L6871-16	REPORT TYPE	22-APR-96	22-APR-96		13-MAY-96
Location:					
Water 1	S GERMANN				
Water 1	S RAD RPT TYPE 2				

Signature: [illegible]

Date: 4-22-96

C4.3.3.74

Williard Inc.

Chain of Custody

L6871

Client Name: IEM. INC.

Date Sampled: 3/25-3/26

Technician: T.N.

Project #: IER-1405B

Material:

Sampling Location: SHIELDALLOY METALURGICAL CORP.
NEWFIELD, N.J.
DEPT. III STACKS.

Type of Sample: PARTICULATE ON FILTERS.

Sample No.	Cond.	Sample No.	Cond.	Sample No.	Cond.
F-1	GOOD	F-9	GOOD	JAR #1	GOOD
F-2	GOOD	F-10	GOOD	JAR #4	GOOD
F-3	GOOD	F-11	GOOD	JAR #5	GOOD.
F-5	GOOD	F-12	GOOD		
F-6	GOOD	F-14	GOOD		
F-7	GOOD				
F-8	GOOD				

ANALYSIS REQUIRED - JAR SAMPLES
GAMMA SPECTROSCOPY ---

ANALYSIS REQUIRED:
FILTERS ONLY
GROSS ALPHA/GROSS BETA
ISOTOPIC THORIUM
ISOTOPIC URANIUM

Total Number of Samples: 15

Results Reported To: Phone # By:

Report Sent To:

Samples Taken By:	TN	Signature:	Tony Nomad	Date:	3/26/96
Samples Transported By:	TN	Signature:	Tony Nomad	Date:	3/26/96
Relinquished By:	TN	Signature:	Tony Nomad	Date:	4/19/96
Received By:	MM	Signature:	M Miller	Date:	4-22-96
Relinquished By:		Signature:		Date:	
Received By:		Signature:		Date:	
Analyzed By:		Signature:		Date:	

Comments: PURCHASE ORDER CONTAINS REQUIRED ANALYSIS
PER PHONE CONVERSATION WITH KAREN GERMANN.
IEM - PO# 94005.05 - CONTACT - CAROL BERGER
@ 301-762-0502 / ALLAN DUFF. 423-531-9140

C-41 J 57

LOCKHEED MARTIN

Sample Login
Login Review Checklist

Lot Number LG471

The login review should be conducted by that person logging in the samples as well as a peer. Please use this checklist to ensure that such reviews occur in a *uniform* basis. Please sign and date below to verify that a login review has occurred. This checklist should be affixed to each login package prior to distribution.

For effective login review, at a minimum, five reports form the login process are required. These are the COC (or equivalent), the login COC report, the sample summary report, the sample receiving checklist, and the login quotation. Before beginning review, ensure that these five components are available. Jobs with single component samples, the sample summary report may be omitted.

SAMPLE SUMMARY REPORT	YES	NO	N/A	Comment
1. Are all sample ID's correct?	Y			
2. Are all samples present?	Y			
3. Are all matrices indicated correctly?	Y			
4. Are all analyses on the COC logged in for the appropriate samples?	Y			
5. Are all analyses logged in for the correct container?	Y			
6. Are samples logged in according to LAS batching procedures?	Y			

LOGIN CHAIN OF CUSTODY	YES	NO	N/A	Comment
1. Are the collect, receive, and due dates correct for every sample?	X			
2. Have all appropriate comments been indicated in the comment section?			X	

SAMPLE RECEIVING CHECKLIST	YES	NO	N/A	Comment
1. Are all discrepancies between the COC and the login noted (if applicable)?			X	

[signature] 4 22 96
primary review signature date

[signature] 4 22 96
secondary review signature date

C4225741

Lockheed Analytical Services
Sample Receiving Checklist

Client Name: IEM Job No. L6871 Cooler ID:

COOLER CONDITION UPON RECEIPT

Temperature of cooler upon receipt: 20°C samples received in a box

temperature of temp. blank upon receipt:

	Yes	No	* Comments/Discrepancies
custody seals intact	X		
chain of custody present	X		
blue ice (or equiv.) present/frozen		X	no ice
rad survey completed	X		

SAMPLE CONDITION UPON RECEIPT

	Yes	No	* Comments/Discrepancies
all bottles labeled	X		
samples intact	X		
proper container used for sample type	X		
sample volume sufficient for analysis	X		
proper pres. indicated on the COC	X		
VOA's contain headspace	~~X~~		
are samples bi-phasic (if so, indicate sample ID'S):			

MISCELLANEOUS ITEMS

	Yes	No	* Comments/Discrepancies
samples with short holding times		X	
samples to subcontract		X	

ADDITIONAL COMMENTS/DISCREPANCIES

Completed by / date: [illegible] 4-22-96

Sent to the client (date/initials): ** Client's signature upon receipt:

*Notes: * = contact the appropriate CSR of any discrepancies immediately upon receipt*

*** = please review this information and return via facsimile to the appropriate CSR (702) 361-8146*

version 2.0 (11/11/94)

Lockheed Analytical Laboratory
SAMPLE SUMMARY REPORT (su02)
IEM, Inc.

Client Sample Number	LAL Sample Number	SDG Number	Matrix	Method
F-1	L6871-1		Filter	GR ALP/BETA LAL-
	L6871-1		Filter	TH-ISOTOPIC LAL-
	L6871-1		Filter	U-ISOTOPIC LAL-C
F-10	L6871-9		Filter	GR ALP/BETA LAL-
	L6871-9		Filter	TH-ISOTOPIC LAL-
	L6871-9		Filter	U-ISOTOPIC LAL-C
F-11	L6871-10		Filter	GR ALP/BETA LAL-
	L6871-10		Filter	TH-ISOTOPIC LAL-
	L6871-10		Filter	U-ISOTOPIC LAL-C
F-12	L6871-11		Filter	GR ALP/BETA LAL-
	L6871-11		Filter	TH-ISOTOPIC LAL-
	L6871-11		Filter	U-ISOTOPIC LAL-C
F-14	L6871-12		Filter	GR ALP/BETA LAL-
	L6871-12		Filter	TH-ISOTOPIC LAL-
	L6871-12		Filter	U-ISOTOPIC LAL-C
F-2	L6871-2		Filter	GR ALP/BETA LAL-
	L6871-2		Filter	TH-ISOTOPIC LAL-
	L6871-2		Filter	U-ISOTOPIC LAL-C
F-3	L6871-3		Filter	GR ALP/BETA LAL-
	L6871-3		Filter	TH-ISOTOPIC LAL-
	L6871-3		Filter	U-ISOTOPIC LAL-C
F-5	L6871-4		Filter	GR ALP/BETA LAL-
	L6871-4		Filter	TH-ISOTOPIC LAL-
	L6871-4		Filter	U-ISOTOPIC LAL-C
F-6	L6871-5		Filter	GR ALP/BETA LAL-
	L6871-5		Filter	TH-ISOTOPIC LAL-
	L6871-5		Filter	U-ISOTOPIC LAL-C
F-7	L6871-6		Filter	GR ALP/BETA LAL-
	L6871-6		Filter	TH-ISOTOPIC LAL-
	L6871-6		Filter	U-ISOTOPIC LAL-C
F-8	L6871-7		Filter	GR ALP/BETA LAL-
	L6871-7		Filter	TH-ISOTOPIC LAL
	L6871-7		Filter	U-ISOTOPIC LAL-
F-9	L6871-8		Filter	GR ALP/BETA LAL
	L6871-8		Filter	TH-ISOTOPIC LAL
	L6871-8		Filter	U-ISOTOPIC LAL-
JAR#1	L6871-13		SolidWaste	GAMMA SPEC LAL-
JAR#4	L6871-14		SolidWaste	GAMMA SPEC LAL-
JAR#5	L6871-15		SolidWaste	GAMMA SPEC LAL-
REPORT TYPE	L6871-16		Water	GERMANN

C N7-0574

Lockheed Analytical Laboratory
SAMPLE SUMMARY REPORT (su02)
IEM, Inc.

Client Sample Number	LAL Sample Number	SDG Number	Matrix	Method
	L6871-16		Water	RAD RPT TYPE 2

CN 33741

LOCKHEED ANALYTICAL SERVICES

RADIOCHEMISTRY DATA REPORT
Account Name: IEM, Inc.
Project Name: IEM-FILTERS
Project Desc: filters for rad analyses

Client Sample ID: F-1
Date Collected: 26-MAR-96
Matrix: Filter

Login Number: L6871
Date Received: 22-APR-96

Constituent	Method	Batch	Activity	Error	MDA	Qualifier	Units	Analyzed	Lab ID
Gross Alpha	LAL-0061	36345	11.6	8.7	12.	C	pCi/smp	07-MAY-96	L6871-1
Gross Beta	LAL-0061	36345	635.	40.	11.	C	pCi/smp	07-MAY-96	L6871-1
Th-228	LAL-0108	36346	0.08	0.29	0.41		pCi/smp	07-MAY-96	L6871-1
Th-230	LAL-0108	36346	0.75	0.25	0.16		pCi/smp	07-MAY-96	L6871-1
Th-232	LAL-0108	36346	0.16	0.13	0.13		pCi/smp	07-MAY-96	L6871-1
U-233/4	LAL-0108	36347	2.91	0.43	0.12		pCi/smp	07-MAY-96	L6871-1
U-235	LAL-0108	36347	0.23	0.12	0.088		pCi/smp	07-MAY-96	L6871-1
U-238	LAL-0108	36347	19.4	1.4	0.12		pCi/smp	07-MAY-96	L6871-1

LOCKHEED ANALYTICAL SERVICES

RADIOCHEMISTRY DATA REPORT
Account Name: IEM, Inc.
Project Name: IEM-FILTERS
Project Desc: filters for rad analyses

Client Sample ID: F-2
Date Collected: 26-MAR-96
Matrix: Filter

Login Number: L6871
Date Received: 22-APR-96

Constituent	Method	Batch	Activity	Error	MDA	Qualifier	Units	Analyzed	Lab-ID
Gross Alpha	LAL-0061	36345	28.	12.	13.	C	pCi/smp	07-MAY-96	L6871-2
Gross Beta	LAL-0061	36345	31.7	8.5	11.	C	pCi/smp	07-MAY-96	L6871-2
Th-228	LAL-0108	36346	0.03	0.25	0.37		pCi/smp	07-MAY-96	L6871-2
Th-230	LAL-0108	36346	0.76	0.24	0.13		pCi/smp	07-MAY-96	L6871-2
Th-232	LAL-0108	36346	0.15	0.11	0.12		pCi/smp	07-MAY-96	L6871-2
U-233/4	LAL-0108	36347	0.83	0.25	0.15		pCi/smp	07-MAY-96	L6871-2
U-235	LAL-0108	36347	0.020	0.052	0.094		pCi/smp	07-MAY-96	L6871-2
U-238	LAL-0108	36347	1.08	0.28	0.11		pCi/smp	07-MAY-96	L6871-2

LOCKHEED ANALYTICAL SERVICES

RADIOCHEMISTRY DATA REPORT
Account Name: IEM, Inc.
Project Name: IEM-FILTERS
Project Desc: filters for rad analyses

Client Sample ID: F-3
Date Collected: 26-MAR-96
Matrix: Filter

Login Number: L6871
Date Received: 22-APR-96

Constituent	Method	Batch	Activity	Error	MDA	Qualifier	Units	Analyzed	Lab ID
Gross Alpha	LAL-0061	36345	12.4	8.9	12.	C	pCi/smp	07-MAY-96	L6871-3
Gross Beta	LAL-0061	36345	22.6	7.7	11.	C	pCi/smp	07-MAY-96	L6871-3
Th-228	LAL-0108	36346	0.15	0.23	0.31		pCi/smp	07-MAY-96	L6871-3
Th-230	LAL-0108	36346	0.57	0.19	0.096		pCi/smp	07-MAY-96	L6871-3
Th-232	LAL-0108	36346	0.19	0.11	0.086		pCi/smp	07-MAY-96	L6871-3
U-233/4	LAL-0108	36347	0.96	0.24	0.11		pCi/smp	07-MAY-96	L6871-3
U-235	LAL-0108	36347	0.141	0.097	0.088		pCi/smp	07-MAY-96	L6871-3
U-238	LAL-0108	36347	0.82	0.22	0.11		pCi/smp	07-MAY-96	L6871-3

LOCKHEED ANALYTICAL SERVICES

RADIOCHEMISTRY DATA REPORT
Account Name: IEM, Inc.
Project Name: IEM-FILTERS
Project Desc: filters for rad analyses

Client Sample ID: F-5
Date Collected: 26-MAR-96
Matrix: Filter

Login Number: L6871
Date Received: 22-APR-96

Constituent	Method	Batch	Activity	Error	MDA	Qualifier	Units	Analyzed	Lab ID
Gross Alpha	LAL-0061	36345	55.	16.	15.	C	pCi/smp	07-MAY-96	L6871-4
Gross Beta	LAL-0061	36345	769.	46.	11.	C	pCi/smp	07-MAY-96	L6871-4
Th-228	LAL-0108	36346	0.08	0.22	0.31		pCi/smp	07-MAY-96	L6871-4
Th-230	LAL-0108	36346	0.77	0.23	0.14		pCi/smp	07-MAY-96	L6871-4
Th-232	LAL-0108	36346	0.29	0.13	0.042		pCi/smp	07-MAY-96	L6871-4
U-233/4	LAL-0108	36347	7.49	0.78	0.16		pCi/smp	07-MAY-96	L6871-4
U-235	LAL-0108	36347	1.11	0.27	0.098		pCi/smp	07-MAY-96	L6871-4
U-238	LAL-0108	36347	50.2	3.1	0.098		pCi/smp	07-MAY-96	L6871-4

.OCKHEED ANALYTICAL SERVICES

ADIOCHEMISTRY DATA REPORT
.ccount Name: IEM, Inc.
'roject Name: IEM-FILTERS
'roject Desc: filters for rad analyses

:lient Sample ID: F-6
)ate Collected: 26-MAR-96
fatrix: Filter

Login Number: L6871
Date Received: 22-APR-96

Constituent	Method	Batch	Activity	Error	MDA	Qualifier	Units	Analyzed	Lab ID
Gross Alpha	LAL-0061	36345	108.	22.	13.	C	pCi/smp	07-MAY-96	L6871-5
Gross Beta	LAL-0061	36345	169.	16.	11.	C	pCi/smp	07-MAY-96	L6871-5
Th-228	LAL-0108	36346	0.15	0.27	0.36		pCi/smp	07-MAY-96	L6871-5
Th-230	LAL-0108	36346	0.71	0.23	0.15		pCi/smp	07-MAY-96	L6871-5
Th-232	LAL-0108	36346	0.24	0.14	0.13		pCi/smp	07-MAY-96	L6871-5
U-233/4	LAL-0108	37009	2.28	0.42	0.17		pCi/smp	16-MAY-96	L6871-5
U-235	LAL-0108	37009	0.31	0.16	0.12		pCi/smp	16-MAY-96	L6871-5
U-238	LAL-0108	37009	9.78	0.95	0.13		pCi/smp	16-MAY-96	L6871-5

LOCKHEED ANALYTICAL SERVICES

RADIOCHEMISTRY DATA REPORT
Account Name: IEM, Inc.
Project Name: IEM-FILTERS
Project Desc: filters for rad analyses

Client Sample ID: F-7
Date Collected: 26-MAR-96
Matrix: Filter

Login Number: L6871
Date Received: 22-APR-96

Constituent	Method	Batch	Activity	Error	MDA	Qualifier	Units	Analyzed	Lab ID
Gross Alpha	LAL-0061	36345	20.	10.	12.	C	pCi/smp	07-MAY-96	L6871-6
Gross Beta	LAL-0061	36345	24.8	8.0	11.	C	pCi/smp	07-MAY-96	L6871-6
Th-228	LAL-0108	36346	0.03	0.23	0.34		pCi/smp	07-MAY-96	L6871-6
Th-230	LAL-0108	36346	0.70	0.23	0.16		pCi/smp	07-MAY-96	L6871-6
Th-232	LAL-0108	36346	0.25	0.14	0.12		pCi/smp	07-MAY-96	L6871-6
U-233/4	LAL-0108	37009	0.97	0.23	0.12		pCi/smp	16-MAY-96	L6871-6
U-235	LAL-0108	37009	0.209	0.10	0.074		pCi/smp	16-MAY-96	L6871-6
U-238	LAL-0108	37009	1.04	0.23	0.090		pCi/smp	16-MAY-96	L6871-6

LOCKHEED ANALYTICAL SERVICES

RADIOCHEMISTRY DATA REPORT
Account Name: IEM, Inc.
Project Name: IEM-FILTERS
Project Desc: filters for rad analyses

Client Sample ID: F-8
Date Collected: 26-MAR-96
Matrix: Filter

Login Number: L6871
Date Received: 22-APR-96

Constituent	Method	Batch	Activity	Error	MDA	Qualifier	Units	Analyzed	Lab ID
Gross Alpha	LAL-0061	36345	9.0	8.9	14.	C	pCi/smp	07-MAY-96	L6871-7
Gross Beta	LAL-0061	36345	23.4	7.7	11.	C	pCi/smp	07-MAY-96	L6871-7
Th-228	LAL-0108	36346	0.14	0.24	0.33		pCi/smp	07-MAY-96	L6871-7
Th-230	LAL-0108	36346	0.65	0.22	0.12		pCi/smp	07-MAY-96	L6871-7
Th-232	LAL-0108	36346	0.17	0.11	0.083		pCi/smp	07-MAY-96	L6871-7
U-233/4	LAL-0108	36347	0.98	0.26	0.13		pCi/smp	07-MAY-96	L6871-7
U-235	LAL-0108	36347	0.110	0.093	0.098		pCi/smp	07-MAY-96	L6871-7
U-238	LAL-0108	36347	1.01	0.26	0.11		pCi/smp	07-MAY-96	L6871-7

LOCKHEED ANALYTICAL SERVICES

RADIOCHEMISTRY DATA REPORT
Account Name: IEM, Inc.
Project Name: IEM-FILTERS
Project Desc: filters for rad analyses

Client Sample ID: F-9
Date Collected: 26-MAR-96
Matrix: Filter

Login Number: L6871
Date Received: 22-APR-96

Constituent	Method	Batch	Activity	Error	MDA	Qualifier	Units	Analyzed	Lab ID
Gross Alpha	LAL-0061	36345	23.	12.	15.	C	pCi/smp	07-MAY-96	L6871-8
Gross Beta	LAL-0061	36345	29.5	8.1	11.	C	pCi/smp	07-MAY-96	L6871-8
Th-228	LAL-0108	36346	0.25	0.24	0.30		pCi/smp	07-MAY-96	L6871-8
Th-230	LAL-0108	36346	0.69	0.24	0.15		pCi/smp	07-MAY-96	L6871-8
Th-232	LAL-0108	36346	0.26	0.15	0.13		pCi/smp	07-MAY-96	L6871-8
U-233/4	LAL-0108	36347	1.12	0.27	0.13		pCi/smp	07-MAY-96	L6871-8
U-235	LAL-0108	36347	0.25	0.13	0.095		pCi/smp	07-MAY-96	L6871-8
U-238	LAL-0108	36347	1.05	0.26	0.13		pCi/smp	07-MAY-96	L6871-8

LOCKHEED ANALYTICAL SERVICES

RADIOCHEMISTRY DATA REPORT
Account Name: IEM, Inc.
Project Name: IEM-FILTERS
Project Desc: filters for rad analyses

Client Sample ID: F-10
Date Collected: 26-MAR-96
Matrix: Filter

Login Number: L6871
Date Received: 22-APR-96

Constituent	Method	Batch	Activity	Error	MDA	Qualifier	Units	Analyzed	Lab ID
Gross Alpha	LAL-0061	36345	18.	10.	13.	C	pCi/smp	07-MAY-96	L6871-9
Gross Beta	LAL-0061	36345	18.3	7.6	11.	C	pCi/smp	07-MAY-96	L6871-9
Th-228	LAL-0108	36346	0.43	0.31	0.37		pCi/smp	07-MAY-96	L6871-9
Th-230	LAL-0108	36346	0.56	0.25	0.22		pCi/smp	07-MAY-96	L6871-9
Th-232	LAL-0108	36346	0.22	0.15	0.14		pCi/smp	07-MAY-96	L6871-9
U-233/4	LAL-0108	36347	0.86	0.24	0.12		pCi/smp	07-MAY-96	L6871-9
U-235	LAL-0108	36347	0.071	0.069	0.072		pCi/smp	07-MAY-96	L6871-9
U-238	LAL-0108	36347	0.88	0.24	0.13		pCi/smp	07-MAY-96	L6871-9

LOCKHEED ANALYTICAL SERVICES

RADIOCHEMISTRY DATA REPORT
Account Name: IEM, Inc.
Project Name: IEM-FILTERS
Project Desc: filters for rad analyses

Client Sample ID: F-11
Date Collected: 26-MAR-96
Matrix: Filter

Login Number: L6871
Date Received: 22-APR-96

Constituent	Method	Batch	Activity	Error	MDA	Qualifier	Units	Analyzed	Lab ID
Gross Alpha	LAL-0061	36345	20.	11.	13.	C	pCi/smp	07-MAY-96	L6871-10
Gross Beta	LAL-0061	36345	33.8	8.4	11.	C	pCi/smp	07-MAY-96	L6871-10
Th-228	LAL-0108	36346	0.20	0.38	0.52		pCi/smp	07-MAY-96	L6871-10
Th-230	LAL-0108	36346	0.72	0.31	0.26		pCi/smp	07-MAY-96	L6871-10
Th-232	LAL-0108	36346	0.28	0.20	0.20		pCi/smp	07-MAY-96	L6871-10
U-233/4	LAL-0108	36347	0.57	0.20	0.14		pCi/smp	07-MAY-96	L6871-10
U-235	LAL-0108	36347	0.002	0.034	0.081		pCi/smp	07-MAY-96	L6871-10
U-238	LAL-0108	36347	1.02	0.25	0.11		pCi/smp	07-MAY-96	L6871-10

LOCKHEED ANALYTICAL SERVICES

RADIOCHEMISTRY DATA REPORT
Account Name: IEM, Inc.
Project Name: IEM-FILTERS
Project Desc: filters for rad analyses

Client Sample ID: F-12
Date Collected: 26-MAR-96
Matrix: Filter

Login Number: L6871
Date Received: 22-APR-96

Constituent	Method	Batch	Activity	Error	MDA	Qualifier	Units	Analyzed	Lab ID
Gross Alpha	LAL-0061	36345	74.	19.	14.	C	pCi/smp	07-MAY-96	L6871-11
Gross Beta	LAL-0061	36345	48.2	9.4	11.	C	pCi/smp	07-MAY-96	L6871-11
Th-228	LAL-0108	36346	0.21	0.27	0.36		pCi/smp	07-MAY-96	L6871-11
Th-230	LAL-0108	36346	0.85	0.26	0.17		pCi/smp	07-MAY-96	L6871-11
Th-232	LAL-0108	36346	0.23	0.14	0.13		pCi/smp	07-MAY-96	L6871-11
U-233/4	LAL-0108	36347	0.88	0.24	0.14		pCi/smp	07-MAY-96	L6871-11
U-235	LAL-0108	36347	0.055	0.068	0.090		pCi/smp	07-MAY-96	L6871-11
U-238	LAL-0108	36347	0.85	0.24	0.13		pCi/smp	07-MAY-96	L6871-11

LOCKHEED ANALYTICAL SERVICES

RADIOCHEMISTRY DATA REPORT
Account Name: IEM, Inc.
Project Name: IEM-FILTERS
Project Desc: filters for rad analyses

Client Sample ID: F-14
Date Collected: 26-MAR-96
Matrix: Filter

Login Number: L6871
Date Received: 22-APR-96

Constituent	Method	Batch	Activity	Error	MDA	Qualifier	Units	Analyzed	Lab ID
Gross Alpha	LAL-0061	36345	11.6	9.6	14.	C	pCi/smp	07-MAY-96	L6871-12
Gross Beta	LAL-0061	36345	23.9	7.7	11.	C	pCi/smp	07-MAY-96	L6871-12
Th-228	LAL-0108	36346	-0.05	0.29	0.44		pCi/smp	07-MAY-96	L6871-12
Th-230	LAL-0108	36346	0.63	0.25	0.19		pCi/smp	07-MAY-96	L6871-12
Th-232	LAL-0108	36346	0.18	0.14	0.15		pCi/smp	07-MAY-96	L6871-12
U-233/4	LAL-0108	37009	0.99	0.25	0.16		pCi/smp	16-MAY-96	L6871-12
U-235	LAL-0108	37009	0.138	0.092	0.083		pCi/smp	16-MAY-96	L6871-12
U-238	LAL-0108	37009	0.66	0.20	0.12		pCi/smp	16-MAY-96	L6871-12

LOCKHEED ANALYTICAL SERVICES

RADIOCHEMISTRY DATA REPORT
Account Name: IEM, Inc.
Project Name: IEM-FILTERS
Project Desc: filters for rad analyses

Client Sample ID: JAR#1
Date Collected: 26-MAR-96
Matrix: SolidWaste

Login Number: L6871
Date Received: 22-APR-96

Constituent	Method	Batch	Activity	Error	MDA	Qualifier	Units	Analyzed	Lab ID
Ac-228	LAL-0064	36344	-2.2	3.8	9.7		pCi/smp	03-MAY-96	L6871-13
Bi-214	LAL-0064	36344	8.7	4.1	4.7		pCi/smp	03-MAY-96	L6871-13
Co-57	LAL-0064	36344	-0.39	0.28	0.93		pCi/smp	03-MAY-96	L6871-13
Co-60	LAL-0064	36344	-1.24	0.69	2.8		pCi/smp	03-MAY-96	L6871-13
Cs-134	LAL-0064	36344	-0.23	0.68	2.2		pCi/smp	03-MAY-96	L6871-13
Cs-137	LAL-0064	36344	-0.6	1.3	2.4		pCi/smp	03-MAY-96	L6871-13
K-40	LAL-0064	36344	6.	23.	32.		pCi/smp	03-MAY-96	L6871-13
Pb-212	LAL-0064	36344	0.9	2.3	3.0		pCi/smp	03-MAY-96	L6871-13
Pb-214	LAL-0064	36344	4.4	3.0	4.0		pCi/smp	03-MAY-96	L6871-13
Th-234	LAL-0064	36344	-2.	13.	29.		pCi/smp	03-MAY-96	L6871-13
Tl-208	LAL-0064	36344	0.1	1.9	2.6		pCi/smp	03-MAY-96	L6871-13
U-235(GAMMA)	LAL-0064	36344	-0.3	5.8	8.1		pCi/smp	03-MAY-96	L6871-13

LOCKHEED ANALYTICAL SERVICES

RADIOCHEMISTRY DATA REPORT
Account Name: IEM, Inc.
Project Name: IEM-FILTERS
Project Desc: filters for rad analyses

Client Sample ID: JAR#4
Date Collected: 26-MAR-96
Matrix: SolidWaste

Login Number: L6871
Date Received: 22-APR-96

Constituent	Method	Batch	Activity	Error	MDA	Qualifier	Units	Analyzed	Lab ID
Ac-228	LAL-0064	36344	1.	4.1	7.0		pCi/smp	03-MAY-96	L6871-14
Bi-214	LAL-0064	36344	3.1	2.7	3.4		pCi/smp	03-MAY-96	L6871-14
Co-57	LAL-0064	36344	-0.09	0.51	0.88		pCi/smp	03-MAY-96	L6871-14
Co-60	LAL-0064	36344	-0.73	0.37	1.8		pCi/smp	03-MAY-96	L6871-14
Cs-134	LAL-0064	36344	0.17	0.61	1.3		pCi/smp	03-MAY-96	L6871-14
Cs-137	LAL-0064	36344	-0.50	0.81	1.5		pCi/smp	03-MAY-96	L6871-14
K-40	LAL-0064	36344	0	16.	24.		pCi/smp	03-MAY-96	L6871-14
Pb-212	LAL-0064	36344	1.	2.0	2.8		pCi/smp	03-MAY-96	L6871-14
Pb-214	LAL-0064	36344	-0.3	2.1	3.4		pCi/smp	03-MAY-96	L6871-14
Th-234	LAL-0064	36344	-2.	16.	48.		pCi/smp	03-MAY-96	L6871-14
Tl-208	LAL-0064	36344	0.3	1.3	1.8		pCi/smp	03-MAY-96	L6871-14
U-235(GAMMA)	LAL-0064	36344	0.3	5.4	7.6		pCi/smp	03-MAY-96	L6871-14

LOCKHEED ANALYTICAL SERVICES

RADIOCHEMISTRY DATA REPORT
Account Name: IEM, Inc.
Project Name: IEM-FILTERS
Project Desc: filters for rad analyses

Client Sample ID: JAR#5
Date Collected: 26-MAR-96
Matrix: SolidWaste

Login Number: L6871
Date Received: 22-APR-96

Constituent	Method	Batch	Activity	Error	MDA	Qualifier	Units	Analyzed	Lab ID
Ac-228	LAL-0064	36344	-0.3	4.0	7.1		pCi/smp	03-MAY-96	L6871-15
Bi-214	LAL-0064	36344	9.4	3.3	3.8		pCi/smp	03-MAY-96	L6871-15
Co-57	LAL-0064	36344	0.35	0.51	0.84		pCi/smp	03-MAY-96	L6871-15
Co-60	LAL-0064	36344	-0.42	0.52	1.8		pCi/smp	03-MAY-96	L6871-15
Cs-134	LAL-0064	36344	-0.08	0.65	1.4		pCi/smp	03-MAY-96	L6871-15
Cs-137	LAL-0064	36344	-0.36	0.85	1.5		pCi/smp	03-MAY-96	L6871-15
K-40	LAL-0064	36344	0	15.	23.		pCi/smp	03-MAY-96	L6871-15
Pb-212	LAL-0064	36344	-0.4	2.0	2.8		pCi/smp	03-MAY-96	L6871-15
Pb-214	LAL-0064	36344	5.7	2.4	3.2		pCi/smp	03-MAY-96	L6871-15
Th-234	LAL-0064	36344	-8.	36.	48.		pCi/smp	03-MAY-96	L6871-15
Tl-208	LAL-0064	36344	0.5	1.3	1.8		pCi/smp	03-MAY-96	L6871-15
U-235(GAMMA)	LAL-0064	36344	-5.8	3.9	7.5		pCi/smp	03-MAY-96	L6871-15

.OCKHEED ANALYTICAL SERVICES

ETHOD BLANK DATA SUMMARY

.ogin/SDG Number: L6871

Analyte	Batch ID	Date Analyzed	Prep ID	Ana ID	Inst ID	LAL ID	Acceptance Criteria	MBB Result	UNCTY 2 sigma	MDA	Units	Data Qual
Ac-228	36344	06-MAY-96	JH	DH	GAM-1	36344MBB1	20.	-4.05	3.93	10.1	pCi/smp	
Bi-214	36344	06-MAY-96	JH	DH	GAM-1	36344MBB1	7.0	-0.454	2.77	4.78	pCi/smp	
Co-57	36344	06-MAY-96	JH	DH	GAM-1	36344MBB1	2.0	0.129	0.694	0.846	pCi/smp	
Co-60	36344	06-MAY-96	JH	DH	GAM-1	36344MBB1	5.0	-0.756	1.00	2.42	pCi/smp	
Cs-134	36344	06-MAY-96	JH	DH	GAM-1	36344MBB1	3.0	-0.595	0.502	2.06	pCi/smp	
Cs-137	36344	06-MAY-96	JH	DH	GAM-1	36344MBB1	3.0	0.779	1.35	2.26	pCi/smp	
K-40	36344	06-MAY-96	JH	DH	GAM-1	36344MBB1	40.	0.244	18.9	28.0	pCi/smp	
Pb-212	36344	06-MAY-96	JH	DH	GAM-1	36344MBB1	5.0	1.74	2.30	2.94	pCi/smp	
Pb-214	36344	06-MAY-96	JH	DH	GAM-1	36344MBB1	7.0	0.718	2.70	3.95	pCi/smp	
Th-234	36344	06-MAY-96	JH	DH	GAM-1	36344MBB1	40.	-1.60	12.8	29.8	pCi/smp	
Tl-208	36344	06-MAY-96	JH	DH	GAM-1	36344MBB1	5.0	-0.410	1.81	2.59	pCi/smp	
U-235(GAMMA)	36344	06-MAY-96	JH	DH	GAM-1	36344MBB1	4.0	2.07	5.76	7.62	pCi/smp	
Gross Alpha	36345	07-MAY-96	JH	LV	LB1-A2	36345MBB1	2.0	-0.0355	0.111	0.261	pCi/smp	
Gross Beta	36345	07-MAY-96	JH	LV	LB1-A2	36345MBB1	4.0	-0.0191	0.286	0.511	pCi/smp	
Th-228	36346	07-MAY-96	SR	LV	AL1-18	36346MBB1	0.50	0.00997	0.0487	0.0706	pCi/smp	
Th-230	36346	07-MAY-96	SR	LV	AL1-18	36346MBB1	0.50	0.00483	0.0137	0.0239	pCi/smp	
Th-232	36346	07-MAY-96	SR	LV	AL1-18	36346MBB1	0.50	0.00332	0.0140	0.0255	pCi/smp	
U-233/4	36347	07-MAY-96	SR	LV	AL1-3	36347MBB1	0.50	0.0117	0.0154	0.0210	pCi/smp	Y
U-235	36347	07-MAY-96	SR	LV	AL1-3	36347MBB1	0.50	0.00473	0.00864	0.0139	pCi/smp	Y
U-238	36347	07-MAY-96	SR	LV	AL1-3	36347MBB1	0.50	0.00498	0.0148	0.0245	pCi/smp	Y
U-233/4	37009	16-MAY-96	SR,AW	CS	AL1-2	37009MBB1	0.50	0.0483	0.0255	0.0261	pCi/smp	
U-235	37009	16-MAY-96	SR,AW	CS	AL1-2	37009MBB1	0.50	0.00118	0.00766	0.0159	pCi/smp	
U-238	37009	16-MAY-96	SR,AW	CS	AL1-2	37009MBB1	0.50	0.0306	0.0185	0.0173	pCi/smp	

OCKHEED ANALYTICAL SERVICES

:S DATA SUMMARY

ɔgin/SDG Number: L6871

Analyte	Batch ID	Date Analyzed	Prep ID	Ana ID	Inst ID	LAL ID	LCS Result	UNCTY 2 Sigma	Known Value	UNCTY 2 Sigma	Units	% Rec	Data Qual	QC Limits
o-60	36344	03-MAY-96	JH	LV	GAM-1	36344LCS1	251.	21.1	218.	11.0	pCi/smp	115		80-120
s-137	36344	03-MAY-96	JH	LV	GAM-1	36344LCS1	248.	26.6	197.	10.0	pCi/smp	126	*	80-120
ross Alpha	36345	07-MAY-96	JH	LV	LB1-A3	36345LCS1	7.66	1.22	9.72	0.486	pCi/smp	79.0		70-130
ross Beta	36345	07-MAY-96	JH	LV	LB1-A3	36345LCS1	10.3	0.896	10.5	0.523	pCi/smp	99.0		70-130
h-232	36346	07-MAY-96	SR	LV	AL1-17	36346LCS1	6.05	0.412	5.42	0.271	pCi/smp	112		80-120
J-233/4	36347	07-MAY-96	SR	LV	AL1-2	36347LCS1	4.99	0.341	5.40	0.270	pCi/smp	92.0		80-120
J-238	36347	07-MAY-96	SR	LV	AL1-2	36347LCS1	5.24	0.354	5.39	0.269	pCi/smp	97.0		80-120
J-233/4	37009	16-MAY-96	SR,AW	CS	AL1-1	37009LCS1	5.20	0.350	5.40	0.270	pCi/smp	96.0		80-120
U-238	37009	16-MAY-96	SR,AW	CS	AL1-1	37009LCS1	5.46	0.364	5.39	0.269	pCi/smp	101		80-120

.OCKHEED ANALYTICAL SERVICES

UPLICATE DATA SUMMARY

.ogin/SDG Number: L6871

Analyte	Batch ID	Date Analyzed	Prep ID	Ana ID	Inst ID	Client ID	LAL ID	SMP Result	UNCTY 2 Sigma	DUP Result	UNCTY 2 Sigma	Units	RER	RPD	Data Qual	RPD Limit
Gross Alpha	36345	07-MAY-96	JH	LV	LB1-A4	F-1	L6871-1	11.6	8.69	27.9	12.1	pCi/smp	0.788	83		30
Gross Beta	36345	07-MAY-96	JH	LV	LB1-A4	F-1	L6871-1	635.	40.0	773.	46.8	pCi/smp	1.59	20		30
Th-228	36346	07-MAY-96	SR	LV	AL1-16	F-2	L6871-2	0.0260	0.255	0.201	0.234	pCi/smp	0.357	154		20
Th-230	36346	07-MAY-96	SR	LV	AL1-16	F-2	L6871-2	0.764	0.239	0.677	0.215	pCi/smp	0.192	12		20
Th-232	36346	07-MAY-96	SR	LV	AL1-16	F-2	L6871-2	0.146	0.113	0.149	0.117	pCi/smp	0.0100	2		20
U-233/4	36347	07-MAY-96	SR	LV	AL1-1	F-3	L6871-3	0.957	0.243	0.810	0.241	pCi/smp	0.303	17		20
U-235	36347	07-MAY-96	SR	LV	AL1-1	F-3	L6871-3	0.141	0.0966	0.198	0.117	pCi/smp	0.265	33		20
U-238	36347	07-MAY-96	SR	LV	AL1-1	F-3	L6871-3	0.818	0.224	0.924	0.257	pCi/smp	0.220	12		20

SAMPLING OF PARTICULATE EMISSIONS FROM FILTERED EXHAUST SYSTEMS INVOLVED WITH THE SMELTING OF PYROCHLORE IN THE PRODUCTION OF FERROCOLUMBIUM

Addendum #1

REPORT NO.: IER-14058-01 Addendum #1

CUSTOMER: INTEGRATED ENVIRONMENTAL MANAGEMENT, INC.

LOCATION: SHIELDALLOY METALLURGICAL CORPORATION
NEWFIELD, NEW JERSEY

CUSTOMER P.O.: 94005.06

WILLIARD JOB NO.: IER-14058

Test Report IER-14058-01
Addendum #1
August 12, 1995

TABLE OF CONTENTS

INSTRUMENTATION CALIBRATION FORM Page 1

Job No. IER - 14058

INSTRUMENTATION CALIBRATION FORM

Work Order No. Stack Testing
Activity No.:
Resp. Supv.: Terry Noonan

Work Description: Stack sampling at Shieldalloy Metalurgical Corporation
Direct to Integrated Environmental Management, Inc.

Instrument I.D.	Serial No.	Application	Dates Used	Calibration Date	Calibrated Accuracy	Remarks
W - 010	M 91558	Air flow & Pressures	3/11 - 3/26/96	7/20/95	+/- 2% of reading	Used for orfice plate differential
W - 015	M 92069	Air flow & Pressures	3/11 - 3/26/96	1/17/96	+/- 2% of reading	Used for velocity measurement during samples Also for barometric pressure readings
W - 030	N/A	Temperatures	3/11 - 3/26/96	2/20/96	+/- 1 deg. F.	Used for wet bulb and dry bulb temperature readings taken at the orfice plate.
Orfice plate - 1" dia.	N/A	Air flows	3/25 - 3/26/96	3/21/96	+/- 5 %	Used to measure air flow velocity

This report was prepared under the direction of
Shieldalloy Metallurgical Corporation

by

Carol D. Berger, C.H.P.
Integrated Environmental Management, Inc.
1680 East Gude Drive, Suite 305
Rockville, Maryland 20850
(301) 762-0502

and

Daniel W. Jarvis
Integrated Environmental Management, Inc.
9040 Executive Park Drive, Suite 205
Knoxville, Tennessee 37923
(423) 531-9140