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New Total Rewrite Revision Page Change

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Birdsboro Steel & Foundry Company

B.1 Introduction

This document serves as an appendix to Battelle-TBD-6000, Site Profiles for Atomic Weapons Employers that Worked Uranium and Thorium Metals. This appendix describes the results of document research specific to this site. Where specific information is lacking, research into similar facilities described in the body of this Site Profile is used.

B.2 Site Description

The Birdsboro Steel & Foundry Company located in Birdsboro, Pennsylvania was under contract with the Atomic Energy Corporation (AEC) to assist in the design and development of the metal fabrication facilities, specifically the rolling mill plant, at the Feed Materials Production Center (FMPC), Fernald from 1951-1954. Activities documented and associated with uranium at Birdsboro are two small quantity developmental projects. The specific nature of each is not documented. Only the receipt of materials, i.e. one to two inch uranium wafers and the disposal of materials, i.e. 346 pounds in the form of eight assorted pieces of uranium billets, are documented.

In 1962, Birdsboro is documented as providing a rotary piercing device for the fabrication of uranium tubes at FMPC. An equipment acceptance test took place at Birdsboro but there are no references indicated whether or not uranium was handled in the acceptance test. The DOE Worker's Advocacy site¹ limits the AWE work period to 1951- 1952 so only activities that occurred within that time frame are considered here.

No documentation was found indicating workers exposed to AEC related radioactive materials were exposed to other sources of radiation.

B.2.1 Site Activities

1951 – Eight pieces of billets received as process waste

In November 1951, 346 pounds of uranium waste was received at Lake Ontario Ordinance Waste facility from Birdsboro. The waste was in the form of uranium billet pieces. (RefID9545, p16) For the purposes of dose reconstruction, the billets were assumed to be associated with developmental rolling work as part of the FMPC contract involving the design and development of the rolling mill plant at FMPC.

1952 – Uranium wafers

Some time after January 1952, four uranium wafers, which had been cut from uranium rods at Lackawanna, were shipped to Birdsboro. The combined weight of the wafers was 11.5 pounds. Based upon a claimant's account, they may have been associated with developmental work in uranium slug design, which involved crushing and pressing uranium pellets.

No other activities are documented. Documentation was very limited. With the exception of the waste shipping reference found in a Tonawanda Area Monthly Report and the wafer shipment found in a single correspondence, all the information available for this

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site has come from FUSRAP documents, the DOE Worker's Advocacy Site¹ and the Residual Radioactivity Evaluations for Individual Sites.²

B.2.2 Job Categories

Each claim will be evaluated to determine the most appropriate Job Category from the list below.

Developmental Rolling Campaign - 1951

Plant Floor High	(Involved directly in operations—dose based on Generic Metal TBD)
Plant Floor Low	(Involved in support of operations—dose based on 50% of plant floor high above)
Supervisor	(Assumed to spend some time in the production areas—dose based on 25% of plant floor high above)
Clerk	(Assumed to have minimal exposure—dose based on exposure to 2.5% of plant floor high above)
Employed after AWE period	(Assumed to have no exposure based upon FUSRAP research)

Uranium Wafers Work Unknown – 1952

Plant Floor High	While this TBD does not apply directly to the work, machining can be used.
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B.3 Occupational Medical Dose

No information regarding occupational medical dose specific to Birdsboro Steel & Foundry Company was found. Information to be used in dose reconstructions for which no specific information is available is provided in ORAUT-OTIB-0006, the dose reconstruction project technical information bulletin covering diagnostic x-ray procedures.

B.4 Occupational Internal Dose

No air monitoring data were available for any of the work at the Birdsboro Steel & Foundry Company. Internal dose estimates have been derived from the Generic Metal TBD for rolling operations as well as machining operations, which typically accompany rolling.

These values were used to derive the inhalation values presented in Table B.2. The values in the table present these values in terms of pCi for the total operational period in 1951 and in 1952, since the duration of each operation was short. These values were also used to determine an ingestion intake in accordance with this TBD. Those values are presented as total pCi for the operational periods in Table B.3.

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B.5 Occupational External Dose

No data were found in the ORAU Site Query Database related to occupational external dose during AEC work. External dose calculations are based upon the Generic Metal TBD for rolling operations as well as machining operations, which typically accompany rolling.

Tables B.4 and B.5 present these values as total mrem for the operational period, or as mrem per calendar day value to be used for each calendar year listed.

B.6 Residual Contamination

The NIOSH “Report on Residual Radioactive and Beryllium Contamination at Atomic Weapons Employer Facilities and Beryllium Vender Facilities” indicates that: “...there is little potential for significant residual contamination outside the period in which weapons-related production occurred.”²

B.7 References

1. DOE Office of Health, Safety and Security, EEOICPA web site.
<http://www.hss.energy.gov/healthsafety/fwsp/advocacy/faclist/findfacility.cfm>
2. Report on Residual Radioactive and Beryllium Contamination at Atomic Weapons Employer Facilities and Beryllium Vender Facilities.
<http://www.cdc.gov/niosh/ocas/pdfs/tbd/rescon/rcontam1206.pdf> &
<http://www.cdc.gov/niosh/ocas/pdfs/tbd/rescon/appen-a2.pdf>

Table B.1. Job Titles Corresponding to Exposure Categories for Birdsboro Steel.

Job Title	Exposure Category
Machinist	Plant Floor High Machining

Table B.2 INTERNAL DOSE PATHWAYS - Inhalation of Airborne Radionuclides**Assumptions:**

No process specific exposure data available – Generic Metal TBD used for all dose estimates.
 Very limited work performed at Birdsboro – some rolling of uranium rods and some machining into slugs.
 1951: one week of rolling
 1952: a short machining job
 TBD GSD Default is 5
 Conversion Factor: 2.22 dpm/pCi
 Breathing Rate: 1.2 m³/hour
 All intakes and doses assume full-time employment for the given year.
 Intakes values are the geometric mean of a lognormal distribution

Job Category	Year	Operation Phase	Hr/Yr	Relevant Nuclide	Intake (pCi/d)	GSD	TBD Reference or Research Justification
Plant Floor High	1951	Operations	40	U234	209	5	Generic Metal TBD - Rolling Operator
Plant Floor High	1952	Operations	8	U234	64.92	5	Generic Metal TBD - Machining Operator
Plant Floor Low	1951	Operations	20	U234	104.64	5	Ratio'ed from Plant Floor High
Plant Floor Low	1952	Operations	4	U234	32.46	5	Ratio'ed from Plant Floor High
Supervisor	1951	Operations	10	U234	52.32	5	Ratio'ed from Plant Floor High
Supervisor	1952	Operations	2	U234	16	5	Ratio'ed from Plant Floor High
Clerical	1951	Operations	1	U234	5	5	Ratio'ed from Plant Floor High
Clerical	1952	Operations	0.2	U234	1.62	5	Ratio'ed from Plant Floor High

Table B.3 INTERNAL DOSE PATHWAYS - Ingestion of Airborne Radionuclides**Assumptions:**Air Concentration to Intake Conversion Factor: $3.06E-05$ (M^3/d)/(hr/y) - see 7.1.6 TBD-6000

Deposition velocity: 0.00075 m/s

Resuspension Factor: $1.00E-06$ 1/m

TBD GSD Default is 5

Intakes values are the geometric mean of a lognormal distribution

Job Category	Year	Operation Phase	Hr/Yr	Relevant Nuclide	Intake (pCi/d)	GSD	TBD Reference or Research Justification
Plant Floor High	1951	Operations	40	U234	1.95	5	Generic Metal TBD - Rolling Operator
Plant Floor High	1952	Operations	8	U234	0.605	5	Generic Metal TBD - Machining Operator
Plant Floor Low	1951	Operations	20	U234	0.97	5	Ratio'ed from Plant Floor High
Plant Floor Low	1952	Operations	4	U234	0.302	5	Ratio'ed from Plant Floor High
Supervisor	1951	Operations	10	U234	0.49	5	Ratio'ed from Plant Floor High
Supervisor	1952	Operations	2	U234	0.151	5	Ratio'ed from Plant Floor High
Clerical	1951	Operations	1	U234	0.05	5	Ratio'ed from Plant Floor High
Clerical	1952	Operations	0.2	U234	0.015	5	Ratio'ed from Plant Floor High

Table B.4 EXTERNAL DOSE PATHWAYS - Whole Body**Assumptions:**Submersion Dose Conversion Factor: 2.462E-09 mrem/h/dpm/m³

Deposition velocity: 0.00075 m/s

Contaminated Surface Dose Conversion Factor: 5.615E-10 mrem/h/dpm/m²

All external dose from estimated exposure to uranium rods

Residual period: Assume no handling of U metal - only exposure is from residual contamination on floor and in air

Dose in this table is the geometric mean of a lognormal distribution

Job Category	Year	Operation Phase	Hr/Yr	Relevant Nuclide	External Whole Body (mR/d)	GSD	TBD Reference or Research Justification
Plant Floor High	1951	Operations	40	U234	3.13E-02	5	Generic Metal TBD - Rolling Operator
Plant Floor High	1952	Operations	8	U234	6.25E-03	5	Generic Metal TBD - Machining Operator
Plant Floor Low	1951	Operations	20	U234	1.56E-02	5	Ratio'ed from Plant Floor High
Plant Floor Low	1952	Operations	4	U234	3.13E-03	5	Ratio'ed from Plant Floor High
Supervisor	1951	Operations	10	U234	7.81E-03	5	Ratio'ed from Plant Floor High
Supervisor	1952	Operations	2	U234	1.56E-03	5	Ratio'ed from Plant Floor High
Clerical	1951	Operations	1	U234	7.81E-04	5	Ratio'ed from Plant Floor High
Clerical	1952	Operations	0.2	U234	1.56E-04	5	Ratio'ed from Plant Floor High

Table B.5 EXTERNAL DOSE PATHWAYS - Skin**Assumptions:**

All assumptions from TBD-6000 Section 6.3

Operational Period: Non-penetrating dose to skin 115 mr/hour (hands and forearms) 10.4 mr/hour (other)

Plant Floor High: Assume hands in contact with metal 50% of time. Other skin is 100% of dose rate at 1-ft, 20.8 mrem/h

Plant Floor Low: 50% of Plant Floor High

Supervisor: assume 10% of Plant Floor Low for time in contact with metal

Clerical: assume no handling of U metal.

Residual Period: Non-penetrating dose to skin 3.9E-06 mr/hour

Assume no handling of U metal.

Assume 10x the photon whole body dose rate

Dose in this table is the geometric mean of a lognormal distribution

Job Category	Year	Operation Phase	Hr/Yr	Relevant Nuclide	Skin: Hands & Forearms (mR/d)	Skin - Other (mR/d)	GSD	TBD Reference or Research Justification
Plant Floor High	1951	Operations	40	U234	13	1	5	Generic Metal TBD - Rolling Operator
Plant Floor High	1952	Operations	8	U234	3	0	5	Generic Metal TBD - Machining Operator
Plant Floor Low	1951	Operations	20	U234	6	1	5	Ratio'ed from Plant Floor High
Plant Floor Low	1952	Operations	4	U234	1	0	5	Ratio'ed from Plant Floor High
Supervisor	1951	Operations	2	U234	1	0	5	Ratio'ed from Plant Floor High
Supervisor	1952	Operations	0.4	U234	0	0	5	Ratio'ed from Plant Floor High
Clerical	1951	Operations	0	U234	0	0	5	Ratio'ed from Plant Floor High
Clerical	1952	Operations	0	U234	0	0	5	Ratio'ed from Plant Floor High