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American Chain and Cable Company

C.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.

C.2 Site Description

The American Chain and Cable Company located in Bridgeport, Connecticut performed experimental swaging with uranium rods in 1944 as a subcontractor under DuPont for the Manhattan Engineering District (MED).

C.2.1 Site Activities

The work documented for the American Chain and Cable Company (ACC) was the swaging of eight uranium rods. The rods were reduced from 1.46" to 1.39" diameter by cold swaging. The rods were delivered and removed from the plant by an AEC representative, who was also present during the work. Upon completion of the work, the rods were shipped to the Metallurgical Laboratory for evaluation.

The work was done under a DuPont Engineering Department subcontract No. RPG-3199-1/2. The purpose of the test was to see if this cold working method could reclaim oversized rods. It was decided at the completion of the test that this method was not satisfactory, as the outside surface of the rods was impaired, and so the method was abandoned.

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

C.2.2 Job Categories

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

Plant Floor High	(Involved directly in operations—dose based on Generic Metal TBD Extrusion data as a surrogate operation favorable to the claimant)
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—inhalation dose based on 25% of plant floor high; external dose based on 10% of plant floor low above)
Clerk	(Assumed to have minimal exposure—inhalation dose based on exposure to 2.5% of plant floor high above)

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C.3 Occupational Medical Dose

No information regarding occupational medical dose specific to American Chain and Cable 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.

C.4 Occupational Internal Dose

No air sampling data were available for the 1944 operation. The Generic Metal TBD does not address cold swaging of uranium. Air monitoring data were collected at another company, Torrington, which performed experimental swaging work for AEC in 1951-1952. No uranium was detected during the one air monitoring campaign at Torrington. Because there are no details available for the work performed at ACC in 1944, the Torrington air monitoring data might underestimate the exposure at ACC in 1944. In an approach that is favorable to the claimant, extrusion has been used as a surrogate for the swaging job rather than the Torrington data.

Air concentrations for the Plant Floor High job category were taken from the TBD for uranium extrusion. Air concentrations for other job categories were scaled from the Plant Floor High. Hours worked per year were based on the report of eight rods being swaged and the swaging rate documented at Torrington. At Torrington one rod could be swaged in a minute. Each experimental campaign, however, typically swaged 3 or 4 rods and lasted two hours. Sixteen hours of work in 1944 was assigned to ACC for the swaging of eight rods as an estimate favorable to the claimant.

Tables V.1 and V.2 contain inhalation and ingestion intakes in terms of pCi per day for each job category and each year.

C.5 Occupational External Dose

No data were found in the Site Research database related to occupational external dose during AWE work. In an approach similar to the internal dose above, the external dose values in the TBD for extrusion should be used.

Tables V.3 and V.4 present these values as mR per calendar day value to be used for each calendar year listed.

C.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 It is assumed that workers at ACC during 1944, after the operations, were exposed to residual contamination from uranium deposited on the floor but not cleaned up. Since the date of operation was not specified, it was assumed that residual exposure lasted for 2384 hours (the remainder of a 2400-hour year after the 16-hour operation).

C.7 References

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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 V.1 INTERNAL DOSE PATHWAYS - Inhalation of Airborne Radionuclides**Assumptions:**Operational Period Daily Weighted Average Air Concentration, Plant Floor High: 992 dpm/m³Residual Period Daily Weighted Average Air Concentration: 0.043 dpm/m³

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.

Job Category	Year	Operation Phase	Hr/Yr	Relevant Nuclide	Intake (pCi/d)	GSD	TBD Reference or Research Justification
Plant Floor High	1944	Operations	16	U234	2.35E+01	5.0	Metal TBD Table 7.2, Extrusion
Plant Floor High	1944	Residual	2384	U234	1.51E-01	5.0	Resuspension of contamination deposited during operations, no cleanup
Plant Floor Low	1944	Operations	16	U234	1.18E+01	5.0	Ratio from Plant Floor High
Plant Floor Low	1944	Residual	2384	U234	1.51E-01	5.0	Resuspension of contamination deposited during operations, no cleanup
Supervisor	1944	Operations	16	U234	5.88E+00	5.0	Ratio from Plant Floor High
Supervisor	1944	Residual	2384	U234	1.51E-01	5.0	Resuspension of contamination deposited during operations, no cleanup
Clerical	1944	Operations	16	U234	5.88E-01	5.0	Ratio from Plant Floor High
Clerical	1944	Residual	2384	U234	1.51E-01	5.0	Resuspension of contamination deposited during operations, no cleanup

Table V.2 INTERNAL DOSE PATHWAYS - Ingestion of Airborne Radionuclides**Assumptions:**Air Concentration to Intake Conversion Factor: $3.06E-05$ (M³/d)/(hr/y) - see 7.1.6 TBD-6000

Deposition velocity: 0.00075 m/s

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

Job Category	Year	Operation Phase	Hr/Yr	Relevant Nuclide	Intake (pCi/d)	GSD	TBD Reference or Research Justification
Plant Floor High	1944	Operations	16	U234	2.19E-01	5.0	Metal TBD Table 7.2, Extrusion
Plant Floor High	1944	Residual	2384	U234	1.41E-03	5.0	Resuspension of contamination deposited during operations, no cleanup
Plant Floor Low	1944	Operations	16	U234	1.09E-01	5.0	Ratio from Plant Floor High
Plant Floor Low	1944	Residual	2384	U234	1.41E-03	5.0	Resuspension of contamination deposited during operations, no cleanup
Supervisor	1944	Operations	16	U234	5.47E-02	5.0	Ratio from Plant Floor High
Supervisor	1944	Residual	2384	U234	1.41E-03	5.0	Resuspension of contamination deposited during operations, no cleanup
Clerical	1944	Operations	16	U234	5.47E-03	5.0	Ratio from Plant Floor High
Clerical	1944	Residual	2384	U234	1.41E-03	5.0	Resuspension of contamination deposited during operations, no cleanup

Table V.3 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 slugs

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

Job Category	Year	Operation Phase	Hr/Yr	Relevant Nuclide	External Whole Body (mR/d)	GSD	TBD Reference or Research Justification
Plant Floor High	1944	Operations	16	U234	1.25E-02	5.0	Generic Metal TBD, Section 6.3
Plant Floor High	1944	Residual	2384	U234	1.57E-04	5.0	Generic Metal TBD, Section 6.3
Plant Floor Low	1944	Operations	16	U234	6.25E-03	5.0	Generic Metal TBD, Section 6.3
Plant Floor Low	1944	Residual	2384	U234	1.57E-04	5.0	Generic Metal TBD, Section 6.3
Supervisor	1944	Operations	16	U234	6.26E-04	5.0	Generic Metal TBD, Section 6.3
Supervisor	1944	Residual	2384	U234	1.57E-04	5.0	Generic Metal TBD, Section 6.3
Clerical	1944	Operations	16	U234	1.06E-06	5.0	Generic Metal TBD, Section 6.3
Clerical	1944	Residual	2384	U234	1.57E-04	5.0	Generic Metal TBD, Section 6.3

Table V.4 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

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	1944	Operations	16	U234	5.04E+00	4.56E-01	5	Generic Metal TBD, Section 6.3
Plant Floor High	1944	Residual	2384	U234	1.57E-03	1.57E-03	5	Generic Metal TBD, Section 6.3
Plant Floor Low	1944	Operations	8	U234	2.52E+00	2.28E-01	5	Generic Metal TBD, Section 6.3
Plant Floor Low	1944	Residual	2384	U234	1.57E-03	1.57E-03	5	Generic Metal TBD, Section 6.3
Supervisor	1944	Operations	0.8	U234	2.52E-01	2.28E-02	5	Generic Metal TBD, Section 6.3
Supervisor	1944	Residual	2384	U234	1.57E-03	1.57E-03	5	Generic Metal TBD, Section 6.3
Clerical	1944	Operations	0	U234	0.00E+00	0.00E+00	5	Generic Metal TBD, Section 6.3
Clerical	1944	Residual	2384	U234	1.57E-03	1.57E-03	5	Generic Metal TBD, Section 6.3