# SEC Petition Evaluation Report
## Petition SEC-00157

Report Rev #: 0 Report Submittal Date: October 29, 2010

| | |
|---|---|
| Subject Expert(s): | Robert Coblentz, Joseph Guido |
| Site Expert(s): | N/A |

**Petition Administrative Summary**

**Petition Under Evaluation**

| Petition # | Petition Type | Petition Receipt Date | Qualification Date | DOE/AWE Facility Name |
|---|---|---|---|---|
| SEC-00157 | 83.13 | December 4, 2009 | March 8, 2010 | Simonds Saw and Steel Co. |

**Petitioner Class Definition**

All employees who worked in any area at Simonds Saw and Steel, Lockport, New York, during the applicable covered operational and residual periods from 1948 through 2006.

**Class Evaluated by NIOSH**

All employees who worked in any area at Simonds Saw and Steel, Lockport, New York, during the applicable covered operational and residual periods from January 1, 1948 through December 31, 2006.

**NIOSH-Proposed Class(es) to be Added to the SEC**

All Atomic Weapons Employer employees who worked at Simonds Saw and Steel Co. from January 1, 1948 through December 31, 1957, for a number of work days aggregating at least 250 work days, occurring either solely under this employment or in combination with work days within the parameters established for one or more other classes of employees included in the Special Exposure Cohort.

**Related Petition Summary Information**

| SEC Petition Tracking #(s) | Petition Type | DOE/AWE Facility Name | Petition Status |
|---|---|---|---|
| N/A | N/A | N/A | N/A |

**Related Evaluation Report Information**

| Report Title | DOE/AWE Facility Name |
|---|---|
| N/A | N/A |

**ORAU Lead Technical Evaluator:** Robert Coblentz

**ORAU Peer Review Completed By:** Daniel Stempfley

| | | |
|---|---|---|
| **Peer Review Completed By:** | [Signature on file]<br>*Samuel E. Glover* | 10/29/2010<br>*Date* |
| **SEC Petition Evaluation Reviewed By:** | [Signature on file]<br>*J. W. Neton* | 10/29/2010<br>*Date* |
| **SEC Evaluation Approved By:** | [Signature on file]<br>*Stuart L. Hinnefeld* | 10/29/2010<br>*Date* |

This page intentionally left blank

# Evaluation Report Summary: SEC-00157, Simonds Saw and Steel Co.

This evaluation report by the National Institute for Occupational Safety and Health (NIOSH) addresses a class of employees proposed for addition to the Special Exposure Cohort (SEC) per the *Energy Employees Occupational Illness Compensation Program Act of 2000*, as amended, 42 U.S.C. § 7384 *et seq.* (EEOICPA) and 42 C.F.R. pt. 83, *Procedures for Designating Classes of Employees as Members of the Special Exposure Cohort under the Energy Employees Occupational Illness Compensation Program Act of 2000*.

Petitioner-Requested Class Definition

Petition SEC-00157 was received on December 4, 2009, and qualified on March 8, 2010. The petitioner requested that NIOSH consider the following class: *All employees who worked in any area at Simonds Saw and Steel, Lockport, New York, during the applicable covered operational and residual periods from 1948 through 2006.*

Class Evaluated by NIOSH

Based on its preliminary research, NIOSH accepted the petitioner-requested class. NIOSH evaluated the following class: All employees who worked in any area at Simonds Saw and Steel, Lockport, New York, during the applicable covered operational and residual periods from January 1, 1948 through December 31, 2006.

NIOSH-Proposed Class to be Added to the SEC

Based on its full research of the class under evaluation, NIOSH has defined a single class of employees for which NIOSH cannot estimate radiation doses with sufficient accuracy. The NIOSH-proposed class includes all Atomic Weapons Employer employees who worked at Simonds Saw and Steel Co. from January 1, 1948 through December 31, 1957, for a number of work days aggregating at least 250 work days, occurring either solely under this employment or in combination with work days within the parameters established for one or more other classes of employees included in the Special Exposure Cohort. The class under evaluation was divided (see Section 3.0 below) because for the period from January 1, 1948 through December 31, 1957 (the operational period), NIOSH does not have adequate information on the amount and frequency of thorium processing to bound individual thorium exposures. NIOSH is not proposing a class for the period from January 1, 1958 through December 31, 2006 (the non-operational/residual period) because there is sufficient information available to bound exposures during this period.

Feasibility of Dose Reconstruction

NIOSH finds it is not feasible to estimate internal or external exposures with sufficient accuracy for all workers at the site from January 1, 1948 through December 31, 1957. NIOSH does not have adequate information on the amount and frequency of thorium processing to bound individual thorium exposures. With the exception of this class, per EEOICPA and 42 C.F.R. § 83.13(c)(1), NIOSH has established that it has access to sufficient information to: (1) estimate the maximum radiation dose, for every type of cancer for which radiation doses are reconstructed, that could have been incurred in

plausible circumstances; or (2) estimate radiation doses more precisely than an estimate of maximum dose. Information available from the site profile and additional resources is sufficient to document or estimate the maximum internal and external potential exposure to members of the evaluated class under plausible circumstances during the specified period (January 1, 1958 through December 31, 2006).

The NIOSH dose reconstruction feasibility findings are based on the following:

- Principal sources of internal and external radiation for members of the proposed class included exposures to natural, enriched, and depleted uranium metals, and thorium metal. Workers were internally exposed, via inhalation and ingestion, to dust generated during uranium or thorium rolling and forging activities, as well as to accumulated uranium and thorium surface contamination that was re-suspended into the air during normal steel work. Workers were externally exposed to beta and gamma radiation from directly handling, or working in close proximity to, uranium or thorium billets, ingots, or rods. Workers also received external exposures from uranium and thorium contamination buildup in work areas and on equipment.

- NIOSH has located sufficient personnel monitoring, area monitoring, and source term data that, when coupled with existing dose reconstruction methods in ORAUT-TKBS-0032, support reconstructing doses from uranium exposures during the period from January 1, 1948 through December 31, 1957. However, NIOSH has not located sufficient personnel monitoring, source term, and air sampling data which will allow exposures to thorium and its associated gaseous decay product (thoron) to be reconstructed during the period from January 1, 1948 through December 31, 1957. Therefore, NIOSH concludes that it cannot bound internal or external dose (reconstruct dose with sufficient accuracy) for members of the class under evaluation for the period from January 1, 1948 through December 31, 1957.

- NIOSH finds that it is not applicable to reconstruct occupational medical dose for Simonds Saw and Steel Co. workers because medical x-ray procedures were performed at an off-site, non-covered facility.

- Pursuant to 42 C.F.R. § 83.13(c)(1), NIOSH determined that there is insufficient information to either: (1) estimate the maximum radiation dose, for every type of cancer for which radiation doses are reconstructed, that could have been incurred under plausible circumstances by any member of the class; or (2) estimate the radiation doses of members of the class more precisely than a maximum dose estimate.

- Although NIOSH found that it is not possible to completely reconstruct radiation doses for the proposed class, NIOSH intends to use any internal and external monitoring data that may become available for an individual claim (and that can be interpreted using existing NIOSH dose reconstruction processes or procedures), and existing methods contained within ORAUT-TKBS-0032, to support partial dose reconstructions for individual claims. Therefore, dose reconstructions for individuals employed at Simonds Saw and Steel Co. during the period from January 1, 1948 through December 31, 1957, but who do not qualify for inclusion in the SEC, may be performed using these data as appropriate.

- NIOSH has determined that it can reconstruct internal and external dose from all sources during the residual period from January 1, 1958 through December 31, 2006, using the assumptions and approaches presented within Sections 7.2 and 7.3 of this report.

Health Endangerment Determination

Per EEOICPA and 42 C.F.R. § 83.13(c)(3), a health endangerment determination is required because NIOSH has determined that it does not have sufficient information to estimate dose for the members of the proposed class from January 1, 1948 through December 31, 1957.

NIOSH did not identify any evidence supplied by the petitioners or from other resources that would establish that the proposed class was exposed to radiation during a discrete incident likely to have involved exceptionally high-level exposures. However, evidence indicates that some workers in the proposed class may have accumulated substantial chronic exposures through episodic intakes of radionuclides, combined with external exposures to gamma, beta, and neutron radiation. Consequently, NIOSH has determined that health was endangered for those workers covered by this evaluation who were employed for at least 250 aggregated work days either solely under their employment or in combination with work days within the parameters established for other SEC classes (excluding aggregate work day requirements).

For the period from January 1, 1958 through December 31, 2006, a health endangerment determination is not required because NIOSH has determined that it has sufficient information to estimate dose for the members of the evaluated class.

This page intentionally left blank

# Table of Contents

# Figures

# Tables

This page intentionally left blank

# SEC Petition Evaluation Report for SEC-00157

## 1.0 Purpose and Scope

This report evaluates the feasibility of reconstructing doses for all employees who worked in any area at Simonds Saw and Steel, Lockport, New York, during the applicable covered operational and residual periods from January 1, 1948 through December 31, 2006. It provides information and analyses germane to considering a petition for adding a class of employees to the congressionally-created SEC.

This report does not make any determinations concerning the feasibility of dose reconstruction that necessarily apply to any individual energy employee who might require a dose reconstruction from NIOSH. This report also does not contain the final determination as to whether the proposed class will be added to the SEC (see Section 2.0).

This evaluation was conducted in accordance with the requirements of EEOICPA, 42 C.F.R. pt. 83, and the guidance contained in the Division of Compensation Analysis and Support's (DCAS) *Internal Procedures for the Evaluation of Special Exposure Cohort Petitions*, OCAS-PR-004.[1]

## 2.0 Introduction

Both EEOICPA and 42 C.F.R. pt. 83 require NIOSH to evaluate qualified petitions requesting that the Department of Health and Human Services (HHS) add a class of employees to the SEC. The evaluation is intended to provide a fair, science-based determination of whether it is feasible to estimate with sufficient accuracy the radiation doses of the class of employees through NIOSH dose reconstructions.[2]

42 C.F.R. § 83.13(c)(1) states: *Radiation doses can be estimated with sufficient accuracy if NIOSH has established that it has access to sufficient information to estimate the maximum radiation dose, for every type of cancer for which radiation doses are reconstructed, that could have been incurred in plausible circumstances by any member of the class, or if NIOSH has established that it has access to sufficient information to estimate the radiation doses of members of the class more precisely than an estimate of the maximum radiation dose.*

Under 42 C.F.R. § 83.13(c)(3), if it is not feasible to estimate with sufficient accuracy radiation doses for members of the class, then NIOSH must determine that there is a reasonable likelihood that such radiation doses may have endangered the health of members of the class The regulation requires NIOSH to assume that any duration of unprotected exposure may have endangered the health of members of a class when it has been established that the class may have been exposed to radiation during a discrete incident likely to have involved levels of exposure similarly high to those occurring during nuclear criticality incidents. If the occurrence of such an exceptionally high-level exposure has

[1] DCAS was formerly known as the Office of Compensation Analysis and Support (OCAS).
[2] NIOSH dose reconstructions under EEOICPA are performed using the methods promulgated under 42 C.F.R. pt. 82 and the detailed implementation guidelines available at http://www.cdc.gov/niosh/ocas.

not been established, then NIOSH is required to specify that health was endangered for those workers who were employed for at least 250 aggregated work days within the parameters established for the class or in combination with work days within the parameters established for other SEC classes (excluding aggregate work day requirements).

NIOSH is required to document its evaluation in a report, and to do so, relies upon both its own dose reconstruction expertise as well as technical support from its contractor, Oak Ridge Associated Universities (ORAU). Once completed, NIOSH provides the report to both the petitioner(s) and to the Advisory Board on Radiation and Worker Health (Board). The Board will consider the NIOSH evaluation report, together with the petition, petitioner(s) comments, and other information the Board considers appropriate, in order to make recommendations to the Secretary of HHS on whether or not to add one or more classes of employees to the SEC. Once NIOSH has received and considered the advice of the Board, the Director of NIOSH will propose a decision on behalf of HHS. The Secretary of HHS will make the final decision, taking into account the NIOSH evaluation, the advice of the Board, and the proposed decision issued by NIOSH. As part of this decision process, petitioners may seek a review of certain types of final decisions issued by the Secretary of HHS.[3]

# 3.0 SEC-00157, Simonds Saw and Steel Co. Class Definitions

The following subsections address the evolution of the class definition for SEC-00157, Simonds Saw and Steel Co. When a petition is submitted, the requested class definition is reviewed as submitted. Based on its review of the available site information and data, NIOSH will make a determination whether to qualify for full evaluation all, some, or no part of the petitioner-requested class. If some portion of the petitioner-requested class is qualified, NIOSH will specify that class along with a justification for any modification of petitioner's class. After a full evaluation of the qualified class, NIOSH will determine whether to propose a class for addition to the SEC and will specify that proposed class definition.

## 3.1 Petitioner-Requested Class Definition and Basis

Petition SEC-00157 was received on December 4, 2009, and qualified on March 8, 2010. The petitioner requested that NIOSH consider the following class: *All employees who worked in any area at Simonds Saw and Steel, Lockport, New York, during the applicable covered operational and residual periods from 1948 through 2006.*

The petitioner provided information and affidavit statements in support of the petitioner's belief that accurate dose reconstruction over time is impossible for the Simonds Saw and Steel Co. workers in question. NIOSH deemed the following information and notarized affidavit statement sufficient to qualify SEC-00157 for evaluation:

> *No employees were monitored during operations or residual for thorium, and many employees were not monitored externally. This was in a Simonds Saw & Steel document.*

[3] See 42 C.F.R. pt. 83 for a full description of the procedures summarized here. Additional internal procedures are available at http://www.cdc.gov/niosh/ocas.

Based on its Simonds Saw and Steel Co. research and data capture efforts, NIOSH determined that it has access to personnel internal exposure monitoring data for uranium, work area uranium and thorium monitoring data, and production quantities for Simonds Saw and Steel workers during the time period under evaluation. However, NIOSH also determined that the available personnel or area monitoring data associated with thorium work may be lacking for some years of apparent thorium-rolling operations at the site. NIOSH concluded that there is sufficient documentation to support, for at least part of the requested time period, the petition basis that radiation exposures and radiation doses were not adequately monitored at Simonds Saw and Steel Co., either through personal monitoring or area monitoring for the thorium operational and residual periods. The information and statements provided by the petitioner qualified the petition for further consideration by NIOSH, the Board, and HHS. The details of the petition basis are addressed in Section 7.4.

## 3.2 Class Evaluated by NIOSH

Originally, at the time NIOSH reviewed the petition document, NIOSH modified the petitioner-requested class to include all employees who worked in any area at Simonds Saw and Steel, Lockport, New York, during the applicable covered thorium operational and residual periods from 1951 through 2006. Subsequent to the class modification, additional information indicated that the thorium operational period may have begun prior to 1951. NIOSH adjusted the evaluated class to include the earlier years back to the start of the Simonds Saw and Steel Co. contract with the Atomic Energy Commission (AEC), which began in 1948. Also, recently-acquired documents indicate that AEC-related work was performed at Simonds Saw and Steel in April 1957 and that final contract closure occurred sometime in late 1957; therefore, the operational year was extended by one year to the end of 1957 (Site Clarification, 2010). Therefore, consistent with the petitioner's requested class, NIOSH defined the following class for further evaluation: All employees who worked in any area at Simonds Saw and Steel, Lockport, New York, during the applicable covered operational and residual periods from January 1, 1948 through December 31, 2006.

## 3.3 NIOSH-Proposed Class to be Added to the SEC

Based on its research of the class under evaluation, NIOSH has defined a single class of employees for which NIOSH cannot estimate radiation doses with sufficient accuracy. The NIOSH-proposed class to be added to the SEC includes all Atomic Weapons Employer employees who worked at Simonds Saw and Steel Co. from January 1, 1948 through December 31, 1957, for a number of work days aggregating at least 250 work days, occurring either solely under this employment or in combination with work days within the parameters established for one or more other classes of employees included in the Special Exposure Cohort.

# 4.0 Data Sources Reviewed by NIOSH to Evaluate the Class

As a standard practice, NIOSH completed an extensive database and Internet search for information regarding Simonds Saw and Steel Co. The database search included the DOE Legacy Management Considered Sites database, the DOE Office of Scientific and Technical Information (OSTI) database, the Energy Citations database, the Atomic Energy Technical Report database, and the Hanford Declassified Document Retrieval System. In addition to general Internet searches, the NIOSH

Internet search included OSTI OpenNet Advanced searches, OSTI Information Bridge Fielded searches, Nuclear Regulatory Commission (NRC) Agency-wide Documents Access and Management (ADAMS) web searches, the DOE Office of Human Radiation Experiments website, and the DOE-National Nuclear Security Administration-Nevada Site Office-search. Attachment One contains a summary of Simonds Saw and Steel Co. documents. The summary specifically identifies data capture details and general descriptions of the documents retrieved.

In addition to the database and Internet searches listed above, NIOSH identified and reviewed numerous data sources to determine information relevant to determining the feasibility of dose reconstruction for the class of employees under evaluation. This included determining the availability of information on personal monitoring, area monitoring, industrial processes, and radiation source materials. The following subsections summarize the data sources identified and reviewed by NIOSH.

## 4.1 Site Profile Technical Basis Documents (TBDs)

A Site Profile provides specific information concerning the documentation of historical practices at the specified site. Dose reconstructors can use the Site Profile to evaluate internal and external dosimetry data for monitored and unmonitored workers, and to supplement, or substitute for, individual monitoring data. A Site Profile consists of an Introduction and five Technical Basis Documents (TBDs) that provide process history information, information on personal and area monitoring, radiation source descriptions, and references to primary documents relevant to the radiological operations at the site. The Site Profile for a small site may consist of a single document. As part of NIOSH's evaluation detailed herein, it examined the following TBD for insights into Simonds Saw and Steel Co. operations or related topics/operations at other sites:

- *Site Profile for Simonds Saw and Steel*, ORAUT-TKBS-0032, Rev. 00 PC-1; July 8, 2005; SRDB Ref ID: 20180

- *Site Profiles for Atomic Weapons Employers that Worked Uranium and Thorium Metals*, Battelle-TBD-6000, Rev. F0; December 13, 2006; SRDB Ref ID: 30671

## 4.2 Technical Information Bulletins

A Technical Information Bulletin is a general working document that provides guidance for preparing dose reconstructions at particular sites or categories of sites. NIOSH reviewed the following technical information bulletins as part of its evaluation:

- *Estimation of Ingestion Intakes*, OCAS-TIB-009, Rev. 00, National Institute for Occupational Safety and Health (NIOSH); Cincinnati, Ohio; April 13, 2004; SRDB Ref ID: 22397

- *Dose Reconstruction from Occupationally Related Diagnostic X-Ray Procedures*, ORAUT-OTIB-0006, Rev. 03 PC-1; Oak Ridge Associated Universities; December 21, 2005; SRDB Ref ID: 20220

- *Estimation of Neutron Dose Rates from Alpha-Neutron Reactions in Uranium and Thorium Compounds*, ORAUT-OTIB-0024, Rev. 00; Oak Ridge Associated Universities; April 7, 2005; SRDB Ref ID: 19445

## 4.3 Facility Employees and Experts

To obtain additional information, NIOSH interviewed 13 former Simonds Saw and Steel Co. employees. With the exception of one mailed interview, the interviews were conducted by telephone.

- Personal Communication, 2010a, *Personal Communication with Former Swing Grinder at Simonds Saw and Steel Co.*; Telephone Interview by ORAU Team; May 10, 2010, 5:15 PM; SRDB Ref ID: 82202

- Personal Communication, 2010b, *Personal Communication with Former Mill Hand and Maintenance Man at Simonds Saw and Steel Co.*; Telephone Interview by ORAU Team; May 11, 2010, 10:30 AM; SRDB Ref ID: 82205

- Personal Communication, 2010c, *Personal Communication with Former Band Mill Operator at Simonds Saw and Steel Co.*; Telephone Interview by ORAU Team; May 11, 2010, 5:00 PM; SRDB Ref ID: 82208

- Personal Communication, 2010d, *Personal Communication with Former Laborer at Simonds Saw and Steel Co.*; Telephone Interview by ORAU Team; May 12, 2010, 12:30 PM; SRDB Ref ID: 82203

- Personal Communication, 2010e, *Personal Communication with Former Laborer at Simonds Saw and Steel Co.*; Telephone Interview by ORAU Team; May 12, 2010, 3:30 PM; SRDB Ref ID: 82206

- Personal Communication, 2010f, *Personal Communication with Former Laborer at Simonds Saw and Steel Co.*; Telephone Interview by ORAU Team; May 12, 2010, 5:00 PM; SRDB Ref ID: 82209

- Personal Communication, 2010g, *Personal Communication with Former Laborer at Simonds Saw and Steel Co.*; Telephone Interview by ORAU Team; May 12, 2010, 5:30 PM; SRDB Ref ID: 82207

- Personal Communication, 2010h, *Personal Communication with Former Laborer at Simonds Saw and Steel Co.*; Telephone Interview by ORAU Team; May 13, 2010, 1:00 PM; SRDB Ref ID: 82204

- Personal Communication, 2010i, *Personal Communication with Former Laborer at Simonds Saw and Steel Co.*; Telephone Interview by ORAU Team; May 14, 2010, 11:00 AM; SRDB Ref ID: 82210

- Personal Communication, 2010j, *Personal Communication with Former Laborer at Simonds Saw and Steel Co.*; Mailed Interview by ORAU Team; May 27, 2010; SRDB Ref ID: 83401

- Personal Communication, 2010k, *Personal Communication with Former Laborer at Simonds Saw and Steel Co.*; Telephone Interview by ORAU Team; June 17, 2010; SRDB Ref ID: 84730

- Personal Communication, 2010L, *Personal Communication with Former Metallurgist at Simonds Saw and Steel Co.*; Telephone Interview by ORAU Team and NIOSH staff; July 7, 2010; SRDB Ref ID: 84727

- Personal Communication, 2010m, *Personal Communication with Former Laborer at Simonds Saw and Steel Co.*; Telephone Interview by ORAU Team; June 28, 2010; SRDB Ref ID: 84725

## 4.4 Previous Dose Reconstructions

NIOSH reviewed its NIOSH DCAS Claims Tracking System (NOCTS) to locate EEOICPA-related dose reconstructions that might provide information relevant to the petition evaluation. Table 4-1 summarizes the results of this review. (NOCTS data available as of July 13, 2010)

**Table 4-1: No. of Simonds Claims Submitted Under the Dose Reconstruction Rule**

| Description | Totals |
|---|---|
| Total number of claims submitted for dose reconstruction | 191 |
| Total number of claims submitted for energy employees who meet the definition criteria for the class under evaluation (January 1, 1948 through December 31, 2006) | 191 |
| Number of dose reconstructions completed for energy employees who meet the definition criteria for the class under evaluation (i.e., the number of such claims completed by NIOSH and submitted to the Department of Labor for final approval). | 180 |
| Number of claims for which internal dosimetry records were obtained for the identified years in the evaluated class definition | 6 |
| Number of claims for which external dosimetry records were obtained for the identified years in the evaluated class definition | 1 |

NIOSH reviewed each claim to determine whether internal and/or external personal monitoring records could be obtained for the employee. There were six claims with internal dosimetry records and one claim with external dosimetry records. Computer Assisted Telephone (CATI) Interviews were reviewed and while the interviews provided useful information (i.e., general working conditions and hours worked), most did not include details regarding protective measures or area radiological monitoring.

## 4.5 NIOSH Site Research Database

NIOSH also examined its Site Research Database (SRDB) to locate documents supporting the assessment of the evaluated class. Six hundred fifty documents in this database were identified as pertaining to Simonds Saw and Steel Co. These documents were evaluated for their relevance to this petition. The documents include historical background on processing methods, processing dates, production quantities, airborne dust sampling data, and area radiological monitoring data.

## 4.6 Documentation and/or Affidavits Provided by Petitioners

In qualifying and evaluating the petition, NIOSH reviewed the following document submitted by the petitioner:

- *Petition Form B for SEC-00157*; received by NIOSH on December 4, 2009; OSA Ref ID: 110300 (NIOSH, 2009)

# 5.0 Radiological Operations Relevant to the Class Evaluated by NIOSH

The following subsections summarize both radiological operations at the Simonds Saw and Steel Co. site from January 1, 1948 through December 31, 2006 and the information available to NIOSH to characterize particular processes and radioactive source materials. From available sources NIOSH has gathered process and source descriptions, information regarding the identity and quantities of each radionuclide of concern, and information describing processes through which radiation exposures may have occurred and the physical environment in which they may have occurred. The information included within this evaluation report is intended only to be a summary of the available information.

## 5.1 Simonds Saw and Steel Co. Plant and Process Descriptions

*ATTRIBUTION: Section 5.1 and its related subsections were completed by Robert Coblentz, Quantaflux, LLC. The rationales for all conclusions in this document are explained in the associated text.*

Simonds Saw and Steel processed uranium and thorium metal for the AEC from February 1948 to December 1957. This section describes the period of AEC operations from January 1, 1948 through December 31, 1957, involving AEC-contracted work. Additionally, it is assumed that the residual contamination period was from January 1, 1958 through December 31, 2006, although the buildings were closed and the contaminated areas were isolated as of May 1, 1983.

### 5.1.1 Site Description

A radiological survey described the former Simonds site as a 28-hectare (one hectare equals 2.47 acres) area bordered by Ohio Street to the east, residential and commercial properties to the north, U.S. Route 95 to the west, and the New York State Barge Canal to the south (Vitkus, 1999). As of 1999, the property was grouped into three areas:

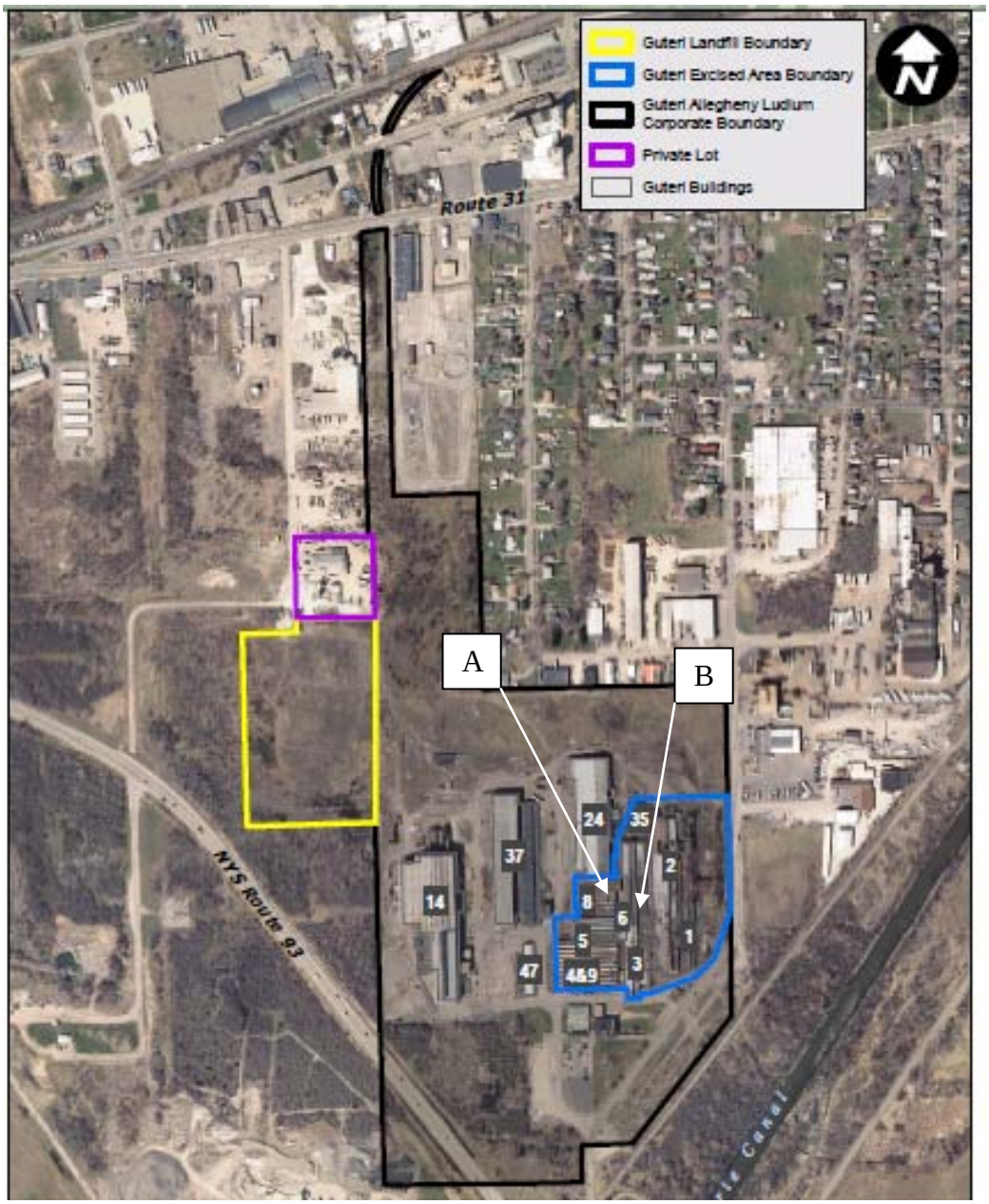
- The Allegheny Ludlum Corporation, which includes four buildings constructed after the termination of AEC activities;
- The 3.5-hectare landfill area in the northwest corner of the site; and
- The 3.6-hectare excised property in the southeast corner of the site, which includes the buildings where AEC-contracted activities were performed (Vitkus, 1999). This area was not purchased by the current property owner and remains under the control of the State of New York and the U.S. Army Corps of Engineers.

Table 5-1 lists the buildings where contamination has been found; thus, these buildings likely existed at the time of AEC operations.

**Table 5-1: Simonds Saw and Steel Co. Buildings**

| Building Number | Building Letter | Building Use |
|---|---|---|
| 1 | | Manufacturing |
| 2 | | Manufacturing |
| 3 | B | Grinding and rolling, hammer forge shop |
| 4 | | Manufacturing |
| 5 | | 25-cycle heat exchanger |
| 6 | A | 16” rolling mill |
| 8 | A | 10” rolling mill |
| 9 | | Manufacturing |

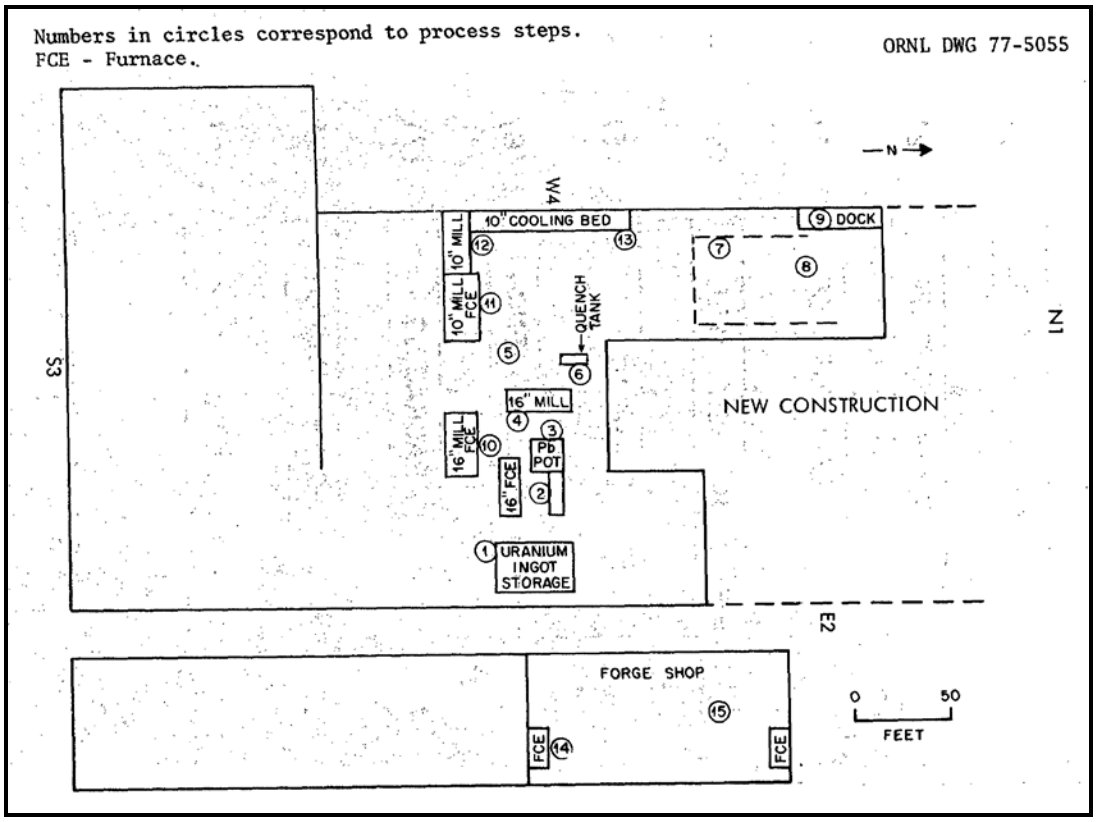
The Simonds Saw and Steel Co. buildings closely associated with AEC operations were referred to as Building A (also known as Buildings 6 and 8) with the 16” and 10” rolling mills, and Building B (also known as Building 3) with the hammer forge shop (Ford, 1981b). Figure 5-1 shows an aerial view of Simonds Saw and Steel Co. identifying the three site areas and Buildings A and B.




Source: Modified version of an image from Army Corps, 2010, pdf p. 2

**Figure 5-1: Aerial View of Simonds Saw and Steel Co.**

Figure 5-2 provides a general view of the rolling and forging operational layouts.




Source: Modified version of Figure 2 from ORNL, 1979

**Figure 5-2: Simonds Saw and Steel Co. Operational Layouts**

### 5.1.2 Process Description

Simonds Saw and Steel Co. performed experimental uranium rolling for AEC on February 24, 1948, before entering into a contractual agreement with the U.S. AEC. The first contract, AT-30-1 Gen-339, negotiated with the AEC New York Operations Office (NYOO) was initiated in May of 1948, and was renewed annually through February 1952. Contract AT-30-1-Gen-339 was officially closed on July 21, 1952. Simonds Saw and Steel Co. continued work under subcontract S-4 (effective March 1, 1952, through December 31, 1957) to the National Lead of Ohio (NLO) in Fernald, Ohio, contract AT (30-1)-1156 with NYOO (Unknown author, post-November 1976).

The earliest document located regarding thorium rolling at Simonds Saw and Steel is correspondence dated August 1951 (Huke, 1951**)**. In relation to thorium, it states:

> *Approximately two tons of thorium metal were rolled at Simonds Steel Co., Lockport, New York on August 16, 1951 … We believe that this is the first time that thorium billets have been rolled directly to rods on what might be termed production scale. Previously, billets were forged to 2" squares and then rolled. … Most of the material received consisted of 3-in. diameter round billets in the range of 15-in. long*.

The statement, "*Previously, billets were forged…and then rolled…*" indicates that thorium forging and rolling were performed prior to August, 16, 1951. However, since insufficient information is available to determine an accurate thorium-processing start date, NIOSH assumes that thorium processing began coincident with the start of AEC-contracted work at Simonds in February 1948.

Uranium and thorium process materials arrived crated or palleted, predominantly by railcar, and the ingots or billets were placed in temporary storage near the processing areas. The billets were then transferred, via a crane/monorail system, to the scales to be individually weighed. After weighing, the ingots or billets were transferred to a furnace and heated to greater than $1000^{o}$ F. The heated ingots or billets were then immediately transferred for processing.

After rolling, the rods were quenched (either pressure quenched or dipped in a tank) and transferred in bundles by crane to the shipping area, where they were placed in tared H-beams, weighed, and loaded into railcars from the shipping dock (Keller, 1979; ORNL, 1979). AEC noted that trucks instead of railcars were being used as of August 1950, which eliminated daily handling and shoring of the load by shippers (Heatherton, 1950b).

Thorium processing methods varied over time, apparently attempting, in part, to determine which method produced the highest-quality rods. Most billets, according to a worker interview, were hammer-forged, and then rolled. Some billets were rolled directly after heating. Thorium was predominantly hammer-forged and then rolled on the 10" rolling mill, but occasionally was also rolled on the 16" mill (Personal Communication, 2010L). Correspondence dated May 1956 refers to a planned thorium rolling which was to be performed for Babcock and Wilcox and would involve forging, rolling on the 16" mill, and finishing on the strip mill (Wunder, 1956). The performance of this work is documented in *Trip Report to Simonds Saw and Steel Company* dated April 25, 1956 (Magoun, 1956).

Occasional tests were run with uranium to determine if different coatings, or heating and rolling methods, would either produce a better product, or reduce worker exposure. AEC reported on the rolling of copper-clad uranium on March 7 or 8, 1951 which was deemed unsuccessful due to increased product problems and increased air concentrations (Heatherton, 1951a). The heating of uranium billets progressed from a gas-fired furnace to salt bath heating, and finally to lead bath heating. While uranium billet protective coatings and heating methods changed over time, documents indicate that thorium billets were always heated in a gas-fired furnace and were processed with no protective coatings.

In 1952, Fernald became the primary AEC site for processing uranium; thus, Simonds Saw and Steel uranium-processing activities were significantly reduced, with thorium processing continuing on an occasional basis. Simonds Saw and Steel received odd lots of uranium that could not be easily processed at Fernald. For example: "A few of the later lots of material were depleted uranium and several were enriched to the extent of about 2.5% [by mass]" (Keller, 1979). Fernald also had a document entitled *Standard Operating Procedure for Rolling 7.2% Enriched Metal at Simonds Saw and Steel Company* (NLO Procedure, 1955). However, it is not known if such rolling was ever performed.

While a majority of documents state that no uranium or thorium was processed for the AEC at Simonds after 1956, some documents indicate that approximately 13 tons of uranium slabs were produced in April 1957. NLO Production Order Request # A-60 in April 1957 states that the work was not to be billed because it was applied to research and development (POR, 1957). In reference to Production Order # A-60, a subsequent June 1957 memo states that 26,860 pounds of normal uranium forged slabs had been shipped via truck from Simonds to Superior Steel Corporation on April 29, 1957 (McCreery, 1957). This signifies that the work associated with the production order request had been completed. Subsequent documents indicate the final contract closure occurred sometime in late 1957; the exact date is unknown (NLO Letter, 1957; NLO Minutes, 1957; NLO Telegram, 1957).

**Employment Categories and Hours**

Simonds employees worked two shifts. AEC reports indicate that a shift lasted from 8 to 11 hours, with the typical shift lasting about 10 hours. These work-hours included at least 45 minutes for time spent in the locker room and at lunch. Table 5-2 lists the job categories included in the AEC and NLO exposure studies, but the AEC reports indicated that workers switched categories. In addition, it was noted that workers could have worked on both the 16" and the 10" rolling mill. (ORAUT-TKBS-0032)

**Table 5-2: Job Categories Involved in Uranium/Thorium Rolling**

| | |
|---|---|
| Assistant Foreman | Rod Stamper |
| Billet Loader | Roller #1 (Rougher) |
| Dippers | Roller #2 (Finisher) |
| Drag Down Man | Run-Out |
| Foreman | Shear Man |
| Furnace Man (Heater) | Shippers |
| Heater Helper | Straightener |
| Hook Man | Stranner |
| Poke-In | Weighers (Rod) |
| (Pressure) Quencher | Weighin (Weighup) |

Source: ORAUT-TKBS-0032

### 5.1.3 Forging Operations

Simonds Saw and Steel performed hot forging of uranium and thorium metal - uranium on an experimental basis, and thorium mostly on a production basis. The metals were usually forged and then rolled into rods (Huke, 1951). This was apparently the primary method for processing thorium at Simonds (Personal Communication, 2010L).

Information on Simonds uranium forging is limited, but records indicate that "*some 15 of* [or?] *20 ingots were processed in the hammer forge shop*" (Keller, 1979). The AEC concluded that forging was a very dusty operation and, based on health considerations, recommended not using the process for uranium (Heatherton, 1950a). A 1957 document refers to the production of 26,860 pounds of uranium forged slabs that had been shipped by truck to Superior Steel Corporation (McCreery, 1957).

In 1956, Simonds reportedly requested that NLO survey the thorium work that consisted of drop forging, rolling on the 16" bar mill, and finishing on the strip mill (Wunder, 1956). This thorium work was reportedly commercial work for Babcock & Wilcox and was to occur in June 1956. However, this work was reportedly completed in July 1956 (Heatherton, 1956**).**

### 5.1.4 Engineering Exposure Controls

The main AEC safety recommendations for Simonds Saw and Steel involved workplace contamination controls, consisting primarily of ventilation controls and cleaning to minimize uranium dust in the workplace. Simonds Saw and Steel documents contain little mention of external radiation safety practices. Simonds-related documents do not mention area access controls, but do indicate that security guards accompanied all uranium shipments. Former Simonds Saw and Steel workers explained that there were no controls in place that would prevent other plant workers from entering or passing through the uranium/thorium work areas.

AEC reports documented incremental improvements in Simonds' contamination control programs (Heatherton, 1950a; Heatherton, 1950b; Heatherton, 1951b; Klevin, 1949a; Klevin, 1949b; Klevin, 1950; Klevin, 1951b; NYOO, 1948a; NYOO, 1948b). Over time, by December 1948, Simonds Saw and Steel went from having no ventilation controls to having local ventilation exhausts over the 16" rolling mill as well as a central vacuum cleaner to replace broom sweeping. In January 1949, a local exhaust was installed over the descaler. No local ventilation was described for the 10" rolling mill or for the limited forging work, which were the methods most often used for processing thorium. The only mention of engineered controls during forging operations referred to the use of a fan to blow dust away from the forge machine operators (Dust Data, 1954-1956, pdf p. 6). Improvements in air concentrations over time are illustrated in Figure 5-3, which illustrates the general area air concentrations on the east side, west side, and in the lunch area.

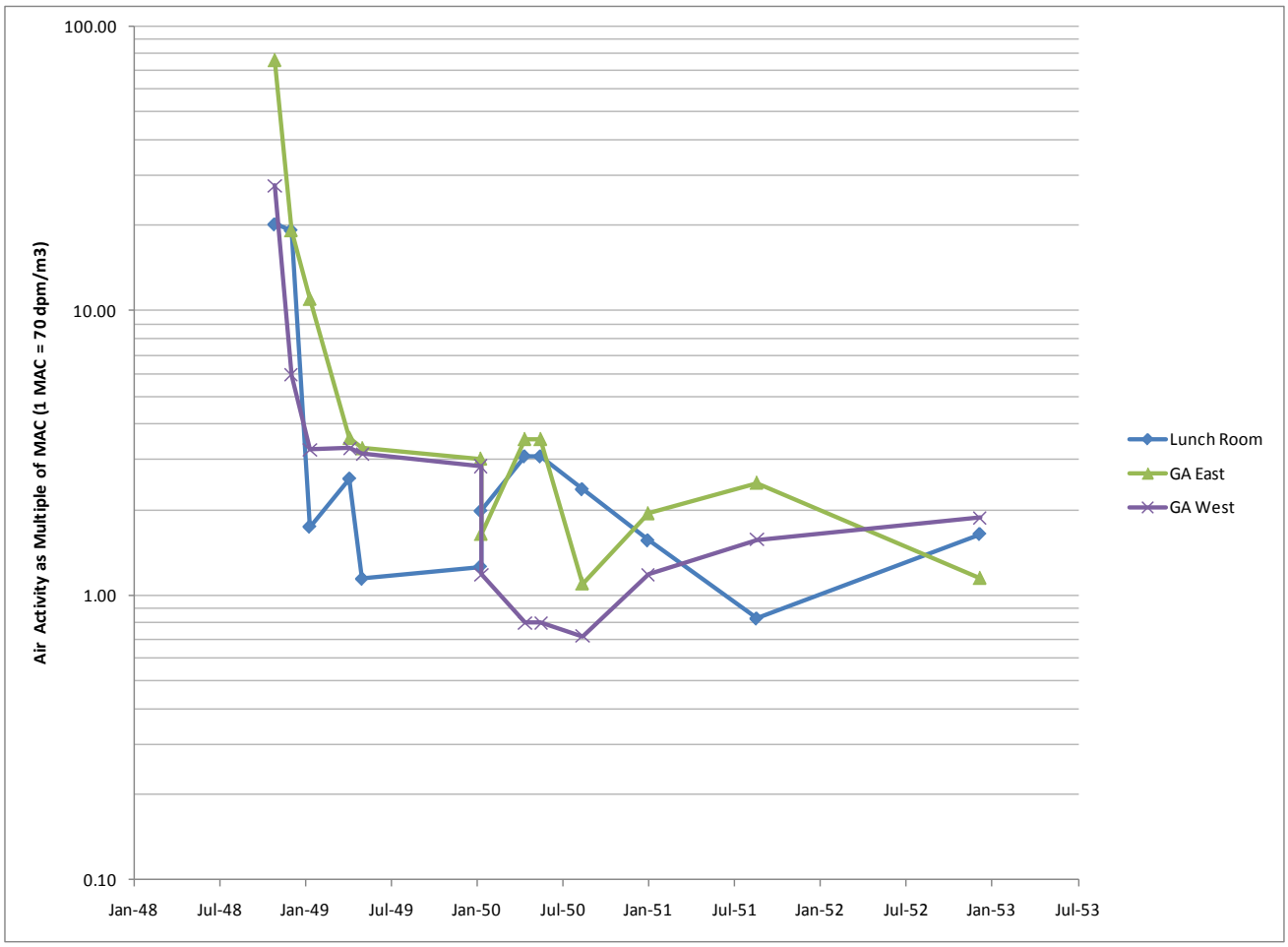



**Figure 5-3: General Area Air Activity During Initial AEC Contract Period (1948-1953)**

AEC reports document the effectiveness of recommended contamination controls, but noted inconsistency in their implementation (Heatherton, 1951b, pdf pg 5; Klevin, 1951a; Klevin, 1951b, pdf p. 7; Klevin, 1953b, pdf p. 5; Klevin, 1954; Schumann, 1953a, pdf p. 6). Available documentation indicates that after 1953, the engineering controls that were previously installed were not consistently used. The AEC and NLO constantly reminded Simonds Saw and Steel to use the vacuum cleaner instead of broom sweeping the uranium dust areas. Simonds' use of the Plexiglas shields, floor grating, and ventilation system dust collectors appear to have been intermittent. In addition, the practice of wearing dedicated anti-contamination clothing was also appears to have been sporadic. AEC and NLO reports mention dedicated work clothes, but actual use of these clothes is not clear. Cotton gloves appear to have been worn intermittently. In later years, there is mention of dust masks and respirators, especially in conjunction with the enriched uranium processing and the thorium processing, but it was noted that respirator use was intermittent, if not rare, during AEC material processing.

Late 1953 correspondence indicates that to decontaminate Simonds Saw and Steel Co. the ventilation over the bar mill would be removed rather than leave it for future rollings (Heatherton, 1953a). Correspondence states that cleaning up from a single thorium rolling would result in less overall cost than maintaining the ventilation; it also indicates that the workers would be provided with respirators.

A September 3, 1954 memo discussing August rolling operations noted the deviations from previously-agreed-upon controls and indicated that the average general area air activity was 350 $dpm/m^3$ (5 MAC) (Klevin, 1954). As shown in Figure 5-3, in 1949, previously-instituted engineering controls had reduced general area air activity to below this level.

November 1954 correspondence (Polson, 1954) states that during the next several rollings:

> *…all operators have worn coveralls and caps supplied by NLO. Shoe covers are available but the men do not care to wear them. We have supplied respirators in the past but very few are worn continuously.*
>
> *Recently, we rolled enriched materials there (P.O. 296) and the men were concerned about its increased toxicity. Almost everyone wore coveralls, hats, shoecovers and respirators. Some, however, wore no protective equipment.*
>
> *For these past rollings, the two dust hoods over the 16-inch mill were used. There are no hoods over the 10-inch mill. The mill area has been cleaned after each rolling as well as possible considering the type of floor (steel plates).*

NLO concluded that other rolling facilities would be used instead of Simonds as soon as the other facilities became available (Polson, 1954).

## 5.2 Radiological Exposure Sources from Simonds Saw and Steel Co. Operations

*ATTRIBUTION: Section 5.2 was completed by Robert Coblentz, Quantaflux, LLC. The rationales for all conclusions in this document are explained in the associated text.*

Numerous documents provide summaries of Simonds Saw and Steel's operational history, including the estimated total quantities of uranium and thorium metals that were processed. The documents typically state that between 25 and 35 million pounds of uranium and approximately 30,000 to 40,000 pounds of thorium were rolled from February 24, 1948 until operations ceased in 1956 (Vitkus, 1999). Additional AEC-related uranium forging work was apparently performed in April 1957, during which 26,860 pounds of normal uranium forged slabs were processed and shipped to the Superior Steel Company (McCreery, 1957). Processed-quantity data were compiled from all available Simonds-related documents; the derived values are shown in Table 5-3.

| Table 5-3: Documented Amounts (in Tons) of Uranium and Thorium Processed at Simonds | | | | | | | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | 1948 | | 1949 | | 1950 | | 1951 | | 1952 | | 1953 | | 1954 | | 1955 | | 1956 | | 1957 | |
| | U | Th | U | Th | U | Th | U | Th | U | Th | U | Th | U | Th | U | Th | U | Th | U | Th |
| **Jan** | | | 159 | | | | 176 | | 260 | | 149 | | | | | | | | | |
| **Feb** | | | | | 144 | | 125 | | | | 240 | | | | | | | | | |
| **Mar** | 57 | | 110 | | | | 221 | | 355 | | 0 | | | | | | 0.5 | | | |
| **Apr** | | | 86.6 | | | | 218 | | | | 0.11 | | | | | | 0.94 | 1 | 13.4 | |
| **May** | 100 | | 167 | | 150 | | 95 | | 419 | 1 | | | 2.6 | 7.16 | | | | | | |
| **Jun** | 100 | | | | 138 | | 119 | | 425 | | | | | 2 | | | | | | |
| **Jul** | 107 | | | | | | 268 | | 0.5 | | | | | | | | | 3.4* | | |
| **Aug** | 129 | | | | 151 | | 108 | 2 | 259 | | | | * | 1.8 | | | | | | |
| **Sep** | 150 | | 38 | | 100 | | 48 | | 240 | 3 | | | | | | | | | | |
| **Oct** | 150 | | | | 98 | | 59 | | 224.5 | | | | 36 | | | | | | | |
| **Nov** | 150 | | | | 87 | | 148 | 1.80 | 182 | 4.5 | | | | | | | | | | |
| **Dec** | 57 | | | | 95 | | 196 | 1.50 | 414 | 4 | | 21 | | | | | 11.5 | | | |
| **Annual Total** | **943** | | **1474** | | **1135** | | **3120** | **5.34** | **3120** | **12.5** | **389** | **21** | **580** | **18** | **580** | | **220** | **4.4*** | **13.4** | |

Notes:

This table was created after the review of numerous Simonds Saw and Steel Co. documents. The totals in this table reflect the compilation of quantity data from all reviewed documents.

Monthly values represent the amounts found through documentation reviews; the values include depleted and enriched uranium.

Annual total values represent either the sum of the monthly values, or are taken from documented annual amounts, whichever were greater.

***** indicates that documents reviewed indicate that processing work was performed, but did not provide an amount.

.

Based on these data, the derived total quantities of uranium and thorium processed are estimated to be 11,500 tons and 57 tons, respectively. The total thorium quantity, as indicated, exceeds the amounts stated in the documented historical narratives by about a factor of three.

Throughout the periodic air monitoring reports published by the AEC, there are frequent accounts of the failure of Simonds to either implement recommended exposure control practices or to continue to adhere to such practices. The concerns conveyed by the AEC are best summarized in a November 1954 memo (Polson, 1954).

> *On the rolling of October 9-11, 1954, a NLO Health and Safety representative was present. In his report, reference 5, mention was made of some of the "doubtful practices" noted.*
>
> *This included:*
>
> 1. *Dropping of billets on floor prior to rolling*
> 2. *Wire brushing billets to observe temperature*
> 3. *Sweeping of floor instead of vacuum cleaning*
> 4. *Use of cloth gloves*
> 5. *Eating in vicinity during rolling*
>
> *These practices have been going on for as long as anyone connected with the operations can remember. … Rolling has continued with the thought that as soon as other facilities become more fully developed future fabrication at Simonds will be almost nil. It is planned to extrude the depleted uranium orders at Wolverine Tube and extrude the thorium material at Bridgeport Brass in Adrian Michigan. Both of these facilities should be satisfactory from a health and safety standpoint.*

The following subsections provide an overview of the internal and external exposure sources for the Simonds Saw and Steel class under evaluation.

### 5.2.1 Internal Radiological Exposure Sources from Simonds Saw and Steel Co. Operations

*ATTRIBUTION: Section 5.2.1 was completed by Robert Coblentz, Quantaflux, LLC. The rationales for all conclusions in this document are explained in the associated text.*

The primary source for personnel internal exposure at Simonds Saw and Steel Co. was inhalation and ingestion of uranium and thorium dust. Oxide formed and sloughed off the metal surfaces and caused widespread contamination. Significant amounts of contamination became suspended in the air in the work areas, both directly from the metal-processing activities, as well as from personnel movement and foot traffic that caused re-suspension of contamination that had accumulated on floors in the work areas (ORAUT-TKBS-0032). Secondary sources of internal exposure were from decay products of recycled uranium (neptunium-237, plutonium-239), and from radon-220 (thoron), a gaseous decay-chain product of thorium-228.

Numerous documents summarize the operational history and list the total quantities of uranium and thorium metals processed at Simonds Saw and Steel Co. The documents typically state that between 25 and 35 million pounds of uranium and approximately 30,000 to 40,000 pounds of thorium were rolled from February 24, 1948 until operations ceased in 1956 (Vitkus, 1999) (additional AEC-related uranium work was apparently performed in 1957; see Section 5.2.1.1). Processed quantity data were compiled from all available Simonds-related documents and the values are shown in Table 5-3. Based on these data, the derived total quantities of uranium and thorium processed are 11,500 tons and 114,000 pounds, respectively. The total thorium quantity, as indicated, exceeds the amounts stated in various documented historical narratives by about a factor of three.

### 5.2.1.1 Uranium

*ATTRIBUTION: Section 5.2.1.1 was completed by Robert Coblentz, Quantaflux, LLC. The rationales for all conclusions in this document are explained in the associated text.*

Simonds Saw and Steel Co.'s radiological source term consisted primarily of natural uranium metal, uranium oxides, and uranium's short-lived progeny. The uranium source term was predominantly natural uranium with significantly smaller amounts of depleted uranium and enriched uranium up to about 2.5% by mass (Keller, 1979).

Uranium processing occurred in turnings ("rolling turns") of about 15,000 to 20,000 pounds each. There were approximately 312 turnings per year from 1948 through 1952. It appears that a rolling turn took up one shift (Schumann, 1953a); there were about 156 days per year, two shifts each day, devoted to AEC work from 1948 through 1952. This translates into 31 of 52 weeks, or approximately 60% of the total operations time, being spent on AEC work. At the end of the initial AEC contract, turnings reportedly decreased to 29 turnings in 1953, 56 in 1954, 58 in 1955, and 22 in 1956 (Keller, 1979). Documentation of specific rolling dates was only available for those periods included in the AEC Visit reports. Based on the number of turnings reported in a 1979 letter from Simonds to the DOE (Keller, 1979**)**, the number of uranium-rolling days can be estimated as 15 rolling days in 1953, 28 in 1954, 29 in 1955, and 11 in 1956.

Additional AEC-related uranium forging work was apparently performed in April 1957, during which 26,860 pounds of normal uranium forged slabs were processed and shipped to the Superior Steel Company (McCreery, 1957). The Production Order Request states that the work was not to be billed because it was applied to research and development (POR, 1957). No former workers who were interviewed had any recollection of this work. Recently-acquired documents indicate that final contract closure occurred sometime in late 1957; the exact date is unknown (NLO Letter, 1957; NLO Minutes, 1957; NLO Telegram, 1957).

5.2.1.2 Thorium

*ATTRIBUTION: Section 5.2.2.1was completed by Robert Coblentz, Quantaflux, LLC. The rationales for all conclusions in this document are explained in the associated text.*

The earliest document located regarding thorium rolling at Simonds Saw and Steel is correspondence dated August 1951 (Huke, 1951**)**. In relation to thorium, it states:

> *"Approximately two tons of thorium metal were rolled at Simonds Steel Co., Lockport, New York on August 16, 1951 … We believe that this is the first time that thorium billets have been rolled directly to rods on what might be termed production scale. Previously, billets were forged to 2" squares and then rolled. … Most of the material received consisted of 3-in. diameter round billets in the range of 15-in. long."*

A progress report for November 1951 indicates that 36 thorium billets were shipped to Simonds Saw and Steel Co. for rolling on November 19, 1951 (Malone, 1951). A January 1952 progress report states that no thorium metal was rolled in January 1952, and that there were no plans to roll thorium at Simonds Saw and Steel Co. for the next few months (Malone, 1952). Inventory amounts of thorium were shown for 1952 during the months of May, September, and November (Gustavson, 1953). In November 1952, 8,500 pounds of thorium were to be rolled (Belmore, 1952). An additional rolling of 38 thorium billets took place in August 1954 (Harris, 1954); this is approximately 1.8 tons based on 95 pounds per billet. Documents indicate that thorium-forging work was performed in May and July, 1956 (Magoun, 1956; Dust Data, 1954-1956). The largest single thorium rolling known was performed in December 1953 (Wunder, 1953, pdf p. 7**)** in which 21 tons (455 ingots) of thorium were rolled in a three-day period.

5.2.1.3 Recycled Uranium Contaminants (Np-237, Pu-239)

*ATTRIBUTION: Section 5.2.1.3 was completed by Joseph Guido, MJW Corporation. The rationales for all conclusions in this document are explained in the associated text.*

Recycled uranium might have been processed at Simonds Saw and Steel after 1952. Based on a review of recycled uranium contaminants at Hanford and Fernald, estimates of contaminants that might have contributed the most to Simonds internal doses are shown in Table 5-4. It is unlikely that recycled uranium would constitute the entire Simonds Saw and Steel source term. The activity fractions shown in Table 5-4 are based on the specific activity of depleted uranium, which increases the proportion of the contaminants by activity. The contaminant level for depleted uranium overestimates the contaminants in uranium of normal enrichment by about 40%.

**Table 5-4: Estimated Contaminant Activity Fractions in Recycled, Depleted Uranium Source Term**
(pCi contaminant per pCi uranium)

| Uranium | Neptunium-237 | Plutonium-239 |
|---|---|---|
| 1 | 0.00182 | 0.00261 |

#### 5.2.1.4 Thoron

*ATTRIBUTION: Section 5.2.1.3 was completed by Joseph Guido, MJW Corporation. The rationales for all conclusions in this document are explained in the associated text.*

Thoron is the second daughter product of Th-228, and after a couple of weeks, following the processing of thorium ores for thorium purification, thoron can be considered to be in full equilibrium with the parent Th-228. The degree of equilibrium between Th-232 and Th-228 is dependent on: (1) the decay of Th-228 (without replenishment from the 5.7 year half-life of Ra-228) after removal of the thorium daughters; and (2) the time it takes the Ra-228 to build into equilibrium with Th-232. While the equilibrium state is unknown during the operational period at Simonds Saw and Steel, it can be assumed to have been near equilibrium by the end of the period under evaluation (December 31, 2006).

Thoron was present at Simonds Saw and Steel Co. A portion was released during thorium processing and storage, and from associated residual thorium contamination. The thoron, with its subsequent daughter products, would act as a potential source of internal exposure in areas in which thorium was processed (during the operational period) or where residual thorium contamination could exist (during the residual period).

### 5.2.2 External Radiological Exposure Sources from Simonds Saw and Steel Co. Operations

*ATTRIBUTION: Section 5.2.2 and its related subsections were completed by Joseph Guido, MJW Corporation. The rationales for all conclusions in this document are explained in the associated text.*

After arrival by rail or truck, uranium and thorium billets were stored on site near their respective processing areas in preparation for rolling and/or forging. The finished rods were stacked and stored in the shipping area awaiting shipment. These two areas (processing and shipping) presented sources for personnel external radiation exposure. Continual handling of the individual billets and rods presented another source. Accumulation of uranium and thorium scale in areas such as the furnace, underneath the rolling mills, in the quench tank, etc., would have also been a source of external radiation exposure (ORAUT-TKBS-0032).

The primary sources for external radiation exposure to personnel at Simonds Saw and Steel were:

- Beta and photon radiation from uranium metal billets and rods
- Beta and photon radiation from thorium ingots and rods

Tables 5-5 and 5-6 list the radionuclides of concern for external radiation from uranium and thorium.

| Table 5-5: Principal Radiation Emissions from Natural Uranium and its Short-lived Decay Products | | | |
|---|---|---|---|
| **Radionuclide** | **Half-life** | **Beta Energy (MeV Max)** | |

| Table 5-6: Principal Radiation Emissions from Thorium-232 and its Short-Lived Decay Products | | | |
|---|---|---|---|
| **Radionuclide** | **Half-life** | **Beta Energy (MeV Max)** | **• • • • • • • • • : Energy (MeV)** |
| Thorium-232 | 1.405 x $10^{10}$ years | None | 0.059 (0.19%) |
| | | | 0.126 (0.04%) |
| Radium-228 | 5.71 years | 0.389 (100%) | 0.0067 (6 x $10^{-5}$%) |
| Actinium-228 | 6.25 hours | 0.983 (7%) | 0.338 (11.4%) |
| | | 1.014 (6.6%) | 0.911 (27.7%) |
| | | 1.115 (3.4%) | 0.969 (16.6%) |
| | | 1.17 (32%) | 1.588 (3.5%) |
| | | 1.74 (12%) | --- |
| | | 2.08 (8%) | --- |

non-penetrating external exposure. Table 5-6 shows the primary isotopes and photon energies associated with thorium and its progeny.

#### 5.2.2.2 Beta

Tables 5-5 and 5-6 show the principal beta emitters and their energies for the uranium and thorium metal used at Simonds Saw and Steel. As indicated in these tables, there are a significant number of high-energy beta radiations that represent a shallow dose exposure concern for site workers. Workers who handled the uranium and thorium metal would have received shallow dose exposures. The primary exposure areas would have been the hands and forearms, the neck and face, and other areas of the body that might not have been covered.

#### 5.2.2.3 Neutron

Due to the fact that Simonds Saw and Steel only processed natural and low-enriched uranium in metal form, there is no credible source of neutron radiation exposure because neutron radiation levels from these types of materials are negligible (ORAUT-OTIB-0024). Thus, neutron exposures will not be discussed throughout the rest of this report.

### 5.2.3 Incidents

*ATTRIBUTION: Section 5.2.3 was completed by Joseph Guido, MJW Corporation. The rationales for all conclusions in this document are explained in the associated text.*

ORAUT-TKBS-0032 describes four specific incidents related to the Simonds operations:

- An AEC employee noted while sampling air in January 1949 that his face and hands were occasionally stung by particles that could have come from the descaling machine (Klevin, 1949a).

- A flying chip, thought to be from the die head or the hammer, embedded itself in the flesh of the inner thigh of a rod stamper (Heatherton, 1951a). Laboratory analysis determined that this was not uranium (NYOO, 1951a).

- A rod stamper had a chip of material taken from his wrist with a reported uranium mass of 1.5 µg (NYOO, 1951b).

- In March 1952, there was a concern about an "allergic" reaction by a doctor and a nurse at a local hospital who were treating a Simonds 10” bar mill worker. The rumor was enhanced by reports of several other Simonds workers who complained of dermatitis. The dermatitis was limited to the day shift and cleared up within a week or so. It was concluded that the dermatitis was unlikely the result of radiation or uranium exposure (Tabershaw, 1952).

# 6.0 Summary of Available Monitoring Data for the Class Evaluated by NIOSH

The following subsections provide an overview of the state of the available internal and external monitoring data for the Simonds Saw and Steel Co. class under evaluation.

## 6.1 Available Simonds Saw and Steel Co. Internal Monitoring Data

*ATTRIBUTION: Section 6.1 was completed by Joseph Guido, MJW Corporation. The rationales for all conclusions in this document are explained in the associated text.*

### Urinalysis Data

Internal monitoring was not performed to assess thorium exposure. Urinalysis samples are available for the period from November 1948 through December 1952. The uranium fusion photofluorimetry urinalyses performed by the University of Rochester and the AEC NYOO were similar to those performed at other AEC facilities. The default detection threshold for uranium urinalysis is assumed to be 10 µg/L based on a reported sensitivity of 5 to 10 µg/L for uranium fluorimetry urinalysis in the early years (ORAUT-TKBS-0032**).** Several early Simonds bioassay reports noted that the results of less than 0.01 mg/L were insufficient for reliable detection (Urinalysis Results, 1948). These data are summarized in ORAUT-TKBS-0032 and shown below in Table 6-1. These data were used to perform a co-worker intake study, the results of which are published in ORAUT-TKBS-0032 and shown below in Table 6-2.

**Table 6-1: Summary of Uranium Bioassay Data**
(This table spans two pages)

| Bioassay Date | Geometric Mean (mg/l) | 84th percentile (mg/l) | Maximum (mg/l) |
|---|---|---|---|
| 11/1/1948 | 0.021 | 0.045 | 0.14 |
| 11/3/1948 | 0.022 | 0.042 | 0.09 |
| 11/4/1948 | 0.022 | 0.043 | 0.07 |
| 11/8/1948 | 0.011 | 0.018 | 0.03 |
| 11/11/1948 | 0.016 | 0.031 | 0.05 |
| 11/15/1948 | 0.016 | 0.035 | 0.05 |
| 1/6/1949 | 0.006 | 0.016 | 0.018 |
| 4/27/1949 | 0.017 | 0.028 | 0.036 |
| 11/4/1949 | 0.016 | 0.036 | 0.272 |
| 11/17/1949 | 0.001 | 0.01 | 0.164 |
| 1/6/1950 | 0.002 | 0.009 | 0.026 |
| 1/19/1950 | 0.01 | 0.024 | 0.035 |
| 5/15/1950 | 0.005 | 0.014 | 0.022 |

| Table 6-1: Summary of Uranium Bioassay Data (This table spans two pages) | | | |
|---|---|---|---|
| **Bioassay Date** | **Geometric Mean (mg/l)** | **84th percentile (mg/l)** | **Maximum (mg/l)** |
| 5/23/1950 | 0.008 | 0.019 | 0.034 |
| 8/14/1950 | 0.027 | 0.041 | 0.102 |
| 8/28/1950 | 0.016 | 0.022 | 0.033 |
| 9/23/1950 | 0.002 | 0.009 | 0.02 |
| 9/25/1950 | 0.011 | 0.018 | 0.024 |
| 10/20/1950 | 0.006 | 0.026 | 0.067 |
| 10/25/1950 | 0.005 | 0.016 | 0.043 |
| 11/9/1950 | 0.003 | 0.01 | 0.03 |
| 11/16/1950 | 0.005 | 0.014 | 0.028 |
| 12/14/1950 | 0.006 | 0.015 | 0.08 |
| 12/20/1952 | 0.016 | 0.035 | 0.066 |
| 12/22/1952 | 0.015 | 0.033 | 0.054 |

Source: This is a slightly-modified version of Table 4 from ORAUT-TKBS-0032**.**

| Table 6-2: Inhalation Intakes Based on Co-Worker Data | | | | | |
|---|---|---|---|---|---|
| **Start** | **End** | **Intake Rate, Type S[a]** | | **Intake Rate, Type M[a]** | |
| | | **Geometric Mean (mg/day)** | **Geometric Standard Deviation** | **Geometric Mean (mg/day)** | **Geometric Standard Deviation** |
| 2/24/1948 | 12/1/1948 | 0.422 | 1.98 | 12.6 | 1.99 |
| 12/1/1948 | 12/15/1950 | 0.173 | 2.25 | 1.76 | 2.58 |
| 12/15/1950 | 12/31/1956 | 0.329 | 2.16 | 5.32 | 2.15 |

Notes:
Source: This is a slightly-modified version of Table 5 from ORAUT-TKBS-0032.
**a** indicates that a lognormal distribution was assumed.

## Air Monitoring Data

During the period when the AEC was responsible for the Simonds contract, uranium inhalation intakes were monitored by the Industrial Hygiene Branch, Health and Safety Division of the New York Operations Office. These studies consisted of general area and breathing zone air samples that were combined with occupancy time estimates to derive daily weighted average (DWA) exposure values for various Simonds job categories. The results of these studies, along with a study performed by the Health and Safety Division of NLO are summarized in Tables 6-3 and 6-4. The NLO survey coincides with the timeframe in which responsibility for Simonds oversight shifted from the NYOO to NLO. While there is evidence of other inhalation studies, along with ambient air sample results, the NLO study is the only published uranium exposure study located for the post-1953 period.

**Table 6-3: Summary of Uranium Dust Exposure Studies, Oct. 1948 - Jan. 1950**
Airborne Dust Exposure (DWA, Multiples of MAC, MAC = 70 dpm/$m^2$)

| Job Title | **Simonds Visit Report** 10/27/48 | **Simonds Visit Report** 12/01/48 | **Simonds Visit Report** 01/10-01/21/49 | **Simonds Survey Summary Report** 04/05/49 | **Simonds Survey Results** 05/10-05/20/49 | **Simonds Survey Results** 01/09/50 | **Simonds Survey Results** 01/10/50 |
|---|---|---|---|---|---|---|---|
| Foreman | 25.0 | 13.0 | 4.6 | 3.1 | 2.7 | 2.5 | 1.8 |
| Roller #1, West | 23.0 | 12.0 | 3.6 | 1.3 | 2.4 | 1.7 | 11.8 |
| Roller #1, East | 190.0 | 21.0 | 9.9 | 1.3 | 5.6 | 3.7 | 7.7 |
| Roller #2, West | 11.0 | 15.0 | 4.1 | 6.7 | 3.1 | 6.2 | 1.9 |
| Roller #2, East | 120.0 | 36.0 | 15.7 | 6.1 | 6.7 | 2.9 | 4.3 |
| Pressure Quencher | 21.0 | 7.0 | 37.0 | 3.7 | 5.1 | 7.4 | 1.0 |
| Stamping Rods | 28.0 | 12.0 | 26.7 | 8.4 | 12.0 | 5.3 | 2.1 |
| Furnace Man | 8.0 | 4.0 | 1.4 | 2.1 | 1.7 | 1.2 | 2.7 |
| Heater Helper | - | - | - | - | - | - | - |
| Dragdown Operator | 9.0 | 10.0 | 1.6 | 2.6 | 3.1 | 1.5 | 6.2 |
| Shearman | - | - | - | - | 2.0 | 2.0 | 1.1 |
| Billet Loader | - | - | - | - | - | - | - |
| Weighers | - | - | - | - | - | - | - |
| Weighers (Billet) | - | - | - | - | - | - | - |
| Dippers | - | - | - | - | - | - | - |
| Skippers | - | - | - | - | - | - | - |

Source: This table was created from various reports, including the following: AEC, 1948-1949; Klevin, 1948; Klevin, 1949a; Klevin, 1949b; Klevin, 1949c; Klevin, 1950; and NYOO, 1948b.

**Table 6-4: Summary of Uranium Dust Exposure Studies, Apr. 1950 - Jan. 1953**
Airborne Dust Exposure (DWA, Multiples of MAC, MAC = 70 dpm/$m^2$)

| Job Title | Simonds Survey Results | | Simonds Survey Results 08/14-08/16/50 | Simonds Survey Results 01/01/51 | Simonds Survey Results 08/21/51 | Simonds Survey Results 12/09/52 | NLO Study Results 01/14-01/21/53 |
|---|---|---|---|---|---|---|---|
| | 04/13-04/18/50 | 05/17-05/22/50 | | | | | |
| Foreman | 1.0 | 2.2 | 1.2 | 1.6 | 2.1 | 1.4 | - |
| Roller #1, West | 0.6 | 0.6 | 1.2 | 0.9 | 1.9 | 2.3 | 2.5 |
| Roller #1, East | 4.0 | 3.9 | 2.3 | 12.4 | 1.8 | 1.7 | 1.3 |
| Roller #2, West | 1.5 | 2.4 | 1.5 | 1.1 | 1.6 | 4.1 | 1.8 |
| Roller #2, East | 4.3 | 4.6 | 2.0 | 18.9 | 2.5 | 1.4 | 0.8 |
| Pressure Quencher | 0.8 | 0.8 | 0.7 | - | 1.3 | 3.3 | 10.0 |
| Stamping Rods | 1.8 | 2.2 | 0.7 | 1.7 | 1.1 | 4.2 | 5.5 |
| Furnace Man | 0.9 | 0.3 | 1.2 | 1.6 | 1.0 | 1.1 | 0.5 |
| Heater Helper | - | - | - | - | 1.8 | 1.1 | 1.3 |
| Dragdown Operator | 1.2 | 2.6 | 1.1 | 1.8 | 1.7 | 0.9 | 0.6 |
| Shearman | 1.5 | 0.9 | 1.0 | 1.2 | 0.9 | 1.8 | 3.4 |
| Billet Loader | - | - | - | - | 1.1 | 0.9 | - |
| Weighers | 1.0 | 0.3 | - | - | 0.8 | 2.5 | 5.5 |
| Weighers (Billet) | - | - | - | - | - | 0.9 | - |
| Dippers | 1.1 | 1.1 | 2.5 | 1.8 | - | - | - |
| Skippers | 0.5 | 0.2 | - | - | - | - | - |

Source: This table was created from various reports, including the following: SRDB Ref IDs: Heatherton, 1950b; Heatherton, 1950c; Heatherton, 1951b; Klevin, 1951b; Klevin, 1953a; and Klevin, 1953b.

Periodically, Simonds Saw and Steel rolled enriched uranium and depleted uranium. The maximum enrichment of uranium processed at Simonds is unknown. Available documents indicate that uranium as high as 2.5% enrichment was processed (Keller, 1979). However, Fernald had two standard operating procedures for rolling uranium at Simonds, one for up to 2.75% enrichment (NLO Procedure, 1954) and another for up to 7.2% enrichment (NLO Procedure, 1955). Air monitoring data associated with these activities are summarized in Tables 6-5 and 6-6. In the enriched uranium air study, a weighted exposure was calculated for the brief (80-minute) activity for the lowest- and highest-exposed individual. These were 0.9 MAC-days and 22.0 MAC-days for the South Side Rougher and North Side Stranner, respectively (Heatherton, 1953b). These exposure rates correspond to daily weighted activities of 5.3 MAC and 128 MAC, respectively.

**Table 6-5: Air Concentrations During Rolling - Enriched Uranium on 10" Mill**

| Location | Air Concentration (dpm/$m^3$) |
|---|---|
| **Breathing Zone Air Concentrations** | |
| Foreman | 701 |
| Rougher, south side | 372 |
| Rougher, north side | 1,061 |
| Finisher, south side | 406 |
| Stranner, south side | 5,031 |
| Stranner, north side | 9,001 |
| Poke-in, north side | 2,061 |
| Straightener, north side | 6,081 |
| Straightener, run out | 8,011 |
| Rod stamper and straightener | 2,041 |
| **General Area Air Concentrations** | |
| Behind rod straightener | 208 |
| Mill floor during cleanup | 300 |
| Mill floor during rolling | 2,867 |
| Rod area during rolling | 1,678 |
| Furnace area during rolling | 2,186 |
| Near bull head | 1,196 |
| 10 foot east of mill | 83 |

Source: Information for this table, including location descriptions, is from Heatherton, 1953b.

| Table 6-6: Air Concentrations During Rolling - Molybdenum Depleted Uranium on 16" Mill | | | |
|---|---|---|---|
| **Location** | **Air Concentration (dpm/m$^3$)** | | |
| | **High** | **Low** | **Average** |
| **Breathing Zone Air Concentrations** | | | |
| Rougher, east side | 20 | 15 | 18 |
| Rougher, west side | 209 | 5 | 51 |
| Finisher, east side | 452 | 47 | 192 |
| Finisher, west side | 2,866 | 939 | 1,903 |
| **General Area Air Concentrations** | | | |
| Weigh-in and furnace area | 440 | 106 | 297 |
| West side of mill | 193 | 16 | 58 |
| East side of mill | 460 | 122 | 336 |

Source: Information for this table, including location descriptions, is from Schumann, 1953b.

Forging operations using uranium were periodically conducted. Air sampling data for uranium forging operations conducted on April 18, 1950 and July 12, 1956 are summarized in Tables 6-7 and 6-8. The April 1950 survey is discussed in an AEC air monitoring report (Heatherton, 1950c) which states:

> *The forge-hammering operation was very dusty. Individual general air dust samples collected in the vicinity of the forging were from 76 to 260 times the preferred level. Samples collected in the breathing zones of men handling the billets with tongs were 220 to 400 times the preferred level.*

| Table 6-7: Airborne Uranium Dust from Forging - April 18, 1950 | |
|---|---|
| **Location/Comment** | **Air Concentration (dpm/m$^3$)** |
| **General Area** | |
| Three feet above<br>5" billet forged to 1 15/16" | 7,600<br>5,200<br>6,400<br>12,000 |
| Forging 2 billets | 13,000<br>3,800 |
| **Breathing Zone** | |
| Operator, east side forge | 11,000 |
| Tong man, east side of forge | 20,000 |

Source: Information for this table, including location/comment descriptions, is from Air and Urine Data, 1949-1954, pdf pp. 58-60.

| Table 6-8: Airborne Uranium Dust from Forging - July 12, 1954 | |
|---|---|
| **Location/Comment** | **Air Concentration** ($dpm/m^3$) |
| **General Area** | |
| Hammer, south | 140<br>1,600<br>820<br>870<br>220 |
| East of 7 ton hammer, between hammer and furnace | 630 |
| 35 feet SEE of press | 100 |
| 35 feet from hammer (lunch) | 1100<br>990<br>850 |
| Bench (lunch area), north | 100 |
| Bench, SW of hammer ( lunch) | 27 |
| Lunch area, SSW hammer | 48 |
| 15 feet SW of hammer | 160 |
| 20 feet SW of hammer | 43 |
| 1 foot south of 7 ton | 2,100<br>10,000 |
| SE of 7 ton | 15,000 |
| 6 feet | 180 |
| 5 feet | 72 |
| **Breathing Zone** | |
| Hammer operating position downward | 310<br>270<br>500 |
| Charg. atop unit | 240<br>370<br>400 |
| NW corner of hammer-2 ingots | 1,900<br>3,500 |
| Around hammer | 8,300<br>29,000<br>3,600<br>650 |
| Opening furnace door, removing ingot | 4,500 |
| SW of 7 ton hammer | 5,600<br>6,000<br>2,200 |
| NE of 7 ton hammer | 730<br>770<br>950<br>4,000 |

Source: Information for this table, including location/comment descriptions, is from Air and Urine Data, 1949-1954, pdf pp. 145-148.

Documentation of an April 1956 hammer-forging operation did not contain any monitoring data. However, it did provide the following descriptive information (Magoun, 1956):

> *No salt or other coolant or oxidation inhibitor was used in this operation. Because of this, appreciable amounts of uranium oxide were formed on the slabs and thrown into the surrounding air by the heavy blows of the forge hammer. The operating personnel in the area were protected by respiratory during the time the forging hammer was in use.*

Airborne thorium dust inhalation studies were conducted on the unventilated 10" mill during rolling operations in November 1952, and on the ventilated 16" mill during rolling operations in December 1953. The results of these studies are presented in Table 6-9.

**Table 6-9: Airborne Thorium Dust Inhalation Studies - 16" Mill and 10" Mill**

| Position | Average Weighted Exposure ($dpm/m^3$) | |
|---|---|---|
| | 1953 (16" Ventilated Mill)[a] | 1952 (10" Unventilated Mill)[b] |
| Heater | 20 | 365 |
| Ingot Dragdown Operator | 17 | 245 |
| Roughers[c] | 32 | 1180 |
| Finishers[c] | 27 | 1456 |
| Rod Dragdown Operator | 10 | 785 |
| Rod Stamper | 13 | 1065 |
| Shear Operator/Helper[d] | 147 | 154 |
| Rod Straightener Operator/Helper[d] | 126 | 785 |
| Foreman/Assistant Foreman | | 595 |
| Stranner[d] | | 1355 |
| Hookman[d] | | 1962 |
| Extra Roller | | 2380 |

Notes:
[a] Samples were collected on 12/04/1953 (Schumann, 1953c).
[b] Samples were collected on 11/24/1952 and 11/25/1952 (Klevin, 1953a).
[c] For the purpose of this presentation, samples collected for 'east' / 'west' and 'north' / 'south' operations were averaged.
[d] For the purpose of this tabulation, sample results for Operator and Helper were averaged.
Information for this table, including position descriptions, is from the referenced source documents.

The only other thorium air sampling data related to rolling operations that could be located are samples collected in 1954 by NLO during a visit to Simonds in conjunction with another subcontract (Harris, 1954). The correspondence states:

> *…as time was available during the rolling performed for the National Lead Company, he took samples at the operations on the 16 inch and 10 inch rolling mills. The results of the few samples which were taken this time indicate that conditions were quite similar to those noted in November 1952 when exposures to thorium dust up to 40 times the maximum permissible level were found.*

In late 1953, both thorium and uranium machining operations were conducted on the 16" rolling mill. A comparison of the average weighted exposures during these activities is presented in Table 6-10; a comparison of the ambient air concentrations is presented in Table 6-11. Details of employed dust controls were not specified in the reports, except to say that there was inadequate ventilation during shearing and straightening operations for thorium rolling, there was broom-sweeping instead of vacuuming, and there was inadequate ventilation for the pressure-quenching operation during uranium rolling.

**Table 6-10: Comparison: Airborne Dust from U and Th Activities - Time Weighted Exposures**

| Position | Average Weighted Exposure ($dpm/m^3$) | |
|---|---|---|
| | 1953 (16" Mill) Thorium[a] | 1953 (16" Mill) Uranium[b] |
| Heater & Heater Helper | 20 | 61 |
| Ingot Dragdown Operator | 17 | 45 |
| Roughers (East Side) | 42 | 53 |
| Roughers (West Side) | 21 | 175 |
| Finishers (East Side) | 30 | 89 |
| Finishers (West Side) | 24 | 123 |
| Rod Dragdown Ope rator | 10 | |
| Rod Stamper | 13 | 385 |
| Shear Operator | 29 | 238 |
| Shear Helpers | 266 | |
| Rod Straightener Operator | 154 | |
| Helpers - Rod Straightener | 98 | |
| Pressure Quencher | | 700 |
| Weighout | | 385 |

Notes:
[a] Samples were collected on 12/04/1953 (Schumann, 1953c).
[b] Samples were collected on January 14-21, 1953 (Schumann, 1953a).
Information for this table, including position descriptions, is from the referenced source documents

| Table 6-11: Comparison: Airborne Dust from U and Th Activities - General Area and BZ Data | | |
|---|---|---|
| **Location** | **Air Concentration (General Area and Breathing Zone) (dpm/m$^3$)** | |
| | **1953 (16" Mill) Thorium[a]** | **1953 (16" Mill) Uranium[b]** |
| Weigh in and furnace area | 12 | 22 |
| Roughing mill - east side | 38 | 34 |
| Roughing mill - west side | 25 | 204 |
| Finishing mill east side | 15 | 119 |
| Finishing mill west side | 3 | 44 |
| Cooling grate and rod stamping | 6 | 589 |
| Crop shear | 145 | 421 |
| Rod straightener area | 121 | |
| Heater and helper | 62 | |
| Ingot dragdown operator | 40 | 105 |
| Roughers - east side | 69 | 66 |
| Roughers - wast side | 20 | 280 |
| Finishers - east side | 45 | 110 |
| Finishers - west side | 38 | 222 |
| Rod dragdown operator | 27 | |
| Rod stamper | 37 | 144 |
| Shear operator | 1751 | |
| Rod straightener operator | 508 | |

Notes:
[a] Samples were collected on 12/04/1953 (Schumann, 1953c).
[b] Samples were collected on January 14-21, 1953 (Schumann, 1953a).
Information for this table, including location descriptions, is from the referenced source documents

Forging operations using thorium were periodically conducted. The only air sampling data available for thorium-forging are related to operations conducted in July 1956. These data are summarized in Table 6-12. It should be noted that engineered controls were in place at the time that monitoring was performed (i.e., fans were in place to blow dust away from operators). Air monitoring data, therefore, may not be indicative of air concentrations during prior forging operations that may not have used the same controls. Simonds documentation indicates that there were previous forging operations involving thorium. For example, when describing the 1951 rolling operation as the first production scale rolling of thorium billets to rods, correspondence states: "*…previously billets were forged to 2 inch squares and then rolled"* (Huke, 1951, pdf p. 124). Previous operations were confirmed by an interview with a former Simonds Saw and Steel worker who indicated that thorium forging was a standard practice (Personal Communication, 2010L).

**Table 6-12: Thorium Air Monitoring Data from Forging Operations**

| Location/Comment | Air Concentration dpm/$m^3$ |
|---|---|
| **General Area** | |
| Background sample collected in forge area prior to forging work; ingots being heated in furnace 35 to 40 feet away | 6 |
| By furnace just before first ingot was removed | 60 |
| South side of forge downwind from fans blowing over forge die to keep dust away from operators | 1907 |
| By desk approximately eight feet south of forge during hammering of five ingots plus interval time | 505 |
| **Breathing Zone** | |
| Tong man on east side of forge during hammering of one ingot | 346<br>64 |
| Tong man on west side of forge during hammering of one ingot | 693<br>80<br>216 |
| Crane operator removing one ingot from furnace and placing on forge. | 27 |
| Hook man on east side of forge during forging of one ingot | 868 |
| Forge operator opening door on furnace and assisting crane operator in removing one ingot | 113<br>20 |
| Forge operator standing at controls on NE corner of forge during hammering of one ingot | 48 |

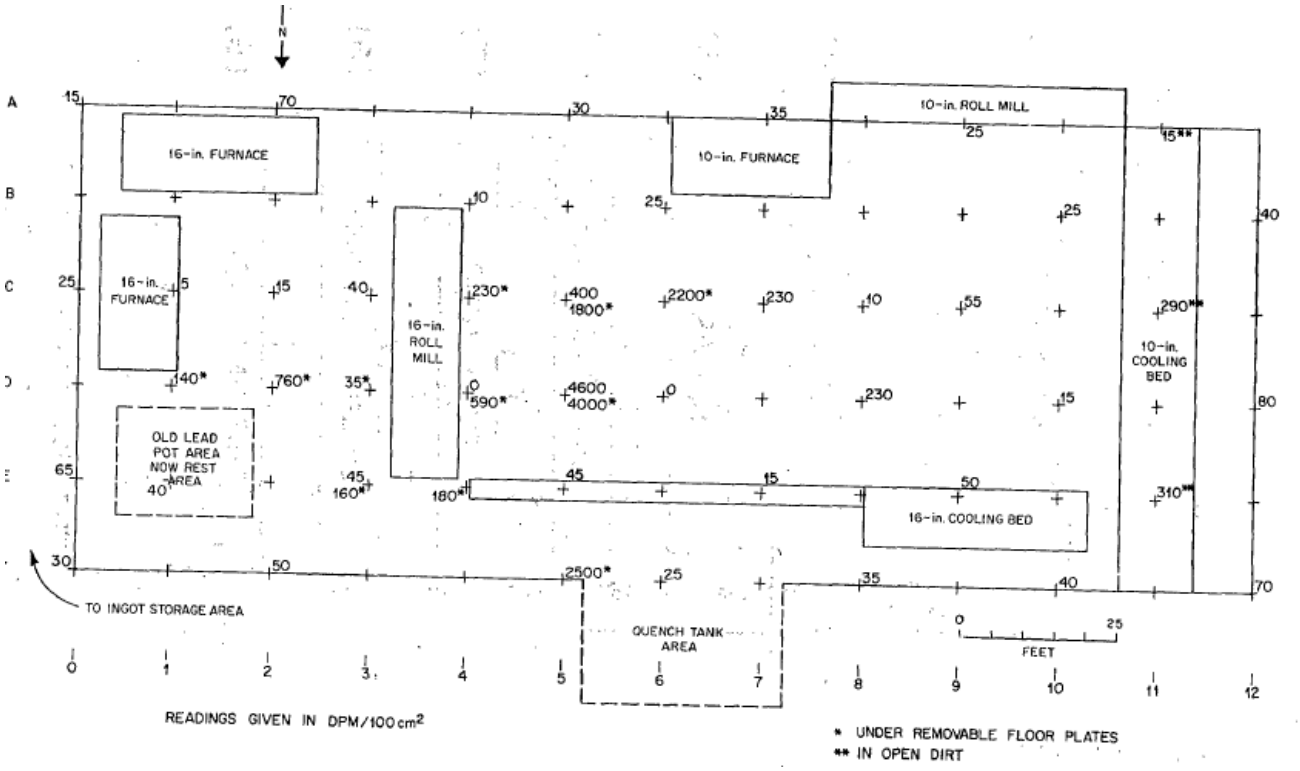
Source: Information for this table, including location/comment descriptions, is from Dust Data, 1954-1956**.**

## Surface Contamination Studies

Radiation and contamination monitoring data are available for the Simonds facility starting with the initial survey after the cessation of operations in 1958 (Glitzer, 1958a; Glitzer, 1958b) and continuing with additional surveys in support of the initial FUSRAP program in 1976 (ORNL, 1977), 1981(Ford, 1981a), 1984 (ORNL, 1984), and 1999 (Vitkus, 1999). All of the previous radiological survey data related to Simonds is summarized in the 2008 remedial investigation report (Earth Tech, 2008).

Nuclear Science and Engineering Corporation and Carborundum Metals performed surveys in late 1958. The November 1958 survey results do not appear meaningful or consistent with earlier results (Glitzer, 1958a). Alpha air activity was reported as 0 dpm with no indication of the air volume collected. The beta air activity was reported as 0 to 2.8 dpm. Smear samples were mostly less than 20 dpm except in the vicinities of the rollers and quenching areas, where the maximum removable activity appeared to be about 42 dpm and the maximum beta activity was 114.4 dpm. A second set of survey results dated 13 days later showed a maximum removable alpha activity of 404 dpm. A review of the data indicates that the alpha-counting efficiency was lower than the beta-counting efficiency. A single soil result, which is not completely legible, appears to be reported as 39 mg uranium/gram of soil. After the November 1958 survey, the quench tank was removed and clean steel was placed over the floor (DOE, 1979). Smear samples collected by Carborundum Metals on December 12, 1958 were less than 10 dpm alpha and less than 25 dpm beta in the former quenching area (Glitzer, 1958b).

Subsequent surveys were performed by other organizations. Figure 6-1 shows surface contamination measurements collected during the 1976 by Oak Ridge National Laboratory (ORNL, 1977).




Source: ORNL, 1977

**Figure 6-1: Direct Alpha Readings Measured During 1976 Survey**

Results of surface contamination and soil sampling conducted by Oak Ridge Institute for Science and Education (ORISE) are summarized in Tables 6-13 and 6-14 (Vitkus, 1999).

**Table 6-13: Summary: Dec. 1999 Contamination Survey Results – Maximum Recorded Values** (dpm/100 $cm^2$)

| Building No. | Accessible Surface[b] | | | Object / Component[b] | | |
|---|---|---|---|---|---|---|
| | Total activity | Removable | | Total activity | Removable | |
| | | Alpha | Beta | | Alpha | Beta |
| 1 | 1700 | 1 | -2 | 340000 | 5 | 7 |
| 2 | 11000 | - | - | 24000 | 3 | -1 |
| 3 | 67000 | 0 | -1 | 340000 | 130 | 195 |
| 4/9 | 23000 | - | - | 9700 | 7 | -1 |
| 6 | 4200 | 0 | 2 | 30000 | 1 | -1 |
| 8 | 54000 | 54 | 40 | 62000 | 74 | 120 |
| 24 | 99000 | 65 | 80 | 66000 | 16 | 22 |
| 35 | 120 | 0 | -1 | 650 | 0 | -4 |

a Source: Vitkus, 1999

b An "Accessible Surface" includes floors and lower walls that may be expected to be disturbed during daily activities and may be considered representative of general area conditions. This is in contrast to "Object / Component" which is a discrete item/object that would not be representative of general area conditions.

**Table 6-14: Summary of Radiological Soil Sampling Results**

| Sample Type | | Range of Radionuclide Concentrations (pCi/g) | | | |
|---|---|---|---|---|---|
| | | Ra-226 | Th-232 | U-235 | U-238 |
| Surface | Interior of Buildings | <0.1 – 8.4 | <0.1 – 442 | <0.1 – 772 | <4.1 – 41,600 |
| | Exterior of Buildings | <0.1 – 3.0 | <0.1 – 1.5 | <0.1 – 2.6 | <2.4 – 36.2 |
| | Outside of Buildings | <0.1 – 9.7 | <0.2 – 2.2 | <0.3 | <15 |
| Subsurface | Exterior of Buildings | <0.1 – 2.1 | <0.3 – 371 | <0.2 – 105.7 | <4.4 – 17,780 |
| Sediment | | <0.1 – 0.2 | <0.1 – 1.2 | 0.2 – 3.9 | 3.8 – 96.8 |
| Biased | | <0.1 – 21.0 | <0.3 – 307 | <0.3 – 1079 | < 8.6 – 54,800 |

Source: Vitkus, 1999

As part of the remedial investigation completed in 2007, a detailed survey was performed of the entire Simonds Saw and Steel facility. Surface contamination measurements performed during this investigation were used to derive 'Exposure Point Concentration' (EPC) values to be used in exposure and risk assessment studies. The EPC values represent 95% upper confidence limit values for each particular parameter reported. Table 6-15 presents a summary of the EPC values calculated for surface contamination.

**Table 6-15: Exposure Point Concentrations for Surface Contamination Measurements (Beta) (dpm/100 $cm^2$)**

| Building No. | Maximum | Average | EPC Value |
|---|---|---|---|
| 1 | 21000 | 300 | 600 |
| 2 | 140100 | 200 | 400 |
| 3 | 145900 | 3500 | 4600 |
| 4/9 | 30700 | 1100 | 1300 |
| 5 | 2200 | 1000 | 1200 |
| 8 | 58300 | 2600 | 6800 |
| 24 | 124200 | 5400 | 9300 |
| 35 | 2800 | 300 | 400 |

The presence of widespread residual contamination at the Simonds facility was recognized early on. In 1950, the AEC collected air samples for two days before, during, and after a rolling period. This study indicated that the air concentration did not go below 50% of the preferred level of 70 $dpm/m^3$, even when uranium rolling was not underway (AEC, 1948-1949). This survey also reported that a wash-down with a high-pressure fire hose after rolling resulted in no noticeable difference in air activity. The AEC concluded that the source of the airborne activity was coming from somewhere other than the steel floor. A subsequent report (Klevin, 1950) states:

*"…the fact that a residual air contamination of the order of 25 $\mu g/m^3$ exists, even after a thorough cleaning and a full month of no rolling indicates two things: 1) The entire mill has a low level of uranium contamination; 2) It will probably be impractical to reduce the airborne uranium level consistently below 15 $\mu g/m^3$."*

Subsequent survey data indicate the presence of contamination in the overhead spaces at Simonds. Table 6-16 provides a summary of data on uranium content in building dust over time in units of weight percent total uranium.

**Table 6-16: Uranium Content in Dust**

| Date | Location / Comment | Uranium Content (weight % total uranium) |
|---|---|---|
| 9/10/1953[a] | Platform above rolls | 1.5 |
| | T beam above rolling area | 2.3 |
| | 45 degree support above rolling area | 1.15 |
| | T beam 20 foot from rolls | 1.54 |
| | Angle iron 20 foot west of rolls | 4.6 |
| | I beam 6 foot over rolls | 3.46 |
| | Duct above furnace | 0.77 |
| | Lamp shade over furnace | 0.38 |
| | Pipe 50 foot north of furnace | 0.96 |
| | I beam 70 foot east of rolls | 1.15 |
| 5/10/1957[b] | Floor dirt in front of 16" mill shear | 3.1 |
| | Dust from between plates on 16" bar mill floor | 3.9 |
| | Accumulated dust on floor and ingots at side of hammer mill | 0.76 |
| | Dust from top of gas furnaces on east end of 16" bar mill floor | 0.38 |
| 11/04/1958[c] | Dirt and dust sample | 3.9 |
| 09/19/2007[d] | Dust in overhead roof trusses in Building 24 extending into original Building 8 footprint. | 0.4 |

References:
a: Air Dust Samples, 1953; Stefanec, 1953
b: Dust Data, 1957
c: Glitzer, 1958a, pdf p. 89
d: Earth Tech, 2007

## 6.2 Available Simonds Saw and Steel Co. External Monitoring Data

*ATTRIBUTION: Section 6.2 was completed by Joseph Guido, MJW Corporation. The rationales for all conclusions in this document are explained in the associated text.*

The AEC issued 21 film badges to Simonds Saw and Steel workers who worked on the 16" mill for the period from October 11-19, 1949 (Film Badge Data, 1949). One badge was lost, so only 20 results were reported. No information was available to indicate when the workers actually wore the badges or where the badges were stored during off hours. The beta results ranged from 160 to 1,250 mR for the period, and the calculated and derived geometric means were both 362 with a GSD of 1.6. The gamma results ranged from not reported (less than 50 mR) to 115 mR, and the derived geometric mean and GSD for the set were 63 mR and 1.4.

The AEC suspended 20 film badges about five feet from the floor in the Simonds facility for 192 consecutive hours "to determine the long term direct [external] radiation to individuals" (AEC, 1948-1949). When the badges were retrieved, they were covered with radioactive dust from the plant, which would probably result in an overestimate of the true area radiation levels. The maximum results were reported as 5.6 mR/hr beta and 0.34 mR/hr gamma. This analysis assumed (1) that these results represented the general levels of external exposure from submersion in air and contaminated surfaces at Simonds; and (2) that the data distribution was lognormal. The calculated geometric means were 1.3 mR/hr with a GSD of 2.3 for non-penetrating radiation, and 0.26 mR/hr with a GSD of 1.2 for penetrating radiation. This assumption does not appear to be inconsistent with the reported Zeuto (portable ionization chamber) beta and gamma readings at Simonds of 2 mR/hr or less for most areas (AEC, 1948-1949), some of which appear to be contact readings. The analysis assumed that the beta reading relates to the non-penetrating dose and that the gamma reading relates to the penetrating dose.

# 7.0 Feasibility of Dose Reconstruction for the Class Evaluated by NIOSH

The feasibility determinations for the class of employees under evaluation in this report are governed by both EEOICPA and 42 C.F.R. § 83.13(c)(1). Under that Act and rule, NIOSH must establish whether or not it has access to sufficient information either to estimate the maximum radiation dose for every type of cancer for which radiation doses are reconstructed that could have been incurred under plausible circumstances by any member of the class, or to estimate the radiation doses to members of the class more precisely than a maximum dose estimate. If NIOSH has access to sufficient information for either case, NIOSH would then determine that it would be feasible to conduct dose reconstructions.

In determining feasibility, NIOSH begins by evaluating whether current or completed NIOSH dose reconstructions demonstrate the feasibility of estimating with sufficient accuracy the potential radiation exposures of the class. If the conclusion is one of infeasibility, NIOSH systematically evaluates the sufficiency of different types of monitoring data, process and source or source term data, which together or individually might assure that NIOSH can estimate either the maximum doses that members of the class might have incurred, or more precise quantities that reflect the variability of exposures experienced by groups or individual members of the class. This approach is discussed in DCAS's SEC Petition Evaluation Internal Procedures which are available at http://www.cdc.gov/niosh/ocas. The next four major subsections of this Evaluation Report examine:

- The sufficiency and reliability of the available data. (Section 7.1)
- The feasibility of reconstructing internal radiation doses. (Section 7.2)
- The feasibility of reconstructing external radiation doses. (Section 7.3)
- The bases for petition SEC-00157 as submitted by the petitioner. (Section 7.4)

## 7.1 Pedigree of Simonds Saw and Steel Co. Data

*ATTRIBUTION: Section 7.1 and its related subsections were completed by Robert Coblentz, Quantaflux, LLC. The rationales for all conclusions in this document are explained in the associated text.*

This subsection answers questions that need to be asked before performing a feasibility evaluation. Data Pedigree addresses the background, history, and origin of the data. It requires looking at site methodologies that may have changed over time; primary versus secondary data sources and whether they match; and whether data are internally consistent. All these issues form the bedrock of the researcher's confidence and later conclusions about the data's quality, credibility, reliability, representativeness, and sufficiency for determining the feasibility of dose reconstruction. The feasibility evaluation presupposes that data pedigree issues have been settled.

### 7.1.1 Internal Monitoring Data Pedigree Review

**Operational Period**

In this evaluation, NIOSH has determined that it lacks sufficient data relating to worker internal doses from thorium-related work performed at Simonds Saw and Steel during the operational period from January 1, 1948 through December 31, 1957. Therefore, a complete internal data sufficiency and pedigree evaluation is not possible for thorium data for the period from January 1, 1948 through December 31, 1957.

Data for uranium-related work consist of individual worker internal monitoring data sheets and reports, area radiological monitoring data reports, work practice hazards reports, and work place air monitoring data sheets. These sources are copies of original data sheets and reports, and are therefore considered primary data sources. Data collection performed by AEC representatives would have been in accordance with standard practices using state-of-the-art methods of the day.

**Residual Period**

NIOSH has determined that it has sufficient internal data pedigree information for the residual radioactivity period. Radiological survey data collected by AEC representatives are available for the period preceding the end of the operational period. In addition, data collected under the FUSRAP program are available, which include isotopic analysis results for sampling and surveys performed during the residual period. The data sources are copies of original reports and are, therefore, primary data sources. The data collection by AEC representatives would have been performed in accordance with standard practices using state-of-the-art methods of the day; furthermore, the FUSRAP program has a rigorous Quality Assurance program governing its methodologies.

### 7.1.2 External Monitoring Data Pedigree Review

**Operational Period**

In this evaluation, NIOSH has determined that it lacks sufficient data relating to worker external doses from thorium-related work performed at Simonds Saw and Steel during the operational period from January 1, 1948 through December 31, 1957. Therefore, a complete external data sufficiency and pedigree evaluation is not possible for thorium-related work/operations for the period from January 1, 1948 through December 31, 1957.

NIOSH has determined that external data are sufficient to support bounding external dose from uranium-related work. The data consist of film badge data, work area radiological measurement data, and source term data. The data sources are copies of original reports and are, therefore, primary data sources. The data collection by AEC representatives would have been performed in accordance with standard practices using state-of-the-art methods of the day.

**Residual Period**

NIOSH has determined that it has sufficient external data pedigree information for the residual radioactivity period. Radiological survey data collected by AEC representatives are available for the period preceding the end of the operational period. In addition, data collected under the FUSRAP program are available, which include isotopic analysis results for sampling and surveys performed during the residual period. The data sources are copies of original reports and are, therefore, primary data sources. The data collected by AEC representatives would have been performed in accordance with standard practices using state-of-the-art methods of the day; furthermore, the FUSRAP program has a rigorous Quality Assurance program governing its methodologies.

## 7.2 Evaluation of Bounding Internal Radiation Doses at Simonds Saw and Steel

*ATTRIBUTION: Section 7.2 and its related subsections were completed by Joseph Guido, MJW Corporation. The rationales for all conclusions in this document are explained in the associated text.*

The principal source of internal radiation doses for members of the class under evaluation was uranium and thorium metal. The following subsections address the ability to bound internal doses, methods for bounding doses, and the feasibility of internal dose reconstruction.

### 7.2.1 Evaluation of Bounding Process-Related Internal Doses

In considering the ability to bound internal exposure at Simonds Saw and Steel, the following must be considered.

The Simonds operational period (January 1, 1948 through December 31, 1957) can be divided into two timeframes:

- From the inception of AEC activities (1948) to the end of 1952: During this period, the AEC maintained an active role in administrating site activities and monitoring worker exposures.

- From 1953 to the end of radiological operations: During this period, work with radioactive material was less frequent, oversight by health and safety professionals was less active, and previously-installed engineering controls were deactivated.

Radioactive materials processed at Simonds fell into two broad categories:

- Uranium, primarily natural, constituted the bulk of the material processed at Simonds. This evaluation estimates that >99% of the material processed at Simonds was uranium. Of that material, almost all was natural uranium with the remainder being either enriched or depleted. The bulk of the available monitoring data (i.e., all of the urinalysis data, and most of the air monitoring data) pertain to uranium operations.

- Thorium was also processed, but to a lesser degree (<1%). Detailed information on thorium operations is not as abundant as it is for uranium; monitoring data are much more limited and there are no bioassay data.

Simonds Saw and Steel Co. operations at can be divided into three broad categories:

- Rolling uranium billets and, to a lesser degree, thorium billets on the 16" mill: This was the predominant activity performed. The 16" mill was the focus of most of the AEC's attention regarding engineering controls and dust-control measures. Early on in the process, ventilation was installed on this mill.

- Rolling uranium and thorium on the 10" mill: The 10" mill was unventilated and no attempt was made to install any engineered dust controls. The amount of material processed through the 10" mill was substantially less than the material processed through the 16" mill.

- Forging of uranium and thorium: Forging activities were known to have occurred over the course of the Simonds operational period. The only engineering control that is known to have been instituted at the forging station was the use of a fan to blow fumes away from the operators.

The following subsections summarize the extent and limitations of information available for reconstructing the process-related internal doses for the class under evaluation.

#### 7.2.1.1 Uranium Urinalysis Information and Available Data

The AEC maintained a uranium urinalysis monitoring program at Simonds from 1948 through 1952. During this period, a subset of individuals (all working on the 16" rolling mill) participated in the program. Analyses of these data are presented in ORAUT-TKBS-0032. The urinalysis data are indicative of the internal exposure to the predominant exposure population (i.e., uranium workers on the 16" rolling mill between 1948 and 1952). However, there are limitations in applying these data to the later time period and to operations other than the 16" rolling mill. A cursory review of the air monitoring data from the uranium-forging operations (Tables 6-5 and 6-6) and the enriched-uranium rolling operations on the 10" mill (Table 6-3) indicates that the exposure profile from operations on the 16" mill was not the same as these activities. With this in mind, it would not be possible to extend the urinalysis data to the 10" mill and the forge workers without some understanding of the

operational frequencies. Such an understanding allows one to conclude that, for uranium, the overall exposure to a worker on the 16" mill bounds that to a worker in the forge shop or on the 10" mill (purely due to the infrequency of the forging or rolling operations). In addition, rolling operations and forging operations were performed by distinctly different work crews (Personal Communication, 2010L). Therefore, urinalyses of the rolling personnel cannot be directly applied to exposure estimates for the forging personnel.

NIOSH's current understanding is that depleted and enriched uranium were processed after 1952; therefore, those operations did not coincide with the urine monitoring program (1948 through 1952). Thus, the presence of depleted or enriched uranium at Simonds does not pose any limitation on the use of these urinalysis data for the period in which they were collected. If it is determined that enriched or depleted uranium operations occurred before 1953, it would be necessary to modify the specific activity used to convert the mass-based urine activity-to-activity.

When considering whether to take the urine data from 1948 through 1952 and extend intakes to cover the later period, there are clear limitations caused by the tendency of site personnel to remove previously-installed engineering controls and revert to poor radiological practices (discussed in Section 5.2.3).

#### 7.2.1.2 Airborne Levels

As with urinalysis, the AEC maintained a frequent uranium dust exposure monitoring program from 1948 through 1952. The number of studies covering the uranium operations on the 16" mill is sufficient for the results to be used to determine uranium exposure to individuals working on that mill during that time period. After 1952, the quantity of uranium air monitoring data for the 16" mill is limited to one study conducted in 1953.

Air monitoring data for uranium operations on the 10" mill and in the forge shop are limited to one study on the 10" mill (enriched uranium) and two studies on uranium forging. Use of these data to cover operations over the entire period (1948 – 1957) would depend on an understanding of the frequency and duration of each type of operation.

Air monitoring data for thorium is limited to one study on the 10" mill, one on the 16" mill, and one on the forge shop. These three studies cover all three possible operations involving thorium, but being single measurements, only provide a single reference point and do not indicate how exposures during this operations might have varied prior to or after that single point. In addition, the three measurement events were conducted with distinctly different engineered dust controls in place at the time of sampling:

- 10" mill: No controls
- 16" mill: Ventilation in place exhausting to outside the building
- Forging: Fans in place to blow dust/fumes away from operators (no outside exhaust)

### 7.2.2 Evaluation of Bounding Residual Period Internal Doses

During the residual period, January 1, 1958 through December 31, 2006, workers were potentially exposed to re-suspended uranium and thorium contamination. Worst-case residual period air concentrations can be based on measurements of surface contamination and knowledge of airborne radioactivity at the cessation of operations involving radioactive material. This information can be used to bound internal dose during the residual period.

### 7.2.3 Methods for Bounding Internal Dose at Simonds Saw and Steel Co.

#### 7.2.3.1 Methods for Bounding Operational Period Internal Dose

There are insufficient internal monitoring data to directly determine internal exposure for all thorium operations. Although there are some air monitoring data for thorium rolling and forging operations, these data are limited to single instances for each operation with unique dust control measures in place. These data do not provide a sufficient frame of reference to determine if exposures were increasing or decreasing over the time period under evaluation. Without accurate information on the frequency and duration of thorium rolling and forging activities, it is not possible to extrapolate the limited air monitoring data to cover all time periods and operations.

A review of the air concentrations from similar operations involving uranium and thorium (Tables 6-8 and 6-9) indicates that airborne activity from thorium operations could be bounded using uranium data from similar operations. However, in order to use this relationship, a complete understanding of the frequency and duration of thorium processing would be required; this type of information is not available.

There are insufficient source term and area monitoring data to accurately bound doses associated with thoron, the gaseous decay product of thorium.

As discussed in Sections 7.2.1.1 and 7.2.1.2, uranium air monitoring and urinalysis data are available in sufficient detail to bound operational internal dose during the 1948 to 1952 time period. Data after 1952 are more limited and could be subject to a negative bias based on the site's failure to maintain engineering controls in later time periods. ORAUT-TKBS-0032 provides a methodology for assigning uranium exposures to Simonds workers based on the available data. The contribution from recycled uranium contaminants may be bounded based on the uranium intake and by using the radionuclide ratios provided in Table 5-4 of this evaluation report.

7.2.3.2 Methods for Bounding Residual Period Internal Dose

Internal exposure during the residual period can be bounded using the methodology in ORAUT-OTIB-0070. In this methodology, air concentrations at the beginning and end of a time period are used with an assumption of an exponential relationship to calculate exposure rates for intervening time periods.

The average of general area air sample results reported during air monitoring studies conducted between 1949 and 1953 were used as an estimate of the air concentration at the start of the residual period (AEC, 1948-1949; Heatherton, 1950b; Heatherton, 1950c; Heatherton, 1951b; Klevin, 1948; Klevin, 1949a; Klevin, 1949b; Klevin, 1949c; Klevin, 1950; Klevin, 1951b; Klevin, 1953a; Klevin, 1953b, NYOO, 1948b; Schumann, 1953b). This value was 94 $\mu g/m^3$. This air concentration, which corresponds to an intake rate of 422 pCi/calendar day, would represent an upper bound of the level of airborne contamination present at the cessation of operations, which corresponds to the beginning of the residual period.

Exposure Point Concentration values calculated for each of the various Simonds buildings (see Table 6-15) can be used to establish a bounding estimate of the air activity at the time of these measurements (i.e, 2007). The maximum EPC value of 9300 dpm/100$cm^2$, applicable to Building 24, can be used to represent the bounding surface contamination present within the facility for the purpose of performing these re-suspension calculations. Although an EPC value was not calculated for Building 6, surface contamination data collected during the 1999 remedial investigation (summarized in Table 6-13) show that the surface contamination would be bounded by the Building 24 value. Using a re-suspension factor of $1 \times 10^{-6}$, an intake rate of 2.8 pCi/calendar day would correspond to the 9300 dpm/100 $cm^2$ surface contamination level. The $1 \times 10^{-6}$ re-suspension factor is bounding given the fact that the measured surface contamination levels represent total activity and the amount of removable contamination is a very small fraction of that value (as indicated in Table 6-13).

The intake rates indicated above were used to calculate an exponential rate constant relating the two values, separated by a time period of 24 years (1958 to 1982) based on the assumption that the source term would have stayed relatively constant from 1982 (when the facility ceased operations) until the time of the measurements. After 1982 intake rates are assumed to remain constant. This constant is calculated as 0.21 $yr^{-1}$ and is used to adjust the intake rates in Table 7-1 to account for the reduction in the intake rate over time.

Consideration of exposure to thorium dust could be included based on the relative fraction of thorium within the process material. ORAUT-TKBS-0032 estimates this fraction at 1%. This activity fraction is used to calculate the thorium intakes shown in Table 7-1.

Internal exposure from ingestion would be bounded based on the calculated inhalation intake using the methodology in OCAS-TIB-009. The contribution from recycled uranium contaminants may be bounded based on the uranium intake and using the nuclide ratios provided in Table 5-4 of this evaluation report.

**Table 7-1: Residual Period Inhalation and Ingestion Intakes (pCi/calendar day)**
(This table spans two pages)

| Year | Uranium[a] | | Thorium[b] | | Np-237 | | Pu-239 | |
|---|---|---|---|---|---|---|---|---|
| | Inhalation | Ingestion | Inhalation | Ingestion | Inhalation | Ingestion | Inhalation | Ingestion |
| 1958 | 4.2E+02 | 8.7E+00 | 4.2E+00 | 8.8E-02 | 7.6E-01 | 1.6E-02 | 1.1E+00 | 2.3E-02 |
| 1959 | 3.4E+02 | 7.1E+00 | 3.4E+00 | 7.1E-02 | 6.2E-01 | 1.3E-02 | 8.9E-01 | 1.8E-02 |
| 1960 | 2.8E+02 | 5.7E+00 | 2.8E+00 | 5.8E-02 | 5.0E-01 | 1.0E-02 | 7.2E-01 | 1.5E-02 |
| 1961 | 2.2E+02 | 4.7E+00 | 2.3E+00 | 4.7E-02 | 4.1E-01 | 8.5E-03 | 5.8E-01 | 1.2E-02 |
| 1962 | 1.8E+02 | 3.8E+00 | 1.8E+00 | 3.8E-02 | 3.3E-01 | 6.9E-03 | 4.7E-01 | 9.9E-03 |
| 1963 | 1.5E+02 | 3.1E+00 | 1.5E+00 | 3.1E-02 | 2.7E-01 | 5.6E-03 | 3.8E-01 | 8.0E-03 |
| 1964 | 1.2E+02 | 2.5E+00 | 1.2E+00 | 2.5E-02 | 2.2E-01 | 4.5E-03 | 3.1E-01 | 6.5E-03 |
| 1965 | 9.7E+01 | 2.0E+00 | 9.8E-01 | 2.0E-02 | 1.8E-01 | 3.7E-03 | 2.5E-01 | 5.3E-03 |
| 1966 | 7.9E+01 | 1.6E+00 | 7.9E-01 | 1.7E-02 | 1.4E-01 | 3.0E-03 | 2.1E-01 | 4.3E-03 |
| 1967 | 6.4E+01 | 1.3E+00 | 6.4E-01 | 1.3E-02 | 1.2E-01 | 2.4E-03 | 1.7E-01 | 3.5E-03 |
| 1968 | 5.2E+01 | 1.1E+00 | 5.2E-01 | 1.1E-02 | 9.4E-02 | 2.0E-03 | 1.4E-01 | 2.8E-03 |
| 1969 | 4.2E+01 | 8.8E-01 | 4.2E-01 | 8.8E-03 | 7.7E-02 | 1.6E-03 | 1.1E-01 | 2.3E-03 |
| 1970 | 3.4E+01 | 7.1E-01 | 3.4E-01 | 7.2E-03 | 6.2E-02 | 1.3E-03 | 8.9E-02 | 1.9E-03 |
| 1971 | 2.8E+01 | 5.8E-01 | 2.8E-01 | 5.8E-03 | 5.0E-02 | 1.1E-03 | 7.2E-02 | 1.5E-03 |
| 1972 | 2.2E+01 | 4.7E-01 | 2.3E-01 | 4.7E-03 | 4.1E-02 | 8.5E-04 | 5.9E-02 | 1.2E-03 |
| 1973 | 1.8E+01 | 3.8E-01 | 1.8E-01 | 3.8E-03 | 3.3E-02 | 6.9E-04 | 4.8E-02 | 9.9E-04 |
| 1974 | 1.5E+01 | 3.1E-01 | 1.5E-01 | 3.1E-03 | 2.7E-02 | 5.6E-04 | 3.9E-02 | 8.1E-04 |
| 1975 | 1.2E+01 | 2.5E-01 | 1.2E-01 | 2.5E-03 | 2.2E-02 | 4.6E-04 | 3.1E-02 | 6.5E-04 |
| 1976 | 9.8E+00 | 2.0E-01 | 9.9E-02 | 2.1E-03 | 1.8E-02 | 3.7E-04 | 2.5E-02 | 5.3E-04 |
| 1977 | 7.9E+00 | 1.6E-01 | 8.0E-02 | 1.7E-03 | 1.4E-02 | 3.0E-04 | 2.1E-02 | 4.3E-04 |
| 1978 | 6.4E+00 | 1.3E-01 | 6.5E-02 | 1.4E-03 | 1.2E-02 | 2.4E-04 | 1.7E-02 | 3.5E-04 |
| 1979 | 5.2E+00 | 1.1E-01 | 5.3E-02 | 1.1E-03 | 9.5E-03 | 2.0E-04 | 1.4E-02 | 2.8E-04 |
| 1980 | 4.2E+00 | 8.8E-02 | 4.3E-02 | 8.9E-04 | 7.7E-03 | 1.6E-04 | 1.1E-02 | 2.3E-04 |
| 1981 | 3.4E+00 | 7.2E-02 | 3.5E-02 | 7.2E-04 | 6.3E-03 | 1.3E-04 | 9.0E-03 | 1.9E-04 |
| 1982 | 2.8E+00 | 5.8E-02 | 2.8E-02 | 5.9E-04 | 5.1E-03 | 1.1E-04 | 7.3E-03 | 1.5E-04 |
| 1983 | 2.8E+00 | 5.8E-02 | 2.8E-02 | 5.9E-04 | 5.1E-03 | 1.1E-04 | 7.3E-03 | 1.5E-04 |
| 1984 | 2.8E+00 | 5.8E-02 | 2.8E-02 | 5.9E-04 | 5.1E-03 | 1.1E-04 | 7.3E-03 | 1.5E-04 |
| 1985 | 2.8E+00 | 5.8E-02 | 2.8E-02 | 5.9E-04 | 5.1E-03 | 1.1E-04 | 7.3E-03 | 1.5E-04 |
| 1986 | 2.8E+00 | 5.8E-02 | 2.8E-02 | 5.9E-04 | 5.1E-03 | 1.1E-04 | 7.3E-03 | 1.5E-04 |
| 1987 | 2.8E+00 | 5.8E-02 | 2.8E-02 | 5.9E-04 | 5.1E-03 | 1.1E-04 | 7.3E-03 | 1.5E-04 |
| 1988 | 2.8E+00 | 5.8E-02 | 2.8E-02 | 5.9E-04 | 5.1E-03 | 1.1E-04 | 7.3E-03 | 1.5E-04 |
| 1989 | 2.8E+00 | 5.8E-02 | 2.8E-02 | 5.9E-04 | 5.1E-03 | 1.1E-04 | 7.3E-03 | 1.5E-04 |
| 1990 | 2.8E+00 | 5.8E-02 | 2.8E-02 | 5.9E-04 | 5.1E-03 | 1.1E-04 | 7.3E-03 | 1.5E-04 |
| 1991 | 2.8E+00 | 5.8E-02 | 2.8E-02 | 5.9E-04 | 5.1E-03 | 1.1E-04 | 7.3E-03 | 1.5E-04 |
| 1992 | 2.8E+00 | 5.8E-02 | 2.8E-02 | 5.9E-04 | 5.1E-03 | 1.1E-04 | 7.3E-03 | 1.5E-04 |
| 1993 | 2.8E+00 | 5.8E-02 | 2.8E-02 | 5.9E-04 | 5.1E-03 | 1.1E-04 | 7.3E-03 | 1.5E-04 |
| 1994 | 2.8E+00 | 5.8E-02 | 2.8E-02 | 5.9E-04 | 5.1E-03 | 1.1E-04 | 7.3E-03 | 1.5E-04 |
| 1995 | 2.8E+00 | 5.8E-02 | 2.8E-02 | 5.9E-04 | 5.1E-03 | 1.1E-04 | 7.3E-03 | 1.5E-04 |
| 1996 | 2.8E+00 | 5.8E-02 | 2.8E-02 | 5.9E-04 | 5.1E-03 | 1.1E-04 | 7.3E-03 | 1.5E-04 |
| 1997 | 2.8E+00 | 5.8E-02 | 2.8E-02 | 5.9E-04 | 5.1E-03 | 1.1E-04 | 7.3E-03 | 1.5E-04 |
| 1998 | 2.8E+00 | 5.8E-02 | 2.8E-02 | 5.9E-04 | 5.1E-03 | 1.1E-04 | 7.3E-03 | 1.5E-04 |
| 1999 | 2.8E+00 | 5.8E-02 | 2.8E-02 | 5.9E-04 | 5.1E-03 | 1.1E-04 | 7.3E-03 | 1.5E-04 |

**Table 7-1: Residual Period Inhalation and Ingestion Intakes (pCi/calendar day)**
(This table spans two pages)

| Year | Uranium[a] | | Thorium[b] | | Np-237 | | Pu-239 | |
|---|---|---|---|---|---|---|---|---|
| | Inhalation | Ingestion | Inhalation | Ingestion | Inhalation | Ingestion | Inhalation | Ingestion |
| 2000 | 2.8E+00 | 5.8E-02 | 2.8E-02 | 5.9E-04 | 5.1E-03 | 1.1E-04 | 7.3E-03 | 1.5E-04 |
| 2001 | 2.8E+00 | 5.8E-02 | 2.8E-02 | 5.9E-04 | 5.1E-03 | 1.1E-04 | 7.3E-03 | 1.5E-04 |
| 2002 | 2.8E+00 | 5.8E-02 | 2.8E-02 | 5.9E-04 | 5.1E-03 | 1.1E-04 | 7.3E-03 | 1.5E-04 |
| 2003 | 2.8E+00 | 5.8E-02 | 2.8E-02 | 5.9E-04 | 5.1E-03 | 1.1E-04 | 7.3E-03 | 1.5E-04 |
| 2004 | 2.8E+00 | 5.8E-02 | 2.8E-02 | 5.9E-04 | 5.1E-03 | 1.1E-04 | 7.3E-03 | 1.5E-04 |
| 2005 | 2.8E+00 | 5.8E-02 | 2.8E-02 | 5.9E-04 | 5.1E-03 | 1.1E-04 | 7.3E-03 | 1.5E-04 |
| 2006 | 2.8E+00 | 5.8E-02 | 2.8E-02 | 5.9E-04 | 5.1E-03 | 1.1E-04 | 7.3E-03 | 1.5E-04 |
| 2007 | 2.8E+00 | 5.8E-02 | 2.8E-02 | 5.9E-04 | 5.1E-03 | 1.1E-04 | 7.3E-03 | 1.5E-04 |
| >2007 | 4.2E+02 | 8.7E+00 | 4.2E+00 | 8.8E-02 | 7.6E-01 | 1.6E-02 | 1.1E+00 | 2.3E-02 |

[a] Uranium intake should be assigned as 100% U-234.
[b] Thorium intake should be assigned at indicated rate to Th-232, Th-228, and Ra-228.

Internal exposure from thoron can be bounded using the thorium material concentration (building material, surface soil, subsurface soil, or sediment, whichever is claimant-favorable) from Table 6.3.3-1 of the 2008 remedial investigation report (Earth Tech, 2008). This table provides 95 percent upper confidence level values (termed 'Exposure Point Concentrations' or EPC) for Th-232 and Th-228 in each of the described media. These data, along with the site-specific Resrad-Build input parameters contained in Table 6.3.4-4 of that same document can be used to calculate the thoron concentration applicable to a particular area and circumstance. For example, using the maximum EPC value (40.88 pCi/g in Building 24) and assuming occupancy of 2000 hours, the thoron concentration calculated by Resrad-Build is 0.13 WL.

### 7.2.4 Internal Dose Reconstruction Feasibility Conclusion

NIOSH concludes that it cannot bound internal dose (reconstruct dose with sufficient accuracy) for members of the Simonds Saw and Steel class under evaluation because NIOSH has not located sufficient personnel monitoring, source term, and air sampling data to allow exposures to thorium (and, by extension, thoron, its associated gaseous decay-chain product) to be reconstructed for the period from January 1, 1948 through December 31, 1957. However, NIOSH can use existing methods provided in ORAUT-TKBS-0032 to reconstruct internal uranium exposures along with the nuclide ratios provided in Table 5-4 of this evaluation report to reconstruct associated recycled uranium exposures for Simonds workers during this same period.

NIOSH has determined that it can reconstruct internal dose from all sources during the residual period from January 1, 1958 through December 31, 2006, using the assumptions and approaches presented within the preceding section of this report.

Although NIOSH found that it is not possible to completely reconstruct internal radiation doses for the period from January 1, 1948 through December 31, 1957, NIOSH intends to use any internal monitoring data that may become available for an individual claim (and that can be interpreted using existing NIOSH dose reconstruction processes or procedures). Dose reconstructions for individuals employed at Simonds Saw and Steel Co. during the period from January 1, 1948 through December 31, 1957, but who do not qualify for inclusion in the SEC, may be performed using these data as appropriate.

## 7.3 Evaluation of Bounding External Radiation Doses at Simonds Saw and Steel

*ATTRIBUTION: Section 7.3 and its related subsections were completed by Joseph Guido, MJW Corporation. The rationales for all conclusions in this document are explained in the associated text.*

The principal sources of external radiation doses for members of the evaluated class were uranium and thorium metals (ORAUT-TKBS-0032).

The following subsections address the ability to bound external doses, methods for bounding doses, and the feasibility of external dose reconstruction.

### 7.3.1 Evaluation of Bounding Process-Related External Doses

As indicated in Section 6.2, Simonds personnel monitoring data are available for a one-week period for the subset of uranium workers on the 16" rolling mill, but the data are directly applicable only to these workers.

ORAUT-TKBS-0032 presents Monte Carlo calculations of external dose rates for uranium billets and rods in the configurations used at Simonds Saw and Steel. The results are shown in Table 7-2. These values are used in ORAUT-TKBS-0032 to project external photon exposure values for Simonds uranium workers.

**Table 7-2: Calculated Photon Dose Rates for Uranium Billet and Uranium Rod**

| Distance from Source | Billet Dose Rate (mrem/hr) | Rod Dose Rate (mrem/hr) |
|---|---|---|
| Surface | 7.74 | 5.09 |
| 1 foot | 0.703 | 0.285 |
| 1 meter | 0.108 | 0.0883 |

Source: This is a slightly-modified version of Table 16 from ORAUT-TKBS-0032.

In order to apply the data from the Monte Carlo analysis, air dust studies were reviewed to estimate a worker's time near a billet or rod compared to just being in the general area. The records indicated that for most workers the time spent near uranium billets or rods was less than 5 hours/shift, but some workers may have spent 6.5 hours near them. Because workers changed jobs, this analysis assumes that workers were near the billets 3.5 hours per rolling day and near the rods 3.5 hours per rolling day. It also assumes that the dose rate at 1 foot was the median dose rate, and the dose rate at the surface was the 95th-percentile rate. The annual penetrating dose rates were calculated by multiplying the median photon dose rates by the number of rolling days per year and the 3.5 hours per workday near the billets or the rods.

A methodology for evaluating shallow dose for Simonds uranium workers is provided in ORAUT-TKBS-0032, using data from an AEC survey performed in September 1948 at Aliquippa Forge. Measurements are shown in Table 7-3.

**Table 7-3: Radiation Measurements Used as a Basis for Shallow Dose Assessment**

| Location of Measurement | Dose Rate (mrep/hr)[a] |
|---|---|
| **Billet Assumptions** | |
| Contact with floor next to the quench tank where oxide scale has collected | 8 |
| Contact with floor in front of rolls where oxide scale has collected | 5–10 |
| Same location but 18 inches high | 2 – 5 |
| **Rod Assumptions** | |
| 4 feet above a pile of rods in the boxcar | 20 |
| 5 feet from the end of a pile of rods next to the door of the boxcar | 5 |
| 2 feet from the end of the same pile | 13 |

Notes:
Source: This is a slightly-modified version of Table 17 from ORAUT-TKBS-0032.
[a] A rep (roentgen-equivalent-physical) is a historical unit of dose equivalence approximately equal to a rem.

The analysis in ORAUT-TKBS-0032 estimated a shallow dose from billets by assuming that the median dose rate was 5 mrem/hour and the 95$^{th}$ percentile dose rate was 10 mrem/hour, giving a GSD of 1.5. For rods, the assumed median dose rate was 5 mrem/hour and the assumed 95$^{th}$ percentile dose rate was 20 mrem/hour, giving a GSD of 2.3.

### 7.3.2 Evaluation of Bounding Residual Period External Doses

After the Simonds' AEC contract work ended, NLO conducted a survey in July 1957 to determine the effectiveness of decontamination efforts (Heatherton, 1957); Table 7-4 summarizes the results. On July 10, 1957, the forge area, the 16" bar mill, the 10" strip metal area, and the shipping and receiving areas were surveyed. All these areas were found to be slightly above background, but at three feet above the floor, only two small areas exceeded 0.2 mrep/hr beta/gamma. Most contact readings were less than 0.5 mrep/hr (Heatherton, 1957), and it was noted that while some contamination was found in inaccessible areas, it was estimated that a worker would be exposed to less than 10 mrep/week.

| Table 7-4: Measured Radiation Levels on July 10, 1957 | | | |
|---|---|---|---|
| **Location** | **Contact (mrep/hr) Beta/Gamma** | **Beta (mrep/hr) 3 ft. from surface** | **Gamma (mR/hr) 3 ft from surface** |
| 10” bar mill bed | 10 – 20 | 1.0 – 1.7 | 0.04 – 0.05 |
| Front of Shear | 1 – 2 | 0.4 | 0.08 |
| Between plates on mill floor | 0.7 – 1.2 | 0.2 | None detected |
| Forge Area | 0.7 – 1.2 | 0.2 | 0.02 |
| Top of Furnace | 1.0 | No reading | No reading |

Source: This is a slightly-modified version of Table 19 from ORAUT-TKBS-0032**.**

Additional radiation surveys conducted in 1976 (Table 7-5), 1984 (Figure 7-1) and 1999 (Table 7-6) are summarized below and are generally consistent with the survey performed in 1957.

| Table 7-5: Measured Radiation Levels in 1976 | | | | |
|---|---|---|---|---|
| **Location** | **Beta / Gamma Readings (mrad/hr)** | | **Gamma Readings (µR/hr)** | |
| | **Maximum** | **Average** | **Maximum** | **Average** |
| Uranium Storage Area | 0.04 | 0.02 | 8 | 6 |
| Forging Shop | 0.03 | 0.02 | 6 | 5 |
| Grinding Area | 0.02 | 0.02 | 6 | 5 |
| South of Storage Area | 0.04 | 0.03 | 7 | 6 |
| Southwest Bay | 0.04 | 0.02 | 10 | 6 |
| West Central Bay | 0.04 | 0.04 | 10 | 10 |
| South of 10” Roll Mill | 0.04 | 0.03 | 12 | 8 |
| North West Bay | 0.04 | 0.02 | 0.04 | 0.02 |

Source: ORNL, 1979

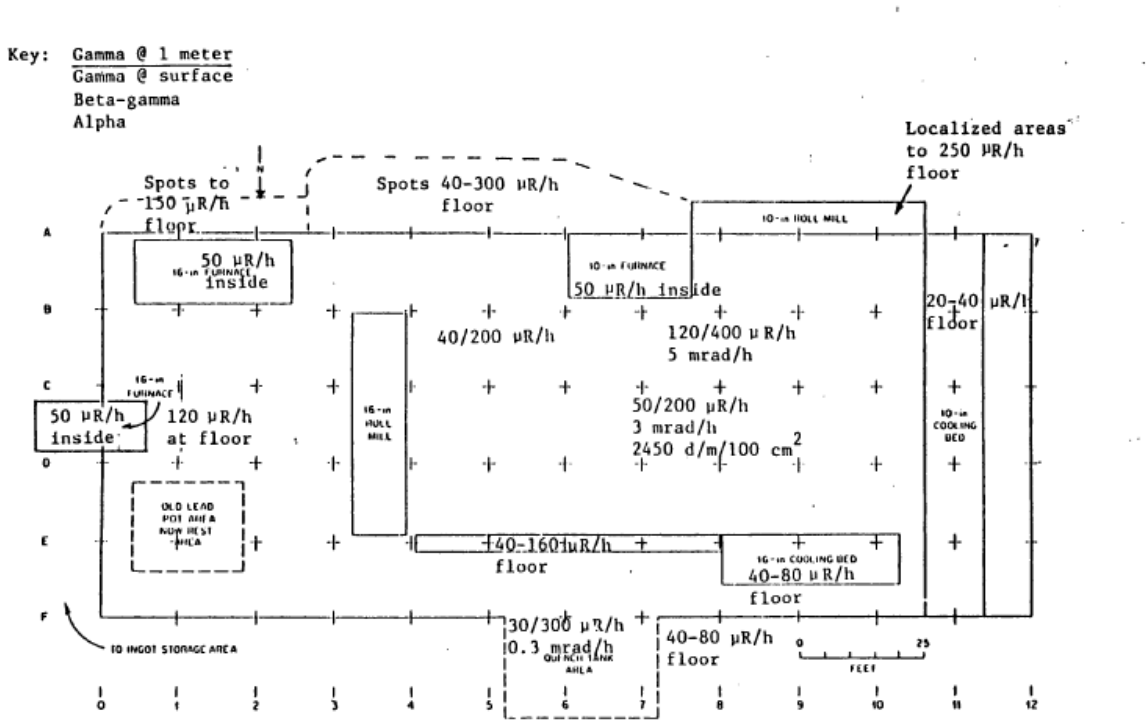



Fig. 1. Radiation levels in rolling mill area.

Source: ORNL, 1984

**Figure 7-1: July 1984 Radiation Survey**

| Table 7-6: Measured Radiation Levels During 1999 Survey | | |
|---|---|---|
| **Location** | **No. of Measurements** | **Exposure Rate Range (µR/h at 1 meter)** |
| **Interior** | | |
| Building 1 | 5 | 6 to 12 |
| Building 2 | 17 | 5 to 12 |
| Building 3 | 20 | 5 to 11 |
| Building 4/9 | 5 | 5 to 10 |
| Building 6 | 7 | 5 to 12 |
| Building 8 | 8 | 6 to 50 |
| Building 24, South Section | 5 | 5 to 9 |
| Building 35 | 5 | 5 to 8 |
| **Exterior** | | |
| Excised Property | 131 | 3 to 50 |
| All Remaining Property | 129 | 3 to 25 |

Source: Vitkus, 1999

### 7.3.3 Simonds Saw and Steel Co. Occupational X-Ray Examinations

Physical examinations for all personnel were to include an annual X-ray, urinalysis (medical, not radioactive), and blood analysis (Belmore 1948). Tabershaw stated that the physical examinations were done at the Bewly Building in Lockport, New York, and that X-ray and laboratory examinations were done at the local hospital (Tabershaw, 1948). As of December 7, 1948, about 100 workers had been examined. Tabershaw noted: "…in three weeks, the entire group of 150 workers will have had a physical examination" (Tabershaw, 1948). Tabershaw recommended that NYOO send a letter requesting annual X-ray examinations at Simonds. On December 29, 1948, Morgan sent a letter requesting a pre-placement physical examination of all employees including chest X-ray, complete blood count, medical urinalysis, and history of radiation exposures (especially information on diagnostic radiographic examinations and X-ray or radium therapy) (Morgan, 1948). Morgan further noted that chest X-rays should be repeated yearly and that additional examinations (X-ray or physical) should be based on specific "symptomatology." Termination examinations were essentially repeats of the pre-placement exams. Morgan responded to Simonds on January 13, 1949, that the mention of a pelvis X-ray requirement was in error (Morgan, 1949). Morgan further stated that although "no previous X-rays were included in the pre-placement examination, it would be well to have them included at termination."

### 7.3.4 Methods for Bounding External Dose at Simonds Saw and Steel Co.

There is an established protocol for assessing external exposure when performing dose reconstructions (these protocol steps are discussed in the following subsections):

- Photon Dose
- Beta Dose
- Medical X-ray Dose

#### 7.3.4.1 Methods for Bounding Operational Period External Dose

Photon Dose

NIOSH has not identified sufficient information to bound external photon exposure to thorium during rolling and forging operations. Without more details on the frequency and extent of thorium operations it is not possible to bound external photon exposures to thorium workers with sufficient accuracy.

Methodology provided in ORAUT-TKBS-0032 can be used to bound photon exposures to individuals working with uranium on the 16" rolling mill. This methodology makes use of radiation survey data and calculated dose rates for uranium billets and rods along with information on the uranium-handling process garnered from site records.

Beta Dose

NIOSH has not identified sufficient information to bound external exposure to thorium during rolling and forging operations. Without more detailed information on the frequency and extent of thorium operations it is not possible to bound external exposures to thorium workers with sufficient accuracy.

Methodology provided in ORAUT-TKBS-0032 can be used to bound beta exposures to individuals working with uranium on the 16" rolling mill. This methodology makes use of radiation survey data and calculated dose rates on uranium billets and rods along with information on the uranium-handling process garnered from site records

Medical X-ray Dose

NIOSH is required to account for dose from medical X-rays performed on an EEOICPA-covered site (either the covered site where the AWE work was being performed or a covered site where medical X-rays were performed as a service). Simonds X-rays were performed off-site at a non-covered commercial facility. Therefore, the dose from medical X-rays cannot be included in the overall estimated dose calculation.

7.3.4.2 Methods for Bounding Residual Period External Doses

External radiation survey data first measured in 1957 and subsequently monitored in 1976, 1984, and 1999 (as discussed in Section 7.3.2) can be used to bound external exposure from both penetrating and non-penetrating radiation. The surveys conducted over the time period under evaluation provide sufficient detail and coverage to be used for this purpose. Based on a review of the 1957 survey and the subsequent surveys, the external dose assigned by ORAUT-TKBS-0032 (based on a penetrating dose rate of 0.08 mR/hour and non-penetrating dose rate of 0.200 mR/hour) would be bounding.

### 7.3.5 External Dose Reconstruction Feasibility Conclusion

NIOSH concludes that it cannot bound external dose (reconstruct dose with sufficient accuracy) for members of the Simonds Saw and Steel class under evaluation because NIOSH has not located sufficient personnel monitoring, source term, and area monitoring data to allow exposures to thorium to be reconstructed for the period from January 1, 1948 through December 31, 1957. However, NIOSH can use existing methods provided in ORAUT-TKBS-0032 to reconstruct external uranium exposures for Simonds workers who worked in the 16" mill during this same period.

NIOSH has determined that it can reconstruct external dose from all sources during the residual period from January 1, 1958 through December 31, 2006, using the available radiation survey data presented in Section 7.3.2 of this report.

Although NIOSH found that it is not possible to completely reconstruct external radiation doses for the period from January 1, 1948 through December 31, 1957, NIOSH intends to use any external monitoring data that may become available for an individual claim (and that can be interpreted using existing NIOSH dose reconstruction processes or procedures). Dose reconstructions for individuals employed at Simonds Saw and Steel Co. during the period from January 1, 1948 through December

31, 1957, but who do not qualify for inclusion in the SEC, may be performed using these data as appropriate.

## 7.4 Evaluation of Petition Basis for SEC-00157

*ATTRIBUTION: Section 7.4 and its related subsections were completed by Robert Coblentz, Quantaflux, LLC. The rationales for all conclusions in this document are explained in the associated text.*

The following subsections evaluate the assertions made on behalf of petition SEC-00157 for Simonds Saw and Steel Co.

### 7.4.1 Thorium Monitoring

SEC-00157: *No employees were monitored during operations or residual for thorium…*

In this evaluation, NIOSH has determined that it lacks sufficient data relating to internal and external doses from thorium-related work performed at Simonds Saw and Steel Co. during the operational period from January 1, 1948 through December 31, 1957. NIOSH has, however, determined that sufficient area radiological, isotopic, and source term data are available to bound doses related to uranium-related work performed on the 16" mill, as well as doses resulting from residual radioactivity for all radionuclides during the period from January 1, 1958 to December 31, 2006.

### 7.4.2 External Monitoring

SEC-00157: *…many employees were not monitored externally.*

While not all individual workers were monitored for external exposures, external monitoring data are available for individuals directly involved in uranium metal processing at Simonds Saw and Steel Co. In this evaluation, NIOSH has determined that available data are sufficient to support bounding estimates of external dose from uranium-related work on the 16" mill. The available data include worker film badge data, work area radiological measurement data, and source term data.

## 7.5 Other Potential SEC Issues Relevant to the Petition Identified During the Evaluation

*ATTRIBUTION: Section 7.5 was completed by Robert Coblentz, Quantaflux, LLC. The rationales for all conclusions in this document are explained in the associated text.*

During the feasibility evaluation for SEC-00157, issues were identified that needed further analysis and resolution. The issues and their current status are:

- ISSUE: Available documents indicate that thorium-related work may have been performed at Simonds Saw and Steel Co. prior to 1951.

  RESPONSE: NIOSH acknowledges this. The thorium operational period was adjusted to include the start of AEC-contracted work at Simonds.

- ISSUE: Recently-acquired documents indicate that AEC-related work was performed at Simonds Saw and Steel Co. in 1957. This is beyond the previously-stated operational period end date of 1956.

  RESPONSE: In response to a formal NIOSH request, the DOL revisited this issue. Consequently, the DOL extended the operational end date. The official operations period is now January 1, 1948 through December 31, 1957. This evaluation report reflects that change.

## 7.6 Summary of Feasibility Findings for Petition SEC-00157

This report evaluates the feasibility for completing dose reconstructions for employees at the Simonds Saw and Steel Co. during the operational period from January 1, 1948 through December 31, 1957, and the residual radioactivity period from January 1, 1958 through December 31, 2006. NIOSH found that the available monitoring records, process descriptions and source term data available are not sufficient to complete dose reconstructions during the operational period of the evaluated class, but are sufficient to complete dose reconstructions for the residual radioactivity period.

Table 7-7 summarizes the results of the feasibility findings at Simonds Saw and Steel Co. for each exposure source during the time period January 1, 1948 through December 31, 2006.

**Table 7-7: Summary of Feasibility Findings for SEC-00157**
January 1, 1948 through December 31, 2006

| Source of Exposure | Operational Period (January 1, 1948-December 31, 1957) | | Residual Period (January 1, 1958-December 31, 2006) | |
|---|---|---|---|---|
| | **Reconstruction Feasible** | **Reconstruction Not Feasible** | **Reconstruction Feasible** | **Reconstruction Not Feasible** |
| **Internal**[1] | | **X** | **X** | |
| - Uranium | X | | X | |
| - Thorium | | X | X | |
| - Recycled uranium contaminants | X | | X | |
| - Thoron | | X | X | |
| **External** | | **X** | **X** | |
| - Uranium operations Beta-Gamma | X | | X | |
| - Thorium operations Beta-Gamma | | X | X | |
| - Neutron | N/A | N/A | N/A | N/A |
| - Occupational Medical X-ray | N/A[2] | | N/A | N/A |

[1] Internal includes an evaluation of urinalysis (in vitro) and airborne dust data.

[2] Although NIOSH has methods for estimating dose from medical X-rays, NIOSH is required to account for dose from medical X-rays performed on an EEOICPA-covered site (either the covered site where the AWE work was being performed or a covered site where medical X-rays were performed as a service). Simonds X-rays were performed off-site at a non-covered commercial facility. Therefore, the dose from medical X-rays cannot be accounted for in the overall estimated dose calculation (see Section 7.3.4.1).

As of July 13, 2010, a total of 191 claims have been submitted to NIOSH for individuals who worked at Simonds Saw and Steel Co. and are covered by the class definition evaluated in this report. Dose reconstructions have been completed for 180 individuals (~94%).

Although NIOSH found that it is not possible to completely reconstruct radiation doses for the proposed class, NIOSH intends to use any internal and external monitoring data that may become available for an individual claim (and that can be interpreted using existing NIOSH dose reconstruction processes or procedures). Therefore, dose reconstructions for individuals employed at Simonds Saw and Steel Co. during the period from January 1, 1948 through December 31, 1957 but who do not qualify for inclusion in the SEC, may be performed using these data as appropriate.

# 8.0 Evaluation of Health Endangerment for Petition SEC-00157

The health endangerment determination for the class of employees covered by this evaluation report is governed by both EEOICPA and 42 C.F.R. § 83.13(c)(3). Under these requirements, if it is not feasible to estimate with sufficient accuracy radiation doses for members of the class, NIOSH must also determine that there is a reasonable likelihood that such radiation doses may have endangered the health of members of the class. Section 83.13 requires NIOSH to assume that any duration of unprotected exposure may have endangered the health of members of a class when it has been established that the class may have been exposed to radiation during a discrete incident likely to have involved levels of exposure similarly high to those occurring during nuclear criticality incidents. If the occurrence of such an exceptionally high-level exposure has not been established, then NIOSH is required to specify that health was endangered for those workers who were employed for a number of work days aggregating at least 250 work days within the parameters established for the class or in combination with work days within the parameters established for one or more other classes of employees in the SEC.

Because NIOSH has not located sufficient personnel monitoring, source term, and air sampling data related to thorium exposures, NIOSH's evaluation determined that it is not feasible to estimate radiation dose for all time periods of the NIOSH-evaluated class with sufficient accuracy based on the sum of information available from available resources. Modification of the class definition regarding health endangerment and minimum required employment periods, therefore, is required.

# 9.0 Class Conclusion for Petition SEC-00157

Based on its full research of the class under evaluation, NIOSH has defined a single class of employees for which NIOSH cannot estimate radiation doses with sufficient accuracy. The NIOSH-proposed class includes all Atomic Weapons Employer employees who worked at Simonds Saw and Steel Co. from January 1, 1948 through December 31, 1957, for a number of work days aggregating at least 250 work days, occurring either solely under this employment or in combination with work days within the parameters established for one or more other classes of employees included in the Special Exposure Cohort. The class under evaluation was divided because for the period from January 1, 1948 through December 31, 1957 (the operational period), NIOSH does not have adequate information on the amount and frequency of thorium processing to bound individual thorium exposures. NIOSH is not proposing a class for the period from January 1, 1958 through December 31, 2006 (the residual period) because there is sufficient information available to bound exposures during this period.

NIOSH has carefully reviewed all material sent in by the petitioner, including the specific assertions stated in the petition, and has responded herein (see Section 7.4). NIOSH has also reviewed available technical resources and many other references, including the Site Research Database (SRDB), for information relevant to SEC-00157. In addition, NIOSH reviewed its NOCTS dose reconstruction database to identify EEOICPA-related dose reconstructions that might provide information relevant to the petition evaluation.

These actions are based on existing, approved NIOSH processes used in dose reconstruction for claims under EEOICPA. NIOSH's guiding principle in conducting these dose reconstructions is to ensure that the assumptions used are fair, consistent, and well-grounded in the best available science. Simultaneously, uncertainties in the science and data must be handled to the advantage, rather than to the detriment, of the petitioners. When adequate personal dose monitoring information is not available, or is very limited, NIOSH may use the highest reasonably possible radiation dose, based on reliable science, documented experience, and relevant data to determine the feasibility of reconstructing the dose of an SEC petition class. NIOSH contends that it has complied with these standards of performance in determining the feasibility or infeasibility of reconstructing dose for the class under evaluation.

# 10.0 References

42 C.F.R. pt. 81, *Guidelines for Determining the Probability of Causation Under the Energy Employees Occupational Illness Compensation Program Act of 2000;* Final Rule, Federal Register/Vol. 67, No. 85/Thursday, p 22,296; May 2, 2002; SRDB Ref ID: 19391

42 C.F.R. pt. 82, *Methods for Radiation Dose Reconstruction Under the Energy Employees Occupational Illness Compensation Program Act of 2000*; Final Rule; May 2, 2002; SRDB Ref ID: 19392

42 C.F.R. pt. 83, *Procedures for Designating Classes of Employees as Members of the Special Exposure Cohort Under the Energy Employees Occupational Illness Compensation Program Act of 2000*; Final Rule; May 28, 2004; SRDB Ref ID: 22001

42 U.S.C. §§ 7384-7385 [EEOICPA], *Energy Employees Occupational Illness Compensation Program Act of 2000*, as amended

AEC, 1948-1949, *Summary Report of Three Surveys Conducted between October 27, 1948 and February 15, 1949*; Atomic Energy Commission (AEC); October 27, 1948-February 15, 1949; SRDB Ref ID: 23579

Air and Urine Data, 1949-1954, *Data Sheets for Air Dust Samples and Urine Samples from Simonds Saw and Steel Company and Employees*; SRDB Ref ID: 10191

Air Dust Samples, 1953, *Air Dust Sample Data Forms*, forms from National Lead of Ohio and from U.S. Atomic Energy Commission, New York Operations Office, Medical Division; various dates in 1953; SRDB Ref ID: 42553

Army Corps, 2005, *Summary of Historical and Analytical Data for the Guterl Steel FUSRAP Site, Lockport, New York*; U.S. Army Corps of Engineers; June 2005; SRDB Ref ID: 82890

Army Corps, 2010, *Guterl Steel FUSRAP Site Plan Remedial Action Posters*; U.S. Army Corps of Engineers; October 2010; SRDB Ref ID: 89201

Battelle-TBD-6000, *Site Profiles for Atomic Weapons Employers that Worked Uranium and Thorium Metals*, Rev. F0; Battelle Team Dose Reconstruction Project for NIOSH; December 13, 2006; SRDB Ref ID: 30671

Belmore, 1948, *Recommendations for Proposed Contract – Simonds Saw & Steel Co.*, from F. M. Belmore (U.S. Atomic Energy Commission) to A. Potts (Simonds Saw and Steel Co.); May 14, 1948; SRDB Ref ID: 82417

Belmore, 1952, *Thorium Rolling-Simonds Saw and Steel Company*, correspondence to C. L. Karl; F. M. Belmore; November 20, 1952; SRDB Ref ID: 14653

DOE, 1979, *Evaluation of Radiation Exposures at the Former Simonds Saw and Steel Company, Lockport, New York*; authorship uncertain, arguably U. S. Department of Energy; annotated date of 1979; SRDB Ref ID: 11996, pdf pp. 227-228

Dust Data, 1954-1956, *Uranium and Thorium Dust Sample Results for Simonds Saw and Steel*; collected October 1954 and July 1956; SRDB Ref ID: 14152

Dust Data, 1957, *Analytical Data Sheet for Simonds Saw & Steel*; samples collected May 10, 1957; results reported August 2, 1957; Simonds Saw and Steel Co.; SRDB Ref ID: 81511

Earth Tech, 2007, *Building 24 Radiological Assessment*, draft report written for the U.S> Army Corps of Engineers; Earth Tech, Inc., a Tyco International Ltd. Company; December 6, 2007; SRDB Ref ID: 82919

Earth Tech, 2008, *Former Guterl Specialty Steel Corporation FUSRAP Site, Lockport, New York*; Draft Remedial Investigation Report, Volume I: Text, Table and Figures; Earth Tech, Inc., an AECOM Company; December 2008; SRDB Ref ID: 82847

Film Badge Data, 1949, *Simonds Saw and Steel Co. Film Badge Report for Badges Worn During Operations from October 11, 1949 through October 19, 1949*; SRDB Ref ID: 17287

Ford, 1981a, *Formerly Utilized MED/AEC Sites Remedial Action Program Engineering Evaluation of the Former Simonds Saw and Steel Company Site, Lockport, New York*; Ford, Bacon and Davis Utah Inc.; April 1981; SRDB Ref ID: 82886

Ford, 1981b, *Preliminary Engineering and Environmental Evaluation of the Remedial Action Alternatives for the Former Simonds Saw and Steel Company Site, Lockport, New York*; Ford, Bacon and Davis Utah Inc.; November 1981; SRDB Ref ID: 14790

Glitzer, 1958a, *Data from Survey of Simonds Saw and Steel*, correspondence to D. H. Mackey; M. S. Glitzer; November 25, 1958; SRDB Ref ID: 11996, pdf pp. 87-90

Glitzer, 1958b, *Data from Former Quenching Areas*, correspondence to D. H. Mackey; M. S. Glitzer; December 3, 1958; SRDB Ref ID: 11996, pdf pp. 92-93

Gustavson, 1953, *Simonds Saw and Steel Material Balance Report*; S. R. Gustavson; June 4, 1953; SRDB Ref ID: 6867

Harris, 1954, *Rolling of Thorium and Uranium at Simonds Saw and Steel Company*, correspondence to C. L. Karl; W. B. Harris; September 3, 1954; SRDB Ref ID: 11996, pdf pp. 537-539

Heatherton, 1950a, *Simonds Saw and Steel Company Occupational Exposure to Radioactive Dust-April and May Surveys*; R. C. Heatherton; June 21, 1950; SRDB Ref ID: 10879

Heatherton, 1950b, *Simonds Saw and Steel Company Occupational Exposure to Radioactive Dust-August Survey*; R. C. Heatherton; October 24, 1950; SRDB Ref ID: 17024

Heatherton, 1950c, *Simonds Saw and Steel Company Occupational Exposure to Radioactive Dust*; R. C. Heatherton; June 21, 1950; SRDB Ref ID: 16310

Heatherton, 1951a, *Trip Report-Visits to L.O.O.W and Simonds Saw and Steel-March 7 and 8, 1951*, correspondence to W. B. Harris; R. C. Heatherton; March 14, 1951; SRDB Ref ID: 63787

Heatherton, 1951b, *Simonds Saw and Steel Company Occupational Exposure to Radioactive Dust-January Survey*; R. C. Heatherton; March 20, 1951; SRDB Ref ID: 16353

Heatherton, 1953a, *Decontamination Assignment at Simonds Saw and Steel*, correspondence (2) to R. C. Heatherton and C. Bussart; November 18 and November 23, 1953; SRDB Ref ID: 11996, pdf pp. 682-683

Heatherton, 1953b, *Air Survey of Special Rolling "E" Material on 10" Mill*, correspondence to J. A. Quigley; R. C. Heatherton; April 30, 1953; SRDB Ref ID: 81449

Heatherton, 1956, *Industrial Hygiene and Radiation Department Monthly Report for July 1 through July 31, 1956*; R. C. Heatherton; August 2, 1956; SRDB Ref ID: 81440

Heatherton, 1957, *Trip Report to Simonds Saw and Steel Company on July 10, 1957*, correspondence to J. A. Quigley; R. C. Heatherton; July 12, 1957; SRDB Ref ID: 11996, pdf pp. 627-629

Huke, 1951, *Rolling of Thorium*, correspondence to F. M. Belmore; Frank Huke; August 24, 1951; SRDB Ref ID: 11996, pdf pp. 124-127

Keller, 1979, *Response to Preliminary Summary of MED/AEC Activities*, correspondence to W. E. Mott with attached uranium information; E. C. Keller; January 16, 1979; SRDB Ref ID: 11996, pdf pp. 13-18

Klevin, 1948, *Simonds Saw and Steel Co. Occupational Exposure to Radioactive Dust: Visit of October 27, 1948*; P. B. Klevin; October, 1948: SRDB Ref ID: 10226

Klevin, 1949a, *Simonds Saw and Steel Co. Occupational Exposure to Radioactive Dust: Visit of January 10-21, 1949*; P. B. Klevin; January, 1949: SRDB Ref ID: 10908

Klevin, 1949b, *Simonds Saw and Steel Co. Occupational Exposure to Radioactive Dust: April 5, 1949*; P. B. Klevin; April 22, 1949: SRDB Ref ID: 16230

Klevin, 1949c, *Simonds Saw and Steel Co. Occupational Exposure to Radioactive Dust: Visits of May 2-20, 1949*; P. B. Klevin; June 20, 1949: SRDB Ref ID: 11214

Klevin, 1950, *Simonds Saw and Steel Co. Occupational Exposure to Radioactive Dust: January 6, 9, and 10, 1950*; P. B. Klevin and R. C. Heatherton; February 1, 1950; SRDB Ref ID: 10184

Klevin, 1951a, Visit to LOSA, Model City, NY – August 22, 1951 and Simonds Saw and Steel, P. B. Klevin; September 6, 1951; SRDB Ref ID: 8918, pdf p. 6

Klevin, 1951b, *Simonds Saw and Steel Co. Occupational Exposure to Radioactive Dust: August 20-21, 1951*; P. B. Klevin; October 12, 1951; SRDB Ref ID: 10878

Klevin, 1953a, *Simonds Saw and Steel Company Occupational Exposure to Thorium*; P. B. Klevin and M. S. Weinstein; February 20, 1953; SRDB Ref ID: 17025

Klevin, 1953b, *Simonds Saw and Steel Company Occupational Exposure to Uranium*; P. B. Klevin and M. S. Weinstein; February 18, 1953; SRDB Ref ID: 17017

Klevin, 1954, *National Lead of Ohio Rolling Operations at Simonds Saw and Steel: August 5-6, 1954*, correspondence to W. B. Harris; P. B. Klevin; September 3, 1954; SRDB Ref ID: 11996, pdf pp. 616-617

Magoun, 1956, *Trip Report to Simonds Saw and Steel Company on April 19, 1956*, correspondence to A. Stewart; J. W. Magoun and A. S. Yocco; April 25, 1956; SRDB Ref ID: 81543

Malone, 1951, *Progress Report for November 1951*; F. W. Malone; November 26, 1951; SRDB Ref ID: 75068

Malone, 1952, *Monthly Progress Report for January 1952*; F. W. Malone; January 24, 1952; SRDB Ref ID: 61155

McCreery, 1957, *Completion of AEC Production Order #A-60*; correspondence to F. L. Cuthbert; P. N. Mc Creery; June 3, 1957; SRDB Ref ID: 81553

Morgan, 1948, *Medical Program*, clinical recommendations from J. P. Morgan (U.S. Atomic Energy Commission) to A. D. Potts (Simonds Saw and Steel Co.); December 29, 1948; SRDB Ref ID: 11226, pdf pp. 3-4

Morgan, 1949, *Medical Program*, letter from J. P. Morgan (U.S. Atomic Energy Commission) to R. A. Ferris (Simonds Saw and Steel Co.); January 13, 1949; SRDB Ref ID: 11226, pdf p. 2

NIOSH, 2009, *SEC Petition Evaluation Report for Petition SEC-00157, Simonds Saw and Steel Co.*; National Institute for Occupational Safety and Health (NIOSH); December 4, 2009; OSA Ref ID: 110300

NLO Letter, 1957, *Subcontract No. S-4 – Simonds Saw and Steel Company*, letter from National Lead of Ohio to U. S. Atomic Energy Commission; October 1, 1957; SRDB Ref ID: 81562

NLO Minutes, 1957, *Minutes of Management Committee Meeting, April 29, 1957*, National Lead of Ohio; April 29, 1957; SRDB Ref ID: 81555

NLO Procedure, 1954; *Standard Operating Procedure for Rolling 2.75% Enriched Metal at Simonds Saw and Steel Company;* National Lead of Ohio, November 9, 1955; SRDB Ref ID: 80177

NLO Procedure, 1955; *Standard Operating Procedure for Rolling 7.2% Enriched Metal at Simonds Saw and Steel Company;* National Lead of Ohio, November 9, 1955; SRDB Ref ID: 44168

NLO Telegram, 1957, *Telegram from NLO to Simonds Saw and Steel Requesting Closure of Subcontract S-4*, National Lead of Ohio; September 27, 1957; SRDB Ref ID: 81566

NYOO, 1948a, *Simonds Saw and Steel Co. Occupational Exposure to Radioactive Dust: Visit of October 27, 1948*; New York Operations Office (NYOO); written sometime after October 27, 1948; SRDB Ref ID: 10883

NYOO, 1948b, *Simonds Saw and Steel Co. Occupational Exposure to Radioactive Dust: Visit of December 1, 1948*; New York Operations Office (NYOO) Medical Division, Atomic Energy Commission (AEC); December 1948; SRDB Ref ID: 10167

NYOO, 1951a, *Laboratory Sample Analysis Report*, New York Operations Office (NYOO), April 4, 1951; SRDB Ref ID: 10219, pdf p. 59

NYOO, 1951b, *Laboratory Sample Analysis Report*, New York Operations Office (NYOO), August 29, 1951; SRDB Ref ID: 10199

OCAS-PR-004, *Internal Procedures for the Evaluation of Special Exposure Cohort Petitions*, Rev. 0, National Institute for Occupational Safety and Health (NIOSH); Cincinnati, Ohio; September 23, 2004; SRDB Ref ID: 32022

OCAS-TIB-009, *Estimation of Ingestion Intakes*, Rev. 00, National Institute for Occupational Safety and Health (NIOSH); Cincinnati, Ohio; April 13, 2004; SRDB Ref ID: 22397

ORAUT-OTIB-0006, *Dose Reconstruction from Occupationally Related Diagnostic X-Ray Procedures*, Rev. 03 PC-1; ORAU Team Dose Reconstruction Project for NIOSH; December 21, 2005; SRDB Ref ID: 20220

ORAUT-OTIB-0024, *Estimation of Neutron Dose Rates from Alpha-Neutron Reactions in Uranium and Thorium Compounds*, Rev. 00; ORAU Team Dose Reconstruction Project for NIOSH; April 7, 2005; SRDB Ref ID: 19445

ORAUT-TKBS-0032, *Site Profile for Simonds Saw and Steel*, Rev. 00 PC-1; ORAU Team Dose Reconstruction Project for NIOSH; July 8, 2005; SRDB Ref ID: 20180

ORNL, 1977, *Final Report Radiological Survey of the Simonds Saw and Steel Company*; Oak Ridge National Laboratory (ORNL), Health Physics Division; February 1977; SRDB Ref ID: 16199

ORNL, 1979, *Formerly Utilized MED/AEC Sites Remedial Action Program-Radiological Survey of the Former Simonds Saw and Steel Co., Lockport, New York*, DOE/EV-0005/17; Oak Ridge National Laboratory (ORNL); November 1979; SRDB Ref ID: 10877

ORNL, 1984, *Radiological Survey of the Guterl Steel Facility, Lockport, New York*; Oak Ridge National Laboratory; July 20, 1984; SRDB Ref ID: 71882

Personal Communication, 2010a, *Personal Communication with Former Swing Grinder at Simonds Saw and Steel Co.*; Telephone Interview by ORAU Team; May 10, 2010, 5:15 PM; SRDB Ref ID: 82202

Personal Communication, 2010b, *Personal Communication with Former Mill Hand and Maintenance Man at Simonds Saw and Steel Co.*; Telephone Interview by ORAU Team; May 11, 2010, 10:30 AM; SRDB Ref ID: 82205

Personal Communication, 2010c, *Personal Communication with Former Band Mill Operator at Simonds Saw and Steel Co.*; Telephone Interview by ORAU Team; May 11, 2010, 5:00 PM; SRDB Ref ID: 82208

Personal Communication, 2010d, *Personal Communication with Former Laborer at Simonds Saw and Steel Co.*; Telephone Interview by ORAU Team; May 12, 2010, 12:30 PM; SRDB Ref ID: 82203

Personal Communication, 2010e, *Personal Communication with Former Laborer at Simonds Saw and Steel Co.*; Telephone Interview by ORAU Team; May 12, 2010, 3:30 PM; SRDB Ref ID: 82206

Personal Communication, 2010f, *Personal Communication with Former Laborer at Simonds Saw and Steel Co.*; Telephone Interview by ORAU Team; May 12, 2010, 5:00 PM; SRDB Ref ID: 82209

Personal Communication, 2010g, *Personal Communication with Former Laborer at Simonds Saw and Steel Co.*; Telephone Interview by ORAU Team; May 12, 2010, 5:30 PM; SRDB Ref ID: 82207

Personal Communication, 2010h, *Personal Communication with Former Laborer at Simonds Saw and Steel Co.*; Telephone Interview by ORAU Team; May 13, 2010, 1:00 PM; SRDB Ref ID: 82204

Personal Communication, 2010i, *Personal Communication with Former Laborer at Simonds Saw and Steel Co.*; Telephone Interview by ORAU Team; May 14, 2010, 11:00 AM; SRDB Ref ID: 82210

Personal Communication, 2010j, *Personal Communication with Former Laborer at Simonds Saw and Steel Co.*; Mailed-out Interview by ORAU Team; May 27, 2010; SRDB Ref ID: 83401

Personal Communication, 2010k, *Personal Communication with Former Laborer at Simonds Saw and Steel Co.*; Telephone Interview by ORAU Team; June 17, 2010; SRDB Ref ID: 84730

Personal Communication, 2010L, *Personal Communication with Former Metallurgist at Simonds Saw and Steel Co.*; Telephone Interview by ORAU Team and NIOSH staff; July 7, 2010; SRDB Ref ID: 84727

Personal Communication, 2010m, *Personal Communication with Former Laborer at Simonds Saw and Steel Co.*; Telephone Interview by ORAU Team; June 28, 2010; SRDB Ref ID: 84725

Polson, 1954, *Contamination-Simonds Steel Company, Lockport, New York*, correspondence; C. E. Polson; November 22, 1954; SRDB Ref ID: 11996, pdf pp. 71-72

POR, 1957, *NLO Intra Plant Production Order Request*; April 1, 1957; SRDB Ref ID: 81554

Radiological Health Handbook, 1998, *Handbook of Health Physics and Radiological Health*, 3rd edition; B. Shleien, L. A. Slaback, Jr., and B. K. Birky; 1998; SRDB Ref ID: 22737

Schumann, 1953a, *Industrial Hygiene Survey of Uranium Rolling at Simonds Saw and Steel Co.*; C. E. Schumann; February 5, 1953; SRDB Ref ID: 6866

Schumann, 1953b, *Rolling of D-38 Alloy at Simonds Saw and Steel Co.*, correspondence to R. C. Heatherton; C. E. Schumann; December 11, 1953; SRDB Ref ID: 81448

Schumann, 1953c, *Industrial Hygiene Survey of Thorium Rolling at Simonds Saw and Steel Company*; C. E. Schumann; December 14, 1953; SRDB Ref ID: 80178

Site Clarification, 2010, *Letter from the Department of Labor to the Department of Energy Regarding the Covered Period for Simonds Saw and Steel Company;* Department of Labor; August 12, 2010; OSA Ref ID: 112456

Stefanec, 1953, *Simonds Saw & Steel Co. Visit, Lockport, New York*; trip report from A. J. Stefanec to R. C. Heatherton; National Lead Company of Ohio; September 10, 1953; SRDB Ref ID: 81452

Tabershaw, 1948, *Visit to Simonds Saw and Steel, Lockport, New York, on December 7, 1948*; correspondence to B. S. Wolf from I. R. Tabershaw; December 15, 1948; SRDB Ref ID: 11226, pdf pp. 5-7

Tabershaw, 1952, *Visit to Simonds Saw and Steel, Lockport, New York, on Saturday March 22, 1952*; correspondence to M. Eisenbud from I. R. Tabershaw; April 2, 1952; SRDB Ref ID: 10213, pdf pp. 1-4

Unknown author; post-November 1976, *Authority Review for the Former Simonds Saw and Steel Co., Lockport, New York*; unknown author; written sometime after November 1976; SRDB Ref ID: 11996, pdf pp. 1-11

Urinalysis Results, 1948, *Report of Uranium Content of Urine Samples from Simonds Saw and Steel Employees*; Various dates throughout November 1948; SRDB Ref ID: 11227

Vitkus, 1999, *Radiological Survey of the Guterl Specialty Steel Corporation*; T. J. Vitkus, Radiological Safety, Assessments, and Training Environmental Survey and Site Assessment Program for Oak Ridge Institute for Science and Education; December 1999; SRDB Ref ID: 10228

Wunder, 1953, *Resume Activities Month Ending December 20, 1953*, correspondence to C. L. Karl; G. W. Wunder; December 21, 1953; SRDB Ref ID: 81597

Wunder, 1956, *Request for Services at Simonds Saw and Steel Company, Lockport, New York*, correspondence to C. L. Karl; G. W. Wunder; May 31, 1956; SRDB Ref ID: 11996, pdf p. 630

This page intentionally left blank

# Attachment 1: Data Capture Synopsis

| Table A1-1: Data Capture Synopsis for Simonds Saw and Steel Co. | | | |
|---|---|---|---|
| **Data Capture Information** | **General Description of Documents Captured** | **Date Completed** | **Uploaded To SRDB** |
| Primary Site/Company Name: Simonds Saw and Steel Co. AWE 1948-1956, Residual Radiation 1957-October 2009<br><br>Other Site Names:<br>Simonds Saw and Steel Division, Guterl Special Steel Corp.<br>Allegheny-Ludlum Steel Corp.<br>Simonds Steel Division, Wallace-Murray Corporation<br><br>Successor/Company Contacts: Facility and Maintenance Manager at Simonds International; USACE Project Manager; Project Assistant at Ford Bacon & Davis; RSO at AlVac-Allegheny; Household International | NOTE: Waiting on decision regarding ownership of records at the Lockport NY location.<br>NOTE: Waiting on information from Household International as to whether they hold any relevant records. | OPEN | N/A |
| State Contacted: New York | No relevant data identified. | 05/24/2010 | 0 |
| Claimant Provided | Notes on public meeting for proposed special exposure cohort procedures and notes on a program for study of uranium losses. | 04/18/2005 | 3 |
| Department of Labor/Paragon | Environmental status, monthly and weekly reports, survey of control over source and fissionable materials, thorium slugs from extruded rod report, ingots requirements, and a trip report. | 12/30/2008 | 31 |
| DOE Germantown | Air contamination during uranium fabrication, bioassay data, contamination of Simonds Saw and Steel, hazards associated with rolling uranium, health physics activities report, medical monitoring program report, New York Operations Office uranium operations flow chart, occupational exposure to radioactive dust and air sample reports, trip reports, and urinanalysis data. | 06/18/2008 | 20 |
| DOE Hanford | Reactor branch monthly reports. NOTE: Records request was submitted on 07/09/2010. | OPEN | 10 |

| Table A1-1: Data Capture Synopsis for Simonds Saw and Steel Co. | | | |
|---|---|---|---|
| **Data Capture Information** | **General Description of Documents Captured** | **Date Completed** | **Uploaded To SRDB** |
| DOE Legacy Management - Grand Junction Office | Air sample results, control of uranium dust during rolling, FUSRAP site summary, health physics activities, industrial hygiene survey, inventory of Simonds solid scrap at LOSA, material accounting and losses, monthly progress and accountability reports, radiological problems at inactive uranium mill sites, radiological surveys, rolling thorium studies, shipments, stack effluent analysis, subcontract amendments, site characteristics and radiological history, trip reports, and urine samples. | 06/11/2010 | 142 |
| DOE Legacy Management - MoundView (Fernald Holdings, includes Fernald Legal Database) | Air sample results, amendments to subcontracts, decontamination assignment, hazardous waste disposal in Erie and Niagara counties, health records, Simonds Saw and Steel personnel by occupation, production of thorium rods and uranium feed materials, responsibilities assigned to Simonds Saw and Steel by National Lead of Ohio, shipments of depleted uranium received, standard operating procedure for rolling 7.2% enriched metal, department reports, and trip reports. | 08/13/2010 | 130 |
| EML/HASL Library | Industrial hygiene of uranium fabrication, site visits, annual report, and an analysis report. | 03/08/2005 | 3 |
| Interlibrary Loan | Radiological survey. | 01/19/2004 | 1 |
| Internet - DOE Comprehensive Epidemiologic Data Resource (CEDR) | No relevant data identified. | 04/12/2010 | 0 |
| Internet - DOE Hanford Declassified Document Retrieval System (DDRS) | Rolling of uranium rod, experimental uranium rolling at Lockport and Joslyn, health problems associated with off-plant uranium rolling, production report, rolling of natural and enriched uranium at Simonds, specifications and procedure for rolling uranium billets, and trip reports. NOTE: 49 documents were added by site association review. | 04/12/2010 | 52 |
| Internet - DOE Legacy Management Considered Sites | Progress reports. | 10/25/2007 | 2 |
| Internet - DOE OpenNet | Fifteenth semiannual report of the Atomic Energy Commission and monthly status and progress reports. NOTE: 11 documents were added by site association review. | 04/12/2010 | 11 |
| Internet - DOE OSTI Energy Citations | Monthly reports. | 05/06/2010 | 2 |
| Internet - DOE OSTI Information Bridge | Metallurgy division semiannual report. | 05/06/2010 | 1 |

| Table A1-1: Data Capture Synopsis for Simonds Saw and Steel Co. | | | |
|---|---|---|---|
| **Data Capture Information** | **General Description of Documents Captured** | **Date Completed** | **Uploaded To SRDB** |
| Internet - Google | Preliminary partial dose estimates from the processing of nuclear materials at three plants during the 1940s and 1950s, Allegheny Ludlum Steel purchase of Guterl Special Steel Corporation, company history, Guterl purchase of Simonds Steel, It May Not Have Been Radioactive...But It Was Hot! Remembering Production at Simonds Saw and Steel Mill, division monthly reports, Poisoned Workers and Poisoned Places part 1/3, USA Today series, radiological surveys, Simonds sold to Wallace-Murray Corporation, US Army Corps of Engineers FUSRAP background and investigation. | 04/12/2010 | 32 |
| Internet - Health Physics Journal | No relevant data identified. | 06/14/2010 | 0 |
| Internet - International Journal of Occupational and Environmental Health | No relevant data identified. | 06/14/2010 | 0 |
| Internet - National Academies Press (NAP) | No relevant data identified. | 04/12/2010 | 0 |
| Internet - National Nuclear Security Administration (NNSA) - Nevada Site Office | No relevant data identified. | 04/12/2010 | 0 |
| Internet - NRC Agencywide Document Access and Management (ADAMS) | Research and Development of The Flat Fuel Element. NOTE: This document was added by site association review. | 04/12/2010 | 1 |
| Internet - State University of New York (Archives and Library) | No relevant data identified. | 06/01/2010 | 0 |
| Internet - United State Army Corps of Engineers | Guterl Steel FUSRAP site fact sheet, eligibility for inclusion in the FUSRAP, and a sampling and analysis plan volume 1. | 04/12/2010 | 11 |
| Internet - Washington State University (U.S. Transuranium and Uranium Registries) | No relevant data identified. | 04/12/2010 | 0 |
| Lockport NY Library | No relevant data identified. | 05/06/2010 | 0 |
| NARA Atlanta | Correspondence regarding a Vitro contract and a returned voucher, dust collecting system and exhaust stack concentrator, inspection of rolled uranium rods, notes on uranium in steel making, physical examinations for rolling crew, plant inspection report, progress reports, radiation surveys, radiation monitoring progress reports, Simonds Saw and Steel health hazards, thorium rolling, unloading k-65 from railroad car, and uranium rolling hazards and mitigating actions. | 05/12/2010 | 20 |
| NARA Kansas City | Description of operations, radiological survey, historical information, occupational exposure to thorium, and a preliminary engineering and environmental evaluation of the remedial action alternatives. | 08/14/2008 | 15 |

| Table A1-1: Data Capture Synopsis for Simonds Saw and Steel Co. | | | |
|---|---|---|---|
| **Data Capture Information** | **General Description of Documents Captured** | **Date Completed** | **Uploaded To SRDB** |
| National Institute for Occupational Safety and Health (NIOSH) | Alpha counting of uranium filtered air samples from contractor facilities, comparison of Bethlehem Steel and Simonds Saw and Steel air sampling data, and occupational exposure to radioactive dust. | 01/11/2007 | 8 |
| Office of Scientific and Technical Information (OSTI) | Industrial hygiene survey of thorium rolling and a standard operating procedure for rolling 2.75% enriched metal. | 03/29/2010 | 3 |
| ORAU Team | Documented communication on Simonds Saw and Steel 1948-1956 and documented communication on activities, processes, and radiation protection measures. | 06/09/2010 | 27 |
| ORO Vault | Film badge report, Linde health physics progress reports, occupational exposure to radioactive dust, radiological survey, and urine uranium samples. | 10/28/2005 | 13 |
| Southern Illinois University | The Uranium Story Mallinckrodt Chemical Works. | 10/08/2008 | 1 |
| Unknown | Air, dust, and urine sample reports, badges worn during operations, health hazards in New York Operations Office facilities producing and processing uranium, health hazards in thorium processing, industrial hygiene survey of uranium rolling, occupational exposure to thorium and uranium, radiological laboratory reports, material balance report, trip reports, waste water reports, and weekly reports. | 04/15/2004 | 65 |
| US Army Corps of Engineers | Radiological surveys, declaration of taking 9.108 acres of land in the county of Niagara, DOE findings of site conditions after radiological surveys, site history, remedial investigation report, engineering evaluation, structural inspection excised buildings numbers 1-6, 8, 9, and 35, photographs, site safety and health plan, USA Today source documents, and trip reports. | 10/02/2010 | 46 |
| **TOTAL** | | | **650** |

| Table A1-2: Database Searches for Simonds Saw and Steel Co. | | | |
|---|---|---|---|
| **Database/Source** | **Keywords / Phrases** | **Hits** | **Uploaded To SRDB** |
| DOE CEDR<br>http://cedr.lbl.gov/<br>COMPLETED 04/12/2010 | "Simonds Saw and Steel Co."<br>"Simonds Saw & Steel Co."<br>"Simonds Saw and Steel Div."<br>"Guterl Special Steel Corp."<br>"Allegheny-Ludlum Steel Corp."<br>"Simonds Steel Division"<br>"Wallace-Murray Corporation"<br>"Ford Bacon and Davis" "Simonds Saw and Steel"<br>"Household International" "Simonds Saw and Steel"<br>"National Lead of Ohio" OR NLO "Simonds Saw and Steel" | 0 | 0 |
| DOE Hanford DDRS<br>http://www2.hanford.gov/declass/<br>COMPLETED 04/12/2010 | "Simonds Saw and Steel Co."<br>"Simonds Saw & Steel Co."<br>"Simonds Saw and Steel Div."<br>"Guterl Special Steel Corp."<br>"Allegheny-Ludlum Steel Corp."<br>"Simonds Steel Division"<br>"Wallace-Murray Corporation"<br>"Ford Bacon and Davis" "Simonds Saw and Steel"<br>"Household International" "Simonds Saw and Steel"<br>"National Lead of Ohio" OR NLO "Simonds Saw and Steel" | 30 | 3 |
| DOE Legacy Management Considered Sites<br>http://csd.lm.doe.gov/<br>COMPLETED 10/25/2007 | Simonds Saw and Steel | 12 | 2 |

| Table A1-2: Database Searches for Simonds Saw and Steel Co. | | | |
|---|---|---|---|
| **Database/Source** | **Keywords / Phrases** | **Hits** | **Uploaded To SRDB** |
| DOE OpenNet<br>http://www.osti.gov/opennet/advancedsearch.jsp<br>COMPLETED 04/12/2010 | "Simonds Saw and Steel Co."<br>"Simonds Saw & Steel Co."<br>"Simonds Saw and Steel Div."<br>"Guterl Special Steel Corp."<br>"Allegheny-Ludlum Steel Corp."<br>"Simonds Steel Division"<br>"Wallace-Murray Corporation"<br>"Ford Bacon and Davis" "Simonds Saw and Steel"<br>"Household International" "Simonds Saw and Steel"<br>"National Lead of Ohio" OR NLO "Simonds Saw and Steel" | 55 | 0 |
| DOE OSTI Energy Citations<br>http://www.osti.gov/energycitations/<br>COMPLETED 05/06/2010 | "Simonds Saw" in any field<br>"Ford Bacon and Davis" "Simonds Saw and Steel"<br>"Household International" "Simonds Saw and Steel"<br>"National Lead of Ohio" OR NLO "Simonds Saw and Steel"<br>"Wallace-Murray Corporation"<br>"Guterl Special Steel Corporation" | 97 | 2 |
| DOE OSTI Information Bridge<br>http://www.osti.gov/bridge/advancedsearch.jsp<br>COMPLETED 05/06/2010 | "Simonds Saw and Steel Co."<br>"Simonds Saw & Steel Co."<br>"Simonds Saw and Steel Div."<br>"Guterl Special Steel Corp."<br>"Allegheny-Ludlum Steel Corp."<br>"Simonds Steel Division"<br>"Wallace-Murray Corporation"<br>"Ford Bacon and Davis" "Simonds Saw and Steel"<br>"Household International" "Simonds Saw and Steel"<br>"National Lead of Ohio" OR NLO "Simonds Saw and Steel" | 82 | 1 |

| Table A1-2: Database Searches for Simonds Saw and Steel Co. | | | |
|---|---|---|---|
| **Database/Source** | **Keywords / Phrases** | **Hits** | **Uploaded To SRDB** |
| Google<br>http://www.google.com<br>COMPLETED 04/12/2010 | "Simonds Saw and Steel Co." americium Am241 Am-241 "Am 241" 241Am 241-Am "241 Am"<br><br>"Simonds Saw and Steel Co." ionium Th230 Th-230 "Th 230" 230Th 230-Th "230 Th"<br><br>"Simonds Saw and Steel Co." neptunium Np237 Np-237 "Np 237" 237Np 237-Np "237 Np" palm palmolive<br><br>"Simonds Saw and Steel Co." polonium Po210 Po-210 "Po 210" 210Po 210-Po "210 Po"<br><br>"Simonds Saw and Steel Co." thorium thoria Th232 Th-232 "Th 232" 232Th 232-Th "232 Th" "Z metal" Z-metal myrnalloy "chemical 10-66" "chemical 1066" "chemical 10 66"<br><br>"Simonds Saw and Steel Co. "chemical 18-12" "chemical 1812" "chemical 18 12" "chemical 10-12" "chemical 1012" "chemical 10 12" UX1 UX2 Th-234 Th234 "Th 234" 234-Th 234Th "234 Th" | 276,881 | 32 |

| Table A1-2: Database Searches for Simonds Saw and Steel Co. | | | |
|---|---|---|---|
| **Database/Source** | **Keywords / Phrases** | **Hits** | **Uploaded To SRDB** |
| | "Simonds Saw and Steel Co." tritium H3 H-3 mint HTO<br>"Simonds Saw and Steel Co." uranium<br><br>"Simonds Saw and Steel Co." uranium U233 U-233 U 233 233U 233-U 233 U U234 "U 234" U-234 234U 234-U "234 U"<br><br>"Simonds Saw and Steel Co." U235 "U 235" U-235 235-U 235U "235 U" U238 "U 238" U-238 238-U 238U "238 U" U308 "U 308" U-308 308-U 308U "308 U"<br><br>"Simonds Saw and Steel Co." "black oxide" "brown oxide" "green salt" "orange oxide" "yellow cake" UO2 UO3 UF4 UF6 C-216 C-616 C-65 C-211 U3O8<br><br>"Simonds Saw and Steel Co." "phosphate research"<br>"Simonds Saw and Steel Co." photon<br>"Simonds Saw and Steel Co." picocurie<br>"Simonds Saw and Steel Co." pitchblende<br>"Simonds Saw and Steel Co." "pocket ion chamber" PIC<br>"Simonds Saw and Steel Co." problem<br>"Simonds Saw and Steel Co." procedure<br>"Simonds Saw and Steel Co." radeco<br>"Simonds Saw and Steel Co." radiation<br>"Simonds Saw and Steel Co." radioactive<br><br>"Simonds Saw and Steel Co." "uranium extraction" "uranium dioxide" "uranium hexafluoride" "uranium tetrafluoride" "uranium trioxide"<br><br>"Simonds Saw and Steel Co." radioactivity<br>"Simonds Saw and Steel Co." radiograph<br>"Simonds Saw and Steel Co." radiological<br>"Simonds Saw and Steel Co." "Radiological Survey Data Sheet" RSDS<br>"Simonds Saw and Steel Co." radionuclide<br>"Simonds Saw and Steel Co." raffinate<br>"Simonds Saw and Steel Co." reactor<br>"Simonds Saw and Steel Co." respiratory | | |

| Table A1-2: Database Searches for Simonds Saw and Steel Co. | | | |
|---|---|---|---|
| **Database/Source** | **Keywords / Phrases** | **Hits** | **Uploaded To SRDB** |
| | "Simonds Saw and Steel Co." "retention schedules"<br>"Simonds Saw and Steel Co." roentgen<br><br>"Simonds Saw and Steel Co." plutonium Pu-238 Pu238 "Pu 238" 238Pu 238-Pu "238 Pu" Pu-239 Pu239 "Pu 239" 239Pu 239-Pu "239 Pu"<br><br>"Simonds Saw and Steel Co." sample "air sample" "dust sample" "general area air sample"<br><br>"Simonds Saw and Steel Co." sampling "air sampling" "dust sampling" "general area air sampling"<br><br>"Simonds Saw and Steel Co." "solvent extraction"<br>"Simonds Saw and Steel Co." source "sealed source"<br>"Simonds Saw and Steel Co." spectra<br>"Simonds Saw and Steel Co." spectrograph<br>"Simonds Saw and Steel Co." spectroscopy<br>"Simonds Saw and Steel Co." spectrum<br><br>"Simonds Saw and Steel Co." "operating standard" "processing standard"<br><br>"Simonds Saw and Steel Co." survey "building survey" "routine survey" "special survey"<br><br>"Simonds Saw and Steel Co." Pu-240 Pu240 "Pu 240" 240Pu 240-Pu "240 Pu" Pu-241 Pu241 "Pu 241" 241Pu 241-Pu "241 Pu"<br><br>"Simonds Saw and Steel Co." "technical basis"<br><br>"Simonds Saw and Steel Co." "thermal diffusion"<br>"Simonds Saw and Steel Co." "thermoluminescent dosimeter" TLD<br>"Simonds Saw and Steel Co." "Tiger Team"<br>"Simonds Saw and Steel Co." "tolerance dose"<br>"Simonds Saw and Steel Co." urinalysis<br>"Simonds Saw and Steel Co." urine | | |

| Table A1-2: Database Searches for Simonds Saw and Steel Co. | | | |
|---|---|---|---|
| **Database/Source** | **Keywords / Phrases** | **Hits** | **Uploaded To SRDB** |
| | "Simonds Saw and Steel Co." "whole body count" WBC<br>"Simonds Saw and Steel Co." "working level" WL<br>"Simonds Saw and Steel Co." X-ray "X ray" Xray<br><br>"Simonds Saw and Steel Co." radium Ra-226 Ra226 "Ra 226" 226-Ra 226Ra "226 Ra" Ra-228 Ra228 "Ra 228" 228Ra 228-Ra "228 Ra"<br><br>"Simonds Saw & Steel Co." americium Am241 Am-241 "Am 241" 241Am 241-Am "241 Am"<br><br>"Simonds Saw & Steel Co." ionium Th230 Th-230 "Th 230" 230Th 230-Th "230 Th"<br><br>"Simonds Saw & Steel Co." neptunium Np237 Np-237 "Np 237" 237Np 237-Np "237 Np" palm palmolive<br><br>"Simonds Saw & Steel Co." polonium Po210 Po-210 "Po 210" 210Po 210-Po "210 Po"<br><br>"Simonds Saw & Steel Co." thorium thoria Th232 Th-232 "Th 232" 232Th 232-Th "232 Th" "Z metal" Z-metal myrnalloy "chemical 10-66" "chemical 1066" "chemical 10 66"<br><br>"Simonds Saw & Steel Co." "chemical 18-12" "chemical 1812" "chemical 18 12" "chemical 10-12" "chemical 1012" "chemical 10 12" UX1 UX2 Th-234 Th234 "Th 234" 234-Th 234Th "234 Th"<br><br>"Simonds Saw & Steel Co." tritium H3 H-3 mint HTO<br>"Simonds Saw & Steel Co." uranium<br><br>"Simonds Saw & Steel Co." uranium U233 U-233 U 233 233U 233-U 233 U U234 "U 234" U-234 234U 234-U "234 U" U235 "U 235" U-235 235-U 235U "235 U"<br><br>"Simonds Saw & Steel Co." U238 "U 238" U-238 238-U 238U "238 U" U308 "U 308" U-308 308-U 308U "308 U" | | |

| Table A1-2: Database Searches for Simonds Saw and Steel Co. | | | |
|---|---|---|---|
| **Database/Source** | **Keywords / Phrases** | **Hits** | **Uploaded To SRDB** |
| | "Simonds Saw and Steel Co." radon Rn-222 Rn222 "Rn 222" 222Rn 222-Rn "222 Rn"<br><br>"Simonds Saw & Steel Co." "black oxide" "brown oxide" "green salt" "orange oxide" "yellow cake"<br><br>"Simonds Saw & Steel Co." UO2 UO3 UF4 UF6 C-216 C-616 C-65 C-211 U3O8 "uranium extraction" "uranium dioxide" "uranium hexafluoride" "uranium tetrafluoride" "uranium trioxide"<br><br>"Simonds Saw & Steel Co." plutonium Pu-238 Pu238 "Pu 238" 238Pu 238-Pu "238 Pu" Pu-239 Pu239 "Pu 239" 239Pu 239-Pu "239 Pu"<br><br>"Simonds Saw & Steel Co." Pu-240 Pu240 "Pu 240" 240Pu 240-Pu "240 Pu" Pu-241 Pu241 "Pu 241" 241Pu 241-Pu "241 Pu"<br><br>"Simonds Saw & Steel Co." radium Ra-226 Ra226 "Ra 226" 226-Ra 226Ra "226 Ra" Ra-228 Ra228 "Ra 228" 228Ra 228-Ra "228 Ra"<br><br>"Simonds Saw & Steel Co." radon Rn-222 Rn222 "Rn 222" 222Rn 222-Rn "222 Rn"<br><br>"Simonds Saw & Steel Co." thoron Rn-220 Rn220 "Rn 220" 220Rn 220-Rn "220 Rn"<br><br>"Simonds Saw & Steel Co." protactinium Pa-234m Pa234m "Pa 234m" 234mPa 234m-Pa "234m Pa"<br><br>"Simonds Saw & Steel Co." strontium Sr-90 Sr90 "Sr 90" 90-Sr 90Sr "90 Sr"<br><br>"Simonds Saw & Steel Co." oralloy<br><br>"Simonds Saw and Steel Co." thoron Rn-220 Rn220 "Rn 220" 220Rn 220-Rn "220 Rn" | | |

| Table A1-2: Database Searches for Simonds Saw and Steel Co. | | | |
|---|---|---|---|
| **Database/Source** | **Keywords / Phrases** | **Hits** | **Uploaded To SRDB** |
| | "Simonds Saw & Steel Co." postum<br>"Simonds Saw & Steel Co." tuballoy<br>"Simonds Saw & Steel Co." "uranyl nitrate hexahydrate" UNH<br>"Simonds Saw & Steel Co." K-65<br>"Simonds Sa w & Steel Co." "sump cake"<br>"Simonds Saw & Steel Co." accident<br>"Simonds Saw & Steel Co." "air count"<br>"Simonds Saw & Steel Co." "air dust"<br>"Simonds Saw & Steel Co." "air filter"<br>"Simonds Saw & Steel Co." "airborne test"<br><br>"Simonds Saw and Steel Co." protactinium Pa-234m Pa234m "Pa 234m" 234mPa 234m-Pa "234m Pa"<br><br>"Simonds Saw & Steel Co." alpha<br>"Simonds Saw & Steel Co." "belgian congo ore"<br>"Simonds Saw & Steel Co." beta<br>"Simonds Saw & Steel Co." bioassay bio-assay<br>"Simonds Saw & Steel Co." breath "breathing zone" BZ<br>"Simonds Saw & Steel Co." "body burden"<br>"Simonds Saw & Steel Co." calibration<br><br>"Simonds Saw and Steel Co." strontium Sr-90 Sr90 "Sr 90" 90-Sr 90Sr "90 Sr"<br><br>"Simonds Saw and Steel Co." oralloy<br>"Simonds Saw and Steel Co." postum<br>"Simonds Saw and Steel Co." tuballoy<br>"Simonds Saw and Steel Co." "uranyl nitrate hexahydrate" UNH<br>"Simonds Saw and Steel Co." K-65<br>"Simonds Saw and Steel Co." "sump cake"<br>"Simonds Saw and Steel Co." accident<br>"Simonds Saw and Steel Co." "air count"<br>"Simonds Saw and Steel Co." "air dust"<br>"Simonds Saw and Steel Co." "air filter"<br>"Simonds Saw and Steel Co." "airborne test" | | |

| Table A1-2: Database Searches for Simonds Saw and Steel Co. | | | |
|---|---|---|---|
| **Database/Source** | **Keywords / Phrases** | **Hits** | **Uploaded To SRDB** |
| | "Simonds Saw and Steel Co." alpha<br>"Simonds Saw and Steel Co." "belgian congo ore"<br>"Simonds Saw and Steel Co." beta<br>"Simonds Saw and Steel Co." bioassay bio-assay<br>"Simonds Saw and Steel Co." breath "breathing zone" BZ<br>"Simonds Saw and Steel Co." "body burden"<br>"Simonds Saw and Steel Co." calibration<br>"Simonds Saw and Steel Co." "chest count"<br>"Simonds Saw and Steel Co." columnation<br>"Simonds Saw and Steel Co." contamination<br>"Simonds Saw and Steel Co." curie<br>"Simonds Saw and Steel Co." denitration "denitration pot"<br>"Simonds Saw and Steel Co." derby regulus<br>"Simonds Saw and Steel Co." "derived air concentration" DAC<br>"Simonds Saw and Steel Co." dose<br>"Simonds Saw and Steel Co." dosimeter<br>"Simonds Saw and Steel Co." dosimetric<br>"Simonds Saw and Steel Co." dosimetry<br>"Simonds Saw and Steel Co." electron<br>"Simonds Saw and Steel Co." environment<br>"Simonds Saw and Steel Co." "Ether-Water Project"<br><br>"Simonds Saw and Steel Co." exposure "exposure investigation" "radiation exposure"<br><br>"Simonds Saw and Steel Co." external<br>"Simonds Saw and Steel Co." "F machine"<br>"Simonds Saw and Steel Co." fecal<br>"Simonds Saw and Steel Co." "feed material"<br>"Simonds Saw and Steel Co." femptocurie<br>"Simonds Saw and Steel Co." film<br>"Simonds Saw and Steel Co." fission<br>"Simonds Saw and Steel Co." fluoroscopy<br><br>"Simonds Saw and Steel Co." "Formerly Utilized Sites Remedial Action Program" FUSRAP | | |

| Table A1-2: Database Searches for Simonds Saw and Steel Co. | | | |
|---|---|---|---|
| **Database/Source** | **Keywords / Phrases** | **Hits** | **Uploaded To SRDB** |
| | "Simonds Saw and Steel Co." gamma-ray "gamma ray"<br>"Simonds Saw and Steel Co." "gas proportional"<br>"Simonds Saw and Steel Co." "gaseous diffusion"<br><br>"Simonds Saw and Steel Co." health "health instrument" "health physics" H.I. HI HP<br><br>"Simonds Saw and Steel Co." "highly enriched uranium" HEU<br>"Simonds Saw and Steel Co." hydrofluorination<br>"Simonds Saw and Steel Co." "in vitro"<br>"Simonds Saw and Steel Co." "in vivo"<br>"Simonds Saw and Steel Co." incident<br>"Simonds Saw and Steel Co." ingestion<br>"Simonds Saw and Steel Co." inhalation<br>"Simonds Saw and Steel Co." internal<br>"Simonds Saw and Steel Co." investigation<br>"Simonds Saw and Steel Co." isotope<br>"Simonds Saw and Steel Co." isotopic<br>"Simonds Saw and Steel Co." "isotopic enrichment"<br>"Simonds Saw and Steel Co." "JS Project"<br>"Simonds Saw and Steel Co." Landauer<br>"Simonds Saw and Steel Co." "liquid scintillation"<br>"Simonds Saw and Steel Co." log "log sheet" "log book"<br>"Simonds Saw and Steel Co." "low enriched uranium" LEU<br>"Simonds Saw and Steel Co." "lung count"<br><br>"Simonds Saw and Steel Co." "maximum permissible concentration" MPC<br><br>"Simonds Saw and Steel Co." metallurgy<br>"Simonds Saw and Steel Co." microcurie<br>"Simonds Saw and Steel Co." millicurie<br>"Simonds Saw and Steel Co." "mixed fission product" MFP<br>"Simonds Saw and Steel Co." monitor "air monitoring"<br>"Simonds Saw and Steel Co." nanocurie<br>"Simonds Saw and Steel Co." "nasal wipe" | | |

| Table A1-2: Database Searches for Simonds Saw and Steel Co. | | | |
|---|---|---|---|
| **Database/Source** | **Keywords / Phrases** | **Hits** | **Uploaded To SRDB** |
| | "Simonds Saw and Steel Co." neutron<br>"Simonds Saw and Steel Co." "nose wipe"<br><br>"Simonds Saw and Steel Co." nuclear "Chicago-Nuclear" "nuclear fuels"<br><br>"Simonds Saw and Steel Co." "nuclear track emulsion type A" NTA<br>"Simonds Saw and Steel Co." "occupational radiation exposure"<br>"Simonds Saw and Steel Co." occurrence<br>"Simonds Saw and Steel Co." "ore concentrate"<br>"Simonds Saw and Steel Co." "PC Project"<br><br>"Simonds Saw and Steel Co." permit "radiation work permit" "safe work permit" "special work permit" RWP SWP<br><br>"Simonds Saw & Steel Co." "chest count"<br>"Simonds Saw & Steel Co." columnation<br>"Simonds Saw & Steel Co." contamination<br>"Simonds Saw & Steel Co." curie<br>"Simonds Saw & Steel Co." denitration "denitration pot"<br>"Simonds Saw & Steel Co." derby regulus<br>"Simonds Saw & Steel Co." "derived air concentration" DAC<br>"Simonds Saw & Steel Co." dose<br>"Simonds Saw & Steel Co." dosimeter<br>"Simonds Saw & Steel Co." dosimetric<br>"Simonds Saw & Steel Co." dosimetry<br>"Simonds Saw & Steel Co." electron<br>"Simonds Saw & Steel Co." environment<br>"Simonds Saw & Steel Co." "Ether-Water Project"<br><br>"Simonds Saw & Steel Co." exposure "exposure investigation" "radiation exposure"<br><br>"Simonds Saw & Steel Co." external<br>"Simonds Saw & Steel Co." "F machine" | | |

| Table A1-2: Database Searches for Simonds Saw and Steel Co. | | | |
|---|---|---|---|
| **Database/Source** | **Keywords / Phrases** | **Hits** | **Uploaded To SRDB** |
| | "Simonds Saw & Steel Co." fecal<br>"Simonds Saw & Steel Co." "feed material"<br>"Simonds Saw & Steel Co." femptocurie<br>"Simonds Saw & Steel Co." film<br>"Simonds Saw & Steel Co." fission<br>"Simonds Saw & Steel Co." fluoroscopy<br><br>"Simonds Saw & Steel Co." "Formerly Utilized Sites Remedial Action Program" FUSRAP<br><br>"Simonds Saw & Steel Co." gamma-ray "gamma ray"<br>"Simonds Saw & Steel Co." "gas proportional"<br>"Simonds Saw & Steel Co." "gaseous diffusion"<br><br>"Simonds Saw & Steel Co." health "health instrument" "health physics" H.I. HI HP<br><br>"Simonds Saw & Steel Co." "highly enriched uranium" HEU<br>"Simonds Saw & Steel Co." hydrofluorination<br>"Simonds Saw & Steel Co." "in vitro"<br>"Simonds Saw & Steel Co." "in vivo"<br>"Simonds Saw & Steel Co." incident<br>"Simonds Saw & Steel Co." ingestion<br>"Simonds Saw & Steel Co." inhalation<br>"Simonds Saw & Steel Co." internal<br>"Simonds Saw & Steel Co." investigation<br>"Simonds Saw & Steel Co." isotope<br>"Simonds Saw & Steel Co." isotopic<br>"Simonds Saw & Steel Co." "isotopic enrichment"<br>"Simonds Saw & Steel Co." "JS Project"<br>"Simonds Saw & Steel Co." Landauer<br>"Simonds Saw & Steel Co." "liquid scintillation"<br>"Simonds Saw & Steel Co." log "log sheet" "log book"<br>"Simonds Saw & Steel Co." "low enriched uranium" LEU<br>"Simonds Saw & Steel Co." "lung count" | | |

| Table A1-2: Database Searches for Simonds Saw and Steel Co. | | | |
|---|---|---|---|
| **Database/Source** | **Keywords / Phrases** | **Hits** | **Uploaded To SRDB** |
| | "Simonds Saw & Steel Co." "maximum permissible concentration" MPC<br><br>"Simonds Saw & Steel Co." metallurgy<br>"Simonds Saw & Steel Co." microcurie<br>"Simonds Saw & Steel Co." millicurie<br>"Simonds Saw & Steel Co." "mixed fission product" MFP<br>"Simonds Saw & Steel Co." monitor "air monitoring"<br>"Simonds Saw & Steel Co." nanocurie<br>"Simonds Saw & Steel Co." "nasal wipe"<br>"Simonds Saw & Steel Co." neutron<br>"Simonds Saw & Steel Co." "nose wipe"<br>"Simonds Saw & Steel Co." nuclear "Chicago-Nuclear" "nuclear fuels"<br>"Simonds Saw & Steel Co." "nuclear track emulsion type A" NTA<br>"Simonds Saw & Steel Co." "occupational radiation exposure"<br>"Simonds Saw & Steel Co." occurrence<br>"Simonds Saw & Steel Co." "ore concentrate"<br>"Simonds Saw & Steel Co." "PC Project"<br><br>"Simonds Saw & Steel Co." permit "radiation work permit" "safe work permit" "special work permit" RWP SWP<br><br>"Simonds Saw & Steel Co." "phosphate research"<br>"Simonds Saw & Steel Co." photon<br>"Simonds Saw & Steel Co." picocurie<br>"Simonds Saw & Steel Co." pitchblende<br>"Simonds Saw & Steel Co." "pocket ion chamber" PIC<br>"Simonds Saw & Steel Co." problem<br>"Simonds Saw & Steel Co." procedure<br>"Simonds Saw & Steel Co." radeco<br>"Simonds Saw & Steel Co." radiation<br>"Simonds Saw & Steel Co." radioactive<br>"Simonds Saw & Steel Co." radioactivity<br>"Simonds Saw & Steel Co." radiograph<br>"Simonds Saw & Steel Co." radiological<br>"Simonds Saw & Steel Co." "Radiological Survey Data Sheet" RSDS | | |

| Table A1-2: Database Searches for Simonds Saw and Steel Co. | | | |
|---|---|---|---|
| **Database/Source** | **Keywords / Phrases** | **Hits** | **Uploaded To SRDB** |
| | "Simonds Saw & Steel Co." radionuclide<br>"Simonds Saw & Steel Co." raffinate<br>"Simonds Saw & Steel Co." reactor<br>"Simonds Saw & Steel Co." respiratory<br>"Simonds Saw & Steel Co." "retention schedules"<br>"Simonds Saw & Steel Co." roentgen<br><br>"Simonds Saw & Steel Co." sample "air sample" "dust sample" "general area air sample"<br><br>"Simonds Saw & Steel Co." sampling "air sampling" "dust sampling" "general area air sampling"<br><br>"Simonds Saw & Steel Co." "solvent extraction"<br>"Simonds Saw and Steel Div." investigation<br>"Simonds Saw and Steel Div." isotope<br>"Simonds Saw and Steel Div." isotopic<br>"Simonds Saw and Steel Div." "isotopic enrichment"<br>"Simonds Saw and Steel Div." "JS Project"<br>"Simonds Saw and Steel Div." Landauer<br>"Simonds Saw and Steel Div." "liquid scintillation"<br>"Simonds Saw and Steel Div." log "log sheet" "log book"<br>"Simonds Saw and Steel Div." "low enriched uranium" LEU<br>"Simonds Saw and Steel Div." "lung count"<br>"Simonds Saw & Steel Co." source "sealed source"<br><br>"Simonds Saw and Steel Div." "maximum permissible concentration" MPC<br><br>"Simonds Saw and Steel Div." metallurgy<br>"Simonds Saw and Steel Div." microcurie<br>"Simonds Saw and Steel Div." millicurie<br>"Simonds Saw and Steel Div." "mixed fission product" MFP<br>"Simonds Saw and Steel Div." monitor "air monitoring"<br>"Simonds Saw and Steel Div." nanocurie<br>"Simonds Saw and Steel Div." "nasal wipe" | | |

| Table A1-2: Database Searches for Simonds Saw and Steel Co. | | | |
|---|---|---|---|
| **Database/Source** | **Keywords / Phrases** | **Hits** | **Uploaded To SRDB** |
| | "Simonds Saw and Steel Div." neutron<br>"Simonds Saw and Steel Div." "nose wipe"<br>"Simonds Saw & Steel Co." spectra<br><br>"Simonds Saw and Steel Div." nuclear "Chicago-Nuclear" "nuclear fuels"<br><br>"Simonds Saw and Steel Div." "nuclear track emulsion type A" NTA<br>"Simonds Saw and Steel Div." "occupational radiation exposure"<br>"Simonds Saw and Steel Div." occurrence<br>"Simonds Saw and Steel Div." "ore concentrate"<br>"Simonds Saw and Steel Div." "PC Project"<br><br>"Simonds Saw and Steel Div." permit "radiation work permit" "safe work permit" "special work permit" RWP SWP<br><br>"Simonds Saw and Steel Div." "phosphate research"<br>"Simonds Saw and Steel Div." photon<br>"Simonds Saw and Steel Div." picocurie<br>"Simonds Saw & Steel Co." spectrograph<br>"Simonds Saw and Steel Div." pitchblende<br>"Simonds Saw and Steel Div." "pocket ion chamber" PIC<br>"Simonds Saw and Steel Div." problem<br>"Simonds Saw and Steel Div." procedure<br>"Simonds Saw and Steel Div." radeco<br>"Simonds Saw and Steel Div." radiation<br>"Simonds Saw and Steel Div." radioactive<br>"Simonds Saw and Steel Div." radioactivity<br>"Simonds Saw and Steel Div." radiograph<br>"Simonds Saw and Steel Div." radiological<br>"Simonds Saw & Steel Co." spectroscopy<br>"Simonds Saw and Steel Div." "Radiological Survey Data Sheet" RSDS<br>"Simonds Saw and Steel Div." radionuclide<br>"Simonds Saw and Steel Div." raffinate<br>"Simonds Saw and Steel Div." reactor<br>"Simonds Saw and Steel Div." respiratory | | |

| Table A1-2: Database Searches for Simonds Saw and Steel Co. | | | |
|---|---|---|---|
| **Database/Source** | **Keywords / Phrases** | **Hits** | **Uploaded To SRDB** |
| | "Simonds Saw and Steel Div." "retention schedules"<br>"Simonds Saw and Steel Div." roentgen<br><br>"Simonds Saw and Steel Div." sample "air sample" "dust sample" "general area air sample"<br><br>"Simonds Saw and Steel Div." sampling "air sampling" "dust sampling" "general area air sampling"<br><br>"Simonds Saw and Steel Div." "solvent extraction"<br>"Simonds Saw & Steel Co." spectrum<br>"Simonds Saw and Steel Div." source "sealed source"<br>"Simonds Saw and Steel Div." spectra<br>"Simonds Saw and Steel Div." spectrograph<br>"Simonds Saw and Steel Div." spectroscopy<br>"Simonds Saw and Steel Div." spectrum<br><br>"Simonds Saw and Steel Div." "operating standard" "processing standard"<br><br>"Simonds Saw and Steel Div." survey "building survey" "routine survey" "special survey"<br><br>"Simonds Saw and Steel Div." "technical basis"<br>"Simonds Saw and Steel Div." "thermal diffusion"<br>"Simonds Saw and Steel Div." "thermoluminescent dosimeter" TLD<br>"Simonds Saw & Steel Co." "operating standard" "processing standard"<br>"Simonds Saw and Steel Div." "Tiger Team"<br>"Simonds Saw and Steel Div." "tolerance dose"<br>"Simonds Saw and Steel Div." urinalysis<br>"Simonds Saw and Steel Div." urine<br>"Simonds Saw and Steel Div." "whole body count" WBC<br>"Simonds Saw and Steel Div." "working level" WL<br>"Simonds Saw and Steel Div." X-ray "X ray" Xray | | |

| Table A1-2: Database Searches for Simonds Saw and Steel Co. | | | |
|---|---|---|---|
| **Database/Source** | **Keywords / Phrases** | **Hits** | **Uploaded To SRDB** |
| | "Guterl Special Steel Corp." americium Am241 Am-241 "Am 241" 241Am 241-Am "241 Am"<br><br>"Guterl Special Steel Corp." ionium Th230 Th-230 "Th 230" 230Th 230-Th "230 Th"<br><br>"Guterl Special Steel Corp." neptunium Np237 Np-237 "Np 237" 237Np 237-Np "237 Np" palm palmolive<br><br>"Simonds Saw & Steel Co." survey "building survey" "routine survey" "special survey"<br><br>"Guterl Special Steel Corp." polonium Po210 Po-210 "Po 210" 210Po 210-Po "210 Po"<br><br>"Guterl Special Steel Corp." thorium thoria Th232 Th-232 "Th 232" 232Th 232-Th "232 Th" "Z metal" Z-metal myrnalloy "chemical 10-66" "chemical 1066" "chemical 10 66"<br><br>"Guterl Special Steel Corp." "chemical 18-12" "chemical 1812" "chemical 18 12" "chemical 10-12" "chemical 1012" "chemical 10 12" UX1 UX2 Th-234 Th234 "Th 234" 234-Th 234Th "234 Th"<br><br>"Guterl Special Steel Corp." tritium H3 H-3 mint HTO<br><br>"Guterl Special Steel Corp." uranium U233 U-233 U 233 233U 233-U 233 U U234 "U 234" U-234 234U 234-U "234 U"<br><br>"Guterl Special Steel Corp." U235 "U 235" U-235 235-U 235U "235 U" U238 "U 238" U-238 238-U 238U "238 U" U308 "U 308" U-308 308-U 308U "308 U"<br><br>"Guterl Special Steel Corp." "black oxide" "brown oxide" "green salt" "orange oxide" "yellow cake" | | |

| Table A1-2: Database Searches for Simonds Saw and Steel Co. | | | |
|---|---|---|---|
| **Database/Source** | **Keywords / Phrases** | **Hits** | **Uploaded To SRDB** |
| | "Guterl Special Steel Corp." UO2 UO3 UF4 UF6 C-216 C-616 C-65 C-211 U3O8 "uranium extraction" "uranium dioxide" "uranium hexafluoride" "uranium tetrafluoride" "uranium trioxide"<br><br>"Guterl Special Steel Corp." plutonium Pu-238 Pu238 "Pu 238" 238Pu 238-Pu "238 Pu" Pu-239 Pu239 "Pu 239" 239Pu 239-Pu "239 Pu"<br><br>"Guterl Special Steel Corp." Pu-240 Pu240 "Pu 240" 240Pu 240-Pu "240 Pu" Pu-241 Pu241 "Pu 241" 241Pu 241-Pu "241 Pu"<br><br>"Simonds Saw & Steel Co." "technical basis"<br><br>"Guterl Special Steel Corp." radium Ra-226 Ra226 "Ra 226" 226-Ra 226Ra "226 Ra" Ra-228 Ra228 "Ra 228" 228Ra 228-Ra "228 Ra"<br><br>"Guterl Special Steel Corp." radon Rn-222 Rn222 "Rn 222" 222Rn 222-Rn "222 Rn"<br><br>"Guterl Special Steel Corp." thoron Rn-220 Rn220 "Rn 220" 220Rn 220-Rn "220 Rn"<br><br>"Guterl Special Steel Corp." protactinium Pa-234m Pa234m "Pa 234m" 234mPa 234m-Pa "234m Pa"<br><br>"Guterl Special Steel Corp." strontium Sr-90 Sr90 "Sr 90" 90-Sr 90Sr "90 Sr"<br><br>"Guterl Special Steel Corp." oralloy<br>"Guterl Special Steel Corp." postum<br>"Guterl Special Steel Corp." tuballoy<br>"Guterl Special Steel Corp." "uranyl nitrate hexahydrate" UNH<br>"Guterl Special Steel Corp." "K-65"<br>"Simonds Saw & Steel Co." "thermal diffusion"<br>"Guterl Special Steel Corp." "sump cake"<br>"Guterl Special Steel Corp." accident<br>"Guterl Special Steel Corp." "air count" | | |

| Table A1-2: Database Searches for Simonds Saw and Steel Co. | | | |
|---|---|---|---|
| **Database/Source** | **Keywords / Phrases** | **Hits** | **Uploaded To SRDB** |
| | "Guterl Special Steel Corp." "air dust"<br>"Guterl Special Steel Corp." "air filter"<br>"Guterl Special Steel Corp." "airborne test"<br>"Guterl Special Steel Corp." alpha<br>"Guterl Special Steel Corp." "belgian congo ore"<br>"Guterl Special Steel Corp." beta<br>"Guterl Special Steel Corp." bioassay bio-assay<br>"Simonds Saw & Steel Co." "thermoluminescent dosimeter" TLD<br>"Guterl Special Steel Corp." breath "breathing zone" BZ<br>"Guterl Special Steel Corp." "body burden"<br>"Guterl Special Steel Corp." calibration<br>"Guterl Special Steel Corp." "chest count"<br>"Guterl Special Steel Corp." columnation<br>"Guterl Special Steel Corp." contamination<br>"Guterl Special Steel Corp." curie<br>"Guterl Special Steel Corp." denitration "denitration pot"<br>"Guterl Special Steel Corp." derby regulus<br>"Guterl Special Steel Corp." "derived air concentration" DAC<br>"Simonds Saw & Steel Co." "Tiger Team"<br>"Guterl Special Steel Corp." "dose"<br>"Guterl Special Steel Corp." dosimeter<br>"Guterl Special Steel Corp." dosimetric<br>"Guterl Special Steel Corp." dosimetry<br>"Guterl Special Steel Corp." electron<br>"Guterl Special Steel Corp." environment<br>"Guterl Special Steel Corp." "Ether-Water Project"<br><br>"Guterl Special Steel Corp." exposure "exposure investigation" "radiation exposure"<br><br>"Guterl Special Steel Corp." external<br>"Guterl Special Steel Corp." "F machine"<br>"Simonds Saw & Steel Co." "tolerance dose"<br>"Guterl Special Steel Corp." fecal<br>"Guterl Special Steel Corp." "feed material"<br>"Guterl Special Steel Corp." femptocurie | | |

| Table A1-2: Database Searches for Simonds Saw and Steel Co. | | | |
|---|---|---|---|
| **Database/Source** | **Keywords / Phrases** | **Hits** | **Uploaded To SRDB** |
| | "Guterl Special Steel Corp." film<br>"Guterl Special Steel Corp." fission<br>"Guterl Special Steel Corp." fluoroscopy<br><br>"Guterl Special Steel Corp." "Formerly Utilized Sites Remedial Action Program" FUSRAP<br><br>"Guterl Special Steel Corp." gamma-ray "gamma ray"<br>"Guterl Special Steel Corp." "gas proportional"<br>"Guterl Special Steel Corp." "gaseous diffusion"<br>"Simonds Saw & Steel Co." urinalysis<br><br>"Guterl Special Steel Corp." health "health instrument" "health physics" H.I. HI HP<br><br>"Guterl Special Steel Corp." "highly enriched uranium" HEU<br>"Guterl Special Steel Corp." hydrofluorination<br>"Guterl Special Steel Corp." "in vitro"<br>"Guterl Special Steel Corp." "in vivo"<br>"Guterl Special Steel Corp." incident<br>"Guterl Special Steel Corp." ingestion<br>"Guterl Special Steel Corp." inhalation<br>"Guterl Special Steel Corp." internal<br>"Guterl Special Steel Corp." investigation<br>"Simonds Saw & Steel Co." urine<br>"Guterl Special Steel Corp." isotope<br>"Guterl Special Steel Corp." isotopic<br>"Guterl Special Steel Corp." "isotopic enrichment"<br>"Guterl Special Steel Corp." "JS Project"<br>"Guterl Special Steel Corp." Landauer<br>"Guterl Special Steel Corp." "liquid scintillation"<br>"Guterl Special Steel Corp." log "log sheet" "log book"<br>"Guterl Special Steel Corp." "low enriched uranium" LEU<br>"Guterl Special Steel Corp." "lung count" | | |

| Table A1-2: Database Searches for Simonds Saw and Steel Co. | | | |
|---|---|---|---|
| **Database/Source** | **Keywords / Phrases** | **Hits** | **Uploaded To SRDB** |
| | "Guterl Special Steel Corp." "maximum permissible concentration" MPC<br><br>"Simonds Saw & Steel Co." "whole body count" WBC<br>"Guterl Special Steel Corp." metallurgy<br>"Guterl Special Steel Corp." microcurie<br>"Guterl Special Steel Corp." millicurie<br>"Guterl Special Steel Corp." "mixed fission product" MFP<br>"Guterl Special Steel Corp." monitor "air monitoring"<br>"Guterl Special Steel Corp." nanocurie<br>"Guterl Special Steel Corp." "nasal wipe"<br>"Guterl Special Steel Corp." neutron<br>"Guterl Special Steel Corp." "nose wipe"<br>"Guterl Special Steel Corp." nuclear "Chicago-Nuclear" "nuclear fuels"<br>"Simonds Saw & Steel Co." "working level" WL<br>"Guterl Special Steel Corp." "nuclear track emulsion type A" NTA<br>"Guterl Special Steel Corp." "occupational radiation exposure"<br>"Guterl Special Steel Corp." occurrence<br>"Guterl Special Steel Corp." "ore concentrate"<br>"Guterl Special Steel Corp." "PC Project"<br><br>"Guterl Special Steel Corp." permit "radiation work permit" "safe work permit" "special work permit" RWP SWP<br><br>"Guterl Special Steel Corp." "phosphate research"<br>"Guterl Special Steel Corp." photon<br>"Guterl Special Steel Corp." picocurie<br>"Guterl Special Steel Corp." pitchblende<br>"Simonds Saw & Steel Co." X-ray "X ray" Xray<br>"Guterl Special Steel Corp." "pocket ion chamber" PIC<br>"Guterl Special Steel Corp." problem<br>"Guterl Special Steel Corp." procedure<br>"Guterl Special Steel Corp." radeco<br>"Guterl Special Steel Corp." radiation<br>"Guterl Special Steel Corp." radioactive<br>"Guterl Special Steel Corp." radioactivity | | |

| Table A1-2: Database Searches for Simonds Saw and Steel Co. | | | |
|---|---|---|---|
| **Database/Source** | **Keywords / Phrases** | **Hits** | **Uploaded To SRDB** |
| | "Guterl Special Steel Corp." radiograph<br>"Guterl Special Steel Corp." radiological<br>"Guterl Special Steel Corp." "Radiological Survey Data Sheet" RSDS<br><br>"Simonds Saw and Steel Div." americium Am241 Am-241 "Am 241" 241Am 241-Am "241 Am"<br><br>"Guterl Special Steel Corp." radionuclide<br>"Guterl Special Steel Corp." raffinate<br>"Guterl Special Steel Corp." reactor<br>"Guterl Special Steel Corp." respiratory<br>"Guterl Special Steel Corp." "retention schedules"<br>"Guterl Special Steel Corp." roentgen<br><br>"Guterl Special Steel Corp." sample "air sample" "dust sample" "general area air sample"<br><br>"Guterl Special Steel Corp." sampling "air sampling" "dust sampling" "general area air sampling"<br><br>"Guterl Special Steel Corp." "solvent extraction"<br>"Guterl Special Steel Corp." source "sealed source"<br><br>"Simonds Saw and Steel Div." ionium Th230 Th-230 "Th 230" 230Th 230-Th "230 Th"<br><br>"Guterl Special Steel Corp." spectra<br>"Guterl Special Steel Corp." spectrograph<br>"Guterl Special Steel Corp." spectroscopy<br>"Guterl Special Steel Corp." spectrum<br>"Guterl Special Steel Corp." "operating standard" "processing standard"<br><br>"Guterl Special Steel Corp." survey "building survey" "routine survey" "special survey"<br><br>"Guterl Special Steel Corp." "technical basis" | | |

| Table A1-2: Database Searches for Simonds Saw and Steel Co. | | | |
|---|---|---|---|
| **Database/Source** | **Keywords / Phrases** | **Hits** | **Uploaded To SRDB** |
| | "Guterl Special Steel Corp." "thermal diffusion"<br>"Guterl Special Steel Corp." "thermoluminescent dosimeter" TLD<br>"Guterl Special Steel Corp." "Tiger Team"<br><br>"Simonds Saw and Steel Div." neptunium Np237 Np-237 "Np 237" 237Np 237-Np "237 Np" palm palmolive<br><br>"Guterl Special Steel Corp." "tolerance dose"<br>"Guterl Special Steel Corp." urinalysis<br>"Guterl Special Steel Corp." urine<br>"Guterl Special Steel Corp." "whole body count" WBC<br>"Guterl Special Steel Corp." "working level" WL<br>"Guterl Special Steel Corp." X-ray "X ray" Xray<br><br>"Allegheny-Ludlum Steel Corp." americium Am241 Am-241 "Am 241" 241Am 241-Am "241 Am"<br><br>"Allegheny-Ludlum Steel Corp." ionium Th230 Th-230 "Th 230" 230Th 230-Th "230 Th"<br><br>"Allegheny-Ludlum Steel Corp." neptunium Np237 Np-237 "Np 237" 237Np 237-Np "237 Np" palm Palmolive<br><br>"Allegheny-Ludlum Steel Corp." polonium Po210 Po-210 "Po 210" 210Po 210-Po "210 Po"<br><br>"Simonds Saw and Steel Div." polonium Po210 Po-210 "Po 210" 210Po 210-Po "210 Po"<br><br>"Allegheny-Ludlum Steel Corp." thorium thoria Th232 Th-232 "Th 232" 232Th 232-Th "232 Th" "Z metal" Z-metal myrnalloy "chemical 10-66" "chemical 1066" "chemical 10 66"<br><br>"Allegheny-Ludlum Steel Corp." "chemical 18-12" "chemical 1812" "chemical 18 12" "chemical 10-12" "chemical 1012" "chemical 10 12" UX1 UX2 Th-234 Th234 "Th 234" 234-Th 234Th "234 Th" | | |

| Table A1-2: Database Searches for Simonds Saw and Steel Co. | | | |
|---|---|---|---|
| **Database/Source** | **Keywords / Phrases** | **Hits** | **Uploaded To SRDB** |
| | "Allegheny-Ludlum Steel Corp." tritium H3 H-3 mint HTO<br><br>"Allegheny-Ludlum Steel Corp." uranium U233 U-233 U 233 233U 233-U 233 U U234 "U 234" U-234 234U 234-U "234 U"<br><br>"Allegheny-Ludlum Steel Corp." U235 "U 235" U-235 235-U 235U "235 U" U238 "U 238" U-238 238-U 238U "238 U" U308 "U 308" U-308 308-U 308U "308 U"<br><br>"Allegheny-Ludlum Steel Corp." "black oxide" "brown oxide" "green salt" "orange oxide" "yellow cake" UO2 UO3 UF4 UF6 C-216 C-616 C-65 C-211 U3O8<br><br>"Allegheny-Ludlum Steel Corp." "uranium extraction" "uranium dioxide" "uranium hexafluoride" "uranium tetrafluoride" "uranium trioxide"<br><br>"Allegheny-Ludlum Steel Corp." plutonium Pu-238 Pu238 "Pu 238" 238Pu 238-Pu "238 Pu" Pu-239 Pu239 "Pu 239" 239Pu 239-Pu "239 Pu"<br><br>"Allegheny-Ludlum Steel Corp." Pu-240 Pu240 "Pu 240" 240Pu 240-Pu "240 Pu" Pu-241 Pu241 "Pu 241" 241Pu 241-Pu "241 Pu"<br><br>"Allegheny-Ludlum Steel Corp." radium Ra-226 Ra226 "Ra 226" 226-Ra 226Ra "226 Ra" Ra-228 Ra228 "Ra 228" 228Ra 228-Ra "228 Ra"<br><br>"Simonds Saw and Steel Div." thorium thoria Th232 Th-232 "Th 232" 232Th 232-Th "232 Th" "Z metal" Z-metal myrnalloy "chemical 10-66" "chemical 1066" "chemical 10 66"<br><br>"Allegheny-Ludlum Steel Corp." radon Rn-222 Rn222 "Rn 222" 222Rn 222-Rn "222 Rn" | | |

| Table A1-2: Database Searches for Simonds Saw and Steel Co. | | | |
|---|---|---|---|
| **Database/Source** | **Keywords / Phrases** | **Hits** | **Uploaded To SRDB** |
| | "Allegheny-Ludlum Steel Corp." thoron Rn-220 Rn220 "Rn 220" 220Rn 220-Rn "220 Rn"<br><br>"Allegheny-Ludlum Steel Corp." protactinium Pa-234m Pa234m "Pa 234m" 234mPa 234m-Pa "234m Pa"<br><br>"Allegheny-Ludlum Steel Corp." strontium Sr-90 Sr90 "Sr 90" 90-Sr 90Sr "90 Sr"<br><br>"Allegheny-Ludlum Steel Corp." oralloy<br>"Allegheny-Ludlum Steel Corp." postum<br>"Allegheny-Ludlum Steel Corp." tuballoy<br>"Allegheny-Ludlum Steel Corp." "uranyl nitrate hexahydrate" UNH<br>"Allegheny-Ludlum Steel Corp." "K-65"<br>"Allegheny-Ludlum Steel Corp." "sump cake"<br><br>"Simonds Saw and Steel Div. "chemical 18-12" "chemical 1812" "chemical 18 12" "chemical 10-12" "chemical 1012" "chemical 10 12" UX1 UX2 Th-234 Th234 "Th 234" 234-Th 234Th "234 Th"<br><br>"Allegheny-Ludlum Steel Corp." accident<br>"Allegheny-Ludlum Steel Corp." "air count"<br>"Allegheny-Ludlum Steel Corp." "air dust"<br>"Allegheny-Ludlum Steel Corp." "air filter"<br>"Allegheny-Ludlum Steel Corp." "airborne test"<br>"Allegheny-Ludlum Steel Corp." alpha<br>"Allegheny-Ludlum Steel Corp." "belgian congo ore"<br>"Allegheny-Ludlum Steel Corp." beta<br>"Allegheny-Ludlum Steel Corp." bioassay bio-assay<br>"Allegheny-Ludlum Steel Corp." breath "breathing zone" BZ<br>"Simonds Saw and Steel Div." tritium H3 H-3 mint HTO<br>"Allegheny-Ludlum Steel Corp." "body burden"<br>"Allegheny-Ludlum Steel Corp." calibration<br>"Allegheny-Ludlum Steel Corp." "chest count"<br>"Allegheny-Ludlum Steel Corp." columnation<br>"Allegheny-Ludlum Steel Corp." contamination | | |

| Table A1-2: Database Searches for Simonds Saw and Steel Co. | | | |
|---|---|---|---|
| **Database/Source** | **Keywords / Phrases** | **Hits** | **Uploaded To SRDB** |
| | "Allegheny-Ludlum Steel Corp." curie<br>"Allegheny-Ludlum Steel Corp." denitration "denitration pot"<br>"Allegheny-Ludlum Steel Corp." derby regulus<br>"Allegheny-Ludlum Steel Corp." "derived air concentration" DAC<br>"Allegheny-Ludlum Steel Corp." "dose"<br><br>"Simonds Saw and Steel Div." uranium U233 U-233 U 233 233U 233-U 233 U U234 "U 234" U-234 234U 234-U "234 U"<br><br>"Allegheny-Ludlum Steel Corp." dosimeter<br>"Allegheny-Ludlum Steel Corp." dosimetric<br>"Allegheny-Ludlum Steel Corp." dosimetry<br>"Allegheny-Ludlum Steel Corp." electron<br>"Allegheny-Ludlum Steel Corp." environment<br>"Allegheny-Ludlum Steel Corp." "Ether-Water Project"<br><br>"Allegheny-Ludlum Steel Corp." exposure "exposure investigation" "radiation exposure"<br><br>"Allegheny-Ludlum Steel Corp." external<br>"Allegheny-Ludlum Steel Corp." "F machine"<br>"Allegheny-Ludlum Steel Corp." fecal<br><br>"Simonds Saw and Steel Div." U238 "U 238" U-238 238-U 238U "238 U" U308 "U 308" U-308 308-U 308U "308 U"<br><br>"Allegheny-Ludlum Steel Corp." "feed material"<br>"Allegheny-Ludlum Steel Corp." femptocurie<br>"Allegheny-Ludlum Steel Corp." film<br>"Allegheny-Ludlum Steel Corp." fission<br>"Allegheny-Ludlum Steel Corp." fluoroscopy<br><br>"Allegheny-Ludlum Steel Corp." "Formerly Utilized Sites Remedial Action Program" FUSRAP<br><br>"Allegheny-Ludlum Steel Corp." gamma-ray "gamma ray" | | |

| Table A1-2: Database Searches for Simonds Saw and Steel Co. | | | |
|---|---|---|---|
| **Database/Source** | **Keywords / Phrases** | **Hits** | **Uploaded To SRDB** |
| | "Allegheny-Ludlum Steel Corp." "gas proportional"<br>"Allegheny-Ludlum Steel Corp." "gaseous diffusion"<br><br>"Allegheny-Ludlum Steel Corp." health "health instrument" "health physics" H.I. HI HP<br><br>"Simonds Saw and Steel Div." "black oxide" "brown oxide" "green salt" "orange oxide" "yellow cake" UO2 UO3 UF4 UF6 C-216 C-616 C-65 C-211<br><br>"Allegheny-Ludlum Steel Corp." "highly enriched uranium" HEU<br>"Allegheny-Ludlum Steel Corp." hydrofluorination<br>"Allegheny-Ludlum Steel Corp." "in vitro"<br>"Allegheny-Ludlum Steel Corp." "in vivo"<br>"Allegheny-Ludlum Steel Corp." incident<br>"Allegheny-Ludlum Steel Corp." ingestion<br>"Allegheny-Ludlum Steel Corp." inhalation<br>"Allegheny-Ludlum Steel Corp." internal<br>"Allegheny-Ludlum Steel Corp." investigation<br>"Allegheny-Ludlum Steel Corp." isotope<br><br>"Simonds Saw and Steel Div." "uranium extraction" "uranium dioxide" "uranium hexafluoride" "uranium tetrafluoride" "uranium trioxide"<br><br>"Allegheny-Ludlum Steel Corp." isotopic<br>"Allegheny-Ludlum Steel Corp." "isotopic enrichment"<br>"Allegheny-Ludlum Steel Corp." "JS Project"<br>"Allegheny-Ludlum Steel Corp." Landauer<br>"Allegheny-Ludlum Steel Corp." "liquid scintillation"<br>"Allegheny-Ludlum Steel Corp." log "log sheet" "log book"<br>"Allegheny-Ludlum Steel Corp." "low enriched uranium" LEU<br>"Allegheny-Ludlum Steel Corp." "lung count"<br><br>"Allegheny-Ludlum Steel Corp." "maximum permissible concentration" MPC | | |

| Table A1-2: Database Searches for Simonds Saw and Steel Co. | | | |
|---|---|---|---|
| **Database/Source** | **Keywords / Phrases** | **Hits** | **Uploaded To SRDB** |
| | "Allegheny-Ludlum Steel Corp." metallurgy<br><br>"Simonds Saw and Steel Div." plutonium Pu-238 Pu238 "Pu 238" 238Pu 238-Pu "238 Pu" Pu-239 Pu239 "Pu 239" 239Pu 239-Pu "239 Pu"<br><br>"Allegheny-Ludlum Steel Corp." microcurie<br>"Allegheny-Ludlum Steel Corp." millicurie<br>"Allegheny-Ludlum Steel Corp." "mixed fission product" MFP<br>"Allegheny-Ludlum Steel Corp." monitor "air monitoring"<br>"Allegheny-Ludlum Steel Corp." nanocurie<br>"Allegheny-Ludlum Steel Corp." "nasal wipe"<br>"Allegheny-Ludlum Steel Corp." neutron<br><br>"Simonds Saw and Steel Div." Pu-240 Pu240 "Pu 240" 240Pu 240-Pu "240 Pu" Pu-241 Pu241 "Pu 241" 241Pu 241-Pu "241 Pu"<br><br>"Simonds Saw and Steel Div." radium Ra-226 Ra226 "Ra 226" 226-Ra 226Ra "226 Ra" Ra-228 Ra228 "Ra 228" 228Ra 228-Ra "228 Ra"<br><br>"Simonds Saw and Steel Div." radon Rn-222 Rn222 "Rn 222" 222Rn 222-Rn "222 Rn"<br><br>"Simonds Saw and Steel Div." thoron Rn-220 Rn220 "Rn 220" 220Rn 220-Rn "220 Rn"<br><br>"Simonds Saw and Steel Div." protactinium Pa-234m Pa234m "Pa 234m" 234mPa 234m-Pa "234m Pa"<br><br>"Simonds Saw and Steel Div." strontium Sr-90 Sr90 "Sr 90" 90-Sr 90Sr "90 Sr"<br><br>"Simonds Saw and Steel Div." oralloy<br>"Simonds Saw and Steel Div." postum<br>"Simonds Saw and Steel Div." tuballoy<br>"Simonds Saw and Steel Div." "uranyl nitrate hexahydrate" UNH | | |

| Table A1-2: Database Searches for Simonds Saw and Steel Co. | | | |
|---|---|---|---|
| **Database/Source** | **Keywords / Phrases** | **Hits** | **Uploaded To SRDB** |
| | "Simonds Saw and Steel Div." K-65<br>"Simonds Saw and Steel Div." "sump cake"<br>"Simonds Saw and Steel Div." accident<br>"Simonds Saw and Steel Div." "air count"<br>"Simonds Saw and Steel Div." "air dust"<br>"Simonds Saw and Steel Div." "air filter"<br>"Simonds Saw and Steel Div." "airborne test"<br>"Simonds Saw and Steel Div." alpha<br>"Simonds Saw and Steel Div." "belgian congo ore"<br>"Simonds Saw and Steel Div." beta<br>"Simonds Saw and Steel Div." bioassay bio-assay<br>"Simonds Saw and Steel Div." breath "breathing zone" BZ<br>"Simonds Saw and Steel Div." "body burden"<br>"Simonds Saw and Steel Div." calibration<br>"Simonds Saw and Steel Div." "chest count"<br>"Simonds Saw and Steel Div." columnation<br>"Simonds Saw and Steel Div." contamination<br>"Simonds Saw and Steel Div." curie<br>"Simonds Saw and Steel Div." denitration "denitration pot"<br>"Simonds Saw and Steel Div." derby regulus<br>"Simonds Saw and Steel Div." "derived air concentration" DAC<br>"Simonds Saw and Steel Div." dose<br>"Simonds Saw and Steel Div." dosimeter<br>"Simonds Saw and Steel Div." dosimetric<br>"Simonds Saw and Steel Div." dosimetry<br>"Simonds Saw and Steel Div." electron<br>"Simonds Saw and Steel Div." environment<br>"Simonds Saw and Steel Div." "Ether-Water Project"<br><br>"Simonds Saw and Steel Div." exposure "exposure investigation"<br>"radiation exposure"<br><br>"Simonds Saw and Steel Div." external<br>"Simonds Saw and Steel Div." "F machine"<br>"Simonds Saw and Steel Div." fecal<br>"Simonds Saw and Steel Div." "feed material" | | |

| Table A1-2: Database Searches for Simonds Saw and Steel Co. | | | |
|---|---|---|---|
| **Database/Source** | **Keywords / Phrases** | **Hits** | **Uploaded To SRDB** |
| | "Simonds Saw and Steel Div." femptocurie<br>"Simonds Saw and Steel Div." film<br>"Simonds Saw and Steel Div." fission<br>"Simonds Saw and Steel Div." fluoroscopy<br><br>"Simonds Saw and Steel Div." "Formerly Utilized Sites Remedial Action Program" FUSRAP<br><br>"Simonds Saw and Steel Div." gamma-ray "gamma ray"<br>"Simonds Saw and Steel Div." "gas proportional"<br>"Simonds Saw and Steel Div." "gaseous diffusion"<br><br>"Simonds Saw and Steel Div." health "health instrument" "health physics" H.I. HI HP<br><br>"Simonds Saw and Steel Div." "highly enriched uranium" HEU<br>"Simonds Saw and Steel Div." hydrofluorination<br>"Simonds Saw and Steel Div." "in vitro"<br>"Simonds Saw and Steel Div." "in vivo"<br>"Simonds Saw and Steel Div." incident<br>"Simonds Saw and Steel Div." ingestion<br>"Simonds Saw and Steel Div." inhalation<br>"Simonds Saw and Steel Div." internal<br>"Allegheny-Ludlum Steel Corp." "nose wipe"<br><br>"Allegheny-Ludlum Steel Corp." nuclear "Chicago-Nuclear" "nuclear fuels"<br><br>"Allegheny-Ludlum Steel Corp." "nuclear track emulsion type A" NTA<br>"Allegheny-Ludlum Steel Corp." "occupational radiation exposure"<br>"Allegheny-Ludlum Steel Corp." occurrence<br>"Allegheny-Ludlum Steel Corp." "ore concentrate"<br>"Allegheny-Ludlum Steel Corp." "PC Project"<br><br>"Allegheny-Ludlum Steel Corp." permit "radiation work permit" "safe work permit" "special work permit" RWP SWP | | |

| Table A1-2: Database Searches for Simonds Saw and Steel Co. | | | |
|---|---|---|---|
| **Database/Source** | **Keywords / Phrases** | **Hits** | **Uploaded To SRDB** |
| | "Allegheny-Ludlum Steel Corp." "phosphate research"<br>"Allegheny-Ludlum Steel Corp." photon<br>"Simonds Steel Division" external<br>"Simonds Steel Division" "F machine"<br>"Simonds Steel Division" fecal<br>"Simonds Steel Division" "feed material"<br>"Simonds Steel Division" femptocurie<br>"Simonds Steel Division" film<br>"Simonds Steel Division" fission<br>"Simonds Steel Division" fluoroscopy<br><br>"Simonds Steel Division" "Formerly Utilized Sites Remedial Action Program" FUSRAP<br><br>"Simonds Steel Division" gamma-ray "gamma ray"<br>"Allegheny-Ludlum Steel Corp." picocurie<br>"Simonds Steel Division" "gas proportional"<br>"Simonds Steel Division" "gaseous diffusion"<br><br>"Simonds Steel Division" health "health instrument" "health physics" H.I. HI HP<br><br>"Simonds Steel Division" "highly enriched uranium" HEU<br>"Simonds Steel Division" hydrofluorination<br>"Simonds Steel Division" "in vitro"<br>"Simonds Steel Division" "in vivo"<br>"Simonds Steel Division" incident<br>"Simonds Steel Division" ingestion<br>"Simonds Steel Division" inhalation<br>"Allegheny-Ludlum Steel Corp." pitchblende<br>"Simonds Steel Division" internal<br>"Simonds Steel Division" investigation<br>"Simonds Steel Division" isotope<br>"Simonds Steel Division" isotopic<br>"Simonds Steel Division" "isotopic enrichment"<br>"Simonds Steel Division" "JS Project" | | |

| Table A1-2: Database Searches for Simonds Saw and Steel Co. | | | |
|---|---|---|---|
| **Database/Source** | **Keywords / Phrases** | **Hits** | **Uploaded To SRDB** |
| | "Simonds Steel Division" Landauer<br>"Simonds Steel Division" "liquid scintillation"<br>"Simonds Steel Division" log "log sheet" "log book"<br>"Simonds Steel Division" "low enriched uranium" LEU<br>"Allegheny-Ludlum Steel Corp." "pocket ion chamber" PIC<br>"Simonds Steel Division" "lung count"<br>"Simonds Steel Division" "maximum permissible concentration" MPC<br>"Simonds Steel Division" metallurgy<br>"Simonds Steel Division" microcurie<br>"Simonds Steel Division" millicurie<br>"Simonds Steel Division" "mixed fission product" MFP<br>"Simonds Steel Division" monitor "air monitoring"<br>"Simonds Steel Division" nanocurie<br>"Simonds Steel Division" "nasal wipe"<br>"Simonds Steel Division" neutron<br>"Allegheny-Ludlum Steel Corp." problem<br>"Simonds Steel Division" "nose wipe"<br>"Simonds Steel Division" nuclear "Chicago-Nuclear" "nuclear fuels"<br>"Simonds Steel Division" "nuclear track emulsion type A" NTA<br>"Simonds Steel Division" "occupational radiation exposure"<br>"Simonds Steel Division" occurrence<br>"Simonds Steel Division" "ore concentrate"<br>"Simonds Steel Division" "PC Project"<br><br>"Simonds Steel Division" permit "radiation work permit" "safe work permit" "special work permit" RWP SWP<br><br>"Simonds Steel Division" "phosphate research"<br>"Simonds Steel Division" photon<br>"Allegheny-Ludlum Steel Corp." procedure<br>"Simonds Steel Division" picocurie<br>"Simonds Steel Division" pitchblende<br>"Simonds Steel Division" "pocket ion chamber" PIC<br>"Simonds Steel Division" problem<br>"Simonds Steel Division" procedure<br>"Simonds Steel Division" radeco | | |

| Table A1-2: Database Searches for Simonds Saw and Steel Co. | | | |
|---|---|---|---|
| **Database/Source** | **Keywords / Phrases** | **Hits** | **Uploaded To SRDB** |
| | "Simonds Steel Division" radiation<br>"Simonds Steel Division" radioactive<br>"Simonds Steel Division" radioactivity<br>"Simonds Steel Division" radiograph<br>"Allegheny-Ludlum Steel Corp." radeco<br>"Simonds Steel Division" radiological<br>"Simonds Steel Division" "Radiological Survey Data Sheet" RSDS<br>"Simonds Steel Division" radionuclide<br>"Simonds Steel Division" raffinate<br>"Simonds Steel Division" reactor<br>"Simonds Steel Division" respiratory<br>"Simonds Steel Division" "retention schedules"<br>"Simonds Steel Division" roentgen<br><br>"Simonds Steel Division" sample "air sample" "dust sample" "general area air sample"<br><br>"Simonds Steel Division" sampling "air sampling" "dust sampling" "general area air sampling"<br><br>"Allegheny-Ludlum Steel Corp." radiation<br>"Simonds Steel Division" "solvent extraction"<br>"Simonds Steel Division" source "sealed source"<br>"Simonds Steel Division" spectra<br>"Simonds Steel Division" spectrograph<br>"Simonds Steel Division" spectroscopy<br>"Simonds Steel Division" spectrum<br>"Simonds Steel Division" "operating standard" "processing standard"<br><br>"Simonds Steel Division" survey "building survey" "routine survey" "special survey"<br><br>"Simonds Steel Division" "technical basis"<br><br>"Simonds Steel Division" "thermal diffusion"<br>"Allegheny-Ludlum Steel Corp." radioactive | | |

| Table A1-2: Database Searches for Simonds Saw and Steel Co. | | | |
|---|---|---|---|
| **Database/Source** | **Keywords / Phrases** | **Hits** | **Uploaded To SRDB** |
| | "Simonds Steel Division" "thermoluminescent dosimeter" TLD<br>"Simonds Steel Division" "Tiger Team"<br>"Simonds Steel Division" "tolerance dose"<br>"Simonds Steel Division" urinalysis<br>"Simonds Steel Division" urine<br>"Simonds Steel Division" "whole body count" WBC<br>"Simonds Steel Division" "working level" WL<br>"Simonds Steel Division" X-ray "X ray" Xray<br>"Allegheny-Ludlum Steel Corp." radioactivity<br>"Allegheny-Ludlum Steel Corp." radiograph<br>"Allegheny-Ludlum Steel Corp." radiological<br><br>"Allegheny-Ludlum Steel Corp." "Radiological Survey Data Sheet" RSDS<br><br>"Allegheny-Ludlum Steel Corp." radionuclide<br>"Allegheny-Ludlum Steel Corp." raffinate<br>"Allegheny-Ludlum Steel Corp." reactor<br>"Allegheny-Ludlum Steel Corp." respiratory<br>"Allegheny-Ludlum Steel Corp." "retention schedules"<br>"Allegheny-Ludlum Steel Corp." roentgen<br><br>"Allegheny-Ludlum Steel Corp." sample "air sample" "dust sample" "general area air sample"<br><br>"Allegheny-Ludlum Steel Corp." sampling "air sampling" "dust sampling" "general area air sampling"<br><br>"Allegheny-Ludlum Steel Corp." "solvent extraction"<br>"Allegheny-Ludlum Steel Corp." source "sealed source"<br>"Allegheny-Ludlum Steel Corp." "spectra"<br>"Allegheny-Ludlum Steel Corp." "spectrograph"<br>"Allegheny-Ludlum Steel Corp." spectroscopy<br>"Allegheny-Ludlum Steel Corp." spectrum | | |

| Table A1-2: Database Searches for Simonds Saw and Steel Co. | | | |
|---|---|---|---|
| **Database/Source** | **Keywords / Phrases** | **Hits** | **Uploaded To SRDB** |
| | "Allegheny-Ludlum Steel Corp." "operating standard" "processing standard"<br><br>"Allegheny-Ludlum Steel Corp." survey "building survey" "routine survey" "special survey"<br><br>"Allegheny-Ludlum Steel Corp." "technical basis"<br>"Allegheny-Ludlum Steel Corp." "thermal diffusion"<br>"Allegheny-Ludlum Steel Corp." "thermoluminescent dosimeter" TLD<br>"Allegheny-Ludlum Steel Corp." "Tiger Team"<br>"Allegheny-Ludlum Steel Corp." "tolerance dose"<br>"Allegheny-Ludlum Steel Corp." urinalysis<br>"Allegheny-Ludlum Steel Corp." urine<br>"Allegheny-Ludlum Steel Corp." "whole body count" WBC<br>"Allegheny-Ludlum Steel Corp." "working level" WL<br>"Allegheny-Ludlum Steel Corp." X-ray "X ray" Xray<br><br>"Simonds Steel Division" americium Am241 Am-241 "Am 241" 241Am 241-Am "241 Am"<br><br>"Simonds Steel Division" ionium Th230 Th-230 "Th 230" 230Th 230-Th "230 Th"<br><br>"Simonds Steel Division" neptunium Np237 Np-237 "Np 237" 237Np 237-Np "237 Np" palm palmolive<br><br>"Simonds Steel Division" polonium Po210 Po-210 "Po 210" 210Po 210-Po "210 Po"<br><br>"Simonds Steel Division" thorium thoria Th232 Th-232 "Th 232" 232Th 232-Th "232 Th" "Z metal" Z-metal myrnalloy "chemical 10-66" "chemical 1066" "chemical 10 66"<br><br>"Simonds Steel Division" "chemical 18-12" "chemical 1812" "chemical 18 12" "chemical 10-12" "chemical 1012" "chemical 10 12" UX1 UX2 Th-234 Th234 "Th 234" 234-Th 234Th "234 Th" | | |

| Table A1-2: Database Searches for Simonds Saw and Steel Co. | | | |
|---|---|---|---|
| **Database/Source** | **Keywords / Phrases** | **Hits** | **Uploaded To SRDB** |
| | "Simonds Steel Division" tritium H3 H-3 mint HTO<br><br>"Simonds Steel Division" uranium U233 U-233 U 233 233U 233-U 233 U U234 "U 234" U-234 234U 234-U "234 U"<br><br>"Simonds Steel Division" U235 "U 235" U-235 235-U 235U "235 U" U238 "U 238" U-238 238-U 238U "238 U" U308 "U 308" U-308 308-U 308U "308 U"<br><br>"Simonds Steel Division" "black oxide" "brown oxide" "green salt" "orange oxide" "yellow cake" UO2 UO3 UF4 UF6 C-216 C-616 C-65 C-211 U3O8<br><br>"Simonds Steel Division" "uranium extraction" "uranium dioxide" "uranium hexafluoride" "uranium tetrafluoride" "uranium trioxide"<br><br>"Simonds Steel Division" plutonium Pu-238 Pu238 "Pu 238" 238Pu 238-Pu "238 Pu" Pu-239 Pu239 "Pu 239" 239Pu 239-Pu "239 Pu"<br><br>"Simonds Steel Division" Pu" Pu-240 Pu240 "Pu 240" 240Pu 240-Pu "240 Pu" Pu-241 Pu241 "Pu 241" 241Pu 241-Pu "241 Pu"<br><br>"Simonds Steel Division" radium Ra-226 Ra226 "Ra 226" 226-Ra 226Ra "226 Ra" Ra-228 Ra228 "Ra 228" 228Ra 228-Ra "228 Ra"<br><br>"Simonds Steel Division" radon Rn-222 Rn222 "Rn 222" 222Rn 222-Rn "222 Rn"<br><br>"Simonds Steel Division" thoron Rn-220 Rn220 "Rn 220" 220Rn 220-Rn "220 Rn"<br><br>"Simonds Steel Division" protactinium Pa-234m Pa234m "Pa 234m" 234mPa 234m-Pa "234m Pa"<br><br>"Simonds Steel Division" strontium Sr-90 Sr90 "Sr 90" 90-Sr 90Sr "90 Sr" | | |

| Table A1-2: Database Searches for Simonds Saw and Steel Co. | | | |
|---|---|---|---|
| **Database/Source** | **Keywords / Phrases** | **Hits** | **Uploaded To SRDB** |
| | "Simonds Steel Division" oralloy<br>"Simonds Steel Division" postum<br>"Simonds Steel Division" tuballoy<br>"Simonds Steel Division" "uranyl nitrate hexahydrate" UNH<br>"Simonds Steel Division" "K-65"<br>"Simonds Steel Division" "sump cake"<br>"Simonds Steel Division" accident<br>"Simonds Steel Division" "air count"<br>"Simonds Steel Division" "air dust"<br>"Simonds Steel Division" "air filter"<br>"Simonds Steel Division" "airborne test"<br>"Simonds Steel Division" alpha<br>"Simonds Steel Division" "belgian congo ore"<br>"Simonds Steel Division" beta<br>"Simonds Steel Division" bioassay bio-assay<br>"Simonds Steel Division" breath "breathing zone" BZ<br>"Simonds Steel Division" "body burden"<br>"Simonds Steel Division" calibration<br>"Simonds Steel Division" "chest count"<br>"Simonds Steel Division" columnation<br>"Simonds Steel Division" contamination<br>"Simonds Steel Division" curie<br>"Simonds Steel Division" denitration "denitration pot"<br>"Simonds Steel Division" derby regulus<br>"Simonds Steel Division" "derived air concentration" DAC<br>"Simonds Steel Division" dose<br>"Simonds Steel Division" dosimeter<br>"Simonds Steel Division" dosimetric<br>"Simonds Steel Division" dosimetry<br>"Simonds Steel Division" electron<br>"Simonds Steel Division" environment<br>"Simonds Steel Division" "Ether-Water Project"<br><br>"Simonds Steel Division" exposure "exposure investigation" "radiation exposure" | | |

| Table A1-2: Database Searches for Simonds Saw and Steel Co. | | | |
|---|---|---|---|
| **Database/Source** | **Keywords / Phrases** | **Hits** | **Uploaded To SRDB** |
| | "Wallace-Murray Corporation" americium Am241 Am-241 "Am 241" 241Am 241-Am "241 Am"<br><br>"Wallace-Murray Corporation" ionium Th230 Th-230 "Th 230" 230Th 230-Th "230 Th"<br><br>"Wallace-Murray Corporation" neptunium Np237 Np-237 "Np 237" 237Np 237-Np "237 Np" palm palmolive<br><br>"Wallace-Murray Corporation" polonium Po210 Po-210 "Po 210" 210Po 210-Po "210 Po"<br><br>"Wallace-Murray Corporation" thorium thoria Th232 Th-232 "Th 232" 232Th 232-Th "232 Th" "Z metal" Z-metal myrnalloy "chemical 10-66" "chemical 1066" "chemical 10 66"<br><br>"Wallace-Murray Corporation" "chemical 18-12" "chemical 1812" "chemical 18 12" "chemical 10-12" "chemical 1012" "chemical 10 12" UX1 UX2 Th-234 Th234 "Th 234" 234-Th 234Th "234 Th"<br><br>"Wallace-Murray Corporation" tritium H3 H-3 mint HTO<br><br>"Wallace-Murray Corporation" uranium U233 U-233 U 233 233U 233-U 233 U U234 "U 234" U-234 234U 234-U "234 U"<br><br>"Wallace-Murray Corporation" U235 "U 235" U-235 235-U 235U "235 U" U238 "U 238" U-238 238-U 238U "238 U" U308 "U 308" U-308 308-U 308U "308 U"<br><br>"Wallace-Murray Corporation" "black oxide" "brown oxide" "green salt" "orange oxide" "yellow cake" UO2 UO3 UF4 UF6 C-216 C-616 C-65 C-211 U3O8<br><br>"Wallace-Murray Corporation" "phosphate research"<br>"Wallace-Murray Corporation" photon<br>"Wallace-Murray Corporation" picocurie | | |

| Table A1-2: Database Searches for Simonds Saw and Steel Co. | | | |
|---|---|---|---|
| **Database/Source** | **Keywords / Phrases** | **Hits** | **Uploaded To SRDB** |
| | "Wallace-Murray Corporation" pitchblende<br>"Wallace-Murray Corporation" "pocket ion chamber" PIC<br>"Wallace-Murray Corporation" problem<br>"Wallace-Murray Corporation" procedure<br>"Wallace-Murray Corporation" radeco<br>"Wallace-Murray Corporation" radiation<br>"Wallace-Murray Corporation" radioactive<br><br>"Wallace-Murray Corporation" "uranium extraction" "uranium dioxide" "uranium hexafluoride" "uranium tetrafluoride" "uranium trioxide"<br><br>"Wallace-Murray Corporation" radioactivity<br>"Wallace-Murray Corporation" radiograph<br>"Wallace-Murray Corporation" radiological<br><br>"Wallace-Murray Corporation" "Radiological Survey Data Sheet" RSDS<br><br>"Wallace-Murray Corporation" radionuclide<br>"Wallace-Murray Corporation" raffinate<br>"Wallace-Murray Corporation" reactor<br>"Wallace-Murray Corporation" respiratory<br>"Wallace-Murray Corporation" "retention schedules"<br>"Wallace-Murray Corporation" roentgen<br><br>"Wallace-Murray Corporation" plutonium Pu-238 Pu238 "Pu 238" 238Pu 238-Pu "238 Pu" Pu-239 Pu239 "Pu 239" 239Pu 239-Pu "239 Pu"<br><br>"Wallace-Murray Corporation" sample "air sample" "dust sample" "general area air sample"<br><br>"Wallace-Murray Corporation" sampling "air sampling" "dust sampling" "general area air sampling"<br><br>"Wallace-Murray Corporation" "solvent extraction" | | |

| Table A1-2: Database Searches for Simonds Saw and Steel Co. | | | |
|---|---|---|---|
| **Database/Source** | **Keywords / Phrases** | **Hits** | **Uploaded To SRDB** |
| | "Wallace-Murray Corporation" source "sealed source"<br>"Wallace-Murray Corporation" spectra<br>"Wallace-Murray Corporation" spectrograph<br>"Wallace-Murray Corporation" spectroscopy<br>"Wallace-Murray Corporation" spectrum<br><br>"Wallace-Murray Corporation" "operating standard" "processing standard"<br><br>"Wallace-Murray Corporation" survey "building survey" "routine survey" "special survey"<br><br>"Wallace-Murray Corporation" Pu-240 Pu240 "Pu 240" 240Pu 240-Pu "240 Pu" Pu-241 Pu241 "Pu 241" 241Pu 241-Pu "241 Pu"<br><br>"Wallace-Murray Corporation" "technical basis"<br>"Wallace-Murray Corporation" "thermal diffusion"<br>"Wallace-Murray Corporation" "thermoluminescent dosimeter" TLD<br>"Wallace-Murray Corporation" "Tiger Team"<br>"Wallace-Murray Corporation" "tolerance dose"<br>"Wallace-Murray Corporation" urinalysis<br>"Wallace-Murray Corporation" urine<br>"Wallace-Murray Corporation" "whole body count" WBC<br>"Wallace-Murray Corporation" "working level" WL<br>"Wallace-Murray Corporation" X-ray "X ray" Xray<br><br>"Wallace-Murray Corporation" radium Ra-226 Ra226 "Ra 226" 226-Ra 226Ra "226 Ra" Ra-228 Ra228 "Ra 228" 228Ra 228-Ra "228 Ra"<br><br>"Wallace-Murray Corporation" radon Rn-222 Rn222 "Rn 222" 222Rn 222-Rn "222 Rn"<br><br>"Wallace-Murray Corporation" thoron Rn-220 Rn220 "Rn 220" 220Rn 220-Rn "220 Rn" | | |

| Table A1-2: Database Searches for Simonds Saw and Steel Co. | | | |
|---|---|---|---|
| **Database/Source** | **Keywords / Phrases** | **Hits** | **Uploaded To SRDB** |
| | "Wallace-Murray Corporation" protactinium Pa-234m Pa234m "Pa 234m" 234mPa 234m-Pa "234m Pa"<br><br>"Wallace-Murray Corporation" strontium Sr-90 Sr90 "Sr 90" 90-Sr 90Sr "90 Sr"<br><br>"Wallace-Murray Corporation" oralloy<br>"Wallace-Murray Corporation" postum<br>"Wallace-Murray Corporation" tuballoy<br>"Wallace-Murray Corporation" "uranyl nitrate hexahydrate" UNH<br>"Wallace-Murray Corporation" "K-65"<br>"Wallace-Murray Corporation" "sump cake"<br>"Wallace-Murray Corporation" accident<br>"Wallace-Murray Corporation" "air count"<br>"Wallace-Murray Corporation" "air dust"<br>"Wallace-Murray Corporation" "air filter"<br>"Wallace-Murray Corporation" "airborne test"<br>"Wallace-Murray Corporation" alpha<br>"Wallace-Murray Corporation" "belgian congo ore"<br>"Wallace-Murray Corporation" beta<br>"Wallace-Murray Corporation" bioassay bio-assay<br>"Wallace-Murray Corporation" breath "breathing zone" BZ<br>"Wallace-Murray Corporation" "body burden"<br>"Wallace-Murray Corporation" calibration<br>"Wallace-Murray Corporation" "chest count"<br>"Wallace-Murray Corporation" columnation<br>"Wallace-Murray Corporation" contamination<br>"Wallace-Murray Corporation" curie<br>"Wallace-Murray Corporation" denitration "denitration pot"<br>"Wallace-Murray Corporation" derby regulus<br>"Wallace-Murray Corporation" "derived air concentration" DAC<br>"Wallace-Murray Corporation" "dose"<br>"Wallace-Murray Corporation" dosimeter<br>"Wallace-Murray Corporation" dosimetric<br>"Wallace-Murray Corporation" dosimetry<br>"Wallace-Murray Corporation" electron | | |

| Table A1-2: Database Searches for Simonds Saw and Steel Co. | | | |
|---|---|---|---|
| **Database/Source** | **Keywords / Phrases** | **Hits** | **Uploaded To SRDB** |
| | "Wallace-Murray Corporation" environment<br>"Wallace-Murray Corporation" "Ether-Water Project"<br><br>"Wallace-Murray Corporation" exposure "exposure investigation" "radiation exposure"<br><br>"Wallace-Murray Corporation" external<br>"Wallace-Murray Corporation" "F machine"<br>"Wallace-Murray Corporation" fecal<br>"Wallace-Murray Corporation" "feed material"<br>"Wallace-Murray Corporation" femptocurie<br>"Wallace-Murray Corporation" film<br>"Wallace-Murray Corporation" fission<br>"Wallace-Murray Corporation" fluoroscopy<br><br>"Wallace-Murray Corporation" "Formerly Utilized Sites Remedial Action Program" FUSRAP<br><br>"Wallace-Murray Corporation" gamma-ray "gamma ray"<br>"Wallace-Murray Corporation" "gas proportional"<br>"Wallace-Murray Corporation" "gaseous diffusion"<br><br>"Wallace-Murray Corporation" health "health instrument" "health physics" H.I. HI HP<br><br>"Wallace-Murray Corporation" "highly enriched uranium" HEU<br>"Wallace-Murray Corporation" hydrofluorination<br>"Wallace-Murray Corporation" "in vitro"<br>"Wallace-Murray Corporation" "in vivo"<br>"Wallace-Murray Corporation" incident<br>"Wallace-Murray Corporation" ingestion<br>"Wallace-Murray Corporation" inhalation<br>"Wallace-Murray Corporation" internal<br>"Wallace-Murray Corporation" investigation<br>"Wallace-Murray Corporation" isotope<br>"Wallace-Murray Corporation" isotopic | | |

| Table A1-2: Database Searches for Simonds Saw and Steel Co. | | | |
|---|---|---|---|
| **Database/Source** | **Keywords / Phrases** | **Hits** | **Uploaded To SRDB** |
| | "Wallace-Murray Corporation" "isotopic enrichment"<br>"Wallace-Murray Corporation" "JS Project"<br>"Wallace-Murray Corporation" Landauer<br>"Wallace-Murray Corporation" "liquid scintillation"<br>"Wallace-Murray Corporation" log "log sheet" "log book"<br>"Wallace-Murray Corporation" "low enriched uranium" LEU<br>"Wallace-Murray Corporation" "lung count"<br><br>"Wallace-Murray Corporation" "maximum permissible concentration" MPC<br><br>"Wallace-Murray Corporation" metallurgy<br>"Wallace-Murray Corporation" microcurie<br>"Wallace-Murray Corporation" millicurie<br>"Wallace-Murray Corporation" "mixed fission product" MFP<br>"Wallace-Murray Corporation" monitor "air monitoring"<br>"Wallace-Murray Corporation" nanocurie<br>"Wallace-Murray Corporation" "nasal wipe"<br>"Wallace-Murray Corporation" neutron<br>"Wallace-Murray Corporation" "nose wipe"<br><br>"Wallace-Murray Corporation" nuclear "Chicago-Nuclear" "nuclear fuels"<br><br>"Wallace-Murray Corporation" "nuclear track emulsion type A" NTA<br>"Wallace-Murray Corporation" "occupational radiation exposure"<br>"Wallace-Murray Corporation" occurrence<br>"Wallace-Murray Corporation" "ore concentrate"<br>"Wallace-Murray Corporation" "PC Project"<br><br>"Wallace-Murray Corporation" permit "radiation work permit" "safe work permit" "special work permit" RWP SWP<br><br>"Ford Bacon and Davis" "Simonds Saw and Steel" americium Am241 Am-241 "Am 241" 241Am 241-Am "241 Am" | | |

| Table A1-2: Database Searches for Simonds Saw and Steel Co. | | | |
|---|---|---|---|
| **Database/Source** | **Keywords / Phrases** | **Hits** | **Uploaded To SRDB** |
| | "Ford Bacon and Davis" "Simonds Saw and Steel" ionium Th230 Th-230 "Th 230" 230Th 230-Th "230 Th"<br><br>"Ford Bacon and Davis" "Simonds Saw and Steel" neptunium Np237 Np-237 "Np 237" 237Np 237-Np "237 Np" palm palmolive<br><br>"Ford Bacon and Davis" "Simonds Saw and Steel" polonium Po210 Po-210 "Po 210" 210Po 210-Po "210 Po"<br><br>"Ford Bacon and Davis" "Simonds Saw and Steel" thorium thoria Th232 Th-232 "Th 232" 232Th 232-Th "232 Th" "Z metal" Z-metal myrnalloy<br><br>"Ford Bacon and Davis" "Simonds Saw and Steel" "chemical 10-66" "chemical 1066" "chemical 10 66"<br><br>"Ford Bacon and Davis" "Simonds Saw and Steel" "chemical 18-12" "chemical 1812" "chemical 18 12" "chemical 10-12" "chemical 1012" "chemical 10 12" UX1 UX2<br><br>"Ford Bacon and Davis" "Simonds Saw and Steel" Th-234 Th234 "Th 234" 234-Th 234Th "234 Th"<br><br>"Ford Bacon and Davis" "Simonds Saw and Steel" tritium H3 H-3 mint HTO<br><br>"Ford Bacon and Davis" "Simonds Saw and Steel" uranium U233 U-233 U 233 233U 233-U 233 U U234 "U 234" U-234 234U 234-U "234 U"<br><br>"Ford Bacon and Davis" "Simonds Saw and Steel" "ore concentrate" "Ford Bacon and Davis" "Simonds Saw and Steel" "PC Project"<br><br>"Ford Bacon and Davis" "Simonds Saw and Steel" permit "radiation work permit" "safe work permit" "special work permit" RWP SWP | | |

| Table A1-2: Database Searches for Simonds Saw and Steel Co. | | | |
|---|---|---|---|
| **Database/Source** | **Keywords / Phrases** | **Hits** | **Uploaded To SRDB** |
| | "Ford Bacon and Davis" "Simonds Saw and Steel" "phosphate research"<br>"Ford Bacon and Davis" "Simonds Saw and Steel" photon<br>"Ford Bacon and Davis" "Simonds Saw and Steel" picocurie<br>"Ford Bacon and Davis" "Simonds Saw and Steel" pitchblende<br><br>"Ford Bacon and Davis" "Simonds Saw and Steel" "pocket ion chamber" PIC<br><br>"Ford Bacon and Davis" "Simonds Saw and Steel" problem<br>"Ford Bacon and Davis" "Simonds Saw and Steel" procedure<br><br>"Ford Bacon and Davis" "Simonds Saw and Steel" U235 "U 235" U-235 235-U 235U "235 U" U238 "U 238" U-238 238-U 238U "238 U"<br><br>"Ford Bacon and Davis" "Simonds Saw and Steel" radeco<br>"Ford Bacon and Davis" "Simonds Saw and Steel" radiation<br>"Ford Bacon and Davis" "Simonds Saw and Steel" radioactive<br>"Ford Bacon and Davis" "Simonds Saw and Steel" radioactivity<br>"Ford Bacon and Davis" "Simonds Saw and Steel" radiograph<br>"Ford Bacon and Davis" "Simonds Saw and Steel" radiological<br><br>"Ford Bacon and Davis" "Simonds Saw and Steel" "Radiological Survey Data Sheet" RSDS<br><br>"Ford Bacon and Davis" "Simonds Saw and Steel" radionuclide<br>"Ford Bacon and Davis" "Simonds Saw and Steel" raffinate<br>"Ford Bacon and Davis" "Simonds Saw and Steel" reactor<br><br>"Ford Bacon and Davis" "Simonds Saw and Steel" U308 "U 308" U-308 308-U 308U "308 U"<br><br>"Ford Bacon and Davis" "Simonds Saw and Steel" respiratory<br>"Ford Bacon and Davis" "Simonds Saw and Steel" "retention schedules"<br><br>"Ford Bacon and Davis" "Simonds Saw and Steel" roentgen | | |

| Table A1-2: Database Searches for Simonds Saw and Steel Co. | | | |
|---|---|---|---|
| **Database/Source** | **Keywords / Phrases** | **Hits** | **Uploaded To SRDB** |
| | "Ford Bacon and Davis" "Simonds Saw and Steel" sample "air sample" "dust sample" "general area air sample"<br><br>"Ford Bacon and Davis" "Simonds Saw and Steel" sampling "air sampling" "dust sampling" "general area air sampling"<br><br>"Ford Bacon and Davis" "Simonds Saw and Steel" "solvent extraction"<br><br>"Ford Bacon and Davis" "Simonds Saw and Steel" source "sealed source"<br><br>"Ford Bacon and Davis" "Simonds Saw and Steel" spectra<br>"Ford Bacon and Davis" "Simonds Saw and Steel" spectrograph<br>"Ford Bacon and Davis" "Simonds Saw and Steel" spectroscopy<br><br>"Ford Bacon and Davis" "Simonds Saw and Steel" "black oxide" "brown oxide" "green salt" "orange oxide" "yellow cake" UO2 UO3 UF4 UF6 C-216 C-616 C-65 C-211 U3O8<br><br>"Ford Bacon and Davis" "Simonds Saw and Steel" spectrum<br><br>"Ford Bacon and Davis" "Simonds Saw and Steel" "operating standard" "processing standard"<br><br>"Ford Bacon and Davis" "Simonds Saw and Steel" survey "building survey" "routine survey" "special survey"<br><br>"Ford Bacon and Davis" "Simonds Saw and Steel" "technical basis"<br>"Ford Bacon and Davis" "Simonds Saw and Steel" "thermal diffusion"<br><br>"Ford Bacon and Davis" "Simonds Saw and Steel" "thermoluminescent dosimeter" TLD<br><br>"Ford Bacon and Davis" "Simonds Saw and Steel" "Tiger Team"<br>"Ford Bacon and Davis" "Simonds Saw and Steel" "tolerance dose"<br>"Ford Bacon and Davis" "Simonds Saw and Steel" urinalysis | | |

| Table A1-2: Database Searches for Simonds Saw and Steel Co. | | | |
|---|---|---|---|
| **Database/Source** | **Keywords / Phrases** | **Hits** | **Uploaded To SRDB** |
| | "Ford Bacon and Davis" "Simonds Saw and Steel" urine<br><br>"Ford Bacon and Davis" "Simonds Saw and Steel" "uranium extraction" "uranium dioxide" "uranium hexafluoride" "uranium tetrafluoride" "uranium trioxide"<br><br>"Ford Bacon and Davis" "Simonds Saw and Steel" "whole body count" WBC<br><br>"Ford Bacon and Davis" "Simonds Saw and Steel" "working level" WL "Ford Bacon and Davis" "Simonds Saw and Steel" X-ray "X ray" Xray "Household International" "Simonds Saw and Steel"<br><br>"Household International" "Simonds Saw and Steel" americium Am241 Am-241 "Am 241" 241Am 241-Am "241 Am"<br><br>"Household International" "Simonds Saw and Steel" ionium Th230 Th-230 "Th 230" 230Th 230-Th "230 Th"<br><br>"Household International" "Simonds Saw and Steel" neptunium Np237 Np-237 "Np 237" 237Np 237-Np "237 Np" palm palmolive<br><br>"Household International" "Simonds Saw and Steel" polonium Po210 Po-210 "Po 210" 210Po 210-Po "210 Po"<br><br>"Household International" "Simonds Saw and Steel" thorium thoria Th232 Th-232 "Th 232" 232Th 232-Th "232 Th" "Z metal" Z-metal myrnalloy<br><br>"Household International" "Simonds Saw and Steel" "chemical 10-66" "chemical 1066" "chemical 10 66"<br><br>"Ford Bacon and Davis" "Simonds Saw and Steel" plutonium Pu-238 Pu238 "Pu 238" 238Pu 238-Pu "238 Pu" Pu-239 Pu239 "Pu 239" 239Pu 239-Pu "239 Pu" | | |

| Table A1-2: Database Searches for Simonds Saw and Steel Co. | | | |
|---|---|---|---|
| **Database/Source** | **Keywords / Phrases** | **Hits** | **Uploaded To SRDB** |
| | "Household International" "Simonds Saw and Steel" "chemical 18-12" "chemical 1812" "chemical 18 12" "chemical 10-12" "chemical 1012" "chemical 10 12" UX1 UX2<br><br>"Household International" "Simonds Saw and Steel" Th-234 Th234 "Th 234" 234-Th 234Th "234 Th"<br><br>"Household International" "Simonds Saw and Steel" tritium H3 H-3 mint HTO<br><br>"Household International" "Simonds Saw and Steel" uranium U233 U-233 U 233 233U 233-U 233 U U234 "U 234" U-234 234U 234-U "234 U"<br><br>"Household International" "Simonds Saw and Steel" U235 "U 235" U-235 235-U 235U "235 U" U238 "U 238" U-238 238-U 238U "238 U"<br><br>"Household International" "Simonds Saw and Steel" U308 "U 308" U-308 308-U 308U "308 U"<br><br>"Household International" "Simonds Saw and Steel" "black oxide" "brown oxide" "green salt" "orange oxide" "yellow cake" UO2 UO3 UF4 UF6 C-216 C-616 C-65 C-211 U3O8<br><br>"Household International" "Simonds Saw and Steel" "uranium extraction" "uranium dioxide" "uranium hexafluoride" "uranium tetrafluoride" "uranium trioxide"<br><br>"Household International" "Simonds Saw and Steel" plutonium Pu-238 Pu238 "Pu 238" 238Pu 238-Pu "238 Pu" Pu-239 Pu239 "Pu 239" 239Pu 239-Pu "239 Pu"<br><br>"Household International" "Simonds Saw and Steel" Pu-240 Pu240 "Pu 240" 240Pu 240-Pu "240 Pu" Pu-241 Pu241 "Pu 241" 241Pu 241-Pu "241 Pu" | | |

| Table A1-2: Database Searches for Simonds Saw and Steel Co. | | | |
|---|---|---|---|
| **Database/Source** | **Keywords / Phrases** | **Hits** | **Uploaded To SRDB** |
| | "Ford Bacon and Davis" "Simonds Saw and Steel" Pu-240 Pu240 "Pu 240" 240Pu 240-Pu "240 Pu" Pu-241 Pu241 "Pu 241" 241Pu 241-Pu "241 Pu"<br><br>"Household International" "Simonds Saw and Steel" radium Ra-226 Ra226 "Ra 226" 226-Ra 226Ra "226 Ra" Ra-228 Ra228 "Ra 228" 228Ra 228-Ra "228 Ra"<br><br>"Household International" "Simonds Saw and Steel" radon Rn-222 Rn222 "Rn 222" 222Rn 222-Rn "222 Rn"<br><br>"Household International" "Simonds Saw and Steel" thoron Rn-220 Rn220 "Rn 220" 220Rn 220-Rn "220 Rn"<br><br>"Household International" "Simonds Saw and Steel" protactinium Pa-234m Pa234m "Pa 234m" 234mPa 234m-Pa "234m Pa"<br><br>"Household International" "Simonds Saw and Steel" strontium Sr-90 Sr90 "Sr 90" 90-Sr 90Sr "90 Sr"<br><br>"Household International" "Simonds Saw and Steel" oralloy<br>"Household International" "Simonds Saw and Steel" postum<br>"Household International" "Simonds Saw and Steel" tuballoy<br><br>"Household International" "Simonds Saw and Steel" "uranyl nitrate hexahydrate" UNH<br><br>"Household International" "Simonds Saw and Steel" "K-65"<br><br>"Ford Bacon and Davis" "Simonds Saw and Steel" radium Ra-226 Ra226 "Ra 226" 226-Ra 226Ra "226 Ra" Ra-228 Ra228 "Ra 228" 228Ra 228-Ra "228 Ra"<br><br>"Household International" "Simonds Saw and Steel" "sump cake"<br>"Household International" "Simonds Saw and Steel" accident<br>"Household International" "Simonds Saw and Steel" "air count" | | |

| Table A1-2: Database Searches for Simonds Saw and Steel Co. | | | |
|---|---|---|---|
| **Database/Source** | **Keywords / Phrases** | **Hits** | **Uploaded To SRDB** |
| | "Household International" "Simonds Saw and Steel" "air dust"<br>"Household International" "Simonds Saw and Steel" "air filter"<br>"Household International" "Simonds Saw and Steel" "airborne test"<br>"Household International" "Simonds Saw and Steel" alpha<br><br>"Household International" "Simonds Saw and Steel" "belgian congo ore"<br><br>"Household International" "Simonds Saw and Steel" beta<br>"Household International" "Simonds Saw and Steel" bioassay bio-assay<br><br>"Ford Bacon and Davis" "Simonds Saw and Steel" radon Rn-222 Rn222 "Rn 222" 222Rn 222-Rn "222 Rn"<br><br>"Household International" "Simonds Saw and Steel" breath "breathing zone" BZ<br><br>"Household International" "Simonds Saw and Steel" "body burden"<br>"Household International" "Simonds Saw and Steel" calibration<br>"Household International" "Simonds Saw and Steel" "chest count"<br>"Household International" "Simonds Saw and Steel" columnation<br>"Household International" "Simonds Saw and Steel" contamination<br>"Household International" "Simonds Saw and Steel" curie<br><br>"Household International" "Simonds Saw and Steel" denitration "denitration pot"<br><br>"Household International" "Simonds Saw and Steel" derby regulus<br><br>"Household International" "Simonds Saw and Steel" "derived air concentration" DAC<br><br>"Ford Bacon and Davis" "Simonds Saw and Steel" thoron Rn-220 Rn220 "Rn 220" 220Rn 220-Rn "220 Rn"<br><br>"Household International" "Simonds Saw and Steel" "dose" | | |

| Table A1-2: Database Searches for Simonds Saw and Steel Co. | | | |
|---|---|---|---|
| **Database/Source** | **Keywords / Phrases** | **Hits** | **Uploaded To SRDB** |
| | "Household International" "Simonds Saw and Steel" dosimeter<br>"Household International" "Simonds Saw and Steel" dosimetric<br>"Household International" "Simonds Saw and Steel" dosimetry<br>"Household International" "Simonds Saw and Steel" electron<br>"Household International" "Simonds Saw and Steel" environment<br><br>"Household International" "Simonds Saw and Steel" "Ether-Water Project"<br><br>"Household International" "Simonds Saw and Steel" exposure "exposure investigation" "radiation exposure"<br><br>"Household International" "Simonds Saw and Steel" external<br>"Household International" "Simonds Saw and Steel" "F machine"<br><br>"Ford Bacon and Davis" "Simonds Saw and Steel" protactinium Pa-234m Pa234m "Pa 234m" 234mPa 234m-Pa "234m Pa"<br><br>"Household International" "Simonds Saw and Steel" fecal<br>"Household International" "Simonds Saw and Steel" "feed material"<br>"Household International" "Simonds Saw and Steel" femptocurie<br>"Household International" "Simonds Saw and Steel" film<br>"Household International" "Simonds Saw and Steel" fission<br>"Household International" "Simonds Saw and Steel" fluoroscopy<br><br>"Household International" "Simonds Saw and Steel" "Formerly Utilized Sites Remedial Action Program" FUSRAP<br><br>"Household International" "Simonds Saw and Steel" gamma-ray "gamma ray"<br><br>"Household International" "Simonds Saw and Steel" "gas proportional"<br><br>"Household International" "Simonds Saw and Steel" "gaseous diffusion" | | |

| Table A1-2: Database Searches for Simonds Saw and Steel Co. | | | |
|---|---|---|---|
| **Database/Source** | **Keywords / Phrases** | **Hits** | **Uploaded To SRDB** |
| | "Ford Bacon and Davis" "Simonds Saw and Steel" strontium Sr-90 Sr90 "Sr 90" 90-Sr 90Sr "90 Sr"<br><br>"Household International" "Simonds Saw and Steel" health "health instrument" "health physics" H.I. HI HP<br><br>"Household International" "Simonds Saw and Steel" "highly enriched uranium" HEU<br><br>"Household International" "Simonds Saw and Steel" hydrofluorination<br>"Household International" "Simonds Saw and Steel" "in vitro"<br>"Household International" "Simonds Saw and Steel" "in vivo"<br>"Household International" "Simonds Saw and Steel" incident<br>"Household International" "Simonds Saw and Steel" ingestion<br>"Household International" "Simonds Saw and Steel" inhalation<br>"Household International" "Simonds Saw and Steel" internal<br>"Household International" "Simonds Saw and Steel" investigation<br>"Ford Bacon and Davis" "Simonds Saw and Steel" oralloy<br>"Household International" "Simonds Saw and Steel" isotope<br>"Household International" "Simonds Saw and Steel" isotopic<br><br>"Household International" "Simonds Saw and Steel" "isotopic enrichment"<br><br>"Household International" "Simonds Saw and Steel" "JS Project"<br>"Household International" "Simonds Saw and Steel" Landauer<br><br>"Household International" "Simonds Saw and Steel" "liquid scintillation"<br><br>"Household International" "Simonds Saw and Steel" log "log sheet" "log book"<br><br>"Household International" "Simonds Saw and Steel" "low enriched uranium" LEU | | |

| Table A1-2: Database Searches for Simonds Saw and Steel Co. | | | |
|---|---|---|---|
| **Database/Source** | **Keywords / Phrases** | **Hits** | **Uploaded To SRDB** |
| | "Household International" "Simonds Saw and Steel" "lung count"<br><br>"Household International" "Simonds Saw and Steel" "maximum permissible concentration" MPC<br><br>"Ford Bacon and Davis" "Simonds Saw and Steel" postum<br>"Household International" "Simonds Saw and Steel" metallurgy<br>"Household International" "Simonds Saw and Steel" microcurie<br>"Household International" "Simonds Saw and Steel" millicurie<br><br>"Household International" "Simonds Saw and Steel" "mixed fission product" MFP<br><br>"Household International" "Simonds Saw and Steel" monitor "air monitoring"<br><br>"Household International" "Simonds Saw and Steel" nanocurie<br>"Household International" "Simonds Saw and Steel" "nasal wipe"<br>"Household International" "Simonds Saw and Steel" neutron<br>"Household International" "Simonds Saw and Steel" "nose wipe"<br><br>"Household International" "Simonds Saw and Steel" nuclear "Chicago-Nuclear" "nuclear fuels"<br><br>"Ford Bacon and Davis" "Simonds Saw and Steel" tuballoy<br><br>"Household International" "Simonds Saw and Steel" "nuclear track emulsion type A" NTA<br><br>"Household International" "Simonds Saw and Steel" "occupational radiation exposure"<br><br>"Household International" "Simonds Saw and Steel" occurrence<br>"Household International" "Simonds Saw and Steel" "ore concentrate"<br>"Household International" "Simonds Saw and Steel" "PC Project" | | |

| Table A1-2: Database Searches for Simonds Saw and Steel Co. | | | |
|---|---|---|---|
| **Database/Source** | **Keywords / Phrases** | **Hits** | **Uploaded To SRDB** |
| | "Household International" "Simonds Saw and Steel" permit "radiation work permit" "safe work permit" "special work permit" RWP SWP<br><br>"Household International" "Simonds Saw and Steel" "phosphate research"<br><br>"Household International" "Simonds Saw and Steel" photon<br>"Household International" "Simonds Saw and Steel" picocurie<br>"Household International" "Simonds Saw and Steel" pitchblende<br><br>"Ford Bacon and Davis" "Simonds Saw and Steel" "uranyl nitrate hexahydrate" UNH<br><br>"Household International" "Simonds Saw and Steel" "pocket ion chamber" PIC<br><br>"Household International" "Simonds Saw and Steel" problem<br>"Household International" "Simonds Saw and Steel" procedure<br>"Household International" "Simonds Saw and Steel" radeco<br>"Household International" "Simonds Saw and Steel" radiation<br>"Household International" "Simonds Saw and Steel" radioactive<br>"Household International" "Simonds Saw and Steel" radioactivity<br>"Household International" "Simonds Saw and Steel" radiograph<br>"Household International" "Simonds Saw and Steel" radiological<br><br>"Household International" "Simonds Saw and Steel" "Radiological Survey Data Sheet" RSDS<br><br>"Ford Bacon and Davis" "Simonds Saw and Steel" "K-65"<br>"Household International" "Simonds Saw and Steel" radionuclide<br>"Household International" "Simonds Saw and Steel" raffinate<br>"Household International" "Simonds Saw and Steel" reactor<br>"Household International" "Simonds Saw and Steel" respiratory<br><br>"Household International" "Simonds Saw and Steel" "retention schedules" | | |

| Table A1-2: Database Searches for Simonds Saw and Steel Co. | | | |
|---|---|---|---|
| **Database/Source** | **Keywords / Phrases** | **Hits** | **Uploaded To SRDB** |
| | "Household International" "Simonds Saw and Steel" roentgen<br><br>"Household International" "Simonds Saw and Steel" sample "air sample" "dust sample" "general area air sample"<br><br>"Household International" "Simonds Saw and Steel" sampling "air sampling" "dust sampling" "general area air sampling"<br><br>"Household International" "Simonds Saw and Steel" "solvent extraction"<br><br>"Household International" "Simonds Saw and Steel" source "sealed source"<br><br>"Ford Bacon and Davis" "Simonds Saw and Steel" "sump cake"<br>"Household International" "Simonds Saw and Steel" spectra<br>"Household International" "Simonds Saw and Steel" spectrograph<br>"Household International" "Simonds Saw and Steel" spectroscopy<br>"Household International" "Simonds Saw and Steel" spectrum<br><br>"Household International" "Simonds Saw and Steel" "operating standard" "processing standard"<br><br>"Household International" "Simonds Saw and Steel" survey "building survey" "routine survey" "special survey"<br><br>"Household International" "Simonds Saw and Steel" "technical basis"<br>"Household International" "Simonds Saw and Steel" "thermal diffusion"<br><br>"Household International" "Simonds Saw and Steel" "thermoluminescent dosimeter" TLD<br><br>"Household International" "Simonds Saw and Steel" "Tiger Team"<br>"Ford Bacon and Davis" "Simonds Saw and Steel" accident<br>"Household International" "Simonds Saw and Steel" "tolerance dose"<br>"Household International" "Simonds Saw and Steel" urinalysis | | |

| Table A1-2: Database Searches for Simonds Saw and Steel Co. | | | |
|---|---|---|---|
| **Database/Source** | **Keywords / Phrases** | **Hits** | **Uploaded To SRDB** |
| | "Household International" "Simonds Saw and Steel" urine<br><br>"Household International" "Simonds Saw and Steel" "whole body count" WBC<br><br>"Household International" "Simonds Saw and Steel" "working level" WL<br><br>"Household International" "Simonds Saw and Steel" X-ray "X ray" Xray<br><br>"National Lead of Ohio" OR NLO "Simonds Saw and Steel"<br><br>"National Lead of Ohio" OR NLO "Simonds Saw and Steel" americium Am241 Am-241 "Am 241" 241Am 241-Am "241 Am"<br><br>"National Lead of Ohio" OR NLO "Simonds Saw and Steel" ionium Th230 Th-230 "Th 230" 230Th 230-Th "230 Th"<br><br>"National Lead of Ohio" OR NLO "Simonds Saw and Steel" neptunium Np237 Np-237 "Np 237" 237Np 237-Np "237 Np" palm palmolive<br><br>"Ford Bacon and Davis" "Simonds Saw and Steel" "air count"<br><br>"National Lead of Ohio" OR NLO "Simonds Saw and Steel" polonium Po210 Po-210 "Po 210" 210Po 210-Po "210 Po"<br><br>"National Lead of Ohio" OR NLO "Simonds Saw and Steel" thorium thoria Th232 Th-232 "Th 232" 232Th 232-Th "232 Th" "Z metal" Z-metal myrnalloy<br><br>"National Lead of Ohio" OR NLO "Simonds Saw and Steel" "chemical 10-66" "chemical 1066" "chemical 10 66" | | |

| Table A1-2: Database Searches for Simonds Saw and Steel Co. | | | |
|---|---|---|---|
| **Database/Source** | **Keywords / Phrases** | **Hits** | **Uploaded To SRDB** |
| | "National Lead of Ohio" OR NLO "Simonds Saw and Steel" "chemical 18-12" "chemical 1812" "chemical 18 12" "chemical 10-12" "chemical 1012" "chemical 10 12" UX1 UX2<br><br>"National Lead of Ohio" OR NLO "Simonds Saw and Steel" Th-234 Th234 "Th 234" 234-Th 234Th "234 Th"<br><br>"National Lead of Ohio" OR NLO "Simonds Saw and Steel" tritium H3 H-3 mint HTO<br><br>"National Lead of Ohio" OR NLO "Simonds Saw and Steel" uranium U233 U-233 U 233 233U 233-U 233 U U234 "U 234" U-234 234U 234-U "234 U"<br><br>"National Lead of Ohio" OR NLO "Simonds Saw and Steel" U235 "U 235" U-235 235-U 235U "235 U" U238 "U 238" U-238 238-U 238U "238 U"<br><br>"National Lead of Ohio" OR NLO "Simonds Saw and Steel" U308 "U 308" U-308 308-U 308U "308 U"<br><br>"National Lead of Ohio" OR NLO "Simonds Saw and Steel" "black oxide" "brown oxide" "green salt" "orange oxide" "yellow cake" UO2 UO3 UF4 UF6 C-216 C-616 C-65 C-211 U3O8<br><br>"Ford Bacon and Davis" "Simonds Saw and Steel" "air dust"<br><br>"National Lead of Ohio" OR NLO "Simonds Saw and Steel" "uranium extraction" "uranium dioxide" "uranium hexafluoride" "uranium tetrafluoride" "uranium trioxide"<br><br>"National Lead of Ohio" OR NLO "Simonds Saw and Steel" plutonium Pu-238 Pu238 "Pu 238" 238Pu 238-Pu "238 Pu" Pu-239 Pu239 "Pu 239" 239Pu 239-Pu "239 Pu" | | |

| Table A1-2: Database Searches for Simonds Saw and Steel Co. | | | |
|---|---|---|---|
| **Database/Source** | **Keywords / Phrases** | **Hits** | **Uploaded To SRDB** |
| | "National Lead of Ohio" OR NLO "Simonds Saw and Steel" Pu-240 Pu240 "Pu 240" 240Pu 240-Pu "240 Pu" Pu-241 Pu241 "Pu 241" 241Pu 241-Pu "241 Pu"<br><br>"National Lead of Ohio" OR NLO "Simonds Saw and Steel" radium Ra-226 Ra226 "Ra 226" 226-Ra 226Ra "226 Ra" Ra-228 Ra228 "Ra 228" 228Ra 228-Ra "228 Ra"<br><br>"National Lead of Ohio" OR NLO "Simonds Saw and Steel" radon Rn-222 Rn222 "Rn 222" 222Rn 222-Rn "222 Rn"<br><br>"National Lead of Ohio" OR NLO "Simonds Saw and Steel" thoron Rn-220 Rn220 "Rn 220" 220Rn 220-Rn "220 Rn"<br><br>"National Lead of Ohio" OR NLO "Simonds Saw and Steel" protactinium Pa-234m Pa234m "Pa 234m" 234mPa 234m-Pa "234m Pa"<br><br>"National Lead of Ohio" OR NLO "Simonds Saw and Steel" strontium Sr-90 Sr90 "Sr 90" 90-Sr 90Sr "90 Sr"<br><br>"National Lead of Ohio" OR NLO "Simonds Saw and Steel" oralloy<br>"National Lead of Ohio" OR NLO "Simonds Saw and Steel" postum<br>"Ford Bacon and Davis" "Simonds Saw and Steel" "air filter"<br>"National Lead of Ohio" OR NLO "Simonds Saw and Steel" tuballoy<br><br>"National Lead of Ohio" OR NLO "Simonds Saw and Steel" "uranyl nitrate hexahydrate" UNH<br><br>"National Lead of Ohio" OR NLO "Simonds Saw and Steel" "K-65"<br><br>"National Lead of Ohio" OR NLO "Simonds Saw and Steel" "sump cake"<br><br>"National Lead of Ohio" OR NLO "Simonds Saw and Steel" accident<br>"National Lead of Ohio" OR NLO "Simonds Saw and Steel" "air count" | | |

| Table A1-2: Database Searches for Simonds Saw and Steel Co. | | | |
|---|---|---|---|
| **Database/Source** | **Keywords / Phrases** | **Hits** | **Uploaded To SRDB** |
| | "National Lead of Ohio" OR NLO "Simonds Saw and Steel" "air dust"<br>"National Lead of Ohio" OR NLO "Simonds Saw and Steel" "air filter"<br><br>"National Lead of Ohio" OR NLO "Simonds Saw and Steel" "airborne test"<br><br>"National Lead of Ohio" OR NLO "Simonds Saw and Steel" alpha "Ford Bacon and Davis" "Simonds Saw and Steel" "airborne test"<br><br>"National Lead of Ohio" OR NLO "Simonds Saw and Steel" "belgian congo ore"<br><br>"National Lead of Ohio" OR NLO "Simonds Saw and Steel" beta<br><br>"National Lead of Ohio" OR NLO "Simonds Saw and Steel" bioassay bio-assay<br><br>"National Lead of Ohio" OR NLO "Simonds Saw and Steel" breath "breathing zone" BZ<br><br>"National Lead of Ohio" OR NLO "Simonds Saw and Steel" "body burden"<br><br>"National Lead of Ohio" OR NLO "Simonds Saw and Steel" calibration<br><br>"National Lead of Ohio" OR NLO "Simonds Saw and Steel" "chest count"<br><br>"National Lead of Ohio" OR NLO "Simonds Saw and Steel" columnation<br><br>"National Lead of Ohio" OR NLO "Simonds Saw and Steel" contamination<br><br>"National Lead of Ohio" OR NLO "Simonds Saw and Steel" curie "Ford Bacon and Davis" "Simonds Saw and Steel" alpha | | |

| Table A1-2: Database Searches for Simonds Saw and Steel Co. | | | |
|---|---|---|---|
| **Database/Source** | **Keywords / Phrases** | **Hits** | **Uploaded To SRDB** |
| | "National Lead of Ohio" OR NLO "Simonds Saw and Steel" denitration "denitration pot"<br><br>"National Lead of Ohio" OR NLO "Simonds Saw and Steel" derby regulus<br><br>"National Lead of Ohio" OR NLO "Simonds Saw and Steel" "derived air concentration" DAC<br><br>"National Lead of Ohio" OR NLO "Simonds Saw and Steel" "dose"<br>"National Lead of Ohio" OR NLO "Simonds Saw and Steel" dosimeter<br>"National Lead of Ohio" OR NLO "Simonds Saw and Steel" dosimetric<br>"National Lead of Ohio" OR NLO "Simonds Saw and Steel" dosimetry<br>"National Lead of Ohio" OR NLO "Simonds Saw and Steel" electron<br><br>"National Lead of Ohio" OR NLO "Simonds Saw and Steel" environment<br><br>"National Lead of Ohio" OR NLO "Simonds Saw and Steel" "Ether-Water Project"<br><br>"Ford Bacon and Davis" "Simonds Saw and Steel" "belgian congo ore"<br><br>"National Lead of Ohio" OR NLO "Simonds Saw and Steel" exposure "exposure investigation" "radiation exposure"<br><br>"National Lead of Ohio" OR NLO "Simonds Saw and Steel" external<br><br>"National Lead of Ohio" OR NLO "Simonds Saw and Steel" "F machine"<br><br>"National Lead of Ohio" OR NLO "Simonds Saw and Steel" fecal<br><br>"National Lead of Ohio" OR NLO "Simonds Saw and Steel" "feed material" | | |

| Table A1-2: Database Searches for Simonds Saw and Steel Co. | | | |
|---|---|---|---|
| **Database/Source** | **Keywords / Phrases** | **Hits** | **Uploaded To SRDB** |
| | "National Lead of Ohio" OR NLO "Simonds Saw and Steel" "feed material"<br><br>"National Lead of Ohio" OR NLO "Simonds Saw and Steel" femptocurie<br><br>"National Lead of Ohio" OR NLO "Simonds Saw and Steel" film<br>"National Lead of Ohio" OR NLO "Simonds Saw and Steel" fission<br><br>"National Lead of Ohio" OR NLO "Simonds Saw and Steel" fluoroscopy<br><br>"National Lead of Ohio" OR NLO "Simonds Saw and Steel" "Formerly Utilized Sites Remedial Action Program" FUSRAP<br><br>"Ford Bacon and Davis" "Simonds Saw and Steel" beta<br><br>"National Lead of Ohio" OR NLO "Simonds Saw and Steel" gamma-ray "gamma ray"<br><br>"National Lead of Ohio" OR NLO "Simonds Saw and Steel" "gas proportional"<br><br>"National Lead of Ohio" OR NLO "Simonds Saw and Steel" "gaseous diffusion"<br><br>"National Lead of Ohio" OR NLO "Simonds Saw and Steel" health "health instrument" "health physics" H.I. HI HP<br><br>"National Lead of Ohio" OR NLO "Simonds Saw and Steel" "highly enriched uranium" HEU<br><br>"National Lead of Ohio" OR NLO "Simonds Saw and Steel" hydrofluorination<br><br>"National Lead of Ohio" OR NLO "Simonds Saw and Steel" "in vitro" | | |

| Table A1-2: Database Searches for Simonds Saw and Steel Co. | | | |
|---|---|---|---|
| **Database/Source** | **Keywords / Phrases** | **Hits** | **Uploaded To SRDB** |
| | "National Lead of Ohio" OR NLO "Simonds Saw and Steel" "in vivo"<br>"National Lead of Ohio" OR NLO "Simonds Saw and Steel" incident<br>"National Lead of Ohio" OR NLO "Simonds Saw and Steel" ingestion<br>"Ford Bacon and Davis" "Simonds Saw and Steel" bioassay bio-assay<br>"National Lead of Ohio" OR NLO "Simonds Saw and Steel" inhalation<br>"National Lead of Ohio" OR NLO "Simonds Saw and Steel" internal<br><br>"National Lead of Ohio" OR NLO "Simonds Saw and Steel" investigation<br><br>"National Lead of Ohio" OR NLO "Simonds Saw and Steel" isotope<br>"National Lead of Ohio" OR NLO "Simonds Saw and Steel" isotopic<br><br>"National Lead of Ohio" OR NLO "Simonds Saw and Steel" "isotopic enrichment"<br><br>"National Lead of Ohio" OR NLO "Simonds Saw and Steel" "JS Project"<br><br>"National Lead of Ohio" OR NLO "Simonds Saw and Steel" Landauer<br><br>"National Lead of Ohio" OR NLO "Simonds Saw and Steel" "liquid scintillation"<br><br>"National Lead of Ohio" OR NLO "Simonds Saw and Steel" log "log sheet" "log book"<br><br>"Ford Bacon and Davis" "Simonds Saw and Steel" breath "breathing zone" BZ<br><br>"National Lead of Ohio" OR NLO "Simonds Saw and Steel" "low enriched uranium" LEU<br><br>"National Lead of Ohio" OR NLO "Simonds Saw and Steel" "lung count" | | |

| Table A1-2: Database Searches for Simonds Saw and Steel Co. | | | |
|---|---|---|---|
| **Database/Source** | **Keywords / Phrases** | **Hits** | **Uploaded To SRDB** |
| | "National Lead of Ohio" OR NLO "Simonds Saw and Steel" "maximum permissible concentration" MPC<br><br>"National Lead of Ohio" OR NLO "Simonds Saw and Steel" metallurgy<br>"National Lead of Ohio" OR NLO "Simonds Saw and Steel" microcurie<br>"National Lead of Ohio" OR NLO "Simonds Saw and Steel" millicurie<br><br>"National Lead of Ohio" OR NLO "Simonds Saw and Steel" "mixed fission product" MFP<br><br>"National Lead of Ohio" OR NLO "Simonds Saw and Steel" monitor "air monitoring"<br><br>"National Lead of Ohio" OR NLO "Simonds Saw and Steel" nanocurie<br><br>"National Lead of Ohio" OR NLO "Simonds Saw and Steel" "nasal wipe"<br><br>"Ford Bacon and Davis" "Simonds Saw and Steel" "body burden"<br>"National Lead of Ohio" OR NLO "Simonds Saw and Steel" neutron<br><br>"National Lead of Ohio" OR NLO "Simonds Saw and Steel" "nose wipe"<br><br>"National Lead of Ohio" OR NLO "Simonds Saw and Steel" nuclear "Chicago-Nuclear" "nuclear fuels"<br><br>"National Lead of Ohio" OR NLO "Simonds Saw and Steel" "nuclear track emulsion type A" NTA<br><br>"National Lead of Ohio" OR NLO "Simonds Saw and Steel" "occupational radiation exposure"<br><br>"National Lead of Ohio" OR NLO "Simonds Saw and Steel" occurrence | | |

| Table A1-2: Database Searches for Simonds Saw and Steel Co. | | | |
|---|---|---|---|
| **Database/Source** | **Keywords / Phrases** | **Hits** | **Uploaded To SRDB** |
| | "National Lead of Ohio" OR NLO "Simonds Saw and Steel" "ore concentrate"<br><br>"National Lead of Ohio" OR NLO "Simonds Saw and Steel" "PC Project"<br><br>"National Lead of Ohio" OR NLO "Simonds Saw and Steel" permit "radiation work permit" "safe work permit" "special work permit" RWP SWP<br><br>"National Lead of Ohio" OR NLO "Simonds Saw and Steel" "phosphate research"<br><br>"Ford Bacon and Davis" "Simonds Saw and Steel" calibration<br>"National Lead of Ohio" OR NLO "Simonds Saw and Steel" photon<br>"National Lead of Ohio" OR NLO "Simonds Saw and Steel" picocurie<br><br>"National Lead of Ohio" OR NLO "Simonds Saw and Steel" pitchblende<br><br>"National Lead of Ohio" OR NLO "Simonds Saw and Steel" "pocket ion chamber" PIC<br><br>"National Lead of Ohio" OR NLO "Simonds Saw and Steel" problem<br>"National Lead of Ohio" OR NLO "Simonds Saw and Steel" procedure<br>"National Lead of Ohio" OR NLO "Simonds Saw and Steel" radeco<br>"National Lead of Ohio" OR NLO "Simonds Saw and Steel" radiation<br>"National Lead of Ohio" OR NLO "Simonds Saw and Steel" radioactive<br><br>"National Lead of Ohio" OR NLO "Simonds Saw and Steel" radioactivity<br><br>"Ford Bacon and Davis" "Simonds Saw and Steel" "chest count"<br>"National Lead of Ohio" OR NLO "Simonds Saw and Steel" radiograph | | |

| Table A1-2: Database Searches for Simonds Saw and Steel Co. | | | |
|---|---|---|---|
| **Database/Source** | **Keywords / Phrases** | **Hits** | **Uploaded To SRDB** |
| | "National Lead of Ohio" OR NLO "Simonds Saw and Steel" radiological<br><br>"National Lead of Ohio" OR NLO "Simonds Saw and Steel" "Radiological Survey Data Sheet" RSDS<br><br>"National Lead of Ohio" OR NLO "Simonds Saw and Steel" radionuclide<br><br>"National Lead of Ohio" OR NLO "Simonds Saw and Steel" raffinate<br>"National Lead of Ohio" OR NLO "Simonds Saw and Steel" reactor<br>"National Lead of Ohio" OR NLO "Simonds Saw and Steel" respiratory<br><br>"National Lead of Ohio" OR NLO "Simonds Saw and Steel" "retention schedules"<br><br>"National Lead of Ohio" OR NLO "Simonds Saw and Steel" roentgen<br><br>"National Lead of Ohio" OR NLO "Simonds Saw and Steel" sample "air sample" "dust sample" "general area air sample"<br><br>"Ford Bacon and Davis" "Simonds Saw and Steel" columnation<br><br>"National Lead of Ohio" OR NLO "Simonds Saw and Steel" sampling "air sampling" "dust sampling" "general area air sampling"<br><br>"National Lead of Ohio" OR NLO "Simonds Saw and Steel" "solvent extraction"<br><br>"National Lead of Ohio" OR NLO "Simonds Saw and Steel" source "sealed source"<br><br>"National Lead of Ohio" OR NLO "Simonds Saw and Steel" spectra<br><br>"National Lead of Ohio" OR NLO "Simonds Saw and Steel" spectrograph | | |

| Table A1-2: Database Searches for Simonds Saw and Steel Co. | | | |
|---|---|---|---|
| **Database/Source** | **Keywords / Phrases** | **Hits** | **Uploaded To SRDB** |
| | "National Lead of Ohio" OR NLO "Simonds Saw and Steel" spectroscopy<br><br>"National Lead of Ohio" OR NLO "Simonds Saw and Steel" spectrum<br><br>"National Lead of Ohio" OR NLO "Simonds Saw and Steel" "operating standard" "processing standard"<br><br>"National Lead of Ohio" OR NLO "Simonds Saw and Steel" survey "building survey" "routine survey" "special survey"<br><br>"National Lead of Ohio" OR NLO "Simonds Saw and Steel" "technical basis"<br><br>"Ford Bacon and Davis" "Simonds Saw and Steel" contamination<br><br>"National Lead of Ohio" OR NLO "Simonds Saw and Steel" "thermal diffusion"<br><br>"National Lead of Ohio" OR NLO "Simonds Saw and Steel" "thermoluminescent dosimeter" TLD<br><br>"National Lead of Ohio" OR NLO "Simonds Saw and Steel" "Tiger Team"<br><br>"National Lead of Ohio" OR NLO "Simonds Saw and Steel" "tolerance dose"<br><br>"National Lead of Ohio" OR NLO "Simonds Saw and Steel" urinalysis<br>"National Lead of Ohio" OR NLO "Simonds Saw and Steel" urine<br><br>"National Lead of Ohio" OR NLO "Simonds Saw and Steel" "whole body count" WBC<br><br>"National Lead of Ohio" OR NLO "Simonds Saw and Steel" "working level" WL | | |

| Table A1-2: Database Searches for Simonds Saw and Steel Co. | | | |
|---|---|---|---|
| **Database/Source** | **Keywords / Phrases** | **Hits** | **Uploaded To SRDB** |
| | "National Lead of Ohio" OR NLO "Simonds Saw and Steel" X-ray "X ray" Xray<br><br>"Ford Bacon and Davis" "Simonds Saw and Steel" curie<br><br>"Ford Bacon and Davis" "Simonds Saw and Steel" denitration "denitration pot"<br><br>"Ford Bacon and Davis" "Simonds Saw and Steel" derby regulus<br><br>"Ford Bacon and Davis" "Simonds Saw and Steel" "derived air concentration" DAC<br><br>"Ford Bacon and Davis" "Simonds Saw and Steel" "dose"<br>"Ford Bacon and Davis" "Simonds Saw and Steel" dosimeter<br>"Ford Bacon and Davis" "Simonds Saw and Steel" dosimetric<br>"Ford Bacon and Davis" "Simonds Saw and Steel" dosimetry<br>"Ford Bacon and Davis" "Simonds Saw and Steel" electron<br>"Ford Bacon and Davis" "Simonds Saw and Steel" environment<br><br>"Ford Bacon and Davis" "Simonds Saw and Steel" "Ether-Water Project"<br><br>"Ford Bacon and Davis" "Simonds Saw and Steel" exposure "exposure investigation" "radiation exposure"<br><br>"Ford Bacon and Davis" "Simonds Saw and Steel" external<br>"Ford Bacon and Davis" "Simonds Saw and Steel" "F machine"<br>"Ford Bacon and Davis" "Simonds Saw and Steel" fecal<br>"Ford Bacon and Davis" "Simonds Saw and Steel" "feed material"<br>"Ford Bacon and Davis" "Simonds Saw and Steel" femptocurie<br>"Ford Bacon and Davis" "Simonds Saw and Steel" film<br>"Ford Bacon and Davis" "Simonds Saw and Steel" fission<br>"Ford Bacon and Davis" "Simonds Saw and Steel" fluoroscopy<br><br>"Ford Bacon and Davis" "Simonds Saw and Steel" "Formerly Utilized Sites Remedial Action Program" FUSRAP | | |

| Table A1-2: Database Searches for Simonds Saw and Steel Co. | | | |
|---|---|---|---|
| **Database/Source** | **Keywords / Phrases** | **Hits** | **Uploaded To SRDB** |
| | "Ford Bacon and Davis" "Simonds Saw and Steel" gamma-ray "gamma ray"<br><br>"Ford Bacon and Davis" "Simonds Saw and Steel" "gas proportional"<br>"Ford Bacon and Davis" "Simonds Saw and Steel" "gaseous diffusion"<br><br>"Ford Bacon and Davis" "Simonds Saw and Steel" health "health instrument" "health physics" H.I. HI HP<br><br>"Ford Bacon and Davis" "Simonds Saw and Steel" "highly enriched uranium" HEU<br><br>"Ford Bacon and Davis" "Simonds Saw and Steel" hydrofluorination<br>"Ford Bacon and Davis" "Simonds Saw and Steel" "in vitro"<br>"Ford Bacon and Davis" "Simonds Saw and Steel" "in vivo"<br>"Ford Bacon and Davis" "Simonds Saw and Steel" incident<br>"Ford Bacon and Davis" "Simonds Saw and Steel" ingestion<br>"Ford Bacon and Davis" "Simonds Saw and Steel" inhalation<br>"Ford Bacon and Davis" "Simonds Saw and Steel" internal<br>"Ford Bacon and Davis" "Simonds Saw and Steel" investigation<br>"Ford Bacon and Davis" "Simonds Saw and Steel" isotope<br><br>"Ford Bacon and Davis" "Simonds Saw and Steel" isotopic<br><br>"Ford Bacon and Davis" "Simonds Saw and Steel" "isotopic enrichment"<br><br>"Ford Bacon and Davis" "Simonds Saw and Steel" "JS Project"<br>"Ford Bacon and Davis" "Simonds Saw and Steel" Landauer<br>"Ford Bacon and Davis" "Simonds Saw and Steel" "liquid scintillation"<br><br>"Ford Bacon and Davis" "Simonds Saw and Steel" log "log sheet" "log book"<br><br>"Ford Bacon and Davis" "Simonds Saw and Steel" "low enriched uranium" LEU<br>"Ford Bacon and Davis" "Simonds Saw and Steel" "lung count" | | |

| Table A1-2: Database Searches for Simonds Saw and Steel Co. | | | |
|---|---|---|---|
| **Database/Source** | **Keywords / Phrases** | **Hits** | **Uploaded To SRDB** |
| | "Ford Bacon and Davis" "Simonds Saw and Steel" "maximum permissible concentration" MPC<br><br>"Ford Bacon and Davis" "Simonds Saw and Steel" metallurgy<br>"Ford Bacon and Davis" "Simonds Saw and Steel" microcurie<br>"Ford Bacon and Davis" "Simonds Saw and Steel" millicurie<br><br>"Ford Bacon and Davis" "Simonds Saw and Steel" "mixed fission product" MFP<br><br>"Ford Bacon and Davis" "Simonds Saw and Steel" monitor "air monitoring"<br><br>"Ford Bacon and Davis" "Simonds Saw and Steel" nanocurie<br>"Ford Bacon and Davis" "Simonds Saw and Steel" "nasal wipe"<br>"Ford Bacon and Davis" "Simonds Saw and Steel" neutron<br>"Ford Bacon and Davis" "Simonds Saw and Steel" "nose wipe"<br><br>"Ford Bacon and Davis" "Simonds Saw and Steel" nuclear "Chicago-Nuclear" "nuclear fuels"<br><br>"Ford Bacon and Davis" "Simonds Saw and Steel" "nuclear track emulsion type A" NTA<br><br>"Ford Bacon and Davis" "Simonds Saw and Steel" "occupational radiation exposure"<br><br>"Ford Bacon and Davis" "Simonds Saw and Steel" occurrence | | |
| Health Physics Journal<br>http://journals.lww.com/health-physics/pages/default.aspx<br>COMPLETED 06/14/2010 | Simonds<br>Guterl | 13 | 0 |
| International Journal of Occupational Environmental Health<br>http://www.ijoeh.com/index.php/ijoeh/search<br>COMPLETE 06/14/2010 | Simonds<br>Guterl | 0 | 0 |

| Table A1-2: Database Searches for Simonds Saw and Steel Co. | | | |
|---|---|---|---|
| **Database/Source** | **Keywords / Phrases** | **Hits** | **Uploaded To SRDB** |
| National Academies Press<br>http://www.nap.edu/<br>COMPLETED 04/12/2010 | "Simonds Saw and Steel Co."<br>"Simonds Saw & Steel Co."<br>"Simonds Saw and Steel Div."<br>"Guterl Special Steel Corp."<br>"Allegheny-Ludlum Steel Corp."<br>"Simonds Steel Division"<br>"Wallace-Murray Corporation"<br>"Ford Bacon and Davis" "Simonds Saw and Steel"<br>"Household International" "Simonds Saw and Steel"<br>"National Lead of Ohio" OR NLO "Simonds Saw and Steel" | 846 | 0 |
| NNSA - Nevada Site Office<br>www.nv.doe.gov/main/search.htm<br>COMPLETED 04/12/2010 | "Simonds Saw and Steel Co."<br>"Simonds Saw & Steel Co."<br>"Simonds Saw and Steel Div."<br>"Guterl Special Steel Corp."<br>"Allegheny-Ludlum Steel Corp."<br>"Simonds Steel Division"<br>"Wallace-Murray Corporation"<br>"Ford Bacon and Davis" "Simonds Saw and Steel"<br>"Household International" "Simonds Saw and Steel" | 0 | 0 |
| | "National Lead of Ohio" OR NLO "Simonds Saw and Steel" | | |
| NRC ADAMS Reading Room<br>http://www.nrc.gov/reading-rm/adams/web-based.html<br>COMPLETED 04/12/2010 | "Simonds Saw and Steel Co."<br>"Simonds Saw & Steel Co."<br>"Simonds Saw and Steel Div."<br>"Guterl Special Steel Corp."<br>"Allegheny-Ludlum Steel Corp."<br>"Simonds Steel Division"<br>"Wallace-Murray Corporation"<br>"Ford Bacon and Davis" "Simonds Saw and Steel"<br>"Household International" "Simonds Saw and Steel"<br>"National Lead of Ohio" OR NLO "Simonds Saw and Steel" | 44 | 0 |
| State University of NY<br>http://library.buffalo.edu/libraries/specialcollections/<br>COMPLETED 06/01/2010 | Simonds<br>Guterl | 0 | 0 |
| USACE/FUSRAP<br>http://www.lrb.usace.army.mil/fusrap/<br>COMPLETED 04/12/2010 | Guterl Steel Site | 11 | 11 |

| Table A1-2: Database Searches for Simonds Saw and Steel Co. | | | |
|---|---|---|---|
| **Database/Source** | **Keywords / Phrases** | **Hits** | **Uploaded To SRDB** |
| U.S. Transuranium & Uranium Registries<br>http://www.ustur.wsu.edu/<br>COMPLETED 04/12/2010 | "Simonds Saw and Steel Co."<br>"Simonds Saw & Steel Co."<br>"Simonds Saw and Steel Div."<br>"Guterl Special Steel Corp."<br>"Allegheny-Ludlum Steel Corp."<br>"Simonds Steel Division"<br>"Wallace-Murray Corporation"<br>"Ford Bacon and Davis" "Simonds Saw and Steel"<br>"Household International" "Simonds Saw and Steel"<br>"National Lead of Ohio" OR NLO "Simonds Saw and Steel" | 0 | 0 |

| Table A1-3: OSTI Documents Requested for Simonds Saw and Steel Co. | | | |
|---|---|---|---|
| **Document Number** | **Document Title** | **Requested Date** | **Received Date** |
| FMPC-477<br>OSTI ID: 4199259<br>Ref ID: 80177 | Standard Operating Procedure for Rolling 2.75% Enriched Metal at Simonds Saw and Steel Company, Production Order No. 296 (Section 1.4.3.12) dated 10-20-1954 | 03/12/2010 | 03/29/2010 |
| AECD-3714<br>OSTI ID: 4377259<br>Ref ID: 80178 | Industrial Hygiene Survey of Thorium Rolling at Simonds Saw and Steel Company dated 12-14-1953 | 03/12/2010 | 03/29/2010 |
| FMPC-360<br>OSTI ID: NA<br>Ref ID: 80175 | Industrial Hygiene Survey of Thorium Rolling at Simonds Saw and Steel Company dated 12-14-1953 | 03/12/2010 | 03/29/2010 |