



ORAU TEAM Dose Reconstruction Project for NIOSH

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Page 1 of 18

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Guidance on Assigning Occupational X-Ray Dose Under EEOICPA for X-Rays Administered Off Site

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EFFECTIVE DATE	REVISION NUMBER	DESCRIPTION
01/03/2011	00	New technical information bulletin to implement new DCAS guidance based on recent NIOSH interpretation of EEOICPA statute language. Incorporates formal internal and NIOSH review comments. Training required: As determined by the Objective Manager. Initiated by Elyse M. Thomas.
03/18/2016	01	Incorporates new information, references, and updated list of facilities that had X-rays performed off the site. Three sites moved from Table 1 (off site) to Table 2 (on site), resulting in the addition of X-ray dose (Hanford, Portsmouth, and Extrusion Plant (from 1996-2006)). Incorporates formal internal review comments. No review comments were received as a result of formal NIOSH review. Constitutes a total rewrite of the document. Training required: As determined by the Objective Manager. Initiated by Elyse M. Thomas.
06/15/2017	02	Revision initiated to incorporate new information, references, and updated list of facilities that performed X-rays off the site at noncovered facilities. BWXT and PNNL added to Table 3-1 with information regarding procedures performed at non-covered facilities. No information was added to Table 3-2 concerning covered dates. However, the dates for PNNL was reduced to reflect the addition of information in Table 3-1. Incorporates formal internal review comments. Constitutes a total rewrite of the document. Training required: As determined by the Objective Manager. Initiated by Elyse M. Thomas.

TABLE OF CONTENTS

<u>SECTION</u>	<u>TITLE</u>	<u>PAGE</u>
Acronyms and Abbreviations		4
1.0	Introduction	5
2.0	Guidance	5
3.0	Discussion	5
References		13

LIST OF TABLES

<u>TABLE</u>	<u>TITLE</u>	<u>PAGE</u>
3-1	Covered facilities that administered occupational X-rays at noncovered, offsite facilities	6
3-2	Covered facilities that administered occupational X-rays on site, or for which no evidence exists that X-rays were taken off site	9

ACRONYMS AND ABBREVIATIONS

AWE	Atomic Weapons Employers
CTW	construction trade worker
DCAS	Division of Compensation Analysis and Support
DOE	U.S. Department of Energy
EEOICPA	Energy Employees Occupational Illness Compensation Program Act of 2000
NIOSH	National Institute for Occupational Safety and Health
ORAU	Oak Ridge Associated Universities
SEC	Special Exposure Cohort
SRDB Ref ID	Site Research Database Reference Identification (number)
TIB	technical information bulletin
U.S.C.	United States Code
§	section or sections

1.0 INTRODUCTION

Technical information bulletins (TIBs) are not official determinations made by the National Institute for Occupational Safety and Health (NIOSH) but are rather general working documents that provide historical background information and guidance to assist in the preparation of dose reconstructions at particular sites or categories of sites. They will be revised in the event additional relevant information is obtained about the affected site(s). TIBs may be used to assist NIOSH staff in the completion of individual dose reconstructions.

In this document, the word “facility” is used as a general term for an area, building, or group of buildings that served a specific purpose at a site. It does not necessarily connote an “atomic weapons employer facility” or a “Department of Energy (DOE) facility” as defined in the Energy Employees Occupational Illness Compensation Program Act of 2000 [42 U.S.C. § 7384l(5) and (12)].

The Energy Employees Occupational Illness Compensation Program Act of 2000 (EEOICPA) requires the assignment of external dose from medical X-ray examinations that were performed for occupational health screening and were required as a condition of employment. Many DOE and Atomic Weapons Employer (AWE) sites had their own medical clinics and equipment to perform medical X-ray screening of their workers. At some sites, however, and sometimes dependent on the timeframe, the sites contracted with private physicians, clinics, or local community hospitals to provide this service to workers.

The NIOSH interpretation of the EEOICPA statute affects how X-ray dose should be assigned when the X-rays were taken at a site or location that is not defined under the statute as a covered facility. This includes the scenario in which X-rays were taken at offsite locations, such as private physicians' offices, clinics, or local community hospitals. The NIOSH interpretation is that the statute defines covered radiation as the radiation received by a covered employee at a covered facility during a covered period (NIOSH 2010). Except in limited circumstances concerning residual radiation, only radiation that the employee received while at a covered facility can be included in dose reconstruction. Any site profile stating or suggesting that offsite medical screening doses should be included will be revised to be consistent with this NIOSH interpretation.

2.0 GUIDANCE

If it is known that occupational medical X-ray dose was received at a location other than a covered facility (i.e., an offsite physician's office, clinic, or local community hospital), it shall not be included in dose reconstruction. If there is doubt about where the X-ray exposure was received, dose reconstructors should assume that the dose was received at a covered facility.

3.0 DISCUSSION

Whether X-ray exposure was received at a covered facility is often discovered in the research process during the review and analysis of historical documentation and claim file records from a particular covered site. This information is then included in the site profile and/or Special Exposure Cohort (SEC) evaluation report for that site. Table 3-1 is a list of sites for which historical information has been found about X-rays administered to energy employees at offsite noncovered facilities. Table 3-1 lists those sites along with appropriate periods of applicability.

When historical documentation does not provide needed information about where occupational X-rays might have been taken, the energy employee claim file records might contain evidence that some X-rays were taken off site. For example, X-ray request forms might contain a private physician's, clinic's, or hospital's letterhead. This is not always adequate evidence that the X-rays were taken off site, because many sites contracted with private radiologists for radiological interpretation of the

Table 3-1. Covered facilities that administered occupational X-rays at noncovered offsite facilities.

Covered facility	Noncovered (offsite) location	Applicable periods for X-rays at noncovered facilities	Reference
Albany Research Center	Corvallis Clinic or private physicians' offices in Albany, OR.	All	Corvallis Clinic 1959–1986, 1972–1986
Aliquippa Forge	"The X-rays were taken by Dr. W. T. Rice of Rochester, Pa. ...but the X-ray films are retained in his office" (Tabershaw 1949a, p. 3).	All	ORAUT 2015a, p. 23; Tabershaw 1949a
Allied Chemical Corp. Plant	"All new hires are given a pre-employment physical at the doctor's office which includes a careful medical history, general health assessment by the physician and a chest X-ray..." (Freeman 1975, p. 178).	All	ORAUT 2014a, p. 20; Freeman 1975
Ames Laboratory	"The X-ray equipment for occupational medical examinations of Ames Laboratory staff members was located at the Iowa State Student Health Center/College Hospital..." (ORAUT 2012a, p. 23).	All	ORAUT 2012a; Voss 1957
Baker Brothers	"Dr. Norwood made arrangements for chest X-rays....at the Robin Wood Hospital in Toledo...."	All	Nickson 1943, p. 2
Battelle Columbus	"During the 1950s, there is evidence that the X-rays of Battelle workers were taken at a private physician's office and included chest fluoroscopy" (ORAUT 2016a, p. 17).	All chest fluoroscopy	ORAUT 2016a, 2010a
Battelle Columbus	"X-rays and blood counts are done at the University Hospital which is only a short distance from the Institute." "...x-rays were performed on site in Health Services from the late 1950s to the early 1980s for Battelle staff that required them. Prior to this time period, the x-rays were provided at a physician's office."	1943–1956	Tabershaw 1949b, p. 3; Amstein 2008, p. 4
BWX Technologies	Nearby physicians' offices.	All	ORAUT 2016d, p. 3, ORAUT 2016e, p. 2, ORAUT 2016f, p. 2, ORAUT 2016g, p. 2
Extrusion Plant	"Laboratory work, i.e. urinalyses, blood tests, and X-rays, is done at the local hospital, Ashtabula General" (Hibbitts and Pryor 1970, p. 8). "Based on information in the claim file records, it appears that X-rays were taken off site at Ashtabula General Hospital through 1980" (ORAUT 2017d, p. 23). "...it is assumed that X-rays were taken on site from 1981 to 2006, when the site was decommissioned" (ORAUT 2017d, p. 23).	Before 1981 and after 2006	Hibbitts and Pryor 1970; ORAUT 2017d, p. 23.
Grand Junction	Warren Bush "said the company doctor was Dr. Raso, who had an x-ray unit in his office in Grand Junction."	1947–1961 and 1970–2002	Stoller undated, p. 9
Kansas City Plant	"In 1997, medical X-ray services were outsourced; ..." (ORAUT 2017b, p. 20).	After 1996	ORAUT 2017b; Todd 2004, p. 3

Covered facility	Noncovered (offsite) location	Applicable periods for X-rays at noncovered facilities	Reference
Kellex/Pierpont	"It is understood that the only examination that will not be performed by Kellex personnel is the chest radiograph."	All	Beckerley 1948, p. 3
Lawrence Berkeley National Laboratory	"In the early years before about 1964, workers had their physical exams (including X-rays) in their private physicians' offices ..." (ORAUT 2010c, p. 22). "Doses for 1991 to 1995 are for the Picker machine, and for 1996 to the present ... employees have been sent off site for X-rays ..." (ORAUT 2010c, p. 23).	Before 1964 and after 1995	ORAUT 2010c; Parker 1963; Grondona 2010
Linde Ceramics	"Linde X-rays were performed off site at a non-covered commercial facility" (ORAUT 2015b, p. 67).	All	ORAUT 2015b; Author unknown 1948; Various authors 1943–1950, pp. 30, 43, 50; Holmes 1944; Van Horn 1943
Mallinckrodt	"The annual chest x-rays and presumably the pelvic x-rays were taken at the Barnes Hospital (the Washington University School of Medicine) ... and the x-ray records remained the property of the hospital ..." (ORAUT 2010d, p. 108).	All	ORAUT 2010d, p. 108; Quigley 1950; Mason 1955, pp. 23, 35
Metallurgical Laboratory	"At first the dispensary facilities of Billings Hospital were used but after July 1944 Drexel House was used for this purpose."	Before July 1944	Author unknown 1946, p. 27
Nevada Test Site	"Chest X-rays before 1960 were taken off the site at non-covered contractor facilities, probably physicians' offices in Las Vegas" (ORAUT 2012b, p. 7).	1951–1959 (all)	ORAUT 2012b, pp. 7, 10
Nevada Test Site	"During [1986–1995], workers continued to receive pre-employment physicals at contracted non-covered facilities in Las Vegas... These contractors might also have provided the periodic and termination chest X-rays if the worker was in Las Vegas" (ORAUT 2012b, p. 10).	1986–1995 preemployment X-rays	ORAUT 2012b; DeMarre 2012
Nevada Test Site	"NTS sold and removed its X-ray equipment in 1996. After this date, all radiographic services were contracted out to a variety of offsite, non-covered facilities in Las Vegas ..." (ORAUT 2012b, p. 10).	1996–present (all)	ORAUT 2012b; DeMarre 2012; Moon 2012
Nuclear Materials and Equipment Corporation	"NUMEC apparently did not have its own medical X-ray department during AEC operational years and the medical X-rays for NUMEC employees appear to have been performed at a local clinic or hospital" (ORAUT 2017c, p. 34).	All	ORAUT 2017c; Author unknown 1978; Cain 1964; Wieland 1981; Quigley 1972
Pacific Northwest National Laboratory	"Since October 1, 2012, occupational medical X-rays for PNNL employees have been performed at the Kadlec Medical Center in Richland, Washington. Kadlec Medical Center is not a covered facility under EEOICPA for this time period;"	After 2012	ORAUT 2016b, p. 25

Covered facility	Noncovered (offsite) location	Applicable periods for X-rays at noncovered facilities	Reference
Portsmouth Gaseous Diffusion Plant	DOE contractor personnel – X-rays performed at Southern Ohio Medical Center	2010- 2011	ORAUT 2016h
Portsmouth Gaseous Diffusion Plant	All personnel – Adena Occupational Health - Waverly	April 2012 – May 4, 2014	ORAUT 2016h
Sandia National Laboratories	“...the Sandia Base Army Hospital and the Kirtland Air Force Base Dispensary are not part of the EEOICPA covered facilities as they are outside the boundaries of DOE facilities.”	X-rays taken at the Sandia Base Hospital or the Kirtland Air Force Base Dispensary	Anders 2015, p. 2
Simonds Saw and Steel	“Simonds X-rays were performed off site at a non-covered commercial facility” (ORAUT 2014c, p. 20).	All	ORAUT 2014c; Tabershaw 1948
Stanford Linear Accelerator Center	X-rays on Be workers performed at the Palo Alto Clinic.	All	ORAUT 2007b, p. 20; Pinder 1965
University of Rochester	X-rays taken at Strong Memorial Hospital.	All	Dowdy 1947, p.5-7
Ventron Corporation	Some X-rays taken at the Beverly Hospital.	Some	Todd 1945, p. 17
West Valley	“Chest X-rays for West Valley workers have always been performed at an offsite location” (ORAUT 2007a, p. 51).	All	ORAUT 2007a, 2010b, 2010e

X-rays, even if the X-rays were obtained on the covered site, and the radiologist’s report might be on the office or clinic letterhead. Dose reconstructors should not include the dose from X-rays when it is clear from the claim file records that they were taken off site at a noncovered facility. When it is not clear where the X-rays were taken, dose reconstructors should include the dose. Dose reconstructors should consult the Project Principal Medical Dosimetrist if questions arise.

When neither historical documentation nor claim file records provide the needed information about where the occupational X-rays might have been taken, dose reconstructors should assume that any occupational medical X-ray exposure occurred at the covered facility where the energy employee worked.

Table 3-2 lists the covered facilities where it is known that occupational medical X-rays were taken on site or at another covered facility, according to historical documentation. Table 3-2 also lists sites that might have had occupational medical X-rays taken at an offsite location, but for which this cannot be demonstrated with certainty at present. Dose reconstructors should, therefore, include X-ray dose in dose reconstructions for the sites in Table 3-2 unless there is evidence in the claim file records that the X-rays were taken at a noncovered facility.

Dose reconstructions are also performed for sites that might not be listed here. In reconstructing doses for these claims, dose reconstructors should use any available historical documentation or evidence in claim file records to assign X-ray dose in accordance with the guidance in this TIB. Where historical documentation of offsite X-ray doses has not been found and energy employee medical records are not provided, dose reconstructors should generally assume that occupational medical X-ray exposure occurred on site at the covered facility where the energy employee worked.

X-ray dose assignment for construction trade workers (CTWs) should be the same as for other energy employees described in this TIB. In other words, dose reconstructors should assume that CTWs had X-rays taken on site at the covered facility where they worked, unless evidence shows that these X-rays were taken off site at a noncovered facility.

Table 3-2. Covered facilities that administered occupational X-rays on site, or for which no historical evidence exists that X-rays were taken off site.

Covered facility	Notes	Reference
Albuquerque Operations Office	All years covered.	None
Allied Chemical and Dye	All years covered.	None
Amchitka	"A 100 kVp -200 mA X-ray machine and associated film processing equipment is provided [at a special building in the Huskey Camp Area]."	Eberline 1973, p. 33.
Argonne National Laboratory – East	"...the status of the employee's health and ability to work through the use of X-ray, biochemical, hematological, and metabolic facilities which will be available at the Site D dispensary."	Hasterlik 1949, p. 4.
Baker-Perkins Company	All years covered	NIOSH 2012c, p. 12
Battelle Columbus ^a	1957–2000 for King Ave, and 1957–present for West Jefferson.	NIOSH 2012b, p. 4; NIOSH 2015a, p. 23
Bethlehem Steel Corporation	All years covered.	NIOSH 2010, p. 29
Bliss and Laughlin Steel Company	All years covered.	None
Blockson Chemical Company	All years covered.	NIOSH 2014, p. 32
Bridgeport Brass	All years covered.	None
Brookhaven National Laboratory	All years covered.	None
Canoga Avenue Facility	All years covered.	None
Carborundum Company	All years covered.	None
Chapman Valve	All years covered.	None
Clarksville Modification Center	All years covered.	None
Clinton Engineer Works	All years covered.	None
Combustion Engineering	All years covered.	None
Connecticut Aircraft Nuclear Engine Laboratory	All years covered.	None
Dayton Project (Units I, III, and IV)	All years covered.	None
De Soto Avenue Facility	All years covered.	None
Dow Chemical Company	All years covered.	None
Dow Chemical Company (Madison Site)	All years covered.	None
Downey Facility	All years covered.	None
DuPont Deepwater Works	All years covered.	NIOSH 2015b, p. 16
Electro Metallurgical	All years covered.	NIOSH 2015c, p. 34
Extrusion Plant ^a	1981–2006 covered.	ORAUT 2017d, p. 23

Covered facility	Notes	Reference
Fernald	"It is possible that some of the X-ray examinations were performed off the [Fernald] site at local area hospitals, but there does not seem to be a fixed pattern, and no clear evidence exists in relation to when or for whom this might have occurred."	ORAUT 2014b, p. 8
General Atomics	"A former GA nurse recalled that chest X-rays were required for beryllium workers and stated the X-ray examinations were conducted at La Jolla Radiology." No historical documentation found to support this statement.	ORAUT 2008a, p. 46
General Electric Company (Ohio)	All years covered.	None
General Steel	All years covered.	None
Grand Junction ^a	1962–1969 covered.	Author unknown ca. 2002, p. 10
Hanford	X-rays taken at Kadlec Hospital from 1944-1956 are now to be included in dose reconstruction, as the AEC owned Kadlec during this time.	Travis 1956
Harshaw	"Continue to use the services of the Radiological Clinic or its equivalent, but all X-rays should be obtained from them and kept in a locked fireproof cabinet in the dispensary" (Belmore 1948, p. 123), or the "X-ray laboratory in Cleveland" (Tabershaw 1950).	Belmore 1948; Tabershaw 1950
Hood Building	All years covered.	None
Hooker Electrochemical	All years covered.	NIOSH 2011b, p. 14
Horizons	All years covered.	None
Huntington Pilot Plant	All years covered.	NIOSH 2013, pp. 18-19
Idaho National Laboratory and Argonne National Laboratory-West	"Offsite facilities might have been contracted to perform the examinations."	ORAUT 2009, p. 8
Iowa Army Ammunition Plant	All years covered.	NIOSH 2011a, pp. 6–7.
Joslyn Manufacturing and Supply Company	All years covered.	None
K-25 Plant	All years covered.	None
Kansas City Plant ^a	Before 1997 covered.	ORAUT 2017b, p. 20; Todd 2004, p. 3
Lake Ontario Ordnance Works	All years covered.	None
Lawrence Berkeley National Laboratory ^a	1964–1995 covered.	ORAUT 2010c, pp. 21–22; Parker 1963; Grondona 2010
Lawrence Livermore National Laboratory	All years covered.	None
Los Alamos National Laboratory	All years covered.	None
Medina Modification Center	Some records indicate the X-rays might have been taken off site at the Minter X-Ray Clinic.	Claim file records
Metallurgical Laboratory ^a	July 1944 and later covered.	Author unknown 1946, p. 27
Metals and Controls	All years covered.	None
Mound Plant	All years covered.	None

Covered facility	Notes	Reference
Nevada Test Site	1960–1985 covered, 1986–1995 other than preemployment X-rays covered.	ORAUT 2012b, pp. 7, 10; DeMarre 2012; Moon, 2012
Norton Company	All years covered.	None
Nuclear Metals	All years covered.	NIOSH 2015d, p. 9
Oak Ridge National Laboratory	All years covered.	None
Pacific Northwest National Laboratory ^a	Same as Hanford through September 30, 2012.	ORAUT 2016b, p. 25.
Pacific Proving Ground	“The dose reconstructor should use the occupational medical dose TBDs for the participant’s employers and associated DOE sites to determine X-ray dose.”	ORAUT 2016c, pp. 12–13
Paducah Gaseous Diffusion Plant	All years covered.	None
Pantex Plant	All years covered.	None
Pinellas Plant	All years covered.	None
Piqua Organic Moderated Reactor	All years covered.	None
Portsmouth Gaseous Diffusion Plant	1954-March 2012 (except 2010-2011 when Southern Ohio Medical Center records found in claim file) May 5, 2014-present	ORAUT 2016h
Revere Copper and Brass	All years covered.	None
Rocky Flats Plant	All years covered.	None
S-50 Plant	All years covered.	None
SAM Laboratories, Columbia University	All years covered.	None
Sandia National Laboratories ^a	X-rays are assumed to have been taken on site except those marked Sandia Base Hospital and/or Kirtland Air Force Base Dispensary.	Anders 2015
Sandia National Laboratories, Livermore	“The X-ray machine equipment was removed from the site in approximately 1990 ...” (ORAUT 2014d, p. 22). After 1990, X-rays were performed at Lawrence Livermore National Laboratory, a covered facility.	ORAUT 2014d; ORAUT 2006a
Santa Susana Field Laboratory (Area IV)	“By 1998, all radiographic examinations were subcontracted to West Hills Hospital in West Hills, California” (ORAUT 2008b, p. 10). No historical documentation found to support this statement.	ORAUT 2008b, pp. 10, 13
Savannah River Site	All years covered.	None
Spencer Chemical Company/Jayhawk Works	All years covered.	None
St. Louis Airport Storage Site	All years covered.	None
Standard Oil Company of New Jersey	All years covered.	None
Superior Steel	All years covered.	None
Tennessee Valley Authority	All years covered.	None
Texas City Chemicals	All years covered.	None
Titanium Alloy Manufacturing Company	All years covered.	None

Covered facility	Notes	Reference
Tyson Valley Powder Farm	All years covered.	None
United Nuclear Corporation	All years covered.	NIOSH 2017, p. 15
Ventron Corporation ^a	Some X-rays taken at the Beverly Hospital.	Todd 1945, p. 17; NIOSH 2012a, pp. 34–35.
Vitro Manufacturing	All years covered.	None
W. R. Grace (Tennessee)	All years covered.	None
Wah Chang	All years covered.	None
Weldon Spring Plant	All years covered.	None
Westinghouse Atomic Power Development Plant	All years covered.	None
Westinghouse Electric Corporation (New Jersey)	All years covered.	None
Winchester Engineering and Analytical Center	All years covered.	None
Y-12 Plant	All years covered.	None

a. See also Table 3-1.

The guidance in this TIB supersedes previous guidance on the issue of assignment of X-ray dose at covered facilities that might be found in the following documents or in site profiles issued before this TIB:

- Revision 04 of ORAUT-OTIB-0006, *Dose Reconstruction from Occupational Medical X-Ray Procedures* (ORAUT 2011);
- Revision 02 of ORAUT-OTIB-0052, *Parameters to Consider When Processing Claims for Construction Trade Workers* (ORAUT 2014e);
- Revision 01 of ORAUT-PROC-0006, *External Dose Reconstruction* (ORAUT 2006b); and
- Revision 04 of ORAUT-PROC-0061, *Occupational Medical X-Ray Dose Reconstruction for DOE Sites* (ORAUT 2017a).

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