



Update for the Advisory Board on Radiation and Worker Health Y-12 Work Group

Lara Hughes, PhD, CHP
Health Physicist

Teleconference of the Y-12 Work Group
September 24, 2020

Overview

- Y-12 Background
- Y-12 SEC Petition History
- SEC-00250 Petition Evaluation
- SEC-00250 Evaluation Report Addendum
- Co-Exposure Effort
- Y-12 Issues Matrix
- Post ER Petitioner Submission
- Questions and Discussion

Y-12 Background

Y-12 Background



- 811-acre site
- 0.67 by 3.2 miles
- Peak employment: 22,000 workers, down to ~5700 by 1998
- Covered period: 1942 – present

Y-12 Site History

- First Era (until 1946) – Uranium (U) isotope separation
 - Calutrons for U enrichment
- Second Era (until ~ 1994) – Cold War nuclear weapons components manufacturing
 - Produce and test key components of nuclear weapons
 - Stockpiling High-Enriched Uranium (HEU)
 - Technology development for new weapons designs
- Third Era (after ~ 1994) – Multiple new missions
 - Storing HEU
 - Continued weapons part production on smaller scale
 - Environmental and waste management

Y-12 Site History – Thorium

- Thorium (Th) production began in 1959
- Arc-melting, forging, machining and other related metal processes to produce metal parts for nuclear weapons
- Consumable electrode arc melting: Radium volatilizes
- Main production period: 1961 – mid-1970s, metric ton quantities
- Parts refurbishment until 1989
- 1994: plant in stand down mode, special project Th work only

Y-12 Petition History

Y-12 Petition History

Petition	Status	Basis
SEC-00250 Addendum	Under evaluation	Reserved Period from 1987-1994 due to need to collect and evaluate Th data from Y-12
SEC-00250	Class added to SEC for 1976 – 7/31/1979	Infeasibility to reconstruct doses from Th 1976-7/31/1979; DR feasible for 8/1/1979-1987
SEC-00251	Class added to SEC for 1958 - 1976	Infeasibility to reconstruct doses from Th, and Plutonium-241
SEC-00186	Class added to SEC for 1948 - 1957	Infeasibility to reconstruct doses from Th and cyclotron radionuclides
SEC-00098	Class added to SEC for 1943 - 1947	Infeasibility to reconstruct internal doses from calutron operations
SEC-00028	1948-1957	Initial limited class
SEC-00018	1943-1947	Initial limited class

Y-12 SEC-00250 Petition Evaluation

SEC-00250 Petition Evaluation

- Evaluation Report presented in August 2019
- Class recommended to be added to SEC: 1/1/1977 – 7/13/1979
- Class effective: November 24, 2019
- Dose Reconstruction feasible: 8/1/79 – 12/31/86
- Reserved Period: 1/1/1987 – 12/31/1994
 - Reserved because of data accessibility issues at Y-12
- SC&A issued review of SEC-00250 Evaluation Report on: 02/21/2020
- NIOSH issued a response to SC&A Review on: 06/03/2020

SEC-00250 Petition Evaluation - cont'd

- Petition qualified based on basis F.4 for issues related to in-vivo Th data from evaluation of SEC-00251 (83.14 petition)
- Evaluated the feasibility of reconstructing internal doses from Th
- Three different periods identified:
 - 1977 – 1979: Th internal data only in mg results, no calibration data available, thus Th DR infeasible → SEC class recommended
 - 1979 – 1986: Th in-vivo data have Pb-212 and Ac-228 results and can be used to bound internal Th doses → DR feasible
 - 1987 – 1994: Th data are available but have to be collected from Y-12 and evaluated → Reserved period

SEC-00250 Evaluation Report Review by SC&A

- Issued in February 2020
- 4 Findings, 12 Observations
- Main discussion points:
 - Th scope of work
 - Th in-vivo data and potential use for co-exposure model
 - Job categories
 - U data used in existing co-exposure model
 - Machinist exposures at Y-12
 - Exotic Radionuclides, Pu-241, RPRT-0090 issues

NIOSH Response to SC&A Review of SEC-00250

- NIOSH issued response to SC&A review of SEC-00250 in June 2020:
 - Th co-exposure model will be based on new guidelines
 - Data completeness evaluation of Th in-vivo data will be based on new guidelines
 - New information on Th inventory data was collected in late 2019
 - Revisions of existing co-exposure models will follow new guidelines
 - Pu-241 monitoring ability is addressed in SEC-00251 ER
 - RPRT-0090 issues are addressed under ORNL effort

Y-12 SEC-00250 Addendum

SEC-00250 Addendum

- Reserved Period: 1987 – 1994
- Additional data requests to Y-12 for in-vivo Th data
- Several calls to clarify and corroborate information on Th data
- Assessing different issues with available data (lack of Pb-212 channel data in records from 1992 – 1994)
 - DCAS-RPRT-008: “Evaluation of the Pb-212 Detection Limit for a Lung Count at the Y-12 Facility from 1992 – 1995”
- Current Status: to be finalized after receiving final data clarification from Y-12

Co-Exposure Model Revisions

Y-12 Co-Exposure Model Development

- Current effort is revision of external co-exposure model using current methods
- Addresses the need to update OTIB-0044, OTIB-0045, OTIB-0046, OTIB-0064
- Specifically:
 - Assess validity of Y-12 data set using RPRT-0086 methods
 - Perform analysis of Y-12 data set using RPRT-0071 guidance
 - Completely revise OTIB-0064, Y-12 external coworker model

Y-12 Co-Exposure Model Development – cont'd

- Database evaluation
- Statistical analysis instructions are being developed
- Questions for Y-12 dosimetry staff to clarify some issues with the data sets to ensure correct interpretation of the data
- Example issues:
 - Exchange frequency
 - Wear time gaps
 - Wear time overlaps
- Response from Y-12 expected mid-September 2020

Y-12 Issues Matrix

Y-12 Issues Matrix from 2005

- SC&A Review of Y-12 Documents (TBDs TIBs) from ~ 2005
- NIOSH issues resolution effort in 2008
- Former Y-12 WG retired, effort was put on hold
- Documents have been revised
- Several SEC classes implemented
- New Co-exposure models are underway
- NIOSH to re-assess what issues remain and resolve

Post ER Petitioner Submissions

SEC-00250 – Y-12 Former Worker Interview

- Petitioners contacted NIOSH with knowledge of former worker involved with in-vivo counting at Y-12
- Interview with petitioner and individual who worked on in-vivo counter
 - Hand contamination from machining
 - Employees were surveyed before in-vivo count
 - Survey meter use was done incorrectly (suggested bias towards detecting surface contamination when none was present)
 - Contaminated workers were deferred from in-vivo count
 - Workers were also restricted from work if found contaminated
 - Contention that this reduced the frequency of high in-vivo counts

SEC-00250 – Additional Petitioner Submission

- Received August 15, 2020, available to WG and SC&A in DSA
- “Analysis of Working Conditions, Worker Exposures and Monitoring”, 1980-1994”
 - Compliance Issues
 - Data base quality issues (CER and hardcopy records)
 - Some issues from previous SC&A Review of Y-12 TBD in 2005
 - Availability of worker records for DR
 - Machinists not wearing gloves and long sleeves (entrapment hazard)
- No information that would indicate an infeasibility for reserved period

Petitioner Documentation

Issue	NIOSH preliminary assessment
CER dose records veracity and applicability	CER data has undergone QC and has been found suitable for use, NIOSH uses bioassay data, not the reported dose data for modeling
Pb-212 background levels too high	Unclear attribution for this statement. Pb-212 lung count methodology is available for DR from mid-1979 on
Th lung counting discontinued in 1984	Lung count data is available past 1984, data is for Ac-228 and Pb-212 which are used to infer Th lung burden
Insoluble internal dose monitoring not done until 1989	Bioassay suitable for DR at Y-12 is available prior to 1989, including fecal sampling
Bioassay for some workers more frequent (salaried vs. hourly)	DR methods have been developed and no bias toward salaried workers has been observed.

Petitioner Documentation – cont'd

Issue	NIOSH preliminary assessment
Machinists required to work without arm/hand coverings	NIOSH has reviewed this issue and found it can be addressed for DR at Y-12
Some machinists were not monitored	Unmonitored dose can be assigned using co-exposure dose
Supervisors determined who needed respirators	The primary data used for DR takes into account any reduction in exposure afforded by respiratory protection
Uncertainties in bioassay data need to be addressed (Super S, 48 hr sampling)	Methodology for Super S Pu has been developed, some other issues related to bioassay data still need to be addressed
Air monitoring insufficient to estimate internal doses	ORAUT-TKBS-0014-4 provides an alternate methodology to arrive at a more claimant favorable estimation of environmental internal dose

Petitioner Documentation – cont'd

Issue	NIOSH preliminary assessment
Tiger team findings on air monitoring	These findings do not affect DR feasibility for Y-12
Other radionuclides not monitored	ORAUT-TKBS-0014-5 contains guidance on the interpretation and assessment of exposure from the listed nuclides, some additional assessment may be needed
10CFR requirement on PNADs	This does not impact the feasibility of NIOSH to complete DR for Y-12 claims
DOE regulation issues (eating, smoking in work areas...)	This does not impact the feasibility of NIOSH to complete DR for Y-12 claims
Worker dosimetry data is not available or incorrect	Worker dosimetry data at Y-12 has been reviewed and found suitable for DR approaches and co-exposure models
Workers have trouble accessing their own records, assumes NIOSH has the same issue	NIOSH does receive worker records from Y-12

Questions and Discussion