

ORAUT-OTIB-0070

**Dose Reconstruction During Residual Radioactivity
Periods at Atomic Weapons Employer Facilities**

Report from the Procedures Review Subcommittee

Presented to the
ABRWH Full Board meeting
Augusta, Georgia

March 12, 2013

ORAUT-OTIB-0070 Summary

- Provides guidance for
 - Estimating dose to workers at Atomic Weapons Employer (AWE) facilities when NIOSH determines “significant residual contamination”
 - Reconstruction of internal doses due to the resuspension of particulate surface contamination
- Only internal and external radiation exposures defined in 42 U.S.C. §7384n(c)(4) are included in residual period dose reconstructions; exposure from commercial sources is not used

ORAUT-OTIB-0070 Timeline

- March 10, 2008 – Revision 0
- August 29, 2008 – SC&A Review (SCA-TR-TASK3-0009)
- July 14, 2010 – NIOSH Initial Responses
- July 26, 2010 – Discussed with Subcommittee
- December 30, 2010 – SC&A Reply to NIOSH Responses
- January 5, 2012 – 2nd Discussion – Agreed on Approach
- March 5, 2012 – Revision 1
- July 31, 2012 – 3rd Discussion – Findings Resolved

ORAUT-OTIB-0070, Revision 0

- Provides guidance for reconstruction of internal doses due to the resuspension of particulate surface contamination
- Recommends _
 - 6 methods for estimating internal exposure to residual radioactivity at AWE facilities depending on:
 - Type of data available (air sample or surface contamination)
 - Timing of data (operational and/or post-operational)
 - Resuspension factor of $1 \times 10^{-6} \text{ m}^{-1}$, based on numerous studies from 1964 to 2002
 - Revision of 0.01 day⁻¹ source term depletion rate to 0.00067 in Rev 1, based on data from 4 AWE sites

Findings Summary: OTIB-0070

- 15 Findings in total– complete histories captured in the Board Review System (BRS)
 - <http://app-cinc-dcas.cdc.gov:8106/documents/default.aspx?mode=ASSIGNED>
 - Resolution spanned 4+years
 - 14 findings are Closed
 - 1 is Addressed in TBD-6000 (also Closed)
- The following slides provide summary information on resolution of each Finding – Details in BRS and handout

OTIB-0070 Review Findings

#	Finding	Resolution
1	Inconsistent use of the resuspension factor (RF) – The default source term depletion value of the 1% day ⁻¹ implies a RF of 8e-05 per meter, which is nearly 2 orders of magnitude higher than NIOSH's recommended RF of 10 ⁻⁶ m ⁻¹ .	Closed on July 31, 2012 OTIB-0070, Revision 1 changed the source term depletion rate from 1% day ⁻¹ to 0.00067 day ⁻¹ , which is consistent with a RF of 10 ⁻⁶ m ⁻¹ .

OTIB-0070 Review Findings

#	Finding	Resolution
2	OTIB-0070, Section 2.5 references Sehmel 1980, Till and Meyer 1983, Linsley 1978, and Healy 1971. All of these references are (except Healy 1971) to outdoor soil contamination, which involve conditions with little resemblance to building surfaces, building uses, room heights, and ventilation rates.	Closed on July 31, 2012 OTIB-0070, Revision 1 recalculated the default source-term depletion rate during the residual radiation periods based actual data from 4 AWE sites (Blockson, Dow Madison, General Atomics, and Simonds Saw) rather than being based on literature sources where outdoor measurements were preponderant.

OTIB-0070 Review Findings

#	Finding	Resolution
3	<p>Implicit in deriving the source term depletion rate (λ, Section 2.6) is that airborne contaminants are (1) uniformly distributed throughout the interior volume and (2) removed with 100% efficiency. Neither assumption is likely to exist.</p>	<p>Closed on July 31, 2012</p> <p>OTIB-0070, Revision 1, Section 4.1 recalculated the default source-term depletion rate during the residual radiation periods based on averaging observed depletion rates at four AWE sites.</p>

OTIB-0070 Review Findings

#	Finding	Resolution
4	Battelle-TBDs-6000/6001 identified relatively large air concentrations during facility operations that were job specific. In contrast, OTIB-0070, Attachment B identifies a single value for each of 3 thorium sites that excludes process air sampling data.	Closed on January 5, 2011 Air samples were selected to be indicative of general area conditions within the facilities at the start of the residual period and not potential exposure during the operational period.

OTIB-0070 Review Findings

#	Finding	Resolution
5	Attachment B cites survey data for 3 thorium facilities, but provides no further guidance on how these data sets are to be used.	Both Closed on January 5, 2011 Since it has never been used for DR purposes, Appendix B has been deemed unnecessary for the purpose of OTIB-0070, and has been removed from Revision 1.
6	Use of Horizons' summary survey data as a default value for operational air concentration at a thorium refining facility is inappropriate and not claimant favorable.	

OTIB-0070 Review Findings

#	Finding	Resolution
7	It is unclear how the Attachment B Horizons geometric mean value of 4.8 dpm/m ³ was derived from the data contained in AEC 1955.	Both Closed on January 5, 2011
8	The derivation of Appendix B air concentration values (i.e., a GM of 1.2 dpm/m ³ and a GSD of 3.9 dpm/m ³) for Nuclear Metals from AEC 1958 was not adequately explained.	Since it has never been used for DR purposes, Appendix B has been deemed unnecessary for the purpose of OTIB-0070, and has been removed from Revision 1.

OTIB-0070 Review Findings

#	Finding	Resolution
9	The derivation of the Appendix B, Lindsey air concentrations values was not adequately explained and the values does not appear to correspond to those reported in the survey.	Closed on July 31, 2012 Since it has never been used for DR purposes, Appendix B has been deemed unnecessary for the purpose of OTIB-0070, and has been removed from Revision 1.
10	NIOSH's recommended RF of 10^{-6} m^{-1} is inappropriate. The scientific literature indicates RF values of 10^{-4} to 10^{-3} m^{-1} for indoor activities involving substantial industrial activities.	Closed on July 31, 2012 A footnote added to Table 5-1 indicates that a site by site analysis should be conducted to establish the RF at sites where no post-operational clean-up has been performed, rather than simply accepting an RF of 10^{-6} m^{-1} .

OTIB-0070 Review Findings

#	Finding	Resolution
11	Use of NUREG-1400 is inappropriate and technically not feasible since the total absence of data precludes a quantitative assignment to the source term that reflects residual contamination.	Closed on July 31, 2012 Consideration of NUREG 1400 as a possible method for estimating residual contamination has been deleted from OTIB-0070, Revision 1 (see Table 5).

OTIB-0070 Review Findings

#	Finding	Resolution
12	Use of Battelle-TBD-6000 for assigning operational air concentration values may not be claimant favorable.	<p>This finding is being addressed in Battelle-TBD-6000, Issue 4 – July 26, 2010</p> <p>This finding will be closed when documentation from the TBD-6000 Work Group is received indicating that TBD-6000, Issue 4 has been Closed.</p>
13	It is not possible to judge whether the basic approach to developing inhalation doses in TBD-6001 is claimant favorable.	<p>Closed on July 31, 2012</p> <p>Since TBD-6001 has been cancelled, all references to and data from TBD-6001 have been removed from OTIB-0070, Revision 1.</p>

OTIB-0070 Review Findings

#	Finding	Resolution
14	Use of Battelle-TBD-6001 for determining inhalation doses may not be claimant favorable.	Closed on July 31, 2012 Since TBD-6001 has been cancelled, all references to and data from TBD-6001 have been removed from OTIB-0070, Revision 1.
15	Many of the assumptions that form the basis of the OCAS-TIB-009 ingestion model are too restrictive and may yield low ingestion estimates.	Closed on February 5, 2013 Since Finding TIB-009-01 has been resolved and Closed, Finding OTIB-0070-15 has also been Closed.

Questions?