



ORAU TEAM Dose Reconstruction Project for NIOSH

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<p>Document Title: Assignment of Missed Neutron Doses Based on Dosimeter Records</p>	<p>Document Number: ORAUT-OTIB-0023 Revision: 01 Effective Date: 05/14/2008 Type of Document: OTIB Supersedes: 00</p>
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New
 Total Rewrite
 Revision
 Page Change

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PUBLICATION RECORD

EFFECTIVE DATE	REVISION NUMBER	DESCRIPTION
03/07/2005	00	New technical information bulletin to provide information to allow ORAU Team dose reconstructors to determine when it is appropriate to assign neutron doses to workers at DOE sites using the LOD/2 method. First approved issue. Initiated by Steven E. Merwin.
05/14/2008	01	Approved revision to incorporate comments from ABWG on Procedures and align with page change to IG-001. Added minor editorial changes for consistency with current requirements, including the addition of an Acronym and Abbreviations list, incorporating an Introduction section to include standard OTIB language, and updating section numbers. No further changes occurred as a result of formal internal review. Incorporates formal NIOSH review comments. Training required: As determined by the Task Manager. Initiated by Matthew H. Smith.

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ACRONYMS AND ABBREVIATIONS

DOE	U.S. Department of Energy
DR	dose reconstruction
IG	implementation guideline
LOD	limit of detection
NIOSH	National Institute for Occupational Safety and Health
ORAU	Oak Ridge Associated Universities
TIB	technical information bulletin

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 historic background information and guidance concerning 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)].

2.0 PURPOSE

The purpose of this TIB is to provide information to allow Oak Ridge Associated Universities (ORAU) Team dose reconstructors to determine when it is appropriate to assign neutron doses to workers at DOE sites using the Limit of Detection (LOD)/2 method.

3.0 BACKGROUND

According to OCAS-IG-001, missed doses are to be assigned using the “LOD/2 method,” which was originally proposed by the National Research Council in their evaluation of film badge dosimetry for compensation of atomic veterans. The method involves the assignment of a dose equal to the LOD divided by 2 for each dosimetry measurement that is recorded as either zero, below the limit of detection, or below a reported threshold. According to the IG, this method is recommended “since this scheme has been used in other compensation programs and has been shown to result in a slight positive bias.”

Workers who were unmonitored for external radiation exposure are not assigned missed dose using the LOD/2 method; rather, they are assigned either external on-site ambient doses, if they were non-radiological workers and would not have been exposed to workplace radiation sources; or unmonitored doses (using coworker studies or some other approach) if a potential for exposure existed.

The assignment of missed neutron doses is somewhat more complex. In the early years at most DOE sites, neutron doses were not measured reliably, so missed neutron doses are assigned based on neutron-gamma ratios, coworker studies, or some other approach. In these situations the guidance given in this TIB will not apply. This TIB does provide further guidance regarding when to apply missed neutron dose if data from neutron monitoring devices are used for dose reconstruction and when other information is available regarding the energy employee’s potential for neutron exposure.

4.0 APPLICATIONS AND LIMITATIONS

The guidance in this TIB applies to cases in which the data from neutron monitoring devices in use at the site were used in dose reconstruction. It does not apply to periods during which the monitoring was unreliable and some method other than the monitoring data (e.g., neutron-gamma ratios) is normally used to assign neutron dose based on information in the site technical basis document (TBD) or other reliable source.

5.0 ANALYSIS

As described in OCAS-IG-001, the LOD/2 method results in a positive bias for photon exposures. By definition, this bias is extreme if there was no potential for photon exposure (e.g., a worker downtown in an administrative building who did not visit the site). By and large, however, workers who were issued dosimeter badges at DOE sites had a potential for photon exposure, and photon radiation sources were generally omnipresent at the sites so the issuance of dosimeter badges is considered an indicator of the potential for exposure. Thus, even though the LOD/2 method for assigning missed dose is claimant favorable in general, and highly claimant favorable for employees with limited or no potential for exposure (i.e., employees with all or mostly zeroes in the records), this approach has been prescribed in the IG upon analysis of alternative approaches.

Regarding neutron exposures, however, at some DOE sites and during certain eras, neutron dosimeters were included in the site dosimetry badges as a matter of administrative practice rather than as an indicator of a potential for neutron exposure. Thus, some employees have a string of zeroes in the neutron column in their monitoring records even though there may have been little or no exposure potential based on their work locations. Additionally, at a few DOE sites zeroes may be included in the records as an administrative practice even though monitoring did not occur. Therefore, not only are there instances in which the LOD/2 method results in unreasonably high neutron doses, as acknowledged in the IG, but also instances in which the method is not applicable because it could result in the assignment of neutron doses even though there was no potential for neutron exposure.

6.0 GUIDANCE

Workers who were monitored for neutrons using reliable dosimeters should generally be assigned missed doses in accordance with OCAS-IG-001 (i.e., using the LOD/2 method for any null results). An exception, however, to the method is needed for unreasonably high neutron doses.

Missed neutron doses do not need to be assigned if the following condition is met:

The dose reconstructor determines that the employee's neutron dose was zero or incidental relative to the external dose assigned based on the employee's work location(s) and relevant information in the site TBD or other documentation (e.g., neutron source term information, neutron survey results, and the potential for neutron exposures).

If the above condition is met, dose reconstructors should include appropriate explanatory language in the dose reconstruction (DR) report. This should include a discussion in the DR report of the available information regarding work locations and the rationale for the conclusion that neutron doses could not have exceeded incidental levels.

7.0 ATTRIBUTIONS AND ANNOTATIONS

All information requiring identification was addressed via references integrated into the reference section of this document.

REFERENCES

NIOSH (National Institute for Occupational Safety and Health), 2007, *External Dose Reconstruction Implementation Guideline*, OCAS-IG-001, Rev. 3, Office of Compensation Analysis and Support, Cincinnati, Ohio, November 21.