

**ISSUES RESOLUTION MATRIX FOR ORAUT-OTIB-0052,  
“PARAMETERS TO CONSIDER WHEN PROCESSING CLAIMS FOR CONSTRUCTION TRADE WORKERS”**

Finding Number	Finding Description (originally for Revision 00)	NIOSH Response	Finding Resolution
1	OTIB-0052 does not address differences in doses received by different construction occupations.	<b>08/29/07:</b> NIOSH believes that the goal of favorable treatment for construction trade workers who were unmonitored or were monitored but are deficient in some portion of their records for a period of time has been achieved. Any refinement in the model with respect to different construction occupations is unnecessary.	<b>04/11/12:</b> Because this issue is essentially the same as Finding 16, the SCPR changed the status to “Addressed in OTIB-0052-16.” The SCPR transferred Finding 16 (and, by extension, Finding 1) to OTIB-0020. On November 14, 2011, NIOSH issued OTIB-0020, Revision 03, with the requested change to address the OTIB-0052 findings. Therefore, the SCPR closed Finding 1 along with Finding 16.
2	The dose databases used are lacking significant data for the early operational years.	<b>08/29/07:</b> NIOSH concurs with SC&A’s July 30, 2007, report, which postulates on page 77 a reason for relatively low CTW exposure during the early years of site operations. In the early years of any site, the task of construction trade workers would more likely be involved with initial facility construction rather than retrofits and would therefore involve less radiation dose potential. Any deficiency in data during early operational years would apply to all monitored workers, not just construction trade workers, and would therefore tend to be an unbiased source of uncertainty.	<b>06/24/08:</b> The SCPR was satisfied with this response and closed the finding.

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3	The dose databases do not always identify who were CTWs, and for CTWs, what were their occupations.	<b>08/29/07:</b> The dose databases constitute the best available source of information for a large population (more than 179,000 bioassay values and 216,000 external dose data values for CTWs were included in the analysis). The criteria used to identify CTWs were either set at the time the record was created by site personnel or were identified in the OTIB in a description of the database query.	<b>06/24/08:</b> SC&A and the SCPR agree with the NIOSH response, and the SCPR closed the finding.
4	NIOSH did not make modifications to the internal dose calculation methodology as they indicated to CPWR that they would.	<b>08/29/07:</b> When NIOSH attempted to make the CPWR agreed-upon modifications (i.e., increase the GSD), the result was “implausibly large values.” At that point, NIOSH decided to use existing internal dosimetry bioassay data, which also eliminated issues about breathing rates, oronasal breathing, number of hours worked per week, etc. NIOSH determined that a better course of action was available based on actual CTW bioassay data rather than assumed intakes based on air concentration. NIOSH believes that the resulting method provides a more site-specific-based approach to dose reconstruction that is favorable to the claimant.	<b>06/24/08:</b> SC&A and the SCPR were satisfied with NIOSH’s response, and the SCPR closed the finding.

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5	<p>Plutonium and/or uranium were used to compare internal CTW to all monitored workers (AMW) doses. What about other radionuclides?</p> <p><b>SC&amp;A Follow-up:</b> It is not whether a comparison between groups for less prominent radionuclides is “feasible,” but whether such a comparison is “necessary.” For example, do the plutonium/uranium doses always dominate the AMW doses, or do other radionuclides sometimes dominate? Also, do the AMW doses from other radionuclides “follow” the plutonium/uranium doses in any predictable fashion? When AMW have bioassay data for other radionuclides, why were these data collected? Was there any systematic reason?</p>	<p><b>08/29/07:</b> The underlying assumption for internal dose comparison is that the internal dose hazard for a site is closely tied to the radionuclide being handled in greatest quantity at the site. The vast majority of bioassay data in the DOE complex are for plutonium and uranium. Data on other radionuclides are limited in timeframe and number of results. Consequently, meaningful comparisons between the groups for less prominent radionuclides were not judged to be feasible.</p> <p><b>NIOSH Follow-up:</b> NIOSH added Section 3.1, “Limits and Exceptions,” which refers OTIB-0052 users to the site TBD for information on intakes of less common radionuclides.</p>	<p><b>07/14/11:</b> Based on the change made by NIOSH in Revision 01 regarding this issue and SC&amp;A’s concurrence, the Subcommittee closed this finding.</p>
6	<p>OTIB-0052 does not address how to determine CTW doses at sites that do not have a coworker model.</p>	<p><b>08/29/07:</b> For sites lacking coworker studies, the dose for unmonitored CTWs is reconstructed in the same way as for other unmonitored workers with a potential for exposure or intakes (see Section 8.1 in OTIB-0052). The site TBD provides direction on how to assign external and internal doses, and then the appropriate adjustment factor defined in OTIB-0052 is applied.</p>	<p><b>06/24/08:</b> SC&amp;A agreed with NIOSH’s response, and the SCPR closed this finding.</p>

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7	OTIB-0052 does not address how to determine neutron CTW doses.	<b>08/29/07:</b> External doses were not intentionally differentiated according to gamma or neutron doses, so no inherent bias in reconstruction of neutron dose is likely. Note that neutron dose is normally associated with access to special nuclear materials, which requires a security clearance or security escort. Workers with security clearances were known and likely to be monitored. Consequently, it is reasonable to assume that the neutron dose would be higher in the group of all monitored workers than in the somewhat more transient CTW group.	<b>06/24/08:</b> SC&A and the SCPR agreed with NIOSH's response, and the SCPR closed this finding.
8	All SRS external doses are from the HPAREH. There needs to be an evaluation of other dose databases, e.g., Fayerweather, SRS-ABST.	<b>08/29/07:</b> No additional value is gained in this case by expending resources to study the contents of other, less complete, databases. Quoting from the SC&A report dated July 30, 2007, page 33, <i>“Based on this analysis, there is no reason to believe that including the Fayerweather database in the ORAUT-OTIB-0052 analysis would change the results of that study for the SRS or for the ratio of 1.4 to be applied to external coworker models. The limitations of the above comparison should be kept in mind, particularly the fact that 22% of the data presented in Fayerweather lack exposure and/or dosimetry information.”</i>	<b>08/21/08:</b> SC&A and the SCPR agreed with NIOSH's response, and the SCPR closed this finding.
9	Evaluation is based on DOE annual exposure report. Needs to address the Master Update Dump (MUD) dose database for INL.	<b>08/29/07:</b> The MUD database covers the time period prior to 1986. The data in the Annual Reports are equivalent (because the Annual Report was created from the MUD data) for the overlapping time periods. However, NIOSH agreed to modify the OTIB to explain why it did not use the MUD dose database.	<b>07/14/11:</b> Based on the change made by NIOSH in Revision 01 regarding this issue and SC&A's concurrence, the Subcommittee closed this finding.

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10	<p>For post-1974, the ratio of penetrating doses experienced by CTWs to other workers in OTIB-0052 does not agree with the INL epidemiologic study (NIOSH 2005), which indicates a correction factor closer to 2, and perhaps greater for some job types.</p> <p><b>SC&amp;A Follow-up:</b> NIOSH 2005, Table 2-7, indicates 30,604 construction workers out of a total worker population of 112,304, or 27% construction workers. Also, NIOSH 2005, Figure 3-12 (reproduced as Figure 3.14-1 of the SC&amp;A review of OTIB-0052, Revision 00), indicates that the number of unmonitored construction workers compared to monitored non-construction workers is larger prior to 1960, about the same from 1960 to 1964, and less after 1964. SC&amp;A does not see the basis for the statement “<i>the CTW population is effectively all radiation workers,</i>” would like to see more information on this subject from NIOSH, and recommends keeping the status of the issue “In Progress.”</p>	<p><b>08/29/07:</b> The two worker populations are not equivalent in that the CTW population is effectively all radiation workers, while the “other workers” population includes administrative workers and engineers who are not radiation workers and tend to dilute the average exposure for “other workers,” which would artificially raise the correction factor. The unmonitored CTW at INL would not have worked in a radiation area, so assigning the CTW a dose equal to 1.4 times the non-CTW dose would be very claimant favorable.</p> <p><b>06/24/08 NIOSH Follow-up:</b> NIOSH added a new paragraph to Section 5.13 that explains that the NIOSH 2005 data were not used because the service workers are grouped with CTWs, a practice that is inconsistent with the definition of CTW used in OTIB-0052.</p>	<p><b>07/14/11:</b> Based on the change made by NIOSH in Revision 01 regarding this issue and SC&amp;A’s concurrence, the Subcommittee closed this finding.</p>

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11	<p>The claimant favorability of the OTIB-0052 approach for INL early period internal dose (to 1965) cannot be determined.</p> <p><b>SC&amp;A Follow-up:</b> OTIB-0052, Section 5.14, states: <i>“Data for internal exposures for workers at the INL was not available.”</i> Also, NIOSH 2005 states: <i>“Until about 1965 construction and service workers had relatively higher percentages of internal dose than non-construction/non-service workers.”</i> Both of these statements lead SC&amp;A to believe that the INL pre-1965 internal dose is not well known or documented.</p>	<p><b>08/29/07:</b> Internal exposures are well known and documented.</p> <p><b>06/24/08 NIOSH Follow-up:</b> NIOSH modified the second paragraph of Section 5.14 to address SC&amp;A’s concern and provide clarity to the dose reconstructors. NIOSH explained that the reason pipefitters at SRS received higher doses during the 1960s was the major modifications taking place in the F and H Canyons. Since these are classified areas, all workers would have been monitored, and any unmonitored CTWs (the subjects of OTIB-0052) would have received lower exposures.</p>	<p><b>07/14/11:</b> Based on the change made by NIOSH in Revision 01 regarding this issue and SC&amp;A’s concurrence, the Subcommittee closed this finding.</p>
12	<p>The Radiological Exposure (REX) dose database was not used. NIOSH needs to compare results based on the REX database to those given in OTIB-0052.</p>	<p><b>08/29/07:</b> The data used for the Hanford analysis were extracted by the site expert from the REX database and provided to the OTIB-0052 team as spreadsheet files. The text of OTIB-0052 did not communicate the identity of the source database. Any subsequent revision will correct this oversight. In summary, NIOSH believes that the analysis of Hanford penetrating dose presented in OTIB-0052 is valid and need not be reevaluated.</p> <p><b>06/24/08 NIOSH Follow-up:</b> NIOSH added the following statement to Section 6 of OTIB-0054: <i>“Electronic access to the REX database was not available when this bulletin was drafted. However the data in REMS was derived from the data in REX and is judged to adequately represent the ratio of CTW and AMW doses.”</i></p>	<p><b>11/25/14:</b> Based on the change made by NIOSH in Revision 01 regarding this issue and SC&amp;A’s concurrence, the Subcommittee closed this finding.</p>

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13	<p>The CTW doses need to be compared consistently to either AMW or non-CTWs. Currently different sections perform different comparisons.</p> <p><b>04/10/12 SC&amp;A Follow-up:</b> SC&amp;A examined the SRS HPAREH average penetrating data (excluding zero measurements) from 1953 to 1999 and found that the ratio of (CTW to non-CTW) and (CTW to AMW) ranged from 89.7% to 104.1%. When the ratio is greater than 100%, the average CTW dose is greater than the average non-CTW dose.</p> <p>Likewise, SC&amp;A examined the SRS HPAREH 90th percentile penetrating data (excluding zero measurements) from 1953 to 1999 and found that the ratio of (CTW to non-CTW) and (CTW to AMW) ranged from 85.9% to 101.0%. When the ratio is greater than 100%, the average CTW dose is greater than the average non-CTW dose.</p> <p>SC&amp;A recommended changing the status to closed.</p>	<p><b>08/29/07:</b> Methods differ in the details because of data availability. Because CTW doses are similar to or higher than AMW doses, the calculated ratios, which are used to form an adjustment factor, tend to be similar or higher when non-CTW is used in the denominator instead of AMW. The baseline method is to use AMW in the denominator, but the ratio would tend to be more favorable to the CTW population when non-CTW data are used in the denominator.</p> <p><b>12/19/11 NIOSH Follow-up:</b> Regardless of comparison method, the outcome would be favorable to CTWs because the correction is typically applied to doses in a site-specific coworker model that is based on data for all monitored workers. When CTW are removed from the comparison population, the ratio favors the CTW if the CTW doses are in fact elevated. In addition, the 20% threshold criteria for adjustment falls inside the margin of uncertainty (~ 30%) for dosimetry programs during the film era as well as modern programs covered by DOELAP.</p>	<p><b>04/11/12:</b> The SCPR agreed with SC&amp;A's recommendation and closed this finding.</p>

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14	The handling of “missing dose” needs to be consistent. Currently, some sections include “missing dose” while others do not.	<p><b>08/29/07:</b> The external dose data used in the Rocky Flats analysis had been prepared for a coworker study by others on the ORAU Team. In the process, “missed dose” was added as necessary to each record according to the normal dose reconstruction practice, then the data were reviewed and approved. For Rocky Flats, the comparison of CTWs to the coworker population used these data. For all other sites studied, missed dose adjustments to the data were not available. Regardless of how missed dose was treated, the site-specific comparison between CTWs and AMW was fair because missed dose was handled consistently for both groups within each site.</p> <p><b>12/19/11 NIOSH Follow-up:</b> NIOSH added the following paragraph to Section 4.0:</p> <p><i>The quality, usability, and accessibility of the data varied, making a standardized comparison among sites difficult. For example, some data are available in a modern database as official records while others are available only as summaries in centralized compilations. Some data have rigorously characterized parametric descriptions, while others are described only by a mean value. At some sites, the AMW group includes the CTWs and at others it does not. Some site comparisons are made using data that have been corrected for external missed dose, while others are made without that correction. The analysis method was appropriately adapted to the differences in data, but in all cases the comparisons are consistent for each site. The outcome of a specific comparison might have been affected by these differences, but only negligibly in the context of the threshold for adjustment described in Section 4.2 [2].</i></p>	<b>07/31/12:</b> SC&A agreed with NIOSH’s modification, and the SCPR closed this finding.

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15	<p>OTIB-0052 does not give instructions for what to do if high or low cumulative exposures are suspected.</p> <p><b>SC&amp;A Follow-up:</b> OTIB-0020 does give guidance on what to do for individuals who were unlikely to have been exposed to low doses. OTIB-0020 also states that for individuals who were encouraged or instructed not to wear their badges (dosimeters), the dose reconstructor should “<i>modify the dose reconstruction and/or perform additional research.</i>” Issue OTIB-0020-06 questions whether the dose reconstructor would be able to carry out the required reconstructions. Also, there is nothing in OTIB-0020 to instruct the dose reconstructor to modify the dose reconstruction and/or perform additional research when other circumstances arise (e.g., a traditional high-dose construction trade).</p>	<p><b>08/29/07:</b> The normal assessment methods defined in OTIB-0020 for these types of exposures apply. The method in OTIB-0052 does not change when either low or high cumulative exposures are suspected. Consequently, no additional clarification on this topic is needed.</p>	<p><b>04/11/12:</b> The SCPR and NIOSH agreed that the finding should be transferred to ORAUT-OTIB-0020. On November 14, 2011, NIOSH issued OTIB-0020, Revision 03, with the requested change to address the OTIB-0052 finding, and the SCPR closed the finding.</p>

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16	<p>Some construction occupations (e.g., pipefitters) receive exposures larger than the average CTW exposure. The average member of such groups may consistently receive external exposures above the 95th percentile, but possibly not by much. Occupational details in the data are not plentiful enough to define percentile value.</p> <p><b>SC&amp;A Follow-up:</b> SC&amp;A recommended that this issue be transferred to OTIB-0020, with a statement alerting the dose reconstructor that certain construction trades (e.g., pipefitters) may have received higher exposures than the CTW as a whole, and therefore, additional conservatism should be included in the dose reconstruction when the claimant belongs to one of these trades.</p>	<p><b>08/29/07:</b> NIOSH believes that the goal of favorable treatment for construction trade workers who were unmonitored, or who were monitored but are deficient in some portion of their records for a period of time, has been achieved by assigning doses that are among the highest observed on any site. Any refinement in the model with respect to subgroups of construction occupations is not necessary.</p>	<p><b>04/11/12:</b> The SCPR and NIOSH agreed that the finding should be transferred to ORAUT-OTIB-0020. On November 14, 2011, NIOSH issued OTIB-0020, Revision 03, with the requested change to address the OTIB-0052 finding, and the SCPR closed the finding.</p>

AMW = all monitored workers; CPWR = Center to Protect Workers' Rights; CTW = construction trade worker; DOE = U.S. Department of Energy; DOELAP = Department of Energy Laboratory Accreditation Program; GSD = geometric standard deviation; HPAREH = Health Protection Annual Radiation Exposure History Database; INL = Idaho National Laboratory; MUD = Master Update Dump; OTIB = technical information bulletin; REMS = Radiation Exposure Monitoring System; REX = Radiological Exposure (database); SCPR = Subcommittee for Procedure Reviews; SRS = Savannah River Site; SRS-ABST = SRS Abstract Database; TBD = technical basis document