

NIOSH Response to SC&A's Metals and Controls Corp. Exposure Pathway Evaluation and Dust Loading Commentary

Response Paper

**National Institute for Occupational
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BACKGROUND: EXPOSURE PATHWAYS

Since the National Institute of Occupational Safety and Health (NIOSH) presented the Special Exposure Cohort (SEC) Petition SEC-00236 Metals and Controls Corp (M&C) Evaluation Report (ER) [NIOSH 2017] at the August 2017 Board meeting, NIOSH, SC&A, and the M&C Work Group (WG) have spent considerable efforts refining the exposure bounding models. At its March 18, 2021 meeting, the M&C WG tasked SC&A to review each of the exposure models that NIOSH presented in its January 21, 2021 paper, *Response to Comments from the Metals and Controls Corp. Work Group Meeting Held on September 2, 2020* [NIOSH 2021]. On October 25, 2021, NIOSH received the SC&A report *Metals and Controls Corp. Exposure Pathway Evaluation* [SC&A 2021a], which provides SC&A's evaluation of the six exposure pathways NIOSH developed in support of SEC-00236. Since SC&A and NIOSH have reached a general agreement regarding the exposure pathways, this response paper will briefly describe NIOSH's understanding of SC&A's review and attempt to clarify any remaining issues and concerns.

SC&A reviewed the following six exposure pathways [SC&A 2021a]:

1. Subsurface Inside
2. Subsurface Outside
3. Roof and Overhead
4. Welding
5. HVAC Maintenance
6. Remaining (nonmaintenance)

SC&A's review summarized each exposure pathway and the data supporting the intake model and included any concerns the M&C WG and petitioners expressed. Then SC&A replicated the annual committed effective dose calculations to demonstrate they understood NIOSH's assumptions used from the pathway.

For most pathways, SC&A calculated a similar but lower dose and presented conclusions that include the following [SC&A 2021a]:

- "SC&A reviewed the NIOSH revised modeling in the matrix and agreed with the penetrating dose modeled. SC&A modeled beta doses and had a modestly different interpretation of beta dosimetry results. SC&A calculated a similar but lower dose of 9.7 mrem/month. The difference is modest; therefore, SC&A believes this concern is not worth pursuing further" [PDF p. 8].
- "SC&A believes there is no evidence that suggests that equal weights of thorium should be expected when uranium is present; however, there is not sufficient information to establish that it could not be that high. It is reasonable to conclude that it is unlikely that thorium weights would be greater than uranium weights. Therefore, given the uncertainties associated with the thorium-to-uranium ratios

present on site and the fact that we cannot rule out a 1:1 mass ratio of uranium to thorium, the NIOSH approach is claimant favorable" [PDF p. 13].

- "SC&A believes the impacts of the conservativeness of the assumptions applied to the model are greater than the impacts of the uncertainties associated with material dilution and extraction. Taken in combination, SC&A believes that the methods and assumptions used by NIOSH to reconstruct internal doses to M&C workers involved in subsurface maintenance and repurposing activity in Building 10 during the residual period are scientifically sound and claimant favorable" [PDF p. 15].
- "SC&A agrees with the WG members' concern that the data from the waste and associated contamination in the burial grounds are representative of only a subset of the work performed during operations. The wastes do not capture the entirety of the operations period. However, SC&A does not believe this represents a DR infeasibility. Although the data do not represent all of the operations period, they do represent the remaining source term onsite throughout the residual period" [PDF p. 18].

NIOSH RESPONSES TO SC&A EXPOSURE PATHWAY FINDINGS AND OBSERVATIONS

This section presents the SC&A exposure pathway findings and observations that require clarification or a NIOSH response.

SC&A Finding 1: Building 10 subsurface external exposures not bounded

SC&A finds that NIOSH's proposed external dose rate assumptions are inconsistent with the contamination levels assumed for the subsurface of Building 10. SC&A's independent calculations suggest dose rates from the modeled pathway are expected to be substantially greater. NIOSH's 2017 SEC ER proposed using the 95th percentile dosimetry values (with adjustments for missed dose) of 200 mrem/year (16.7 mrem/month). SC&A believes it is more appropriate to assign elevated subsurface exposures inside Building 10 using the 95th percentile of the dosimetry with occupancy adjustments [SC&A 2021a, PDF p. 16].

NIOSH Response to SC&A Finding 1

Although SC&A recommends using the 95th percentile film-badge data for the indoor subsurface model, they do not recommend it for outdoor subsurface exposures because of their comparison to a value calculated using Federal Guidance Report (FGR) No. 12. NIOSH believes using the actual soil contamination data workers were exposed to (as calculated by SC&A) is appropriate for modeling subsurface exposures. NIOSH can use the dose coefficients for exposure to soil contaminated to an infinite depth tabulated in FGR 12 and the same soil contamination values used in our subsurface internal exposure model to assign doses. If NIOSH changes the model, we will also use this method to model outdoor subsurface exposures to remain consistent.

SC&A Observation 1: Indoor and outdoor subsurface scenarios

SC&A reviewed the claimant interviews and does not believe that there is sufficient evidence to limit any individual's subsurface exposures to a single subsurface scenario. The interviews indicate that, irrespective of an individual's job title, they may have been asked to complete any task on site. SC&A believes that means an individual could have participated in both indoor and outdoor subsurface scenarios within a year [SC&A 2021a, PDF p. 20].

NIOSH Response to SC&A Observation 1

Since NIOSH used worker interviews to determine the two-month per year occupancy rate, we decided the most claimant favorable method was to assign the location with the highest exposure rate. NIOSH's understanding of this observation is that SC&A recommends increasing the total subsurface exposures duration (combined indoor and outdoor) to four months. Although this assumption is inconsistent with the interviews indicating two months total, NIOSH is open to considering this change. This change would amount to four months of subsurface exposure, and NIOSH would assign the remaining eight months as "remaining exposures" per the Technical Basis Document (TBD).

SC&A Finding 2: Welding prep resuspension factor

SC&A raised a concern (finding 2) in its 2019 (SC&A, 2019) and 2020 (SC&A, 2020b) reviews of welding and thorium activities that a resuspension factor of $10^{-3}/m$ may not be adequate to represent the dust generated by grinding and wire brushing to prepare a surface for welding. The work group members echoed this concern during the September 2, 2020, M&C Work Group meeting (M&C WG, 2020). To date, this issue has not been resolved. SC&A agrees that this is a "TBD issue" rather than an SEC issue [SC&A 2021a, PDF pp. 24, 25].

NIOSH Response to SC&A Finding 2

NIOSH believes a 10^{-3} resuspension factor is representative and bounding of work activities and conditions at M&C. Work activities are a distribution of actions in which the majority of resuspension factors in Table 3-1 of OTIB-0070 are sizably smaller (in most cases orders of magnitude smaller) than the proposed 10^{-3} resuspension factor.

Although NIOSH believes using a 10^{-3} resuspension factor is claimant favorable and bounding, we agree it is a TBD issue and not an SEC issue.

CONCLUSIONS AND RECOMMENDATIONS: EXPOSURE PATHWAYS

This section presents SC&A's exposure pathways conclusion and NIOSH's response.

SC&A Exposure Pathways Conclusion

With the modifications suggested in the finding and observation, SC&A believes internal and external doses from each maintenance exposure pathway can be bounded.

SC&A recommends NIOSH develop guidance for dose reconstructors that allows modification to the established occupancy factors if statements in the computer-assisted telephone interview or evidence in the energy employee's employment records suggest a different breakdown of work may be more appropriate. SC&A also recommends that NIOSH include guidance to help dose reconstructors prorate doses for partial years of employment. SC&A is unaware of any other AWE sites with many exposure pathways where precedent has been set for the treatment of partial years of employment. Developing guidance would help ensure partial years of employment are treated consistently in all M&C cases. SC&A recommends prorating all occupancy factors based on partial years of employment [SC&A 2021a, PDF p. 29].

NIOSH Response to SC&A Exposure Pathways Conclusion

When NIOSH finalizes our dose reconstruction method, we will include additional guidance on occupancy factors and assigning partial-year doses.

BACKGROUND AND DISCUSSION: DUST LOADING

At the March 18, 2021 meeting, the M&C WG tasked SC&A to evaluate the representativeness of NIOSH's dust loading values for M&C indoor and outdoor excavations as presented in NIOSH's January 21, 2021 paper *Response to Comments from the Metals and Controls Corp. Work Group Meeting Held on September 2, 2020* [NIOSH 2021] and the appropriateness of using the data as a generic default value for incorporation into ORAUT-OTIB-0070.

Note: Although NIOSH will use M&C to inform our modeling of similar Energy Employees Occupational Illness Compensation Program Act work, we agree with SC&A that "one size will not fit all." We will address this further during the next ORAUT-OTIB-0070 revision.

On October 25, 2021, NIOSH received SC&A's report *SC&A Commentary on NIOSH's Approach to Quantifying Outdoor and Indoor Airborne Dust Loadings* [SC&A 2021b]. This report provides SC&A's evaluation of the dust load model developed over many iterations in support of SEC-00236. Since SC&A and NIOSH have reached a general agreement regarding dust loading values, this response paper will briefly describe NIOSH's understanding of SC&A's review and attempt to clarify any remaining issues and concerns.

SC&A's review of NIOSH's dust load model included a statistical analysis of the supporting Mound data in determining the model's validity. Then SC&A independently calculated the 95th percentile to demonstrate they understood NIOSH's assumptions. Their result was "... modestly larger though reasonably similar to ..." [SC&A 2021b, PDF p. 11] the NIOSH value.

Additionally, SC&A noted, "... that this dust loading when applied at M&C makes no adjustment for background (ambient) levels of dust in the air, which adds an additional degree of conservatism to the calculation" [SC&A 2021b, PDF p. 11].

CONCLUSIONS AND RECOMMENDATIONS: DUST LOADING

Using the Board's surrogate data criteria, SC&A evaluated the model to determine if there were any surrogate data issues and noted the following: "SC&A deems the dust loading results of the Mound study to be scientifically plausible. This determination was made by analysis of the data obtained from the Mound study, which had a range consistent with values expected from excavation activities" [SC&A 2021b, PDF p. 13].

SC&A summarized several studies that address dust loadings and believes NIOSH should reference them as the basis for the dust loading of 212 $\mu\text{g}/\text{m}^3$ in addition to the Mound data.

SC&A also suggests NIOSH address enrichment/enhancement issues for dust loadings. This section presents SC&A's dust loading conclusion and NIOSH's response.

SC&A Dust Loading Conclusion

SC&A concludes that NIOSH's adoption of 212 $\mu\text{g}/\text{m}^3$ for estimating respirable outdoor dust loading during excavation activities is reasonable but not necessarily bounding. While SC&A's survey and interpretation of the data indicate that the suggested value of 212 $\mu\text{g}/\text{m}^3$ may not necessarily be sufficiently conservative for many excavation scenarios, a number of mitigating factors are also present at M&C that should be considered. First, the soil at M&C was likely moist. Second, the dust loading used for dose reconstruction at M&C covered the entire assumed time period of 2 months; i.e., the suggested exposure models are not trying to reconstruct short-term exposures, where dust loading might peak during active and aggressive excavation, but are making use of the dust loading for deriving inhalation exposures over a more protracted period of time [SC&A 2021b, PDF pp. 21, 22].

NIOSH Response to SC&A Dust Loading Conclusion

NIOSH intends to review the references provided by SC&A and incorporate them as appropriate. In addition, NIOSH will update our M&C models that utilize dust loads (i.e., Subsurface Inside, Subsurface Outside) to consider the impact of enhancement factors.

REFERENCES

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