

Superior Steel Co. Special Exposure Cohort (SEC-00247) Issues Matrix

Finding 1

Author, Date	Response
SC&A initial finding	<p>SC&A believes it is important to qualify the use of the Vulcan Crucible billing rate against the Board’s five surrogate data criteria. SC&A questions the selection of Vulcan Crucible and Steel as a data source used to support the SEC petition. Although the site was also an AWE that processed uranium metal, no rationale is given for why the site’s mill-hour billing rate is a reasonable substitute to SSC other than this is the site used in the TBD. It is unclear to SC&A what the impacts of process conditions, final mill product, and mill throughput have on final mill costs. Additionally, no information was provided to support the selection of this billing rate over other uranium processing facilities’ rates. In a cursory search for other facilities’ billing rates, SC&A identified Joslyn Manufacturing Company had a mill rate of \$88 per mill hour in 1948 (SRDB Ref. ID 11996, PDF p. 131). Use of this billing rate would increase the estimated number of mill hours by over 200 hours and is not bounded by the NIOSH “bounding” estimate of 500 hours per year.</p> <p>SC&A does note that the SEC bounding assumption of 500 hours per year is in conflict with the TBD bounding assumption of 800 hours per year.</p>
NIOSH response, October 2019	<p>Given that “SC&A concludes that doses to workers covered by the SEC petition can be reconstructed in a scientifically sound and claimant-favorable manner” (SCA-TR-2019-SEC003, p.5), NIOSH proposes that this finding be considered a Site Profile issue for tracking purposes.</p> <p>In the review of the ER for SEC-00247, SC&A states the Vulcan Crucible billing rate should be qualified for use in Superior Steel Co. exposure assessment. This surrogate billing rate is used to determine the number of uranium rolling hours in order to establish the occupancy rate, or exposure time from uranium rolling. As such, this information is used to develop a parameter for use in dose reconstruction. Therefore, it is “Type II” surrogate data, according to the Board’s 2010 “Criteria for the Use of Surrogate Data.” SC&A, in their review, uses the Board’s five surrogate data criteria to qualify use of this piece of information. Finding 1 is specific to the “Site or Process Similarities” criterion and SC&A found no issues with the other four criteria in the Board’s document.</p> <p>NIOSH agrees with SC&A that the billing rate should be reviewed and qualified for applicability to Superior Steel Co. NIOSH evaluates surrogate data in accordance with five criteria listed in Section 3 of “The Use of Data from</p>

Superior Steel Co. Special Exposure Cohort (SEC-00247) Issues Matrix

Author, Date	Response
	<p>Other Facilities in the Completion of Dose Reconstructions Under the Energy Employees Occupational Illness Compensation Program Act” (OCAS-IG-004). It is important to note the Board’s criteria are different than NIOSH’s criteria.</p> <p>To specifically respond to this finding, NIOSH evaluated the Vulcan Crucible Billing rate via the 5 criteria in the IG:</p> <p>1. Source Term</p> <p>Both Vulcan Crucible and Superior Steel rolled uranium billets. The source term, in this sense, is used only to determine the metal being processed to justify a comparable process for billing purposes.</p> <p>Note: the Vulcan Crucible source term is not used to determine air concentrations or other exposures at Superior Steel Co.</p> <p>2. Facility and Process Similarities</p> <p>This NIOSH criterion is similar to the specific Board Criterion discussed in finding 1.</p> <p>Vulcan Crucible was performing billet rolling (roughing and finishing work) into rods using five rolling machines. According to their contract, Vulcan Crucible was to roll at least two consecutive weeks out of a five-week period (a week is defined as six, nine-hour days) (SRDB 079177). Twenty percent of Vulcan Crucible total rolling time was AEC contract work (SRDB 006322). Vulcan Crucible utilized 25 employees to accomplish their rollings (SRDB 006321). Vulcan Crucible’s process involved:</p> <ul style="list-style-type: none"> • Uranium metal heated in a furnace; • Billets conveyed to roughing roll; • Billets passed through roughing roll twice; • Rods passed through a finishing roll; • Rods dragged to shears, cut and taken back to a quenching area for marking and descaling (brushing); and • Rods conveyed to receiving and shipping room. <p>The total time to heat and roll one billet was approximately 75 minutes (SRDB 008527).</p>

Superior Steel Co. Special Exposure Cohort (SEC-00247) Issues Matrix

The Superior Steel process involved:

- Uranium slab placed into salt bath then into a furnace;
- Slab craned to roughing mill table;
- Hot slab passed through roughing mill five times;
- Slab sent through brushing station;
- Slab sent to finishing stand;
- Slab cut to desired dimensions at shear station; and
- Slab rolled for storage or shipping purposes.

The total time estimate for the sequence is approximately one hour.

Although Vulcan Crucible turned slabs into rods and Superior Steel turned slabs into small slabs, these two processes are similar from a billing rate (payment per hour) consideration.

3. Temporal Considerations

The contract that gives Vulcan Crucible’s billing rate is dated 1948 and the Superior Steel contract covered 1952 to 1957. Therefore, they are both in the same era of operations.

Billing rates tend to increase over time; therefore, the billing rate in the 1950s would likely be higher than the billing rate in the late 1940s. The higher billing rate would result in a smaller number of milling hours. Therefore, the use of the earlier Vulcan Crucible billing rate is considered claimant-favorable.

4. Data Evaluation

This criterion doesn’t directly apply, as the IG discusses review of the quality of exposure data (i.e., “Type I” surrogate data as defined in the Board Criteria) and monitoring data from Vulcan Crucible is not being used. The surrogate data in question is the billing rate.

Because the data in question is the billing rate, NIOSH considers the “data evaluation” criterion to involve reviewing other available billing rates. In Finding 1, SC&A questioned the choice of the Vulcan Crucible billing rate over other facilities’ billing rates and found that no information was provided to support that choice. Therefore, the evaluation of this criterion provides a response to that part of the Finding.

Superior Steel Co. Special Exposure Cohort (SEC-00247) Issues Matrix

Author, Date	Response
	<p>Extensive SRDB, OSTI, and Google searches were performed for the years 1949 to 1969 with search terms “rolling rates, hours milling, pieces per...”, “Rolled uranium”, “Rolled thorium”, “Rolling uranium”, “Rolling thorium” for the following sites:</p> <ul style="list-style-type: none"> • Aliquippa Forge • Allegheny-Ludlum Steel • Bliss & Laughlin Steel • Brush Beryllium Co (Detroit) • Carpenter Steel Co • Fernald • Hanford • Joslyn Manufacturing and Supply Co, and • Simonds Saw and Steel Co <p>[Note: NIOSH is still awaiting responses on 3 data requests. If additional pertinent information is captured, NIOSH will share it with the work group.] These searches returned 3 potential billing rates in addition to the Vulcan Crucible billing rate.</p> <p>In 1952, Simonds Saw and Steel had a billing rate of \$110.53 per rolling hour (SRDB 11996, page 32). The number of mill-hours calculated using this billing rate and FY1957 payment is comparable to the assumed 500 mill-hours, determined using the Vulcan Crucible billing rate.</p> <p>In a letter dated February 26, 1948, Joslyn Manufacturing was stated as providing a rate of \$0.265/pound (SRDB 11996, page 129) equating to approximately \$450.00/rolling hour. However, this rate was quoted to roll rods from 4.25” round down to approximately 1.5” round and it would be imperative that the temperature not exceed 650° at any time during the operation. This surrogate billing rate was not used due to the different processes and controls taking place, which were likely driving the cost up. Also note, this higher billing rate would have resulted in less exposure hours.</p> <p>In their review, SC&A references a billing rate of \$88.03 per hour for Joslyn Manufacturing Company (SRDB Ref. ID 11996, PDF p. 131). Further review of the reference revealed that this estimate is for the Simonds Company mill costs and equates to 11 cents per pound. Simonds then indicates that they will consider a possible bid at cost +10%</p>

Superior Steel Co. Special Exposure Cohort (SEC-00247) Issues Matrix

Author, Date	Response
	<p>or \$96.83 per hour. However, Simonds chose not to take the work, due to the strict medical and security requirements. Therefore, the hourly rate in this reference was not implemented. Because this rate was not implemented, it is not a good candidate as a surrogate billing rate.</p> <p>Modification #5 to the Superior Steel contract, effective July 1955, was located during a data capture (SRDB 174312). This contract details an increase in the rolling rate to \$1.01 per pound plus details payment rates for additional services that may be performed on the slabs: (1) \$0.030 per pound for inspection after pickling and before shipment to heat treating facility, (2) \$0.050 per pound for inspection of flats before planing, and \$0.055 per pound for Beta treating the slabs. If all additional services are provided, the total rate per pound is \$1.145.</p> <p>5. Review of Bounding Exposure Scenario</p> <p>Since the surrogate data in question is not exposure data (Type I), this criterion doesn't directly apply. However, for this evaluation NIOSH reviewed the conservatism included in the calculation of the uranium mill-hours, as proposed in the ER, and compared this to other information available that can inform the number of mill-hours.</p> <p>The total amount paid to Superior Steel over the contract was \$356,849 (SRDB 16488). Based on contract payments for 1954 through 1957, the highest annual payment was \$217,246 in FY1956. Data for the remaining years indicate payments ranging from \$17,658 (FY 1955) to \$54,632 (FY 1957). There is no evidence that the production rate in 1956 was different from other years. In addition, Modification #5 to the contract (SRDB 174312) Schedule A shows that Superior Steel Co. was approved to receive funds for equipment. Given the dates of this contract modification, it is likely these purchases would have taken place in 1956, which could explain the large payment to Superior Steel Co. in that year.</p> <p>Using the Vulcan Crucible billing rate of \$132 per mill-hour and the FY1957 payment of \$54,632, the number of Superior Steel Co. mill hours would be approximately 414 mill-hours for FY 1957. For the proposed ER approach, this number was rounded up to 500 mill-hours of exposure to be assumed for all years as a bounding assumption for the number of uranium mill rolling hours. This equates to 500 hours internal exposure and 500 hours external exposure for rolling activities. Additional internal exposures are assumed per settling and resuspension during non-uranium rolling and additional external exposure hours are assumed from contamination and during storage of the material and scrap on site (see discussion in Observation #3).</p>

Superior Steel Co. Special Exposure Cohort (SEC-00247) Issues Matrix

Comparison to Other Available Information

Rolling Information in Table 7-1

Table 7-1 in the ER shows, conservatively, there were 16 rolling days in the approximately 3 years of rolling data represented in the table. Doubling this number to account for 6 years of work yields 32 rolling days over the contract. Assuming 10 hours per rolling day provides a total of 320 total hours *over the contract* or an average of approximately 54 hours per year = 6 days per year.

Modification #5 to Superior Steel Co. Contract

Modification #5 to the Superior Steel Co. contract, effective July 1955, was located during a data capture (SRDB 174312). This contract details an increase in the rolling rate to \$1.01 per pound plus details payment rates for additional services that may be performed on the slabs: (1) \$0.030 per pound for inspection after pickling and before shipment to heat treating facility, (2) \$0.050 per pound for inspection of flats before planing, and \$0.055 per pound for Beta treating the slabs. If all additional services are provided, the total rate per pound is \$1.145.

Assuming the amount paid to Superior Steel Co. over the entire contract (\$356,849) was paid for mill time and that only rolling was performed (use the rolling rate of \$1.01 per pound), Superior Steel rolled approximately 353,316 pounds of uranium. Using the slab weight data available in Table 7-1 of the ER, the average slab weights ranged from 216 pounds to 599 pounds (overall average of 272 pounds) and Superior Steel could roll approximately 25-30 slabs in a day. Using this information and the total pounds rolled calculated above, the total number of calculated rolling days is approximately 51 days *for the entire contract*. This is substantially lower than the current TBD's 800 hours per year (80 days per year) and lower than the proposed 500 hours per year (50 days per year) in the ER.

CONCLUSION

Though the exact Superior Steel Co. contract was located, the billing rate is quoted per pound. Unfortunately, there is limited information available regarding the typical weights per slab or typical weight processed in a day or year. Therefore, in order to use the billing rate specific for Superior Steel Co., additional assumptions regarding these variables are required. Given the uncertainty in these additional assumptions, that use of these assumptions drastically reduces the number of rolling hours, and that the Vulcan Crucible billing rate was evaluated and qualified as a surrogate (via the review of surrogate data above), NIOSH stands by the use of the Vulcan Crucible billing rate to determine the uranium rolling hours, as proposed.

Superior Steel Co. Special Exposure Cohort (SEC-00247) Issues Matrix

Author, Date	Response
<p>SC&A response, January 2020</p>	<p>SC&A and NIOSH agree that annual milling hours can be bounded at Superior Steel. However, in light of the discovery of Modification #5 to the Superior Steel Co. contract (SRDB 174312), SC&A believes the NIOSH response requires discussion with the work group. Using the Board’s hierarchy of data criterion, the known billing rate at Superior Steel Co. should take precedence over all surrogate site billing rates (even if it results in a lower dose estimate).</p> <p>Using the following assumptions, SC&A calculates an annual bounding number of mill hours to be approximately 25 days per year.</p> <ul style="list-style-type: none"> • Billing rate: \$1.01/lb (assuming no additional services, which could add \$0.145/lb; presumably, earlier billing rates were lower) • Slab weight: 216 lbs (smallest known weight) • Slabs processed per day: 25 • Milling hours per day: 10 • Highest billing year: 1956 – \$138,246 (\$217,246 less \$79,000 estimated schedule A reimbursable expenses with no credit taken for the slab furnace) <p>SC&A’s calculation using these assumptions is as follows:</p> <p style="padding-left: 40px;">\$138,246 / (\$1.01/lb) = 136,877 lbs/year maximum</p> <p style="padding-left: 40px;">216 lbs/slab × 25 slabs/day = 5,400 lbs/day</p> <p style="padding-left: 40px;">136,877 lbs/year / 5,400 lbs/day = 25.3 days/year maximum, or 253 hours per year</p> <p>SC&A acknowledges that different assumptions would modify this calculation; however, these assumptions are believed to place a plausible upper bound on the number of hours milling occurred on site. This result is roughly half the NIOSH estimate based on a surrogate billing. The NIOSH response states that, using the total contract billings, they calculated “approximately 51 days <i>for the entire contract.</i>” This comparison shows that the conditions modeled using the Vulcan Crucible billing rate are bounding but not plausible.</p>

Superior Steel Co. Special Exposure Cohort (SEC-00247) Issues Matrix

Author, Date	Response
Work group discussion, February 4, 2020	The work group broke this finding into two parts; 1A, the SEC component; and 1B, the TBD component. Based on the discussion, the work group decided that it is possible to reconstruct doses at Superior Steel and closed finding 1A. The work group preferred the use of real site data and requested NIOSH sharpen the existing model by taking into account the range of parameters observed at the site.
NIOSH response, March 2020	NIOSH issued a response on March 19, 2020, that is available on the CDC website at https://ftp.cdc.gov/pub/FOIAREQ/180219-508.pdf .
SC&A response, March 2021	<p>In its March 19, 2020, response, NIOSH presents the results of a simulation of potential annual rolling times using site-specific data and the equation specified in SC&A’s January 2020 response. NIOSH proposes using the 95th percentile of the simulation, 267 rolling hours. SC&A interprets this to mean that NIOSH is proposing to assume 267 rolling hours per year for each year of the AWE covered period. This value is close to the value (253 hours per year) proposed by SC&A in its January 2020 response.</p> <p>SC&A initially attempted to reproduce the results presented in the NIOSH March 19, 2020, response and calculated similar but modestly different values. SC&A requested that NIOSH provide documentation supporting the NIOSH calculation. On January 29, 2021, NIOSH provided SC&A with documentation in the form of R code and CSV files. SC&A reviewed the supporting documentation and found that minor differences in modeling and the selection of the random number seed value were responsible for the discrepancy. SC&A evaluated each of the model components independently as a means of accessing the quality of the overall model.</p> <p>Annual Payments</p> <p>NIOSH randomly sampled with replacement from the four known annual payments: \$46,294, \$38,677, \$138,246, and \$54,632. These payments correspond to payments made in 1954, 1955, 1956, and 1957 (as of 6/30/1957). SC&A verified that SRDB 16488 reflects these payments, with a modification to the 1956 value of \$138,246 (\$217,246 less \$79,000 estimated “schedule A” reimbursable expenses with no credit taken for the slab furnace (SRDB 174312)). The payments represent the only known payments in support of the contract. Although the years 1952 and 1953 have no known payments, it is likely payments in the subsequent years include compensation for work done in these years because the annual known payments sum to the known contract expenditure. Further, there is no evidence that suggests that the production rate in the earlier years was higher than the documented years; therefore, SC&A believes it is reasonable to use known payments to estimate earlier production.</p>

Superior Steel Co. Special Exposure Cohort (SEC-00247) Issues Matrix

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	<p>Cost per Pound</p> <p>The NIOSH model assumes a constant billing rate of \$1.01 per lb of uranium at receipt. This value comes from Modification 5 to the Superior Steel Co. contract that was effective on July 1, 1955. It assumes no additional services were provided, which could add an additional \$0.135/lb. Use of \$1.01 per lb without adjustments is claimant favorable because it is not known to what extent these services were performed, and inclusion of additional services would reduce the estimate of total uranium rolled annually and, by extension, total hours rolled. Although earlier contract modifications are not available, it is likely this billing rate is greater than previous billing rates.</p> <p>Number of Slabs Rolled</p> <p>To model the number of slabs rolled per day, NIOSH used the values in table 1 of their March 2020 response. NIOSH assumed the data represent a triangular distribution with a minimum equal to the smallest number of slabs known to be rolled per day (10), a maximum equal to the maximum known slabs rolled per day (50), and an average equal to the weighted average of the table (28.14).</p> <p>SC&A reviewed the information in table 1 and found it to be comprehensive of the known number of slabs rolled in a day. SC&A notes that reference SRBD 132695, which pertains to the maximum 50 slabs, may refer to multiple days of rolling. Although the rolling is referred to as the “August 3rd rolling” in the record, the times associated with the rolling seem to indicate the rollings were done over several days. There is minimal text accompanying this record to aid with interpretation. Lacking definitive proof that the rollings were done on multiple days, it is reasonable to assume they occurred on a single day. If this value was removed from the simulation, a decrease in annual rolling hours would be expected.</p> <p>Given the modest number of data points supporting the modeling, SC&A believes the triangular distribution assumption is appropriate. Random numbers pulled from this distribution were appropriately applied to the model.</p> <p>Daily Rolling Time</p> <p>NIOSH assumed a constant 10 hours rolling time. No clear documentation could be located indicating the number of hours spent rolling on a given day. Presumably, the time spent rolling on any given day was correlated to the quantity and volume of material processed in that day. The model assumes that the number of rolling hours is not impacted by throughput. This adds a layer of conservatism to the model.</p>

Superior Steel Co. Special Exposure Cohort (SEC-00247) Issues Matrix

Author, Date	Response
	<p>SC&A notes that contract Modification 5 stipulated that no one supporting the contract be permitted to work in excess of 8 hours unless they were “compensated for all hours worked in excess of eight hours per day at not less than one and one-half times the basic rate of pay.” SC&A believes this may have incentivized completing work within an 8-hour day; however, no definitive evidence could be identified supporting how long was spent rolling. Lacking conclusive evidence, SC&A believes that the assumption of a constant 10 hours per day is appropriate and is consistent with the assumptions made for other AWE facilities.</p> <p>Average Slab Weight</p> <p>NIOSH used the data from table 2 of its March 2020 response to model average daily annual slab weights. Only total weights and total number of slabs are available for the 56 groupings of slabs that NIOSH used to calculate an average slab weight for each grouping. NIOSH fit the average slab weight values for the 56 groupings to a lognormal distribution with a geometric mean of 234.2 and a geometric standard deviation of 1.073. The fitted distribution was then sampled from within the simulation. SC&A evaluated the QQ-plot included with the R coding and found that the plot indicates that the data follow a lognormal distribution with a high degree of right skew. This indicates that while the majority of values can be modeled by a lognormal distribution, the higher values will deviate from the model.</p> <p>When evaluating how the fitted distribution performed in the simulation, SC&A noted that the sampled values have a minimum of 169.4 and a maximum of 325. The original data distribution has a minimum of 198 and a maximum of 533. Six of the original 56 averages fall outside of the range represented in the simulation. These six averages represent 70 slabs (approximately 12 percent) that fall outside of the range modeled by the fitted distribution. This was somewhat predicted by the highly right skewed nature of the average slab weight at receipt data. Although this discrepancy initially seems problematic, especially for the upper end of the model, it is important to keep in mind what the slab weights used in the modeling represent: the average slab weights at receipt. They are being used as a surrogate to represent the average slab weight rolled daily over the course of a year. From the Central Limit Theorem, it is known that irrespective of the distribution of the population of slabs, the distribution of sample means (average annual slab weights) should approach normality. Averaging the averages of slab groupings will converge on a more normal distribution, thus effectively eliminating the high and low individual slab weight values from the model.</p>

Superior Steel Co. Special Exposure Cohort (SEC-00247) Issues Matrix

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	<p>As a cursory test of the NIOSH modeling, SC&A simulated slab weight data for each line in table 2 assuming (1) the weights follow a normal distribution, (2) the number of slabs simulated is equal to the number of slabs, and (3) the mean of the normal distribution is equal to the total weight at receipt divided by the number of slabs with a standard deviation of 5. This produced a simulation representing the 606 slabs from the available slab data. Then SC&A sampled repeatedly from this distribution, with the sample sizes following the triangular distribution that NIOSH used for the number of slabs per day modeling. This resulted in average daily rolling weights ranging from 214 to 341 pounds with a mean of approximately 253 pounds. This suggests that the range of possible average daily rolling weights is reasonably approximated by the NIOSH model.</p> <p>Conclusion</p> <p>NIOSH’s March 2020 response suggests that the possible annual rolling hours range from 14.4 to 691.3 hours; however, the simulation actually predicted a range of 26.1 to 715.6 hours. The primary reason for this discrepancy can be traced to the simulated values of the average slab weight. The differences in these values is modest and reasonable given the many uncertainties in the data.</p> <p>SC&A believes the NIOSH-modeled 95th percentile value of 267 rolling hours is a bounding value for all years of AWE operations. In analyzing the NIOSH model, SC&A finds it does a reasonable job of estimating the possible range of rolling hours in any given year of AWE operations. SC&A recommends closure.</p>

Observation 1

Author, Date	Response
SC&A initial observation	<p>New approach to bounding source term using contract billings.</p> <p>To SC&A’s knowledge, bounding the source term has not been done based on contract billing in combination with another site’s billing rate in the manner that it is being done here. SC&A believes the Board needs to weigh in on the acceptability of this use.</p>

Superior Steel Co. Special Exposure Cohort (SEC-00247) Issues Matrix

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<p>NIOSH response, October 2019</p>	<p>To clarify, NIOSH used the Vulcan Crucible billing rate to calculate the number of uranium rolling hours from the Superior Steel contract payments. The number of uranium rolling hours gives the occupancy rate (i.e., exposure time); it is not used to bound the source term.</p> <p>The source term for Superior Steel Co. is based on the AEC contract (i.e., the initial bid was for uranium rolling) and other AEC process documents (e.g., memos regarding shipments of material, technical reports). For internal dose, the intake rate is calculated based on the air sampling results from the HASL air-sampling campaigns performed during four uranium rollings at Superior Steel Co. For external dose, the ER proposed to use the external dose rate for uranium rolling exposures provided in Battelle-TBD-6000.</p> <p>As NIOSH sees it, the occupancy rates (i.e., exposure time) are determined by the information available for a site. The approach taken here is a defensible approach because Superior Steel Co. was on a cost-plus-fixed-fee contract with AEC, meaning they would have been paid based on the work performed. The assumption that the entire payment to Superior Steel was made for mill hours is claimant-favorable because these payments could include equipment upgrades (i.e., documentation shows Superior Steel made requests for additional equipment from AEC) and other payments (e.g. indirect administrative costs and awards of extra compensation) not directly related to milling time. However, the assumption made is that the entire payment is for milling time alone.</p> <p>Reviewing the rolling information supplied in Table 7-1 of the ER, there were 16 rolling days in the approximately 3 years of rolling data represented in the table. Doubling this number to account for 6 years of work yields 32 rolling days over the contract. Assuming 10 hours per rolling day provides a total of 320 total hours over the contract. See also discussion in Finding 1. Therefore, NIOSH upholds that the estimate of 500 rolling hours per year is conservative and bounding.</p>
<p>SC&A response, January 2020</p>	<p>No response necessary; however, resolution of finding 1 has a bearing on the resolution of this observation discussion.</p>
<p>Work group discussion, February 4, 2020</p>	<p>The work group left this item in progress.</p>

Superior Steel Co. Special Exposure Cohort (SEC-00247) Issues Matrix

Finding 2

Author, Date	Response
SC&A initial finding	<p>SC&A finds insufficient evidence to support splitting the data into pre- and post-1955 survey distributions. Evidence suggests that the May 1955 sample results may not be representative of the typical working air concentrations at the site because they represent a theoretically small point in time where engineering controls reduced airborne contamination. The reductions in air concentrations seen by the introduction of man-cooling fans and additional ventilation appear to have been largely offset by the introduction of slab brushing in the September 1955 survey. Lacking evidence of additional engineering controls implemented after the introduction of slab brushing, SC&A does not believe that limiting the post-1955 distribution to just 1955 data bounds potential air concentrations in later years.</p>
NIOSH response, October 2019	<p>Given that “SC&A concludes that doses to workers covered by the SEC petition can be reconstructed in a scientifically sound and claimant-favorable manner” (SCA-TR-2019-SEC003, p. 5), NIOSH proposes that this finding be considered a Site Profile issue for tracking purposes.</p> <p>As this finding states, SC&A found “there was insufficient evidence to support splitting the data into pre- and post-1955 survey distributions.” (SCA-TR-2019-SEC003, p.14) In addition, “SC&A does not believe that limiting post-1955 distribution to just 1955 data bounds potential air concentrations in later years.” (SCA-TR-2019-SEC003, p. 15)</p> <p>On June 21, 2019, NIOSH requested to see the data analysis and method used by SC&A for this conclusion. NIOSH received and reviewed the SC&A air sample data analysis. In reviewing the information provided, NIOSH found that SC&A made an error in the development of the box plots presented in their ER review. This was specifically due to a problem with the default action of the function used when a plot is zoomed and resulted in not all of the air sampling data being included in their box plots.</p> <p>Since box plots are only a visual test of whether data distributions are similar, ORAUT performed hypothesis tests to compare the datasets. A summary of this analysis is below:</p> <p>Four sets of air monitoring data were found for Superior Steel; 5/13/1953, 8/3/1953, 5/9/1955, and 9/19/1955. In each set of raw data values located, a subset in each was excluded due to the data not being representative of operational data:</p>

Superior Steel Co. Special Exposure Cohort (SEC-00247) Issues Matrix

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	<ul style="list-style-type: none"> • 5/13/1953 – 28 data values were located but five were excluded because they were taken during pre-rolling, i.e., no slabs were being processed. Four sets of data were excluded because they appear to be a reiteration of the average values for the finishing areas. Therefore, there were 19 samples used from the May 1953 dataset. • 8/3/1953 – 36 data values were found and all are considered representative of operational data. • 5/9/1955 – 61 data values were located but 10 were excluded because they were labeled as background readings and therefore not considered operational data; leaving 51 data values for analysis. • 9/19/1955 – 46 data values were located but five were marked as being taken during lunch and therefore were not considered as operational data, leaving 41 data values for analysis. <p>This statistical review demonstrated that the May 1955 dataset is not from the same distribution as the other three datasets. Visually it appears lower. Since the data doesn't demonstrate a sustained decrease in air concentrations (i.e., September 1955 is from the same distribution as the May and September 1953 dataset) and the Superior Steel Co. references don't provide strong evidence engineered controls had been installed prior to the May 1955 sampling, NIOSH proposes to remove this data from the intake analysis as not representative.</p> <p>NIOSH would combine the remaining 3 data sets (i.e., May 1953, September 1953, and September 1955) to determine intake rates that would be applied for the entire exposure period. In-line with the approach in TBD-6000, separate intake rates would be determined by job title (i.e., operator, general laborer, supervisor, and clerical).</p>
SC&A response, January 2020	NIOSH performed a statistical test and agrees with SC&A's suggestion to remove the May 1955 sampling data and combine the remaining three sampling dates. SC&A recommends the Board accept the modified approach.
Work group discussion, February 4, 2020	The work group agreed with the suggestion to remove the May 1955 data and closed the finding.

Superior Steel Co. Special Exposure Cohort (SEC-00247) Issues Matrix

Observation 2

Author, Date	Response
SC&A initial finding	<p>There is a sound basis to use some fraction of the uranium concentration as the basis for the thorium concentration; however, SC&A notes that use of a one-to-one ratio could be important for consistency. This ratio is considerably more claimant favorable than the 10 percent assumption. The approach used here could establish a precedent that might require NIOSH to revisit previous ERs that use a lower ratio.</p> <p>For the reasons noted in finding 1, SC&A does not support isolating the 1955 HASL studies from the 1953 studies. SC&A notes that resolution of that issue will have a direct impact on the thorium internal dose reconstruction.</p>
NIOSH response, October 2019	<p>NIOSH disagrees that the approach used for Superior Steel is inconsistent with the approach used at other sites.</p> <p>In the case of Bridgeport Brass, the 10% ratio is applied because both uranium and thorium were being processed at the same time (i.e., milling time is assumed to be overlapping). See page 13 of ORAUT-TKBS-0030 Rev 02 for a discussion of the determination of the 10% by mass, and Tables 3-6 and 3-8 for the applicable date ranges for the uranium and thorium intakes respectively.</p> <p>The Bridgeport Brass air mass load is being divided based on the total mass of uranium and thorium material that was concurrently processed during a given time. This approach can be thought of as splitting or proportioning the alpha result for the air sample based on the proportion of thorium work to uranium work. This would need to be done because the air sampler would have been running during both thorium rolling and uranium rolling activities. Therefore, the total alpha result for the air sample would represent concurrent thorium and uranium intakes. Note the typical alpha analysis performed on air samples would not be able to distinguish the thorium from uranium directly to report these separately.</p> <p>In the case of Superior Steel, the uranium and thorium metals were processed during separate periods (i.e., thorium rolling was not performed during the HASL air-sampling campaigns, only uranium rolling occurred). Therefore, the air sample alpha result is only due to uranium contamination.</p> <p>The proposed Superior Steel approach assumes that the generation rate of airborne contamination (and therefore the air sample mass load) calculated from the HASL air sample results from uranium rollings at Superior Steel is applicable to thorium rollings at Superior Steel. The air mass load for uranium is assumed to be the same for the</p>

Superior Steel Co. Special Exposure Cohort (SEC-00247) Issues Matrix

Author, Date	Response
	<p>thorium operations because it was stated that Superior Steel would use the same procedures (SRDB 75651, License No. C-3480).</p> <p>Note: This same assumption (i.e., that the uranium airborne contamination generation rate during milling is the same as the thorium airborne contamination generation rate during milling) is applied in the Bridgeport Brass approach, but is not directly stated as so.</p>
<p>SC&A response, January 2020</p>	<p>After review of the NIOSH response, SC&A understands the need for the 10% assumption at Bridgeport Brass. This assumption is not applicable at Superior Steel because the materials were not processed simultaneously. Measured air concentrations from the HASL studies could not have contained thorium because they were done prior to thorium licensing. SC&A recommends closing the observation.</p>
<p>Work group discussion, February 4, 2020</p>	<p>The work group appreciated the expanded explanation and closed the observation.</p>

Observation 3

Author, Date	Response
<p>SC&A initial finding</p>	<p>SC&A finds this storage time assumption to be inadequate to capture the length of time material was likely found on site. If the site milled uranium metals for 500 hours per year, then it is reasonable to assume 10-hour milling once per week. For the 250 pre-rolling and 250 post-rolling hours, assumption to hold true, uranium metals would have to arrive on the day before rolling and be shipped off-site the day following rolling. Table 7-1 in the NIOSH SEC ER shows that the site regularly had more than a single day's rolling in inventory. Additionally, during the April 2019 Board meeting, the petitioner indicated that scrap material was stored on-site for extended periods of time post rolling.</p>

Superior Steel Co. Special Exposure Cohort (SEC-00247) Issues Matrix

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NIOSH response, October 2019	<p>In light of the April 2019 ABRWH petitioners’ comments and additional review of applicable reference documents, NIOSH has re-evaluated the amount of onsite storage time associated with the uranium source materials and scrap metal.</p> <p>NIOSH proposes to change the exposure time assumptions for stored material from 500 hours per year to year-round, minus rolling time, for the entire operational period (i.e., from June 1952 through the end of the contract in November 1957).</p>
SC&A response, January 2020	<p>SC&A finds NIOSH’s proposed modified storage time assumption to be consistent with the likely storage conditions on site. SC&A notes that the rolling time assumed will be affected by the resolution of finding 1. SC&A recommends the Board accept the modified approach.</p>
Work group discussion, February 4, 2020	<p>The work group was satisfied with the changes made to the storage time assumption and closed the observation.</p>

Observation 4

Author, Date	Response
SC&A initial finding	<p>Despite the claimant favorability of the assumption, SC&A questions the decision to assume annual medical examinations in spite of a lack of evidence. In recent years, the Board has made a concerted effort to improve consistency between sites. It is unclear if all AWE sites with no evidence of examinations receive the same claimant-favorable assumptions.</p>

Superior Steel Co. Special Exposure Cohort (SEC-00247) Issues Matrix

Author, Date	Response
<p>NIOSH response, October 2019</p>	<p>For occupational medical X-ray dose reconstruction, NIOSH uses the guidance provided by ORAUT-OTIB-0006 Rev. 05, <i>Dose Reconstruction from Occupational Medical X-Ray Procedures</i>, which provides default assumptions when evidence is lacking. With regards to chest X-rays, ORAUT-OTIB-0006 states, “In the complete absence of information about a site’s chest X-ray screening protocol and standard projections (including the lack of X-ray records in the claim files), a pre-employment, annual, and termination PA radiographic chest X-ray should be assumed” (p. 25). Therefore, with a lack of X-ray protocol information and a lack of X-ray records in the claimant files for the Superior Steel Co., this default applies.</p> <p>An additional consideration for whether to assign occupational medical dose is the physical location of where the X-ray examination occurred. To determine the location where the X-rays were performed, NIOSH uses the guidance provided by ORAUT-OTIB-0079 Rev. 02, <i>Guidance on Assigning Occupational X-Ray Dose Under EEOICPA for X-Rays Administered Off-Site</i>, which states that when neither historical documentation nor claim file records provide information about where the occupational X-rays were taken, dose reconstructors should assume occupational medical X-ray exposure occurred at the covered facility where the energy employee worked. Therefore, with a lack of evidence regarding where X-rays were taken, the default assumption that occupational medical X-rays occurred on-site is applied for Superior Steel Co.</p> <p>NIOSH welcomes examples from SC&A regarding its inconsistent application of this guidance for other AWE sites.</p>
<p>SC&A response, January 2020</p>	<p>As identified in the SC&A review, SC&A is aware of the applicable guidance in ORAUT-OTIB-0006 and ORAUT-OTIB-0079. SC&A’s concern is tied to the <i>consistent</i> application of this guidance at each of the roughly 200 AWE facilities. To further investigate, SC&A sampled 10 AWE reviews completed by SC&A for the Subcommittee for Dose Reconstruction Reviews and found that each of these reviews followed the approach consistent with the recommendations in this SEC. Many of these reviews were overestimating claims, which typically assume an annual scan as an efficiency measure and may not be a strong indicator of assumptions in a best-estimate claim. Additionally, SC&A has only evaluated claims at roughly a quarter of the AWE covered facilities. A more thorough investigation into this concern would require further tasking by the Board.</p>
<p>Work group discussion, February 4, 2020</p>	<p>The work group was satisfied with the response and closed the observation.</p>