Carborundum Work Group

SEC Petition 00223 Recommendations

ABRWH Meeting

Naperville, IL

March 2017

Work Group Members

- Genevieve S. Roessler, Chair
- Bradley P. Clawson
- R. William Field
- John W. Poston, Sr.

Carborundum Company

- Located in Niagara Falls, New York
- Atomic Weapons Employer: June –Sept. 1943, 1959–1967
- Residual Radiation: 1943–1958, 1968–1992

EEOICPA Facility Listing

- **June – Sept. 1943:** “In June of 1943, the Carborundum Company at its Globar Plant and Buffalo Avenue locations performed experimental grinding of uranium metal using a centerless grinder. Uranium slugs were received in June and return shipped in September 1943.”

EEOICPA Facility Listing

- **1959 through 1967:** Carborundum manufactured uranium and plutonium carbide pellets for an AEC research program.

- Carborundum also performed work during the 1950s that is not covered under EEOICPA, including the fabrication of nuclear fuel elements for commercial purposes.

Proposed and Evaluated SEC Class

- Petitioner-requested class definition:

  "All employees who worked in any area of the Carborundum Company facility on Buffalo Avenue, Niagara Falls, NY, from January 1, 1943 through December 31, 1976."

- Note: Because there are no identified dose reconstruction infeasibilities for the site, NIOSH limited its evaluation to the petitioner's class period from 1943 through 1976, rather than to 1992, the end of the residual period.

Feasibility Summary

June – Sept. 1943 and 1959-1967 (operational periods) 1943-1958 and 1968-1976 (residual periods)		
Source of Exposure	**Feasible**	**Not Feasible**
Internal	Yes	
External	Yes	

SC&A Findings on Use of Surrogate Data from TBD-6000

- **Intakes of Uranium Aerosols: First Operational Period**
  - Airborne activity concentrations: assumed arithmetic mean
    - BZ = 20,192 vs. 13,000 dpm/m^3 (Harris and Kingsley 1959)
  - Satisfy ABRWH criteria?
    - Hierarchy of data ✓
      - No site-specific airborne dust measurements for uranium machining operations at Carborundum
    - Exclusivity constraint ✓
    - Site and process similarities ✓
      - Centerless grinding at both sites
      - No ventilation at either site
    - Temporal considerations: different time frames, but
      - Centerless grinding at both sites ✓
      - No ventilation at either site ✓
    - Plausibility ✓
      - Values comparable within variability and uncertainty
  - Conclusion: surrogate data on uranium intakes satisfy all five ABRWH criteria

SC&A Findings on Use of Surrogate Data from TBD-6000

- **External Exposure to Uranium Metal**
  - Actual source terms
    - 1st operational period: 13.6 kg of natural uranium metal slugs on site
    - 2nd operational period:
      - Carborundum requested 4.5 kg of uranium shot
      - Produced batches of 30 g to 2.7 kg
  - NIOSH used MCNP model of 477-kg uranium ingot
  - Satisfy ABRWH criteria?
    - Hierarchy of data ✓
    - Exclusivity constraint: other source terms available **X**
    - Site and process similarities: major differences in source terms **X**
    - Temporal considerations: computer model not time dependent **N/A**
    - Plausibility: major differences in actual and modeled source terms **X**
  - Suggested resolution of discrepancies
    - 1st period: Use modeled dose rate from 7 slugs (total mass = 14 kg)
    - 2nd period: Use modeled dose rate from uranium plate (mass = 3.1 kg)
  - Not an SEC issue: other source terms available in TBD-6000

SEC Petition 00223

- Carborundum Work Group reported results of the review of the petition and NIOSH evaluation to the Board on November 30, 2016.
  - SC&A identified seven Issues, some closed by the Work Group and others identified as site profile issues.
  - SC&A also identified Issues with the NIOSH selection of dose rates from surrogate data for uranium work, also considered site profile issues.
- Work Group concluded that with appropriate adjustments, NIOSH can indeed reconstruct doses for the proposed SEC Class, and the Work Group moved that the SEC petition be denied.

Board Discussion of Motion

- The Board referred the surrogate data and site profile issues back to the Work Group for resolution.
  - Need to develop a new set of surrogate data from TBD-6000
  - Can criteria be met for this site?
  - Need an example of dose reconstruction
  - Need to make sure site profile issues aren't actually SEC issues
- Work Group met March 13, 2017 to discuss NIOSH resolution of site profile Issues, and the SC&A review of those resolutions.

NIOSH Resolution of SC&A Findings on Use of Surrogate Data from TBD-6000

- **External Exposure to Uranium Metal: Updated Methods to Estimate External Dose**
  - 1st operational period
    - Used dose rates in TBD-6000 for a uranium slug
    - Multiplied by ten to allow for dose from an array of the ten slugs that were handled at Carborundum
    - Modeled slugs only slightly larger than Carborundum slugs
  - 2nd Operational period
    - Used dose rates in TBD-6000 for a uranium plate
    - Similar to largest batches processed at Carborundum
  - Revised dose estimates resolves source term discrepancies for ABRWH surrogate data use criteria

SC&A Review of Surrogate Data Issues

- **First AWE Period**
  - NIOSH provided updated external doses from uranium slugs in 1943 from a more appropriate exposure geometry provided in TBD-6000.
  - SC&A concurred with the photon doses and commented that the beta doses may be overestimated.
  - Beta dose rates discussed. SC&A agreed with the NIOSH rationale for beta dose estimates.
  - Work Group agreed that doses can be estimated with sufficient accuracy.

SC&A Review of Surrogate Data Issues

- **Second AWE Period**
  - NIOSH provided updated external doses from uranium materials used in 1959 - 1967 from a more appropriate exposure geometry provided in TBD-6000.
  - SC&A agreed with the photon doses but commented beta doses may be underestimated based on a modeled one foot beta dose rate.
  - NIOSH pointed out TBD-6000 beta dose rates incorporate actual measured whole body beta dose rates as a function of one foot photon dose rates.
  - SC&A agreed that the resolution of the approach on this is a site profile issue.
  - Work Group agreed that beta dose rate can be estimated with sufficient accuracy.

SC&A Review of Dose Reconstruction Issues and Observations

- **MCNP Simulations of External Dose from Plutonium Glovebox Work**
  - SC&A provided comments on glovebox geometry and other input parameters used in estimating external dose from plutonium-bearing materials used in 1961 - 1967.
  - Considered an Observation in the SC&A review.
  - SC&A agrees that there is enough information to do dose reconstructions.
  - Work Group agreed that the doses can be estimated with sufficient accuracy.
  - Site profile comment is under review by NIOSH.

SC&A Review of Dose Reconstruction Issues and Observations

- **Doses from X-Ray Diffraction (XRD)**
  - Additional review by SC&A prompted by lower estimates for external dose in uranium processing areas.
  - XRD area dose estimates by NIOSH may now be higher than dose in uranium work areas for some workers.
  - SC&A obtained information from a former worker and recommended an increase in the exposure time assumed by NIOSH. They also commented NIOSH should increase the correction factor applied to ion chamber dose rate measurements. With those changes, and the use of more appropriate low energy organ dose conversion factors, final organ dose estimates will be similar to previous NIOSH estimates.
  - SC&A comments discussed during Work Group meeting.
  - Work Group agreed dose can be estimated with sufficient accuracy.
  - Resolution of SC&A comment is a site profile issue.

SC&A Review of Dose Reconstruction Issues and Observations

- **Thorium Review**
  - NIOSH provided additional response on potential for thorium contamination during the second AWE Operational period from earlier non-covered thorium work at Carborundum.
  - Available information indicates thorium is not a significant source of exposure during the AWE Operational period.
  - SC&A provided additional review and agreed with the NIOSH conclusion.
  - Work Group agreed and closed the Issue.

SC&A Review of Dose Reconstruction Issues and Observations

- **Dose from Medical X Rays**
  - NIOSH provided updated responses for reconstruction of medical x rays during the AWE Operational periods.
  - SC&A provided additional review and agreed that NIOSH appropriately assigned doses from medical x rays for each year of employment during the two AWE periods.
  - Work Group agreed that NIOSH could reconstruct the doses from medical x rays with sufficient accuracy and closed the Issue.

SC&A Review of Dose Reconstruction Issues and Observations

- **External Dose from Uranium Contamination**
  - NIOSH provided resolution of factors to use for estimating dose from uranium contamination.
  - External dose estimates provided using conversion factors in TBD-6000 instead of old data from FGR-12.
  - SC&A reviewed the NIOSH response and agreed with the updated method.
  - Work Group agreed and closed the Issue.

SC&A Review of Dose Reconstruction Issues and Observations

- **Example Dose Reconstructions**
  - SC&A noted problems with duplicating original example dose reconstructions (DRs).
  - NIOSH provided updated dose/intake tables and implementing instructions.
  - New example DRs provided.
  - Work Group agreed that DRs can be reconstructed with sufficient accuracy using the updated methods.

Work Group Conclusions

- The work group concluded that NIOSH can reconstruct doses with sufficient accuracy for the proposed SEC class.

- The work group moves that SEC Petition 00223 be denied.

- Questions?