Cleanup after Uranium Operations at Baker Brothers Toledo, Ohio

Prepared by Thomas P. Tomes, DCAS

April 2, 2013

NIOSH received a list of talking points on the Baker Brothers site prepared by SC&A for the February 21, 2013, Work Group meeting on TBD-6000. During discussions at the meeting SC&A indicated that the significant issue from the list of talking points was to determine if the contamination resulting from uranium fires at Baker Brothers would be bounded by the methods NIOSH presented in the SEC Evaluation Report (ER) to estimate contamination levels at the start of the residual contamination period.

Briefly summarizing the issue, the ER used the TBD-6000 maximum daily weighted air concentration for operators of uranium machining facilities, 5480 dpm/m^3, combined with the settling and resuspension methods described in TBD-6000 and ORAUT-OTIB-0070 to bound the surface contamination at the beginning of the residual period. Available air sampling results from Baker Brothers in 1943 and 1944 indicate a lower air concentration, although the number of air sample results are very limited and were not taken during fires.

SC&A has indicated the methods presented in the Baker Brothers ER for reconstructing dose during the residual contamination period should bound intakes if there is evidence of cleanup at the Baker Brothers site after termination of AWE operations. As described below, NIOSH has obtained and reviewed references indicating cleanup was required prior to contract termination for those contractors engaged in uranium metal work in 1943-1944.

Uranium machining at Baker Brother began in early June 1943. They were one of several subcontractors selected by DuPont for production level processing of uranium metal. DuPont issued a detailed report of activities and contractors who performed the metal work for this program (DuPont, 1945). The DuPont subcontractors received cast billets, rolled or extruded them into rods, and machined the rods into slugs for use in both the Clinton (Oak Ridge) and Hanford reactors (DuPont, 1945, pdf p. 13). Herring-Hall-Marvin Safe Company was the initial contractor selected for machining the uranium rods into slugs in early 1943. To increase capacity due to production demands, Baker Brothers was subsequently awarded a contract. Bakers Brothers work also consisted of receiving rods and machining them into slugs.

Several fires from uranium turnings occurred in 1943. In June a fire in a container at Baker Brothers consumed one hundred pounds of uranium (Nickson, 1943). DuPont provided the following assessment on the significance of fires during machining of uranium (Daniels, 1943):

Several experiments have been conducted at Herring-Hall-Marvin Safe Company, Hamilton, Ohio, and Baker Brother, Inc., Toledo, Ohio, and in addition there have been a number of accidental fires, of which at least three were spontaneous. Fires of quantities ranging from several pounds to several hundred pounds have been experienced and a number of extinguishers have been tried. Records of this work are available in our files. While the work to date does not constitute an exhaustive survey of the problem, we believe that it is now safe to outline precautionary and protective measures.

The letter also listed measures determined to be effective for controlling and extinguishing uranium fires.

Uranium work at Baker Brothers and the uranium metal project (slug production project) managed by DuPont ended in late 1944 after slugs were delivered to both the Clinton and Hanford sites and after all residues and scrap were shipped back to the locations designated by the government.

The conditions the government required for cleanup of facilities and equipment for the DuPont uranium metal subcontractors is listed in a letter concerning the cleanup of the B & T Metals site in Columbus, Ohio, and the Herring-Hall-Marvin Safe Co (Shinn, 1943). The letter was issued November 24, 1943, which coincides with the completion of machining work for slugs for the Clinton site and prior to awarding contracts for machining slugs for the Hanford site in 1944. B&T Metals had completed their extrusion work (DuPont, 1945, pdf p. 36) and the subcontract to Herring-Hall-Marvin Safe Company for Clinton slugs was completed (DuPont 1945, pdf p. 105). (Baker Brothers had completed the production machining for Clinton slugs by that date, but was awarded another miscellaneous machining contract, and then in early 1944 awarded a contract for machining slugs for Hanford.)

B&T Metals and Herring-Hall-Marvin Safe had specific cleanup requirement to complete prior to releasing the contractor from responsibilities. DuPont representatives were required to ensure the following steps were followed (summarized from list from Shinn, 1943):

(1) All machines inspected for cleanliness; wet residues and oxides shipped according to instructions.
(2) Floors cleanly swept and sweepings shipped as directed.
(3) Outside areas cleaned to satisfaction of inspectors.

Similar requirements are presumed to have been required of Baker Brothers in 1944 after they had completed all machining work on the slugs for Hanford. An August 1, 1944 letter from the Corps of Engineers discussed scrap shipping arrangements needed to close out the Baker Brothers contract. The letter indicated machining work at Baker Brothers was expected to be completed in mid August and instructions were provided to prepare the scrap and turnings for

shipment; actual shipping of the containers of scrap could not occur for some weeks later. A guard was required to be maintained at Baker Brothers to guard containers of scrap, turnings, and burned oxides (Morris, 1944). That letter does not list the specific cleanup activities, although the earlier correspondence for the other sites indicated inspection was required to verify removal of oxides, wet residues, turnings and scrap.

Shipping records indicate sweepings, oxides, and residues were packaged separately from solid scrap metal. The 1943 shipping records indicate that Baker Brothers shipped out over 47,000 pounds of "turnings and sweepings" from June 14 through December 1, 1943 (Accountability Reports, 1943, pdf p. 8). The August 1944 letter (Morris, 1944) indicated that Baker Brothers had 27 drums of scrap turnings on hand at that time. Available shipping records from 1944 are not complete, but available records indicate a small shipment of scrap from Baker Brothers as late as October 1944, but records of shipping dates of the bulk of the scrap and residues in 1944 are not available (Accountability Reports, 1944, pdf p. 46).

Given that inspections were required to ensure all equipment and surfaces were swept and visible residues were containerized, and guarded until removed from the site, NIOSH believes that methods specified in the ER for estimating dose from residual contamination is sufficient to bound intakes of uranium during the residual contamination period.

References

Accountability Reports, 1943, Shipping and receiving accountability reports, SRBD Ref ID 120593.

Accountability Reports, 1944, Shipping and receiving accountability reports, SRBD Red ID 120591.

Daniels, 1943, *Project 9536 Metal Turnings-Fire Hazards*, correspondence to J. N. Tilley from C. E. Daniels, August 27, 1943, SRBD Ref ID 116470.

DuPont, 1945, *The Metal Fabrication Program for the Clinton Engineer Works and the Hanford Engineer Works Including the Dummy Slug Program and the Unbounded Slug Program-Project 1553*, E. I. DuPont de Nemours and Company, Inc., August 1945; SRDB Ref ID: 33190.

Morris, 1944, letter from R. D. Morris, Captain, Corps of Engineers, August 1, SRDB Ref ID 68572.

Nickson, 1943, *Uranium Metal Machining*, correspondence to C. E. Daniels from J. J. Nickson, June 29, 1943, SRDB Ref ID 11581.

ORAUT-OTIB-0070, Revision 01, *Dose Reconstruction During Residual Radioactivity Periods at Atomic Weapons Employer Facilities*, ORAU Team, June 5, 2012.

SEC Petition Evaluation Report, Petition SEC-00204, DCAS, November 14, 2013.

Shinn, 1943, letter from F. A. Shinn, War Department, United States Engineer Office, Manhattan, District, November 24, SRDB Ref ID 79035.

TBD-6000, *Site Profiles for Atomic Weapons Employers that Worked Uranium Metals*, Battelle-TBD-6000, Revision No. 1, DCAS, June 17, 2011.