Memorandum

To: Henry A. Anderson, M.D., Chair
Uranium Refining Atomic Weapons Employers (AWEs) Work Group
Advisory Board on Radiation and Worker Health

From: Thomas P. Tomes

Subject: Reduction Pilot Plant SEC Evaluation Report Review

Date: 4-29-2021

Introduction

The National Institute for Occupational Safety and Health (NIOSH) issued an Evaluation Report (ER) for Special Exposure Cohort (SEC) petition SEC-00253 on April 24, 2020 [NIOSH 2020]. Petition SEC-00253 requested a class be added to the SEC for Security Guards at the Reduction Pilot Plant (RPP) from June 7, 1976, through November 26, 1978. NIOSH presented the ER to the Advisory Board on Radiation and Worker Health (Advisory Board) on August 27, 2020. NIOSH concluded doses can be reconstructed for the requested class with sufficient accuracy. The Board discussed the SEC petition during its meeting on August 27, 2020. SC&A was subsequently tasked with reviewing the ER.

SC&A issued a report of its review to the Advisory Board on April 2, 2021. SC&A agreed with the NIOSH conclusion that reconstruction of internal and external doses is feasible; however, SC&A included two observations that are discussed herein [SCA 2021].

Background Information

The period covered by petition SEC-00253 encompasses an approximately 29-month period while the RPP facility was idle. Nickel production at the RPP ended in 1962, but the plant was maintained in a standby condition by INCO, the operating contractor. During the standby period, INCO was contracted to have maintenance personnel check certain equipment on specified frequencies, and a security guard was required to check the production building and compressor building once per shift (3 times daily). In March 1975 the government terminated all maintenance activities and designated the facility for demolition. INCO security guards continued to make rounds in the facility through November 26, 1978. Demolition began November 27, 1978 [NIOSH 2020].

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NIOSH obtained radiation and contamination data of the facility from surveys done in January 1975. These data were used in the ER to demonstrate that doses to Security Guards can be reconstructed during the period covered by the petition (June 7, 1976, through November 26, 1978). The ER provided an estimate of exposure time to use with the data to determine external and internal doses. The dose reconstruction methods specified in the ER were reviewed by SC&A; their report included two observations [SC&A 2021].

Observation 1

SC&A suggested NIOSH further refine exposure time for the Security Guards. The number of hours of exposure NIOSH assumed in the ER was discussed by the Advisory Board during its meeting on August 27, 2020. It was noted by NIOSH and Board members that there was uncertainty and lack of definitive information on how long guards were in the RPP facility during daily security checks.

Additional Information on inspections

SC&A reported that two claimant interviews (CATIs) contain information on Security Guard work. NIOSH reviewed those CATIs. One CATI (redacted) was from a survivor of a former worker. The other CATI (redacted) was from a Security Guard who performed the inspections.

The survivor-claimant reported that another person told her it took a half hour every day to inspect the RPP facility. That is more time than the estimate provided in the ER.

The former guard provided additional information. He said all seven floors of the RPP were checked. He also stated he walked the perimeter of the fence during the security checks. No time estimate was provided.

Documentation and photographs indicate the Process Building was a 130 feet long, five story building. It had a main stairway, a freight elevator, and a passenger elevator. The four upper floors of the building were largely made of steel grating. An office was located on the second floor. The Compressor Building was a 150 feet long, single floor building. There was a small structure attached to one corner that housed a change room and an upper level office [NIOSH 2020; Smith 1957; Smith 1979; Berger et al. 1981].

The 3.67 acre rectangular shaped RPP lot measured 500 feet by 320 feet [Description c. 1963], which indicates a total perimeter distance of 1,640 feet.

Revised Estimate of Hours

The ER provided an estimate of the time it took to perform a walk-through inspection of the RPP. The ER estimated 34 seconds to walk the length of the building based on walking 150 feet at 4.4 feet per second. That value was increased to 5 minutes to allow for stops. Then a factor of 3 was applied to allow for walking through both the Process Building and the

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Compressor Building, and the RPP grounds. Those assumptions yielded 15 minutes per day at the RPP. The 15 minutes per day was then multiplied by 365 days to provide an exposure time of 91.3 hours per year.

An updated estimate of hours is presented here using different assumptions based on information in the interview discussed above and other references that provide building and site descriptions. Using the ER estimate of time to walk through the building, allowing for stops, 5 minutes is assumed for each floor. Although records indicate a five-floor building, for time calculations, seven floors (as mentioned in the CATI) is assumed for the Process Building because there may have been structures and catwalks in the upper levels that required additional time. These assumptions result in 35 minutes to check the Process Building. An additional 5 minutes is added to check the Compressor Building. The Security Guard said he walked the fence line as part of the daily check. The 4.4 feet per minute walking rate, applied to the total 1640 feet perimeter distance, results in 6.2 minutes to walk the perimeter. That time was increased to 12 minutes to allow for stops along the way.

The above revised assumptions result in 35 minutes to check the Process Building, 5 minutes to check the Compressor Building, and 12 minutes to check the fence line. The total time is 52 minutes. Security guards are assumed to have made 1 security check per day, 6 days per week, 50 weeks per year. This results in a total exposure time of 260 hours (15,600 minutes) per year. This annual exposure time estimate is applicable to Security Guards from March 4, 1975 (maintenance termination date) through November 26, 1978 (end of INCO security checks), which includes the June 7, 1976, through November 26, 1978, period of the SEC petition. NOTE: Exposure time in the standby period prior to March 4, 1975 (i.e., prior to the end of maintenance), will be evaluated during revision of the RPP technical basis document (TBD).

Dose Rates

The ER used a bounding external dose rate with the number of hours to calculate annual dose. The 35 µR/hour (0.035 mR/hour) bounding photon dose rate provided in the ER is from the highest dose rate location (at 3 feet) and does not consider other, lower dose rate areas that Security Guards encountered during a walkthrough inspection. The dose rates in most areas and locations were largely indistinguishable from the 8-10 µR/hr (0.008 – 0.010 mR/hr) reported background dose rates. There were a few small areas with elevated photon dose rates. The beta dose rate used in the ER was also a bounding rate.

The bounding dose rates were used in the ER to demonstrate that doses for the requested class can be reconstructed. In order to complete the ER in a timely manner, an evaluation of all the dose rate data, to determine a more appropriate dose rate, was not provided in the ER. NIOSH needs to revise the TBD to add the standby period because that period (1963 through 1978) was not previously considered a covered period. An analysis of the various dose rate measurements will be provided in the TBD revision to consider time spent at the high dose rate locations as well as other areas. The overall annual dose *may* be lower than

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was presented in the ER even though the above assessment increases the Security Guard exposure from 91.3 hours to 260 hours per year during the evaluated period.

Observation 2

SC&A commented that the ER did not include an evaluation of potential ingestion intakes during the requested SEC period. The report noted that the TBD includes estimates of both inhalation and ingestion during the production period and D&D periods.

Ingestion dose for the security guards can be estimated based on contamination levels. The ER used the bounding alpha contamination value of 19 dpm/100 cm^2 to estimate inhalation intakes. That value is applied to a 10^{-4} m^2/hr ingestion coefficient from NUREG/CR-5512 [NRC 1992] to determine a 0.19 dpm/hr alpha ingestion rate for the Security Guards.

Details for the assignment of the ingestion intakes will be included in a revised TBD.

References

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