

 **Memorandum**

To: Subcommittee for Procedure Reviews
From: Robert Anigstein, SC&A, Inc.
Date: June 7, 2023
Subject: Reply to NIOSH Response to SC&A Review Comments on PER-073

At the September 29, 2022, teleconference meeting of the Subcommittee for Procedure Reviews (SPR), the National Institute for Occupational Safety and Health (NIOSH) presented its response (NIOSH, 2022) to finding 1 of the SC&A review (SC&A, 2018) of DCAS-PER-073, “Birdsboro Steel and Foundry Company” (NIOSH, 2016). The SPR requested SC&A to reply to the NIOSH response at its next meeting (ABRWH, 2022, p. 56).

SC&A Reply to NIOSH Comments on Finding 1

Finding 1: NIOSH neglected the external exposure to documented radiographic sources in assigning photon doses to Birdsboro workers [SC&A, 2018]

SC&A (2018, p. 17), citing the Steel Founders’ Society of America (1961), stated that “Birdsboro had nondestructive test facilities comprising a 24-MV betatron, a 300-kVp x-ray machine, 200 mCi of ⁶⁰Co, and 500 mg of radium in 1961.” NIOSH (2022, p. 3), citing the results of records searches, stated: “none of the records identified the presence of these sources or X-ray machines during the AEC covered time period in 1951 or 1952.”

SC&A concedes that the 24-mega-electron volt (MeV) betatron apparatus and the Andrex x-ray unit were located in the Birdsboro Armorcast facility (Birdsboro, n.d.), which was 500 yards from the main Birdsboro plant (NLRB, 1953, p. 23). Furthermore, we agree that there is no conclusive information that Birdsboro employees who might have been exposed to the uranium metal handled at the Birdsboro steel foundry worked at the Armorcast facility during the covered period.

However, a much greater source of exposure to external radiation of Birdsboro employees was the use of sources of radium (²²⁶Ra)¹ for the radiography of steel castings at the main Birdsboro plant. There are several sources of information regarding the use of radium sources during the time that spans the covered period. First are

¹ The element radium comprises a number of radioactive isotopes. In common, nonscientific usage, the term “radium” is understood to mean ²²⁶Ra.

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records of telephone interviews with the survivors of one energy employee (EE) . . . According to the interview report: “[the EE was exposed to] radium . . . from a bucket lifting out a source with a pole from the bucket. There is a radioactive sign next to it.” [SC&A, 2018, p. 16]

This

information is entirely consistent with the information on radiographic operations at GSI [General Steel Industries, Inc.]. Since the greatest source of external photon exposure at GSI was the use of ^{226}Ra employing the fishpole technique, a strong case can be made for using the external exposure scenarios developed for GSI as surrogate data for Birdsboro. [SC&A, 2018, p. 17]

The EE was employed during the covered period. It is therefore plausible and claimant favorable to assume that this EE and some of the EE’s coworkers were exposed to ^{226}Ra radiographic sources during the covered period.

Further information about this EE’s occupational exposure is provided by the U.S. Department of Labor (DOL, 2001). The EE’s survivors filled out and signed a copy of this DOL form. In the form field labeled “Describe all factor(s) believed to have contributed to the development of the claimed illness,” they each entered: “Chronic acute exposure to radiation from capsules of radium & cobalt 60 during . . . employment at Birdsboro Steel Corp.” This further indicates that the EE had been exposed to ^{226}Ra radiographic sources during the covered period.

Further information regarding the possible use of ^{226}Ra sources during the covered period at a steel foundry such as Birdsboro is provided by ASTM International.² ASTM E446-10 describes the “Significance and Use” of

graded reference radiographs [that] are intended to provide a guide enabling recognition of specific casting discontinuity types and relative severity levels that may be encountered during typical fabrication processes. . . These reference radiographs are intended as a basis from which manufacturers and purchasers may, by mutual agreement, select particular discontinuity classes to serve as standards representing minimum levels of acceptability. [Reprinted from ASTM E446-10, “Standard Reference Radiographs for Steel Castings up to 2 in. (50.8 mm) in Thickness,” copyright ASTM International, www.astm.org.]

If a steel foundry such as Birdsboro adopted such a standard, it would have performed radiographs of their castings and compared the resulting films to reference radiographs purchased from ASTM to establish the acceptability of its products.

Further information that is relevant to radiographic standards in use during the covered period is provided by ASTM International (2014): “Note 2—Reference radiographs previously used for this thickness range carried the designation E71, but included a now rarely used gamma source,

² Formerly known as “American Society for Testing and Materials,” ASTM International is a developer of international voluntary consensus standards.

that is, radium.”³ The ASTM E71 standard was first published in 1947, with subsequent editions issued in 1952 and on August 31, 1964 (Accuris, n.d.). Consequently, this standard might have been employed by the Birdsboro Steel Foundry during the covered period.

SC&A therefore concludes that it is plausible that Birdsboro used ²²⁶Ra sources to radiograph the castings it produced during this period to conform to the ASTM E71 standard in order to satisfy the requirements of its customers. Exposures to such sources should be included in dose reconstructions of workers who might have plausibly been exposed to such sources during the covered period.

³ Reprinted from ASTM E446-10, “Standard Reference Radiographs for Steel Castings up to 2 in. (50.8 mm) in Thickness,” copyright ASTM International, www.astm.org.

References

- Accuris. (n.d.). *ASTM E71 1964 edition, August 31, 1964*. Standards Store by Accuris. https://global.ihs.com/doc_detail.cfm?document_name=ASTM%20E71&item_s_key=00020220
- Advisory Board on Radiation and Worker Health, Subcommittee for Procedure Reviews. (2022). *Thursday, September 29, 2022* [Transcript of teleconference meeting]. <https://www.cdc.gov/niosh/ocas/pdfs/abrwh/2022/sctr092922-508.pdf>
- ASTM International. (2014). *ASTM E446-10: Standard reference radiographs for steel castings up to 2 in. (50.8 mm) in thickness*. <https://www.astm.org/e0446-10.html>
- Birdsboro Corporation. (n.d.). *X-ray operators safety manual*. SRDB Ref. ID 193501
- National Institute for Occupational Safety and Health. (2003). *Energy Employees Occupational Illness Compensation Program Act (EEOICPA) dose reconstruction telephone interview, NIOSH claimant ID [redacted]* [Computer-assisted telephone interview in NIOSH OCAS Claims Tracking System].
- National Institute for Occupational Safety and Health. (2016). *Birdsboro Steel and Foundry Company* (DCAS-PER-073, rev. 0). <https://www.cdc.gov/niosh/ocas/pdfs/pers/dc-per73-r0.pdf>
- National Institute for Occupational Safety and Health. (2022, September 2). *NIOSH DCAS response to SC&A review of DCAS-PER-073 “Birdsboro Steel and Foundry Company” finding 1*. [Memorandum from Mark Rolfes to Subcommittee for Procedure Reviews]. <https://www.cdc.gov/niosh/ocas/pdfs/dps/dc-per73-092222-508.pdf>
- National Labor Relations Board. (1953). *Decisions and orders of the National Labor Relations Board, 101, 22–25*. <https://casetext.com/admin-law/birdsboro-armorcast-inc>
- SC&A, Inc. (2018). *A review of NIOSH’s program evaluation report DCAS-PER-073, “Birdsboro Steel and Foundry Company”* [redacted] (SCA-TR-2018-PR003, rev. 0). <https://www.cdc.gov/niosh/ocas/pdfs/abrwh/scarpts/sca-per73-r0-508.pdf>
- Steel Founders’ Society of America. 1961. *Directory of steel foundries in the United States, Canada, and Mexico: 1961–62*. <https://babel.hathitrust.org/cgi/pt?id=coo.31924004418764;view=1up;seq=7>
- U.S. Department of Labor, Employment Standards Administration, Office of Workers Compensation Programs. (2001). Initial case file for Claimant [redacted] [NIOSH OCAS Claims Tracking System].