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Advisory Board on Radiation and Worker Health
National Institute for Occupational Safety and Health

A Review of NIOSH's Program Evaluation Report DCAS-PER-072, "Seymour Specialty Wiring Company"

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Abbreviations and Acronyms

ABRWH, Board	Advisory Board on Radiation and Worker Health
AEC	Atomic Energy Commission
cm	centimeter
DCAS	Division of Compensation Analysis and Support
DOE	U.S. Department of Energy
dpm/100 cm^2	disintegrations per minute per 100 square centimeters
dpm/calendar day	disintegrations per minute per calendar day
DR	dose reconstruction
FUSRAP	Formerly Utilized Sites Remedial Action Program
m^{-1}	per meter
mg/L	milligrams per liter
mrad/hr	millirad per hour
mR/hr	milliroentgen per hour
mR/yr	milliroentgen per year
NIOSH	National Institute for Occupational Safety and Health
ORAUT	Oak Ridge Associated Universities Team
PER	program evaluation report
POC	probability of causation
rem/yr	rem per year
SRDB	Site Research Database
TBD	technical basis document

1 Statement of Purpose

To support dose reconstruction (DR), the National Institute for Occupational Safety and Health (NIOSH) and the Oak Ridge Associated Universities Team (ORAUT) assembled a large body of guidance documents, workbooks, computer codes, and tools. In recognition of the fact that all of these supporting elements in DR may be subject to revisions, provisions exist for evaluating the effect of such programmatic revisions on the outcome of previously completed DRs. Such revisions may be prompted by document revisions due to new information, misinterpretation of guidance, changes in policy, and/or programmatic improvements.

A program evaluation report (PER) provides a critical evaluation of the effects that a given issue or programmatic change may have on previously completed DRs. This includes a qualitative and quantitative assessment of potential impacts. Most important in this assessment is the potential impact on the probability of causation (POC) of previously completed DRs with POCs less than 50 percent.

During a teleconference by the Advisory Board on Radiation and Worker Health (Board) Subcommittee for Procedure Reviews on June 21, 2023, the Board tasked SC&A to review DCAS-PER-072, revision 0 (NIOSH, 2016; "PER-072"), which was issued to address the impacts on previously completed claims of issuing revision 01 of Appendix CD to Battelle-TBD-6000 (NIOSH, 2015a), the technical basis document (TBD) for Seymour Specialty Wiring Company. In conducting a PER review, SC&A is committed to perform the following five subtasks, each of which is discussed in this report:

- **Subtask 1:** Assess NIOSH's evaluation and characterization of the issue addressed in the PER and its potential impacts on DR. Our assessment intends to ensure that the issue was fully understood and characterized in the PER.

- **Subtask 2:** Assess NIOSH's specific methods for corrective action. When the PER involves a technical issue that is supported by documents (e.g., white papers, technical information bulletins, procedures) that have not yet been subjected to a formal SC&A review, subtask 2 will include a review of the scientific basis and/or sources of information to ensure the credibility of the corrective action and its consistency with current/consensus science. Conversely, if such technical documentation has been formalized and previously subjected to a review by SC&A, subtask 2 will simply provide a brief summary and conclusion of this review process.

- **Subtask 3:** Evaluate the PER's stated approach for identifying the universe of potentially affected DRs and assess the criteria by which a subset of potentially affected DRs was selected for reevaluation. The second step may have important implications where the universe of previously denied DRs is very large and, for reasons of practicality, NIOSH's reevaluation is confined to a subset of DRs that, based on their scientific judgment, have the potential to be significantly affected by the PER. In behalf of subtask 3, SC&A will also evaluate the timeliness of the completion of the PER.

- **Subtask 4:** Conduct audits of DRs affected by the PER under review. The number of DRs selected for audit for a given PER will vary. (It is assumed that the Board will select the DRs and the total number of DR audits for each PER.)

- **Subtask 5:** Prepare a written report that contains the results of DR audits under subtask 4, along with our review conclusions.

2 Relevant Background Information

The Bridgeport Brass Company consisted of two locations, the Adrian plant in Adrian, Michigan, and Havens Laboratory in Bridgeport, Connecticut. Atomic Energy Commission (AEC) work began at Havens Laboratory on June 26, 1952. In May 1962, the AEC approved Bridgeport Brass Company's request to relocate the Havens Laboratory operations to Seymour, Connecticut, at the Seymour Specialty Wire Company. AEC work continued at the Seymour Specialty Wire Company until 1964, when all Bridgeport Brass work was consolidated and moved to Ashtabula, Ohio, as Reactive Metals, Inc. A final survey of the Seymour site was conducted on October 21, 1964. Work at the Seymour site was developmental and included extrusion, machining, and metallurgical laboratory analysis of uranium rods.

3 Subtask 1: Identify the Circumstances that Necessitated DCAS-PER-072

3.1 Chronology of events

Dose reconstructions for claims from Seymour Specialty Wire Company were originally performed using site research. On July 16, 2007, Appendix CD to Battelle-TBD-6000 was issued as the TBD for Seymour Specialty Wire Company (Battelle, 2007). Revision 01 of this document was issued on April 23, 2015 (NIOSH, 2015a). On July 11, 2016, PER-072 (NIOSH, 2016) was issued, which evaluated the effects of the changes on all previously completed Seymour Specialty Wire Company claims.

3.2 SC&A's comments

Programmatic revisions that may affect the outcome of previously completed DRs and mandate the need for a PER include any revisions to guidance documents that may result in the assignment of a higher dose. SC&A believes that the revisions to Appendix CD of Battelle-TBD-6000 for Seymour site dose estimates is justification for the reevaluation of worker doses as defined in PER-072. SC&A concurs with NIOSH's decision to issue PER-072 and has no findings.

4 Subtask 2: Assess NIOSH's Specific Methods for Corrective Action

The principal changes to revision 01 of Appendix CD are the incorporation of changes from revision 1 of Battelle-TBD-6000 (NIOSH, 2011) and other programmatic changes. Since SC&A has not previously reviewed Appendix CD to Battelle-TBD-6000, SC&A's review of PER-072 includes an evaluation of Appendix CD to assess the scientific basis and sources of information to ensure the credibility of the corrective action. It should be noted that there was a significant reduction in the amount of background information in Appendix CD revision 01 from revision 0, and the reason for this is unclear.

In 2017, SC&A reviewed DCAS-PER-061, revision 0 (NIOSH, 2015b; "PER-061"), for Bridgeport Brass Company. This review, like the current PER-072 review, included a mini site profile review because the TBD supporting the PER had not previously been reviewed (SC&A, 2017). The one finding and observation from that review was discussed in the September 28, 2017, meeting of the Subcommittee for Dose Reconstruction Reviews (SDRR), where the subcommittee determined that NIOSH's methods and assumptions were claimant favorable. The resolution of issues from that review impacts dose estimates for the Seymour site because operations from Havens Laboratory moved to Seymour, Connecticut. For instance, the absence of discussion relating to possible neutron exposures from spontaneous fissions was raised in the review of PER-061. The issue would also impact the Seymour site, which had the same source term. During the September 28, 2017, SDRR meeting, the SDRR determined that, since the neutron dose component is such a small fraction of total dose and there are claimant-favorable assumptions built into photon dose assignment, it was not necessary to be considered further (ABRWH, 2017). As such, SC&A believes no further discussion is necessary.

4.1 External dose estimate

No individual film badge data were located for Seymour Specialty Wire Company. Due to the fact that the Bridgeport Brass operations at Havens Laboratory moved to Seymour Specialty Wire Company, NIOSH used the 95th percentile external dose estimates from Havens Laboratory film badge results for the operational period of Seymour Specialty Wire Company of 1.225 rem per year (rem/yr) gamma and 2.932 rem/yr beta.

4.1.1 SC&A's comments

SC&A agrees with NIOSH's reasoning for using the gamma and beta external dose estimates from Havens Laboratory for the operational period of Seymour Specialty Wire Company, since all operations at Havens Laboratory moved to the Seymour facility.

Observation 1: Missing guidance on the energy ranges for assigned doses

Appendix CD does not provide guidance on the energy ranges to use for assigning doses. SC&A assumes that photons should be assigned using the 30–250 kiloelectron volt range; however, it is not started in that report. For consistency and completeness, SC&A believes the document would benefit from the addition of this information.

Observation 2: Discussion needed on the presence of industrial radiography at the site and potential dose to workers

SC&A believes that references made in the Bridgeport Brass TBD (ORAUT, 2013), the Extrusion Plant TBD (ORAUT, 2017), and 1963 Bridgeport Brass monthly progress reports (Bridgeport Brass Company, 1963) indicate that industrial radiography was used at the site. Additionally, the use of radiography at the Havens Laboratory was discussed during the September 28, 2017 (ABRWH, 2017), SDRR meeting. SC&A also believes that Appendix CD would benefit from a discussion of the potential external extremity dose to workers from industrial radiography used at the site.

4.2 Residual period external dose estimate

None of the surveys conducted during the residual period included beta/gamma dose rate measurements at 1 meter; therefore, NIOSH corrected available contact (1 centimeter (cm)) dose rate measurements to a 1-meter height to use for the residual period external dose estimates. NIOSH used the maximum contact beta/gamma measurement from the surveys that was measured in 1977 and confirmed in 1980. The measurement was from a thin crack that measured almost 13 feet long. Therefore NIOSH assumed the crack to be a line source and divided the measurements by 100 to calculate the 1-meter dose rates of 0.0175 millirad per hour (mrad/hr) and 0.011 mrad/hr.

NIOSH assumed the surface measurements from the 1964 survey, which were extensive, to be of a circular area source. NIOSH used the average of the 1964 measurements from Seymour Specialty Wire Company and from the Health and Safety Laboratory and the average area of the rooms surveyed to calculate the 1-meter dose rates of 0.0174 mrad/hr and 0.0214 mrad/hr. NIOSH used the maximum of these four beta-plus-gamma dose rates rounded up to 0.022 mrad/hr for the dose calculations.

The maximum 1-meter gamma only dose rates measured in the 1980 survey was 0.010 milliroentgen per hour (mR/hr). Therefore, NIOSH assumed this to be the gamma dose rate and calculated the beta dose rate to be 0.012 mrad/hr. Employees were assumed to be exposed continuously for 2,000 hours per year for a total external dose of 20 milliroentgen per year (mR/yr) gamma and 24 mR/yr beta.

4.2.1 SC&A's comments

SC&A reviewed a report of a 1980 followup survey of the Seymour site (ORNL, 1985), which contains results from the surveys of the site conducted in 1977 and 1980. SC&A confirmed the maximum 1-cm beta/gamma measurements of 1.1 mrad/hr and 1.75 mrad/hr collected from a crack in the floor. Documentation from the 1980 survey says the crack was in the former machine shop area, and the 1977 survey says the crack was in the former office area. SC&A agrees with NIOSH's assumption that the crack could be treated as a line source. Therefore, to convert the 1-cm dose rate to a 1-meter dose rate, it is appropriate to divide by 100.

SC&A also compiled the surface measurements from two 1964 surveys, which were included in the report of the 1980 followup survey (ORNL, 1985). SC&A calculated 1-meter beta-plus-gamma dose rates that closely matched NIOSH's calculated 1-meter beta-plus-gamma dose rates.

Observation 3: The method used to calculate the residual period external dose may not be bounding

It is unclear why NIOSH used maximum measurements from the 1977 and 1980 surveys when calculating beta-plus-gamma dose rates yet used average beta-plus-gamma dose rate measurements and an average room area to calculate dose rates from the 1964 surveys. Revision 01 of Appendix CD states that the estimated dose rate of 0.022 mrad/hr is assumed to be bounding, yet this dose rate was calculated from the *averages* of the 1964 surveys. SC&A believes that this may not be bounding and that it would be more claimant favorable to use *maximum* measurements from the 1964 surveys, similar to how NIOSH handled data from the 1977 and 1980 surveys.

SC&A reviewed a 1993 Oak Ridge National Laboratory report on the Bridgeport Brass Seymour location (ORNL, 1993), which contains results from a survey conducted as part of the U.S. Department of Energy (DOE) Formerly Utilized Sites Remedial Action Program (FUSRAP) in May 1992. The survey included indoor and outdoor measurements and samples. Some indoor gamma exposure rates and beta/gamma dose rates were higher than what is currently used in the Appendix CD, revision 01, calculations. It is unclear why this survey was not discussed in Appendix CD, revision 01, and why its results were not considered when calculating residual period external doses.

4.3 Occupational medical dose estimate

No site-specific guidance for Seymour Specialty Wire Company occupational medical dose exists. Therefore, at the time of PER-072, NIOSH used the guidance in ORAUT-OTIB-0006, revision 04 (ORAUT, 2011), for assigning occupational medical dose in DRs.

4.3.1 SC&A's comments

SC&A reviewed Appendix CD and agrees with the guidance at that time to use ORAUT-OTIB-0006 (ORAUT, 2011) to calculate occupational medical doses.[1]

4.4 Internal dose estimate

Uranium urinalysis samples were collected periodically from Seymour Specialty Wire Company employees. According to the TBD, samples were collected 14 times from 25 employees during the operational period. NIOSH calculated uranium intakes for 21 of the employees for solubility types M and S after excluding 4 employees with no or only one positive result. NIOSH also excluded one result that was deemed to be abnormally high, and unsupported by a later urinalysis from the same employee. NIOSH then calculated the geometric mean and geometric standard deviation for the distribution of intakes for each solubility type.

4.4.1 SC&A's comments

SC&A reviewed the AEC records cited by NIOSH for table 1 of Appendix CD (AEC, 1956–1964; AEC, 1962–1964). These Site Research Database (SRDB) files contain employee uranium urinalysis records for Seymour Specialty Wire Company. SC&A was able to verify most of the

[1] SC&A notes that this version of ORAUT-OTIB-0006 has since been superseded by revision 06 (ORAUT, 2019).

urinalysis data included in Appendix CD, table 1. SC&A agrees with NIOSH's determination to exclude the results from four employees who had either only one or zero non-zero results. SC&A also agrees with NIOSH's determination that the extremely high result of 2,200 micrograms per liter should be excluded, as the employee's urinalysis result nearly a month later was significantly lower than would be expected if the employee in fact had a large intake previously. One entry for an employee's November 19, 1962, uranium urinalysis result was reported as a range with an upper value of 0.018 milligrams per liter (mg/L) (AEC, 1956–1964, PDF p. 185). However, a duplicate of this record on PDF page 26 of AEC (1962–1964) only records the result as 0.013 mg/L. NIOSH used 0.013 for this specific urinalysis result in the calculations for occupational internal dose. Use of the lower value has only a modest impact on the modeled intakes.

During the review of these AEC records, SC&A was able to locate uranium urinalysis records for 13 sampling dates. SC&A was not able to locate any uranium urinalysis records from February 11, 1964, which are reported in the last column of Appendix CD, table 1.

Finding 1: Urinalysis results duplicated in analyses of occupational internal dose

SC&A was not able to locate any urinalysis records from February 11, 1964. However, SC&A noted that the records for the January 10, 1964, urinalyses have a "date sent" of February 11, 1964 (AEC, 1956–1964, PDF p. 208; AEC, 1962–1964, PDF p. 6). Further, the data included in the Appendix CD, table 1, columns for January 10, 1964, and February 11, 1964, are nearly identical, the only exception being one result from January 10, 1964, that is not in the February 11, 1964, column. Additionally, revision 0 of Appendix CD (Battelle, 2007, p. 4) states:

> The number of sampling occasions that occurred in the approximately two-year period of operation were **13 sets of urine samples**, nine sets of process waste samples, and four days of air monitoring samples. Urine sample data are available for dose reconstruction. [Emphasis added.]

SC&A believes the January 10, 1964, data were mistakenly included a second time in Appendix CD, table 1, with the February 11, 1964, "date sent" as the urinalysis date. If so, the modeled type M and type S uranium intakes and the resulting geometric means and geometric standard deviations from Appendix CD, table 2, will require revision. SC&A requests additional documentation for the February 11, 1964, urinalyses NIOSH uses in table 1, or, if a mistake was made, requests that NIOSH revise the type M and type S uranium intake modeling and intake calculations.

Observation 4: Discussion needed on the potential presence of recycled uranium and internal dose estimates from contaminants

The Bridgeport Brass TBD states that recycled uranium might have been processed at Havens Laboratory after 1952 (ORAUT, 2013). Since all operations moved from Havens Laboratory to the Seymour location in 1962, recycled uranium likely was handled at the Seymour site. Appendix CD does not mention the possibility of recycled uranium. Battelle-TBD-6000 states that in the absence of definitive information about the origin of processed uranium, it should be assumed that the uranium contains contaminants from recycled uranium (NIOSH, 2011).

Therefore, SC&A believes Appendix CD should discuss the possibility of recycled uranium and, if necessary, include internal dose estimates for those radionuclides.

Observation 5: Discussion needed on the presence of thorium on site

SC&A reviewed AEC (1962–1964) sample sheets and noted that there are two liquid waste samples alluding to thorium processing at the Seymour site, listed as "thorium coolant from Do-All" and "thorium chips and coolant from Do-All" (AEC, 1962–1964, PDF pp. 4 and 10). Additionally, the Bridgeport Brass (1963) SRDB file appears to include a 1963 telegram from an employee of the Seymour site confirming dimensions for the extrusion of a thorium rod. These documents indicate that thorium was likely present at the site. Therefore, SC&A believes Appendix CD would benefit from a discussion on the presences of thorium on site and its impact on dose estimates.

4.5 Residual period internal dose estimate

NIOSH used the maximum removable contamination levels from a 1964 survey after operations were moved from Seymour to Ashtabula of 112 disintegrations per minute per 100 square centimeters (dpm/100 cm^2) for the residual period dose estimate (ORNL, 1985). This value was the highest removable contamination result from four surveys conducted from 1964 to 1980 at the site after operations moved. NIOSH assumed a resuspension factor of 1E-05 m^{-1} and a 2,000-hour work year to calculate an inhalation rate of 0.736 dpm/calendar day.

To calculate the ingestion intake rate, NIOSH used the 112 dpm/100 cm^2 value, along with a rate of 1.1E-04 square meters per hour from NUREG/CR-5512 (NRC, 2001). This resulted in an ingestion rate of 6.75 dpm/calendar day.

4.5.1 SC&A's comments

SC&A reviewed ORNL (1985) and the removable alpha contamination measurements from the 1964 surveys and the 1980 survey of the Seymour site after operations ended in 1964. The 1977 survey did not contain removable alpha contamination measurements. The highest removable contamination measurement of 112 dpm/100 cm^2 was collected by Seymour Specialty Wire Company in the metal storage area (PDF p. 25). SC&A also confirmed NIOSH's calculations for inhalation and ingestion intake rates.

The FUSRAP survey (ORNL, 1993) included indoor and outdoor measurements and samples. Removable alpha contamination measurements in several rooms exceeded 112 dpm/100 cm^2, and up to 750 dpm/100 cm^2 was recorded within the building. This survey is not discussed in Appendix CD, revision 01, and the reason for the omission is unclear.

Observation 6: 1992 FUSRAP survey not discussed in revision 01 of Appendix CD

SRDB document 10847 (ORNL, 1993) contains the survey results of the 1992 FUSRAP survey performed at the Seymour site. Survey results included removable alpha contamination measurements higher than what is currently discussed in Appendix CD, revision 01. It is unclear why this survey was not discussed in Appendix CD, revision 01. SC&A believes NIOSH should take this survey into consideration for the residual period dose calculations.

5 Subtask 3: Evaluate the PER's Stated Approach for Identifying the Number of DRs Requiring Reevaluation of Dose

5.1 NIOSH's selection criteria

Section 3.0 of PER-072 describes the following criteria NIOSH used to identify previously completed claims requiring reevaluation using revision 01 of Appendix CD. First, NIOSH identified all previously completed claims with verified employment at Seymour Specialty Wire Company that had a POC of less than 50 percent. This search identified eight claims. Two of these claims had been completed using revision 01 of Appendix CD and were removed from further evaluation. One claim had employment at another site, and changes to Appendix CD were evaluated under another PER for that site. The remaining five claims have been reevaluated by NIOSH using revision 01 of Appendix CD, as well as other applicable approved DR methods. For all five claims, the POC was below 45 percent.

5.2 SC&A's comments

SC&A concurs with NIOSH's selection criteria for defining the claims requiring reevaluation of dose. The selection criteria are broad enough that they capture all potentially impacted claims. Additionally, SC&A believes the PER was conducted in a timely manner, as revision 01 was issued in April 2015, and PER-072 was issued in July 2016. There are no findings associated with subtask 3.

6 Subtask 4: Conduct Audits of a Sample Set of Reevaluated DRs Mandated by DCAS-PER-072

Previous sections of this report described the issuance of revision 01 of Appendix CD, the TBD for Seymour Specialty Wire Company. SC&A recommends that the Board select one case of the five reevaluated by NIOSH for additional evaluation.

7 References

Advisory Board on Radiation and Worker Health, Dose Reconstruction Subcommittee. (2017). *Thursday September 28, 2017* [Transcript of teleconference meeting]. https://www.cdc.gov/niosh/ocas/pdfs/abrwh/2017/sctr092817-508.pdf

Atomic Energy Commission. (1956–1964). *AEC health and safety bioassay and environmental sample results 1956–1964* [SRDB record]. SRDB Ref. ID 9885

Atomic Energy Commission. (1962–1964). *Sample sheets* [SRDB record]. SRDB Ref. ID 9895

Battelle. (2007). *Site profiles for Atomic Weapons Employers that worked uranium and thorium metals Appendix CD – Seymour Specialty Wire Company* (Battelle-TBD-6000, Appendix CD, rev. 0). https://www.cdc.gov/niosh/ocas/pdfs/arch/b-6000-apcd-r0.pdf

Bridgeport Brass Company. (1963–1964). *Report of thorium extrusion 1963* [SRDB record]. SRDB Ref. ID 26494

Bridgeport Brass Company. (1963). *Monthly progress reports 1963* [SRDB record]. SRDB Ref. ID 026768

National Institute for Occupational Safety and Health. (2011). *Site profiles for Atomic Weapons Employers that worked uranium metals* (Battelle-TBD-6000, rev. 1). https://www.cdc.gov/niosh/ocas/pdfs/tbd/bat-6000-r1.pdf

National Institute for Occupational Safety and Health. (2015a). *Site profiles for Atomic Weapons Employers that worked uranium and thorium metals Appendix CD – Seymour Specialty Wire Company* (Battelle-TBD-6000, Appendix CD, rev. 01). https://www.cdc.gov/niosh/ocas/pdfs/tbd/b-6000-apcd-r1.pdf

National Institute for Occupational Safety and Health. (2015b). *Bridgeport Brass Company* (DCAS-PER-061, rev. 0). https://www.cdc.gov/niosh/ocas/pdfs/pers/dc-per61-r0.pdf

National Institute for Occupational Safety and Health. (2016). *Seymour Specialty Wiring Company* (DCAS-PER-072, rev. 0). https://www.cdc.gov/niosh/ocas/pdfs/pers/dc-per72-r0.pdf

Oak Ridge Associated Universities Team. (2011). *Dose reconstruction from occupational medical x-ray procedures* (ORAUT-OTIB-0006, rev. 04). https://www.cdc.gov/niosh/ocas/pdfs/arch/tibs/or-t6-r4.pdf

Oak Ridge Associated Universities Team. (2013). *An exposure matrix for the Adrian facility and Bridgeport Brass Company, Havens Laboratory* (ORAUT-TKBS-0030, rev. 02). https://www.cdc.gov/niosh/ocas/pdfs/tbd/bbrass-r2.pdf

Oak Ridge Associated Universities Team. (2017). *Summary of Extrusion Plant site information for dose reconstruction* (ORAUT-TKBS-0056, rev. 01). https://www.cdc.gov/niosh/ocas/pdfs/tbd/extruplant-r1.pdf

Oak Ridge Associated Universities Team. (2019). *Dose reconstruction from occupational medical x-ray procedures* (ORAUT-OTIB-0006, rev. 06). https://www.cdc.gov/niosh/ocas/pdfs/tibs/or-t6-r6-508.pdf

Oak Ridge National Laboratory. (1985). *Follow-up survey of Bridgeport Brass Company, Seymour, Connecticut* (ORNL/RASA-85/4). SRDB Ref. ID 10851

Oak Ridge National Laboratory. (1993). *Radiological survey results at the former Bridgeport Brass Company Facility Seymour, Connecticut* (ORNL/TM-12225). SRDB Ref. ID 10847

SC&A, Inc. (2017). *A review of NIOSH's program evaluation report DCAS-PER-061: Bridgeport Brass Company* (SCA-TR-2017-PR005, rev. 0). https://www.cdc.gov/niosh/ocas/pdfs/abrwh/scarpts/sca-bbrassper61.pdf

U.S. Nuclear Regulatory Commission. (2001). *Residual radioactive contamination from decommissioning* (NUREG/CR-5512, Vol. 2). https://www.nrc.gov/docs/ML0109/ML010940257.pdf