



The Dow Chemical Company
Midland, Michigan 48674
USA

U.S. Nuclear Regulatory Commission
Region III
2443 Warrenville Road, Suite 210
Lisle, IL 60532-4352

November 22, 2017

This event is being reported per 10 CFR 20.2203(a)(2)(iv) due to the potential exposure of a member of the public at Dow Corning's Auburn, Michigan site. An area of elevated contamination with C-14 was discovered on an analytical instrument in a restricted area that was accessed by a contractor to perform maintenance on the instrument.

The individual was contacted to acquire additional information for a Certified Health Physicist to conduct an exposure assessment, including maximum potential time spent in close proximity to the contaminated instrument. See attached Appendix 1 containing detailed dose calculations by James R. Weldy, CHP, CIH. From these calculations, it was determined that the individual received a Total Effective Dose Equivalent of 0 mrem. It was determined that the individual may have received up to 49 mrem as a shallow dose equivalent to the skin. Appendix 2 contains this individual's name, birthdate, and social security number as required by 10 CFR 20.2203(b)(2).

The cause and timing of the contamination on the instrument is not yet known. A formal root cause investigation will be conducted and documented, and findings will be submitted as a supplement to this report. The lab the instrument resides in is wipe tested routinely including the bench top surfaces that the instrument sits on. These wipe tests have not shown areas of elevated contamination. Sections of this instrument are also periodically surveyed with a GM survey meter and have not shown areas of elevated contamination.

The following corrective actions have been taken or planned to prevent recurrence of this type of event. If the formal root cause investigation results in additional corrective actions, these will be submitted as a supplement to this report.

- The contaminated instrument is in the process of being disposed of as radioactive waste.
- A policy has been written and implemented effective immediately to perform wipe testing and surveys prior to any service being performed by maintenance personnel on analytical equipment used for radioactive analysis.
- Dow Corning plans to move all analytical equipment used with higher C-14 activity levels to a single restricted use lab where the radioactive materials are synthesized. This lab will be badge reader access only. The move will eliminate the need to transport materials through an unrestricted area for analysis, and will consolidate the instruments with the highest potential for contamination into one restricted area.

Please contact me if you have any questions.

Sincerely,

Kelly Wegener
Radiation Safety Officer
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APPENDIX 1

Exposure Estimate from Contamination Incident at Dow Corning Corporation

11/20/17

Given:

- Radeye 2 Survey Meter measured (no gamma energy filter applied):
 - o 295 mrem/hr @ 0.5 cm
 - o 0.3 mrem/hr @ 6 in
 - o ~background @ 1 ft

Per the Radeye B20-ER User Manual (Thermo Scientific), the dose rate on the B20-ER without the energy filter applied is a good approximation of the directional dose equivalent at a depth of 0.07 mm (skin dose).

- C-14 emissions:
 - o Average: 49 keV
 - o Max: 159 keV
- Glove was a 5-mil nitrile glove, thickness = 0.127 mm
 - o Density of nitrile rubber is 1.2 – 1.5 g/cm³ (conservative assume 1.2 g/cm³)
 - o Thickness * Density of glove is [1200 mg / cm³] * 0.0127 cm = 15.2 mg/cm²
- Contractor spent up to 20 minutes with his gloved hands in close contact with the contaminated area

C-14 Beta Penetration Depth

Per Rad Health Handbook (Bureau of Radiological Health, 1970)

- beta energy must exceed 100 keV to penetrate a material with a thickness * density of 15.2 mg/cm².
- betas from C-14 (159 keV maximum energy) can penetrate only about 30 mg/cm², and cannot deliver a deep dose, which is the dose at a depth of 1000 mg/cm²).

Based on the average emission energy of 49 keV, more than 50% of C-14 emissions will be at energies less than 100 keV, and will not penetrate the nitrile lab glove.

Calculation:

1. Deep dose to the extremities: Dose = 0 mrem. Radiation from C-14 cannot penetrate to the depth of 1000 mg/cm² required to deliver a deep dose.
2. Total Effective Dose Equivalent = 0 mrem
3. Shallow dose equivalent (SDE) to the hands:
 - SDE = Dose rate * (1-shielding reduction) * Exposure Time
 - SDE = 295 mrem/hr * (1-0.5) * 20 min * 1 hr/60 min
 - SDE = 49 mrem

Conclusions:

The contractor may have received up to 49 mrem as a shallow dose equivalent to the skin.

The contractor received a Total Effective Dose Equivalent of 0 mrem.

References

Bureau of Radiological Health, 1970. Radiological Health Handbook. Rockville, Maryland: US Department of Health, Education, and Welfare.