

DEFENSE NUCLEAR FACILITIES SAFETY BOARD

May 27, 2022

TO: Christopher J. Roscetti, Technical Director
FROM: Matthew Duncan, Frank Harshman, Clinton Jones, and Brandon Weathers,
Resident Inspectors
SUBJECT: Oak Ridge Activity Report for Week Ending May 27, 2022

Nuclear Criticality Safety: CNS submitted a Justification for Continued Operation and Evaluation of the Safety of the Situation for the drum that contains Raschig rings and an unknown uranium-bearing material (see 4/22/22 report). Non-destructive assay measurements of this drum indicated that the estimated fissile mass was greater than the analyzed loading limits. CNS wrote that the magnitude of the over-mass condition is such that corrective actions need to proceed with due caution. The existing compensatory measures remain, including an administrative control boundary, an additional protective drum cover, handling/movement restrictions, and daily inspections for water leakage in the area. If approved, there would be two new compensatory measures to ensure that all non-criticality-based hazards associated with the drum remain bounded by the documented safety analysis. First, the drum must be located within the coverage area of a credited fire suppression sprinkler system. Second, the drum must be located within an area of the facility with sufficient enriched uranium material-at-risk capacity to accommodate the drum without exceeding the overall material-at-risk limits for the area. CNS requested approval to perform additional passive non-destructive assay measurements to further characterize the drum contents. CNS anticipates that the additional measurements may help refine the estimated enriched uranium mass and improve the confidence interval associated with the measurement uncertainty for the existing non-destructive assay results.

As part of the overall effort to investigate and develop a plan to safely disposition the drum, CNS suspects that material in the drum could have been removed from a clogged distillate pot in the 1950s. Distillate pots were used to condense volatile organic vapors into a dark tar-like substance. This is based on the visual observation of the material, the limited test results (see 3/4/22 report), Y-12 process history, and nuclear criticality safety approvals from the 1950s and 1960s.

CNS performed a series of nuclear criticality safety calculations that investigated the effect of a low-density distribution of Raschig rings on the critical mass of a U_3O_8 and water mixture. Y-12 phased out of the use of Raschig rings several decades ago, but CNS may need to credit them as a strong neutron absorber for this drum (see 4/22/22 report).

CNS identified this drum as part of the reviews and walkdowns of all Y-12 fissile control areas that focused on legacy portable items and removed equipment that may contain fissile material (see 4/9/21 and 5/21/21 reports).

Building 9212: CNS unloaded the material that was preventing performance of an expired technical safety requirement surveillance requirement using the recently approved safety basis supplement (see 5/20/22 report). CNS plans to perform the overdue surveillance requirement early next week.