

**Additional Information Requested
from Washington University in St. Louis
NRC Material License No. 24-00167-11
by NRC Region III
on Final Status Report
for Kingshighway, Steinberg, and Yalem Buildings**

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NRC Question

1. Structural surface survey

“Each survey unit consists of many rooms and the number of room is greater than the number of the systematic sampling. Most rooms only have one or no sample. Since scan is not applicable for H-3, no tritium contamination will be detected, unless there are sufficient biased samplings. Please provide the biased sampling result of areas of highest probability for residual contamination.”

WU Response

Washington University in St. Louis (WU) contracted Chase Environmental Group, Inc. (Chase) to perform and document a final status survey (FSS), including any necessary decontamination, of these three buildings following WU's determination the buildings did not contain residual radioactivity such that they would be unsuitable for unrestricted release in accordance with NRC requirements. WU's determination was based on the WU Radiation Safety (RS) staff's review of historical use and operational survey documents, and on the RS staff's final "closeout" surveys of all the former use areas in the three buildings.

In rooms approved for use or storage of radioactive materials, WU authorized users and radiation workers (users) are required to perform and document operational radiation surveys on at least a monthly frequency. They are trained to focus the majority of their survey locations on their areas of radioactive material use or storage in each room, resulting in highly biased surveys. Their surveys are required to include wipe tests analyzed on a liquid scintillation counter when tritium (H-3) is included in the authorization. RS staff also conduct operational surveys of rooms approved for use or storage of radioactive materials on a quarterly, monthly, or semi-annual basis. These RS surveys include the radioactive material use or storage areas in each room, and areas where contamination would not be expected to be found. RS staff's wipe tests are

analyzed on a liquid scintillation counter, and potential tritium contamination is evaluated. An operational surface contamination limit has been set since 1989 at 200 dpm/100 cm² removable, including H-3 contamination. Prior to 1989, the level was 100 dpm/100 cm². Users are required to decontaminate anytime this level was exceeded on any room surface, and to document a follow-up survey demonstrating the operational limit was no longer exceeded.

Each time approved use and storage of radioactive materials has been ended in a room, RS staff have performed and documented a "closeout" survey which includes a greater number of survey locations, biased to use and storage areas, and also documents the overall condition of the room. The same operational surface contamination limit is applied for "closeout" surveys, and either users or RS staff would decontaminate room surfaces where the level was exceeded and document the follow-up survey. In preparation for the decommissioning of these three buildings, RS staff performed a historical review of the user and RS records for all approved use areas in these buildings and performed additional closeout surveys to confirm previous closeout results and to make a final effort to identify any residual contamination. Where the records of earlier closeout surveys were available and were consistent with recent survey practice, the additional closeout surveys focused primarily on measuring for removable contamination within vacuum lines (nozzles) and sink drains (at least 6 inches into drain line), which did not receive as much attention in earlier closeout surveys. Where the earlier records were not available, or not up to current survey practices, full closeout surveys according to current practice were done.

The results of Chase's FSS confirmed WU's determination that the three buildings met the NRC release criteria for unrestricted use, and provided FSS documentation according to NRC guidance. The biased sampling results the NRC has requested for areas of highest probability for residual contamination are contained in the WU historical records and in the RS final closeout survey records for approximately 230 authorized use or storage rooms in these three buildings. The records are available on site for NRC inspection.

WU's use of operational records in determining that certain facilities are releasable is based on NRC guidance for broad scope licensees in NUREG-1757, Vol. 1, Rev. 2, section 7.4 "Group 2" (second paragraph) and section 15.5.3 "Broad Scope Licenses".

NRC Question

2. System survey – ventilation/exhaust, vacuum, and drain

“Please describe the locations and number of the removable contamination measurements taken in ventilation/exhaust ductworks, vacuum lines, and drain lines. A review of FSS indicates that the only measurements for drain and vacuum system were at drain openings and vacuum nozzles. Please provide the justification that the locations and number of measurements are sufficient to characterize the contamination of the entire system.

The ventilation system FSS only includes fume hood ventilation. Please provide the contamination survey of the ventilation/exhaust ductwork.”

WU Response

Inlets to special locations like vacuum lines, sink drains, and fume hood vent ducts have been routinely surveyed for removable contamination to provide indication of potential internal contamination of the more inaccessible parts, i.e., vacuum system accumulators, drain lines, ventilation ducts, and exhaust fans. Since these inaccessible locations have fewer routine surveys, there are fewer opportunities for decontamination during operations. The RS staff work with facilities staff to do “surveys of opportunity” when ductwork and exhaust fans, sink traps and drain lines, and vacuum system lines and accumulators are opened for maintenance or remodeling activities. RS staff’s many years of experience in doing these “surveys of opportunity” in these inaccessible locations have shown that contamination is found only at or near the inlet to each system. Systems contamination is not found more than a few feet into the system. Where surface contamination was not found during surveys of vacuum nozzles, sink drains (at least 6 inches into the drain line), or fume hood exits into exhaust duct work, RS staff’s historical characterization of these systems has indicated no surface contamination would likely be found further into the system.

Chase’s Final Status Report (FSR) described the removable contamination measurements taken in ventilation/exhaust ductworks, vacuum lines, and drain lines: 100% of the vacuum nozzles and vacuum system accumulators, 100% of the drain openings and traps (at least 6 inches into the drain lines), and 100% of the fume hood ventilation ducts and exhaust fans were surveyed, or sampled for removable radioactivity (see text sections 4.4, 4.5, 4.6, 20.0 (third paragraph), 22.5; Table 22-2; and Appendix F). The number of removable contamination measurements for systems components are detailed in tables on FSR pages 33 through 38. The total number of locations sampled was not listed in the report. The totals were as follows: 420 vacuum system samples (including the 2 accumulators); 365 sink drain opening and trap samples, and 67 hood exhaust system samples (including 12 exhaust fans).

Please note that the justification explained above for sampling sink drain openings and traps, the hood vent ducts and exhaust fans, and vacuum nozzles and accumulators was provided in Chase's FSR (see Appendix I, section 4.0). From Chase's experience in decommissioning similar types of radioactive material use areas, the sampled locations are the points where contamination would enter the systems and where the potential for internal contamination would be highest. Chase and RS staff used extremely conservative calculations, treating the levels found at the locations with the highest contamination as if they would be present throughout the systems. Even with that conservative (high dose) assumption, all systems still met NRC criteria for building release.

Additional Information Request for Final Status Survey Report

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