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DEFENSE NUCLEAR FACILITIES SAFETY BOARD

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November 2, 1999

The Honorable Carolyn L. Huntoon
Assistant Secretary for Environmental Management
Department of Energy
1000 Independence Avenue, SW
Washington, DC 20585-0113

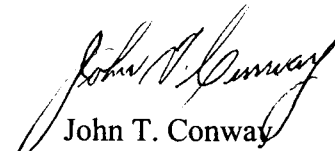
Dear Dr. Huntoon:

The staff of the Defense Nuclear Facilities Safety Board (Board) visited the Oak Ridge National Laboratory on September 15-17, 1999, to review ventilation systems required for uranium-233 operations and long-term storage in Building 3019. This review also evaluated progress made on the ventilation system requirements analysis and development of the Building 3019 Safety Analysis Report (SAR). The Board understands that planned near-term operations for uranium-233 inspection activities will be covered by an existing Basis for Interim Operation document until a revised SAR is completed.

As discussed in the enclosed staff report, the potential exists for contamination of a substantial portion of the Building 3019 vessel off-gas systems, with attendant worker hazards and costly clean-up efforts should a container of uranium-233 be breached during handling in the storage vaults. The placements of pre-filters in the inspection chambers to catch accidental releases as close to the source as possible would enhance the safety function of the ventilation system. The staff report also identifies the need for potentially hazardous legacy chemicals and radioactive contamination in the ventilation system to be addressed in the facility's SAR.

These matters are called to your attention and appropriate follow up action. If you have comments or questions on this matter, please do not hesitate to contact me.

Sincerely,


John T. Conway
Chairman

c: Dr. Martha A. Krebs
Ms. Gertrude Leah Dever
Mr. Mark B. Whitaker, Jr.

Enclosure

DEFENSE NUCLEAR FACILITIES SAFETY BOARD

Staff Issue Report

September 22, 1999

MEMORANDUM FOR: G. W. Cunningham, Technical Director
J. K. Fortenberry, Deputy Technical Director

COPIES: Board Members

FROM: H. W. Massie
R. W. Zavadoski

SUBJECT: Review of Building 3019 Ventilation Systems Required for Safe Uranium-233 Operations and Long-Term Storage

This report documents a review by the staff of the Defense Nuclear Facilities Safety Board (Board) of the ventilation systems for uranium-233 operations at Building 3019, Oak Ridge, Tennessee. This review was conducted during a visit to the facility on September 15–16, 1999. Staff members H. Massie, B. Jones, P. Gubanc, D. Moyle, and R. Zavadoski also reviewed a report prepared by Oak Ridge National Laboratory entitled *Site Assessment Report on the Storage of ²³³U* prior to this visit.

Background. During the days of the Manhattan Project, Building 3019 served as a pilot plant for chemical processing of uranium, plutonium, and thorium. Since 1943, when simple hot cells were used, the building and its ventilation systems have evolved to their present condition. The robustness and operational flexibility of the ventilation systems were integral aspects of this evolution. Some portions of the ventilation systems are of original Manhattan Project vintage, while other portions were installed as recently as this year.

Current plans to make portions of this facility the national repository for uranium-233 must adequately reflect the mission change involved and the legacy materials in the facility. To this end, the contractor is performing a requirements analysis for an upgraded ventilation system, as described in the *Site Assessment Report on the Storage of ²³³U*, which was provided to the Board as a deliverable under Recommendation 97-1, *Safe Storage of Uranium-233*. However, that analysis is not expected to be finished until the Safety Analysis Report (SAR) is completed in December 1999.

Discussion. Four off-gas systems ventilate Building 3019 (see attached diagram): (1) the Laboratory Off-Gas system (LOG), (2) the Cell Off-Gas system (COG), (3) the Glove Box Off-Gas system, and (4) the Vessel Off-Gas system (VOG). Most of these systems normally exhaust to the 3020 stack, the principal release point for the building. The primary ventilation system serving the uranium-233 inspection and storage areas is the VOG. Unlike the other

Building 3019 ventilation systems, the VOG usually exhausts through stack 3039. The VOG cross-connects to the COG and can therefore exhaust to either the 3020 or the 3039 stack. Further complicating the situation, the LOG can also be aligned to the COG.

All of this redundancy and diversity complicates the ventilation requirements analysis for uranium-233 inspection and storage. In addition, each system bears a legacy of chemicals and radioisotopes. This situation is further complicated in that the discharge at stack 3039 is not under direct control of the Building 3019 contractor. Lockheed Martin Energy Research operates Building 3019, while Bechtel-Jacobs operates the 3039 system.

As part of the requirements analysis, the contractor has culled through related requirements found in the facility authorization basis; Department of Energy Orders, standards, and handbooks; and contract- and site-specific work smart standards, directives, and procedures. This review identified 211 applicable requirements, which are currently being assessed and grouped logically. However, completion of the ventilation assessment is linked to issuance of the SAR, scheduled to be completed by the end of December 1999. A Fire Hazards Analysis is also awaiting completion of the SAR.

The complications introduced by the safety analysis lie in the determination of the functional classification of safety-related equipment. The facility was built with safety-class equipment appropriate to its time, but the existing equipment cannot serve a safety-class role in today's environment without significant modifications. The equipment can probably serve a safety-significant role without significant modification, and preliminary work on the safety-analysis indicates that safety-significant classification may be adequate. However, the preliminary safety analysis does not account for legacy chemicals and radioisotopes that are known to be present.

The legacy chemicals include perchlorates, which have been found in the ventilation system. The perchlorates have not been systematically assessed or remediated, despite the fact that perchlorate salts can present either a shock-sensitive explosion or a deflagration hazard in sufficient quantities. The duct work also contains measurable quantities of fission product radioisotopes (strontium and cesium) and alpha contamination (possibly transuranics). These materials will clearly influence the functional classification of equipment and should be assessed.

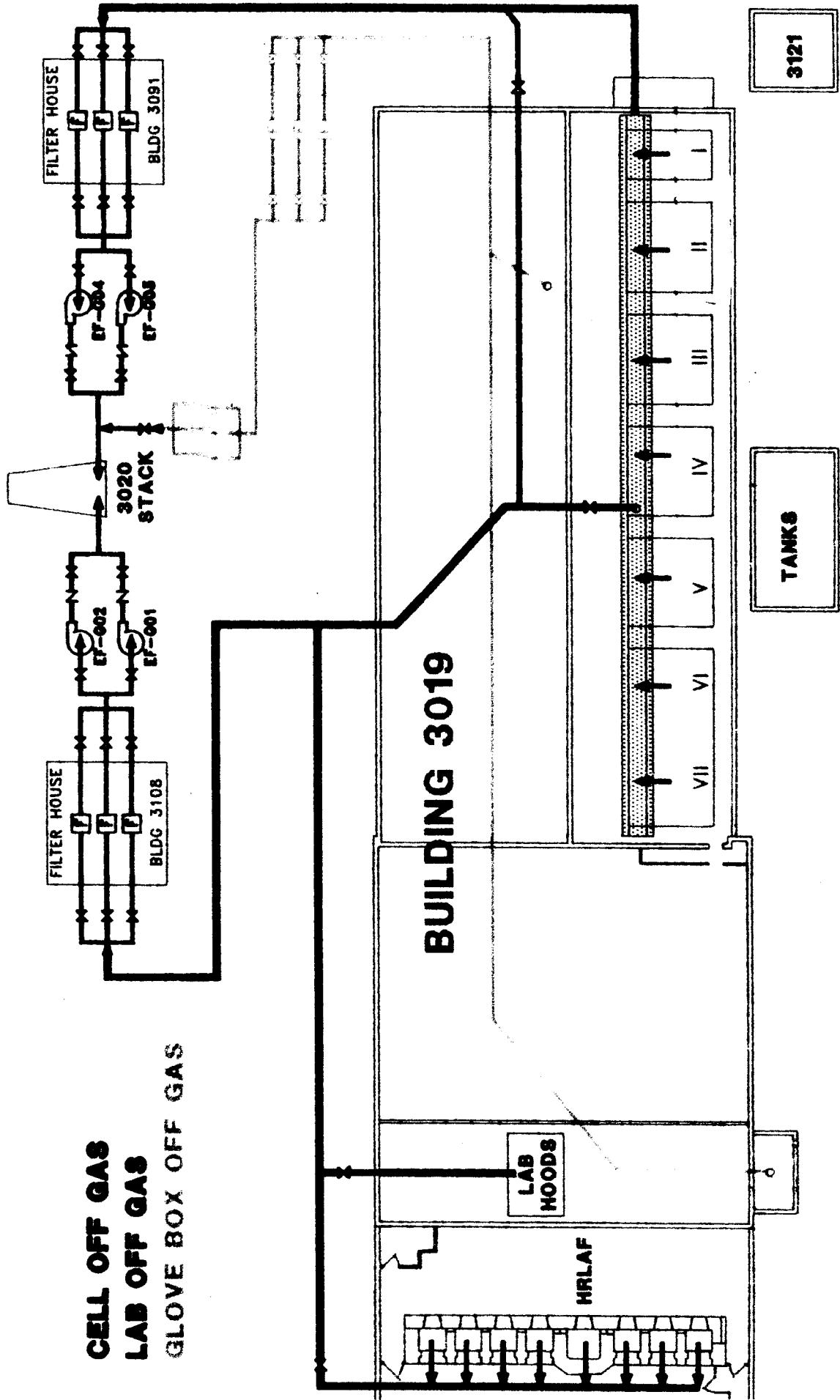
The VOG system provides containment for any contamination released from the storage vaults. During certain operations involving movement of containers from the vaults, it is possible for a breached container to contaminate considerable lengths of the VOG ductwork because no filtration is provided near the point of potential release. The VOG exhausts through a filter at the 3039 stack, which is located approximately 100 yards away down a hill from Building 3019. Portions of the outside VOG lines are unshielded, and operations at the 3039 stack are under the purview of the waste management contractor. This situation can represent a potential hazard to nearby workers.

Staff Observations. Overall, the ventilation assessment at Building 3019 is comprehensive and praiseworthy in its identification of requirements. Unfortunately, conclusions regarding both the ventilation requirements analysis and the Fire Hazards Analysis hinge on completion of the SAR. In addition, an operational readiness review for the uranium-233 inspection program is scheduled prior to completion of the SAR. While a new SAR is not a prerequisite, because an acceptable Basis for Interim Operations is in place, the revised SAR may specify new safety-class and safety-significant equipment and controls, and verifying the implementation of these requirements during the readiness review would be more efficient and potentially more effective than separately reviewing their implementation at a later date.

Further, the SAR still needs to deal with the issue of legacy chemical and radioactive materials in the ductwork. This analysis is no easy task, and its results could change the functional classification of safety-related equipment.

Finally, the lack of filtration close to the source of potential contamination releases in the VOG system may pose an unreviewed worker exposure issue. The staff believes selected compensatory measures (e.g., prefilters in the inspection chamber) are necessary for the VOG system prior to initiation of uranium-233 operations.

RDF VENTILATION SYSTEMS



To 3039
STACK