Department of Energy
Washington, DC 20585

APR 27 1998

The Honorable John T. Conway
Chairman
Defense Nuclear Facilities Safety Board
625 Indiana Avenue, N.W.
Suite 700
Washington, D.C. 20004

Dear Mr. Chairman:

In response to your letter of March 26, 1998, a report of actions being taken to address vulnerabilities from ventilation filter degradation is attached. Additionally, a memorandum tasking field evaluation of safety vulnerabilities, caused by wetting High Efficiency Particulate Air (HEPA) filters, was signed on April 13, 1998. A copy is enclosed for your information.

Efforts to address concerns expressed in your letter of October 30, 1997, have been ongoing. Informal questioning in December 1997, revealed one field office, the Rocky Flats Environmental Technology Site (RFETS), was intentionally wetting HEPA filters by testing of manual fire suppression systems. An Unreviewed Safety Question was declared for three facilities at RFETS, and the contractor has been directed to defer wetting the filters credited by safety analyses, pending resolution of fire suppression system test methods. The occurrence report, cited in the Board's letter of March 26, 1998, related to accidental initiation of the automatic fire suppression subsystem.

I share the Board's belief that protection of the public, workers and the environment is of paramount importance and recognize that HEPA filters are a crucial barrier in protection from release of airborne particulate nuclear materials.

Sincerely,

James M. Owendoff
Acting Assistant Secretary for
Environmental Management

Enclosure
cc: Mark Whitaker, S-3.1

Department of Energy Report of Corrective Action
Nuclear Facility Ventilation High Efficiency Particulate Air (HEPA) Filter Wetting

This report is prepared for response to the Defense Nuclear Facilities Safety Board (Board) as required by their letter of March 26, 1998. The content of this report directly addresses the information requested in the Board letter:

Specific actions by DOE for:

1. Completion of a formal assessment of vulnerabilities associated with ventilation filter degradation from wetting during fire system testing.

A memorandum tasking field review of this concern is attached. The tasking requires a report to headquarters by September 30, 1998, which addresses the scope of vulnerabilities, specifically:

- What nuclear facilities have performed fire suppression testing (or other activities) which wet safety filters,
- Whether such testing and degradation represents potential inadequacies in procedures, configurations, or risk assessments, and
- Completion of a review of fire-fighting strategy.

The tasker requires local review of firefighting guidance and training for emergency response personnel as they relate to vulnerabilities of ventilation confinement systems. This is intended to ensure that they appropriately address coordination of safety concerns for emergency response personnel with concerns for control of fires, and release of radioactive materials to the workplace, the public and environment.

The tasking requires local determination and implementation of appropriate corrective actions. The Department is aware that there is some diversity of thought on the best means to address related concerns. Many facility specific concerns might apply to selection and prioritization of the appropriate corrective actions. Therefore, local DOE authorities are best situated to ascertain appropriate corrective actions.

A discussion below addresses actions at Rocky Flats. There may be no other sites which wets nuclear safety ventilation filters. An informal poll of fire protection personnel from DOE field activities identified no other sites with this vulnerability. A more formal assessment is tasked to provide greater assurance that the response is adequately researched and that managers are aware of the related concerns. Reporting of this assessment will permit DOE Headquarters to determine whether additional inquiry or generic problem analysis is appropriate. If generic problems are identified, further feedback is expected consistent with the Department's implementation of Integrated Safety Management Systems (Board Recommendation 95-2).

Commitments:
1.A. Field activities report results of vulnerability assessment by Sep 30, 1998.
1.B. DOE determine whether there is need for additional generic analysis and action within 30 days of receipt of (all) site reports.

Attachment: (1) DOE (EM, DP, NE) memo of April 13, 1998, to Distribution, "Evaluate Safety Vulnerabilities Relating to High Efficiency Particulate Filter Degradation"

2. Evaluation and correction of the problem by field offices,

The Rocky Flats study on HEPA filter service life concluded that wetting filter media posed potential for significant filter strength degradation, and provided some fundamental quantification of effect. Some degradation due to environmental factors, including moisture, has been understood for decades, and has been considered in development of technical specifications for filter materials. The study suggested that the magnitude of degradation might exceed that for which technical procurement specifications had accounted. Further, it suggested that degraded filter failure modes might involve significant reduction in filtration efficiency. The underlying concern is whether nuclear facility activities adequately account for such considerations in hazard assessments and decisions on related maintenance and controls, such as fire system testing and filter replacement. Whether this concern applies for a given facility, and within a facility for a specific filter (plenum and stage) might not depend solely upon the (uncertain) magnitude of strength degradation, and whether it exceeds the magnitude accounted for in development of technical procurement specifications. It might also depend upon filter safety function, the magnitude of dependence upon filtration in various modes of operation and accident conditions, other configurations or procedures mitigating scenarios of concern, etc.

Whether or not to test plenum deluge systems in a way that wets filters involves both a compliance issue and a safety evaluation judgement. Department of Energy Directives invoke National Fire Protection Association code, which generally requires such testing, both to verify system operability and spray patterns. Directives make provision for federal fire protection engineers to approve equivalencies or exemptions if it serves safety interests. Such determinations involve a balancing the significance of testing to assure system reliability based on design features, operating experience and problems, against the significance of potential filter degradation.

Ventilation system fire suppression configurations typical of the plena of concern at Rocky Flats include three functional components: an automatic sprinkler system which uses heat sensors to initiate sprinkler mist into a heat chamber upstream of the HEPA chamber (and separated from the HEPAs by a demister filter of metal construction), the demister, and a manually initiated sprinkler system which sprays on first stage filters to suppress fire if initiated in them or to extinguish any embers passed by the demister. See the attached schematic figure. The automatic system cools gasses and removes some particulate matter (smoke and water). The demister removes particles, especially larger particles which might be burning, and water droplets. The manual system is needed to extinguish fire flash over to the filters on which it sprays, and to further cool gasses. It helps preclude need for firefighters to enter plena. The occurrence report cited in the Board's letter of March 26, 1998, related to accidental initiation of the automatic subsystem, which does not significantly wet filter media, and is not expected to cause the degree of wetting evaluated in the testing which initiated this concern (15 minute soak and/or saturation).

As the series of Board letters and DOE responses on ventilation systems have suggested, field determination of appropriate local actions is complemented by expert consensus efforts to revise technical standards and enforce intended manufacturing quality controls. Operational concerns relate to the consensus judgements that are represented in the technical standards for design, procurement and operation of safety significant ventilation systems and components. Industry and Department technical standards for nuclear ventilation HEPA filters are being revised and regenerated in response to these concerns. In the process of revising standards, experts are considering the import of evolving technology, the differing approaches taken within this country and others to the issues, and the diversity of dependence upon confinement systems as facility missions change. Regeneration by DOE of a related (Department of Defense) procurement quality control process which assures that vendors meet the standards, the Quality Products List (QPL) testing requirement, is important and is stipulated in revised standards. The Department's Plutonium Ventilation System Study Report, forwarded to the Board by Secretary of Energy letter of March 15, 1996, identified technical standard revision commitments. Two DOE Technical standards have been revised to date. The Department is also preparing a revision of the Nuclear Air Cleaning Handbook and has provided a draft to the Board staff for comment.

For existing nuclear facilities, if filters have been wet, the most appropriate corrective actions are determined by a confluence of concerns. Action decisions should not be made based on wetting concerns in isolation, but should reflect the related concerns for risks and implications of water or dust/smoke loading of filters during fires, management of ventilation flows and filter differential pressures, risk of degrade of confinement function without active ventilation (negative pressure confinement), ALARA concerns for worker radiation exposures, etc. The interdependence of such related factors cause local DOE authorities to be best suited to determine operational resolutions.

The Rocky Flats disposition of their related Unreviewed Safety Question (USQ) has been informally reviewed by headquarters EM staff, and field office engagement is considered adequate and appropriate to resolve operational concerns. Authority to approve the USQ, and accept related risks, had previously been delegated by the Assistant Secretary for Environmental Management to the Manager, Rocky Flats Field Office. The Rocky Flats process identified USQs for specific filter plena and stages in Buildings 371, 707 and 559. In these facilities, the potential for malfunction of some first stage filtration which had been wet had not previously been considered in evaluating risks from major fire accidents (Building Leak Path Factors accounted for two stages of filtration). Reduction in the analyzed margin of safety was reported for two of the buildings. No compensatory actions were identified, but the Rocky Flats Field Office has directed contractors to defer wetting filters for a period (3 years from last test) sufficient to resolve how best to modify testing requirements for the manually initiated systems which wet filters. Department fire protection engineers have informally concluded that some exemption to the NFPA code test requirements may be appropriate in this case and may be provided to resolve the testing issue. The contractor has been directed to provide their plan for resolution of deluge system testing questions to the field office by June 30, 1998.

The Rocky Flats Field Office has also directed the contractor to include in their resolution a plan for replacement of previously wet filters, or a justification for not replacing them. The evaluated incremental risk from major fires in the affected facilities met site risk acceptance criteria, and

was approved by Manager, Rocky Flats Field Office. Filter performance is periodically verified by efficiency testing in-place to reasonably assure that routine operational exhausts meet safety analysis criteria. Building exhausts are monitored for radioactive particulate contamination as well.

Commitment:

2.A. RFFO approve plans for wetted filter replacement and plenum manual deluge testing procedures by July 31, 1998.

Note: The Department of Energy Plutonium Ventilation System Study Report of February 1996, forwarded to the Board under Secretary of Energy letter of March 15, 1996, identifies commitments for revision of technical standards.

Ref:
- a. "Evaluation of HEPA Filter Service Life" , RFP-514, July 14, 1997, J. Fretthold, A. Stithem
- b. "Nuclear Facility Plenum and Deluge System Operation During Fires", Nov 12, 1997, Rocky Flats
- c. "Potential for HEPA Filter Damage from Fire Protection Systems in Filter Plena", 24 DOE/NRC Nuclear Air Cleaning and Treatment Conference, July 1996, W. Bergman,J. Fretthold, J. Slawski
- d. DOE Order 420.1 and Implementation Guide, Fire Safety Program
- e. NFPA standard 25, Inspection, Testing and Maintenance of Water-Based Fire Protection Systems
- f. DOE-STD-3020-97, Specifications for HEPA Filters used by DOE Contractors
- g. DOE-STD-3022-98, DOE HEPA Filter Test Program
- h. MIL-F-51079D, Filter Medium, Fire-resistant, High-efficiency
- i. Board letters of Feb 1, 1994, June 15, 1995, July 21, 1995, October 3, 1996, December 5, 1996, October 30, 1997, February 9, 1998, and March 26, 1998, all relating to nuclear facility ventilation systems.
- j. DOE letters of July 16, 1996, and January 15, 1998, which responded to DNFSB suggestions.
- k. Kaiser-Hill L.L.C. memo of February 19, 1998, USQ - Degraded HEPA Filters, Rev. 1 - GMV-065-98.
- l. RFFO memo to Kaiser-Hill, L.L.C. of April 24, 1998, RFFO Disposition of HEPA Filter USQ/Issues

Attachment: (2) Figure - Typical Plenum Deluge System

3. Promulgation of the "lessons learned" document,

The lessons learned document was forwarded to the Board with the DOE letter of January 15, 1998. It was sent to all DOE Lessons Learned Coordinators and other interested parties via the DOE Lessons Learned List Server on January 18, 1998. It was placed on the Internet web site for DOE Lessons Learned Information Services in April 1998 (http://tis-hq.eh.doe.gov:80/ll/ll.html). The concern had previously been promulgated in part by Operating

Experience Weekly Summary 97-34, which is also available by Internet (http://tis.eh.doe.gov/web/oeaf/oe-weekly/oe-weekly.html.) The lessons learned was also attached to memo requiring field vulnerability assessment (attached), which went to DOE field managers. Thus, both standard feedback mechanisms and management attention have been invoked in this case.

4. Improvements in the qualification test program for certification of nuclear ventilation filter materials.

Edgewood Laboratories at Aberdeen, MD has informally continued the QPL test program and vendor product certification at vendor request and expense, with DOE encouragement. They have continued to provide this service to support all nuclear filter procurements, but the process must be formalized to assure its intended implementation by both vendors and filter procurement activities. Questions relating to applicability of vendor indemnification under the Price-Anderson Act, and applicability of the Price-Anderson Amendment Quality Assurance Rule (10CFR830.120) may require resolution to complete this action. The QPL program expectations must be formally documented and promulgated to procurement authorities. Included in that documentation is to be an expectation that materials to be tested for vendor certification will be selected by independent test representatives at random, rather than by the vendors as before. Implementing plans and methods are being negotiated by DOE.

Commitment:

4.A. Initiate an improved qualification test program for certification of nuclear ventilation filter materials by December 1998.