

## DEFENSE NUCLEAR FACILITIES SAFETY BOARD

August 28, 1996

**MEMORANDUM FOR:** G. W. Cunningham

**COPIES:** Board Members

**FROM:** W. M. Shields

**SUBJECT:** Fire Protection Visit to Rocky Flats Environmental Technology Site, Building 771 (July 31-August 1, 1996)

1. **Background:** This fire protection review of Building 771 was part of the Board staff's ongoing evaluation of this facility for planned operations over the next several years. The review consisted of document examination, building tour, and technical discussions over a two-day period. Questions were provided in advance to RFO (Ref. 1). This very old facility is protected in some degree by fixed fire detection/suppression systems and low combustible loading in many areas, however, there are numerous deficiencies. The effort to verify the assumptions in the Basis for Operation (BFO) is focusing attention on these deficiencies and the need for corrective or compensatory measures.
2. **Discussion:**
  - a. Condition of the Facility and Installed Systems

Building 771 is an old industrial structure dating from the 1950s. Throughout its operational life (ending in the late 1980s) it has been modified a number of times and equipment has been abandoned in place. A considerable quantity of plutonium remains in the building, in addition to a large number of drums containing hazardous and radioactive materials. A serious plutonium chip fire occurred in 1957 (Ref. 2).

Typical of other Rocky Flats buildings, 771 has been outfitted with sprinkler systems and attendant fire alarms, plenum deluge systems, glovebox heat detectors, interior hose connections, and other fire protection features (extinguishers, barriers, fire doors, etc.) (Refs. 2, 12). These features are in varying states of repair and design adequacy. Major modifications and upgrades would be needed if a long-term production mission were contemplated. However, that is not the case. The building is slated for stabilization and D&D. Thus, fire protection must be maintained to control fire risk until such time as radioactive materials have been removed and the hazard to the public and workers has been eliminated.

Based on this review, it appears likely that an adequate level of protection can be established and maintained using a combination of installed fire protection features (properly maintained), fire department response, and strict control of combustibles. Some initial repairs will be needed on fire barriers (walls, doors, penetrations) and suppression deficiencies must be remedied.

b. Documentation of Fire Protection Program

A complete Fire Hazards Analysis was prepared in 1994 (Ref. 2). It has not been updated since then though little action has been taken to change the facility since that time. An update will be needed to support the final versions of the BFO (if pursued) and the SER.

Prefire plans have been prepared (Refs. 5 and 6). The Operations Order (Ref. 7) contains requirements on fire safety inspections, permitted combustible loading, and appropriate cross-references to sitewide Health and Safety Practices. A USQ package was prepared on the proposal to do away with the BEST team concept. (Ref. 8) The Program Execution Guide (Ref. 9) prepared by RFO is unusually detailed and appears adequate in scope to provide field office oversight if carried out diligently.

The recent occurrence reports for 771 (Refs. 15 and 16) are unusual in the sense that the out-of-compliance conditions “discovered” were described in the 1994 FHA. It is possible that these reports (one is an LCO violation, the other a USQ identification) were written to bring the building into compliance with reporting requirements which may be codified shortly and thus enforceable by civil penalty.

c. Specific Problems and Deficiencies

Maintaining the building’s safety envelope over the next several years is dependent on addressing known deficiencies and assessing features whose status is unknown:

**Sprinklers:** there are known design problems (e.g. Rooms 179, 249), corroded or painted sprinkler heads, and lack of maintenance/testing (Room 146 deluge).

**Barriers:** the walls, doors, and penetrations relied upon for the safety analysis (BFO) must be inspected to ensure reliability as fire barriers. The HVAC ductwork must be inspected to determine whether or not fire dampers are needed.

**Documentation:** the FHA and all other documentation required by DOE Orders and guidance must be revised as needed to reflect current conditions and approaches.

**Compensatory measures:** wherever physical changes cannot be cost-effectively implemented to achieve compliance, compensatory measures (e.g. fire watches, removal of combustibles) must be developed and implemented.

These various efforts were commencing at the time of the review. However, funding for FHAs remained in doubt. The occurrence reports noted in the previous section were filed during initial BFO verification walkdowns of sprinklers and fire barriers in the Operational Area.

d. Reliance on Fire Department Response

Rocky Flats has maintained for a number of years a highly-trained, professional firefighting force. This has been necessary because of the unique hazards of plutonium, the desirability of fast response, and the need for a high level of security. The RFFD provides a full range of emergency services in addition to firefighting capability. Board staff reviews beginning in 1991 have regularly commented on the RFFD's high level of training, staffing, equipment, and readiness.

Recent budget pressures have resulted in a reduction in force of this department from 56 (FY96) to 49 (FY97). The RFFD Strategic Plan (Ref. 11) and the previous EH baseline evaluation (Ref. 10) indicate that this steady-state level is adequate to maintain readiness and sufficient numbers to attack a major fire. It is also apparent, however, that further reductions will diminish this capability below acceptable levels. While plutonium is present at RFETS in large quantities and in uncontrolled storage configurations, fire will remain a major hazard to the public and workers. The RFFD cannot be further reduced in force until much progress is made on plutonium stabilization and D&D of contaminated facilities such as Building 771.

e. Validity of BFO Approach

The BFO (Ref. 3) uses a PRA-oriented approach to assess fire risk. A number of fire scenarios are developed and analyzed using assumptions about suppression, detection, barriers, material-at-risk, and fire department response. The results of these bounding scenarios are releases of radioactive materials in quantities found to be below DOE criteria for public and worker exposure. TSRs and administrative controls are developed to ensure that the analysis input parameters are maintained.

This is not the place to examine this methodology in detail, or whether it is the most useful approach for a very old facility entering a stabilization/D&D phase. Because the various PRA scenarios make very specific assumptions, the BFO cannot be relied upon until all of these assumptions are verified. Where deficiencies are found which invalidate the calculations (e.g. sprinkler design problems), these deficiencies must be remedied to a degree restoring the calculational basis.

For the 771 areas containing large quantities of combustible Benelex shielding, funds used to calculate accident scenarios might have been better spent removing this material. This would have decreased the reliance on sprinkler systems in these areas and lowered overall risk substantially.

The TSRs developed from the BFO calculations generally seem to be adequate to ensure that the safety envelope is preserved. The LCOs are general ("performance-based"), unlike commercial tech specs. Required actions are set forth, however, in the TSR "Action" sections, which cannot be changed without invocation of the USQ procedure.

A substantial period of time will be needed to validate the BFO and correct deficiencies. It is uncertain at this point whether DOE intends to proceed with this safety methodology. Fire protection improvements in Building 771 could certainly be carried out on a cost-effective basis without reliance on elaborate PRA calculations.

### 3. **Future Action:**

The DNFSB staff will need to monitor progress on the fire protection deficiencies noted above. A site visit will be advisable when DOE concludes that corrective actions have been completed.

### 4. **References**

1. Technical questions provided to RFO for review and discussion, together with answers provided by DOE or in documentation.
2. Fire Hazards Analysis, Building 771/774, Rev. 0, August 1994.
3. Basis for Operation, Building 771, Rev. 0, Draft F, June 21, 1996.
4. Building 771 System Evaluation Report (SER) 27, Rev. 0, "Fire Protection Systems."
5. Pre-Fire Plan, Building 771, Jan. 10, 1996.
6. Glovebox and Pu Firefighting Guidelines, No. 3-FES-GOG-232, Rev. 0.
7. Operations Order, Building 771/774, Fire Safety Inspections, No. 00-771-39, Rev. 2.
8. USQD-RFP-95.0141-ARS, "Proposed Site-Wide Elimination of Building Emergency Support Teams."
9. DOE-RFO Authorization Basis Group, "Fire Protection Program Execution Guide" (draft), Rev. 1.1, June 11, 1996.
10. Rocky Flats Fire Department Evaluation, May 10, 1995, D. Kubicki, DOE-EH.
11. Rocky Flats Fire Department Strategic Plan-2000 (DynCorp, undated).
12. Technical Presentation slides, J. Galaska, FPE Kaiser-Hill.
13. Building 771 Hydroxide Precipitation Process Readiness Assessment Plan of Action, No. 96-RF-03939, Rev. 1, June 21, 1996.
14. Implementation Plan for Readiness Assessment No. 96-0144, Rev. 0, July 8, 1996.
15. Occurrence Report, August 8, 1996, "Out-of-Tolerance Conditions With the Bldg. 771 OSR Existed in Rooms 146A and 179."
16. Occurrence Report, August 20, 1996, "An Unreviewed Safety Question Was Determined to Exist for the Building 771 Fire Barrier Deficiencies."

### Reference 1: Technical Q's and A's

- Q1: The Operational Area in some places is delimited only by interior partition walls from other building areas. This appears to be true for Room 153 which contains Benelex shielding. Are these boundaries credited as true fire barriers with at least a 2 hour rating? If not, what is the basis for areas outside the Operational Area not being covered by the LCO for fire protection systems?
- R1: There is an error in the drawings in the FHA--the Operational Area is bounded by concrete walls. However, a thorough walkdown is needed to verify the adequacy of these walls as fire barriers. (See Ref. 16: USQ declared on barriers.)
- Q2: The Benelex areas within the Operational Area are separated from other areas by (in some cases) only partition walls. Are the Benelex areas true fire areas (i.e. separated from other areas by sealed, rated fire barriers)? If not, what is the basis for the LCO treating these areas differently vis-a-vis required fire protection features?
- R2: The sprinklers in the Benelex areas are considered adequate to suppress fires sufficiently to prevent spread until the Fire Department has responded. Fire suppression systems in non-Benelex areas will be maintained even if not covered by LCOs.
- Q3: Credit is taken in the BFO for fire suppression for Benelex areas. When will the sprinkler deficiencies in these areas be remedied? Will steps be taken to ensure that the Benelex areas are bounded by fire barriers, including rated doors and penetrations?
- R3: A sprinkler walkdown was commenced in early August. Deficiencies have been identified. (See Ref. 15). A schedule for correction of sprinkler deficiencies is not yet available. On the Benelex areas, see R2.
- Q4: The FHA (page 14) points out that existing HVAC ducts lack fire dampers and are not constructed so as to meet the Rocky Flats exemption criteria for ducts. What steps are being taken to address this problem?
- R4: No ducts penetrate from the Operational Area to other areas of the building. The ducts are expected to qualify under the exemption criteria but further examination and analysis is required before this finding can be made. If any ducts do not qualify, they will either have to be strengthened or dampers installed to prevent spread of fire and smoke within the Operational Area.
- Q5: The FHA (at 13-14) notes that the exterior walls of the building are unrated and that exterior doors have been modified so as to violate their listing. What is the basis for assuming a fire rating for the building exterior, especially if a fire should occur in a room such as 186 (Benelex and on the perimeter of the building)?

- R5: The exterior walls of the building are of extremely heavy construction and are believed to meet or exceed a 2-hr rating. Exterior doors with deficiencies have been or will be repaired to ensure that a reasonable containment function in the event of a fire.
- Q6: The FHA lists BEST team deficiencies for Building 771. Have these been corrected?
- R6: The BEST teams can no longer be maintained in this building and will not be relied upon for fire response. This is a site-wide problem--see discussion in Ref. 8.
- Q7: What is the status of Room 146A?
- R7: The auto-deluge system is not considered operational. It may be made operational or a wet-pipe system substituted. See Ref. 15.
- Q8: It is stated on page 14 of the 771 SER that the "Fire Barriers System (penetrations and supports" are not Safety SSCs and do not support the functional requirements. How does this square with the statement on page 9 of the SER that "The sprinklers required to maintain the BFO envelope are those located in the Operational Area within areas which are bounded by fire barriers." (my emphasis) In what sense can it be said that the fire barriers system does not "support the functional requirements" for detection and suppression systems? Note that on page 3-5 of the BFO, the walls, roof, and internal fire barriers are listed as "Engineered Features" relied on to maintain the safety envelope.
- R8: Fire barriers are considered to support the functional requirements for suppression and detection systems. The wording in the SER is incorrect. The intent was to state that barriers are not active systems covered by LCOs, but must be maintained to preserve the safety envelope provided by the LCOs.
- Q9: On page 3-10 of the BFO, LCOs are characterized as "functional" rather than component specific. Examination of the TSRs shows that all specificity is contained in the "Actions" rather than in the LCO itself. Can the "Actions" section of the TSRs be changed without invoking the USQ process?
- R9: No.
- Q10: For SOC 5 (chemical fires), the BFO states (page 3-47) that gaseous production products "are expected to be minor...providing that the fire is extinguished in a reasonable period of time." The Fire Department "will be equipped with supplied breathing air and other proper protective equipment and thus will be able to fight the fire without being affected by the combustion products." What is the basis for these statements given that some 5,000 chemical containers are present in the building? Does the preplan tell firefighters what chemicals may be encountered in what areas? Has the Fire Department conducted drills using breathing air and full chemical protective suits? What are the response times

when such drills are held?

- R10: These numerous chemical containers are mostly small and are scattered through the building. The Fire Department will respond to serious fires in full breathing gear. See Ref. 5. Two drills have been held in the last 6 months. Response time (fully suited for building entry) is about 5 minutes from receipt of alarm.
- Q11: For SOCs 7a and 7b (propane explosion and fire), the BFO states (3-49) that following the postulated propane/air explosion, the "automatic fire suppression system extinguishes the fire within approximately 30 minutes." What is the basis for assuming that the sprinkler system and its water supply are not damaged or even destroyed by the explosion?
- R11: The postulated explosion is not large given that the total quantity of propane available is held in a small tank outside the building. The suppression system might be partially damaged, but should control any resultant fire pending Fire Department response.
- Q12: The BFO states (page B-15) that "building management may need to establish a combustible loading control program for the building." Such a program is actually required by ACR 5.2.15. Has such a program been developed, or is one being worked on?
- R12: Yes; see Ref. 7.
- Q13: Has the program required in ACR 5.2.4 (work near hydrogen--containing tanks) been established?
- R14: Yes; see Ref. 7.
- Q14: The BFO comments (page TSRs-96) that Fire Department response can be counted on because of "procedures, training and adequate staffing." Is there a complete, detailed prefire plan for Building 771? (Copy will be requested.) Are any changes being contemplated for the staffing levels of the Fire Department?
- R14: Yes; see Refs. 5 and 6. On the Fire Department, see Refs. 10 and 11. Further reductions in force are not being considered at this time.
- Q15: How will DOE-RFO confirm that all fire protection features relied upon in the BFO are fully operational and will be maintained properly? What level of inspection (type, frequency, staffing) is planned by DOE to ensure that the fire protection safety envelope is maintained?
- R15: DOE-RFO will conduct inspections as required by DOE Orders; other inspections are

conducted by DOE-EH.

Q16: What is the status of the site-wide fire alarm system upgrade?

R16: This project is fully funded; completion expected in 1998.