



UNITED STATES
NUCLEAR REGULATORY COMMISSION
REGION II
101 MARIETTA STREET, N.W.
ATLANTA, GEORGIA 30323

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Report No.: 50-62/90-05

Licensee: University of Virginia
Charlottesville, VA 22901

Docket No.: 50-62

License No.: R-66

Facility Name: University of Virginia Reactor Facility (UVAR)

Inspection Conducted: December 11-13, 1990

Inspector:

James L. Kreh
J. L. Kreh

02 Jan. 1991
Date Signed

Accompanying Personnel: M. Lesser, NRC

Approved by:

E. H. Rankin, Jr.
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Emergency Preparedness Section
Radiological Protection and Emergency
Preparedness Branch
Division of Radiation Safety and Safeguards

01/02/91
Date Signed

SUMMARY

Scope:

This routine, announced inspection was conducted in order to assess the operational readiness of the emergency preparedness program, and to observe and evaluate the licensee's annual emergency response drill conducted on December 11, 1990.

Results:

In the area inspected, no violations or deviations were identified. The licensee appeared to be maintaining an acceptable level of operational readiness for responding to emergencies. No significant response problems were disclosed during the drill, although some minor ones occurred and were identified during the licensee's critique for follow-up corrective action. One discrepancy was identified concerning the calibration of radiological survey instruments as actually performed versus the Emergency Plan specification; the licensee committed to prompt corrective action (see Paragraph 6).

REPORT DETAILS

1. Licensee Employees Contacted

- *P. Benneche, Reactor Services Supervisor
- *J. Farrar, Reactor Administrator
- *R. Mulder, Director, University of Virginia Reactor Facility
- L. Scheid, Reactor Operator
- *D. Steva, Reactor Health Physicist/Radiation Specialist, Environmental Health and Safety Department

Other licensee employees contacted during this inspection included operators and administrative personnel.

*Attended exit interview

2. Emergency Response Drill (82745)

The licensee's Emergency Plan required that an annual onsite emergency drill be conducted to test the adequacy of emergency procedures and to ensure that emergency organization personnel are familiar with their duties. In addition, at least biennially, drills must contain provisions for coordination with offsite emergency organizations for testing communications and notification procedures with these groups.

The following discussion makes reference to accident/casualty conditions which were postulated to have occurred in order to effect activation of the licensee's emergency response organization. All such conditions referenced herein were simulated, although the licensee's responses actually occurred (to the extent practicable) and were evaluated.

On December 11, 1990, the licensee conducted the annual emergency drill, which included the biennial participation of offsite emergency organizations. The drill started at about 8:15 a.m. and lasted 45 minutes. The scenario involved a minor earthquake which was eventually determined to have not affected the reactor but which caused a glass flask to shatter in the mezzanine laboratory M019, splattering a student with a concentrated solution of hydrofluoric acid (HF) and activation products. The attachment to this report provides a detailed description of the scenario and objectives.

The inspector observed the response by the UVAR emergency organization following the simulated occurrence of the earthquake. Facility conditions included simulated loss of power. The contaminated injured person was found expeditiously by facility personnel. Treatment of the casualty did not initially include precautions for uncontained acid and radioactive material because their presence was not immediately recognized (probably a drill artificiality, especially with respect to the HF). The facility was

not evacuated because the severity of the earthquake was not such as to produce structural damage or reactor anomalies that would mandate such a precaution. Activation of the Emergency Support Center (ESC) was prompt (less than two minutes), and its operation by the Emergency Director was effective in coordinating accident investigation and mitigation. The campus Police Department, the University's Environmental Health and Safety Department, and the Charlottesville-Albemarle Rescue Squad were contacted and requested to assist in the response at UVAR; each organization did so, although some confusion and delay was associated with the acquisition of the Rescue Squad's services (apparently an artificiality intruded here with regard to whether actual dispatch to the UVAR was being requested for the purposes of the drill). The Charlottesville Fire Department arrived in a "first responder" capacity by virtue of the "911" contact, even though their assistance had not been specifically requested by UVAR.

During the preparatory stage of the drill (several weeks prior), the licensee learned through discussions with cognizant personnel at the University of Virginia Hospital that, notwithstanding a renewed letter of agreement signed by a hospital administrator on October 25, 1990, that facility's Emergency Room was not physically prepared to treat a contaminated injured patient. Appropriate modifications to this (still relatively new) facility were expected to be completed by approximately February 1, 1991. In the interim, any actual contaminated injuries would be sent to a hospital in Richmond, VA for treatment.

The inspector considered the licensee's drill to be an overall success. Minor points of "drillsmanship" were brought to the attention of licensee management for use in improving the conduct of future drills.

As required by the Emergency Plan, a critique was conducted after the drill and was observed by the inspectors. The critique was judged to be thorough (lasting 90 minutes), with pertinent input from drill participants as well as evaluators. The deficiencies identified during the critique were minor; most should be readily correctable. Some of the observed shortcomings resulted from the generic artificiality of the drill situation, in which there is not infrequently a lack of attendant urgency on the part of the responders. Corrective actions implemented in response to the critique findings will be reviewed during future inspections.

No violations or deviations were identified.

3. Emergency Organization (82745)

Pursuant to Section IV.A and IV.F of Appendix E to 10 CFR Part 50, this area was inspected to determine if the licensee had defined the key functional areas of the onsite and offsite emergency organizations, and assigned trained personnel to all functional areas of the onsite organization.

The inspector reviewed Section 3.0 of the Emergency Plan for a description of the emergency organization. Based on this review and observations made during the emergency drill, the inspector determined that the licensee had defined the key functional areas for the onsite emergency organization, and that, in general, staff and management personnel were aware of their responsibilities during an emergency.

No violations or deviations were identified.

4. Emergency Response Training (82745)

Section 10.1 of the Emergency Plan described the training program for UVAR personnel. The training for these individuals was to include at least two classroom training sessions and practical drills yearly.

The inspector reviewed the training records for the period January 1 - November 30, 1990, and discussed emergency training provided to management and staff personnel. Through review of the records and discussions with licensee personnel, the inspector determined that training and practical drills had been conducted at the required frequency. Training sessions on the Emergency Plan and response methodology were held for the UVAR staff on June 29 and November 6, 1990. The licensee took credit for the semiannual evacuation drills as the two required practical drills during 1990.

No violations or deviations were identified.

5. Maintenance of Emergency Plan and Emergency Plan Implementing Procedures (EIPs) (82745)

The Emergency Plan and EIPs were selectively reviewed to note changes made since the last inspection and determine whether these changes had adversely affected the overall state of emergency preparedness at the facility.

One round of changes (designated as Revision 12, dated December 10, 1990) was made to the EIPs since the last inspection of the emergency preparedness program in November-December 1989. This revision primarily consisted of updates and reformatting of emergency notification lists. The only substantive changes that were made to the EIPs are discussed below in Paragraphs 7.c and 7.d in connection with the closures of two previous inspection findings. No changes to the Emergency Plan had been made since the above-referenced inspection.

In October 1990, the licensee sent written solicitations to 10 offsite support organizations seeking renewed letters of agreement. Seven of those organizations had responded (all favorably) as of the closing date of the inspection.

No violations or deviations were identified.

6. Emergency Facilities and Equipment (82745)

Section 8.6 of the Emergency Plan specified that emergency equipment and supplies would be inventoried every six months, and that portable instruments and dosimeters dedicated for emergency use would be functionally checked quarterly and calibrated semiannually.

The inspector selectively examined emergency kits and equipment at various locations in the facility. The two formal kits, contained in lockers located on the first (or main) floor and the ground floor, included radiation survey meters, dosimetry, protective clothing, first-aid supplies, self-contained breathing apparatus, and Health Physics signs and barriers. The inspector noted that the portable survey instruments in the emergency kits (one ion-chamber instrument in each locker) were calibrated on an annual schedule instead of semiannually as referenced above. Because both instruments happened to be "current" relative to the semiannual requirement (they were calibrated on September 19 and October 13, 1990, respectively), and because the American National Standards Institute (ANSI) specifies an annual calibration for radiation protection instrumentation (reference: ANSI N323-1983), the inspector accepted as appropriate corrective action the licensee's commitment to revise Section 8.6 of the Emergency Plan by January 31, 1991 to stipulate that radiation survey instruments would be calibrated annually. Other supplies in the emergency kits appeared appropriate and adequate for aiding the response to a radiological emergency.

The inspector reviewed the program for maintaining the emergency equipment and for keeping the proper inventory of items in the kits. The licensee's documentation indicated that the emergency kits were inventoried and maintained as required by Section 8.6 of the Emergency Plan, except as noted above.

No violations or deviations were identified.

7. Licensee Action on Previous Inspector Follow-up Items (IFIs) (92701)

- a. (Closed) IFI 50-62/89-04-01: Performing accountability immediately following an evacuation of the reactor facility.

The response to the postulated events during the December 11, 1990 exercise did not include a building evacuation. However, since the licensee was required to conduct semiannual evacuation drills, the inspector was able to conclude, through documental review of an evacuation drill conducted on May 17, 1990 and direct observation of one conducted on December 13, 1990, that accountability was being performed immediately and systematically after evacuation of the facility.

- b. (Closed) IFI 50-62/89-04-02: Conducting the annual emergency drill in a manner that fully tests implementation of the Emergency Plan.

The inspector determined that the scenario for the 1990 drill was developed in confidence by the Reactor Director and the Reactor Services Supervisor (who served as the controllers/evaluators), and that there was no indication of advance knowledge of the scenario on the part of the players.

- c. (Closed) IFI 50-62/89-04-03: Determining who would fill the position of Emergency Communicator and changing EPIP-1 or actual practice accordingly.

The licensee revised (on December 10, 1990) Attachment 2 to EPIP-1 to specify that the position of Emergency Communicator would be filled by a member of the Reactor Staff designated by the Emergency Director. This change suitably addressed the concern of the subject IFI.

- d. (Closed) IFI 50-62/89-04-04: Correction of the inconsistency between the Emergency Plan and EPIP-14 concerning the designation of a Primary Assembly Area.

EPIP-14 (page 3) was revised on December 10, 1990 to be consistent with the Emergency Plan on this point. The inspector observed that a notice was prominently displayed at a number of locations within the Reactor Facility advising staff of this change, and that the evacuation drill on December 13, 1990 demonstrated personnel awareness of the current assembly area.

8. Exit Interview

The inspection scope and results were summarized on December 13, 1990, with those persons indicated in Paragraph 1. The inspector described the area inspected and discussed in detail the inspection results. Licensee management committed to revising the Emergency Plan by January 31, 1991 to correct the discrepancy regarding instrument calibration as discussed in Paragraph 6. The licensee was informed that four previous IFIs were reviewed and closed, as discussed in Paragraph 7. Proprietary information is not contained in this report. Dissenting comments were not received from the licensee.

Attachment: Scope and Scenario
for 1990 UVAR Drill

DEPARTMENT OF NUCLEAR ENGINEERING AND ENGINEERING PHYSICS
UNIVERSITY OF VIRGINIA
REACTOR FACILITY
MEMORANDUM

November 21, 1990

To: Emergency Procedures Training File
From: Robert U. Mulder, Reactor Director
Paul E. Benneche, Reactor Services Supervisor
Subject: 1990 Bi-annual Emergency Drill Description

PREPARATION:

Conduct scheduled emergency requalification training with reactor staff.

Renew letters of commitment with off-site support organizations.

Request updated copies of support agencies' E-Plans, if applicable, to review compatibility.

Distribute updated emergency actions lists and emergency phone numbers to appropriate off-site organizations.

Offer to provide familiarization training to off-site support organizations, consisting of tours of the reactor facility and discussions of possible emergencies.

Update EPIP's as required.

Coordinate drill date in advance with NRC and off-site support organization heads (while maintaining scenario confidentiality as much as possible).

Notify U.Va. Information Services of drill one day in advance.

Develop and discuss drill scenario with drillmaster(s) and "victim(s)". Set the scene prior to drill initiation.

PARTICIPANTS:

Reactor staff, with the exception of the Reactor Director and a Reactor Supervisor, who will act as drillmasters and observers 1 and 2. An operator trainee will play the part of the contaminated and injured student.

Environmental Health and Safety (HP) Staff

Rescue Squad

U.Va. Hospital

Va. Office of Emergency Services (Charl'ville Office).

SCENARIO:

A. It is a work-day morning and the UVAR is being started up (actual or simulated condition). The reactor director is away at a conference and one of the reactor supervisors is on leave. A number of faculty and students are present in the Reactor Facility and involved in classes and experiments.

NOTE:

Drillmasters will distribute the above information to all staff as they begin work.

B. Sometime later that morning, an "earthquake" of magnitude 4 on Richter scale occurs, with "tremors" felt for about 30 seconds. The buffeting does not result in cracked walls or immediate signs of severe building damage. The electrical lights in the building go out.

NOTE:

The second reactor supervisor, in his office, is instructed by drillmaster 1 to use the PA system to announce the start of a drill and advise faculty and students to remain in their offices and classrooms until further notice. For the benefit of those drilling, the supervisor will describe scenario steps A and B over the PA system. From that point onwards, the supervisor is required to act on his own, and further scenario steps will be "dished out" by the drillmasters as the situation is made to evolve.

Drillmaster 2 has option at this point to add realism to the drill by actually cutting off electrical power to the building.

At this stage, the supervisor is expected to take some actions, for example, call the reactor control room for status report, call the staff for quick meeting, send staff to access damage, etc....

C: Immediately after the supervisor finishes his "announcement," a "student" pleads for help in the mezzanine lab M019 (sometimes referred to as the TGW lab) at the direction of drillmaster 2. This appeal could be addressed to people perchance in the immediate area. Otherwise, use of the PA system is to be made. The student is able to report that he/she has been dissolving UVAR irradiated steel samples in concentrated acids, to

effect a radiochemical separation. Due to the earthquake, the glassware has shattered, releasing a concentrated (about 28 mole/lit) and radioactive solution of about 250 ml volume of HF (hydrofluoric acid) in the hood and surrounding area. The acid solution containing activated products has splattered on the hands, clothing, shoes and face of the student. The remaining acid solution reacts with the counter in the hood, and the floor just below, generating obvious fumes.

NOTE:

Drillmaster 2 will remain in the lab to observe and evolve the drill scenario for that component of the drill. Water representing the acid solution will have been spilled, and vapor from the interaction of acid with concrete will be "announced" to all those entering the room. The victim will have been prepared for the injury/contamination simulation.

The contaminated and injured student reports when asked that the radioisotopes involved are Fe-59, Co-60, Mn-54 and Mo-99, exact concentrations unknown, but total activity present in mCi quantities.

D. Meanwhile, the reactor has scrambled, due to the vibration or the loss of electrical power to the building. The external phone system is operable when used.

NOTE:

Drillmaster 1 will play out these occurrences to the staff members in his vicinity, one of which will be the reactor supervisor, who can be expected to declare himself the E-Director. As the potential damage caused by the earthquake must be evaluated, drillmaster 1 will follow the reconnoitering staff members, and relate to them the hypothetical conditions in the various areas of the building. Drillmaster 2 will remain with the injured/contaminated student.

Additional information that the drillmaster will release upon request:

- * The loss of electrical power is for a period of 30 minutes.
 - * There is no loss of phones.
 - * There are no abnormal levels of radiation in the Reactor Facility.
 - * Contamination exist in the lab and in the shower areas.
 - * There are no leaks from the UVAR neutron beamtubes in the mezzanine or lower levels.
 - * There is no leak of poolwater.
 - * The pond dam continues intact.
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E. Nothing appears unusual in the UVAR room, however staff must take certain actions simulated by asking probing questions to the drillmaster.

NOTE:

Drillmaster 1 will declare poolwater level to be stable, after staff has taken care to mark and observe it for a while. The reactor structure will also appear to be OK, but the future operability of the reactor will be left as an open question. The control rods will be declared to have inserted when staff checks this.

EMERGENCY CLASSIFICATION:

Unusual Event, as per EAL's on page 16 of EP, 5.1(1)(b) and (f). However, E-Director must check whether or not 5.2(c) and later, 5.3(c) or 5.3(e) warrant upgrading the emergency classification.

EMERGENCY ACTIONS:

The expected first response is the initiation of first aid to the injured/contaminated student and verification of potential or actual damage to the reactor.

The senior-most person on staff should assume the role of emergency director (here being the second reactor supervisor) and quickly determine the level and extent of the emergency. As emergency director, he must provide overall direction and name an E-Coordinator.

Next, the pertinent notifications should be made and off-site support requested.

Since radioactive materials are used in the laboratory, the possibility of radioactive contamination must be considered by those entering it. Appropriate stepdown areas with the necessary frisking equipment should be set up to monitor all personnel leaving contaminated areas.

Temporary loss of electrical power must be addressed.

The radioactive fume problem must be addressed. (uncontrolled release).

Acid mitigation may warrant use of shower. This must be reconciled with the increase in contamination potential.

Precautionary and recovery actions associated with the earthquake should be played out by the reactor staff.

Reasonable props will be used for adding realism to the scenarios. However, in the response to the same, damage to equipment, breaking down of doors or locks, etc. will not be necessary.

The CAVALIER has been defuelled and will be ignored for purposes of this drill.

CRITIQUE:

In the afternoon of the drill day, a drill critique session to which all participants have been invited will be held at the Reactor Facility. A reactor facility representative will attempt to attend critique sessions of the support groups, if these occur.