

UNITED STATES  
NUCLEAR REGULATORY COMMISSION  
OFFICE OF NUCLEAR MATERIAL SAFETY AND SAFEGUARDS  
WASHINGTON, D.C. 20555

December 26, 1991

NRC INFORMATION NOTICE 91-84: PROBLEMS WITH CRITICALITY ALARM  
COMPONENTS/SYSTEMS

Addressees

All Nuclear Regulatory Commission (NRC) fuel cycle licensees, interim spent fuel storage licensees, and critical mass licensees.

Purpose

NRC is issuing this notice to remind licensees of the importance of adequate reviews of plant modification, installation, maintenance, and response actions, to ensure that required criticality alarm systems meet their intended purpose. It is expected that recipients will review this information for applicability to their facilities, distribute it to responsible staff, and consider actions, as appropriate, to avoid similar problems. However, suggestions contained in this information notice do not constitute any new NRC requirements, and no written response is required.

Description of Circumstances

The following cases are recent events involving problems with licensee's criticality alarm systems that have been reported to, or discovered by, NRC.

Case 1: During a routine test of the criticality alarm system, a licensee discovered that several of the site's audible alarms ("howlers") did not actuate. The licensee found that wiring to the alarms had been accidentally broken while other electrical cables were being pulled through the cable run that contained the criticality alarm wiring. The licensee's system provided indication, prior to the next scheduled test, that some of the audible alarms had been disabled.

Case 2: Engineering drawings describing modifications at a licensed facility specified removal of "heat detectors (radiation)." The licensee's review of the modification package did not recognize that it included removal, rather than relocation, of criticality alarm system detectors. When the specified detectors were removed no alarm was generated at the system monitoring panel. Subsequent investigation disclosed that the alarm panel was wired in such a way that, although a "failure" light was activated at an intermediate panel (an unmanned location), a "loss of power/loss of detector" signal was not generated at the monitoring panel in a normally manned area.

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Case 3: A licensee experienced an activation of the plant's criticality alarm system, but no criticality accident had actually occurred. Investigation found that the alarm had been generated when the uninterruptable power supply (UPS) circuit that powered the alarm system was turned off by means of a switch in the facility's main computer room. The switch had been backfitted to the system to allow for cutoff of all power to the computer room in emergency situations and was not intended to affect power to the criticality alarm system. The modification review associated with the addition of the switch did not identify the fact that the planned location was between the UPS source and the primary criticality alarm system circuit.

Case 4: During an electrical storm, the criticality safety alarms at only the Waste Treatment Facility (WTF) sounded because of a momentary power interruption. Personnel in the WTF did not evacuate, but instead called Security, who then notified Radiation Control and Electrical Shop personnel. Electricians then entered the WTF to silence the alarms before obtaining clearance from Radiation Control. An investigation of the incident determined that the personnel in the WTF did not evacuate in accordance with procedures required by 10 CFR 70.24, and that the electricians made an uncontrolled entry into the WTF to silence the alarms prior to getting clearance from Radiation Control.

Case 5: During a routine NRC inspection of a licensee's criticality accident monitoring system, the inspector found that: (1) since 1970, no evaluation had been performed to demonstrate that the system provided adequate monitoring coverage for facility modifications or additions where large quantities of special nuclear material were being stored or used; (2) the licensee did not have a system to ensure that such technical evaluations were performed and documented; and (3) no program existed to limit the storage of intervening shielding materials between the neutron criticality detectors and the monitored areas.

Case 6: During maintenance, a licensee discovered that under design basis accident conditions (greater than  $1 \text{ E}+15$  fissions) its criticality alarm system might not function as intended. The alarm system used Geiger-Mueller detectors that could become electronically saturated in a high radiation field and not function. As a result, the licensee declared an Unusual Event and discontinued transfers of fissile materials within the facility. The licensee terminated the Unusual Event after connecting anti-saturation circuitry to the criticality alarm system.

### Discussion

All licensees are reminded of the importance of maintaining operable criticality detection, monitoring, and annunciation capabilities, as well as procedures and training for response to criticality alarms. As the forementioned cases indicate, a lack of detailed knowledge of the system's configuration and routing of detector or power circuits can result in failure to recognize the possible impact of installation, modification, or maintenance activities on the criticality alarm system. Physical and electrical modifications have the

clear potential to degrade or disable all or part of this important safety system. Licensees should ensure that they have established a comprehensive testing program, both on a routine basis and after maintenance and modification activities, and a method of continuously monitoring the integrity of criticality alarm system lines and components, through line supervision, to preclude failure of criticality alarm system capabilities. These activities should include clearly written implementing procedures, and a training program to ensure appropriate implementation.

This information notice requires no specific action or written response. If you have questions about the information in this notice, please contact one of the technical contacts listed below or the appropriate regional office.



Richard E. Cunningham, Director  
Division of Industrial and  
Medical Nuclear Safety, NMSS

Technical contacts: Scott Pennington, NMSS  
(301) 504-2693

Gerald Troup, RII  
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Attachments:

1. List of Recently Issued NMSS Information Notices
2. List of Recently Issued NRC Information Notices

LIST OF RECENTLY ISSUED  
NMSS INFORMATION NOTICES

Information Notice No.	Subject	Date of Issuance	Issued to
91-71	Training and Supervision of Individuals Supervised by an Authorized User	11/12/91	All NRC medical licensees.
91-66	(1) Erroneous Data in "Nuclear Safety Guide, TID-7016, Revision 2," (NUREG/CR-0095, ORNL/NUREG/CSD-6 (1978)) and (2) Thermal Scattering Data Limitation in the Cross-Section Sets Provided with the KENO and SCALE Codes	10/18/91	All fuel cycle licensees, critical mass licensees, interim spent fuel storage licensees, and all holders of operating licenses or construction permits for test, research, and nuclear power reactors.
91-65	Emergency Access to Low-Level Radioactive Waste Disposal Facilities	10/16/91	All NRC licensees.
91-60	False Alarms of Alarm Ratemeters Because of Radiofrequency Interference	09/24/91	All Nuclear Regulatory Commission (NRC) licensees authorized to use sealed sources for industrial radiography
91-49	Enforcement of Safety Requirements for Radiographers	08/15/91	All Nuclear Regulatory Commission (NRC) licensees authorized to use sealed sources for industrial radiography.
91-44	Improper Control of Chemicals in Nuclear Fuel Fabrication	07/07/91	All nuclear fuel facilities.
91-39	Compliance with 10 CFR Part 21, "Reporting of Defects and Noncompliance"	06/17/91	All Nuclear Regulatory Commission (NRC) material licensees.
91-35	Labeling Requirements for Transporting Multi-Hazard Radioactive Materials	06/07/91	All U.S. Nuclear Regulatory Commission (NRC) licensees.

LIST OF RECENTLY ISSUED  
 NRC INFORMATION NOTICES

Information Notice No.	Subject	Date of Issuance	Issued to
91-83	Solenoid-Operated Valve Failures Resulted in Turbine Overspeed	12/20/91	All holders of OLs or CPs for nuclear power reactors.
91-18, Supp. 1	High-Energy Piping Failures Caused by Wall Thinning	12/18/91	All holders of OLs or CPs for nuclear power reactors.
91-82	Problems with Diaphragms in Safety-Related Tanks	12/18/91	All holders of OLs or CPs for nuclear power reactors.
91-81	Switchyard Problems that Contribute to Loss of Offsite Power	12/16/91	All holders of OLs or CPs for nuclear power reactors.
91-80	Failure of Anchor Head Threads on Post-Tensioning System During Surveillance Inspection	12/11/91	All holders of OLs or CPs for nuclear power reactors.
91-79	Deficiencies in the Procedures for Installing Thermo-Lag Fire Barrier Materials	12/06/91	All holders of OLs or CPs for nuclear power reactors.
88-92, Supp. 1	Potential for Spent Fuel Pool Draindown	11/29/91	All holders of OLs or CPs for nuclear power reactors.
91-78	Status Indication of Control Power for Circuit Breakers Used in Safety-Related Applications	11/28/91	All holders of OLs or CPs for nuclear power reactors.
90-57, Supp. 1	Substandard, Refurbished Potter & Brumfield Relays Represented as New	11/27/91	All holders of OLs or CPs for nuclear power reactors.

OL = Operating License  
 CP = Construction Permit