UNITED STATES
NUCLEAR REGULATORY COMMISSION
OFFICE OF NUCLEAR REACTOR REGULATION
WASHINGTON, D.C. 20555-0001

September 21, 2000

NRC INFORMATION NOTICE 2000-12: POTENTIAL DEGRADATION OF FIREFIGHTER PRIMARY PROTECTIVE GARMENTS

Addressees

All holders of licenses for nuclear power, research, and test reactors and fuel cycle facilities.

Purpose

The U.S. Nuclear Regulatory Commission (NRC) is issuing this information notice to alert addressees to potential degradation of performance of firefighter primary protective garments (FFPPGs). It is expected that recipients will review the information for applicability to their facilities and consider actions, as appropriate, to avoid similar problems. However, suggestions contained in this information notice are not NRC requirements; therefore, no specific action or written response is required.

Description of Circumstances

The licensee for Hope Creek Nuclear Power Plant reported that following a fire event at the plant it outsourced its FFPPGs to a firm that specializes in decontamination and repair of FFPPGs. The firm found that some of the FFPPGs were degraded and had to be condemned while others had to be repaired. None of this damage was attributed to the fire event; rather, it was all attributed to storage practices and normal wear. Informal NRC staff discussions with representatives at several other nuclear power plants indicated that licensees may not be aware of this problem.

Discussion

Moisture Barrier Degradation

Aldan Engineered Coated Fabrics indicated in a letter dated November 3, 1999, http://www.usfa.fema.gov/alerts/breathetex.htm, that its product BREATHE-TEX has shown signs of degradation under certain conditions. BREATHE-TEX is a trade name for a material that is used as a moisture barrier in FFPPGs. In a letter from Edwin T. Winter, Chairman and CEO of Aldan Engineered Coated Fabrics, to manufacturers of FFPPGs, the degradation is described as follows:

> "The degradation, not readily observable by routine visual inspection, is primarily in the form of film cracking. A degraded moisture barrier film will allow the passage of liquids, thereby reducing the level of protection in proportion to the degree of degradation."

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In a joint statement issued by manufacturers of FFPPGs, dated November 15, 1999, http://www.turnout-info.com/en/news/joint_stmt.htm (note there is an underline "_" between "joint" and "stmt" in this web address) they remind users of FFPPGs that the moisture barriers are the "most fragile component in your gear [FFPPGs]" and that FFPPGs should be inspected on a regular basis. They also state that "particular attention should be paid to the moisture barrier, regardless of what brand it is."

Outer Shell Degradation

Lawrence Livermore National Laboratory (LLNL) report titled "Statistics for the Time-Dependent Failure of Kevlar-49/Epoxy Composites: Micromechanical Modeling and Data Interpretation" by S. L. Phoenix and E. M. Wu indicates that Kevlar, a common fabric used in the production of the durable and heat-resistant outer shell of FFPPGs, is susceptible to photodegradation from ultraviolet (UV) light sources.

Photodegradation is a phenomenon in which the tensile strength of the fibers is reduced as a result of exposure to UV light sources such as sunlight and fluorescent light. Photodegradation leads to reduced abrasion and tear resistance in aramid fibers such as Kevlar.

Many fabrics used in FFPPGs (see list quoted below) use aramid fibers that are subject to photodegradation. Therefore, special care must be taken to ensure that the fabrics are protected from UV light sources. The User Instruction, Safety and Training Guide provided by Lion Apparel (Dayton, Ohio) gives the following warning:

> "Exposure to ultraviolet light (found in the sun's rays and fluorescent light) will severely weaken and damage the fabrics in your protective clothing after only A FEW DAYS. This is especially true for fabrics of the following aramid materials: Hoechst Celanese Pbi, Dupont Kevlar, Dupont Nomex, Dupont Nomex Omega, Dupont Nomex IIIA, Lenzing P84, Southern Mills Advance, and BASF Basofil."

FFPPGs should be dried after cleaning in the shade rather than in a place exposed to UV light.

Users of FFPPGs should consider photodegradation as a damage mechanism. This degradation may not be readily apparent but may seriously degrade the protection offered to plant firefighters. Regular inspection and testing should be performed in accordance with the recommendation of manufacturers and distributers.

Conclusion

Proper storage and regular thorough inspection of FFPPGs are important to ensure that FFPPGs provide effective firefighter protection. FFPPG degradation may not be readily apparent; therefore, special training may be required for inspection of FFPPGs.

This information notice requires no specific action or written response. If you have any questions about the information in this notice, please contact the technical contacts listed below or the Office of Nuclear Reactor Regulation (NRR) project manager.

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2. List of Recently Issued NMSS Information Notices

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LIST OF RECENTLY ISSUED
NMSS INFORMATION NOTICES

Information Notice No.	Subject	Date of Issuance	Issued to
2000-11	Licensee Responsibility for Quality Assurance Oversight of Contractor Activities Regarding Fabrication and Use of Spent Fuel Storage Cask Systems	08/07/2000	All U.S. NRC 10 CFR Part 50 and Part 72 licensees, and Part 72 Certificate of Compliance holders
2000-10	Recent Events Resulting in Extremity Exposures Exceeding Regulatory Limits	7/18/2000	All material licensees who prepare or use unsealed radioactive materials, radio-pharmaceuticals, or sealed sources for medical use or for research and development
2000-07	National Institute for Occupational Safety and Health Respirator User Notice: Special Precautions for Using Certain Self-Contained Breathing Apparatus Air Cylinders	4/10/2000	All holders of operating licenses for nuclear power reactors, non-power reactors, and all fuel cycle and material licensees required to have an NRC approved emergency plan
2000-05	Recent Medical Misadministrations Resulting from Inattention to Detail	3/06/2000	All medical licensees
2000-04	1999 Enforcement Sanctions for Deliberate Violations of NRC Employee Protection Requirements	2/25/2000	All U.S. Nuclear Regulatory Commission licensees
2000-03	High-Efficiency Particulate Air Filter Exceeds Mass Limit Before Reaching Expected Differential Pressure	2/22/2000	All NRC licensed fuel-cycled conversion, enrichment, and fabrication facilities
2000-02	Failure of Criticality Safety Control to Prevent Uranium Dioxide (UO_2) Powder Accumulation	2/22/2000	All NRC licensed fuel-cycled conversion, enrichment, and fabrication facilities
99-33	Management of Wastes Contaminated With Radioactive Materials	12/28/99	All medical licensees

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Information Notice No.	Subject	Date of Issuance	Issued to
2000-11	Licensee Responsibility for Quality Assurance Oversight of Contractor Activities Regarding Fabrication and Use of Spent Fuel Storage Cask Systems	8/7/2000	All U.S. NRC 10 CFR Part 50 and Part 72 licensees, and Part 72 Certificate of Compliance holders
2000-10	Recent Events Resulting in Extremity Exposures Exceeding Regulatory Limits	7/18/2000	All material licensees who prepare or use unsealed radioactive materials, radio pharmaceuticals, or sealed sources for medical use or for research and development
95-03, Supp 2	Loss of Reactor Coolant Inventory and Potential Loss of Emergency Mitigation Functions While in a Shutdown Condition	7/03/2000	All holders of OL for nuclear power reactors except those who have ceased operations and have certified that fuel has been permanently removed from the reactor vessel
2000-09	Steam Generator Tube Failure at Indian Point Unit 2	6/28/2000	All holders of OL for nuclear power reactors, except those who have permanently ceased operations and have certified that fuel has been permanently removed from the reactor vessel
2000-08	Inadequate Assessment of the Effect of Differential Temperatures on Safety-Related Pumps	5/15/2000	All holders of operating licensees for nuclear power reactors
2000-07	National Institute for Occupational Safety and Health Respirator User Notice: Special Precautions for Using Certain Self-Contained Breathing Apparatus Air Cylinders	4/10/2000	All holders of operating licenses for nuclear power reactors, non-power reactors, and all fuel cycle and material licensees required to have an NRC-approved emergency plan

OL = Operating License
CP = Construction Permit