

UNITED STATES  
NUCLEAR REGULATORY COMMISSION  
OFFICE OF INSPECTION AND ENFORCEMENT  
WASHINGTON, D. C. 20555

January 30, 1985

IE INFORMATION NOTICE NO. 85-08: INDUSTRY EXPERIENCE ON CERTAIN MATERIALS  
USED IN SAFETY-RELATED EQUIPMENT

Addressees:

All nuclear power reactor facilities holding an operating license (OL) or construction permit (CP).

Purpose:

This information notice is being issued to provide licensees and construction permit holders with information pertaining to the behavior of certain materials used in safety-related equipment. The materials, as described below, were observed to have the potential of degrading the operability of safety-related equipment. These observations were made during environmental qualification testing and/or during routine inspection of in-service equipment. It is expected that recipients will review the information for specific and generic applicability to their facilities. However, suggestions contained in this notice do not constitute NRC requirements; therefore, no specific action or response is required.

Description of Circumstances:

1. Elastomeric Seals Used in Personnel Air Locks for the Reactor Containment Systems

In a recent 10 CFR 21 report to the NRC, the W. J. Woolley Company reported that they have a testing program to qualify one type of airlock that utilizes inflatable elastomeric seals around the perimeter of the door for sealing against differential pressure. During this testing, one of the inflatable seals manufactured by Presray Corporation ruptured. The seal material is an EPDM elastomeric with a fabric reinforcement part way around the seal, and the rupture occurred in the area where the fabric ended. The ruptured seal was subjected to the following conditions during the qualification test: artificial aging for an equivalent of 5 years by exposure to 201°F for 200 hours, exposure to an integrated radiation dose of  $1 \times 10^7$  rads, and exposure to a test chamber post-LOCA environment of 465°F. These parameters are applicable to Midland Nuclear Station.

The ruptured seal was examined by Woolley Company and Presray Corporation. It was determined that the high temperature (465°F) had weakened the EPDM and caused the material to stretch resulting in a rupture. The W. J. Woolley Company further stated that the Presray inflatable seals may be

inadequate for the following plants because of their relatively high temperature applications:

Grand Gulf (Drywell Lock only)	330°F
Perry (Drywell Lock only)	330°F
River Bend (Drywell Lock only)	330°F
South Texas (Containment Locks)	280°F

The Woolley Company is working with Presray Corporation on the design of a new inflatable seal that will have fabric reinforcement around the entire seal. The new design will be used to replace the current installed seals, according to the Woolley Company report.

2. Epoxy Phenolic Coating Applied to the Lower Portion of the Interior Surface of Diesel Oil Storage Tank

In a 10 CFR 50.55(e) report to the NRC, the Philadelphia Electric Company reported that during final inspection of the diesel oil storage tanks at Limerick Generating Station, the epoxy phenolic coating on portions of the interior surface of three of the four Unit 1 tanks was observed to have extensive peeling and flaking. If not repaired, these fragments could have entered the fuel oil transfer piping and filters, thus impeding fuel oil flow and potentially causing a diesel generator failure.

The specification for Limerick Station required that the entire interior surface of the tanks be coated with an inorganic zinc primer to a thickness of between 2.0 mils and 4.0 mils. On top of the zinc primer, an epoxy phenolic coating was applied to a minimum of 12 mils and a maximum of 18 mils dry film thickness.

Philadelphia Electric Company stated that there are two factors that may have contributed to the coating failure: (1) chemical incompatibility between the zinc primer and the epoxy coating, and (2) improper curing of the zinc primer.

Subsequent investigation by Philadelphia Electric Company has revealed an additional concern regarding the coating system. The zinc in the primer coat may react adversely with diesel fuel when exposed over a long period of time. Products of this reaction are often soluble when the fuel is at room temperature, but may degrade into insoluble gums as the fuel passes through the hot injectors and intake manifolds of a diesel engine, and thus may result in degraded performance as the engine is operated over a period of time.

The Philadelphia Electric Company has proposed corrective actions to provide sufficient protection against the deficiencies described above and also against any internal corrosion of the tanks as a result of internal condensation. The interior surface of the tanks will be sandblasted to white metal and recoated with a substitute epoxy phenolic coating applied directly to the white metal. The new coating will be certified by the vendor for compatibility with diesel fuel.

3. The Use of Viton Elastomer as the Seal Material in Hydrogen Recombiner Applications

In a 10 CFR 21 report, Rockwell International reported that during the evaluation of the post-LOCA hydrogen recombinder to develop methodology for mechanical qualification of pressure retaining components, a concern was raised as to the appropriateness of the use of Viton elastomer as the seal material in recombinder application. Initial findings indicate that Viton material would compress as a result of exposure to radiation, elevated temperature, and steam. This compression may cause some loss of sealing capability when the temperature is subsequently reduced. Literature searches and inquiries to vendors and research organizations reveals that, in laboratory tests, Viton will exhibit deterioration in seal effectiveness when exposed to environmental parameters similar to those conditions for which the RI recombiners are designed. The effects on Viton elastomer are believed to be synergistic, but the extent of synergism is not quantifiable; e.g., steam absorption softens the material while radiation and temperature harden it.

Rockwell International has recommended that its customers replace Viton seals with alternate seals.

4. Environmental Qualification of ASCO NP Valves With Viton and Ethylene Propylene Parts

The Equipment Qualification Branch of the Office of Nuclear Reactor Regulation has reached the conclusions listed below regarding the qualification of ASCO NP Solenoid Valves. This information superceeds and/or supplements information previously provided in IE Information Notices 80-11, 81-29 (Equipment Environmental Qualification Notice No. 10--Test Summary Report No. 1) and 82-52 (Equipment Environmental Qualification Notice 10--Test Summary Report No. 2).

- a. ASCO NP series solenoid valves with resilient seats and Viton elastomers may be considered qualified only for those applications in which the valves are not required to shift position following exposure to total gamma radiation doses greater than 20 megarads up to 200 megarads. No qualification data are available for applications in which the radiation dose exceeds 200 megarads gamma.
- b. Except for model NP 8316 with Ethylene Propylene elastomers (Suffix "E"), ASCO NP series solenoid valves are considered qualified to the extent and levels reported in Table 5.1, pages 59 and 60 of ASCO Test Report No. AOR-78368/Rev. 1, "Report on Qualification of Automatic Switch Co. (ASCO) Category NP-1 Solenoid Valves for Safety-Related Applications in Nuclear Power Generating Stations," dated March 2, 1982.
- c. ASCO valve model NP 8316 with Ethylene Propylene elastomers is considered qualified to the levels reported in Isomedix Test Report No. AOS 21678/TR, Rev. A, dated March 1978, revised July 1979. (Category III as defined in Table 5.1 of ASCO Test Report AOR-67368/Rev. 1.)


Discussion:

The above described circumstances, along with those circumstances that were described and disseminated previously in Information Notices 84-12, 84-31, and 84-83 point out the need for ongoing surveillance and evaluation of in-service equipment to detect material degradation that may occur as a result of the synergistic effects between material in use and the normal operating requirements and associated environmental parameters.

The operability of the equipment will be less reliable as its constituent materials age. The actual degradation of equipment is not quantifiable because the synergistic effect of material is dependent on (1) the environmental parameters where the equipment is installed and (2) the cyclic and functional design requirements of the equipment. Very often, records of these environmental parameters (under normal and abnormal conditions) and records of equipment cycling or operation are not readily available and have not been accounted for during the environmental qualification review process. Therefore, a routine surveillance program for equipment that is known to contain degradable material might be considered. Some licensees have indicated that they are considering such a program, including periodic review of the resulting data.

The items described in the above description of circumstances identify certain deficiencies in specific equipment types. However, the NRC staff considers that the potential effect of each of the above deficiencies is generic in nature and is applicable to other equipment where circumstances are similar.

No specific action or written response is required by this notice. If you have any questions concerning this notice, please contact the Regional Administrator of the appropriate NRC regional office or this office.

  
Edward V. Jordan, Director  
Division of Emergency Preparedness and  
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Office of Inspection and Enforcement

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Attachment: List of Recently Issued IE Information Notices

LIST OF RECENTLY ISSUED  
IE INFORMATION NOTICES

Information Notice No.	Subject	Date of Issue	Issued to
85-07	Contaminated Radiography Source Shipments	1/29/85	All NRC licensees authorized to possess industrial radiography sources
85-06	Contamination of Breathing Air Systems	1/23/85	All power reactor facilities holding an OL or CP
85-05	Pipe Whip Restraints	1/23/85	All power reactor facilities holding an OL or CP
85-04	Inadequate Management Of Security Response Drills	1/17/85	All power reactor facilities holding an OL or CP, & fuel fabrication & processing facilities
85-03	Separation Of Primary Reactor Coolant Pump Shaft And Impeller	1/15/85	All pressurized water power reactor facilities holding an OL or CP
85-02	Improper Installation And Testing Of Differential Pressure Transmitters	1/15/85	All power reactor facilities holding an OL or CP
85-01	Continuous Supervision Of Irradiators	1/10/85	All material licensees possessing irradiators that are not self-shielded and contain more than 10,000 curies of radioactive material
84-94	Reconcentration Of Radio-nuclides Involving Discharges Into Sanitary Sewage Systems Permitted Under 10 CFR 20.303	12/21/84	All NRC materials licensees other than licensees that use sealed sources only

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OL = Operating License  
CP = Construction Permit