SSINS No.: 6835
IN 85-24

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

March 26, 1985

IE INFORMATION NOTICE NO. 85-24: FAILURES OF PROTECTIVE COATINGS IN PIPES AND HEAT EXCHANGERS

Addressees:

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

Purpose:

This information notice is provided to alert recipients of a potentially significant problem pertaining to the selection and application of protective coatings for safety-related use, especially painting interior surfaces of pipes and tubing. It is expected that recipients will review the information for applicability to their facilities and consider actions, if appropriate, to preclude a similar problem occurring at their facilities. However, suggestions contained in this information notice do not constitute NRC requirements; therefore, no specific action or written response is required.

Description of Circumstances:

1. Spray Pond Piping

While making minor repairs to the spray pond piping system in 1982, Palo Verde Nuclear Generation Station Unit 1 personnel discovered delamination and peeling of the interior epoxy lining in three 24-inch-diameter 90° elbows. Examination of the remainder of the piping system showed similar lining failures in other elbows, such as 3-inch blisters that contained solvent, poor adhesion, soft film, and excessive film thickness. The spray pond is the ultimate heat sink for the Palo Verde Station. During a shutdown where the ultimate heat sink was needed, separation of the epoxy lining from the elbows could potentially cause a flow restriction in the piping system.

The epoxy coating specified was Plasite 7122-H, a product of Wisconsin Protective Coatings Company. This material is formulated to be applied by mechanical spraying equipment in layers 2-1/2 to 4 mils thick with sufficient time allowed for each layer to cure. The use of mechanical spray equipment provides a uniform and controlled coating film thickness. The straight sections of the piping system were coated in this manner. The multilayer mechanical deposition and curing of 12-15 mils of coating in the straight sections of pipe took 7 days, and no discrepancies similar to those in the elbows were found.

However, the elbows were coated in two layers using a hand-held gun. The lining was uneven with the coating up to 25 mils thick. Coating took only 3 days in December of 1980; this reduction in curing time can be critical, especially in the winter when chemical curing and solvent evaporation tends to be retarded. In addition, the elbows were capped after the final coating application and there was insufficient air necessary for curing.

A hand-held gun was used to spray the coating because of the shape of the elbow. There are other methods of applying epoxy coatings that are more controllable and use less solvent. Electrostatic spray uses less epoxy and solvent for the same coating thickness. Electrodeposition in a water solution provides the most uniform coating and does not use solvents. The fluidized bed method will provide the thickest epoxy deposit. Whatever application method is selected, epoxies are thermosetting materials and are normally cured by oven baking or infrared heating. Heating reduces curing time from several days to several hours.

The elbows were repaired by removing the deficient lining, preparing the surface by grit blasting, and recoating with Plasite 9009-IT. The repairs were acceptable and a final report was issued in January 1984.

2. Diesel Generator Heat Exchangers

While operating train A of the spray pond piping system in May 1984, Palo Verde Nuclear Generation Station Unit 2 personnel discovered an accumulation of epoxy material. The jacket water cooler, air after-coolers, and lube oil coolers of all the train A and train B diesel generator heat exchangers had extensive failure of the epoxy coating and resulted in complete blockage of the governor oil coolers.

The failures of the epoxy coating included severe blistering, moisture entrapment between layers of the coating, delamination, peeling, and widespread rusting. The epoxy coating specified was Plasite 7155-H. It is formulated to be deposited in thin layers using mechanical spraying equipment.

An evaluation of the deficiencies showed the presence of cutting oils on the heat exchanger surface before the coating was applied. It is a basic requirement to have a dry, oil-free surface before applying coatings. In addition, the surface was too smooth for the epoxy coating to adhere. Epoxy coatings are applied directly to the metal without a primer and it is necessary to slightly roughen the metal surface. Finally, the heat exchangers were sealed after spraying and there was insufficient air to complete the curing process. Repairs were successfully made with Plasite 9009-IT and a final report was issued in September 1984.

It should be noted that this information notice is not intended to imply that Plasite materials produced by Wisconsin Protective Coatings Company are unacceptable. Other applications using appropriately selected materials and application techniques have been successful.

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

Edward L. Jordan, Director
Division of Emergency Preparedness
and Engineering Response
Office of Inspection and Enforcement

Technical Contact: P. Cortland, IE
(301) 492-4175

Attachment: List of Recently Issued IE Information Notices

Attachment 1
IN 85-24
March 26, 1985

LIST OF RECENTLY ISSUED
IE INFORMATION NOTICES

Information Notice No.	Subject	Date of Issue	Issued to
85-23	Inadequate Surveillance And Postmaintenance And Post-modification System Testing	3/22/85	All power reactor facilities holding an OL or CP
85-22	Failure Of Limitorque Motor-Operated Valves Resulting From Incorrect Installation Of Pinon Gear	3/21/85	All power reactor facilities holding an OL or CP
85-21	Main Steam Isolation Valve Closure Logic	3/18/85	All PWR facilities holding an OL or CP
85-20	Motor-Operated Valve Failures Due To Hammering Effect	3/12/85	All power reactor facilities holding an OL or CP
85-19	Alleged Falsification Of Certifications And Alteration Of Markings On Piping, Valves And Fittings	3/11/85	All power reactor facilities holding an OL or CP
85-10 Sup. 1	Posstensioned Containment Tendon Anchor Head Failure	3/8/85	All power reactor facilities holding an OL or CP
84-18	Failures Of Undervoltage Output Circuit Boards In The Westinghouse-Designed Solid State Protection System	3/7/85	All Westinghouse PWR facilities holding an OL or CP
83-70 Sup. 1	Vibration-Induced Valve Failures	3/4/85	All power reactor facilities holding an OL or CP
85-17	Possible Sticking Of ASCO Solenoid Valves	3/1/85	All power reactor facilities holding an OL or CP
85-16	Time/Current Trip Curve Discrepancy Of ITE/Siemens-Allis Molded Case Circuit Breaker	2/27/85	All power reactor facilities holding an OL or CP

OL = Operating License
CP = Construction Permit