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IN 86-104

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

December 16, 1986

IE INFORMATION NOTICE NO. 86-104: UNQUALIFIED BUTT SPLICE CONNECTORS IDENTIFIED
IN QUALIFIED PENETRATIONS

Addressees:

All pressurized and boiling-water reactor facilities holding an operating license or a construction permit.

Purpose:

This notice is to alert recipients to unqualified butt splice connectors supplied by General Electric (GE) in conjunction with qualified F-01 series penetration enclosures. These connectors failed during a recent environmental qualification test performed by Wyle Laboratories. It is suggested that recipients review this information for applicability to their facility and consider actions, if appropriate, to preclude occurrence of similar problems. Suggestions contained in this notice do not constitute NRC requirements; therefore, no specific action or written response is required.

Description of Circumstances:

During an NRC equipment qualification (EQ) inspection at Dresden Nuclear Power Station, May 19-23, 1986, a deficiency was discovered concerning a lack of similarity between tested and installed nylon insulated butt splices in EQ qualified GE electrical penetrations. Commonwealth Edison sent four sample splices removed from Quad Cities Nuclear Power Station to Wyle Laboratory to further substantiate their qualification for use in a harsh environment. These splices were identical to those installed at Dresden. During the testing performed at Wyle Laboratory December 4-5, 1986, all four samples exhibited excessive leakage currents to ground when exposed to a steam environment. Commonwealth Edison consequently declared the splices unqualified and shut down its Quad Cities Unit 1 to rework the splices by wrapping them with previously qualified tape. Dresden Unit 2 has similarly reworked the splices by wrapping them with tape. Duane Arnold Energy Center also has commenced a shutdown in order to make repairs.

Discussion:

The splices in question were supplied by GE as part of their F-01 penetration assemblies. GE obtained the splices from three different manufacturers: Amp, Thomas and Betts, and Hollinsworth. The splices in question are nylon insulated


butt splices and most appear to be for 12-to-22 gauge conductors although other sizes may be installed as well. The splices from the three manufacturers are almost identical in design and are all manufactured using either Zytel-42 or Celanese-1200 nylon tubing over a metal crimp connector.

The splices tested at Wyle were manufactured by Amp and had been removed from Quad Cities where they had been exposed to approximately 12 years of aging (thermal and radiation). Wyle also subjected the samples to aging and radiation sufficient to add an additional year. After this aging and irradiation, the samples were inspected and tested for insulation resistance. The samples showed no sign of fatigue and exhibited a high insulation resistance. The samples were then put into a loss-of-coolant-accident (LOCA) chamber and energized for the start of the LOCA test. Two samples were energized with 528 volts and two samples were energized with 132 volts. During the preheat of the LOCA chamber and before the actual LOCA test, one of the 528-volt samples began shorting to ground and blew its fuse. At this point the temperature in the chamber had reached only 150°F. The test was continued with two other specimens blowing fuses at the 20-second point and at the 2-hour, 23-minute point of the test. The fourth sample finished the test, but excessive leakage currents were measured.

The short circuits that occurred appeared to start by condensation entering the splice between the wire insulation and the nylon tubing. The arcing caused insulation degradation that then allowed arcs to pass through the insulation to the enclosure.

The NRC is currently evaluating additional data pertaining to butt splice connectors and may be issuing additional information on this subject in the near future.

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


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

Technical Contact: J. Jacobson
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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
86-14 Supplement 1	Overspeed Trips Of AFW, HPCI, And RCIC Turbines	12/17/86	All power reactor facilities holding an OL or CP
86-103	Respirator Coupling Nut Assembly Failures	12/16/86	All power reactor facilities holding an OL or CP and fuel facilities
86-102	Repeated Multiple Failures Of Steam Generator Hydraulic Snubbers Due To Control Valve Sensitivity	12/15/86	All power reactor facilities holding an OL or CP
86-101	Loss Of Decay Heat Removal Due To Loss Of Fluid Levels In Reactor Coolant System	12/12/86	All PWR facilities holding an OL or CP
86-100	Loss Of Offsite Power To Vital Buses At Salem 2	12/12/86	All PWRs or BWRs holding an OL or CP
86-99	Degradation Of Steel Containments	12/8/86	All power reactor facilities holding an OL or CP
86-21 Sup. 1	Recognition Of American Society Of Mechanical Engineers Accreditation Program For N Stamp Holders	12/4/86	All power reactor facilities holding an OL or CP
86-98	Offsite Medical Services	12/2/86	All power reactor facilities holding an OL or CP
86-97	Emergency Communications System	11/28/86	All power reactor facilities holding an OL or CP and fuel facilities
86-96	Heat Exchanger Fouling Can Cause Inadequate Operability Of Service Water Systems	11/20/86	All power reactor facilities holding an OL or CP

OL = Operating License
 CP = Construction Permit