

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

May 8, 1989

NRC INFORMATION NOTICE NO. 89-45: METALCLAD, LOW-VOLTAGE POWER CIRCUIT BREAKERS  
REFURBISHED WITH SUBSTANDARD PARTS

Addressees:

All holders of operating licenses or construction permits for nuclear power reactors.

Purpose:

This information notice is being provided to alert addressees to the discovery of defects in metalclad, low-voltage power circuit breakers, including missing, nonstandard, and substandard parts, and improper assembly and misadjustment. It is expected that recipients will review this information for applicability to their facilities and consider actions, as appropriate, to avoid similar problems. However, suggestions contained in this notice do not constitute NRC requirements; therefore, no specific action or written response is required.

Description of Circumstances:

The NRC has learned of the discovery of defects in metalclad, low-voltage, power circuit breakers which had been installed at the Quad Cities nuclear power plant. The breakers had missing, nonstandard, and substandard parts that were identified during maintenance at the General Electric (GE) switch-gear service shop in Hammond, Indiana. The breakers were GE type AKF-2-25, DC field discharge breakers used as anticipated transient without scram (ATWS) breakers for the reactor coolant recirculation pump motor-generators.

Commonwealth Edison Company (CECo) purchased the AKF-2-25s for Quad Cities from the Satin American Corporation. In a recent inspection at Satin American, the NRC reviewed the records pertaining to these breakers. The Quad Cities purchase order and the Satin American invoice and shipping documents indicated that the breakers were purchased as commercial grade equipment. The shipping documents contained no certifications and described the breakers only by model number and serial number. Satin American's inspection and testing records for the breakers indicated that they had been taken from the vendor's stock of reportedly new breakers and only inspection and testing was documented before they were shipped to Quad Cities. Satin American's catalog defines "new" as

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never used and obtained from the manufacturer. The catalog classifies as "unused" those breakers that have never been used, but were obtained from sources other than the manufacturer. However, the vendor's stock is obtained from various sources, and consists predominantly of ostensibly never-used surplus switchgear. The information available at the time of the inspection did not establish clear traceability to the source of these breakers, nor could the circumstances under which they were purchased be confirmed.

Records at Quad Cities reviewed thus far indicate that only routine maintenance had been performed on the breakers at the plant. The deviations were discovered by the GE Hammond Switchgear Service Shop during the course of their overhaul of the breakers for Quad Cities. The NRC has not determined who was responsible for the condition of the AKF-2-25s at Quad Cities or why these conditions remained undetected during intervening maintenance activities.

#### Discussion:

Some of the deviations found by the GE Hammond service shop in one of the AKF-2-25s from Quad Cities were apparently the result of either substandard or improper materials, poor quality workmanship and/or substitution of non-standard parts and misrepresentation of condition and/or quality.

Deviations in one of the breakers' nameplates were reported to have initially alerted GE to the possibly refurbished condition of the breaker. On an AKF-type breaker, the nameplate should have included an "Inspected by" stamp, a "GEK" instruction book number, and the serial number should have included the "ATL" designation for the GE facility in Atlanta that modifies AK breakers, built in Burlington, Iowa, to the AKF configuration. The nameplate on this AKF breaker was missing the inspection stamp and the instruction book number, and its serial number did not have the "ATL" designation. Also, the nameplate was loosely fastened by two improperly installed rivets.

During disassembly and inspection, GE identified the lower stud, the lower pivot shims, the moving contact springs, a cam follower, and some moving contact arms as nonstandard, non-GE parts. The paint was reported as being a glossy nonstandard type, of excessive thickness, and had been applied in locations where a potential to jam the mechanism existed, particularly the closing coil plunger assembly and the E-frame. Several layers of hand-cut black electrical insulation paper were found under the center stationary contact mounting block where one thickness of insulation paper and machined steel lower pivot shims would normally be installed. The mounting block is fastened to the breaker frame with two machine screws and two dowel pins. In one of the AKF-2-25s, the dowel pins were missing. The flat or leaf spring type contact arm spring laminations are supposed to be machine stamped from copper-plated spring steel, whereas the breaker was found to contain springs made of untempered copper and mild steel that appeared to have been roughly

cut from sheet metal stock by hand with a hacksaw and metal shears. Also, these breakers have boomerang-shaped cam follower arms in the contact mechanism cut or stamped from stock about 1/8-inch thick. The arms contain a machined slot of conforming shape. In genuine GE parts, the inside edge of the slot at the elbow where the angle changes is machined to a point; whereas, on the cam followers found in the Quad Cities breaker, this point was rounded off to about a 1/4-inch radius. This could impair the breaker function, possibly causing the mechanism to jam. Additionally, the closing coil, which appeared to have been rewound, was cracked, and the leads exited the windings in a manner inconsistent with GE standard practice.

During the inspection at Satin American, NRC inspectors examined about 20 of the AK-type breakers in the Satin American warehouse that had been obtained reportedly as unused surplus material and found only one or two of the nameplates exhibiting the inspection stamp. In addition, breakers were found with nameplates missing most of the normal data, and one had two serial numbers. The NRC is continuing its inquiry into this matter; however, similar to the Quad Cities case, available information did not establish traceability to the source of these breakers.


Although it has not been determined what party or parties are responsible for the deviations identified on the Quad Cities AKF-2-25 ATWS breaker, it is clear that breaker failures or malfunctions could result from the types of deviations observed and that users of these and other breakers must exercise appropriate controls when procuring commercial grade components. A properly implemented commercial grade dedication program for circuit breakers would include measures to ensure that the component design is suitable for the application, that the component is traceable to the original manufacturer, and that the component, when received, is adequately inspected and tested to verify all critical characteristics. Such a program would identify many of the deficiencies described above.

In addition, licensees are responsible for assuring that all maintenance and refurbishment and/or modification of equipment is performed properly by qualified personnel (including contractors) using correct parts and materials and that all required retests are properly conducted and evaluated.

The NRC is particularly interested in obtaining information on these or other types of circuit breakers that have been found with deficiencies similar to those described in this notice. Documentation, in as much detail as practicable, of any such circuit breaker deficiencies discovered, especially in cases where a breaker may have been improperly serviced or refurbished is important. Licensees may communicate the availability of information of this type by telephone to the NRC technical contact listed below.

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

  
Charles E. Rossi, Director  
Division of Operational Events Assessment  
Office of Nuclear Reactor Regulation

Technical Contact: S. Alexander, NRR  
(301) 492-0995

Attachment: List of Recently Issued NRC Information Notices

LIST OF RECENTLY ISSUED  
 NRC INFORMATION NOTICES

| Information Notice No. | Subject   | Date of Issuance | Issued to   |
|------------------------|---|------------------|---|
| 89-44                  | Hydrogen Storage on the Roof of the Control Room  | 4/27/89          | All holders of OLs or CPs for nuclear power reactors. |
| 88-82, Supp. 1         | Torus Shells with Corrosion and Degraded Coatings in BWR Containments                         | 5/2/89           | All holders of OLs or CPs for BWRs.                   |
| 89-43                  | Permanent Deformation of Torque Switch Helical Springs in Limitorque SMA-Type Motor Operators | 5/1/89           | All holders of OLs or CPs for nuclear power reactors. |
| 88-97, Supp. 1         | Potentially Substandard Valve Replacement Parts   | 4/28/89          | All holders of OLs or CPs for nuclear power reactors. |
| 89-42                  | Failure of Rosemount Models 1153 and 1154 Transmitters  | 4/21/89          | All holders of OLs or CPs for nuclear power reactors. |
| 89-41                  | Operator Response to Pressurization of Low-Pressure Interfacing Systems                       | 4/20/89          | All holders of OLs or CPs for nuclear power reactors. |
| 88-75, Supplement 1    | Disabling of Diesel Generator Output Circuit Breakers by Anti-Pump Circuitry                  | 4/17/89          | All holders of OLs or CPs for nuclear power reactors. |
| 89-40                  | Unsatisfactory Operator Test Results and Their Effect on the Requalification Program          | 4/14/89          | All holders of OLs or CPs for nuclear power reactors. |
| 89-39                  | List of Parties Excluded from Federal Procurement or Non-Procurement Programs                 | 4/5/89           | All holders of OLs or CPs for nuclear power reactors. |
| 89-38                  | Atmospheric Dump Valve Failures at Palo Verde Units 1, 2, and 3                               | 4/5/89           | All holders of OLs or CPs for nuclear power reactors. |

OL = Operating License  
 CP = Construction Permit

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\*See previous page for concurrence.

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| OFC  | :*VIB:DRIS   | :*SC/VIB:DRIS | :*TECH ED | :*BC/VIB:DRIS | :*DIR:DRIS | : | : |
| NAME | :SAlexander: | :UPotapovs    | :BCalure* | :EWBrach      | :BKGrimes  | : | : |
| DATE | :4/26/89     | :4/27/89      | :4/20/89  | :4/27/89      | :4/27/89   | : | : |

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| OFC  | :*OI/RIII | :*BC/GCB:DOEA | :DIR:DOEA | : | : | : | : |
| NAME | :EPawlick | :CBerlinger   | :CERossi  | : | : | : | : |
| DATE | :4/14/89  | :5/1/89       | :5/2/89   | : | : | : | : |

If you have questions about this matter, please contact the Regional Administrator of the appropriate NRC regional office or this office.

Charles E. Rossi, Director  
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 Office of Nuclear Reactor Regulation

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1. List of Recently Issued NRC Information Notices

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| DATE : 4/20/89     | : 4/21/89     | : 4/20/89         | : 4/27/89     | : 4/27/89  | : |

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| OFC : OI/RIII   | : BC/GCBE/DOEA | : DIR:DOEA | :        | : | : |
| NAME : EPawlick | : CBerlinger   | : CERossi  | :        | : | : |
| DATE : 4/14/89  | : 5/1/89       | : 4/ /89   | : 4/ /89 | : | : |

*release to Alexander*  
*CB with noted change*