Personnel at other DOE facilities should review these publications to identify similar situations at their facilities.

P21 94415

5. DEFECTIVE RELAY CONTACT CAUSES ELECTRICAL LOAD TEST FAILURE

On March 12, 1994, facility personnel performing a monthly load test on an emergency diesel generator at the Rocky Flats Plutonium Fabrication facility determined that the diesel generator would not accept the power load. They terminated the test and returned the generator and associated electrical systems to the normal configuration.

Failure of the generator to accept load invalidated the assumption in the Final Safety Analysis Report that electrical power would be available within the time frame stated. The generator is a safety-related component that provides emergency power to Building 707. (ORPS Report RFO--EGGR-PUFAB-1994-0042)

Investigators determined that the generator operated correctly; but, a failed relay contact in the trip coil control circuit of the normal supply breaker prevented transfer of building electrical loads to the generator. When the operator placed the test switch in TEST position to allow the transfer, the control interlock circuitry sensed that the normal supply breaker to the fans was still closed and did not allow the generator supply breaker to the fans to close. Maintenance personnel determined that the relay contact failed because of misalignment and dirt accumulation on contact surfaces. The breaker was replaced with a spare breaker certified by the vendor.

Managers at Rocky Flats are implementing a preventive maintenance program for vital breakers and components.

ONS reviewed previous Operating Experience Weekly Summaries and identified other events related to breaker and relay preventive maintenance programs.

- OEWS 93-47: On July 29, 1993, personnel at Ames Laboratory reported a similar failure for a transfer switch of the same style. Facility personnel traced the failure to a buildup of oxide on the contacts of three relays in the control circuitry, which caused high resistance in the circuit when the contacts closed. This prevented the transfer switch from energizing. Technicians disassembled, cleaned, and placed the relays back in service. Facility personnel reported that it was common for oxide to build up on the contacts of relays used in this kind of service. They established an annual program for inspection of the relays. (ORPS REPORT CH--AMES-AMES-1993-0004)

- OEWS 93-33: On August 9, 1993, test personnel at the High Flux Test Facility at Oak Ridge National Laboratory determined that a breaker failed to automatically close as expected, causing a failed surveillance test. The test included timing position changes of various breakers after a test key switch was placed in the test position and an emergency-power generator was started. All breakers except one, changed position as expected within the required time frames. Test personnel expected that breaker, which connects a circuit for supply of emergency power to the diesel fuel oil transfer pump, to close within 20 seconds. The test supervisor permitted the test to continue for one minute, but the breaker did not close. Test personnel completed the remainder of the test and notified the operations manager and electrical engineers of the results. (ORO--MMES-X10HFIR-1993-0024)

  Facility management personnel attributed the direct cause of the breaker failure to close to a dirty sequence timer and a weak trip-bar spring. They cited other causes that included management failure to implement preventive-maintenance cleaning of the component and to ensure timely preventive maintenance, a corrective action required as a result of a similar occurrence in 1990. The 1990 occurrence involved another breaker failure to automatically close during performance of the same test procedure (ORO--MMES-X10HFIR-1990-0237). Corrective action specified for that event included implementation of routine preventive maintenance for breaker components. Facility personnel issued a procedure for breaker timer checks in

January 1993 and a procedure for breaker cleaning in June 1993. Neither procedure had been implemented prior to the 1993 event.

These events illustrate the importance of a preventive maintenance program that ensures availability and reliability of safety-related equipment. An effective preventive maintenance program can minimize the possibility of relay contact and breaker failures. Failure of breakers to trip at appropriate set point values may result in equipment damage, loss of safety system functions, and personnel injury.

DOE-STD-1053-93, *Guidelines to Good Practices for Control of Maintenance Activities at DOE Nuclear Facilities*, and DOE-STD-1052-93, *Guidelines to Good Practices for Types of Maintenance Activities at DOE Nuclear Facilities*, provide directions for implementing and maintaining an effective preventive maintenance program. NUREG/CR-5762, "Comprehensive Aging Assessment Study of Circuit Breakers and Relays," discusses various inspection, surveillance, monitoring techniques, and preventive maintenance practices associated with breakers and relays. The NUREG states that, in addition to manual exercising, periodic testing and monitoring are required for effective detection and assessment of age-related degradation. DOE 4330.4A, *Maintenance Management Program*, Chapter II, Section 8.1, states: "Management-directed and -delegated involvement in control of maintenance activities should ensure that maintenance practices are effective in maintaining safe and reliable facility operation."

Personnel at other facilities who are responsible for maintenance of breakers and relays should review these publications and vendor and industry-related recommendations for applicability.

6. POTENTIAL FOR OVER-STRESSED BOLTS ON HEAVY LIFT CRANES

On March 2, 1994, personnel at Whiting Corporation notified the Nuclear Regulatory Commission that results of a stress analysis of a heavy lift crane at the Summer Nuclear Plant of South Carolina Electric and Gas indicated a potential for over stressing bolted connections in the under-hung sheave nest area and bearing support mechanism. They performed the analysis to upgrade the rating on the crane manufactured by the prior Whiting Corporation in Harvey, Illinois. Based on this analysis, Whiting Corporation engineers determined that modifications, an upgrade in bolt quality, and strengthening of structural elements in the crane bridge were required and that these findings were reportable in accordance with 10CFR21.21 requirements. Whiting personnel advised that the cranes in question are in the 140-to-625-ton lift-capacity range, utilize a double-drum design with an eight-wheel trolley, and were built by the prior Whiting Corporation. The Nuclear Regulatory Commission issued an event notification and advised nuclear licensees with the cranes in question to discontinue use of the main hoist to avoid the potential risk of failure. (NRC Event 26869)

Whiting personnel stated that utility personnel requested the calculations and stress analysis necessary to support re-rating their heavy lift crane prior to an upcoming refueling outage at the Summer Nuclear Plant. While reviewing engineering drawings, calculations, and historical company records and applying current analytical methods, Whiting engineers discovered that the design factors for the affected areas were