

# Cutler-Hammer

Nuclear Programs  
130 Commonwealth Drive, Warrendale, PA 15086

LTR00342  
August 30, 2000

Document Control Desk  
United States Nuclear Regulatory Commission  
Washington, DC 20555

Attention: Director, Office of Inspection and Enforcement

Subject: Potential failure to close on demand for DS 206 Circuit Breaker

The following information is provided pursuant to the requirements of 10CFR Part 21 to report a potential safety concern. This issue concerns the possibility for malfunction of the Eaton Cutler-Hammer DS 206 circuit breakers due to "shock-out" of Direct Trip Actuators (DTA's). Shock-out is defined as the unwarranted or undesired change in the state of a DTA from the normally un-tripped state to a tripped state. Shock-out occurs as a result of shock caused by the circuit breaker cycling from the open position to the closed position. The shock force is supplied by the closing springs striking the bottom plate of the breaker frame during the breaker closing operation. The result of shock-out is that the DTA trips immediately, returning the breaker to an open condition, which is neither required nor desired.

Shock-out has been observed in DS206 breakers after replacing the operating mechanism and/or closing springs during reconditioning. Shock-out has NOT been observed in new DS 206 breakers or in DS 206 breakers reconditioned in accordance with Eaton Cutler-Hammer Nuclear Programs (C-HNP) procedures. The standard C-HNP reconditioning process does not routinely replace Operating Mechanisms or Closing Springs. DTA's that exhibited shock-out in breakers reconditioned with new operating mechanisms and/or new closing springs did NOT exhibit shock-out when installed and extensively tested in a new DS 206 breaker.

C-HNP has supplied safety related operating mechanisms, closing springs and DTA's to a single nuclear customer. The non-nuclear, commercial segment of Eaton Cutler-Hammer has sold the same items to third party suppliers. Third party suppliers may have provided the same items to the nuclear industry as safety related. After the C-H NP customer identified the problems with DTA shock-out, an investigation was conducted to determine the cause(s) of the problem. Some of the actions taken during the investigation included:

- 1) C-HNP insured that the customer was installing the DTA's in accordance with the guidance provided in the commercial Instruction Book for the breaker.
- 2) DTA's that appeared to be susceptible to shock-out in the customer's reconditioned DS 206 breakers were installed into current vintage new DS 206 breakers. The DTA's were tested with several different force closing springs. No shock-out was observed.

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E-Rios*

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- 3) Following high-speed videography of the breaker undergoing shock-out, C-HNP performed a modified reconditioning of a customer breaker that had exhibited repeated shock-out. The customer specifically requested the C-HNP reconditioning process be modified to NOT include every standard OEM recommended upgrade. The reconditioning process did include the upgrade to the Trip Shaft Bearing Plate that is part of the current configuration of production DS 206 Circuit Breakers. Significant improvement in breaker performance was seen although shock-out still occurred when using the highest force Closing Springs available.
- 4) Design modifications to the existing DTA were prototyped, evaluated and tested. DTA magnetic coupling increased by approximately 30% over the present DTA design. Testing in a shock-out prone breaker revealed that shock-out might still occur with the re-designed DTA.
- 5) Previous design changes made to both the Closing Springs and DTA's were examined and evaluated as to their possible effect. No design changes were identified which would lead to a conclusion that they were a factor in the shock-out problem.

The result of the investigation undertaken by C-H NP reveals the following contributing causes.

- 1) DTA shock-out was experienced in DS 206 breakers that were reconditioned by the customer. The customer reconditioning process included the replacement of the breaker operating mechanism with a new mechanism and in some cases with new closing springs.
- 2) The vintage of the subject circuit breakers were such that the Levering In Device of the breakers being reconditioned were not equipped with a Reverse Override Pin which was a modification introduced in the mid 1970's.
- 3) The customer's reconditioning process was not the same process recommended by Cutler-Hammer, the OEM.
- 4) The amount of force generated by the Closing Springs appears to relate to the susceptibility of these early vintage breakers to exhibit shock-out. The nominal design spring force for the closing spring for the DS 206 has not changed since 1967. Closing springs, with spring force near the upper tolerance limit, installed in a test breaker (older vintage customer reconditioned breaker with new operating mechanism) resulted in a higher frequency of shock-out. The same springs installed in a new breaker with a DTA that had shocked-out in the test breaker, did NOT result in shock-out.

C-HNP has determined that the root cause of DTA shock-out in DS 206 breakers is the replacement of operating mechanisms and/or closing springs with new operating mechanisms and/or new closing springs, as part of the standard reconditioning process. DTA shock-out has not been observed in vintage DS 206 breakers that are reconditioned in accordance with C-HNP procedures, which does not include the replacement of operating mechanisms and/or closing springs as part of the standard reconditioning process. The standard C-HNP reconditioning process DOES include installation of design upgrades.

To eliminate the possibility of shock-out, when the DS 206 breaker reconditioning process includes installation of a new operating mechanism and/or closing springs, C-HNP recommends the installation of a modified bottom plate to eliminate transmission of shock to the DTA. A modified bottom plate has been designed, tested and is being seismically qualified by C-HNP.

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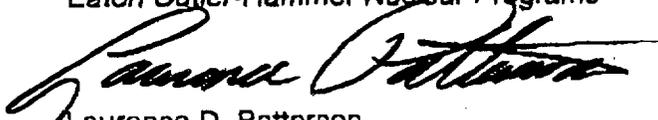
This deficiency was identified and determined to be of a chronic reportable nature on approximately July 31, 2000.

The installed base of the C-H NP supplied operating mechanisms and closing springs is limited to a single utility and plant, Tennessee Valley Authority Sequoyah Nuclear Plant. C-HNP does not know where operating mechanisms and closing springs, procured commercially by third party dedicators, may have been installed in safety related applications.

For additional information the Licensee should contact Eaton Cutler-Hammer Nuclear Programs at (724) 779-5931.

Sincerely,

*Eaton Cutler-Hammer Nuclear Programs*



Laurence D. Patterson  
Manager, Quality Assurance

General Information or Other

Event Number: 37275

P ORG: EATON CUTLER-HAMMER  
LICENSEE: EATON CUTLER-HAMMER  
CITY: WARRENDALE  
COUNTY:  
LICENSE#:  
DOCKET:

REGION: 1  
STATE: PA  
AGREEMENT: N

NOTIFICATION DATE: 08/30/2000  
NOTIFICATION TIME: 15:06 [EDT]  
EVENT DATE: 07/31/2000  
EVENT TIME: [EDT]  
LAST UPDATE DATE: 08/30/2000

PERSON	ORGANIZATION
PETE ESELGROTH	R1
CAUDLE JULIAN	R2
MELVYN LEACH	R3
CHUCK PAULK	R4
VERN HODGE (via fax)	NRR

NRC NOTIFIED BY: LAURENCE PATTERSON  
HQ OPS OFFICER: LEIGH TROCINE

EMERGENCY CLASS: N/A  
10 CFR SECTION:  
CCCC 21.21 UNSPECIFIED PARAGRAPH

#### EVENT TEXT

10 CFR PART 21 NOTIFICATION REGARDING THE POTENTIAL FAILURE OF  
EATON-CUTLER-HAMMER DS-206 CIRCUIT BREAKERS TO CLOSE ON DEMAND

The following text is a portion of a facsimile received from Eaton  
Cutler-Hammer Nuclear Programs personnel:

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CFR Part 21 to report a potential safety concern. This issue concerns the  
possibility for malfunction of the Eaton Cutler-Hammer DS-206 circuit  
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defined as the unwarranted or undesired change in the state of a DTA from  
the normally un-tripped state to a tripped state. Shock-out occurs as a  
result of shock caused by the circuit breaker cycling from the open position  
to the closed position. The shock force is supplied by the closing springs  
striking the bottom plate of the breaker frame during the breaker closing  
operation. The result of shock-out is that the DTA trips immediately,  
returning the breaker to an open condition, which is neither required nor  
desired."

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mechanisms and/or closing springs with new operating mechanisms and/or new  
closing springs, as part of the standard reconditioning process. DTA  
shock-out has not been observed in vintage DS-206 breakers that are  
reconditioned in accordance with C-HNP procedures, which does not include  
the replacement of operating mechanisms and/or closing springs as part of  
a standard reconditioning process. The standard C-HNP reconditioning  
process DOES include installation of design upgrades."

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reconditioning process includes installation of a new operating mechanism

and/or closing springs, C-HNP recommends the installation of a modified bottom plate to eliminate transmission of shock to the DTA. A modified bottom plate has been designed, [and] tested and is being seismically qualified by C-HNP."

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(Contact the NRC operations officer for supplier contact information.)

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