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 GRIER, B.H. Region 1, Philadelphia, Office of the Director

SUBJECT: Forwards final deficiency rept re Cutler-Hammer E-30 pushbutton switches.

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April 18, 1980

Mr. Boyce H. Grier
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U. S. Nuclear Regulatory Commission
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SUSQUEHANNA STEAM ELECTRIC STATION
FINAL REPORT OF A DEFICIENCY IN CUTLER HAMMER
E-30 SWITCHES
ERs 100450/100508 FILE 840-4
PLA-472

References: PLA-399 dated 09/11/79
 PLA-409 dated 10/11/79
 PLA-438 dated 01/11/80

Dear Mr. Grier:

This letter serves to provide the Commission with a final report of a deficiency on Cutler Hammer E-30 switches originally reported and discussed in the above listed references. In addition, notice is given that another condition involving Amphenol connectors discussed in the referenced letters has been evaluated by Bechtel and PP&L Engineering and determined to be not reportable. This information is forwarded in fulfillment of our obligations under the provisions of 10CFR50.55(e).

Attachment 1 is our final report of the deficiency surrounding Cutler Hammer E-30 Pushbutton switches. The attachment describes the deficient condition along with its safety implications and the corrective action being taken to achieve resolution.

Attachment 2 is the rationale supporting our conclusion that the conditions involving Amphenol female connectors is not reportable under the provisions of 10CFR50.55(e).

We trust the Commission will find the information forwarded by this letter to be satisfactory.

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Mr. Boyce H. Grier

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April 18, 1980

Very truly yours,

NW Curtis

N. W. Curtis
Vice President-Engineering & Construction

Attachment 1 - Report on Cutler Hammer E-30 Pushbuttons
Attachment 2 - Analysis of Amphenol Connector Condition

FLW:mcb

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Subject

Cutler Hammer E-30 Pushbuttons

Description

- a. Cutler-Hammer pushbutton switches installed in PGCC/ACR benchboards, are sticking; of 189 switches inspected, ten switches do not retract when manual depression is relieved. These switches bear GE P/N 851E341P2GXGXXX and are purchased from Cutler-Hammer under P/N CH E-30AC. These nonconformances are documented on NCR 4313.
- b. A second condition, as described on Sheet 20 of NCR 3403, involves switch (HV-1112D) CH E-30AB, which became dislodged due to failure of the mechanical locking device between the pushbutton operating module and contact block. While this particular switch and the second switch of the same type which have failed were installed in non-safety related equipment, the concern is for similar switches used in safety related equipment.

Cause

- a. The sticking of the pushbuttons occurs on 2-button modules. When one pushbutton is depressed, a latch device is actuated that prevents depressing the other pushbutton. During the manufacturing process the lower edge of the plastic pushbutton cap will have a sharp edge formed. This can become wedged against the latch preventing the button from resetting when it is released.
- b. The dislodgement of the pushbutton operating module from the contact block is apparently caused by the mechanical locking ring not being tightly locked.

Analysis of Safety Implications

- a. CH E-30 pushbuttons are used in Class 1E safety related circuits. The sticking of the pushbuttons could result in the inoperation, misoperation, or improper line-up of electro-mechanical or solid state logic when pushbutton operation is attempted.

Project Engineering has determined that the reported CH E-30 pushbutton sticking is a reportable deficiency under 10CRF50.55 (e).

- b. The dislodgement of the CH E-30 locking device permitted the contact blocks to disengage from the pushbutton operator sufficiently to prevent the contacts from changing state upon depression of the pushbutton. The identified deficiency, had it gone uncorrected, could have prevented a safety system from performing its intended function.

Project Engineering has determined that the reported CH E-30 dislodged mechanical locking device is a reportable deficiency under 10CFR50.55(e).

Corrective Actions

- a. GE requested that Cutler-Hammer investigate the pushbutton sticking problem for the PGCC/ACR at the site. After the investigation Cutler-Hammer reported that the problem was on pushbutton switches manufactured before November 1978.

In a report attached to a letter dated February 29, 1980 (DCN 116060), Cutler-Hammer stated that the sticking problem was first noted in June 1976. They did not consider it to be a critical problem because if the button stuck on the first attempt to depress, it could always be depressed with further attempts. Manufacturing changes were made in September 1977 and November 1978. Cutler-Hammer feels that, with these changes, it is reasonable to assume that devices made after November 1978 will not exhibit this problem. The date stamp is located under the button on top of the button plate and will show the month and year the device was manufactured.

In the letter Cutler-Hammer states that a sticking pushbutton can be corrected by scraping or buffing a slight radius to the sharp lower edge of the button where it contacts the latching device, or by operating the pushbutton several times. They state that the operation of the pushbuttons should improve with use due to smoothing of the sharp edge of the button against the interlock surface.

For the PGCC/ACR benchboards General Electric has agreed to replace all Cutler-Hammer E-30AC operator pushbutton modules manufactured prior to November 1978. The contact modules will not be replaced. NCR 4313 shall be revised to reflect the corrective action taken.

- b. The construction of the Cutler-Hammer type E-30 pushbutton switches is such that the contact blocks are held to the operating module by a locking ring mounted on the operating module and actuated by a quarter-turn locking screw. The dislodgement of the contact modules from the operating modules was investigated and no manufacturing defect was apparent.

Since these same devices successfully passed an integrated system factory test at the manufacturers facility, it is assumed the locking devices worked loose during transit. The locking devices for CH E-30 switches will be retightened to assure proper installation for both Units 1 and 2. QC inspection will verify that the locking devices are tight.

- c. Project Engineering is investigating the usage of Cutler-Hammer type E-30 pushbuttons in essential applications in the remainder of the plant. At the conclusion of the investigation any deficiencies will be documented on NCR's and the field advised of any future corrective actions to be taken.

Conclusions

- a. The replacement of pushbutton operation modules that are, or are suspected of not operating properly should resolve the problem of the E-30 AC pushbuttons on the PGCC/ACR benchboards. NCR 4313 will track the replacement of the pushbutton modules on the PGCC/ACR benchboards.
- b. Project Engineering instructions and field verification should insure no further dislodgement of the contact modules from the operating module.
- c. Further investigations to date have failed to locate any Cutler-Hammer type E-30 pushbutton switches being used in the remainder of the plant.

SUBJECT

Amphenol female connectors

DESCRIPTION

The anomalies summarized below have been noted during routine Quality Control surveillance and/or inspections of PGCC/ACR Panels.

Amphenol female connector pins are not seating properly in the dielectric. The relative position of the pins often vary after mating and unmating of the connectors. It has been observed that some pins partially retract as the result of turning the connector. This is especially the case after pins have been removed and reinserted into the connector dielectric.

While performing pull tests on the individual conductors to check the holding force of the pin crimps to the wires, the connector female pins were extracted from the dielectric, in many instances, before the required pull test force was achieved.

One of the methods for performing the pull testing of conductor pin crimps was to use a hemostat pull testing device. The device was utilized for pull testing to avoid complete removal of all pins from connectors. The hemostat pull test method tended to amplify or further aggravate the Amphenol connector problem.

CAUSE

General Electric conducted a quality study on the condition identified with these Amphenol connectors. The results were attached to their letter GB-79-283 dated December 10, 1979 and forwarded to the NRC in our PLA-438. GE concluded that the probable cause of pin seating nonconformances was not due to connector design but rather to damaged mating connectors, errors during assembly or rework at the plant site.

ANALYSIS OF SAFETY IMPLICATIONS

The identification of pins which had backed out from the dielectric raised a concern relative to the connectors ability to maintain continuity. However, regardless of how well the pin seats in the dielectric, as long as the male and female pins are mated together, the circuit continuity can be maintained through the pins. In no instance was it reported that the pins failed to mate together.

Project Engineering has determined that the identified Amphenol connector pins, that did not seat properly in the dielectric, do not constitute a reportable deficiency under 10CFR50.55(e).

