

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

January 23, 1981

IE CIRCULAR NO. 81-01: DESIGN PROBLEMS INVOLVING INDICATING PUSHBUTTON SWITCHES MANUFACTURED BY HONEYWELL INCORPORATED

Background:

By letter dated September 18, 1980 (J. M. Curran to R. H. Engelken), Southern California Edison Company (SCE) notified NRC of design problems involving certain indicating pushbutton switches. The subject switches are of the type designated as Series 2 indicating pushbutton switches that are manufactured by the Micro Switch Division of Honeywell Incorporated. The switches identified by SCE as having design deficiencies are used on the containment isolation panels at San Onofre Unit 1 (Docket No. 50-206).

SCE identified two problems with the subject switches, both of which manifest themselves during relamping: (1) a short circuit may be induced; and (2) the circuit controlled by the switch may inadvertently be actuated. Although the specificity of this circular is restricted to the previously mentioned Series 2 switches the deficiencies cited may be common to other indicating pushbutton switches. Accordingly, holders of operating licenses and construction permits should scrutinize the design of other indicating pushbutton switches in their facilities for susceptibility to the above problems.

By letter dated October 10, 1980 (J. G. Haynes to R. H. Engelken), SCE submitted a detailed followup report addressing the defective switches. Sections of the SCE report containing relevant information have been excerpted and included in the paragraphs that follow. Sections so excerpted are identified by quotation marks.

Discussion:

The SCE report provided the following details of the problems previously mentioned:

- "1. The design of indicating pushbutton switches is such that during insertion of the lamp assembly into the switch housing, shorting could occur between the metallic plunger and the energized indicator lamp connection inside the switch assembly. Since the metal plunger is connected to the cabinet ground through the switch housing, the control circuit could be short circuited, causing failure of the control circuit if it is energized.

2. The design of the lamp assembly is such that to lock the switch into place after relamping will cause actuation of the switch resulting in operation of the control circuit if it is energized. Since the current containment isolation system operational design requires that the power supply to the containment isolation panels remain energized during relamping, the potential exists for operating containment isolation valves during the lamp replacement."

To circumvent the preceding problems, SCE, in cooperation with Honeywell Incorporated, is implementing the following corrective actions.

- "1. The metallic plunger is being redesigned to solve the short circuit problem discussed in Item 1 above. The design modification involves providing a plastic tip on the plunger. The plastic tip will provide isolation between the metallic plunger and energized indicator lamp connection inside the switch assembly and this will avoid short circuit problems. A prototype modified switch assembly was received on September 20, 1980 and successfully tested. Accordingly, the manufacturer is developing the necessary tooling for production purposes. It is expected that the modified switch assemblies can be delivered and installed prior to return to power operation from the current outage.
2. The indicating pushbutton lamp assembly system is being redesigned to solve the switch actuation problem discussed in Item 2 above. The design modification will permit relamping with the power supply energized, without causing switch actuation. It is expected that the system will be redesigned and the current switches replaced during the next scheduled cold shutdown of sufficient duration following return to power operation from the current outage."

In addition, SCE has instructed its station personnel on procedural steps to be followed when changing lamps. The procedural steps currently in effect at San Onofre Unit 1 for relamping the indicating push button switches address the potential for shorting or for inadvertently actuating the control circuit as follows:

- "1. Containment Isolation Valves on Non-essential Systems

All automatic containment isolation valves are included in this category. When replacement of a burned out lamp is necessary, the power supply of the circuit of the valve will be opened and the associated valve will close if open or will be de-energized in the closed position if already closed. The burned out lamp will be replaced and the power supply to the circuit will be closed permitting the valve to be reopened or re-energized in the closed position.

2. Remote Manual Containment Isolation Valves on Essential Systems

The systems in this category include the Chemical Volume and Control Letdown System, Reactor Coolant Pump Seal Water Return System, Turbine Plant Cooling Water Supply and Return System, and Pressurizer Relief

Tank Nitrogen Supply System. The containment isolation valves on these systems are normally open during operation and may be required to be open during accident conditions.

If it is necessary to replace burned out lamps after the metallic plunger has been redesigned as described in corrective action 1 above, the following steps will be taken:

1. The touch plate with the burned out lamp will be removed and lamps replaced.
2. The glass cover on the HFA relay (panels behind north vertical board) associated with the valve in question will be removed and the relay held in place by depressing the insulated portion of the spring loaded relay plunger.
3. The touch plate with the replaced lamps will be inserted into the switch chassis.
4. The "open" switch of the valve in question will be depressed to assure that the circuit has been reset and the glass cover replaced on the HFA relay."

"If it is necessary to replace burned out lamps before the metallic plunger is redesigned, the replacement will be performed during an outage of sufficient duration when the affected system and valve can be removed from service. At that time, the procedural steps to be followed are identical to those established for the automatic containment isolation valves on non-essential systems discussed above. Until such time as the lamp can be replaced, the position of the affected valve can be determined by examining the system flow, pressure and temperature process instrumentation."

Recommended Actions for Holders of Construction Permits or Operating Licenses:

1. Determine whether your facility uses the subject Series 2 indicating push-button switches in any safety-related function. If there are no indicating pushbutton switches of this type in your facility, you need not pursue this matter further.
2. If the subject switches are used to perform safety-related functions at your facility, either replace them with qualified units or modify them to eliminate the deficiencies. Holders of operating licenses should take the appropriate action as soon as practical; construction permit holders should take the appropriate action prior to startup. (If the switches are to be modified, contact Honeywell Incorporated for assistance.)
3. Until the appropriate corrective action is completed, the following interim measures should be taken:

- a. If the design of the affected equipment permits its switch assembly to be deenergized for relamping, verify that the procedures specify that power is to be removed from the switch assembly during relamping. If the procedures do not so specify, revise them to include such a provision.
- b. If the design of the affected equipment does not permit its switch assembly to be deenergized for relamping, verify that the operator can determine the status of the affected equipment by alternate means. Towards this end, implement procedures to enable the operator to determine the status of the affected equipment by alternate means. (e.g., acceptable method for inferring the position of a valve could include system flow, pressure, or temperature measurements). If alternate status indication methods are not available, relamping should be deferred until the next outage during which time the affected equipment can be removed from service. However, during the resulting blind time, rigid administrative controls should be implemented to provide the operator with reliable status information.

No written response to this circular is required. If you require additional information with regard to this subject, please contact the appropriate NRC Regional Office.

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OL = Operating Licenses
CP = Construction Permit