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50-348/364-CIVP
2/19/92

LOCKETED
USNRC

Staff Exh. 46

92 MAR 13 11:09

Proposed Violations:

The Chico Seal qualification package has not demonstrated that Raychem will bond to conduit.

OFFICE OF REGULATORY
LOCKETING & SERVICE
BRANCH

*never heard of
Zinc coating*

APCo Position:

The postulated failure mechanism discussed during the audit was chemical spray during a LOCA reacting with the zinc coating on the galvanized steel nipple to form a gray powder over the nipple. The result is a path for enough moisture to enter the limit switch between the Raychem and the degraded conduit causing the limit switch to fail. The following paragraphs describe in detail the Farley configuration and its configuration relative to the postulated failure described above. In summary, it should be noted that Chico A alone provides a pressure tight seal inside the pipe nipple which provides a pressure tight seal. To provide additional assurance that moisture will not enter the limit switch, three additional barriers have been applied to the FNP configuration. They are:

- 1) Raychem breakout boot
- 2) Keeper sleeve
- 3) Compression adapter clamp

The Raychem breakout kit used for the FNP application is environmentally qualified including thermal aging, irradiation, and LOCA testing (Reference Kyle Test Report No. 58442-2, dated 4/03/81). The Farley configuration uses a breakout at the end of pipe nipple. Since the breakout had been qualified previously, Farley conducted a test on the RAYCHEM/CHICO environmental seal configuration shown in Figure 1 for pressure and temperature conditions postulated during a LOCA (Reference Qualification Testing of Raychem Environmental Seals for Alabama Power Co., Joseph H. Farley Nuclear Plant, dated 12/30/81). The test did not include exposing the test specimen for chemical spray. The following paragraphs address the affect of chemical spray.

The environmental seals used with MARCO EA-180 limit switches are composed of a Raychem MCSF breakout boot that has been shrunk onto a 1" pipe nipple attached to the limit switch (See Figure 1). The individual conductors connected to the switch pass through the breakout boot which forms a seal to the conductor insulation/jacket. To provide mechanical rigidity to the breakout boot, the nipple and the breakout boot are filled with Creuso-Kinds sealing compound (CHICO A) and allowed to cure. In addition to providing mechanical rigidity to the breakout boot crutch, the CHICO A provides an additional pressure tight barrier (seal) inside the pipe nipple which is environmentally qualified. CHICO A was qualified by test conducted by Southwest Research Institute (SRI Project No. 03-4974-001) for use as drywell penetrations for Grand Gulf Nuclear Station. In addition, on the recommendation of Raychem, a keeper sleeve was installed over the breakout boot and the nipple to add rigidity to the boot, and to keep the boot in place during elevated accident temperatures when the adhesive softens.

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NUCLEAR REGULATORY COMMISSION

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Docket No. 50-348/1-101 Official Exh. No. 40
In the matter of Alabama Power Company
Staff _____ IDENTIFIED 12:22 p.m. 2/19/92
Applicant _____ RECEIVED 12:33 p.m. 2/19/92
Intervenor _____ REJECTED _____
Cont'g Off'y _____ DATE 2/19/92
Contractor _____ Witness _____
Chief _____
of pages 1 Estep

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OK
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1200 Position: (continued)

In the final assembly, an appleton compression adaptor is clamped over the keeper sleeve to provide support for the flexible conduit, and it also mechanically clamps the keeper sleeve to the pipe nipple.

The zinc coating on the galvanized steel nipple may interact with the chemical spray during LOCA and form a gray powder over the nipple. However, the chemical spray does not react with the Raychem S1119 adhesive (Reference Kyle Test Report No. 58442-2, Section 3.4, Page 9 and Section 3.4.2). In addition to the duration of spray at Farley is only 67 minutes and the individual conductors will be effectively shielded from the spray.

Should there be a failure of the adhesive between the pipe nipple and the breakout boot, for whatever reason, the seal assembly would remain intact because of the keeper sleeve and the clamping action of the compression adapter. If it is postulated that the breakout boot, the keeper sleeve and the compression adapter clamp all fail, the internals of the NAMCO limit switch will still be protected by the approximately 3 inch long CHICO A seal.

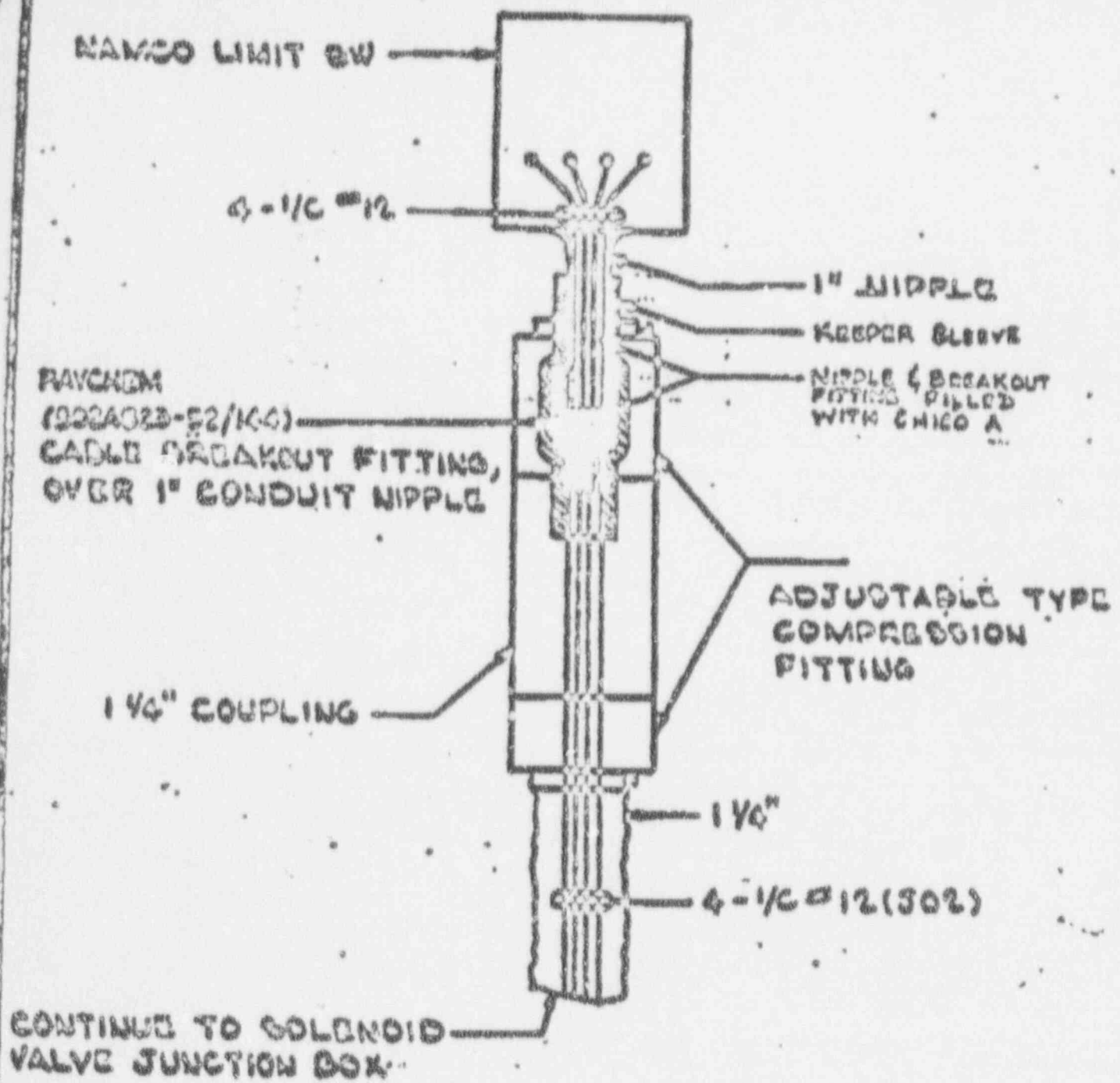


FIGURE 1