NRC PDR

UNITED STATES
NUCLEAR REGULATORY COMMISSION
WASHINGTON, D. C. 20555

OCT 17 1979

MEMORANDUM FOR: R. Reid, Chief, Operating Reactors Branch #4, DOR

FROM: G. Lainas, Chief, Plant Systems Branch, DOR

SUBJECT: FIRE PROTECTION - CALVERT CLIFFS 1 AND 2 - TEST PROCEDURES TO QUALIFY CABLE AND PIPE PENETRATIONS

Facility: Calvert Cliffs Nuclear Power Plant
Licensee: Baltimore Gas and Electric Company
Docket No.: 50-317 and 50-318
Responsible Branch: ORB#4
Project Manager: E.L. Conner
Reviewing Branch: Plant Systems Branch
Status: SER Issued; Evaluation of Incomplete Items On-going

We have reviewed the procedures entitled, "Test to Qualify Cable and Pipe Penetrations in Fire Walls and Floors for Calvert Cliffs Nuclear Power Plant", which was provided with the licensee's letter dated September 14, 1979. Our comments are listed in the enclosure. We approve the procedures subject to a satisfactory resolution of these comments. A meeting between the staff and BG&E to resolve these comments should be arranged within two weeks.

This test is to demonstrate the fire rating of the cable and pipe penetrations and the ability of certain electrical cables contained in steel conduit to remain functional during and after a fire as simulated by the ASTM E-119 time-temperature characteristic.

The licensee is requested to notify the Commission of the test date at least 30 days in advance, so that the staff can witness and verify the test. We also request that a full test report be submitted for the staff's evaluation following the test.

G. Lainas, Chief
Plant Systems Branch
Division of Operating Reactors

cc: See page 2

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Enclosure:
List of Comments

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CALVERT CLIFFS NUCLEAR POWER PLANT

DOCKET NOS. 50-317, 50-318

COMMENTS ON TEST PROCEDURES

1. It appears that the results of one or two tests will be applied throughout the plant; therefore, each of the test variables should reflect the most conservative condition among all plant areas. The following considerations as proposed in the licensee's procedure did not appear to be conservative:

   A) Tray Fill (C-5)*

   Cable loading of 50% in trays was proposed while in many plant areas tray fill in excess of 100% was observed. Verify that the 50% cable tray load is conservative.

   B) Type of Cables (C-5)

   Silicone rubber insulated, glass braid covered, and asbestos braid jacketed cables were proposed for the test to qualify the electrical penetration seal while the plant is known to have many non-silicone rubber cables (see Section 4.8 of NRC's Fire Protection SER). By the licensee's previous test results, silicone rubber cables were shown to have a better fire retardant characteristics than conventional electrical cables; test results qualifying silicone rubber cable penetrations, therefore, will not be applicable to non-silicone rubber cable penetrations. The licensee is requested to include a provision in the test which will qualify non-silicone rubber cable penetrations.

   C) Slab Thickness (Fig. 1)

   A minimum of 2 feet thick wall or floor was proposed as the test assembly. We request the licensee to verify that there is not a wall or a floor in the plant that is less than 2 feet thick and is penetrated by electrical cables.

   D) Test Configuration (cover letter)

   It was proposed that the penetration assembly will be tested in the horizontal or floor configuration to quality both wall and floor fire stop design. We agree that floor configuration is more conservative; however, the wall and the floor penetrations in Calvert Cliffs have different designs. The licensee is requested to include some wall penetration design (without Vermiculite void fill) in the horizontal configuration to quality the wall penetrations.

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*The number noted in the parentheses refer to the section in the licensee's procedure.

E) Piping Penetrations (C-8)

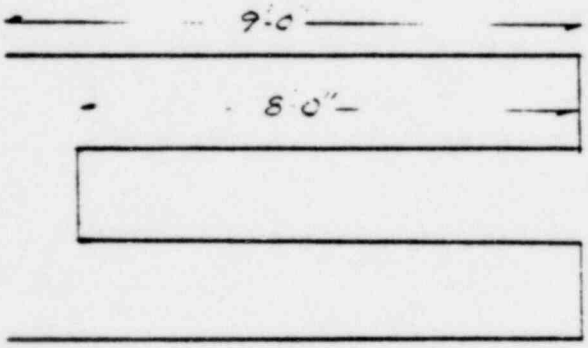
It was indicated that the pipe penetration will utilize 6" diameter pipe and 10" diameter sleeve. We request the licensee to verify: (i) if all piping penetrations have sleeves; and (ii) if 6" pipe and 10" sleeve corresponds to the worst configuration in the plant. A larger sleeve and/or a smaller pipe is believed to represent a worse configuration.

2. The test procedure did not specify the pressure differential to be maintained across the penetrations. Verify that a positive pressure differential will be maintained to simulate a fire situation.

3. Conduit Assembly

A) The off-gassing of cables inside conduits may induce a fire in the terminal switch box outside the fire area which has an ignition source. A provision should be included in the test to demonstrate that the off-gassing of cables in the conduit will not cause a fire in the terminal switch box.

B) Testing the conduit of only two feet is unrealistic and non-conservative because it does not simulate differential expansions, off-gassing and changes in conductor and insulation resistance; we recommend a configuration similar to that shown below be tested. Sharp turns should be included. Verify that the new length and configuration provide a realistic simulation of the plant conduit configuration. (C-6)



4. Test Duration (E-3)

   Since some cables required for the long term cooling may be required to function up to 30 days following the fire, the test should demonstrate that the function of electric circuits can be maintained not only before, during and right after the fire, but also a reasonable period of time thereafter, exposing the cables and the conduit to an atmosphere similar to that following a fire.

5. The test should include certain provisions to demonstrate that mechanical disturbances, (e.g., impact) generally expected in fire fighting and other possible activities subsequent to the fire, on the conduit will not disable the function of the cables.

6. Hose Stream Test (D-2)

   The hose stream with the nozzle discharge angle of 30° is proposed for the hose stream test. This stream while it is acceptable to the area equipped with a spray nozzle, may not be conservative in the areas where spray nozzles are not provided. Specifically, it is unlikely that spray nozzles are provided for all areas where pipe penetrations exist. Testing the piping penetration with the proposed hose stream, therefore, is not conservative. Straight stream should be used to qualify penetrations located in areas protected by hoses equipped with the regular nozzle.

7. Provide an analysis which verifies that changes in conductor and insulation resistance during a fire will not cause circuit malfunctions.

8. Describe the post test inspections and criteria to be used to determine that the cable is still functional and the length of the cable can be expected to remain functional. Provide a brief description of the procedure to be used to replace the damaged cable following a fire.

9. The circuit integrity test should include a provision to verify that switching transients will not have an adverse effect in maintaining the electrical function of the cable.