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F. L. CLAYTON, JR.
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the southern electric system

November 4, 1980

Docket No. 50-364

Director, Nuclear Reactor Regulation
U. S. Nuclear Regulatory Commission
Phillips Building, Room 116
7920 Norfolk Avenue
Washington, D. C. 20555

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Attention: Mr. A. Schwencer

JOSEPH M. FARLEY NUCLEAR PLANT - UNIT 2
REQUEST FOR ADDITIONAL INFORMATION

Gentlemen:

Enclosed is Alabama Power Company's response to NRC Reactor Systems Branch question 210.1 item 4 concerning Farley Nuclear Plant Unit 2 containment sump design.

If you have any further questions, please advise.

Yours very truly,

F. L. Clayton, Jr.

F. L. Clayton, Jr.

RWS:rt

Enclosure

cc: Mr. R. A. Thomas
Mr. G. F. Trowbridge
Mr. L. L. Kintner (w/enclosure)
Mr. W. H. Bradford (w/enclosure)

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4. As stated in the Farley SER memorandum, a full scale model test of the Farley sump design has been conducted to show that adverse hydraulic phenomena which would impede long-term cooling of the core following a LOCA will not occur. This testing was performed with up to fifty percent of the sump screens blocked. The responses to the following concerns are required to support this assumption.

CONCERN

a. Various types of insulation may be used in the containment. For each type provide the following information:

(1) The manufacturer, brand name, volume and area covered.

(2) A brief description of the material and an estimate of the tendency of this material either to form particles small enough to pass through the fine screen in the sump or to block the sump trash racks or sump screens.

(3) Location of the material (metal mirrored, foam glass, foam rubber, foam concrete, fiberglass, etc.) with respect to whether a mechanism exists for the material to be transported to the sump.

RESPONSE

a. (1) Only metal reflective and anti-sweat insulations are used in the Farley Nuclear Plant containment.

The metal reflective insulation is a mirror type insulation manufactured by Diamond Power Specialty Corporation. Approximately 5,100 $ft.^3$ of this insulation is used to insulate about 14,700 $ft.^2$ of piping systems. The three steam generators, each with about 3,175 $ft.^2$ outside surface area, are insulated with about 706 $ft.^3$ metal reflective insulation each. The pressurizer and reactor pressure vessel are also insulated with metal reflective insulation. The volume of i ,ulation and the area covered are not included here since insulation on these components cannot get to the containment recirculation sumps.

The anti-sweat insulation is called Aerotube and is manufactured by Johns-Manville Company. About 10,800 $ft.^2$ of cooling water piping systems are insulated with 1,405 $ft.^3$ of this insulation.

a. (2) The metal reflective insulation is a "mirror" type insulation. Large pieces of this insulation could be blown off components or piping systems by high energy pipe breaks, but this insulation would not disintegrate into pieces small enough to pass through the fine screen in the sump.

The anti-sweat insulation is a closed cell, foamed plastic with a built-in vapor barrier. The manufacturer has verified that this insulation, if subjected to the impact forces of a high energy fluid jet, would blow off in large pieces without disintegrating.

a. (3) The only mechanism for transporting insulation debris to the containment sump is for the debris to be carried or pushed along by water flow to the sump. Following an accident, no established flow patterns to the recirculation sumps exist until recirculation begins, approximately 30 minutes after the accident. Thirty minutes is more than enough time for any metal reflective insulation to sink to the containment floor. The minimum calculated water level in containment for ECCS sump performance is 58.3 inches, so anti-sweat insulation will float well above the sumps.

CONCERN

b. Provide an estimate of the amount of debris that the sump inlet screens may be subjected to during a loss-of-coolant accident. Describe the origin of the debris and design features of the containment sump and equipment which would preclude the screens becoming blocked or the sump plugged by debris. Your discussion should include consideration of at least the following sources of possible debris: equipment insulation, sand plug materials, reactor cavity annulus sand tanks or sand bags for biological shielding, containment loose insulation, and debris which could by generated by failure of non-safety related equipment within the containment. Entry of sand plug materials into the containment sump and the possibility of sand covering the recirculation line inlets prior to the initiation of recirculation flow from the containment should be specifically addressed.

Please provide this information along with your conclusion regarding the percentage of the screens which would be expected to be blocked by particles of all sizes, including those greater than 250 mils.

RESPONSE

Surveillance test procedure number STP 43.0, the housekeeping program, ensures that the containment is kept free of debris. Sand plug materials, reactor cavity annulus sand tanks or sand bags for bilogical shielding, and loose insulation are not used in the containment at Farley Nuclear Plant Unit 2. Therefore, the only source of debris inside the containment is from equipment and piping insulation.

Large pieces of mirror-metal reflective insulation are much heavier than water and would sink to the containment floor. They are not expected to be carried along with the flow to the screened grating around the containment sumps because of low velocity and distance. The majority of the metal reflective insulation is located between the primary shield and the secondary shield wall. The containment sumps are located outside the secondary shield wall and pieces of metal reflective insulation inside the secondary sheild wall would have to successfully transit a labyrinth to get to the sump.

Anti-sweat insulation is much lighter than water and any anti-sweat debris would float on the water surface in the sumps, well above the protective screened structures. Model tests of the FNP containment sumps are reported in Appendix 6C of the FSAR. These tests showed that there were no vortices which establish an air core from the free surface within the containment area to the screen grating around the sumps. Therefore, the anti-sweat insulation debris will not block the sump trash racks or sump screens.

The blockage test results, presented in Appendix 6C of the FSAR, show that blockages of up to 71% of the screen-grating surface area do not make an appreciable difference in approach velocities to screen and tendency for vortex formation. The percentage of the screens which would be expected to be blocked will be much lower than 71%.

Design features which would preclude the screens becoming blocked or the sump plugged by debris are as follows:

The sump intakes are protected by an outer trash rack and the sumps are designed to yield low velocities-of-approach in the vicinity of the sumps to promote the settling-out of debris. Materials inside containment which could cause sump screen blockage post-LOCA have been eliminated or minimized by design.

CONCERN

c. With respect to the conclusion that debris with a specific gravity greater than unity will settle before reaching the sump cover, consider the potential for flow paths which may direct significant quantities of debris laden coolant into the lower containment in the vicinity of the sump and the availability or lack of sufficient horizontal surface areas or obstructions to promote settlings or holdup of debris prior to reaching the sump.

RESPONSE

Because of the location of the containment sumps outside of the secondary shield wall, there are no flow paths which could direct significant quantities of debris laden coolant into the lower containment in the vicinity of the sumps. Most equipment and piping with metal reflective insulation are located outside of major flow paths to the sumps and all have sufficient surface area between their location and the sump to promote settling of debris heavier than water. The labyrinths around the secondary shield wall and other obstructions between the primary and secondary shields will also promote holdup of debris prior to reaching the sump.

CONCERN

d. Does metal mirror insulation house other materials, fibrous or otherwise, which could become debris if the insulation were blown off as a result of a LOCA?

RESPONSE

Metal reflective insulation does not house any other materials which could become debris if the insulation were blown off as a result of a LOCA.

CONCERN

e. If the Farley containment contains loose insulation, include examples of how the insluation will be precluded f-om reaching the sump.

RESPONSE

Loose insulation is not used inside the Farley containment.

CONCERN

e. (4) Provide a schematic drawing of the post-LOCA water level in containment during the recirculation mode relative to the elevation of the ECCS sump floor. Include on this drawing the location of the containment water level sensor and the elevations corresponding to readings of zero and 100 percent of range on the control room indicator.

e. (5) Provide several large scale drawings of the containment structures, systems and components at elevations.

e. (6) Does Farley utilize similar materials in the containment during power operation for purposes such as reactor cavity annulus biological shielding (e.g., sand tanks or sand bags) or reactor cavity blow out sand plugs?

RESPONSE

e. (4) In Figure 1, Elevations 106' and 116' correspond to readings of zero and 100 percent of range on the control room indicator.

The water level of 113'-6" shown in Figure 1 is a realistic calculation for the post LOCA water level. It is bounded by a maximum water depth calculated for equipment flooding qualification, and the minimum water depth used for ECCS sump performance calculations.

e. (5) The following drawings show systems, containment structures and components at elevations discussed in these responses:

1. D-205465 and D-205468 show the piping for the reactor coolant pump motor air coolers of the service water system.

2. D-205452 and D-205453 show the piping for the reactor coolant pump motor bearings and thermal barrier, excess letdown heat exchanger and reactor coolant drain tank heat exchanger of the component cooling water system.

3. Drawings of Equipment Locations - Containment and Fuel Handling Area

D-205050	Plan at El. 155'
D-205051	Plan at El. 139'
D-205052	Plan at El. 129'
D-205053	Plan at El. 105'-6"
D-205067	Section View
D-205068	Section View

e. (6) Farley does not utilize reactor cavity annulus biological shielding or reactor cavity blow out sand plugs or similar materials in the containment.

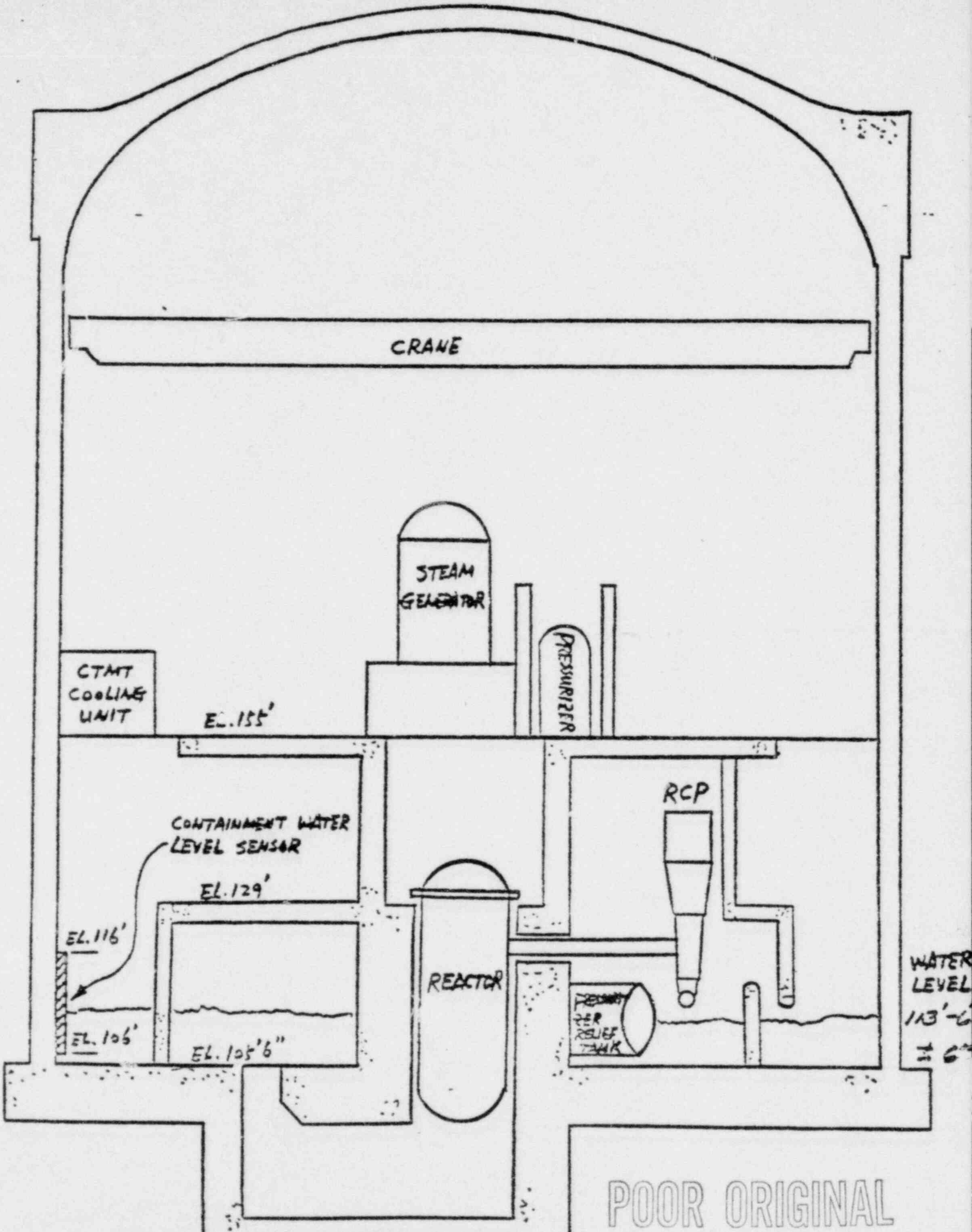
CRANE
STEAM GENERATOR
PRESSURIZER
CTMT COOLING UNIT
EL. 155'
RCP
CONTAINMENT WATER LEVEL SENSOR
EL. 129'
EL. 116'
REACTOR
EL. 106'
EL. 105'6"
RELIEF TANK
WATER
LEVEL

FIG. 1