Form 244

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CP&L

Carolina Power & Light Company

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Company Correspondence

H. B. ROBINSON STEAM ELECTRIC PLANT
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OCT 12 1984

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Mr. James P. O'Reilly
Regional Administrator
U. S. Nuclear Regulatory Commission
Suite 2900
101 Marietta Street, N. W.
Atlanta, Georgia 30303

H. B. ROBINSON STEAM ELECTRIC PLANT, UNIT NO. 2.
DOCKET NO. 50-261
LICENSE NO. DP-23
IEB-84-03

Dear Mr. O'Reilly:

In a letter dated August 31, 1984, Carolina Power and Light Company (CP&L) provided a preliminary response to the subject bulletin informing the NRC that the seal arrangement at H. B. Robinson Unit 2 (HBR2) was significantly different from that at Haddam Neck. This response discusses these differences and concludes that the pneuma-seal at HBR2 will not "push through" the annulus as is understood to be failure the mechanism at Haddam Neck.

I. Annulus Seal Description

The opening between the reactor vessel and the reactor cavity liner is a nominal 2" annulus. Originally, a one foot wide metal ring, along with a set of square O-rings and the liberal use of a sealing compound performed the annulus sealing function during refuelings. Since 1978, a single pneuma-seal has been used as the primary seal for the 2" annulus. The same metal ring has been cut into 3 sections for ease of handling and is installed by resting it on the pneuma-seal and bolting it to the flanges on either side of the 2" annulus. See Figure 1. The intent of resting this metal ring on the pneuma-seal was to protect the pneuma-seal from overhead objects and to help hold the pneuma-seal down. The pneuma-seal is designed so that, in the unlikely event of damage to the inflatable section, the wedge configuration at the top holds itself into the annulus and prevents excessive leakage.

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II. Potential for Seal Failure

The failure mechanism at Haddam Neck is understood to have been a "push through" of a properly inflated seal due to the hydraulic force of the head of water.

Figure 2 compares the Haddam Neck and HBR2 pneuma-seals. One significant difference is that HBR2 has more rubber in the wedge and top portions of the pneuma-seal. Another difference is that at HBR2, the cavity gap or annulus opening is smaller than that at Haddam Neck. These significant differences would not allow the pneuma-seal to "push through" the annulus at HBR2.

Calculations were performed which support the position that the HBR2 pneuma-seal is appropriately sized and will not "push through" the cavity annulus due to the forces of the maximum cavity water level.

The maximum downward deflection of the head of the pressure seal was computed using a beam model. This model accounts for the properties of rubber as well as the geometry of the seal. The model does not include frictional forces due to the edges supporting the seal and the internal pressure of 30 psi. The additional stiffness due to the plate is also ignored. These result in a conservative value for the deflection of the seal due to the water pressure. Including a safety factor of four (4) for the normal water level of twenty-five feet (25') deep, the maximum deflection of the top of the head of the seal is .120 inches. Results of this calculation demonstrates, therefore, that four times the level of water could not result in the movement of a properly installed seal through the gap between the reactor pressure vessel and the cavity liner.

A test was performed on a one foot section of a deflated spare pneuma-seal. The test configuration utilized two steel plates to create a non-uniform gap (2 3/16" to 2 1/4"). The pneuma-seal surfaces were wetted to simulate operating conditions. A constant pulling force equivalent to approximately 65 ft. of water was applied for 30 minutes to the deflated seal with no measurable movement of the seal. The calculation and test results will be available at the H. B. Robinson Plant

In addition, the metal ring resting on the pneuma-seal results in the water pressure being uniformly distributed across the top of the pneuma-seal. See Figure 3. Also, the use of a single pneuma-seal between two immovable objects at HBR2 insures the size of the annulus is fixed and not subject to potential shifting of a seal ring.

III. Evaluation of Consequences

Based on the above tests and calculations of a deflated pneuma-seal which demonstrates that the pneuma-seal will not fall through the annulus, CP&L considers the pneuma-seal a passive seal system. Therefore, failure of the pneuma-seal is not a creditable event.

However, existing procedures and operator actions in the event of a decreasing cavity level during fuel movement were reviewed. This review considered the various cavity and spent fuel building elevation shown in Figure 4. Based on this review, procedures will be revised to provide additional guidance in the unlikely event that some unforeseen problems occur. These revisions are addressed in Section V below.

IV. Action Taken

The metal ring that rests on the pneuma-seal at HBR2 has a rib on the center line of the bottom of the metal ring which made the actual contact with the pneuma-seal. This metal ring has been turned over so that the rib is on top, and the metal plate now makes full contact with the pneuma-seal. See Figure 5.

V Action to be Taken

Prior to moving fuel back to the containment from the Spent Fuel Pit, the Refueling Emergency Procedure will be revised to address actions to take in case of a decreasing level in the Refueling Cavity exceeding the make-up capacity.

This procedure will address isolating the Spent Fuel Pit from the reactor cavity and will provide instructions for relocating fuel in transient to locations which will ensure the fuel remains covered with water. As an additional conservative action, operations in containment will be restricted such that the operator will have to be concerned with the relocation of only one spent fuel assembly.

VI. Conclusion

Calculations, along with a physical test of a pneuma-seal at HBR2, have clearly demonstrated that the pneuma-seal will not experience a "push through" gross failure as occurred at Haddam Neck and is considered as a passive sealing system. However, procedures which deal with handling fuel during refueling operations have been reviewed and will be upgraded prior to moving fuel back to the reactor cavity which will address appropriate actions to take in the case of a decreasing level in the refueling cavity.

If you have any questions concerning this response, please contact my staff or me.

Guy P. Beatty, Jr.
Manager
Robinson Nuclear Project Department

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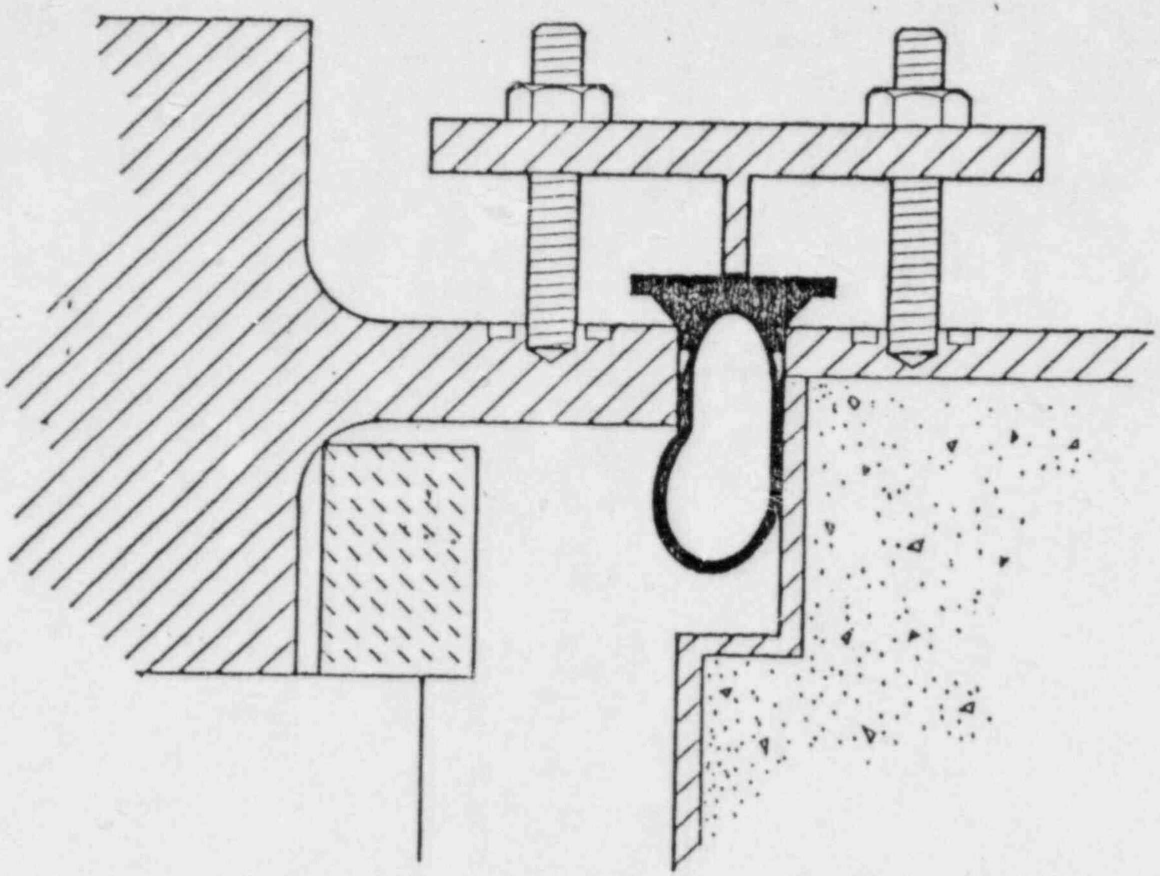
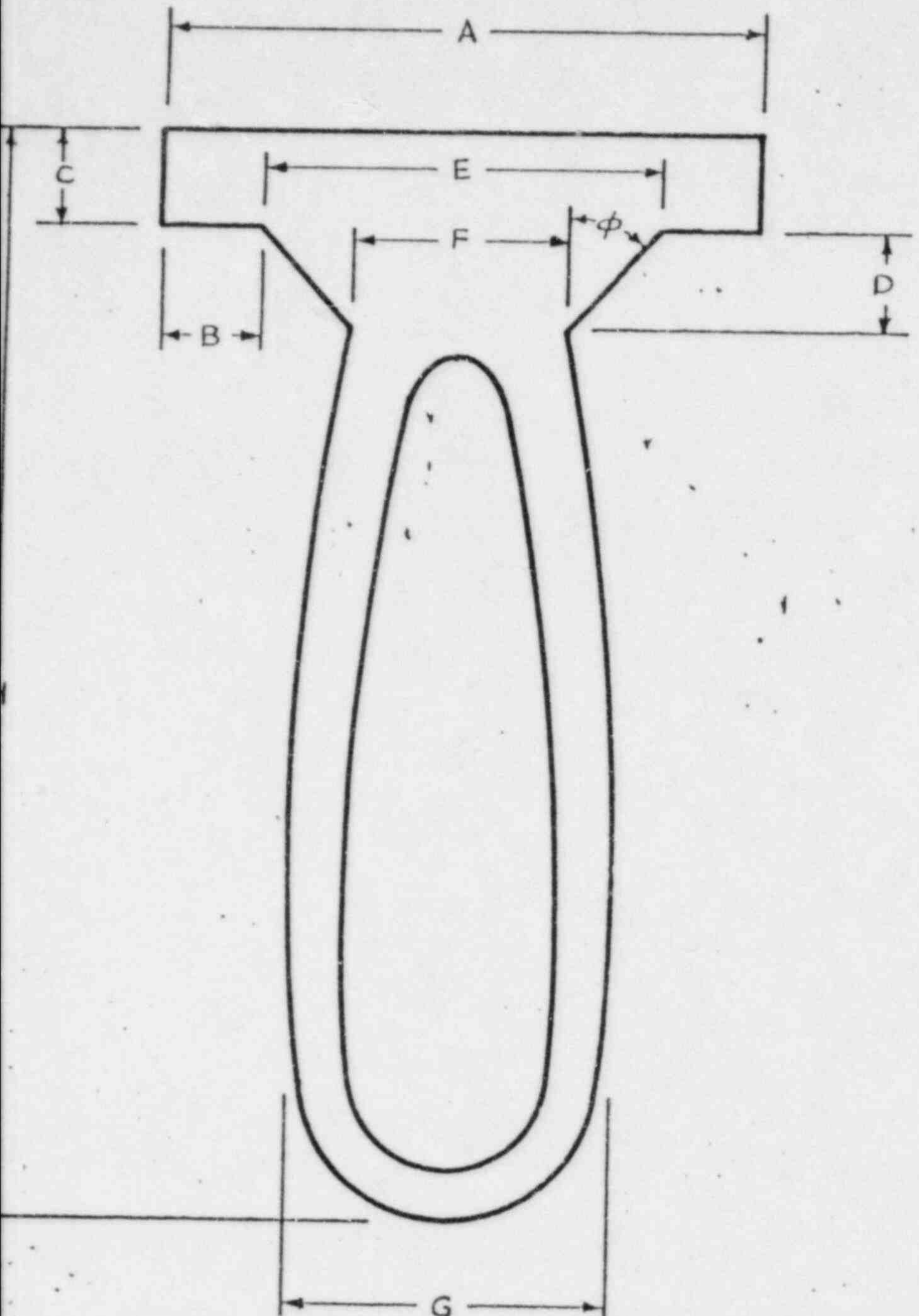


FIGURE I

H.B. ROBINSON SEAL CONFIGURATION
WITH BACKING RING IN ORIGINAL POSITION



HADDAM NECK	HBR 2
1. 9 POINT STRONG BACK. 2. STUB DOES NOT COVER ENTIRE SEAL. 3. LEVELING ADJUSTABLE. 4. 2 SEALS. 5. 2 THIN LEDGES.	1. CONTINUOUS STRONG-BACK. 2. BACKING RING COVERS ENTIRE SEAL AND OVERLAP. 3. LEVELING FIXED. 4. 1 SEAL. 5. 1 THIN LEDGE / 1 WALL.

DIMENSIONS			
HADDAM NECK		HBR 2	
A.	3.5"	A.	4.0"
B.	0.350"	B.	0.5625"
C.	0.5"	C.	0.5"
D.	1.125"	D.	1.450"
E.	2.8"	E.	2.875"
F.	1.5"	F.	1.625"
G.	1.5"	G.	1.5"
φ.	30°	φ.	25°
H.	5.5"	H.	6.5"
CAVITY GAP . . .	2 1/8" (2 ea)	CAVITY GAP . . .	2.0" (1 ea)

FIGURE 2

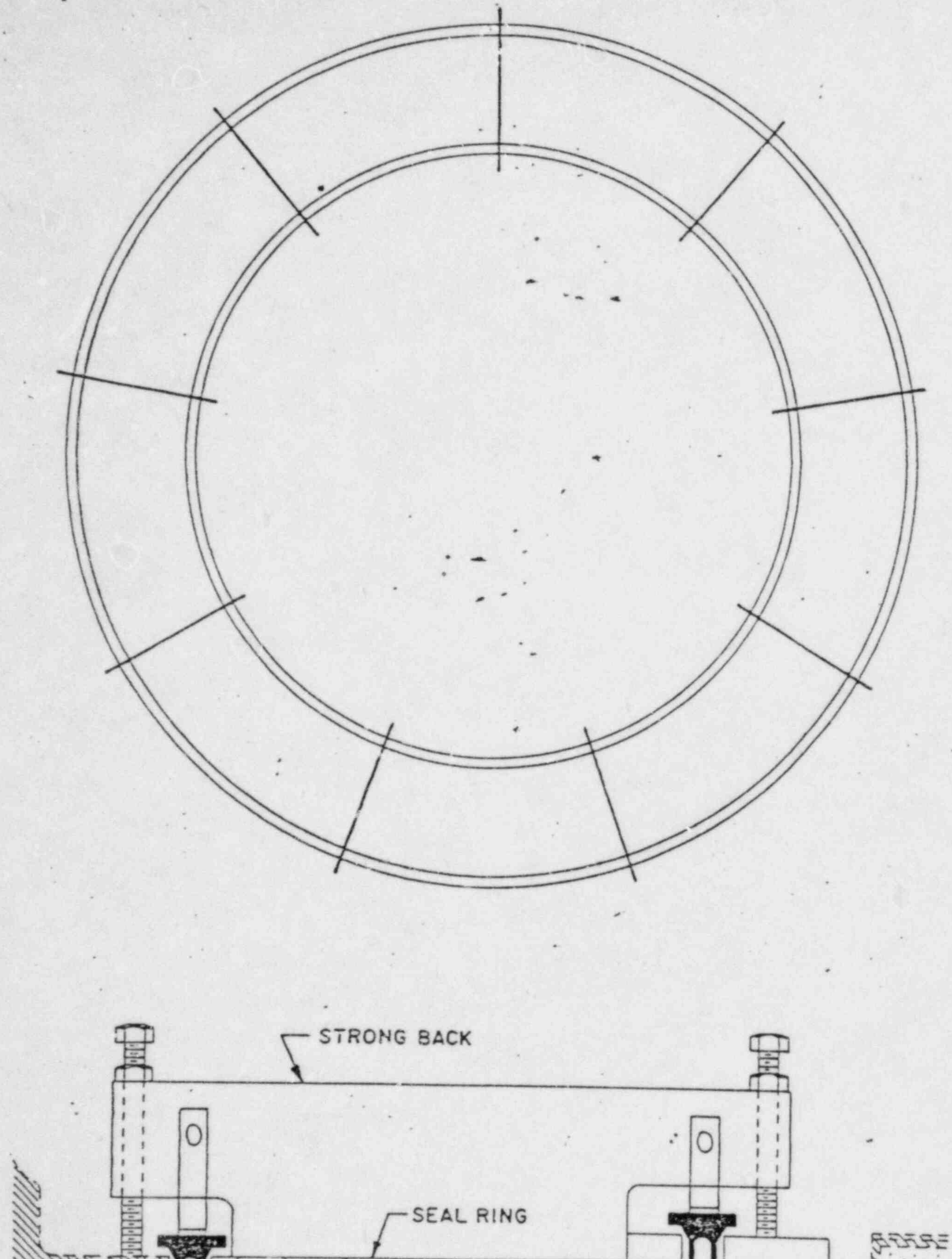


FIGURE 3
CP&L UNDERSTANDING OF THE HADDAM NECK
PNEUMA-SEAL ARRANGEMENT

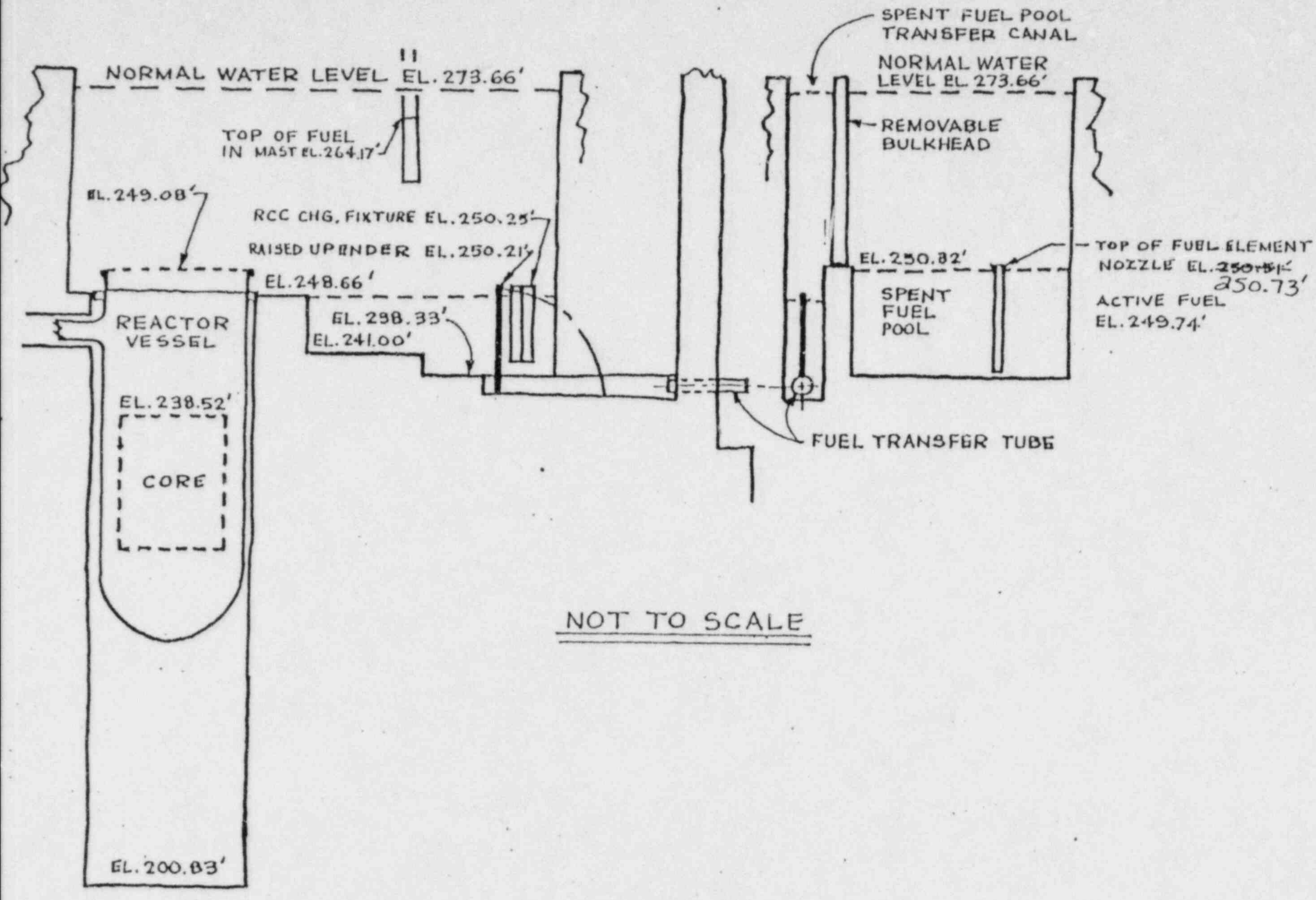


FIGURE 4

H.B. ROBINSON CONTAINMENT & SPENT FUEL PIT ELEVATIONS

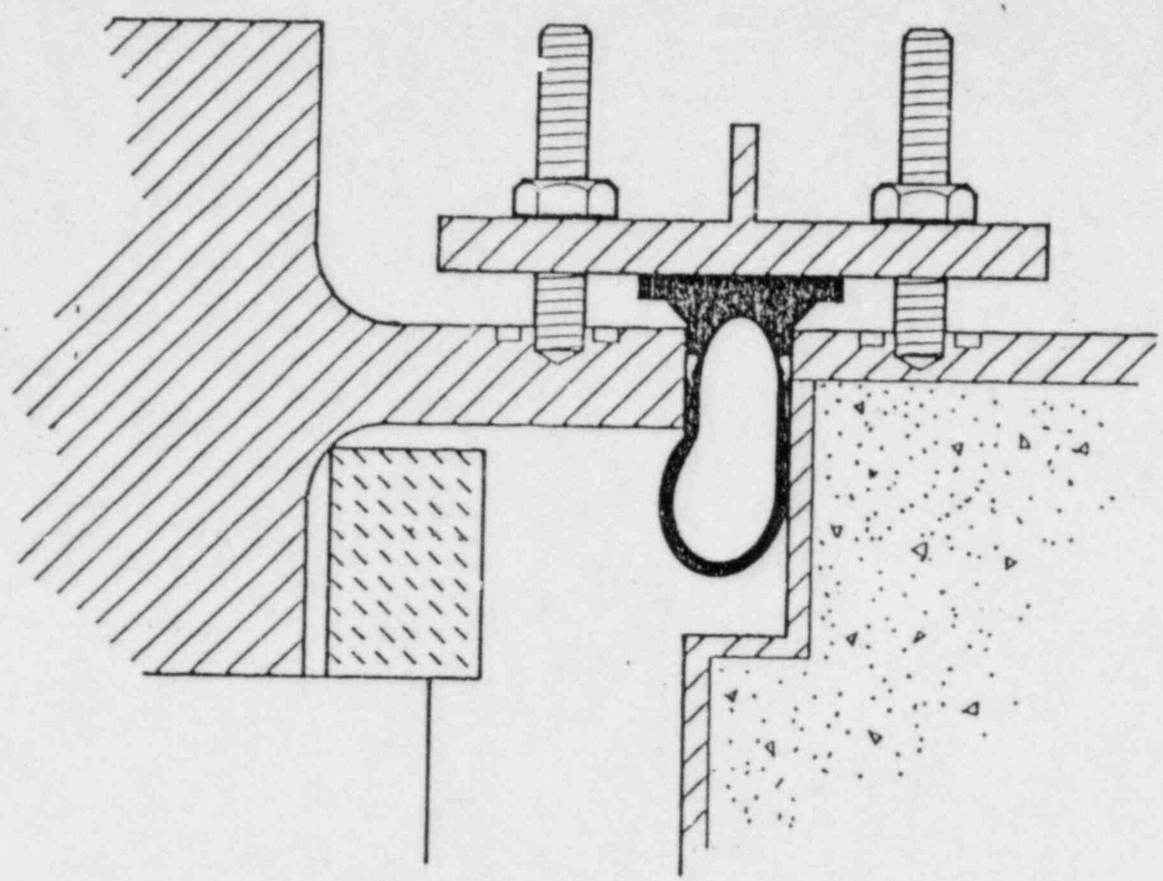


FIGURE 5

H.B. ROBINSON SEAL CONFIGURATION
WITH BACKING RING IN MODIFIED POSITION