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SUBJECT: Forwards update to util revised response to IE Bulletin 84-03, re final design of plant refueling cavity water seal. Seal provides redundant passive safety-related means of limiting refueling pool leakage.

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L-87-405

U. S. Nuclear Regulatory Commission
Attn: Document Control Desk
Washington, D. C. 20555

Gentlemen:

Re: Turkey Point Units 3 and 4
Docket Nos. 50-250 and 50-251
IE Bulletin 84-03 (Revised Response)

The attached response updates Florida Power & Light Company's revised response to IE Bulletin 84-03. Our letter L-86-131, dated March 24, 1986, provided a response based on "as found" conditions. This revision provides FPL's final design of the refueling cavity water seal for Turkey Point Units 3 and 4.

Should there be any questions, please contact us.

Very truly yours,

R. J. Acosta for
C. O. Woody
Group Vice President
Nuclear Energy

COW/RG/gp

cc: Dr. J. Nelson Grace, Regional Adminstrator, Region II, USNRC
Senior Resident Inspector, USNRC, Turkey Point Plant

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AMENDED RESPONSE TO IE BULLETIN 84-03
"REFUELING CAVITY WATER SEAL"

PURPOSE

The purpose of this Amended Response to IE Bulletin 84-03 is to document the revised reactor cavity seal design recently implemented on Turkey Point Unit #3 by PCM 86-14.

BACKGROUND

IE Bulletin 84-03 was issued to notify licensees of an incident in which the refueling cavity water seal failed at the Haddam Neck Plant on August 21, 1984 resulting in the rapid draining of the refueling canal. The Haddam Neck failure occurred when the water level in the refueling canal reached the point where water pressure forced the seal through the annular gap in which it resided.

Florida Power & Light subsequently reviewed the design at Turkey Point and submitted a response to IE Bulletin 84-03 in November 1984. The review concluded that a catastrophic failure of the Turkey Point cavity seal as occurred at Haddam Neck was not considered a credible event because of the inherent design differences between the Turkey Point and Haddam Neck reactor cavity seals.

Although it was concluded that failure of the Turkey Point reactor cavity seal was not a credible event, FPL decided it would be a prudent management action to add a set of back-up seals to limit leakage in the event of an inflatable seal failure. The designs were documented in PC/M 84-214 for Unit #3 and PC/M 85-94 for Unit #4.

During the implementation of PC/M 85-94 in January 1986, a discrepant condition was discovered that required an interim design to be implemented. The interim design which was discussed in a previous Amended Response to IE Bulletin 84-03 submitted in March, 1986 installed shim rings to provide seating surfaces for the inflatable seal as well as the back-up seals. The interim design is shown in Figure 1.

REVISED DESIGN

Although the seals installed under PC/M 85-94 met all design criteria and successfully performed its function, FPL committed to implement a new design prior to the next refueling of both units.

The design criteria of the reactor cavity seal revised design was to provide a completely redundant set of passive seals to limit high volume losses from the refueling pool to perform the safety related design function and a non-safety related inflatable seal to minimize leakage in accordance with ALARA considerations.

PC/M 86-14 was generated to implement the revised design on Unit #3 and PC/M 87-100 will implement the same design on Unit #4.

The revised design is shown in Figure 2. A new seal ring plate was fabricated from stainless steel to replace the original carbon steel seal ring plate. The new stainless steel plate was analyzed and stiffener members added to reduce stresses and deflection of the plate during lifting and while in place.

Measurements of the existing condition of the reactor cavity were taken and compression seals were designed and fabricated to provide a leaktight seal with the expected tolerance of the installed assembly. Two compression seals are provided on each side of the 2" annular gap comprising the reactor cavity and are affixed to the seal ring plate by dovetail retainers molded into the seal (which fit into dovetail grooves machined into the bottom of the seal ring plate.) The compression seals perform the safety function by providing a redundant passive means of limiting high volume losses (greater than 50 gpm) from the refueling pool. The acceptable leakage rate of 50 gpm is based on: a) The ability of the two 75 gpm reactor sump pumps to transfer this flowrate to the waste hold-up tank or refueling water storage tank; and, b) The acceptable rate of falling reactor cavity/spent fuel pit levels of less than two inches per hour allows for adequate operator response times to take corrective action. Although the maximum acceptable leakage rate has been set at 50 gpm, actual leakage past the seals is expected to be near zero based on previous experience with similar seals and based upon experimental and in situ testing.

Preload is applied to the compression seals via compression arms that act on the top of the seal ring plate. The compression arms are torqued to a predetermined value that will deflect the compression seals into their operating range around their entire circumference.

An analysis was performed on the compression seals to determine margin of safety against failure. Considering the preload obtained from the compression arms and hydrostatic forces, the compression seals have a margin of safety of at least 4.68 against failure. In addition, the compression seals were tested by the vendor at up to 30 psig equivalent static water pressure, a factor of safety of at least 2.77, without leakage.

An inflatable seal is also provided to perform the non-safety related function of minimizing leakage in accordance with ALARA considerations. The inflatable seal is also affixed to the seal ring plate by dovetail retainers molded onto the seal which fit into dovetail grooves machined into the bottom of the plate. When the plate is installed, the inflatable seal hangs into the 2" annular gap between the reactor vessel flange and refueling cavity ledge. When inflated to its operating pressure of 30 to 35 psig, the inflatable seal expands to form a seal against the wall of the reactor cavity and the reactor vessel flange to stop any leakage that may have passed the compression seals.

The inflatable seal is pressurized using plant instrument air. The seal pressurization system is shown in Figure 3. The system includes a pressure regulator to control air pressure to the seal, local pressure indication upstream and downstream of the regulator, a relief valve sized to handle flowrates that will be experienced in the event of a regulator failure and a check valve to maintain the seal in the inflated condition should air supply pressure be lost. A failure modes analysis was performed on the inflatable seal and concluded that no potential failure mode of the inflatable seal will have an adverse effect on the safety related compression seals.

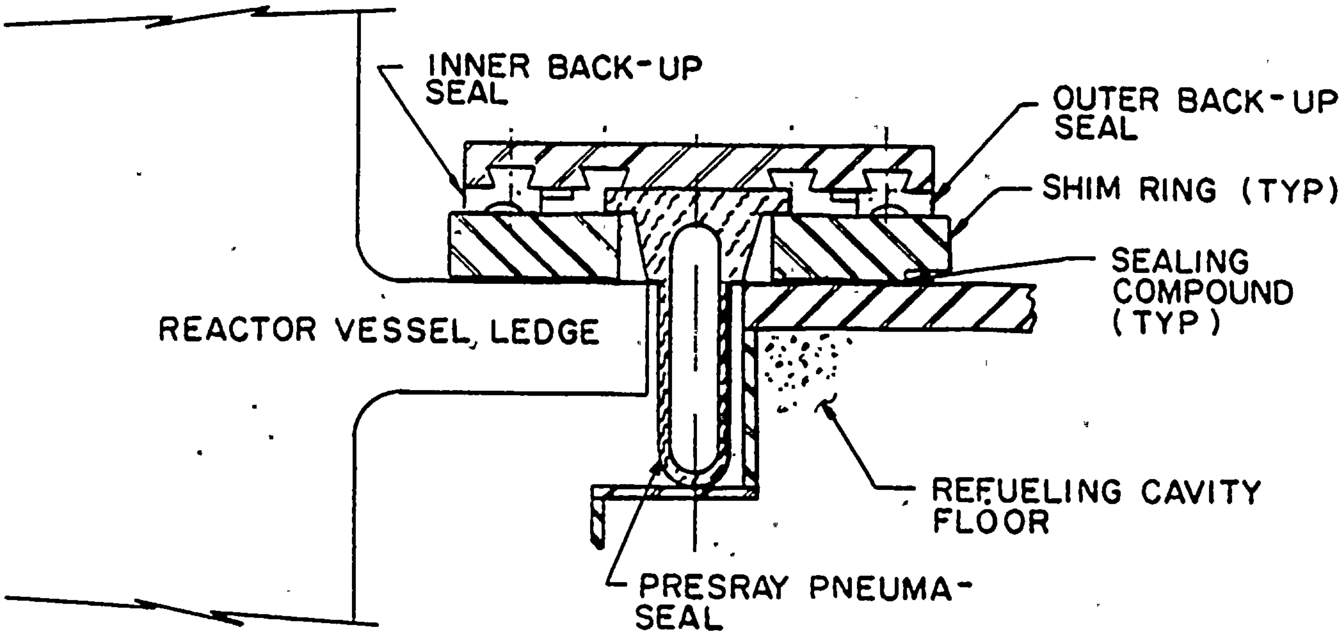
The revised design was installed on Unit #3 in March, 1987 during the scheduled refueling. The assembly was placed and torqued as designed. In order to verify the compression seals performed their safety function, the refueling pool was filled without pressurizing the inflatable seal to determine the leakage rate, if any, past the compression seals. The test results show there was no perceivable leakage past the compression seals. The inflatable seal was inflated as an added measure against leakage and the refueling proceeding without leakage.

The revised design will be implemented under PC/M 87-100 on Unit #4 during the next scheduled refueling.

CONCLUSION

The revised reactor cavity seal provides a redundant passive safety related means of limiting leakage from the refueling pool. The design has been analyzed, tested and proven during use to demonstrate that the design provides an effective seal against leakage while eliminating the possibility of a catastrophic failure.

JPE-M-87-073
REV. 0



TURKEY POINT UNIT 4
REACTOR CAVITY SEAL
INTERIM DESIGN
FIGUPE 1
FLORIDA POWER & LIGHT COMPANY
DATE 5/22/87
SCALE

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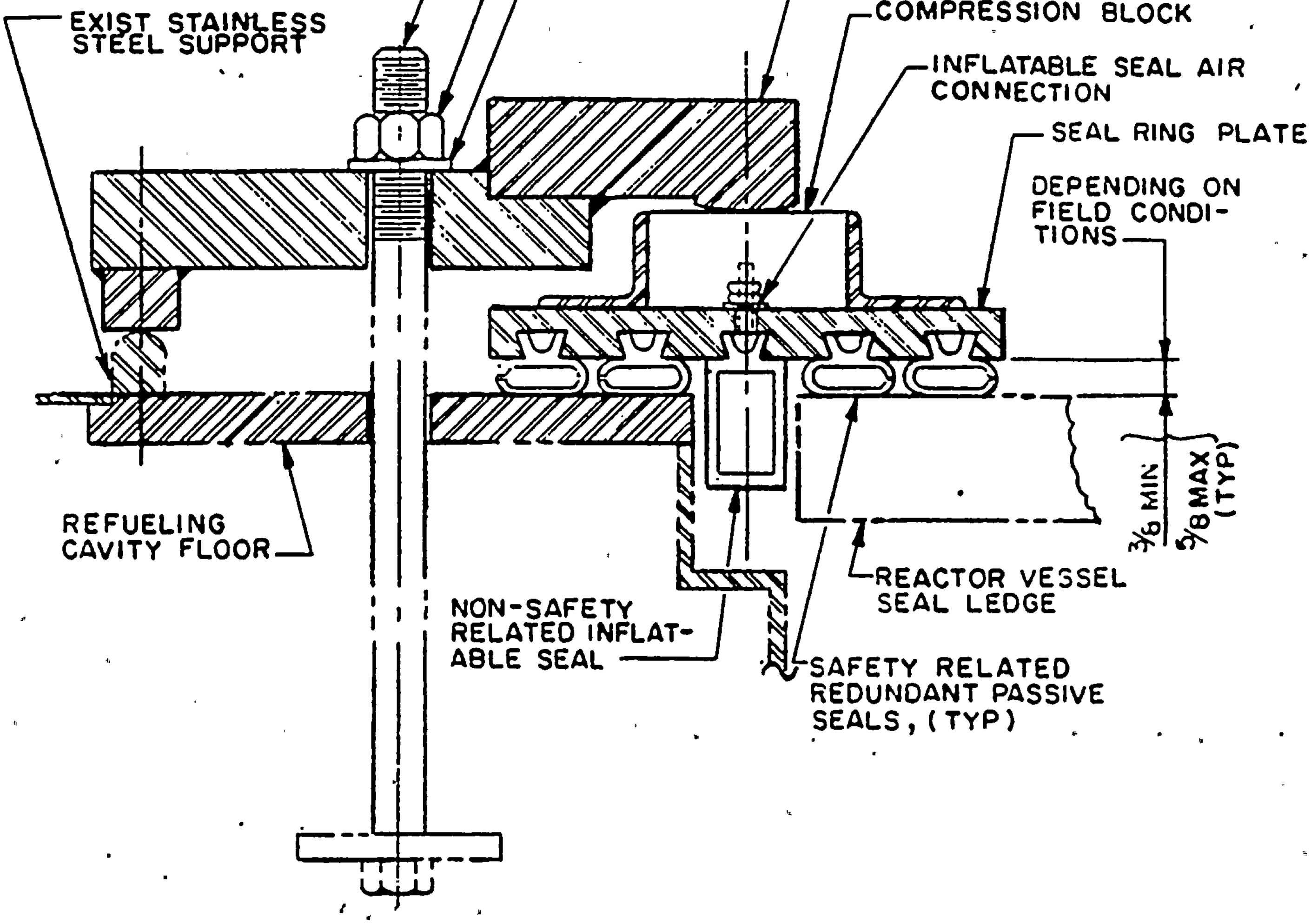

TYPICAL SECTION OF INSTALLED ASSEMBLY

APPROVED:

TURKEY POINT UNITS 3&4
REACTOR CAVITY SEAL
REVISED DESIGN
FIGURE 2

FLORIDA POWER & LIGHT COMPANY
DATE 5/22/87
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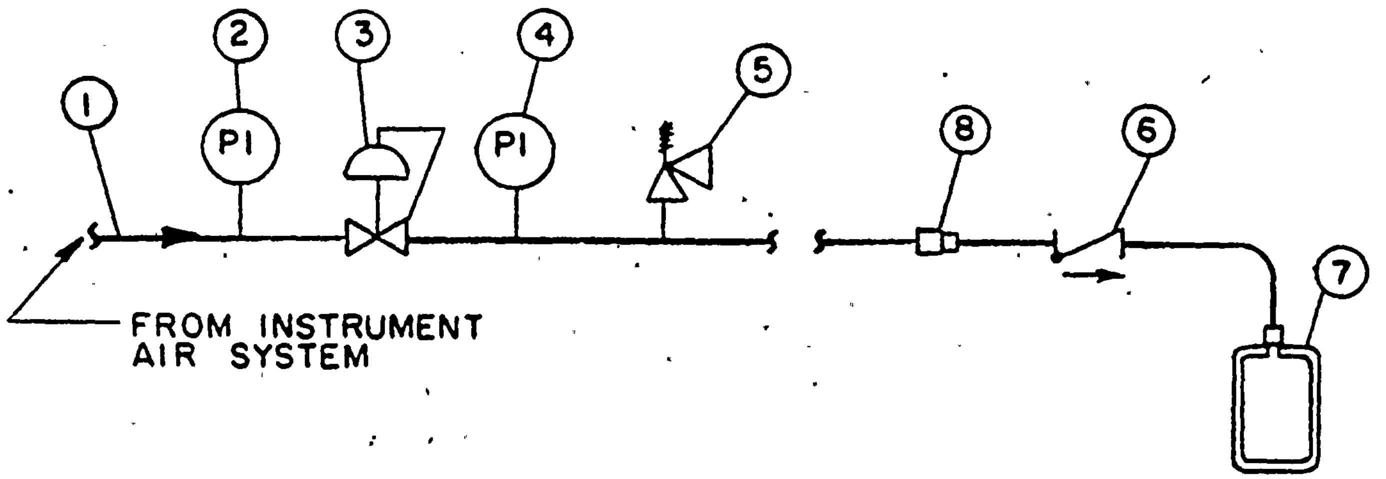
BILL OF MATERIAL

NO	QUAN	DESCRIPTION
1		1/2" SS TUBING
2		PRESSURE GAUGE 0-400 PSIG
3		PRESSURE REG. VALVE
4		PRESSURE GAUGE 0-50 PSIG
5		PRESSURE RELIEF VALVE, 1/2" NPT
6		CHECK VALVE
7		PRESRAY INFLATABLE SEAL
8		QUICK-DISCONNECT



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TURKEY POINT UNITS 3 & 4
REACTOR CAVITY SEAL
SEAL PRESSURIZATION SYSTEM
FIGURE 3
FLORIDA POWER & LIGHT COMPANY
DATE 5/22/87
SCALE