SNUPPS

Standardized Nuclear Unit
Power Plant System

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SUBJ: IE Bulletin 84-03: Refueling Cavity Water Seal

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Docket Nos. STN 50-482 and STN 50-483

Gentlemen:

The subject Bulletin described an incident in which a refueling cavity water seal failed and requested an evaluation of the potential for and consequences of a refueling cavity water seal failure at the SNUPPS plants - Callaway Plant Unit No. 1 and Wolf Creek Generating Station Unit No. 1.

The attached report provides a summary of the requested evaluation. Based on the report, it is concluded that the SNUPPS refueling cavity water seal design makes a gross seal failure an extremely unlikely event. In addition, SNUPPS plant design features provide for adequate spent fuel cooling and for safe plant recovery from a postulated gross failure of the seal.

Very truly yours,

Nicholas A. Petrick

MHF/nld13b3&4
Attachment
cc: See Page 2.

IE11
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Attachment to SLNRC 84-127

SNUPPS Response to IE Bulletin 84-03, "Refueling Cavity Water Seal"

I. Introduction

The SNUPPS Standard Plant FSAR contains several sections which are applicable to the evaluation of the potential for and consequences of a refueling cavity water seal failure. These are:

Section 9.1.2 SNUPPS Spent Fuel Storage Facility (SFSF) design, boration requirements.

Section 9.1.3 Fuel Pool Cooling and Cleanup System design, sources of normal and emergency makeup water.

Section 9.1.4 Fuel Handling System and Operations.

Section 1.2 Fuel Building Plan Drawings.

II. Potential for Refueling Cavity Water Seal Failure

A review of the SNUPPS and Haddam Neck refueling cavity seal designs reveals several differences which make the type of failure experienced at Haddam Neck extremely unlikely at the SNUPPS plants. Details of the SNUPPS seal design are shown in Figure 1. The major difference is the manner in which the SNUPPS seal fits into the annular opening between the reactor vessel flange and the refueling cavity. At the outer radius of the SNUPPS seal, near each radial stiffener, are two keepers (for a total of 48 keepers) which provide a 1/8" alignment between the seal assembly and the refueling cavity. This feature prevents misalignment of the seal such as occurred at the Haddam Neck Plant. The SNUPPS seal rubber material is significantly harder than the Haddam Neck seal material. This and the guide stud support arrangement for the SNUPPS seal provide increased resistance to the seal distortion or buckling. If the pneumatic (primary) seal were to lose air pressure, leakage could occur through the seal; however, the wedge part of the SNUPPS seal provide substantial passive sealing capability. A leak through the seal of more than one gpm for one hour will be detected, and an alarm is provided in the control room. Also, if the leakage fills the incore instrument tunnel, this condition is alarmed in the control room.

III. Consequences of a Gross Refueling Cavity Water Seal Failure

Although the SNUPPS seal design makes a gross seal failure an unlikely event, to comply with I.E. Bulletin 84-03, a gross failure of the SNUPPS reactor cavity water seal was evaluated. During fuel transfer, a gross seal failure of the SNUPPS reactor cavity water seal would, due to design of the structure, result in only a partial drainage of the refueling pool, fuel transfer canal and spent fuel pool. Level alarms will alarm locally and in the control room with a 3" drop in water level in the spent fuel pool. Also, operators in the area of the spent fuel pool, fuel transfer canal and refueling pool would be able to visually observe a level drop in these areas.

Assuming a drainage rate similar to that reported at Haddam Neck, (200,000 gallons within 20 minutes) a drop of approximately 9 feet would occur in the refueling pool and spent fuel pool after 20 minutes. A drop of 9 feet of water level represents approximately 90,000 gallons of spent fuel pool water volume. If there is fuel in the transfer tube, the operator will clear the tube and close the valve. The plant operators should be able to clear the tube within 5 minutes and close the fuel transfer tube isolation valve in less than 15 minutes, thereby, limiting the amount of water lost out of the spent fuel pool to approximately 90,000 gallons. These times are based on a review of the Westinghouse Fuel Transfer System Technical Manual, and are considered conservative. A 9 foot drop in water level in the spent fuel pool will leave approximately 15 feet of water above the fuel assemblies. This depth provides sufficient shielding such that the dose rate from direct radiation shine from stored spent fuel will not exceed allowable dose rates for the area. Even if the transfer tube valve were not closed the fuel stored in the spent fuel pool will not become uncovered since the elevation of the top of the fuel assemblies are below the refueling cavity water seal elevation. Also, the design of the spent fuel pool will not allow draining to a level below the top of the spent fuel racks. Forced fuel pool cooling will not be available once the fuel pool level drops below a certain elevation since the fuel pool cooling pumps are tripped by level switches. The fuel pool cooling pumps will be available once refilling of the spent fuel pool is completed. As noted in the SNUPPS FSAR, boration of makeup water to the SFSF is not required; therefore, emergency makeup from the Essential Service Water system or fire protection system can be used in an emergency.

The refueling pool in containment cannot be isolated from a leaking cavity seal, therefore, all water above the seal/reactor vessel flange level will drain out into the containment. Fuel in transit from the vessel to the transfer cart would not be exposed within 20 minutes since the top of the assembly in the full up position in the refueling machine is more than 9 feet below the normal water level. Operator action will assure that fuel in transit is placed in a safe position in either the reactor vessel or the upending machine. Fuel assemblies in the upending machine or the rod control cluster change assembly will be under water whenever the refueling pool water level is at or above the reactor vessel flange/seal elevation. Makeup to the refueling pool, as required to replace water loss through evaporation, can be provided from the RWST via the Residual Heat Removal (RHR) system through the reactor vessel.

A procedure for mitigation of reactor cavity seal leakage has been implemented at Wolf Creek plant. This procedure assures that fuel assemblies are moved to appropriate safe locations and other mitigating actions are taken in the event of a leaking cavity water seal. A similar procedure will be implemented at Callaway Plant prior to beginning the first refueling outage.

IV. Conclusion

Based on the above evaluation, the likelihood of a refueling cavity seal failure, similar to that experienced at Haddam Neck, is extremely remote based on SNUPPS plant design features. The evaluation shows that, even for the assumption of gross seal failure, SNUPPS design features provide adequate cooling for the spent fuel assemblies both inside containment and in the Fuel Building and seal repairs could be effected and plant conditions returned to normal through the use of recovery procedures.

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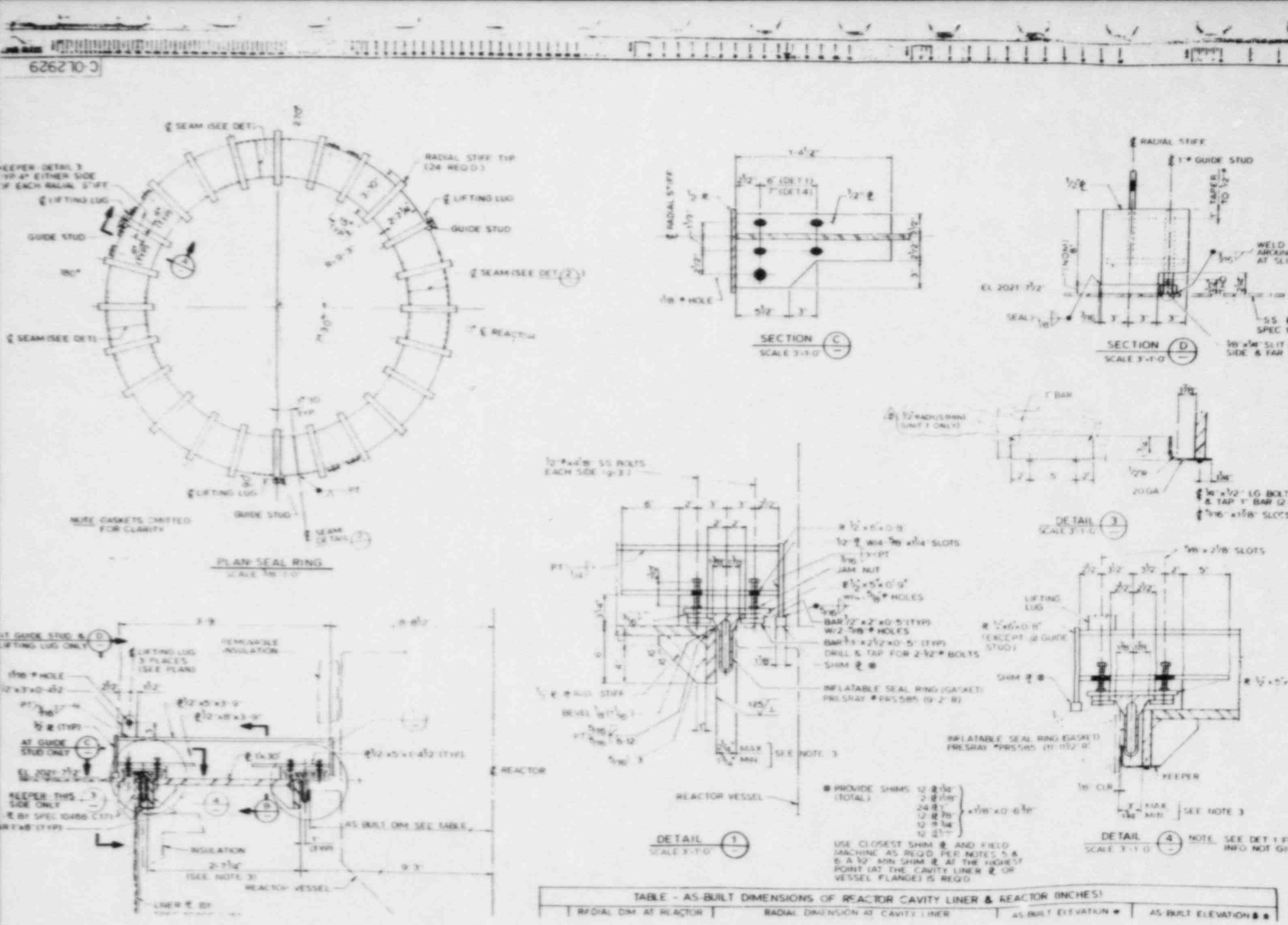
C-0L2929
PLAN-SEAL RING
NOTE: GASKETS OMITTED FOR CLARITY
RADIAL STIFF TYP (24 REQ'D)
LIFTING LUG
GUIDE STUD
SEAM (SEE DET 2)
REACTOR
SECTION C
SCALE 3"=1'-0"
SECTION D
SCALE 3"=1'-0"
RADIAL STIFF
1" GUIDE STUD
WELD AROUND AT SLIT
EL 2021'-7 1/2"
DETAIL 3
SCALE 3"=1'-0"
DETAIL 1
SCALE 3"=1'-0"
JAM NUT
INFLATABLE SEAL RING (GASKET) PRESRAY #PRS585 (9'-2" R)
DRILL & TAP FOR 2-1/2" BOLTS
REACTOR VESSEL
SEE NOTE 3
USE CLOSEST SHIM AND FIELD MACHINE AS REQ'D PER NOTES 5 & 6. A 1/2" MIN SHIM AT THE HIGHEST POINT (AT THE CAVITY LINER OR VESSEL FLANGE) IS REQ'D
DETAIL 4
SCALE 3"=1'-0"
INFLATABLE SEAL RING (GASKET) PRESRAY #PRS585 (11'-11 1/2" R)
KEEPER
LIFTING LUG
REMOVABLE INSULATION
INSULATION
AS BUILT DIM SEE TABLE
TABLE - AS-BUILT DIMENSIONS OF REACTOR CAVITY LINER & REACTOR (INCHES)
RADIAL DIM AT REACTOR
RADIAL DIMENSION AT CAVITY LINER
AS-BUILT ELEVATION
AS-BUILT ELEVATION

FIGURE 1