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 RECIP. NAME RECIPIENT AFFILIATION

SUBJECT: LER 88-022-00: on 881007, corrected containment flood level results in submergence of addl components.

W/8 ltr.

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NRC Form 366
 (9-83)

LICENSEE EVENT REPORT (LER)

FACILITY NAME (1)
 H. B. ROBINSON STEAM ELECTRIC PLANT, UNIT NO. 2

DOCKET NUMBER (2)
 0 | 5 | 0 | 0 | 0 | 2 | 6 | 1 | 1 | OF | 1 | 0

PAGE (3)
 1 OF 10

TITLE (4)
 CORRECTED CONTAINMENT FLOOD LEVEL RESULTS IN SUBMERGENCE OF ADDITIONAL COMPONENTS

EVENT DATE (5)			LER NUMBER (6)			REPORT DATE (7)			OTHER FACILITIES INVOLVED (8)										
MONTH	DAY	YEAR	YEAR	SEQUENTIAL NUMBER	REVISION NUMBER	MONTH	DAY	YEAR	FACILITY NAMES	DOCKET NUMBER(S)									
1	0	0	7	8	8	8	8	8		0 5 0 0 0									
				0	2	2		0	0	1	1	0	4	8	8		0 5 0 0 0		

OPERATING MODE (9) N

POWER LEVEL (10) 1 | 0 | 0

THIS REPORT IS SUBMITTED PURSUANT TO THE REQUIREMENTS OF 10 CFR §: (Check one or more of the following) (11)

<input type="checkbox"/> 20.402(b)	<input type="checkbox"/> 20.405(c)	<input type="checkbox"/> 50.73(a)(2)(iv)	<input type="checkbox"/> 73.71(b)
<input type="checkbox"/> 20.405(a)(1)(i)	<input type="checkbox"/> 50.38(c)(1)	<input type="checkbox"/> 50.73(a)(2)(v)	<input type="checkbox"/> 73.71(c)
<input type="checkbox"/> 20.405(a)(1)(ii)	<input type="checkbox"/> 50.38(c)(2)	<input type="checkbox"/> 50.73(a)(2)(vii)	<input checked="" type="checkbox"/> OTHER (Specify in Abstract below and in Text, NRC Form 366A)
<input type="checkbox"/> 20.405(a)(1)(iii)	<input type="checkbox"/> 50.73(a)(2)(i)	<input type="checkbox"/> 50.73(a)(2)(viii)(A)	50.49
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LICENSEE CONTACT FOR THIS LER (12)

NAME: Don Sayre, Senior Specialist - Regulatory Compliance

TELEPHONE NUMBER: 8 | 0 | 1 | 3 | 3 | 8 | 3 | - | 1 | 2 | 4 | 2

COMPLETE ONE LINE FOR EACH COMPONENT FAILURE DESCRIBED IN THIS REPORT (13)

CAUSE	SYSTEM	COMPONENT	MANUFACTURER	REPORTABLE TO NPRDS	CAUSE	SYSTEM	COMPONENT	MANUFACTURER	REPORTABLE TO NPRDS

SUPPLEMENTAL REPORT EXPECTED (14)

YES (If yes, complete EXPECTED SUBMISSION DATE) NO

EXPECTED SUBMISSION DATE (15)

ABSTRACT (Limit to 1400 spaces, i.e., approximately fifteen single-space typewritten lines) (16)

On October 6, 1988 the licensee discovered an error in the Containment Vessel (CV) flood level calculation used for the 90-day response to Information Bulletin No. 79-01B. The corrected flood level would be approximately three feet higher than originally stated. The licensee justified continued reactor operation by engineering evaluation which assured that environmentally qualified equipment subject to immersion with the revised CV flood level would meet Plant Technical Specifications operability requirements. An inadequate methodology for performing the original flood level calculation had resulted in the error. A continuing licensee evaluation of the Plant Environmental Qualification program had discovered the error. Planned corrective actions include revision of applicable Environmental Qualification files for submergence, Plant modification of a specific CV electrical penetration for Regulatory Guide 1.97 components, resolution of certain post-accident monitoring component operability concerns, and clarification of the CV flood level as stated in the response to Information Bulletin No. 79-01B. This LER is submitted to identify an apparent impact to compliance with 10CFR50.49.

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TEA

LICENSEE EVENT REPORT (LER) TEXT CONTINUATION

FACILITY NAME (1) H.B. ROBINSON, S.E. PLANT UNIT NO. 2	DOCKET NUMBER (2) 0500026188	LER NUMBER (6)			PAGE (3)		
		YEAR	SEQUENTIAL NUMBER	REVISION NUMBER			
		88	022	00	0	2	OF 10

TEXT (If more space is required, use additional NRC Form 366A's) (17)

I. DESCRIPTION OF EVENT

On October 6, 1988, the licensee discovered an error in the Containment Vessel (CV) flood level calculation used for the 90-day response to NRC Information Bulletin (IEB) No. 79-01B.^{1,2} The corrected flood level would be approximately three feet higher than stated in the 90-day response.³

By the following day, the licensee had completed an Engineering Evaluation to provide a Justification for Continued Operation (JCO) since various environmentally qualified equipment would be submerged using the corrected flood level.^{4,5} The Plant Nuclear Safety Committee reviewed and approved the JCO and continued reactor operation was authorized.

The licensee's 90-day response to IEB 79-01B stated that the CV flood level would be 3.2 feet above ground level Elevation 228 (Figure 1). This level was based on calculated water volumes and an actual measured water level, following a seal failure in May 1975 on one of the three Reactor Coolant pumps.⁶

During the 1975 seal failure event, an estimated 133,000 gallons of water had spilled from the pump into the CV. This resulted in a measured CV average water level of 12.5 inches above Elevation 228.

When the 90-day response to IEB 79-01B was being developed, an additional calculation was performed to establish the CV flood level to be used for the environmental qualification of installed equipment. This calculation used the 1975 calculation results as a basis and derived a CV flood level of 3.2 feet above Elevation 228; however, it overlooked the Containment sump water volume.

The realization on October 6 that the expected CV flood level would be approximately three feet higher occurred during an ongoing evaluation of the Plant Environmental Qualification Program by the licensee.⁷ Upon verification of the accuracy of the corrected level, an investigation was conducted to determine what environmentally qualified equipment would be submerged. Immediately following this determination, the impact of submergence on the equipment was evaluated.

- 1/ H. B. Robinson Steam Electric Plant, Unit No. 2, is a Westinghouse Pressurized Water Reactor nuclear power plant, in commercial operation since March 1971.
- 2/ IEB 79-01B, ENVIRONMENTAL QUALIFICATION OF CLASS 1E ELECTRICAL EQUIPMENT.
- 3/ The original flood level was calculated at CV Elevation 231.2 while the corrected level was at Elevation 234.09.
- 4/ Engineering Evaluation No. 88-132.
- 5/ JCO No. 88-010.
- 6/ Originally discussed in the H. B. Robinson Unit No. 2 Semi-Annual Operating Report No. 10 for the Period January 1, 1975 through June 30, 1975.
- 7/ Letter, E. E. Utley, CP&L, to J. Lieberman, NRC, Serial: NLS-88-188, dated September 1, 1988.

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Based on the evaluation, all equipment subject to submergence was determined to operate prior to becoming submerged, be qualified or qualifiable for submergence, or there was justification for continued operation despite the probable failure of the equipment following submergence.

II. CAUSE OF EVENT

The calculation error was due to an inadequate methodology for performing the original calculation in response to IEB 79-01B.⁸ Because of the 1975 seal failure event, it was assumed that the 12.5 inch level above Elevation 228 accounted for all water volume locations in the CV, including the 67,390 gallons contained in the CV sump. However, the licensee discovered on October 6, 1988 that the calculation had overlooked the CV sump volume when determining the maximum flood level rise. Instead of recognizing that the geometry of the CV above ground level equated to 62,986 gallons per foot of elevation, the calculation had assumed that, since 133,000 gallons equaled 12.5 inches, the maximum CV flood level would equal 3.2 feet, with a total of 451,000 gallons of water available for CV flooding.⁹

III. ANALYSIS OF EVENT

As discussed in Section I., all environmentally qualified equipment subject to immersion following a Loss of Coolant Accident (LOCA) has been evaluated and found to be either required to operate prior to becoming submerged or was qualified or qualifiable for submergence, or there is justification for continued operation despite the probable failure of the equipment following submergence.

The following subsections provide detailed discussions on the environmentally qualified equipment involved in this event and the basis for the JCO pending final corrective action..

1. Solenoid Valves

The solenoid valves are of ASCO manufacture and have not been evaluated for submergence. The Environmental Qualification Central File (EQCF) Generic File contains no test data to support qualification for submergence and conversation with the manufacturer has indicated that the solenoid valves cannot be qualified for immersion following a Loss of Coolant Accident (LOCA).

8/ Cause Code: D.

9/ 451,000 gallons of water are available for CV flooding from the following sources: Refueling Water Storage Tank, three Safety Injection Accumulators, the Containment Spray Additive Tank, and the Reactor Coolant System spilled volume. These values are described in Revision 3 of the licensee's 90-day response to IEB 79-01B, dated February 1, 1981.

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There are 11 environmentally qualified solenoid valves subject to the corrected CV flood level: one on each of the three Letdown Orifice Isolation Valves, CVC-200A, B, and C; three on each of two Containment Purge Valves, V12-7 and V12-9; and, two on the Containment Vacuum Breaker Valve, V12-13. The three Letdown Orifice Isolation Valves are required to close on receipt of a Phase A Containment Isolation signal and the other three valves are to close on receipt of a Containment Ventilation Isolation signal. When the solenoids receive the signal, the coils de-energize and the isolation valves close. Following valve closure, the solenoids have no active function. The valve closures would occur prior to the CV flood level reaching the solenoid valves. Therefore, the valves are qualified to perform their required safety function.

2. Containment Electrical Penetration Assembly, F01

CV Penetration No. F01 is the only penetration associated with environmentally qualified equipment affected by the corrected CV flood level. Review of EQCF Generic Files has indicated that no submergence testing has been conducted on the assembly. Discussions with the manufacturer have indicated that the wire insulation on the feedthroughs cannot be qualified for immersion following a LOCA due to long-term degradation caused by hydrolysis.

The capability of the penetration to maintain CV integrity will not be degraded by submergence since degradation of the wire insulation affects only the electrical insulating properties of the penetration. The components served by the penetration would be inoperable with a CV flood level at approximately three feet above ground level as discussed below:

- Reactor Vessel Level Indication System (RVLIS)

The RVLIS is currently non-operational and is scheduled to be in operable status prior to startup from the upcoming Refueling Outage No. 12. Resolution of the RVLIS operability concern is planned to be completed during the Outage.

- Neutron Flux Detector NE-51

The neutron flux detector system is not to be used for indicated reactor flux during or following a LOCA. Operators are to initiate emergency boration should the normal Nuclear Instrumentation System channels fail. The detector, NE-51, would not be affected by the corrected CV flood level.

- Channel I Core Exit Thermocouples

NRC Regulatory Guide 1.97 requires core exit temperature as a Category 1 variable. In the event of loss of the core exit temperature measurement system, backup variables have been provided, including T-hot and T-cold temperature elements on the three Reactor Coolant Loops.

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Plant Technical Specifications require one channel of the Subcooling Monitor to be operable. This is accomplished by the Channel II Core Exit Thermocouples which are not associated with Penetration F01. On loss of the Channel I Core exit temperature indication, sufficient information would be available to the Operator for monitoring an accident using the Channel II thermocouples and the Reactor Coolant System temperature instrumentation.

3. Neutron Flux Detectors

The manufacturer has issued a 10CFR21 notification for the Gamma-Metrics neutron flux detectors. The notification identified the potential for moisture intrusion at certain soldered and threaded connections at the tops of the detector housings (above the corrected CV flood level).

4. Containment Level Transmitters

The level transmitters have been environmentally qualified for submergence.

5. Limit Switches

The limit switches are NAMCO, EA180 Series, and are used to provide Containment isolation valve indication (closed/not closed) for CVC-200A, B, and C, for V12-7, and for V12-13. The lowest switch elevation is approximately four feet above ground level.

The Plant Master Equipment List for Regulatory Guide 1.97 components categorizes the limit switches as B.1. A Safety Injection signal would initiate the Containment isolation valves to close and then position verification would be performed by Control Room indications in accordance with Plant emergency procedures before the switches would become submerged. The valves are not required to reopen following initial isolation. The switches will be qualified for submergence.

6. Transmitters

The transmitters are of Rosemount manufacture and had not been evaluated for submergence. Recent discussions with the manufacturer, however, have indicated that environmental qualification for submergence has been successfully documented. The manufacturer tested identical Series transmitters submerged in three feet of water at 130 degrees Fahrenheit for two weeks following LOCA testing. The transmitters remained functional and within required tolerance throughout.

Qualification of the transmitters, according to the manufacturer, depends on the installation of environmentally qualified electrical conductor seal assemblies. The transmitters inside the CV have been installed with these seal assemblies.

7. Conduit Seals

The conduit seals are of Patel manufacture. The seals are multi-cable mechanical interfaces that are used to seal existing conduit and field lead cables with a proprietary grommet. The seals serve no electrical function.

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The seals have been subjected to pressure boundary testing after being aged to an equivalent of 40 years and irradiated at 2-E8 rads gamma, then exposed to simulated LOCA conditions. The seals were then tested with an air pressure of 100 psig for one minute and found free of any leakage from the high to low pressure sides of the grommet.¹⁰

8. Electrical Cable

The following cable has been identified as being located below the corrected CV flood level:

- Kerite HT/FR, FR2, and FR3
- Brand Rex Ultrol
- Continental CC2115
- Anaconda Instrumentation Cable
- Rockbestos Firewall III
- Raychem Special Coax
- Samuel Moore 1X52-68340-001
- Eaton Dekoron

Review of the EQCF Generic Files has indicated that these cables have successfully completed LOCA testing and post-LOCA voltage withstand testing, involving soaking the cable in water for one hour, then applying a voltage of 80 volts per mil of insulation thickness.

The acceptance criteria for the cable voltage withstand testing required that the cable insulation withstand the applied voltage stress for at least five minutes without breaking down.¹¹

9. Cable Splices

The cable splices are of Raychem manufacture. These splice sleeves are located on all cable splices for environmentally qualified equipment inside Containment both above and below the corrected CV flood level.

Cable splices were evaluated for qualification using the same criteria as for electrical cable. Submergence qualification has been demonstrated by successful completion of post-LOCA voltage withstand testing (above).

Review of the Generic File has indicated that the splice specimens have passed a post-LOCA voltage withstand test at 3600 VAC.

^{10/} The 100 psig is considered to be in excess of the head pressure which would be created by submergence.

^{11/} The test voltage of a 600 volt rated cable is typically 2400 VAC.

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In addition to the evaluations of environmentally qualified equipment discussed above, three components were evaluated for possible adverse impact due to the chemically treated water and head pressure associated with submergence: the CV Personnel Airlock and Equipment Hatch and the V12-13 valve. It was concluded that the pressure increase due to water head would have no effect since the component catalogue ratings exceed CV accident pressures plus water head. It was also concluded that gasket and seal materials which would come in contact with CV water would not be affected since the materials are resistant to the design concentrations of 0.8 percent sodium hydroxide.

IV. CORRECTIVE ACTION

The following actions are planned. Items 1 through 4 are scheduled for completion prior to Plant restart following Refueling Outage No. 12. Item 5 is scheduled for March 1989.

1. Revise the EQCF Generic Files to indicate environmental qualification during submergence where applicable.
2. Schedule and implement a Plant Modification to either move, replace, or modify CV Penetration F01.
3. Resolve the RVLIS operability concern.
4. Resolve the neutron flux detector operability issues related to submergence of the F01 penetration.
5. Demonstrate qualification of the NAMCO switches under submergence.

V. ADDITIONAL INFORMATION

A. Failed Component Identification

None.

B. Previous Similar Events

There have been prior LERs on the environmental qualification of Plant equipment, however, none have concerned CV flood level.

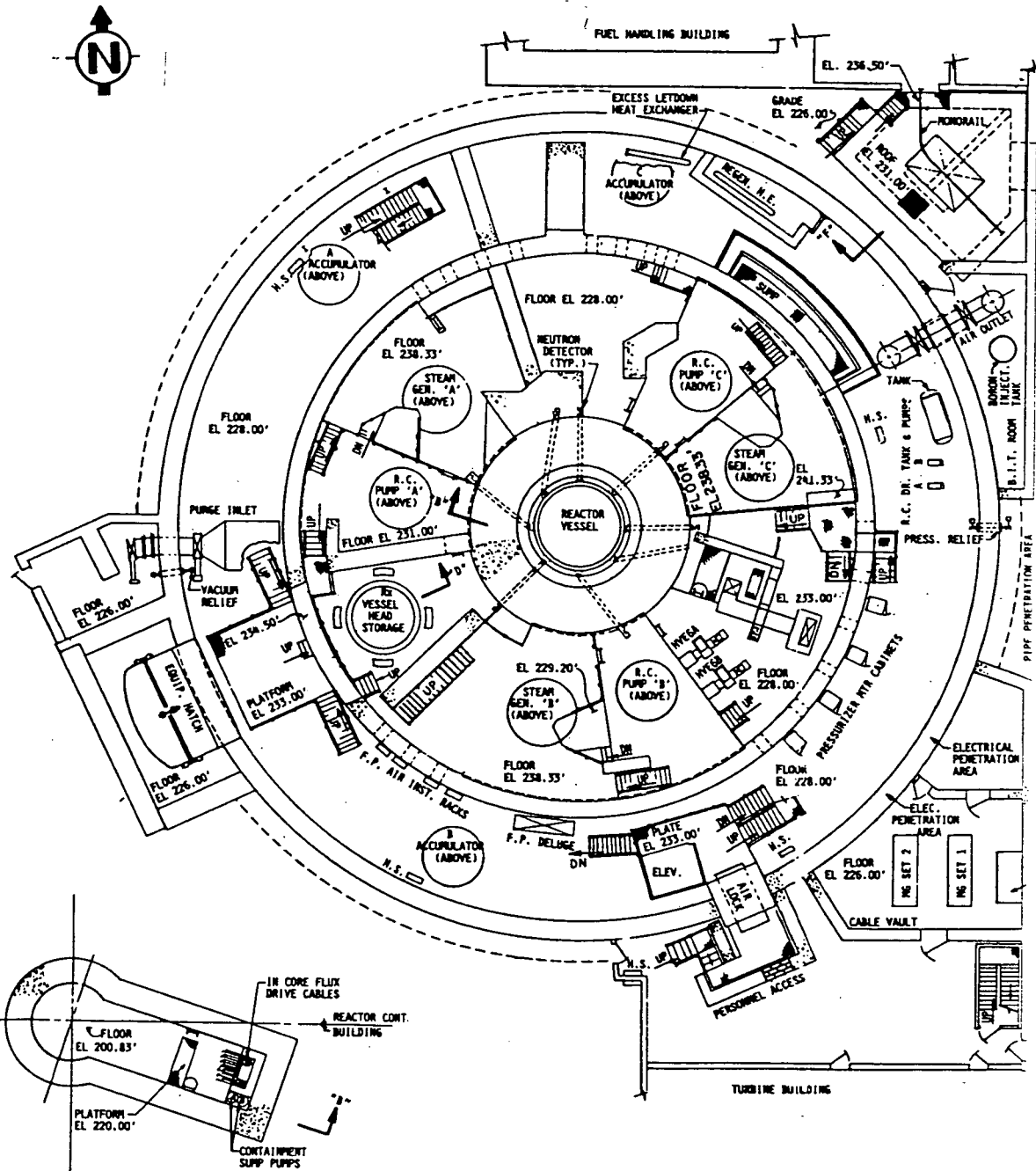
C. Figures

- Figure 1 - CV Ground Level, Floor Elevation 228.
- Figure 2 - CV Mezzanine Level, Floor Elevation 251.
- Figure 3 - CV Operating Level, Floor Elevation 275.

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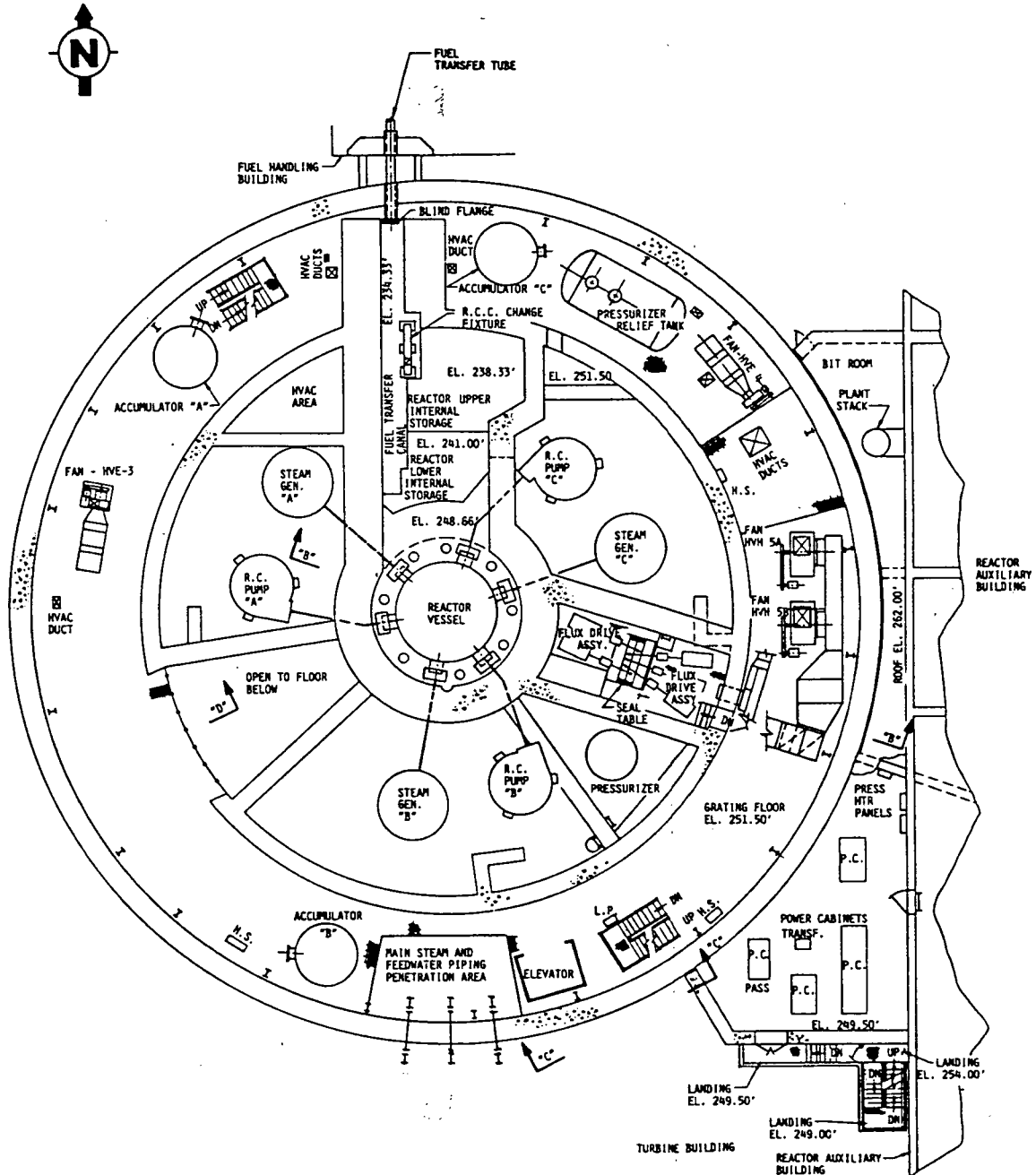
PARTIAL PLAN
AREA BELOW REACTOR VESSEL

CV - GROUND LEVEL
FLOOR ELEVATION 228

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FACILITY NAME (1) H.B. ROBINSON, S.E. PLANT, UNIT NO. 2	DOCKET NUMBER (2) 050002161	LER NUMBER (8)			PAGE (3)	
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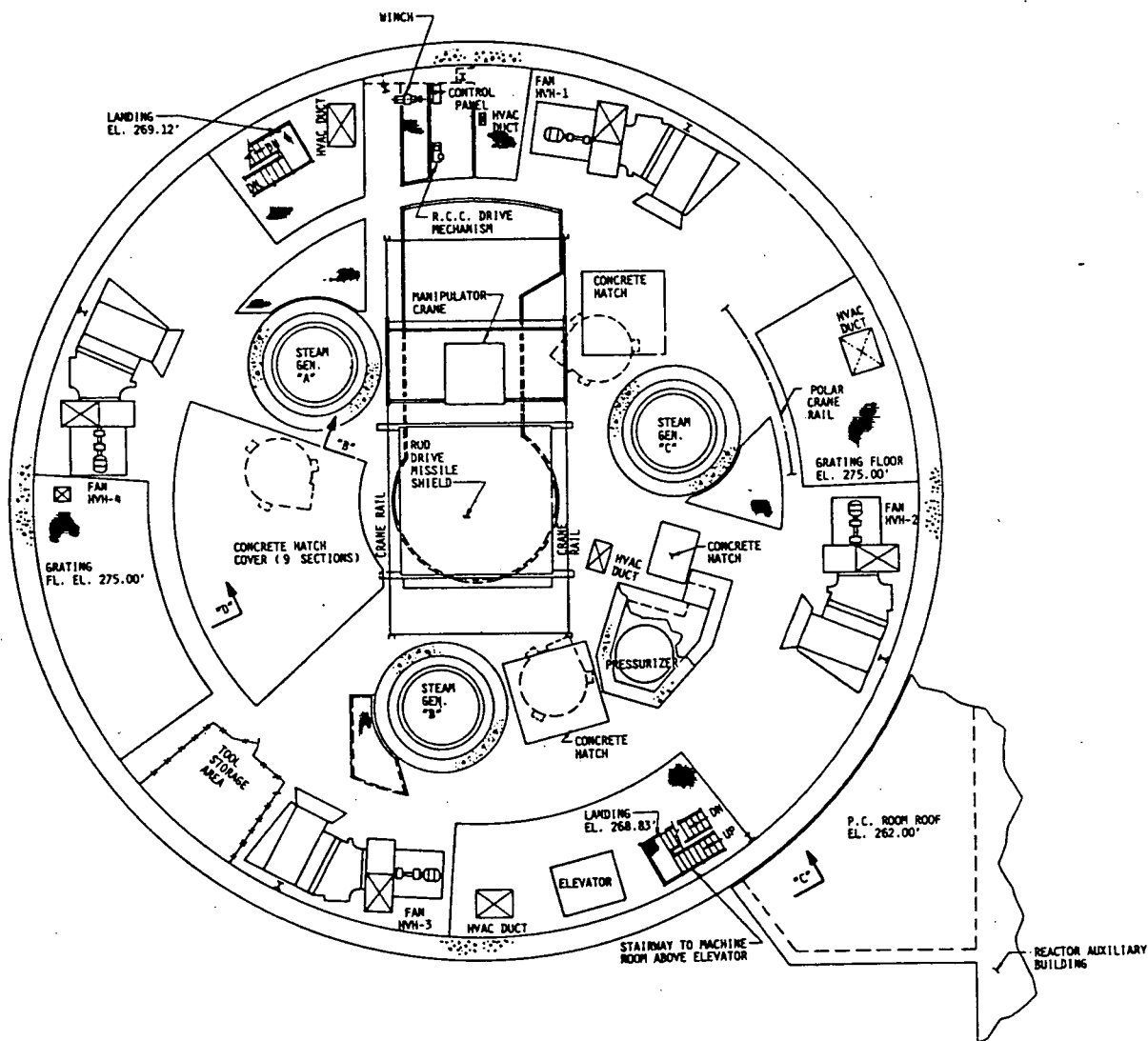


CV - MEZZANINE LEVEL
FLOOR ELEVATION 251

LICENSEE EVENT REPORT (LER) TEXT CONTINUATION

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CV - OPERATING LEVEL
FLOOR ELEVATION 275



Carolina Power & Light Company

ROBINSON NUCLEAR PROJECT DEPARTMENT
POST OFFICE BOX 790
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NOV 4 1988

Robinson File No: 13510C

Serial: RNP/88-5202
(10 CFR 50.73)

United States Nuclear Regulatory Commission
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H. B. ROBINSON STEAM ELECTRIC PLANT, UNIT NO. 2
DOCKET NO. 50-261
LICENSE NO. DPR-23
LICENSEE EVENT REPORT 88-022-00

Gentlemen:

The enclosed Licensee Event Report (LER) is submitted in accordance with 10 CFR 50.73 and NUREG-1022 including Supplements No. 1 and 2.

Please be advised that two previous LERs, 88-004-00 and 88-016-00, were submitted as security event LERs, 88-S01-00 and 88-S02-00.

Very truly yours,

R. E. Morgan
General Manager
H. B. Robinson S. E. Plant

DAS:jch

Enclosure

cc: Dr. J. N. Grace
Mr. L. W. Garner
INPO

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