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SACRAMENTO MUNICIPAL UTILITY DISTRICT ☐ 6201 S Street, Box 15830, Sacramento, California 95813; (916) 452-3211

January 6, 1981

Mr. R. H. Engelken, Director
Region V Office of Inspection & Enforcement
U. S. Nuclear Regulatory Commission
1990 North California Boulevard
Walnut Creek Plaza, Suite 202
Walnut Creek, CA 94596

RECEIVED
JAN 19 1981
U.S. NUCLEAR REGULATORY COMMISSION

Re: Operating License DPR-54
Docket No. 50-312
IE Bulletin 80-24

Dear Mr. Engelken:

In response to your letter of November 21, 1980, which transmitted the subject IE Bulletin, the Sacramento Municipal Utility District is hereby submitting the required response.

IE Bulletin 80-24 "Prevention of Damage Due to Water Leakage Inside Containment", request for action 4 required a written report. Please find attached two documents which are the result of the investigations. The reports should complete the necessary actions requested in the Bulletin. If you desire any further information concerning this item, please contact Mr. R. Colombo on my Rancho Seco Operating Staff.

Respectfully submitted,

J.J. Mattimoe

J. J. Mattimoe
Assistant General Manager
and Chief Engineer

Attachments (2)

JJM:RWC:rm

Sworn to and subscribed before me

this 6th day of January, 1981.

Patricia K. Geisler
Notary Public

OFFICIAL SEAL
PATRICIA K. GEISLER
NOTARY PUBLIC CALIFORNIA
PRINCIPAL OFFICE IN
SACRAMENTO COUNTY
My Commission Expires November 22, 1983

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A HISTORY OF LEAKAGE FROM SYSTEMS
INSIDE CONTAINMENT AT RANCHO SECO

This report, prepared in response to the November 21, 1980 IEB 80-24 request from the NRC, is the summary of a study of leakage rates from systems inside the reactor containment building. Included is a description of the normal drainage route from the reactor building, an outline of the method used to compile a history of leakage, determination of a distinction between normal and abnormal leak rates, review of history, and conclusions.

Normal Drainage Route from the Reactor Containment Building

Some of the liquid handling systems inside the Reactor Containment Building are the Reactor Coolant System, Nuclear Service Cooling Water System, Component Cooling Water System, Main Feedwater System, Auxiliary Feedwater System, Decay Heat System, and the Miscellaneous System. These are all closed systems as indicated in Appendix I, Table 1. Liquids which are spilled or leaked from these systems inside containment are routed to the Reactor Building Normal Sump B via various equipment drains, the Instrumentation Trench, and Reactor Building Normal Sump A. All liquid collected in Normal Sump B is drained from the Reactor Building through a 4" diameter line and accumulated in the Reactor Building Drain Accumulation Tank (RBDAT). When 120 gallons have accumulated in the RBDAT, the tank is automatically dumped to the East Decay Heat Removal Pump Room Sump in the Auxiliary Building. Sump pumps then pump the liquid to the Miscellaneous Waste Tank for processing through the Miscellaneous Waste System. This is the only route for the removal of excess liquids from the Reactor Building during normal operation. Each time the RBDAT is dumped, the event is recorded in the Control Room Log.

Method of History Compilation

In order to compile a history of leakage from systems inside containment, all Control Room Log Books for the period beginning January 1, 1975 and ending November 30, 1980 were reviewed. Log entries indicating RBDAT dumps were tallied on a daily basis and recorded on the RBDAT Daily Dump Frequency Charts (Appendix II). The assumption that leakage from systems inside containment is approximately equal to drainage into the RBDAT was made. This is justified by the fact that large accumulations of liquid have not been found in the Reactor Building during previous inspections. Based on this assumption, the RBDAT Dump Frequency Charts comprise a history of leakage from systems inside containment. Although a determination of exact leak rates was not possible utilizing this information, the frequency charts did enable a distinction between normal and abnormal leakage and the identification of abnormal leakage periods. Surveillance and Maintenance records were then utilized in an attempt to identify the source of the abnormal leakage.

Determination of Normal and Abnormal Dump Frequencies

The distinction between normal and abnormal dump frequencies, and therefore, normal and abnormal leakage rates, was made by statistical analysis:

Mean:

$$\bar{c} = \frac{\Sigma N_D}{n}$$

Where $\bar{c}$ represents the mean of dump frequencies

N_D is the daily dump frequency

n is the number of days considered

$$\bar{c} = \frac{638 + 4531 + 761 + 662 + 140}{3(365) + 366 + 335} = 3.75 \text{ dumps/day}$$

Standard Deviation:

$$\sigma = \sqrt{\bar{c}} = 1.94 \text{ dumps/day}$$

Upper Control Limit:

$$UCL = \bar{c} + 3\sigma = 3.75 + 3(1.94) = 9.57 \text{ say 9 dumps/day}$$

For the purposes of this report, the Upper Control Limit was considered the limit for distinguishing between normal and abnormal daily dump frequencies. A frequency of 9 dumps per day corresponds to a daily average flow of 0.75 GPM into the RBDAT. A reduction of this value by 0.5 GPM, the maximum value allowed for evaporation from the Reactor Coolant System by SP 207.08, establishes a normal leak rate of 0.25 GPM.

Note that data from years prior to 1976 was considered questionable because Log Book entries were not consistent. For this reason, pre-1976 data was not utilized in the determination of the Upper Control Limit.

Review of History

As mentioned above, 9 or fewer dumps per day were considered normal in reviewing the RBDAT Dump Frequency Charts. Dump frequencies greater than 9 dumps per day were considered indicative of abnormal leakage. Periods of 3 or more consecutive days showing frequencies greater than 9 dumps per day were flagged for additional investigation. Surveillance and Equipment Maintenance History Records maintained during these periods were then examined in an attempt to identify sources of abnormal leakage. Information obtained from the examination is shown in Appendix I, Table 2.

As shown in Table 2, three periods of abnormality were found on the 1979 and 1980 Charts. Surveillance and Maintenance Records indicate that leakage sources were the RCS and OTSG-A during these periods.

Conclusions

The information obtained during this study indicates that leakage from the various systems inside the Reactor Containment Building, with the exception of the RCS and Steam Generator System, has not been significant. Using the maximum evaporation rate allowed by SP 207.08 to adjust calculated flows based on dump frequency, the spillage and leakage rate from these systems has not exceeded a maximum daily average value of 0.25 GPM.

APPENDIX I

Table 1

System	System Reservoir[1]	Reservoir Volume (Gallons)	Reservoir to System Transfer Mode	Approximate Equivalent Reactor Building Level[2] (Ft.)
Reactor Coolant	RCS Make-Up Tank	3,000	Make-Up & High Pressure Injection Pumps	Insignificant
Nuclear Service Cooling Water	NSCW Surge Tank	2,000	System Head	Insignificant
Component Cooling Water	CCW Surge Tank	2,000	System Head	Insignificant
Main Feedwater	Condensate Storage Tank	450,000	Gravity	4.5
Auxiliary Feedwater	Condensate Storage Tank	450,000	Gravity	4.5
Decay Heat	Borated Water Storage Tank	450,000	Gravity	4.5
Miscellaneous	None	None	--	--

[1] All reservoirs are equipped with liquid level indicators and low level annunciators.

[2] This is a calculated level based upon a volume of the Reactor Containment Building equivalent to the appropriate reservoir volume.

APPENDIX I

TABLE 2

Periods and Sources of Abnormal Leakage

Year	Initial Date	Final Date	Source	Comments
1980	1-1	2-2	RCS-OTSG	Feedwater Riser Nozzle Flange leak repaired during shutdown beginning on 1-12-80. Average RCS unidentified leak rate based on RCS surveillance log 0.99 GPM.
1979	7-13	12-31	RCS-OTSG	Same as above.
	4-1	4-28	RCS	Average RCS unidentified leak rate based on RCS surveillance log 0.95 GPM.
	1-9	1-17	RCS-OTSG	Feedwater Riser Nozzle Flange leak. Average RCS unidentified leak rate 0.98 GPM.
1978	-	-		No abnormal leakage.
1977	-	-		No abnormal leakage.
1976	-	-		No abnormal leakage.
1975	-	-		Average unidentified RCS leak rate based on RCS surveillance log 0.422 GPM.

1980 RBOAT DUMP FREQUENCY

DAY →

MO ↓	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31
1	17	16	19	20	19	23	21	18	20	18	15	9	14	12	12	14	11	8	3	3	1	0	0	24	18	17	16	14	4	16	13
2	11	9	0	2	2	4	1	0	0	0	0	0	0	0	5	0	0	0	5	3	3	7	0	1	0	0	0	1	0		
3	0	0	0	0	0	0	0	0	0	3	1	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0
4	0	0	0	0	0	0	7	1	0	0	1	0	0	1	0	3	0	0	0	2	0	0	0	3	0	0	0	0	4	3	
5	2	3	2	0	2	1	0	1	0	0	0	1	1	0	0	1	0	0	0	1	1	0	0	0	1	2	0	1	1	0	1
6	1	0	0	1	0	2	0	0	2	1	0	0	1	0	0	2	0	0	0	2	0	0	0	0	1	1	1	2	1	1	
7	1	0	3	0	1	0	0	0	1	0	2	1	0	0	0	1	0	1	0	1	2	0	1	0	1	0	2	0	0	1	0
8	7	1	0	1	1	0	1	1	1	1	3	1	0	0	0	1	1	1	0	1	0	0	0	0	0	0	0	1	0	0	
9	0	0	0	0	0	1	1	0	1	1	0	2	0	1	0	1	2	0	2	0	2	0	0	0	0	2	2	0	1	0	
10	0	2	0	1	0	0	0	1	0	0	1	0	2	1	0	1	1	0	1	1	1	0	1	0	0	1	1	1	0	1	1
11	1	1	0	1	0	2	0	1	1	0	2	1	2	0	3	0	0	0	0	2	0	1	0	0	2	0	0	3	0	0	
12																															

APPENDIX II

APPENDIX II

1979 RBDAT DUMP FREQUENCY

MO ↓ / DAY →	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31
1	3	4	2	4	5	5	5	8	10	12	12	13	16	14	16	14	14	0	0	0	2	3	5	7	6	6	5	7	7	6	6
2	5	7	6	6	6	7	6	5	7	7	6	7	7	6	7	6	7	9	5	6	6	7	5	0	0	1	6	6			
3	7	7	7	7	7	7	6	7	6	6	7	7	7	9	10	8	8	8	7	10	10	6	8	8	6	6	7	10	8	6	9
4	11	10	9	12	10	8	10	8	10	9	9	9	10	11	10	12	9	10	10	12	10	13	10	11	10	11	10	11	2	1	
5	2	10	3	0	10	5	0	1	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	2	0	0	0	2	1
6	0	0	0	0	1	0	0	0	3	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	6	
7	6	1	0	0	4	6	6	9	11	9	9	8	13	16	12	15	17	12	18	12	16	14	16	14	15	16	16	11	15	17	17
8	18	19	18	20	20	20	19	22	19	20	21	21	19	21	19	20	22	22	21	19	14	11	19	20	23	24	24	22	24	24	28
9	24	26	23	25	25	26	26	26	28	26	28	23	25	26	27	28	25	26	31	31	32	28	31	34	32	33	38	26	35	36	
10	36	40	[illegible]	37	40	40	40	40	37	37	35	21	15	19	20	18	16	12	14	17	14	17	20	15	21	19	20	20	14	16	18
11	18	20	16	19	17	19	17	17	21	15	16	19	17	15	18	19	16	12	14	15	17	15	15	13	4	10	14	13	12	19	
12	18	16	18	12	20	15	15	11	13	19	20	15	14	16	13	16	14	15	18	19	18	15	17	18	17	18	16	16	18	19	18

APPENDIX II

1978 RBDAT DUMP FREQUENCY

MO ↓ / DAY →	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31
1	5	5	4	6	5	6	4	6	6	6	6	8	1	6	5	5	6	6	6	6	5	6	8	6	7	7	5	1	0	0	0
2	1	0	0	3	0	2	4	3	3	2	1	1	2	1	2	0	2	4	2	3	2	2	4	3	2	1	1	1			
3	1	1	1	1	1	0	1	1	0	1	1	1	1	1	3	2	2	2	1	2	0	1	1	1	1	2	1	1	1	1	
4	1	3	1	2	1	2	2	1	1	1	2	4	3	2	3	3	4	2	2	3	4	3	4	3	5	5	4	3	5	4	
5	2	4	6	4	1	0	5	6	7	6	9	6	8	7	3	6	7	8	6	2	3	8	7	8	8	7	6	7	8	7	8
6	8	7	[illegible]	7	[illegible]	8	[illegible]	9	9	8	10	8	1	7	6	9	3	2	2	2	0	0	0	0	0	0	0	0	1		
7	0	0	0	2	0	0	0	1	0	0	1	2	1	2	1	2	1	2	2	2	1	1	0	0	1	0	1	3	1	1	1
8	2	2	1	2	0	2	1	2	1	1	2	1	1	1	1	2	1	1	1	1	1	2	0	1	1	1	1	1	0	1	2
9	0	1	2	0	2	1	2	0	0	1	0	0	1	0	1	0	1	0	0	1	1	0	1	0	1	1	1	0	1	1	
10	1	1	1	1	1	0	1	1	1	1	0	1	1	0	1	0	0	0	0	1	0	0	0	0	1	1	0	0	1	0	0
11	0	0	0	0	1	0	0	0	0	1	0	0	1	0	3	0	1	0	0	0	1	0	0	0	0	0	1	0	1	0	
12	0	0	0	1	2	1	1	0	1	0	0	1		0	1	0	0	0	0	1	0	0	1	1	1	3					

1977 RBDAT DUMP FREQUENCY

DAY →
MO ↓

MO	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31
1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	1	2	2	2	1	2	2
2	1	2	2	2	2	2	2	2	2	0	0	0	3	3	3	1	2	4	2	3	3	2	2	3	2	0	2	2			
3	3	3	2	3	2	5	5	6	8	6	4	2	1	0	0	0	0	3	6	4	4	1	2	1	2	1	0	1	2	0	0
4	1	0	1	0	1	1	0	0	1	0	1	0	1	0	1	0	1	0	0	1	0	1	0	0	0	1	1	1	3	5	
5	[illegible]	2	4	1	2	4	1	2	3	2	2	3	2	2	1	3	3	1	1	1	2	1	2	2	3	1	3	3	3	3	2
6	3	3	3	3	3	2	2	4	2	1	3	1	1	1	0	4	3	3	3	1	2	2	2	2	3	5	4	3	3	2	
7	2	3	1	2	3	3	2	3	1	1	2	2	2	3	1	3	3	5	3	6	2	4	3	6	3	2	6	4	6	4	3
8	4	5	6	5	4	3	4	5	4	4	6	2	0	2	4	2	3	1	2	2	0	2	0	0	0	0	0	0	0	2	9
9	1	2	0	0	0	0	0	0	1	1	0	1	0	1	0	0	0	0	1	0	0	0	0	0	0	0	1	3	0	0	
10	0	0	0	0	0	0	0	0	1	0	0	2	9	2	0	1	1	1	2	0	1	0	0	0	0	0	0	0	1	0	0
11	2	1	2	1	1	1	0	2	1	2	1	1	1	1	1	8	15	0	1	1	1	0	1	1	2	1	1	2	1	2	
12	1	1	2	3	1	2	2	1	2	1	1	1	3	2	2	1	2	4	5	3	5	5	4	5	4	5	5	5	1	5	5

APPENDIX II

APPENDIX II

1976 RBDAT DUMP FREQUENCY

DAY →

MO ↓	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31
1	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
2	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0		
3	0	0	1	0	0	1	0	1	1	1	1	1	2	1	1	1	1	0	0	0	0	1	0	2	1	2	1	2	1	0	1
4	2	3	1	1	13	3	0	1	5	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
5	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0
6	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
7	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	1	0	0	0	1	0	0	0	0	0	0	0	0	0	1
8	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
9	0	0	0	0	0	0	0	4	0	0	0	0	0	0	0	4	0	0	0	0	0	0	0	2	0	0	0	0	0	0	
10	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	1	1	2	2	1	1	0	0	0	1	1	2
11	1	0	0	0	0	0	12	2	3	7	13	2	0	0	0	0	0	0	0	1	0	1	0	1	1	0	0	0	1	0	
12	0	0	1	1	2	2	1	1	0	0	0	0	0	1	0	1	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0

APPENDIX II

1975 RBDAT DUMP FREQUENCY

DAY →

MO ↓

MO	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31
1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	4	4	2	1	0	0	0	0
2	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0			
3	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
4	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
5	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
6	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
7	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
8	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
9	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
10	0	0	0	0	0	0	0	2	0	0	0	0	0	1	0	0	0	2	1	1	1	0	0	0	0	1	0	0	1	1	0
11	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	1	0	1	1	0	0	0	
12	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0

ENTRY ON 6-12-75 IDENTIFIES RCS LEAKAGE @ 2.1 GPM; 0.4 GPM FROM UNIDENTIFIED SOURCES.

CONTAINMENT FLOOD DETECTION INVESTIGATION

Objective

Determine how an accumulation of liquid in the containment structure would be detected, the level of first detection, and the extent of liquid contact with the reactor vessel before detection.

Hypothesis

Assume the normal sump B drain line (66380-4-HD) is plugged and normal drainage from the reactor building via this route is completely impeded. Drainage from miscellaneous sources is allowed to accumulate in the containment structure.

Summary of Findings

Liquid level detection devices are not installed in normal sumps A and B, the fuel transfer canal, the instrumentation trench, the emergency sump, and various reactor building equipment drains.

Elevations:

Top of emergency sump retainer curb (-) 24.5 ft. ref: C-273
Top of incore tube support (-) 25.1 ft. ref: C-399
Bottom of lower reactor vessel head (-) 17.0 ft. ref: N3.01, C-274

Two liquid level detection devices (LSH 26112A and LSH 26112B) are installed in the general floor area of the containment building: one is located in the NW building quadrant, the other is in the SE quadrant. These devices are actuated at five levels between elevations (-) 23.75 and (-) 18.75 ft.

Liquid level detection devices are not installed in the Emergency Sump.

A television monitor is available for a remote visual inspection of Normal Sump B and the immediate area.

Conclusions

An undetected accumulation of water in the containment building, caused by a plugged reactor building accumulator tank line is possible. Should this situation occur, liquid level in the containment structure would increase, undetected, until the surface of the liquid attained an elevation of (-) 23.75 ft. At this level, normal sumps A and B, the emergency sump, and the general floor areas at elevation (-) 26.5 ft. would be flooded. The surface at this level would also exceed the elevation at the top of the lowest incore tube support by about 1.4 ft. The incore tubes would then be partially submersed in liquid.

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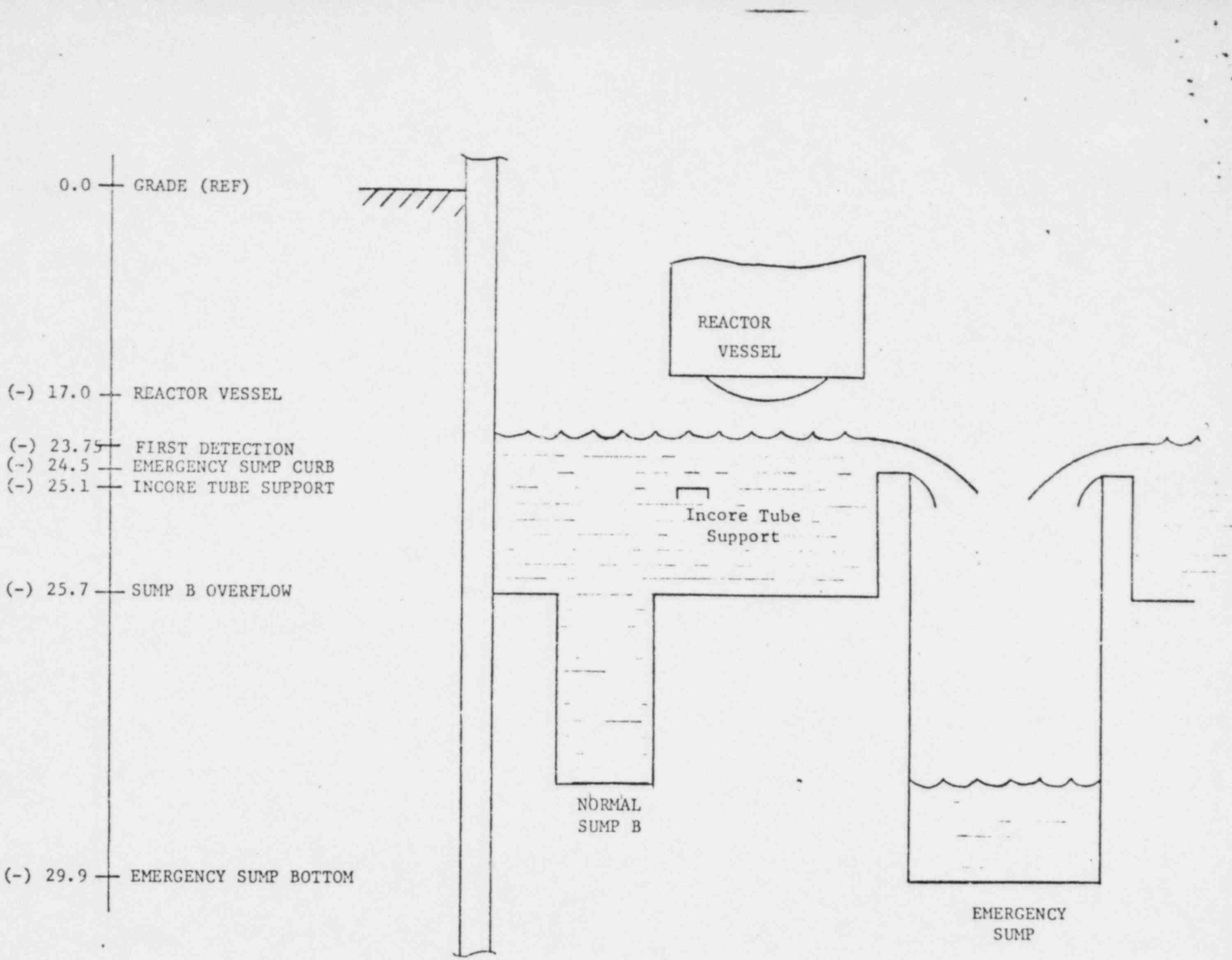
A television monitor is available for a remote visual inspection of Normal Sump B and the immediate area.

Conclusions

An undetected accumulation of water in the containment building, caused by a plugged reactor building accumulator tank line is possible. Should this situation occur, liquid level in the containment structure would increase, undetected, until the surface of the liquid attained an elevation of (-) 23.75 ft. At this level, normal sumps A and B, the emergency sump, and the general floor areas at elevation (-) 26.5 ft. would be flooded. The surface at this level would also exceed the elevation at the top of the lowest incore tube support by about 1.4 ft. The incore tubes would then be partially submersed in liquid.

The elevation at the lowest point on the lower reactor vessel head is (-) 17.0 ft., well above the maximum undetected liquid level attainable. Therefore, the lower reactor vessel head will not be subjected to contact with an undetected accumulation of liquid unless there is a malfunction of the existing liquid level detection system.

The present liquid level detection system provides adequate detection protection.


0.0 GRADE (REF)
(-) 17.0 REACTOR VESSEL
(-) 23.75 FIRST DETECTION
(-) 24.5 EMERGENCY SUMP CURB
(-) 25.1 INCORE TUBE SUPPORT
(-) 25.7 SUMP B OVERFLOW
(-) 29.9 EMERGENCY SUMP BOTTOM
REACTOR
VESSEL
Incore Tube
Support
NORMAL
SUMP B
EMERGENCY
SUMP