UNITED STATES
NUCLEAR REGULATORY COMMISSION
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ERRATA SHEET

for

NUREG/CR-2403

SURVEY OF INSULATION USED IN NUCLEAR POWER PLANTS
AND THE POTENTIAL FOR DEBRIS GENERATION

Prepared by

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for the

U. S. Nuclear Regulatory Commission

Please replace pages 5, F-6, I-4, I-7, I-8, and L-10 with the attached revised pages. The Legal Notice is new and should be placed on the back of the title page.

DIVISION OF TECHNICAL INFORMATION

AND

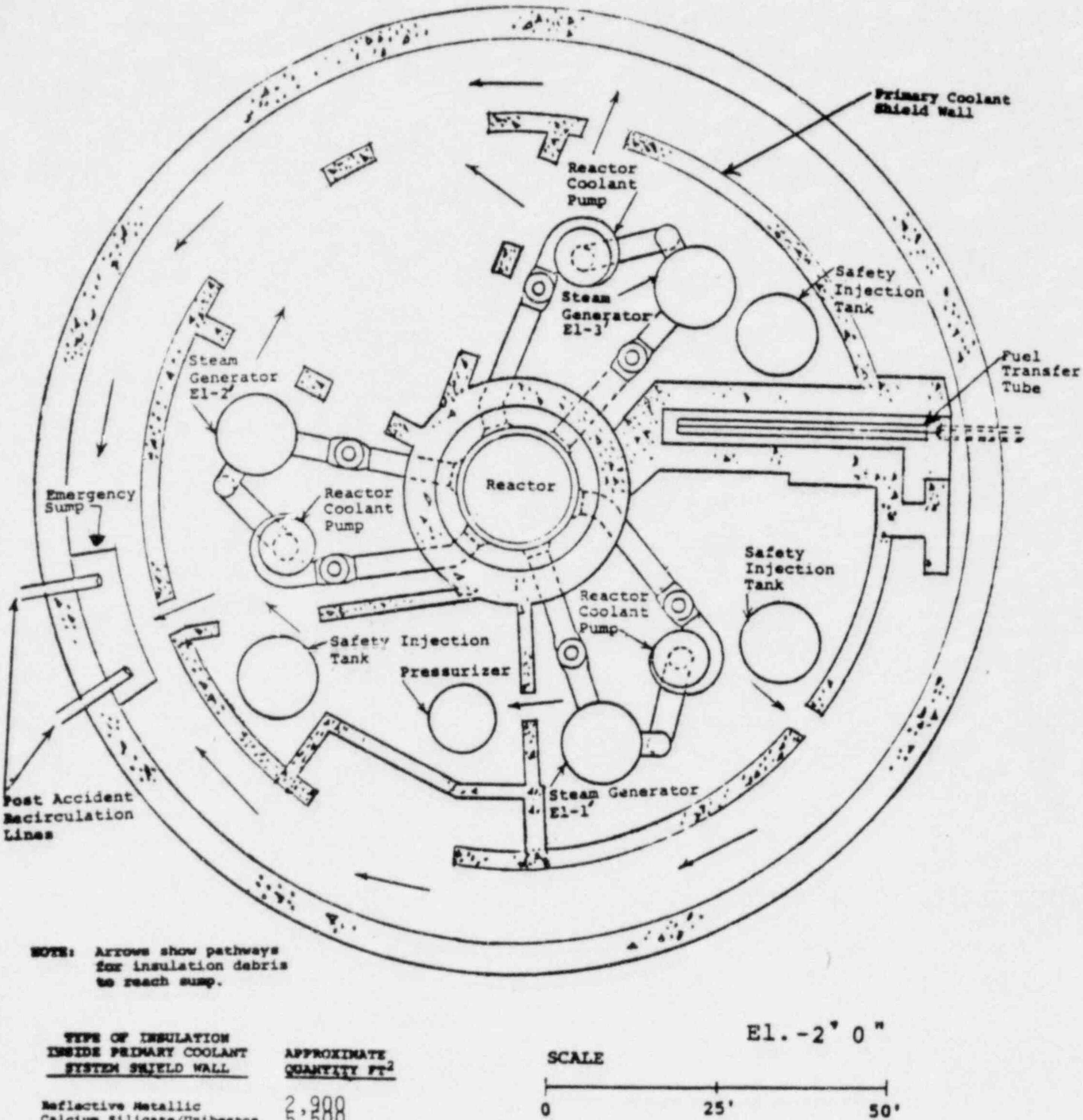
DOCUMENT CONTROL

Table 3-1. Types and percentages of insulation used within the primary coolant system shield wall in plants surveyed

Plant	Types of Insulation and Percentage*					
	Reflective Metallic	Totally Encapsulated	Mineral Fiber/Wool Blanket	Calcium Silicate Block	Unibestos Block	Fiberglass
Crystal River Unit 3	94	5	1	-	-	-
Oconee Unit 3	98	-	-	-	-	2
Midland Unit 2	78	-	-	-	-	22
Maine Yankee	19	-	48	24	12	1
Arkansas Unit 2	46	53	-	-	-	1
Waterford Unit 3	15	85	-	-	-	-
Salem Unit 1	34	-	66**	-	-	-
Sequoyah Unit 2	100	-	-	-	-	-
McGuire Units 1&2	100	-	-	-	-	-
Cooper	30	70	-	-	-	-
WPPSS Unit 2	100	-	-	-	-	-

* Tolerance is ± 20 percent

** Both totally and semi-encapsulated Cerablanket is used, however, inside containment only totally encapsulated is employed.



NOTE: Arrows show pathways for insulation debris to reach sump.

TYPE OF INSULATION INSIDE PRIMARY COOLANT SYSTEM SHIELD WALL	APPROXIMATE QUANTITY FT^2
Reflective Metallic	2,900
Calcium Silicate/Unibestos	5,500
Mineral Wool	6,700
Fiberglass	100

Figure F-2. Reactor containment, Maine Yankee

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Reflective metallic insulation is used for the reactor vessel, reactor coolant pump, pressurizer, and bottom area of the steam generators to one foot above the tube sheet. The upper part of the steam generator uses semi-encapsulated cerablanket with stainless steel lagging. For systems connected to the primary coolant system, metallic reflective insulation is used out to the first isolation valve. After the first isolation valve, totally encapsulated Cerablanket (Johns-Manville product) is used for the safety injection, main steam, feedwater, residual heat removal, and chemical volume and control piping. Service water and component cooling-water piping inside containment is insulated with antisweat insulation. Information on the type of antisweat insulation used was not provided to Burns and Roe.

D. TYPICAL INSULATION DETAILS

The reflective metallic insulation used for primary coolant system equipment and piping was manufactured by Johns-Manville. It is similar in construction to the reflective insulation manufactured by Mirror and Transco.

E. PIPE BREAK LOCATIONS

Refer to the FSAR[1] for a list of the pipe break locations for high-energy piping inside the primary containment.

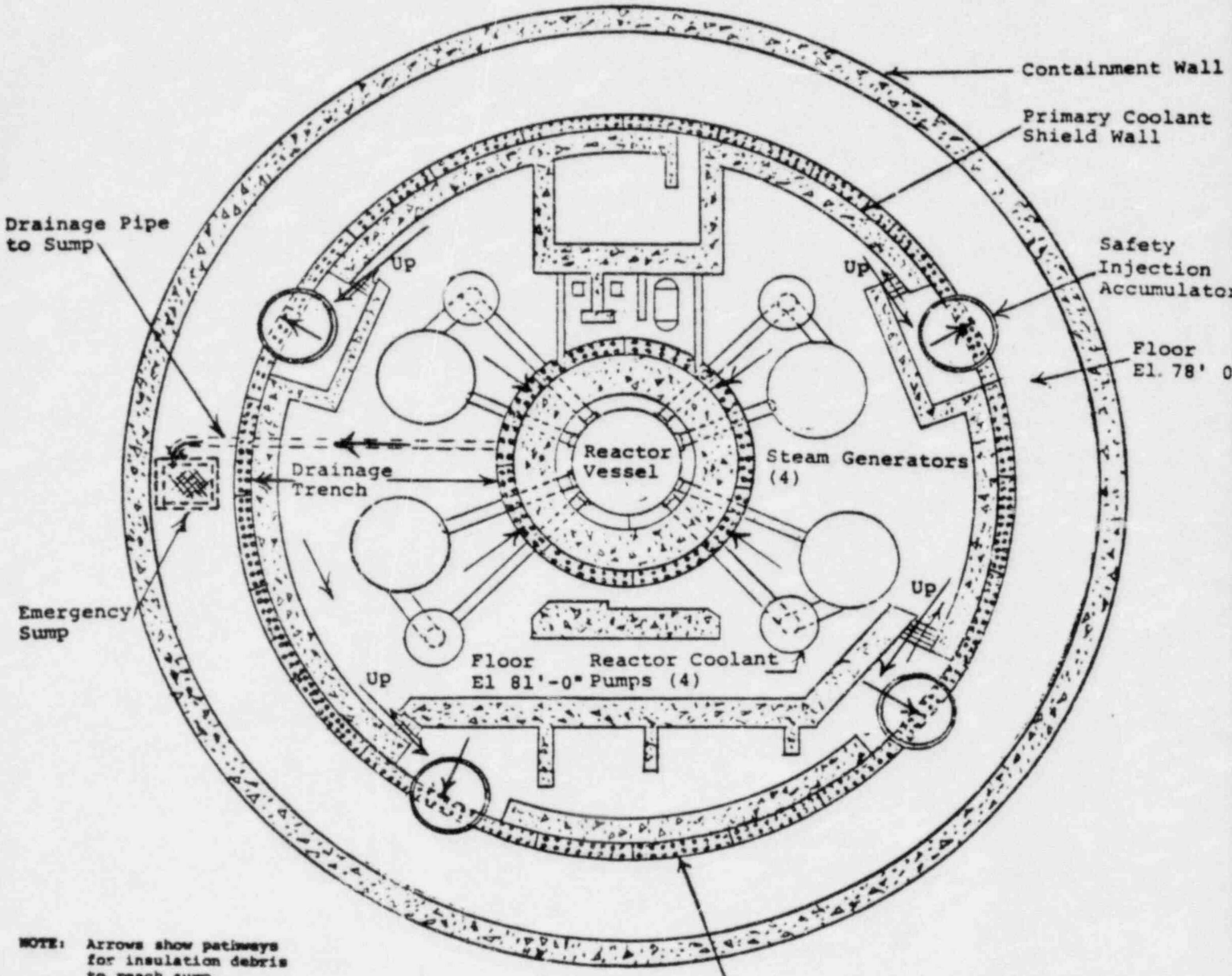
F. FSAR REFERENCES ON PERTINENT INSULATION QUESTIONS

None were submitted by PSE&G.

G. PRELIMINARY INSULATION DEBRIS HAZARD ANALYSIS

Figures I-1 and I-2 are simplified sketches of the Salem Unit 1 containment. The reactor vessel, lower part of the steam generators, pressurizer, reactor coolant pumps, and primary coolant piping are all located inside the shield wall. The accumulators, letdown heat exchanger, and regenerative heat exchangers are located outside the primary coolant shield wall. The emergency sump is located outside the shield wall below the basement floor with the bottom at elevation 70'-0" as shown in Figure I-3. Figure I-3 shows the details of the emergency sump. Figures I-1 and I-2 show the drainage trenches in the containment building. There are two trenches that are located in an inscribed circle around the building; one trench located inside the primary coolant shield wall and another trench located outside the primary coolant shield wall. Water drains into the trench through perforated pans with 3/16" diameter holes staggered on 5/16" centers. The outer trench drains into the sump through a 16" diameter pipe. The inner trench drains into the outer trench through a 12" diameter pipe. Both trenches are sloped toward the sump. Water also enters the sump directly from the annular space between primary coolant shield and containment walls through sets of cages and screens at the top of the sump pit as shown in Figure I-3. The RHR recirculation piping is protected from debris by the 3/16" diameter holes in perforated trench pans.

For a pipe break event near the upper portion of the steam generators, the floor at elevation 130' will catch the insulation debris. For a pipe



NOTE: Arrows show pathways for insulation debris to reach sump.

TYPE OF INSULATION INSIDE PRIMARY COOLANT SYSTEM SHIELD WALL	APPROXIMATE QUANTITY FT²
Reflective Metallic	6,700
Encapsulated Cerablanket	13,200

Figure I-2. Reactor containment arrangement plan view, Salem Unit 1

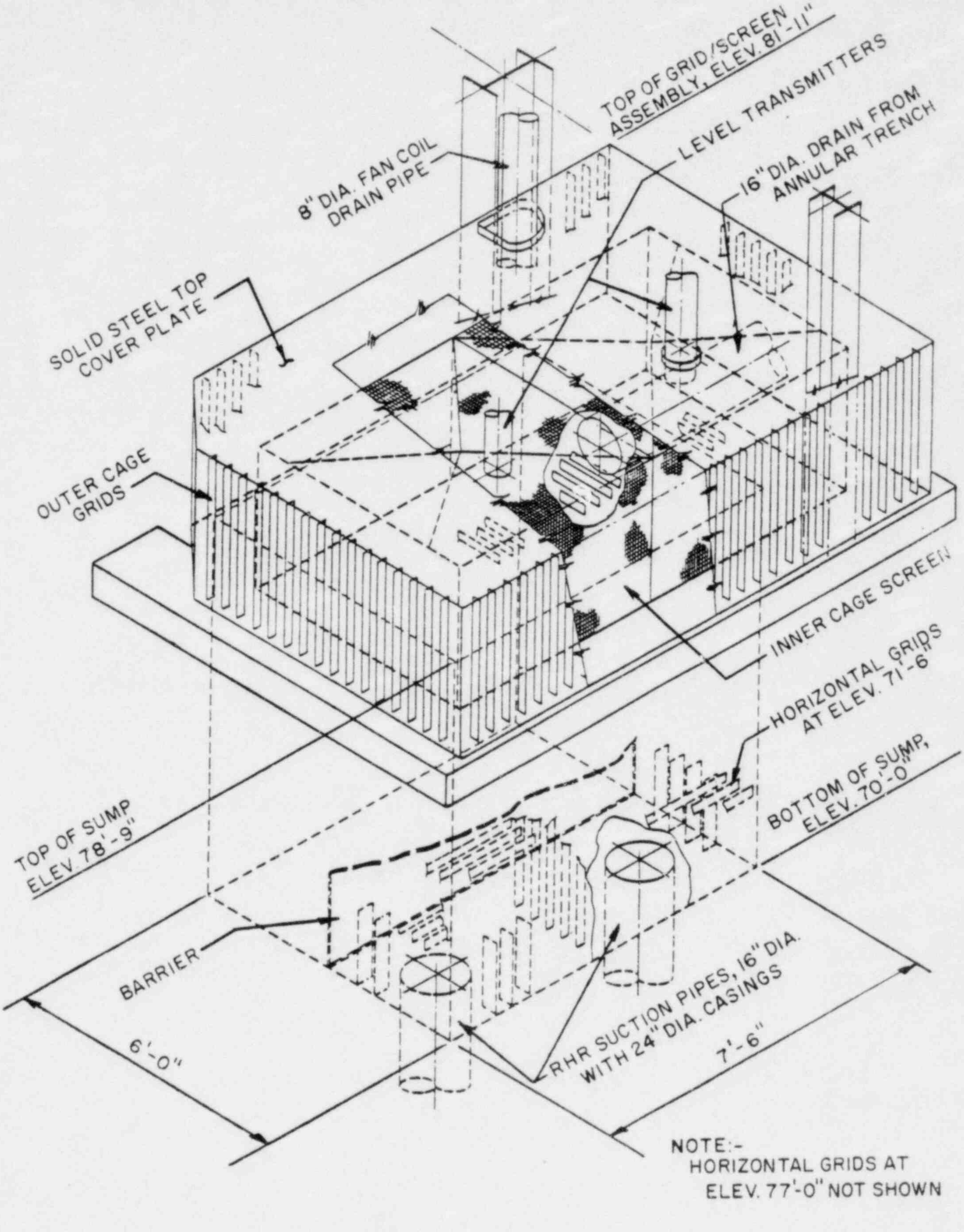


Figure I-3 Emergency Sump Detail, Salem Unit 1

If some insulation works its way into the vent pipe, it would still face a tortuous path to the torus. Each of the eight 5 foot 11 inch vent pipes terminates in a 4 foot 2 inch ring header located 26 feet from the drywell. Insulation debris must negotiate a 90° turn upon reaching the ring header after sliding along a shallow angle in the vent pipe (Figure L-5). Downcomers off the ring headers limit the insulation size still further (21 inch pipe) as seen in Figure L-9. A "lip" exists where the downcomers connect to the ring header, further adding to the difficulty for debris to enter a downcomer.

The geometry of the downcomer and the pump suction lines is shown in Figure L-8. The various suction line intakes of the emergency core-cooling system pumps have screens which have twice the flow area needed to allow for blockage of 50 percent of the screen area (see Figure L-10). The location of each intake screen in a different area of the wetwell along with its excess screening capacity makes it unlikely that more than one core cooling pump suction would be impacted by a postulated pipe break. Even then, it is doubtful that the debris would be in sufficient quantity to block the flow area required for safe operation of the pump involved.

H. REFERENCES

1. Cooper Station, Final Safety Analysis Report, Nebraska Public Power District, Columbus, Nebraska.

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