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Trojan Nuclear Plant  
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October 27, 1989  
CPV-282-89

U.S. Nuclear Regulatory Commission  
Document Control Desk  
Washington DC 20555

Gentlemen:

Licensee Event Report No. 89-16, Revision 1, is attached. This report discusses an event in which the containment recirculation sump was found not to be in accordance with design requirements.

Sincerely,

C. P. Yundt  
General Manager  
Trojan Nuclear Plant

c: Mr. John B. Martin  
Regional Administrator, Region V  
US Nuclear Regulatory Commission

Mr. David Stewart-Smith  
State of Oregon  
Department of Oregon

Mr. R. C. Barr  
USNRC Resident Inspector  
Trojan Nuclear Plant

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LICENSEE EVENT REPORT (LER)

FACILITY NAME (1) Trojan Nuclear Plant	DOCKET NUMBER (2) 0 5 0 0 0 3 4 4 1	PAGE (3) 1 OF 0 8
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TITLE (4) Inadequate Management Oversight, Procedure Deficiencies and Personnel Errors Result in Power Operation With An Inoperable Recirculation Sump

EVENT DATE (2)			LER NUMBER (5)			REPORT DATE (7)			OTHER FACILITIES INVOLVED (8)													
MONTH	DAY	YEAR	YEAR	SEQUENTIAL NUMBER	REVISION NUMBER	MONTH	DAY	YEAR	FACILITY NAMES			DOCKET NUMBER(S)										
0	7	1	6	8	9	8	9	0	1	6	0	1	1	0	2	7	8	9	N/A			0 5 0 0 0
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OPERATING MODE (9) 5	THIS REPORT IS SUBMITTED PURSUANT TO THE REQUIREMENTS OF 10 CFR §: (Check one or more of the following) (11)										
POWER LEVEL (10) 0, 0, 0	20.402(b)	20.406(a)	80.73(a)(2)(iv)	73.71(b)							
	20.406(a)(1)(i)	80.38(a)(1)	80.73(a)(2)(v)	73.71(e)							
	20.406(a)(1)(ii)	80.38(a)(2)	80.73(s)(2)(vii)	OTHER (Specify in Abstract below and in Text, NRC Form 388A)							
	20.406(a)(1)(iii)	X 80.73(a)(2)(i)	80.73(a)(2)(viii)(A)								
	20.406(a)(1)(iv)	X 80.73(a)(2)(ii)	80.73(a)(2)(viii)(B)								
20.406(a)(1)(v)	80.73(a)(2)(iii)	80.73(a)(2)(ix)									

LICENSEE CONTACT FOR THIS LER (12)	
NAME John Guberski - Compliance Engineer	TELEPHONE NUMBER AREA CODE: 5 0 3 5 5 6 - 5 5 2 3

COMPLETE ONE LINE FOR EACH COMPONENT FAILURE DESCRIBED IN THIS REPORT (13)											
CAUSE	SYSTEM	COMPONENT	MANUFACTURER	REPORTABLE TO NPDOS	CAUSE	SYSTEM	COMPONENT	MANUFACTURER	REPORTABLE TO NPDOS		

SUPPLEMENTAL REPORT EXPECTED (14)			EXPECTED SUBMISSION DATE (15)	MONTH	DAY	YEAR
<input type="checkbox"/> YES (If yes, complete EXPECTED SUBMISSION DATE)	<input checked="" type="checkbox"/> NO					

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

On July 17, 1989 the plant was in Mode 5 (Cold Shutdown) with Reactor Coolant System (RCS) conditions of 360 psig and 185 degrees F when an inspection of the containment recirculation sump determined that the wire mesh screen on the top of the Containment recirculation sump trash rack was not installed. This inspection was being conducted due to significant amounts of debris discovered within the screened area of the Containment recirculation sump. The screen is part of the design of the Containment recirculation sump and therefore the plant was outside its design basis. The reason for the mesh screen not being installed was apparently a failure to complete all construction activities. Failure to detect this condition earlier than 1989 is attributed to inadequate inspections of the containment recirculation sump, as a result of ineffective management and supervisory oversight of Containment recirculation sump maintenance, surveillance, engineering and quality activities. Corrective actions were to install the missing screen, repair damaged portions of the existing screen, remove the foreign materials from the area, revise the inspection procedure, and inspect containment using the revised procedure. A Nuclear Division Improvement Plan has been developed to implement actions to improve performance. This plan addresses concerns relating to management performance, assurance of quality and other areas where it has been identified that improvements are needed. It is currently being implemented. The effects of foreign material in the containment recirculation sump could have caused loss of all or a portion of the Emergency Core Cooling Systems during recirculation phase operation.

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TEXT (If more space is required, use additional NRC Form 388A's) (17)

BACKGROUND INFORMATION

The Containment recirculation sump is a large collecting reservoir designed to provide an adequate supply of water with a minimum amount of particulate matter to the Containment Spray System (CSS) and Residual Heat Removal System (RHR) for the recirculation phase of a loss of coolant accident (LOCA). The sump is as far removed as possible from the Reactor Coolant System (RCS) piping and components which could become sources of debris (see attached Figures 1 and 2). Flow through the south baffle of the Containment recirculation sump goes through a pipe chase to reach the area where the CSS/RHR pump suction piping opening is located. A baffle arrangement consisting of a series of screens, bars, and plates completely surrounds the sump to prevent floating debris and large water entrained particles from entering the sump. The arrangement of the sump baffles and screens is shown in attached Figure 1 and 2. Within the Containment recirculation sump baffle are the CSS/RHR pump suction piping inlets, one for each train. These inlets are located below the nominal Containment floor elevation of 45 feet, in a pit referred to as the sump. In this report the term Containment recirculation sump means any portion of the area enclosed by the baffle. The term sump means the area between the 39 foot and 45 foot elevations immediately around the CSS/RHR suction piping inlets.

The lower vertical portion of the baffle consists of a trash rack constructed from Irving type CM-4 grating (approximately 1/4 x 4 inch opening) with no wire mesh screen attached. The upper vertical portion of the baffle is constructed of a 1/8 inch thick plate. An angled trash rack consisting of 1/2 inch by 3 inch bars spaced 3 inches apart connects the two vertical sections. This trash rack supports an outer industrial wire mesh screen with a 1/2 inch maximum opening. An inner mesh screen, located approximately 2 feet behind the lower vertical and angled portion of the trash rack and in line with the upper plate, has a 3/16 inch maximum opening. Both wire mesh screens are designed to withstand the differential pressure of 100 percent clogging, and sufficient screen area exists to allow over 50 percent clogging of both screens without degrading the Containment Spray or Residual Heat Removal pumps net positive suction head (NPSH).

The Final Safety Analysis Report (FSAR) states that Containment water level after a Loss Of Coolant Accident (LOCA) reaches a maximum elevation of 52 feet 11 inches. This places the top of the Containment recirculation sump approximately 10 inches below the water surface. The Containment recirculation sump baffle design allows flow into the sump between elevations 45 feet 6 inches and 49 feet 3-1/2 inches. This arrangement allows a margin against screen clogging by floating debris. Sufficient baffle areas exists such that the velocity of recirculated fluids approaching the sump, even during maximum flow conditions, will be below 0.5 feet per second. High density particles will settle out in this low velocity area if they have not done so prior to approaching the sump area.



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Trash racks, screens and settling regions notwithstanding, debris that passes into the sump through the 3/16 inch screen can be drawn into the suction piping for the CSS and RHR system. Such debris is of small enough dimension to pass through any restriction in either system, and will eventually be pumped back into the Containment.

Equipment located within the Containment recirculation sump includes the Reactor Coolant Drain Tank, two motor operated valves, water level alarm switches, and piping lines with associated hangers and manual valves. The Reactor Coolant Drain Tank collects various drainage from the RCS. The motor operated valves (motor located above maximum water level) are, 18 inch, normally opened, gate type valves, used as the inside Containment isolation valves for the CSS/RHR pump suction lines. The level switches are used to detect if leakage of the valves isolating the sump from the Refueling Water Storage Tank occurs.

DESCRIPTION OF EVENT

On July 8, 1989 a cleanup of containment was conducted as the plant neared the end of the 1989 refueling outage. During the cleanup of the Containment recirculation sump, debris was discovered in the pipe chase where it exited into the area around the CSS/RHR piping suction. Upon removing this material an inspection was made of the remaining portion of the pipe chase. Additional items were found and removed. A question was also raised as to the possibility of two pins taped to hangers located above the Containment recirculation sump coming loose and falling into the sump. Quality Assurance (QA) personnel were contacted, informed of the debris and hanger pins, and requested to investigate. As part of this investigation, Quality Assurance documented the materials removed and arranged for the material to be held under a Quality Hold tag. Examples of items found include insulation, pieces of metal wire, pipe fittings, and pieces of fabricated steel. The non insulation material was later reviewed by design engineers to determine characteristics (size, weight, etc.) of the items. The insulation material was processed as radioactive waste material prior to review by Nuclear Plant Engineering (NPE). Personnel who viewed the insulation material were contacted to determine characteristics of the insulation. The information on the characteristics of the debris was supplied to the vendors performing the evaluation of effects of the debris on the CSS/RHR pumps.

Removal of material from Containment prior to establishing Containment integrity continued on July 8 and 9. The material found in the Containment recirculation sump was discussed on July 10, 1989 in the Plant Manager's morning meeting. No operability questions were raised as recollected by personnel in attendance. At 1000 on July 10, 1989 the management walk down team made its housekeeping and cleanliness inspection of Containment as required by Administrative Order (AO) 3-25, "Ready for Startup". The responsible managers delegated the performance of this inspection, as permitted by AO 10-1, "Plant Housekeeping", to non-supervisory personnel. No

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discrepancies were identified that involve the Containment recirculation sump.

Quality Assurance personnel made another inspection of the Containment recirculation sump at approximately 1130 on July 10, 1989. During this inspection duct tape was found on a valve, and a piece of masslin material was found just inside the pipe chase. These items were removed and added to the material being held under a Quality Hold tag. Quality Assurance Management directed the inspector(s) involved to discuss reportability questions with the on-site Licensing Engineer.

At approximately 1500 the QA inspectors discussed the type of material found, the fact that some of the material had been there long enough to rust or collect a film of dust, and that there appeared to be no mechanism to prevent this material from entering the CSS/RHR suction pipe inlet with the Licensing Engineer. A plant internal event report (ER 89-100) was initiated to determine the reason for the presence of the debris; and so the design engineering group (NPE) could determine if the materials found could have been transported to the CSS/RHR suction piping inlet(s) and what the effect would be on CSS or RHR system operability. Operability was not an immediate concern as the plant was in Mode 5 (Cold Shutdown).

An inspection of Containment in accordance with AO 3-11, 'Containment Access, Integrity, Evacuation and Inspection', for material that potentially could cause damage to equipment in, or obstruct flow to, the Emergency Core Cooling Systems was conducted at 1700 on July 11, 1989 prior to establishing Containment integrity. A work list of discrepant items was prepared as a result of this walk down. None of these items was in, or in the vicinity of, the Containment recirculation sump. Due to a misunderstanding between two of the three people assigned to inspect the Containment, neither person assigned to the lower levels of Containment entered the Containment recirculation sump. Subsequent to exiting Containment the AO-3-11 inspection form was signed off. The line for the inspection of the Containment recirculation sump is in the middle of several sign offs for areas of Containment that are remote from the recirculation sump. The line for the recirculation sump was mistakenly signed by the third inspector who was responsible for the areas immediately above and below this line.

In conjunction with the above inspection the question on the pins taped to the spring hangers was raised with Plant Management personnel. Quality Assurance personnel explained the location of the pins and what was viewed as the problem. At 2100 on July 11, 1989 these pins were removed from Containment. Work continued on removing material identified during the 1700 July 11, 1989 inspection.

A meeting was held on July 12, 1989 to discuss the chronology of events regarding the material found in the Containment recirculation sump, review actions taken to date, and determine what further actions, if any, were necessary. During this meeting it was concluded that some of the material found in the Containment recirculation sump was probably there during the last



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power operation cycle and that the effect of this material on CSS and RHR system operability needed to be evaluated. After a discussion with the Plant Manager, a decision was made to make a courtesy report to the Nuclear Regulatory Commission (NRC) using the Emergency Notification System (Red Phone). This notification was made at 1313 on July 12, 1989. The initial evaluation results were that some of the debris in the Containment recirculation sump would have had the potential to cause damage to, or significantly degrade the performance of, the CSS or RHR pumps. The final evaluation report is scheduled to be completed by late November 1989. No significant changes in the evaluation results are expected.

The final walk down of Containment was conducted and Containment integrity was set at 0345 on July 13, 1989 prior to the plant entering Mode 4 (Hot Shutdown) at 0610 on July 14, 1989. The recirculation sump was not inspected during this walk down. This walk down concentrated on areas in which work had been performed since the last inspection. During an inspection of the Containment recirculation sump conducted on July 14, 1989 by an NRC Resident Inspector, after entering Mode 4, additional debris was discovered by a Quality Assurance inspector and the NRC Resident Inspector. Examples of these items include a bag of nylon tie wraps, washers, and welding rod. Plant internal event report 89-104 was initiated to evaluate this discovery. At 1330 a discussion was held with the Plant Manager concerning the finding of the additional items in the Containment recirculation sump. Operations and Licensing personnel determined that the Technical Specification operability requirements for the Emergency Core Cooling Systems were satisfied. Most of the material found in the Containment recirculation sump was removed by 1700 on July 14, 1989. Items embedded in crystallized boric acid were removed during the July 14 - 21, 1989 time period. The Containment inspection criteria contained in AO 3-11 were revised to provide a check list for inspecting the Containment recirculation sump. The revised criteria were used for subsequent inspections of Containment.

The question on the hanger pins potentially falling into the Containment recirculation sump was followed up by NPE. As a result, on July 17, 1989 at approximately 1230, it was determined by NPE that the Containment recirculation sump baffle did not have the 3/16 inch mesh screen installed on the top portion of the baffle. The Plant was in Mode 5, with the RCS at 360 psig and 185 F. Plant internal event report 89-106 and Non-Conformance Report 89-355 were initiated to evaluate this event. Subsequent inspections identified that some of the mesh screen in the side baffles was damaged or missing. Also, pipe penetrations through the baffle were identified as having gaps greater than the allowed 3/16 of an inch. These gaps resulted from conflicting information on design drawings. The civil drawings do not allow any gap larger than 3/16 of an inch, while the piping drawings have information that the opening can be sized as necessary to accommodate the piping. The missing top mesh screen was reported to the NRC (Red Phone report) as a condition outside the design basis at 1620 on July 17, 1989. Also, while performing the inspections of the baffle, it was noted that some of the bolts in the Containment recirculation sump and in the pipe chase had

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boric acid build up on them from previous spills of borated water in the area. The boric acid build up was removed and the bolts evaluated as acceptable for use as is.

During the investigation of this event it was also determined that the surveillance required by Trojan Technical Specification (TTS) 4.5.2, "Emergency Core Cooling Systems, ECCS SubSystems - Tav<sub>g</sub> greater than 350 F", Surveillance Requirements section C and D.2 were not properly performed at the conclusion of the 1989 refueling outage prior to entering Mode 4 on July 14, 1989.

A review of construction and design change information for the Containment recirculation sump was performed. No conclusive evidence could be found to show that the missing top screen had ever been installed. An examination of the existing top grating did not show any signs of tack welding having been done to hold the mesh screen in place (design specified method of attachment).

CAUSE OF OCCURRENCE

Primary Cause(s)

The primary cause of this event was ineffective management and supervisory oversight of the Containment recirculation sump related maintenance, surveillance, engineering and quality activities.

The cause of the debris in the Containment recirculation sump was a result of inadequate compliance with post-work cleanliness requirements and failure of post-work inspections to identify the presence of the debris.

The top sump screen was not installed because of an apparent failure to complete all construction activities. Additionally, the inspection procedures for satisfying the surveillance requirements of TTS 4.5.2 did not include the criteria necessary to fully meet the requirements of the Technical Specification.

The missing/damaged screens and gaps were not discovered earlier than July 1989 because of the failure of the System Engineer to adequately perform a walk down of the Containment recirculation sump to ensure that it was maintained in accordance with the FSAR and the Design Basis Document.

Contributing Causes:

1. Incomplete procedures. There was a lack of detailed inspection criteria and understanding of the basis for the inspection criteria.
2. Personnel error. System material condition walk downs should have discovered the gaps and tears in the mesh screen. The

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recirculation sump should have been inspected by one of the inspectors during the July 11, 1989 pre-integrity inspection.

3. Inadequate standards, policies, and administrative controls. No managers were involved in the management housekeeping review of Containment on July, 10, 1989. Management involvement in the debris problem became significant only after the debris found on July 14, 1989.

Corrective Actions

The mesh screen was installed on the top of the Containment recirculation sump, damage repaired, and mesh installed to eliminate the gaps around piping penetrations. In addition the following actions were taken to revise AO 3-11 prior to performing the Containment pre-integrity inspection for entering Mode 4 on July 23, 1989:

- a. Included detailed criteria in terms of what to look for and where to look.
- b. Required pre-inspection briefings, for the inspectors, which review the inspection criteria and clearly define which area each inspector will cover.

The following items will be included in the Containment inspection requirements prior to entering the 1990 refueling outage (CTL # 30377):

- a. Require inspectors to be trained, including the basis for the inspection criteria, before performing the inspections.
- b. Improve the procedures for conducting the inspections, including revising the maps of the inspection areas and separating the areas according to the way the inspections are normally conducted (inside the biological shield, outside the biological shield, etc.).

In the remainder of 1989 and in 1990, an upgrade of the Design Basis Document Program will be implemented. The Design Basis Documents which were issued in 1987 and 1988, and those to be issued in 1989, will be reviewed and revised as required to provide additional information on the design basis. Previously performed walk downs of systems for which the Design Basis Documents have been issued will be performed again by the Systems Engineers with specific expectations established (CTL # 30379).

Individuals who identified the initial problems and pursued resolution will be recognized by PGE for outstanding performance. The personnel who failed to perform up to expectations have received disciplinary action and/or will have



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their performance reflected in their annual performance appraisals. General Employee Training and Retraining will be revised, prior to January 31, 1990 (CTL # 30378), to reinforce the expectation that individuals are responsible for cleaning up after the job and why this is particularly important inside Containment.

In July 1988 items were also found in the sump. An aggressive evaluation of how this debris entered the sump could have discovered the above identified deficiencies and would have resulted in improved inspection procedures. To correct the ineffective management and supervisory oversight of activities the following actions have been taken:

Key Managers who have exhibited a strong resistance to change have been replaced. The complete impact of these changes has yet to be realized.

A Nuclear Division Improvement Plan has been developed to implement actions to improve performance. This plan addresses concerns relating to management performance, assurance of quality and other areas where it has been identified that improvements are needed. It is currently being implemented. Periodic updates will be issued with the first one scheduled to be issued by January 31, 1990 (CTL #31589).

Significance of Occurrence:

If a loss of coolant accident had occurred some of the debris already inside the Containment recirculation sump or which could have entered through the missing/damaged mesh screen or gaps could have entered the CSS/RHR suction piping. This material could have caused a partial or complete loss of one or more of the Containment Spray or Residual Heat Removal systems during recirculation phase operation.

Figure 1 LER 89-16 - Rev. 1

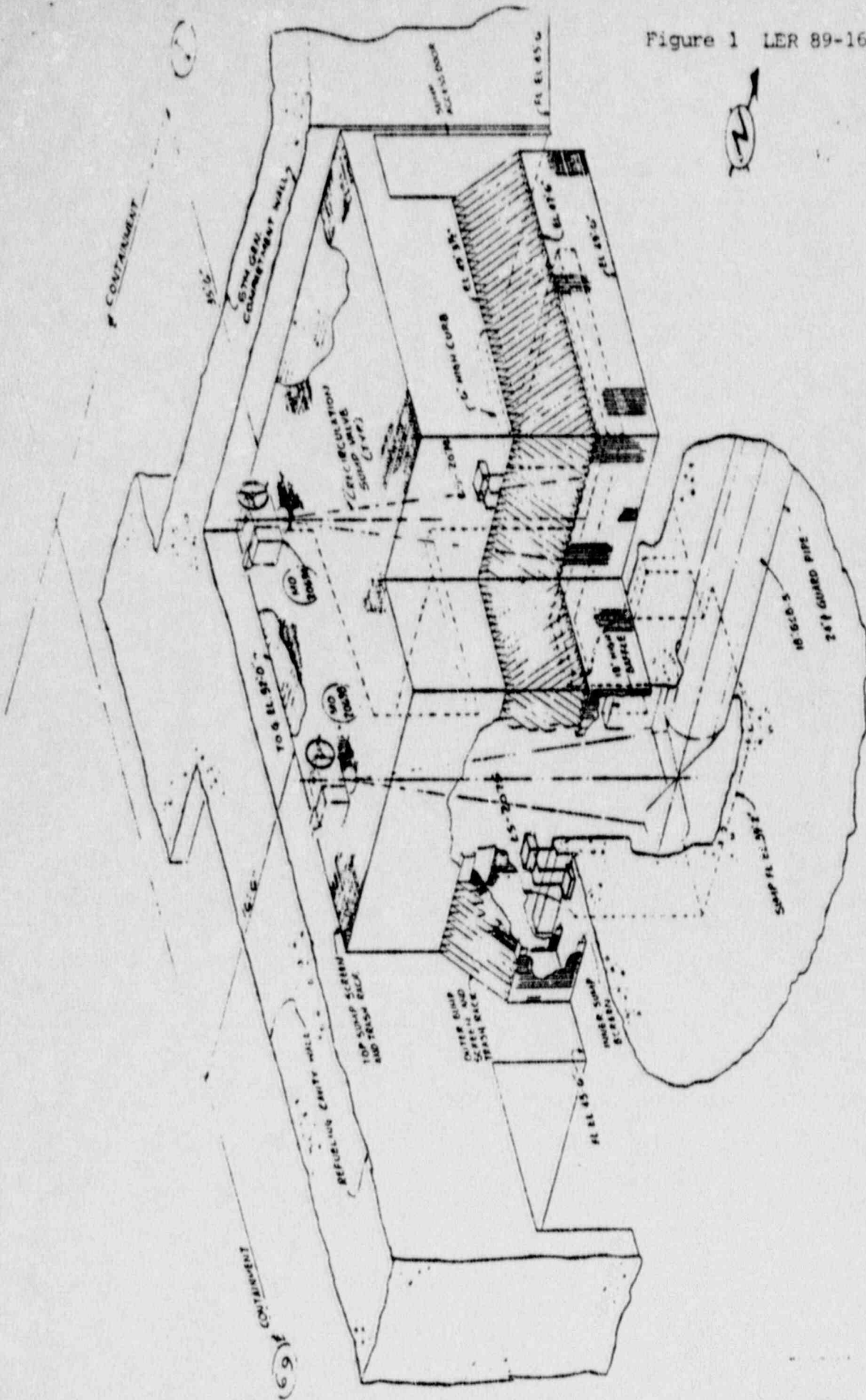
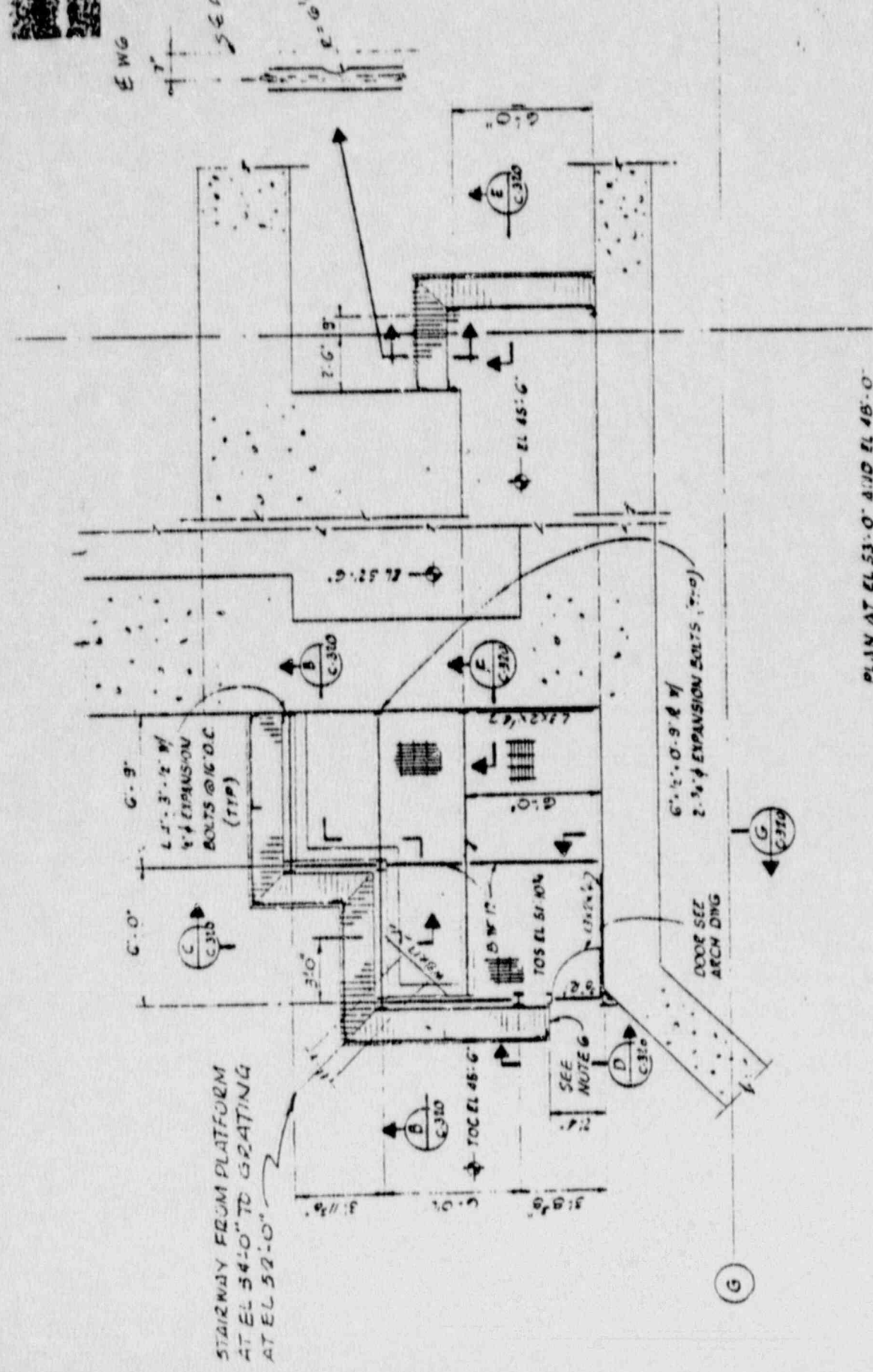


Figure 1 / Containment Recirculation Sump



Figure 2 LER 89-16 - Rev. 1



PLAN AT EL 53'-0" AND EL 48'-0"

SCREEN FRAMING AROUND THE RECIRCULATION SUMP

16" x 1'-0"

(FOR GENERAL FLOOR PLAN SEE DWG C-301)