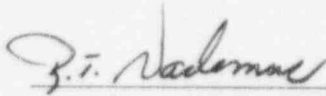
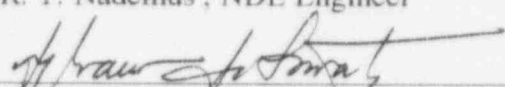
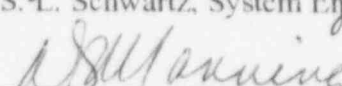
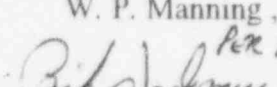
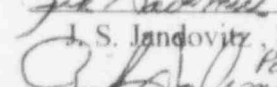
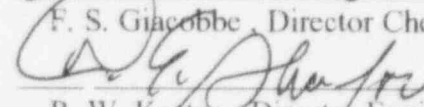


**Oyster Creek Core Spray System  
Inspection Program - 16R**

**Topical Report No. TR-110  
Project No. 328382**

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### Abstract

During the 1996 refueling outage (16R) at Oyster Creek Nuclear Generating Station, an augmented Inspection Program was implemented on the Core Spray Sparger System. In addition to the augmented program, GPUN performed visual examinations per the recommendation of the BWRVIP, (Boiling Water Reactor Vessel and Internals Project), document BWRVIP-18, "BWR Core Spray Internals Inspection and Flaw Evaluation Guidelines". The inspection scope included the in-vessel annulus piping, sparger assemblies, and associated brackets utilizing remote visual examination and supplemental air test. In accordance with the above reference document, BWRVIP-18, accessible portions of the annulus piping welds and the accessible portions of the end cap welds on the sparger assemblies were cleaned with a nylon brush and inspected to the VIP enhanced VT-1 Technique, (1/2 mil wire resolution). Remote visual examinations revealed no new indications. The air test revealed leakage reported in the previous outages in System II at the 208 degree azimuth repair clamp.

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OYSTER CREEK CORE SPRAY SPARGER SYSTEM  
INSPECTION PROGRAM

INTRODUCTION

The Augmented Inspection for the Core Spray Sparger System was performed during the 1996 refueling outage (16R). The results of the inspection reported herein meet the requirements outlined by "Section 6.9.3.d, Unique Reporting Requirements", of the Oyster Creek Technical Specification.

### Visual Inspection

The Core Spray Spargers and Annulus piping were visually inspected utilizing the IST, ETV-1250 underwater camera with the twin 50 watt underwater lighting affixed. Auxiliary lighting was provided as needed by acorn lights and/or area lights lowered into the vessel from the refueling bridge. Auxiliary lighting was controlled by a rheostat. This inspection program has exceed past inspections by conforming to the BWRVIP, Reference 6 Page 9. The video tapes were reviewed by at least two visual Level III individuals. Agreement of the individuals was required to finalize the disposition of these inspections.

#### Core Spray Spargers

Accessible portions of the end cap welds on the spargers, (8 places), were cleaned using a nylon brush attached to an underwater motor. These welds were inspected utilizing the (BWRVIP) enhanced VT-1 designated as EVT-1. This technique uses a ½ mil wire for camera/system resolution. The remainder of the spargers were inspected to the CSVT-1 technique using a 1 mil wire for camera/system resolution, which has been performed in prior inspections, in accordance with the requirements of NRC I&E Bulletin 80-13. This outage Oyster Creek utilized the refueling bridge and a auxiliary bridge to perform these inspections. The primary means of operating the camera system was by hand held camera manipulated by ropes. The rigid pole system mounted to the refueling bridge was used when accessibility permitted. The calibration standards used for qualification of the camera system were as stated above.

The visual inspection of the Core Spray Spargers was performed as follows (Reference Figure 1 & 2):

#### Sparger A & C

1. Upper view - looking down on the sparger from above.
2. Front view - looking straight at the sparger.
3. Lower view - looking up at the sparger from below.
4. Nozzle view - looking below the sparger directly at the nozzles.
5. End cap welds- cleaned and EVT-1.

#### Sparger B & D

1. Upper view - looking down on the sparger from above.
2. Front view - looking straight at the sparger.
3. Nozzle view - looking below the sparger directly at the nozzles.
4. End cap welds - cleaned and EVT-1.

**Note:** A lower view is not possible for Sparger B & D because of their location in the vessel.

No relevant indications were noted during the inspections or subsequent review of the video tapes.

#### Annulus Piping

Accessible portions of the Core Spray Annulus Piping welds (Figures 3 through 7) were cleaned using a nylon brush and visual inspections performed utilizing the EVT-1 technique. All accessible portions of the piping and attachments were visually inspected. Inspections were performed using the ETV-1250 camera system. No new relevant indications were noted during the inspection or subsequent review of the video tapes.

#### Air Test

Air tests were performed on the core spray system I and II spargers. Because of the configuration of the Core Spray piping, the upper spargers with downward pointing nozzles should be filled completely with air (System II). The down leg between the reactor vessel penetration and the horizontal circumferential pipe run in the annulus is filled completely with air. All other piping will, at best, fill only partially with air or just pass air bubbles along its upper inside surface.

The Core Spray Sparger Systems air test was performed in accordance with GPUN Spec. SP-1302-22-007, rev. 3. The pressure was held at approximately 68 psi as verified through GPUN I&C Department.

### System I ( Lower Spargers)

During the performance of the air test, the core spray sparger system I, was inspected utilizing a hand held IST ETV-1250 camera manipulated with an attached rope from the bridge.

Core Spray Sparger System I was the first system tested. Inspection of the sparger during the air test noted air bubbles coming from the nozzles. With no means of isolating the nozzles, air escaping is normal during this examination. Inspection of the balance of the lower spargers on system I revealed no additional air leaks.

### System II ( Upper Spargers)

During the performance of the air test, the core spray sparger system II was inspected utilizing a hand held IST ETV-1250 camera manipulated with an attached rope from the bridge.

Core Spray System II, (Upper Spargers), was the second system inspected. In addition, the annulus piping was inspected at this stage of the air test. As pointed out during system I air test, air bubbles were also observed emitting from the sparger nozzles. Air bubbles were also observed coming from the end (204 degrees) and middle (208 degrees) of the repair clamp located between azimuth 204 - 210 degrees. No other air bubbles were observed coming from the other eight repair clamps, spargers or annulus piping other than that previously noted above.

### Conclusions

The following are the conclusions relative to the inspection of the Core Spray System conducted during the Oyster Creek Refueling Outage (16R):

- ☐ The number of confirmed cracks in the core spray sparger systems is one (1) in system II, that being the through wall crack at 208 degrees identified and clamped in 1978 and confirmed by continuous stream of air bubbles. No change was noted from previous inspections.
- ☐ Visual inspection of the spargers and annulus piping showed various scuff marks, scrapes, undercut, arc strikes, oxide deposits, (in locations that had not been brushed), and discoloration's on the sparger surfaces. No changes from previous inspections were noted.
- ☐ All repair clamps appear to be intact and in good condition.
- ☐ No indications that could be interpreted as crack like in appearance were noted during the examination or post examination review of the sparger assembly.
- ☐ One rounded, through wall, indication was observed in the toe of weld designated as L-3A. This weld is in System I of the annulus piping. Visual examination during 16R and previous air test during 15R revealed no change in this indication since its discovery in 14R. This indication was determined to be a fabrication flaw.
- ☐ Two linear indications originally observed during outage 14R in the annulus piping in system II, weld U-3A appear to be a weld past between 2 beads, as determined after cleaning. No changes and no air bubbles were observed emanating from this location during the air test.



References

- 1 - NRC I&E Bulletin 80-13, "Cracking in Core Spray Spargers".
- 2 - GPUN Procedure 5361-NDE- 7209.46, Rev.1, "Visual Examination of Reactor Vessel Internals".
- 3 - GPUN Specification Sp-1302-56-128, Rev.1, "Reactor Vessel Internals Inspection - 16R".
- 4 - GPUN Topical Report No. TR-098 , "Oyster Creek Core Spray System Inspection Program -15R".
- 5 - GPUN SP-13-2-22-007, Rev.3, "Core Spray Sparger Piping Air Test".
- 6 - BWRVIP-18, "BWR Core Spray Internals Inspection and Flaw Evaluation Guidelines".

**TABLE 1**  
**CORE SPRAY PIPING INSPECTION SUMMARY**

	<u>Spargers</u>		<u>Annulus Piping</u>		<u>Air Test</u>	<u>Remarks</u>
	<u>Visual</u>	<u>Ultrasonic</u>	<u>Visual</u>	<u>Ultrasonic</u>		
1978	1 through wall crack	-----	No indications	-----	Air release observed from 1 crack (208° only)	One repair bracket installed at 208° (Sys. II)
1980	19 indications  <b>28 Total Indications (excluding 1978 indication)</b>	16 indications	2 indications	-----	" "	Seven repair brackets installed (Sys. II) two repair brackets installed (Sys. I)
1982	Video enhanced 1980 visual indications. Results identified: 3 cracks 2 possible cracks	-----	Video enhanced on 1980 indication Results: Not a crack on the 6x5 reducer)	-----	-----	-----
1983	No indications* (4 of the 1980 indications examined)	No indications* (5 of 16-1980 indications examined)	No indications	No indications 7 welds inspected	" "	*Area of inspection limited by repair brackets
1986	No indications*	No indications*	No indications	-----	-----	-----
1988	No indications*	-----	No indications	-----	** Air release observed from repair brackets upper sparger	** Air release from 196° repair bracket intermittent. Air release from 208° repair bracket

**TABLE 1 (Continued)**  
**CORE SPRAY PIPING INSPECTION SUMMARY**

	<u>Spargers</u>		<u>Annulus Piping</u>		<u>Air Test</u>	<u>Remarks</u>
	<u>Visual</u>	<u>Ultrasonic</u>	<u>Visual</u>	<u>Ultrasonic</u>		
1991	No indications*	-----	No indications	-----	Air release observed from one repair bracket (208° )upper sparger	Air release from 208° repair bracket continuous (Sys. II)
1992	No indications*	-----	Initial no indications	-----	Air release observed from one repair bracket	Air release from 208° repair bracket continuous (Sys. II)
			*** Additional Visual 3 indications A) 1 through weld hole B) 2-linear	-----	Air release from downcommer at 240°. Weld L-3A has through weld hole	Air release from weld L-3A is continuous (Sys. I)
1994	No indications*	-----	No indications	-----	Air release observed from repair bracket  Air release from downcommer at 240°, Weld L-3A has through weld hole	Air release from 208° repair bracket continuous (Sys. II) Air release from Weld L-3A is continuous (Sys. I) No change from 2 linears Note on Weld U-3A (Sys. II)
1996	No indications*	-----	***No indications	-----	Air release from one repair clamp	Air release from 208° repair bracket (Sys. II) No visual change to indication in U-3A (Sys. II)&L-3A(Sys. I)

\* Area of inspection limited by repair brackets

\*\* A subsequent air test confirmed that air bubbles were released from the sparger nozzles beneath the 196° repair clamp

\*\*\* Through weld hole in weld L-3A System I 2 linears, both in same weld U-3A System II

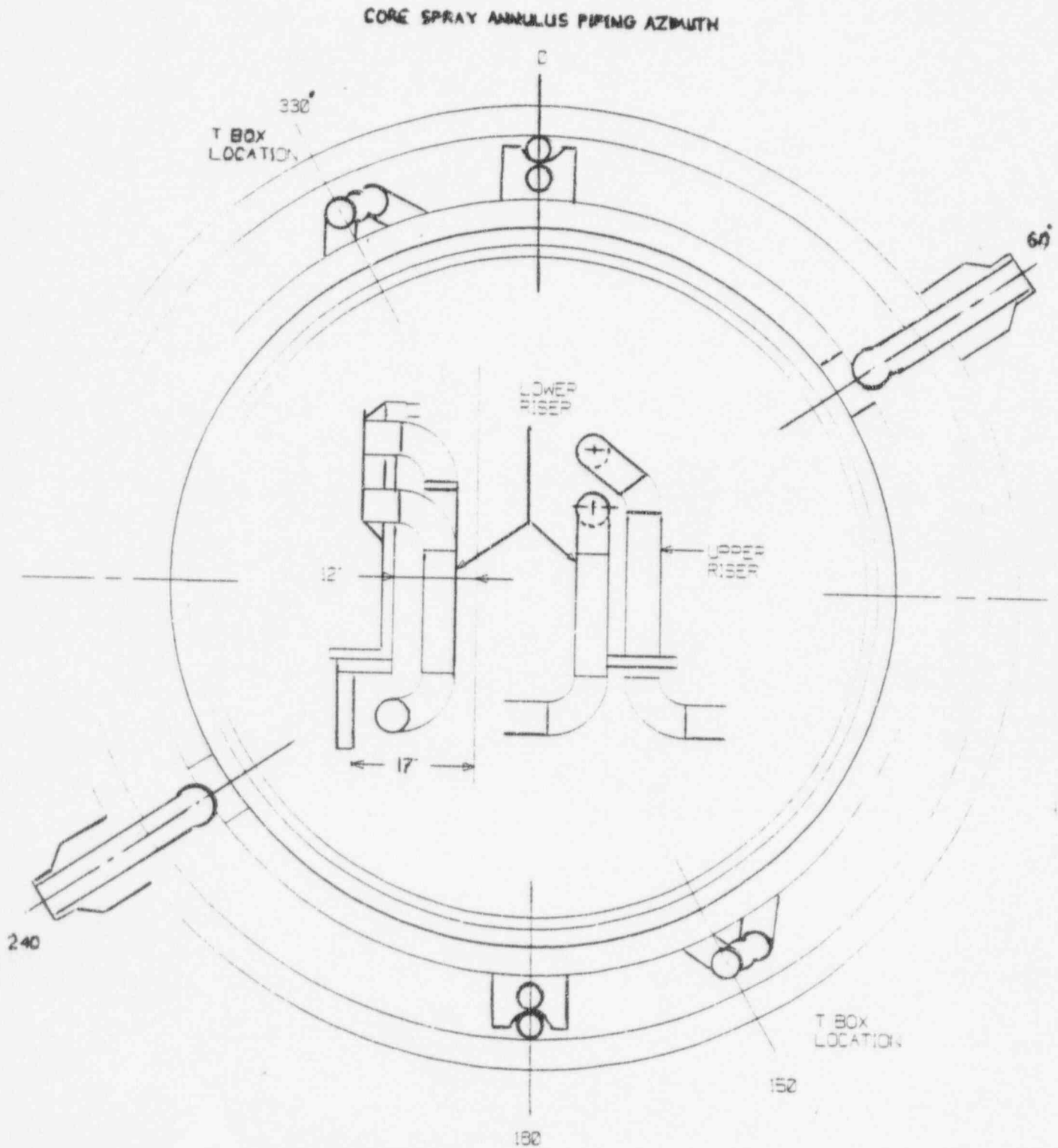
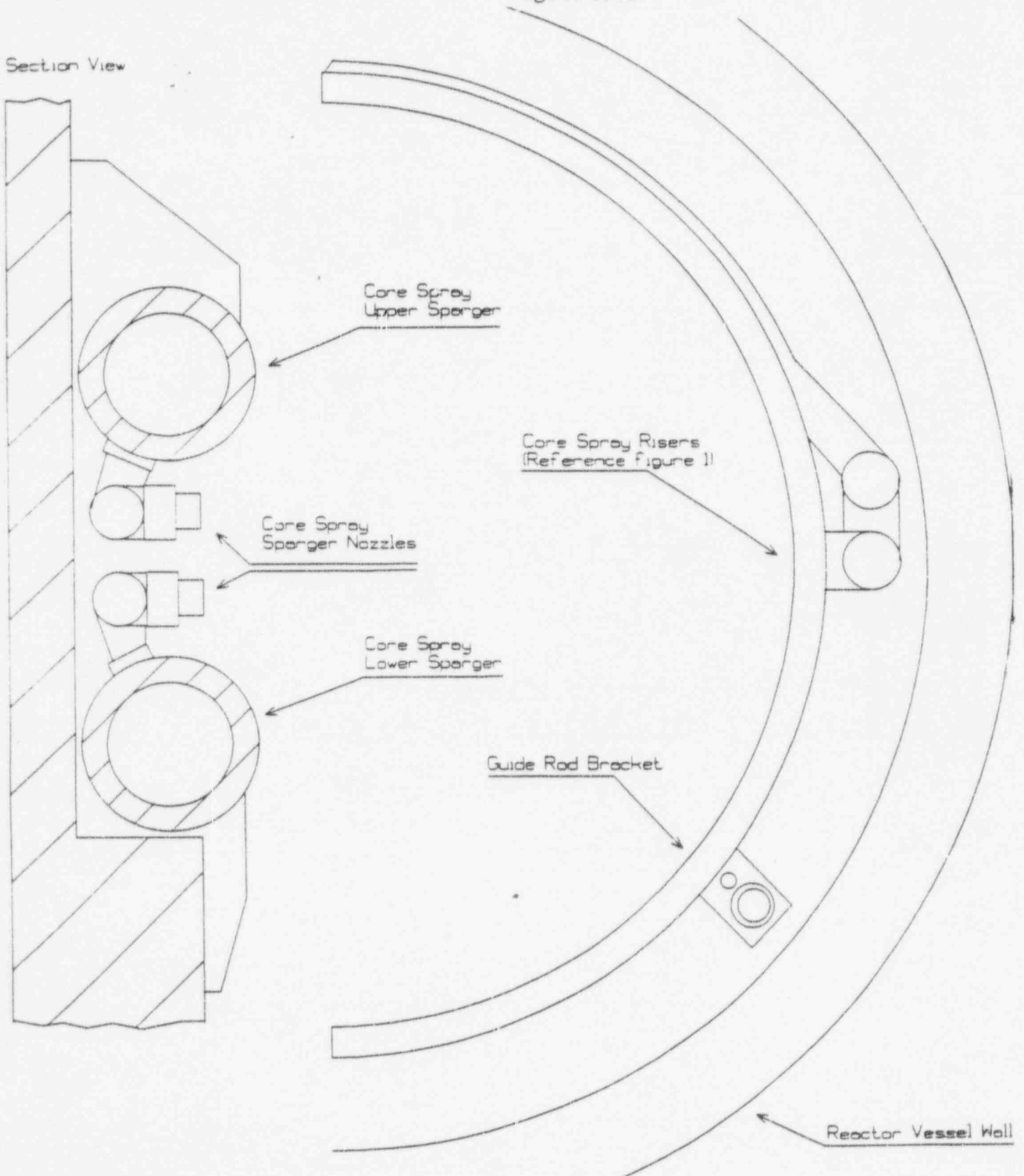


FIGURE 1

Section View



Oyster Creek Nuclear Generating Station

Figure Number 2

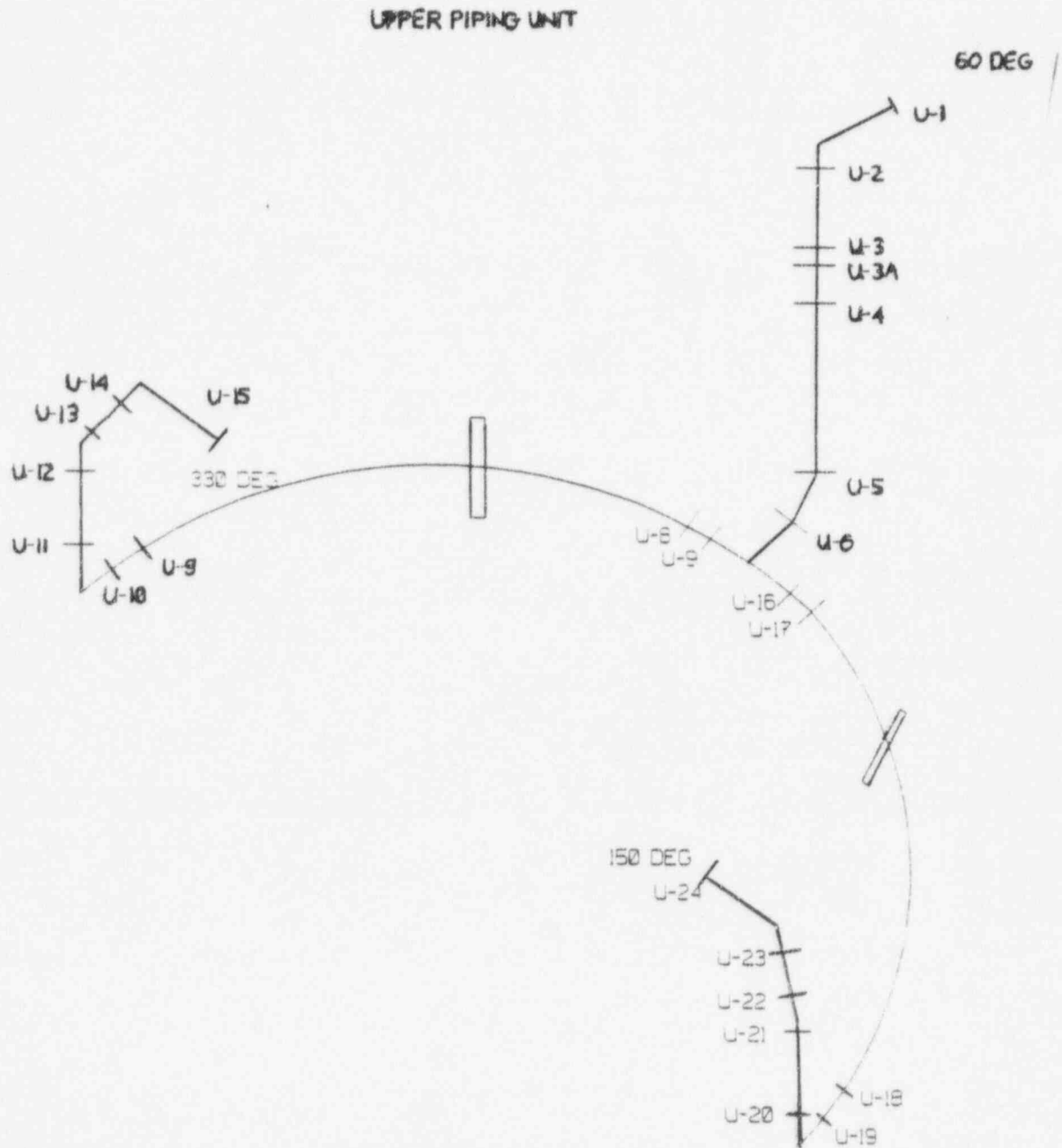


FIGURE 3

LOWER PIPING UNIT

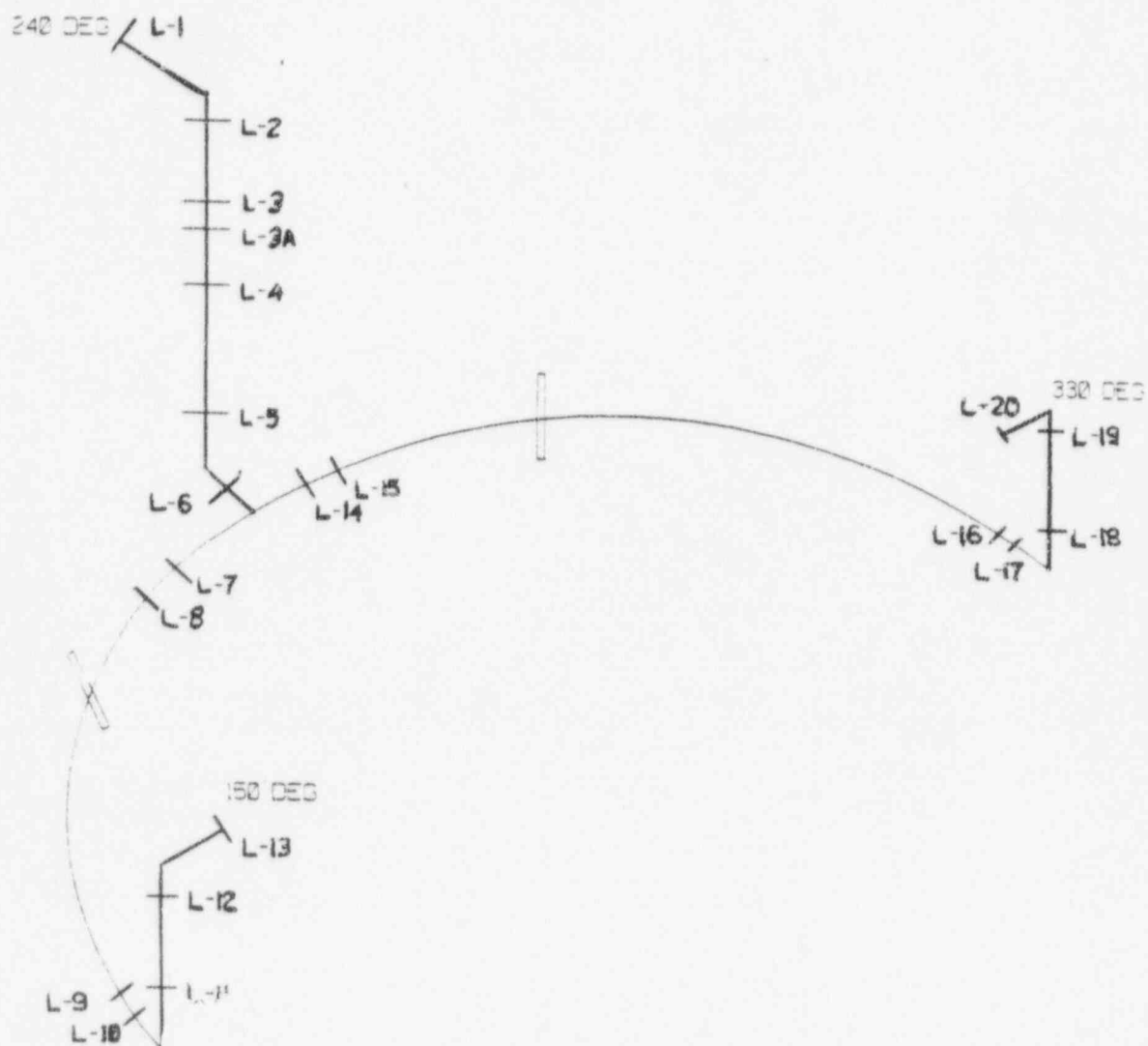


FIGURE 4

# OSTER CREEK CORE SPRAY SPARGER INLET PIPE COUPLING

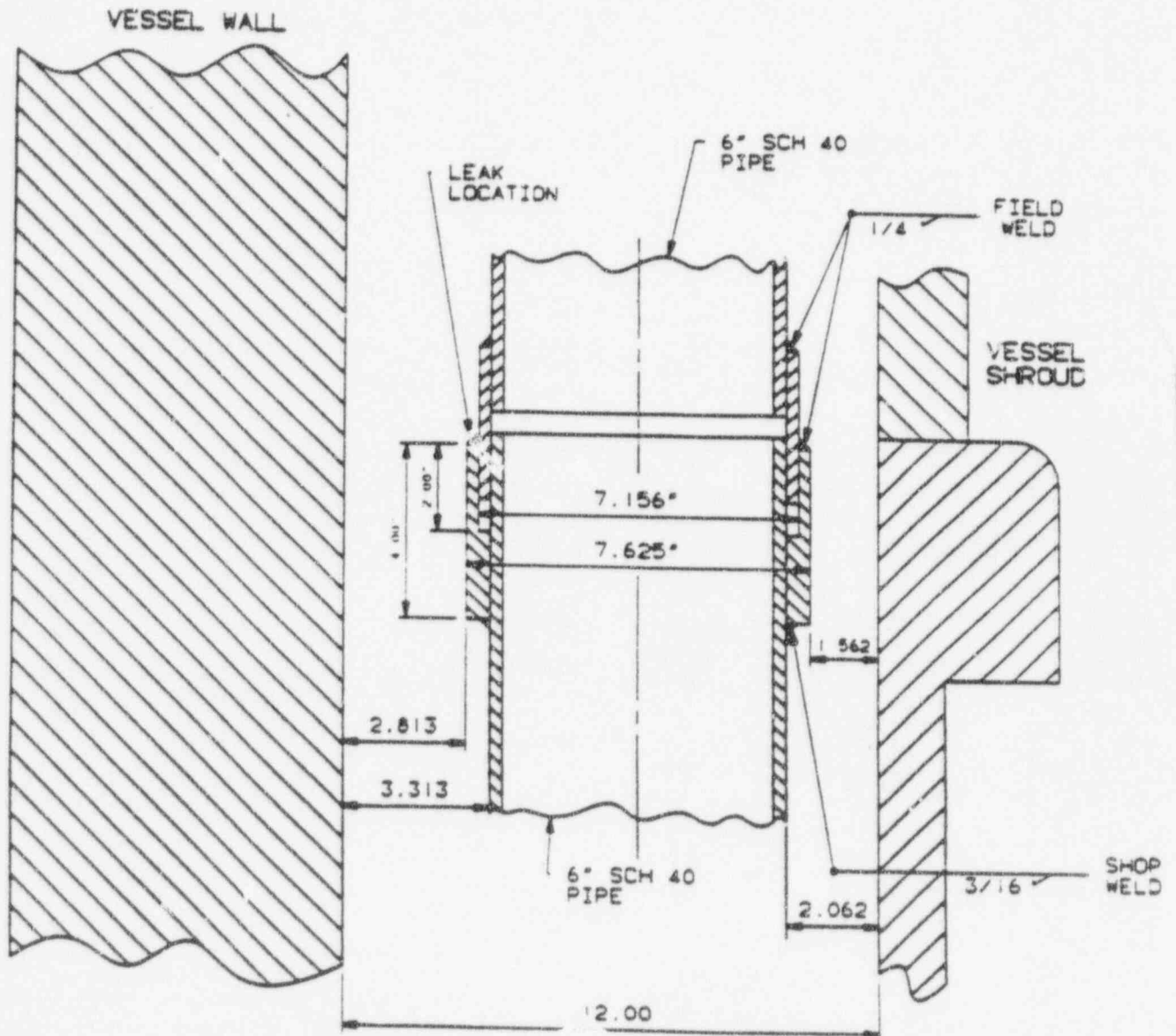


FIGURE 5



CORE SPRAY PIPING WELD IDS  
INDICATION AT WELD U-3A

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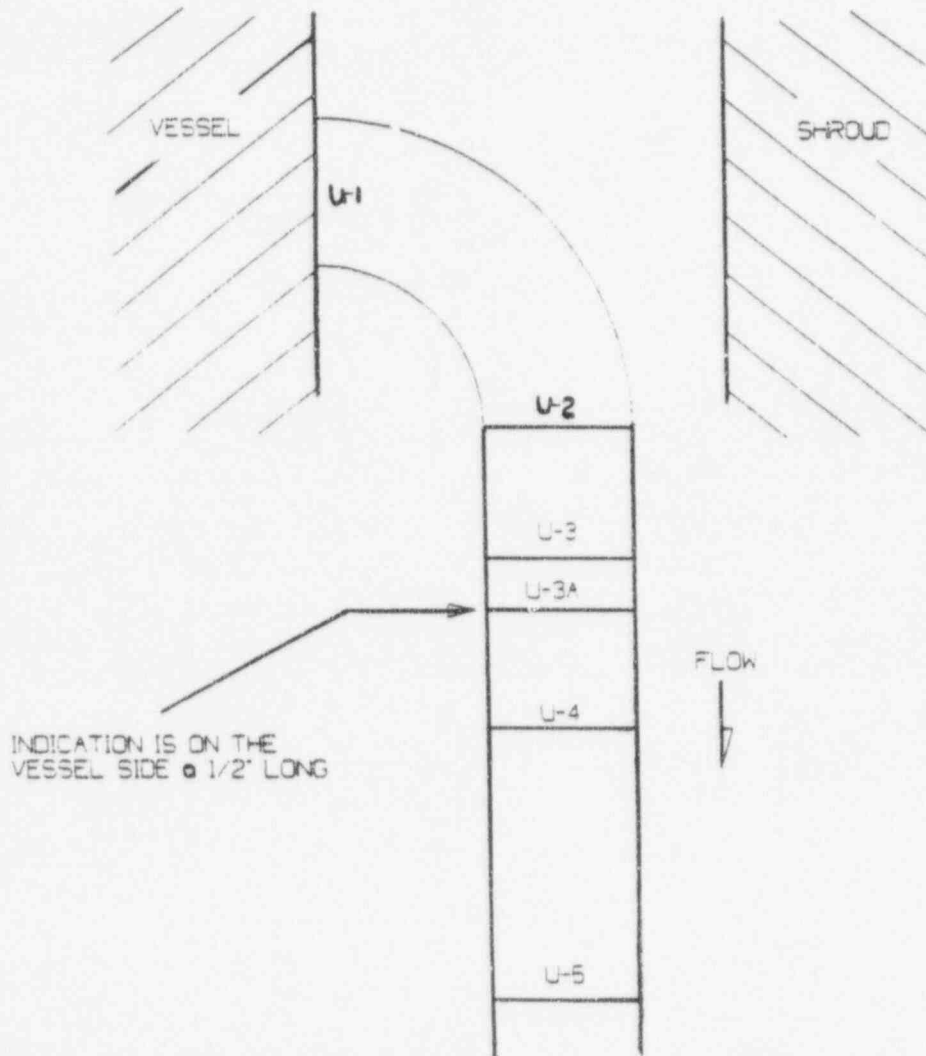


FIGURE 6

CORE SPRAY PIPING WELD IDS  
LEAKER AT WELD L-3A

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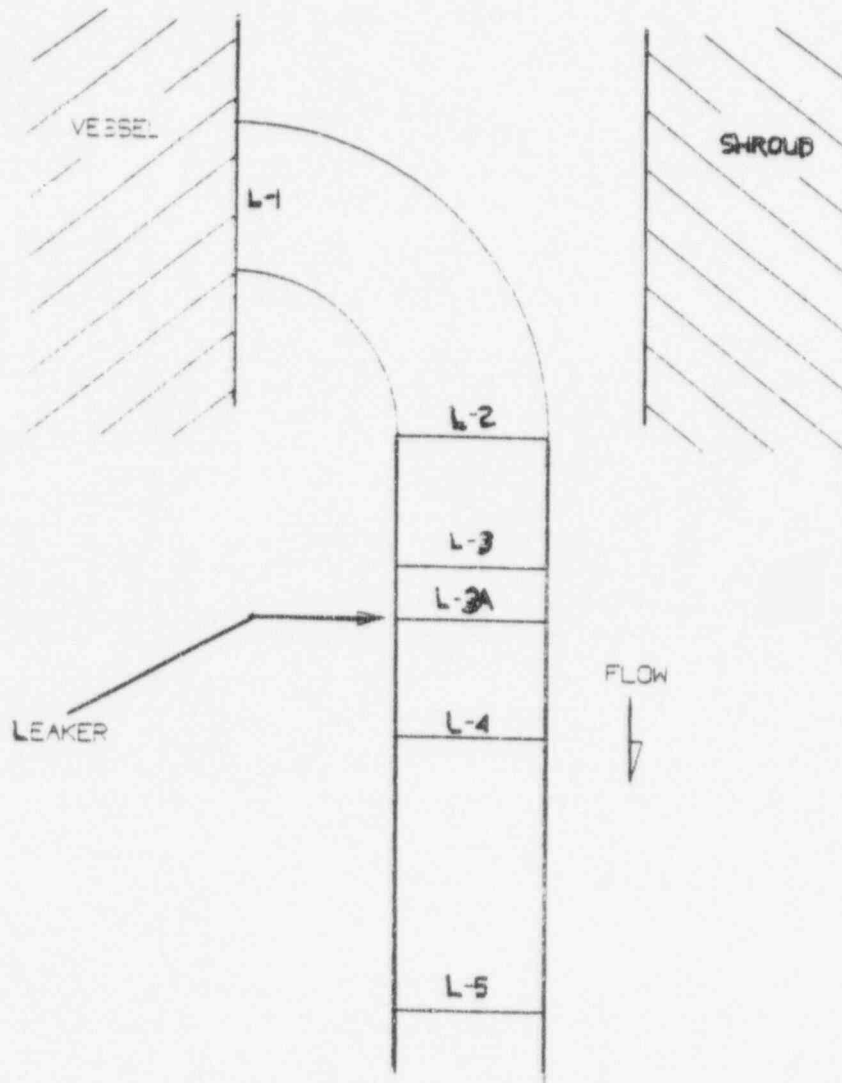


FIGURE 7