

# REGULATORY INFORMATION DISTRIBUTION SYSTEM (RIDS)

ACCESSION NBR: 8109080174 DOC. DATE: 81/09/03 NOTARIZED: NO DOCKET #  
 FACIL: 50-361 San Onofre Nuclear Station, Unit 2, Southern California 05000361  
 50-362 San Onofre Nuclear Station, Unit 3, Southern California 05000362  
 AUTH. NAME: BASKIN, K. P. AUTHOR AFFILIATION: Southern California Edison Co.  
 RECIP. NAME: MIRAGLIA, F. RECIPIENT AFFILIATION: Licensing Branch 3

SUBJECT: Forwards info summarizing feedwater ring damage, discussed at NRC 810731 meeting. Proposed feedwater ring mods render auxiliary feedwater initiation test unnecessary. Final design details for repair will be provided.

DISTRIBUTION CODE: B001S COPIES RECEIVED: LTR 1 ENCL 1 SIZE: 19  
 TITLE: PSAR/FSAR AMDTS and Related Correspondence

NOTES: L Chandler: all FSAR & ER amends. 1 cy: J Hanchett (Region V). 05000361  
 D Scaletti: 1 cy all envir info.  
 L Chandler: all FSAR & ER amends. 1 cy: J Hanchett (Region V). 05000362  
 D Scaletti: 1 cy all envir info.

ACTION:	RECIPIENT		COPIES		RECIPIENT	COPIES	
	ID CODE/NAME	LTR	ENCL	ID CODE/NAME		LTR	ENCL
ACTION:	A/D LICENSNG	1	0	LIC BR #3 BC	1	0	
	LIC BR #3 LA	1	0	ROOD, H.	04	1	
INTERNAL:	ACCID EVAL BR25	1	1	AUX SYS BR 27	1	1	
	CHEM ENG BR 11	1	1	CONT SYS BR 09	1	1	
	CORE PERF BR 10	1	1	EFF TR SYS BR12	1	1	
	EMRG PRP DEV 33	1	1	EMRG PRP LIC 36	3	3	
	EQUIP QUAL BR13	3	3	FEMA-REP DIV 39	1	1	
	GEOSCIENCES 28	2	2	HUM FACT ENG 40	1	1	
	HYD/GED BR 30	2	2	I&C SYS BR 16	1	1	
	I&E 06	3	3	LIC GUID BR 33	1	1	
	LIC QUAL BR 32	1	1	MATL ENG BR 17	1	1	
	MECH ENG BR 18	1	1	MPA	1	0	
	OELD	1	0	OP LIC BR 34	1	1	
	POWER SYS BR 19	1	1	PROC/TST REV 20	1	1	
	QA BR 21	1	1	RAD ASSESS BR22	1	1	
	REAC SYS BR 23	1	1	<u>REG FILE</u> 01	1	1	
	SIT ANAL BR 24	1	1	STRUCT ENG BR25	1	1	
	EXTERNAL:	ACRS 41	16	16	LPDR 03	1	1
NRC PDR 02		1	1	NSIC 05	1	1	
NTIS		1	1				

SEP 11 1981

SEP 11 1981

TOTAL NUMBER OF COPIES REQUIRED: LTR

63

52

ENCL

58

51

5

*Southern California Edison Company*

P. O. BOX 800  
2244 WALNUT GROVE AVENUE  
ROSEMEAD, CALIFORNIA 91770

K. P. BASKIN  
MANAGER OF NUCLEAR ENGINEERING,  
SAFETY, AND LICENSING

September 3, 1981

TELEPHONE  
(213) 572-1401

Director, Office of Nuclear Reactor Regulation  
Attention: Mr. Frank Miraglia, Branch Chief  
Licensing Branch No. 3  
U. S. Nuclear Regulatory Commission  
Washington, D.C.



Gentlemen:

Subject: Docket Nos. 50-361 and 50-362  
San Onofre Nuclear Generating Station  
Units 2 and 3

During a meeting with the NRC staff on July 31, 1981 in Bethesda, Maryland, SCE discussed the damage to the San Onofre Unit 2 Steam Generator No. 2 feedwater ring as a result of the secondary feedwater system water hammer test, including proposed modifications to the feedring and a revised waterhammer test simulating normal auxiliary feedwater operation.

Enclosure 1 contains a copy of the handouts provided to the NRC staff during the meeting. It should be noted that SCE has elected to use schedule 120 pipe for the feedwater rings for San Onofre Units 2 and 3 instead of replacing the originally used schedule 40 pipe. The other proposed modifications to the feedwater rings such as increasing the J-tube discharge area and modifications to the feedwater distribution box to increase its capability to withstand larger compressive loads will be implemented.

Consistent with a conversation between SCE (Mr. F. Nandy) and the NRC (Mr. B. Mann) on September 3, 1981, SCE considers that the above modifications render a test simulating automatic auxiliary feedwater initiation unnecessary.

SCE will provide the final design details for the feedwater ring repair and a detailed discussion of the basis for not repeating the feedwater hammer test.

If you have any questions or comments, please contact me.

Very truly yours,

Enclosure

8109080174 810903  
PDR ADDCK 05000361  
A PDR

Boo!  
5/11

JULY 31, 1981

MEETING AGENDA

SAN ONOFRE UNIT 2 FEEDWATER RING DAMAGE

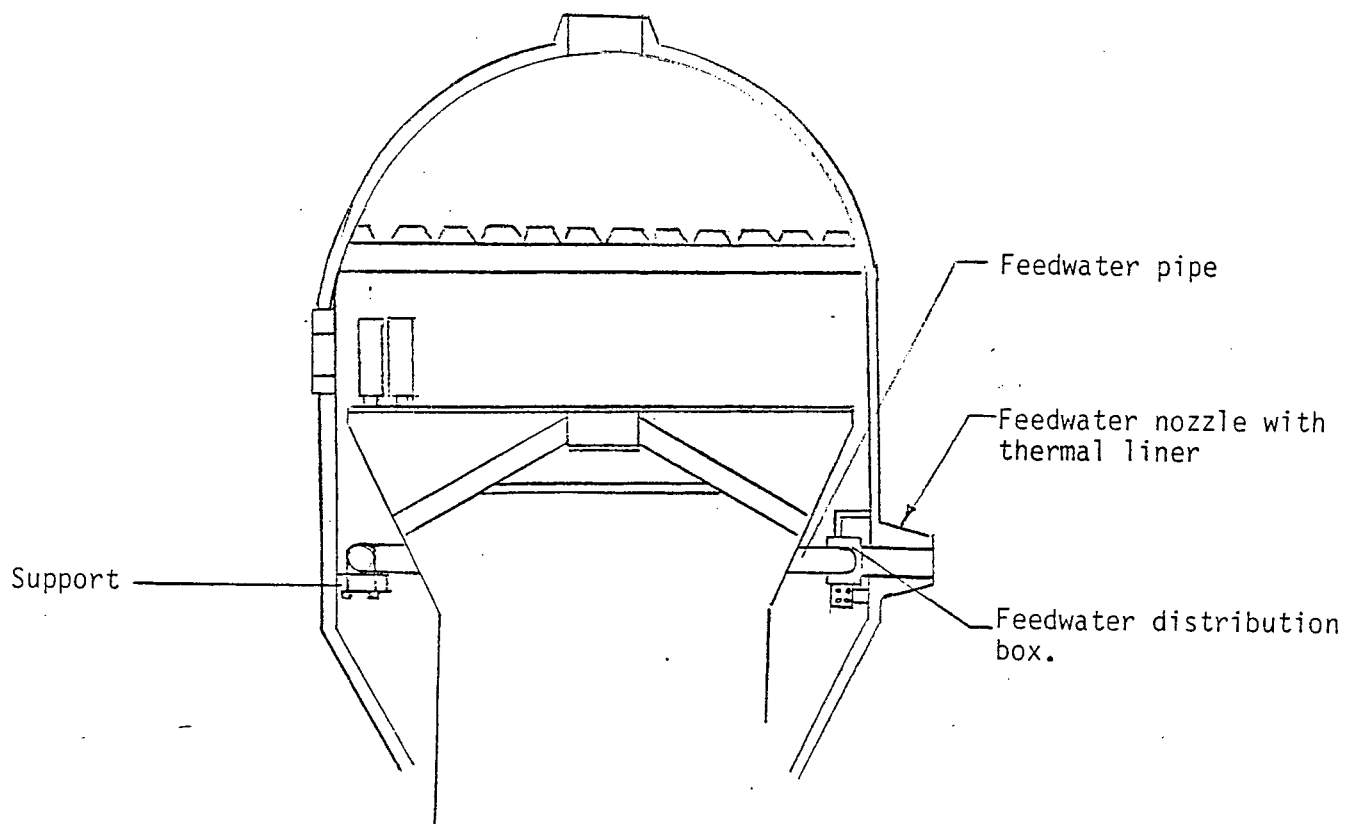
INTRODUCTION	F. NANDY
DAMAGE REPORT	J. SODERGREN
FEEDWATER HAMMER TEST	R. ROSENBLUM
DAMAGE MECHANISM	B. HEILKER
FEEDWATER RING REPAIR	J. SODERGREN
FEEDWATER RING INTERGRITY TEST	R. ROSENBLUM
----- QUESTIONS -----	
SUMMARY	F. NANDY

July 31, 1981

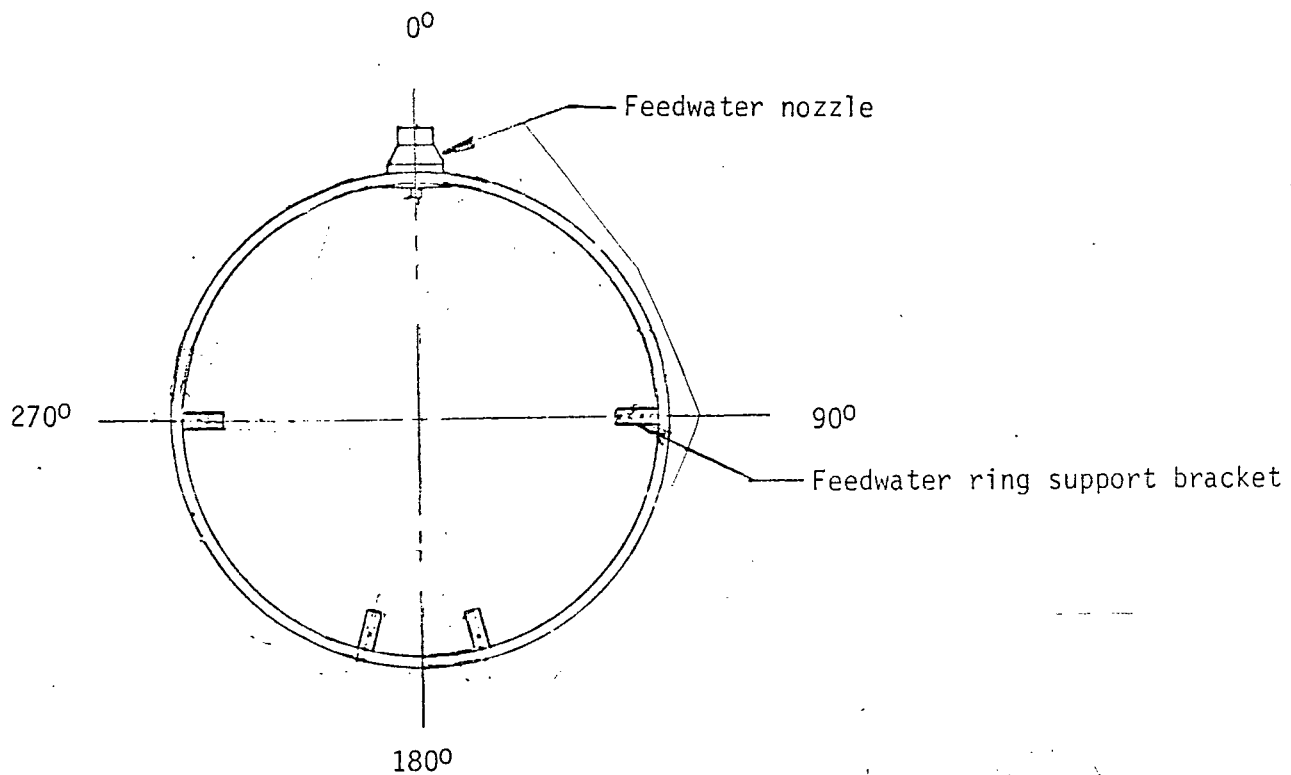
PRELIMINARY REPORT OF CONDITION OF  
FEEDWATER PIPE ASSEMBLY  
IN  
SAN ONOFRE UNIT 2, NO. 2  
STEAM GENERATOR

The damaged pipe is in Steam Generator E088 (SCE designation). The CE Chattanooga designation is Steam Generator 2. This Steam Generator is also referred to as the North Steam Generator.

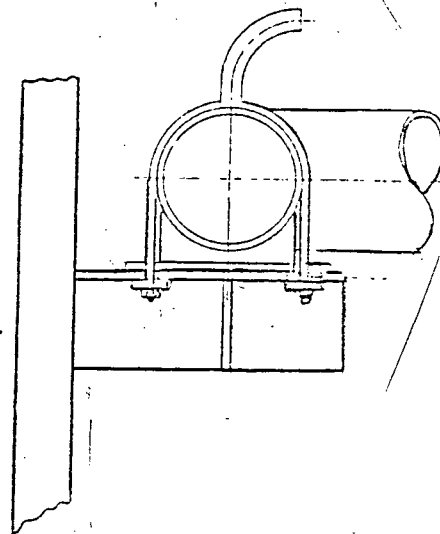
The feedwater pipe is located in the down comer approximately 75" below the Steam Separator Support Deck (Can Deck).



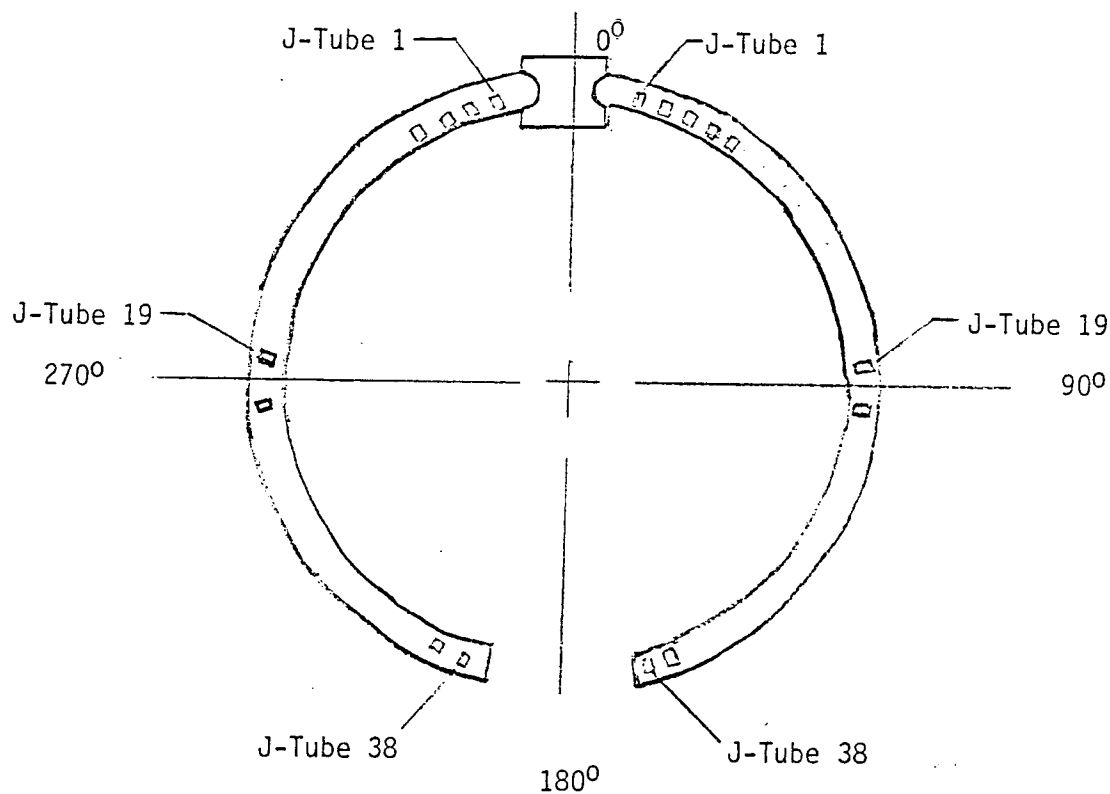
The feedwater pipe assembly is supported on four (4) brackets. These brackets are welded to the pressure boundary with full penetration welds. The brackets are located at the 90°, 166°, 194° and 270° locations. The feedwater nozzle and water distribution box is located at the 0° position.



Detail of Feedwater ring  
Support bracket

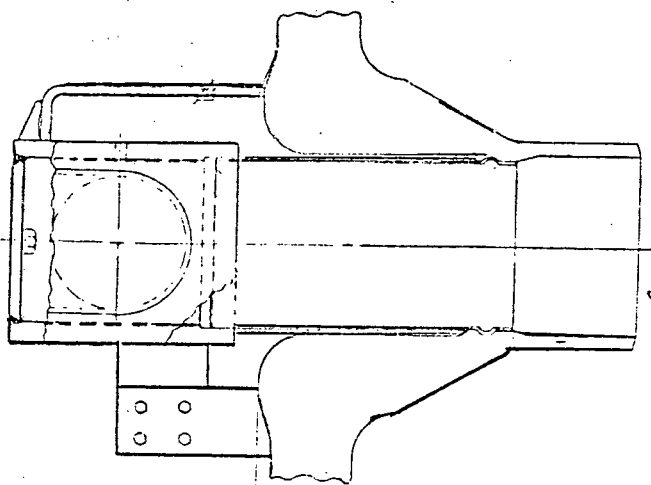


The feedwater pipe is fabricated from SA-106-Grade B, 12" schedule 40 pipe (nominal wall thickness 0.406"). The feedwater pipe assembly is made in two sections. These sections are referred to herein as the 0-90° section and the 0-270° section. The 0-90° section is supported at the feedwater distribution box and on brackets located at the 90° and 166° positions. The 0-270° section is supported at the feedwater distribution box and on brackets located at the 270° and 194° position.



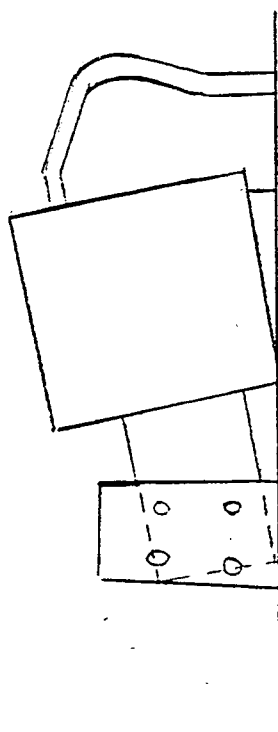
The discharge nozzles on top of the feedwater pipe are referred to as J-Tubes. There are 38 J-Tubes in each section of the feedwater pipe assembly. The J-Tubes are numbered starting at the feedwater distribution box. In the 0-90° section the numbering system is clockwise (as viewed from top of ring) and counter clockwise in the 0-270° section.

1. Condition Of The Feedwater Distribution Box



Original condition

Rotation in the  
plane of the  
paper. (Note: the  
rotation is greatly  
exaggerated)

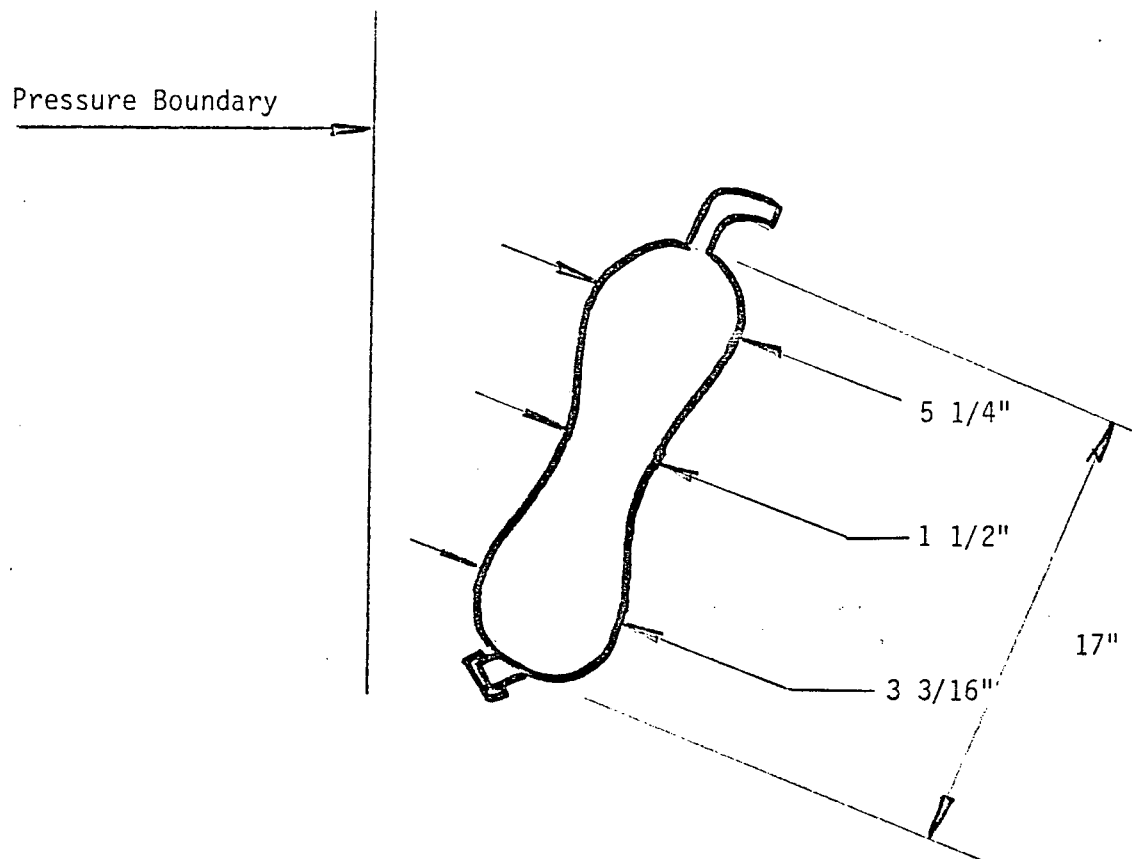


deformed condition

— All four bolts sheared off.

## 2. Condition Of Feedwater Pipe Assembly 0-90° Section

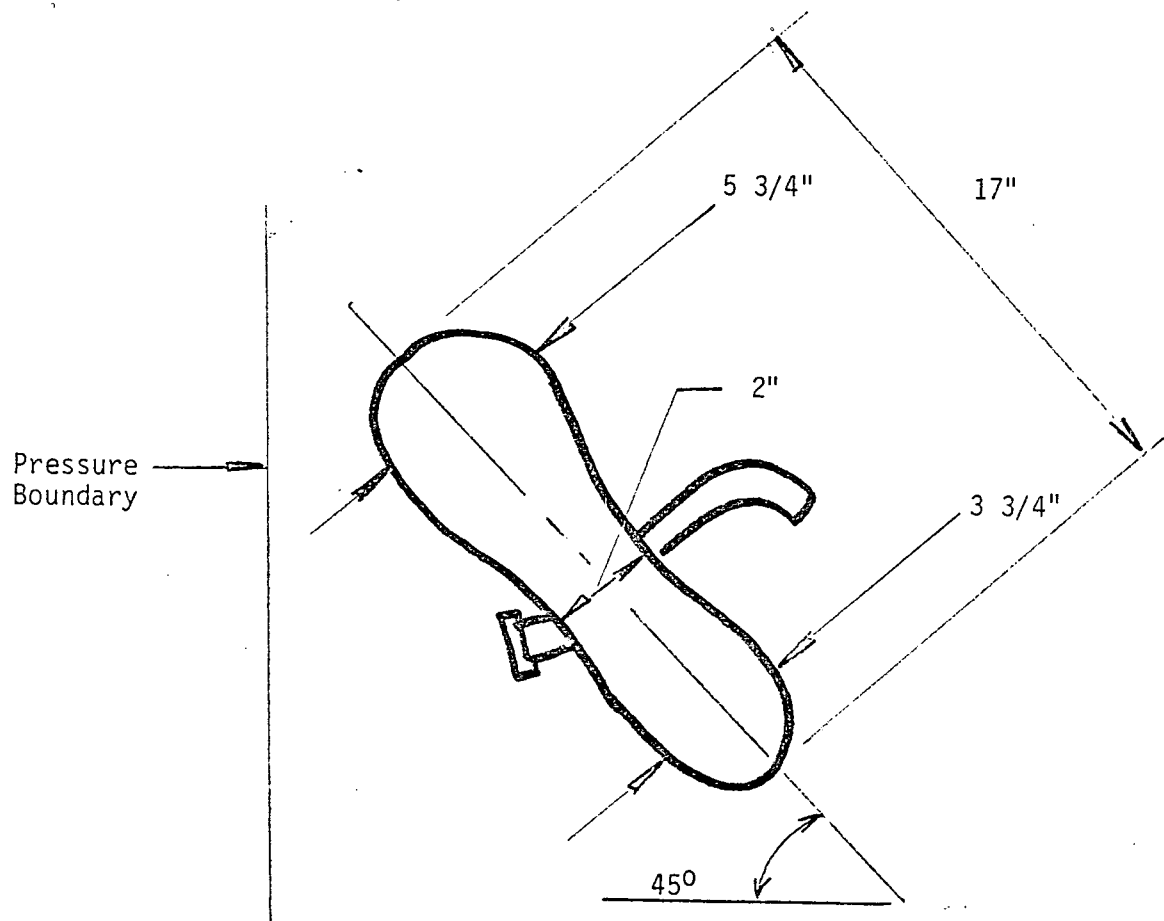
The visual deformation of the feedwater ring starts approximately 10" from the water distribution box (Pipe ovality checks indicate that the deformation starts about 2" from the box). The sketch below describes the condition of the pipe between J-Tubes 4 and 5.



The above condition is typical up to J-Tube 9 after which the deformation switches from vertical to horizontal.



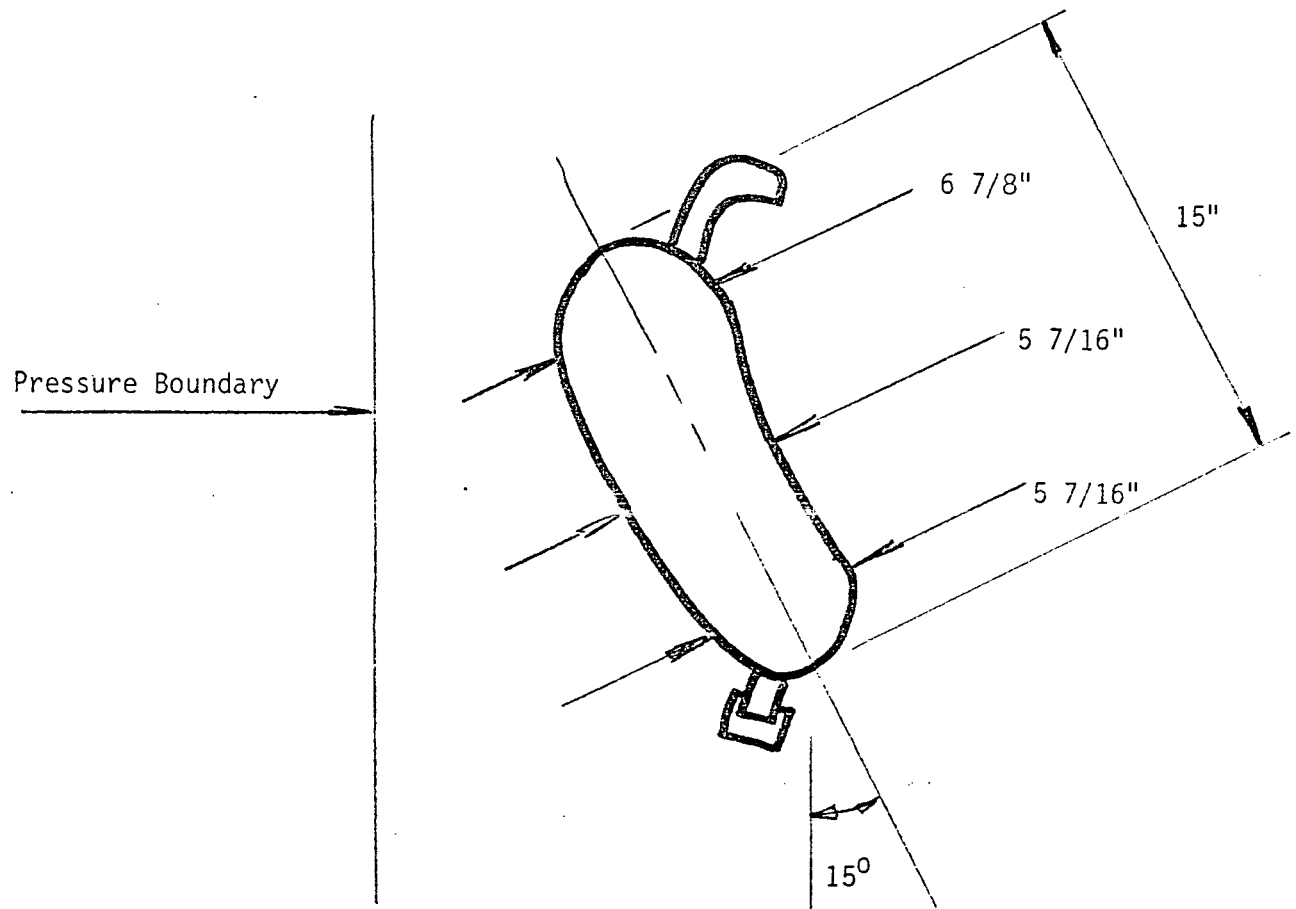
The sketch below describes the condition between J-Tubes 9 and 10.



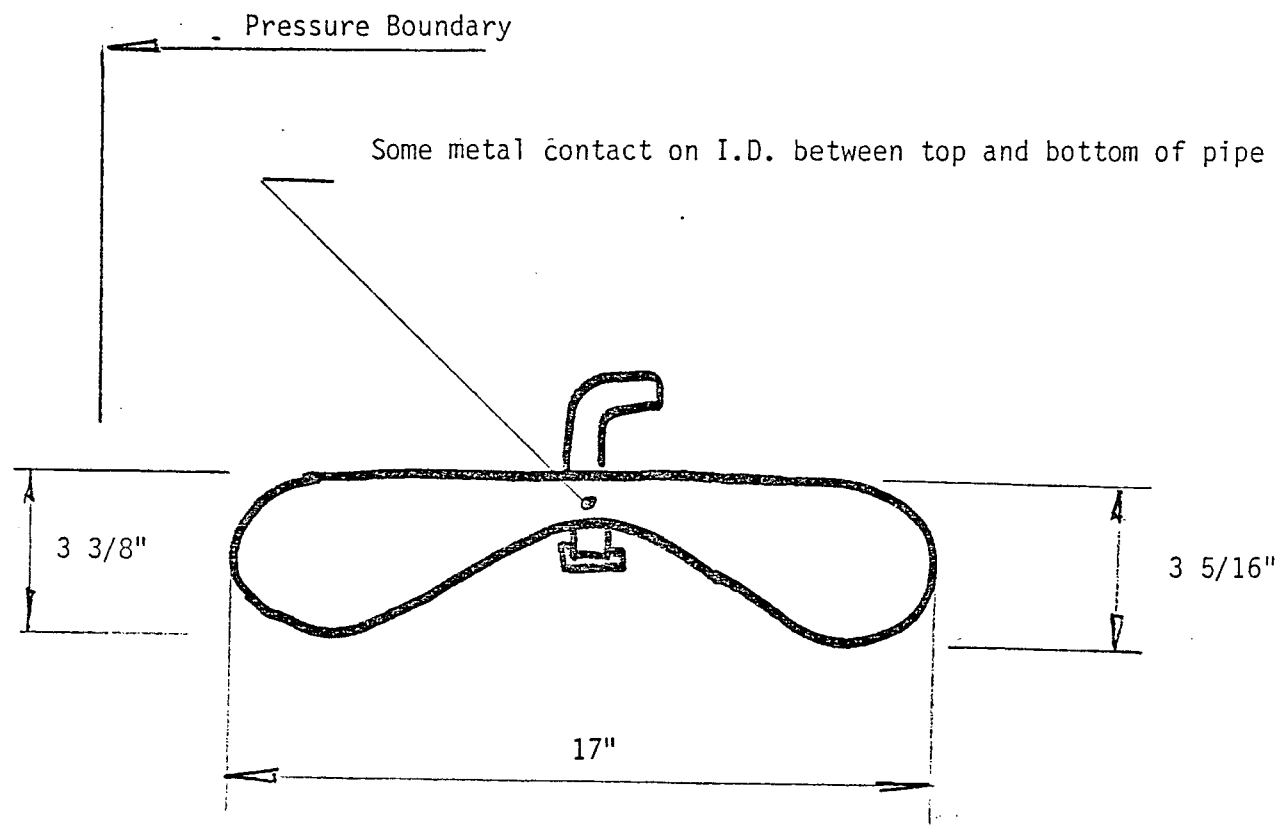
The above cross section is typical until approximate J-Tube 19 (cross section is rotating counter clockwise as J-Tube 19 is approached. J-Tube is located immediately prior to the 90° support bracket). At this location the pipe regains the original round shape. This condition remains to the end of the pipe section. There is no apparent deformation of the end plate.

3. Condition Of The Feedwater Pipe Assembly 0-270° section.

The visual deformation starts about 18" (between J-Tubes 2 and 3) from the water distribution box. The sketch below depicts the pipe cross section between J-Tubes 4 and 5.



The above cross section remains past J-Tube 6. The deformation switches from vertical to horizontal between J-Tubes 7 and 10. Past J-Tube 10 the deformation is horizontal. The sketch below depicts the pipe cross section between J-Tubes 14 and 15.



This condition is typical (although less crushing) up to J-Tube 20. Past J-Tube 21 the ring regains its original circular cross section.

#### 4. Condition of Support Brackets

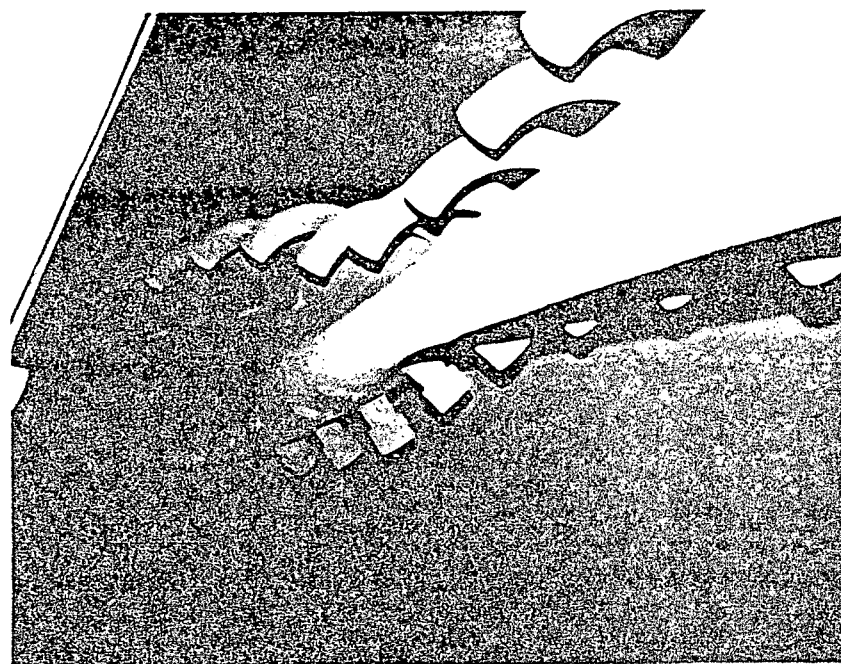
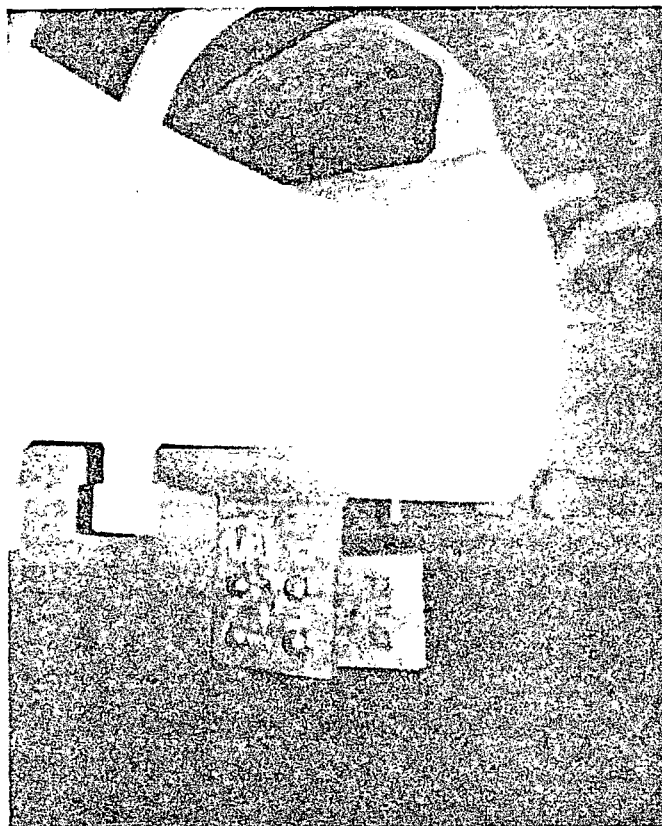
All brackets have been visually inspected and no defects were detected. A MT inspection revealed some minor indications in three of the six brackets. It is believed that these indications are not a result of the loading that occurred during the feed-water sparger collapse. The indications are probably porosity or slag and they can be removed. No welding to the pressure boundary is anticipated.

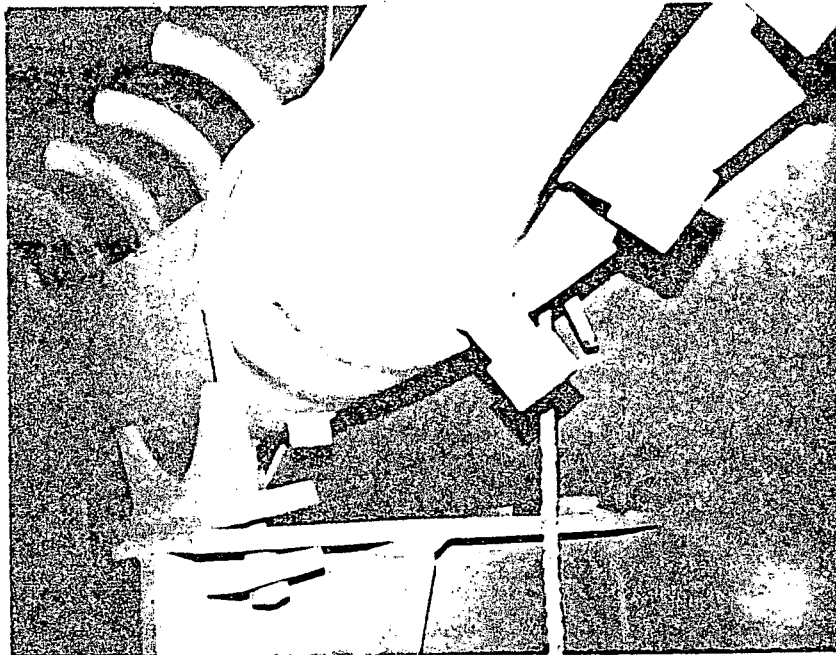
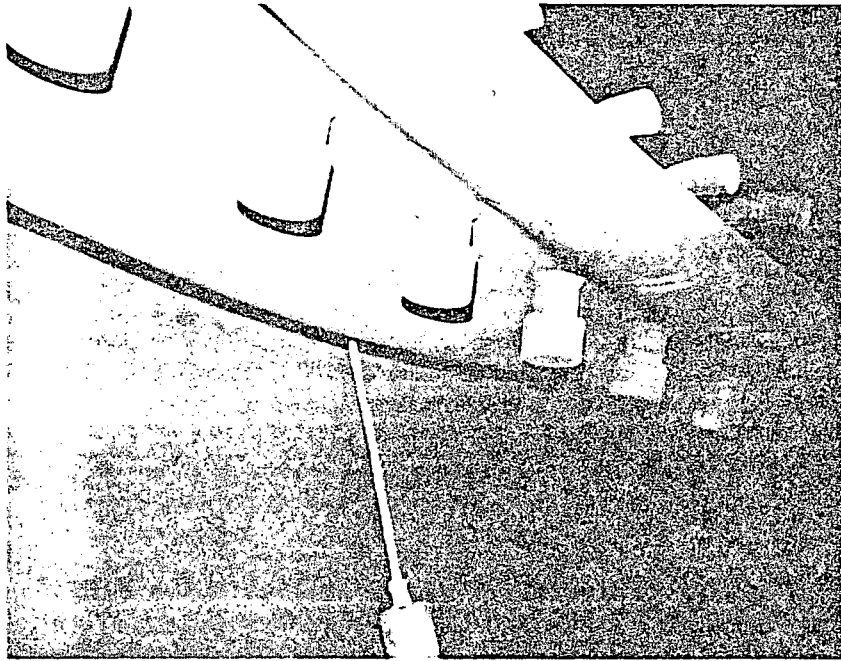
#### 5. Condition of U-bolts

- a) (@ 90° bracket). U-bolts were stretched upward beyond the elastic limit. Bolts did not fail but assembly loose.
- b) (@ 166° bracket). Condition is the same as described in 5(a) above.
- c) (@ 270° brackets).

Both U-bolts failed at the threads. U-bolts deformed beyond elastic limit.

- d) (@ 194° bracket).  
Condition is the same as described in 5-(c) above.





## TEST PERFORMED

### 14.2.12.72t Secondary Feedwater System Waterhammer Test

#### 14.2.12.72t.1 Objective

To demonstrate the absence of any significant waterhammer during steam generator water level recovery following the exposure of the feedwater sparger to a steam environment.

#### 14.2.12.72t.2 Prerequisites

- A. Appropriate construction activities have been completed.
- B. Appropriate permanently-installed instrumentation has been properly calibrated and is operable.
- C. All test instrumentation required is available and is properly calibrated.
- D. Auxiliary feedwater system is available.
- E. Main steam system is available.
- F. Appropriate ac and dc power sources are available.

#### 14.2.12.72t.3 Test Method

- A. Lower the steam generator water level to below the feedwater sparger by terminating feedwater flow.
- B. Maintain the steam generator water level below the feedwater sparger for a period of 1-1/2 to 2 hours, or until the auxiliary feedwater actuation point is reached. (No feedwater will be introduced into the generator through the sparger during this period.)
- C. Initiate maximum auxiliary feedwater flow to reflood the steam generator feeding.

#### 14.2.12.72t.4 Acceptance Criteria

- A. No significant noise or vibrations are observed during the test.
- B. Visual inspection indicates that the integrity of feedwater piping and supports have not been violated.

## FEEDWATER SPARGER BUCKLING CONSIDERATIONS

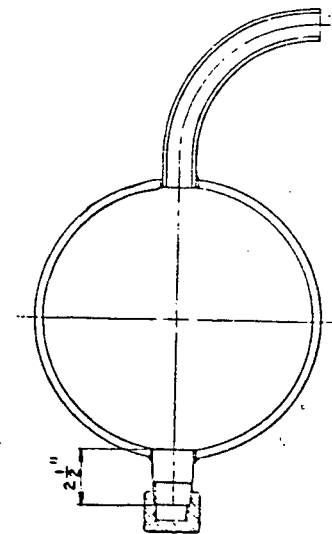
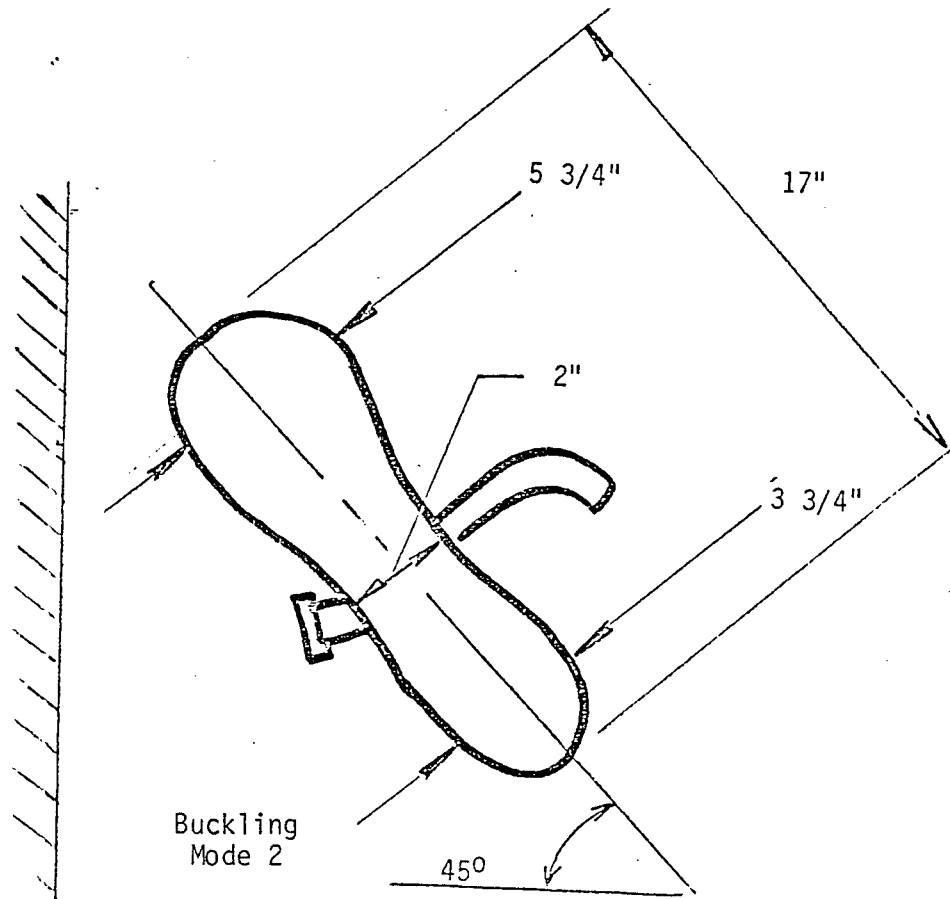
DAMAGE MECHANISM: SUDDENLY APPLIED DIFFERENTIAL PRESSURE

FACTORS WHICH REDUCE THE LOAD CARRYING CAPACITY OF THE  
PIPE:

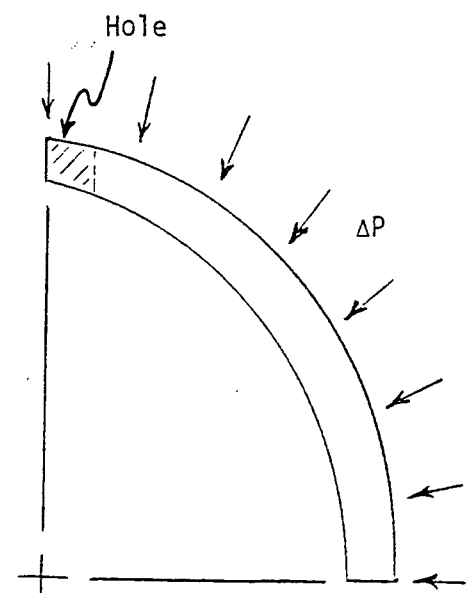
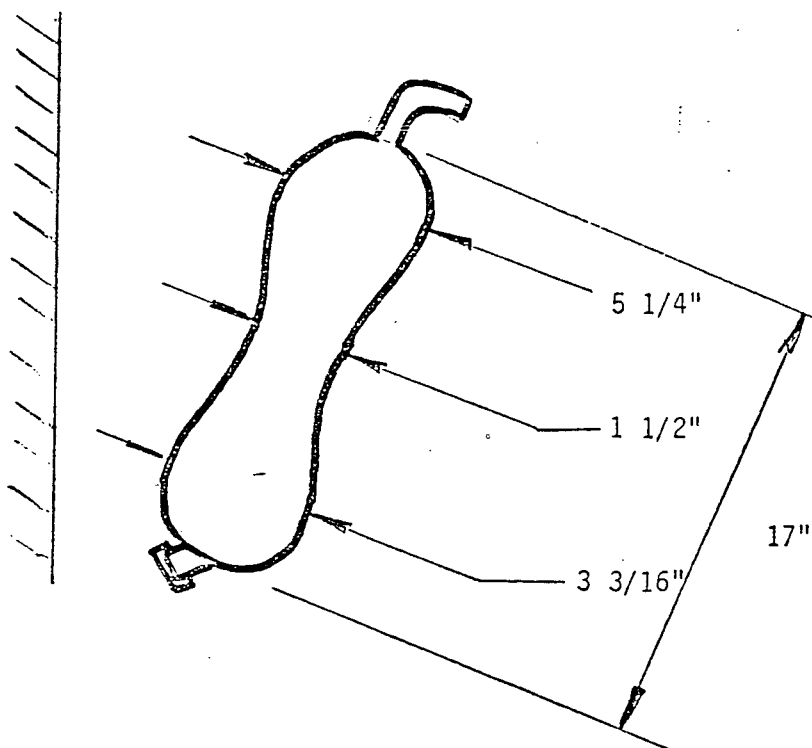
- (A) OVALITY
- (B) VARIATION IN THICKNESS
- (C) HOLES IN THE PIPE
- (D) UNBALANCED  $\Delta$  P LOADING



# FEEDWATER SPARGER COLLAPSE MODE



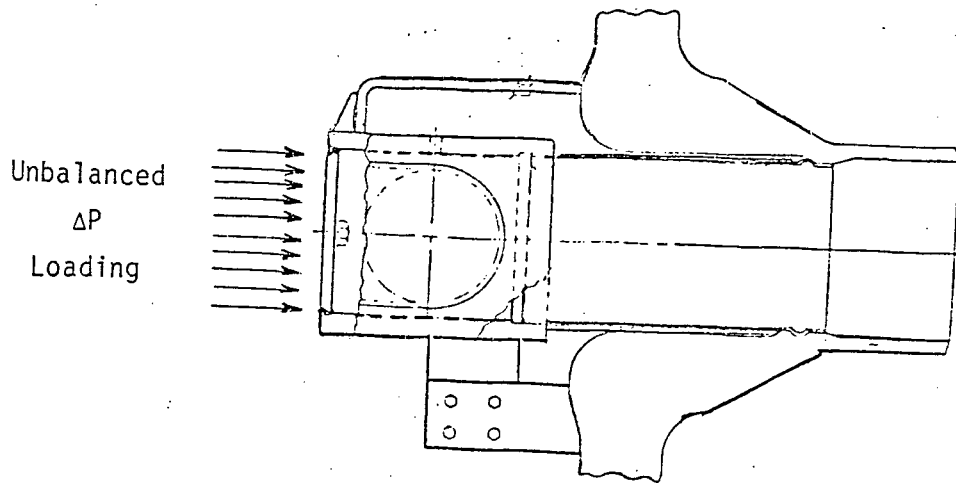
SECTION VIEW  
TYPICAL T6 PLACES



ELASTIC - PLASTIC  
ANALYSIS MODEL

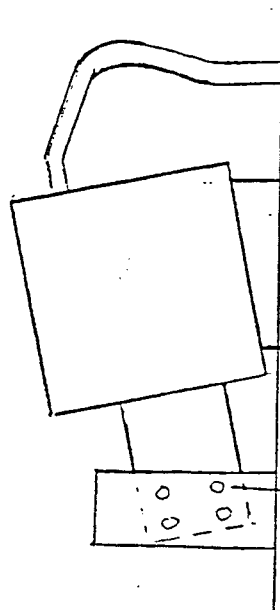
# FEEDWATER DISTRIBUTOR BOX SUPPORTS AND LOADING

## Feedwater Distribution Box



Original condition

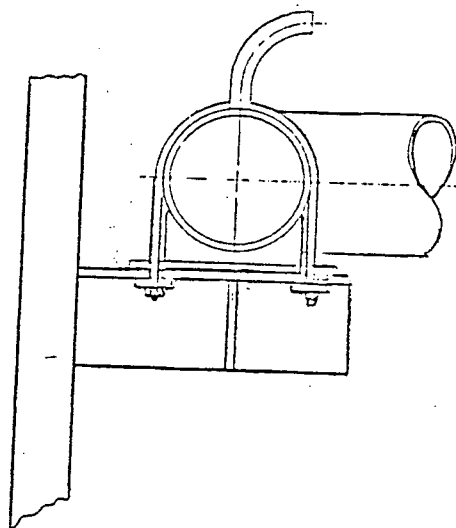
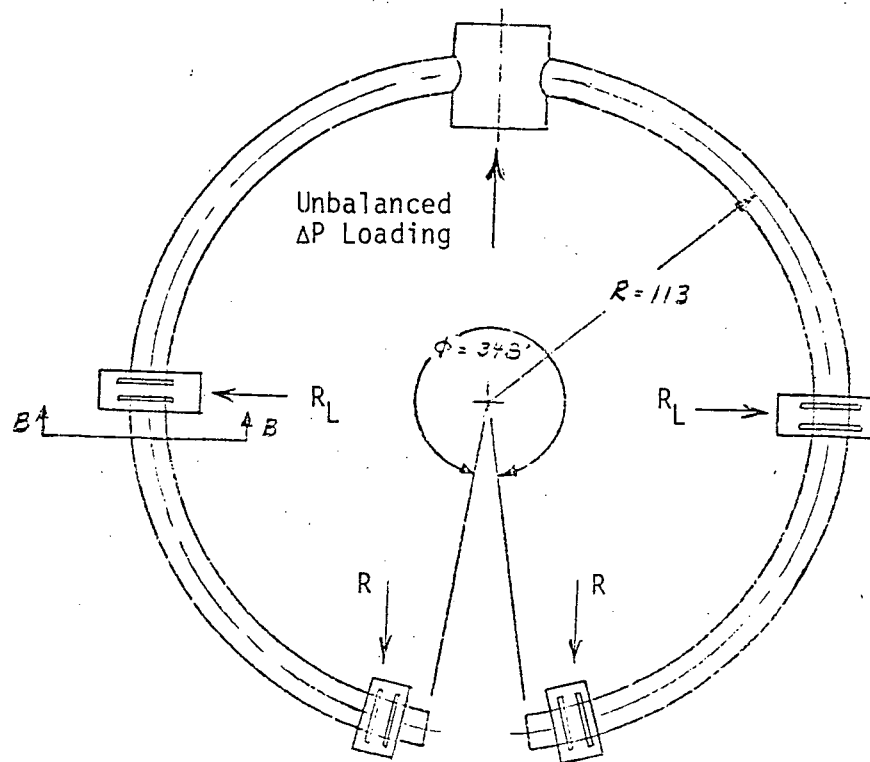
Rotation in the  
plane of the  
paper. (Note: the  
rotation is greatly  
exaggerated)



deformed condition

All four bolts sheared off.

# FEEDWATER SPARGER SUPPORTS AND SUPPORT LOADING



SECTION VIEW BB

## PROPOSED FEEDWATER RING INTEGRITY TEST

### 14.2.12.72t Secondary Feedwater System Waterhammer Test

#### 14.2.12.72t.1 Object

To demonstrate the absence of any significant waterhammer during steam generator water level recovery consistent with operating procedures for Auxiliary Feedwater System Operation.

#### 14.2.12.72t.2 Prerequisites

- A. Appropriate construction activities have been completed.
- B. Appropriate permanently-installed instrumentation has been properly calibrated and is operable.
- C. All test instrumentation required is available and is properly calibrated.
- D. Auxiliary feedwater system is available.
- E. Main steam system is available.
- F. Appropriate ac and dc power sources are available.

#### 14.2.12.72t.3 Test Method

- A. Lower the steam generator water level to below the feedwater sparger by terminating feedwater flow.
- B. Maintain the steam generator water level below the feedwater sparger, but within the level indication band for a period of approximately 30 minutes (no feedwater will be introduced into the generator through the sparger during this period).
- C. Initiate auxiliary feedwater flow to reflood the steam generator feeding, in accordance with normal operating procedures.

#### 14.2.12.72t.4 Acceptance Criteria

- A. No significant noise or vibrations are observed during the test.
- B. Visual inspection indicates that the integrity of feedwater piping supports and feedwater ring have not been violated.