ENCLOSURE 2

Consumers Power Company
Palisades Plant
Docket 50-255

PRESSURIZER SAFE END CRACK ACTION PLAN

October 7, 1993

PALISADES PLANT
PRESSURIZER SAFE END CRACK REPAIR ACTION PLAN
REVISION 0 10/07/93

APPROVALS:

Action Plan Revision 0: 10/7/93

Plant General Manager Date

PURPOSE:

The purpose of the Pressurizer Safe End Crack Repair Action Plan is to provide a document which identifies responsibilities, ensures necessary actions are completed prior to the plant startup, and ensures assignments for long term actions are made.

The Action Plan may only be modified with the approval of the Plant General Manager or his designated alternate.

Action Plan

1. Conduct an engineering evaluation of the failure.

   The specific elements of this engineering analysis include the following:

   a. Metallurgical analysis of the failed safe end to identify the cause of the crack.

   Metallurgical Analysis Complete and Crack Cause Evaluated

   NECO Mechanical, Civil, and Structural Manager

   b. Analysis of factors contributing to PWSCC in the pressurizer nozzle safe end. This includes evaluation of material properties and stresses that may have contributed to the failure. Piping stresses and weld residual stresses are being evaluated and will be reviewed by an independent third party.

   Analysis of Material Properties and Stresses Complete and Third Party Review Complete

   NECO Mechanical, Civil, and Structural Manager

   c. Evaluation of other nozzles safe ends in the primary coolant system, based on the engineering evaluation of the failure, to identify other locations which may be susceptible to the same failure cause. This evaluation includes both nozzles with Inconel 600 safe ends and other safe end materials. Contributing factors to PWSCC will also be evaluated for the safe ends that are identified as being susceptible to the same failure cause. This will include evaluation of material properties and stresses.

   Nozzle Safe End Evaluation Complete

   NECO Mechanical, Civil, and Structural Manager

d. Evaluation of appropriate non-destructive examination techniques to identify similar flaws in other susceptible safe ends.

Evaluation of NDE

Predictive Testing Services
Supervisor

2. Identify corrective actions for the specific safe end that failed.

An engineering evaluation of the repair to the pressurizer safe end, based on the root cause analysis of the failure, has shown that the lifetime of the repaired safe end well exceeds the length of the next operating cycle.

Corrective Actions of Safe End Failure Identified

NECO Mechanical, Civil,
and Structural Manager

3. Identify corrective actions for other safe ends that may be susceptible to the same failure.

Other safe ends that may be susceptible to the same failure will be inspected for flaws using appropriate non-destructive examination techniques.

NDE for Additional Safe Ends Identified, Documented, and Evaluated Satisfactorily

Predictive Testing Services
Supervisor

4. Complete necessary corrective actions to ensure safe operation of Palisades during the next operating cycle prior to returning the plant to service.

   a. Repair of the failed pressurizer safe end.

   Repair Complete

   _____
   Maintenance Manager

   b. Non-destructive examinations of other safe ends potentially susceptible to the same failure cause.

   Repair Complete and Acceptance NDE Satisfactory

   _____
   Predictive Testing Services
   Supervisor

5. Identify corrective actions necessary to ensure long term safe operation of Palisades.

   a. Engineering evaluation of additional repairs which may be necessary for long term operation of the pressurizer safe ends will be performed and additional repairs and corrective actions, if required, will be completed by the end of the next refueling shutdown.

   Assign Action for the Above Corrective Actions for Next Refueling Outage

   _____
   NECO Mechanical, Civil,
   and Structural Manager

b. Further evaluation of non-destructive examination techniques in light of the pressurizer safe end crack will be conducted. Enhanced ultrasonic techniques will be employed in an augmented inspection program for safe ends beginning in the next refueling shutdown. To provide assurance that we are performing the most effective NDE possible the following actions will be completed:

Assign Action to Evaluate NDE Techniques and Employ Them in Augmented Inspection Program in Next Refueling Outage

Predictive Testing Services Supervisor

6. Technical Report Prepared, Finalized.

NECO Mechanical, Civil and Structural Manager

7. Send Report to NRC.

Safety and Licensing Manager

8. Hold Meeting with NRC to Review Technical Report.

Safety and Licensing Manager

9. Provide NRC with crack tip sample for independent sample analysis.

Predictive Testing Service Supervisor

10. PRC Review of Technical Report and Recommended Approvals.

PRC Chairman

11. Authorization For Leaving Cold Shutdown.

Plant General Manager

ENCLOSURE 3

Consumers Power Company
Palisades Plant
Docket 50-255

PRESSURIZER SAFE END CRACK
NDE SUMMARY

October 7, 1993

		WALL THICKNESS			SURFACE PROFILE							
WELD #	DIA	P/EL	SE/F	N	ID	OD	RT C/L	OD PT	ID PT	IGSCC UT	CODE UT	COMMENTS
PORV #1 SE TO NOZZLE	6"		1.5"	1.8"	Smooth Bore	Moderate Transition	Done	Done	Done	No*	No*	*Configuration precludes UT
WELD #1A SE TO PIPE	4-6"	.438"	1.5"		Taper Bore	Heavy Transition	Done	Done	Done	No*	No*	New Weld *Configuration precludes UT
SPRAY #20 ELBOW TO SE #21	4"	.625"	.625"		As Welded	No Transition	Done	Done	No	No*	No*	*Configura-tion precludes UT
#21 NOZZLE TO SE	4-8"		.625"	2.5"	Smooth Bore	Heavy Transition	Done	Done	No	No*	No*	*Configura-tion precludes UT
RELIEF VALVES												
RV-1039 #1 NOZZLE TO IN FLANGE	6"		1.3"	1.6"	Smooth Bore	Moderate Transition	Done	Done	Done	Done	No	
RV-1040 #1 NOZZLE TO IN FLANGE	6"		1.3"	1.6"	Smooth Bore	Moderate Transition	Done	Done	Done	Done	No	
RV-1041 #1 NOZZLE TO IN FLANGE	6"		1.3"	1.6"	Smooth Bore	Moderate Transition	Done	Done	Done	Done	No	

Do = Scheduled But Not Complete
Done = Completed
No = Decision Made Not To Examine

P/EL = Pipe or Elbow
SE = Safe End
N = Nozzle
F = Flange

Effective as of October 7, 1993

		WALL THICKNESS			SURFACE PROFILE							
WELD #	DIA	P/EL	SE/F	N	ID	OD	RT C/L	OD PT	ID PT	IGSCC UT	CODE UT	COMMENTS
PORV PIPING WELDS												
WELD #2 PIPE TO PIPE	4"	.438			As-Welded	No Transition	Done	Done	No	No	No	New Weld
WELD #3 PIPE TO ELBOW	4"	.438			As-Welded	No Transition	Done	Done	No	No	No	New Weld
WELD #4 ELBOW TO PIPE	4"	.438			As-Welded	No Transition	Done	Done	No	No	No	
WELD #5 PIPE TO ELBOW	4"	.438			As-Welded	No Transition	Done	Done	No	No	No	
WELD #6 ELBOW TO PIPE	4"	.438			As-Welded	No Transition	Done	Done	No	No	No	

Do = Scheduled But Not Complete
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No = Decision Made Not To Examine

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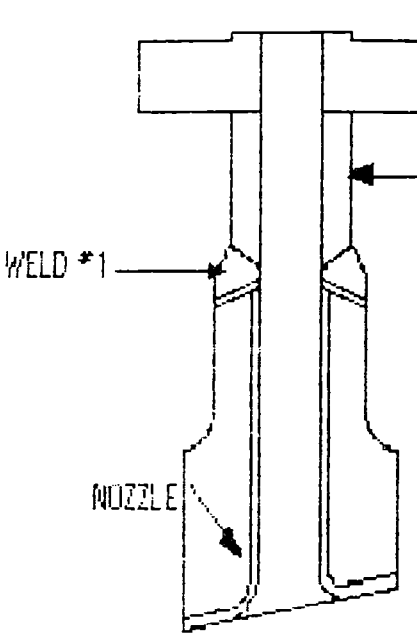
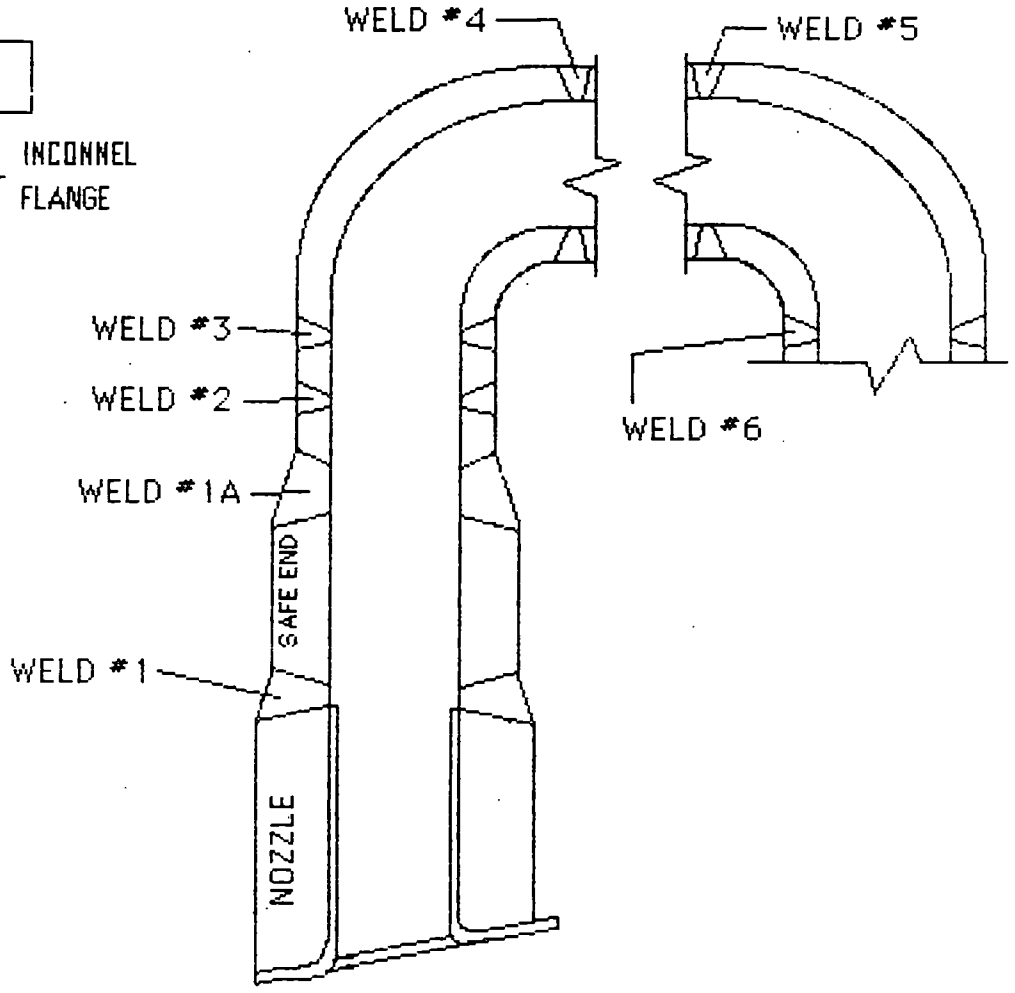
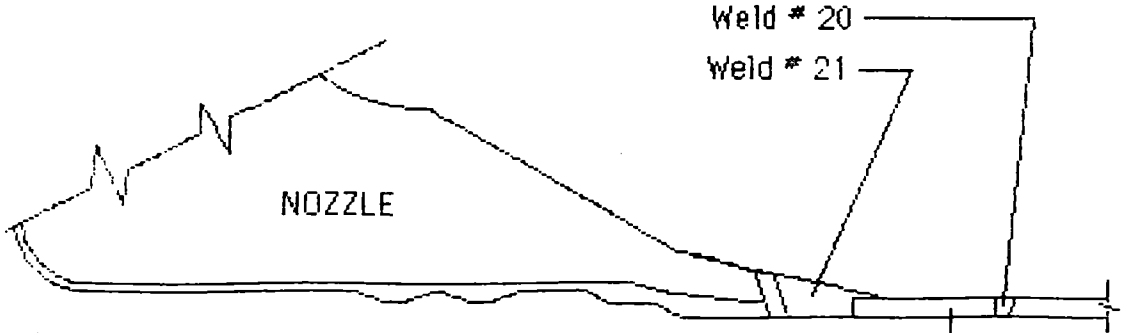
PRESSURIZER RELIEF VALVE NOZZLE ASSEMBLY





PORV NOZZLE ASSEMBLE



SPRAY NOZZLE ASSEMBLE

October 8, 1993

THE ATTACHED TWO DOCUMENTS (ONE OF WHICH IS PROPRIETARY) ARE REFERENCES LISTED IN CONSUMERS 10/7/93 LETTER FROM SLADE TO NRC DOCUMENT CONTROL DESK. THESE DOCUMENTS WERE SENT TO NRC AT NRC'S REQUEST AND SHOULD BE DOCKETED ALONG WITH THE INCOMING LETTER.

THANK YOU.

CAROLE JAMERSON, PD3-1
504-1337

OUTLINE

- *PRESENT SITUATION*
- *CORRELATION ANALYSIS*
  - *PRESSURIZER NOZZLES*
  - *TUBE MATERIAL*
  - *THEORETICAL MODEL*
- *WEIBULL FAILURE MODEL*
  - *ESTIMATION OF PARAMETERS*
  - *DEVELOPMENT OF EXTREMAL MODEL*
  - *ESTIMATION OF BOUNDS FOR FIRST FAILURES*
- *APPLICATION TO CRDM LIFE PREDICTION ANALYSIS*
  - *CASE 1 : 50 KSI MATERIAL*
  - *CASE 2 : 36 KSI MATERIAL*
- *CONCLUSIONS*

PRESENT SITUATION

- *RECENT HISTORY*
- *STATUS OF PRESSURIZER NOZZLES*
  - *FIELD FAILURES EVEN IN LEAST SUSCEPTIBLE HEATS*
- *STATISTICAL QUANDRY*
  - *ONLY INITIAL FAILURE INFORMATION AVAILABLE*
  - *DIFFICULTY IN DEVELOPING OVERALL ASSESSMENT*