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Palisades Nuclear Plant: 27780 Blue Star Memorial Highway, Covert, MI 49043

G B Slade
General Manager

November 2, 1993

Nuclear Regulatory Commission
Document Control Desk
Washington, DC 20555

DOCKET 50-255 - LICENSE DPR-20 - PALISADES PLANT - LICENSEE EVENT REPORT
93-011 - PRESSURIZER TEMPERATURE ELEMENT CRACK RESULTS IN PCS LEAKAGE

Licensee Event Report (LER) 93-011 is attached. This event is reportable in
accordance with 10 CFR 50.73(a)(2)(ii).

Gerald B Slade
General Manager

CC Administrator, Region III, USNRC
NRC Resident Inspector - Palisades

Attachment

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A CMS ENERGY COMPANY

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LICENSEE EVENT REPORT (LER)

FACILITY NAME (1) Palisades Plant	DOCKET NUMBER (2) 0 5 0 0 0 2 5 5	PAGE (3) 1 OF 0 4
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TITLE (4) **PRESSURIZER TEMPERATURE ELEMENT CRACK RESULTS IN PCS LEAKAGE**

EVENT DATE (5)			LER NUMBER (6)			REPORT DATE (8)			OTHER FACILITIES INVOLVED (8)		
MONTH	DAY	YEAR	YEAR	SEQUENTIAL NUMBER	REVISION NUMBER	MONTH	DAY	YEAR	FACILITY NAMES		
1	0	9	9	3	0	1	1	0	N/A		
9	3	9	3	1	0	1	1	0	N/A		
9	3	9	3	1	0	1	1	0	N/A		

OPERATING MODE (9) N	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(c)	50.73(a)(2)(iv)	73.71(b)						
	20.406(a)(1)(i)	50.36(c)(1)	50.73(a)(2)(v)	73.71(c)						
	20.406(a)(1)(ii)	50.36(c)(2)	50.73(a)(2)(vii)	OTHER (Specify in Abstract below and in Text, NRC Form 386A)						
	20.406(a)(1)(iii)	50.73(a)(2)(i)	50.73(a)(2)(viii)(A)							
	20.406(a)(1)(iv)	X 50.73(a)(2)(ii)	50.73(a)(2)(viii)(B)							
20.406(a)(1)(v)	50.73(a)(2)(iii)	50.73(a)(2)(ix)								

LICENSEE CONTACT FOR THIS LER (12)

NAME William L. Roberts	TELEPHONE NUMBER
	AREA CODE: 6 1 6 7 6 4 - 8 9 1 3

COMPLETE ONE LINE FOR EACH COMPONENT FAILURE DESCRIBED IN THIS REPORT (13)

CAUSE	SYSTEM	COMPONENT	MANUFACTURER	REPORTABLE TO NPRDS	CAUSE	SYSTEM	COMPONENT	MANUFACTURER	REPORTABLE TO NPRDS

SUPPLEMENTAL REPORT EXPECTED (14)

<input type="checkbox"/> YES <i>if yes, complete EXPECTED SUBMISSION DATE</i>	<input checked="" type="checkbox"/> NO	EXPECTED SUBMISSION DATE (15)	MONTH 	DAY 	YEAR
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ABSTRACT (Limit to 1400 spaces, i.e., approximately fifteen single-space typewritten lines) (16)

On October 9, 1993, at approximately 0900 hours, the plant was in cold shutdown and beginning heat up. Inspection of the pressurizer upper temperature nozzle penetration (TE-0101) found it to be leaking. Subsequent inspection of the lower temperature nozzle penetration (TE-0102) found it to be leaking also. The cause of this event has been attributed to primary water stress corrosion cracking of the Inconel 600 nozzle material.

Other similar penetrations in the PCS were inspected and none showed evidence of any past or present leakage. The two leaking pressurizer temperature nozzle penetrations were repaired. A comprehensive Inconel 600 inspection and maintenance program will be developed for the Palisades plant.

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EVENT DESCRIPTION

On October 9, 1993, at approximately 0900 hours, the plant was in cold shutdown and beginning heat up following the repair of the pressurizer relief valve nozzle safe end crack. The primary coolant system was at 250 psia pressure and approximately 85°F. Inspections of the pressurizer found the upper pressurizer temperature penetration (TE-0101) leaking. The primary coolant system was depressurized and plans were made for repair or replacement of the leaking penetration nozzles and augmented inspections of similar locations in the PCS. Inspections of other pressurizer penetrations and selected PCS hot and cold leg piping temperature nozzle penetrations were made. During these follow-up inspections the lower pressurizer temperature penetration (TE-0102) was also discovered to be leaking. Weld repairs were eventually completed for the two leaking penetrations. No other penetrations that were inspected showed evidence of any past or present leakage.

This event is reportable to the NRC in accordance with 10 CFR 50.73(a)(2)(ii) as an event that resulted in one of the nuclear power plants principal safety barriers being seriously degraded.

CAUSE OF THE EVENT

The cause of the nozzle cracking has been attributed to primary water stress corrosion cracking of the pressurizer temperature penetration Inconel 600 nozzle material. The cracking is similar in orientation and extent to the axial cracks that have been observed in pressurizer heater sleeves and instrument nozzles in several other nuclear power plants in this country and abroad. Similar cracking has occurred in heater sleeves and instrument nozzles in the Calvert Cliffs-2 pressurizer, as well as pressurizer instrument nozzles at San Onofre-3, St. Lucie-2, Arkansas Nuclear One-1 and several Electricite de France plants. All of these previous events have been associated with partial penetration welds (J-weld) similar to those used to attach the Palisades Inconel pressurizer temperature nozzles to the pressurizer shell.

Eddy current examination of temperature instrumentation nozzle TE-0101 indicated four axial cracks beginning near the structural "J weld" to the pressurizer and each extending a length of approximately one-half inch towards the outside of the pressurizer (see Figure 1). The four axial cracks were located about equidistant around the circumference of the nozzle. Similar cracks are suspected in instrument nozzle TE-0102, although these cracks were not confirmed by eddy current examination due to the difficulties and significant dose associated with performing an examination of this nozzle.

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ANALYSIS OF THE EVENT AND SAFETY SIGNIFICANCE

Extensive analyses of pressurizer heater sleeve and instrument nozzle failures have been performed by the Combustion Engineering Owners Group and provided to the Nuclear Regulatory Commission (CE NPSD-690-P, "Evaluation of Pressurizer Penetrations and Evaluation of Corrosion after Unidentified Leakage Develops"). These analyses have shown that:

- Circumferential cracking leading to catastrophic failure of a heater sleeve or instrumentation nozzle is not a credible failure mode.
- If primary water stress corrosion cracking occurs in heater sleeves or instrument nozzles, the cracks will be axial and located near the J-weld. In addition, the cracks will be contained within the pressurizer shell.
- Axial cracks of two inches in length, which are greater than any cracks previously observed in other plants (as well as those observed in Palisades instrument nozzle TE-0101), will not exhibit unstable crack growth due to mechanical loading. Some stress corrosion crack propagation may continue, resulting in increased leakage that will gradually increase with time and thus will be detected.
- Visual inspection of the pressurizer heater sleeve and instrument nozzle areas is the best method of detecting a leaking sleeve or nozzle or for detecting damage to the pressurizer shell as a result of boric acid corrosion.

Given that the Palisades TE-0101 instrument nozzle cracking has been confirmed by eddy current examination to be similar in orientation and extent to that observed in other plants, and that analysis of the cracks in these other plants has shown that a catastrophic failure of the instrument nozzle will not occur and that the leakage from such cracks will be detected before any significant damage to the pressurizer shell has occurred, it is concluded that the event did not involve a significant safety concern.

CORRECTIVE ACTION

Short Term Actions

The following corrective actions were completed prior to start-up from the outage.

- Both upper and lower pressurizer temperature nozzles (TE-0101 and TE-0102) were repaired by installation of a weld pad on the outside of the pressurizer shell (see figures 1 and 2 for TE-0101 and TE-0102 respectively). The following NDE examinations were performed in conjunction with these repairs.

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Prior to the repair, the external area of the pressurizer surrounding the temperature nozzle was MT (magnetic particle test) and UT (Ultrasonic Test) tested. Following the repair, the repair area was PT (Dye penetrant test) tested while the area of the pressurizer surrounding the repair was MT and UT tested. Since the temperature nozzle well was removed from TE-0101, the nozzle was eddy current tested before and after the repair process. Also, after the repair was complete and the well re-installed in the TE-0101 nozzle, the thermowell to nozzle seal weld was PT tested. All test results were acceptable.

B. The following expanded inspection scope was completed during the outage to ensure no additional leaks existed:

- 1) The four upper pressurizer level nozzles were PT and RT tested (8 welds total) with satisfactory results.
- 2) The four lower pressurizer level nozzles and heater penetrations (120) were visually inspected for leakage with no evidence of leakage apparent.
- 3) A visual leakage inspection was performed on 22 primary coolant system piping nozzles of similar configuration or construction to the pressurizer temperature nozzles (i.e., PCS cold and hot leg RTDs). None of the inspected nozzles were leaking.

A summary of the NDE examinations are shown in Table 1 attached.

Long Term Actions

- C) Permanent repair of instrument nozzles TE-0101 and TE-0102 will be evaluated prior to the next refueling shutdown and modifications will be completed as necessary to assure long term integrity of the instrument nozzles.
- D) A comprehensive Inconel 600 inspection and maintenance program for the Palisades plant will be developed.

ADDITIONAL INFORMATION

LER 93-009 dated October 15, 1993, reported a leak in the pressurizer relief valve nozzle which had resulted from a crack in the Inconel 600 safe end of the nozzle.

TABLE 1

NDE PERFORMED FOLLOWING PRESSURIZER TEMPERATURE PENETRATION LEAKS

Description	VT	MT	PT	RT	UT	ECT
TE-0101 nozzle prior to repair	X	X*			X*	X
TE-0101 nozzle after repair		X*	X		X*	X
TE-0101 nozzle to thermowell after repair			X			
TE-0102 nozzle prior to repair	X	X*			X*	
TE-0102 nozzle after repair		X*	X		X*	
4 upper pressurizer level nozzles (8 welds total)	X		X	X		
4 lower pressurizer level nozzles	X					
120 pressurizer heater sleeves	X					
22 PCS hot and cold leg RTD nozzles	X					

* Base metal areas around nozzles

Pressurizer
Temperature
Element TE-0101
Nozzle
Arrangement

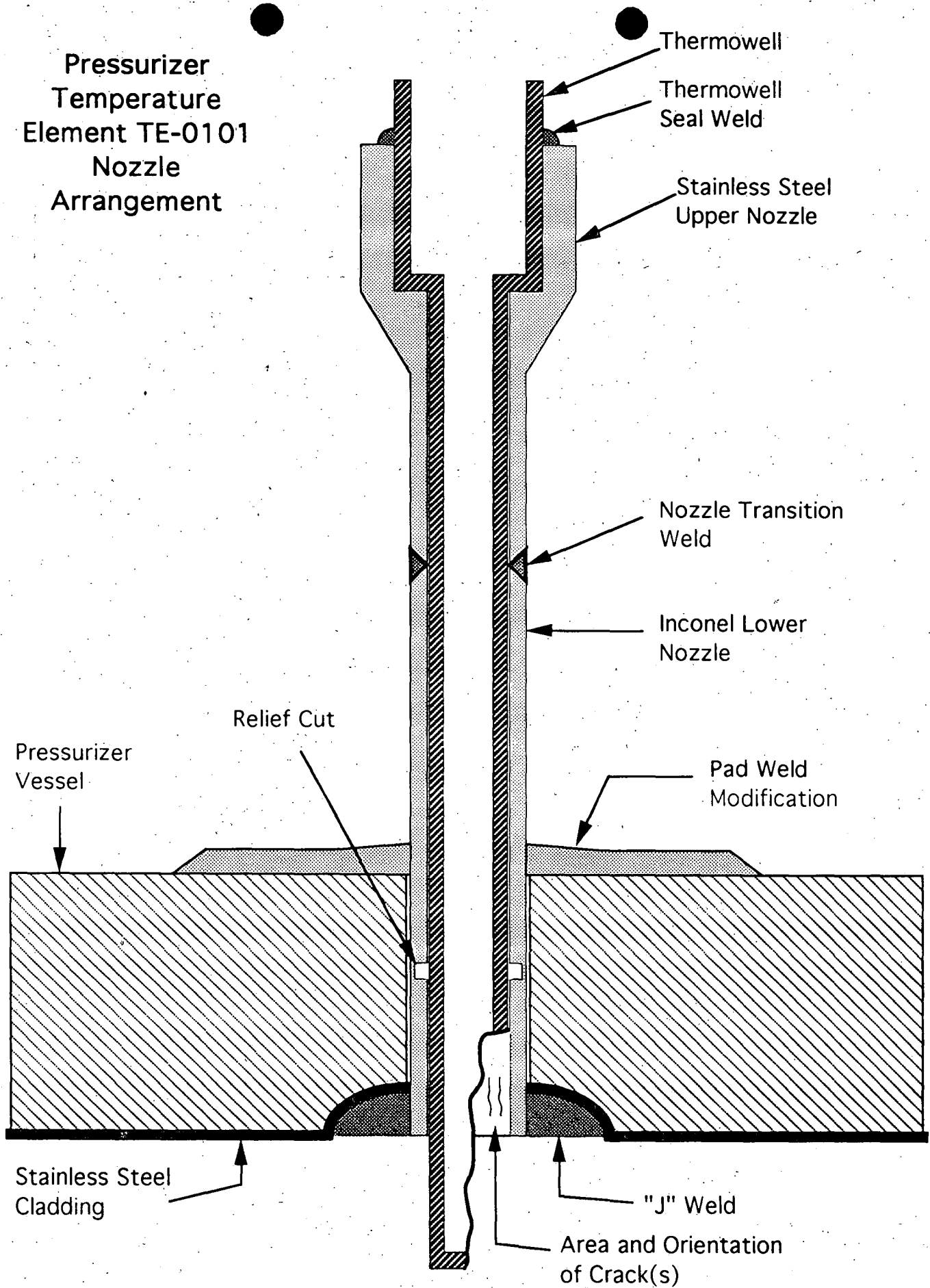


Figure 1

Pressurizer
Temperature
Element TE-0102
Nozzle
Arrangement

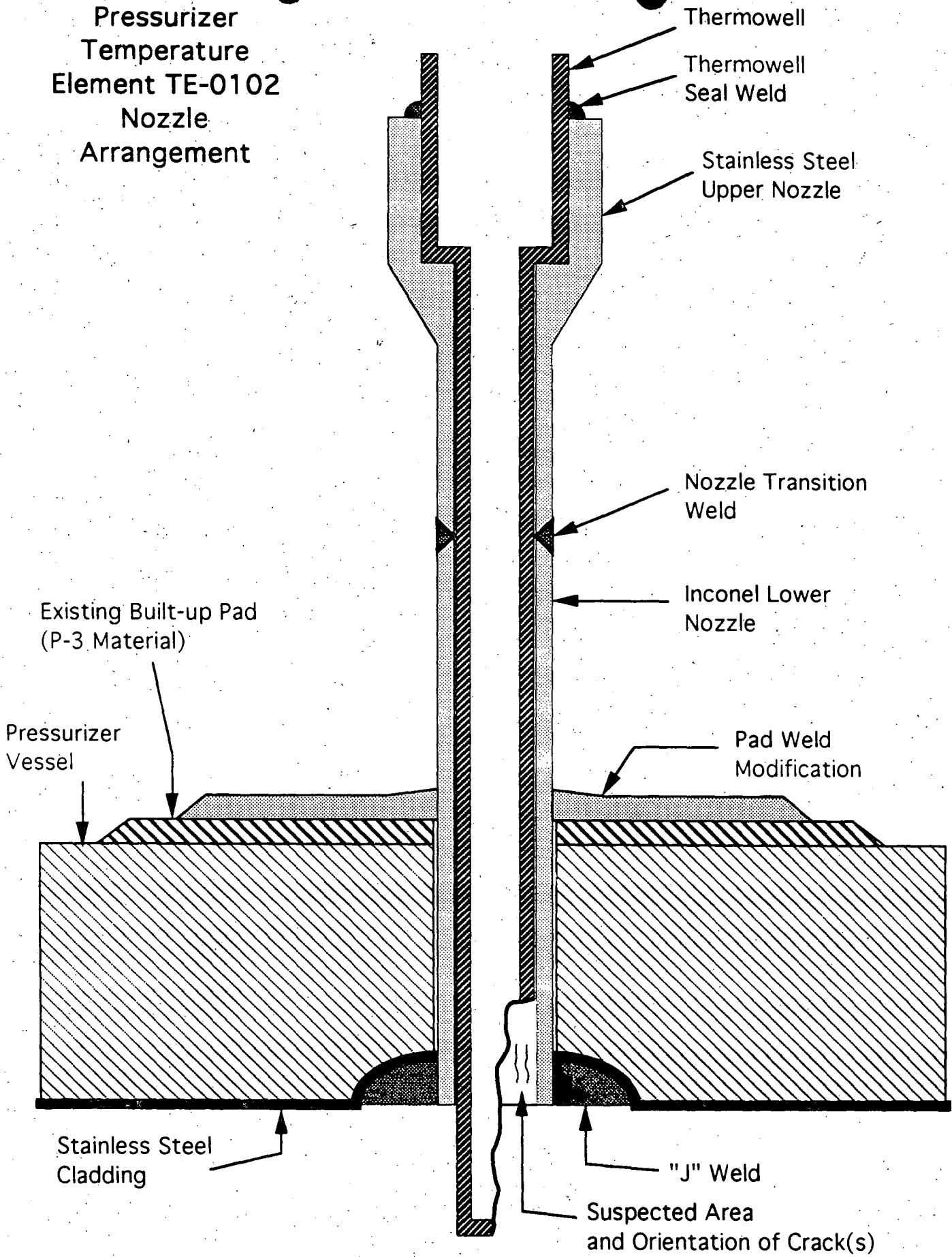


Figure 2

LICENSING CORRESPONDENCE\COMMITMENT TRACKING RECORD SUMMARY

DATE: November 2, 1993

DOCKET 50-255 LICENSE DPR-20 - PALISADES PLANT - LICENSEE EVENT REPORT 93-011 - PRESSURIZER TEMPERATURE ELEMENT CRACK RESULTS IN PCS LEAKAGE

SUMMARY: Discusses the leakage observed from the pressurizer temperature penetrations that was observed during re-pressurization of the PCS following repairs of the PORV nozzle leak.

Previous
NRC Letters Dated:

LC _____
LC _____
LC _____

Previous
CPCo Letters Dated:

LC _____
LC _____
LC _____

UFI NO: 950-73*20*01*01

Originator:

WLRoberts

Concurrences:

DWRogers

JLKuemin

RDOrosz

DABemis

Information Copy

AMDavis (RS only)

Concurrences:

KEOsborne

SCCedarquist

PJGire

DJVandWalle

CWMain

Individuals

Providing Info:

DJVandWalle

SCCedarquist

PSE LOG NA

PRC MTG NA

NPAD LOG NA

COMMITMENT TRACKING

COMMITMENTS MADE:

1. Permanent repair of instrument nozzles TE-0101 and TE-0102 will be evaluated prior to the next refueling shutdown and modifications will be completed as necessary to assure long term integrity of the instrument nozzles.

Assigned Individual: SCCedarquist
Related CA Document No: E-PAL-93-032C
Commitment To Be Made Resident?

Due Date: 1995 Refueling outage
CTS Commitment No: _____
Resident Document: _____

COMMITMENTS CLOSED:

30 day reporting requirement per 10 CFR 50.73.

Related CA Document No:

CTS Commitment No: _____

Additional Information Needed for CTS Entry:

System Code: PCS _____

Suggested Keywords: pressurizer temperature penetration leak porv
nozzle (tie this issue to the pzs safe end crack issue also)

COMMITMENTS CONTINUATION SHEET

2. A comprehensive Inconel 600 inspection and maintenance program for the Palisades plant will be developed.

Assigned Individual: DABemis
Related CA Document No: E-PAL-93-032F
Commitment To Be Made Resident?

Target Date: 8-31-94
CTS Commitment No: _____
Resident Document: _____