

March 14, 2002

U.S. Nuclear Regulatory Commission
ATTN: Document Control Desk
Washington, DC 20555-0001

DOCKET 50-255 - LICENSE DPR-20 - PALISADES NUCLEAR PLANT
LICENSEE EVENT REPORT 01-004-01, CONTROL ROD DRIVE MECHANISM
UPPER HOUSING ASSEMBLY CRACK INDICATIONS

Attached is supplemental Licensee Event Report (LER) 01-004-01. This supplemental LER augments the information provided in LER 01-004, which was submitted on August 20, 2001.

SUMMARY OF COMMITMENTS

This letter contains two new commitments as follows:

1. Future examinations of the butt welds on the new Control Rod Drive Mechanism upper housings will be performed by ultrasonic examination from the outer diameter surface.
2. Examination of selected incore instrumentation reactor head nozzle-to-flange butt welds will be performed during the next refueling outage.



Paul A. Harden
Director, Engineering

CC Administrator, Region III, USNRC
Project Manager, NRR, USNRC
NRC Resident Inspector - Palisades

Attachment

IE22

NRC FORM 366 (1-2001)	U.S. NUCLEAR REGULATORY COMMISSION	APPROVED BY OMB NO. 3150-0104 <small>Estimated burden per response to comply with this mandatory information collection request: 50 hours. Reported lessons learned are incorporated into the licensing process and fed back to industry. Send comments regarding burden estimate to the Records Management Branch (T-6 E6), U.S. Nuclear Regulatory Commission, Washington, DC 20555-0001, or by internet e-mail to bjs1@nrc.gov, and to the Desk Officer, Office of Information and Regulatory Affairs, NEOB-10202 (3150-0104), Office of Management and Budget, Washington, DC 20503. If a means used to impose information collection does not display a currently valid OMB control number, the NRC may not conduct or sponsor, and a person is not required to respond to, the information collection.</small>	EXPIRES 6-30-2001
LICENSEE EVENT REPORT (LER) <small>(See reverse for required number of digits/characters for each block)</small>			

FACILITY NAME (1) NUCLEAR MANAGEMENT COMPANY PALISADES NUCLEAR PLANT	DOCKET NUMBER (2) 05000255	PAGE (3) 1 OF 6
---	--------------------------------------	---------------------------

TITLE (4)
CONTROL ROD DRIVE MECHANISM UPPER HOUSING ASSEMBLY CRACK INDICATIONS

EVENT DATE (5)			LER NUMBER (6)			REPORT DATE (7)			OTHER FACILITIES INVOLVED (8)	
MO	DAY	YEAR	YEAR	SEQUENTIAL NUMBER	REV NO	MO	DAY	YEAR	FACILITY NAME	DOCKET NUMBER
06	21	2001	2001	004	01	03	14	2002	FACILITY NAME	DOCKET NUMBER
										05000
									FACILITY NAME	DOCKET NUMBER
										05000

OPERATING MODE (9)	3	THIS REPORT IS SUBMITTED PURSUANT TO THE REQUIREMENTS OF 10 CFR §: (Check all that apply) (11)								
		20.2201(b)		20.2203(a)(3)(ii)		50.73(a)(2)(ii)(B)		50.73(a)(2)(ix)(A)		
		20.2201(d)		20.2203(a)(4)		50.73(a)(2)(iii)		50.73(a)(2)(x)		
POWER LEVEL (10)	0	20.2203(a)(1)		50.36(c)(1)(I)(A)		50.73(a)(2)(iv)(A)		73.71(a)(4)		
		20.2203(a)(2)(I)		50.36(c)(1)(ii)(A)		50.73(a)(2)(v)(A)		73.71(a)(5)		
		20.2203(a)(2)(ii)		50.36(c)(2)		50.73(a)(2)(v)(B)		OTHER Specify in Abstract below or in NRC Form 366A		
		20.2203(a)(2)(iii)		50.46(a)(3)(ii)		50.73(a)(2)(v)(C)				
		20.2203(a)(2)(iv)		50.73(a)(2)(I)(A)		50.73(a)(2)(v)(D)				
		20.2203(a)(2)(v)		50.73(a)(2)(I)(B)		50.73(a)(2)(vii)				
		20.2203(a)(2)(vi)		50.73(a)(2)(I)(C)		50.73(a)(2)(viii)(A)				
		20.2203(a)(3)(I)	X	50.73(a)(2)(ii)(A)		50.73(a)(2)(viii)(B)				

LICENSEE CONTACT FOR THIS LER (12)

NAME	TELEPHONE NUMBER (Include Area Code)
Barbara E. Dotson, Licensing General Technical Analyst	(616) 764-2265

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

CAUSE	SYSTEM	COMPONENT	MANU-FACTURER	REPORTABLE TO EPIX	CAUSE	SYSTEM	COMPONENT	MANU-FACTURER	REPORTABLE TO EPIX
B	AA	DRIV	C490	Y					

SUPPLEMENTAL REPORT EXPECTED (14)				EXPECTED SUBMISSION DATE (15)		
YES (If yes, complete EXPECTED SUBMISSION DATE).	X	NO				

ABSTRACT (Limit to 1400 spaces, i.e., approximately 15 single-spaced typewritten lines) (16)

On June 21, 2001, with the plant in Mode 3, a pressure boundary leak was identified in the upper housing assembly for control rod drive mechanism (CRDM) number 21. The leak was observed near the weld of the upper housing assembly pipe to the eccentric reducer. Upon identification, the plant was placed in Mode 5 to effect repairs. Non-destructive examination of the CRDM-21 upper housing assembly revealed a through-wall axially oriented crack through the weld. Subsequently, the CRDM-21 upper housing assembly was destructively examined, revealing axial as well as circumferential indications. Further non-destructive examinations identified recordable indications in the same weld location on the upper housing assemblies for 42 of the 45 CRDMs.

The cause of the through-wall crack in CRDM-21 and the crack indications in the other upper housings is attributed to transgranular stress corrosion cracking. All 45 CRDM upper housing assemblies were replaced prior to start-up from the plant outage with new CRDM upper housing assemblies which were modified to decrease their susceptibility to transgranular stress corrosion cracking.

The safety significance of the CRDM-21 through-wall crack was determined to be very low.

This condition was reported as a principal safety barrier being seriously degraded in accordance with 10 CFR 50.73(a)(2)(ii)(A).

LICENSEE EVENT REPORT (LER)

FACILITY NAME (1)	DOCKET (2)	LER NUMBER (6)			PAGE (3)
		YEAR	SEQUENTIAL NUMBER	REVISION NUMBER	
NUCLEAR MANAGEMENT COMPANY PALISADES NUCLEAR PLANT	05000255	2001	-- 004	-- 01	2 OF 6

NARRATIVE (If more space is required, use additional copies of NRC Form 366A) (17)

EVENT DESCRIPTION

During the week preceding June 17, 2001, Operations personnel began to notice potential indication of increased Primary Coolant System (PCS) [AB] unidentified leakage. On June 17, 2001, an entry into containment was made to attempt to identify the source of the increased unidentified leakage. During the entry, leakage was identified which appeared consistent with a known leak from a fitting on a pressurizer sample line. It appeared that this known leak had worsened.

On June 20, 2001, the plant was shut down from full power operation in accordance with plans to confirm the source of the leak and make repairs. Unidentified leakage had trended from approximately 0.1 gpm to 0.3 gpm. On June 21, 2001, with the plant in Mode 3, entry into containment confirmed slightly increased leakage at the suspected fitting. However, by observation, it was determined that the fitting leakage did not completely account for the change in unidentified leakage. Subsequently, during further walkdown of the PCS, a pressure boundary leak was identified in the control rod drive mechanism (CRDM) number 21 [DRIV;AA] upper housing assembly. Specifically, the leak was observed near the weld (Weld #3) of the upper housing assembly pipe to the eccentric reducer. Upon identification, the plant was placed in Mode 5 to effect repairs. Figure 1 (page 5) depicts a drawing of a CRDM upper housing assembly and identifies the Weld #3 location.

Non-destructive examination of the CRDM-21 upper housing assembly revealed a through-wall axially oriented crack through the weld. Subsequently, the CRDM-21 upper housing assembly was destructively examined. A detailed metallographic examination of the Weld #3 area identified axial, as well as circumferential indications.

ANALYSIS OF EVENT

The CRDM-21 housing is one of 45 assemblies that are fabricated from a nominal eight-inch diameter austenitic stainless steel pipe. Each of the 45 CRDMs consists of a reactor vessel head penetration, upper housing assembly and seal housing that are primary pressure boundary components. Each stainless steel (type 347) CRDM upper housing assembly is mounted on a nozzle flange and extends approximately 15 feet to the seal housing and drive package. There are four welds (#2 through #5) on the upper housing assembly, as shown in Figure 1. Weld #1 is located between the control rod mechanism housing flange and the reactor vessel penetration. All five welds on a number of housings were initially examined using various non-destructive examination techniques. The only additional indications identified were near the same weld location as that discovered on CRDM-21 (Weld #3). The Weld #3 region then became the focal point of further inspections. Examinations of the CRDM upper housings using various non-destructive examination techniques (ultrasonic, radiographic and/or visual) identified recordable indications in the Weld #3 location for 42 of the 45 CRDM upper housing assemblies. Figure 2 (page 6) shows the CRDM configuration on the reactor head, and identifies which CRDMs have been found with recordable indications near the Weld #3 area. Only the original indication on CRDM-21 was determined to be through-wall.

SAFETY SIGNIFICANCE

The safety significance of the CRDM-21 through-wall crack was determined to be very low. The crack and associated leakage were very small. Although the leak rate was small, it was detected, which allowed a controlled plant shutdown for repair.

LICENSEE EVENT REPORT (LER)

FACILITY NAME (1)	DOCKET (2)	LER NUMBER (6)			PAGE (3)
NUCLEAR MANAGEMENT COMPANY PALISADES NUCLEAR PLANT	05000255	YEAR	SEQUENTIAL NUMBER	REVISION NUMBER	3 OF 6
		2001	-- 004	-- 01	

NARRATIVE (If more space is required, use additional copies of NRC Form 366A) (17)

Based on flaw evaluations considering destructive examination results of CRDM-21 and non-destructive examinations of other upper housings, it is expected that leakage from a crack in any of the housings would have been detected well before the crack propagated to a length that would have challenged the structural integrity of the housings.

While a through-wall leak would have been expected before any indication reached a size that would allow a catastrophic failure, the potential occurrence of such a catastrophic failure of an upper housing at the Weld #3 area was evaluated. The evaluation concluded that even if the housing separated, the seismic restraints of the CRDM assembly would prevent a rod ejection, limiting both the reactivity transient and leakage rate to within bounding analyses.

CAUSE OF THE EVENT

The cause of the through-wall crack in the CRDM-21 upper housing assembly and the indications in the other CRDM upper housing assemblies was transgranular stress corrosion cracking (TGSCC) due to a susceptible material existing in an enabling chemical environment under adverse stress conditions.

CORRECTIVE ACTIONS

All 45 CRDM upper housing assemblies were replaced prior to start-up from the plant outage. Design changes were made in the new CRDM upper housing assemblies to decrease their susceptibility to transgranular stress corrosion cracking. These changes included:

- Weld #2 (lower flange to eccentric reducer weld) was eliminated.
- Weld #3 (eccentric reducer to pipe weld) was moved to a higher elevation which reduces geometrically induced local stresses and moves the weld away from the crud trap that existed for the old housings at Weld #3.
- Heat sink welding was utilized during the fabrication of the butt welds to create a compressive residual stress on the inside surface.
- A smoother finished surface at the inside diameter of the butt welds was specified.

Future examinations of the butt welds on the new CRDM upper housings will be performed by ultrasonic examination from the outer diameter surface versus outside diameter dye penetrant examination used previously.

Other components were evaluated for their potential to experience TGSCC. As a result of this review, the incore instrumentation (ICI) reactor head nozzle-to-flange butt welds [RPV;AB] were determined to be potentially susceptible to TGSCC. Consequently, examination of selected ICI reactor head nozzle-to-flange butt welds will be performed during the next refueling outage.

LICENSEE EVENT REPORT (LER)

FACILITY NAME (1)	DOCKET (2)	LER NUMBER (6)			PAGE (3)
NUCLEAR MANAGEMENT COMPANY PALISADES NUCLEAR PLANT	05000255	YEAR	SEQUENTIAL NUMBER	REVISION NUMBER	4 OF 6
		2001	-- 004	-- 01	

NARRATIVE (If more space is required, use additional copies of NRC Form 366A) (17)

PREVIOUS LERs

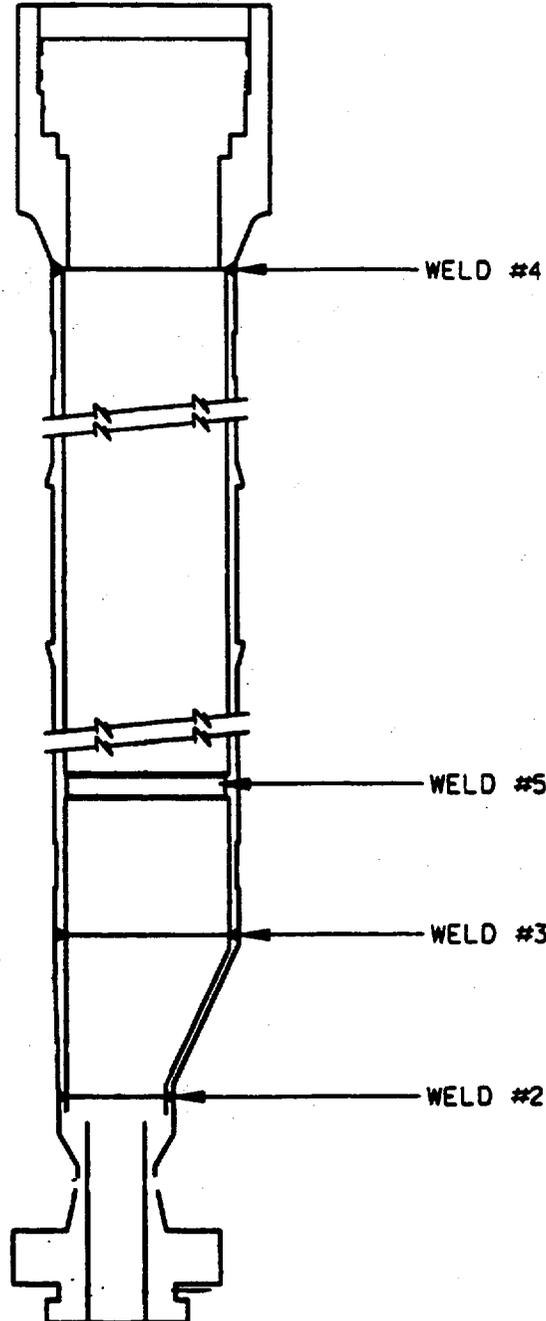
LER 86-40	01/16/87	Cracking of Control Rod Drive Seal Housing
LER 86-40, Rev 1	02/16/87	Cracking of Control Rod Drive Seal Housing
LER 86-40, Rev 2	04/16/87	Cracking of Control Rod Drive Seal Housing
LER 86-40, Rev 3	12/02/87	Cracking of Control Rod Drive Seal Housing
LER 98-14	01/26/99	Control Rod Drive Seal Housing Leak
LER 99-004	12/01/99	Control Rod Drive Seal Housing Leak and Crack Indications
LER 99-004-001	11/08/00	Control Rod Drive Seal Housing Leak and Crack Indications
LER 01-002	05/30/01	Control Rod Drive Seal Housing Leak and Crack Indications
LER 01-004	08/20/01	Control Rod Drive Mechanism Upper Housing Assembly Crack Indications

LICENSEE EVENT REPORT (LER)

FACILITY NAME (1)	DOCKET (2)	LER NUMBER (6)			PAGE (3)
		YEAR	SEQUENTIAL NUMBER	REVISION NUMBER	
NUCLEAR MANAGEMENT COMPANY PALISADES NUCLEAR PLANT	05000255	2001	-- 004	-- 01	5 OF 6

NARRATIVE (If more space is required, use additional copies of NRC Form 366A) (17)

**FIGURE 1
PALISADES PLANT
CRDM UPPER HOUSING ASSEMBLY DRAWING**



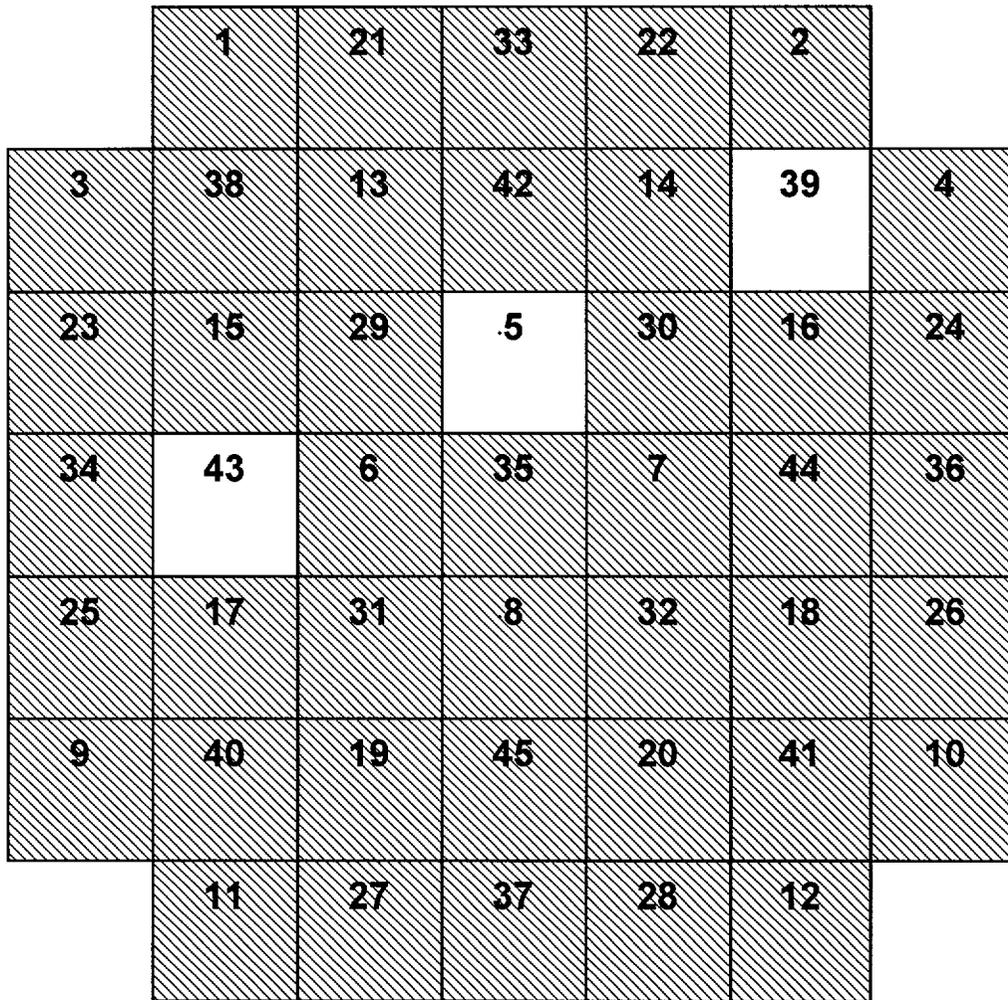
Weld #1 is not shown on this diagram, but is located between the control rod mechanism housing flange and the reactor vessel penetration

LICENSEE EVENT REPORT (LER)

FACILITY NAME (1)	DOCKET (2)	LER NUMBER (6)			PAGE (3)
NUCLEAR MANAGEMENT COMPANY PALISADES NUCLEAR PLANT	05000255	YEAR	SEQUENTIAL NUMBER	REVISION NUMBER	6 OF 6
		2001	-- 004 --	01	

NARRATIVE (If more space is required, use additional copies of NRC Form 366A) (17)

**FIGURE 2
PALISADES PLANT
CONTROL ROD DRIVE MECHANISM MAP**



Legend

-  No Recordable Indications @ Weld #3
-  Recordable Indications @ Weld #3