

UNITED STATES
NUCLEAR REGULATORY COMMISSION
OFFICE OF NUCLEAR REACTOR REGULATION
WASHINGTON, D.C. 20555-0001

June 7, 1994

NRC INFORMATION NOTICE 94-42: CRACKING IN THE LOWER REGION OF THE CORE SHROUD
IN BOILING-WATER REACTORS

Addressees

All holders of operating licenses or construction permits for boiling-water reactors (BWRs).

Purpose

The U.S. Nuclear Regulatory Commission (NRC) is issuing this information notice to alert addressees that a 360-degree crack has been observed at a weld in the lower region of the core shroud in two boiling-water reactors. It is expected that recipients will review the information for applicability to their facilities and consider actions, as appropriate, to avoid similar problems. However, suggestions contained in this information notice are not NRC requirements; therefore, no specific action or written response is required.

Description of Circumstances

During the April 1994 refueling outage at Dresden Unit 3, Commonwealth Edison Company, the licensee, found a 360-degree crack that extended around the outside circumference of the core plate support ring weldment. The shroud is a 5.1 centimeter [2 inch]-thick stainless steel cylinder that directs the flow of water inside the reactor pressure vessel. The shroud is completely contained inside the reactor pressure vessel. The structural integrity of the reactor pressure vessel is not affected by cracks in the shroud.

The cracking was found during a visual inspection and was located in the lower section of the shroud in the heat-affected zone (HAZ) of weld H-5. (See Figures 1 and 2.) Weld H-5 is a horizontal weld that joins the core plate support ring to the core shroud. Subsequent ultrasonic testing, utilizing automated equipment from General Electric, determined that the maximum crack depth was 2.13 cm [0.84 inches].

Commonwealth Edison Company also performed a visual inspection of the Quad Cities Unit 1 core shroud. That inspection revealed a similar 360-degree circumferential crack located at the same place as the crack found at Dresden Unit 3. Both Dresden and Quad Cities units are BWR-3s and have similar core shroud geometries. Core shroud designs for other BWRs may exhibit some differences, and weld identification numbers are not necessarily congruent between the designs.

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PDR I&E Notice 94-042

updated on 9/30/13

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Discussion

At Dresden Unit 3, in addition to the 360-degree circumferential crack in the HAZ of weld H-5, numerous crack indications were also found in the HAZ of weld H-3. The licensee plans to perform UTs and take boat samples at both Dresden Unit 3 and Quad Cities Unit 1 to help determine the root cause of the cracking.

Commonwealth Edison Company inspected the Dresden shroud using a criterion that required the resolution of a 25 micron [1 mil] wire with a 25-mm camera lens positioned to within 2.5 to 7.6 cm [1 to 3 inches] of the shroud surface. The same 25 micron [1 mil] wire resolution criterion had been used previously at Quad Cities, but with a 9 mm camera lens positioned approximately 15.2 to 30.5 cm [6 to 12 inches] from the shroud surface. Using this technique, no crack indications were initially detected at Quad Cities. However, after Commonwealth Edison Company detected the crack at Dresden, the H-5 weld at Quad Cities was inspected again, this time using the Dresden technique, and the 360-degree crack was detected.

Related Generic Communications

In Information Notice (IN) 93-79, "Core Shroud Cracking at Beltline Region Welds in Boiling-Water Reactors," (issued September 30, 1993) which discusses cracks detected at Brunswick Unit 1, the staff pointed out that camera and lighting positions were crucial in performing adequate visual inspections. It is imperative to position the camera or video probe as near to the examination surface as possible and to use an appropriate camera lens. The lighting direction and intensity are important factors and should be adjustable to enhance the detection of these tight surface crack indications.

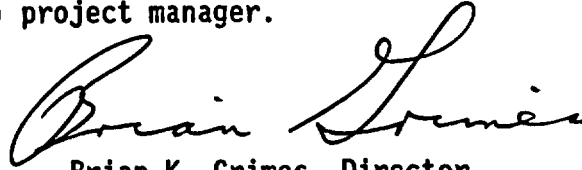
Crack indications have been previously reported at shroud welds in domestic and overseas reactors at the beltline region and higher in the shroud. However, the severely cracked H-5 shroud welds at Dresden Unit 3 and Quad Cities Unit 1 are located 45.7 centimeters [18 inches] below the bottom of the fuel, suggesting that horizontal welds in all regions of the shroud may be susceptible to stress corrosion cracking

The IN 93-79 also referred to GE Rapid Information Communication Service Information Letter (RICSIL) No. 054, Revision 1, "Core Support Shroud Crack Indication." Since IN 93-79 was issued, GE issued additional information on core shroud cracks in October 1993, April 1994, and May 1994.

The BWR Owner's Group (BWROG) submitted an evaluation of core shroud cracking to the staff on April 5, 1994. After reviewing the evaluation, and in light of the Dresden and Quad Cities findings, the staff issued a list of questions to the Chairman of the BWROG Executive Oversight Committee on May 12, 1994.

The NRC staff is evaluating the safety implications of the shroud cracks for normal plant operating and accident conditions and will consider the need for additional generic communication.

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Brian K. Grimes, Director
Division of Operating Reactor Support
Office of Nuclear Reactor Regulation

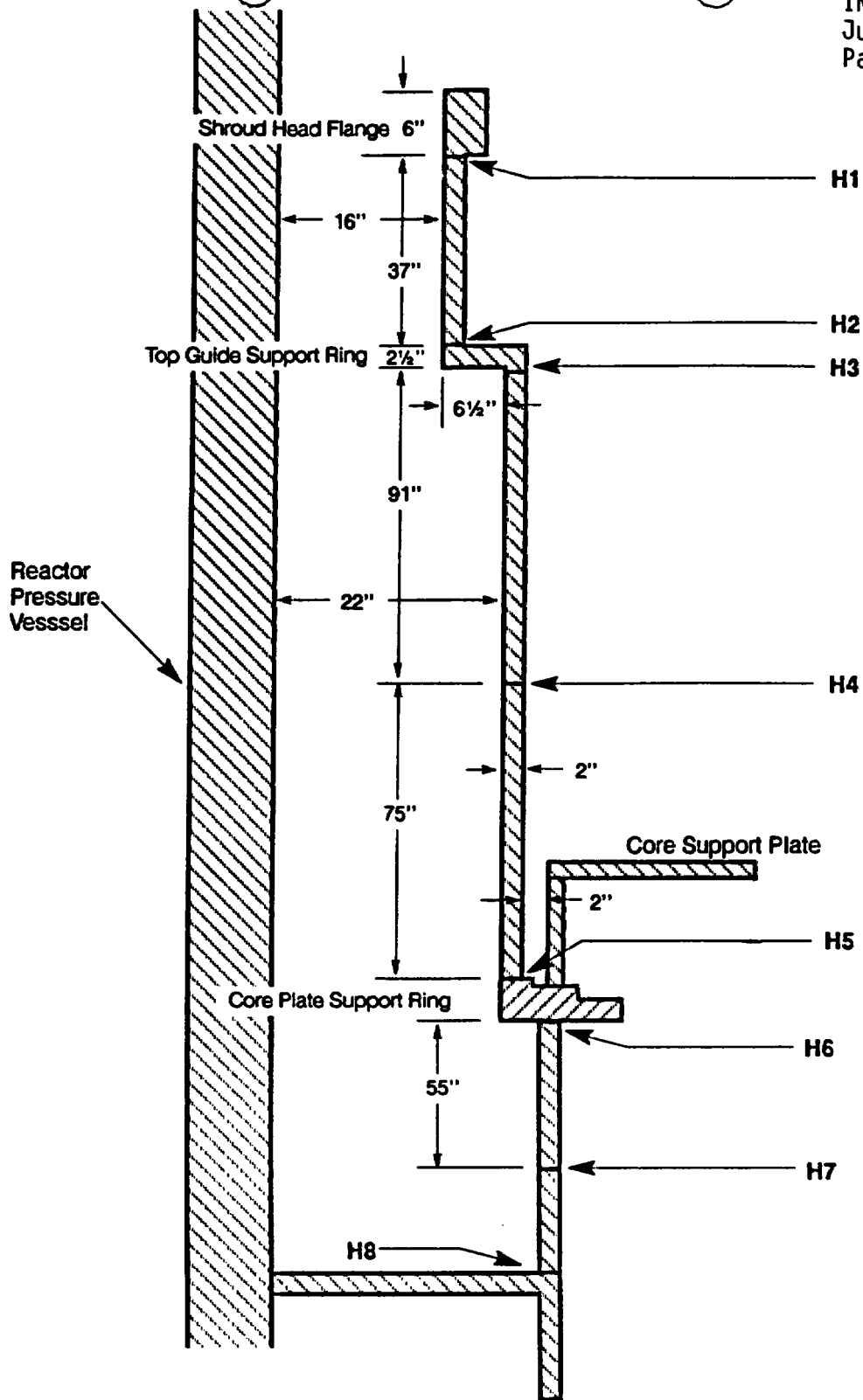
Technical contacts: R. Hermann, NRR
(301) 504-2768

J. Schapker, RIII
(708) 829-9715

T. Greene, NRR
(301) 504-1175

Attachments:

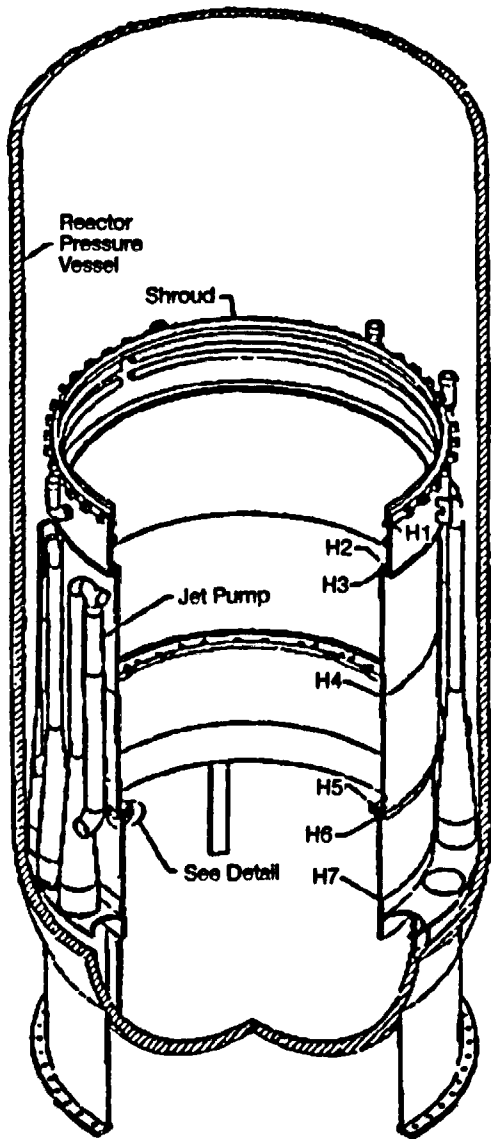
1. Figure 1: Shroud Weld Locations for Dresden Unit 3
2. Figure 2: Details of Weld Locations H-5 and H-6 in the Dresden Unit 3 Core Shroud
3. List of Recently Issued NRC Information Notices



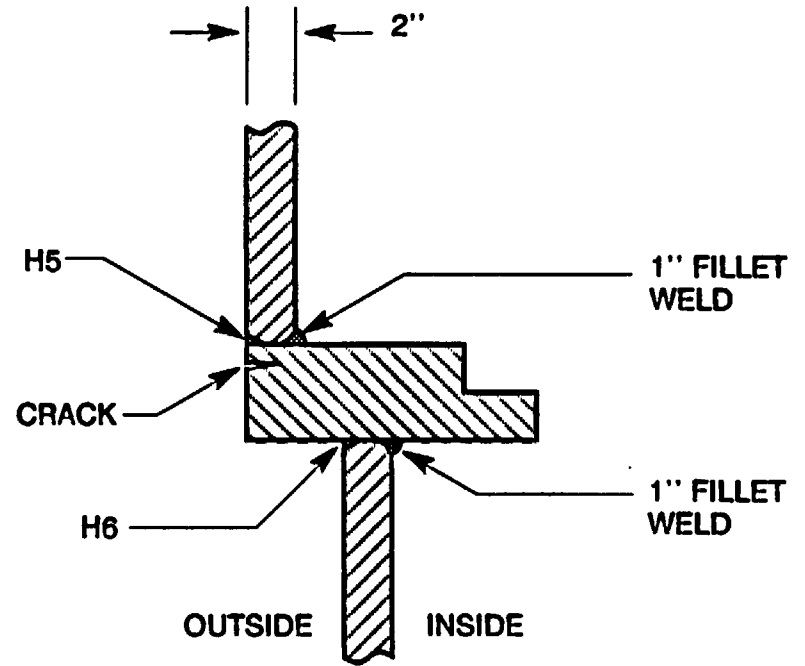
Not to Scale

Figure 1. Shroud Weld Locations for Dresden, Unit 3

DRESDEN UNIT-3 CORE SHROUD



DETAIL - WELDS TYPE H5



Not to Scale

Figure 2. Detail of Weld Locations H5 and H6 in the Dresden, Unit 3 Core Shroud

LIST OF RECENTLY ISSUED
 NRC INFORMATION NOTICES

Information Notice No.	Subject	Date of Issuance	Issued to
94-41	Problems with General Electric Type CR124 Overload Relay Ambient Compensation	06/07/94	All holders of OLs or CPs for nuclear power reactors.
94-40	Failure of a Rod Control Cluster Assembly to Fully Insert Following a Reactor Trip at Braidwood Unit 2	05/26/94	All holders of OLs or CPs for pressurized-water reactors (PWRs).
94-39	Identified Problems in Gamma Stereotactic Radiosurgery	05/31/94	All U.S. Nuclear Regulatory Commission Teletherapy Medical Licensees.
94-38	Results of a Special NRC Inspection at Dresden Nuclear Power Station Unit 1 Following a Rupture of Service Water Inside Containment	05/27/94	All holders of OLs or CPs for NPRs and all fuel cycle and materials licensees authorized to possess spent fuel.
94-37	Misadministration Caused by a Bent Interstitial Needle during Brachytherapy Procedure	05/27/94	All U.S. Nuclear Regulatory Commission Medical Licensees authorized to use brachytherapy sources in high-, medium-, and pulsed-dose-rate remote afterloaders.
94-36	Undetected Accumulation of Gas in Reactor Coolant System	05/24/94	All holders of OLs or CPs for nuclear power reactors.
91-81, Supp. 1	Switchyard Problems that Contribute to Loss of Offsite Power	05/19/94	All holders of OLs or CPs for nuclear power reactors.

OL = Operating License
 CP = Construction Permit

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orig /s/'d by BKGrimes

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*See previous concurrence

OFC	OEAB:DORS	SC/OEAB:DORS	PUB:ADM	PDIII-2:ADR3
NAME	TGreene*	RDennig*	Tech Ed*	JStang*
DATE	06/03/94	06/03/94	05/17/94	05/19/94
OFC	PDIII-2:ADR3	PD/PDIII-2	PDI-1:ADR1	SRXB:DSSA
NAME	CPatel*	RCapra*	DBrinkman*	ACubbage*
DATE	05/19/94	05/19/94	05/19/94	05/19/94
OFC	SRXB:DSSA	AD/DSSA	EMCB:DE	EMCB:DE
NAME	MRubin*	MVirgilio*	WKoo*	RHermann*
DATE	05/19/94	06/03/94	05/18/94	05/18/94
OFC	C/EMCB:DE	RI	RIII	RIII
NAME	JStrosnider*	JSchapker*	MLeach*	TMartin*
DATE	05/18/94	05/19/94	06/01/94	05/19/94
OFC	C/OEAB:DORS	AC/OGCB:DORS	D/DORS	
NAME	AChaffee*	RKiessel*	BGrimes	
DATE	06/03/94	06/03/94	06/6/94	

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additional generic communication.

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NAME	TGreene	RDennig	Tech Ed*	JStang*
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OFC	PDIII-2:ADR3	PD/PDIII-2	PDI-1:ADR1	SRXB:DSSA
NAME	CPatel*	RCapra*	DBrinkman*	ACubbage*
DATE	05/19/94	05/19/94	05/19/94	05/19/94
OFC	SRXB:DSSA	AD/DSSA	EMCB:DE	EMCB:DE
NAME	MRubin*	MVirgili ^W	WKoo*	RHermann*
DATE	05/19/94	6/3/94 250	05/18/94	05/18/94
OFC	C/EMCB:DE	RI	RIII ^{per E-mail message}	RIII
NAME	JStrosnider*	JSchapker*	MLeach ^{DRL for}	TMartin*
DATE	05/18/94	05/19/94	06/01/94	05/19/94
OFC	C/OEAB:DORS	AC/OGCB:DORS	D/DORS	
NAME	ACHaffee ^{13:13}	AKugler ^{with concurrence}	BGrimes	
DATE	6/3/94	6/3/94		

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OFC	PDI-2:ADR3	PD/PDI-2	PDI-1:ADR1	SRXB:DSSA
NAME	CPatel <i>CP</i>	RCapra <i>RC</i>	DBrinkman <i>DB</i>	ACubbage
DATE	5/19/94	5/19/94	5/19/94	/ /94
OFC	SRXB:DSSA	C/SRXB:DSSA	EMCB:DE	EMCB:DE
NAME	MRubin	RJones	GHornseth	RHermann
DATE	/ /94	/ /94	/ /94	/ /94
OFC	C/EMCB:DE	RI	RIII	C/OEAB:DORS
NAME	JStrosnider	JSchapker	MLeach	AChaffee
DATE	/ /94	/ /94	/ /94	/ /94
OFC	AC/OGCB:DORS	D/DORS		
NAME	AKugler	BGrimes		
DATE	/ /94	/ /94		

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OFC	SRXB:DSSA	C/SRXB:DSSA	EMCB:DE	EMCB:DE
NAME	MRubin	RJones	W. KOP GHornseth	RHermann <i>✓</i>
DATE	/ /94	/ /94	5/18/94	5/18/94
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DATE	/ /94	/ /94	5/17/94	/ /94

OFC	TECH BRANCH	CHF TECH BR	C/OGCB:DORS	D/DORS
NAME			AKugler	BGrimes
DATE	/ /94	/ /94	/ /94	/ /94

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ADD TO CONCURRENCE:

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Chandu Patel PDIII-2
Robert Capra PDIII-2

Donald Brinkman PDI-1

Amy Cabbage SRXB
Mark Rubin SRXB
Robert Jones SRXB

Geoffrey Hornseth EMCB
Robert Hermann EMCB
Jack Strosnider EMCB

Jerry Schapker RI
Mel Leach Rgn III

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