

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

May 15, 1991

NRC INFORMATION NOTICE NO. 91-32: POSSIBLE FLAWS IN CERTAIN PIPING
SYSTEMS FABRICATED BY ASSOCIATED PIPING
AND ENGINEERING

Addressees:

All holders of operating licenses or construction permits for nuclear power reactors.

Purpose:

This information notice is intended to alert addressees to possible flaws in certain piping systems fabricated by Associated Piping and Engineering (AP&E), Compton, California. 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 do not constitute NRC requirements; therefore, no specific action or written response is required.

Description of Circumstances:

During inservice inspection (ISI) in the January 1991 outage at the Hope Creek facility, the licensee detected cracks with liquid penetrant examination (PT) techniques on the outside diameter surface of two 28-inch-diameter by 1.35- to 1.40-inch wall butt welds. The welds were located in loops A and B of the type 304 stainless steel recirculation piping system. The licensee found three indications of lengths ranging from 1 1/2 inches to 7 1/2 inches. These indications were circumferentially oriented and were located approximately in the center of the weld. The welds, which coincidentally were the same welds in both loops, were fabricated as shop welds by AP&E in 1980. The records showed that the spool pieces were solution annealed after welding at 1925 to 1960 degrees F followed by water quenching. The subject welds were reportedly made using the gas tungsten arc welding process for the root pass, followed by a cover pass deposited by the manual metal arc process, with subsequent fill layers deposited by an automatic submerged arc (flux/wire) process.

After light grinding failed to remove the defects, the licensee completely removed indications from both welds by excavating the areas to a depth of 7/16 inch (32 percent of wall thickness). Before excavation, the licensee removed a 1/4-inch-wide by 1 1/2-inch-long boat sample for metallurgical examination. The examination indicated that the defect was a hot short crack, a welding defect typically found in stainless steel welds. The cracks apparently

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developed during the submerged arc process because of the low ferrite level (0.1 to 1.9 percent) that was found in the boat sample even though certified test reports of the filler materials used by AP&E showed a ferrite level of 6 to 12 percent. (A minimum ferrite content of 5 percent in a deposited austenitic weld metal is usually specified to avoid weld metal cracking.) The examination also indicated no evidence of propagation during the solution anneal process or by some corrosion or fatigue mechanism during subsequent service.

The licensee for Hope Creek reported that a review of the fabrication nondestructive examination (NDE) record showed no reportable PT indications and no rejectable radiographic indications. The licensee also reported that the defects were not detected by the ISI ultrasonic testing (UT) specified in Section XI of the current American Society of Mechanical Engineering (ASME) Standards principally because the UT method used (shear wave) is designed to find intergranular stress corrosion cracking (IGSCC) on the inside diameter surface as well as flaws in the bottom third of the weld. The hot short cracks in this case were found in the upper third of the weld.

To determine the extent of the problem and to ensure integrity of the recirculation piping system, the licensee proceeded to perform PT on all 36 similar welds (100 percent) in the recirculation system. No other rejectable indication was found. The licensee also performed UT on eight additional welds (five 28-inch-diameter and three 12-inch-diameter pipes) using a high-angle longitudinal refractive wave method. The method was validated to find defects in the upper third (near the outer surface of the weld) with a mock-up furnished by the Electric Power Research Institute (EPRI) that contained weld defects similar to and at the same level as those found in the recirculation piping welds. The licensee found no rejectable indications in any of the eight welds.

Discussion:

The cracks found during the ISI activities at Hope Creek in 1991 were not detected by pre-service inspection and are different from the IGSCC associated with welds in large-diameter stainless steel piping. IGSCC is found in the heat-affected zone at the pipe's inner surface in the base metal adjacent to the fusion line. The cracks in the Hope Creek case were found at the pipe welds' outer surfaces in the upper third of the weld and were caused during fabrication by a "hot short" cracking mechanism. The NRC has not identified any similar problems at other facilities. However, since the piping manufacturer, AP&E, is out of business, notice of defective welds manufactured by this company may not have been disseminated properly to potentially affected facilities.

This information notice requires no specific action or written response. If you have any questions about the information in this notice, please contact one of the technical contacts listed below or the appropriate NRR project manager.

Charles E. Rossi

Charles E. Rossi, Director
Division of Operational Events Assessment
Office of Nuclear Reactor Regulation

Technical Contacts: David E. Smith, NRR
(301) 492-0711

Herbert J. Kaplan, RI
(215) 337-5346

Attachment: List of Recently Issued NRC Information Notices

Attachment
IN 91-32
May 15, 1991
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LIST OF RECENTLY ISSUED
NRC INFORMATION NOTICES

Information Notice No.	Subject	Date of Issuance	Issued to
91-31	Nonconforming Magnaflux Magnetic Particle (14AM) Prepared Bath	05/09/91	All holders of OLs or CPs for nuclear power reactors.
91-30	Inadequate Calibration of Thermoluminescent Dosimeters Utilized to Monitor Extremity Dose at Uranium Processing and Fabrication Facilities	04/23/91	All fuel cycle licensees and other licensees routinely handling unshielded uranium materials.
86-21, Supp. 2	Recognition of American Society of Mechanical Engineers Accreditation Program for N Stamp Holders	04/16/91	All holders of OLs or CPs for nuclear power reactors and all recipients of NUREG-0040, "Licensee Contractor and Vendor Inspection Status Report" (White Book).
91-29	Deficiencies Identified During Electrical Distribution System Functional Inspections	04/15/91	All holders of OLs or CPs for nuclear power reactors.
91-28	Cracking in Feedwater System Piping	04/15/91	All holders of OLs or CPs for pressurized water reactors (PWRs).
91-27	Incorrect Rotation of Positive Displacement Pump	04/10/91	All holders of OLs or CPs for nuclear power reactors.
89-90, Supp. 1	Pressurizer Safety Valve Lift Setpoint Shift	04/10/91	All holders of OLs or CPs for nuclear power reactors.

OL = Operating License
CP = Construction Permit

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Original Signed By
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Attachment: List of Recently Issued NRC Information Notices

Document Name: INFO NOTICE FOR HOPE CREEK ISI

*C/OGCB:DOEA:NRR CHBerlinger 05/06/91	D/DOEA:NRR CERossi 05/01/91	*A/C/VIB:DRIS:NRR UPotapovs 05/01/91	*RVIB:DRIS:NRR RPMcIntyre 05/01/91	*D/DET:NRR JRichardson 05/01/91	*C/EMCB:DET:NRR CYCheng 05/01/91
*RPB:ADM TechEd 05/03/91	*RI HJKaplan 04/30/91	*SC/RI EHGray 04/30/91	*EMCB:DET:NRR DESmith 05/01/91	*SC/EMCB:DET:NRR RAHermann 05/01/91	

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<i>CUB</i> C/OGCB:DOEA:NRR	D/DOEA:NRR			
CHBerlinger	CERossi <i>05/1</i>			
05/6/91	05/ /91			
RPB:ADM	*A/C/VIB:DRIS:NRR	*RVIB:DRIS:NRR	*D/DET:NRR	*C/EMCB:DET:NRR
TechEd <i>Calure</i>	UPotapovs	RPMcIntyre	JRichardson	CYCheng
05/3/91	05/01/91	05/01/91	05/01/91	05/01/91
*OGCB:DOEA:NRR	*RI	*SC/RI	*EMCB:DET:NRR	*SC/EMCB:DET:NRR
PCWen	HJKaplan	EHGray	DESmith	RAHermann
04/30/91	04/30/91	04/30/91	05/01/91	05/01/91

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TechEd		RPMcIntyre	JRichardson	CYCheng	
04/ /91	05/ V91	04/ /91	05/ /91	05/ /91	
OGCB:DOEA:NRR	RI	SO/RI	EMCB:DET:NRR	SC/EMCB:DET:NRR	
PCWen PCW	HJKaplan	EHGray	DESmith	RAHermann	
04/30/91	04/30/91	04/30/91	05/ /91	05/ /91	

PCW for *PCW for* *for* *for* *for*

PER TEL CON ON 4/30/91