

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

March 23, 1989

NRC INFORMATION NOTICE NO. 89-33: POTENTIAL FAILURE OF WESTINGHOUSE STEAM
GENERATOR TUBE MECHANICAL PLUGS

Addressees:

All holders of operating licenses or construction permits for pressurized-water reactors (PWRs).

Purpose:

This information notice is being provided to alert addressees to the potential for failure of Westinghouse steam generator tube mechanical plugs. Such failures could lead to a large primary-to-secondary leak and possible damage to adjacent tubes. 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:

On February 25, 1989, North Anna Unit 1 experienced a large primary-to-secondary leak of about 70 gallons per minute (gpm) following a reactor trip from 76 percent power. Unit response to the trip was normal. No safety injection (manual or automatic) was initiated or required during the event, and post-trip cooldown and depressurization were conducted in a stable manner.

Primary-to-secondary leakage in the affected steam generator (S/G) had been negligible (≤ 1.0 gallon per day) with no increasing trend before the reactor trip.

The licensee's investigation performed after plant shutdown showed the leak was associated with a broken plug located in the hot leg of tube R3C60. This tube had been plugged in 1985 because a 55 percent indication had been found at the first support plate location. The broken plug was a "mechanical" plug supplied by Westinghouse. The top portion of the plug was completely severed from the body of the plug, which was expanded against the tube and tubesheet. The severed portion of the plug was apparently propelled up the length of the tube by the primary system pressure to a location just above the U-bend transition where it impacted the outer curvature of the tube approximately 4 inches above the seventh support plate.

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Further investigation with a modified Welsh-Allyn video probe showed that the impact of the broken plug piece had punctured the tube over an area approximately 2½ inches long and ¾ inches wide. The broken plug piece subsequently impacted and dented the adjacent tube R4C60 directly above.

Discussion:

Westinghouse informed several licensees on January 17, 1989 that a few utilities had observed dripping or wetness around tube ends plugged with Westinghouse mechanical plugs. When some of these plugs were removed and examined, intergranular cracks were found. Westinghouse reported that these cracks appeared to be associated with minimal intergranular carbide precipitation, which, in turn, may be the result of a low mill annealing temperature.

Preliminary information obtained informally from Westinghouse indicates that plugs from two heats (numbers 3513 and 3962) may exhibit this susceptible microstructure. The broken plug at North Anna Unit 1 was fabricated from heat number 3962.

The licensee for North Anna Unit 1 is currently determining where other plugs from the susceptible heats may be installed at Units 1 and 2 and what remedial measures need to be taken.

During a recent inspection of steam generator tube plugs at Millstone Unit 2 (a Combustion Engineering-designed reactor), in response to the North Anna event, the licensee removed four similar Westinghouse mechanical plugs. Current indications are that these plugs were from the suspected susceptible heats. One of the plugs severed during the removal operation as a result of a circumferential crack.

The NRC staff is currently investigating the potential generic implications of these plug failures.

No specific action or written response is required by this information notice. If you have any questions about this matter, please contact the technical contact listed below or the Regional Administrator of the appropriate regional office.


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

Technical Contact: E. Murphy, NRR
(301) 492-0945

Attachment: List of Recently Issued NRC Information Notices

LIST OF RECENTLY ISSUED
NRC INFORMATION NOTICES

Information Notice No.	Subject	Date of Issuance	Issued to
89-32	Surveillance Testing of Low-Temperature Overpressure-Protection Systems	3/23/89	All holders of OLs or CPs for PWRs.
89-31	Swelling and Cracking of Hafnium Control Rods	3/22/89	All holders of OLs or CPs for PWRs with Hafnium control rods.
89-30	High Temperature Environments at Nuclear Power Plants	3/15/89	All holders of OLs or CPs for nuclear power reactors.
89-29	Potential Failure of ASEA Brown Boveri Circuit Breakers During Seismic Event	3/15/89	All holders of OLs or CPs for nuclear power reactors.
89-28	Weight and Center of Gravity Discrepancies for Copes-Vulcan Air-Operated Valves	3/14/89	All holders of OLs or CPs for nuclear power reactors.
89-27	Limitations on the Use of Waste Forms and High Integrity Containers for the Disposal of Low-Level Radioactive Waste	3/8/89	All holders of OLs or CPs for nuclear power reactors, fuel cycle licenses and certain by-product materials licenses.
89-26	Instrument Air Supply to Safety-Related Equipment	3/7/89	All holders of OLs or CPs for nuclear power reactors.
89-25	Unauthorized Transfer of Ownership or Control of Licensed Activities	3/7/89	All U.S. NRC source, byproduct, and special nuclear material licensees.

OL = Operating License
CP = Construction Permit

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