

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

February 29, 1988

INFORMATION NOTICE NO. 88-06: FOREIGN OBJECTS IN STEAM GENERATORS

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 a potentially generic problem with foreign objects on the secondary side of steam generators in PWRs and the potential for failure of steam generator tubes as a result of fretting. It is expected that recipients will review the information for applicability to their facilities and consider actions, as appropriate, to preclude similar problems from occurring at their facilities. 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 3, 1988, during the first refueling outage at Catawba 2, the licensee submitted a report to the NRC, as required under 10 CFR 50.72, indicating that foreign metal objects in two of four steam generators had caused loss of 50% of the wall thickness for one tube in each of these steam generators. One of the objects was a steel block 1-1/2 inches x 2 inches x 3 inches and the other was a steel sliver approximately 1/4 inch x 3/8 inch x 8 inches. Both objects were located on the tube sheet. On the basis of a subsequent evaluation, the licensee concluded that it was unlikely that these objects had caused damage. However, the licensee found three jacking studs 2 to 3 inches long by 2-1/4 inches in diameter on the tube sheet in one of the other two steam generators. One of these studs did cause significant damage to a tube in that steam generator. The licensee also found small gauge wire, a nail, a 6 inch piece of welding rod, and welding slag in the steam generators. The licensee was able to remove all of the foreign objects and debris except for the piece of welding rod. The licensee did eddy current testing of 100% of the peripheral tubes in all of the steam generators for Catawba 2 and found that plugging of seven tubes was necessary. Of the seven tubes plugged, two had visible damage to the exterior surface near the tube sheet. The maximum defect indicated by eddy current testing was 77%.

The licensee's records indicate that all of the steam generators were carefully inspected for foreign objects after fabrication of the steam generators was completed and prior to operation of the reactor at power. Nothing of significance

8802230035

ZA

was found at that time. The foreign objects and debris found recently in the steam generators may have accumulated in the top works of the steam generators and may have been washed down to the tube sheet after preservice inspections.

Discussion:

As described in NUREG/CR-0718, "Steam Generator Tube Integrity Program Phase I Report," tests for certain steam generators indicate that tube failure can be expected during normal operation if the tube wall thickness is reduced by 85% to 90% and if the defect is 1-inch long or longer. Likewise, during a steam line break accident, failure can be expected if wall thickness is reduced by 75% to 80%.

Information Notice 83-24, "Loose Parts in the Secondary Side of Steam Generators at Pressurized Water Reactors," addressed events involving foreign objects and loose parts on the secondary side of steam generators at PWRs, including the events at Ginna and Prairie Island 1 where tube ruptures were related to the presence of loose parts.

Generic Letter 85-02, "Staff Recommended Actions Stemming from NRC Integrated Program for Resolution of Unresolved Safety Issues Regarding Steam Generator Tube Integrity," requested that PWR licensees perform visual inspections on steam generator secondary sides in the vicinity of the tube sheet along the entire periphery of the tube bundle and the tube lane to identify any foreign objects and damage to the external surfaces of tubes. For licensees with operating licenses, these inspections were to be performed during the next planned outage for eddy current testing and after any secondary side repairs or modifications to steam generator internals were completed. For applicants for operating licenses, these inspections were to be performed as part of the preservice inspection program. The licensee for Catawba 2 complied with this request as an applicant for an operating license. The preservice inspections would not detect foreign objects in the top works of the steam generators that could be washed down to the tube sheets during the first fuel cycle.

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

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

Technical Contact: Roger Woodruff, NRR  
(301) 492-1180

Attachment: List of Recently Issued NRC Information Notices

**LIST OF RECENTLY ISSUED  
 NRC INFORMATION NOTICES**

<b>Information Notice No.</b>	<b>Subject</b>	<b>Date of Issuance</b>	<b>Issued to</b>
88-05	Fire in Annunciator Control Cabinets	2/11/88	All holders of OLs or CPs for nuclear power reactors.
88-04	Inadequate Qualification and Documentation of Fire Barrier Penetration Seals	2/5/88	All holders of OLs or CPs for nuclear power reactors.
88-03	Cracks in Shroud Support Access Hole Cover Welds	2/2/88	All holders of OLs or CPs for BWRs.
88-02	Lost or Stolen Gauges	2/2/88	All NRC licensees authorized to possess gauges under a specific or general license.
88-01	Safety Injection Pipe Failure	1/27/88	All holders of OLs or CPs for nuclear power reactors.
86-81, Supp. 1	Broken External Closure Springs on Atwood & Morrill Main Steam Isolation Valves	1/11/88	All holders of OLs or CPs for nuclear power reactors.
87-67	Lessons Learned from Regional Inspections of Licensee Actions in Response to IE Bulletin 80-11	12/31/87	All holders of OLs or CPs for nuclear power reactors.
87-66	Inappropriate Application of Commercial-Grade Components	12/31/87	All holders of OLs or CPs for nuclear power reactors.
87-28, Supp. 1	Air Systems Problems at U.S. Light Water Reactors	12/28/87	All holders of OLs or CPs for nuclear power reactors.
87-65	Plant Operation Beyond Analyzed Conditions	12/23/87	All holders of OLs or CPs for nuclear power reactors.

OL = Operating License  
 CP = Construction Permit

was found at that time. The foreign objects and debris found recently in the steam generators may have accumulated in the top works of the steam generators and may have been washed down to the tube sheet after preservice inspections.

Discussion:

As described in NUREG/CR-0718, "Steam Generator Tube Integrity Program Phase I Report," tests for certain steam generators indicate that tube failure can be expected during normal operation if the tube wall thickness is reduced by 85% to 90% and if the defect is 1-inch long or longer. Likewise, during a steam line break accident, failure can be expected if wall thickness is reduced by 75% to 80%.

Information Notice 83-24, "Loose Parts in the Secondary Side of Steam Generators at Pressurized Water Reactors," addressed events involving foreign objects and loose parts on the secondary side of steam generators at PWRs, including the events at Ginna and Prairie Island 1 where tube ruptures were related to the presence of loose parts.

Generic Letter 85-02, "Staff Recommended Actions Stemming from NRC Integrated Program for Resolution of Unresolved Safety Issues Regarding Steam Generator Tube Integrity," requested that PWR licensees perform visual inspections on steam generator secondary sides in the vicinity of the tube sheet along the entire periphery of the tube bundle and the tube lane to identify any foreign objects and damage to the external surfaces of tubes. For licensees with operating licenses, these inspections were to be performed during the next planned outage for eddy current testing and after any secondary side repairs or modifications to steam generator internals were completed. For applicants for operating licenses, these inspections were to be performed as part of the preservice inspection program. The licensee for Catawba 2 complied with this request as an applicant for an operating license. The preservice inspections would not detect foreign objects in the top works of the steam generators that could be washed down to the tube sheets during the first fuel cycle.

No specific action or written response is required by this information notice. If you have 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: Roger Woodruff, NRR  
(301) 492-1180

Attachment: List of Recently Issued NRC Information Notices

\*see previous concurrence

EAB:NRR*	EAB:NRR*	C:EAB:NRR*	C:GCB:NRR*	Tech Ed*	AD:RGN II*
RWoodruff:db	RLobel	WLanning	CBerlinger	AThomas	GLainas
2/18/88	2/19/88	2/19/88	2/22/88	2/18/88	2/19/88

D:DOEA  
CER0681  
2/23/88

was found at that time. The foreign objects and debris found recently in the steam generators may have accumulated in the top works of the steam generators and may have been washed down to the tube sheet after preservice inspections.

Discussion:

As described in NUREG/CR-0718, "Steam Generator Tube Integrity Program Phase I Report," tests for certain steam generators indicate that tube failure can be expected during normal operation if the tube wall thickness is reduced by 85% to 90% and if the defect is 1-inch long or longer. Likewise, during a steam line break accident, failure can be expected if wall thickness is reduced by 75% to 80%.

Information Notice 83-24, "Loose Parts in the Secondary Side of Steam Generators at Pressurized Water Reactors," addressed events involving foreign objects and loose parts on the secondary side of steam generators at PWRs, including the events at Ginna and Prairie Island 1 where tube ruptures were related to the presence of loose parts.

Generic Letter 85-02, "Staff Recommended Actions Stemming from NRC Integrated Program for Resolution of Unresolved Safety Issues Regarding Steam Generator Tube Integrity," requested that PWR licensees perform visual inspections on steam generator secondary sides in the vicinity of the tube sheet along the entire periphery of the tube bundle and the tube lane to identify any foreign objects and damage to the external surfaces of tubes. For licensees with operating licenses, these inspections were to be performed during the next planned outage for eddy current testing and after any secondary side repairs or modifications to steam generator internals were completed. For applicants for operating licenses, these inspections were to be performed as part of the preservice inspection program. The licensee for Catawba 2 complied with this request as an applicant for an operating license.

On the basis of the assumption that foreign objects had been in the top works of the Catawba 2 steam generators and that these objects could have been washed down to the tube sheets after the preservice inspection, the licensee performed after the first fuel cycle an additional visual inspection on the secondary side of each steam generator in the vicinity of the tube sheet, found the foreign objects and debris, and removed them before they could cause failure of a tube.

No specific action or written response is required by this information notice. If you have 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: Roger Woodruff, NRR  
(301) 492-1180

D:DOEA  
CERossi  
2/ /88

Attachment: List of Recently Issued NRC Information Notices

\*see previous concurrence

EAB:NRR*	EAB:NRR*	C:EAB:NRR*	C:GCB:NRR*	Tech Ed*	AD:RGN II*
RWoodruff:db	RLobel	WLanning	CBerlinger	AThomas	GLainas
2/18/88	2/19/88	2/19/88	2/22/88	2/18/88	2/19/88

works of the steam generators and may have been washed down to the tube sheet after preservice inspections.

Discussion:

As described in NUREG/CR-0718, tests for certain steam generators indicate that tube failure can be expected during normal operation if the tube wall thickness is reduced by 85% to 90% and if the defect is 1-inch long or longer. Likewise, during a steam line break accident, failure can be expected if wall thickness is reduced by 75% to 80%.

Information Notice 83-24 addressed events involving foreign objects and loose parts on the secondary side of steam generators at PWRs, including the events at Ginna and Prairie Island 1 where tube ruptures were related to the presence of loose parts.

Generic Letter 85-02 requested that PWR licensees perform visual inspections on steam generator secondary sides in the vicinity of the tube sheet along the entire periphery of the tube bundle and the tube lane to identify any foreign objects and damage to the external surfaces of tubes. For licensees with operating licenses, these inspections were to be performed during the next planned outage for eddy current testing and after any secondary side repairs or modifications to steam generator internals were completed. For applicants for operating licenses, these inspections were to be performed as part of the preservice inspection program. The licensee for Catawba 2 complied with this request as an applicant for an operating license.

On the basis of the assumption that the foreign objects and debris in the Catawba 2 steam generators had been in the top works of the steam generators and were washed down to the tube sheet, an additional careful visual inspection on the secondary side of each steam generator in the vicinity of the tube sheet along the entire periphery of the tube bundle and the tube lane is suggested as a way to preclude similar problems at newer plants. In addition to the preservice inspection, it is suggested that these inspections be performed after initial operation and before startup after the first refueling outage.

No specific action or written response is required by this information notice. If you have 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 Contacts: Roger Woodruff, NRR  
(301) 492-1180

Attachment: List of Recently Issued Information Notices

CONCURRENCE: Woodruff, Lobe], Lanning, Berlinger, Tech Ed, Lomas, Rossi  
2/12/88 2/14/88 2/14/88 2/18/88 2/19/88