

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

February 13, 1996

NRC INFORMATION NOTICE 96-10: POTENTIAL BLOCKAGE BY DEBRIS OF SAFETY SYSTEM  
PIPING WHICH IS NOT USED DURING NORMAL  
OPERATION OR TESTED DURING SURVEILLANCES

Addressees

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

Purpose

The U.S. Nuclear Regulatory Commission (NRC) is issuing this information notice to alert addressees to the potential for the blockage, by debris, of safety system piping in boiling-water reactors (BWRs) or pressurized-water reactors (PWRs). 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.

The source of the information contained in this information notice was the incident reporting system (IRS) of the Organization for Economic Cooperation and Development Nuclear Energy Agency. The Spanish regulatory staff authorized public dissemination of this information.

Description of Circumstances

During refueling outages at PWRs in Spain, containment sumps are usually inspected visually to ensure that the sump, screens, and suction inlet pipes in the emergency core cooling system (ECCS) are free of debris, and that the sumps screens are not corroding.

In November 1993, the licensee of a PWR in Spain inspected its containment sumps during outage surveillance. The licensee did not consider it unusual for the sumps to contain water because there is some leakage to the sump during functional testing of a three-way valve which connects the ECCS borated tanks with the containment sumps. However, in this case, the individual inspecting the sump believed that the water was unusually dirty, so he had it siphoned off. Once the water had been removed, he could see that three of the four sumps had debris in the bottom below the suction pipe for the ECCS. A closer examination of the ECCS suction lines revealed that two of the four

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ECCS lines taking suction from the sumps were partially blocked by debris. One of the two partially blocked lines had almost half the flow area of the pipe blocked off; the other was blocked less. It is believed that the debris had been there since the plant was commissioned, and that this event demonstrated a significant failure of the surveillance program. Figure 1 shows a cross-sectional view of the sump and indicates where the debris was found.

Upon further review, the Spanish regulators noted that there are no technical specification requirements to inspect the piping from the containment sumps to the ECCS to ensure that it is clear of any obstruction by debris. It was also noted that many sections of piping on safety systems in both PWRs and BWRs are only called upon to function during accident conditions, and are not used during normal operation or tested during functional surveillance tests. Confidence in the operability of these pipes was based on the fact that they had not been used since they were tested before plant startup.

In response to the event, Spanish regulators issued a generic letter which asked their licensees to take four actions. First, they were requested to establish administrative controls, including a locking device, on the sump hatch and on any other removable sump parts (PWRs only). Second, they were requested to inspect the containment sump and the piping between the sump and the first ECCS valve which separates the part of the system that is functionally tested from the part that is not (PWRs only). Third, they were requested to inspect the sump every refueling outage. If more than 1 kilogram of debris was found in the sump, licensees were then requested to reinspect the piping between the sump and the functionally tested portion of the ECCS (PWRs only). And fourth, licensees were requested to identify piping segments of safety systems through which flow does not occur, either during normal operation or during surveillance testing, and to analyze whether there are reasonable guarantees that no obstruction exists (BWRs and PWRs). Examples of the piping segments that would require this analysis are crossover piping from the essential service cooling system to the auxiliary feedwater system (PWRs), relief valve discharge piping (PWRs), low-pressure coolant injection suction piping from the condensate storage tank (BWRs), and crossover connections between low-pressure coolant injection trains (BWRs).

### Discussion

The licensee in this case concluded that the safety significance of this event was small because the partial blockage of the lines would not prevent the ECCS from providing sufficient core cooling. However, it was also noted that some of the debris could have been entrained in the water flow and could have detrimental effects on other parts of the system (e.g., pump and valve components and heat exchangers). The licensee initial corrective actions (prior to issuance of the generic letter) included cleaning up the sumps and

suction lines, locking sump hatches, and establishing administrative controls. These corrective actions address the root cause of the presence of debris in the sump and suction line.

It has been noted in previous NRC generic communications that debris could prevent such safety systems as the ECCS from functioning reliably throughout a design-basis accident. These previous NRC communications have dealt with the potential for debris to clog the ECCS strainers (operational debris, loss-of-coolant-accident-generated debris, or a combination of both). The debris described in this information notice is another example of the potential for debris to impair the operation of safety systems. Although the licensee in this case has determined that the debris found in its sump was insufficient to prevent the ECCS from performing its safety function, such debris could damage individual components of the safety system (e.g., pumps), degrade system performance, or (in combination with the debris generated during a loss-of-coolant accident) could accelerate a loss of net positive suction head for the ECCS pumps.

#### Related Generic Communications

- NRC Bulletin 93-02 and Supplement 1: "Debris Plugging of Emergency Core Cooling Suction Strainers," dated May, 11, 1993, and February 18, 1994.
- NRC Information Notice 92-85: "Potential Failures of Emergency Core Cooling Systems Caused by Foreign Material Blockage," dated December 23, 1992.
- NRC Information Notice 92-71: "Partial Plugging of Suppression Pool Strainers at a Foreign BWR," dated September 30, 1992.
- NRC Information Notice 89-77: "Debris in Containment Emergency Sumps and Incorrect Screen Configurations," dated November 21, 1989.
- NRC Information Notice 88-87: "Pump Wear and Foreign Objects in Plant Piping Systems," dated November 16, 1988.
- NRC Information Notice 88-28: "Potential for Loss of Post LOCA Recirculation Capability Due to Insulation Debris Blockage," dated May 19, 1988.

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.

  
Dennis M. Crutchfield, Director  
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Office of Nuclear Reactor Regulation

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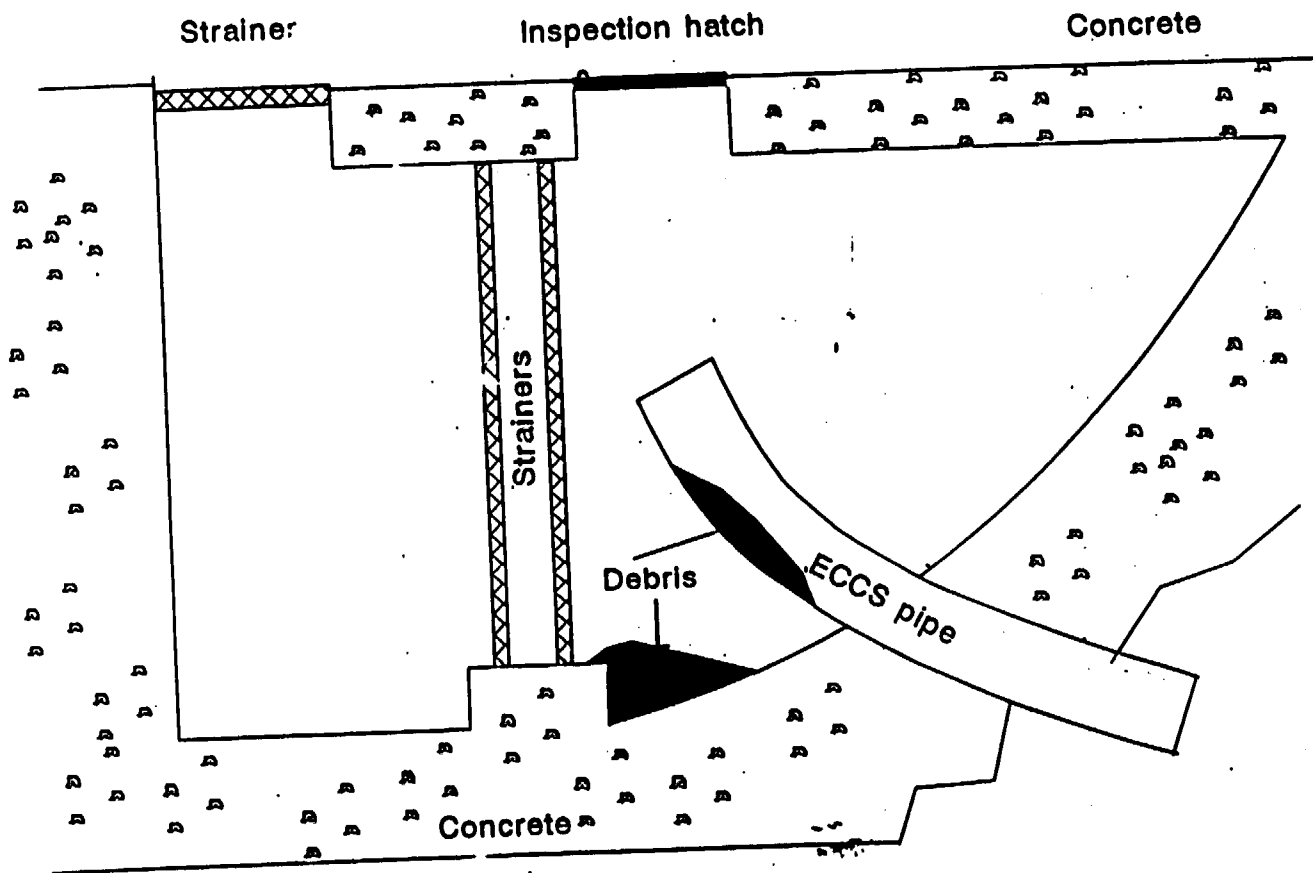
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Attachments:

1. Figure 1: Scheme of Containment Sump
2. List of Recently Issued NRC Information Notices

*Attachments filed in Jacket*

FIGURE 1. Scheme of containment sump



LIST OF RECENTLY ISSUED  
NRC INFORMATION NOTICES

Information Notice No.	Subject	Date of Issuance	Issued to
96-09	Damage in Foreign Steam Generator Internals	02/12/96	All holders of OLs or CPs for pressurized water reactors
96-08	Thermally Induced Pressure Locking of a High Pressure Coolant Injection Gate Valve	02/05/96	All holders of OLs or CPs for nuclear power reactors
96-07	Slow Five Percent Scram Insertion Times Caused By Viton Diaphragms in Scram Solenoid Pilot Valves	01/26/96	All holders of OLs or CPs for boiling water reactors
96-06	Design and Testing Deficiencies of Tornado Dampers at Nuclear Power Plants	01/25/96	All holders of OLs or CPs for nuclear power reactors
96-05	Partial Bypass of Shutdown Cooling Flow from the Reactor Vessel	01/18/96	All holders of OLs or CPs for boiling water reactors
96-04	Incident Reporting Requirements for Radiography Licensees	01/10/96	All radiography licensees and manufacturers of radiography equipment
96-03	Main Steam Safety Valve Setpoint Variation as a Result of Thermal Effects	01/05/96	All holders of OLs or CPs for nuclear power reactors

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OL = Operating License  
CP = Construction Permit

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 IN faxed to Jose Villadoniga of Consejo De Seguridad on 2/6/96.  
 IN concurred on by Bill Upshaw of International Programs on 1/4/95  
 Reviewed by Mike Cullingford on 2/6/96.  
 \*See previous concurrence

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example of the potential for foreign material to impact operation of safety systems. Although the licensee in this case has determined that the debris found in their sump was insufficient to prevent the ECCS from performing its safety function, it is important to realize that this debris could damage individual components of the safety system (e.g., pumps), degrade system performance or, in combination with the debris generated during a loss-of-coolant accident, could accelerate a loss of net positive suction head for the ECCS pumps.

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