

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

November 6, 1992

NRC INFORMATION NOTICE 92-61, SUPPLEMENT 1: LOSS OF HIGH HEAD  
SAFETY INJECTION

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 additional developments relating to the loss of high head safety injection (HHSI) function because of anomalies in the associated alternate minimum flow (AMF) system. 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

On April 3, 1991, Carolina Power & Light Company (the licensee) determined that the HHSI system for the Shearon Harris Nuclear Power Plant had been in a degraded condition during the previous operating cycle. The degraded condition resulted from relief valve and drain line failures in the AMF system for the charging/safety injection pumps (CSIPs) which would have diverted a significant amount of safety injection (SI) flow away from the reactor coolant system (RCS). Additional description of the existing AMF system and additional discussion regarding the specifics of this event are contained in Information Notice 92-61, "Loss of High Head Safety Injection," dated August 20, 1992, and in NRC Special Inspection Report 50-400/92-201, dated September 1, 1992. In addition, Figure 1 provides a schematic of the existing HHSI system at Shearon Harris.

To address NRC staff concerns regarding long-term operability of the existing HHSI system, the licensee committed to implement procedures to minimize the potential for gas or air intrusion into the AMF system and to perform additional testing of the AMF system.

On September 17, 1992, the licensee tested the HHSI AMF system. When the 1CS-746 motor-operated isolation valve was opened to test train "A" of the HHSI AMF system (1CS-746 will stroke fully open in approximately 7 seconds), relief valve 1CS-744 chattered slightly for several seconds and then

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successfully opened. When the ICS-752 motor-operated isolation valve was opened (also requiring approximately 7 seconds) to test train "B" of the HHSI AMF system, relief valve ICS-755 chattered significantly, the valve bellows failed, and the test was halted. Additional discussion regarding these tests is contained in NRC Inspection Report 50-400/92-17, dated October 1, 1992.

### Discussion

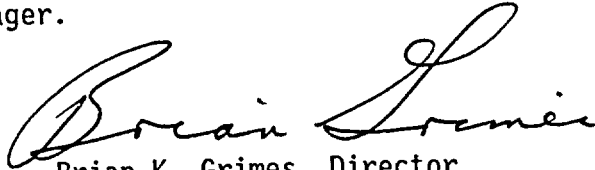
The licensee has indicated that the chattering of the ICS-755 relief valve is believed to have been caused by hydraulic effects associated with opening the ICS-752 motor-operated isolation valve. The NRC staff believes that the fluid frictional and dynamic pressure loss characteristics of the long inlet piping upstream of ICS-752 may have also contributed to the chattering. The licensee indicated that the testing, disassembly, and examination of the ICS-755 relief valve identified that the valve lift setpoint (2300 psi) had not changed, and that the bellows failure was caused by cyclic fatigue of an inside weld. Static testing to verify the valve lift setpoint had been routinely performed, during the plant lifetime, whereas testing to simulate flow through the valve to assure proper operation and reseating apparently never was performed.

The Crosby relief valve technical manual states that chattering can affect the life, operation, and performance of a relief valve. The manual recommends that relief valves not have restricted inlets because restricted inlets can cause valve chatter. The opening and closing of the motor-operated isolation valve in the existing HHSI AMF design at Shearon Harris restricts the inlet to the relief valve. In addition, relief valves are generally designed to provide system overpressure protection and are not designed for continuous fluid throttling purposes.

The licensee also indicated that modifications will be made to the HHSI AMF system before restarting the plant from the current refueling outage. Figure 2 provides a schematic of the proposed modifications to the HHSI AMF system at Shearon Harris. The licensee intends to install flow restricting orifices upstream of the motor-operated isolation valves and to remove the relief valves. The motor-operated isolation valve actuation logic will also be modified so that the isolation valves will open when a safety injection signal is present coincident with RCS pressure above approximately 2300 psi.

The NRC staff is aware that other facilities may employ an HHSI AMF design similar to the existing system at Shearon Harris. These include, but may not be limited to, Millstone Unit 3 Comanche Peak Units 1 and 2, Beaver Valley Unit 2, and Vogtle Units 1 and 2. In addition, systems other than the HHSI AMF system may contain relief valves with restricted inlets, thus also making these valves potentially susceptible to chatter.

This information notice requires no specific action or written response. If you have any questions about the information in this notice, please contact the technical contact listed below or the appropriate Office of Nuclear Reactor Regulation (NRR) project manager.



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

Technical contact: J. Ramsey, NRR  
(301) 504-1167

Attachments:

1. Figure 1, Existing Shearon Harris High Head Safety Injection System
2. Figure 2, Modified Shearon Harris High Head Safety Injection System
3. List of Recently Issued NRC Information Notices

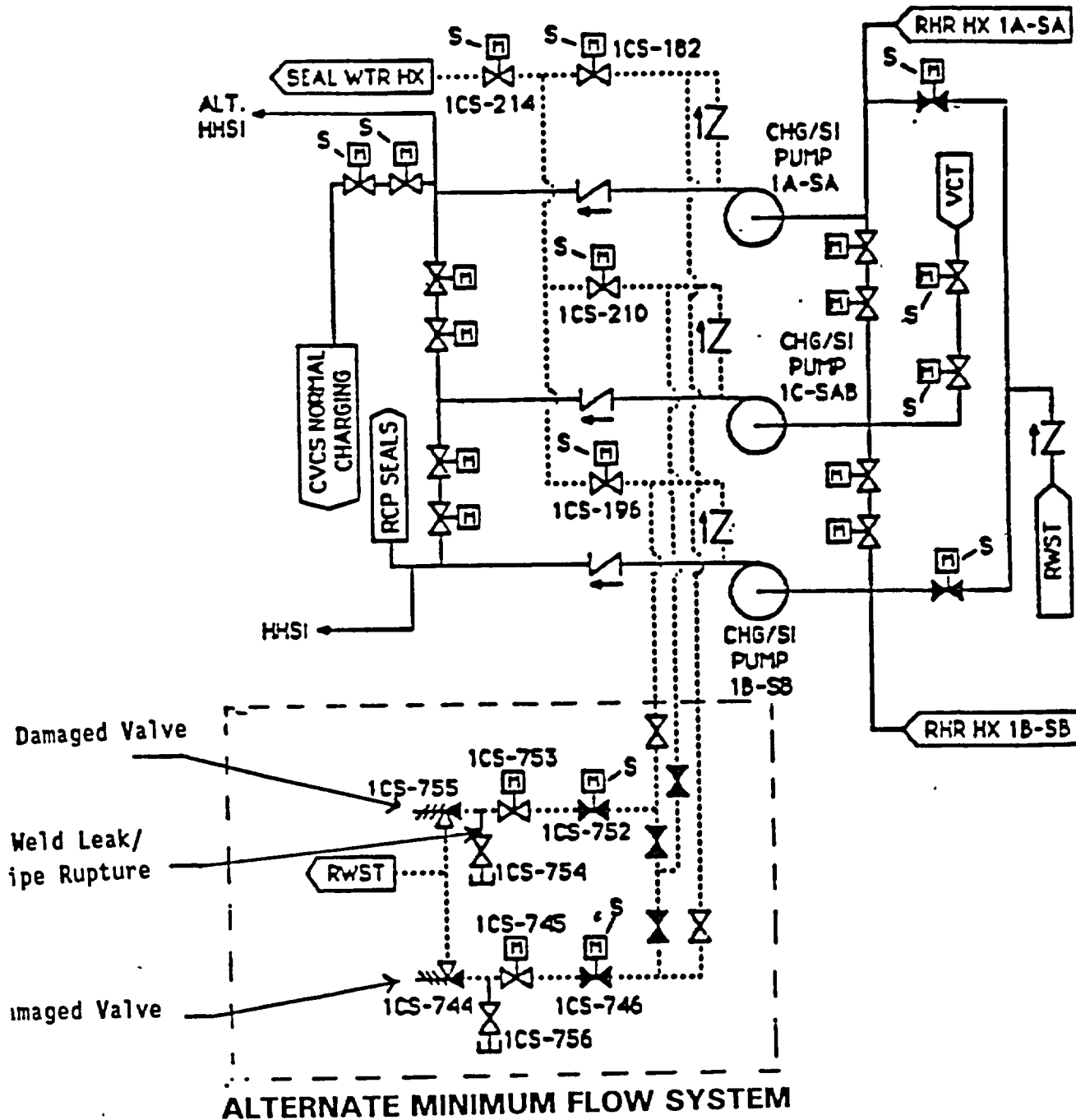


FIGURE 1  
EXISTING SHEARON HARRIS HIGH HEAD INJECTION SYSTEM

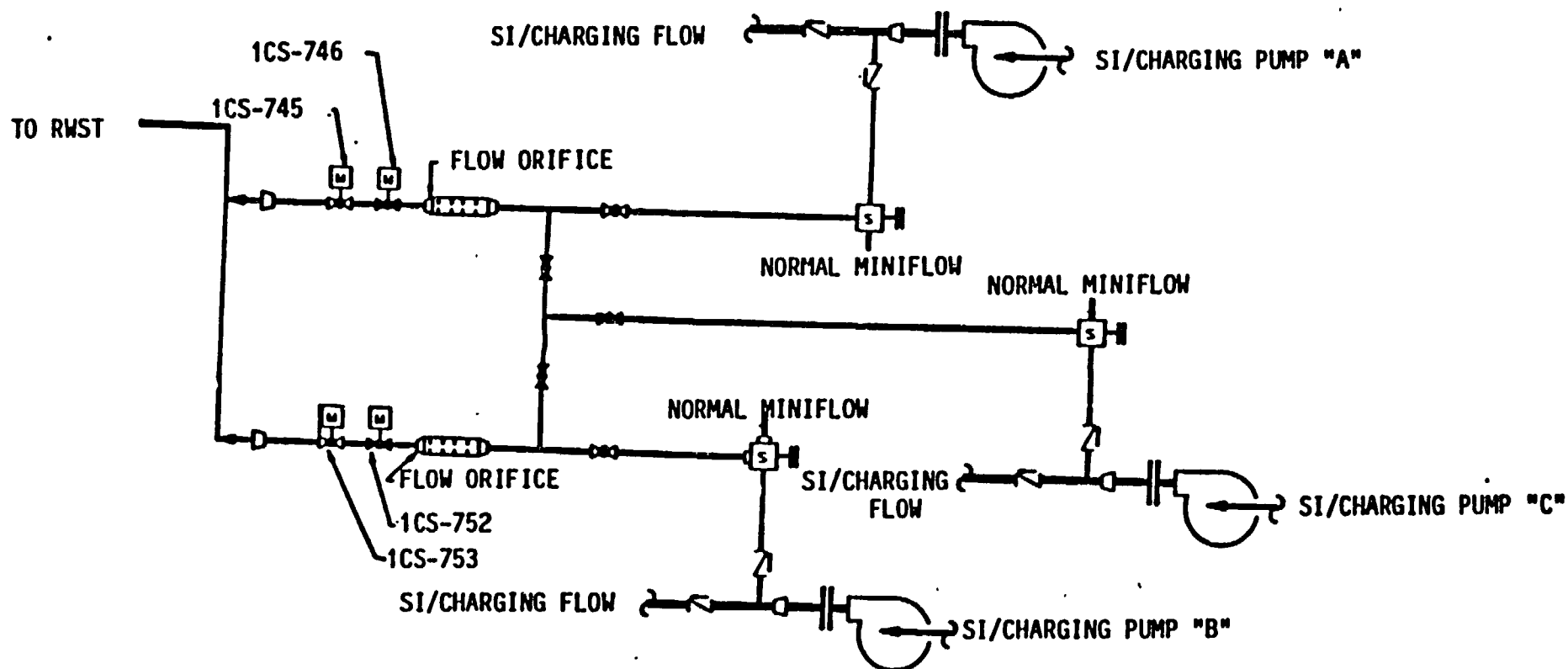


FIGURE 2  
MODIFIED SHEARON HARRIS HIGH HEAD INJECTION SYSTEM

LIST OF RECENTLY ISSUED  
NRC INFORMATION NOTICES

| Information<br>Notice No. | Subject  | Date of<br>Issuance | Issued to  |
|---------------------------|--|---------------------|--|
| 92-73                     | Removal of A Fuel<br>Element from A Re-<br>search Reactor Core<br>While Critical                             | 11-04/92            | All holders of OLs or CPs<br>for nuclear power reactors. |
| 92-59,<br>Rev. 1          | Horizontally-Installed<br>Motor-Operated Gate<br>Valves  | 11/04/92            | All holders of OLs or CPs<br>for nuclear power reactors. |
| 92-72                     | Employee Training and<br>Shipper Registration<br>Requirements for Trans-<br>porting Radioactive<br>Materials | 10/28/92            | All U.S. Nuclear Regulatory<br>Commission Licensees.     |
| 91-64,<br>Supp. 1         | Site Area Emergency<br>Resulting from A Loss<br>of Non-Class 1E<br>Uninterruptible Power<br>Supplies         | 10/07/92            | All holders of OLs or CPs<br>for nuclear power reactors. |
| 92-71                     | Partial Plugging of<br>Suppression Pool<br>Strainers At A<br>Foreign BWR                                     | 09/30/92            | All holders of OLs or CPs<br>for nuclear power reactors. |
| 92-70                     | Westinghouse Motor-Operated<br>Valve Performance Data<br>Supplied to Nuclear Power<br>Plant Licensees        | 09/25/92            | All holders of OLs or CPs<br>for nuclear power reactors. |
| 92-69                     | Water Leakage from Yard<br>Area Through Conduits<br>Into Buildings   | 09/22/92            | All holders of OLs or CPs<br>for nuclear power reactors. |
| 91-29,<br>Supp. 1         | Deficiencies Identified<br>During Electrical Dis-<br>tribution System Func-<br>tional Inspections            | 09/14/92            | All holders of OLs or CPs<br>for nuclear power reactors. |

OL = Operating License  
CP = Construction Permit