UNITED STATES
NUCLEAR REGULATORY COMMISSION
OFFICE OF NUCLEAR REACTOR REGULATION
WASHINGTON, D.C. 20555-0001

October 3, 2001

NRC INFORMATION NOTICE NO. 2001-14: PROBLEMS WITH INCORRECTLY-INSTALLED SWING-CHECK VALVES

Addressees

All holders of operating licenses for nuclear power reactors, except those who have ceased operations and have certified that fuel has been permanently removed from the reactor vessel.

Purpose

The U.S. Nuclear Regulatory Commission (NRC) is issuing this information notice to alert addressees to swing-check valve problems caused by incorrect installation. 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

Cooper Nuclear Station

While trouble-shooting a leaking check valve between the reactor core isolation cooling barometric condenser and the suppression pool, the licensee determined that a check valve had been installed rotated 90 degrees away from the orientation recommended by the valve vendor. According to the vendor's technical manual, the valve should have been installed either in a horizontal line with the hinge pin centerline vertical or in a vertical line with flow upward. The staff documents this problem with certain Anderson-Greenwood check valves in Inspection Report 50-298/98-05 (NUDOCS Accession Number 9809240061).[1]*

The check valves of concern are designed so that, when installed in a horizontal run of piping, the axis of the hinge is vertical and the check valve disc pivots in the horizontal plane, like a door. The licensee incorrectly installed the valves with the hinge pin horizontal, so the disc did not pivot in the horizontal plane as required. The disc face pivoted from a horizontal plane, on forward flow, to a vertical plane on flow reversal. Therefore, the disc tended to hang open on reversal and cessation of flow. This effect can be visualized from attached Figure 1, which shows the relationship of the center of gravity of the disc to the axis of the hinge pin. The spring shown wound around the hinge pin is intended to close the valve against only the design frictional and drag forces expected to exist with the hinge pin vertical or with the valve in a

[1] *NUDOCS documents can be accessed at the NRC Public Document Rooms

vertical run of pipe; it was not designed to overcome the gravitational force that would tend to hold the valve open when the hinge pin axis is horizontal and the valve is in a horizontal run of pipe.

As part of its actions to correct this problem, the licensee identified several other check valves of this type installed with this incorrect orientation.

Palo Verde Nuclear Station

The licensee experienced excessive leakage through some Borg-Warner swing-check valves in the high-pressure safety injection (HPSI) system. The root cause of the problem was determined to be an error in valve assembly during the original installation. As a result, the disc assembly was suspended too low inside the body of the valve. With the disc assembly suspended too low, the valve might have seated acceptably at first but remained partially open after forward flow exercised the valve.

The improper assembly occurred during plant construction. The licensee removed the internals of these valves so the valve bodies could be welded into the piping. During reassembly of the internals, the bonnet retaining ring was threaded into the body until it bottomed. The original factory assembly process included a step that involved backing out the bonnet retaining ring, after it bottomed in the valve body, until the correct disc height was obtained, as visually observed through the open ends of the valve body. At Palo Verde, however, the valve had been installed in the piping and the valve internals could not be observed. Therefore, the disc height adjustment could not be made during valve reassembly, and the disc remained too low in the body to engage the seat properly.

The NRC staff had addressed this problem in Information Notice IN 89-62, “Malfunction of Borg-Warner Pressure Seal Bonnet Check Valves Caused by Vertical Misalignment of Disk,” dated August 31, 1989 (NUDOCS Accession Number 8908240375). After IN 89-62 was issued, the valve vendor issued maintenance guidance to recommend that measurements of an internal critical dimension be done to ensure that the disc is in the correct position following maintenance.

Until November 1994, the licensee’s maintenance procedure for these check valves did not include adequate instructions for ensuring correct vertical positioning of the disc. Once the problem was diagnosed in 1998, the licensee implemented a plan to identify and correct the error on all of the HPSI discharge check valves. The NRC staff described the licensee’s actions on this problem in Inspection Report 50-528/529/530 98-14 (NUDOCS Accession Number 9809090298).

Discussion

As a result of the installation and maintenance errors discussed in this information notice, some check valves did not seat properly. Furthermore, the problems at Cooper and Palo Verde reveal the importance of timely incorporation of vendor recommendations into work instructions to ensure that check valves are installed and maintained properly. Specifically, the problems

highlight the need to install Anderson Greenwood check valves in accordance with vendor guidance and to ensure that the Borg-Warner check valve disc is in its correct vertical position.

This information notice requires no specific action or written response. However, recipients are reminded that they are required to consider industry-wide operating experience (including NRC information notices), where practical, when setting goals and performing periodic evaluations under 10 CFR 50.65, "Requirement for Monitoring the Effectiveness of Maintenance at Nuclear Power Plants." If you have any questions about the information in this notice, please contact one of the technical contacts listed below or the appropriate Office of Nuclear Reactor Regulation (NRR) project manager.

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Attachments:
1. Figure 1. Anderson Greenwood Check Valve
2. Figure 2. Borg-Warner Check Valve With Disk Jammed in Open Position
3. List of Recently Issued NRC Information Notices

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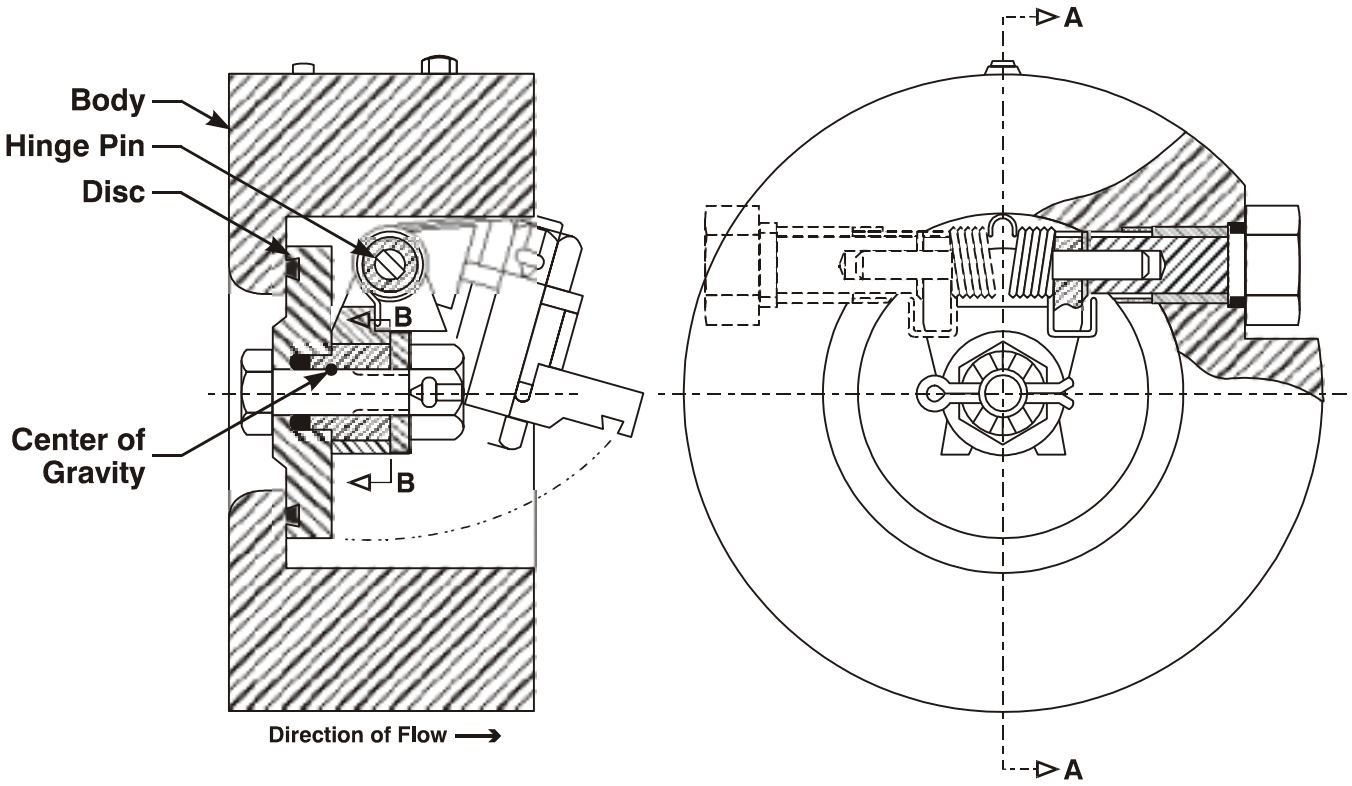

Figure 1. Anderson Greenwood Check Valve

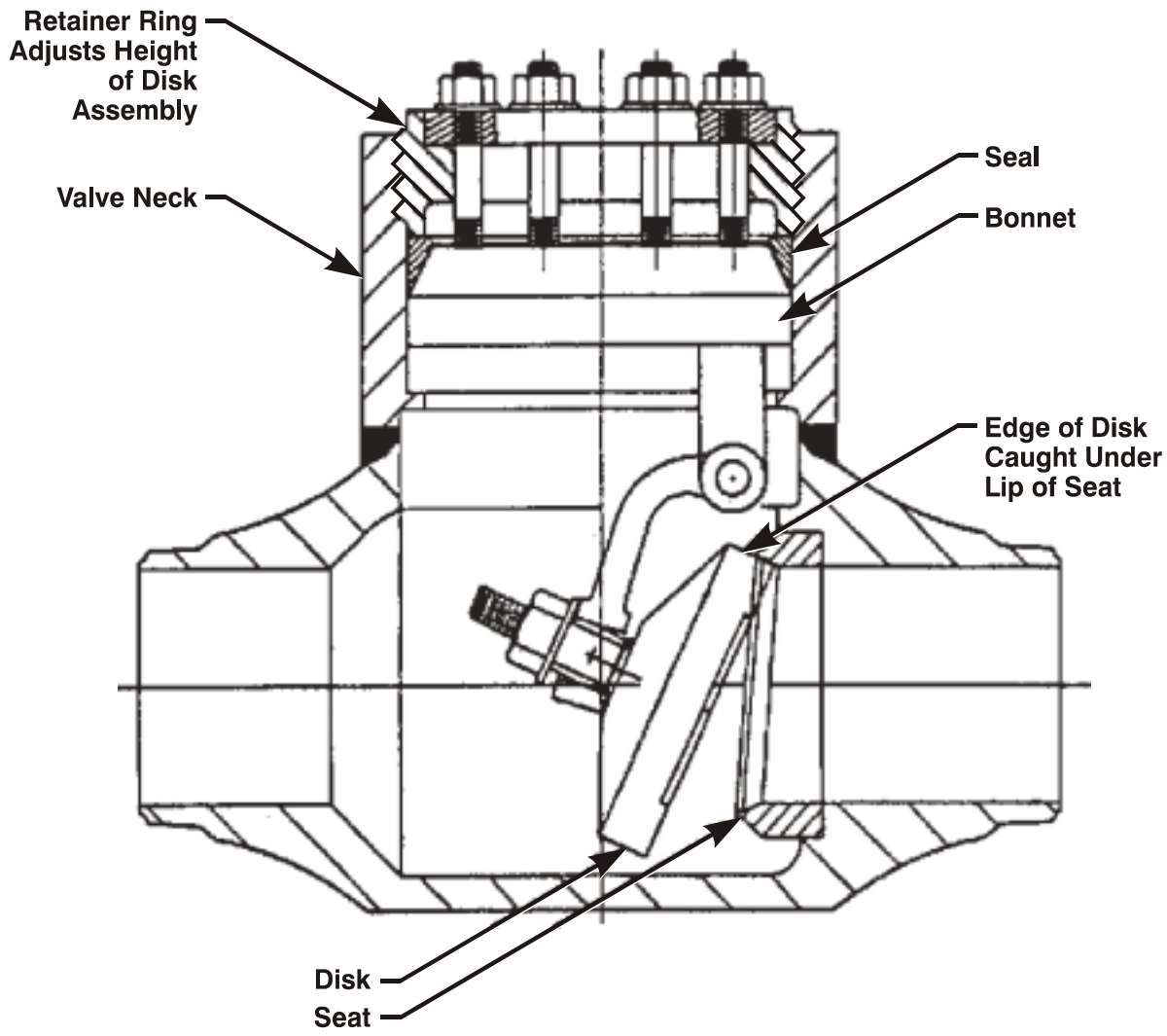

Figure 2. Borg-Warner Check Valve Shown with Disk Jammed in Open Position

LIST OF RECENTLY ISSUED
NRC INFORMATION NOTICES

Information Notice No.	Subject	Date of Issuance	Issued to
2001-13	Inadequate Standby Liquid Control System Relief Valve Margin	10/03/01	All holders of operating licenses for boiling water reactors
2001-12 (ERRATA)	Hydrogen Fire at Nuclear Power Stations	8/08/01	All holders of operating licenses or construction permits for nuclear power reactors except those who have ceased operations and have certified that fuel has been permanently removed from the reactor vessel
2001-12	Hydrogen Fire at Nuclear Power Stations	7/13/01	All holders of operating licenses or construction permits for nuclear power reactors except those who have ceased operations and have certified that fuel has been permanently removed from the reactor vessel
2001-11	Thefts of Portable Gauges	07/13/01	All portable gauge licensees
2001-10	Failure of Central Sprinkler Company Model GB Series Fire Sprinkler Heads	06/28/01	All holders of licenses for nuclear power, research, and test reactors and fuel cycle facilities
2001-09	Main Feedwater System Degradation in Safety-Related ASME Code Class 2 Piping Inside the Containment of a Pressurized Water Reactor	06/12/01	All holders of operating licenses for pressurized water nuclear power reactors, except those who have permanently ceased operations and have certified that fuel has been permanently removed from the reactor vessel
2001-08 Supplement 1	Update on the Investigation of Patient Deaths in Panama, Following Radiation Therapy Overexposures	06/06/01	All Medical Licensees

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