

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

October 14, 1988

NRC INFORMATION NOTICE NO. 88-85: BROKEN RETAINING BLOCK STUDS ON
ANCHOR DARLING CHECK VALVES

Addressees:

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

Purpose:

This information notice is being provided to alert addressees to potential problems relating to the failure of retaining block studs on Anchor Darling check valves and the possible generic implications. Diablo Canyon, Unit 2, and D.C. Cook Units 1 and 2, have recently reported problems with this type of failure. 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:

In October 1988 at Diablo Canyon, Unit 2, a scheduled preventative maintenance performed on a check valve in the Residual Heat Removal (RHR) System revealed that two retaining block studs (see drawing) were completely broken. This valve had been successfully stroked by hand several times before the mechanic detected slight movement of the retaining block. Upon further investigation the mechanic discovered that the studs were actually broken. The valve is an 8-inch pressure isolation valve in piping attached to the Reactor Coolant System hot leg. One stud was sheared at the block to valve body interface and the other stud was broken off inside the retaining block. There were signs of significant corrosion product build-up on the failed studs. The valve was manufactured by Anchor Darling.

Discussion:

The licensee has taken actions to repair the RHR valve, and a metallurgical evaluation of the failed studs is underway. The companion valve for the other RHR loop valve at Diablo Canyon, Unit 2, has been disassembled and found to be acceptable. The licensee has also disassembled eight 10-inch Anchor Darling swing check valves in the Safety Injection (SI) System. These valves are also pressure isolation valves. These valves have also been found to be acceptable. The stud material in all ten of these valves is ASTM A193 Grade B6 Type 410 stainless steel. A discussion of problems noted with 410 stainless steel parts in other valve applications is contained in Information Notice 85-59, "Valve Stem Corrosion Failures."

8810140212

ZA

IDR-11C

Several weeks prior to the failure at Diablo Canyon, Unit 2, D.C. Cook, Unit 2, discovered similar stud failures in Anchor Darling swing check valves. One broken stud and one cracked stud were discovered in each of two 8-inch RHR low head injection check valves. These valves are the second check valves back from the reactor coolant loop hot legs, and they act as pressure isolation valves. At D.C. Cook, Unit 2, there are two additional 8-inch Anchor Darling swing check valves in the RHR system. There are also eight 10-inch Anchor Darling swing check valves in the SI system. All four RHR valves and six of the eight SI valves have been inspected. One of the SI accumulator injection check valves was also found to have a cracked stud. The remainder of the valves inspected were found to be acceptable.

At D.C. Cook, Unit 1, the two RHR injection check valves were inspected and each was found to have one broken stud. Two SI accumulator injection check valves were also inspected and found to be acceptable. Metallurgical evaluation of the failed studs is ongoing with the preliminary analysis indicating that the failures are due to intergranular stress corrosion cracking.

Based upon discussions with the valve vendor, the NRC has learned that the affected valves at the plants discussed above are Anchor Darling Model Number S350WSC, Drawing Number 94-12892. The vendor also indicated that based primarily on experience with pressure boundary bolting, they have been using Type 17-4PH stainless steel for bolts and studs in borated water service. They no longer manufacture the S350WSC valve, and they recommend replacement studs be made of Type 17-4PH stainless steel rather than Type 410.

The NRC staff believes that with seriously degraded studs, the retaining blocks could be dislodged if these valves are called upon to open rapidly during accident conditions. This could lead to blockage of the flow path, and the valves would be incapable of reseating.

Licensees may wish to consider potential actions that would be appropriate if one of these check valves should fail in service prior to inspection of the studs. Such actions might include appropriate procedures and operator training.

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.

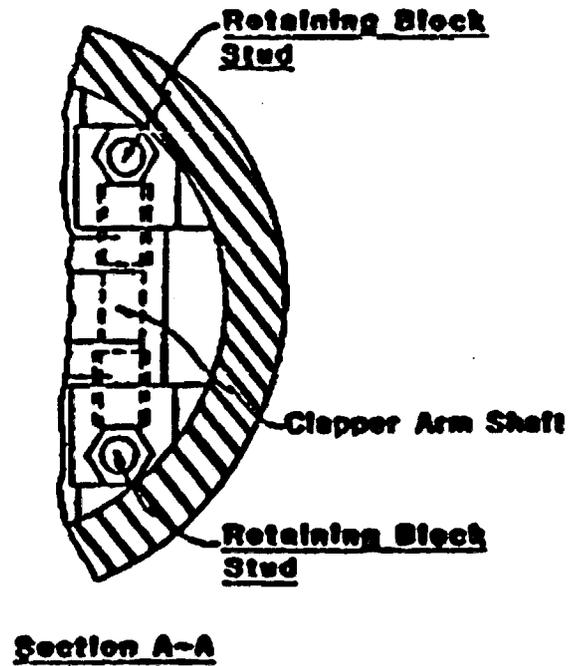
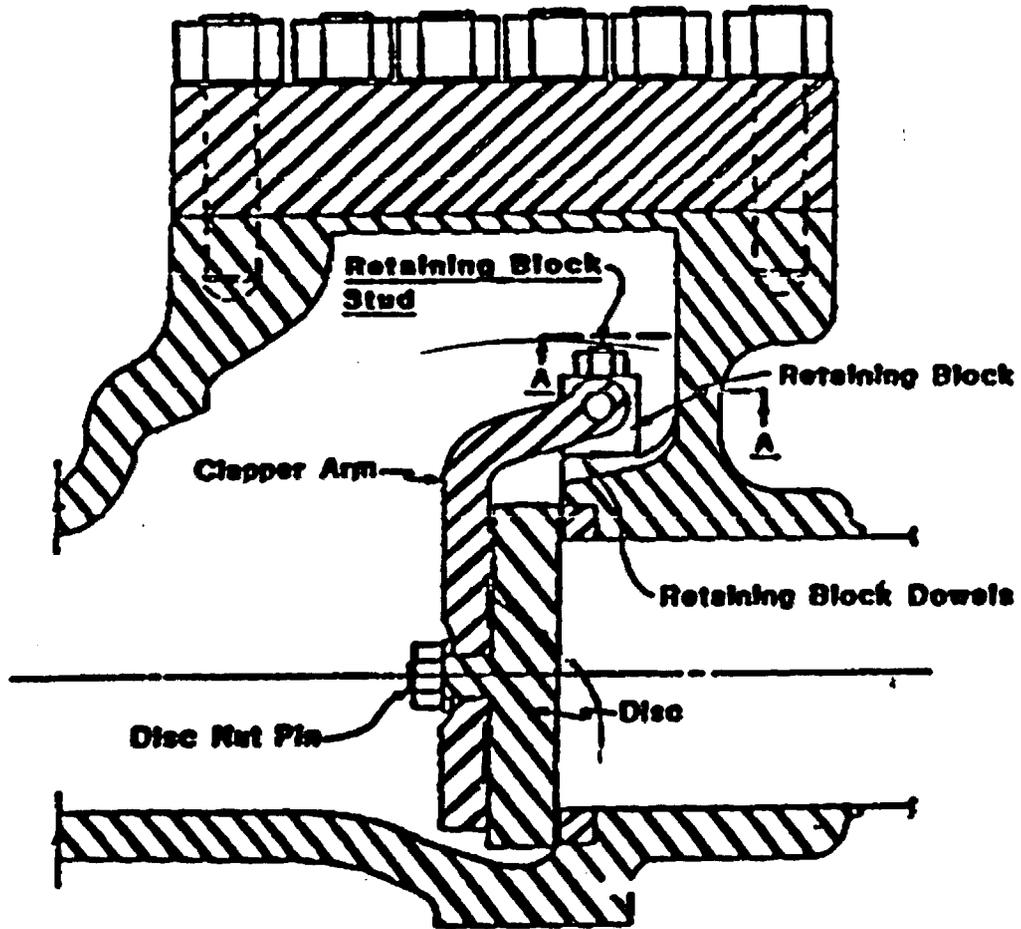
Charles E. Rossi

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

Technical Contact: Ted Sullivan, NRR
(301) 492-0901

Attachments:

1. Figure of Valve
2. List of Recently Issued NRC Information Notices



(Not to Scale)

LIST OF RECENTLY ISSUED
NRC INFORMATION NOTICES

Information Notice No.	Subject	Date of Issuance	Issued to
88-84	Defective Motor Shaft Keys in Limiting Motor Actuators	10/20/88	All holders of OIs or CPs for nuclear power reactors.
88-83	Inadequate Testing of Relay Contacts in Safety-Related Logic Systems	10/19/88	All holders of OIs or CPs for nuclear power reactors.
88-82	Torus Shells with Corrosion and Degraded Coatings in BWR Containments	10/14/88	All holders of OIs or CPs for BWRs.
88-81	Failure of Amp Window Indent Kynar Splices and Thomas and Betts Nylon Wire Caps During Environmental Qualification Testing	10/7/88	All holders of OIs or CPs for nuclear power, test, and research reactors.
88-80	Unexpected Piping Movement Attributed to Thermal Stratification	10/7/88	All holders of OIs or CPs for PWRs.
88-79	Misuse of Flashing Lights for High Radiation Area Controls	10/7/88	All holders of OIs or CPs for nuclear power reactors.
88-69, Supp 1	Movable Contact Finger Binding in MFA Relays Manufactured by General Electric (GE)	9/29/88	All holders of OIs or CPs for nuclear power reactors.
88-78	Implementation of Revised NRC-Administered Requalification Examinations	9/22/88	All holders of OIs or CPs for nuclear power reactors.
88-77	Inadvertent Reactor Vessel Overfill	9/22/88	All holders of OIs or CPs for BWRs.

OL = Operating License
CP = Construction Permit

UNITED STATES
NUCLEAR REGULATORY COMMISSION
WASHINGTON, D.C. 20555

OFFICIAL BUSINESS
PENALTY FOR PRIVATE USE, \$300

FIRST CLASS MAIL
POSTAGE & FEES PAID
USNRC
PERMIT No. G-87

Several weeks prior to the failure at Diablo Canyon, Unit 2, D.C. Cook, Unit 2, discovered similar stud failures in Anchor Darling swing check valves. One broken stud and one cracked stud were discovered in each of two 8-inch RHR low head injection check valves. These valves are the second check valves back from the reactor coolant loop hot legs, and they act as pressure isolation valves. At D.C. Cook, Unit 2, there are two additional 8-inch Anchor Darling swing check valves in the RHR system. There are also eight 10-inch Anchor Darling swing check valves in the SI system. All four RHR valves and six of the eight SI valves have been inspected. One of the SI accumulator injection check valves was also found to have a cracked stud. The remainder of the valves inspected were found to be acceptable.

At D.C. Cook, Unit 1, the two RHR injection check valves were inspected and each was found to have one broken stud. Two SI accumulator injection check valves were also inspected and found to be acceptable. Metallurgical evaluation of the failed studs is ongoing with the preliminary analysis indicating that the failures are due to intergranular stress corrosion cracking.

Based upon discussions with the valve vendor, the NRC has learned that the affected valves at the plants discussed above are Anchor Darling Model Number S350WSC, Drawing Number 94-12892. The vendor also indicated that based primarily on experience with pressure boundary bolting, they have been using Type 17-4PH stainless steel for bolts and studs in borated water service. They no longer manufacture the S350WSC valve, and they recommend replacement studs be made of Type 17-4PH stainless steel rather than Type 410.

The NRC staff believes that with seriously degraded studs, the retaining blocks could be dislodged if these valves are called upon to open rapidly during accident conditions. This could lead to blockage of the flow path, and the valves would be incapable of reseating.

Licensees may wish to consider potential actions that would be appropriate if one of these check valves should fail in service prior to inspection of the studs. Such actions might include appropriate procedures and operator training.

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: Ted Sullivan, NRR
(301) 492-0901

Attachments:

1. Figure of Valve
2. List of Recently Issued NRC Information Notices

*SEE PREVIOUS CONCURRENCE

*EAB:NRR *ACT:C:EAB:NRR *NRR:EMEB *ACT:C:RI*NRR:DEST *C:OGCB:NRR:DOEA:NRR
JThompson:dbJJaudon TSullivan JDurr LShao CHBerlingerCERossi
10/14/88 10/14/88 10/14/88 10/14/88 10/14/88 10/14/88

each of two

discovered similar stud failures in Anchor Darling swing check valves. One broken stud and one cracked stud were discovered in 8" RHR low head injection check valves. These valves are the second check valves back from the reactor coolant loop hot legs, and they therefore act as pressure isolation valves. At D.C. Cook, Unit 2, there are two additional 8" Anchor Darling swing check valves. There are also eight 10" Anchor Darling swing check valves in the SI system. *the two RHR valves and six of the eight SI valves have been inspected. One of the SI accumulator injection check valves was also found to have a cracked stud. The remainder of the valves inspected were found to be acceptable.* *valves in the RHR system.*

At D.C. Cook, Unit 1, the two RHR injection check valves were inspected and each found to have one ~~cracked~~ stud. Two SI accumulator injection check valves were inspected and found to be acceptable. Metallurgical evaluation of the failed studs is ongoing with the preliminary analysis indicating that the failures are due to intergranular stress corrosion cracking. *all four broken*

Based upon discussions with the valve vendor, the NRC has learned that the affected valves at the plants discussed above are Anchor Darling Model Number S350WSC, Drawing Number 94-12892. The vendor also indicated that based primarily on experience with pressure boundary bolting, they have been using Type 17-4PH stainless steel for studs in borated water service. They no longer manufacture the S350WSC valve, but they recommend replacement studs be made of Type 17-4PH stainless steel rather than Type 410. *bolts and*

The NRC staff believes that with seriously degraded studs, the retaining blocks could be dislodged if these valves are called upon to open rapidly during accident conditions. This could lead to blockage of the flow path, and the valves would be incapable of reseating.

Licenseses may wish to consider potential actions that would be appropriate if one of these check valves should fail in service prior to inspection of the bolts. Such actions might include appropriate procedures and operator training.

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: Ted Sullivan
(301) 492-0901

Attachments:

- 1. Figure of Valve
- 2. List of Recently Issued Information Notices

EAB:NRR	ACT:C:EAB:NRR	NRR:EMEB	ACT:C:RI	NRR:DEST	C:OCCB:NRR	D:DOEA:NRR
JThompson:db	JJaudon	TSullivan	JDurr	LShao	CHBerlinger	CERossi
10/14/88	10/14/88	10/14/88	10/14/88	10/14/88	10/14/88	10/14/88

As modified

[Handwritten signatures and initials under the distribution list]