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SUBJECT: Provides info re degradation of A-193 Grade B6 Type 410 stainless steel retaining block studs in check valves.

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Donald C. Cook Nuclear Plant Unit Nos. 1 and 2
Docket Nos. 50-315 and 50-316
License Nos. DPR-58 and DPR-74
VOLUNTARY REPORT: DEGRADATION OF RETAINING BLOCK STUDS IN DARLING VALVE AND MANUFACTURING COMPANY CLEAR WATERWAY CHECK VALVES

U.S. Nuclear Regulatory Commission
Attn: Document Control Desk
Washington, D.C. 20555

Attn: A. B. Davis

October 28, 1988

Dear Mr. Davis:

The purpose of this letter is to provide you with information concerning recently observed degradation of A-193 Grade B6 Type 410 stainless steel retaining block studs in Darling Valve and Manufacturing Company Clear Waterway check valves installed at the Cook Nuclear Plant. The observed condition did not result in any check valve failures, and we have determined that the condition was not reportable under Title 10 CFR or our technical specifications (T/Ss). However, because degradation of the type observed at the Cook Nuclear Plant has been of general industry interest in the past (e.g., INPO Significant Operating Experience Report [SOER] 86-03), we have elected to submit this voluntary report. A summary of the observed condition and actions we have taken is provided below.

Background

In conjunction with the performance of other maintenance on 8" Darling Clear Waterway swing check valve (2-SI-151W) installed in the low pressure emergency core cooling system (ECCS), an inspection of the valve internals was performed in accordance with the maintenance program that we established in response to INPO SOER 86-03. During this inspection, one of the two retaining block studs was found broken and the other cracked. A diagram of the valve type in question is provided in Figure 1. The retaining block studs (Part No. 11542-61-5) retain the blocks (Part Nos. 11542-60/60-1) that hold the valve disc assembly in place. As a result of this finding, the corresponding check valve (2-SI-151E) in the redundant low pressure ECCS train was

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inspected. Again, one of the two retaining block studs was found broken and the other cracked. Discovery of this second instance prompted the expansion of the inspection to all Unit 2 Darling check valves of the same design as those in which the degraded studs were found. There are 12 valves of this design installed in the ECCS and RHR systems in each unit at Cook Nuclear Plant. All of these valves are classified as pressure isolation valves (PIVs) and leak tested in accordance with our IST valve program. They are:

- (4) 10" check valves at the accumulator outlet (SI-166L1, L2, L3, L4)
- (4) 10" check valves ECCS injection to cold legs (SI-170L1, L2, L3, L4)
- (2) 8" check valves low pressure ECCS (SI-151E & W)
- (2) 8" check valves normal RHR (RH-133, -134)

Figure 2 provides a simplified flow diagram which identifies the locations of these check valves in either unit at Cook Nuclear Plant.

Soon after the decision was made to initiate the inspection of Unit 2 check valves however, Unit 1 went from power operation to hot shutdown (Mode 4) due to an unrelated event. As a result, a decision was made to immediately inspect all Unit 1 check valves of this design accessible in Mode 4. In Unit 1, the only check valves accessible for inspection during the Mode 4 forced outage were 1-SI-151E, 1-SI-151W, 1-SI-166L1, and 1-SI-166L4. The Unit 1 inspections found one broken stud in each of the check valves installed in the low pressure ECCS (1-SI-151E & W) and stud material with an appearance not typical of Type 410 stainless steel in each of the two accessible accumulator outlet valves (1-SI-166L1, & L4).

The continuing Unit 2 inspections identified one additional check valve with one cracked stud (2-SI-166L4), and one valve (2-SI-166 L1) in which, although the studs were intact, the stud material did not have the appearance typical of Type 410 stainless steel, the material specified on the valve drawing for the retaining block studs. Both valves are located on the accumulator outlet. A summary of inspection results for the valves inspected in both Unit 1 and Unit 2 is provided in Table 1.

Actions Resulting from Check Valve Inspections

In each of the cases discussed above, the cracked or broken studs, or studs of a material having an appearance not typical of

Type 410 stainless steel were replaced with A-193 Grade B8 stud material. This new stud material is recommended by the valve manufacturer for this application. In addition, maintenance job orders were initiated to replace all A-193 Grade B6 Type 410 stainless steel studs with the new A-193 Grade B8 material regardless of whether any degradation is currently evident. This action is also in accordance with the valve manufacturer's recommendation. To date, retaining block studs in 10 of the 12 Unit 2 check valves and 4 of the 12 Unit 1 check valves have been replaced with the new A-193 Grade B8 stud material. The studs in the remaining Unit 2 check valves will be replaced during the current steam generator repair project outage. The studs in the remaining Unit 1 check valves are to be replaced during the next scheduled outage, with the possible exception of those installed in the low pressure injection lines to the cold legs (1-SI-170L1, L2, L3 and L4). Service conditions for these valves may not be conducive to the type of stud degradation observed in the other systems inspected. Westinghouse, who supplied the check valves under the original NSSS contract, and Darling, the valve manufacturer, were advised of the inspection findings discussed above. Westinghouse is conducting metallurgical evaluations to determine the root cause of the stud degradation.

Evaluation of Safety Significance

With regard to the evaluation of the safety significance of our valve inspection findings, the following key factors were considered:

1) The check valves in their as-found condition had not failed, nor was valve operability impaired.

2) Inadvertent pressurization of a low pressure ECCS system is precluded since in each case where a check valve with potentially degraded studs was found, at least two valves were available to prevent back leakage from the reactor coolant system.

3) The check valves would have performed their intended function (i.e., opened) in the event of a LOCA regardless of whether the retaining block studs had completely failed.

4) Of the 10 valves inspected on Unit 2, three showed degradation of the retaining block studs and one was found to have questionable stud material. The corresponding Unit 1 valves which see the same service conditions as Unit 2 were inspected and studs replaced with the new stud material. No anomalies were observed in the remaining Unit 2 check valves inspected.

5) The Unit 2 valves in the degraded condition had functioned successfully in passing the required flow during Mode 5 or 6 operation at the beginning of the steam generator repair outage. Successful operation of these valves during this evolution is equivalent to passing the full flow test normally performed to confirm valve operability.

Unit 1 was returned to service on September 15, 1988, and the actions discussed above to replace retaining block studs on both units have commenced.

This document has been prepared following Corporate procedures which incorporate a reasonable set of controls to ensure its accuracy and completeness prior to signature by the undersigned.

Sincerely,

M. P. Alexich
Vice President

ldp

cc: D. H. Williams, Jr.
W. G. Smith, Jr. - Bridgman
R. C. Callen
G. Charnoff
A. B. Davis
NRC Resident Inspector - Bridgman
G. Bruchmann

TABLE 1

SUMMARY OF ANCHOR/DARLING CHECK VALVE INSPECTIONS

	Valve	Size	Service Location	Retaining Block Stud Condition
Unit 1				
	1-SI-151E	8"	Safety Injection (SI) To Hot Legs	One Broken Stud[1]
	1-SI-151W	8"	SI To Hot Legs	One Broken Stud
	1-SI-166L1	10"	Accumulator Outlet	Questionable Stud Material[2]
	1-SI-166L4	10"	Accumulator Outlet	Questionable Stud Material
Unit 2				
	2-RH-133	8"	Residual Heat Removal (RHR) To Cold Leg	OK
	2-RH-134	8"	RHR To Cold Leg	OK
	2-SI-151E	8"	SI To Hot Legs	One Broken Stud One Cracked Stud[3]
	2-SI-151W	8"	SI To Hot Legs	One Broken Stud One Cracked Stud
	2-SI-166L1	10"	Accumulator Outlet	Questionable Stud Material
	2-SI-166L2	10"	Accumulator Outlet	OK
	2-SI-166L3	10"	Accumulator Outlet	OK
	2-SI-166L4	10"	Accumulator Outlet	One Cracked Stud
	2-SI-170L1	10"	Low Pressure Injection To Cold Leg	OK
	2-SI-170L4	10"	Low Pressure Injection To Cold Leg	OK

Table 1 Notes:

1) A broken stud is a stud that has completely sheared into two parts. In each case where a broken stud is reported, the break occurred at or near the plane of the interface between the valve body and the retaining block.

2) Questionable stud material refers to studs that looked shiny instead of having the black appearance typical of Type 410 stainless steel, the material listed on the valve drawings for the retaining block studs. It appears that the "as-found" material is either Type 304 or 316 stainless steel.

3) A cracked stud is a stud that has partially sheared but has not parted into two pieces.

FIGURE 1: DARLING CLEAR WATERWAY CHECK VALVE

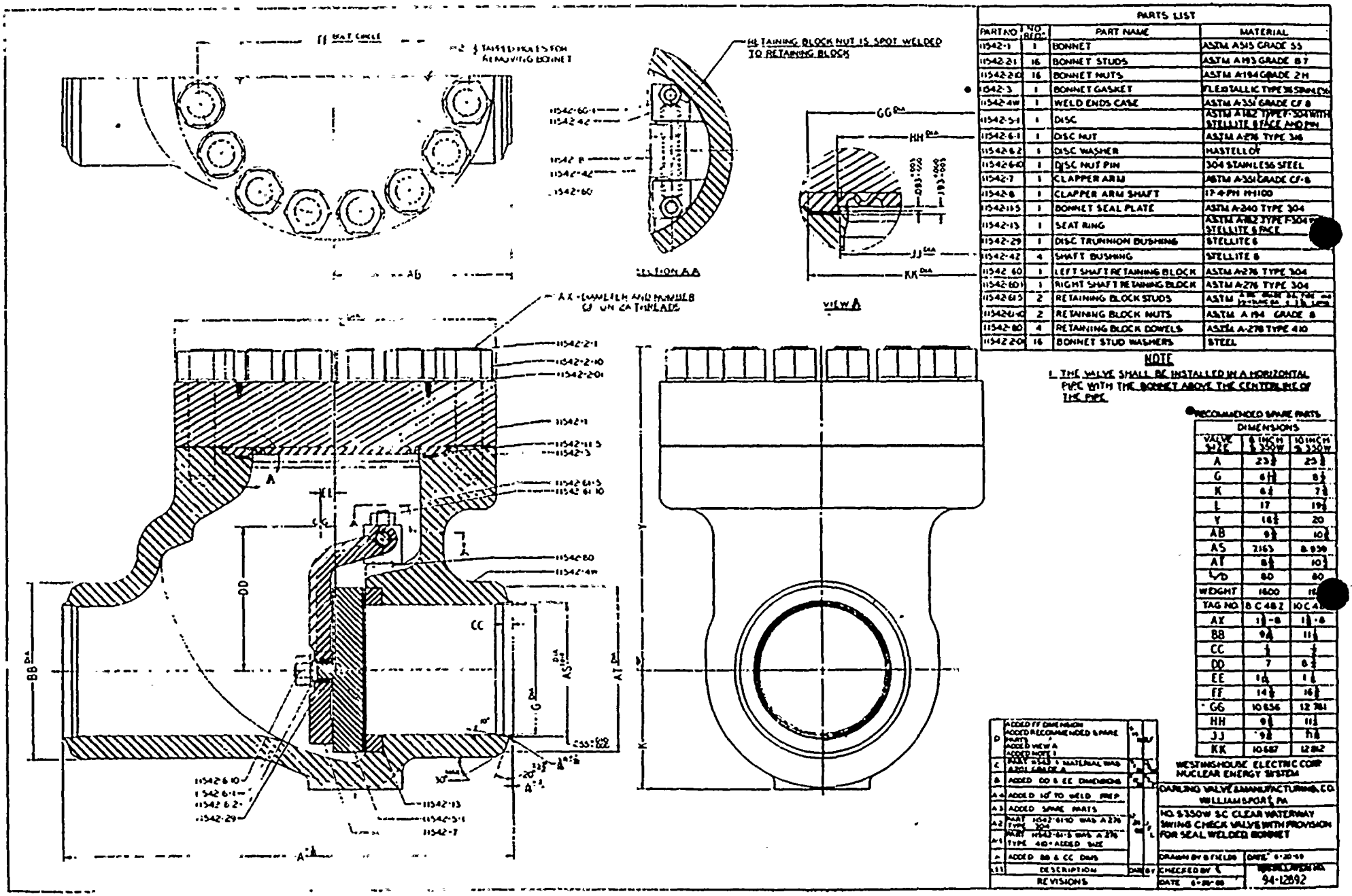

FIGURE 2: EMERGENCY CORE COOLING FLOW DIAGRAM