

ACCELERATED DISTRIBUTION DEMONSTRATION SYSTEM

REGULATORY INFORMATION DISTRIBUTION SYSTEM (RIDS)

ACCESSION NBR: 8811080073 DOC. DATE: 88/10/28 NOTARIZED: NO DOCKET #
 FACIL: 50-315 Donald C. Cook Nuclear Power Plant, Unit 1, Indiana & 05000315
 50-316 Donald C. Cook Nuclear Power Plant, Unit 2, Indiana & 05000316
 AUTH. NAME AUTHOR AFFILIATION
 ALEXICH, M.P. Indiana Michigan Power Co. (formerly Indiana & Michigan Ele)
 RECIP. NAME RECIPIENT AFFILIATION
 Document Control Branch (Document Control Desk)

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

DISTRIBUTION CODE: A001D COPIES RECEIVED: LTR 1 ENCL 1 SIZE: 8
 TITLE: OR Submittal: General Distribution

NOTES:

	RECIPIENT		COPIES			RECIPIENT		COPIES	
	ID CODE/NAME		LTTR	ENCL		ID CODE/NAME		LTTR	ENCL
	PD3-1 LA		1	0		PD3-1 PD		2	2
	SCOTT, W		1	1					
INTERNAL:	ARM/DAF/LFMB		1	0		NRR/DEST/ADS 7E		1	1
	NRR/DEST/CEB 8H		1	1		NRR/DEST/ESB 8D		1	1
	NRR/DEST/MTB 9H		1	1		NRR/DEST/RSB 8E		1	1
	NRR/DOEA/TSB 11		1	1		NRR/PMAS/ILRB12		1	1
	<u>NUDGS-ABSTRACT</u>		1	1		OGC/HDS1		1	0
	REG FILE 01		1	1		RES/DSIR/EIB		1	1
EXTERNAL:	LPDR		1	1		NRC PDR		1	1
	NSIC		1	1					

NOTE TO ALL "RIDS" RECIPIENTS:

PLEASE HELP US TO REDUCE WASTE! CONTACT THE DOCUMENT CONTROL DESK,
 ROOM P1-37 (EXT. 20079) TO ELIMINATE YOUR NAME FROM DISTRIBUTION
 LISTS FOR DOCUMENTS YOU DON'T NEED!

TOTAL NUMBER OF COPIES REQUIRED: LTTR 19 ENCL 16

R
I
D
S
/
A
D
D
S
/
A
D
D
S
/
A
D
D
S

*MP
EDW*



AEP:NRC:1054

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

8811080073 881028
PDR ADOCK 05000315
P PDC

A001
11



10-10-10

10-10-10

10-10-10

10-10-10

10-10-10

10-10-10

10-10-10

10-10-10

10-10-10

10-10-10

10-10-10

10-10-10

10-10-10

10-10-10

10-10-10

10-10-10

10-10-10

10-10-10

10-10-10

10-10-10

10-10-10

10-10-10

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:

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

THE
FEDERAL BUREAU OF INVESTIGATION
UNITED STATES DEPARTMENT OF JUSTICE
WASHINGTON, D. C. 20535

TO : DIRECTOR, FBI (100-442610)

FROM : SAC, NEW YORK (100-100000)
SUBJECT: [REDACTED]
[REDACTED]

- 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

	<u>Valve</u>	<u>Size</u>	<u>Service Location</u>	<u>Retaining Block Stud Condition</u>
<u>Unit 1</u>				
	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
<u>Unit 2</u>				
	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 ³ One Cracked Stud
	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.

PARTS LIST

PART NO.	QTY	PART NAME	MATERIAL
11542-1	1	BONNET	ASTM A315 GRADE SS
11542-21	16	BONNET STUDS	ASTM A193 GRADE B7
11542-22	16	BONNET NUTS	ASTM A194 GRADE 2H
11542-3	1	BONNET GASKET	FLEXIBLE TYPE 316 STAINLESS STEEL
11542-4W	1	WELD ENDS CAME	ASTM A334 GRADE CF-8
11542-5-1	1	DISC	ASTM A182 TYPE 304 WITH STELLITE 6 FACE AND PIN
11542-6-1	1	DISC NUT	ASTM A276 TYPE 316
11542-6-2	1	DISC WASHER	HASTELLOF
11542-6-3	1	DISC NUT PIN	304 STAINLESS STEEL
11542-7	1	CLAPPER ARM	ASTM A334 GRADE CF-8
11542-8	1	CLAPPER ARM SHAFT	17-4 PH IN-100
11542-11-5	1	BONNET SEAL PLATE	ASTM A240 TYPE 304
11542-13	1	SEAT RING	ASTM A182 TYPE 304 WITH STELLITE 6 FACE
11542-29	1	DISC TRUNNION BUSHING	STELLITE 6
11542-42	4	SHAFT BUSHING	STELLITE 6
11542-40	1	LEFT SHAFT RETAINING BLOCK	ASTM A276 TYPE 304
11542-60-1	1	RIGHT SHAFT RETAINING BLOCK	ASTM A276 TYPE 304
11542-61-5	2	RETAINING BLOCK STUDS	ASTM A193 GRADE B7
11542-61-2	2	RETAINING BLOCK NUTS	ASTM A194 GRADE 2H
11542-80	4	RETAINING BLOCK DOWELS	ASTM A-276 TYPE 410
11542-20	16	BONNET STUD WASHERS	STEEL

NOTE
1. THE VALVE SHALL BE INSTALLED IN A HORIZONTAL PIPE WITH THE BONNET ABOVE THE CENTERLINE OF THE PIPE.

RECOMMENDED SPARE PARTS

PART NO.	QTY	PART NAME	DIMENSIONS
A	25	8 INCH S.S.W.	25
G	8	8 INCH S.S.W.	8
K	8	8 INCH S.S.W.	8
L	17	17 INCH S.S.W.	17
Y	16	16 INCH S.S.W.	16
AB	8	8 INCH S.S.W.	8
AS	2163	8 INCH S.S.W.	2163
AT	8	8 INCH S.S.W.	8
VD	80	80 INCH S.S.W.	80
WEIGHT	1800	1800 LBS	1800
TAG NO.	B C 482	10 CA	10 CA
AY	11-8	11-8 INCH S.S.W.	11-8
BB	9	9 INCH S.S.W.	9
CC	1	1 INCH S.S.W.	1
DD	7	7 INCH S.S.W.	7
EE	14	14 INCH S.S.W.	14
FF	14	14 INCH S.S.W.	14
GG	10856	10856 INCH S.S.W.	10856
HH	9	9 INCH S.S.W.	9
JJ	9	9 INCH S.S.W.	9
KK	10867	10867 INCH S.S.W.	10867

WESTINGHOUSE ELECTRIC CORP.
NUCLEAR ENERGY SYSTEM
CARLENO VALVE MANUFACTURING CO.
WILLIAMSPORT, PA.
NO. 8730W S.C. CLEAR WATERWAY
SHOWN CHECK VALVE WITH PROVISION FOR SEAL WELDED BONNET

REVISIONS

REV.	DESCRIPTION	DATE
1	ADDED TO DIMENSION	10-10-60
2	ADDED RECOMMENDED SPARE PARTS	10-10-60
3	ADDED VIEW A	10-10-60
4	ADDED TAG NO. MATERIAL WAS ADDED	10-10-60
5	ADDED DD & EE DIMENSIONS	10-10-60
6	ADDED AT TO WELD PREP.	10-10-60
7	ADDED SPARE PARTS	10-10-60
8	ADDED TAG NO. MATERIAL WAS ADDED	10-10-60
9	ADDED TAG NO. MATERIAL WAS ADDED	10-10-60
10	ADDED BB & CC DRWS	10-10-60

PARTS LIST			
PART NO	QTY	PART NAME	MATERIAL
11542-1	1	BONNET	ASTM A515 GRADE 55
11542-21	16	BONNET STUDS	ASTM A193 GRADE B7
11542-22	16	BONNET NUTS	ASTM A194 GRADE 2H
11542-3	1	BONNET GASKET	FLUORALIC TYPE 36 SIGNATURE
11542-4W	1	WELD ENDS CAME	ASTM A351 GRADE CF 8
11542-5-1	1	DISC	ASTM A182 TYPE 304 WITH STELLITE 6 FACE AND PIN
11542-6-1	1	DISC NUT	ASTM A276 TYPE 316
11542-6-2	1	DISC WASHER	HASTELLOY
11542-6-3	1	DISC NUT PIN	304 STAINLESS STEEL
11542-7	1	CLAPPER ARM	ASTM A351 GRADE CF-8
11542-8	1	CLAPPER ARM SHAFT	17-4 PH M100
11542-115	1	BONNET SEAL PLATE	ASTM A340 TYPE 304
11542-13	1	SEAT RING	ASTM A182 TYPE F304 WITH STELLITE 6 FACE
11542-29	1	DISC TURBINE BUSHING	STELLITE 6
11542-42	4	SHAFT BUSHING	STELLITE 6
11542-60	1	LEFT SHAFT RETAINING BLOCK	ASTM A276 TYPE 304
11542-60-1	1	RIGHT SHAFT RETAINING BLOCK	ASTM A276 TYPE 304
11542-61-5	2	RETAINING BLOCK STUDS	ASTM A193 GRADE B7
11542-62	2	RETAINING BLOCK NUTS	ASTM A194 GRADE 2H
11542-80	4	RETAINING BLOCK DOMELS	ASTM A-278 TYPE 410
11542-20	16	BONNET STUD WASHERS	STEEL

NOTE
1. THE VALVE SHALL BE INSTALLED IN A HORIZONTAL PIPE WITH THE BOPPET ABOVE THE CENTERLINE OF THE PIPE.

DIMENSIONS		
VALVE SIZE	8 1/4" M 350 W	10 1/4" M 350 W
A	23 1/2	25 1/2
G	8 1/2	8 1/2
K	6 1/2	7 1/2
L	17	19 1/2
Y	18 1/2	20
AB	9 1/2	10 1/2
AS	21 1/2	23 1/2
AT	8 1/2	10 1/2
WD	80	80
WEIGHT	1800	1600
TAG NO.	B C 482	10 C 4
AX	11 - 8	11 - 8
BB	9 1/2	11 1/2
CC	1	1
DD	7	8 1/2
EE	1 1/2	1 1/2
FF	14 1/2	16 1/2
GG	10 1/2 36	12 1/2 41
HH	9 1/2	11 1/2
JJ	9 1/2	11 1/2
KK	10 1/2 37	12 1/2 42

WESTINGHOUSE ELECTRIC CORP
NUCLEAR ENERGY SYSTEM

DARLING VALVE MANUFACTURING CO.
WILLIAMSBURG PA

NO. 8350W 3C CLEAR WATERWAY
SWING CHECK VALVE WITH PROVISION
FOR SEAL WELDED BONNET

D	A	ADDED FF DIMENSIONS		
		ADDED REINFORCE WELD & SPARE PARTS		
		A	ADDED NEW A	
		A	ADDED NOTE 1	
		A	PART 1 WAS A MATERIAL WAS A201 GRABER A	
B	A	ADDED OO & EE DIMENSIONS		
A	A	ADDED 10" TO WELD PREP		
A3	A	ADDED SPARE PARTS		
A	A	NOTE H242-6140 WAS A216 TYPE 304		
A1	A	NOTE H242-6145 WAS A 216 TYPE 40-ADDED DIME		
A	A	ADDED BB & CC DIMS		
111		DESCRIPTION		
		REVISIONS		

10



