

Commonwealth Edison Company  
Quad Cities Generating Station  
22710 206th Avenue North  
Cordova, IL 61242-9740  
Tel 309-654-2241



ESK 95-223

December 21, 1995

Mr. William T. Russell, Director  
Office of Nuclear Reactor Regulation  
U.S. Nuclear Regulatory Commission  
Washington, D.C. 20555

**Attention:** Document Control Desk

**Subject:** Commonwealth Edison 10CFR Part 21 Final Report (File 95-15)  
Binding of Anchor Darling Valves with Cavitation Trim

Dear Mr. Russell:

The purpose of this letter is to notify the NRC Staff of a defect with the Residual Heat Removal Service Water (RHRSW) outlet valve MO 2-1001-5B. This valve throttles the RHRSW system pressure and flow. An identical valve is installed on the "A" loop (MO 2-1001-5A). Unit 1 does not have this valve installed.

The nature of the defect is that Anchor Darling designed and manufactured the valve with a combination of plug/trim clearance and plug eccentricity that did not provide sufficient protection against galling and eventual valve seizure.

It has been determined that this created a potential substantial safety hazard because the simultaneous loss of this valve on both loops would eliminate the ability of RHR containment cooling modes and shutdown cooling mode to perform their intended function.

Anchor Darling proposed corrective action was to send guidance to increase the clearance between the valve plug and the trim to approximately 0.018 inches and make the stem/plug true. This has been accomplished for the original "B" loop valve. As an interim corrective action Quad Cities will perform monthly testing of running loads on the "A" loop valve until it is modified.

These control valves used custom trim designed for this particular application, thus, Quad Cities Unit 2 is the only plant affected by this problem.

9512280312 951221  
PDR ADOCK 05000254  
S PDR

280037

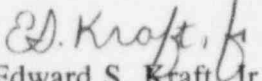
JE 19.1

ESK-95-223  
December 21, 1995  
Page 2

Provided as an attachment to this letter is ComEd's notification in accordance with the requirements of 10CFR Part 21, Section 21.1(b), 21.3a(3), and 21.3d(4).

If there are any questions regarding this notification, please direct them to Steve Killian at (309) 654-2241 extension 2613.

Respectfully,

  
Edward S. Kraft, Jr.  
Site Vice President  
Quad Cities Station

Attachment: 10CFR Part 21 Final Report

cc: H. J. Martin, Regional Administrator - R III ,  
C. G. Miller, Senior Resident Inspector - Quad Cities  
R.A. Capra, Directorate HI-2 Director, NRR  
R. M. Pulsifer, Quad Cities Project Manager, NRR  
Office of Nuclear Facility Safety - IDNS

---

## 10CFR PART 21 EVALUATION CHECKLIST

---

**10CFR Part 21 Notification**  
**Binding of Anchor Darling Valves with Cavitation Trim**  
**Quad Cities Station**  
**Part 21 File # 9515**

### Applicability

This notification is submitted in accordance with the requirements of 10CFR Part 21, Section 21.1(b), 21.3a(3), and 21.3d(4).

### Identification of Facility and Component

This notification concerns the binding of the Residual Heat Removal Service Water (RHRSW) outlet valve MO 2-1001-5B at Quad Cities Station, Unit 2. The valve is a 12 inch 300 lb. welded end carbon steel globe valve with anti-cavitation trim and an SMB-0 Limatorque Actuator. The valve throttles the RHRSW system pressure and flow. It is the outlet valve from the 2B RHR Heat Exchanger. An identical valve is also installed on the A loop (MO 2-1001-5A). The valve is not installed on Unit 1.

High Pressure Coolant Injection (HPCI) valves MO 1(2)-2301-10 are of similar design.

These control valves used custom trim designed for this particular application. The defect would apply only to valves of similar plug size and trim package. Other ComEd plants do not have these valves.

### Identification of Component Manufacturer

Anchor Darling Valve Company  
701 1st Street  
Williamsport, PA. 17701

### Nature of Defect

This valve locked up at the 60% open position during a surveillance. When the valve was subsequently disassembled, severe galling between the valve plug and the valve trim was observed. The engineering drawings for this valve specify a clearance of 0.004 to 0.007 inches between the plug and the trim. Anchor/Darling admits that the specification for the clearance is too small and that a more appropriate clearance would be 0.010 to 0.018 inches. In addition, runout (eccentricity) of 0.006 inches was measured on the valve plug. The center line of the plug was offset by 0.006 inches from the center line of the stem. Stem runout was measured to be insignificant, less than 0.0005 inches. Similar valve plug/stem/trim clearance and eccentricity were also measured on the two spare Anchor/Darling valves that are scheduled to be installed in Unit 1 during Q1R14. The galling had probably initiated during the previous event on this valve when the anti-rotation device slipped on the valve shaft and became cocked, locking up the stem. The lateral loads applied to the stem allowed galling to start since the clearance between the valve plug and trim was minimal. Once galling had initiated, each stroke of the valve increased the friction between the valve

---

## 10CFR PART 21 EVALUATION CHECKLIST

---

plug and trim.

The nature of the defect is that Anchor Darling designed and manufactured the valve with a combination of plug/trim clearance and plug eccentricity that did not provide sufficient protection against galling and eventual valve seizure.

### Safety Significance

Simultaneous loss of this valve on both loops would eliminate the capability of RHR containment cooling modes and shutdown cooling mode to perform their function.

At the time of discovery, Unit 2 was shut down and Containment Cooling was not required to be operable. Redundancy in the Shutdown Cooling mode was provided by valve MO 2-1001-5A. Although this valve also has the same defect, testing has revealed no sign of the onset of galling in this valve. In addition, several alternate methods of decay heat removal were available, including the Reactor Water Cleanup System (RWCU).

### Time of Discovery

On August 28, 1995, with Unit 2 in cold shutdown, and while performing QCOS 1000-4, valve MO 2-1001-5B stuck at approximately 60% open. The NSO was unable to open or close the valve from that position. An RHRSW Pump was started in an attempt to flush any possible debris that may have been caught internally in the valve. The NSO was still unable to throttle the position of MO 2-1001-5B. The discharge pressure and flow in the B Loop of RHRSW was therefore unable to be adjusted. The NSO then shutdown the RHRSW pump. With no RHRSW pumps running, RHRSW system logic sends a CLOSE signal to MO 2-1001-5B. The valve still would not move. The 2B Loop of Containment Cooling was declared inoperable. It was determined that a defect existed per the requirements of 10CFR21 on November 14, 1995 and the vendor was contacted to make the Part 21 notification. On the week of December 11, 1995, the vendor informed the station that it was not going to make a Part 21 notification. Thus the station is making the Part 21 notification.

### Corrective Actions

Guidance was received from Anchor/Darling to increase the clearance between the valve plug and the trim to approximately 0.018 inches and to make the stem/plug true. This was done by machining the plug from a spare valve that was scheduled to be installed in Unit 1 during Q1R14. The new stem, plug, upper trim, lower trim, valve yoke, and bonnet from the spare valve was installed in valve MO 2-1001-5B. The valve was successfully VOTES tested on September 1, 1995. No excessive running loads were observed.

To address MO 2-1001-5A, since it has the same clearance/runout as MO 2-1001-5B originally had, a "Packing N-Forcer" test was performed on both MO 2-1001-5A and 5B. This VOTES type equipment is much more sensitive at measuring running loads and would be capable of detecting rubbing that could lead to galling. Similar traces were received on both MO 2-1001-5A and 5B. The "Packing N-Forcer" test will be run on MO 2-1001-5A on a monthly basis to determine if galling is starting on this valve. The "Packing N-

---

## 10CFR PART 21 EVALUATION CHECKLIST

---

Forcer" test was repeated on September 28 with the same running loads observed. This testing will continue monthly until the modified plug is installed on this valve.

Valves of similar design and original clearance specifications are also installed in valves MO 1(2)-2301-10 on the High Pressure Coolant Injection (HPCI) system. These valves were installed approximately four years ago and no problems have been observed. These valves are different from the RHRSW valves in several significant respects. The plug on the HPCI valves has nickel-chrome hardfacing, which makes them less susceptible to galling. The HPCI valves are 900 lb. valves with smaller diameter plugs, i.e. 4.6 in. as compared to 6.6 in. for the RHRSW valves. Therefore the specified clearances for the HPCI valves are effectively larger than for the RHRSW valves. Finally, the HPCI system is a condensate grade water system. It has been concluded that the HPCI valves are adequate and that no changes are needed to their design.

The remaining portions of the spare valves that are scheduled to be installed in Unit 1 will be sent to Anchor/Darling for refurbishment and machining for the proper clearances. Anchor/Darling has committed to correct and return both valves on-site prior to Q1R14.

### Number and Location of All Defective Components

These valves were custom designed for the Quad Cities Station and therefore affect no other plants.

---

**10CFR PART 21 EVALUATION CHECKLIST**

---

Contacts

Questions pertaining to this notification should be addressed to:

Stephen D. Killian  
Quad Cities Nuclear Power Station  
**ComEd**  
22710 206th Ave. North  
Cordova, IL. 61242  
(309) 654-2241 x2613