

Public Service
Electric and Gas
Company

Thomas J. Martin
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November 26, 1984

Dr. Thomas E. Murley, Administrator
U. S. Nuclear Regulatory Commission
Office of Inspection and Enforcement
Region I
631 Park Avenue
King of Prussia, Pennsylvania 19406

50-354/355-

Dear Dr. Murley:

SIGNIFICANT CONSTRUCTION DEFICIENCY
GE TYPE AKR-30 CIRCUIT BREAKERS
HOPE CREEK GENERATING STATION

On November 23, 1983, a report was submitted to your office concerning defective parts identified by a General Electric Service Advice letter applicable to type AKR-30 circuit breakers. Subsequently, on December 23, 1983, a verbal report was made to your office concerning improper operation of several AKR-30 circuit breakers during start-up testing. Status reports were provided on January 18, 1984, February 24, 1984, May 14, 1984 and September 14, 1984.

The defects found in the AKR-30 circuit breakers could cause the breakers to fail to close upon command. These breakers supply class 1E loads that are needed for the safe shut down of the unit. Therefore, this deficiency is reportable in accordance with 10CFR50.55e.

In our February letter we committed to a complete reinspection, rework and testing program for all of the affected AKR-30 breakers. This activity was performed by GE at their Connecticut facility and included 244 AC and 91 DC AKR-30 circuit breakers. A copy of the inspection and testing checklist is attached for your information. In addition, the same program was applied to AKR-50 circuit breakers which are not used in safety related applications.

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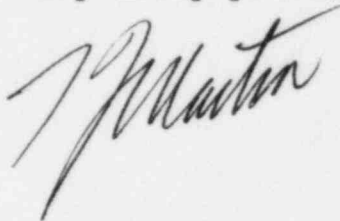
In our September letter we advised you of the potential relevance of problems with GE circuit breakers at Diablo Canyon to the Hope Creek circuit breakers. Analysis of this issue by General Electric concluded the problem was not applicable to the AKR-30 design.

In order to verify operability of the reworked breakers and to correct any deficiencies caused by return shipment to Hope Creek, PSE&G will functionally test each breaker prior to installation. These tests will be witnessed by PSE&G Quality Assurance personnel.

Complete records of the work performed by General Electric, analysis by Bechtel and the testing performed by PSE&G are available for review by your inspectors.

Should you need any additional information, please let me know.

Very truly yours,



Attachment

C Office of Inspection and Enforcement
Division of Reactor Construction Inspection
Washington, D. C. 20555

NRC Resident Inspector - Hope Creek
P. O. Box 241
Hancocks Bridge, NJ 08038

Records Center
Institute of Nuclear Power Operations
1100 Circle 75 Parkway, Suite 1500
Atlanta, GA 30339

HOPE CREEK NUCLEAR POWER PLANTAKR-30/50 CIRCUIT BREAKERSAUDIT CHECK LIST**F128492**

BREAKER TYPE _____

INSPECTOR _____

BREAKER
SERIAL NO. _____BREAKER
CODE DATE _____GENERAL ELECTRIC COMPANY
QUALITY ASSURANCE APPROVAL _____BECHTEL POWER CORPORATION
ENGINEER _____

NOTES:

1. Record all deviations found and corrective action taken in Table 4.
2. Reinspection and sign off of all rework is required.

PREPARED BY P. M. PiqueiraREVISION 3DATE ISSUED February 10, 1984DATE April 03, 1984

CHECK POINT		GAGE NO.	REFERENCE	ACCEPT	REJ	FINAL ACCEPT
1.	Nameplates in place.	---	425D407			
2.	a. Verify that the serial number, ID, and ratings are correct on the nameplate.	---	---			
	b. Verify the remaining summary information is correct on the nameplates.					
3.	Labels in place.		425D407			
4.	Verify that the arc chutes are correct per summary and were correctly assembled.	---	---			
5.	a. For DC breakers verify that the 568B627G17 rejection brackets are installed.	---	568B627G27 568B622P5 568B622P9			
	b. For AC breakers verify that the 568B627G10 rejection brackets are installed.		568B627G10 568B627P1 568B627P8			
6.	For ELECTRIC and MANUAL breakers, verify that the latest ratchet assembly design is installed.	---	Ser. Adv. 175-9.6			
7.	a. Verify that the closing spring prop assembly has the black identifying mark.	---	Serv. Adv. 175-9.11			
	b. Verify that the closing spring prop drive spring is properly assembled. The spring leg must extend over the edge of the front frame and not rest in a hole.					
	c. Verify the switchette has a code date of 82-22 or higher.					
8.	For ELECTRIC breakers, verify that the distance between the mechanism frame and the motor frame in the area of the upper spacers is $1 \frac{5}{16} \pm \frac{1}{16}$.	I-1297	---			
9.	Secondary disconnect wipe. Check for free action.	---	---			
10.	Verify that the control wiring is free of abrasion or damage. Replace all damaged wires.	---	---			
11.	Force to trip breaker is 24 in. oz max. (check with torque meters).	NK1-10B140	11M44.2			

	CHECK POINT	GAGE NO.	REFERENCE	ACCEPT	REJ	FINAL ACCEPT
12. ⚠	Verify that the positive interlock operates freely and trips the breaker within a 0.38" movement.	K2-493B	11M44.2			
13.	Rail pin adjustment is .795 +/- .015".	K2-435B	11M44.2			
14.	Mounting bracket flush within +/- .015" to lower side of front frame.	---	---			
15. ⚠	Distance between rack pins on same side is 10.625 in.	K2-394B	11M44.2			
16.	Trip button depression to trip breaker is 5/16 max.	K2-381B	11M44.2			
17. ⚠	For MANUAL breakers, the force to close the breaker is 15 lbs. maximum.	NK1-10B110	11M44.2			
18.	Verify that racking mech. has 1-2 1/2 turns after breaker trips, and that racking door is functioning properly.	---	11M44.2			
19.	Manual handle centerline within 5 degrees.	---	11M44.2			
20.	Insulations and barriers complete and in place.	---	---			
21. ⚠	Primary disconnect finger force is 95 +/- 10 pounds.	K2-391B13	---			
22.	a. With breaker closed, buffer clearance to be .005" minimum (without 2nd charge).	---	11M44.2			
	b. Verify that the buffer washers are free of cuts or cracks and are not deformed by over compression.	---	---			
	c. Verify that the buffer hardware is tightened enough to just put pressure on the buffer washers and not to deform them.		---			
23.	With the breaker opened and closing spring discharged, verify that the flat head screw on the closing spring assembly holds a 60 in.-lbs. torque counterclockwise.	K110B-103	Ser. Adv. 175-9.7			
24. ⚠	Verify that the racking mechanism has been adjusted.	I-1300A I-1300B I-1300C	Ser. Adv. 175-9.18			
25. ⚠	a. Verify correct shunt trip rating and coil rating.	---	11K44.4			

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CHECK POINT		GAGE NO.	REFERENCE	ACCEPT	REJ	FINAL ACCEPT
3	b. Armature must seat properly and must not bind.	---	11K44.4			
	c. Verify that the trip paddle is securely assembled to the trip shaft. Use a visual check. Also, verify there is no paddle movement on the trip shaft by physically trying to move the trip paddle.					
	d. Verify that the paddle lines up with the shunt trip armature and that there is a .030" min. clearance between shunt trip and paddle with breaker closed.	I-1291				
	e. Verify .030 in. minimum overtravel after the point of tripping.	I-1292				
26.	a. Verify correct closing coil solenoid number or rating. Record	---	11K44.4			
	b. Verify the closing solenoid armature engages and disengages with its magnet without binding by manually operating it.					
	c. Verify that the breaker may be closed by manually operating the closing solenoid armature.					
	d. Verify that the armature of the closing solenoid has a minimum of 1/32" overtravel by placing a 1/32" shim between the magnet and armature and closing the breaker using the closing solenoid.					
27.	a. For DC breakers verify that the EC device trip paddles consist of a 286A8637G1 paddle and a V-6447766P2 clamp.	---	286A8637G1 V6447766P2			
	b. For AC breakers verify that the flux shifter trip paddle consists of a K6203939P5 paddle and a 192A9567P1 clamp.		192A9567P1 K6203939P5			

CHECK POINT		GAGE NO.	REFERENCE	ACCEPT	REJ	FINAL ACCEPT
3	c. Verify that the trip device paddles are securely assembled to the trip shaft. Use a visual check. Also, verify there is no paddle movement on the trip shaft by physically trying to move the trip paddle.		---			
	28. Clearance between flux shifter trip paddle and trip rod is .078-.140 with breaker in charged position.	I-1299	11K44.4			
	29. Gap between coupling and roll pin is 0.040" minimum with breaker closed.	I-1296	11K44.4			
3	30. Gap between trip button rod and paddle is .100-.140 with breaker charged.	I-1298	11M44.2			
	31. Verify that the 192A6990P153 opening springs are installed.	---	192A6990P153			
	32. a. Verify anti-pump relay per summary.	---	11K44.1			
3	b. Verify integrity of anti-pump (W) relay solder connections.	---	10L1.1			
	c. Verify that the anti-pump relay bracket mounting screws extend .062" minimum.	---	---			
	33. For ELECTRIC breakers, verify the control (X) relay is per the summary.	---	11K44.4			
3	34. a. For ELECTRIC breakers, verify that the cut-off switch paddle is properly oriented to activate the switches.	---	---			
	b. Use the breaker wiring diagram for steps 34d and 34e. Record the wiring diagram number:	---	---			
	c. Verify that the cut-off switch electrical connections are tight. Verify the ring terminals are securely installed to the wires by pulling on the wires and moving them back and forth. There must not be any motion between the wire and the crimped barrel.	---	---			

CHECK POINT		GAGE NO.	REFERENCE	ACCEPT	REJ	FINAL ACCEPT
34	d. With the breaker OPEN and DISCHARGED, use a continuity checker to verify that there is continuity across the "G" contacts, also check that there is no continuity across the "F" contacts.	---	11K44.4			
	e. Turn the camshaft 10 teeth with the maintenance handle (count the teeth as they pass the holding pawl). At this point, use a continuity checker to verify that there is no continuity across the "G" contacts, also check that there is continuity across the "F" contacts.					
	f. Once the checks of 34e are accepted, add Glyptol type 1201 to the external mounting nuts of the cut-off switches.		---			
35	a. Verify that holding pawl nut is torqued to 250 in.-lbs. minimum.	---	139C4616			
	b. Add LOCTITE 290 retaining compound to the threads of the holding pawl pivot pin.					
	c. Verify that the holding pawl spring has been properly installed.					
36	Gap between top contact and its' pivot (.050"-.080") in AKR-30 without 2nd charge (contact wipe). Check adjustment.	I-1266	11M44.2			
37	Verify that the moveable and stationary arcing contacts centerlines are within 1/16" when the breaker is closed.	---	11M44.2			
38	"A" contacts of auxiliary switch make when arcing contacts close within .250-.500" at their closest point.	I-1306	11K44.4			

CHECK POINT		GAGE NO.	REFERENCE	ACCEPT	REJ	FINAL ACCEPT
39.	Verify that the electrical connections and crimp terminations associated with the phase C/T's, shunt trip, switchette, closing solenoid, x-relay, and auxiliary switch are secure. Check the crimp terminations by pulling and moving the wires looking for any motion between the wire and the crimped barrel.	---	---			
40.	Accessible lock washers, cotter pins, retaining rings assembled properly (visual).	---	---			
41.	Verify hardware listed in Table 1 is properly torqued and assembled.	---	---			
42.	For MANUAL breakers operate shunt trip two times at minimum voltage, two times at maximum, and five times at nominal.	---	11K44.1			
43.	For ELECTRIC breakers perform necessary electrical operations. Breaker <u>must not</u> nuisance trip and breaker <u>must close</u> on 1st impulse.	---	11L44.1			
44.	For electric breakers perform 3 anti-pump operations.	---	11L44.1			
45.	Verify that while manually performing a 2nd charge operation, the breaker doesn't trip.	---	---			
46.	Dielectric test performed.	---	12L44.3			
47.	a. Programmer checked for catalog number.	---	---			
	b. For SST equipped breakers, check the phase C/T's for tap setting. Record in Table 2.					
	c. For DC breakers check coil ratings and settings. Record in Table 3.					
	d. For AC breakers, perform calibration check. Record calibration data in Table 2.		15K44.1			
	e. For DC breakers, perform calibration check. record calibration date in Table 3.		15K44.2			

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CHECK POINT		GAGE NO.	REFERENCE	ACCEPT	REJ	FINAL ACCEPT
48.	Verify the following areas are lubricated: a. Drawout mechanism screw. b. Flux shifter reset linkage.	---	---			
49.	Remove any lubrication from the primary disconnects and attach a tube of Mobil 28 to the breaker frame.	---	---			
50.	Verify that the mechanism return spring is properly installed.	---	---			
51.	Verify that all contact end projections engage the contact stop fingers by a minimum of .062".	I-1305	11M44.2			

TABLE 1 - TORQUE REQUIREMENTS

ITEM NO.	HARDWARE DESCRIPTION	SIZE	TYPE	TORQUE (IN.-LBS.)
1	Primary Disconnect	5/16 - 18	Hex	100 \pm 5
2	Lower Connector/Pivot Block - AC Breaker	3/8 - 16	Cap	250 \pm 10
3	Backframe Channel	5/16 - 18	Hex F.H. Hex Dr.	100 \pm 5
4	Secondary Disconnect Assembly	1/4 - 20	Hex	45 \pm 5
5	Racking Mechanism Mounting	1/4 - 20	Hex	60 \pm 5
6	Buffer Block	3/8 - 16	Cap	250 \pm 10
7	Buffer Mounting	1/4 - 20	Hex	60 \pm 5
8	Closing Spring Intl. Adj. Screw	10 - 32	R.H.	23 - 32
9	Lower Connector/Primary Disconnect - AC Breaker	1/4 - 20	Hex	110 - 130
10	EC Trip Device - Holding Clamp Screws	1/4 - 20	R.H.	15 \pm 5
11	EC Trip Device - Lower Connector/Pivot Block	3/8 - 16	Cap	250 \pm 10

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TABLE 2 - SST CALIBRATION DATA



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SST CATALOG NUMBER _____

S/N _____

C/T TAP SETTING _____

	Left Pole	Center Pole	Right Pole
1COT at 1.1X minimum delay	300 sec. no trip		
200% at .6X	min. band trip 34-56 sec.		
300% at .6X		int. band trip 37-64 sec.	max. band trip 84-143 sec.
ground fault pick up + 10%	min. band trip 065 - 140ms	int. band trip 165 - 260ms	max. band 320 - 420ms
ground fault pick up - 10%	min. band no trip	int. band no trip	max. band no trip

TABLE 3 - EC TRIP DEVICE CALIBRATION DATA



EC TYPE: _____ EC1 _____ EC2A

COIL: _____ AMPS

LONG TIMESHORT TIMEINSTANTANEOUS

____ 1A	Pickup	____ 2A	Range ____ X	____ Yes	Range ____ X
____ 1B	_____	____ 2B	Set @ ____ X	____ No	Set @ ____ X
____ 1C		____ 2C			

LEFT POLERIGHT POLE

Test Current

Actual Trip Time

Limits

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TABLE 4 - DEVIATION RECORD

[illegible]