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SUBJECT: Part 21 rept re molded case circuit breakers that tripped before allowable time.

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AEP:NRC:0971G
10 CFR 21.21

Donald C. Cook Nuclear Plant Units 1 and 2
Docket Nos. 50-315 and 50-316
License Nos. DPR-58 and DPR-74
10 CFR 21 REPORT: WESTINGHOUSE FB3125L MOLDED-CASE CIRCUIT BREAKERS

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

Attn: T. E. Murley

December 12, 1989

Dear Dr. Murley:

Introduction (10 CFR 21.21(b)(3)(i), (ii) and (iii))

This letter constitutes a follow-up report, as required by 10 CFR 21.21, of information provided to your staff via telephone on December 7, 1989. This report is being submitted by Indiana Michigan Power Company, P. O. Box 16631, Columbus, Ohio 43216. The 10 CFR 21 report concerns Westinghouse FB3125L (125-amp) molded-case circuit breakers, which have been observed to trip before the allowable time band given the time-current characteristics curve for this breaker. The subject circuit breakers were purchased from Westinghouse in 1989 to replace non-traceable circuit breakers identified in our review per NRC Bulletin No. 88-10, "Nonconforming Molded-Case Circuit Breakers." There are five of these FB3125L circuit breakers installed in safety-related applications at the Donald C. Cook Nuclear Plant.

Background (10 CFR 21.21(b)(3)(iv) and (v))

A 125-amp circuit breaker feeding turbine room sump pump #2 failed due to a loose connection. The failed circuit breaker was replaced with an FB3125L circuit breaker from stock. The new circuit breaker would not hold on starting of the sump pump. Two more breakers were drawn from stock and subsequently failed to hold on starting of the sump pump. All three of the circuit breakers that would not hold on starting of the sump pump were purchased under the above 1989 Westinghouse purchase order. Finally, the 125-amp circuit breaker feeding turbine room sump pump #3 was exchanged with the circuit breaker installed in the circuit for sump pump #2. After exchange, the circuit breaker feeding sump

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pump #2 held on starting and the pump was returned to service after satisfactory testing. The circuit breaker now feeding sump pump #3 would not hold on starting, as had occurred during testing with the circuit breaker feeding sump pump #2.

After three FB3125L circuit breakers tripped while starting a turbine room sump pump, two of the three circuit breakers were bench tested at Cook Nuclear Plant. Bench testing over a range of input currents led us to conclude that both circuit breakers were tripping before the time span given by the Westinghouse time-current characteristics curve for this circuit breaker.

In order to determine whether the above problem was generic to all Westinghouse circuit breakers purchased with the 1989 purchase order, a sample of circuit breakers, including a variety of current ratings, was tested at Cook Nuclear Plant. This in-house testing indicated that the FB3090L (90-amp) circuit breakers were also tripping before their allowable time band.

Since field testing is not considered an accurate measure for determining the time-current characteristics (per NEMA standards), the circuit breakers were returned to Westinghouse for verification of our test results. On December 5, 1989, two FB3125L and two FB3090L circuit breakers were tested by the circuit breaker manufacturer at their facilities. This testing led to the conclusion that:

1) The FB3090L (90-amp) circuit breakers were performing satisfactorily.
2) The FB3125L (125-amp) circuit breakers were tripping earlier than the time band given by the Westinghouse time-current characteristics curve for this breaker.

On December 6, 1989, the results of Westinghouse circuit breaker testing was reviewed and the condition was determined to be reportable per 10 CFR 21.

The attachment to this letter shows the observed tripping times for the two FB3125L circuit breakers during Westinghouse testing. The data show that the circuit breakers tripped before the allowable time band in the range of 400% to 500% of rated current.

We can postulate two safety hazards that could be created by the above problem:

1) The circuit breaker could trip on starting of a safety-related load, precluding the accomplishment of a safety function.
2) Breaker coordination may be lost for certain fault currents.

Discussion (10 CFR 21.21(b)(3)(vi) and (vii))

There are five FB3125L circuit breakers from the 1989 Westinghouse purchase order installed in safety-related applications at Cook Nuclear Plant. In all cases, the loads fed by the breaker are balance of plant (BOP). Since the balance of plant loads are fed from safety-related electrical buses, the safety function of the breaker is to protect the bus from faults on the BOP loads. Therefore, tripping early is not a safety concern at Cook Nuclear Plant. Furthermore, the five installed circuit breakers have not tripped while energizing their attendant loads. Specifically, the FB3125L circuit breakers are installed in the following applications:

Unit	System
1	Exhaust fan for auxiliary building ventilation
2	Control air compressor
2	Auxiliary jacket water heater for CD diesel generator
2	Exhaust fan for auxiliary building ventilation
2	Freeze protection heater for refueling water storage tank

Westinghouse FB3125L circuit breakers being maintained as stored spares at Cook Nuclear Plant have been placed on "temporary hold." We are pursuing resolution of the problem with Westinghouse.

Conclusion (10 CFR 21.21(b)(3)(viii))

Westinghouse FB3125L circuit breakers have been demonstrated to trip before the time band given by the time-current characteristics curve in the 400-500% rated current region. Therefore, if this breaker is used to feed a motor with a starting current in this region, the problem described in this 10 CFR 21 report may be encountered. We believe that Westinghouse is planning to issue some form of publication to notify applicable licensees of Westinghouse findings and recommendations regarding the concern addressed by this 10 CFR 21 report.

To date, we have no reason to suspect that Westinghouse FB3125L circuit breakers purchased prior to our 1989 purchase order are subject to the problem described in this 10 CFR 21 report.

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

Sincerely,

M. P. Alexich
Vice President

MPA/eh

Attachment

cc: D. H. Williams, Jr.
A. A. Blind - Bridgman
R. C. Callen
G. Charnoff
NFEM Section Chief
A. B. Davis
NRC Resident Inspector - Bridgman

ATTACHMENT TO AEP:NRC:0971G

TIME-CURRENT CHARACTERISTICS CURVES

FOR WESTINGHOUSE FB3125L

CIRCUIT BREAKER SHOWING TRIP POINTS

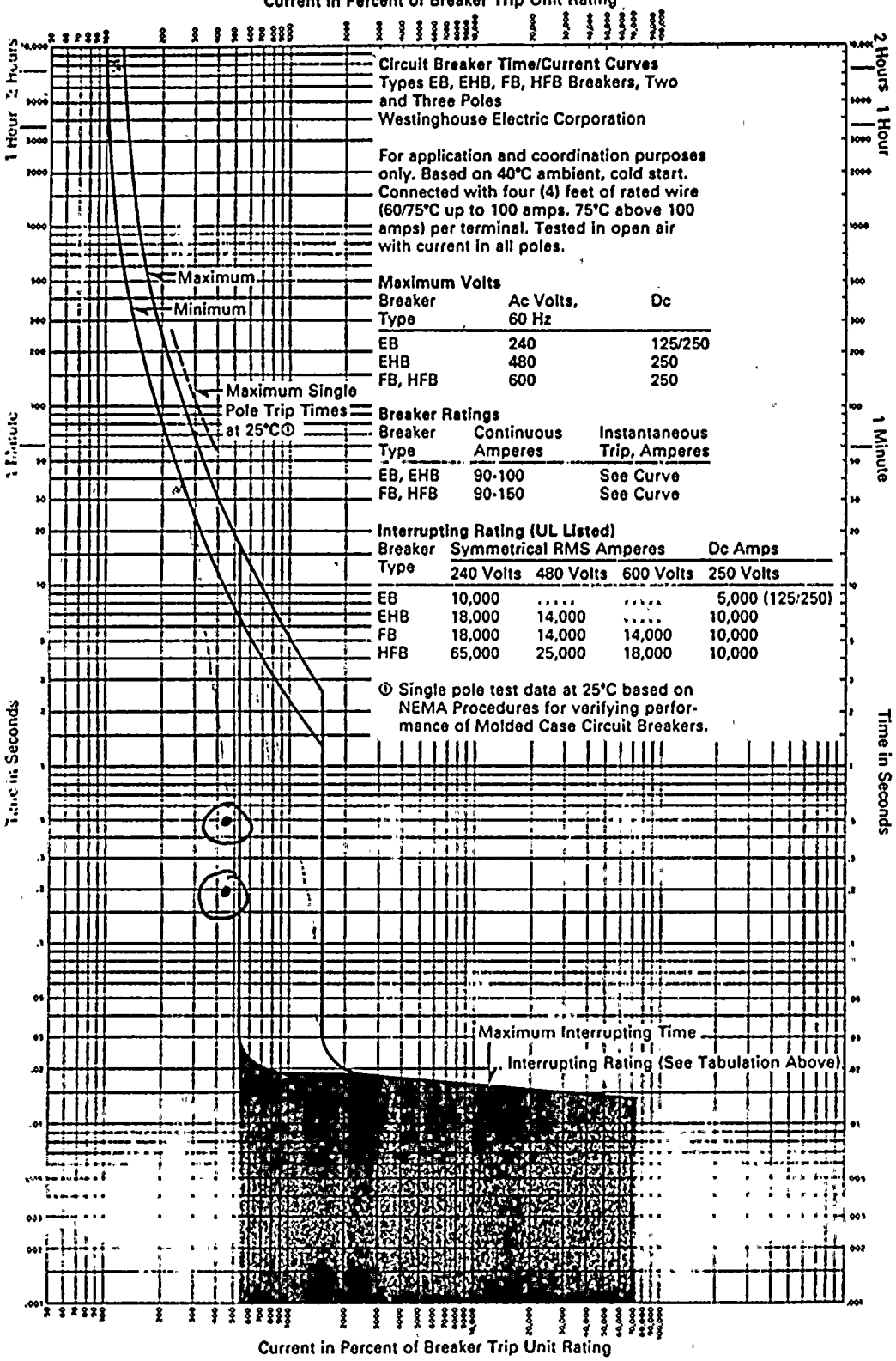
FOR TWO CIRCUIT BREAKERS TESTED

AT WESTINGHOUSE FACILITIES

FB-3125L TESTED AT (W)
Breaker A - Thermal position only
TEST DATE: 12/5/89

AB DE-ION Circuit Breakers

Types EB, EHB: 90-100 Amperes, 2 and 3 Poles
Types FB, MARK 75 Type HFB: 90-150 Amperes, 2 and 3 Poles



Circuit Breaker Time/Current Curves
Types EB, EHB, FB, HFB Breakers, Two and Three Poles
Westinghouse Electric Corporation

For application and coordination purposes only. Based on 40°C ambient, cold start. Connected with four (4) feet of rated wire (60/75°C up to 100 amps. 75°C above 100 amps) per terminal. Tested in open air with current in all poles.

Maximum Volts

Breaker Type	Ac Volts, 60 Hz	Dc
EB	240	125/250
EHB	480	250
FB, HFB	600	250

Breaker Ratings

Breaker Type	Continuous Amperes	Instantaneous Trip, Amperes
EB, EHB	90-100	See Curve
FB, HFB	90-150	See Curve

Interrupting Rating (UL Listed)

Breaker Type	Symmetrical RMS Amperes			Dc Amps
	240 Volts	480 Volts	600 Volts	250 Volts
EB	10,000	.....	.....	5,000 (125/250)
EHB	18,000	14,000	.....	10,000
FB	18,000	14,000	14,000	10,000
HFB	65,000	25,000	18,000	10,000

① Single pole test data at 25°C based on NEMA Procedures for verifying performance of Molded Case Circuit Breakers.

LEGEND

• – indicates within specs.

⊙ – indicates out of specs.

Curve No. SC 3511-77

December, 1988

FB-3125L TESTED AT (W)

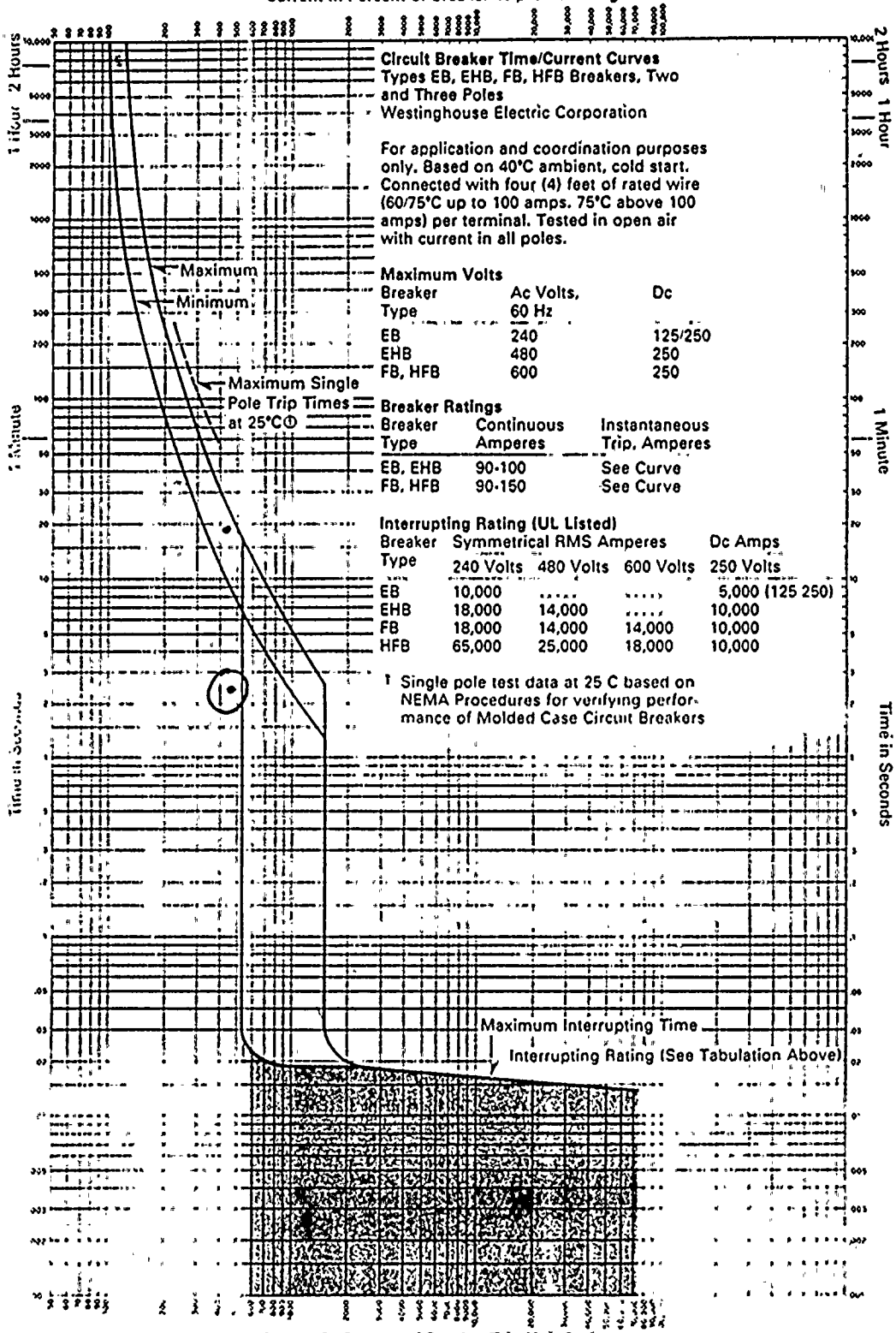
AB DE-ION Circuit Breakers

BREAKER B - Thermal Portion Only

Types EB, EHB: 90-100 Amperes, 2 and 3 Poles
Types FB, MARK 75 Type HFB: 90-150 Amperes, 2 and 3 Poles

TEST DATE: 12/5/89

Current in Percent of Breaker Trip Unit Rating



Current in Percent of Breaker Trip Unit Rating

LEGEND

• - indicates within specs.

(•) - indicates out of specs.

Curve No. SC 3511-77

December, 1988