CONNECTICUT YANKEE ATOMIC POWER CO.

PROCEDURE COVER SHEET

AUG 02 1988

PROCEDURE NUMBER	TITLE	REV. NO. 6
PM 9.5-41	TESTING OF MOLDED CASE CIRCUIT BREAKERS	MAJOR

ORIGINATOR	DATE	DEPT.
Thomas K. Womack	7/6/88	Maintenance

TECHNICAL REVIEW

[√]	OPERATION	R. Grassi	[ ]	HEALTH PHYSICS	
[ ]	ENGINEERING		[ ]	CHEMISTRY	
[ ]	REACTOR ENGR.		[ ]	SECURITY	
[√]	MAINTENANCE	B Leslie	[ ]	STORES	
[ ]	INST. & CONTROL		[√]	QA	J Sedams
[ ]	ADMIN.		[ ]	RECORDS	
[ ]	[ ]		[ ]	[ ]	
[ ]	[ ]		[ ]	[ ]	

DEPARTMENT HEAD REVIEW

COMPLETE/ BIENNIAL REVIEW?	[√] YES [ ] NO	PORC REVIEW REQUIRED	[√] YES [ ] NO
MAJOR REVISION?	[√] YES [ ] NO	ENVIRONMENTAL IMPACT	[ ] YES [√] NO
A CHANGE TO INTENT?	[√] YES [ ] NO	WRITTEN SAFETY EVAL ATTACHED?	[ ] YES [√] NO
SAFETY EVALUATION REQUIRED?	[ ] YES [√] NO	UNREVIEWED SAFETY QUESTION?	[ ] YES [√] NO

APPROVAL

DEPARTMENT HEAD	DATE	SUPERINTENDENT
[illegible]	7/14/88	[illegible]

PORC MEETING NO.	DATE	PROCEDURE EFFECTIVE DATE	REQUIRES LICENSED OPERATOR REVIEW?
88-95	7-20-88	8-2-88	YES [ ] NO [ ]

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PDR FOIA
PEPPER89-404 PDR

W17

Connecticut Yankee
Preventive Maintenance Procedure
PMP 9.5-41
Maintenance Department

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Testing Of Molded Case Circuit Breakers.

1.0 PURPOSE

1.1 **Objective:** This procedure provides steps necessary to test overload tripping of Westinghouse molded case circuit breakers.

1.2 **Applicability:** This procedure is applicable to Westinghouse molded case circuit breaker types EA, EH, FA, FB, HFA, HFB and HFD.

1.3 **Frequency:** This procedure shall be performed on a refuel schedule or as needed.

2.0 LICENSE OR ADMINISTRATIVE REQUIREMENTS

N/A

3.0 REFERENCES

3.1 FSAR Section 8.3.1.1.2, 480V System Description; Section 8.3.1.1.6, AC Power Systems Protection Capabilities; Section 8.3.2.1, 125V DC Power System Description.

3.2 Technical Specifications Section 3.12, Station Service Power.

3.3 ACP 1.2-2.3, Certification and Identification of Qualified Testing Personnel.

3.4 ACP 1.2-5.1, PMMS Trouble Reporting System and Automated Work Orders.

3.5 Instructions for Type W Control Centers, Westinghouse Electric Corporation, I.B. 12-129b Effective July, 1971 (Manual File Number W-11-80).

3.6 Westinghouse AB De-ion Circuit Breakers, Application Data 29-160.

3.7 Westinghouse AB De-ion Circuit Breakers, Application Data 29-167.

3.8 NUSCO Drawings, Drawing Numbers: 16103-30004 Sheets 2, 3, and 4; 480 Volt One Line Diagram MCC's.

3.9 NEMA Standards Publication/NO. AB 2-1980, Procedures for Verifying the Performance of Molded Case Circuit Breakers.

3.10 IEEE Standard 62-1978, IEEE Guide for Field Testing Power Apparatus Insulation.

3.11 Procedure Number PMP 9.5-42, Motor Control Centers.

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4.0 PREREQUISITES

4.1 Personnel:

4.1.1 Personnel performing this procedure shall be Certified Test Personnel per ACP 1.2-2.3, Certification and Identification Of Qualified Inspection and Testing Personnel.

4.1.2 The job supervisor shall review the procedure and job requirements prior to start of work.

4.2 **Measuring and Test Equipment:** The following equipment or its equivalent (i.e., with equal or better accuracy and adequate range to measure the desired parameter) shall be required for the performance of this procedure. Instruments utilized in this procedure shall be in current calibration.

4.2.1 Breaker Test Device with capabilities to provide current at 3 and 15 times the current rating of breaker.

4.2.2 Multimeter (To verify wiring de-energized).

4.2.3 Fluke (VOM).

4.2.4 Megger (500 or 1000VDC).

4.3 **Preliminary Conditions:**

4.3.1 Operation Department has completed tag out of subject equipment.

4.3.2 Work Order signed W.O.#_____

4.3.3 Radiation Work Permit (RWP) issued, if required.

4.4 **Independent Verification:** Indicates a verification must be performed by a person other than the one actually performing the action step.

5.0 PRECAUTIONS

5.1 **Cautions:** Procedure contains cautions that apply to specific steps and are displayed in the procedure immediately prior to the applicable step.

5.1.1 Ensure motor controller or breaker assembly is returned to MCC and locked in after completion of testing.

5.1.2 Do not excessively heat breaker.

5.2 **Warnings:** Procedure contains warnings that apply to specific steps and are displayed in the procedure immediately prior to the applicable step.

5.2.1 Check all wires with a voltage tester prior to removing or installing breaker or motor controller for testing.

6.0 INSTRUCTIONS

INITIALS

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6.1 **Introduction:** Those steps or sections which are not performed shall be marked N/A, and a line drawn through the following consecutive steps not performed.

_____ 6.1.1 VERIFY all prerequisite steps are met.

_____ 6.1.2 RECORD "Applicable MCC/Dist. Panel", "Cubicle Number", and "Affected Equipment Number" in Table 6.1-1, below.

Table 6.1-1
Applicable Equipment

Applicable MCC/Dist. Panel	Cubicle Number	Affected Equipment Number

6.1.3 REQUEST Operations to approve unit inspection or approve unit "Removal From Service".

_____
SS/SCO

NOTE

Section 6.2 shall be N/A for molded case breakers not contained in MCC buckets.

6.2 **MCC Bucket Removal.**

WARNING

Ensure all wiring is de-energized prior to working on equipment.

_____ 6.2.1 VERIFY wiring to be lifted is de-energized utilizing a multimeter.

_____ 6.2.2 MARK all wiring connections and DRAW a wiring diagram of motor controller compartment on Attachment 12.1. VERIFY Independent Verifications have been performed as required.

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6.2 **MCC Bucket Removal (Continued):**

_____ 6.2.3 DISCONNECT necessary wiring to permit removal of motor controller bucket from MCC compartment.

_____ 6.2.4 REMOVE motor controller bucket from MCC compartment.

6.3 **Molded Case Breaker Removal.**

WARNING

Ensure all wiring is de-energized prior to working on equipment.

_____ 6.3.1 VERIFY wiring to be lifted is de-energized utilizing a multimeter.

_____ 6.3.2 MARK all wiring connections and DRAW a wiring diagram of breaker on Attachment 12.1. VERIFY Independent Verifications have been performed as required.

WARNING

Do not remove breaker from MCC compartment without first removing MCC bucket.

_____ 6.3.3 DISCONNECT necessary wiring to permit removal of molded case breaker.

_____ 6.3.4 REMOVE molded case breaker.

_____ 6.3.5 RECORD molded case breaker information in Table 6.3-1, below.

Table 6.3-1
Breaker Nameplate Data

Breaker Type	Breaker Catalog Number	Breaker Serial Number	Breaker Frame Size	Breaker Current Rating

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NOTES

1. [illegible] test on any pole must be spaced by at least 20 minutes; tests on adjacent poles must be spaced by at least 5 minutes.
2. An engineering disposition shall be required if breaker does not meet acceptable trip times.

6.4 Molded Case Circuit Breaker Current Testing.

_____ 6.4.1 COMPUTE and RECORD "Test Currents" on Table 6.4-1. (Compute 300% Test Current by multiplying breaker current rating by the number "3" then, compute 1500% Test Current by multiplying breaker current rating by the number "15").

_____ 6.4.2 RECORD "Acceptable Trip Times" for the 300% Breaker Current Trip Test from Attachment 12.2 (Thermal magnetic molded case circuit breaker trip times) for breaker to be tested on Table 6.4-1, below.

Table 6.4-1
Breaker Test Data

	300% Breaker Current Trip Test				1500% Breaker Current Trip Test		
Breaker Phase	Test Current (3 x Rating)	Acceptable Trip Times From Attachment 12.2 Minimum	Maximum	Measured Breaker Trip Time	Test Current (15 x Rating)	Acceptable Trip Time	Measured Breaker Trip Time
A						< 1sec.	
B						< 1sec.	
C						< 1sec.	

_____ 6.4.3 OPEN and CLOSE breaker several times ensuring breaker opens and closes successfully without any binding.

_____ 6.4.4 **300% Breaker Current Test**

a. CLOSE breaker.

b. CONNECT test leads to phase "A".

c. APPLY 300% breaker rated current to phase "A" and RECORD time for breaker to trip in Table 6.4-1, Breaker Test Data.

d. TEST continuity of phase "A" and VERIFY phase opened.

e. CLOSE breaker.

f. TEST continuity of phase "A" and VERIFY phase shut.

g. WAIT 5 minutes then REPEAT steps 6.4.4 a thru f for phase "B".

6.4.4 **300% Breaker Current Test (Continued)** AUG 0 2 1988

h. WAIT 5 minutes then REPEAT steps 6.4.4 a thru f for phase "C".

i. VERIFY measured trip times agree with table from Attachment 12.2.

_____ j. **Independent Verification:** Measured trip times agree with table from Attachment 12.2.

_____ 6.4.5 **1500% Breaker Current Test.**

a. CLOSE breaker.

CAUTION

Do not excessively heat breaker. If breaker does not trip within its recommended trip time current flow to breaker should be discontinued.

b. APPLY 1500% breaker rated current to phase "A" and RECORD time for breaker to trip in Table 6.4-1, Breaker Test Data.

c. TEST continuity of phase "A" and VERIFY phase opened.

d. CLOSE breaker.

e. TEST continuity of phase "A" and VERIFY phase shut.

f. WAIT 5 minutes then REPEAT steps 6.4.5 a thru e for phase "B".

g. WAIT 5 minutes then REPEAT steps 6.4.5 a thru e for phase "C".

i. VERIFY measured trip times < 1 second.

_____ i. **Independent Verification:** Measured trip times < 1 second.

6.5 **Molded Case Circuit Breaker Meggering:**

_____ 6.5.1 DETERMINE voltage to megger molded case breaker at from table 6.5-1, below.

Table 6.5-1
Megger Voltage Table

Breaker Operating Voltage	Megger Voltage
125VDC	500VDC
480VAC	1000VDC

_____ 6.5.2 MEGGER breaker Line to Load on each phase with breaker open. RECORD information on Table 6.5-2, Molded Case Breaker Megger Readings.

6.5 **Molded Case Circuit Breaker Meggering (Continued):**

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_____ 6.5.3 MEGGER breaker phase to phase with breaker closed. RECORD information on Table 6.5-2, Molded Case Breaker Megger Readings.

Table 6.5-2
Molded Case Breaker Megger Readings

Test Connections	Breaker Status	Megger Voltage	Acceptable Megger Reading	Measured Megger Reading
Line to Load Ø A	Open		>1.0MΩ	MΩ
Line to Load Ø B	Open		>1.0MΩ	MΩ
Line to Load Ø C	Open		>1.0MΩ	MΩ
Ø A to Ø B	Closed		>1.0MΩ	MΩ
Ø A to Ø C	Closed		>1.0MΩ	MΩ
Ø B to Ø C	Closed		>1.0MΩ	MΩ

_____ 6.5.3 **Independent Verification:** Megger readings >1 megohm.

6.6 **Resistance Testing of Molded Case Breaker Contacts.**

6.6.1 CLOSE breaker.

_____ 6.6.2 TEST circuit breaker resistance of each phase with a ohmmeter (Fluke). RECORD readings in table 6.6-1 below.

Table 6.6-1
Breaker Resistance Readings

Test Connections	Breaker Status	Measured Resistance Reading
Line to Load Ø A	Closed	Ω
Line to Load Ø B	Closed	Ω
Line to Load Ø C	Closed	Ω

6.7 **Restoration/Cleanup:**

6.7.1 DISCONNECT test leads.

6.7.2 MCC bucket preparation.

_____ a. RECONNECT wiring on molded case breaker contained in MCC bucket per Attachment 12.1. VERIFY Independent Verifications have been performed, as required.

_____ b. INSPECT MCC bucket wiring and terminal connections for tightness and any evidence of overheating.

6.7 **Restoration/Cleanup (Continued):**

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WARNING

Installation of breaker into MCC or distribution panel with breaker closed will energize load side of breaker.

_____ 6.7.3 ENSURE molded case breaker is open.

_____ 6.7.4 INSTALL breaker in distribution panel, or motor controller bucket in MCC compartment.

_____ 6.7.5 RECONNECT wiring per drawing in Attachment 12.1. VERIFY Independent Verifications have been performed, as required.

6..7.6 NOTIFY Operations that equipment is available for service.

_____
SS/SCO

7.0 CHECKLISTS

N/A

8.0 ACCEPTANCE CRITERIA

8.1 All work and required testing has been completed in accordance with this procedure.

9.0 REVIEW AND SIGNOFF

Performed By _____/_____ Date _____
(Signature) (Initials)

Performed By _____/_____ Date _____
(Signature) (Initials)

Approved By _____ Date _____

Reviewed By _____ Date _____

10.0 FOOTNOTES

N/A

11.0 SUMMARY OF CHANGES

11.1 The entire procedure was changed to provide a standard format to help ensure correct, consistent, and complete procedures.

11.2 Breaker types HFD and EA added to procedure.

11.3 Acceptance criteria added for each breaker type from breaker curves.

11.4 New section added for breaker meggering.

11.5 New section added for recording breaker contact resistance (for information only).

11.6 Updated references to new FSAR and Technical Specifications.

11.7 Incorporated Temporary Procedure Changes: 88-429 and 88-205.

12.0 ATTACHMENTS

12.1 Motor control center and molded case breaker field prepared equipment wiring connection diagram.

12.2 Thermal magnetic molded case circuit breaker trip times.

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ATTACHMENT 12.1

MOTOR CONTROL CENTER AND MOLDED CASE BREAKER FIELD PREPARED EQUIPMENT WIRING CONNECTION DIAGRAM

NOTE: UTILIZE ADDITIONAL SHEETS AS NECESSARY

Lead Termination Diagram Prepared	Component Wires Removed	Component Wires Replaced
Initials	Initials	Initials
Independant Verification Initials	Independant Verification Initials	Independant Verification Initials

ATTACHMENT 12.2

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Thermal magnetic molded case circuit breaker trip times.

NOTE

These trip times are for non-adjustable instantaneous trip breakers only.

Breaker Type	Number Poles	Current Range (Amps)	300% Trip Test Acceptable Trip Times in (Seconds) Minimum	Maximum
EA	1	15-60	10	27
EA	1	70-100	6	26
EA	2,3	15-50	9	30
EA	2,3	70-100	11	26
EH	1	15-60	9.5	26
EH	1	70-100	5	17
EH	2,3	15-60	10	32
EH	2,3	70-100	5.5	20
FA	2,3,4	10-40	10	25
FA	2,3,4	125-150	26	42
FA	2,3,4	50-100	20	44
FB	2,3	15-40	10	26
FB	2,3	50-70	25	44
FB	2,3	90-150	23	60
HFA	2,3	10-40	10	25
HFA	2,3	50-100	21	44
HFB	1	15-40	7.5	20
HFB	1	50-70	21	36
HFB	1	90-100	22	60
HFB	2,3	15-40	10.5	26
HFB	2,3	50-70	25	42
HFB	2,3	90-150	23	60
HFD	2,3	15	9	70

CONNECTICUT YANKEE ATOMIC POWER CO.

PROCEDURE COVER SHEET

AUG 02 1988

PROCEDURE NUMBER	TITLE	REV. NO.
PMP 9.5-41	TESTING OF MOLDED CASE CIRCUIT BREAKERS	6 MAJOR

ORIGINATOR	DATE	DEPT.
Thomas K. Womack	7/6/88	Maintenance

TECHNICAL REVIEW

[√] OPERATION	R. F. Deane	[ ] HEALTH PHYSICS	
[ ] ENGINEERING		[ ] CHEMISTRY	
[ ] REACTOR ENGR.		[ ] SECURITY	
[√] MAINTENANCE	B Peiffle	[ ] STORES	
[ ] INST. & CONTROL		[√] QA	J Sedams
[ ] ADMIN.		[ ] RECORDS	
[ ] [ ]		[ ] [ ]	
[ ] [ ]		[ ] [ ]	

DEPARTMENT HEAD REVIEW

COMPLETE/ BIENNIAL REVIEW?	[√] YES [ ] NO	PORC REVIEW REQUIRED	[√] YES [ ] NO
MAJOR REVISION?	[√] YES [ ] NO	ENVIRONMENTAL IMPACT	[ ] YES [√] NO
A CHANGE TO INTENT?	[√] YES [ ] NO	WRITTEN SAFETY EVAL. ATTACHED?	[ ] YES [√] NO
SAFETY EVALUATION REQUIRED?	[ ] YES [√] NO	UNREVIEWED SAFETY QUESTION?	[ ] YES [√] NO

APPROVAL

DEPARTMENT HEAD	DATE	SUPERINTENDENT
[illegible]	7/14/88	[illegible]

PORC MEETING NO.	DATE	PROCEDURE EFFECTIVE DATE	REQUIRES LICENSED OPERATOR REVIEW?
88-85	7-20-88	8-2-88	YES [ ] NO [—]

8808050195 (11pp)

Connecticut Yankee
Preventive Maintenance Procedure
PMP 9.5-41
Maintenance Department

AUG 0 2 1988

Testing Of Molded Case Circuit Breakers.

1.0 PURPOSE

1.1 **Objective:** This procedure provides steps necessary to test overload tripping of Westinghouse molded case circuit breakers.

1.2 **Applicability:** This procedure is applicable to Westinghouse molded case circuit breaker types EA, EH, FA, FB, HFA, HFB and HFD.

1.3 **Frequency:** This procedure shall be performed on a refuel schedule or as needed.

2.0 LICENSE OR ADMINISTRATIVE REQUIREMENTS

N/A

3.0 REFERENCES

3.1 FSAR Section 8.3.1.1.2, 480V System Description; Section 8.3.1.1.6, AC Power Systems Protection Capabilities; Section 8.3.2.1, 125V DC Power System Description.

3.2 Technical Specifications Section 3.12, Station Service Power.

3.3 ACP 1.2-2.3, Certification and Identification of Qualified Testing Personnel.

3.4 ACP 1.2-5.1, PMMS Trouble Reporting System and Automated Work Orders.

3.5 Instructions for Type W Control Centers, Westinghouse Electric Corporation, I.B. 12-129b Effective July, 1971 (Manual File Number W-11-80).

3.6 Westinghouse AB De-ion Circuit Breakers, Application Data 29-160.

3.7 Westinghouse AB De-ion Circuit Breakers, Application Data 29-167.

3.8 NUSCO Drawings, Drawing Numbers: 16103-30004 Sheets 2, 3, and 4; 480 Volt One Line Diagram MCC's.

3.9 NEMA Standards Publication/NO. AB 2-1980, Procedures for Verifying the Performance of Molded Case Circuit Breakers.

3.10 IEEE Standard 62-1978, IEEE Guide for Field Testing Power Apparatus Insulation.

3.11 Procedure Number PMP 9.5-42, Motor Control Centers.

4.0 PREREQUISITES

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4.1 Personnel:

4.1.1 Personnel performing this procedure shall be Certified Test Personnel per ACP 1.2-2.3, Certification and Identification Of Qualified Inspection and Testing Personnel.

4.1.2 The job supervisor shall review the procedure and job requirements prior to start of work.

4.2 **Measuring and Test Equipment:** The following equipment or its equivalent (i.e., with equal or better accuracy and adequate range to measure the desired parameter) shall be required for the performance of this procedure. Instruments utilized in this procedure shall be in current calibration.

4.2.1 Breaker Test Device with capabilities to provide current at 3 and 15 times the current rating of breaker.

4.2.2 Multimeter (To verify wiring de-energized).

4.2.3 Fluke (VOM).

4.2.4 Megger (500 or 1000VDC).

4.3 **Preliminary Conditions:**

4.3.1 Operation Department has completed tag out of subject equipment.

4.3.2 Work Order signed W.O.#_____

4.3.3 Radiation Work Permit (RWP) issued, if required.

4.4 **Independent Verification:** Indicates a verification must be performed by a person other than the one actually performing the action step.

5.0 PRECAUTIONS

5.1 **Cautions:** Procedure contains cautions that apply to specific steps and are displayed in the procedure immediately prior to the applicable step.

5.1.1 Ensure motor controller or breaker assembly is returned to MCC and locked in after completion of testing.

5.1.2 Do not excessively heat breaker.

5.2 **Warnings:** Procedure contains warnings that apply to specific steps and are displayed in the procedure immediately prior to the applicable step.

5.2.1 Check all wires with a voltage tester prior to removing or installing breaker or motor controller for testing.

6.0 INSTRUCTIONS

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INITIALS

6.1 **Introduction:** Those steps or sections which are not performed shall be marked N/A, and a line drawn through the following consecutive steps not performed.

_____ 6.1.1 VERIFY all prerequisite steps are met.

_____ 6.1.2 RECORD "Applicable MCC/Dist. Panel", "Cubicle Number", and "Affected Equipment Number" in Table 6.1-1, below.

Table 6.1-1
Applicable Equipment

Applicable MCC/Dist. Panel	Cubicle Number	Affected Equipment Number

6.1.3 REQUEST Operations to approve unit inspection or approve unit "Removal From Service".

_____
SS/SCO

NOTE

Section 6.2 shall be N/A for molded case breakers not contained in MCC buckets.

6.2 **MCC Bucket Removal.**

WARNING

Ensure all wiring is de-energized prior to working on equipment.

_____ 6.2.1 VERIFY wiring to be lifted is de-energized utilizing a multimeter.

_____ 6.2.2 MARK all wiring connections and DRAW a wiring diagram of motor controller compartment on Attachment 12.1. VERIFY Independent Verifications have been performed as required.

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6.2 **MCC Bucket Removal (Continued):**

_____ 6.2.3 DISCONNECT necessary wiring to permit removal of motor controller bucket from MCC compartment.

_____ 6.2.4 REMOVE motor controller bucket from MCC compartment.

6.3 **Molded Case Breaker Removal.**

WARNING

Ensure all wiring is de-energized prior to working on equipment.

_____ 6.3.1 VERIFY wiring to be lifted is de-energized utilizing a multimeter.

_____ 6.3.2 MARK all wiring connections and DRAW a wiring diagram of breaker on Attachment 12.1. VERIFY Independent Verifications have been performed as required.

WARNING

Do not remove breaker from MCC compartment without first removing MCC bucket.

_____ 6.3.3 DISCONNECT necessary wiring to permit removal of molded case breaker.

_____ 6.3.4 REMOVE molded case breaker.

_____ 6.3.5 RECORD molded case breaker information in Table 6.3-1, below.

Table 6.3-1
Breaker Nameplate Data

Breaker Type	Breaker Catalog Number	Breaker Serial Number	Breaker Frame Size	Breaker Current Rating

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NOTES

1. Repeated test on any pole must be spaced by at least 20 minutes; tests on adjacent poles must be spaced by at least 5 minutes.
2. An engineering disposition shall be required if breaker does not meet acceptable trip times.

6.4 Molded Case Circuit Breaker Current Testing.

_____ 6.4.1 COMPUTE and RECORD "Test Currents" on Table 6.4-1. (Compute 300% Test Current by multiplying breaker current rating by the number "3" then, compute 1500% Test Current by multiplying breaker current rating by the number "15").

_____ 6.4.2 RECORD "Acceptable Trip Times" for the 300% Breaker Current Trip Test from Attachment 12.2 (Thermal magnetic molded case circuit breaker trip times) for breaker to be tested on Table 6.4-1, below.

Table 6.4-1
Breaker Test Data

	300% Breaker Current Trip Test				1500% Breaker Current Trip Test		
Breaker Phase	Test Current (3 x Rating)	Acceptable Trip Times From Attachment 12.2 Minimum	Maximum	Measured Breaker Trip Time	Test Current (15 x Rating)	Acceptable Trip Time	Measured Breaker Trip Time
A						< 1sec.	
B						< 1sec.	
C						< 1sec.	

_____ 6.4.3 OPEN and CLOSE breaker several times ensuring breaker opens and closes successfully without any binding.

_____ 6.4.4 **300% Breaker Current Test**

a. CLOSE breaker.

b. CONNECT test leads to phase "A".

c. APPLY 300% breaker rated current to phase "A" and RECORD time for breaker to trip in Table 6.4-1, Breaker Test Data.

d. TEST continuity of phase "A" and VERIFY phase opened.

e. CLOSE breaker.

f. TEST continuity of phase "A" and VERIFY phase shut.

g. WAIT 5 minutes then REPEAT steps 6.4.4 a thru f for phase "B".

6.4.4 **300% Breaker Current Test (Continued)** AUG 0 2 1988

h. WAIT 5 minutes then REPEAT steps 6.4.4 a thru f for phase "C".

i. VERIFY measured trip times agree with table from Attachment 12.2.

_____ j. **Independent Verification:** Measured trip times agree with table from Attachment 12.2.

_____ 6.4.5 **1500% Breaker Current Test.**

a. CLOSE breaker.

CAUTION

Do not excessively heat breaker. If breaker does not trip within its recommended trip time current flow to breaker should be discontinued.

b. APPLY 1500% breaker rated current to phase "A" and RECORD time for breaker to trip in Table 6.4-1, Breaker Test Data.

c. TEST continuity of phase "A" and VERIFY phase opened.

d. CLOSE breaker.

e. TEST continuity of phase "A" and VERIFY phase shut.

f. WAIT 5 minutes then REPEAT steps 6.4.5 a thru e for phase "B".

g. WAIT 5 minutes then REPEAT steps 6.4.5 a thru e for phase "C".

h. VERIFY measured trip times < 1 second.

_____ i. **Independent Verification:** Measured trip times < 1 second.

6.5 **Molded Case Circuit Breaker Meggering:**

_____ 6.5.1 DETERMINE voltage to megger molded case breaker at from table 6.5-1, below.

Table 6.5-1
Megger Voltage Table

Breaker Operating Voltage	Megger Voltage
125VDC	500VDC
480VAC	1000VDC

_____ 6.5.2 MEGGER breaker Line to Load on each phase with breaker open. RECORD information on Table 6.5-2, Molded Case Breaker Megger Readings.

6.5 **Molded Case Circuit Breaker Meggering (Continued):**

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_____ 6.5.3 MEGGER breaker phase to phase with breaker closed. RECORD information on Table 6.5-2, Molded Case Breaker Megger Readings.

Table 6.5-2
Molded Case Breaker Megger Readings

Test Connections	Breaker Status	Megger Voltage	Acceptable Megger Reading	Measured Megger Reading
Line to Load Ø A	Open		>1.0MΩ	MΩ
Line to Load Ø B	Open		>1.0MΩ	MΩ
Line to Load Ø C	Open		>1.0MΩ	MΩ
Ø A to Ø B	Closed		>1.0MΩ	MΩ
Ø A to Ø C	Closed		>1.0MΩ	MΩ
Ø B to Ø C	Closed		>1.0MΩ	MΩ

_____ 6.5.3 **Independent Verification:** Megger readings >1 megohm.

6.6 **Resistance Testing of Molded Case Breaker Contacts.**

6.6.1 CLOSE breaker.

_____ 6.6.2 TEST circuit breaker resistance of each phase with a ohmmeter (Fluke). RECORD readings in table 6.6-1 below.

Table 6.6-1
Breaker Resistance Readings

Test Connections	Breaker Status	Measured Resistance Reading
Line to Load Ø A	Closed	Ω
Line to Load Ø B	Closed	Ω
Line to Load Ø C	Closed	Ω

6.7 **Restoration/Cleanup:**

6.7.1 DISCONNECT test leads.

6.7.2 MCC bucket preparation.

_____ a. RECONNECT wiring on molded case breaker contained in MCC bucket per Attachment 12.1. VERIFY Independent Verifications have been performed, as required.

_____ b. INSPECT MCC bucket wiring and terminal connections for tightness and any evidence of overheating.

6.7 **Restoration/Cleanup (Continued):**

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WARNING

Installation of breaker into MCC or distribution panel with breaker closed will energize load side of breaker.

_____ 6.7.3 ENSURE molded case breaker is open.

_____ 6.7.4 INSTALL breaker in distribution panel, or motor controller bucket in MCC compartment.

_____ 6.7.5 RECONNECT wiring per drawing in Attachment 12.1. VERIFY Independent Verifications have been performed, as required.

6..7.6 NOTIFY Operations that equipment is available for service.

_____
SS/SCO

7.0 CHECKLISTS

N/A

8.0 ACCEPTANCE CRITERIA

8.1 All work and required testing has been completed in accordance with this procedure.

9.0 REVIEW AND SIGNOFF

Performed By _____/_____ Date _____
(Signature) (Initials)

Performed By _____/_____ Date _____
(Signature) (Initials)

Approved By _____ Date _____

Reviewed By _____ Date _____

10.0 FOOTNOTES

N/A

11.0 SUMMARY OF CHANGES

11.1 The entire procedure was changed to provide a standard format to help ensure correct, consistent, and complete procedures.

11.2 Breaker types HFD and EA added to procedure.

11.3 Acceptance criteria added for each breaker type from breaker curves.

11.4 New section added for breaker meggering.

11.5 New section added for recording breaker contact resistance (for information only).

11.6 Updated references to new FSAR and Technical Specifications.

11.7 Incorporated Temporary Procedure Changes: 88-429 and 88-205.

12.0 ATTACHMENTS

12.1 Motor control center and molded case breaker field prepared equipment wiring connection diagram.

12.2 Thermal magnetic molded case circuit breaker trip times.

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ATTACHMENT 12.1

MOTOR CONTROL CENTER AND MOLDED CASE BREAKER FIELD PREPARED EQUIPMENT WIRING CONNECTION DIAGRAM

NOTE: UTILIZE ADDITIONAL SHEETS AS NECESSARY

Lead Termination Diagram Prepared	Component Wires Removed	Component Wires Replaced
Initials	Initials	Initials
Independant Verification Initials	Independant Verification Initials	Independant Verification Initials

ATTACHMENT 12.2

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Thermal magnetic molded case circuit breaker trip times.

NOTE

These trip times are for non-adjustable instantaneous trip breakers only.

Breaker Type	Number Poles	Current Range (Amps)	300% Trip Test Acceptable Trip Times in (Seconds) Minimum	Maximum
EA	1	15-60	10	27
EA	1	70-100	6	26
EA	2,3	15-60	9	30
EA	2,3	70-100	11	26
EH	1	15-60	9.5	26
EH	1	70-100	5	17
EH	2,3	15-60	10	32
EH	2,3	70-100	5.5	20
FA	2,3,4	10-40	10	25
FA	2,3,4	125-150	26	42
FA	2,3,4	50-100	20	44
FB	2,3	15-40	10	26
FB	2,3	50-70	25	44
FB	2,3	90-150	23	60
HFA	2,3	10-40	10	25
HFA	2,3	50-100	21	44
HFB	1	15-40	7.5	20
HFB	1	50-70	21	36
HFB	1	90-100	22	60
HFB	2,3	15-40	10.5	26
HFB	2,3	50-70	25	42
HFB	2,3	90-150	23	60
HFD	2,3	15	9	70