



U.S. NUCLEAR REGULATORY COMMISSION
**RESPONSE TO FREEDOM OF
INFORMATION ACT (FOIA) REQUEST**

NRC FOIA REQUEST NUMBER(S)
FOIA — 92-212

RESPONSE TYPE

☐ FINAL

☒ PARTIAL

DATE

JUL 31 1992

DOCKET NUMBER(S) (if applicable)

REQUESTER

Ms. Marsha Hymanson

PART I.—AGENCY RECORDS RELEASED OR NOT LOCATED (See checked boxes)

☐ No agency records subject to the request have been located.

☐ No additional agency records subject to the request have been located.

☐ Requested records are available through another public distribution program. See Comments section.

☒ Agency records subject to the request that are identified in Appendix(es) **A** are already available for public inspection and copying at the NRC Public Document Room, 2120 L Street, N.W., Washington, DC.

☒ Agency records subject to the request that are identified in Appendix(es) **B** are being made available for public inspection and copying at the NRC Public Document Room, 2120 L Street, N.W., Washington, DC, in a folder under this FOIA number.

The nonproprietary version of the proposal(s) that you agreed to accept in a telephone conversation with a member of my staff is now being made available for public inspection and copying at the NRC Public Document Room, 2120 L Street, N.W., Washington, DC, in a folder under this FOIA number.

Agency records subject to the request that are identified in Appendix(es) _____ may be inspected and copied at the NRC Local Public Document Room identified in the Comments section.

Enclosed is information on how you may obtain access to and the charges for copying records located at the NRC Public Document Room, 2120 L Street, N.W., Washington, DC.

☒ Agency records subject to the request are enclosed. **Appendices A & B**

Records subject to the request have been referred to another Federal agency(ies) for review and direct response to you.

Fees

You will be billed by the NRC for fees totaling \$ _____

You will receive a refund from the NRC in the amount of \$ _____

In view of NRC's response to this request, no further action is being taken on appeal letter dated _____ No. _____

PART II, A—INFORMATION WITHHELD FROM PUBLIC DISCLOSURE

Certain information in the requested records is being withheld from public disclosure pursuant to the exemptions described in and for the reasons stated in Part II, B, C, and D. Any released portions of the documents for which only part of the record is being withheld are being made available for public inspection and copying in the NRC Public Document Room, 2120 L Street, N.W., Washington, DC in a folder under this FOIA number.

COMMENTS

SIGNATURE, DIRECTOR, DIVISION OF FREEDOM OF INFORMATION AND PUBLICATIONS SERVICES

John D. Philpotts

9301110137 920731
PDR FOIA
HYMAN5092-212 PDR

Re: FOIA-92-212

APPENDIX A

RECORDS MAINTAINED AMONG PDR FILES

<u>NUMBER</u>	<u>DATE</u>	<u>DESCRIPTION</u>
1.	3/6/90	Letter to H. W. Keiser from J. P. Durr re: Combined Inspection Report Nos. 50- 387/90-02 & 50-388/90-02 with enclosed report (10 pages) ANO 9003140003
2.	2/12/91	Letter to H. W. Keiser from J. P. Durr re: NRC Regional Combined Inspection 50- 387/90-24; 50-388/90-24 with enclosed report (15 pages) ANO 9102210013

APPENDIX B

RECORDS BEING PLACED INTO THE PDR UNDER THE ABOVE REQUEST NUMBER

<u>NUMBER</u>	<u>DATE</u>	<u>DESCRIPTION</u>
1.	Undated	4.0 Licensee's Actions on Previous NRC Concern (1 page)
2.	7/29/82	Susquehanna SES Work Authorization, WA No. S22518 (6 pages)
3.	7/31/82	Susquehanna SES Work Authorization, WA No. S22520 (3 pages)
4.	2/10/86	Instruction Manual for Motor Control Center (6 pages)
5.	1/4/88	Procedure Cover Sheet, 480 Volt and Under Circuit Breaker High Current Testing, MT-GE-008, Revision 7 (13 pages)
6.	6/19/89	Allegation Panel Decisions, RI-89-A-0072 (1 page)
7.	6/22/89	Allegation Panel Decisions, RI-89-A-0072 (1 page)
8.	1/19/90	Procedure Cover Sheet, 480 Volt and under Circuit Breaker High Current Testing, MT-GE-008, Revision 8 (17 pages)
9.	3/14/90	Allegation File Document Control Form, Allegation No. RI-89-A-0072 (1 page)
10.	6/7/90	Allegation Review Board Summary, Allegation No. NRR-89-A-0023 with enclosure (19 pages)
11.	7/3/90	Memo to W. T. Russell from T. T. Martin re: Allegation (RI-89-A-0072) Adjustment of Molded Case Circuit Breakers (MCCB) at Susquehanna (4 pages)
12.	2/25/91	NRC Open Item 387/90-24-01 with attachments (16 pages)

Re: FOIA-92-212

APPENDIX B

RECORDS BEING PLACED INTO THE PDR UNDER THE ABOVE REQUEST NUMBER

<u>NUMBER</u>	<u>DATE</u>	<u>DESCRIPTION</u>
13.	11/15/91	Letter to H. W. Keiser from J. P. Durr re: Combined Inspection Nos. 50-387/91- 17 & 50-388/91-17 with enclosed inspection report and Region I Open Item Input Form (20 pages)
14.	4/3/92	USNRC Open Item 387/90-24-01 (6 pages)

DRAFT

4.0 LICENSEE'S ACTIONS ON PREVIOUS NRC CONCERN

(Closed) Unresolved item (50-387/90-24-01; 50-388/90-24-01), Molded Case Circuit Breakers (MCCBs) internal adjustment done at Susquehanna.

In NRC Inspection 90-02, an issue regarding the licensee's practice of permitting maintenance personnel to disassemble and make internal adjustments to MCCB trip units in accordance with maintenance procedure MT-GE-008 was identified. Concerns were raised that the licensee was disassembling and adjusting MCCB trip units without specific vendor published instructions or approval and industry guidance.

During subsequent inspection 90-24, the inspector noted that the licensee's procedure MT-GE-008 did not provide detailed information regarding the operations involved in disassembly/reassembly of breakers. Additionally, the MCCBs were never tested after original functional test dated July 1982 due to the lack of a formal maintenance testing program. This item was unresolved pending the licensee's re-evaluation of the breakers functional adequacy and periodic testing.

The inspector noted that the licensee has permanently suspended internal adjustment to molded case breakers and procedure MT-GE-008 was revised to reflect this change. The safety evaluation, NL-90-40, prepared by the licensee in accordance with 10 CFR 50.59 and additional analysis of April 3, 1992, concluded that the adjustment made to 10 MCCBs did not degrade the safety function of these breakers. Also, test records for two of these breakers (which underwent surveillance testing twice after the original adjustment) showed acceptable time/current characteristics which was within the manufacturer's curves. The licensee has placed these breakers on a periodic testing schedule since March 1991 under PMIP NO. 020.

Based on the above licensee corrective actions, this item is considered closed.

3/1

SUSQUEHANNA SES WORK AUTHORIZATION

I. PROBLEM DESCRIPTION

UNIT 1	SYSTEM 34	EQUIP. NUMBER 18216/IV211A	LOCATION A 27 E 683	WA NUMBER 522518
RESPONSIBLE WORK GROUP MECH. <u>ELEC</u>		I & C	SUB GROUP TRM	NEED DATE 7/26/82

NCR* 82-209 Tag* 11

Perform breaker retest on:

MCC# 18216 Bkr# 13

Identified Date
G. J. Treven 7-16-82

Approved Date
R. C. G. 7-21-82

II. WORK CLASSIFICATION

QUALITY ☒ YES ☐ NO ASME CODE ☐ YES ☒ NO

ER CTN AIN 400436-001

Work Group Supervisor Date
7/23/82

III. WORK PLANNING

A. INVESTIGATION

PRIORITY CODE 3+3

WORK CODE 2

PLANT STATUS CODE ALL

Work Group Foreman Date
N/A

Operations Authorization Date
N/A

B. WORK PLAN

- Document and determinate breaker power leads.
- Perform breaker retest and if data is given, overload test, per MT-GE-008 using the following data:

Magnetic Current value 40 Amps

Overload Size H 1029 Setting H1

- Retermine breaker power leads per documentation in step #1 above.

ERF NO. A 2668 ERF REQ ☒ YES ☐ NO RWP REQ ☒ YES ☐ NO

RWP NO N/A EST. Man Hrs 8 RWP Man Hrs N/A

Work Group Foreman Date
M. H. SL 7-24-82

Work Group Supervisor Date
R. C. G. 7-23-82

Quality Control Review Date
7-25-82

Operations Authorization Date
A 2668

C. FUNCTIONAL TESTING REQUIREMENTS

1. PERFORM UNIT COOLER OPERABILITY CHECK.

IV. ACTION TAKEN

EQUIPMENT HISTORY SUMMARY

(360 Spaces)

Tested Breaker Test acceptable
Ops to perform unit cooler operability check

see continuation sheets for action taken.

Work Completed Date
7/29/82

Work Group Review Date
7/29/82

Quality Control Review Date
7/29/82

Operations Review Date
7/29/82

V. PROBLEM CODE

PROBLEM AV CAUSE XX ACTION GF

PMIS OK

TEST RECORD

A.C. MOLDED CASE BREAKERS, MOTOR OVERLOADS AND GROUND RELAYS

Syst.# 34D W.A.# 522518 EM# N/A Q(X, non Q ()

Breaker# 1B216-013 MFG. WEST Type HFB m

Print # E95h11 Curve# N/A Curve Date N/A

Breaker: Rating 10

Adjustable (from) 35 amps. (to) 110 amps.

Overload: No. H1029 Setting H1

Rating (from) 4.69 amps. (to) 4.88 amps.

Test amps 14

Ground relay: Setting N/A amps.

MAGNETIC	PHASE	AS FOUND DATA	AS LEFT DATA
	A	1 70 105	LO 47 105
	B	1 47 105	LO 44 105
	C	1 60 105	LO 43 105

THERMAL	PHASE	AS FOUND DATA	AS LEFT DATA
	A	N/A	N/A
	B	N/A	N/A
	C	N/A	N/A

OVERLOADS	PHASE	AS FOUND DATA	AS LEFT DATA
H1	A	14 47.5	14 47.5
H1	B	14 52.2	14 52.2
H1	C	14 52.3	14 52.3

TEST RECORD

A.C. MOLDED CASE BREAKERS, MOTOR OVERLOADS AND GROUND RELAYS

1B216-013

GROUND	PHASE	AS FOUND DATA	AS LEFT DATA
	N	N/A	N/A

TEST INSTRUMENT	I.D. #	CALIBRATION DUE DATE
MULTI-AMP MS-1A	EM037	1-28-83
MULTI-AMP CB7725	EM046	5-7-83

Performed by: Quayle, Mylen Date: 7-29-82

Reviewed by: Robert [Signature] Date: 7-29-82 acceptable: YES (yes/no)

Comments:

CØ ADJUSTED INTERNALLY

SUSQUEHANNA SES WORK AUTHORIZATION

WA NUMBER

CONTINUATION SHEET

SECTION NO. TITLE

IV

ACTION TAKEN

UNIT

1

SYSTEM

34D

522518

DE-TERMINATED CABLE
NUMBER EP1V2520A FROM BREAKER
1B216-013. THE WIRES WERE CONNECTED
TO THE FOLLOWING POINTS:

BLACK-L3

WHITE-L2

RED-L1

THE GROUND WIRE WAS
REMOVED FROM A SCREW ABOVE THE
OVERLOAD RELAY.

THE BREAKER WAS REMOVED
FOR CLEANING, OVERLOAD REPLACEMENT,
AND TESTING.

THE OVERLOAD HEATERS H1028(HI)
WERE CHANGED TO H1029(HI).

TESTED OVERLOAD RELAY
AND ATTACHED TEST SHEET TO THE
WA.

TESTED BREAKER 1B216-013
AND ATTACHED THE TEST SHEET
TO THE WA.

SUSQUEHANNA SES WORK AUTHORIZATION

WA NUMBER

CONTINUATION SHEET

SECTION NO. TITLE

IV ACTION TAKEN

UNIT

1

SYSTEM

34D

522518

RE-TERMINATED CABLE
NUMBER EPIV2520A IN BREAKER
1B216-013. THE WIRES WENT TO
THE FOLLOWING POINTS!

BLACK-L3

WHITE-L2

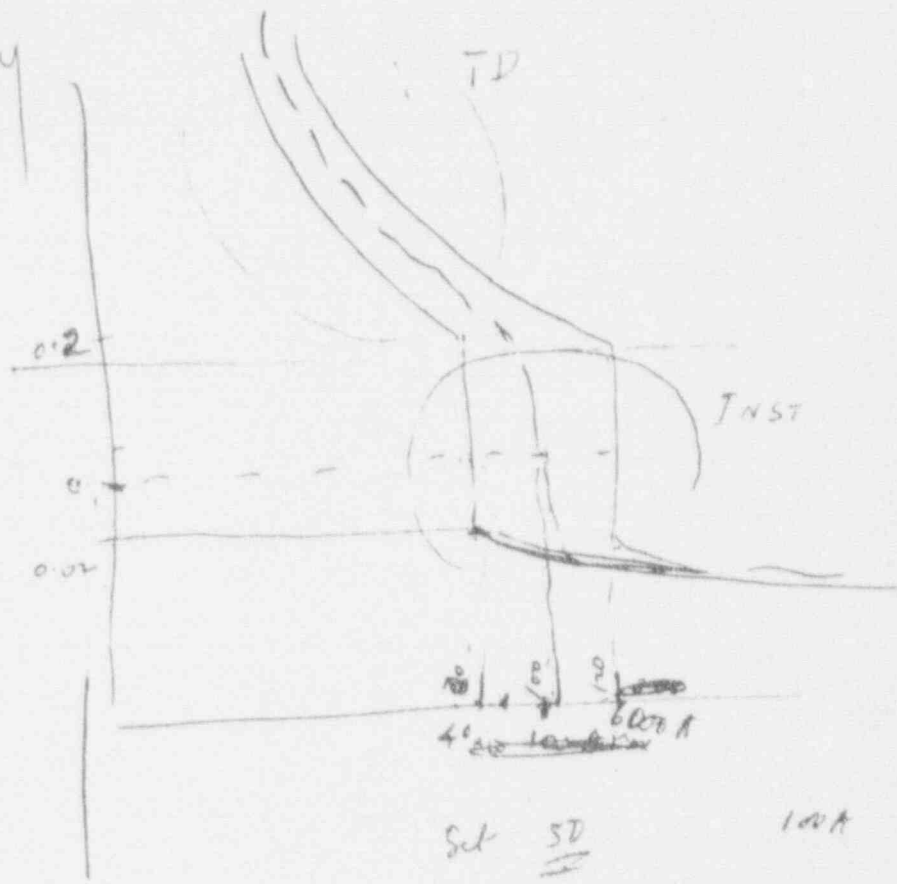
RED-L1.

THE GROUND WIRE WAS
RE-CONNECTED TO THE SCREW
ABOVE THE OVERLOAD RELAY.

OPERATIONS TO PERFORM
FUNCTIONAL TEST WHEN THE
EQUIPMENT IS OPERATED.

— 7-29-82 WRS

X
 Steve Belkowsky
 3320



Set SD

100A

1.25

1.5

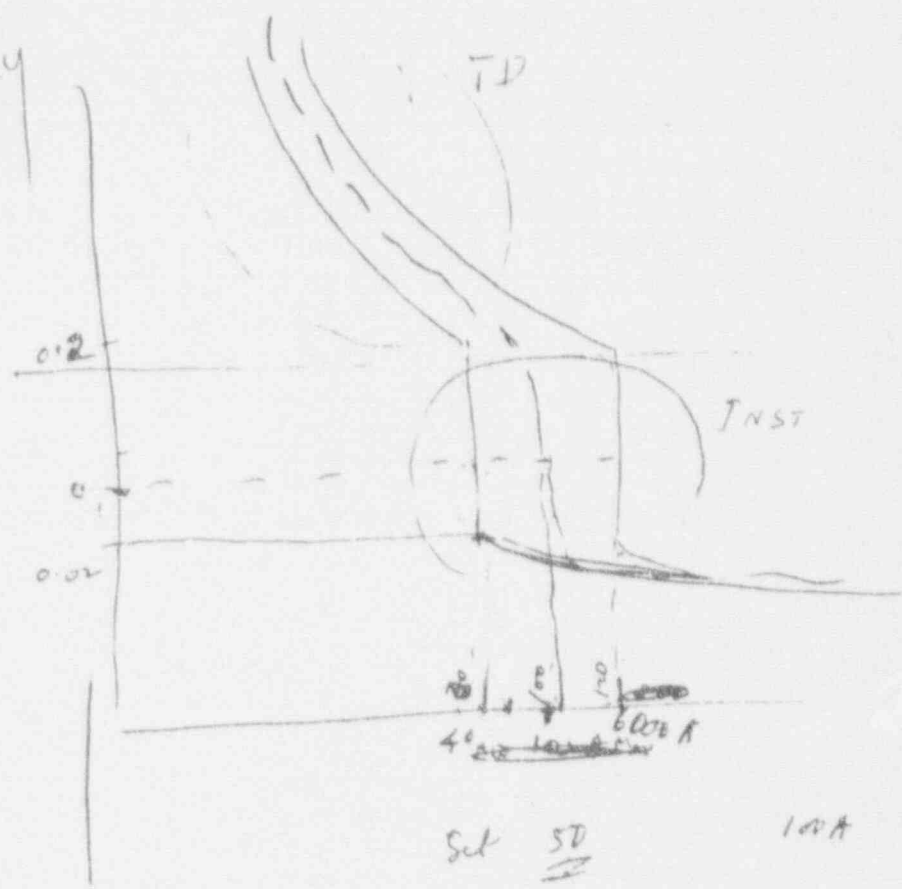
40 60A

15-40 Am

90-100 A

1.25
 1.5, turn

Steve Belyuzsky
3320



Set SD 100A

1.25

1.35

40 60A

15-40 Am

90-100A

1.25
1.35
turn

SUSQUEHANNA SES WORK AUTHORIZATION

WA NUMBER

522520

I. PROBLEM DESCRIPTION

UNIT

1

SYSTEM

34

EQUIP NUMBER

18257/IV

LOCATION

A 27 E 670

NEED DATE

7/26/82

RESPONSIBLE
WORK GROUP

MECH.

ELEC

I&C

SUB
GROUP

TRM

Identified

Date

G. J. Treven 7-16-82

Approved

Date

R.C. Glin 7-21-82

ER

CTN

AIN

400436-001

Work Group Supervisor

Date

B 7/23/82

II. WORK CLASSIFICATION

QUALITY

☒ YES

☐ NO

ASME CODE

☐ YES

☒ NO

III. WORK PLANNING

A. INVESTIGATION

PRIORITY
CODE

3 TB

WORK
CODE

2

PLANT STATUS
CODE

ALL

Work Group Foreman

Date

N/A

Operations Authorization

Date

N/A

B. WORK PLAN

1. Document and determinate breaker power leads.
2. Perform breaker retest and if data is given, overload test, per MT-GE-008 using the following data:

Magnetic Current value 40 Amps

Overload Size 41029 Setting Hi

3. Reterminate breaker power leads per documentation in step 01 above.

ERF NO.

A 2669

RWP NO.

N/A

ERF
REQ

☒ YES

☐ NO

RWP
REQ

☐ YES

☒ NO

EST
Man Hrs

8

RWP
Man Hrs

N/A

Work Group Foreman

Date

M. L. Sh 7-24-82

Work Group Supervisor

Date

B. K. K. 7-23/82

Quality Control Review

Date

B. K. K. 7-25-82

Operations Authorization

Date

A 2669

C. FUNCTIONAL TESTING REQUIREMENTS

1. PERFORM UNIT COOLER OPERABILITY CHECK.

IV. ACTION TAKEN

EQUIPMENT HISTORY SUMMARY

(360 Spaces)

Tested Breaker Test Acceptable
ops to perform operability check

See cont sheets for action taken

Work Completed

Date

W. J. H. 7-31-82

Work Group Review

Date

W. J. H. 7-31-82

Quality Control Review

Date

W. J. H. 7-31-82

Operations Review

Date

W. J. H. 7-31-82

V. PROBLEM CODE

PROBLEM

AV

CAUSE

XX

ACTION

AI

PMIS

Operations Review

Date

W. J. H. 7-31-82

TEST RECORD

A.C. MOLDED CASE BREAKERS, MOTOR OVERLOADS AND GROUND RELAYS

Syst.# 34D W.A.# 522520 EM# N/A Q(x, non Q ()

Breaker# 1B237-053 MFG. WEST Type HEB-M

Print # E95h9 Curve# N/A Curve Date N/A

Breaker: Rating 10

Adjustable (from) 35 amps. (to) 110 amps.

Overload: No. H1029 Setting H1

Rating (from) 4.69 amps. (to) 4.88 amps.

Test amps 14

Ground relay: Setting N/A amps.

set at Low

MAGNETIC	PHASE	AS FOUND DATA	AS LEFT DATA
	A	1 57.05	LO 40.05
	B	1 95.05	LO 40.05
	C	1 140.05	LO 40.05

THERMAL	PHASE	AS FOUND DATA	AS LEFT DATA
	A	N/A	N/A
	B	N/A	N/A
	C	N/A	N/A

OVERLOADS	PHASE	AS FOUND DATA	AS LEFT DATA
H1	A	14 52	14 52
H1	B	14 60.8	14 60.8
H1	C	14 50.3	14 50.3

TEST RECORD

A.C. MOLDED CASE BREAKERS, MOTOR OVERLOADS AND GROUND RELAYS

1B237-053

GROUND	PHASE	AS FOUND DATA	AS LEFT DATA
	N	N/A	N/A

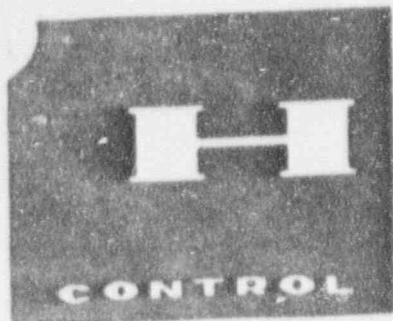
TEST INSTRUMENT	I.C. #	CALIBRATION DUE DATE
MULTI-AMP 125-1A	EM037	1-28-83
MULTI-AMP CB7725	EM046	5-7-83

Performed by: Wayne Snyder Date: 7-31-82

Reviewed by: [Signature] Date: 7-31-82, acceptable: yes (yes/no)

Comments:

BREAKER ADJUSTED INTERNALLY



INSTRUCTION MANUAL
FOR MOTOR CONTROL CENTER
P.O. 8856-E-118-AL

GENERIC FOR SAFEGUARD MOTOR CONTROL CTR.

COMMENTS:

1. REVISE DRAWING P100442-D3 AS PER BECHTEL COMMENTS
(SEE V.I.P. # 8856-E/118-161-1)
2. ADD SHEETS 3 & 4 OF PARTS LIST, DRAWING 70-6673

MCC TAG NO.'S

1B216	2B217	0B517
1B217	2B216	0B516
1B219	2B219	0B536
1B226	2B226	0B146
1B227	2B227	0B526
1B229	2B229	0B527
1B236	2B236	0B536
1B237	2B237	0B546
1B246	2B246	
1B247	2B247	

SWW
2-18-86

CUTLER - HAMMER

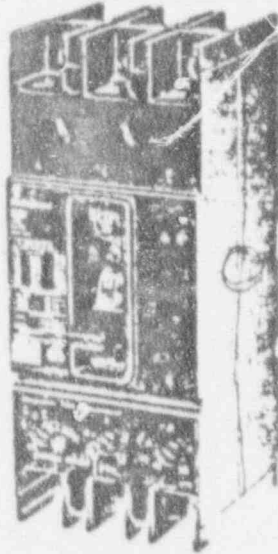
B/c



September, 1976
Supersedes Application Data 29-160
all previous issues
Mailed to: E. D. C/1901, 1928/DB

Standard Types JB, KB, and MARK 75®
Type HKB
70-250 Amperes, 600 Volts Ac, 250 Volts Dc,
2 and 3 Poles

AB DE-ION® Circuit Breakers



Continuous Ampere Ratings
Underwriters Laboratories, Inc. Listed
70, 90, 100, 125, 160, 175, 200, 225, 250

Interrupting Ratings, Amperes
Underwriters Laboratories, Inc. Listed

Types JB and KB
240 Volts Ac: 30,000 Asym., 25,000 Sym.
480 Volts Ac: 25,000 Asym., 22,000 Sym.
600 Volts Ac: 25,000 Asym., 22,000 Sym.
250 Volts Dc: 10,000

MARK 75 Type HKB
240 Volts Ac: 75,000 Asym., 65,000 Sym.
480 Volts Ac: 30,000 Asym., 25,000 Sym.
600 Volts Ac: 25,000 Asym., 22,000 Sym.
250 Volts Dc: 20,000

Application
These breakers are designed for the protection of branch and feeder circuits. Being of compact size, they are ideally suited for use in control panels, panelboards, switchboards or separate enclosures where a 250 ampere frame size breaker is required.

MARK 75 Type HKB Breakers, because of their higher interrupting capacity, are ideally suited for use in network systems where unusually high fault currents are available.

Listed with Underwriters Laboratories, Inc.

On all three phase Delta, grounded B phase applications, refer to Westinghouse.

Construction
These breakers have all the standard AB breaker features. Two and three pole breakers are supplied in one frame size; the current carrying parts being omitted from the center pole for two pole breakers. In addition, the MARK 75 Type HKB molded case is a higher strength glass polyester material with greater resistance to tracking. Type JB Breakers have non-interchangeable trip units, while Types KB and HKB have interchangeable trips.

Federal Specification W-C-375b
See tabulation on page 20.1

Terminals
Two terminals required per pole. Terminals are Underwriters Laboratories, Inc. listed for wire type and range listed below. When used with aluminum conductors, use joint compound.

Terminal arrangement permits ready use of other circuit connecting means, such as rear-connecting studs, panelboard connectors and plug-in adaptor kits.

Max. Breaker Amps.	Catalog Number	Wire Range, Type No. of Cables
Standard Pressure Terminals (Copper Only)		
250	T250KB	1 #4-350 MCM Cu. or 1 #2-350 MCM Al
Optional Al/Cu Pressure Terminals		
250	TA250KB	1 #4-350 MCM Al/Cu

Operation
When the breaker contacts are open the handle is in either the mid or OFF position. If in the mid-position the breaker has been tripped automatically. The latch must be reset by moving the operating handle to the extreme OFF position before attempting to restore service. Contacts may be closed, after resetting the latch, by moving the handle to the ON position. JB breakers may be mounted in an inverted position and are approved for reverse feed. Types KB and HKB may be mounted in an inverted position, but are not approved for reverse feed. The toggle handle operates with the following force in pounds from the end of the handle: ON - 27 lbs, OFF - 29 lbs; RESET - 43 lbs.

Thermal Magnetic Breakers
These breakers are equipped with thermal,

front-adjustable magnetic trip elements. Thermal trip elements are of an indirectly heated bimetallic type having a long time delay well suited for starting motors having high inrush currents of long duration. Instantaneous magnetic trip setting may be adjusted between established limits to take care of circuit surge conditions. Trip units are non-interchangeable on JB breakers, and interchangeable on Type KB and HKB.

Magnetic Trip and Setting Range

Ampere Rating	70	90	100	125	160	175	200	225	250
High	700	900	1000	1250	1500	1750	2000	2250	2500
Low	350	450	500	625	750	875	1000	1125	1250

Magnetic Only Circuit Interrupters
These are breakers with adjustable magnetic trip elements only, for applications where short circuit protection only is required. Magnetic trip ranges are the same as those listed for thermal-magnetic breakers, but the continuous current ratings in all cases are 225 amperes.

Saf-T-Vue Breakers (JB, KB Only)
Saf-T-Vue breakers are similar to standard breakers except that they have a transparent window located over the breaker contacts. Saf-T-Vue breakers are commonly used in steel mill applications where sight of contacts is required. Can be supplied in all standard ratings.

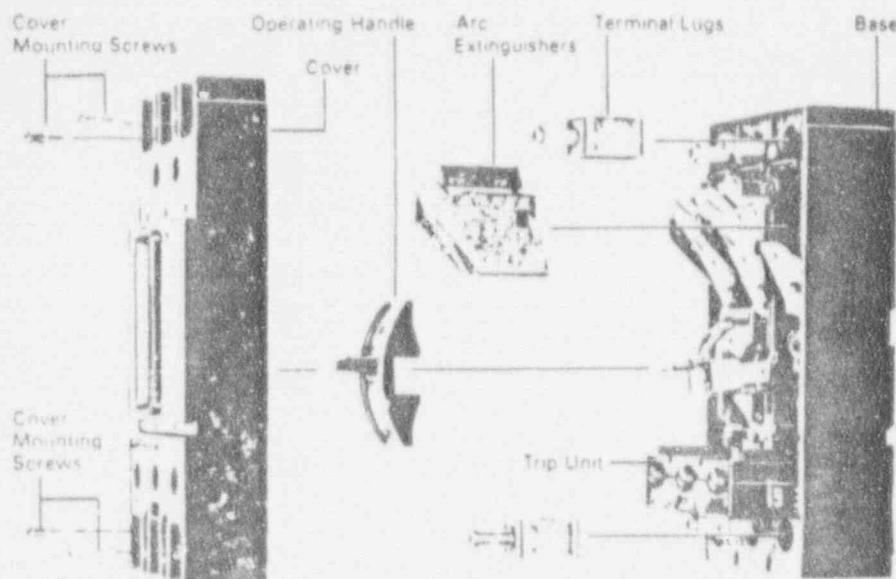
Molded Case Switches (JB, KB Only)
(Non-Automatic Interrupters)
Breakers with non-automatic details can be installed where a heavy-duty, high capacity disconnect switch without overcurrent protection is required.

Circuit Breaker Removal
Before inspecting, installing, or removing from a circuit, the circuit breaker should be in the OFF position, and if practicable, the circuit should be de-energized. If the circuit cannot be de-energized, insulated tools, rubber gloves and a rubber floor mat should be used.

- ① All adjustable magnetic trip settings in trip position at factory may be adjusted down to required limit in the field.
- ② Not for use as a disconnect switch.
- ③ Breakers with internal disconnect are not suitable for reverse feed.
- ④ Ratings above 10,000 amps are not UL listed.



Typical Exploded View



To remove a rear-connected circuit breaker from its mounting, remove terminal stud lock-nuts and pull circuit breaker forward.

To remove a front-connected circuit breaker from its mounting, loosen screws in terminal lugs and remove cables from terminals. Remove circuit breaker mounting screws and pull circuit breaker forward.

To remove a circuit breaker equipped with plug-in mounting blocks from its mounting, remove breaker mounting screws and pull circuit breaker forward.

Inspection and Maintenance

Good maintenance procedure calls for periodic inspection of all electrical apparatus including molded case circuit breakers. Terminal lugs and trip units must be tight to prevent overheating. Due to the inherent wiping action built into the moving contacts of all Westinghouse circuit breakers, operating the breaker several times under load will remove any high resistance film that may have formed. Under normal conditions, additional cleaning of contacts is not required. However, should operating and/or atmospheric conditions make it desirable to clean the contacts further, the following procedure is recommended:

1. Remove cover, arc extinguishers and stationary contact assemblies.
2. Wipe contact surfaces with a clean cloth dipped in a chlorinated solvent. If surfaces are excessively oxidized or corroded, scrape lightly with a fine file before wiping.

It should be noted that removing the sealed cover of the type JB breaker voids the Underwriters Laboratories, Inc., label.

Replacing Interchangeable Trip Unit, Types KB and HKB

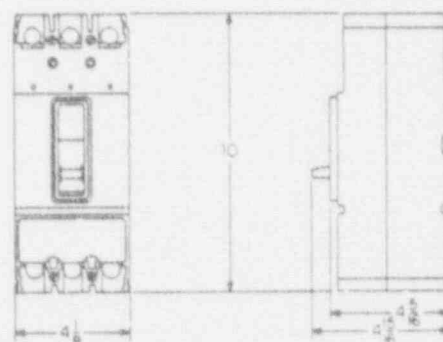
1. Remove circuit breaker from its mounting per instructions under "circuit breaker removal".
2. Remove cover by removing four screws.
3. Remove screws from the outer poles of the line side of the trip unit and loosen the screw in the center pole of the same side of the trip unit.
4. Lift trip unit from frame after removing the operating handle from its mounting.
5. Install new trip unit by reversing above procedure.
6. Before replacing frame cover and mounting circuit breaker, check for proper latching and closing. Perform latching and closing operations per instructions under "operation". Open and close breaker several times to make certain proper latching has been achieved.
7. Replace frame cover and mount circuit breaker.

Accessories and Modifications

Accessories and modifications available include: alarm switch, auxiliary switch, shunt trip, undervoltage release, line terminal shields, plug-in adapter kits, rear-connecting studs, center studs, mechanical interlocks, panel-board connectors, paralleling straps, motor operators, handle locking devices, moisture and fungus treatment.

Dimensions, Inches[Ⓢ]

Not to be used for construction purposes. See Dimension Sheet 29-170 for detailed dimensions.



Ⓢ 2-pole breakers supplied in 3-pole frames with center pole parts omitted.

Further Information

Prices: Price List 29-020 P WE A
Ordering Data: Tech. Data 29-120 T WE A
Dimensions: Dimension Sheet 29-170
Trip Curves: App. Data 29-161 A WE A



September, 1976
Supersedes Application Data
29-160 all previous issues
Mailed to: E. D. C/1901, 1928/DB

Standard Types EB, EHB, FB, and MARK 75[®]
Type HFB
15-100 Amperes, 1, 2, 3 Poles; 15-150
Amperes 2, 3, 4 Poles

AB DE-ION[®] Circuit Breakers

Continuous Ampere Ratings Underwriters' Laboratories, Inc. Listed

Type EB

1 Pole, 120 Volts Ac, 125 Volts Dc: 15-100
2, 3 Poles, 240 Volts Ac, 125/250 Volts Dc:
15-100

Type EHB

1 Pole, 277 Volts Ac, 125 Volts Dc: 15-100
2 Poles, 480 Volts Ac, 250 Volts Dc: 15-100
3 Poles, 480 Volts Ac: 15-100

Type FB

2 Poles, 600 Volts Ac, 250 Volts Dc: 15-150
3, 4 Poles, 600 Volts Ac: 15-150

MARK 75 Type HFB

1 Pole, 277 Volts Ac, 125 Volts Dc: 15-100
2 Poles, 600 Volts Ac, 250 Volts Dc: 15-150
3 Poles, 600 Volts Ac: 15-150

Interrupting Ratings, Amperes Underwriters' Laboratories, Inc. Listed

Type EB:

120, 240 Volts Ac: 10,000 (Asym. and Sym.)
120/250 Volts Dc: 5,000

Type EHB:

240 Volts Ac: 20,000 Asym., 18,000 Sym.
277 Volts Ac: 15,000 Asym., 14,000 Sym.
480 Volts Ac: 15,000 Asym., 14,000 Sym.
250 Volts Dc: 10,000

Type FB:

240 Volts Ac: 20,000 Asym., 18,000 Sym.
480 Volts Ac: 15,000 Asym., 14,000 Sym.
600 Volts Ac: 15,000 Asym., 14,000 Sym.
250 Volts Dc: 10,000

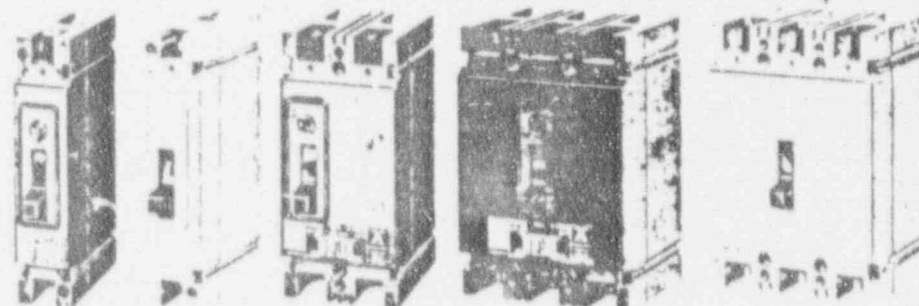
MARK 75 Type HFB

240 Volts Ac: 75,000 Asym., 65,000 Sym. [Ⓐ]
480 Volts Ac: 30,000 Asym., 25,000 Sym.
600 Volts Ac: 20,000 Asym., 18,000 Sym.
250 Volts Dc: 20,000[Ⓓ]

Application

These breakers are designed for use in control panels, convertible power panelboards, switchboards, motor control centers, lighting panels, bus duct plug-ins, individual enclosures and machine tool control panels. This breaker is used most frequently on motor branch circuits because its ratings cover most protective requirements. These breakers are listed with the Underwriters' Laboratories, Inc.

On all three phase Delta, grounded B phase applications, refer to Westinghouse.



EB
1 Pole

HFB
1 Pole

EHB
2 Poles

FB
3 Poles

HFB
3 Poles

Construction

These breakers have all the standard AB breaker features. The HFB breaker molded material is a high impact, high tensile, flame resistant glass polyester, six times stronger and 21 times more resistant to tracking than the standard black moldings.

Federal Specification W-C-375b See tabulation on page 20.1.

Terminals

Thermal magnetic breakers include load terminals only. Underwriters' Laboratories, Inc. listed for wire sizes and ranges listed below. Line terminals are available if required. When used with aluminum conductors, use joint compound.

Max Breaker Amps	Wire Type	Wire Range
Standard Pressure Terminals		
20 (EB, EHB)	Al/Cu	#14 - #10
100	Al/Cu	#14 - 1/0
150	Al/Cu	#4 - 4/0
Optional Al/Cu Pressure Terminals		
50	Al/Cu	#14 - #4
100	Al/Cu	#4 - 4/0

Removable terminal collar permits ready use of rear connected studs, plug-in adapter kits, or panelboard connector straps.

Operation

When the breaker contacts are open, the handle is in either the mid or OFF position.

If in mid-position, the breaker has been tripped automatically and the latch must be reset by moving the operating handle to the extreme OFF position before attempting to restore to service. Contacts may be closed, after resetting the latch, by moving the handle to the ON position.

Pounds of force required to operate toggle handle:

Breaker Amps	On	Off	Relatch
Up to 100	15.5	3.75	6.5
125, 150	25.5	6.5	9.5

Thermal Magnetic Breakers

EB, EHB, FB and HFB frame breakers are equipped with cooperative thermal magnetic trip elements. On low overloads, the bimetal initiates tripping action. On short circuits, the magnetic element instantly opens the circuit. On high overloads, the bimetal, gradually bending, assists magnetic tripping by shortening the air gap. After calibration, breaker cases are sealed to prevent tampering; thus trip elements are not adjustable and are not interchangeable.

Magnetic Only Breakers (FB, HFB) [Ⓐ]

Front adjustable magnetic only circuit breakers are instantaneous trip devices providing short circuit protection only. They are normally used in conjunction with additional over-current protection.

Trip units are calibrated and set at the factory on the high value of the trip range, but may be field-adjusted to the low value. The trip setting may be changed by turning the

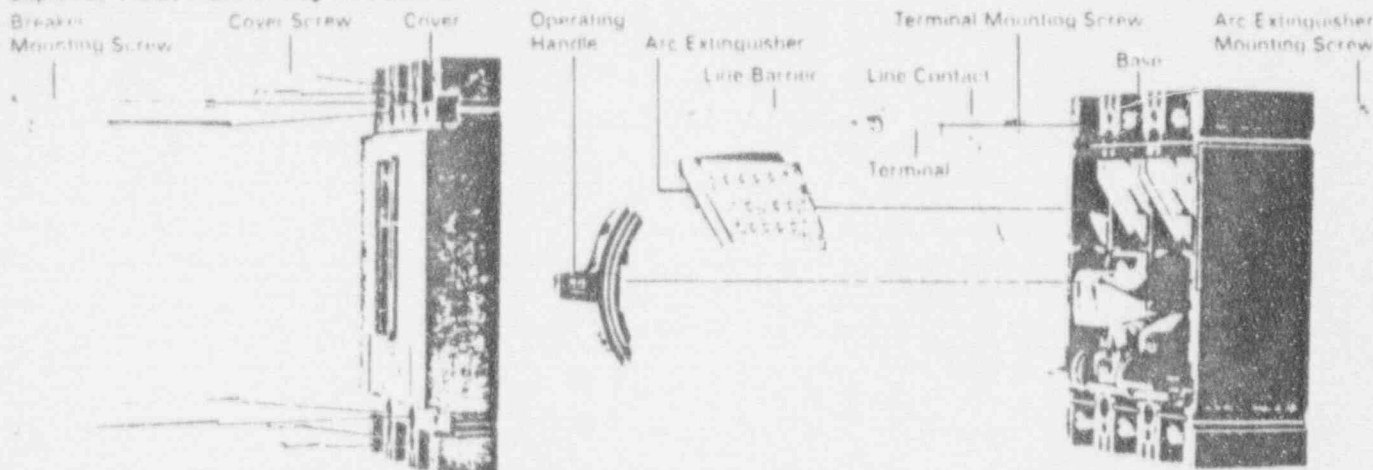
[Ⓐ] 1 pole breakers are listed at 277 volts Ac with an interrupting rating of 75,000 amps Asym. 65,000 amps Sym. for 15, 30 amps and 30,000 amps Asym. 25,000 amps Sym. for 40, 100 amps.

[Ⓓ] Not UL Inc. Listed

[Ⓔ] Ratings above 10,000 amps not UL listed



Exploded View, Thermal Magnetic Breaker



adjusting knob in the front cover of the breaker. The adjustment is designed to follow a linear scale, so that each of the settings provided has a definite ampere significance within calibration tolerances.

Magnetic Trip Range and Settings

Setting	3	5	10	25	25	30	30
Low	7	15	35	32	66	50	90
High	22	45	110	80	190	150	270

Setting	50	50	70	100	100	150
Low	88	160	107	150	450	575
High	190	480	270	480	1550	1800

Saf-T-Vue Breakers (Except HFB)Ⓐ

Saf-T-Vue breakers are similar to standard breakers except that the cover is fitted with a transparent window located over the breaker contacts. They are commonly used in steel mill applications where sight of contacts is required. Can be supplied in all standard ratings.

Molded Case Switches (Except HFB) (Non-Auto Interrupters)

These are breakers without overload or short circuit tripping elements and can be installed where a compact high capacity disconnect switch is required without overcurrent protection.

Mining Service BreakersⒸ

A special version of FB and HFB breakers is available to meet Bureau of Mines requirements for trailing cable applications. Refer to Technical Data 29-128 T WE A.

Breaker Mounting

Breakers are approved for either upside down mounting or reverse feed.Ⓓ

Circuit Breaker Removal

Before inspecting, installing, or removing from a circuit, the circuit breaker should be in the OFF position, and if practical, the circuit should be de-energized. If the circuit cannot be de-energized, insulated tools, rubber gloves, and a rubber floor mat should be used.

To remove a rear-connected circuit breaker from its mounting, remove terminal stud lock-nuts and pull circuit breaker forward.

To remove a front-connected circuit breaker from its mounting, loosen terminal screws and remove cables from terminals. Remove circuit breaker mounting screws and pull circuit breaker forward.

To remove a circuit breaker equipped with support blocks from its mounting, remove support block breaker mounting screws and pull circuit breaker forward. When the optional bolt-on support block feature is used, the screws mounting the stabs to the breaker conductor must also be removed.

Inspection and Maintenance

Good maintenance procedure calls for periodic inspection of all electrical apparatus including molded case circuit breakers. Terminal lugs must be tight to prevent overheating. Due to the inherent wiping action built into the moving contacts of all Westinghouse circuit breakers, operating the breaker several times under load will remove any high resistance film that may have formed.

Ⓐ Not Underwriters Laboratories, Inc. listed

Ⓒ 3 pole breakers are 1 1/2" wide; 2 pole breakers are 2 1/2" wide, except 2 pole FB magnetic only, and all 2 pole HFB which are the same as 3 pole; 4 pole FB breakers are 5 1/2" wide; other dimensions are same as 3 pole

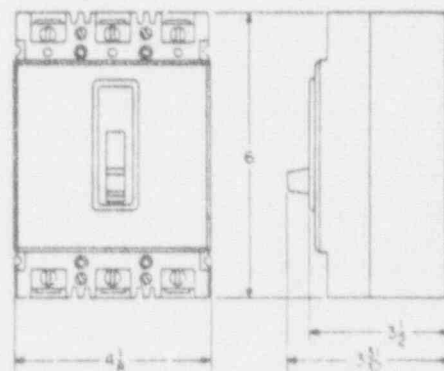
Ⓓ Breakers with internal attachments are not suitable for reverse feed

Accessories, Modifications

Accessories and modifications are available as follows. See PL 29-120 or DB 29-150 for description. Line terminal shields, rear connecting studs, plug-in adapter kits, panel-board connectors, center studs, handle locking devices, parallel connectors, moisture and fungus treatment, shunt trip, undervoltage release, auxiliary switch, alarm switch, mechanical interlocks, and motor operator.

Dimensions, InchesⒺ

Not to be used for construction purposes. See Dimension Sheet 29-170 for detailed dimensions.



Further Information

Prices: Price List 29-020 P WE A

Ordering Data: Tech Data 29-120, T WE A

Dimensions: Dimension Sheet 29-170

Trip Curves: Application Data 29-161 A WE A

