TERA

UNITED STATES
NUCLEAR REGULATORY COMMISSION
WASHINGTON, D. C. 20555

NOV 1 9 1980

Docket No. 50-364

APPLICANT: Alabama Power Company

FACILITY: Joseph M. Farley Nuclear Plant, Unit 2

SUBJECT: SUMMARY OF OCTOBER 30, 1980 MEETING REGARDING REVIEW OF OPERATING LICENSE APPLICATION

The purpose of the meeting was to hear and discuss the means by which power cables in containment electrical presentation are protected from over current. The presentation was in response to a Request No. 040.15, transmitted by letter dated September 10, 1980. Enclosure 1 is a list of attendees. Enclosure 2 is the draft response to Request No. 040.15 that was discussed in the meeting.

Staff said the draft response was well-prepared and acceptable for review. Applicant plans to submit this response the week of November 10, 1980, with minor modifications as discussed in the meeting.

Lester L. Kintner

Lester L. Kintner, Project Manager
Licensing Branch No. 2
Division of Licensing

Enclosures:
As stated

cc: See next page

THIS DOCUMENT CONTAINS
POOR QUALITY PAGES

7

8012120615

Mr. F. L. Clayton, Jr., Senior Vice President
Alabama Power Company
Post Office Box 2641
Birmingham, Alabama 35291

cc: Mr. W. O. Whitt
Executive Vice President
Alabama Power Company
Post Office Box 2641
Birmingham, Alabama 35291

Mr. Ruble A. Thomas
Vice President
Southern Company Services, Inc.
Post Office Box 2625
Birmingham, Alabama 35202

Mr. George F. Trowbridge
Shaw, Pittman, Potts and Trowbridge
1800 M Street, N. W.
Washington, D. C. 20036

Mr. W. Bradford
NRC Resident Inspector
P. O. Box 1814
Dothan, Alabama 36302

ENCLOSURE 1

OCTOBER 30, 1980 MEETING
ALABAMA POWER COMPANY - NRC
OVERCURRENT PROTECTION

R. Fitzpatrick	Power Systems Branch, DSI, NRC
O. Chopra	Power Systems Branch, DSI, NRC
L. Kintner	Licensing Branch No. 2, DOL, NRC
H. Bell	Bechtel
J. Love	Bechtel
R. George	Alabama Power Company
O. Kingsley	Alabama Power Company
K. McCracken	Alabama Power Company
T. Milton	Southern Company Services

PROTECTION ANALYSIS FOR RESPONSE TO NRC STAFF POSITION 040.15 CONTAINMENT PENETRATION OVERCURRENT PROTECTION J. M. FARLEY NUCLEAR PLANT UNIT 2

1. The following categories of electrical circuits penetrate the containment:

   A. Medium voltage power for Reactor Coolant Pump Motors: 3 Ø, 4.16 KV

   B. Low voltage power: 3 Ø, 600V, 480V and 208V

   C. Low voltage control power: 120V AC, 125V DC

   D. Lighting circuits: 480/277V AC

   E. Instrumentation circuits using electronic power supplies

   F. Instrumentation circuits which generate their own signal (e.g., thermocouples)

2. Categories 1E and 1F above will not be discussed further because they are inherently self-limiting and of such low power to be of no concern.

3. For Category 1A, the power supply circuits to the Reactor Coolant Pump Motors, Table 1 and Figure 1 depict the primary and backup overcurrent protection devices provided by the existing plant design. As shown in Figure 1, adequate time-current coordination exists between the motor feeder breaker overcurrent protection and the bus supply breaker overcurrent protection to provide primary and backup overload and short circuit protection for the containment penetration conductors.

   In regard to NRC Staff Position 040.15B, the G. E. switchgear and the associated overcurrent relays are suitable for the service environment in the plant area where they are installed. However, the switchgear is non-Class IE and no seismic qualification data was obtained for this equipment. Other plants have utilized similar type switchgear in Class IE application.

   In regard to NRC Staff Position 040.15E, the external control power used for tripping both the primary and backup breakers is currently provided from the same 125V DC section of the 250V DC Turbine Building Battery. A modification will be made to provide 125V DC control power to the primary and backup breakers from different 125V DC sections of the Turbine Building Battery. The 125V DC control power cables for the backup breakers will be installed in conduit and be physically separated from the 125V DC control power cables for the primary breakers.

4. Category 1B consists of low voltage power supply circuits to equipment loads inside the containment which are powered from 600V AC load centers, 600V AC motor control centers, 208V AC motor control centers, 600V AC distribution panels, and the 480V AC, 3 Ø supplies to the H_2 recombiners. Each of these sub-categories will be discussed separately below.

   A. 600V AC Load Centers: Table 2 provides a tabulation of the loads inside the containment which are powered from 600V AC load centers. As shown on Figure 2, the existing load feeder breakers which provide the primary overcurrent protection provide both short circuit and overload protection for the containment penetration conductors. However, the existing bus supply breakers are magnetic trip only breakers and as shown on Figure 2 do not provide thermal overload protection. Therefore, a modification will be made to provide MSCP fuses in series with each phase of the power cables for the loads in Table 2.* The MSCP fuses will be located between the load center feeder breakers and the containment penetration conductors as shown on the single line on Figure 2. The MSCP fuses will provide adequate backup overload and short circuit protection for the containment penetration conductors as shown on Figure 2.

   B. 600V AC Motor Control Centers: Table 3 provides a tabulation of the loads inside the containment which are powered from 600V AC Motor Control Centers (MCC's). As shown in Table 3, three sizes of containment penetration conductors are used for these loads (#4/0 AWG, #6 AWG and #2 AWG).

   Figure 3 shows the time-current coordination curves for the existing overcurrent protection devices associated with the #4/0 AWG penetration conductors. As shown in Figure 3, adequate time-current coordination exists between the 600V MCC breaker feeding the load and the 600V load center breaker which supplies the MCC to provide primary and backup overload and short circuit protection for the #4/0 containment penetration conductors.

   Figure 4 shows the time-current coordination curves for the existing overcurrent protection devices associated with the #6 AWG containment penetration conductors. As shown on Figure 4, the existing 600V MCC breakers and O/L relays provide primary overcurrent protection for both short citcuit and overload protection of the containment penetration conductors. However, the existing 600V load center

* Except for loads which are noted on Table as not required in Modes 1-4 or loads which are noted on Table as only required occassionally for short periods of time. These loads will be normally deenergized and controlled administratively.

breakers which supply the 600V MCC's do not provide adequate backup overcurrent protection. Therefore, a modification will be made to provide MSCP fuses in series with each phase of the power cables for the loads in Table 3* which use #6 AWG penetration conductors. The MSCP fuses will be located between the 600V MCC's and the containment penetration conductors as shown on the single line on Figure 4. The MSCP fuses will provide adequate backup overload and short circuit protection for the #6 AWG penetration conductors as shown on Figure 4.

Figure 5 shows the time-current coordination curves for the existing overcurrent protection devices associated with the #2 AWG containment penetration conductors. As shown on Figure 5, the existing 600V MCC breakers and O/L relays provide adequate primary overcurrent protection for both short circuit and overload protection of the penetration conductors. However, the existing 600V load center breakers which supply the 600V MCC's do not provide adequate backup overcurrent protection. Therefore, a modification will be made to provide MSCP fuses in series with each phase of the power cables for the loads in Table 3 which use #2 AWG penetration conductors. The MSCP fuses will be located between the 600V MCC's and the containment penetration conductors as shown on the single line on Figure 5. The MSCP fuses will provide adequate backup overload and short circuit protection for the #2 AWG containment penetration conductors as shown on Figure 5.

C. 208V Motor Control Centers: Table 4 provides a tabulation of the loads inside the containment which are powered from 208V MCC's. As shown on Figure 6, adequate primary and backup overload and short circuit protection is provided for the penetration conductors by the existing 208V MCC breakers/overload relays, and the 600V MCC breakers which supply the 208V MCC's.

* Except for loads which are noted on Table as not required in Modes 1-4 or loads which are noted on Table as only required occasionally for short periods of time. These loads will be normally deenergized and controlled administratively.

D. 600V AC Distribution Panels: Table 5 provides a tabulation of the pressurizer heater groups inside the containment which are powered from the 600V AC distribution panels. As shown on Figure 7, adequate primary and backup overload and short circuit protection is provided for the penetration conductors by the distribution panel breakers and the 600V load center breakers which supply power to the distribution panels.

E. 480V, 3 Ø Supplies to H_2 Recombiners: Table 6 provides a tabulation of the primary and backup overcurrent protection which exists for the containment penetration conductors associated with the H_2 Recombiner power supplies. As shown on Figure 8, adequate primary and backup overcurrent protection is provided for short circuit and overload protection of the penetration conductors.

5. Category 1C consists of low voltage control power supply circuits to 120V AC and 125V DC devices located inside the containment which originate from 120V AC or 125V DC distribution panels or control power cabinets located outside the containment. Subcategories of Category 1C consist of power supplies to 125V DC and 120V AC solenoid valves, power supplies to the Control Rod Drive Mechanism (CRDM) and power supplies to the Rod Position Indication (RPI) system. Each of these subcategories will be discussed separately below.

   A. 125V DC and 120V AC Solenoid Power Supplies: Table 7 provides a list of the solenoid valves inside the containment which are powered from 125V DC and 120V AC distribution panels. Figure 9 shows the time-current coordination curves for the existing 3 Ampere fuses which provide primary overcurrent protection for the penetration conductors, and for the existing 30 Ampere breakers which provide backup overcurrent protection. As shown on Figure 9, adequate primary and backup short circuit and overload protection for the containment penetration conductors is provided by the existing fuses and breakers.

B. CRDM Power Supply: Table 8 provides a tabulation of the CRDM stationary gripper and lift control power cables which penetrate the containment. Each of these cables have adequate primary short circuit and overload protection provided by fuses located in the Rod Control Power Cabinets as shown on Figures 10 and 11. In addition, these cables are de-energized on a SIAS signal which will eliminate the possibility of a cable fault damaging the penetration conductors subsequent to a LOCA.

C. Rod Position Indication (RPI) Distribution Panels: Table 9 and Figure 11A show the existing primary and backup overcurrent protection devices for the RPI power supply penetration conductors. As shown on Figure 11A, adequate primary and backup short circuit and overload protection is provided for the containment penetration conductors.

6. Category 1D consists of 480/277V AC lighting circuits inside the containment as shown on Table 10 which are powered from 600V AC to 480/277V AC lighting transformers located outside the containment. Figures 12 and 13 show the time-current coordination curves for the existing overcurrent protection provided on these circuits.

   As shown on Figure 12, adequate primary short circuit and overload protection is provided for the containment penetration conductors by the existing 600V AC load center feeder breaker. However, as the 600V AC load center supply breaker is a magnetic trip only breaker, no backup overload protection is provided by the 600V load center supply breaker. A modification will be made to add MSCP fuses between the 225 KVA lighting transformer and the penetration conductors. As shown on Figure 12, the MSCP fuses will provide adequate short and overload backup protection for the penetration conductors.

   As shown on Figure 13, adequate primary and backup overload and short circuit protection is provided for the containment penetration conductors by the existing 600V AC MCC breaker and the 600V AC load center feeder breaker which supply power to the 75 KVA lighting transformer.

7. NRC Staff Position 040.15B - All primary and backup overcurrent protection devices discussed in Items 1 thru 6 above are suitable for operation in the plant area service environments where they are installed. All MSCP fuse cabinets which will be added to provide backup protection for both non-Class IE and Class IE circuits as discussed in Items 1 thru 6 above will be qualified to IEEE 323-74 and IEEE 344-75.

CALCULATION SHEET

BECHTEL

CALC. NO. ______ REV. NO. ______

ORIGINATOR Arce Mendiola DATE ______ CHECKED ______ DATE ______

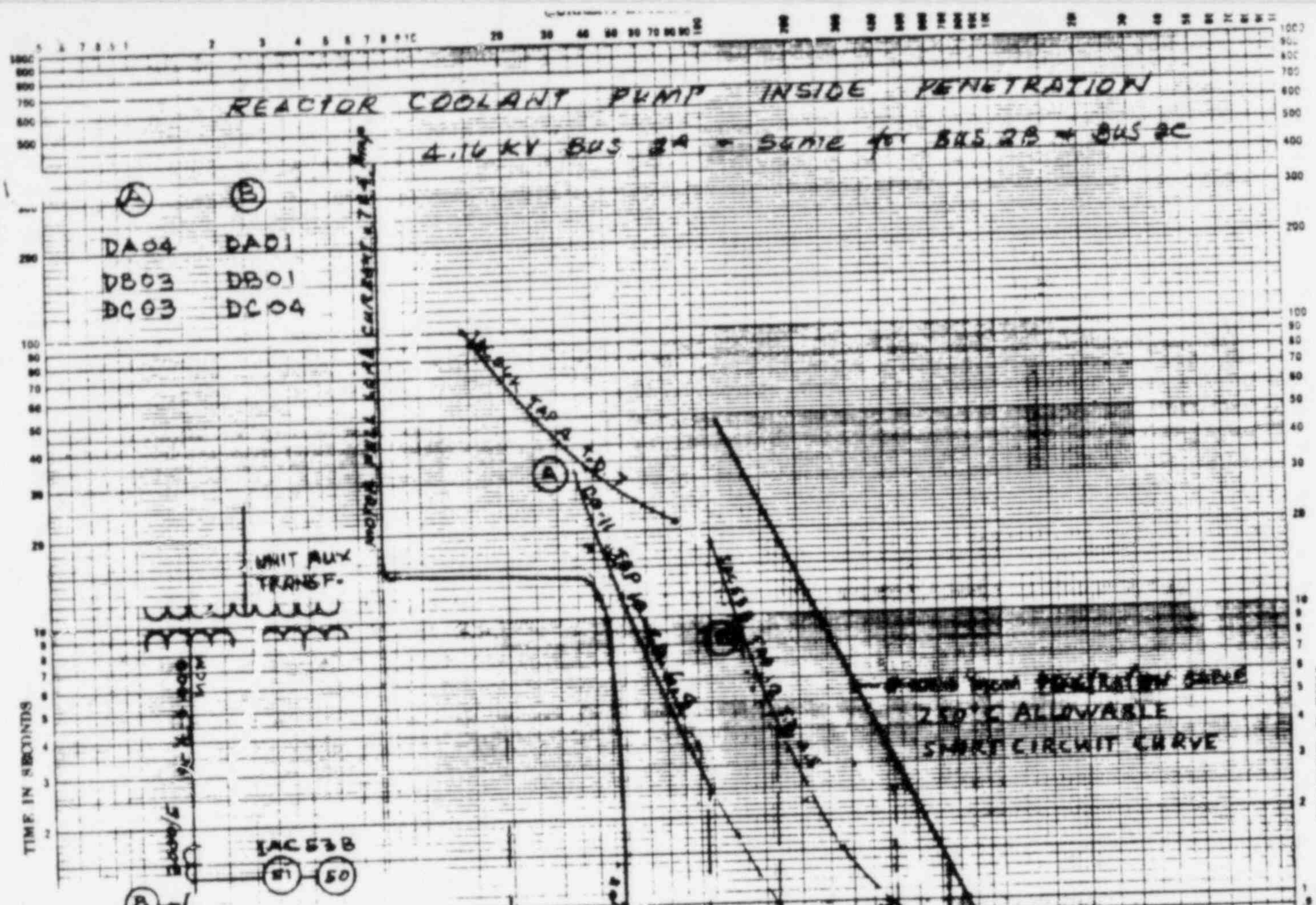
PROJECT J.M. Farley Nuclear Plant Unit #2 JOB NO. 7597-20

SUBJECT Penetration Cable SHEET NO. 1 of 1

TABLE 1 - 4.16 KV MEDIUM VOLTAGE

SERVICE	4160 V AC SWGR	PRIMARY PROTECTION	BACK-UP PROTECTION	PENETRATION CABLE SIZE	LOAD
Reactor Coolant Pump 2A	2A (AM-4.16)	DA04 ① IAC66K tap 4; TD 7 ② CO-11 tap 10; TD 6.9	DA01 IAC53B tap 12; TD 4.5	1000 MCM	6000 HP
Reactor Coolant Pump 2B	2B (AM-4.16)	DB03 ① IAC66K tap 4; TD 7 ② CO-11 tap 10; TD 6.9	DB01 IAC53B tap 12; TD 4.5	1000 MCM	6000 HP
Reactor Coolant Pump 2C	2C (AM 4.16)	DC03 ① IAC66K tap 4; TD 7 ② CO-11 tap 10; TD 6.9	DC04 IAC53B tap 12; TD 4.5	1000 MCM	6000 HP

The enclosed curve shows the single line diagram, short time thermal capability of the penetration cable and setting of the relays.



#1000 MCM O/C TIME-CURRENT CHARACTERISTIC CURVES

For MEDIUM VOLTAGE PENETRATION (4.16KV) Fuse Links. In

BASIS FOR DATA Standards Dated

1. Tests made at Volts a-c at p.f., Starting at 25C with no initial load

2. Curves are plotted to Test points so variations should be

No.

Date

FIGURE 1 - RCP

K+E TIME-CURRENT CHARACTERISTIC 46 5257 MADE IN U.S.A.

KEUFFEL & ESSER CO.

CALCULATION SHEET

BECHTEL

CALC. NO. ________ REV. NO. ________

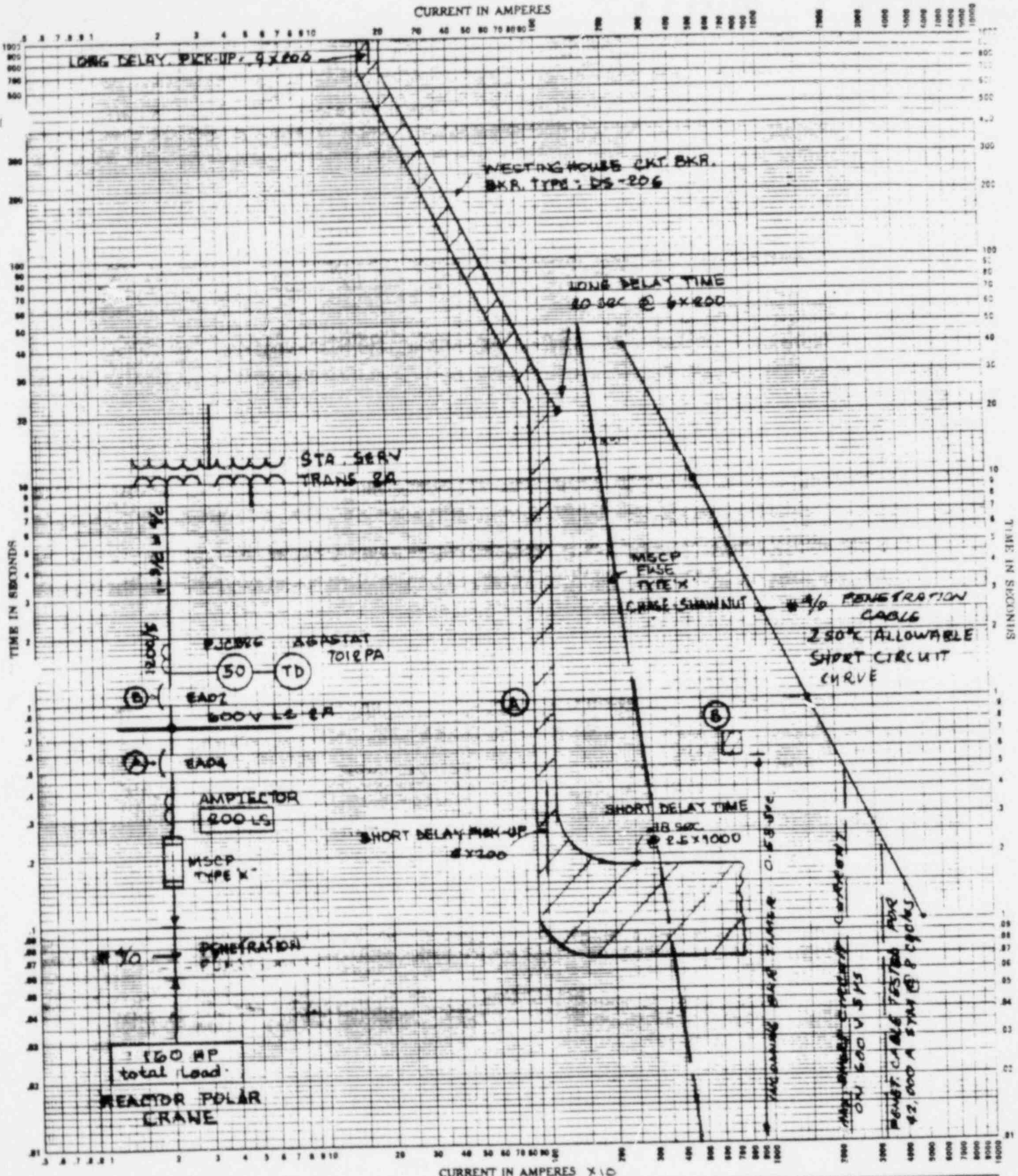
ORIGINATOR Arce Mendiola DATE ________ CHECKED ________ DATE ________

PROJECT J.M. Farley Nuclear Plant Unit #2 JOB NO. 7597-20

SUBJECT Penetration Cable SHEET NO. 1 of 1

TABLE 2 - 600 VAC LOAD CENTERS

	PRIMARY PROTECTION			PROPOSED BACK-UP PROTECTION			
SERVICE	600V AC LOAD CTR	CKT BKR FRAME/ SENSOR RATE	SETTING	FUSE TYPE	PENET. CABLE SIZE	LOAD	REMARK
Reactor Polar Crane	EA04	800/300	L.D. = 180A. S.D. = 1000A	See Remarks	# 4/0	160 HP total Load	maybe ocassionally required for short periods of time, - per APCO
Containment Cooler 2A (NOR.)	EA10	800/150	L.D. = 112.5A Inst. = 1800A	"MSCP" FUSE TYPE "X"	# 4/0	125 HP	
Containment Cooler 2B (NOR)	EB05	800/150	L.D. = 112.5A Inst. = 1800A	"MSCP" FUSE TYPE "X"	# 4/0	125 HP	
Containment Cooler 2C (NOR.)	EB06	800/150	L.D. = 112.5A Inst. = 1800A	"MSCP" FUSE TYPE "X"	# 4/0	125 HP	
Containment Cooler 2D (NOR.)	EC12	800/150	L.D. = 112.5A Inst. = 1800A	"MSCP" FUSE TYPE "X"	# 4/0	125 HP	
CRDM Cooler Fan 2A	ED11	800/150	L.D. = 135A Inst = 1200A	"MSCP" FUSE TYPE "X"	# 4/0	100 HP	
Containment Cooler 2A (Emerg.)	ED15	800/150	L.D = 187.5A Inst = 1500A	"MSCP" FUSE TYPE "X"	# 4/0	125 HP	
Containment Cooler 2B (Emerg.)	ED16	800/150	LD = 187.5A Inst. = 1500A	"MSCP" FUSE TYPE "X"	# 4/0	125 HP	
Containment Cooler 2C (Emerg.)	EE08	800/150	LD = 187.5A Inst : 1500A	"MSCP" FUSE TYPE "X"	# 4/0	125 HP	
CRDM Cooler Fan 2B	EE13	800/150	LD = 135A Inst: 1201A	"MSCP" FUSE TYPE "X"	# 4/0	100 HP	
Containment Cooler 2D (Emerg.)	EE16	800/150	LD = 187.5A Inst: 1500A	"MSCP" FUSE TYPE "X"	# 4/0	125 HP	



#4/0 PENET. CABLE

TIME-CURRENT CHARACTERISTIC CURVES

For 600 V LC BUS 2A EA04 - Type DS-206 Fuse Links. In

BASIS FOR DATA Standards .... Dated ....

1. Tests made at .... Volts a-c at .... p-f., Starting at 25C with no initial load
2. Curves are plotted to .... Test points so variations should be ....

No.

Date

FIGURE 2 - 600 V AC Load Centers

K+E TIME-CURRENT CHARACTERISTIC 48 5257 MADE IN U.S.A.

KEUFFEL & ESSER CO.

TABLE 3 - 600 VAC MCC's

	PRIMARY PROTECTION			EXISTING BACK-UP PROTECTION	PROPOSED BACK-UP PROTECTION			
SERVICE	600V AC MCC	CKT. BKR OR COMB. BKR/START. SIZE	INST. SETTING	600V AC LOAD CTR	FUSE	PENET. CABLE SIZE	LOAD	REMARK
Reactor Cavity clg. Fan Mtr. 2A	FA-F7	A010	210	None	"MSCP" Fuse Type "S"	#6	5 HP	
Reactor. Cavity Cool Fan MOV	FA-I6	A003	10	None	"MSCP" Fuse Type "S"	#6	.13 HP	
CTMT Post LOCA Air Mixing Fan 2D	FA-I5	A025	105	None	"MSCP" Fuse Type "S"	#6	7.5 HP	
CTMT Post LOCA Air Mixing Fan 2C	FA-J5	A025	105	None	"MSCP" Fuse Type "S"	#6	7.5 HP	
CTMT Post LOCA Air Mixing Fan 2B	FB-I3	A025	105	None	"MSCP" Fuse Type "S"	#6	7.5 HP	
CTMT Post LOCA Air Mixing Fan 2A	FB-I4	A025	105	None	"MSCP" Fuse Type "S"	#6	7.5 HP	
Reactor Cavity clg. Fan Mtr. 2A	FB-J7	A025	210	None	"MSCP" Fuse Type "S"	#6	15 HP	
CTMT Elevator No. 9 Controller	FB-A4R	B035	400-700	None	See Remarks	#6	15 HP	maybe occassionally required for short periods of time. - per APCO.
CTMT Dome Recirc. Fan 2A	FC-P3	A025	105	None	"MSCP" Fuse Type "S"	#6	7.5/2 HP	
CTMT Dome Recirc. Fan 2B	FC-P4	A025	105	None	"MSCP" Fuse Type "S"	#6	7.5/2 HP	
RCP Motor Space Heaters	FC-I2	B015	400-700	None	see remark	#6	3.44 KW	Not required in Mode 1-4 - per APCO
RCP Brg. Oil Lift Pump	FC-I4	A025	125	None	"MSCP" Fuse Type "S"	#6	10 HP	

TABLE 3

SERVICE	PRIMARY PROTECTION: 600V AC MCC	PRIMARY PROTECTION: CKT. BKR OR COMB. BKR/START SIZE	PRIMARY PROTECTION: INST SETTING	EXISTING BACK-UP PROTECTION: 600 V AC LOAD CTR	PROPOSED BACK-UP PROTECTION: FUSE	PENET. CABLE SIZE	LOAD	REMARK
RCP Brg Oil Lift Pump	FC-N3	A025	125	None	MSCP" Fuse Type 'S'	#6	10 HP	
Refueling Water Surface Supply	FC-J3	A025	210	None	see remark	#6	15 HP	not required in Mode 1-4 - per APCO
Refueling Water Surface Exhaust	FC-M5	A100	630	None	see remark	#2	50 HP	not required in Mode 1-4 - per APCO
CTMT Pre-Access Fan Motors	FC-J5	L050	330	None	MSCP" Fuse Type 'S'	#6	25 HP	
RCP Mtr. Space Heaters AC	FC-N4	B015	400-700	None	see remark	#6	3.44 KW	not required in Mode 1-4 - per APCO.
Receptacles Term. Box 2A	FC-J6L	B100	600-1000	EC04 LD = 600A SD = 3000A	None	#4/0	50 HP	maybe occasionally required for short periods of time - per APCO.
Reactor Cavity Filter Pmp Recep.	FC-J6R	B020	400-700	None	see remark	#6	7.5 HP	not required in Mode 1-4 - per APCO
Up Ending Frame Winch Mtr	FC-S3L	B015	400-700	None	See remark	#6	3/1 HP	not required in Mode 1-4 - per APCO
CTMT GIB Crane (N2T71K004-A)	FC-M4L	B030	400-700	None	See Remark	#6	10 HP	maybe occassionally required for short periods of time - per APCO
Reactor Cavity Manipulator Crane	FC-N2L	B030	400-700	None	see remark	#6	15 HP	not required in Mode 1-4 - per APCO
CTMT GIB Crane (N2T31K004-A)	FC-S3R	B030	400-700	None	See remark	#6	10 HP	maybe occassionally required for short periods of time - per APCO
SW Port Drain Pump Recept.	FC-C5R	B040	400-700	None	see remark	#6	10.5	not required in Mode 1-4 - per APCO

CALCULATION SHEET

BECHTEL

CALC. NO. ______ REV. NO. ______

ORIGINATOR Arce Mendiola DATE ______ CHECKED ______ DATE ______

PROJECT J. M. Farley Nuclear Plant Unit #2 JOB NO. 7597-20

SUBJECT Penetration Cable. SHEET NO. 3 of 6

TABLE 3

SERVICE	PRIMARY PROTECTION: 600V AC MCC.	PRIMARY PROTECTION: CKT. BKR OR COMB. BKR/START SIZE	PRIMARY PROTECTION: INST. SETTING	EXISTING BACK-UP PROTECTION: 600V AC LOAD CENTER	PROPOSED BACK-UP PROTECTION: FUSE	PENET. CABLE SIZE	LOAD	REMARK
CTMT GIB Crane (H2T11M05N)	FD-H7R	B030	400-700	None	See remark	#6	10 HP	May be occasionally required for short periods of time - per APCO.
RCP Brg Oil Lift Pump	FD-D6	A025	125	None	"MSCP" Fuse Type "S"	#6	10 HP	
CTMT Dome Recirc. Fan 2D	FD-E3	A025	105	None	"MSCP" Fuse Type "S"	#6	7.5/2 HP	
Reactor Cool Drain Tank Pump 2B	FD-B4	L050	330	None	"MSCP" Fuse Type "S"	#6	25 HP	
CTMT Sump Pump Mtr. 2A	FD-C2	A025	125	None	"MSCP" Fuse Type "S"	#6	10 HP	
CTMT Sump Pump Mtr. 2B	FD-D2	A025	125	None	"MSCP" Fuse Type "S"	#6	10 HP	
CTMT Pre-Access Fan Mtr.	FD-C4	L050	330	None	"MSCP" Fuse Type "S"	#6	25 HP	
RCP Mtr Space Heaters 2B	FD-G3	B015	400-700	None	See remark	#6	3.44 kW	Not required in Mode 1-4 - per APCO
Receptacles Term Box 2C	FD-A3L	B070	600-1000	EB04 LD = 600A SD = 2400A	None	#4/0	50	May be occassionally required for short period of time - per APCO.
Reactor Cool Drain Tank Pump 2A	FE-A6	L050	330	none	"MSCP" fuse Type "S"	#6	25 HP	
Receptacles Term Box 2B	FE-A4L	B100	600-1000	EA05 LD = 500A SD = 3600A	None	#4/0	50	May be occassionally required for short period of time - per APCO
Incore Det. Drive & Cont. Panel.	FE-C3L	B050	600-1000	none	"MSCP" fuse Type "S"	#6	20	

TABLE 3

SERVICE	PRIMARY PROTECTION			EXISTING BACK-UP PROTECTION	PROPOSED BACK-UP PROTECTION			
	600V AC MCC	CKT. BKR OR COMB. BKR/STRTR SIZE	INST. SETTING	600V AC LOAD CENTER	FUSE	PENET. CABLE SIZE	LOAD	REMARK
CTMT Dome Recirc. Fan 2C	FE-H5	A025	105	None	MSCP" FUSE TYPE "S"	#6	7.5/2 HP	
RHR Pump Inlet MOV	FU-G2	A005	29	None	"MSCP" FUSE TYPE "S"	#6	2.6 HP	
CTMT AIR Cooling Fan MOV	FU-H2	A003	12	None	"MSCP" FUSE TYPE "S"	#6	.13 HP	
CTMT Air Cooling Fan MOV	FU-H3	A003	12	None	"MSCP" Fuse TYPE "S"	#6	.13 HP	
RCP motor Cooler Disch MOV	FU-H4	A003	10	None	"MSCP" Fuse TYPE "S"	#6	.66 HP	
CTMT to Atmos Diff. Press MOV	FU-J4	A003	10	None	"MSCP" Fuse Type "S"	#6	.33 HP	
Pressurizer to Relief Tank MOV	FU-K4	A005	22	None	"MSCP" Fuse Type "S"	#6	1.6 HP	
CTMT Cooler Disch MOV	FU-K6	A003	10	None	"MSCP" Fuse Type "S"	#6	.7 HP	
Post ACDT Air Sampler From CTMT	FU-L4	A003	12	None	"MSCP" Fuse Type "S"	#6	.5 HP	
Post ACDT Air Sampler From CTMT	FU-L5	A003	12	None	"MSCP" Fuse Type "S"	#6	.5 HP	
RCP Seal Water Return Isol.	FU-T4	A005	22	None	"MSCP" Fuse Type "S"	#6	.66 HP	
Post ACDT Air Sampler Return MOV	FU-M4	A003	12	None	"MSCP" Fuse Type "S"	#6	.5 HP	

TABLE 3

SERVICE	PRIMARY PROTECTION			EXISTING BACK-UP PROTECTION	PROPOSED BACK-UP PROTECTION			
	600V AC MCC	CKT. BKR or COMB. BKR/STRTR SIZE	INST. SETTING	600V AC LOAD CENTER	FUSE	PENET. CABLE SIZE	LOAD	REMARK
CTMT Air Sampler MOV	FU-R5	A003	16	none	"MSCP" fuse Type "S"	#6	1 HP	
CRDM Cool Fan Dampers MOV	FU-V4	A003	12	None	"MSCP" fuse Type "S"	#6	.13 HP	
CTMT Air Cooler Disch MOV	FU-W2	A003	16	None	"MSCP" fuse Type "S"	#6	.66 HP	
Reactor Cavity H2 Dilution Fan VLV	FU-W4	A005	29	None	"MSCP" fuse Type "S"	#6	2 HP	
RHR System Inlet Isol. VLV.	FU-T5	A010	45	None	"MSCP" fuse Type "S"	#6	2.6 HP	
Accumulator 2A Disch VLV.	FU-Z2	H050	565	None	"MSCP" fuse Type "U"	#2	26.6 HP	changed cable size per 2BE-932
Accumulator 2C Disch VLV.	FU-Z3	H050	565	None	"MSCP" fuse Type "U"	#2	26.6 HP	Changed cable size per 2BE-932
Post ACDT Air Sampler Return MOV	FV-M3	A003	12	None	"MSCP" fuse Type "S"	#6	.5 HP	
Post ACDT Air Sampler From CTMT	FV-H4	A003	12	None	"MSCP" fuse Type "S"	#6	.5 HP	
Post ACDT Air Sampler From CTMT	FV-H5	A003	12	None	"MSCP" fuse Type "S"	#6	.5 HP	
Post LOCA CTMT Vent MOV	FV-Y4	A003	12	None	"MSCP" fuse Type "S"	#6	.7 HP	
Instr. Air Line Disch. MOV	FV-Y5	A005	29	None	"MSCP" fuse Type "S"	#6	2 HP	

BECHTEL

CALCULATION SHEET

ORIGINATOR: Arce Mendiola DATE ______ CALC. NO. ______ REV. NO. ______

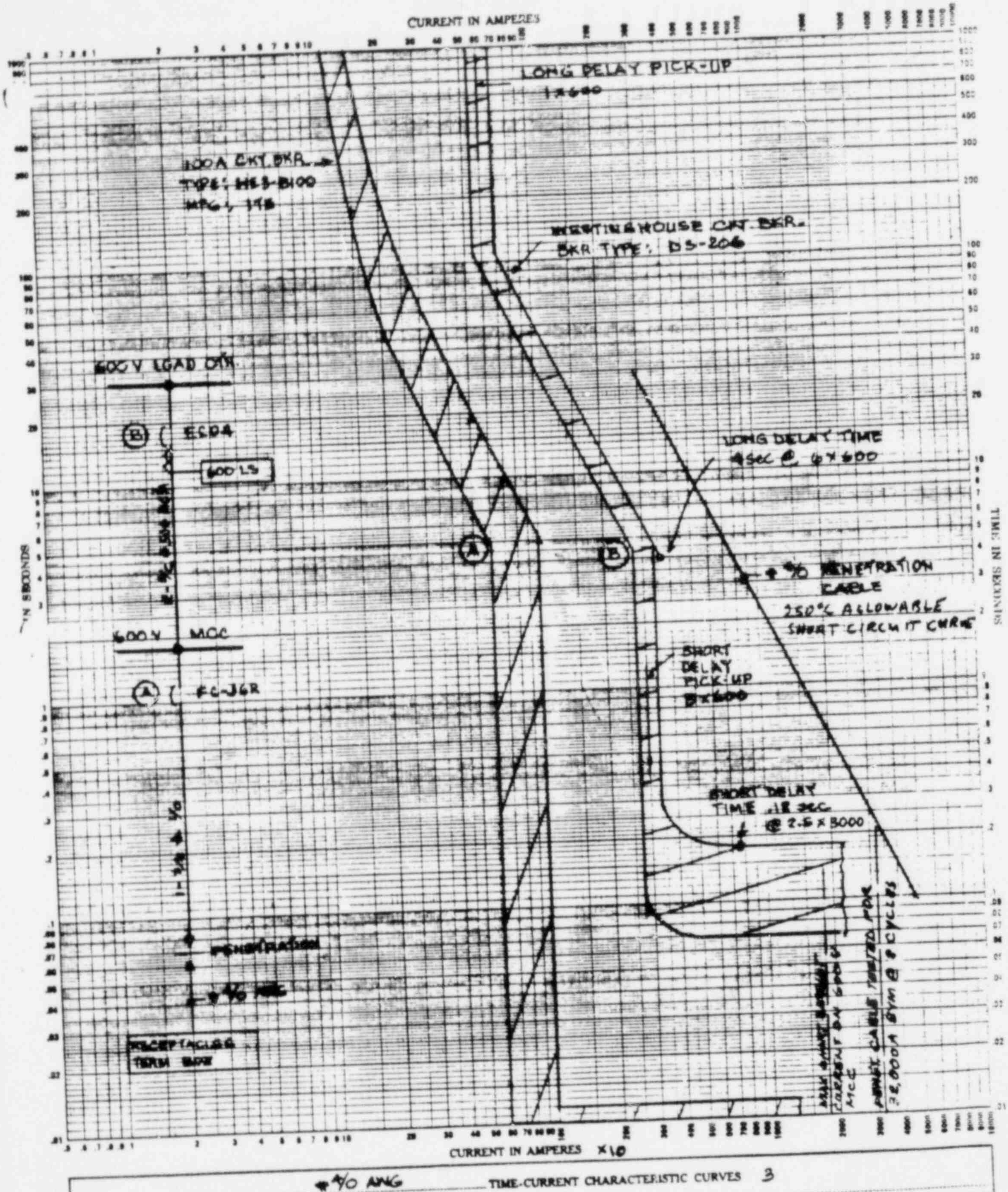
CHECKED ______ DATE ______

PROJECT: J. M. Farley Nuclear Plant Unit #2 JOB NO. 7597-20

SUBJECT: Penetration Cable SHEET NO. 6 of 6

TABLE 3

SERVICE	PRIMARY PROTECTION: 600V AC MCC	PRIMARY PROTECTION: CKT. BKR OR COMB. BKR/STRTR SIZE	PRIMARY PROTECTION: INST. SETTING	EXISTING BACK-UP PROTECTION: 600V AC LOAD CENTER	PROPOSED BACK-UP PROTECTION: FUSE	POWER CABLE SIZE	LOAD	REMARK
CRDM Cool Fan Damper	FV-I2	A003	12	None	"MSCP" fuse Type 'S'	#6	.13 HP	
CTMT Air Cooler Disch MOV	FV-J4	A003	16	None	"MSCP" fuse Type 'S'	#6	.66 HP	
CTMT Air Cooler Disch MOV	FV-J5	A003	16	None	"MSCP" fuse Type 'S'	#6	.66 HP	
Reac. Cavity H_2 Dilution Fan VLV.	FV-N2	A005	29	None	"MSCP" fuse Type 'S'	#6	2 HP	
Accumulator 2B Disch VLV	FV-S2	H050	565	None	"MSCP" fuse Type "U"	#2	26.6 HP	Changed cable size per 2 BE-932
RHR System Inlet Isol. VLV.	FV-V3	A010	45	None	"MSCP" fuse Type 'S'	#6	2.6 HP	
Pressurizer to Relief Isol. VLV.	FV-W4	A005	22	None	"MSCP" fuse Type 'S'	#6	1.6 HP	
RHR System Outlet Isol VLV	FV-V2	A010	45	None	"MSCP" fuse Type 'S'	#6	2.6 HP	
RCP CCW Return from Oil Cool	FV-C3	A005	22	None	"MSCP" fuse Type 'S'	#6	1.33 HP	
CTMT Air Cooling Fan MOV	FV-F2	A003	12	None	"MSCP" fuse Type 'S'	#6	.13 HP	
CTMT Air Cooling Fan MOV	FV-F3	A003	12	None	"MSCP" fuse Type 'S'	#6	.13 HP	



4/0 AWG — TIME-CURRENT CHARACTERISTIC CURVES 3

For RECEPTACLES TERM. BOX — Fuse Links. In

BASIS FOR DATA Standards — Dated

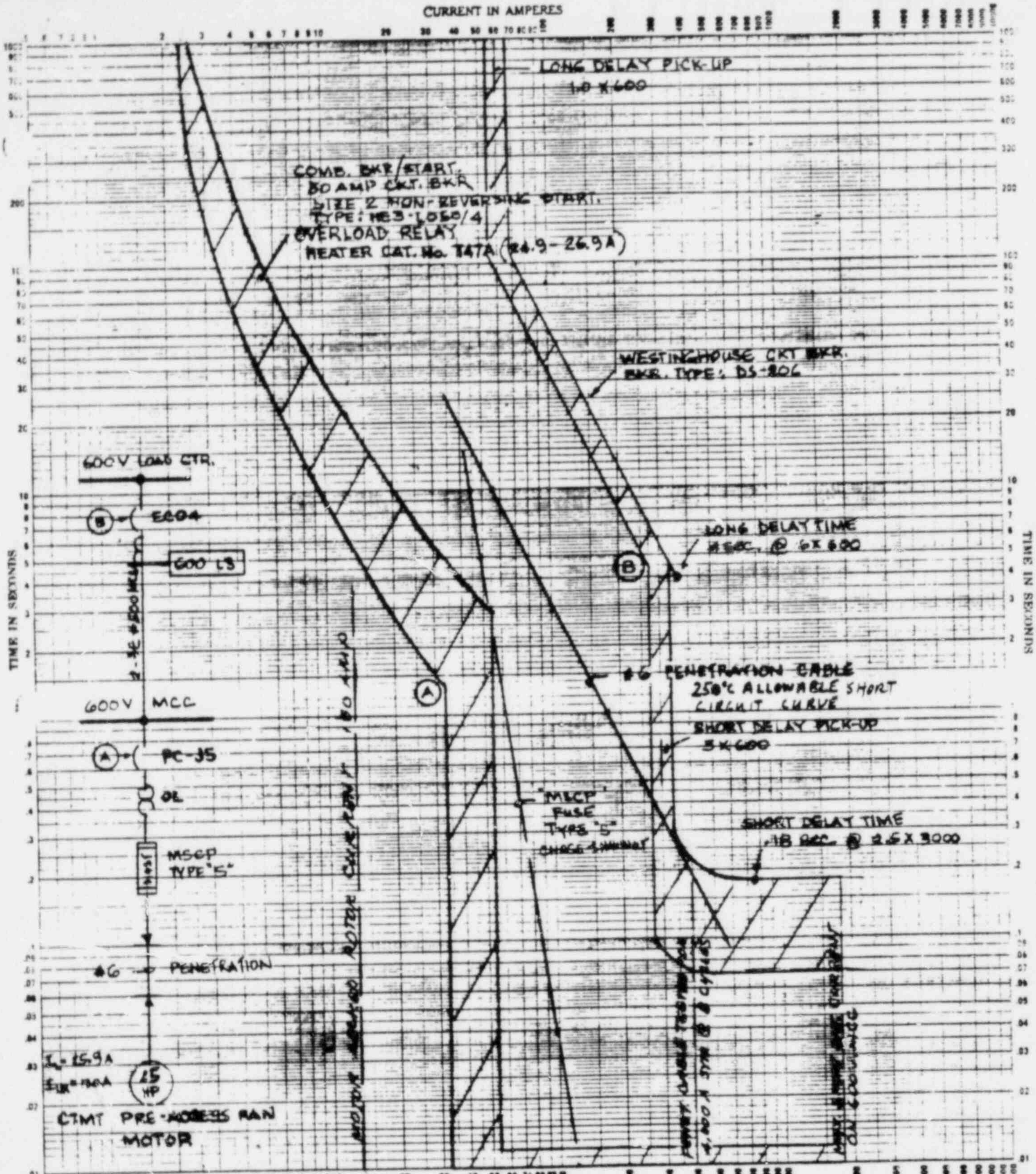
1. Tests made at — Volts a-c at — p.f., Starting at 25C with no initial load

2. Curves are plotted to — Test points so variations should be

No.

Date

FIGURE 3 - 600 VAC MCC



#6 AWG TIME-CURRENT CHARACTERISTIC CURVES 1

For CTMT PRE-ACCESS FAN MOTOR Fuse Links In

BASIS FOR DATA Standards .... Dated ....

1. Tests made at .... Volts a-c at .... p.f., Starting at 25C with no initial load

2. Curves are plotted to .... Test points so variations should be ....

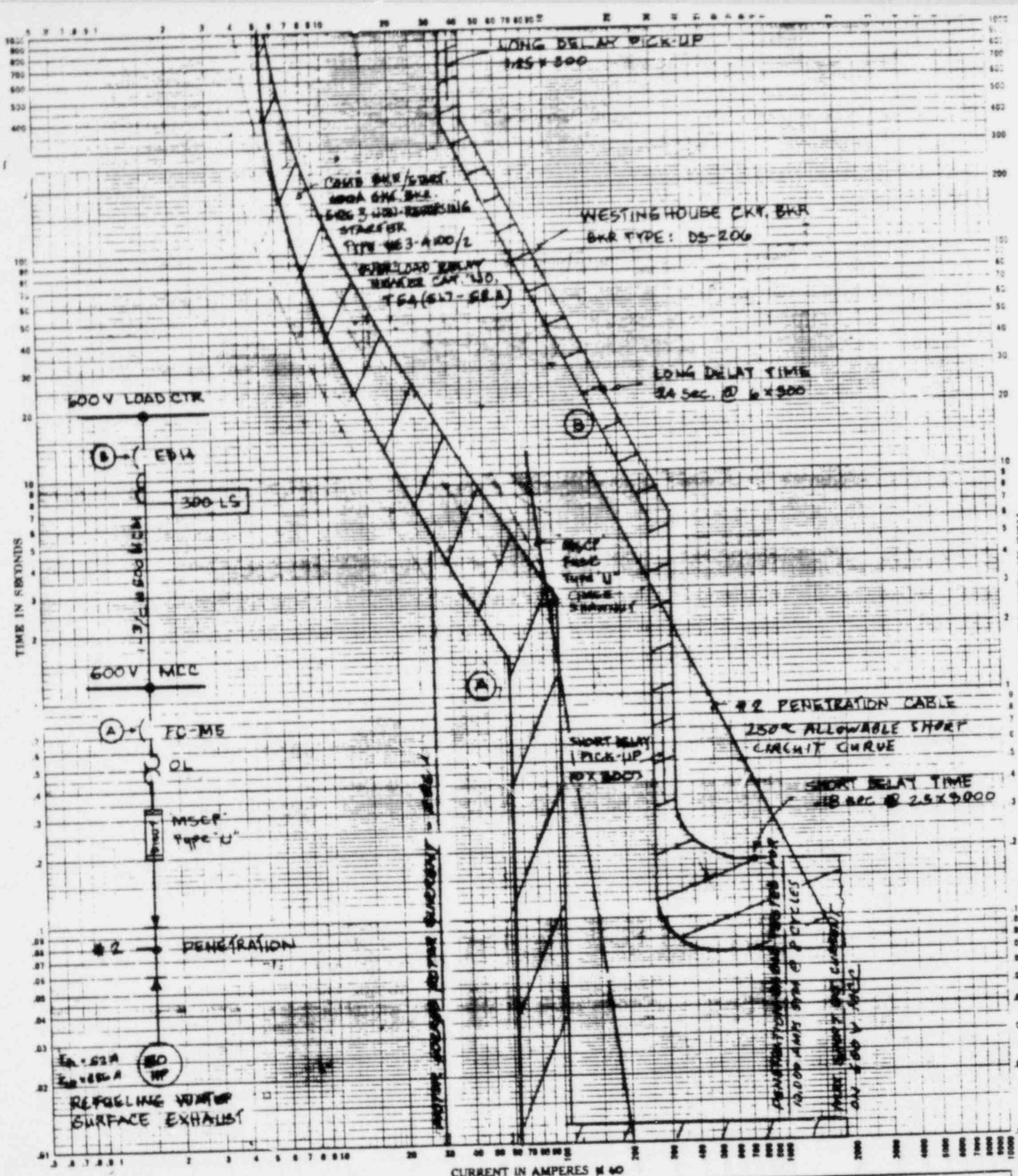
No. ....

Date ....

FIGURE 4 - 600 VAC MCC

TIME-CURRENT CHARACTERISTIC 48 5257

KEUFFEL & ESSER CO.



#2 AWG TIME-CURRENT CHARACTERISTIC CURVES 2	
For REFUELING WATER SURFACE EXHAUST Fuse Links. In	
BASIS FOR DATA Standards Dated	No.
1. Tests made at Volts a-c at p.f., Starting at 25C with no initial load	Date
2. Curves are plotted to Test points so variations should be	

FIGURE 5 - 600 VAC MCC

K-E TIME-CURRENT CHARACTERISTIC 48 5257

KEUFFEL & ESSER CO.

BECHTEL

CALCULATION SHEET

CALC. NO. ________ REV. NO. ________

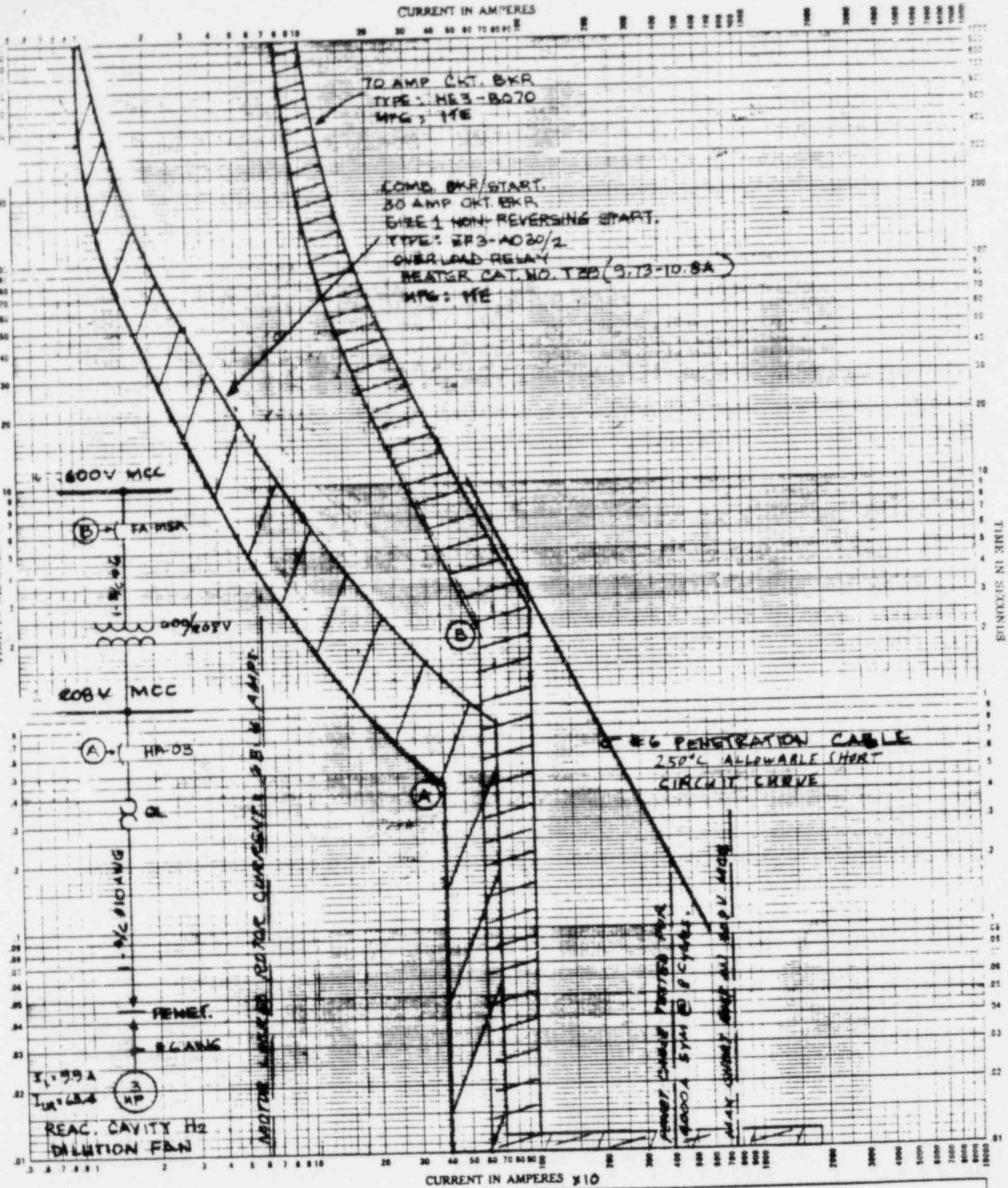
ORIGINATOR Arce Mendiola DATE ________ CHECKED ________ DATE ________

PROJECT J. M. Farley Nuclear Plant Unit #2 JOB NO. 7597-20

SUBJECT Penetration Cable SHEET NO. 1 of 1

TABLE 4 - 208 VAC MCC's

SERVICE	PRIMARY PROTECTION: 208V AC MCC	PRIMARY PROTECTION: CKT. BKR. OR COMB. BKR/STARTER SIZE	PRIMARY PROTECTION: INST. SETTING	EXISTING BACK-UP PROTECTION: 600V AC MCC	PROPOSED BACK-UP PROTECTION: FUSE	POWER CABLE SIZE	LOAD	REMARK
Reac. Cavity H_2 Dilution Fan 2A	HA-03	A030	105	FA-MSR 70A CKT. BKR. Inst: 600-1000A	none	#6	3 HP	
React Cavity H_2 Dilution Fan 2B	HB-N7	A030	105	FB-KSL 70A CKT BKR Inst: 600-1000A	none	#6	3 HP	



#6 AWG TIME-CURRENT CHARACTERISTIC CURVES

For REAC. CAVITY H2 DILUTION FAN ... Fuse Links. In ...

BASIS FOR DATA Standards ... Dated ...

1. Tests made at ... Volts a-c at ... p.f., Starting at 25C with no initial load

2. Curves are plotted to ... Test points so variations should be ...

No. ...

Date ...

FIGURE 6 - 208V AC MCC'S

K-E TIME-CURRENT CHARACTERISTIC 48 5257

KEUFFEL & ESSER CO.

BECHTEL

CALCULATION SHEET

CALC. NO. ____ REV. NO. ____

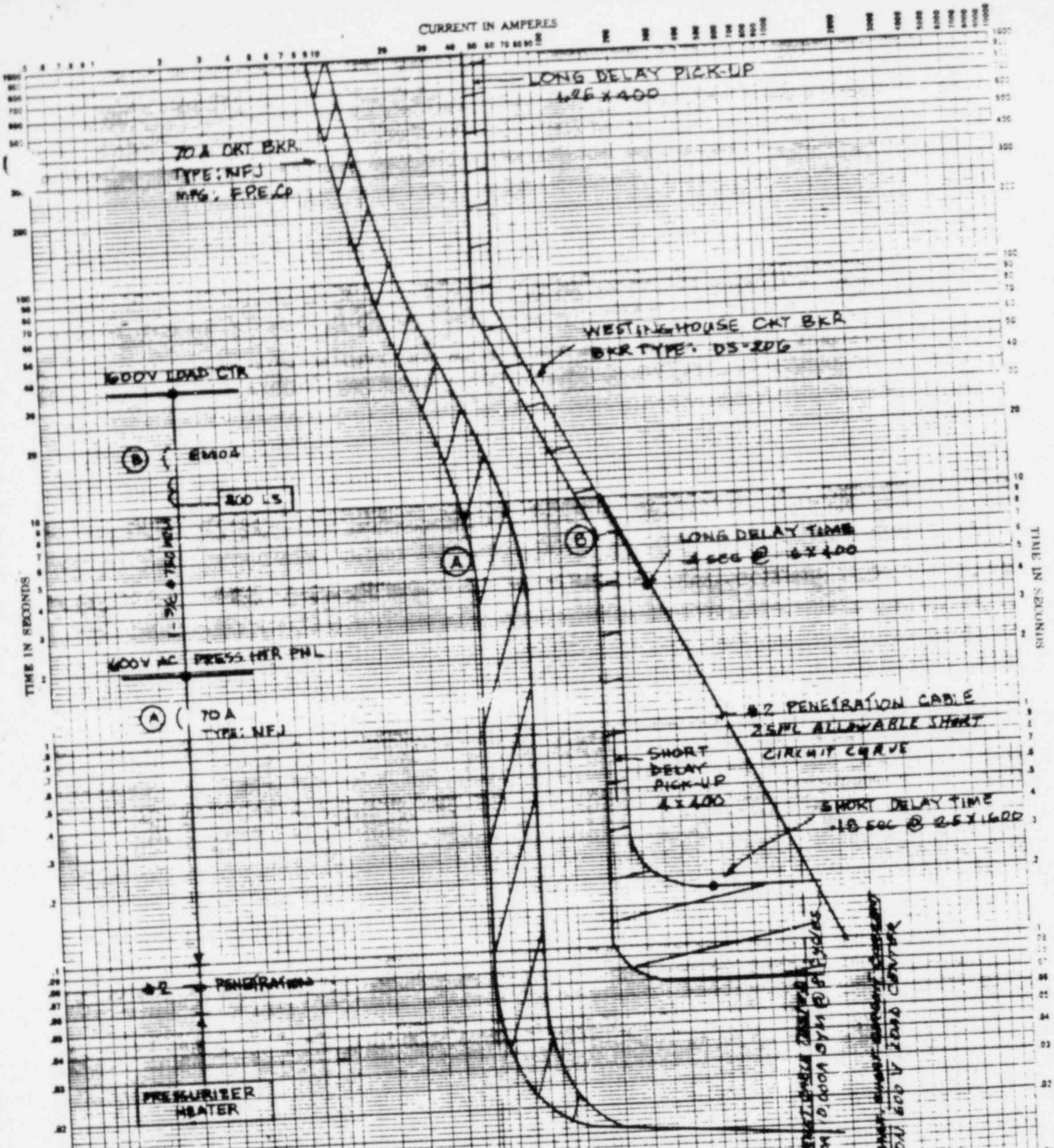
ORIGINATOR Arce Mendiola DATE ____ CHECKED ____ DATE ____

PROJECT J.M. Farley Nuclear Plant Unit 2 JOB NO. 7597-20

SUBJECT Penetration Cable. SHEET NO. 1 of 1

TABLE 5 - 600 VAC DISTRIBUTION PANELS

SERVICE	PRIMARY PROTECTION 600V AC PRESS HTR PNL	EXISTING BACK-UP PROTECTION 600V AC LOAD CTR.	PENET. CABLE SIZE	LOAD (KW)	REMARK
PRESSURIZER HTR. GROUP 2A TERM. BOX N2TB010	CKT. BKR. 1 thru 5 70 A/JL3 INST. = 750-1600 A	EA11 LD = 330 A SD = 1200 A	#2	69.3 KW/CKT. max.	
PRESSURIZER HTR. GROUP 2B TERM BOX N2TB011	CKT. BKR 1 thru 5 70A/JL3 INST. = 750-1600 A	EC11 LD = 330 A SD = 1200 A	#2	69.3 KW/CKT max.	
PRESSURIZER HTR GROUP 2C TERM BOX N2TB008	CKT BKR 1 thru 7 70A/NFJ INST. = 750-1600 A	EM04 LD = 500 A SD = 1600 A	#2	69.3 KW/CKT max	
PRESSURIZER HTR GROUP 2D TERM BOX N2TB007	CKT. BKR 1 thru 4 70A/NFJ INST. 750-1600 A	EM05 LD = 270 A SD = 1200 A	#2	69.3 KW/CKT max.	
PRESSURIZER HTR GROUP 2E TERM BOX N2TB009	CKT. BKR 1 thru 5 70A/NFJ INST. = 750-1600 A	EN07 (UNIT 2) LD = 330 A SD = 1200 A	#2	69.3 KW/CKT max	



TIME-CURRENT CHARACTERISTIC CURVES #2 AWG

For 600V AC PRESSURIZER HEATER DIST. PNL 2C, 2D & 2E Fuse Links. Dated No.

BASIS FOR DATA Standards p.L, Starting at 25C with no initial load Date

1. Tests made at Volts a-c at

2. Curves are plotted to Test points so variations should be

FIGURE 7 - 600VAC DIST. PANELS

K+E TIME-CURRENT CHARACTERISTIC 48 5257 MADE IN U.S.A.

KEUFFEL & ESSER CO.

CALCULATION SHEET

BECHTEL

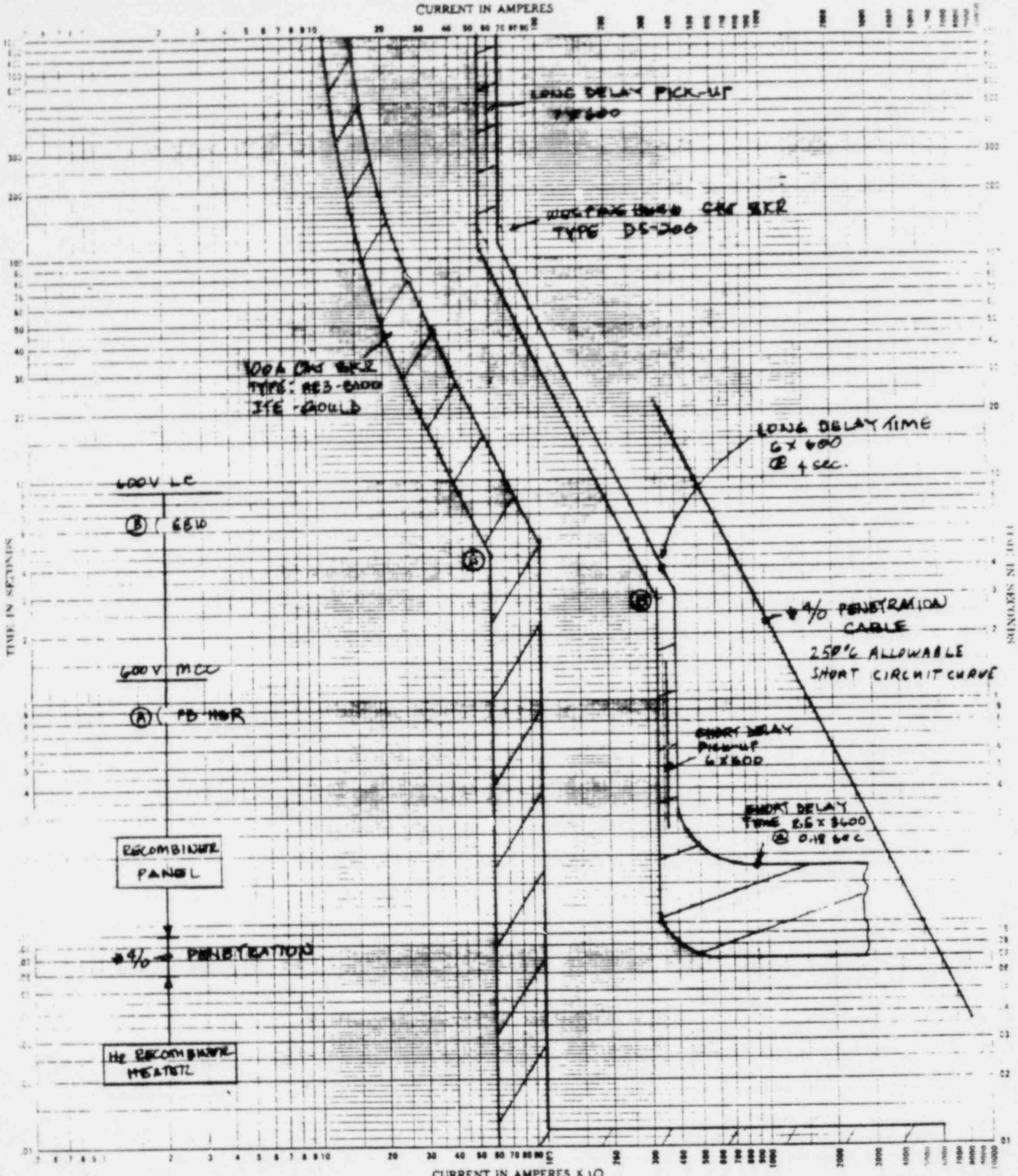
CALC. NO. ____ REV. NO. ____
ORIGINATOR ____ DATE ____ CHECKED ____ DATE ____
PROJECT ____ JOB NO. ____
SUBJECT ____ SHEET NO. 1 of 1

TABLE 6 – 480V, 3ϕ H_2 Recombiner Supplies

SERVICE	PRIMARY PROTECTION		SECONDARY PROTECTION			PENET CABLE SIZE	LOAD (KW)
	600V MCC	CKT BKR FRAME/ SENSOR RTG	600V AC LOAD CTR	CKT BKR FRAME/ SENSOR RTG	SETTING		
H_2 RECOMBINER HTR 2A	FALL 3	100/100	ED10	800/600	L.D.=600 S.D.=1200	4/0	75
H_2 RECOMBINER HTR 2B	FBRH6	100/100	EE10	800/600	L.D.=600 S.D.=1200	4/0	75

TABLE 6

Table 6



Penetration Cable #4/0 AWG

H_2 Recombiner Heater 2A + 2B

TIME-CURRENT CHARACTERISTIC CURVES

Fuse Links. In ....

BASIS FOR DATA .... Dated ....

1. Tests made at .... Volts a-c at .... p-f, Starting at 25C with no initial load ....

2. Curves .... Test points so variations should be ....

No. ....

Date ....

FIGURE 8 - 480V, 3Ø H_2 Recombiner Supplies

BECHTEL

CALCULATION SHEET

CALC. NO. ______ REV. NO. ______

ORIGINATOR Arce Mendiola DATE ______ CHECKED ______ DATE ______

PROJECT J.M. Farley Nuclear Plant Unit #2 JOB NO. 7597-20

SUBJECT Penetration Cable SHEET NO. 1 of 7

TABLE 7 - 125VDC And 120VAC Solenoids

	PRIMARY PROTECTION	EXISTING BACK-UP PROTECTION			
SERVICE	FUSE	125V DC DISTR. PNL	PENET. CABLE SIZE	LOAD (W)	REMARK
PRZR PWR Relief VLV (445A) 2A	FB1 (TC-05A) 3 Amps	DISTR. PNL 2A 15A CKT BKR CKT. #11	#12	70	
PRZR PWR Relief VLV (444B) 2B	FB1 (TC-25A) 3 AMPS	DISTR. PNL 2D 15A CKT BKR CKT #7	#12	70	
Letdown Line Isol. VLV. (459)	FB5 (TC-06A) 3 Amps	Distr. PNL. 2A 15A CKT BKR CKT #17	#12	35	
Letdown Line Isol. VLV (460)	FB6 (TC-06A) 3 Amps	DISTR PNL 2A 15A CKT BKR CKT #17	#12	35	
Reac Cool Drn Tank Pump Disch VLV	FB5 (TC-05A) 3 Amps	Distr. PNL 2A 15A CKT BKR CKT #11	#12	35	
Reac Cool Drn Tank Vent Isol VLV	FB6 (TC-05A) 3 Amps	Distr Pnl 2A 15A CKT BKR CKT #11	#12	35	
RMW to RCP Standpipe Fill	FB3 (TC-06A) 3 Amps	Distr PNL 2A 15A CKT BKR CKT #17	#12	35	
PRZR Rel. Tnk to RMW Isol. VLV	FB4 (TC-25B) 3 Amps	Distr. PNL 2D 15A CKT BKR CKT. #7	#12	35	
PRZR Rel Tnk to Drn to WPS Drn Tnk	FB5 (TC-25B) 3 Amps	Distr. Pnl 2D 15A CKT BKR CKT #7	#12	35	
Excess Letdown Isol VLV (8153)	FB6 (TC-27B) 3 Amps	Distr. Pnl 2D 15A CKT BKR CKT #15	#12	35	
RCS PRZR AUX Spray VLV (8145)	FB5 (TC-27B) 3 Amps	Distr PNL 2D 15A CKT BKR CKT #18	#12	35	
Excess Letdown Isol VLV (8154)	FB7 (TC-27B) 3 Amps	Distr. Pnl 2D 15A CKT BKR CKT #15	#12	35	
RMW to RCP Standpipe Fill (8166A)	FB2 (TC-27B) 3 Amps	Distr. Pnl 2D 15A CKT BKR CKT #15	#12	35	
RMW to RCP Standpipe Fill (8168B)	FB3 (TC-27B) 3 Amps	Distr Pnl 2D 15A CKT BKR CKT #15	#12	35	

CALCULATION SHEET

BECHTEL

CALC. NO. ______ REV. NO. ______

ORIGINATOR Aree Mendiola DATE ______ CHECKED ______ DATE ______

PROJECT J.M. Farley Nuclear Plant Unit #2 JOB NO. 7597-20

SUBJECT Penetration Cable SHEET NO. 2 of 7

TABLE 7

SERVICE	PRIMARY PROTECTION FUSE	EXISTING BACK-UP PROTECTION 125V DC DISTR. PNL	PENET CABLE SIZE	LOAD (W)	REMARK
ACCUM. N_2 SUPPLY + VENT ISOL.	FB2 (TC-08A) 3 AMPS	DIST. PNL 2A 15A CKT BKR. CKT #13	12	35	
ACCUM. N_2 SUPPLY + VENT ISOL.	FB6 (TC-08A) 3 AMPS	DIST. PNL. 2A 15A CKT BKR CKT # 13	12	35	
ACCUM. LINE TEST ISOL.	FB4 (TC-08A) 3 AMPS	DIST. PNL. 2A 15A CKT BKR CKT # 13	12	35	
ACCUM. LINE TEST ISOL.	FB8 (TC-08A) 3 AMPS	DIST PNL 2A 15A CKT BKR CKT # 13	12	35	
ACCUM. FILL LINE ISOL.	FB3 (TC-08A) 3 AMPS	DIST. PNL 2A 15A CKT BKR CKT # 13	12	35	
ACCUM FILL. LINE ISOL.	FB7 (TC-08A) 3 AMPS	DIST. PNL 2A 15A CKT BKR CKT # 13	12	35	
ACCUM. INJEC. TEST LINE ISOL.	FB5 (TC-08A) 3 AMPS	DIST. PNL 2A 15A CKT BKR CKT #13	12	35	
ACCUM. INJEC TEST LINE ISOL.	FB9 (TC-08A) 3 AMPS	DIST. PNL 2A 15A CKT BKR CKT # 13	12	35	
ACCUM N_2 SUPPLY + VENT ISOL.	FB2 (TC-29B) 3 AMPS	DIST PNL 2D 15A CKT BKR CKT # 9	12	35	
ACCUM. LINE TEST ISOL.	FB4 (TC-29B) 3 AMPS	DIST. PNL 2D 15A CKT BKR CKT # 9	12	35	
ACCUM. FILL. LINE ISOL.	FB3 (TC-29B) 3 AMPS	DIST. PNL 2D 15A CKT BKR CKT # 9	12	35	
ACCUM. INJECT. TEST LINE ISOL.	FB5 (TC-29B) 3 AMPS	DIST PNL 2D 15A CKT BKR CKT # 9	12	35	
RCP SEAL LEAK OFF ISOL.	FB1 (TC-06A) 3 AMPS	DIST. PNL 2A 15A CKT BKR CKT # 17	12	35	
DAMPER SV'S CTMT PURGE ISOL.	FB1 (TC-29B) 3 AMPS	DIST PNL 2D 15A CKT BKR CKT # 8	12	35	

CALCULATION SHEET

BECHTEL

ORIGINATOR Aree Mendiola DATE ______ CALC. NO. ______ REV. NO. ______

CHECKED ______ DATE ______

PROJECT J.M. Farley Nuclear Plant Unit #2 JOB NO. 7597-70

SUBJECT Penetration Cable SHEET NO. 3 of 7

TABLE 7

SERVICE	PRIMARY PROTECTION FUSE	EXISTING BACK-UP PROTECTION 125V DC DISTR. PNL	PENET CABLE SIZE	LOAD (W)	REMARK	
LETDOWN ORIFICE ISOL. VLV	FB9(TC-06A) 3 AMPS	DIST. PNL 2A 15A CKT BKR CKT #17	12	35	SV-A	THERE ARE TWO SV'S IN SERIES CONTROLLING THIS VALVE BOTH SV'S MUST OPEN TO OPEN THE VALVE. SV-A HAS REDUNDANT CONTROL AND POWER FEEDS.
	NBAFP 2605A-A 3 AMPS	DIST PNL. 2C 30A CKT BKR CKT #9	12	35	SV-A	
	NGASC 2506D-A 3AMPS	DIST PNL 2A 15A CKT BKR CKT #23	12	35	SV-B	
RCP SEAL LEAK OFF ISOL.	FB2(TC-06A) 3 AMPS	DIST. PNL 2A 15A CKT. BKR. CKT #17	12	35		
RCP SEAL LEAK OFF ISOL.	FB1(TC-27B) 3 AMPS	DIST. PNL. 2D 15A CKT BKR. CKT #15	12	35		
RCS ALTERNATE CHARGING LINE	FB1(TC-06A) 3 AMPS	DIST. PNL. 2A 15A CKT. BKR CKT #18	12	35		
RCS NORMAL CHARGING LINE	FB1(TC-27B) 3 AMPS	DIST PNL 2D 15A CKT BKR CKT #14	12	35		
REAC. VESSEL LEAK OFF ISOL.	FB7(TC-25B) 3 AMPS	DIST PNL 2D 15A CKT BKR CKT #7	12	35		
PRZR REL. TNK TO RMW SUPPLY	FB2(TC-25B) 3 AMPS	DIST PNL 2D 15A CKT BKR. CKT #7	12	35		
RCP SEALS WTR. BYPASS ISOL	FB8(TC-27B) 3 AMPS	DIST PNL 2D 15A CKT BKR CKT #15	12	35		
EXCESS LETDOWN TO VCT OR RCDT	FB5(TC-27B) 3 AMPS	DIST. PNL 2D 15A CKT BKR CKT #15	12	35		
LETDOWN ORIFICE ISOL.	FB10(TC-06A) 3 AMPS	DIST PNL 2A 15A CKT BKR CKT #17	12	35	SV-A	THERE ARE TWO SV'S IN SERIES CONTROLLING THIS VALVE. BOTH SV'S MUST OPEN TO OPEN THE VALVE. SV-A HAS REDUNDANT CONTROL AND POWER FEEDS
	NBAFP 2605A-A 3 AMPS	DIST PNL 2C 30A CKT BKR CKT #9	12	35	SV-A	
	NGASC 2605-D-A 3 AMPS	DIST PNL 2A 15A CKT BKR CKT #23	12	35	SV-B	

CALCULATION SHEET

BECHTEL

CALC. NO. ______ REV. NO. ______

ORIGINATOR Arce Mendiola DATE ______ CHECKED ______ DATE ______

PROJECT J.M. Farley Nuclear Plant Unit #2 JOB NO. 7597-70

SUBJECT Penetration Cable SHEET NO. 4 of 7

TACLE 7

SERVICE	PRIMARY PROTECTION FUSE	EXISTING BACK-UP PROTECTION 125V DC DISTR. PNL	PENET CABLE SIZE	LOAD (W)	REMARK	
LETDOWN ORIFICE ISOL.	FBB(TC-06A) 3 AMPS	DIST PNL 2A 15A CKT BKR CKT #17	12	35	SV-A	THERE ARE TWO SV'S IN SERIES CONTROLLING THIS VALVE. BOTH SV'S MUST OPEN TO OPEN THE VALVE. SV-A HAS REDUNDANT CONTROL AND POWER FEEDS.
	NBAFP 2505A-A 3 AMPS	DIST PNL 2C 30A CKT BKR CKT #9	12	35	SV-A	
	NGASC 2506D-A 3 AMPS	DIST PNL 2A 15A CKT BKR CKT #23	12	35	SV-B	
ACCUM. TEST LINE ISOL VLV.	FBI(TC-08A) 3 AMPS	DIST PNL 2A 15A CKT BKR CKT #13	12	35		
RCP COMP. COOL.	FB4(TC-318) 3 AMPS	DIST PNL 2D 15A CKT BKR CKT #12	12	35		
EXCESS LETDOWN HX COOL DISC.	FBI(TC-09A) 3 AMPS	DIST. PNL 2A 20A CKT BKR CKT #6	12	35		
SG2A BLOWDOWN	FAN (NBL2702B-B) 3 AMPS	DIST. PNL 2E 30 A CKT BKR CKT #5	12	35		
SG2B BLOWDOWN	FAM (NBL2702B-B) 3AMPS	DIST PNL 2E 30A CKT BKR CKT #5	12	35		
SG2C BLOWDOWN	FAL (NBL2702B-B) 3 AMPS	DIST PNL 2E 30 A CKT BKR CKT #5	12	35		
SG2A BLOWDOWN	FAC (NBL2702B-B) 3 AMPS	DIST PNL 2E 30 A CKT BKR CKT #5	12	35		
SG2B BLOWDOWN	FAB (NBL2702B-B) 3 AMPS	DIST PNL 2E 30A CKT BKR CKT #5	12	35		
SG2C BLOWDOWN	FAA (NBL2702B-B) 3 AMPS	DIST PNL 2E 30A CKT BKR CKT #5	12	35		
CVCS LETDOWN LINE	FAD (NBL2702B-B) 3 AMPS	DIST. PNL 2E 30A CKT BKR CKT #5	12	35		
CVCS LETDOWN LINE	FD (NBL2702A-A) 3 AMPS	DIST PNL 2B 30A CKT BKR CKT #5	12	35		

CALCULATION SHEET

CALC. NO. ______ REV. NO. ______

ORIGINATOR Arce Mendiola DATE ______ CHECKED ______ DATE ______

PROJECT J.M. Farley Nuclear Plant Unit #2 JOB NO. 7597-70

SUBJECT Penetration Cable SHEET NO. 5 of 7

TABLE 7

SERVICE	PRIMARY PROTECTION FUSE	EXISTING BACK-UP PROTECTION 125V DC DISTR. PNL	PENET CABLE SIZE	LOAD (W)	REMARK
SG2A BLOWDOWN	FC (NBL2702A-A) 3 AMPS	DIST. PNL 2B 30A CKT BKR CKT # 5	12	35	
SG2B BLOWDOWN	FB (NBL2702A-A) 3 AMPS	DIST. PNL 2B 30A CKT BKR CKT # 5	12	35	
SG2C BLOWDOWN	FA (NBL2702A-A) 3 AMPS	DIST. PNL 2B 30A CKT BKR CKT # 5	12	35	
SG2A BLOWDOWN	FK (NBL2702A-A) 3 AMPS	DIST. PNL 2B 30A CKT BKR CKT # 5	12	35	
SG2B BLOWDOWN	FJ (NBL2702A-A) 3 AMPS	DIST. PNL 2B 30A CKT BKR CKT # 5	12	35	
SG2C BLOWDOWN	FH (NBL2702A-A) 3 AMPS	DIST. PNL 2B 30A CKT BKR CKT # 5	12	35	
SG2A BLOWDOWN	FAK (NBL2702B-B) 3 AMPS	DIST. PNL 2E 30A CKT BKR CKT # 5	12	35	
SG2B BLOWDOWN	FAJ (NBL2702B-B) 3 AMPS	DIST. PNL 2E 30A CKT BKR CKT # 5	12	35	
SG2C BLOWDOWN	FAH (NBL2702B-B) 3 AMPS	DIST PNL 2E 30A CKT BKR CKT # 5	12	35	
PRESS. STM. SPACE SAMPLER	FAS (NBL2702B-B) 3 AMPS	DIST. PNL. 2E 30A CKT BKR CKT # 5	12	35	
PRESS. LIQ. SPACE SAMPLER	FAR (NBL2702B-B) 3 AMPS	DIST. PNL 2E 30A CKT BKR CKT # 5	12	35	
ACCUMULATOR SAMPLER	F/3266 (NFSS2607A-A) 3 AMPS	DIST. PNL. 2C 20A CKT BKR CKT # 6	12	35	
SG2A BLOWDN SAMPLER	F/3179A (NFSS2607A-A) 3 AMPS	DIST. PNL 2C 20A CKT BKR CKT # 6	12	35	
SG2A BLOWDN SAMPLER	F/3179B (NFSS2607A-A) 3 AMPS	DIST. PNL 2C 20A CKT BKR CKT # 6	12	35	

CALCULATION SHEET

BECHTEL

CALC. NO. ______ REV. NO. ______

ORIGINATOR Arce Mendiola DATE ______ CHECKED ______ DATE ______

PROJECT J.M. Farley Nuclear Plant Unit #2 JOB NO. 7597-70

SUBJECT Penetration Cable SHEET NO. 6 of 7

TABLE 7

SERVICE	PRIMARY PROTECTION FUSE	EXISTING BACK-UP PROTECTION 125V DC DISTR. PNL	PENET CABLE SIZE	LOAD (W)	REMARK
SG2B BLOWDN SAMPLER	F/3180A (NFSS2607A-A) 3 AMPS	DIST PNL 2C 20A CKT BKR CKT #6	12	35	
SG2B BLOWDN SAMPLER	F/3180 (NFSS2607A-A) 3 AMPS	DIST. PNL 2C 20A CKT BKR CKT #6	12	35	
SG2C BLOWDN SAMPLER	F/3181A (NFSS2607A-A) 3 AMPS	DIST PNL 2C 20A CKT BKR CKT #6	12	35	
SG2C BLOWDN SAMPLER	F/3181B (NFSS2607A-A) 3 AMPS	DIST PNL 2C 20A CKT BKR CKT #6	12	35	
ACCUM. TANK 2A SAMPLER	F/3162 (NFSS2607A-A) 3 AMPS	DIST. PNL 2C 20A. CKT BKR CKT #6	12	35	
ACCUM TANK 2B SAMPLER	F/3163 (NFSS2607A-A) 3 AMPS	DIST PNL 2C 20A CKT BKR CKT #6	12	35	
ACCUM TANK 2C SAMPLER	F/3164 (NFSS2607A-A) 3 AMPS	DIST. PNL 2C 20A CKT BKR CKT #6	12	35	
REAC. COOLANT HOT LEG	F/3101 (NFSS2607B-B) 3 AMPS	DIST PNL 2F 20A CKT BKR CKT # 10	12	35	
REAC. COOLANT HOT LEG	F/3102 (NFSS2607B-B) 3 AMPS	DIST PNL 2F 20A CKT BKR CKT # 10	12	35	
CTMT SUMP DISCH.	FA (NGB2504Q) 3 AMPS	DIST PNL 2D 15A CKT BKR CKT # 16	12	35	
CTMT COOLER DRAINS	FA (NGB2504Q) 3 AMPS	DIST PNL 2G 30A CKT BKR CKT # 12	12	35	
CTMT COOLER DRAINS	FD (NGB2504Q) 3 AMPS	DIST PNL 2G 30A CKT BKR CKT # 12	12	35	
CTMT COOLER DRAINS	FC (NGB2504Q) 3 AMPS	DIST PNL 2G 30A CKT BKR CKT # 12	12	35	
CTMT COOLER DRAINS	FB (NGB2504Q) 3 AMPS	DIST. PNL 2G 30A CKT BKR CKT # 12	12	35	

CALCULATION SHEET

BECHTEL

CALC. NO. ____________ REV. NO. ____________

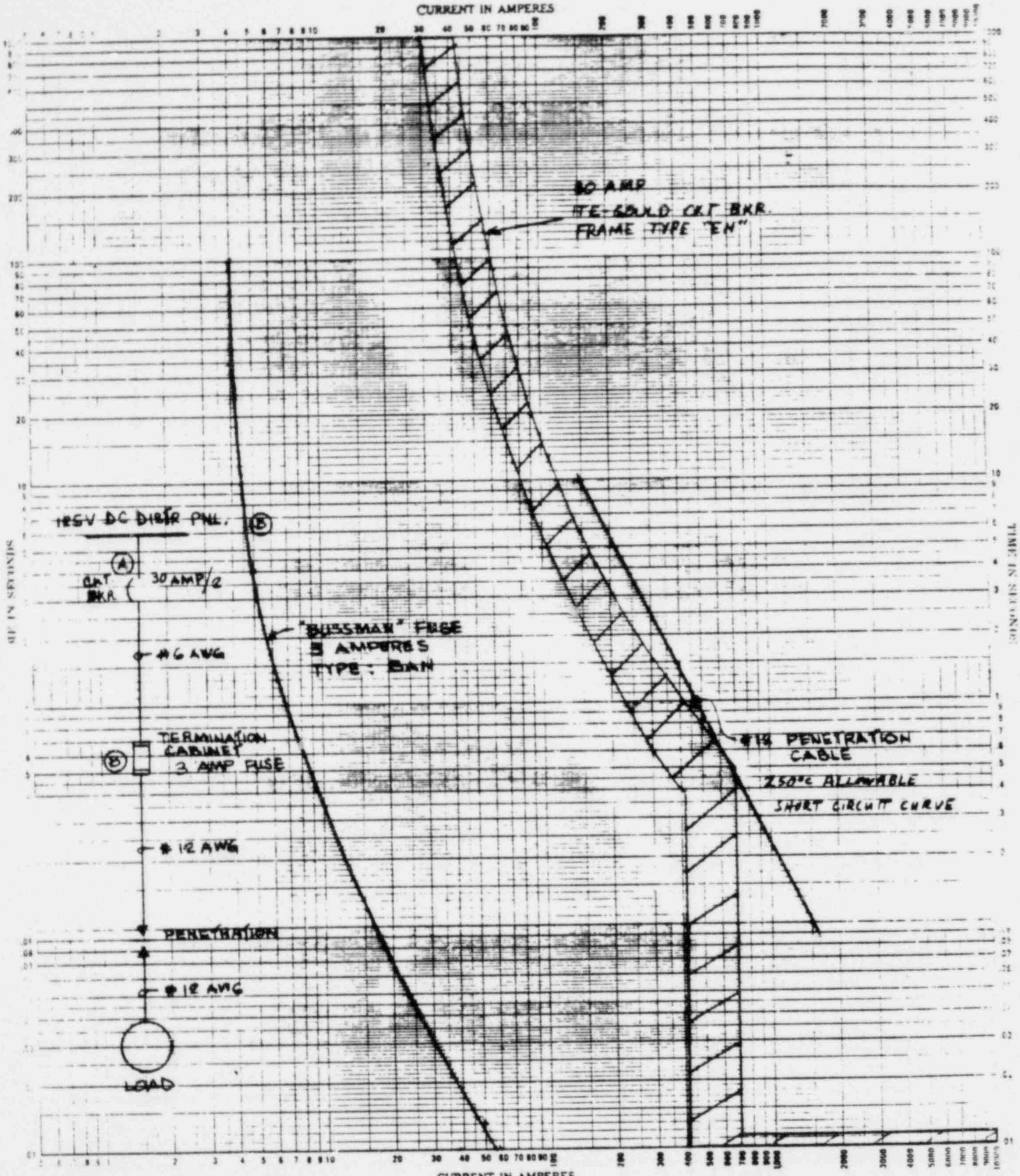
ORIGINATOR Arce Mendiola DATE ____________ CHECKED ____________ DATE ____________

PROJECT J.M. Farley Nuclear Plant Unit #2 JOB NO. 7597-20

SUBJECT Penetration Cable SHEET NO. 7 of 7

TABLE 7

SERVICE	PRIMARY PROTECTION FUSE	EXISTING BACK-UP PROTECTION 125V DC DISTR. PNL	PENET CABLE SIZE	LOAD (W)	REMARK
PRZR LIQUID SAMPLER	F/3103 (NFSS2607A-A) 3AMPS	DIST. PNL 2C 20A CKT BKR CKT # 6	12	35	
PRZR LIQUID SAMPLER	F/3104 (NFSS2607A-A) 3 AMPS	DIST. PNL 2C 20A CKT BKR CKT # 6	12	35	
REAC. HOT LEG SAMPLER	F/3765 (NFSS2607A-A) 3 AMPS	DIST. PNL 2C 20A CKT BKR CKT # 6	12	35	
REAC. CAVITY COOLING	FM (NGB2504M) 3 AMPS	AC DIST PNL 2J 20A CKT BKR CKT # 2	12	35	120V AC SV.
REAC. CAVITY COOLING	FF (NGB2504Ø) 3 AMPS	AC DIST PNL 2K 20A CKT BKR CKT # 2	12	35	120V AC SV.



BUSSMAN 3 AMP. FUSE TYPE BAN #12 AWG TIME-CURRENT CHARACTERISTIC CURVES

For 125 V DC + 120 V AC SOLENOID VALVES Fuse Links. In

BASIS FOR DATA Standards Dated

1. Tests made at Volts a-c at p.f., Starting at 25C with no initial load

2. Curves are plotted to Test points so variations should be

No.

Date

FIGURE 9 - 125VDC & 120VAC Solenoids

CALCULATION SHEET

BECHTEL

CALC. NO. ______ REV. NO. ______

ORIGINATOR ______ DATE ______ CHECKED ______ DATE ______

PROJECT ______ JOB NO. ______

SUBJECT TABLE 8 - CRDM SHEET NO. SAT 1 of 2

SERVICE				PRIMARY PROTECTION	PENET. CABLE SIZE	LOAD (KW)	REMARKS
CRDM	#1	STA. GRIP.	GROUP A	10 AMP FUSE	6	2.15	
	#2						THE 10 AMP FUSES ARE CHASE SHAWMUT A25X10.
	#3						
	#4						
	#1		GROUP B				THE 30 AMP FUSES ARE CHASE SHAWMUT A60X30
	#2						
	#3						THE 50 AMP FUSES ARE CHASE SHAWMUT A60X50
	#4						
	#1		GROUP C				
	#2						THE 150 AMP FUSES ARE CHASE SHAWMUT A60X150
	#3						
	#4						
CRDM	#1	LIFT	GROUP A	50 AMP FUSE	2	10.75	
	#2						
	#3						
	#4						
	#1		GROUP B				
	#2						
	#3						
	#4						
	#1		GROUP C				
	#2						
	#3						
	#4						

Table

CALCULATION SHEET

BECHTEL

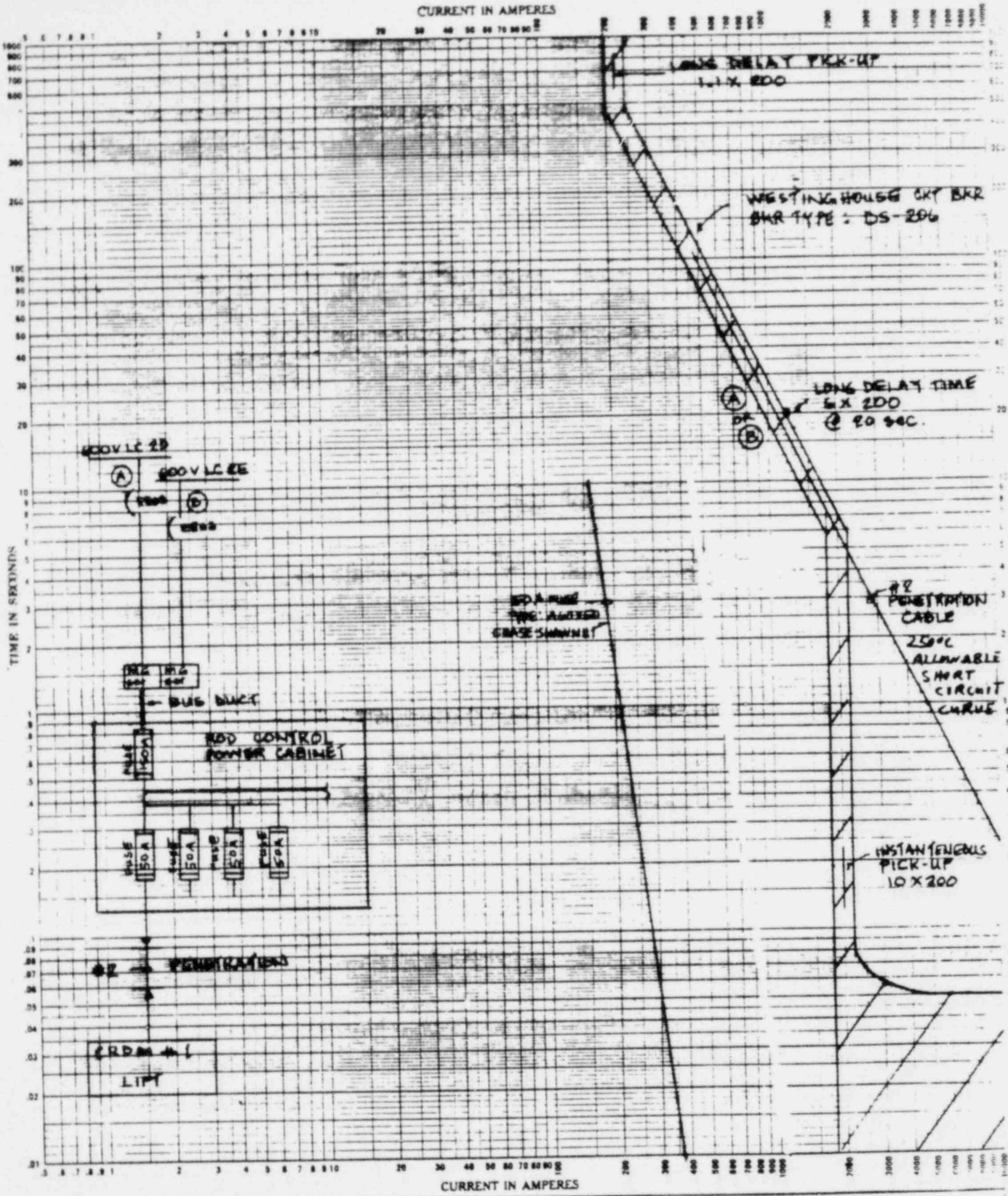
ORIGINATOR ______ DATE ______ CALC. NO. ______ REV. NO. ______

CHECKED ______ DATE ______

PROJECT ______ JOB NO. ______

SUBJECT TABLE 8 - CRDM SHEET NO. SKT-242

SERVICE				PRIMARY PROTECTION		PENET. CABLE SIZE	LOAD (KW)	REMA[illegible]S
CRDM	#1	MOV. GRIP	GROUP A	10 AMP FUSE		7	2.15	
	#2							
	#3							
	#4							
	#1		GROUP B					
	#2							
	#3							
	#4							
	#1		GROUP C					
	#2							
	#3							
	#4							



PENETRATION CABLE #2 AWG

TIME-CURRENT CHARACTERISTIC CURVES

For CONTROL ROD DRIVE MECHANISM .... Fuse Links. In ....

BASIS FOR DATA Standards .... Dated ....

1. Tests made at .... Volts a-c at .... p-f., Starting at 25C with no initial load ....

2. Curves are plotted to .... Test points so variations should be ....

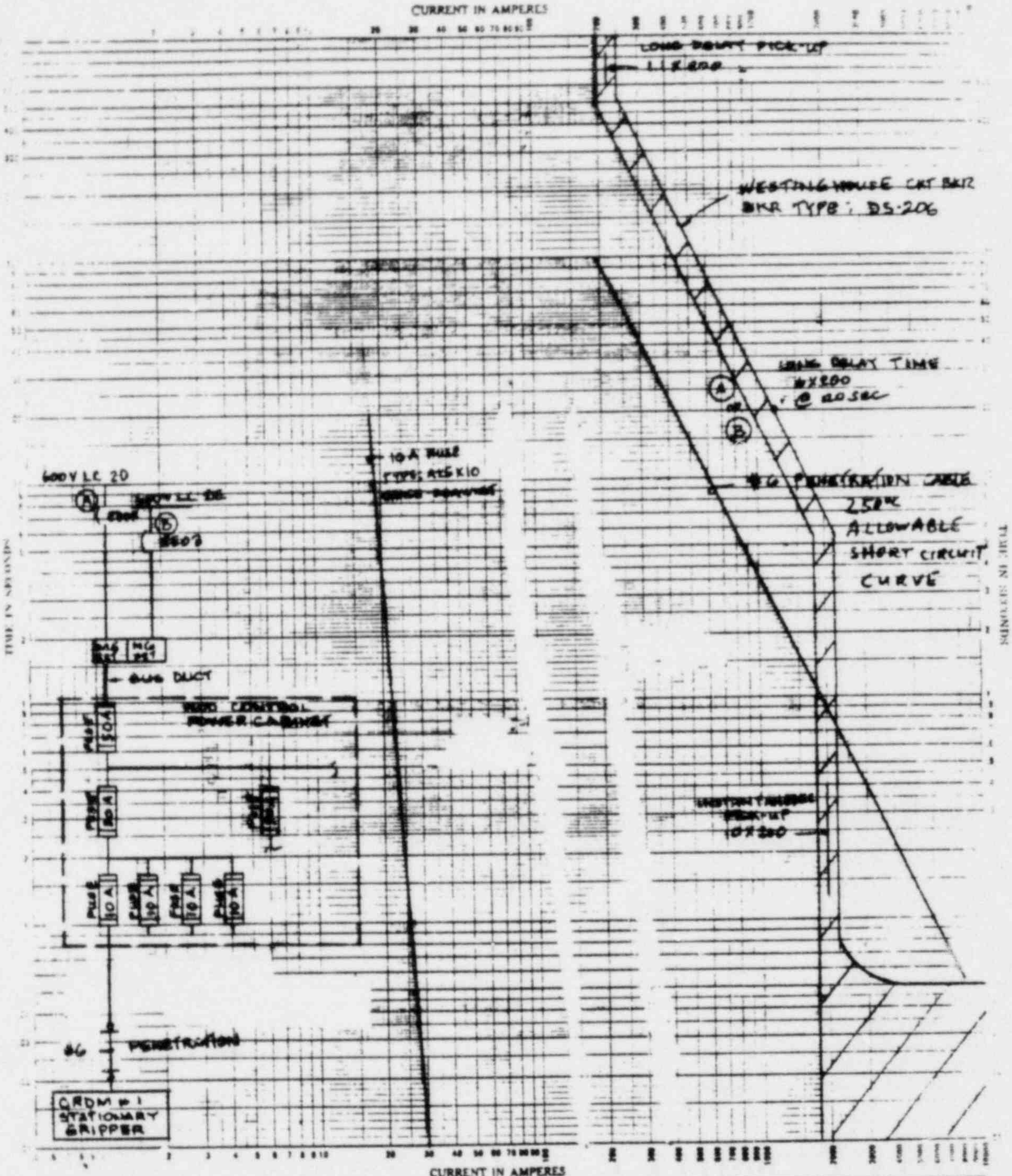
No.

Date

TIME-CURRENT CHARACTERISTIC 48 5257

KEUFFEL & ESSER CO.

FIGURE 10 - CRDM LIFT



PENETRATION CABLE #6 AWG — TIME-CURRENT CHARACTERISTIC CURVES

For CONTROL ROD DRIVE MECHANISM — Fuse Links. In

BASIS FOR DATA Standards .... Dated ....

1. Tests made at .... Volts a-c at .... p.f., Starting at 25C with no initial load
2. Current values plotted to .... Test points so variations should be ....

No.
Date

48 5257

FIGURE 11 - CRDM Stationary Gripper

BECHTEL

CALCULATION SHEET

ORIGINATOR ____ DATE ____ CALC. NO. ____ REV. NO. ____

PROJECT J.M. FARLEY NUCLEAR UNIT 2 ____ CHECKED ____ DATE ____

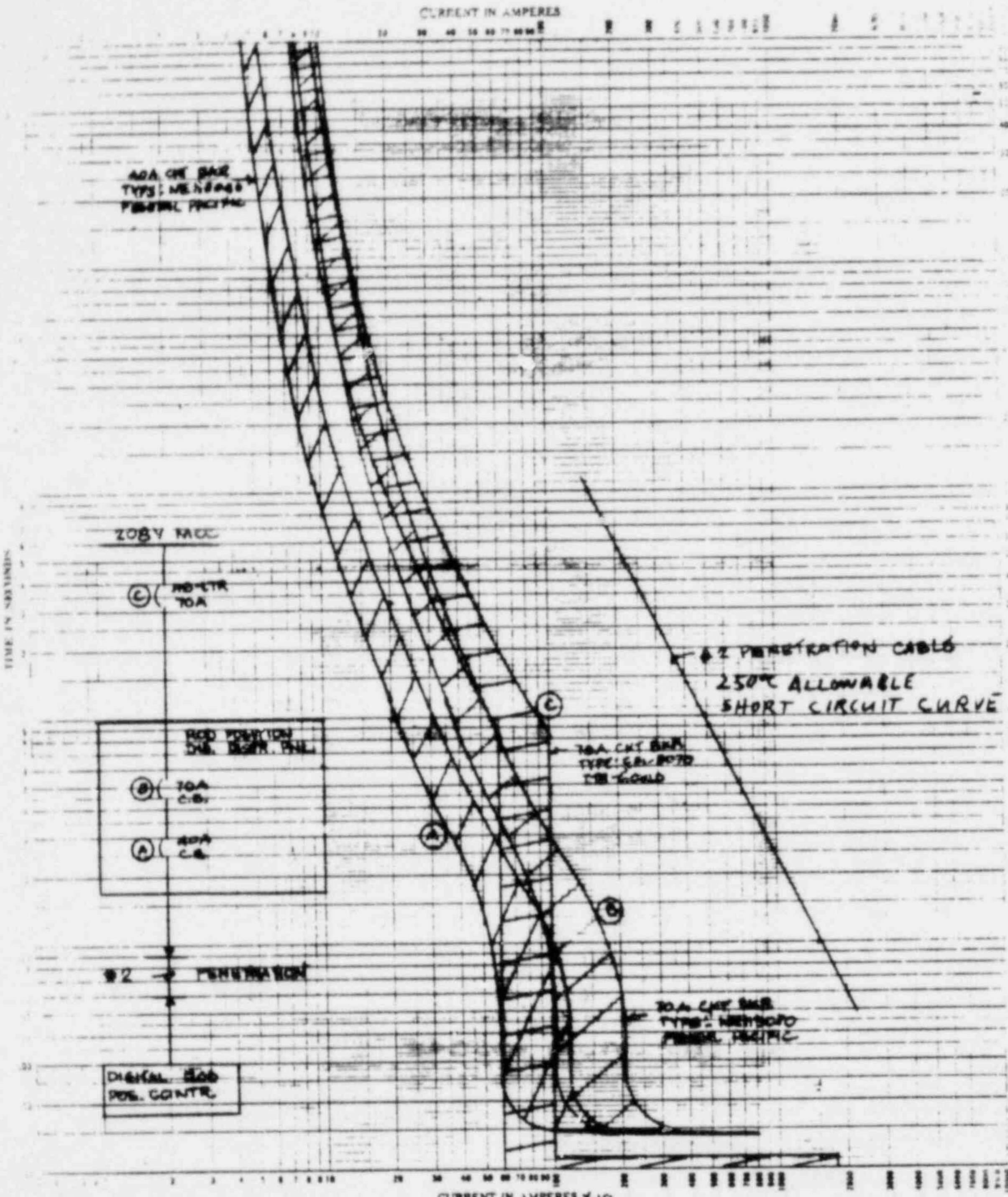
SUBJECT DIGITAL ROD POSITION CONTROL ____ JOB NO. ____ SHEET NO. 1 of 1

PENETRATION PROTECTION

SERVICE	PRIMARY PROTECTION	SECONDARY PROTECTION		PENET CABLE SIZE	REMARKS
	N2C11 L008-N	N2C11 L008-N	208V MCC HDLN6 OR HBRL7 *		
DIGITAL ROD POS. IND. PNL 2A	40 AMP BKR	70 AMP BKR	70 AMP BKR	2	* 208V MCC'S HDLN6 OR HBRL7 ARE REDUNDANT FEEDS FOR N2C11L008-N. A MECHANICAL INTERLOCK IS PROVIDED ON THE 70 AMP MAIN BREAKERS IN N2C11L008-N.
DIGITAL ROD POS. IND. PNL 2B	40 AMP BKR	70 AMP BKR	70 AMP BKR	2	

TABLE 9 - RPI

Table 9



PENETRATION CABLE #2 AWG

TIME-CURRENT CHARACTERISTIC CURVES

For RPI .... Fuse Links In ....

BASIS FOR DATA Standards .... Dated ....

1. Tests made at .... Volts a-c at .... p.f. Starting at 25C with no initial load ....

2. Curves are plotted to .... Test points so variations should be ....

No ....

Date ....

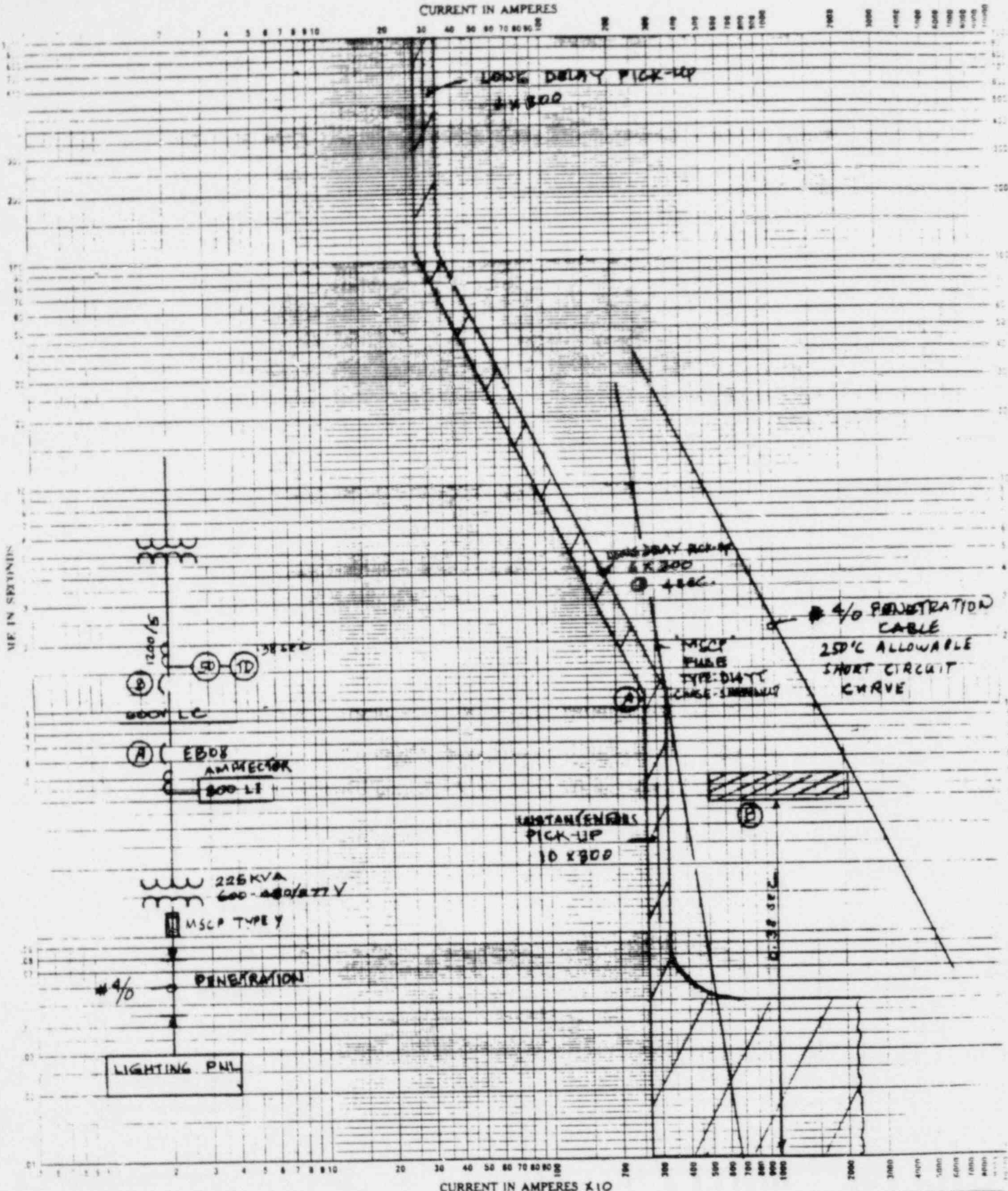
FIGURE 11A - RPI

SERVICE		600V AC LOAD CTR	CKT BKR FRAME/ SENSOR R'G	SETTING	PROPOSED BACK UP PROTECTION	PENET CABLE SIZE	LOAD (KW)	REMARKS
LIGHTING PANEL	2Q	EB08	800/300	L.D.=300 INST.=3000	"MSCP" FUSE TYPE Y	4/0	30	
↓	2R	↓	↓	↓	↓	↓	↓	
↓	2P	EC13	↓	↓	↓	↓	↓	

SERVICE	PRIMARY PROT. 600V MCC	EXISTING BACK UP PROT.			PENET. CABLE SIZE	LOAD (KW)	REMARKS
		600V AC LOAD CTR	CKT BKR FRAME/ SENSOR R'G	SETTING			
LIGHTING PANEL 2Q	100 AMP ITE-GOULD TYPE HE3-B100	EA05	800/400	L.D.=500 SD=2400	4/0	30	

TABLE 10

1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24 25 26 27 28 29 30 31 32 33 34 35 36



PENETRATION CABLE #4/0 AWG .... TIME-CURRENT CHARACTERISTIC CURVES

For LIGHTING PANEL .... Fuse Links. In ....

BASIS FOR DATA Standards .... Dated ....

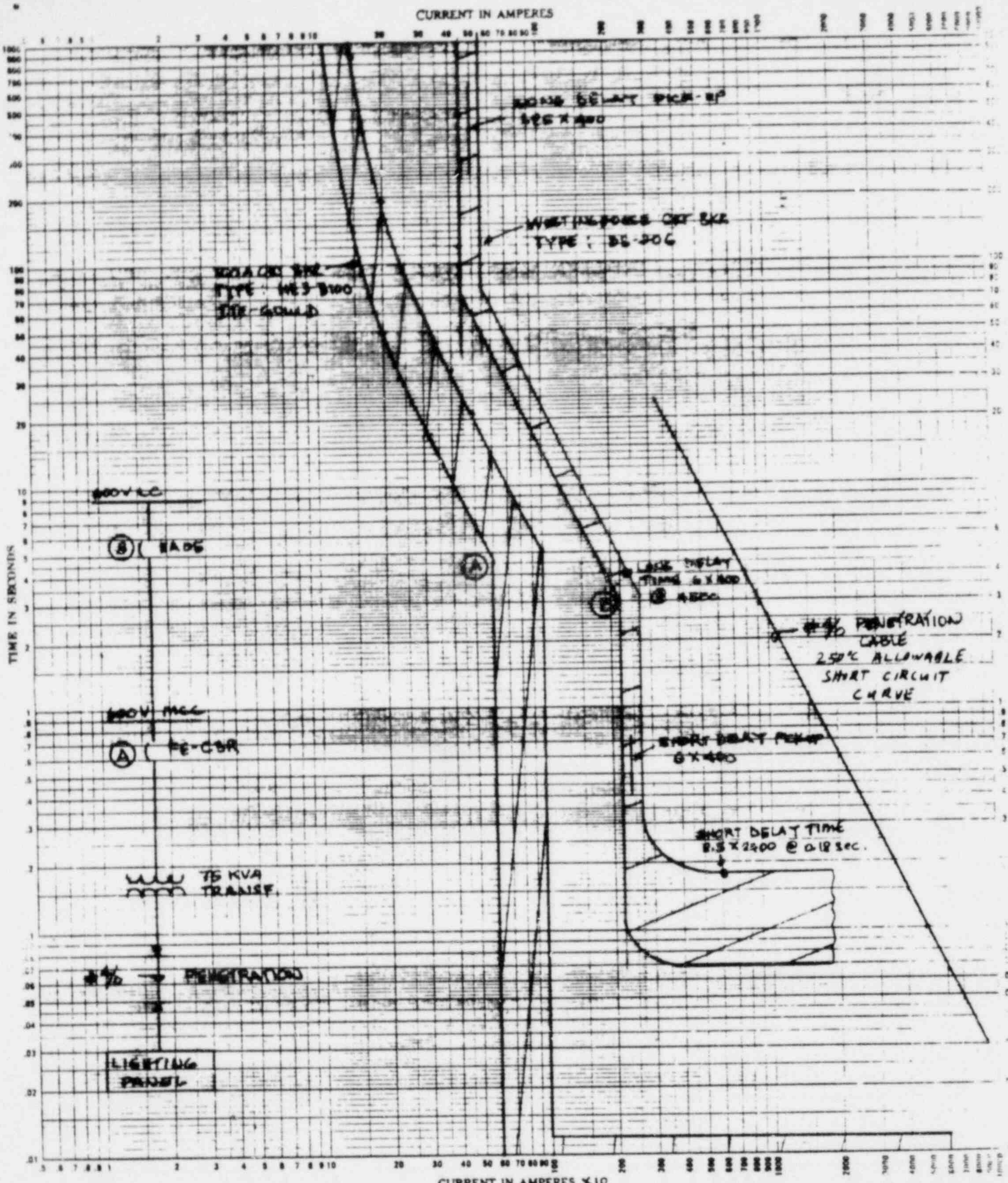
1. Tests made at .... Volts a-c at .... p.f., Starting at 25C with no initial load ....

2. Curves are plotted to .... Test points so variations should be ....

No. ....

Date ....

FIGURE 12



Penetration cable #4/0 AWG .... TIME-CURRENT CHARACTERISTIC CURVES

For Lighting Panel .... Fuse Links. In ....

BASIS FOR DATA Standards .... Dated ....

1. Tests made at .... Volts a-c at .... p.f., Starting at 25C with no initial load ....

2. Curves are plotted to .... Test points so variations should be ....

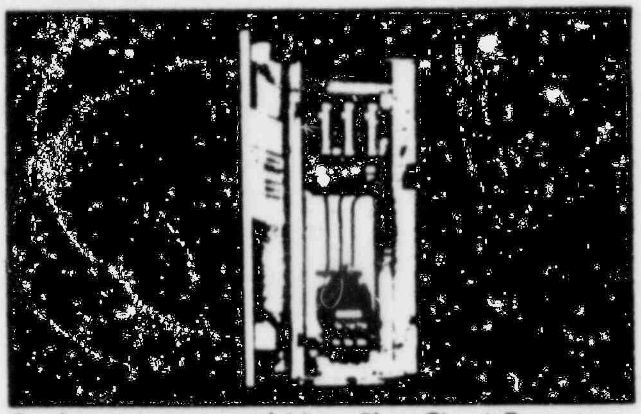
No.

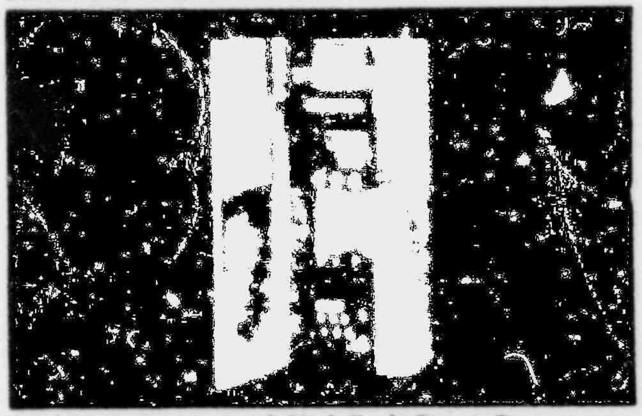
Date

FIGURE 13

TIME-CURRENT CHARACTERISTIC 48 5257

TOTAL PROTECTION


Combination starter with Motor Short Circuit Protectors.


Combination starter with High Fault Circuit Protectors.

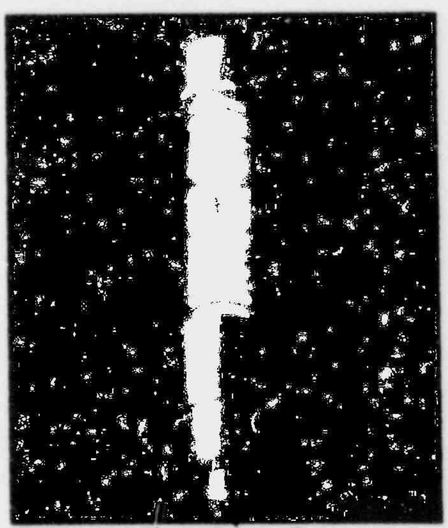
I-T-E's combination starters with Motor Short Circuit Protectors (MSCPs)* or High Fault Circuit Protectors (HFCPs)* provide more overcurrent protection than any other device available. They bring to the motor branch circuit the first system engineered to provide total overcurrent protection. MSCPs, used with fusible type combination starters, and HFCPs, used with circuit breaker type combination starters, clear faults up to 100,000 amperes.

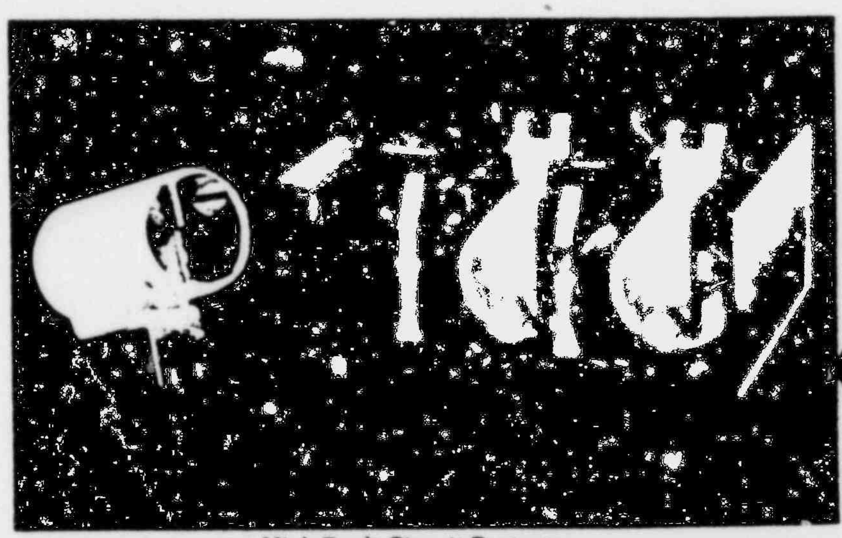
MSCPs are used in place of fuses and are precisely coordinated with the starter's heaters. HFCPs are used in conjunction with circuit breakers and are precisely coordinated with them and with the starter's heaters. The heaters and circuit breakers provide protection against lower level overcurrents. The MSCPs and HFCPs take over where these other devices leave off and protect against the higher levels of current.

The result is complete, uninterrupted protection from full load motor current all the way up to 100,000 amperes at 600 V AC. This total protection means that the devices guard against all damage to heaters, relays, contacts and all other starter elements. Even if the overcurrent is caused by damage within the motor itself, MSCPs and HFCPs greatly limit the motor damage.

MSCP combination starters are available in NEMA sizes 0 through 5. HFCP combination starters are available in NEMA sizes 0 through 4. Both are UL listed and include patented circuitry to prevent a blown energy limiter from causing single phasing.

*patent pending

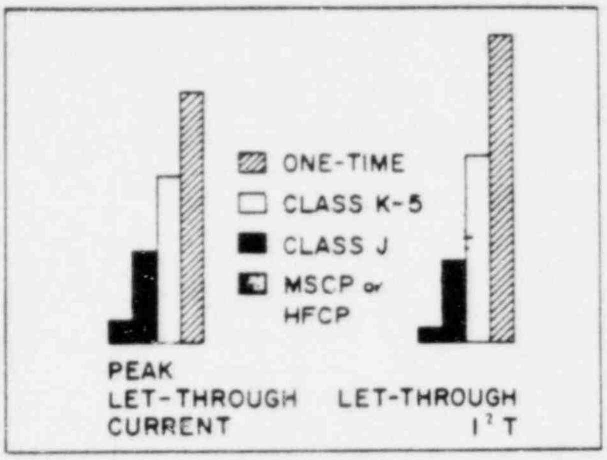

Motor Short Circuit Protector


High Fault Circuit Protectors

Quick Current Interruption

MSCPs and HFCPs are special types of energy-limiting fuse-like devices. Typical single and dual element fuses are designed to protect against overloads as well as short circuits. As a result, compromises must be made in the design of these devices. In MSCPs and HFCPs this is not necessary. Their purpose is to protect against short circuits only. This allowed I-T-E to design them with extremely short fault-clearing time.

High level fault clearing with an MSCP or HFCP is virtually instantaneous. These devices limit let-through energy and peak let-through current to a fraction of the let-throughs experienced with Class J fuses selected according to NEC article 430.



Protection Where It Counts Most

Extending protection up to 100,000 amperes is important with today's higher available fault currents. But just as important, or even more so, is the complete motor branch circuit protection in the range from locked rotor current up to 10,000, 20,000 or 30,000 amperes.

This is where most motor branch circuit overcurrents occur. This is where most damage is done. This is where MSCPs and HFCPs save the most dollars, in terms of both equipment repairs and extended downtime.

Coordination—The Key

Section 430-52 of the 1971 National Electrical Code recognizes the MSCP and HFCP principle to give complete protection to motor branch circuits when used in coordination with the other protection elements in a combination starter. Coordination of an MSCP with the overload heaters, and coordination of an HFCP with the instantaneous-trip circuit breaker is absolutely essential.

This coordination is the heart of the "total protection" system that I-T-E has developed. Each size of MSCP is designed specifically for operation with properly coordinated heaters. The same is true for HFCPs and the heaters and circuit breakers used with them.

This coordination is so important that all of the combination starter elements—starter, heaters, switch or circuit breaker and MSCP or HFCP—must be tested together. Factory-prepared charts designate the proper heaters, breakers and MSCPs or HFCPs to be used together to obtain total protection for each application. MSCPs are listed and identified not by current level that they are designed for but simply by a letter designation as a measure against improper applications. HFCPs are designated by the current ratings of the circuit breakers for which they are designed.

Elements Work Together

In MSCP combination starters, the devices are coordinated so that the MSCP will be inoperative in the overload relay's normal operating range. At less than 13 times full load motor current, the MSCP begins to provide protection and continues it up to 100,000 amperes at 600 V AC.

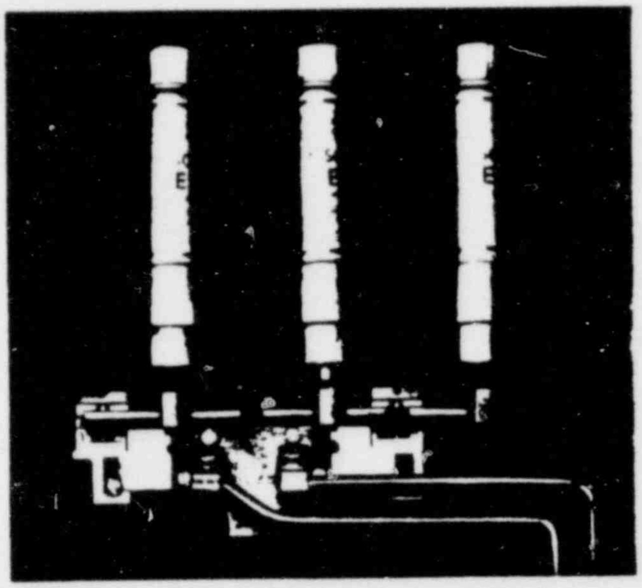
In HFCP combination starters, the overload relay protects the circuit in its normal range from full load motor current up to 13 times that value. The instantaneous-trip breaker provides protection from just below that point up to the upper limit of its heater-protecting capability. From this point up to 100,000 amperes at 600 V AC, the HFCP provides protection.

With both types of combination starters, each type of protective device becomes active for the range where its advantages are maximum. At the same time there is no gap in protection and no nuisance blowing or tripping.

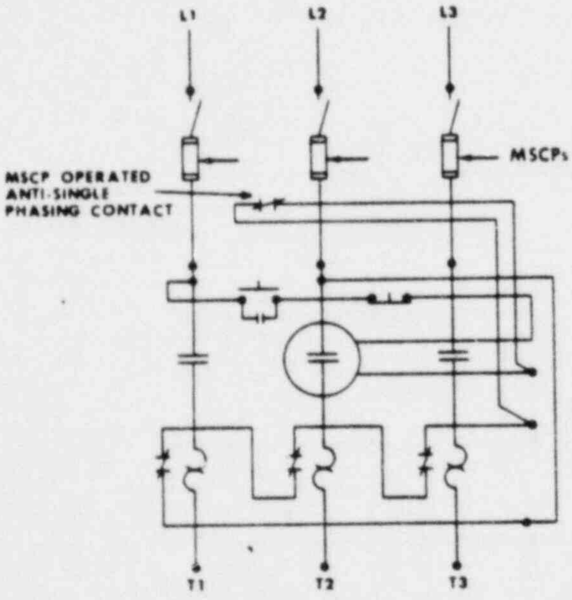
Anti-Single Phasing

I-T-E's MSCPs and HFCPs have different types of systems which prevent causing single phasing. When one of these devices blows, it provides for very quick cutoff of operating current in all three phases.

An MSCP has a TRIGGER® which extends from its casing when it blows. This provides two advantages. It indicates which phase has sustained the fault. And, more important, it operates an auxiliary contact which opens all three phases by dropping out the starter. This TRIGGER feature is an I-T-E exclusive.

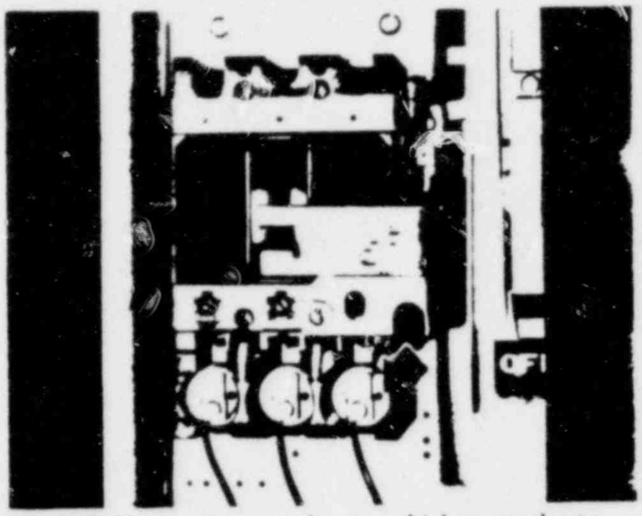


MSCPs contain TRIGGERS which protrude and operate an auxiliary contact to open all three phases, preventing a blown MSCP from causing single phasing.

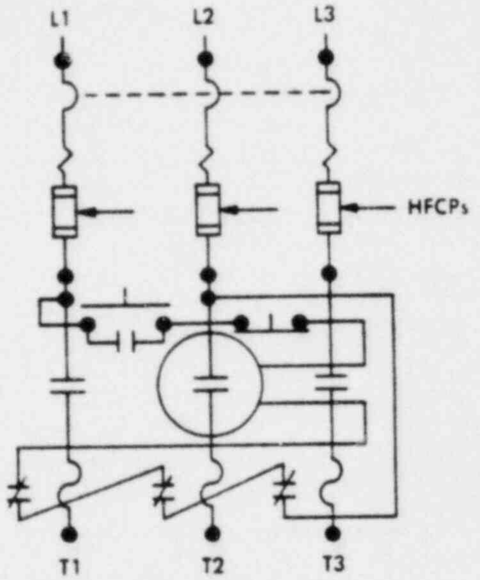


MSCP Combination Starter Circuit

When an HFCP blows, the circuit breaker is tripped through a circuit designed for this specific purpose. The HFCP limits let-through current immediately and the circuit breaker opens all three phases in less than one cycle.



Each HFCP contains an indicator which protrudes to signal which one has blown. Single phasing from a blown HFCP is prevented by a circuit within the blown limiter. This circuit trips the breaker when a fault occurs in any phase.



HFCP Combination Starter Circuit

Can't Void Protection

MSCP holders are designed so that they will not accept standard fuses. Six different holder sizes are used for the six starter sizes, 0 through 5. Each specific holder is designed for use with a certain size starter. It will accept any of the various MSCP sizes intended for that starter. And it will accept devices designed for smaller sizes, but not those for larger starter sizes.

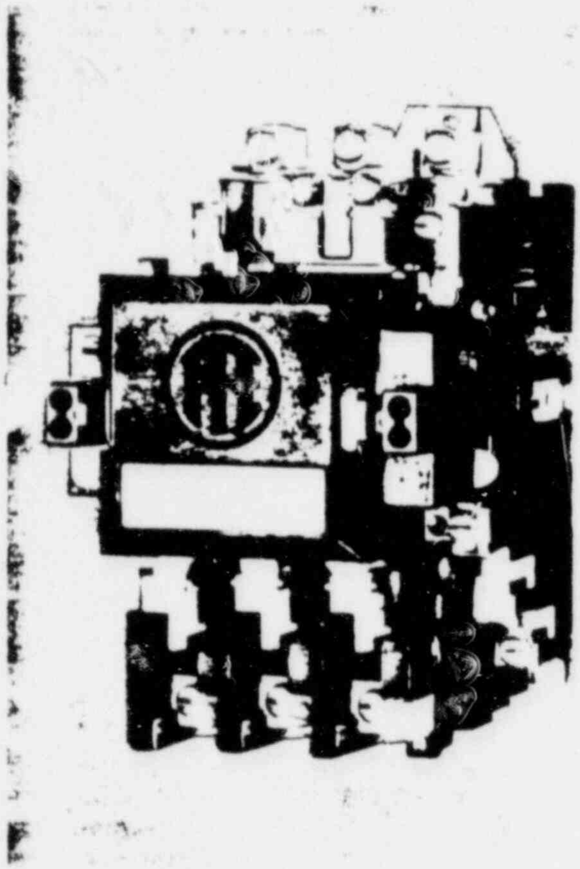
If a misapplication should be made, combining the largest size MSCP for a certain starter size with the lowest rated heater, any starter damage that might result during a short circuit is minimal.

HFCP holders, which will not accept fuses, have rejection keys for each size circuit breaker. They are designed so that only the correct size HFCP can be inserted. Rejection keys in the HFCPs prevent insertion of HFCPs larger or smaller than the proper ones for a given breaker.

Wide Selection of Combination Starters

I-T-E MSCP and HFCP combination starters are built around the dependable Class A20 starter. All of the installation and maintenance advantages of this starter, proven by extensive experience, are retained. MSCP combination starters are available in NEMA sizes 0 through 5, in NEMA 1, 4 and 12 enclosures. HFCP combination starters are available in NEMA sizes 0 through 4, in NEMA 1, 4, 12, 7 and 9 enclosures. All of these modern enclosures, except explosion-proof types, have flange-mounted disconnect handles that maintain control of the switch or circuit breaker even when the door is open.

I-T-E STARTERS SIMPLIFY INSTALLATION



The starter components in MSCP and HFCP combination starters give the user the ultimate in design, ease of maintenance and dependability for millions of operations. Check these features for cutting installation, inspection and maintenance time and for broad applicability.

STRAIGHT THROUGH WIRING. No wiring errors or wasted time. The LINE comes in at the top . . . the LOAD terminals are at the bottom.

CONNECTIONS ARE UP FRONT where you can easily see and reach them. Installation, inspection, general maintenance and replacement take less time and cost less money.

MOUNTING VERSATILITY is another advanced I-T-E motor control feature. The starter can be installed in any position in the vertical plane. This means more freedom, whatever your application needs. I-T-E's horizontal magnet design obsoletes gravity dropout.

AUXILIARY INTERLOCK provides one normally open or normally closed contact or both (all independent circuits). Up to three interlock blocks can be furnished without increasing outline dimensions or adding special insulating barriers.

NO TOOLS REQUIRED to inspect contacts. The cover cap snaps off to expose all contacts. A safety interlock feature prevents contacts from closing with cover cap off.

EASY CONTACT REPLACEMENT. You don't need to disconnect a single wire or remove any accessory. Movable contacts, held by spring-loaded clips, slip straight out. The stationary contacts are each held by one screw. All contacts are symmetrical on each starter size and will fit in any position.

COIL is encapsulated in hot-molded insulating compound to eliminate moisture and mechanical failure. Wired connections aren't necessary, owing to built-in contacts. Forget broken coil leads and insulation wear.

PLUG-IN OVERLOAD RELAYS are a real boon to the man on the job. Fast installation. No wiring errors. The third overload relay is furnished as standard with no increase in starter dimensions.

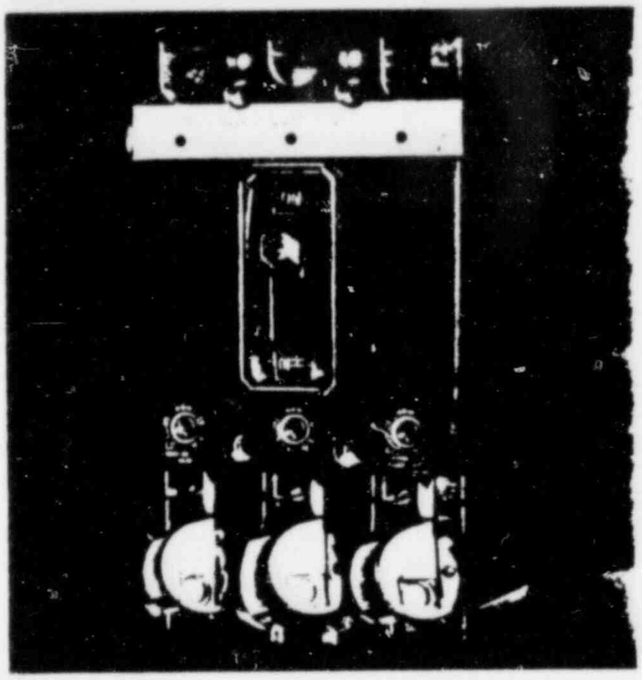
IDENTICAL BASIC STRUCTURE. You needn't contend with different problems in different starter sizes. I-T-E's total design approach makes starters identical, sizes 0-5.

I•T•E TIME TESTED DISCONNECT SWITCHES

MSCPs mount in holders on the disconnect switch with visible contacts but not visible arcs. Window openings in the switch front show the double-break contacts when the switch is open, and a red "ON" flag when the switch is closed. Closing of contacts and arcing take place safely inside arc chambers. All exposed current-carrying parts, including the MSCP holders, are dead when the switch is open. Auxiliary electrical interlocks are available for switch mounting when an external control source is brought into the starter enclosure.

- DOUBLE-BREAK ACTION . . . QUICK-MAKE, QUICK-BREAK
- FRONT-MOUNTED COMPACT MSCP HOLDERS FOR EASIER MSCP INSTALLATION AND REPLACEMENT
- DIRECT-ACTION OPERATION FROM FLANGE-MOUNTED HANDLE
- HORSEPOWER RATED
- VISIBLE CONTACTS WITHOUT VISIBLE ARCS
- STRAIGHT-THROUGH WIRING, TOP TO BOTTOM. NO WIRE BENDING. NEATER ARRANGEMENTS.
- SILVER-PLATED CURRENT-CARRYING PARTS THROUGHOUT
- PROVISION FOR AUXILIARY INTERLOCKS TO EXTEND RANGE OF CONTROL
- DEAD-FRONT SAFETY WITH ISOLATED CONTACTS AND SHIELDED CURRENT-CARRYING PARTS
- ENCLOSED ARC CHAMBERS FOR MAXIMUM SAFETY, LONGER CONTACT LIFE, LESS MAINTENANCE

I·T·E INSTANTANEOUS TRIP CIRCUIT BREAKERS



The ETI magnetic instantaneous trip circuit breaker can be adjusted to eliminate tripping from motor rting currents. But it still provides split-second operation (less than one cycle) when dangerous overcurrents occur. HFCPs mount in holders below the ETI breaker. They are installed easily from the front, and attach to the load side of the breaker.

- INSTANTANEOUS TRIPPING UNDER SHORT CIRCUIT CONDITIONS WITHOUT NUISANCE TRIPPING
- RECESSED TERMINALS FOR DEAD-FRONT SAFETY
- DIRECT OVER-CENTER TOGGLE HANDLE GIVES QUICK-MAKE QUICK-BREAK OPERATION
- STRAIGHT-THROUGH WIRING. LINE ENTERS AT TOP, LOAD CONNECTS AT BOTTOM
- SILVER-PLATED CURRENT-CARRYING PARTS THROUGHOUT FOR LONG LIFE, LOW WATTAGE LOSS
- PROVISION FOR AUXILIARY CONTACTS, NORMALLY OPEN OR CLOSED, SHUNT TRIP OR UNDERVOLTAGE DEVICES
- CONVENIENT BREAKER TRIP ADJUSTMENT—THREE DIALS ON FRONT OF BREAKER
- TRIP-FREE MECHANISM PREVENTS CONTACTS FROM BEING HELD CLOSED AGAINST OVERCURRENT

MSCP COMBINATION STARTERS

Class A40 Combination Starters—Non-Reversing

[illegible]

Class A42 Combination Starters—Reversing

[illegible]

Class A44 Combination Starters—Two-Speed

[illegible]

◆ For 25- and 50-Hertz applications, use 60-hertz Catalog No. and specify Hertz.

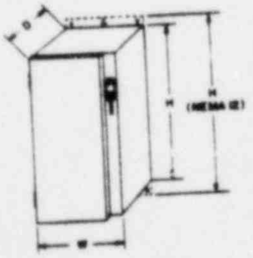
† Suitable for NEMA 5, dust-tight applications. Reset button furnished when requested.

NOTE: These combination starters do not contain MSCPs or heater elements when shipped. MSCPs and heaters must be ordered separately from the tables on the opposite page.

§ Catalog numbers shown for 3-phase separate winding motors apply only when motor windings are star connected. When motor windings are connected open Delta, use 3-phase single-winding starters.

* Starter is limited to the maximum horsepower shown. In addition, motor full-load current must be less than the ampere rating for the same size A10 contactor.

Combination Starter Enclosure Dimensions—For Both MSCP and HFCP Types



Non-Reversing

[illegible]

• Add 1" for handle depth.

Reversing

[illegible]

• Add 1" for handle depth.

Two-Speed

[illegible]

• Add 1" for handle depth.

HOW TO SELECT HEATERS AND MSCPs

For total circuit protection, first select the correct heater element. Nameplate full load motor current is the most important information for heater selection. Size of starter and ambient conditions are also necessary data for proper selection. The heater tables will also show what MSCP to use. MSCPs are designated by a letter corresponding to a heater size for each starter. Three MSCPs are required for each in combination starter.

HEATER SELECTION TABLES

[illegible]

Current at which heaters will trip overload relay with the knob at 100% mark in an ambient of 40°C is 1.25 times minimum full load motor current in tables. Heaters selected in this manner give 125% protection.

Size 0 & 1 Comb. Starters

[illegible]

* Maximum heater for size 0.

Size 2 Comb. Starter

[illegible]

Size 3 Comb. Starter

[illegible]

Size 4 Comb. Starter

[illegible]

Size 5 Comb. Starter

[illegible]

Replacement MSCPs

[illegible]

MEETING SUMMARY DISTRIBUTION

Docket File
NRC PDR
Local PDR
NSIC
TIC
TERA
NRR Reading
LB #2 File
H. Denton
E. Case
D. Eisenhut
R. Purple
B. J. Youngblood
A. Schwencer
F. Miraglia
J. Miller
G. Lainas
R. Vollmer
J. P. Knight
R. Bosnak
F. Schauer
R. E. Jackson
Project Manager S. Kintner
Licensing Assistant MService
Attorney, OELD
I&E (3)
ACRS (16)
R. Tedesco
G. Lear
V. Noonan
S. Pawlicki
V. Benaroya
Z. Rosztoczy
W. Haass

D. Muller
R. Ballard
W. Regan
D. Ross
P. Check
R. Satterfield
O. Parr
F. Rosa
W. Butler
W. Kreger
R. Houston
T. Murphy
L. Rubenstein
T. Speis
W. Johnston
J. Stolz
S. Hanauer
W. Gammill
F. Schroeder
D. Skovholt
M. Ernst
R. Baer
C. Berlinger
K. Kniel
G. Knighton
A. Thadani
D. Tondi
D. Vassallo
J. Kramer
P. Collins
D. Ziemann

NRC Participants:

Others:

BCC: Applicant & Service List