CALCULATION
ED-Q0268-88463
480 V REACTOR MOV BOARDS 3A/B

TVA 10697 (DNE 4-86) 72164A EBASCO SERVICES INC. Q. A. Record
-E044 CALCULATION COVER SHEET S 1 of 133

TITLE FUSE PROGR 480V REACTOR MOV BOARDS 3A/B	PLANT BFNP UNIT 2
PREPARING ORGANIZATION EED/EBASCO	KEY NOUNS (Consult RIMS DESCRIPTORS LIST) FUSE EVALUATION
BRANCH/PROJECT IDENTIFIERS ED-Q0 268-88 463	Each time these calculations are issued, preparers must ensure that the original (RO) RIMS accession number is filled in.
APPLICABLE DESIGN DOCUMENT(S) AS REFERENCED	Rev (for RIMS' use) / RIMS accession number R0 / R_ / R_ / R_
SAR SECTION(S): N/A; UNID SYSTEM(S): 268	

	Revision 0	R1	R2	R3
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Use form TVA 10534 if more space required.

Safety-related? Yes ☒ No ☐

Statement of Problem

EVALUATE FUSE TYPES INSTALLED AT BROWNS FERRY NUCLEAR PLANT (BFN) TO DETERMINE WHETHER THESE FUSE TYPES ARE ACCEPTABLE OR SHALL BE REPLACED WITH ACCEPTABLE FUSE TYPES.

Abstract

These calculations contain an unverified assumption(s) that must be verified later. Yes ☐ No ☒

CLASSIFICATION: ESSENTIAL

DIRECT DESIGN INPUT

THIS CALCULATION DOCUMENTS ADHERENCE TO THE FOLLOWING STANDARDS:

IEEE:
242-1986
323-1974
384-1981

ANSI:
C37.27-72
C37.46-81
C37.48A-80
C37.47-81

ANSI/UL:
198B-82
198C-81
198D-82
198L-32
198M-82

ANSI/NFPA:
70-1987

FEDERAL CODE AND STANDARD:
10CFR50 APP. B
10CFR50 APP. R
10CFR PART 50.49

ICEA:

P32-382-1969

☐ Microfilm and store calculations in RIMS Service Center.

☐ Microfilm and return calculations to

Microfilm and destroy. ☐

Address:

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VISION LOG

Revision No.	DESCRIPTION OF REVISION	Date Approved
0	INITIAL ISSUE	5/16/88

TVA 10534 (EN DES-4-78)

TABLE OF CONTENTS

BB: 8/17/88

BB: 8/20/88

10 PURPOSE

THE PURPOSE OF THIS CALCULATION IS TO DETERMINE THE PROPER FUSE SIZE AND TYPE FOR THE 480V. REACTOR MOV. BOARDS 3A/B (SYS. #268) WHICH ARE REQUIRED FOR UNIT 2 RESTART (REF. 5.22)

20 CRITERIA

THE CRITERIA FOR EVALUATING AND SELECTING PROPER FUSE TYPE FOR THE 480 V. REACTOR MOV BOARDS 3A/B IS AS FOLLOWS:

2.1 FUSE CIRCUITS WERE CATEGORIZED BY CIRCUIT CONFIGURATION AND CIRCUIT VOLTAGE. THE WORST CASE LOAD FOR EACH CATEGORIZED GROUP WAS ANALIZED FOR FUSE SIZING.

2.2 THE BASIC CRITERIA FOR THE APPLICATION OF THE FUSE IS THAT IT MUST BE SELECTED FOR VOLTAGE RATING, CURRENT-CARRYING CAPABILITY AND INTERRUPTING CAPACITY.

2.3 FUSE COORDINATION IS NOT A PART OF THIS EFFORT.

2.4 FUSE SELECTION CRITERIA FOR NON-EQ AND NON-APPENDIX 'R' FUSES IS IN ACCORDANCE WITH REF. 5.27 AND/OR THE CRITERIA BELOW:
TOTAL LOAD IN THE CIRCUIT WILL BE DETERMINED BY MULTIPLYING THE LARGEST LOAD BY A SAFETY FACTOR OF 1.25 AND ADDING ALL REMAINING LOADS IN THE CIRCUIT.

2.5 UNDER ELEVATED AMBIENT TEMPERATURE CONDITIONS OF HIGHER THAN 40°C LOAD CURRENT FOR FUSES WILL BE COMPENSATED FOR TEMPERATURE CORRECTION AS REQUIRED (REF. 5.21)

2.6 CALCULATION OF LOAD IS BASED ON OPERATING VOLTAGE NOT RATED VOLTAGE OF DEVICE [SEE SECT. 2.18 EQ (27) THROUGH EQ (29).]

2.7 FUSES INSTALLED IN CLASS 1E BOARDS LOCATED OUTSIDE HARSH ENVIRONMENTAL ZONES SHALL BE CLASS 1E ED AS CLASS 1E FUSES (REF. 5.19A) REGARDLESS OF CIRCUIT FUNCTION/SERVICE OF END DEVICE/EQUIPMENT.

2.0 CRITERIA [CONTINUED]

2.8 FUSES INSTALLED IN CLASS 1E BOARDS LOCATED IN HARSH ENVIRONMENTS SHALL BE CLASSIFIED AS CLASS 1E-EQ FUSES (10 CFR 50.49) REGARDLESS OF END DEVICE/EQUIPMENT CLASSIFICATION (REF. 5.19A)

2.9 FUSE UNIQUE IDENTIFICATION (UNID) NUMBERS AND EXISTING FUSE TYPES WERE OBTAINED FROM REFERENCE 5.19 IF NO 'UNID' EXISTED A 'UNID' NUMBER WAS OBTAINED FROM THE BFNP ELECTRICAL MAINTENANCE DEPARTMENT.

2.10 SPARE FUSES WILL BE NOTED BUT NOT EVALUATED, AND WILL BE LISTED AS 'SPARE' IN SECTIONS 6.0, 6.3 AND 6.4.

2.11 TRANSFORMER INRUSH CURRENT IS DETERMINED BY MULTIPLYING FULL LOAD CURRENT OF TRANSFORMER PRIMARY BY 12 FOR NORMAL CONDITION AND 25 TIMES FOR WORST CASE. (REF. 3.1)

2.12 FOR TRANSFORMERS WITH PRIMARY FULL LOAD CURRENT LESS THAN OR EQUAL TO 2.0 AMPS, A MULTIPLIER OF 5 WILL BE USED FOR DETERMINING MAXIMUM ALLOWABLE CURRENT OF PRIMARY, AND MULTIPLIER OF 1.67 WILL BE USED FOR DETERMINING MAXIMUM ALLOWABLE CURRENT OF SECONDARY SIDE (REF. 5.9).

2.13 TRANSFORMER SECONDARY FUSE, WITHOUT PRIMARY FUSE, WILL BE SIZED AT 125 PERCENT OF FULL LOAD CURRENT. (REF. 3.10)

2.14 FUSES INSTALLED IN 480V. REACTOR MOV. BOARDS 3A/B WERE FOUND TO BE IN MILD ENVIRONMENTS, HOWEVER DURING ABNORMAL CONDITIONS THE TEMPERATURE RISE UP TO 43.3°C. (REF. DWG 47W225-1, REV. 0).

THEREFORE, FUSES WILL BE DERATED USING A TEMPERATURE CORRECTION FACTOR (T_C) FOUND IN SECTION 2.18, EQ (26).

2.0 CRITERIA [CONTINUED]

2.15 THE FOLLOWING CALCULATIONS AND DRAWINGS WERE UTILIZED TO IDENTIFY THE FUSES USED IN APPENDIX 'R' RELATED CIRCUIT IN THE BOARDS.

CALCULATION NO.	RIMS No.
BFEP-E1-86041 REV. 2	B22 861126 111
BFEP-E1-86019 REV. 5	B30 870903 003

DWG. No.	DESCRIPTION
45B900 SERIES REV. 0	CABLE LIST
45B901 SERIES REV. 1	EQUIPMENT LIST

2.16 THE FOLLOWING CALCULATIONS WERE UTILIZED TO IDENTIFY THE FUSES USED FOR PENETRATION PROTECTION CIRCUIT IN THE BOARDS.

CALCULATION NO.	RIMS No.
ED-Q2000-87068	B43870805942
ED-Q2000-87070	B43870805944
ED-Q2000-87067	B43870805941

17 TABLE A CONTAINS DESIGN INPUT DATA AND CROSS REFERENCES.
TABLE B CONTAINS SUMMARY OF RESULTS.
TABLE C CONTAINS CONCLUSION AND RECOMMENDATION.

7A FUSE SIZES ARE DERATED FOR THE MAXIMUM SUSTAINED TEMPERATURE (REFERENCE 47W225-2, NOTE D) USING THE MAXIMUM ALLOWED CURRENT OF THE END DEVICE OR TRANSFORMER (RS = 5.2). THE NORMAL SAFETY FACTOR HAS BEEN LOWERED. WHEN THIS NOTE IS REFERENCED, BASED UPON TEMPERATURE DURATION AND EVALUATING THAT (1) FUSE WILL CARRY INRUSH CURRENT AND (2) CARRY GREATER THAN FULL LOAD CURRENT FOR THE EVENT DURATION

2.18 FORMULAE USED IN CALCULATION
(SEE SECT. 2.19 FOR NOTES AND DEFINITION)

- FIND SINGLE PHASE FULL LOAD CURRENT:

$$I_L = \frac{VA}{V} \qquad \text{EQ-(1)}$$

- FIND INRUSH CURRENT:

$$I_R = I_L \times F_R \qquad \text{EQ-(2)}$$

- FIND MAXIMUM FUSE AMPERE RATING:

$$I_F = I_L \times F_F \qquad \text{EQ-(3)}$$

- FIND ALLOWABLE SHORT CIRCUIT CURRENT FOR INSULATED CU CONDUCTORS.
EQUATION (4) THROUGH (6) ARE DERIVED FROM REF. 3.19

$$\left[\frac{I_W}{A}\right]^2 t = 0.0297 \log \left[\frac{T_2+234}{T_1+234}\right] \qquad \text{eq. (4)}$$

$$I_W = \left\{\left\{0.0297 \log \left[\frac{T_2+234}{T_1+234}\right]\right\}(A^2)(t)^{-1}\right\}^{1/2}$$

$$\therefore I_W = \left\{\left\{0.0297 \log \left[\frac{484}{T_1+234}\right]\right\}(A^2)(t)^{-1}\right\}^{1/2}$$

$$I_W = \left\{\left\{0.0297 \log \left[\frac{484}{90+234}\right]\right\}(A^2)(t)^{-1}\right\}^{1/2}$$

$$\therefore I_W = \left\{\left\{0.0297 \log 1.49\right\}(A^2)(t)^{-1}\right\}^{1/2} \qquad \text{eq (5)}$$

2.18 FORMULAE USED IN CALCULATION [CONTINUED]

$$\therefore t = 0.0297 \log\left[\frac{484}{T_i + 234}\right]\left[\left(\frac{I_M}{A}\right)^2\right]^{-1} \quad \text{eq} - (6)$$

EQUATIONS (7) THROUGH (23) ARE DERIVED FROM REF. 5.9

- FIND FAULT CURRENT @ F_1:

$$I_{F_1} = I_{SC} \times M_T \quad \text{eq} - (7)$$

- FIND SHORT CKT. CURRENT @ TRANSF.

$$I_{SC} = I_L \times M_1 \quad \text{eq} - (8)$$

(1Φ):
$$I_L = \frac{VA}{V} \quad \text{eq} - (9)$$

$$M_1 = \frac{100}{\text{TRANSF } \%Z} \quad \text{eq} - (10)$$

$$\therefore I_{SC} = \left(\frac{VA}{V}\right)\left[\frac{100}{\text{TRANSF } \%Z}\right] \quad \text{eq} - (11)$$

(3Φ):
$$I_L = \frac{VA}{\sqrt{3}V} \quad \text{eq} - (12)$$

$$\therefore I_{SC} = \left(\frac{VA}{\sqrt{3}V}\right)\left[\frac{100}{\text{TRANSF } \%Z}\right] \quad \text{eq} - (13)$$

- FIND MULTIPLIER M_T:

$$M_T = \frac{1}{1 + f_1} \quad \text{eq} - (14)$$

$$f_1 = (2 \times L_1 \times I_{SC})(C \times E_L)^{-1} \quad \text{eq} - (15)$$

$$\therefore M_T = 1 \times \left[1 + \left(\frac{2 \times L_1 \times I_{SC}}{C \times E_L}\right)\right]^{-1} \quad \text{eq} - (16)$$

(1Φ):
$$\therefore I_{F_1} = \left\{\left(\frac{VA}{V}\right)\left[\frac{100}{\text{TRANF } \%Z}\right]\right\}\left\{1 \times \left[1 + \left(\frac{2 \times L_1 \times I_{SC}}{C \times E_L}\right)\right]^{-1}\right\} - (17)$$

(3Φ):
$$\therefore I_{F_1} = \left\{\left(\frac{VA}{\sqrt{3}V}\right)\left[\frac{100}{\text{TRANF } \%Z}\right]\right\}\left\{1 \times \left[1 + \left(\frac{2 \times L_1 \times I_{SC}}{C \times E_L}\right)\right]^{-1}\right\} - (18)$$

8.18 FORMULAE USED IN CALCULATION [CONTINUED]

- FIND FAULT CURRENT @ F_2:

$$I_{F2} = I_{F1} \times M_2 \quad -Eq\ (19)$$

$$M_2 = 1 \times [1 + f_2]^{-1} \quad -Eq\ (20)$$

$$f_2 = \frac{2 \times L_2 \times I_{F1}}{C \times E_L} \quad -Eq\ (21)$$

$$\therefore M_2 = 1 \times \left\{ 1 + \left[\frac{2 \times L_2 \times I_{F1}}{C \times E_L} \right] \right\}^{-1} \quad -Eq\ (22)$$

$$\therefore I_{F2} = I_{F1} \left\{ 1 + \left[\frac{2 \times L_2 \times I_{F1}}{C \times E_L} \right] \right\}^{-1} \quad -Eq\ (23)$$

- DETERMINE TEMPERATURE CORRECTION FACTOR (T_C) IN ORDER TO DERATE FUSE NAMEPLATE CURRENT. THIS WILL ENSURE FUSES WILL BE SIZED PROPERLY AND WILL PROVIDE ADEQUATE PROTECTION UNDER ABNORMAL CONDITIONS. EQUATIONS (24) THROUGH (27) ARE DERIVED FROM REF. 5.21

$$I_{NR} = I_N \times [T_C] \quad -Eq\ (24)$$

$$T_C = \left[\frac{150 - T_a}{125} \right]^{1/2} \quad -Eq\ (25)$$

$T_a = 110^\circ F$ (REF. DWG. 47W225-1, REV. 0)

$\therefore T_a(^\circ F) = 110\ F^\circ$

$T_a(^\circ C) = 5/9\ (F - 32)$

$= 5/9\ (110 - 32)$

$\therefore T_a(^\circ C) = 43.3^\circ C$

Substitute T_a in to (25):

$$\therefore T_C = \left[\frac{150 - 43.3}{125} \right]^{1/2}$$

$$\therefore T_C = 0.924 \quad -Eq\ (26)$$

Substitute (26) in to (24):

$$I_{NR} = I_N \times 0.924 \quad -Eq\ (27)$$

2.B FORMULAE USED IN CALCULATION [CONTINUED]

- FIND DEVICE/COMPONENT RESISTANCE @ ITS RATED VOLTAGE

$$P_1 = E_1 \times I_1 \qquad \text{-Eq (28)}$$

$$P = I_1^2 \times R_1 \qquad \text{-Eq (29)}$$

$$I_1 = E_1 / R_1 \qquad \text{-Eq (30)}$$

Substitute (30) into (29),

$$P_1 = \left[\frac{E_1}{R_1}\right]^2 \times R_1 \qquad \text{-Eq (31)}$$

$$P_1 = \frac{E_1^2}{R_1} \qquad \text{-Eq (32)}$$

$$R_1 = \frac{E_1^2}{P_1} \qquad \text{-Eq (33)}$$

- FIND CURRENT OF DEVICE/COMPONENT @ OPERATING VOLTAGE

$$P_2 = \frac{E_2^2}{R_2} \qquad \text{-Eq (35)}$$

$$P_2 = I_2^2 \times R_2 \qquad \text{-Eq (36)}$$

$$I_2^2 = \frac{P_2}{R} \qquad \text{-Eq (37)}$$

Let,

$$P_2 \cong (VA)_2 \qquad \text{-Eq (38)}$$

$$I_2 = \sqrt{\frac{(VA)_2}{R}} \qquad \text{-Eq (39)}$$

- FIND 3ϕ FULL LOAD CURRENT

$$VA = \sqrt{3} E I_L$$

$$I_L = VA\,[\sqrt{3}E]^{-1}$$

$$\therefore I_L = VA\,[\sqrt{3}V]^{-1} \qquad \text{-Eq (40)}$$

2.5 NOTES AND DEFINITION USED IN FORMULAE ITEM 2.1.8

I_L = FULL LOAD CURRENT IN AMPERE(S)
VA = CAPACITY RATING IN VOLT-AMP
V = VOLTAGE IN VOLT
I_R = INRUSH CURRENT - IN AMPERE(S)
F_R = INRUSH CURRENT MULTIPLIER FACTOR
NORMAL CONDITION : 12 ($\times I_L$) } REF 3.1
WORST CONDITION : 25 ($\times I_L$) }
I_F = ALLOWABLE MAXIMUM CURRENT - IN AMPS
P_1 = DEVICE/COMPONENT CAPACITY @ RATED VOLTAGE
E_1 = DEVICE/COMPONENT @ ITS VOLTAGE RATING
I_1 = FULL LOAD CURRENT OF DEVICE/COMPONENT @ RATED VOLTAGE
R_1, R_2 = RESISTANCE
P_2 = DEVICE/COMPONENT CAPACITY @ (NEW) OPERATING VOLTAGE
E_2 = DEVICE/COMPONENT @ (NEW) OPERATING VOLTAGE
I_2 = FULL LOAD CURRENT (NEW) @ OPERATING VOLTAGE
F_F = MULTIPLIER (SAFETY FACTOR)
IN = ALLOWABLE SHORT CIRCUIT CURRENT - IN AMPS
A = CONDUCTOR AREA IN CIRCULAR MILS
T_1 = OPERATING TEMPERATURE @ 90°C
T_2 = MAXIMUM SHORT CIRCUIT TEMP. @ 250°C
t = FAULT CLEARING TIME - IN SEC
I_{F1} = SHORT CIRCUIT CURRENT AT FAULT LOCATION F_1
I_{F2} = SHORT CIRCUIT CURRENT AT FAULT LOCATION F_2
I_{F3} = SHORT CIRCUIT CURRENT AT FAULT LOCATION F_3
Isc = SHORT CIRCUIT CURRENT AT EQUIP SOURCE (TRANSF)
MT = M_1 = M2 = MULTIPLIER FACTOR
f_1 = f_2 = FACTOR
L_1 = L_1 = CU WIRE LENGTH - IN FT
E_L = LINE TO LINE VOLTAGE - IN VOLTS
C = CONSTANT FROM TABLE 5-7-1 (REF 5.9)
%Z = TRANSF IMPEDANCE - IN PERCENT

2.18 NOTES AND DEFINITION USED IN FORMULAE ITEM 2.18 (CONTINUED)

I_{NR} = NEW RATING OF FUSE AT DERATED TEMPERATURE

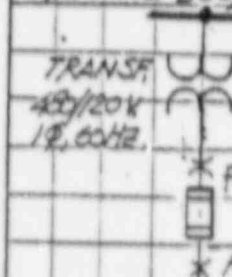
I_N = NAMEPLATE RATING OF FUSE

T_c = TEMPERATURE CORRECTION FACTOR

220 TECHNICAL JUSTIFICATION CRITERIA -

THE INTENT OF THE FOLLOWING CALCULATION IS TO JUSTIFY THE SELECTED FUSE SIZE BASED ON SHORT CIRCUIT PROTECTION.

A. AC CIRCUIT:



- BASIS OF DESIGN/CALCULATION:
- POINT TO POINT METHOD FOR SHORT CKT. CALC. [REF. 5.9]
- INFINITE BUS (UNLIMITED PRIMARY SHORT CKT. CURRENT)
- WIRE # 14 AWG. (REF. 5.25)
- MAX. CABLE LENGTH WITHIN PNL. (L_1) @ F1 (REF. 5.25)
- CABLE LENGTH AT FAULT LOCATION F2 (END DEVICE) IS A SCALED LENGTH (L_2), FROM BOARD LOCATION TO MAIN CONTROL RM. (REF. DWGS 45N812-12 & 45N810-2).
- CABLE LENGTH 'L3' AT FAULT LOCATION F3 IS 4 TIMES OF SCALED LENGTH (L_2) (OR $L_3 = 4 \times 250' = 1000'$) - REF. DWGS 45N812-12 & 45N810-2).
- TRANSFORMER IMPEDANCE (Z) = 6.49% (REF. 5.30)
- CABLE SHORT CIRCUIT CURRENT WITHSTANDABILITY CALC. IS BASED ON CLEARING TIME 0.01 SECOND OR 0.5 CYCLE @ T_c
- ARCING TIME IS NEGLIGIBLE (REF. 5.10 PAGES 38 & 72)

DETERMINE #14 AWG. CABLE SHORT CIRCUIT CURRENT WITHSTANDABILITY WHEN FAULT OCCURS AT F1 @ 0.01 SECOND OR @ 0.5 CYCLE.

from eq. (5)

$$I_{IN} = \left\{ \left\{ 0.0297 \log\left(1.49\right) \right\} \left(A^2\right)\left(t^{-1}\right) \right\}^{1/2}$$

A = 4110 cir Mil (Ref. 5.18);

$$= \left\{ \left\{ 0.0297 \log\left(1.49\right) \right\} \left(4110^2\right)\left(0.01\right)^{-1} \right\}^{1/2}$$

$$I_{IN} = \sqrt{8688674.9}$$

$$\therefore I_{IN} = 2947.66 \text{ AMPS} \quad \text{(A)}$$

THEREFORE, ONE #14 AWG CAN WITHSTAND SHORT CIRCUIT CURRENT OF 2947.66 A @ 0.01 SEC. OR ½ CYCLE @ T_c

220 CONTINUED

- FIND SHORT CIRCUIT CURRENT @ F_1, 23' AWAY FROM POWER SOURCE:

from (11): $$I_{F_1} = \left\{\left(\frac{VA}{V}\right)\left[\frac{100}{\text{TRANSF \%Z}}\right]\right\}\left\{1\times\left[1+\left(\frac{2\times L_1\times I_{SC}}{C\times E_L}\right)\right]\right\}$$

from (11): $$I_{SC} = \left(\frac{VA}{V}\right)\left[\frac{100}{\text{TRANSF \%Z}}\right]$$

$$= \left(\frac{750}{120}\right)\left[\frac{100}{6.49}\right]$$

$$\therefore I_{SC} = 96.30\ A$$

Use C=617; for wire #14:

$$I_{F_1} = (96.30)\left\{1\times\left[1+\left(\frac{2\times 23\times 96.30}{617\times 120}\right)\right]\right\}$$

$$\therefore I_{F_1} = 90.86\ A \quad \text{— (B)}$$

- FIND SHORT CIRCUIT CURRENT @ F_2, 250' AWAY FROM F_1.

from eq (12) & (B): $$I_{F_2} = I_{F_1}\left\{1+\left[\frac{2\times L_2\times I_{F_1}}{C\times E_L}\right]\right\}^{-1}$$

$$= 90.86\left\{1+\left[\frac{2\times 250\times 90.86}{617\times 120}\right]\right\}^{-1}$$

$$\therefore I_{F_2} = 56.3\ A \quad \text{— (C)}$$

- FIND SHORT CIRCUIT CURRENT @ F_3, 1000' AWAY FROM F_1 (END DEVICES)

from eq (12) & (B): $$I_{F_3} = I_{F_1}\left\{1+\left[\frac{2\times L_3\times I_{F_1}}{C\times E_L}\right]\right\}^{-1}$$

$$= 90.86\left\{1+\left[\frac{2\times 1000\times 90.86}{617\times 120}\right]\right\}^{-1}$$

$$\therefore I_{F_3} = 26.30\ A \quad \text{— (D)}$$

220 CONTINUED

- FIND THE LENGTH OF TIME (t_1) THAT CABLE CAN WITHSTAND SHORT CIRCUIT CURRENT AT FAULT LOCATION F_1

from eq. (3);

$$t_1 = 0.0297 \log 1.49 \left\{\left[\frac{I_1}{A}\right]^2\right\}^{-1}$$

$I_1 = I_{F_1} = 90.86$;

$$= 0.0297 \log 1.49 \left\{\left[\frac{90.86}{4110}\right]^2\right\}^{-1}$$

$$\therefore t_1 = 10.52 \text{ SEC.} \quad -(E)$$

- FIND THE LENGTH OF TIME (t_2) THAT CABLE CAN WITHSTAND SHORT CIRCUIT CURRENT AT FAULT LOCATION F_2

from eq (5);

$$t_2 = 0.0297 \log 1.49 \left\{\left[\frac{I_2}{A}\right]^2\right\}^{-1}$$

$I_2 = I_{F_2} = 563$;

$$= 0.0297 \log 1.49 \left\{\left[\frac{563}{4110}\right]^2\right\}^{-1}$$

$$\therefore t_2 = 27.41 \text{ SEC.} \quad (F)$$

- FIND THE LENGTH OF TIME (t_3) THAT CABLE CAN WITHSTAND SHORT CIRCUIT CURRENT AT FAULT LOCATION F_3

from eq (5);

$$t_3 = 0.0297 \log 1.49 \left\{\left[\frac{I_3}{A}\right]^2\right\}^{-1}$$

$$= 0.0297 \log 1.49 \left\{\left[\frac{26.3}{4110}\right]^2\right\}^{-1}$$

$$\therefore t_3 = 125.62 \text{ SEC.} \quad -(G)$$

220 CONTINUED

- SUMMARY OF RESULTS

THE RESULT OF SHORT CIRCUIT CALCULATION AT FAULT LOCATIONS F_1, F_2 AND F_3 FOUND THAT AVAILABLE SHORT CIRCUIT CURRENT AT F_1, F_2 AND F_3 ARE SUBSTANTIALLY LESS THAN THE CABLE SHORT CIRCUIT WITHSTANDABILITY.

$$(A) > (B) > (C) > (D) = 2947.66 > 90.86 > 56.30 > 26.30\ A \quad -(G)$$

THE CABLE CAN WITHSTAND CALCULATED AVAILABLE SHORT CIRCUIT CURRENT AT FAULTS LOCATIONS F_1, F_2 AND F_3 FOR LONGER PERIODS OF TIME AS COMPARED TO CABLE ALLOWABLE SHORT CIRCUIT @ 1/2 CYCLE WITHOUT DAMAGING THE CABLE

WHERE: $t_0 < t_1 < t_2 < t_3 = .01 < 10.52 < 27.41 < 125.62$ SEC. —(H)

- CONCLUSION AND RECOMMENDATIONS

SINCE THE ALLOWABLE AMPACITY OF WIRE #14 AWG. IS 15 AMP (REF. 3.10) THE MAXIMUM FUSE SIZE THAT CAN BE UTILIZED IN THE CIRCUIT IS 15 A.

THE 15A FUSE WILL SEE A SHORT CIRCUIT CURRENT OF 26.30 A, IF SHORT CIRCUIT CURRENT OCCURS AT F_3 (MIN. AVAILABLE SHORT CIRCUIT CURRENT.)

BASED ON THE SUMMARY OF RESULTS AND THE ABOVE CONCLUSION THE MAXIMUM FUSE SIZE OF 15 AMPS CAN BE UTILIZED TO PROTECT #14 AWG. WIRE FOR SHORT CIRCUIT AND WIRE OVERLOAD.

CALCULATED LOAD < FUSE SIZE ≤ 15 AMPS —(J)

3.0 APPLICABLE CODES AND STANDARDS

	CODE OR STANDARD	TITLE
3.1	IEEE 242-1986	RECOMMENDED PRACTICE FOR PROTECTION AND COORDINATION OF INDUSTRIAL AND COMMERCIAL POWER SYSTEM.
3.2	IEEE 323-1974	STANDARD FOR QUALIFYING CLASS 1E EQUIPMENT FOR NUCLEAR POWER GENERATING STATION
3.3	10CFR50.49 [JAN 1, 1986]	ENVIRONMENTAL QUALIFICATION OF ELECTRIC EQUIPMENT IMPORTANT TO SAFETY FOR NUCLEAR POWER PLANT.
3.4	IEEE 384-1981	STANDARD CRITERIA FOR INDEPENDENCE OF CLASS 1E EQUIPMENT AND CIRCUITS.
3.5	ANSI-C37.27-72	IEEE STANDARD APPLICATION GUIDE FOR LOW-VOLTAGE AC NON-INTEGRALLY FUSED POWER CIRCUIT BREAKERS (USE SEPARATELY MOUNTED CURRENT-LIMITING FUSE)
3.6	ANSI-C37.46-81	SPECIFICATIONS FOR POWER FUSE AND FUSE DISCONNECTING SWITCHES.
3.7	ANSI-C37.48-69	GUIDE FOR APPLICATION, OPERATION, AND MAINTENANCE OF DISTRIBUTION CUTOUTS AND FUSE LINKS, SECONDARY FUSES, DISTRIBUTION ENCLOSED SINGLE-POLE AIR SWITCHES, POWER FUSES, FUSE DISCONNECTING SWITCHES, AND ACCESSORIES
3.8	ANSI-C37.48A-80	GUIDE FOR APPLICATION OF CURRENT LIMITING FUSES IN ENCLOSURES

3.9	ANSI-C3247-1981	AMERICAN NATIONAL STANDARD SPECIFICATIONS FOR FUSES AND FUSE DISCONNECTING SWITCHES
3.10	ANSI/NFPA 70-1987	NATIONAL ELECTRICAL CODE
3.11	ANSI/UL 198B-1982	SAFETY STANDARD FOR CLASS H FUSES
3.12	ANSI/UL 198C-1981	SAFETY STANDARD FOR HIGH-INTERRUPTING CAPACITY FUSES, CURRENT-LIMITING TYPES
3.13	ANSI/UL 198D-1982	SAFETY STANDARD FOR CLASS K FUSES.
3.14	ANSI/UL 198E-1982	SAFETY STANDARD FOR CLASS R FUSES
3.15	ANSI/UL 198L-1982	DC FUSE FOR INDUSTRIAL USE
3.16	ANSI/UL 198M-1982	SAFETY STANDARD FOR CLASS K, R, H FUSES
3.17	10CFR50, APPENDIX 'R' [JAN. 1, 1986]	FIRE PROTECTION PROGRAM FOR NUCLEAR POWER FACILITIES OPERATING PRIOR TO JANUARY 1, 1979
3.18	10CFR50, APPENDIX 'B' [JAN 1, 1986]	QUALITY ASSURANCE PROGRAM
3.19	ICEA-P32-382-1969	SHORT CIRCUIT CHARACTERISTICS OF INSULATED CABLE

EBASCO SERVICES INCORPORATED

[ED-Q0268-88463]

BY _____ DATE 8/[illegible]9

CHKD. BY CLO DATE 8-1 8

SHEET _ OF 133

CLIENT TVA OFS NO. _____ DEPT. NO. _____

PROJECT BFNP UNITS 1,2,3

SUBJECT FUSE PROGRAM [480V. REACTOR MOV BOARDS 3A/B]

4.0 REFERENCE DRAWINGS

DWG. ITEM NO.	CONNECTION DIAG. REF. DWG. NO.	REV. NO.
101	45N3749-1	7
102	45N3749-2	6
103	45N3749-3	10
104	45N3749-4	9
105	45N3749-5	13
106	45N3749-6	9
107	45N3749-16	6
108	45N3749-17	5
109	45N3749-14	1

DWG. ITEM NO.	CONNECTION DIAG. REF. DWG. NO.	REV. NO.
201	45N3750-1	8
202	45N3750-2	7
203	45N3750-3	6
204	45N3750-4	7
205	45N3750-5	7
206	45N3750-6	5
207	45N3750-7	3
208	45N3750-20	5

5.0 REFERENCES/DESIGN INPUT INFORMATION.

	DOCUMENT NO.	TITLE
5.1	DS-E1.2.3 (REV.5)	MASTER FUSE LIST AND FUSE LABELING
5.2	DS-E8.1.1 (REV.7)	SUBSTITUTION STANDARD FOR LOW-VOLTAGE POWER AND CONTROL FUSE (600V OR LESS)
5.3	DS-E3.1.2 (REV.4)	SUBSTITUTION STANDARD FOR MIDGET AND SMALL DIMENSION FUSES
5.4	BFN-50-728 (REV.1)	PHYSICAL INDEPENDENCE OF SAFETY RELATED SYSTEM
5.5	BFN-50-727 (REV.0)	ENVIRONMENTAL QUALIFICATION TO 10CFR50.49
5.6	SS-E18.10.01 (REV.2)	ENVIRONMENTAL QUALIFICATION REQUIREMENTS FOR SAFETY-RELATED ELECTRICAL EQUIPMENT
5.7	DG-E2.3.5 (REV.3)	480V. MOTOR BRANCH-CIRCUIT DESIGN AND PROTECTION
5.8	EQIS MANUAL [1986]	EQUIPMENT INFORMATION SYSTEM MANUAL (ONLINE USER TRANSACTION MANUAL)
5.9	SPD 87	ELECTRICAL PROTECTION HANDBOOK, BUSSMANN DIV., MC GRAW-EDISON COMPANY
5.10	ISNBO7-606693-2	OVERCURRENT PROTECTION, ELECTRICAL CONSTRUCTION AND MAINTENANCE; BY ARTHUR FREUND, MC GRAW-HILL, INC

5.11	ED-Q2000-87068 [RIMS#B438708 05942]	FAULT CURRENT IN THE INSTRUMENT CIRCUITS PENETRATING BFNP CONTAINMENT THROUGH INSTRUMENT PENETRATION
5.12	ED-Q2000-87070 [RIMS#B438708059 44]	EVALUATION OF PROTECTION PROVIDED FOR BFNP CONTAINMENT ELECT. PENETRATIONS 'EB & EE'
5.13	ED-Q2000-87067 [RIMS#B438708059 41]	EVALUATION OF PROTECTION PROVIDED FOR BFNP CONTAINMENT ELECT. PENETRATIONS EA, ED, EF, FA, AA, AB, AC, AD, AE, AF
5.14	ECN P0913 [RIMS#B22 870929 509]	FUSE PROTECTION FOR 250V, DC, CIRCUIT
5.15	ECN P0933 (RIMS#B22860923 505)	FUSE PROTECTION FOR 250V, DC, CIRCUIT
5.16	ECN P0914 [RIMS#B22 870929 511]	FUSE PROTECTION FOR 250V, DC, CIRCUIT
5.17	NOT USED	
5.18	EHB 81	COPPER AND ALUMINUM CONDUCTOR ELECTRICAL CABLES, ENGINEERING DATA; THE OKONITE COMPANY.
5.19	QIR# EEB88035 (RIMS#B22 880308 002)	WALKDOWN INFORMATION REQUIRED FOR BFNP FUSE PROGRAM DEVELOPMENT
5.19A	BF-6.12 [REV.2]	FUSE CONTROL

5.20	CP-50-M-1085 [REV. 11/88]	SHAWMUT ADVISOR, GOULD ELECTRONICS
5.21	FORM 101 [1981]	SEMICONDUCTOR FUSE APPLICATIONS, GOULD ELECTRONICS
5.22	RIMS#B43860206912 [REV.1]	ELECTRICAL EQUIPMENT REQUIRED TO SUPPORT UNIT 2 RESTART
5.23	BFEP-E1-86041 [RIMS#B22 861126 111]	APPENDIX R-TABULATION OF EQUIP POWER SUPPLIERS AND DETAILING CRITERIA FOR THE AUX. PWR. SYS. (APS)
5.24	BFEP-E1-86019 [RIMS#B30870903003]	ELECTRICAL MODIFICATIONS REQUIRED FOR 10CFR50 APPENDIX 'R'
5.25	Q/R#BFNEE286029 [RIMS#B22870115002]	BECHTEL JOB #16985, EQ ENGINEERING, ELECT. ISSUES, BECHTEL CALC ASSUMPTIONS, ITEM 'e' OF BECHTEL LETER #62
5.26	GEA 10265A [GE CAT. PUB.]	LOW-VOLTAGE POWER CIRCUIT BREAKER TYPE AKR
5.27	FLC [3/25/87]	BUSS FULL LINE CATALOG, BUSSMANN DIV., MCGRAW-EDISON CO.
5.28	BFN-VTD-6080-0130 [CONTRACT No]	GE. INSTRUCTION GEI-90810A "VOLTAGE RELAYS TYPE IAV69A AND JAV69B"
5.30	RIM#B22870304 002	ELECTRICAL ISSUES UNAVAILABLE WALKDOWN DATA
5.31	RIM#B22871201 303	DOCUMENT TRANSMITTAL (WALKDOWN DATA)
5.32	GEA-3592S [GE CAT. PUB]	LOAD CENTER UNIT SUBSTATION FEATURING POWERMASTER AKD-5 LOW VOLTAGE SWITCHGEAR

EBASCO SERVICES INCORPORATED

BY JB: 8/12/88 [ED-Q0268-88463]

CHKD. BY CCC DATE 8-12-88

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CLIENT TVA OFS NO. DEPT. NO.

PROJECT BFNP UNITS 1,2,3

SUBJECT FUSE PROGRAM [480V. REACTOR MOV BOARDS 3A/B]

60 DESIGN INPUT DATA, CALC. AND DWG. CROSS REF.

ITEM	FUSE UNID	TYPE	UNIT	NUMBER FIG.	NUMBER CALC.	ATT.	REF. DWG. ITEM NO.	REMARKS
01	3-FU 2 L 76 - 49A	A4J3	3A	1.0	1.0	1.0	108	INDICATING LIGHT
02	3-FU 2 L 31 - 196A	A4J3	3A	1.0	1.0	1.0	108	
03	3-FU 2 L 31 - 197A	A4J3	3A	1.0	1.0	1.0	108	
04	3-FU 2 L 31 - 199A	A4J3	3A	1.0	1.0	1.0	108	
05	3-FU 2 L 31 - 200A	A4J3	3A	1.0	1.0	1.0	108	
06	3-FU 2 L 31 - 96A	A4J3	3A	1.0	1.0	1.0	101	
07	3-FU 2 L 31 - 96B	A4J3	3A	1.0	1.0	1.0	101	
08	3-FU 2 L 40 - 31AA	A4J3	3A	1.0	1.0	1.0	101	
09	3-FU 2 L 47 - 31BA	A4J3	3A	1.0	1.0	1.0	101	
10	3-FU 2 L 47 - 32AA	A4J3	3A	1.0	1.0	1.0	101	
11	3-FU 2 L 74 - 52A	A4J3	3A	1.0	1.0	1.0	101	
12	3-FU 2 L 64 - 68A	A4J3	3A	1.0	1.0	1.0	102	
13	3-FU 2 L 78 - 62A	A4J3	3A	1.0	1.0	1.0	102	
14	3-FU 2 L 74 - 1A	A4J3	3A	1.0	1.0	1.0	102	
15	3-FU 2 L 77 - 14AA	A4J3	3A	1.0	1.0	1.0	102	
16	3-FU 2 L 78 - 67A	A4J3	3A	1.0	1.0	1.0	102	
17	3-FU 2 L 74 - 12A	A4J3	3A	1.0	1.0	1.0	102	
18	3-FU 2 L 77 - 1AA	A4J3	3A	1.0	1.0	1.0	102	
19	3-FU 2 L 75 - 72A	A4J3	3A	1.0	1.0	1.0	102	
20	3-FU 2 L 74 - 2A	A4J3	3A	1.0	1.0	1.0	102	
21	3-FU 2 L 74 - 62A	A4J3	3A	1.0	1.0	1.0	102	

[REF. S.I.P. TYP.] TABLE A [SEE SECT. 4.0]

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EBASCO SERVICES INCORPORATED

[ED-Q0268-884403]

BY DB: DATE 8/13/

CHKD. BY CCO DATE 8-13-08

SHEET 2. OF 133

CLIENT TVA OFS NO. DEPT. NO.

PROJECT BFNP UNITS 1,2,3

SUBJECT FUSE PROGRAM [480V. REACTOR MOV BOARDS 3A/B]

60 DESIGN INPUT DATA, CALC. AND DWG. CROSS REF.

ITEM	FUSE UNID	TYPE	UNIT	NUMBER FIG.	NUMBER CALC.	NUMBER ATT.	REF. DWG ITEM No.	REMARKS
22	3-FU 2 - 32 - 64A	A4U3	3A	1.0	1.0	1.0	103	INDICATING LIGHT
23	3-FU 2 - 74 - 13A	A4U3	3A	1.0	1.0	1.0	103	
24	3-FU 2 - 74 - 14A	A4U3	3A	1.0	1.0	1.0	103	
25	3-FU 2 - 74 - 48A	A4U3	3A	1.0	1.0	1.0	103	
26	3-FU 2 - 74 - 78A	A4U3	3A	1.0	1.0	1.0	103	NONEXISTENT
27	3-FU 2 - 78 - 65A	A4U3	3A	1.0	1.0	1.0	103	INDICATING LIGHT
28	3-FU 2 - 78 - 64A	A4U3	3A	1.0	1.0	1.0	103	
29	3-FU 2 - 47 - 10A	A4U3	3A	1.0	1.0	1.0	104	
30	3-FU 2 - 69 - 35A	A4U3	3A	1.0	1.0	1.0	104	
31	3-FU 2 - 75 - 2A	A4U3	3A	1.0	1.0	1.0	104	
32	3-FU 2 - 74 - 57A	A4U3	3A	1.0	1.0	1.0	104	
33	3-FU 2 - 74 - 61A	A4U3	3A	1.0	1.0	1.0	104	
34	3-FU 2 - 63 - 5AA	A4U3	3A	1.0	1.0	1.0	104	
35	3-FU 2 - 75 - 11A	A4U3	3A	1.0	1.0	1.0	104	
36	3-FU 2 - 74 - 58A	A4U3	3A	1.0	1.0	1.0	105	
37	3-FU 2 - 75 - 23A	A4U3	3A	1.0	1.0	1.0	105	
38	3-FU 2 - 74 - 60A	A4U3	3A	1.0	1.0	1.0	105	
39	3-FU 2 - 64 - 70A	A4U3	3A	1.0	1.0	1.0	105	
40	3-FU 2 - 75 - 25A	A4U3	3A	1.0	1.0	1.0	105	
41	3-FU 2 - 75 - 9A	A4U3	3A	1.0	1.0	1.0	105	
42	3-FU 2 - 69 - 1A	A4U3	3A	1.0	1.0	1.0	106	

SEE [SECT. 40] TABLE A

EBASCO SERVICES INCORPORATED

BY DS 8/13/88 [ED-Q0268-8814G3]

CHKD. BY CLO DATE 8-13-88

SHEET 25 OF 133

CLIENT TVA OFS NO. DEPT. NO.

PROJECT BFNP UNITS 1,2,3

SUBJECT FUSE PROGRAM [480V. REACTOR MOV BOARDS 3A/B]

60 DESIGN INPUT DATA, CALC. AND DWG. CROSS REF.

ITEM	FUSE UNID	TYPE	UNIT	NUMBER FIG.	CALC.	ATT.	REF. DWG ITEM No.	REMARKS
43	3-FU 2 - 70 - 39A	A4U3	3A	1.0	1.0	1.0	106	INDICATING LIGHT
44	3-FU 2 - 23 - 34A	A4U3	3A	1.0	1.0	1.0	106	
45	3-FU 2 - 73 - 2A	A4U3	3A	1.0	1.0	1.0	106	
46	3-FU 2 - 70 - 44A	A4U3	3A	1.0	1.0	1.0	106	
47	3-FU 2 - 23 - 40A	A4U3	3A	1.0	1.0	1.0	106	
48	3-FU 2 - 75 - 22A	A4U3	3A	1.0	1.0	1.0	106	
49	3-FU 2 - 71 - 59A	A4U3	3A	1.0	1.0	1.0	107	
50	3-FU 2 - 47 - 31AB	TR3.2	3A	2.0	8.0	2.0	[illegible]	CONTROL CIRCUIT
51	3-FU 2 - 77 - 14AB	TR 3.2	3A	2.0	8.0	2.0	102	
52	3-FU 2 - 77 - 1AB	TR 3.2	3A	2.0	8.0	2.0	102	
53	3-FU 2 - 31 - 1961B	TR 1.6	3A	2.0	13.0	2.0	108	
54	3-FU 2 - 31 - 1973B	TR 1.6	3A	2.0	13.0	2.0	108	
55	3-FU 2 - 31 - 1999B	TR 1.6	3A	2.0	13.0	2.0	108	
56	3-FU 2 - 31 - 2000B	TR 1.6	3A	2.0	13.0	2.0	108	
57	3-FU 2 - 32 - 64B	TR 1.6	3A	2.0	13.0	2.0	103	
58	3-FU 2 - 47 - 10B	TR 1.6	3A	2.0	13.0	2.0	104	
59	3-FU 2 - 64 - 68B	TR .8	3A	2.0	2.0	2.0	102	
60	3-FU 2 - 78 - 62B	TR .8	3A	2.0	2.0	2.0	102	
61	3-FU 2 - 78 - 67B	TR .8	3A	2.0	2.0	2.0	102	
62	3-FU 2 - 74 - 62B	TR .8	3A	2.0	2.0	2.0	102	
63	3-FU 2 - 74 - 104B	TR .8	3A	2.0	2.0	2.0	103	

SEE [SECT. 10] TABLE A

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EBASCO SERVICES INCORPORATED

BY CB: DAT 1/13/88 [ED-Q0268-88463]

CHKD. BY CCO DATE 1-13-88

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CLIENT TVA OFS NO. DEPT. NO.

PROJECT BFNP UNITS 1,2,3

SUBJECT FUSE PROGRAM [480V. REACTOR MOV BOARDS 3A/B]

6.0 DESIGN INPUT DATA, CALC. AND DWG. CROSS REF.

ITEM	FUSE UNID	TYPE	UNIT	NUMBER FIG.	NUMBER CALC.	NUMBER ATT.	REF. DWG ITEM No.	REMARKS
64	3-FU 2 - 74 - 78B	TR-8	3A	+	+	+	103	NONEXISTENT CONTROL CIRCUIT
65	3-FU 2 - 78 - 65B	TR-8	3A	20	20	20	103	
66	3-FU 2 - 78 - 64B	TR-8	3A	20	20	20	103	
67	3-FU 2 - 69 - 35B	TR-8	3A	20	20	20	104	
68	3-FU 2 - 75 - 2B	TR-8	3A	20	20	20	104	
69	3-FU 2 - 74 - 61B	TR-8	3A	20	20	20	104	
70	3-FU 2 - 75 - 11B	TR-8	3A	20	20	20	104	
71	3-FU 2 - 74 - 58B	TR-8	3A	20	20	20	104	
72	3-FU 2 - 75 - 23B	TR-8	3A	20	20	20	104	
73	3-FU 2 - 64 - 70B	TR-8	3A	20	20	20	105	
74	3-FU 2 - 75 - 25B	TR-8	3A	20	20	20	105	
75	3-FU 2 - 75 - 9B	TR-8	3A	20	20	20	105	
76	3-FU 2 - 69 - 1B	TR-8	3A	20	20	20	105	
77	3-FU 2 - 73 - 2B	TR-8	3A	20	20	20	106	
78	3-FU 2 - 75 - 22B	TR-8	3A	20	20	20	106	
79	3-FU 2 - 71 - 59B	TR-8	3A	20	20	20	106	
80	3-FU 2 - 74 - 52B	TR 2	3A	20	60	20	107	
81	3-FU 2 - 74 - 1B	TR-8	3A	20	20	20	101	CONTROL WDR
82	3-FU 2 - 74 - 12B	TR-8	3A	20	20	20	102	
83	3-FU 2 - 74 - 2B	TR-8	3A	20	20	20	102	
84	3-FU 2 - 74 - 13B	TR-8	3A	20	20	20	102	
							103	

TABLE A

SEE [SECT 40]

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EBASCO SERVICES INCORPORATED

[EDQ-00268-8846G3]

BY [illegible] DATE [illegible] '88

CHK'D. BY CCO DATE 8-13-88

SHEET 1 OF 133

CLIENT TVA OFS NO. DEPT. NO.

PROJE. BFNP UNITS 1,2,3

SUBJECT FUSE PROGRAM [480V REACTOR MOV BOARDS 3A/B]

60 DESIGN INPUT DATA, CALC. AND DWG. CROSS REF.

ITEM	FUSE UNID	TYPE	UNIT	NUMBER FIG.	CALC.	ATT.	REF. DWG ITEM No.	REMARKS
85	3-FU 2 - 74 - 48B	TR .8	3A	20	20	20	102	CONTROL MOV
86	3-FU 2 - 74 - 52B	TR .8	3A	20	20	20	104	
87	3-FU 2 - 74 - 60B	TR .8	3A	20	20	20	105	
88	3-FU 2 - 1 - 55B	TR .8	3A	20	20	20	106	
89	3-FU 2 - 23 - 34B	TR .8	3A	20	20	20	106	
90	3-FU 2 - 23 - 40B	TR .8	3A	20	20	20	106	
91	3-FU 2 - 74 - 52B	TR 2	3A	20	60	20	101	CONTROL EMRG.
92	3-FU 2 - 70 - 39B	TR 3.2	3A	20	20	20	106	
93	3-FU 2 - 70 - 44B	TR 3.2	3A	20	20	20	106	
94	3-FU 2 - 74 - 1C	TR .8	3A	20	20	20	102	
95	3-FU 2 - 74 - 12C	TR .8	3A	20	20	20	102	
96	3-FU 2 - 74 - 2C	TR .8	3A	20	20	20	102	
97	3-FU 2 - 74 - 13C	TR .8	3A	20	20	20	103	
98	3-FU 2 - 74 - 48C	TR .8	3A	20	20	20	102	
99	3-FU 2 - 74 - 57C	TR .8	3A	20	20	20	104	
100	3-FU 2 - 74 - 60C	TR .8	3A	20	20	20	105	
101	3-FU 2 - 1 - 55C	TR .8	3A	20	20	20	106	
102	3-FU 2 - 23 - 34C	TR .8	3A	20	20	20	106	
103	3-FU 2 - 23 - 40C	TR .8	3A	20	20	20	106	
104	3-FU 2 - 74 - 52C	TR 2	3A	20	60	20	101	
105	3-FU 2 - 70 - 39C	TR 3.2	3A	20	130	20	106	

TABLE A [SEE SECT 4.0]

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BY DS: 8/13/88
CHK'D. BY CLO DATE 8-13-88
CLIENT TVA
PROJECT BFNP UNITS 1,2,3
SUBJECT ELSE PROGRAM [480V REACTOR MOV BOARDS 3A/B]

60 DESIGN INPUT DATA, CALC. AND DWG. CROSS REF

ITEM	FUSE UNID	FUSE TYPE	NUMBER UNIT	NUMBER FIG.	NUMBER CALC.	NUMBER ATT.	REF. DWG. ITEM No.	REMARKS
106	3-FU 2 - 70 - 44C	TR 3.2	3A	2.0	8.0	2.0	106	CONTROL SMRG.
107	3-FU 2 - 76 - 49B	TR 4.6	3A	2.0	13.0	2.0	108	CONTL XFMR
108	3-FU 2 - 74 - 52D	A4J6	3A	2.0	5.0	1.0	101	CONT XFMR
109	3-FU 2 - 268 - 38A	TR 2	3A	2.0	6.0	2.0	107	CONT. XFMR
110	3-FU 2 - 268 - 34A	JHC15	3A	4.0	11.0	4.0	101	C PWR TRANSF
111	3-FU 2 - 268 - 3AF	JHC15	3A	4.0	11.0	4.0	105	C PWR TRANSF
112	3-FU 2 - 31 - 110A	A4J3	3A	T	T	-	103	NONEXISTENT
113	3-FU 2 - 31 - 110B	TR.8	3A	T	T	-	103	NONEXISTENT
114	3-FU 2 - 47 - 10F	A4J6	3A	2.0	3.0	1.0	104	XFMR & COIL
115	3-FU 2 - 31 - 96C	TR 4.6	3A	2.0	13.0	2.0	101	CONT. MAIN
116	3-FU 2 - 31 - 96D	TR 4.6	3A	2.0	13.0	2.0	101	FCO-31-96
117	3-FU 2 -268 - 3AB	A4J10	3A	6.0	15.0	1.0	101	VM UV & XFER
118	3-FU 2 - 268 - 3AC	A4J10	3A	7.0	16.0	1.0	101	UV & DV CKT
119	3-FU 2 - 268 - 3AD	A4J15	3A	8.0	17.0	3.0	101	NC BKR CL
120	3-FU 2 - 268 - 3AH	A4J15	3A	8.0	17.0	3.0	105	NC BKR CL
121	3-FU 2 - 268 - 3AE	A4J30	3A	9.0	18.0	3.0	101	NC BKR TR
122	3-FU 2 -268 - 3AJ	A4J30	3A	9.0	18.0	3.0	105	NC BKR TR
123	3-FU 2 - 63 - 5AB	TR 5.6	3A	3.0	9.0	2.0	104	TC-63-54
124	3-FU 2 - 63 - 6AC	TR 5.6	3A	3.0	9.0	2.0	104	PWR MTR HT
125	3-FU 2 -268 - 3AG	A4J10	3A	7.0	16.0	1.0	105	VM & DV
126	3-FU 2 - 268 - 34K	A4J3	3A	19.0	19.0	1.0	105	UV ANN

SEE [SECT 10] TABLE A

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6.0 DESIGN INPUT DATA, CALC. AND DWG. CROSS REF.

ITEM	FUSE UNID	TYPE	NUMBER UNIT	NUMBER FIG.	NUMBER CALC.	NUMBER ATT.	REF. DWG. ITEM No.	REMARKS	
127	3-FU 2 -32 - 65B	TR 6.25	3 A	2.0	2.0	2.0	103	PWR CIRCUIT	
127.1	3-FU 2 - 1 - 55A	A4J3	3 A	1.0	1.0	1.0	106	IND. LTG.	
127.2	3- FU 2 - 75 - 72B	TR .8	3 A	2.0	2.0	2.0	102	75 VA. TRANSF SEC.	
127.3	SPARE	NONE	N/A	N/A	N/A	N/A	101	COMPARTMENT NO.	1B
127.4							101		1B
127.5							102		6B
127.6							102		6B
127.7							103		7C
127.8							103		8C
127.9							104		10B
127.10							104		11C
127.11							104		12A
127.12							104		12C
127.13							104		12C
127.14							104		12C
127.15							104		12C
127.16							104		12C
127.17							104		13C
127.18							105		14C
127.19							105		16A
127.20							102		16-2C
							106		16-2C

SEE [SECT. 4.0]

TABLE A

6.0 DESIGN INPUT DATA, CALC. AND DWG. CROSS REF.

ITEM	FUSE UNID	TYPE	UNIT	NUMBER FIG.	CALC.	ATT.	REF. DWG ITEM No.	REMARKS
127.21	SPARE (2 FUSES BLOCK)	NONE	3A				106	COMPARTMENT 16-2C
127.22			3A				106	16-2C
127.23			3A				106	17A
127.24			3A				106	17C
127.25			3A				106	18A
127.26			3A				106	18C
127.27	3-FU2-31-120A	A4W3	3A			1.0	109	XFMR SEC. (JB3178)
127.28	3-FU2-31-121A NOT USED	TR.8	3A	2.0	2.0	2.0	109	XFMR PRIM (JB4092)

TABLE A SEE [SECT. 10]

EBASCO SERVICES INCORPORATED

BY CD. 8/13/88 [ED-Q0268-88463]

CHKD. BY CCO DATE 8-13-88

SHEET 31 OF 133

CLIENT TVA OFS NO. DEPT. NO.

PROJECT BFNP UNITS 1,2,3

SUBJECT FUSE PROGRAM [480V. REACTOR MOV BOARDS 3A/B]

60 DESIGN INPUT DATA, CALC. AND DWG. CROSS REF.

ITEM	FUSE UNID	TYPE	UNIT	NUMBER FIG.	NUMBER ATT.	REF. DWG. ITEM No.	REMARKS
128	3-FU 2 L 76 - 59A	A4J3	3B	1.0	1.0	207	INDICATING LIGHT.
129	3-FU 2 L 31 - 1982A	A4J3	3B	1.0	1.0	207	
130	3-FU 2 L 31 - 3A	A4J3	3B	1.0	1.0	207	
131	3-FU 2 L 31 - 2002A	A4J3	3B	1.0	1.0	207	
132	3-FU 2 L 31 - 2003A	A4J3	3B	1.0	1.0	207	
133	3-FU 2 L 77 - 1A	A4J3	3B	1.0	1.0	201	
134	3-FU 2 L 77 - 8BA	A4J3	3B	1.0	1.0	201	
135	3-FU 2 L 7V - 2A	A4J3	3B	1.0	1.0	201	
136	3-FU 2 L 75 - 50A	A4J3	3B	1.0	1.0	201	
137	3-FU 2 L 74 - 66A	A4J3	3B	1.0	1.0	201	
138	3-FU 2 L 75 - 39A	A4J3	3B	1.0	1.0	201	
139	3-FU 2 L 70 - 40A	A4J3	3B	1.0	1.0	202	
140	3-FU 2 L 75 - 30A	A4J3	3B	1.0	1.0	202	
141	3-FU 2 L 75 - 37A	A4J3	3B	1.0	1.0	202	
142	3-FU 2 L 70 - 48A	A4J3	3B	1.0	1.0	202	
143	3-FU 2 L 23 - 57A	A4J3	3B	1.0	1.0	202	
144	3-FU 2 L 74 - 24A	A4J3	3B	1.0	1.0	202	
145	3-FU 2 L 70 - 44A	A4J3	3B	1.0	1.0	203	
146	3-FU 2 L 74 - 25A	A4J3	3B	1.0	1.0	204	
147	3-FU 2 L 74 - 35A	A4J3	3B	1.0	1.0	205	
148	3-FU 2 L 74 - 68A	A4J3	3B	1.0	1.0	206	

TABLE A SEE [SECT 10]

581 9-87

EBASCO SERVICES INCORPORATED

BY [illegible] 8/13/88 [ED-QO263-E8463]

CHKD. BY CCO DATE 8-13-88

SHEET 32 OF 133

CLIENT TVA OFS NO. DEPT. NO.

PROJECT EFHP UNITS 1,2,3

SUBJECT FUSE PROGRAM [GEOV, REACTOR MOV BOARDS 3A/B]

ECO DESIGN INPUT DATA, CALC. AND DWG. CROSS REF

ITEM	FUSE UNID	TYPE	UNIT	NUMBER FIG.	NUMBER CALC.	NUMBER ATT.	REF. DWG. ITEM No.	REMARKS
149	3-FU 2 L-64 - 69A	A4V3	3B	1.0	1.0	1.0	203	INDICATING LIGHT
150	3-FU 2 L-74 - 36A	A4V3	3B	1.0	1.0	1.0	203	
151	3-FU 2 L-23 - 46A	A4V3	3B	1.0	1.0	1.0	203	
152	3-FU 2 L-75 - 78A	A4V3	3B	1.0	1.0	1.0	203	
153	3-FU 2 L-74 - 46A	A4V3	3B	1.0	1.0	1.0	203	
154	3-FU 2 L-23 - 52A	A4V3	3B	1.0	1.0	1.0	203	
155	3-FU 2 L-13 - 58A	A4V3	3B	1.0	1.0	1.0	203	
156	3-FU 2 L-78 - 63A	A4V3	3B	1.0	1.0	1.0	203	
157	3-FU 2 L-78 - 66A	A4V3	3B	1.0	1.0	1.0	203	
158	3-FU 2 L-78 - 68A	A4V3	3B	1.0	1.0	1.0	203	
159	3-FU 2 L-74 - 75A	A4V3	3B	1.0	1.0	1.0	204	
160	3-FU 2 L-32 - 67A	A4V3	3B	1.0	1.0	1.0	204	
161	3-FU 2 L-69 - 60A	A4V3	3B	1.0	1.0	1.0	204	
162	3-FU 2 L-75 - 76A	A4V3	3B	1.0	1.0	1.0	204	
163	3-FU 2 L-74 - 72A	A4V3	3B	1.0	1.0	1.0	204	
164	3-FU 2 L-74 - 106A	A4V3	3B	1.0	1.0	1.0	204	
165	3-FU 2 L-64 - 71A	A4V3	3B	1.0	1.0	1.0	204	
166	3-FU 2 L-73 - 64A	A4V3	3B	1.0	1.0	1.0	205	
167	3-FU 2 L-78 - 61A	A4V3	3B	1.0	1.0	1.0	205	
168	3-FU 2 L-74 - 71A	A4V3	3B	1.0	1.0	1.0	205	
169	3-FU 2 L-67 - 26A	A4V3	3B	1.0	1.0	1.0	205	

SEE [SECT. 4.0] TABLE A

581 9-87

EBASCO SERVICES INCORPORATED

BY DS 8/13/88 [ED-QQ268-884631] SHEET 33 OF 133

CHKD. BY CCO DATE 8-13-88 OFS NO. DEPT. NO.

CLIENT TVA

PROJECT BFNP UNITS 1,2,3

SUBJECT FUSE PROGRAM [480V. REACTOR MOV BOARDS 3A/B]

60 DESIGN INPUT DATA, CALC. AND DWG. CROSS REF.

ITEM	FUSE UNID	TYPE	UNIT	NUMBER FIG.	NUMBER CALC.	NUMBER ATT.	REF. DWG ITEM No.	REMARKS
170	3-FU 2 - 70 - 45A	A4J3	3B	1C	1C	1C	205	INDICATING LIGHT
171	3-FU 2 - 75 - 51A	A4J3	3B	1C	1C	1C	205	
172	3-FU 2 - 75 - 53A	A4J3	3B	1C	1C	1C	205	
173	3-FU 2 - 31 - 139A	A4J3	3B	1C	1C	1C	206	
174	3-FU 2 - 69 - 12A	A4J3	3B	1C	1C	1C	206	
175	3-FU 2 - 74 - 99A	A4J3	3B	1C	1C	1C	206	
176	3-FU 2 - 77 - 14BA	A4J3	3B	1C	1C	1C	206	
177	3-FU 2 - 77 - 17BA	A4J3	3B	1C	1C	1C	206	
178	3-FU 2 - 74 - 74A	A4J3	3B	1C	1C	1C	206	
179	3-FU 2 - 47 - 41AA	A4J3	3B	1C	1C	1C	206	
180	3-FU 2 - 47 - 41BA	A4J3	3B	1C	1C	1C	206	
181	3-FU 2 - 74 - 190A	A4J3	3B	1C	1C	1C	207	
182	3-FU 2 - 74 - 97A	A4J3	3B	1C	1C	1C	207	
183	3-FU 2 - 74 - 191A	A4J3	3B	1C	1C	1C	207	
184	3-FU 2 - 77 - 14BB	TR 3.2	3B	2C	8C	2C	208	CONT. ROD CIRC UIT
185	3-FU 2 - 77 - 17BB	TR 3.2	3B	2C	8C	2C	206	
186	3-FU 2 - 74 - 66B	TR 2.5	3B	6C	13C	2C	201	
187	3-FU 2 - 31 - 1982B	TR 1.6	3B	2C	13C	2C	208	
188	3-FU 2 - 31 - 2002B	TR 1.6	3B	2C	13C	2C	208	
189	3-FU 2 - 31 - 2003B	TR 1.6	3B	2C	13C	2C	208	
190	3-FU 2 - 32 - 67B	TR 1.6	3B	2C	13C	2C	204	

SEE [SECT 4.0] TABLE A

581 9-87

EBASCO SERVICES INCORPORATED

[ED-Q0268-8846J]

BY DB: 8/12/88

CHK'D. BY CLC DATE 8-13-88

SHEET 34 OF 133

CPS NO. DEPT. NO.

CLIENT TVA

PROJECT BFNP UNITS 1,2,3

SUBJECT FUSE PROGRAM [480V REACTOR MOV BOARDS 3A/B]

6.0 DESIGN INPUT DATA, CALC. AND DWG. CROSS REF

ITEM	FUSE UNID	TYPE	UNIT	NUMBER FIG.	NUMBER CALC.	ATT.	REF. DWG ITEM No.	REMARKS
191	3-FU 2 L 75 - 76B	TR 4G	3B	2.0	13.0	2.0	204	CONTROL CIRCUIT
192	3-FU 2 L 31 - 1993B	TR 4G	3B	2.0	13.0	2.0	208	
193	3-FU 2 - 47 L 41AB	TR 3.2	3B	2.0	8.0	2.0	206	
194	3-FU 2 L 77 L 18B	TR 3.2	3B	2.0	8.0	2.0	201	
195	3-FU 2 L 75 - 50B	TR-8	3B	2.0	2.0	2.0	201	
196	3-FU 2 L 75 L 39B	TR-8	3B	2.0	2.0	2.0	201	
197	3-FU 2 L 75 - 30B	TR-8	3B	2.0	2.0	2.0	201	
198	3-FU 2 L 75 L 37B	TR-8	3B	2.0	2.0	2.0	201	
199	3-FU 2 L 74 - 24B	TR-8	3B	2.0	2.0	2.0	201	
200	3-FU 2 L 74 L 35B	TR-8	3B	2.0	2.0	2.0	201	
201	3-FU 2 L 74 L 63B	TR-8	3B	2.0	2.0	2.0	203	
202	3-FU 2 L 64 L 69B	TR-8	3B	2.0	2.0	2.0	203	
203	3-FU 2 - 23 - 46B	TR-8	3B	2.0	2.0	2.0	203	
204	3-FU 2 L 76 L 73B	TR-8	3B	2.0	2.0	2.0	203	
205	3-FU 2 - 23 - 52B	TR-8	3B	2.0	2.0	2.0	233	
206	3-FU 2 = 78 - 63B	TR-8	3B	2.0	2.0	2.0	205	
207	3-FU 2 = 78 - 66B	TR-8	3B	2.0	2.0	2.0	203	
208	3-FU 2 = 78 - 68B	TR-8	3B	2.0	2.0	2.0	203	
209	3-FU 2 = 74 - 75B	TR-8	3B	2.0	2.0	2.0	201	
210	3-FU 2 L 32 - 67B	TR-8	3B	2.0	2.0	2.0	114	
211	3-FU 2 - 60 - 60B	TR-8	3B	2.0	2.0	2.0	104	

TABLE A [SECT 4.0]

581 9-87

EBASCO SERVICES INCORPORATED

BY DB: 8/13/88 [ED-QO268-88463] SHEET 35 OF 133

CHK'D. BY CCO DATE 8-13-88 OFS NO. DEPT. NO.

CLIENT TVA

PROJECT BFNP UNITS 1,2,3

SUBJECT FUSE PROGRAM [480V. REACTOR MOV BOARDS 3A/B]

60 DESIGN INPUT DATA, CALC. AND DWG. CROSS REF.

ITEM	FUSE UNID	TYPE	UNIT	NUMBER FIG.	NUMBER CALC.	ATT.	REF. DWG. ITEM No.	REMARKS
212	3-FU 2 L 74 - 72B	TR .8	3B	20	20	20	204	CONTROL CIRCUIT
213	3-FU 2 L 74 - 106B	TR .8	3B	20	20	20	204	
214	3-FU 2 L 64 - 71B	TR .8	3B	20	20	20	204	
215	3-FU 2 L 73 - 64B	TR .8	3B	20	20	20	205	
216	3-FU 2 L 78 - 61B	TR .8	3B	20	20	20	205	
217	3-FU 2 L 74 L 71B	TR .8	3B	20	20	20	205	
218	3-FU 2 L 75 L 51B	TR .8	3B	20	20	20	205	
219	3-FU 2 L 75 L 53B	TR .8	3B	20	20	20	205	
220	3-FU 2 L 31 - 139B	TR .8	3B	20	20	20	206	
221	3-FU 2 L 69 L 12B	TR .8	3B	20	20	20	206	
222	3-FU 2 L 74 L 99B	TR .8	3B	20	20	20	206	
223	3-FU 2 - 74 - 74B	TR .8	3B	20	20	20	206	
224	3-FU 2 - 70 - 40B	TR 3.2	3B	20	20	20	202	CONTROL NORMAL
225	3-FU 2 L 70 L 45B	TR 3.2	3B	20	20	20	205	
226	3-FU 2 - 71 - 2B	TR .8	3B	20	20	20	201	
227	3-FU 2 - 70 - 48B	TR .8	3B	20	20	20	202	
228	3-FU 2 L 23 L 57B	TR .8	3B	20	20	20	202	
229	3-FU 2 L 70 L 47B	TR .8	3B	20	20	20	202	
230	3-FU 2 L 74 L 25B	TR .8	3B	20	20	20	202	
231	3-FU 2 L 74 - 34B	TR .8	3B	20	20	20	203	
232	3-FU 2 - 74 L 46B	TR .8	3B	20	20	20	203	

TABLE A

SEE [SECT 40]

581 9-87

EBASCO SERVICES INCORPORATED

BY PB: 8/13/88 [ED-Q0268-88463]

CHKD. BY CCO DATE 8-13-88

SHEET 36 OF 133

CLIENT TVA OFS NO. DEPT. NO.

PROJECT BFNP UNITS 1,2,3

SUBJECT FUSE PROGRAM [ABOV. REACTOR MOV BOARDS 3A/B]

60 DESIGN INPUT DATA, CALC. AND DWG. CROSS REF.

ITEM	FUSE UNID	TYPE	UNIT	NUMBER FIG.	NUMBER CALC.	ATT.	REF. DWG. ITEM No.	REMARKS
233	3-FU 2 - 74 - 100B	TR-.8	3B	2D	2D	2.0	207	CONTROL NORMAL
234	3-FU 2 - 74 - 92B	TR-.8	3B	2D	2D	2.0	207	
235	3-FU 2 - 74 - 101B	TR-.8	3B	2D	2D	2.0	207	
236	3-FU 2 - 70 - 40C	TR 3.2	3B	2D	8.0	2.0	202	CONTROL EMERG.
237	3-FU 2 - 70 - 45C	TR 3.2	3B	2D	8.0	2.0	205	
238	3-FU 2 - 70 - 47C	TR-.8	3B	2D	2D	2.0	202	
239	3-FU 2 - 74 - 25C	TR-.8	3B	2D	2.0	2.0	202	
240	3-FU 2 - 74 - 46C	TR-.8	3B	2D	2D	2.0	203	
241	3-FU 2 - 74 - 100C	TR-.8	3B	2D	2.0	2.0	207	
242	3-FU 2 - 74 - 97C	TR-.8	3B	2D	2D	2.0	207	
243	3-FU 2 - 74 - 101C	TR-.8	3B	2D	2.0	2.0	207	
244	3-FU 2 - 76 - 59D	TR 4.6	3B	2D	13.0	2.0	208	CONT XFMR
245	3-FU 2 - 268 - 38A	JHC 15	3B	4D	111.0	4.0	201	C PWR XFMR
246	3-FU 2 - 74 - 66E	AAJ 6	3B	2D	5.0	1.0	201	COIL & P XFMR
247	3-FU 2 - 31 - 112A	AAJ 3	3B	†	†	†	205	NONEXISTENT
248	3-FU 2 - 31 - 112B	TR-.8	3B	†	†	†	205	NONEXISTENT
249	3-FU 2 - 268 - 36F	JHC 15	3B	4D	111.0	4.0	206	C PWR XFMR
250	3-FU 2 - 268 - 35Q	TR 2	3B	†	†	†	-	NONEXISTENT
251	3-FU 2 - 71 - 2C	TR-.8	3B	2D	2.0	2.0	201	CONT EMERG.
252	3-FU 2 - 70 - 48C	TR-.8	3B	2D	2.0	2.0	202	CONT EMERG.
253	3-FU 2 - 23 - 57C	TR-.8	3B	2D	2.0	2.0	202	CONT EMERG.

TABLE A

SEE [SECT 4.0]

581 9-87

BY DB 8/13/88 LED-Q0268-884637

CHK'D. BY CCO DATE 8-13-88

CLIENT TVA OFS NO. DEPT. NO.

PROJECT BFNP UNITS 1,2,3

SUBJECT FUSE PROGRAM (480V REACTOR MOV BOARDS 3A/B)

60 DESIGN INPUT DATA, CALC. AND DWG. CROSS REF.

ITEM	FUSE UNID	TYPE	UNIT	NUMBER FIG.	CALC.	ATT.	REF. DWG. ITEM NO.	REMARKS
254	3-FU 2 - 268 - 38D	A4J15	3B	8.0	17.0	3.0	201	NC BKR CL CKT
255	3-FU 2 - 268 - 38H	A4J15	3B	8.0	17.0	3.0	206	NC BKR CL CKT
256	3-FU 2 - 268 - 38E	A4J30	3B	9.0	18.0	6.0	201	BKR TR CKT
257	3-FU 2 - 268 - 38J	A4J30	3B	9.0	18.0	6.0	206	BKR TR CKT
258	3-FU 2 - 268 - 38B	A4J10	3B	5.0	14.0	1.0	201	VM LV & XFER
259	3-FU 2 - 268 - 38C	A4J10	3B	6.0	15.0	1.0	201	LV & OV CKT
260	3-FU 2 - 63 - 58B	TR5.6	3B	3.0	9.0	2.0	203	TC-6B-5B
261	3-FU 2 - 63 - 68C	TR5.6	3B	3.0	9.0	2.0	203	PWR MTR HT
262	3-FU 2 - 32 - 69B	TR6.25	3B	11.0	20.0	2.0	204	PWR CKT
263	3-FU 2 - 268 - 38K	A4J10	3J	10.0	19.0	1.0	206	LV A.N.
264	3-FU 2 - 268 - 38G	A4J10	3B	7.0	16.0	1.0	206	VM & LV
265	3-FU 2 - 77 - 88B	TR.8	3B	2.0	2.0	2.0	201	75VA XFMR SEC.
266	3-FU 2 - 67 - 26B	TR.8	3B	2.0	2.0	2.0	204	75VA XFMR SEC.
267	3-FU 2 - 73 - 81A	A4J3	3B	1.0	1.0	1.0	204	RUN LIGHT
268	3-FU 2 - 73 - 81B	TR.8	3B	2.0	2.0	2.0	204	75VA XFMR SEC
269	3-FU 2 - 74 - 36C	TR.8	3B	2.0	2.0	2.0	103	75VA XFMR. SEC
270	SPARE (2 FUSE BLOCK)	NONE	3B				207	COMPARTMENT
271		NONE	3B				201	NC
272		NONE	3B				204	4A
273		NONE	3B				202	5A
274		NONE	3B				202	5C2

SEE (SECT. 4.0)

TABLE A

581 9-87

6.0 DESIGN INPUT DATA, CALC. AND DWG. CROSS REF.

ITEM	FUSE UNID	TYPE	NUMBER UNIT	FIG.	CALC.	A.T.	REF. DWG. ITEM No.	REMARKS COMPARTMENT
275	SPARE (2 FUSE BLOCK)	NONE	3B	N/A	N/A	N/A	202	6A
276							202	6C2
277								7C
278								8A
279								8A
280								8C
281								12C
282								12C
283								12C
284								12C
285								12E
286								12E
287								14A
288								14D
289								14D
290								14D
291								14D
292								15A
293								17D
294								17D
295								19A

SEE [SECT. 40]

TABLE A

581 9-87

EBASCO SERVICES INCORPORATED

[ED-QO268-8843]

BY BS: 8/13/88

CHKD. BY CCO DATE 8-13-88

SHEET 39 OF 133

CLIENT TVA OFS NO. DEPT. NO.

PROJECT BFNP UNITS 1,2,3

SUBJECT FUSE PROGRAM [480V. REACTOR MOV BOARDS 3A/B]

DESIGN INPUT DATA, CALC. AND DWG. CROSS REF.

ITEM	FUSE UNID	TYPE	UNIT	NUMBER FIG.	CALC.	ATT.	REF. DWG ITEM No.	REMARKS
296	SPARE (2 FUSE BLOCK)	NONE	3B	†	†	†	207	COMPARTMENT 19C
297	3-FU2-31-122A	A4J3	3B	12.0	21.0	1.0	207	XFMR PRIM (JB 4099)
298	3-FU2-31-123A	TR.8	3B	2.0	2.5	2.0	207	XFMR SEC (JB 3211)
	NOT USED							

TABLE A

SEE SECT 40

6.1 LOAD CALCULATION & FUSE SIZING.

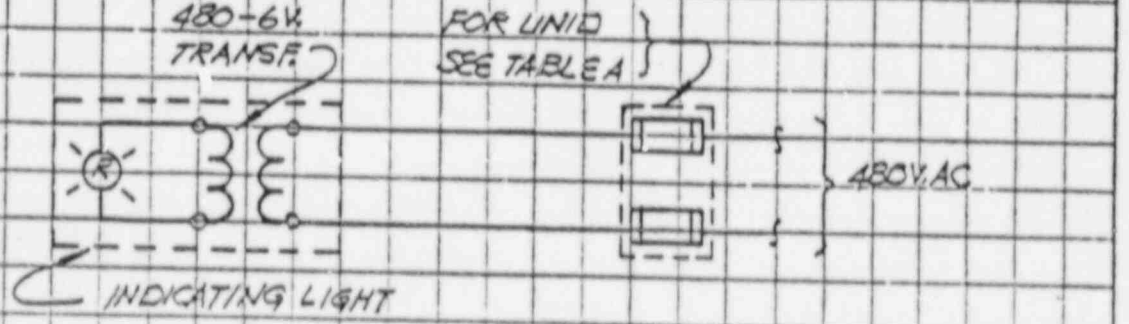

FIGURE 1.0
(INDICATING LTG. TRANSF TYPE)

CALCULATION # 1.0

FOR MILD ENVIRONMENT AREA
CIRCUIT CONFIGURATION : FIGURE 1.0
CIRCUIT LOAD : INDICATING LIGHT, TRANSF TYPE
1VA TRANSF., 480-6V. A.C.
1Φ, 50/60 HZ.
CRITERIA : PER SECTION 2.0
REFERENCES : ATT 12.0

• FIND PRIMARY TRANSF. FULL LOAD CURRENT (I_L)

$$I_L = \frac{VA}{V}$$

$$= \frac{1}{480}$$

$$\therefore I_L = 0.00208\ A$$

6.1 LOAD CALC. & FUSE SIZING.

CALC. # 10 (CONTINUED)

- FIND MAX. ALLOWABLE CONTINUOUS CURRENT (I_F) @ 5 TIMES OF I_L

$$I_F = I_L \times 5$$
$$= 0.00208 \times 5$$
$$\therefore I_F = 0.0104\ A$$

- FIND MAX. ALLOWABLE CONTINUOUS CURRENT (I_{FN}).

$$I_{FN} = I_F \times 1.25$$
$$= 0.0104 \times 1.25$$
$$\therefore I_{FN} = 0.013\ A$$

- FIND INRUSH CURRENT @ NORMAL CONDITION. (I_{R_1})

$$I_{R_1} = I_L \times F_R$$
$$= 0.00208 \times 12$$
$$\therefore I_{R_1} = 0.02496\ A$$

- FIND INRUSH CURRENT @ WORST CONDITION (I_{R_2})

$$I_{R_2} = I_L \times F_R$$
$$= 2.08 \times 25$$
$$\therefore I_{R_2} = 0.052\ A$$

- FUSE SELECTION:

3.0 AMP FUSE (I_N) IS SELECTED (ATT. 10)

- DETERMINE NEW RATING OF FUSE (I_{NR}), DERATED FOR 110°F

$$I_{NR} = I_N \times T_C$$
$$= 3 \times 0.924$$
$$\therefore I_{NR} = 2.77\ A$$

Cal LOAD CALC. & FUSE SIZING.

CALC. # 1.0 (CONTINUED)

- 3.0 AMP FUSE, 600V.AC, 200 KA (RMS) INTERRUPTING CAPACITY IS ACCEPTABLE PER CRITERIA SECTION 2.0.

- FOR SUMMARY OF RESULTS SEE TABLE 'B'
- FOR CONCLUSIONS AND RECOMMENDATIONS SEE TABLE 'C'

6.1 LOAD CALCULATION AND FUSE SIZING.

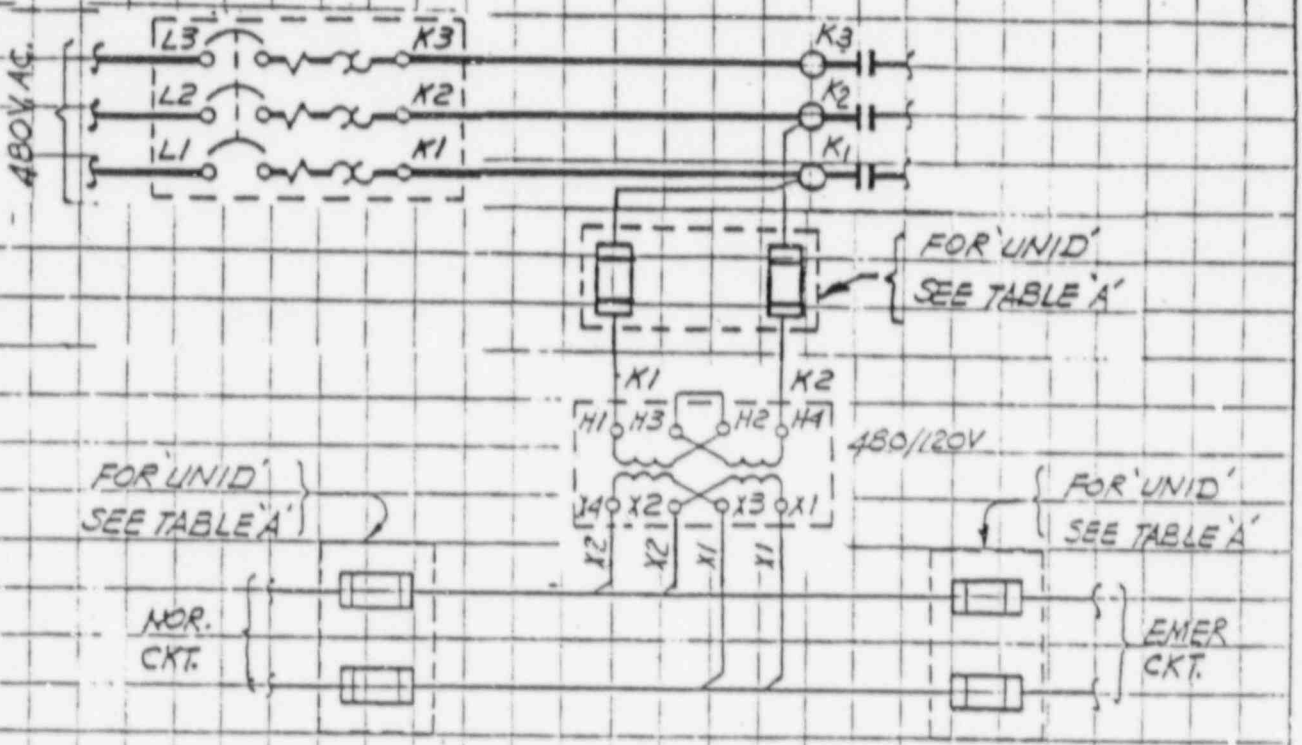

FIGURE 2.0

6.1 LOAD CALCULATION AND FUSE SIZING

CALCULATION No. 2.0

MILD ENVIRONMENT AREA

CIRCUIT CONFIGURATION: FIGURE 2.0

CIRCUIT LOAD: 75 VA. TRANSF. [REF. TABLE A]
120V.AC, 1 Φ, 60HZ

BASIS OF CALC: CRITERIA SECT. 2.0

REFERENCE: FOR TRANSF. SIZE SEE TABLE A

- FIND TRANSF. SECONDARY FULL LOAD CURRENT. (I_L)

$$I_L = \frac{VA}{V}$$

$$= \frac{75}{120}$$

$$\therefore I_L = 0.625 A.$$

- FIND ALLOWABLE MAX CURRENT (I_F) @ 125% SAFETY FACTOR

$$I_F = I_L \times 1.25$$

$$= 0.625 \times 1.25$$

$$\therefore I_F = 0.78 A.$$

- FUSE SELECTION:
  0.8 AMP FUSE (I_N) IS SELECTED (ATT. 2.0)

- DETERMINE NEW RATING OF FUSE (I_{NR}), DERATED FOR 110°F

$$I_{NR} = I_N \times T_C$$

$$= 0.8 \times 0.924$$

$$\therefore I_{NR} = 0.74 A$$

- 0.8 AMP FUSE, 250V.AC., 200KA INTERRUPTING CAPACITY IS ACCEPTABLE PER CRITERIA. SECT. 2.17A
  - FOR SUMMARY OF RESULTS SEE TABLE 'B'
  - FOR CONCLUSIONS AND RECOMMENDATIONS SEE TABLE 'C'

6.1 LOAD CALCULATION AND FUSE SIZING.

CALCULATION No. 3.0

MILD ENVIRONMENT AREA

CIRCUIT CONFIGURATION: FIGURE 2.0

CIRCUIT LOAD: 150 VA. TRANSF. [REF. TABLE 6.1]

480VAC, 1φ, 60HZ (PRIMARY SIDE)

BASIS OF CALC: CRITERIA SEC 2.0

- FIND TRANSF. PRIMARY FULL LOAD CURRENT (I_L)

$$I_L = \frac{VA}{V}$$

$$= \frac{150}{480}$$

$$\therefore I_L = 0.3125\ A$$

- FIND ALLOWABLE MAX CURRENT (I_F) @ 500% SAFETY FACTOR

$$I_F = I_L \times 5$$

$$= 0.3125 \times 5$$

$$\therefore I_F = 1.56\ A$$

- FIND INRUSH CURRENT @ NORMAL CONDITION (IR_1)

$$I_{R_1} = I_L \times FR$$

$$= 0.3125 \times 12$$

$$IR_1 = 3.75\ A$$

- FIND INRUSH CURRENT @ WORST CONDITION (IR_2)

$$I_{R_2} = I_L \times FR$$

6.1 LOAD CALCULATION AND FUSE SIZING.
CALCULATION NO. 3.0 (CONTINUED)

$$I_{R_2} = 0.3/25 \times 25$$
$$\therefore IR_2 = 7.81\ A$$

- FUSE SELECTION:

- 1.5 AMP FUSE (I_N) IS SELECTED (ATT. 20)

- DETERMINE NEW RATING OF FUSE (I_{NR}), DERATED FOR 40°F

$$I_{NR} = I_N \times T_C$$
$$= 1.5 \times 0.924$$
$$\therefore I_{NR} = 1.39\ A$$

- 1.5 AMP FUSE, 600 V.A.C., 200KA (RMS) INTERRUPTING CAPACITY IS ACCEPTABLE PER CRITERIA SECTION 2.17A
  - FOR SUMMARY OF RESULTS SEE TABLE 'B'
  - FOR CONCLUSIONS AND RECOMMENDATIONS SEE TABLE 'C'

6.1 LOAD CALCULATION AND FUSE SIZING.

TRANSF. CKTS. WITH PRIMARY AND SECONDARY FUSE PROTECTION

CALCULATION No. 4.0

MILD ENVIRONMENT AREA

CIRCUIT CONFIGURATION: FIGURE 2.0

CIRCUIT LOAD: 150 VA. TRANSF. [REF. TABLE A]
120VAC, 1φ, 60HZ (SECONDARY)

BASIS OF CALC: CRITERIA SECT. 2.0

- FIND TRANSF. SECONDARY FULL LOAD CURRENT. (I_L)

$$I_L = \frac{VA}{V}$$

$$= \frac{150}{120}$$

$$\therefore I_L = \underline{1.25}\ A.$$

- FIND ALLOWABLE MAX CURRENT (I_F) @ 167 % SAFETY FACTOR.

$$I_F = I_L \times 1.67$$

$$= 1.25 \times 1.67$$

$$\therefore I_F = \underline{2.09}\ A.$$

- FUSE SELECTION:
  - 2.25 AMP FUSE (I_N) IS SELECTED (ATT. 2.0)

- DETERMINE NEW RATING OF FUSE (I_{NR}), DERATED FOR 110°F.

$$I_{NR} = I_N \times T_C$$

$$= 2.25 \times 0.924$$

$$\therefore I_{NR} = 2.08\ AMPS$$

- 2.25 AMP FUSE, 250VAC, 200KA(RMS) INTERRUPTING CAPACITY IS ACCEPTABLE PER CRITERIA SECTION 2.17A
  - FOR SUMMARY OF RESULTS SEE TABLE B
  - FOR CONCLUSIONS AND RECOMMENDATION SEE TABLE 'C'

BY DB: 8/13/88 SHEET 48 OF 133
CHK'D. BY CCO DATE 8-13-88 OFS NO. DEPT. NO.
CLIENT TVA
PROJECT BFNP UNITS 1,2,3
SUBJECT FUSE PROGRAM [480V. REACTOR MOV BOARDS 3A/B]

6.1 LOAD CALCULATION AND FUSE SIZING

CALCULATION No. 5.0

MILD ENVIRONMENT AREA

CIRCUIT CONFIGURATION: FIGURE 2.0

CIRCUIT LOAD: 200 VA. TRANSF. [REF. TABLE A]
480VAC, 1φ, 60HZ (PRIMARY)

BASIS OF CALC: CRITERIA SECT. 2.0

• FIND TRANSF. PRIMARY FULL LOAD CURRENT. (I_L)

$$I_L = \frac{VA}{V}$$

$$= \frac{200}{480}$$

$$\therefore I_L = 0.417 \text{ A.}$$

• FIND ALLOWABLE MAX CURRENT (I_F) @ 500% SAFETY FACTOR

$$I_F = I_L \times 5$$

$$= 0.417 \times 5$$

$$\therefore I_F = 2.09 \text{ A.}$$

• FIND INRUSH CURRENT @ NORMAL CONDITION (IR_1)

$$IR_1 = I_L \times F_R$$

$$= 0.417 \times 12$$

$$\therefore IR_1 = 5.0 \text{ A}$$

• FIND INRUSH CURRENT @ WORST CONDITION (IR_2)

$$IR_2 = I_L \times F_R$$

$$= 0.417 \times 25$$

$$\therefore IR_2 = 10.425 \text{ A}$$

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6.1 LOAD CALCULATION & FUSE SIZING.
CALC. # 5.0 (CONTINUED)

- FUSE SELECTION:
  - 3.0 AMP FUSE (I_N) IS SELECTED (ATT. 5.0)
- DETERMINE NEW RATING OF FUSE (I_{NR}), DERATED FOR 110°F

$$I_{NR} = I_N \times T_C$$
$$= 3.0 \times 0.924$$
$$\therefore I_{NR} = 2.77 \text{ AMPS}$$

- 3.0 AMP FUSE, 600VAC., 200KA(RMS) INTERRUPTING CAPACITY IS ACCEPTABLE. PER CRITERIA SECTION 2.0
  - FOR SUMMARY OF RESULTS SEE TABLE 'B'
  - FOR CONCLUSIONS AND RECOMMENDATIONS SEE TABLE 'C'

6.1 LOAD CALCULATION AND FUSE SIZING

CALCULATION No. 6.0

MILD ENVIRONMENT AREA

CIRCUIT CONFIGURATION: FIGURE 2.0

CIRCUIT LOAD: 200 VA. TRANSF. [REF. TABLE A]
120VAC, 1φ, 60HZ (SECONDARY)

BASIS OF CALC: CRITERIA SECT. 20

- FIND TRANSF. SECONDARY FULL LOAD CURRENT. (I_L)

$$I_L = \frac{VA}{V}$$

$$= \frac{200}{120}$$

$$\therefore I_L = 1.67 \text{ A.}$$

- FIND ALLOWABLE MAX CURRENT (I_F) @167% SAFETY FACTOR

$$I_F = I_L \times 1.67$$

$$= 1.67 \times 1.67$$

$$\therefore I_F = 2.79 \text{ A.}$$

- FUSE SELECTION:
  - 3.0 AMP FUSE(IN) IS SELECTED (ATT. 2.0)
- DETERMINE NEW RATING OF FUSE (I_{NR}). DERATED FOR 110°F

$$I_{NR} = I_N \times T_C$$

$$= 3.0 \times 0.924$$

$$\therefore I_{NR} = 2.77 \text{ AMPS}$$

- 3.0 AMP FUSE, 600VAC., 200KA(RMS) INTERRUPTING CAPACITY IS ACCEPTABLE PER CRITERIA SECTION 2.17A
- FOR SUMMARY OF RESULTS SEE TABLE 'B'
- FOR CONCLUSIONS AND RECOMMENDATIONS SEE TABLE 'C'

6.1 LOAD CALCULATION AND FUSE SIZING.

CALCULATION No. 7.0

MILD ENVIRONMENT AREA

CIRCUIT CONFIGURATION: FIGURE 2.0

CIRCUIT LOAD: 300 VA. TRANSF. [REF. TABLE A]
480 VAC, 1φ, 60HZ (PRIMARY)

BASIS OF CALC: CRITERIA SECT. 2.0

• FIND TRANSF. PRIMARY FULL LOAD CURRENT. (I_L)

$$I_L = \frac{VA}{V}$$

$$= \frac{300}{480}$$

$$\therefore I_L = 0.625 \text{ A.}$$

• FIND ALLOWABLE MAX CURRENT (I_F) @ 500% SAFETY FACTOR

$$I_F = I_L \times 5$$

$$= 0.65 \times 5$$

$$\therefore I_F = 3.25 \text{ A.}$$

• FIND INRUSH CURRENT @ NORMAL CONDITION (IR_1)

$$IR_1 = I_L \times F_R$$

$$= 0.625 \times 12$$

$$\therefore IR_1 = 7.5 \text{ A}$$

• FIND INRUSH CURRENT @ WORST CASE (IR_2)

$$IR_2 = I_L \times F_R$$

$$= 0.625 \times 25$$

$$\therefore IR_2 = 15.625 \text{ A.}$$

6.1 LOAD CALCULATION & FUSE SIZING.

CALC. # 7.0 (CONTINUED)

- FUSE SELECTION:
  - 4.0 AMP FUSE (I_N) IS SELECTED. (ATT. 5.0)
- DETERMINE NEW RATING OF FUSE (I_{NR}), DERATED FOR 110°F

$$I_{NR} = I_N \times T_C$$
$$= 4.0 \times 0.924$$
$$\therefore I_{NR} = 3.7 \text{ AMPS}$$

- 4.0 AMP FUSE, 600VAC, 200 KA(RMS) INTERRUPTING CAPACITY IS ACCEPTABLE PER CRITERIA SECTION 2.0
- FOR SUMMARY OF RESULTS SEE TABLE 'B'
- FOR CONCLUSIONS AND RECOMMENDATIONS SEE TABLE 'C'

(a) LOAD CALCULATION AND FUSE SIZING.

CALCULATION No. 8.0

MILD ENVIRONMENT AREA

CIRCUIT CONFIGURATION: FIGURE 2.0

CIRCUIT LOAD: 300 VA. TRANSF. [REF. TABLE A]
120VAC, 1φ, 60HZ (SECONDARY)

BASIS OF CALC.: CRITERIA SECT. 2.0

- FIND TRANSF. SECONDARY FULL LOAD CURRENT. (I_L)

$$I_L = \frac{VA}{V}$$

$$= \frac{300}{120}$$

$$\therefore I_L = 2.5 \text{ AMPS}$$

- FIND ALLOWABLE MAX CURRENT (I_F) @ 125% SAFETY FACTOR

$$I_F = I_L \times 1.25$$

$$= 2.5 \times 1.25$$

$$\therefore I_F = 3.125 \text{ AMPS}$$

- FUSE SELECTION:
  - 3.5 AMP FUSE (I_N) IS SELECTED (ATT. 2.0)

- DETERMINE NEW RATING OF FUSE (I_{NR}), DERATED FOR 110°F

$$\therefore I_{NR} = I_N \times T_C$$

$$= 3.5 \times 0.924$$

$$\therefore I_{NR} = 3.23 \text{ AMPS}$$

- 3.5 AMP FUSE, 250 VAC., 200 KA (RMS) INTERRUPTING CAPACITY IS ACCEPTABLE PER CRITERIA SECTION 2.0
  - FOR SUMMARY OF RESULTS SEE TABLE 'B'
  - FOR CONCLUSIONS AND RECOMMENDATIONS SEE TABLE 'C'

(a1) LOAD CALCULATION AND FUSE SIZING.

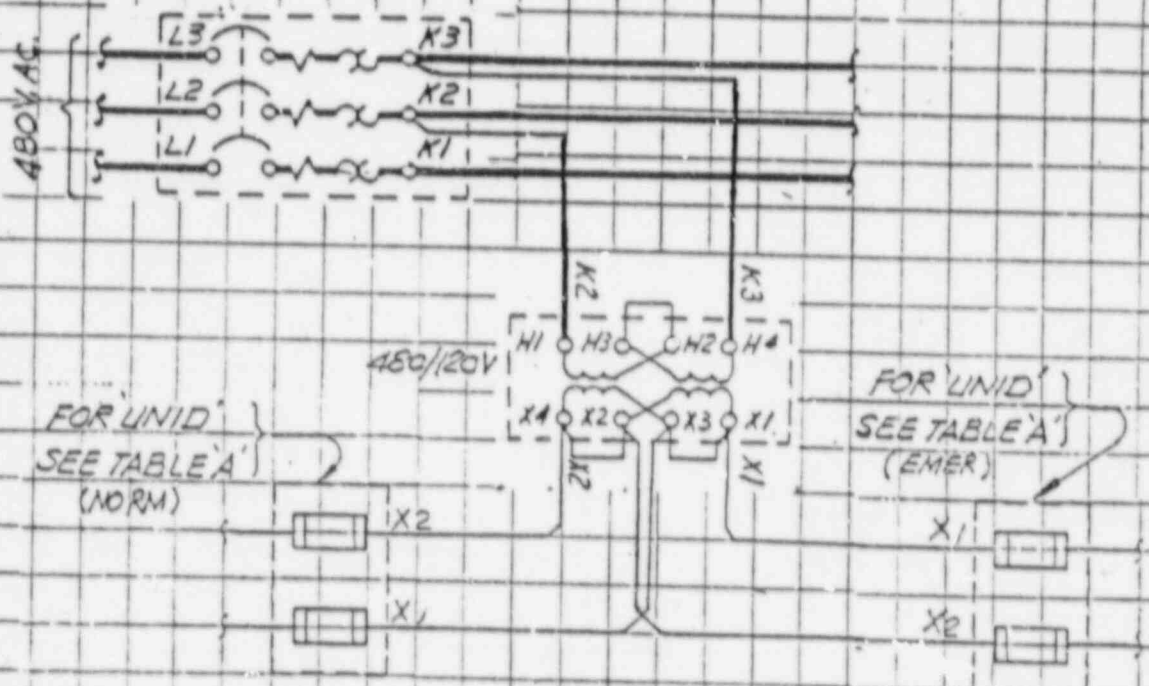

FIGURE 3.0

6.1 LOAD CALCULATION AND FUSE SIZING.

CALCULATION No. 9.0

MILD ENVIRONMENT AREA.

CIRCUIT CONFIGURATION: FIGURE 3.0

CIRCUIT LOAD: 500 VA. TRANSF. [REF. TABLE A]
120 VAC, 1 Φ, 60 HZ [SECONDARY]

BASIS OF CALC: CRITERIA SECT. 20

- FIND TRANSF. SECONDARY FULL LOAD CURRENT. (I_L)

$$I_L = \frac{VA}{V}$$

$$= \frac{500}{120}$$

$$\therefore I_L = 4.17 \text{ A.}$$

- FIND ALLOWABLE MAX CURRENT (I_F) @ 125% SAFETY FACTOR

$$I_F = I_L \times 1.25$$

$$= 4.17 \times 1.25$$

$$\therefore I_F = 5.21 \text{ A.}$$

- FUSE SELECTION:
  - 5.6 AMP FUSE (I_N) IS SELECTED (ATT. 5.0)

- DETERMINE NEW RATING OF FUSE (I_{NR}), DERATED FOR 110°F

$$I_{NR} = I_N \times T_C$$

$$= 5.6 \times 0.924$$

$$\therefore I_{NR} = 5.17 \text{ AMPS}$$

- 5.6 AMP FUSE, 250 VAC, 200 KA (RMS) INTERRUPTING CAPACITY IS ACCEPTABLE PER CRITERIA SECTION 2.17A
  - FOR SUMMARY OF RESULTS SEE TABLE 'B'
  - FOR CONCLUSIONS AND RECOMMENDATIONS SEE TABLE 'C'

6.1 LOAD CALCULATION AND FUSE SIZING.

CALCULATION No. 10.0

MILD ENVIRONMENT AREA

CIRCUIT CONFIGURATION: FIGURE 20

CIRCUIT LOAD: 750 VA. TRANSF. (REF. TABLE A)
120VAC, 1φ, 60HZ (SECONDARY)

BASIS OF CALC: CRITERIA SECT. 20

- FIND TRANSF. SECONDARY FULL LOAD CURRENT. (I_L)

$$I_L = \frac{VA}{V}$$

$$= \frac{750}{120}$$

$$\therefore I_L = 6.25 \text{ A}$$

- FIND ALLOWABLE MAX CURRENT (I_F) @ 125% SAFETY FACTOR

$$I_F = I_L \times 1.25$$

$$= 6.25 \times 1.25$$

$$\therefore I_F = 7.8 \text{ A}$$

- FUSE SELECTION:
  - 9.0 AMP FUSE (I_N) IS SELECTED. (ATT. 5.0)

- DETERMINE NEW RATING OF FUSE (I_{NR}); DERATED FOR 110°F

$$I_{NR} = I_N \times T_C$$

$$= 9.0 \times 0.924$$

$$\therefore I_{NR} = 8.36 \text{ AMPS}$$

- 9.0 AMP FUSE, 600VAC, 200KA(RMS) INTERRUPTING CAPACITY IS ACCEPTABLE PER CRITERIA SECTION 2.0
  - FOR SUMMARY OF RESULTS SEE TABLE 'B'
  - FOR CONCLUSIONS AND RECOMMENDATIONS SEE TABLE 'C'

G.1 LOAD CALCULATION AND FUSE SIZING

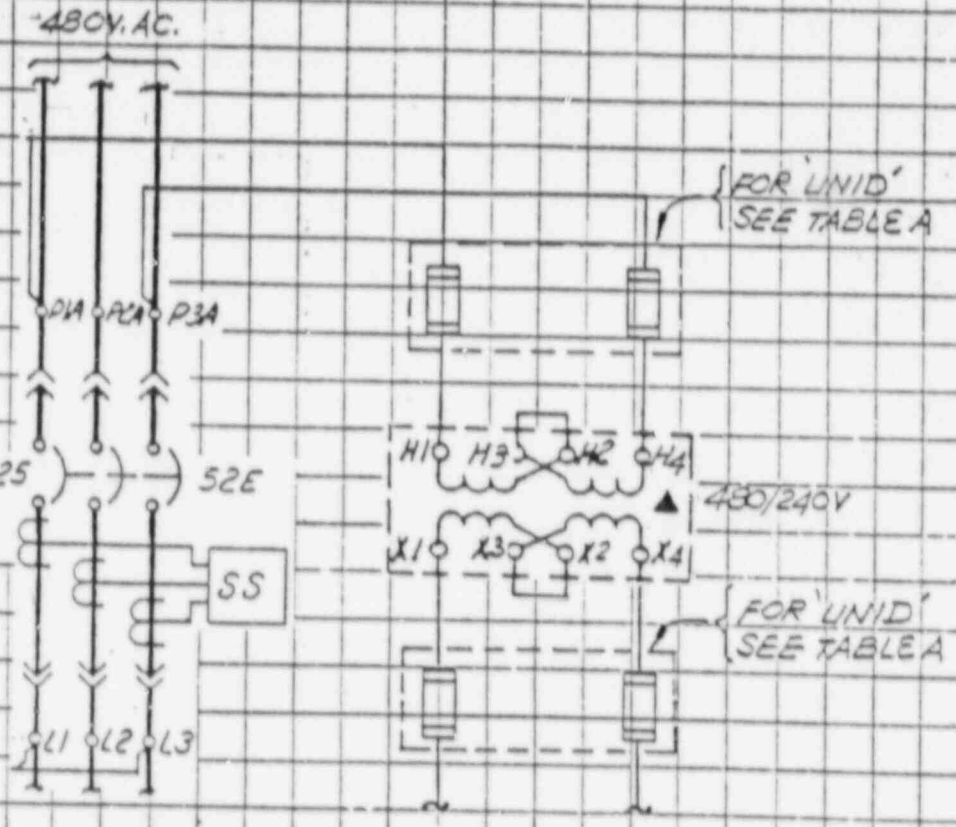

FIGURE 4.0

6.1 LOAD CALCULATION AND FUSE SIZING

CALCULATION No. 11.0

MILD ENVIRONMENT AREA.

CIRCUIT CONFIGURATION: FIGURE 4.0

CIRCUIT LOAD: 2.000VA. TRANSF. [REF. TABLE A]

480 VAC, 1φ, 60HZ (PRIMARY)

BASIS OF CALC.: CRITERIA SECT. 20

- FIND TRANSF. PRIMARY FULL LOAD CURRENT. (I_L)

$$I_L = \frac{VA}{V}$$

$$= \frac{2000}{480}$$

$$\therefore I_L = 4.17 \text{ A}$$

- FIND ALLOWABLE MAX CURRENT (I_F) @ 500% SAFETY FACTOR

$$I_F = I_L \times 5$$

$$= 4.17 \times 5$$

$$\therefore I_F = 20.85 \text{ A}$$

- FIND INRUSH CURRENT @ NORMAL CONDITION (IR_1)

$$IR_1 = I_L \times 12$$

$$= 4.17 \times 12$$

$$\therefore IR_1 = 50.04 \text{ A}$$

- FIND INRUSH CURRENT @ WORST CONDITION (IR_2)

$$IR_2 = I_L \times 25$$

$$= 4.17 \times 25$$

$$\therefore IR_2 = 104.25 \text{ A}$$

6.1 LOAD CALCULATION & FUSE SIZING.
CALC. # 110 (CONTINUED)

- FUSE SELECTION:
  - 15.0 AMP FUSE (I_N) IS SELECTED IN ORDER TO PROVIDE BOTH OVERLOAD AND SHORT CIRCUIT PROTECTION OF #14 AWG WIRE. SEE CRITERIA SECTION 2.20
- DETERMINE NEW RATING OF FUSE (I_{NR}), DERATED FOR 110°F

$$I_{NR} = I_N \times T_C$$
$$= 15.0 \times 0.924$$
$$\therefore I_{NR} = 13.86 \text{ AMPS}$$

- 15.0 AMP FUSE, 600VAC, 200KA(RMS) INTERRUPTING CAPACITY (ATT. 2.0) IS ACCEPTABLE PER CRITERIA SECTIONS 2.17A AND 2.20.
  - FOR SUMMARY OF RESULTS SEE TABLE 'B'
  - FOR CONCLUSIONS AND RECOMMENDATIONS SEE TABLE 'C'

6.1 LOAD CALCULATION AND FUSE SIZING

CALCULATION No. 12.0

MILD ENVIRONMENT AREA.

CIRCUIT CONFIGURATION: FIGURE 4.0

CIRCUIT LOAD: 2,000VA. TRANSF. (REF TABLE A)
240VAC, 1φ, 60HZ (SECONDARY)

BASIS OF CALC: CRITERIA SECT. 2.0

- FIND TRANSF. SECONDARY FULL LOAD CURRENT. (I_L)

$$I_L = \frac{VA}{V}$$

$$= \frac{2000}{240}$$

$$\therefore I_L = 8.3 \text{ A.}$$

- FIND ALLOWABLE MAX CURRENT (I_F) @ 1.25 % SAFETY FACTOR

$$I_F = I_L \times 1.25$$

$$= 8.3 \times 1.25$$

$$\therefore I_F = 10.38 \text{ A.}$$

- FUSE SELECTION:
  - 12.0 AMP FUSE (I_N) IS SELECTED (ATT. 7.0)

- DETERMINE NEW RATING OF FUSE (I_{NR}), DERATED FOR 110°F

$$I_{NR} = I_N \times T_C$$

$$= 12.0 \times 0.924$$

$$\therefore I_{NR} = 11.09 \text{ AMPS}$$

- 12.0AMP FUSE, 600VAC, 200KA(RMS) INTERRUPTING CAPACITY IS ACCEPTABLE:
  PER CRITERIA SECTION 2.0
  - FOR SUMMARY OF RESULTS SEE TABLE 'B'.
  - FOR RECOMMENDATIONS AND CONCLUSIONS SEE TABLE 'C'

61 LOAD CALCULATION AND FUSE SIZING.
TRANSF CKTS WITH SECONDARY FUSE PROTECTION
CALCULATION No. 13.0

MILD ENV. AREA.

CIRCUIT CONFIGURATION: FIGURE 20
CIRCUIT LOAD: 150 VA. TRANSF. [REF. TABLE A]
120VAC, 1Φ, 60HZ (SECONDARY SIDE)
BASIS OF CALC: CRITERIA SECT. 2.0

- FIND TRANSF. SECONDARY FULL LOAD CURRENT. (I_L)

$$I_L = \frac{VA}{V}$$

$$= \frac{150}{120}$$

$$\therefore I_L = 1.25 \text{ AMPS}$$

- FIND ALLOWABLE MAX CURRENT (I_F) @ 125 % SAFETY FACTOR

$$I_F = I_L \times 1.25$$

$$= 1.25 \times 1.25$$

$$\therefore I_F = 1.56 \text{ AMPS}$$

- FUSE SELECTION:
  - 1.8 AMP FUSE (I_N) IS SELECTED (ATT. 2.0)

- DETERMINE NEW RATING OF FUSE (I_{NR}), DERATED FOR 110°F

$$I_{NR} = I_N \times T_C$$

$$= 1.8 \times 0.924$$

$$\therefore I_{NR} = 1.66 \text{ AMPS}$$

- 1.8 AMP FUSE, 250 VAC, 200 KA(RMS) INTERRUPTING CAPACITY IS ACCEPTABLE PER CRITERIA SECTION 2.0
- FOR SUMMARY OF RESULTS SEE TABLE B
- FOR CONCLUSIONS AND RECOMMENDATIONS SEE TABLE C

(a) LOAD CALCULATION & FUSE SIZING

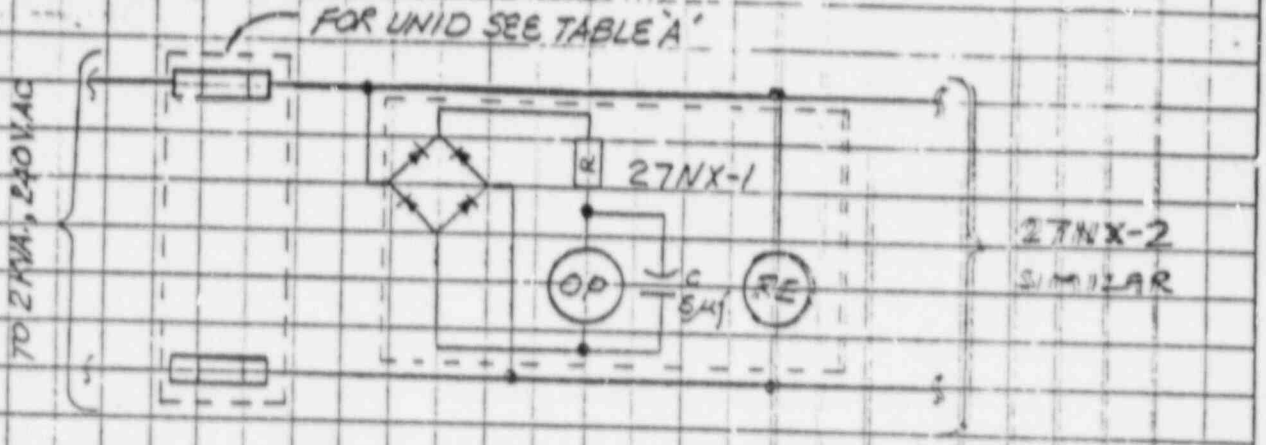

FIGURE 5.0
(BUS TRANSFER CKT.)

CALC. # 14.0

CIRCUIT CONFIGURATION: FIG. # 5.0

CIRCUIT FUNCTION: BUS TRANSFER CKT.

CIRCUIT LOADS: 27NX-1, 27NX-2 (RMS# [illegible])
-[RECTIFIER, RESISTOR(R), OPERATING COIL (OP)-ATTRO
-RESET COIL (RE), CAPACITOR (C)].
R = 200 Ω GE CAT. # IC9006C

- DETERMINE LOADS IN THE CIRCUIT.

THE OPERATIONAL SEQUENCE OF 27NX-1 AND 27NX-2 IS AS FOLLOWS:
WHEN OPERATING COILS ARE ENERGIZED, RESET COILS ARE DE-ENERGIZED
WHEN RESET COILS ARE ENERGIZED, OPERATING COILS ARE DE-ENERGIZED

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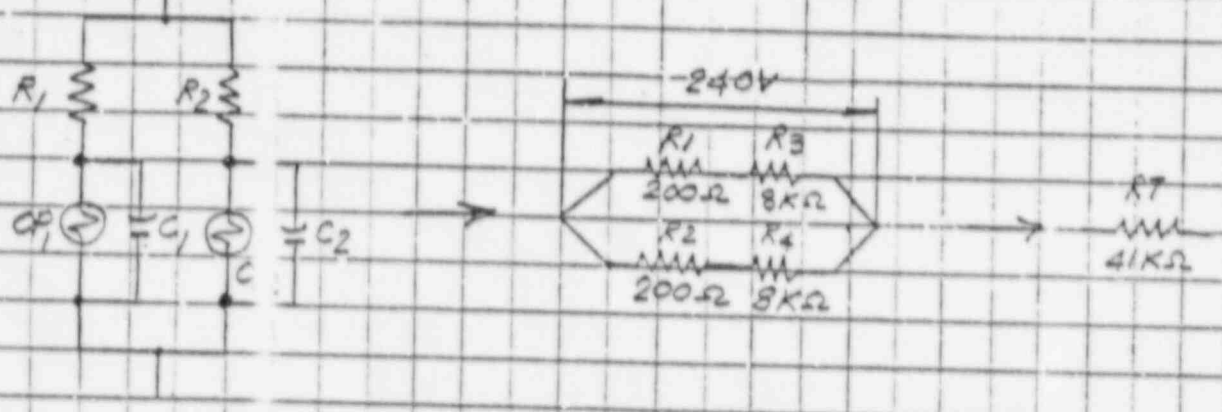
G1 LOAD C LCULATION AND FUSE SIZING
CALC. #14.C (CONTINUED)



CURRENT FLOW THROUGH OPERATING COILS OP1 & OP2 IS LIM ED BY RESISTORS R1 & R2, THEREFORE, LOAD CURRENT WILL BE C CULATED AS EQUIVALENT CIRCUIT SHOWN ABOVE.

$$R_T = \frac{1}{1/R_1 + 1/R_2}$$

$$= \frac{1}{1/8200 + 1/8200}$$

$$\therefore R_T = 4100\ \Omega$$

• FIN LOAD CURRENT THROUGH OPERATING COIL (I_L)

$$I_L = \frac{E}{R_T}$$

$$= \frac{240}{4100}$$

$$\therefore I_L = 0.06\ A.$$

61 LOAD CALCULATION AND FUSE SIZING. (CONTINUED)
CALC. #14.0 (CONTINUED)

- FIND LOAD CURRENT OF RESET COIL (RE) - I_{L2}
  (2 RESET COILS IN THE CIRCUIT)

$$I_{L2} = \frac{E}{R}$$

$$= \frac{240}{740}$$

$$\therefore I_{L2} = 0.324 \text{ A}$$

- FIND TOTAL CONNECTED LOAD IN CIRCUIT (I_T)
  SINCE FULL LOAD CURRENT IS A MAXIMUM WHEN RESET COIL IS ENERGIZED, MAXIMUM ALLOWABLE CURRENT FOR THE RESET COIL WILL BE USED IN SELECTING FUSE SIZE.

$$I_T = 2 \times 0.324 \text{ A}$$

$$\therefore I_T = 0.65 \text{ A}$$

- FIND MINIMUM FUSE SIZE (I_F)

$$I_F = 1.25 \times 0.65$$

$$\therefore I_F = 0.813 \text{ A}$$

- FUSE SELECTION:
  - 10.0 AMP FUSE (I_N) IS SELECTED. (ATT. 2.0)

- DETERMINE NEW RATING OF FUSE (I_{NR}), DERATED FOR 110°F

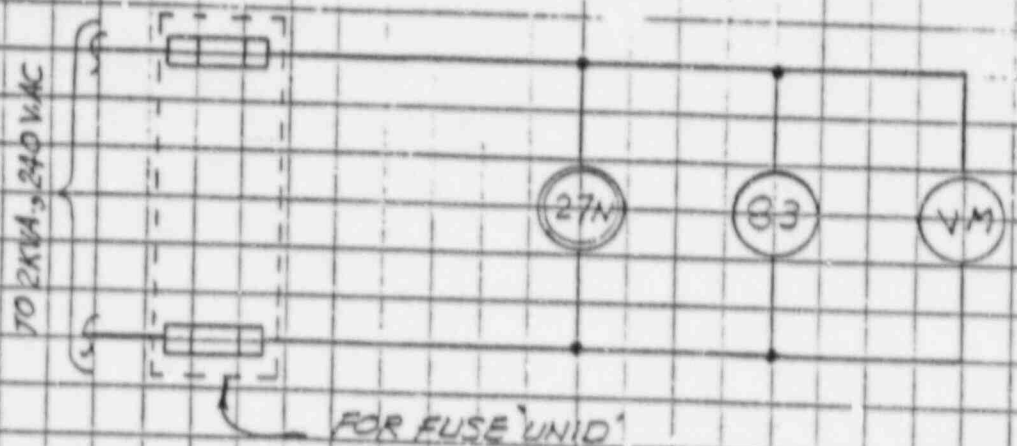
$$I_{NR} = I_N \times T_D$$

$$= 10 \times 0.924$$

$$\therefore I_{NR} = 9.24 \text{ AMPS}$$

- 10.0 AMP FUSE, 600VAC, 200KA(RMS) INTERRUPTING CAPACITY IS ACCEPTABLE PER CRITERIA SECTION 2.0
  - FOR SUMMARY OF RESULTS SEE TABLE 'B'
  - FOR CONCLUSIONS AND RECOMMENDATION SEE TABLE 'C'

6J LOAD CALCULATION & FUSE SIZING



FOR FUSE 'UNID' SEE TABLE 'A'

FIGURE 6.0
UNDERVOLTAGE, TRANSFER RELAYS AND VOLTMETER

CALC. # 15.0

CIRCUIT CONFIGURATION : FIG. # 6.0
CIRCUIT FUNCTION: UNDER VOLTAGE, TRANSFER RELAYS & VM.
CIRCUIT LOAD : 27N = GE CAT. # 12IAV69B2A (ATT. 11.0)
: 83 = GE CAT. # 12HFA51A51H (ATT. 16.0)
: VOLT METER LOAD IS CONSIDERED NEGLIGIBLE (ATT. 17A/B)

- FIND FULL LOAD CURRENT OF UNDER VOLTAGE RELAY 27N (I_L)

$$I_L = \frac{VA}{V} \quad \text{—①}$$

VA IS OBTAINED FROM ATT. 11.0 AND ADJUSTED FOR 160 V. PICKUP ON 240V. RELAY (REF. ELECT. EQUIP. FIELD VERIFICATION RIMS # R018707202G2 PAGE 28 OF 28)

591 LOAD CALCULATION AND FUSE SIZING
CALC. #15 (CONTINUED)

from Att. 11.0: TAP RATING @ 120V. VA

82	7.4
93	5.8

• FIND TAP RATING FOR 240 V. @ 7.4 VA & 5.8 VA

TAP RATIO = 240V / 120V = 2:1.

∴ TAP RATING OF 240V, RELAY @ 7.4 VA = 82 x 2 = 164 V — (2)

∴ TAP RATING OF 240V. RELAY @ 5.8 VA = 93 x 2 = 186 V — (3)

• FIND BURDENS (VA) @ 180 V. OF 240 V. RELAY.

from (2) & (3): TAP RATING: 186 - 164 = 22

— " — VA: 7.4 - 5.8 = 1.6 VA

∴ @ 1 V INCREMENT = 1.6 / 22

1V = 0.0727 VA — (4)

from (2): 186 V = 5.8 VA

Δ SETTING = 186 - 180 V.

∴ Δ = 6 V

from (3): ∴ VA @ 6 V = 0.0727 x 6

= 0.436 VA

∴ VA @ 180 V TAP = 5.8 + 0.436

= 6.24 VA — (5)

• FIND FULL LOAD CURRENT OF 240V., 27N RELAY FOR 180 V. PICKUP [I_{L_1}]

from (1) & (5): $I_{L_1} = \frac{VA}{V}$

= 6.24 / 240

∴ I_{L_1} = 0.026 A. — (6)

6.1 LOAD CALCULATION AND FUSE SIZING.

CALC. #15.0 (CONTINUED)

- FIND FULL LOAD CURRENT OF TRANSFER RELAY(83)$_2$ - I_L

$$I_{L_2} = \frac{E}{R}$$

from att. 1a; $Z = 1650\Omega$

let $R = 2$;

$$I_{L_2} = \frac{240}{1650}$$

$$\therefore I_{L_2} = 0.145\ A \quad -(7)$$

- VOLT METER LOAD IS CONSIDERED NEGLIGIBLE

- FIND TOTAL CONNECTED LOAD IN THE CKT. (I_T)

$$I_T = 1.25 \times I_L[(7)] + I_{L2}[(6)]$$
$$= (1.25 \times 0.145) + 0.026$$
$$\therefore I_T = 0.21\ A \quad -(8)$$

- SINCE THE CONNECTED LOAD IN THE CIRCUIT IS SMALL, FUSE SIZE WILL BE DETERMINED BY FULL LOAD CURRENT OF TRANSFORMER SECONDARY AND CABLE PROTECTION [CABLE OVERLOAD AND SHORT CIRCUIT] REFER TO CALCULATION No. 12.

- FUSE SELECTION:
  - 12 AMP FUSE, 600 V AC, 200 KA (RMS) INTERRUPTING CAPACITY (ATT. 20) IS ACCEPTABLE PER CRITERIA SECTION 2.0
  - FOR SUMMARY OF RESULTS SEE TABLE 'B'
  - FOR CONCLUSIONS AND RECOMMENDATIONS SEE TABLE 'C'

Sal LOAD CALCULATION & FUSE SIZING

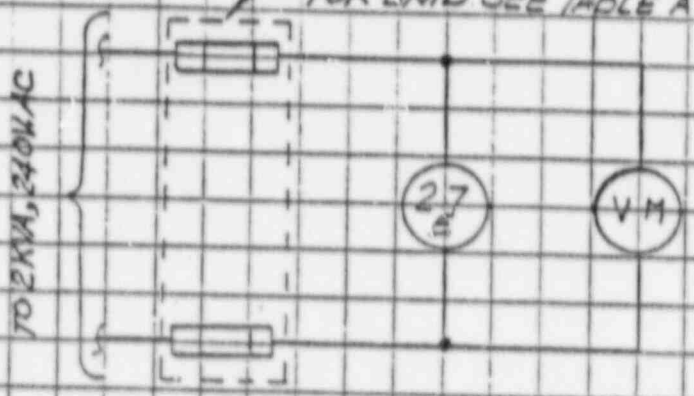


FIGURE 7.0
(BUS UNDER VOLTAGE & VOLT METER)

CALC. # 16.0

FOR EMERGENCY CIRCUIT

CIRCUIT CONFIGURATION : FIG. 7.0

CIRCUIT FUNCTION : BUS UNDER VOLTAGE & VOLT METER

CIRCUIT LOAD : - UNDER VOLTAGE RELAY (27E)
GE CAT. # 12IAV69B2A
- VOLT METER (ATT. 17a/8)

- FULL LOAD CURRENT OF UNDER VOLTAGE RELAY = 0.026A [CALC # 15, (6)]
- DETERMINE FUSE SIZE FOR EMERGENCY CIRCUIT (I_F)
- VOLT METER LOAD IS CONSIDERED NEGLIGIBLE
- FIND MAX. CURRENT IN CIRCUIT WITH 1.25 SAFETY FACTOR

$$I_F = 0.026 \times 1.25$$

$$\therefore I_F = 0.0325\,A$$

6.1 LOAD CALCULATION & FUSE SIZING:-
CALC. #16.0 (CONTINUED)

- FUSE SELECTION:
  - 10.0 AMP FUSE (I_N) IS SELECTED (AT 1.0)
- DETERMINE NEW RATING OF FUSE (I_{NR}); DERATED FOR 116°F

$$I_{NR} = I_N \times T_d$$
$$= 10.0 \times 0.924$$
$$\therefore I_{NR} = 9.24 \text{ AMPS}$$

- 10.0 AMP FUSE, 600 VAC, 200 KA (RMS) INTERRUPTING CAPACITY IS ACCEPTABLE PER CRITERIA SECTION 2.0
- FOR SUMMARY OF RESULTS SEE TABLE 'B'
- FOR CONCLUSIONS AND RECOMMENDATIONS SEE TABLE 'C'

6.1 LOAD CALCULATION AND FUSE SIZING

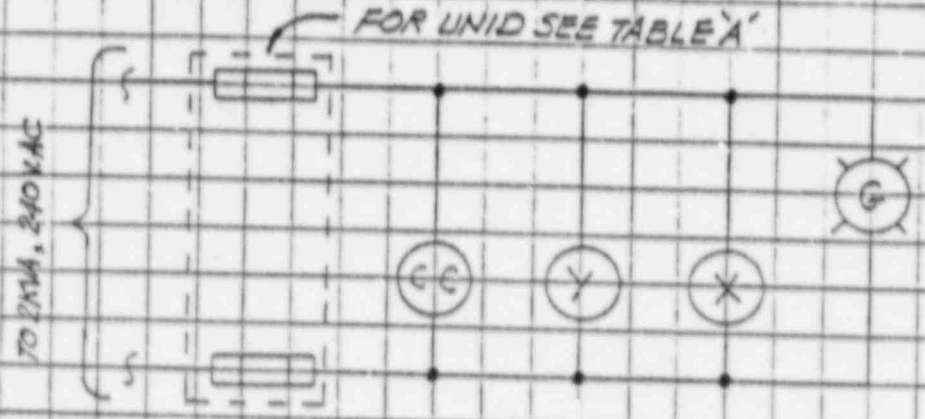


FIGURE 8.0
(CIRCUIT BREAKER CLOSE CKT.)

CALCULATION # 17.0

CIRCUIT CONFIGURATION : FIG. 8.0
CIRCUIT FUNCTION : NORMAL & EMER BKR. CLOSING CKT.
CIRCUIT LOADS : VENDOR STD. BKR. CONTROL CKT. (ATT. 15.0)

- FUSE SELECTION.

- 15.0 A FUSE, 600VAC, 200 KA (RMS) INTERRUPTING CAPACITY IS ACCEPTABLE. SEE VENDOR RECOMMENDED FUSE (ATT. 15.0)
- FOR SUMMARY OF RESULT SEE TABLE 'B'
- FOR CONCLUSIONS AND RECOMMENDATIONS SEE TABLE 'C'

6.1 LOAD CALCULATION AND FUSE SIZING.

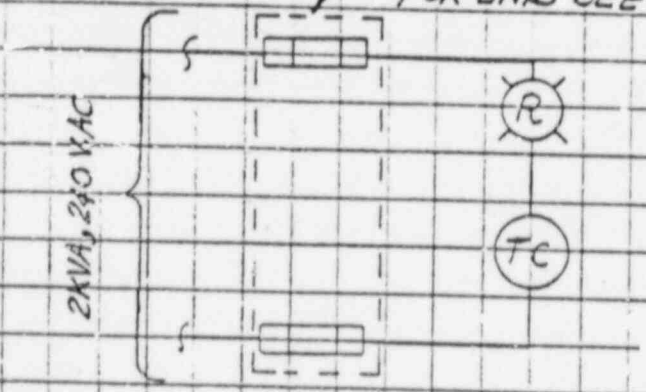


FIGURE 9.0
(CIRCUIT BREAKER TRIP CKT.)

CALCULATION NO. 180

CIRCUIT CONFIGURATION : FIG. NO. 9.0
CIRCUIT FUNCTION : NORMAL & EMERGENCY BKR. TRIP CIRCUIT
CIRCUIT LOADS : INDICATING LIGHT (R), TRANSFORMER TYPE, 1VA TRANSF., 250-6V (RATED), 1Φ, 60 HZ,
- GE CAT.# CR 2940UE 212A3 (ATT. 12.0)
- TRIPPING COIL GE. CAT. # 6275081G26 (ATT. 13.0)

- THE INDICATING LIGHT WILL NOT BE CONSIDERED IN CIRCUIT LOAD CALCULATION. WHEN TRIPPING COIL IS OPERATING, THE INDICATING LIGHT WILL BE SHORTED AND HAVE NO LOAD CONTRIBUTION.
- FIND SUSTAINED CURRENT OF TRIPPING COIL AT OPERATING VOLTAGE OF 240V.

SUSTAINED CURRENT OF TRIPPING COIL @ 230V. RATED VOLTAGE (I_1)

$\therefore I_1 = 5.7A$ PER ATT. 13.0

6.1 LOAD CALCULATION AND FUSE SIZING

CALC # 18.0 (CONTINUED)

$R = V_1 \times [I_1]^{-1}$

$= 230/5.7$

$= 40.35\ \Omega$

FIND TRIPPING COIL SUSTAINED CURRENT @ 240V, (I_2)

$$I_2 = \frac{V_2}{R}$$

$= 240/40.35$

$\therefore I_2 = 5.95\ A$

- DETERMINE FUSE SIZE @ 125% SAFETY FACTOR (I_{F_1})

$I_{F_1} = I_2 \times 1.25$

$= 5.95 \times 1.25$

$\therefore I_{F_1} = 7.44\ A$

- FUSE SELECTION:
  - 15.0 AMP FUSE (I_N) IS SELECTED. (ATT. 5.0)

- DETERMINE NEW RATING OF FUSE (I_{NR}), DERATED FOR 110°F

$I_{NR} = I_N \times T_C$

$= 15.0 \times 0.924$

$\therefore I_{NR} = 13.86\ A$

- 150 AMP FUSE, 600 VAC, 200 KA (RMS) INTERRUPTING CAPACITY IS ACCEPTABLE PER CRITERIA SECTION 2.0
  - FOR SUMMARY OF RESULTS SEE TABLE 'B'
  - FOR CONCLUSIONS AND RECOMMENDATIONS SEE TABLE 'C'

6.1 LOAD CALCULATION & FUSE SIZING.

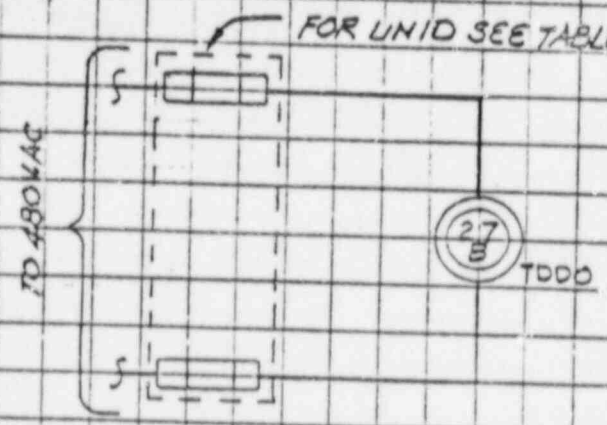


FIGURE 10.0
(BUS UNDER VOLTAGE ANNUNCIATOR)

CALC. #19.0

CIRCUIT CONFIGURATION: FIG. NO. 10.
CIRCUIT FUNCTION: BUS UNDER VOLTAGE ANNUNCIATOR CIRCUIT.
CIRCUIT LOAD : AGASTAT RELAY, TYPE 27, 480VAC RATED, 60 Hz., CAT. # 2422CC, POWER CONSUMATION 8 WATTS (ATT. 14.0)

• FIND OPERATING COIL CURRENT (I_L)

$$I_L = \frac{P}{E}$$

$$= \frac{8}{120}$$

$$\therefore I_L = 0.0167\ A$$

6.1 LOAD CALCULATION & FUSE SIZING.
CALC. # 19.0 (CONTINUED)

- FIND MAXIMUM ALLOWABLE CURRENT (I_F):

$$I_F = I_L \times 1.25$$
$$= 0.0167 \times 1.25$$
$$\therefore I_F = 0.0209\ A$$

- FUSE SELECTION:
  - 3.0 AMP FUSE (I_N) IS SELECTED (ATT. 1.0)

- DETERMINE NEW RATING OF FUSE (I_{NR}), DERATED FOR 110°F

$$I_{NR} = I_N \times T_C$$
$$= 3.0 \times 0.924$$
$$I_{NR} = 2.77\ A$$

- 3.0 AMP FUSE, 600V, AC, 200 KA (RMS) INTERRUPTING CAPACITY IS SELECTED (ATT. 5.0)
- THE SELECTED FUSE IS ACCEPTABLE PER CRITERIA SECTION 2.0
- FOR SUMMARY OF RESULTS SEE TABLE 'B'
- FOR CONCLUSIONS AND RECOMMENDATIONS SEE TABLE 'C'

Cal LOAD CALCULATION AND FUSE SIZING.

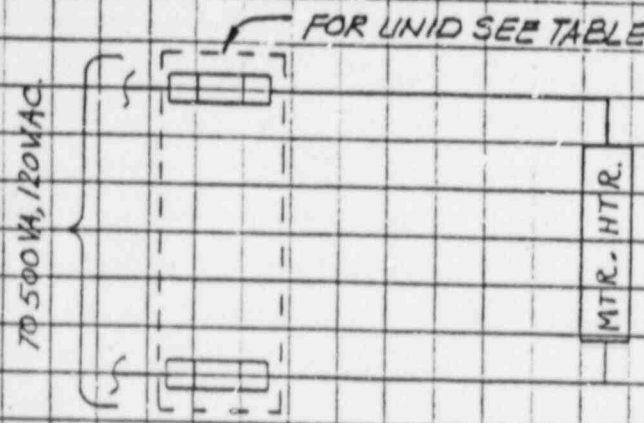


FIGURE 11.0
(MOTOR HEATER CKT.)

CALC # 200

CIRCUIT CONFIGURATION : FIG. 11.0
CIRCUIT FUNCTION: MOTOR HEATER CKT.
CIRCUIT LOAD: MOTOR HEATER.

- BASIS FOR SELECTING FUSE SIZE
  - FUSE SIZE MUST NOT EXCEED TRANSF. FULL LOAD CURRENT AND MUST PROVIDE ADEQUATE SHORT CIRCUIT PROTECTION (REF CALC #60)
- 5.6 AMP. FUSE, 250 V AC., 200 KA (RMS) INTERRUPTING CAPACITY IS SELECTED (ATT. 2.0)
  THE SELECTED FUSE IS ACCEPTABLE PER CRITERIA SECTION 2.0
  - FOR SUMMARY OF RESULTS SEE TABLE 'B'
  - FOR CONCLUSIONS AND RECOMMENDATIONS SEE TABLE 'C'

Ca1 LOAD CALCULATION AND FUSE SIZING.

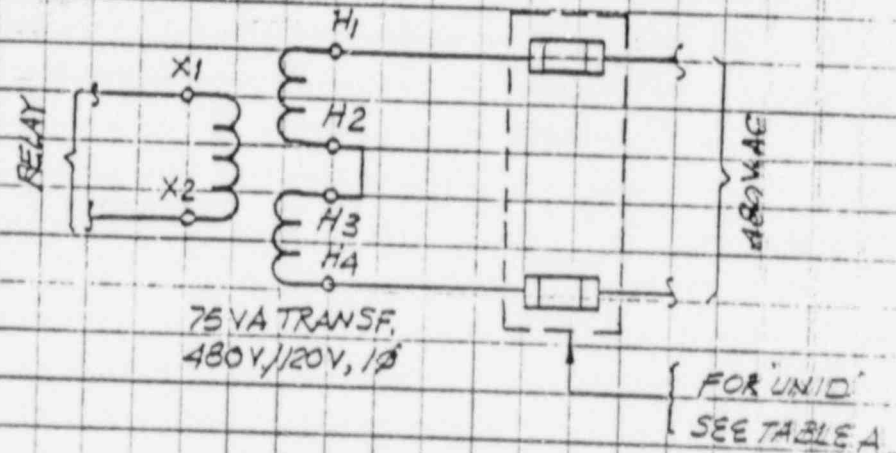


FIGURE 12.0
(CALC. #21)

6.1 LOAD CALCULATION AND FUSE SIZING.

TRANSF. CIRCUIT WITH PRIMARY FUSE PROTECTION ONLY.

CALCULATION No. 21.0.

MILD ENVIRONMENT AREA

CIRCUIT CONFIGURATION: FIGURE 12.0

CIRCUIT LOAD: 75 VA. TRANSF. [REF. TABLE A]
480 VAC, 1φ, 60HZ (PRIMARY)

BASIS OF CALC: CRITERIA SECT. 20

- FIND TRANSF. PRIMARY FULL LOAD CURRENT. (I_L)

$$I_L = \frac{VA}{V}$$

$$= \frac{75}{480}$$

$$\therefore I_L = 0.156 \text{ A.}$$

- FIND ALLOWABLE MAX CURRENT (I_F) @ 500% SAFETY FACTOR

$$I_F = I_L \times 5$$

$$= 0.156 \times 5$$

$$\therefore I_F = 0.78 \text{ A.}$$

- FIND INRUSH CURRENT @ NORMAL CONDITION (IR_1)

$$I_{R_1} = I_L \times F_R$$

$$= 0.156 \times 12$$

$$\therefore I_{R_1} = 1.87 \text{ A}$$

- FIND INRUSH CURRENT @ WORST CASE (IR_2)

$$IR_2 = I_L \times F_R$$

$$= 0.156 \times 25$$

$$\therefore IR_2 = 3.9 \text{ A}$$

Vol I — LOAD CALCULATION & FUSE SIZING:
CALC. # 21.0 (CONTINUED)

- FUSE SELECTION:
  - 1.0 AMP FUSE (I_N) IS SELECTED. (ATT. 5.0)
- DETERMINE NEW RATING OF FUSE (I_{NR}), DERATED FOR 110°F

$$I_{NR} = I_N \times T_C$$
$$= 1.0 \times 0.924$$
$$\therefore I_{NR} = 0.924 \text{ AMPS}$$

- 1.0 AMP FUSE, 600 VAC, 200 KA (RMS) INTERRUPTING CAPACITY IS ACCEPTABLE PER CRITERIA SECTION 2.0
  - FOR SUMMARY OF RESULTS SEE TABLE 'B'
  - FOR CONCLUSIONS AND RECOMMENDATIONS SEE TABLE 'C'

G.2 IDENTIFY SAFETY CLASS APPLICATION

480V. REACTOR MOV BOARDS 3A AND 3B ARE CLASS 1E BOARDS AND ARE LOCATED IN A MILD ENVIRONMENT (REF. DWG. 47W225-1, REV. 0)

THEREFORE ALL THE FUSES INSTALLED IN THESE BOARDS ARE CLASSIFIED AS CLASS 1E FUSE (REF. 5.19A).

FUSE USED IN APPENDIX 'R' OR PENETRATION APPLICATIONS WERE IDENTIFIED AND LISTED IN SUMMARY OF RESULT (TABLE B) AND IN SECTION G.4 (TABLE C).

EBASCO SERVICES INCORPORATED

BY DB 9/3/88 CHKD. BY CCO DATE 8-13-88 CLIENT TVA PROJECT BFNP UNITS 1&2

SUBJECT FUSE PROGRAM (480V REACTOR MOV BOARDS 3A/B)

(ED-Q0268-880463)

SHT 80 OF 133 DEPT. NO. OFS NO.

581 9-87

6.3 SUMMARY OF RESULTS

ITEM	FUSE UNID	FUSE TYPE	RESULT PASS	RESULT FAIL	SAFETY CLASS 1E	SAFETY CLASS NON-1E	SAFETY CLASS 1E-EQ	APPLICATION PERM.	APPLICATION APP'R	NOTE 1	NOTE 2	NOTE 3	NOTE 4	NOTE 5
01	3-FU 2 - 76 - 49A	A4J3	X	-	X	-	-	-	-	X	-	-	X	-
02	3-FU 2 - 31 - 1961A	A4J3	X	-	X	-	-	-	-	X	-	-	X	-
03	3-FU 2 - 31 - 1973A	A4J3	X	-	X	-	-	-	-	X	-	-	X	-
04	3-FU 2 - 31 - 1999A	A4J3	X	-	X	-	-	-	-	X	-	-	X	-
05	3-FU 2 - 31 - 2000A	A4J3	X	-	X	-	-	-	-	X	-	-	X	-
06	3-FU 2 - 31 - 96A	A4J3	X	-	X	-	-	-	-	X	-	-	X	-
07	3-FU 2 - 31 - 96B	A4J3	X	-	X	-	-	-	-	X	-	-	X	-
08	3-FU 2 - 47 - 31AA	A4J3	X	-	X	-	-	-	-	X	-	-	X	-
09	3-FU 2 - 47 - 31BA	A4J3	X	-	X	-	-	-	-	X	-	-	X	-
10	3-FU 2 - 47 - 32AA	A4J3	X	-	X	-	-	-	-	X	-	-	X	-
11	3-FU 2 - 74 - 52A	A4J3	X	-	X	-	-	-	-	X	-	-	X	-
12	3-FU 2 - 64 - 68A	A4J3	X	-	X	-	-	-	-	X	-	-	X	-
13	3-FU 2 - 78 - 62A	A4J3	X	-	X	-	-	-	-	X	-	-	X	-
14	3-FU 2 - 74 - 1A	A4J3	X	-	X	-	-	-	-	X	-	-	X	-
15	3-FU 2 - 77 - 14AA	A4J3	X	-	X	-	-	-	-	X	-	-	X	-
16	3-FU 2 - 78 - 67A	A4J3	X	-	X	-	-	-	-	X	-	-	X	-
17	3-FU 2 - 74 - 12A	A4J3	X	-	X	-	-	-	-	X	-	-	X	-
18	3-FU 2 - 77 - 1AA	A4J3	X	-	X	-	-	-	-	X	-	-	X	-
19	3-FU 2 - 76 - 72A	A4J3	X	-	X	-	-	-	-	X	-	-	X	-
20	3-FU 2 - 74 - 2A	A4J3	X	-	X	-	-	-	-	X	-	-	X	-
21	3-FU 2 - 74 - 62A	A4J3	X	-	X	-	-	-	-	X	-	-	X	-

NOTE #1 : ACCEPTABLE FUSE SIZE

NOTE #2 : OVERSIZED FUSE

NOTE #3 : UNDERSIZED FUSE

TABLE B

NOTE #4 : CLASS 1E FUSE IS REQ'D

NOTE #5 : CLASS 1E-EQ FUSE IS REQ'D (10CFR 50.49)

EBASCO SERVICES INCORPORATED

[ED-QQ268-88A63]

BY DS: 8/13/88

CHK'D. BY CCO DATE 8-13-88

SHEET 61 OF 133

CLIENT TVA OFS NO. DEPT. 65

PROJECT BFNP UNITS 1,2,3

SUBJECT FUSE PROGRAM [480V. REACTOR MOV BOARDS 3A/B]

SUMMARY OF RESULTS

ITEM	FUSE UNID	TYPE	RESULT PASS	RESULT FAIL	SAFETY CLASS 1E	SAFETY CLASS NON-1E	SAFETY CLASS IE-EQ	APPLICATION PERM.	APPLICATION APP'R	NOTE 1	NOTE 2	NOTE 3	NOTE 4	NOTE 5
22	3-FU 2 L-32	64A	X		X					X				
23	3-FU 2 L-74	13A	X		X						X			
24	3-FU 2 L-74	194A	X		X					X				
25	3-FU 2 L-74	48A	X		X						X			
26	3-FU 2 L-74	78A	-		-					X				
27	3-FU 2 L-78	65A			X					TO BE DELETED				
28	3-FU 2 L-78	64A	X		X					X				
29	3-FU 2 L-42	10A	X		X						X			
30	3-FU 2 L-69	35A	X		X					X				
31	3-FU 2 L-75	2A	X		X						X			
32	3-FU 2 L-74	57A	X		X					X				
33	3-FU 2 L-74	61A	X		X						X			
34	3-FU 2 L-63	5A4	X		X					X				
35	3-FU 2 L-75	11A	X		X						X			
36	3-FU 2 L-74	58A	X		X					X				
37	3-FU 2 L-75	2AA	X		X						X			
38	3-FU 2 L-74	60A	X		X					X				
39	3-FU 2 L-64	70A	X		X						X			
40	3-FU 2 L-75	35A	X		X					X				
41	3-FU 2 L-75	9A	X		X						X			
42	3-FU 2 L-69	1A	X		X					X				

TABLE B

NOTE #1 : ACCEPTABLE FUSE SIZE

NOTE #2 : OVERSIZED FUSE

NOTE #3 : UNDERSIZED FUSE

NOTE #4 : CLASS 1E FUSE IS REQ'D

NOTE #5 : CLASS 1E-EQ FUSE IS REQ'D (10CFR 50.49)

6.3

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EBASCO SERVICES INCORPORATED

BY BS 8/3/88 [ED-9026B-884G3]

CHKD. BY CCO DATE 8-13-88

CLIENT TVA OFS NO.

PROJECT BFNP UNITS 1,2,3 DEPT. NO.

SUBJECT FUSE PROGRAM (480V REACTOR MOV BOARDS 3A/B)

SHEET 82 OF 133

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6.3 SUMMARY OF RESULTS

ITEM	FUSE UNID	FUSE TYPE	RESULT PASS	RESULT FAIL	SAFETY CLASS 1E	SAFETY CLASS NON-1E	SAFETY CLASS 1E-EQ	APPLICATION PERM.	APPLICATION APP'R	NOTE 1	NOTE 2	NOTE 3	NOTE 4	NOTE 5
43	3-FU 2 - 70 - 39A	A4J3	X		X					X			X	
44	3-FU 2 - 23 - 34A	A4J3	X		X					X			X	
45	3-FU 2 - 73 - 2A	A4J3	X		X					X			X	
46	3-FU 2 - 70 - 44A	A4J3	X		X					X			X	
47	3-FU 2 - 23 - 40A	A4J3	X		X					X			X	
48	3-FU 2 - 75 - 22A	A4J3	X		X					X			X	
49	3-FU 2 - 71 - 59A	A4J3	X		X					X			X	
50	3-FU 2 - 47 - 31AB	TR 32		X	X							X	X	
51	3-FU 2 - 77 - 14AB	TR 32		X	X							X	X	
52	3-FU 2 - 77 - 1AB	TR 32		X	X							X	X	
53	3-FU 2 - 31 - 1961B	TR 16		X	X							X	X	
54	3-FU 2 - 31 - 1973B	TR 16		X	X							X	X	
55	3-FU 2 - 31 - 1999B	TR 16		X	X							X	X	
56	3-FU 2 - 31 - 2000B	TR 16		X	X							X	X	
57	3-FU 2 - 32 - 64B	TR 16		X	X							X	X	
58	3-FU 2 - 47 - 10B	TR 16		X	X							X	X	
59	3-FU 2 - 64 - 68B	TR 8	X		X							X	X	
60	3-FU 2 - 78 - 62B	TR 8	X		X					X			X	
61	3-FU 2 - 78 - 67B	TR 8	X		X					X			X	
62	3-FU 2 - 74 - 62B	TR 8	X		X					X			X	
63	3-FU 2 - 74 - 104B	TR 8	X		X					X			X	

NOTE #1 : ACCEPTABLE FUSE SIZE

NOTE #2 : OVERSIZED FUSE

NOTE #3 : UNDERSIZED FUSE

TABLE B

NOTE #4 : CLASS 1E FUSE IS REQ'D

NOTE #5 : CLASS 1E-EQ FUSE IS REQ'D (10CFR 50.49)

EBASCO SERVICES INCORPORATED

[ED-Q0268-88A63]

BY PB 8/13/88

CHKD. BY CCO DATE 8-13-88

SHEET 83 OF 133

CLIENT TVA OFS NO. DEPT. NO.

PROJECT BFNP UNITS 1,2,3

SUBJECT FUSE PROGRAM [480V. REACTOR MOV BOARDS 3A/B]

6.3 SUMMARY OF RESULTS

ITEM	FUSE UNID	TYPE	RESULT PASS	RESULT FAIL	SAFETY CLASS 1E	SAFETY CLASS NON-1E	SAFETY CLASS 1E-EQ	APPLICATION PENT.	APPLICATION APP'R	NOTE 1	NOTE 2	NOTE 3	NOTE 4	NOTE 5
64	3-FU 2 - 74 - 78B	TR .8	-		-					TO BE DELETED				
65	3-FU 2 - 78 - 65B	TR .5	X		X					X	-	X	-	
66	3-FU 2 - 78 - 64B	TR .8	X		X					X	-	-	X	-
67	3-FU 2 - 69 - 35B	TR .8	X		X					X	-	-	X	-
68	3-FU 2 - 76 - 2B	TR .8	X		X					X	-	-	X	-
69	3-FU 2 - 74 - 61B	TR .8	X		X					X	-	-	X	-
70	3-FU 2 - 75 - 11B	TR .8	X		X					X	-	-	X	-
71	3-FU 2 - 74 - 58B	TR .8	X		X					X	-	-	X	-
72	3-FU 2 - 75 - 23B	TR .8	X		X					X	-	-	X	-
73	3-FU 2 - 64 - 70B	TR .8	X		X					X	-	-	X	-
74	3-FU 2 - 75 - 25B	TR .8	X		X					X	-	-	X	-
75	3-FU 2 - 75 - 9B	TR .8	X		X					X	-	-	X	-
76	3-FU 2 - 69 - 1B	TR .5	X		X					X	-	-	X	-
77	3-FU 2 - 73 - 2B	TR .2	X		X					X	-	-	X	-
78	3-FU 2 - 75 - 22B	TR .8	X		X				X	X	-	-	X	-
79	3-FU 2 - 71 - 59B	TR .8	X		X					X	-	-	X	-
80	3-FU 2 - 74 - 52B	TR 2	X		X					X	-	-	X	-
81	3-FU 2 - 74 - 1B	TR .8	X		X					X	-	-	X	-
82	3-FU 2 - 74 - 12B	TR .8	X		X					X	-	-	X	-
83	3-FU 2 - 74 - 2B	TR .8	X		X					X	-	-	X	-
84	3-FU 2 - 74 - 13B	TR .8	X		X					X	-	-	X	-

TABLE B

NOTE #1 : ACCEPTABLE FUSE SIZE

NOTE #2 : OVERSIZED FUSE

NOTE #3 : UNDERSIZED FUSE

NOTE #4 : CLASS 1E FUSE IS REQ'D

NOTE #5 : CLASS 1E-EQ FUSE IS REQ'D (10CFR 50.49)

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6.3 SUMMARY OF RESULTS

ITEM	FUSE UNID	FUSE TYPE	RESULT PASS	RESULT FAIL	SAFETY CLASS 1E	SAFETY CLASS NON-1E	SAFETY CLASS 1E-EQ	APPLICATION PERM.	APPLICATION APPR	NOTE 1	NOTE 2	NOTE 3	NOTE 4	NOTE 5
85	3-FU 2 - 74 - 48B	TR .8	X	-	X	-	-	X	-	X	-	-	X	-
86	3-FU 2 - 74 - 52B	TR .8	X	-	X	-	-	-	-	X	-	-	X	-
87	3-FU 2 - 74 - 60B	TR .8	X	-	X	-	-	-	-	X	-	-	X	-
88	3-FU 2 - 1 - 55B	TR .8	X	-	X	-	-	-	-	X	-	-	X	-
89	3-FU 2 - 23 - 34B	TR .8	X	-	X	-	-	-	-	X	-	-	X	-
90	3-FU 2 - 23 - 40B	TR .8	X	-	X	-	-	-	-	X	-	-	X	-
91	3-FU 2 - 74 - 52B	TR 2	-	X	X	-	-	-	-	-	-	X	X	-
92	3-FU 2 - 70 - 39B	TR 3.2	-	X	X	-	-	-	-	-	-	X	X	-
93	3-FU 2 - 70 - 44B	TR 3.2	-	X	X	-	-	-	-	-	-	X	X	-
94	3-FU 2 - 74 - 1C	TR .8	X	-	X	-	-	-	-	X	-	-	X	-
95	3-FU 2 - 74 - 12C	TR .8	X	-	X	-	-	-	-	X	-	-	X	-
96	3-FU 2 - 74 - 2C	TR .8	X	-	X	-	-	-	-	X	-	-	X	-
97	3-FU 2 - 74 - 13C	TR .8	X	-	X	-	-	-	-	X	-	-	X	-
98	3-FU 2 - 74 - 48C	TR .8	X	-	X	-	-	X	-	X	-	-	X	-
99	3-FU 2 - 74 - 57C	TR .8	X	-	X	-	-	-	-	X	-	-	X	-
100	3-FU 2 - 74 - 60C	TR .8	X	-	X	-	-	-	-	X	-	-	X	-
101	3-FU 2 - 1 - 55C	TR .8	X	-	X	-	-	-	-	X	-	-	X	-
102	3-FU 2 - 23 - 34C	TR .8	X	-	X	-	-	-	-	X	-	-	X	-
103	3-FU 2 - 23 - 40C	TR .8	X	-	X	-	-	-	-	X	-	-	X	-
104	3-FU 2 - 74 - 52C	TR 2	-	X	X	-	-	-	-	-	-	X	X	-
105	3-FU 2 - 70 - 39C	TR 3.2	-	X	X	-	-	-	-	-	-	X	X	-

NOTE #1 : ACCEPTABLE FUSE SIZE

NOTE #2 : OVERSIZED FUSE

NOTE #3 : UNDERSIZED FUSE

TABLE B

NOTE #4 : CLASS 1E FUSE IS REQ'D

NOTE #5 : CLASS 1E-EQ FUSE IS REQ'D (10CFR 50.49)

EBASCO SERVICES INCORPORATED

[ED-Q0268-8843]

BY BS 8/13/88

CHKD. BY CCO DATE 8-13-88

SHEET 85 OF 133

CLIENT TVA OFS NO. DEPT. NO.

PROJECT BFNP UNITS 1,2,3

SUBJECT FUSE PROGRAM [480V. REACTOR MOV BOARDS 3A/B]

6.3 SUMMARY OF RESULTS

ITEM	FUSE UNID	FUSE TYPE	RESULT PASS	RESULT FAIL	SAFETY CLASS 1E	SAFETY CLASS NON-1E	SAFETY CLASS IE-EQ	APPLICATION PERM.	APPLICATION APPR	NOTE 1	NOTE 2	NOTE 3	NOTE 4	NOTE 5
106	3-FU 2 - 70 - 44C	TR32	-	X	X					-	-	X	X	-
107	3-FU 2 - 76 - 49B	TR 46	-	X	X					-	-	X	X	-
108	3-FU 2 - 74 - 52D	A4J6	-	X	X					-	X	-	X	-
109	3-FU 2 - 268 - 38A	TR 2	-	X	X					-	-	X	X	-
110	3-FU 2 - 268 - 3A4	JHC15	X	-	X					X	-	-	X	-
111	3-FU 2 - 268 - 3AF	JHC15	X	-	X					X	-	-	X	-
112	3-FU 2 - 31 - 110A	A4J3	-	X	X					TO BE DELETED				
113	3-FU 2 - 31 - 110B	TR.8	-	X	X					TO BE DELETED				
114	3-FU 2 - 47 - 10F	A4J6	-	X	X					-	X	-	X	-
115	3-FU 2 - 31 - 96C	TR46	-	X	X					-	-	X	X	-
116	3-FU 2 - 31 - 96D	TR46	-	X	X					-	-	X	X	-
117	3-FU 2 -268 - 3AB	A4J10	X	-	X					X	-	-	X	-
118	3-FU 2 - 268 - 3AC	A4J10	X	-	X					X	-	-	X	-
119	3-FU 2 - 268 - 3AD	A4J15	X	-	X					X	-	-	X	-
120	3-FU 2 - 268 - 3AH	A4J15	X	-	X					X	-	-	X	-
121	3-FU 2 - 268 - 3AE	A4J30	-	X	X					-	X	-	X	-
122	3-FU 2 -268 - 3AJ	A4J30	-	X	X					-	X	-	X	-
123	3-FU 2 - 63 - 5AB	TR5.6	X	-	X					X	-	=	X	=
124	3-FU 2 = 68 = 6AG	TR 5.6	X	-	X					X	-	=	X	=
125	3-FU 2 =268 = 3AG	A4J16	X	-	X					X	-	=	X	=
126	3-FU 2 - 268 - 8AK	A4J3	X	-	X					X	-	-	X	-

TABLE B

NOTE #1 : ACCEPTABLE FUSE SIZE

NOTE #2 : OVERSIZED FUSE

NOTE #3 : UNDERSIZED FUSE

NOTE #4 : CLASS 1E FUSE IS REQ'D

NOTE #5 : CLASS 1E-EQ FUSE IS REQ'D (10CFR 50.49)

581 9-87

581 9-87

6.3 SUMMARY OF RESULTS

ITEM	FUSE UNID	FUSE TYPE	RESULT PASS	RESULT FAIL	SAFETY CLASS 1E	SAFETY CLASS NON-1E	SAFETY CLASS 1E-EQ	APPLICATION PERM.	APPLICATION APP'R	NOTE 1	NOTE 2	NOTE 3	NOTE 4	NOTE 5
127	3-FU2-32-65B	TR6.25	X							X			X	
127.1	3-FU2-1-55A	A4J3	X							X			X	
127.2	3-FU2-75-72B	TR.8	X							X			X	
127.3	SPARE (2 FUSE BLOCK)	NONE												
127.4														
127.5														
127.6														
127.7														
127.8														
127.9														
127.10														
127.11														
127.12														
127.13														
127.14														
127.15														
127.16														
127.17														
127.18														
127.19														
127.20														

NOTE #1 : ACCEPTABLE FUSE SIZE

NOTE #2 : OVERSIZED FUSE

NOTE #3 : UNDERSIZED FUSE.

TABLE B

NOTE #4 : CLASS 1E FUSE IS REQ'D

NOTE #5 : CLASS 1E-EQ FUSE IS REQ'D (10CFR 50.49)

EBASCO SERVICES INCORPORATED

BY EB: 3/13/88 LED-QQ268-884637 SHEET 87 OF 133

CHK'D. BY ECO DATE 8-13-88 DEPT. NO.

CLIENT TVA OFS NO.

PROJECT BFNP UNITS 1,2,3

SUBJECT FUSE PROGRAM (HBOV, REACTOR MOV BOARDS 3A/B)

581 9-87

6.3 SUMMARY OF RESULTS

ITEM	FUSE UNID	FUSE TYPE	RESULT PASS	RESULT FAIL	SAFETY CLASS 1E	SAFETY CLASS NON-1E	SAFETY CLASS 1E-EQ	APPLICATION PERT.	APPLICATION APP. R	NOTE 1	NOTE 2	NOTE 3	NOTE 4	NOTE 5
127.21	SPARE (2 FUSE BLOCK)	NONE	-	-	-	-	-	-	-	-	-	-	-	-
127.22			-	-	-	-	-	-	-	-	-	-	-	-
127.23			-	-	-	-	-	-	-	-	-	-	-	-
127.24			-	-	-	-	-	-	-	-	-	-	-	-
127.25			-	-	-	-	-	-	-	-	-	-	-	-
127.26			-	-	-	-	-	-	-	-	-	-	-	-
127.27	3-FU2-31-120A	A4J3	-	X	X	-	-	-	-	-	X	-	X	-
127.28	3-FU2-31-121A	TK.8	X	-	X	-	-	-	-	X	-	-	X	-
	NOT USED		-	-	-	-	-	-	-	-	-	-	-	-
			-	-	-	-	-	-	-	-	-	-	-	-
			-	-	-	-	-	-	-	-	-	-	-	-
			-	-	-	-	-	-	-	-	-	-	-	-
			-	-	-	-	-	-	-	-	-	-	-	-
			-	-	-	-	-	-	-	-	-	-	-	-
			-	-	-	-	-	-	-	-	-	-	-	-
			-	-	-	-	-	-	-	-	-	-	-	-
			-	-	-	-	-	-	-	-	-	-	-	-
			-	-	-	-	-	-	-	-	-	-	-	-
			-	-	-	-	-	-	-	-	-	-	-	-
			-	-	-	-	-	-	-	-	-	-	-	-
			-	-	-	-	-	-	-	-	-	-	-	-
			-	-	-	-	-	-	-	-	-	-	-	-
			-	-	-	-	-	-	-	-	-	-	-	-
			-	-	-	-	-	-	-	-	-	-	-	-
			-	-	-	-	-	-	-	-	-	-	-	-
			-	-	-	-	-	-	-	-	-	-	-	-

NOTE #1 : ACCEPTABLE FUSE SIZE

NOTE #2 : OVERSIZED FUSE

NOTE #3 : UNDERSIZED FUSE

TABLE B

NOTE #4 : CLASS 1E FUSE IS REQ'D

NOTE #5 : CLASS 1E-EQ FUSE IS REQ'D (10CFR 50.49)

EBASCO SERVICES INCORPORATED

[ED-90268-88463]

BY PJ 8/13/88

CHKD. BY CCO DATE 8-13-88

SHEET 88 OF 133

CLIENT TVA OFS NO. DEPT. NO.

PROJECT BFNP UNITS 1,2,3

SUBJECT FUSE PROGRAM [480V. REACTOR MOV BOARDS 3A/B]

6.3 SUMMARY OF RESULTS

ITEM	FUSE UNID	FUSE TYPE	RESULT PASS	RESULT FAIL	SAFETY CLASS 1E	SAFETY CLASS NON-1E	SAFETY CLASS 1E-EQ	APPLICATION PERM.	APPLICATION APPR'D	NOTE 1	NOTE 2	NOTE 3	NOTE 4	NOTE 5
128	3-FU-2-L76-59A	A4J3	X		X			X		X				
129	3-FU-2-L31-1982A	A4J3	X		X			X		X			X	
130	3-FU-2-L31-1993A	A4J3	X		X			X		X			X	
131	3-FU-2-L31-2002A	A4J3	X		X			X		X			X	
132	3-FU-2-L31-2003A	A4J3	X		X			X		X			X	
133	3-FU-2-L77-14A	A4J3	X		X			X		X			X	
134	3-FU-2-L77-8B4	A4J3	X		X			X		X			X	
135	3-FU-2-L71-2A	A4J3	X		X			X		X			X	
136	3-FU-2-L75-50A	A4J3	X		X			X		X			X	
137	3-FU-2-L74-66A	A4J3	X		X			X		X			X	
138	3-FU-2-L75-39A	A4J3	X		X			X		X			X	
139	3-FU-2-L70-40A	A4J3	X		X			X		X			X	
140	3-FU-2-L75-30A1	A4J3	X		X			X		X			X	
141	3-FU-2-L75-37A	A4J3	X		X			X		X			X	
142	3-FU-2-L70-41B4	A4J3	X		X			X		X			X	
143	3-FU-2-L29-57A	A4J3	X		X			X		X			X	
144	3-FU-2-L74-24A	A4J3	X		X			X		X			X	
145	3-FU-2-L70-47A	A4J3	X		X			X		X			X	
146	3-FU-2-L74-25A	A4J3	X		X			X		X			X	
147	3-FU-2-L74-36A	A4J3	X		X			X		X			X	
148	3-FU-2-L74-6B4	A4J3	X		X			X		X			X	

TABLE B

NOTE #1 : ACCEPTABLE FUSE SIZE

NOTE #2 : OVERSIZED FUSE

NOTE #3 : UNDERSIZED FUSE

NOTE #4 : CLASS 1E FUSE IS REQ'D

NOTE #5 : CLASS 1E-EQ FUSE IS REQ'D (10 CFR 50.49)

581 9-87

EBASCO SERVICES INCORPORATED

[ED-Q0268-88463]

BY BS: 9/13/88

CHKD. BY CCO DATE 8-13-88

SHEET 89 OF 133

OFS NO. DEPT. NO.

CLIENT TVA

PROJECT BFNP UNITS 1,2,3

SUBJECT FUSE PROGRAM [480V. REACTOR MOV BOARDS 3A/B]

6.3 SUMMARY OF RESULTS

ITEM	FUSE UNID	FUSE TYPE	RESULT PASS	RESULT FAIL	SAFETY CLASS 1E	SAFETY CLASS NON-1E	SAFETY CLASS 1E-EQ	APPLICATION PERM.	APPLICATION APP'R	NOTE 1	NOTE 2	NOTE 3	NOTE 4	NOTE 5
149	3-FU 2 L-64	A4J3	X		X			T	T	X	-	-	X	-
150	3-FU 2 L-74	A4J3	X		X			T	T	X	-	-	X	-
151	3-FU 2 L-23	A4J3	X		X			T	T	X	-	-	X	-
152	3-FU 2 L-75	A4J3	X		X			T	T	X	-	-	X	-
153	3-FU 2 L-74	A4J3	X		X			T	T	X	-	-	X	-
154	3-FU 2 L-23	A4J3	X		X			T	T	X	-	-	X	-
155	3-FU 2 L-63	A4J3	X		X			T	T	X	-	-	X	-
156	3-FU 2 L-78	A4J3	X		X			T	T	X	-	-	X	-
157	3-FU 2 L-78	A4J3	X		X			T	T	X	-	-	X	-
158	3-FU 2 L-78	A4J3	X		X			T	T	X	-	-	X	-
159	3-FU 2 L-74	A4J3	X		X			T	T	X	-	-	X	-
160	3-FU 2 L-32	A4J3	X		X			T	T	X	-	-	X	-
161	3-FU 2 L-69	A4J3	X		X			T	T	X	-	-	X	-
162	3-FU 2 L-75	A4J3	X		X			T	T	X	-	-	X	-
163	3-FU 2 L-74	A4J3	X		X			T	T	X	-	-	X	-
164	3-FU 2 L-74	A4J3	X		X			T	T	X	-	-	X	-
165	3-FU 2 L-64	A4J3	X		X			T	T	X	-	-	X	-
166	3-FU 2 L-73	A4J3	X		X			T	T	X	-	-	X	-
167	3-FU 2 L-78	A4J3	X		X			T	T	X	-	-	X	-
168	3-FU 2 L-74	A4J3	X		X			T	T	X	-	-	X	-
169	3-FU 2 L-67	A4J3	X		X			T	T	X	-	-	X	-

TABLE B

NOTE #1 : ACCEPTABLE FUSE SIZE

NOTE #2 : OVERSIZED FUSE

NOTE #3 : UNDERSIZED FUSE

NOTE #4 : CLASS 1E FUSE AS REQ'D

NOTE #5 : CLASS 1E-EQ FUSE IS REQ'D (10CFR 50.49)

581 9-87

EBASCO SERVICES INCORPORATED

BY [illegible] 8/3/88 (ED-Q0268-8846B)

CHKD. BY CCC DATE 8-13-88

CLIENT TVA PROJECT BFNP UNITS 1&2

SUBJECT FUSE PROGRAM (480V REACTOR MOV BOARDS 3A/B)

SHEET 20 OF 133

OFS NO. DEPT. NO.

6.3 SUMMARY OF RESULTS

ITEM	FUSE UNID	FUSE TYPE	RESULT PASS	RESULT FAIL	SAFETY CLASS 1E	SAFETY CLASS NON-1E	SAFETY CLASS 1E-EQ	APPLICATION PERM.	APPLICATION APPR	NOTE 1	NOTE 2	NOTE 3	NOTE 4	NOTE 5
170	3-FU 2 - 70 - 45A	A4J3	X	-	X	-	-	-	-	X	-	-	X	-
171	3-FU 2 - 75 - 51A	A4J3	X	-	X	-	-	-	-	X	-	-	X	-
172	3-FU 2 - 75 - 53A	A4J3	X	-	X	-	-	-	-	X	-	-	X	-
173	3-FU 2 - 31 - 139A	A4J3	X	-	X	-	-	-	-	X	-	-	X	-
174	3-FU 2 - 69 - 12A	A4J3	X	-	X	-	-	-	-	X	-	-	X	-
175	3-FU 2 - 74 - 99A	A4J3	X	-	X	-	-	-	-	X	-	-	X	-
176	3-FU 2 - 77 - 14BA	A4J3	X	-	X	-	-	-	-	X	-	-	X	-
177	3-FU 2 - 77 - 17BA	A4J3	X	-	X	-	-	-	-	X	-	-	X	-
178	3-FU 2 - 74 - 74A	A4J3	X	-	X	-	-	-	-	X	-	-	X	-
179	3-FU 2 - 47 - 41AA	A4J3	X	-	X	-	-	-	-	X	-	-	X	-
180	3-FU 2 - 47 - 41BA	A4J3	X	-	X	-	-	-	-	X	-	-	X	-
181	3-FU 2 - 74 - 100A	A4J3	X	-	X	-	-	-	-	X	-	-	X	-
182	3-FU 2 - 74 - 97A	A4J3	X	-	X	-	-	-	-	X	-	-	X	-
183	3-FU 2 - 74 - 101A	A4J3	X	-	X	-	-	-	-	X	-	-	X	-
184	3-FU 2 - 77 - 14BB	TR 3.2	-	X	X	-	-	-	-	-	-	X	X	-
185	3-FU 2 - 77 - 17BB	TR 3.2	-	X	X	-	-	-	-	-	-	X	X	-
186	3-FU 2 - 74 - 66B	TR 2.5	-	X	X	-	-	-	-	-	-	X	X	-
187	3-FU 2 - 31 - 1982B	TR 1.6	-	X	X	-	-	-	-	-	-	X	X	-
188	3-FU 2 - 31 - 2002B	TR 1.6	-	X	X	-	-	-	-	-	-	X	X	-
189	3-FU 2 - 31 - 2003B	TR 1.6	-	X	X	-	-	-	-	-	-	X	X	-
190	3-FU 2 - 32 - 67B	TR 1.6	-	X	X	-	-	-	-	-	-	X	X	-

NOTE #1 : ACCEPTABLE FUSE SIZE

NOTE #2 : OVERSIZED FUSE

NOTE #3 : UNDERSIZED FUSE

TABLE B

NOTE #4 : CLASS 1E FUSE IS REQ'D

NOTE #5 : CLASS 1E-EQ FUSE IS REQ'D (10CFR 50.49)

581 9-87

BY [illegible] 8/19/88

CHKD. BY CCC DATE 8-13-88

CLIENT TVA

PROJECT BFNP UNITS 1,2,3

SUBJECT FUSE PROGRAM (480V REACTOR MOV BOARDS 3A/B)

BASCO SERVICES INCORPORATED

[ED-Q026G-88463]

OFS NO. _____

SHEET 91 OF 133

DEPT. NO. _____

6.3 SUMMARY OF RESULTS

ITEM	FUSE UNID	FUSE TYPE	RESULT PASS	RESULT FAIL	SAFETY CLASS 1E	SAFETY CLASS NON-1E	SAFETY CLASS 1E-EQ	APPLICATION PERM.	APPLICATION APP'R	NOTE 1	NOTE 2	NOTE 3	NOTE 4	NOTE 5
191	3-FU 2 - 75 - 76B	TR 1.6	-	X	X	-	-	-	-	-	-	X	X	-
192	3-FU 2 - 31 - 1993B	TR 1.6	-	X	X	-	-	-	-	-	-	X	X	-
193	3-FU 2 - 47 - 41AB	TR 3.2	-	X	X	-	-	-	-	-	-	X	X	-
194	3-FU 2 - 77 - 18B	TR 3.2	-	X	X	-	-	-	-	-	-	X	X	-
195	3-FU 2 - 76 - 50B	TR .8	X	-	X	-	-	-	-	X	-	-	X	-
196	3-FU 2 - 75 - 39B	TR .8	X	-	X	-	-	-	-	X	-	-	X	-
197	3-FU 2 - 75 - 30B	TR .8	X	-	X	-	-	-	-	X	-	-	X	-
198	3-FU 2 - 75 - 37B	TR .8	X	-	X	-	-	-	-	X	-	-	X	-
199	3-FU 2 - 74 - 24B	TR .8	X	-	X	-	-	-	-	X	-	-	X	-
200	3-FU 2 - 74 - 35B	TR .6	X	-	X	-	-	-	-	X	-	-	X	-
201	3-FU 2 - 74 - 63B	TR .8	X	-	X	-	-	-	-	X	-	-	X	-
202	3-FU 2 - 64 - 69B	TR .8	X	-	X	-	-	-	-	X	-	-	X	-
203	3-FU 2 - 23 - 46B	TR .8	X	-	X	-	-	-	-	X	-	-	X	-
204	3-FU 2 - 75 - 73B	TR .8	X	-	X	-	-	-	-	X	-	-	X	-
205	3-FU 2 - 23 - 52B	TR .8	X	-	X	-	-	-	-	X	-	-	X	-
206	3-FU 2 - 78 - 63B	TR .8	X	-	X	-	-	-	-	X	-	-	X	-
207	3-FU 2 - 78 - 66B	TR .8	X	-	X	-	-	-	-	X	-	-	X	-
208	3-FU 2 - 78 - 68B	TR .8	X	-	X	-	-	-	-	X	-	-	X	-
209	3-FU 2 - 74 - 75B	TR .8	X	-	X	-	-	-	-	X	-	-	X	-
210	3-FU 2 - 32 - 67B	TR .8	X	-	X	-	-	-	-	X	-	-	X	-
211	3-FU 2 - 69 - 60B	TR .8	X	-	X	-	-	-	-	X	-	-	X	-

NOTE #1 : ACCEPTABLE FUSE SIZE

NOTE #2 : OVERSIZED FUSE

NOTE #3 : UNDERSIZED FUSE

TABLE B

NOTE #4 : CLASS 1E FUSE IS REQ'D

NOTE #5 : CLASS 1E-EQ FUSE IS REQ'D (10CFR 50.49)

581 9-87

EBASCO SERVICES INCORPORATED

[ED-Q0268-884G3]

BY PB: 8/13/88

CHKD. BY CCO DATE 8-13-88

SHEET 92 OF 133

OFS NO. DEPT. NO

CLIENT TVA

PROJECT BFNP UNITS 1,2,3

SUBJECT FUSE PROGRAM [ABOV. REACTOR MOV BOARDS 3A/B]

6.3 SUMMARY OF RESULTS

ITEM	FUSE UNID	TYPE	RESULT PASS	RESULT FAIL	SAFETY CLASS 1E	SAFETY CLASS NON-1E	SAFETY CLASS 1E-EQ	APPLICATION PERM.	APPLICATION APP'R	NOTE 1	NOTE 2	NOTE 3	NOTE 4	NOTE 5
212	3-FU 2 - 74 - 72B	TR .8	X		X					X	-	-	-	-
213	3-FU 2 L 74 - 106B	TR .8	X		X					X	-	-	-	-
214	3-FU 2 - 64 - 71B	TR .8	X		X					X	-	-	-	-
215	3-FU 2 - 73 - 64B	TR .8	X		X				X	X	-	-	-	-
216	3-FU 2 L 78 - 61B	TR .8	X		X					X	-	-	-	-
217	3-FU 2 L 74 - 71B	TR .8	X		X					X	-	-	-	-
218	3-FU 2 - 75 - 51B	TR .8	X		X					X	-	-	-	-
219	3-FU 2 L 75 - 53B	TR .8	X		X					X	-	-	-	-
220	3-FU 2 L 31 - 139B	TR .6	X		X					X	-	-	-	-
221	3-FU 2 - 69 - 12B	TR .8	X		X					X	-	-	-	-
222	3-FU 2 - 74 - 99B	TR .8	X		X					X	-	-	-	-
223	3-FU 2 - 74 - 74B	TR .8	X		X					X	-	-	-	-
224	3-FU 2 - 70 - 40B	TR 3.2	X		X					X	-	-	-	-
225	3-FU 2 L 70 - 45B	TR 3.2	X		X					X	-	-	-	-
226	3-FU 2 - 71 - 2B	TR .8	X		X					X	-	-	-	-
227	3-FU 2 - 70 J 48B	TR .8	X		X					X	-	-	-	-
228	3-FU 2 L 23 J 57B	TR .8	X		X					X	-	-	-	-
229	3-FU 2 L 70 J 47B	TR .8	X		X					X	-	-	-	-
230	3-FU 2 - 74 - 23B	TR .8	X		X					X	-	-	-	-
231	3-FU 2 - 74 - 36B	TR .8	X		X					X	-	-	-	-
232	3-FU 2 - 74 - 46B	TR .8	X		X					X	-	-	-	-

TABLE B

NOTE #1 : ACCEPTABLE FUSE SIZE

NOTE #2 : OVERSIZED FUSE

NOTE #3 : UNDERSIZED FUSE

NOTE #4 : CLASS 1E FUSE IS REQ'D

NOTE #5 : CLASS 1E-EQ FUSE IS REQ'D (10CFR 50.49)

581 9-87

EBASCO SERVICES INCORPORATED

BY PB: 8/3/88 (ED-90268-884637)

CHKD. BY CCC DATE 8-13-88

CLIENT TVA OFS NO.

PROJECT BFNP UNITS 1,2,3 DEPT. NO.

SUBJECT FUSE PROGRAM (480V REACTOR MOV BOARDS 3A/B)

SHEET 93 OF 133

581 9-87

6.3 SUMMARY OF RESULTS

ITEM	FUSE UNID	TYPE	RESULT PASS	RESULT FAIL	SAFETY CLASS 1E	SAFETY CLASS NON-1E	SAFETY CLASS 1E-EQ	APPLICATION PENT.	APPLICATION APP'R	NOTE 1	NOTE 2	NOTE 3	NOTE 4	NOTE 5
233	3-FU 2 - 74 - 100B	TR .8	X	-	X	-	-	-	-	X	-	-	X	-
234	3-FU 2 - 74 - 97B	TR .8	X	-	X	-	-	-	-	X	-	-	X	-
235	3-FU 2 - 74 - 101B	TR .8	X	-	X	-	-	-	-	X	-	-	X	-
236	3-FU 2 - 70 - 40C	TR 3.2	-	X	X	-	-	X	-	-	-	X	X	-
237	3-FU 2 - 70 - 45C	TR 3.2	-	X	X	-	-	-	-	-	-	X	X	-
238	3-FU 2 - 70 - 47C	TR .8	X	-	X	-	-	-	-	X	-	-	X	-
239	3-FU 2 - 74 - 25C	TR .8	X	-	X	-	-	-	-	X	-	-	X	-
240	3-FU 2 - 74 - 46C	TR .8	X	-	X	-	-	-	-	X	-	-	X	-
241	3-FU 2 - 74 - 100C	TR .8	X	-	X	-	-	-	-	X	-	-	X	-
242	3-FU 2 - 74 - 97C	TR .8	X	-	X	-	-	-	-	X	-	-	X	-
243	3-FU 2 - 74 - 101C	TR .8	X	-	X	-	-	-	-	X	-	-	X	-
244	3-FU 2 - 76 - 59D	TR 1.6	-	X	X	-	-	-	-	-	-	X	X	-
245	3-FU 2 - 268 - 38A	JHC15	X	-	X	-	-	-	-	X	-	-	X	-
246	3-FU 2 - 74 - 64E	AA16	-	X	X	-	-	-	-	-	X	-	X	-
247	3-FU 2 - 31 - 112A	AAJ3	-	-	-	-	-	-	-	TO BE DELETED				
248	3-FU 2 - 31 - 112B	TR .8	-	-	-	-	-	-	-	TO BE DELETED				
249	3-FU 2 - 268 - 38F	JHC15	X	-	X	-	-	-	-	X	-	-	X	-
250	3-FU 2 - 268 - 38Q	TR 2	-	-	X	-	-	-	-	TO BE DELETED				
251	3-FU 2 - 71 - 2C	TR .8	X	-	X	-	-	X	-	X	-	-	X	-
252	3-FU 2 - 70 - 48C	TR .8	X	-	X	-	-	-	-	X	-	-	X	-
253	3-FU 2 - 23 - 57C	TR .8	X	-	X	-	-	-	-	X	-	-	X	-

NOTE #1 : ACCEPTABLE FUSE SIZE

NOTE #2 : OVERSIZED FUSE

NOTE #3 : UNDERSIZED FUSE

TABLE B

NOTE #4 : CLASS 1E FUSE IS REQ'D

NOTE #5 : CLASS 1E-EQ FUSE IS REQ'D (10CFR 50.49)

EBASCO SERVICES INCORPORATED

[EDS-00268-88A63]

BY PSL DATE 3/13/88

CHKD. BY CCO DATE 8-13-88

SHEET 94 OF 133

CLIENT TVA

OFS NO. _____ DEPT. NO. _____

PROJECT BFNP UNITS 1,2,3

SUBJECT FUSE PROGRAM [480V. REACTOR MOV BOARDS 3A/B]

6.3 SUMMARY OF RESULTS

ITEM	FUSE UNID	TYPE	RESULT PASS	RESULT FAIL	SAFETY CLASS 1E	SAFETY CLASS NON-1E	SAFETY CLASS 1E-EQ	APPLICATION PERM.	APPLICATION APP'R	NOTE 1	NOTE 2	NOTE 3	NOTE 4	NOTE 5
254	3-FU 2-268-3B0	A4J15	X		X			T	T	X			X	
255	3-FU 2-268-3B4	A4J15	X		X			T	T	X			X	
256	3-FU 2-268-3BE	A4J30	X		X			T	T	X			X	
257	3-FU 2-268-3BJ	A4J30	X		X			T	T	X			X	
258	3-FU 2-268-3AB	A4J10	X		X			T	T	X			X	
259	3-FU 2-268-3BC	A4J10	X		X			T	T	X			X	
260	3-FU 2-63-5B8	TR5.6	X		X			T	T	X			X	
261	3-FU 2-63-6BC	TR5.6	X		X			T	T	X			X	
262	3-FU 2-32-6BB	TR6.35	X		X			T	T	X			X	
263	3-FU 2-268-3BK	A4J10	X		X			T	T	X			X	
264	3-FU 2-268-3B9	A4J10	X		X			T	T	X			X	
265	3-FU 2-77-8B6	TR.8	X		X			T	T	X			X	
266	3-FU 2-67-26B	TR.8	X		X			T	T	X			X	
267	3-FU 2-73-B1A	A4J3	X		X			T	T	X			X	
268	3-FU 2-73-B1B	TR.8	X		X			T	T	X			X	
269	3-FU 2-74-36C	TR.8	X		X			T	T	X			X	
270	SPARE (2 FUSE BLOCK)	NONE												
271														
272														
273														
274														

TABLE B

NOTE #1 : ACCEPTABLE FUSE SIZE

NOTE #2 : OVERSIZED FUSE

NOTE #3 : UNDERSIZED FUSE

NOTE #4 : CLASS 1E FUSE IS REQ'D

NOTE #5 : CLASS 1E-EQ FUSE IS REQ'D (10CFR 50.49)

581 9-87

EBASCO SERVICES INCORPORATED

[ED-Q0268-8840G3]

BY B. 8/13/88

CHKD. BY CCO DATE 8-13-88

SHT 95 OF 133

OFS NO. DEPT. NO.

CLIENT TVA

PROJECT BFNP UNITS 1,2,3

SUBJECT FUSE PROGRAM (ABOV. REACTOR MOV BOARDS 3A/B)

6.3 SUMMARY OF RESULTS

ITEM	FUSE UNID	FUSE TYPE	RESULT PASS	RESULT FAIL	SAFETY CLASS 1E	SAFETY CLASS NON-1E	SAFETY CLASS 1E-EQ	APPLICATION PERM.	APPLICATION APP'R	NOTE 1	NOTE 2	NOTE 3	NOTE 4	NOTE 5
275	SPARE (2 FUSE BLOCKS)	NONE	-	-	-	-	-	-	-	-	-	-	-	-
276			-	-	-	-	-	-	-	-	-	-	-	-
277			-	-	-	-	-	-	-	-	-	-	-	-
278			-	-	-	-	-	-	-	-	-	-	-	-
279			-	-	-	-	-	-	-	-	-	-	-	-
280			-	-	-	-	-	-	-	-	-	-	-	-
281			-	-	-	-	-	-	-	-	-	-	-	-
282			-	-	-	-	-	-	-	-	-	-	-	-
283			-	-	-	-	-	-	-	-	-	-	-	-
284			-	-	-	-	-	-	-	-	-	-	-	-
285			-	-	-	-	-	-	-	-	-	-	-	-
286			-	-	-	-	-	-	-	-	-	-	-	-
287			-	-	-	-	-	-	-	-	-	-	-	-
288			-	-	-	-	-	-	-	-	-	-	-	-
289			-	-	-	-	-	-	-	-	-	-	-	-
290			-	-	-	-	-	-	-	-	-	-	-	-
291			-	-	-	-	-	-	-	-	-	-	-	-
292			-	-	-	-	-	-	-	-	-	-	-	-
293			-	-	-	-	-	-	-	-	-	-	-	-
294			-	-	-	-	-	-	-	-	-	-	-	-
295			-	-	-	-	-	-	-	-	-	-	-	-

TABLE B

NOTE #1 : ACCEPTABLE FUSE SIZE

NOTE #2 : OVERSIZED FUSE

NOTE #3 : UNDERSIZED FUSE

NOTE #4 : CLASS 1E FUSE IS REQ'D

NOTE #5 : CLASS 1E-EQ FUSE IS REQ'D (10CFR 50.49)

581 9-87

BY CB: 8/13/88 SG 28: 8/17/88

CHKD. BY CCO DATE 8-13-89 SHEET 97 OF 133

OFS NO. DEPT. NO.

CLIENT TVA

PROJECT BFNP UNITS 1,2,3

SUBJECT FUSE PROGRAM [480V. REACTOR MOV BOARDS 3A/B]

6.3 SUMMARY OF RESULTS — TABLE B

ITEM	FUSE UNID	FUSE TYPE	RESULT PASS	RESULT FAIL	SAFETY CLASS 1E	SAFETY CLASS NON-1E	SAFETY CLASS 1E-EQ	APPLICATION PERM.	APPLICATION APP'R	NOTE 1	NOTE 2	NOTE 3	NOTE 4	NOTE 5
296	SPARE (2 FUSE BLOCK)	NONE	-	-	T	-	T	T	T	-	-	-	-	-
297	3-FU2-31-122A	A4J3	-	X	T	-	T	T	T	-	X	-	X	-
298	3-FU2-31-123A	TRB	X	-	T	-	T	T	T	X	-	-	X	-
	NOT USED	NONE	-	-	T	-	T	T	-	-	-	-	-	-

NOTE #1 : ACCEPTABLE FUSE SIZE
NOTE #2 : OVERSIZED FUSE
NOTE #3 : UNDERSIZED FUSE
NOTE #4 : CLASS 1E FUSE IS REQ'D
NOTE #5 : CLASS 1E-EQ FUSE IS REQ'D (10CFR 50.49)

581 9-87

EBASCO SERVICES INCORPORATED
[ED-Q0268-8846]

BY [illegible] 8/13/88
CHKD. BY CCO DATE 8-13-88
CLIENT TVA
PROJECT BFNP UNITS 1,2,3
SUBJECT FUSE PROGRAM [ABOV. REACTOR MOV BOARDS 3A/B]

97 Pb: 8/17/88
SHT 96a OF 133
OBS NO. DEPT. NO.

6.4 CONCLUSIONS AND RECOMMENDATIONS

BASED ON THE CALCULATIONS/FUSE SELECTION AND SAFETY CLASS APPLICATION IN SECTIONS 6.2 AND 6.3 RESPECTIVELY, IT WAS FOUND THAT

442		FUSES WERE DETERMINED ACCEPTABLE
94		FUSES REQUIRE REPLACEMENT
104		SPARE FUSES (52 FUSE BLOCK)
12		FUSE/6 UNID TO BE DELETED
TOT.	652	FUSES (SEE TABLE C)

581 9-87

EBASCO SERVICES INCORPORATED

[ED-Q0268-884G3]

BY DB: 8/12/88

CHKD. BY CCO DATE 8-13-88

SHEET 98 OF 133

OFS NO. DEPT. NO.

CLIENT TVA

PROJECT BFNP UNITS 1,2,3

SUBJECT FUSE PROGRAM [480V. REACTOR MOV BOARDS 3A/B]

6.4 CONCLUSIONS AND RECOMMENDATIONS

ITEM	FUSE UNID	FUSE REQUIRED	AIT.	SAFETY CLASS 1E	SAFETY CLASS NON-1E	SAFETY CLASS IE-EQ	APPLICATION PERM.	APPLICATION APPR	NOTE 1	NOTE 2	NOTE 3	NOTE 4	NOTE 5
01	3-FU 2 L-76 J-49A	A4U3	1.0	X					X	-	-	X	-
02	3-FU 2 L-31 J-196A	A4U3	1.0	X					X	-	-	X	-
03	3-FU 2 L-31 J-197A	A4U3	1.0	X					X	-	-	X	-
04	3-FU 2 L-31 J-199A	A4U3	1.0	X					X	-	-	X	-
05	3-FU 2 L-31 J-200A	A4U3	1.0	X					X	-	-	X	-
06	3-FU 2 L-31 J-96A	A4U3	1.0	X					X	-	-	X	-
07	3-FU 2 L-31 J-96B	A4U3	1.0	X					X	-	-	X	-
08	3-FU 2 L-40 J-31AA	A4U3	1.0	X					X	-	-	X	-
09	3-FU 2 L-47 J-31BA	A4U3	1.0	X					X	-	-	X	-
10	3-FU 2 L-47 J-32AA	A4U3	1.0	X					X	-	-	X	-
11	3-FU 2 L-74 J-52A	A4U3	1.0	X					X	-	-	X	-
12	3-FU 2 L-64 J-68A	A4U3	1.0	X					X	-	-	X	-
13	3-FU 2 L-78 J-62A	A4U3	1.0	X					X	-	-	X	-
14	3-FU 2 L-74 J-14	A4U3	1.0	X					X	-	-	X	-
15	3-FU 2 L-77 J-14AA	A4U3	1.0	X					X	-	-	X	-
16	3-FU 2 L-78 J-67A	A4U3	1.0	X					X	-	-	X	-
17	3-FU 2 L-74 J-12A	A4U3	1.0	X					X	-	-	X	-
18	3-FU 2 L-77 J-11A	A4U3	1.0	X					X	-	-	X	-
19	3-FU 2 L-76 J-72A	A4U3	1.0	X					X	-	-	X	-
20	3-FU 2 L-74 J-24	A4U3	1.0	X					X	-	-	X	-
21	3-FU 2 L-74 J-62A	A4U3	1.0	X					X	-	-	X	-

TABLE C

NOTE #1: ACCEPTABLE FUSE SIZE

NOTE #2: REPLACEMENT FUSE

NOTE #3: UNID TO BE DELETED

NOTE #4: CLASS 1E FUSE IS REQ'D

NOTE #5: CLASS 1E-EQ FUSE IS REQ'D (10CFR 50.49)

581 9-87

BY _____ 8/13/88

CHKD. BY CCO DATE 8-13-88

SHEET 99 OF 133

OFS NO. _____ DEPT. NO. _____

CLIENT TVA

PROJECT BFNP UNITS 1,2,3

SUBJECT FUSE PROGRAM [480 V. REACTOR MOV BOARDS 3A/B]

6.4 CONCLUSIONS AND RECOMMENDATIONS

ITEM	FUSE UNID	FUSE REQUIRED	ATT.	SAFETY CLASS 1E	SAFETY CLASS NON-1E	SAFETY CLASS 1E-EQ	APPLICATION PERM.	APPLICATION APP'R	NOTE 1	NOTE 2	NOTE 3	NOTE 4	NOTE 5
22	3-FU 2 - 32 - 64A	A4J3	1.0	X					X	-	-	X	-
23	3-FU 2 - 74 - 13A	A4J3	1.0	X					X	-	-	X	-
24	3-FU 2 - 74 - 194A	A4J3	1.0	X					X	-	-	X	-
25	3-FU 2 - 74 - 48A	A4J3	1.0	X					X	-	-	X	-
26	3-FU 2 - 74 - 78A	NONE	-	-					-	-	X	-	-
27	3-FU 2 - 78 - 65A	A4J3	1.0	X					X	-	-	X	-
28	3-FU 2 - 78 - 64A	A4J3	1.0	X					X	-	-	X	-
29	3-FU 2 - 47 - 10A	A4J3	1.0	X					X	-	-	X	-
30	3-FU 2 - 69 - 35A	A4J3	1.0	X					X	-	-	X	-
31	3-FU 2 - 75 - 2A	A4J3	1.0	X					X	-	-	X	-
32	3-FU 2 - 74 - 57A	A4J3	1.0	X					X	-	-	X	-
33	3-FU 2 - 74 - 61A	A4J3	1.0	X					X	=	=	X	=
34	3-FU 2 - 63 - 5AA	A4J3	1.0	X					X	=	=	X	=
35	3-FU 2 - 75 - 11A	A4J3	1.0	X					X	=	=	X	=
36	3-FU 2 - 74 - 58A	A4J3	1.0	X					X	=	=	X	=
37	3-FU 2 - 75 - 23A	A4J3	1.0	X					X	=	=	X	=
38	3-FU 2 - 74 - 60A	A4J3	1.0	X					X	=	=	X	=
39	3-FU 2 - 64 - 7AA	A4J3	1.0	X					X	=	=	X	=
40	3-FU 2 - 75 - 23A	A4J3	1.0	X					X	=	=	X	=
41	3-FU 2 - 75 - 9A	A4J3	1.0	X					X	=	=	X	=
42	3-FU 2 - 69 - 1A	A4J3	1.0	X					X	-	-	X	-

TABLE C

NOTE #1: ACCEPTABLE FUSE SIZE

NOTE #2: REPLACEMENT FUSE

NOTE #3: UNID TO BE DELETED

NOTE #4: CLASS 1E FUSE IS REQ'D

NOTE #5: CLASS 1E-EQ FUSE IS REQ'D (10CFR 50.49)

SB1 9-87

64 CONCLUSIONS AND RECOMMENDATIONS

ITEM	FUSE UNID	REQUIRED	ATT.	SAFETY CLASS 1E	SAFETY CLASS NON-1E	SAFETY CLASS 1E-EQ	APPLICATION PENT.	APPLICATION APP.R	NOTE 1	NOTE 2	NOTE 3	NOTE 4	NOTE 5
43	3-FU 2-70-39A	A4J3	1.0	X					X	-	-	X	-
44	3-FU 2-23-34A	A4J3	1.0	X					X	-	-	X	-
45	3-FU 2-73-2A	A4J3	1.0	X					X	-	-	X	-
46	3-FU 2-70-44A	A4J3	1.0	X					X	-	-	X	-
47	3-FU 2-23-40A	A4J3	1.0	X					X	-	-	X	-
48	3-FU 2-75-22A	A4J3	1.0	X					X	-	-	X	-
49	3-FU 2-71-59A	A4J3	1.0	X					X	-	-	X	-
50	3-FU 2-47-31AB	TR 3.5R	2.0	X					-	X	-	X	-
51	3-FU 2-77-14AB	TR 3.5R	2.0	X					-	X	-	X	-
52	3-FU 2-77-1AB	TR 3.5R	2.0	X					-	X	-	X	-
53	3-FU 2-31-1961B	TR 1.8R	2.0	X					-	X	-	X	-
54	3-FU 2-31-1973B	TR 1.8R	2.0	X					-	X	-	X	-
55	3-FU 2-31-1999B	TR 1.8R	2.0	X					-	X	-	X	-
56	3-FU 2-31-2000B	TR 1.8R	2.0	X					-	X	-	X	-
57	3-FU 2-32-64B	TR 1.8R	2.0	X					-	X	-	X	-
58	3-FU 2-47-10B	TR 1.8R	2.0	X					-	X	-	X	-
59	3-FU 2-64-68B	TR .8	2.0	X					X	-	-	X	-
60	3-FU 2-78-62B	TR .8	2.0	X					X	=	=	X	=
61	3-FU 2-78-67B	TR .8	2.0	X					X	=	=	X	=
62	3-FU 2-74-68B	TR .8	2.0	X					X	=	=	X	=
63	3-FU 2-74-104B	TR .8	2.0	X					X	-	-	X	-

NOTE #1: ACCEPTABLE FUSE SIZE
NOTE #2: REPLACEMENT FUSE
NOTE #3: UNID TO BE DELETED

TABLE C

NOTE #4: CLASS 1E FUSE IS REQ'D
NOTE #5: CLASS 1E-EQ FUSE IS REQ'D (10CFR 50.49)

EBASCO SERVICES INCORPORATED

[ED-QO268-88463]

BY PB: 8/13/88

CHKD. BY CCO DATE 8-13-88

SHEET 101 OF 133

CLIENT TVA

OFS NO. _____ DEPT. NO. _____

PROJECT BFNP UNITS 1,2,3

SUBJECT FUSE PROGRAM [480V REACTOR MOV BOARDS 3A/B]

64 CONCLUSIONS AND RECOMMENDATIONS

TABLE C

ITEM	FUSE UNID	FUSE REQUIRED	ATT.	SAFETY CLASS 1E	SAFETY CLASS NON-1E	SAFETY CLASS 1E-EQ	APPLICATION PERM.	APPLICATION APP. R	NOTE 1	NOTE 2	NOTE 3	NOTE 4	NOTE 5
64	3-FU 2 - 74 - 78B	NONE	-	-	-	-	-	-	-	-	-	-	-
65	3-FU 2 - 78 - 65B	TR .8	2.0	X	-	-	-	-	X	-	X	-	-
66	3-FU 2 - 78 - 64B	TR .8	2.0	X	-	-	-	-	X	-	-	X	-
67	3-FU 2 - 69 - 35B	TR .8	2.0	X	-	-	-	-	X	-	-	X	-
68	3-FU 2 - 75 - 2B	TR .8	2.0	X	-	-	-	-	X	-	-	X	-
69	3-FU 2 - 74 - 61B	TR .8	2.0	X	-	-	-	-	X	-	-	X	-
70	3-FU 2 - 75 - 11B	TR .8	2.0	X	-	-	-	-	X	-	-	X	-
71	3-FU 2 - 74 - 58B	TR .8	2.0	X	-	-	-	-	X	-	-	X	-
72	3-FU 2 - 75 - 23B	TR .8	2.0	X	-	-	-	-	X	-	-	X	-
73	3-FU 2 - 64 - 70B	TR .8	2.0	X	-	-	-	-	X	-	-	X	-
74	3-FU 2 - 75 - 25B	TR .8	2.0	X	-	-	-	-	X	-	-	X	-
75	3-FU 2 - 75 - 9B	TR .8	2.0	X	-	-	-	-	X	-	-	X	-
76	3-FU 2 - 69 - 1B	TR .8	2.0	X	-	-	-	-	X	-	-	X	-
77	3-FU 2 - 73 - 2B	TR .8	2.0	X	-	-	-	-	X	-	-	X	-
78	3-FU 2 - 75 - 22B	TR .8	2.0	X	-	-	-	X	X	-	-	X	-
79	3-FU 2 - 71 - 59B	TR .8	2.0	X	-	-	-	-	X	-	-	X	-
80	3-FU 2 - 74 - 52B	TR 2	2.0	X	-	-	-	-	X	-	-	X	-
81	3-FU 2 - 74 - 1B	TR .8	2.0	X	-	-	-	-	X	-	-	X	-
82	3-FU 2 - 74 - 12B	TR .8	2.0	X	-	-	-	-	X	-	-	X	-
83	3-FU 2 - 74 - 2B	TR .8	2.0	X	-	-	-	-	X	-	-	X	-
84	3-FU 2 - 74 - 13B	TR .8	2.0	X	-	-	-	-	X	-	-	X	-

NOTE #1: ACCEPTABLE FUSE SIZE

NOTE #2: REPLACEMENT FUSE

NOTE #3: UNID TO BE DELETED

NOTE #4: CLASS 1E FUSE IS REQ'D

NOTE #5: CLASS 1E-EQ FUSE IS REQ'D (10CFR 50.49)

581 9-87

6.4 CONCLUSIONS AND RECOMMENDATIONS

ITEM	FUSE UNID	REQUIRED	ATT.	SAFETY CLASS 1E	SAFETY CLASS NON-1E	SAFETY CLASS 1E-EQ	APPLICATION PERM.	APPLICATION APP'R	NOTE 1	NOTE 2	NOTE 3	NOTE 4	NOTE 5
85	3-FU 2-74-48B	TR .8	2.0	X	-	-	X	-	X	-	-	X	-
86	3-FU 2-74-57B	TR .8	2.0	X	-	-	-	-	X	-	-	X	-
87	3-FU 2-74-60B	TR .8	2.0	X	-	-	-	-	X	-	-	X	-
88	3-FU 2-1-55B	TR .8	2.0	X	-	-	-	-	X	-	-	X	-
89	3-FU 2-23-34B	TR .8	2.0	X	-	-	-	-	X	-	-	X	-
90	3-FU 2-23-40B	TR .8	2.0	X	-	-	-	-	X	-	-	X	-
91	3-FU 2-74-52B	TR 3R	2.0	X	-	-	-	-	-	X	-	X	-
92	3-FU 2-70-39B	TR 3.5R	2.0	X	-	-	-	-	-	X	-	X	-
93	3-FU 2-70-44B	TR 3.5R	2.0	X	-	-	-	-	-	X	-	X	-
94	3-FU 2-74-1C	TR .8	2.0	X	-	-	-	-	X	-	-	X	-
95	3-FU 2-74-12C	TR .8	2.0	X	-	-	-	-	X	-	-	X	-
96	3-FU 2-74-2C	TR .8	2.0	X	-	-	-	-	X	-	-	X	-
97	3-FU 2-74-13C	TR .8	2.0	X	-	-	-	-	X	-	-	X	-
98	3-FU 2-74-48C	TR .8	2.0	X	-	-	-	-	X	-	-	X	-
99	3-FU 2-74-57C	TR .8	2.0	X	-	-	-	-	X	-	-	X	-
100	3-FU 2-74-60C	TR .8	2.0	X	-	-	-	-	X	-	-	X	-
101	3-FU 2-1-55C	TR .8	2.0	X	-	-	-	-	X	-	-	X	-
102	3-FU 2-23-34C	TR .8	2.0	X	-	-	-	-	X	-	-	X	-
103	3-FU 2-23-40C	TR .8	2.0	X	-	-	-	-	X	-	-	X	-
104	3-FU 2-74-52C	TR 3R	2.0	X	-	-	-	-	-	X	-	X	-
105	3-FU 2-70-39C	TR 3.5R	2.0	X	-	-	-	-	-	X	-	X	-

NOTE #1: ACCEPTABLE FUSE SIZE
NOTE #2: REPLACEMENT FUSE
NOTE #3: UNID TO BE DELETED

TABLE C

NOTE #4: CLASS 1E FUSE IS REQ'D
NOTE #5: CLASS 1E-EQ FUSE IS REQ'D (10CFR 50.49)

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EBASCO SERVICES INCORPORATED
[ED-QO268-88463]

6.4 CONCLUSIONS AND RECOMMENDATIONS

ITEM	FUSE UNID	FUSE REQUIRED	ATT.	SAFETY CLASS 1E	SAFETY CLASS NON-1E	SAFETY CLASS 1E-EQ	APPLICATION PERM.	APPLICATION APPR	NOTE 1	NOTE 2	NOTE 3	NOTE 4	NOTE 5
106	3-FU 2 - 70 - 44C	TR 3.5R	2.0	X	-	-	-	-	-	X	-	X	-
107	3-FU 2 - 76 - 49B	TR 1.8	2.0	X	-	-	-	-	-	X	-	X	-
108	3-FU 2 - 74 - 52D	AJT3	5.0	X	-	-	-	-	-	X	-	X	-
109	3-FU 2 - 268 - 3BA	TR 3R	2.0	X	-	-	-	-	-	X	-	X	-
110	3-FU 2 - 268 - 3AA	JHC15	4.0	X	-	-	-	-	X	-	-	X	-
111	3-FU 2 - 268 - 3AF	JHC15	4.0	X	-	-	-	-	X	-	-	X	-
112	3-FU 2 - 31 - 110A	A4J3	-	-	-	-	-	-	-	-	X	-	-
113	3-FU 2 - 31 - 110B	NONE	-	-	-	-	-	-	-	-	X	-	-
114	3-FU 2 - 47 - 10F	AJT1.5	5.0	X	-	-	-	-	-	X	-	X	-
115	3-FU 2 - 31 - 96C	TR 1.8R	2.0	X	-	-	-	-	-	X	-	X	-
116	3-FU 2 - 31 - 96D	TR 1.8R	2.0	X	-	-	-	-	-	X	-	X	-
117	3-FU 2 - 268 - 3AB	A4J10	1.0	X	-	-	-	-	X	-	-	X	-
118	3-FU 2 - 268 - 3AC	A4J10	1.0	X	-	-	-	-	X	-	-	X	-
119	3-FU 2 - 268 - 3AD	A4J15	3.0	X	-	-	-	-	X	-	-	X	-
120	3-FU 2 - 268 - 3AH	A4J15	3.0	X	-	-	-	-	X	-	-	X	-
121	3-FU 2 - 268 - 3AE	AJT15	5.0	X	-	-	-	-	-	X	-	X	-
122	3-FU 2 - 268 - 3AJ	AJT15	5.0	X	-	-	-	-	-	X	-	X	-
123	3-FU 2 - 63 - 5AB	TR 5.6	2.0	X	-	-	-	-	X	-	-	X	-
124	3-FU 2 - 63 - 6AC	TR 5.6	2.0	X	-	-	-	-	X	-	-	X	-
125	3-FU 2 - 268 - 3AG	A4J10	1.0	X	-	-	-	-	X	-	-	X	-
126	3-FU 2 - 268 - 3AK	A4J3	1.0	X	-	-	-	-	X	-	-	X	-

NOTE #1: ACCEPTABLE FUSE SIZE
NOTE #2: REPLACEMENT FUSE
NOTE #3: UNID TO BE DELETED

TABLE C

NOTE #4: CLASS 1E FUSE IS REQ'D
NOTE #5: CLASS 1E-EQ FUSE IS REQ'D (10CFR 50.49)

6.4 CONCLUSIONS AND RECOMMENDATIONS

ITEM	FUSE UNID	REQUIRED	ATT.	SAFETY CLASS 1E	SAFETY CLASS NON-1E	SAFETY CLASS 1E-EQ	APPLICATION PERM.	APPLICATION APPR	NOTE 1	NOTE 2	NOTE 3	NOTE 4	NOTE 5
127	3-FU 2-32-65B	TR 6.25	2.0	X					X			X	
127.1	3-FU 2-1-55A	A4J3	1.0	X					X			X	
127.2	3-FU 2-75-72B	TR.B	2.0	X					X			X	
127.3	SPARE (2 FUSE BLOCK)	NONE											
127.4													
127.5													
127.6													
127.7													
127.8													
127.9													
127.10													
127.11													
127.12													
127.13													
127.14													
127.15													
127.16													
127.17													
127.18													
127.19													
127.20													

NOTE #1: ACCEPTABLE FUSE SIZE
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TABLE C

NOTE #4: CLASS 1E FUSE IS REQ'D
NOTE #5: CLASS 1E-EQ FUSE IS REQ'D (10CFR 50.49)

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EBASCO SERVICES INCORPORATED

BY SB 9/13/88 (ED-90268-88463)

CHK'D. BY ECO DATE 8-13-88

CLIENT TVA OFS NO.

PROJECT BFNP UNITS 1,2,3 DEPT. NO.

SUBJECT FUSE PROGRAM (480V REACTOR MOV BOARDS 3A/B) SHEET 105 OF 133

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64 CONCLUSIONS AND RECOMMENDATIONS

ITEM	FUSE UNID	FUSE REQUIRED	ATT.	SAFETY CLASS 1E	SAFETY CLASS NON-1E	SAFETY CLASS 1E-EQ	APPLICATION PERM.	APPLICATION APP'R	NOTE 1	NOTE 2	NOTE 3	NOTE 4	NOTE 5
127.21	SPARE (2 FUSE BLOCK)	NONE											
127.22													
127.23													
127.24													
127.25													
127.26													
127.27	3-FU2-31-120A	AJT1	5.0	X						X		X	
127.28	3-FU2-31-121A	TR.8	2.0	X					X			X	
	NOT USED												

NOTE #1: ACCEPTABLE FUSE SIZE

NOTE #2: REPLACEMENT FUSE

NOTE #3: UNID TO BE DELETED

TABLE C

NOTE #4: CLASS 1E FUSE IS REQ'D

NOTE #5: CLASS 1E-EQ FUSE IS REQ'D (10CFR 50.49)

EBASCO SERVICES INCORPORATED

[ED-90268-88463]

BY DB: 8/13/88

CHKD. BY CCO DATE 8-13-88

SHEET 106 OF 133

OFS NO. DEPT. NO.

CLIENT TVA

PROJECT BFNP UNITS 1,2,3

SUBJECT FUSE PROGRAM (480V. REACTOR MOV BOARDS 3A/B)

64 CONCLUSIONS AND RECOMMENDATIONS

TABLE C

ITEM	FUSE UNID	FUSE REQUIRED	ATT.	SAFETY CLASS 1E	SAFETY CLASS NON-1E	SAFETY CLASS 1E-EQ	APPLICATION PERM.	APPLICATION APP'R	NOTE 1	NOTE 2	NOTE 3	NOTE 4	NOTE 5
128	3-FU 2 L 76 - 59A	A4J3	1.0	X	-	T	T	T	X	-	-	X	-
129	3-FU 2 L 31 - 1982A	A4J3	1.0	X	-	T	T	T	X	-	-	X	-
130	3-FU 2 L 31 - 1993A	A4J3	1.0	X	-	T	T	T	X	-	-	X	-
131	3-FU 2 L 31 - 2002A	A4J3	1.0	X	-	T	T	T	X	-	-	X	-
132	3-FU 2 L 31 - 2003A	A4J3	1.0	X	-	T	T	T	X	-	-	X	-
133	3-FU 2 L 77 - 1BA	A4J3	1.0	X	-	T	T	T	X	-	-	X	-
134	3-FU 2 L 77 - 8BA	A4J3	1.0	X	-	T	T	T	X	-	-	X	-
135	3-FU 2 L 71 - 2A	A4J3	1.0	X	-	T	T	T	X	-	-	X	-
136	3-FU 2 L 75 - 50A	A4J3	1.0	X	-	T	T	T	X	-	-	X	-
137	3-FU 2 L 74 - 66A	A4J3	1.0	X	-	T	T	T	X	-	-	X	-
138	3-FU 2 L 75 - 39A	A4J3	1.0	X	-	T	T	T	X	-	-	X	-
139	3-FU 2 L 70 - 40A	A4J3	1.0	X	-	T	T	T	X	-	-	X	-
140	3-FU 2 L 75 - 30A	A4J3	1.0	X	-	T	T	T	X	-	-	X	-
141	3-FU 2 L 75 - 37A	A4J3	1.0	X	-	T	T	T	X	-	-	X	-
142	3-FU 2 L 70 - 48.1	A4J3	1.0	X	-	T	T	-	X	-	-	X	-
143	3-FU 2 L 23 - 57A	A4J3	1.0	X	-	T	T	T	X	-	-	X	-
144	3-FU 2 L 74 - 24A	A4J3	1.0	X	-	T	T	T	X	-	-	X	-
145	3-FU 2 L 70 - 47A	A4J3	1.0	X	-	T	T	T	X	-	-	X	-
146	3-FU 2 L 74 - 25A	A4J3	1.0	X	-	T	T	T	X	-	-	X	-
147	3-FU 2 L 74 - 35A	A4J3	1.0	X	-	T	T	T	X	-	-	X	-
148	3-FU 2 L 74 - 6BA	A4J3	1.0	X	-	T	T	T	X	-	-	X	-

NOTE #1: ACCEPTABLE FUSE SIZE

NOTE #2: REPLACEMENT FUSE

NOTE #3: UNID TO BE DELETED

NOTE #4: CLASS 1E FUSE IS REQ'D

NOTE #5: CLASS 1E-EQ FUSE IS REQ'D (10CFR 50.49)

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6.4 CONCLUSIONS AND RECOMMENDATIONS

ITEM	FUSE UNID	REQUIRED	ATT.	SAFETY CLASS 1E	SAFETY CLASS NON-1E	SAFETY CLASS 1E-EQ	APPLICATION PENT.	APPLICATION APP'R	NOTE 1	NOTE 2	NOTE 3	NOTE 4	NOTE 5
149	3-FU 2 - 64 - 69A	A4J3	1.0	X	-	-	-	-	X	-	-	X	-
150	3-FU 2 - 74 - 36A	A4J3	1.0	X	-	-	-	-	X	-	-	X	-
151	3-FU 2 - 23 - 46A	A4J3	1.0	X	-	-	-	-	X	-	-	X	-
152	3-FU 2 - 75 - 78A	A4J3	1.0	X	-	-	-	-	X	-	-	X	-
153	3-FU 2 - 74 - 46A	A4J3	1.0	X	-	-	-	-	X	-	-	X	-
154	3-FU 2 - 23 - 52A	A4J3	1.0	X	-	-	-	-	X	-	-	X	-
155	3-FU 2 - 63 - 58A	A4J3	1.0	X	-	-	-	-	X	-	-	X	-
156	3-FU 2 - 78 - 68A	A4J3	1.0	X	-	-	-	-	X	-	-	X	-
157	3-FU 2 - 78 - 66A	A4J3	1.0	X	-	-	-	-	X	-	-	X	-
158	3-FU 2 - 78 - 68A	A4J3	1.0	X	-	-	-	-	X	-	-	X	-
159	3-FU 2 - 74 - 75A	A4J3	1.0	X	-	-	-	-	X	-	-	X	-
160	3-FU 2 - 32 - 67A	A4J3	1.0	X	-	-	-	-	X	-	-	X	-
161	3-FU 2 - 69 - 60A	A4J3	1.0	X	-	-	-	-	X	-	-	X	-
162	3-FU 2 - 75 - 76A	A4J3	1.0	X	-	-	-	-	X	-	-	X	-
163	3-FU 2 - 74 - 72A	A4J3	1.0	X	-	-	-	-	X	-	-	X	-
164	3-FU 2 - 74 - 106A	A4J3	1.0	X	-	-	-	-	X	-	-	X	-
165	3-FU 2 - 64 - 71A	A4J3	1.0	X	-	-	-	-	X	-	-	X	-
166	3-FU 2 - 73 - 64A	A4J3	1.0	X	-	-	-	-	X	-	-	X	-
167	3-FU 2 - 78 - 61A	A4J3	1.0	X	-	-	-	-	X	-	-	X	-
168	3-FU 2 - 74 - 71A	A4J3	1.0	X	-	-	-	-	X	-	-	X	-
169	3-FU 2 - 67 - 20A	A4J3	1.0	X	-	-	-	-	X	-	-	X	-

NOTE #1: ACCEPTABLE FUSE SIZE
NOTE #2: REPLACEMENT FUSE
NOTE #3: UNID TO BE DELETED

TABLE C

NOTE #4: CLASS 1E FUSE IS REQ'D
NOTE #5: CLASS 1E-EQ FUSE IS REQ'D (10CFR 50.49)

EBASCO SERVICES INCORPORATED

[ED-90268-88463]

BY B: 8/12/88

CHKD. BY CCO DATE 8-13-88

SHEET 108 OF 133

OFS NO. DEPT. NO.

CLIENT TVA

PROJECT BFNP UNITS 1,2,3

SUBJECT FUSE PROGRAM [480V REACTOR MOV BOARDS 3A/B]

6.4 CONCLUSIONS AND RECOMMENDATIONS

ITEM	FUSE UNID	FUSE REQUIRED	ATT.	SAFETY CLASS 1E	SAFETY CLASS NON-1E	SAFETY CLASS 1E-EQ	APPLICATION PERM.	APPLICATION APP'R	NOTE 1	NOTE 2	NOTE 3	NOTE 4	NOTE 5
170	3-FU 2 - 70 - 45A	A4J3	1.0	X					X			X	
171	3-FU 2 - 75 - 51A	A4J3	1.0	X					X			X	
172	3-FU 2 - 75 - 53A	A4J3	1.0	X					X			X	
173	3-FU 2 - 31 - 139A	A4J3	1.0	X					X			X	
174	3-FU 2 - 69 - 12A	A4J3	1.0	X					X			X	
175	3-FU 2 - 74 - 99A	A4J3	1.0	X					X			X	
176	3-FU 2 - 77 - 148A	A4J3	1.0	X					X			X	
177	3-FU 2 - 77 - 178A	A4J3	1.0	X					X			X	
178	3-FU 2 - 74 - 74A	A4J3	1.0	X					X			X	
179	3-FU 2 - 47 - 41AA	A4J3	1.0	X					X			X	
180	3-FU 2 - 47 - 41BA	A4J3	1.0	X					X			X	
181	3-FU 2 - 74 - 100A	A4J3	1.0	X					X			X	
182	3-FU 2 - 74 - 97A	A4J3	1.0	X					X			X	
183	3-FU 2 - 74 - 101A	A4J3	1.0	X					X			X	
184	3-FU 2 - 77 - 148B	TR3.5R	2.0	X						X		X	
185	3-FU 2 - 77 - 178B	TR3.5R	2.0	X						X		X	
186	3-FU 2 - 74 - 66B	TR3R	2.0	X						X		X	
187	3-FU 2 - 31 - 198ZB	TR1.8R	2.0	X						X		X	
188	3-FU 2 - 31 - 200ZB	TR1.8R	2.0	X						X		X	
189	3-FU 2 - 31 - 200ZB	TR1.8R	2.0	X						X		X	
190	3-FU 2 - 32 - 67B	TR1.8R	2.0	X						X		X	

TABLE C

NOTE #1: ACCEPTABLE FUSE SIZE

NOTE #2: REPLACEMENT FUSE

NOTE #3: UNID TO BE DELETED

NOTE #4: CLASS 1E FUSE IS REQ'D

NOTE #5: CLASS 1E-EQ FUSE IS REQ'D (10CFR 50.49)

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EBASCO SERVICES INCORPORATED

BY SB 8/13/88 [ED-9026B-88463] SHEET 109 OF 133

CHK'D. BY CCO DATE 8-13-88 OFS NO. DEPT. NO.

CLIENT TVA

PROJECT BFNP UNITS 1,2,3

SUBJECT FUSE PROGRAM (480V REACTOR MOV BOARDS 3A/B)

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64 CONCLUSIONS AND RECOMMENDATIONS

ITEM	FUSE UNID	REQUIRED	ATT.	SAFETY CLASS 1E	SAFETY CLASS NON-1E	SAFETY CLASS 1E-EQ	APPLICATION PENT.	APPLICATION APP'R	NOTE 1	NOTE 2	NOTE 3	NOTE 4	NOTE 5
191	3-FU 2 - 75 - 76B	TR 1.8R	2.0	X	-	-	-	-	-	X	-	X	-
192	3-FU 2 - 31 - 1993B	TR 1.8R	2.0	X	-	-	-	-	-	X	-	X	-
193	3-FU 2 - 47 - 41AB	TR 3.5R	2.0	X	-	-	-	-	-	X	-	X	-
194	3-FU 2 - 77 - 18B	TR 3.5R	2.0	X	-	-	-	-	-	X	-	X	-
195	3-FU 2 - 75 - 50B	TR .8	2.0	X	-	-	-	-	X	-	-	X	-
196	3-FU 2 - 75 - 39B	TR .8	2.0	X	-	-	-	-	X	-	-	X	-
197	3-FU 2 - 75 - 30B	TR .8	2.0	X	-	-	-	-	X	-	-	X	-
198	3-FU 2 - 75 - 37B	TR .8	2.0	X	-	-	-	-	X	-	-	X	-
199	3-FU 2 - 74 - 24B	TR .8	2.0	X	-	-	-	-	X	-	-	X	-
200	3-FU 2 - 74 - 35B	TR .8	2.0	X	-	-	-	-	X	-	-	X	-
201	3-FU 2 - 74 - 63B	TR .8	2.0	X	-	-	-	-	X	-	-	X	-
202	3-FU 2 - 64 - 69B	TR .8	2.0	X	-	-	-	-	X	-	-	X	-
203	3-FU 2 - 23 - 46B	TR .8	2.0	X	-	-	-	-	X	-	-	X	-
204	3-FU 2 - 75 - 73B	TR .8	2.0	X	-	-	-	-	X	-	-	X	-
205	3-FU 2 - 23 - 52B	TR .8	2.0	X	-	-	-	-	X	-	-	X	-
206	3-FU 2 - 78 - 63B	TR .8	2.0	X	-	-	-	-	X	-	-	X	-
207	3-FU 2 - 78 - 66B	TR .8	2.0	X	-	-	-	-	X	-	-	X	-
208	3-FU 2 - 78 - 68B	TR .8	2.0	X	-	-	-	-	X	-	-	X	-
209	3-FU 2 - 74 - 75B	TR .8	2.0	X	-	-	-	-	X	-	-	X	-
210	3-FU 2 - 32 - 67B	TR .8	2.0	X	-	-	-	-	X	-	-	X	-
211	3-FU 2 - 69 - 60B	TR .8	2.0	X	-	-	-	-	X	-	-	X	-

NOTE #1: ACCEPTABLE FUSE SIZE

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C.4 CONCLUSIONS AND RECOMMENDATIONS

ITEM	FUSE UNID	REQUIRED	ATT.	SAFETY CLASS 1E	SAFETY CLASS NON-1E	SAFETY CLASS 1E-EQ	APPLICATION PERM.	APPLICATION APPR	NOTE 1	NOTE 2	NOTE 3	NOTE 4	NOTE 5
212	3-FU 2 - 74 - 72B	TR .8	2.0	X					X	-	-	X	-
213	3-FU 2 - 74 - 106B	TR .8	2.0	X					X	-	-	X	-
214	3-FU 2 - 64 - 71B	TR .8	2.0	X					X	-	-	X	-
215	3-FU 2 - 73 - 64B	TR .8	2.0	X				X	X	-	-	X	-
216	3-FU 2 - 78 - 61B	TR .8	2.0	X					X	-	-	X	-
217	3-FU 2 - 74 - 71B	TR .8	2.0	X					X	-	-	X	-
218	3-FU 2 - 75 - 51B	TR .8	2.0	X					X	-	-	X	-
219	3-FU 2 - 75 - 53B	TR .8	2.0	X					X	-	-	X	-
220	3-FU 2 - 31 - 139B	TR .8	2.0	X					X	-	-	X	-
221	3-FU 2 - 69 - 12B	TR .8	2.0	X					X	-	-	X	-
222	3-FU 2 - 74 - 99B	TR .8	2.0	X					X	-	-	X	-
223	3-FU 2 - 74 - 74B	TR .8	2.0	X					X	-	-	X	-
224	3-FU 2 - 70 - 40B	TR 3.5R	2.0	X			X		-	X	-	X	-
225	3-FU 2 - 70 - 45B	TR 3.5R	2.0	X			X		-	X	-	X	-
226	3-FU 2 - 71 - 2B	TR .8	2.0	X					X	-	-	X	-
227	3-FU 2 - 70 - 48B	TR .8	2.0	X					X	-	-	X	-
228	3-FU 2 - 80 - 57B	TR .8	2.0	X					X	-	-	X	-
229	3-FU 2 - 70 - 47B	TR .8	2.0	X					X	-	-	X	-
230	3-FU 2 - 74 - 25B	TR .8	2.0	X					X	-	-	X	-
231	3-FU 2 - 74 - 36B	TR .8	2.0	X					X	-	-	X	-
232	3-FU 2 - 74 - 40B	TR .8	2.0	X					X	-	-	X	-

NOTE #1: ACCEPTABLE FUSE SIZE
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6.4 CONCLUSIONS AND RECOMMENDATIONS

ITEM	FUSE UNID	REQUIRED	ATT.	SAFETY CLASS 1E	SAFETY CLASS NON-1E	SAFETY CLASS 1E-EQ	APPLICATION PENT.	APPLICATION APP'R	NOTE 1	NOTE 2	NOTE 3	NOTE 4	NOTE 5
233	3-FU 2 - 74 - 100B	TR .8	2.0	X	-	-	-	-	X	-	-	X	-
234	3-FU 2 - 74 - 97B	TR .8	2.0	X	-	-	-	-	X	-	-	X	-
235	3-FU 2 - 74 - 101B	TR .8	2.0	X	-	-	-	-	X	-	-	X	-
236	3-FU 2 - 70 - 40C	TR 3.5R	2.0	X	-	-	X	-	-	X	-	X	-
237	3-FU 2 - 70 - 45C	TR 3.5R	2.0	X	-	-	-	-	-	X	-	X	-
238	3-FU 2 - 70 - 47C	TR .8	2.0	X	-	-	-	-	X	-	-	X	-
239	3-FU 2 - 74 - 25C	TR .8	2.0	X	-	-	-	-	X	-	-	X	-
240	3-FU 2 - 74 - 46C	TR .8	2.0	X	-	-	-	-	X	-	-	X	-
241	3-FU 2 - 74 - 100C	TR .8	2.0	X	-	-	-	-	X	-	-	X	-
242	3-FU 2 - 74 - 97C	TR .8	2.0	X	-	-	-	-	X	-	-	X	-
243	3-FU 2 - 74 - 101C	TR .8	2.0	X	-	-	-	-	X	-	-	X	-
244	3-FU 2 - 76 - 59D	TR 18R	2.0	X	-	-	-	-	-	X	-	X	-
245	3-FU 2 - 268 - 38A	JHC15	4.0	X	-	-	-	-	X	-	-	X	-
246	3-FU 2 - 74 - 64E	AJT3	5.0	X	-	-	-	-	-	X	-	X	-
247	3-FU 2 - 31 - 112A	NONE	-	-	-	-	-	-	-	-	X	-	-
248	3-FU 2 - 31 - 112B	NONE	-	-	-	-	-	-	-	-	X	-	-
249	3-FU 2 - 268 - 38F	JHC15	4.0	X	-	-	-	-	X	-	-	X	-
250	3-FU 2 - 268 - 38Q	NONE	-	-	-	-	-	-	-	-	X	-	-
251	3-FU 2 - 71 - 2C	TR .8	2.0	X	-	-	X	-	X	-	-	X	-
252	3-FU 2 - 70 - 42C	TR .8	2.0	X	-	-	-	-	X	-	-	X	-
253	3-FU 2 - 23 - 57C	TR .8	2.0	X	-	-	-	-	X	-	-	X	-

NOTE #1: ACCEPTABLE FUSE SIZE
NOTE #2: REPLACEMENT FUSE
NOTE #3: UNID TO BE DELETED

TABLE C

NOTE #4: CLASS 1E FUSE IS REQ'D
NOTE #5: CLASS 1E-EQ FUSE IS REQ'D (10CFR 50.49)

581 9-87

EBASCO SERVICES INCORPORATED

[ED-80268-88463]

BY BS 8/12/88

CHKD. BY CCO DATE 8-13-88

SHEET 112 OF 133

CLIENT TVA

OFS NO. DEPT. NO.

PROJECT BFNP UNITS 1,2,3

SUBJECT FUSE PROGRAM [480V. REACTOR MOV BOARDS 3A/B]

64 CONCLUSIONS AND RECOMMENDATIONS

ITEM	FUSE UNID	FUSE REQUIRED	ATT.	SAFETY CLASS 1E	SAFETY CLASS NON-1E	SAFETY CLASS 1E-EQ	APPLICATION PERM.	APPLICATION APPR	NOTE 1	NOTE 2	NOTE 3	NOTE 4	NOTE 5
254	3-FU 2-268-38D	A4U15	3.0	X			T	T	X	-	-	X	-
255	3-FU 2-268-38H	A4U15	3.0	X			T	T	X	-	-	X	-
256	3-FU 2-268-38E	AJT15	5.0	X			T	T	-	X	-	X	-
257	3-FU 2-268-38J	AJT15	5.0	X			T	T	-	X	-	X	-
258	3-FU 2-268-38B	A4U10	1.0	X			T	T	X	-	-	X	-
259	3-FU 2-268-38C	AJT12	7.0	X			T	T	-	X	-	X	-
260	3-FU 2-63-58B	TR5,6	2.0	X			T	T	X	-	-	X	-
261	3-FU 2-63-6BC	TR5,6	2.0	X			T	T	X	-	-	X	-
262	3-FU 2-32-69B	TR9R	2.0	X			T	T	-	X	-	X	-
263	3-FU 2-268-38K	AJT3	5.0	X			T	T	-	X	-	X	-
264	3-FU 2-268-38G	A4U10	1.0	X			T	T	X	-	-	X	-
265	3-FU2-77-88B	TR.8	2.0	X			T	T	X	-	-	X	-
266	3-FU2-67-26B	TR.8	2.0	X			T	T	X	-	-	X	-
267	3-FU2-73-81A	A4U3	1.0	X			T	T	X	-	-	X	-
268	3-FU2-73-81B	TR.8	2.0	X			T	T	X	-	-	X	-
269	3-FU2-74-36C	TR.8	2.0	X			T	T	X	-	-	X	-
270	SPARE [2 FUSE BLOCK]	NONE		-	-	-	-	-	-	-	-	-	-
271				-	-	-	-	-	-	-	-	-	-
272				-	-	-	-	-	-	-	-	-	-
273				-	-	-	-	-	-	-	-	-	-
274				-	-	-	-	-	-	-	-	-	-

TABLE C

NOTE #1: ACCEPTABLE FUSE SIZE

NOTE #2: REPLACEMENT FUSE

NOTE #3: UNID TO BE DELETED

NOTE #4: CLASS 1E FUSE IS REQ'D

NOTE #5: CLASS 1E-EQ FUSE IS REQ'D (10CFR 50.49)

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EBASCO SERVICES INCORPORATED

[ED-QO268-88463]

BY DB: 8/12/88

CHK'D. BY CCO DATE 8-13-88

SHEET 113 OF 133

OFS NO. _____ DEPT. NO. _____

CLIENT TVA

PROJECT BFNP UNITS 1,2,3

SUBJECT FUSE PROGRAM (480V. REACTOR MOV BOARDS 3A/B)

64 CONCLUSIONS AND RECOMMENDATIONS

ITEM	FUSE UNID	FUSE REQUIRED	ATT.	SAFETY CLASS 1E	SAFETY CLASS NON-1E	SAFETY CLASS 1E-EQ	APPLICATION PEN.	APPLICATION APPR.	NOTE 1	NOTE 2	NOTE 3	NOTE 4	NOTE 5
275	SPARE(2 FUSE BLOCK)	NONE											
276													
277													
278													
279													
280													
281													
282													
283													
284													
285													
286													
287													
288													
289													
290													
291													
292													
293													
294													
295													

TABLE C

NOTE #1: ACCEPTABLE FUSE SIZE

NOTE #2: REPLACEMENT FUSE

NOTE #3: UNID TO BE DELETED

NOTE #4: CLASS 1E FUSE IS REQ'D

NOTE #5: CLASS 1E-EQ FUSE IS REQ'D (10CFR 50.49)

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EBASCO SERVICES INCORPORATED

[ED-Q0266-88463]

BY: ØB: 8/13/88

CHKD. BY: Clo DATE: 8-13-88

SHEET 114 OF 133

OFS NO.: DEPT. NO.:

CLIENT: TVA

PROJECT: BFNP UNITS 1,2,3

SUBJECT: FUSE PROGRAM [480V. REACTOR MOV BOARDS 3A/B]

64 CONCLUSIONS AND RECOMMENDATIONS

ITEM	FUSE		ATT.	SAFETY CLASS			APPLICATION		NOTE				
	UNID	REQUIRED		1E	NON-1E	1E-EQ	PENT.	APP'R	1	2	3	4	5
296	SPARE [2 FUSE BLOCK]	NONE	—	—	—	—	—	—	—	—	—	—	—
297	3-FU2-31-122A	AJT1	5.0	X	—	—	—	—	—	X	—	X	—
298	3-FU2-31-123A	TR.8	2.0	X	—	—	—	—	X	—	—	X	—
	NOT USED			—	—	—	—	—	—	—	—	—	—

TABLE C

NOTE #1: ACCEPTABLE FUSE SIZE

NOTE #2: REPLACEMENT FUSE

NOTE #3: UNID TO BE DELETED

NOTE #4: CLASS 1E FUSE IS REQ'D

NOTE #5: CLASS 1E-EQ FUSE IS REQ'D (10CFR 50.49)

EBASCO SERVICES INCORPORATED

[ED-Q0268-88A63]

BY DB 8/19/88

CHKD. BY CCO DATE 8-13-88

7.0 ATTACHMENT No. 1.0

SHEET 115 OF 133

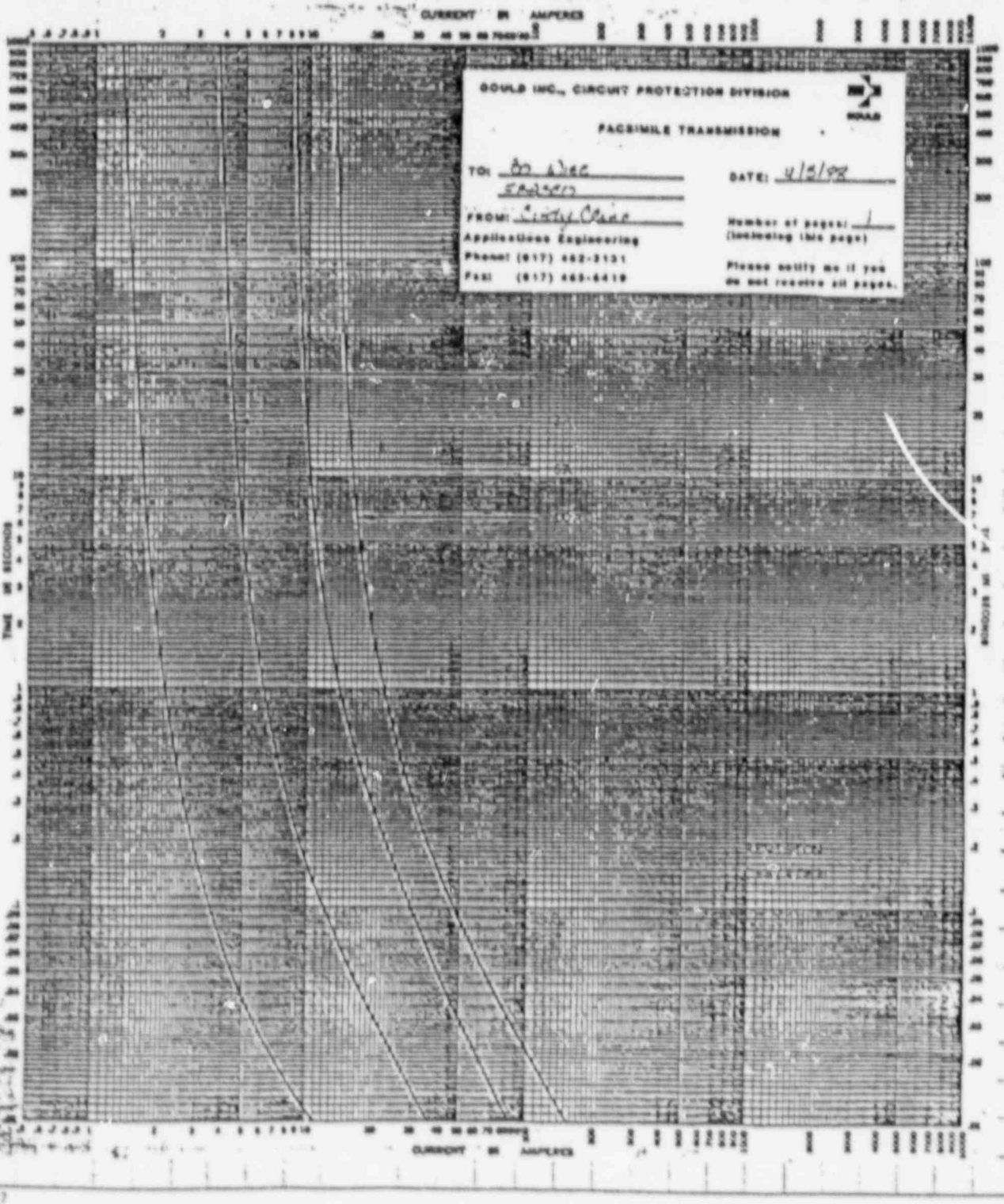
OFS NO. DEPT. NO.

CLIENT TVA

PROJECT BFNP UNITS 1,2,3

SUBJECT FUSE PROGRAM (ABOV. REACTOR MOV BOARDS 3A/B)

CLASS 'J' TRAP FUSE
MELTING TIME - CURRENT DATA
1-10 AMPS. 600 VOLT
CAT. NO. A4J(AMP. RATING)
GOULD INC., CIRCUIT PROTECTION DIV.
NEWBURYPORT, MA 01950



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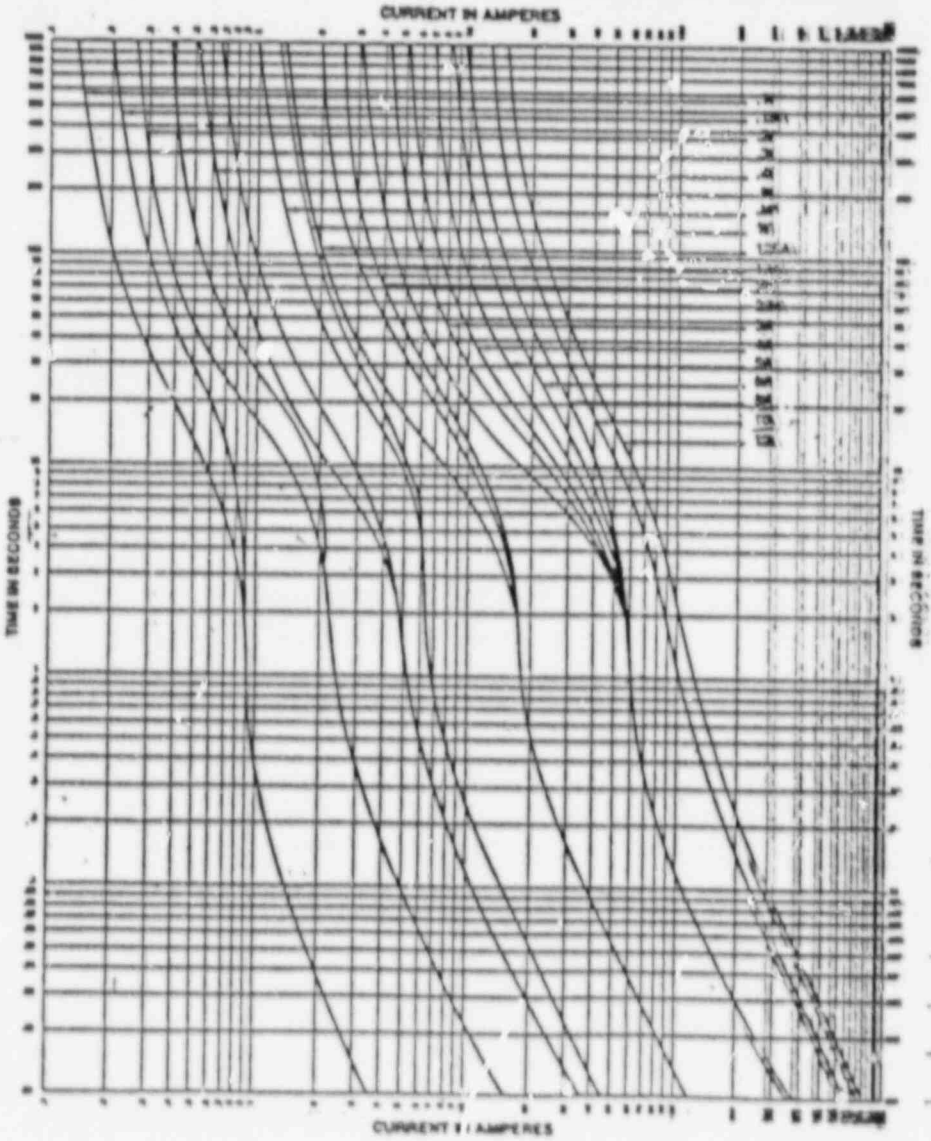
[REF. 5.20]

Tri-onic®–Class RK5
Time Delay Fuses

TR

Melting Time—Current Data
0.1-12 Amperes, 250 Volts AC

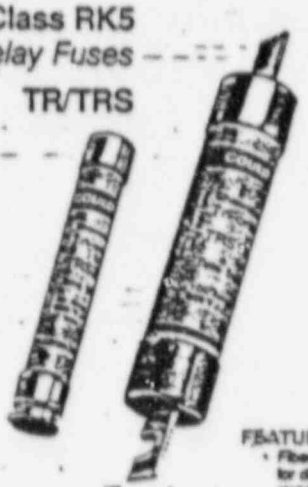


GOULD SHAWMUT

Tri-onic®–Class RK5

Time Delay Fuses

TR/TRS



Most popular fuse for motor branch circuits. Also suitable for general purpose protection of transformers, service entrance equipment, feeder circuits and branch circuits. The time delay characteristic of the Tri-onic fuse allows it to ignore normal surge conditions without compromising overcurrent protection.

This is a rejection fuse. Replacement of this fuse with a fuse of a lower voltage or lower interrupting rating is not possible provided the fuse is used with rejection fuse blocks such as those listed on page 18.

The fiberglass body and plated contacts provide superior reliability in adverse industrial environments.

UL Class RK5
Time Delay
Current Limiting
200KA I.R.
250 and 600 Volts AC
1/10 to 600 Amperes
UL Listed
CSA Certified
MSHA Certified
DC Ratings

FEATURES
- Fiberglass body for dimensional stability
- Plated contact surfaces for contact reliability
- Imprint labeling for permanent identification

Standard Fuse Ampere Ratings, Catalog Numbers

AMPERE RATING	CATALOG NUMBER 250V	CATALOG NUMBER 600V	AMPERE RATING	CATALOG NUMBER 250V	CATALOG NUMBER 600V	AMPERE RATING	CATALOG NUMBER 250V	CATALOG NUMBER 600V	AMPERE RATING	CATALOG NUMBER 250V	CATALOG NUMBER 600V
1/10	TR1/10R	TRS1/10R	2 1/4	TR2 1/4R	TRS2 1/4R	10	TR10R	TRS10R	90	TR90R	TRS90R
15/100	TR15/100R	TRS15/100R	2 1/2	TR2 1/2R	TRS2 1/2R	12	TR12R	TRS12R	100	TR100R	TRS100R
2/10	TR2/10R	TRS2/10R	2 9/10	TR2 9/10R	TRS2 9/10R	15	TR15R	TRS15R	110	TR110R	TRS110R
3/10	TR3/10R	TRS3/10R	3	TR3R	TRS3R	17 1/2	TR17 1/2R	TRS17 1/2R	125	TR125R	TRS125R
4/10	TR4/10R	TRS4/10R	3 4/10	TR3 4/10R	TRS3 4/10R	20	TR20R	TRS20R	150	TR150R	TRS150R
1/2	TR1/2R	TRS1/2R	3 1/2	TR3 1/2R	TRS3 1/2R	25	TR25R	TRS25R	175	TR175R	TRS175R
6/10	TR6/10R	TRS6/10R	4	TR4R	TRS4R	30	TR30R	TRS30R	200	TR200R	TRS200R
7/10	TR7/10R	TRS7/10R	4 1/2	TR4 1/2R	TRS4 1/2R	35	TR35R	TRS35R	225	TR225R	TRS225R
1	TR1R	TRS1R	5	TR5R	TRS5R	40	TR40R	TRS40R	250	TR250R	TRS250R
1 1/8	TR1 1/8R	TRS1 1/8R	5 4/10	TR5 4/10R	TRS5 4/10R	45	TR45R	TRS45R	300	TR300R	TRS300R
1 1/4	TR1 1/4R	TRS1 1/4R	6	TR6R	TRS6R	50	TR50R	TRS50R	350	TR350R	TRS350R
1 4/10	TR1 4/10R	TRS1 4/10	6 1/4	TR6 1/4R	TRS6 1/4R	60	TR60R	TRS60R	400	TR400R	TRS400R
1 6/10	TR1 6/10R	TRS1 6/10R	7	TR7R	TRS7R	70	TR70R	TRS70R	450	TR450R	TRS450R
1 7/10	TR1 7/10R	TRS1 7/10R	8	TR8R	TRS8R	75	TR75R	TRS75R	500	TR500R	TRS500R
2	TR2R	TRS2R	9	TR9R	TRS9R	80	TR80R	TRS80R	600	TR600R	TRS600R

EBASCO SERVICES INCORPORATED

BY DB: 8/13/88 (ED-Q0268-8846J)

CHK'D. BY CCO DATE 8-13-88 - 7.0 ATTACHMENT No. 3.0

SHEET 118 OF 133

OFS NO. DEPT. 503

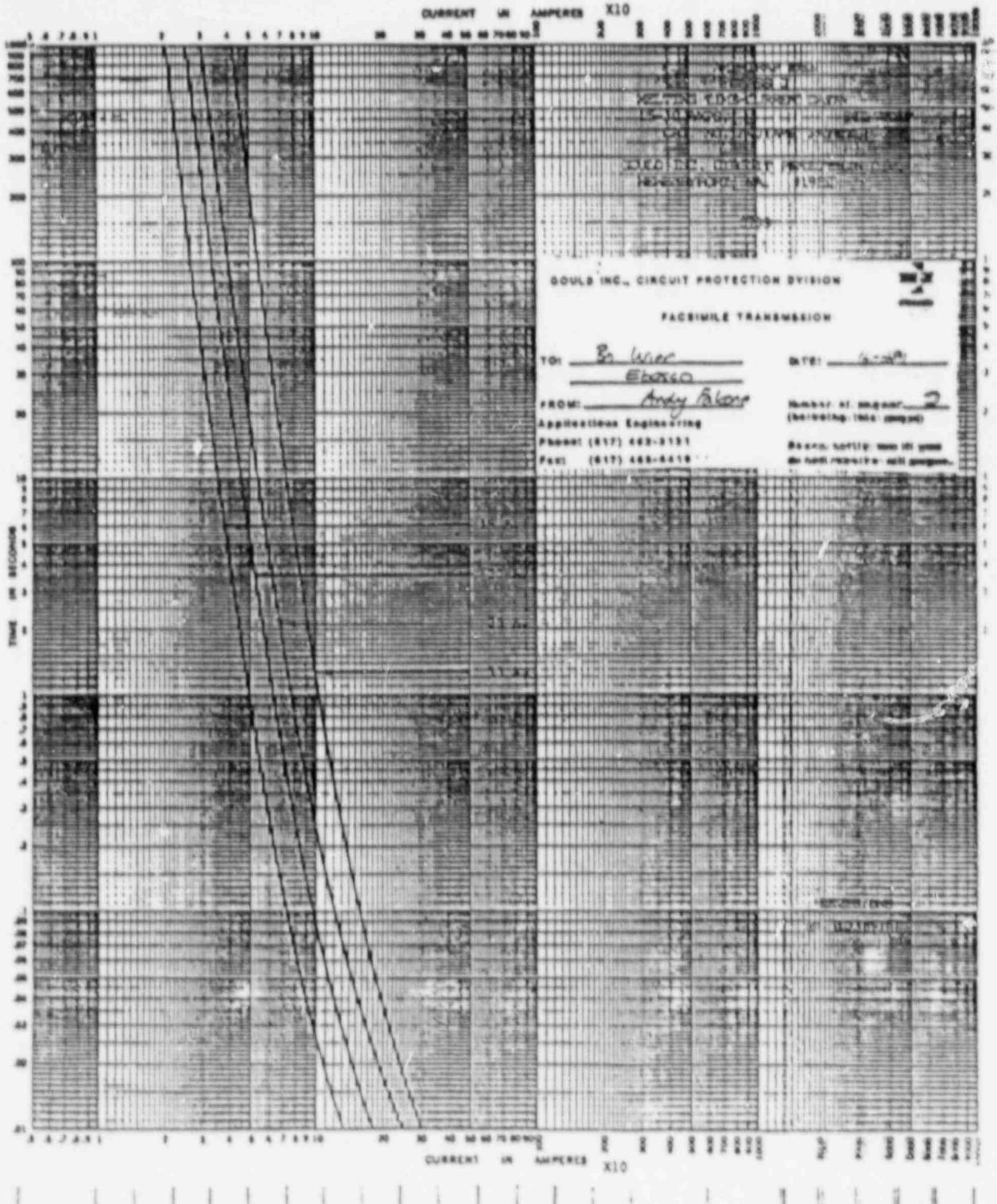
CLIENT TVA

PROJECT BFNP UNITS 1,2,3

SUBJECT FUSE PROGRAM (ABOV. REACTOR MOV BOARDS 3A/B)

SUBJECT FUSE PROGRAM (ABOV. REACTOR MOV BOARDS 1/B)

06. 29. 88 01:28 PM *GOULD CPD SLS. -MKTG P02



SRI 9-87

Section 1-12
Power Distribution Fuses—600 Volts (or less)

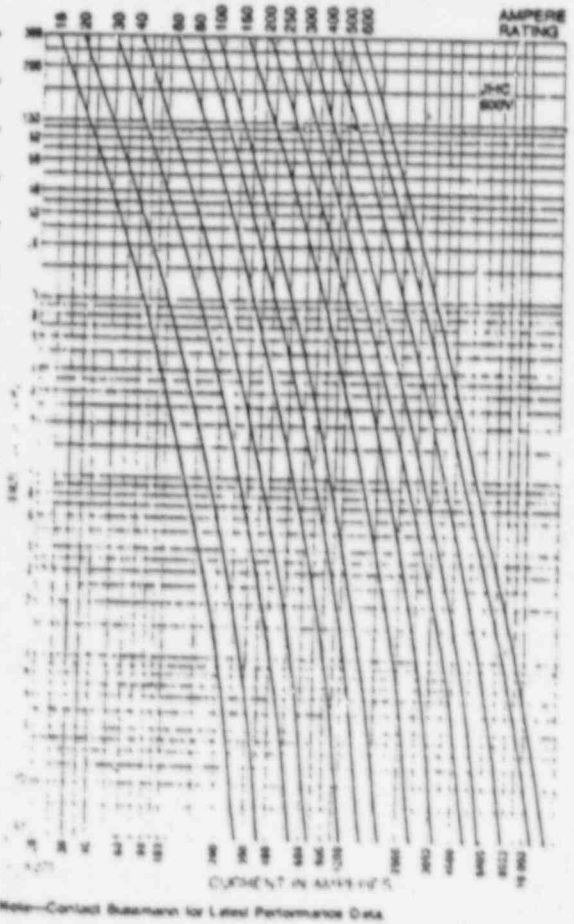
HI-CAP Time-Delay—JHC

Ampere Ratings—JHC HI-CAP Fuses (600 Volts AC)†

Catalog Number	Ctn. Qty.	Weight* Lbs.	Weight* Kg	Catalog Number	Ctn. Qty.	Weight* Lbs.	Weight* Kg
JHC-1	10	1.09	0.494	JHC-90	1	0.42	0.190
JHC-3				JHC-100			
JHC-6				JHC-110	1	0.91	0.412
JHC-10				JHC-125			
JHC-15				JHC-150			
JHC-20				JHC-175			
JHC-25				JHC-200			
JHC-30				JHC-225	1	2.36	1.070
JHC-35	10	2.05	0.929	JHC-250			
JHC-40				JHC-300			
JHC-45				JHC-350			
JHC-50				JHC-400			
JHC-60				JHC-450	1	3.76	1.705
JHC-70	1	0.42	0.190	JHC-500			
JHC-80				JHC-600			

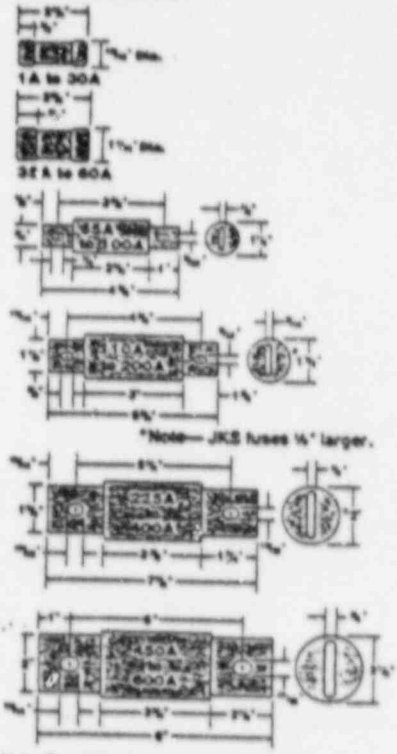
*Weight per carton
†Contact Bussmann for DC ratings.

Time-Current Characteristic Curves—Average Melt



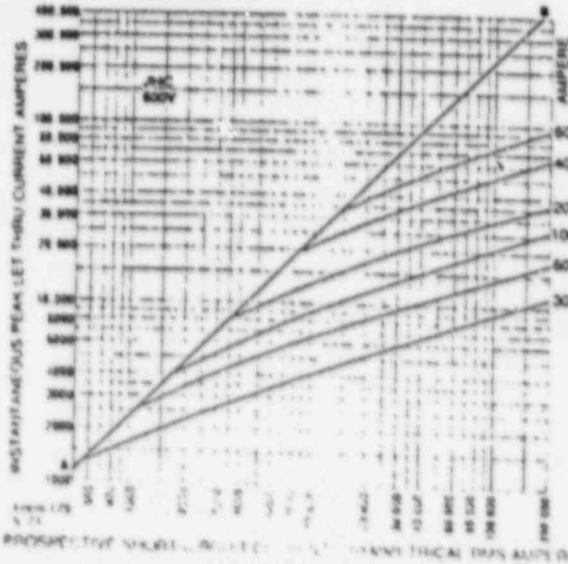
Note—Contact Bussmann for Latest Performance Data.

Dimensional Data



Note: For metric dimensions see Section 1-2.

Current Limitation Curves



581 9-87

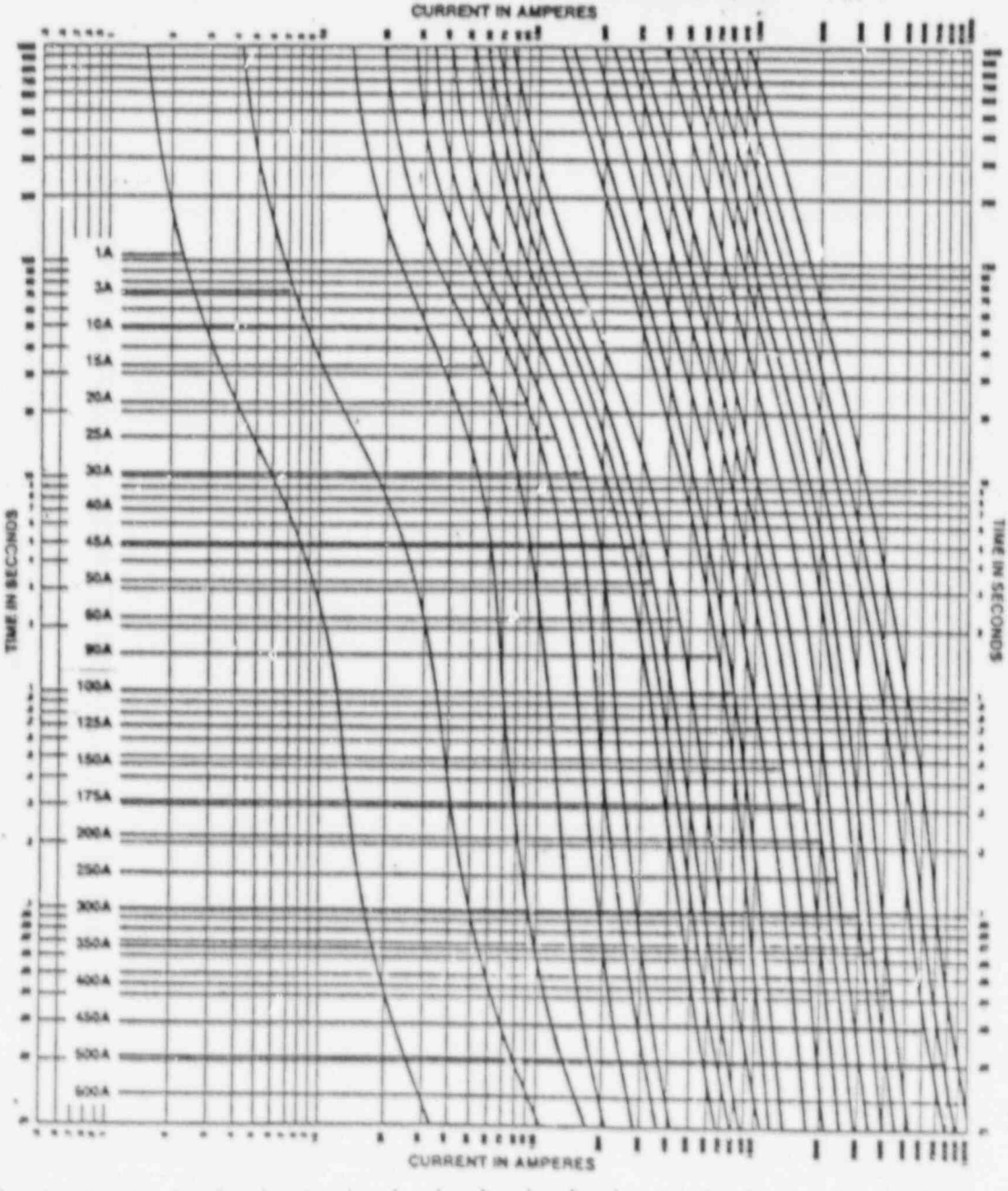
Amp-trap®–Class J

Time Delay Fuses

AJT

Gould Inc., Circuit Protection Division
374 Merrimac Street, Newburyport, MA 01950
Tel: (617) 462-6662 until July, 1988
(508) 462-6662 after July, 1988
International Telex: 215838

Melting Time—Current Data
1-600 Amperes, 600 Volts AC



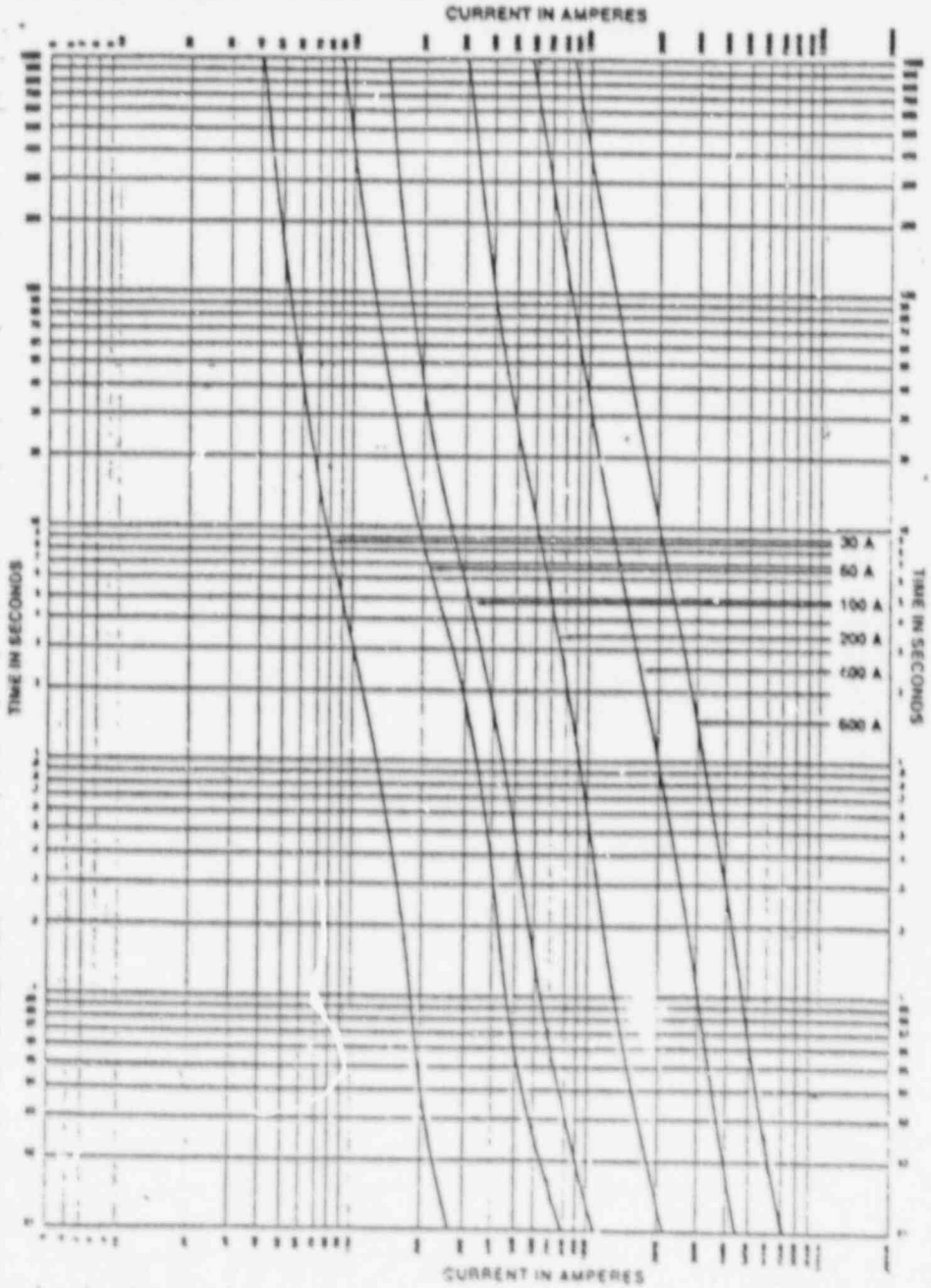
SUBJECT FUSE PROGRAM [480V. REACTOR MOV BOARDS 3A/B]

Amp-trap®–Class J

Fast Acting Fuses

A4J

Melting Time—Current Data
30-600 Amperes, 600 Volts AC



581 9-87

BY DB: 8/13/88 | 7.0 ATTACHMENT No. 7.0 | SHEET 122 OF 133

CHKD. BY CCO Date 8-13-88 | OFS NO. | DEPT. NO.

CLIENT TVA

PROJECT BFNP UNITS 1,2,3

SUBJECT FUSE PROGRAM [480V. REACTOR MOV BOARDS 3A/B]

SUBJECT FUSE PROGRAM [480V. REACTOR MOV BOARDS 1A/B]

CLASS J TIME-DELAY
MELTING TIME-CURRENT DATA
0-30 AMP. 600 VOLT
CAT. NO. AJT(AMP. RATING)
GOULD, INC. CIRCUIT PROTECTION DIV.
NEWBURYPORT, MA 01950

284211

CURRENT IN AMPERES X10

TIME IN SECONDS

CURRENT IN AMPERES X10

581 9-87

INSTRUCTIONS

GEI-68720C
Supersedes GEI-[illegible]B

MULTI-CONTACT AUXILIARY RELAYS

Type HFA54

EXTRACTED FROM GEI-68720C

TABLE IX

	DC COILS					
	RESET COIL VOLTS	OPERATING COIL VOLTS	RESISTANCE OF RESET COIL OHMS*	RESISTANCE OF OPER. COIL OHMS *	EXTERNAL RESISTOR OHMS *	EXTERNAL CAPACITOR μf *
1	125	125	188	2000	100	5
2	48	48	26	334	50	15
3	250	250	740	8000	200	5

* Resistance and capacitance values are nominal-variation is ± 10%

POWER SYSTEMS MANAGEMENT DEPARTMENT

GENERAL ELECTRIC

PHILADELPHIA, PA.

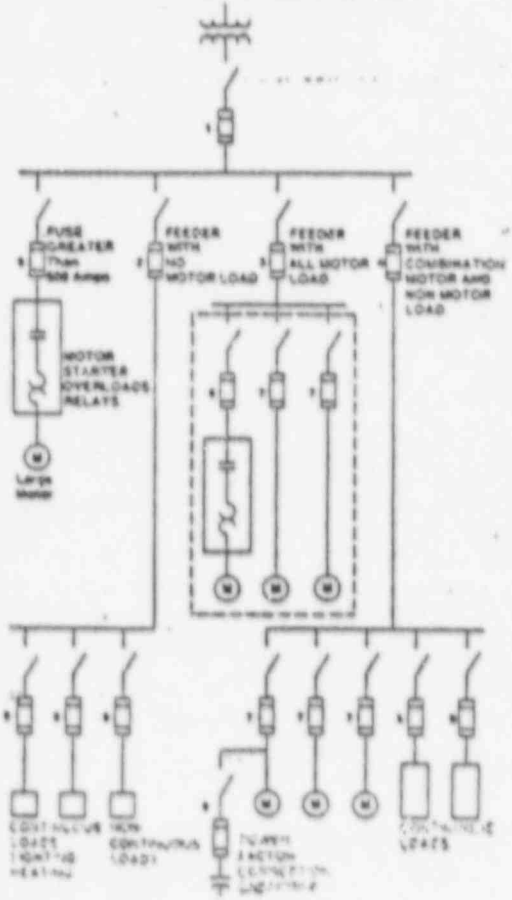
581 9-87

Section 3—Main, Feeder, Branch Circuit Protection

3.1 Guide For Sizing Fuses

General guidelines are given for selecting fuse ampere ratings for most circuits. Some specific applications may warrant other fuse sizing; in these cases, the load characteristics and appropriate N.E.C. sections should be considered. The selections shown here are not, in all cases, the minimum or maximum ampere ratings permitted by the N.E.C. Demand factors as permitted per the N.E.C. are not included in these guidelines.

Fuse Recommendations
601 to 6000A Hi-CAP Time-Delay Fuse KRP-C
1A to 600A LOW-PEAK Fuses LPN-RK (250V); LPS-RK (600V)
or
FUSETRON Fuses FRN-R (250V); FRS-R (600V)



Dual-Element Time-Delay Fuses (LOW-PEAK® or FUSETRON®)

1 Main Service. Size fuse according to method in 4.

2 Feeder Circuit With No Motor Loads. Fuse size must be at least 125% of continuous load† plus 100% of the non-continuous load. Do not size larger than ampacity of conductor*.

3 Feeder Circuit With All Motor Loads. Size fuse at 150% or full load current of largest motor plus full-load current of all other motors.

4 Feeder Circuit With Mixed Loads. Size fuse at sum of
a. 150% of full-load current of largest motor plus,
b. 100% of full-load current of all other motors plus
c. 125% of continuous, non-motor load† plus
d. 100% of non-continuous, non-motor load.

5 Branch Circuit With No Motor Loads. Fuse size must be at least 125% of continuous load† plus 100% of non-continuous load. Do not size larger than ampacity of conductor*.

6 Motor Branch Circuit With Overload Relays. Where overload relays are sized for motor running overload protection, the following provide backup, ground fault, and short-circuit protection:
a. Motor 1.15 service factor or 40°C rise: size fuse at 125% of motor full-load current or next higher standard size.
b. Motor less than 1.15 service factor or over 40°C rise: size fuse at 115% of motor full-load current or next higher standard size.

7 Motor Branch Circuit With Fuse Protection Only. Where the fuse is the only motor protection, the following fuses provide motor running overload protection and short-circuit protection:
a. Motor 1.15 service factor or 40°C rise: size fuse at 110% to 125% of the motor full load current.
b. Motor less than 1.15 service factor or over 40°C rise: size fuse at 100% to 115% of motor full load current.

8 Large Motor Branch Circuit —Fuse larger than 600 amps. For large motors, size KRP-C Hi-CAP time-delay Fuse at 150% to 225% of the motor full load current, depending on the starting method; i.e. part-winding starting, reduced voltage starting, etc.

9 Power Factor Correction Capacitors —Size Dual Element fuses as low as practicable, typically 150% to 175% of capacitor rated current.

Non-Time-Delay Fuses (LIMITRON® and T-TRON® fuses, typically)

1 Main service. Size fuse according to method in 4.

2 Feeder Circuit With No Motor Loads. Fuse size must be at least 125% of the continuous load† plus 100% of non-continuous load. Do not size larger than ampacity of wire.

3 Feeder Circuit With All Motor Loads. Size fuse at 300% of full-load current of largest motor plus full-load current of all other motors.

4 Feeder Circuit With Mixed Loads. Size fuse at sum of:
a. 300% of full-load current of the largest motor plus
b. 100% of full-load current of all other motors plus
c. 125% of continuous, non-motor load† plus
d. 100% of non-continuous, non-motor load.

5 Branch Circuit With No Motor Loads. Fuse size must be at least 125% of the continuous load† plus 100% of the non-continuous load. Do not size larger than the ampacity of conductor.*

6 Motor Branch Circuit With Overload Relays. Size the fuse as close to but not exceeding 300% of the motor running full load current. Provides ground fault and short-circuit protection only.

7 Motor Branch Circuit With Fuse Protection Only. Non-time-delay fuses cannot be sized close enough to provide motor running overload protection. If sized for motor overload protection, non-time-delay fuses would open due to motor starting current. Use dual-element fuses.

Conductor Ampacity Selection

1 Feeder Circuit And Main Circuit With Mixed Loads. Conductor ampacity at least sum of:
a. 125% of continuous non-motor load†
b. 100% of non-continuous non-motor load
c. 125% of the largest motor full load current
d. 100% of all other motors' full load current.

2 Feeder Circuit With No Motor Load. Conductor ampacity at least 125% of the continuous load† plus 100% of the non-continuous load.

3 Feeder Circuit With All Motor Loads. Conductor ampacity at least 125% of the largest motor full load amperes plus 100% of all other motors' full load amperes.

4 Feeder Circuit With Mixed Loads. Size according to Method 1 above.

5 Branch Circuit With No Motor Load. Conductor ampacity at least 125% of the continuous load† plus 100% of the non-continuous load.

6, 7, & 8 Motor Branch Circuits. Conductor ampacity at least 125% of the motor full load current.

9 Conductor ampacity at least 135% of capacitor rated current. The ampacity of conductors for a capacitor connected to a motor circuit may be the ampacity of the motor circuit conductors.

† 100% of the continuous load can be used rather than 125% when the switch and fuse are listed for continuous operation at 100% of rating. Most building electrical switches and high amperage contact switches 400A to 6000A with Class L fuses are listed for 100% continuous operation.

*Where a conductor ampacity does not correspond to a standard fuse rating, next higher rating fuse is permitted when 800 amps or less (240.3 Exc. 1).

See Mark motor feeder applications dual element fuses can be sized at ampacity of motor conductors.

Allowable short-circuit current and the circuit-opening time of the overcurrent device must be correlated so that the conductor I²t (I²t or 12t) withstand rating is not exceeded.

SUBJECT FUSE PROGRAM [ABOV. REACTOR MOV BOARDS 3A/B]

QA

B22 871201 304

TENNESSEE VALLEY AUTHORITY

Browns Ferry Nuclear Plant
P. O. Box 2000, Decatur, Alabama 35602

DEC 01 1987

Ebasco Services Incorporated
P. O. Box 408
Tanner, Alabama 35671

Attention: Susan Gros, Document Control Supervisor

Dear Ms. Gros:

BROWNS FERRY NUCLEAR PLANT - BROWNS FERRY ENGINEERING PROJECT - DOCUMENT TRANSMITTAL

Per your request, Engineering Records Control Unit is transmitting documents for Task Scoping Document E101 shown on the enclosed list. Please acknowledge receipt of documents by signing below and returning this form within ten working days.

Very truly yours,

TENNESSEE VALLEY AUTHORITY

Susan A Burt

S. A. Burt, Engineering Records Control Unit Supervisor
Division of Nuclear Engineering

E01 0 07

THIS TABLE EXTRACTED FROM BFN-VTD-6080-0130 (REF. 5.16)
GE INSTRUCTION GEI-90818A "VOLTAGE RELAYS TYPE IAV69A AND IAV69B"
TAP SETTING WERE ADJUSTED TO PICKUP TAB 180V (PICK UP TAP SETTING PER REF. RIMS # B70120 262 'ELECTRICAL EQUIP FIELD VERIFICATIONS')
SEE CALC # 6.0 FOR BURDEN @ 180V.

Burden

The burden imposed on a potential transformer by a 120 volt IAV69 relay operating at rated voltage and frequency is given in Table B. Burdens are essentially the same for the 240 volt relay.

TABLE "B"

TAP RATING	60 CYCLE		50 CYCLE	
	WATTS	VOLT AMP	WATTS	VOLT AMP
55	6.6	19.2	4.6	16.0
64	4.3	13.3	3.7	11.4
70	2.8	9.6	2.4	8.2
82	2.2	7.4	1.9	6.4
93	1.6	5.8	1.4	5.0
105	1.1	4.6	1.0	3.9
120	0.8	3.5	.7	2.9
140	0.6	2.6	.5	2.2

June, 1979

HEAVY-DUTY, OILTIGHT PUSH BUTTONS

600 Volts Max., Ac/Dc

CR9, CR9NL, CR9K

PRICING INFORMATION

Indicating-Light Units

Indicating-light unit less color cap

Pub-voltage type with 6S8 incan. lamp

Pub-voltage type with 87A Neon Lamp

Resistor type with 6S8 incan. lamp

Transformer type with 1W, 5S, 6V incan. lamp

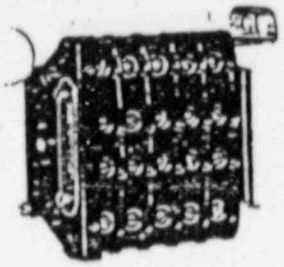
Refer to nearest General Electric Sales Office for 25-hour* rtg

Operating Voltage	Lens Color / Lamp Color / Less Cap	Catalog Number w/ Front Mounting CR2940	Catalog Number	Price
6 Volts	Less Cap	UC223A8		
12 Volts	Less Cap	UC212A10	UE21 3A10	
18 Volts	Less Cap	UC212A11	UE21 3A11	
24 Volts	Less Cap	UC212A12	UE21 3A12	
32 Volts (Bayonet) (Candelabra)	Less Cap	UC212A14	UE21 3A13	
	Less Cap and Bulb	UC223A1		
	Less Cap and Bulb	UC212A1	UE21 3A1	
110-125 Volts 60/50	Less Cap	UC212A2	UE21 3A02	
	Red	UC212B2	UE21 3B02	
	Green	UC212C2	UE21 3C02	
	Amber	UC212D2	UE21 3D02	
	Blue	UC212E2	UE21 3E02	
	White	UC212F2	UE21 3F02	
	Clear	UC212G2	UE21 3G02	
Pub-voltage type with 87A Neon Lamp	Less Cap	UC214A2	UE21 3A02	
110-125 Volts 60/50	Red	UC214B2	UE21 3B02	
	Amber	UC214D2	UE21 3D02	
	Clear	UC214G2	UE21 3G02	
220-250 Volts 60/50	Less Cap	UC212A3	UE21 3A03	
	Red	UC212B3	UE21 3B03	
	Green	UC212C3	UE21 3C03	
	Amber	UC212D3	UE21 3D03	
	Blue	UC212E3	UE21 3E03	
	White	UC212F3	UE21 3F03	
	Clear	UC212G3	UE21 3G03	
110-120 Volts 60/50 Hz	Less Cap	UE212A2	UE21 3A02	
	Red	UE212B2	UE21 3B02	
	Green	UE212C2	UE21 3C02	
	Amber	UE212D2	UE21 3D02	
	Blue	UE212E2	UE21 3E02	
	White	UE212F2	UE21 3F02	
	Clear	UE212G2	UE21 3G02	
220-240 Volts 60/50 Hz	Less Cap	UE212A3	UE21 3A03	
	Red	UE212B3	UE21 3B03	
	Green	UE212C3	UE21 3C03	
	Amber	UE212D3	UE21 3D03	
	Blue	UE212E3	UE21 3E03	
	White	UE212F3	UE21 3F03	
	Clear	UE212G3	UE21 3G03	
440-480 Volts 60/50 Hz	Less Cap	UE212A4	UE21 3A04	
	Red	UE212B4	UE21 3B04	
	Green	UE212C4	UE21 3C04	
	Amber	UE212D4	UE21 3D04	
	Blue	UE212E4	UE21 3E04	
	White	UE212F4	UE21 3F04	
	Clear	UE212G4	UE21 3G04	
550-600 Volts 60/50 Hz	Less Cap	UE212A5	UE21 3A05	
	Red	UE212B5	UE21 3B05	
	Green	UE212C5	UE21 3C05	
	Amber	UE212D5	UE21 3D05	
	Blue	UE212E5	UE21 3E05	
	White	UE212F5	UE21 3F05	
	Clear	UE212G5	UE21 3G05	

* Price does not include nameplate. Must be ordered as a separate item. See page 146 for nameplate ordering and price information.

581 9-87

REF. 5.32



Auxiliary switches are devices with a rotary drum that provide necessary contacts of the "a" and "b" type to provide control in secondary circuits. Contacts operate as follows: "a" is closed when breaker is closed, "b" is open when the breaker is closed. Standard arrangements comprise four contacts (two stages), or ten contacts (five stages).

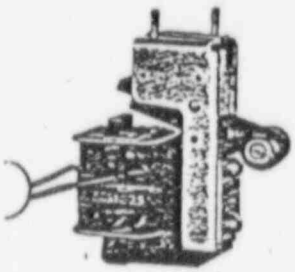
While alternate arrangements can be provided, two "a" and "b" switches are normally furnished on the four-contact switch with five of both types provided on a ten-contact switch. Special combinations of "a" and "b" contacts are available.

Interrupting ratings for one-stage auxiliary switches are:

TABLE II

Volts d-c	Non-inductive	Inductive	Volts a-c	Non-inductive	Inductive
125	11A △ 5	6.25A △ 5	115	75A △ 5	10A △ 5
250	2A	1.75A	230	50A △ 5	15A △ 5
			460	25A △ 5	5A

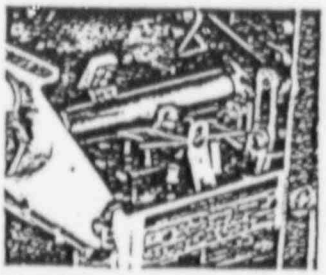
△ Limited to 20A continuous rating of switch on all breakers and to 5A continuous rating of No. 16 wire on drawout breakers.



Shunt trip device, standard on electrically-operated breakers and optional on manual types, features a hinged armature that trips the breaker instantaneously when its coil is energerized from a voltage source. Intended for remote electrical tripping from a control switch or push-button station, the device may also be used in conjunction with protective relays for automatic tripping. Operating currents are:

TABLE III

Volts	Volt Operating Range Volts	Amperes Inrush	Amperes Sustained
48 dc	28-60	4.5	4.5
125 dc	70-140	1.9	1.9
250 dc	140-280	1.0	1.0
115—60 cy	95-125	12.3	10.8
230—60 cy	190-250	6.9	5.7
460—60 cy	380-500	3.4	3.1
575—60 cy	475-625	2.8	2.5
208—60 cy	175-225	5.2	4.5
380—50 cy	315-410	2.9	2.6



Bell alarm device, used to close a bell circuit or other signaling device indicating automatic breaker tripping, is actuated by opening of the breaker. Used also for interlocking purposes, a lockout device is added to the alarm circuit to mechanically lock the breaker at "open" when the device is actuated. Current-closing rating of the contacts is 30 amperes at any voltage listed, with 10-ampere continuous current-carrying capacity and inductive interrupting ratings as indicated:

TABLE IV

Volts A-C			Volts D-C	
115 / 30A	230 / 15A	460 / 7A	125 / 2.5A	250 / 0.5A

Types IB1 or IHC thermal relays, and IAC-66 overcurrent relays are typical of the special-design relays that can be featured on motor starting power circuit breakers. Among the numerous special-purpose types available are the types IAC and PJC ground sensor relays.

Specifications (All values shown are at nominal operating voltage and 77°F unless otherwise noted)

Linear Timing Ranges

A .1 to 1 Sec.	E 10 to 200 Sec.	I 2 to 60 Min.*
B .2 to 5 Sec.	F .5 to 10 Min.	J 3 to 120 Cyc.**
C .8 to 15 Sec.	G 1 to 20 Min.	K 1 to 300 Sec.
D 2.5 to 50 Sec.	H 1 to 30 Min.	

* Not available with time-calibrated dials in Models 2414, 2424, 2432.

**Not available in Models 2414, 2424, 2432.

All dial head units are furnished with dials calibrated in linear increments covering the range selected. In addition, time-calibrated ranges C through K provide non-linear adjustment from .2 second to the beginning of the linear zone. For easiest adjustment and lowest cost, the shortest time range suitable for the application should be selected.

In addition to the dial head models above, the basic 2400 Series units are also available with needle valve adjustment. They are recommended only for applications where frequent readjustment of the delay period is not required, or where initial cost is a prime consideration. One timing range is offered:

Code N .2 to 180 sec.

Coil data, switch capacities and other performance specifications are identical with dial head models.

Contact Ratings

Contact Capacity in Amperes (Resistive Loads)

Contact Voltage	Min. 100,000 Operations	Min. 1,000,000 Operations
30 vdc	15.0	7.0
110 vdc	1.0	0.5
120 v 60 Hz	20.0	15.0
240 v 60 Hz	20.0	15.0
480 v 60 Hz	12.0	10.0

Contact Ratings as listed under the UL Component Recognition Program:

120/240 VAC	½ H.P.
120/240 VAC	10 A. RES.
600 VAC	5 A.G.P.
30 VDC	15 A.G.P.

Inductive and capacitive loads should not have inrush currents that exceed five times normal operating load.

Maximum total loads for four pole units are twice the values given above.

All specifications listed here are for reference only, and are subject to continuing revision. Verified drawings are available on request. If your requirements cannot be met by the standard production units described here, they may be filled by one of the many non-standard models produced by us over the years. Many of these unusual configurations are available on a shorter-delivery, lower-cost basis than a purely custom model. We welcome your inquiry.

Coil Data

Coil Part Number	Code Letter	Rated Voltage @ 60 Hz	Operating Voltage Range @ 60 Hz	Rated Voltage @ 50 Hz	Operating Voltage Range @ 50 Hz
2400	A	120	102-132	110	93.5-121
	B	240	204-264	220	187-242
	C	480	408-528		
	D	550	468-605		
AC	E	24	20.5-26.5		
	F			127	108-140
	G			240	204-264
	H	12	10.2-13.2		
	I	6	5.1-6.6		
	J	208	176-229		
	K	Dual Voltage Coil (Combines A & B)			
	L	Special AC Coils (L1, L2, etc.)			
2410	M	28	22.5-33.5		
	N	48	38.5-57.5		
	O	24	19.2-28.8		
	P	120	96-144		
	Q	12	9.6-14.4		
	R	60	48-74		
DC	S	250	200-300		
	T	550	440-660		
	U	16	12.8-19.2		
	V	32	25.6-38.4		
	W	96	76.8-115		
	Y	6	4.8-7.2		
	Z	220	176-264		
	X	Special DC Coils (X1, X2, etc.)			

All units draw approximately 8 watts power at rated voltage. Minimum operating voltages are based on vertically mounted 2412 units. 2412 horizontally mounted or 2422 vertically or horizontally mounted units will operate satisfactorily at minimum voltages approximately 5% lower than those listed.

AC units drop out at approximately 50% of rated voltage. DC units drop out at approximately 10% of rated voltage.

All units may be operated on intermittent duty cycles at voltages 10% above the listed maximums. (Intermittent duty = maximum 50% duty cycle and 30 minutes "on" time.)

Repeat Accuracy

For units set at 200 sec. or under—better than ±5% of preset adjustment. For longer time settings—better than ±10% of preset adjustment.

In 20, 30, and 60 minute delay on pull-in units the first delay will be approximately 20% longer than subsequent delays after coil warm-up.

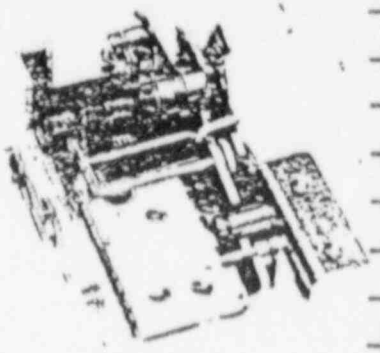
Panel-mount style

REF. 5.29

Closing Mechanism Operating Amperes

Breaker Frame	120 Volt, 60 Hz (Operating Range 104-127 VAC)			240 Volt, 60 Hz (Operating Range 208-254 VAC)			125 Volt, Dc (Operating Range 100-140 VDC)			250 Volt, Dc (Operating Range 200-280 VDC)		
	Inrush	Sustained	Recommended Fuse Size	Inrush	Sustained	Recommended Fuse Size	Inrush	Sustained	Recommended Fuse Size	Inrush	Sustained	Recommended Fuse Size
AKR-30 AKR-50 AKRT-50	25	5	6	12	3	6	27	5	6	13	3	6
AKR-75 AKR-100	25	8.1	10	12	3.5	10	27	7	10	13	3.2	10
AK-25	153	78	30	68	28	15	44	44	10	24	24	8
AK-50 AKT-50 AK-75	9	4	6	4	2.6	6	30	4	6	15	2	6
AK-100	9	4	10	4	3.2	10	30	5	10	15	2.5	10

Control Voltage		Bell Alarm Contact Ratings (amperes)	
		Inrush	Continuous
Dc	125	2.5	2.5
	250	0.9	0.9
60 Hz. Ac	120	30	10
	240	15	5
	480	7	3



Bell Alarm Device with Lockout

EBASCO SERVICES INCORPORATED

[LED-Q0268-88A63]

BY DBi 8/13/88

CHKD. BY CCO 8-13-88

7.0 ATTACHMENT No. 16.0

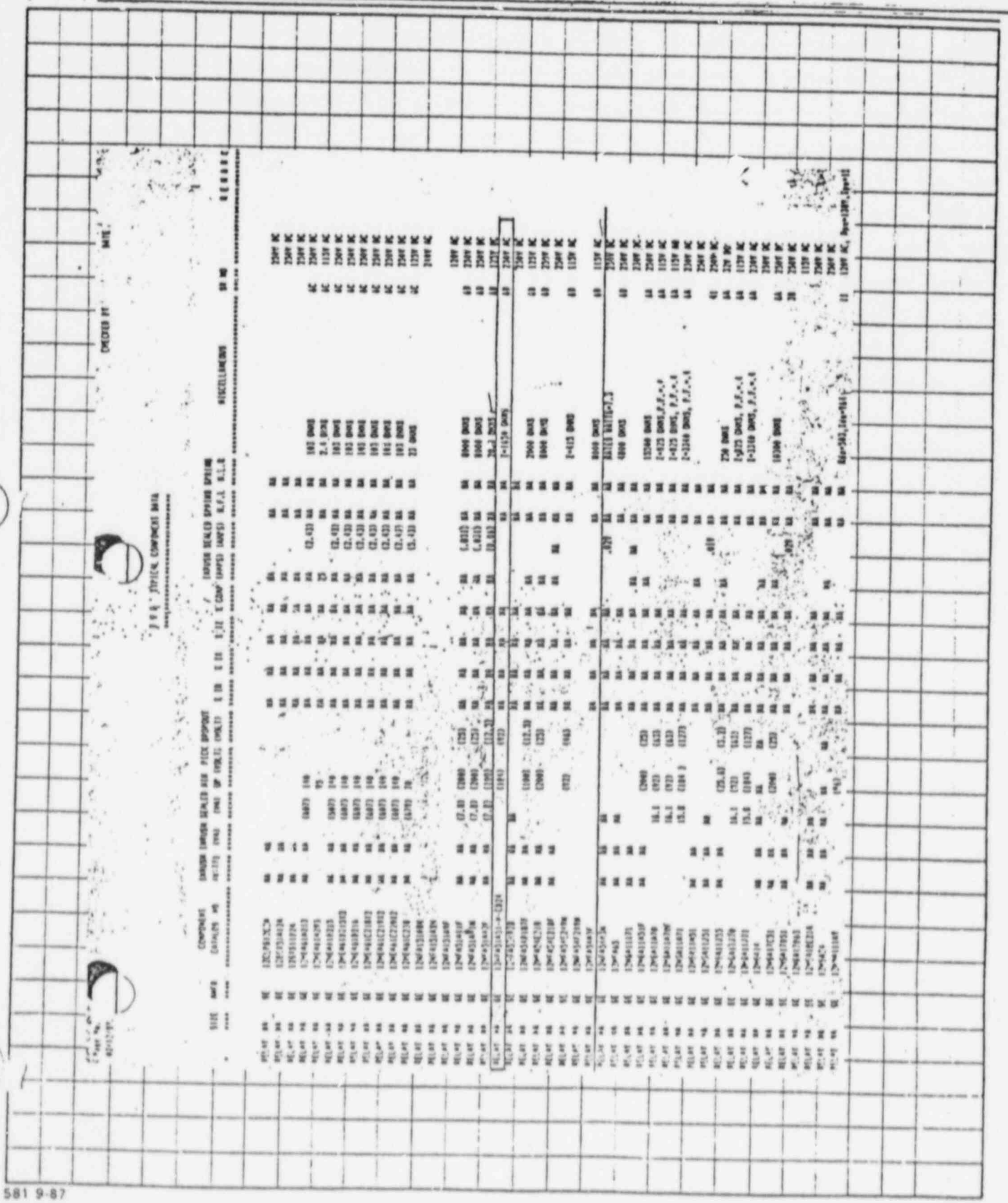
SHEET 131 OF 133

OFS NO. DEPT. NO.

CLIENT TVA

PROJECT BFNP UNITS 1,2,3

SUBJECT FUSE PROGRAM [480V. REACTOR MOV BOARDS 3A/B]



581 9-87

GE Switchboard Instruments

SPECIFICATIONS, BURDEN DATA

130-VOLT, 60-HERTZ POTENTIAL CIRCUIT

Type	Impedance in Ohms	Resistance Component in Ohms	Inductance in Henries or Capacitance in Microfarads	Volt-amperes			
Voltmeters, AB-1*	3030	2960	1.37H	4.76	4.67	W	0.98
Voltmeters, AB-16, -40	3372	3219	0.34H	4.33	4.34	0.8	0.99
Voltmeters, AB-30	3190	3120	1.0H	4.53	4.43	0.8	0.977
Expanded-scale Voltmeters (Linear Blade Type)	4230	4230	0	3.5	3.5	0	1.0
Single and Polyphase Wattmeters*, AB-16, -30, -40	271,000*	194,000	302H	0.033	0.038	0037	0.73 Lagging
Single-phase Varmeters, AB-16, -30, -40	271,000	194,000	302H	0.033	0.038	0037	0.78 Lagging
Single Phase Varmeters, AB-16, -30, -40 across phase terminal phase shifter	3900	393	0.66μf	3.69	6.19	366	0.85 Leading
Phase-shifting Transformer for Polyphase Varmeters*	1060*	179	3.77H	13.6	2.3	13.6	0.17 Lagging
Power Factor Meters, AB-16, -30, -40, Single-phase Type	3430	1823	0.49μf	2.61	0.38	260	0.14 Leading
Three-phase Type #2 to #3	13,300	3913	0.293μf	1.27	8.31	132	0.29 Leading
Three-phase Type #3 to #3	13,300	3913	0.293μf	1.27	8.31	132	0.29 Leading
Three-phase Type #2 to #3	27,200	7600	0.702μf	6.33	8.13	865	0.29 Leading
Frequency Meters, AB-16, -30, -40, 55-65, 50-75, 38-62	6300	3600	14.8H	2.6	1.3	36	0.54
45-55	5130	3600	14.8H	3.6	1.4	32	0.46
350-450	6000	2700	3.1H	2.4	1.1	32	0.46
Synchroscopes, Running Incoming	7900	6033	18.3H	2.0	1.66	11	0.84
	3420	2845	1.4μf	4.3	3.3	338	0.83

5-AMPERE, 60-HERTZ CURRENT CIRCUIT

Ammeters, AB-1*	0.066	0.03	0.000157	3.13	1.33	139	0.53
Ammeters, AB-16, -40	0.0417	0.0179	0.000094	1.843	0.961	0.615	0.783
Ammeters, AB-30	0.100	0.073	0.000170	2.6	1.93	91	0.83
Single and Polyphase Wattmeters*, AB-16, -30, -40	0.013*	0.013	0	0.11	0.11	0	1.0
Single and Polyphase Varmeters,* AB-16, -30, -40	0.013*	0.013	0	0.11	0.11	0	1.0
Single and Polyphase Power Factor Meters	0.013	0.013	0	0.11	0.11	0	1.0

D-C VOLTMETERS

* Data based on a per-element basis.

Rating (Volts)	Impedance (Ohms Per Volt)		
	DB-30	DB-40	DB-16
From 0-15 To 0-750	1000	1000	1000

D-C MILLIVOLTMETERS

Rating (mv)	Calibrated for 2-way Lead Resistances of ... Ohms as Indicated	Ohms Terminal Resistance ±15%		
		DB-30	DB-40	DB-16
0-30	0.063	30	30	16
30-0-30	0.063	60	60	32
0-100	0.063	80	80	32
100-0-100	0.063	80	80	40

* When calibrated for 0.063 ohms can be used with 2-way lead resistances from ..... to ..... ohms as listed below with an additional error of less than 0.5 percent.

Rating (mv)	Lead-length Range (Ohms)		
	DB-30	DB-40	DB-16
0-30	0 to 0.14	0 to 0.14	0.01 to 0.11
30-0-30	0 to 0.24	0 to 0.24	0 to 0.14
0-100	0 to 0.24	0 to 0.24	0 to 0.14
100-0-100	0 to 0.44	0 to 0.44	0 to 0.24

Also can be calibrated for any specific 2-way lead-length resistance within the following ranges when specified.

Rating (mv)	Calibration Range (Ohms)		
	DB-30	DB-40	DB-16
0-30	0 to 0.3	0 to 0.3	0 to 0.3
30-0-30	0 to 0.3	0 to 0.3	0 to 0.3
0-100	0 to 1.0	0 to 1.0	0 to 1.0
100-0-100	0 to 1.0	0 to 1.6	0 to 1.0

The DB-40 & DB30 with lead-length compensator can also be calibrated for any specific resistance up to a maximum of 3 ohms. The DB-16 with lead-length compensator can

D-C AMMETERS

Rating (Amperes)	Ohms Terminal Resistance ±15%		
	DB-30	DB-40	DB-16
0-1	0.05	0.030	0.03
0-5	0.01	0.01	0.01
0-10	0.005	0.005	0.005
0-15	0.005	0.004	0.003
0-20	0.0025	0.0025	0.0025
0-30	0.00167	0.00167	0.00167
0-40	0.00125	0.00125	0.00125
0-50	0.001	0.001	0.001
0-60	0.00083	0.00083	0.00083

D-C MILLIAMMETERS

Rating (ma)	Ohms Terminal Resistance ±5%		
	DB-30	DB-40	DB-16
0-1	33	31	1400
0-3	11	10.5	200
0-5	6.8	6.7	80
0-10	3	3	31
0-30	1	1	13
0-100	0.3	0.3	3.8
0-300	0.1	0.1	0.8
30-0-30	1	1	14
0-75	2.3	2.3	220
0-3	3.8	4.3	40

D-C MICROAMMETERS

Rating (μa)	Ohms Terminal Resistance ±5%		
	DB-30	DB-40	DB-16
0-30	4600	4736	.....
0-100	1362	1336	.....
0-300	444	444	.....
0-300	2.17	4.28	1980
0-300	904	990	3790

be calibrated for any specific resistance up to 2100 ohms (for 0-50mv, 50-0-50mv & 0-100mv) and 3.5 ohms (for 100-0-100mv).

581 9-87

EBASCO SERVICES INCORPORATED

BY BJ DATE 8/ 9 [ED-Q0268-88A63]

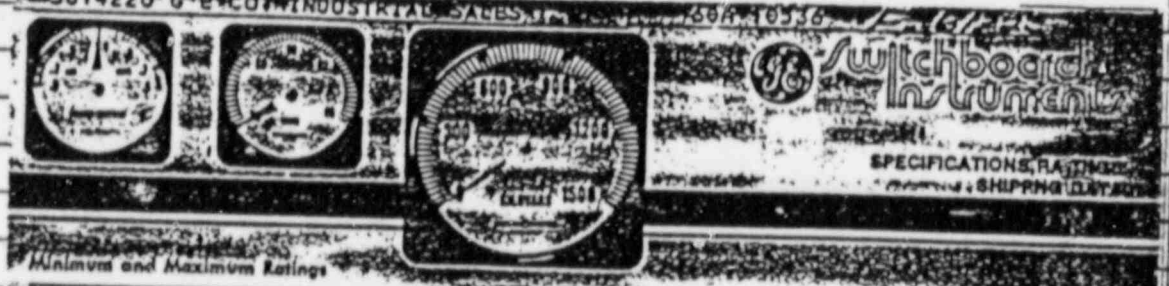
CHKD. BY CCO DATE 8-1-88 7.0 ATTACHMENT No. 18.0 SHEET 1 OF 83

CLIENT TVA OFS NO. DEPT. NO.

PROJECT BFNP UNITS 1,2,3

SUBJECT FUSE PROGRAM [480V. REACTOR MOV BOARDS 3A/3]

3874220 GE-CO INDUSTRIAL SALES



Minimum and Maximum Ratings

Indicator	Type	Nonstandard SPRECHER		Indicator	Type	Nonstandard Self-contained	
		Minimum	Maximum			Minimum	Maximum
Ac Voltmeter	Iron-vane	10 Volts 33 Hertz	750 Volts 1000 Hertz	Ac Voltmeter 3-phase 4-wire		30 Hertz 190-0-190 (CW+) 120 Volts 1.25 Amperes	600 Hertz 750 CW+ 600 Volts 10 Amperes
	Rectifier	20 Hertz 3 Volts 100 Ohms/Volt at 30 & above	3000 Hertz 150 Volts 6000 Ohms/Volt	Frequency Meter		2 Hertz Span	
Ac Ammeter	Iron-vane	25 Hertz 1 Ampere	1000 Ohms 30 Amperes	Synchroscope		25 Hertz	690 Hertz
	Rectifier	20 Hertz 1 Ampere	3000 Hertz 5 Amperes	Power-factor Meter 3-phase 3-wire		30 Hertz 120 Volts 5 Amperes	600 Hertz 120 Volts 5 Amperes
Ac Milliammeter	Iron-vane	25 Hertz 30 Milliamperes	1000 Hertz 1000 Milliamperes	Power-factor Meter 3-phase 3-wire 3-phase 4-wire		30 Hertz 120 Volts 5 Amperes	600 Hertz 600 Volts 5 Amperes
	Rectifier	20 Hertz 0.5 Milliamperes	3000 Hertz 1000 Milliamperes	Phase-angle Meter		30 Hertz 120 Volts 5 Amperes	600 Hertz 600 Volts 5 Amperes
Ac Wattmeter 1-phase 2-wire	Single Phase	30 Hertz 240 CW+† 190-0-190 CW+† 69 Volts 1.25 Amperes	600 Hertz 750 CW+† 600 Volts 10 Amperes	Ac Ground Detector		5 Hertz 10 Volts	1000 Hertz 750 Volts
Ac Wattmeter 3-phase 3-wire 2-phase 3-wire 2-phase 4-wire 3-phase 3-wire 3-phase 4-wire	Polyphase	30 Hertz 240 CW+† 190-0-190 CW+† 69 Volts 1.25 Amperes	600 Hertz 750 CW+† 600 Volts 10 Amperes	Dc Millivoltmeter		60 Millivolts 100 Ohms/Volt	1000 Millivolts 3000 Ohms/Volt
Ac Wattmeter (if ordered Nonsuperior Horizontal Mount)	Polyphase	30 Hertz 240 CW+† 190-0-190 CW+† 69 Volts 1.25 Amperes	600 Hertz 750 CW+† 600 Volts 10 Amperes	Dc Voltmeter		1 Volt 100 Ohms/Volt	750 Volts 30.0 Ohms/Volt
Ac Watthourmeter 3-phase 3-wire 2-phase 3-wire	Polyphase	30 Hertz 240 CW+† 190-0-190 CW+† 69 Volts 1.25 Amperes	600 Hertz 750 CW+† 600 Volts 10 Amperes	Dc Microammeter		Microamperes 84-30 84-40 100 30 84-16 84-16 300 300	1000 Microamperes
Ac Varmeter 1-phase 2-wire		30 Hertz 190-0-190 CW+† 120 Volts 1.25 Amperes	600 Hertz 750 CW+† 600 Volts 10 Amperes	Dc Millivoltmeter		1 Millivolt	1000 Millivolts
Ac Varmeter 3-phase 3-wire 2-phase 3-phase 3-wire 2-phase 4-wire		30 Hertz 190-0-190 CW+† 120 Volts 1.25 Amperes	600 Hertz 750 CW+† 600 Volts 10 Amperes	Dc Ammeter	Shuntless	1 Ampere	60 Amperes
					Shunted	60 Millivolts	1000 Millivolts
					Dc Current transformer rated	0.5 Ampere	5 Amperes
				Dc Ground Detector		60 Millivolts 100 Ohms/Volt	750 Volts 3000 Ohms/Volt
				Temperature 120 Volts 50-60 Hertz		100 F 100 C Ohms = 100 F = 75 C = 200 F = 129 C	250 F 140 C 0-360 F 0-137 C 0-1208 F 0-649 C

Shipping and Storage Weights

Instrument	AB-/DB-30, -60		AB-/DB-16	
	Net (lbs.)	Ship (lbs.)	Net (lbs.)	Ship (lbs.)
Ac Ammeters and Voltmeters	3	5	7	12
Single-phase Wattmeters	3	4	5	10
Polyphase Wattmeters	4	5	6	11
Frequency Meter	3	5	6	9
Power-factor Meter	3	5	6	9
Synchroscope	3	5	7	10
Dc Ammeters and Voltmeters	3	5	7	12
Millivoltmeters Microammeters	3	5	7	9
Phase-angle Transformer	3	4	7	11
	6	9	8	14

* Applies only to 120-volt/5-ampere models; other ratings in proportion.
† Calibrating watts.

Approximate Package Size in Inches

AB AB/DB (Except AB-/DB-16) Shipping 6X8X18
AB-/DB-16 Shipping 7X8X18
10X10X18
11X18X18

HOW TO ORDER—Specify the following:

Type: AB/DB-14, 16, 17, 16, 30 or 60

Rating (Input): ..... Amperes ..... Volts AC or DC

Frequency: 50 Hz, 60 Hz, 400 Hz, ... Hz

Scale: Min. Value - Max. Value, Zero-left, Zero-center or offset at zero

Legend: Specify words and/or symbols desired

Potential Transformer Ratio: ..... to 120 volts, or ..... to ..... Volts

Current Transformer Ratio: ..... to 5 amperes, or ..... to ..... Amperes

Circuit: 2-wire/single-phase, 3-wire/2-phase, 3-phase/4-wire, ... other

Other Features: .....

3-09

81 9-87