TYPICAL PROCESS USED TO SIZE A PENETRATION PROTECTION DEVICE

A COMPARISON OF THE TIME VERSUS CURRENT WITHSTANDABILITY (I^2t) OF THE PENETRATION ASSEMBLY CONDUCTORS AND THE ASSOCIATED PROTECTIVE DEVICES SHALL BE PERFORMED TO ENSURE THAT BOTH PRIMARY AND BACKUP OVERCURRENT PROTECTIVE DEVICES ARE DESIGNED TO CLEAR A FAULT CONDITION PRIOR TO REACHING THE (I^2t) CAPABILITY OF THE ASSOCIATED PENETRATION ASSEMBLY CONDUCTORS.

STEP 1. PLOT THE (I^2t) WITHSTANDABILITY OF THE PENETRATION ASSEMBLY CONDUCTOR ON A LOG-LOG TIME-CURRENT CURVE USING INFORMATION OBTAINED FROM TABLE 1.

STEP 2. CALCULATE THE MAXIMUM AVAILABLE SHORT CIRCUIT CURRENT THAT COULD BE EXPERIENCED IF A BOLTED FAULT WERE TO OCCUR BETWEEN CONDUCTORS AT THE INBOARD END OF THE PENETRATION ASSEMBLY. NOTE THAT THIS STEP NEED NOT BE PERFORMED IF THE OVERCURRENT PROTECTIVE DEVICE TIME-CURRENT CHARACTERISTICS INDICATE A CLEARING TIME WHICH IS LESS THAN THE TIME REQUIRED TO REACH THE (I^2t) CURVE PLOTTED IN STEP 1 REGARDLESS OF THE SHORT CIRCUIT CURRENT VALUE (SEE NOTE 4).

STEP 3. PLOT A VERTICAL LINE TO DISPLAY THE MAXIMUM AVAILABLE SHORT CIRCUIT CURRENT CALCULATED IN STEP 2, IF APPLICABLE.

STEP 4. CHOOSE AN OVERCURRENT PROTECTIVE DEVICE WHOSE MANUFACTURER'S TIME-CURRENT CHARACTERISTICS COORDINATE WITH THE (I^2t) CURVE OF THE PENETRATION ASSEMBLY CONDUCTOR AS ESTABLISHED IN STEP 1 AND THE AVAILABLE SHORT CIRCUIT CALCULATION PERFORMED IN STEP 2, IF APPLICABLE.

STEP 5. PLOT THE TIME-CURRENT CHARACTERISTICS OF THE PRIMARY AND BACKUP OVERCURRENT PROTECTIVE DEVICES AS SPECIFIED BY THE RESPECTIVE DEVICE MANUFACTURER. THE MAXIMUM BAND VALUES DISPLAYED BY THE MANUFACTURER'S OVERCURRENT PROTECTIVE DEVICE TIME-CURRENT CHARACTERISTIC CURVE SHOULD BE USED FOR CONSERVATISM.

NOTES: -

1. THIS PROCESS IS NOT THE ONLY METHOD USED TO SIZE OVERCURRENT PROTECTIVE DEVICES.
2. THIS PROCESS DOES NOT ADDRESS OVERCURRENT PROTECTION OF LOAD EQUIPMENT OR ASSOCIATED FIELD CABLING. IN MOST CASES THE ABOVE PROCEDURE IS USED TO DETERMINE WHETHER THE O/C PROTECTIVE DEVICES DESIGNED FOR LOAD EQUIPMENT AND FIELD CABLING PROTECTION PROVIDE ADEQUATE PROTECTION FOR ASSOCIATED PENETRATION CONDUCTORS.
3. PRIMARY AND BACKUP OVERCURRENT DEVICES USED FOR PENETRATION PROTECTION MAY OR MAY NOT BE COORDINATED WITH EACH OTHER OR UPSTREAM SYSTEM PROTECTION.
4. ALTHOUGH NOT A REQUIREMENT OF NRC REGULATORY GUIDE 1.63, WHICH ADDRESSES ONLY PENETRATION PROTECTION, THE PROTECTIVE DEVICE SHALL HAVE AN INTERRUPTING RATING SUFFICIENT FOR THE SYSTEM VOLTAGE AND THE MAXIMUM SHORT CIRCUIT CURRENT WHICH IS AVAILABLE AT THE LINE TERMINALS OF THE PROTECTIVE DEVICE.

TABLE 1

THE FOLLOWING AMPERE VALUES WERE OBTAINED BY CALCULATION USING ICEA P-32-382 FORMULA AND D.G.O'BRIEN'S TEST REPORT NO. ER-262.
INFORMATION: ACTUAL CALCULATIONS ARE DOCUMENTED IN G/C CALCULATION NO. DC-350001/56, WHICH HAS BEEN REPLACED BY CALCULATION NOS. DC08470-006 AND DC08470-013.

ITEM	CONDUCTOR SIZE	$I^2t=$	IF t=0.1 SECONDS, I=	IF t=75 SECONDS, I=	IF t=100 SECONDS, I=	IF t=200 SECONDS, I=	IF t=300 SECONDS, I=
1	#16 AWG	50,583.98	711.22	25.97	22.49	15.90	12.99
2	#12 AWG	324,040.99	1,800.11	65.73	56.92	40.25	32.87
3	#4 AWG	13,239,710	11,506.39	420.15	363.86	257.29	210.08
4	#1/0 AWG	84,742,530	29,110.57	1,062.97	920.56	650.93	531.48
5	250 MCM	474,956,250	68,917.07	2,516.50	2,179.35	1,541.03	1,258.25

THE FOLLOWING AMPERE VALUES WERE OBTAINED FROM D.G. O'BRIEN REPORT NO. ER-262:

ITEM	CONTINUOUS CURRENT	1000 SECOND CURRENT	60 SECOND SHORT TIME OVERLOAD
1	5 AMPS		
2	20 AMPS*	21	85 AMPS*
3	70 AMPS*	120	490 AMPS*
4	129 AMPS*	221	903 AMPS*
5	275 AMPS*	471	1925 AMPS*

* CONFIRMED BY D.G. O'BRIEN TESTS

NOTES:

1. THE 60 SECOND VALUE FOR #12 AWG CONDUCTORS IS LESS THAN 7X CONTINUOUS CURRENT RATING (FAILURES EXPERIENCED AT 140 AMPS).
2. 1000 MCM PENETRATION ASSEMBLY CONDUCTORS ARE USED SOLELY FOR 7.2 KV REACTOR COOLANT PUMPS, XPP-30A, B, AND C. THE (I^2t) WITHSTANDABILITY OF 1000 MCM PENETRATION ASSEMBLY CONDUCTORS WAS PLOTTED ON A LOG-LOG TIME CURRENT CURVE USING INFORMATION SPECIFIED BY D.G. O'BRIEN. SINCE ALL EXISTING 1000 MCM PENETRATION ASSEMBLY CONDUCTORS ARE USED (i.e., NO SPARES) AND SINCE FUTURE REQUIREMENTS FOR 1000 MCM PENETRATION ASSEMBLY CONDUCTORS ARE NOT ANTICIPATED, TIME-CURRENT VALUES ESTABLISHING (I^2t) WITHSTANDABILITY OF THE 1000 MCM CONDUCTORS WILL NOT BE IDENTIFIED.
3. CALCULATED CURRENT VALUES FOR TIMES OVER TEN (10) SECONDS ARE CONSERVATIVE SINCE THE ICEA STANDARD P-32-382 FORMULA DOES NOT COMPENSATE FOR HEAT DISPERSION TO THE ENVIROMENT.

TYPICAL METHODOLOGY USED TO ESTABLISH TEST SETPOINTS AND RESPONSE TIMES OF PENETRATION PROTECTION DEVICES

TEST SETPOINT AND ASSOCIATED RESPONSE TIME VALUES ARE ESTABLISHED TO ENSURE THAT THE PROTECTION DEVICES WILL OPERATE IN ACCORDANCE WITH MANUFACTURER'S DESIGN CHARACTERISTICS AND THAT THE OPERATION WILL OCCUR PRIOR TO REACHING THE (I^2t) CAPABILITY OF THEIR ASSOCIATED PENETRATION ASSEMBLY CONDUCTORS, WITH ADEQUATE MARGIN (i.e., THE POINT ESTABLISHED BY THE TEST SETPOINT/RESPONSE TIME VALUE SHOULD AS A MINIMUM BE EQUAL TO THAT ESTABLISHED BY THE MAXIMUM BAND OF THE PROTECTIVE DEVICE, AND SHOULD AS A MAXIMUM BE LESS THAN THE VALUE OF PENETRATION ASSEMBLY CONDUCTOR (I^2t) CAPABILITY ESTABLISHED BY CALCULATION AS PLOTTED ON A TIME VERSUS CURRENT CURVE).

480V SWITCHGEAR POWER CIRCUIT BREAKERS

THE METHOD USED TO ESTABLISH TEST SETPOINTS AND RESPONSE TIMES ASSOCIATED WITH 480V SWITCHGEAR POWER CIRCUIT BREAKERS IS AS FOLLOWS:

ESTABLISH TEST SETPOINTS AND ASSOCIATED RESPONSE TIMES IN ACCORDANCE WITH GOULD/ITE SWITCHGEAR INSTRUCTION MANUAL BULLETIN IB-9.1.7-22 TABLE 4, PAGE 9 AND THE APPROPRIATE SHEETS OF G/C, INC RELAY AND BREAKER SETTING DWG. SS-200-927.

EXAMPLE:

TEST SET POINT

LONG-TIME DELAY = 3 X LONG-TIME P.U. AMP SETTING
SHORT-TIME DELAY = 1.5 X SHORT-TIME P.U. AMP SETTING
INSTANTANEOUS DELAY = 1.5 X INSTANTANEOUS P.U. AMP SETTING

RESPONSE TIME

LONG-TIME DELAY ≤ 2 X HIGH RANGE OF DEVICE BAND SETTING
SHORT-TIME DELAY ≤ 2 X HIGH RANGE OF DEVICE BAND SETTING
INSTANTANEOUS ≤ 4 X 0.05 SECONDS (0.20 SECONDS)

NOTE:

SOLID STATE TRIP DEVICE TYPE/BAND SELECTION, AND RELAY SETTING INFORMATION SHOULD BE OBTAINED FROM G/C, INC DRAWING SS-200-927.

480V AC, 120V AC, AND 125V DC MOLDED CASE CIRCUIT BREAKERS

THE METHOD USED TO ESTABLISH TEST SETPOINTS AND RESPONCE TIMES OF MOLDED CASE CIRCUIT BREAKERS LOCATED IN MOTOR CONTROL CENTERS AND POWER DISTRIBUTION PANELS IS AS FOLLOWS:

ESTABLISH TEST SETPOINTS AND ASSOCIATED RESPONSE TIMES FOR THERMAL-MAGNETIC CIRCUIT BREAKERS IN ACCORDANCE WITH NEMA STANDARD AB-2.

EXAMPLE:

TEST SET POINT = 3 X BREAKER AMPERE RATING

RESPONSE TIME = MAXIMUM TRIPPING TIME (SECONDS) AS IDENTIFIED IN NEMA STANDARD AB-2 1980, PART 2, TABLE 2-1.

ESTABLISH TEST SETPOINTS AND ASSOCIATED RESPONSE TIMES FOR MAGNETIC CIRCUIT BREAKERS IN ACCORDANCE WITH MANUFACTURER'S RECOMMENDATIONS.

EXAMPLE:

TEST SET POINT = 15 X BREAKER AMPERE RATING

RESPONSE TIME = INSTANTANEOUS TRIPPING IN THE REGION OF ½ CYCLE (0.0083 SECONDS) IS REPRESENTED BY (N/A) ON THE FUSE CHART. RESPONSE TIME MEASUREMENT IS NOT REQUIRED SINCE FAILURE OF THE BREAKER TO TRIP INSTANTANEOUSLY WOULD CAUSE DAMAGE TO THE UNIT AND CONSEQUENT REPLACEMENT.

FUSES

THE METHOD USED TO ESTABLISH TEST SETPOINTS AND RESPONSE TIMES OF FUSES IS AS FOLLOWS:

ESTABLISH TEST SETPOINTS OF FUSES IN ACCORDANCE WITH VENDOR SUPPLIED RESISTANCE VALUES WHICH HAVE BEEN OBTAINED FOR EACH SPECIFIC TYPE AND SIZE OF FUSE USED. RESISTANCE VALUES AT 40°C WERE DERIVED BY CALCULATION USING 25°C VALUES PROVIDED BY THE FUSE MANUFACTURER.

TEST SET POINT RESISTANCE VALUES ARE AS FOLLOWS:

MANUFACTURER	TYPE AND SIZE	MATERIAL FUSE LINK	RESISTANCE IN MILLIOHMS (MINIMUM) AT 25°C (77°F)	(MINIMUM) AT 40°C (104°F)	(MAXIMUM) AT 25°C (77°F)	(MAXIMUM) AT 40°C (104°F)
BUSS	ABC-3	COPPER	≥ 41.0	≥ 43.38	49.0	51.84
	ABC-5	ZINC	≥ 24.0	≥ 25.49	33.0	35.05
	ABC-8	ZINC	≥ 20.5	≥ 21.77	25.0	26.55
	P/N2432859	GUILDING METAL	≥ 37.5	N/A	52.5	N/A
	NON-3	AG PLATED CU	≥ 45.0	≥ 47.7	62.0	65.72
	NON-6	ZINC	≥ 18.0	≥ 19.12	24.0	25.49
	NON-15 (CLASS H)	ZINC	≥ 6.05	≥ 6.42	8.03	8.53
	(CLASS K5)	COPPER	≥ 10.10	≥ 10.68	16.5	17.46
	FNM-3.2	CONSTANTAN	≥ 65.0	≥ 65.0	88.0	88.02
	FRN-3.2 OR FRN-R3.2	COPPER	≥ 100.0	≥ 105.8	135.0	142.8
	FRN-R6	COPPER	≥ 75.0	≥ 79.35	84.0	88.87
	FRN R10	CONSTANTAN	≥ 30.0	≥ 30.0	38.0	38.01
	FRN-R15	65% CU, 18% NI, 17% ZN	≥ 14.0	≥ 15.02	17.0	18.24
	FRN-6	COPPER	≥ 33.0	≥ 34.91	45.0	47.61
	FRN-R80	UNKNOWN	≥ 1.0	N/A	1.3	N/A
GOULD	OT-3	UNKNOWN	≥ 86.0	N/A	120.0	N/A
	OT-6	ZINC	≥ 19.0	≥ 20.2	25.4	26.97
	OT-10	ZINC	≥ 14.0	≥ 14.87	17.4	18.48
	OT-15	COPPER	≥ 6.29	≥ 6.65	7.8	8.25
	TRS150R	COPPER	> 0.169	> 0.655	0.720	0.762
	TRS200R	COPPER	> 0.409	> 0.433	0.460	0.487
	A25X50-4	COPPER	> 1.62	> 1.71	1.97	2.08
	A2Y6-1	UNKNOWN	> 22.4	N/A	26.6	N/A
	A2Y15-1	ZINC	> 8.10	≥ 8.61	9.10	9.66
	A2Y20-1	SILVER	≥ 4.27	≥ 4.53	4.74	5.02
	A2Y50-1	SILVER	> 1.66	≥ 1.76	1.81	1.92
	A2Y60-1	SILVER	> 1.26	> 1.34	1.46	1.55
	A2K6R	UNKNOWN	> 20.6	N/A	25.9	N/A
	A2K15R	UNKNOWN	> 7.7	N/A	9.8	
	A2K20R	UNKNOWN	≥ 7.65	N/A	8.2	
	A2K50R	UNKNOWN	≥ 1.5	N/A	1.73	
	A2K60R	UNKNOWN	≥ 1.21	N/A	1.5	
	TR3.2R	UNKNOWN	≥ 197.0	N/A	272.0	
	TR6R	UNKNOWN	≥ 73.4	N/A	80.6	
	TR10R	UNKNOWN	≥ 21.0	N/A	31.6	
	TR15R	UNKNOWN	≥ 18.8	N/A	23.5	
	TR80R	UNKNOWN	≥ 1.1	N/A	1.36	N/A
BUSS	A655	ZINC	≥ 25.0	≥ 26.55	34.0	36.11
	FWX-10	GUILDING METAL	≥ 37.5	N/A	52.5	N/A
	NON-10	ZINC	≥ 11.0	≥ 11.68	18.0	19.12
	KTN R6	AG PLATED CU	≥ 24.5	≥ 25.97	30.0	31.8
	KTN-R15	AG PLATED CU	≥ 6.5	≥ 6.89	8.05	8.53
	KTN-R20	AG PLATED CU	≥ 5.7	≥ 6.04	7.1	7.53
	KTN-R50	AG PLATED CU	≥ 1.62	≥ 1.72	2.1	2.23
	KTN-R60	AG PLATED CU	≥ 1.1	≥ 1.17	1.4	1.48
	KTS R6	AG PLATED CU	≥ 31.5	≥ 33.39	37.5	39.75
	KTS-R15	AG PLATED CU	≥ 8.0	≥ 8.48	9.2	9.75
	KTS-R20	AG PLATED CU	≥ 3.75	≥ 3.98	4.5	4.77
	KTS-R50	AG PLATED CU	≥ 1.5	≥ 1.59	1.85	1.96
	KTS-R60	AG PLATED CU	≥ 1.2	≥ 1.27	1.5	1.59
	KAB-50	SILVER	≥ 2.3	≥ 2.44	2.8	2.97
	FDA-15	BRASS	≥ 5.50	≥ 5.77	7.30	7.52
LITTELFUSE	313301	UNKNOWN	≥ 318.75	≥ 334.69	431.25	452.81
	313003	UNKNOWN	≥ 20.87	≥ 21.87	28.18	29.59
	314003	UNKNOWN	≥ 33.02	N/A	48.38	N/A
	314005	UNKNOWN	≥ 28.25	N/A	35.95	N/A
	314006	UNKNOWN	≥ 21.56	N/A	27.44	N/A

RESPONSE TIMES ARE NOT APPLICABLE AND ARE REPRESENTED BY (N/A) ON THE FUSE CHART.

NOTES:

1. FUSES WHICH HAVE BEEN IN SERVICE SHALL BE ALLOWED TO COOL TO ROOM TEMPERATURE BEFORE RESISTANCE TEST MEASUREMENTS ARE MADE. FOR CONSERVATISM THE 40°C RESISTANCE VALUES ARE APPLICABLE FOR ESTABLISHING TEST SETPOINTS. (EXCEPTIONS: BUSS 2432859, FWX-10 FRN-R80; GOULD A2K6R, A2K15R, A2K20R, A2K50R, A2K60R, A2Y6-1 OT-3, TR3.2R, TR6R, TR10R, TR15R, TR80R; LITTELFUSE 314003, 314005, 314006 FUSES SHALL BE TESTED AT 25°C (77°F ±5°F).
2. THE APPROPRIATE FUSE MANUFACTURER SHALL CONFIRM THAT THE MINIMUM RESISTANCE VALUES AT 25°C AND THE FUSE LINK MATERIAL OF APPLICABLE FUSES INSTALLED COMPLIES WITH THE ABOVE INFORMATION.
3. THE 25°C RESISTANCE VALUE CAN BE SUBSTITUED FOR ITS CORRESPONDING 40°C RESISTANCE VALUE (TEST SETPOINT VALUE) AS LONG AS THE AMBIENT TEMPERATURE IS VERIFIED TO BE 25°C (77°F ± 5°F).
4. BUSS FUSE PART NO. 2432859 IS A SPECIAL FUSE RECOMMENDED BY WESTINGHOUSE BUT PROCURED FROM BUSSMANN. SEE WESTINGHOUSE LETTER NSD-78-12, DATED 12-19-78 FOR FURTHER DETAILS.

GENERAL NOTES: -

1. THIS DRAWING IDENTIFIES OVERCURRENT PROTECTION DEVICES REQUIRED TO PROTECT CONTAINMENT PENETRATION ASSEMBLY CONDUCTORS IN ACCORDANCE WITH THE REQUIREMENTS OF NRC REGULATORY GUIDE 1.63, REVISION 1, DATED MAY 1977, AS INTERPRETED BY G/C INC.
2. THIS DRAWING IS IDENTIFIED AS NUCLEAR SAFETY RELATED SINCE IT CONTAINS INFORMATION FOR BOTH NON-CLASS 1E AND CLASS 1E PROTECTION DEVICES.
3. ALTHOUGH NRC REGULATORY GUIDE 1.63 REQUIRES THE USE OF TWO PROTECTIVE DEVICES WHEN PENETRATIONS CANNOT WITHSTAND THE MAXIMUM FAULT CURRENT INDEFINITELY, IT PERMITS THE USE OF NON-CLASS 1E PROTECTIVE DEVICES FOR PROTECTION OF NON-CLASS 1E CIRCUITS. HOWEVER, TO ENSURE THE CONTINUITY OF POWER TO CLASS 1E CIRCUITS, THE FAULT CURRENT PROTECTION DEVICES FOR CLASS 1E CIRCUITS MUST ALSO BE CLASS 1E.
4. THE LET-THRU ENERGY OF THE PROTECTIVE DEVICE SHALL NOT EXCEED THE SHORT CIRCUIT CURRENT WITHSTANDABILITY OF THE CONDUCTOR BEING PROTECTED.
5. THE SPECIFIC TEST SETPOINT AND ASSOCIATED RESPONSE TIME FOR EACH LISTED PROTECTIVE DEVICE WAS ESTABLISHED BY VENDOR SUPPLIED RECOMMENDATIONS AND/OR ENGINEERING EVALUATION.
6. EXCEPTIONS TO THE METHODOLOGY USED TO ESTABLISH SPECIFIC TEST SETPOINTS AND ASSOCIATED RESPONSE TIMES MAY EXIST. SPECIFIC TEST SETPOINT AND ASSOCIATED RESPONSE TIME VALUES MAY NOT ALWAYS BE CONSISTENT WITH VALUES DERIVED BY USING THE STANDARD METHODS.
7. CONTAINMENT PENETRATION ASSEMBLIES USED ON V.C. SUMMER NUCLEAR STATION WERE TESTED IN ACCORDANCE WITH IEEE 317 AND NRC REGULATORY GUIDE 1.63 USING MAXIMUM SHORT CIRCUIT CURRENT VALUES AND TIME REQUIREMENTS ESTABLISHED IN ACCORDANCE WITH ICEA STANDARD P-32-382 FORMULA.
8. AN EVALUATION TO ENSURE THAT ADEQUATE PRIMARY AND BACKUP OVERCURRENT PROTECTION, AND/OR JUSTIFICATION, EXISTS TO CONFIRM V.C. SUMMER NUCLEAR STATION COMPLIANCE TO NRC REGULATORY GUIDE 1.63 REQUIREMENTS IS DOCUMENTED, IN CALCULATION NO. DC-350001/56 WHICH HAS BEEN REPLACED BY CALCULATION NOS. DC08470-006 AND DC08470-013.
9. G/C INC. SHOULD REVIEW ANY DESIGN CHANGES INVOLVING SIZING, TEST SETPOINTS, AND RESPONSE TIMES OF EXISTING AND NEW PENETRATION PROTECTIVE DEVICES FOR CONCURRENCE WITH NRC REGULATORY GUIDE 1.63 PRIOR TO COMPLETION OF THOSE DESIGN CHANGES.
10. CALCULATION NO. DC-350001/56 * WAS REPLACED BY CALCULATION NOS. DC08470-006 AND DC08470-013. CALCULATION NO. DC08470-006 PROVIDES THE DESIGN BASES FOR ESTABLISHING THE PENETRATION PROTECTION DEVICE TEST SETPOINTS. CALCULATION NO. DC08470-013 EVALUTES THE PRIMARY AND BACKUP PROTECTION FOR EACH SET OF PINS FEED THROUGH THE PENETRATION BASED ON THE DEVICE SIZES AND SETTINGS TO ENSURE COMPLIANCE WITH THE REQUIREMENTS OF NRC REGULATORY GUIDE 1.63. THESE CALCULATIONS SHALL BE REVISED AS REQUIRED WHENEVER ANY INFORMATION AS SHOWN ON THIS DRAWING IS CHANGED OR NEW INFORMATION ADDED.
11. PERIODIC TESTING AND SURVEILLANCE OF CONTAINMENT PENETRATION CONDUCTOR OVERCURRENT PROTECTIVE DEVICES SHALL BE PERFORMED IN ACCORDANCE WITH THE REQUIREMENTS ESTABLISHED BY TECHNICAL SPECIFICATION, SECTION 3/4.8.4.
12. ACCEPTABLE REPLACEMENT FUSES IDENTIFIED ON TABLE 1 OF S-200-961 (CLASS 1E AND PENETRATION PROTECTION FUSE LIST) MAY BE USED IN LIEU OF THOSES SHOWN ON SHEETS 5 THROUGH 10 OF THIS DRAWING PROVIDING THAT THE APPLICABLE TEST SETPOINT (RESISTANCE VALUES) ARE USED.

	MANUFACTURER	TYPE	MATERIAL FUSE LINK	(MINIMUM) AT 25°C (77°F)	(MAXIMUM) AT 25°C (77°F)	(MINIMUM) AT 40°C (104°F)	(MAXIMUM) AT 40°C (104°F)
*	BUSSMAN	KTS-R80	UNKNOWN	≥ 1.0 MILLIOHM	1.3 MILLIOHMS		
	BUSSMAN	JJS-500	UNKNOWN	≥ 120 MICROHMS	150 MICROHMS		
	BUSSMAN	KTU-800	SILVER	≥ 76 MICROHMS	90 MICROHMS		
	GOULD	A6K-R80		≥			
	GOULD	A6T-500		≥			
	GOULD	A4BY-800		≥			
	BUSSMAN	NON-2	COPPER	≥ 72.5 MILLIOHMS	92.5 MILLIOHMS	≥ 76.7 MILLIOHMS	97.8 MILLIOHMS
	BUSSMAN	NON-1½	COPPER	≥ 115.0 MILLIOHMS	150.0 MILLIOHMS	≥ 121.6 MILLIOHMS	158.7 MILLIOHMS

THIS IS A NUCLEAR SAFETY RELATED DOCUMENT. NO DEVIATION SHALL BE INITIATED OR PERFORMED WITHOUT PRIOR DOCUMENTATION AND WRITTEN APPROVAL

NO.	DATE	BY	REVISION	CKD. BY	LE APPROVAL
8	6/14/99	HJM	REVISED PER CGSS-99-0173	CWH	CEH
7	5/28/99	RHM	REVISED PER CGSS-99-0311	MGR	SCS
6	4/29/99	DDJ	REVISED PER ECR-50144	RHM	GJR
5	09/03/93	JMH	REVISED PER MRF-22074	JHR	WLJ

FSAR Figure 8G-1

SOUTH CAROLINA ELECTRIC & GAS COMPANY

VIRGIL C. SUMMER NUCLEAR STATION

ELECTRICAL

CONTAINMENT PENETRATION CONDUCTOR OVERCURRENT PROTECTION DEVICES

DESIGN ENGINEERING — V. C. SUMMER NUCLEAR STATION JENKINSVILLE, S. C.

MADE: JMH | CHECKED: JHR | LE APPROVAL: WLJ

SCALE: NO SCALE | DRAWING NUMBER: E-224-532 | SHT. NUMBER: 1 | REV: 8

1/4" = 1'-0" 0' 5' 10' 15' 20'