Prepared by: [redacted]

CUTOUTS, FUSES, AND DISCONNECTS FOR OVERHEAD DISTRIBUTION LINES

015225

Asset Type:	Electric Distribution [redacted]	**Function:**	Construction, Maintenance, and Operation
Issued by:	[redacted]	**Date:**	9/5/2024

Rev. #26: This document replaces PG&E Document 015225, Rev. #25. For a description of the changes, see Page 21.

Purpose and Scope

This document provides ordering and application information for overhead cutouts, disconnects, and fuses.

References	Location	Document
Cutouts and Fuses for Underground Distribution Lines	UG-1: Switches	015226
Insulation Districts for Overhead Lines and Stations	OH: General	026300
Guide for Calculating Short Circuit Currents on Distribution Lines	ELS	027844
Application of Surge Arresters on Overhead Distribution Lines	OH: General	031822
Overcurrent Protection for Distribution Lines	FRO: OH Switches	038718A
Overhead Transformer Installation	OH: Transformers	056425
Fire Responsibility and Urban Wildland Fire Areas	OH: General	072148

Cutouts and Disconnects - Selection, Ordering, and Pictorial Index

Notes

1. All fault duties and short–circuit interrupting (SCI) capabilities shown on this document are in asymmetrical amperes unless otherwise noted.
2. Part 73B cutouts are no longer approved for purchase. Install approved cutouts with respective fuses if part 73B cutouts need to be replaced. **DO NOT USE** liquid fuses (Figure 8 on Page 5) for the clip–style cutouts. The large current–limiting fuse (Figure 9 on Page 5) for the clip–style cutouts are no longer approved for purchase. The replacements for these fuses are the ELF–LR (Energy Limiting Fuse–Liquid Replacement) fuse (Figure 10 on Page 5). The ELF–LR fuse is a Cal Fire exempt fuse. The smaller 8–inch ELF–LR fuses (Table 18 on Page 17) will also fit in the open link cutouts with the use of the fuse clips shown in Table 18 on Page 17. Follow TD–2908P–01 –JA243 for part 73B cutout operating guidance.
3. Starting in January, 2018, PG&E has switched over to polymer cutouts replacing the porcelain ones that have been in use for many years. The polymer cutouts have the same exact end fittings as the porcelain ones that we used but with polymer bodies thus weighing much less. After the cutover date, no porcelain cutouts are available for purchase. The only exception is the Part 57HSB, the 600A rated disconnects with porcelain body. It will continue be used for the foreseeable future until a suitable polymer Part 57HSB is identified. Refer to Table 2 on Page 6 for the codes for material ordering. In addition, the polymer Part 85H (ELF–Dropout) cutouts have been eliminated due to the Eaton–Cooper's polymer cutouts not being approved because the unacceptable design of the loadbuster hooks. However, the ELF–Dropout fuse cartridges can still be used with any existing (porcelain) Part 44H or a new polymer Part 44H. The resultant ELF–Dropout cutouts are still considered to be Cal Fire exempt equipment. All the material codes listed in Table 19 on Page 18 are placed in Do Not Purchase status.
4. The Cal Fire's Power Line Fire Prevention Guide defines exempt and non–exempt equipment. Fire areas are defined as SRA (State Responsibility Areas for Fire Protection), FRA (Federal Responsibility Areas for Fire Protection), and UWF (Urban Wildland Fire Areas) see Document 072148 for the fire area designations. To date, only cutout Parts 73B, 75H, and 63H have been classified as exempt equipment. However, we should stop using the Part number assigned to a cutout in determining its exempt status. Instead it's the fuse selected to use in the cutout that will make such determination. For example, a "T" fuse in a polymer Part 44H is non–exempt while an ELF–Dropout fuse in the same Part 44H cutout is exempt. One exception to this rule is the Part 75H cutout. A Part 75H cutout is made up of a Fault Tamer door and an S&C Part 44H polymer cutout and it has its own material code for ordering. PG&E will continue to purchase a Part 75H, even though the previous restriction on using only S&C or MacLean Power Systems (MPS) polymer Part 44H cutouts with Fault Tamer doors has been lifted based

on fit testing conducted by the Electric Distribution Standards group prior to cutover to polymer cutout. The Fault Tamer fuses can be used with any of the approved polymer Part 44H cutouts. And the resultant Fault Tamer cutouts are considered to be Cal Fire exempt equipment similar to the ELF−Dropout cutouts mentioned in Note 3 on Page 1. Of all the types of fuses in use at PG&E, “T” and “K” are non−exempt while “E”, “CL”, “FT”, “ELF−LR” and “ELF−Dropout” are exempt. In general, “T” type refers to open link fuses or universal link fuses; “K” type refers to universal fuses; “CL” refers to current−limiting fuses; “FT” refers to Fault Tamer fuse cartridges; “ELF−LR” refers to the full range current−limiting fuses for liquid fuse replacements and “ELF−Dropout” refers to full range current−limiting fuses similar to ELF−LR and power fuses are “E” type.

5. In support of the Wildfire System Hardening Initiative, follow the “Fire Area” path in the Fuse Application Decision Tree shown in Figure 20 on Page 20 when selecting cutout/fuse to use. Select riser and tap line cutouts based on load and fault duty requirements. Use fused cutouts when the fuses selected coordinate with other protective devices on the circuit. Solid blade cutouts can be installed ONLY when replacing a non−exempt fuse for line protection in High Fire Threat Districts (HFTD) & High Fire Risk Areas (HFRA). Follow vegetation clearing per TD−7112S. Install preferred EPSS overhead fault indicators after replacing non−exempt fuse with solid blade cutouts. At the time of this document release the Horstmann Navigator LM are the preferred fault indicators to support EPSS circuits. Refer to engineering document 064048 or latest bulletin for guidance. New installations of standalone solid blade cutouts **ARE NOT** to be installed in HFTD & HFRA. Solid blade cutouts **ARE NOT** to be installed in overhead transformer protection.
6. In non−fire areas, all new capacitor banks should be installed with Part 44H cutouts with “K” fuses. In fire areas, all new capacitor banks shall be installed with Part 63H cutouts with “E” fuses in accordance to Table 4 on Page 7. In the previous revision of the drawing, the fire area options were not available on 1,200 KVAR, 12 kV banks and 1,800 KVAR, 21 kV banks. For these two bank sizes, adequate coordination cannot be obtained with the Part 63H cutout fuses that were available at the time. Upon further study, it is apparent that a new 25kV SMU−20 65K Power Fuse matches very closed to the Kearney 65K link that makes it suitable to use in a polymer Part 63H cutout as fire areas alternative. Use code 602501 to order the SMU−20 65K Power Fuse. Furthermore, to prevent capacitor unit tank rupture, backup current−limiting fuses are required in high fault current areas. On Cooper/McGraw−Edison Type EX capacitor units, backup current−limiting fuses are required when the line−to−ground fault duty exceeds 10,000 amps. On capacitor banks with ABB/Westinghouse or GE capacitor units, backup current−limiting fuses are required when the line−to−ground fault duty exceeds the value shown below the fuse size in Table 4 on Page 7.

   Also, see Document 031822 for capacitor bank surge arrester requirements.
7. Standoff insulators add leakage distance in the bracket of crossarm−mounted cutout installations. Standoff insulators are required in 21kV AA installation areas (see Figure 5 on Page 5).
8. All current−limiting fuses that include the Fault Tamer, ELF−LR and ELF−Dropout generate what is known as peak−arc voltage during fuse operations. This peak−arc voltage is an overvoltage that drives the current down to zero before the next naturally occurring current zero, thus limiting the energy let−through into the transformers. But this peak−arc voltage may exceed the insulation rating of the equipment. A higher voltage rated fuse will generate a higher overvoltage. Therefore, it is not appropriate to use only one voltage−rated current limiting fuse at all of our distribution circuits of various system voltages. Manufacturer recommends that we can continue using 17kV rated Fault Tamer fuses on 12kV, 17kV and 21kV circuits, but not on 4kV circuits. Similarly, we can continue using 23kV rated ELF−LR and ELF−Dropout fuses on 3−wire 12kV, 17kV and 21kV circuits, but not on 4−wire 12kV and 4kV circuits. On 4kV and 4−wire 12kV circuits, select power fuses (E fuses) instead of current limiting fuses to correct this issue. Refer to changes in Table 6, Transformer Fuse Sizes for 2.4 to 4.8kV Circuits, on Pages 9 and 10 and Table 8, Transformer Fuses Sizes for 12 to 21kV Circuits, on Pages 11 and 12. In addition, the Fault Tamer, ELF−LR and ELF−Dropout are designed for transformer protection only. They should be limited for use on lateral or tapped line fusing. The reasons for such restriction are the difficulty in achieving proper coordination with any downstream lateral fuses and the limit on the available fuse sizing. Distribution Planning Engineer will need to review protection coordination and approve the usage of Fault Tamer or ELF fuses on line & lateral installations. The maximum size of Fault Tamer is 20 amps and ELF−Dropout is 30 amps.

Cutouts and Disconnects - Selection, Ordering, and Pictorial Index (continued)

9. Transformer Cutout and Fuse Selection

A. Refer to Table 6 on Page 9 or Table 8 on Page 11 and determine the available fuse types and sizes for the transformers.

B. In non-fire areas, select fuses in the following order (refer to Figure 20 on Page 20):

1. Use Type T universal in a Part 44H cutout, up to 100-amp maximum fuse size and 12,000-amp maximum SCI current.
2. Use Fault Tamer fuse in a Part 75H cutout or Fault Tamer in a polymer Part 44H cutout, up to 20−amp maximum fuse size and 22,400−amp maximum SCI.
3. Use ELF−Dropout fuse in a polymer Part 44H cutout, up to 30−amp maximum fuse size and 31,000−amp maximum SCI.
4. Use Type E power fuse in a Part 63H cutout, up to 200−amp maximum fuse size and 20,000−amp maximum SCI.

C. In fire areas, select fuses in the following order (refer to Figure 20 on Page 20):

1. Use Fault Tamer fuse in a Part 75H cutout or Fault Tamer in a polymer Part 44H cutout, up to 20−amp maximum fuse size and 22,400−amp maximum SCI.
2. Use ELF−Dropout fuse in a polymer Part 44H cutout, up to 30−amp maximum fuse size and 31,000−amp maximum SCI.
3. Use Type E power fuse in a Part 63H cutout, up to 200−amp maximum fuse size and 20,000−amp maximum SCI.

D. Fusing banks of unequally sized transformers.

1. Select fuses as if the bank consisted of three of the larger sized transformers.
2. Fuses supplying only the smaller transformer(s) are reduced to the size required for a bank of three of that size. This applies to open−delta, closed−delta, and wye banks.

Examples**:**

(a) A 15-50-15 closed-delta bank on 12 kV.

From Table 7 on Page 11: Use Column A in Table 8 (Page 11).

From Table 8 on Page 11: A 50-50-50 would require a 15T or 20E fuse.
A 15-15-15 would require a 6T or 5E fuse.

The two fuses that connecting the 50 and 15 banks are 15T or 20E. The one fuse that connecting 15 and 15 banks is reduced to a 6T or 5E.

(b) A 25-50 open-delta bank on 12 kV.

From Table 7 on Page 11: Use Column B in Table 8 (Page 11).
From Table 8 on Page 11: A 50-50 would require a 10T or 15E fuse.
A 25-25 would require a 6T or 5E fuse.

From Document 056425 (see Figure 22 on Page 23 titled “Open Delta, Tangent Construction”): The two fuses connecting the 50 bank are 10T or 15E. The third fuse that connecting only the 25 bank is reduced to a 6T or 5E.

E. Fusing three-phase and single-phase transformers on a single pole (Document 056425, see Figure 27 on Page 27 titled “Tangent Construction Single and Three-Phase Transformers on Same Pole”).

1. Select the fusing for the three-phase transformer.

Example**:**

A 75 kVA, 480 V, three-phase and a 10 kVA, 240 V, single-phase transformer on the same pole on 12 kV.
From Table 7 on Page 11: Use Column A in Table 8 (Page 11).
From Table 8 on Page 11: Use 10T or 10E fuses.

Note: If both transformers are very heavily loaded, it may be necessary to increase the fuse sizes by one size.

Note: Using a larger fuse than is called for in the tables can result in the transformer being damaged by faults in the secondary or service.

Cutouts and Disconnects - Selection, Ordering, and Pictorial Index (continued)

10. At field discretion, formed flat steel hooks on existing Part 57HSB disconnect switches can be replaced with the new style formed wire hooks. Order Code 342369 for a package of 12 formed wire hooks.

Table 1 Selection of Cutouts for Cable Risers and Line Fusing [1]

Application				Fuse Type	Mounting	Part Number	Figure Number
System Voltage (kV)	Load Current Max. (amps)	Max. Fault Duty Assy. (amps)	Location				
4–21	100	12,000	Non-Fire Areas	“T” Fuse Link	Bracket	44H	Figure 1 on Page 5
4–21	200	20,000	All Districts including Fire Areas	“E” Power Fuse	Bracket	63H	Figure 16 on Page 5
4–21	300	–	Non-Fire Areas	Solid Blade	Bracket	44HSB 2	Figure 1 on Page 5
4–21	600	–	Non-Fire Areas	Solid Blade	Bracket	57HSB 2	Figure 2 on Page 5

[1] When crossarm mounting the cutouts, order mounting bracket Code 180081.
[2] Use when fusing is not required or for use as bypass emergency loading or paralleling of circuits.

Cutouts, Fuses, and Disconnects for Overhead Distribution Lines

Cutouts and Disconnects – Selection, Ordering, and Pictorial Index (continued)

Note

1. Code 322127 includes the standoff insulator, 4-inch link, and all mounting hardware.

Cutouts

Figure 1
Parts 44H and 44HSB

Figure 2
Part 57HSB
(see Note 10 on Page 4)

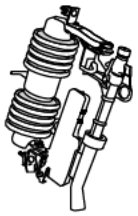


Figure 3
Part 75H

Figure 16
Part 63H

Figure 4
Part 73B
(see Note 2 on Page 1)

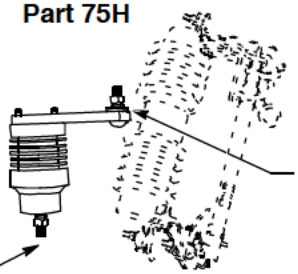


Figure 5
Standoff Insulator (see Note 1)
Use in 21 kV AA Areas to
Standoff Bracket Mounted Cutouts

Fuses

Figure 6
Open Link
(replacement fuse only)

Figure 7
Universal Link

Figure 8
Liquid and
Sand filled Fuses

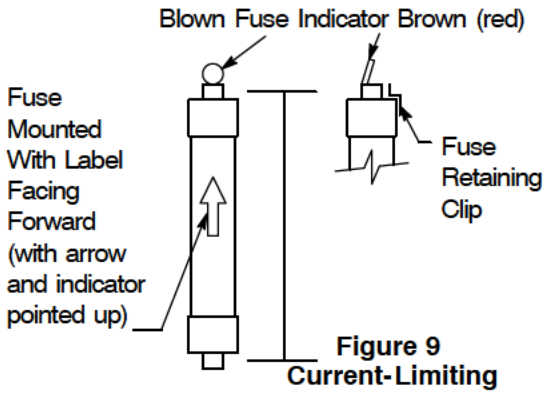


Figure 9
Current-Limiting
(Not approved for purchase. Use existing stock first.)

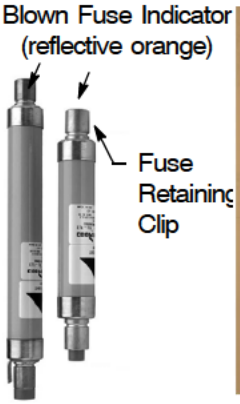


Figure 10
ELF-LR

Figure 11
Power

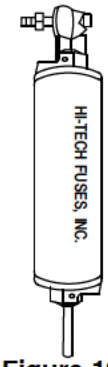


Figure 12
Backup
Current-Limiting Fuse

Figure 13
Fault Tamer
Fuse Cartridge

Figure 14
Fault Tamer,
Backup Limiter
(see Footnotes 1 and 2 in Table 16 on Page 15)

Figure 15
ELF–Dropout
Fuse Cartridge

Cutouts and Disconnects – Selection, Ordering, and Pictorial Index (continued)

Table 2 Data and Codes for Ordering Cutouts

Part Number	Code	Maximum Ratings					Minimum Porcelain Leakage (inches)
		Application Voltage (kV)	Rated Voltage (kV)	BIL (kV)	Load Current (amps)	Interrupting Current (amps)	
73B [1]	330175 [10]	21	23	125	20/15/20 [2]	1,800/20,000/43,000 [2]	15
75H [3, 6, 7]	330309	21	22	150	20	22,400	17
85H [3, 9]	–	21	23	150	30	31,000	17
44H [3, 8]	330306 [6]	21	27	150	100	12,000	17
63H [3]	330311	21	27	150	200	20,000	17
44HSB [4]	330307	21	27	150	300	–	17
57HSB [4]	341276 [11]	21	28.5	150	600 [5]	–	24

1 See Note 2 on Page 1.
2 With liquid fuse/with current–limiting fuse/with ELF–LR fuse.
3 Suffix H indicates that cutouts are equipped with hooks for use with Loadbuster tool.
4 Suffix HSB indicates disconnect solid blades are equipped with hooks for use with Loadbuster tool.
5 24–hour emergency load–current–capability rating is 828 amps.
6 In addition to the cutout that came with Part 75H, the Fault Tamer door can use any approved polymer Part 44H cutouts
7 To receive only the door for Part 75H cutouts, order the following three codes:

1) Fault Tamer Fuse Tube (Code 330126, from Table 17 on Page 16). (This code does not include the trunnion hot parts for the backup limiter.)
2) Backup Limiter (Code 330127, from Table 16 on Page 15). (This code also includes the trunnion hot parts.)
3) Fuse Cartridge. (Use the code for the amp rating required, from Table 16 on Page 15).

8 The polymer Part 44H cutouts can be used with both Fault Tamer and ELF–Dropout doors.
9 See Note 4 on Page 1 on the elimination of Part 85H cutouts as well as Eaton–Cooper polymer Part 44H cutouts.
10 The code is currently on a Do Not Purchase (DNP) status.
11 See Note 4 on Page 1 on the only porcelain cutouts still available.

Table 3 Manufacturers and Catalog Numbers for Cutouts

Code	Manufacturer and Catalog Number			
	Chance	S&C	MPS	Eaton Cooper
330175 [1]	–	85712	–	291801-1
330309	–	98018-P-D-S101	–	–
330306	TP710313P2B047	98018–P–D2	SC27SG112-D	–
330311	–	92123R3-P-D-S128	–	–
330307	TP710333P2B047	–	SC27SG300-D	–
341276	–	–	–	HOM236S

1 Part 73B is currently on a Do Not Purchase (DNP) status.

Selection of Fuse Sizes for Capacitors

Note

1. Capacitor Cutout and Fuse Selection.
   A. Use the capacitor fuse size and type shown in Table 4.
   B. For Type E power fuses, see Table 9 on Page 13, and use a Part 63H cutout.
   C. For Type K universal fuses, see Table 11 on Page 14, and use a Part 44H cutout.
   D. For backup current-limiting fuse, see Table 12 on Page 14.
   E. For Type K power fuse see Table 10 on Page 13, and use a Part 63H cutout.

Table 4 Selection of Fuse Sizes for Capacitors, see Note 6 on Page 2

Circuit Voltage	Bank Size	44H Cutout (code number) (see Table 11 on Page 14)	63H Cutout (code number) (see Table 9 on Page 13)	Backup Current-Limiting Fuse (code number) (see Table 12 on Page 14)
4 kV	300 kvar	**50K** (333380) 2,800 A SCI	**40E** (332274) 1,800 A SCI	**EXT50** (330108) 8.3 kV
12 kV	300 kvar	**15K** (333382) 4,200 A SCI	**15E** (332270) 3,200 A SCI	**EXT25** (330107) 8.3 kV
12 kV	600 kvar	**40K** (333379) 4,800 A SCI	**30E** (332273) 4,200 A SCI	**EXT50** (330108) 8.3 kV
12 kV	900 kvar	**50K** (333380) 5,800 A SCI	**40E** (332274) 4,200 A SCI	**EXT50** (330108) 8.3 kV
12 kV	1,200 kvar	**65K** (330217) 3,800 A SCI	**65K** (602501) 3,800 A SCI [1]	**EXT65** (330110) 8.3 kV
17 kV	300 kvar	**15K** (333382) 4,200 A SCI	**15E** (332270) 3,200 A SCI	**EXT25** (330111) 15.5 kV
17 kV	600 kvar	**30K** (333378) 5,800 A SCI	**20E** (332462) 4,600 A SCI	**EXT50** (330113) 15.5 kV
17 kV	900 kvar	**40K** (333379) 6,000 A SCI	**30E** (332273) 4,600 A SCI	**EXT50** (330113) 15.5 kV
17 kV	1,200 kvar	**50K** (333380) 5,200 A SCI	**40E** (332274) 4,000 A SCI	**EXT50** (330113) 15.5 kV
21 kV	300 kvar	**15K** (333382) 4,200 A SCI	**15E** (332270) 3,200 A SCI	**EXT25** (330111) 15.5 kV
21 kV	600 kvar	**20K** (333377) 6,000 A SCI	**15E** (332270) 4,600 A SCI	**EXT25** (330111) 15.5 kV
21 kV	900 kvar	**30K** (333378) 6,500 A SCI	**20E** (332462) 5,000 A SCI	**EXT50** (330113) 15.5 kV
21 kV	1,200 kvar	**40K** (333379) 5,200 A SCI	**30E** (332273) 4,200 A SCI	**EXT50** (330113) 15.5 kV
21 kV	1,800 kvar	**65K** (330217) 5,000 A SCI	**65K** (602501) 5,000 A SCI [1]	**EXT65** (330114) 15.5 kV

[1] See Note 7 on Page 2, on the new SMU-20 65k Power Fuse.

Selection of Fuse Sizes for Transformers

Notes

1. Transformer fuse sizes are provided in Table 6 on Page 9 and Table 8 on Page 11. In Columns A through E of these tables, five fuse types are listed: E, T, CL, FT, and ELF-LR. Liquid and power fuses are both E type. Open link fuses and universal link fuses are T type. CL refers to current-limiting fuses. FT refers to Fault Tamer fuse cartridges. ELF-LR refers to the full range current-limiting fuses for liquid fuse replacements. Fuse type is based on the cutout used. Refer to Page 3, “Cutout and Disconnects - Selection, Ordering, and Pictorial Index.” Transformers are fused at approximately 2.5 times their nominal rating.
2. See Note 10 on Page 3 for additional information regarding transformer fusing.

Table 5 Transformer Fuse Selection for 2.4 to 4.8 kV Circuits in Table 6

Circuit Voltage	Transformer Primary Connection	Use Column (Table 6)
2.4 kV	Closed Delta	A
	Open Delta or Single-Phase (L-L) [1]	B
4.16 kV	Closed Delta, (includes three-phase transformers) Wye, Open Wye, or SIngle-Phase (L-N). [2]	B
	Open Delta or Single-Phase (L-L) [1]	C
4.8 kV	Closed Delta	D
	Open Delta or Single-Phase (L-L) [1]	E

[1] L-L means transformers are connected line-to-line.
[2] L-N means transformers are connected line-to-neutral.

Selection of Fuse Sizes for Transformers (continued)

Table 6 Transformer Fuse Sizes for 2.4 to 4.8 kV Circuits [1]

Transformer kVA		Fuse Size – Amperes											
		Column A						Column B					
Single-Phase	Three-Phase	Type T	Type E	Type CL [2]	Type FT [2]	Type ELF-LR [2]	ELF-Dropout [2]	Type T	Type E	Type CL [2]	Type FT [2]	Type ELF-LR [2]	ELF-Dropout [2]
1.5	–	3	2	–	–	–	–	3	2	–	–	–	–
3	–	6	5	–	–	–	–	3	5	–	–	–	–
5	–	10	10	–	–	–	–	6	5	–	–	–	–
7.5	–	15	15	–	–	–	–	10	10	–	–	–	–
10	–	15	20	–	–	–	–	10	15	–	–	–	–
15	45	25	25	–	–	–	–	15	15	–	–	–	–
25	75	40	40	–	–	–	–	25	25	–	–	–	–
37.5	112-1/2	65	65	–	–	–	–	40	40	–	–	–	–
50	150	80	100	–	–	–	–	50	65	–	–	–	–
75	225	100	150	–	–	–	–	65	100	–	–	–	–
100	300	100	150	–	–	–	–	100	100	–	–	–	–
150	–	–	200	–	–	–	–	100	150	–	–	–	–
167	500	–	200	–	–	–	–	100	200	–	–	–	–
250	750	–	200	–	–	–	–	–	200	–	–	–	–

[1] E-rated fuses, up to 5-amp rating, are only available in liquid. E-rated fuses in sizes from 10 amps to 20 amps are available in liquid or power. E-rated fuses over 20 amps are only available in power fuses. Use liquid fuses in Part 74 or Part 73B cutouts, and use power fuses in Part 63H cutouts. FT fuses are for Fault Tamer fused cutouts. ELF-LR fuses are for clip-style cutouts. ELF–Dropout fuses are for ELF–Dropout cutouts.

[2] See Note 9 on Page 2 on the use of current-limiting fuses on 4kV circuits. Select the Type E power fuses instead.

Selection of Fuse Sizes for Transformers (continued)

Table 6 Transformer Fuse Sizes for 2.4 to 4.8 kV Circuits (continued) [1]

Transformer kVA		Fuse Size – Amperes																	
		Column C						Column D						Column E					
Single-Phase	Three-Phase	Type						Type						Type					
Single-Phase	Three-Phase	T	E	CL [2]	FT [2]	ELF-LR [2]	ELF-Dropout [2]	T	E	CL [2]	FT [2]	ELF-LR [2]	ELF-Dropout [2]	T	E	CL [2]	FT [2]	ELF-LR [2]	ELF-Dropout [2]
1.5	–	3	2	–	–	–	–	3	2	–	–	–	–	3	2	–	–	–	–
3	–	3	2	–	–	–	–	3	2	–	–	–	–	3	2	–	–	–	–
5	–	3	5	–	–	–	–	6	5	–	–	–	–	3	2	–	–	–	–
7.5	–	6	5	–	–	–	–	6	10	–	–	–	–	3	5	–	–	–	–
10	–	6	10	–	–	–	–	10	10	–	–	–	–	6	5	–	–	–	–
15	–	10	10	–	–	–	–	15	15	–	–	–	–	10	10	–	–	–	–
25	75	15	15	–	–	–	–	25	20	–	–	–	–	15	15	–	–	–	–
37.5	112.5	25	20	–	–	–	–	25	40	–	–	–	–	15	20	–	–	–	–
50	150	25	25	–	–	–	–	40	40	–	–	–	–	25	25	–	–	–	–
75	225	40	30	–	–	–	–	65	65	–	–	–	–	40	40	–	–	–	–
100	300	50	65	–	–	–	–	80	100	–	–	–	–	50	65	–	–	–	–
150	–	80	100	–	–	–	–	100	150	–	–	–	–	65	100	–	–	–	–
167	500	80	100	–	–	–	–	100	150	–	–	–	–	80	100	–	–	–	–
250	750	100	150	–		–	–	–	200	–	–	–	–	100	150	–	–	–	–

[1] E-rated fuses, up to 5-amp rating, are only available in liquid. E-rated fuses in sizes from 10 amps to 20 amps are available in liquid or power. E-rated fuses over 20 amps are only available in power fuses. Use liquid fuses in Part 74 or Part 73B cutouts, and use power fuses in Part 63H cutouts. FT fuses are for Fault Tamer fused cutouts. ELF-LR fuses are for clip-style cutouts. ELF–Dropout fuses are for ELF–Dropout cutouts.

[2] See Note 9 on Page 2 on the use of current-limiting fuses on 4kV circuits. Select the Type E power fuses instead.

Selection of Fuse Sizes for Transformers (continued)

Table 7 Transformer Fuse Selection for 12 to 21 kV Circuits in Table 8

Circuit Voltage	Transformer Primary Connection	Use Column (Table 8)
12 kV	Closed-Delta (includes three-phase transformers)	A [1]
	Open-Delta or Single-Phase (L-L)	B
17 kV	Closed-Delta (includes three-phase transformers)	C
	Open-Delta or Single-Phase (L-L)	D
21 kV	Closed-Delta (includes three-phase transformers)	B
	Open-Wye, Wye, or Single-Phase (L-N)	B
	Open-Delta or Single-Phase (L-L)	E

[1] Also applies to 7,200 V transformers Wye connected on 12 kV circuits.

Table 8 Transformer Fuse Sizes for 12 to 21 kV Circuits [1]

Transformer kVA		Fuse Size – Amperes											
Transformer kVA		Column A						Column B					
		Type						Type					
Single-Phase	Three-Phase	T	E	CL [3]	FT [3]	ELF-LR [3]	ELF-Dropout [3]	T	E	CL [3]	FT [3]	ELF-LR [3]	ELF-Dropout [3]
5	–	3	2	6	2	6	– [2]	3	2	6	1	6	– [2]
7.5	–	3	2	6	2	6	– [2]	3	2	6	2	6	– [2]
10	–	3	5	6	3	6	– [2]	3	2	6	2	6	– [2]
15	45	6	5	6	5	6	6	3	5	6	3	6	– [2]
25	75	10	10	15	7	8	8	6	5	6	5	6	6
37.5	112.5	15	15	15	10	12	12	10	10	15	7	8	8
50	150	15	20	–	15	18	18	10	15	15	10	8	8
75	225	25	25	–	20	20	20	15	20	15	15	12	12
100	300	40	40	–	–	–	25	25	20	–	15	18	18
150	–	50	65	–	–	–	30	25	25	–	20	–	20
167	500	50	65	–	–	–	30	40	40	–	–	–	25
250	750	80	100	–	–	–	–	50	65	–	–	–	30
333	1,000	100	150	–	–	–	–	65	65	–	–	–	30
500	1,500	100	200	–	–	–	–	100	100	–	–	–	–
667	2,000	–	200	–	–	–	–	100	150	–	–	–	–
–	2,500	–	200	–	–	–	–	100	150	–	–	–	–

[1] E-rated fuses, up to 5-amp rating, are only available in liquid. E-rated fuses in sizes from 10 amps to 20 amps are available in liquid or power. E-rated fuses over 20 amps are only available in power fuses. Use liquid fuses in Part 74 or Part 73B cutouts, and use power fuses in Part 63H cutouts. FT fuses are for Fault Tamer fused cutouts. ELF-LR fuses are for clip-style cutouts. ELF–Dropout fuses are for ELF–Dropout cutouts.

[2] Select the Fault Tamer fuse instead for better transformer overload protection.

[3] See Note 8 on Page 2 on the use of current-limiting fuses on 4–wire 12kV circuits. Select the Type E power fuses instead.

Selection of Fuse Sizes for Transformers (continued)

Table 8 Transformer Fuse Sizes for 12 to 21 kV Circuits (continued) [1]

Transformer kVA		Fuse Size – Amperes																	
		Column C						Column D						Column E					
		Type																	
Single-Phase	Three-Phase	T	E	CL[3]	FT[3]	ELF-LR[3]	ELF-Dropout[3]	T	E	CL[3]	FT[3]	ELF-LR[3]	ELF-Dropout[3]	T	E	CL[3]	FT[3]	ELF-LR[3]	ELF-Dropout[3]
5	–	3	2	6	1	6	– [2]	3	2	6	1	6	– [2]	–	–	–	1	6	– [2]
7.5	–	3	2	6	2	6	– [2]	3	2	6	1	6	– [2]	–	–	–	1	6	– [2]
10	–	3	2	6	2	6	– [2]	3	2	6	2	6	– [2]	3	2	6	2	6	– [2]
15	45	3	5	6	3	6	– [2]	3	2	6	2	6	– [2]	3	2	6	2	6	– [2]
25	75	6	10	15	5	8	6	3	5	6	3	6	– [2]	3	5	6	3	6	– [2]
37.5	112.5	10	10	15	7	8	8	6	5	6	5	6	6	6	5	6	5	6	6
50	150	15	15	15	10	12	12	6	10	15	7	8	8	6	10	15	5	6	6
75	225	15	20	–	15	18	18	10	15	15	10	8	8	10	10	15	7	8	8
100	300	25	25	–	20	20	20	15	15	15	15	12	12	15	15	15	10	12	12
150	–	40	40	–	–	–	25	25	20	–	20	18	18	15	20	–	15	18	18
167	500	40	40	–	–	–	25	25	20	–	20	20	20	15	20	–	15	18	18
250	750	65	65	–	–	–	30	40	40	–	–	–	25	25	25	–	20	–	20
333	1,000	80	100	–	–	–	–	50	65	–	–	–	30	40	40	–	–	–	25
500	1,500	100	150	–	–	–	–	65	100	–	–	–	–	50	65	–	–	–	30
667	2,000	100	150	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–
–	2,500	–	200	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–

[1] E-rated fuses, up to 5-amp rating, are only available in liquid. E-rated fuses in sizes from 10 amps to 20 amps are available in liquid or power. E-rated fuses over 20 amps are only available in power fuses. Use liquid fuses in Part 74 or Part 73B cutouts, and use power fuses in Part 63H cutouts. FT fuses are for Fault Tamer fused cutouts. ELF-LR fuses are for clip-style cutouts. ELF–Dropout fuses are for ELF–Dropout cutouts.

[2] Select the Fault Tamer fuse instead for better transformer overload protection.

[3] See Note 9 on Page 2 on the use of current-limiting fuses on 4–wire 12kV circuits. Select the Type E power fuses instead.

Fuse and Replacement Part Information

Notes

1. Once the required fuse size and the type of cutout is determined, select fuses from this section. Fuses footnoted as “not a recommended fuse size” should not be used, if possible. Using the recommended sizes reduces the need for truck and warehouse stock, makes fusing practices more consistent, and increases the likelihood that a troubleman will have the correct fuse size for emergency re-fusing. Replacement part information is provided for both equipment that is approved for purchase and existing equipment.
2. Do not salvage “Not Approved for Purchase” cutouts after removing them from service. Keep the fuse tube, door, or solid blade as replacement parts, but discard the porcelain.
3. In fire areas, do not substitute fuse type or size.

Table 9 Data and Codes for Type E Power and Liquid Fuses (see Figure 8 and Figure 11 on Page 5)

23 kV SMU-20 Power Fuses				23 kV Liquid Fuses [1]		
Amp Rating	Code	S&C Catalog Number	Type	Fuse Size (amps)	Code	Bussmann Catalog Number
2	–	–	–	2	332429 [2]	23LIF2E
5	–	–	–	5	332401 [2]	23LIF5E
10	332269	613010	S&C Standard	10	332307	23LIF10E
15	332270	713015	S&C Slow	15	332308 [2]	23LIF15E
20	332462	713020		20	332352	23LIF20E
25	332272	713025		–	–	–
30	332273	713030		–	–	–
40	332274	713040		–	–	–
50	332275	713050		–	–	–
65	332276	713065		–	–	–
80	332277	713080		–	–	–
100	332278	713100		–	–	–
150	332280	713150		–	–	–
200	332282	713200		–	–	–

[1] Not approved for purchase. Use existing stock first.
[2] The existing stock is exhausted. Use Table 6 on Page 9 and Table 8 on Pages 11 and 10 to find the appropriate replacement fuse.

Table 10 Data and Codes for Type K Power Fuse

23 kV SMU-20 Power Fuses				23 kV Liquid Fuses [1]		
Amp Rating	Code	S&C Catalog Number	Type	Fuse Size (amps)	Code	Bussmann Catalog Number
65	602501	703065	S&C Fast	–	–	–

[1] Not approved for purchase. Use existing stock first.

Table 11 Data and Codes for Universal Type K Fuse Links (see Figure 7 on Page 5)

Amp Rating	Universal Fuse Links		
	Code	Manufacturer and Catalog Number	
		Kearney	Cooper
15	333382	31015	FL3K15
20	333377	31020	FL3K20
30	333378	31030	FL3K30
40	333379	31040	FL3K40
50	333380	31050	FL3K50
65	330217	31065	FL3K65

Table 12 Data and Codes for Backup Current-Limiting Type EXT Fuses (see Figure 12 on Page 5)

Amp Rating	Backup Current-Limiting Fuses [1]		
	Code	kV Rating	Manufacturer and Catalog Number
			Hi-Tech Fuses
25	330107	8.3	HTDE 23U025
	330111	15.5	HTDE 24U025
50	330108	8.3	HTDE 239050
	330113	15.5	HTDE 249050
65	330110	8.3	HTDE 33U065
	330114	15.5	HTDE 34U065

[1] For capacitor fusing only.

Table 13 Current-Limiting Fuses - Clip Style (11-1/2") (see Figure 9 on Page 5) [1]

Fuse Size (amps)	Code	Manufacturer and Catalog Number
		Cooper/Bussmann/Brush
6	333392	23FDSH486E
15	333393	23FDSH4815E

[1] Not approved for purchase. Use existing stock first.

Table 14 ELF-LR Fuses, 17.2/23 kV, Clip Style (11-1/2") (see Figure 10 on Page 5)

Fuse Size (amps)	Code	Manufacturer and Catalog Number
		Cooper
6	330152	FAK71W6LR
8	330156	FAK71W8LR
12	330157	FAK71W12LR
18	330140	FAK71W18LR
20	330146	FAK71W20LR

Fuse and Replacement Part Information (continued)

Table 15 Data and Codes for Type T Fuse Links (see Figure 7 on Page 5)

Amp Rating	Universal Fuse Links (24")				
	Code	Manufacturer and Catalog Number			
		A. B. Chance	Kearney	Cooper	S&C
3	333083	M3TA23	–	FL3H3 [1]	–
6	333268	M6TA23	51006	FL3T6	279006
8 [2]	333269	M8TA23	51008	FL3T8	279008
10	333270	M10TA23	51010	FL3T10	279010
12 [2]	333271	M12TA23	51012	FL3T12	279012
15	333272	M15TA23	51015	FL3T15	279015
20 [2]	333273	M20TA23	51020	FL3T20	279020
25	333274	M25TA23	51025	FL3T25	279025
30 [2]	333275	M30TA23	51030	FL3T30	279030
40	333276	M40TA23	51040	FL3T40	279040
50	333277	M50TA23	51050	FL3T50	279050
65	333278	M65TA23	51065	FL3T65	279065
80	333279	M80TA23	51080	FL3T80	279080
100	333280	M100TA23	51100	FL3T100	279100

1 "H" Link.

2 Not a recommended fuse size. To reduce stock requirements and ensure sufficient coordination margins, avoid these intermediate fuse sizes.

Table 16 Data and Codes for Fault Tamer Fuses [3, 4] (see Figure 13 and Figure 14 on Page 5)

Amp Rating	Fuse Cartridge and Backup Limiter	
	Code Number	S&C Catalog Number
1	330134	527001
2	330132	527002
3	330130	527003
5	330129	527005
7	330128	527007
10	330125	527010
15	330133	527015
20	330131	527020
Backup Limiter [1, 2]	330127	98218

1 Fault Tamer has only one size backup limiter which is used with all fuse cartridge ampere sizes. The backup limiter will operate approximately 800A.

2 **Caution:** Do not overtighten the limiter nut. The maximum recommended torque is 10 foot-pounds.

3 See Note 8 on Page 2 on the correct application for the Fault Tamer fuses.

4 Based on the form–fit testing conducted prior to the approval of polymer cutouts, the Fault Tamer doors will fit in any of the approved polymer Part 44H cutouts.

Fuse and Replacement Part Information (continued)

Table 17 Data and Codes for Replacement Fuse Holders and Solid Blades

Fuse Holders				Solid Blades				
Part Number	Code	Manufacturer	Catalog Number	Part Number	Max. Cont. (amps)	Code	Manufacturer	Catalog Number
24H	331197	MPS	89522R10	24HSB	300	–	–	–
	–	–	–			331203	MPS	89622R10
43H	331241	MPS	89532R10	43HSB	300	–	–	–
	331255	Chance	T710213T			331203	Chance	T710233T
	–	–	–				MPS	89622R10
61H	331221	S&C	3095 (end fittings)			331268	ABB	279C606A21
44H	331241	MPS	89532R10	44HSB	300	–	–	–
	331255	Chance	T710213T			331203	Chance	T710233T
63H	331221	S&C	3095				MPS	89622R10
–	–	–	–			331268	ABB	279C606A21
–	–	–	–	63HSB	200	330077	S&C	3253
75H	330126 [1]	S&C	98522	–	–	–	–	–

[1] This code is for a Fault Tamer replacement fuse tube.

Fuse and Replacement Part Information (continued)

Table 18 Replacement Fuses and Fuse Clips for "Not Approved for Purchase" Cutouts (see Figure 6, Figure 8, Figure 10, and Figure 11 on Page 5)

Fuse Size (amps)	Type E Power Fuses, 15.5 kV			Liquid Fuses, 7.5 kV [1]		Open Fuse Links (8-1/2"), Type T, Rating 21 kV			ELF-LR, 8.3/13.2 kV Clip Style (8")	
	Code	S&C Catalog Number	Wesco Catalog Number [2]	Code	Bussmann Catalog Number	Code	Manufacturer and Catalog Number		Code	Cooper Catalog Number
							Cooper	Kearney		
2	–	–	–	332428	7.5LIF2E	–	–	–	–	–
3	–	–	–	–	–	333115	FL4H3	52003	–	–
5	–	–	–	332400	7.5LIF5E	–	–	–	–	–
6	–	–	–	–	–	333281	FL4T6	52006	330154	FAK81 W6LR
8	–	–	–	–	–	333282	FL4T8	52008	330138	FAK81 W8LR
10	332265	612010	–	332300	7.5LIF10E	333283	FL4T10	52010	–	–
12	–	–	–	–	–	333284	FL4T12	52012	330139	FAK81 W12LR
15	332248	712015	5978C92G01	332301	7.5LIF15E	333285	FL4T15	52015	–	–
18	–	–	–	–	–	–	–	–	330143	FAK81 W18LR
20	332456	712020	5978C92G02	332302	7.5LIF20E	333286	FL4T20	–	330147	FAK81 W20LR
25	332251	712025	5978C92G03	–	–	333287	FL37T25		–	–
30	332252	712030	5978C92G04	–	–	333288	FL37T30	–	–	–
40	332253	712040	5978C92G05	–	–	333289	FL37T40	–	–	–
50	332254	712050	5978C92G06	–	–	333290	FL37T50	–	–	–
65	332255	712065	5978C92G07	–	–	–	–	–	–	–
80	332256	712080	5978C92G08	–	–	–	–	–	–	–
100	332257	712100	5978C92G09	–	–	–	–	–	–	–
150	332259	712150	5978C92G11	–	–	–	–	–	–	–
200	332261	712200	5978C92G13	–	–	–	–	–	–	–
Fuse Clips for Use on 8.3/13.2 kV ELF-LR Fuses With Parts 22 and 23										
–	Code	Safety Line Catalog Number	–	–	–	–	–	–	–	–
–	331227	8570-P	–	–	–	–	–	–	–	–

1 Not approved for purchase. Use existing stock.
2 Do not purchase – For Reference Only.

Fuse and Replacement Part Information (continued)

Table 19 Data and Codes for ELF - Dropout Fuse Cutouts [1, 3]

Amp Rating	Code [2]	Cooper Catalog Number
6	330259	L9DEPO5A
8	330260	L9DEPO5B
12	330261	L9DEPO5C
18	330262	L9DEPO5D
20	330263	L9DEPO5E
25	330264	L9DEPO5F
30	330265	L9DEPO5G

1 See Note 3 on Page 1 on the elimination of Part 85H.
2 The codes are placed in Do Not Purchase status.
3 See Note 8 on Page 2 on the correct application for the ELF−Dropout fuses.

Table 20 Data and Codes for ELF-Dropout Fuse Cartridges (see Figure 15 on Page 5)

Amp Rating	Code	Cooper Catalog Number
6 [1]	330252	FAK45W6
8 [1]	330253	FAK45W8
12 [1]	330254	FAK45W12
18 [1]	330255	FAK45W18
20 [1]	330256	FAK45W20
25 [2]	330257	FAK45W25
30 [2]	330258	FAK45W30

1 Single barrel design.
2 Two barrel design.

Care and Handling and Installation of Type E Power Fuses

This applies to all sizes of Type E Power fuses from Table 9

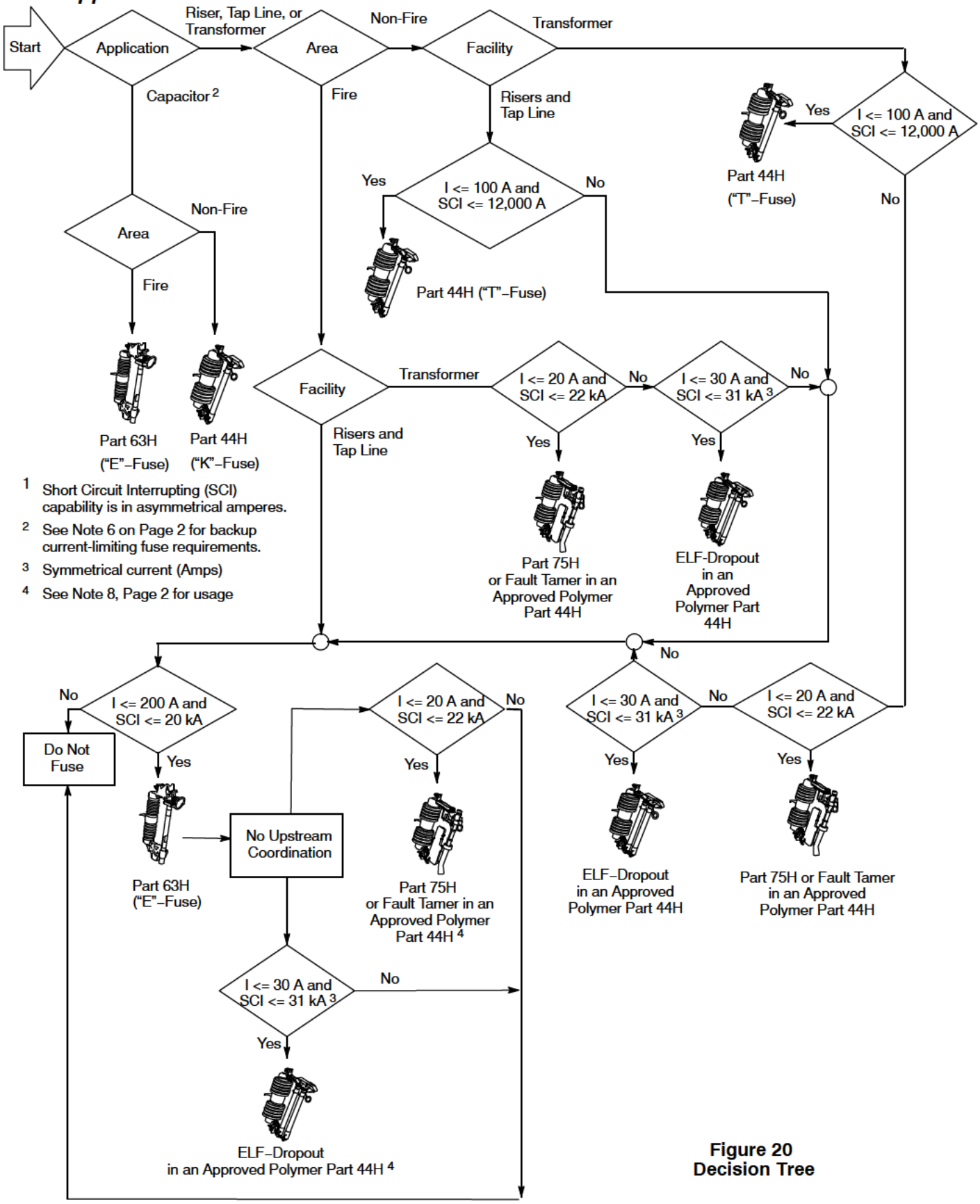
1. Power fuses are manufactured for outdoor use; however, proper care and storage of the fuse is critical.
   A. **ALWAYS STORE** fuses in as dry an environment as possible.
   B. **NEVER LEAVE** fuses in standing water.
   C. **DO NOT LEAVE** fuses hanging in the open position.
      1. IF fuse must be left open for an extended period, **THEN HANG** it on pole step.
   D. **LEAVE** fuses in the protective packaging until installation – this will prevent any water ingress, even if stored in a truck bin (see Figure 17).
2. IF it is unknown whether a power fuse has been exposed to standing water, **THEN DISCARD** the fuse for safety and fire prevention reasons.
3. **Only use hand tools** to install Power E fuses' end fittings. Ensure that there is a parallel gap after installing the end fittings. Over tightening end fittings will prevent fuse to drop out.

Figure 17
Fuse in Protective Packaging with Red Cap On

Figure 18
Proper End Fitting Installation

Figure 19
Improper End Fitting Installation

Fuse Application Decision Tree [1]



1 Short Circuit Interrupting (SCI) capability is in asymmetrical amperes.

2 See Note 6 on Page 2 for backup current-limiting fuse requirements.

3 Symmetrical current (Amps)

4 See Note 8, Page 2 for usage

Figure 20 Decision Tree

Revision Notes

Revision 26 has the following changes:

1. Revised Note 2 on Page 1.
   Deleted Note 3 on Page 1, Renumbered Noted.
2. Revised Note 2 on Page 1.
3. Revised Note 5 on Page 2.
4. Revised Section Title to “Care and Handling and Installation of Type E Power Fuses” on Page 19.
5. Added Note 3, Figure 18, and Figure 19 on Page 19.