

Primary Fuse Selection, Looped Radial System



1. Scope

This work practice provides Seattle City Light (SCL) personnel and contractors with the cross-reference tables necessary to select primary fuses, fuse links, and fault current limiters to protect overhead and underground distribution transformers, capacitor banks, and switchgear within the SCL Looped Radial System. Selection information for 4 kV legacy equipment is also provided.

See SCL 1065.11 for cutout and fuse selection.

Fault current limiting (FCL) fuses are also known as fault limiters or limiters.

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The following types of fuses are referenced in this work practice:

Fuse Type	Table Reference	
Back-Up Fault Current Limiter (FCL)	4.1a, 4.2a, 4.2b, 4.6	
Fuse link	4.1a, 4.2a, 4.2b, 4.3a, 4.3b, 4.6	
Molded Current-Limiting Fuse (MCLF) ^a	4.1b	
^a MCLF fuses are full-range current-limiting fuses.		
Bay-O-Net fuse	4.4	
Full-Range Current-Limiting Fuse	4.5	
Capacitor Bank Back-Up Fault Current Limiter (FCL)	4.6	

2. Application

This work practice is for SCL personnel and contractors to select the appropriate fuse for use in new and existing fuse holders and equipment on the SCL Looped Radial System.

3. Discussion

Fuses are installed throughout the Looped Radial system to isolate equipment and reduce damage when a line is subjected to a fault or when the equipment fails. For the electrical system to function properly, fuses must be selected appropriately to ensure faults are isolated and outages to the remainder of the distribution system are minimized.

Fuse selection is based on equipment kVA size, voltage, phasing, connection scheme, and overhead and underground application. Proper selection and coordination ensures that the load side (protecting) fuse operates before the source side (protected) fuse.

In a fault situation, an over-sized fuse can damage upstream material and equipment. An under-sized fuse can cause nuisance outages.

4. Selection Tables

4.1 Underground Transformer Fuses

Table 4.1a. Fuse Sizes for 26 kV, Padmount or Submersible, Single-Phase and Three-Phase, Wye-Connected Transformers Fed from Terminal Poles

Maximum Load / Phase (kVA)	Transformer Size		Fuse Link			Back-Up Fault Current Limiter (FCL)	
	Single-Phase (kVA)	Three-Phase (kVA)	Stock No.	Type	Rating (A)	Type	Stock No.
25	25	75	683706	3T	3	25K	014417
50	50	150	683708	6K	6	25K	014417
75–100	75–100	225–300	683710	10K	10	25K	014417
167	167	500	683711	15K	15	25K	014417
250	250	750	683713	25K	25	25K	014417
333	–	1000	683715	40K	40	50K	014418
500	–	1500	683717	50K	50	65K	014419
833	–	2000–2500	683718	65K	65	65K	014419
1000	–	3000	683724	100K	100	65K	014419

Table 4.1b. Fuse Sizes for 26 kV, Padmount, Three-Phase, Wye-Connected Transformers Fed from Underground or In-Building Vaults

Total Transformer Size (kVA)	Molded Current-Limiting Fuse ^a		
	Stock No.	Type	Rating (A)
0-750	012276	MCLF	25
1000	012277	MCLF	40
1500-2500	012278	MCLF	65

^a Molded current-limiting fuses are full-range current-limiting fuses.

4.2 Overhead Transformer Fuses

Table 4.2a. Fuse Sizes for 26 kV, Single-Phase and Three-Phase, Wye-Connected Transformers

Maximum Load / Phase (kVA)	Transformer Size		Fuse Link			Back-Up Fault Current Limiter (FCL)	
	Single-Phase (kVA)	Three-Phase Bank (kVA)	Stock No.	Type	Rating (A)	Type	Stock No.
25	25	75	683706	3T	3	12K	684920
50	50	150	683708	6K	6	12K	684920
75–100	75–100	225–300	683710	10K	10	12K	684920
167	167	500	683711	15K	15	25K	014417
250	250	750	683713	25K	25	25K	014417

Table 4.2b. Fuse Sizes for 26 kV, Open Wye-Open Delta Transformers

Transformer Size (kVA)	Fuse Link			Back-Up Fault Current Limiter (FCL)	
	Stock No.	Type	Rating (A)	Type	Stock No.
25	683706	3T	3	12K	684920
50	683708	6K	6	12K	684920
75–100	683710	10K	10	12K	684920
167	683711	15K	15	25K	014417

4.3 Legacy Padmount Transformer Fuses

These fuses are used with 4 kV padmount legacy transformers that are installed in Generation and other areas of the SCL electric distribution system.

Table 4.3a. Fuse Sizes for 4 kV, Single-Phase Legacy Transformers

Transformer Size		Fuse Link	
Single-Phase (kVA)	Stock No.	Type	Rating (A)
25	683706	10K	10
37.5–50	683711	15K	15
75	683713	25K	25
100	683715	40K	40
150–167	683717	50K	50

Table 4.3b. Fuse Sizes for 4 kV, Single-Phase and Three-Phase, Legacy Transformers

Transformer Size		Fuse Link		
Single-Phase (kVA)	Three-Phase (kVA)	Stock No.	Type	Rating (A)
5	–	683706	3T	3
7.5–10	–	683708	6K	6
15	–	683710	10K	10
25	75	683711	15K	15
37.5	112	683713	25K	25
50	150	683715	40K	40
75	225	683717	50K	50
100	300	683718	65K	65
150–167	500	683724	100K	100

4.4 Bay-O-Net Transformer Fuses

The RTE Bay-O-Net is limited to 2000 A interrupting capability at 15 kV. A 25K limiter must be used in series with the RTE Bay-O-Net. It should be located either on the terminal pole or in a vault adjacent to a padmount switch.

NX Type full-range current limiting fuses are carried in Spare Parts and not available from the Warehouse General Section.

Table 4.4. Fuse Sizes for 26 kV, Padmount or Submersible, Single-Phase and Three-Phase Transformers

Transformer Size		Bay-O-Net Fuse		
Single-Phase (kVA)	Three-Phase (kVA)	Stock No.	Rating (A)	Older NX Type
25	–	685101	8	FA4H6
50	–	685102	15	FA4H10
75	–	685102	15	FA4H12
100	–	685102	15	FA4H18
167	–	685103	25	FA4H25
–	150	685102	15	–
–	225	685102	15	–
–	300	685102	15	–
–	500	685102	15	–
–	750	–	–	FA4H35
–	1000	–	–	FA4H40
–	1500	–	–	2-FA4H35
–	2000	–	–	2-FA4H40
–	2500	–	–	2-FA4H40

4.5 Switchgear Fuses

Padmount, Metal-Enclosed Interrupter (MEI), and automatic transfer switchgear use full-range, current-limiting fuses.

Table 4.5. Fuse Sizes for 26 kV Transformers Fed from Padmount, MEI, and Source Transfer Switchgear

Total Transformer Size (kVA)	Full-Range Current-Limiting Fuse		
	Stock No.	Type	Rating (A)
0-750	014332	25X	25
1000	014331	40X	40
1500-2500	014330	65X	65

4.6 Capacitor Bank Fuses

Table 4.6. Fuse Sizes for Capacitor Banks

Capacitor Rating (KVAR)	Fuse Link			Capacitor Back-Up Fault Current Limiter	
	Stock No.	Type	Rating (A)	Type	Stock No.
4 kV, 60 KVAR, Fixed, Single-Phase	683713	25K	25	None	–
4 kV, 300 KVAR, Three-Phase	683717	50K	50	None	–
4 kV, 450 KVAR. Switched, Three-Phase	683718	65K	65	None	–
26 kV, 1200 KVAR, Three-Phase, Grounded Wye	683715	40K	40	50K	014418
26 kV, 1200 KVAR, Three-Phase, Floating Wye	683715	40K	40	50K	014418

5. References

SCL 1065.11; "Cutout and Fuse Selection"

6. Sources

Hall, Alan; SCL Manager and subject matter expert for 1065.17 (alan.hall@seattle.gov)

Newby, Lane; SCL Engineer and subject matter expert for 1065.17
(lane.newby@seattle.gov)

Shetab, Muneer; SCL Engineer and subject matter expert and originator for 1067.17
(muneer.shetab@seattle.gov)

SCL Construction Standard DU11-1 (canceled); "Fusing Schedule"

SCL Construction Standard D11-2; "27 kV Fault Limiter Installation"

SCL Material Standard 4507.90; "Switchgear, 27 kV, Three-Pole, Padmount"

SCL Material Standard 6820.90 (canceled); 27 kV Cutout, Open Type, Porcelain"

SCL Material Standard 6820.95; "27 kV Cutout, Open Type, Polymer"

SCL Material Standard 6837.10; "Links, Distribution Fuse"

SCL Material Standard 6839.45; Fuses 17.2 kV, Full-Range, Current-Limiting, Molded"

SCL Material Standard 6840.10; "Fuses, 15.5 kV, Full-Range, Current-Limiting, Type X"

SCL Material Standard 6840.20; "Fuses, 15.5 kV, Back-Up Fault Current-Limiting,
Type "K"