

11. CABLE SPECIFICATIONS 5kV, 15kV, AND 35kV RUBBER OR PLASTIC INSULATED CABLE

11.1 GENERAL

Only single conductor cables as described in this section are acceptable for connection to PECO Energy Company aerial or underground lines.

Before purchasing cable, which is to be terminated by the PECO Energy Company, approval must be obtained from the Company to assure dimensional compatibility with prefabricated cable terminators.

Customer's cables connected to the Company distribution facilities must have sufficient copper shielding to withstand the short-circuit currents that are characteristic of the system. To accommodate these short-circuit currents, the shielding specified herein is greater than the shielding most cable manufacturers and distributors offer on many of their "stock" cables. The Customer, and the Customer's agents, should be aware of this limitation on "stock" cables and be prepared to order cable with sufficient time for manufacturing.

The Company may provide assistance if the Customer should encounter difficulties in obtaining suitable service cable.

11.2 CONCENTRIC NEUTRAL

A concentric neutral cable consists of a copper or aluminum conductor, a semi-conducting thermosetting conductor shield, a thermosetting insulation, a semi-conducting thermosetting insulation shield and a concentric neutral of bare or coated copper wires. An insulating encapsulating polyethylene jacket is installed over the wires is required.

Table 11.1 - Acceptable 15kV and 35kV Cable

Item No.	Voltage (kV)	See Note	Compressed Conductor	Cu Concentric Neutral Conductor	Insulation Thickness	Extruded Shield	Jacket Min Point Thickness	Insulation Min	Insulation Max	Shield Min	Shield Max	Jacket Max
1	15	a	#2 7 Str. Al	10 x #14	.175"	.030"	.050"	.680"	.725"	.745"	.825"	1.163"
2	15		#2 7 Str. Cu	16 x #14	.175"	.030"	.050"	.680"	.725"	.745"	.825"	1.163"
3	15	e	4/0 19 Str. Cu	16 x #12	.175"	.030"	.045"	.905"	.950"	.970"	1.050"	1.422"
4	15		400 kcmil 37 Str. Al	16 x #14	.175"	.040"	.050"	1.110"	1.115"	1.195"	1.275"	1.587"
5	15	c	500 kcmil 37 Str. Cu	6 x #14	.175"	.040"	.050"	1.195"	1.240"	1.280"	1.360"	1.732"
6	15	c	750 kcmil 61 Str. Al	6 x #14	.175"	.040"	.050"	1.385"	1.430"	1.470"	1.550"	1.922"
7	15	c	1000 kcmil 61 Str. Al	6 x #14	.175"	.055"	.070"	1.530"	1.575"	1.645"	1.725"	2.097"
8	15	b	350 kcmil Cu	4 x 0.030 x 0.175"	.175"	.024"	.045"	.965"	1.045"	1.040"	1.105"	1.300"
9	15	b	500 kcmil Cu	4 x 0.030 x 0.175"	.175"	.024"	.045"	1.085"	1.165"	1.135"	1.255"	1.440"
10	35		1/0 19 Str. Al	16 x #14	.345"	.040"	.045"	1.080"	1.140"	1.160"	1.260"	1.548"
11	35		4/0 19 Str. Al	32 x #14	.345"	.040"	.045"	1.230"	1.290"	1.310"	1.410"	1.698"
12	35	c	750 kcmil 61 Str. Al	24 x #14	.345"	.055"	.070"	1.725"	1.785"	1.835"	1.935"	2.303"

Notes to Table 11.1

- (a) #2 aluminum cable is restricted to applications where 1) the Company specifically accepts its use, 2) the service is supplied from an aerial line with Company fuses, and 3) the Customer's connected transformers do not exceed 1800 kVA @ 13 kV or 500 kVA @ 4 kV.
- (b) Items 8 and 9 shall be compact round conductor with flatstrap neutral
- (c) Items 5, 6 and 7 require that a separate #2 AWG copper ground wire be run with the cable. Item 12 requires a 2/0 AWG copper ground wire be run with the cable.
- (d) #1/0 aluminum cable is restricted to applications where 1) the Company specifically accepts its use, 2) the service is supplied from an aerial line with Company fuses and 3) the Customer's connected transformers do not exceed 4500 kVA @ 35 kV.
- (e) Not a Company stock cable.

**SUGGESTED MANUFACTURERS OF CABLES
AND ACCESSORIES**

**APPROVED CABLE MANUFACTURERS
5. 15 & 35 kV**

	Type of Insulation	
	<u>EPR</u>	<u>XLP</u>
American Wire and Cable Co.		X
General Cable Co.	X	X
Hendrix Wire & Cable Corp.	X	
Kerite Company	X	
Okonite Company	X	
Nexans		X
Prysmian Corp.	X	X
Southwire Co.	X	X

The cable shall comply with all the requirements of the latest AEIC Specification for CrossLinked Polyethylene or the latest AEIC Specification for Ethylene Propylene Insulation.

CABLE TERMINATIONS AND SPLICES

When ordering terminations and splices, provide the supplier with specifications of the cables on which terminations and splices are to be installed. Cable specifications should include conductor size and type, diameter over insulation, type of shielding (e.g. concentric neutral or drain wire) and diameter over the jacket. If ordering connectors separately, provide the supplier with dimensions of connectors also.

5 kV TERMINATIONS

The cables shall be terminated in accordance with the manufacturers' recommendations for 5 kV outdoor terminals except the ground connection at the terminal shall be made with a #2 AWG or larger copper conductor

15 kV TERMINATIONS

Long barrel, compression terminal connectors are required on all terminations; except, approved clamp type terminal connectors may be used when terminating copper conductor cables in dry indoor locations. Circumferential type compression terminal connectors are required for aluminum conductors. Dual rated shearbolt terminal connectors may be used on both copper and aluminum conductors. Terminal connectors, as listed by the manufacturers, must be suitable for conductor size and material.

The following terminating kits are acceptable for the cables specified in table 11.1 only. The following terminations may or may not be suitable for cables not

meeting the dimensional requirements of table 11.1. The ground connection from all terminations shall be made with a #2 AWG or larger copper conductor.

#2. 15 kV CONCENTRIC NEUTRAL CABLE

<u>Manufacturer</u>	<u>Trade Name</u>
3-M Manufacturing Co.	Quick-Term III, 7642-S-2 (Outdoor) (Cold Shrink)
3-M Manufacturing Co.	Quick-Term III, 7642-T-110 (Indoor) (Cold Shrink)
Tyco/Raychem Corp.	HVT 151SJ (Outdoor) (Heat Shrink)

4/0 15kV CONCENTRIC NEUTRAL CABLE

3-M Manufacturing Co.	Quick-Term III, 7642-S-2 (Outdoor)
	Quick-Term III, 7653-S-4 (Outdoor)
	Quick-Term III, 7654-S-4 (Outdoor)
	Quick-Term III, 7643-T-110 (Indoor)
Tyco/Raychem Corp.	HVT 152-SJ (Outdoor) (Heat Shrink)
	TFT-151E (Cold Applied)
	TFT-152E (Cold Applied)

350 kcmil 15kV CONCENTRIC NEUTRAL CABLE

3-M Manufacturing Co.	Quick-Term III, 7654-S-4 (Outdoor)
	Quick-Term III, 7644-T-110 (Indoor)
Tyco/Raychem Corp.	HVT 152-SJ (Outdoor) (Heat Shrink)
	TFT-152E (Cold Applied)

400 kcmil, 15 kV CONCENTRIC NEUTRAL CABLE

3M Co.	Quick-Term III, 7654-S-4 [4/0–500] (Outdoor) Quick-Term III, 7644-T-110 (Indoor)
Tyco/Raychem	HVT152-SJ (Outdoor) (Heat Shrink)

500 – 750 kcmil, 15 kV CONCENTRIC NEUTRAL CABLE

3M Co.	Quick-Term III, 7654-S-4 (Outdoor) Quick-Term III, 7645-T-110 (Indoor)
Tyco/Raychem	HVT153-SJ (Outdoor) (Heat Shrink) TFT-153E (Cold Applied)

1000 kcmil, 15 kV CONCENTRIC NEUTRAL CABLE

3M Co.	Quick-Term III, 7655-S-4 (Outdoor) Quick-Term III, 7645-T-110 (Indoor)
Tyco/Raychem	HVT153-SJ (Outdoor) (Heat Shrink) TFT-154E (Cold Applied)

Tape terminations are acceptable provided the design is submitted to and approved by the Company.

NOTE: This specification applies only to rubber or plastic insulated cables. It does not exclude the use of paper and lead cable manufactured in accordance with the latest AEIC Specifications. The cable shall have a #2 AWG or larger copper conductor and a neoprene or plastic jacket.

15 kV SPLICES

The following splice kits are acceptable: (See Caution below.)

15 kv CONCENTRIC NEUTRAL CABLE

<u>Manufacturer</u>	<u>Trade Name</u>
Elastimold	15PCJ (Direct Buried)
3-M Company	Quick Splice 5400 QS Series 5411 (Direct Buried) 5412 QS II (Direct Buried) 5417A QS III
Tyco/Raychem	HVS 152X-S (heat shrink) CSJA-152X-PECO (cold shrink)

Specific kit numbers selected for appropriate cable type and dimensions. Follow the manufacturer's instructions when assembling the splice kits.

CAUTION

Continuity of cable neutral and copper tape shield must be maintained across splice.

Grounding eyes on splice housing must be connected to cable neutral of concentric neutral shielded cable.

Tape splices are acceptable for the cables listed in this section provided the design is approved by the PECO Energy Company.

Use shear colt connectors for Tyco CSJA splices.

15 kV ELBOWS

#2. 15 kv CONCENTRIC NEUTRAL CABLE

<u>Manufacturer</u>	<u>Trade Name</u>
Elastimold	166LR-A-5220 168DELR-6689-5220 with V2 Cap Indicating Lamp
Cooper Power Systems	LE215A04T

35 kV TERMINATIONS

The following terminating kits are acceptable for the cables specified in table 11.1 only. The following terminations may or may not be suitable for cables not meeting the dimensional requirements of table 11.1. The ground connection from all other terminations shall be made with a 1/0 or larger copper conductor.

1/0, 35 kV CONCENTRIC NEUTRAL CABLE

<u>Manufacturer</u>	<u>Trade Name</u>
3-M Manufacturing Co.	Quick Term III, 7655-S-4, 7663-S-8
Tyco/Raychem Corp.	HVT352 (Indoor), HVT352S (Outdoor)

4/0, 35 kV CONCENTRIC NEUTRAL CABLE

<u>Manufacturer</u>	<u>Trade Name</u>
3-M Manufacturing Co.	Quick Term III, 7655-S-4
Tyco/Raychem Corp.	HVT352 (Indoor), HVT352S (Outdoor)

750 kcmil, 35 kV CONCENTRIC NEUTRAL CABLE

<u>Manufacturer</u>	<u>Trade Name</u>
3-M Manufacturing Co.	Quick Term III, 7655-S-4 Quick Term III, 7656-S-4
Tyco/Raychem Corp	HVT353 (Indoor), HVT353S (Outdoor)

NOTE: This specification applies only to rubber or plastic insulated cables. It does not exclude the use of paper and lead cable manufactured in accordance with the latest AEIC Specifications. The cable shall have a 1/0 or larger copper conductor or a 4/0 AWG or larger aluminum conductor and a neoprene or plastic jacket.

35 kV SPLICES

The following splice kits are acceptable designs: (See caution below)

35 kV CONCENTRIC NEUTRAL CABLE

(PREMOLDED and Cold Shrink)

<u>Manufacturer</u>	<u>Trade Name</u>
3-M Company	Quick-Splice, 5661 (1/0) (Direct Buried), QS III 5467, QS III 5468
Elastimold	35PCJ (Direct Buried)
Tyco/Raychem	CSJA-352X-PECO

(HEAT SHRINK)

Tyco/Raychem	HVS-352X-S
--------------	------------

Follow the instructions provided by the manufacturer when assembling a splice kit.

CAUTIONS

1. Continuity of cable neutral must be maintained across splice.
2. Grounding eyes on splice housing must be bonded to cable neutral.
3. Use shear bolt connectors for Tyco CSJA splices.

35 kV ELBOWS

1/0 and 4/0, 35 kV CONCENTRIC NEUTRAL CABLE

Cooper	LE235D06 (1/0)
Cooper	LE235F09 (4/0)
Hubbell	9U01DBD655