

**Elbows, Deadbreak, Cold Shrink, 600 A, 125 kV BIL**



**1. Scope**

This standard covers the requirements for 600 A, 125 kV BIL, deadbreak elbows utilizing cold shrink technology. Elbows are also known as T-bodies, hammerheads, and separable connectors.

This standard applies to the following Seattle City Light (SCL) stock numbers:

Stock No.	Description	Conductor Range (AWG/kcmil)
014311	Cold Shrink 600 A Elbow Kit with Copper-Top, Compression Lug	#1 str-1/0 sol
014312	Cold Shrink 600 A Elbow Kit with Range-Taking, Shear Bolt	350-500 str
014313	Cold Shrink 600 A Elbow Kit with Range-Taking, Shear Bolt	750-1250 str
014314	Cold Shrink 600 A Elbow Kit with Copper-Top, Compression Lug and Integral 200 A Loadbreak Tap	#1 str-1/0 sol
014315	Cold Shrink 600 A Elbow Kit with Range-Taking, Shear Bolt and Integral 200 A Loadbreak Tap	350-500 str
014316	Cold Shrink 600 A Elbow Kit with Range-Taking, Shear Bolt and Integral 200 A Loadbreak Tap	750-1250 str
014317	Range-Taking, Copper-Top Compression Lug for 600A Elbow	#1 str-1/0 sol
014318	Range-Taking, Shear Bolt Lug for 600A Elbow	350-500 str
014319	Range-Taking, Shear Bolt Lug for 600A Elbow	750-1250 str

The requirements for 150 kV BIL, deadbreak elbows are outside the scope of this standard. See SCL 6863.25.

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## 2. Application

An elbow (separable connector) is a fully insulated and shielded system for terminating and electrically connecting an insulated power cable to electrical apparatus, other power cables, or both, so designed that the electrical connection can be readily established or broken by engaging or separating the connector at the operating interface.

The elbows specified in this material standard are intended for use on the following three-phase, 60 Hz systems:

- 13.8 kV, 3-wire, delta, where load consists of network type transformers with delta-connected primary and grounded wye-connected secondary
- 26.4 kV, 4-wire, solidly-grounded, wye-connected

Cold shrink technology provides range-taking capability and eliminates the need for cable adapters.

Elbow kits contain everything needed to make up a splice including the conductor lug.

The conductor lugs used with the kits specified in this standard are not interchangeable with the lugs typically used with traditional elbows that incorporate cable adapters.

#1-1/0 AWG kits, Stock Nos. 014311 and 014314, includes a compression lug. The remaining kits include a shear-bolt style lug. All lugs are appropriate for either copper or aluminum conductors.

Elbow housings Stock Nos. 014314, 014315, and 014316 include an integral 25 kV class, 200 A loadbreak tap. This tap is intended for testing and grounding purposes and not for carrying load. Elbows with integral loadbreak taps cannot be stacked.

Elbow kits, Stock Nos. 014312, 014313, 014315, and 014316 each include a copper ground adapter assembly. When splicing #1-1/0 AWG, round wire concentric neutral cable it is expected the concentric wires will be used to provide continuity.

For elbow kit-to-cable cross reference, see Table 4c.

For cable technical data, see SCL 0525.04.

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## 3. Industry Standards

Elbows shall meet the applicable requirements of the following industry standard:

**IEEE 386-2016**; "Standard for Separable Insulated Connector Systems for Power Distribution Systems Rated 2.5 kV through 35 kV"

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## 4. Requirements

Elbows shall meet the electrical requirements of Table 4a.

**Table 4a. Elbow Electrical Requirements**

Attribute	Requirement
Voltage class	25 kV
Maximum voltage rating (ph-g)	8.3 kV rms (delta systems) 15.2 kV rms (grounded wye systems)
BIL	125 kV crest
Continuous current rating	600 A rms (with all-aluminum compression connector) 900 A rms (with all-copper compression connector)
Short-time current rating, 0.17 S, x/r 20	25 kA rms, symmetrical
IEEE 386-2016 interfaces	Figure 12 - Interface 19 (new to IEEE 386-2016) Figure 13 - Interface 11 (previously Figure 11 in IEEE 386-2006)

Integral 200 A loadbreak tap interfaces shall meet the electrical requirements of Table 4b.

**Table 4b. Integral 200 A Loadbreak Tap Interface Electrical Requirements**

Attribute	Requirement
Voltage class	25 kV
Maximum voltage rating (ph-g/ph-ph)	15.2/26.3 kV rms
BIL	125 kV crest
Continuous current rating	200 A rms
Short-time current rating, 0.17 S, x/r 20	10 kA rms, symmetrical
IEEE 386-2016 interface	Figure 6 - Interface 7A (previously Figure 7 in IEEE 386-2006)

Elbow housings shall include:

- Capacitive test point
- Integral jacket seal
- Integral 200 A loadbreak tap interface (Stock Nos. 014314, 014315, and 014316 only)

Elbow kits shall include:

- Appropriately-sized, range-taking conductor lug
- Ground adapter<sup>1</sup> consisting of: covered, tinned #4 AWG copper braid with solder block, pin terminal on one end, and constant force spring
- Installation instructions
- Everything else, such as mastics and lubricants, needed to make up the elbow

<sup>1</sup> Stock Nos. 014311 and 014314 do not require a ground adapter.

Elbow kits shall be designed for use with the cables described in Table 4c.

**Table 4c. Elbow Kit-to-Cable Cross Reference**

<b>Elbow Kit Stock No.</b>	<b>Elbow with LBT<sup>1</sup> Kit Stock No.</b>	<b>Cable Stock No.</b>	<b>Conductor Size (AWG/kcmil)</b>	<b>Cable Construction</b>	<b>Insulation Overall Diameter Range (in)</b>	<b>Jacket Overall Diameter, Maximum (in)</b>
014311	014314	602027	#1 str	RWCN <sup>2</sup>	0.88-0.98	1.30
"	"	012098	1/0 sol	RWCN	0.88-0.97	1.35
014312	014315	012099	350 str	FS <sup>3</sup>	1.22-1.28	1.57
"	"	012100	500 str	FS	1.34-1.40	1.70
014313	014316	012101	750 str	FS	1.52-1.58	2.00
"	"	012102	1000 str	FS	1.67-1.73	2.10

<sup>1</sup> Loadbreak tap, 200 A  
<sup>2</sup> Round wire concentric neutral  
<sup>3</sup> Flat strap shield

Each elbow kit will include the items shown in Table 4d. (quantities of some components may vary with kit size.)

**Table 4d. Elbow Kit Component Images (not to scale)**



Cold shrink deadbreak elbow housing



Cold shrink deadbreak elbow housing with integral 200 A loadbreak tap



Threaded aluminum stud



Ground adapter



Range-taking copper-top compression lug



Range-taking shear bolt lug



Silicone grease packet



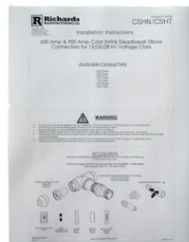
Jacket mastic



Sealing mastic



Stress control mastic



Installation instructions

## 5. Testing

Elbow housings shall be tested according to the requirements of IEEE 386, Section 7. Production tests shall include partial discharge, AC withstand, impulse withstand, and test point voltage.

Test results shall be provided upon request.

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## 6. Design Changes

Manufacturer shall inform Seattle City Light in writing of all design changes that could affect the understood or published capabilities of the product.

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## 7. Marking

Elbow housings shall be permanently marked according to the requirements of IEEE 386, Section 6.1.

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## 8. Packaging

Elbow kits shall be individually packaged to prevent damage during shipping, handling, and inside storage.

Each kit shall be legibly marked with the following information:

- Manufacturer identification
- Product description
- Date of manufacture (month and year)
- "Use before" date and storage conditions, if applicable
- Seattle City Light stock number

Each shipping container shall be legibly marked with the following information:

- Manufacturer's identification
  - Product description
  - Seattle City Light purchase order number
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## 9. Issuance

Stock Unit: EA

## 10. Approved Manufacturer

Stock No.	Description	Conductor Range (AWG/kcmil)	Richards Manufacturing Co. Catalog No.
014311	SSC Series Cold Shrink 600 A Elbow Kit with Copper-Top, Compression Lug	#1 str-1/0 sol	72CSHT1O8-SCL
014312	CSH Series Cold Shrink 600 A Elbow Kit with Range-Taking Shear Bolt	350-500 str	62CSHT1PR3-SCL
014313	CSH Series Cold Shrink 600 A Elbow Kit with Range-Taking Shear Bolt	750-1250 str	62CSHT1QR5-SCL
014314	CSH Series Cold Shrink 600 A Elbow Kit with Copper-Top, Compression Lug and Integral 200 A Loadbreak Tap	#1 str-1/0 sol	72CS8FT2O8-SCL
014315	CSH Series Cold Shrink 600 A Elbow Kit with Range-Taking Shear Bolt and Integral 200 A Loadbreak Tap	350-500 str	62CS8FT2PR3-SCL
014316	CSH Series Cold Shrink 600 A Elbow Kit with Range-Taking Shear Bolt and Integral 200 A Loadbreak Tap	750-1250 str	62CS8FT2QR5-SCL
014317	Range-Taking, Copper-Top, Compression Lug for 600A Elbow	#1 str-1/0 sol	P7ALCU-8
014318	Range-Taking, Shear Bolt Lug for 600A Elbow	350-500 str	P6AL-R3
014319	Range-Taking, Shear Bolt Lug for 600A Elbow	750-1250 str	P6AL-R5

## 11. References

**SCL Material Standard 6863.25**; "Separable Connector, Deadbreak, Dielectric Components, 150 kV BIL"

**SCL Work Practice 0525.04**; "Properties of Medium Voltage Cables"

## 12. Sources

**Shipek, John**; SCL Standards Supervisor, originator, and subject matter expert for 6863.20 (john.shipek@seattle.gov)

**Richards Manufacturing Co.**; CSH Series, Cold Shrink Hammerhead 2016 Product Guide, MVCSH1115

**Richards Manufacturing Co.**; Deadbreak Shear Bolt Lug, Product Data Sheet, P6ALR 0316

**Richards Manufacturing Co.**; CSHN/CSHT Product Family Installation Instructions, 600 Amp & 900 Amp Cold Shrink Deadbreak Elbow Connectors for 15/25/28 kV Voltage Class, RP-II-62CSH-CN, Rev. B