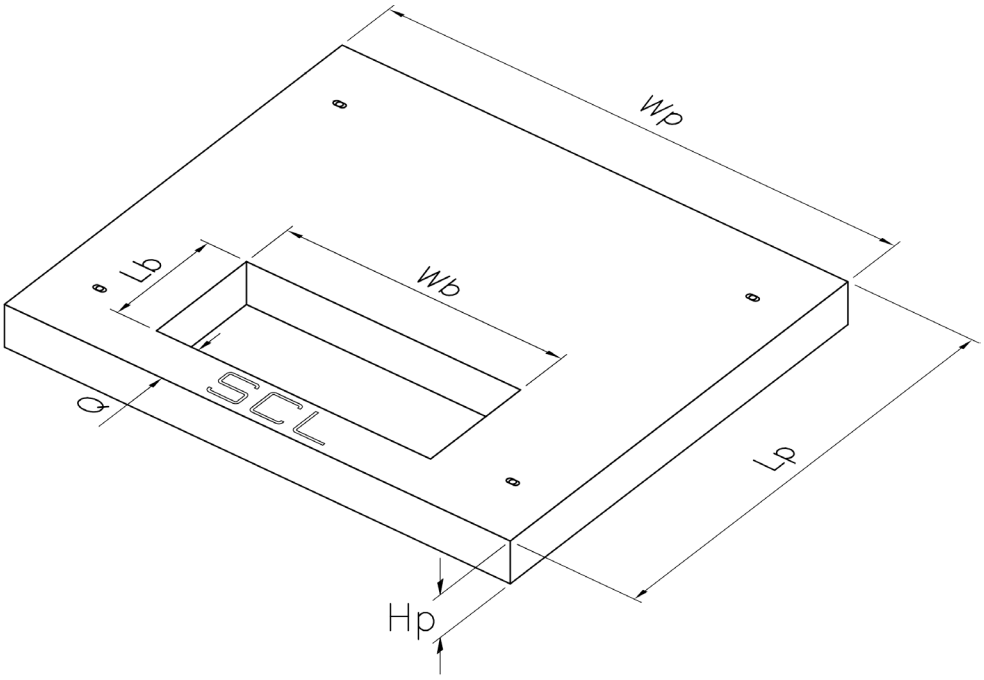
Seattle City Light

Volume 2

Material Standards

December 2015



Seattle City Light

Material Standards

Volume 2 of 2

December 2015

Welcome to your 2015 edition of the Material Standards.

Seattle City Light construction, design, and material standards, as well as our stock catalog, define the utility's best practices. Compliance with standards is mandatory for all City Light employees and contractors. Your cooperation in this compliance is essential to our shared success.

Phil West, Customer Services and Energy Delivery Officer

Seattle City Light
Material Standards 2015

Published by the Seattle City Light Standards Org

Prepared by Laura Vanderpool and Jamie Eby

Seattle, Washington
December 2015

Preface

MATERIAL STANDARDS VOLUME 2 (6800–8999)

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The Standards org runs four committees: Looped Radial, Network, Grounding, and Streetlight. If you have a standards-related question or problem, please bring it to the attention of the Chair or Clerk.

Be aware that security requires those without keycard rights to obtain a pass on the 32nd floor to reach City Light offices and meeting rooms.

Looped Radial

The Looped Radial Standards Committee discusses and solves problems related to design, construction methods, and material used to construct and maintain our overhead and underground distribution systems.

Date: Second Tuesday of each month
Time: 9:00 a.m. to 11:30 a.m.
Location: Confirm with the Standards org

Chair: John Shipek, (206) 684-3950
Clerk: Quan Wang, (206) 386-1785

Network

The Network Standards Committee discusses and solves problems related to design, construction methods, and material used to construct and maintain our network distribution systems.

Date: Third Tuesday of each month
Time: 9:00 a.m. to 11:00 a.m.
Location: Confirm with the Standards org

Chair: Brett Hanson, (206) 684-3726

Grounding

The Grounding Standards Committee discusses and solves problems related to design, construction methods, and material used to construct and maintain our grounding system.

Date: Third Tuesday of each month
Time: 10:00 a.m. to 11:30 a.m.
Location: Confirm with the Standards org

Chair: Brett Hanson, (206) 684-3726

Streetlight

The Streetlight Standards Committee discusses and solves problems related to design, construction methods, and material used to construct and maintain our streetlight system.

Date: Second Wednesday of each month
Time: 10:00 a.m. to 12:00 p.m.
Location: Confirm with the Standards org

Chair: Yaochiem Chao, (206) 684-3076

Online Access

Internal
Employees can access all City Light standards at http://sclweb/engstds/ ("The Red Page").

External
The public can access all standards, except design standards, at http://www.seattle.gov/light/engineerstd/ ("The Blue Page")

Recent Revisions

New standards and revisions are published regularly on both the internal and external sites. Be sure to check there for the most recent version of any standard.

You can also view a chronological list of recent revisions at http://sclweb/engstds/revDate.aspx.

Corrections and Additions

To submit corrections or additions to City Light standards, please see SCL 0010.07, "How to Mark Up and Submit a Standard for Revision."

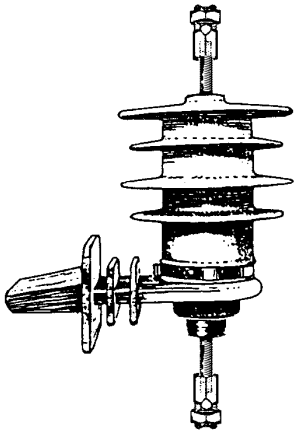
Book Distribution

Print
We provide printed books to internal users who place advance orders. A limited supply of printed books will be available for those who missed the order deadline.

Digital
We publish digital versions of all Standards books on the internal City Light Standards page ("The Red Page") at http://sclweb/engstds.

Important: We update standards and stock catalog pages throughout the year. As a result, print and digital books might not reflect the most recent revisions. Visit The Red Page to view the latest revision of a standard or stock catalog entry.

3kV HEAVY DUTY DISTRIBUTION CLASS METAL-OXIDE SURGE ARRESTER



680002

1. Scope

This Material Standard applies to surge arresters used on a 4160GrdY/2400 volt power system. Surge arresters will be installed on riser poles to protect underground cable and equipment.

2. Industry Standards

Surge arresters shall meet all applicable requirements of the following national standard:

IEEE C62.11-1999, Standard for Metal-Oxide Surge Arresters for AC Power Circuits (> 1 kV)

3. Electrical Requirements

Class (recognized by IEEE C62.1 1):	Heavy Duty Distribution
Subclass (recognized by industry):	Riser Pole
Type:	Metal-Oxide
Duty-Cycle Rating:	3 kV rms
Maximum Continuous Operating Voltage (MCOV):	2.55 kV rms
Maximum Front-of-Wave Voltage Cresting in 0.5 Microseconds for **10 kA** Wave:	10.3 kV crest
Maximum Discharge Voltage for 8 X 20 Microsecond **5 kA** Wave:	8.6 kV crest
Maximum Discharge Voltage for 8 X 20 Microsecond **20 kA** Wave:	10.4 kV crest
Minimum Symmetrical RMS Fault-Current Withstand Rating:	20 kA rms
Minimum Temporary Overvoltage Capability for Three Seconds at 60 Degrees Centigrade Ambient and No Prior Energy Absorption (Overvoltage/MCOV):	1.4 per Unit

STANDARDS COORDINATOR	STANDARDS SUPERVISOR	UNIT DIRECTOR
John Shipek	John Barnett	Hardev Juj

4. Construction

Housing Material: ..... Polymer.

Housing Material/Hanger Bracket Color: ..... Gray.

Ground Lead Isolator: ..... Required.

Terminal - Top: ..... 3/8-16˝ stainless steel stud with Penn Union STS-4, Burndy KF-23, or Dossert DGG-6 connector (Stock No. 668872).

Terminal - Bottom: ..... 3/8-16 stainless steel stud with Penn Union STS-4, Burndy KF-23, or Dossert DGG-6 connector (Stock No. 668872).

Nameplate: ..... Required per IEEE C62.11-1999, Section 10.1 Identification data.

6. Marking and Packaging

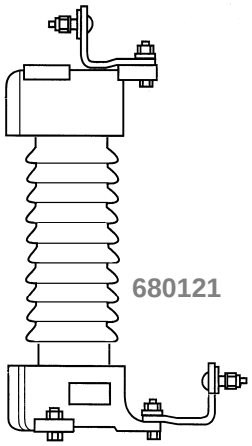
Surge arresters shall be packaged fully assembled, one per cardboard box. Each package shall be legibly marked with manufacturer's name or symbol, product description, and quantity contained. Shipping containers shall be marked with manufacturer's name or symbol and Seattle City Light's purchase order number. A packing slip shall be included with each shipment.

7. Stock Unit: EA

8. Stock Number 680002

Approved Manufacturers	Type	Catalog Number
Cooper Power Systems	Vari-Star	URS0303-0M1X-1A1A
General Electric	Tranquell	9L27HXX003
Hubbell (Ohio Brass)	PVR	221603-7111
Joslyn Manufacturing Co.	ZJP	ZRP003-0000000

21 KV INTERMEDIATE CLASS, PORCELAIN, METAL-OXIDE SURGE ARRESTER



1. Scope

This Material Standard applies to 21 kV duty-cycle rating, intermediate class, porcelain-housed, metal-oxide surge arresters.

2. Application

Intermediate class surge arresters are intended for use on maximum 26400GrdY/15240 Volt power systems in areas where the fault duty is nominally between 20 kA and 40 kA rms symmetrical.

Porcelain surge arresters are used to construct terminal riser poles.

In situations where vertical pole space is limited, refer to Material Standard 6801.6 - 21 kV Intermediate Class, Polymer, Metal-Oxide Surge Arrester.

In areas where the fault duty is less than 20 kA, refer to Material Standard 6801.4 - 21 kV, Heavy Duty Distribution Class, Polymer, Metal-Oxide Surge Arrester.

Surge arresters designed with gaps (6801.4) offer slightly better electrical performance than surge arresters designed without gaps (6801.3 and 6801.6). Intermediate class arresters are not available with gaps.

3. Industry Standards

Surge arresters shall meet all applicable requirements of the following national standard:

IEEE C62.11-1999, Standard for Metal-Oxide Surge Arresters for AC Power Circuits (> 1 kV)

STANDARDS COORDINATOR	STANDARDS SUPERVISOR	UNIT DIRECTOR

4. Electrical Requirements

Class (recognized by IEEE C62.11):	intermediate
Type:	metal-oxide
Duty-Cycle Rating:	21.0 kV rms
Maximum Continuous Operating Voltage (MCOV):	17.0 kV rms
Maximum Front-of-Wave Voltage Cresting in 0.5 Microseconds for **5 kA** Wave:	60.6 kV crest
Maximum Discharge Voltage for 8 X 20 Microsecond **5 kA** Wave:	50.8 kV crest
Maximum Discharge Voltage for 8 X 20 Microsecond **20 kA** Wave:	61.8 kV crest
Minimum Symmetrical RMS Fault-Current Withstand Rating:	40 kA rms
Minimum Temporary Overvoltage Capability for Three Seconds at 60 Degrees Centigrade Ambient and No Prior Energy Absorption (Overvoltage/MCOV):	1.4 per unit

5. Construction

Housing Material:	porcelain
Housing Material/Hanger Bracket Color:	gray
Ground Lead Isolator:	not required or desired
Terminal – Top:	metal with three 0.625 inch diameter holes on 8.75 inch bolt circle
Terminal – Bottom:	metal with three 0.625 inch diameter holes on 8.75 inch bolt circle
Height:	23 inches, +/- 1 inch
Cantilever Strength (minimum):	5,000 in-lbs.
Nameplate:	required per IEEE C62.11-1999, Section 10.1 identification data

7. Marking and Packaging

Surge arresters shall be packaged fully assembled, one per cardboard box or wood crate. Each package shall be legibly marked with manufacturer's name or symbol, product description, and quantity contained. Shipping containers shall be marked with manufacturer's name or symbol and Seattle City Light's purchase order number. A packing slip shall be included with each shipment.

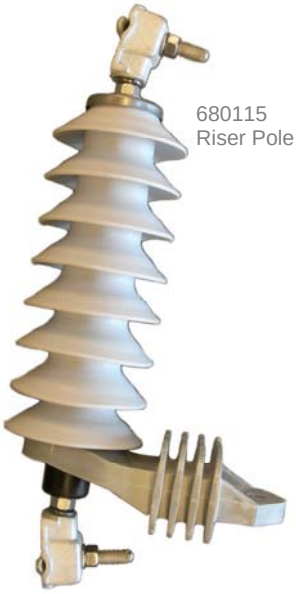
8. Stock Unit: EA

9. Manufacturers

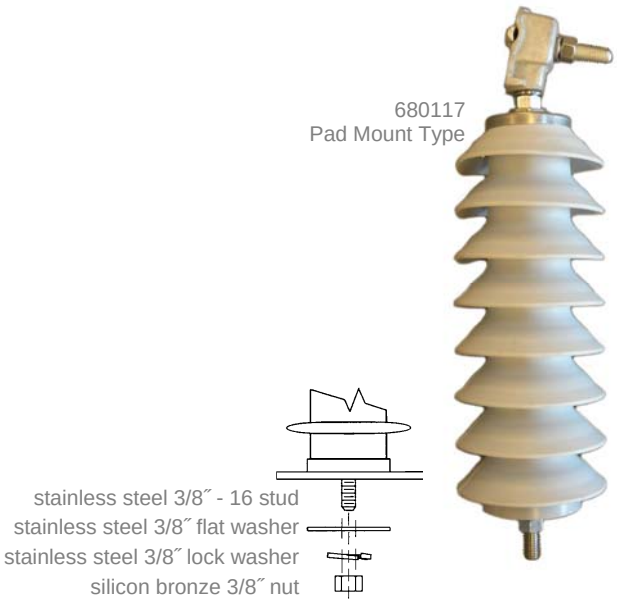
Stock Number 680121

Approved Manufacturer	Type	Catalog Number
Cooper Power Systems	AZF	AZF1A21

21 KV HEAVY DUTY DISTRIBUTION CLASS, POLYMER, METAL-OXIDE SURGE ARRESTER



680115
Riser Pole Type



680117
Pad Mount Type

1. Scope

This Material Standard applies to 21 kV duty-cycle rating, heavy duty distribution class, polymer-housed, metal-oxide surge arresters.

2. Application

Heavy duty distribution class surge arresters are intended for use on maximum 26400GrdY/15240 Volt power systems in areas where the nominal fault duty is less than 20 kA rms symmetrical.

In areas where the fault duty is greater than 20 kA, refer to Material Standard 6801.60 - 21 kV, Intermediate Class, Polymer, Metal-Oxide Surge Arrester.

Surge arresters designed with gaps (6801.40) offer slightly better electrical performance than surge arresters designed without gaps (6801.3 and 6801.60). Intermediate class arresters are not available with gaps.

This Material Standard applies to two types of surge arresters. The first type of surge arrester is installed on riser poles to protect underground cable and equipment. The second type is installed inside pad mount switches. These two surge arresters differ only in their bottom terminal hardware.

This Material Standard applies to two types of surge arresters. The first type of surge arrester is installed on riser poles to protect underground cable and equipment. The second type is installed inside pad mount switches. These two surge arresters differ only in their bottom terminal hardware and ground lead isolator.

3. Industry Standards

Surge arresters shall meet all applicable requirements of the following national standard:

IEEE C62.11-1999, Standard for Metal-Oxide Surge Arresters for AC Power Circuits (> 1 kV)

4. Electrical Requirements

Class (recognized by IEEE C62.11):	heavy duty distribution
Subclass (recognized by industry)	riser pole
Type:	metal-oxide
Duty-Cycle Rating:	21.0 kV rms
Maximum Continuous Operating Voltage (MCOV):	17.0 kV rms

standards coordinator	*standards manager*	*unit director*
John Shipek	John Shipek	Pamela S. Johnson

4. Electrical Requirements, continued

Maximum Front-of-Wave Voltage Cresting in 0.5 Microseconds for **10 kA** Wave: ..... 64.8 kV crest

Maximum Discharge Voltage for 8 X 20 Microsecond **5 kA** Wave: ..... 46.3 kV crest

Maximum Discharge Voltage for 8 X 20 Microsecond **20 kA** Wave: ..... 57.9 kV crest

Minimum Symmetrical RMS Fault-Current Withstand Rating: ..... 20 kA rms

Minimum Temporary Overvoltage Capability for Three Seconds at 60 Degrees Centigrade Ambient and No Prior Energy Absorption (Overvoltage/MCOV): ..... 1.78 per unit

5. Construction

Housing Material: ..... silicon rubber

Housing Material/Hanger Bracket Color: ..... gray

Ground Lead Isolator for Stock No. 680115 (riser pole required

Ground Lead Isolator for Stock No. 680117 (pad mount): ..... not required or desired

Terminal – Top (both types): ..... 3/8-16 stainless steel stud with Penn Union STS-4, Burndy KF-23, or Dossert DGG-6 connector (Stock No. 668872), or approved equivalent

Terminal - Bottom for Stock No. 680115 (riser pole): ..... 3/8-16 stainless steel stud with Penn Union STS-4, Burndy KF-23, or Dossert DGG-6 connector (Stock No. 668872), or approved equivalent

Terminal - Bottom for Stock No. 680117 (pad mount): ..... 3/8-16 stainless steel stud with one stainless steel flat washer, one stainless steel lock washer, and one silicon bronze nut

Nameplate: ..... required per IEEE C62.11-1999, Section 10.1 Identification data

7. Marking and Packaging

Surge arresters shall be packaged fully assembled, one per cardboard box. Each package shall be legibly marked with manufacturer's name or symbol, product description, and quantity contained. Shipping containers shall be marked with manufacturer's name or symbol and Seattle City Light's purchase order number. A packing slip shall be included with each shipment.

8. Stock Unit: EA

9. Manufacturers

Stock Number 680115
Riser Pole Type Arrester

Approved Manufacturer	Catalog Number
Cooper Power Systems	URT2109-0M1X-1A1A
	URG2109-0M1X-1A1A

Stock Number 680117
Pad Mount Type Arrester

Approved Manufacturer	Catalog Number
Cooper Power Systems	URT2109-0M0D-0A1A
	URG2109-0M0D-0A1A

10. References

Shipek, John; SCL Standards Engineer, subject matter expert of 6801.40 (john.shipek@seattle.gov)

235-99; UltraSIL Polymer-Housed Evolution (10 kA) Surge Arresters; (Electrical Apparatus); Cooper Power Systems, September 2008

21 kV Intermediate Class, Polymer, Metal-Oxide Surge Arrester

012593
Riser pole type

1. Scope

This standard applies to 21 kV duty-cycle rating, intermediate class, polymer-housed, metal-oxide surge arresters.

2. Application

Intermediate class surge arresters are intended for use on maximum 26400GrdY/15240 volt power systems in areas where the nominal fault duty is between 20 kA and 40 kA rms symmetrical.

In areas where the fault duty is less than 20 kA, refer to Material Standard 6801.40 – 21 kV, Heavy Duty Distribution Class, Polymer, Metal-Oxide Surge Arrester.

Surge arresters designed with gaps (6801.40) offer slightly better electrical performance than surge arresters designed without gaps (6801.3 and 6801.60). Intermediate class arresters are not available with gaps.

This Material Standard applies to two types of surge arresters. The first type of surge arrester (Stock No. 012593) is installed on riser poles to protect underground cable and equipment. The second type (Stock No. 012594) is installed inside pad mount switches. These two surge arresters differ only in their bottom terminal hardware and provision for ground lead isolator.

3. Industry Standards

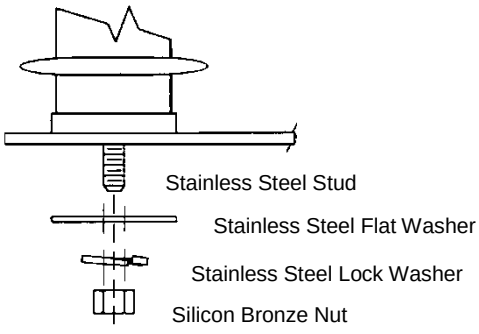
Surge arresters shall meet all applicable requirements of the following national standard:

IEEE C62.11-1999, Standard for Metal-Oxide Surge Arresters for AC Power Circuits (> 1 kV)

4. Electrical Requirements

Class (recognized by IEEE C62.11):	Intermediate
Type:	Metal-oxide
Duty-Cycle Rating:	21 kV rms
Maximum Continuous Operating Voltage (MCOV):	17 kV rms
Maximum Front-of-Wave Voltage Cresting in 0.5 Microseconds for **10 kA** Wave:	59.5 kV crest
Maximum Discharge Voltage for 8 X 20 Microsecond **5 kA** Wave:	51.3 kV crest
Maximum Discharge Voltage for 8 X 20 Microsecond **20 kA** Wave:	61.3 kV crest
Minimum Symmetrical RMS Fault-Current Withstand Rating:	40 kA rms
Minimum Temporary Overvoltage Capability for Three Seconds at 60 Degrees Centigrade Ambient and No Prior Energy Absorption (Overvoltage/MCOV):	1.38 per unit

5. Construction

Housing Material:	silicon rubber
Housing Material/ Hanger Bracket Color:	Gray
Ground Lead Isolator for Stock No. 012593 (riser pole):	Required
Ground Lead Isolator for Stock No. 012594 (pad mount):	not required or desired
Terminal – Top (both types): 	stainless steel stud with "L" bracket and eyebolt connector that accepts copper or aluminum conductors #6 AWG to 250 kcmil
Terminal - Bottom for Stock No. 012593 (riser pole): 	3/8-16 stainless steel stud with Penn Union STS-4, Burndy KF-23, or Dossert DGG-6 connector (Stock No. 668872), or approved equivalent
Terminal - Bottom for Stock No. 012594 (pad mount): 	stainless steel stud with one stainless steel flat washer, one stainless steel lock washer, and one silicone bronze nut
Nameplate:	required per IEEE C62.11-1999, Section 10.1 Identification data

7. Marking and Packaging

Surge arresters shall be packaged fully assembled, one per cardboard box. Each package shall be legibly marked with manufacturer's name or symbol, product description, and quantity contained. Shipping containers shall be marked with manufacturer's name or symbol and Seattle City Light's purchase order number. A packing slip shall be included with each shipment.

8. Stock Unit: EA

9. Manufacturers

Cooper Power Systems, Type VariSTAR

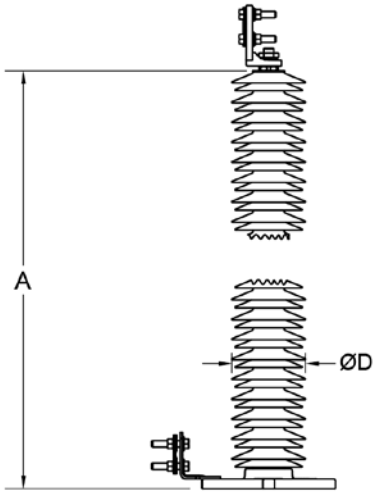
Stock Number	Type	Catalog Number
012593	Riser Pole Type Arrester	UIAA021017A101NL27
012594	Pad Mount Type Arrester	UIAA021017A101KB27

10. References

Shipek, John; SCL Standards Engineer and subject matter expert for 6801.60 (john.shipek@seattle.gov)

235-102; UltraSIL Polymer-Housed VariSTAR Type UI Intermediate-Class Surge Arresters, Cooper Power Systems

Station Class, Polymer, Metal-Oxide Surge Arrester for 26 kV Systems



1. Scope

This standard details requirements for 21 kV duty-cycle rating, station class, polymer-housed, metal-oxide surge arresters.

This standard applies to Seattle City Light (SCL) stock number 013533.

2. Application

Station class surge arresters are intended for use on a nominal 26 kV, grounded, wye-connected, 60 Hz power system.

Arresters are intended for upright or horizontal mounting in substations.

Arresters are intended for direct connection to the substation ground grid.

3. Industry Standards

Surge arresters shall meet all the applicable requirements of the following national standard:

IEEE C62.11 – 2012, Standard for Metal-Oxide Surge Arresters for AC Power Circuits (> 1 kV)

4. Requirements

Class (recognized by IEEE C62.11)	Station
Type	Metal oxide
Duty-Cycle Rating	21 kV rms
Maximum Continuous Operating Voltage (MCOV)	17 kV rms
Maximum Front-of-Wave Voltage Cresting in 0.5 Microseconds for **10 kA** Wave	58 kV crest
Maximum Discharge Voltage for 8 x 20 Microsecond **10 kA** Wave	53 kV crest
Maximum Discharge Voltage for 8 x 20 Microsecond **20 kA** Wave	59 kV crest
Maximum Discharge Voltage for **500 A** Switching Surge	43 kV crest
Minimum Temporary Overvoltage (TOV) Capability, **No Prior Duty**,	
1 sec	1.42 per MCOV
10 sec	1.35 per MCOV
Minimum Energy Capability	8.7 kJ/kV of MCOV
Minimum Pressure Relief Rating	63 kA rms
Minimum Cantilever Strength,	
Ultimate	21,000 in-lb
Maximum design (40% of ultimate)	8,400 in-lb

5. Construction

Housing Material	Silicone rubber; To qualify as silicone type, housing material must be composed of at least 33% silicone by weight; "EP/silicone alloys" do not qualify
Housing Color	Gray
Terminal – Top	4-hole NEMA vertical pad
Terminal – Bottom	Ground clamp suitable for #4 AWG to 250 kcmil stranded copper conductor
Mounting	Three 1/2-in mounting holes spaced 120 degrees from each other on an 8.75 to 10 in-diameter bolt circle
Height, nominal	14 ± 2 in, measured from bottom of mounting base to just underneath terminal pad
Minimum Leakage Distance	30 in

6. Marking and Packaging

Surge arresters shall be packaged individually in wood crates to protect against physical damage that could occur during shipping, handling, or long-term outside storage. Crates shall be secured to pallets for handling by forklift.

Crates shall be marked with the manufacturer's name or symbol, catalog number, SCL stock number, and purchase order number.

7. Issuance

Stock Unit: EA

8. Approved Manufacturers

Manufacturer	**Eaton's Cooper Power Systems**
Type	UX
Catalog No.	UXAA021017A1449A12

Manufacturer	**TE Connectivity**
Type	PCA
Catalog No.	PCA121L21E2M7

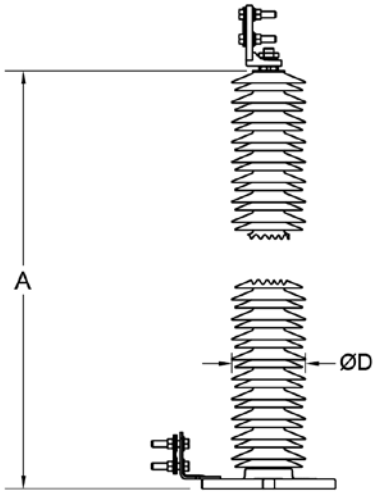
9. Sources

235-103; UltraSIL polymer-housed VariSTAR station-class surge arresters, Eaton's Cooper Power Systems; October 2013

Bowthorpe EMP High Voltage Surge Arresters Brochure; TE Connectivity, June 2012

Panomvana, Tanya; SCL Standards Engineer, subject matter expert and originator of 6802.20 (tanya.panomvana@seattle.gov)

Station Class, Polymer, Metal-Oxide Surge Arrester for 34.5 kV Systems



1. Scope

This standard details requirements for 30 kV duty-cycle rating, station class, polymer-housed, metal-oxide surge arresters.

This standard applies to Seattle City Light (SCL) stock number 013547.

2. Application

Station class surge arresters are intended for use on a nominal 34.5 kV, grounded, wye-connected, 60 Hz power system.

Arresters are intended for upright or horizontal mounting in substations.

Arresters are intended for direct connection to the substation ground grid.

3. Industry Standards

Surge arresters shall meet all the applicable requirements of the following national standard:

IEEE C62.11 – 2012, Standard for Metal-Oxide Surge Arresters for AC Power Circuits (> 1kV)

4. Requirements

Class (recognized by IEEE C62.11)	Station
Type	Metal oxide
Duty-Cycle Rating	30 kV rms
Maximum Continuous Operating Voltage (MCOV)	24.4 kV rms
Maximum Front-of-Wave Voltage Cresting in 0.5 Microseconds for **10 kA** Wave	80 kV crest
Maximum Discharge Voltage for 8 x 20 Microsecond **10 kA** Wave	74 kV crest
Maximum Discharge Voltage for 8 x 20 Microsecond **20 kA** Wave	81 kV crest
Maximum Discharge Voltage for **500 A** Switching Surge	59 kV crest
Minimum Temporary Overvoltage (TOV) Capability, **No Prior Duty**,	
1 sec	1.42 per MCOV
10 sec	1.35 per MCOV
Minimum Energy Capability	8.7 kJ/kV of MCOV
Minimum Pressure Relief Rating	63 kA rms
Minimum Cantilever Strength,	
Ultimate	21,000 in-lb
Maximum design (40% of ultimate)	8,400 in-lb

5. Construction

Housing Material	Silicone rubber; To qualify as silicone type, housing material must be composed of at least 33% silicone by weight; "EP/silicone alloys" do not qualify
Housing Color	Gray
Terminal – Top	4-hole NEMA vertical pad
Terminal – Bottom	Ground clamp suitable for #4 AWG to 250 kcmil stranded copper conductor
Mounting	Three 1/2-in mounting holes spaced 120 degrees from each other on an 8.75 to 10 in-diameter bolt circle
Height, nominal	16 in, measured from bottom of mounting base to just underneath terminal pad
Minimum Leakage Distance	43 in

6. Marking and Packaging

Surge arresters shall be packaged individually in wood crates to protect against physical damage that could occur during shipping, handling, or long-term outside storage. Crates shall be secured to pallets for handling by forklift.

Crates shall be marked with the manufacturer's name or symbol, catalog number, SCL stock number, and purchase order number.

7. Issuance

Stock Unit: EA

8. Approved Manufacturers

Manufacturer	**Eaton's Cooper Power Systems**
Type	UX
Catalog No.	UXAA030024A1849A12

Manufacturer	**TE Connectivity**
Type	PCA
Catalog No.	PCA130L21E2M7

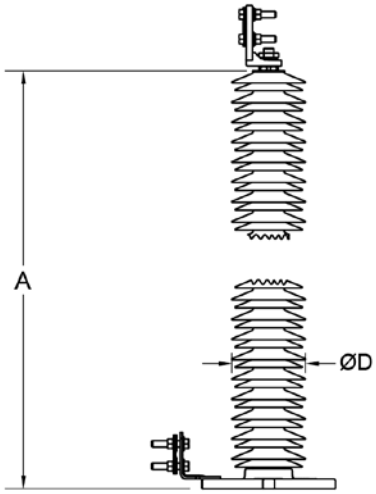
9. Sources

235-103; UltraSIL polymer-housed VariSTAR station-class surge arresters, Eaton's Cooper Power Systems; November 2013

Bowthorpe EMP High Voltage Surge Arresters Brochure; TE Connectivity, June 2012

Panomvana, Tanya; SCL Standards Engineer, subject matter expert and originator of 6802.40 (tanya.panomvana@seattle.gov)

Station Class, Polymer, Metal-Oxide Surge Arrester for 115 kV Systems



1. Scope

This standard details requirements for 96 kV duty-cycle rating, station class, polymer-housed, metal-oxide surge arresters.

This standard applies to Seattle City Light (SCL) stock number 013548.

2. Application

Station class surge arresters are intended for use on a nominal 115 kV, grounded, wye-connected, 60 Hz power system.

Arresters are intended for upright or horizontal mounting in substations.

Arresters are intended for direct connection to the substation ground grid.

3. Industry Standards

Surge arresters shall meet all the applicable requirements of the following national standard:

IEEE C62.11 – 2012, Standard for Metal-Oxide Surge Arresters for AC Power Circuits (> 1kV)

4. Requirements

Class (recognized by IEEE C62.11)	Station
Type	Metal oxide
Duty-Cycle Rating	96 kV rms
Maximum Continuous Operating Voltage (MCOV)	76 kV rms
Maximum Front-of-Wave Voltage Cresting in 0.5 Microseconds for **10 kA** Wave	250 kV crest
Maximum Discharge Voltage for 8 x 20 Microsecond **10 kA** Wave	230 kV crest
Maximum Discharge Voltage for 8 x 20 Microsecond **20 kA** Wave	252 kV crest
Maximum Discharge Voltage for **500 A** Switching Surge	184 kV crest
Minimum Temporary Overvoltage (TOV) Capability, **No Prior Duty**,	
1 sec	1.42 per MCOV
10 sec	1.35 per MCOV
Minimum Energy Capability	8.7 kJ/kV of MCOV
Minimum Pressure Relief Rating	63 kA rms
Minimum Cantilever Strength,	
Ultimate	21,000 in-lb
Maximum design (40% of ultimate)	8,400 in-lb

5. Construction

Housing Material	Silicone rubber; To qualify as silicone type, housing material must be composed of at least 33% silicone by weight; "EP/silicone alloys" do not qualify
Housing Color	Gray
Terminal – Top	4-hole NEMA vertical pad
Terminal – Bottom	Ground clamp suitable for #4 AWG to 250 kcmil stranded copper conductor
Mounting	Three 1/2-in mounting holes spaced 120 degrees from each other on an 8.75 to 10 in-diameter bolt circle
Height, nominal	41 ± 2 in, measured from bottom of mounting base to just underneath terminal pad
Minimum Leakage Distance	143 in

6. Marking and Packaging

Surge arresters shall be packaged individually in wood crates to protect against physical damage that could occur during shipping, handling, or long-term outside storage. Crates shall be secured to pallets for handling by forklift.

Crates shall be marked with the manufacturer's name or symbol, catalog number, SCL stock number, and purchase order number.

7. Issuance

Stock Unit: EA

8. Approved Manufacturers

Manufacturer	**Eaton's Cooper Power Systems**
Type	UX
Catalog No.	UXAA096076A4849A12

Manufacturer	**TE Connectivity**
Type	PCA
Catalog No.	PCA396L21E2M7

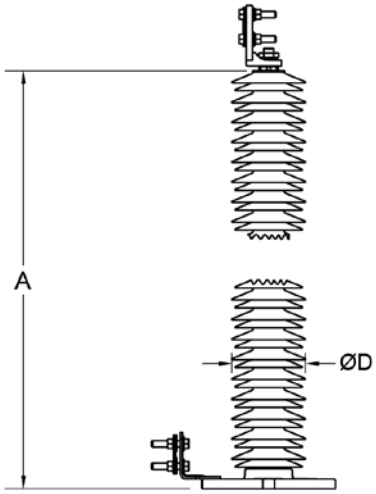
9. Sources

235-103; UltraSIL polymer-housed VariSTAR station-class surge arresters, Eaton's Cooper Power Systems; November 2013

Bowthorpe EMP High Voltage Surge Arresters Brochure; TE Connectivity, June 2012

Panomvana, Tanya; SCL Standards Engineer, subject matter expert and originator of 6802.60 (tanya.panomvana@seattle.gov)

Station Class, Polymer, Metal-Oxide Surge Arrester for 230 kV Systems



1. Scope

This standard details requirements for 192 kV duty-cycle rating, station class, polymer-housed, metal-oxide surge arresters.

This standard applies to Seattle City Light (SCL) stock number 013549.

2. Application

Station class surge arresters are intended for use on a nominal 230 kV, grounded, wye-connected, 60 Hz power system.

Arresters are intended for upright or horizontal mounting in substations.

Arresters are intended for direct connection to the substation ground grid.

3. Industry Standards

Surge arresters shall meet all the applicable requirements of the following national standard:

IEEE C62.11 – 2012, Standard for Metal-Oxide Surge Arresters for AC Power Circuits (> 1kV)

4. Requirements

Class (recognized by IEEE C62.11)	Station
Type	Metal oxide
Duty-Cycle Rating	192 kV rms
Maximum Continuous Operating Voltage (MCOV)	152 kV rms
Maximum Front-of-Wave Voltage Cresting in 0.5 Microseconds for **10 kA** Wave	505 kV crest
Maximum Discharge Voltage for 8 x 20 Microsecond **10 kA** Wave	465 kV crest
Maximum Discharge Voltage for 8 x 20 Microsecond **20 kA** Wave	509 kV crest
Maximum Discharge Voltage for **500 A** Switching Surge	382 kV crest
Minimum Temporary Overvoltage (TOV) Capability, **No Prior Duty**,	
1 sec	1.42 per MCOV
10 sec	1.35 per MCOV
Minimum Energy Capability	8.7 kJ/kV of MCOV
Minimum Pressure Relief Rating	63 kA rms
Minimum Cantilever Strength,	
Ultimate	21,000 in-lb
Maximum design (40% of ultimate)	8,400 in-lb

5. Construction

Housing Material	Silicone rubber; To qualify as silicone type, housing material must be composed of at least 33% silicone by weight; "EP/silicone alloys" do not qualify
Housing Color	Gray
Terminal – Top	4-hole NEMA vertical pad
Terminal – Bottom	Ground clamp suitable for #4 AWG to 250 kcmil stranded copper conductor
Mounting	Three 1/2-in mounting holes spaced 120 degrees from each other on an 8.75 to 10 in-diameter bolt circle
Height, nominal	70.5 ± 4 in, measured from bottom of mounting base to just underneath terminal pad
Minimum Leakage Distance	285 in

6. Marking and Packaging

Surge arresters shall be packaged individually in wood crates to protect against physical damage that could occur during shipping, handling, or long-term outside storage. Crates shall be secured to pallets for handling by forklift.

Crates shall be marked with the manufacturer's name or symbol, catalog number, SCL stock number, and purchase order number.

7. Issuance

Stock Unit: EA

8. Approved Manufacturers

Manufacturer	**Eaton's Cooper Power Systems**
Type	UH
Catalog No.	UHAA192152A8849A12

Manufacturer	**TE Connectivity**
Type	PCA
Catalog No.	PCA33192L2E2M7

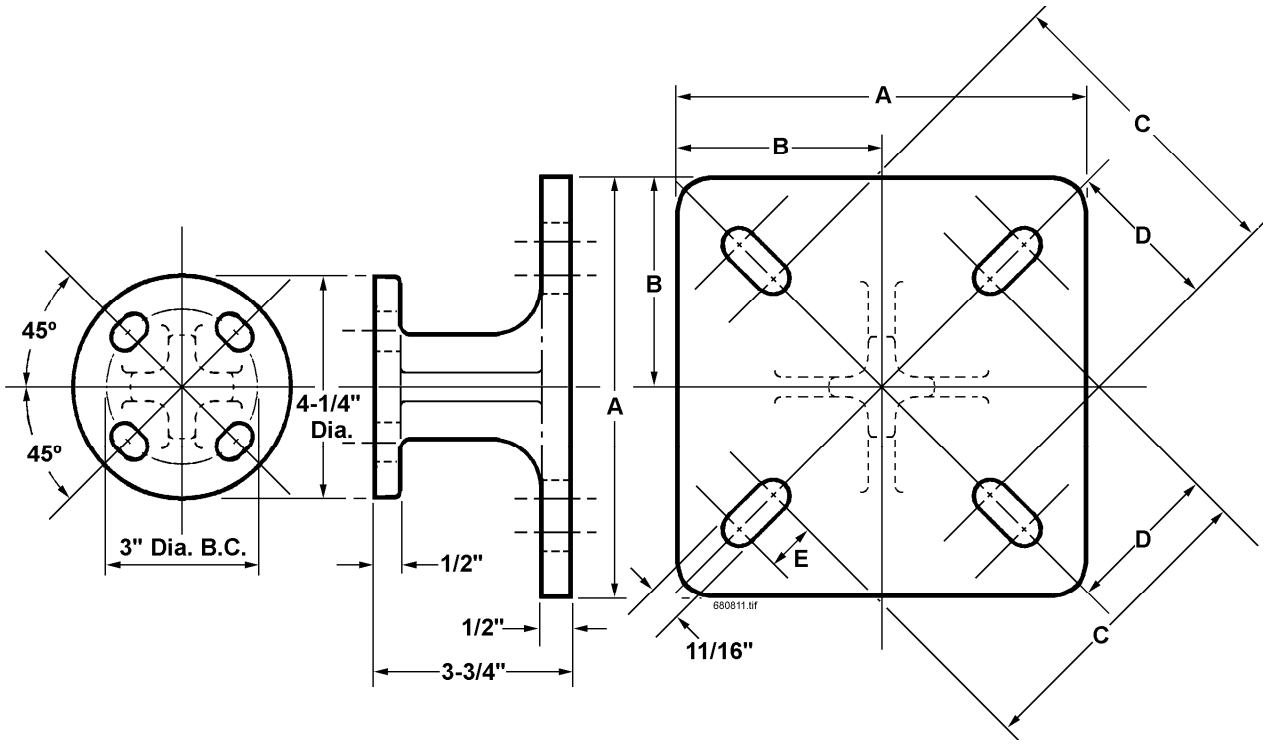
9. Sources

235-103; UltraSIL polymer-housed VariSTAR station-class surge arresters, Eaton's Cooper Power Systems; November 2013

Bowthorpe EMP High Voltage Surge Arresters Brochure; TE Connectivity, June 2012

Panomvana, Tanya; SCL Standards Engineer, subject matter expert and originator of 6802.80 (tanya.panomvana@seattle.gov)

INSULATOR BRACKETS FOR IWCB



Notes:

A. Ends are to be flat and free of burrs and sharp projections.

B. Ends must be parallel.

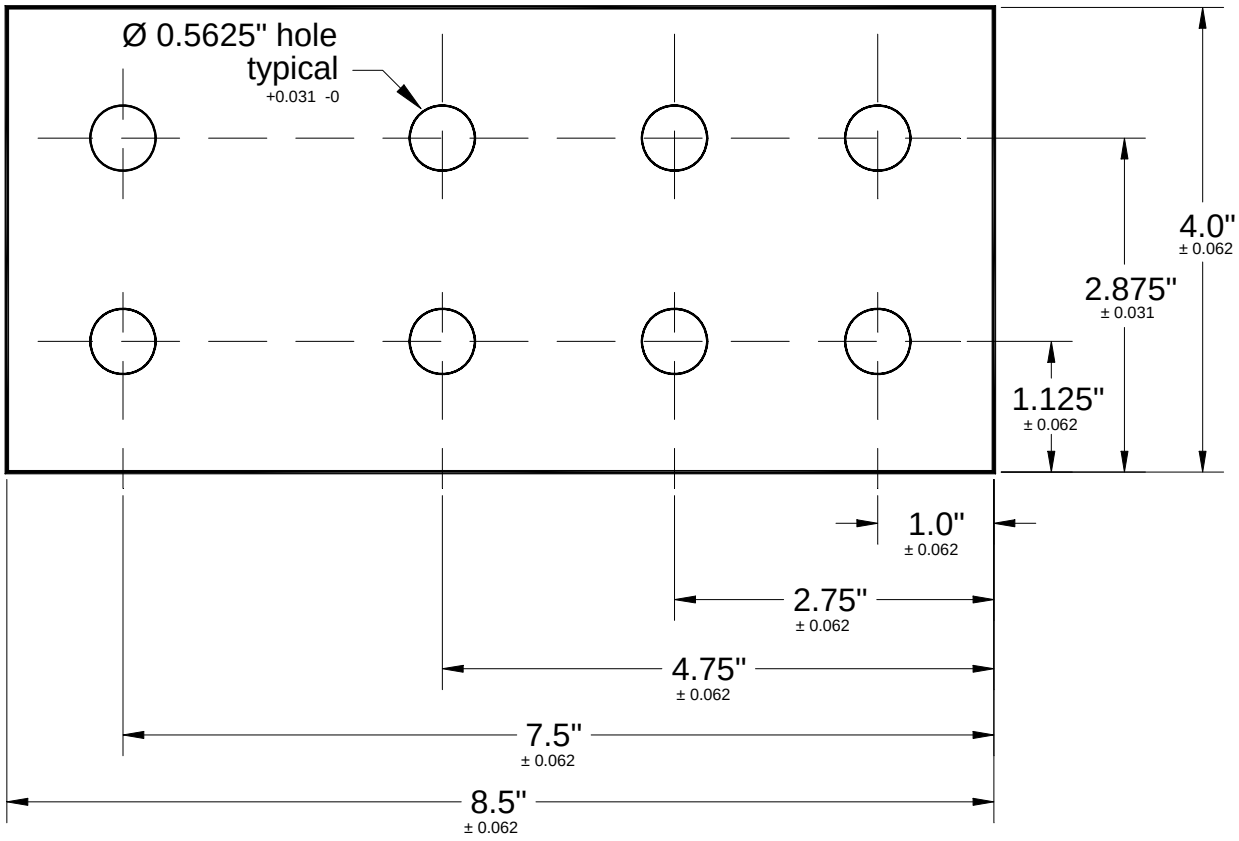
C. Dimension tolerances shall be ± 1/32", except hole diameters.

Material: Cast aluminum A356-T6, per ASTM B26.

Stock Number	Description	Dimensions, Inches					Approved Manufacturer
		A	B	C	D	E	Homac
690862	Size 2 for 8" x 8" IWCB	8	4	5-7/8	2-15/16	1	IWCBS-88-3

ORIGINATOR	STANDARDS COORDINATOR	STANDARDS SUPERVISOR	UNIT DIRECTOR
Jim S. Horn	Charles L. Shaffer	John C. Skinner	Harold Jay

BUS TIE SWITCH CONNECTOR PLATE



680812.tif

NOTES:

Finished unit shall be free of sharp edges, sharp corners and burrs.

Material is 1/2 inch thick, C11000 copper plate (flat bus).

Stock No.: 010467

STANDARDS COORDINATOR	STANDARDS SUPERVISOR	UNIT DIRECTOR

Connector Plate for 8-Inch IWCB

1. Scope

This standard covers the fabrication requirements for aluminum alloy connector plates.

This standard applies to Seattle City Light (SCL) Stock No. 680860.

2. Application

Connector plates are bolted to integral web channel bus (IWCB) to create attachment points for electrical connectors. Bus of this type is used exclusively in the network system.

3. Requirements

Product shall be fabricated from aluminum plate of one of the following the alloys:

6061-T6
6061-T651

Note: Seattle City Light stocks aluminum plate meeting these requirements (Stock No. 630052).

Finished product shall be free of sharp edges, sharp corners and burrs.

Product shall be fabricated according to Figure 1.

Maximum allowable tolerances shall be as cited in Figure 1.

4. Packaging

Each standard package shall be legibly marked with the following information

- Fabricator's identification
- Seattle City Light's stock number
- Quantity contained.

Each shipping container shall be legibly marked with the following information

- Fabricator's identification
- Seattle City Light's purchase order number
- Seattle City Light's stock number.

5. Issuance

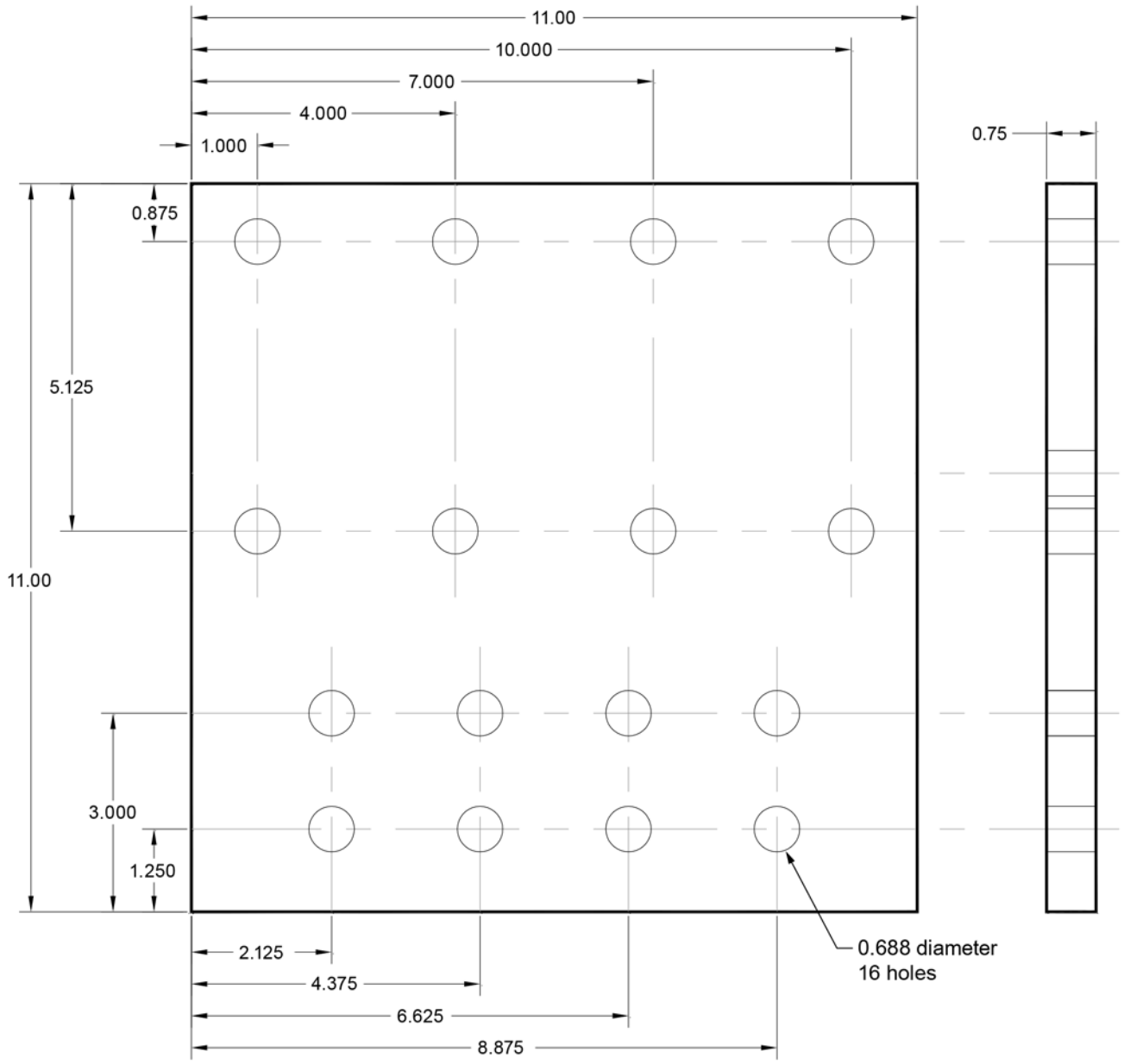
Stock Unit: EA

6. Approved Manufacturers

Seattle City Light's Machine Shop is an approved fabricator.

Seattle City Light Material Control personnel may identify and approve alternate, external fabricators.

Figure 1. Connector Plate Dimensions



Notes
1. All dimensions are in inches.
2. Maximum allowable tolerances are as follows:

Length, width:	± 0.063 in
Thickness, edge radius easing, hole diameter:	± 0.031 in

INSULATOR PLATE FOR 8″ X 8″ IWCB

1. Foreword

1.1 Scope

This material standard covers the fabrication requirements for aluminum alloy mounting plates.

This material standard applies to the following Seattle City Light Stock Number: 680874

1.2 Application

Insulator mounting plates are used to mount standard ANSI insulators to integral web channel bus (IWCB). Bus of this type is used exclusively in the network system.

2. Fabrication

2.1 Common Requirements

Product shall be fabricated from aluminum plate of one of the following alloys: 6061-T6
6061-T651

Note: Seattle City Light stocks aluminum plate meeting these requirements; it is identified by Stock Number 630053.

Finished product shall be free of sharp edges, sharp corners, and burrs.

2.2 Detailed Requirements

Product shall be fabricated according to Figure 1.
Maximum allowable tolerances shall be cited in Figure 1.

3. Packaging

Each standard package shall be legibly marked with the following information

- Fabricator's identification
- Seattle City Light's Stock Number
- Quantity contained

Each shipping container shall be legibly marked with the following information

- Fabricator's identification
- Seattle City Light's Purchase Order Number
- Seattle City Light's Stock Number

4. Shipping

Product shall be shipped to the address specified on the Purchase Order.

5. Issuance

Stock Unit: EA

6. Approved Manufacturers

Seattle City Light's Machine Shop is an approved fabricator.
Seattle City Light Material Control personnel may identify and approve alternate, external fabricators.

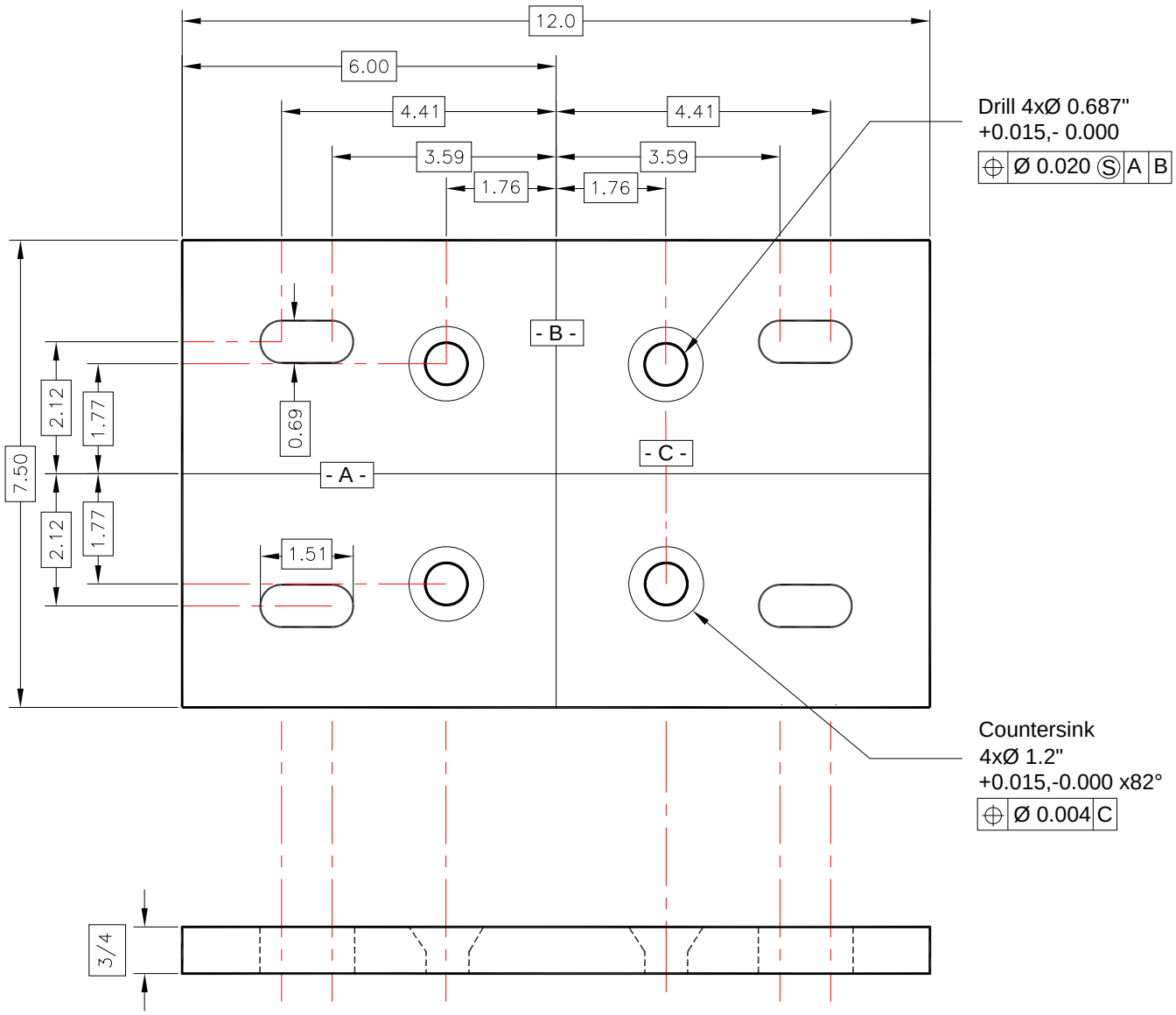
STANDARDS COORDINATOR	STANDARDS SUPERVISOR	UNIT DIRECTOR
Bill Shoemaker	John Barnett	John Nierenberg

Figure 1

All dimensions are in inches.

Maximum allowable tolerances are as follows unless otherwise specified:

Tolerances = .X ± 0.03 in
.XX ± 0.015 in
Fraction = ± 1/16



Current Transformer Connector Plate for 8" x 8" IWCB

1. Scope

This material standard covers the fabrication requirements for aluminum alloy current transformer mounting plates.

This material standard applies to the following Seattle City Light Stock Number: 680885

2. Application

Current transformer mounting plates are used to mount current transformers to integral web channel bus (IWCB). Bus of this type is used exclusively in the network system.

3. Requirements

Product shall be fabricated from aluminum plate of one of the following the alloys: 6061-T6
6061-T651

Note: Seattle City Light stocks aluminum plate meeting these requirements; it is identified by Stock Number: 630052.

Finished product shall be free of sharp edges, sharp corners, and burrs.

Product shall be fabricated according to Figure 1.
Maximum allowable tolerances shall be as cited in Figure 1.

4. Packaging

Each standard package shall be legibly marked with the following information

- Fabricator's identification
- Seattle City Light's Stock Number
- Quantity contained

Each shipping container shall be legibly marked with the following information

- Fabricator's identification
- Seattle City Light's Purchase Order Number
- Seattle City Light's Stock Number

5. Issuance

Stock Unit: EA

6. Approved Manufacturers

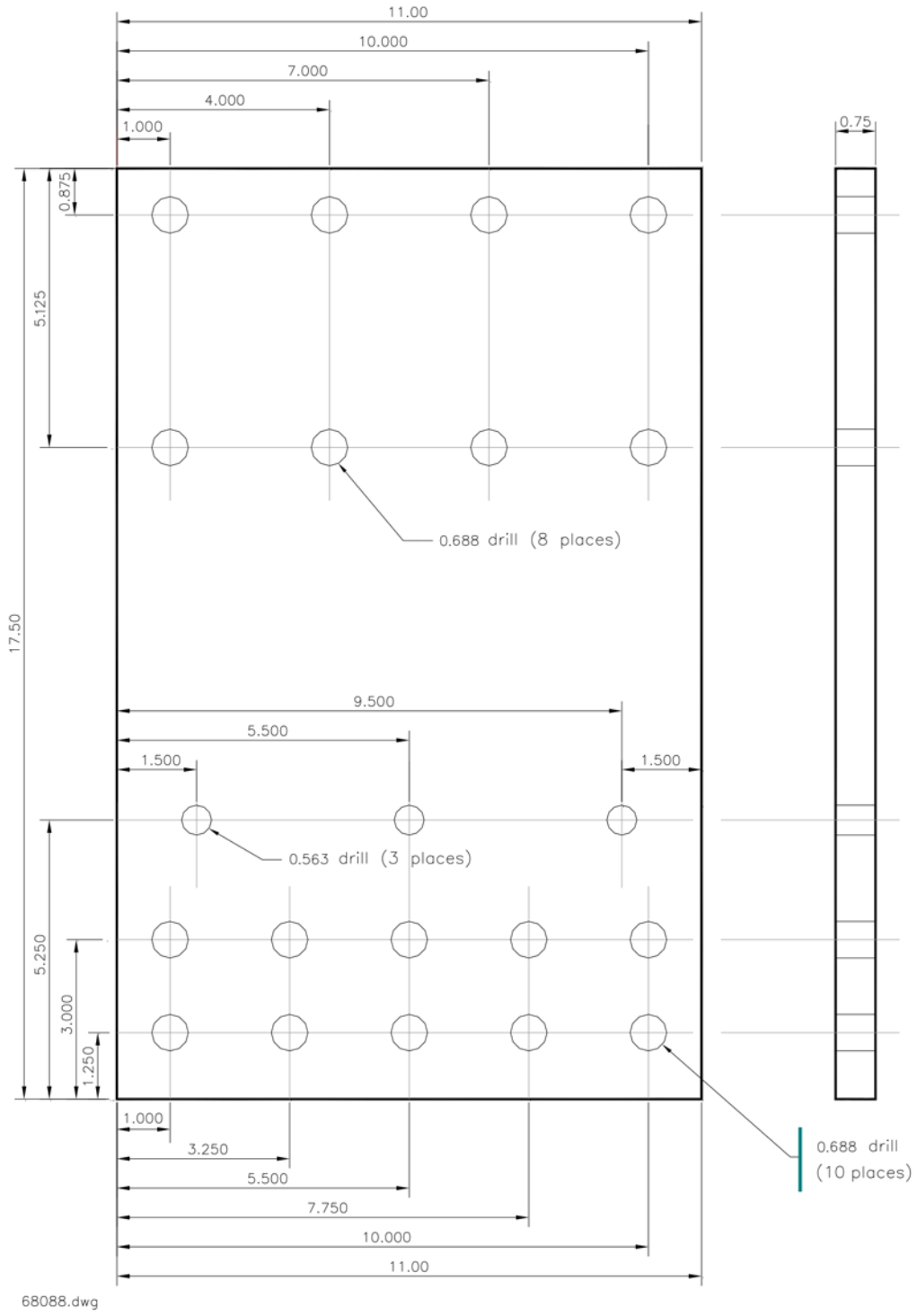
Seattle City Light's Machine Shop is an approved fabricator.
Seattle City Light Material Control personnel may identify and approve alternate, external fabricators.

Figure 1

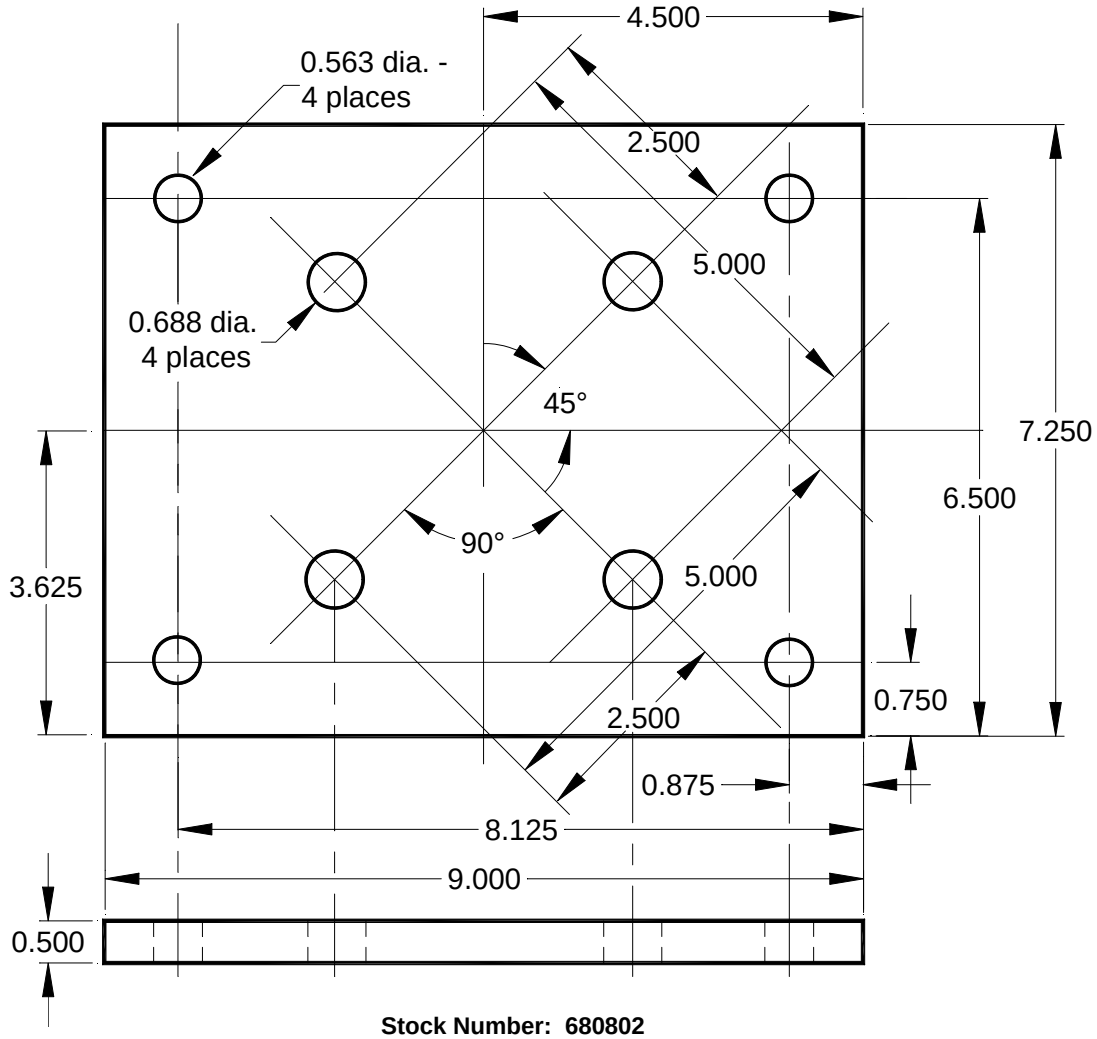
All dimensions are in inches.

Maximum allowable tolerances are as follows:

Length, Width	± 0.063 in
Thickness, Edge radius easing, Hole diameter	± 0.031 in



ACCESSORIES FOR IWCB ASSEMBLY



Stock Number: 680802

Measurements in drawings are in inches.

PLATE, MOUNTING, INSULATOR TO RAIL

NOTES FOR MOUNTING PLATE:

(1) Dimension tolerance shall be ± 0.031", except hole diameters which shall be + 0.015 and – 0.000.

(2) Finished units shall be free of sharp edges, corners, and burrs.

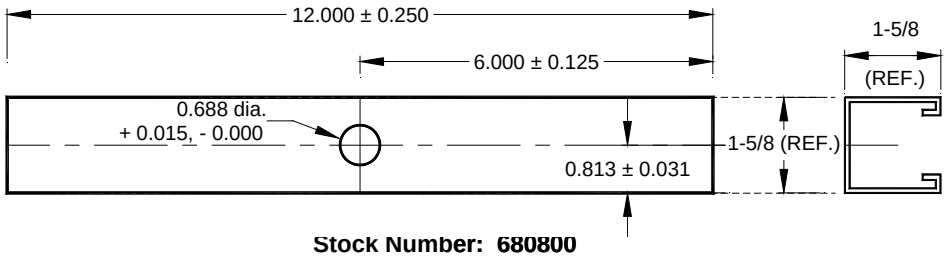
References: DU-390

Material: Hot-rolled mild steel, ASTM A36.

Stock Number: 680802

ORIGINATOR	STANDARDS COORDINATOR	STANDARDS SUPERVISOR	UNIT DIRECTOR
Jim S. Horn	Charles L. Shaffer		

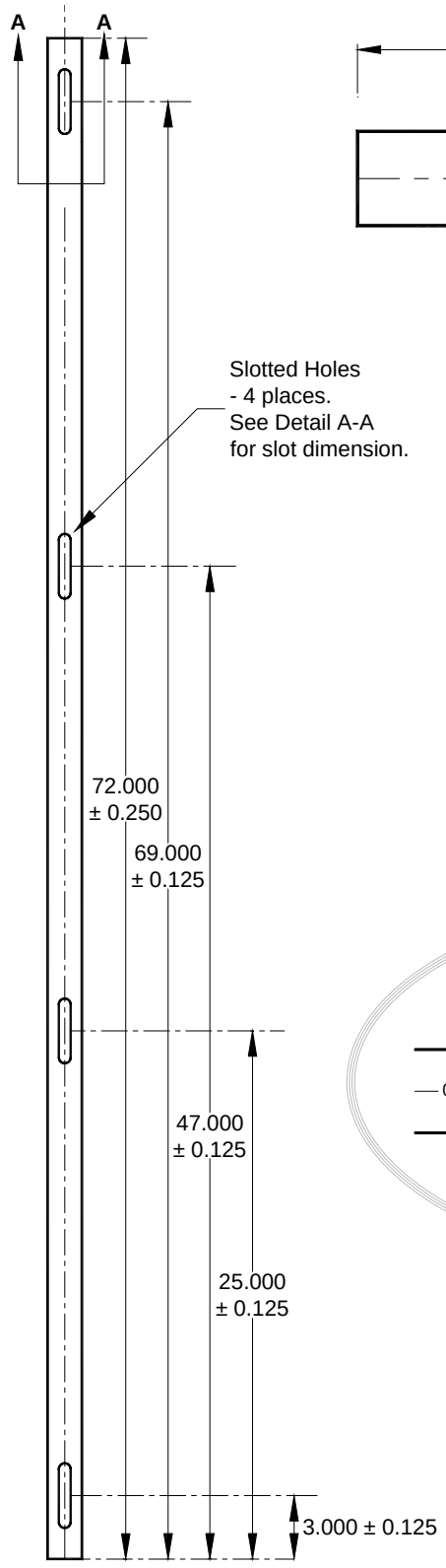
MATERIAL STANDARD



Stock Number: 680800

Measurements in drawings are in inches.

TIE, ANCHOR TO RAIL

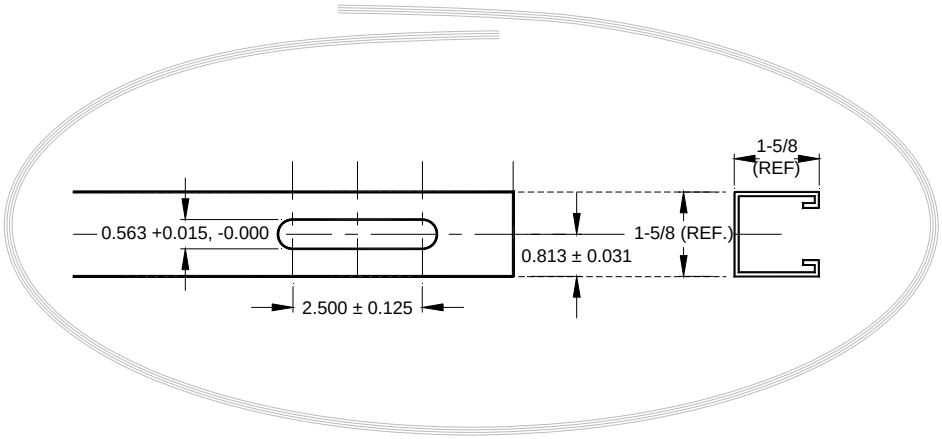


Material:

Anchor and Rail Tie, 12-gage steel Channel, 1-5/8" x 1-5/8" unpunched, pre-galvanized finish.

Unitstrut #P1000 (PG); Eristrut #A12 (PG); Powerstrut #PS200 (PG) or equivalent.

Stock Unit: EA



Detail A-A:

RAIL
Slot and Cross-Section

RAIL, TIE TO MOUNTING PLATE

Stock Number: 680801

FUSE CUTOUT, ENCLOSED

1. Scope

This material standard covers the requirements for 2.6 kV, totally-enclosed, porcelain, fuse cutouts, SCL Stock No. 682047.

2. Application

Enclosed fuse cutouts described here are for use on the 2400/4160Y volt overhead primary distribution system.

3. Industry Standards

These enclosed fuse cutouts shall meet the applicable requirements of the following industry standards:

ANSI C37.41-1981 –Standard Design Tests for High-Voltage Fuses, Distribution Enclosed Single-Pole Air Switches, Fuse Disconnecting Switches, and Accessories

ANSI C37.42-1981 – Switchgear – Distribution Cutouts and Fuse Links - Specifications

NEMA SG-2 (1986) – National Electrical Manufacturers Association; January 1, 1993

4. Ratings and attributes

Continuous current rating, RMS amperes, minimum:	100
Interrupting rating, 2.6 kV, five-shot, RMS asymmetrical amperes, minimum:	8,000
Interrupting rating, 2.6 kV, one-shot, RMS asymmetrical amperes, minimum:	14,000
Cutout enclosure material:	porcelain
Cutout enclosure color:	gray
NEMA "A" crossarm mounting bracket:	not required or desired

5. Tests and Test Reports

Data that establishes compliance with the requirements of ANSI C37.41, ANSI C37.42, and this material standard shall be provided upon request.

6. Marking

The cutout door of each assembly shall be permanently marked with the device's nameplate rating.

7. Packaging

Each fuse cutout shall be packaged to prevent damage during shipping, storage, and casual handling prior to installation.

Each package shall be marked with Seattle City Light's Stock Number.

8. Issuance

EA

9. Approved Manufacturer

Stock No.	Manufacturer	Style	Type
682047	ABB	632A808A01	EU

10. References

ABB Descriptive Bulletin 38-611, “Type EU and EUH Enclosed Fuse Cutouts”; rev. July 2003

standards coordinator	standards manager	unit director
John Shipek	John Shipek	Pamela S. Johnson

27 KV CUTOUT, OPEN TYPE, PORCELAIN

1. Scope

This material standard covers the requirements for 27 kV, open type, porcelain cutouts and their related accessories.

This material standard applies to the following Seattle City Light Stock Numbers:

Stock Number	Description
682099	cutout with fuseholder tube
682297	replacement fuseholder tube
682278	300 A, blade disconnect

2. Application

27 kV cutouts provide overcurrent protection for Seattle City Light's 26.4 kV primary distribution circuits and visible indication of fuse operation.

27 kV cutouts should not be installed in areas where the available fault current exceeds 10,600 A (RMS) symmetrical.

Note: The cutouts specified in this standard have undergone additional electrical testing and have a higher interrupting rating than is published in manufacturer's standard literature or marked on the unit's nameplate.

Note: When evaluating protective devices, be careful not to confuse symmetrical rms ratings with asymmetrical rms ratings.

Disconnect blades, Stock Number 682278, are used to convert fuse cutouts to 300 A disconnect switches.

Figure 2, 300 A, bade disconnect

27 kV cutouts, fuseholder tubes, and accessories are designed to be electrically and mechanically interchangeable between different manufacturers.

Fuse links appropriate for use with this cutout are specified in Material Standard 6837.10.

standards coordinator	*standards supervisor*	*unit director*
Yaochiem Chao	John Shipek	Darnell Cola

3. Industry Standards

Cutout, fuseholder tube, and accessories shall meet the applicable requirements of the following industry standards:

ANSI C37.42-1996 - Specification for High-Voltage Expulsion Type Distribution Class Fuses, Cutouts, Fuse Disconnecting Switches and Fuse Links

IEEE C37.41-2008 - Standard Design Tests for High-Voltage (>1000 V) Fuses, Fuse and Disconnecting Cutouts, Distribution Enclosed Single-Pole Air Switches, Fuse Disconnecting Switches, and Fuse Links and Accessories Used with These Devices

4. Attributes

Cutout with fuseholder installed shall have the following ratings and attributes:

Cutout type	Open, distribution class
Fuse type	Expulsion
Rated maximum voltage, kV	27
Rated continuous current, A (rms)	100
Rated interrupting current (breaking capacity), kA (rms)	
symmetrical	10.6
asymmetrical	16
Basic impulse insulation level (BIL), kV	150
Cutout material	One-piece, solid porcelain
Color	Gray
Leakage distance, in	17

Cutout shall be provided with attachment hooks for use with an S&C Electric Company load-break tool.

Cutout shall be provided with two parallel-groove connectors, each capable of accepting two conductors 0.162 to 0.447 inches in diameter.

Bottom connector shall be field rotatable over 90 degrees and lockable in either position. Refer to Figure 4 for one example of an acceptable bottom connector.

Figure 4, Example of acceptable bottom connector

5. Testing and Test Reports

Data that establishes compliance with the requirements of IEEE C37.41, ANSI C37.42, and this material standard shall be provided upon request.

6. Marking

Cutouts shall be marked according to the requirements of ANSI C37.42, Section 3.6. This information shall include, but not be limited to:

- Manufacturer's name or symbol
- Manufacturer's type or identification number
- Rated continuous current
- Rated maximum voltage
- Rated interrupting current

7. Packaging

Cutouts, fuseholder tubes, and accessories shall be packaged to prevent damage during shipping, handling, and storage.

8. Issuance

EA

9. References

327-30; "Cutouts and Fuse Links, UltraSIL Polymer-Insulated and Porcelain Type L, Open Distribution Cutout;" Cooper Power Systems; June 2009

6837.10; "Links, Distribution Fuse;" Material Standard; SCL

Cutouts Catalog; "Porcelain Cutouts;" MacLean Power Systems; May 2010

"Cutouts (Standard, Linkbreak & Loadbreak) and Cutout-Arrester Combinations," Section 10A; Hubbell Power Systems; September 2007

Shipek, John; SCL Standards Engineer, subject matter expert and originator of 6820.90 (john.shipek@seattle.gov)

10. Approved Manufacturers

		Item and Stock Number		
		Cutout with Fuseholder **682099**	Replacement Fuseholder **682297**	300 A Disconnect Blade **682278**
Manufacturer	Type	Catalog Number	Catalog Number	Catalog Number
ABB	ICX	X5NCNDMM12	7194C60G06MP	7194C60G08
Cooper Power Systems	L	L9DAP0A	LDCA00A	LDC300A
Hubbell Power Systems (Chance)	C	C710313P	T710313T	T710333T
MacLean Power Systems	XS	89052R10-D	89532R10	89622R10

27 kV Cutout, Open Type, Polymer

1. Scope

This standard covers the requirements for 27 kV, open type polymer cutouts and related accessories.

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

Stock No.	Description
013739	Cutout with fuseholder tube
682297	Replacement fuseholder tube
682278	Disconnect blade, 300 A

2. Application

27 kV polymer cutouts provide overcurrent protection for the SCL 26.4 kV primary distribution circuits and visible indication of fuse operation.

See SCL 9065.11, “Primary Fuse Selection and Applications,” for detailed application information.

Disconnect blades, Stock No. 682278, are used to convert fuse cutouts to 300 A disconnect switches.

Figure 2. Disconnect Blade, 300 A

27 kV polymer and porcelain cutouts and accessories are designed to be electrically and mechanically interchangeable between different manufacturers.

Fuse links appropriate for use with this cutout are specified in SCL 6837.10.

3. Industry Standards

The cutout and accessories shall meet the applicable requirements of the following industry standards:

IEEE C37.41-2008; **"**IEEE Standard Design Tests for High-Voltage (>1000V) Fuses, Fuse and Disconnecting Cutouts, Distribution Enclosed Single-Pole Air Switches, Fuse Disconnecting Switches, and Fuse Links and Accessories Used with These Devices"

IEEE C37.42-2009; **"**IEEE Standard Specifications for High-Voltage (>1000V) Expulsion-Type Distribution-Class Fuses, Fuse and Disconnecting Cutouts, Fuse Disconnecting Switches, and Fuse Links, and Accessories Used with These Devices"

4. Requirements

Cutouts and their accessories shall meet the following requirements:

Cutout type	Open, distribution class
Fuse type	Expulsion
Rated maximum voltage, kV	27
Rated continuous current, A (rms)	100
Rated interrupting current (breaking capacity), kA (rms)	
Symmetrical	8
Asymmetrical	12
Basic impulse insulation level (BIL), kV	150
Cutout insulator material	Silicone
Color	Gray
Leakage distance, in	≥18

Cutouts shall be provided with attachment hooks for use with an S&C Electric Company load break tool.

Cutouts shall be provided with two parallel-groove connectors, one upper and one lower, each capable of accepting two conductors 0.162 to 0.447 inches in diameter.

The bottom connector shall be field-rotatable over 90° and lockable in either position. Refer to Figure 4 for one example of an acceptable bottom connector.

Figure 4. Example of an Acceptable Bottom Connector

5. Testing

Data that establishes compliance with the requirements of IEEE C37.41, IEEE C37.42, and this standard shall be provided upon request.

6. Marking

Cutouts shall be marked according to the requirements of IEEE C37.42, Section 3.6.4, which includes:

- Manufacturer's name or symbol
- Manufacturer's type or identification number
- Rated continuous current
- Rated maximum voltage
- Rated lightning impulse withstand voltage (BIL)
- Identifying date code (month and year)

Fuseholders shall be marked according to the requirements of IEEE C37.42, Section 3.6.1, which includes:

- Manufacturer's name or symbol
- Manufacturer's type or identification number
- Rated continuous current
- Rated maximum voltage
- Rated interrupting current
- Identifying date code (month and year)

Disconnect blades shall be marked according to the requirements of IEEE C37.42, Section 3.6.3, which includes:

- Manufacturer's name or symbol
- Rated continuous current
- Identifying date code (month and year)

7. Packaging

Cutouts with fuseholders *(*Stock No. 013739*)* shall be packaged as a single unit to prevent damage during shipping, handling, and storage.

Replacement fuseholders (Stock No. 682297) and disconnect blades (Stock No. 682278) shall be individually protected to prevent damage during shipping, handling, and storage. Each package shall contain no more than 10 fuseholders or disconnect blades.

Shipping containers shall be legibly marked with the SCL purchase order number.

8. Issuance

Stock Unit: EA

9. Approved Manufacturers

		Stock No. and Description		
		013739 Cutout with fuseholder	682297 Replacement fuseholder (only)	682278 Disconnect blade, 300 A
Manufacturer	**Type**	**Manufacturer Catalog No.**		
ABB	ICX	X5JCNNMM12	7194C60G06MP	7194C60G08
Cooper Power Systems	L	S9DAP0A	LDCA00A	LDC300A
Hubbell Power Systems	C	CP710313P	T710313T	T710333T
MacLean Power Systems	XS	SC27SG112-D90	89532R10	89622R10

10. References

SCL Design Standard 9065.11; "Primary Fuse Selection and Applications"

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

SCL Material Standard 6837.10; "Links, Distribution Fuse"

11. Sources

Catalog 10AA; "Type C-Polymer Cutouts (Standard, Linkbreak, Loadbreak) and Cutout-Arrester Combinations," Hubbell Power Systems, Inc., July 2014

Electrical Apparatus 327-30; "Type L Cutouts, UltraSIL Polymer-Insulated and Porcelain Type L Open Distribution Cutout," Cooper Power Systems, May 2013

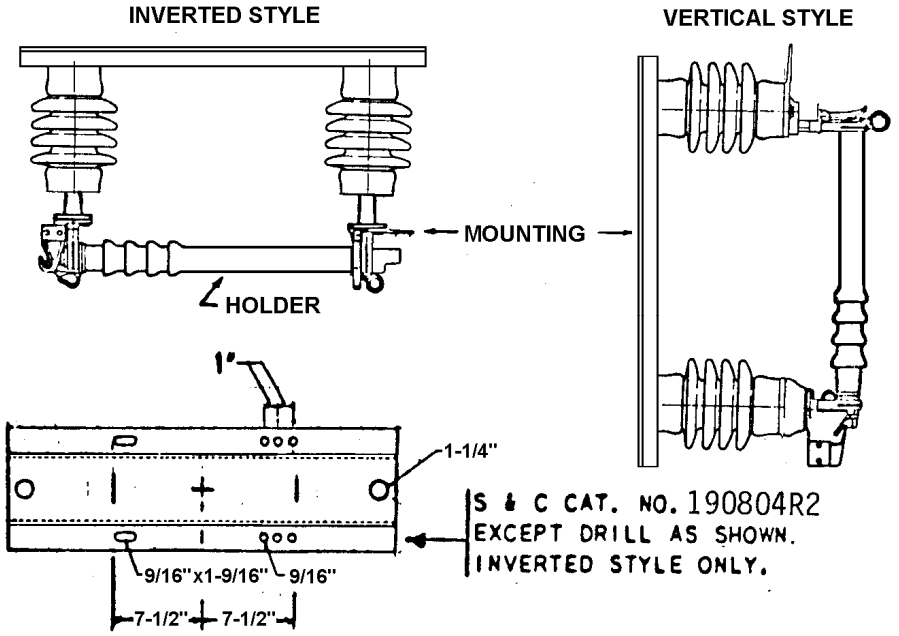
Kephart, Bob; SCL Associate Electrical Engineer and originator of 6820.95 (bob.kephart@seattle.gov)

MacLean Power Systems; www.macleanpower.com

Product Bulletin 1VAG271201-DB_ICX; "Distribution cutouts Type ICX Outdoor open type cutout," ABB, Rev M, May 2013

Shipek, John; SCL Standards Supervisor and subject matter expert for 6820.95 (john.shipek@seattle.gov)

FUSES, HOLDERS AND MOUNTINGS 26-KV UNIT SUBSTATIONS & HEAVY INDUSTRIAL SUBSTATIONS



Power Fuses, Holders, and Mountings of the types shown are used on 26-kV unit substations and heavy industrial substations of 2,500 to 10,000 kVA, 3 Ø capacity. Insulators shall be standard station post type conforming to the requirements of ANSI C29.9 for wet process porcelain. Glaze color shall be sky gray, ANSI No. 70.

Stock Unit: Each

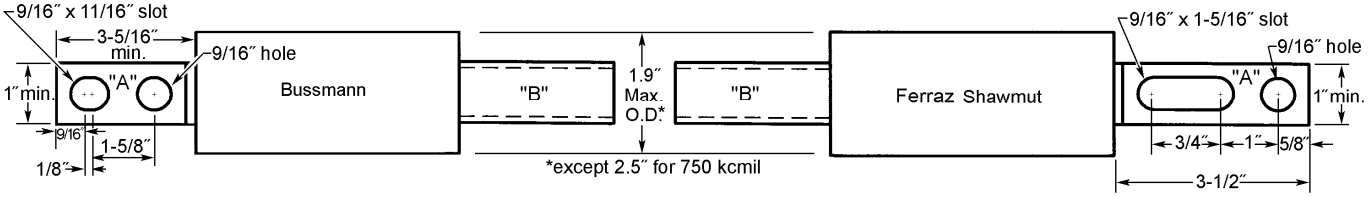
Stock Number	Item	Item No.*	Amps	Style	Mfr. & Cat. No.	For Use with Item No. *
682847	Mounting	M-1	300 Max	Inverted	S&C 190804R2	H-1
682871	Mounting	M-2	300 Max	Vertical	S&C 190604R2	H-2
682415	Holder	H-1	300 Max	Inverted	S&C 86194R2	M-1, F-2, F-3
682403	Holder	H-2	300 Max	Vertical	S&C 86154R2 †	M-2, F-2, F-3
684711	Fuse	F-2	250E	SM-5	S&C 134400R4	H-1, H-2
684714	Fuse	F-3	300E	SM-5	S&C 264500R4	H-1, H-2

* Item No. indicates assembly combinations.

† Old-style Cat. No. 86154 with addition of new-style pull rings will interchange with No. 86154R2.

ORIGINATOR	STANDARDS COORDINATOR	STANDARDS SUPERVISOR	UNIT DIRECTOR
Jim S. Horn	Charles L. Shaffer	John C. Skinner	Betty Robin

LIMITER – 600 VOLT, COPPER CABLE TO BUS BAR



1. **Cable Limiters** of the configuration shown are intended to protect copper cables on 277/480, 120/208, or 120/240 volt, 1-phase or 3-phase, underground or overhead, distribution or network systems.

2. **Interrupting Duty:** The cable limiter shall have an AC interrupting duty of 200,000 amperes rms symmetrical at 600 volts or less, and shall clear faults within its duty range without any visible external physical damage to the cable or limiter. No ionized gases or volatilized metal shall be emitted.

3. **Terminals:** Terminal "A" shall be plated copper bar of size and drilling meeting all applicable requirements of NEMA CC 1 (ANSI C 119.3).

   Terminal "B" shall be plated copper meeting all applicable requirements of NEMA SG 8.1. Terminal "B" shall meet the tool and die requirements listed below, and shall have durable markings showing the conductor size, either on the terminal or on the limiter body.

4. **Insulating Sleeves:** Not desired.

5. **Reference Specifications:**

   NEMA CC 1, *Electric Power Connectors for Substations;* ANSI C 119.3; latest revisions

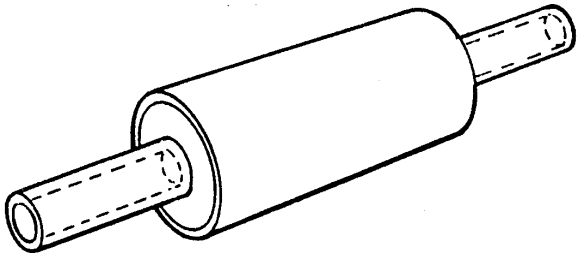
   NEMA SG 8.1, *Pressure Connectors for Copper Conductor;* 8/59

6. **Stock Unit:** EA

		Limiters					
		Approved Manufacturers		**Terminal Tool and Die Requirements**			
Stock Numbers	**Cable Size**	**Cooper/ Bussmann**	**Mersen**	**EEI Die Index**	**Burndy**	**Cooper/ Kearney**	**T&B**
683621	#4	KDY	–	8	242, U4CRT	5/16	29
683622	#2	KDA	CP2C3	10	162, U2CRT	3/8	33
683623	2/0 AWG	KDD	CP2/0C3	13	241, U26RT	9/16	45
683624	3/0 AWG	KDE	–	14	243, U27RT	9/16	50
683625	4/0 AWG	KDF	CP4/0C3	15	U28RT	5/8	54
683626	250 kcmil	KDH	CP250C3	16	166, U29RT	11/16	62
683627	350 kcmil	KDJ	CP350C3	18	168, U31RT	840	71
683629	500 kcmil	KDM	CP500C3	20	251, U34RT	1	87
011158	600 kcmil	KDU	CP600C3	–	U36RT, P36RT	–	–
683630	750 kcmil	KDR-S	CP750C3	24	209, S39RT	H25	106

standards coordinator	*standards manager*	*unit director*
John Shipek	John Shipek	Pamela S. Johnson

LIMITER - 600 VOLT - COPPER CABLE TO COPPER CABLE

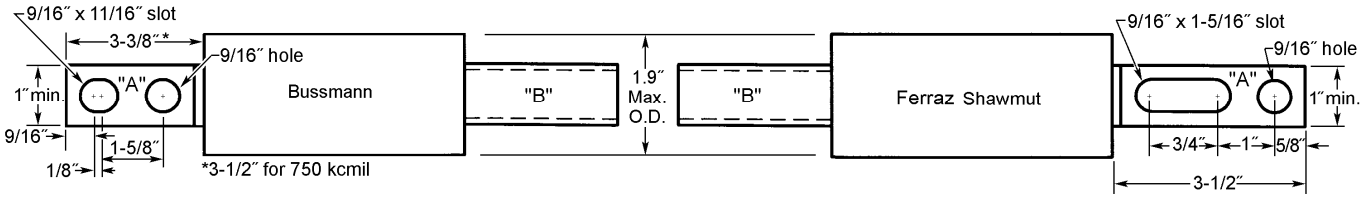


1. **Application:** Cable Limiters of the configuration shown are intended protect copper cables on 277/480, 120/208, or 120/240 volt, 1-phase or 3-phase, underground or overhead, distribution or network systems.
2. **Interrupting Duty:** The cable limiter shall have an AC interrupting duty of 200,000 amperes rms symmetrical at 600 volts or less, and shall clear faults within its duty range without any visible external physical damage to the cable or limiter. No ionized gases or volatilized metal shall be emitted.
3. **Terminals:** Both terminals shall be plated copper. The terminals shall have durable markings showing the conductor size, either on the terminals or on the limiter body.
4. **Stock Unit:** EA

Stock Numbers	Cable Size	Approved Manufacturers	
		Cooper/ Bussmann	Mersen
683641	#4	KCY	–
683643	#2	KCA	CP2C1
683646	2/0 AWG	KCD	CP2/0C1
683647	3/0 AWG	KCE	–
683648	4/0 AWG	KCF	CP4/0C1
683649	250 kcmil	KCH	CP250C1
683650	350 kcmil	KCJ	CP350C1
683651	500 kcmil	KCM	CP500C1
683652	750 kcmil	KCR	CP750C1

standards coordinator	*standards supervisor*	*unit director*
John Shipek	John Shipek	Darnell Cola

LIMITER – 600 VOLT, ALUMINUM CABLE TO BUS BAR



1. **Cable Limiters** of the configuration shown are intended protect aluminum cables on 277/480, 120/208, or 120/240 volt, 1-phase or 3-phase, underground or overhead, distribution or network systems.
2. **Cable Class:** The cable limiters shall coordinate with the insulation damage curves of L-260 (See AIEE Paper 59-27.).
3. **Interrupting Duty:** The cable limiter shall have an AC interrupting duty of 200,000 amperes rms symmetrical at 600 volts or less, and shall clear faults within its duty range without any visible external physical damage to the cable or limiter. No ionized gases or volatilized metal shall be emitted.
4. **Terminals**: Terminal "A" shall be plated copper bar of size and drilling meeting all applicable requirements of NEMA CC 1.

   Terminal "B" shall be aluminum meeting all applicable requirements of NEMA CC 3. Terminal "B" shall be factory-filled with a measured amount of oxide-inhibiting compound that will not affect the dielectric strength or power factor of cables insulated with butyl, polyvinyl chloride, polyethylene, or cross-linked polyethylene. Terminal "B" shall meet the tool and die requirements listed below, and shall have durable body markings showing the conductor size, either on the terminal or on the limiter body.
5. **Insulating Sleeves**: Not desired.
6. **Reference Specifications**:

   AIEE Paper 59-27, June 1959, No. 42, pages 129-416, *Power Apparatus and Systems*.

   NEMA Standard CC 1, Electrical Power Connection for Power Stations, latest revision.

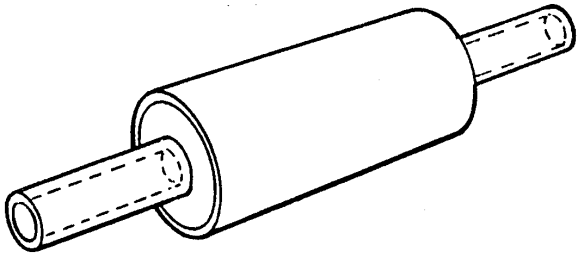
   NEMA Standard CC 3 (EEI TDJ-162), Connectors for Use Between Aluminum or Aluminum-Copper Overhead Conductors, latest revision.
7. **Stock Unit**: EA

		Limiters					
		Approved Manufacturers		**Terminal Tool and Die Requirements**			
Stock Numbers	**Cable Size**	**Bussmann**	**Mersen**	**Die Index**	**Burndy**	**Kearney**	**T&B**
683637	4/0 AWG	–	CP4/0A3	11A	298, U28AR	840	76
683638	350 kcmil	–	CP350A3	13A	299, U31AR	1-1/8	96
683639	500 kcmil	CDB-R	CP500A3	15A	300, U34AR	1-5/16	115
683659	750 kcmil	CDB-W	CP750A3-SP2*	–	301, P39AR	1-1/2	125

* SP2 = Special Production 2.

standards coordinator	*standards manager*	*unit director*
John Shipek	John Shipek	Pamela S. Johnson

LIMITER - 600 VOLT - ALUMINUM CABLE TO ALUMINUM CABLE



1. **Application:** Cable Limiters of the configuration shown are intended protect aluminum cables on 277/480, 120/208, or 120/240 volt, 1-phase or 3-phase, underground or overhead, distribution or network systems.
2. **Interrupting Duty:** The cable limiter shall have an AC interrupting duty of 200,000 amperes rms symmetrical at 600 volts or less, and shall clear faults within its duty range without any visible external physical damage to the cable or limiter. No ionized gases or volatilized metal shall be emitted.
3. **Terminals:** Both terminals shall be aluminum. Both terminals shall be factory-filled with a measured amount of oxide-inhibiting compound. Both terminals shall have durable markings showing the conductor size, either on the terminals or on the limiter body.
4. **Stock Unit:** EA

Stock Numbers	Cable Size	Approved Manufacturers	
		Cooper/ Bussmann	Mersen
683615	4/0 AWG	–	CP4/0A1
683616	250 kcmil	–	CP350A1
683617	350 kcmil	CDA-R	CP500A1
683618	750 kcmil	CDA-W	CP750A1

standards coordinator	*standards manager*	*unit director*
John Shipek	John Shipek	Pamela S. Johnson

Links, Distribution Fuse

1. **Distribution Fuse Links** shall be the universal, removable buttonhead type for use in enclosed cutouts, and shall conform to the requirements of ANSI C37.42 except as modified herein.

   Auxiliary tubes shall be firmly affixed to the ferrule to prevent loosening after installation. All fuse elements shall be of solderless construction. The fusible element shall be made of silver in the 6-ampere to 100-ampere fuse links, inclusive.

   The threaded portion of the buttonhead shall be 1/4-28 UNF, Class 2A in accordance with ANSI B1.1, *Unified Inch Screw Threads*.

   The fuse rating shall be legibly stamped on the head or shoulder of the ferrule so the rating may be read if the washer is removed.

2. **Industry Standards**

   Distribution fuse links shall meet the applicable requirements of the following industry standards:

   B1.1 – "Unified Inch Screw Threads"; ANSI, *Edition 95*

   C37.42 – "Specification for High-Voltage Expulsion Type Distribution Class Fuses, Cutouts, Fuse Disconnecting Switches and Fuse Links"; ANSI; 1996

3. **Melting Time-Current Characteristics** shall be EEI-NEMA Type K (except the 3-ampere*). The fuse shall have a suitable time-current characteristic to allow for energization surges of the applicable distribution transformers listed in the table below, and be of the approved manufacturer's type listed below.

4. **Stock Unit:** EA

5. **Approved Manufacturers**

Stock No.	Fuse Rating (Amperes)	Chance/ Hubbell	Cooper	Kearney	S&C
683706	003*	M3TA23	FL12H3	21003	64003R1
683708	006K	–	FL6K6	–	265006R1
683710	010K	–	FL6K10	–	265010R1
683711	015K	–	FL6K15	–	265015R1
683713	025K	–	FL6K25	–	265025R1
683715	040K	–	FL6K40	–	265040R1
683717	050K	–	FL6K50	–	265050R1
683718	065K	–	FL6K65	–	265065 R1
683724	100K	–	FL6K100	–	265100R1
683726**	140K	M140KA23	–	31140	265140R1
683728	200K	M200KA23	–	31200	265200R2

* EEI-NEMA Type T, standard speed or manufacturer's special high-surge link. Type is approved as listed above

** No longer purchased. Information presented here for reference only.

For fusing schedule, see Construction Guideline DU11-1.

FAULT LIMITER
GENERAL PURPOSE CURRENT-LIMITING FUSE, "TYPE X"

Description

This standard applies to high-voltage general purpose current-limiting fuses and accessories for use on an AC-grounded wye 27/15.5 kV system. These current-limiting fuses are to be used both in single-phase and three-phase applications.

The fuse shall be a non-expulsion silver element fuse and shall comply with the latest revision of ANSI C37.47 except as amended by this material specification.

This general purpose current-limiting fuse will be mounted in SMU-20 fuse holders in pad mount switchgear or SMD-20 overhead cutouts. The fuse will be used to protect distribution transformers and equipment against low-impedance, high current faults.

Construction

Weight: 12 pounds maximum

Housing: The fuse shall be sealed for outdoor use. The tube shall be reinforced fiberglass, coated with an ultraviolet-resistant two-part epoxy paint, and have an EPDM rubber-skirted sleeve. The fuse must have no external element solder joints.

Terminals: The top and bottom end terminals shall be suitable to retrofit the fuse for mounting in existing S&C Electric 27-kV SMU-20 fused units. The fuse must operate the indicator mechanism on the SMU-20 live parts after operation. A terminal bottom end fitting adapter shall be supplied with each fuse unit.

Electrical Specifications

Voltage Rating	15.5 kV phase-to-neutral and 27-kV three-phase on solidly-grounded wye system
Rated Continuous Current	The fuse must meet ANSI 65E definition, ANSI 40E definition, or ANSI 25E definition as specified
Interrupting Rating	Shall be a minimum of 50,000 amperes RMS symmetrical
Basic Insulation	The BIL rating of the fuse shall be 125-kV
Radio Influence	The RIV of the complete device, fuse and fittings, shall not be greater than 30 microvolts at 1 megahertz when energized at 17.4 kV
Leakage Distance	The leakage distance of the fuse and assembly shall be equivalent to 19 inches of porcelain and shall be a material of proven dielectric integrity.

Labeling

In addition to the fuse markings as required under Section 6.2 of ANSI C37.47-1981, the manufacturer shall provide an identifying part number for the fuse and a part number for the end fitting, the date of manufacture, and the BIL rating. The fuse markings shall be legible and permanently installed on both the fuse and carton. The carton label shall also include the City Light stock number.

Packaging

Each fuse shall be packaged one to a carton, with the end fitting adapter attached to the bottom end terminal and instructions for mounting the fuse with S&C SM-20 fittings.

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ORIGINATOR	STANDARDS COORDINATOR	STANDARDS SUPERVISOR	UNIT DIRECTOR
Jim S. Horn	Charles L. Shaffer	John C. Skinner	Betty Robin

FAULT LIMITER
GENERAL PURPOSE CURRENT-LIMITING FUSE

Test Requirement

The fuses must be 100% electrically tested before shipment to withstand 95% minimum melt energy without damage.

Data To Be Submitted for Qualification as an Approved Manufacturer

The manufacturer shall indicate any exceptions to this material specification and/or any test requirements as outlined in the latest revision of ANSI C37.47.

a. Time-Current characteristic graphs on standard-size transparencies

b. Maximum developed switching surge voltage

c. Maximum let-through Ampere-Squared-Seconds

d. Weight, dimensions, outside body material, and leakage distance

e. Test data on contaminated insulator performance. The test shall be as suggested in Seattle City Light Standard 6840.3, *A Suggested Method for Contaminated Insulator Performance Test for 27-kV System Voltage*, or a City Light approved equivalent test method.

f. Certified test data on 15.5 kV interrupting tests at critical current (that current which allows maximum energy let-through)

g. Certified test data on interruption at 15.5 kV where the applied voltage immediately rises to 27 kV and is held for 10 minutes

h. Certified test data on interrupting three-phase and phase-to-phase faults

i. End fitting terminal adapter drawings

j. Part number for fuse and part number for bottom end fitting retaining nut

Warranty

The manufacturer shall warrant the fault limiter to be free of defects of workmanship and materials when used for the applications as stated in this specification (three-phase operation at 27 kV) for a period of five years from the date of shipment.

Stock No.	Size	MAX I^2T	Approved Mfg. Cat. No.
685006	25x	31 kA	Cooper 15F025EHC2CN
685008	40x	110 kA	Cooper 15F040EHC2CN
685010	65x	240 kA	Cooper 15F065EHC2CN
685011	Nut, end fitting retainer		Cooper EF-H

FAULT LIMITER
GENERAL PURPOSE CURRENT-LIMITING FUSE, TYPE "ET"

Description

This standard applies to high-voltage general purpose current-limiting fuses and accessories for use on an AC-grounded wye 27/15.5 kV system. These current-limiting fuses are to be used both in single-phase and three-phase applications.

The fuse shall be a non-expulsion silver element fuse and shall comply with the latest revision of ANSI C37.47 except as amended by this material specification.

This general purpose current-limiting fuse will be mounted in a air insulated submersible fuse holder and be used to protect distribution transformers and equipment against low-impedance, high current faults.

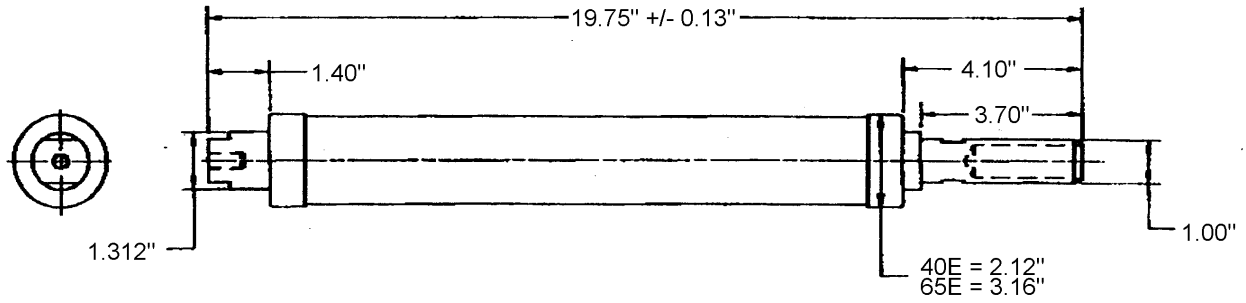
Construction

Weight: 12 pounds maximum

Housing: The tube shall be reinforced fiberglass. The fuse must have no external element solder joints.

Terminals: The top and bottom end terminals shall be of the dimensions shown in Figure 1 below.

FIGURE 1



Electrical Specifications

Voltage Rating	15.5 kV phase-to-neutral and 27-kV three-phase on solidly-grounded wye system
Rated Continuous Current	The fuse must meet ANSI 65E definition, or ANSI 40E definition, definition as specified.
Interrupting Rating	Shall be a minimum of 50,000 amperes RMS symmetrical
Basic Insulation	The BIL rating of the fuse shall be 125-kV
Radio Influence	The RIV of the complete device, fuse and fittings, shall not be greater than 30 microvolts at 1 megahertz when energized at 17.4 kV

Leakage Distance The leakage distance of the fuse and assembly shall be equivalent to 19 inches of porcelain and shall be a material of proven dielectric integrity.

Standards Coordinator	Standards Supervisor	Unit Director
Laura Vanderpool	John Shipek	Darnell Cola

FAULT LIMITER
GENERAL PURPOSE CURRENT-LIMITING FUSE, TYPE "ET"

Labeling

In addition to the fuse markings as required under Section 6.2 of ANSI C37.47-1981, the manufacturer shall provide an identifying part number for the fuse, the date of manufacture, and the BIL rating. The fuse markings shall be legible and permanently installed on both the fuse and carton. The carton label shall also include the City Light stock number.

Packaging

Each fuse shall be packaged one to a carton, with instructions for mounting the fuse.

Test Requirement

The fuses must be 100% electrically tested before shipment to withstand 95% minimum melt energy without damage.

Data To Be Submitted for Qualification as an Approved Manufacturer

The manufacturer shall indicate any exceptions to this material specification and/or any test requirements as outlined in the latest revision of ANSI C37.47.

a. Time-Current characteristic graphs on standard-size transparencies
b. Maximum developed switching surge voltage
c. Maximum let-through Ampere-Squared-Seconds
d. Weight, dimensions, outside body material, and leakage distance
e. Certified test data on 15.5 kV interrupting tests at critical current (that current which allows maximum energy let-through)
f. Certified test data on interruption at 15.5 kV where the applied voltage immediately rises to 27 kV and is held for 10 minutes
g. Certified test data on interrupting three-phase and phase-to-phase faults

Warranty

The manufacturer shall warrant the fault limiter to be free of defects of workmanship and materials when used for the applications as stated in this specification (three-phase operation at 27 kV) for a period of five years from the date of shipment.

Stock No.	Size	MAX I^2T	Approved Mfg. Cat. No.
684935	40ET	20 kA	Cooper 15F040ET/SEA
684937	65ET	75 kA	Cooper 15F065ET/SEA

In November 2015, this standard was renumbered from 6840.1.1 to 6840.11.

FAULT LIMITER
BACKUP CURRENT LIMITING FUSE

Description

This standard applies to high voltage backup current limiting fuses and accessories for use on an AC grounded wye 27/15.5 kV system. These current limiting fuses are to be used both in single-phase and three-phase applications.

The fuse shall be a non-expulsion silver element fuse and shall comply with the latest revision of ANSI C37.47 except as amended by this material specification.

This backup current limiting fuse will be used to protect distribution transformers and equipment against low impedance faults.

Construction

Weight: 12 pounds maximum.

Housing: The fuse shall be sealed for outdoor use. The tube shall be reinforced fiberglass, coated with an ultraviolet resistant two-part epoxy paint, and with EDPM rubber skirted sleeve. The fuse must have no external element solder joints.

Terminals: The top terminal shall be single hole spade type suitable for a bolted connector. Tin-plated aluminum shall not be used. The bottom terminal shall be a stud designed to support the limiter in a vertical or horizontal position. The stud shall be approximately 2 inches long, knurled, and have a diameter of 0.33 ± 0.04 inches. Tin-plated aluminum shall not be used.

Electrical Specifications

Voltage Rating:	15.5 kV phase to neutral and 27 kV three-phase on solidly grounded wye system.
Rated Continuous Current:	The backup fuse must be current rated and must coordinate with the respective ANSI K definition fuse links for currents less than 2,000 amperes. The minimum melting time-current characteristic of the limiter shall be greater than the total-clearing TCC of the K-speed fuse link for currents less than the TCC Intersect current
Interrupting Rating:	Shall be a minimum of 50,000 amperes RMS symmetrical.
Basic Insulation:	The BIL rating of the fuse shall be 125 kV.
Radio Influence:	The RIV of the complete device, fuse and connectors shall not be greater than 30 microvolts at 1 megahertz when energized at 17.4 kV.
Maximum Let-Through Ampere Squared Seconds:	The maximum I^2T shall be indicated by the manufacturer.
Leakage Distance:	The leakage distance of the fuse and assembly shall be equivalent to 17 inches of porcelain and shall be a material of proven dielectric integrity.

Labeling

In addition to the fuse markings as required under Section 6.2 of ANSI C37.47, the manufacturer shall provide the date of manufacture, BIL rating, and coordinating K link fuse size. The fuse markings shall be

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Jim S. Horn	Charles L. Shaffer	John C. Skinner	Betty Robin

legible and permanently installed on both the fuse and carton. The carton label shall also include the City Light Stock Number.

Packaging

Each fuse, shall be packaged one to a carton and include an eyebolt connector for #4 to #2 copper conductors, bolted to the spade end.

Test requirement

The fuses must be 100% electrically tested before shipment to withstand 95% minimum melt energy without damage.

Data to be Submitted for Qualification as a Manufacturer

The manufacturer shall indicate any exceptions to this material specification and/or any test requirements as outlined in the latest revision of ANSI C37.47.

A. Time-Current characteristic graphs on standard size transparencies.

B. Maximum developed switching surge voltage.

C. Maximum let-through Ampere-Squared-Seconds.

D. TCC intersect point in Amperes with respective coordinating K links.

E. Weight, dimensions, outside body material and leakage distance.

F. Test data on contaminated insulator performance. The test shall be as suggested in Seattle City Light Standard 6840.3, "A Suggested Method for Contaminated Insulator Performance Test for 27 kV System Voltage," or a pre-approved equivalent test method.

G. Certified test data on 15.5 kV interrupting tests at critical current (that current which allows maximum energy let-through).

H. Certified test data on interruption at 15.5 kV where the applied voltage immediately rises to 27 kV and is held for 10 minutes.

I. Certified test data on interrupting three-phase and phase-to-phase faults.

J. Part number for fuse.

Warranty

The manufacturer shall warrant the fault limiter to be free of defects of workmanship and materials when used for the applications as stated in this specification (three-phase operation at 27 kV) for a period of five years from the date of shipment.

Stock Unit: Each

STOCK NO.	K LINK	SIZE	I^2T	TCC INTERSECT	COOPER CAT. NO.
684900	12k	(A)	15,000	450	155 K12-SEA
684902	25k	(B)	40,000	750	155 K25-SEA
684905	50k	(C)	160,000	1000	155 K50-SEA
684907	65k	(D)	200,000	1800	155 K65-SEA

CONNECTOR BAR

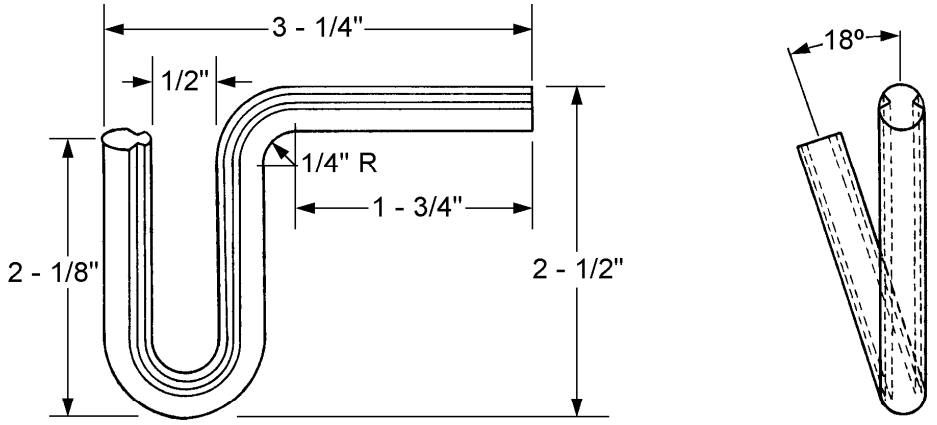
Connector Bars are used to offset fault limiters from fused cutouts, particularly on wire #2 in three-phase construction.

Material: #2/0 copper trolley wire (Stock No. 610020)

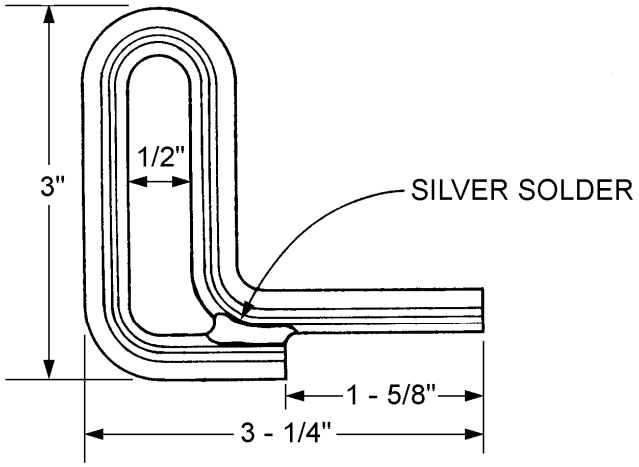
Manufacturer: City Light Shops

Reference Standards: Construction Guideline D11-2

Stock Unit: EA



Standard Connector Bar
Stock No. 684910



Reinforced Connector Bar
Stock No. 684912

6849-1.TIF

ORIGINATOR	STANDARDS COORDINATOR	STANDARDS SUPERVISOR	UNIT DIRECTOR
Jim S. Horn	Charles L. Shaffer	John C. Skinner	Betty Robin

FUSE HOLDER AND MOUNTING RACK, SUBMERSIBLE SINGLE-PHASE, 15.5 kV, 100 AMPERE

1. General

1.1 This specification covers submersible, air insulated single-phase, 15.5 kV, 100 ampere fuse holder and mounting rack for three units.

1.2 The fuse holder shall meet or exceed the material and testing requirements of the latest revision of all applicable standards by ANSI, IEEE, NEMA, except as modified herein.

1.3 The completed unit shall be capable of withstanding internal failure without explosion of fire.

2. Service

This fuse holder is intended for use on a 26.4 GRD-Y/15.2 kV, three-phase, 60 Hertz distribution system.

3. Ratings

The ratings for the integrated fuseholder assembly shall be as follows:

Normal Voltage - phase to ground	15.5 kV
Maximum Design Voltage	15.5 kV
Basic Impulse Insulation Level (BIL)	125 kV
Flashover	200 kV
Continuous Current Rating	100 amperes
Short-Circuit Rating – one second	20,000 amperes, sym.

4. Materials

4.1 The fuse holder tank shall be constructed of 14 gauge 304 stainless steel

4.2 The fuse holder rack shall be constructed of mild steel angle stock and shall be hot dip galvanized.

4.3 Hot dip galvanizing shall meet the requirements of ASTM A 153.

5. Fuse Holder Tank

5.1 The stainless steel tank shall be all welded construction.

5.2 The sides of the fuseholder shall be painted black for improved heat transfer. Paint is not required on the top of bottom of the tank.

5.3 The fuse holder shall be constructed to withstand all pressure buildup during interruption without permanent distortion or damage to any portion of the structure.

5.4 Four mounting tabs shall be provided for securing the fuse holder to the mounting rack.

5.5 A Load break parking stand shall be supplied on each fuse holder.

5.6 A 1/4" NPT half coupling and pipe plug shall be located on the top of the tank for installation of a pressure relief valve by City Light.

6. Grounding Provisions

Each fuse holder shall have a grounding nut, threaded 1/2" x 13 Welded to the front of the tank within 8 inches of the top.

ORIGINATOR	STANDARDS COORDINATOR	STANDARDS SUPERVISOR	UNIT DIRECTOR
Jim S. Horn	Charles L. Haffer	John C. Skinner	Harold Gray

7. Bushings

7.1 Primary bushings shall be 200 ampere bushing wells. The bushing wells shall be rated 200 amperes and 125 kV BIL and shall meet the requirements of the 15.2 kV version of Figure 3 of ANSI/IEEE 386-95 for 200 A bushing-well interface, 8.3 kV, 15.2 kV, and 21.1 kV.

7.2 Each bushing well shall have a cap to prevent the entrance of moisture or contamination during shipping and storage. The bushings shall be protected against damage during shipping.

8. Operation

8.1 The bayonet access for fuse replacement shall be secured with three cam lock releases which are easily operated with a switch stick.

8.2 The bayonet fuse access shall be interlocked to prevent opening without first removing the elbow connector.

9. Mounting Rack

Top shall slant fifteen degrees out from the mounting surface.

10. Signs and Nameplates

Each fuseholder shall be provided with a stainless steel nameplate indicating the following:

(a) Manufacturer's name and drawing or catalog number for the completed assembly.
(b) Voltage ratings.
(c) Continuous current rating.
(d) Short-circuit ratings.
(e) One line diagram.

11. Guarantee

Any fuse holder failing due to defective design, material, and/or workmanship within 12 months after being energized or 18 months after delivery shall be repaired or replaced at no charge to the City of Seattle Light Department. Any defect in design, material, and/or construction discovered within this period shall be corrected either by repair or replacement on all units furnished on this order by the manufacturer at no charge to the City of Seattle Light Department.

12. Approved Manufacturers

Stock No.	Description	Trayer Engineering Cat. No.
684930	Fuse Holder, 100 Ampere, 1 Phase, 15.5 kV, Submersible, Air Insulated	311ATDOM1 DWG # 000321 REV. C
684933	Rack, Fuse Holder Mounting, 3 Phase, Submersible, Galvanized Steel	HDGR3-10 DWG # 961021 REV. B

Stock Unit: EA

Overhead Fault Indicators

1. Scope

This material standard covers the detailed requirements for single-phase overhead fault indicators.

Because product design engineers are constantly attempting improvements, overhead fault indicators are available in a wide variety of models and features. To be effective, field personnel require a clear understanding of the operating characteristics of each type of fault indicator on the system. For these reasons, to simplify training, operational work practices, and maintenance requirements, only one overhead fault indicator manufactured by one supplier shall be approved for purchase at a time (for this application). A thoughtful review should occur before changing technology.

2. Application

Fault indicators are intended for semi-permanent installation on 26.4 kV, three-phase, bare, overhead, distribution conductors for the purpose of aiding crews with locating faults.

Fault indicators are intended for installation at the following locations:

- Mid-point of the feeder near switches
- Feeder “getaways”
- Underground dips
- Un-fused laterals
- 3/4 point on long feeders

Fault indicators may be installed alone on one conductor or in sets of three on a circuit.

Units may be manually reset with Test/Reset magnet, Stock number 013006.

3. Industry Standard

Fault indicators shall meet the requirements of the following industry standard:

IEEE 495-1986 - Guide for Testing Faulted Circuit Indicators

4. Requirements

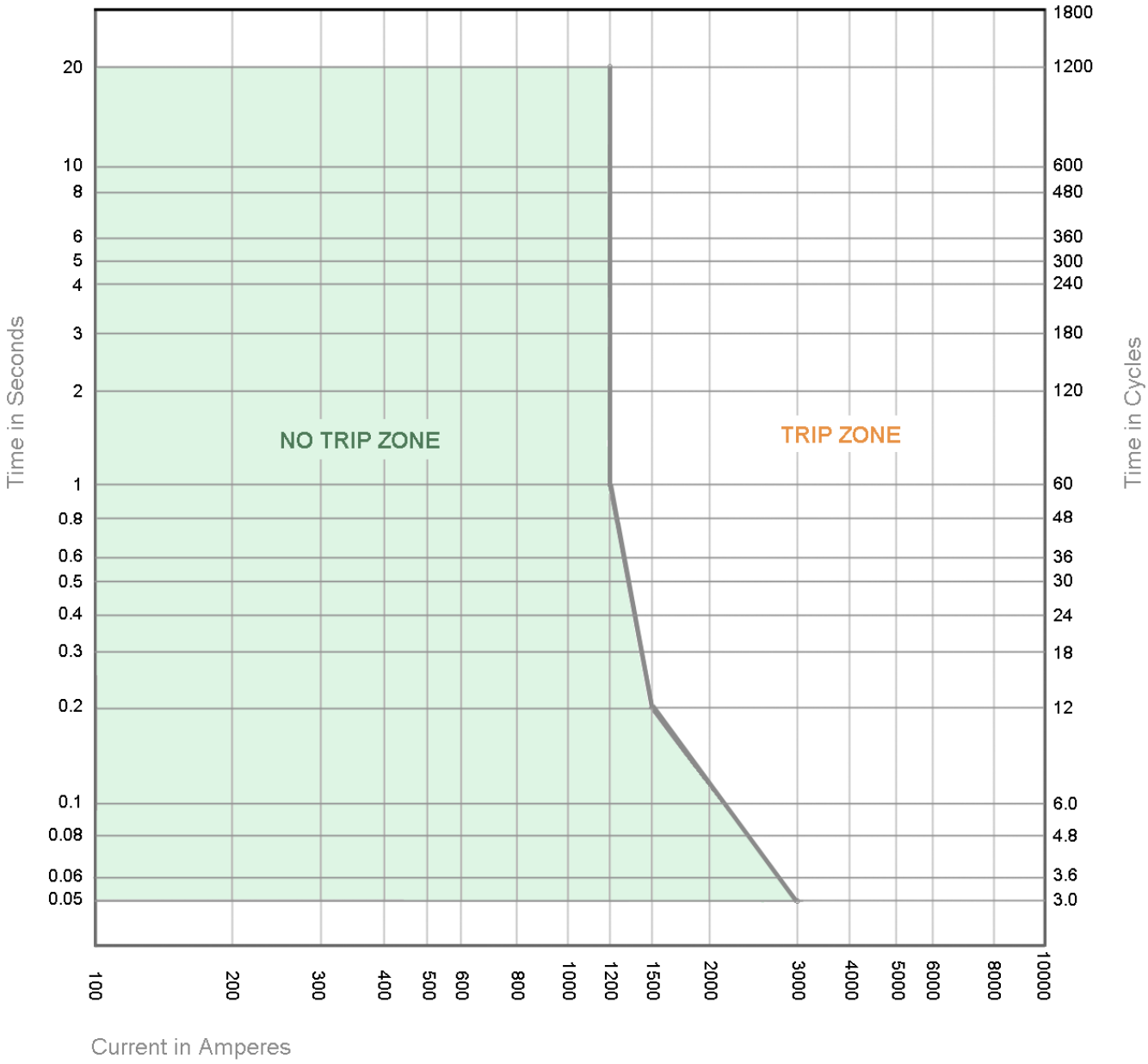
4.1 Electrical Parameters

Type:	Non-directional, fixed trip
Fixed trip point:	1200 A (steady state) +/- 10%
Trip speed:	1 cycle (at 4500 A)
	3 cycles (at 3000 A)
	12 cycles (at 1500 A)
Operating temperature range:	-40 to +85 degrees C
Operating voltage (maximum):	46 kV
Current withstand (minimum):	25 kA (10 cycles)

Fault indicators shall trip according to the time current characteristic curve shown in Figure 4.1.

4. Requirements, continued

Figure 4.1



4. Requirements, continued

4.2 Indication*

Indication type:	High intensity light emitting diodes (LED)
Indication color:	Red, yellow, or both
Flashing frequency (minimum):	30 per minute
Visibility (day):	1000 feet
Visibility (night):	2000 feet

**Adequacy of indication based on SCL field tests and Standards review*

4.3 Reset

Reset type:	Time
Time reset duration:	4 hours, +/- 1 hours
Manual reset capable:	Yes

4.4 Mounting

Wire diameter range low-end (maximum):	0.3 in
Wire diameter range high-end (minimum):	1.2 in
Hot stick installation capable:	Yes

4.5 Power Supply

Power supply type:	Lithium battery
Battery shelf life:	20 years
Battery replaceability:	Replaceable or non-replaceable
Low battery voltage indication:	Yes
Continuous flash life (minimum):	400 hours

5. Marking

Each fault indicator shall be marked with the last two digits of its year of manufacture.

Two digit year code marking shall be reflective (or on reflective background) in 3/4 + 1/4, - 1/16 inch high characters.

6. Packaging

Fault indicators shall be packaged fully assembled, one per cardboard box, complete with installation instructions.

Individual boxes shall be marked with manufacturer's name or symbol, product description, catalog number, year of manufacture, quantity contained, and Seattle City Light's Stock Number.

Shipping containers shall be marked with manufacturer's name or symbol, Seattle City Light's Purchase Order Number, and Seattle City Light's Stock Number.

7. Issuance

Stock Unit: EA

8. Approved Manufacturer

Stock Number	Description	Power Delivery Products Catalog Number
765872	Overhead fault Indicator	PDP 41-2001-271-1500A, Navigator LM
013006	Test/ reset magnet	49-6001-002

9. References

Shipek, John; SCL Standards Engineer, subject matter expert and originator of 6850.00 (john.shipek@seattle.gov}

FUSE, GENERAL PURPOSE, NON-CURRENT LIMITING, 250 AND 600 VOLT

1. Scope

This material standard covers the requirements for 250 and 600 Vac rated, general purpose, non-current limiting, cartridge type fuses.

This material standard applies to the following Seattle City Light Stock Numbers:

Stock Number	Voltage Rating, Vac	Current Rating, A
683020	250	1
683021	250	3
683023	250	6
683024	250	10
683025	250	15
683026	250	20
683027	250	25
683028	250	30
683029	250	35
683030	250	40
683031	250	45
683032	250	50
683033	250	60
683034	250	70
683035	250	80
682607	600	3
682609	600	10

2. Application

General purpose fuses are used to protect feeder and branch circuits where the available short-circuit current does not exceed 50,000 amperes for circuits rated up to 60 A (or 10,000 amperes for circuits rated 65 to 600 A).

General purpose fuses are appropriate for lighting, heating, and other non-inductive circuits.

General purpose fuses are intended for dry applications only.

Stock Numbers 682607 and 682609 are used in fire detection control cabinets. Refer to Construction Guidelines NCB-140 and NCB-141.

3. Industry Standards

General purpose fuses shall meet the applicable requirements of the following industry standards and their amendments:

UL Standard 248-6; Underwriters Laboratories Inc., Low Voltage Fuses - Part 6: Class H, Non-Renewable Fuses, January 1, 2000

UL Standard 248-6 (Amendment); Underwriters Laboratories Inc., Low Voltage Fuses - Part 6: Class H, Non-Renewable Fuses, April 14, 2004

4. Attributes

General purpose fuses shall have the following attributes:

4.1 Fuses rated 0 to 60A

UL class	K5
Interrupting rating (IR)	50,000 A RMS symmetrical
Terminal style	ferrule
Figure	4.1

standards coordinator	*standards manager*	*unit director*
John Shipek	John Shipek	Pamela S. Johnson

Figure 4.1, Ferrule, non-rejection style fuse

4.2 Fuses rated 65 to 600A

UL class	H
Interrupting rating (IR)	10,000 A RMS symmetrical
Terminal style	end blade
Figure	4.2

Figure 4.2, End blade, non-rejection style fuse

5. Tests and Test Reports

Data that establishes compliance with the requirements of UL 248-6 and this material standard shall be provided upon request.

6. Marking

Each general purpose fuse shall be permanently marked with:

- Manufacturer's name or symbol
- Manufacturer's catalog number
- Voltage rating
- Ampere rating

7. Packaging

General purpose fuses shall be packaged to prevent damage during shipping, handling, and storage.

8. Issuance

EA

9. Approved Manufacturers

					Catalog Numbers		
Stock Number	Voltage Rating, Vac	Current Rating, A	Diameter, in	Length, in	Bussman	Ferraz Shawmut	Littelfuse
683020	250	1	9/16	2	NON-1	OT1	NLN-1
683021	250	3	9/16	2	NON-3	OT3	NLN-3
683023	250	6	9/16	2	NON-6	OT6	NLN-6
683024	250	10	9/16	2	NON-10	OT10	NLN-10
683025	250	15	9/16	2	NON-15	OT15	NLN-15
683026	250	20	9/16	2	NON-20	OT20	NLN-20
683027	250	25	9/16	2	NON-25	OT25	NLN-25
683028	250	30	9/16	2	NON-30	OT30	NLN-30
683029	250	35	13/16	3	NON-35	OT35	NLN-35
683030	250	40	13/16	3	NON-40	OT40	NLN-40
683031	250	45	13/16	3	NON-45	OT45	NLN-45
683032	250	50	13/16	3	NON-50	OT50	NLN-50
683033	250	60	13/16	3	NON-60	OT60	NLN-60
683034	250	70	1-1/16	5-5/8	NON-70	OT70	NLN-70
683035	250	80	1-1/16	5-5/8	NON-80	OT80	NLN-80
682607	600	3	13/16	5	NOS-3	OTS3	NLS-3
682609	600	10	13/16	5	NOS-10	OTS10	NLS-10

10. References

6830.5 (canceled); "Fuse, Cartridge, One-Time, Zinc Alloy, 250-Volt;" Material Standard; SCL

Cooper Bussmann Full Line Catalog No. 1007; 2007

NCB-140; "Fire Detection Installation Details and Wiring Diagram for Dry Vault;" Construction Guideline; SCL

NCB-141; "Fire Detection Installation Details and Wiring Diagram for Wet Vaults;" Construction Guideline; SCL

Shipek, John; SCL Standards Engineer, subject matter expert and originator of SCL Material Standard 6855.05 (john.shipek@seattle .gov)

DUMMY NEUTRALS, 250 VOLT

1. Scope

This material standard covers the requirements for 250 Vac rated, dummy neutrals.

This material standard applies to the following Seattle City Light Stock Numbers:

Stock Number	Fuse Size Equivalent, A
683235	30
683240	60

2. Application

Dummy neutrals are used where a neutral conductor terminates on a UL Class H fuse block and it is not appropriate for a fuse to be in that leg of the circuit.

Dummy neutrals are installed in fuse blocks to effectively form a short-circuit across the terminals of the block.

Dummy neutrals are ***not*** fuses.

Dummy neutrals are also known as neutral slugs.

3. Attributes

Stock Number 683235 shall:

- Mimic the physical dimensions of a 250 Vac, 30 ampere, UL Class H fuse.
- Form an effective short-circuit across the terminals of a 250 Vac, 1/10 to 30 ampere rated, Class H fuse block.

Stock Number 683240 shall:

- Mimic the physical dimensions of a 250 Vac, 60 ampere, UL Class H fuse.
- Form an effective short-circuit across the terminals of a 250 Vac, 31 to 60 ampere rated, Class H fuse block.

4. Packaging

Dummy neutrals shall be packaged to prevent damage during shipping, handling, and storage.

5. Issuance

EA

6. Approved Manufacturer

Stock Current	Fuse Size Equivalent, A	Diameter, in	Length, in	Catalog Numbers		
				Bussman	Mersen	Littelfuse
683235	30	0.54	2	NTN-R-30	-	-
683120	60	0.84	5	NTN-R-60	-	-

standards coordinator	*standards supervisor*	*unit director*
John Shipek	John Shipek	Darnell Cola

7. References

6832.3 (canceled)**;** “Solid Neutral Slugs”; Material Standard; SCL

Cooper Bussmann Full Line Catalog No. 1007; 2007

Shipek, John; SCL Standards Engineer, subject matter expert and originator of 6855.07 (john.shipek@seattle.gov)

UL Standard 248-6 - Underwriters Laboratories Inc.; Low Voltage Fuses - Part 6: Class H, Non-Renewable Fuses; January 1, 2000

FUSE, DUAL-ELEMENT, TIME-DELAY, 250 VOLT

1. Scope

This material standard covers the requirements for 250 Vac rated, dual-element, time-delay, cartridge type fuses with rejection feature terminals.

This material standard applies to the following Seattle City Light Stock Numbers:

Stock Number	Current Rating, A
683037	100
683039	125
683040	150
683042	200
683043	225
683045	300
683047	400
683049	500
683050	600

2. Application

Unlike single-element, general purpose fuses (Material Standard 6855.05), dual-element, time-delay fuses can be sized closer to provide both high performance short-circuit protection and reliable overload protection in circuits subject to temporary overloads and surge currents.

Dual-element fuses are appropriate for motor, transformer, and other inductive circuits.

Dual-element fuses are intended for dry applications only.

3. Industry Standards

Dual-element fuses shall meet the applicable requirements of the following industry standard and its amendments:

UL Standard 248-12; Underwriters Laboratories Inc., Low Voltage Fuses - Part 12: Class R Fuses, January 1, 2000

UL Standard 248-12 (Amendment); Underwriters Laboratories Inc., Low Voltage Fuses - Part 12: Class R Fuses, April 14, 2004

4. Attributes

Dual element fuses shall have the following attributes:

UL class	RK5
Voltage Rating	250 Vac
Interrupting rating (IR)	200,000 A RMS symmetrical
Terminal style	end blade, with rejection feature

5. Tests and Test Reports

Data that establishes compliance with the requirements of UL 248-12 and this material standard shall be provided upon request.

6. Marking

Each dual-element fuse shall be permanently marked with:

- Manufacturer's name or symbol
- Manufacturer's catalog number
- Voltage rating
- Ampere rating

standards coordinator	*standards manager*	*unit director*
John Shipek	John Shipek	Pamela S. Johnson

7. Packaging

Dual-element fuses shall be packaged to prevent damage during shipping, handling, and storage.

8. Issuance

EA

9. Approved Manufacturers

Stock Number	Current Rating, A	Diameter, in	Length, in	Catalog Numbers		
				Bussman	Mersen	Littelfuse
683037	100	1-1/16	5-5/8	FRN-R-100	TR-R100	FLNR-100
683039	125	1-9/16	7-1/8	FRN-R-125	TR-R125	FLNR-125
683040	150	1-9/16	7-1/8	FRN-R-150	TR-R150	FLNR-150
683042	200	1-9/16	7-1/8	FRN-R-200	TR-R200	FLNR-200
683043	225	2-1/16	8-5/8	FRN-R-225	TR-R225	FLNR-225
683045	300	2-1/16	8-5/8	FRN-R-300	TR-R300	FLNR-300
683047	400	2-1/16	8-5/8	FRN-R-400	TR-R400	FLNR-400
683049	500	2-19/32	10-3/8	FRN-R-500	TR-R500	FLNR-500
683050	600	2-19/32	10-3/8	FRN-R-600	TR-R600	FLNR-600

10. References

6830.6 (canceled); **"**Fuse, Cartridge, One-Time, 250 Volt, 200,000 Amp Interrupting"; Material Standard; SCL

Cooper Bussmann Full Line Catalog No. 1007, 2007

Shipek, John; SCL Standards Engineer, subject matter expert and originator of 6855.10 (john.shipek@seattle.gov)

FUSE, DUAL-ELEMENT, TIME-DELAY, PLUG TYPE, 125 VOLT, S- AND T-SERIES

1. Scope

This material covers the requirements for 125 Vac rated, dual-element, time-delay, S- and T-series, plug type, fuses, and an adapter.

This material standard applies to the following Seattle City Light Stock Numbers:

Stock Number	Series	Base Type	Current Rating, A
683003	T	Edison	6
683354	T	Edison	10
683355	T	Edison	15
683356	T	Edison	20
683357	T	Edison	25
683358	T	Edison	30
683350	S	Rejection	15
683351	S	Rejection	20
683353	S	Rejection	30

683411 Adapter, T series (Edison) to S series (Rejection)

2. Application

Plug fuses are used to protect branch circuits where the available short-circuit current does not exceed 10,000 amperes.

T-series (Edison base) plug fuses are appropriate for general purpose circuits and can provide small motor overload protection when used with box cover units.

S-series plug fuses are designed with an industry standard attribute called *rejection feature*. Fuses with rejection feature promote safety by preventing the overfusing of branch circuits.

Plug fuses are intended for dry applications, only.

T- to S-series adapters, Stock Number 683411, screw into Edison thread fuse sockets of standard fuse boxes making it easy to retrofit existing fuse installations. Adapters only accept 15 A plug fuses, Stock Number 683350.

3. Industry Standards

Plug fuses shall meet the applicable requirements of the following industry standard and its amendment:

UL Standard 248-11 - Underwriters Laboratories Inc., Low Voltage Fuses - Part 11: Plug Fuses, January 1, 2000

UL Standard 248-11 (Amendment) - Underwriters Laboratories Inc., Low Voltage Fuses - Part 11: Plug Fuses, April 14, 2004

4. Attributes

4.1 T-series plug fuses shall have the following attributes:

UL type	T
Voltage rating	125 Vac
Interrupting rating (IR)	10,000 A RMS symmetrical
Base	Brass with Edison threads
Body	ceramic
Figure	4.1

standards coordinator	*standards manager*	*unit director*
John Shipek	John Shipek	Pamela S. Johnson

Figure 4.1, T-series plug fuse

4.2 S-series plug fuses shall have the following attributes:

UL type	S
Voltage rating	125 Vac
Interrupting rating (IR)	10,000 A RMS symmetrical
Base	ceramic with rejection threads
Body	ceramic
Figure	4.2

Figure 4.2, S-series plug fuse (typical)

5. Tests and Test Reports

Data that establishes compliance with the requirements of UL 248-11 and this material standard shall be provided upon request.

6. Marking

Each plug fuse shall be permanently marked with:

- Manufacturer's name or symbol
- Manufacturer's catalog number
- Voltage rating
- Ampere rating

7. Packaging

Plug fuses shall be packaged to prevent damage during shipping, handling, and storage.

8. Issuance

EA

10. References

6833.5 (canceled); "Fuses – Plug, Dual Element, Time-Delay"; Material Standard; SCL

Cooper Bussmann Full Line Catalog No. 1007; 2007

Shipek, John; SCL Standards Engineer, subject matter expert and originator of 6855.15 (john.shipek@seattle.gov)

9. Approved Manufacturers

Stock Number	Series	Base Type	Current Rating, A	Catalog Numbers		
				Bussman	Mersen	Littelfuse
683003	T	Edison	6	T-6	GT6	TOO-6
683354	T	Edison	10	T-10	GT10	TOO-10
683355	T	Edison	15	T-15	GT15	TOO-15
683356	T	Edison	20	T-20	GT20	TOO-20
683357	T	Edison	25	T-25	GT25	TOO-25
683358	T	Edison	30	T-30	GT30	TOO-30
683350	S	Rejection	15	S-15	-	SOO-15
683351	S	Rejection	20	S-20	-	SOO-20
683353	S	Rejection	30	S-30	-	SOO-30
683411	Adapter, T-series(Edison) to S-series (Rejection)			SA-15	SAG15	SAO-15

FUSE, TIME-DELAY, 480 VOLT

1. Scope

This material standard covers the requirements for 480 Vac rated, time-delay, cartridge type fuses.

This material standard applies to the following Seattle City Light Stock Numbers:

Stock Number	Current Rating, A
683171	10
683172	15
683165	35
683163	50

2. Application

Time-delay fuses are used to protect branch circuits where the available short-circuit current does not exceed 100,000 amperes.

Time-delay fuses are appropriate for lighting, heating, and other non-inductive circuits.

Time-delay fuses are designed with varied lengths to prevent misapplication.

Time-delay fuses are used in holders specified in Material Standard 6857.05.

Stock Number 683171 is used in physical totaling metering schemes (rare).

3. Industry Standards

Time-delay fuses shall meet the applicable requirements of the following industry standard and its amendment:

UL Standard 248-5 - Underwriters Laboratories Inc., Low Voltage Fuses - Part 5: Class G Fuses, January 1, 2000

UL Standard 248-5 (Amendment) - Underwriters Laboratories Inc., Low Voltage Fuses - Part 5: Class G Fuses, April 14, 2004

4. Attributes

Time-delay fuses shall have the following attributes:

UL class	G
Voltage rating	480 Vac
Interrupting rating (IR)	100,000 A RMS symmetrical
Terminal style	ferrule

5. Tests and Test Reports

Data that establishes compliance with the requirements of UL 248-5 and this material standard shall be provided upon request.

6. Marking

Each time-delay fuse shall be permanently marked with:

- Manufacturer's name or symbol
- Manufacturer's catalog number
- Voltage rating
- Ampere rating

7. Packaging

Time-delay fuses shall be packaged to prevent damage during shipping, handling, and storage.

8. Issuance

EA

standards coordinator	*standards manager*	*unit director*
John Shipek	John Shipek	Pamela S. Johnson

9. Approved Manufacturers

Stock Number	Current Rating, A	Diameter, in	Length, in	Catalog Numbers		
				Bussman	Mersen	Littelfuse
683171	10	13/32	1-5/16	SC-10	AG10	SLC-10
683172	15	13/32	1-5/16	SC-15	AG15	SLC-15
683165	35	13/32	2-1/4	SC-35	AG35	SLC-35
683163	50	13/32	2-1/4	SC-50	AG50	SLC-50

10. References

6857.05; "Fuse Holders, In-line, Water-Resistant, and Insulating Boots"; Material Standard; SCL

Cooper Bussmann Full Line Catalog No. 1007; 2007

Shipek, John; SCL Standards Engineer, subject matter expert and originator of 6855.25 (john.shipek@seattle.gov)

FUSE, TIME-DELAY, 125 VOLT

1. Scope

This material standard covers the requirements for 125 Vac rated, time-delay, cartridge type fuses.

This material standard applies to the following Seattle City Light Stock Numbers:

Stock Number	Current Rating, A
683193	5
683199	10

2. Application

Time-delay fuses may be used only where proper protection is already being provided by a branch circuit device.

Time-delay fuses are used to provide supplementary protection on branch circuits so that the branch circuit fuse is not disturbed in downstream, overcurrent situations.

Time-delay fuses may be used only where the available short-circuit current does not exceed 10,000 amperes at 125 Vac. Interrupting rating significantly decreases with voltage.

Time-delay fuses are appropriate for general purpose, lighting, and meter circuits.

Fuses measuring 13/32 x 1-1/2 inches are also known as midget fuses.

3. Industry Standards

Time-delay fuses shall meet the applicable requirements of the following industry standard and its amendment:

UL Standard 248-14 - Underwriters Laboratories Inc., Low Voltage Fuses - Part 14: Supplemental Fuses, January 1, 2000

UL Standard 248-14 (Amendment) - Underwriters Laboratories Inc., Low Voltage Fuses - Part 14: Supplemental Fuses, April 14, 2004

4. Attributes

Time-delay fuses shall have the following attributes:

UL type	Supplemental
Interrupting rating (IR)	10,000 A RMS symmetrical at 125 Vac
Diameter	13/32 in
Length	1-1/2 in
Terminal style	ferrule

5. Tests and Test Reports

Data that establishes compliance with the requirements of UL 248-14 and this material standard shall be provided upon request.

6. Marking

Each time-delay fuse shall be permanently marked with:

- Manufacturer's name or symbol
- Manufacturer's catalog number
- Voltage rating
- Ampere rating

7. Packaging

Time-delay fuses shall be packaged to prevent damage during shipping, handling, and storage.

8. Issuance

EA

standards coordinator	*standards manager*	*unit director*
John Shipek	John Shipek	Pamela S. Johnson

9. Approved Manufacturers

Stock Number	Current Rating, A	Catalog Numbers		
		Bussman	Mersen	Littelfuse
683193	5	FNM-5	TRM5	FLM-5
683199	10	FNM-10	TRM10	FLM-10

10. References

Cooper Bussmann Full Line Catalog No. 1007; 2007

Shipek, John; SCL Standards Engineer, subject matter expert and originator of SCL Material Standard 6855.35 (john.shipek@seattle.gov)

FUSE, FAST-ACTING, 125 VOLT, WITH PIN INDICATION

1. Scope

This material standard covers the requirements for 125 Vac rated, fast-acting, cartridge type fuses with pin indication.

This material standard applies to the following Seattle City Light Stock Number:

Stock Number	Current Rating, A
683120	5

2. Application

Fast-acting fuses may be used only where proper protection is already being provided by a branch circuit device.

Fast-acting fuses may be used only where the available short-circuit current does not exceed 10,000 amperes.

Fast-acting fuses have a red pin indicator that provides visual identification of failed circuits, resulting in faster troubleshooting.

Fast-acting fuses are appropriate for control and electronic circuits.

3. Industry Standards

Fast-acting fuses shall meet the applicable requirements of the following industry standard and its amendment:

UL Standard 248-14 - Underwriters Laboratories Inc., Low Voltage Fuses - Part 14: Supplemental Fuses, April 14, 2004

UL Standard 248-14 (Amendment) - Underwriters Laboratories Inc., Low Voltage Fuses - Part 14: Class G Fuses, April 14, 2004

4. Attributes

Fast-acting fuses shall have the following attributes:

UL type	Supplemental
Voltage rating	125 Vac
Interrupting rating (IR)	10,000 A RMS symmetrical
Diameter	1/4 in
Length	1-1/4 in
Terminal style	ferrule

5. Tests and Test Reports

Data that establishes compliance with the requirements of UL 248-14 and this material standard shall be provided upon request.

6. Marking

Fast-acting fuses shall be permanently marked with:

- Manufacturer's name or symbol
- Manufacturer's catalog number
- Voltage rating
- Ampere rating

7. Packaging

Fast-acting fuses shall be packaged to prevent damage during shipping, handling, and storage.

8. Issuance

EA

standards coordinator	*standards supervisor*	*unit director*
John Shipek	John Shipek	Darnell Cola

9. Approved Manufacturers

Stock Number	Rating, A	Catalog Numbers		
Current		Bussman	Mersen	Littelfuse
683120	5	GBA-5	-	-

10. References

Shipek, John; SCL Standards Engineer,
subject matter expert and originator of 6855.40
(john.shipek@seattle.gov)

Cooper Bussmann Full Line Catalog No. 1007;
2007

Fuse, Fast-Acting, Current-Limiting, 600 V, 40 A

1. Scope

This material standard covers the requirements for 600 V, 40 A rated, fast-acting, current-limiting, cartridge type fuses.

This standard applies to Seattle City Light (SCL) Stock No. 683162.

2. Application

Fast-acting fuses may be used only where proper protection is already being provided by a branch circuit device.

Fast-acting fuses provide supplementary protection on branch circuits so that the branch circuit fuse is not disturbed in downstream, overcurrent situations.

Fast-acting fuses may be used only where the available ac short-circuit current does not exceed 10,000 A. This value is significantly less for dc circuits.

Fast-acting fuses are appropriate for lighting, control, and meter circuits. Fast-acting fuses are not appropriate for protecting motors or motor circuits

3. Industry Standards

Fast-acting fuses shall meet the applicable requirements of the following industry standard and its amendment:

UL Standard 248-14 - Underwriters Laboratories Inc., Low Voltage Fuses - Part 14: Supplemental Fuses, January 1, 2000

UL Standard 248-14 (Amendment) - Underwriters Laboratories Inc., Low Voltage Fuses - Part 14: Supplemental Fuses, April 14, 2004

4. Attributes

Fast-acting fuses shall have the following attributes:

UL type:	Supplemental
Interrupting rating (IR):	
600 Vac	10,000 A
600 Vdc	30 A
Diameter:	13/32 in
Length:	1-1/2 in
Terminal style:	ferrule

5. Tests and Test Reports

Data that establishes compliance with the requirements of UL 248-14 and this material standard shall be provided upon request.

6. Marking

Fast-acting fuses shall be permanently marked with:

- Manufacturer's name or symbol
- Manufacturer's catalog number
- Voltage rating
- Ampere rating

7. Packaging

Fast-acting fuses shall be packaged to prevent damage during shipping, handling, and inside storage.

Each shipping container shall be marked with the Seattle City Light purchase order number.

8. Issuance

EA

9. Approved Manufacturers

		Catalog Numbers		
Stock No.	**Current Rating (A)**	**Bussman**	**Mersen**	**Littelfuse**
683162	40	KTK-40	ATM40	KLK-40

10. Sources

Cooper Bussmann Full Line Catalog No. 1007; 2007

SCL Construction Guideline NCB-70; “Traffic and Streetlight Services in Network Areas”

SCL Construction Guideline SL-2/NSL-20 (canceled); “Fusing Schedule, Underground Streetlighting”

Shipek, John; SCL Standards Engineer, subject matter expert and originator of 6855.50 (john.shipek@seattle.gov)

Fuse, Rejection-Type, Fast-Acting, Current-Limiting, 600 V

1. Scope

This standard covers the requirements for 600 V rated, fast-acting, current-limiting, cartridge, rejection-type fuses.

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

Stock No.	Current Rating (A)
013509	3
013510	5
013511	10
013512	15
013513	20
013514	30

2. Application

Rejection-type, fast-acting fuses may be used only where proper protection is already being provided by a branch circuit device.

Rejection-type fuses:

- Are used to provide supplementary protection on branch circuits so that the branch circuit fuse is not disturbed in downstream, overcurrent situations.
- May be used only where the available ac short-circuit current does not exceed 200,000 A. This value is less for dc circuits.
- Are appropriate for lighting, control, and meter circuits. Fast-acting fuses are not appropriate for protecting motors or motor circuits.
- Are compatible with both standard and rejection-type holders.

When installed in a rejection-type fuse holder, rejection-type fuses prevent the replacement of fuses rated lower than 600 V.

3. Industry Standards

Fast-acting fuses shall meet the applicable requirements of the following industry standard and its amendment:

UL Standard 248-4 - Underwriters Laboratories Inc., Low Voltage Fuses - Part 4: Class CC Fuses, August 1, 2000

4. Attributes

Fast-acting fuses shall have the following attributes:

UL type:	248-4
Interrupting rating (IR):	
600 Vac	200,000 A
600 Vdc	100,000 A
Diameter:	13/32 in
Length:	1-1/2 in
Terminal style:	ferrule
Rejection feature:	yes

5. Tests and Test Reports

Data that establishes compliance with the requirements of UL 248-4 and this material standard shall be provided upon request.

6. Marking

Rejection-type, fast-acting fuses shall be permanently marked with:

- Manufacturer's name or symbol
- Manufacturer's catalog number
- Voltage rating
- Ampere rating

7. Packaging

Rejection-type, fast-acting fuses shall be packaged to prevent damage during shipping, handling, and inside storage.

Each shipping container shall be marked with the Seattle City Light purchase order number.

8. Issuance

EA

9. Approved Manufacturers

		Catalog Numbers		
Stock No.	**Current Rating (A)**	**Bussmann**	**Mersen**	**Littelfuse**
013509	3	KTK-R-3	ATMR3	KLKR-3
013510	5	KTK-R-5	ATMR5	KLKR-5
013511	10	KTK-R-10	ATMR10	KLKR-10
013512	15	KTK-R-15	ATMR15	KLKR-15
013513	20	KTK-R-20	ATMR20	KLKR-20
013514	30	KTK-R-30	ATMR30	KLKR-30

10. Sources

ATMR – Class CC Datasheet; Ferraz Shawmut

Chao, Yaochiem; SCL Standards Engineer, subject matter expert and originator of 6855.55

Datasheet 1015; KTK-R; Cooper Bussmann; July 2013

KLDR – Class CC Fuses; Littelfuse; June 2011

SCL Material Standard 6855.50; “Fuse, Fast-Acting, Current-Limiting, 600-Volt”

SCL Material Standard 6857.07, “Fuse Holders, Rejection-Type, In-Line, Non-Breakaway, Waterproof”

Tilley, Kathy; SCL Electrical Engineering Support Specialist and subject matter expert for 6855.55 (kathy.tilley@seattle.gov)

FUSE, ELECTRONIC, SMALL DIMENSION, GLASS

1. Scope

This material standard covers the requirements for electronic, small dimension, glass fuses.

This material standard applies to the following Seattle City Light Stock Numbers:

Stock Number	Current Rating , A
683290	1
683360	30
012620	1
012619	2

2. Application

Electronic fuses are appropriate for electronic circuits.

Stock Number 683360 is a time-delay type that avoids needless blows from starting currents or surges. This fuse is used in fuse holder Stock Number 682348 to protect streetlight relays.

3. Industry Standards

Electronic fuses shall meet the applicable requirements of the following industry standard and its amendment:

UL Standard 248-14 - Underwriters Laboratories Inc., Low Voltage Fuses - Part 14: Supplemental Fuses, January 1, 2000

UL Standard 248-14 (Amendment) - Underwriters Laboratories Inc., Low Voltage Fuses - Part 14: Supplemental Fuses, April 14, 2004

4. Attributes

Stock Number	683290	683360	012620	012619
General type	fast-acting	time-delay	fast-acting	fast-acting
Voltage Rating, Vac	250	32	250	250
Current Rating, A	1	30	1	2
Interrupting rating (IR)	35 at 250 Vac	n/a	35 A at 250 Vac 10 kA at 125 Vac	100 A at 250 Vac 10 kA at 125 Vac
Diameter	1/4 inch	9/32 inch	5 mm	5 mm
Length	1-1/4 inch	1-1/4 inch	20 mm	20 mm
UL type	supplemental			
Terminal style	nickel plated brass ferrules			

standards coordinator	*standards manager*	*unit director*
John Shipek	John Shipek	Pamela S. Johnson

5. Tests and Test Reports

Data that establishes compliance with the requirements of UL 248-14 and this material standard shall be provided upon request.

6. Marking

Each electronic fuse shall be permanently marked with:

- Manufacturer's name or symbol
- Manufacturer's catalog number
- Ampere rating

7. Packaging

Electronic fuses shall be packaged to prevent damage during shipping, handling, and storage.

8. Issuance

EA

9. Approved Manufacturers

		Catalog Numbers		
Stock Number	Current Rating, A	Bussman	Mersen	Littelfuse
683290	1	AGC-1	GGC1	312.1
683360	30	MDM-30	-	-
012620	1	GMA-1-R	GGM1	-
012619	2	GMA-2-R	GGM2	-

10. References

6857.10; “Fuse Holders, Panel-Mount”; Material Standard; SCL

Cooper Bussmann Full Line Catalog No. 1007; 2007

Shipek, John; SCL Standards Engineer, subject matter expert and originator of SCL Material Standard 6855.65 (john.shipek@seattle .gov)

FUSE HOLDERS, IN-LINE, WATER-RESISTANT, AND INSULATING BOOTS

1. Scope

This material standard covers the requirements for water-resistant, single-pole, break-away and non-break-away, in-line fuse holders and insulating boots.

This material standard applies to the following Seattle City Light Stock Numbers:

Stock Number	Voltage Rating, V	for Fuses measuring, diameter x length, in
682370	600	13/32 x 1-5/16
682346	600	13/32 x 1-1/2
682349		
682350		
682351		
682353		
682366		
682335	480	13/32 x 2-1/4
682352		
012603		
682360	Rubber-insulating boot, single-pole (two required per holder)	

2. Application

In-line fuse holders may be used in dry or wet locations. In wet locations, use rubber insulating boots, Stock Number 682360, to provide added protection against dirt and water. When called for, two boots are required per in-line holder.

Fuse holder assembly, Stock Number 682366, is a breakaway version which includes a set of rubber insulating boots; all other Stock Numbers are non-breakaway and absent boots.

Fuse holders, Stock Numbers 682346, 682349, 682350, 682351, 682353, and 682366 are used with the "midget" fuses cited in Material Standards 6855.35 and 6855.50.

Fuse holder, Stock Number 682370, is used with the 480 V fuses, Stock Numbers 683171 and 683172, cited in Material Standard 6855.25.

Fuse holders, Stock Numbers 682335, 682352, and 012603 are used with the 480 V fuses, Stock Numbers 683165 and 683163, cited in Material Standard 6855.25.

Recommended coupling nut torque is 10 to 20 in-lb.

3. Attributes

Fuse holders shall be Underwriters Laboratories Inc. (UL) or other approved agency recognized.

Fuse holders shall be water-resistant.

Fuse holders shall be in-line, single-pole type.

4. Tests and Test Reports

Data that establishes compliance with the requirements of UL 248-14 and this material standard shall be provided upon request.

standards coordinator	*standards supervisor*	*unit director*
John Shipek	John Shipek	Darnell Cola

5. Marking

Each fuse holder shall be permanently marked with:

- Manufacturer's name or symbol
- Manufacturer's catalog number
- Voltage rating
- Ampere rating
- UL (or other approved agency) recognition

6. Packaging

Fuse holders shall be packaged to prevent damage during shipping, handling, and storage.

7. Issuance

EA

8. Approved Manufacturers

Stock Number	**682370**
Voltage rating, V	600
Current rating, maximum, A	15
For fuses measuring, d x l, in	13/32 x 1-5/16
Loadside terminal	#12 to #8, Cu crimp
Lineside terminal	#12 to #8, Cu crimp
Breakaway design?	no

Catalog Number	
Bussmann	HEG-AA
Mersen	-
Littelfuse	-

Stock Number	**682346**
Voltage rating, V	600
Current rating, maximum, A	30
For fuses measuring, d x l, in	13/32 x 1-1/2
Loadside terminal	#12 to #8, Cu crimp
Lineside terminal	#12 to #8, Cu crimp
Breakaway design?	no

Catalog Number	
Bussmann	HEB-AA
Mersen	-
Littelfuse	-

Stock Number	**682349**
Voltage rating, V	600
Current rating, maximum, A	30
For fuses measuring, d x l, in	13/32 x 1-1/2
Loadside terminal	#12 to #3, Cu setscrew
Lineside terminal	#12 to #3, Cu setscrew
Breakaway design?	no

Catalog Number	
Bussmann	HEB-JJ
Mersen	-
Littelfuse	-

Stock Number	**682350**
Voltage rating, V	600
Current rating, maximum, A	30
For fuses measuring, d x l, in	13/32 x 1-1/2
Loadside terminal	#12 to #8, Cu crimp
Lineside terminal	#6, Cu crimp
Breakaway design?	no

Catalog Number	
Bussmann	HEB-AB
Mersen	-
Littelfuse	-

Stock Number	**682351**
Voltage rating, V	600
Current rating, maximum, A	30
For fuses measuring, d x l, in	13/32 x 1-1/2
Loadside terminal	#12 to #2, Al setscrew
Lineside terminal	#12 to #2, Al setscrew
Breakaway design?	no

Catalog Number	
Bussmann	HEB-LL
Mersen	-
Littelfuse	-

Stock Number	**682353**
Voltage rating, V	600
Current rating, maximum, A	30
For fuses measuring, d x l, in	13/32 x 1-1/2
Loadside terminal	#12 to #3, Cu setscrew
Lineside terminal	#12 to #2, Al setscrew
Breakaway design?	no
Catalog Number	
Bussmann	HEB-JY
Mersen	-
Littelfuse	-

Stock Number	**682366**
Voltage rating, V	600
Current rating, maximum, A	30
For fuses measuring, d x l, in	13/32 x 1-1/2
Loadside terminal	#12 to #8, Cu crimp
Lineside terminal	#6, Cu crimp
Breakaway design?	yes
Catalog Number	
Bussmann	HEB-AW-RCL-B
Mersen	-
Littelfuse	-

Stock Number	**682335**
Voltage rating, V	480
Current rating, maximum, A	60
For fuses measuring, d x l, in	13/32 x 2-1/4
Loadside terminal	#6 stranded to #4 solid, Al crimp
Lineside terminal	#6 stranded to #4 solid, Al crimp
Breakaway design?	no
Catalog Number	
Bussmann	HEJ-PP
Mersen	-
Littelfuse	-

Stock Number	**682352**
Voltage rating, V	480
Current rating, maximum, A	60
For fuses measuring, d x l, in	13/32 x 2-1/4
Loadside terminal	#12 to #2, Al setscrew
Lineside terminal	#12 to #2, Al setscrew
Breakaway design?	no
Catalog Number	
Bussmann	HEJ-LL
Mersen	-
Littelfuse	-

Stock Number	**012603**
Voltage rating, V	480
Current rating, maximum, A	60
For fuses measuring, d x l, in	13/32 x 2-1/4
Loadside terminal	#2, stranded Cu crimp
Lineside terminal	#2, stranded Cu crimp
Breakaway design?	no
Catalog Number	
Bussmann	HEJ-DD
Mersen	-
Littelfuse	-

Stock Number	**682360**
Description	Rubber insulating boot, single-pole (two used per holder)
Catalog Number	
Bussmann	2A0660
Mersen	-
Littelfuse	-

9. References

6855.25, “Fuse, Time-Delay, 480 Volt”; Material Standard; SCL

6855.35, “Fuse, Time-Delay, 120 Volt”; Material Standard; SCL

6855. 50, “Fuse, Fast-Acting, Current-Limiting, 600 Volt”; Material Standard; SCL

Cooper Bussmann Full Line Catalog No. 1007; 2007

Shipek, John; SCL Standards Engineer, subject matter expert and originator of 6857.05 (john.shipek@seattle.gov)

Fuse Holders, Rejection-Type, In-Line, Non-Breakaway, Waterproof, Crimp-Terminal

1. Scope

This material standard covers the requirements for waterproof, single-pole, non-breakaway, crimp-terminal, in-line fuse holder.

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

Stock No.	Loadside Terminal (AWG)	Lineside Terminal (AWG)
013518	#12 - #8	#6
013519	#6	#6
013520	#6	#2
013521	#2	#2

2. Application

Rejection-type, in-line, waterproof fuse holder accepts Class CC rejection type fuses. Non-rejection type fuses will not operate if installed.

Rejection-type fuse holders:

- Prevent the installation of fuses rated less than 600 V.
- Are used with class CC, rejection-type fuses cited in Material Standards 6855.55.
- Are UL-Listed for IPX7 conditions for protection against water immersion up to 3 ft.
- Are intended for installation in wet conditions. Two rubber insulating boots, Stock No. 682360, are required per in-line holder.

The recommended coupling nut torque is 10 to 20 in-lb.

3. Industry Standards

Fast-acting fuses shall meet the applicable requirements of the following industry standard and its amendment:

UL Standard 4248-4 - Underwriters Laboratories Inc., Fuseholders - Part 4: Class CC, February 28, 2007

4. Requirements

Rejection-type fuse holders shall have the following attributes:

UL Type:	4248-4
Voltage:	600 V
Amperage:	Up to 30 A
Waterproof Rating:	IPX7
Terminal Style:	Copper crimp
Rejection Feature:	Yes

Rejection-type fuse holders shall be in-line, single-pole, non-breakaway type.

Rejection-type fuse holders shall be designed to accept fuses measuring 13/32 x 1-1/2 (diameter x length, in) with rejection feature.

5. Tests and Test Reports

Data that establishes compliance with the requirements of UL 4248-4 and this material standard shall be provided upon request.

6. Marking

Each fuse holder shall be permanently marked with the following:

- Manufacturer's name or symbol
- Manufacturer's catalog number
- Voltage rating
- Ampere rating
- UL (or other approved agency) recognition.

7. Packaging

Fuse holders shall be packaged to prevent damage during shipping, handling, and inside storage.

8. Issuance

EA

9. Approved Manufacturers

			Catalog Numbers		
Stock No.	**Loadside Terminal (AWG)**	**Lineside Terminal (AWG)**	**Cooper Bussman**	**Mersen (formerly Ferraz Shawmut)**	**Littelfuse**
013518	#12 - #8	#6	–	FEC-11-21	LEC-AB
013519	#6	#6	–	FEC-21-21	LEC-BB
013520	#6	#2	–	–	LEC-BD
013521	#2	#2	–	–	LEC-DD

10. References

SCL Material Standard 6855.55; "Fuse, Rejection-Type, Fast-Acting, Current-Limiting, 600 Volt"

SCL Material Standard 6857.05; "Fuse Holders, In-Line, Water-Resistant, and Insulating Boots"

11. Sources

Chao, Yaochiem; SCL Standards Engineer, subject matter expert and originator of 6857.07 (yaochiem.chao@seattle.gov)

Datasheet 2130; Cooper Bussmann; 2012

Hewitt, Al; Cooper Bussmann Field Application Engineer and subject matter expert for 6857.07

Littelfuse Powr-Gard Blocks and Holders Datasheet; In-Line Watertight Fuse Holders, revision 01//24/14

Mersen 600 Volt In-Line Fuse Holders Datasheet; FEB, FEC, FEX, FEY, revision 2014

FUSE HOLDERS, PANEL-MOUNT, 250 VOLT

1. Scope

This material standard covers the requirements for 250 V rated, single-pole, panel-mount fuse holders.

This material standard applies to the following Seattle City Light Stock Number:

Stock Number	Voltage Rating, V	for Fuses Measuring diameter x length, in
682348	250	1/4 x 1-1/4

2. Application

Panel-mount fuse holders are used to mount small dimension, electronic, glass fuses in panels.

Panel-mount fuse holders are intended for mounting in panel holes 0.505 +/- .005 inches in diameter.

Panel-mount fuse holders may be used with fuse Stock Number 683360, cited in Material Standard 6855.65.

3. Attributes

Panel-mount fuse holders shall be Underwriters Laboratories Inc. (UL) or other approved agency recognized.

Panel-mount fuse holders shall be suitable for installation in panels up to 5/16-inch thick.

Panel-mount fuse holders shall have a maximum current rating of 30 A.

Panel-mount fuse holders shall feature:

- Thermoplastic body, cap, and nut
- Bayonet-type knob
- Vibration resistance
- Tin-plated brass, quick-connect/solder type terminals

4. Tests and Test Reports

Data that establishes compliance with the requirements of this material standard shall be provided upon request.

5. Marking

Each panel-mount fuse holder shall be permanently marked with:

- Manufacturer's name or symbol
- Manufacturer's catalog number
- Voltage rating
- Ampere rating
- UL (or other approved agency) recognition

6. Packaging

Panel-mount fuse holders shall be packaged to prevent damage during shipping, handling, and storage.

7. Issuance

EA

8. Approved Manufacturers

	Catalog Numbers		
Stock Number	Bussman	Mersen	Littlefuse
682348	HKP	GPM-G	-

9. References

6855.65; "Fuse, Electronic, Small Dimension, Glass"; Material Standard; SCL

Cooper Bussmann Full Line No.1007*; 2007*

Cooper Bussmann Data Sheet No. 2106

Shipek, John; SCL Standards Engineer, subject matter expert and originator of SCL Material Standard 6857.10 (john.shipek@seattle.gov)

standards coordinator	*standards manager*	*unit director*
John Shipek	John Shipek	Pamela S. Johnson

FUSE HOLDERS, BLOCK TYPE, NON-REJECTION, 600 VOLT

1. Scope

This material standard covers the requirements for 600 volt rated, single- and three-pole, block type, non-rejection, fuse holders.

This material standard applies to the following Seattle City Light Stock Numbers:

Stock Number	Description
012994	single-pole
012995	three-pole

2. Application

Block type fuse holders accept all fuses measuring 13/32 x 1-1/2 inch. Fuses measuring 13/32 x 1-1/2 inch are also known as midget fuses.

Block type fuse holders may be mounted to a variety of flat surfaces. Refer to specific manufacturer's literature for mounting hole drill patterns.

The block type fuse holders specified in this standard **lack** an optional industry standard attribute called *rejection feature*. Fuse holders **with** *rejection feature* (UL Class CC) promote safety by preventing the insertion of low fault duty rated fuses in high fault duty circuits.

Block type fuse holders will accept the any of the fuses cited in Material Standards 6855.35 and 6855.50.

3. Attributes

Block type fuse holders shall be Underwriters Laboratories Inc. (UL) or other approved agency recognized.

Block type fuse holders shall have the following attributes:

Voltage rating, V	600
Current rating, maximum, A	30
Short-circuit withstand rating, A RMS symmetrical	10,000
For fuses measuring, diameter x length, in	13/32 x 1-1/2
Material	thermoplastic
Terminal type	box lug
Terminal wire range	#6 to #14 AWG, copper only

4. Tests and Test Reports

Data that establishes compliance with the requirements of this material standard shall be provided upon request.

5. Marking

Each block type fuse holder shall be permanently marked with:

- Manufacturer's name or symbol
- Manufacturer's catalog number
- Voltage rating
- Ampere rating
- UL (or other approved agency) recognition

standards coordinator	*standards supervisor*	*unit director*
John Shipek	John Shipek	Darnell Cola

6. Packaging

Block type fuse holders shall be packaged to prevent damage during shipping, handling, and storage.

7. Issuance

EA

8. Approved Manufacturers

Stock Number	Description	Catalog Numbers		
		Bussman	Mersen	Littelfuse
012994	single-pole	BM6031B	-	-
012995	three-pole	BM6033B	-	-

9. References

6855.35; Fuse, Time-Delay, 125 Volt; Material Standard; SCL

6855.50; Fuse, Fast-Acting, Current-Limiting, 600 Volt; Material Standard; SCL

Cooper Bussmann Data Sheet No. 1104; dated September 4, 2002

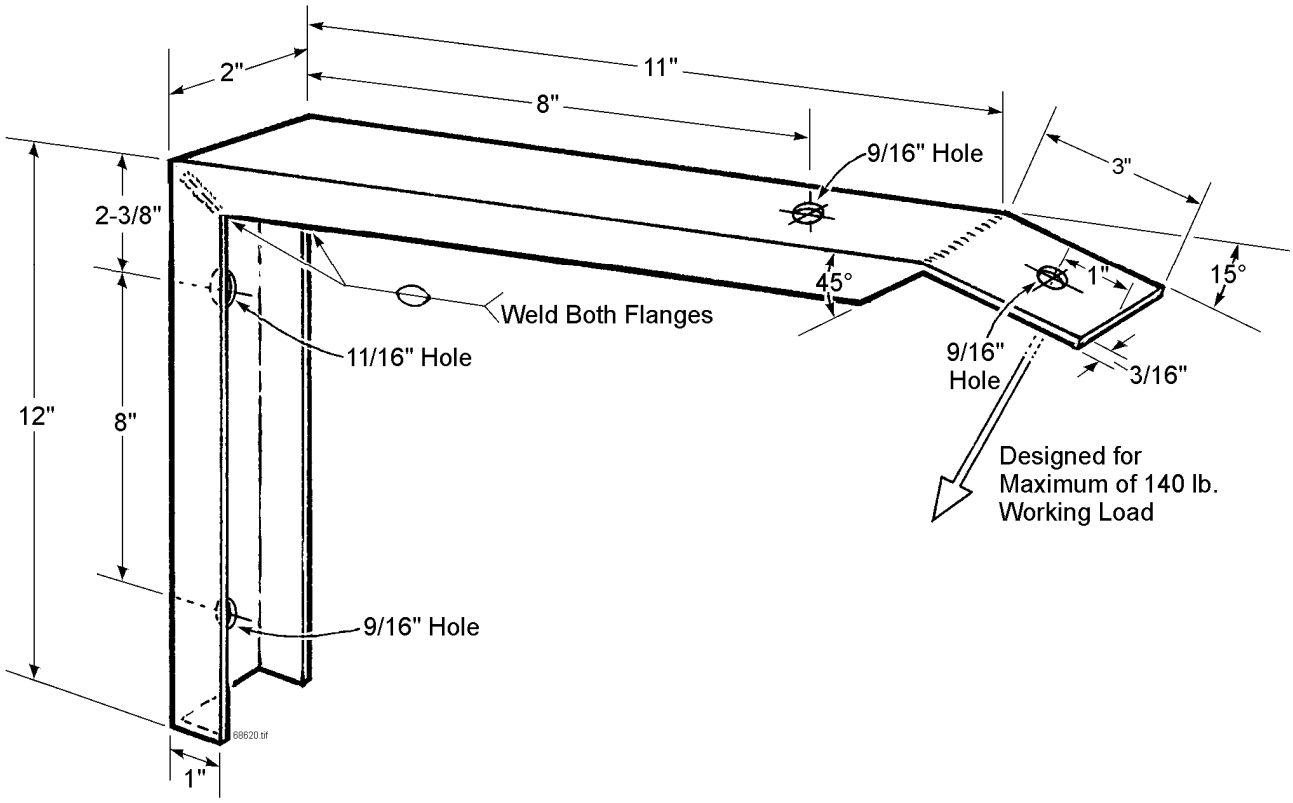
Cooper Bussmann Full Line Catalog No. 1007*;* 2007

Shipek, John; SCL Standards Engineer, subject matter expert and originator of 6857.15 (john.shipek@seattle.gov)

UL Standard 248-4 - Underwriters Laboratories Inc., Low Voltage Fuses - Part 4: Class CC Fuses; January 1, 2000

BRACKET, TERMINATOR

(FOR PAT 1902, 1872, ALUMA FORM CS-820)



Terminator Brackets, shall be of the configuration and dimensions shown.

Material: The brackets shall be made of Merchant Quality, two-inch, steel channel that conforms to ASTM A 29, Grade M1020. The channel shall weigh 2.32 pounds per foot.

Galvanizing: The brackets shall be hot-dipped galvanized after fabrication, in accordance with ASTM A 123 and in accordance with City Light Material Standard 7240.1.

Reference Specifications: ASTM A 29, Grade M1020, and ASTM A 123, latest revisions.

Stock Unit: EA

Stock Number: 686200

ORIGINATOR	STANDARDS COORDINATOR	STANDARDS SUPERVISOR	UNIT DIRECTOR
Jim S. Horn	Charles L. Shaffer	John C. Skinner	Harold Jug

ADAPTER PLATE AND GASKET FOR SINGLE-PHASE G&W 1/C, 27 kV TERMINATOR REPLACEMENT

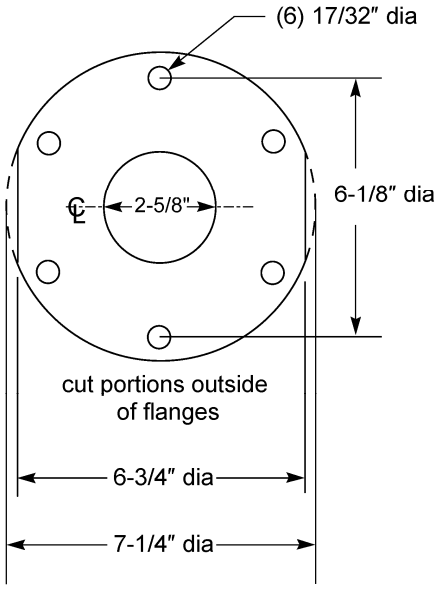
Adapter Plate

Description: Seattle City Light (SCL) Shops made.

Application: Application for both the adapter plate and gasket (686270). For conversion of G&W TR 180245R or W pothead to 600 ampere apparatus bushing on 26 kV network transformers and other apparatus. See Stock Catalog page 70-47 for more information.

Stock No.: 686196

Stock Unit: EA



Fabrication Notes:

1. "Flower Pot" bushing - Elastimold K1601-T1 (SCL Stock No. 686434)
2. Fabricated from 1/2-inch 304 stainless steel plate.
3. Weld all around stainless steel flange on "flower pot" bushing well. While welding, be sure to provide a heat sink!
4. Test weld with 3 lbs. nitrogen pressure and apply *Leak Tec* to test for leaks.
5. Package in plastic bag.

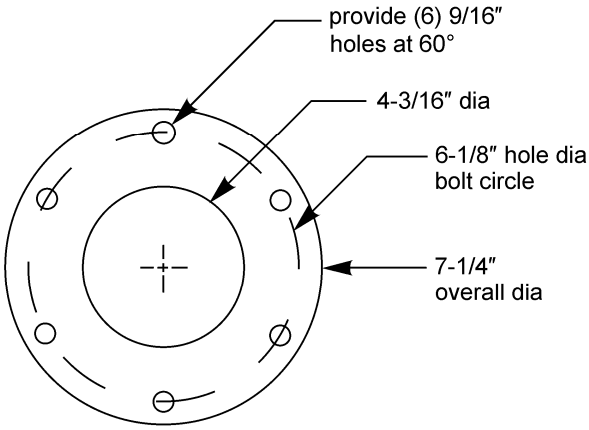
Adapter Plate Gasket

Description: Seattle City Light Shops made from cork and synthetic rubber composition in 1/4-inch sheets (SCL Stock No. 727714). Refer to SCL Material Standard 7276.9.

Application: Application for use with the adapter plate left (686196).

Stock No.: 686270

Stock Unit: EA



standards coordinator	standards supervisor	unit director
John Shipek	John Barnett	Richard Kent

STRAIGHT APPARATUS BUSHING WITH BOLTABLE ADAPTER PLATE FOR 13 kV NETWORK TRANSFORMER

1. Application:

For conversion of G & W pothead terminations to straight 600 ampere apparatus bushing on 13 kV network transformers and other apparatus. Used with gasket Stock Number: 686386. See Stock Catalog for further information.

Also for use with 26kV Network Transformers when welding in adapter ring (Stock Number 686250, Material Standard 6862.5).

2. Manufacture

2.1 600A straight apparatus bushing - SCL Stock Number 686392 (Material Standard 6863.17), Elastimold K650-T1.

2.2 Adapter plate, SCL Stock No. 686213

2.3 Reduce OD of welding flange embedded in bushing to 3-3/4˝ to provide clearance at bolt circle holes of boltable flange.

2.4 Weld all around stainless steel flange on bushing. Be sure to provide a heat sink while welding to prevent heat damage to the epoxy bushing.

2.5 Test the weld for leaks in the shop test fixture using *Leak Tec* with nitrogen at 3 lbs. pressure.

2.6 Perform dielectric test: One minute at 150 percent of rated voltage.

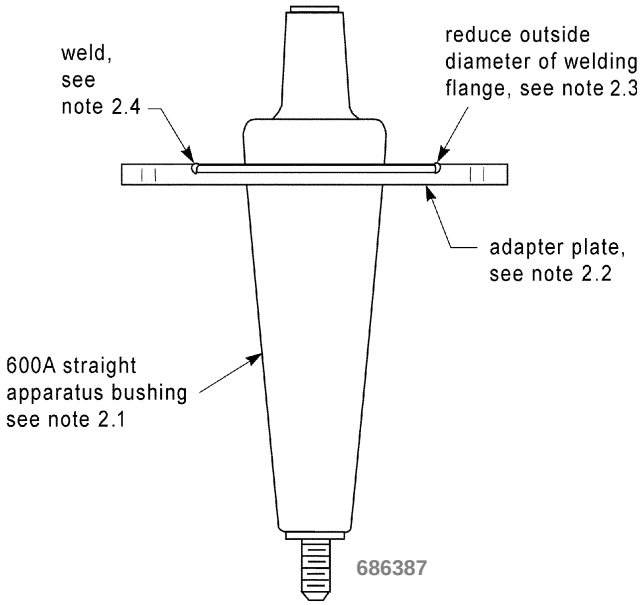
2.7 Package in plastic bags.

3. Bushing with Adapter Plate:

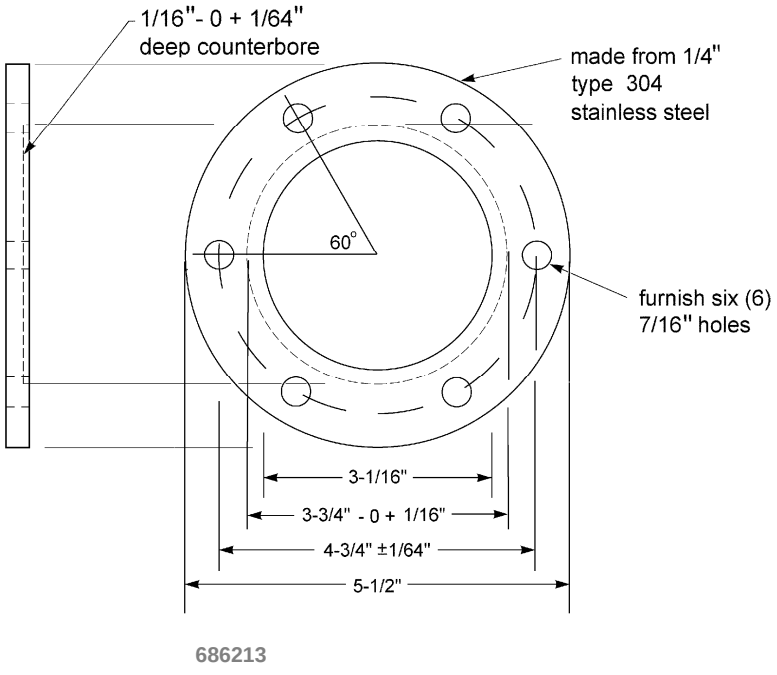
Seattle City Light Shops Made
Stock Unit: EA
Stock Number: 686387

4. Adapter Plate only:

Seattle City Light Shops Made
Stock Unit: EA
Stock Number: 686213



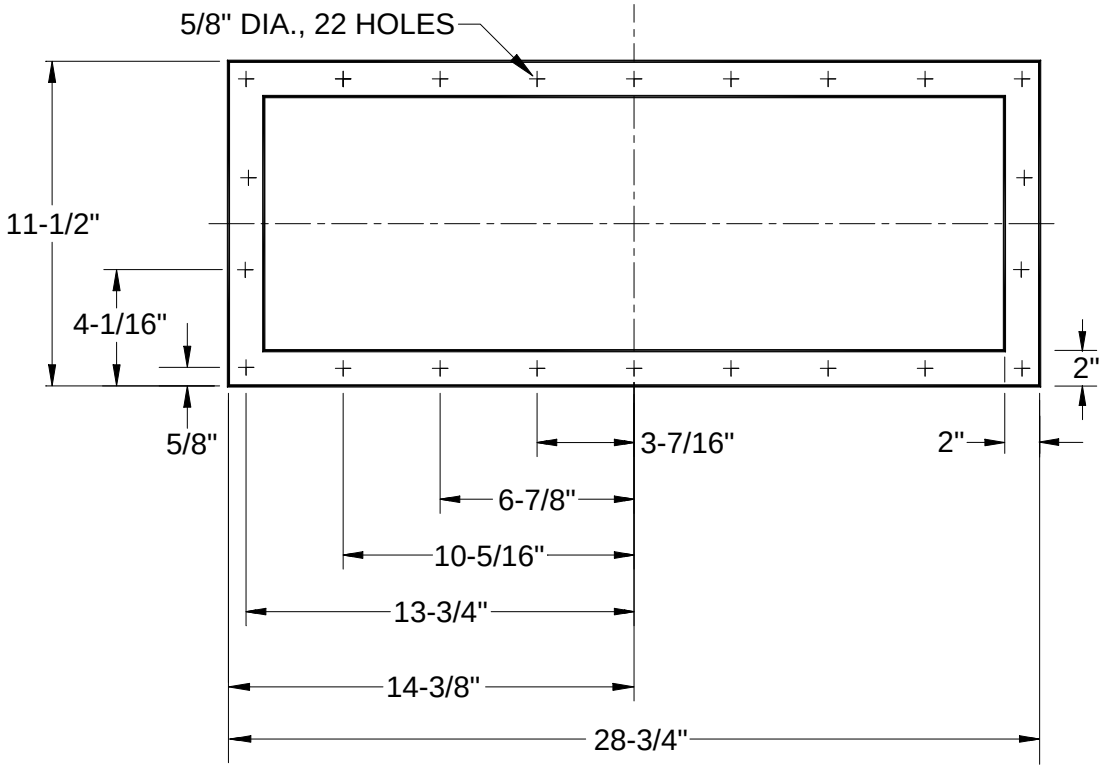
Bushing with Adapter Plate



Adapter Plate Only

STANDARDS COORDINATOR	STANDARDS SUPERVISOR	UNIT DIRECTOR
John Shipek	John Barnett	Pamela S. Johnson

GASKET FOR TERMINATOR ADAPTER PLATE



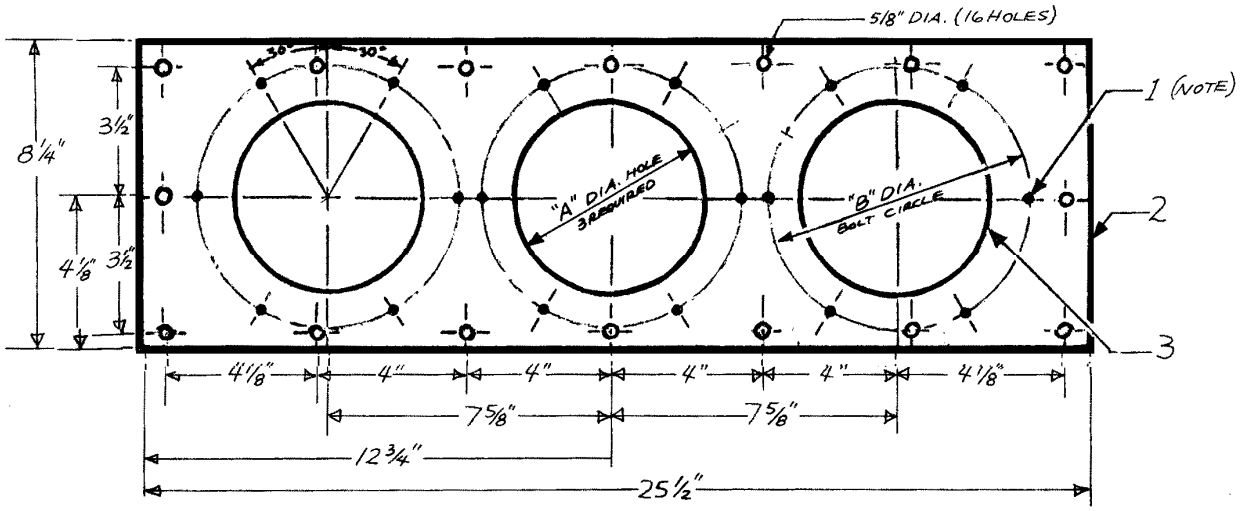
For terminator adapter plates, Stock Numbers 686201, 686203, and 686209.

Material shall be as per City Light Material Standard 7276.9 (Stock No. 727714). Gasket shall be one-piece construction.

Stock No. 686220

ORIGINATOR	STANDARDS COORDINATOR	STANDARDS SUPERVISOR	UNIT DIRECTOR
Jim S. Horn	Charles L. Shaffer	John C. Skinner	Betty Robin

TERMINATOR ADAPTER PLATE TO REPLACE 3/C, 27-kV POTHEAD G&W TRA 3855C



NOTES:

1. Blind drill and tap 3/8" -16NC x 1/2" deep. Install 18, 3/8" -16NC x 1-1/2" bronze studs. Protect studs with Caplug® or equal. Seat stud lightly. On terminator adapter plate (Stock #686205), use 18, 3/8" -16NC x 1-1/2" bronze studs (Stock #012944). No bolt circle holes or studs required for "flower pot" bushing wells.
2. 5/8-inch steel plate
3. Weld all around stainless steel flange on "flower pot" bushing well. While welding, be sure to provide heat sink.
4. Finish Coat:

   4.1 **Adapter Plate for PATR Terminators**. Prime outside (stud side) with DuPont LF-1858S and paint with black (Devoe Coatings Devguard 4308). Prime inside with epoxy primer (DuPont Corlar #824S) and paint with epoxy white (Impron #508U).

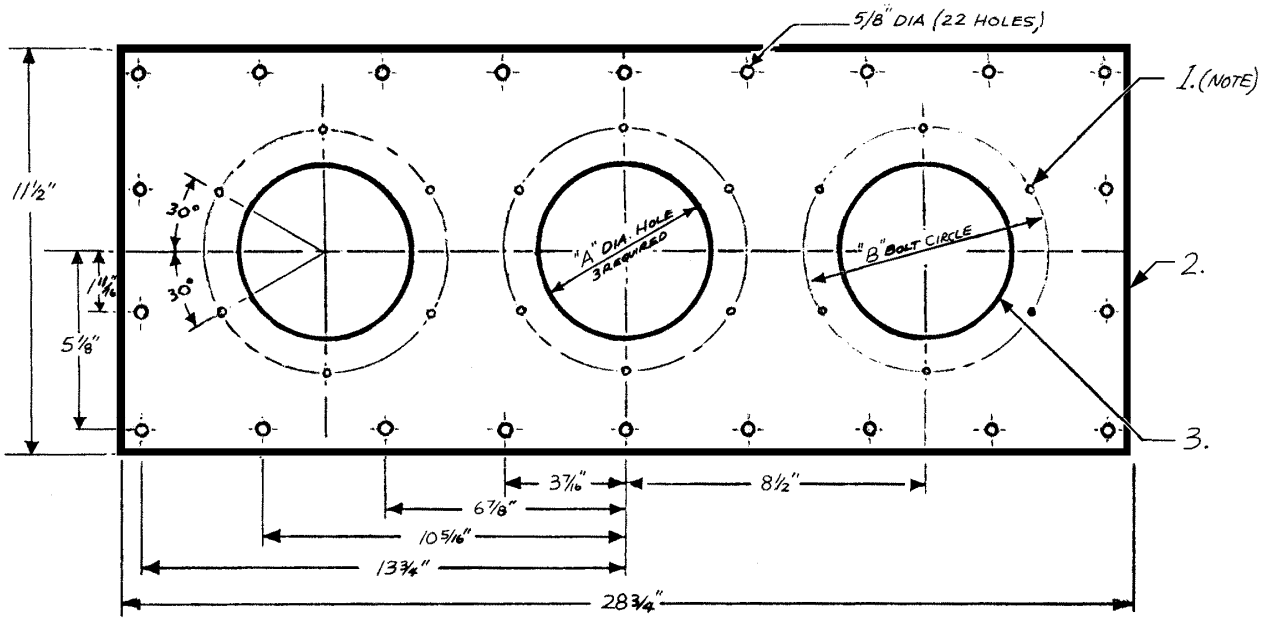
   4.2 **Adapter Plate with "Flower Pot" Bushing Wells.** Prime topside (well side) with DuPont LF-1858S and paint black (Devoe Coatings Devguard 4308) and cover all welds, but do not coat the stainless steel surfaces. Prime bottom side with epoxy primer (DuPont Corlar #824S) and paint with epoxy white (Impron 508U). Protect "flower pot" bushings from contamination.

Stock Unit: EA

Adapter Plate Stock #	Termination Device	Bushing Stock #	"A"	"B"
686202	PATR 1802	686482	4-3/8"	5-7/8"
686204	PATR 1873	686461	5-1/8"	6-5/8"
686205	Network 600 Amp BLR Bushing 90° Straight	687009 686387	3-3/4"	4-3/4"
686208 ASSY	Flower Pot Bushing 3 EA Elastimold K1601-PC-T1	686434	2-5/8"	Welded

standards coordinator	*standards manager*	*unit director*
Quan Wang	John Shipek	Pam S. Johnson

TERMINATOR ADAPTER PLATE
3/C, 34.5 KV POTHEAD G&W TRA 3925C



NOTES

1. Blind drill 3/8″-1/2″ deep, tap 3/8″ -16NC. Install 3/8" -16NC x 1-1/2″ bronze stud (18 required - Stock number 012944). No bolt circle holes or studs required for "flower pot" bushing wells.
2. 5/8-inch steel plate
3. Weld all around stainless steel flange on "flower pot" bushing well. While welding, be sure to provide a heat sink.
4. Finish coat:

   4.1 **Adapter Plate for PATR Terminators**. Prime outside (stud side) with DuPont LF-1858S and paint with black (Devoe Coatings Devguard 4308). Prime inside with epoxy primer (DuPont Corlar #824S) and paint with epoxy white (Impron #508U).

   4.2 **Adapter Plate with "Flower Pot" Bushing Wells**. Prime topside (well side) with DuPont LF-1858S and paint black (Devoe Coatings Devguard 4308) and cover all welds, but do not coat the stainless steel surfaces. Prime bottom side with epoxy primer (DuPont Corlar #824S) and paint with epoxy white (Impron 508U). Protect "flower pot" bushings from contamination.

Stock Unit: EA

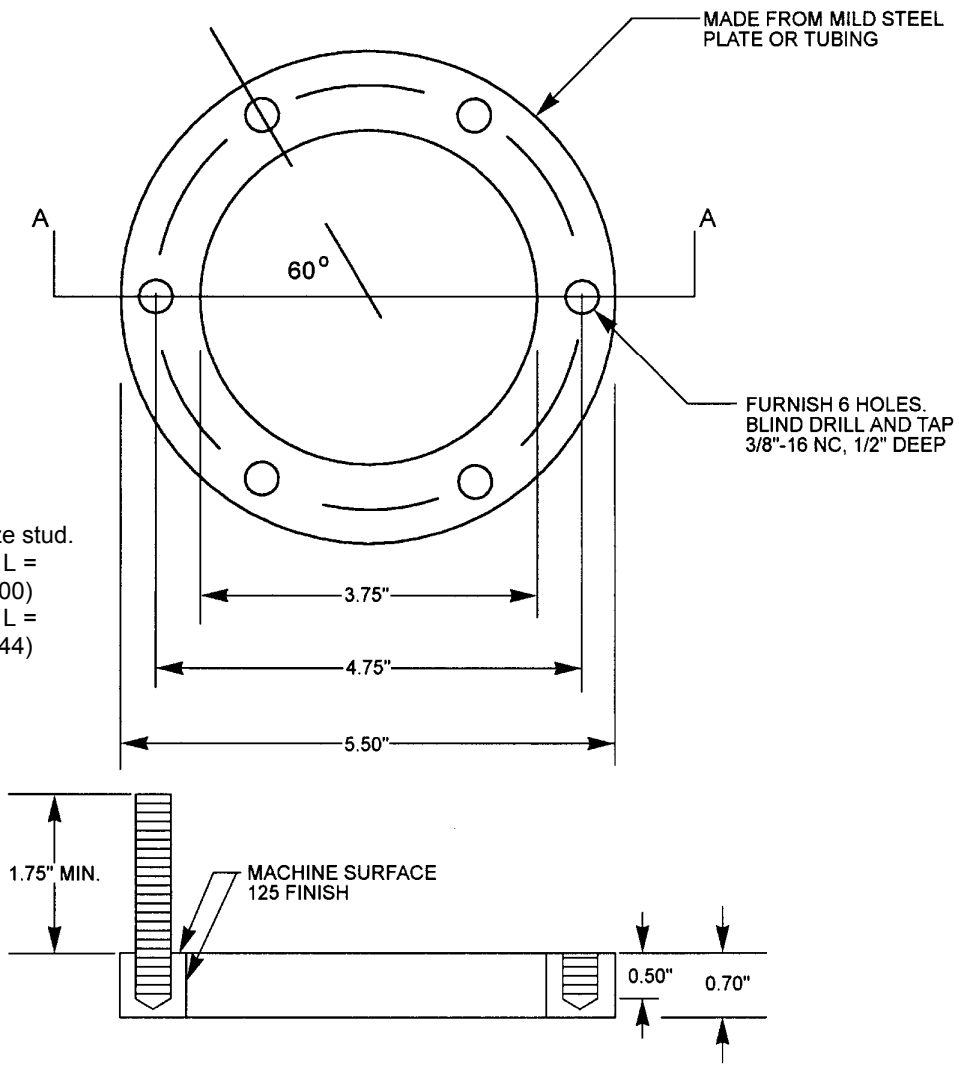
Adapter Plate Stock #	Termination Device	Bushing Stock #	"A"	"B"
686201	PATR 1802	686482	4-3/8″	5-7/8″
686203	PATR 1873	686461	5-1/8″	6-5/8″
686209 ASSY	Flower Pot Bushing 3 EA Elastimold K1601-PC-T1	686434	2-5/8″	----

standards coordinator	*standards manager*	*unit director*
Quan Wang	John Shipek	Pam S. Johnson

WELD-IN ADAPTER RING AND GASKET FOR 13 kV PATR 1701 TERMINATOR REPLACEMENT

Also used to convert 26kV Network Transformers when welded onto terminal chamber and using bushing Stock Number 686387.

Adapter Plate
Stock No.: 686250



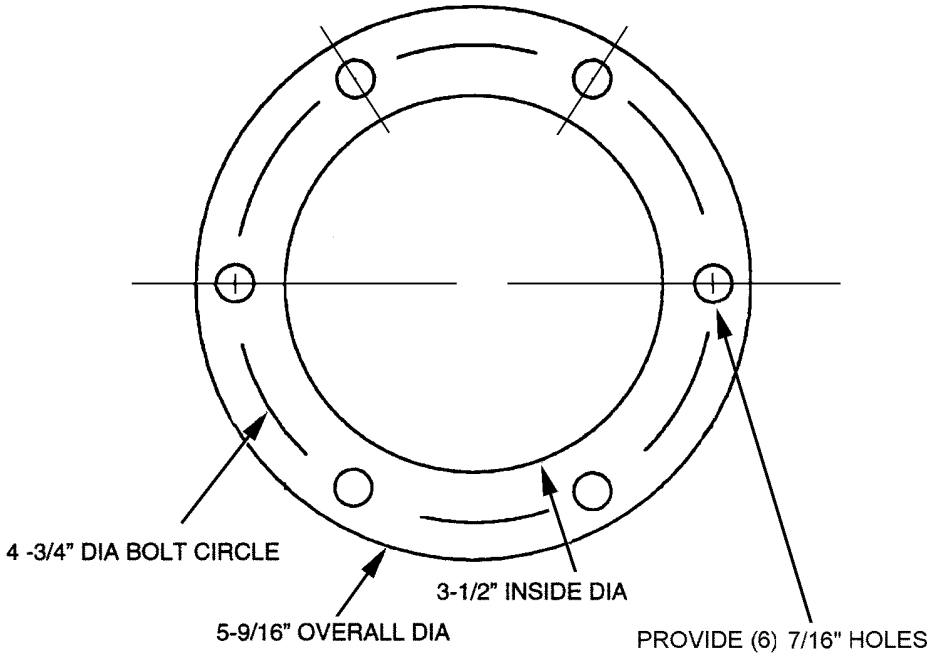
Install 6 each:
3/8″ - 16NC x "L" bronze stud.
For Stock No. 687009, L = 2-3/8″ (Stock No. 786600)
For Stock No. 686387, L = 1-1/2″ (Stock No. 012944)
Seat studs lightly.
Locktite in place.
Protect studs with Caplug® or equal.

Application: For conversion of wiped lead pothead to straight 600 ampere bushing on 13 kV network transformers and other apparatus. See Stock Catalog page 70-47 for gasket and bushing Stock Numbers.

standards coordinator	*standards manager*	*unit director*
Quan Wang	John Shipek	Pam S. Johnson

Gasket
Stock No.: 686386

For use with 686250 adapter plate shown on page 1.



Material: Cork & Synthetic (Buna N) Rubber Composition: 3/16", C.L. Stock no.: 727687

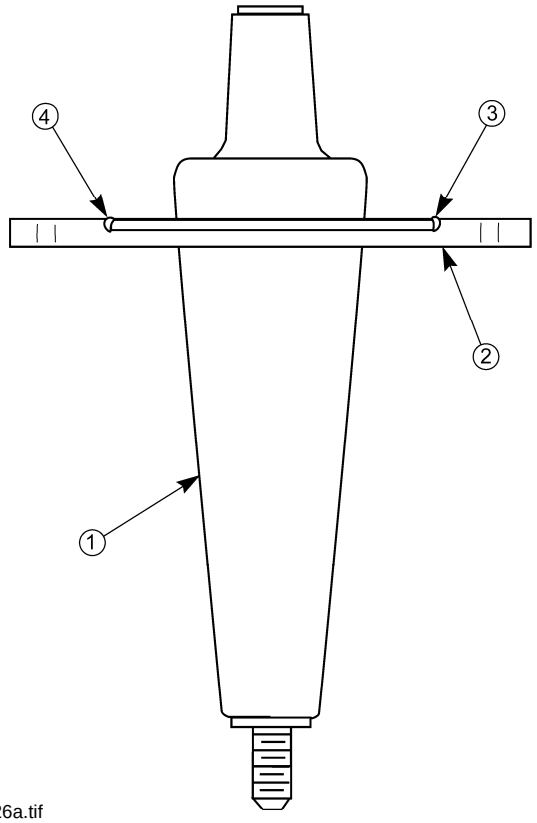
Material Standard: 7276.9

Stock Unit: EA

Application: For both the adapter plate and gasket. For conversion of PATR 1701 pothead to 600 ampere apparatus bushing on 13 kV network transformers and other apparatus. See Stock Catalog page 70-47 for more information.

BUSHING, ADAPTER PLATE AND GASKET FOR 26 kV SINGLE-PHASE G&W PATR 1802 TERMINATOR REPLACEMENT

BUSHING WITH ADAPTER PLATE



68626a.tif

Notes:

1. 600A straight apparatus bushing - C.L. Stock No. 686392 (Material Standard 6863.1), Elastimold K650-T1.
2. Adapter plate, C. L. Stock No. 686282 (see page 2).
3. Reduce O. D. of welding flange embedded in bushing to 3-3/4” to provide clearance at bolt circle holes of boltable flange.
4. Weld all around stainless steel flange on bushing, Be sure to provide a heat sink while welding to prevent heat damage to the epoxy bushing.
5. Test the weld for leaks in the shop test fixture using *Leak Tec* with nitrogen at 3 lbs. pressure.
6. Perform dielectric test: One minute at 150 percent of rated voltage.
7. Package in plastic bags with gasket.

City Light Shops Made
Stock Unit: EA
Stock Number: 686273

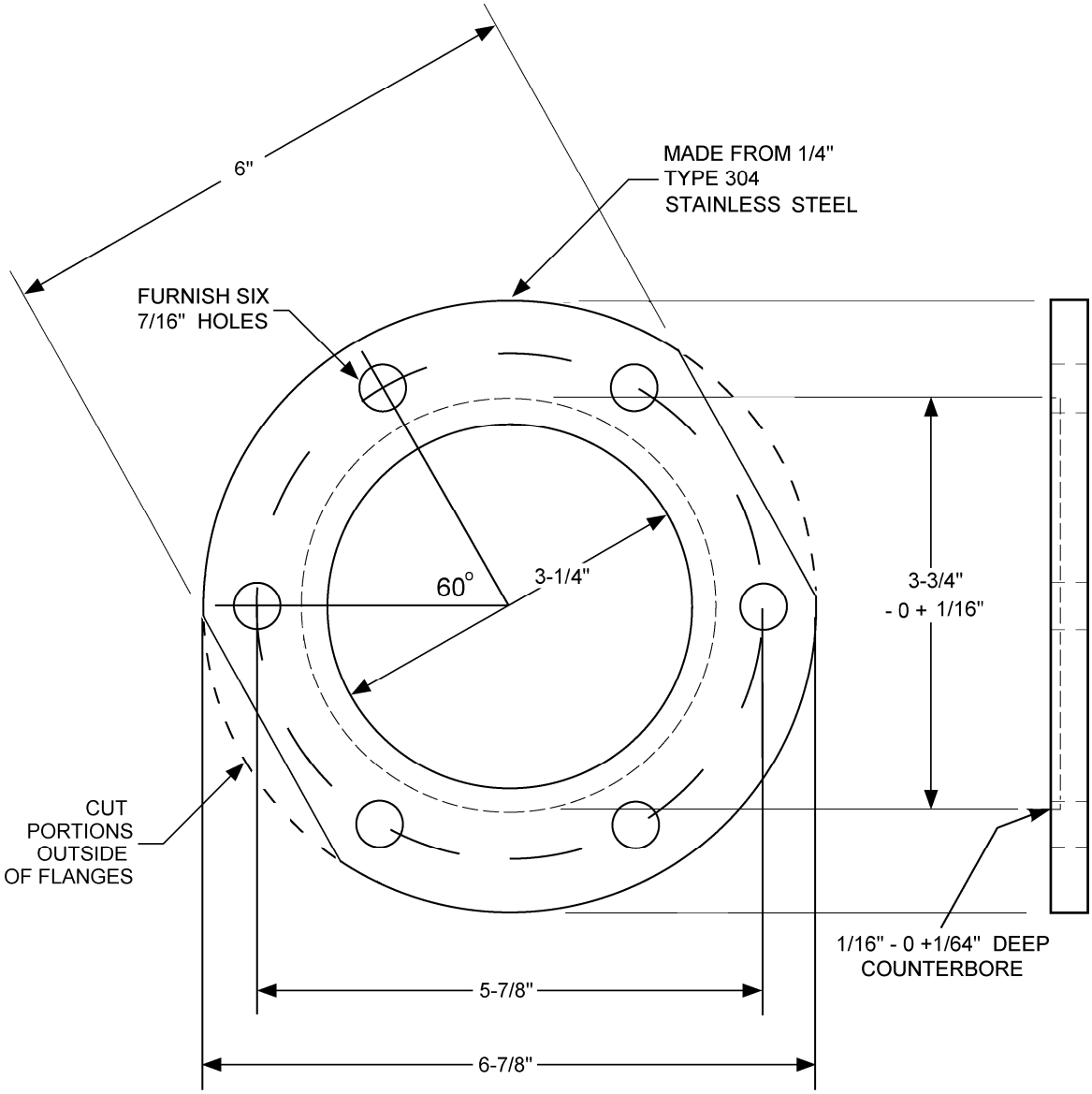
Application: For conversion of G & W PATR 1802 pothead terminations to straight 600 ampere apparatus bushing on 26 kV network transformers and other apparatus. Used with gasket Stock Number: 686281. See Stock Catalog for further information.

ORIGINATOR	STANDARDS COORDINATOR	STANDARDS SUPERVISOR	UNIT DIRECTOR
Jim S. Horn	Charles L. Shaffer	[signature]	[signature]

MATERIAL STANDARD

ADAPTER PLATE FOR 26 kV SINGLE-PHASE G&W PATR 1802 TERMINATOR REPLACEMENT

ADAPTER PLATE ONLY



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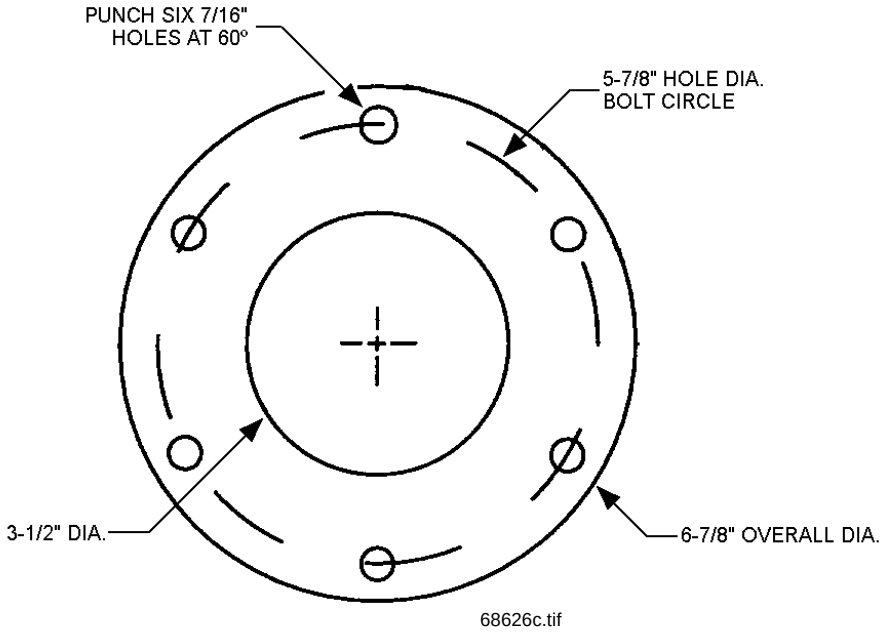
Stock Unit: EA
Stock Number: 686282

MATERIAL STANDARD

GASKET FOR 26 kV SINGLE-PHASE G&W PATR 1802 TERMINATOR REPLACEMENT

GASKET ONLY



Stock Unit: EA
Gasket Stock Number: 686281

Gasket Material:
1/4” thick cork and synthetic rubber (Buna N) composition.
Composition C.L. Stock Number: 727714.
Material Standard: 7276.9

SEATTLE CITY LIGHT

MATERIAL STANDARD

STANDARD NUMBER: **6862.7**
PAGE: 1 of 1
DATE: August 29, 1985
REV: June 24, 2002

GASKETS, SILICONE SPONGE RUBBER

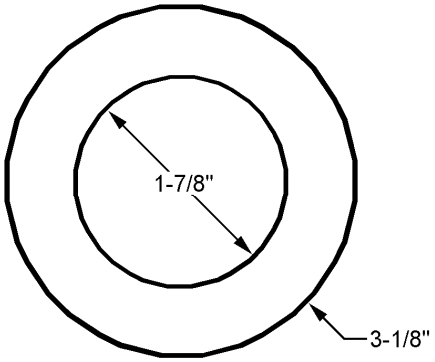


Fig. 1

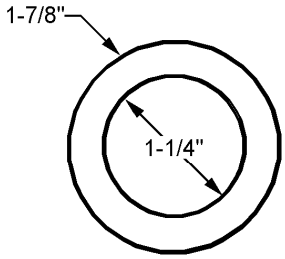


Fig. 2

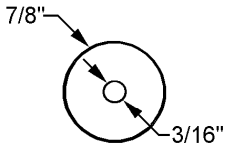


Fig. 3

Scope: Silicone sponge rubber gaskets of the configurations shown are intended to be used on pole-type transformers where the gasket will be outdoors on a pole exposed to the sun, wind, rain, ozone, corona, and air pollutants.

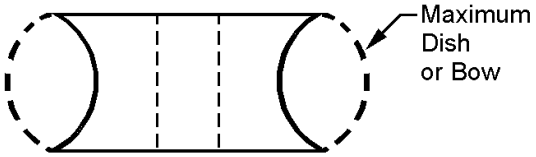
The gaskets will be used to fill gaps between the bird guard and the porcelain high-voltage bushing.

Material: The gaskets shall be cut from stabilized soft-density closed-cell silicone sponge rubber meeting the requirements of ASTM D 1056. The material shall be Groendyk 7910 or equal.

Physical Characteristics:

- Color: Gray
- Finish: Fabric impression, both sides
- Water Absorption: 10% maximum
- Compression/Deflection: 2 to 6 psi
- Compression Set: maximum 35% after 22 hours
- Percent Elongation: 350% minimum on 1/8" samples
- Tensile Strength: 75 psi minimum on 1/8" samples
- Temperature Range: -30º F to 450º F (-17º C to 230º C)
- Flame Resistance: 1-1/2" flame vertical for 12 seconds

Fabrication: The gaskets shall be die cut with the following tolerances:



0.05” on 1/2” material
0.03” on 1/4” material
0.01” on 1/8” material

± 1/16" maximum tolerance on dimensions, out-of-round, and concentricity.

Stock Number	Fig. Number	O.D. In.	I.D. In.	Thickness, In.
686236	1	3-1/8	1-7/8	1/2
686235	1	3-1/8	1-7/8	1/4
686234	1	3-1/8	1-7/8	1/8

ORIGINATOR	STANDARDS COORDINATOR	STANDARDS SUPERVISOR	UNIT DIRECTOR
Jim S. Horn	Charles L. Haffner	John C. Kinman	Haydee Jay

686233	2	1-7/8	1-1/4	1/2
686232	2	1-7/8	1-1/4	1/4
686231	2	1-7/8	1-1/4	1/8

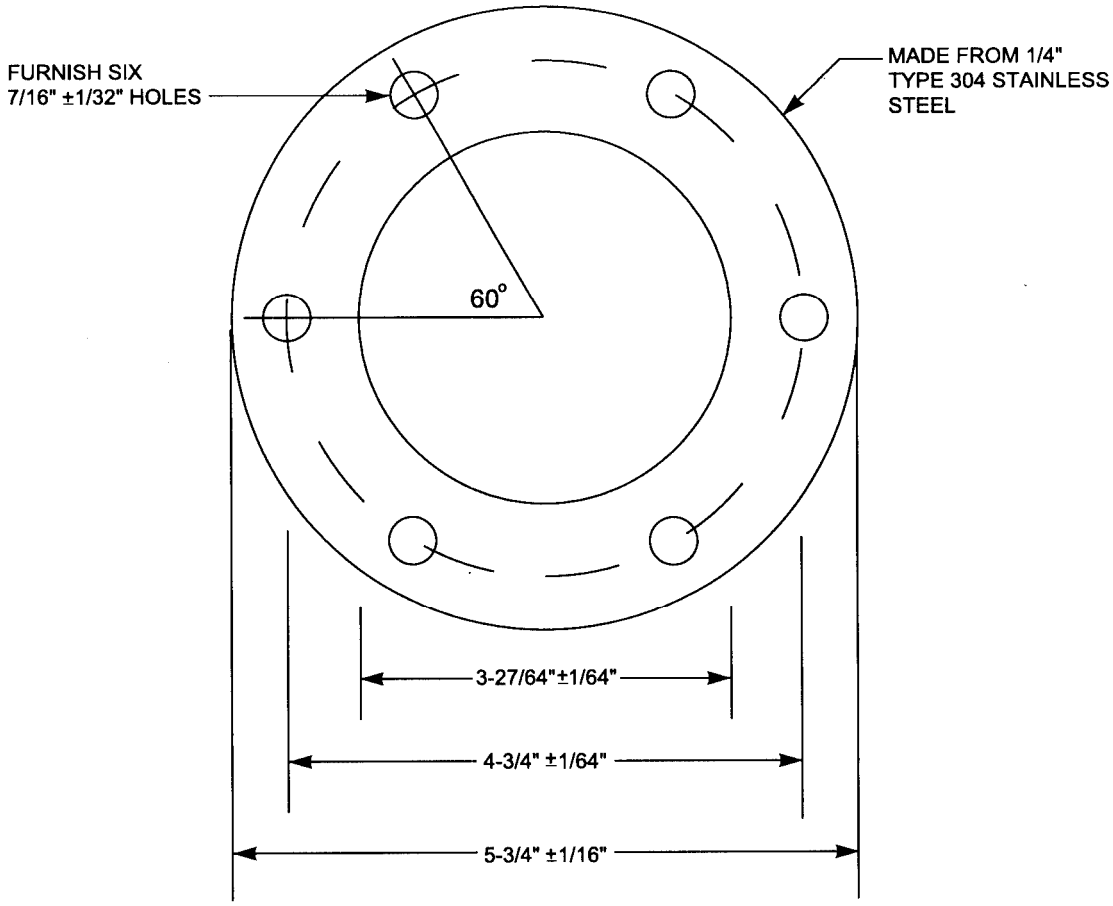
Since Figure 2 gaskets can be made from the center punching of Figure 1, gaskets are most economical when ordered in equal quantities of Figures 1 and 2 (for the same material thickness).

SEATTLE CITY LIGHT

MATERIAL STANDARD

STANDARD NUMBER: **6862.8**
PAGE: 1 of 1
DATE: February 23, 1989
REV: October 21, 1996

ADAPTER RING & GASKET
for 90° APPARATUS BUSHING
on 13 kV NETWORK TRANSFORMER



Application: For conversion of G & W pothead to 90°, 600 ampere apparatus bushing on 13 kV network transformers and other apparatus. See also Stock Catalog page 70-47. 90° apparatus bushing Stock Number is 687009.

Stock Unit: Each
Adapter Ring Stock Number: 686280
Gasket Stock Number: 686386

ORIGINATOR	STANDARDS COORDINATOR	STANDARDS SUPERVISOR	UNIT DIRECTOR
Jim S. Horn	Charles L. Shaffer	John C. Skinner	Betty Robin

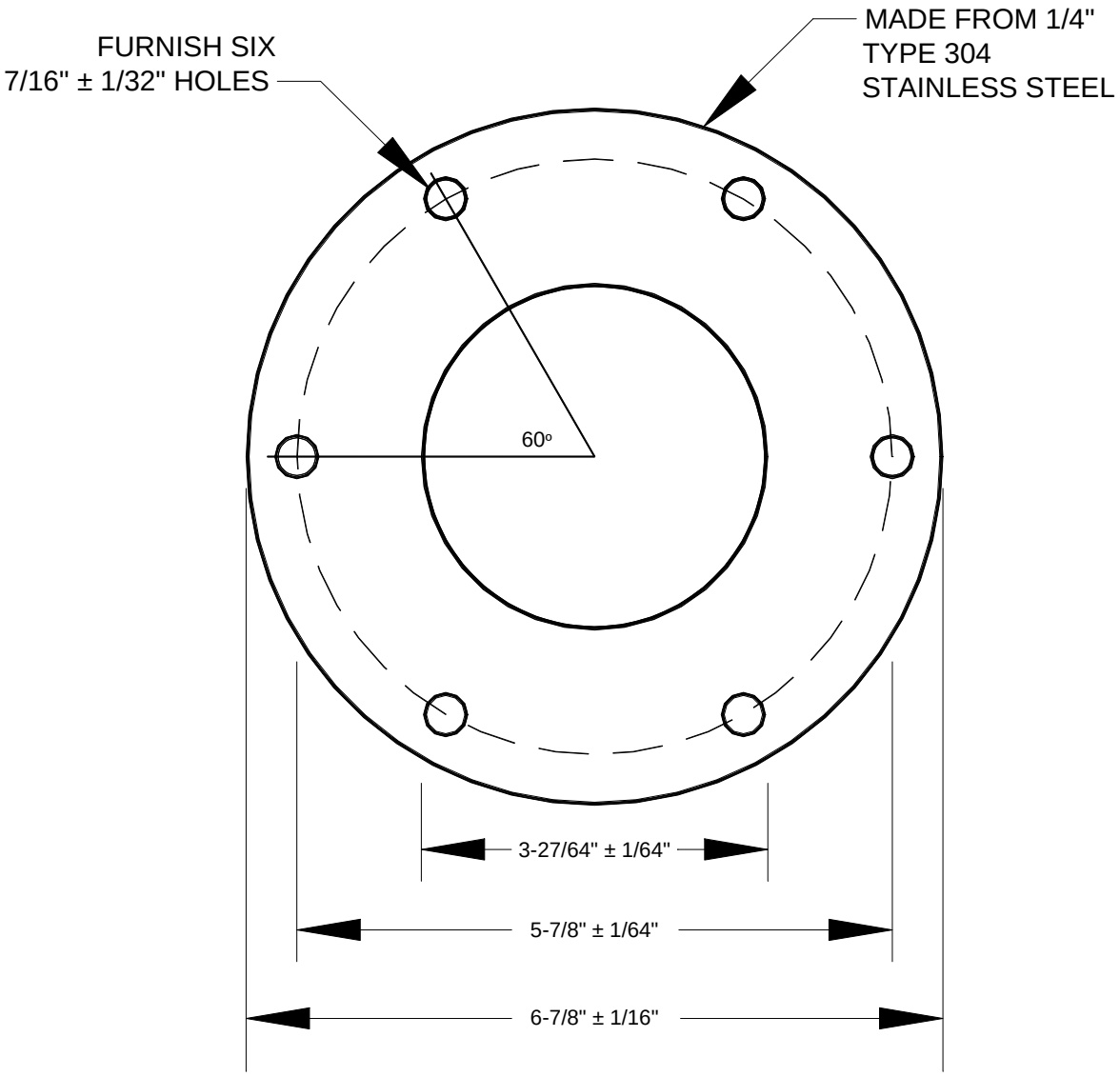
SEATTLE CITY LIGHT

MATERIAL STANDARD

STANDARD NUMBER: **6862.9**
PAGE: 1 of 1
DATE: April 2, 1996
REV: June 12, 1996

ADAPTER PLATE

FOR 90° APPARATUS BUSHING
(26 kV NETWORK TRANSFORMER)



68629a.psd

Application: For conversion of G & W pothead to 90°, 600 ampere apparatus bushing on 26 kV network transformers and other apparatus. See Stock Catalog page 70-47 for gasket & 90° apparatus bushing Stock Numbers.

Stock Unit: EA
Stock Number: 686283

ORIGINATOR	STANDARDS COORDINATOR	STANDARDS SUPERVISOR	UNIT DIRECTOR
Jim S. Horn	Charles L. Shaffer	John C. Skinner	Betty Robin

COMPRESSION CONNECTORS, ALL-ALUMINUM TYPE

1. Scope

This material standard covers the requirements for all-aluminum type compression connectors.

The requirements for bi-metallic compression connectors, intended for use with 200 A separable connectors, are specified in 6864.00. The requirements for all-copper compression connectors, intended for use with 900 A separable connectors, are specified in 6863.30.

This material standard applies to the following Seattle City Light Stock Numbers:

Stock Number	Conductor
686375	#1 AWG compressed, 1/0 AWG solid
686377	2/0 AWG compact
686376	2/0 AWG compressed
686378	3/0 AWG compressed
686369	4/0 AWG compressed
686366	350 kcmil compact
686351	350 kcmil compressed
686362	500 kcmil compact
010135	500 kcmil compressed
686349	750 kcmil compact
686359	750 kcmil compressed
686398	1000 kcmil compact
010136	1000 kcmil compressed

2. Application

All-aluminum compression connectors are used to make up 600 A, 125 kV and 150 kV BIL, deadbreak separable connectors, utilizing the dielectric components specified in Material Standards 6863.15 and 6863.25, respectively.

2. Application, continued

All-aluminum compression connectors can be used with either aluminum or copper conductor cable.

For cable technical data, refer to E6-1.0/NGE-70.

3. Industry Standards

Compression connectors shall meet the applicable requirements of the following industry standard:

ANSI C119.4-2004 – American National Standard for Electric Connectors – Connectors for Use Between Aluminum-to-Aluminum or Aluminum-to-Copper Conductors

4. Detailed Requirements

Compression connectors shall be designed and fabricated for use with the 125 kV and 150 kV BIL, deadbreak separable connector dielectric components specified in Material Standards 6863.15 and 6863.25 respectively.

Compression connectors shall accommodate conductor according to Section 9, below.

Compression connectors shall be all-aluminum, and tin-plated.

Compression connectors shall be current Class A, as defined in ANSI C119.4.

Compression connectors shall be tensile strength Class 3, minimum tension (or better), as defined in ANSI C119.4.

Compression connector shall be highly conductive aluminum.

Compression connector barrel shall be pre-filled with oxide inhibitor.

Compression connector barrel ends shall be capped or sealed to protect the oxide inhibitor from contamination.

standards coordinator	standards supervisor	unit director
John Shipek	John Shipek	Pamela S. Johnson

4. Detailed Requirements, continued

Each compression connector shall be provided with tool type, die number, and number of crimps information for:

- Burndy
- Kearney
- Alcoa
- Thomas & Betts (T&B)
- EEI reference

5. Marking

Each compression connector shall be permanently marked with:

- Manufacturer's name
- Manufacturer's catalog number
- Conductor types and sizes (ranges)
- Die number

6. Packaging

Compression connectors shall be packaged to prevent damage during shipping.

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

- Manufacturer's identification
- Product description
- Quantity contained
- Seattle City Light's Purchase Order Number
- Seattle City Light's Stock Number

Shipping container weight shall not exceed 50 pounds.

7. Issuance

EA

8. Approved Manufacturers

	Manufacturers' Catalog Numbers			
Stock Number	**Cooper Power Systems**	**Richards Manufacturing Co.**	**Thomas & Betts (Elastimold)**	**Conductor**
686375	CC6A12U	P6AL-8	03700230	#1 AWG compressed
				1/0 AWG solid
686377	CC6A13U	P6AL-9	03700240	2/0 AWG compact
686376	CC6A14U	P6AL-10	03700250	2/0 AWG compressed
686378	CC6A15U	P6AL-11	03700260	3/0 AWG compressed
686369	CC6A16U	P6AL-12	03700270	4/0 AWG compressed
686366	CC6A18U	P6AL-14	03700290	350 kcmil compact
686351	CC6A19U	P6AL-15	03700300	350 kcmil compressed
686362	CC6A21U	P6AL-17	03700320	500 kcmil compact
010135	CC6A22U	P6AL-18	03700330	500 kcmil compressed
686349	CC6A24U	P6AL-21	03700360	750 kcmil compact
686359	CC6A25U	P6AL-23	03700380	750 kcmil compressed
686398	CC6A26U	P6AL-26	03700400	1000 kcmil compact
010136	CC6A27U	P6AL-28	03700410	1000 kcmil compressed

9. References

6863.15; "Separable Connector Dielectric Components, 125 kV BIL, Deadbreak"; *Material Standards*; SCL

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

6863.30; "Compression Connectors, All-Copper Type"; *Material Standards*; SCL

6864.00; "Compression Connectors, Bi-Metallic Type, for 200 A Elbows"; *Material Standards*; SCL

B100-02024; *Components Master Catalog, 5 kV-35 kV Electrical Distribution Systems, Specifiers Guide*, Cooper Power Systems

E6-1.0/NGE-70; "Properties of Medium Voltage Cables; *Construction Guidelines*; SCL

PG-CA-0506; *Cable Accessories for 5 kV-35 kV Distribution Systems, Product Selection Guide*; Elastimold

Shipek, John; SCL Standards Engineer, subject matter expert and originator of 6863.10 (john.shipek@seattle.gov)

Separable Connector, Deadbreak, Dielectric Components, 125 kV BIL

1. Scope

This standard covers the requirements for 125 kV BIL, deadbreak, separable connector dielectric components. Separable connector dielectric components consist of T-bodies, and cable adapters.

The requirements for 125 kV BIL, deadbreak, straight line apparatus connector kits are specified in SCL 6863.16.

The requirements for 600 A and 900 A compression connectors are specified in SCL 6863.10 and 6863.30 respectively.

The requirements for 125 kV BIL, 600 A and 900 A junction boxes, plugs, miscellaneous components and tools, and accessories are specified in SCL 6863.17 and 6863.37 respectively.

The requirements for 150 kV BIL, deadbreak, separable connector dielectric components are specified in SCL 6863.25.

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

Stock No.	Description	Cable Insulation OD Minimum Range (in)
686350	T-body	–
686310	Cable adapter	0.640-0.820
686315	Cable adapter	0.760-0.950
686370	Cable adapter	0.850-1.050
686361	Cable adapter	0.980-1.180
686365	Cable adapter	1.090-1.310
686352	Cable adapter	1.180-1.465
686348	Cable adapter	1.370-1.630
686372	Cable adapter	1.515-1.780
010137	Cable adapter	1.725-1.935

2. Application

A separable connector (elbow) 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 separable connectors 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.

125 kV BIL T-bodies, and cable adapters ***cannot*** be used interchangeably with 150 kV BIL dielectric components. New construction should utilize 125 kV BIL material, except in cases where the equipment being connected to has 150 kV BIL bushings.

600 A and 900 A compression connectors can be used to make up either 125 kV BIL or 150 kV BIL separable connectors. Dielectric components alone do not have a current rating.

Because of high fault duty, connectors rated 200 A continuous are not appropriate for network systems. Network systems should be constructed with connectors rated 600 A (or 900 A) continuous.

For cable technical data, refer to SCL 9660.04.

For cable specific information relating to the parts required to make-up a complete separable connector, including jacket sealing and metallic shield adapters, refer to U5-17.05.

3. Industry Standards

Separable connector dielectric components shall meet the applicable requirements of the following industry standard:

IEEE 386-2006 – Standard for Separable Insulated Connector Systems for Power Distribution Systems Above 600 V

4. Detailed Requirements

Separable connector dielectric components shall have the following electrical ratings and attributes:

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	25 kA RMS, symmetrical
IEEE 386 interface	Figure 11

Each separable connector T-body shall be provided with assembly instructions.

Cable adapters shall be designed and fabricated for use with the 125 kV BIL T-body specified in this standard.

5. Testing

Separable connector dielectric components shall be tested according to the requirements of IEEE 386, Section 7.

Test results shall be provided upon request.

6. Design Changes

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

7. Marking

Separable connector dielectric components shall be marked according to the requirements of IEEE 386, Section 6.1.

8. Packaging

Separable connector dielectric components shall be packaged to prevent damage and/or contamination during shipping, handling, and storage.

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

- Manufacturer's identification
- Product description
- Quantity contained
- Seattle City Light's purchase order number
- Seattle City Light's stock number.

Shipping container weight shall not exceed 50 pounds.

9. Issuance

EA

10. Approved Manufacturers

			Manufacturer Catalog No.		
Stock No.	**Description**	**Cable Insulation OD Minimum Range (in)**	**Cooper Power Systems**	**Richards Manufacturing Co.**	**Thomas & Betts (Elastimold)**
686350	T-body	-	DT625	62LCN0	K655BLRN
686310	Cable adapter	0.640-0.820	CA625AB	P625CA-F	655CA-F
686315	Cable adapter	0.760-0.950	CA625CC	P625CA-G	655CA-G
686370	Cable adapter	0.850-1.050	CA625CC	P625CA-H	655CA-H
686361	Cable adapter	0.980-1.180	CA625DD	P625CA-J	655CA-J
686365	Cable adapter	1.090-1.310	CA625EE	P625CA-K	655CA-K
686352	Cable adapter	1.180-1.465	CA625EE	P625CA-L	655CA-L
686348	Cable adapter	1.370-1.630	CA625GG	P625CA-M	655CA-M
686372	Cable adapter	1.515-1.780	CA625HH	P625CA-N	655CA-N
010137	Cable adapter	1.725-1.935	CA625JJ	P625CA-P	655CA-P

11. References

SCL Construction Guideline U5-17.05; ‘’Separable Connector (T-Body), 125 kV BIL, Deadbreak”

SCL Design Standard 9660.04; “Properties of Medium Voltage Cables”

SCL Material Standard 6863.10; “Compression Connectors, All-Aluminum Type”

SCL Material Standard 6863.16; “Separable Connector, Deadbreak, Straight Line Apparatus Connector Kits, 125 kV BIL”

SCL Material Standard 6863.17; “Separable Connector Accessories, 125 kV BIL, 600 A”

SCL Material Standard 6863.25; “Separable Connector, Deadbreak, Dielectric Components, 150 kV BIL”

SCL Material Standard 6863.30; “Compression Connectors, All-Copper Type”

SCL Material Standard 6863.37; “Separable Connector Accessories, 125 kV BIL, 900 A”

12. Sources

B100-02024; “Components Master Catalog, 5 kV-35 kV Electrical Distribution Systems, Specifiers Guide,” Cooper Power Systems

PG-CA-0506; “Cable Accessories for 5 kV-35 kV Distribution Systems, Product Selection Guide”; Thomas & Betts (Elastimold)

Shipek, John; SCL Standards Engineer, subject matter expert and originator of 6863.15 (john.shipek@seattle.gov)

SEPARABLE CONNECTOR, BOLTED TYPE, DEADBREAK, CABLE JOINT PARTS AND KITS, 600 A, 125 KV BIL

1. Scope

This material standard covers the requirements for 125 kV BIL, 600 A, bolted, deadbreak, cable joint kits, straight cable-to-apparatus connector kits, insulating caps with bails, cable adapter retaining rings and special tools.

Connector systems of this type are known within Seattle City Light as modular systems. Straight cable-to-apparatus connectors are sometimes referred to as SOB connectors, where SOB stands for straight-on-bushing.

Cable joint parts consist of housings, bolts, flat washers, Belleville washers, insulated bus bars, straight receptacle adapters, and cable adapter retaining rings.

Compression lugs and cable adapters are outside the scope of this standard, but required to make a complete connection. For selection information, refer to Material Standard 6863.10 for 600 A compression connectors and Material Standard 6863.15 for 125 kV BIL cable adapters.

Jacket sealing and metallic shield adapters are also outside the scope of this standard. For more information regarding the installation of straight cable-to-apparatus connection kits, refer to Construction Guidelines NSP-320 and NSP-321.

This Material Standard applies to the following Seattle City Light Stock Numbers:

standards coordinator	*standards manager*	*unit director*
John Shipek	John Shipek	Pam S. Johnson

2. Application

A bolted cable joint is a fully insulated and shielded system for terminating and electrically connecting an insulated power cable to electrical apparatus or other power cables.

Bolted cable joints are available in cable-to-apparatus (one way), straight (two-way), Y (three way), and H (four way) versions.

De-energized (and grounded) joints can be quickly and easily connected and disconnected using standard hand tools. Bus bars can be changed to add or remove cables from the joint. Note that when modifying an existing joint, jacket sealing and metallic shield adapter connections may need to be reworked.

The cable-to-apparatus connector specified in this standard has an IEEE 386 interface on one end and is designed to be operated in the same manner as 600 A, T-body, separable connector.

The connectors 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

For cable technical data, refer to E6-1.0/NGE-70.

3. Industry Standards

Bolted cable joints shall meet the applicable requirements of ***either one*** of the following industry standards:

IEEE 386-2006 – Standard for Separable Insulated Connector Systems for Power Distribution Systems Above 600 V

IEEE 404-2006 - Standard for Extruded and Laminated Dielectric Shielded Cable Joints Rated 2500 V to 500 000 V

4. Detailed Requirements

Bushing interfaces shall meet the applicable requirements of IEEE 386 and have the following electrical ratings and attributes:

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
short-time current rating	25 kA RMS, symmetrical
IEEE 386 interface	Figure 11

Bolted cable joints shall have the following electrical ratings and attributes:

voltage class	25 kV
voltage rating (ph-ph)	25 kV RMS (grounded WYE systems)
voltage rating (ph-g)	15.2 kV RMS (grounded WYE systems)
BIL	125 kV crest
continuous current rating	600 A RMS
short-time current rating	25 kA RMS, symmetrical

Bolted cable joint kits (H or Y joint kits) shall include:

- Straight receptacle housings (quantity appropriate for number of ways)
- Insulated bus
- Bolts, flat washers, Belleville washers (quantity appropriate for number of ways)
- Silicone lubricant
- Vent rod
- Instruction sheet

Each **insulated bus bar** shall be provided with a test point with cap.

Straight cable-to-apparatus connector kits shall include:

- Straight receptacle housing (with shipping cap each end)
- Bushing converter
- Contact adapter
- Brass bolt (5/8-11, specialized socket head)
- Loctite 271, thread locker, single application package
- Stainless steel bolt (5/8-11 x 1-1/2), flat washer, Belleville washer
- Silicone lubricant, single application package
- Vent rod
- Instruction sheet

Cable adapter retaining rings shall be marked with the intended conductor size or an application code (manufacturer shall provide Seattle City Light with a legend, if an application code is employed.)

5. Testing

Bushing interfaces shall be tested according to the requirements of IEEE 386, Section 7.

Bolted cable joints shall be tested according to the requirements of IEEE 386, Section 7, or IEEE 404, Section 7.

Test results shall be provided upon request.

6. Design Changes

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

7. Marking

Bushing interfaces shall be marked according to the requirements of IEEE 386, Section 6.1.

Bolted cable joints shall be marked according to the requirements of IEEE 386, Section 6.1, or IEEE 404, Section 6.1.

8. Packaging

Bolted cable joint parts and kits shall be individually packaged in heavy duty, clear plastic bags or cardboard boxes, as appropriate for their size and weight, to prevent damage and/or contamination during shipping, handling, and storage.

8. Packaging, continued

Each individual package shall be marked with the following information:

- Manufacturer's identification
- Product description
- Each shipping container shall be legibly marked with the following information:
- Manufacturer's identification
- Product description
- Quantity contained
- Seattle City Light's Purchase Order Number
- Seattle City Light's Stock Number

9. Issuance

EA

10. Approved Manufacturers

Stock Number:	**687429**
Description:	**Housing kit**, includes bolt and washers
Application:	For adding a primary cable to an existing insulated bus with at least one unused way. Additional parts are required to complete the connection.
Richards Manufacturing Co.	P625JS1
Thomas & Betts (Elastimold)	K655Y-BSR

Stock Number:	**013075**
Description:	**3-way bus** (only)
Application:	For building a Y-joint when housings and bolt kits will be obtained elsewhere.
Richards Manufacturing Co.	P625JY0

Stock Number:	**013076**
Description:	**4-way bus** (only)
Application:	For building a H-joint when housings and bolt kits will be obtained elsewhere.
Richards Manufacturing Co.	P625JH0

10. Approved Manufacturers, continued

Stock Number:	**687430**
Description:	**H joint kit**
Application:	For joining four primary cables through a single, insulated bus. Additional parts are required to complete the connection.
Richards Manufacturing Co.	P625JH2
Thomas & Betts (Elastimold)	K656CH-HP

not shown: instructions
assembly aid

Stock Number:	**687431**
Description:	**Y joint kit**
Application:	For joining three primary cables through a single, insulated bus. Additional parts are required to complete the connection.
Richards Manufacturing Co.	P625JY2
Thomas & Betts (Elastimold)	K656CY-HP

not shown: instructions
assembly aid

Stock Number:	**687437**
Description:	**Straight cable-to-apparatus connector kit**
Application:	For connecting primary cable inline to an IEEE 386, 600 A, apparatus bushing. Additional parts are required to complete the connection.
Richards Manufacturing Co.	P625SRA1
Thomas & Betts (Elastimold)	K655-BSR

not shown: instructions

10. Approved Manufacturers, continued

Stock Number:	**687435**
Description:	**Insulating cap**, with bail
Application:	An accessory device designed to electrically insulate, electrically shield, and mechanically seal an unused way of an insulated bus.
Richards Manufacturing Co.	P625JIC
Thomas & Betts (Elastimold)	K655YDR

Stock Number:	**687604**
Description:	**Cable adapter retaining ring**
Application:	To secure the cable adapter within a bolted cable joint. For #1 AWG compressed conductor.
Richards Manufacturing Co.	P6JR-8
Thomas & Betts (Elastimold)	650ARR-230 *(part stamped 10)*

Stock Number:	none
Description:	**Cable adapter retaining ring**
Application:	To secure the cable adapter within a bolted cable joint. For 2/0 AWG compressed conductor.
Richards Manufacturing Co.	P6JR-10
Thomas & Betts (Elastimold)	650ARR-250

photo not available

Stock Number:	**687606**
Description:	**Cable adapter retaining ring**
Application:	To secure the cable adapter within a bolted cable joint. For 3/0 AWG compressed conductor.
Richards Manufacturing Co.	P6JR-11
Thomas & Betts (Elastimold)	650ARR-260 *(part stamped 1)*

Stock Number:	**687610**
Description:	**Cable adapter retaining ring**
Application:	To secure the cable adapter within a bolted cable joint. For 350 kcmil compact conductor.
Richards Manufacturing Co.	P6JR-14
Thomas & Betts (Elastimold)	650ARR-290 *(part stamped 3)*

Stock Number:	**687612**
Description:	**Cable adapter retaining ring**
Application:	To secure the cable adapter within a bolted cable joint. For 500 kcmil compact conductor.
Richards Manufacturing Co.	P6JR-17
Thomas & Betts (Elastimold)	650ARR-320 *(part stamped 4)*

10. Approved Manufacturers, continued

Stock Number:	none
Description:	**Cable adapter retaining ring**
Application:	To secure the cable adapter within a bolted cable joint. For 500 kcmil compressed conductor.
Richards Manufacturing Co.	P6JR-18
Thomas & Betts (Elastimold)	650ARR-330

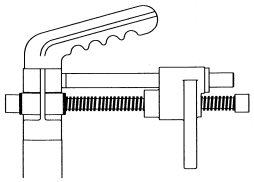
photo not available

Stock Number:	**687614**
Description:	**Cable adapter retaining ring**
Application:	To secure the cable adapter within a bolted cable joint. For 750 kcmil compact conductor.
Richards Manufacturing Co.	P6JR-21
Thomas & Betts (Elastimold)	650ARR-360 *(part stamped 6)*

Stock Number:	**687615**
Description:	**Cable adapter retaining ring**
Application:	To secure the cable adapter within a bolted cable joint. For 1000 kcmil compressed conductor.
Richards Manufacturing Co.	P6JR-28
Thomas & Betts (Elastimold)	650ARR-410 *(part stamped 8)*

Stock Number:	**687490**
Description:	**Assembly/disassembly tool**, lever drive type
Application:	Recommended for ease of assembly/disassembly of receptacle to insulated bus bar.
Thomas & Betts (Elastimold)	600YADT

Stock Number:	**012856**
Description:	**Assembly/disassembly tool**, worm gear type
Application:	Recommended for ease of assembly/disassembly of receptacle to insulated bus bar.
Richards Manufacturing Co.	P6JAT3



11. References

6863.10; "Compression Connectors, All-Aluminum Type"; *Material Standards*; SCL

6863.15; "Separable Connector, Deadbreak, Dielectric Components, 125 kV BIL"; *Material Standards*; SCL

E6-1.0/NGE-70; "Properties of Medium Voltage Cables"; *Construction Guidelines*; SCL

NSP-320; "Deadbreak Straight Line Connector 600 Amp, 13 kV and 26 kV"; *Construction Guideline*s SCL

NSP-321; "25 kV 600 Amp, Straight Receptacle Installation Instructions"; *Construction Guidelines*; SCL

PG-CA-0506; *Cable Accessories for 5 kV-35 kV Distribution Systems, Product Selection Guide*; Thomas & Betts (Elastimold)

Shipek, John; SCL Standards Engineer, subject matter expert and originator of 6863.16 (john.shipek@seattle.gov)

ACCESSORIES, SEPARABLE CONNECTOR, 600 A, 125 kV BIL, DEADBREAK

1. Scope

This standard covers the requirements for 600 A, 125 kV BIL, deadbreak, separable connector accessories, such as multi-way junction boxes (J-boxes), parking bushings, extension bushings, apparatus bushings, wells, plugs, caps, threaded studs, and special tools.

The requirements for 125 kV BIL, deadbreak, separable connector dielectric components are specified in SCL 6863.15.

The requirements for 125 kV BIL, deadbreak, straight cable-to-apparatus connector kits are specified in SCL 6863.16.

The requirements for 600 A, 150 kV BIL, deadbreak, separable connector accessories are specified in SCL 6863.27.

The requirements for 900 A, 125 kV BIL, deadbreak, separable connector accessories are specified in SCL 6863.37.

This standard applies to the following Seattle City Light Stock Numbers:

Stock No.	Description	Page
686383	Multi-way junction (J-Box), three-bushing	3
686384	Multi-way junction (J-Box), four-bushing	3
012285	Multi-way junction (J-Box), three-bushing, cast resin	4
012286	Multi-way junction (J-Box), four-bushing, cast resin	4
686396	Threaded stud	4
686353	Connecting plug with one loose stud	5
686356	Insulated plug with test point cap	5
686357	Insulated plug with test point cap and one loose stud	5
013461	Loadbreak reducing tap plug with one loose stud	5
686355	Deadbreak reducing tap plug	5
686354	Deadbreak reducing tap plug with one loose stud	6
686363	Reducing tap well with one loose stud	6
686380	Bushing extender with one loose stud	6
686379	Insulated cap with test point and one stud	6
686382	Insulated parking bushing	7
686394	Integral bushing with 2-15/16 inch shank	7
686392	Integral bushing with 8-9/16 inch shank	7
686393	Integral bushing with 18 inch shank	8
686399	In-air bushing with 8-1/2 inch shank	8
686397	Boot and collars	8
686358	Spanner wrench	8

Standards Coordinator
John Shipek

Standards Supervisor
John Shipek

Unit Director
Darnell Cola

2. Application

The cable accessories specified in this standard are intended to be used in conjunction with 125 kV BIL, deadbreak separable connector dielectric components (T-bodies and cable adapters), SCL 6863.15, to construct complete connector systems.

Important Note: Some accessories are provided with a stud. If an accessory is provided with the stud factory-installed, it should be considered permanent and not removable.

3. Industry Standards

Separable connectors (elbows) accessories shall meet the applicable requirements of the following industry standard:

IEEE 386-2006 – Standard for Separable Insulated Connector Systems for Power Distribution Systems Above 600 V

4. General Requirements

600 A interfaces shall have the following electrical ratings and attributes:

voltage class	25 kV
maximum voltage rating (ph-g)	15.2 kV RMS
BIL	125 kV crest
continuous current rating	600 A RMS
short-time current rating	25 kA RMS, symmetrical
IEEE 386 interface	Figure 11

200 A loadbreak interfaces shall have the following electrical ratings and attributes:

voltage class	25 kV
maximum voltage rating (ph-g)	15.2 kV RMS
BIL	125 kV crest
continuous current rating	200 A RMS
short-time current rating	10 kA RMS, symmetrical
IEEE 386 interface	Figure 7

200 A deadbreak interfaces shall have the following electrical ratings and attributes:

voltage class	25 kV
maximum voltage rating (ph-g)	15.2 kV RMS
BIL	125 kV crest
continuous current rating	200 A RMS
short-time current rating	10 kA RMS, symmetrical
IEEE 386 interface	Figure 4

200 A bushing well interfaces shall have the following electrical ratings and attributes:

voltage class	15, 25, and 35 kV
maximum voltage rating (ph-g)	21.1 kV RMS
BIL	150 kV crest
continuous current rating	200 A RMS
short-time current rating	10 kA RMS, symmetrical
IEEE 386 interface	Figure 3

Brackets and mounting hardware shall be stainless steel or other corrosion-proof alloy. Galvanized parts are not acceptable.

Multi-way junction boxes shall be provided with adjustable angle mounting brackets.

Any accessory that requires permanent grounding shall be equipped with a connector for attaching a #2 AWG, bare, stranded copper grounding conductor.

Insulated caps shall be provided with grounding tab for the purpose of attaching a drain wire lead.

For the purposes of this Material Standard, parking stands designed for use with Elastimold type 160 grounding and insulated parking bushings shall be designated type 160PS. Parking stands of this design have a nominal horizontal opening of 2 inches. IEEE 386 does not provide specifications for 160PS parking stands.

Figure 4.1, type 160PS parking stand

5. Testing

Separable connector (elbow) accessories shall be tested according to the requirements of IEEE 386, Section 7.

6. Design Changes

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

7. Marking

Separable connector (elbow) accessories shall be marked according to the requirements of IEEE 386, Section 6.1.

8. Packaging

Separable connector (elbow) accessories shall be individually packaged in heavy duty, clear plastic bags or cardboard boxes, as appropriate for their size and weight, to prevent damage and/or contamination during shipping, handling, and storage.

8. Packaging, continued

Each individual package shall be marked with the following information:

- Manufacturer's identification
- Product description

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

- Manufacturer's identification
- Product description
- Quantity contained
- Seattle City Light's Purchase Order Number
- Seattle City Light's Stock Number

9. Issuance

EA

10. Approved Manufacturers

Stock Number:	**686383**
Description:	**Multi-way junction (J-Box)**, three-bushing, with type 160PS parking stand each end.
Application:	An accessory device with three interconnected bushings. Center-to-center spacing is four inches.
Cooper Power Systems	DJ625A3B
Richards Manufacturing Co.	P625JD43B
Thomas & Betts (Elastimold)	K650J3-U

Stock Number:	**686384**
Description:	**Multi-way junction (J-Box)**, four-bushing, with type 160PS parking stand each end.
Application:	An accessory device with four interconnected bushings. Center-to-center spacing is four inches.
Cooper Power Systems	DJ625A4B
Richards Manufacturing Co.	P625JD44B
Thomas & Betts (Elastimold)	K650J4-U

10. Approved Manufacturers, continued

Stock Number:	**012285**
Description:	**Multi-way junction (J-Box)**, three-bushing, cast resin type, with type 160PS parking stand each end.
Application:	An accessory device with three interconnected bushings. Center-to-center spacing is four inches. Cast resin type junctions are for installations where extra high-reliability components are required.
Cooper Power Systems (formerly Patton & Cooke)	JBI25C3BSPS
Richards Manufacturing Co.	-
Thomas & Betts (Elastimold)	-

Stock Number:	**012286**
Description:	**Multi-way junction (J-Box)**, four-bushing, cast resin type, with type 160PS parking stand each end.
Application:	An accessory device with four interconnected bushings. Center-to-center spacing is four inches. Cast resin type junctions are for installations where extra high-reliability components are required.
Cooper Power Systems (formerly Patton & Cooke)	JBI25C4BSPS
Richards Manufacturing Co.	-
Thomas & Betts (Elastimold)	-

Stock Number:	**686396**
Description:	**Threaded stud**, 5/8 inch, aluminum
Application:	For replacement purposes if original threaded stud is lost or damaged. This part is only appropriate for 600 A rated connector systems.
Cooper Power Systems	STUD-A
Richards Manufacturing Co.	P625HIP-STUD
Thomas & Betts (Elastimold)	650SA

10. Approved Manufacturers, continued

Stock Number:	**686353**
Description:	**Connecting plug** with one loose stud
Application:	A connector that provides two in-line bushing interfaces.
Cooper Power Systems	DCP625AS
Richards Manufacturing Co.	P625CP-LS
Thomas & Betts (Elastimold)	K650CPS

Stock Number:	**686356**
Description:	**Insulated plug** with test point cap
Application:	An accessory device designed to electrically insulate, electrically shield, and mechanically seal an elbow interface. Test point cap is removable to allow access to capacitive test point. Requires stud.
Cooper Power Systems	DIP625A
Richards Manufacturing Co.	P625HIP
Thomas & Betts (Elastimold)	K650BIP

Stock Number:	**686357**
Description:	**Insulated plug** with test point cap and one loose stud
Application:	An accessory device designed to electrically insulate, electrically shield, and mechanically seal an elbow interface. Test point cap is removable to allow access to capacitive test point.
Cooper Power Systems	DIP625AS
Richards Manufacturing Co.	P625HIP-LS
Thomas & Betts (Elastimold)	K650BIPS

Stock Number:	**013461**
Description:	**Loadbreak** reducing tap plug with one loose stud
Application:	An accessory device designed for the transition of a 600 A deadbreak system to a 200 A loadbreak system. Intended for installation on the back of an existing T-body to provide a 200 A interface for testing and grounding.
Cooper Power Systems	BLRTP625AS
Richards Manufacturing Co.	-
Thomas & Betts (Elastimold)	-

10. Approved Manufacturers, continued

Stock Number:	**686355**
Description:	**Deadbreak reducing tap plug**
Application:	An accessory device designed for the transition of a 600 A deadbreak system to a 200 A deadbreak system. Requires stud.
Cooper Power Systems	-
Richards Manufacturing Co.	P625RTP
Thomas & Betts (Elastimold)	K650RTP

Stock Number:	**686354**
Description:	**Deadbreak reducing tap plug** with one loose stud
Application:	An accessory device designed for the transition of a 600 A deadbreak system to a 200 A deadbreak system.
Cooper Power Systems	-
Richards Manufacturing Co.	P625RTP-LS
Thomas & Betts (Elastimold)	K650RTPS

Stock Number:	**686363**
Description:	**Reducing tap well** with one loose stud
Application:	A connector that provides a transition from a 600 A elbow to a 200 A bushing well.
Cooper Power Systems	-
Richards Manufacturing Co.	P625RTW-LS
Thomas & Betts (Elastimold)	K650RTWS

Stock Number:	**686380**
Description:	**Bushing extender** with one loose stud
Application:	A connector that provides two in-line elbow interfaces.
Cooper Power Systems	DBE625S
Richards Manufacturing Co.	P625BE
Thomas & Betts (Elastimold)	K655BE

10. Approved Manufacturers, continued

Stock Number:	**686379**
Description:	**Insulated cap** with test point and one stud. Stud may be loose or permanent.
Application:	An accessory device designed to electrically insulate, electrically shield, and mechanically seal a bushing insert or integral bushing.
Cooper Power Systems	DPC625
Richards Manufacturing Co.	P625IC
Thomas & Betts (Elastimold)	K656DR

Stock Number:	**686382**
Description:	**Insulated parking bushing**, type 160PS
Application:	An accessory device designed to electrically insulate, electrically shield, and mechanically seal a power cable terminated with an elbow and to be installed into a type 160PS parking stand. Requires stud.
Cooper Power Systems	ISB625A
Richards Manufacturing Co.	P625IPB
Thomas & Betts (Elastimold)	K650SOP

Stock Number:	**686394**
Description:	**Integral bushing** with 2-15/16 inch shank
Application:	An apparatus bushing designed for use with another connector component, such as an elbow. Requires stud. For sidewall, under oil mounting.
Cooper Power Systems	-
Richards Manufacturing Co.	P625AB-3
Thomas & Betts (Elastimold)	K650S1

10. Approved Manufacturers, continued

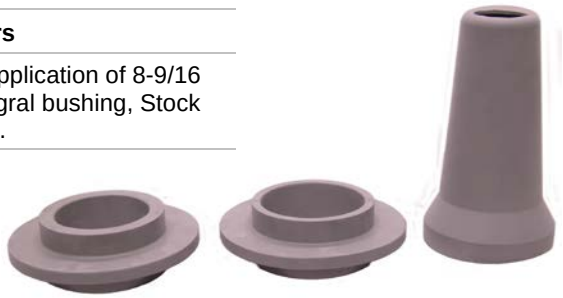
Stock Number:	**686392**
Description:	**Integral bushing** with 8-9/16 inch shank
Application:	An apparatus bushing designed for use with another connector component, such as an elbow. Requires stud. Use with adapter plate, Stock Number 686213, to convert G&W pothead termination to straight apparatus bushing on 13.8 kV network transformer. This assembly requires welding. Refer to Material Standard 6862.10. Use with adapter plate, Stock Number 686282, to convert G&W PATR 1802 pothead termination to straight apparatus bushing on 26.4 kV network transformer. This assembly requires welding. Refer to Material Standard 6862.6. For in-air application, use with Stock Number 686397.
Cooper Power Systems	-
Richards Manufacturing Co.	P625AB-9
Thomas & Betts (Elastimold)	K650T1

Stock Number:	**686393**
Description:	**Integral bushing** with 18 inch shank
Application:	An apparatus bushing designed for use with another connector component, such as an elbow. Requires stud. For CS transformers.
Cooper Power Systems	-
Richards Manufacturing Co.	-
Thomas & Betts (Elastimold)	K650L18-CS458

Stock Number:	**686399**
Description:	**In-air bushing** with 8-1/2 inch shank
Application:	Apparatus bushing
Central Maloney	70-2522-53
Cooper Power Systems	-
Elliot	1201-6 with 1902-CR-4A2F
Richards Manufacturing Co.	-
Thomas & Betts (Elastimold)	-

10. Approved Manufacturers, continued

Stock Number:	**686397**
Description:	**Boot and collars**
Application:	To allow in-air application of 8-9/16 inch shank, integral bushing, Stock Number 686392.
Cooper Power Systems	-
Richards Manufacturing Co.	-
Thomas & Betts (Elastimold)	600BC



Stock Number:	**686358**
Description:	**Spanner wrench**
Application:	Used to install connecting plugs, deadbreak reducing tap plugs, and reducing tap wells.
Cooper Power Systems	-
Richards Manufacturing Co.	P6SW
Thomas & Betts (Elastimold)	600SW

11. References

SCL Material Standard 6863.15; “Separable Connector, Deadbreak, Dielectric Components, 125 kV BIL”

SCL Material Standard 6863.16; “Separable Connector, Bolted Type, Deadbreak, Cable Joint Parts and Kits, 125 kV BIL; 600 A”

SCL Material Standard 6863.27; “Accessories, Separable Connector, 600 A, 150 kV BIL, Deadbreak”

SCL Material Standard 6863.37; “Accessories, Separable Connector, 900 A, 125 kV BIL, Deadbreak”

12. Sources

B100-02024; Components Master Catalog; 5 kV-35 kV Electrical Distribution Systems, Specifiers Guide; Cooper Power Systems

Components & Protective Equipment UD (Underground Distribution) Manual; Cooper Power Systems; 1993

PG-CA-0506; Cable Accessories for 5 kV-35 kV Distribution Systems, Product Selection Guide; Thomas & Betts (Elastimold)

Shipek, John; SCL Standards Engineer, subject matter expert and originator of 6863.17 (john.shipek@seattle.gov)

SEPARABLE CONNECTOR, DEADBREAK, DIELECTRIC COMPONENTS, 150 KV BIL

1. Scope

This material standard covers the requirements for 150 kV BIL, deadbreak, separable connector dielectric components. Separable connector dielectric components consist of T-bodies, and cable adapters.

The requirements for 600 A and 900 A compression connectors are specified in Material Standards 6863.10 and 6863.30 respectively.

The requirements for 150 kV BIL, 600 A connecting and insulating plugs are specified in Material Standards 6863.27. 150 kV BIL, multi-way junction boxes (J-boxes) are non-stock items.

The requirements for 125 kV BIL, deadbreak, separable connector dielectric components are specified in Material Standard 6863.15.

This Material Standard applies to the following Seattle City Light Stock Numbers:

Stock Number	Description	Cable Insulation OD Minimum Range, in.
687060	T-body	-
687019	Cable adapter	0.875-0.985
687020	Cable adapter	1.220-1.375
687025	Cable adapter	1.285-1.395
687028	Cable adapter	1.485-1.595
687030	Cable adapter	1.575-1.685
687035	Cable adapter	1.665-1.780

2. Application

A separable connector (elbow) 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 separable connectors 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

150 kV BIL T-bodies, and cable adapters ***cannot*** be used interchangeably with 125 kV BIL dielectric components. New construction should utilize 125 kV BIL material, except in cases where the equipment being connected to has 150 kV BIL bushings.

600 A and 900 A compression connectors can be used to make up either 125 kV BIL or 150 kV BIL separable connectors. Dielectric components alone do not have a current rating.

Because of high fault duty, connectors rated 200 A continuous are not appropriate for network systems. Network systems should be constructed with connectors rated 600 A (or 900 A) continuous.

For cable technical data, refer to 9660.04.

For cable specific information relating to the parts required to make-up a complete separable connector, including jacket sealing and metallic shield adapters, refer to U5-17.10.

3. Industry Standards

Separable connector dielectric components shall meet the applicable requirements of the following industry standard:

IEEE 386-2006 – Standard for Separable Insulated Connector Systems for Power Distribution Systems Above 600 V

4. Detailed Requirements

Separable connector dielectric components shall have the following electrical ratings and attributes:

voltage class	35 kV
maximum voltage rating (ph-g)	21.1 kV RMS ((grounded WYE systems)
BIL	150 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	25 kA RMS, symmetrical
IEEE 386 interface	Figure 13

Each separable connector T-body shall be provided with assembly instructions.

Cable adapters shall be designed and fabricated for use with the 150 kV BIL T-body specified in this material standard.

Cable adapters shall meet the dimensional requirements specified in **Section 10**.

5. Testing

Separable connector dielectric components shall be tested according to the requirements of IEEE 386, Section 7.

Test results shall be provided upon request.

6. Design Changes

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

7. Marking

Separable connector dielectric components shall be marked according to the requirements of IEEE 386, Section 6.1.

8. Packaging

Separable connector dielectric components shall be packaged to prevent damage and/or contamination during shipping, handling, and storage.

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

- Manufacturer's identification
- Product description
- Quantity contained
- Seattle City Light's Purchase Order Number
- Seattle City Light's Stock Number

9. Issuance

EA

10. Approved Manufacturers

Stock Number	Description	Cable Insulation OD Minimum Range, in.	Manufacturers' Catalog Numbers		
			Cooper Power Systems	Richards Manufacturing Co.	Thomas & Betts (Elastimold)
687060	T-body	-	DT635	P63LCN0	K755BLRN
687019	Cable adapter	0.875-0.985	CA635D	P635CA-H	755CA-H
687020	Cable adapter	1.220-1.375	CA635K	P635CA-L	755CA-L
687025	Cable adapter	1.285-1.395	CA635L	P635CA-L	755CA-L
687028	Cable adapter	1.485-1.595	CA635N	P635CA-M	755CA-M
687030	Cable adapter	1.575-1.685	CA635Q	P635CA-N	755CA-N
687035	Cable adapter	1.665-1.780	CA635R	P635CA-N	755CA-N

Note: Refer to Construction Guideline U5-17.10 for selecting the best cable adapter for a given cable.

11. References

SCL Design Standard 9660.04; "Properties of Medium Voltage Cables"

SCL Material Standard 6863.10; "Compression Connectors, All-Aluminum Type"

SCL Material Standard 6863.15; "Separable Connector, Deadbreak, Dielectric Components, 125 kV BIL"

SCL Material Standard 6863.27; "Accessories, Separable Connector, 600 A, 150 kV BIL, Deadbreak"

SCL Material Standard 6863.30; "Compression Connectors, All-Copper Type"

SCL Construction Guideline U5-17.10; "Separable Connector (T-Body), 150 kV BIL, Deadbreak"

12. Sources

B100-02024; *Components Master Catalog; 5 kV-35 kV Electrical Distribution Systems, Specifiers Guide*; Cooper Power Systems

Components & Protective Equipment UD (Underground Distribution) Manual; Cooper Power Systems; 1993

PG-CA-0506; *Cable Accessories for 5 kV-35 kV Distribution Systems, Product Selection Guide*; Thomas & Betts (Elastimold)

Shipek, John; SCL Standards Supervisor, subject matter expert, and originator of 6863.25 (john.shipek@seattle.gov)

ACCESSORIES, SEPARABLE CONNECTOR, 600 A, 150 kV BIL, DEADBREAK

1. Scope

This standard covers the requirements for 600 A, 150 kV BIL, deadbreak, separable connector accessories, such as connecting and insulating plugs and caps. 150 kV BIL, multi-way junction boxes (J-boxes) are non-stock items.

The requirements for 150 kV BIL, deadbreak, separable connector dielectric components are specified in SCL 6863.25.

The requirements for 600 A, 125 kV BIL, deadbreak, separable connector accessories are specified in SCL 6863.17.

This standard applies to the following Seattle City Light Stock Numbers:

Stock Number	Description
687260	Connecting plug with one stud
687270	Insulated plug with test point cap
687280	Insulated plug with test point cap and one loose stud
687340	Insulated cap

2. Application

The cable accessories specified in this standard are intended to be used in conjunction with 150 kV BIL, deadbreak separable connector dielectric components (T-bodies and cable adapters), SCL 6863.25, to construct complete connector systems.

3. Industry Standards

150 kV BIL T-bodies and cable adapters ***cannot*** be used interchangeably with 125 kV BIL dielectric components. New construction should utilize 125 kV BIL material, except in cases where the equipment being connected to has 150 kV BIL bushings.

Separable connectors (elbows) shall meet the applicable requirements of the following industry standard:

IEEE 386-2006 – Standard for Separable Insulated Connector Systems for Power Distribution Systems Above 600 V

4. General Requirements

600 A interfaces shall have the following electrical ratings and attributes:

voltage class	35 kV
maximum voltage rating (ph-g)	21.1 kV RMS
BIL	150 kV crest
continuous current rating	600 A RMS
short-time current rating	25 kA RMS, symmetrical
IEEE 386 interface	Figure 13

Insulated caps shall be provided with grounding tab for the purpose of attaching a drain wire lead.

5. Testing

Separable connector (elbow) accessories shall be tested according to the requirements of IEEE 386, Section 7.

6. Design Changes

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

7. Marking

Separable connector (elbow) accessories shall be marked according to the requirements of IEEE 386, Section 6.1.

8. Packaging

Separable connector (elbow) accessories shall be individually packaged in heavy duty, clear plastic bags or cardboard boxes, as appropriate for their size and weight, to prevent damage and/or contamination during shipping, handling, and storage.

8. Packaging, continued

Each individual package shall be marked with the following information:

- Manufacturer's identification
- Product description

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

- Manufacturer's identification
- Product description
- Quantity contained
- Seattle City Light's Purchase Order Number
- Seattle City Light's Stock Number

9. Issuance

EA

10. Approved Manufacturers

Stock Number:	**687260**
Description:	**Connecting plug** with one stud
Application:	A connector that provides two in-line bushing interfaces.
Cooper Power Systems	DCP635AS
Richards Manufacturing Co.	P635CP-LS
Thomas & Betts (Elastimold)	750CPS

Stock Number:	**687270**
Description:	**Insulated plug** with test point cap
Application:	An accessory device designed to electrically insulate, electrically shield, and mechanically seal an elbow interface. Test point cap is removable to allow access to capacitive test point. Requires stud.
Cooper Power Systems	DIP635A
Richards Manufacturing Co.	P635HIP
Thomas & Betts (Elastimold)	750BIP

10. Approved Manufacturers, continued

Stock Number:	**687280**
Description:	**Insulated plug** with test point cap and one loose stud
Application:	An accessory device designed to electrically insulate, electrically shield, and mechanically seal an elbow interface. Test point cap is removable to allow access to capacitive test point.
Cooper Power Systems (formerly Patton & Cooke)	DIP635AS
Richards Manufacturing Co.	P635HIP-S
Thomas & Betts (Elastimold)	750BIPS

Stock Number:	**687340** (no longer available for purchase)
Description:	**Insulated cap**
Application:	An accessory device designed to electrically insulate, electrically shield, and mechanically seal a bushing insert or integral bushing. For 35 kV loadbreak, transformer and junction box bushings.
Cooper Power Systems (formerly Patton & Cooke)	-
Richards Manufacturing Co.	-
Thomas & Betts (Elastimold)	-

11. References

SCL Material Standard 6863.25; “Separable Connector, Deadbreak, Dielectric Components, 150 kV BIL”

SCL Material Standard 6864.17; “Accessories, Separable Connector (Elbow), 200 A, 125 kV BIL, Deadbreak”

12. Sources

B100-02024; Components Master Catalog; 5 kV-35 kV Electrical Distribution Systems, Specifiers Guide; Cooper Power Systems

Components & Protective Equipment UD (Underground Distribution) Manual; Cooper Power Systems; 1993

PG-CA-0506; Cable Accessories for 5 kV-35 kV Distribution Systems, Product Selection Guide; Elastimold

Shipek, John; SCL Standards Engineer, subject matter expert and originator of 6863.27 (john.shipek@seattle.gov)

COMPRESSION CONNECTORS, ALL-COPPER TYPE

1. Scope

This material standard covers the requirements for all copper-type compression connectors.

The requirements for bi-metallic, compression connectors, intended for use with 200 A separable connectors, are specified in 6864.00. The requirements for all-aluminum compression connectors, intended for use with 600 A separable connectors, are specified in 6863.10.

This material standard applies to the following Seattle City Light Stock Numbers:

Stock Number	Conductor
686913	#1 AWG compressed
686914	3/0 AWG compressed
686916	350 kcmil compact
686917	500 kcmil compact
686918	500 kcmil compressed
686919	750 kcmil compact
686920	1000 kcmil compact
012128	1000 kcmil compressed

2. Application

All-copper compression connectors are used to make up 900 A, 125 kV and 150 kV BIL, deadbreak separable connectors, utilizing the dielectric components specified in Material Standards 6863.15 and 6863.25, respectively.

2. Application, continued

All-copper compression connectors can only be used with copper conductor cable; all-copper compression connectors shall not be used with aluminum conductor cable.

For cable technical data, refer to 9660.04.

3. Industry Standards

Compression connectors shall meet the applicable requirements of the following industry standard:

ANSI C119.4-2004 – American National Standard for Electric Connectors – Connectors for Use Between Aluminum-to-Aluminum or Aluminum-to-Copper Conductors

4. Detailed Requirements

Compression connectors shall be designed and fabricated for use with the 125 kV and 150 kV BIL, deadbreak separable connector dielectric components specified in Material Standards 6863.15 and 6863.25 respectively.

Compression connectors shall accommodate conductor according to Section 8, below.

Compression connectors shall be all-copper and tin-plated.

Compression connectors shall be current Class A, as defined in ANSI C119.4.

Compression connectors shall be tensile strength Class 3, minimum tension (or better), as defined in ANSI C119.4.

standards coordinator	*standards manager*	*unit director*
John Shipek	John Shipek	Pam S. Johnson

4. Detailed Requirements, continued

Each compression connector shall be provided with tool type, die number, and number of crimps information for:

- Alcoa
- Burndy
- EEI reference
- Kearney
- Thomas & Betts (T&B)

5. Marking

Each compression connector shall be permanently marked with:

- Manufacturer's name
- Manufacturer's catalog number
- Conductor types and sizes (ranges)
- Die number

6. Packaging

Compression connectors shall be packaged to prevent damage during shipping.

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

- Manufacturer's identification
- Product description
- Quantity contained
- Seattle City Light's Purchase Order Number
- Seattle City Light's Stock Number

Shipping container weight shall not exceed 50 pounds.

7. Issuance

EA

8. Approved Manufacturers

	Manufacturers' Catalog Numbers			
Stock Number	Cooper Power Systems	Richards Manufacturing Co.	Thomas & Betts (Elastimold)	Conductor
686913	CC6C62U	P9CU-8	03702-230	#1 AWG compressed
686914	CC6C65U	P9CU-11	03702-260	3/0 AWG compressed
686916	CC6C68U	P9CU-14	03702-290	350 kcmil compact
686917	CC6C71U	P9CU-17	03702-320	500 kcmil compact
686918	CC6C72U	P9CU-18	03702-330	500 kcmil compressed
686919	CC6C74U	P9CU-21	03702-360	750 kcmil compact
686920	CC6C76U	P9CU-26	03702-400	1000 kcmil compact
012128	CC6C77U	P9CU-28	03702-410	1000 kcmil compressed

9. References

6863.10; "Compression Connectors All-Aluminum Type"; Material Standard; SCL

6863.15; "Separable Connector Dielectric Components, 125 kV BIL, Deadbreak"; Material Standard; SCL

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

6864.00; "Compression Connectors Bi-Metallic Type, for 200 A Elbows"; Material Standard; SCL

9660.04; "Properties of Medium Voltage Cables; Design Standard; SCL

B100-02024; *Components Master Catalog, 5 kV-35 kV Electrical Distribution Systems, Specifiers Guide*; Cooper Power Systems

RMC-HVC-0708; *High Voltage Product Catalog;* Richards Manufacturing Co.

PG-CA-0506; *Cable Accessories for 5 kV-35 kV Distribution Systems, Product Selection Guide*; Elastimold

Shipek, John; SCL Standards Engineer, subject matter expert and originator of 6863.30 (john.shipek@seattle.gov)

SEPARABLE CONNECTOR, DEADBREAK, COOPER POWER SYSTEMS T-OP II, KITS, 900 A, 125 KV BIL

1. Scope

This material standard covers the requirements for Cooper Power Systems, 900 A, 125 kV BIL, T-OP II, deadbreak, separable connector system kits. Kits are cable specific and include a T-body with test point, test point cap, cable adapter, threaded copper stud, copper compression connector, and an insulated cap for the 200 A bushing.

This Material Standard applies to the following Seattle City Light Stock Numbers:

Stock Number	Description
686223	T-OP II kit for 28 kV, 1/0 AWG cable
012486	T-OP II kit for 28 kV, 500 kcmil cable
686226	T-OP II kit for 28 kV, 750 kcmil cable
686227	Combined operating, test, and torque tool
686228	5/16-inch T-wrench

2. Application

A separable connector (elbow) 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 separable connectors specified in this material standard are intended for use on the following three-phase, 60 Hz system: 26.4 kV, 4-wire, solidly-grounded, wye-connected.

A T-OP II separable connector may be used where a 200 A interface is required for testing, grounding, or overvoltage protection.

A T-OP II separable connector has an alignment segment and internal rotating nut feature in the loadbreak reducing tap plug which, along with the extended length stud, eliminates cross threading and ensures proper torque.

For cable technical data, refer to E6-1.0/NGE-70.

3. Industry Standards

T-OP II separable connectors shall meet the applicable requirements of the following industry standard:

IEEE 386-2006 – Standard for Separable Insulated Connector Systems for Power Distribution Systems Above 600 V

standards coordinator	*standards manager*	*unit director*
John Shipek	John Shipek	Pamela S. Johnson

4. Detailed Requirements

600 A interfaces shall have the following electrical ratings and attributes:

voltage class	25 kV
maximum voltage rating (ph-g)	15.2 kV RMS
BIL	125 kV crest
continuous current rating	900 A RMS (with included all-copper compression connector)
short-time current rating	25 kA RMS, symmetrical
IEEE 386 interface	Figure 11

200 A loadbreak interfaces shall have the following electrical ratings and attributes:

voltage class	25 kV
maximum voltage rating (ph-g)	15.2 kV RMS
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	10 kA RMS, symmetrical
IEEE 386 interface	Figure 7

Each T-OP II separable connector kit shall consist of:

- T-body with test point and cap
- Cable adapter
- Copper compression connector
- Extended length, T-OP II threaded copper stud
- 200 A, loadbreak reducing tap plug (LRTP)
- Insulated cap
- Silicon lubricant
- Assembly instructions

Insulated caps shall be provided with grounding tab for the purpose of attaching a drain wire lead.

5. Testing

T-OP II separable connectors shall be tested according to the requirements of IEEE 386, Section 7.

Test results shall be provided upon request.

6. Design Changes

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

7. Marking

T-OP II separable connectors shall be marked according to the requirements of IEEE 386, Section 6.1.

8. Packaging

T-OP II separable connectors shall be individually packaged in heavy duty, clear plastic bags or cardboard boxes.

Each individual package shall be marked with the following information:

- Manufacturer's identification
- Product description

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

- Manufacturer's identification
- Product description
- Quantity contained
- Seattle City Light's Purchase Order Number
- Seattle City Light's Stock Number

9. Issuance

EA

10. Approved Manufacturers

Stock Number: **686223**

Description:	**T-OP II separable connector kit** for 1/0 AWG
Application:	28 kV, 1/0 AWG solid aluminum, bare CN cable, Stock Number 602025 28 kV, 1/0 AWG solid aluminum, jacketed CN cable, Stock Number 012098

Cooper Power Systems	TP625CC12TC	photo not available

10. Approved Manufacturers, continued

Stock Number:	**012486**
Description:	**T-OP II separable connector kit** for 500 kcmil
Application:	28 kV, 500 kcmil compact stranded copper cable, Stock Number 012100
Cooper Power Systems	TP625FF22TC

photo not available

Stock Number:	**686226**
Description:	**T-OP II separable connector kit** for 750 kcmil
Application:	28 kV, 750 kcmil compact stranded copper cable, Stock Number 012101
Cooper Power Systems	TP625HH24TC

Stock Number:	**686227**
Description:	**Combined operating, test, and torque tool**
Application:	Allows single hotstick operation of Cooper Power System T-OP II. The tool is used with a hotstick to test for circuit de-energization and to install and remove a 25 kV Class loadbreak reducing tap plug (LRTP) equipped connector for an apparatus tap. Tool is equipped with a molded EPDM rubber cap and torque limiter to allow proper tool seating and gripping of the T-OP II connector. It also ensures that the connector has been properly torqued into the mating bushing.
Cooper Power Systems	OTTQ625

Stock Number:	**686228**
Description:	**5/16-inch T-Wrench**
Application:	For installing loadbreak reducing tap plug (LRTP) into Cooper Power Systems T-OP II
Cooper Power Systems	TWRENCH

11. References

600-32; “Molded Rubber Products, 600 A 25 kV Class, T-OP II Deadbreak Connector”; Cooper Power Systems; 2005

E6-1.0/NGE-70; “Properties of Medium Voltage Cables”; Construction Guideline; SCL

Shipek, John; SCL Standards Engineer, subject matter expert and originator of 6863.34 (john.shipek@seattle.gov)

ACCESSORIES, SEPARABLE CONNECTOR, 900 A, 125 kV BIL, DEADBREAK

1. Scope

This material standard covers the requirements for 900 A, 125 kV BIL, deadbreak, separable connector accessories, such as apparatus bushings, plugs, caps, wells, and threaded studs.

The requirements for 125 kV BIL, deadbreak, separable connector dielectric components are specified in Material Standard 6863.15.

This material standard applies to the following Seattle City Light Stock Numbers:

Stock Number	Description	Page
686925	Threaded stud	2
686905	Connecting plug with one loose stud	2
686910	Insulated plug with test point cap	3
686915	Reducing tap well	3
686900	Integral bushing	3

2. Application

The cable accessories specified in this standard are intended to be used in conjunction with 125 kV BIL, deadbreak separable connector dielectric components (T-bodies and cable adapters), Material Standard 6863.15, to construct complete connector systems.

Important Note: Some accessories are provided with a stud. If an accessory is provided with the stud factory-installed, it should be considered permanent and not removable.

3. Industry Standards

Separable connectors (elbows) shall meet the applicable requirements of the following industry standard:

IEEE 386-2006 – Standard for Separable Insulated Connector Systems for Power Distribution Systems Above 600 V

4. General Requirements

900 A interfaces shall have the following electrical ratings and attributes:

voltage class	25 kV
maximum voltage rating (ph-g)	15.2 kV RMS
BIL	125 kV crest
continuous current rating	900 A RMS
short-time current rating	25 kA RMS, symmetrical
IEEE 386 interface	Figure 11

200 A bushing well interfaces shall have the following electrical ratings and attributes:

voltage class	15, 25, and 35 kV
maximum voltage rating (ph-g)	21.1 kV RMS
BIL	150 kV crest
continuous current rating	200 A RMS
short-time current rating	10 kA RMS, symmetrical
IEEE 386 interface	Figure 3

4. General Requirements, continued

Any accessory that requires permanent grounding shall be equipped with a connector for attaching a #2 AWG, bare, stranded copper grounding conductor.

Insulated caps shall be provided with grounding tab for the purpose of attaching a drain wire lead.

5. Testing

Separable connector (elbow) accessories shall be tested according to the requirements of IEEE 386, Section 7.

Test results shall be provided upon request.

6. Design Changes

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

7. Marking

Separable connector (elbow) accessories shall be marked according to the requirements of IEEE 386, Section 6.1.

8. Packaging

Separable connector (elbow) accessories shall be individually packaged in heavy duty, clear plastic bags or cardboard boxes, as appropriate for their size and weight, to prevent damage and/or contamination during shipping, handling, and storage.

Each individual package shall be marked with the following information:

- Manufacturer's identification
- Product description

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

- Manufacturer's identification
- Product description
- Quantity contained
- Seattle City Light's Purchase Order Number
- Seattle City Light's Stock Number

9. Issuance

EA

10. Approved Manufacturers

Stock Number:	**686925**
Description:	**Threaded stud**, 5/8-inch, copper
Application:	For replacement purposes if original threaded stud is lost or damaged. This part may be used for 600 or 900 A rated connector systems.
Cooper Power Systems	STUD-C
Richards Manufacturing Co.	P925HIP-STUD
Thomas & Betts (Elastimold)	675SA

Stock Number:	**686905**
Description:	**Connecting plug** with one loose copper stud
Application:	A connector that provides two in-line bushing interfaces.
Cooper Power Systems	DCP625CS
Richards Manufacturing Co.	P925CP-LS
Thomas & Betts (Elastimold)	K675CPS

10. Approved Manufacturers, continued

Stock Number:	**686910**
Description:	**Insulated plug** with test point cap and one loose copper stud
Application:	An accessory device designed to electrically insulate, electrically shield, and mechanically seal an elbow interface. Test point cap is removable to allow access to capacitive test point.
Cooper Power Systems	DIP625CS
Richards Manufacturing Co.	P925HIP-LS
Thomas & Betts (Elastimold)	K675BIPS

Stock Number:	**686915**
Description:	**Reducing tap well**
Application:	A connector that provides a transition from a 600 A elbow to a 200 A bushing well.
Cooper Power Systems	-
Richards Manufacturing Co.	-
Thomas & Betts (Elastimold)	K675RTW

Stock Number:	**686900**
Description:	**Integral bushing** with 2-15/16 inch shank
Application:	An apparatus bushing designed for use with another connector component, such as an elbow. Requires copper stud. For sidewall, under oil mounting.
Cooper Power Systems	-
Richards Manufacturing Co.	-
Thomas & Betts (Elastimold)	K675S1

11. References

6863.15; "Separable Connector, Deadbreak, Dielectric Components, 125 kV BIL"; *SCL Material Standard*

B100-02024; *Cooper Power Systems Components Master Catalog, 5 kV-35 kV Electrical Distribution Systems, Specifiers Guide;* Cooper Power Systems

PG-CA-0506; *Elastimold Cable Accessories for 5 kV-35 kV Distribution Systems, Product Selection Guide*; Thomas & Betts (Elastimold)

Shipek, John; SCL Standards Engineer, subject matter expert and originator of SCL Material Standard 6863.37 (john.shipek@seattle.gov)

MATERIAL STANDARD

APPARATUS BUSHING, 90 DEGREE, 600 AMPERE

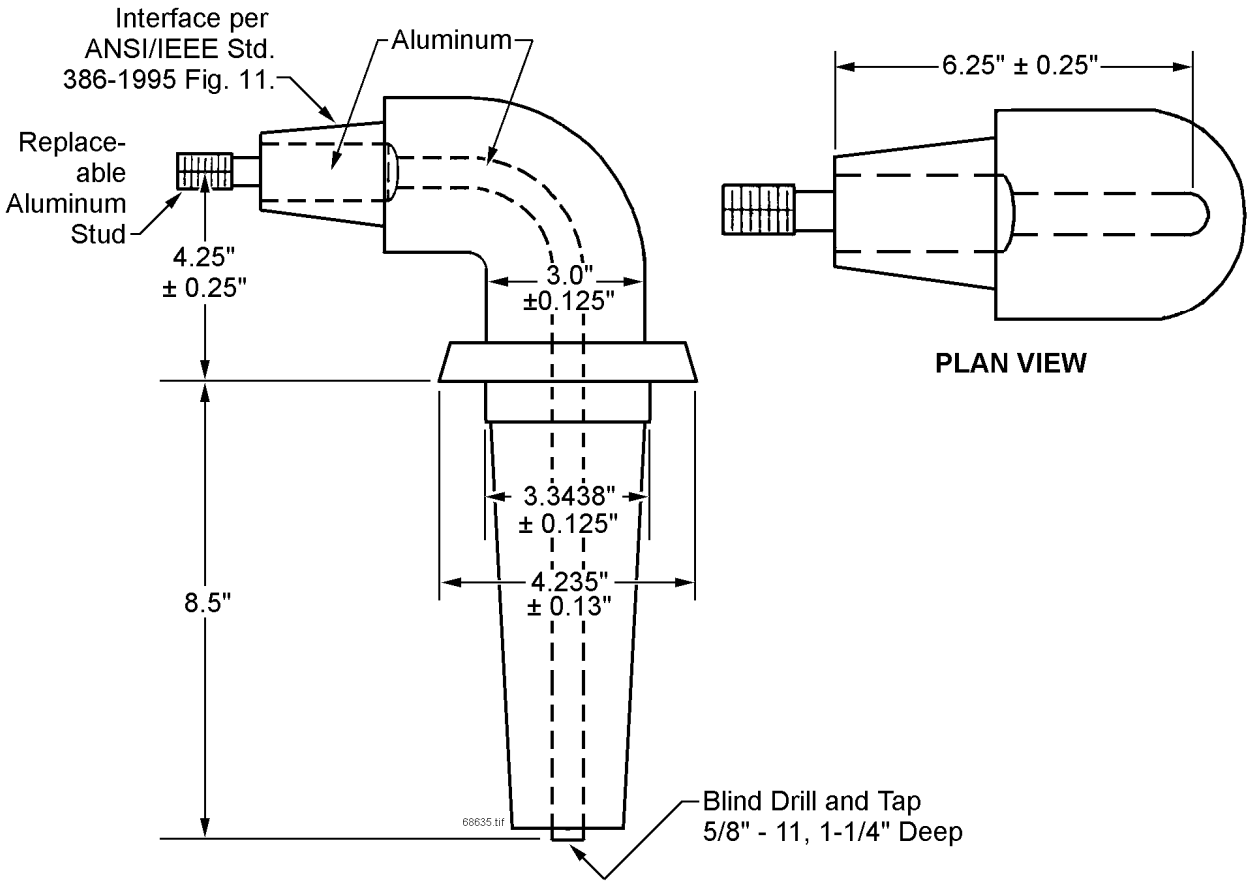


Figure 1

1. General

The bushing will be used to terminate XLPE power cable with separable connectors on the primary side of network transformers. The bushing will be clamped into the terminal chamber with the lower end submersed in oil and the outer end interfaced to terminate with 600 ampere deadbreak elbows and components.

2. Ratings

A. For use on 25 kV class equipment.
B. BIL: 125 kV.
C. Withstand: 42 kV, 60 Hz, 1 minute.
80 kV, D.C., 15 minutes.
D. Corona: 19 kV extinction.
E. Current: 600 amperes rms continuous.
F. Momentary: 40,000 amperes rms, asymmetrical, 12 cycles.
27,000 amperes, symmetrical, 4 seconds.

ORIGINATOR	STANDARDS COORDINATOR	STANDARDS SUPERVISOR	UNIT DIRECTOR
Jim S. Horn	Charles L. Shaffer	John C. Skinner	Harold Gray

MATERIAL STANDARD

3. Construction

The bushing shall be constructed as shown in Figure 1. The current-carrying parts shall be aluminum.

The 5/8" x 11 NC stud on the bushing interface shall be made of aluminum and shall be removable.

The bushing interface shall be in accordance with ANSI/IEEE Standard 386-1995, Figure 11.

The bushing construction shall be capable of withstanding clamping forces of 14 ft-lbs applied to six bolts evenly spaced around a clamping ring. See Material Standard 6862.8 for clamping ring.

4. Data to be Submitted with Bid

Each bidder shall submit with his proposal all the data necessary to evaluate the item bid. The bidder shall submit a description of any changes, additions or exceptions to the specifications that the bidder proposes, together with reasons for departure. The drawings and data furnished must be in sufficient detail and clarity to enable making a complete and positive check with the technical provisions of the specifications.

5. Data to be Furnished by Successful Bidder

The successful bidder shall supply with every shipment a certificate of compliance to include test results verifying the ratings in Section 2 of this specification.

6. Receiving of Apparatus Bushings

All apparatus bushings may be X-rayed upon receipt by Seattle City Light. Any units found defective (voids, foreign material, etc.,) will be rejected and the manufacturer shall replace the defective units at his expense.

Stock Unit: EA

Stock Number: 687009

Approved Manufacturer: Elliott Industries #1611-625L

Reference: ANSI C57.12.40, Figures 1 and 2
ANSI/IEEE Standard 386-1995, Figure 11
Seattle City Light Material Standard 6862.8

COMPRESSION CONNECTORS, BI-METALLIC TYPE, FOR 200 A ELBOWS

1. Scope

This material standard covers the requirements for bi-metallic (copper-top) type compression connectors.

The requirements for all-aluminum compression connectors, intended for use with 600 A separable connectors, are specified in 6863.10. The requirements for all-copper compression connectors, intended for use with 900 A separable connectors, are specified in 6863.30.

This material standard applies to the following Seattle City Light Stock Numbers:

Stock Number	Conductor
686417	#1 AWG stranded, 1/0 AWG solid
686421	#2 AWG stranded, #1 AWG solid
686424	#8 AWG stranded (Kerite)

2. Application

Bi-metallic compression connectors are used to make up 200 A loadbreak and 200 A deadbreak separable connectors (elbows), Material Standards 6864.05 and 6864.15 respectively.

In the majority of cases, 200 A elbow kits include a bi-metallic compression connector. Bi-metallic compression connectors are available separately for situations where the connector provided with a particular kit is lost, damaged, or not the correct size.

Bi-metallic compression connectors can be used with either aluminum or copper conductor cable.

Compression connector, Stock Number 686424, is used exclusively with elbows, Stock Numbers

2. Application, continued

686442 or 686440, to terminate 27 kV, #8 AWG copper cable (Kerite), Stock Number 623650.

For cable technical data, refer to E6-1.0/NGE-70.

3. Industry Standards

Compression connectors shall meet the applicable requirements of the following industry standard:

ANSI C119.4-2004 – American National Standard for Electric Connectors – Connectors for Use Between Aluminum-to-Aluminum or Aluminum-to-Copper Conductors

4. Detailed Requirements

Compression connectors shall be designed and fabricated to be used with 200 A loadbreak and 200 A deadbreak separable connectors (elbows), Material Standards 6864.05 and 6864.15 respectively.

Compression connectors shall be bi-metallic, with copper top.

Compression connectors shall be current Class A, as defined in ANSI C119.4.

Compression connectors shall be tensile strength Class 3, minimum tension (or better), as defined in ANSI C119.4.

Compression connector barrel shall be highly conductive aluminum.

Compression connector barrel shall be pre-filled with oxide inhibitor.

Compression connector barrel ends shall be capped or sealed to protect the oxide inhibitor from contamination.

Compression connector shall accommodate conductor according to Section 8, below.

4. Detailed Requirements, continued

Each compression connector shall be provided with tool type, die number, and number of crimps information for:

- Burndy
- Kearney
- Alcoa
- Thomas & Betts (T&B)
- EEI reference

5. Marking

Each compression connector shall be permanently marked with:

- Manufacturer's name
- Manufacturer's catalog number
- Conductor types and sizes (ranges)
- Die number

6. Packaging

Compression connectors shall be packaged to prevent damage during shipping.

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

- Manufacturer's identification
- Product description
- Quantity contained
- Seattle City Light's Purchase Order Number
- Seattle City Light's Stock Number

Shipping container weight shall not exceed 50 pounds.

7. Issuance

EA

8. Approved Manufacturers

	Manufacturers' Catalog Numbers		
Stock Number	**Cooper Power Systems**	**Thomas & Betts (Elastimold)**	**Conductor**
686417	CC2C05T	02500230	#1 AWG stranded 1/0 AWG solid
686421	CC2C04T	02500220	#2 AWG stranded #1 AWG solid
686424	na	164LRC-4	#8 AWG stranded

9. References

6863.10; "Compression Connectors All-Aluminum Type; *Material Standards*; SCL

6863.30; "Compression Connectors, All-Copper Type; *Material Standards*; SCL

6864.15; "Separable Connector (Elbow), 200 A, Deadbreak; *Material Standards*; SCL

6864.05; "Separable Connector (Elbow), 200 A, Loadbreak; *Material Standards*; SCL

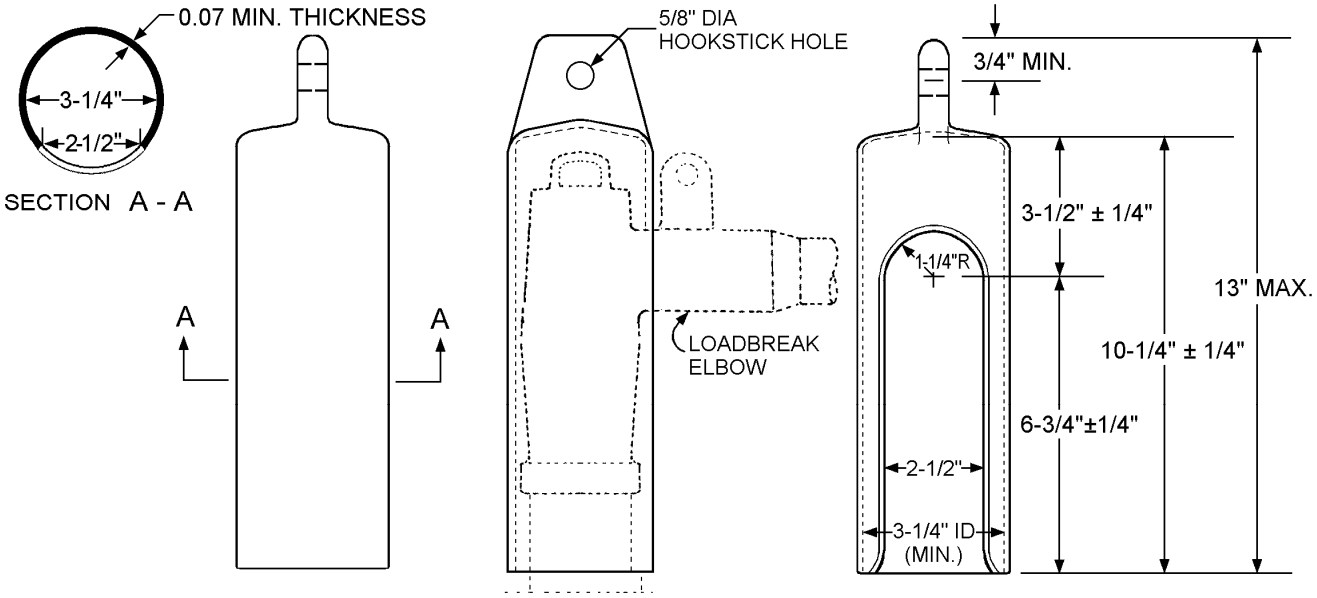
B100-02024; *Components Master Catalog, 5 kV-35 kV Electrical Distribution Systems, Specifiers Guide*; Cooper Power Systems

E6-1.0/NGE-70; "Properties of Medium Voltage Cables"; *Construction Guideline*; SCL

PG-CA-0506; *Cable Accessories for 5 kV-35 kV Distribution Systems, Product Selection Guide*; Elastimold

Shipek, John; SCL Standards Engineer, subject matter expert and originator of 6864.00 (john.shipek@seattle.gov)

COVER, LOADBREAK ELBOW



Covers for loadbreak elbows, of the configuration shown, are intended to aid in keeping the loadbreak elbow/bushing interfaces free of dirt, mud, and other contaminants. Reasonable variations are acceptable.

Covers shall be made from PVC, polyethylene, or other plastic material suitable for use in underground vaults. The covers may be fabricated from 3" PVC conduit.

Color: Black

Stock Unit: EA

Stock Number	Approved Manufacturer
	CMC
686467	CC-1928-1

standards coordinator	*standards supervisor*	*unit director*
John Shipek	John Shipek	Pamela S. Johnson

SEPARABLE CONNECTOR (ELBOW), 200 A, LOADBREAK

1. Scope

This standard covers the requirements for 200 A, loadbreak, separable connectors (elbows) kits.

The requirements for 200 A deadbreak elbows are specified in Material Standard 6864.15.

This material standard applies to the following Seattle City Light Stock Numbers:

Stock Number	Description
686445	Loadbreak elbow kit for 28 kV, 1/0 AWG cable
686442	Loadbreak elbow kit for 27 kV, #8 AWG, Kerite cable
686423	Loadbreak probe

2. Application

A separable connector (elbow) 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 separable connectors specified in this material standard are intended for use on the following three-phase, 60 Hz systems:

- 26.4 kV, 4-wire, solidly-grounded, wye-connected
- 5 kV and below

Because of high fault duty, connectors rated 200 A continuous are not appropriate for network systems. Network systems should be constructed with connectors rated 600 A (or 900 A) continuous.

For cable technical data, refer to 9660.04.

For cable specific information relating to jacket sealing and metallic shield adapters, refer to U5-15.05.

3. Industry Standards

Separable connectors (elbows) shall meet the applicable requirements of the following industry standard:

IEEE 386-2006 – Standard for Separable Insulated Connector Systems for Power Distribution Systems Above 600 V

standards coordinator	*standards supervisor*	*unit director*
John Shipek	John Shipek	Darnell Cola

4. Detailed Requirements

Separable connectors (elbows) shall have the following electrical ratings and attributes:

voltage class	25 kV
maximum voltage rating (ph-g)	15.2 kV RMS
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	10 kA RMS, symmetrical
IEEE 386, interface	Figure 7

Separable connectors (elbows) shall have the following features:

- Test point with cap
- Removable white band with centered black strip as specified in IEEE 386, Section 6.1 e) 2) to indicate both phase-to-ground and phase-to-phase voltage ratings

Each separable connector (elbow) kits shall include:

- Body
- Compression connector (Stock Number 686445 only)
- Loadbreak probe
- Probe installation tool
- Silicone lubricant
- Instruction sheet

Compression connectors shall be bi-metallic, with copper top and meet the requirements of Material Standard 6864.00.

Separable connector (elbow) shall be designed for a cable insulation shield cutback length of 6-7/8 in. measured from the end of the installed compression connector.

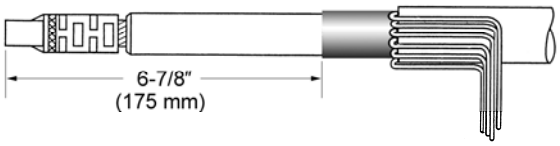


Figure 4, Cutback Length

5. Testing

Separable connectors (elbows) shall be tested according to the requirements of IEEE 386, Section 7.

Test results shall be provided upon request.

6. Design Changes

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

7. Marking

Separable connectors (elbows) shall be marked according to the requirements of IEEE 386, Section 6.1.

Optional color-coding as described in IEEE 386, Section 6.1 f) is not required or desired.

8. Packaging

Separable connectors (elbows) shall be individually packaged in heavy duty, clear plastic bags or cardboard boxes.

Each individual package shall constitute a kit that includes all of the parts cited in Section 4 of this material standard.

Each individual package shall be marked with the following information:

- Manufacturer's identification
- Product description

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

- Manufacturer's identification
- Product description
- Quantity contained
- Seattle City Light's Purchase Order Number
- Seattle City Light's Stock Number

9. Issuance

Unit: EA

10. Approved Manufacturers

Stock Number:	**686445**
Description:	**Loadbreak elbow kit**
Application:	28 kV, 1/0 AWG solid aluminum, bare CN cable, Stock No. 602025
	28 kV, 1/0 AWG solid aluminum, jacketed CN cable, Stock No. 012098
Cooper Power Systems	LE225DD05T
Thomas & Betts (Elastimold)	267LR-DD5230

Stock Number:	**686442**
Description:	**Loadbreak elbow kit**
Application:	27 kV, #8 AWG copper Kerite cable, Stock Number 623650
Cooper Power Systems	LE225AB00TX (quantities under 20)
	LE225AB00T (standard package of 20)

Stock Number:	**686423**
Description:	**loadbreak probe kit,** includes probe, installation tool, silicone lubricant, and instruction sheet
Application:	For replacement of spent loadbreak elbow probes of any make
Cooper Power Systems	PK225
Thomas & Betts (Elastimold)	274LRF

11. References

SCL 6864.00; "Compression Connectors, Bi-Metallic Type, for 200 A Elbows;" Material Standard

SCL 6864.15; "Separable Connector (Elbow), 200A, Deadbreak;" Material Standard

B100-02024; *Cooper Power Systems Components Master Catalog, 5 kV-35 kV Electrical Distribution Systems, Specifiers Guide*; Cooper Power Systems

SCL 9660.04; "Properties of Medium Voltage Cables;" Design Standard

PG-CA-0506; *Elastimold Cable Accessories for 5 kV-35 kV Distribution Systems, Product Selection Guide*; Thomas & Betts (Elastimold)

Shipek, John; SCL Standards Engineer, subject matter expert and originator of SCL *Material Standard* 6864.05 (john.shipek@seattle.gov)

U5-15.05; "Separable Connector (Elbow), 200 A, Loadbreak;" Construction Guideline; SCL

ACCESSORIES, SEPARABLE CONNECTOR (ELBOW), 200 A, 125 kV BIL, LOADBREAK

1. Scope

This material standard covers the requirements for 200 A, 125 kV BIL, loadbreak, separable connector (elbow) accessories, such as multi-way junction boxes (J-boxes), parking bushings, wells, inserts, plugs, caps, threaded studs, and test probes.

The requirements for 200 A, 125 kV BIL, loadbreak, separable connector (elbow) kits are specified in Material Standard 6864.05.

The requirements for 200 A, 125 kV BIL, deadbreak, separable connector (elbow) accessories are specified in Material Standard 6864.17.

This material standard applies to the Seattle City Light Stock Numbers in the table, right.

Stock Number	Description	Page
686452	Insulated cap	3
686555	Multi-way junction (J-Box), five-well	3
686216	Threaded stud	3
686455	Multi-way junction (J-Box), four-bushing	4
686454	Multi-way junction (J-Box), three-bushing	4
686552	Multi-way junction (J-Box), two-bushing	4
686453	Feed-thru parking bushing	4
686449	Bushing insert	5
686450	Insulated parking bushing	5
686451	Grounding parking bushing	5
686443	Test probe	5

2. Application

The cable accessories specified in this standard are intended to be used in conjunction with 200 A, 125 kV BIL, loadbreak separable connector (elbow) kits, Material Standard 6864.05 to construct complete connector systems.

Because of high fault duty, connectors rated 200 A continuous are not appropriate for network systems. Network systems should be constructed with connectors rated 600 A (or 900 A) continuous.

3. Industry Standards

Separable connectors (elbows) shall meet the applicable requirements of the following industry standard:

IEEE 386-2006 – Standard for Separable Insulated Connector Systems for Power Distribution Systems Above 600 V

4. General Requirements

Separable connector (elbow) accessories (except bushing well interfaces) shall have the following electrical ratings and attributes:

voltage class	25 kV
maximum voltage rating (ph-g)	15.2 kV RMS
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	10 kA RMS, symmetrical
IEEE 386 interface	Figure 7

Bushing well interfaces shall have the following electrical ratings and attributes:

voltage class	15, 25, and 35 kV
maximum voltage rating (ph-g)	21.1 kV RMS
BIL	150 kV crest
continuous current rating	200 A RMS
short-time current rating	10 kA RMS, symmetrical
IEEE 386 interface	Figure 3

Brackets and mounting hardware shall be stainless steel or other corrosion-proof alloy. Galvanized parts are not acceptable.

Multi-way junction boxes shall be provided with adjustable angle mounting brackets.

Each cable accessory well shall be provided with a threaded stud.

Grounding parking bushing bases shall be marked red, orange, or yellow.

Grounding parking bushings shall be provided with 5-foot, flexible, 2/0 AWG copper ground leads.

Any accessory that requires permanent grounding shall be equipped with a connector for attaching a #2 AWG, bare, stranded copper grounding conductor.

Insulated caps shall be provided with grounding tab for the purpose of attaching a drain wire lead.

For the purposes of this Material Standard, parking stands designed for use with Elastimold type 151 grounding and insulated parking bushings shall be designated type **151PS**. Parking stands of this design have a nominal horizontal opening of 3/8 inch. Parking stands designed for use with Elastimold type 160 grounding and insulated parking bushings shall be designated type **160PS**. Parking stands of this design have a nominal horizontal opening of 2 inches. IEEE 386 does not differentiate between type 151PS and 160PS parking stands.

Figure 4.0, type 151PS parking stand

Figure 4.1, type 160PS parking stand

5. Testing

Separable connector (elbow) accessories shall be tested according to the requirements of IEEE 386, Section 7.

Test results shall be provided upon request.

6. Design Changes

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

7. Marking

Separable connectors (elbows) shall be marked according to the requirements of IEEE 386, Section 6.1.

8. Packaging

Separable connector (elbow) accessories shall be individually packaged in heavy duty, clear plastic bags or cardboard boxes, as appropriate for their size and weight, to prevent damage and/or contamination during shipping, handling, and storage.

Each individual package shall be marked with the following information:

- Manufacturer's identification
- Product description

8. Packaging, continued

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

- Manufacturer's identification
- Product description
- Quantity contained
- Seattle City Light's Purchase Order Number
- Seattle City Light's Stock Number

9. Issuance

EA

10. Approved Manufacturers

Stock Number:	**686452**
Description:	**Insulated cap** with 5-foot drain wire lead
Application:	An accessory device designed to electrically insulate, electrically shield, and mechanically seal a bushing insert or integral bushing. For 26.4 kV or 5 kV loadbreak, transformer and junction box bushings.
Cooper Power Systems	L PC225CS
Thomas & Betts (Elastimold)	273DRG-5

Stock Number:	**686555**
Description:	**Multi-way junction** (J-Box), five-well, with type 160PS parking stand each end
Application:	An accessory device with five interconnected wells. Center-to-center spacing is four inches. This Stock No. does not include bushing inserts. Order five loadbreak bushing inserts, Stock No. 686449, or five deadbreak bushing inserts, Stock No. 686430, for each five-well, junction box to form a complete unit.
Cooper Power Systems	JBI25C5WSPS
Thomas & Betts (Elastimold)	-

Stock Number:	**686216**
Description:	**Threaded stud,** 1-5/16″ x 3/8″-16
Application:	For replacement purposes if original threaded stud is lost or damaged. Stud is used to connect a loadbreak bushing insert, Stock No. 686449, or deadbreak bushing insert, Stock No. 686430, into a Patton & Cooke or Cooper Power Systems five-well, junction box, Stock No. 686555.
Cooper Power Systems	JBIWELLSTUD
Thomas & Betts (Elastimold)	-

10. Approved Manufacturers, continued

Stock Number:	**686455**
Description:	**Multi-way junction** (J-Box), four-bushing, with type 160PS parking stand each end
Application:	An accessory device with four interconnected bushings. Center-to-center spacing is four inches.

Cooper Power Systems	L J225C4B
Thomas & Betts (Elastimold)	274J4

Stock Number:	**686454**
Description:	**Multi-way junction** (J-Box), three-bushing, with type 160PS parking stand each end
Application:	An accessory device with three interconnected bushings. Center-to-center spacing is four inches.

Cooper Power Systems	L J225C3B
Thomas & Betts (Elastimold)	274J3

Stock Number:	**686552**
Description:	**Multi-way junction** (J-Box), two-bushing, with type 160PS parking stand each end
Application:	An accessory device with two interconnected bushings. Center-to-center spacing is four inches.

Cooper Power Systems	L J225C2B
Thomas & Betts (Elastimold)	274J2

Stock Number:	**686453**
Description:	**Feed-thru parking bushing**
Application:	An accessory device with two electrically interconnected bushing interfaces that can be installed into a type PS160 parking stand.

Cooper Power Systems	L PF225H
Thomas & Betts (Elastimold)	274FT

10. Approved Manufacturers, continued

Stock Number:	**686449**
Description:	**Bushing insert**
Application:	A connector component intended for insertion into a bushing well designed for use with another connector component, such as an elbow.
Cooper Power Systems	L BI225
Thomas & Betts (Elastimold)	2701A4

Stock Number:	**686450**
Description:	**Insulated parking bushing**, type 160PS
Application:	An accessory device designed to electrically insulate, electrically shield, and mechanically seal a power cable terminated with an elbow and to be installed into a type 160PS parking stand.
Cooper Power Systems	ISB225S
Thomas & Betts (Elastimold)	272SOP

Stock Number:	**686451**
Description:	**Grounding parking bushing**, type 160PS, with 5' ground lead, 2/0 AWG copper
Application:	An accessory device designed to electrically ground and mechanically seal a de-energized power cable terminated with an elbow and to be installed into a type 160PS parking stand.
Cooper Power Systems	-
Thomas & Betts (Elastimold)	371GB

Stock Number:	**686443**
Description:	**Test probe**
Application:	An accessory device designed to extend the energized bus contained within a bushing for the purpose of allowing easy attachment of a voltage detector, fault locator, or other test equipment. Test probe is ***not*** rated for grounding.
Cooper Power Systems	2606602A01
Thomas & Betts (Elastimold)	370TR

11. References

6864.05; "Separable Connector (Elbow), 200 A, Loadbreak"; *Material Standards*; SCL

6864.17; "Accessories, Separable Connector (Elbow), 200 A, 125 kV BIL, Deadbreak"; *Material Standards*; SCL

B100-02024; *Components Master Catalog; 5 kV-35 kV Electrical Distribution Systems, Specifiers Guide*; Cooper Power Systems

Components & Protective Equipment UD (Underground Distribution) Manual; Cooper Power Systems; 1993

PG-CA-0506; *Cable Accessories for 5 kV-35 kV Distribution Systems, Product Selection Guide*; Thomas & Betts (Elastimold)

Shipek, John; SCL Standards Supervisor, subject matter expert and originator of 6864.07 (john.shipek@seattle.gov)

SEPARABLE CONNECTOR (ELBOW), 200 A, DEADBREAK

1. Scope

This material standard covers the requirements for 200 A, deadbreak, separable connectors (elbows) kits.

The requirements for 200 A, loadbreak separable connectors (elbows) are specified in Material Standard 6864.05.

This material standard applies to the following Seattle City Light Stock Numbers:

Stock Number	Description
686412	Deadbreak elbow kit for 5 kV, #2 AWG cable
686413	Deadbreak elbow kit for 5 kV, 1/0 AWG cable
686414	Deadbreak elbow kit for 15 kV, 1/0 AWG cable
686416	Deadbreak elbow kit for 28 kV, 1/0 AWG cable
686440	Deadbreak elbow kit for 27 kV, #8 AWG, Kerite cable
686426	Probe contact
012435	Hold down bail assembly, spring loaded, for Cooper Power Systems elbows
012587	Hold down bail assembly, spring loaded, for Elastimold elbows

2. Application

A separable connector (elbow) 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 separable connectors specified in this material standard are intended for use on the following three-phase, 60 Hz systems:

- 26.4 kV, 4-wire, solidly-grounded, wye-connected
- 5 kV and below

Elbow kits, Stock Numbers 686412, 686413, and 686414, are special cases. Little technical information is known about the cables they are to be used with. Elbows and related cables were installed in the Seattle neighborhoods of Laurelhurst, Hillcrest, and/or Edge-O-Town. Kits are spares for emergency replacement.

Because of high fault duty, connectors rated 200 A continuous are not appropriate for network systems. Network systems should be constructed with connectors rated 600 A (or 900 A) continuous.

For cable technical data, refer to E6-1.0/NGE-70.

For cable specific information relating to jacket sealing and metallic shield adapters, refer to U5-16.05.

standards coordinator	*standards supervisor*	*unit director*
John Shipek	John Barnett	Richard Kent

3. Industry Standards

Separable connectors (elbows) shall meet the applicable requirements of the following industry standard:

IEEE 386-2006 – Standard for Separable Insulated Connector Systems for Power Distribution Systems Above 600 V

4. Detailed Requirements

Separable connectors (elbows) shall have the following electrical ratings and attributes:

voltage class	25 kV
maximum voltage rating (ph-g)	15.2 kV RMS
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	10 kA RMS, symmetrical
IEEE 386 interface	Figure 4

Separable connectors (elbows) shall be equipped with a test point with cap.

Each separable connector (elbow) kit shall include:

- Body
- Compression connector (not included with Stock Number 686440)
- Probe contact
- Probe installation tool
- Silicone lubricant
- Spring loaded hold down bail assembly
- Instruction sheet

Separable connector (elbow) kit Stock Number 686412 shall be designed to accommodate cable with XLP insulation with an outside diameter of 0.540 inch.

Separable connector (elbow) kit Stock Number 686413 shall be designed to accommodate cable with XLP insulation with an outside diameter of 0.585 inch.

Separable connector (elbow) kit Stock Number 686414 shall be designed to accommodate cable with XLP insulation with an outside diameter of 0.765 inch.

Compression connectors shall be bi-metallic, with copper top, and meet the requirements of 6864.00.

Separable connector (elbow) shall be designed for a cable insulation shield cutback length of 6-7/8 in. measured from the end of the installed compression connector.

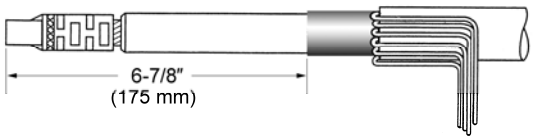


Figure 4, Cutback Length

Spring loaded hold down bail assemblies shall be stainless steel.

5. Testing

Separable connectors (elbows) shall be tested according to the requirements of IEEE 386, Section 7.

Test results shall be provided upon request.

6. Design Changes

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

7. Marking

Separable connectors (elbows) shall be marked according to the requirements of IEEE 386, Section 6.1.

8. Packaging

Separable connectors (elbows) shall be individually packaged in heavy duty, clear plastic bags or cardboard boxes.

Each individual package shall constitute a kit that includes all of the parts cited in Section 4 of this material standard.

Each individual package shall be marked with the manufacturer's identification and product description.

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

- Manufacturer's identification
- Product description
- Quantity contained
- Seattle City Light's Purchase Order Number
- Seattle City Light's Stock Number

9. Issuance

EA

10. Approved Manufacturers

Stock Number:	**686412**
Description:	**Deadbreak elbow kit**
Application:	5 kV, #2 AWG cable, Stock Number none, Seattle neighborhoods of Laurelhurst, Hillcrest, and/or Edge-O-Town
Cooper Power Systems	DE225BA04TSP
Thomas & Betts (Elastimold)	156LR-EB5220-CS624

Stock Number:	**686413**
Description:	**Deadbreak elbow kit**
Application:	5 kV, 1/0 AWG cable, Stock Number none, Seattle neighborhoods of Laurelhurst, Hillcrest, and/or Edge-O-Town
Cooper Power Systems	DE225BA06TSP
Thomas & Betts (Elastimold)	156LR-FA5240-CS624

Stock Number:	**686414**
Description:	**Deadbreak elbow kit**
Application:	15 kV, 1/0 AWG cable, Stock Number none, Seattle neighborhoods of Laurelhurst, Hillcrest, and/or Edge-O-Town
Cooper Power Systems	DE225DA06TSP
Thomas & Betts (Elastimold)	156LR-F5240-CS624

Stock Number:	**686416**
Description:	**Deadbreak elbow kit**
Application:	28 kV, 1/0 AWG solid aluminum, bare CN cable, Stock Number 602025
	28 kV, 1/0 AWG solid aluminum, jacketed CN cable, Stock Number 012098
Cooper Power Systems	DE225HA05TSP
Thomas & Betts (Elastimold)	156LR-H5230-CS624

Stock Number:	**686440**
Description:	**Deadbreak elbow kit** (does not include compression connector)
Application:	27 kV, #8 AWG copper Kerite cable, Stock Number 623650
Cooper Power Systems	DE225DA00TSP
Thomas & Betts (Elastimold)	156LR-F-CS624

10. Approved Manufacturers, continued

Stock Number:	**686426**
Description:	**Probe contact**
Application:	replacement
Cooper Power Systems	2638370C01EX
Thomas & Betts (Elastimold)	156LR-F

Stock Number:	**012435**
Description:	**Hold down bail assembly**, spring loaded, for Cooper Power Systems elbows
Application:	replacement
Cooper Power Systems	2690322D02

Stock Number:	**012587**
Description:	**Hold down bail assembly**, spring loaded, for Elastimold elbows
Application:	replacement
Thomas & Betts (Elastimold)	158BA

11. References

6864.00; “Compression Connectors, Bi-Metallic Type for 200 A Elbows”; *Material Standards*; SCL

6864.05; “Separable Connector (Elbow), 200 A, Loadbreak”; *Material Standards*; SCL

B100-02024; *Components Master Catalog; 5 kV-35 kV Electrical Distribution Systems, Specifiers Guide*; Cooper Power Systems

E6-1.0/NGE-70; “Properties of Medium Voltage Cables”; *Construction Guideline*; SCL

PG-CA-0506; *Cable Accessories for 5 kV-35 kV Distribution Systems, Product Selection Guide*; Elastimold

U5-16.05; “Separable Connector (Elbow), 200 A, Deadbreak”; *Construction Guideline*; SCL

Shipek, John; SCL Standards Engineer, subject matter expert and originator of 6864.15 (john.shipek@seattle.gov)

ACCESSORIES, SEPARABLE CONNECTOR (ELBOW), 200 A, 125 kV BIL, DEADBREAK

1. Scope

This standard covers the requirements for 200 A, 125 kV BIL, deadbreak, separable connector (elbow) accessories, such as multi-way junction boxes (J-boxes), parking bushings, wells, inserts, plugs, caps, and special purpose hold down bails.

The requirements for 200 A, 125 kV BIL, deadbreak, separable connector (elbow) kits, which include spring-loaded hold down bails, are specified in SCL 6864.15.

The requirements for 200 A, 125 kV BIL, loadbreak, separable connector (elbow) accessories are specified in SCL 6864.07.

This standard applies to the Seattle City Light Stock Numbers, right:

2. Application

The cable accessories specified in this standard are intended to be used in conjunction with 200 A, 125 kV BIL, deadbreak separable connector (elbow) kits, SCL 6864.15 to construct complete connector systems.

Because of high fault duty, connectors rated 200 A continuous are not appropriate for network systems. Network systems should be constructed with connectors rated 600 A (or 900 A) continuous.

Standards Coordinator
Kathy Tilley

Standards Supervisor
John Shipek

Unit Director
Darnell Cola

3. Industry Standards

Separable connectors (elbows) shall meet the applicable requirements of the following industry standard:

IEEE 386-2006 – Standard for Separable Insulated Connector Systems for Power Distribution Systems Above 600 V

4. General Requirements

Separable connector (elbow) accessories (except bushing well interfaces) shall have the following electrical ratings and attributes:

voltage class	25 kV
maximum voltage rating (ph-g)	15.2 kV RMS
BIL	125 kV crest
continuous current rating	200 A RMS
short-time current rating	10 kA RMS, symmetrical
IEEE 386 interface	Figure 4

Bushing well interfaces shall have the following electrical ratings and attributes:

voltage class	15, 25, and 35 kV
maximum voltage rating (ph-g)	21.1 kV RMS
BIL	150 kV crest
continuous current rating	200 A RMS
short-time current rating	10 kA RMS, symmetrical
IEEE 386 interface	Figure 3

Hold down bails for separable connector (elbow) accessories shall be provided separately, unless stated otherwise.

Brackets and mounting hardware shall be stainless steel or other corrosion-proof alloy. Galvanized parts are not acceptable.

Multi-way junction boxes shall be provided with adjustable angle mounting brackets.

Grounding parking bushing bases shall be marked red, orange, or yellow.

Grounding parking bushings and grounding elbows shall be provided with 5-foot, flexible, covered, 2/0 AWG copper ground leads.

Any accessory that requires permanent grounding shall be equipped with a connector for attaching a #2 AWG, bare, stranded copper grounding conductor.

Insulated caps shall be provided with grounding tab for the purpose of attaching a drain wire lead.

For the purposes of this standard, parking stands designed for use with Elastimold type 151 grounding and insulated parking bushings shall be designated type **151PS**. Parking stands of this design have a nominal horizontal opening of 3/8 inch. Parking stands designed for use with Elastimold type 160 grounding and insulated parking bushings shall be designated type **160PS**. Parking stands of this design have a nominal horizontal opening of 2 inches. IEEE 386 does not differentiate between type 151PS and 160PS parking stands.

Figure 4.0, type 151PS parking stand

Figure 4.1, type 160PS parking stand

5. Testing

Separable connector (elbow) accessories shall be tested according to the requirements of IEEE 386, Section 7.

Test results shall be provided upon request.

6. Design Changes

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

7. Marking

Separable connectors (elbows) shall be marked according to the requirements of IEEE 386, Section 6.1.

8. Packaging

Separable connector (elbow) accessories shall be individually packaged in heavy duty, clear plastic bags or cardboard boxes, as appropriate for their size and weight, to prevent damage and/or contamination during shipping, handling, and storage.

Each individual package shall be marked with the following information:

- Manufacturer's identification
- Product description

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

- Manufacturer's identification
- Product description
- Quantity contained
- Seattle City Light's Purchase Order Number
- Seattle City Light's Stock Number

9. Issuance

EA

10. Approved Manufacturers

Stock Number:	**686411**
Description:	**Insulated cap**
Application:	An accessory device designed to electrically insulate, electrically shield, and mechanically seal a bushing insert or integral bushing. For 26.4 kV or 5 kV deadbreak, transformer and junction box bushings.
Cooper Power Systems	DRC250
Thomas & Betts (Elastimold)	K150DR


Cooper


Elastimold

Stock Number:	**686469**
Description:	**Shipping cap**
Application:	Replacement shipping cap for instances when original cap is lost. Shipping caps are used to keep the mating surface of the elbow clean during shipping, storage, and handling prior to installation. It has no dielectric properties and is not to be used on energized systems.
Cooper Power Systems	-
Thomas & Betts (Elastimold)	180PPC

10. Approved Manufacturers, continued

Stock Number:	**686732**
Description:	**Multi-way junction** (J-Box), three-bushing, with type 160PS parking stand each end
Application:	An accessory device with three interconnected bushings. Center-to-center spacing is four inches.
Cooper Power Systems	-
Thomas & Betts (Elastimold)	K1501-J3U-8

Stock Number:	**686730**
Description:	**Multi-way junction** (J-Box), four-bushing, with type 160PS parking stand each end
Application:	An accessory device with four interconnected bushings. Center-to-center spacing is four inches.
Cooper Power Systems	-
Thomas & Betts (Elastimold)	K1501-J4U-8

Stock Number:	**686420**
Description:	**T-Splice**
Application:	A receptacle connector component for connecting a power cable to two in-line bushing interfaces, so designed that the axes of the cable and bushing interfaces are perpendicular. Hold down bails are required, but not included.
Cooper Power Systems	DJ250-T1
Thomas & Betts (Elastimold)	K150T

Stock Number:	**686432**
Description:	**Grounding parking bushing**, type 151PS
Application:	An accessory device designed to electrically ground and mechanically seal a de-energized power cable terminated with an elbow and to be installed into a type 151PS parking stand.
Cooper Power Systems	DPE250 w/ground lead
Thomas & Betts (Elastimold)	151GP

10. Approved Manufacturers, continued

Stock Number:	**686463**
Description:	**Grounding parking bushing**, type 160PS
Application:	An accessory device designed to electrically ground and mechanically seal a de-energized power cable terminated with an elbow and to be installed into a type 160PS parking stand.
Cooper Power Systems	-
Thomas & Betts (Elastimold)	152-GP

Stock Number:	**686458**
Description:	**Insulated parking bushing**, type 151PS
Application:	An accessory device designed to electrically insulate, electrically shield, and mechanically seal a power cable terminated with an elbow and to be installed into a type 151PS parking stand.
Cooper Power Systems	DPS250
Thomas & Betts (Elastimold)	K151SOP

Stock Number:	**686456**
Description:	**Insulated plug**
Application:	An accessory device designed to electrically insulate, electrically shield, and mechanically seal an elbow interface.
Cooper Power Systems	-
Thomas & Betts (Elastimold)	K150DP

Stock Number:	**686433**
Description:	**Bushing well**, 4-hole clamp ring, gasket to be field fabricated
Application:	An apparatus bushing having a cavity for insertion of connector component, such as a bushing insert.
Cooper Power Systems	-
Elliot	1101-E200-25A with 1901CR4S clamp ring
Thomas & Betts (Elastimold)	-

10. Approved Manufacturers, continued

Stock Number:	**686434**
Description:	**Bushing well**, 9-1/2-inch shank
Application:	An apparatus bushing having a cavity for insertion of connector component, such as a bushing insert.
Cooper Power Systems	-
Thomas & Betts (Elastimold)	K1601-PC-T1-R


686434

Stock Number:	**686435**
Description:	**Bushing well**, 10-1/2-inch shank, 3/8-inch stud
Application:	An apparatus bushing having a cavity for insertion of connector component, such as a bushing insert. Bushing well designed to fit in 2.31 inch hole.
Coltec	702131-52
Cooper Power Systems	-
Thomas & Betts (Elastimold)	-


686435

Stock Number:	**686437**
Description:	**Bushing well**, 15-inch shank
Application:	An apparatus bushing having a cavity for insertion of connector component, such as a bushing insert.
Cooper Power Systems	-
Thomas & Betts (Elastimold)	K1601-PC-L15

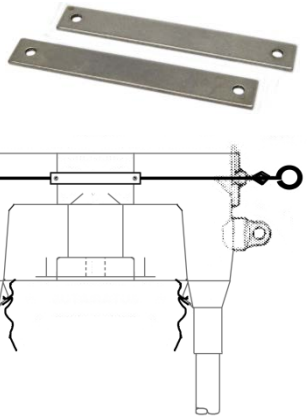

686437

Stock Number:	**686430**
Description:	**Bushing insert**
Application:	A connector component intended for insertion into a bushing well designed for use with another connector component, such as an elbow.
Cooper Power Systems	-
Thomas & Betts (Elastimold)	K1501A1

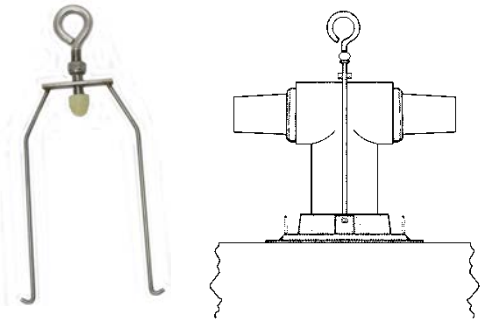
Stock Number:	**686726**
Description:	**Feed-thru bushing insert**
Application:	An accessory device with two electrically interconnected bushing interfaces that can be installed into a bushing well.
Cooper Power Systems	-
Thomas & Betts (Elastimold)	K1502A1

10. Approved Manufacturers, continued

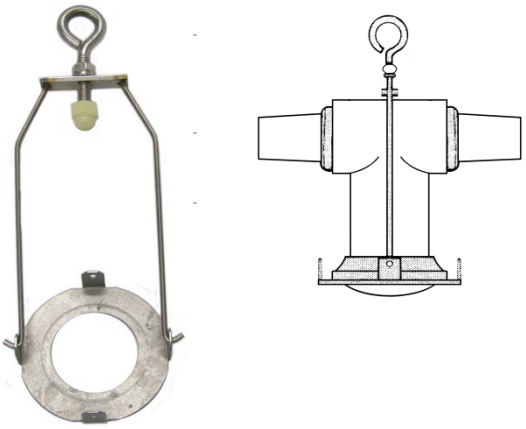
Stock Number:	**686551**
Description:	**Bailing assembly connectors**, special purpose, dual elbow hold down assembly
Application:	Hold down two elbows on inline junction and/or "T" connector. To be used in conjunction with hold down bails provided with elbows.
Cooper Power Systems	-
Thomas & Betts (Elastimold)	150TB3



Stock Number:	**686560**
Description:	**Bail**, special purpose, "T" connector hold down assembly
Application:	Hold down "T" connector to apparatus
Cooper Power Systems	-
Thomas & Betts (Elastimold)	150TB1



Stock Number:	**686561**
Description:	**Bail**, special purpose, deadend plug hold down assembly
Application:	Hold down deadend plug inside "T" connector
Cooper Power Systems	-
Thomas & Betts (Elastimold)	150TB2



10. Approved Manufacturers, continued

Stock Number:	**686562**
Description:	**Bail**, special purpose, elbow hold down assembly
Application:	Hold down deadbreak elbow on J-box or transformer bushing.
Cooper Power Systems	-
Thomas & Betts (Elastimold)	150BA (2)
Wilcor	DPFM-1

Stock Number:	**686563**
Description:	**Bail**, special purpose, insulating cap hold down assembly
Application:	Hold down insulating cap, Stock Number 686411.
Cooper Power Systems	-
INWESCO	82A59
Thomas & Betts (Elastimold)	-

11. References

SCL Material Standard 6864.15; “Separable Connector (Elbow), 200 A, Deadbreak”

SCL Material Standard 6864.07; “Accessories, Separable Connector (Elbow), 200 A, 125 kV BIL, Loadbreak”

12. Sources

B100-02024; *Components Master Catalog; 5 kV-35 kV Electrical Distribution Systems, Specifiers Guide*; Cooper Power Systems

Components & Protective Equipment UD (Underground Distribution) Manual; Cooper Power Systems; 1993

PG-CA-0506; *Cable Accessories for 5 kV-35 kV Distribution Systems, Product Selection Guide*; Thomas & Betts (Elastimold)

Shipek, John; SCL Standards Engineer, subject matter expert and originator of 6864.17 (john.shipek@seattle.gov)

TERMINATORS – HIGH VOLTAGE CABLES

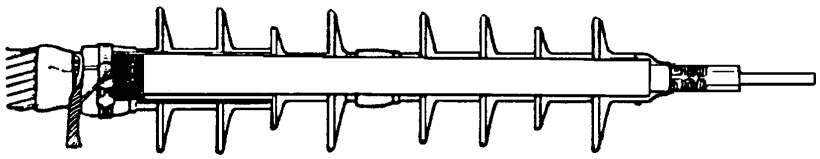


Figure 1. Cold Shrink

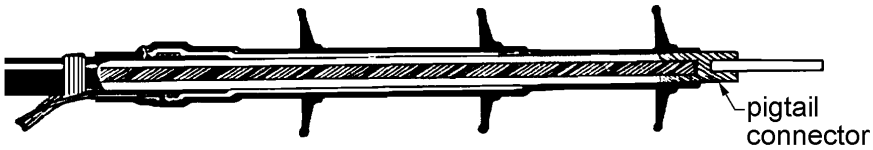


Figure 2. Heat Shrink

1. Scope

This specification is for outdoor isolated phase cable terminations to be used on single or multi-phase circuits of a 26.4 kV or 34.5 kV solid grounded neutral system.

2. Construction

2.1 The terminators shall be made of irradiated ethylene-propylene diene monomer (EPDM) formulated to resist severe atmospheric contamination without tracking and to withstand thermal, ultraviolet, and oxidation decomposition under electrical stress. The insulation shall comply with the ASTM D2303 (latest revision) test for liquid contaminant, inclined plane tracking, and erosion of insulating materials. Silicone rubber will be accepted for the weather shedding materials. Creepage distance shall be 24" minimum.

2.2 Cold Shrink Terminators (Figure 1) shall be a one-piece, EPDM relief tube inside a silicone skirted insulator that is a non-force fit.

2.3 Heat Shrink Terminators (Figure 2) shall have a coating of meltable adhesive or meltable tape on the inner wall, which on the application of heat, shall adhere to the cable jacket forming a watertight seal. The weather shedding skirts shall be heat-shrink non-force fit.

3. Specifications

All terminators shall meet the requirements of the latest revision of IEEE 48 for Class I terminations. Voltage rating and BIL shall be as shown on page 2 of this material standard.

4. Packaging

The terminator shall be packaged complete in self-contained kits including all material required for a single cable termination including skirts (modules), caps, and ground clamps.

5. Instructions

Each terminator package shall contain complete, current instructions for installation of all materials required for a single cable termination and any accessories. If the package contains three terminations, three sets of instructions shall be included.

standards coordinator	*standards supervisor*	*unit director*
John Shipek	John Shipek	Darnell Cola

6. Details and Approved Manufacturers

6.1 Cold Shrink Terminators

Refer to SCL Construction Guideline U5-26.20 for selecting appropriate Stock No. for a given cable size.

Fig.	Stock No.	Stock Unit	Voltage, kV	BIL, kV	Insulation OD Range, in.	Approved Manufacturer **3M**
1	686531	EA	35	200	0.64 – 0.90	7663 - S - HSG - 8
1	686532	EA	35	200	0.83 – 1.53	7664 - S - 8
1	012125	EA	35	200	1.05 - 1.80	7665 - S - HSG - 8
1	686534	KT	35	200	1.10 - 1.65	5697K*
1	012126	EA	35	200	1.53 - 2.32	7666 - S - HSG - 8

6.2 Heat Shrink Terminators

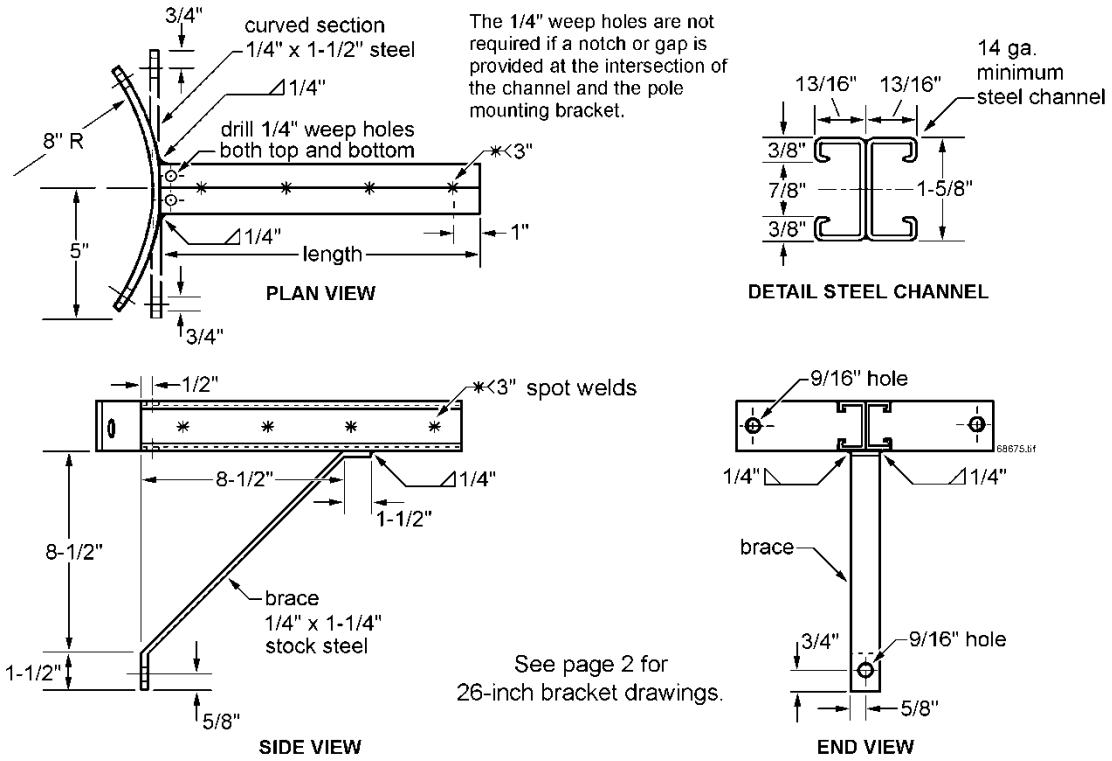
Fig.	Stock No.	Stock Unit	Voltage, kV	BIL, kV	Nominal Range	Insulation OD Range, in.	Approved Manufacturer Raychem	City Light Cable Size	Pigtail Connector Stock No.
2	686521♥	EA	5	95	300 - 500	0.80 - 1.25	HVT - Z - 82 - SG	350	650578
2	686522♥	EA	15	110	400 - 1000	1.10 - 1.65	HVT - Z - 153 - SG	400 - 1000	na
2	686526♥	EA	25	150	#2 - 400	0.85 - 1.40	HVT - Z - 252/352 - SJ	#1 - 1/0 URD	686056
2	686527♥	EA	25	150	350 - 1000	1.25 - 1.80	HVT - Z - 253/353 - SJ	350 URD	650578
2	686528♥	EA	25	150	300 - 750	1.10 - 1.70	HVT - Z - 253/353 - SG	350	650578
								500	650579
								750	686075
2	686536♥	EA	35	200	750 - 1750	1.60 - 2.45	HVT - Z - 254/354 - SG	750 CR	686075
2	686538§	EA	46	250	1000 - 1500	1.97 - 2.56	EHVT - 464 - SG	1000 CR	677110

* The unit of issue and the standard package is the "kit". Each "kit" includes three terminations. All other items on this page are issued in quantities of one each (EA).

♥ Pigtail connector not included. See Seattle City Light Material Standard 6772.00 for pigtail connectors.

§ Two bolt paddle not included. Shown on Seattle City Light Material Standard 6770.70.

Bracket, For Pole Riser Conduit



See page 2 for
26-inch bracket drawings.

Figure 1. Conduit bracket (not to scale)

1. Scope

Conduit Bracket shall be of the configuration and dimensions shown, free of rough or uneven surfaces and edges.

This standard applies to the following Seattle City Light Stock Numbers:

Without Brace		With Brace	
Stock No.	Length, in	Stock No.	Length, in
686784	10-1/2	686792	10-1/2
686786	12-1/2	686794	12-1/2
686790	18	686796	18
		012330	26

2. Industry Standards

ASTM A109, Steel, Strip, Carbon (0.25 Maximum Percent), Cold-Rolled, latest revisions

ASTM A123, Zinc (Hot-Dip Galvanized) Coatings on Iron and Steel Products, latest revisions

3. Galvanizing

The bracket shall be galvanized, after fabrication, in accordance with ASTM A123.

4. Material

The bracket shall be made of cold-rolled steel strip in accordance with ASTM A109. The channel shall be Power Strut PS-501, Unistrut P-4101, Super Strut B1402, Speed Strut 800-2, or equal.

5. Packaging

Brackets shall be packaged in boxes that will fit on a standard wood pallet. Boxes shall be suitable for inside storage. Individual boxes shall not exceed 500 pounds in weight.

6. Issuance

Stock Unit: EA

7. Approved Manufacturers

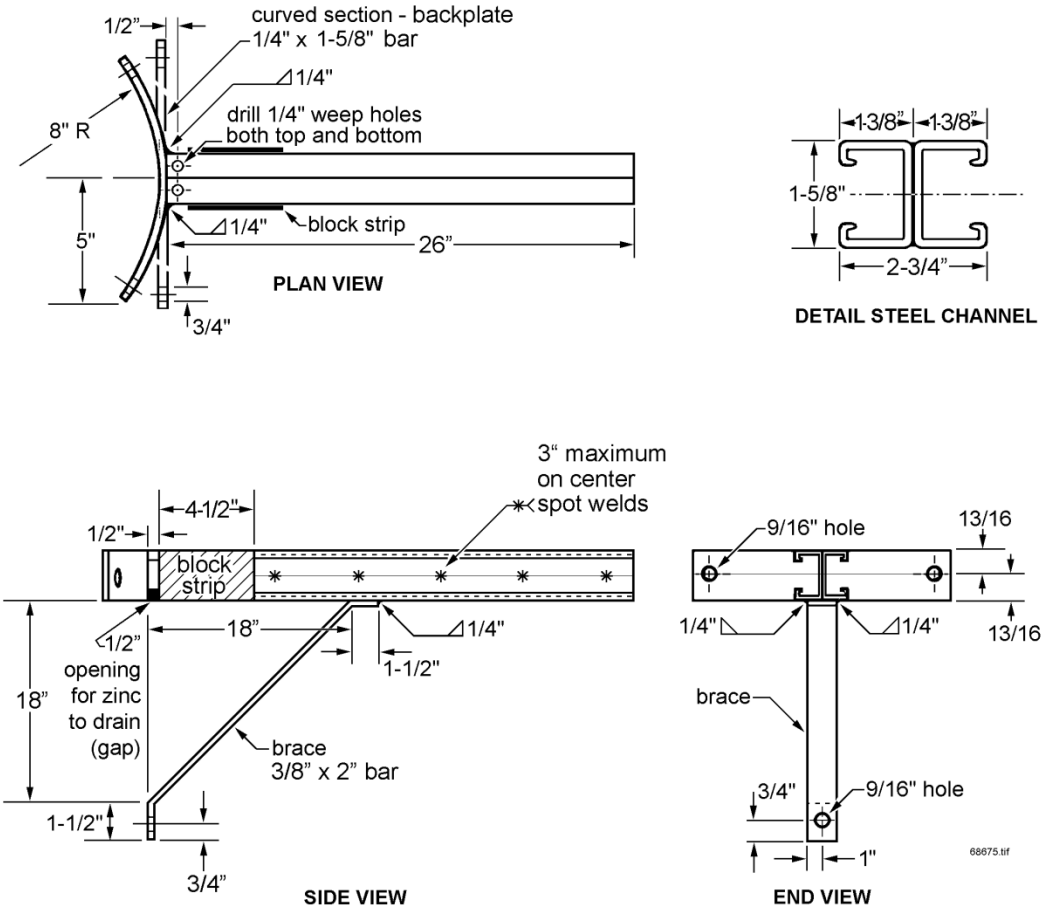
Bracket Without Brace

Stock Number	Length, in.	Morfab Co.	Wesanco	Wilcor
686784	10-1/2	105SOSMC-WH	W-1012-10.5 WH	WA10SB
686786	12-1/2	125SOSMC-WH	W-1012-12.5 WH	WA12SB
686790	18	18SOSMC-WH	W-1012-18 WH	WA18SB

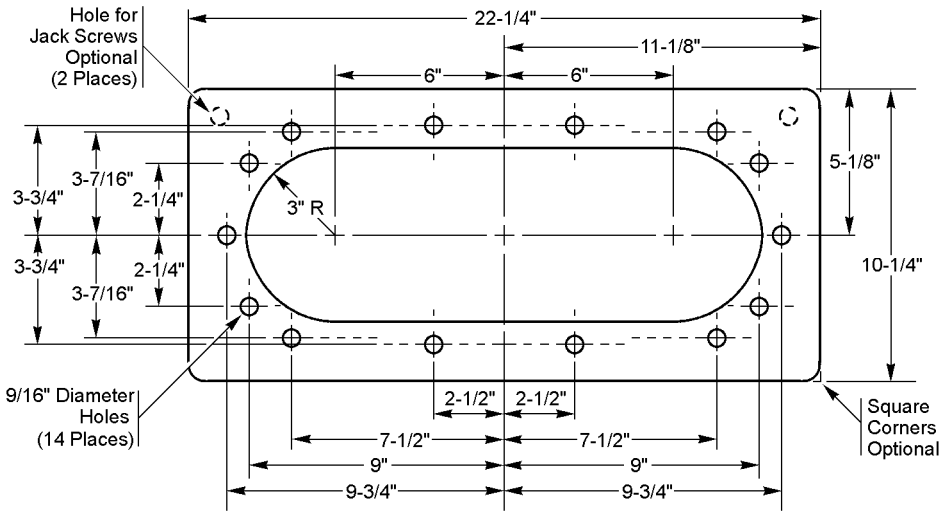
Bracket With Brace

Stock Number	Length, in.	Morfab Co.	Wesanco	Wilcor
686792	10-1/2	105SOSMCB	W-1013-10.5 WH	WA10SB-S
686794	12-1/2	125SOSMCB	W-1013-12.5 WH	WA12SB-S
686796	18	18SOSMCB	W-1013-18 WH	WA18SB-S
012330	26	–	WSF 101663 WHHD	WA26SBS-SCL

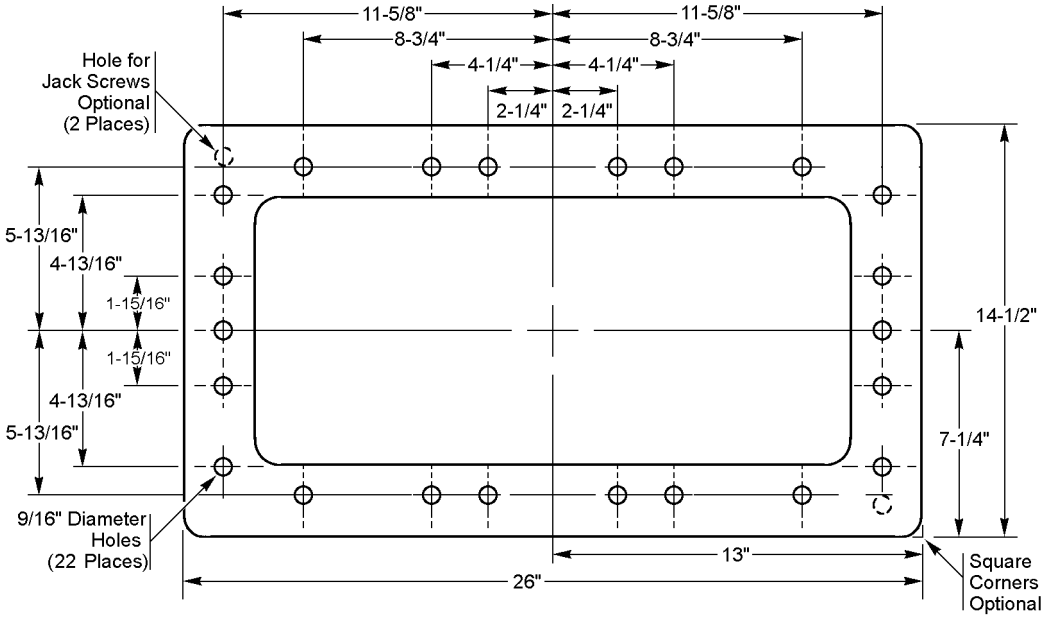
Figure 2. 26-in Bracket With Brace (not to scale)



GASKET, TRANSFORMER TO NETWORK PROTECTOR



Gasket for 800 through 1875 AMP Protectors Stock No. 686798



Gasket for 2500 through 3500 AMP Protectors Stock No. 686799

Stock Unit: EA

Stock Number	Fits
686798	800-1875 AMP Protectors
686799	2500-3500 AMP Protectors

Material 1/4 inch cork and synthetic (Buna N) rubber per ASTM D 1170, Type 2, ID P2245A.

City Light Stock No.: 727714

Material Standard: 7276.9

ORIGINATOR	STANDARDS COORDINATOR	STANDARDS SUPERVISOR	UNIT DIRECTOR
Jim S. Horn	Charles L. Shaffer	John C. Skinner	Harold Jay

SPLICES
15-kV Through 69-kV, HEAT SHRINKABLE

This specification covers four items: (1) Splices to be used to join 28 kV or 35 kV solid dielectric power cables. (2) Splices to be used to join 15 kV or 28 kV solid dielectric to PILC power cables in a transition joint. (3) Three and four way "wye" splices. (4) Live end seals for 15 kV solid dielectric power cables. All items shall meet or exceed the requirements of the latest revision of ANSI/IEEE Standard 404, except as modified herein.

For 15 kV, straight, heat shrink splices for solid dielectric cable, refer to Construction Standard 0535.11.

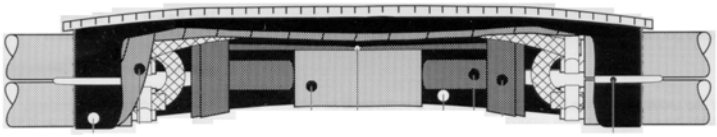
Transition splices shall withstand 15 psi or more of continuous internal operating oil pressure under load.

All splices shall have a 25-year minimum shelf life under normal storage conditions.

Manufacturers shall submit electrical data and test data and supply two samples for utility testing, evaluation, and approval before being listed as an approved manufacturer.

Grounding kits and/or connectors listed on Page 2 shall be supplied with splicing kits.

HEATSHRINK, 3 OR 4 WAY WYE SPLICE
15 kV, 110 kV BIL



Stock No.	Item	Main Cable Range	Tap Cable Range	Main Dia. Min-Max, In.	Tap Dia. Min-Max, In.	BIL kV	Raychem Cat. No.
687540	Splice	#2 to 350✣	#2 to 350✣	0.65 to 1.05	0.65 to 1.05	110	HVSY-1522S-SCL
687545	❖4 way Mod. kit	#2 to 350✣	#2 to 350✣	0.65 to 1.05	0.65 to 1.05	110	HVSH-1522-MOD
687541	Splice	250 – 750	#2 – 750	0.95 to 1.45	0.65 to 1.45	110	HVSY-1523S-SCL
687546	❖4 way Mod. kit	250 – 750	#2 – 750	0.95 to 1.45	0.65 to 1.45	110	HVSH-1523-MOD
011909	Splice	750 – 1000	#1 – 250	1.05 to 1.70	0.65 to 1.05	110	HVSY-1524S-SCL

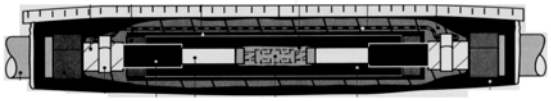
❖ Modification Kits are used when making a 4-way splice.
✣ The diameter over the insulation must be less than 1.05".

SHIM KITS for 3 or 4 Way Wye Splices and Straight Splices

Stock No.	Item	Raychem Cat. No.
687551	Shim Kit	HVS-SHIM-1
687553	Shim Kit	HVS-SHIM-3
687554	Shim Kit	HVS-SHIM-4

standards coordinator	*standards manager*	*unit director*
John Shipek	John Shipek	Pamela S. Johnson

SPLICES, 15-kV Through 69-kV, HEAT SHRINKABLE



Stock No.	Item	kV	Bil	Connector	Cable Insulation Diameter		City Light Cable Range	Mfr's Labeled Cable Range	Approved Mfr. Raychem Catalog No.
					Min.	Max.			
686611	Live End Seal, 1/C XLP	15	110	None	0.65	1.05	#1-3/0 XLP	#4-4/0	HVES-1521D
686612	Live End Seal, 1/C XLP	15	110	None	0.90	1.30	350 to 500 kcmil XLP	250-350	HVES-1522D
686613	Live End Seal, 1/C XLP	15	110	None	1.10	1.60	750 kcmil XLP	500-750	HVES-1523D
686616	Live End Seal, 3/C PILC	15	110	None	0.60	1.00	#4 to 3/0 PILC	#4-4/0	HVES-3-1591
687130	Splice, Transition, 3/C PILC to 3-1/C XLP	15	110	None	0.65 XLP 0.60 PILC	1.05 XLP 1.00 PILC	#1-3/0 XLP to #4-3/0 PILC	#4-4/0	HVS-T-1581S w/ HVS-EG-1
687132	Splice, Transition, 3/C PILC to 3-1/C XLP	15	110	None	0.90 XLP 0.85 PILC	1.30 XLP 1.10 PILC	350 kcmil XLP to #3/0-300 kcmil PILC	250-350	HVS-T-1582S w/ HVS-EG-1
687134	Splice, Transition, 3/C PILC to 3-1/C XLP	15	110	None	1.10 XLP 1.05 PILC	1.60 XLP 1.50 PILC	500 kcmil XLP to 500 kcmil PILC	500-750	HVS-T-1583S w/ HVS-EG-2
687136	Splice, Transition, 3/C PILC to 3-1/C XLP	25	150	Homac SAC 4/0R2	0.90 XLP 0.85 PILC	1.25 XLP 1.20 PILC	#1-1/0 XLP to #1-4/0 PILC	#1-250	HVS-T-2582E w/ HVS-EG-1
687138	Splice, Transition, 3/C PILC to 3-1/C XLP	25	150	Homac SAC 350R4/0	0.90 XLP 0.85 PILC	1.25 XLP 1.20 PILC	350 kcmil XLP to #4/0 PILC	#1-250	HVS-T-2582E w/ HVS-EG-2
687140	Splice, Transition, 3/C PILC to 3-1/C XLP	25	150	Homac SAC 500R350	1.15 XLP 1.15 PILC	1.50 XLP 1.40 PILC	350 kcmil XLP to 500 kcmil PILC	350-500	HVS-T-2583E w/ HVS-EG-2
687506	Splice, Repair, Extra long, 1/C XLP	25	150	None	0.90	1.20	#1-1/0 2/C XLP	#1-250	HVS-2511E-R
687507	Splice, 1/C XLP	25	150	None	0.90	1.20	#1-1/0 2/C XLP	#1-250	HVS-2511E
687508	Splice, 1/C XLP	25	150	None	1.20	1.50	350 kcmil 2/C XLP	350-500	HVS-2512E
687510	Splice, 1/C XLP, Cu Tape	25	150	None	0.90	1.20	#1 XLP	#1-250	HVS-2521S w/ HVS-EG-1
687514	Splice, 1/C XLP, Cu Shielded	25	150	None	1.20	1.50	350-500 kcmil XLP▼	350-500	HVS-2522S w/ HVS-EG-2
687516	Splice, 1/C XLP, Cu Shielded	25	150	None	1.50	1.80	750-1000 kcmil XLP	750-1000	HVS-2523S w/ HVS-EG-2
687520	Splice, 1/C XLP, Cu Shielded	69	250	Raychem EPPA047-27/52-130	1.69	2.13	1000 kcmil XLP 35 kV (420 mil)	1000	❖EHVS-6921W-C17

▼ Also for Sumitomo 750 kcmil compact sector 15 kV cable.

❖ For Salmon Bay steel 1000 kcmil 35 kV cables in South Sub. Raychem catalog No. EHVS-7221-C17 is the same splice as that listed above and is OK to use.

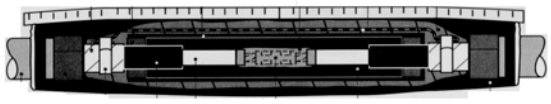
SPLICES
15 kV THROUGH 25 kV, COLD SHRINK

This specification covers cold shrink splices to be used to join 15 kV or 28 kV solid dielectric power cables.

All splices shall meet or exceed the requirements of the latest revision of ANSI/IEEE Standard 404, except as modified herein.

All splices shall have a 3-year minimum shelf life under normal storage conditions.

Splices shall be provided without connector.



Stock No.	kV	BIL	Cable Insulation Diameter in inches	City Light Cable Size & Type	3M Catalog No.
012131	25	150	1.11 to 1.64	350 & 500 28 kV flat strap or drain wire	5525A
012132	25	150	1.69 to 2.13	750 & 1000 28 kV flat strap or drain wire	5526A

ORIGINATOR	STANDARDS COORDINATOR	STANDARDS SUPERVISOR	UNIT DIRECTOR
Jim S. Horn	Charles L. Shaffer	John C. Skinner	Harold Jug

Heat Shrink Splices, Straight, 110 kV BIL, Tyco

1. Scope

This standard covers the requirements for Tyco, 110 kV BIL, straight, heat shrink cable splices. Cable splices are also known as cable joints.

This Material Standard applies to the Seattle City Light Stock Numbers shown below:

Stock Number	City Light Application, AWG/kcmil
013055	#1 - 2/0
013056	350 - 500
013057	750 - 1000

2. Application

Heat shrink splices are used to permanently join two like- sized conductors, TRXLPE or EPR insulated, tape or flat strap shielded, medium voltage cable ends.

The current and temperature rating of a properly installed heat shrink splice is equal to or greater than that of the cable for which it is designed.

The heat shrink splices specified in this material standard are intended for use on Seattle City Light's 13.8 kV, 3-wire, delta network system, where load consists of network type transformers with delta connected primary and grounded wye connected secondary.

Heat shrink type joints consist of one or more expanded polymeric extruded tubes or molded parts that undergo thermally activated recovery when heated to an appropriate temperature.

Heat shrink kits contain everything that is needed to make up a splice, except the connector.

For cable-specific application information, refer to Construction Standard 0535.11 - Heat Shrink Splice, Straight, 110 kV BIL

The industry-popular Raychem Corporation was purchased by Tyco Electronics in 1999; in some circles, heat shrink splices are still referred to as Raychems.

3. Industry Standards

Heat shrink splices shall meet the requirements of the following industry standard:

IEEE 404-2006 - Standard for Extruded and Laminated Dielectric Shielded Cable Joints Rated 2500 V to 500 000 V

4. Detailed Requirements

Heat shrink splices described in this Standard shall have the following electrical ratings and attributes:

Voltage class	15 kV
Maximum voltage rating (ph-g), grounded systems	8.7 kV rms
Maximum voltage rating (ph-ph)	15 kV rms
Basic impulse insulation level, BIL	110 kV crest
Withstand voltage, 15 minute	75 kV DC
Withstand fault current, 100 cycles	10 kA rms

Specific heat shrink splices shall be designed for use with the cables described in Table 4.

Table 4, Splice to Cable Cross Reference

Stock Number	Conductor Size, AWG/kcmil	Insulation overall dia, range, in	Jacket overall dia, max, in
013055	#2 - 2/0	0.65 - 0.95	1.20
013056	3/0 - 400	0.85 - 1.30	1.65
013057	500 - 750	1.10 - 1.55	1.90

Each heat shrink splice kit shall include (quantities of some components may vary with kit size):

4 - Strips adhesive-backed copper tape
1 - Red/black triple layer tube
1 - SRM-stress relief mastic
4 - Red sealant strips
2 - Ground braid with solder block
4 - Spring clamps
2 - Rolls shielding mesh
1 - Black/green wraparound sleeve
2 - Stainless steel channels
1 - Stainless steel retention clip
1 - Set installation instructions

Figure 4, Heat Shrink Splice Kit Contents:

5. Testing

Heat shrink splices shall be tested according to the requirements of IEEE 404, Section 7.

Test results shall be provided upon request.

6. Design Changes

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

7. Marking

Heat shrink splices shall be marked according to the requirements of IEEE 404, Section 6.1. This shall include but not be limited to:

- Company name or logo
- Part identification
- Date of manufacture (month and year)

8. Packaging

Heat shrink splices shall be individually packaged to prevent damage during shipping, handling, and storage.

Each individual package shall constitute a kit that includes all of the parts cited in Section 4 of this material standard.

Individual packages shall be legibly marked with:

- Manufacturer's name
- Manufacturer's catalog number
- Product description
- Seattle City Light's Stock Number

Shipping containers shall be legibly marked with:

- Seattle City Light's Purchase Order Number
- Seattle City Light's Stock Number

9. Issuance

Stock unit: EA

10. Approved Manufacturers

Stock Number	City Light Application, AWG/kcmil	Tyco Electronics Energy Division
013055	#1 - 2/0	HVS-C-1531S-SCL
013056	350 - 500	HVS-C-1532S-SCL
013057	750 - 1000	HVS-C-1533S-SCL

11. Sources

2-1773453-8 E322; Tyco Electronics Energy Division, Raychem Rayfit In-Line Heat Shrinkable Splices; HVS-C-1530S & HVS-S-1530S, 1/C Shielded Longitudinal Corrugated and FS Cables 15 kV; November 2008

PCN DH793P-000; Installation Instructions, Tyco Electronics, HVS-C-1530S-SCL, 15 kV Class, Splice for Extruded Dielectric (Poly/EPR) Power Cable with Flat Strap Neutral (FS) or Table Shield; April 23, 2010

Shipek, John, SCL Standards Engineer, subject matter expert and originator of 6873.11 (john.shipek@seattle.gov)

12. References

SCL Construction Standard 0535.11; “Heat Shrink Splice, Straight, 110 kV BIL, Tyco”

SCL Material Standard 6871.3; Splices, “15-kV through 69-kV, Heat Shrinkable”

AUTOTRANSFORMER, 100 VA, 277/125V

1. GENERAL

This specification covers single-phase, 60 Hertz, dry-type autotransformers that will be used to supply power to network monitoring transmitters and will be installed within a network protector case.

2. RATINGS

2.1 Primary Voltage (Terminals 1-3): 277 volts

2.2 Secondary Voltage (Terminals 2-3): 125 volts

2.3 Frequency: 60 Hertz

2.4 Secondary Load Current: 0.83 amperes

2.5 Regulation: 5% maximum at 125^{o} C. ambient, no load to full load.

3. ENVIRONMENTAL REQUIREMENTS

3.1 Temperature: -20^{o} C. to 150^{o} C. Internal temperature rise at nominal load shall not exceed 150^{o} C.

3.2 Humidity: 0% to 95% relative humidity.

4. DIELECTRIC WITHSTAND

4.1 Primary winding shall withstand 3.5 kV RMS, 60 Hz, applied between it and the core for 5 seconds.

5. PHYSICAL REQUIREMENTS

5.1 Mounting: 0.125 inch rolled steel brackets suitable for chassis mounting.

5.2 Terminals: Insulated stranded wire, No. 20 AWG, 200^{o} C. Teflon insulation, color coded, minimum 18 inches long.

5.3 Corrosion Protection: Metallic surfaces shall be cadmium plated or equivalent. Windings shall be impregnated against moisture.

5.4 Grounding: The core shall be grounded to the mounting brackets.

5.5 Marking: Markings shall include manufacturer's name, voltage, current, and frequency ratings, and terminal identification.

5.6 Maximum size: 3.0 inches wide, 4.0 inches long, 3.5 inches high.

6. APPROVED MANUFACTURERS

Tierney Electrical Mfg. Co. Model AC100A-277V125A

7. STOCK NUMBER 687730

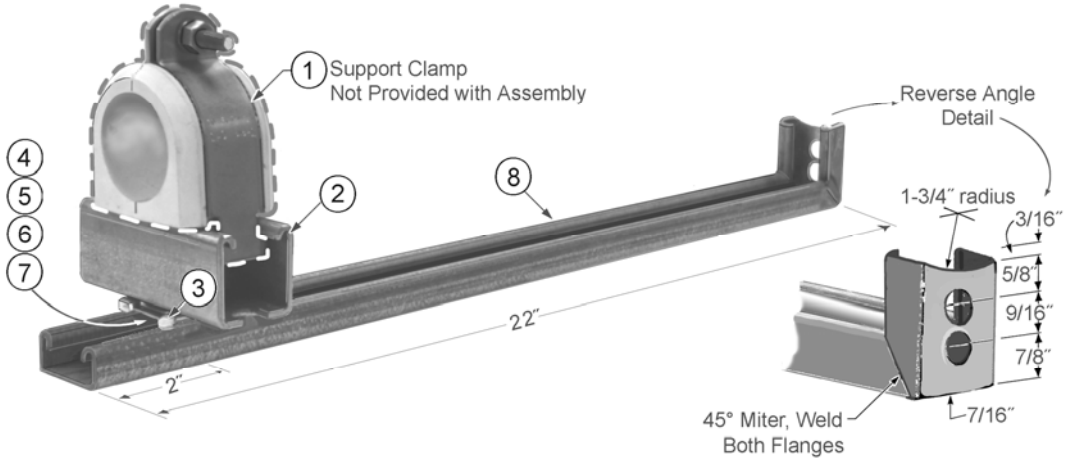
ORIGINATOR	STANDARDS COORDINATOR	STANDARDS SUPERVISOR	UNIT DIRECTOR
James S. Horn	Charles L. Shaffer	John C. Timmer	Denis DeVries

SEATTLE CITY LIGHT

MATERIAL STANDARD

STANDARD NUMBER: **6880.00**
PAGE: 1 of 1
SUPERCEDING: new
EFFECTIVE DATE: February 1, 2008

BRACKET ASSEMBLY, VERTICAL CABLE SUPPORT



1. **Scope:** This Material Standard covers the fabrication and assembly of a cable support bracket utilized by Seattle City Light Construction Guideline **NSP-270.**
2. **Fabrication and Assembly:** Cut, drill, shape, and weld item 8 as shown. Following fabrication, paint exposed steel with zinc-rich, gray, single-component, primer.
3. **Material List**

Item	Quantity	Description	Typical Cable Application	Stock No.
1	1*	Thermoplastic cable support	28 kV, 1/0, 2/C, bare	011961
			28 kV, 350 kcmil, 1/C 28 kV, 1/0, 2/C, jacketed	011962
			28 kV, 500 kcmil, 1/C	011963
			28 kV, 750 kcmil, 1/C	011964
			28 kV, 1000 kcmil, 1/C	012501
2	1	Adapter bracket, 4 in.		012465
3	1	Washer, flat, square, with tabs and 9/16 in. hole		720658
4	1	Nut, 3/8 in., with short spring for 13/16 x 1-5/8 in. strut channel		723608
5	1	Washer, steel, flat, zinc-plated, 3/8 in.		788044E
6	1	Washer, steel, lock, split, zinc-plated, 3/8 in.		010468
7	1	Cap screw, steel, hex head, zinc-plated, 3/8 x 1 in.		784765E
8	22 in. (approx.)	13/16 x 1-5/8 in. channel, without holes		723506

* Non-ceramic cable support assembly (consisting of a stainless steel clamp set and a thermoplastic cushion) is issued as a separate item.

4. **Stock Unit:** EA
5. **City Light Stock No.:** 012468

STANDARDS COORDINATOR	STANDARDS SUPERVISOR	UNIT DIRECTOR
John Shipek	John Barnett	Richard Kent

INSULATOR, MEDIUM-VOLTAGE, PORCELAIN, PIN-TYPE

1. Scope

This standard covers the requirements for porcelain medium-voltage pin-type insulators.

This standard applies to Seattle City Light Stock Number 690005.

2. Application

Porcelain medium-voltage pin-type insulators are installed on wood cross arms to support lines rated up to 2.6 kV, phase-to-ground.

3. Industry Standards

Porcelain pin-type insulators shall meet the requirements of the following national standard:

ANSI C29.5-1984 - American National Standard for Wet-Process Porcelain Insulators Low- and Medium-Voltage Types

4. Requirements

Porcelain pin-type insulators shall meet the following requirements:

ANSI C29.5 Class	55-2 (Radio Freed)
60 Hz dry flashover, kV rms, nominal	45
60 Hz wet flashover, kV rms, nominal	25
Positive critical impulse flashover, kV crest, nominal	70
Leakage distance, in, nominal	5
Strike/dry arc distance, in, nominal	3-3/8
Pin height, in, minimum	4
Pin diameter, in, nominal	1
Cantilever strength, ultimate, lbs	2500
Porcelain color	gray, according to ANSI C29.5, Section 5.2
Semi-conductive glaze	required
Top and side wire grooves	according to ANSI C29.5, Figure 2
Neck type	“C”

standards coordinator	*standards supervisor*	*unit director*
Aida Diop	John Shipek	Darnell Cola

5. Testing

Test data that establishes compliance with the requirements of ANSI C29.5, Section 8 shall be provided upon request.

6. Marking

Porcelain, pin-type insulators shall be clearly and indelibly marked in accordance with ANSI C29.5-Section 7.

Marking shall include but not be limited to:

- Manufacturer's name or symbol
- Year of manufacture
- Product Identification Number

7. Packaging

Porcelain pin-type insulators shall be packaged in a way that prevents damage during shipping, handling, and long-term outside storage.

Crates shall be secured to pallets for handling by forklifts. Pallets shall not exceed 4 feet in height or 1,000 pounds in weight.

Individual packages shall be legibly marked with:

- Manufacturer's name
- Manufacturer's catalog number
- Seattle City Light's Stock Number

Shipping containers shall be legibly marked with:

- Seattle City Light's Purchase Order Number
- Seattle City Light's Stock Number

8. Issuance

Stock Unit: EA

9. Approved Manufacturers

	Manufacturers and Catalog Numbers			
Stock No	Gamma Insulators (formerly Lapp)	PPC (Seves)	Santa Terezinha (CST)	Victor Insulators, Inc.
690005	6188R-70	253-S	1112	8R

10. References

Diop, Aida; SCL Standards Engineer, subject matter expert and originator of 6900.10 (aida.diop@seattle.gov)

Shipek, John; SCL Standards Engineer, subject matter expert for 6900.10 (john.shipek@seattle.gov)

Insulator, Guy Strain

1. Scope

This standard details manufacturer requirements for guy strain insulators.

This standard applies to the following Seattle City Light Stock numbers:

Stock No.	Section Length (in)
690090	36
690092	12
690094	108
690096	24

Some manufacturers do not consider this product an 'insulator' because they are not intended to be connected directly to energized lines. They are also referred to as a 'guy strain' or 'isolator'. Seattle City Light will continue to refer to this product as an 'insulator'.

2. Application

Guy strain insulators are installed in-line with down guys on utility poles. They are installed to provide electrical insulation to the guy wire and anchor if a conductor makes contact to the guy. The insulator is installed to keep grounded guy wires out of hot working areas.

3. Industry Standards

Guy strain insulators shall meet the applicable requirements of the following industry standards:

ASTM A153 / A153M - 09 Standard Specification for Zinc Coating (Hot-Dip) on Iron and Steel Hardware

ANSI C29.1-1988 (R2002) Test Methods for Electrical Power Insulators

4. Requirements

4.1 General

Guy strain insulators shall utilize glass-fiber filaments designed to meet cited strength requirements.

The guy strain insulator rod surface shall have a high-gloss finish to resist the adherence of contaminating materials and to minimize tracking and ultraviolet damage.

The guy strain insulator shall have excellent weathering characteristics, and remain stable and uniform in varying temperatures.

Guy strain insulators shall meet the requirements listed in Tables 4.1 and 4.2.

Table 4.1. General Requirements

End Fitting Material	Ductile iron
End fitting type (top/structure)	Clevis with roller
End fitting type (bottom/guy)	Clevis with roller

The end fittings shall be hot-dip galvanized per ASTM A153.

The junction between the fiberglass rod and end fittings shall be sealed to prevent moisture ingress.

Rollers shall rotate freely between the clevis ears.

4.2 Detailed

Table 4.2. Detailed Requirements

	Stock No.			
	690090	**690092**	**690094**	**690096**
Section Length, nom (in)	36	12	108	24
Ultimate Strength Rating, min (lb)	21,000	15,000	21,000	36,000
Roller Groove Radius (in)	5/16	5/16	5/16	3/8 +- 1/32
Flashover, Dry, min (kV)	330	120	820	230
Flashover, Wet, min (kV)	195	70	506	130

5. Testing

Test data that establishes compliance with the requirements of ANSI C29.1 and this standard shall be provided upon request.

6. Product Marking

Each guy strain insulator shall be clearly and indelibly marked with:

- Manufacturer's name or symbol
- Year of manufacture

7. Packaging

Guy strain insulators shall be packaged in a manner that prevents damage during shipping, handling, and long-term outside storage.

Shipping containers shall be legibly marked with:

- Seattle City Light's Purchase Order Number
- Seattle City Light's Stock Number

8. Issuance

Stock Unit: EA

9. Approved Manufacturers

		Manufacturers and Catalog Numbers			
Stock No.	**Section Length, in**	**Hubbell Power Systems, Inc**	**Hughes Bros.**	**MacLean Power Systems**	**Aluma-Form**
690090	36	GS21036CC2	CF694-36R2	GCC21-36R2	FGS21-36RR
690092	12	GS16012CC2	CF692-12R2	GCC15-12R2	FGS16-12RR
690094	108	GS21108CC2	CF694-108R2	GCC21-108R2	FGS21-108RR
690096	24	GS36024CC2	CF696-24R2	GCC36-24R2	FGS36-24RR

10. References

6900.5 (canceled); "Insulators – Guy Strain Glass-Fiber, Clevis-Clevis, Two Roller;" Material Standard; SCL

Panomvana, Tanya; SCL Standards Engineer, subject matter expert and originator of 6900.50 (tanya.panomvana@seattle.gov)

INSULATOR, PORCELAIN, GUY STRAIN

1. Scope

This standard covers the requirements for porcelain guy strain insulators.

The Seattle City Light Stock Numbers for this insulator type are 690104 and 690106.

2. Application

Porcelain guy strain insulators are installed in down guys and span guys to create an electric break. Their use is governed by NESC, Section 21, Rule 215.

Porcelain guy strain insulators provide a safer working space in the area of high voltage conductors and minimize corrosion of anchors and anchor rods.

3. Industry Standards

Porcelain guy strain insulators shall meet the requirements of the following national standard:

ANSI C29.4-1989 - American National Standard for Wet-Process Porcelain Insulators Strain Type

4. Requirements

Porcelain guy strain insulators shall meet the following requirements:

Stock No	690104	690106
ANSI C29.4 Class	54-2	54-3
60 Hz dry flashover, kV rms, nominal	30	35
60 Hz wet flashover, kV rms, nominal	15	18
Leakage distance, in, nominal	1-7/8	2-1/4
Length, in, nominal	4-1/4	5-1/2
Rated tensile strength, lbs, nominal	12,000	20,000
Porcelain color	gray, according to ANSI C29.4, Section 5	gray, according to ANSI C29.4, Section 5

standards coordinator	*standards supervisor*	*unit director*
Aida Diop	John Shipek	Darnell Cola

5. Testing

Test data that establishes compliance with the requirements of ANSI C29.4, Section 8 shall be provided upon request.

6. Marking

Porcelain guy strain insulators shall be clearly and indelibly marked in accordance with ANSI C29.4, Section 7.

Marking shall include but not be limited to:

- Manufacturer's name or symbol
- Year of manufacture
- Product Identification Number

7. Packaging

Porcelain guy strain insulators shall be packaged in a way that prevents damage during shipping, handling, and long-term outside storage.

Crates shall be secured to pallets for handling by forklifts. Pallets shall not exceed 4 feet in height or 1,000 pounds in weight.

Individual packages shall be legibly marked with:

- Manufacturer's name
- Manufacturer's catalog number
- Seattle City Light's Stock Number

Shipping containers shall be legibly marked with:

- Seattle City Light's Purchase Order Number
- Seattle City Light's Stock Number

8. Issuance

Stock Unit: EA

9. Approved Manufacturers

	Manufacturers and Catalog Numbers			
Stock No	Gamma Insulators (formerly Lapp)	PPC Insulators (Seves)	Santana Terezinha (CST)	Victor Insulators, Inc.
690104	8504-70	504	1197	VI 4604
690106	8506-70	506	1173	VI 4606

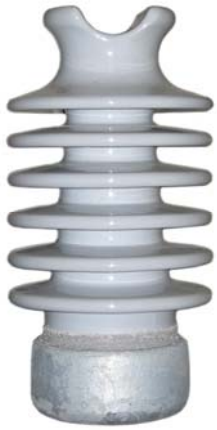
10. References

Diop, Aida; SCL Standards Engineer, subject matter expert and originator of 6901.10 (aida.diop@seattle.gov)

IEEE C2-2007; National Electrical Safety Code

Shipek, John; SCL Standards Engineer, subject matter expert for 6901.10 (john.shipek@seattle.gov)

INSULATOR, VERTICAL LINE-POST, PORCELAIN, TIE-TOP, FOR DISTRIBUTION SYSTEMS



1. Scope

This standard covers requirements for porcelain, tie-top vertical line post insulators.

This standard applies to Seattle City Light Stock Numbers 690157 and 690161.

2. Application

Porcelain, tie top, vertical line post insulators are used on wood poles to support distribution conductors. The following table gives the application for each of the Stock Numbers.

Stock No	Application
690157	26 kV lines, nominal
690161	26 kV lines, nominal in contaminated and non-contaminated areas

3. Industry Standards

Porcelain, vertical line post insulators shall meet the requirements of the following national standard:

ANSI C29.7-1996 – American National Standard for Wet-Process Porcelain Insulators – High- Voltage Line-Post Type

4. Requirements

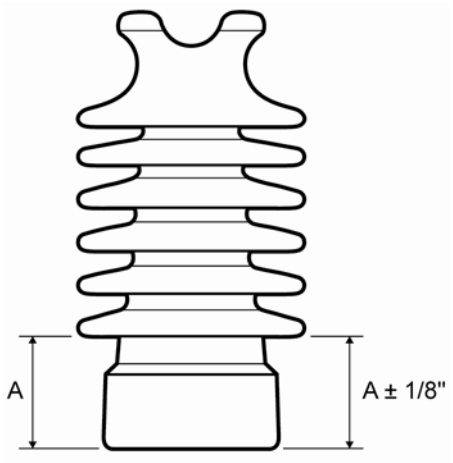
Porcelain, vertical line post insulators shall meet the following requirements:

	Stock No.	
	690157	690161
ANSI C29.7 Class	57-2	57-3
60 Hz dry flashover, kV rms, minimum	100	125
60 Hz wet flashover, kV rms, minimum	70	95
Positive critical impulse flashover, kV crest, minimum	160	200
Leakage distance, in, nominal	22	29
Strike/dry arc distance, in, nominal	9.5	12.25
Reference length, in, nominal	12	15
Ultimate cantilever strength, lb	2800	2800
Center hole thread, in, nominal	3/4 – 10, UNC	3/4 – 10, UNC
Neck type	"F"	"F"
Porcelain color	gray, according to ANSI C29.7, Section 5.2	
Insulator base	according to ANSI C29.7, Section 5.3	

standards coordinator	*standards supervisor*	*unit director*
Tanya Panomvana	John Shipek	Darnell Cola

5. Quality Assurance

The distance between the bottom of the base and the bottom skirt around the circumference of the insulator shall be uniform with a maximum difference of 1/8 inch.



6. Testing

Test data that establishes compliance with the requirements of ANSI C29.7, Section 8 shall be provided upon request.

7. Marking

Porcelain, vertical line-post insulators shall be clearly and indelibly marked in accordance with ANSI C29.7, Section 7.

Marking shall include but not be limited to:

- Manufacturer's name or symbol
- Year of manufacture
- Product Identification Number

8. Packaging

Porcelain, vertical line-post insulators shall be packaged in a way that prevents damage during shipping, handling, and long-term outside storage.

Crates shall be secured to pallets for handling by forklifts. Pallets shall not exceed 4 feet in height or 2,000 pounds in weight.

Individual packages shall be legibly marked with:

- Manufacturer's name
- Manufacturer's catalog number
- Seattle City Light's Stock Number

Shipping containers shall be legibly marked with:

- Seattle City Light's Purchase Order Number
- Seattle City Light's Stock Number

9. Issuance

Stock Unit: EA

10. References

Diop, Aida; SCL Standards Engineer, subject matter expert and originator of 6901.30 (aida.diop@seattle.gov)

Shipek, John; SCL Standards Engineer, subject matter expert for 6901.30 (john.shipek@seattle.gov)

Panomvana, Tanya; SCL Standards Engineer and subject matter expert for 6901.30 (Tanya.panomvana@seattle.gov)

11 Approved Manufacturers

	Manufacturers and Catalog Numbers			
Stock No.	Gamma Insulators (formerly Lapp)	Newell Porcelain Company	PPC Insulators (Seves)	Victor Insulators, Inc.
690157	9335X-70	37620-7001	5135	62055 or VI 57-2
690161	9345X-70	41640-7001	5145	62056

STUD BOLTS FOR LINE POST INSULATORS

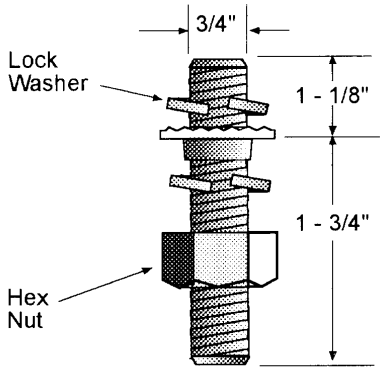
Long and short bolts shall be interchangeable in the insulators. All parts shall be hot-dip galvanized per ASTM A-153 (2 mils min.).

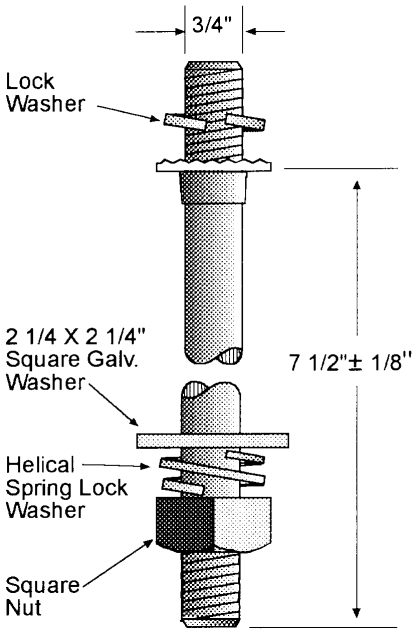
Long stud bolts shall be furnished with a 2-1/4" x 2-1/4" square washer, a lock washer, a square nut, and a helical spring washer. The helical spring washer shall have a section width of 0.234" and a section thickness of 0.188" meeting ANSI B18.21.1. See City Light Material Standard 5842.5, Stock No. 584267.

Short stud bolts shall be furnished with two lock washers and a hex nut.

It shall be the Bidder's responsibility to update and/or maintain the referenced manufacturer's catalog numbers shown. A written explanation must accompany each bid if different from the numbers shown.

Stock Unit: EA





Stock No.	Size	Approved Manufacturers						
		Hubbell/ Chance	Joslyn	Lapp	Locke	Newell	TIFFIN/ Porc. Prod	Victor
696826	Short Stud	DF19M3	J25249.1	10186	27542	87573	6502	72088
696828	Long Stud	Obsolete	J25250.34	–	–	87574 S	6512-7-1/2 S	72087 S

Note: S = Special; coil spring washer in place of standard locknut.

INSULATOR, VERTICAL LINE POST, PORCELAIN, CLAMP TOP, FOR DISTRIBUTION SYSTEMS

1. Scope

This Material Standard applies to porcelain, vertical line post insulators. This Material Standard applies to Seattle City Light Stock Numbers 690159, 690163, and 690166.

2. Application

Vertical line post insulators are used on wood poles to support distribution conductors. The following table gives the application for each of the Stock Numbers.

Stock No	Application
690159	26 kV lines, nominal
690163	46 and 26 kV lines in contaminated areas
690166	69 and 35 kV lines in contaminated areas

3. Industry Standards

Vertical line post insulators shall meet the requirements of the following industry standard:

ANSI C29.7-1996 – American National Standard for Wet Process Porcelain Insulators – High Voltage Line Post Type

4. Requirements

Vertical line post insulators shall meet the following requirements:

	Stock No		
	690159	690163	690166
ANSI C29.7 Class	57-12	57-13	57-15
60 Hz dry flashover, kV rms, minimum	110	125	160
60 Hz wet flashover, kV rms, minimum	85	100	130
Positive critical impulse flashover, kV crest, minimum	180	200	265
Leakage distance, in, nominal	22	29	45
Strike/dry arc distance, in, nominal	9.5	12.25	17.25
Reference length, in, nominal	13	16	21.5

standards coordinator	*standards supervisor*	*unit director*
Aida Diop	John Shipek	Darnell Cola

4. Requirements, continued

	Stock No
	690159, 690163, and 690166
Cantilever strength	
ultimate, lbs	2800
proof test, lbs	1400
Center hole thread, in	3/4 – 10, UFS-2B
Porcelain color	gray, according to ANSI C29.7, Section 5.2
Insulator base and clamp bracket	according to ANSI C29.7, Section 5.3
Trunnion bolt, City Light special	2 inches long with hot-dipped galvanized jam nut

5. Testing

Test data that establishes compliance with the requirements of ANSI C29.7, Section 8 shall be provided upon request.

6. Marking

Vertical line-post insulators shall be clearly and indelibly marked in accordance with ANSI C29.7-1996, Section 7. Marking shall include but not limited to:

- Manufacturer's name or symbol
- Year of manufacture
- Product Identification Number

7. Packaging

Vertical line-post insulators shall be packaged in a way that prevents damage during shipping, handling, and long-term outside storage.

Crates shall be secured to pallets for handling by forklifts. Pallets shall not exceed 4 feet in height or 1,000 pounds in weight.

Individual packages shall be legibly marked with:

- Manufacturer's name
- Manufacturer's catalog number
- Seattle City Light's Stock Number

Shipping containers shall be legibly marked with:

- Seattle City Light's Purchase Order Number
- Seattle City Light's Stock Number

8. Issuance

Stock Unit: EA

9. Approved Manufacturers

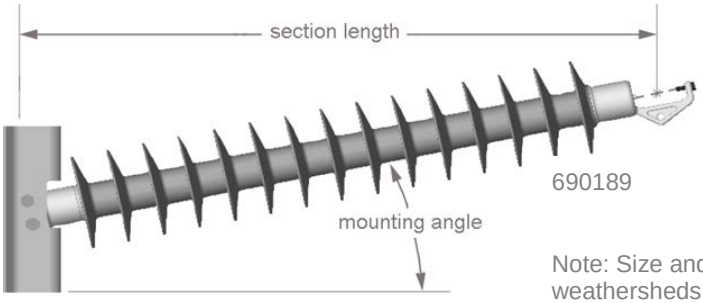
	Manufacturers and Catalog Numbers		
Stock No	Lapp Insulator	Newell Porcelain Company	Victor Insulators, Inc.
690159	4235LN70	43930-7401	62155-SL
690163	4245LN70	43940-7401	62156-SL
690166	4266LN70	43970-7401	62158-SL

10. References

Diop, Aida; SCL Standards Engineer, subject matter expert and originator of 6901.40 (aida.diop@seattle.gov)

Shipek, John; SCL Standards Engineer, subject matter expert for 6901.40 (john.shipek@seattle.gov)

Insulator, Horizontal Line Post, Polymer, For 115 kV Nominal Systems



Note: Size and number of actual weathersheds will vary.

1. Scope

This standard applies to polymer, horizontal line post insulators used to construct 115 kV transmission lines. Insulators have a trunnion end fitting.

This standard applies to the Seattle City Light (SCL) stock numbers listed in Table 2.

2. Application

Horizontal line post insulators are used on wood or steel poles to support transmission conductors. Table 2 gives the application for each of the stock numbers.

Table 2. Horizontal Line Post Insulator Applications

Stock No.	Application
012830	115 kV, nominal, steel poles, no base
013307	115 kV, nominal, steel poles, flat base
690189	115 kV, nominal, wood poles, curved base

In 2008, stock number 012830 was used with SCL-fabricated bases to re-insulate the 115 kV north to Bothell line. If an insulator on the 115 kV north to Bothell line becomes damaged, re-use the existing base with the new insulator. If a base is required, SCL's shop will need to be contacted to fabricate a base.

3. Industry Standards

Insulators shall meet the applicable requirements of the following national standards:

ANSI C29.1-1988 (R2002) Test Methods for Electrical Power Insulators

ANSI C29.7-1996 (R2002) Wet Process Porcelain Insulators – High Voltage Line Post Type

ANSI C29.11-1989 (R1996) Tests for Composite Suspension Insulators for Overhead Transmission Lines

ASTM A153-1982 Zinc Coating (Hot Dip) on Iron and Steel Hardware

4. Requirements

4.1 Common Requirements

Ultimate mechanical strength ratings shall be based on fully assembled insulators; insulators with base and end fittings attached.

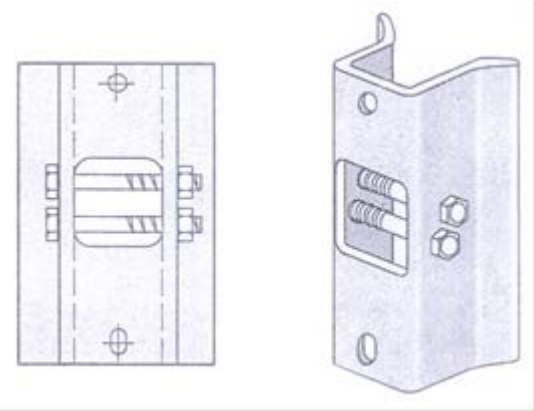
Table 4.1. Common Requirements

60 Hz dry flashover	325 kV rms, minimum
60 Hz wet flashover	295 kV rms, minimum
Positive critical impulse flashover	505 kV crest, minimum
Horizontal coupling length	46 in (plus 3, minus 2)
Mounting angle	12 degrees
Leakage	82 in, minimum
Strike/dry arc distance	33 in, minimum
Ultimate mechanical strength in cantilever	3,790 lb, minimum As defined by ANSI C29.1-1988 (R2002) and ANSI C29.7-1996 (R2002), section 8
Maximum design cantilever (MDC)	1,515 lb, minimum Where MDC is defined as 40% of the ultimate mechanical strength in cantilever
Ultimate mechanical strength in tension	5,000 lb, minimum At 0%, MDC shall be as defined by ANSI C29.1-1988 (R2002), section 5
End fitting type (line end)	Horizontal trunnion (clamp top) Similar to ANSI C29.7-1996 (R2002), figure 11, with one supplemental hole capable of accepting a 3/4-inch diameter Y-clevis and carrying the full design load of the insulator. Trunnion bolt shall be at least 2 inches long and include a hot dip galvanized jam nut.
Weathershed/sheath material	Silicon rubber; to qualify as silicon type, weathershed/sheath material must be composed of at least 33% silicon by weight; “EP/silicon alloys” do not qualify.
Weathershed/sheath material color	Gray

4.2 Stock No. 690189 Requirements, Bendable Curved Base

Base type (structure end)	Steel or aluminum gain channel (a.k.a. bendable)
Base mounting bolt holes	Two holes spaced 12 inches vertically from one hole or slot, designed to accommodate 3/4-inch nominal diameter fasteners.

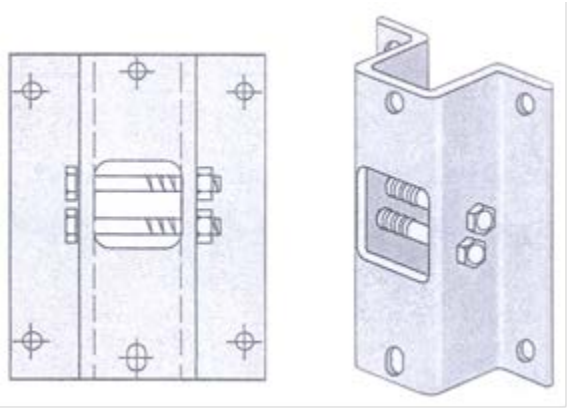
Figure 4.2. Bendable Curved Base



4.3 Stock No. 013307 Requirements, Bendable Flat Base

Base type (structure end)	Steel or aluminum formed channel (a.k.a. bendable)
Base mounting bolt holes	Two holes spaced 12 in vertically from one hole or slot. Four holes or slots in rectangular pattern spaced 10 in vertically and 8 in horizontally. Holes shall be designed to accommodate 3/4-in nominal diameter fasteners.

Figure 4.3. Bendable Flat Base



4.4 Stock No. 012830 Requirements

Insulator shall be furnished without a base.

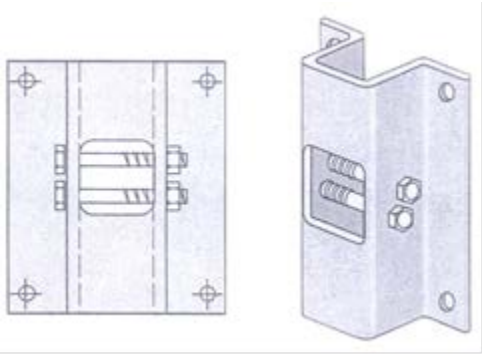
Insulator shall be furnished with sets of mounting fasteners.

4.5 Flat Base Requirements – No Stock Number

Base shall be fabricated by SCL shop according to L2-SN251-28 W/ELT.

Base type (structure end)	Steel or aluminum formed channel (A.K.A. bendable)
Base mounting bolt holes	Four holes or slots in rectangular pattern spaced 13 in vertically and 8 in horizontally, designed to accommodate 3/4-in nominal diameter fasteners.

Figure 4.5. Bendable Flat Base



5. Notice of Changes

Manufacturer shall provide Seattle City Light reasonable notice of anticipated insulator design changes. This includes, but is not limited to, changes in polymer formulation, dimensions, electrical characteristics, mechanical characteristics, or accessories.

6. Marking

Insulators shall be clearly and indelibly marked with the manufacturer's name or symbol, the year of manufacture, and the maximum design cantilever (MDC). Load ratings shall be stated in units of pounds. Labeling shall be in English.

7. Packaging

Insulators shall be packaged in wood crates to protect against physical damage that could occur during shipping, handling, or long-term outside storage. If slatted crates are used, each insulator shall be sealed in plastic. If sealed crates are used, plastic is not required.

Insulator weathersheds shall not bear any load due to its own weight or that of insulators or crates above or below it.

Crates shall be secured to pallets for handling by forklift. Pallets shall not exceed 4 ft in height or 1,000 lb in weight. Crates shall be marked with the manufacturer's name or symbol, catalog number, SCL stock number, and purchase order number.

Number of insulators per crate: 16 maximum.

8. Issuance

Stock Unit: EA

9. Approved Manufacturers

Stock No.	NGK-Locke	MacLean Power Systems
012830	L2-SN251-2 W/ELT (without base)	-
013307	L2-SN211-28 W/ELT	H212044VX06
690189	L2-SN251-23 W/ELT	NBKG30XH02-3S0-122

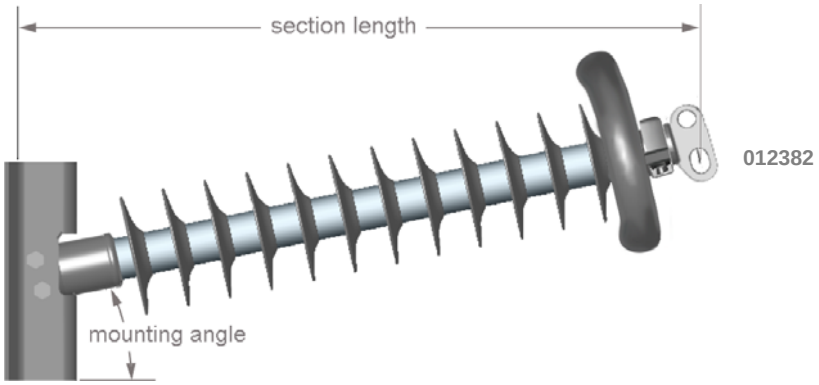
10. References

Diop, Aida; SCL Standards Engineer and subject matter expert for 6901.55 (aida.diop@seattle.gov)

Shipek, John; SCL Standards Engineer and subject matter expert and originator of 6901.55 (john.shipek@seattle.gov)

Shop Drawing for Catalog No. L2-SN251-28 W/ELT; dated 8/1/2008; NGK-Locke

INSULATOR, HORIZONTAL LINE POST, POLYMER, FOR 230 kV NOMINAL SYSTEMS



Note: Size and number of actual weathersheds will vary.

1. Scope

This Material Standard applies to polymer, horizontal line post insulators used to construct 230 kV transmission lines. Insulators have a drop eye end fitting and are designed for mounting on single wood poles.

This standard applies to the Seattle City Light Stock Numbers: 012382, and 013308.

2. Application

Horizontal line post insulators are used on wood or steel poles to support transmission conductors. The following table gives the application for each of the Stock Numbers.

Stock No	Application
012382	230 kV, nominal, wood poles, curved base
013308	230 kV, nominal, steel poles, flat base

3. Industry Standards

Insulators shall meet the applicable requirements of the following national standards:

ANSI C29.1-1988 (R2002) Test Methods for Electrical Power Insulators

ANSI C29.2-1992 (R1999) Wet Process Porcelain and Toughened Glass - Suspension Type

ANSI C29.11-1989 (R1996) Tests for Composite Suspension Insulators for Overhead Transmission Lines

ASTM A153-1982 Zinc Coating (Hot Dip) on Iron and Steel Hardware

4. Requirements

4.1 Common Requirements

Ultimate mechanical strength ratings shall be based on fully assembled insulators; insulators with base and end fittings attached.

60 Hz dry flashover, kV rms, minimum	618
60 Hz wet flashover, kV rms, minimum	555
Positive critical impulse flashover, kV crest, minimum	990
Horizontal coupling length, in	74 (plus 1, minus 1)
Mounting angle, degrees	12
Leakage, in, minimum	177
Strike/dry arc distance, in, minimum	63

standards coordinator	*standards supervisor*	*unit director*
Aida Diop	John Shipek	Darnell Cola

4. Requirements, continued

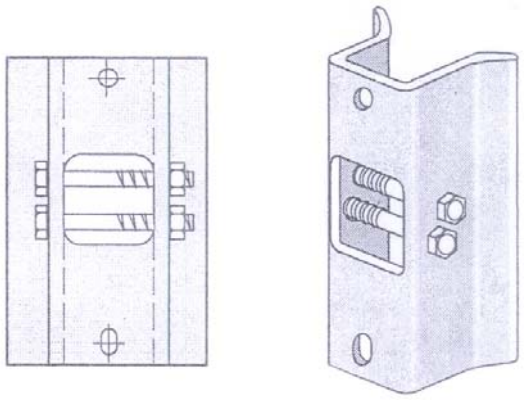
4.1 Common Requirements, continued

Ultimate mechanical strength in cantilever, lbs, minimum	2,330 as defined by ANSI C29.1-1988 (R2002) and ANSI C29.7-1996 (R2002), section 8
Maximum design cantilever (MDC), lbs, minimum	930 where MDC is defined as 40% of the ultimate mechanical strength in cantilever
Ultimate mechanical strength in tension, lbs, minimum	15,000 at 0% MDC as defined by ANSI C29.1-1988 (R2002), section 5
End fitting type (line end), in	extended two-hole (also known as two-hole drop eye) with centers of holes or slots spaced 2-3/4 inches (plus 2-1/4, minus 0) apart
Weathershed/sheath material	silicon rubber – to qualify as silicon type, weathershed/ sheath material must be composed of at least 33% silicon by weight; “EP/silicon alloys” do not qualify
Weathershed/sheath material color	gray

4.2 Stock Number 012382 Requirements, Bendable Curved Base

Base type (structured end)	Steel or aluminum gain channel (aka, bendable)
Base mounting bolt holes, in	one 15/16 or 1 diameter hole spaced 12 inches vertically from one 15/16 or 1 x 1-5/16 or 1-1/2 slot

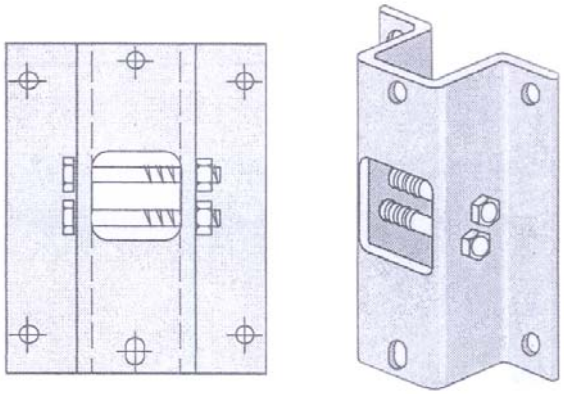
Figure 4.2, Bendable curved base



4.3 Stock Number 013308 Requirements, Flat Base

Base type (structured end)	Steel or aluminum formed channel
Base mounting bolt holes	Two holes spaced 12 inches vertically from one hole or slot. Four holes or slots in rectangular pattern spaced 10 inches vertically and 8 inches horizontally. Holes shall be designed to accommodate 3/4-inch nominal diameter fasteners.

Figure 4.3, Bendable flat base



5. Grading Ring

One 9-inch diameter (plus or minus 3 inches) grading ring shall be provided for the line end of each insulator. Grading rings shall be designed to allow easy installation and removal with the conductor in place. No information bands or tags shall be placed in the area where the grading ring brackets are mounted to the end fitting. Grading ring installation instructions shall be packaged with each insulator in a waterproof, ultraviolet-light resistant plastic envelope or other waterproof, Seattle City Light approved means.

6. Notice of Changes

Manufacturer shall provide Seattle City Light reasonable notice of anticipated insulator design changes. This includes, but is not limited to, changes in polymer formulation, dimensions, electrical characteristics, mechanical characteristics, or accessories.

7. Marking

Insulators shall be clearly and indelibly marked with the manufacturer's name or symbol, the year of manufacture, and the maximum design cantilever (MDC). Load ratings shall be stated in units of pounds. Labeling shall be in English.

8. Packaging

Insulators shall be packaged in wood crates to protect against physical damage that could occur during shipping, handling, or long-term outside storage. If slatted crates are used, each insulator shall be sealed in plastic. If sealed crates are used, plastic is not required.

Insulator weathersheds shall not bear any load due to its own weight or that of insulators or crates above or below it.

Crates shall be secured to pallets for handling by forklift. Pallets shall not exceed 4 feet in height or 1,000 pounds in weight. Crates shall be marked with the manufacturer's name or symbol, catalog number, Seattle City Light's Stock Number, and Purchase Order number.

Number of insulators per crate: 16 maximum.

9. Stock Unit: EA

10. Approved Manufacturers

	Manufacturers and Catalog Numbers	
Stock No	NGK-Locke	MacLean Power Systems
012382	L2-SN431-13-W	NBSG30XH043S0
013308	L2-SN431-18-W	H211074VA02

11. References

Diop, Aida; SCL Standards Engineer, subject matter expert for 6901.57 (aida.diop@seattle.gov)

Shipek, John; SCL Standards Engineer, subject matter expert and originator of 6901.57 (john.shipek@seattle.gov)

INSULATOR, HORIZONTAL LINE POST, PORCELAIN, CLAMP TOP, FOR DISTRIBUTION SYSTEMS

1. Scope

This Material Standard applies to porcelain, horizontal line post insulators. This Material Standard applies to Seattle City Light Stock Number 690173.

2. Application

Horizontal line post insulators are used to construct 26.4 and 34.5 kV overhead distribution lines.

3. Industry Standards

Horizontal line post insulators shall meet the requirements of the following industry standard:

ANSI C29.7-1996 – American National Standard for Wet Process Porcelain Insulators – High Voltage Line Post Type

4. Requirements

Horizontal line post insulators shall meet the following requirements:

ANSI C29.7 Class	57-22
60 Hz dry flashover, kV rms	110, minimum
60 Hz wet flashover, kV rms	100, minimum
Positive critical impulse flashover, kV crest	180, minimum
Leakage distance, in	22, nominal
Strike/dry arc distance, in	9.5, nominal
Reference length, in	14, nominal
Cantilever strength	
ultimate, lbs	2800, nominal
proof test, lbs	1400, minimum
Center hole thread, in	3/4 – 10, UFS-2B
Porcelain color	gray, according to ANSI C29.7, Section 5.2
Insulator base and clamp bracket	according to ANSI C29.7, Section 5.3
Trunnion bolt, City Light special	2 inches long with hot-dipped galvanized jam nut

5. Testing

Test data that establishes compliance with the requirements of ANSI C29.7, Section 8 shall be provided upon request.

6. Marking

Horizontal line-post insulators shall be clearly and indelibly marked in accordance with ANSI C29.7-1996, Section 7. Marking shall include but not limited to:

- Manufacturer's name or symbol
- Year of manufacture
- Product Identification Number

standards coordinator	*standards supervisor*	*unit director*
Aida Diop	John Shipek	Darnell Cola

7. Packaging

Horizontal line-post insulators shall be packaged in a way that prevents damage during shipping, handling, and long-term outside storage.

Crates shall be secured to pallets for handling by forklifts. Pallets shall not exceed 4 feet in height or 1,000 pounds in weight.

Individual packages shall be legibly marked with:

- Manufacturer's name
- Manufacturer's catalog number
- Seattle City Light's Stock Number

Shipping containers shall be legibly marked with:

- Seattle City Light's Purchase Order Number
- Seattle City Light's Stock Number

8. Issuance

Stock Unit: EA

9. Approved Manufacturers

	Manufacturers and Catalog Numbers		
Stock No	Lapp Insulator	Newell Porcelain Company	Victor Insulators, Inc.
690173	4635LN70	48623-7401	62255-SL

10. References

Diop, Aida; SCL Standards Engineer, subject matter expert and originator of 6901.60 (aida.diop@seattle.gov)

Shipek, John; SCL Standards Engineer, subject matter expert for 6901.60 (john.shipek@seattle.gov)

INSULATOR, STATION POST-TYPE, PORCELAIN

1. Scope

This standard covers the requirements for porcelain station post-type insulators.

This standard applies to Seattle City Light Stock Numbers 690253, 690280, 690186 and 690187.

2. Application

Porcelain station post-type insulators are used in substations to support buses or apparatus.

The following table gives the maximum voltage ratings for each of the Stock Numbers and their ANSI Technical Reference (TR) numbers.

Stock Number	ANSI TR Number	Voltage Rating, maximum
690253	202	7.5 kV
690280	222	7.5 kV
690186	205	15 kV
690187	208	23 kV

3. Industry Standards

Porcelain station post-type insulators shall meet the requirements of the following national standard:

ANSI C29.9-1983 – American National Standard for Wet-Process Porcelain Insulators Apparatus, Post –Type

4. Requirements

Porcelain station post-type insulators shall meet the following requirements:

	Stock Number			
	690253	690280	690186	690187
ANSI C29.9 TR Number	202	222	205	208
BIL (Basic Impulse Insulation Level) rating, kV, nominal	95	95	110	150
60 Hz, wet flashover, kV, rms, nominal	30	30	45	60
Positive critical impulse flashover, kV crest, nominal	105	105	125	170
Leakage distance, in, nominal	10-1/2	10-1/2	15-1/2	24
Four tapped holes, size, in	1/2−13, UFS	5/8−11, UFS	1/2−13, UFS	1/2−13, UFS
Bolt circle diameter, in	3	5	3	3
Height, in, overall	7-1/2	10	10	14
Height, in, tolerance	±1/32	±1/32	±1/32	±1/32
Cantilever strength, lb, ultimate, upright	2000	4000	2000	2000

Porcelain color for station post-type insulators shall be gray, according to ANSI C29.9, Section 4.2.

Cap material and coating for station post-type insulators shall be hot-dipped galvanized iron or steel, according to ANSI C29.9, Section 4.3.

standards coordinator	*standards supervisor*	*unit director*
Aida Diop	John Shipek	Darnell Cola

5. Testing

Test data that establishes compliance with the requirements of ANSI C29.9, Section 7 shall be provided upon request.

6. Marking

Porcelain station post-type insulators shall be clearly and indelibly marked in accordance with ANSI C29.9, Section 6.

Marking shall include but not limited to:

- Manufacturer's name or symbol
- Year of manufacture
- Product Identification Number

7. Packaging

Porcelain station post-type insulators shall be packaged in a way that prevents damage during shipping, handling, and long-term outside storage.

Crates shall be secured to pallets for handling by forklifts. Pallets shall not exceed 4 feet in height or 1,000 pounds in weight.

Individual packages shall be legibly marked with:

- Manufacturer's name
- Manufacturer's catalog number
- Seattle City Light's Stock Number

Shipping containers shall be legibly marked with:

- Seattle City Light's Purchase Order Number
- Seattle City Light's Stock Number

8. Issuance

Stock Unit: EA

9. References

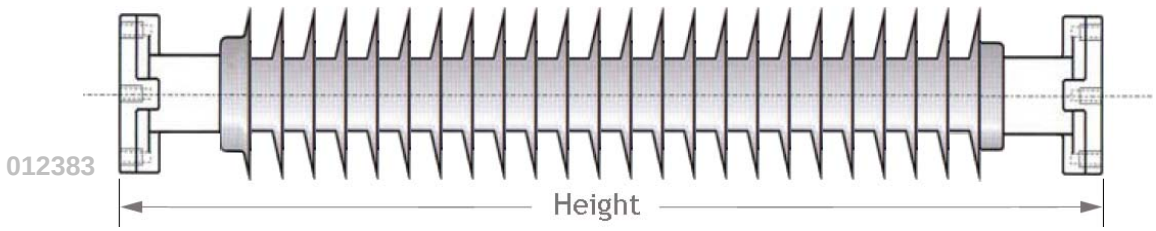
Diop, Aida; SCL Standards Engineer, subject matter expert and originator of 6901.80 (aida.diop@seattle.gov)

Shipek, John; SCL Standards Engineer, subject matter expert for 6901.80 (john.shipek@seattle.gov)

10. Approved Manufacturers

	Manufacturers and Catalog Numbers					
Stock Number	Gamma Insulators	Lapp Insulators	Locke Insulators	Newell Porcelain Company	PPC Insulators (Seves)	Victor Insulators, Inc.
690253	8420	315202-70	PS00910	231001-7001	95 SU	1750
690280	na	315222-70	PH00910	41510-7001	95 HU	1766
690186	8425	315205-70	PS01110	231002-7001	110 SU	1751
690187	8428	315208-70	PS01510	231003-7001	150 SU	1752

INSULATOR, STATION POST, POLYMER FOR 115 kV NOMINAL SYSTEMS



Note: Size and number of actual weathersheds will vary.

1. Scope

This Material Standard applies to polymer, station post insulators used to support 115 kV bus in substations. The end of each insulator has a 5-inch diameter bolt circle end fitting.

This insulator, in combination with a steel trunnion adapter, Stock No. 012381, can also be used as a 115 kV vertical line post insulator.

2. Industry Standards

Insulators shall meet the applicable requirements of the following national standards:

ANSI C29.1-1988 (R2002) Test Methods for Electrical Power Insulators

ANSI C29.9-1983 (R1996) Wet Process Porcelain Insulators – Apparatus, Post-Type

ASTM A153-1982 Zinc Coating (Hot Dip) on Iron and Steel Hardware

Insulator is intended to be as similar as practical to Technical Reference Number 286 unit as identified in Table 2 of ANSI C29.9-1983 (R1996) for porcelain post type insulators. No industry standard exists for polymer station post insulators.

3. Requirements

Overall height:	45˝ (plus/minus 1/16˝)
Impulse withstand:	550 kV crest minimum
Leakage:	99˝ minimum
Positive critical impulse flashover:	610 kV crest minimum
60 Hz wet withstand:	230 kV rms minimum
Ultimate mechanical strength in cantilever:	2,600 lbs. minimum
Ultimate mechanical strength in tension:	17,500 lbs. minimum
Ultimate mechanical strength in compression:	12,000 lbs. minimum
Ultimate mechanical strength in torsion:	30,000 in.-lbs. minimum

Ultimate mechanical strength ratings shall be based on fully assembled insulators; insulators with base and end fittings attached.

STANDARDS COORDINATOR	STANDARDS SUPERVISOR	UNIT DIRECTOR

3. Requirements, Continued

Base type (structure end):	5˝ bolt circle as defined by ANSI C29.9-1983 (R1996), Table 2, for technical reference number 286 type insulators.
End fitting type (line end):	5˝ bolt circle as defined by ANSI C29.9-1983 (R1996), Table 2, for technical reference number 286 type insulators.
Weathershed/sheath material:	Silicon rubber – to qualify as silicon type, weathershed/sheath material must be composed of at least 33% silicon by weight; “EP/silicon alloys” do not qualify.
Weathershed/sheath material color:	Gray

4. Notice of Changes

Manufacturer shall provide Seattle City Light reasonable notice of anticipated insulator design changes. This includes, but is not limited to, changes in polymer formulation, dimensions, electrical characteristics, mechanical characteristics, or accessories.

5. Marking

Insulators shall be clearly and indelibly marked with the manufacturer’s name or symbol, the year of manufacture, and load ratings. Load ratings shall be stated in units of pounds. Labeling shall be in English.

6. Packaging

Insulators shall be packaged in wood crates to protect against physical damage that could occur during shipping, handling, or long-term outside storage. If slatted crates are used, each insulator shall be sealed in plastic. If sealed crates are used, plastic is not required.

Insulator weathersheds shall not bear any load due to it’s own weight or that of insulators or crates above or below it.

Crates shall be secured to pallets for handling by forklift. Pallets shall not exceed 4 feet in height or 1,000 pounds in weight. Crates shall be marked with the manufacturer’s name or symbol, catalog number, Seattle City Light’s Stock Number, and Purchase Order number.

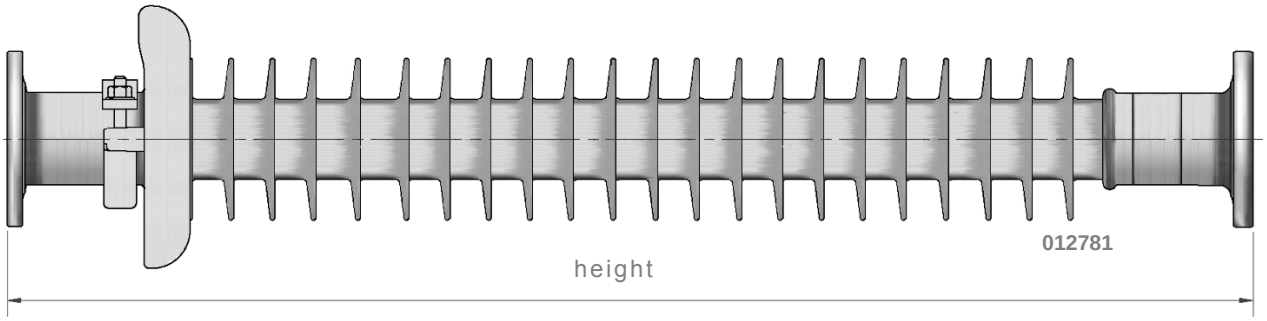
Number of insulators per crate: 12 maximum.

Stock Unit: EA

Stock Number 012383

Approved Manufacturers	Type	Catalog Number
MacLean Power Systems	Armoursil	NAA100XH23S0
NGK-Locke	2-1/2˝ Core	S2–SG311–21
NGK-Locke	3-1/2˝ Core	S4–SH251–22

INSULATOR, STATION POST, POLYMER FOR 230 kV NOMINAL SYSTEMS



size and number of actual weathersheds will vary

1. Scope

This material standard applies to polymer, station post insulators.

This material standard applies to the following Seattle City Light Stock Number:

Stock No.: 012781

2. Application

Insulator is intended for use in substations to support 230 kV bus.

This insulator, in combination with a steel trunnion adapter, Stock No. 012381, can also be used as a 230 kV vertical line post insulator.

3. Industry Standards

Insulator shall meet the applicable requirements of the following industry standards:

ANSI C29.1-1988 (R2001) Test Methods for Electrical Power Insulators

ANSI C29.9-1983 (R2002) Wet-Process Porcelain Insulators —Apparatus, Post Type

ASTM A153-2005 Standard Specification for Zinc Coating (Hot Dip) on Iron and Steel Hardware

Insulator is intended to be as similar as practical to Technical Reference Number 304 unit as identified in Table 2 of ANSI C29.9 for porcelain post type insulators. No industry standard exists for polymer station post insulators.

STANDARDS COORDINATOR	STANDARDS SUPERVISOR	UNIT DIRECTOR
Sean Parker	John Barnett	John Nierenberg

4. Construction

4.1 General

Unless indicated otherwise, all values cited below should be consistent with industry standards – they are repeated here for the convenience of the reader. Values or requirements different from industry standards are identified with the symbol ▲.

Insulator shall meet the following requirements (with the grading ring installed):

	Requirements	Reference
Stock Number	012781	-
BIL Rating, kV	900	ANSI C29.9, Table 2
Overall Height, in.	80 +/- 1/8	ANSI C29.9, Table 2
Impulse Withstand Minimum, kV rms	900	ANSI C29.9, Table 2
Leakage Distance, minimum, in.	165	ANSI C29.9, Table 2
Positive Critical Impulse Flashover, minimum, kV peak-to-peak	1,010	ANSI C29.9, Table 2
Low Frequency Wet Withstand Minimum, kV rms	385	ANSI C29.9, Table 2
Ultimate Mechanical Strength Cantilever, lb	1,600 ▲	SCL preference
Ultimate Mechanical Strength In Tension, lb	17,500 ▲	SCL preference
Ultimate Mechanical Strength In Compression, lb	3,400 ▲	SCL preference
Ultimate Mechanical Strength In Torsion, in-lb	30,000 ▲	SCL preference

4.2 Weathershed/Sheath Material

Weathershed/sheath material shall be made out of silicon rubber – to qualify as silicon type, weathershed/sheath material must be composed of at least 33% silicon by weight; “EP silicon alloys” do not qualify.

Parting lines along the weathershed/sheath must be kept to a minimum so as to reduce the likelihood of tracking when contaminated.

Weathershed/sheath material shall be gray.

4.3. End Fittings

	Requirements	Reference
Material	ductile iron or forged steel	SCL preference
End Fitting Type (top/structure)	flange	ANSI C29.9, Table 2
End Fitting Type (bottom/line)	flange	ANSI C29.9, Table 2

End fittings shall have a 5” inch diameter bolt circle as defined in ANSI C29.9, Table 2 for technical reference number 304 type insulators.

4.4 Grading Ring

One 9” diameter (plus/minus 3”) grading ring shall be provided for the line end of each insulator. Grading rings shall be designed to allow easy installation and removal with the conductor in place. No information bands or tags shall be placed in the area where the grading ring brackets are mounted to the end fitting. Grading ring installation instructions shall be packed with each insulator in a waterproof, ultraviolet-light resistant plastic envelope or other waterproof, Seattle City Light approved means.

5. Notice of Changes

Manufacturer shall provide Seattle City Light reasonable notice of anticipated design changes. This includes, but is not limited to, changes in polymer formulation, dimensions, electrical characteristics, mechanical characteristics, or accessories.

6. Testing

Insulator test data that establishes compliance with the requirements of ANSI C29.9, Section 7 shall be provided upon request.

7. Marking

Insulator shall be clearly and indelibly marked in accordance with ANSI C29.9, Section 6. Load ratings shall be stated in units of pounds.

Labeling shall be in English.

8. Packaging

Insulators shall be packaged in wood crates to protect against physical damage that could occur during shipping, handling, or long-term outside storage. If slatted crates are used, each insulator shall be sealed in plastic. If sealed crates are used, plastic is not required.

Insulator weathersheds shall not bear any load due to its own weight or that of insulators or crates above or below it.

Crates shall be secured to pallets for handling by forklift. Pallets shall not exceed 4 feet in height or 1,000 pounds in weight. Crates shall be marked with the manufacturer's name or symbol, catalog number, Seattle City Light's Stock Number, and Purchase Order number.

Number of insulators per crate: 18 maximum.

9. Issuance

Stock Unit: EA

10. Approved Manufacturers

Manufacturer	Catalog No.
MacLean Power Systems (Reliable Power Products)	NAA100XH46S1
NGK-Locke	S2-SN471-22-W

INSULATOR, SUSPENSION, POYLMER, FOR 26.4 KV SYSTEMS

1. Scope

This standard applies to overhead distribution polymer, suspension insulators.

This standard applies to the following Seattle City Light Stock Numbers:

Stock No	Nominal Section Length, in
690233	20
690235	25

2. Application

Suspension insulators are intended for use in overhead distribution systems nominally rated up to 26.4 kV phase-to-phase, 60Hz.

Insulators with a nominal section length of 20 inches are used to deadend overhead distribution conductors.

Insulators with a nominal section length of 25 inches are used in situations where additional section length is required, such as preserving climbing space.

3. Industry Standards

Insulator shall meet the applicable requirements of the following industry standards:

ANSI C29.1-1988 (R2000) Test Methods for Electrical Power Insulators

ANSI C29.13-2000 For Insulators- Composite-Distribution Deadend Type

ASTM A153-2005 Standard Specification for Zinc Coating (Hot Dip) on Iron and Steel Hardware

4. Specifications

4.1 General

Unless indicated otherwise, all values cited below should be consistent with industry standards – they are repeated here for the convenience of the reader. Values or requirements different from industry standards are identified with the symbol ▲.

standards coordinator	*standards supervisor*	*unit director*
Aida Diop	John Shipek	Darnell Cola

4. Specifications, continued

4.1 General, continued

Insulator shall meet the following requirements:

	Stock Number		
	690233	690235	Reference
Section length, in	20 ±2 ▲	25 +1/-0 ▲	SCL preference
Class	DS-35	none	ANSI 29.13, Table 2
Strike/dry arc distance, minimum, in	13.5 ▲	20 ▲	SCL preference
Leakage distance, minimum, in	28.7	28.7	ANSI 29.13, Table 2
60 Hz dry flashover minimum, kV rms	145	145	ANSI 29.13, Table 2
60 Hz wet flashover minimum, kV rms	130	130	ANSI 29.13, Table 2
Positive critical impulse flashover, minimum, kV peak-to-peak	250	250	ANSI 29.13, Table 2
Specified Mechanical Load, minimum, lb	15,000 ▲	15,000 ▲	SCL preference
Routine Test Load, minimum, lb	7,500 ▲	7,500 ▲	SCL preference
Torsional Load, minimum, ft / lb	35	35	ANSI 29.13, Table 2

▲ values and requirements differ from industry standards

4.2 End Fittings

	Stock Number		
	690233	690235	Reference
Material	ductile iron, aluminum or forged steel	ductile iron, aluminum or forged steel	SCL preference
End fitting type (top/structure) end	clevis, ANSI 52-2 class	clevis, ANSI 52-2 class	ANSI 29.13, Figure 1
End fitting type (bottom/line) end	tongue, ANSI 52-2 class	tongue, ANSI 52-2 class	ANSI 29.13, Figure 1

Clevis pin shall be nominal 5/8-inch diameter.

Cotter pin shall be stainless steel and humped; self-retaining and self-locking after each installation.

4.3 Weathershed/Sheath Material

Weathershed/sheath material shall be made out of silicon rubber – to qualify as silicon type, weathershed/sheath material must be composed of at least 33% silicon by weight; “EP silicon alloys” do not qualify.

Parting lines along the weathershed/sheath must be kept to a minimum so as to reduce the likelihood of tracking when contaminated.

Weathershed/sheath material shall be gray.

5. Notice of Change

Manufacturer shall provide Seattle City Light reasonable notice of anticipated design changes. This includes, but is not limited to, changes in polymer formulation, dimensions, electrical characteristics, mechanical characteristics, or accessories.

6. Testing

Insulator test data that establishes compliance with the requirements of ANSI C29.13, Section 7 shall be provided upon request.

7. Marking

Suspension insulators shall be clearly and indelibly marked in accordance with ANSI C29.13-2000, Section 6. Marking shall include but not limited to:

- Manufacturer's name or symbol
- Year of manufacture
- Product Identification Number

8. Packaging

Suspension insulators shall be packaged in a way that prevents damage during shipping, handling, and long-term outside storage.

Crates shall be secured to pallets for handling by forklifts. Pallets shall not exceed 4 feet in height or 1,000 pounds in weight.

Individual packages shall be legibly marked with:

- Manufacturer's name
- Manufacturer's catalog number
- Seattle City Light's Stock Number

Shipping containers shall be legibly marked with:

- Seattle City Light's Purchase Order Number
- Seattle City Light's Stock Number

8. Issuance

Stock Unit: EA

9. Approved Manufacturers

Stock Number	Nominal Section Length, in	Manufacturers and Catalog Numbers				
		APR Advanced Rubber Products	Hubbell Power Systems (Ohio Brass)	K-Line	MacLean Power Systems (Reliable)	Salisbury by Honeywell
690233	20	ARP-35SKCE-S	4010250215	KL35SCTM	DS-35M	9503U-SI
690235	25	ARP-35SKCE-SHP	4010350215	-	-	-

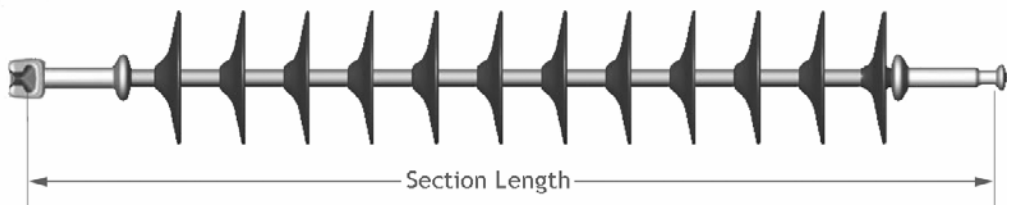
10. References

Diop, Aida; SCL Standards Engineer, subject matter expert for 6902.30 (aida.diop@seattle.gov)

Parker, Sean; SCL Standards Student Intern, subject matter expert for 6902.30

Shipek, John; SCL Standards Engineer, subject matter expert for 6902.30 (john.shipek@seattle.gov)

INSULATOR, SUSPENSION, POLYMER FOR 115 kV NOMINAL SYSTEMS



Note: Size and number of actual weathersheds will vary.

1. Scope

This Standard applies to polymer, suspension insulators used to construct 115 kV transmission lines. Insulators have an ANSI 52-5 type J socket on their structure end and an ANSI 52-5 type J ball on their line end.

This material Standard applies to the following Seattle City Light Stock Number: 690237

2. Industry Standards

Insulators shall meet the applicable requirements of the following national standards:

ANSI C29.1-1988 (R2002) Test Methods for Electrical Power Insulators

ANSI C29.2-1992 (R1999) Wet Process Porcelain and Toughened Glass - Suspension Type

ANSI C29.11-1989 (R1996) Tests for Composite Suspension Insulators for Overhead Transmission Lines

ASTM A153-1982 Zinc Coating (Hot Dip) on Iron and Steel Hardware

3. Requirements

60 Hz dry flashover:	395 kV rms minimum
60 Hz wet flashover:	356 kV rms minimum
Positive critical impulse flashover:	600 kV crest minimum

3. Requirements, continued

Horizontal coupling length:	50″ (plus 3″, minus 2″)
Leakage:	105″ minimum
Strike/dry arc distance:	38″ minimum
Specified mechanical load (SML) as defined by ANSI C29.11-1989 (R1996):	30,000 lbs. minimum
Routine test load (RTL):	15,000 lbs. minimum, where RTL is defined as 50% of SML.
End fitting type (top/structure end):	ANSI 52-5, type J socket according to ANSI C29.2-1992 (R1999), Table 3, with stainless steel humped cotter key.
End fitting type (bottom/line end):	ANSI 52-5, type J ball according to ANSI C29.2-1992 (R1999), Table 3.
Weathershed/sheath material:	silicon rubber – to qualify as silicon type, weather-shed/sheath material must be composed of at least 33% silicon by weight; “EP/silicon alloys” do not qualify.
Weathershed/sheath material color:	gray

standards coordinator	*standards supervisor*	unit director
Tanya Panomvana	John Shipek	Darnell Cola

4. Notice of Changes

Manufacturer shall provide Seattle City Light reasonable notice of anticipated insulator design changes. This includes, but is not limited to, changes in polymer formulation, dimensions, electrical characteristics, mechanical characteristics, or accessories.

5. Marking

Insulators shall be clearly and indelibly marked according to ANSI C29.11-1989 (R1996), section 6.

Load ratings shall be stated in units of pounds.

Labeling shall be in English.

6. Packaging

Insulators shall be packaged in wood crates to protect against physical damage that could occur during shipping, handling, or long-term outside storage. If slatted crates are used, each insulator shall be sealed in plastic. If sealed crates are used, plastic is not required.

Insulator weathersheds shall not bear any load due to its own weight or that of insulators or crates above or below it.

Crates shall be secured to pallets for handling by forklift. Pallets shall not exceed 4 feet in height or 2,000 pounds in weight. Crates shall be marked with the manufacturer's name or symbol, catalog number, Seattle City Light's Stock Number, and Purchase Order number.

Number of insulators per crate: 50 maximum.

7. Stock Unit: EA

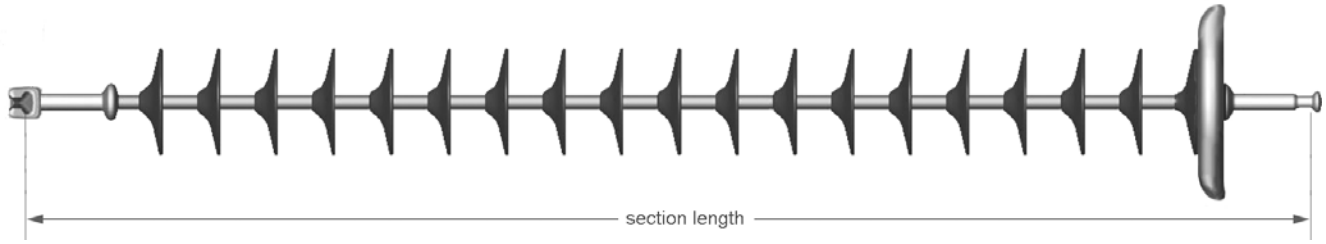
8. Approved Manufacturers

Manufacturers	Type	Catalog No.
Hubbell Power Systems (Ohio Brass)	QuadriSil	S030040S3010
MacLean Power Systems	S5 Series	S578052VX05
NGK-Locke	SS Shed Series	301–SS310–SJ

9. References

Panomvana, Tanya, SCL Standards Engineer and subject matter expert for 6902.35 (tanya.panomvana@seattle.gov)

INSULATOR, SUSPENSION, POLYMER FOR 230 KV NOMINAL SYSTEMS



1. Scope

This standard applies to 230 kV polymer, suspension insulators.

This material standard applies to the following Seattle City Light Stock Number: 012782.

2. Application

Insulator is intended for use in overhead transmission systems nominally rated up to 230 kV phase-to-phase, 60Hz.

3. Industry Standards

Insulator shall meet the applicable requirements of the following industry standards:

ANSI C29.1-1988 (R2002) Test Methods for Electrical Power Insulators

ANSI C29.2-1992 (R1999) Insulators – Wet-Process Porcelain and Toughened Glass – Suspension Types

ANSI C29.11-1989 (R1996) Tests for Composite Suspension Insulators for Overhead Transmission Lines

ANSI C29.12-1997 (R2002) Insulators—Composite Suspension Type

ASTM A153-2005 Standard Specification for Zinc Coating (Hot Dip) on Iron and Steel Hardware

4. Construction

4.1 General

Insulator shall meet the following requirements (with the grading ring installed):

section length, in.	89 (± 2)
strike/dry arc distance, minimum, in	75
leakage distance, minimum, in	150
60 Hz dry flashover minimum, kV RMS	725
60 Hz wet flashover minimum, kV RMS	625
positive critical impulse flashover, minimum, kV peak-to-peak	1105
specified mechanical load, minimum, lb	30,000
routine test load, minimum, lb	15,000

4.2 Weathershed/Sheath Material

Weathershed/sheath material shall be made out of silicon rubber – to qualify as silicon type, weathershed/sheath material must be composed of at least 33% silicon by weight; “EP silicon alloys” do not qualify.

Parting lines along the weathershed/sheath must be kept to a minimum so as to reduce the likelihood of tracking when contaminated.

Weathershed/sheath material shall be gray.

standards coordinator	*standards supervisor*	*unit director*
John Shipek	John Shipek	Darnell Cola

4. Construction, continued

4.3 End Fittings

Insulator shall meet the following requirements:

	Requirements	Reference
material	ductile iron or forged steel	SCL preference
end fitting type (top/structure end)	socket, ANSI 52-5 class	ANSI C29.2 Table 3
end fitting type (bottom/line end)	ball, ANSI 52-5 class	ANSI C29.2 Table 3

Cotter key shall be stainless steel and humped, self-retaining and self-locking after each installation.

4.4 Grading Ring

One 9″ diameter (plus/minus 3″) grading ring shall be provided for the line end of each insulator.

Grading rings shall be designed to allow easy installation and removal with the conductor in place.

No information bands or tags shall be placed in the area where the grading ring brackets are mounted to the end fitting.

Grading ring installation instructions shall be packed with each insulator in a waterproof, ultraviolet-light resistant plastic envelope or other waterproof, Seattle City Light approved means.

5. Notice of Changes

Manufacturer shall provide Seattle City Light reasonable notice of anticipated design changes. This includes, but is not limited to, changes in polymer formulation, dimensions, electrical characteristics, mechanical characteristics, or accessories.

6. Testing

Insulator test data that establishes compliance with the requirements of ANSI C29.11, Section 7 shall be provided upon request.

7. Marking

Insulator shall be clearly and indelibly marked in accordance with ANSI C29.12, Section 6.

Load ratings shall be stated in units of pounds.

Labeling shall be in English.

8. Packaging

Insulators shall be packaged in wood crates to protect against physical damage that could occur during shipping, handling, or long-term outside storage. If slatted crates are used, each insulator shall be sealed in plastic. If sealed crates are used, plastic is not required.

Insulator weathersheds shall not bear any load due to its own weight or that of insulators or crates above or below it.

Crates shall be secured to pallets for handling by forklift. Pallets shall not exceed 4 feet in height or 1,000 pounds in weight. Crates shall be marked with the manufacturer's name or symbol, catalog number, Seattle City Light's Stock Number, and Purchase Order number.

Number of insulators per crate: 18 maximum

9. Issuance

Stock Unit: EA

10. Approved Manufacturers

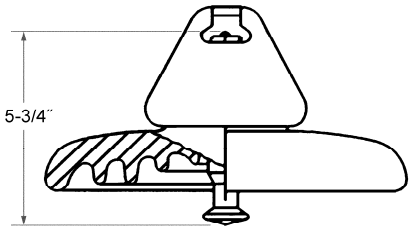
Manufacturer	Catalog Number
MacLean Power Systems (Reliable Power Products)	S57080089VA
NGK-Locke	301-SC640-SJ-08
Hubbell Power Systems	S030077S301AP1

11. References

Diop, Aida; SCL Engineer; subject matter expert for 6902.37 (aida.diop@seattle.gov)

Shipek, John; SCL Engineer; subject matter expert for 6902.37 (john.shipek@seattle.gov)

INSULATORS, SUSPENSION
PORCELAIN BALL AND SOCKET TYPE



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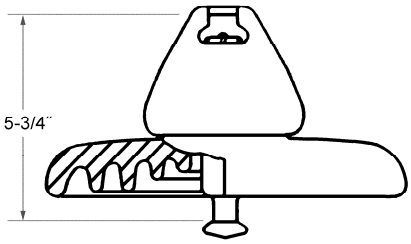

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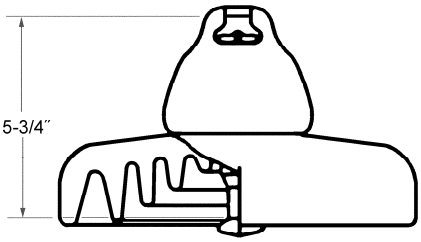


690220

1. Scope

This specification covers 10-inch diameter standard and fog type porcelain ball and socket type suspension insulators.

2. Industry Standards

Insulators shall meet all applicable requirements of the following National Standards:

ANSI Standard C29.2-1992 (R1999), Wet-Process Porcelain and Toughened Glass - Suspension Type Insulators.

3. Requirements

Stock Number	690210	690214	690215	690220
ANSI Class	52-3	52-5	52-5	52-3*
Leakage Distance, in.	11.5	11	11	17
M&E Strength, lbs.	15,000	25,000	25,000	15,000
Flashover, kV, Dry	80	80	80	80
Flashover, kV, Wet	50	50	50	50
Color	brown	gray	brown	gray

* Increased leakage version of 690210.

4. Cotter Pins

Shall be made of stainless steel and shall be self-retaining and self-locking after installation.

5. Marking

Each insulator shall bear symbols identifying the manufacturer and giving the year of manufacture and the tension proof load in pounds, identified by the word “TEST”. The markings shall be legible and durable.

STANDARDS COORDINATOR	STANDARDS SUPERVISOR	UNIT DIRECTOR
Charles L. Shaffer	John C. Skinner	Hardev Juj

6. Packaging

Insulators shall be securely crated and assembled with cotter pins in place. Class 52-3 and 52-5 insulators shall be assembled in six-unit strings, and the fog type insulators in five-unit strings. Each crate shall be marked with the manufacturer's name and catalog number of the insulators contained therein.

7. Stock Unit: EA

8. Approved Manufacturers

	Catalog Numbers	
Stock Number	**Lapp**	**NGK-Locke**
690210	8200	20S840 (brown)
690214	5960A-70	30S255 (light gray)
690215	5960A	–
690220	302268-70	CA-826MC (light gray) or CA-825ME (brown)*

* This item is non-conforming in color. Purchase only with specific approval of transmission engineer.

INSULATOR, PORCELAIN, SPOOL AND CLEVISES

1. Scope

This standard covers the requirements for porcelain spool insulators and their assembly parts.

This standard applies to the following Seattle City Light Stock Numbers:

Stock No	Spool ANSI C29.3 Class	Description
690658	53-1	spool only
690656	53-2	spool only
690455	53-1	with clevis
690452	53-2	with clevis
690458	53-5	with clevis

2. Application

Stock Numbers 690452, 690455, 690456, and 690658 are used to deadend a variety of secondary conductors.

Stock Number 690458 is used to deadend common neutral conductors.

3. Industry Standards

Porcelain spool insulators and their assembly parts shall meet the requirements of the following national standards:

ANSI C29.3-1986 – American National Standard for Wet Process Porcelain Insulators-Spool Type

ASTM A153 / A153M - 09 Standard Specification for Zinc Coating (Hot-Dip) on Iron and Steel Hardware

ASTM A 568/A 568M – 95, Standard Specification for Steel, Sheet, Carbon, and High-Strength, Low-Alloy, Hot-Rolled and Cold-Rolled, General Requirements for

EEI TD-1, 1949 – Specifications for Steel Bolts and Nuts, approved by the Transmission and Distribution Committee Edison Electric Institute

standards coordinator	*standards supervisor*	*unit director*
Aida Diop	John Shipek	Darnell Cola

4. Requirements

Porcelain spool insulators and their assembly parts shall meet the following requirements:

	Stock No				
	690658	690656	690455	690452	690458
ANSI C29.3 Class	53-1	53-2	53-1	53-2	53-5
60 Hz, dry flashover, kV rms, nominal	20	25	20	25	35
60 Hz, wet flashover, kV rms, nominal					
vertical	8	12	8	12	18
horizontal	10	15	10	15	25
Length, in, nominal	2.13	3	2.13	3	4.13
Mechanical strength, lbs, nominal	2000	3000	2000	3000	6000
Groove diameter, in, nominal	0.83	1.3	0.83	1.3	0.83
Insulator neck type	"A"	"A"	"A"	"A"	"F"
Clevis hole diameter, in, nominal	na	na	11/16	11/16	11/16
Clevis pin diameter, in, nominal	na	na	5/8	5/8	5/8
Clevis material	na	na	flat steel	flat steel	flat steel
Clevis yokes	na	na	hot rolled carbon steel in accordance with ASTM A568/A 568M	hot rolled carbon steel in accordance with ASTM A568/A 568M	hot rolled carbon steel in accordance with ASTM A568/A 568M
Buttonhead spool pins	na	na	according to EEI TD-1	according to EEI TD-1	according to EEI TD-1
Cotter pins City Light special	na	na	self retaining and self locking	self retaining and self locking	self retaining and self locking

The color of the spool insulator porcelain shall be gray, according to C29.3, Section 5.2.

All steel parts shall be hot-dipped galvanized according to ASTM A153.

5. Testing

Test data that establishes compliance with the requirements of ANSI C29.3, Section 8 shall be provided upon request.

6. Marking

Porcelain spool insulators shall be clearly and indelibly marked in accordance with ANSI C29.3, Section 7.

Marking shall include but not be limited to:

- Manufacturer's name or symbol
- Year of manufacture
- Product Identification Number

7. Packaging

Stock Numbers 690452, 690455, and 690458 shall be assembled in accordance with EE1 packaging standards.

Porcelain spool insulators shall be packaged in a way that prevents damage during shipping, handling, and long-term outside storage.

Crates shall be secured to pallets for handling by forklifts. Pallets shall not exceed 4 feet in height or 1,000 pounds in weight.

Individual packages shall be legibly marked with:

- Manufacturer's name
- Manufacturer's catalog number
- Seattle City Light's Stock Number

Shipping containers shall be legibly marked with:

- Seattle City Light's Purchase Order Number
- Seattle City Light's Stock Number

8. Issuance

Stock Unit: EA

9. References

Diop, Aida; SCL Standards Engineer, subject matter expert and originator of 6904.10 (aida.diop@seattle.gov)

10. Approved Manufacturers

	Manufacturers and Catalog Numbers					
Stock No	Hubbell Power Systems, Inc (Chance)	Kortick	MacLean Power Systems	PPC Insulators (Seves)	Santana Terezinha (CST)	Victor Insulators, Inc.
Insulator only						
690658	C909-1031	-	-	5112	1101	VI 2611
690656	DE4S5	-	J151	5101	1108	VI 2612
Insulator assembled with clevis						
690455	0341 with C909-1031	K9101 with K524 (gray)	-	-	-	-
690452	-	K9245 with K516 (gray)	J0342 with J151	-	-	-
690458	0344 with C909-1035	K9104 with K540 (gray)	-	-	-	-

BRACKET – WITH SECONDARY SPOOL INSULATOR, ASSEMBLED

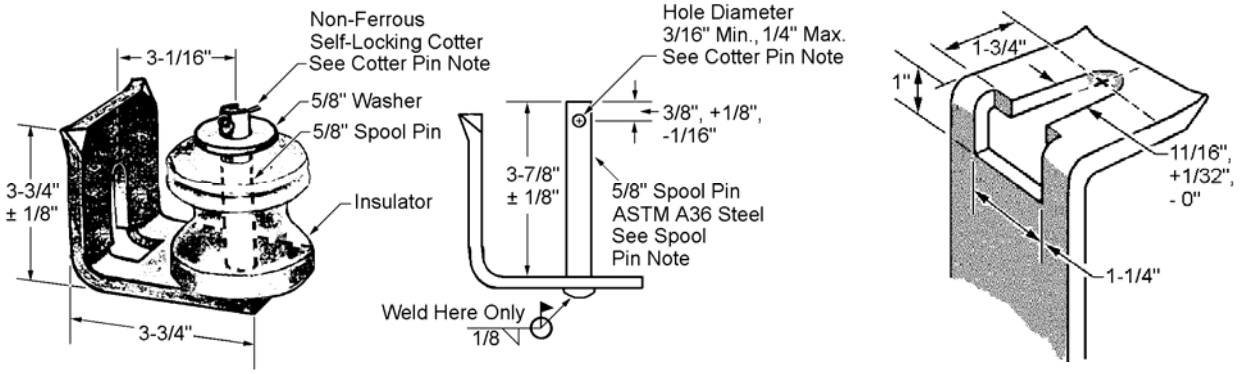


Figure 1, Angle Bracket, Small

Stock Number 690402
All linear dimensions to be ± 1/8" unless specific tolerance is shown.

1. **Angle Brackets** shall be of the configurations and dimensions shown, and shall be made of hot-rolled carbon steel. The steel shall meet the requirements of ASTM Specification A 569. See page 2 for Angle Bracket, Large (Stock Number 690404).

2 **Industry Standards**

Angle brackets shall meet the applicable requirements of the following industry standards:

A 569; "Steel Carbon, Hot-Rolled Sheet & Strip, Commercial"; ASTM

A153; "Standard Specification for Zinc Coating (Hot-Dip) on Iron and Steel Hardware"; ASTM

A36; "Standard Specification for Carbon Structural Steel"; ASTM

C29.3; "Wet-Process Porcelain Insulators-(Spool Type)"; ANSI

6906.1; "Insulators, Porcelain Spool"; *SCL Construction Guidelines*

3. **Galvanizing:** The brackets shall be galvanized, after assembly, in accordance with ASTM Specification A 153 (3 mils minimum). Hole diameters are minimums following plating. Maximum diameter following plating shall not exceed + 1/32 inch.

4. **Spool Pins** shall be firmly affixed to the brackets by welding. The welding shall only be on the side opposite the spool location. The hole to receive the 5/8 inch spool pin shall be the minimum diameter to allow clearance of the pin. The steel shall meet the requirements of ASTM Specification A 36.

5. **Cotter Pins** shall be made of hard-drawn bronze or stainless steel, and shall be self-locking. The cotter pin must be of an appropriate size to allow insertion with reasonable force and withdrawal with 4 lb. minimum force.

6. **Insulator**. The insulator, of the configuration shown, below, **shall be assembled on the bracket**. The insulator shall be made of commercial-grade, wet-process porcelain in accordance with ANSI C29.3. The color of the glaze shall by Sky Gray, ANSI No. 70. (Brown may be accepted, **upon approval**, only if Sky Gray is unavailable.) Note, insulators listed on SCL Material Standard 6906.1 may be substituted.

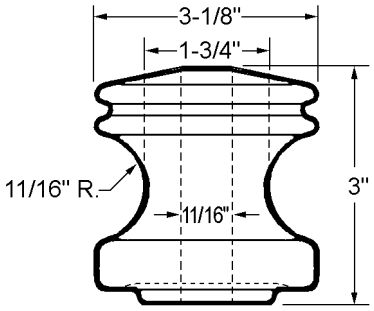


Figure 2, ANSI, Class 53-2

standards coordinator	*standards manager*	*unit director*
John Shipek	John Shipek	Pam S. Johnson

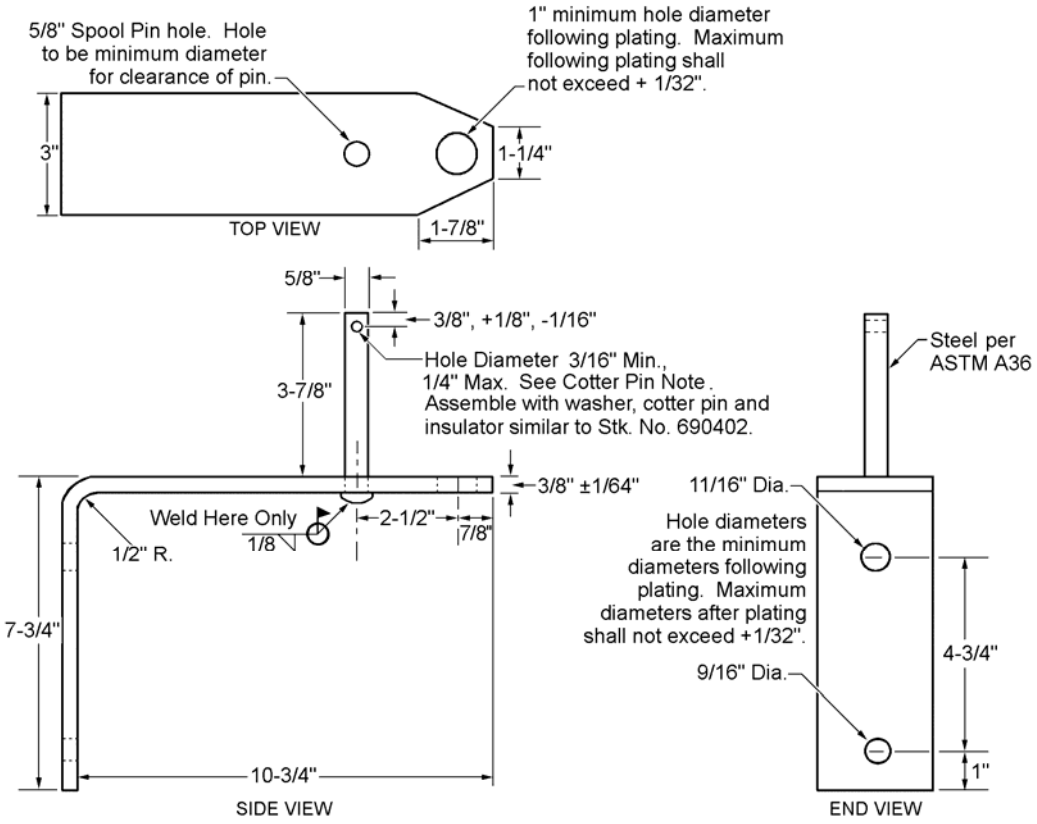


Figure 3, Angle Bracket, Large

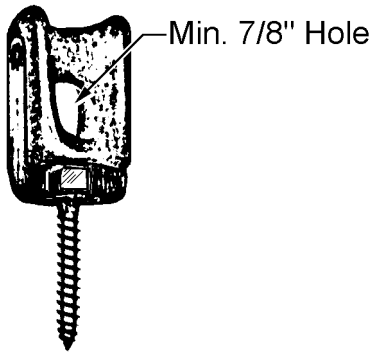
Stock Number 690404
All linear dimensions to be ± 1/8" unless specific tolerance is shown.

7. Stock Unit: EA

8. Approved Manufacturers

Angle Bracket	Figure	Stock Number	Wilcor
small	1	690402	WAPRS
large	3	690404	WAPRS-X

REINFORCED PORCELAIN WIREHOLDERS



Reinforced Porcelain Wireholders shall be similar to configuration shown and shall be made of a good commercial grade, dry-process porcelain in accordance with EEI specification TD-24, except for dimensional changes shown in the figure above.

The color of the porcelain glaze shall be sky gray. Standard brown glaze may be accepted, on approval, only if the gray color is not available.

The wood screw shall be #22 x 2-1/4 inches. Minimum length shall be 2-1/8 inches.

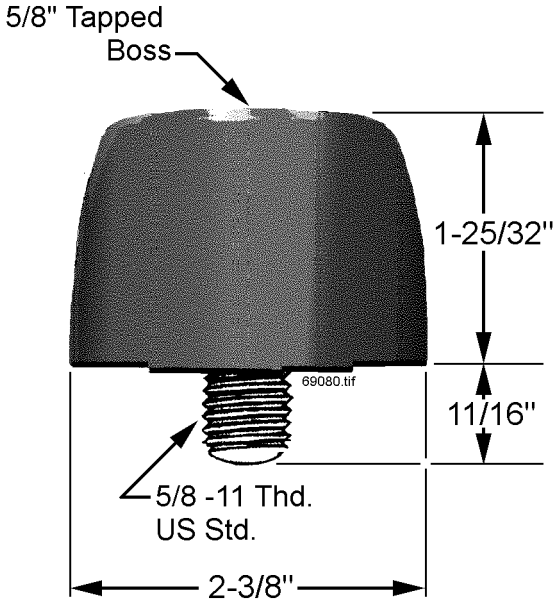
Reference Specification: EEI TD-24, latest revision

Stock Unit: EA

Stock Number	Approved Manufacturers				
	Cooper	**FWC**	**Hubbell/ Chance**	**Joslyn**	**Porcelain Products**
690706	DW2R 9	FW089SG	3-11-44	J089HG	1986

ORIGINATOR	STANDARDS COORDINATOR	STANDARDS SUPERVISOR	UNIT DIRECTOR
Jim S. Horn	Charles L. Shaffer	John C. Skinner	Haedee Jay

INSULATOR, PHENOLIC SPOOL
NEUTRAL BUS SUPPORT



General: Molded phenolic insulator is intended for a maximum of 750 volt service. All threads are 5/8" - 11 NC with a minimum of 11/16" thread depth. Cantilever rating is 250 foot pounds (minimum).

Stock Unit: EA

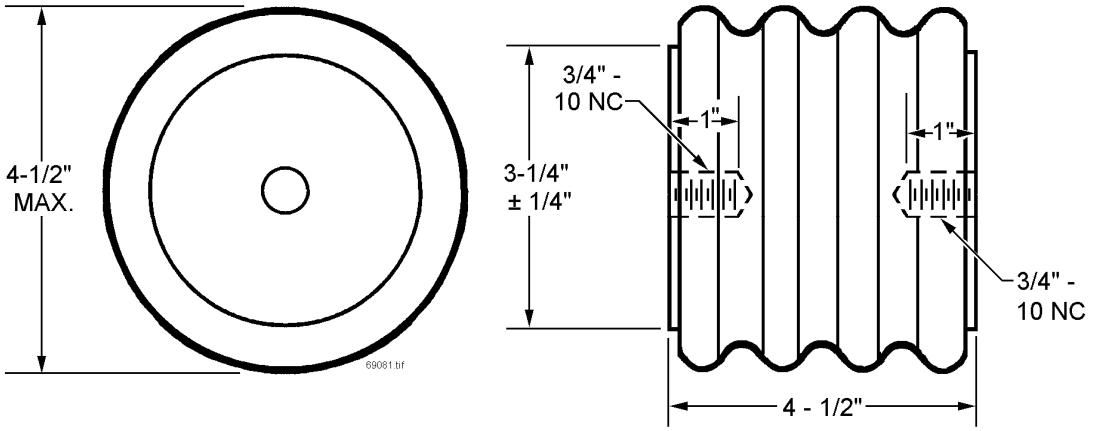
Stock Number: 690880

Approved Manufacturer: O.B. Products #16835

Phoenix Mining Equip. #8525

ORIGINATOR	STANDARDS COORDINATOR	STANDARDS SUPERVISOR	UNIT DIRECTOR
Jim S. Horn	Charles L. Shaffer	John C. Skinner	Haedw Jay

INSULATOR
BUS BAR SUPPORT
UNDERGROUND VAULT



The insulator shall be of the configuration shown and meet the requirements of the latest revision of ANSI C37.31 tables 1 and 4 for class A indoor insulators. Material shall be composite (not porcelain).

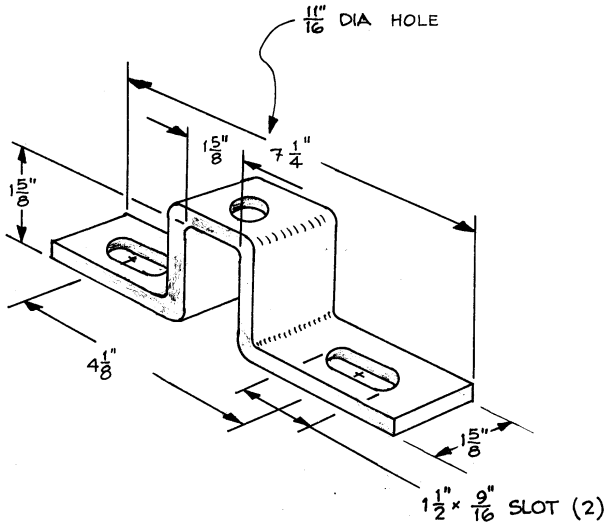
Reference Specifications: ANSI C37.31

Stock Unit: EA

Stock Number	BIL kV	Rating kV	Bending Moment at Base: In-lbs	Torsion In.-Lbs	Tension Lbs	NEMA Class	Approved Manufacturers
							C-K Composites
690856	75	7.5	21,000	6,000	5,000	A-30	16-D-7191 REV. 2

ORIGINATOR	STANDARDS COORDINATOR	STANDARDS SUPERVISOR	UNIT DIRECTOR
Jim S. Horn	Charles L. Shaffer	John C. Skinner	Harold Jay

BASE, NEUTRAL BUS SUPPORT



1. **Material:** Support shall be formed from 1/4" steel, electro-galvanized after forming, or may be any of the following standard 1-5/8" x 1-5/8" channel mounting brackets modified by increasing the diameter of the existing 9/16" center hole to 11/16" as shown.

   CAUTION: If a standard channel bracket is used to manufacture this part, the redrilled hole shall be deburred and re-plated.

3. **Stock Unit:** EA

4. **Stock No.:** 690882

5. **Approved Manufacturers and Catalog Numbers:**

B-Line	Eristrut	Superstrut	Unistrut	Wesanco
B333-1NS11/16	U13SCL	AN259-1SCL	P1048	W-5307-M-E/G

Wildlife Protection Products, Assorted

1. Scope

This standard covers the requirements for an assortment of small wildlife protection products.

This standard applies to the following Stock Numbers:

Stock No.	Description
013038	Raptor protection cover, single arm/pin construction
013039	Raptor protection cover, double arm/pin construction
013040	Line and insulator protector, single pin/arm
013041	Pin insulator cover
013042	Cutout cover, Kaddas Enterprises, Inc.
013043	Wildlife connector cap
580776	Wildlife guard
013359	Conductor marker/diverter, flapper
013360	Conductor marker/diverter, round
013582	Bushing cover, 15 – 35 kV

2. Application

The products specified in this standard are intended to cover a variety of exposed high-voltage parts commonly found on the 26.4 kV, overhead distribution system for the purpose of protecting small birds, such as crows and pigeons, and other wildlife from electrical shock.

Stock number 013360 may also be effective in diverting large birds such as swans, eagles, ducks, and geese.

Products are suitable for indoor or outdoor applications and are non-tracking.

Operations personnel shall determine if products may be installed on energized systems or if equipment must be de-energized and grounded first. It should not be necessary to disassemble system components to install protection products.

Protective products may be cut to improve fit.

Operations personnel are encouraged to try different products and report their experiences and findings to Standards.

For additional information, refer to Construction Standard 0072.01 - Avian and Wildlife Protection, Small Birds and Animals.

3. Product Requirements

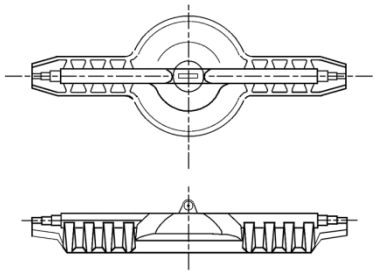
3.1 Stock Number 013038

Description	**Raptor protection cover**, single arm/pin construction
Manufacturer	Tyco Electronics/Raychem
Catalog Number	BCIC-G-PIN-556-01
Color	Gray
Material	Track resistant, UV resistant, polymer
Overall length	42 inches
Specific application	Product is installed over vertical, tie-top, "F" neck, Class 57-2 porcelain insulators or over vertical, clamp top, Class 57-12 porcelain insulators. Tie-top, "F" neck insulators are typically used with 397.5 kcmil (Chickadee) or smaller conductor. Clamp top insulators are typically used with 954 kcmil (Rail) conductor. Flexible cover allows conductors to exit up to 30 degree angles from any axis.

3.2 Stock Number 013039

Description	**Raptor protection cover**, double arm/pin construction
Manufacturer	Tyco Electronics/Raychem
Catalog Number	BCIC-G-DPIN-556-01
Color	Gray
Material	Track resistant, UV resistant, polymer
Overall length	42 inches
Specific application	Product is installed over vertical, tie-top, "F" neck, Class 57-2 porcelain insulators or over vertical, clamp top, Class 57-12 porcelain insulators. Tie-top, "F" neck insulators are typically used with 397.5 kcmil (Chickadee) or smaller conductor. Clamp top insulators are typically used with 954 kcmil (Rail) conductor. Flexible cover allow conductors to exit up to 30 degree angles from any axis.

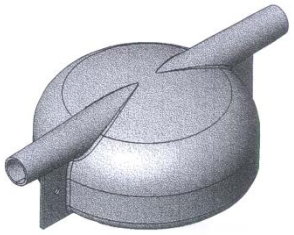
3.3 Stock Number 013040



Description	**Line and insulator protector**, single pin/arm construction
Manufacturer	Kaddas Enterprises
Catalog Number	KE1039-F-GR, Reference 27017
Color	Gray
Material	Fire retardant, flame resistant ABS/PVC blend with UV inhibitors
Overall length	32 inches
Specific application	Product is installed over vertical, tie-top, "F" neck, Class 57-2 porcelain insulators or over vertical, clamp top, Class 57-12 porcelain insulators. Tie-top, "F" neck insulators are typically used with 397.5 kcmil (Chickadee) or smaller conductor. Clamp top insulators are typically used with 954 kcmil (Rail) conductor.

3. Product Requirements, continued

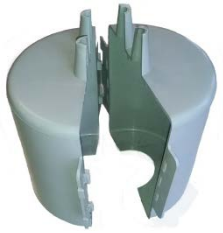
3.4	**Stock Number**	**013041**
	Description	**Pin insulator cover**
	Manufacturer	Midsun Group
	Catalog Number	126-00-01
	Color	Gray
	Material	Silicone rubber
	Overall length	15 inches
	Specific application	Product is installed over vertical, tie-top, "F" neck, Class 57-2 porcelain insulators. Tie-top, "F" neck insulators are typically used with 397.5 kcmil (Chickadee) or smaller conductor.



3.5	**Stock Number**	**013042**
	Description	**Cutout cover with fastener pin**
	Manufacturer	Kaddas Enterprises, Inc.
	Catalog Number	KE1183-BR or KE1138-GR
	Color	Brown or Gray
	Material	Fire retardant, flame resistant base material with UV inhibitors
	Specific application	Product is installed over 100 ampere, open type, porcelain cutouts, Seattle City Light Stock Number 682099, and locked with a pin.

3.6	**Stock Number**	**013043**
	Description	**Wildlife connector cap**
	Manufacturer	Central Moloney
	Catalog Number	70380326
	Color	Gray
	Material	Molded glass-filled polyester
	Specific application	Product is used to add wildlife protection to overhead distribution transformer primary bushings. Unscrew the original connector and install new connector in its place. Connector will accept copper or aluminum conductor up to 2/0 AWG. Note: All new overhead transformers are already provided with this type of protective connector.

3.7	**Stock Number**	**580776**
	Description	**Wildlife guard**
	Manufacturer	Colt Industries/Central Moloney
	Catalog Number	703803-85
	Color	Gray
	Material	UV stabilized polypropylene
	Specific application	Hinged cover snaps and locks around overhead distribution transformer primary bushings. This cover is approximately 5 inches in diameter and may be used with other types of equipment.



3. Product Requirements, continued

3.8	**Stock Number**	**013359**
	Description	**Conductor marker/diverter, flapper**
	Manufacturer	P&R Technologies, Inc.
	Catalog Number	FF-HW
	Color	Combination of fluorescent, highly reflective, and glow-in-the-dark surfaces
	Material	Weather resistant ABS Makrolon plastic and stainless steel spring

Specific application	Product is attached along spans of primary conductor to protect birds in flight from colliding with overhead power lines, guy wires, communications towers, and other thin profile obstructions. The device can also be used to haze birds from buildings and structures. Fits conductor 0.375″ – 2.75″ in diameter. Device can be installed on live power lines with a hot stick and a (non-stock) proprietary P&R Technologies "SnapFast" installation tool. Recommended spacing is every 30 feet.

3.9	**Stock Number**	**013360**
	Description	**Conductor marker/diverter, round**
	Manufacturer	P&R Technologies, Inc.
	Catalog Number	BM-AG
	Color	See Application Section below.
	Material	Weather resistant ABS plastic and stainless steel spring

Specific application	Product is attached along a span of primary conductor. Device stand out like a beacon against background features, letting birds see where the power lines are. When swaying in the wind, the device also make a noise that birds can hear. Highly reflective orange and yellow tape is positioned in the center of each device to further assist in warning birds. Device glows up to 10 hours after the sun has set, providing extended protection for at risk birds. Fits conductor 0.375″ – 2.50″ in diameter. Device can be installed on live power lines with a hot stick and a (non-stock) proprietary P&R Technologies "SnapFast" installation tool. Recommended spacing is every 30 feet.

3.10	**Stock Number**	**013582**
	Description	**Animal Protection Bushing Cover**
	Manufacturer	TE Connectivity
	Catalog Number	BCAC-5D/8
	Color	Gray
	Material	Cross-linked polymer

Specific application	Hot-stickable insulating cover designed to prevent animal-related outages on pole-top transformer bushings. Fits bushing sizes ranging from 15 to 35 kV.

4. Packaging

Products shall be packaged to prevent damage during shipping, handling, and storage.

5. Issuance

Stock Unit: EA (for all products)

6. Approved Manufacturers

Approved manufacturers and catalog numbers are cited in Section 3 of this standard.

7. References

SCL Construction Standard 0072.01; "Avian & Wildlife Protection, Small Birds and Animals"

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

Midsun Group; Pin Insulator Cover, Drawing Part No. 126-00-01, dated 8/10/2005

P&R Technologies, Inc.; www.pr-tech.com

8. Sources

4-1773455-0 E361; "Energy Ready Reference Guide, Generation, Distribution, Transmission," Tyco Electronics; 12/09

KE1039; Revision C; "Line Protector," Drawing; Kaddas Enterprises; Released 05-11-08

Shipek, John; SCL Standards Engineer, subject matter expert and originator of 6910.10 (john.shipek@seattle.gov)

TE Connectivity; www.te.com

SPLIT, SILICONE RUBBER, INSULATING HOSE

1. Scope

This material standard covers the requirements for split, silicone rubber, insulating hose.

This standard applies to the Seattle City Light Stock Numbers shown in Table 1.

Table 1

Stock Number	Conductor Diameter Use Range, in	Application
013044	up to 0.45	#4 AWG - 2/0 AWG
013045	0.50 - 0.75	3/0 AWG - 336.4 kcmil
013046	0.75 - 1.00	397.5 kcmil - 636 kcmil
013047	1.00 - 1.20	666.6 kcmil - 954 kcmil

2. Application

Insulating hose is used to cover bare, high-voltage leads and jumpers for the purpose of protecting small birds and other wildlife from electrical shock.

Insulating hose is suitable for indoor or outdoor applications, non-tracking, and easy to install over existing conductor. Refer to Table 1 for more-specific application information.

Insulating hose may only be installed on de-energized and grounded systems.

Insulating hose is not appropriate for covering spans of bare conductor; it would be too time-consuming to install.

For additional information, refer to Construction Standard 0072.01 - Avian and Wildlife Protection, Small Birds and Animals.

3. Attributes

Insulating hose shall have the following attributes:

Base material	silicone rubber
Color	gray
Continuous operating temperature, maximum	90 degrees C
Install temperature, minimum	0 degrees C
Withstand voltage, one minute dry, AC, minimum	20 kV

Insulating hose shall have the nominal dimensions cited in Table 1.

4. Packaging

Insulating hose shall be packaged to prevent damage during shipping, handling, and storage.

Individual packages or spools shall be legibly marked with:

- Manufacturer's name
- Manufacturer's catalog number
- Product description
- Seattle City Light's Stock Number

Shipping containers shall be legibly marked with:

- Seattle City Light's Purchase Order Number
- Seattle City Light's Stock Number

standards coordinator	*standards manager*	*unit director*
John Shipek	John Shipek	Pam S. Johnson

5. Issuance

Stock Unit: RL

6. Approved Manufacturers

Stock Number	Tyco Electronics Energy Division/ Raychem	Midsun Group
013044	MVCC-G-10/.40	E/INS-050
013045	MVCC-G-19/0.750	E/INS-075
013046	MVCC-G-25/1.0	E/INS-100
013047	-	E/INS-125

7. References

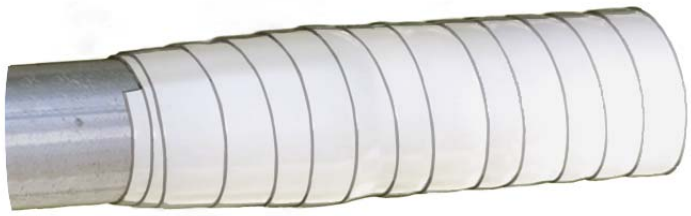
0072.01; "Avian & Wildlife Protection, Small Birds & Animals"; *Construction Standard*, SCL

4-1773455-0 E361; "Energy Ready Reference Guide, Generation, Distribution, Transmission"; Tyco Electronics; 12/09

EDR-5461, Revision 0; Tyco Electronics, Medium Voltage Conductor Cover Electrical Qualification Testing, February 3, 2009

Shipek, John; SCL Standards Engineer, subject matter expert and originator of 6910.30 (john.shipek@seattle.gov)

SELF AMALGAMATING, SILICONE RUBBER, INSULATING TAPE



1. Scope

This material standard covers the requirements for self amalgamating, silicone rubber, insulating tape.

This standard applies to the following Seattle City Light Stock Number:

Stock Number	Description
013048	2-inch wide x 36 foot long roll

2. Application

Self amalgamating, insulating tape is used to cover exposed, high-voltage conductor, bus, and fittings for the purpose of protecting small birds and other wildlife from electrical shock.

Self amalgamating, insulating tape is suitable for indoor or outdoor applications, non-tracking, and easy to install.

Self amalgamating, insulating tape may only be installed on de-energized and grounded systems.

Upon application, the tape amalgamates the overlapped layers together, producing a complete seal. A single layer of tape, two-thirds overlapped, will provide an AC voltage withstand rating of 15 kV. A second layer will increase the AC voltage withstand rating to 35 kV.

Surface should be free of sharp edges or burrs and thoroughly cleaned and degreased before applying. Use sufficient tension to provide snug fit, but do not stretch more than 10%.

Although insulating tape will stick to itself and other insulating materials, it will not adhere to metal or porcelain allowing easy removal.

For additional information, refer to Construction Standard 0072.01 - Avian and Wildlife Protection, Small Birds and Animals.

3. Attributes

Self amalgamating, insulating tape shall have the following attributes:

Base material	silicone rubber
Color	gray
Continuous operating temperature, maximum	90 degrees C
Install temperature, minimum	0 degrees C
Withstand voltage, one minute dry, AC, minimum	
One insulation layer	15 kV
Two insulation layers	35 kV

4. Packaging

Insulating tape shall be packaged to prevent damage during shipping, handling, and storage.

Individual packages shall be legibly marked with:

- Manufacturer's name
- Manufacturer's catalog number
- Product description
- Seattle City Light's Stock Number

standards coordinator	*standards manager*	*unit director*
John Shipek	John Shipek	Pamela S. Johnson

4. Packaging, continued

Shipping containers shall be legibly marked with:

- Manufacturer's name
- Manufacturer's catalog number

5. Issuance

Stock unit: RL

6. Approved Manufacturer

Stock Number	Description	Approved Manufacturer
013048	2 inch wide x 36 foot long roll	Tyco Electronics/ Raychem, MVFT-G-2-12(B4)

7. References

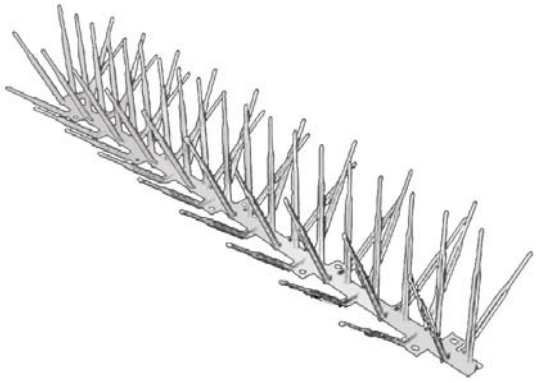
0072.01; "Avian and Wildlife Protection, Small Birds and Animals"; *Construction Standard*, SCL

EDR-5465; Medium Voltage Fusion Tape (MVFT) Electrical Qualification Testing; Tyco Electronics; January 28, 2009

PCN F1814P-000; Medium Voltage Fusion Tape, General Information and Installation Instructions, Tyco Electronics; May 1, 2009

Shipek, John; SCL Standards Engineer, subject matter expert and originator of 6910.40 (john.shipek@seattle.gov)

PLASTIC BIRD SPIKES



1. Scope

This material standard covers the requirements for plastic bird spikes.

This standard applies to the following Seattle City Light Stock Number:

Stock Number	Description
013049	7-inch coverage x 2-foot section

2. Application

Plastic bird spikes can be installed on ledges, conduit, large flat surfaces, and nesting areas to deter pigeons, crows and seagulls from landing and roosting near high voltage lines or equipment. Product is non-conductive and may be installed on overhead distribution cross arms.

Plastic bird spikes require no maintenance, are virtually unbreakable, and are UV protected.

Plastic bird spikes may be glued, nailed, screwed, or tied down. One standard tube of outdoor rated adhesive (not silicone based) will secure approximately 24 feet of spike sections to steel, brick, stone, or concrete. Use rust-proof, #8 wood screws for mounting to wood, ten screws per two-foot section. Use UV protected tie-wraps for mounting to curved surfaces.

For additional information, refer to Construction Standard 0072.01 - Avian and Wildlife Protection, Small Birds and Animals.

3. Attributes

Plastic bird spikes shall have the following attributes:

Base material	UV stabilized polycarbonate
Color	light gray
Temperature resistance, range	+310 to -200 degrees F
Dimensions	
width	7 inches
height	4-1/2 inches
length	2 feet
Electrical properties	Non-conductive

4. Packaging

Plastic bird spikes shall be packaged to prevent damage during shipping, handling, and storage.

Individual packages shall be legibly marked with:

- Manufacturer's name
- Manufacturer's catalog number
- Product description
- Seattle City Light's Stock Number

Shipping containers shall be legibly marked with:

- Seattle City Light's Purchase Order Number
- Seattle City Light's Stock Number

standards coordinator	*standards manager*	*unit director*
John Shipek	John Shipek	Pam S. Johnson

5. Issuance

Stock Unit: EA

6. Approved Manufacturer

Stock Number	Description	Approved Manufacturer
013049	7-inch x 2-foot section	Bird-B-Gone, part number BBG2000-7

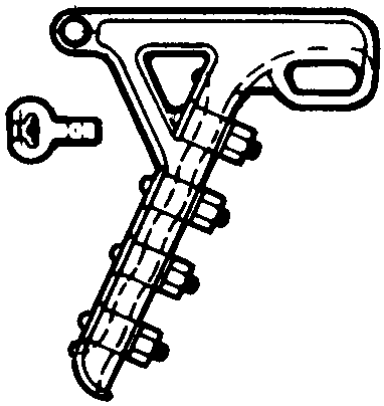
7. References

0072.01; "Avian and Wildlife Protection, Small Birds and Animals"; *Construction Standard;* SCL

Installation and Applications; "Spike 2000" System; Bird-B-Gone, Inc.

Shipek, John; SCL Standards Engineer, subject matter expert and originator of 6912.07 (john.shipek@seattle.gov)

CLAMPS, DEADEND, QUADRANT STRAIN, FORGED STEEL AND MALLEABLE IRON



69331b.tif

Strain Clamps of the type shown, their keepers and connectors, shall be made of malleable iron or drop-forged steel. Malleable iron shall conform to ASTM A47, and forged steel shall conform to ASTM A273. The clamps shall meet the strength requirements listed in the table below. The clamp bodies and keepers shall be smooth surfaced, and all edges rounded to prevent damage to the conductor or the formation of corona. A stringing, or pulling eye shall be an integral part of the clamp body.

Socket Eyes. The clamp shall be equipped with socket eye connectors meeting the requirements of ANSI C29.2 as it applies to ball and socket gauges for Class 52-3 insulators.

Cotter Pins. Cotter pins for the socket eye and button-head pins shall be hard-drawn bronze or stainless steel. They shall be the humpback type, and shall be self-locking and self-retaining.

Galvanizing. The clamps shall be galvanized in accordance with ASTM A153.

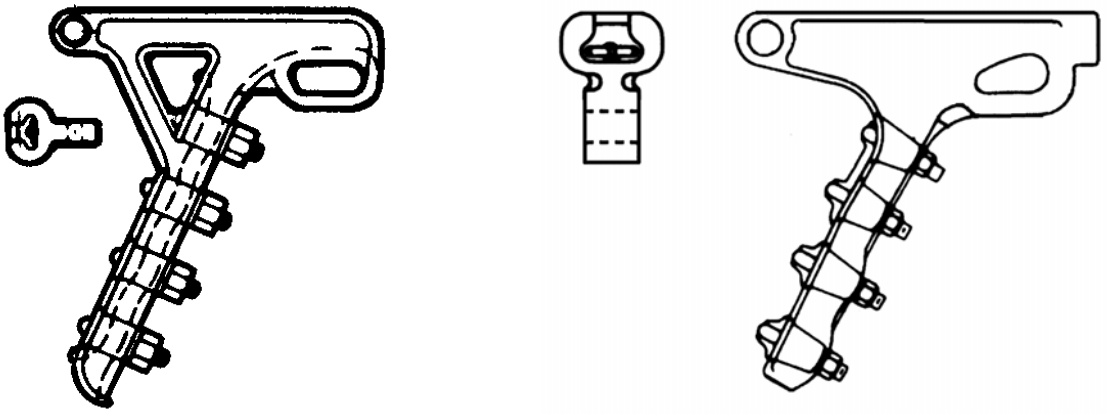
Reference Specifications: ANSI C29.2, ASTM A47, A153, A273, latest revisions.

Stock Unit: EA

Stock Number	Conductor Size, Copper	Conductor Diameter, Inches		Ultimate Strength, Lbs.	Approved Manufacturer
		Minimum	Maximum		Line Hardware Inc.
693370	1/0-300	0.30	0.68	20,000	QSC 724-S

ORIGINATOR	STANDARDS COORDINATOR	STANDARDS SUPERVISOR	UNIT DIRECTOR
Jim S. Horn	Charles L. Shaffer	John C. Skinner	Harold Gray

CLAMPS, ALUMINUM DEADEND, QUADRANT STRAIN



1. **Aluminum Strain Clamps** of the type shown, and their keepers, shall be made of 356-T6 cast aluminum alloy or high-strength, heat-treated wrought aluminum alloy, and shall be designed to meet the ultimate strengths listed below.

   The body and keeper pieces of the clamps shall be smooth surfaced and all edges rounded to prevent formation of corona or damage to the conductor. A string, or pulling, eye shall be an integral part of the clamp body.

2. **Socket Eyes**. Socket eye connectors for the clamps shall be made of malleable iron conforming to ASTM A 47, or drop-forged steel conforming to ASTM A 273. The dimensions of the socket eye shall meet the requirements of ASA C29.2 as it applies to ball-and-socket gauges for Class 52-3 and Class 52-5 insulators.

3. **Cotter Pins.** Cotter pins for the socket eye and button-head pins shall be stainless steel, humpback type, and shall be self-locking and self-retaining.

4. **Galvanizing.** All ferrous parts shall be galvanized in accordance with ASTM A 153.

5. **Reference Specifications:** ASTM A 47, A 153, A 273, ASA C29.2, latest revisions.

6. **Stock Unit:** EA

Stock Number	Conductor Size, ACSR	Conductor Diameter, in.		Ultimate Strength, lbs.	Approved Manufacturers	
		Min.	Max.		Hubbell/Anderson	MacLean
693805	397.5-477	0.58	0.94	25,000	SD-86-S*	ADE-24-S ADE-120-S AQDH-94-S
693825	477 - 954	1.00	1.30	30,000	SD-130-S	ADE-2526-S ADE-26-S ADE-140-S

* SD 98-S OK if in stock – no longer made.

STANDARDS COORDINATOR	STANDARDS SUPERVISOR	UNIT DIRECTOR
Charles L. Shaffer	John C. Skinner	Haydee Jay

Clamps - Deadend, Straight Line
Malleable or Ductile Iron

1. Scope

This standard covers the requirements for malleable or ductile iron, straight line dead-end clamps and associated clevis pin.

This standard applies to the following Seattle City Light (SCL) Stock Numbers:

Stock No.	Description
693901	Straight Line Deadend Clamp
013167	5/8-inch Clevis Pin

2. Application

Straight line deadend clamps are for constructing pole switch terminations.

Straight line deadend clamps are use to attach aluminum, ACSR, or copper conductors ranging in size from 2/0 to 500KCM to suspension insulators.

3. Industry Standards

Straight Line Deadend clamps shall be manufactured according to the following industry standards:

ANSI/ASME B18.8.1-1994(R2005) - Clevis Pins and Cotter Pins

ASME B18.12-2001 - Glossary of Terms for Mechanical Fasteners

ASTM A47/A47M-99(2009) - Standard Specification for Ferritic Malleable Iron Castings

ASTM A153-2005 - Standard Specification for Zinc Coating (Hot Dip) on Iron and Steel Hardware

ASTM A439 – 83 (2009) - Standard Specification for Austenitic Ductile Iron Castings

ASTM A571/A571M-01(2011) - Standard Specification for Austenitic Ductile Iron Castings for Pressure-Containing Parts Suitable for Low-Temperature Service

4. Clamp Requirements

Straight line deadend clamps shall be made of malleable iron conforming to ASTM A47, Grade 35018, or ductile iron conforming to ASTM A439 and A571.

The body and keeper piece of the clamps shall be smooth surfaced and all edges rounded to prevent damage to the conductor.

A stringing or pulling eye shall be an integral part of the clamp body, and the keeper shall have a lifting eye (3/4-inch diameter) for hot-line work.

Straight line deadend clamps and clevis pins shall be hot-dipped galvanized according to ASTM A153.

Straight line deadend clamps shall be provided with round and cotter pins installed.

Split lock washers shall be included under each nut on the U-bolt.

Figure 4. Clamp Dimensions

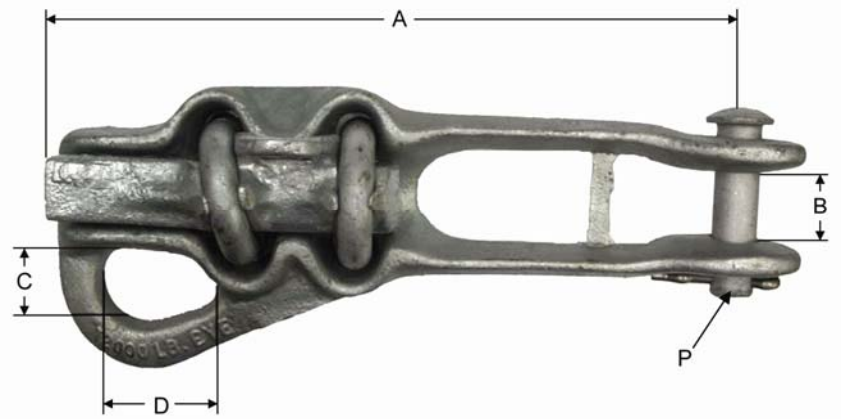


Table 4. Clamp Dimensions

Stock No.	Conductor Diameter Range (in)		Body Length to Centerof Pin Hole nominal (in)	Pin Width nominal (in)	Sag Eye Dimension nominal (in)		Pin Diameter nominal (in)	U - Bolts		Ultimate Strength minimum (lb)	
	Min	Max						Qty.	Diam. nom (in)	Clamp	Sag Eye
			A	B	C	D	P				
693901	0.36	0.93	9-3/8	15/16	1-1/8	1-5/8	5/8	2	1/2	15,000	12,000

5. Clamp Accessories Requirements

Cotter pins shall meet the applicable requirements of SCL 5825.90.

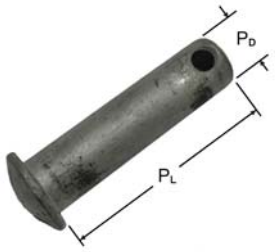
Clevis or Round pin shall meet the applicable requirements of ANSI/ASME B18.8.1 with the following clarification below.

Table 5.1. Clevis Pin Common Requirements

	Requirement	Reference
Product Name	Clevis Pin	ASME B18.12, Section 9.2
Material	C1010-1018 Steel	ANSI/ASME B18.8.1 Section 2.5
Dimension	Per reference	ANSI/ASME B18.8.1, Table 1
Corrosion Protection	Hot Dipped Galvanized	ANSI C153

Table 5.2. Clevis Pin Dimensions:

Stock No.	Diameter nominal (in)	Length nominal (in)
	P_D	P_L
013167	5/8	2-1/2



6. Marking

Each straight line deadend clamp body shall be permanently and legibly marked in raised or stamped letters. Marking shall include but not be limited to the following information:

- Manufacturer's name or symbol or part number
- Eye Ultimate Strength
- Clamp Ultimate Strength
- U-Bolt Torque value

7. Packaging

Product shall be packaged to prevent damage during shipping, handling and storage.

Standard package quantity shall not exceed 100 per box.

Standard package weight shall not exceed 50 pounds.

Individual packages shall be legibly marked with:

- Manufacturer's name
- Manufacturer's catalog number
- Product description
- SCL Stock Number

Shipping containers shall be legibly marked with:

- SCL Purchase Order Number
- SCL Stock Number

8. Issuance

Stock Unit: EA

9. Approved Manufacturers

Stock No.	MacLean Power Systems
693901	SDE-93F
013167	H-0300-02

10. References

SCL Material Standard 5825.90, “Cotter Pin, Humpback, Stainless Steel”; dated 08/10

SCL Material Standard 6966.15, “Anchor Shackles, Round Pin”; dated 10/10

Wang, Quan; SCL Standards Engineer, subject matter expert and originator for 6939.10 (quan.wang@seattle.gov)

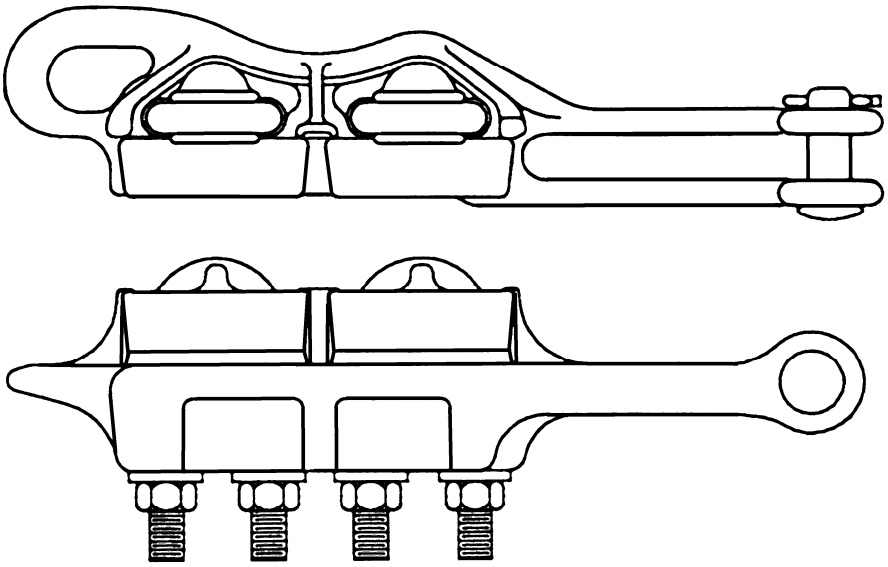
SCL Material Standard 6939.1 (canceled)

SEATTLE CITY LIGHT

MATERIAL STANDARD

STANDARD NUMBER: **6942.2**
PAGE: 1 of 1
DATE: June 5, 1969
REV: June 5, 2003

CLAMPS, ALUMINUM DEADEND STRAIN STRAIGHT-LINE, HOT LINE OPERABLE



Aluminum Spring Loaded, Side Opening Straight Line Strain Clamps shall be of the configuration shown and shall be capable of being installed on an energized conductor before it is cut, without removing keeper piece, bolts or nuts.

The body and keeper shall be fabricated from 356-T6 aluminum alloy. All surfaces shall be smooth and all edges rounded to prevent damage to conductor or the formation of corona.

All bolts, nuts, washers and buttonhead pins shall be steel and shall be hot-dipped galvanized in accordance with ASTM A 123.

Cotterpins and compression springs shall be made of stainless steel.

Reference Specifications: ASTM A 123, A 313, latest revisions.

Stock Unit: EA

Stock Number	Conductor Range, Inches		Conductor Type ACSR	Ultimate Strength, Lbs	Approved Manufacturer
	Min.	Max.			Reliable/ MacLean
694292	0.502	0.888	#3/0 - 397	12,000	ASO- 858-2-N
694294	0.666	1.263	336.4* - 954 (45/7) "Rail"	15,000	ASO-1259-2-N

*Note to lineworkers: Engineering recommends use of 694292 for 397.5 ACSR and smaller.

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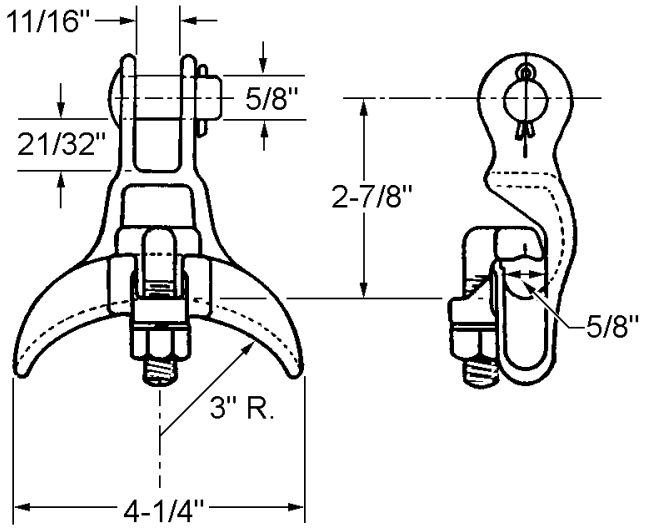
CLAMPS, ANGLE



Angle clamps, used for turning angles to 120 degrees, shall be made of ductile iron or forged steel. Ductile iron shall conform to ASTM A 536, and steel shall meet the requirements of ASTM A 711.

The clamps shall be so designed that they may be worked hot when required.

The clamps shall be galvanized in accordance with ASTM A 153.

The cotter pins for the buttonhead pins shall be made of stainless steel or hard-drawn bronze, and shall be self-retaining after installation.

Reference Specifications: ASTM A 536, A 153, A 711, latest revisions

Stock Unit: EA

Stock Number	Conductor Diameter, Inches		Ultimate Strength, Lbs	Approved Manufacturers	
	Min.	Max.		Hubbell/ Anderson	Line Hardware Inc.
695016	0.162	0.6	7,000	82860-2000	AC60

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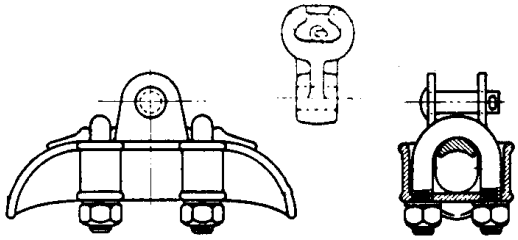
CLAMPS
MALLEABLE IRON SUSPENSION



Malleable Iron Suspension Clamps, bodies, keepers, and connector fittings shall be made of high-strength, heat-treated malleable iron. The malleable iron shall meet the requirements of ASTM A 47.

The body and keeper pieces shall be smooth surfaced, and all edges rounded to prevent damage to the conductor and to prevent the formation of corona.

Socket Eyes. The clamps shall be equipped with socket eye connectors. The dimensions of the socket eye shall conform to ANSI C29.2, as it applies to ball and socket gauge for Class 52-3 insulators.

Cotter Pins. Cotter pins for the socket eye and button-head pins shall be hard-drawn bronze or stainless steel. They shall be the humpback type, and shall be self-locking and self-retaining.

Galvanizing. All ferrous components shall be galvanized in accordance with ASTM A 153.

Reference Specifications: ASTM A 47, A 153, ANSI C29.2, latest revisions.

Stock Unit: Each

Stock	Cond. Range		Cond. Size		Ult. Str.	Approved Manufacturers		
No.	Min.	Max.	Min.	Max.	Lbs.	Anderson	Reliable	ACE
695015	0.40	0.82	2/0	500 kcmil	18,000	MS-82-S	FS-83-S	FLS-88-S

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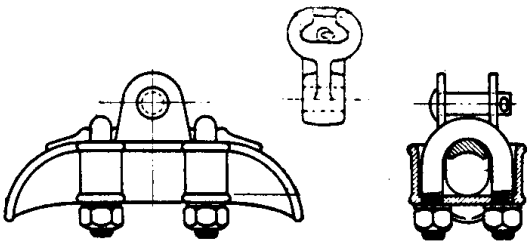
CLAMPS, ALUMINUM SUSPENSION



Aluminum Suspension Clamps, and their keepers, shall be made of high-strength, heat-treated No. 356-T6 cast aluminum alloy.

The body and keeper pieces shall be smooth surfaced, and all edges rounded to prevent damage to the conductor and to prevent the formation of corona.

Socket Eyes. The clamps shall be equipped with socket eye connectors made of malleable iron conforming to ASTM A 47, or drop-forged steel conforming to ASTM A 273. The dimensions of the connector socket eye shall meet the requirements of ASA C29.2, as it applies to ball and socket gauge for Class 52-3 insulators.

Cotter Pins. Cotter pins shall be made of hard-drawn bronze or stainless steel. The cotter pins in the socket eye shall be self-locking and self-retaining after installation.

Galvanizing. All ferrous components shall be galvanized in accordance with ASTM A 153.

Reference Specifications: ASTM A 47, A 153, A 273, ASA C29.2, latest revisions.

Stock Unit: EA

Stock Number	Cond. Dia., In.		ACSR Range	Ultimate Str.-Lbs.	Approved Manufacturers			
	Min.	Max.			Anderson/ Hubbell	Bethea/ MacLean	Lapp	O.B./ Hubbell
695115	0.40	0.80	4/0-397.5	15,000	HAS-85S	LS-1S	51453	87085
695119	0.50	1.02	477-556.5	25,000	HAS-104S	LS-1-2S	51456	87105
695137	1.00	1.45	795	25,000	HAS-147S	LS-6S	51468	87145
695155	1.25	1.82	477-556.5 w/rods	25,000	HAS-182S	LS-8S	51474	87185
695167	1.75	2.25	795 w/rods	25,000	HAS-227S	ASC-10S	51480	87225

C&R Products, clamps CRSC-1-S and CRSC-2-S, are approved for Stock Nos. 695115 and 695119, respectively.

ORIGINATOR	STANDARDS COORDINATOR	STANDARDS SUPERVISOR	UNIT DIRECTOR
Jim S. Horn	Charles L. Shaffer	John C. Skinner	Harold Gray

SEATTLE CITY LIGHT

MATERIAL STANDARD

STANDARD NUMBER: **6951.5**
PAGE: 1 of 1
SUPERSEDING: June 5, 2003
EFFECTIVE DATE: August 30, 2006

CLAMPS, TRUNNION, LINE POST INSULATOR

1. **Line Post Insulator Clamp** bodies and keeper pieces shall be:
   - Smooth surfaced with all edges rounded to prevent damage to the conductor and to prevent the formation of corona.
   - Functionally compatible with the clamp top line post insulators specified by the latest revision of ANSI C29.7.
2. **Aluminum Clamps and Keeper Pieces** for use with all aluminum or ACSR conductors, shall be made of high-strength, heat-treated No. 356-T6 aluminum alloy.
3. **Malleable Iron Clamps and Keeper Pieces** for use with copper conductors shall be made of malleable iron that conforms to the requirements of the latest revision of ASTM A 47.
4. **Anti-Static Springs:** All trunnion clamps shall be provided with a stainless steel anti-static spring installed in one of the trunnions.
5. **Cap screws** shall be American Standard Course Thread Series Class 2 fit.
6. **Spring Lock Washers:** Each cap screw shall be provided with a spring lock washer.
7. **Galvanizing:** All ferrous parts shall be galvanized in accordance with ASTM A 153.
8. **Reference Specifications:** ANSI C29.7, ASTM A 47, ASTM A 153.
9. **Stock Unit:** EA

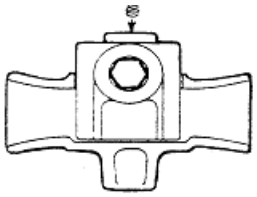


figure 1, **single bolt**

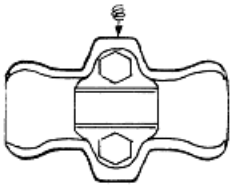


figure 2, **two bolt**

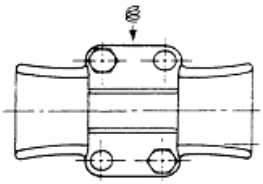


figure 3, **four bolt**

Stock No.	Clamp Metal	Conductor Diameter, in.		Approved Manufacturers					
				single bolt (figure 1)		two bolt (figure 2)			
		Min.	Max.	Columbia Mfg	Lindsey	Anderson	C & R	Lapp	MacLean
34.5 kV Line Post Rating									
695182	Fe	0.25	0.56	ALPS-57-SE*	1101-RIV*	270650-2001-ARIV	–	47101-S1	LPS-57-F
695183	Fe	0.50	1.06	–	–	270651-3001-ARIV	–	47103A-S1	LPS-118-F
695192	Al	0.25	0.56	–	1100-RIV*	TSC-57-ARIV	CRTC-1	47111-S1	ACTS-057-SL1
695193	Al	0.50	1.06	–	1104-RIV*	TSC-106-ARIV	CRTC-2	–	ACTS-118-SL1
695196	Al	0.99	1.50	ALPS-150-SE†*	–	–	–	–	–
115 kV Line Post Rating									
695194	Al	1.00	1.50	–	1108-RIV*	TSC-150-ARIV	CRTC-3	47114-S1	ACTS-150-SL1
695195	Al	1.50	2.00	ALPS-200-SE*	1128-RIV*	TSC-200-ARIV ▲	CRTC-4	47115-S1	ACTS-200-SL1

* Hot line operable clamps † Captive stainless steel bolts ▲ Four bolt clamp (figure 3)

STANDARDS COORDINATOR	STANDARDS SUPERVISOR	UNIT DIRECTOR
John Shipek	John Barnett	Hardev Juj

FITTINGS, FORGED STEEL INSULATOR

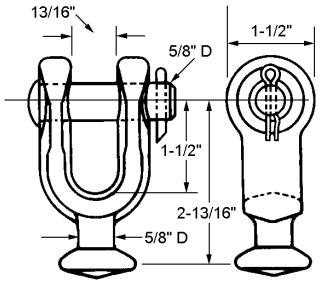


Fig. 1

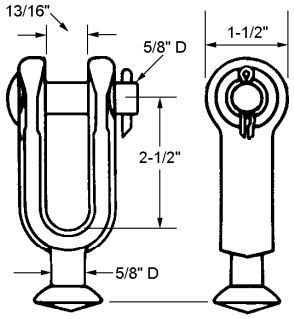


Fig. 2

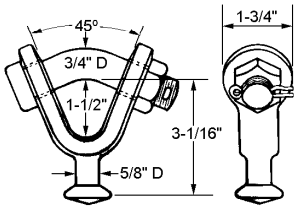


Fig. 3

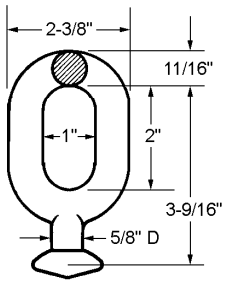


Fig. 4

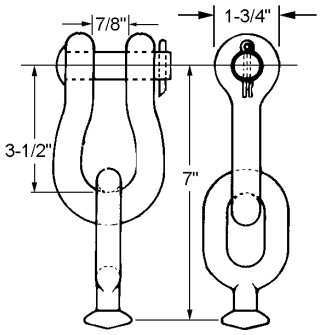


Fig. 5

6955-1ii.tif

Insulator Fittings commonly used to attach suspension insulators to supporting structures shall be made of heat-treated, drop-forged steel of AISI No. C-1038 grade. The dimensions of the ball shall meet the requirements of EEI-NEMA standard TDJ-52 as it applies to ball-and-socket gauge for Class 52-3 insulators.

Cotterpins, where required, shall be made of hard-drawn bronze or stainless steel, and shall be self-locking. The insulator fitting, Figure 5, shall be shipped assembled.

The fittings shall be galvanized in accordance with ASTM specification A 153.

Reference Specifications: ASTM A 153; EEI-NEMA TDJ-52, latest revisions.

Stock Unit: EA

Stock Number	Fig. No.	Type of Fitting	Ultimate Str-Lbs	Approved Manufacturers			
				Anderson/ Hubbell	B.T./Joslyn	Flagg/ Joslyn	Reliable/ MacLean
695505	1	Ball Clevis	30,000	BC-30	BT3055	13200	CB-55
695515	2	Ball Clevis	30,000	70488-2000	–	13201	CB-55L
695525	3	Y-Clevis Ball	30,000	YBC-30	BT3030	–	YCB-65A
695860	4	Ball Eye	30,000	BE-30	BT3014	13000	OEB-55
696135	5	Tower	30,000	BE-30-AS-50	BT3014/ BT3025	–	ASBE-65A

ORIGINATOR	STANDARDS COORDINATOR	STANDARDS SUPERVISOR	UNIT DIRECTOR
Jim S. Horn	Charles L. Shaffer		

SEATTLE CITY LIGHT

MATERIAL STANDARD

STANDARD NUMBER: **6955.2**
PAGE: 1 of 1
DATE: May 18, 1960
REV: July 10, 2002

FITTINGS
STRAIN INSULATOR

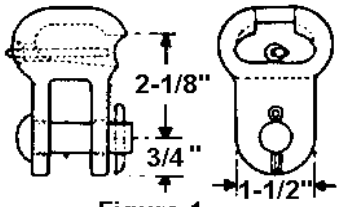


Figure 1

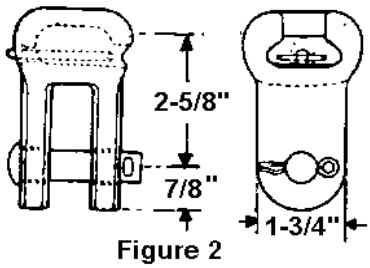


Figure 2

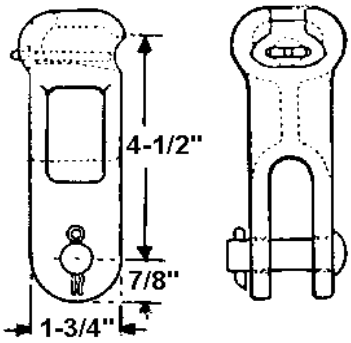


Figure 3

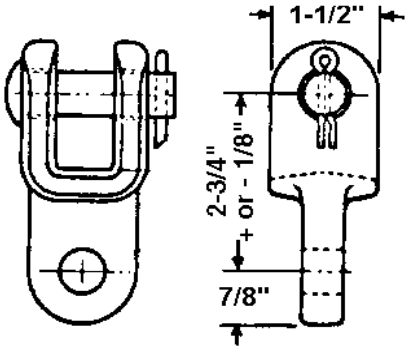


Figure 4

Strain Insulator Fittings, shown, shall be made of drop-forged steel or malleable iron, and shall meet the strength requirements listed in the table below.

Malleable Iron shall be made in accordance with ASTM A47.

Drop-Forged Steel shall be made in accordance with ASTM A235.

Ball Socket dimensions shall be in accordance with EEI-NEMA TDJ-52.

Cotter Pins shall be made of hard-drawn bronze or stainless steel, and shall be self-locking and self-retaining after installation.

Galvanizing: The fittings shall be galvanized in accordance with ASTM A153.

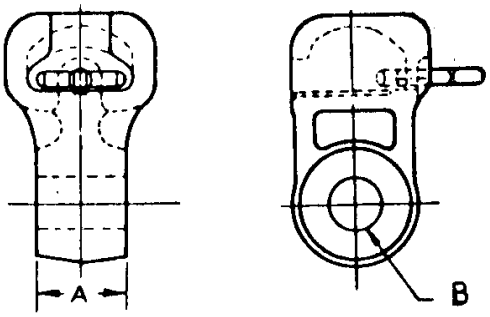
Reference Specifications: ASTM A47, A235, A153; EEI-NEMA TDJ-52, latest revisions.

Stock Unit: EA

Stock Number	Fig. No.	Type of Fitting	Ultimate Strength, Lbs.	Approved Manufacturers			
				Anderson	Joslyn	Lindsey	Reliable
695540	1	Socket Clevis	18,000	11545-2000	–	–	–
695545	2	Socket Clevis	30,000	SC-30	33301	3183	SCR55
695550	3	Socket Clevis	30,000	SC-30AHM	33302	3180	SCL55B
695970	4	Clevis Eye, 90°	18,000	CE025-04	–	–	RCE-55-625

ORIGINATOR	STANDARDS COORDINATOR	STANDARDS SUPERVISOR	UNIT DIRECTOR
Jim S. Horn	Charles L. Shaffer	John C. Skinner	Haydee Jay

FITTINGS – SOCKET EYE
STRAIN INSULATOR



Socket Eye Fittings shall be made of malleable iron conforming to ASTM A 47 or drop-forged AISI Grade C-1038 steel.

Ball Socket dimensions shall conform to NEMA TDJ-52.

Cotter Pins shall be made of hard-drawn bronze or stainless steel, and shall be self-locking and self-retaining after installation.

Galvanizing The fittings shall be galvanized in accordance with ASTM A 153.

Reference Specifications: ASTM A 47, A 153; NEMA TDJ-52, latest revisions.

Stock Unit: EA

Stock No.	Dim., In.		Min. Ult. Str., Lbs.	Approved Manufacturers		
	A	B		Hubbell/ Anderson	MacLean	O.B.
696008	1/2	11/16	16,000	SA-04	SI-500	78721
696017	3/4	11/16	18,000	SA-06	SI-750	83626
696020	3/4	13/16	27,000	SA-10-13	–	93603
696029	1	11/16	18,000	SA-10	–	77861

ORIGINATOR	STANDARDS COORDINATOR	STANDARDS SUPERVISOR	UNIT DIRECTOR
Jim S. Horn	Charles L. Shaffer	John C. Skinner	Harold Jug

ANCHOR SHACKLES, ROUND PIN

1. Scope

This material standard covers the requirements for Class 1 anchor shackles with round pins.

This material standard applies to the following Seattle City Light Stock Numbers:

Stock Number	Body Diameter, Nominal, in	Ultimate Strength, Minimum, lbs
696603	1/2	20,000
696604	5/8	32,500
696605	3/4 (wide bow)	47,500
696618	3/4	47,500

Class 2 anchor shackles with screw pins and Class 3 safety anchor shackles are outside the scope of this standard.

Anchor shackles used for rigging are specified in Material Standard 6966.17.

2. Application

Anchor shackles with round pins are for constructing permanent assemblies, such as attaching a high-voltage insulator to a steel tower.

Anchor shackles with round pins can be used in tie down, towing, suspension or lifting applications where the load is strictly applied in-line. Round pin shackles should never be used in rigging applications to gather multiple sling legs, or where side loading conditions may occur.

Working load limit (WWL) values are calculated by dividing a shackle's ultimate strength (also known as breaking load rating) by a safety factor. Working load limit is also known as safe working load (SWL).

Seattle City Light transmission line engineers commonly employ a safety factor of four. Federal Specification RR-C-271D calculates working load limits based on a safety factor of five.

If a shackle is marked with a working load limit (WWL) or safe working load (SWL) value, the ultimate strength or breaking load is (probably) five times higher. If a shackle is marked with an ultimate strength, the working load limit is calculated as either four or fives times less, depending on the user's choice of safety factor.

An anchor shackle should never be applied above its working load limit.

3. Industry Standard

Anchor shackles shall be manufactured according to the following industry standards:

Federal Specification RR-C-271D; "Chains and Attachments, Welded and Weldless"; September 25, 1990

Federal Specification RR-C-271D, "Chains and Attachments, Welded and Weldless," Amendment 1, November 29, 1995

ASTM A153-2005 "Standard Specification for Zinc Coating (Hot Dip) on Iron and Steel Hardware," 2005

standards coordinator	*standards manager*	*unit director*
John Shipek	John Shipek	Pamela S. Johnson

4. Requirements and Attributes

Anchor shackles shall meet the requirements of Federal Specification RR-C-271D as clarified below:

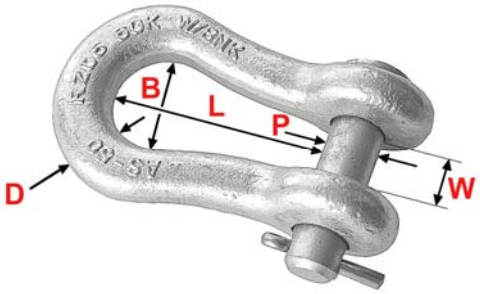
Anchor shackles shall be Type IVA, Grade A, regular and shall be Class 1.

Anchor shackles and pins shall be hot-dipped galvanized according to ASTM A153.

Cotter pins shall be bronze or stainless steel.

Cotter pins shall be of humped design.

Anchors shackles shall be provided with round and cotter pins installed.



Stock number	Body diameter, nominal, in	Pin diameter, nominal, in	Width between eyes, nominal. in	Length inside, nominal. in	Bow width, min., in	Weight per 100 shackles, approx., lb	Ultimate strength min., lb
	D	**P**	**W**	**L**	**B**		
696603	1/2	5/8	13/16	1-7/8	1-3/16	74	20,000
696604	5/8	3/4	1-1/16	2-13/32	1-1/2	144	32,500
696605	3/4	7/8	1-1/2	2-27/32	1-3/4	216	47,500
696618	3/4	3/4	1-3/4	3-1/8	1-1/2	216	47,500

5. Testing

Test data that establishes compliance with the requirements of Federal Specification RR-C-271D shall be provided upon request.

6. Marking

Each anchor shackle body shall be permanently and legibly marked in raised or stamped letters on the side of the shackle bow according to the requirements of Federal Specification RR-C-271D, Section 3.5.3.1.6. Marking shall include but not be limited to the following information:

- Manufacturer's name or symbol
- Size (body diameter)
- Working load limit (WLL), safe working load (SWL), or ultimate strength

7. Packaging

Anchor shackles shall be packaged to prevent damage during shipping, handling and storage.

Individual packages shall be legibly marked with:

- Manufacturer's name
- Manufacturer's catalog number
- Product description
- Seattle City Light's Stock Number

Shipping containers shall be legibly marked with:

- Seattle City Light's Purchase Order Number
- Seattle City Light's Stock Number

8. Issuance

Stock Unit: EA

9. Approved Manufacturers

Stock Number	Body Diameter, Nominal, in	Catalog numbers	
		Hubbell Power Systems/ Anderson	MacLean Power Systems
696603	1/2	AS-25	ASH-45
696604	5/8	AS-35	ASH-56
696605	3/4 (wide bow)	AS-50-W	ASH-67
696618	3/4	AS-50	ASH-66A

10. References

6966.1; "Shackles – Anchor and Chain" (canceled); Material Standard; SCL

6966.17, "Anchor Shackles, Screw Pin"; Material Standard; SCL

Ng, Sharon; subject matter expert; (sharon.ng@seattle.gov)

Shipek, John; SCL Standards Engineer, subject matter expert and originator of 6966.15 (john.shipek@seattle.gov)

www.everyspec.com

ANCHOR SHACKLES, SCREW PIN

1. Scope

This material standard covers the requirements for Class 2 anchor shackles with screw pins.

This material standard applies to the following Seattle City Light Stock Numbers:

Stock Number	Body Diameter, Nominal, in	Ultimate Strength, Minimum, lbs
696620	1/4	5,000
696621	3/8	10,000
696622	7/16	15,000
696623	1/2	20,000
696624	5/8	32,500
696625	3/4	47,500
696626	7/8	65,000
696627	1	85,000

Class 1 anchor shackles with round pins and Class 3 safety anchor shackles are outside the scope of this standard.

Anchor shackles used for construction are specified in Material Standard 6966.15.

2. Application

Anchor shackles with screw pins are for pick and place applications.

Anchor shackles with screw pins can be used in side-loading situations; however users should be aware that this reduces effective working load limits.

There are many dos and donts to rigging. Inexperienced users should not attempt rigging without consulting someone who is.

Working load limit (WWL) values are calculated by dividing a shackles' ultimate strength (also known as breaking load rating) by a safety factor. Working load limit is also known as safe working load (SWL).

Federal Specification RR-C-271D calculates working load limits based on a safety factor of five.

An anchor shackle should never be applied above its working load limit.

3. Industry Standard

Anchor shackles shall be manufactured according to the following industry standards:

Federal Specification RR-C-271D; "Chains and Attachments, Welded and Weldless"; September 25, 1990

Federal Specification RR-C-271D; "Chains and Attachments, Welded and Weldless"; Amendment 1; November 29, 1995

ASTM A153-2005; "Standard Specification for Zinc Coating (Hot Dip) on Iron and Steel Hardware"; 2005

standards coordinator	*standards manager*	*unit director*
John Shipek	John Shipek	Pamela S. Johnson

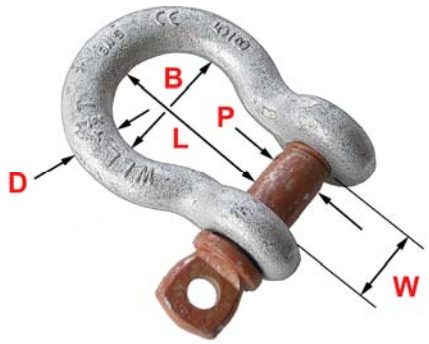
4. Requirements and Attributes

Anchor shackles shall meet the requirements of Federal Specification RR-C-271D as clarified below:

Anchor shackles shall be Type IVA, Grade A, regular, Class 1.

Anchor shackles and pins shall be hot-dipped galvanized according to ASTM A153.

Anchors shackles shall be provided with screw pin installed.



Stock number	Body diameter, nominal, in	Pin diameter, nominal, in	Width between eyes, nominal, in	Length inside, nominal, in	Bow width, min., in	Weight per 100 shackles, approx., lb	Ultimate strength, min., lb
	D	P	W	L	B		
696620	1/4	5/16	15/32	1-1/8	3/4	12	5,000
696621	3/8	7/16	21/32	1-7/16	15/16	30	10,000
696622	7/16	1/2	23/32	1-11/16	1-1/16	49	15,000
696623	1/2	5/8	13/16	1-7/8	1-3/16	74	20,000
696624	5/8	3/4	1-1/16	2-13/32	1-1/2	144	32,500
696625	3/4	7/8	1-1/4	2-27/32	1-3/4	216	47,500
696626	7/8	1	1-7/16	3-5/16	2	337	65,000
696627	1	1-1/8	1-11/16	3-3/4	2-5/16	530	85,000

5. Testing

Test data that establishes compliance with the requirements of Federal Specification RR-C-271D shall be provided upon request.

6. Marking

Each anchor shackle body shall be permanently and legibly marked in raised or stamped letters on the side of the shackle bow according to the requirements of Federal Specification RR-C-271D, Section 3.5.3.1.6. Marking shall include but not be limited to the following information:

- Manufacturer's name or symbol
- Size (body diameter)
- Working load limit (WLL), safe working load (SWL), or ultimate strength

7. Packaging

Anchor shackles shall be packaged to prevent damage during shipping, handling and storage.

Individual packages shall be legibly marked with:

- Manufacturer's name
- Manufacturer's catalog number
- Product description
- Seattle City Light's Stock Number

Shipping containers shall be legibly marked with:

- Seattle City Light's Purchase Order Number
- Seattle City Light's Stock Number

8. Issuance

Stock Unit: EA

9. Approved Manufacturer

Stock Number	Body Diameter, Nominal, in	Catalog number
		Crosby
696620	1/4	1018375
696621	3/8	1018419
696622	7/16	1018437
696623	1/2	1018455
696624	5/8	1018473
696625	3/4	1018491
696626	7/8	1018516
696627	1	1018534

10. References

6966.1; "Shackles – Anchor and Chain" (canceled); Material Standard; SCL

6966.15, "Anchor Shackles, Round Pin"; Material Standard; SCL

Ng, Sharon; subject matter expert; (sharon.ng@seattle.gov)

Shipek, John; SCL Standards Engineer, subject matter expert and originator of 6966.17 (john.shipek@seattle.gov)

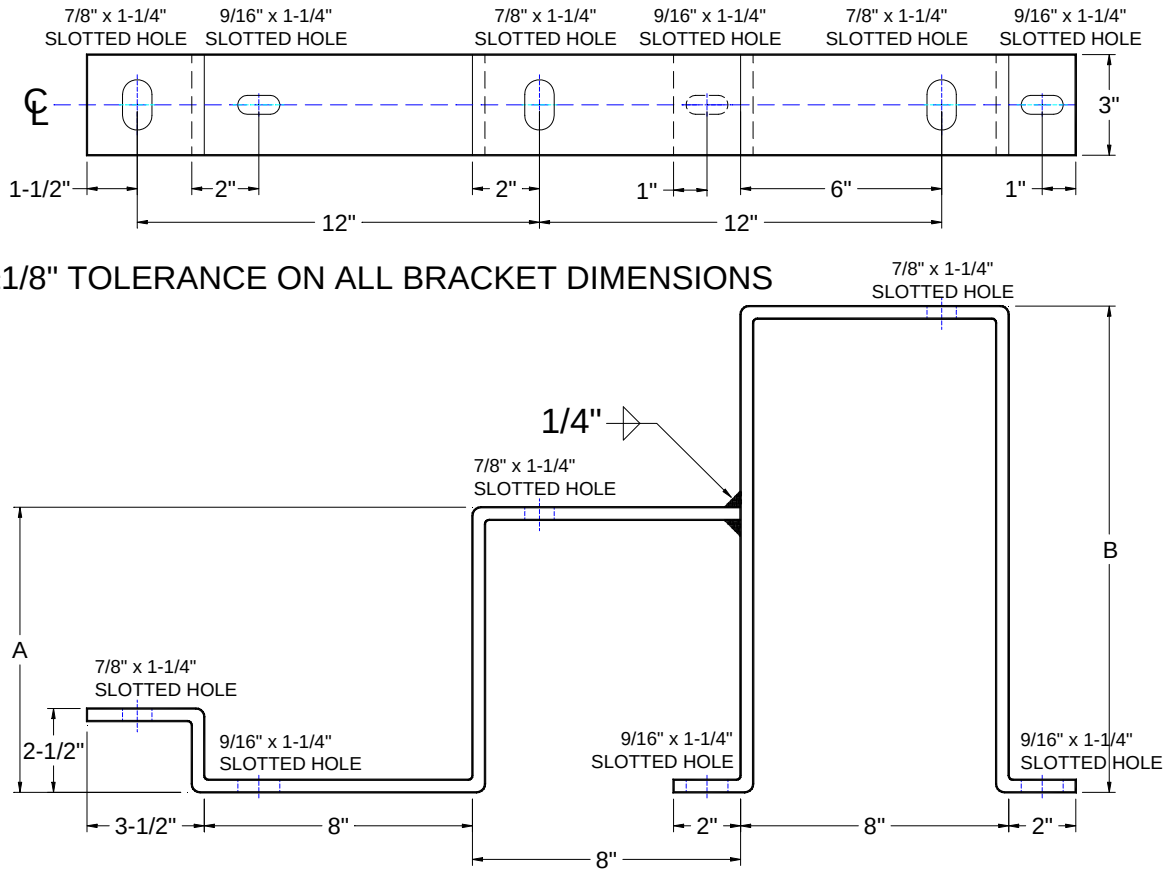
www.thecrosbygroup.com

SEATTLE CITY LIGHT

MATERIAL STANDARD

STANDARD NUMBER: **6968.1**
PAGE: 1 of 1
SUPERCEDING: January 4, 2001
EFFECTIVE DATE: March 16, 2005

SUPPORTS - SECONDARY BUS INSULATOR



6968.1.dwg

1. **Secondary Bus Insulator Supports** shall be of the configuration and dimensions shown, and shall be hot-formed from 3/8" x 3" carbon steel bars conforming to the requirements of ASTM A-36, latest revision. The supports shall be hot dipped galvanized after fabrication in accordance with ASTM specification A123, Grade 100.
2. **Reference Specifications:** ASTM A-36, A123, latest revisions.
3. **Stock Unit:** EA

Stock Number	Dimensions, inches A	B	Support Type
696832	8-1/2	14-1/2	For installation in normal working space.
696836	6	9-1/2	For limited working space.

STANDARDS COORDINATOR	STANDARDS SUPERVISOR	UNIT DIRECTOR
Charles L. Shaffer	John C. Skinner	Haedee Jay

Yoke Plate Assembly, Deadend Strain

1. Scope

This standard covers the material requirements for a galvanized steel heavy-duty deadend yoke plate assembly.

This standard applies to Seattle City Light (SCL) stock number 693085.

2. Application

Yoke plate assemblies are commonly used to attach double strings of transmission class suspension insulators to supporting structures. The yoke plate assembly provides an insulator spacing of 18 inches.

3. Industry Standards

Yoke plate assembly shall meet the applicable requirements of the following industry standards:

ASTM A153; "Standardized Specification for Zinc Coating (Hot-Dip) on Iron and Steel Hardware"

ASTM A47; "Standard Specification for Ferritic Malleable Iron Castings"

ASTM A668/A668M; "Standard Specification for Steel Forgings, Carbon and Alloy, for General Industrial Use"

Federal Specification RR-C-271D; "Chains and Attachments Carbon and Alloy Steel"

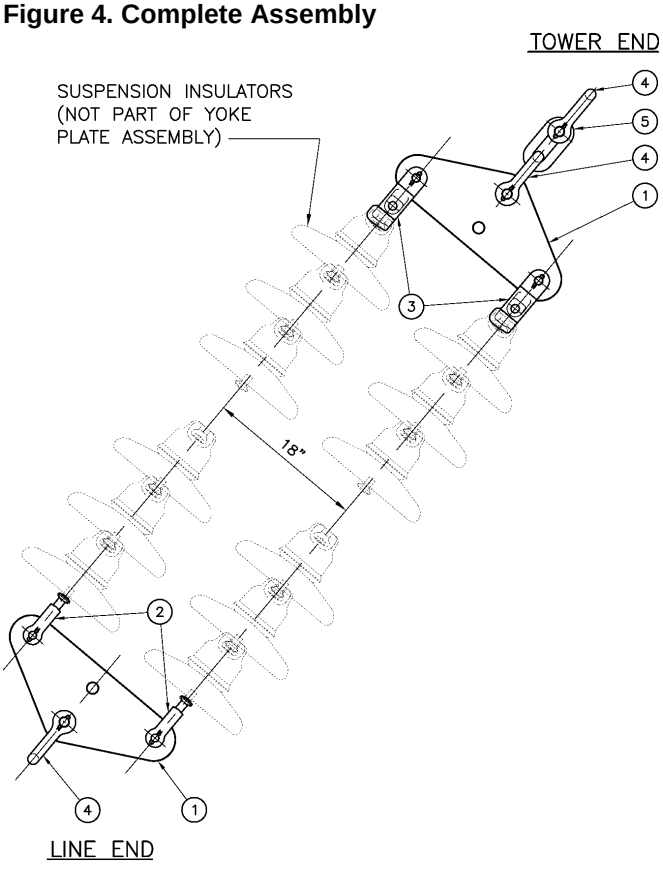
4. Requirements

Each assembly shall be composed of the material listed in Table 4 and shown in Figure 4.

Table 4. Yoke Plate Assembly Material List

Item No.	Qty	Description	Stock No.	Ultimate Strength Rating (lb)	
1	2	Galvanized steel yoke plate	013660	90,000	
2	2	Forged steel ball clevis	695515	30,000	
3	2	Iron socket clevis	695550	30,000	
4	3	Forged steel anchor shackle	696618	47,500	
5	1	Forged steel chain link	696200	60,000	

Figure 4. Complete Assembly



5. Packaging

Each assembly kit shall be shipped assembled.

Each standard package shall be legibly marked with the following information:

- Manufacturer's identification
- Product description
- SCL stock number
- Quantity contained

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

- Manufacturer's identification
- Country of origin
- Product description
- SCL purchase order number
- SCL stock number

6. Issuance

Stock Unit: EA

7. Approved Manufacturers

Hubbell Power Systems Kit Part #KIT-693085

8. Sources

Leung, Kee; SCL Transmission Engineer and subject matter expert for SCL 6970.15 (kee.leung@seattle.gov)

Lin, Jimmy; SCL Transmission Engineer and subject matter expert for SCL 6970.15 (jimmy.lin@seattle.gov)

Ng, Sharon; SCL Senior Civil Engineer and subject matter expert for SCL 6970.15 (sharon.ng@seattle.gov)

Tilley, Kathy; SCL Electrical Engineering Support Specialist and originator of 6970.15 (kathy.tilley@seattle.gov)

Drawing C-11924, Cat. No. TAD-12-11924, Double String Deadend Assembly, 60,000 lb, Anderson Electrical Connectors, Square D Company, Circa 1980.

National Electric Safety Code (NESC) 2012; Table 263-1, “Sizes for Grade N Supply Line Conductors”

Schedule 40 PVC Conduit and Fittings

1. Scope

This standard covers the requirements for Schedule 40 extruded rigid polyvinyl chloride (PVC) conduit and fittings consisting of elbows, couplings, adapters.

2. Application

Schedule 40 PVC conduit and fittings are used to construct smooth raceways for the pulling in of cable installed in a variety of looped radial and network system applications:

- Service
- Secondary
- Primary
- Communication
- Control

Refer to SCL 0222.02.

Five-inch (IPS) size conduit is specified with both ends straight cut to minimize the gap at the conduit joints. Minimized gaps are less likely to catch debris during construction and lead to damaged cable.

Elbows are also known as bends. Large radius elbows are also known as sweeps.

The straight cut end of a section of conduit or elbow is also known as the spigot end.

3. Industry Standards

Schedule 40 PVC conduit and fittings shall meet the requirements of the following industry standard:

UL 651 - Standard for Schedule 40 and 80 Rigid PVC Conduit and Fittings, 7th Edition, dated October 4, 2005

The following clarifications apply:

- Five inch (IPS) size shall meet the requirements for specific applications, Section 4.5 (straight cut, without couplings or adapters).
- All other (IPS) sizes shall meet the requirements for *general use*, Section 4.6 (one bell end).

4. Detailed Requirements

4.1 General

Conduit and fittings shall be suitable for above ground use indoors or outdoors exposed to sunlight and weather, and for underground use by direct burial or encasement in concrete.

Conduit and fitting dimensions shall conform to UL 651 and the Iron Pipe Standard (IPS), where dimensions are based on outside diameters of iron pipe sizes.

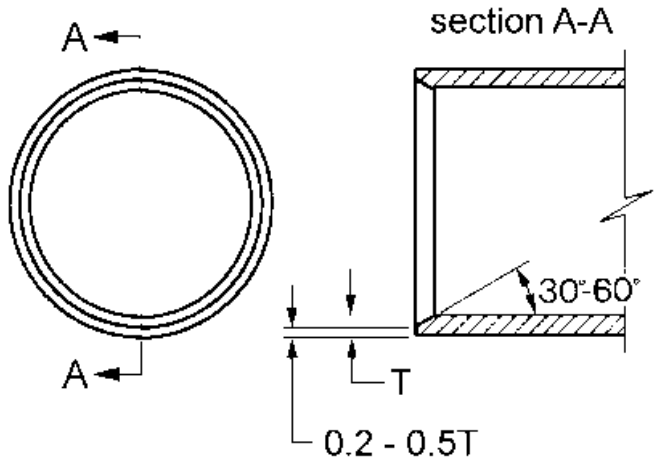
Conduit and fitting color shall be medium to dark gray.

Conduit and fittings shall not have any features that can abrade or otherwise damage cable.

All straight-cut ends from conduit, reducers and elbows with a diameter of 2 in (IPS) and larger shall be chamfered according to Figure 4.1.

Conduit, elbows, and fittings shall be designed and manufactured to be a system intended to guarantee complete interchangeability and compatibility between components.

Figure 4.1. Chamfer Detail



4.2 Conduit

Conduit shall be certified by Underwriters Laboratories (UL) or one of the following NRTLs (Nationally Recognized Testing Laboratories) as meeting the minimum requirements of Standard UL 651:

- CSA (Canadian Standards Association)
- ETL
- NSF International

Manufacturer shall inform SCL in writing of all design changes that could affect the product's understood or published capabilities or attributes.

Dimensional information cited in Sections 4.2, 4.3, and 4.4 should be consistent with UL requirements and is provided for the convenience of SCL design engineers, construction crews, inspectors, and quality assurance personnel who do not have ready access to UL 651.

Conduit shall meet the performance requirements as described in Table 4.2a

Table 4.2a. Conduit performance requirements

Description	UL 651 Section
Tensile strength	7
Deflection under heat and load	8
Extrusion process	9
Low-temperature handling	10
Water absorption	11
Resistance to crushing	12
Resistance to impact	13
Flame	14
Conduit for use with 90 degree C wire	17
Resistance to specific reagents	18
Sunlight resistance	19
Pipe stiffness	20
Pull-joint separation	21
Bending and pull-joint separation	22
Joint water tightness	23
Elastomeric materials accelerated aging	24
Permanency of printing	25

Table 4.2b. Conduit Dimensions, Straight (str)

Stock No.	Trade Size, IPS (in)	End #1	End #2	Outside Diameter, Min (in)	Outside Diameter, Average, (in)	Outside Diameter, Max (in)	Inside Diameter, Min, Average (in)	Wall Thickness, Min (in)	Weight, Nominal, (lb / ft)
734525	1/2	Bell	Str cut	0.832	0.840	0.848	0.578	0.109	0.16
734526	3/4	"	"	1.040	1.050	1.060	0.780	0.113	0.22
734527	1	"	"	1.305	1.315	1.325	1.004	0.133	0.32
734528	1-1/4	"	"	1.648	1.660	1.672	1.335	0.140	0.43
734529	1-1/2	"	"	1.888	1.900	1.912	1.564	0.145	0.52
734530	2	"	"	2.363	2.375	2.387	2.021	0.154	0.70
734531	2-1/2	"	"	2.860	2.875	2.890	2.414	0.203	1.11
734532	3	"	"	3.485	3.500	3.515	3.008	0.216	1.45
734533	3-1/2	"	"	3.950	4.000	4.050	3.486	0.226	1.74
734523	4	"	"	4.450	4.500	4.550	3.961	0.237	2.10
734524	5	Str cu	"	5.513	5.563	5.613	4.975	0.258	2.80
010334	6	Bell	"	6.575	6.625	6.675	5.986	0.280	3.63

4.3 Elbows

Table 4.3a. Elbow Dimensions, 90 and 45 Degree

Stock No.	Trade Size, IPS (in)	Degree Bend	End #1	End #2	Radius (in)
734551	1/2	90	Bell	Str. cut	4
734671	3/4	90	"	"	4-1/2
734550	1	90	"	"	5-3/4
734546	1-1/4	90	"	"	7-1/4
734547	1-1/2	90	"	"	8-1/4
734548	2	90	"	"	24
734549	2-1/2	90	"	"	24
734553	1-1/4	45	"	"	7-1/4
734554	1-1/2	45	"	"	8-1/4
734555	2	45	"	"	18
734557	3	45	"	"	36
734558	3-1/2	45	"	"	36
734559	4	45	"	"	36

90-degree elbow

45-degree elbow

Table 4.3b. Elbow Dimensions, 22-1/2 and 5 Degree

Stock No.	Trade Size, IPS (in)	Degree Bend	End #1	End #2	Radius (in)
734561	2	22-1/2	Bell	Str. cut	18
734562	2-1/2	22-1/2	"	"	18
734563	3	22-1/2	"	"	24
734564	3-1/2	22-1/2	"	"	24
734566	4	22-1/2	"	"	24

22-1/2 degree elbow

4.4 Fittings

Female adapters shall have straight threads. Coupling fittings, 2 inch (IPS) and larger, shall be of molded manufacture, not expanded.

Table 4.4a. Fittings, Female (F), Male (M), and Slip (S)

Stock No.	Trade Size, IPS (in)	Description	Ends
734508	1/2	Female adapter	S x F
734540	3/4	"	"
734541	1	"	"
734542	1-1/4	"	"
734543	1-1/2	"	"
734544	2	"	"
734545	2-1/2	"	"
734537	3	"	"
734538	3-1/2	"	"
734539	4	"	"
734536	5	"	"
010342	6	"	"

Female adapter

734920	1/2	Male adapter	S x M
734914	3/4	"	"
734918	1	"	"
734924	1-1/4	"	"
734925	1-1/2	"	"
734926	2	"	"
734921	3	"	"
734923	4	"	"
010341	6	"	"

Male adapter

Coupling fittings, 2 inch (IPS) and larger, shall be of molded manufacture, not expanded.

Table 4.4b. Fittings, Straight Couplings, Slip (S)

Stock No.	Trade Size, IPS (in)	Description	Ends
734512	1/2	Straight coupling	S x S
734513	3/4	"	"
734514	1	"	"
734515	1-1/4	"	"
734516	1-1/2	"	"
734517	2	"	"
734518	2-1/2	"	"
734519	3	"	"
734520	3-1/2	"	"
734521	4	"	"
734522	5	"	"
010343	6	"	"

Table 4.4c. Fitting, Swedge Reducer

Stock No.	End #1 Trade Size, IPS (in)	End #2 Trade Size, IPS (in)	Description	End #1	End #2
734470	3	2-1/2	Reducer	Chamfered Str. Cut	Chamfered Str. Cut
012503	4	3-1/2	Reducer	Chamfered Str. Cut	Chamfered Str. Cut

Long sleeve repair couplings shall have no center stop.

Long sleeve repair couplings shall have minimum length of 10 in.

Table 4.4d. Fittings, Long Sleeve Couplings without Center Stop, Slip (S)

Stock No.	Trade Size, IPS (in)	Description	Ends
013705	2	Long sleeve coupling	S x S
013706	3	"	"
013707	4	"	"
013708	5	"	"

5. Marking

Each conduit section shall be marked according to the requirements of UL 651, Section 25.

The outer surface of each conduit section shall be marked with the following minimum information:

- Trade size
- Schedule number or equivalent information
- Manufacturer's name or symbol
- Date (or period) of manufacture
- UL or NRTL mark

Each fitting shall be marked according to the requirements of UL 651, Section 46.

The outer surface of each fitting shall be marked with the following minimum information:

- Manufacturer's name or symbol
- Catalog number

6. Testing

Conduit and fitting test data that establishes compliance with the requirements of UL 651 and this material standard shall be provided upon request.

7. Packaging

Straight conduit shall be furnished in 10-ft sections, unless specified otherwise on the purchase order.

Master bundles shall be secured with at least two bands of steel or UV-resistant plastic strapping.

Each master bundle of straight conduit shall be legibly marked with the following information:

- Manufacturer's identification
- Product description
- Seattle City Light purchase order number
- Seattle City Light stock number
- Gross, net, and tare weight

8. Shipping

Conduit may be delivered on enclosed, covered, or flatbed trucks. If conduit is delivered on a flatbed truck, conduit shall be side-loaded.

Because Washington State law requires a 10-in minimum side board when driving a forklift or pallet jack onto the bed of a truck or trailer, most flatbed trucks or trailers must be side-loaded to ease off-loading.

9. Issuance

Conduit: FT

Elbows: EA

All Other Fittings: EA

10. Approved Manufacturers

10.1 Products Approved for Purchase by SCL

Conduit Straight Sections

- Cantex (Mitsubishi Corp.)
- Cresline NW
- Heritage Plastics Inc. (Atkore Int'l)
- IPEX
- JM Eagle
- Prime Conduit (formerly Carlon; Mitsubishi Corp.)
- Ridgeline Pipe Mfg. (Atkore Int'l)
- Royal Pipe Systems

Elbows

- Cantex (Mitsubishi Corp.)
- Heritage Plastics Inc. (Atkore Int'l)
- Scepter (IPEX)
- JM Eagle
- Kraloy (IPEX)
- Raceways Technology & Mfg.
- Ridgeline Pipe Mfg. (Atkore Int'l)
- Carlon (Thomas & Betts)
- Royal Pipe Systems

All Other Fittings

- Cantex (Mitsubishi Corp.)
- Heritage Plastics Inc. (Atcore Int'l)
- Scepter (IPEX)
- JM Eagle
- Kraloy (IPEX)
- Ridgeline Pipe Mfg. (Atkore Int'l)
- Carlon (Thomas & Betts)
- Royal Pipe Systems

10.2 Products Approved for Purchase and Installation by SCL Contractors

SCL contractors may purchase and install cellular core PVC conduit straight sections from Rocky Mountain Colby Company.

SCL contractors may purchase and install solid PVC conduits, elbows, and fittings from the approved manufacturers cited in section 10.1.

SCL contractors may purchase and install 5-in conduit with belled end and spigot end from approved manufacturers cited in Section 10.1, "Conduit Straight Sections."

11. References

SCL Construction Standard 0222.02; "Requirements for Duct Banks in the Public Right-of-Way"

SCL Material Standard 7345.2; "Conduit and Fittings, EPC 40 and EPC 80 Rigid Polyvinyl Chloride" (canceled)

12. Sources

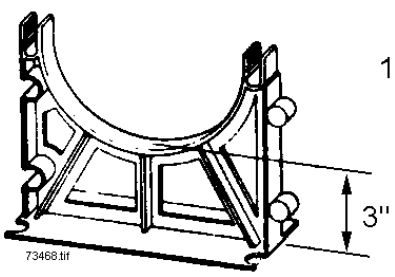
ASTM F 512; "Standard Specification for Smooth-Wall Poly Vinyl Chloride (PVC) Conduit and Fittings for Underground Installation"

ASTM F891; "Standard Specification for Coextruded Poly Vinyl Chloride (PVC) Plastic Pipe With a Cellular Core"

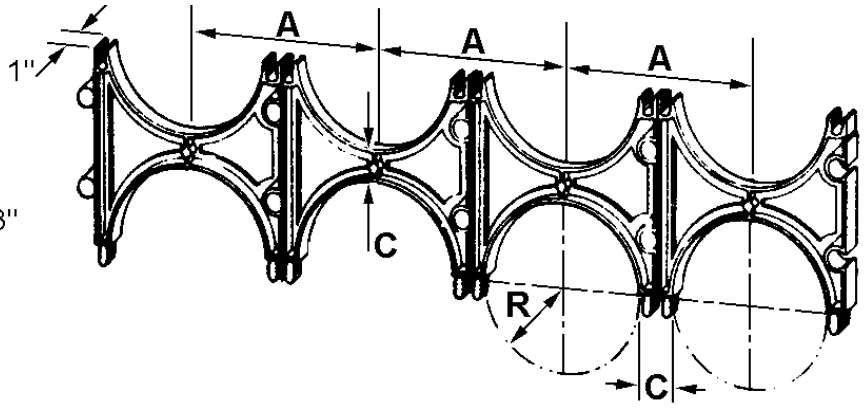
Shipek, John; SCL Standards Engineer, subject matter expert and originator of 7015.05 (john.shipek@seattle.gov)

Wang, Quan; SCL Standards Engineer and subject matter expert for 7015.05

Conduit Spacers for PVC and FG Conduit



Base Spacer
Figure 1



Intermediate Spacer
Figure 2

Plastic Spacers for Nonmetallic Conduit shall be of the general configuration shown, and shall be molded from a general-purpose polystyrene meeting the requirements of ASTM Standard D4549 for Type 1 molding material.

Each unit shall have two lugs for interlocking on one side and bottom, and two mating holes on the other side and top. The lugs shall fit corresponding holes snugly, permitting rapid, secure field assembly of multiple units. Separation between conduits shall be 2 inches for all sizes of spacers.

Reference Specification: ASTM D4549, latest revision.

Stock Unit: EA

	Stock Number	Figure Number	Nominal Conduit Size	Dimensions in Inches			Approved Manufacturers		
				A	C	R	CalAm	*GS Industries	Kraloy/Ipex
intermediate	734669	2	3	5.6	2.0	1.8	4130-20	158-1	IV-3020
	734670	2	4	6.6	2.0	2.3	4140-20	124-1	IV-4020
	734680	2	5	7.9	2.0	2.9	4150-20	130-1	IV-5020
	010447	2	6	8.7	2.0	3.4	4160-20	134-1	IV-6020
base	010448	1	3	5.6	2.0	1.8	4030-20	159-1	BV-3020
	734690	1	4	6.6	2.0	2.3	4040-20	125-1	BV-4020
	734692	1	5	7.9	2.0	2.9	4050-20	131-1	BV-5020
	010446	1	6	8.7	2.0	3.4	4060-20	135-1	BV-6020

* GS Industries of Bassett, Inc. GS Industries spacers marked "Underground Products" are acceptable.

These items are approved for contractor use but NOT for City Light stock.

Approved Manufacturers:

- Underground Device Inc. Wunpeece Duc Spacer SERIES
- Cantex 53360xx and 53359xx SERIES
- PWPipe 6268 and 6266 SERIES

In October 2015, this standard was renumbered from 7346.8 to 7015.80.

Directional Drilling Conduit Systems

1. Scope

This standard covers the requirements for conduit systems specifically intended for directional drilling construction projects.

2. Application

Directional drilling is an underground excavation method using a steerable system for installing pipe, conduit and cable using a surface launched drill rig. A fluid-filled pilot bore is drilled using a fluid-driven motor, and the bore is then enlarged by pre-reaming when necessary, and back reaming to the size required for product pipe installation. The drill head steers the pilot boring.

The conduit systems cited in this standard have been reviewed and approved by Seattle City Light (SCL) for use on our system.

3. Industry Standards

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

UL 651 - Standard for Schedule 40 and 80 Rigid PVC Conduit and Fittings, 7th Edition, dated October 4, 2005

4. Requirements

Conduit shall meet the requirements of the latest revision of SCL 7015.05 with the following clarification: the requirements of SCL 7015.05 are waived where they conflict with the specific nature of the approved, directional drilling-designed joints.

Conduit shall be listed by Underwriters Laboratories (UL 651).

5. Marking

Each conduit section shall be marked according to the requirements of UL 651, Section 25.

The outer surface of each conduit section shall be marked with the following minimum information:

- Trade size
- Schedule number or equivalent information
- Manufacturer's name or symbol
- Date (or period) of manufacture.

6. Testing

Conduit test data that establishes compliance with the requirements of UL 651 and this standard shall be provided upon request.

7. Packaging

Conduit shall be furnished in 20 ft sections, unless specified otherwise.

Locking and sealing accessories shall be packaged with each conduit stick.

8. Approved Manufacturers

Can-Loc by Cantex

Certa-Com by NASP (North American Specialty Products LLC)

Bore-Gard by Prime Conduit

9. References

SCL Material Standard 7015.05; “Schedule 40 PVC Conduit and Fittings”

10. Sources

City of Seattle Standard Specifications for Road, Bridge, and Municipal Construction; 2008 edition

Lu, Curtis; SCL Standards Engineer and subject matter expert for 7017.05 (lu.curtis@seattle.gov)

Shipek, John; SCL Standards Engineer, subject matter expert and originator of 7017.05 (john.shipek@seattle.gov)

www.cantexinc.com

www.naspecialtyproducts.com

www.primeconduit.com

Schedule 80 PVC Conduit and Elbows

1. Scope

This material standard covers the requirements for Schedule 80 extruded rigid polyvinyl chloride (PVC) conduit.

The requirements for Schedule 40 PVC conduit and fittings are located in SCL 7015.05.

2. Application

Schedule 80 PVC conduit is used to construct smooth raceways for the pulling in of cable installed in a variety of applications.

Five-inch Iron Pipe Standard (IPS) size conduit is specified with both ends straight cut to minimize the gap at the conduit joints. Minimized gaps are less likely to catch debris during construction and lead to damaged cable.

Elbows are also known as bends. Large radius elbows are also known as sweeps.

The straight cut end of a section of conduit is also known as the spigot end.

Design engineers should be aware that different types of conduit have widely different physical properties that affect their application.

3. Industry Standards

Schedule 80 PVC conduit and fittings shall meet the requirements of the following industry standard:

UL 651; Standard for Schedule 40 and 80 Rigid PVC Conduit and Fittings, 7th Edition, October 4, 2005

4. Detailed Requirements

4.1 General

Conduit shall be suitable for aboveground use indoors or outdoors exposed to sunlight and weather, and for underground use by direct burial or encasement in concrete.

Conduit dimensions shall conform to UL 651 and the IPS, where dimensions are based on outside diameters of iron pipe sizes.

Conduit color shall be medium to dark gray.

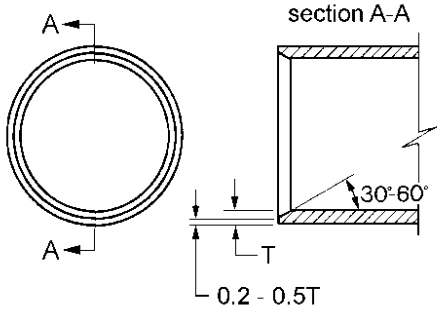
Conduit shall not have any features that can abrade or otherwise damage cable.

All conduit that is 2 inch (IPS) and larger shall be chamfered according to Figure 4.1.

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

Dimensional information cited in Section 4.2 should be consistent with UL requirements and is provided for the convenience of Seattle City Light design engineers, construction crews, inspectors, and quality assurance personnel who do not have ready access to UL 651.

Figure 4.1. Chamfer Detail



4.2 Conduit

Conduit shall be certified by Underwriters Laboratories or one of the following Nationally Recognized Testing Laboratories (NRTLs) as meeting the minimum requirements of Standard UL 651:

- Canadian Standards Association (CSA)
- ETL
- NSF International

Conduit shall meet the requirements of Table 4.2a.

Five inch IPS size shall meet the requirements in Table 4.2b (straight cut, without couplings or adapters).

All other IPS sizes shall meet the requirements in Table 4.2b (one bell end).

Table 4.2a. Conduit Performance Requirements

Description	UL 651 Section
Tensile strength	7
Deflection under heat and load	8
Extrusion process	9
Low-temperature handling	10
Water absorption	11
Resistance to crushing	12
Resistance to impact	13
Flame	14
Conduit for use with 90 degree C wire	17
Resistance to specific reagents	18
Sunlight resistance	19
Pipe stiffness	20
Pull-joint separation	21
Bending and pull-joint separation	22
Joint water tightness	23
Elastomeric materials accelerated aging	24
Permanency of printing	25

Table 4.2b. Conduit Dimensions, Straight (str)

Stock No.	Trade Size, IPS (in)	End #1	End #2	Outside Diameter, Minimum (in)	Outside Diameter, Average (in)	Outside Diameter, Maximum (in)	Inside Diameter, Minimum, Average (in)	Wall Thickness, Minimum (in)	Weight, Nominal (lb/ft)
738740	1-1/2	Bell	Straight cut	1.888	1.900	1.912	1.446	0.200	0.69
738741	2	"	"	2.363	2.375	2.387	1.881	0.218	0.96
738742	2-1/2	"	"	2.860	2.875	2.890	2.250	0.276	1.50
738743	3	"	"	3.485	3.500	3.515	2.820	0.300	1.96
738744	3-1/2	"	"	3.950	4.000	4.050	3.280	0.318	2.35
738745	4	"	"	4.450	4.500	4.550	3.737	0.337	2.86
738746	5	Straight cut	"	5.513	5.563	5.613	4.713	0.375	3.98
010333	6	Bell	"	6.575	6.625	6.675	5.646	0.432	5.47

4.3 Elbows

Table 4.3. Elbow dimensions, 24-in Radius

Stock No.	Trade Size, IPS (in)	Degree Bend	End #1	End #2	Radius (in)
013647	2	22-1/2	Bell	Straight cut	24
013650	3	22-1/2	"	"	24
013648	2	45	"	"	24
013651	3	45	"	"	24
013649	2	90	"	"	24
013652	3	90	"	"	24

22-1/2 degree elbow

45-degree elbow

90-degree elbow

5. Marking

Each conduit section shall be marked according to the requirements of UL 651, Section 25.

The outer surface of each conduit section shall be marked with the following minimum information:

- Trade size
- Schedule Number or equivalent information
- Manufacturer name or symbol
- Date (or period) of manufacture
- UL or NRTL mark

6. Testing

Conduit test data that establishes compliance with the requirements of UL 651 and this material standard shall be provided upon request.

7. Packaging

Straight conduit shall be furnished in 10-ft sections, unless specified otherwise on the purchase order.

Master bundles shall be secured with at least two bands of steel or UV-resistant plastic strapping.

Each master bundle of straight conduit shall be legibly marked with the following information:

- Manufacturer identification
- Product description
- Seattle City Light purchase order number
- Seattle City Light stock number
- Gross, net, and tare weight

8. Shipping

Conduit may be delivered on enclosed, covered, or flatbed trucks. If conduit is delivered on a flatbed truck, conduit shall be side-loaded.

Because Washington State law requires a 10-in minimum side board when driving a forklift or pallet jack onto the bed of a truck or trailer, most flatbed trucks or trailers must be side-loaded to ease off-loading.

9. Issuance

Conduit: FT

Elbows: EA

10. Approved Manufacturers

Conduit Straight Sections

Cantex (Mitsubishi Corp.)
Cresline NW
Heritage Plastics Inc. (Atkore Int'l)
IPEX
JM Eagle
Prime Conduit (formerly Carlon; Mitsubishi Corp.)
Ridgeline Pipe Mfg. (Atkore Int'l)
Royal Pipe Systems

Elbows

Cantex (Mitsubishi Corp.)
Heritage Plastics Inc. (Atkore Int'l)
Scepter (IPEX)
JM Eagle
Kraloy (IPEX)
Raceways Technology & Mfg.
Ridgeline Pipe Mfg. (Atkore Int'l)
Carlon (Thomas & Betts)
Royal Pipe Systems

11. References

SCL Material Standard 7015.05, “Schedule 40 PVC and Fittings”

12. Sources

ASTM F512; “Standard Specification for Smooth-Wall Poly Vinyl Chloride (PVC) Conduit and Fittings for Underground Installation”

SCL Material Standard 7345.2 (cancelled), “Conduit and Fittings, EPC 40 and EPC 80 Rigid Polyvinyl Chloride”

Shipek, John; SCL Standards Engineer, subject matter expert and originator of 7020.05 (john.shipek@seattle.gov)

Wang, Quan; SCL Standards Engineer and subject matter expert for 7020.05 (quan.wang@seattle.gov)

Fiberglass Fittings, Heavy-Wall, Four-Inch IPS

1. Scope

This standard covers the requirements for 4-inch IPS (iron pipe standard), heavy-wall, fiberglass fittings.

In addition to identifying products that are approved for purchase and installed by Seattle City Light (SCL) personnel, this standard identifies products that may be purchased and installed by contractors working under Seattle City Light's direction.

This material standard applies to the following SCL stock numbers:

Stock No.	Description
013587	Elbow, 5º x 144 in
013588	Elbow, 11-1/4º x 144 in
013589	Elbow, 15º x 144 in
013590	Elbow, 22-1/2º x 144 in
013591	Elbow, 45º x 144 in
013592	Elbow, 90º x 144 in

2. Application

Four-inch fiberglass elbows are appropriate for riser pole, other above ground, and below ground (encased in concrete) applications.

The intended application for large radius 4-in fiberglass elbows is to allow ease of cable pull around bends. The fiberglass elbows will have a deep socket PVC coupling attached at each ends. The PVC couplings enable a smooth transition between the fiberglass elbow and the PVC straight conduit in the duct system.

When Champion Fiberglass was first obtaining its UL Listed certification, it had offered different wall choices: standard wall (SW), medium wall (MW) and heavy wall (HW). However, the wall names were not associated with a numerical thickness, 0.070 inches, 0.096 inches, or 0.110 inches respectively.

The Champion 4-in HW conduit, elbow and fittings have the same numerical wall thickness (0.096 in) as the Champion 5-in MW conduit or elbows that SCL also uses. Champion does not offer a medium wall option for the 4-in fiberglass conduit, elbow and fittings.

3. Detailed Requirements

3.1 General

Fittings shall be listed by UL 2515 (Underwriters Laboratories standard).

Fittings shall be heavy wall, type AG (above ground) as defined by UL 2515.

Fitting dimensions shall conform to the Iron Pipe Standard (IPS), where dimensions are based on outside diameters of iron pipe sizes.

Resin system shall be epoxy with no fillers. Glass shall be E-type.

Conduit and fittings shall be manufactured from the same resin/hardener/glass systems and by the same filament wound system.

Conduit and fittings shall be halogen-free as defined by UL 2515.

Conduit, fittings, and accessories shall be designed and manufactured as a system that guarantees complete interchangeability and compatibility between components.

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

3.2 Fittings

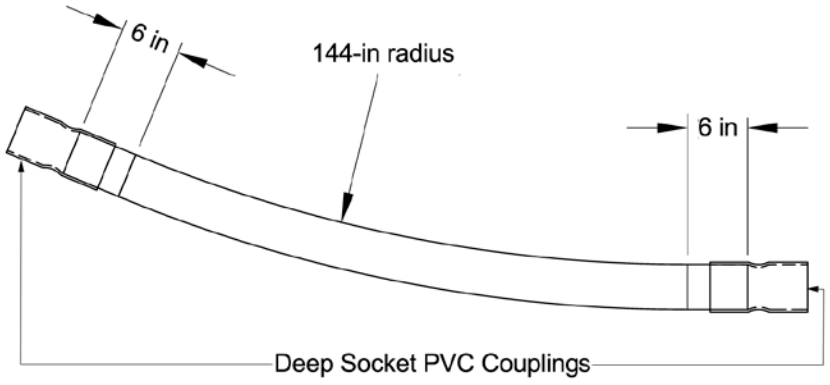
Fittings shall be appropriate and compatible for use with Schedule 40 PVC conduit.

Elbow angles shall be accurate to ± 2% of specified.

Elbow shall have a 6-in tangent on each end as shown in Figure 3.2.

A deep socket PVC coupling shall be permanently attached to each end of the elbow.

Figure 3.2. 4-in Fiberglass Elbow with Deep Socket PVC Couplings



Trade size	4 in (IPS)
Outside diameter	
Minimum	4.490 in
Average	4.512 in
Maximum	4.540 in
Inside diameter, minimum	4.320 in
Wall thickness, nominal	0.096 in
UV stability	Meeting the requirements of UL 2515
Fire resistance	Meeting the requirements of UL 2515

4. Marking

Each fitting shall be marked according to the requirements of UL 2515, Section 6.

5. Testing

Test data that establishes compliance with the requirements of UL 2515 and this standard shall be provided upon request.

6. Packaging

Each crate shall be legibly marked with the following information:

- Manufacturer's identification
- Product description
- Seattle City Light's purchase order number
- Seattle City Light's stock number.

7. Shipping

45 degrees or larger elbows shall be delivered on enclosed, covered, or flatbed trucks with side-load capability.

Because Washington State law requires a 10-in minimum side board when driving a forklift or pallet jack onto the bed of a truck or trailer, most flatbed trucks or trailers must be side-loaded to ease off-loading.

8. Issuance

EA

9. Approved Manufacturers

9.1 Products Approved for Purchase by Seattle City Light

Table 9.1 Approved Products, Champion Fiberglass

Stock No.	Description	Item No.
013587	Elbow, 5º x 144 in	40C-HW-CD05CR1442D
013588	Elbow, 11-1/4º x 144 in	40C-HW-5CR1442D
013589	Elbow, 15º x 144 in	40C-HW-15CR1442D
013590	Elbow, 22-1/2º x 144 in	40C-HW-6CR1442D
013591	Elbow, 45º x 144 in	40C-HW-8CR1442D
013592	Elbow, 90º x 144 in	40C-HW-9CR1442D

9.2 Products Approved for Purchase and Installation by Seattle City Light Contractors

All material items cited in Section 9.1.:

- Champion Fiberglass
- FRE Composites
- Raceway Technology.

10. References

SCL Construction Standard 0222.02; “Requirements for Duct Banks in the Public Right-of-Way”

SCL Design Standard 9220.05; “Electric Power Cable and Conduit Selection”

SCL Material Standard 7025.05; “Fiberglass Conduit and Fitting, Standard Wall, Five-Inch IPS”

SCL Material Standard 7015.05; “Schedule 40 PVC Conduit and Fittings”

11. Sources

Bulletin No. TCB 2-2000; "NEMA Guidelines for the Selection and Installation of Underground Nonmetallic Duct"; National Electrical Manufacturers Association

CD-0807; Champion Duct Fiberglass Conduit product catalog;
Champion Fiberglass; 2003

"Gasket Joint Installation Recommendations"; Champion Fiberglass

"Instructions for Installing Champion Duct Below Ground (Encased in Concrete and Direct Buried)"; Champion Fiberglass

Wang, Quan; SCL Standards Engineer and subject matter expert for 7024.05 (quan.wang@seattle.gov)

Youngs, Rob; SCL Electrical Reviewer and subject matter expert for 7024.05 (rob.youngs@seattle.gov)

www.championfiberglass.com

www.frecomposites.com

Fiberglass Conduit and Fittings, Standard-Wall, Five-Inch IPS

1. Scope

This standard covers the requirements for 5-inch IPS (iron pipe standard), standard-wall, fiberglass conduit, fittings, and accessories. This collection of components may be considered a system.

The formal, industry name for fiberglass conduit is Aboveground Reinforced Thermosetting Resin Conduit (RTRC).

In 2013, the title of this standard was changed from “Fiberglass Conduit and Fittings, ***Medium-Wall***, Five-Inch IPS” to “Fiberglass Conduit and Fittings, ***Standard-Wall***, Five-Inch IPS”. Wall thickness requirements remained unchanged.

In addition to identifying products that are approved for purchase and installed by Seattle City Light (SCL) personnel, this standard identifies products that may be purchased and installed by contractors working under Seattle City Light’s direction.

This material standard applies to the following SCL stock numbers:

Stock No.	Description
012808	Conduit, 20 foot straight section
012809	Elbow, 90 degree x 60 in
012847	Elbow, 90 degree x 144 in
012848	Elbow, 11-1/4 degree x 144 in
013586	Elbow, 15 degree x 144 in
012849	Elbow, 22-1/2 degree x 144 in
012850	Elbow, 45 degree x 144 in
012814	Stop coupling
013358	Repair coupling
012815	End bell, socket type
013568	Elbow, 5 degree x 144 in
012817	Female terminal adapter
012818	Fiberglass end cap with gasket
012819	Adhesive gun
012820	Epoxy cartridge, 20 fl oz
012821	Adhesive kit
013314	Mixing tip, spare
013567	5-in IPS fiberglass to 5-in PVC adapter

The purpose of this standard is three-fold:

- Promote the standardization of material across URD and Network boundaries.
- Make available a family of fiberglass conduit and fittings that reduces engineering construction costs by guaranteeing high component quality, fit, and compatibility. Unlike PVC and steel, fiberglass conduit and fittings are not universally interchangeable between suppliers; to ensure component compatibility, the subject family must be considered a system and sole-sourced.
- Facilitate ordering by providing a cross-reference between SCL stock numbers, common applications, and the manufacturer's catalog numbers.

2. Application

Fiberglass conduit is an alternative to PVC conduit systems where the following (superior) attributes are required:

- Wide operating temperature range, -60 to +250 degrees F (-51 to +121 degrees C)
- Resistant to cable pull burn through
- Low relative coefficient of friction
- Shatter-proof
- Shape retention after impact.

Fiberglass conduit is an alternative to galvanized steel where the following (superior) attributes are required:

- Corrosion resistance
- Low relative unit cost
- Low relative unit weight
- Low relative coefficient of friction
- Non-conductive
- Shape retention after impact.

Five-inch fiberglass conduit systems are appropriate for riser pole, other above ground, and below ground (encased in concrete) applications.

For 5-in fiberglass conduit, one 20 fl oz adhesive cartridge, Stock No. 012820, will make about 20 joints.

Adhesive is required at:

- Joints where a field cut has been made and the interference joint is not available
- Joints between large sweep elbows and vertical risers
- All end bells.

Adhesive gun, Stock Number 012819, may be considered expendable and issued with each job.

Adhesive curing time is approximately one hour at an ambient temperature of 75 degrees F (29 degrees C). Cold weather adhesive is available from the manufacturer by special order.

Female terminal adapter, Stock Number 012817, is used for joining fiberglass conduit to galvanized rigid steel (GRS) conduit. Adapter has same threads as GRS.

Joining may be made easier by applying a lubricant, such as American Polywater or 3M Compound, on the Elastomeric gasket prior to inserting the spigot end into the belled end.

Joining a field cut with a belled end should be discouraged because of the sharp edge created; use a coupling instead.

For many years, Champion created catalog numbers and physically labeled their 5-in IPS, 0.096-inch thick wall conduit as Medium Wall (MW). In 2012, Underwriters Laboratories (UL) revised their standards and now Champion's 0.096-inch thick wall conduit is considered by UL and industry as Standard Wall (SD). In response, Champion elected to retain their existing catalog numbers and physically mark their products SW/MW.

Refer to SCL 9220.05, "Electric Power Cable and Conduit Selection" for the preferred electric power cable and conduit to be used in a given application.

3. Industry Standards

Five-inch fiberglass conduit and fittings shall meet the above ground (type AG) requirements of the following industry standards:

ASTM F512 – 93; Standard Specification for Smooth-Wall Poly (Vinyl Chloride (PVC) Conduit and Fittings for Underground Installation.

NEMA TC 14-2002; Standard for Reinforced Thermosetting Resin Conduit (RTRC) and Fittings

UL 2515; Standard for Aboveground Reinforced Thermosetting Resin Conduit (RTRC) and Fittings, November 16, 2011

4. Detailed Requirements

4.1 General

Conduit and fittings shall be listed by UL 2515 (Underwriter's Laboratories standard).

Conduit and fittings shall be standard wall, type AG (above ground) as defined by UL 2515.

Conduit and fitting dimensions shall conform to the Iron Pipe Standard (IPS), where dimensions are based on outside diameters of iron pipe sizes.

Resin system shall be epoxy with no fillers. Glass shall be E-type.

Conduit and fittings shall be manufactured from the same resin/hardener/glass systems manufactured by the same filament wound system.

Conduit and fittings shall be halogen-free as defined by UL 2515.

Conduit, fittings, and accessories shall be designed and manufactured to be a system intended to guarantee complete interchangeability and compatibility between components.

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

4.2 Conduit

Trade size	5 in (IPS)
Outside diameter	
Minimum	5.544 in
Average	5.572 in
Maximum	5.606 in
Inside diameter, minimum	5.380 in
Wall thickness, nominal	0.096 in
Length	20 ft
Weight per foot, nominal	1.20 lb
Joining system	Gasket joint (triple seal) consisting of an integral bell and spigot. Bell end shall have a triple seal gasket in addition to the interference joint.
Pull-out strength	
Triple-seal gasket with interference joint	2,000 lb
Triple-seal gasket without interference joint (after field cut)	500 lb
UV stability	Meeting the requirements of UL 2515
Fire resistance	Meeting the requirements of UL 2515

Conduit shall be manufactured having non-tapered sections (except for belled ends) to allow for field cutting and joining.

4.3 Fittings

Fittings, consisting of couplers and elbows, shall be appropriate and compatible for use with the conduit specified in this standard.

Elbow angles shall be accurate to ± 2% of specified.

Female terminal adapter shall have straight threads.

4.4 Accessories

Accessory components, consisting of two-part adhesives, adhesive guns, stir sticks, and abrading supplies, shall be appropriate and compatible for use with the conduit and fittings specified in this standard.

Adhesive curing time shall be approximately one hour at an ambient temperature of 75 degrees F (29 degrees C).

Adhesive shall be suitable for bonding fiberglass and PVC together.

5. Marking

Each conduit section and fitting shall be marked according to the requirements of UL 2515, Section 6.

6. Testing

Conduit test data that establishes compliance with the requirements of UL 2515 and this standard shall be provided upon request.

7. Packaging

Standard crate dimensions shall be approximately 4 ft by 4 ft by 20 ft.

Each crate shall be legibly marked with the following information:

- Manufacturer's identification
- Product description
- Seattle City Light's purchase order number
- Seattle City Light's stock number.

8. Shipping

Conduits and 45-degree or larger elbows shall be delivered on enclosed, covered, or flatbed trucks with side-load capability.

Because Washington State law requires a 10-in minimum side board when driving a forklift or pallet jack onto the bed of a truck or trailer, most flatbed trucks or trailers must be side-loaded to ease off-loading.

9. Issuance

Conduit: FT

Fittings: EA

Accessories: EA

10. Approved Manufacturers

10.1 Products Approved for Purchase by Seattle City Light

Table 10.1. Approved Products, Champion Fiberglass

Stock No.	Description	Item No.
012808	Conduit, 20-ft straight section	50C-MW-20-G
012809	Elbow, 90º x 60 in	50C-MW-94-P
012847	Elbow, 90º x 144 in	50C-MW-9CR144P
012848	Elbow, 11-1/4º x 144 in	50C-MW-5CR144P
012849	Elbow, 22-1/2º x 144 in	50C-MW-6CR144P
012850	Elbow, 45º x 144 in	50C-MW-8CR144P
012814	Stop coupling	50C-MW-40
013358	Repair coupling	50C-MW-42
012815	End bell, socket type	50C-MW-29
012817	Female terminal adapter	50C-MW-32-SCL
012818	Fiberglass end cap with gasket	50C-MW-23-G
012819	Adhesive gun	CM-AG
012820	Epoxy cartridge, 20 fl oz, 70º F	CM-2070
012821	Adhesive kit; includes can of base adhesive, can of hardener, stir sticks, sand paper, and instructions; 70º F	CF-1070
013314	Mixing tip, spare for use with epoxy cartridge Stock No. 012820	CMMT
013567	5-in IPS fiberglass to 5-in PVC adapter	50C-MW-27-5PVC
013568	Elbow, 5º x 144 in	50C-MW-CD05CR144P
013586	Elbow, 15º x 144 in	50C-MW-15CR144P

10.2 Products Approved for Purchase and Installation by Seattle City Light Contractors

All material items cited in Section 10.1.:

- Champion Fiberglass
- FRE Composites

Fiberglass elbows:

- Raceway Technology

11. References

SCL Design Standard 9220.05; "Electric Power Cable and Conduit Selection"

12. Sources

Bulletin No. TCB 2-2000; "NEMA Guidelines for the Selection and Installation of Underground Nonmetallic Duct"; National Electrical Manufacturers Association

CD-0807; Champion Duct Fiberglass Conduit product catalog;
Champion Fiberglass; 2003

"Gasket Joint Installation Recommendations"; Champion Fiberglass

"Instructions for Installing Champion Duct Below Ground (Encased in Concrete and Direct Buried)"; Champion Fiberglass

Shipek, John; SCL Standards Engineer, subject matter expert and originator of 7025.05 (john.shipek@seattle.gov)

Wang, Quan; SCL Standards Engineer and subject matter expert for 7025.05 (quan.wang@seattle.gov)

www.championfiberglass.com

www.frecomposites.com

STEEL ELECTRICAL METALLIC TUBING (EMT)

1. Scope

This material standard covers the requirements for steel electrical metallic tubing, also known as EMT or thinwall conduit. EMT bends and fittings are outside the scope of this standard.

This material standard applies to the following Seattle City Light Stock Numbers:

Stock Number	Trade Size, in
734880	1/2
734881	3/4
734882	1

2. Application

EMT conduit is used to construct smooth, exposed or concealed raceways for the pulling in of low voltage wire or cable.

EMT conduit is not appropriate for use in concrete below grade or in contact with soil without supplementary corrosion protection.

3. Industry Standards

EMT conduit shall meet the requirements of the following industry standard:

ANSI C80.3-2005 - American National Standard for Steel Electrical Metallic Tubing (EMT)

4. Requirements

EMT conduit shall meet the requirements of ANSI C80.3.

EMT conduit shall not have any features that can abrade or otherwise damage wire or cable.

5. Marking

Each EMT conduit section shall be marked according to the requirements of ANSI C80.3.

The outer surface of each EMT conduit section shall be marked with the manufacturer's name or symbol.

6. Testing

Test data that establishes compliance with the requirements of ANSI C80.3 and this material standard shall be provided upon request.

7. Packaging

EMT conduit shall be furnished in 10 ft sections, unless specified otherwise on the purchase order.

Bundles shall be legibly marked with the following information:

- Manufacturer's identification
- Product description
- Seattle City Light's Purchase Order Number
- Seattle City Light's Stock Number
- Gross, net, and tare weight

8. Shipping

EMT conduit may be delivered on enclosed, covered, or flatbed trucks. If conduit is delivered on a flatbed truck, conduit shall be side-loaded.

Because Washington State law requires a 10 inch minimum side board when driving a forklift or pallet jack onto the bed of a truck or trailer, most flatbed trucks or trailers must be side-loaded to ease off-loading.

9. Issuance

Stock Unit: FT

10. Approved Manufacturers

Seattle City Light Material Control personnel may identify and approve distributors, and hence manufacturers, of EMT conduit.

11. References

NFPA 70/NEC-2008, National Electrical Code, Article 358, Electrical Metallic Tubing: Type EMT

Shipek, John; SCL Standards Engineer, originator of 7030.05 (john.shipek@seattle.gov)

standards coordinator	*standards supervisor*	*unit director*
John Shipek	John Shipek	Pam S. Johnson

CONDUIT AND FITTINGS, RIGID ALUMINUM

1. **Scope:** This specification covers rigid aluminum conduit and associated fittings – couplings, elbows, bends, and nipples. Conduit and fittings shall comply with the requirements of ANSI Standard Specification C80.5 for Rigid Aluminum Conduit and Underwriters' Laboratories, Inc. Standard UL6 for Rigid Metallic Conduit.

2. **Identification:** Each length of conduit, elbow, or nipple shall be identified with the manufacturer's name or trademark, UL label, and the words "Rigid Aluminum Conduit" or "Rigid Metal Conduit" -- except that close-threaded nipples need not be so identified.

3. **Couplings:** Each 10-foot length of conduit shall be furnished with a coupling attached to one end, and the other threaded end shall be protected by a suitable cover.

4. **Packaging:** Conduit and fittings shall be packaged in accordance with the manufacturer's commercial practice to ensure safe delivery without damage.

5. **Inspection and Test:** Conduit and fittings may be subject to test and inspection under the provisions of ANSI C80 or UL6. The supplier shall, at his own expense, replace any rejected conduit.

6. **Rigid Aluminum Couplings**
Stock Unit: EA

Stock Number	Nominal Pipe Size, in.	Stock Number	Nominal Pipe Size, in.
731061	1/2	731066	2
731062	3/4	731067	2-1/2
731063	1		

7. **Rigid Aluminum Conduit**
Stock Unit: FT

Stock Number	Nominal Pipe Size, in.	Stock Number	Nominal Pipe Size, in.
734751	1/2	734756	2
734752	3/4	734758	3
734753	1	734759	3-1/2
734754	1-1/4		
734755	1-1/2		

8. **Elbows – Standard 900**
Stock Unit: EA

Stock Number	Nominal Pipe Size, in.	Stock Number	Nominal Pipe Size, in.
734765	1/2	734769	1-1/2
734766	3/4	734770	2
734767	1	734771	2-1/2
		734772	3

In October 2015, this standard was renumbered from 7343.5 to 7040.05.

Standards Coordinator
Laura Vanderpool

Standards Supervisor
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ZINC-COATED STEEL CONDUIT AND FITTINGS

1. Scope

This standard covers the requirements for zinc-coated steel conduit and fittings consisting of elbows, couplings, and nipple stock.

2. Application

Zinc-coated steel conduit and fittings are used to construct smooth raceways for the pulling in of cable.

Design engineers should be aware that different types of conduit have widely different physical properties that affect their application. Less expensive Schedule 40 PVC, Schedule 80 PVC, and/or fiberglass conduit systems should be considered first.

Refer to Design Standard 9220.05 for more information matching conduit with cable and application.

For new construction, design engineers are directed to utilize the following standard conduit trade sizes:

1/2

1-1/2

2

3

4

5

Design engineers should move away from utilizing these trade sizes (IPS):

3/4

1

2-1/2

3-1/2

Steel conduit is also known as electrical rigid metal conduit - steel, abbreviated ERMC-S. Conduit that is finished means it has a threaded coupling attached to one end.

Elbows are also known as bends. Large radius elbows are also known as sweeps or large sweeps. Five-inch trade size, 60-inch radius sweeps, Stock Number 734826, are used at the base of a riser pole.

Underground duct systems typically utilize elbows that are bent in the field from straight sections. Field bending elbows allows for custom angles and better nesting of multiple runs.

UL 6 defines a nipple to be a straight section of conduit 24 inches in length or less, with male pipe threads at each end. Technically, Seattle City Light purchases nipple *stock*, also known as running thread.

3. Industry Standards

Zinc-coated steel conduit and fittings shall meet the requirements of the following industry standard:

UL 6 - Standard for Electrical Rigid Metal Conduit - Steel, 14th Edition, dated November 30, 2007

4. Detailed Requirements

4.1 General

Conduit and fittings shall be suitable for above ground use indoors or outdoors exposed to sunlight and weather, and for underground use by direct burial or encasement in concrete.

Conduit and fittings shall not have any features that can abrade or otherwise damage cable.

Conduit and fittings shall be provided with a primary coating of zinc.

Dimensional information cited in Sections 4.2 through 4.5 should be consistent with UL requirements and is provided for the convenience of Seattle City Light design engineers, construction crews, inspectors, and quality assurance personnel who do not have ready access to UL 6.

4. Detailed Requirements, continued

4.2 Straight Section Conduit

Conduit shall be listed by Underwriters Laboratories, Standard UL 6.

Each straight conduit section shall be finished with one threaded coupling attached.

Table 4.2. Conduit

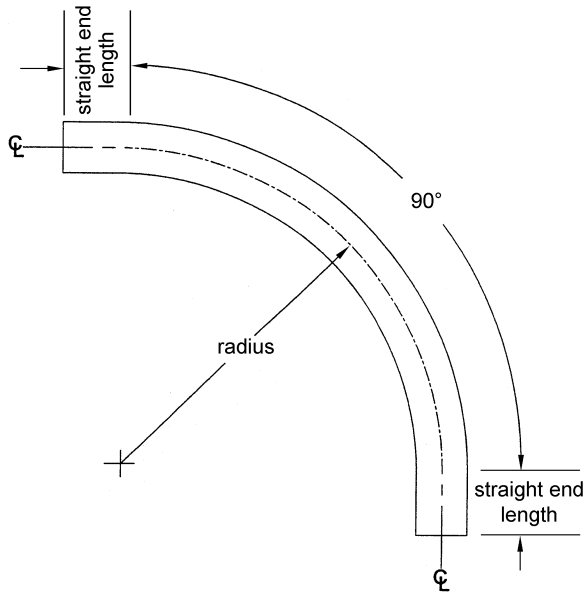
Stock No.	Trade Size (in)	Outside Diameter min (in)	Outside Diameter average (in)	Outside Diameter max (in)	Inside Diameter nom (in)	Wall Thickness nom (in)	Weight min (lbs / ft)
012085	1/2	0.825	0.840	0.855	0.632	0.104	0.79
012086	3/4	1.035	1.050	1.065	0.836	0.107	1.05
012087	1	1.300	1.315	1.330	1.063	0.126	1.53
734740	1-1/2	1.885	1.900	1.915	1.624	0.138	2.49
734741	2	2.351	2.375	2.399	2.083	0.146	3.32
734742	2-1/2	2.846	2.875	2.904	2.489	0.193	5.27
734743	3	3.465	3.500	3.535	3.090	0.205	6.82
734744	3-1/2	3.960	4.000	4.040	3.570	0.215	8.31
734745	4	4.455	4.500	4.545	4.050	0.225	9.27
734747	5	5.507	5.563	5.619	5.073	0.245	13.1

4.3 Elbows

Elbows shall be listed by Underwriters Laboratories, Standard UL 6.

Elbow angles shall be accurate to +/- 2% of specified.

Figure 4.3a. Conduit Elbows



4. Detailed Requirements, continued

4.3 Elbows, continued

Table 4.3b. Standard Sweep Elbows

Stock No.	Trade Size (in)	Degree Bend	Radius (in)	Straight End Length (in)
734805	3/4	90	4-1/2	1-1/2
734806	1	"	5-3/4	1-7/8
734808	1-1/2	"	8-1/4	2
734809	2	"	9-1/2	2
734810	2-1/2	"	10-1/2	3

Figure 4.3b. Standard Sweep Elbows

Table 4.3c. Large Sweep Elbows

Stock No.	Trade Size (in)	Degree Bend	Radius (in)	Straight End Length (in)
734820	2	90	36	11
734821	2-1/2	"	36	11
734822	3	"	36	11
734823	3-1/2	"	36	11
734824	4	"	36	11
012176	4	"	48	12
734826	5	"	60	12
013749	4	22-1/2	48	12
013750	4	45	48	12

Figure 4.3c. Large Sweep Elbows

4.4 Threaded Couplings

Threaded couplings shall be listed by Underwriters Laboratories, Standard UL 6.

Threaded couplings shall be straight-tapped.

Table 4.4. Straight Threaded Couplings

Stock No.	Trade Size (in)
731091	1/2
731092	3/4
731093	1
731094	1-1/4
731095	1-1/2
731096	2
731097	2-1/2
731098	3
731099	3-1/2
731100	4
731102	5

Figure 4.4. Threaded Coupling

4. Detailed Requirements, continued

4.5 Nipple Stock

Nipple stock shall be provided in three-foot lengths.

Table 4.5. Nipple Stock

Stock No.	Trade Size (in)	Threads per in
734868	1/2	14
734869	3/4	14
734870	1	11-1/2
734872	1-1/2	11-1/2
734873	2	11-1/2
734874	2-1/2	8

Figure 4.5. Nipple Stock

5. Marking

Each straight length of finished conduit, elbow, and threaded coupling shall be marked according to the requirements of UL 6, Section 7. This marking shall include, but not be limited to:

- Manufacturer's name or symbol
- "electrical rigid metal conduit" or "ERMC-S" (conduit and elbows only)
- "EC" (couplings only)

6. Testing

Conduit and fitting test data that establishes compliance with the requirements of UL 6 and this material standard shall be provided upon request.

7. Packaging

Straight conduit shall be furnished in 10 ft sections unless specified otherwise on the purchase order.

Each bundle shall be legibly marked with the following information:

- Manufacturer's identification
- Product description
- Seattle City Light's Purchase Order Number
- Seattle City Light's Stock Number
- Gross, net, and tare weight

8. Shipping

Conduit may be delivered on enclosed, covered, or flatbed trucks. If conduit is delivered on a flatbed truck, conduit shall be side-loaded.

Because Washington State law requires a 10-inch minimum side board when driving a forklift or pallet jack onto the bed of a truck or trailer, most flatbed trucks or trailers must be side-loaded to ease off-loading.

9. Issuance

Conduit FT
Fittings EA

10. Approved Manufacturers

Allied Tube and Conduit	Shamrock
Cal Conduit Products	Steelduct
Conduit Pipe Products	Torrance
Occidental	Triangle
Picoma	Western
Republic	Wheatland

11. References

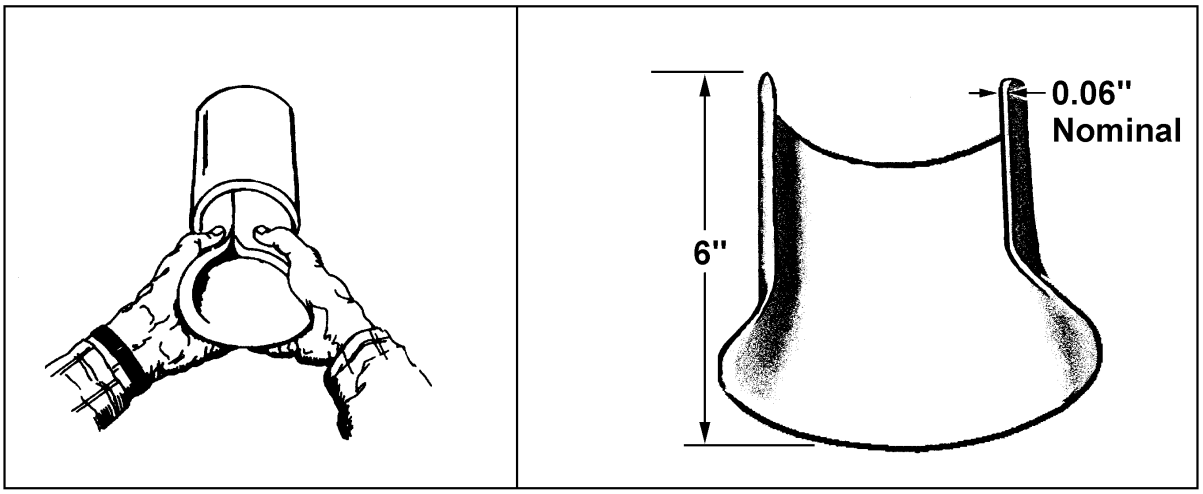
7347.5; “Conduit and Fittings, Rigid Steel, Galvanized” (canceled); Material Standard; SCL

7347.6; “Elbow, 90° Large Sweep, Rigid Galvanized Steel Conduit” (canceled); Material Standard; SCL

9220.05; “Electric Power Cable and Conduit Application” (in development); Design Standard; SCL

Shipek, John; SCL Standards Engineer, subject matter expert and originator of 7050.05 (john.shipek@seattle.gov)

Conduit Fitting, Cable Protector



Cable Protectors for installation in duct and conduit ends shall be of the configuration shown, and shall be made from stress-relieved virgin nylon meeting the requirements of ASTM D789 or high-density polyethylene meeting the requirements of ASTM D1248. The material shall have the following additional requirements.

Exceptional resistance to abrasion
Low coefficient of friction
Burning rate of 1.04"/minute or slower per ASTM D635
Temperature range: -20 to +90°C., and retain uniform characteristics
Resistant to weak acids and alkalis
Color shall be white, light gray or other light colors which can be written on with a black marker. Black is unacceptable.

Reference Specification: ASTM D789, ASTM D1248, ASTM D635

Stock Unit: EA

Stock Number	Conduit Size (in)	Approved Manufacturers			
		Virginia Plastics	Anchor Industrial Plastics	Condux	Electrical Materials Co. (EMCO)
731800 E	2 to 2½	LG-225	APCP-2	80423-01	27-2 Grey
731801 E	3 to 6	LG-345	APCP-3	80423-00	27-1 Grey

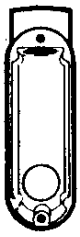
In October 2015, this standard was renumbered from 7311.4 to 7050.19.

Condulets for Aluminum or Galvanized Steel-Threaded Rigid Conduit

Conduit Bodies shall be fabricated from essentially copper-free cast aluminum alloy.▲ Covers shall be fabricated from cast or sheet aluminum with stainless steel or aluminum captive screws. Gaskets shall be synthetic rubber. Covers, gaskets, and bodies shall be either supplied as completely assembled units or all of the items for each condulet shall be packaged in a sealed heavy plastic bag. Conduit body types other than those illustrated are not normally stocked. When special conduit bodies are needed, order by Stores Requisition for special pickup.

Type "LB"

Stock No.	Size, In.
732574	1/2
732575	3/4
732576	1
732577	1-1/4
732578	1-1/2
732579	2
732580	2-1/2
732581	3



Type "C"

Stock No.	Size, In.
732527	1/2
732528	3/4

Type "T"

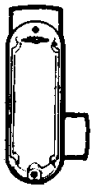
Stock No.	Size, In.
732625	1/2
732629	3/4
732634	1
732639	1-1/4
732646	1-1/2

Type "LL"

Stock No.	Size, In.
732596	1/2
732597	3/4
732598	1
732600	1-1/2
732601	2

Type "LR"

Stock No.	Size, In.
732607	1/2
732608	3/4
732609	1
732610	1-1/4
732611	1-1/2
732612	2



Typical Gasket (Neoprene)

Typical Cover with Captive Screws

▲Some sizes of conduit bodies may not be available in aluminum. Hot-dipped galvanized malleable or ductile iron bodies are an acceptable substitute.

Approved Manufacturers		
Appleton	**Crouse-Hinds**	**Killark**
Form 85 with Type GK_____* N Gasket and Type K Covers	Mark 9 with Mark 9 Gaskets and Covers	O Series with OLK_____* RG Gaskets and OL or OCL Covers

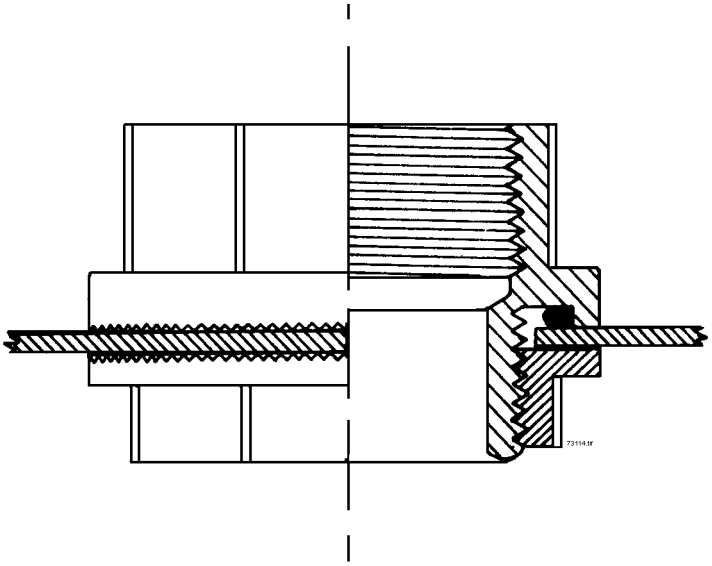
*Manufacturer's Designation for Conduit Size

Stock Unit: EA

Reference Specifications: Federal Specification W-C-586, latest revision as applies to Type I, Design 1, Cast Aluminum Bodies.

In October 2015, this standard was renumbered from 7325.1 to 7050.17.

CONNECTOR, HUB, WATERTIGHT WITH O-RING GASKET



Watertight Hubs with O-Ring Gaskets shall be of the general configuration shown and, when properly installed, shall provide a positive watertight seal and positive electrical ground.

Body: The threaded body and nut shall be zinc-base alloy die castings manufactured in accordance with ASTM B 86. The hub and nut flange surfaces shall be serrated to assure a positive electrical ground and vibration-proof service.

O-Ring: The O-Ring shall be neoprene rubber.

Reference Specification: ASTM B 86, latest revision

Stock Unit: EA

Stock Number	Conduit Size Inches	Approved Manufacturers	
		Steel City	Thomas & Betts
012092	1/2	H050-SC	H050-SC
731130	3/4	H075-SC	H075-SC
731131	1	H0100-SC	H0100-SC

In October 2015, this standard was renumbered from 7311.4 to 7050.19.

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STEEL COUPLINGS, FIVE-INCH, SET-SCREW TYPE

1. Scope

This standard covers the requirements for five-inch, set-screw type, zinc-coated, steel couplings.

This standard applies to Seattle City Light stock number 013421.

2. Application

Set-screw type steel couplings are used to join threaded sections of five-inch steel conduit to straight-cut, unthreaded sections.

This coupling is used where it is not practical or possible to use a standard, five-inch threaded coupling, stock number 731102. This coupling also satisfies federal “Buy American” policies.

3. Requirements

Set-screw type steel couplings shall be fabricated by Seattle City Light’s machine shop from excess couplings meeting the requirements of Material Standard 7050.05 – Zinc-Coated Steel Conduit and Fittings.

Note: It is an industry standard that straight sections of steel conduit are provided with a coupling on one end. After a project it is common for numerous couplings to be left over. It is from these leftovers that the machine shop fabricates a new product. Leftover couplings should be turned in to the warehouse as stock number 731102.

Set-screw type steel couplings shall be fabricated according to the requirements of Figure 3.1.

4. Packaging

Packaging shall accommodate the needs of Seattle City Light warehouse personnel.

Each package shall be legibly marked with Seattle City Light's stock number.

5. Issuance

EA

6. Approved Manufacturers

Seattle City Light machine shop

7. References

Shipek, John; Standards engineer and originator of 7051.03.

Material Standard 7050.05 – Zinc-Coated Steel Conduit and Fittings

American Recovery and Reinvestment Act of 2009, Section 1605

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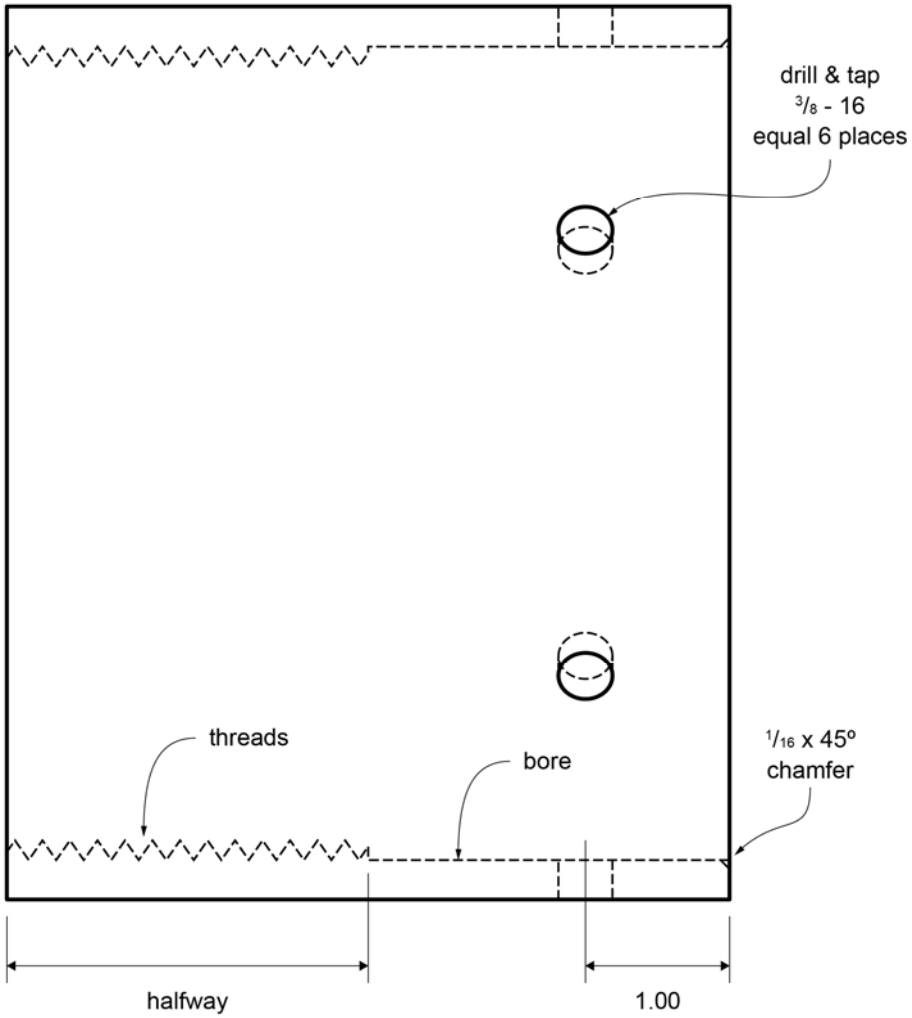
Figure 3.1, Machining Plan



bore threads out half way Ø5.660 ±0.010

DB120, PVC Conduit Fittings

1. **Scope:** This specification is for polyvinyl chloride (PVC) plastic utilities fittings suitable for underground installations: Type DB-120.

   The fittings shall comply with the latest revision to NEMA TC 9, "Fittings for Polyvinyl Chloride (PVC) Plastic Utilities Duct for Underground Installation."

2. **Fittings** shall be furnished in the sizes and types specified on the purchase order. Sockets shall be in accordance with Table 2-2 or 2-3 of NEMA TC 9. Plugs and end bells shall be in accordance with Tables 2-12 and 2-7 or 2-8, respectively, of NEMA TC 9.

3. **Color:** Fittings shall be medium to dark gray in color.

4. **Markings:** In addition to the marking requirements of NEMA TC 9, each shipping lot shall be marked with the City purchase order number, gross and net weights, and the name and address of the manufacturer.

5. **Reference Specification:** NEMA TC 9, ASTM D 2672, ASTM F 512 (latest revisions)

6. **Stock Unit:** EA

End Bells (see note 1)		Plugs (see note 2)	
Stock No.	Size, nominal (in)	Stock No.	Size, nominal (in)
734944	2	734938	2
734946	3	734940	3
734947	3-1/2	–	–
734948	4	734942	4
734949	5	734943	5
010340	6	010338	6

Notes
1. Approved end bell manufacturers: Carlon; Kraloy; PW Eagle Inc., dba PWPipe; Scepter.
2. Approved plug manufacturer: Carlon only.
3. For regular couplings and adapters and 45º and 90º bends, refer to SCL 7020.05..

7. **Adapter:** 3-1/2″ nominal round to 3-1/2″ nominal square by 24″ long.

   Stock No. 734565

   Approved adapter manufacturers: Carlon; J-M Manufacturing Inc.; Picoma; PW Eagle Inc., dba PWPipe; Raceways Tech.

8. **References**

   SCL Material Standard 7015.05; “Schedule 40 PVC Conduit and Fittings”

   SCL Material Standard 7345.7; “DB120, PVC Conduit Fittings” (renamed and renumbered to 7055.09 in October 2015)

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PIPE FITTINGS, PVC PLASTIC, DWV AND SCHEDULE 40

Standards: Plastic Pipe Fittings shall conform to the requirements of the latest revision of the following standards: ASTM D 1784, Class 12454-B for polyvinyl chloride (PVC) material; ASTM D 3311 or ASTM D 2466 for fittings dimensions; and ASTM D 2672 for bell-end dimensions.

Usage: Plastic Pipe Fittings are for permanent installation above or below ground for low to moderate pressure vault sump pump discharge systems.

Type & Color: Fittings shall be polyvinyl chloride DWV or Schedule 40 of the sizes and types as listed below. The color of the fittings shall be white or gray.

Marking: Fittings shall be marked in accordance with ASTM D 2241 and D 2466, respectively.

Packaging shall be in accordance with the manufacturer's standard commercial practice to assure safe undamaged delivery.

Stock Units: EA

Stock Number	PVC Pipe Fittings - DWV and Schedule 40			
	Description	Size	Joint	Type
710100	Elbow, 45°	1-1/4" IPS	S x S	DWV
710101	Elbow, 90°	1-1/4" IPS	S x S	DWV
710110	Tee, Sanitary	2" IPS	S x S	DWV
710112	Adapter, M	2" IPS	MIPT x S	SCH 40
710114	Elbow, 45°	2" IPS	S x S	DWV
710116	Elbow, 90°	2" IPS	S x S	DWV
710117	Elbow, 90°	2" IPS	S x S	SCH 40
710118	Tee, Sanitary	1-1/4" IPS	S x S	DWV
710122	Tee, Cleanout	2" IPS	S x FIPT x S	DWV
710123	Plug, Cleanout	2" IPS	MIPT	DWV
710124	Bushing, Flush, Reducer	2" x 1-1/4"	S x S	DWV
710127	Adapter and Plug, Clean out	1-1/4" IPS	FIPT x S MIPT	DWV
710128	Adapter, Clean out	2" IPS	FIPT x S	DWV
710129	Bushing, Flush, Reducer	1-1/2" x 1-1/4"	S x S	SCH 40
714079	Check Valve	1-1/4"	S x S	DWV
714077	Check Valve, Union type	2"	S x S	DWV

standards coordinator	*standards manager*	*unit director*
John Shipek	John Shipek	Pam S. Johnson

Pipe Fittings, Malleable Iron, Threaded

1. Scope

This standard covers the requirements for threaded, malleable iron pipe fittings.

This standard applies to the Seattle City Light stock numbers cited in Section 4.

2. Application

Pipe fittings are suitable for constructing potable water and drainage systems.

In this standard, nominal pipe size (NPS) and iron pipe size (IPS) are considered interchangeable terms.

3. Industry Standards

Pipe fittings shall meet the applicable requirements of the following industry standard:

ASME B16.3-2011 - Malleable Iron Threaded Fittings: Classes 150 and 300

4. Requirements

4.1 General Requirements

Pipe fittings shall meet the applicable requirements of ASME B16.3 and this material standard.

Pipe fittings shall be Class 150.

Pipe fittings material shall be steel or malleable iron.

4.2 Nipples

Stock No.	NPS	Length (in)
712862	1/4	3
712784	1/2	close
712804	1/2	1-1/2
712824	1/2	2
712864	1/2	3
712904	1/2	4
712785	3/4	close
712825	3/4	2
712786	1	close
712826	1	2
712846	1	2-1/2
712906	1	4
712789	2	close
712849	2	2-1/2
712869	2	3
712989	2	6
712854	2	12

4.3 Couplings

Stock No.	NPS
711665	3/4
711666	1

4.4 Plugs, Square Head

Stock No.	Head Type	NPS
713283	solid	1/4
713285	solid	3/8
713287	cored	1/2
713289	cored	3/4
713291	cored	1
713297	cored	2

4.5 90-Degree Elbows

Stock No.	NPS
711902	1/4
711904	1/2
711906	1
711909	2

4.6 90-Degree Street Elbows

Stock No.	NPS
711945	3/4
711946	1
911947	1-1/4

4.7 Bushings, Outside Hexagon

Stock No.	Size
711175	1/2 x 1/4
711181	1 x 3/4
711194	2 x 1-1/4
711195	2 x 1

4.8 Caps

Stock No.	NPS
711345	3/4
711346	1
711349	2
711353	4

4.9 Unions

Union seat shall be brass or copper.

Stock No.	NPS
713826	1

4.10 Reducers

Stock No.	Size
713389	1 x 3/4
713393	1-1/4 x 1
713400	2 x 1-1/2

4.11 Floor Flanges

Stock No.	NPS
712105	3/4
712109	2

5. Marking

Each pipe fitting shall be marked with the manufacturer's name or trademark.

6. Packaging

Pipe fittings shall be packaged to prevent damage during shipping, handling, and storage.

Shipping containers shall be mark with:

- Seattle City Light Purchase Order Number
- Seattle City Light Purchase Stock Number

7. Issuance

EA

8. Approved Manufacturers

Seattle City Light Material Control personnel will identify and approve distributors, and hence manufacturers, for this family of stock numbers.

9. References

Shipek, John; SCL Standards Engineer and originator of Material Standard 7134.25.

STRAP
ONE-HOLE - MALLEABLE

One-Hole Malleable Pipe Straps for rigid conduit of the general configuration shown shall be made of malleable iron conforming to ASTM Specification A 47.

The straps shall be hot-dipped galvanized, after fabrication, in accordance with ASTM Specification A 153.

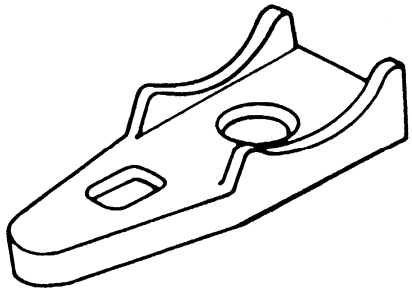
Reference Specifications: ASTM A 47, A 153, latest revisions.

Stock Unit: EA

		Approved Manufacturers					
Stock Number	**Size, in.**	**Appleton**	**Bridgeport**	**O-Z/ Gedney**	**RACO**	**Steel City**	**Thomas & Betts**
713440	1/4	–	–	14-25G	–	–	–
713441	3/8	–	900	14-38G	1301	HS-400	1275
713442	1/2	CL-50MN	901	14-50G	1302	HS-401	1276
713443	3/4	CL-75MN	902	14-75G	1303	HS-402	1277
713444	1	CL-100MN	903	14-100G	1304	HS-403	1278
713445	1-1/4	CL-125MN	904	14-125G	1305	HS-404-SC	1279
713446	1-1/2	CL-150MN	905	14-150G	1306	HS-405	1280
713447	2	CL-200MN	906	14-200G	1308	HS-406	1281
713451	4	CL-400MN	910	14-400G	1316	HS-410	1285

standards coordinator	*standards supervisor*	*unit director*
John Shipek	John Shipek	Darnell Cola

SPACER, PIPE-STRAP, ONE-HOLE, MALLEABLE IRON



Malleable Pipe-Strap Spacers of the general configuration shown are intended to space rigid conduit from wet masonry surfaces.

The spacers shall be made of malleable iron conforming to ASTM Specification A 47.

The spacers shall be hot-dipped galvanized, after fabrication, in accordance with ASTM Specification A 153.

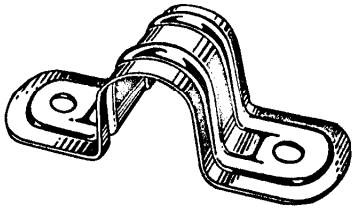
Reference Specifications: ASTM A 47, A 153, latest revisions.

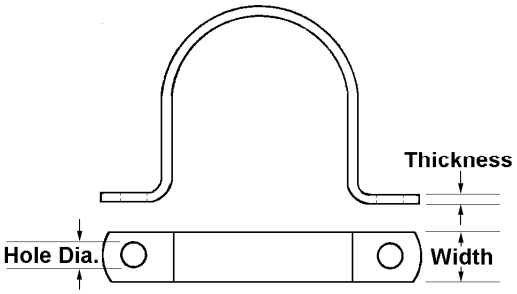
Stock Unit: EA

Stock Number	Size, in.	Approved Manufacturers				
		Appleton	Bridgeport	O-Z/Gedney	RACO	T & B
713338	1/2	CLB-50MN	941	141G	1342	1350
713452	3/4	CLB-75MN	942	142G	1343	1350
713453	1	CLB-100MN	943	143G	1344	1350
713454	1-1/4	CLB-125MN	944	144G	1345	1351
713455	1-1/2	CLB-150MN	945	145G	1346	1351
713456	2	CLB-200MN	946	146G	1348	1351

STANDARDS COORDINATOR	STANDARDS SUPERVISOR	UNIT DIRECTOR
Charles L. Shaffer	John C. Skinner	Haedee Jay

Straps, Pipe, Two-Hole





Two Hole Pipe Straps shall be made of galvanized sheet steel conforming to ASTM Specification A 90 for sizes 3/8-inch to 1-inch (nominal pipe size).

Pipe Straps of 1-1/4-inch to 3-inch (NPS) size shall be made of hot-rolled carbon steel strip, commercial quality, meeting the requirements of ASTM Specification A 425. The straps shall be galvanized after fabrication.

Reference Specifications: ASTM A 90, A 569, latest revisions. See City Light shop drawing A-4648.

Stock Unit: EA

	Dimensions (in)						Approved Manufacturers				
Stock No.	Nominal IPS*	Min. Width	Max. Width	Min. Hole Dia.	Min. Thick-ness	Max. Thick-ness	CL Shop	Cooper	Minerallac	Unistrut	Wesanco
713461	3/8	5/8	1	9/32	1/16	1/8	–	2580110	228	–	–
713462	1/2	9/16	1-5/8	9/32	1/16	1/8	–	2580140	240	P2558-5	W-7826
713463	3/4	3/4	1-5/8	9/32	1/16	1/8	–	2580180	250	P2558-7	W-7828
713464	1	7/8	1-5/8	9/32	3/32	1/8	–	2580200	260	P2558-10	W-7830
713465	1-1/4	7/8	1-5/8	9/32	3/32	1/8	–	2580260	–	P2558-12	W-7832
713466	1-1/2	7/8	1-5/8	9/32	3/32	1/8	–	2580300	–	P2558-15	W-7834
713467	2	1-1/4	1-5/8	11/32	3/32	1/4	–	–	HD290	P2558-20	W-7838
713469	3	1-1/4	1-5/8	13/32	1/8	1/4	A4648	–	HD294	P2558-30	W-7846
713470	3-1/2	1-1/4	1-5/8	13/32	3/16	1/4	A4648	–	HD295	P2558-35	W-7850

* IPS = Iron Pipe Size

Standards Coordinator
John Shipek

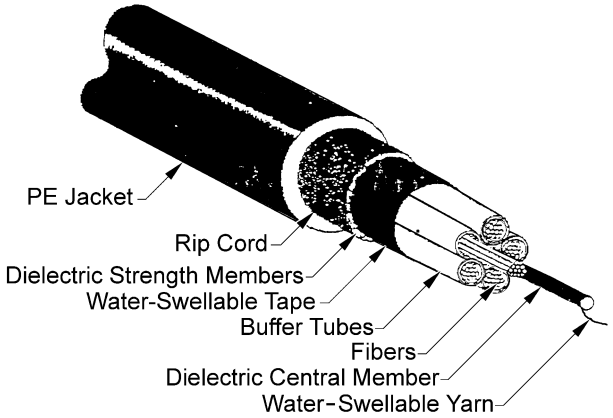
Standards Supervisor
John Shipek

Unit Director
Darnell Cola

FIBER OPTIC OUTDOOR DUCT CABLE

1. Cable Construction

1.0 Loose tube cable.
1.1 Dense pack.
1.2 All dielectric construction.
1.3 Water-swellable tape.
1.4 The glass core must be CORNING-PREMIUM Glass SMF28e. No other glass manufacturer will be accepted.
1.5 The fiber optic cable shall be constructed as shown on right.



Fiber Optic Cable Construction

2. Construction Specifications

2.0 Core Diameter, µm .....8.3 to 8.7
2.1 Cladding Diameter, µm.....125
2.2 Fiber Count.....96 fibers
2.3 Fiber Type, Single Mode (SMF28e)..1310/1383/1550 nm
2.4 Fibers per Buffer Tube.....12

3. Cable Attenuation

3.0 Attenuation at 1310 nm.....0.35dB/km
3.1 Attenuation at 1383 nm.....0.35dB/km
3.2 Attenuation at 1550 nm.....0.25dB/km

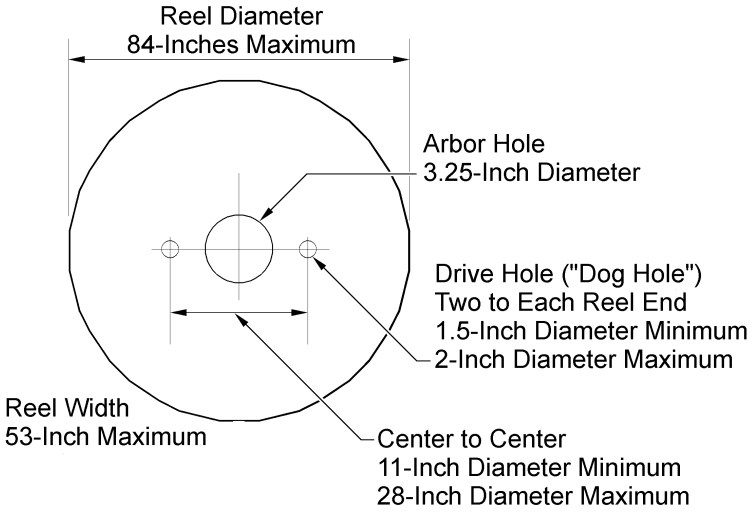
4. Mechanical Specifications

4.0 Maximum Installation Load (EIA RS-455-33) .....2700 N (600 lb.)
4.1 Maximum Operating Load (EIA RS-455-33).....600 N (133 lb.)
4.2 Minimum Bending Radius (at 2700 N).....20 times outside diameter
4.3 Minimum Bending Radius (No Load).....10 times outside diameter
3.4 Crush Resistance(ICEA 640) .....220 N/cm
4.5 Impact Resistance(EIA 455-41).....20 impacts
4.6 Vibration Resistance.....10-55 Hz at IMM amplitude for 2 hours
4.7 Storage Temperature .....– 40º C to + 70º C
4.8 Operating Temperature .....– 40º C to + 70º C
4.9 Installation Temperature.....– 30º C to + 60º C

5. Cable Identification. Length markings on cable shall indicate length in feet.

6. Reel Requirements. The cable reels shall be constructed as follows (see diagram). Deviation from stated reel size must be approved by City Light communications engineer. Each reel end shall have two drive holes (“dog holes”).

6.0	Minimum Cable Length on Reel, ft.	25,000
6.1	Reel Height, not to exceed, in.	84
6.2	Reel Width, not to exceed, in.	53
6.3	Arbor Hole, in.	3.25
6.4	Minimum Drive Hole diameter, in.	1.5
6.5	Maximum Drive Hole diameter, in.	2.0
6.6	Minimum Drive Hole, center to center, in.	11
6.7	Maximum Drive Hole, center to center, in.	28



Reel, End View

7. City Light Stock No.: 010311

8. Stock Unit: FT

9. Approved Manufacturers and Product Numbers:

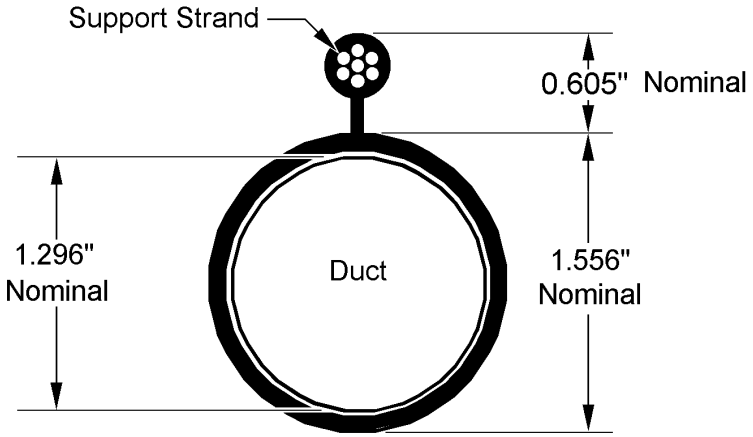
AFL Telecommunications (Fujikura) P/N LE0964C8101N1

Corning Cable Systems P/N 096EW4-T4100D20

Prysmian (formerly Pirelli) P/N 0096HBS1LAFESJA

In November 2015, this standard was renumbered from 8001.0 to 7140.05.

DUCT, AERIAL, SELF-SUPPORTING



Aerial Duct

1. Duct Construction

1.1 Construction material: High tensile strength high density polyethylene (HDPE) with smooth inside and smooth outside and color shall be black with UV protection formula.

1.2 "Figure 8" construction incorporating galvanized support for aerial placement. The supporting strand shall be Class A flooded, 3/8-inch extra high-strength galvanized.

1.3 Standard dimension ratios (SDR): SIDR 9 (standard inside diameter dimension ratios).

1.4 The interior of the duct must be constructed of a material such that the coefficient of friction is, at a minimum, 79-per cent less than standard HDPE conduit with identical pulling forces.

1.5 Minimum bending radius (see construction specifications table) must prevent the duct exceeding 5-per cent of ovality.

1.6 Construction Specifications:

Typical Diameter, Inches		Minimum Breaking Strength, Pounds	Minimum Bending Radius, Inches	Approximate Weight per 100 Feet, Pounds
Inside Duct	Outside Duct			
1.25	1.5	15,000	16	55

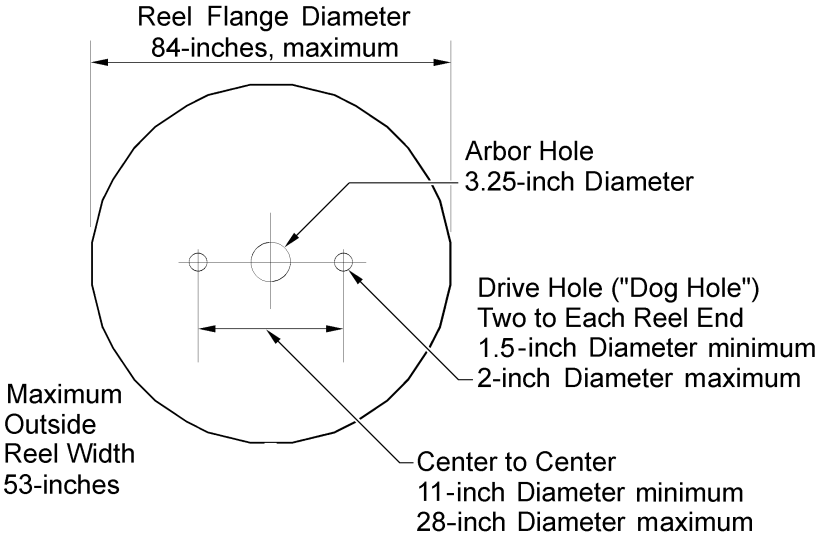
2. Shipping

Duct shall be shipped in 5,000-foot lengths per reel. Duct shall be supplied on non-returnable reels.

3. Reels

The cable reels shall be constructed as follows (see diagram). Reels, including arbor hole, must meet City Light vehicle restraints.

		Not to Exceed, inches			Drive Holes ("Dog Holes") 2 in Each Reel End	
City Light Stock No.	Duct Length on Reel, feet	Max. Flange Diameter	Max. Outside Width of Reel	Arbor Hole, Diameter, inches	Diameter, inches	Center to Center, inches
010312	5,000	84	53	3.25	1.5 min. 2.0 max.	11 min. 28 max.



Reel, End View

4. Stock Unit: FT

5. Approved Manufacturer and Product Number:

AD Technologies, Part No. 5-152305-5000

In November 2015, this standard was renumbered from 8020.0 to 7140.10.

Fluidized Thermal Backfill

1. Scope

This standard covers the requirements for the formulation of thermally conductive concrete and low strength material used in the construction of encased electrical conduits (duct banks) including high strength Fluidized Thermal Backfill (FTB) and low strength Fluidized Thermal Backfill. Because FTB is a mixed-to-order product, it is not stocked in Seattle City Light (SCL) inventory.

This standard applies to the following SCL stock numbers:

Stock No.	Description	Unit
013711	High strength FTB	CYU
013712	Low strength FTB	CYU

2. Application

Fluidized Thermal Backfill (FTB) is used to encase and cover underground power conduits that will contain transmission or distribution cables which may operate at or above normal ampere capacity (ampacity). FTB transfers heat away from power cables, allowing them to conduct more power.

Low-Strength FTB is used like controlled density fill (CDF) to backfill trenches over the high-strength FTB duct banks, and also for encasement where high-strength is not desired. It provides superior thermal properties to other backfills, and is self-compacting.

High-Strength FTB is used like concrete for duct bank encasement. It provides maximum protection against dig-ins and undermining during future excavations. As a rule, high-strength FTB is more thermally conductive than low-strength FTB, but it is much more difficult to remove in future excavations.

FTB is normally not required for vault, manhole, or handhole backfill.

Admixtures must be pre-approved by SCL.

3. Industry Standards

Backfill shall meet the requirements of the latest revisions of the following industry standards:

ASTM C31/C31M; Standard Practice for Making and Curing Concrete Test Specimens in the Field

ASTM C39/C39M; Standard Test Method for Compressive Strength of Cylindrical Concrete Specimens

ASTM C136; Standard Test Method for Sieve Analysis of Fine and Coarse Aggregates

ASTM C143; Standard Test Method for Slump of Hydraulic Cement Concrete

ASTM C150; Standard Specification for Portland Cement

ASTM C618; Standard Specification for Coal Fly Ash and Raw or Calcined Natural Pozzolan for Use in Concrete

ASTM C989; Standard Specification for Ground Granulated Blast-Furnace Slag for Use in Concrete and Mortars.

4. Mix Design & Requirements

4.1 General Requirements

The contractor shall provide a FTB mix design which meets the performance requirements outlined in Table 4.

FTB mix designs must specify the source of all FTB component materials, including the source pit for aggregate materials. The maximum aggregate is 3/8 in.

FTB mix designs must be engineered by a Seattle City Light-approved consultant.

FTB component materials may include:

- 3/8-in minus (medium) aggregate – ASTM C136 Sieve Analysis required for approval
- Building sand (fine aggregate) – ASTM C136 Sieve Analysis required for approval
- Portland Cement – type I per ASTM C150
- Fly Ash – Class F as per ASTM C618-05
- Ground Granulated Blast Furnace Slag – ASTM C989-05
- Water – clean potable water required, or as approved by SCL
- Red concrete dye, where specified by Seattle City Light engineering. Red dye should be added at the equivalent of 4 pounds of red oxide per cubic yard.

Table 4. Performance Requirements

		Low Strength FTB		High Strength FTB		
Criteria	**Unit**	**Mix Design**	**Field Test**	**Mix Design**	**Field Test**	**Testing Method**
Thermal Resistivity						
Maximum at 0% Moisture Content	(°C-cm)/W	100	100	75	75	Consultant
Maximum at Critical Moisture Content	(°C-cm)/W	70	80	60	65	Consultant
Minimum 28-Day Compressive Strength	lb/sq-in	100	100	3000	3000	ASTM C873
Maximum 28-Day Compressive Strength	lb/sq-in	130	150	none	none	ASTM C873
Minimum Slump	in	6	6	6	6	ASTM C143
Maximum Slump	in	9	9	9	9	ASTM C143

4.2 Mix Design Criteria

FTB mix designs shall meet or exceed the performance requirements cited in Table 4.

4.3 Air Content

The total air content of any FTB mix shall not exceed 2% by volume. No air entraining admixtures will be permitted.

4.4 Substitutions

No substitutions allowed for any component material without permission of Seattle City Light.

4.5 Withdrawal of Mix Design Approval

SCL reserves the right to temporarily suspend or permanently withdrawal approval of any mix design.

4.6 Admixtures

Admixtures must be approved for use in FTB by Seattle City Light. When allowed, the admixture shall be added per manufacturer recommendation.

4.7 Accelerating Admixture

The following accelerating admixture is approved for use in Seattle City Light FTB: Pozzolith NC 534, manufactured by BASF Admixtures, Inc.

4.8 Fluidizers

Seattle City Light-approved fluidizers may be used interchangeably where produced under the same ASTM specification. Unapproved fluidizers are not interchangeable with approved fluidizers.

For example, approved fly ash (ASTM C618) may be used in any mix design that specifies fly ash but it may not be substituted for blast furnace slag (ASTM 989) in another mix design. Also, an unapproved fly ash may not be substituted for an approved fly ash.

Fluidizer approval requires formulation of a mix design through an approved consultant, and two compliance certification reports that demonstrate consistent physical properties over a six-month period. Seattle City Light may withdraw approval at any time.

High-strength FTB mix designs may be formulated without fluidizer. Low-strength FTB mix designs must be formulated with fluidizer.

5. Producers Identification Codes

FTB mix designs must be designated as follows on all mix designs, submittals and delivery tickets:

- High Strength FTB – SCLHSFTB
- Low Strength FTB – SCLLSFTB

The addition of red dye must also be indicated.

Product codes and mix ID codes of individual suppliers will not be accepted.

6. Approval of FTB Mix Design

6.1 Submittals

The Contractor shall submit a mix design to SCL for all classes of concrete specified.

The Contractor's submittal of a mix design shall contain a unique identification, as per section 5, for each mix design, and shall include the mix proportions per cubic yard, the proposed sources, admixtures, the average 28-day compressive strength (as per ASTM C873), thermal resistivity testing including thermal dry graphs and the water cement ratio.

Test results for compressive strength and thermal resistivity included in the mix design submittal shall not be more than 60 days old.

The Contractor shall notify SCL in writing of any mix design modifications.

6.2 Expiration

Mix designs are approved for a period of one year from the date of SCL approval.

Expired mix designs will not be permitted for use on Seattle City Light projects.

A mix design may be renewed by resubmitting the mix design, including up to date strength and thermal resistivity test results.

7. Approved Suppliers and Mix Designs

	Stock No. 013711		Stock No. 013712	
Supplier	**High Strength FTB Mix ID**	**Expiration Date**	**Low Strength FTB Mix ID**	**Expiration Date**
Salmon Bay Sand and Gravel	SCLHSFTB	3/3/2016	SCLLSFTB	3/3/2016
Stoneway Concrete (Plant 11)	SCLHSFTB	3/2/2016	SCLLSFTB	3/2/2016
Stoneway Concrete (Plant 14)	SCLHSFTB	3/2/2016	SCLLSFTB	3/2/2016
Cadman, Inc.	SCLHSFTB	3/20/2016	SCLLSFTB	6/4/2016
CalPortland	SCLHSFTB/505	5/1/2016	SCLLSFTB	9/9/2016

8. Sources

Detter, Chris; SCL Engineer and originator of 7150.00 (chris.detter@seattle.gov)

Lu, Curtis; SCL Standards Engineer and subject matter expert for 7150.00 (curtis.lu@seattle.gov)

Read, Steven; SPU Materials Engineering Supervisor and subject matter expert for 7150.00 (steven.read@seattle.gov)

SCL Construction Standard 0226.06; "Fluidized Thermal Backfill"

SCL Design Standard 9266.06; "Understanding Fluidized Thermal Backfill" *(not yet published)*

Stewart, Bob; SCL Civil Inspector, subject matter expert and major contributor to 7150.00 (bob.stewart@seattle.gov)

ACCEPTANCE CRITERIA FOR THE INSTALLATION OF NEW PRECAST CONCRETE DISTRIBUTION FACILITIES

Figure 1. Precast Ring Vault

1. Purpose

This Material Standard sets criteria for acceptability and repair of new precast concrete panel vaults, ring vaults, manholes, handholes and equipment pads from manufacture through the warranty period. Design parameters such as surface loading are not included.

2. General

2.1 Vaults and manholes installed with duct windows, risers, and/or panel seams placed contrary to the original design may be rejected at the discretion of SCL Engineering.

2.2 All repairs referred to in this criteria will be performed by the manufacturer in his yard and the installing contractor in the field.

2.3 Repairs will be performed in accordance with SCL Guideline U2-6.

2.4 These procedures assume an adequate structural unit design is used per established good engineering practices, with sound material and good workmanship conforming to the design. This criteria will not limit SCL's recourses if the above assumptions are not met.

2.5 Manufacturer will provide a one (1) year warranty on all repairs and patches.

2. General, continued

2.6 The Manufacturer will not be held responsible for damage that can be determined to be caused by unusual conditions outside of his control.

3. Action While in Manufacturer's Yard

3.1 Roof-top surface

a. The manufacturer shall replace the roof if cracks 0.012 inch or wider, that run from one edge to another edge or to the manhole opening, or appears to go through the concrete or through a ladder insert.

b. The manufacturer shall replace the roof if a crack 0.062 inch wide or greater develops.

c. Any spalled concrete 0.375 inch or deeper shall be repaired.

d. Exposed rebar shall be repaired.

Figure 2. Precast Panel Vault

3. Action While in Manufacturer's Yard, continued

3.2 Roof -inside surface, risers, walls, and floor slabs

a. Cracks 0.012 inch or wider will be repaired.

b. Repair shall be made for any spalled concrete 0.375 inch deep or greater.

c. Exposed rebar shall be repaired.

3.3 Major defects or excessive patching can be cause for rejection.

4. Action from Facility Placement through SCL Approval

4.1 The installing contractor shall provide repairs to facilities that have been delivered to the installation site in acceptable condition and are damaged after delivery.

4.2 Roof-top surface

a. The installing contractor shall replace the roof if cracks 0.012 inch or wider, that run from one edge to another edge or to the manhole opening, or appears to go through the concrete.

b. The installing contractor shall replace the roof if a crack 0.062 inch wide or greater develops.

4.3 Roof-inside surface, risers, walls, and floor slabs

a. Cracks 0.012 inch wide or greater shall be repaired.

b. Concrete spalls 0.375 inch deep or greater shall be repaired.

c. Exposed rebar shall be repaired.

d. SCL Civil Engineering Department shall determine the remedial action to be taken by the installing contractor for cracks 0.125 inch wide or greater, extensive smaller cracking, and/or delamination of concrete.

4.4 Water intrusion due to structure quality problems, or improper installation, can be cause for rejection.

5. References

224.IR-07; “Causes, Evaluation, and Repair of Cracks in Concrete Structures”; American Concrete Institute

Detter, Chris; SCL Standards Engineer, subject matter expert and originator of 7201.00 (chris.detter@seattle.gov)

NVH-80; “Network Area Requirements for Panel or Cast-In-Place Vaults”; *SCL Construction Guidelines*

U2-6; “Inspecting and Repair Procedures for Precast Vaults and Manholes”; *SCL Construction Guidelines*

Precast Reinforced Concrete Handholes - General

1. Scope

This material standard covers the general requirements for precast reinforced concrete handholes used at Seattle City Light (SCL).

Specific requirements shall be according to the detailed material standards and purchase orders issued.

2. Application

These precast handholes are intended for use in the construction of underground electric system. The precast concrete handhole may be used to house equipment, cables, service connections, fuses and splices for the secondary distribution system and streetlight system. The precast handholes are not intended to be placed in locations subjected to continuous traffic loading.

Standards Coordinator
Quan Wang

Standards Supervisor
John Shipek

Unit Director
Darnell Cola

3. Definitions

3.1 Handhole

National Electrical Safety Code (NESC): An access opening, provided in equipment or in a below-the-surface enclosure in connection with underground lines, into which personnel reach but do not enter, for the purpose of installing, operating, or maintaining equipment or cable or both.

Seattle City Light (SCL): An enclosure that is used for secondary service and/or streetlight system. Enclosures 233 or smaller.

4. Industry Standards

Handholes shall meet the applicable requirements of the following industry standards:

ACI 318-11 – Building Code Requirements for Structural Concrete and Commentary,

ANSI/AWS D1.4/D1.4M-11 – "Structural Welding Code – Reinforced Steel"

ASTM A123/A123M-08 – "Standard Specification for Zinc (Hot-Dip Galvanized) Coatings on Iron and Steel Products"

ASTM A185/A185M-07 – "Standard Specification for Steel Welded Wire Reinforcement, Plain, for Concrete"

ASTM A497/A497M-07 – "Standard Specification for Steel Welded Wire Reinforcement, Deformed, for Concrete"

ASTM A615/A615M-09b – "Standard Specification for Deformed and Plain Carbon-Steel Bars for Concrete Reinforcement"

ASTM A706/A706M-09b – "Standard Specification for Low-Alloy Deformed and Plain Bars for Concrete Reinforcement"

ASTM C39/C39M-10 – "Standard Test Method for Compressive Strength of Cylindrical Concrete Specimens"

ASTM C150/C150M-12 – "Standard Specification for Portland Cement"

ASTM C478-09 – "Standard Specification for Precast Reinforced Concrete Manhole Sections"

ASTM C857-11 – "Standard Practice for Minimum Structural Design Loading for Underground Precast Concrete Utility Structures"

ASTM C858-10e1 – "Standard Specification for Underground Precast Concrete Utility Structures"

NESC - 2012 – National Electric Safety Code, Rule 094B6, Concrete-Encased Electrodes

5. Conflict

Where conflict exists, the following order of precedence shall apply:

1. Seattle City Light purchase order (PO)
2. Seattle City Light General Terms and Conditions
3. Detailed material standards
4. This standard
5. ASTM standards
6. Other industry standards.

6. Dimensions

Manufacturers, the Washington State Department of Transportation (WSDOT) and the City of Seattle Standard Plan No 550A may refer to the different sizes of handhole by name and type. Table 6 summarizes the agreed-upon dimensions.

Table 6. Handhole Names, Types and Dimensions

		Overall Dimensions Nominal (in)			Inside Dimensions Nominal (in)		
Name	**Type**	**Width**	**Length**	**Height**	**Width**	**Length**	**Height**
1419	1	17	22	12	14	19	12
1728	2	21	32	12	17	28	12
3030	None	30	30	25.5	23.5	23.5	24
231	3	32	44	18.75	24	36	12
233	5	32	44	42	24	36	31.5

7. Structural and Construction

7.1 General

Handholes shall be precast concrete, reinforced, and of the type and size indicated on Seattle City Standard Plan no. 550, SCL detailed material standards and this standard.

Design changes shall require the prior written approval of an SCL Standards Engineer or Civil Engineer.

7.2 Reinforced Concrete

Minimum compressive strength of concrete shall not be less than 4,500 pounds per square inch in 28 days as determined by the ASTM Method C39.

Cement shall conform to ASTM C150.

No additives containing calcium chloride or any other material that will produce corrosive ions shall be used in the concrete.

Welded wire fabric shall conform to ASTM A185 or A497.

Steel Reinforcing Bars shall conform to ASTM A615, Grade 60 or ASTM A706, Grade 60.

Welding of reinforcing steel shall conform to the Structural Welding Code, Reinforcing Steel (AWS D1.4) of the American Welding Society.

The concrete cover (measured from the surface of the concrete to the outside surface of the reinforcement) for reinforcement shall be 1-1/2 in minimum for main reinforcing bars and 3/4 in for stirrups and ties.

The concrete finish shall be free of rock pockets and honeycombed areas.

The interior walls, ceiling and exterior surfaces exposed shall be smooth.

Rock pockets over 3/8-in deep and other imperfections on all surfaces shall be patched and troweled to match the surrounding surface.

7.3 Structural Design

Structural design of the precast handhole shall conform to ACI 318 – "Building Code Requirements for Structural Concrete," and ASTM C857, "Minimum Structural Design Loading for Underground Precast Concrete Utility Structures," with the following clarifications:

- Live Load: AASHTO HS-20 truck, P=16 kips. Traffic can approach the structure from any direction.
- 30% Live load impact load factor for soil cover less than or equal to 2 ft.
- No live load surcharge for soil cover greater than 8 ft.
- Soil density = 120 pcf
- 40 pcf Equivalent Fluid Pressure Lateral Soil Pressure Above Water Table
- 80 pcf Equivalent Fluid Pressure Lateral Soil Pressure Below Water Table
- 80 psf Live Load Surcharge

8. Grounding

All handhole bodies shall be supplied with a grounding connector; 1/4-in ground insert/bolt.

Grounding connector shall be electrically bonded to the frame of the handhole.

Type 1 and Type 2 handhole bodies shall have a 5/16-in ground insert or a grounding pad.

All Type 1 and Type 2 handhole lids shall be supplied with at least a 4-ft length copper braid (ground strap).

9. Knockouts

All knockout edges shall be beveled.

Each enclosure with a floor shall have a ground-rod knockout at two corners of the base of the enclosure.

Size, shape, quantity and location of knockouts shall be specified in detailed material standards.

10. Metal Doors and Access Cover Plates

All lids, hatches and frames shall be provided with a grounding site per manufacturer's standards and detailed material standards.

10.1 Frames and Covers

All hatch covers shall be designed for 16 kips wheel load (H20 + 30% impact) applied in any directions and it shall have a non-skid surface.

10.2 Non Slip Surface

The metal covers, doors, lids and frames shall have a non-slip surface with the following properties:

- Slip resistant surface shall be coated with SlipNOT® Grade 3-coarse, by W.S. Molnar Company or have minimum coefficient of friction of 0.8
- Bond strength to the plate of 4000 psi or greater
- Surface hardness of 55 minimum on the Rockwell "C" scale.

The cover shall be identified on the underside with the Type of surface ("S3" for SlipNOT® 3) and the year of manufacture. Example: "S3 2005." The identification shall be bead-welded or clearly stamped into a metal surface on the underside of each lid, or labeled with an adhesive metallic foil-backed label.

10.3 3030, 231 (Type 3) and 233 (Type 5) Doors

Hinged door shall include one 5/8 inch diameter bonding hole located in an underside bearing bar, approximately centered in the door and 2-1/2 to 3-1/2 inches from the hinged edge.

Doors and access cover plates shall be hot dipped galvanized in accordance with ASTM A153, unless otherwise approved in accordance with Section 8.1.

Door shall be hinged and shall fully open 180 degrees.

Doors shall not exceed 55 pounds equivalent lift.

All doors shall have a locking mechanism, such as a Penta head bolt, to prevent unsolicited access.

10.4 1419 (Type 1) and 1728 (Type 2) Door

Lids shall be at least 5/16 inch thick steel and shall be hot-dip galvanized in accordance with ASTM A 153.

The handhole body shall be provided with a non-slip frame on the top of the handhole body.

The surface of the handhole frame shall be coated with SlipNOT® Grade 3-coarse as manufactured by W. S. Molnar Company.

11. Identification "SL/TC, Electric, SL"

Lids shall be identified clearly on the top of the lid/hatch with 3-inch high letters.

Table 11. Lid Identification Standard

Label	Handhole Occupant/Usage
ELECTRIC	Secondary Distribution
SL	Streetlight Only
SL/TC	Streetlight and Traffic Control – Joint Use

The lid marking shall be accomplished by welding or shall be cast onto the cover.

The lids shall be identified with permanent marking on the underside with the type of surface ("S3" for SlipNOT® 3), and the year of manufacture.

This permanent marking shall be clearly legible.

12. Documentation

12.1 General

Documentation shall be in English and use customary inch-pound units.

Documentation shall utilize common industry terminology and well-understood abbreviations.

12.2 Bidder's Data

Bidder shall return the following technical information with their bids:

- Manufacturer's name
- Manufacturing plant location (all possible)
- Bid information shall be presented in a clear and consolidated manner for ease of review.

13. Approved Manufacturer

Approved manufacturers are identified in the detailed material standards.

14. References

SCL Material Standard 7203.04; "3030 Handhole, Precast, Secondary"

SCL Material Standard 7203.08; "Handhole, 2″ x 3″ x 3″ Precast"

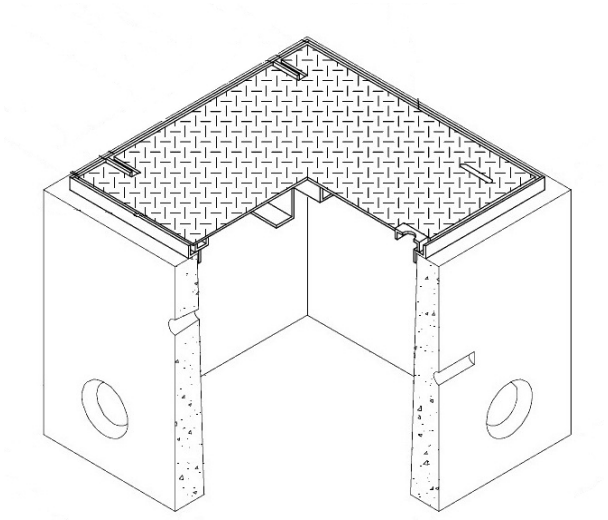
SCL Material Standard 7203.10; "Type 1 and Type 2 Handhole, Precast, Secondary and Streetlight"

SCL Material Standard 7203.21; "Precast Reinforced Concrete Structures – General"

Detter, Chris; SCL Distribution Engineer and subject matter expert for 7203.01 (chris.detter@seattle.gov)

Wang, Quan; SCL Standards Engineer and subject matter expert for 7203.01 (quan.wang@seattle.gov)

3030 Handhole, Precast, Secondary



1. Scope

This standard covers the requirements for 3030 precast secondary handhole bases, frames and covers. Components can be ordered separately or they can be ordered as an assembled handhole unit with cover.

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

Stock No.	Description
013186	3030 handhole base with frame and cover (labeled "Electric")
013187	3030 handhole, base only
013188	3030 handhole frame and cover assembly (labeled "Electric")

2. Application

Handholes are used to house secondary service connections.

Handholes are for use in pedestrian sidewalks where an occasional car or light truck may inadvertently traverse.

3. General Requirements

This detailed standard is to be used in conjunction with the latest version of SCL Material Standard 7203.01, "Precast Reinforced Concrete Handholes – General."

4. Construction - Component Requirements

4.1 Grounding and Bonding Requirements

The handhole base shall be provided with a grounding insert.

The metal frame shall be provided with a grounding lug.

4.2 Handhole Base

The SCL 3030 handhole base (Stock No. 013187) shall have dimensions and features as shown in Tables 4.2a and 4.2b, and Figure 4.2.

Table 4.2a. Handhole Dimensions (Nominal)

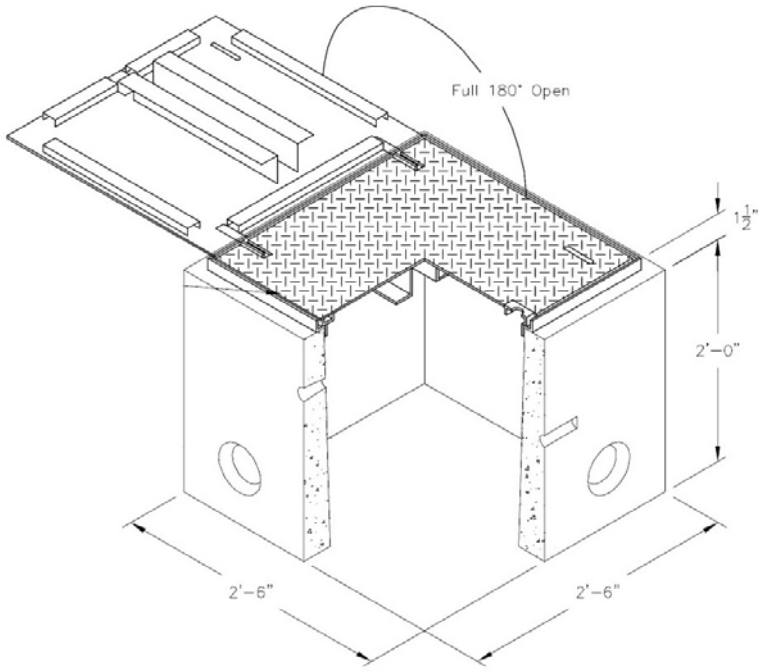
		Outside (in)			Inside (in)		
Stock No.	**Item**	**Length**	**Width**	**Height**	**Length**	**Width**	**Cover Label**
013186	Handhole base, frame and cover	30	30	25.5	24	24	ELECTRIC
013187	Handhole base only	30	30	24	24	24	-
013188	Frame and cover only	28	28	1.5	25	25	ELECTRIC

Table 4.2b. Handhole Features

Feature	**Size, Nominal (in)**	**Location**	**Per Location**	**Total No.**
Knockouts, round	5 dia	All 4 walls, on bottom	2 ea side	8
Lift Holes	1-1/2 dia	Upper center on 2 walls, opposite	1 ea side	2
Ground Inserts, bronze	1/4 dia	One wall, internal	1 ea side	1

Note: Approximate weight is 700 pounds.

Figure 4.2. 3030 Handhole



4.3 Frame and Cover

The 3030 frame and cover assembly (Stock No. 013188) shall have dimensions and features as shown in Table 4.3 and Figure 4.3.

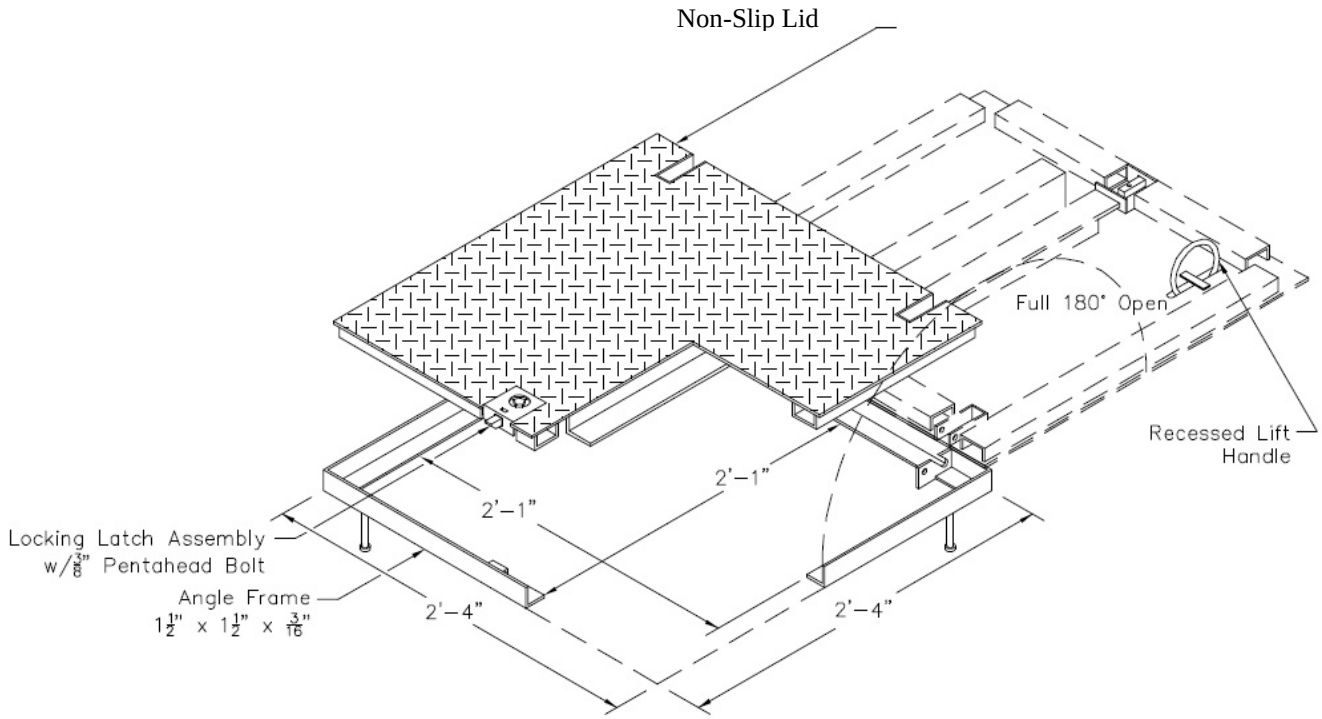
The cover and frame shall be made of slip resistant steel plate

The angle frame shall be securely anchored in the concrete.

Table 4.3. Frame and Cover Features

Non-Slip Surface, (COF)	0.8
Galvanizing	Hot-Dipped Galvanized
Load Rating	H-20
Grounding	Inserts or Lugs
Locking Device	Penta-Bolt Lock
Lift Handle	Recessed Lift Handle

Figure 4.3. 3030 Frame and Cover



5. Issuance

EA

6. Approved Manufacturer

Stock No.	Description	OldCastle Precast / Utility Vault
013186	3030 handhole base with frame and cover	3030 LA Handhole – Electric
013187	3030 handhole, base only	3030-B
013188	3030 handhole frame and cover	3030-No Slip Door – Electric w/ Locking Latch

7. References

ASTM A123M-08; "Standard Specification for Zinc (Hot-Dip Galvanized) Coatings on Iron and Steel Products"

Standard Plan 550a; "Handholes;" City of Seattle; Public Utilities http://www.seattle.gov/util/stellent/groups/public/@spu/@esb/documents/webcontent/spu01_003112.pdf

Standard Plan J-40.10-00; "Locking Lid Standard. Junction Box Types 1 & 2;" Washington State Department of Transportation; http://www.wsdot.wa.gov/publications/fulltext/Standards/4_09StdPlanmanual.pdf

SCL Material Standard 7203.01; **"**Precast Reinforced Concrete Handholes - General"

Detter, Chris; SCL Distribution Engineer and subject matter expert for 7203.04 (chris.detter@sattle.gov)

Ng, Sharon; SCL Civil Engineer and subject matter expert for 7203.04 (sharon.ng@seattle.gov)

Wang, Quan; SCL Standards Engineer, originator and subject matter expert for 7203.04 (quan.wang@seattle.gov)

231 and 233 Handholes, Precast, Secondary and Streetlight, Detailed

1. Scope

This standard covers the detailed requirements for the precast 231 and 233 handhole bases, covers, and hatches; and the assembled 213 and 233 handhole units. Components can be ordered separately or ordered as an assembled unit.

Manufacturers, Washington State Department of Transportation (WSDOT) and City of Seattle Standard Plan No 550A refer to the 231 handhole as a Type 3 handhole and the 233 handhole as a Type 5 handhole.

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

Stock No.	231 and 233 Handhole Components and Assemblies
013182	**Base**, 231 handhole
013183	**Base**, 233 handhole
013184	**Cover with hatch**, "Electric"
013185	**Cover with hatch**, "SL"
013484	**Cover with hatch**, "SL/TC"
013180	**Assembly,** 231 handhole base with cover, “Electric”
013181	**Assembly,** 231 handhole base with cover, "SL"
720388	**Assembly,** 233 handhole base with cover, "Electric"
013179	**Assembly,** 233 handhole base with cover, "SL"
013485	**Assembly,** 233 handhole base with cover, "SL/TC"

2. Application

Handholes are used to house secondary service and streetlight service connections.

Handholes are for use in pedestrian sidewalks where an occasional car or light truck may inadvertently traverse.

3. General Requirements

This standard is to be used in conjunction with the latest version of SCL 7203.01, "Precast Reinforced Concrete Handholes - General".

4. Handhole Base

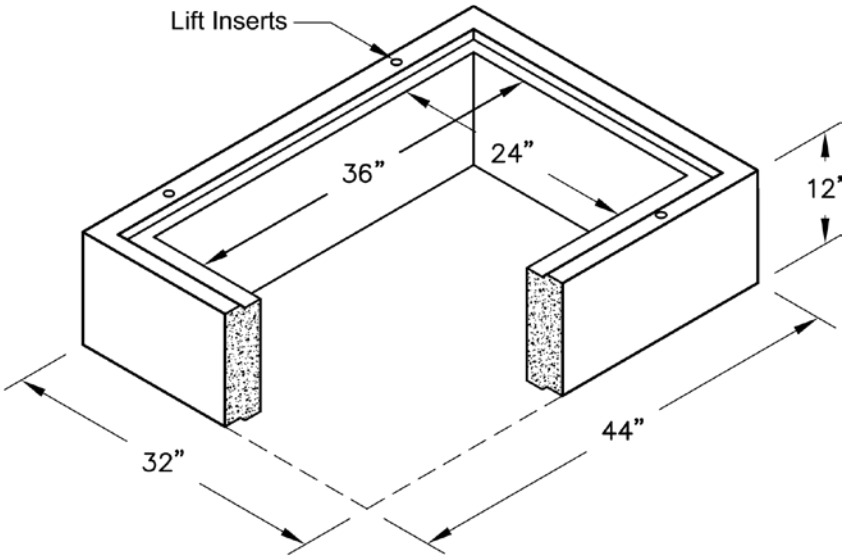
4.1 231 Handhole Base (Stock No. 013182)

Handhole base shall have four 3/4 in diameter lift inserts (2 each along the length of handhole), as shown in Figure 4.1.

Dimensions shall as shown in Figure 4.1.

Top of handhole base shall have a key way to allow proper fit with the cover.

Figure 4.1. 231 Handhole Base



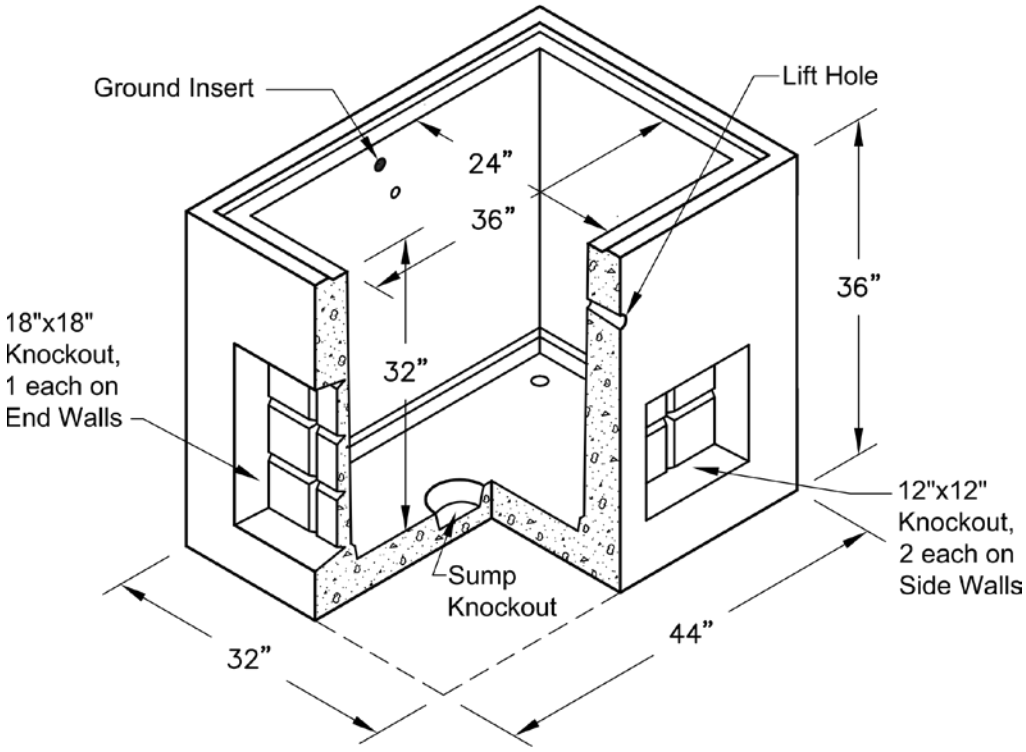
4.2 233 Handhole Base (Stock No. 013183)

233 handhole bases shall have the following attributes:

- Knockouts
  - Waffle (4–6 in squares), 12 in x 12 in on both side walls
  - Waffle (9–6 in squares), 18 in x 18 in on both end walls
  - Ground rod, 1 in diameter at 2 opposite corners of floor
- Galvanized "C" channel, embedded in walls, 18-in length, as requested per project
- Sump, round, 6 in diameter, 3 inches deep, off center on floor
- Pulling Irons, 1/2 in diameter, as requested per project
- Lift Holes, 1-1/2 in diameter on center of wall
- Ground Inserts, bronze, 1/4 in diameter, on the side wall, centered, above lift hole

Dimensions shall be as shown in Figure 4.2.

Figure 4.2. 233 Handhole Base



5. Covers

Cover shall consist of a concrete collar with a 24 in by 36 in slip-resistant steel hatch with steel frame.

Cover shall be of configuration as shown in Figure 5.

- Cover dimensions shall be 32-in wide by 44-in long by 6-in deep.
- Covers shall have a 3/4-in lift insert at each corner on the top.
- Caps shall be provided to cover the lift inserts.
- Cover shall have a keyway to ensure a tight fit.
- A 1/4 in diameter ground insert shall be embedded in the cover on the hinged hatch side for bonding the frame.

The hatch shall have the following:

- Steel frame securely anchored in the concrete
- H20 rating
- Recessed lift handles
- One handle located on each of the short ends of the hatch
- 5/8-in bonding point hole on support bar for grounding hatch
- Hatch-locking mechanism with Penta-head bolt
- Label (Electric, SL, or SL/TC), according to Table 5.

Figure 5. Cover with Slip-Resistant Steel Hatch

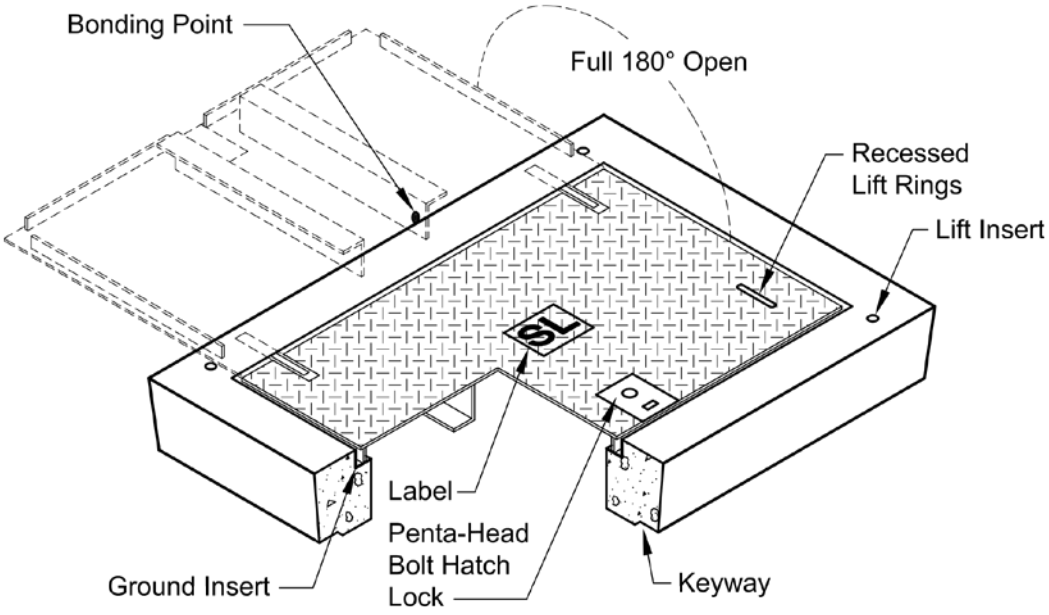


Table 5. Hatch Label

Stock No.	Label
013184	Electric
013185	SL
013484	SL/TC

6. Assemblies

Handhole assemblies consist of a handhole base and a cover with metal hatch. All handhole assemblies use the same size cover.

Table 6. Materials for 231 and 233 Handhole Assemblies

Fig #	Stock No.	Assembly Description	Quantity
4.1	013180	231 handhole base with cover, "Electric"	
4.1	013181	231 handhole base with cover, "SL"	
4.2	720388	233 handhole base with cover, "Electric"	
4.2	013179	233 handhole base with cover, "SL"	
4.2	013485	233 handhole base with cover, "SL/TC"	

Stock No.	Material Description					
013182	Base, 231 handhole	-	-	-	1	1
013183	Base 233 handhole	1	1	1	-	-
013184	Cover with hatch, “Electric”	-	-	1	-	1
013185	Cover with hatch “SL”	-	1	-	1	-
013484	Cover with hatch, “SL/TC”	1	-	-	-	-

7. Issuance

Unit: EA

8. Approved Manufacturers

Stock No.	Description	OldCastle Precast/ Utility Vault.	H2 Pre-Cast Inc.
013182	231 Handhole base	23R-12	VR233CL-12
013183	233 Handhole base	233 – LA Base	VR233CL
013184	**Cover**, with hatch, "Electric"	23-2436F Cover w/ ID Marker "Electric"	VR233-2436SN-ELECTRIC
013185	**Cover** with hatch, "SL"	23-2436F Cover w/ ID Marker "SL"	VR233-2436SN-SL
013484	**Cover** with hatch, "SL/TC"	23-2436F Cover w/ ID Marker "SL/TC"	VR233-2436SN-SL/TC
013180	**231 handhole** base with cover, "Electric"	Type 3 Handhole – SCL – "Electric"	TYPE 3 HANDHOLE-SCL-“ELECTRIC”
013181	**231 handhole** base with cover, "SL"	Type 3 Handhole –SCL – "SL"	TYPE 3 HANDHOLE-SCL-“SL”
720388	**233 handhole** base with cover, "Electric"	233 Handhole – SCL – "Electric"	233 HANDHOLE-SCL-“ELECTRIC”
013179	**233 handhole** base with cover, "SL"	233 Handhole – SCL – "SL"	233 HANDHOLE-SCL-“SL”
013485	**233 handhole** base with cover, "SL/TC"	233 Handhole – SCL – "SL/TC"	233 HANDHOLE-SCL-“SL/TC”

9. References

SCL Material Standard 7203.01; “Precast Reinforced Concrete Handholes - General”

10. Sources

Detter, Chris; SCL Distribution Engineer and subject matter expert for 7203.08 (chris.detter@sattle.gov)

Ng, Sharon; SCL Civil Engineer and subject matter expert for 7203.08 (sharon.ng@seattle.gov)

Wang, Quan; SCL Standards Engineer and subject matter expert for 7203.08 (quan.wang@seattle.gov)

Type 1 and Type 2 Open Bottom Handhole, Precast, Secondary and Streetlight

1. Scope

This standard covers the requirements for precast secondary handholes, streetlight handholes, handhole stacking risers, and handhole covers.

Stock No.	Description
012945	Type 1 handhole, with frame and cover labeled “S/L”
720391	Type 2 handhole, with frame and cover, “ELECTRIC”
013178	Type 2 handhole, with frame and cover, “S/L”
012978	Type 2 handhole, with frame and no cover
720402	Type 2 handhole stacking riser, without frame or cover
012660	Type 2 handhole cover, labeled “ELECTRIC”
012979	Type 2 handhole cover, labeled “S/L”

2. Application

Handhole assemblies are used to construct the means to allow connections to be made for secondary service and streetlight located on pedestrian sidewalks.

H-20 rated frames and covers are for use in pedestrian sidewalks where an occasional car or light truck may inadvertently traverse, or side streets that see only light truck traffic.

3. Industry Standards

All handholes shall meet the applicable requirements of the following industry standards:

City of Seattle Standard Plan 550a; "Handholes"; Public Utilities

WSDOT Standard Plan J-40.10-00; "Locking Lid Standard. Junction Box Types 1 & 2;" Washington State Department of Transportation

ASTM A123/A123M - 08; "Standard Specification for Zinc (Hot-Dip Galvanized) Coatings on Iron and Steel Products;" ASTM

ASTM A185/A185 – 07; "Standard Specification for Steel Welded Wire Reinforcement, Plain, for Concrete"; ASTM

ASTM A615/A615M - 09b; "Standard Specification for Deformed and Plain Carbon-Steel Bars for Concrete Reinforcement"; ASTM

ASTM C39 / C39M – 12; "Standard Test Method for Compressive Strength of Cylindrical Concrete Specimens"; ASTM

ASTM C478 – 11; "Standard Specification for Precast Reinforced Concrete Manhole Sections"; ASTM

ASTM C857 - 12a; "Standard Practice for Minimum Structural Design Loading for Underground Precast Concrete Utility Structures"; ASTM"

ASTM C858 - 10e1; "Standard Specification for Underground Precast Concrete Utility Structures"; ASTM

4. Conflict

Where conflict exists, the following order of precedence shall apply:

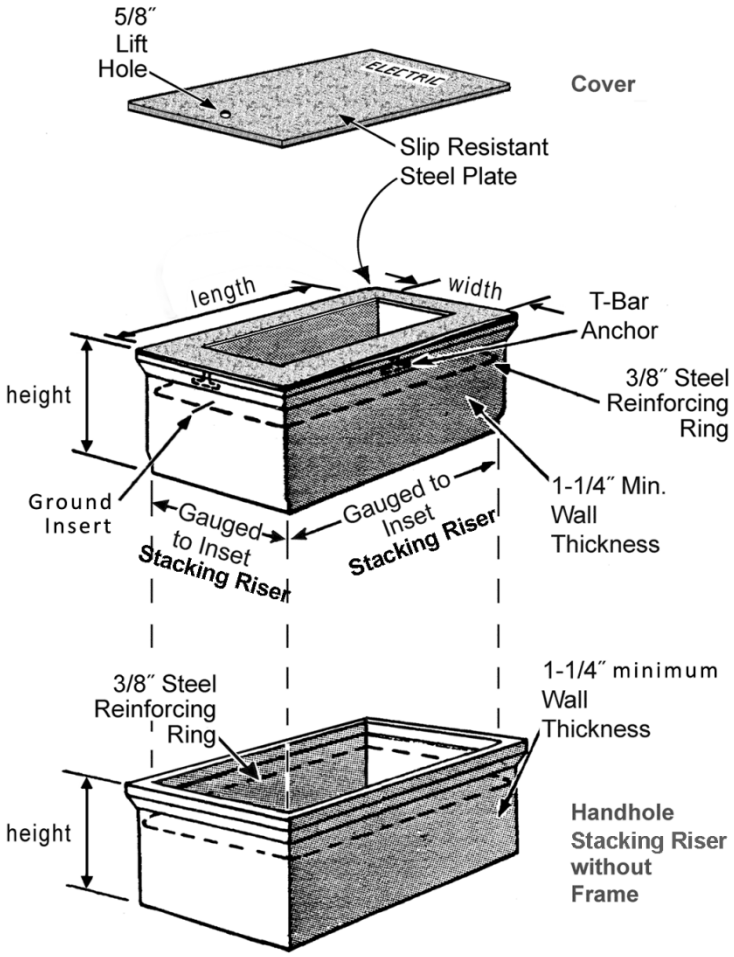
- Seattle City Light Purchase Order (PO)
- Seattle City Light General Terms and Conditions
- This material standard
- Other industry standards

5. Construction

The handhole shall meet Washington State Department of Transportation Standard Plan J-40.10 with the following clarifications.

			Dimensions, nominal (in)					
Stock No.	**Item**	**Type**	**Inside Length**	**Inside Width**	**Outside Length**	**Outside Width**	**Height/ Thickness**	**Cover Label**
012945	Handhole with frame	1	19	14	–	–	12	–
	Cover	1	–	–	17	13	5/16	“SL”
720391	Handhole with frame	2	28	17	–	–	12	–
	Cover	2	–	–	26-5/8	16-1/2	5/16	“ELECTRIC”
013178	Handhole, with frame	2	28	17	–	–	12	–
	Cover	2	–	–	26-5/8	16-1/2	5/16	“SL”
012978	Handhole with frame	2	28	17	–	–	12	–
720402	Stacking riser	2	–	–	28	17	12	–
012660	Cover only	2	–	–	26-5/8	16-1/2	5/16	“ELECTRIC”
012979	Cover only	2	–	–	26-5/8	16-1/2	5/16	“SL”

Figure 5. Handhole



5.1 Precast Handhole

Precast secondary and streetlight handholes shall be of the general configuration shown, in accordance with City of Seattle Standard Plan 550a.

Handhole shall be designed to nest, with an easy, snug fit to increase the depth of the handhole when necessary.

Handhole shall be sound and free of cracks.

5.2 Concrete

The handhole shall be cast of concrete meeting a minimum strength of 4000 psi after 28 days.

5.3 Cover Plate

The cover plate shall adhere to the following requirements:

- The cover shall comply with City of Seattle Standard Plan No. 550a.
- The cover shall be 5/16-in (nominal) in thickness or other design pre-approved by Seattle City Light.
- The cover shall be at least H-20 rated.
- The cover shall have 1/16-in to 1/8-in clearance on each edge within the frame after galvanizing.

5.4 Frame

The frame shall adhere to the following requirements:

- The frame shall comply with City of Seattle Standard Plan No. 550a.
- The steel frame shall be securely anchored in the concrete.
- The frame shall have a ground point, which the copper braid from the cover may be attached.

5.5 Non Slip Surface

The cover and frame shall have a non-slip surface with the following properties:

- Slip resistant surface shall be coated with SlipNOT® Grade 3-coarse by W.S. Molnar Company or have minimum coefficient of friction of 0.8.
- Bond strength shall be to the plate of 4000 psi or greater.
- Surface hardness shall be 55 minimum on the Rockwell “C” scale.
- The cover shall be identified on the underside with the type of surface (“S3” for SlipNOT® 3) and the year of manufacture. Example: “S3 2005.” The identification shall be bead-welded or clearly stamped into a metal surface on the underside of each lid, or labeled with an adhesive metallic foil-backed label.

5.6 Grounding

A 4-ft length of copper braid, equivalent to a #8 AWG THNW or THHW copper wire, shall be secured from the handhole cover.

All handholes shall have a 5/16-in ground insert or a ground pad on the interior wall.

5.7 Labeling

The word “ELECTRIC” or “SL” for streetlight shall be cast or otherwise permanently affixed to the cover and shall be easily readable. Lettering shall be affixed in such a manner as to avoid being a tripping hazard.

5.8 Lock

The cover shall have a Penta-head bolt locking device to prevent easy removal by unauthorized persons.

5.9 Galvanizing

The frame and cover shall be hot-dip galvanized after fabrication in accordance with ASTM A123M.

6. Documentation

6.1 General

Documentation shall be in English and use customary inch-pound units.

Documentation shall use common industry terminology and well-understood abbreviations.

6.2 Technical Information

Upon request, the supplier shall provide the following technical information:

- Manufacturer's name
- Manufacturing plant locations
- Product shop drawing

Technical information shall be presented in a clear and consolidated manner for ease of review.

7. Issuance

EA

8. Approved Manufacturers

Stock No.	Manufacturers	Catalog Numbers
012945	Fog-Tite	J-11 Type 1, with non-skid cover, "SL"
	H2-Pre-Cast Inc	WDOT Type 1 Box with Cover – Galvanized, Non-Slip, "SL"
720391	Fog-Tite	J-11 Type 2 , with non-skid cover, "Electric"
	H2-Pre-Cast Inc	WDOT Type 2 Box with Cover – Galvanized, Non-Slip, "Electric"
013178	Fog-Tite	J-11 Type 2 , with non-skid cover, "S/L"
	H2-Pre-Cast Inc	WDOT Type 2 Box with Cover – Galvanized, Non-Slip, "SL"
012978	Fog-Tite	J-11 Type 2 bottom
	H2-Pre-Cast Inc	WDOT Type 2 Box - Galvanized
720402	Fog-Tite	J-11 Type 2 ext.
	H2-Pre-Cast Inc	WDOT Type 2 riser
012660	Fog-Tite	J-11 Type 2 with non-skid cover, "Electric"
	H2-Pre-Cast Inc	WDOT Type 2 Cover - Galvanized, Non-Slip, "Electric"
012979	Fog-Tite	J-11 Type 2 non-skid cover, "SL"
	H2-Pre-Cast Inc	WDOT Type 2 Cover - Galvanized, Non-Slip, "SL"

9. Sources

9-34.6; **Standard Specifications** for Road, Bridge and Municipal Construction; City of Seattle; Public Utilities

Smalley, Edward; SCL Engineer, Streetlights, and subject matter expert for 7203.10 (edward.smalley@seattle.gov)

Wang, Quan; SCL Standards Engineer, originator and subject matter expert for 7203.10 (quan.wang@seattle.gov)

HANDHOLE, SECONDARY
COMPOSITE FIBERGLASS, REINFORCED PLASTIC TYPE

1. **Composite Fiberglass, Reinforced Plastic, or Fiberglass Reinforced Mortar Secondary Handholes** shall be of the configuration shown and shall meet the applicable requirements of Western Underground Committee Guide 3.6, except as modified herein. The handholes are for use in light vehicular traffic areas.

   The handholes shall have good abrasion resistance, high dielectric strength, a low moisture-absorption rate and be impervious to rot and fungus growth. They shall also be inert to corrosive chemicals, including acids, alkalies, and organic solvents.

2. **Covers.** Handhole covers shall be made of the same material and have an embossed slip resistant surface to enhance pedestrian safety. The covers shall be provided with a locking device to prevent easy removal by unauthorized persons.

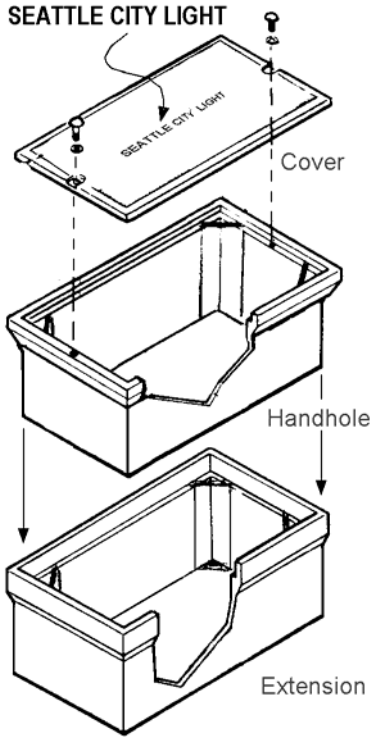
3. **Extensions.** Extensions, used to extend hole depth, shall be designed to nest with the handholes for a snug fit. Handholes may be 1 or 2 piece to equal a 24” to 26” depth.

4. **Color.** The color of the handholes and extensions shall be light to medium grey.

5. **Marking.** The words "Seattle City Light" shall be molded in the handhole cover.

6. **Reference Specification.** Western Underground Committee, Guide 3.6, latest revision.

7. **Stock Unit:** EA



Quazite requires 2 stackable units (handhole plus extension) to achieve the 24-inch depth.

Stock No.	Item	Description	Approved Manufacturers		
			Carson Ind.	Electrimold	Quazite
720393*	Handhole	17" x30" x12" or 24-26"	H1730-24	ECBA-173024 DO-EH	PC1730BA
720397	Cover	17" x 30" x 3/4" or 2"	H1730-P1	ECCA-173002 DO-EH	PC1730CA
720394	Handhole	24" x 36" x 18"	H2436-24	ECBA-243618 DO-EH	PG2436BA
720399	Cover	24" x 36" x 2” or 3"	H2436-P1	ECCA-243603 DO-EH	PG2436CA

* Quazite requires two PC1730BA sections for the 24-inch depth and for the City Light stock number.

formerly Material Standard 7203.10.1

STANDARDS COORDINATOR	STANDARDS SUPERVISOR	UNIT DIRECTOR
Rick Rice	John Barnett	Hardev Juj

POLYMER CONCRETE HANDHOLE, SECONDARY AND STREETLIGHT

1. Scope

This standard covers requirements for precast polymer handholes. There are three main components that make up a handhole assembly: box, extension, and cover.

This standard applies to the following Seattle City Light Stock Numbers: 013321, 013322, 013323, and 013324.

2. Application

Precast polymer handholes are non-conductive, non-flammable, corrosion resistant, and lightweight underground enclosures used to house connections for secondary service and streetlight (SL) located on pedestrian sidewalks. Two types of handholes are approved for secondary and SL connections. Type 1 and 2 with nominal interior dimensions of 13 inches by 24 inches and 17 inches by 30 inches, respectively.

The following table gives the application for each of the Stock Numbers.

Stock number 013322 can be used as a box or an extension.

Stock Number	Type	Description	Application
013321	1	box with cover	streetlight
013322	2	box/extension, without cover	secondary or streetlight
013323	2	cover	secondary
013324	2	cover	streetlight

Polymer concrete handholes are not intended for use in constant traffic areas.

3. Industry Standards

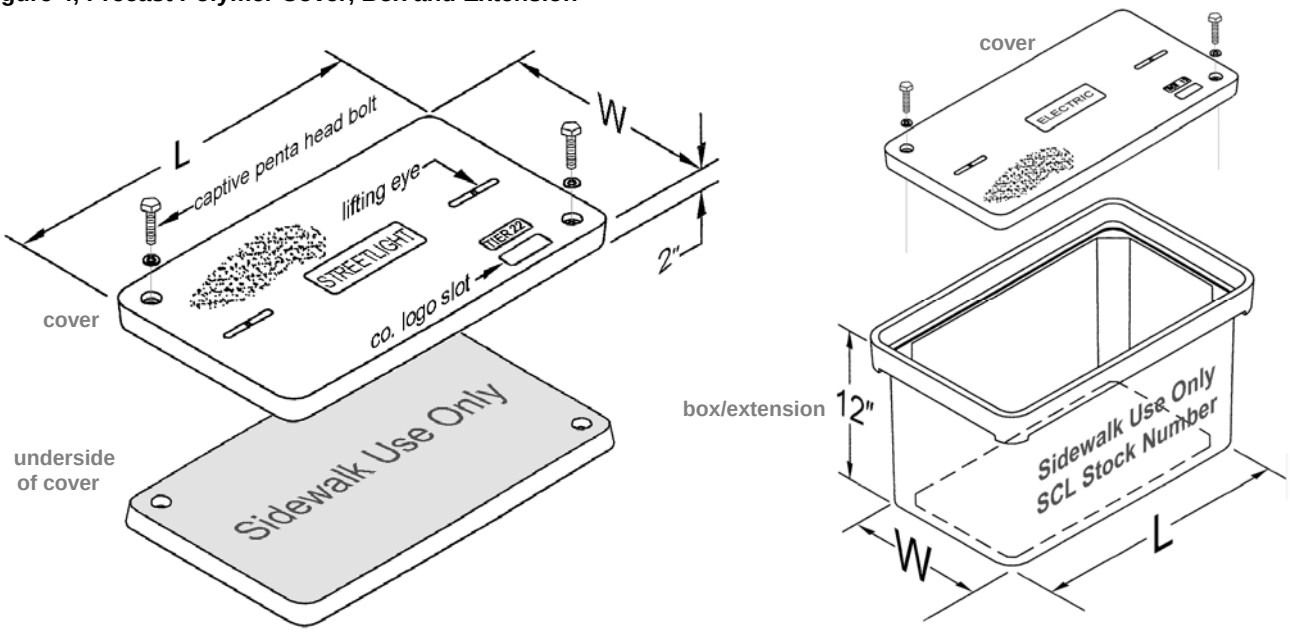
Polymer precast concrete handholes shall meet the following national standard:

ANSI/SCTE 77 2010: Specification for Underground Enclosure Integrity

standards coordinator	*standards supervisor*	*unit director*
Aida Diop	John Shipek	Darnell Cola

4. Requirements

Figure 4, Precast Polymer Cover, Box and Extension



4.1 General

Stock Number	013321		013322	013323	013324
Type	1		2	2	2
Description	box	and cover	box/extension	cover	cover
Dimensions, inside , in, nominal					
Length (L)	24	24	30	30	30
Width (W)	13	13	17	17	17
Height/Thickness	12	02	12	02	02
Cover label	-	"STREETLIGHT"	-	"ELECTRIC"	"STREETLIGHT"
Design load					
Vertical, lb, nominal	22,500	22,500	22,500	22,500	22,500
Lateral, lb/sq ft	800	800	800	800	800
Test Load					
Vertical, lb, nominal	33,750	33,750	33,750	33,750	33,750
Lateral, lb/sq ft	1,200	1,200	1,200	1,200	1,200
Lifting eye (pull slot), lb, minimum	-	3,000	-	3,000	3,000

4. Requirements, continued

4.2 Box, Cover and Extension

Handhole box, cover and extension shall be:

a. Polymer concrete
b. Gray in color
c. Non-conductive
d. Non-flammable
e. Corrosion resistant
f. ANSI Tier 22 load rated, designed for areas subjected to occasional non-deliberate heavy vehicular traffic.
g. To avoid accidental placement of both the box body and the cover in areas for which they are not rated, each product shall display securely affixed labels stating “Sidewalk Use Only”.
h. The chemical resistance (sunlight exposure, water absorption, and flammability) of polymer handholes and covers shall be according to ANSI/SCTE 77 2010, Section 6.

4.3 Box and Extension

Handhole box and extension shall be:

a. Bottomless without any knockouts or mouseholes.
b. Straight wall and stackable.

4.4 Cover

Cover shall:

a. Require the use of tools to open to avoid easy removal by unauthorized persons.
b. Be skid resistant with a minimum coefficient of friction of 0.5 percent.
c. Have recessed bolt holes such that the bolt head will not protrude above the cover surface.
d. Be attached to the handhole box by two, stainless steel, captive, penta head bolts (1/2 inches – 13 UNC, 2-1/2 or 3 inches long).
e. Have 1/16-inch to 1/8-inch clearance on each edge of the box.
f. Be marked with the ANSI load rating (Tier 22)

5. Testing

The structural testing shall be in accordance with ANSI/SCTE 77 2010, Section 7. The maximum deflection shall be one-half-inch for vertical tests and one-quarter-inch per foot of length for lateral tests.

Test data that establishes compliance with the requirements of STCE 77 shall be provided upon request.

Tests of complete boxes and covers shall be performed by an independent testing agency.

6. Marking

Handhole covers shall have embedded on the top surface an identifying mark or label that defines the function of the enclosure: “ELECTRIC” or “STREETLIGHT”.

Polymer handholes shall be clearly and indelibly marked in accordance with NEC2008. Marking shall include but not be limited to:

- Manufacturer’s name
- Year of manufacture
- Product identification number
- ANSI load rating

7. Packaging

Handholes, covers, and extensions shall be packaged in a way that allows the product to withstand normal shipping and installation practices without chipping, cracking, or structural damage.

Individual packages shall be legibly marked with:

- Manufacturer’s name
- Manufacturer’s catalog number
- Product description
- Seattle City Light’s Stock Number

Shipping containers shall be legibly marked with:

- Seattle City Light’s Purchase Order Number
- Seattle City Light’s Stock Number

8. Issuance

Stock Unit: EA

9. Approved Manufacturers

Stock Number	Description	Manufacturers		
		Hubbell	Oldcastle Enclosure Systems	Armorcast Products Company
0013321	Type 1 Assembly, Streetlight	PG1324Z584	13241265	A6001946HDAPCX12
0013322	Type 2 Box/Extension	PG1730B701	17302006	A6001640PCX12
0013323	Type 2 Cover, Electric	PG1730H554CG2	17304016	A6001947HD-EL
0013324	Type 2 Cover, Streetlight	PG1730H554CH2	17304192	A6001947HD-SL

10. References

Diop, Aida; Standards Engineer; originator and subject matter expert for 7203.20 (aida.diop@seattle.gov)

National Electrical Code (NEC) 2008; "Article 314.30"

Ng, Sharon; Senior Civil Engineer; subject matter expert for 7203.20 (sharon.ng@seattle.gov)

SCL 7203.10; "Handhole, 17″ x 28″ Precast, Secondary"; Material Standard

SCL 7203.12; "Handhole, Secondary, Composite Fiberglass, Reinforced Plastic Type"; Material Standard

Standard Plan J-40.10-02; Washington State Department of Transportation

Standard Plan no. 550a; City of Seattle Standard Plans and Specifications, 2010

Wang, Quan; Standards Engineer; subject matter expert for 7203.20 (quan.wang@seattle.gov)

Western Underground Committee; "Guide 3.6 – Non-Concrete Enclosures"

Precast Reinforced Concrete Structures, General

1. Table of Contents

2. Scope

This standard covers the general requirements for precast reinforced concrete structures used at Seattle City Light (SCL).

This standard applies to the following SCL reinforced concrete products:

- Vaults
- Vault cover slabs
- Pads or slabs.

Specific requirements shall be according to the detailed material standards and purchase orders issued subsequent to competitive solicitations.

This standard does not apply to panel vaults.

3. Application

Precast concrete structures are used to construct the underground electric system. Precast concrete structures may be used to house equipment, cables, service connections and splices for the distribution system.

The H20-rated 444 vault assemblies are not intended to be used in high density traffic locations.

Some vault floors may exceed 12 feet 6 inches below finished grade; in which case, a fixed ladder is required.

4. Definitions

Vault (as defined by NESC) - A structurally solid enclosure, (including all sides, top, and bottom), above or below ground, where entry is limited to personnel qualified to install, maintain, operate, or inspect the equipment or cable enclosed. The enclosure may have openings for ventilation, personnel access, cable entrance, and other openings required for operation of equipment in the vault.

Vault (as defined by SCL) - An enclosure that is used for primary service. Enclosures 444 or larger.

Ring Vault (as defined by SCL) - A vault that is composed of multi-sections, i.e. base, mid-section, and a top section. These vaults may also have various risers to achieve the proper height and access openings. Enclosures 818 and 814.

Concrete Encased Electrode (as defined by NESC) - A metallic wire, rod, or structural shape, meeting Rule 93E5 and encased in concrete, that is not insulated from direct contact with earth, shall constitute an acceptable ground electrode. The concrete depth below grade shall be not less than 1 foot, and a depth of 2.5 feet is recommended. Wire shall be no smaller than AWG No. 4 if copper, or 3/8-inch diameter or AWG No. 1/0 if steel. It shall be not less than 20 feet long, and shall remain entirely within the concrete except for the external connection. The conductor should be run as straight as practical.

5. Industry Standards

Concrete structures shall meet the applicable requirements of the following industry standards:

ACI 318-11, “Building Code Requirements for Structural Concrete and Commentary”

ANSI/AWS D1.4/D1.4M-11, “Structural Welding Code – Reinforced Steel”

ASTM A123/A123M-08, “Standard Specification for Zinc (Hot-Dip Galvanized) Coatings on Iron and Steel Products;” ASTM

ASTM A185/A185M-07, "Standard Specification for Steel Welded Wire Reinforcement, Plain, for Concrete"

ASTM A497/A497M-07, "Standard Specification for Steel Welded Wire Reinforcement, Deformed, for Concrete"

ASTM A615/A615M-09b, "Standard Specification for Deformed and Plain Carbon-Steel Bars for Concrete Reinforcement"

ASTM A706/A706M-09b, "Standard Specification for Low-Alloy Deformed and Plain Bars for Concrete Reinforcement"

ASTM C39/C39M-10, "Standard Test Method for Compressive Strength of Cylindrical Concrete Specimens"

ASTM C150/C150M-12, "Standard Specification for Portland Cement"

ASTM C478-09, "Standard Specification for Precast Reinforced Concrete Manhole Sections"

ASTM C857-11, "Standard Practice for Minimum Structural Design Loading for Underground Precast Concrete Utility Structures"

ASTM C858-10e1, "Standard Specification for Underground Precast Concrete Utility Structures"

National Electrical Safety Code (NESC) C2-2012, **Rule 094B6**; "Concrete-Encased Electrodes"

6. Conflict

Where conflict exists, the following order of precedence shall apply:

1. SCL purchase order (PO)
2. SCL General Terms and Conditions
3. This material standard
4. SCL detailed material standards
5. ASTM standards
6. Other industry standards.

7. Order Information

Seattle City Light orders will provide the following minimum information:

- Vault size and description
- SCL general material standard number citing revision date
- SCL detailed material standard number citing revision date
- SCL Stock number
- Total order quantity
- Delivery date
- Delivery location
- Ladder requirement.

8. Structural Requirements

8.1 General

All concrete vaults and accessories, including special order (non-stock) materials shall be manufactured in accordance with the requirements herein.

Design changes shall require the prior written approval of an SCL Org 321 Standards Engineer.

8.2 Reinforced Concrete

Minimum compressive strength of concrete shall not be less than 4,500 pounds per square inch in 28 days as determined by the ASTM Method C39.

Cement shall conform to ASTM C150.

No additives containing calcium chloride or any other material that will produce corrosive ions shall be used in the concrete.

Welded wire fabric shall conform to ASTM A185 or A497.

Steel Reinforcing Bars shall conform to ASTM A615, Grade 60 or ASTM A706, Grade 60.

Welding of reinforcing steel shall conform to the Structural Welding Code, Reinforcing Steel (AWS D1.4) of the American Welding Society.

The concrete cover (measured from the surface of the concrete to the outside surface of the reinforcement) for reinforcement shall be 1-1/2 inches minimum for main reinforcing bars and 3/4 inch for stirrups and ties.

The concrete finish shall be free of rock pockets and honeycombed areas.

The interior walls, ceiling and exterior surfaces exposed shall be smooth.

Rock pockets over 3/8 inch deep and other imperfections on all surfaces shall be patched and troweled to match the surrounding surface.

8.3 Structural Design

Structural design of the precast vault shall conform to ACI 318 and ASTM C857 with the following clarifications:

- Top of vault shall be assumed to be at a minimum of 2 feet and maximum (unless noted on drawings) 5 feet below grade.
- Live Load: AASHTO HS-20 truck, P=16 kips. Traffic can approach the structure from any direction.
- 30% live load impact load factor for soil cover less than or equal to 3 feet.
- No live load surcharge for soil cover greater than 8 feet.
- Soil density shall be 120 pounds force per cubic foot.
- 40 pounds force per cubic foot Equivalent Fluid Pressure Lateral Soil Pressure Above Water Table.
- 80 pounds force per cubic foot Equivalent Fluid Pressure Lateral Soil Pressure Below Water Table.
- 80 pounds per square foot Live Load Surcharge.
- Buoyancy - The weight of vault (without equipment) plus weight of soil cover shall be greater than 1.1 times the hydrostatic uplift force on the base of the vault. It cannot rely on skin frictional resistance between backfill and vault wall surfaces. If the gravity load is insufficient, then the vault shall be designed with restraints to withstand the buoyant force. The restraint design shall be submitted for review and approval.
- The groundwater table shall be assumed to be 5 feet below grade.

8.4 Cable Support and "C" Channel

Vault shall be provided with cast-in-place channel, 1-5/8 in x 1-5/8 in.

"C" channels shall be included on each of the four interior walls unless stated otherwise in the detailed material standard.

9. Grounding

9.1 Electrodes

Concrete-encased electrodes shall comply with NESC 094B6.

The electrode shall meet, but not be limited to, the following specifications:

- Electrode shall be no smaller than AWG No. 4 if copper or 3/8 inch diameter (AWG No. 1/0) if steel
- Electrode shall be no less than 20 feet long and shall remain entirely within the concrete except for the external connections.
- Electrode shall be installed as straight as possible.
- Electrode shall be encased with a minimum of 1-1/2 inches of concrete.
- Electrode shall be positioned a minimum of 2-1/2 feet below the top of the vault.

9.2 Ground Insert Connector

The ground insert connector shall be installed flush (neither recessed nor protruding) with the vault wall.

Each bronze insert shall be 1 inch in diameter or have a minimum surface area of 0.58 square inches for the grounding lug-insert connection.

Each bronze insert shall be tapped for 1/2-13 UNC bolts, and located on two opposite walls.

The nominal thread depth of the bronze insert shall be 1-1/8 inches.

The lead rod, a 3/8-inch steel or bronze rod, shall be connected to the ground electrode with arc or Cadweld (exothermic connection) at a minimum of three points as shown in Figure 9.

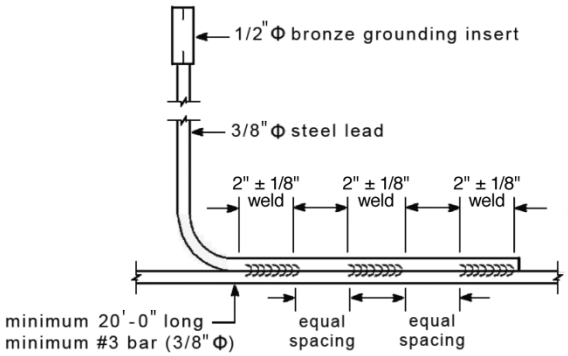
Inserts shall be plugged to prevent contamination from entering.

The inserts shall be exposed and marked prior to pick-up or delivery.

On multi sectioned vaults (3 or more sections):

- The inserts shall be aligned vertically.
- Only the middle section will have the inserts that face inside and outside of the vault.
- All other inserts in the vault shall be placed in accordance with the drawing of the specific vaults on manufacturer's specifications and approved by SCL.

Figure 9. Lead Rod and Ground Electrode Weld Details



10. Knockouts and Vault Openings

10.1 Vault Openings

Vaults 7 ft x 12 ft (inside dimensions) and larger shall have two 42-in diameter access entries, unless specified otherwise in the detailed material standards.

All vaults shall have cable knockouts located in each lower corner of the enclosure according to the manufacturer's standard and SCL's requirements.

Knockout and duct openings shall be beveled on the exterior surface.

Each enclosure with a floor shall have a ground-rod knockout at two corners of the base of the enclosure. Size, shape, quantity and location of knockouts shall be as specified in the detailed material standards.

10.2 Duct Bank Knockout Threaded Inserts

For 712 and larger vaults, and all panel vaults, provide four minimum 1/2-in diameter ferrule-threaded insert at perimeter of each duct bank knockout. These threaded inserts are to allow the duct bank rebar to dowel into the vault wall.

Threaded inserts shall be spaced 12 in (nominal) apart along the height of each knockout panel.

11. Lifting Methods

Lifting provisions shall be provided per manufacturer's and SCL requirements.

11.1 Covers

All vault covers, pads or slabs, or risers weighing less than 9,000 pounds shall have 3/4-in lifting inserts on each corner of the top surface, or as described in the detailed material standards.

11.2 Burke Fittings

All vault covers or structures over 9,000 pounds shall have either a 2-ton or a 4-ton Burke fitting placed in each corner of the top surface or on the four walls, as described in the detailed material standards.

11.3 Lifting Inserts

Lifting inserts shall be provided as shown in the detailed material standards.

All metal lifting devices cast into the internal or external surfaces of vaults for handling purpose shall be hot-dipped galvanized or made from stainless steel.

12. Accessories

Items in the following sections to be included with all vaults.

12.1 Cable Pulling Irons

Vaults larger than 577 shall have 7/8-in diameter cable pulling irons mounted on each corner of the vault and be suitable as anchors for cable pulling operations.

7/8-in diameter cable pulling iron mounts shall withstand 10 kips maximum working tension and 20 kips ultimate strength.

577 and smaller vaults shall have 1/2-in diameter cable pulling irons mounted on each corner of the vault and be suitable as anchors for cable pulling operations.

1/2-in diameter cable pulling iron mounts shall withstand 5 kips maximum working tension and 10 kips ultimate strength.

The pulling irons shall be stainless steel or hot dipped galvanized steel.

The pulling iron's maximum working tension shall be stenciled on the wall surface near two of the roof pulling irons.

Burke lifting devices are not suitable for cable pulling purposes.

12.2 Drainage and Sump

All vaults shall have a drain sump.

Vaults that are 7 ft x 12 ft (inside dimensions) and larger shall have a rectangular sump at one end wall. Sump shall be equipped with galvanized grating.

Vaults smaller than 7 ft x 12 ft shall have a circular sump with cover located near the center of the vault.

The floor shall be sloped to drain to the sump in 577 or larger vaults.

12.3 Ladders

Where a ladder is required, the ladder shall conform to the following:

- Ladders shall be corrosion resistant.
- Ladder shall be made according to SCL Drawing D-28304, "Retractable Ladder, Vault and Manhole Access."

12.4 Joint Sealant

Vault sections shall be provided with butyl rubber joint sealant material or gasket mastic to be used between vault keyways and sections, including hatch riser rings.

13. Metal Doors and Access Cover Plates

All lids, hatches and frames shall be provided with a grounding site.

13.1 Frames and Covers

All frames and hatch covers for shall be designed for at least 20.8 kips wheel load (HS20 + 30% impact) applied in any direction.

All frames and lids shall have a non-slip surface.

The 42-inch round cover and frames shall also comply with requirements in SCL Material Standard 7204.70, Frames and Covers, 42 inch Round, Iron.

13.2 Doors

All doors shall include one 5/8-in diameter bonding hole located in an underside bearing bar, approximately centered in the door and 2-1/2 to 3-1/2 in from the hinged edge.

All doors shall be designed for at least 20.8 kips wheel loading (H20 + 30% impact).

Aluminum doors for 34-in x 37-in and 34-in x 74-in opening access shall be designed for at least 26 kips wheel loading (H25 + 30% impact or equivalent H30 + 8% impact).

All steel doors and access cover plates shall be hot dipped galvanized in accordance with ASTM A123, unless otherwise approved in accordance with Section 8.1.

All doors shall be hinged and shall fully open 180 degrees.

All doors shall not exceed 65 pounds equivalent lift.

All doors shall have a non-slip surface.

All doors shall have a locking mechanism, such as a Penta head bolt, to prevent unsolicited access. Locking mechanism shall not protrude above the door surface.

Square or rectangular doors shall open along the lengthwise of the access opening.

14. Non-Slip Surfaces

All non-slip surfaces shall have the following properties:

- Minimum coefficient of friction of 0.8
- Bond strength to the plate of 4000 psi or greater
- Surface hardness of 55 minimum on the Rockwell “C” scale.

Type of non-slip surface (“S3” for SlipNOT® 3) and the year of manufacture shall be identified on the underside of the door. Example: “S3 2005.” The identification shall be bead welded or clearly stamped into a metal surface on the underside of each lid, or labeled with an adhesive metallic foil-backed label.

15. Identification

All lids and doors shall be permanently marked with 3-inch high letters “Electric” clearly visible on the top where distribution cables occupy the enclosure.

16. Quality Control

Precast concrete vaults shall be manufactured in accordance with ASTM C858.

The vault(s) may be rejected if it fails to conform to ASTM C858’s construction and dimensional tolerances except for concrete cover over reinforcing shall not be less than listed above.

Vaults may also be rejected if it does not meet SCL 7201.00, “Acceptance Criteria for the Installation of New Precast Concrete Distribution Facilities.”

Minor defects that can be repaired in accordance to criteria in SCL Material Standard shall be done in accordance with SCL U2-6/NVH-20, “Inspection and Repair Procedures for Precast Vaults and Manholes.”

The vaults shall be warranted for one year against design and manufacturing defects including those resulting from poor workmanship and materials.

17. Documentation

17.1 General

Documentation shall be in English and use customary inch-pound units.

Documentation shall utilize common industry terminology and well-understood abbreviations.

17.2 Bidder’s Data

Bidder shall return the following technical information with their bids:

- Manufacturer’s name
- Manufacturing plant location (all possible)
- Manufacturer’s experience and qualification.

Bid information shall be presented in a clear and consolidated manner for ease of review.

18. Product Approval

Manufacturers interested in having their precast concrete vaults and accessories approved for purchase by SCLmust participate in the stepped process summarized below.

- Provide evidence of National Precast Concrete Association (NPCA) certification.
- Adhere to Quality Control Program in accordance with the NPCA plant certification.
- Provide product specifications and cut sheet review.
- Provide sample concrete enclosure field trial.
- Review and evaluate field trial.
- Conduct a prototype pulling iron test to demonstrate that the pulling iron could withstand 40 kips ultimate load without failure.
- Submit the certified report for the pulling iron test.
- Manufacturer shall have a local representative or agent who will provide technical support and authorized to allow returns and repairs to be conducted by SCL or contractors.

Manufacturers are encouraged to plan accordingly. The approval process can take up to six months to complete.

19. Issuance

EA

20. Approved Manufacturers

Approved manufacturers are identified in the detailed material standards.

21. References

SCL Drawing D-28304; "Retractable Ladder, Vault and Manhole Access," SCL Engineering internal document

SCL Construction Guideline U2-6/NVH-20; "Inspection and Repair Procedures for Precast Vaults and Manholes," February 2008

SCL Material Standard 7201.00; "Acceptance Criteria for the Installation of New Precast Concrete Distribution Facilities," February 2008

SCL Material Standard 7203.08; "Handhole, 2 in x 3 in x 3 in Precast," December 2013

SCL Material Standard 7203.10; "Handhole, Precast, Secondary and Streetlight," June 2012

SCL Material Standard 7204.70; "Frames and Covers, 42-inch Round, Iron," June 2012

National Electrical Safety Code (NESC); **C2-2012** Edition, Institute of Electrical and Electronics Engineers (IEEE) Inc., New York, NY, 2011

Detter, Chris; SCL Distribution Engineer and subject matter expert for 7203.21 (chris.detter@seattle.gov)

Vault Standard Specifications, Ng, Sharon, Seattle City Light internal publication

Ng, Sharon; Senior Civil Engineer and subject matter expert for 7203.21 (Sharon.ng@seattle.gov

Wang, Quan; SCL Standards Engineer and subject matter expert for 7203.21; (quan.wang@seattle.gov)

444 ELECTRIC VAULT, PRIMARY SERVICE

1. Table of Contents

2. Scope

This standard covers the detailed requirements for the 444 electrical vault components (vault base and cover slabs with cover hatch) and the assembled 444 electric vaults assembled from those components. The basic components can be ordered separately or they can be ordered as assembled vaults with cover slabs.

This standard applies to the following Seattle City Light Stock Numbers:

Stock Number	444 Vault Components
013093	**vault base**, standard 444
013094	**cover slab**, 4- by 4-foot slab with one 3-by 3-foot, non-slip, H-20, solid cover hatch
013095	**cover slab**, 4- by 4-foot slab with one 42--inch round, solid cover and frame, H-20
013157	**cover slab**, 4-foot, 4-inch by 4-foot, 7-inch slab with one 3- by 3-foot, non-slip, solid cover hatch, H-30

Stock Number	Assembled 444 Vaults with Cover Slabs
013120	**assembled 444 vault** with 4- by 4-foot cover slab with one 3-foot by 3-foot, non-slip, H-20, solid cover hatch
013121	**assembled 444 vault** with 4- by 4-foot cover slab with one 42-inch round, solid cover and frame, H-20
013158	**assembled 444 vault** with 4-foot, 4-inch by 4-foot, 7-inch slab with one 3- by 3-foot, non-slip, solid cover hatch, H-30

standards coordinator	standards supervisor	unit director
Quan Wang	John Shipek	Darnell Cola

3. Application

The 444 vaults are intended for use in the construction of underground electric systems. The precast concrete structure may be used to house load break junction boxes, and in making service connections and splices for the distribution system.

The H20-rated 444 vault assemblies are not intended to be used in high density traffic locations.

The standard 444 vault assembly typically consists of the 444 base (Stock Number 013093) and the 4-foot by 4-foot cover slab with one 3- by 3-foot non-slip, H-20 solid cover (Stock Number 013094).

Due to different applications, the vault may need to be customized with a different entry opening.

Depending on the application for the enclosure selected, it can be defined as a handhole or a vault.

When Seattle City Light uses the 444 enclosure for primary service, the 444 enclosure will be designated as a vault. For non-primary service the 444 enclosure can typically be referred to as a handhole (not covered in this Standard).

Steps for selecting the proper vault assembly for your application:

1. Select the appropriate vault base (one option for the 444 size)
2. Select slab cover (three options for the 444)

4. General Requirements

This detailed standard is to be used in conjunction with the latest revision of:

- City Light Material Standard 7203.21, "Precast Reinforced Concrete Structures – General"
- City Light Material Standard 7204.70, "Frames and Covers, 42-Inch Round, Iron"

5. Component Requirements

5.1 Grounding

Vault grounding shall comply with Material Standard 7203.21, Section 9, Grounding.

5.2 Vault Base

The SCL 444 vault base (Stock No. 013093) shall have shall have an overall nominal dimension of 4-feet by 4-feet by 3-feet 6-inches high as shown in Table 5.2a and Figure 5.2.

Approximate base weight is 2,200 pounds.

Table 5.2a, Standard 444 Vault Base Dimensions

Stock Number	Nominal Dimensions, ft-in					
	Wall, Outside		Wall, Inside		Height	
	Length	Width	Length	Width	Outside	Inside
013093	4-0	4-0	3-6	3-6	3-6	3-3

5. Component Requirements, continued

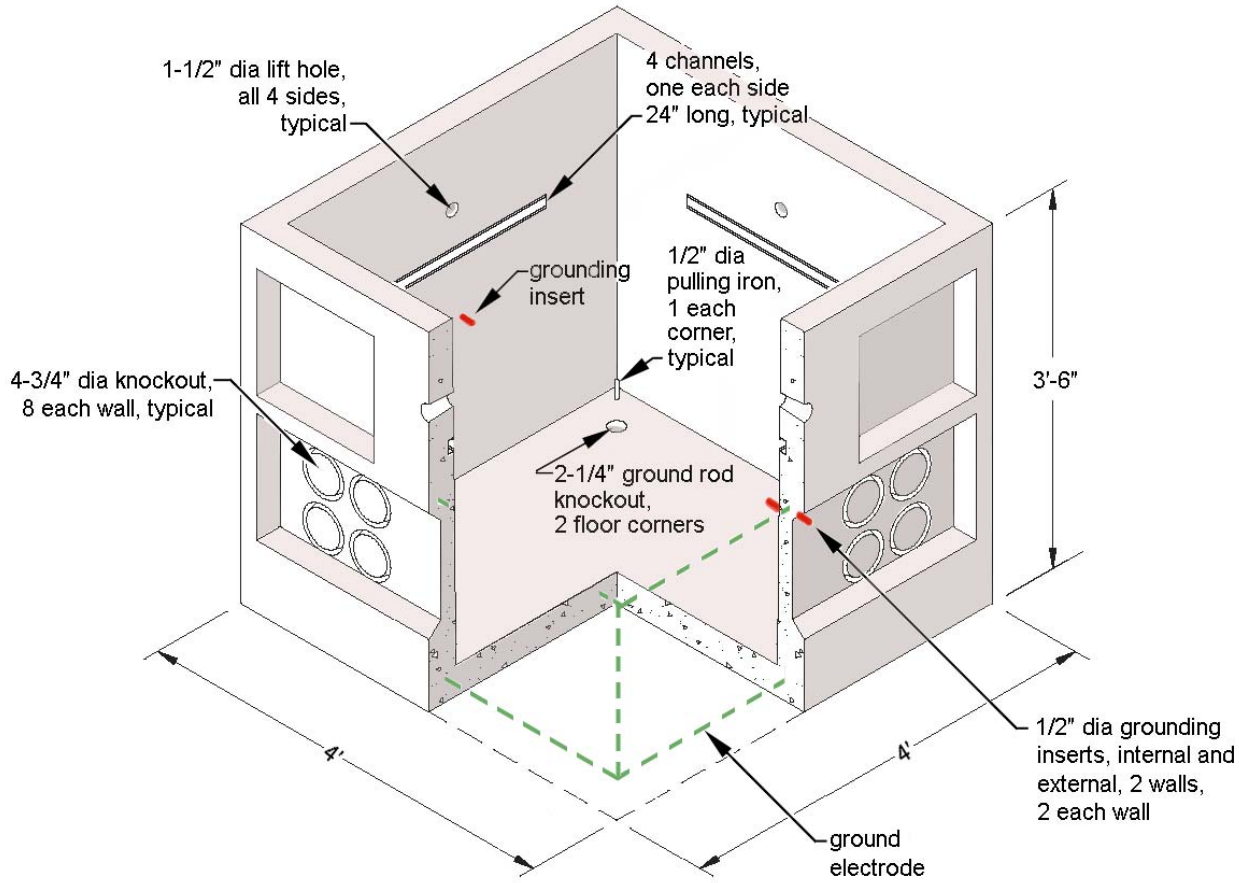
5.2 Vault Base, continued

Table 5.2b, Vault Base Attributes

All Standard 444 Vault Bases Shall Have the Following Features:

	Size, Nominal, in	Location	Per Location	Total Number
Knockouts				
round	4-3/4 dia	all 4 walls, on bottom	8 ea side	32
ground rod	2 dia	2 corners of floor	1 ea	02
Channels				
galvanized "C" channel, horizontal, embedded in walls	24 long	all walls, above all knockouts	1 ea side	04
Pulling Irons	1/2 dia	1 ea corner of floor (typical)	1 ea corner	04
Lift Holes	1-1/2 dia	4 walls, center of wall, above channel	1 ea side	04
Ground Inserts, bronze	1/2 dia	2 walls, opposite, internal and external	2 ea side	04
Ladder		not required		

Figure 5.2, Standard 444 Vault Base (Stock Number 013093)
dimensions shown are nominal values



5. Component Requirements, continued

5.3 Cover Slab

Cover slabs shall have a nominal overall dimension of 4 feet by 4 feet. Thickness shall be 6 inches. Approximate slab weight is 650 pounds.

All cover slabs shall have overall dimension as shown in Table 5.3. Cover slabs shall have shall have a keyed form to match the base for proper assembly.

All cover slabs shall have 3/4-inch diameter (nominal) lift insert at each corner on the top, as shown in Figure 5.3a.

Caps shall be provided to cover the lift inserts.

Cover slab with the 42-inch round cover shall include a 4-inch deep, round frame, as shown in Figure 5.3b. Note, the iron frame in the slab for round opening extends over the sides of the slab.

Figure 5.3a, 4-Foot Square Cover Slab with 3-Foot Square Cover
(Stock Number 013094) dimensions shown are nominal values

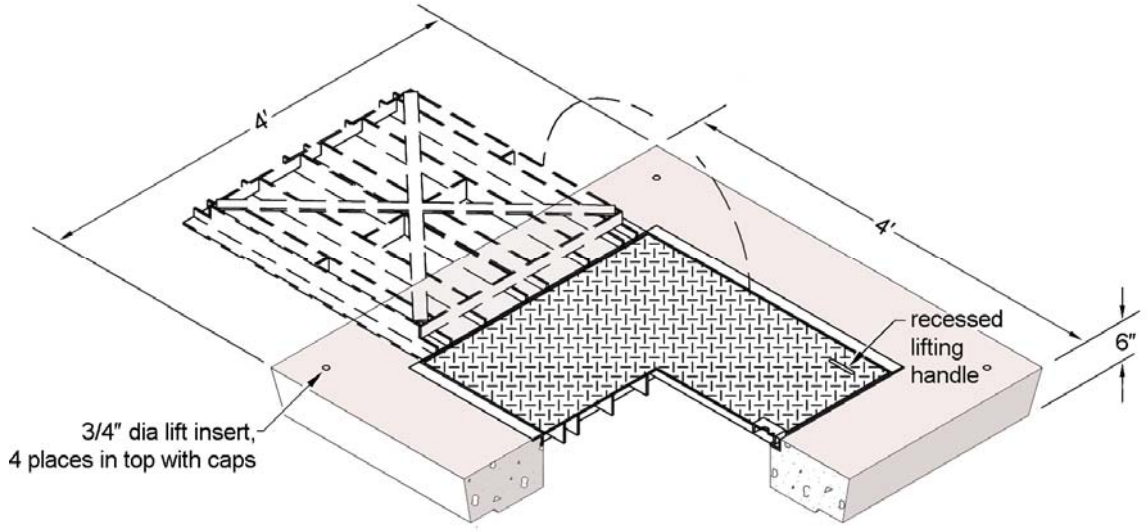


Table 5.3, Cover Slab

Stock Number	Cover Slab Dimensions, Nominal, ft-in			Opening, in	Cover/Hatch
	Length	Width	Thickness		
013094	4-0	4-0	0-6	36 by 36, square	one 3- by 3-foot, non-slip, solid cover hatch, H-20
013095	4-0	4-0	0-6	38, dia, round	one 42-inch round, solid cover and frame, H-20
013157	4-4	4-7	0-6	36 by 36, square	one 36- by 36-inch, non-slip, solid cover hatch, H-30

5. Component Requirements, continued

5.3 Cover Slab, continued

4-Foot, 8-inch Square Cover Slabs, dimensions shown are nominal values

Figure 5.3b, Slab with 42-Inch Round Cover
(Stock Number 013095)

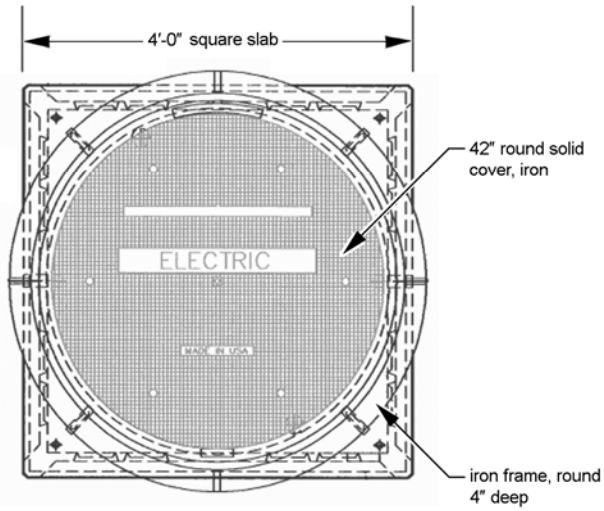
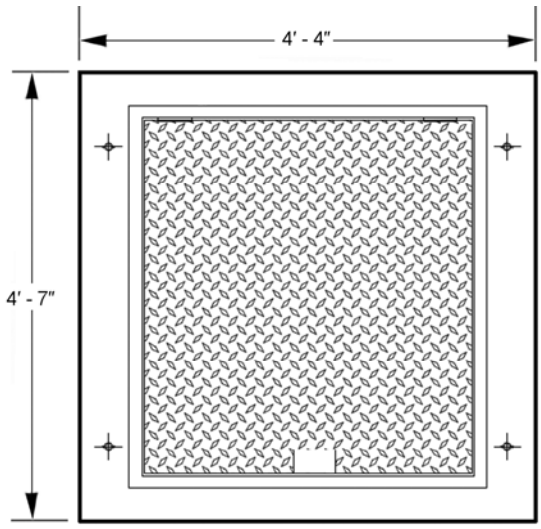


Figure 5.3c, Slab with 36- by 36-Inch Hatch
(Stock Number 013157)



6. 444 Vault Assemblies

Table 6, Assembled 444 Vault Components

Assembled Vault Stock Number	Vault Base Stock Number	Cover Slab Stock Number	Cover
013120	013093	013094	H-20 solid square hatch, 3- by 3-foot
013121	013093	013095	H-20 solid round, 42-inch
013158	013093	013157	H-30 solid square hatch, 3- by 3-foot

Refer to Tables 5.2a, 5.2b, and 5.3 for the various components included in each vault assembly.

6.1 Assembly Options

All vault assemblies use the same vault base. Depending on the type of cover hatch desired, the vault base may be paired with a different cover slab size with appropriate cover hatch, as shown in Table 6.

6.2 Assembly Requirements

All solid cover hatches have non-slip surfaces.

Each section of the vault components shall have keyways for proper assembly.

7. Issuance

Unit: EA

8. Approved Manufacturers

Stock Number	Description	Catalog Number Oldcastle/Utility Vault
013093	**standard base**	444-LA Base w/ Iron and GRD In & Out
013094	**cover slab,** 4-foot by 4-foot cover slab with one 3- by 3-foot, non-slip solid cover	44-33F Cover w/ I.D. Marker
013095	**cover slab**, 4- by 4-foot slab with one 42-inch round, solid cover and frame, H-20	44-38C Cover w/ I.D. Marker with 42" Cover & Frame
130157	**cover slab,** 4-foot, 4-inch by 4-foot, 7-inch slab with one 34-inch by 37-inch, non-slip, solid cover hatch, H-30	Oversized Special 44 Top w/3636 LW Hatch
013120	**assembled vault** with 4-foot by 4-foot cover slab with one 3-foot by 3-foot, non-slip, H-20, solid cover hatch	444-LA Base w/ Iron and GRD In & Out w/332P Non-Slip-SCL
013121	**assembled vault** with 4-foot by 4-foot cover slab with one 42-inch round, solid cover and frame, H-20	444-LA Base w/ Iron and GRD In & Out w/42" Cover & Frame-SCL
013158	**assembled vault** with 4-foot, 4-inch by 4-foot, 7-inch slab with one 36-inch by 36-inch, non-slip, solid cover hatch, H-30	444-LA Base w/ Iron and GRD In & Out w/ Oversized Special 44 Top w/3636 LW Hatch

9. References

Detter, Chris; SCL Distribution Engineer, subject matter expert for 7203.26 (chris.detter@sattle.gov)

Ng, Sharon; SCL Civil Engineer, subject matter expert for 7203.26 (sharon.ng@seattle.gov)

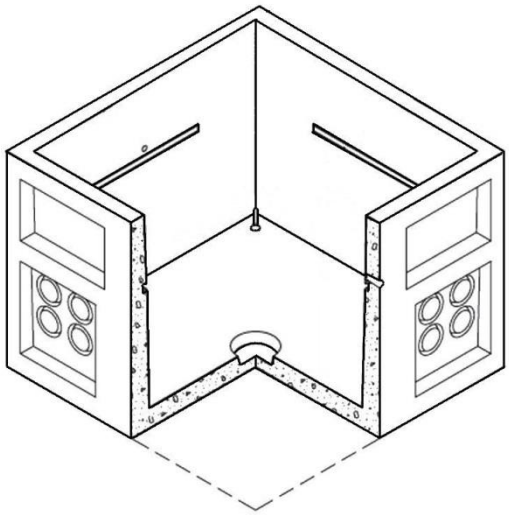
SCL 7203.21; "Precast Reinforced Concrete Structure, General"; Material Standard

SCL 7204.70; "Frames and Covers, 42-Inch Round, Iron"; Material Standard

SCL 9246.10; "Pulling Irons - Fundamentals and Detailed Requirements, Looped Radial and Network Systems"; Design Standard

Wang, Quan; SCL Standards Engineer, originator and subject matter expert for 7203.26 (quan.wang@seattle.gov)

504 Electric Vault, Primary Service



1. Table of Contents

2. Scope

This standard covers the detailed requirements for 504 electrical vault components (base and cover with hatch) and assembled 504 electric vaults. Components can be ordered separately or as complete assemblies, which include covers.

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

Stock No.	Description
013096	**Base**, standard 507
013097	**Cover** with hatch, H-20
013098	**Cover** with 42-in round solid hatch and frame, H-20
013159	**Cover** with solid hatch, H-30
013122	**Assembly**, base and cover with solid hatch, H-20
013123	**Assembly**, base and cover with 42-in round solid hatch and frame, H-20
013160	**Assembly**, base and cover with solid hatch, H-30

3. Application

504 vaults are used to construct underground electric systems. The precast concrete structure may be used to house load break junction boxes, and in making service connections and splices for the distribution system.

H20-rated 504 vault assemblies are not to be used in high density locations.

Depending on the selected application, a 504 vault can be defined as a handhole or a vault. When SCL uses a 504 for primary service, it is designated a vault. For non-primary service it is typically designated a handhole (not covered in this standard).

Also depending on the application selected, the vault may need to be customized with a different entry opening.

4. General Requirements

This detailed standard is to be used in conjunction with the latest revisions of:

SCL 7203.21; “Precast Reinforced Concrete Structures – General”

SCL 7204.70; “Frames and Covers, 42-Inch Round, Iron”

5. Component Requirements

5.1 Grounding and Bonding

Vault grounding shall comply with SCL 7203.21, Section 9, Grounding.

5.2 Base

Table 5.2a. Base Components

	Size, Nominal (in)	Location	Per Location	Total Number
Knockouts				
Round	4-3/4 dia	All 4 walls, on bottom	8 ea side	32
Ground rod	2 dia	2 corners of floor	1 ea	02
Channels				
Galvanized “C” channel, horizontal, embedded in walls	36 length	All walls, above all knockouts	1 ea side	04
Sump	12 dia	Floor, center	1, to one side	01
Pulling Irons	1/2 dia	1 ea corner of floor (typical)	1 ea corner	04
Lift Holes	1-1/2 dia	2 walls, center of wall, above channel, opposite	1 ea side	02
Ground Inserts, bronze	1/2 dia	2 walls, opposite, internal and external	2 ea side	04
Ladder	—	Not required	—	—

Base shall have dimensions as shown in Tables 5.2b and 5.2c, and Figure 5.2.

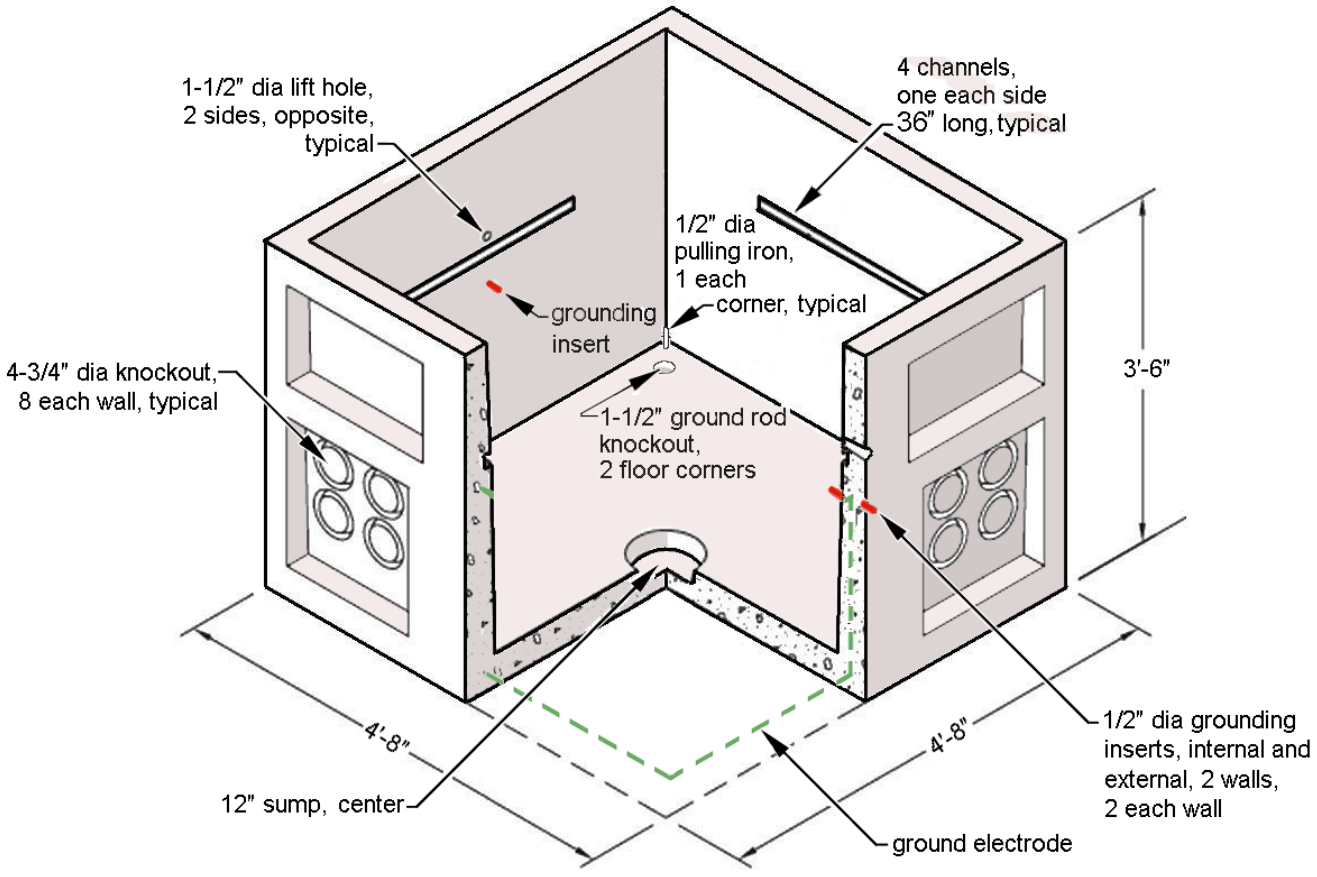
Table 5.2b. Base Dimensions, Inside, Nominal (ft-in)

Length	Width	Height
4-2	4-2	3-2

Table 5.2c. Base Dimensions, Outside, Nominal (ft-in)

Length	Width	Height
4-8	4-8	3-6

Figure 5.2. Base



5.3 Covers

Covers shall consist of a concrete collar with a slip-resistant hatch.

Covers shall have dimensions as shown in Table 5.3. Note: cover for square opening is tapered from top to bottom and is notched on the bottom to fit inside the sides of the vault.

Covers shall have 3/4-inch diameter (nominal) lift insert at each corner on the top, as shown in Figure 5.3a.

Caps shall be provided to cover the lift inserts.

The 42-inch round cover shall include a 4-in deep, round frame, as shown in Figure 5.3b.

Equipment hatches shall have:

- 3 ft x 3 ft dimension
- H20 rating
- Recessed lift handles
- Non-slip surfaces
- One handle located on each of the short ends of the hatch
- 5/8-in bonding point hole on support bar for grounding hatch
- Hatch-locking mechanism with Penta head bolt

Figure 5.3a. Cover with Hatch

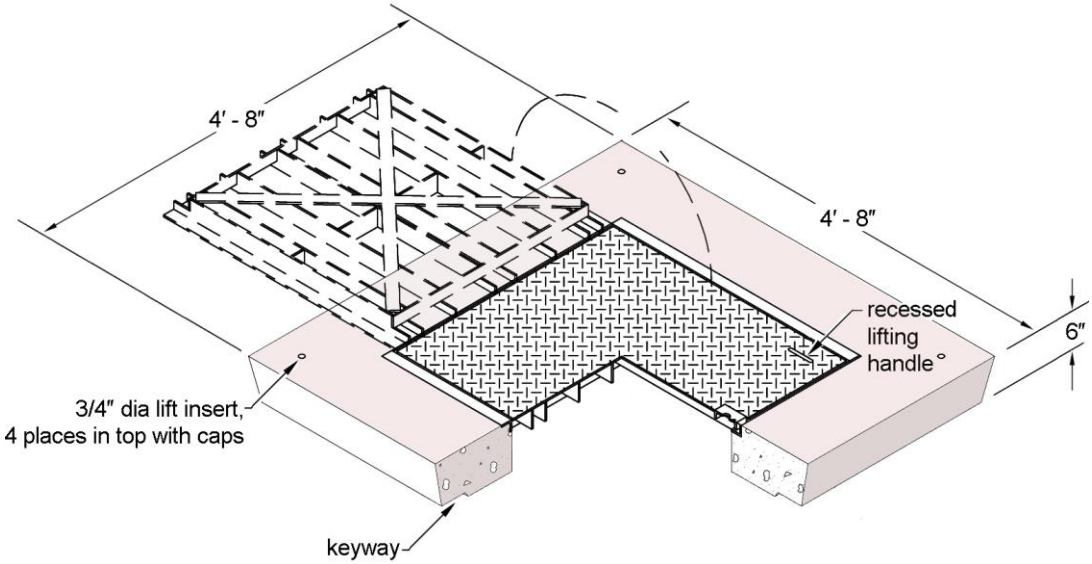


Table 5.3. Cover Dimensions, Nominal

	Concrete Collar (ft-in)				
Stock No.	**Length**	**Width**	**Thickness**	**Opening (in)**	**Hatch**
013094	4-8	4-8	0-6	36 x 36	Solid, H-20
013095	4-8	4-8	0-6	42 dia, round	42-in round, solid, H-20
013159	4-8	4-8	0-6	36 x 36	Solid, H-30

Figure 5.3b. Cover with 42-Inch Round Hatch

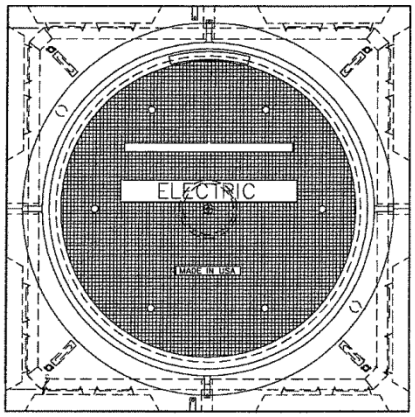
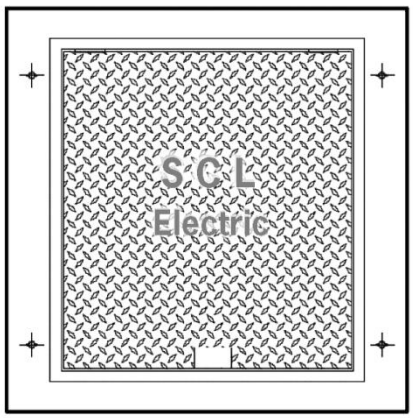


Figure 5.3c. Cover with H30 Hatch



6. Issuance

Unit: EA

7. Approved Manufacturers

Stock No.	Description	Oldcastle/Utility Vault Catalog No.
013096	**Base**, standard 504	504-LA Base w/ Iron and GRD In & Out
013097	**Cover** with hatch, H20	55-332p Cover w/ I.D. Marker
013098	**Cover** with 42-in round solid hatch and frame, H-20	55-42C Cover w/ I.D. Marker and 42” Cover & Frame
013159	**Cover** with solid hatch, H-30	55-w/3437 LW Hatch Cover w/ I.D. Marker
013122	**Assembly**, base and cover with solid hatch, H-20	504-LA Base w/ Iron and GRD In & Out w/332P Non-Slip-SCL
013123	**Assembly**, base and cover with 42-in round solid hatch and frame, H-20	504-LA Base w/ Iron and GRD In & Out w/42” Cover & Frame-SCL
013160	**Assembly**, base and cover with solid hatch, H-30	504-LA Base w/ Iron and GRD In & Out w/3437 LW Non-Slip-SCL

8. References

SCL Material Standard 7203.21; “Precast Reinforced Concrete Structure, General”

SCL Material Standard 7204.70; “Frames and Covers, 42-Inch Round, Iron”

9. Sources

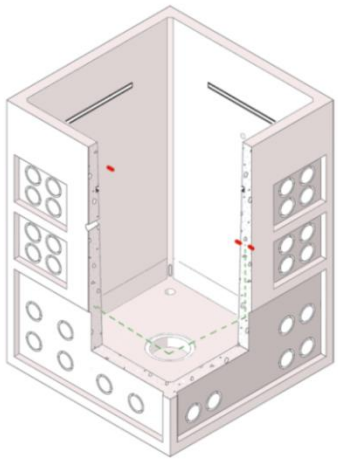
Detter, Chris; SCL Distribution Engineer and subject matter expert for 7203.31 (chris.detter@seattle.gov)

Ng, Sharon; SCL Civil Engineer and subject matter expert for 7203.31 (sharon.ng@seattle.gov)

SCL Design Standard 9246.10; “Pulling Irons - Fundamentals and Detailed Requirements, Looped Radial and Network Systems”

Wang, Quan; SCL Standards Engineer, originator, and subject matter expert for 7203.31 (quan.wang@seattle.gov)

507 Electric Vault, Primary Service



1. Scope

This standard covers the requirements for 507 (also known as 557) electrical vault components (vault base and cover with hatch) and assembled 507 units.

Components can be ordered separately or ordered as an assembly.

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

Stock No.	Description
013101	**Base**, standard 507
013102	**Cover** with hatch
013124	**Assembly** (base and cover with hatch)
013688	**Cover** with 42-in blockout
013169	**Assembly** (base and cover with 42-in blockout)

2. Application

507 vaults are used to construct the underground electric system. This precast concrete vault may be used to house medium-size transformers, loadbreak junction boxes, and service connections and splices for the distribution system.

H20-rated 507 vault assemblies should not be used in high-density locations.

Depending on the selected application, the 507 vault can be defined as a handhole or a vault. When SCL uses the 507 vault for primary service, it is designated a vault. For non-primary service, it is typically designated a handhole (not covered in this standard).

A 42-in round iron frame and cover must be ordered separately. For detailed material specifications for the iron frame and cover, see SCL 7204.70, “Frame and Covers, 42-Inch Round, Iron.”

3. General Requirements

This standard is to be used in conjunction with the latest revision of SCL 7203.21, "Precast Reinforced Concrete Structures, General."

4. Component Requirements

4.1 Grounding and Bonding

Vault grounding shall conform to SCL 7203.21.

4.2 Base

Table 4.2a. Vault Base Components

	Size, Nominal (in)	Location	Per Location	Total Number
Knockouts				
Round	4-3/4 dia	All 4 walls, on bottom	8 ea side	32
Round	4-3/4 dia	4 panels of 4 on middle of all walls	16 ea side	64
Ground rod	2 dia	2 corners of floor	1 ea	2
Channels				
Galvanized "C" channel, horizontal, embedded in walls	36 long	All walls, above all knockouts	1 ea side	4
Sump	12 dia	Floor, center	1, to one side	1
Pulling irons	1/2 dia	1 ea corner of floor (typical)	1 ea corner	4
Lift holes	1-1/2 dia	2 opposite walls, center wall horizontally	1 ea side	2
Ground Inserts, bronze	1/2 dia	2 walls, opposite, internal and external	2 ea side	4
Ladder	–	Not required	–	

The base shall have dimensions as shown in Tables 4.2b and 4.2c, and Figure 4.2.

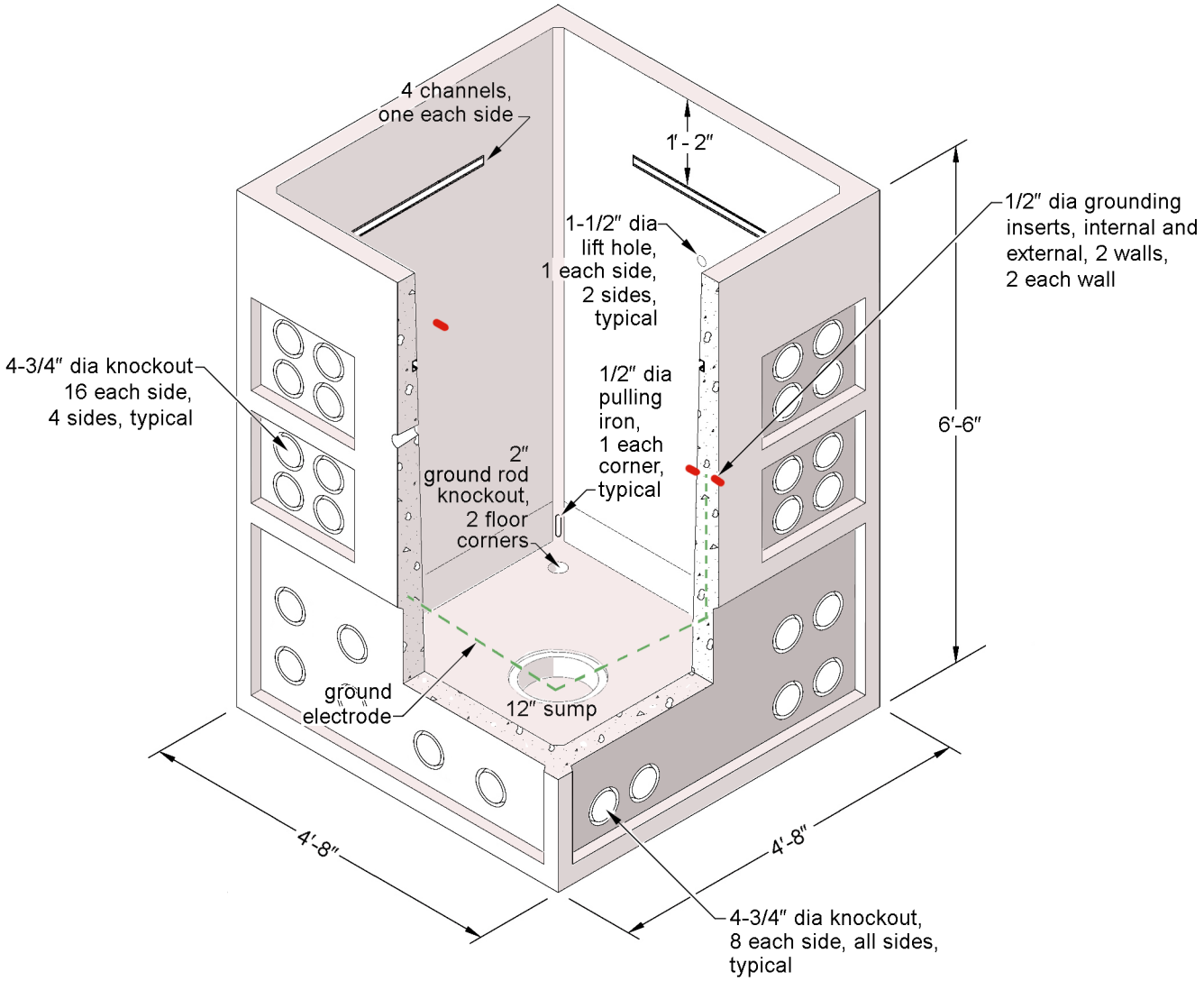
Table 4.2b. Base Dimensions, Inside, Nominal (ft-in)

Length	Width	Height
4-2	4-2	6-0

Table 4.2c. Base Dimensions, Outside, Nominal (ft-in)

Length	Width	Height
4-8	4-8	6-6

Figure 4.2. Base



4.3 Cover

Covers shall consist of a concrete collar with a slip-resistant steel-grated vent hatch or a concrete collar with a 42-in round blockout.

Covers shall have dimensions as shown in Table 4.3. Note: The cover for a square opening is tapered from top to bottom and is notched on the bottom to fit inside the sides of the vault.

Covers shall have a 3/4-in diameter (nominal) lift insert at each corner on the top as shown in Figure 4.3a.

Caps shall be provided to cover the lift inserts.

Covers shall have a keyway to ensure a tight fit.

Covers with a 42-in round blockout are used in conjunction with a 42-in round hatch and frame as shown in Figure 4.3b.

The steel-grated vent hatch shall have:

- 3 ft x 3 ft dimension
- H20 rating
- Recessed lift handles
- Non-slip surfaces
- One handle located on each of the short ends of the hatch
- 5/8-in bonding point hole on support bar for grounding hatch
- Hatch-locking mechanism with Penta head bolt

Figure 4.3a. Cover with Hatch

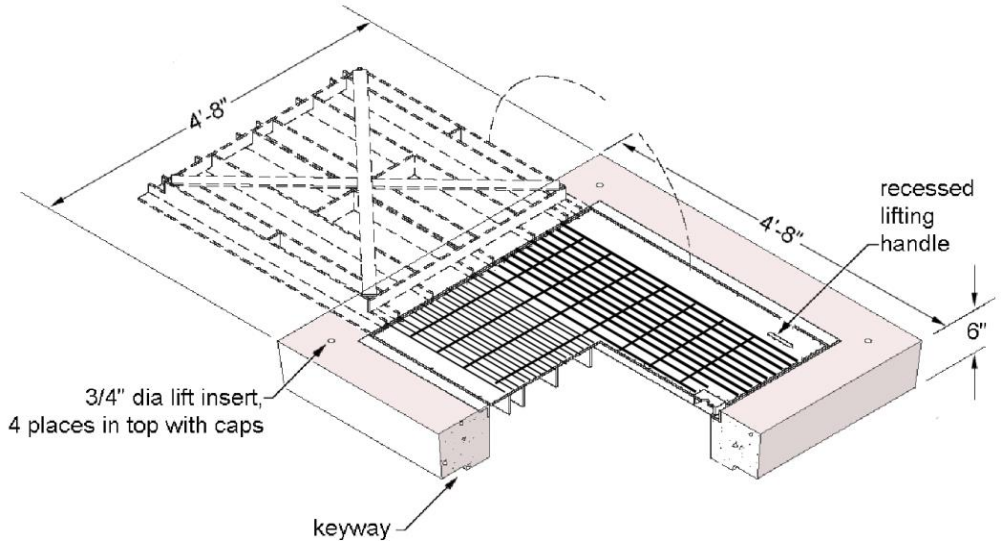


Figure 4.3b. Cover with 42-in Round Blockout

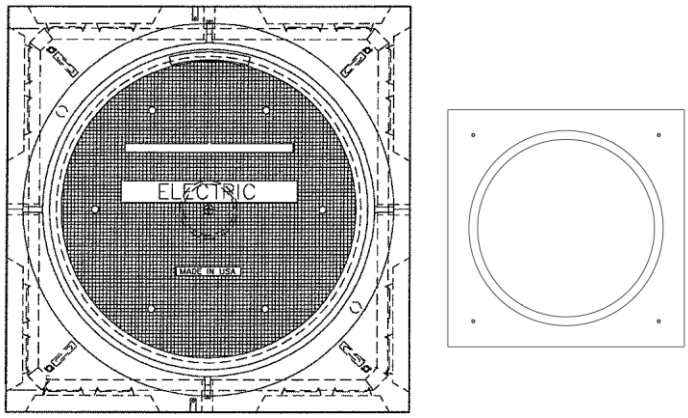


Table 4.3. Cover Dimensions, Nominal

	Concrete Collar			
Stock No.	**Length (ft-in)**	**Width (ft-in)**	**Thickness (in)**	**Opening (in)**
013102	4-8	4-8	6	36 x 36
013688	4-8	4-8	6	42 dia, round

5. Issuance

Unit: EA

6. Approved Manufacturer

Stock No.	Description	Catalog Number Oldcastle/Utility Vault
130101	**Base**, standard 507	507-LA Base w/ Irons and GRD In & Out
130102	**Cover**, with hatch	55-332 GV
013124	**Assembly**; base and cover with hatch	507-LA Base w/ Iron and GRD In & Out w/Grate Vent, SCL
013688	**Cover**, with 42-in blockout	55-42C
013169	**Assembly**; base and cover with 42-in blockout	507-LA with 55-42C

7. References

SCL Material Standard 7203.21; “Precast Reinforced Concrete Structure, General”

SCL Material Standard 7204.70; “Frames and Covers, 42-Inch Round, Iron”

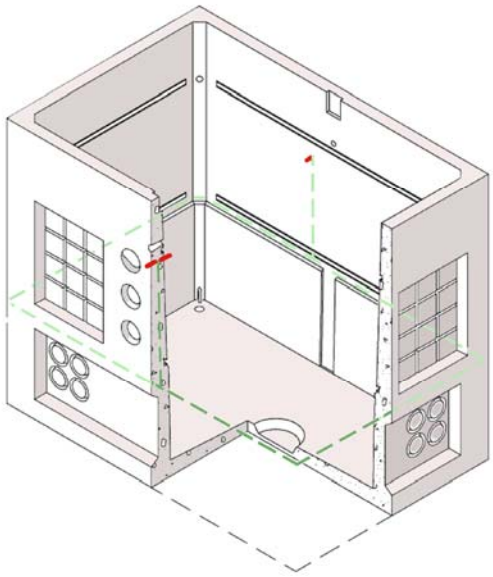
8. Sources

Detter, Chris; SCL Distribution Engineer and subject matter expert for 7203.36 (chris.detter@seattle.gov)

Ng, Sharon; SCL Civil Engineer and subject matter expert for 7203.36 (sharon.ng@seattle.gov)

Wang, Quan; SCL Standards Engineer, originator, and subject matter expert for 7203.36 (quan.wang@seattle.gov)

577 ELECTRIC VAULT, PRIMARY SERVICE



1. Table of Contents

2. Scope

This standard covers the detailed requirements for the 577 electrical vault components (vault base, cover slabs with cover hatches, and divider walls) and the assembled 577 electric vaults assembled from those components. The basic components can be ordered separately or they can be ordered as assembled vaults with cover slabs.

This standard applies to the following Seattle City Light Stock Numbers:

Stock Number	577 Vault Components
013089	**vault base**, standard 577
013090	**removable divider wall**, standard 577
013091	**cover top**, 7-foot by 4-foot-8-inch by 12-inch slab with two 3- by 3-foot, non-slip, solid cover hatches, H-20
013092	**cover top**, 7-foot by 4-foot-8-inch by 12-inch slab with two 3- by 3-foot, H-20 cover hatches (one non-slip, solid hatch and one grated vent hatch)
013151	**cover slab**, 7-foot-6-inch by 5-foot-2-inch slab with two non-slip, H-30 cover hatches

Stock Number	Assembled 577 Vaults with Cover Slabs
013125	**assembled 577 vault** with two 3- by 3-foot, non-slip, H-20 solid cover hatches
013126	**assembled 577 vault** with divider wall and with two 3- by 3-foot, H-20 cover hatches (one non-slip, solid hatch and one grated vent hatch)
013127	**assembled 577 vault** with divider wall and with two 3- by 3-foot, non-slip, H-20 solid cover hatches
013152	**assembled 577 vault** with two non-slip, H-30 cover hatches

standards coordinator	standards supervisor	unit director
Quan Wang	John Shipek	Darnell Cola

3. Application

577 vaults are intended for use in the construction of underground electric systems. This precast concrete structure may be used to house medium-size transformers, load break junction boxes, and in making service connections and splices for the distribution system.

The H20-rated 577 vault assemblies are not intended to be used in high density location.

The standard 577 vault assembly typically consists of the 577 base (Stock Number 013089) and the 7-foot by 4-foot-8-inch cover slab with two 3- by 3-foot non-slip, H-20 solid covers (Stock Number 013091).

Due to different applications, the vault may need to be customized with a divider wall and/or different entry openings and covers.

Depending on the application for the enclosure selected, it can be defined as a handhole or a vault. When Seattle City Light uses the 577 enclosure for primary service, the 577 enclosure will be designated as a vault. For non-primary service the 577 enclosure can typically be referred to as a handhole (not covered in this Standard).

Steps for selecting the proper vault assembly for your application:

1. Select vault base
2. Determine if divider wall is needed
3. Select removable divider wall (optional)
4. Select slab cover

4. General Requirements

This detailed standard is to be used in conjunction with the latest revision of Seattle City Light Material Standard 7203.21, “Precast Reinforced Concrete Structures – General”.

5. Component Requirements

5.1 Grounding Requirements

Vault grounding shall comply with Material Standard 7203.21, Section 9, Grounding.

5.2 Vault Base

The SCL 577 vault base (Stock No. 013089) shall have overall nominal dimensions of 7 feet by 4 feet 8 inches by 6 feet high as shown in Figure 6.2.

Approximate weight is 6,000 pounds.

Table 5.2, Vault Base Attributes

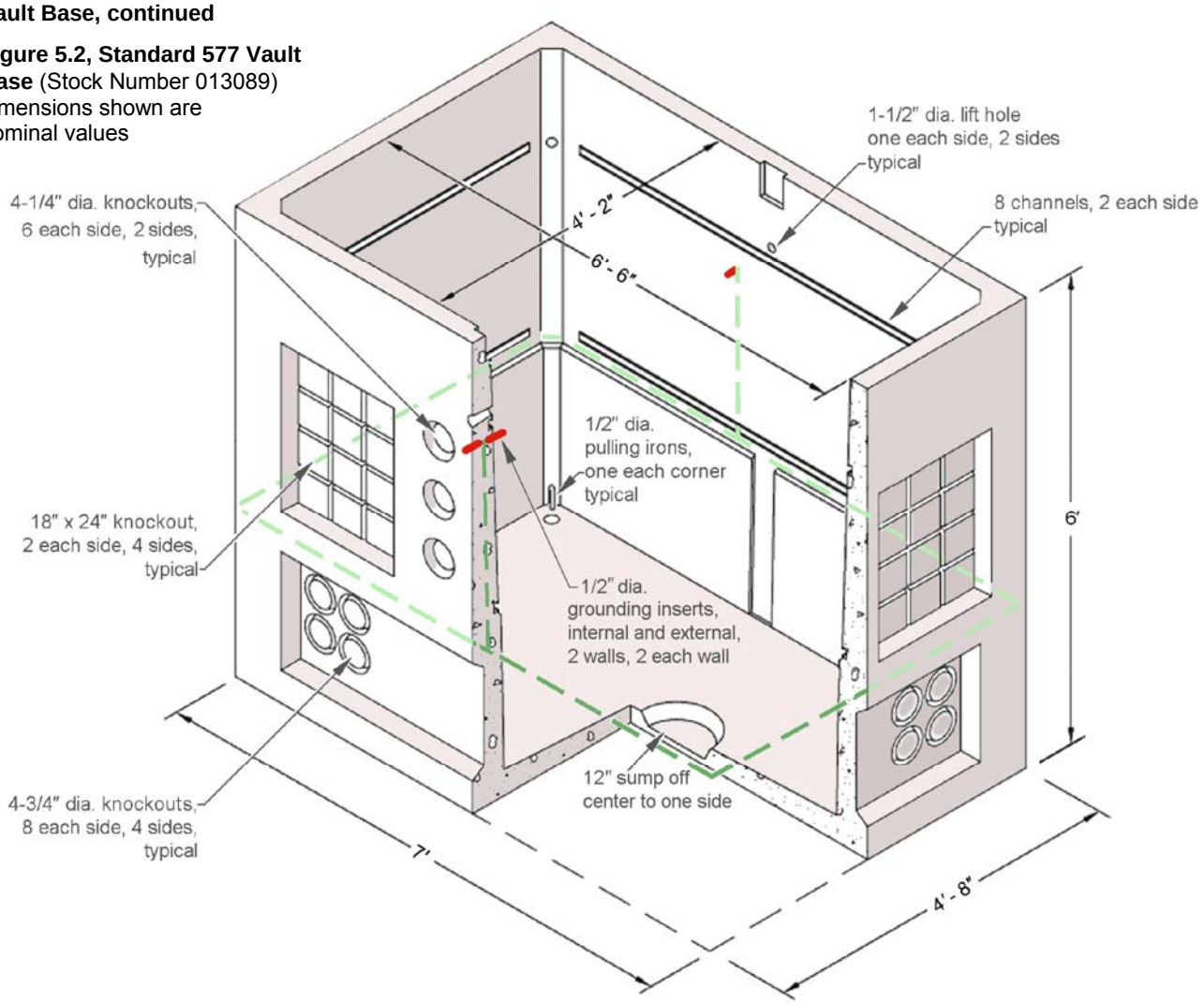
All standard 577 vault bases shall have the following features:

	Size, Nominal, in	Location	Per Location	Total Number
Knockouts				
round	4-3/4 dia	all 4 walls, on bottom	8 ea side	32
round	4-3/4 dia	3 rows of 2 in center of 2 long walls	6 ea side	12
waffle (12 - 6″ squares)	18 x 24	all 4 walls	2 ea side	8 waffles
ground rod	2 dia	2 corners of floor	1 ea	2
Channels				
galvanized “C” channel, horizontal, embedded in walls	42 long	short walls, above waffle	1 ea side	2
	42 long	short walls, below waffle	1 ea side	2
	72 long	long walls, above waffle	1 ea side	2
	72 long	long walls, below waffle	1 ea side	2
Sump, round	12 dia	floor, off center (long axis)	1, to one side	1
Pulling Irons	1/2 dia	1 ea corner of floor (typical)	1 ea corner	4
Lift Holes	1-1/2 dia	2 center of wall, just below channel, long walls, opposite	1 ea side	2
Ground Inserts, bronze	1/2 dia	on opposite long walls, on the internal and external of walls	2 ea side	4
Ladder		not required		

5. Component Requirements, continued

5.2 Vault Base, continued

Figure 5.2, Standard 577 Vault Base (Stock Number 013089) dimensions shown are nominal values



5.3 Removable 577 Divider Wall
(Stock Number 013090)

Divider wall shall be reinforced with #4 rebar.

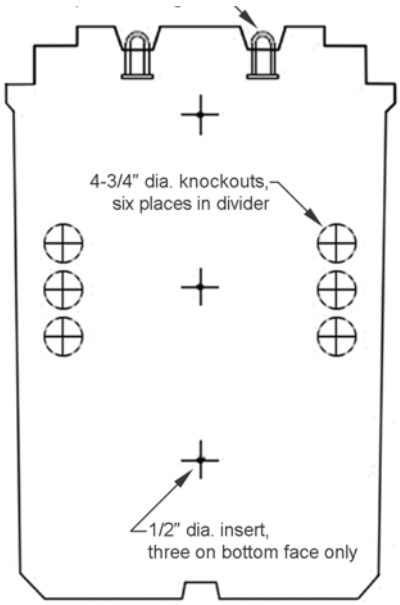
Divider wall shall be 3 inches thick (nominal).

Approximate weight is 1,000 pounds.

The removable 577-divider wall shall include: (see Figure 5.3)

1/2-inch diameter lift ring, placed in the top edge
4-3/4-inch diameter knockouts, 6 locations in divider, 3 to a side laterally
1/2-inch diameter inserts, 3 on bottom face of wall only
3/4-inch diameter inserts, 4 on the top face of wall only

Figure 5.3, Removable Divider Wall



5. Component Requirements, continued

5.4 Cover Slabs

Cover slabs shall have a nominal overall dimension of 7 feet by 4 feet 8 inches. Thickness shall be 12 inches. Approximate weight is 2,200 pounds.

All cover slabs shall have 3/4-inch lift insert at each corner on the top, as shown in Figure 5.4.

Caps shall be provided to cover the lift inserts.

Hinges for the lids shall be along the length of the cover slab.

Cover slabs shall have shall have a keyway to match the base for proper assembly.

Figure 5.4, Cover Slab

(Stock Number 013091)

dimensions shown are nominal values

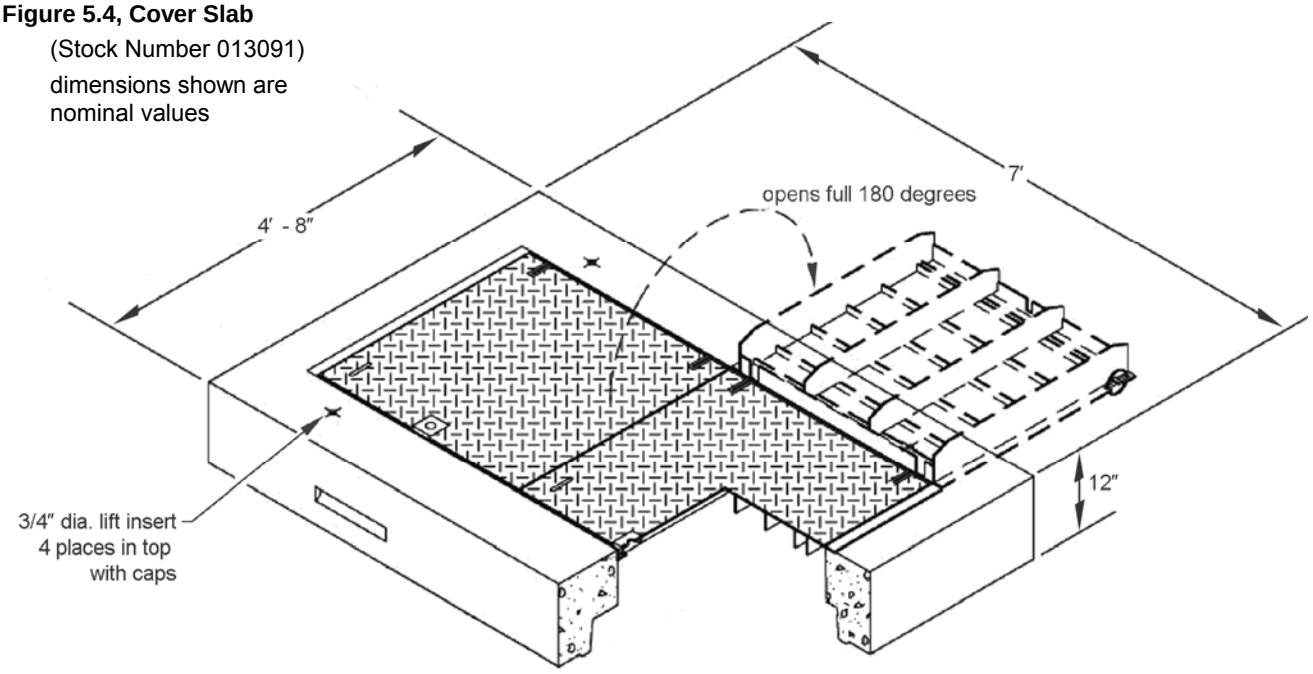


Table 5.4, 577 Vault Cover Slab Options

Stock Number	Inside Dimensions, Nominal, ft-in		Outside Dimensions, Nominal, ft-in		Cover Hatch Options
	Length	Width	Length	Width	
013091	6-6	4-2	7-0	4-8	with two 3- by 3-foot, non-slip, H-20 solid cover hatches
013092	6-6	4-2	7-0	4-8	with two 3- by 3-foot, H-20 cover hatches: one non-slip, solid hatch and one grated vent hatch
013151	6-6	4-2	7-6	5-2	with two non-slip, H-30 LW cover hatches

6. 577 Vault Assemblies

Table 6, Assembled 577 Vault Components

Assembled Vault Stock Number	Vault Base Stock Number	Divider Wall Stock Number	Cover Slab Number	Cover Hatches	
				1	2
013125	013089	none	013091	H-20 solid	H-20 solid
013126	013089	013090	013091	H-20 solid	H-20 solid
013127	013089	013090	013092	H-20 solid	H-20 grate
013152	013089	none	013151	H-30 solid	H-30 solid

Refer to Table 6 for the various components included in each vault assembly.

6.1 Assembly Options

All vault assemblies use the same vault base. The assemblies differ on whether they are provided with a divided wall or not and on the type of cover hatch. Depending on the type of cover hatches desired, the vault base may be paired with a different cover slab size with appropriate hatches, as shown in Table 6.

6.2 Assembly Requirements

All solid cover hatches are and have non-slip surfaces.

Each section of the vault components shall have keyways for proper assembly.

7. Issuance

Unit: EA

8. Approved Manufacturer

Stock Number	Description	Catalog Number
		Oldcastle/Utility Vault
013089	**vault base**, standard 577	577-LA w/ GRD In & Out
013090	**removable divider wall**, standard 577	577-Divider Wall
013091	**cover slab**, 7-foot by 4-foot-8-inch slab with two 3- by 3-foot, non-slip, H-20, solid cover hatches	57-2-332-NS-SA-80
013092	**cover slab**, 7-foot by 4-foot-8-inch slab with two 3- by 3-foot, H-20 cover hatches (one non-slip, solid hatch and one grated vent hatch)	57-2-332-NS-GV-SA-80
013151	**cover slab**, 7-foot-6-inch by 5-foot-2-inch slab with two non-slip, H-30 cover hatches	57 Top w/ LW Hatch 34″ x 74″
013125	**assembled 577 vault** with two 3- by 3-foot, non-slip, H-20 solid cover hatches	577-LA w/ GRD In & Out w/ 2-33 cover - SCL
013126	**assembled 577 vault** with **divider wall** and with two 3- by 3-foot, H-20 cover hatches (one non-slip, solid hatch and one grated vent hatch)	577-LA w/ Iron, GRD In & Out w/ grate and 33 cover - SCL
013127	**assembled 577 vault** with **divider wall** and with two 3- by 3-foot, non-slip, H-20 solid cover hatches	577-LA w/ Iron, GRD In & Out w/ 2-33 cover - SCL
013152	**assembled 577 vault** with two non-slip, H-30 cover hatches	577-LA w/ Iron, GRD In & Out w/ LW Hatches

9. References

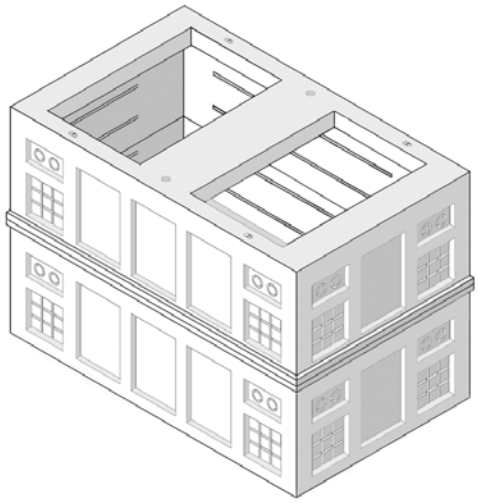
Detter, Chris; SCL Distribution Engineer, subject matter expert for 7203.41 (chris.detter@sattle.gov)

Ng, Sharon; SCL Civil Engineer, subject matter expert for 7203.41 (sharon.ng@seattle.gov)

SCL 7203.21; **"**Precast Reinforced Concrete Structure, General"; Material Standard

Wang, Quan; SCL Standards Engineer, originator and subject matter expert for 7203.41 (quan.wang@seattle.gov)

712 Electric Vault, Primary Service



1. Table of Contents

2. Scope

This standard covers the requirements for the 712 electrical vault components (vault base and top sections) and the assembled 712 electric vaults.

The 712 vault is considered a ring vault by Seattle City Light (SCL) crews.

Most of the basic components can be ordered separately or they can be ordered as assembled vaults with cover slabs.

This standard applies to the SCL stock numbers listed in Section 10.

3. Application

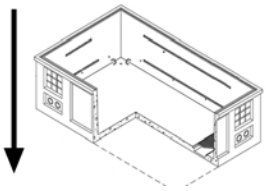
712 vaults are intended for use in the construction of underground electric systems. The precast concrete structure may be used to house medium-size transformers up to 501 kVA, three-phase load break junction boxes, and in making service connections and splices for the distribution system.

The standard 712-vault assembly consists of the 712 base [A], a 712 top with two 78-inch by 50-inch block-outs [B1], various risers to bring access opening to grade, a cover slab with two 3- by 3-foot non-slip, solid cover and a 42-inch entry access.

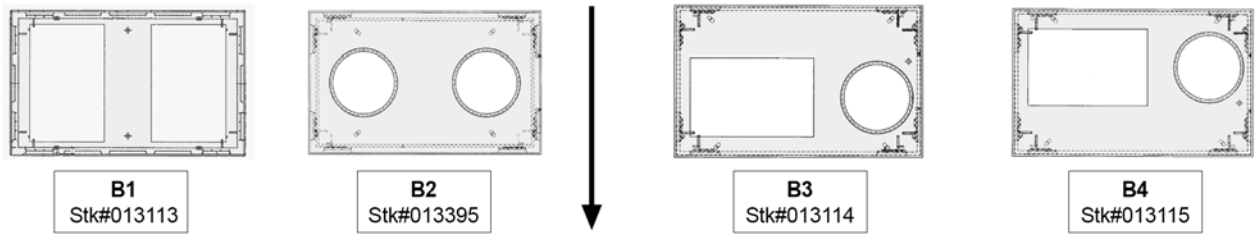
Due to different applications, the vault may need to be customized with different block-out configurations; various risers and access openings (see Figure 3).

Figure 3. Steps for selecting the proper vault assembly for your application:

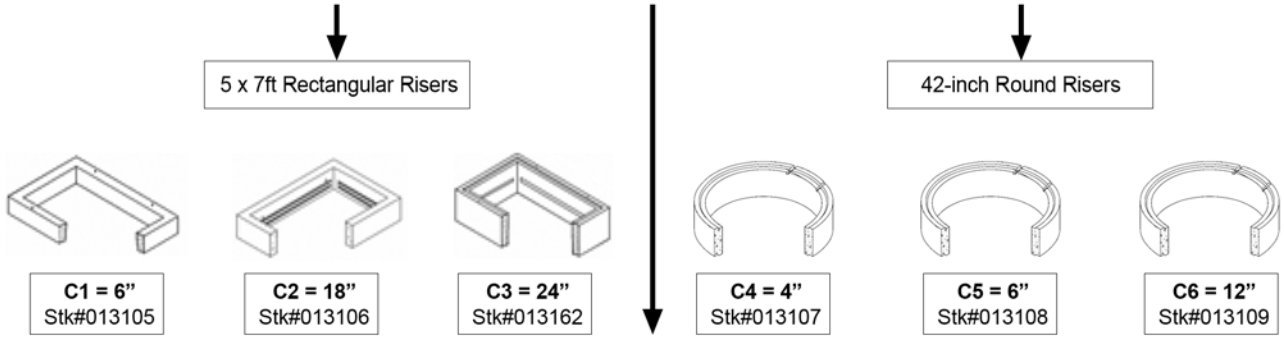
Step 1. *Select standard 712-vault base, [A] (Stock Number 013112, see section 5).*



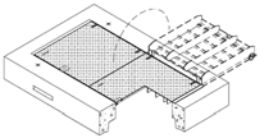
Step 2. *Determine and select the type of blockout configuration needed for the vault top section [B#]. There are 4 possible options for the 712 top sections; each allowing a different set of access openings. (Stock Numbers 013113, 013114, 013395,or 013115, see section 6).*



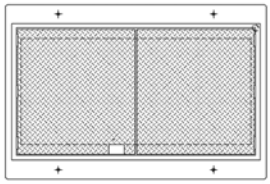
Step 3. *Select appropriate risers [C#] to bring access opening up to grade. Each riser section for the 712 covers half of the top section. (Stock numbers 013105, 013106, 013162, 013107, 013108, and 013109)*



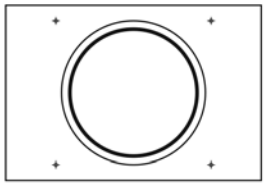
Step 4. Determine the appropriate type of cover slabs and lids or hatches [D#]



D2 = H20 Hatch
Stock No.013111



D3 = H30 Hatch
Stock No.013153



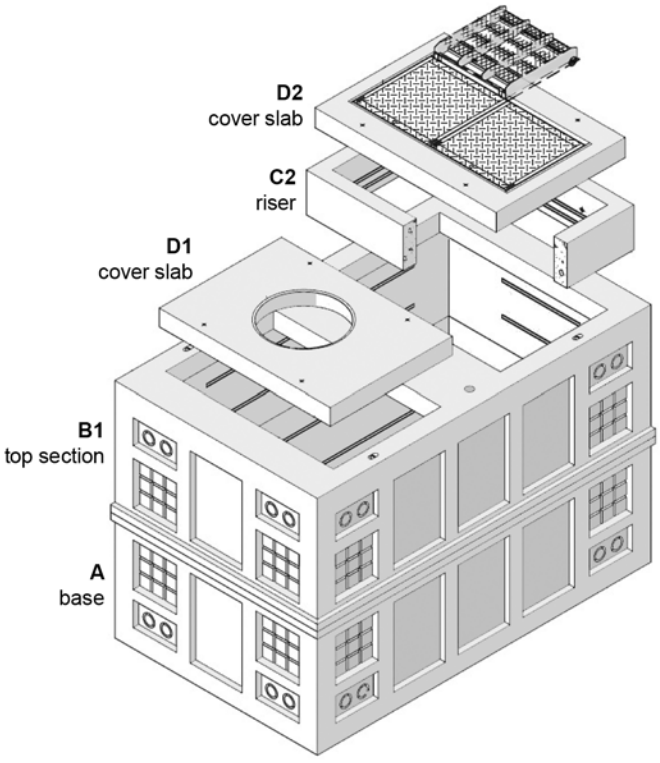
D1 = 42" Round Blockout; use with B1 only
Stock No.013110

42" Round Frame
Stock No.012753

H20 – 42" Round Solid
Stock No.720466

H20 – 42" Round Vented
Stock No.720226

Step 5. *Check the assembled vault configurations in section 8 for vaults that can be ordered configured with base, top section, and cover slabs. Assembled option will still require choices for risers and hatches or lids.*



4. General Requirements

This detailed standard is to be used in conjunction with SCL Material Standard 7203.21, "Precast Reinforced Concrete Structures – General".

Vault grounding shall conform to SCL Material Standard 7203.21, Section 9, Grounding.

5. Vault Base Requirements [A]

All 712 vault bases shall conform to the dimensions cited in Table 5a and Figure 5.

Table 5a. Nominal Base Dimensions

	Outside (ft-in)		Inside (ft-in)		Height (ft-in)		
Stock No.	**Length**	**Width**	**Length**	**Width**	**Outside**	**Inside**	**Figure No.**
013112	12-11	7-10	12-3	7-2	4-2.5	3-9	5

Figure 5. Standard 712 vault base [A]

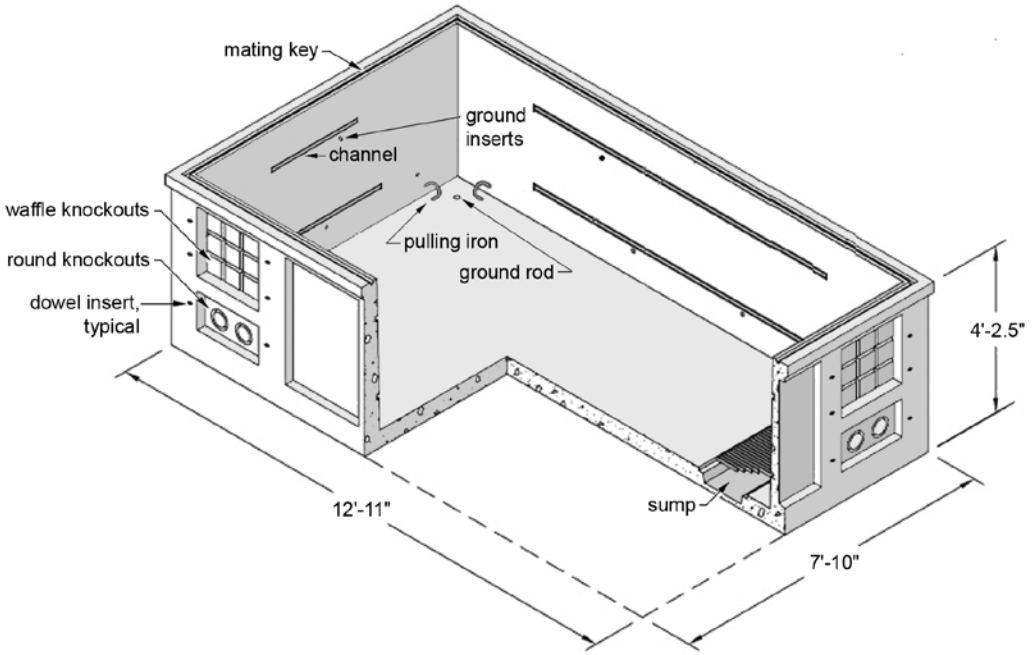


Table 5b. Vault Base Attributes

All standard 712 vault bases shall have the following features:

	Size, Nominal (in)	Location	Per Location	Total Number
Knockouts				
Round	4-3/4 dia	All 4 walls, on bottom corners of wall	4 ea side	16
Waffle, 9 - 6 in squares	18 x 18	All 4 walls, above round knockouts	2 ea side	8
Ground rod	2 dia	4 corners of floor	1 ea	4
Channels				
Galvanized “C” channel, horizontal, embedded in walls	36 length	End walls, 9 inches above floor, between knockouts, 22.5 inches on center between channels.	2 ea side	4
	96 length	Side walls, 9 inches above floor between knockouts, 22.5 inches on center between channel	2 ea side	4
Sump with galvanized grate	12 x 60	Floor, about 1 foot from and parallel to short wall	1	1
Pulling irons	7/8 dia	2 each corner of floor (typical)	2 ea corner	8
Ground inserts, bronze	1/2 dia	Side walls, 4 inches below top channel, internal and external	2 ea side	4
Dowel Inserts	1/2 dia	12 inches on center; around the perimeter of duct knockout		
Ladder		Not required		

6. Top Section Requirements [B1, B2, B3, B4]

All 712 top sections shall conform to the dimensions cited in Table 6.1 and Figure 6.

Table 6a. Nominal Top Section Dimensions

Stock No.	Outside (ft-in)		Inside (ft-in)		Height (ft-in)		Blockout Configurations	Figure
	Length	Width	Length	Width	Outside	Inside		
013113	12-11	7-10	12-3	7-2	4-4.5	3-9	two 78-in by 50-in blockouts	6b, **[B1]**
013395	12-11	7-10	12-3	7-2	4-4.5	3-9	two 42-in round blockouts	6b, **[B2]**
013114	12-11	7-10	12-3	7-2	4-4.5	3-9	one 78-in by 50-in blockout and one 42-in round blockout, offset to left (Type 1) **[B3]**	6b, **[B3]**
013115	12-11	7-10	12-3	7-2	4-4.5	3-9	one 78-in by 50-in blockout and one 42-in round blockout, offset to right (Type 2) **[B4]**	6b, **[B4]**

Notes:
Type 1 refers to a left-offset rectangular blockout from point-of-view of round blockout end.
Type 2 refers to a right-offset rectangular blockout from point-of-view of round blockout end.

Figure 6a. Vault top section [B1]

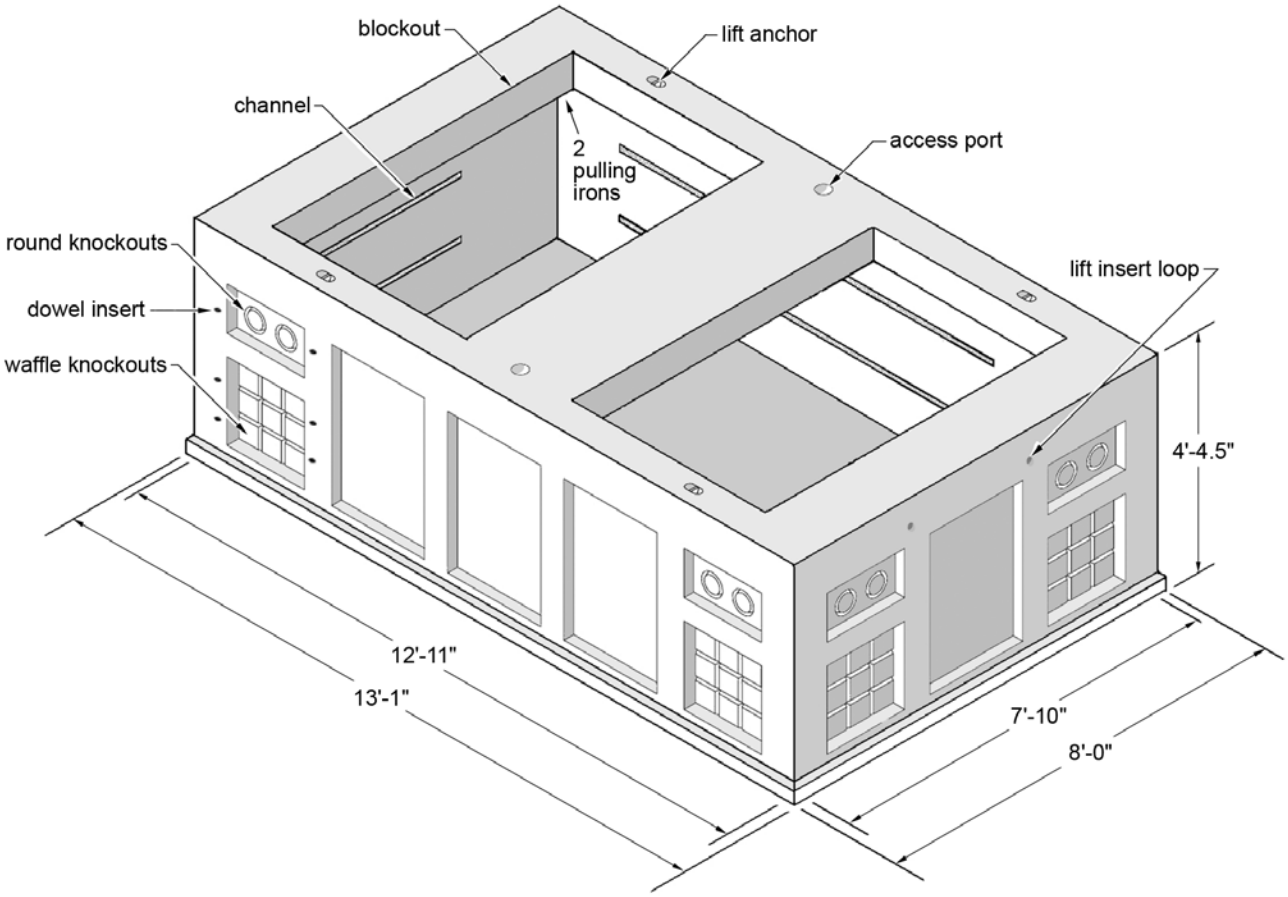
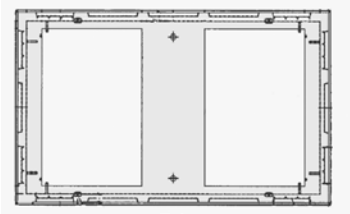
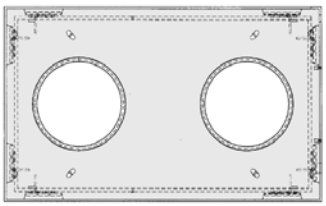


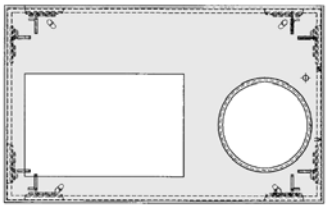
Figure 6b. Vault top section blockout options (top view)



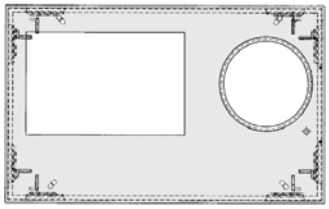
B1
Stock No. 013113



B2
Stock No. 013395
(not available on separate order)



B3
Stock No. 013114



B4
Stock No. 013115

Table 6b. Top Section Attributes Required

	Size, Nominal (in)	Location	Per Location	Total Number
Knockouts				
round	4-3/4 dia	all 4 walls, on top corners of wall	4 ea side	16
waffle, 9 - 6 in squares	18 x 18	all 4 walls, below round knockouts	2 ea side	8 waffles
Channels				
galvanized “C” channel, horizontal, embedded in walls	36 length	end walls, 11.25-inches from ceiling, between knockouts, 22.5-inches on center between channels.	2 ea side	4
	96 length	side walls, 11.25-inches from ceiling, between knockouts, 22.5-inches on center between channels	2 ea side	4
Access Port				
[B1]	3 dia	1 each side on top, centered along length of top	1 ea side	2
[B2]	3 dia	1 each side on top, centered along length of top	1 ea side	2
[B3]	3 dia	1, right of 42-inch blockout	1 side	1
[B4]	3 dia	1, left of 42-inch blockout	1 side	1
Pulling irons	7/8 dia	2 ea corner of ceiling (typical)	2 ea corner	8
Lift anchor	6-1/4	4-ton anchor, 1 each corner on top	1 ea corner	4
Lift insert loop	3/4 dia	2 each on outside of one end wall, above knockouts	2, one side	2
Ground inserts, bronze	1/2 dia	side walls, 4 inches below top channel, internal and external	2 ea side	4
Dowel Inserts	1/2 dia	12-Inch on center; around the perimeter of duct knockout		

7. Cover Slabs, Risers and Hatches or Covers

For detailed material standard of cover slabs and risers used with the 712 vault, refer to the latest version of SCL Material Standard 7204.15, “Risers and covers slab for Self-Grounding Electric Vault."

For detailed material standard of 42-inch round cover and frames, refer to the latest version of SCL Material Standard 7204.70, “Frame and Covers, 42-Inch Round, Iron."

Table 7. Cover slabs, risers and hatches or covers

Stock No.	Description	Mtl. Std.	References to Figure 3
013105	5- by 7-foot by 6-inch riser without galvanized “C” channel	7204.15	**C1**
013106	5- by 7-foot by 18-inch riser with galvanized “C” channels	7204.15	**C2**
013362	5- by 7-foot by 24-inch riser with galvanized “C” channels	7204.15	**C3**
013107	42-inch diameter by 4-inch high round riser	7204.15	**C4**
013108	42-inch diameter by 6-inch high round riser	7204.15	**C5**
013109	42-inch diameter by 12-inch high round riser	7204.15	**C6**
013110	5- by 7-foot cover slab with one 42-inch round access opening	7204.15	**D1**
013111	5- by 7-foot adjustable cover slab with two 3- by 3-foot non-slip solid covers	7204.15	**D2**
012753 and 720466	42-inch frame with 42-inch solid cover	7204.70	
012753 and 720226	42-inch frame with 42-inch grated vent cover	7204.70	

8. Vault Assembly and Packaging

The vault base and the vault top section shall have keyways for proper assembly.

Vault assemblies shall be delivered fully assembled, unless otherwise requested in purchase order.

Vaults shall be delivered to the job site, unless otherwise requested in purchase order.

Refer to Tables 8a, 8b, 8c and 8d for the various components included in each vault assemblies.

Table 8a. 712 Vault Assembly 013116: With 1 Equip. (72 in x 36 in) and 1 Personnel (42-in Round Hatch) [A-B1]

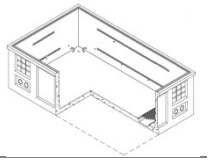
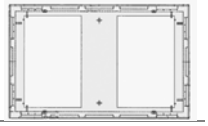
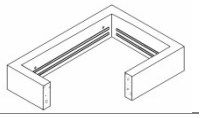
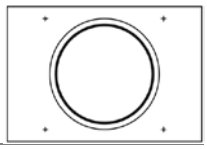
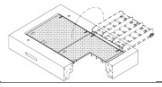
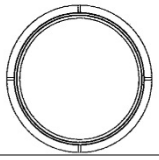
Component	Description	Label	Stock No.	Quantity	Figure
Base		A	013112	1	
Top Section	712 with 2 rectangular blockout	B1	013113	1	
Rectangular Riser	18 in	C2	013106		
42-in Round Riser	4 in	C4	013197	1	
42-in Round Riser	12 in	C6	013109	1	
42-in Round Blockout		D1	013110	1	
Cover Slab with H20 Hatch		D2	013111		
42-in H20 Frame			012753	1	
42-in Solid			720466	1	

Table 8b. 712 Vault Assembly 013117, With 2 Personnel (42-in Round Hatch) [A-B2]

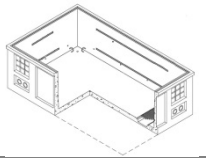
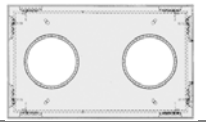
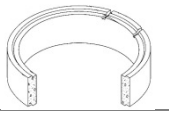
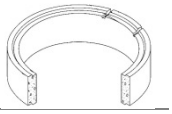
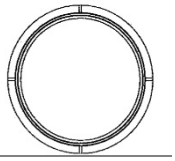
Component	Description	Label	Stock No.	Quantity	Figure
Base		A	013112	1	
Top Section	712 with 2 42-in round blockout	B2	013395	1	
42-in Round Riser	4 in	C4	013107	2	
42-in Round Riser	12 in	C6	013109	2	
42-in H20 Frame			012753	2	
42-in Solid			720466	2	

Table 8c. 712 Vault Assembly 013118, With 1 Equip. (72 in by 36 in) and 1 Personnel (42-in Round) Hatch, Offset Left (Type 1); [A-B3]

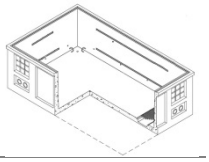
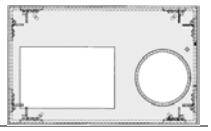
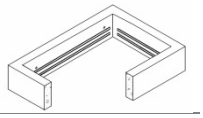
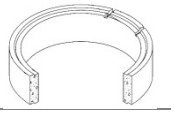
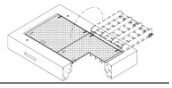
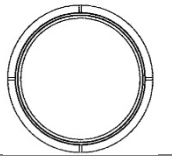
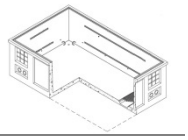
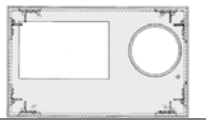
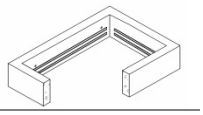
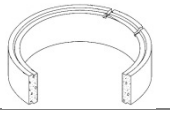
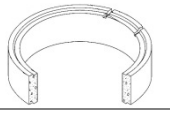
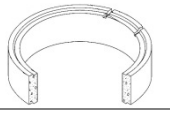
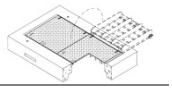
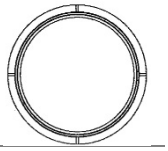
Component	Description	Label	Stock No.	Quantity	Figure
Base		A	013112	1	
Top section	712 with rectangular and 42-inch round blockout	B3	013114	1	
Rectangular Riser	18 in	C2	013106	1	
42-in Round Riser	4 in	C4	013107	1	
42-in Round Riser	6 in	C5	013108	1	
42-in Round Riser	12 in	C6	013109	1	
Cover Slab with H20 Hatch		D2	013111	1	
42-in H20 Frame			012753	2	
42-in Solid			720466	2	

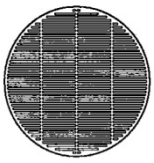
Table 8d. 712 Vault Assembly with 1 Equip. (72 in by 36 in) and 1 Personnel (42-in Round) Hatch, Offset Right (Type 2); [A-B4]

Component	Description	Label	Stock No.	Quantity	Figure
Base		A	013112	1	
Top Section	712 with rectangular and 42-in blockout	B4	013115	1	
Rectangular Riser	18 in	C2	013106	1	
42-in Round Riser	4 in	C4	013107	1	
42-in Round Riser	6 in	C5	013108	1	
42-in Round Riser	12 in	C6	013109	1	
Cover Slab with H20 Hatch		D2	013111	1	
42-in H20 Frame			012753	2	
42-in Solid			720466	2	

Notes:

Re: Stock No. 013117, if having the flexibility to convert the access cover from equipment to personnel is desirable, use top section Stock No. 013113 with 2 each of Stock No. 013110 instead of top section Stock No. 013395.

Re: Stock No 720226, if vault contains more than 75 kVA of transformer capacity, a vented (grate) cover is required, per below:

Stock No.	Description	Figure
720226	42-in H20 vented cover	

9. Issuance

Stock Unit: EA

10. Approved Manufacturers

			Catalog Number
Stock No.	**Components**	**Label**	**Old Castle/Utility Vault**
013116	712 vault with one 72-inch by 36-inch and one 42-inch round entry access	**[A-B1]**	712 CLX Vault Assembly
013117	712 vault with two 42-inch round entry access	**[A-B2]**	712 TEE CLX Assembly w/ (2) 57-CLX-42C cover slabs
013118	712 vault with one 72-inch by 36-inch and one 42-inch round entry access, offset to left (Type 1)	**[A-B3]**	712-CLX Type 1 Vault Assembly
013119	712 vault with one 72-inch by 36-inch and one 42-inch round entry access, offset to right (Type 2)	**[A-B4]**	712-CLX Type 2 Vault Assembly
013112	712 vault base	**[A]**	712 Vault Base
013113	712 top with two 78-inch by 50-inch blockouts	**[B1]**	712-TEE-CLX
013395	712 top with two 42-inch blockouts	**[B2]**	712-TL-42EE
013114	712 top with one 78-inch by 50-inch blockout and one 42-inch round blockout, offset to left (Type 1)	**[B3]**	712 TEE CLX Top – Type 1
013115	712 top with one 78-inch by 50-inch blockout and one 42-inch round blockout, offset to right (Type 2)	**[B4]**	712 TEE CLX Top – Type 2

11. References

SCL Material Standard 7203.21; "Precast Reinforced Concrete Structure, General," June 2012

SCL Material Standard 7204.15; "Risers and Cover Slabs for Self-Grounding Electric Vault" *[date TBD]*

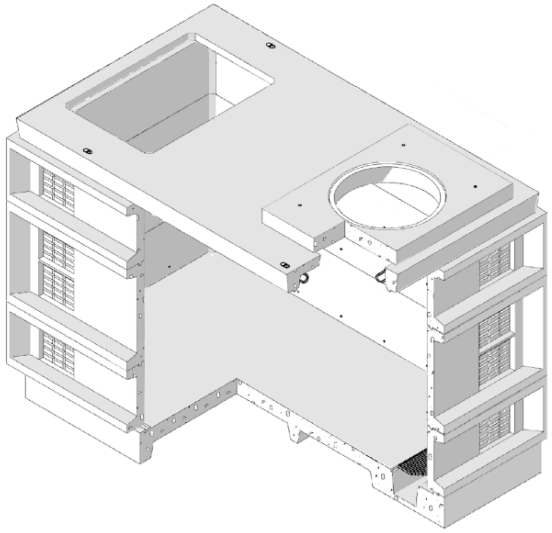
SCL Material Standard 7204.70; "Frames and Covers, 42-Inch Round, Iron," September 2007

Detter, Chris; SCL Distribution Engineer and subject matter expert for 7203.46 (chris.detter@sattle.gov)

Ng, Sharon; SCL Civil Engineer and subject matter expert for 7203.46 (sharon.ng@seattle.gov)

Wang, Quan; SCL Standards Engineer, subject matter expert and originator of 7203.46 (quan.wang@seattle.gov)

814 Electric Vault, Primary Service



1. Table of Contents

2. Scope

This standard covers the requirements for 814 electrical ring vault components (vault base, center sections (risers) and top sections) and assembled 814 electric vaults.

Most of the basic components can be ordered separately or they can be ordered as assembled vaults with cover slabs.

This standard applies to the Seattle City Light (SCL) stock numbers listed in Section 12.

Due to their size, 814 vaults, components, and accessories will not be stocked in SCL inventory. Engineers and the Civil Crew Chief are required to order and specify delivery of these items.

3. Application

814 vaults are used to construct the underground electric system. This precast concrete vault may be used to house medium size transformers up to 501 kVA, three-phase load break junction boxes, and service connections and splices for the distribution system.

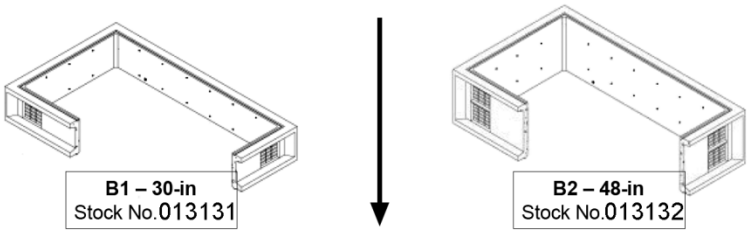
The standard 8-ft high 814-vault assembly consists of the 814 vault base, two 48-in center sections (risers), a 814 top section with two 78-in by 50-in blockouts, various additional risers to bring access opening to grade, a cover slab with two 3-ft by 3-ft non-slip, solid covers and a 42-inch entry access.

Due to different applications, the vault may need to be customized with tops with different block-out configurations, different combinations of center sections, various risers and access openings (see Figure 3).

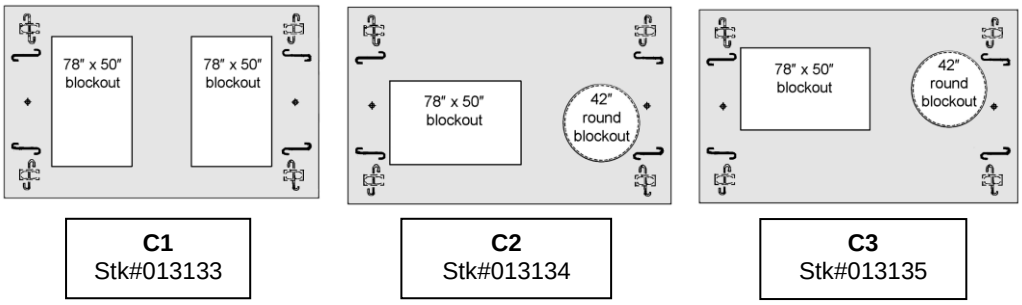
Figure 3. Steps for selecting the proper vault assembly for your application:

Step 1. *Select standard 814 vault* ***base, [A]*** *(Stock No. 013130, Section 5).*

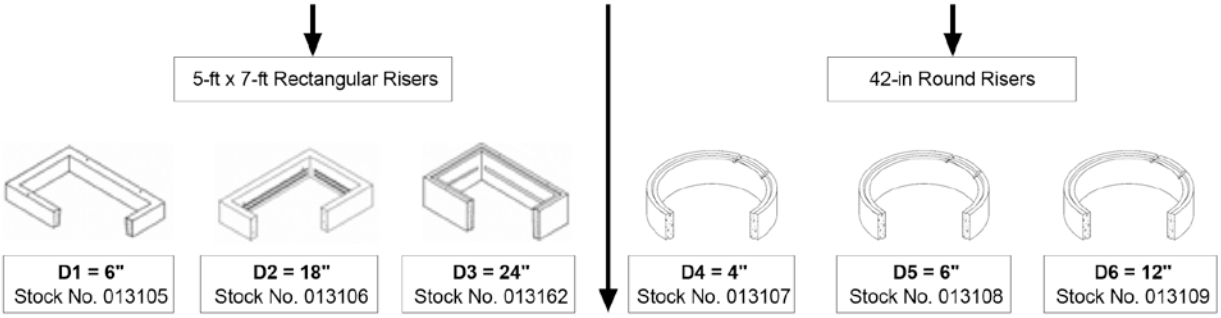
Step 2*. Determine the height of vault needed, select any combination of 30-in* ***[B1]*** *or 48-in* ***[B2]*** *center sections (Stock Nos. 013131 and 013132, Section 6)*



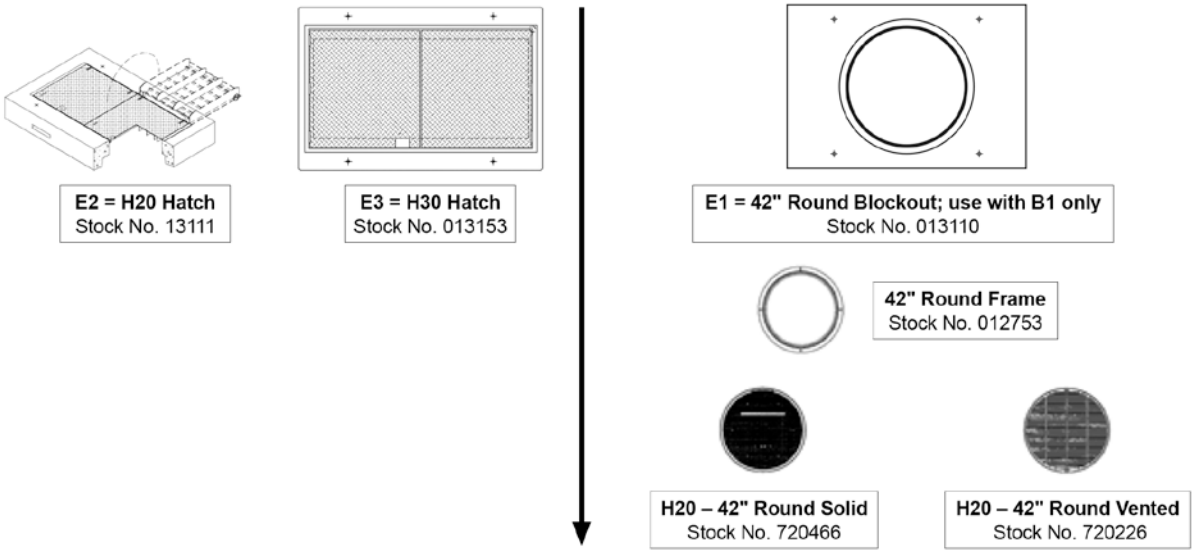
Step 3*. Determine and select the type of blockout configuration needed for the vault* ***top section, [C1, C2 and C3]****. For the 814 top sections there are 4 possible options each allowing a different set of access openings. Note, the top section allowing for two 42-in round access openings is not an option to be ordered separately but can be ordered as part of an assembly. Three top sections can be ordered separately. (Stock Nos. 013133, 013134 or 013135, Section 7).*



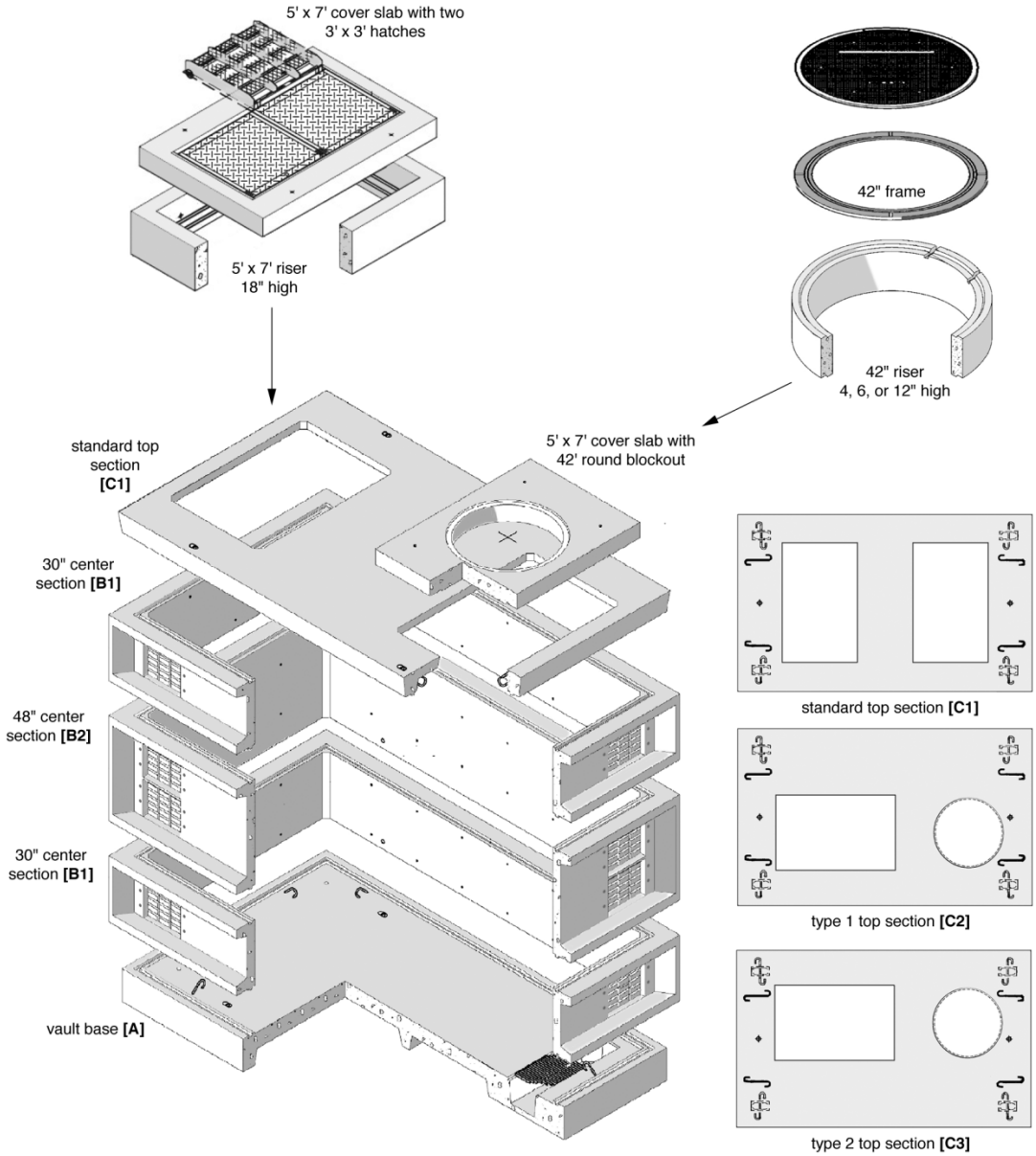
***Step 4**. Select appropriate risers [D#] to bring access opening up to grade. Each riser section for the 814 covers half of the top section. (Stock Nos. 013105, 013106, 013162, 013107, 013108, and 013109).*



***Step 5**. Determine the appropriate type of cover slabs and lids or hatches [E#]*



Step 6. *Check the assembled vault configurations in Section 9 for vaults that can be ordered configured with base, top section, and cover slabs. Assembled option will still require choices for risers and hatches or lids.*



4. General Requirements

This standard is to be used in conjunction with SCL 7203.21, “Precast Reinforced Concrete Structures – General”.

Vault grounding shall conform to SCL 7203.21, Section 9, Grounding.

Typical load rating for ring vaults is H-20; however, if heavy traffic is anticipated, engineer should request an H-25 load rating.

5. Base [A] Requirements

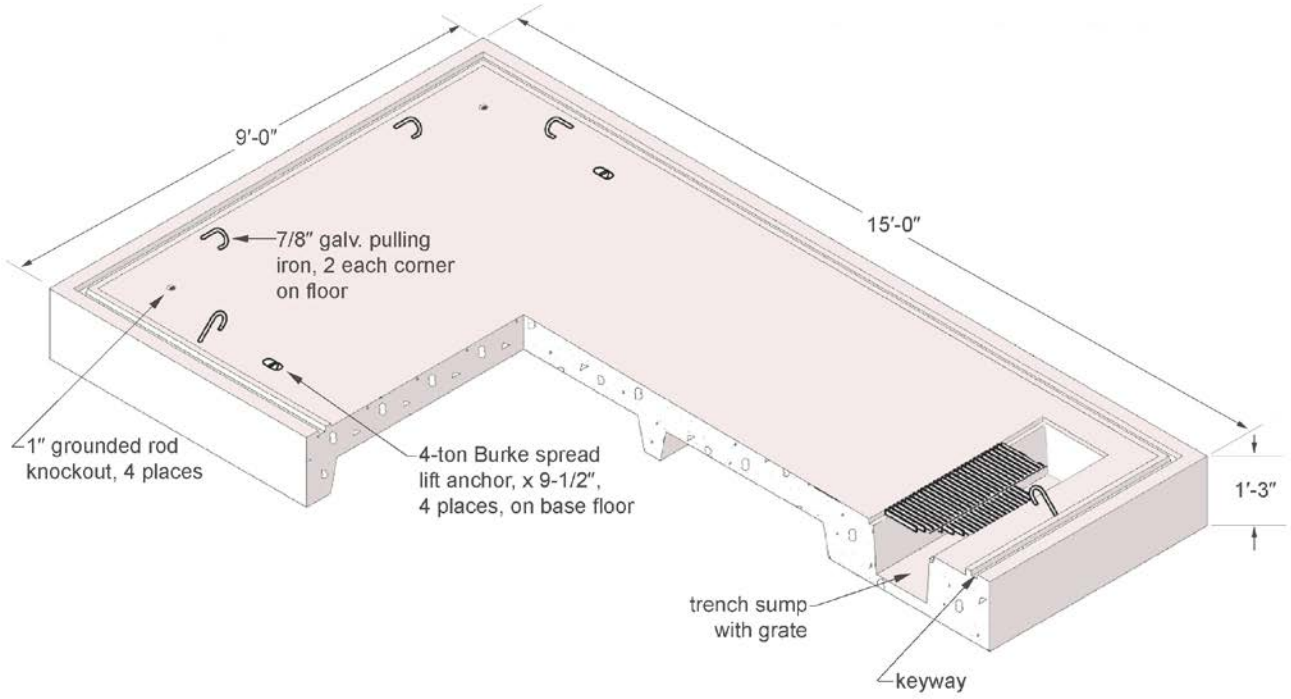
All 814 ring vault bases shall be constructed according to the dimensions shown in Table 5 and Figure 5.

The ring vault floor shall be sloped to drain toward the sump.

Table 5. Nominal Base Dimensions

	Outside (ft-in)		Inside (ft-in)		Height (ft-in)		
Stock No.	**Length**	**Width**	**Length**	**Width**	**Outside**	**Inside**	**Figure**
013130	15-0	9-0	14-0	8-0	1-3	-	5

Figure 5. Standard Vault Base [A]



All 814 ring vault base shall have the following attributes:

- Ground rod knockout (1 inch diameter) at each corner of floor
- Trench sump with removable galvanized grating (12 in x 60 in); 1 ft from, and parallel to, short wall
- Pulling iron (7/8 in diameter); two (2) shall be located at each corner of floor, recessed in floor
- 4-ton lift anchors, one on each corner of floor
- Ground inserts (1/2 in) on opposite end walls on the floor
- Ladder; as required if vault floor is 12 ft-6 in or more below finish grade; fixed ladders shall be per SCL drawing D-28304; ladder substitution shall be submitted for approval

6. Center Section (Riser) Requirements [B1, B2]

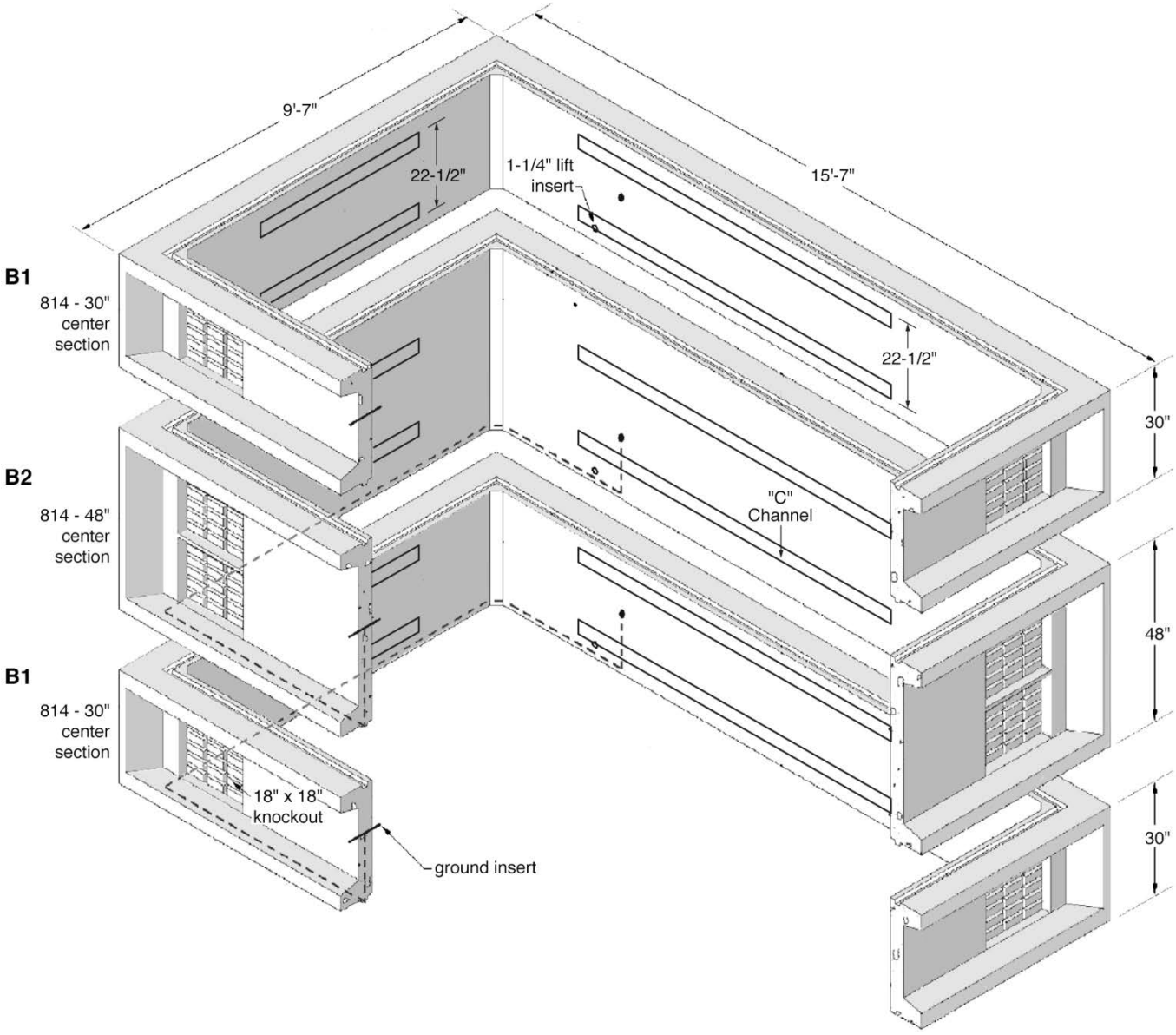
All 814 ring vault center sections shall be constructed according to the dimensions shown in Table 6.

Table 6. Vault Nominal Center Sections Dimensions

	Outside (ft-in)		Inside (ft-in)		Height (ft-in)		
Stock No.	**Length**	**Width**	**Length**	**Width**	**Outside**	**Inside**	**Figure**
013131	15-7	9-7	14-0	8-0	2-6	-	6 **[B1]**
013132	15-7	9-7	14-0	8-0	4-0	-	6 **[B2]**

Note: Center sections are considered to be risers by manufacturers but in this Standard we use the term 'center section' to make a distinction from risers used above the top section for the purpose of adjusting the heights of cover slabs to meet surface elevations (grade).

Figure 6. Vault Center Sections [B1 and B2]



6.1 Knockouts, Waffle

Knockouts shall be of the waffle type.

For a 30-in high vault section **[B1]** (Stock No. 013131, knockout shall measure 18 in by 18 in. Knockouts shall be located on all 4 walls on the outer edge of the wall, two (2) on each side, for a total of eight (8) knockouts.

For a 48-in high vault section **[B2]** (Stock No. 013132), knockout shall measure 15 in by 18 in. Knockouts shall be located on all 4 walls on the outer edge of the wall, four (4) on each side, for a total of 16 knockouts.

6.2 Dowel Inserts

Dowel inserts (duct bank knockout inserts) shall be embedded 12 inches on center, around the perimeter of the knockout. Dowel inserts shall accommodate a 1/2-in diameter threaded rebar or steel dowel.

6.3 Channels

Galvanized "C" channels shall be embedded in vault walls between knockouts, centered, with 22.5-in spacing between rows.

Channels shall measure 1-5/8 in by 7/8 in by 48 in on the end walls and 1-5/8 in by 7/8 in by 120 in on the side walls.

6.4 Lift Inserts

Lift inserts shall measure 1 inch in diameter. These shall be located on wall ends, along the bottom of the side walls, between knockouts.

6.5 Ground Inserts

Material shall be bronze. Ground inserts shall measure 1/2 inch in diameter. Four (4) total inserts shall be used, two (2) each located at the center of both internal and external side walls.

7. Top Section Requirements, [C1], [C2] and [C3]

All 814 top sections shall be constructed according to the dimensions shown in Table 7 and Figures 7a and 7b.

Table 7. Nominal Top Sections Dimensions and Weight

	Top Sections (ft-in)				
Stock No.	**Length**	**Width**	**Thickness (in)**	**Blockout Configurations**	**Figure**
013133	15-2	9-2	9.5	Two 78-in x 50-in blockouts **[C1]**	7a & 7b **[C1]**
013134	15-2	9-2	9.5	One 78-in x 50-in blockouts and one 42-in round blockouts, offset to left (Type 1) **[C2]**	7a & 7b **[C2]**
013135	15-2	9-2	9.5	One 78-in x 50-in blockouts and one 42-in round blockouts, offset to right (Type 2) **[C3]**	7a & 7b **[C3]**

Notes
1. **Type 1** refers to a left-offset rectangular blockout from point-of-view of round blockout end.
2. **Type 2** refers to a right-offset rectangular blockout from point-of-view of round blockout end.

Figure 7a. Vault Top Section [C1]

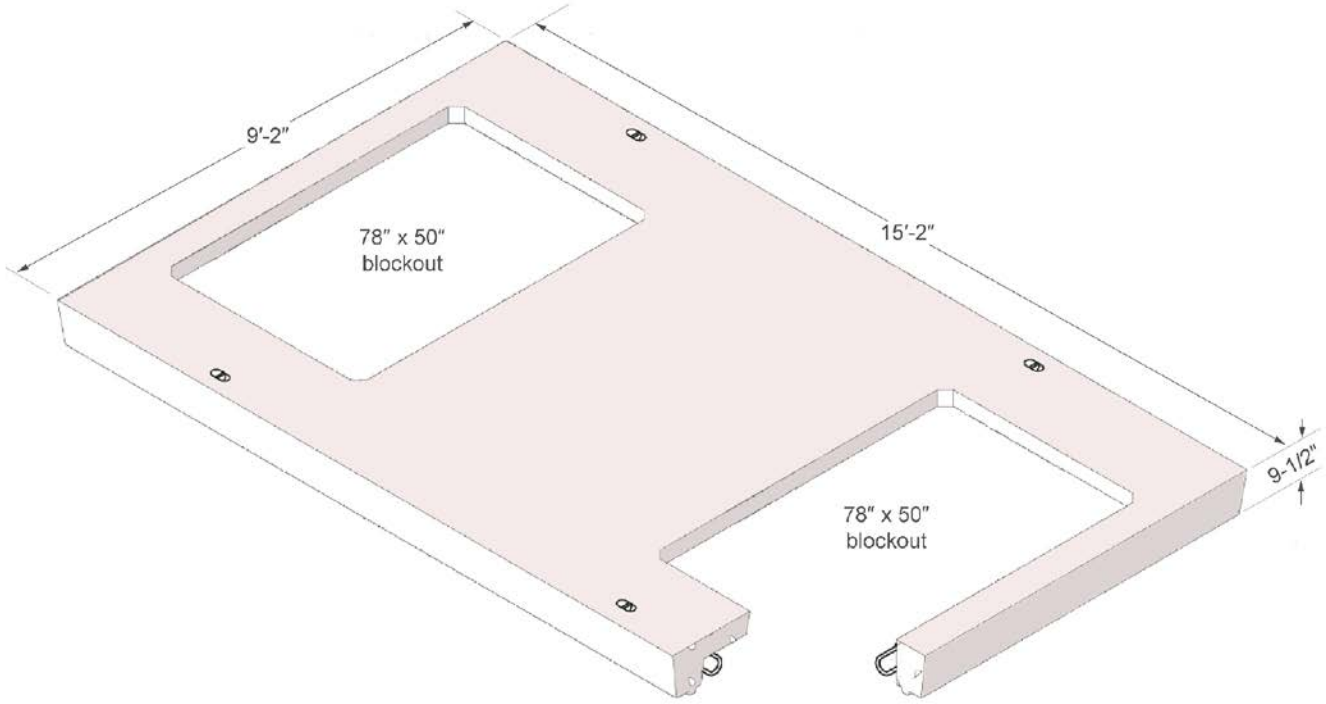
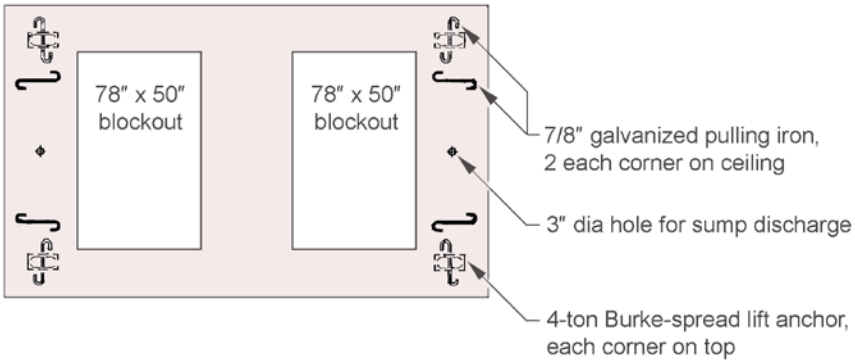
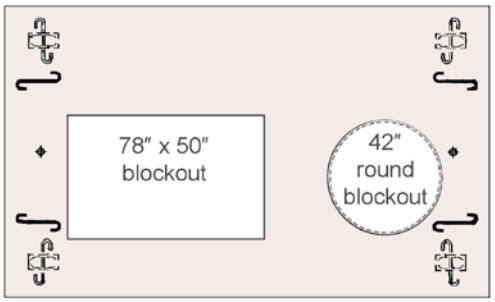


Figure 7b. Vault Top Section Blockout Options

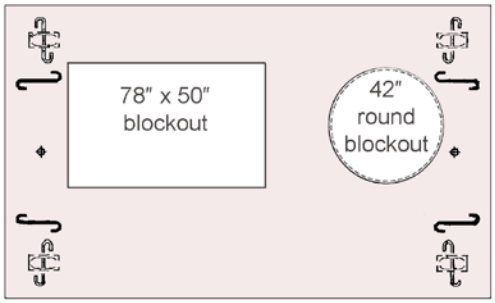
814 Standard Top, Stock No. 013133 **[C1]**



814 Type 1 Top, Stock No. 013134 **[C2]**, blockout offset to left



814 Type 2 Top, Stock No. 013135 **[C3]**, blockout offset to right



All 814 ring vault top covers shall have the following features:

- Pulling iron (7/8 in diameter); two (2) shall be located at each corner of ceiling
- 4-ton lift anchors, one on each corner of floor
- One access port (3 in diameter) shall be located at the center of each ends of top cover

8. Cover Slab, Risers, and Hatches or Covers

Risers described in this section are designed to be set on the vault top section or on the cover slab for the purpose of adjusting the height of the vault access entrance to meet surface elevations (grade).

For a detailed material standard for cover slabs and risers used with the 814 vault, refer to SCL 7204.15, “Cover Slabs and Risers for Electric Vaults."

For a detailed material standard for 42-inch round cover and frames, refer to SCL 7204.70, “Frame and Covers, 42-Inch Round, Iron."

Table 8. Cover Slabs, Risers, and Hatches or Covers

Stock No.	Description	Matl. Std.	References to Figure 3
013105	5-ft x 7-ft x 6-in riser without galvanized “C” channel	7204.15	**D1**
013106	5-ft x 7-ft x 18-in riser with galvanized “C” channels	7204.15	**D2**
013362	5-ft x 7-ft x 24-in riser with galvanized “C” channels	7204.15	**D3**
013107	42-in diameter by 4-in high round riser	7204.15	**D4**
013108	42-in diameter by 6-in high round riser	7204.15	**D5**
013109	42-in diameter by 12-in high round riser	7204.15	**D6**
013110	5-ft x 7-ft cover slab with one 42-in round access opening	7204.15	**E1**
013111	5-ft x 7-ft adjustable cover slab with two 3-ft x 3-ft non-slip solid covers	7204.15	**E2**
013153	5-ft x 7-ft cover slab with two H-30 solid cover	7204.15	**E3**
012753 and 720466	42-in frame with 42-in solid cover	7204.70	
012753 and 720226	42-in frame with 42-in grated vent cover	7204.70	

Rectangular blockout: For all top sections with rectangular openings cover slabs are necessary, one for each top section rectangular blockout. Cover slabs may either be set directly on the top section or may be set on risers. Cover slabs shall be produced with a key shape on the bottom to fit into the 8-ft x 4 ft-6 in opening in the top section or in the riser openings. Risers are used to obtain the required elevation and then topped by the cover slabs. In that case the risers are set with the blockout hole in the top section matching the opening of the risers (the openings have the same dimension). No key system is required to mate the rectangular riser to the top section.

Round blockout: Cover slabs with 42-in round access holes may be set in grout directly on the top section surface. Keyed round risers may also be set directly into top sections that have 42-in round blockouts. Round risers shall have keys that are matched in the top slabs with round blockouts; the same type of matching keys is required in cover slabs with round blockouts.

9. Vault Assemblies

Seattle City Light has specified fourteen 814 vault assemblies that can be ordered by stock number. The predefined assemblies have three interior vault heights of 8, 9, or 10 feet with several options for overall height and type of access openings (see Table 9q).

The vault base and the vault top section shall have keyways for proper assembly.

Vaults shall be delivered to the job site, unless otherwise requested in purchase order.

Refer to Tables 9a – 9p for the various components included in each vault assemblies.

For all vault assemblies, if vault contains more than 75 kVA of transformer capacity, a vented (grate) cover (Stock No. 720226) is required in place of the solid cover (Stock No. 720466) per Table 9a.

Table 9a. 42-in Vented Cover

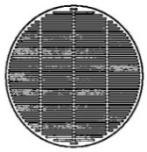
Stock No.	Description	Figure
720226	42-in H20 vented cover	

Table 9b. 8-ft Vault Assembly 013136: With 1 Equip. (72 in x 36 in) and 1 Personnel (42-in Round Hatch) [A-C1]

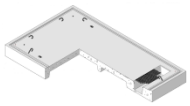
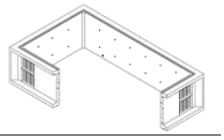
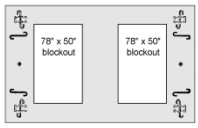
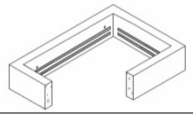
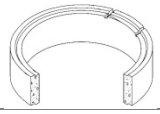
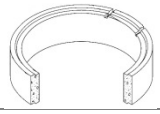
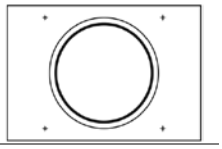
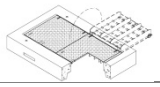
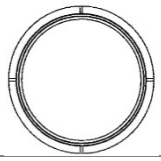
Component	Description	Label	Stock No.	Quantity	Figure
Base		A	013130	1	
Mid-Section Riser	48 in	B2	013132	2	
Top Section	814 with 2 rectangular blockout	C1	013133	1	
Rectangular Riser	18 in	D2	013106	1	
42-in Round Riser	4 in	D4	013197	1	
42-in Round Riser	12 in	D6	013109	1	
42-in Round Blockout		E1	013110	1	
Cover Slab with H20 Hatch		E2	013111	1	
42-in H20 Frame			012753	1	
42-in Solid			720466	1	

Table 9c. 8-ft Vault Assembly 013137: With 1 Equip. (72 in x 36 in) and 1 Personnel (42-in Round Hatch) (Type 1); [A-C2]

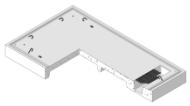
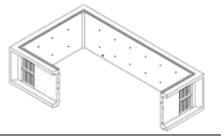
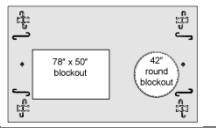
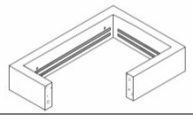
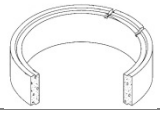
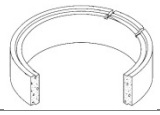
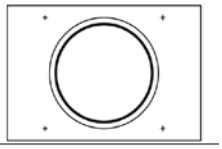
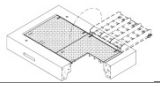
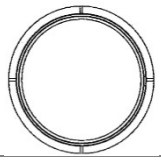
Component	Description	Label	Stock No.	Quantity	Figure
Base		A	013130	1	
Mid-Section Riser	48 in	B2	013132	2	
Top Section	814 with rectangular and 42-inch round blockout, Type 1, offset to left	C2	013134	1	
Rectangular Riser	18 in	D2	013106	1	
42-in Round Riser	4 in	D4	013197	1	
42-in Round Riser	12 in	D6	013109	1	
42-in Round Blockout		E1	013110	1	
Cover Slab with H20 Hatch		E2	013111	1	
42-in H20 Frame			012753	1	
42-in Solid			720466	1	

Table 9d. 8-ft Vault Assembly 013138: With 1 Equip. (72 in x 36 in) and 1 Personnel (42-in Round Hatch) (Type 2); [A-C3]

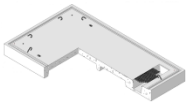
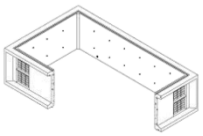
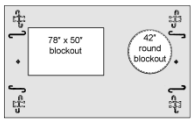
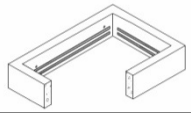
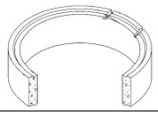
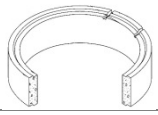
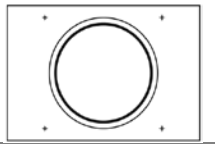
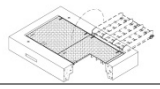
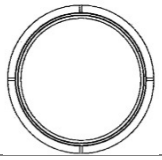
Component	Description	Label	Stock No.	Quantity	Figure
Base		A	013130	1	
Mid-Section Riser	48 in	B2	013132	2	
Top Section	814 with rectangular and 42-in round blockout, Type 2, offset to right	C3	013135	1	
Rectangular Riser	18 in	D2	013106	1	
42-in Round Riser	4 in	D4	013197	1	
42-in Round Riser	12 in	D6	013109	1	
42-in Round Blockout		E1	013110	1	
Cover Slab with H20 Hatch		E2	013111	1	
42-in H20 Frame			012753	1	
42-in Solid			720466	1	

Table 9e. 9-ft Vault Assembly 013139: With 1 Equip. (72 in x 36 in) and 1 Personnel (42-in Round Hatch) [A-C1]

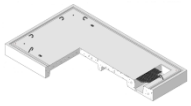
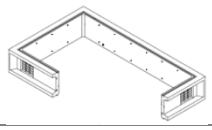
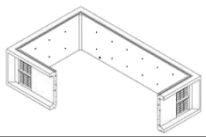
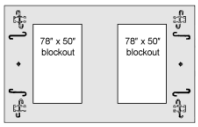
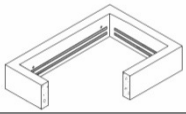
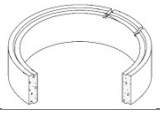
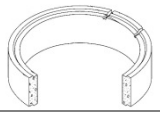
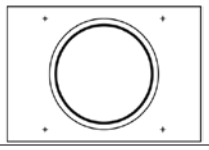
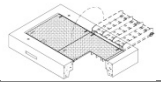
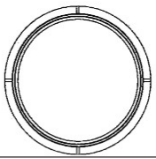
Component	Description	Label	Stock No.	Quantity	Figure
Base		A	013130	1	
Mid-Section Riser	30 in	B1	013131	2	
Mid-Section Riser	48 in	B2	013132	1	
Top Section	814 with 2 rectangular blockouts	C1	013133	1	
Rectangular Riser	18 in	D2	013106	1	
42-in Round Riser	4 in	D4	013197	1	
42-in Round Riser	12 in	D6	013109	1	
42-in Round Blockout		E1	013110	1	
Cover Slab with H20 Hatch		E2	013111	1	
42-in H20 Frame			012753	1	
42-in Solid			720466	1	

Table 9f. 9-ft Vault Assembly 013140: With 2 Personnel (42-in Round Hatch) [A-C1]

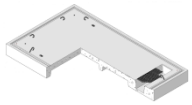
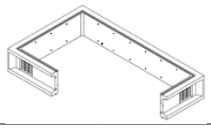
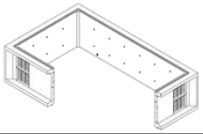
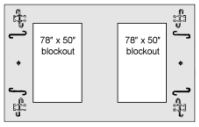
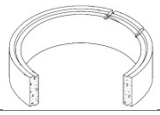
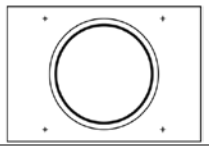
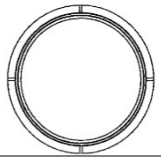
Component	Description	Label	Stock No.	Quantity	Figure
Base		A	013130	1	
Mid-Section Riser	30 in	B1	013131	2	
Mid-Section Riser	48 in	B2	013132	1	
Top Section	814 with 2 rectangular blockouts	C1	013133	1	
42-in Round Riser	4 in	D4	013197	2	
42-in Round Riser	12 in	D6	013109	2	
42-in Round Blockout		E1	013110	2	
42-in H20 Frame			012753	2	
42-in Solid			720466	2	

Table 9g. 814 – 9 ft Vault Assembly 013141: With 1 Equip. (72 in x 36 in) and 1 Personnel (42-in Round Hatch) (Type 1); [A-C2]

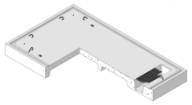
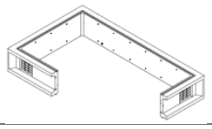
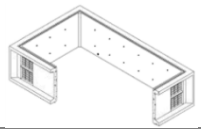
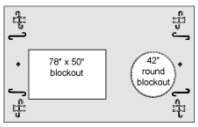
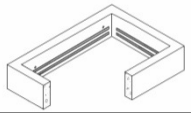
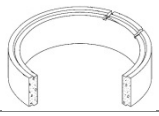
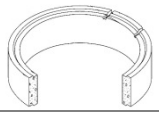
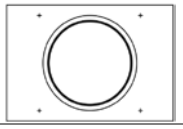
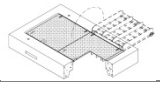
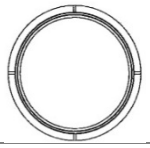
Component	Description	Label	Stock No.	Quantity	Figure
Base		A	013130	1	
Mid-Section Riser	30 in	B1	013131	2	
Mid-Section Riser	48 in	B2	013132	1	
Top Section	814 with rectangular and 42-in round blockout, Type 1, offset to left	C2	013134	1	
Rectangular Riser	18 in	D2	013106	1	
42-in Round Riser	4 in	D4	013197	1	
42-in Round Riser	12 in	D6	013109	1	
42-in Round Blockout		E1	013110	1	
Cover Slab with H20 Hatch		E2	013111	1	
42-in H20 Frame			012753	1	
42-in Solid			720466	1	

Table 9h. 9-ft Vault Assembly 013142: With 1 Equip. (72 in x 36 in) and 1 Personnel (42-in Round Hatch) (Type 2); [A-C3]

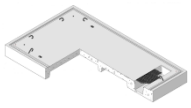
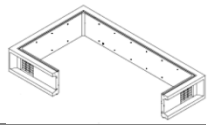
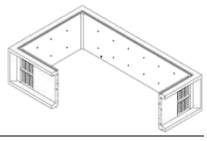
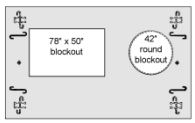
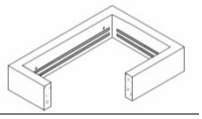
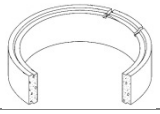
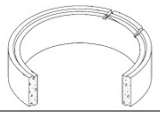
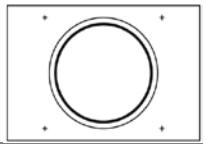
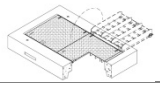
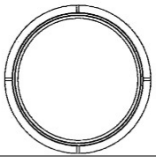
Component	Description	Label	Stock No.	Quantity	Figure
Base		A	013130	1	
Mid-Section Riser	30 in	B1	013131	2	
Mid-Section Riser	48 in	B2	013132	1	
Top Section	814 with rectangular and 42-inch round blockout, Type 2, off-set to right	C3	013135	1	
Rectangular Riser	18 in	D2	013106	1	
42-in Round Riser	4 in	D4	013197	1	
42-in Round Riser	12 in	D6	013109	1	
42-in Round Blockout		E1	013110	1	
Cover Slab with H20 Hatch		E2	013111	1	
42-in H20 Frame			012753	1	
42-in Solid			720466	1	

Table 9i. 10-ft Vault Assembly 013143: With 1 Equip. (72 in x 36 in) and 1 Personnel (42-in Round Hatch) [A-C1]

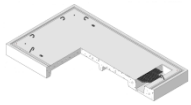
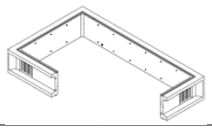
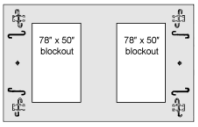
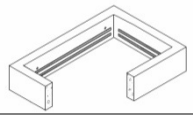
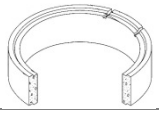
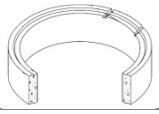
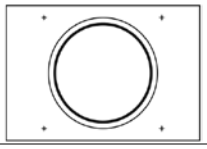
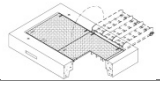
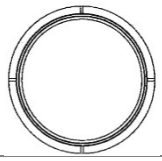
Component	Description	Label	Stock No.	Quantity	Figure
Base		A	013130	1	
Mid-Section Riser	30 in	B1	013131	4	
Top Section	814 with 2 rectangular blockout	C1	013133	1	
Rectangular Riser	18 in	D2	013106	1	
42-in Round Riser	4 in	D4	013197	1	
42-in Round Riser	12 in	D6	013109	1	
42-in Round Blockout		E1	013110	1	
Cover Slab with H20 Hatch		E2	013111	1	
42-in H20 Frame			012753	1	
42-in Solid			720466	1	

Table 9j. 10-ft Vault Assembly 013144: With 2 Personnel (42-in Round Hatch) [A-C1]

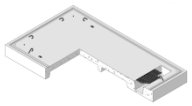
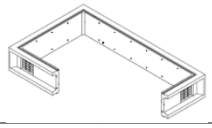
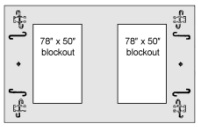
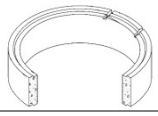
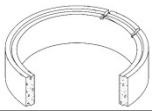
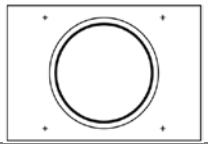
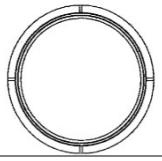
Component	Description	Label	Stock No.	Quantity	Figure
Base		A	013130	1	
Mid-Section Riser	30 in	B1	013131	4	
Top Section	814 with 2 rectangular blockout	C1	013133	1	
42-in Round Riser	4 in	D4	013197	2	
42-in Round Riser	12 in	D6	013109	2	
42-in Round Blockout		E1	013110	2	
42-in H20 Frame			012753	2	
42-in Solid			720466	2	

Table 9k. 10-ft Vault Assembly 013145: With 1 Equip. (72 in x 36 in) and 1 Personnel (42-in Round Hatch) (Type 1); [A-C2]

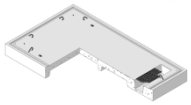
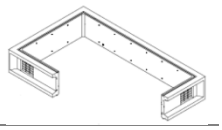
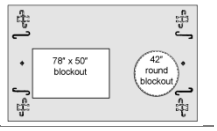
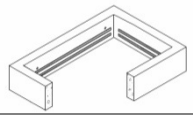
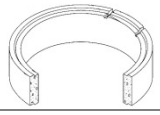
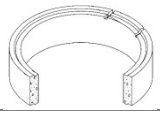
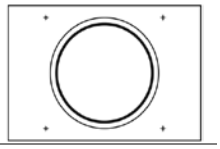
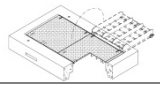
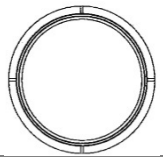
Component	Description	Label	Stock No.	Quantity	Figure
Base		A	013130	1	
Mid-Section Riser	30 in	B1	013131	4	
Top Section	814 with rectangular and 42-inch round blockout, Type 1, off-set to left	C2	013134	1	
Rectangular Riser	18 in	D2	013106	1	
42-in Round Riser	4 in	D4	013197	1	
42-in Round Riser	12 in	D6	013109	1	
42-in Round Blockout		E1	013110	1	
Cover Slab with H20 Hatch		E2	013111	1	
42-in H20 Frame			012753	1	
42-in Solid			720466	1	

Table 9l. 10-ft Vault Assembly 013146: With 1 Equip. (72 in x 36 in) and 1 Personnel (42-in Round Hatch) (Type 2); [A-C3]

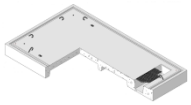
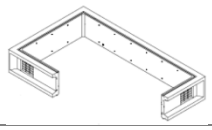
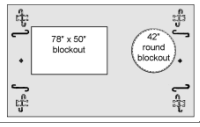
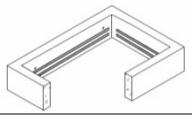
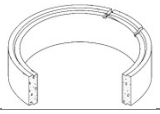
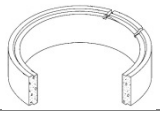
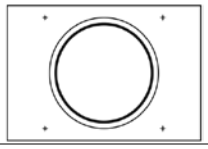
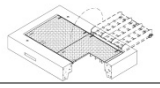
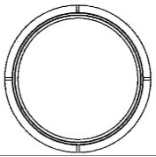
Component	Description	Label	Stock No.	Quantity	Figure
Base		A	013130	1	
Mid-Section Riser	30 in	B1	013131	4	
Top Section	814 with rectangular and 42-inch round blockout, Type 2, offset to right	C3	013135	1	
Rectangular Riser	18 in	D2	013106	1	
42-in Round Riser	4 in	D4	013197	1	
42-in Round Riser	12 in	D6	013109	1	
42-in Round Blockout		E1	013110	1	
Cover Slab with H20 Hatch		E2	013111	1	
42-in H20 Frame			012753	1	
42-in Solid			720466	1	

Table 9m. 8-ft Vault Assembly 013161: With 1 H30 Equip. (72 in x 36 in) and 1 Personnel (42-in Round Hatch) [A-C1]

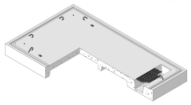
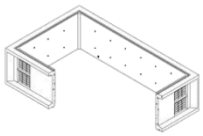
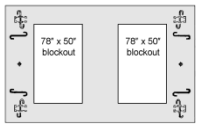
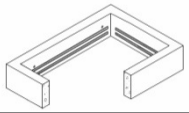
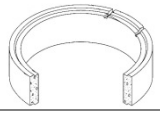
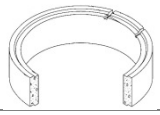
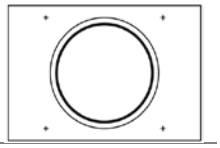
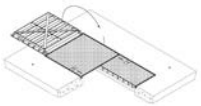
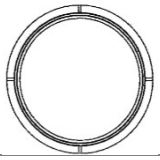
Component	Description	Label	Stock No.	Quantity	Figure
Base		A	013130	1	
Mid-Section Riser	48 in	B2	013132	2	
Top Section	814 with 2 rectangular blockout	C1	013133	1	
Rectangular Riser	18 in	D2	013106	1	
42-in Round Riser	4 in	D4	013197	1	
42-in Round Riser	12 in	D6	013109	1	
42-in Round Blockout		E1	013110	1	
Cover Slab with H30 Hatch		E2	013153	1	
42-in H20 Frame			012753	1	
42-in Solid			720466	1	

Table 9n. 8-ft Vault Assembly 013162: With 1 H30 Equip. (72 in x 36 in) and 1 Personnel (42-in Round Hatch) (Type 1); [A-C2]

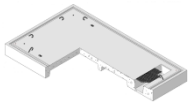
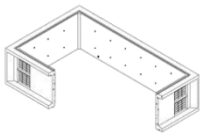
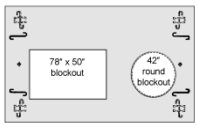
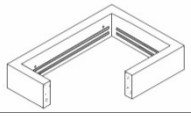
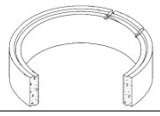
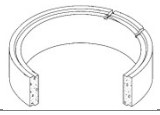
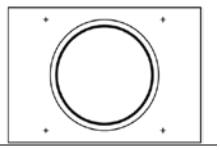
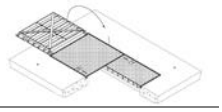
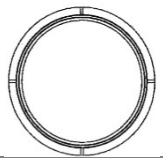
Component	Description	Label	Stock No.	Quantity	Figure
Base		A	013130	1	
Mid-Section Riser	48 in	B2	013132	2	
Top Section	814 with rectangular and 42-inch round blockout, Type 1, offset to left	C3	013134	1	
Rectangular Riser	18 in	D2	013106		
42-in Round Riser	4 in	D4	013197	1	
42-in Round Riser	12 in	D6	013109	1	
42-in Round Blockout		E1	013110	1	
Cover Slab with H30 Hatch		E2	013153	1	
42-in H20 Frame			012753	1	
42-in Solid			720466	1	

Table 9p. 8-ft Vault Assembly 013163: With 1 H30Equip. (72 in x 36 in) and 1 Personnel (42-in Round Hatch) (Type 2); [A-C3]

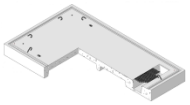
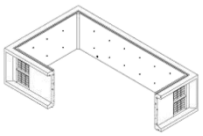
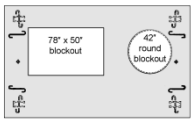
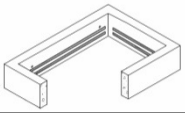
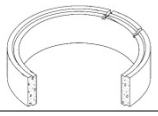
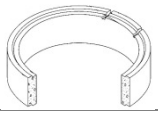
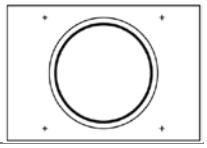
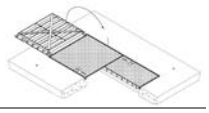
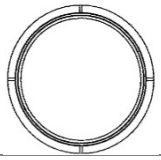
Component	Description	Label	Stock No.	Quantity	Figure
Base		A	013130	1	
Mid-Section Riser	48 in	B2	013132	2	
Top Section	814 with rectangular and 42-inch round blockout, Type 2, offset to right	C3	013135	1	
Rectangular Riser	18 in	D2	013106	1	
42-in Round Riser	4 in	D4	013197	1	
42-in Round Riser	12 in	D6	013109	1	
42-in Round Blockout		E1	013110	1	
Cover Slab with H30 Hatch		E3	013153	1	
42-in H20 Frame			012753	1	
42-in Solid			720466	1	

Table 9q. Vault Assembly Components and Overall Heights and Weight

Vault Assembly (ft)	Inside Height, Nominal	Outside Height[a], Nominal	814 – 30R Risers	814 – 48R Risers	Vault Weight[a], Nominal (lb)
8	8 ft-0 in	10 ft-5 in	-	2	51,700 lb
9	9 ft-0 in	11 ft-5 in	2	1	55,400 lb
10	10 ft-0 in	12 ft-5 in	4	-	59,100 lb

Note
a. Height and weight do not include cover slabs or additional risers to bring access to grade.

10. Shipping

All vaults larger than 444 shall be delivered to the job site. Contact SCL civil crew chief to arrange delivery details.

11. Issuance

Stock Unit: EA

12. Approved Manufacturers

Stock No.	Components	Manufacturer and Catalog No. Old Castle/ Utility Vault
013130	Standard vault base **[A]**	814 – SB
013131	30-in center section **[B1]**	814-30R w/ GRD
013132	48-in center section **[B2]**	814-48R w/ GRD
013133	Vault top section with two 76-in x 50-in blockouts **[C1]**	814-TEE-CLX
013134	Vault top section with one 76-in x 50-in and one 42-in round blockout, offset to left, Type 1 **[C2]**	814 Type 1 Top
013135	Vault top section with one 76-in x 50-in and one 42-in round blockout, offset to right, Type 2 **[C3]**	814 Type 2 Top
	Assemblies	
013136	8-ft high vault with one H-20 72-in x 36-in and one 42-in round entry access	814-8 CLX vault w/ GRD
013137	8-ft high vault with one 72-in x 36-in and one 42-in round entry access, offset to left (Type 1)	814-8 CLX Type 1 vault w/ GRD
013138	8-ft high vault with one 72-in x 36-in and one 42-in round entry access, offset to right (Type 2)	814-8 CLX Type 2 vault w/ GRD
013139	9-ft high vault with one 72-in x 36-in and one 42-in round entry access	814-9 CLX vault w/ GRD
013140	9-ft high vault with two 42-in round entry accesses	814-9 vault w/ 814-TEE-CLX Top w/ (2) 42-in access hole w/ GRD
013141	9-ft high vault with one 72-in x 36-in and one 42-in round entry access, offset to left (Type 1)	814-9 CLX Type 1 vault w/ GRD
013142	9-ft high vault with one 72-in x 36-in and one 42-in round entry access, offset to right (Type 2)	814-9 CLX Type 2 vault w/ GRD
013143	10-ft high vault with one 72-in x 36-in and one 42-in round entry access	814-10 CLX vault w/ GRD
013144	10-ft high vault with two 42-in round entry accesses	814-10 vault w/ 814-TEE-CLX Top w/ (2) 42″ access hole w/ GRD
013145	10-ft high vault with one 72-in x 36-in and one 42-in round entry access, offset to left (Type 1)	814-10 CLX Type 1 vault w/ GRD
013146	10-ft high vault with one 72-in x 36-in and one 42-in round entry access, offset to right (Type 2)	814-10 CLX Type 2 vault w/ GRD
013161	8-ft high vault with H-30 LW 2-door hatch and one 42-in round entry access	814-8 CLX vault w/ GRD w/ LW Hatch
013162	8-ft high vault with H-30 LW 2-door hatch and one 42-in round entry access, offset to left (Type 1)	814-8 CLX Type 1 vault w/ GRD w/ LW Hatch
013163	8-ft high vault with H-30 LW 2-door hatch and one 42-in round entry access, offset to right (Type 2)	814-8 CLX Type 2 vault w/ GRD w/ LW Hatch

13. References

SCL Material Standard 7203.21; “Precast Reinforced Concrete Structure, General”

SCL Material Standard 7204.15; “Cover Slabs and Risers for Electric Vaults”

SCL Material Standard 7204.70; “Frames and Covers, 42-Inch Round, Iron”

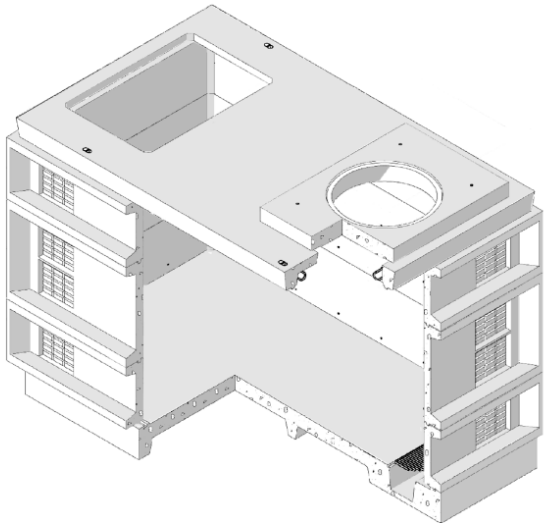
14. Sources

Ng, Sharon; SCL Civil Engineer and subject matter expert for 7203.51 (sharon.ng@seattle.gov)

Wang, Quan; SCL Standards Engineer, subject matter expert, and originator of 7203.51 (quan.wang@seattle.gov)

Youngs, Rob; SCL Electrical Reviewer and subject matter expert for 7203.51 (rob.youngs@seattle.gov)

818 Electric Vault, Primary Service



1. Table of Contents

2. Scope

This standard covers the requirements for 818 electrical ring vault components (vault base, center sections (risers) and top sections) and assembled 818 electric vaults.

Most of the basic components can be ordered separately or they can be ordered as assembled vaults with cover slabs

This standard applies to the Seattle City Light (SCL) stock numbers listed in Section 12.

Due to their size, 818 vaults, components, and accessories will not be stocked in SCL inventory. Engineers and the Civil Crew Chief are required to order and specify delivery of these items.

3. Application

818-vaults are used to construct the underground electric system. This precast concrete vault may be used to house medium size transformers up to 2500 kVA, three-phase load break junction boxes, and service connections and splices for the distribution system.

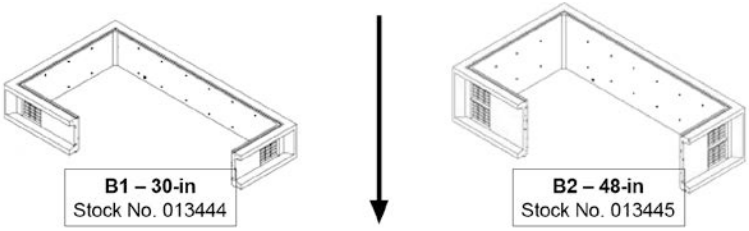
The standard 8-ft high 818-vault assembly consists of the 818 vault base, two 48-in center sections (risers), a 818 top section with two 78-in x 50-in blockouts, various additional risers to bring access opening to grade, a cover slab with two 3-ft x 3-ft non-slip, solid covers and a 42-inch entry access.

Due to different applications, the vault may need to be customized with tops with different block-out configurations, different combinations of center sections, various risers and access openings (see Figure 3).

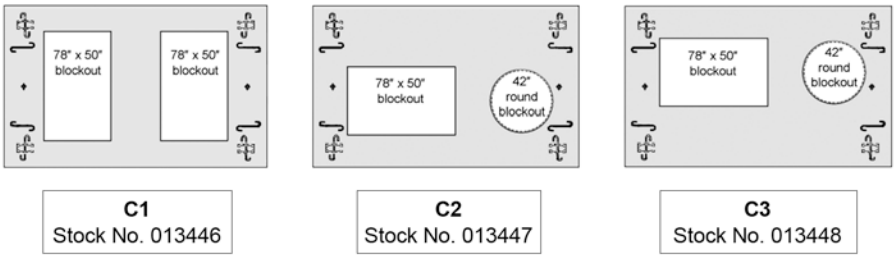
Figure 3. Steps for selecting the proper vault assembly for your application:

Step 1. Select standard 818-**vault base, [A]** (Stock No. 013443, Section 5).

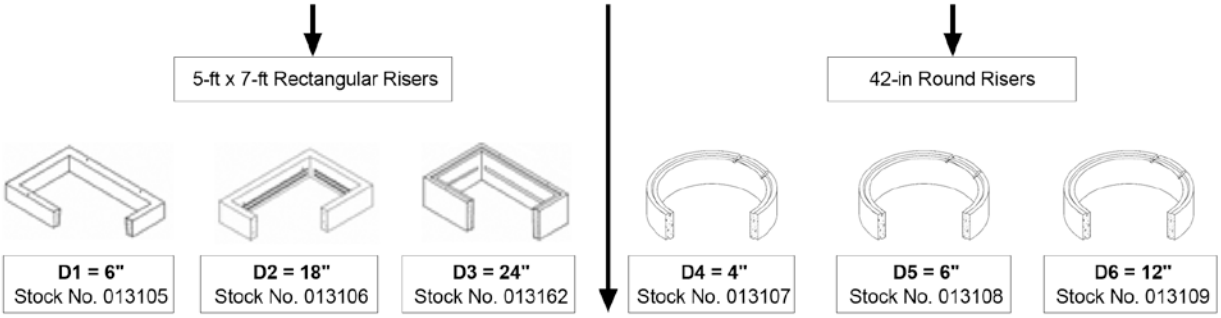
Step 2*.* Determine the height of vault needed, select any combination of 30-in **[B1]** or 48-in **[B2]** center sections (Stock Nos. 013444 and 013445, Section 6)



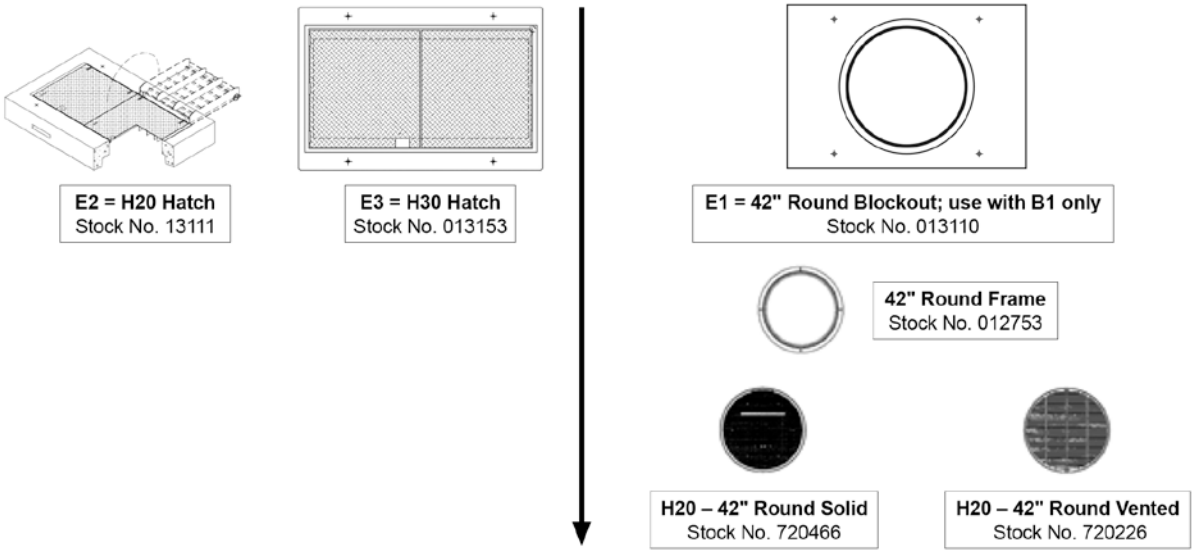
Step 3*. Determine and select the type of blockout configuration needed for the vault* ***top section, [C1, C2 and C3]****. For the 818 top sections there are 4 possible options each allowing a different set of access openings. Note: the top section allowing for two 42-inch round access openings is not an option to be ordered separately but can be ordered as part of an assembly. Three top sections can be ordered separately, Stock Nos. 013446, 013447 or 013448, Section 7).*



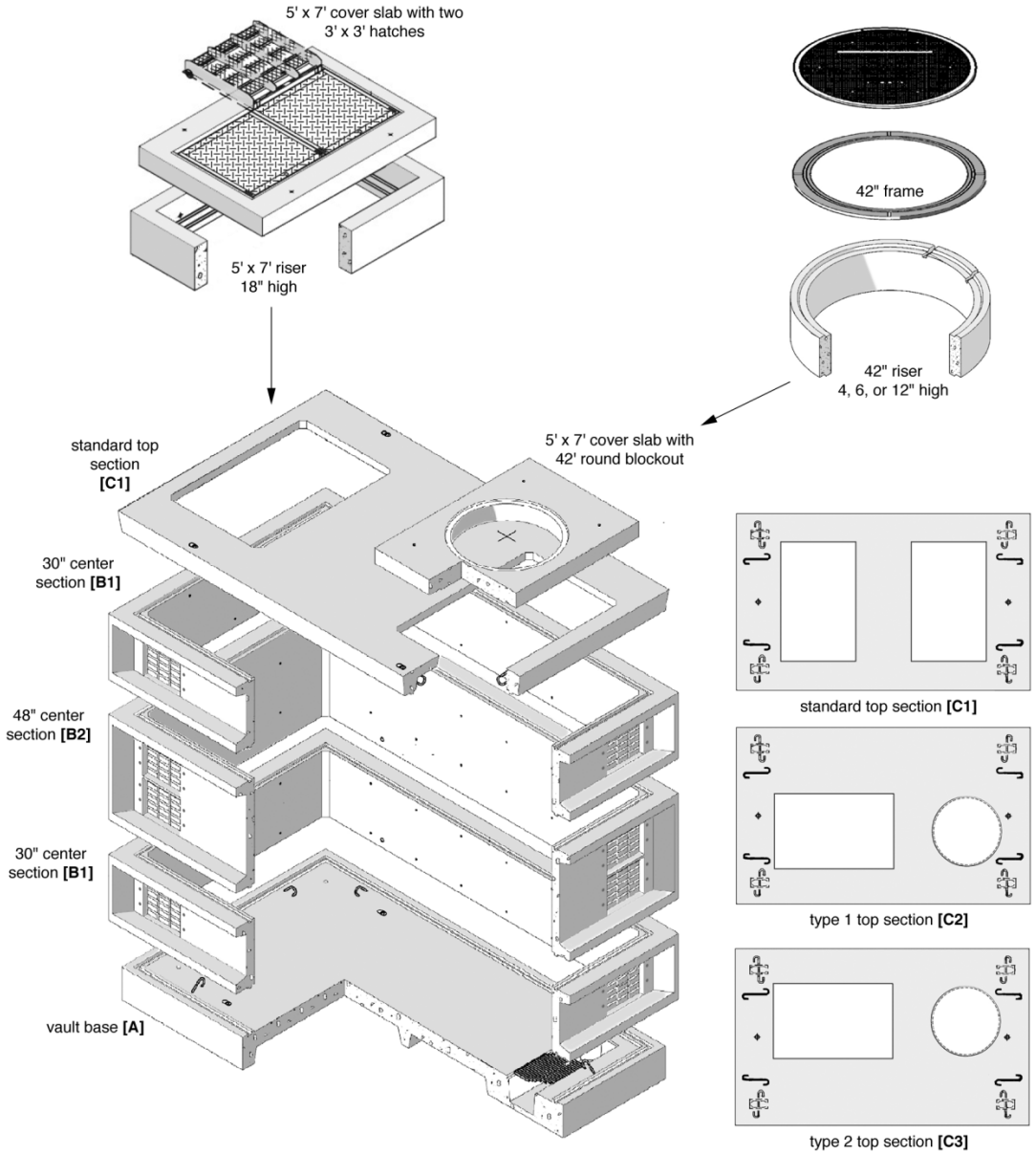
Step 4. *Select appropriate risers [D#] to bring access opening up to grade. Each riser section for the 818 covers half of the top section. (Stock numbers 013105, 013106, 013162, 013107, 013108, and 013109)*



Step 5*. Determine the appropriate type of cover slabs and lids or hatches [E#]*



Step 6. *Check the assembled vault configurations in Section 9 for vaults that can be ordered configured with base, top section, and cover slabs. Assembled option will still require choices for risers and hatches or lids.*



4. General Requirements

This detailed Material Standard is to be used in conjunction with SCL 7203.21, “Precast Reinforced Concrete Structures – General”.

Vault grounding shall conform to SCL Material Standard 7203.21, Section 9, Grounding.

Typical load rating for ring vaults is H-20; however, if heavy traffic is anticipated, engineer should request an H-25 load rating.

5. Base Requirements [A]

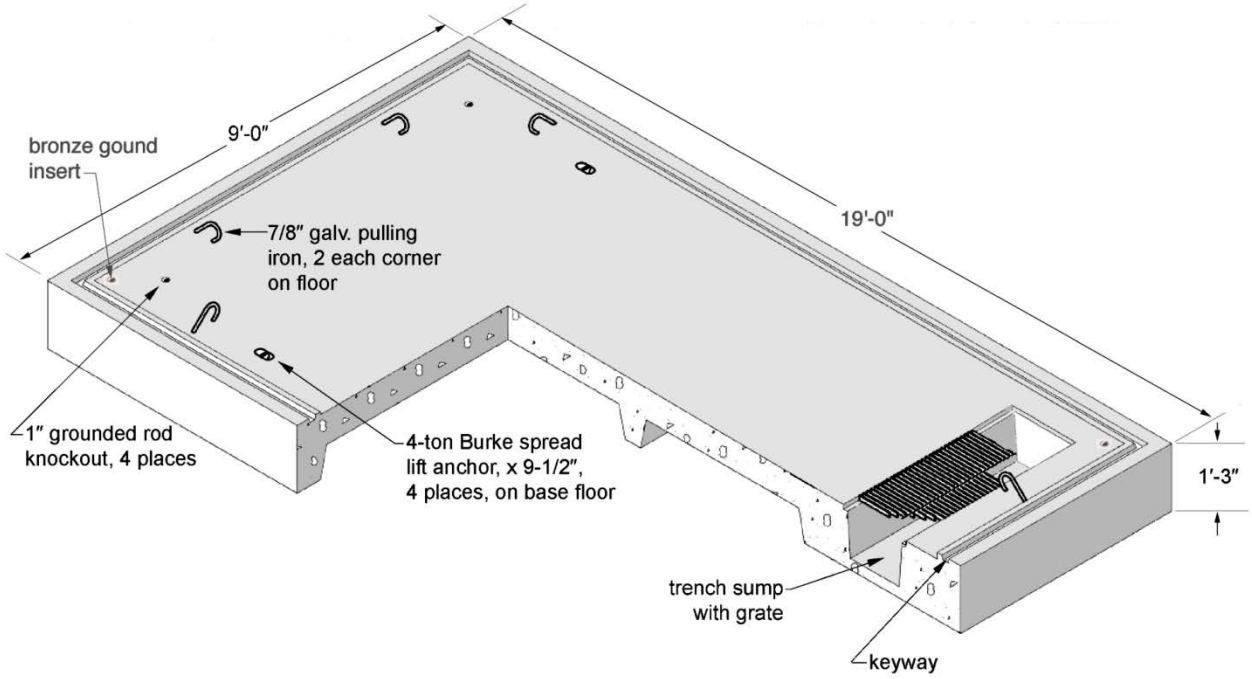
All 818 ring vault bases shall be constructed according to the dimensions shown in Table 5 and Figure 5.

The ring vault floor shall be sloped to drain toward the sump.

Table 5. Nominal Base Dimensions

	Outside (ft-in)		Inside (ft-in)		Height (ft-in)		
Stock No.	**Length**	**Width**	**Length**	**Width**	**Outside**	**Inside**	**Figure No.**
013443	19-0	9-0	18-0	8-0	1-3	-	5

Figure 5. Standard Vault Base [A]



All 818 ring vault base shall have the following attributes:

- Ground rod knockout (1 inch diameter) at each corner of floor
- Trench sump with removable galvanized grating (12 in x 60 in); 1 ft from and parallel to short wall
- Pulling iron (7/8 in diameter); two (2) shall be located at each corner of floor, recessed in floor
- 4-ton lift anchors, one on each corner of floor
- Ground inserts (1/2 inch) on opposite end walls on the floor
- Ladder; as required if vault floor is 12 ft-6 in or more below finish grade; fixed ladders shall be per SCL drawing D-28304; ladder substitution shall be submitted for approval

6. Center Section (Riser) Requirements [B1, B2]

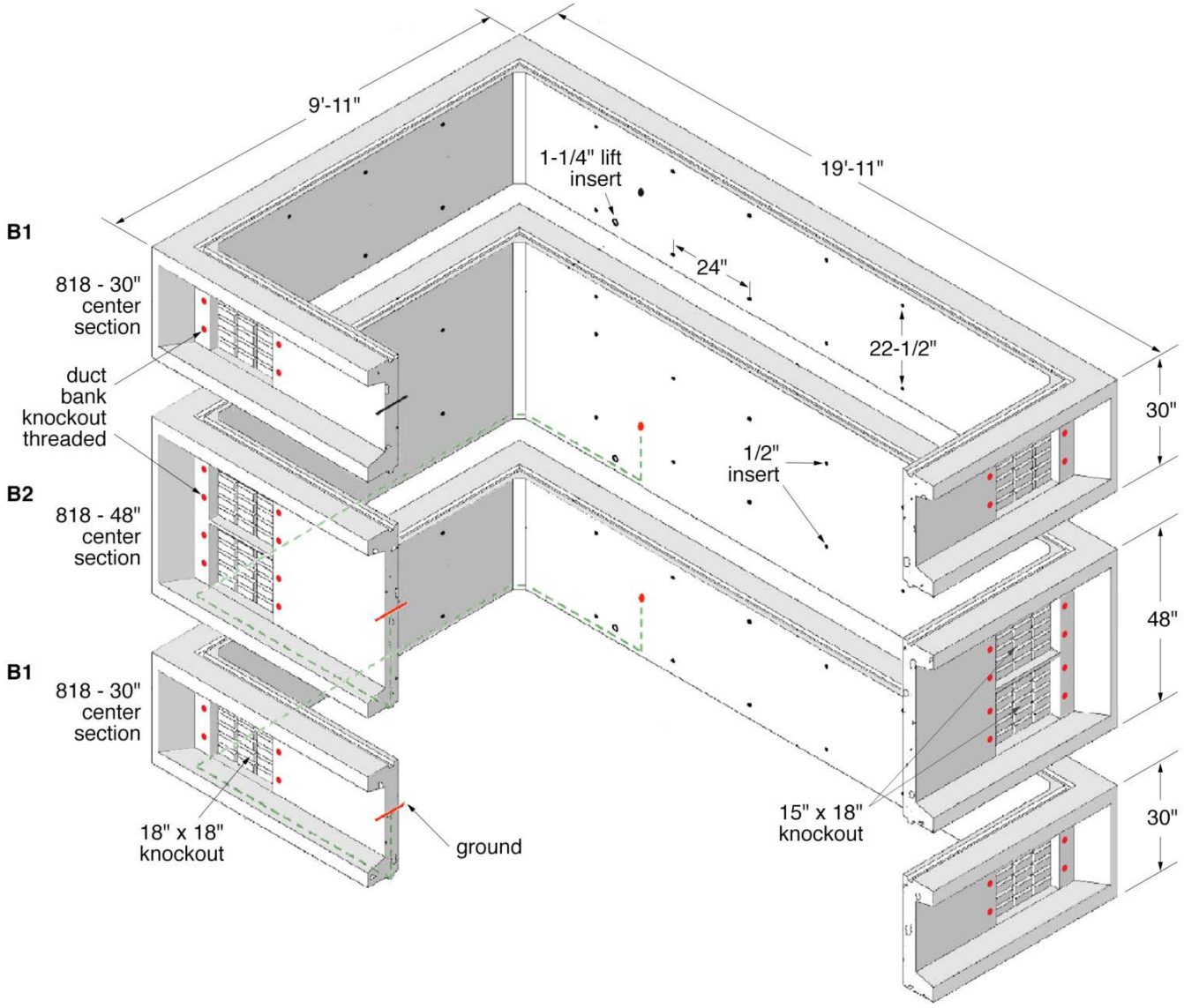
All 818 ring vault center sections shall be constructed according to the dimensions shown in Table 6 and Figure 6.

Table 6. Vault Nominal Center Sections Dimensions

	Outside (ft-in)		Inside (ft-in)		Height (ft-in)		
Stock No.	**Length**	**Width**	**Length**	**Width**	**Outside**	**Inside**	**Figure No.**
013444	19-11	9-11	18-0	8-0	2-6	-	6 **[B1]**
013445	19-11	9-11	18-0	8-0	4-0		6 **[B2]**

Note: Center sections are considered to be risers by manufacturers but in this Standard we use the term 'center section' to make a distinction from risers used above the top section for the purpose of adjusting the heights of cover slabs to meet surface elevations (grade).

Figure 6. Vault Center Sections [B1 and B2]



6.1 Knockouts, Waffle

Knockouts shall be of the waffle type.

For a 30-in high vault section **[B1]** (Stock No. 013444), knockout shall measure 18 in by 18 in. Knockouts shall be located on all 4 walls on the outer edge of the wall, two (2) on each side, for a total of eight (8) knockouts.

For a 48-in high vault section **[B2]** (Stock No. 013445), knockout shall measure 15 in by 18 in. Knockouts shall be located on all 4 walls on the outer edge of the wall, four (4) on each side, for a total of 16 knockouts.

6.2 Dowel Inserts

Dowel inserts (duct bank knockout inserts) shall be embedded 12 inches on center, around the perimeter of the knockout. Dowel inserts shall accommodate a 1/2-in diameter threaded rebar or steel dowel.

6.3 Channels

Galvanized "C" channels shall be embedded in vault walls between knockouts, centered, with 22.5-in spacing between rows.

Channels shall measure 1-5/8 in by 7/8 in by 48 in on the end walls and 1-5/8 in by 7/8 in by 168 in on the side walls.

6.4 Lift Inserts

Lift inserts shall measure 1 inch in diameter. These shall be located on wall ends, along the bottom of the side walls, between knockouts.

6.5 Ground Inserts

Material shall be bronze. Ground inserts shall measure 1/2 inch in diameter. Four (4) total inserts shall be used, two (2) each located at the center of both internal and external side walls.

7. Top Section Requirements, [C1], [C2] and [C3]

All 818 top sections shall be constructed according to the dimensions shown in Table 7 and Figures 7a and 7b.

Table 7. Nominal Top Section Dimensions

	Top Section (ft-in)		Thickness		
Stock No.	**Length**	**Width**	**(in)**	**Blockout Configurations**	**Figure Nos.**
013446	19-4	9-4	12	Two 78-in x 50-in blockouts **[C1]**	7a & 7b **[C1]**
013447	19-4	9-4	12	One 78-in x 50-in blockout and one 42-in round blockout, offset to left (Type 1) **[C2]**	7a & 7b **[C2]**
013448	19-4	9-4	12	One 78-in x 50-in blockout and one 42-in round blockout, offset to right (Type 2) **[C3]**	7a & 7b **[C3]**

Notes
1. **Type 1** refers to a left-offset rectangular blockout from point-of-view of round blockout end.
2. **Type 2** refers to a right-offset rectangular blockout from point-of-view of round blockout end.

Figure 7a. Vault Top Section [C1]

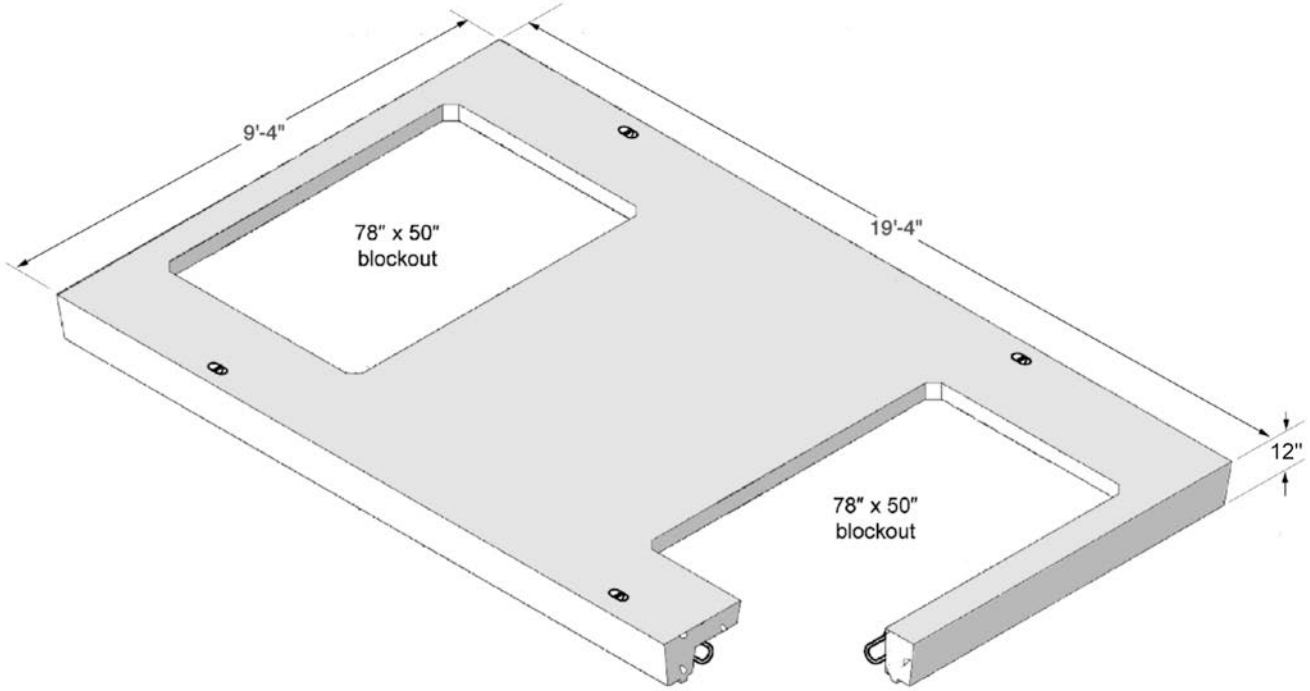
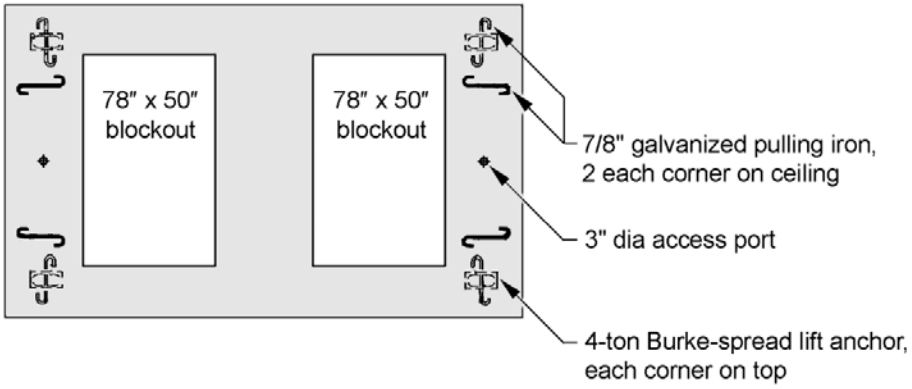
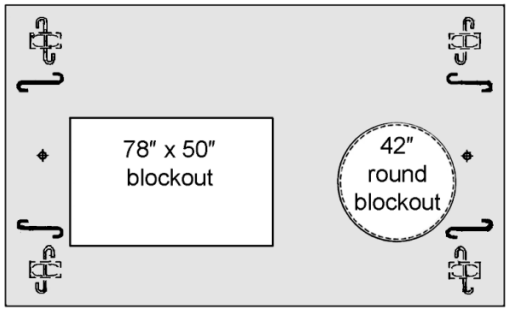


Figure 7b. Vault Top Section Blockout Options

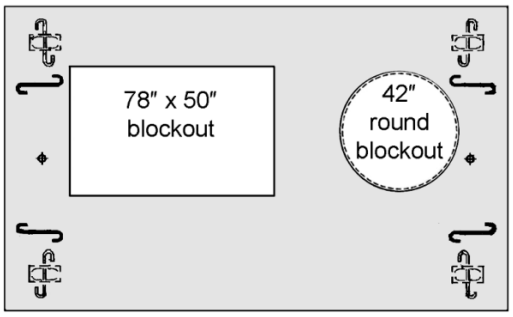
818 Standard Top, Stock No 013446 **[C1]**



818 Type 1 Top, Stock No. 013447 **[C2];** blockout offset to left



818 Type 2 Top, Stock No. 013448 **[C3];** blockout offset to right



All 818 ring vault top cover shall have the following features:

- Pulling iron (7/8 in diameter); two (2) shall be located at each corner of ceiling
- 4-ton Lift anchors, one on each corner of floor
- One 3-in diameter access port located at the center of each ends of the top cover

8. Cover Slab, Risers, and Hatches or Covers

Risers described in this section are designed to be set on the vault top section or on the cover slab for the purpose of adjusting the height of the vault access entrance to meet surface elevations (grade).

For a detailed material standard for cover slabs and risers used with the 818 vault, refer to SCL 7204.15, “Cover Slabs and Risers for Electric Vaults."

For a detailed material standard for a 42-inch round frame and covers, refer to SCL 7204.70, “Frame and Covers, 42-Inch Round, Iron."

Table 8. Cover Slabs, Risers and Hatches or Covers

Stock No.	Description	Mtl. Std.	References to Figure 3
013105	5-ft x 7-ft x 6-in riser without galvanized “C” channel	7204.15	**D1**
013106	5-ft x 7-ft x 18-in riser with galvanized “C” channels	7204.15	**D2**
013362	5-ft x 7-ft x 24-in riser with galvanized “C” channels	7204.15	**D3**
013107	42-in diameter by 4-in high round riser	7204.15	**D4**
013108	42-in diameter by 6-in high round riser	7204.15	**D5**
013109	42-in diameter by 12-in high round riser	7204.15	**D6**
013110	5-ft x 7-ft cover slab with one 42-in round access opening	7204.15	**E1**
013111	5-ft x 7-ft adjustable cover slab with two 3-ft x 3-ft non-slip solid covers	7204.15	**E2**
013153	5-ft x 7-ft cover slab with two H-30 solid cover	7204.15	**E3**
012753 and 720466	42-in frame with 42-in solid cover	7204.70	
012753 and 720226	42-in frame with 42-in grated vent cover	7204.70	

Rectangular blockout: For all top sections with rectangular openings cover slabs are necessary, one for each top section rectangular blockout. Cover slabs may either be set directly on the top section or may be set on risers. Cover slabs shall be produced with a key shape on the bottom to fit into the 8-ft x 4 ft-6 in opening in the top section or in the riser openings. Risers are used to obtain the required elevation and then topped by the cover slabs. In that case the risers are set with the blockout hole in the top section matching the opening of the risers (the openings have the same dimension). No key system is required to mate the rectangular riser to the top section.

Round blockout: Cover slabs with 42-in round access holes may be set in grout directly on the top section surface. Keyed round risers may also be set directly into top sections that have 42-in round blockouts. Round risers shall have keys that are matched in the top slabs with round blockouts; the same type of matching keys is required in cover slabs with round blockouts.

9. Vault Assemblies

Seattle City Light has specified twelve 818 vault assemblies that can be ordered by stock number. The predefined assemblies have three interior vault heights of 8, 9, or 10 ft with several options for overall height and type of access openings (see Table 9n).

The vault base and the vault top section shall have keyways for proper assembly.

Vaults shall be delivered to the job site, unless otherwise requested in purchase order.

Refer to Tables 9a – 9m for the various components included in each vault assemblies.

For all vault assemblies, if vault contains more than 75 kVA of transformer capacity, a vented (grate) cover (Stock No. 720226) is required in place of the solid cover (Stock No. 720466) per Table 9a.

Table 9a. 42-in Vented Cover

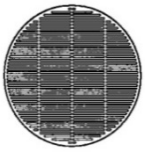
Stock No.	Description	Figure
720226	42-in H20 vented cover	

Table 9b. 8-ft Vault Assembly 013449: With 1 Equip. (72 in x 36 in) and 1 Personnel (42-in Round Hatch) [A-C1]

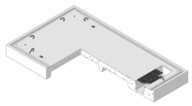
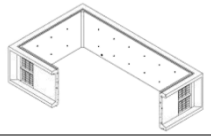
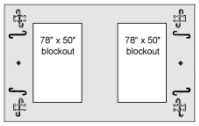
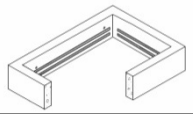
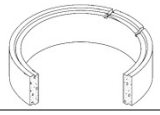
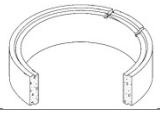
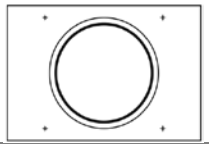
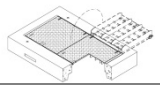
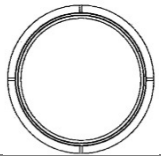
Component	Description	Label	Stock No.	Quantity	Figure
Base		A	013443	1	
Mid-Section Riser	48 in	B2	013445	2	
Top Section	818 with 2 rectangular blockout	C1	013446	1	
Rectangular Riser	18 in	D2	013106	1	
42-in Round Riser	4 in	D4	013197	1	
42-in Round Riser	12 in	D6	013109	1	
42-in Round Blockout		E1	013110	1	
Cover Slab with H20 Hatch		E2	013111	1	
42-in H20 Frame			012753	1	
42-in Solid			720466	1	

Table 9c. 8-ft Vault Assembly 013450: With 1 Equip. (72 in x 36 in) and 1 Personnel (42-in Round Hatch) (Type 1); [A-C2]

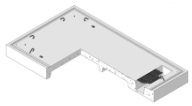
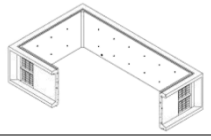
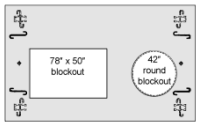
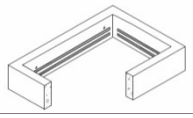
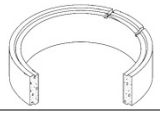
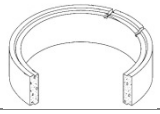
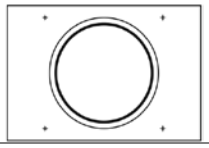
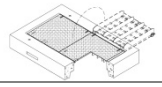
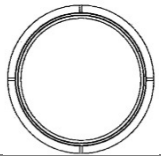
Component	Description	Label	Stock No.	Quantity	Figure
Base		A	013443	1	
Mid-Section Riser	48 in	B2	013445	2	
Top Section	818 with rectangular and 42-inch round blockout, Type 1, off-set to left	C3	013447	1	
Rectangular Riser	18 in	D2	013106	1	
42-in Round Riser	4 in	D4	013197	1	
42-in Round Riser	12 in	D6	013109	1	
42-in Round Blockout		E1	013110	1	
Cover Slab with H20 Hatch		E2	013111	1	
42-in H20 Frame			012753	1	
42-in Solid			720466	1	

Table 9d. 8-ft Vault Assembly 013451: With 1 Equip. (72 in x 36 in) and 1 Personnel (42-in Round Hatch) (Type 2); [A-C3]

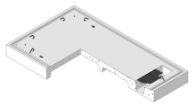
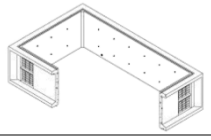
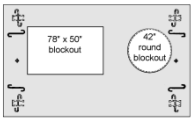
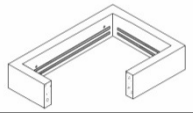
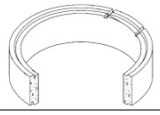
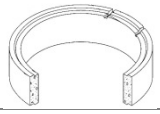
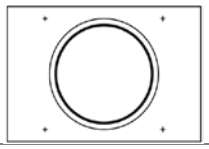
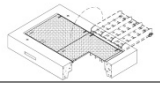
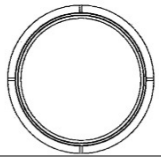
Component	Description	Label	Stock No.	Quantity	Figure
Base		A	013443	1	
Mid-Section Riser	48 in	B2	013445	2	
Top Section	818 with rectangular and 42-in round blockout, Type 2, offset to right	C3	013448	1	
Rectangular Riser	18 in	D2	013106	1	
42-in Round Riser	4 in	D4	013197	1	
42-in Round Riser	12 in	D6	013109	1	
42-in Round Blockout		E1	013110	1	
Cover Slab with H20 Hatch		E2	013111	1	
42-in H20 Frame			012753	1	
42-in Solid			720466	1	

Table 9e. 9-ft Vault Assembly 013452: With 1 Equip. (72 in x 36 in) and 1 Personnel (42-in Round Hatch) [A-C1]

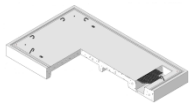
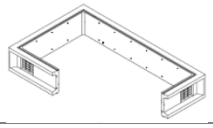
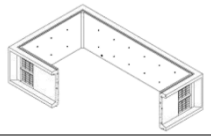
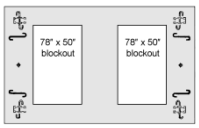
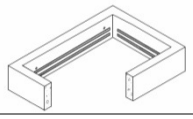
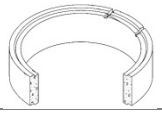
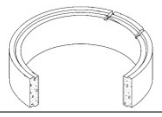
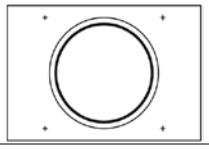
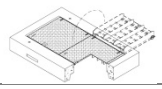
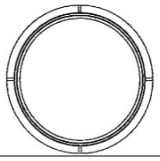
Component	Description	Label	Stock No.	Quantity	Figure
Base		A	013443	1	
Mid-Section Riser	30 in	B1	013444	2	
Mid-Section Riser	48 in	B2	013445	1	
Top Section	818 with 2 rectangular blockouts	C1	013446	1	
Rectangular Riser	18 in	D2	013106	1	
42-in Round Riser	4 in	D4	013197	1	
42-in Round Riser	12 in	D6	013109	1	
42-in Round Blockout		E1	013110	1	
Cover Slab with H20 Hatch		E2	013111	1	
42-in H20 Frame			012753	1	
42-in Solid			720466	1	

Table 9f. 9-ft Vault Assembly 013453: With 1 Equip. (72 in x 36 in) and 1 Personnel (42-in Round Hatch) (Type 1); [A-C2]

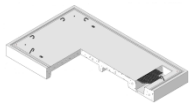
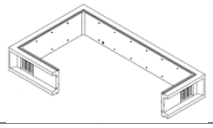
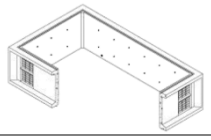
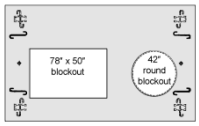
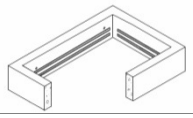
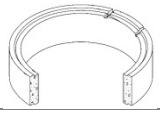
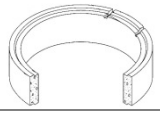
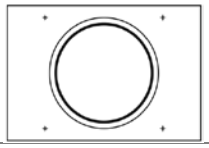
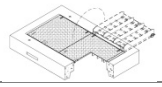
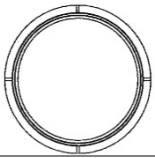
Component	Description	Label	Stock No.	Quantity	Figure
Base		A	013443	1	
Mid-Section Riser	30 in	B1	013444	2	
Mid-Section Riser	48 in	B2	013445	1	
Top Section	818 with rectangular and 42-in round blockout, Type 1, offset to left	C3	013447	1	
Rectangular Riser	18 in	D2	013106	1	
42-in Round Riser	4 in	D4	013197	1	
42-in Round Riser	12 in	D6	013109	1	
42-in Round Blockout		E1	013110	1	
Cover Slab with H20 Hatch		E2	013111	1	
42-in H20 Frame			012753	1	
42-in Solid			720466	1	

Table 9g. 9-ft Vault Assembly 013454: With 1 Equip. (72 in x 36 in) and 1 Personnel (42-in Round Hatch) (Type 2); [A-C3]

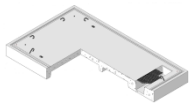
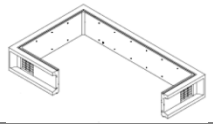
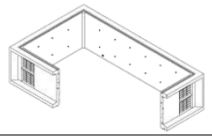
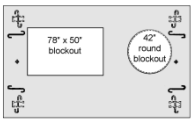
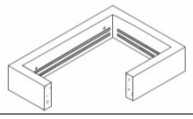
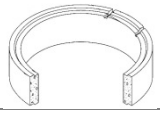
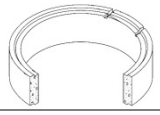
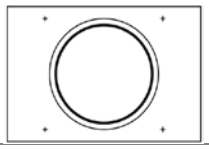
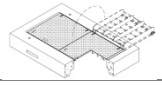
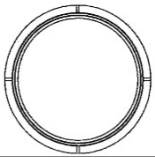
Component	Description	Label	Stock No.	Quantity	Figure
Base		A	013443	1	
Mid-Section Riser	30 in	B1	013444	2	
Mid-Section Riser	48 in	B2	013445	1	
Top Section	818 with rectangular and 42-inch round blockout, Type 2, off-set to right	C3	013448	1	
Rectangular Riser	18 in	D2	013106	1	
42-in Round Riser	4 in	D4	013197	1	
42-in Round Riser	12 in	D6	013109	1	
42-in Round Blockout		E1	013110	1	
Cover Slab with H20 Hatch		E2	013111	1	
42-in H20 Frame			012753	1	
42-in Solid			720466	1	

Table 9h. 10-ft Vault Assembly 013455: With 1 Equip. (72 in x 36 in) and 1 Personnel (42-in Round Hatch) [A-C1]

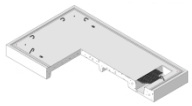
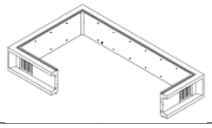
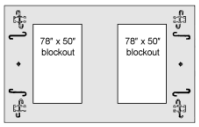
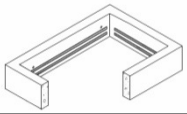
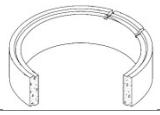
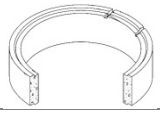
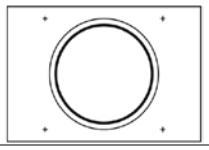
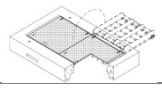
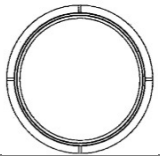
Component	Description	Label	Stock No.	Quantity	Figure
Base		A	013443	1	
Mid-Section Riser	30 in	B1	013444	4	
Top Section	818 with 2 rectangular blockout	C1	013446	1	
Rectangular Riser	18 in	D2	013106	1	
42-in Round Riser	4 in	D4	013197	1	
42-in Round Riser	12 in	D6	013109	1	
42-in Round Blockout		E1	013110	1	
Cover Slab with H20 Hatch		E2	013111	1	
42-in H20 Frame			012753	1	
42-in Solid			720466	1	

Table 9i. 10-ft Vault Assembly 013456: With 1 Equip. (72 in x 36 in) and 1 Personnel (42-in Round Hatch) (Type 1); [A-C2]

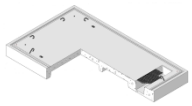
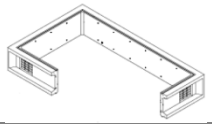
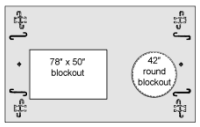
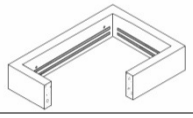
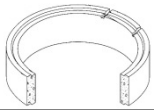
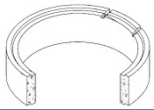
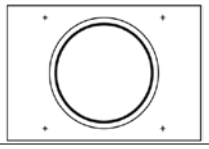
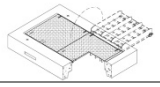
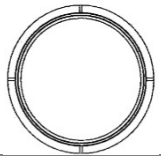
Component	Description	Label	Stock No.	Quantity	Figure
Base		A	013443	1	
Mid-Section Riser	30 in	B1	013444	4	
Top Section	818 with rectangular and 42-inch round blockout, Type 1, off-set to left	C3	013447	1	
Rectangular Riser	18 in	D2	013106	1	
42-in Round Riser	4 in	D4	013197	1	
42-in Round Riser	12 in	D6	013109	1	
42-in Round Blockout		E1	013110	1	
Cover Slab with H20 Hatch		E2	013111	1	
42-in H20 Frame			012753	1	
42-in Solid			720466	1	

Table 9j. 10-ft Vault Assembly 013457: With 1 Equip. (72 in x 36 in) and 1 Personnel (42-in Round Hatch) (Type 2); [A-C3]

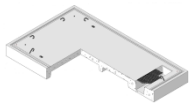
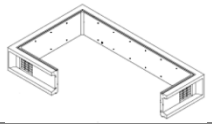
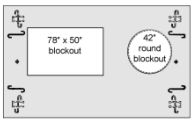
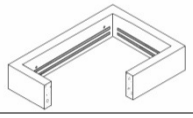
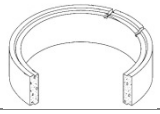
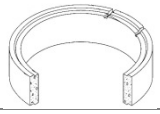
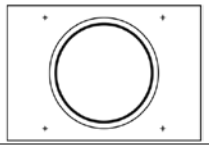
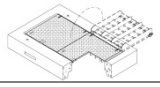
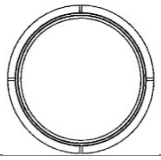
Component	Description	Label	Stock No.	Quantity	Figure
Base		A	013443	1	
Mid-Section Riser	30 in	B1	013444	4	
Top Section	818 with rectangular and 42-inch round blockout, Type 2, off-set to right	C3	013448	1	
Rectangular Riser	18 in	D2	013106	1	
42-in Round Riser	4 in	D4	013197	1	
42-in Round Riser	12 in	D6	013109	1	
42-in Round Blockout		E1	013110	1	
Cover Slab with H20 Hatch		E2	013111	1	
42-in H20 Frame			012753	1	
42-in Solid			720466	1	

Table 9k. 8-ftVault Assembly 013458: With 1 H30 Equip. (72 in x 36 in) and 1 Personnel (42-in Round Hatch) [A-C1]

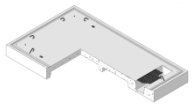
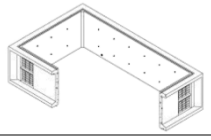
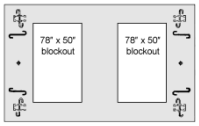
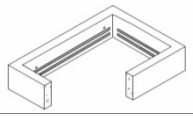
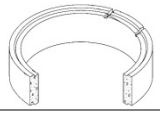
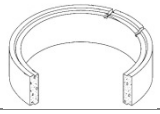
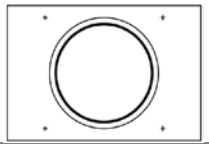
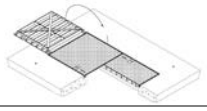
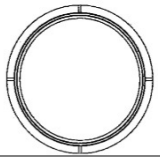
Component	Description	Label	Stock No.	Quantity	Figure
Base		A	013443	1	
Mid-Section Riser	48 in	B2	013445	2	
Top Section	818 with 2 rectangular blockout	C1	013446	1	
Rectangular Riser	18 in	D2	013106	1	
42-in Round Riser	4 in	D4	013197	1	
42-in Round Riser	12 in	D6	013109	1	
42-in Round Blockout		E1	013110	1	
Cover Slab with H30 Hatch		E2	013153	1	
42-in H20 Frame			012753	1	
42-in Solid			720466	1	

Table 9l. 8-ft Vault Assembly 013459: With 1 H30 Equip. (72 in x 36 in) and 1 Personnel (42-in Round Hatch) (Type 1); [A-C2]

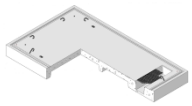
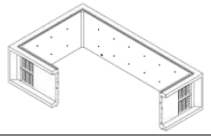
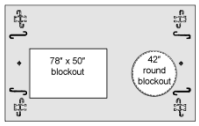
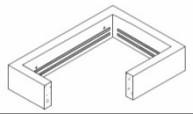
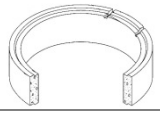
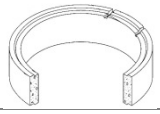
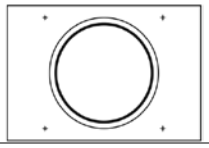
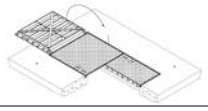
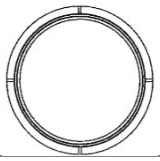
Component	Description	Label	Stock No.	Quantity	Figure
Base		A	013443	1	
Mid-Section Riser	48 in	B2	013445	2	
Top Section	818 with rectangular and 42-inch round blockout, Type 1, off-set to left	C3	013447	1	
Rectangular Riser	18 in	D2	013106	1	
42-in Round Riser	4 in	D4	013197	1	
42-in Round Riser	12 in	D6	013109	1	
42-in Round Blockout		E1	013110	1	
Cover Slab with H30 Hatch		E2	013153	1	
42-in H20 Frame			012753	1	
42-in Solid			720466	1	

Table 9m 8-ft Vault Assembly 013460: With 1 H30Equip. (72 in x 36 in) and 1 Personnel (42-in Round Hatch) (Type 2); [A-C3]

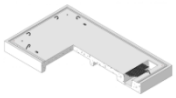
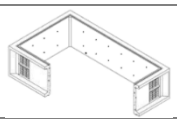
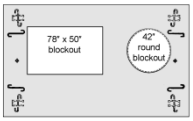
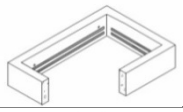
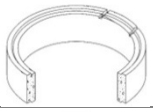
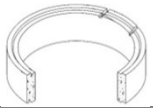
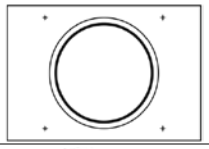
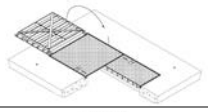
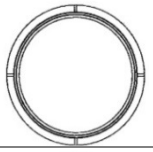
Component	Description	Label	Stock No.	Quantity	Figure
Base		A	013443	1	
Mid-Section Riser	48 in	B2	013445	2	
Top Section	818 with rectangular and 42-inch round blockout, Type 2, off-set to right	C3	013448	1	
Rectangular Riser	18 in	D2	013106	1	
42-in Round Riser	4 in	D4	013197	1	
42-in Round Riser	12 in	D6	013109	1	
42-in Round Blockout		E1	013110	1	
Cover Slab with H30 Hatch		E3	013153	1	
42-in H20 Frame			012753	1	
42-in Solid			720466	1	

Table 9n. Vault Assembly Components and Overall Heights and Weight

Vault Assembly (ft)	Inside Height, Nominal	Outside Height[a], Nominal	818 – 30R Risers	818 – 48R Risers	Vault Weight[a], Nominal (lb)
8	8 ft-0 in	10 ft-5 in	-	2	61,200
9	9 ft-0 in	11 ft-5 in	2	1	67,770
10	10 ft-0 in	12 ft-5 in	4	-	74,200

Note
a. Height and weight do not include cover slabs or additional risers to bring access to grade.

10. Shipping

All vaults larger than 444 shall be delivered to the job site. Contact SCL Civil Crew Chief to arrange delivery details.

11. Issuance

Stock Unit: EA

12. Approved Manufacturers

		Manufacturer and Catalog Number
Stock No.	**Components**	**Old Castle/ Utility Vault**
013443	Standard vault base **[A]**	818 – SB w/ Iron
013444	30-in center section **[B1]**	818-30R w/ GRD
013445	48-in center section **[B2]**	818-48R w/ GRD
013446	Vault top section with two 76-in x 50-in blockouts **[C1]**	818-TEE-CLX
013447	Vault top section with one 76-in x 50-in and one 42-in round blockout, offset to left, Type 1 **[C2]**	818 Type 1 Top
013448	Vault top section with one 76-in x 50-in and one 42-in round blockout, offset to right, Type 2 **[C3]**	818 Type 2 Top
	Assemblies	
013449	8-ft high vault with one H-20 72-in x 36-in and one 42-in round entry access	818-8 CLX vault w/ GRD
013450	8-ft high vault with one 72-in x 36-in and one 42-in round entry access, offset to left (Type 1)	818-8 CLX Type 1 vault w/ GRD
013451	8-ft high vault with one 72-in x 36-in and one 42-in round entry access, offset to right (Type 2)	818-8 CLX Type 2 vault w/ GRD
013452	9-ft high vault with one 72-in x 36-in and one 42-in round entry access	818-9 CLX vault w/ GRD
013453	9-ft high vault with one 72-in x 36-in and one 42-in round entry access, offset to left (Type 1)	818-9 CLX Type 1 vault w/ GRD
013454	9-ft high vault with one 72-in x 36-in and one 42-in round entry access, offset to right (Type 2)	818-9 CLX Type 2 vault w/ GRD
013455	10-ft high vault with one 72-in x 36-in and one 42-in round entry access	818-10 CLX vault w/ GRD
013456	10-ft high vault with one 72-in x 36-in and one 42-in round entry access, offset to left (Type 1)	818-10 CLX Type 1 vault w/ GRD
013457	10-ft high vault with one 72-in x 36-in and one 42-in round entry access, offset to right (Type 2)	818-10 CLX Type 2 vault w/ GRD
013458	8-ft high vault with H-30, 2-door hatch and one 42-in round entry access	818-8 CLX vault w/ GRD w/ LW Hatch
013459	8-ft high vault with H-30, 2-door hatch and one 42-in round entry access, offset to left (Type 1)	818-8 CLX Type 1 vault w/ GRD w/ LW Hatch
013460	8-ft high vault with H-30, 2-door hatch and one 42-in round entry access, offset to right (Type 2)	818-8 CLX Type 2 vault w/ GRD w/ LW Hatch

13. References

SCL Material Standard 7203.21; “Precast Reinforced Concrete Structure, General”

SCL Material Standard 7204.15; “Cover Slabs and Risers for Electric Vaults”

SCL Material Standard 7204.70; “Frames and Covers, 42-Inch Round, Iron”

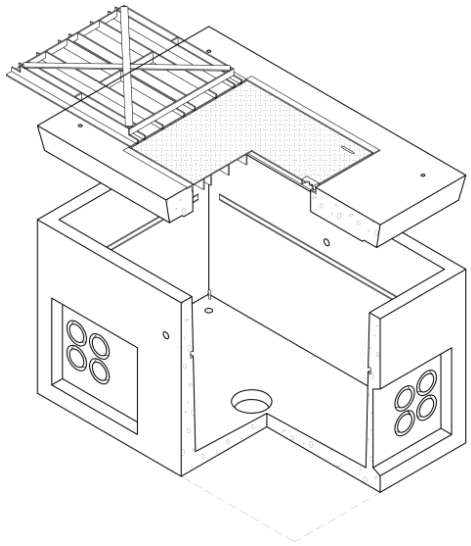
14. Sources

Detter, Chris; SCL Distribution Engineer and subject matter expert for 7203.56 (chris.detter@seattle.gov)

Ng, Sharon; SCL Civil Engineer and subject matter expert for 7203.56 (sharon.ng@seattle.gov)

Wang, Quan; SCL Standards Engineer, subject matter expert and originator of 7203.56 (quan.wang@seattle.gov)

644 Electric Vault, Primary Service



1. Scope

This standard covers the detailed requirements for 644 electrical vault components (vault base and cover with hatch) and 644 vault assemblies. Components may be ordered separately or ordered as an assembly.

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

Stock No	Description
013731	**Base**, standard 644
013732	**Cover**, with hatch
013733	**Assembly**; base and cover with hatch

2. Application

644 vaults are used in the construction of underground electric systems. The precast concrete structure may also house loadbreak junction boxes, and be used to make service connections and splices for the SCL system.

H20-rated 644 vault assemblies are not to be used in high traffic locations.

3. General Requirements

This standard is to be used in conjunction with the latest revision of SCL 7203.21.

4. Component Requirements

4.1 Grounding and Bonding

Vault grounding shall comply with SCL 7203.21.

4.2 Base

Table 4.2a. Vault Base Components

	Size, Nominal (in)	Location	Per Location	Total #
Knockouts				
Round	4-3/4 dia	All 4 walls, on bottom	8 ea side	32
Ground rod	1 dia	2 corners of floor	1 ea corner	2
Channels				
Galvanized “C” channel, horizontal, embedded in walls	36 long	End walls, above all knockouts	1 ea side	2
	60 long	Side walls, above all knockouts	1 ea side	2
Sump	8 dia	Floor, center	1, to one side	1
Pulling irons	1/2 dia	As request per project; 2 corners of floor (typical)	1 ea corner	4
Lift holes	1-1/2 dia	2 opposite walls, center wall, horizontal	1 ea side	2
Ground inserts, bronze	1/2 dia	2 opposite walls, internal and external	2 ea side	4
Ladder	–	Not required	–	

Base shall have dimensions as shown in Tables 4.2b and 4.2c, and Figure 4.2.

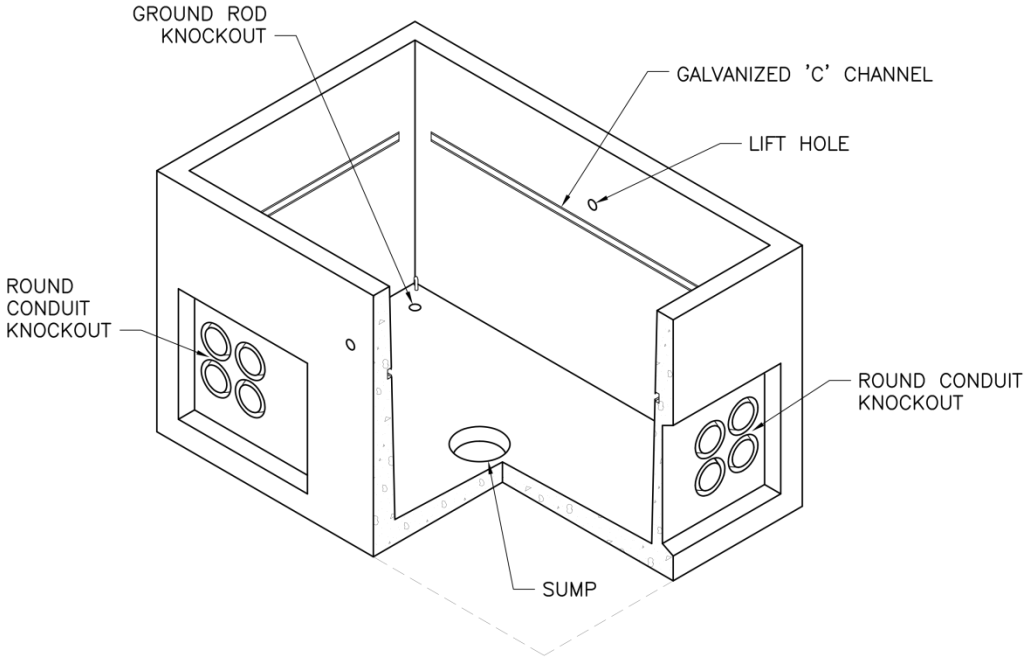
Table 4.2b. Base Dimensions, Inside, Nominal (ft-in)

Length	Width	Height
5-6	3-6	3-2

Table 4.2c. Base Dimensions, Outside, Nominal (ft-in)

Length	Width	Height
6-0	4-0	3-6

Figure 4.2. Base



4.3 Cover

Cover shall consist of a concrete collar with a slip-resistant solid hatch.

Cover shall have overall dimensions as shown in Table 4.3.

Cover shall have a 3/4-in diameter (nominal) lift insert at each corner on the top, as shown in Figure 4.3.

Caps shall be provided to cover the lift inserts.

Cover shall have a keyway to ensure a tight fit.

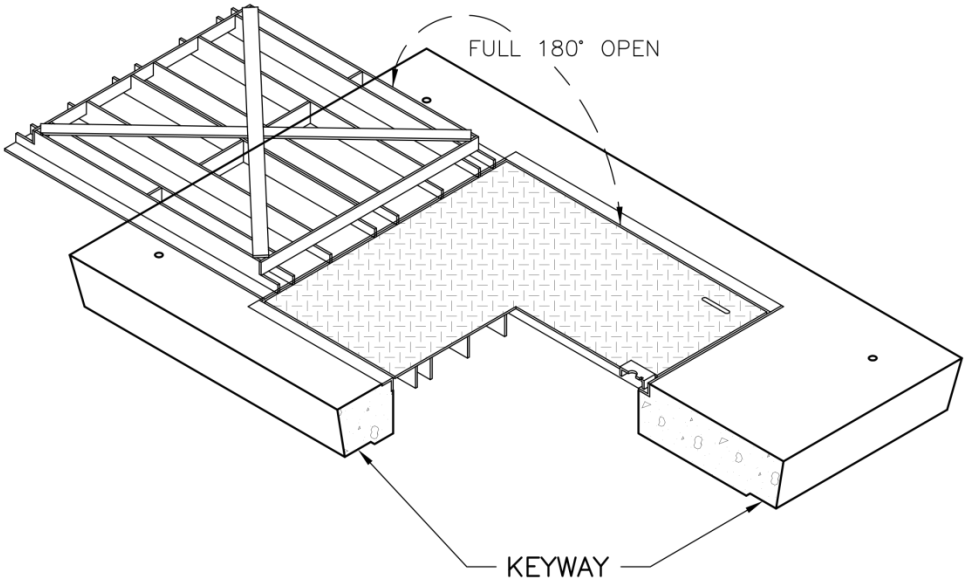
Table 4.3. Cover Dimensions, Nominal

Concrete Collar			
Length (ft-in)	**Width (ft-in)**	**Thickness (in)**	**Opening (ft)**
6-0	4-0	6	3 x 3

The solid hatch shall have the following:

- 3 ft x 3 ft dimension
- H20 rating
- Recessed lift handles
- Non-slip surfaces
- One handle located on each of the short ends of the hatch
- 5/8-in bonding point hole on support bar for grounding hatch
- Hatch-locking mechanism with Penta head bolt

Figure 4.3. Cover with Hatch



5. Issuance

Unit: EA

6. Approved Manufacturer

Stock No.	Description	Oldcastle/Utility Vault Catalog Number
130731	**Base**, standard 644	644-BL
130732	**Cover**, with hatch	64-332P
013733	**Assembly**, base and cover with hatch	644-LA

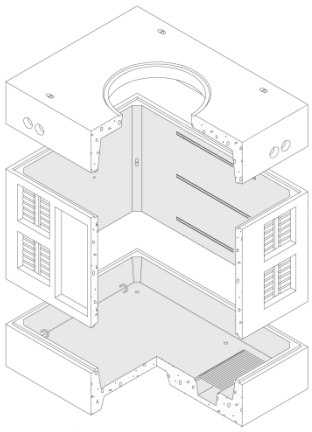
7. References

SCL Material Standard 7203.21; “Precast Reinforced Concrete Structure, General”

8. Sources

Wang, Quan; SCL Standards Engineer, originator, and subject matter expert for 7203.61 (quan.wang@seattle.gov)

687 Electric Vault, Primary Service



1. Scope

This standard covers the requirements for 687 electrical vault components (vault base, mid-section, and cover with round access) and assembled 687 electric vaults.

Either separate components or an assembled unit can be ordered.

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

Stock No.	Description
013734	**Base**, standard 687
013735	**Mid-section**
013736	**Cover** with round access
013737	**Assembly** (base, mid-section, and cover with round access)

2. Application

687 precast concrete vaults are used to construct the underground electric system. The vault may be used to house medium-size transformers, and service connections and splices for the distribution system.

The standard assembly consists of a base, a mid-section, and a cover with one 42-in round access.

A 42-in round iron frame and cover must be ordered separately. For detailed material specifications for the iron frame and cover, see SCL 7204.70, “Frame and Covers, 42-Inch Round, Iron.”

H20-rated vault assemblies with rectangular or square hatches should not be used in locations with high-density traffic.

Standards Coordinator
Quan Wang

Standards Supervisor
John Shipek

Unit Director
Darnell Cola

3. General Requirements

This standard is to be used in conjunction with SCL 7203.21, “Precast Reinforced Concrete Structures, General.”

Vault grounding shall conform to SCL 7203.21, Section 9, “Grounding.”

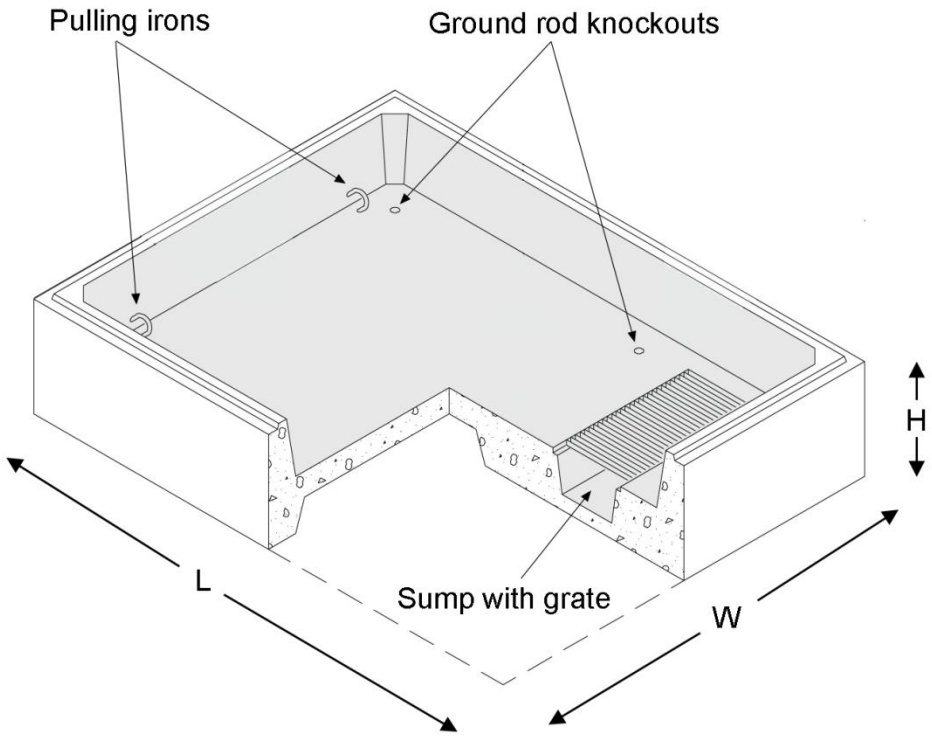
4. Base Requirements

The vault base shall be constructed according to the dimensions and details shown in Table 4 and Figure 4.

Table 4. Base Dimensions (Nominal)

	Outside			Inside		
Stock No.	**Length**	**Width**	**Height**	**Length**	**Width**	**Height**
013734	8' 8"	6' 8"	1' 10"	8' 0"	6' 0"	1' 0"

Figure 4. Base



Vault bases shall have:

- Round rod knockout (1 in diameter) at each corner of the floor.
- Trench sump with removable galvanized grating (12 in x 64 in x 8 in) 1 ft from, and parallel to, the end wall.
- Two pulling irons that are 7/8 in diameter at each end of the floor. 1/2-inch diameter pulling irons shall not be used for 687 vaults.

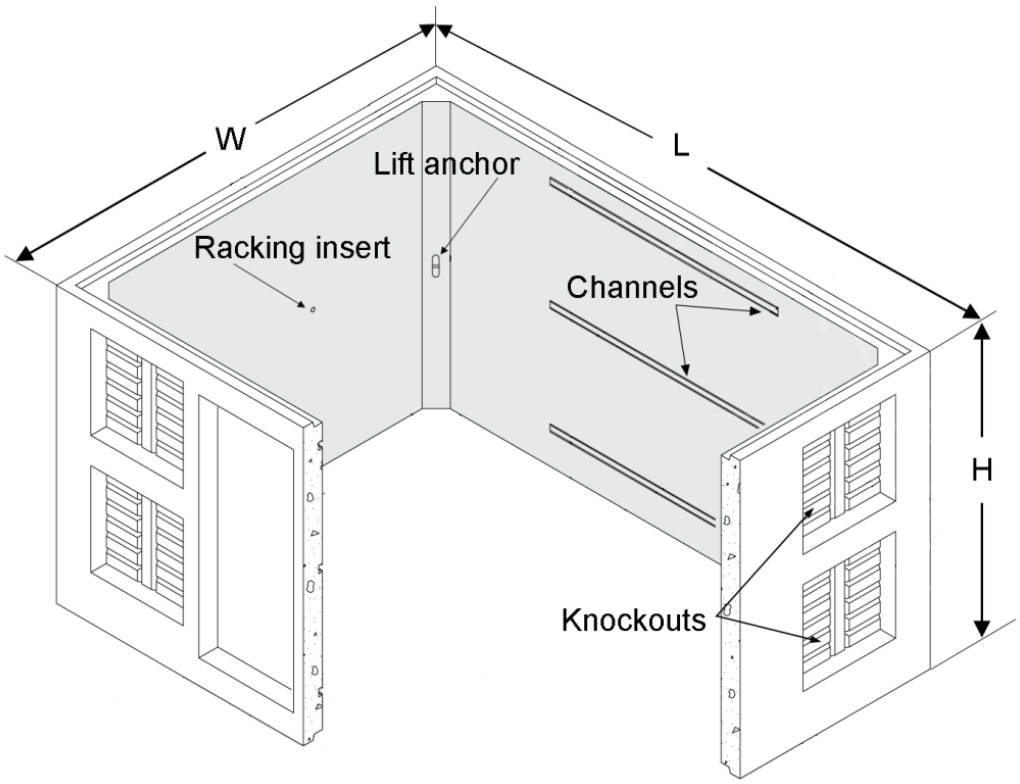
5. Mid-Section Requirements

The vault mid-section shall be constructed according to the dimensions and details shown in Table 5 and Figure 5.

Table 5. Mid-Section Dimensions (Nominal)

	Outside			Inside		
Stock No.	**Length**	**Width**	**Height**	**Length**	**Width**	**Height**
013735	8' 8"	6' 8"	4' 10"	8' 0"	6' 0"	4' 9"

Figure 5. Mid-Section



5.1 Knockouts, Waffle

Knockouts shall be of the waffle type.

Knockouts shall measure 18 in by 18 in.

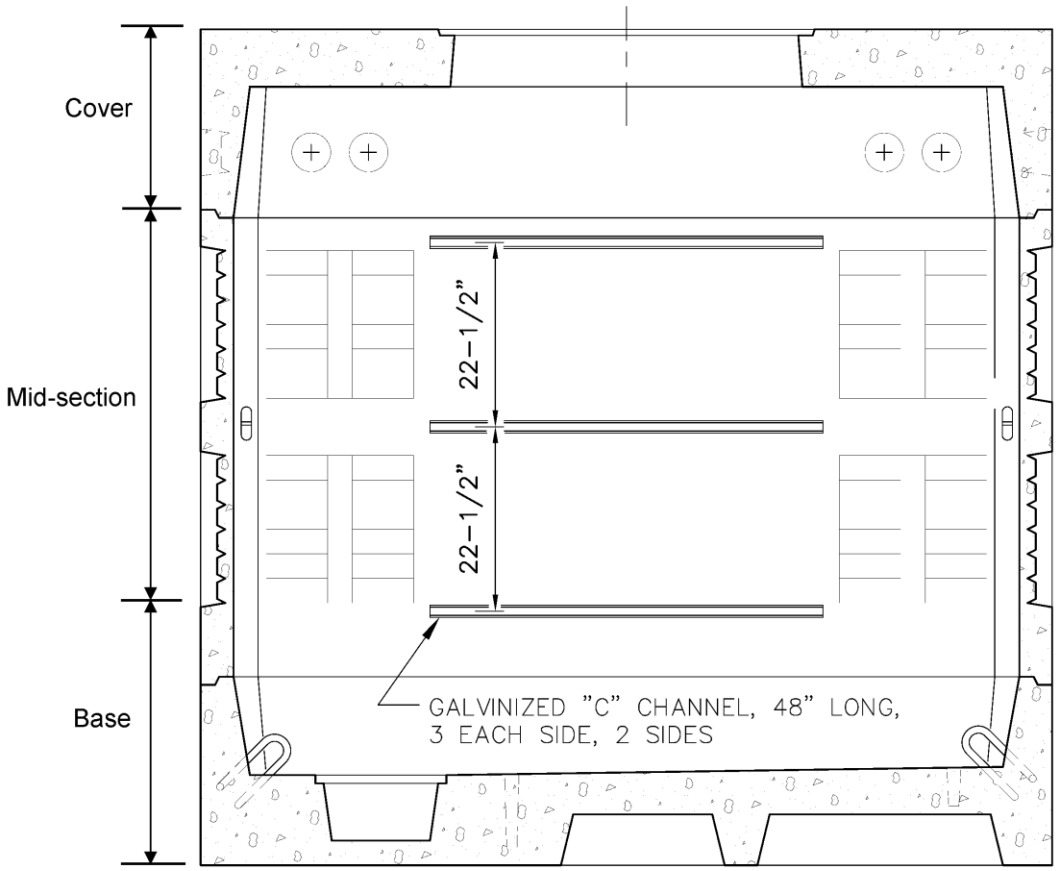
Four knockouts shall be located on the outer edge of each wall for a total of 16 knockouts.

5.2 Channels

Galvanized "C" channels shall be embedded and centered in the side walls between knockouts. There shall be 22-1/2 inches of space between channel rows as measured from the center of each row.

Channels shall measure 1-5/8 in by 13/16 in by 48 in. See Figure 5.2

Figure 5.2. Channel Placement, Side Wall

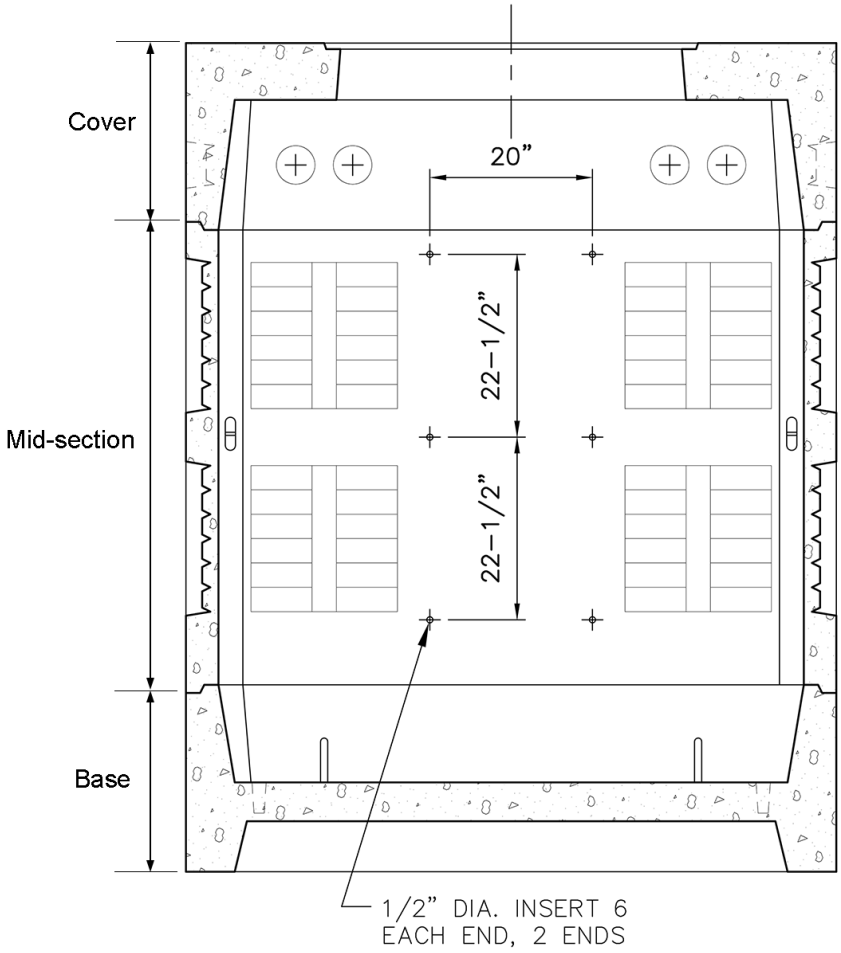


5.3 Racking Inserts

Racking inserts shall accommodate 1/2-in diameter threaded bolts.

Racking inserts shall be embedded in the center of end walls between knockouts. There shall be 20 inches of space (horizontal) and 22-1/2 inches of space (vertical) between racking inserts as measured from the center of each insert.

Figure 5.3. Racking Insert Placement, End Wall



5.4 Lift Anchor

A lift anchor with a 2-ton ultimate strength rating shall be located on each corner of the wall.

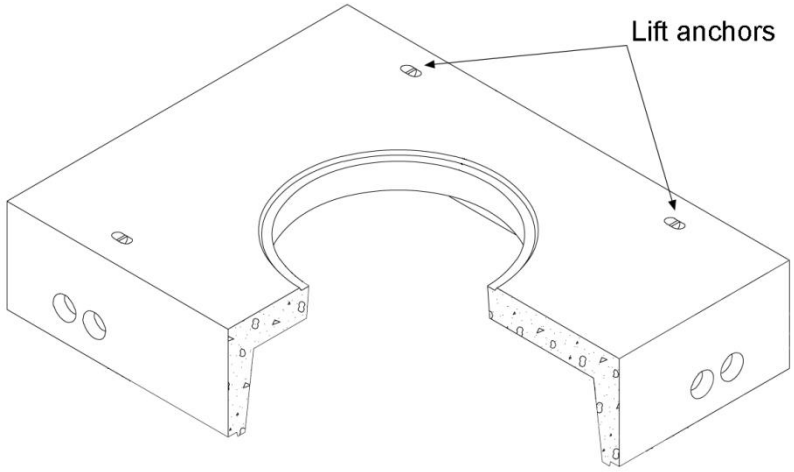
6. Cover Requirements

Covers shall be constructed according to the dimensions shown in Table 6 and Figure 6.

Table 6. Cover Dimensions (Nominal)

	Outside			Inside			
Stock No.	**Length**	**Width**	**Height**	**Length**	**Width**	**Height**	**Access Configuration**
013736	8' 8"	6' 8"	1' 10"	8' 0"	6' 0"	1' 3"	One 42" round

Figure 6. Cover with Round Access



The cover shall have:

- 2-ton lift anchors, two on each end of the top.
- A keyway on the cover to ensure a tight fit with the mid-section.

7. Issuance

Unit: EA

8. Approved Manufacturer

Stock No.	Components	Oldcastle/Utility Vault Catalog No.
130734	Base, standard 687	687-BL
130735	Mid-section with cable supports	687-ML
130736	Cover, with round access	687-TL-42C
130737	Assembly (base and cover with round access)	687-LA

9. References

SCL Material Standard 7203.21; “Precast Reinforced Concrete Structure, General”

SCL Material Standard 7204.70; “Frames and Covers, 42-Inch Round, Iron”

10. Sources

Ng, Sharon; SCL Civil Engineer and subject matter expert for 7203.66 (sharon.ng@seattle.gov)

Wang, Quan; SCL Standards Engineer, and originator and subject matter expert for 7203.66 (quan.wang@seattle.gov)

Precast Reinforced Concrete Transformer Pads

1. Scope

This standard covers the detailed requirements for precast reinforced concrete transformer pads.

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

Stock No	Description
013721	Single phase transformer pad
013722	Three phase transformer pad (75–300 kVA)
013723	Three phase transformer pad (500–1500 kVA)
013724	Three phase transformer pad (2000–2500 kVA)

2. Application

Precast reinforced concrete transformer pads are used as a platform for transformers or switchgear.

Due to their size, transformer pads will not be stocked in SCL inventory. Engineers and the Civil Crew Chief are required to order and specify delivery of these items.

3. General Requirements

This standard is to be used in conjunction with the latest revision of SCL 7203.21.

4. Requirements, General

Pad grounding shall comply with SCL 7203.21.

Transformer pads shall be constructed according to the dimensions and details shown in Table 4.2 and figures 4.2a and 4.2b.

Table 4.2. Pad Dimensions

	Dimensions, nominal (ft-in)			Blockout Dimensions, nominal (in)		
	Width	Length	Height	Width	Length	Blockout placement from edge of pad (in)
Stock No.	W_p	L_p	H_p	W_b	L_b	Q
013721	4-0	4-8	0-6	22	14	8
013722	7-0	7-0	0-6	60	16	12
013723	8-0	7-9	0-6	60	16	12
013724	8-0	10-0	0-8	60	24	12

Figure 4.2a. Transformer Pad

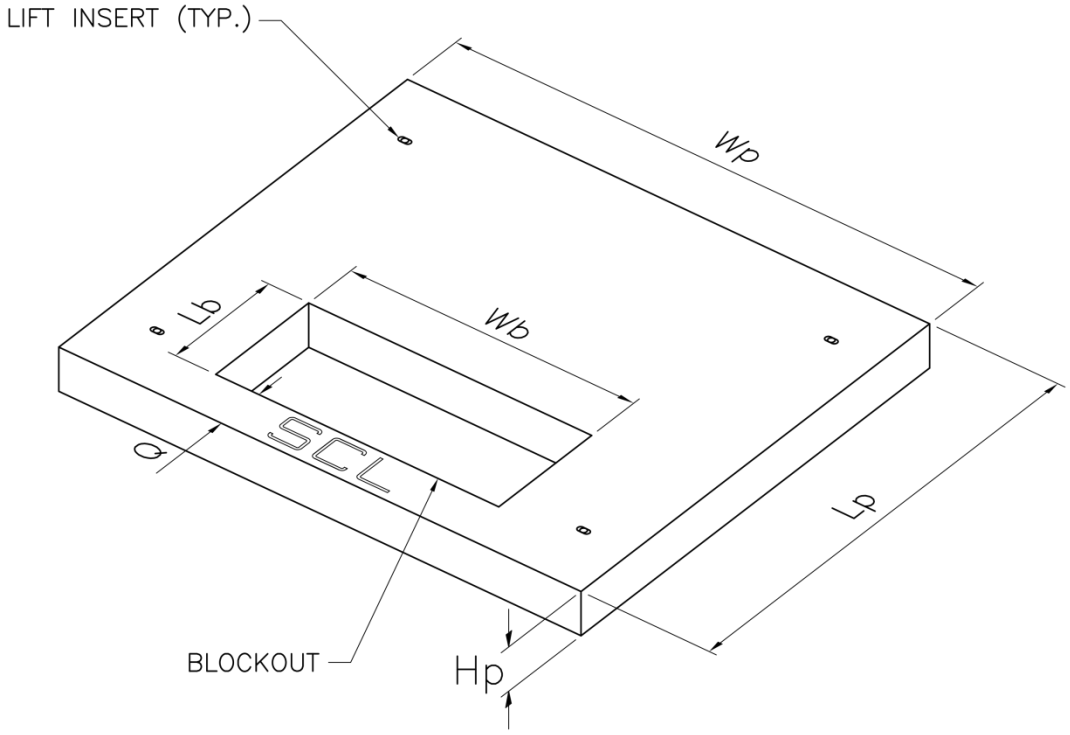
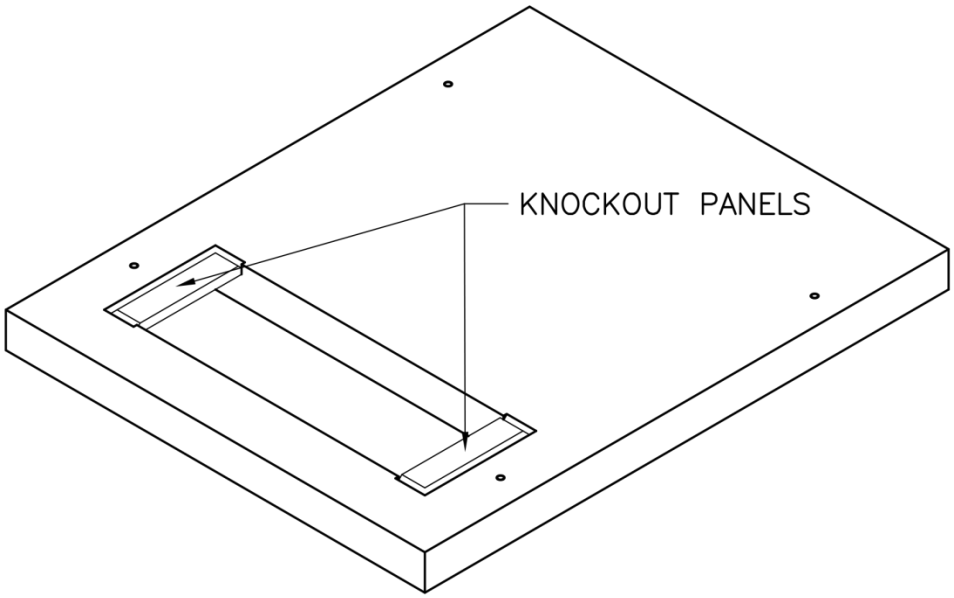


Figure 4.2b. Knockout Panel Detail



Lift inserts measuring 3/4-inch in diameter (nominal) shall be located at each corner on the top side of the pad.

Caps shall cover each lift insert.

For all transformer pads except for Stock No. 013274, the letters “SCL,” measuring 3-in high, shall be cast into the top side of the pad.

For Stock No. 013724, knockout panels measuring 6 in x 24 in shall be installed on each side of the blockout.

5. Issuance

Unit: EA

6. Approved Manufacturer

		Catalog No.
Stock No.	**Description**	**Oldcastle/Utility Vault**
013721	Single phase transformer pad	54-1422
013722	Three phase transformer pad (75–300 kVA)	77-1660
013723	Three phase transformer pad (500–1500 kVA)	88-1660
013724	Three phase transformer pad (2000–2500 kVA)	77-810-2460

7. References

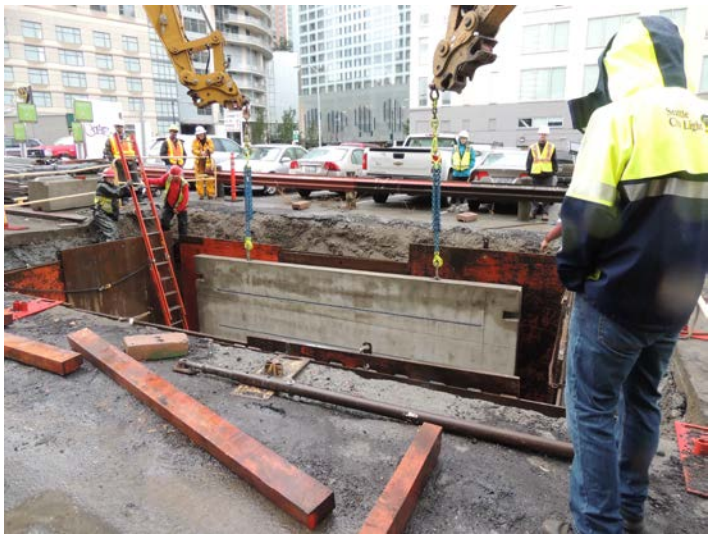
SCL Material Standard 7203.21; “Precast Reinforced Concrete Structure, General”

8. Sources

Ng, Sharon; SCL Civil Engineer, subject matter expert for 7203.76 (sharon.ng@seattle.gov)

Wang, Quan; SCL Standards Engineer, originator and subject matter expert for 7203.76 (quan.wang@seattle.gov)

Precast Reinforced Concrete Panel Vaults



1. Table of Contents

2. Scope

This standard covers the requirements for precast reinforced concrete panel vaults.

Panel vaults are custom designed to any size and configured to each job requirement. Access openings, blockouts, and embedded accessories are configured as required per job.

All panel vault designs shall be submitted to Seattle City Light (SCL) Civil Engineering for approval prior to production.

3. Application

Precast reinforced concrete panel vaults are used to construct the underground electric system. Panel vaults may be used to house equipment, cables, service connections and splices for the distribution system.

Panel vaults are intended to be used in the network system areas.

4. Industry Standards

Precast reinforced concrete panel vaults shall meet the requirements of the following industry standards:

ACI 318-11; "Building Code Requirements for Structural Concrete and Commentary"

ANSI/AWS D1.4/D1.4M-11; "Structural Welding Code – Reinforced Steel"

ASTM A123/A123M-08; "Standard Specification for Zinc (Hot-Dip Galvanized) Coatings on Iron and Steel Products;"

ASTM A185/A185M-07; "Standard Specification for Steel Welded Wire Reinforcement, Plain, for Concrete"

ASTM A497/A497M-07; "Standard Specification for Steel Welded Wire Reinforcement, Deformed, for Concrete"

ASTM A615/A615M-09b; "Standard Specification for Deformed and Plain Carbon-Steel Bars for Concrete Reinforcement"

ASTM A706/A706M-09b; "Standard Specification for Low-Alloy Deformed and Plain Bars for Concrete Reinforcement"

ASTM C39/C39M-10; "Standard Test Method for Compressive Strength of Cylindrical Concrete Specimens"

ASTM C150/C150M-12; "Standard Specification for Portland Cement"

ASTM C478-09; "Standard Specification for Precast Reinforced Concrete Manhole Sections"

ASTM C857-11; "Standard Practice for Minimum Structural Design Loading for Underground Precast Concrete Utility Structures"

ASTM C858-10e1; "Standard Specification for Underground Precast Concrete Utility Structures"

NESC C2-2012, **Rule 094B6**; "Concrete-Encased Electrodes"

5. Structural Design

Structural design of the precast vault shall conform to ACI 318, “Building Code Requirements for Structural Concrete” and ASTM C857, “Standard Practice for Minimum Structural Design Loading for Underground Precast Concrete Utility Structures,” with the following clarifications:

- Top of vault shall be assumed to be at a minimum of 2 ft and a maximum (unless noted on drawings) of 5 ft below grade.
- Live load: AASHTO HS-25 truck, P=20 kips. Traffic can approach the structure from any direction. Load distribution per AASHTO LRFD Bridge Design Specifications.
- 30 percent live load impact load factor for soil cover less than or equal to 3 ft.
- No live load surcharge for soil cover greater than 8 ft.
- 100 lb per square ft live load surcharge.
- Soil density shall be 120 lb force per cubic ft.
- 40 lb force per cubic ft equivalent fluid pressure lateral soil pressure above water table.
- 80 lb force per cubic ft equivalent fluid pressure lateral soil pressure below water table.
- The groundwater table shall be assumed to be 5 ft below grade or higher as shown in project drawings or soil boring.
- Panel vault shall be designed for a single controlled density fill pour from the base to the vault roof.
- Buoyancy: The weight of the vault (without equipment) plus weight of soil cover shall be greater than 1.1 times the hydrostatic uplift force on the base of the vault. It cannot rely on skin frictional resistance between backfill and vault wall surfaces. If the gravity load is insufficient, then the vault shall be designed with restraints to withstand the buoyant force. The restraint design shall be submitted for review and approval.

All panel vaults with inside plan dimensions of 7 ft by 12 ft and larger shall have walls, floor and ceiling with a minimum thickness of 4 in.

10 ft by 20 ft panel vaults shall be fabricated with a single panel floor with built-in slope toward the sump.

A single panel floor with built-in slope is also preferred for other sizes of panel vault.

If multiple floor panels are required, provide positive mechanical connections between the panels to ensure against differential settlement at the floor panel joint.

Termaducts, knockouts and sumps shall be designed to carry the loads imposed upon them. The basic structure shall be designed to carry all imposed loads with knockouts and duct openings removed.

6. General Requirements

All panel vaults and accessories, including special order (non-stock) materials shall be manufactured in accordance with the requirements herein.

Panel vaults shall be reinforced precast concrete with features shown on the submittal drawings.

Panel vaults shall be designed and constructed to be watertight.

Structural components, including, but not limited to, grout, seals or mastics, and joint hardware shall be provided with vault wall, ceiling, and floor components.

Design changes shall require the prior written approval of an SCL standards engineer or civil engineer.

For all other precast reinforced concrete structures, including vaults, vault cover slabs, and pads or slabs, please refer to SCL 7203.21, “Precast Reinforced Concrete Structures – General.”

7. Order Information

Seattle City Light orders will provide the following minimum information:

- Vault size and description
- Access, blockout, knockout and ladder requirement
- SCL general material standard number citing revision date
- SCL detailed material standard number citing revision date
- Total order quantity
- Delivery date
- Delivery location

All panel vault design detailed requirements shall be approved by SCL Civil Engineering prior to production.

8. Submittals

Panel vault design calculations and shop drawings shall be approved by a civil engineer licensed in Washington State.

Panel vault design calculations and shop drawings shall be submitted to SCL Civil Engineering 30 days prior to fabrication for review for compliance to specification.

8.1 Design Calculations

Design calculations shall include the following:

- Material spec notes
- Design loading notes
- Load case for 2 ft and 5 ft of soil cover for panel vaults
- Floor and ceiling design
- Wall design
- Hatch or cover design – hatch and cover shall be designed for 26 kips wheel load (HS 25 truck + 30% impact load)
- Buoyancy check

8.2 Shop Drawings

Shop drawings shall include the following:

- Plan and section views, dimensioning to all features
- Reinforcement placement plans and rebar bent details
- Bill of material
- Structural design notes
- Cover and hatches detail
- Pulling iron detail

8.3 Submittal Review Process

The general submittal review process is as follows for contractor construction of SCL projects:

1. SCL civil engineer works with distribution or network engineers to produce the panel vault design drawing and specifications, or review consultant's design for the project. The project is sent out for bid.
2. Successful bidder/contractor communicates with SCL-approved manufacturer for panel vault design and shop drawing needed for the project. The minimum submittal criteria are outlined in Section 8.
3. Construction schedule shall include transmittal time and the twenty (20) working days SCL requires to conduct its review.
4. The contractor shall furnish three (3) sets of design and construction proposal for review by SCL engineers (civil and electrical) and electrical reviewers. Submittal shall include panel vault design with design calculations and shop drawings for each vault used in the project. (See Section 8)
5. All approval drawings shall be endorsed for approval and be marked with SCL's project location/identification and supplier's shop order number.
6. SCL Civil Engineering will check with the responsible electrical engineer(s) to determine if the vault layout show the latest design (since design changes happen for long and complicated projects)
7. SCL will supply the stake holders a transmittal letter summarizing SCL's comments and results
8. Transmittal letter will indicate the approval status of each drawing and document reviewed by SCL. Approval status categories are as follows:
    a. ACCEPTED – WITHOUT COMMENT - Item is approved by SCL as to general scope and content; however, the supplier is not relieved of their obligation to meet all of the requirements of the material standard.
    b. ACCEPTED – WITH COMMENTS NOTED - Item is approved by SCL as to general scope and content subject to the minor changes noted on the item; however, the supplier is not relieved of their obligation to meet all of the requirements of the material standard.
    c. NOT ACCEPTED - REVISE AND RESUBMIT - Item is not approved by SCL. Supplier shall specifically address and/or incorporate all SCL comments into a revised submittal, and resubmit the item to SCL for approval.
9. SCL will review all revised and resubmitted drawings and documents and return one (1) copy of each, together with a transmittal letter, to the contractor/supplier within (10) working days after receipt. Drawings and documents shall bear a revised revision date. Revised areas of the submittal shall be circled.
10. Contractor/supplier shall present a complete and acceptable submittal package to SCL not later than the second submittal of an item.
11. When the vault design submittal is approved by SCL Civil Engineering, the submittal is stamped and signed off by the SCL Civil Engineering Reviewer. SCL Civil Engineering informs the various stakeholders.
12. Contractor will inform the approved panel vault manufacturer to start production.

- Once panel vaults are manufactured and delivered to the job site, the SCL Electrical Reviewer and other SCL personnel may be onsite for receiving inspection. For critical projects, SCL will sometimes inspect these vaults at the manufacturing plant for compliance prior to concrete pour or delivery. SCL Electrical Reviewer and Civil Inspectors will receive and inspect the vaults. For WSDOT projects, the WSDOT Inspector may inspect the panel vaults at the manufacturing plant and on delivery site. Installation contractor may also inspect the vault to make sure any damages have been incurred prior to their installation.

Panel vault design and construction work done by SCL personnel shall be subject to a similar submittal review process as for contractors.

9. Reinforced Concrete

Minimum compressive strength of concrete shall not be less than 5000 pounds per square inch in 28 days as determined by the ASTM Method C39, Standard Test Method for Compressive Strength of Cylinder Concrete Specimens.

Cement shall conform to ASTM C150.

No additives containing calcium chloride or any other material that will produce corrosive ions shall be used in the concrete.

Welded wire fabric shall conform to ASTM A185 or A497.

Steel Reinforcing Bars shall conform to ASTM A615, Grade 60 or ASTM A706, Grade 60.

Welding of reinforcing steel shall conform to the Structural Welding Code, “Reinforcing Steel (AWS D1.4),” of the American Welding Society.

Concrete cover (measured from the surface of the concrete to the outside surface of the reinforcement) for reinforcement shall be 1-1/2 in minimum for main reinforcing bars and 3/4 inch for stirrups and ties.

Concrete finish shall be free of rock pockets and honeycombed areas.

Interior walls, ceiling, and exposed exterior surfaces shall be smooth.

Rock pockets over 3/8 inch deep and other imperfections on all surfaces shall be patched and troweled to match the surrounding surface.

Reinforcement of the concrete cover (measured from the surface of the concrete to the outside surface of the reinforcement) shall comply with ACI 318.

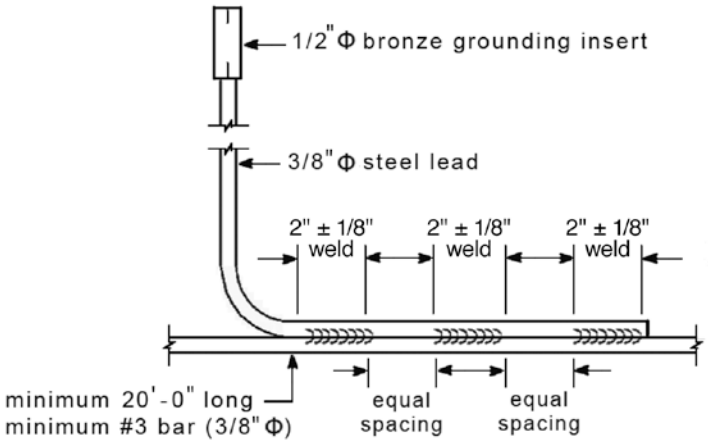
10. Ground Insert Connectors

Each bronze insert shall have a minimum surface contact area of 0.58 sq in.

Each bronze insert shall be tapped for 1/2-in 13 bolts, and located on the lower corner of each wall panel.

The lead rod, a 3/8-in steel or bronze rod, shall be connected to the ground electrode with arc or Cadweld (Exothermic Connection) at a minimum of three points as shown in Figure 10.

Figure 10. Lead Rod and Ground Electrode Weld Details



Each panel vault wall and floor shall be supplied with ground inserts.

Ground inserts shall be accessible internally and externally on vault walls.

The ground insert connector shall be installed flush (neither recessed nor protruding) with the vault wall.

Inserts shall be plugged to prevent contamination from entering threads.

11. Knockouts and Vault Openings

Vaults 7 ft x 12 ft (inside dimensions) and larger shall have two, 42-in-diameter access entries, unless specified otherwise by SCL.

Knockout and duct openings shall be beveled on the exterior surface. Size, shape, quantity, and location of knockouts shall be as specified in the design submittal.

12. Duct Bank Knockout Threaded Inserts (Dowel Inserts)

Panel vaults shall be provide with minimum of four, 1/2-in diameter ferrule-threaded inserts at 12-in on center around the perimeter of each duct bank knockout. These threaded inserts are to allow the duct bank rebar to dowel into the vault wall.

13. Panel Vault Accessories – Requirements

13.1 Cable Pulling Device

Panel vaults shall have cable pulling irons mounted on each corner of the vault and be suitable as anchors for cable pulling operations or as shown in project submittal drawings.

Pulling irons shall be according to the requirements of Table 13.1.

Pulling irons' maximum working tension shall be stenciled on the wall surface near two of the roof pulling irons.

Table 13.1. Pulling Iron Specifications

Pulling Iron Ultimate Strength (lb)	Maximum Working Tension (lb)	Maximum Allowable Tension (lb)	Size (in)	Steel
40,000	20,000	10,000	7/8	Stainless

13.2 Cable Support

Panel vault shall be provided with cast-in galvanized "C" channels for racking. Channels shall measure 1-5/8-in wide (nominal) and be of various depths depending on vault.

13.3 Drainage and Sump

All panel vault floors shall have a 26 in x 51 in blockout to accommodate a rectangular, flanged drop-in sump at one end wall, measuring 44-in long by 18-in (minimum) deep by 14-in wide at the top and 12-in (minimum) wide at the bottom.

Sump shall have a positive mechanical connection to the vault floor to prevent uplift due to hydrostatic pressure from the design water table or the CDF backfill pour.

Panel vaults shall be supplied with galvanized grating for the sump.

The floor shall be sloped to drain toward the sump.

13.4 Lifting Inserts

All metal lifting devices cast into the internal or external surfaces of vaults for handling purposes shall be hot-dipped galvanized or made from stainless steel.

13.5 Ladders

Where a ladder is required, it shall conform to the following requirements:

- Ladders shall be corrosion resistant.
- Ladder shall be made according to SCL drawing D-28304, “Retractable Ladder, Vault and Manhole Access.”

Ladder substitution shall be submitted to SCL engineer for approval.

13.6 Joint Sealant and Grout

Joint sealant and grout shall be provided by the vault manufacturer.

Joint grout shall have a compressive strength of 3000 psi at 3 hours.

Vault sections shall be provided with butyl rubber joint sealant material (such as Con Seal CS0101) and fast-setting cement grout (such as Speed Crete Red Line Repair Fast Setting Patching Material or Quikrete Commercial-Grade FastSet Non-Shrink Grout) to be used between all precast sections, including wall, floor, and roof sections; hatch riser rings; and sumps.

14. Metal Doors and Access Cover Plates

All lids, hatches, and frames shall be provided with a grounding site.

14.1 Frames and Covers

All frames and hatch covers for shall be designed for at least 26 kips wheel load (HS25 + 30% impact) applied in any direction.

All frames and lids shall have a non-slip surface. Refer to Section 15.

Vaults 7 ft x 12 ft or larger shall have two, 42-in diameter access or other access as shown in project submittal drawings.

The 42-in round cover and frames shall also comply with requirements in SCL 7204.70, “Frames and Covers, 42-in Round, Iron.”

14.2 Doors

All doors shall include one 5/8-inch diameter bonding hole located in an underside bearing bar, approximately centered in the door and 2-1/2 to 3-1/2 in from the hinged edge.

All doors shall be designed for at least 26 kips wheel loading (H25 + 30% impact).

Aluminum doors for 36 in x 36 in and 36 in x 74 in opening access shall be designed for at least 26 kips wheel loading (H25 + 30% impact or equivalent H30 + 8% impact).

All steel doors and access cover plates shall be hot dipped galvanized in accordance with ASTM A123.

All equipment doors/hatches used in the Network area shall be of the drop-in/lift-off type. Hinged equipment doors/hatches are not allowed in the Network area.

All doors shall have a non-slip surface. Refer to Section 15.

All doors shall have a locking mechanism, such as a Penta head bolt, to prevent unsolicited access. Locking mechanism shall not protrude above the door surface.

Square or rectangular doors shall open along the lengthwise of the access opening.

15. Non-slip Surfaces

All non-slip surfaces shall have the following properties:

- Minimum coefficient of friction of 0.8
- Bond strength to the plate of 4000 psi or greater
- Surface hardness of 55 minimum on the Rockwell “C” scale

Type of non-slip surface (“S3” for SlipNOT® 3) and the year of manufacture shall be identified on the underside of the door, e.g., “S3 2005.” The identification shall be bead welded or clearly stamped into a metal surface on the underside of each lid, or labeled with an adhesive, metallic foil-backed label.

16. Identification

All lids and doors shall be permanently marked with 3-in high letters “Electric” clearly visible on the top where distribution cables occupy the enclosure.

All panel vaults shall have a permanent identification plate installed inside the vault wall. The identification plate shall include the following information:

- Manufacturer name
- Date of manufacture
- Vault design load, e.g., “HS-25”
- Pulling iron capacity

17. Panel Vault Floor Requirements

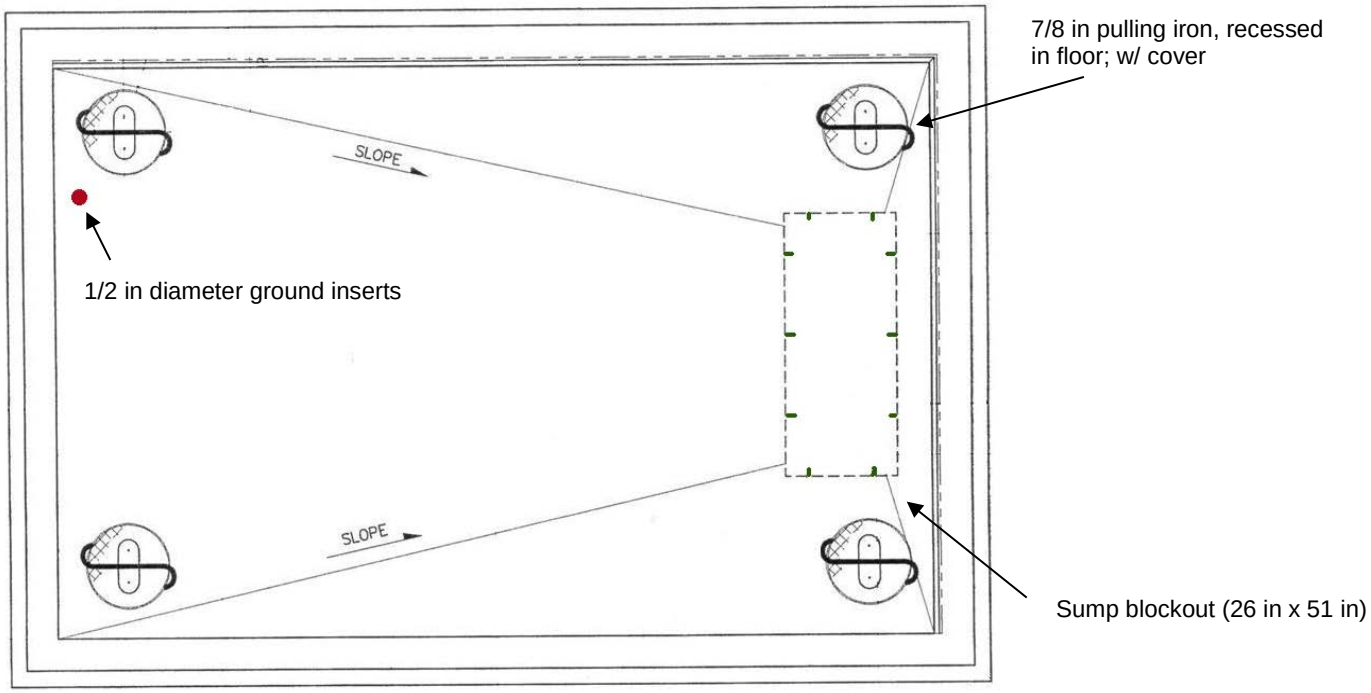
Panel vault floors shall be poured as one piece when possible. If multiple pieces are required, floor pieces shall be mechanically joined.

The1020 panel vault floor shall be sloped at least 1/2 in per 10 ft along the length of the vault toward the sump. Other panel vault sizes shall be sloped when possible.

Panel shall have the following attributes:

- Blockout for a cast-in-place or precast sump; located 6 inches from inside edge of short wall, at bottom of sloped floor; refer to Section 13.3 and Figure 17
- Pre-casted sump or cast-in sump; refer to Section 13.3
- Pulling iron; one (1) shall be located at each corner of base floor (typical), as required, recessed in floor; one (1) each shall be located below personnel hatch (round)
- Pulling iron cover plate, located over each pulling iron
- Lift anchors; size and location as required by project submittal drawings
- Ground inserts
- Ladder

Figure 17. Panel Vault Floor



18. Panel Vault Wall Requirements

Each wall panel section of the panel vault may have some or all of the following features as specified and approved by SCL engineers. Size and location of each feature shall be as described in project submittal drawings:

- Knockouts – Refer to Section 11
- Pulling Irons - Refer to Section 13.1 and Figure 18.2.
- Cable Supports – Refer to Section 13.2 and Figure 18.2.; Crews prefer channels over racking inserts
- Ground Inserts – Refer to Section 10
- Duct Bank Knockout threaded or Dowel Inserts – Refer to Section 12 and Figure 18.2
- Lift Anchors - Refer to Section 13.4 and Figure 18.2
- Identification Plate – Refer to Section 16.
- Gasket/Grout – Refer to Section 13.6 and Figure 18.2.

18.1 Wall Corner Connection

Locations of all component pieces as required in project submittal drawings. See Figure 18.1.

Recessed, galvanized connection box shall be embedded in edge of wall. See Figure 18.1.

Wall connection insert as well as galvanized threaded rod or coil bolt, nut, channel washer, and flat washer shall measure 1 inch in diameter. If a square washer is used, that dimension shall be 2 inches square, or of a sufficient diameter to accommodate a 1-in bolt.

Figure 18.1. Panel Vault Wall Corner Connection Details

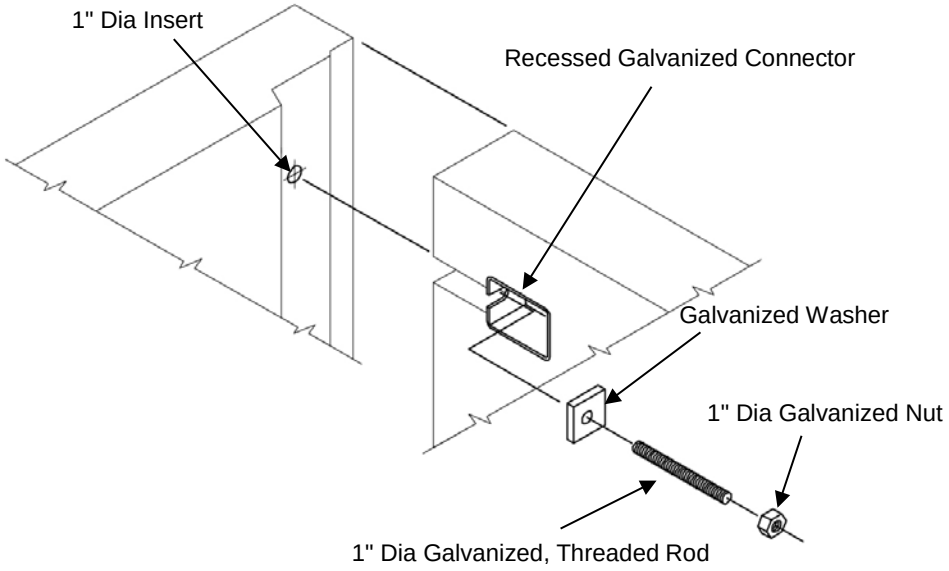
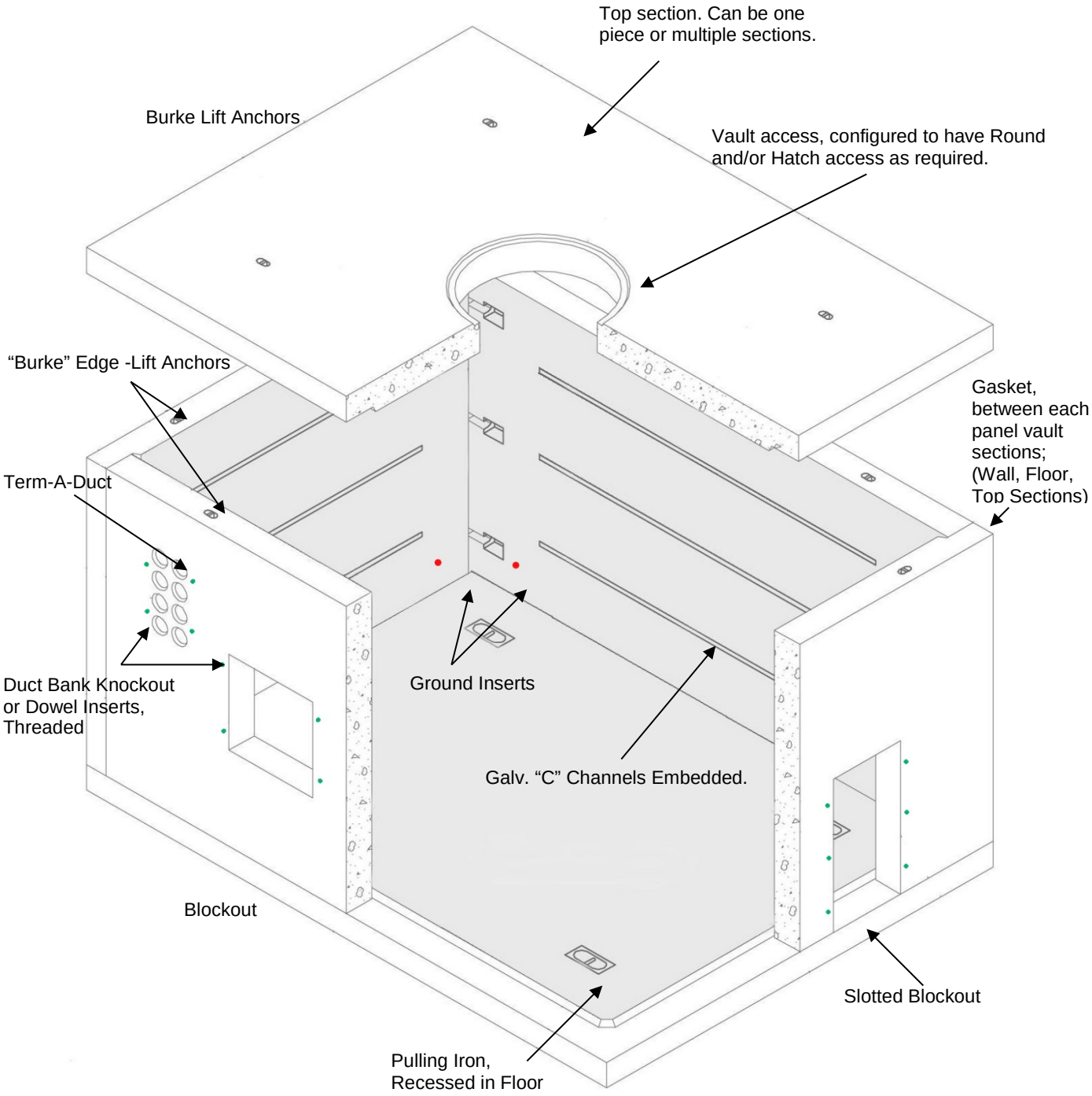


Figure 18.2. Panel Vault Assembly Components



19. Quality Control

Precast concrete vaults shall be manufactured in accordance with ASTM C858.

Vaults may be rejected if they fail to conform to construction and dimensional tolerances specified in ASTM C858.

Vaults may also be rejected if they do not meet SCL 7201.00, “Acceptance Criteria for the Installation of New Precast Concrete Distribution Facilities.”

Minor defects that can be repaired in accordance with SCL material standards shall be done in accordance to SCL U2-6/NVH-20, “Inspection and Repair Procedures for Precast Vaults and Manholes.”

Prior to panel vault delivery, vault manufacturer may be required to provide information such as concrete mix proportion, type and source of cement, aggregates, admixtures, and reinforcement steel mill certification.

Panel vaults shall be warranted for one year against design and manufacturing defects, including those resulting from poor workmanship and materials.

20. Approved Manufacturers

Oldcastle Precast/Utility Vault

21. References

SCL Drawing D-28304; “Retractable Ladder, Vault and Manhole Access”

SCL Construction Guideline U2-6/NVH-20; “Inspection and Repair Procedures for Precast Vaults and Manholes”

SCL Material Standard 7201.00; “Acceptance Criteria for the Installation of New Precast Concrete Distribution Facilities”

SCL Material Standard 7203.21; “Precast Reinforced Concrete Structures – General”

SCL Material Standard 7204.70; “Frames and Covers, 42-inch Round, Iron”

SCL Design Standard 9246.10; “Pulling Irons – Fundamentals and Detailed Requirements, Looped Radial and Network Systems”

Vault Standard Specifications; Ng, Sharon; SCL Civil Engineer, (sharon.ng@seattle.gov)

22. Sources

Ng, Sharon; Senior Civil Engineer and subject matter expert for 7203.81 (sharon.ng@seattle.gov

Wang, Quan; SCL Standards Engineer, originator, and subject matter expert for 7203.81 (quan.wang@seattle.gov)

Youngs, Rob; SCL Electric Utility Inspector and subject matter expert for 7203.81 (rob.youngs@seattle.gov)

Cover Slabs and Risers for Electric Vaults

1. Table of Contents

2. Scope

This standard covers the requirements for the risers and cover slabs used with the electric vaults.

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

Stock No.	Description
013105	5-ft x 7-ft x 6-in riser without Galvanized “C” channel
013106	5-ft x 7-ft x 18-in riser with Galvanized “C” channels
013362	5-ft x 7-ft x 24-in riser with Galvanized “C” channels
013107	42-in diameter x 4-in high round riser
013108	42-in diameter x 6-in high round riser
013109	42-in diameter x 12-in high round riser
013110	5-ft x 7-ft cover slab with one 42-in round access opening
013111	5-ft x 7-ft adjustable cover slab with two, H-20, 3-ft x 3-ft solid covers
013353	5-ft x 7-ft cover slab with two H-30 solid covers

Specific requirements shall be according to the detailed material standard and Purchase Order issued subsequent to competitive solicitations.

3. Application

Risers and covers slabs are parts of a vault assembly used in the construction of underground electric system. The risers are used to bring the access opening of the vault to the surface of the grade. The cover slabs are used to transition from a larger opening of the vault to the appropriate access opening for surface access.

Depending on the application, the vault may need to be customized with different cover slabs; and depending on the depth of the vaults, various risers may be require to bring the access entry to surface grade.

4. General Requirements

This detailed standard is to be used in conjunction with the latest version of SCL 7203.21, “Precast Reinforced Concrete Structures – General.”

5. 5 ft x 7 ft Riser

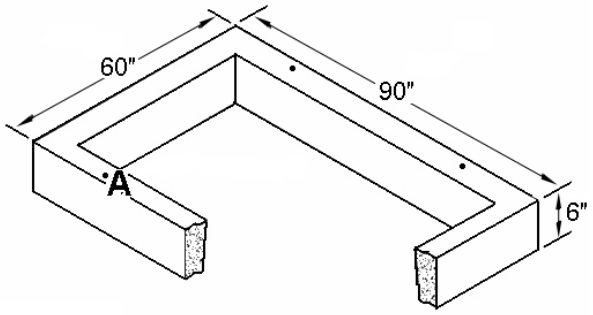
5.1 Dimensions

Five-foot by seven-foot risers shall be constructed according to the dimensions shown in Table 5.1.

Table 5.1. 5-ft x 7-ft Riser Dimensions

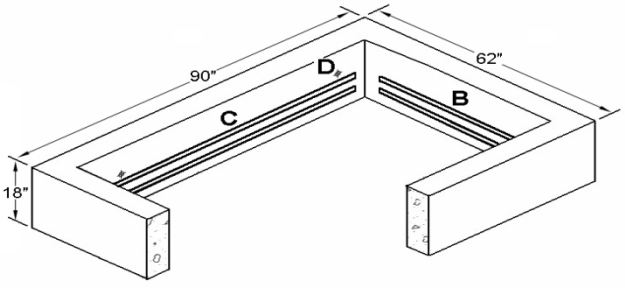
	Riser Dimensions, nominal (in)					
	Wall, Outside		Access Opening			
Stock No.	Length	Width	Length	Width	Height	Fig. No.
013105	90	62	78	50	6	5.1
013106	90	62	78	50	18	5.2
013362	84	56	72	44	24	5.3

Figure 5.1. 5-ft x 7-ft Riser, 6-in H (Stock No. 013105)



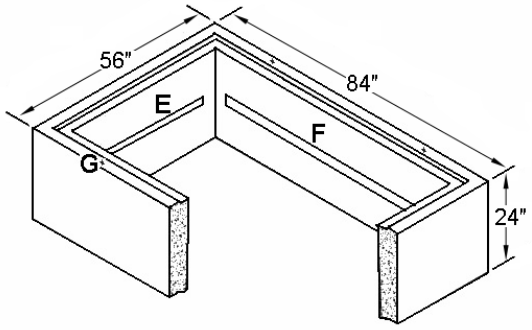
NOTE:
A = 3/4-in lift insert, 4 places on top (2 each side along length of riser)

Figure 5.2. 5-ft x 7-ft Riser, 18-in H with Strut (Stock No. 013106)



NOTES:
B = 2 channels each side, 2 short wall, 48-in length, typical
C = 2 channels each side, 2 long wall, 72-in length, typical
D = 3/4-in lift insert, 2 each side, 1 at each end of 2 long walls

Figure 5.3. 5-ft x 7-ft Riser, 24-in H with Strut (Stock No. 013162)



NOTES:
E = 1 channel each side, 2 short wall, 48-in length, typical
F = 1 channel each side, 2 long wall, 60-in length, typical
G = 4-in lift insert, 4 places on top (2 each side, length of riser)

5.2 Attributes

Table 5.2. 5-ft x 7-ft Riser Attributes

Description	Stock No.	Size, nominal (in)	Location	Per Location	Total
Galvanized "C" channel, horizontal, embedded in walls	013105	-	-	-	-
	013106	48 length	Short walls, approximately center of wall, 4-1/2 in apart	2 ea side	4
		72 length	Long walls, approximately center of wall, 4-1/2 in apart	2 ea side	4
	013362	36	Short walls, center of wall	1 ea side	2
		60	Long walls, center of wall	1 ea side	2
Lift Inserts	013105	3/4 dia	2 on the top of riser, along length side	2 ea side	4
	013106	3/4 dia	2 on long wall above the channels, 1 at each end of long wall	2 ea side	4
	013362	3/4 dia	2 on the top of riser, along length side	2 ea side	4

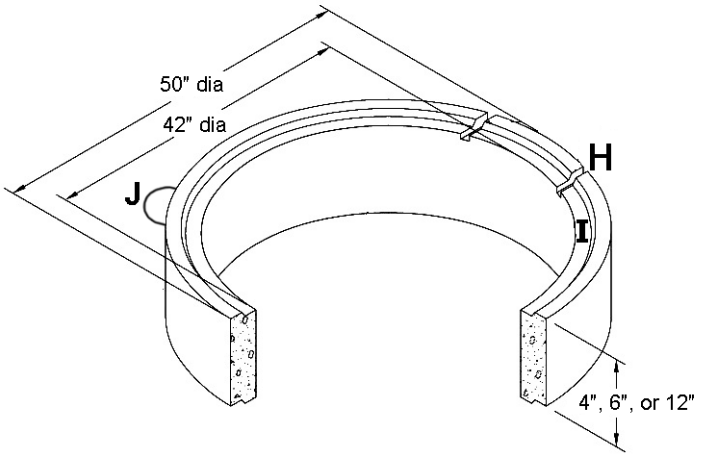
6. 42-in Round Riser

6.1 Dimensions

Table 6. 42-in Round Riser Dimensions

	Riser Dimensions, nominal (in)			
Stock No.	Wall Outside Diameter	Wall Inside Diameter	Height	Fig. No.
013107	50	42	4	6
013108	50	42	6	6
013109	50	42	12	6

Figure 6. 42-in Riser



NOTES:
H = recessed ladder rung grooves
I = 42-in diameter keyway
J = wire lift loops, 3 evenly spaced

6.2 Attributes

All 42-in risers shall have two recessed ladder rung grooves, as shown in Figure 6.

All 42-in risers shall have three (3) wire lift loops.

Wire lift loops shall be equally space apart around the perimeter of the riser; positioned 120 degrees apart.

Wire lift loops on 6-in and 12-in risers shall be parallel with the riser's top surface.

Ends of wire lift loops on 4-in risers shall be even with the riser's top surface.

7. Cover Slabs

7.1 Dimensions

All cover slabs shall have overall dimension of 5 ft-2 in x 7 ft-6 in, as indicated in Table 7.

All cover slabs shall have a 3/4-in lift insert at each corner on the top, as shown in Figure 7.1.

Caps shall be provided to cover the lift inserts.

Table 7. Cover Slab Dimensions

	Cover Slab Overall Dimensions, nominal (in)			Blockout Opening		
Stock No.	Length	Width	Thickness	(in)	Lids and Hatches	Fig. No.
013110	90	62	6	42 diameter round	-	7.1
013111	90	62	8	72 x 36	Two 3 ft x 3 ft, non-slip, H-20, solid covers	7.2
013153	90	62	8	74 x 34	Two non-slip, H-30, solid covers	7.3

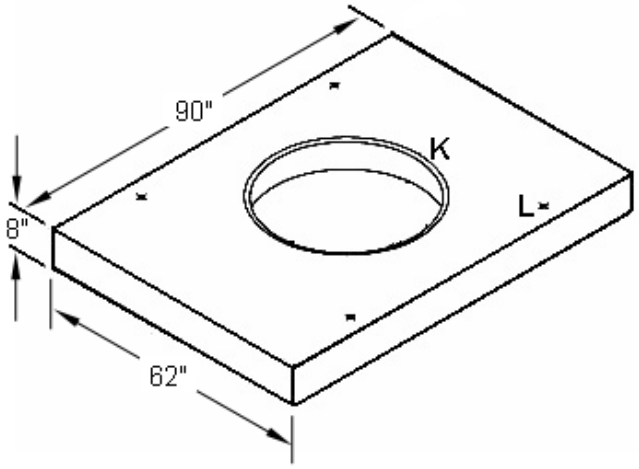
7.2 Attributes, 5 ft x 7 ft Cover Slab with 42-in Blockout Opening (Stock No. 013110)

Cover slab shall have a keyway all around the perimeter on the bottom of the cover slab, as shown in Figure 7.1.

Cover slab shall have a 42-in blockout opening to allow for 42-in risers.

Cover slab shall have a keyway around the top of the 42-in opening to allow for proper joint with 42-in risers.

Figure 7.1. 5-ft x 7-ft with 42-in Round Block-Out Cover Slab



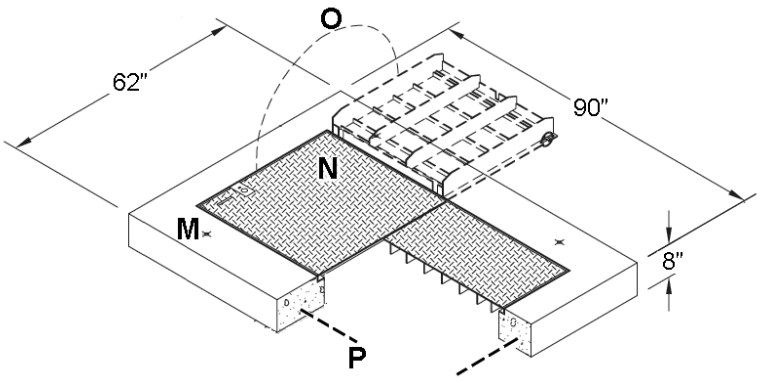
NOTES:
K =42-in diameter keyway for 42-in riser
L = 3/4-in lift insert, 4 places on top with caps

7.3 Attributes, 5 ft x 7 ft Adjustable Cover Slab, H-20, Non-Slip Solid Covers (Stock No. 013111)

Cover Slab shall have a 72-in x 36-in blockout opening.

Cover slab shall include frame with two 3-ft x 3-ft, H-20, non-slip covers, as shown in Figure 7.2.

Figure 7.2. 5-ft x 7-ft Adjustable Cover Slab, H-20, Non-Slip Solid Covers



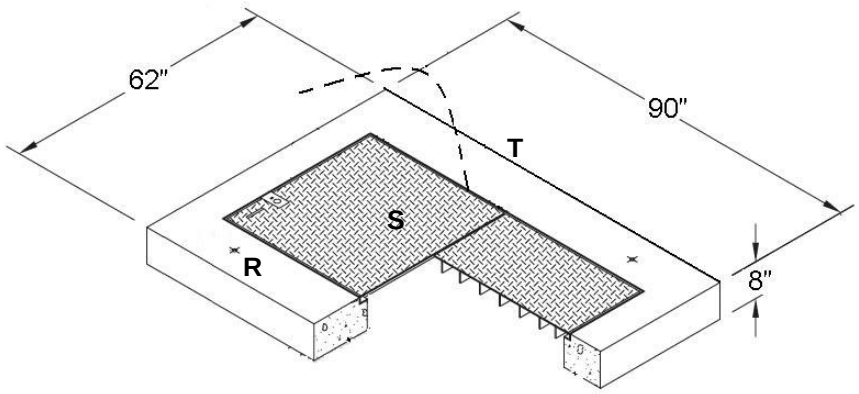
NOTES:
M = 3/4-in diameter lift insert, 4 places in top with caps
N = Non-slip solid covers with locking latch
O = Opens full 180 degrees. All hinges for the lids shall be along the length of the cover slab.

7.4 Attributes, 5-ft x 7-ft Cover Slab, H-30, Non-Slip Solid Covers (Stock No. 013153)

Cover Slab shall have a 74-in x 36-in blockout opening.

Cover slab shall include frame with two 37-in x 36-in, H-30, non-slip doors, as shown in Figure 7.3.

Figure 7.3. 5-ft x 7-ft Cover Slab, Two 3-ft x 3-ft, H-30, Non-Slip Solid Covers



NOTES:
R = 3/4-in diameter lift insert, 4 places in top with caps
S = Non-slip solid covers with locking latch
T = Opens full 180 degrees on the short end; butterfly style

8. Issuance

Unit: EA

9. Approved Manufacturers

Stock No.	Components	Utility Vault Catalog No.
013105	5-ft x 7-ft x 6-in riser without galvanized “C” channels	57R6 – CLX
013106	5-ft x 7-ft x 18-in riser with galvanized “C” channels	57R18 – CLX
013107	42-in diameter x 4-in high round riser	4204 Round Riser
013108	42-in diameter x 6-in high round riser	4206 Round Riser
013109	42-in diameter x 12-in high round riser	4212 Round Riser
013110	5-ft x 7-ft cover slab with one 42-in round blockout opening	57–CLX–42C Cover Slab w/ Key
013111	5-ft x 7-ft adjustable cover slab with two 3-ft x 3-ft non-slip, solid covers	57-2-332-AT-80 Style
013362	5-ft x 7-ft x 24-in riser with galvanized “C” channels	57R24 – CLX
013153	5-ft x 7-ft cover slab with two 3-ft x 3-ft, H-30, non-slip, solid covers	57 CLX Slab w. Key, LW

10. References

Detter, Chris; SCL Distribution Engineer and subject matter expert for 7204.15 (chris.detter@sattle.gov)

Ng, Sharon; SCL Civil Engineer and subject matter expert for 7204.15 (sharon.ng@seattle.gov)

Wang, Quan; SCL Standards Engineer and subject matter expert for 7204.15 (quan.wang@seattle.gov)

SCL Material Standard 7203.21; "Precast Reinforced Concrete Structures – General," June 2012

HATCH ASSEMBLY, SIDEWALK TYPE
4' 6" x 8' 0" OPENING
FRAME - GRATING - PRECAST SLAB

1. Scope

This specification covers a hatch assembly consisting of Frame, Grating and Precast Slab.

2. General

Frames, Gratings and Slabs shall be fabricated true to form and in a plane to prevent rocking of the integral assembly. Top surfaces of all units shall be flush when assembled.

3. Fabrication

Fabrication shall be done in a neat and workmanlike manner. All welding shall be performed in accordance with AWS "Standard Code for Arc and Gas Welding in Building Construction." Welds on mating surfaces between frames, gratings and slabs shall be flush.

4. Finish

After fabrication and welding, all slag and rough or sharp edges shall be removed. Except for the reinforcing bar, the whole assembly shall be sand-blasted in accordance with SSPC SP7 and painted with two coats of black gilsonite base paint, meeting the requirements of Federal Specification TTV-51.

5. Inspection and Rejection

Inspection may be made either at the manufacturer's plant or upon receipt, at the option of the purchaser. Failure to meet any of the requirements of this specification will be cause for rejection.

Reference Specifications: AWS Code for Arc and Gas Welding in Building Construction; SSPC SP7; Fed. Spec. TTV-51; ASTM A 36, latest revisions.

Stock No. 720550 Hatch Grating, Sidewalk Type

ORIGINATOR	STANDARDS COORDINATOR	STANDARDS SUPERVISOR	UNIT DIRECTOR
Jim S. Horn	Charles L. Shaffer	John C. Skinner	Betty Robin

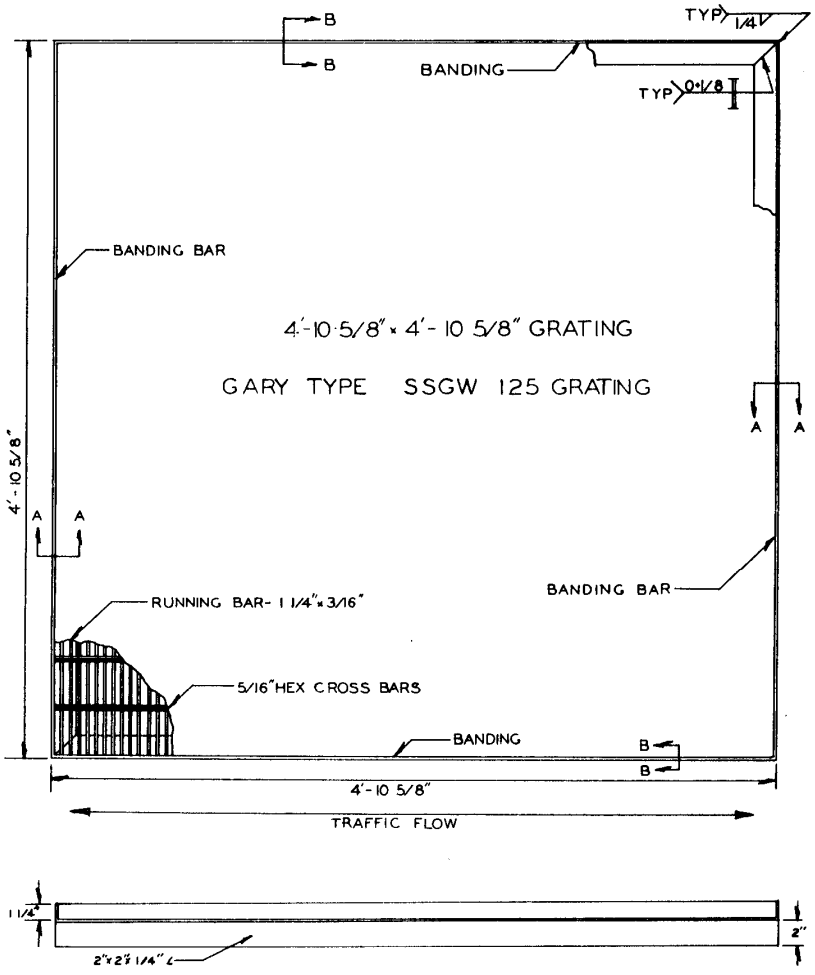
GRATING, HATCH
SIDEWALK TYPE
4' 10-5/8" x 4' 10-5/8"

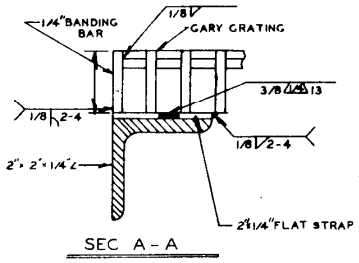
1. Grating shall be Gary Type SSGW-125, or equal.

2. Steel shapes shall be in accordance with ASTM A 36.

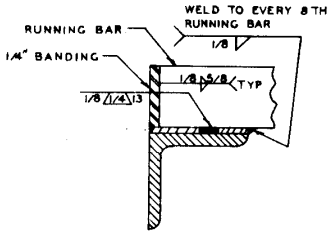
3. Safe concentrated load: 850 lbs.
   Safe uniform load: 375 lbs. per square foot.

Stock No. 720550





SEC A - A



SEC B - B

FRAMES AND COVERS, 42-INCH ROUND, IRON

1. Foreword

1.1 Scope

This material standard covers the requirements for 42-inch round, iron, frames and covers.

This material standard applies to the following Seattle City Light Stock Numbers:

Stock Number	Description	Load Rating (Minimum)
720226	cover, vented	H-20
720466	cover, solid	H-20
720461	frame, 4-lug	H-20
012753	frame, 8-lug	H-25

1.2 Application

Frame and cover assemblies are used to construct the means for entering and exiting underground vaults located in pedestrian sidewalks, side streets, or arterials and highways.

Vented covers are for use with vaults that meet any one of the following conditions, unless provisions are made for separate ventilation:

- Require special ventilation
- Contain more than 75 kVA of transformer capacity

Solid covers are for use with vaults that meet any one of the following conditions:

- Do not require special ventilation
- Contain 75 kVA or less of transformer capacity
- Where higher security is desired
- Where debris falling into the vault may be a concern
- Where a minimum load rating of H-25 is required

H-10 rated frames and covers are only for use in pedestrian sidewalks where motor vehicle access is not possible.

1.2 Application, continued

H-20 rated frames and covers are for use in pedestrian sidewalks where an occasional car or light truck may inadvertently traverse, or side streets that see only light truck traffic; garbage trucks are not considered light trucks.

H-25 rated frames and covers are for use in arterials and highways that see frequent, heavy traffic from trucks and buses.

H-30 rated frames and covers are for use at heavily-used bus stops, or where repetitive, impact, and sustained loading (plus horizontal loading due to braking) is present.

For the purposes of this standard, H-20 may be considered equivalent to HS-20; H-25 may be considered equivalent to HS-25. AASHTO HB-17, Division I, Section 3.7, defines H loading as a two-axle truck and HS loading as tractor truck with semi-trailer.

AASHTO HB-17, Division I, Section 3.8, defines wheel loading in detail. Wheel loading classes above or below H-20 are calculated by simple ratio. For example,

if,	H-20 wheel loading	=	32,000 pounds
then,	H-25 wheel loading	=	25/20 x 32,000 pounds
		=	40,000 pounds

Previous versions of this standard denoted H-25 as H-20+.

Four-lug (H-25) frames are no longer manufactured – cancelled Stock Number 720465 is retained here for record keeping and possible returns to Stores. Engineers should specify the 8-lug (H-25) frame for new designs.

1.3 Industry Standards

Frames and covers shall meet the applicable requirements of the latest revisions of following industry standards:

AASHTO HB-17 - American Association of State Highway and Transportation Officials Standard Specification for Highway Bridges, 17th Edition, 2002

ASTM A 48 - Standard Specification for Gray Iron Castings

ASTM A 536 - Standard Specification for Ductile Iron Castings

1.4 References

Federal Specification RR-F-621E, February 23, 1989 - Frames, Covers, Gratings, Steps, Sump and Catch Basin, Manhole

ASTM C 857-1995 – Minimum Structural Design Loading for Underground Precast Concrete Utility Structures

2. Construction

2.1 General

Unless stated otherwise in this standard, dimensional tolerances shall be +/- 1/16 inch, and an additional tolerance of +/- 1/16 inch per foot of dimension.

Finished product shall be free of blowholes, splits, cracks, blisters, mold-pull, sharp edges, and other imperfections that may impair serviceability or pose a hazard.

2.2 Frame and Cover Assemblies

Not withstanding allowed dimensional tolerances, all frames and covers of the same nominal size shall assemble interchangeably.

Any cover placed in a matched frame shall seat without rocking.

The difference in level between a cover and a matched frame shall not exceed 1/8 inch at any point, and shall not exceed 1/16 inch over a total of more than one quarter of the frame perimeter.

Side play between a cover edge and a matched frame shall not exceed 1/8 inch per foot of diameter.

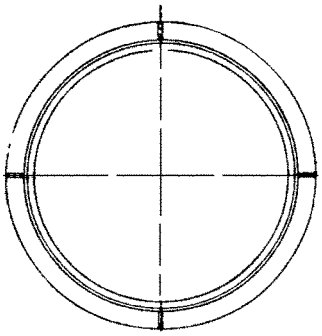
2.3 Frames

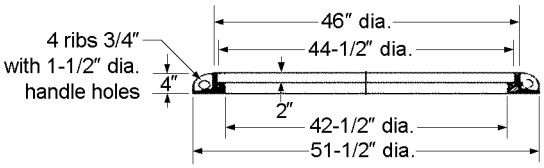
Frames shall be gray cast iron produced according to ASTM A 48, Class 30B (minimum).

Frames shall meet the dimensional requirements of Figures 2.3.1 and 2.3.2.

Figure 2.3.1

4-Lug Frame, H-20
Stock Number 720461

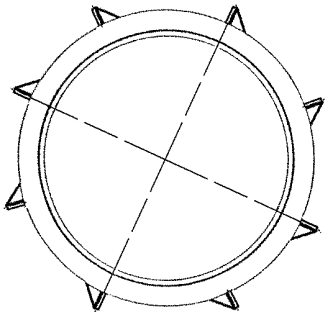




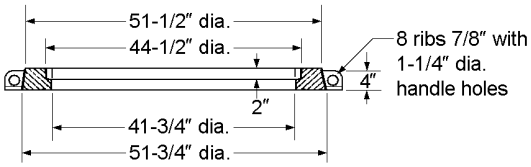
Ring Section

Figure 2.3.2

8-Lug Frame, H-25
Stock Number 012753



Ring Top View



Ring Section

2.4 Covers

Covers shall be ductile cast iron produced according to ASTM A 536, Grade 80-55-06.

Covers shall meet the dimensional requirements of Figures 2.4.1 and 2.4.2.

Solid covers shall be manufactured with a safety tread design.

The word "ELECTRIC" shall be cast in the center of each solid cover and along the edge of each vented cover.

Each cover shall have a minimum of six, equally-spaced, 7/8 inch diameter holes for lifting.

The bottom center of each cover shall be provided with a spin ring that extends at least 1-1/2 inches below the underside of the outside edge.

The center of each cover shall have one 1/2 inch, UNC-series threaded hole for a lifting eye bolt.

A plug shall be provide to protect the 1/2 inch, UNC-series threaded hole from debris and normal wear.

Each vented cover shall have at least 500 square inches of clear opening for ventilation.

Figure 2.4.1
vented cover
Stock Number 720226

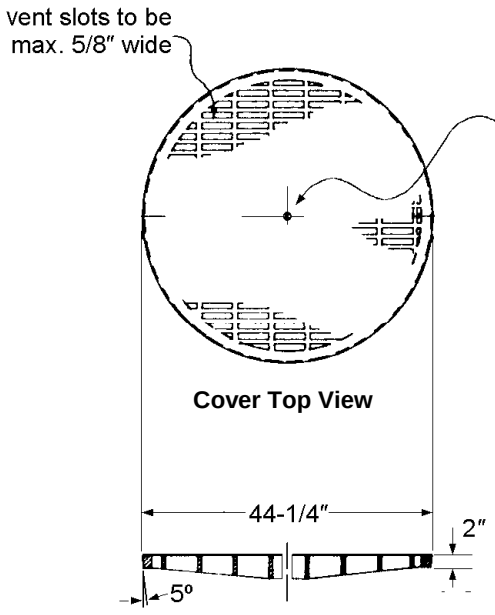
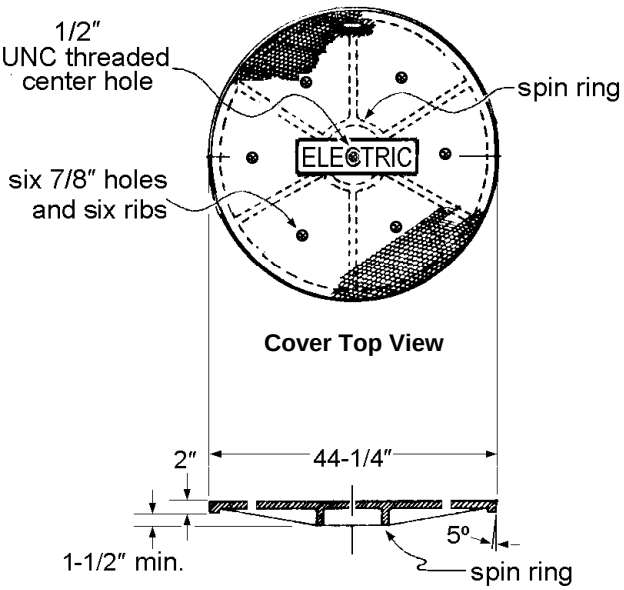


Figure 2.4.2
solid cover
Stock Number 720466



3. Packaging

Frames and covers shall be shipped strapped to wood pallets.

Each pallet shall be legibly marked with the following information:

- Manufacturer's identification
- Product description
- Package weight (gross or net)
- Date of manufacture
- Seattle City Light's Purchase Order Number
- Seattle City Light's Stock Number

4. Shipping

Product shall be shipped to the address specified on the Purchase Order.

5. Issuance

EA

6. Approved Manufacturers

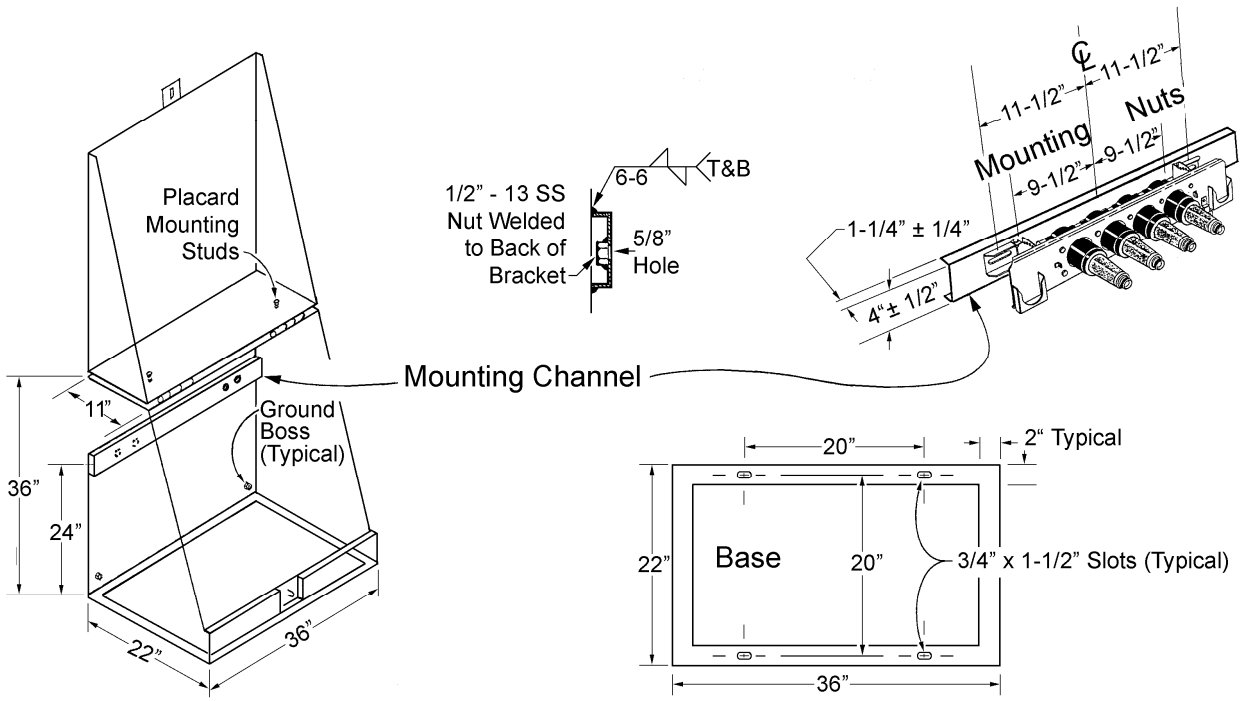
Stock Number	Description	Load Rating	Nominal Weight, lbs.	East Jordan Iron Works	Utility Vault
720226	cover, vented	H-20	445	-	4220 CS
720466	cover, solid	H-20	450	-	4220 S
720461	frame, 4-lug	H-20	272	-	4210-4220
720465 (cancelled)	frame, 4-lug	H-20+ H-25	670	not available	4220-HD
012753	frame, 8-lug	H-25	652	1843Z	4220-HD

SEATTLE CITY LIGHT

MATERIAL STANDARD

STANDARD NUMBER: **7205.1**
PAGE: 1 of 1
DATE: December 3, 1997
REV: August 17, 2004

CABINET – TERMINATING FOR 26 KV LOADBREAK JUNCTIONS



This specification covers Terminating Cabinets for mounting two-, three-, or four-position 25-kV-class loadbreak junctions that include their own adjustable mounting brackets. The cabinets shall meet the physical dimensions listed and the following minimum requirements.

CABINET: The cabinet door shall be a "lift-up" design and shall include a door stop. It shall be all welded construction with welds ground smooth and fully assembled. The cabinet shall meet the security requirements of ANSI C57.12.28, including a corrosion-proof penta head security bolt and a recessed padlocking provision. The roof shall be designed to shed water. Cut edges shall be free of burrs.

MATERIAL: Cabinet: 12-gauge 304 Stainless Steel

Mounting Channel: 12-gauge 304 stainless steel, full cabinet width, as dimensioned above. It shall include four 5/8" min. holes with four ½" - 13 stainless steel nuts welded to the back side for the purpose of mounting junctions. The channel shall be intermittent welded 6"-6" T&B, minimum, to cabinet.

Hinges Locking Mechanism, and Other Hardware: Stainless Steel

FINISH: The finish paint shall meet ANSI C57.12.28, Section 5. The color shall be MUNSELL GREEN 7GY3.29/1.5 or reasonable variation with prior approval.

GROUNDING BOSS: Two ½" - 13 stainless steel grounding nuts shall be welded to the cabinet 4" ± 1" above the base and from the end walls.

PLACARD MOUNTING: For the purpose of attaching switching/clearance cards unique to Seattle City Light, the cabinet shall include either (a) two ¼" - 20 X ½" stainless steel "Nelson" type studs, or (b) two ¼" - 20 stainless steel bosses welded to the cover as shown. The studs or bosses shall be 29¼" apart and approximately 4" ± ½" from the hinged edge.

SUGGESTED SUPPLIERS: Continental Columbus; Cooper Power Systems; Durham; Electrical Equipment; Malton; Reliable.

STOCK NUMBER: 682890

STANDARDS COORDINATOR	STANDARDS SUPERVISOR	UNIT DIRECTOR
Charles L. Shaffer	John C. Skinner	Haedee Jay

CABLE CLEAT AND LINER

1. Scope

This standard covers the requirements for cable cleats and liners.

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

Stock Number	Description
013428	Cleat
013429	Cleat liner for 15 kV, 1000 kcmil, 3-1/C cable

2. Application

Cable cleats (with liners) are used to cushion electric power cables from magnetic forces arising during fault currents. Cable cleats are also used to protect cables from chafing in areas subject to recurring vibration.

Cleat liner, stock number 013429, is designed to fit Seattle City Light's 15 kV, 1000 kcmil, 3-1/C primary cable, stock number 623670.

A complete assembly requires one cleat and one cleat liner. A particular assembly is not range taking.

Cable cleats should not be solely relied upon to provide vertical support of cable. For vertical support of heavy cable, use weave-style grips.

Refer to manufacturer's website (www.kvastrategies.com) for recommended cleat spacing and ratings for withstanding short-circuits.

3. Requirements

3.1 General

Operating temperature range, degrees F	-40 to 140

3.2 Cleat

Figure 3.2, Cleat

Frame material	Marine grade, non-magnetic 316L stainless steel
Frame material dimensions, mm	50 x 2
Closure hardware	Captive 316 stainless steel M12 bolt and Nyloc nut
Mounting bolts	One or two 3/8-inch diameter bolts (not included)

standards coordinator	*standards supervisor*	*unit director*
John Shipek	John Shipek	Darnell Cola

3.3 Cleat Liner

Figure 3.3, Cleat Liner

Liner material	low smoke and fume, zero-halogen polymer

4. Packaging

Cable cleats and liners shall be packaged to prevent damage during shipping, handling, and inside storage.

Individual packages shall be legibly marked with:

- Manufacturer's name
- Manufacturer's catalog number
- Product description
- Quantity contained
- Seattle City Light's stock number

5. Approved Manufacturer

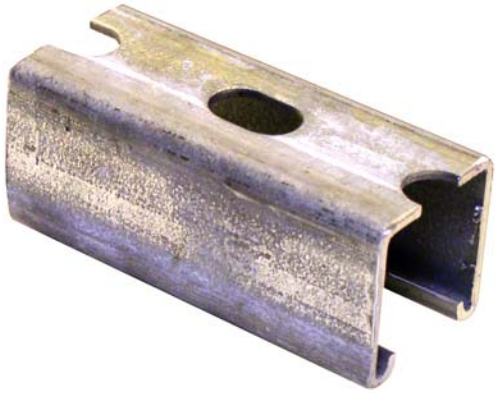
Stock Number	Description	Ellis Patents, Ltd / kVA Strategies, LLC Catalog Number
013428	Cleat	ES94-118
013429	Cleat liner for 15 kV, 1000 kcmil, 3-1/C cable	SFT51

6. References

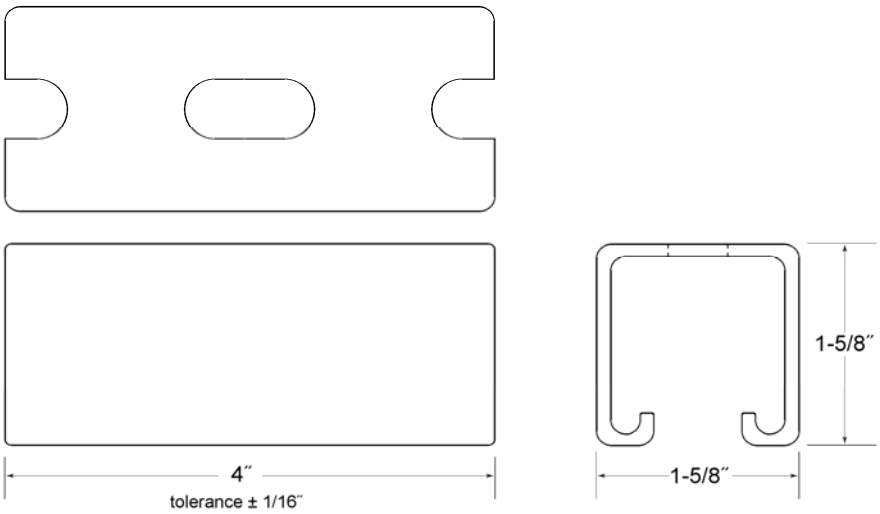
Shipek, John; Standards engineer and originator of 7206.06

European Specification EN-50368:2003; Cable Cleats for Electric Installations

ADAPTER BRACKET, FOUR-INCH



1. **Material:** Made from steel, strut-type channel, 1-5/8-inch by 1-5/8-inch, with holes or slots on 2-inch centers.
2. **Construction**

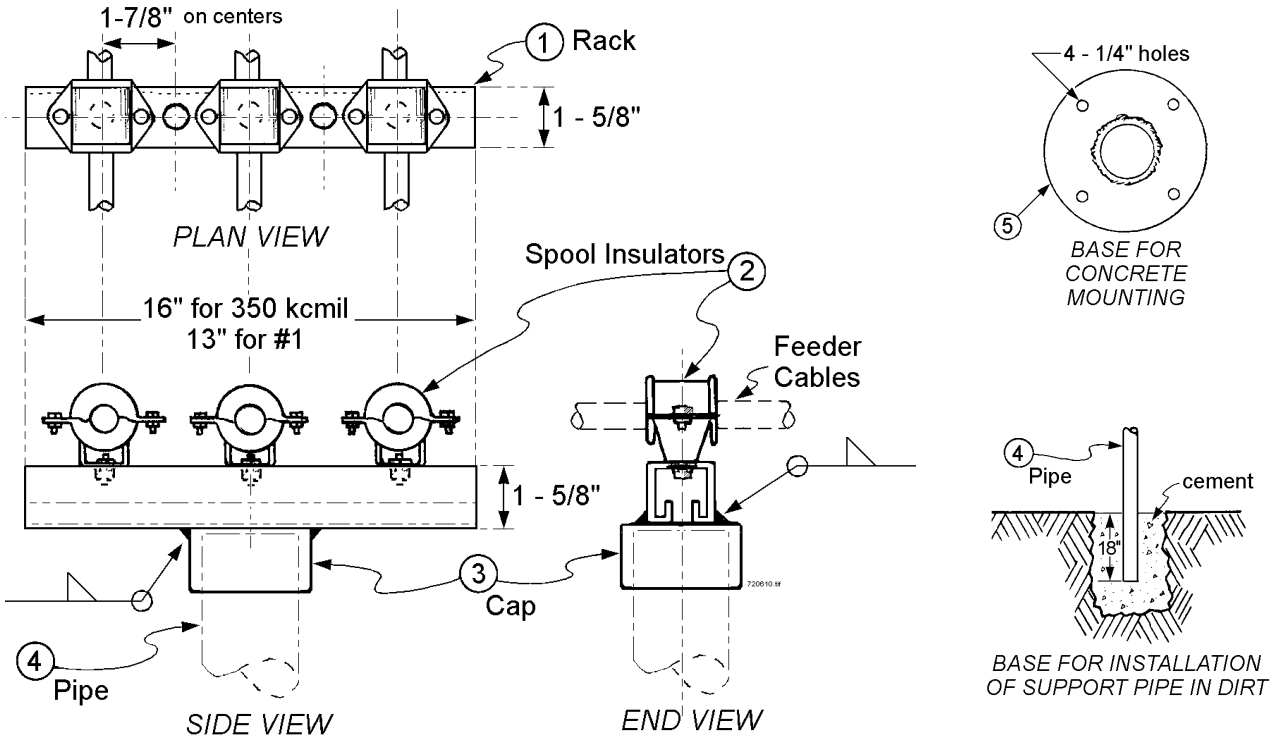


Cut channel on every-other slot (or hole) as shown. Grind ends and points smooth to eliminate hazard from sharp edges. Hot dip galvanize after cutting and grinding.

3. **Stock Unit:** EA
4. **Stock No.:** 012465
5. **Approved Manufacturers:**
   Wesanco – La Mirada, California
   Wilcor – Seattle, Washington

STANDARDS COORDINATOR	STANDARDS SUPERVISOR	UNIT DIRECTOR
Charles L. Shaffer	John C. Clinton	Harold Ivy

BRACKET, CABLE SUPPORT FOR #1 AND 350 KCMIL 28KV CABLE



Cable Support Brackets shall be of the configuration and dimensions shown and shall be fabricated in accordance with the above sketch.

The brackets are used to support primary cables connected to transformers with ESAN type connectors when installed on outdoor pads.

Material List

Item	Stock Number	Description
1	723510	Rack, conduit support, galvanized
2	690765	Spool insulators, for #1 (Delta-Star)
	690770	Spool insulators, for 350 kcmil (Delta-Star)
3	711349	Cap, galvanized malleable iron, 2"
4	710369	Pipe, galvanized steel
5	712109	Flange pipe, galvanized, floor, 2"
*6	686210	Cable support bracket, 13" long, for #1
	686211	Cable support bracket, 16" long, for 350 kcmil

*Assembly items 1, 2, and 3.

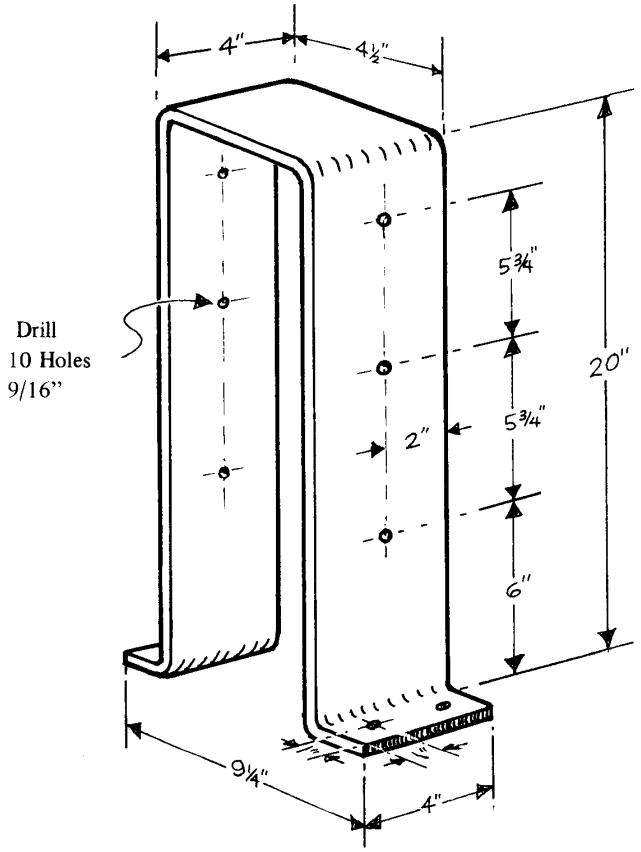
ORIGINATOR	STANDARDS COORDINATOR	STANDARDS SUPERVISOR	UNIT DIRECTOR
Jim S. Horn	Charles L. Shaffer	John C. Skinner	Betty Robin

SEATTLE CITY LIGHT

MATERIAL STANDARD

STANDARD NUMBER: **7206.11**
PAGE: 1 of 1
DATE: May 25, 1976
REV: January 27, 1999

SUPPORT BRACKET
600 AMP SPLICE and TAP



Material: Made from 3/8" x 4" flat, mild, hot-rolled steel. Galvanize after fabrication, in accordance with ASTM Specification A 123, latest revision.

Stock No: 720627

Stock Unit: Each

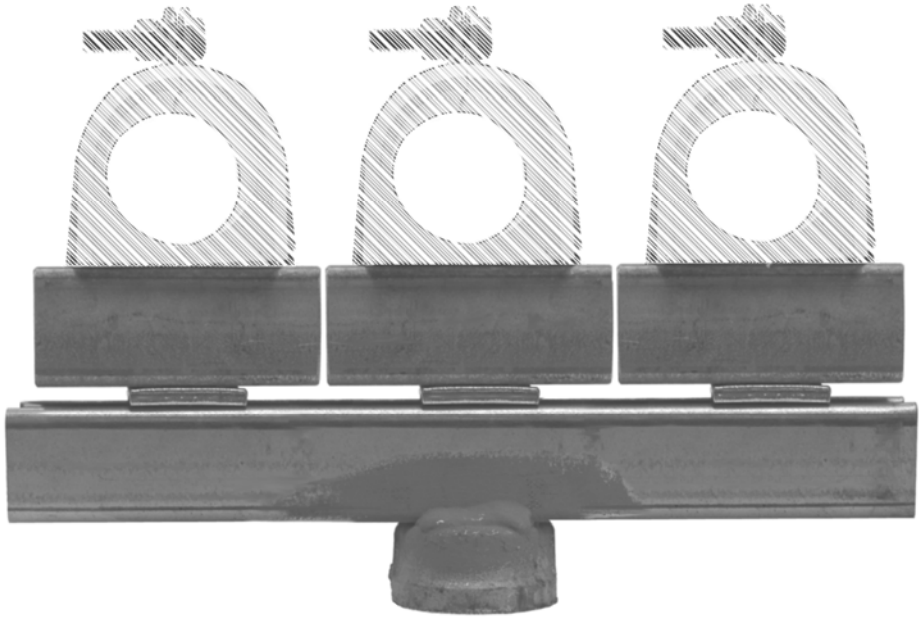
ORIGINATOR	STANDARDS COORDINATOR	STANDARDS SUPERVISOR	UNIT DIRECTOR
Jim S. Horn	Charles L. Shaffer	John C. Skinner	Betty Robin

SEATTLE CITY LIGHT

MATERIAL STANDARD

STANDARD NUMBER: **7206.12**
PAGE: 1 of 2
SUPERCEDING: New
EFFECTIVE DATE: July 6, 2005

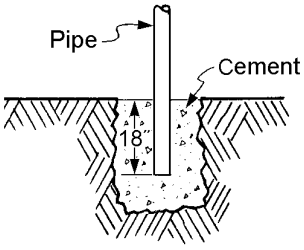
BRACKET ASSEMBLY, HORIZONTAL CABLE SUPPORT



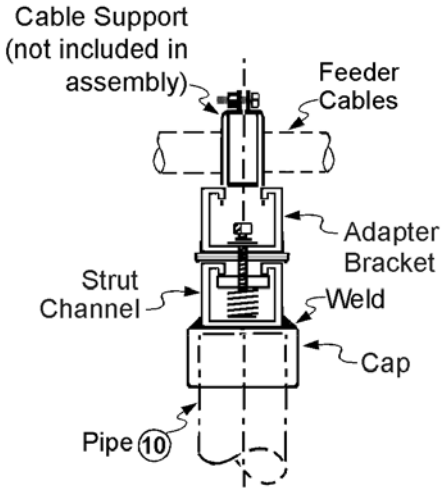
1. **Scope:** This Material Standard covers the fabrication and assembly of a cable support bracket utilized by Seattle City Light Construction Guideline **U11-8**.

2. **Fabrication and Assembly:** Cut, drill, shape, and weld as shown (see page 2). Paint exposed steel with zinc-rich, gray, single-component, primer following fabrication.

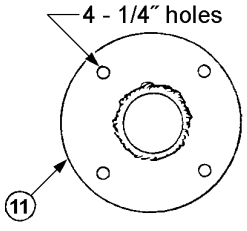
4. **Installation Details:**



Base for Installation of Support in Dirt



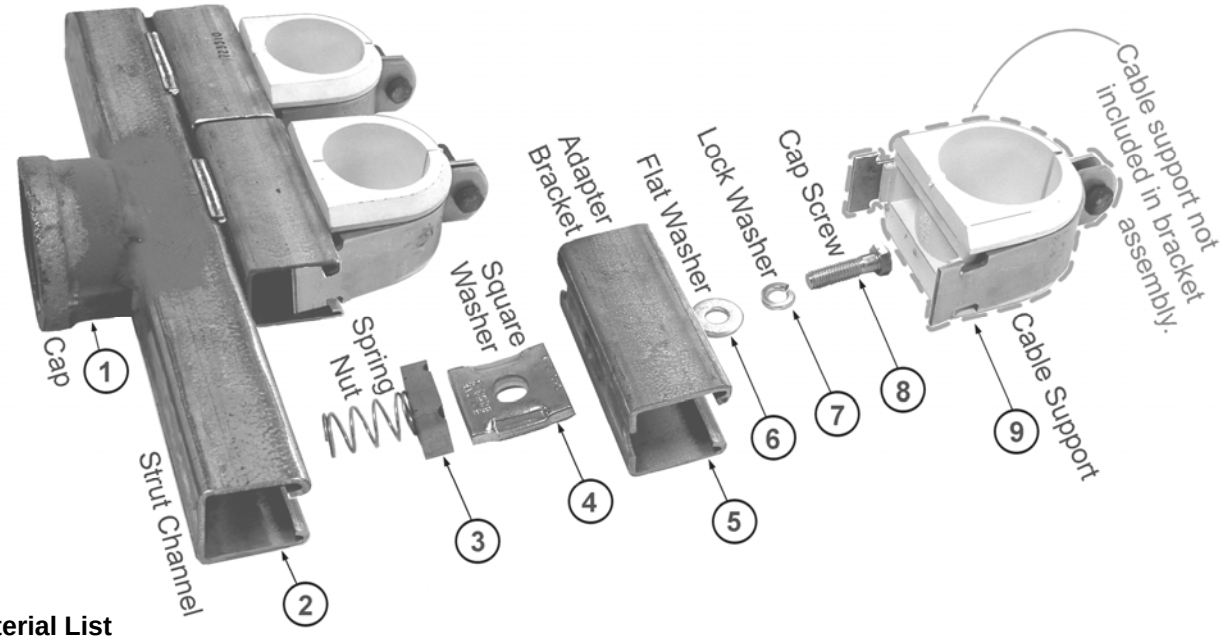
End View



Base for Concrete Mounting

5. **Stock Unit: EA**

STANDARDS COORDINATOR	STANDARDS SUPERVISOR	UNIT DIRECTOR



6. Material List

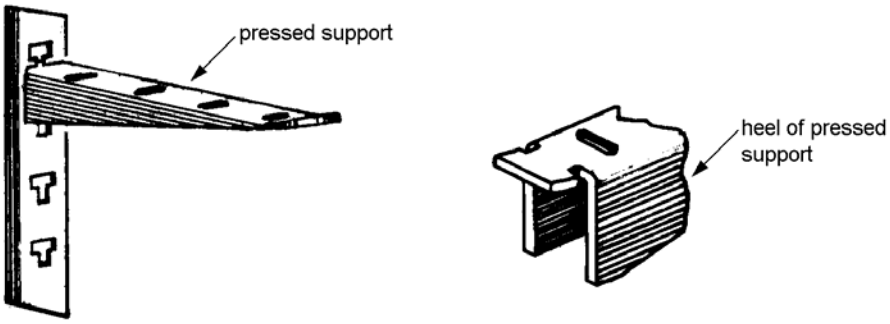
Item	Stock No.	Quantity	Description	
1	711349	1	Cap, galvanized malleable iron, 2″	
2	723510	13 in.*	Strut channel, galvanized steel, 1-5/8 x 1-5/8	
	723510	16 in.*	Strut channel, galvanized steel, 1-5/8 x 1-5/8	
3	723609	3	Nut, 3/8″, with long spring for 1-5/8 x 1-5/8 strut channel	
4	720658	3	Washer, flat, square, with tabs and 9/16 hole	
5	012465	3	Adapter bracket, 4″	
6	788044E	3	Washer, flat, round, zinc-plated, 3/8″	
7	010468	3	Washer, lock, split, zinc-plated, 3/8″	
8	784767E	3	Cap screw, steel, hex head, zinc-plated, 3/8 x 1-1/2	
9	011961	**	Non-ceramic cable support assembly	28 kV, 1/0 solid, 2/C, bare
	011962	**	Non-ceramic cable support assembly	28 kV, 350 kcmil, 1/C
10	710369	**	Pipe, galvanized steel, 2″	
11	712109	**	Flange, floor, for galvanized steel pipe, 2″	

* Strut channel is 13 inches long for 1/0 cable and 16 inches long for 350 kcmil cable.

** Items 9, 10 and 11 are issued separately.

Stock No.	For Cable Size
012466	28 kV, 1/0 solid, 2/C, bare
012467	28 kV, 350 kcmil, 1/C

HOOKS, CABLE RACK, STEEL



1. Construction

Cable Rack Hooks, or supports, shall be fabricated from hot-rolled carbon steel strip conforming to ASTM Specification A 425.

The surface of the hooks shall be smooth and free of imperfections to protect the cable from damage. The interlock of the hook shall fit snugly in the rack to provide a rigid support for the cable.

The hooks shall be galvanized after fabrication in accordance with ASTM Specification A 153.

2. Industry Standards

ASTM A 425 - Specification for Hot-Rolled Carbon Steel Strip, Commercial Quality

ASTM A 153 - Standard Specification for Zinc Coating (Hot-Dip) on Iron And Steel Hardware

3. Issuance

Stock Unit: EA

4. Approved Manufacturer

	Dimensions, in		Approved Manufacturers		
Stock No.	**Length**	**Steel Size**	**AB Chance**	**Inwesco**	**Joslyn**
720625	4	1-1/2 x 1-1/16 x 3/16	C-203-1131	10A35	–
720626	7-1/2	1-1/2 x 1-1/16 x 3/16	C-203-1132	10A36	J5132A
720629	10	1-1/2 x 1-1/16 x 3/16	C-203-1133	10A37	J5133A
720631	14	1-1/2 x 1-1/16 x 3/16	C-203-0315	10A38	J5134A

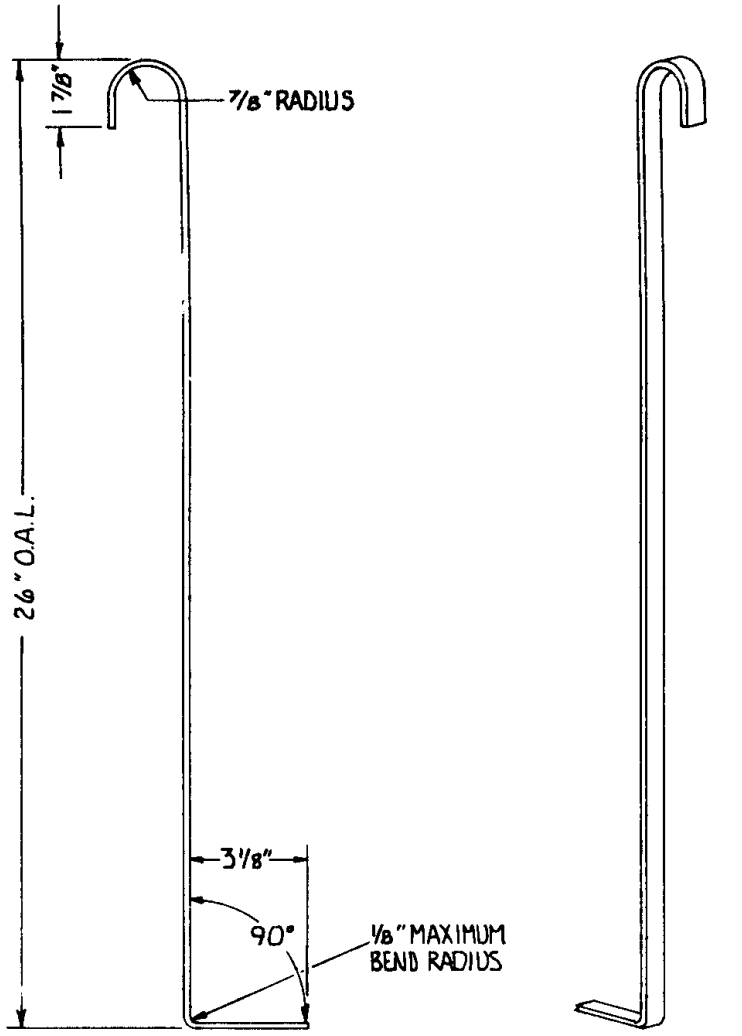
standards coordinator	*standards supervisor*	*unit director*
John Shipek	John Barnett	Pamela S. Johnson

SEATTLE CITY LIGHT

MATERIAL STANDARD

STANDARD NUMBER: **7206.3**
PAGE: 1 of 1
DATE: November 19, 1987
REV: July 6, 1999

HAZELTINE TRANSMITTER SUPPORT RACK



Support Rack shall be fabricated from mild steel stock, 1-1/4" wide by 1/8" thick. Each piece shall be made from new stock, free of rust, cracks, or other manufacturing defects. The rack shall then be hot-dip galvanized in accordance with ASTM A 153.

Reference Specifications: ASTM A 153
Stock Unit: Each
Stock No.: 687725

Seattle City Light shop made

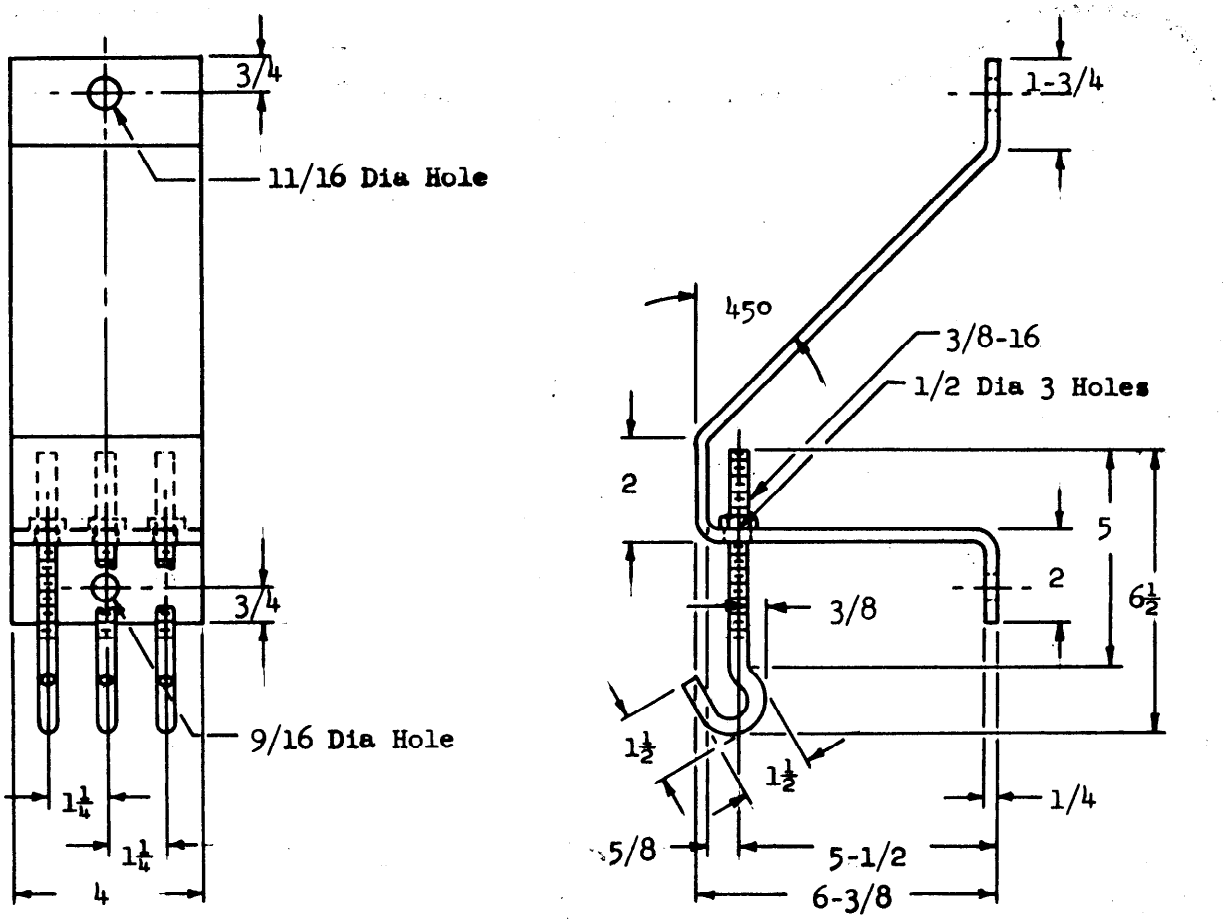
ORIGINATOR	STANDARDS COORDINATOR	STANDARDS SUPERVISOR	UNIT DIRECTOR
Jim S. Horn	Charles L. Shaffer	John C. Skinner	Betty Robin

SEATTLE CITY LIGHT
MATERIAL STANDARD

Specification **7206.5**
Issued Apr. 19, 1967

REV: Jan. 15, 1992

BRACKET, CABLE SUPPORT



All dimensions are in inches.
All radii are 1/4" maximum inside radius.

CABLE SUPPORT BRACKET shall be of the configuration and dimensions shown, free of rough or uneven surfaces and edges, furnished with three (3) J bolts and 3/8NC-2 galvanized nuts. The bracket is fastened to the pole to support cables independent of riser conduit.

Steel. The bracket and J bolts shall be made of hot rolled carbon steel bars meeting the requirements of ASTM specification A107.

Galvanizing. The bracket and J bolts shall be galvanized, after fabrication, in accordance with ASTM specification A123.

Reference Specifications: ASTM A107; A123, latest revisions.

Stock Unit: Each

Stock Number: 720630

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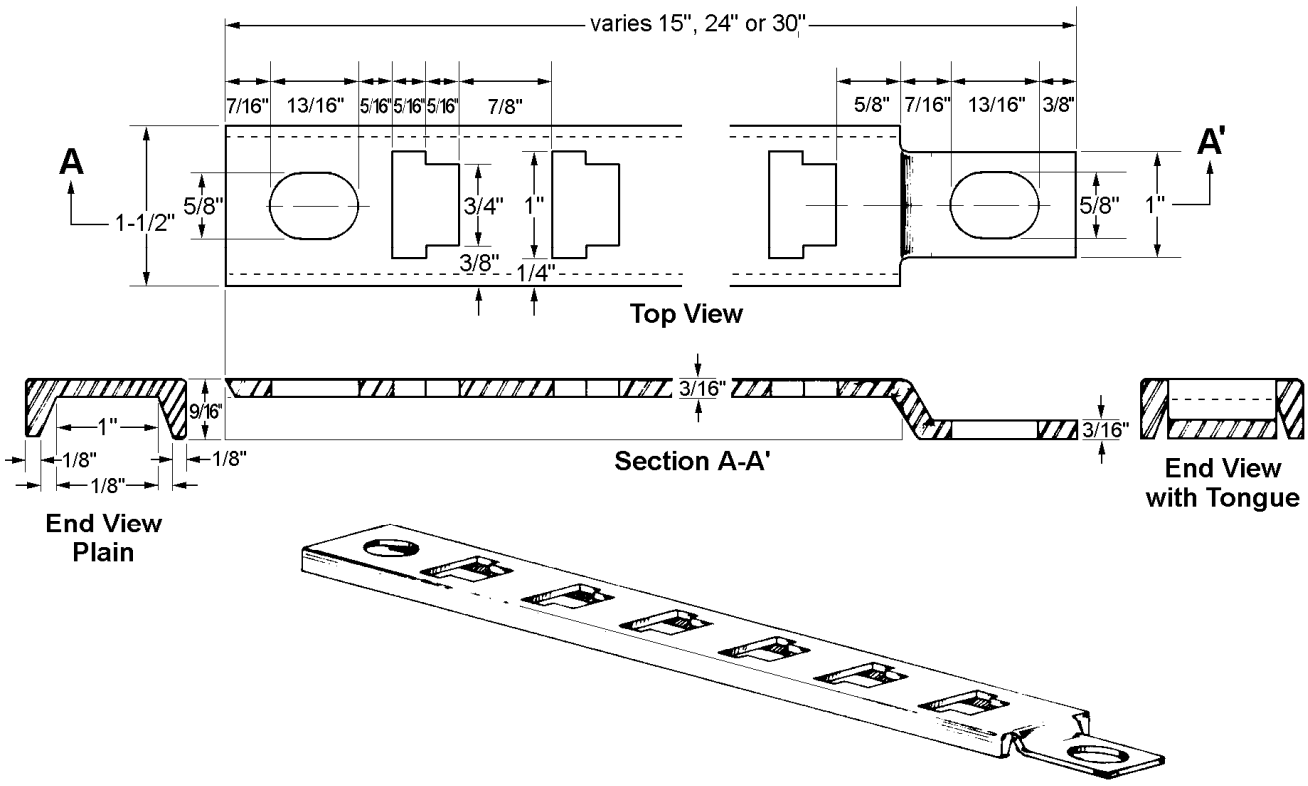
J E Perry	Charles L. Shaffer 4-99	John Thomas	D DeVries

RACKS, UNDERGROUND CABLE



Underground Cable Racks shall be of the configuration shown, and shall be made of hot-rolled, carbon-steel channel conforming to ASTM Specification A 107, Grade C-1020.

Cable racks shall be galvanized, after fabrication, in accordance with ASTM Specification A 153.

Reference Specifications: ASTM A 107, A 153 (latest revisions)

Stock Unit: EA

Stock Number	Dimensions, Inches			No. of Holes	Approved Manufacturers							
	Lgth.	Spacing			Cooper	Hubbell/ Chance	Inwesco	Josyln	Kort.	MacLean	Slacan	Utility Vault
		Hook	Hole									
721662	15	1.5	13.5	8	DU17B2	C203-1124	10A05	5124	5108	617	2124	5910030
721664	24	1.5	22.5	14	DU17B3	C203-1125	10A08	5125	5114	618	2125	5910045
721666	30	1.5	28.5	18	DU17B4	C203-1126	10A11	5126	5118	619	2126	5910050

ORIGINATOR	STANDARDS COORDINATOR	STANDARDS SUPERVISOR	UNIT DIRECTOR
Jim S. Horn	Charles L. Shaffer	John C. Skinner	Harold Gray

SEATTLE CITY LIGHT

STANDARD NUMBER: 7217.5 LF

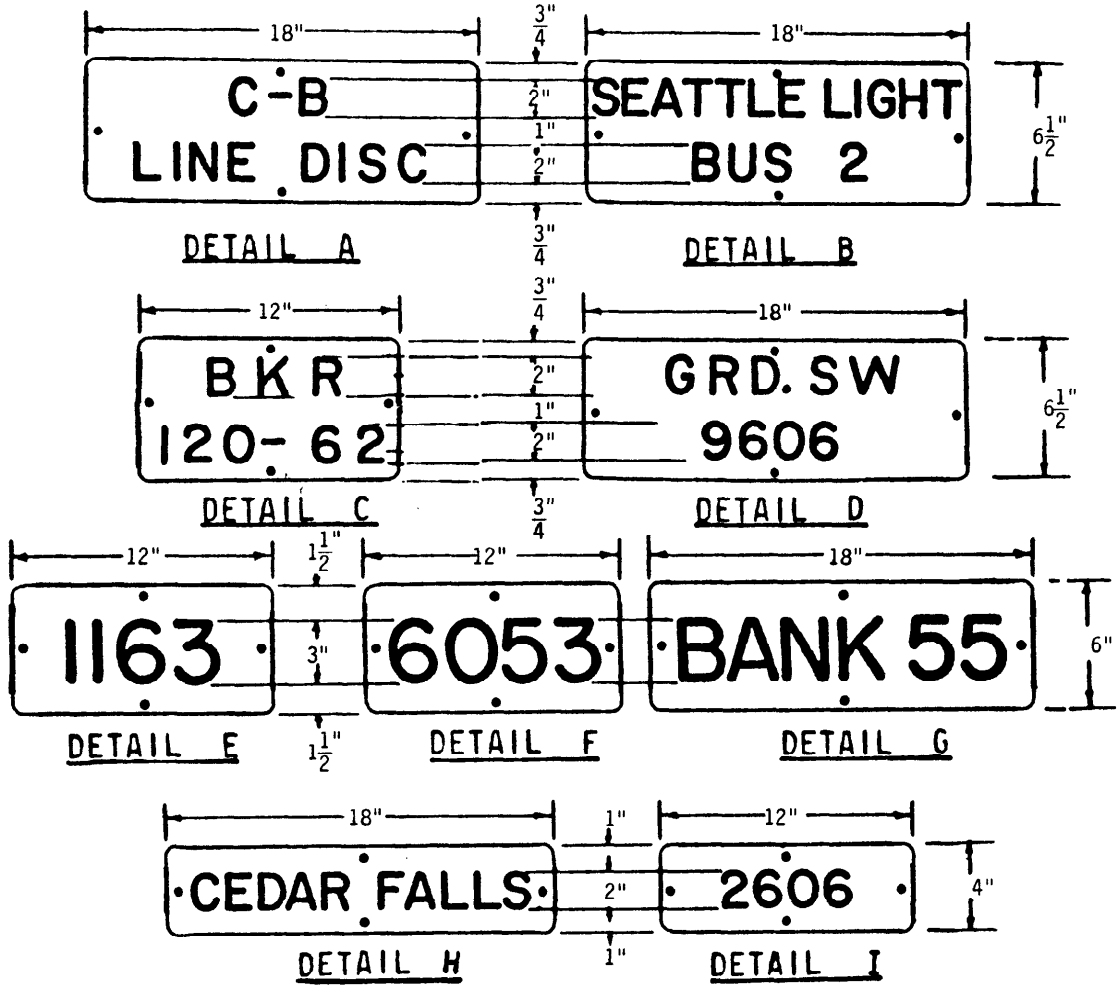
PAGE OF PAGES: 1 of 1

MATERIAL STANDARD

DATE: Sept. 2, 1959

REV: June 29, 1990

PORCELAIN ENAMEL NAMEPLATES



TYPICAL MOUNTING HOLE ARRANGEMENT
4 HOLES 3/8" DIA.

COLOR DESCRIPTION	PEI	FED.S
YELLOW	7	23785
RED	12	11105
BLACK	28	17038
WHITE	1	17875

GENERAL: Porcelain enamel namplates shall be manufactured in accordance with Porcelain Enamel Institute Standard PEI: S-100, latest revision.

PLATES: 20 gauge enameling grade sheet iron shall be of the dimensions shown in the details above and as indicated in the purchase order. Each plate shall have four holes 3/8" in diameter located as shown in the typical mounting hole arrangement above. The holes shall be drilled or punched before enameling. The four corners of the plates shall be rounded off to 1/2" radius.

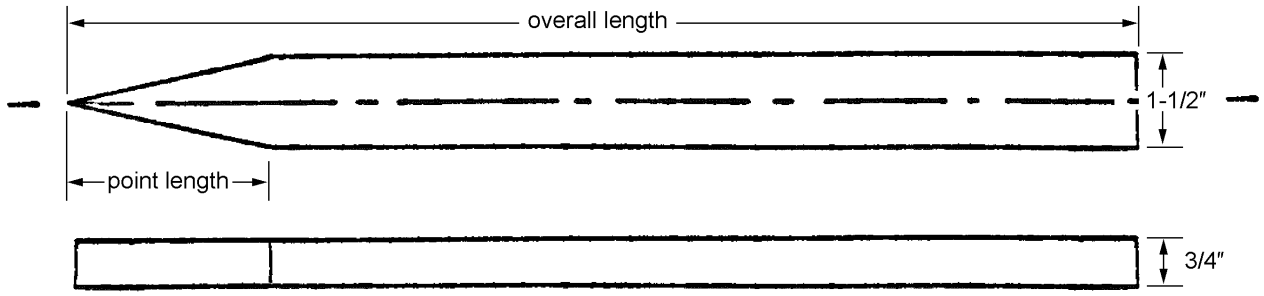
GROMMETS: After enameling, each hole in the plates shall be equipped with a vinyl grommet, Walsco Cat. 7034, or equal, with 1/4" I.D. for 3/8" mounting hole.

LETTERING: Letters and numerals shall be U.S. Bureau of Public Roads Standards, Series "C" and size shown above and as indicated in the purchase order. All lettering, except that of Detail "D" and "F" shall be black on a yellow background. Lettering of Detail "D" and "F" shall be white on a red background.

COLORS: Colors shall be in accordance with Porcelain Enamel Institute color standard PEI: CG-1 and designated: yellow PEI-7, red PEI-12; black PEI-28; white PEI-1.

ORIGINATOR	STANDARDS COORDINATOR	STANDARDS SUPERVISOR	UNIT DIRECTOR
	Charles L. Shaffer	John Simmons	D DeVries

SURVEY STAKES



1. **Survey Stakes** shall be made from No. 1 select Western Redcedar or Douglas-fir. 1-1/2-inch sides shall be suitable for writing. Sound, tight 1-inch or smaller scattered knots are acceptable except in top of stake. Dimensions shall be as shown. Stakes shall have one end pointed to allow stake to be driven into the earth.

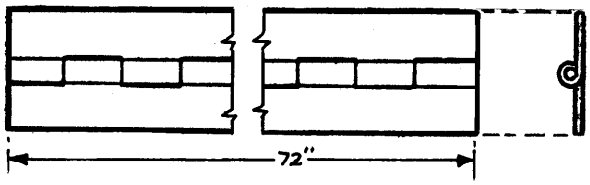
	Size, in			
Stock Number	**Nominal, Side x Side**	**Actual, Side x Side**	**Overall Length**	**Point Length**
721785	1 x 2	3/4 x 1-1/2	18 ± 1/2	5
721782	1 x 2	3/4 x 1-1/2	24 ± 1/2	5

2. **Stock Unit:** EA

standards coordinator	*standards supervisor*	*unit director*
John Shipek	John Barnett	Richard Kent

DATE: Jan. 8, 1964
Rev: May 3, 1973

HINGE
CONTINUOUS, UNDRILLED
STAINLESS STEEL



STAINLESS STEEL, PLAIN, UNDRILLED, CONTINUOUS HINGE for general use, shall be of commercial "18-8" chromium-nickel alloy steel (300 series), with No. 2D finish on both sides.

Pin shall be fast, stainless steel.

Maximum length of joint (loop) shall be one inch.

Purchase Unit: 72-Inch Lengths

Stock Unit: Foot

Stock Number	Open Width In.	Metal Thickness Inc.	Pin Diameter In.
722658	1-1/16	.040 ± .005	.090
722660	2	.062 ± .005	.128

STANDARDS COMMITTEE CHAIRMAN	STANDARDS COORDINATOR	DIVISION HEAD	STEERING COMMITTEE CHAIRMAN
A. McCabe T. N. Carlson	M Ellefson	D. W. Musser	T. A. Gross

Survey and Construction Marking Spray Paint

1. Scope

This standard covers the requirements for water and solvent-based, air-drying paint dispensed in inverted spray cans.

2. Application

Paint shall be suitable for use on soil, grass, gravel, asphalt, concrete, wood, and metal for marking underground facilities, warning of construction site hazards, surveying, and other inverted spray uses.

Solvent-based Stock No. 013005 should be used only in situations where long-lasting durability is required.

Asphalt black, Stock No. 724782, is used to spray over other colors.

3. Requirements

Cans shall be designed for inverted spray application.

Individual cans shall have a nominal net weight of 20 oz consisting of approximately 17 oz of pigment and 2 oz of propellant.

Paint shall be formulated to dry within 15 minutes under normal conditions.

Products shall be hexane-free.

4. Marking

Cases shall be marked with manufacturer's name, product description, color, and Seattle City Light's stock number.

5. Packaging

Paint shall be packaged 12 cans per case.

Individual cases shall contain only paint of the same color.

6. Shipping

Paint shall be shipped in whole cases only.

7. Issuance

Unit: CN

8. References

Shipek, John; SCL Standards Engineer, subject matter expert and originator of 7240.80 (john.shipek@seattle.gov)

Krylon Industrial; www.krylonindustrial.com

Rust-Oleum; www.rustoleum.com

9. Approved Manufacturers

Stock No.	Color	Base	Krylon	Rust-Oleum
724780	APWA brilliant white	Water	03901	–
724786	Fluorescent red	Water	03610	
724779	Fluorescent orange	Water	03700	–
724785	APWA blue	Water	03903	–
724787	APWA brilliant yellow	Water	03801	–
013005	Fluorescent red	Solvent	–	1662838
724782	Asphalt black	Solvent	03550	–

COMPOUND, OXIDE INHIBITING AND LUBRICATING

(No Grit)

Scope: This specification covers an oxide-inhibiting compound free of all abrasive materials for use on aluminum-to-aluminum and aluminum-to-copper flat-to-flat surfaces, such as bus-to-bus and terminal pad-to bus connections.

Network Area: *This is the only recommended flat to flat compound to use in the Network.*

Compound: The compound shall be a petroleum-base compound that acts to dissolve aluminum or copper oxide films, promote low-resistance joints, and seals the contact surfaces against moisture and further oxidation. The compound shall remain stable under the heat-cycling test conditions of EEI publication TJD-162. The dropping point shall not be less than 65^{o} C (150^{o} F) when tested in accordance with ASTM D-566 and shall retain film strength to a minimum of 90^{o} C and (194^{o} F).

Grit: The compound shall **not** contain any metallic, abrasive, or grit particles of any kind.

Packaging: The compound shall be supplied in 8-oz., round or oval, plastic dispensing containers. (Generally packaged with ten 8 oz. containers to a carton.)

Reference Specification: EEI TJD 162, ASTM D-566

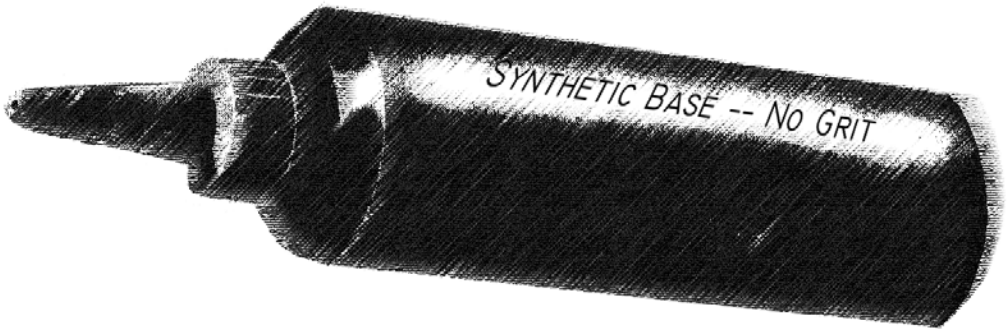
Stock Unit: EA

Stock Number: 726182

Approved Manufacturers: Alcoa - Alcoa No. 2 EJC

ORIGINATOR	STANDARDS COORDINATOR	STANDARDS SUPERVISOR	UNIT DIRECTOR
Jim S. Horn	Charles L. Shaffer	John C. Skinner	Betty Robin

COMPOUND
OXIDE-INHIBITING
SYNTHETIC BASE - NO GRIT



Scope. This specification covers an oxide-inhibiting compound intended to be used on aluminum-to-aluminum and aluminum-to-copper; **cable-to-joint**, **flat-to-flat**, and **sliding surfaces**. The compound shall effectively lower contact resistance, seal out moisture, and be compatible with cable insulations.

Compound Carrier. The compound carrier shall be **synthetic base** (non petroleum) compound that is compatible with rubber, PVC, and polyethylene cable insulations. It shall be nontoxic and shall not harm linemen's leather and rubber goods, and when soiled clothing is laundered, no residual stains shall remain. The carrier shall be insoluble in water and noncorrosive to aluminum, copper, tin, zinc, and silver. It shall effectively seal electrical joints and surfaces against oxidation and corrosion and shall remain stable under the heat cycling test conditions of EEI-NEMA TDJ-162. The maximum pour point (the lowest temperature at which the compound is required to flow) shall be 0^{o} F (-8^{o} C) when tested in accordance with ASTM D-97. The minimum dropping point (the temperature at which the compound passes from a semisolid to a liquid) shall be 350^{o} F (177^{o} C) when tested in accordance with ASTM D566.

Metal Particles. The compound shall **not** contain any conductive or abrasive particles of any kind that may impair or abrade the contact surfaces.

Packaging. The compound shall be supplied in 8* or 10¥ oz. round or oval plastic dispensing containers.

Stock Unit: EA * ¥

Stock Number	Approved Manufacturers			
	Alcoa	**Blackburn**	**Fargo**	**Ilsco**
726181	Alnox-UG¥	Contax CT-B8*	GF-178*	DE-OX*

* Packaged in 8 oz. containers

¥ Packaged in 10 oz. containers

ORIGINATOR	STANDARDS COORDINATOR	STANDARDS SUPERVISOR	UNIT DIRECTOR
Jim S. Horn	Charles L. Shaffer	John C. Skinner	Betty Robin

CLEANER, ELECTRICAL INSULATION (REPLACEMENT FOR 1,1,1-TRICHLOROETHANE)

1. This **Electrical Insulation Cleaner** is intended primarily for cleaning electrical cables in the process of making electrical splices and terminations. It may also be used as a general purpose cleaner/degreaser for cleaning electrical and mechanical parts.

   This cleaning solvent must be a safe to use halogen-free colorless dielectric liquid. This solvent must contain no known ozone-depleting chemicals and not adversely affect the environment. It may contain petroleum distillates. It must effectively remove greases and oils from solid surfaces and be compatible with all plastic and rubber cable insulations. Test reports from manufacturers of underground electrical cable, connectors, and terminators are required.

2. **Dielectric Strength:** When tested by ASTM D877 method (100 mil gap), the cleaner shall show a voltage withstand of at least 35 kV before breakdown.

3. **Toxicity and Combustibility:** This cleaner must contain no suspected carcinogens, teratogens or mutagens. Saturated wipes shall have no flash point and shall be non-flammable. Flash point of liquid products must be 140° F minimum (closed cup method) and boiling point must be 365° F minimum. Products must be classified under the RCRA as “non-hazardous” and must be classified as “non-flammable” or “combustible” by the DOT and OSHA.

4. **Directions:** Clean surfaces per instructions found on product container labels. Wipe surface with dry lint-free wipe after cleaning to speed evaporation. Wiping on top of the semiconducting insulation shield is not recommended.

5. **NOTE:** The products in quart and 5-gallon containers will evaporate much more slowly than 1,1,1-trichloroethane, typically slightly slower than water. However, the products are 100% volatile and will completely dry.

6. **Approved Manufacturers**

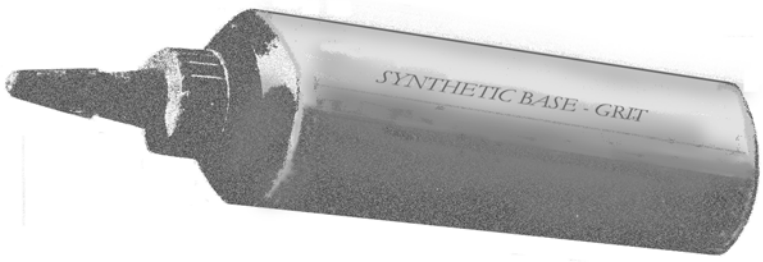
Stock No.	Stock Unit	Packaging	Approved Manufacturers	
			Polywater	PT Technologies “PF”
726157	PK	Saturated 8” x 12” wipe in sealed pouch.	TR-1L	–
726163	EA	1-Quart Bottle	HP-35LF	61432
726158	GL	Pail, 5 Gallon	HP-640	61405

Standards Coordinator
Brett Hanson

Standards Supervisor
John Shipek

Unit Director
Darnell Cola

OXIDE-INHIBITING COMPOUND
SYNTHETIC BASE - WITH GRIT



Scope. A compression joint compound for aluminum cables in aluminum connectors and copper cables in aluminum connectors, which is compatible with cable insulation and effectively lowers contact resistance and seals out moisture.

Compound Carrier. The compound carrier shall be a **synthetic base** (non petroleum) compound that is compatible with rubber, PVC, and polethylene cable insulations. It shall be nontoxic and not harm linemen's leather and rubber goods, and when soiled clothing is laundered, no residual stains shall remain. The carrier shall be insoluble in water and noncorrosive to aluminum or copper. It shall effectively seal electrical joints against oxidation and corrosion and shall remain stable under the heat cycling test conditions of EEI-NEMA TDJ-162. The maximum pour point (the lowest temperature at which the compound is required to flow) shall be -20º F (-29º C). The minimum dropping point (the temperature at which the compound passes from a semisolid to a liquid) shall be 500º F (260º C). The pour point and the dropping point shall be determined in accordance with ASTM D-97 and D-566.

Metal Particles: The compound shall contain **conductive metal particles**, harder than aluminum (zinc, stainless steel, or nickel), whose function is to break through the oxide film on the contact surfaces, provide greater current-carry "bridges" and aid gripping of the conductor for better mechanical integrity.

Packaging: 8-ounce round or oval plastic dispensing containers. City Light would prefer (not require) that the inside diameter of the neck of the container, with the cap removed, be approximately 1-1/4" so that the container will slide over 750 kcmil cable.

Stock Unit: EA

Stock Number	Approved Manufacturers		
	Burndy	Somerset (Homac)	Mac Products
726180	PENA13-8	M-56	Mactex-HV

ORIGINATOR	STANDARDS COORDINATOR	STANDARDS SUPERVISOR	UNIT DIRECTOR
Jim S. Horn	Charles L. Shaffer	John C. Skinner	Haedee Jay

LUBRICANT, CABLE-PULLING

1. **General:** Cable-pulling lubricant is used to provide maximum tension reduction in high stress electrical and communications cable pulling operations. It shall be polymer/water-based and have the consistency of a gel, except that the pourable version shall be a gel with a lower viscosity making it easy to pour or pump.

2. **Compatibility with Cable and Conduit:** It must have no effect on any type of cable insulation or jacket, including rubber, neoprene, lead, PVC, nylon, and polyethylene, including cross-linked polyethylene (XLP) and low density polyethylene (LDPE). Product must have been tested for effect on cable tensile strength after immersion.

   It must have no effect on semiconducting cable jackets or shields. Product must have been tested for resistance levels in accordance with ICEA T-25-425, NEMA WC 5, and NEMA WC 7.

   It must not cause stress cracking of polyethylene. Product must have been tested in accordance with ASTM D 1693.

   Product must have been tested and approved by a number of major cable manufacturers for compatibility with insulation and semiconducting jackets. Test reports are required. Product must be UL listed as a wire pulling compound.

   It shall have no adverse effects on hardware or any conduit, including steel, galvanized steel, aluminum, copper, PVC, and ABS.

3. **Properties:** It must have no significant soap, free alkali, or free acid content. The pH must be within the range of 5.0 to 8.5. The product may leave a slippery film but must not cause any locking or cementing of cable to conduit. Product must be suitable for a temperature range of 28° F to 110° F during application.

4. **Safety:** It must be non-toxic. It shall have no more than a mild, inoffensive odor. It shall be noninjurious to skin and to rubber or leather gloves. It shall not stain clothing nor, when dried on clothing, leave any residue that may appear offensive to personnel. It shall be easily cleaned from clothing with soap and water. It shall be non-flammable and non-combustible.

5. **Markings:** Each container shall bear the manufacturer's brand name.

6. **Reference Standards:** ICEA T-25-425; NEMA WC 5; WC 7; ASTM D 1693; latest revisions.

7. **Approved Manufacturers**

			Approved Manufacturers		
Stock Number	**Stock Unit**	**Description and Packaging**	**Ideal Aqua-Gel II**	**Polywater J**	**PT Technologies HD**
726223	BG	plastic bags designed for 3″ and larger conduit; 64 oz. each.	31-377	J-55	61110
726225	GL	plastic 1 gallon buckets.	31-371	J-128	61101
726226	GL	pourable version, plastic 1 gallon jugs	31-421	PJ-128	61601
726227	PL	pourable version, plastic 5 gallon pails	31-425	PJ-640	61100

STANDARDS COORDINATOR	STANDARDS SUPERVISOR	UNIT DIRECTOR
Charles L. Shaffer	John C. Skinner	Haedee Jay

ABSORBENT MATERIAL
OIL AND WATER (FOR FLOORS AND DECKS)

Oil and Water Absorbent Material, for use on floors, shall be a silicate-type mixture free of organic and foreign matter, and shall meet the requirements of Federal Specification P-A-1056A.

Purchase Unit: 50-lb. bag, maximum

Reference Specification: Federal Specification P-A-1056A, latest revision.

Stock Unit: LB

Stock Number: 726332

ORIGINATOR	STANDARDS COORDINATOR	STANDARDS SUPERVISOR	UNIT DIRECTOR
Jim S. Horn	Charles L. Shaffer	John C. Skinner	Betty Robin

SULFUR HEXAFLUORIDE

1. Scope

This specification applies to sulfur hexafluoride for use as an electrical insulating gas.

2. Applicable Documents

ASTM Standards:

D1070	Test Methods for Specific Gravity (Relative Density) of Gaseous Fuels
D2029	Test Methods for Water Vapor Content of Electrical Insulating Gases by Measurement of Dew Point
D2284	Test Method for Acidity of Sulfur Hexafluoride
D2472	Standard Specification for Sulfur Hexafluoride
D2685	Test Method for Nitrogen and Carbon Tetrafluoride in Sulfur Hexafluoride by Gas Chromatography

3. Detail Requirements

Sulfur Hexafluoride for use as an electrical insulation material shall conform to the requirements prescribed in Table 1.

4. Sampling

All sampling for the test methods listed in Section 5 shall be with the cylinder inverted; that is, the cylinder valve shall be lower than any other portion of the cylinder. This will allow liquid phase delivery from the cylinder.

5. Test Methods

5.1 Water Content - Test Method D2029.

5.2 Hydrolyzable Fluorides - Determine the acidity, expressed as HF, in accordance with Test Method D2284.

5.3 Air - Determine the amount of noncondensable gases, expressed as nitrogen, by gas chromatographic analysis in accordance with Test Method D2685.

5.4 Carbon Tetrafluoride - Gas chromatographic analysis in accordance with Test Method D2685

5.5 Molecular Weight - Test Method D1070.

5.6 Toxicity - The Underwriters' Laboratories criterion for acceptance in Group VI as follows: Guinea pigs should not appear to have injury when exposed for 2 hours to a gas concentration of 20% volume in air.

5.7 Assay - Assay shall be by difference, after impurity content has been determined.

standards coordinator	*standards supervisor*	*unit director*
John Shipek	John Shipek	Darnell Cola

TABLE 1

Detail Requirements for Sulfur Hexafluoride

Requirements	Property
Water Content, maximum dew point, degrees Centigrade*.	– 65º C (– 85º F)
Hydrolyzable fluorides, expressed as HF acidity, maximum parts per million (ppm) by weight.	0.3 ppm
Air, expressed as N_2, maximum, weight percent.	0.05%
Carbon tetrafluoride, maximum, weight percent.	0.05%
Molecular Weight	146 ± 2%
Toxicity	The manufacturer shall certify that the material is at least as nontoxic as Group VI of the Underwriters' Laboratories classification.
Assay, minimum, weight percent.	99.9%

* Corresponds to a maximum water content of 0.65 ppm by weight or 5.3 ppm by volume.

Stock Unit: not stocked, order from vendor

SEATTLE CITY LIGHT

MATERIAL STANDARD

STANDARD NUMBER: **7268.1**

PAGE: 1 of 1

DATE: July 17, 1963

REV: February 5, 2004

BAGS, HEAVY DUTY PAPER

Paper Bags: shall be fabricated from rosin-sized paper of 100% unbleached sulfate (Kraft) fibers.

Packing: Paper bags shall be packaged in accordance with the table below.

Stock Unit: EA

Stock No.	Bag No.	Approximate Dimensions, Inches			Basis Weight, Lbs.	Bail Quantity	Bail Weight, Lbs.	Approved Manufacturers	
		Face	Bottom	Length				Duro	Weyerhauser
726810	2	4-1/16	2-1/2	8-1/4	50	3000	51	80005	
726818	6	6	3-5/8	11	50	1000	36	80010	Order by
726828	16	7-3/4	4-7/8	15-3/4	60	500	35	80960	Description
726832	625	8-3/8	6-1/8	15-3/4	60	500	41	–	
726834	86	12	7	17	75	400	62	80080	

ORIGINATOR	STANDARDS COORDINATOR	STANDARDS SUPERVISOR	UNIT DIRECTOR

ROPE, SYNTHETIC FIBER

Scope: This specification covers heavy-duty synthetic fiber rope, to be used for pulling lines, hand lines, bull lines, capstan work for stringing conductor, hoisting transformers, and general purpose, heavy-duty utility work.

Description:

1. Three-strand, twisted, standard right-hand lay.
2. The rope shall be made of a combination of monofilament and multifilament polyester (polyethylene terephthalate), and polyethylene and polypropylene (olefins) fibers.
3. The basic color of the rope shall be white (except 1/4" barrier tope 727230).

Characteristics: The rope shall have good abrasion resistance, high dielectric strength, a low-moisture absorption rate, and be impervious to rot, mold, mildew, and fungus growth. The rope shall also be inert to most chemicals, including acids, alkalies, and organic solvents.

Packaging: The rope shall be put up on reels with a minimum of 1,200 feet unless otherwise specified on the purchase order. Each length shall be continuous throughout, containing no splices, hockles, kinks, or loose ends. The ends of the rope shall be secured to prevent fraying or unlaying of the strands.

Specification:

Stock Number	Rope Dim. (Approx.)		Lbs. Per 100 Feet **Density	Avg. Break Strength, Lbs.	Recommended Working Load, Lbs.	Lay
	Dia., In.	Circ., In.				
727230*	1/4	3/4	1.2	1050	105	–
727232	7/16	1-1/4	4.9	3900	390	Medium
727233	1/2	1-1/2	7.5	5400	600	Medium
727234	3/4	2-1/4	13.2	9800	1400	Firm
727239	1	3	24.2	17000	2428	Firm

* Stk. No. 727230 - 1/4" barrier rope **shall be yellow with one strand of black** and may be monofilament polypropylene.

** A specification sheet indicating all of the above specifications, or a letter of compliance to the above specifications, and a description of the makeup of the rope; i.e., polyester, polypropylene, or polyethylene fiber construction shall accompany each bid. At time of receipt, acceptance of material shall be subject to verification of compliance to the pounds-per-100-feet requirement. Material found to be less than 95% of the table value shall be rejected and replaced at no cost to Seattle City Light.

Stock Unit: FT

Approved Manufacturers:

Bevis	Continental Western (Stock No. 727230 only, part no. 301015)
The Cordage Group	Jackson
Tubbs	U.S. Rope
Wall	Wellington Puritan, Inc.

ORIGINATOR	STANDARDS COORDINATOR	STANDARDS SUPERVISOR	UNIT DIRECTOR
Jim S. Horn	Charles L. Shaffer	John C. Skinner	Harold Jay

Steel Alloy Chain, Grade 100

1. Scope

This standard covers Grade 100, heat-treated, alloy steel chain.

This standard applies to the following stock numbers:

Stock No	Size, nominal (in)	Working Load Limit (lb)
726918	9/32	4300
726934	3/8	8800

2. Application

Steel alloy chain is used for applications such as slings and lifting assemblies. It is not appropriate for continuous motion applications.

Stock No. 726934 must be cut by the Steel Shop. Please notify the warehouse at least two hours prior.

3. Industry Standards

Steel alloy chain shall meet the requirements of the following industry standard:

ASTM A973/A973M; Standard Specification for Grade 100 Alloy Steel Chain; 2007 (reapproved 2012)

4. Requirements

Steel alloy chain shall conform to the requirements described in Table 4.

The diameter of the material from which the chain is manufactured shall not be smaller than the material diameter listed in Table 4 within -3% tolerance.

Table 4. Requirements for Steel Alloy Chain, Grade 100

Stock No.	Chain Size, Nominal (in)	Material Diameter (in)	Working Load Limit (lb)	Proof Test (lb)	Minimum Breaking Force (lb)	Maximum Inside Length (in)	Inside Width Range (in)
726918	9/32	0.276	4300	8600	17,200	0.9	0.375 to 0.430
726934	3/8	0.394	8800	17,600	35,200	1.26	0.512 to 0.600

5. Finish

The manufacturers applied surface treatment or finish shall not alter the chain properties so that it causes the chain to fall out of compliance with the provisions of the standard.

The chain shall be free of paint and other coatings that could mask surface anomalies.

6. Mechanical Testing

6.1 Proof Test

All chain shall be tested to the load requirements described in Table 4. When tested, the chain shall withstand the load without loss of integrity. Chain links that are not able to withstand the load requirements shall be removed from the chain.

6.2 Breaking Force Test

The test link shall be from a length of the lot that contains the least number of links. Chain shall be quenched and tempered before measuring the breaking strength. The results shall meet or exceed the minimum breaking force values detailed in ASTM A973/A973M and this standard. Elongation shall be a minimum of 20%.

7. Certification

Upon purchaser's request, manufacturer shall:

- Provide certification that the chain conforms to ordered specifications, including year of issue.
- Supply a certificate of proof test to purchaser or purchaser's representative.

8. Product Marking

Chain links shall not be marked with indented characters. Chain links shall be marked at intervals not greater than 3 ft. The marking shall include a grade indicator, manufacturer's mark or symbol, and traceability code or date code.

9. Packaging

Chain shall be packaged in a manner that prevents damage during shipping, handling and long-term storage. Units shall be marked with an SCL purchase order number and stock number.

10. Issuance

100-ft lengths

11. Approved Manufacturers

Stock No.	Size	Gunnebo Johnson	Campbell
726918	9/32	KLB-7-10	405212
726934[1]	3/8	KLA-10-10	KLB-10-10

Note 1. Stock No. 726934 must be cut by the Steel Shop. Please notify the Warehouse at least 2 hours prior.

12. Sources

Tilley, Kathy; SCL Electrical Engineering Support Specialist and originator of 7273.10 (kathy.tilley@seattle.gov)

GASKET MATERIAL
CORK AND SYNTHETIC (BUNA N) RUBBER COMPOSITION

Scope. Cork and synthetic rubber composition gasket material is intended for general purpose gasketing of oil-filled electrical equipment. Cork and synthetic rubber materials provide a transition from the compressibility of cork composition to the non-compressibility of synthetic rubber. This material will compress 25% to 35% at 400 psi without excessive side flow and shall be 60% synthetic rubber and 40% cork.

Material. The gasket material shall meet the requirements of ASTM Specification D 1170 (F 104), Type 2, Identification No. P2245A. The granulated cork shall be fine grain. It shall pass through a No. 20 sieve, and shall be retained on a No. 40 sieve.

Reference Specification: ASTM D 1170, (F 104) latest revision
Purchase Unit: 36" x 36"

Stock Number	Thick. In.	Stock Unit	Approved Manufacturers				
			Armstrong	Dutch Brand	Hercules	Global Tech.	Southland Cork
727686	1/8	Sheet	NC-710	NF 716	547	HC-60	SC-92
727687	3/16	Sheet	NC-710	NF 716	547	HC-60	SC-92
727714*	1/4	Roll				HC-60	
727696	3/8	Sheet	NC710	NF716		HC-60	SC-92

* to be purchased in width of 40" +/- 1/4". Stock Unit: Roll

SYNTHETIC NITRILE (BUNA N) RUBBER
(Special Purpose)

Scope. Synthetic rubber gasket material is intended for special-purpose gasketing of oil-filled electrical equipment, such as high-voltage bushing assemblies. It is especially well adapted where its property of extensibility allows it to flow into threads or recesses. To effect a seal, minimum flange loads of 500 psi should be available. As a general rule, it is best not to deflect synthetic rubber more than 20%.

Material. The material shall meet the requirements of SAE-ASTM Specification D 735 for Type S, Class SB, Grade SB715 synthetic rubber material.

Reference Specification: SAE-ASTM D 735, latest revision
Purchase Unit: 36" x 36" Sheet, or 36" Width Roll, Approx. 185 Lbs.
Stock Unit: Sheet

Stock Number	Thick. In.	Approved Manufacturers
		A.B. Boyd Co.
727706	1/16	AB-SB 715E3F
727708	1/8	AB-SB 715E3F
727710	3/16	AB-SB 715E3F
727712	1/4	AB-SB 715E3F

Notes:
1. All products are to be marked with CURE DATE AND MANUFACTURER NAME
2. The manufacturer's catalog numbers listed are for reference only, and are not intended to indicate compliance with this specification.

ORIGINATOR	STANDARDS COORDINATOR	STANDARDS SUPERVISOR	UNIT DIRECTOR
Jim S. Horn	Charles L. Shaffer	John C. Skinner	Betty Robin

Fluorescent Lamps

1. Scope

This standard covers the requirements for medium bi-pin, aluminum-base, fluorescent lamps.

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

Stock No.	Size	Watts	Color	Length (in)
730332	T12	34	Spec 41	48
730349	T12	34	Cool white	48
730348	T12	34	Warm white	48
730345	T12	60	Cool white	96
730344	T12	75	Spec 41	96
730350	T12	95	Cool white	96
730347	T12	110	Cool white	96
730346	T12	215	Cool white	96
013554	T8	32	Cool white	48

2. Application

Fluorescent lamps are for installation in medium bi-pin fixtures. Lamps have no restriction on operating position.

3. Compliance

Lamps shall be compliant with the EPA Toxicity Characteristic Leaching Procedure (TCLP) test specified in the Resource Conservation and Recovery Act (RCRA) of 1990, except for 215-watt size.

4. General Requirements

Lamp shape shall be T12 or T8, as specified in this standard.

Lamp base shall be aluminum.

Lamp average rated life shall be defined as the total operational hours at which 50% of any group of lamps is still operating. The average life of a lamp shall be based on vertical operation (unless otherwise noted) of representative lamps operated under controlled conditions of up to 15 hours per start.

5. Detailed Requirements

5.1 Fluorescent Tubes – T12

Stock No.	Watts	Starting	Color	Length (in)	Package Quantity	Average Rated Life (hrs)
730332	34	Rapid start	Specification 41	48	30	20,000
730349	34	Rapid start	Cool white	48	30	20,000
730348	34	Rapid start	Warm white	48	30	20,000
730345	60	Instant start	Cool white	96	15	12,000
730344	75	Instant start	Specification 41	96	15	12,000
730350	95	Rapid start	Cool white	96	15	12,000
730347	110	Rapid start	Cool white	96	15	12,000
730346	215	Rapid start	Cool white	96	15	As noted

5.2 Fluorescent Tubes – T8

Stock No.	Watts	Starting	Color	Length (in)	Package Quantity	Average Rated Life (hrs)
013554	32	Rapid start	Cool white	48	30	30,000

6. Packaging

Lamps shall be packaged to prevent damage during shipping, storage, and casual handling prior to installation. Quantity of lamps per shipping carton shall as specified in Section 5.

7. Issuance

EA

8. Approved Manufacturers

8.1 Fluorescent Tubes – T12

Stock No.	**730332**
GE	
Order Code:	23166
Description:	F34/SP41/RS/WM/ECO
Osram Sylvania	
Product No.:	24542
Ordering Abbreviation:	F34/D41/SS/ECO
Philips	
Product No.:	046677-42388-9
Ordering Code:	F40T12/CWSUPREME/ALTO
Product No.:	046677-424400-2
Ordering Code:	F40T12/CWSUPREME/ALTO TG

Stock No.	**730349**
GE	
Order Code:	23010
Description:	F34/CW/RS/WM/ECO
Osram Sylvania	
Product No.:	24596
Ordering Abbreviation:	F34CW/SS/ECO
Philips	
Product No.:	046677-24470-7
Ordering Code:	F34/CW/RS/EW/ALTO

Stock No.	**730348**
GE	
Order Code:	45065
Description:	F34/WW/RS/WM/ECO
Osram Sylvania	
Product No.:	24538
Ordering Abbreviation:	F34WW/SS/ECO
Philips	
Product No.:	046677-25686-7
Ordering Code:	F34/WW/RS/EW/ALTO

Stock No.	**730345**
GE	
Order Code:	27186
Description:	F96T12/CW/WM/ECO
Osram Sylvania	
Product No.:	29505
Ordering Abbreviation:	F96T12/CW/SS/ECO
Philips	
Product No.:	046677-25840-0
Ordering Code:	F96T12/CW/EW/ALTO

Stock No.	**730344**
GE	
Order Code:	–
Description:	–
Osram Sylvania	
Product No.:	29798
Ordering Abbreviation:	F96T12/D41/ECO
Philips	
Product No.:	046677-36650-0
Ordering Code:	F96T12841-ALTO

Stock No.	**730350**
GE	
Order Code:	–
Description:	–
Osram Sylvania	
Product No.:	25001
Ordering Abbreviation:	F96T12/CW/HO/SS/ECO
Philips	
Product No.:	046677-26660-1
Ordering Code:	F96T12/CW/HO/EW/ALTO

Stock No.	**730347**
GE	
Order Code:	–
Description:	–
Osram Sylvania	
Product No.:	25129
Ordering Abbreviation:	F96T12/CW/HO/CT/ECO
Philips	
Product No.:	046677-38176-4
Ordering Code:	F96T12/CW/HO-O/ALTO

Stock No.	**730346**
GE	
Order Code:	13781
Description:	F96T12/CW/1500 (10,000 hr)
Osram Sylvania	
Product No.:	25209
Ordering Abbreviation:	F96T12/CW/VHO (10,000 hr)
Philips	
Product No.:	046677-34234-5
Ordering Code:	F96T12/CW/VHO (12,000 hr)

8.2 Fluorescent Tubes – T8

Stock No.	**013554**
GE	
Order Code:	25613
Description:	F32T8/SPX41/ECO
Osram Sylvania	
Product No.:	21781
Ordering Abbreviation:	FO32/841/ECL
Philips	
Product No.:	046677-24671-0
Ordering Code:	F32T8/TL841/ALTO

9. References

SCL Material Standard 7303.0; “Fluorescent Lamps” (canceled)

10. Sources

Chao, Yaochiem; SCL Standards Engineer, originator and subject matter expert for 7303.01; (yaochiem.chao@seattle.gov)

Lamps, Compact Fluorescent, 68 W

1. Scope

This standard covers the requirements for 68 W, compact fluorescent lamps. Lamps of this design are also known as one-piece spring lamps.

This standard applies to Seattle City Light (SCL) Stock No. 013462.

2. Application

Compact fluorescent lamps are used for lighting in-building vaults. This lamp is a highly efficient alternative to 300 W, incandescent lamps, Stock No. 730630.

While compact fluorescent lamps may be installed in most circuits designed for incandescent lamps, the reverse is not true. Before exchanging lamps in an existing circuit, verify the wiring and the transformer is appropriately sized for the load.

Compact fluorescent lamps are for use in dry locations only and should not be used with dimmers.

Lamps contain mercury. Dispose of properly.

3. Industry Standards

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

ANSI C78.20-2003 – American National Standard for Electric Lamps – A, G, PS, and Similar Shapes with E26 Medium Screw Bases

4. Requirements

Lamps shall meet the applicable requirements of ANSI C78.20 and this material standard with the following clarifications:

- Lamp shall be capable of operation in all positions
- Lamp shall be self-ballasted
- Lamp shall be UL listed.

Table 4. 68W Fluorescent Lamp Requirements

On state power consumption	68 W
Incandescent equivalent	300 W
Input line voltage	120 VAC
Initial	4200 lumens
Correlated Color Temperature (CCT), nominal	5100 °K
Color rendering index (CRI), minimum	82
MOL/height	9.5 in
Diameter/width	4.1 in
Base type	E26 medium screw
Base material	Brass
Starting temperature, minimum	-10 C / 14 F
Power factor	> .50
Total harmonic distortion (THD)	< 150%
Life, nominal	10,000 hours

5. Marking

Each lamp shall be marked with:

- Manufacturer's name
- Manufacturer's part number
- Rated voltage
- Rated wattage
- UL listing.

6. Packaging

Each lamp shall be individually packaged to prevent damage during shipping, handling and storage.

Lamps shall be packaged six per case.

Shipping containers shall be marked with:

- Seattle City Light purchase order number
- Seattle City Light stock number.

7. Issuance

EA

8. Approved Manufacturer

Stock No.	Technical Consumer Products, Inc.
013462	28968-51K

9. References

Shipek, John; SCL Standards Engineer and originator of 7303.68

Technical Consumer Products, Inc.

Service Entrance Caps, PVC

1. Scope

This standard covers the requirements for extruded threadless rigid PVC (poly vinyl chloride) service entrance caps.

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

Stock No.	Conduit Trade Size, IPS (in)
013570	1/2
013571	3/4
013572	1
013573	1-1/4
013574	1-1/2
013575	2
013576	2-1/2
013577	3
013578	3-1/2
013579	4

2. Application

PVC service entrance caps are used as a weatherproof service drop entrance point where overhead power cable enters a building. Caps are suitable for both overhead and underground secondary service lateral, where cable transitions between overhead and underground.

PVC service entrance caps are only used for low voltages (up to 600 volts). These caps are threadless, and attach to the PVC riser with adhesive.

PVC service entrance caps replace aluminum service entrance caps. The PVC version allows for ease of service cable installation as well as to reduce scarring of the cable jacket.

3. Industry Standards

PVC service entrance caps shall meet the requirements of the following industry standards:

UL 514B – Fittings for Cable and Conduit, 6th Edition, July 2012

NEMA TC-3 - Polyvinyl Chloride (PVC) Fittings for Use with Rigid PVC Conduit and Tubing, 2013

4. General Requirements

PVC service entrance caps shall:

- Be suitable for above ground use indoors or outdoors exposed to sunlight and weather.
- Fit conduit and fitting dimensions conforming to UL 651 and the Iron Pipe Standard (IPS), where dimensions are based on outside diameters of iron pipe sizes.
- Be medium to dark gray in color.
- Not have any features that can abrade or otherwise damage cable.
- Be certified by Underwriters Laboratories or one of the following NRTLs (Nationally Recognized Testing Laboratories) as meeting the minimum requirements of Standard UL 514B:
  - CSA (Canadian Standards Association)
  - ETL (Electrical Testing Labs)
  - NSF (National Sanitation Foundation) International.
- Meet the performance requirements as described in Table 4.

Table 4. Conduit Performance Requirements

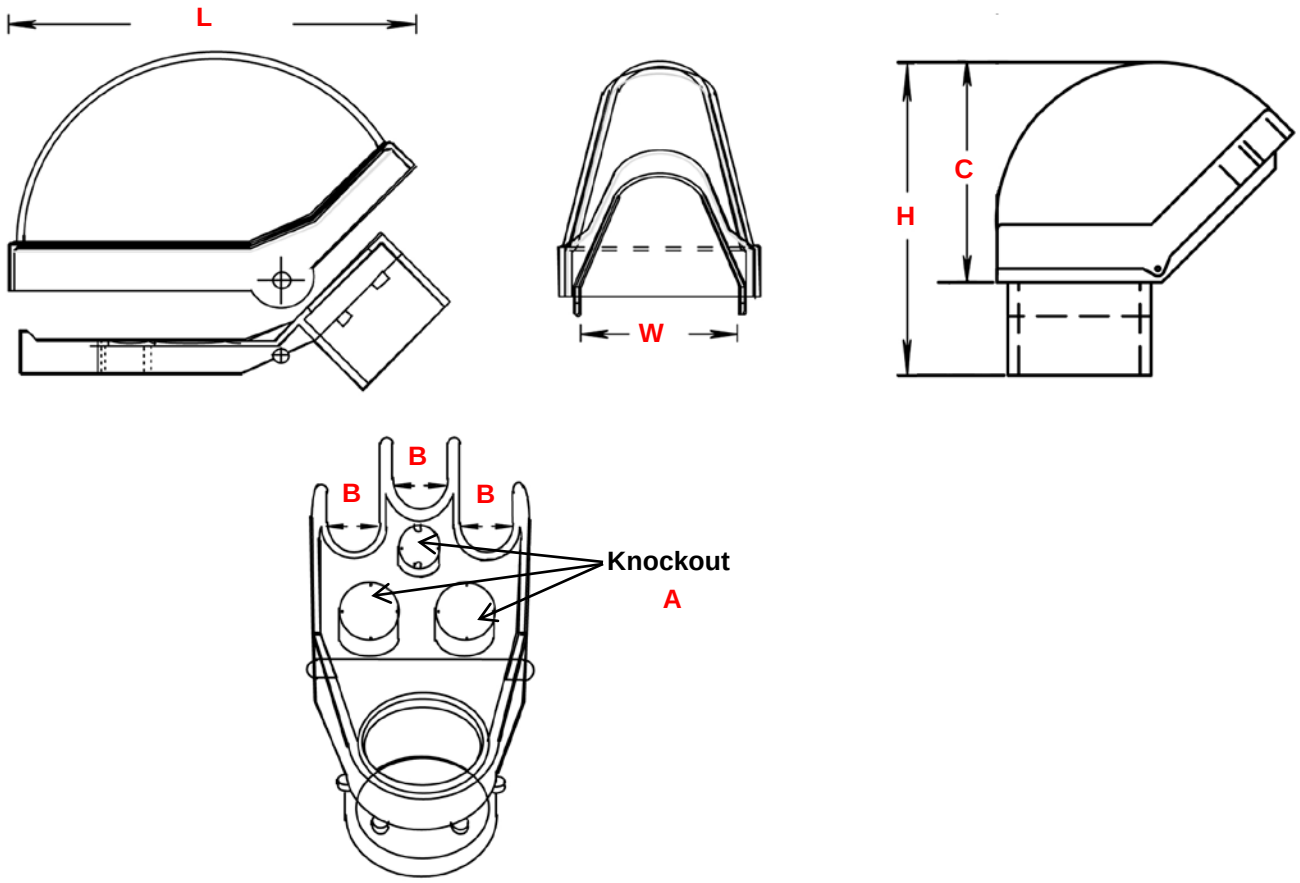
Description	UL 514B Section
Water absorption	91
Flame	92
Extrusion or Molding process	94
Identification	95
Resistance to crushing	96
Low temperature handling	97
Ultraviolet-Light and Water	101.2
Aging	101.3
Resistance to impact	101.4
Impact after Cold Conditioning	101.5
Heat distortion	101.6
Pull	101.7
Wet location	39
Marking	102

5. Detailed Requirements

Table 5. Service Entrance Cap Dimension, Nominal

Stock No.	Conduit Trade Size, IPS (in)	L Length (in)	W Width (in)	C Cap Height (in)	H Overall Height (in)	A Knockout diam. (in)	B Fork (in)
013570	1/2	3	2	2	2.75	0.45	0.45
013571	3/4	3	2	2	2.75	0.45	0.45
013572	1	3.5	2.5	2.5	3.25	0.6	0.6
013573	1-1/4	5	3.5	4	5	0.75	0.75
013574	1-1/2	6.5	3.5	4	5	0.8	0.75
013575	2	6.5	4.25	4.5	6	0.8	0.85
013576	2-1/2	12.25	7.5	7.25	9	1.25	1.75
013577	3	12.25	7.5	7	9	1.25	1.75
013578	3-1/2	12.25	7.5	8	11	1.25	1.75
013579	4	16	11	10.5	12.5	1.25	1.55

Figure 5. Service Entrance Cap



6. Marking

Each conduit section shall be marked according to the requirements of UL 514B, Section 102.

The outer surface of each fitting shall be marked with the following minimum information:

- Manufacturer's name or symbol
- Catalog number
- Trade size.

7. Testing

PVC service entrance cap test data that establishes compliance with the requirements of UL 514B and this material standard shall be provided upon request.

8. Packaging

PVC service entrance caps shall be packaged to prevent damage during shipping, handling and storage.

Each carton shall be legibly marked with the following information:

- Manufacturer's identification
- Product description
- Manufacturer’s catalog number
- Quantity.

9. Issuance

EA

10. Approved Manufacturers

		Approved Manufacturers			
Stock No.	**Trade Size, IPS (in)**	**Carlon (Thomas & Betts)**	**Kraloy (IPEX)**	**Cantex (Mitsubushi Corp.)**	**Royal Pipe Systems**
013570	1/2	E988D	MH05	5133590	E025050
013571	3/4	E998E	MH07	5133591	E025075
013572	1	E998F	MH10	5133741	E025100
013573	1-1/4	E998G	MH12	5133742	E025125
013574	1-1/2	E998H	MH15	5133695	E025150
013575	2	E998J	MH20	5133743	E025200
013576	2-1/2	E998K-UPC	MH25	5133696	E025250
013577	3	E998L	MH30	5133697	E025300
013578	3-1/2	--	MH35	5133698	E025350
013579	4	E998N	MH40	5133699	E025400

11. References

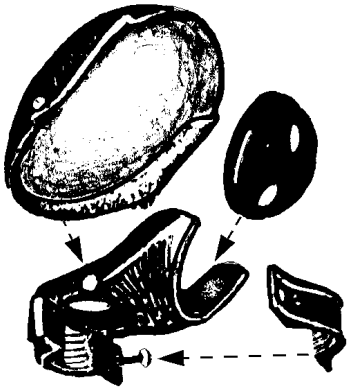
SCL Material Standard 7015.05; “Schedule 40 PVC Conduit and Fittings”

SCL Material Standard 7020.05; “Schedule 80 PVC”

12. Sources

Wang, Quan; SCL Standards Engineer, subject matter expert and originator of 7314.15 (quan.wang@seattle.gov)

CAPS
SERVICE ENTRANCE

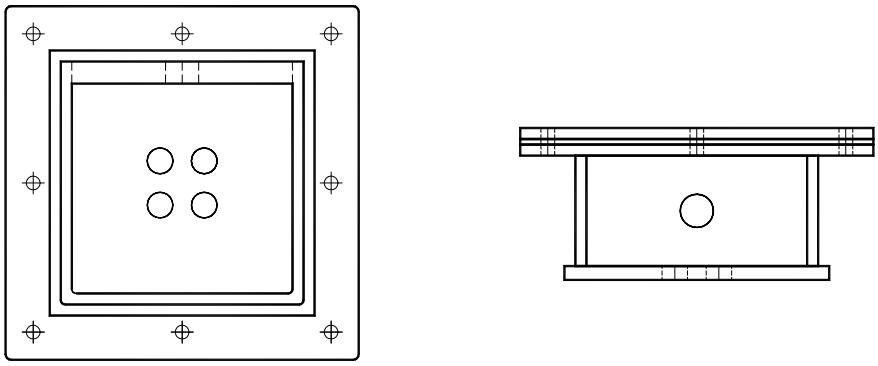


1. **Threadless Universal Service Entrance Caps** shall be of the configuration shown and shall be designed for installation in either horizontal or vertical position.
2. **Body:** The bodies shall be made of high-strength cast aluminum alloy.
3. **Wire Insulator:** The wire insulator shall be high-impact, phenolic resin or other suitable high-strength insulating material.
4. **Screws** shall be stainless steel or cadmium-plated steel.
5. **Stock Unit:** EA

		Approved Manufacturers	
Stock Number	**Conduit Size, in.**	**Bridgeport**	**Steel City**
731425	1/2	1251	SH-101
731426	3/4	1252	SH-102
731427	1	1253	SH-103
731428	1 - 1/4	1254	SH-104
731429	1 - 1/2	1255	SH-105
731430	2	1256	SH-106
731431	2 - 1/2	1257	SH-107
731432	3	1258	SH-108
731433	3 - 1/2	1259	SH-109
731434	4	1260	SH-110

STANDARDS COORDINATOR	STANDARDS SUPERVISOR	UNIT DIRECTOR
Charles L. Shaffer	John C. Kimmes	Harold Jay

JUNCTION BOX FOR NETWORK PROTECTOR FIRE PROTECTION RETROFIT



BILL OF MATERIALS

Quantity	Description	Size & Details
1	U FRAME	1/4" FB x 2-1/2" x 16". Bend up in to "U" with 5" inside dimension.
1	U FRAME TOP	1/2" FB x 2-1/2" x 5". Drill & tap 3/4" N.P.T. in center. Large end of taper to be OUTSIDE box when assembled.
1	BACK	5/16" FB x 6" x 6". Drill & tap 4 – 3/8-18 N.P.T. Large end of taper to be INSIDE box when assembled.
1	FRONT FLANGE	1/4" Plate x 8" x 8" with 4-3/4" x 5" cutout. Drill 8 - 5/16" holes.
1	FRONT COVER	1/4" Plate x 8" x 8". Drill 8 – 5/16" holes.
1	GASKET	"Cork-prene", Stock No. 727686, 1/8" x 8" x 8". Punch 8 – 5/16" holes.

Box must be waterproof when completed (except for the five tapped holes).

1. Bend **U FRAME** up in to "U" with 5" inside dimension.
2. **U FRAME TOP**: Drill & tap 3/4"-14 N.P.T. in center. Large end of taper to be OUTSIDE box when assembled.
3. **BACK**: Drill & tap 4 –3/8"-18 N.P.T. Large end of taper to be INSIDE box when assembled.
4. Weld U Frame to back and weld U Frame Top to back and to U Frame.
5. **FRONT FLANGE**: Make 4-3/4" x 5" cutout. Drill 8 - 5/16" holes. Weld to U Frame & U Frame Top.
6. **FRONT COVER**: Drill 8 – 5/16" holes.
7. Cut **GASKET** and make 8 – 5/16" holes.

Exact sequence of operations performed to be determined by Shop Personnel.

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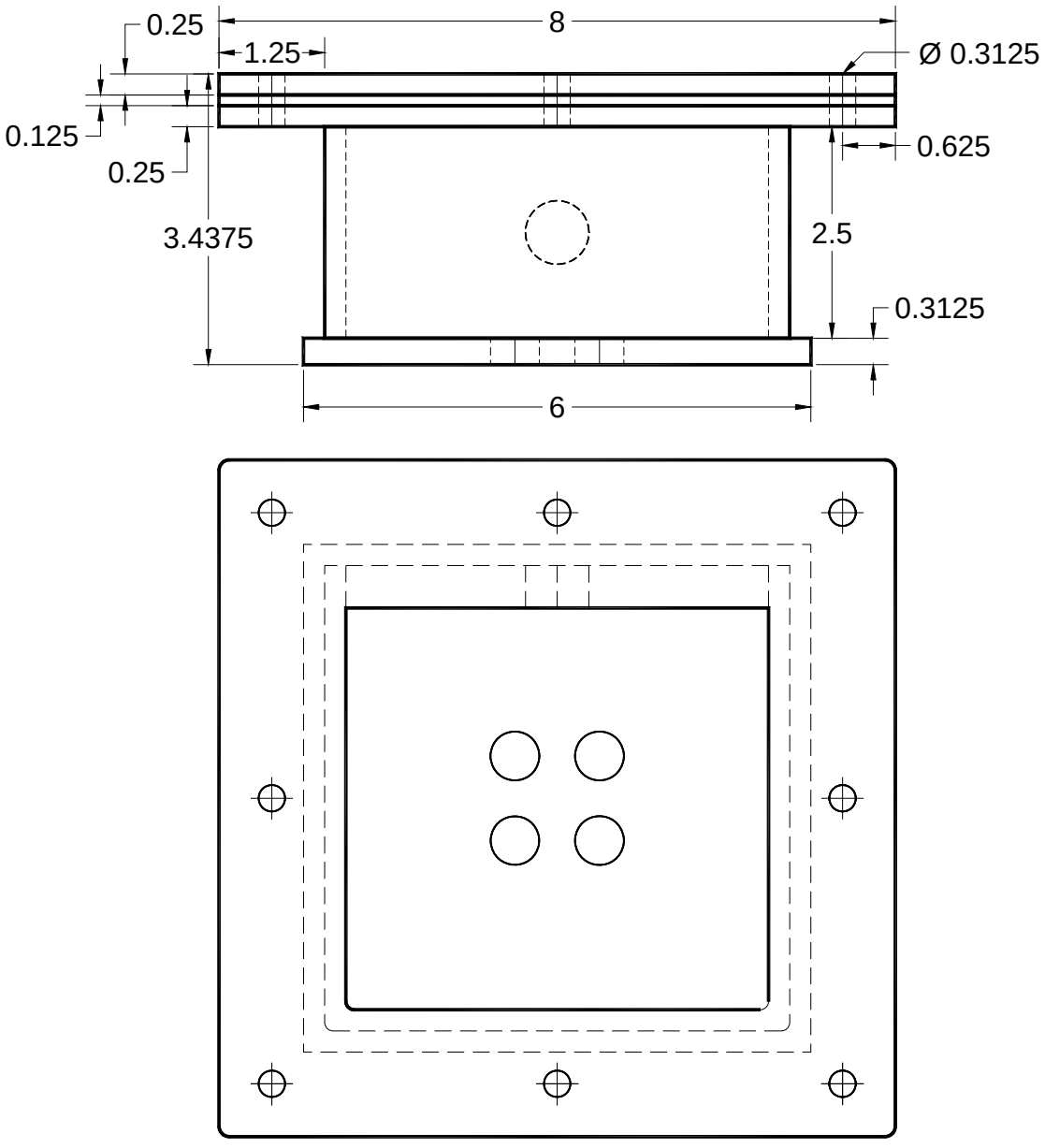
Jim S. Horn	Charles L. Shaffer	John C. Skinner	Betty Robinson

JUNCTION BOX FOR NETWORK PROTECTOR FIRE PROTECTION RETROFIT

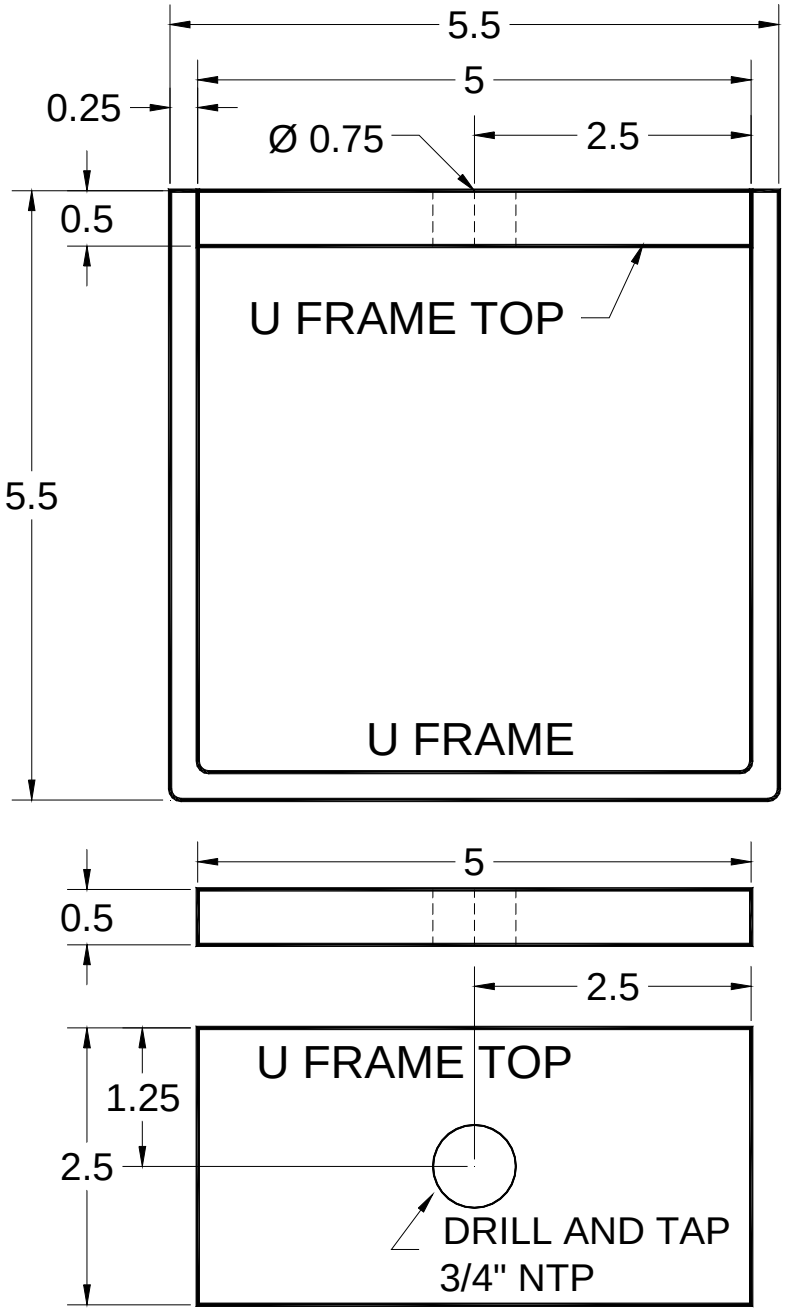
COMPLETE ASSEMBLY



MATERIAL STANDARD

JUNCTION BOX FOR NETWORK PROTECTOR FIRE PROTECTION RETROFIT

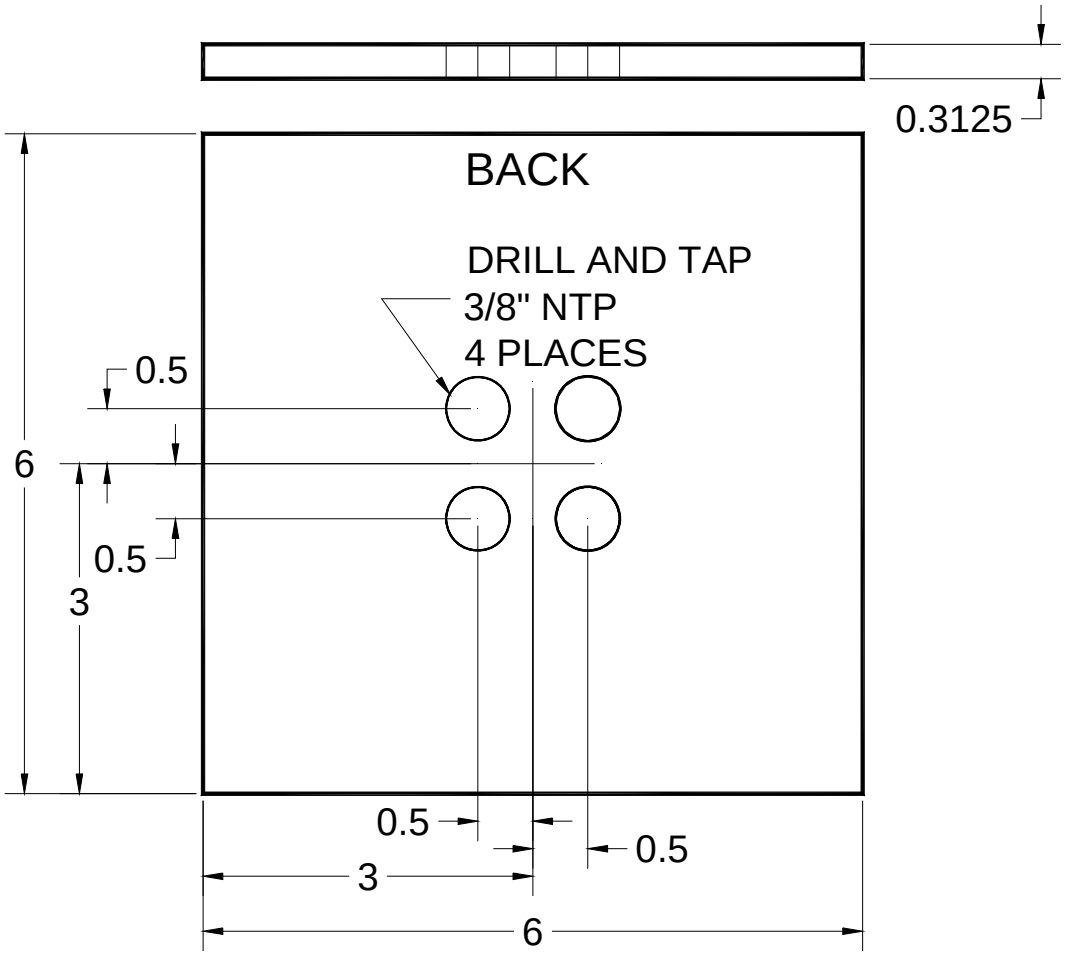
U FRAME & TOP



MATERIAL STANDARD

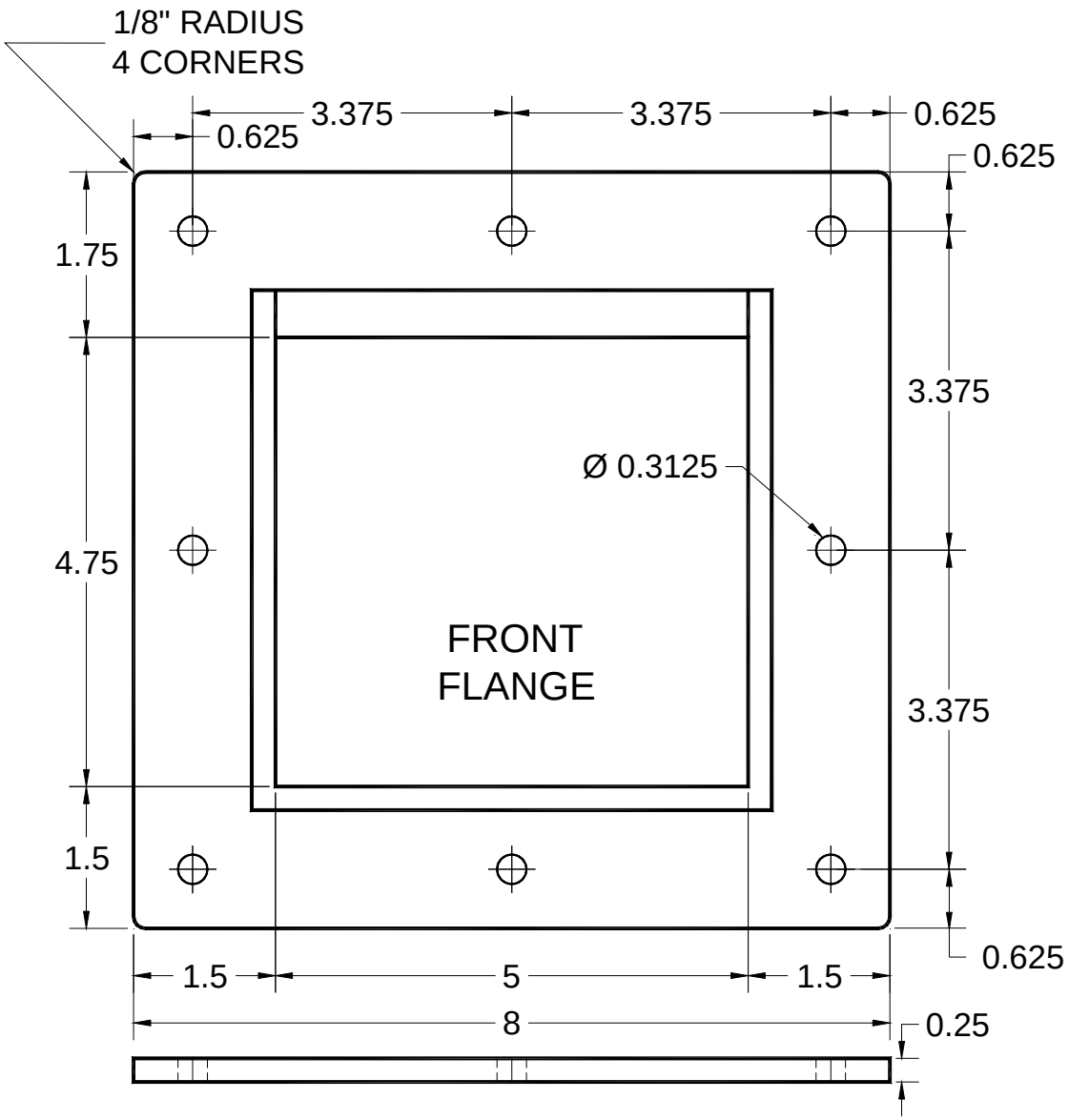
JUNCTION BOX FOR NETWORK PROTECTOR FIRE PROTECTION RETROFIT

BACK



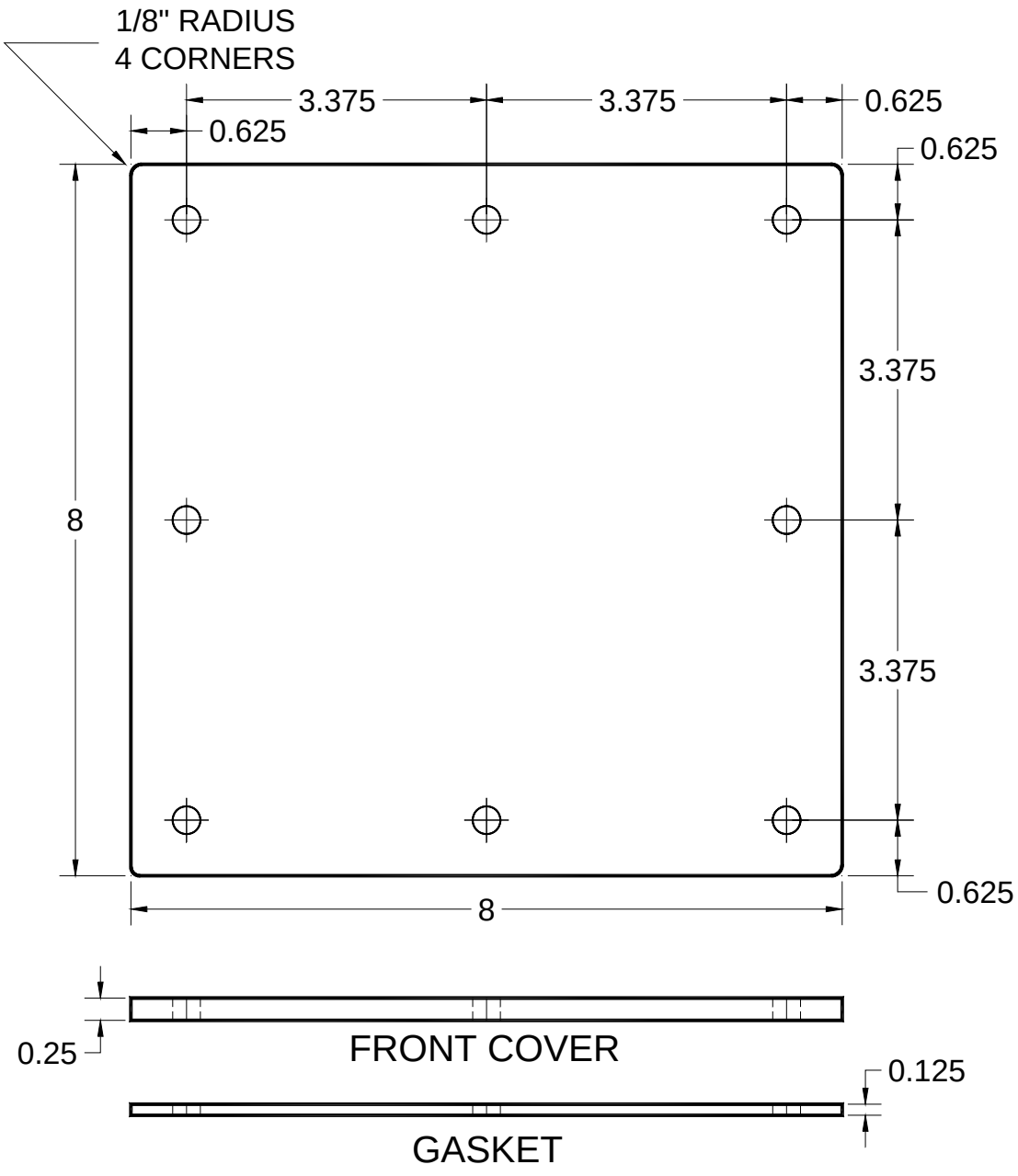
JUNCTION BOX FOR NETWORK PROTECTOR FIRE PROTECTION RETROFIT

FLANGE



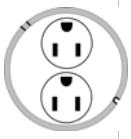
JUNCTION BOX FOR NETWORK PROTECTOR FIRE PROTECTION RETROFIT

FRONT COVER or GASKET

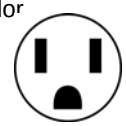


RECEPTACLES (OUTLETS)

1. **Scope:** This specification applies to 120 - 250 Volt electrical appliance receptacles with 15 or 20 ampere capacities.
2. **General:** The receptacles shall be specification grade and meet the latest revisions of the Federal Specifications, ANSI, and NEMA Standards cited in the descriptions below, except as modified herein.
3. **Contacts:** All power and grounding contacts shall be bronze, double wiping, and meet the requirements on NEMA Standard WD 1-3.02.
4. **Ground-Strap:** The ground strap shall be one piece and a minimum of 0.052 inches (1.32 mm) thick.
5. **Wiring Connections:** All wire contact screws shall be no smaller than #8-32. The back wiring contacts shall be clamped by the wiring screws. The wiring connections shall be suitable for all wire up to #10 AWG.
6. **Case:** The receptacles shall be totally enclosed in a heavy-duty case and cover.
7. **Reference:** Federal Specs. WC 596 and WL 142, ANSI C73 series, NEMA WD-1, UL 817.
8. **Note:** See Material Standard 7331.0 for plugs.

		Approved Manufacturers							
Stock Number	**Description**	**Arrow Hart**	**Bryant**	**Eric-son**	**Hubbell**	**Leviton**	**Pass & Seymour**	**Sierra**	**Wood-head**
733011	RECEPTACLE, single. side wired, 20A, 250V NEMA configuration 10-20R, Fed. Spec. W C-596/26 	9140	–	–	HBL-6810	5032	6810	–	–
733041	RECEPTACLE, duplex, parallel slots with ground, back & side wired, brown color, 15A, 125V. NEMA configuration 5-15R, Fed. Spec. W-C-596/11-2 	5282	5282	–	HBL-5282	5042	–	–	–
733042	RECEPTACLE, duplex, ivory, 2 wire with ground, 20A, 125V NEMA config. 5-20R 	–	–	–	CR-5362-I	–	–	–	5362 DWI
733054	RECEPTACLE, duplex, parallel slots with ground, back & side wired, brown color, 15A, 125V, NEMA configuration 5-15R, Fed. Spec. W-C-596/12-2 	5262	5262	–	CR-5262	5262	5262	1454X	5262 DW

standards coordinator	*standards supervisor*	*unit director*
John Shipek	John Shipek	Darnell Cola

Stock Number	Description	Approved Manufacturers							
		Arrow Hart	Bryant	Eric-son	Hubbell	Leviton	Pass & Seymour	Sierra	Wood-head
733055	RECEPTACLE, single, parallel slots with ground, back & side wired, brown color, 15A, 125, NEMA configuration 5-15R, Fed. Spec. W-C-596/11-2 	5261	5261	–	HBL-5261	5261	5261	1200X	5261 DW
733060	RECEPTACLE, duplex, parallel slots with ground, back & side wired, ivory color 15A, 125V, NEMA configuration 5-15R, Fed. Spec. W-C-596/12-1 	5262-I	5262-I	–	CR-5262-I	5262-I	5262-I	1454	5262 DWI
733061	RECEPTACLE, duplex, parallel slots with ground & GFCI, double wiping contacts, brown color, 15A outlets with 20A feedthrough, UL 2003, 125V, NEM configuration 5-15R. 	–	GF52A	–	–	7599	–	–	–
733141	RECEPTACLE, single 2 wire with ground , weather resistant, 20A, 125V, UL 2003, NEMA config. 5-20R 	–	–	–	HBL-15W33	–	–	–	15W33
733142	RECEPTACLE, single locking 2-wire, 20A, 250V NEMA configuration L2-20R, ANSI Std. C73.32, Fed. Spec. WC 596/76-1 	–	–	–	HBL-7101-C	–	7101	–	–
733143	RECEPTACLE, single, locking 3-wire 20A, 250V Non-standard 	7314-C	7314	–	HBL-7314-C	7314-C	–	–	2708
733144	RECEPTACLE, single, parallel slot with ground, 15A, 125V NEMA config. 5-15R ANSI Std. C73.11, Fed. Spec. WC 596/14-1 	5269-N	5269 NSY	1610-C	HBL-5269-C	5269-C	5269-SS	–	5269

PLUGS, LAMPHOLDERS, AND EXTENSION CORDS

1. **General.** Except as modified by this specification, each plug, connector, receptacle, lampholder, and extension cord shall comply with the latest revisions of the Federal Specifications, ANSI, and NEMA Standards in the descriptions below.
2. **Plugs, Connectors, and Lampholders.** All electrical parts shall be brass. The wiring terminals shall be suitable for the capacity of the device. All wiring clamps shall have their pressure maintained by screws. The bodies of these devices shall be built of materials that withstand high impact and crushing forces, and shall be resistant to grease, oil, solvents, moisture, and temperature extremes. The plug, connector, and portable lampholder bodies shall have a suitable means of clamping the cable. There shall be no protruding metal or other sharp edges to cut or damage personnel and equipment. The completed assembly shall be corrosion resistant.
3. **Cordsets.** The plugs and connectors shall comply with the description of their corresponding units. The completed assembly shall comply with the latest revision of UL Standard 817.

		Approved Manufacturers					
Stock No.	**Description**	**Arrow Hart**	**Bryant**	**Ericson**	**Hubbell**	**Leviton**	**Wood–head**
733099	LAMPHOLDER, weatherproof with 4½" #14AWG copper pigtails, 600V, 300W. Fed. Spec. WL 142 	–	–	44W	–	–	600
733125	PLUG, parallel blade, 15A, 125V NEMA configuration 1–15P ANSI Std. C73.10 Fed. Spec. WC 596/3A 	–	–	1505-PW	HBL 5866-VY	111	1404
733129	PLUG, crowfoot, 20A, 125/250V NEMA configuration 10–20P ANSI Std. C73.13, Fed. Spec. WC 596/26A 	9151N	9320	–	HBL 9977-C	9151-N	–
733132	PLUG, locking, 20A, 250V NEMA configuration L2–20P ANSI Std. C73.32 Fed. Spec. WC 596/75–1 	7102N	7102N	–	HBL 7102C	–	–
733135	PLUG, polarized, 20A, 250V NEMA configuration 2–20P ANSI Std. C73.21 Fed. Spec. WC 596/23A 	–	–	–	HBL 9758-VY	–	–
733136	PLUG, crowfoot, 50A, 125/250V NEMA configuration 10–20P ANSI Std. C73.25 Fed. Spec. WC 596/37 	4524-N	7513	–	–	9450-P	–
733137	PLUG, parallel blade with ground, 15A, 125V NEMA configuration 5–15P ANSI Std. C73.11 Fed. Spec. WC 596/13 	5266-N	5266 NCR	1510-PW	HBL 5266-C	5266-C	5266

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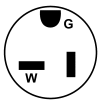
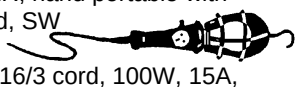
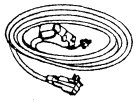
Charles L. Shaffer	John C. Skinner	Haedee Jay

Stock No.	Description	Approved Manufacturers					
		Arrow Hart	Bryant	Ericson	Hubbell	Leviton	Wood–head
733138	PLUG, locking 3–wire, 20A, 250V Non–standard 	9965-C	–	–	HBL 9965-C	7311	2608
733139	PLUG, tandem blade with ground, 15A, 250V NEMA config. 6–15A ANSI Std. C73.20 Fed.Spec. WC 596/17–1 	5666-N	5666 NSY	1514-PW	HBL 5666-CY	5666-C	5666
733140	PLUG, 2 wire with ground, weather resistant, 20A, 125V NEMA config. 5–20P 	–	–	–	14W33	–	14W33

Stock No.	Description	Coleman	Ericson	Hubbell	McGill	Woodhead
733611	LAMPHOLDER, hand portable with reflector guard, SW and grounded  outlet, 25 ft. #16/3 cord, 100W, 15A, 125V, Fed.Spec. WL 142	–	–	–	5025-SRG	276USA-163
761750	CORD, extension, 3/C, #14 AWG, SO, 600V, copper with dead–front NEMA 5–15P Plug and 5–15R receptacle, 25 ft. 	–	1510 PW143A	–	–	14W47A143
761755	CORD, extension, 3/C, #14, AWG, SO, 600V, copper with dead–front NEMA 5–15P plug and 5–15R receptacle, 50 ft.	–	1510 PW143B	–	–	14W47B143
761760	CORD, extension, #12/3 SJEOW–A Yellow, with NEMA 5–15P plug, tri–source NEMA 5–15R receptacle and plug–mounted GFCI, 120V, 15A, 1800W, 25 ft. 	02837	–	–	–	–
761765	CORD, extension, #12/3 SJEOW–A Yellow, w/ NEMA 5–15P plug, tri–source NEMA 5–15R receptacle and plug–mounted GFCI, 120V, 15A, 1800W 50 ft.	02838	–	–	–	–
761770	CORD, extension, #14/3 SJTW–A Yellow, with NEMA 5–15P plug and single GFCI NEMA 5–15R receptacle, 120V, 15A, 18 in. 	–	–	GFP4C15M	–	–

Reference: Federal Specs. WC 596 and WL 142, ANSI C73 series, NEMA WD–1, UL 817.

Note: See Material Standard 7330.0 for receptacles.

SEATTLE CITY LIGHT

MATERIAL STANDARD

STANDARD NUMBER: **7333.0**
PAGE: 1 of 1
SUPERCEDING: March 5, 1999
EFFECTIVE DATE: September 20, 2005

SWITCHES – TOGGLE-FLUSH

1. **Scope.** This specification is for 120-277 volt, 15- through 30-ampere, flush-mount toggle switches, back-and side-wired with screw terminals. The switches are to be mounted in wall outlet boxes.
2. **General.** The switches shall be specification-grade and shall meet the latest revisions of all applicable NEMA and industrial standards, and Federal Specification W-S-896, except as modified herein.
3. **Contacts**
   - 3.1 The switching contacts shall be silver alloy.
   - 3.2 The wiring contact screws shall be #8-32 or larger in size. The back wiring contacts shall be clamped by the wiring screws. The wiring contacts shall be suitable for all wire up to #10 AWG.
4. **Case.** The case shall completely enclose the switching contacts and shall be highly resistant to arcing and tracking. The case shall have low moisture absorption and be scratch-and shatter-resistant. The case shall be color coded.
5. **Mounting Strap.** The mounting strap shall be one-piece steel at least 0.052 inches (1.32 mm) thick. The switch body shall be securely fastened to the strap.
6. **Identification.** The packaging of the assembly shall clearly show the manufacturer's catalog number, style, or model number.
7. **Reference Specifications:** Federal Specification W-S-896.
8. **Stock Unit:** EA

	Description				Approved Manufacturers			
Stock No.	**Voltage**	**Amp**	**Type**	**Color**	**Bryant**	**Hubbell**	**Leviton**	**Pass & Seymour**
–	120-277	15	1 pole AC	brown	4801	HBL 1201	1201-2	PS15AC1
733386	120-277	15	1 pole AC	ivory	4801-I	HBL 1201-I	1201-2I	PS15AC1-I
733376	120-277	15	1 pole AC GLO	ivory	4801-GLI	HBL 1201-IL	1201-LHI	PS15AC1-ISL
733377	120-277	15	2 pole AC	brown	4802	HBL 1202	1202-2	PS15AC2
733378	120-277	15	3 way AC	brown	4803	HBL 1203	1203-2	PS15AC3
733338	120-277	15	3 way AC	ivory	4803-I	HBL 1203-I	1203-2I	PS15AC3-I
733379	120-277	15	3 way AC GLO	ivory	4803-GLI	HBL 1203-IL	1203-LHI	PS15AC3-ISL
733380	120-277	20	1 pole AC	brown	4901	HBL 1221	1221-2	PS20AC1
733391	120-277	20	1 pole AC	ivory	4901-I	HBL 1221-I	1221-2I	PS20AC1-I
–	120-277	20	2 pole AC	brown	4902	HBL 1222	1222-2	PS20AC2
733381	120-277	20	2 pole AC	ivory	4902-I	HBL 1222-I	1222-2I	PS20AC2-I
733392	120-277	20	3 way AC	ivory	4903-I	HBL 1223-I	1223-2I	PS20AC3-I
–	120-277	30	1 pole AC	brown	3001	HBL 3031	3031-2	PS30AC1
–	120-277	30	1 pole AC	ivory	3001-I	HBL 3031-I	3031-2I	PS30AC1-I
733382	120-277	30	2 pole AC	brown	3002	HBL 3032	3032-2	PS30AC2
–	120-277	30	2 pole AC	ivory	3002-I	HBL 3032-I	3032-2I	PS30AC2-I
–	120-277	30	3 way AC	brown	3003BRN	HBL 3033	3033-2	PS30AC3
–	120-277	30	3 way AC	ivory	3003-I	HBL 3033-I	3033-2I	PS30AC3-I

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FITTINGS FOR UNDERGROUND USE, PVC

1. **Scope:** This specification is for polyvinyl chloride (PVC) plastic utilities fittings suitable for underground installations: Type DB-120.

   The fittings shall comply with the latest revision to NEMA TC 9, "Fittings for Polyvinyl Chloride (PVC) Plastic Utilities Duct for Underground Installation."

2. **Fittings** shall be furnished in the sizes and types specified on the purchase order. Sockets shall be in accordance with Table 2-2 or 2-3 of NEMA TC 9. Plugs and end bells shall be in accordance with Tables 2-12 and 2-7 or 2-8, respectively, of NEMA TC 9.

3. **Color:** Fittings shall be medium to dark gray in color.

4. **Markings:** In addition to the marking requirements of NEMA TC 9, each shipping lot shall be marked with the City purchase order number, gross and net weights, and the name and address of the manufacturer.

5. **Reference Specification:** NEMA TC 9, ASTM D 2672, ASTM F 512 (latest revisions)

6. **Stock Unit:** EA

End Bells (see note 1)		Plugs (see note 2)	
Stock No.	**Size, nominal (in)**	**Stock No.**	**Size, nominal (in)**
734944	2	734938	2
734946	3	734940	3
734947	3-1/2	–	–
734948	4	734942	4
734949	5	734943	5
010340	6	010338	6

Notes
1. Approved end bell manufacturers: Carlon; Kraloy; PW Eagle Inc., dba PWPipe; Scepter.
2. Approved plug manufacturer: Carlon only.
3. For regular couplings and adapters and 45º and 90º bends, refer to SCL 7020.05..

7. **Adapter:** 3-1/2″ nominal round to 3-1/2″ nominal square by 24″ long.

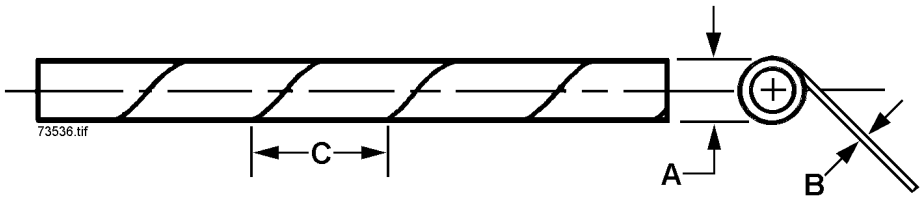
   Stock No. 734565

   Approved adapter manufacturers: Carlon; J-M Manufacturing Inc.; Picoma; PW Eagle Inc., dba PWPipe; Raceways Tech.

8. **References**

   SCL Material Standard 7015.05; “Schedule 40 PVC Conduit and Fittings”

CABLE WRAP
POLYTETRAFLUORETHYLENE



1. Scope

Cable Wrap of the configuration shown shall be Type III, Grade 2, Class B (Teflon) polytetrafluoroethylene meeting the material requirements of ASTM D 1457 and D 3369, latest revision.

2. Industry Standards

ASTM D 1457 ..... Specification for Polytetrafluorethylene (PTFE) Molding and Extrusion Materials (Withdrawn 1996)

ASTM D 3369 ..... Standard Specification for Polytetrafluoroethylene (PTFE) Resin Cast Film

3. Requirements

Color: ..... The color of the cable wrap shall be natural (clear).

		Dimensons, inches			
Stock No.	**Size, inches**	**A**	**B**	**C**	**Wire Bundle Diameter, in.**
735361	0.250	0.250	0.025 – 0.035	0.375	3/16 to 2
735363	0.500	0.500	0.022 – 0.060	0.500	3/8 to 4

4. Packaging

Shipping containers shall be marked with the type, size, and quantity of the items, the City Purchase Order number, the name and address of the manufacturer, and the name and address of the City of Seattle receiving warehouse.

Approved Manufacturers

Stock No.	**AMP**	**Panduit**	**Tyton**	**Wieland Spiroband**
735361	500024-2	T25T-L	2P	–
735363	–	T50T-Q	–	SP 1/2-TF

Stock Unit: FT

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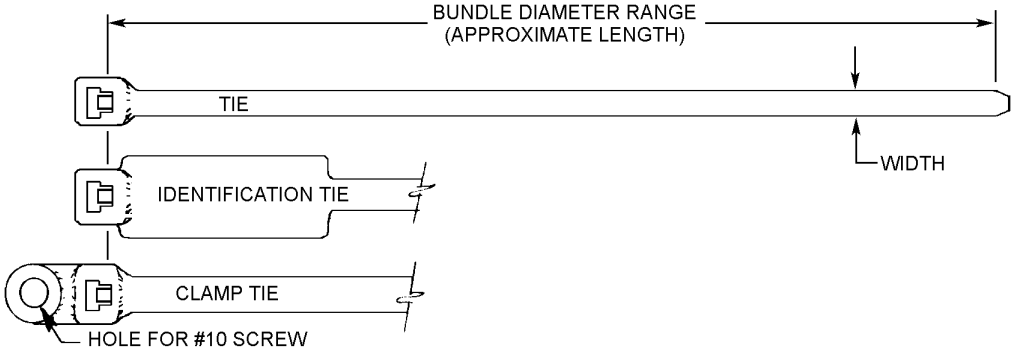
STRAPS, ADJUSTABLE PLASTIC TIE



Stock Number	Type	Bundle Diameter, Inches Min.		Bundle Diameter, Inches Max.	Approx. Length, Inches	Width, Min., Inches	Tensile Strength, Pounds	Color
735804	Tie	1/16	-	7/8	4	0.098	18	Natural
735805	Tie	1/16	-	1-3/4	7	0.184	50	Black
735806	Tie	1/16	-	1-3/4	7	0.184	50	Natural
735811	Tie	3/16	-	3-1/2	14	0.300	120	Black
735812	Tie	1	-	5	20	0.500	175	Black
735807	Identification	3/8	-	1-3/4	7	0.184	50	Natural
735809	Identification	3/4	-	4	15	0.184	50	Natural
735810	Clamp	1/16	-	1-3/4	8	0.184	50	Natural

Adjustable Plastic Tie Straps of the configuration shown above are intended to harness or secure many different types of electrical wires and cables such as small control wire, triplex service cable, high-voltage power cables, etc. The straps are intended for a one-time use and are not required to be releasable.

The tie straps shall be made of polymide (nylon) plastic compound in accordance with MIL-M-20693, Type I (natural) or Type II (UV-resistant black). The straps shall meet all applicable requirements of MIL-S-23190.

The straps shall meet the minimum tensile strengths listed above, regardless of the angle or direction in which the force is applied. (This is to simulate the movement of a single cable with the remaining cables in the bundle held stationary.)

Packaging: In sealed plastic bags of not more than 100 to a bag.

Stock Unit: EA

Stock Number	Type	Approved Manufacturers	
		Panduit	T & B
735804	Tie	PLT1M-C	–
735805	Tie	PLT2S-CO	TY525MX
735806	Tie	PLT2S-C	TY525M
735811	Tie	PLT4H-LO	–
735812	Tie	PLT5EH-CO	–
735807	Identification	PLM2S-C	TY546M
735809	Identification	PLM4S-C	TY548M
735810	Clamp	PLC2S-S10-C	TY535M

ORIGINATOR	STANDARDS COORDINATOR	STANDARDS SUPERVISOR	UNIT DIRECTOR
Jim S. Horn	Charles L. Shaffer	John C. Skinner	Harold Jay

Tape, Sealing and Insulating Mastic

1. **Scope:**

   This Material Standard covers the requirements for self-amalgamating sealing and insulating mastic.

2. **Application:**

   For sealing all types of overhead and direct buried electrical connections up to 600 volts.

   For waterproofing duct work, cable ends, and all types of splices.

   Product is not appropriate for applications that may contact the semi-con layer of primary cable.

3. **Physical Requirements:**

Size:	1/8″ x 3-3/4″ x 120″
Water Absorption:	2.5% maximum by weight per ASTM D 570, Paragraph 7.1; 24 hour immersion at 73.4° F (23° C)

4. **Electrical Requirements:**

Dielectric Strength:	350 volts/mil minimum on 0.020″ thick specimen

5. **Temperature Properties During Operation:**

   -40º F to 194º F (-40º C to 90º C)

6. **Common Name:**

   This product is commonly referred to as "Aqua Seal", regardless of who manufactured it.

7. **Packaging:**

   In roll form with release liner on one side to assure easy unrolling. Rolls to be packaged individually.

8. **Stock Unit:** RL

9. **Approved Manufacturers:**

   Stock Number: 736470

Manufacturer	Trade Name	Catalog Number
3M	Scotch Seal	2229
Cooper Power Systems (formerly Kearney)	Aqua Seal	104742
Plymouth	10 Plyseal	2626

10. **References**

    D-570, “Standard Test Method for Water Absorption of Plastics,” ASTM, 1995.

Standards Coordinator	Standards Supervisor	Unit Director
John Shipek	John Shipek	Darnell Cola

Putty, Electrical Insulation

1. Scope

This standard covers the requirements for insulating mastic tape. This product is also known as electrical insulation putty.

This standard applies to Seattle City Light Stock Number 736750.

2. Application

This product is a self-amalgamating, low voltage insulating mastic, designed for quick void-free insulation build-up. It is easily molded by hand to confirm to irregular shapes and can be used as primary insulation for splices through 5 kV in conjunction with other insulating tapes. Insulating mastic tape provides an excellent moisture seal.

3. Properties (nominal)

Material	mastic
Material thickness	125 mil
Color	black
Temperature, normal service, max	80° C (176° F)
Core Diameter	1-1/2 in
Shelf life (inside storage)	5 years from the date of manufacture

4. Packaging

Tape shall be packaged to prevent damage during shipping, storage, and casual handling prior to use.

Each roll of tape shall be individually packaged and legibly marked with the following information:

- Manufacturer's name
- Product number
- Product description

Number of rolls of tape per case shall be according to Section 6.

Each shipping container shall be marked with Seattle City Light's Purchase Order Number.

5. Issuance

RL

6. Approved Manufacturers

Stock Number	736750
Description	Insulating mastic tape, 1-1/2 in x 5 ft roll

Manufacturer	3M
Product	Scotchfil ®
ID	80610833727
UPC	054007-41750
Case Quality:	12 rolls

Manufacturer	Plymouth (formerly Bishop)
Product	Plyfill ®
Catalog	2644
Case Quality	12 rolls

7. References

3M Electrical Products catalog, 80-6016-0382-4, 2011

3M Scotchrap Tape 50, 51 & Pipe Primer, 3M Scotchfil ® Electrical Insulation Putty, Data Sheet, May 2013, 78-8129-9283-8 Rev C

Plymouth Electrical & Utility Products online catalog, undated, downloaded June 10, 2013

Scotchfil ® Electrical Insulating Putty Material Safety Data Sheet, 11/09-10

Shipek, John; Standards engineer and originator of 7364.80

www.3m.com/electrical

www.plymouthrubber.com/catalogo.php

TAPE, FIRE-RETARDANT, ELECTRIC ARC PROOFING

1. Scope

This material standard covers the requirements for fire-retardant, electric arc proofing tape dispensed in rolls.

This material standard applies to the following Seattle City Light Stock Numbers:

Stock Number	Description
736525	1-1/2″ x 20′ roll
736527	3″ x 20′ roll

2. Application

Tape is applied to high-energy, communication, and control cables that are within 18 inches of other cables to offer protection in the event of a fault from fire and electric arcs until limiting devices have time to operate.

Tape is formulated to expand in a fire to form a thick char buildup. This insulating shield protects cables and accessories from fault arc generated heat and flames.

Tape is conformable and easy to apply. Wrap tape in half-lapped layers. Tape may be stretched to obtain a snug, wrinkle-free wrap which conforms to the cable. Overlap the last 6 inches of protected cable when starting a new roll of tape. Because tape is not adhesive coated, it must be held in place after wrapping with bands of silicone adhesive glass cloth tape, Stock Number 736632. The most effective and economical way to hold tape in place is by banding (two complete wraps) the first and last applied wrap.

Tape is light in color to facilitate visual inspection.

Prior to application, engineering should review tape's potential affect on cable rating.

3. Properties (nominal)

color	white to light gray
thickness, in	0.030
adhesive	none
breaking strength	1200 psi
elongation 0023 degrees C	150% at break
0-12 degrees C	130% at break
flame resistant, per UL 94 (self-extinguishing)	V-O
oxygen index, per ASTM D-2863	29-30%
dielectric breakdown	500 V/mil
shelf life	5 years from the date of manufacture

4. Testing

Test data that confirms the properties cited in the manufacturer's data sheet and this material standard shall be provided upon request.

5. Packaging

Each roll of tape shall be individually protected with plastic and legibly marked with the following information:

- Manufacturer's name
- Manufacturer’s catalog number
- Product description

standards coordinator	*standards manager*	*unit director*
John Shipek	John Shipek	Pamela S. Johnson

5. Packaging, continued

Each shipping container shall be marked with Seattle City Light's Purchase Order Number.

6. Issuance

RL

7. Approved Manufacturer

3M Scotch Brand

Stock Number	Product Number	Description	UPC
736525	77W	1-1/2″ x 20′ roll	00051138983741
736527	77W	3″ x 20′ roll	00051138983758

8. References

78-8124-5426-8 C; 3M Scotch Fire-Retardant Electric Arc Proofing Tape 77 Series, Data Sheet, March 2009

Shipek, John; SCL Standards Engineer, subject matter expert and originator of 7365.20 (john.shipek@seattle.gov)

www.3m.com

Youngs, Rob; subject matter expert (rob.youngs@seattle.gov)

Tape, Electrical Shielding

1. Scope

This standard covers the requirements for electrical shielding tape.

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

Stock Number	Description
736244	1 in x 15 ft roll
736243	2 in x 10 ft roll

2. Application

Shielding tape is intended to:

- Provide shielding for cable joints on shielded power cables
- Make the conductive portion of the stress cone on power cable terminations
- Smooth connector area in oil-filled cables

Shielding tape is an all-metal, open-weave, shielding braid tape in a flat, cable-like form. It is conformable due to the open-weave knit construction of two No. 36 AWG tinned copper wires.

Because of its construction, the tape interlocks with the previous layer, thereby assuring a tighter wrap (no solder bead is required).

This product ***should not*** be used as a ground strap or jumper wire; its ampacity is not sufficient to carry large fault currents.

3. Properties (nominal)

Shielding tape shall be an all-metal, flat, open-weave shielding braid that is compatible with all power cable insulations and all high-voltage splicing and terminating materials.

Material	Woven No. 36 AWG tinned copper wire
Material thickness	16 mil
Temperature rating, emergency	130° C (266° F)
Breaking strength, per ASTM D1000	22 lb/in (of width)
Shelf life (inside storage)	Indefinite

Shielding tape shall be RoHS (European Union Directive 2002/95/EC for Restriction of Hazardous Substance) compliant.

4. Testing

Test data that confirms the properties cited in the manufacturer's literature and this material standard shall be provided upon request.

5. Packaging

Each roll of tape shall be individually packaged in cellophane, plastic, cardboard, or metal containers to prevent damage during shipping, storage, and casual handling prior to use.

Each roll of tape shall be legibly marked with the following information:

- Manufacturer's name
- Manufacturer’s catalog number
- Product description

Number of rolls of tape per case shall be according to Section 7.

Each shipping container shall be marked with Seattle City Light's Purchase Order Number.

6. Issuance

RL

7. Approved Manufacturers

Stock Number	**736244**
Description:	1 inch x 15 ft roll
Manufacturer	3M
Product	24
UPC	054007-15041
Case Quality	50 rolls
Manufacturer	Plymouth
Product	15 Plybraid
ID	5415
Case Quality	50 rolls

Stock Number	**736243**
Description:	2 inch x 10 ft roll
Manufacturer	3M
Product	24
UPC	051128-57289
Case Quality	50 rolls
Manufacturer	Plymouth
Product	15 Plybraid
ID	2230
Case Quality	40 rolls

8. References

3M Electrical Products catalog, 80-6016-0382-4, 2011

Scotch 24 Electrical Shielding Tape, Data Sheet, 2002, 78-8126-5662-3-A

SCL 7362.2 (canceled) Shielding Tape, Electrical, Tinned Copper Wire, Tubular Knit

Shipek, John; Standards Engineer and originator of 7365.22.

Plymouth Electrical Tapes Product Catalog, PRE-01/USA

www.3m.com/electrical

www.plymouthrubber.com

TAPE, SILICONE RUBBER, ELECTRICAL

1. Scope

This standard covers the requirements for self-fusing, silicone rubber, electrical tape.

This standard applies to Seattle City Light stock number 736512.

2. Application

This product is a high-temperature, arc and track-resistant tape composed of self-fusing, inorganic silicone rubber with an easy-tear and easy-strip liner.

Silicone rubber tape is intended for the following applications:

- As an overwrap for protection of terminating high-voltage cables against arcing and tracking.
- As primary insulation where Class “H” (180°C/356°F) temperatures are encountered i.e., silicone rubber cables.
- As splice overwrap on spacer cable operating at 15 kV and above.

3. Properties

Material	self-fusing, inorganic silicone rubber
Material thickness	12 mil
Cross section	rectangular
Color	sky blue gray
Temperature rating, operating	180° C (356° F)
Dielectric strength	875 V/mil
Tensile strength	12 lb/in (of width)
Shelf life (inside storage)	5 years from the date of manufacture

Silicone rubber tape shall be provided with an easy-tearing and easy-stripping polyester liner.

Silicone rubber tape shall be RoHS (European Union Directive 2002/95/EC for Restriction of Hazardous Substance) compliant.

4. Testing

Test data that confirms the properties cited in the manufacturer's literature and this material standard shall be provided upon request.

5. Packaging

Each roll of tape shall be individually packaged in cellophane, plastic, cardboard, or metal containers to prevent damage during shipping, storage, and casual handling prior to use.

Each roll of tape shall be legibly marked with the following information:

- Manufacturer's name
- Manufacturer’s catalog number
- Product description

Number of rolls of tape per case shall be according to Section 7.

Each shipping container shall be marked with Seattle City Light's Purchase Order Number.

6. Issuance

RL

7. Approved Manufacturers

Stock Number:	736512
Description:	1 inch x 30 ft roll
Manufacturer:	3M
Product:	70
ID:	80-6114-3861-7
UPC:	00-051128-57261-0
Case Quantity:	50 rolls

Silicone rubber tape shall be provided with an easy-tearing and easy-stripping polyester liner.

8. References

Shipek, John; Standards engineer and originator of 7365.24.

CID A-A-59163 - Insulation Tape, Electrical, Self Adhering Unsupported Silicon Rubber (Superseding MIL-I-46852C), Published 02/13/1998

Scotch 70 Self-Fusing Silicone Rubber Electrical Tape, Data Sheet, 2001, 78-8126-0479-7-A

3M Electrical Products catalog, 80-6016-0382-4, 2011

www.3m.com/electrical

Tape, Insulating, Electrical

1. Scope

This standard covers the requirements for self-amalgamating, electrical insulating tape. Self-amalgamating means self-bonding, self-fusing, or non - vulcanized.

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

Stock Number	Description
736503	3/4 in x 30 ft roll
736504	1 in x 30 ft roll
736505	1-1/2 in x 30 ft roll

2. Application

This product is a highly conformable, linerless, ethylene rubber (EPR), high-voltage insulating tape, formulated to provide excellent thermal dissipation of splice heat. The tape has excellent physical and electrical properties, which provide immediate moisture seals and void-free build-ups.

Insulating tape is intended for the following applications:

- Primary insulation for splicing all types of solid dielectric insulated cables through 69 kV
- Primary insulation for building stress cones on all types of solid dielectric insulated cables up to 35 kV
- Jacketing (secondary insulation) on high-voltage splices and terminations
- Moisture-sealing electrical connections
- Bus bar insulation

Insulating tape is linerless to permit quicker application.

For best ultraviolet light (UV) protection, overwrap with a high-quality, vinyl electrical tape.

3. Properties (nominal)

Material	Self-amalgamating, ethylene propylene rubber (EPR)
Material thickness	30 mil
Color	black
Temperature rating, emergency	
Operating	90° C (194° F)
Emergency Overload	130° C (266° F)
Dielectric strength	750 V/mil
Thermal conductivity (at 23° C)	0.3 W/m° C
Breaking strength	7.5 lb/in (of width)
Tensile Strength	250 psi
Core Diameter	1-1/2 in
Shelf life (inside storage)	5 years from the date of manufacture

4. Testing

Test data that confirms the properties cited in the manufacturer's literature and this material standard shall be provided upon request.

5. Packaging

Each roll of tape shall be individually packaged in cellophane, plastic, or metal containers to prevent damage during shipping, storage, and casual handling prior to use.

Each roll of tape shall be legibly marked with the following information:

- Manufacturer's name
- Manufacturer’s catalog number
- Product description

Number of rolls of tape per case shall be according to Section 7.

Each shipping container shall be marked with Seattle City Light's Purchase Order Number.

6. Issuance

RL

7. Approved Manufacturers

Stock Number	**736503**
Description	3/4 inch x 30 ft roll
Manufacturer	3M
Product	130C
ID	80-6108-3340-4
UPC	00-54007-41717-0
Case Quality:	24 rolls

Stock Number	**736504**
Description	1 inch x 30 ft roll
Manufacturer	3M
Product	130C
ID	80-6108-3375-0
UPC	00-54007-41753-8
Case Quality	24 rolls

Stock Number	**736505**
Description	1-1/2 inch x 30 ft roll
Manufacturer	3M
Product	130C
ID	80-6108-3341-2
UPC	00-54007-41718-7
Case Quality	12 rolls

8. References

3M Electrical Products catalog, 80-6016-0382-4, 2011

3M Scotch Linerless Rubber Splicing Tape 130C, Data Sheet, 2005, 78-8125-9449-3-B

SCL 7365.3 (canceled); Tape, Insulating, Electrical

Shipek, John; Standards engineer and originator of 7365.31.

www.3m.com/electrical

Tape, Semiconducting, Electrical

1. Scope

This standard covers the requirements for self amalgamating, electrical semiconducting tape. Self amalgamating means self bonding or non- vulcanized.

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

Stock Number	Description
736670	3/4 in x 15 ft roll
736671	1 in x 15 ft roll
010451	1-1/2 in x 15 ft roll

2. Applications

Semiconducting tape is a highly conformable, semi-conducting EPR (Ethylene Propylene Rubber) based high-voltage splicing tape. It elongates easily to conform to irregular shapes and retains its conductivity when stretched.

Semiconducting tape is intended for the following applications:

- To electrically round out high-voltage connectors and to bond to insulating materials to minimize electrical stresses
- Continue semi-conducting strand shielding found in solid dielectric (polyethylene, XLP, EPR, etc.) cables at 5 kV and above
- Provide shielding for cable joints on solid dielectric insulated power cables (shielded or concentric neutral)

- Replace semi-conducting layer beneath metallic shield of similar cables in case of damage (screening)
- Make conductive portion of stress cone of power cable termination on solid dielectric insulated power cables
- Maintain positive connection between concentric neutral semi-conducting jackets of power cables and semi-conducting surfaces of plug-in units
- Establish a more positive contact between concentric neutral wires and pre-molded devices already installed with too much jacket exposed
- Round out bolted connections on insulated bus bars

Semiconducting tape is not oil resistant. It should not be used in splicing and terminating cables which contain oil or slippery compounds as part of dielectric such as PILC.

For best ultraviolet light (UV) protection, overwrap with a high-quality, vinyl electrical tape.

3. Properties (nominal)

Material	Self amalgamating, semi-conducting, ethylene propylene rubber (EPR)
Material thickness	30 mil
Color	black
Temperature, rating	
Continuous	90° C (194° F)
Short-Term	130° C (266° F)
Breaking strength	6 lb/in (of width)
Core diameter	1-1/2 in
Shelf life (inside storage)	5 years from the date of manufacture

Semiconducting tape shall be:

- Self amalgamating.
- Printed with identifying words to ensure it is not confused in the field with insulating tape.
- Provided with a separator/liner to prevent the product from sticking to itself.
- RoHS (European Union Directive 2002/95/EC for Restriction of Hazardous Substance) compliant.

4. Testing

Test data that confirms the properties cited in the manufacturer's literature and this material standard shall be provided upon request.

5. Packaging

Each roll of tape shall be individually packaged in cellophane, plastic, or metal containers to prevent damage during shipping, storage, and casual handling prior to use.

Each roll of tape shall be legibly marked with the following information:

- Manufacturer's name
- Manufacturer’s catalog number
- Product description

Number of rolls of tape per case shall be according to Section 7.

Each shipping container shall be marked with Seattle City Light's Purchase Order Number.

6. Issuance

RL

7. Approved Manufacturers

Stock Number	**736670**
Description:	3/4 inch x 15 ft roll
Manufacturer	3M
Product:	13
ID:	HT-0020-0032-7
UPC:	00-054007-15017-6
Case Quality:	50 rolls
Manufacturer	Plymouth (formerly Bishop)
Product:	17 Plyshield
ID:	2104
Case Quality:	50 rolls

Stock Number	**736671**
Description:	1 inch x 15 ft roll
Manufacturer	3M
Product:	13
ID:	HT-0020-121-8
UPC:	00-054007-15017-6
Case Quality:	50 rolls

Stock Number	**736671** (continued)
Description:	1 inch x 15 ft roll
Manufacturer	Plymouth (formerly Bishop)
Product:	17 Plyshield
ID:	2107
Case Quality:	50 rolls
Stock Number	**010451**
Description:	1-1/2 inch x 15 ft roll
Manufacturer	3M
Product:	13
ID:	HT-0020-0031-9
UPC:	00-054007-15017-6
Case Quality:	50 rolls
Manufacturer	Plymouth (formerly Bishop)
Product:	17 Plyshield
ID:	2156
Case Quality:	50 rolls

8. References

7366.6 (canceled); Tape, Semiconducting, Electrical

Shipek, John; Standards engineer and originator of 7365.54.

3M Scotch Electrical Semi-Conducting Tape 13, Data Sheet, September 2012, 78-8141-5624-2

3M Electrical Products catalog, 80-6016-0382-4, 2011

www.3m.com/electrical

Plymouth Electrical & Utility Products online catalog, undated, downloaded June 10, 2013

www.plymouthrubber.com/catalogo.php

Tape, Adhesive-Backed, Copper Foil

1. Scope

This standard covers the requirements for adhesive-backed, copper foil tape strips.

This standard applies to Seattle City Light (SCL) Stock No. 013499.

2. Application

Adhesive-backed, copper foil tape strips are used to supplement the material listed in SCL 0535.11, “Heat Shrink Splices, Straight, 110 kV BIL, Tyco.”

This product can also be used to hold down constant force springs and aid in rebuilding corroded primary cable shields.

3. Properties

Material	copper foil
Material Dimensions	
Wide	3/8 in
Long	8 in
Thickness	1.5 mil ± 10%
Shelf life (inside storage)	5 years from the date of manufacture

Copper foil strips shall be fabricated with an adhesive on one side protected with easy-to-remove liners.

Standards Coordinator
Brett Hanson

Standards Supervisor
John Shipek

Unit Director
Darnell Cola

4. Packaging

Copper tape strips shall be packaged to prevent damage during shipping, storage, and casual handling prior to use.

Copper tape strips shall be packaged 50 per box.

Each box shall be legibly marked with the following information:

- Manufacturer's name
- Manufacturer's catalog number
- Product description

Each shipping container shall be marked with the SCL purchase order number.

5. Issuance

EA

6. Approved Manufacturer

Stock No.	013499
Description	3/8 in x 8 in, adhesive-backed, copper tape strip
Manufacturer	TE Connectivity
Catalog Number	TAPE-CPR-ADH-3/8X8IN-B50
Case Quantity	50 strips per box

7. References

SCL Construction Standard 0535.11; "Heat Shrink Splice, Straight, 110 kV BIL, Tyco"

8. Sources

SCL Material Standard 6873.11; "Heat Shrink Splices, Straight, 110 kV BIL, Tyco"

Shipek, John; SCL Standards Supervisor and originator of 7365.56.

Tape, Glass, Cloth, Electrical

1. Scope

This standard covers the requirements for glass cloth electrical tape.

This standard applies to Seattle City Light stock number 736632.

2. Application

Glass cloth tape is for applications that require high mechanical strength and resistance to high temperatures. The thermosetting adhesive provides an increased bond once applied in areas of high ambient temperatures.

This tape provides insulation and solvent-resistant protection and features a non-corrosive adhesive. It is conformable, printable and flame retardant.

Glass cloth tape is used to secure non-adhesive-backed, fire-retardant, electric arc proofing tapes, such as Stock Number 736525 and 736527.

Standards Coordinator	Standards Supervisor	Unit Director
John Shipek	John Shipek	Darnell Cola

3. Properties (nominal)

Backing Material	Woven glass cloth
Adhesive	Thermosetting, pressure-sensitive, silicon
Thickness	7 mil
Color	white
Operating Temperature rating, max	200° C (392° F)
Temperature class H	180° C (356° F)
Breaking strength	180 lb/in (of width)
Dielectric breakdown	3000 V/mil
Shelf life (inside storage)	5 years from the date of manufacture

Silicone rubber tape shall be provided with an easy-tearing and easy-stripping polyester liner.

Silicone rubber tape shall be RoHS (European Union Directive 2002/95/EC for Restriction of Hazardous Substance) compliant.

4. Testing

Test data that confirms the properties cited in the manufacturer's literature and this material standard shall be provided upon request.

5. Packaging

Each roll of tape shall be individually packaged in cellophane, plastic, or metal containers to prevent damage during shipping, storage, and casual handling prior to use.

Each roll of tape shall be legibly marked with the following information:

- Manufacturer's name
- Manufacturer’s catalog number
- Product description

Number of rolls of tape per case shall be according to Section 7.

Each shipping container shall be marked with Seattle City Light's Purchase Order Number.

6. Issuance

RL

7. Approved Manufacturers

Stock Number:	736632
Description:	1/2 inch x 66 ft roll
Manufacturer:	3M
Product:	69
UPC:	054007-10083
Case Quantity:	50 rolls

8. References

3M Electrical Products catalog, 80-6016-0382-4, 2011

3M Glass Cloth Electrical Tape 69 with Silicone Pressure-Sensitive Adhesive, Data Sheet, November 2008, 78-8111-0896-4_C

Shipek, John; Standards engineer and originator of 7365.58.

www.3m.com/electrical

Tape, Acrylic Foam, Double-Sided, High-Bond

1. Scope

This standard covers the requirements for gray, 1-1/2-inch wide acrylic foam, double-sided, high-bond tape.

This standard applies to the Seattle City Light stock number 013527.

2. Application

This product is a highly durable, adhesive, double-sided tape formulated to provide excellent bonds in interior and exterior bonding applications.

Acrylic foam, double-sided, high-bond tape is intended for applying street light pole number placards to street light poles, among other applications.

This adhesive provides excellent adhesion to a broad range of surfaces including metals, glass, and a wide variety of plastics.

3. Properties (nominal)

Acrylic foam, double-sided, high-bond tape shall have 100 percent adhesive retention when exposed to the following solvents and fuel:

- Water
- Salt water
- Hydraulic fluid
- 10W30 motor oil
- Glycol antifreeze

Standards Coordinator
Yaochiem Chao

Standards Supervisor
John Shipek

Unit Director
Darnell Cola

Material	Acrylic foam
Material thickness	45 mil
Color	Gray
Temperature rating	
Minimum	-35° C (-31° F)
Maximum	90° C (194° F)
Thermal conductivity (at 23° C)	0.08 W/m° K
Breaking strength	7.5 lb/in (of width)
Adhesion performance	
Normal tensile	85 lb/in^2
90° peel adhesion	22 lb/in
Core diameter	3 in
Shelf life (inside storage)	2 years from the date of manufacture

4. Testing

Test data that confirms the properties cited in the manufacturer's literature and this material standard shall be provided upon request.

5. Packaging

Each roll of tape shall be individually packaged in cellophane, plastic, or metal containers to prevent damage during shipping, storage, and casual handling prior to use.

Each roll of tape shall be legibly marked with the following information:

- Manufacturer's name
- Manufacturer’s catalog number
- Product description

Number of rolls of tape per case shall be according to Section 7.

Each shipping container shall be marked with Seattle City Light's Purchase Order Number.

6. Issuance

RL

7. Approved Manufacturers

Stock No.	**013527**
Description	1-1/2 in x 36 yd roll
Manufacturer	3M
Product	4941
ID	70-0063-0352-6
UPC	00-02120-04808-12
Case Quality	6 rolls

8. References

3M VHB Tapes, Data Sheet, 70-0709-3863-7,June 2011

www.3m.com/electrical

3M Technical Bulletin, "Surface Preparation for 3M VHB Tape Applications," 70070487015, December 2012

Chao, Yaochiem; SCL Standards Engineer and originator of 7365.81 (yaochiem.chao@seattle.gov)

Tape, Corrosion Protection

1. Scope

This standard covers the requirements for all-weather, corrosion protection tape. This product is commonly known as pipe wrap tape.

This standard applies to Seattle City Light stock number 736730.

2. Application

Corrosion protection tape is a tough, polyvinyl chloride based tape with special high tack adhesives formulated to resist corrosion of metal piping systems above and below ground.

Corrosion protection tape is:

- Resistant to corrosive salt water, soil acids, alkalies and salts, common chemicals, chemical vapors, and exposure to outdoor weathering and sunlight.
- Resistant to impact, abrasions, punctures, and tears.

Surfaces to be wrapped should be clean, dry and free of oil, grease, and other contaminants. Blast removal of rust and scale is preferred. Welding slag and spatter, sharp edges or burrs should be chipped, grinded or filed.

3M recommends coating the pipe or other metal surfaces with their non-sag, rubber-based primer before wrapping to enhance adhesion.

Corrosion protection tape is printed with “Pipe Wrap”, “Scotchrap” ®, or other similar words to ensure the product is not confused in the field with electrical tape.

3. Properties (nominal)

Federal Classification Specification	L-T-1512A, Type III
Adhesive material	High-tack, pressure sensitive rubber
Backing material	Polyvinyl chloride (PVC)
Material thickness	10 mil
Color	
Backing	black
Adhesive	black
Temperature, range	
Application	-12° C (10° F) to 65° C (150° F)
Normal Service	-48° C (-55° F) to 80° C (175° F)
Breaking strength	20 lb/in (of width)
Core diameter	1-1/2 in
Shelf life (inside storage)	5 years from the date of manufacture

Tape shall be printed along its entire length with “Pipe Wrap”, “Scotchrap”®, or other similar words to ensure the product is not confused in the field with electrical tape.

4. Testing

Test data that confirms the properties cited in the manufacturer's literature and this material standard shall be provided upon request.

5. Packaging

Tape shall be packaged to prevent damage during shipping, storage, and casual handling prior to use.

Each roll of tape shall be legibly marked with the following information:

- Manufacturer's name
- Product number
- Product description

Number of rolls of tape per case shall be according to Section 7.

Each shipping container shall be marked with Seattle City Light's Purchase Order Number.

6. Issuance

RL

7. Approved Manufacturers

Stock Number	**736730**
Description:	corrosion protection tape, 2 in x 100 ft roll
Manufacturer	3M
Product:	50 Printed
UPC:	054007-00013
Case Quality:	24 rolls
Manufacturer	Plymouth (formerly Bishop)
Product:	Plywrap ® 11
ID:	4611
Case Quality:	24 rolls

8. References

SCL 7367.3 (canceled); Tape, Pipe Wrap, Plastic

Shipek, John; Standards engineer and originator of 7366.35.

3M Scotchrap ® Tape 50, 51 & Pipe Primer, 3M Scotchfil ® Electrical Insulation Putty, Data Sheet, May 2013, 78-8129-9283-8 Rev C

3M Electrical Products catalog, 80-6016-0382-4, 2011

www.3m.com/electrical

Plymouth Electrical & Utility Products online catalog, undated, downloaded June 10, 2013

www.plymouthrubber.com/catalogo.php

Tape, Cotton Fabric, Friction

1. Scope

This standard covers the requirements for cotton fabric, friction tape.

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

Stock Number	Description
736400	3/4 in x 60 ft roll
736401	1 in x 60 ft roll
736415	2 in x 60 ft roll

2. Application

Cotton friction tape has high break strength and low stretch, making it ideal as a heavy-duty binding and harnessing tape.

Cotton friction tape is intended for the following applications:

- Provide abrasion and cut-through protection on wire and cable splices
- Provide mechanical protection for rubber electrical tape
- Provide bundling, binding and spot holding on wire harnesses
- Provide protection on sharp edges, to prevent scratching or cut through.

When applied over tool handles, it effects a non-slip surface.

3. Industry Standards

Cotton friction tape shall meet the requirements of the following industry standards:

ASTM D4514-12 - Standard Specification for Friction Tape

ASTM D69-12 - Standard Test Methods for Friction Tapes

4. Properties (nominal)

Tape construction	high-quality cotton fabric, coated on both sides with an electrical-grade, solvent-free, rubber adhesive
Material thickness	14 mil, +/- 1
Color	black
Temperature, operating	80° C (176° F)
Adhesion, maximum	15 in/min
Aged adhesion, maximum	15 in/min
Breaking strength	40 lb/in (of width)
Breakdown Voltage	1000 V
Parallelism, maximum	0.125 in
Core diameter	1-1/2 in
Shelf life (inside storage)	2 years from the date of manufacture

Tape shall be shall be RoHS (European Union Directive 2002/95/EC for Restriction of Hazardous Substance) compliant.

5. Testing

Test data that confirms the properties cited in the manufacturer's data sheet, industry standards, and this material standard shall be provided upon request.

6. Packaging

Each roll of tape shall be individually packaged in cellophane, plastic, or metal containers and legibly marked with the following information:

- Manufacturer's name
- Manufacturer's catalog number
- Product description

Number of rolls of tape per case shall be according to Section 8.

Each shipping container shall be marked with Seattle City Light's Purchase Order Number.

7. Issuance

RL

8. Approved Manufacturers

Stock Number	**736400**
Description:	Cotton friction tape, 3/4 in x 60 ft roll
Manufacturer:	3M
Product:	Temflex 1755
ID:	80-6116-0428-3
UPC:	00-51128-57173-6
Case Quantity:	20 rolls
Manufacturer:	Plymouth (formerly Bishop)
Product:	100 ASTM
Catalog:	1002
Case Quantity:	100 rolls

Stock Number	**736401**
Description	Cotton friction tape, 1 in x 60 ft roll
Manufacturer	3M
Product	Temflex 1755
ID	0-00-51128-57211-5
UPC	80-6114-3811-2
Case Quantity	60 rolls
Manufacturer	3M
Product	Scotchcast P-4 restricting tape
ID	VE-0000-3503-4
UPC	00-054007-25743-1
Case Quantity	50 rolls
Manufacturer	Plymouth (formerly Bishop)
Product	100 ASTM
Catalog	1053
Case Quantity	

Stock Number	**736415**
Description	Cotton friction tape, 2 in x 60 ft roll
Manufacturer	3M
Product	Temflex 1755
ID	80-6114-3867-4
UPC	00-051128-57267-2
Case Quantity	30 rolls
Manufacturer	Plymouth (formerly Bishop)
Product	100 ASTM
Catalog	1039
Case Quantity	40 rolls

9. References

3M Temflex Friction Tape 1755, Data Sheet, November 2009, 78-8125-9450-1 B

3M Electrical Products catalog, 80-6016-0382-4, 2011

7364.0 (canceled) Electrical Friction Tape

Plymouth Electrical & Utility Products online catalog, undated, downloaded June 10, 2013

Shipek, John; Standards engineer and originator of 7366.41.

www.3m.com/electrical

www.plymouthrubber.com/catalogo.php

Tape, Vinyl, Electrical

1. Scope

This standard covers the requirements for standard- and heavy-duty, pressure-sensitive, vinyl, electrical tape.

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

Stock Number	Description
736655	Standard-duty, 3/4 in x 66 ft roll
736656	Standard-duty, 1-1/2 in x 44 ft roll
736644	Heavy-duty, 1 in x 36 yd roll
736650	Heavy-duty, 2 in x 36 yd roll

2. Application

Standard- and heavy-duty tapes are intended for the following applications:

- Primary electrical insulation for wire and cable splices rated up to 600 volts
- Primary electrical insulation for 600-volt bus applications, and protective jacketing for low and high-voltage bus
- Protective jacketing for high voltage cable splices and repairs
- Harnessing of wires and cables
- Suitable for both indoor and outdoor applications
- Suitable for both above and below-grade applications

Standard-duty tape has a lower installation and operating temperature rating than heavy-duty tape. Heavy-duty tape is more suitable for wrapping pipe than standard-duty tape.

Tape is applied in half-lapped layers with sufficient tension to produce a uniform wind (for most applications this tension will reduce the tape's width to approximately 5/8 of its original width). Connectors having irregular surfaces should be first padded with an appropriate product.

3. Industry Standards

Tape shall meet the requirements of the following industry standards:

ASTM D1000-10 - Standard Test Methods for Pressure-Sensitive Adhesive-Coated Tapes Used for Electrical and Electronic Applications

UL 510 - Underwriters Laboratories, Polyvinyl Chloride Polyethylene and Rubber Insulating Tape, 01-Feb-2005

4. Properties (nominal)

4.1 General

ASTM D1000 Class	2 (elastomeric)
Tape backing material	polyvinyl chloride (PVC) and/or its polymers
Adhesive	rubber-based, pressure-sensitive
Color	black
Breaking strength, per ASTM D1000 @ 22^{O} C (72^{O} F),	20 lbs/in (of width)
Voltage rating, per UL 510	600 V
Core diameter	1-1/2 in
Shelf life (inside storage)	5 years from the date of manufacture

Tape shall have excellent resistance to abrasion, moisture, alkaloids, acids, corrosion and varying weather conditions.

Tape shall be Underwriters Laboratories (UL) listed and marked as "Flame-Retardant, Cold Resistant."

Tape shall be shall be RoHS (European Union Directive 2002/95/EC for Restriction of Hazardous Substance) compliant.

4.2 Standard-duty

Temperature range	
Application	-18° C through 38° C (0° F through 100° F)
Operating	-18° C through 105° C (0° F through 221° F)
Material thickness, mil	8.5

4.3 Heavy-duty

Temperature range	
Application	-10° C through 38° C (15° F through 100° F)
Operating	-10° C through 80° C (15° F through 176° F)
Material thickness, mil	10

5. Testing

Test data that confirms the properties cited in the manufacturer's data sheet and this material standard shall be provided upon request.

6. Packaging

Each roll of tape shall be individually packaged in cellophane, plastic, or metal containers and legibly marked with the following information:

- Manufacturer's name
- Manufacturer's catalog number
- Product description

Number of rolls of tape per case shall be according to Section 8.

Each shipping container shall be marked with Seattle City Light's Purchase Order Number.

7. Issuance

RL

8. Approved Manufacturers

Stock Number	**736655**
Description:	Standard-duty, ¾ in x 66 ft roll
Manufacturer:	3M
Product:	37
ID:	80-6104-5614-9
UPC:	0-00-54007-09894-2
Case Quantity:	100
Manufacturer:	Plymouth
Product:	Premium 85 CW
Catalog:	4243
Case Quantity:	100

Stock Number	**736656**
Description:	Standard-duty, 1-1/2 in x 44 ft roll
Manufacturer:	3M
Product:	15
ID:	80-6109-8097-3
UPC:	0-00-54007-43110-7
Case Quantity:	90 rolls
Manufacturer:	Plymouth
Product:	Premium 85 CW
Catalog:	4252 *(66 ft roll)*
Case Quantity:	100

Stock Number	**736644**
Description:	Heavy-duty, 1 in x 36 yd roll
Manufacturer:	3M
Product:	22
ID:	80-0120-1705-1
UPC:	00-054007-10042-3
Case Quantity:	48 rolls
Manufacturer:	Plymouth
Product:	HD 2
Catalog:	*pending*
Case Quantity:	*pending*

Stock Number	**736650**
Description:	Heavy-duty, 2 in x 36 yd roll
Manufacturer:	3M
Product:	22
ID:	80-0120-1707-7
UPC:	00-054007-10067-6
Case Quantity:	12 rolls
Manufacturer:	Plymouth
Product:	HD 2
Catalog:	8724
Case Quantity:	*pending*

9. References

3M Specification-Grade Vinyl Electrical Tape 15, Data Sheet, March 2011, 78-8141-4627-6 A

3M Specification-Grade Vinyl Electrical Tape 37, Data Sheet, April 2011, 78-8141-4721-7 A

Scotch Heavy Duty Vinyl Electrical Tape 22, Data Sheet, July 2011, 78-8124-4842-7 C

SCL 7366.0 (canceled) Tape, Electrical, Pressure-Sensitive

SCL 7366.5 (canceled) Tape, Electrical, Pressure-Sensitive, Low Temperature Type

Shipek, John; Standards engineer and originator of 7366.55.

Plymouth Electrical Tapes Product Catalog, PRE-01/USA

www.3m.com/electrical

www.plymouthrubber.com

Tape, Vinyl, Color Coding

1. Scope

This standard covers the requirements for vinyl, color coding tape.

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

Stock Number	Color
736775	white
736776	yellow
736777	blue
736778	red
736779	green
736780	orange
736781	brown

2. Application

Vinyl, color coding tape operates over a wide range of temperatures, applies smoothly, conforms, and is available in nine fade-resistant colors.

Vinyl, color coding tape is intended for the following applications:

- Color coding for phase identification, job identification and safety
- Insulating electrical wiring
- Protecting electrical conductors, motor leads and piping from moisture, alkalis, acids, corrosion, abrasion and weather

3. Industry Standards

Vinyl, color coding tape shall meet the requirements of the following industry standards:

ASTM D1000-10 - Standard Test Methods for Pressure-Sensitive Adhesive-Coated Tapes Used for Electrical and Electronic Applications

RoHS (European Union Directive 2002/95/EC for Restriction of Hazardous Substance)

4. Properties (nominal)

ASTM D1000 Class	2 (elastomeric)
Tape backing material	polyvinyl chloride (PVC) and/or its polymers
Adhesive	rubber-based, pressure-sensitive
Temperature	
Application, min	0° C (32° F)
Operating, max	105° C (221° F)
Material thickness, mil	7
Breaking strength, per ASTM D1000 @ 23° C (73° F),	17 lbs/in (of width)
Voltage rating, per UL 510	600 V
Core diameter	1 in
Shelf life (inside storage)	5 years from the date of manufacture

Tape shall have excellent resistance to abrasion, moisture, alkalies, acids, corrosion and varying weather conditions.

Tape shall be Underwriters Laboratories (UL) listed and marked as “Flame-Retardant, Cold Resistant.”

Tape shall be shall be RoHS (European Union Directive 2002/95/EC for Restriction of Hazardous Substance) compliant.

5. Testing

Test data that confirms the properties cited in the manufacturer's data sheet, industry standards, and this material standard shall be provided upon request.

6. Packaging

Tape shall be packaged to prevent damage during shipping, storage, and casual handling prior to use.

Each roll of tape shall be legibly marked with the following information:

- Manufacturer's name
- Manufacturer's catalog number
- Product description

Number of rolls of tape per case shall be according to Section 8.

Each shipping container shall be marked with Seattle City Light's Purchase Order Number.

7. Issuance

RL

8. Approved Manufacturers

Stock Number	**736775**
Description:	Vinyl, color coding tape, white, 1/2 in x 20 ft roll
Manufacturer	3M
Product	Scotch 35
UPC	054007-10232
Case Quality	100 rolls
Manufacturer	Plymouth (formerly Bishop)
Product	Premium 37
Catalog	3706 (3/4 in x 66 ft roll)
Case Quality	100 rolls

Stock Number	**736776**
Description:	Vinyl, color coding tape, yellow, 1/2 in x 20 ft roll
Manufacturer	3M
Product	Scotch 35
UPC	054007-10257
Case Quality	100 rolls
Manufacturer	Plymouth (formerly Bishop)
Product	Premium 37
ID	3703 (3/4 in x 66 ft roll)
Case Quality	100 rolls

Stock Number	**736777**
Description:	Vinyl, color coding tape, blue, 1/2 in x 20 ft roll
Manufacturer	3M
Product	Scotch 35
UPC	054007-10240
Case Quality	100 rolls
Manufacturer	Plymouth (formerly Bishop)
Product	Premium 37
ID	3705 (3/4 in x 66 ft roll)
Case Quality	100 rolls

Stock Number	**736778**
Description:	Vinyl, color coding tape, red, 1/2 in x 20 ft roll
Manufacturer	3M
Product	Scotch 35
UPC	054007-10224
Case Quality	100 rolls
Manufacturer	Plymouth (formerly Bishop)
Product	Premium 37
ID	3704 (3/4 in x 66 ft roll)
Case Quality	100 rolls

Stock Number	**736779**
Description:	Vinyl, color coding tape, green, 1/2 in x 20 ft roll
Manufacturer	3M
Product	Scotch 35
UPC	054007-10265
Case Quality	100 rolls
Manufacturer	Plymouth (formerly Bishop)
Product	Premium 37
ID	3702 (3/4 in x 66 ft roll)
Case Quality	100 rolls

Stock Number	**736780**
Description:	Vinyl, color coding tape, orange, 1/2 in x 20 ft roll
Manufacturer	3M
Product	Scotch 35
UPC	054007-10273
Case Quality	100 rolls
Manufacturer	Plymouth (formerly Bishop)
Product	Premium 37
ID	3708 (3/4 in x 66 ft roll)
Case Quality	100 rolls

Stock Number	**736781**
Description:	Vinyl, color coding tape, brown, 1/2 in x 20 ft roll
Manufacturer	3M
Product	Scotch 35
UPC	054007-10299
Case Quality	100 rolls
Manufacturer	Plymouth (formerly Bishop)
Product	Premium 37
ID	3707 (3/4 in x 66 ft roll)
Case Quality	100 rolls

9. References

3M, Scotch Vinyl Electrical Tape 35, Data Sheet, July 2011, 78-8124-4858-3 E

3M Electrical Products catalog, 80-6016-0382-4, 2011

Plymouth Electrical & Utility Products online catalog, undated, downloaded June 10, 2013

SCL 7367.5 (canceled) Tape, Marking, Vinyl, Pressure Sensitive

Shipek, John; Standards Engineer and originator of 7366.71.

UL 510; Polyvinyl Chloride Polyethylene and Rubber Insulating Tape

www.3m.com/electrical

www.plymouthrubber.com/catalogo.php

TAPE, MASKING
PRESSURE SENSITIVE

Scope: This specification covers high performance pressure-sensitive masking tape consisting of a pressure-sensitive adhesive on crepe paper backing.

Applicable Specification: Except as modified by this specification, the tape shall meet the requirements of Federal Specification UU-T-106, Type I, latest revision.

Clean Stripping: When applied to a properly painted surface, this tape shall strip clean, leaving no film or residue and shall not strip off or remove any of the underlying paint coating.

Physical Properties:

Thickness, maximum ..... 7.5 mils
Tensile strength, longitudinal pounds per inch of width, minimum ..... 19 lbs.
Ultimate elongation, minimum ..... 10 per cent
Adhesion to steel, min. ounces per inch width ..... 30 ounces

Packaging: The tape shall be uniformly and smoothly wound in 60-yard rolls on a suitable core having an inside diameter of 3 ± 1/32 inches. The tape shall be packaged with wax paper separators (or equivalent) between rolls.

Reference Specification: Fed. Spec. UU-T-106, Type I, latest revision

Stock Unit: RL

Stock Number	Width, Inches	Packaging Rolls/Case	Approved Manufacturer	
			3M	
			Product No.	Part No. (UPC)
736702	3/4 (18 mm)	48	233+	26334
736704	1 (24 mm)	24	233+	26336
736710	2 (48 mm)	12	233+	26340

ORIGINATOR	STANDARDS COORDINATOR	STANDARDS SUPERVISOR	UNIT DIRECTOR
Jim S. Horn	Charles L. Shaffer	John C. Skinner	Harold Gray

SPLICE COVERS, CABLE CAPS AND BOOTS HEAT SHRINKABLE

1. Scope

Heat-Shrinkable Splice Covers, Caps and Boots shall be fabricated from thermally stabilized polyolefin and shall meet or exceed the requirements listed below. All listed items shall shrink into place or to minimum recovered dimensions upon uniform application of 250°F heat.

2. Requirements

Physical

Ultimate Tensile Strength (PSI): ..... 2500 (ASTM D 412)
Ultimate Elongation (%): ..... 250 (ASTM D 412)
Water Absorption (mg/sq. in.): 0.30
Air Oven Aging
21 Days (500 hours at 150°C):
Percent Original Tensile 85
Percent Original Elongation 85

Electrical

Dielectric Strength (volts/mil): ..... 275 (ASTM D 149)

Operating Temperature: ..... -65° to +130°C (continuous)

Adhesive: ..... The inner walls of all splice covers and cable boots (Figures 3 and 1) listed in this standard shall have a full-length or total inside surface coating of meltable sealant which, with the application of heat, shall adhere to the cable jacket, forming a watertight seal. The adhesive lining shall be applied as a smooth surface with no spiral bead and no ribbing. The cable caps (Figure 2) shall have a full sealant coating extending at least one-third of the way from the closed end.

3. Packaging

All items shall be shipped as manufactured without bending, collapsing, creasing, or otherwise being deformed. In particular, tubing shall not be shipped bent in order to conform to or accommodate a shipping container. Supplier shall cut splice covers as necessary to conform to lengths specified below.

4. Approved Manufacturers

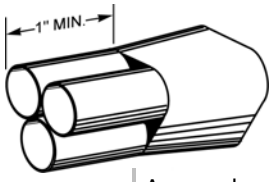


Figure 1

4.1 Cable Boots

Stock No.	Number of Legs	Body Use Range (Cable Diameter), in. Minimum	Body Use Range (Cable Diameter), in. Maximum	Legs Use Range (Cable Diameter), in. Minimum	Legs Use Range (Cable Diameter), in. Maximum	Approved Manufacturer Raychem/Tyco
737513	3	0.85	2.20	0.350	0.90	CBR-3-2-A
737517	3	1.10	2.90	0.500	1.25	CBR-3-3-A
010402	3	1.77	4.53	0.870	2.05	402W248/S
012479	4	2.75	8.50	0.875	2.00	CBR-NPB-4L
737520	6	1.45	3.85	Ø 0.600 G 0.300	Ø 1.50 G 0.75	CBR-6-1-A

standards coordinator	*standards supervisor*	*unit director*
John Shipek	John Shipek	Pamela S. Johnson

4. Approved Manufacturers, continued

4.2 Cable Caps

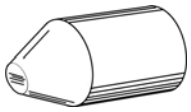


Figure 2

Stock No.	Approx. Length, in.	Minimum Expanded ID, in.	Maximum Recovered ID, in.	Nominal Recovered Wall, in.	Approved Manufacturers					
					AMP/ Tyco	DSG-Canusa	MAC	Raychem/ Tyco	INERTIA-REPL	3M
737475	2.2	0.79	0.36	0.09	383008-2	–	SKE 8/20	ESC-2/A	EC2A	SKE 8/20
737477	3.5	1.37	0.70	0.12	383008-3	CCAP-FR-1500-D-PR-BK	SKE 15/40	ESC-3/A	EC3A	SKE 15/40
737479	5.7	2.17	1.00	0.13	383008-4	–	SKE 25/63	ESC-4/A	EC4A	SKE 25/63
737481	5.7	4.70	2.76	0.16	–	CCAP-4700-FR	–	ESC-7/A	EC7A	–
737483	6.4	3.94	1.77	0.16	383008-6	–	SKE 45/100	ESC-6/A	EC6A	SKE 45/100
737485	6.7	2.87	1.26	0.13	383008-5	–	–	ESC-5/A	EC5A	SKE 30/76

4.3 Splice Covers

Figure 3

Stock No.	Length, in.	Minimum Expanded ID, in.	Maximum Recovered ID, in.	Nominal Recovered Wall, in.	Approved Manufacturers					
					AMP/ Tyco	DSG-Canusa	MAC	Raychem/ Tyco	INERTIA-REPL	3M
737450	9	1.10	0.37	0.12	53712-3	CFW-1100-9-D-PR-BK	ISA 300-9	WCSM-33/8-225-S	HWT-3008-9A	ITCSN-1100-9
737451	12	0.75	0.24	0.09	53711-5	CFW-750-12-D-PR-BK	ISA 250-12	WCSM-20/6-300-S	HWT-2007-12A	ITCSN-0800-12A*
737452	12	1.50	0.50	0.14	53713-4	CFW-1500-12-D-PR-BK	ISA 400-12	WCSM-43/12-300-S-POT	HWT-4012-12A	ITCSN-1500-12
737453	12	1.10	0.37	0.12	1-53712-4	CFW-1100-12-D-PR-BK	ISA 300-12	WCSM-33/8-300-S	HWT-3008-12A	ITCSN-1100-12
737455	12	2.00	0.75	0.16	53714-4	CFW-2000-12-D-PR-BK	ISA 500-12	WCSM-51/16-300-S	HWT-5518-12A	ITCSN-2000-12
737456	12	3.00	1.25	0.16	53715-3	CFW-3500-12-D-PR-BK	ISA 750-14	WCSM-105/30-300-S	HWT-8022-12A	ITCSN-3000-12
737601	48	1.29	0.37	0.12	–	–	–	WCSM-33/8-1200-S	HWT-3008-48A	–
737602	48	1.50	0.50	0.16	1-53713-3	CFW-1500-48-D-PR-BK	–	–	HWT-4012-48A	ITCSN-1500-48
737603	48	2.00	0.75	0.16	1-53714-4	CFW-2000-48-D-PR-BK	–	WCSM-51/16-1200-S	HWT-5518-48A	ITCSN-2000-48
737604	48	3.00	1.25	0.16	53715-9	CFW-3500-48-D-PR-BK	–	–	HWT-8022-48A	ITCSN-3000-48

* "A" indicates a bulk pack of 50.

TUBING, HEAT SHRINK TYPE, THIN WALL

1. Scope

This standard covers the requirements for thin wall, heat shrink type tubing.

This standard applies to Seattle City Light Stock Number 012476.

Medium wall heat shrink tubing and heavy wall splice covers are outside the scope of this standard.

2. Application

Thin wall heat shrink tubing is for general, non-electrical use. Tubing may be used for wire jacket marking.

The requirements for medium wall heat shrink tubing and heavy wall splice covers are specified in Material Standards 7374.70 and 7374.75 respectively.

3. Attributes

Shrink tubing shall have the following attributes:

Material	polyolefin
Color	black
Shrink ratio, expanded-recovered	2:1
Full recovery temperature, degrees C	121
Shrink temperature, minimum, degrees C	90
Operating temperature, continuous, degrees C	
minimum	-55
maximum	110
Tensile strength, pound-force per square inch, minimum	1500
Shelf life, minimum	10 years

Shrink tubing shall be supplied uncoated, without adhesive.

Shrink tubing length, expanded internal diameter, recovered internal diameter, and wall thickness shall be as specified in Section 6.

4. Packaging

Shrink tubing shall be packaged to prevent damage during shipping, handling, and inside storage.

Shrink tubing shall be packaged and shipped in its natural round state. Product received excessively deformed will not be accepted.

standards coordinator	*standards supervisor*	*unit director*
John Shipek	John Shipek	Darnell Cola

4. Packaging, continued

Individual packages shall be legibly marked with:

- Manufacturer's name
- Manufacturer's catalog number
- Product description
- Seattle City Light's Stock Number

Shipping containers shall be legibly marked with:

- Seattle City Light's Purchase Order Number

5. Issuance

Stock Unit: PC

6. Approved Manufacturers

Stock Number	Cut Piece Length, Nominal, in	Diameter, in: As Supplied, Minimum	Diameter, in: Recovered, Maximum	Recovered Wall Thickness, Nominal, in	Approved Manufacturer	Catalog Number
012476	48	0.250	0.125	0.025	Alpha Wire	FIT-221-1/4 black
					DSG-Canusa	CPX100, 0250, BK, 48
					TE Connectivity	CA8545-000, CPGI-RNF-100-1/4-48-BLSK, SP=25

Note: TE Connectivity products have previously gone under the names of Tyco Electronics, Tyco, and Raychem.

7. References

AlphaWire; www.alphawire.com

Shipek, John; SCL Standards Engineer, originator and subject matter expert for 7374.65 (john.shipek@seattle.gov)

Tyco Electronics catalog; 4-1773455-0 E361; 12/2009

TUBING, HEAT SHRINK TYPE, MEDIUM WALL

1. Scope

This standard covers the requirements for medium wall, heat shrink type tubing.

This standard applies to the following Seattle City Light Stock Numbers:

Stock Number	Body Use Diameter, Maximum, in
010414	1.25
737622	1.70
737623	2.90

Heavy and thin wall heat shrink tubing are outside the scope of this standard.

2. Application

Medium wall heat shrink tubing is applied over broken-out, taped-shielded cable to provide mechanical and environmental protection. Cables of this type are exclusive to the Network system.

Medium wall heat shrink tubing may also act as primary insulation for systems rated 600 volts and below. Product is considered non-flame retardant.

Use only an approved propane torch, Stock Number 765897, to install heat shrink products.

3. Attributes

Shrink tubing shall have the following attributes:

Material	cross-linked polyolefin
Color	black
Shrink ratio, expanded-recovered	3:1
Shrink temperature, minimum, degrees C	121
Dielectric rating, kV	1
Operating temperature, continuous, degrees C	
minimum	-55
maximum	110
Tensile strength, pound-force per square inch, minimum	2400
Shelf life, minimum	10 years

Shrink tubing interiors shall be lined their full length with a smooth coating of thermoplastic (hot melt) adhesive.

Shrink tubing lengths, expanded internal diameters, recovered internal diameters, and wall thicknesses shall be as specified in Section 6.

standards coordinator	*standards supervisor*	*unit director*
John Shipek	John Shipek	Darnell Cola

4. Packaging

Shrink tubing shall be packaged to prevent damage during shipping, handling, and inside storage.

Shrink tubing shall be packaged and shipped in its natural round state. Product received bent, collapsed, creased, or otherwise excessively deformed will not be accepted.

Individual packages shall be legibly marked with:

- Manufacturer's name
- Manufacturer's catalog number
- Product description
- Seattle City Light's Stock Number

Shipping containers shall be legibly marked with:

- Seattle City Light's Purchase Order Number

5. Issuance

Stock Unit: EA

6. Approved Manufacturers

Stock Number	Cut Piece Length, Nominal, in	Body Use Diameter, in		Recovered Wall Thickness, Nominal, in	Approved Manufacturer	Catalog Number
		Minimum	Maximum			
010414	48	0.50	1.25	0.08	DSG-Canusa	CFM1300, BK, PRT, D, 48
					INERTIA-REPL, Inc.	MWT3712-48A
					TE Connectivity	MWTM-35/12-1200-S
737622	48	0.65	1.70	0.08	DSG-Canusa	CFM1700, BK, PRT, D, 48
					INERTIA-REPL, Inc.	MWT5017-48A
					TE Connectivity	MWTM-50/16-1200-S
737623	48	1.00	2.90	0.11	DSG-Canusa	CFM3500, BK, PRT, D, 48
					INERTIA-REPL, Inc.	MWT8024-48A
					TE Connectivity	MWTM-85/25-1200-S

note: TE Connectivity products have previously gone under the names of Tyco Electronics, Tyco, and Raychem

7. References

DSG-Canusa; www.dsgcanusa.com

INERTIA-REPL, Inc.; CAT010509; Rev. 1; January 2009

Shipek, John; SCL Standards Engineer, originator and subject matter expert for 7374.70 (john.shipek@seattle.gov)

Tyco Electronics catalog; 4-1773455-0 E361; 12/2009

SPLICE COVERS, HEAT SHRINK TYPE, HEAVY WALL

1. Scope

This standard covers the requirements for heavy wall, heat shrink type splice covers.

This standard applies to the Seattle City Light Stock Numbers cited in Section 8.

Sealing caps, breakout boots, and medium and thin wall heat shrink tubing are outside the scope of this standard.

2. Application

Splice covers, also known as shrink tubes or shrinks, are used to seal, insulate, and protect cable joints and terminations. They are appropriate for submersible and direct burial installations.

Splice covers may also act as primary insulation for systems rated 600 volts and below. Product is considered non-flame retardant.

Use only an approved propane torch, Stock Number 765897, to install heat shrink products.

3. Industry Standards

Splice covers shall meet the applicable requirements of the following industry standards:

ANSI C119.1-2011 - American National Standard for Electric Connectors-Sealed Insulated Underground Connector Systems Rated 600 Volts

UL Standard 486D - Insulated Wire Connectors for Use with Underground Connectors

4. Attributes

Splice covers shall have the following attributes:

Material	cross-linked polyolefin
Color	black
Shrink ratio, expanded-recovered, minimum	3:1
Shrink temperature, minimum, degrees C	121
Dielectric rating, kV	1
Operating temperature, continuous, degrees C	
minimum	-55
maximum	110
Tensile strength, pound-force per square inch, minimum	2400
Shelf life, minimum	10 years

Splice cover interiors shall be lined their full length with a smooth coating of thermoplastic (hot melt) adhesive.

Splice covers shall be non-corrosive.

Splice cover lengths, expanded internal diameters, recovered internal diameters, and wall thicknesses shall be as specified in Section 8.

standards coordinator	*standards supervisor*	*unit director*
John Shipek	John Shipek	Darnell Cola

5. Design Changes

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

6. Packaging

Splice covers shall be packaged to prevent damage during shipping, handling, and inside storage.

Splice covers shall be packaged and shipped in their natural round state. Product received bent, collapsed, creased, or otherwise deformed will not be accepted.

Individual packages shall be legibly marked with:

- Manufacturer's name
- Manufacturer's catalog number
- Product description
- Seattle City Light's Stock Number

Shipping containers shall be legibly marked with:

- Seattle City Light's Purchase Order Number

7. Issuance

Stock Unit: EA

8. Approved Manufacturers

Stock Number	Length, Nominal, in	Expanded Internal Diameter Minimum, in	Recovered Internal Diameter Maximum, in	Recovered Wall Thickness, Nominal, in	Approved Manufacturer	Catalog Number
737450	9	1.10	0.37	0.120	3M	ITCSN-1100-9
					TE Connectivity	WCSM-34/8-225-S
737451	12	0.75	0.24	0.090	3M	ITCSN-0800-12A
					DSG-Canusa	CFW750-BK-PRT-D-12
737452	12	1.50	0.50	0.140	3M	ITCSN-1500-12
					TE Connectivity	WCSM-48/12-300-S
737453	12	1.10	0.37	0.120	3M	ITCSN-1100-12
					TE Connectivity	WCSM-34/8-300-S
737455	12	2.00	0.75	0.160	3M	ITCSN-2000-12
					TE Connectivity	WCSM-110-30-300-S
737456	12	3.00	1.25	0.160	3M	ITCSN-3000-12
					TE Connectivity	WCSM-110-30-300-S
737601	48	1.29	0.37	0.120	3M	-
					TE Connectivity	WCSM-34/8-1200-S
737602	48	1.50	0.50	0.160	3M	ITCSN-1500-48
					TE Connectivity	WCSM-48/12-1200-S
737603	48	2.00	0.75	0.160	3M	ITCSN-2000-48
					TE Connectivity	WCSM-56/16-1200-S
737604	48	3.00	1.25	0.160	3M	ITCSN-3000-48
					TE Connectivity	WCSM-110/30-1200-S

Note: TE Connectivity products have previously gone under the names of Tyco Electronics, Tyco, and Raychem

7. References

3M Data Sheet; 78-8126-0422-7 C; 3M Heavy Wall Heat Shrink Tubing ITCSN; June 2011

Shipek, John; SCL Standards Engineer, originator and subject matter expert for 7374.75 (john.shipek@seattle.gov)

Tyco Electronics catalog; 4-1773455-0 E361; 12/2009

CABLE BREAKOUT BOOTS, HEAT SHRINK TYPE

1. Scope

This standard covers the requirements for heat shrink type cable breakout boots.

This standard applies to the following Seattle City Light Stock Numbers:

Stock Number	Number of Legs	Body Use Diameter, Maximum, in
737513	3	2.20
737517	3	2.90
010402	3	4.53
012479	4	8.50
737520	6	3.85

Sealing caps, and heavy, medium and thin wall heat shrink tubing are outside the scope of this standard.

2. Application

Cable breakout boots provide strain relief and mechanical and environmental protection for breakouts in three-, four-, and six-conductor cables. Cables of this type are exclusive to the Network system. Product is considered non-flame retardant.

Use only an approved propane torch, Stock Number 765897, to install heat shrink products.

3. Attributes

Break out boots shall have the following attributes:

Material	cross-linked polyolefin
Color	black or red
Leg length, minimum, in	1
Shrink temperature, minimum, degrees C	121
Operating temperature, continuous, degrees C	
minimum	-55
maximum	110
Shelf life, minimum	10 years

Breakout boot interiors shall be lined their full length with a smooth coating of thermoplastic (hot melt) adhesive.

Breakout boots shall be non-corrosive.

Breakout boots details shall be as specified in Section 7.

standards coordinator	*standards supervisor*	*unit director*
John Shipek	John Shipek	Darnell Cola

4. Design Changes

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

5. Packaging

Breakout boots shall be packaged to prevent damage during shipping, handling, and inside storage.

Breakout boots shall be packaged and shipped in their natural round state. Product received bent, collapsed, creased, or otherwise deformed will not be accepted.

Individual packages shall be legibly marked with:

- Manufacturer's name
- Manufacturer's catalog number
- Product description
- Seattle City Light's Stock Number

Shipping containers shall be legibly marked with:

- Seattle City Light's Purchase Order Number

6. Issuance

Stock Unit: EA

7. Approved Manufacturers

Stock Number	Number of Legs	Body Use Diameter, in		Leg Use Diameter, in		Approved Manufacturer	Catalog Number
		Minimum	Maximum	Minimum	Maximum		
737513	3	0.85	2.20	0.35	0.90	TE Connectivity	CBR-3-2-A
737517	3	1.10	2.90	0.52	1.25	INERTIA-REPL	CB33A
						TE Connectivity	CBR-3-3-A
010402	3	1.77	4.53	0.87	2.05	INERTIA-REPL	CB34AOX
						TE Connectivity	402W248/S
012479	4	2.75	8.50	0.87	2.00	TE Connectivity	no quote
737520	6	1.45	3.85	0.60 ph 0.30 gr	1.50 ph 0.75 gr	TE Connectivity	CBR-6-1-A

note: TE Connectivity products have previously gone under the names of Tyco Electronics, Tyco, and Raychem

8. References

Shipek, John; SCL Standards Engineer, originator and subject matter expert for 7374.80 (john.shipek@seattle.gov)

Tyco Electronics catalog; 4-1773455-0 E361; 12/2009

SEALING CAPS, HEAT SHRINK TYPE

1. Scope

This standard covers the requirements for heat shrink type cable end sealing caps.

This standard applies to the following Seattle City Light Stock Numbers:

Stock Number	Internal Diameter, Maximum Recovered, in
737475	0.36
737477	0.70
737479	1.00
737485	1.26
737483	1.77
737481	2.76

Breakout boots, and heavy, medium and thin wall heat shrink tubing are outside the scope of this standard.

2. Application

Sealing caps are used to seal cable ends and provide mechanical and environmental protection.

Sealing caps may also be used as a live end seal for systems rated 600 volts and below. Product is considered non-flame retardant.

Use only an approved propane torch, Stock Number 765897, to install heat shrink products.

3. Industry Standards

Sealing caps shall meet the applicable requirements of the following industry standard:

ANSI C119.1-2011 - American National Standard for Electric Connectors-Sealed Insulated Underground Connector Systems Rated 600 Volts

4. Attributes

Sealing caps shall have the following attributes:

Material	cross-linked polyolefin
Color	black
Expanded wall thickness, in	0.050 ± 0.020
Shrink temperature, minimum, degrees C	121
Dielectric rating, minimum, kV	1
Operating temperature, continuous, degrees C	
minimum	-55
maximum	110
Shelf life, minimum	10 years

Sealing cap interiors shall be lined their full length with a smooth coating of thermoplastic (hot melt) adhesive.

Sealing caps shall be non-corrosive.

Sealing caps details shall be as specified in Section 8.

standards coordinator	*standards supervisor*	*unit director*
John Shipek	John Shipek	Darnell Cola

5. Design Changes

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

6. Packaging

Sealing caps shall be packaged to prevent damage during shipping, handling, and inside storage.

Sealing caps shall be packaged and shipped in their natural round state. Product received bent, collapsed, creased, or otherwise deformed will not be accepted.

Individual packages shall be legibly marked with:

- Manufacturer's name
- Manufacturer's catalog number
- Product description
- Seattle City Light's Stock Number

Shipping containers shall be legibly marked with:

- Seattle City Light's Purchase Order Number

7. Issuance

Stock Unit: EA

8. Approved Manufacturers

Stock Number	Expanded Length, Nominal, in	Expanded Internal Diameter Minimum, in	Recovered Internal Diameter Maximum, in	Recovered Wall Thickness, Nominal, in	Approved Manufacturer	Catalog Number
737475	2.2	0.79	0.36	0.09	3M	SKE 8/20
					TE Connectivity	ESC-2/A
737477	3.5	1.37	0.70	0.12	3M	SKE 15/40
					TE Connectivity	ESC-3/A
737479	5.7	2.17	1.00	0.13	3M	SKE 25/63
					TE Connectivity	ESC-4/A
737485	6.5	2.87	1.26	0.13	3M	SKE 30/76
					TE Connectivity	ESC-5/A
737483	6.5	3.94	1.77	0.16	3M	SKE 45/100
					TE Connectivity	ESC-6/A
737481	5.7	4.70	2.76	0.16	3M	-
					TE Connectivity	ESC-7/A

Note: TE Connectivity products have previously gone under the names of Tyco Electronics, Tyco, and Raychem

9. References

3M product documentation, Heat Shrink Heavy Duty End Caps; 3M Part Numbers SKE 4/10 to SKE 45/100; dated September 1997

Shipek, John; SCL Standards Engineer, originator and subject matter expert for 7374.85 (john.shipek@seattle.gov)

Tyco Electronics catalog; 4-1773455-0 E361; 12/2009

Sealing Caps, Cold Shrink Type

1. Scope

This standard covers the requirements for cold shrink type cable end sealing caps.

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

Stock No.	Use Range (in)	Nominal Length (in)
011682	0.46 to 0.82	2.5
011683	0.63 to 1.18	2.75
011684	1.02 to 1.94	3
011685	1.79 to 3.32	3.5

2. Application

Sealing caps are used to seal cable ends and provide mechanical and environmental protection.

Sealing caps may also be used as a live end seal for systems rated 600 V and below.

Product is considered non-flame retardant.

Installation requires no special tools.

3. Industry Standards

Sealing caps shall meet the applicable requirements of the following industry standard:

ANSI C119.1-2011 - American National Standard for Electric Connectors-Sealed Insulated Underground Connector Systems Rated 600 Volts

4. Requirements

Sealing caps shall have the following attributes:

Material	Mixed polyethylene
Color	Black
Wall thickness (in)	0.15
Operating temperature, range	
°C	-40 to 65
°F	-40 to 149
Installation temperature, minimum	
°C	-10
°F	20
Shelf life (years)	5
Dielectric strength, minimum (V/mil)	1

Sealing caps shall be suitable for direct bury, submersible, indoor, outdoor, and overhead application.

Sealing caps shall be ozone and ultraviolet light resistant.

Sealing caps shall meet the use range cited in Section 1.

Sealing cap interiors shall be close-ended, tubular, rubber sleeves that are factory expanded and loaded onto a removable core.

5. Packaging

Sealing caps shall be packaged to prevent damage during shipping, handling, and inside storage.

Sealing caps shall be packaged and shipped in their natural round state. Product received bent, collapsed, creased, or otherwise deformed will not be accepted.

Individual packages shall be legibly marked with:

- Manufacturer's name
- Manufacturer's catalog number
- Product description
- Seattle City Light stock number.

Shipping containers shall be legibly marked with:

- Seattle City Light purchase order number.

6. Issuance

Stock Unit: EA

7. Approved Manufacturers

Stock No.	Manufacturer	Catalog No.
011682	3M	EC1
011683	3M	EC2
011684	3M	EC3
011685	3M	EC4

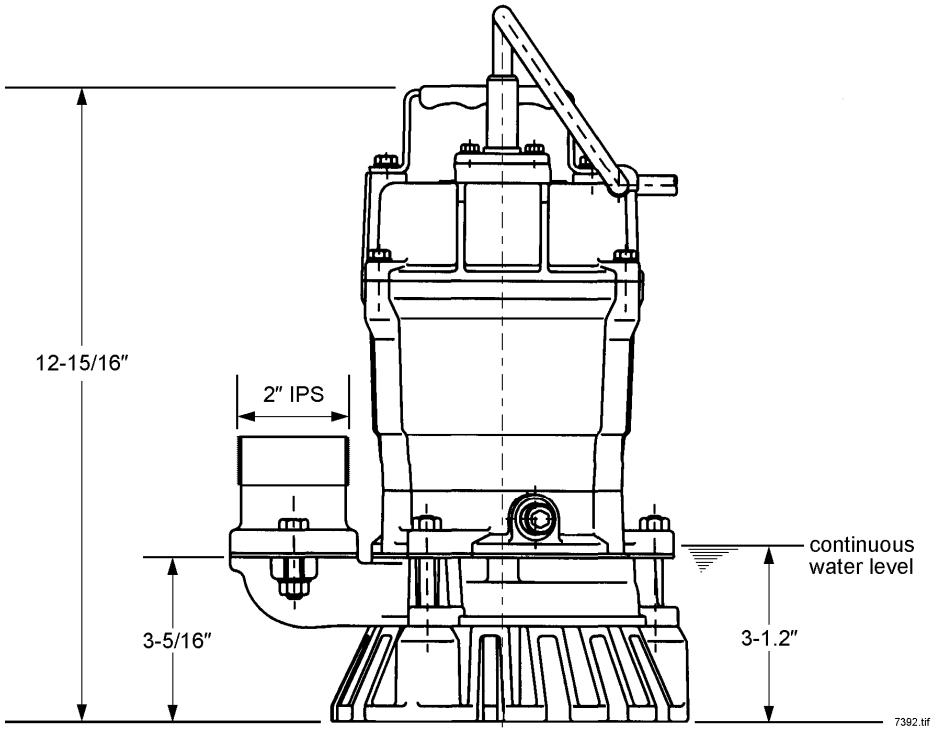
8. Sources

3M Product Data Sheet, Cold Shrink EPDM Tubes; 2003

3M Product Data Sheet, Cold Shrink End Caps EC-Series; 2013

Tilley, Kathy; SCL Electrical Engineering Support Specialist, originator and subject matter expert for 7375.85 (kathy.tilley@seattle.gov)

CAST IRON PUMP



1. Scope

This specification is for 110V-120V submersible centrifugal pumps intended for use in underground transformer vaults. The effluent to be pumped consists of water mixed with silt, small amounts of sand and gravel (up to 3/8″ diameter), detergents, and other materials typical of what might be washed off city streets. The pumps shall comply with the latest revisions to all applicable ANSI, NEMA, NEC, MIL-P-28607 Type lll, Class III, and UL requirements, except where modified by this specification. The motor shall be rated single-phase, 110-120V, 1 phase, 60 Hz.

2 Industry Standards

Cast iron pumps shall meet the applicable requirements of the latest industry standards:

NEMA MG-1 – Motors and Generators
MIL-P-28607 – Military Specification, Pump, Submersible
ANSI
National Electrical Code

3. Performance

The 1/2-hp pump shall have a minimum capacity of 45 U.S. gallons per minute at a 10-foot head. The maximum head shall not be less than 34 feet. The pumps shall be capable of passing suspended solids (up to 1″ in diameter) equal to 30% by volume of the water being pumped without clogging the impeller or pump passages.

4. Construction

4.1 Materials

The pump housing shall be cast iron. The rotor shaft shall be of 403 stainless steel. The semi-vortex impeller may be corrosion-resistant steel or urethane rubber material. If the impeller is not corrosion-resistant steel, the material must be pre-approved by engineering. All external fasteners shall be stainless steel.

4.2 Motor

The motor shall be rated for 115V, single-phase, 60 Hz., intermittent operation and thermally protected by an automatic reset overload protection device. The motor locked rotor rating shall not exceed NEMA Code M. The motor shall have permanently lubricated sealed bearings at both ends of the shaft (bushings are unacceptable). The motor shall be split-phase without a capacitor.

4.3 Outlet/Inlet

The 1/2-hp pump shall have a straight outlet with 2″ NPT female threads. The inlet base shall be cast iron.

4.4 Power Cord

The power cord shall be 16 to 20 feet in length and shall be UL approved for submersible use.

5. Approved Manufacturer

		Approved Manufacturer
Stock Number	**Horsepower**	**Tsurumi**
739290	1/2	HS2-4S-62

SEATTLE CITY LIGHT
MATERIAL STANDARD

Specification **7403.4**
Issued Oct. 4, 1961

REV. Jan. 15, 1992

BABBITT METAL

BABBITT METAL, used principally for generator, synchronous condenser, and turbine bearings, shall conform to the requirements of ASTM Specification B 23, Grade 2.

Reference Specification: ASTM B 23, latest revision.

Purchase Unit: 100-Lb. Lots

Acceptable Manufacturer: Non-Ferrous Metals Inc.

Stock Unit: Lb.

Stock Number: 740332

ORIGINATOR	STANDARDS COORDINATOR	STANDARDS SUPERVISOR	UNIT DIRECTOR
J E Perry	Charles L. Shaffer 611	John Skinner	D DeVries

LUBRICANT, SWITCH CONTACT

1. Scope

This material standard covers the requirements for switch contact lubricant.

This material standard applies to Seattle City Light Stock Number 013241.

2. Application

For lubricating S&C Electric type PMH, padmount, Mini-Rupter switch contacts.

Avoid contact with skin or eyes. During use, wear chemical resistant gloves and safety glasses. No ingredients are known to be hazardous under normal usage.

Refer to S&C Electric Data Bulletin 662-90 for type PMH switchgear inspection and maintenance recommendations.

3. Attributes

Product name	NYE Rheolube 368
Physical state	semi-solid
Packaging type/size	tube, 1/4 oz
Color	light tan to light yellow

4. Packaging

Tubes shall be packaged to prevent damage during shipping, handling, and storage.

Each shipping container shall be marked with:

- Seattle City Light's Purchase Order Number
- Seattle City Light's Stock Number

5. Issuance

Stock Unit: TU

6. Approved Manufacturer

S&C Electric part number 9999-044

7. References

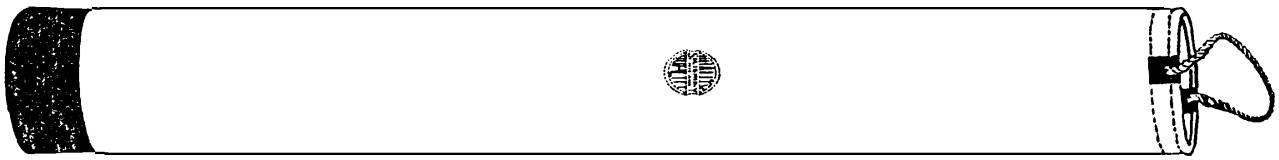
Data Bulletin 662-90; S&C Electric; August 8, 1994

Shipek, John; SCL Standards Engineer, subject matter expert and originator of 7510.44 (john.shipek @seattle.gov)

www.SandC.com

standards coordinator	*standards supervisor*	*unit director*
John Shipek	John Shipek	Pamela S. Johnson

BAG, CANVAS, LINE HOSE



Materials: Canvas line hose bags shall be made of water repellent cotton duck cloth meeting the requirements of Federal Specification CCC-C-419b; Cloth, Cotton, Duck, Unbleached, Plied Yarns, Type I, Numbered Duck.

The weight of the canvas cloth shall be 18-ounce (No. 6) or heavier hard textured canvas duck. The waterproof bottom and cuff shall be made of harness leather conforming to Federal Specification KK-L-156b or molded rubber. The top of the bag shall be formed with a nonmetallic ring over which the canvas is stitched. The stitching shall be of the best commercial practice.

Handle: The rope handle shall be reinforced with leather at attachment points.

Color: The color of the canvas duck shall be natural white or yellow.

Packing: The bags shall be packaged in accordance with the manufacturer's commercial practice to ensure safe delivery, without damage.

Reference Specifications: Federal CCC-C-419b, KK-L-156b, latest revisions

Stock Unit: EA

Stock No.	Bag Dimension Diameter-Length
760148	7 or 8" x 42"

ORIGINATOR	STANDARDS COORDINATOR	STANDARDS SUPERVISOR	UNIT DIRECTOR
Jim S. Horn	Charles L. Shaffer	John C. Skinner	Denis DeVries

BAGS, GLOVE

Canvas Bags for Rubber Glove Storage shall be made of water-repellent, cotton duck cloth meeting the applicable requirements of *Federal Specifications CCC-C-419b; Cloth, Cotton, Duck, Unbleached, Plied Yarns, Type I, Numbered Duck*.

The weight of the canvas cloth for rubber glove bags shall be (#10) minimum 15 ounces per square yard.

The bags shall be furnished with heavy-duty button snaps, securely anchored, reinforced, snap hook, and ventilation and drain hole(s) in the bottom of the bags. Strain points shall be bar-tacked or riveted and the bags lock-stitched with nylon thread. The color of the canvas duck shall be white or yellow.

Reference Specification: *Federal CCC-C-419b*, latest revisions.

Vinyl Bags Made for Rubber Glove Storage shall be made of 10 ounce per square yard, vinyl-coated **both** sides, open-weave nylon cloth with beveled side gussets 2 inches at bottom and 4 inches at top.

The bags shall be furnished with two each #24 line nickel-plated brass snap button fasteners for closing, a securely-anchored, reinforced snap hook, and equally-spaced No. 1 brass grommets in bag bottom. Sewing should be with nylon thread, double row of stitching with corner stress points bar-tacked. Color: yellow.

Lettering: Each bag type shall be lettered "High-Voltage Gloves," or "Low-Voltage Gloves." Letter size shall be a minimum of 1/2 inches high.

Packaging: The bags shall be packaged in accordance with the manufacturer's commercial practice to ensure safe delivery without damage.

Stock Unit: EA

Stock Number	Glove Type	Size (Minimum) Inches	Material	Approved Manufacturers					
				Bashlin	Buzzline	Estex	Klein	Miller	Salisbury
760153	High Voltage	8 x 15 ±1/4	Canvas	24	#20	2220B-SCL	5124-15	9	45-14
			Vinyl	24-BC	–	–	5124-15VC	10-16-H	–
760154	Low Voltage	8 x 12 ±1/4	Canvas	24-M	#19	2210B-SCL	–	–	45-12
			Vinyl	–	–	–	–	9-11-H	–

ORIGINATOR	STANDARDS COORDINATOR	STANDARDS SUPERVISOR	UNIT DIRECTOR
Jim S. Horn	Charles L. Shaffer	John C. Skinner	Harold Jug

HACKSAW BLADES, HAND
HIGH-SPEED, BI-METAL

Hand Hacksaw Blades, for general use, shall be of shatterproof, high-speed steel for the tooth line and spring steel alloy for the back.

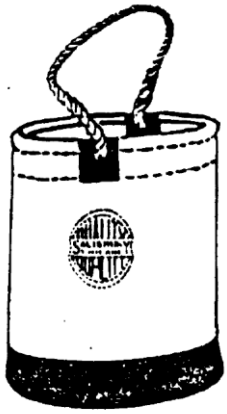
Packaging: 100 blades per box (bundles of 10 each)

Stock Unit: EA

Stock Number	Nominal Length, Inches	Teeth Per Inch	Approved Manufacturers					
			American Lenox Hackmaster 2	Disston ProSelect Bi-Metal	Milford Rezistor Bi-Metal	Morse	Nicholson Bi-Metal	Sandvik Sandflex Bi-Metal
760460	12	14	20115-214HE	–	20544	HHB 1214	NT1214	–
760465	12	18	20116-218HE	B1218	20545	HHB 1218	NT1218	38061218
760480	12	24	20117-224HE	B1224	20546	HHB 1224	NT1224	38061224

ORIGINATOR	STANDARDS COORDINATOR	STANDARDS SUPERVISOR	UNIT DIRECTOR
Jim S. Horn	Charles L. Shaffer	John C. Skinner	Harold Gray

BAG, CANVAS, TOOL



MATERIALS: Canvas tool bags shall be made of No. 4 or heavier water repellent cotton duck cloth meeting the requirements of Federal Specification CCC-C-419b. The weight of the canvas cloth shall be a minimum of 25 oz. per square yard. The hardened, waterproofed bottom and cuff shall be made of leather or rubber. Polypropylene or other plastics are not acceptable. If made of leather, it shall meet Federal Specification KK-L-156b. The top of the bag shall be formed with a nonmetallic ring over which the canvas cloth is stitched. All stitching shall be done with nylon thread. The handle shall be 1/2" Safety Yellow polypropylene (hollow braid), tensile strength a minimum of 3,780 lb., working load a minimum of 420 pounds. A pocket of 6" x 6" minimum size shall be provided inside the tool bag located 3" from the top of the bag.

DRAINAGE HOLE: A 1/4" hole shall be placed in the bottom of the bag for water drainage. If the bag has a leather bottom, the hole shall be reinforced with nonmetallic material or grommet.

COLOR: The color of the bag shall be white or yellow.

SIZE: 12" diameter x 16" to 17" deep.

PACKAGING: The bags shall be packaged in accordance with the manufacturer's commercial practice to ensure safe delivery, without damage.

REFERENCE SPECIFICATIONS:

CCC-C-419b	"Cloth, Cotton Duck, Unbleached, Plied Yarns, Type I, Numbered Duck".
KK-L-156b	"Leather, Cattlehide, Harness, Vegetable Tanned".

APPROVED MANUFACTURERS:

Buzzline (Heim)	#32-203 (Rubber)
Estex	#2060-SCL (Rubber)
Klein	#5104 (Leather)
Salisbury	#30/1328 (Leather)

Stock Unit: Each

Stock No. 760735

ORIGINATOR	STANDARDS COORDINATOR	STANDARDS SUPERVISOR	UNIT DIRECTOR
Jim S. Horn	Charles L. Haffer	John C. Thomas	Denis DeVries

WHEEL CHOCKS, ALUMINUM

1. Scope

This material standard covers the requirements for aluminum wheel chocks. Each wheel chock is equipped with handle.

This material standard applies to Seattle City Light Stock Number 760931.

2. Application

Wheel chocks are used as a back up measure to prevent a vehicle from rolling down a hill in the event the vehicle's parking break system fails.

The wheel chock specified in this standard is only approved for use that conforms to the latest revision of Work Practice 0057.03 – Wheel Chock Application. Extensive field testing went into the development of Work Practice 0057.03.

Misapplication of wheel chocks could lead to serious personal injury to Seattle City Light employees or the general public.

3. Construction

Wheel chocks shall meet the requirements of the following Seattle City Light fabrication drawing:

A-5174 – Aluminum Wheel Chock, revision number 3, dated October 28, 2010

4. Pre-Production Approval

Successful bidder shall submit a first article (proto-type) to Seattle City Light Standards for approval prior to the fabrication of the first production piece.

Successful bidder shall submit a first production piece to Seattle City Light Standards for approval prior to the fabrication of the balance of the order.

5. Packaging

Wheel chocks shall be stacked and shrink-wrapped to wood pallets in quantities not to exceed 50 units per pallet.

Each pallet shall be marked with Seattle City Light's Stock Number.

6. Issuance

EA

7. Approved Manufacturers

Bids may be solicited from any fabricator identified by Civil/Mechanical Engineering or Material Control as being capable.

9. References

SAE J348, SAE International, Surface Vehicle Standard, revision June 1990

0057.03; "Wheel Chock Application," Work Practice; SCL

7609.3; "Wheel Chock (canceled); Material Standard; SCL

Ng, Sharon; SCL civil engineer and subject matter expert for 7609.30 (sharon.ng@seattle.gov)

Shipek, John; SCL Standards Engineer, subject matter expert and originator of 7609.30 (john.shipek@seattle.gov)

standards coordinator	*standards manager*	*unit director*
John Shipek	John Shipek	Pamela S. Johnson

TRAFFIC SAFETY CONES, STANDARD PROFILE

1. Scope

This standard covers the requirements for standard profile, retroreflectorized traffic safety cones.

This standard applies to Seattle City Light Stock Number 761125.

2. Application

Traffic safety cones are used to channelize road users, divide opposing vehicular traffic lanes, divide lanes when two or more lanes are kept open in the same direction, and delineate short duration maintenance and utility work.

The cones specified in this standard are appropriate for day or night time use on low-speed roadways or freeways.

To minimize the possibility of being blown over or displaced by moving vehicular traffic, cones may be doubled up to increase their weight.

3. Industry Standards

Traffic safety cones shall meet the requirements of the following standard:

Federal Highway Administration (FHWA) Manual on Uniform Traffic Control Devices (MUTCD), 2009

4. Requirements

Material	
Base	black PVC
Underline	pink PVC
Top Coat	highly-pigmented, UV-stabilized PVC
Color	brilliant fluorescent orange
Tensile strength, minimum	1200 psi
Tear strength, maximum	250 lbs/in
Weight, nominal	8 lbs
Wall thickness, nominal	
Top	0.075 in
Bottom	0.130 in

Cones shall be provided with a 6-inch wide white, retroreflectorized band located 3 to 4 inches from the top of the cone with an additional 4-inch wide band located approximately 2 inches below the 6-inch band.

Cones shall be designed and fabricated to nest neatly and separate easily when stacked.

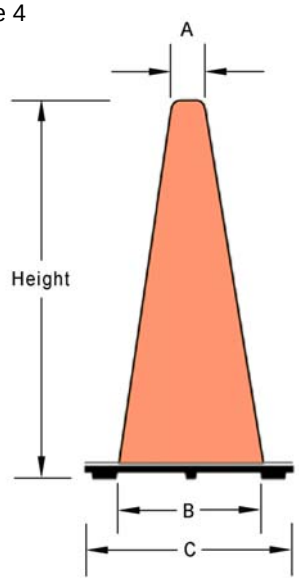
Cones shall be inner (in-mold) stenciled with "**SCL**" or equivalent text in letters readable from a distance of ten feet.

standards coordinator	*standards supervisor*	*unit director*
John Shipek	John Shipek	Darnell Cola

4. Requirements, continued

Dimensions, nominal	
Height	28 in
A	2.38 in
B	10.5 in
C	14.5 in

Figure 4



5. Testing

Test data that establishes compliance with this material standard shall be provided upon request.

6. Packaging

Each shipping container shall be marked with:

- Seattle City Light's Purchase Order Number
- Seattle City Light's Stock Number

7. Issuance

EA

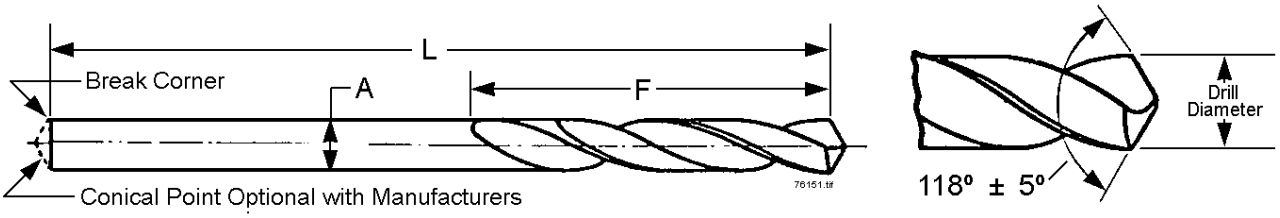
8. Approved Manufacturers

Stock Number	Catalog Numbers	
	Jackson Safety	JBC Safety
761125	3000SCL	JBC700SCL

9. Reference

Shipek, John; SCL Standards Engineer, subject matter expert and originator of 7611.10 (john.shipek@seattle.gov)

TWIST DRILLS, HIGH-SPEED STEEL
STRAIGHT SHANK, JOBBERS LENGTH
(Fractional Sizes)



High-speed steel, twist drills, for general use on ferrous and nonferrous materials. Shall meet the requirements of ANSI Standard B94-11 for Jobbers Length, Straight-Shank Drills.

Reference Specifications: USA B5-12, latest revisions.

Stock Unit: EA

Purchase Unit: Commercial Package

Approved Manufacturers: Ace, Chicago-Latrobe, Cleveland, Continental, Dormer Tools, Morse, National*, New Process, Precision Twist Drill, Republic, Viking, Whitman & Barnes.

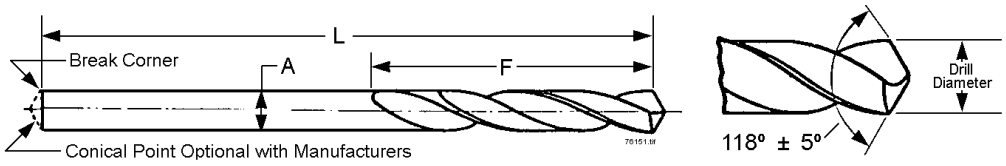
Stock Number	Size Dia. In.	Decimal Equiv. In.	Length, In.	
			Overall L	Flute F
761504	3/64	0.0469	1-3/4	3/4
761505	1/16	0.0625	1-7/8	7/8
761506	5/64	0.0781	2	1
761507	3/32	0.0938	2-1/4	1-1/4
761508	7/64	0.1094	2-5/8	1-1/2
761509	1/8	0.1250	2-3/4	1-5/8
761510	9/64	0.1406	2-7/8	1-3/4
761511	5/32	0.1562	3-1/8	2
761512	11/64	0.1719	3-1/4	2-1/8
761513	3/16	0.1875	3-1/2	2-5/16
761514	13/64	0.2031	3-5/8	2-7/16
761515	7/32	0.2188	3-3/4	2-1/2
761516	15/64	0.2344	3-7/8	2-5/8
761517	1/4	0.2500	4	2-3/4
761518	17/64	0.2656	4-1/8	2-7/8
761519	9/32	0.2812	4-1/4	2-15/16

Stock Number	Size Dia. In.	Decimal Equiv. In.	Length, In.	
			Overall L	Flute F
761520	19/64	0.2969	4-3/8	3-1/16
761521	5/16	0.3125	4-1/2	3-3/16
761522	21/64	0.3281	4-5/8	3-5/16
761523	11/32	0.3438	4-3/4	3-7/16
761524	23/64	0.3594	4-7/8	3-1/2
761525	3/8	0.3750	5	3-5/8
761526	25/64	0.3906	5-1/8	3-3/4
761527	13/32	0.4062	5-1/4	3-7/8
761528	27/64	0.4219	5-3/8	3-15/16
761529	7/16	0.4375	5-1/2	4-1/16
761530	29/64	0.4531	5-5/8	4-3/16
761531	15/32	0.4688	5-3/4	4-5/16
761532	31/64	0.4844	5-7/8	4-3/8
761533	1/2	0.5000	6	4-1/2
761535	17/32	0.5312	6-5/8	4-13/16

* Distributed by Standard Tool Co.

ORIGINATOR	STANDARDS COORDINATOR	STANDARDS SUPERVISOR	UNIT DIRECTOR
Jim S. Horn	Charles L. Shaffer	John C. Skinner	Harold Jay

TWIST DRILLS, HIGH-SPEED STEEL
STRAIGHT SHANK, JOBBERS LENGTH
(Wire Gage Sizes)



High-speed steel, twist drills, for general use on ferrous and nonferrous materials. Shall meet the requirements of ANSI Standard B94-11 for Jobbers Length, Straight-Shank Drills.

Reference Specifications: USA B5-12, latest revisions.

Stock Unit: EA

Purchase Unit: Commercial Package

Approved Manufacturers: Ace, Chicago-Latrobe, Cleveland, Continental, Dormer Tools, Morse, National*, New Process, Precision Twist Drill, Republic, Viking, Whitman & Barnes.

Stock Number	Size Wire Gage	Decimal Equiv. In.	Length, In.	
			Overall L	Flute F
761601	1	0.2280	3-7/8	2-5/8
761602	2	0.2210	3-7/8	2-5/8
761603	3	0.2130	3-3/4	2-1/2
761604	4	0.2090	3-3/4	2-1/2
761605	5	0.2055	3-3/4	2-1/2
761606	6	0.2040	3-3/4	2-1/2
761607	7	0.2010	3-5/8	2-7/16
761608	8	0.1990	3-5/8	2-7/16
761609	9	0.1960	3-5/8	2-7/16
761610	10	0.1935	3-5/8	2-7/16
761611	11	0.1910	3-1/2	2-5/16
761612	12	0.1890	3-1/2	2-5/16
761613	13	0.1850	3-1/2	2-5/16
761614	14	0.1820	3-3/8	2-3/16
761615	15	0.1800	3-3/8	2-3/16
761616	16	0.1770	3-3/8	2-3/16
761617	17	0.1730	3-3/8	2-3/16
761618	18	0.1695	3-1/4	2-1/8
761619	19	0.1660	3-1/4	2-1/8
761620	20	0.1610	3-1/4	2-1/8
761621	21	0.1590	3-1/4	2-1/8
761622	22	0.1570	3-1/8	2
761623	23	0.1540	3-1/8	2
761624	24	0.1520	3-1/8	2
761625	25	0.1495	3	1-7/8
761626	26	0.1470	3	1-7/8
761627	27	0.1440	3	1-7/8
761628	28	0.1405	2-7/8	1-3/4
761629	29	0.1360	2-7/8	1-3/4
761630	30	0.1285	2-3/4	1-5/8
761631	31	0.1200	2-3/4	1-5/8

Stock Number	Size Wire Gage	Decimal Equiv. In.	Length, In.	
			Overall L	Flute F
761632	32	0.1160	2-3/4	1-5/8
761633	33	0.1130	2-5/8	1-1/2
761634	34	0.1110	2-5/8	1-1/2
761635	35	0.1110	2-5/8	1-1/2
761636	36	0.1065	2-1/2	1-7/16
761637	37	0.1040	2-1/2	1-7/16
761638	38	0.1015	2-1/2	1-7/16
761639	39	0.0995	2-3/8	1-3/8
761640	40	0.0980	2-3/8	1-3/8
761641	41	0.0960	2-3/8	1-3/8
761642	42	0.0935	2-1/4	1-1/4
761643	43	0.0890	2-1/4	1-1/4
761644	44	0.0860	2-1/8	1-1/8
761645	45	0.0820	2-1/8	1-1/8
761646	46	0.0810	2-1/8	1-1/8
761647	47	0.0785	2	1
761648	48	0.0760	2	1
761649	49	0.0730	2	1
761650	50	0.0700	2	1
761651	51	0.0670	2	1
761652	52	0.0635	1-7/8	7/8
761653	53	0.0595	1-7/8	7/8
761654	54	0.0550	1-7/8	7/8
761655	55	0.0520	1-7/8	7/8
761656	56	0.0465	1-3/4	3/4
761657	57	0.0430	1-3/4	3/4
761658	58	0.0420	1-5/8	11/16
761659	59	0.0410	1-5/8	11/16
761660	60	0.0400	1-5/8	11/16
761665	65	0.0350	1-1/2	5/8

* Distributed by Standard Tool Co.

ORIGINATOR	STANDARDS COORDINATOR	STANDARDS SUPERVISOR	UNIT DIRECTOR
Jim S. Horn	Charles L. Shaffer	John C. Skinner	Harold Jay

SEATTLE CITY LIGHT

MATERIAL STANDARDS

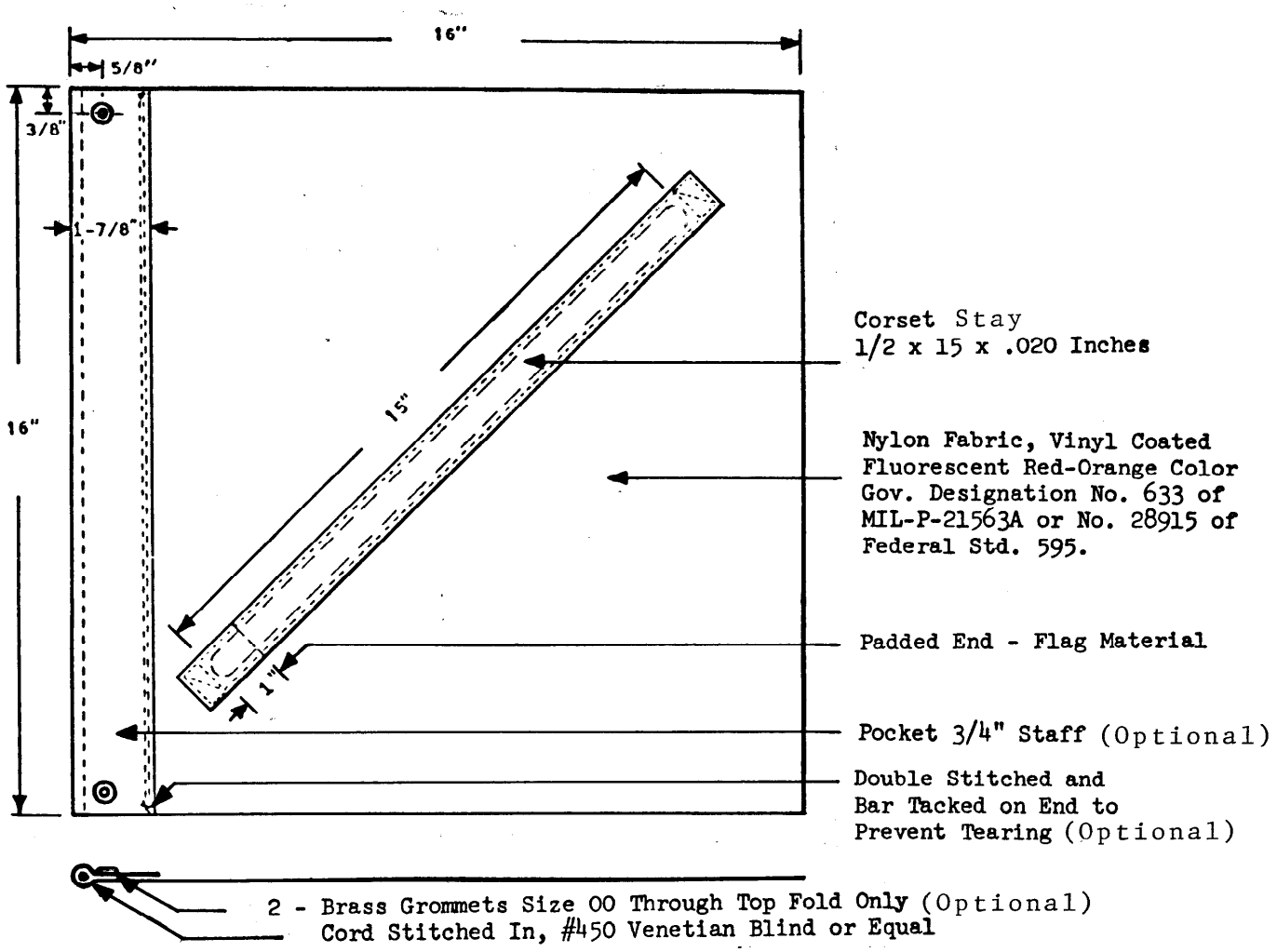
No. 7624.10

Page 1 of 1

DATE: Oct. 2, 1963

Rev: Aug. 24, 1989

FLAG, WARNING



WARNING FLAG of the configuration shown shall be made of nylon fabric, heat sealed between vinyl plastic sheets. The nylon base fabric shall be at least 4 oz. per sq. yd., and shall be 13 oz. per sq. yd. after sealing in vinyl.

Color. The color shall be red-orange fluorescent matching Government Designation Color No. 633 of MIL-P-21563A or No. 28915 of Federal Standard 595.

Stitching. The thread shall be nylon size D-46 or equal, lock stitch, 7 stitches per inch, plus or minus one stitch.

Packaging and Shipping. Warning flags shall be packaged in accordance with the manufacturer's commercial practice to assure safe delivery without damage. Shipping containers shall be legibly marked with the type and quantity of items, the City Purchase Order number, the name and address of the manufacturer, and the address of the receiving warehouse.

Reference Specifications: MIL-P-21563A; Fed. Std. 595.
Stock Unit: Each Stock Number: 762407

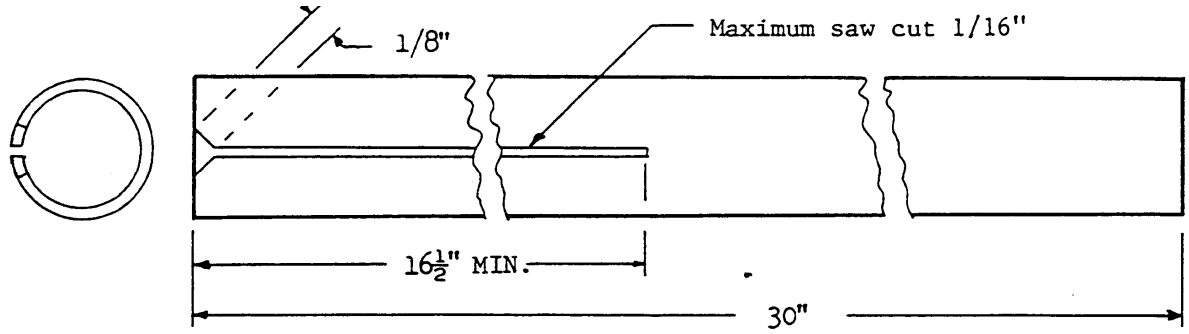
ORIGINATOR	STANDARDS COORDINATOR	STANDARDS SUPERVISOR	UNIT DIRECTOR
J E Perry	Allan O. Whitcomb 622	John Skinner	D DeVries

SEATTLE CITY LIGHT

MATERIAL STANDARD

STANDARD NUMBER: **7624.11**
PAGE: 1 of 1
DATE: August 28, 1963
REV: March 17, 1999

STAFF, WARNING FLAG



Flag Staff shall be of the configuration shown and shall be free of sharp edges. The saw cut shall be clean and smooth.

Material:

❖**Stock No. 762408:** The staff shall be fabricated from 1/2" nominal size Schedule 80, rigid polyvinyl chloride pipe meeting the requirements of NEMA TC 2. (Equivalent wood substitute acceptable.)

✪**Stock No. 762409:** The staff shall be fabricated from 3/4" nominal size Schedule 80, rigid polyvinyl chloride pipe meeting the requirements of NEMA TC 2.

Reference Specification:
NEMA TC 2

Stock Unit: Each

Stock No.	Material	Length In.	Nom. OD In.	Nom. Wall Thickness	Color
❖762408	Schedule 80 PVC	30	0.750	0.147	Gray or Black
✪762409	Schedule 80 PVC	30	1.050	0.154	Gray or Black

ORIGINATOR	STANDARDS COORDINATOR	STANDARDS SUPERVISOR	UNIT DIRECTOR
Jim S. Horn	Charles L. Shaffer	John C. Skinner	Betty Robin

BLANKETS
RUBBER INSULATING

This specification is for rubber insulating blankets used as portable protective devices to guard against accidental contact with live electrical conductors.

Rubber insulating blankets shall meet the requirements of the latest revision of ASTM D 1048 for Type II, CLASS 4, Style A Blankets. The blankets shall be molded of corona-resistant, chlorosulphonated polyethylene rubber or ethylene, propolene, diene, modified rubber (EPDM) compounded to withstand the ASTM Voltage Test of 40,000 (RMS AC) and 70,000 DC applied for 3 minutes as per Sections 9 and 18.6 for Class 4 Blankets. The rubber compound shall remain flexible in a temperature range of -20º F to 235º F.

The blankets shall be of the beaded edge type with molded eyelets. The color of the blankets shall be highly visible orange per ASTM D 1048 Section 7.3.1, latest revision.

Insulating blankets shall be packaged in accordance with the manufacturer's commercial practice to ensure safe delivery without damage.

Reference Specifications: ASTM D 1048, latest revision.

Stock Unit: EA

			Approved Manufacturer
Stock No.	Size (in)	Style	Salisbury
763330	22 x 22 x 1/8	Snap Button	#13 "Orange Salcor"
763332	36 x 36 x 1/8	Eyelet	#900-E "Orange Salcor"

standards coordinator	*standards supervisor*	*unit director*
Tanya Panomvana	John Shipek	Darnell Cola

GLOVES, GENERAL PURPOSE, LEATHER

1. Scope

This material standard covers the requirements for general purpose, leather gloves.

Leather protector gloves that are worn over insulating rubber gloves are outside the scope of this standard.

This material standard applies to the following Seattle City Light Stock Numbers:

Stock No.	Size	Style
013189	small	cowhide
013190	medium	cowhide
013191	large	cowhide
013192	extra-large	cowhide
013193	7	goatskin
013194	8	goatskin
013195	9	goatskin
013196	10	goatskin
013197	11	goatskin
013198	12	goatskin
013199	13	goatskin
013200	7	goatskin with gauntlet
013201	8	goatskin with gauntlet
013202	9	goatskin with gauntlet
013203	10	goatskin with gauntlet
013204	11	goatskin with gauntlet
013205	12	goatskin with gauntlet
013206	13	goatskin with gauntlet

2. Application

General purpose gloves are worn to protect hands against cuts, abrasions, and punctures.

Cowhide gloves are durable and warmer than goatskin, but are prone to get stiff after being wet. Cowhide gloves are not washable.

Goatskin gloves are durable, supple, and waterproof, but do not retain heat as well as cowhide. Goatskin gloves are washable. Because goatskin gloves do not stretch, they must fit on first try.

General purpose gloves with gauntlets offer additional protection.

General purpose gloves are ***not*** appropriate for use as protectors over insulating rubber gloves or for any sort of protection against hazardous voltage.

3. Requirements

3.1 Cowhide

Cream color, LM weight (3.5 oz to 3.75 oz), side grain, economy grade cowhide palm; yellow canvas back. Full fit, gunn pattern with leather finger tips, and knuckle strap, red elastic band at back of wrist. Straight thumb. Two-inch stiff canvas safety cuff with "RAWHIDE" emblazoned in red letters, leather heel pull.

standards coordinator	*standards supervisor*	*unit director*
John Shipek	John Shipek	Pamela S. Johnson

3.2 Goatskin

Cream color, goatskin, non-insulated, seamless palm, fully welted wing thumb, brown colored leather band top.

3.3 Goatskin with Gauntlets

Cream color, goatskin, non-insulated, seamless palm, fully welted wing thumb, brown colored leather 4-inch gauntlet top.

4. Packaging

Gloves shall be packaged to keep them clean and dry during shipping and storage.

Gloves shall be packaged in lots of 12.

The outside of each package shall be marked with Seattle City Light's Stock Number.

5. Issuance

PR

6. References

Shipek, John; SCL Standards Engineer, subject matter expert and originator of 7634.17 **(**john.shipek@seattle.gov**)**

www. napaglove.com

www.northstar.com

7. Approved Manufacturers

			Manufacturers and Catalog Number	
Stock No.	Size	Style	Napa Glove and Safety, Inc	North Star Glove Co.
013189	small	cowhide	-	4822, S
013190	medium	cowhide	-	4822, M
013191	large	cowhide	-	4822, L
013192	extra-large	cowhide	-	4822, XL
013193	7	goatskin	54, size 7	-
013194	8	goatskin	54, size 8	-
013195	9	goatskin	54, size 9	-
013196	10	goatskin	54, size 10	-
013197	11	goatskin	54, size 11	-
013198	12	goatskin	54, size 12	-
013199	13	goatskin	54, size 13	-
013200	7	goatskin with gauntlet	57, size 7	-
013201	8	goatskin with gauntlet	57, size 8	-
013202	9	goatskin with gauntlet	57, size 9	-
013203	10	goatskin with gauntlet	57, size 10	-
013204	11	goatskin with gauntlet	57, size 11	-
013205	12	goatskin with gauntlet	57, size 12	-
013206	13	goatskin with gauntlet	57, size 13	-

PROTECTORS, LEATHER, FOR CLASS 0 RUBBER INSULATING GLOVES

1. Scope

This material standard covers the requirements for leather protector gloves appropriate for use with Class 0 electrical insulating rubber gloves, Material Standard 7634.60.

The requirements for leather protector gloves appropriate for use with Class 1 and 2 electrical insulating rubber gloves are specified in Material Standard 7634.21.

This material standard applies to the following Seattle City Light Stock Numbers:

Stock Number	Size	Length, in
012267	7	10
012268	7-1/2	10
763373	8	10
012797	8 short finger	10
763374	9	10
763379	9-1/2	10
763375	10	10
763380	10-1/2	10
763376	11	10
763377	12	10
013260	10	13
013261	11	13

2. Application

Leather protector gloves, also known as keepers, are worn over rubber insulating gloves to protect against cuts, abrasions, and punctures.

Rubber insulating gloves shall not be used without leather protector gloves.

Leather protector gloves shall not be used alone for protection against electric shock.

Gloves with an overall length of 13 inches, Stock Numbers 013260 and 013261, are used exclusively by network protector crews.

3. Industry Standards

Gloves shall meet the requirements of the following industry standard:

ASTM F 696-06 - Standard Specification for Leather Protectors for Rubber Insulating Gloves and Mittens

4. Detailed Requirements

Leather protector gloves shall have the following attributes:

length	as specified in section 10
glove color	may vary from pearl to tan
cuff design	
10 in length	no cuff
13 in length	straight cuff
type	goatskin
required options	shirred elastic back

standards coordinator	*standards supervisor*	*unit director*
John Shipek	John Shipek	Darnell Cola

5. Marking

Each glove shall be marked according to the requirements of ASTM F-696, Section 9.

6. Testing

Gloves shall be tested according to the requirements of ASTM F-696, Section 8.

Test data that establishes compliance with the requirements of ASTM F-696 shall be provided upon request.

7. Packaging

Gloves shall be packaged to keep them clean during shipping and storage.

8. Issuance

PR

9. References

7634.21; "Protectors, Leather, for Class 1 and 2 Rubber Insulating Gloves;" Material Standard; SCL

7634.60: "Gloves, Insulating, Rubber, Class 0;" Material Standard; SCL

D 120-08; "Standard Specification for Rubber Insulating Gloves"; ASTM

F 496-08; "Standard Specification for In-Service Care of Insulating Gloves and Sleeves"; ASTM

Shipek, John; SCL Standards Engineer, subject matter expert and originator of 7634.20 (john.shipek@seattle.gov)

www.kunzglove.com

www.whsalisbury; Salisbury by Honeywell

10. Approved Manufacturers

			Manufacturers and Catalog Numbers			
Stock Number	Size	Length, in	Edwards Glove Company	Kunz Glove Company	Protective Industrial Products (PIP)	Salisbury
012267	7	10	309G-7	999-7	-	-
012268	7-1/2	10	309G-7.5	999-7.5	-	-
763373	8	10	309G-8	999-8	-	LPG10/8
012797	8 short finger	10	-	-	148-1000	-
763374	9	10	309G-9	999-9	-	LPG10/9
763379	9-1/2	10	309G-9.5	999-9.5	-	LPG10/9H
763375	10	10	309G-10	999-10	-	LPG10/10
763380	10-1/2	10	309G-10.5	999-10.5	-	LPG10/10H
763376	11	10	309G-11	999-11	-	LPG10/11
763377	12	10	309G-12	999-12	-	LPG10/12
013260	10	13	-	913-10	-	-
013261	11	13	-	913-11	-	-

PROTECTORS, LEATHER, FOR CLASS 1 AND 2 RUBBER INSULATING GLOVES

1. Scope

This material standard covers the requirements for leather protector gloves appropriate for use with Class 1 and 2 electrical insulating rubber gloves, Material Standards 7634.61 and 7634.62 respectively.

The requirements for leather protector gloves appropriate for use with Class 0 electrical insulating rubber gloves are specified in Material Standard 7634.20.

This material standard applies to the following Seattle City Light Stock Numbers:

Stock Number	Size
763353	8
763350	8-1/2
763354	9
763351	9-1/2
763355	10
763352	10-1/2
763356	11
763357	12

2. Application

Leather protector gloves, also known as keepers, are worn over rubber insulating gloves to protect against cuts, abrasions, and punctures.

Rubber insulating gloves shall not be used without leather protector gloves.

Leather protector gloves shall not be used alone for protection against electric shock.

3. Industry Standards

Gloves shall meet the requirements of the following industry standard:

ASTM F 696-06 - Standard Specification for Leather Protectors for Rubber Insulating Gloves and Mittens

4. Detailed Requirements

Leather protector gloves shall have the following attributes:

length	12 inches
glove color	may vary from cream to tan
cuff design	straight
cuff color (backside)	fluorescent orange
type	cowhide
required options	non-metallic buckle and pull strap

standards coordinator	*standards manager*	*unit director*
John Shipek	John Shipek	Pamela S. Johnson

5. Marking

Each glove shall be marked according to the requirements of ASTM F-696, Section 9.

6. Testing

Gloves shall be tested according to the requirements of ASTM F-696, Section 8.

Test data that establishes compliance with the requirements of ASTM F-696 shall be provided upon request.

7. Packaging

Gloves shall be packaged to keep them clean during shipping and storage.

8. Issuance

PR

9. References

7634.20; "Protectors, Leather, for Class 0 Rubber Insulating Gloves;" Material Standard; SCL

7634.61: "Gloves, Insulating, Rubber, Class 1;" Material Standard; SCL

7634.62: "Gloves, Insulating, Rubber, Class 2;" Material Standard; SCL

D 120-08; "Standard Specification for Rubber Insulating Gloves"; ASTM

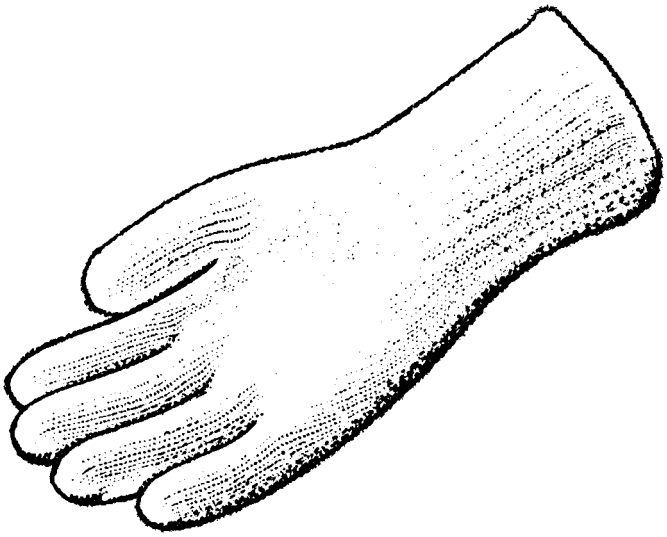
F 496-08; "Standard Specification for In-Service Care of Insulating Gloves and Sleeves"; ASTM

Shipek, John; SCL Standards Engineer, subject matter expert and originator of 7634.21 (john.shipek@seattle.gov)

10. Approved Manufacturers

Stock Number	Size	Edwards Glove Company	Kunz Glove Company	Salisbury
763353	8	303B-8	1050-3*8	LP3S/8
763350	8-1/2	303B-8.5	1050-3*8.5	LP3S/8H
763354	9	303B-9	1050-3*9	LP3S/9
763351	9-1/2	303B-9.5	1050-3*9.5	LP3S/9H
763355	10	303B-10	1050-3*10	LP3S/10
763352	10-1/2	303B-10.5	1050-3*10.5	LP3S/10H
763356	11	303B-11	1050-3*11	LP3S/11
763357	12	303B-12	1050-3*12	LP3S/12

LINERS, COTTON, KNIT
FOR RUBBER OR LEATHER GLOVES



Cotton glove liners are used for cold weather protection and to reduce the discomfort of lineworkers' rubber or leather gloves (keepers).

The liners shall be made of 100% cotton yarn in a seamless, one-piece knit construction. The liners shall have a minimum of 3-1/2" length of thermal-knit wrist cuff to prevent the cuff from rolling up and bunching in the palm.

The liners shall be free from holes, cuts, tears, and dropped or loose stitches.

Stock Unit: PR

Stock Number	Size	Overall Length	Approved Manufacturers	
			Perfect Fit	North Star
110135	Men's	12"-14"	UL18ATC	3266
110134	Women's	10"-13"	UL18ALTC	2246

ORIGINATOR	STANDARDS COORDINATOR	STANDARDS SUPERVISOR	UNIT DIRECTOR
Jim S. Horn	Charles L. Shaffer	John C. Skinner	Harold Jug

GLOVES, INSULATING, RUBBER, CLASS 0

1. Scope

This material standard covers the requirements for Class 0 electrical insulating rubber gloves.

The requirements for leather protector gloves, appropriate for use with Class 0 rubber gloves, are specified in Material Standard 7634.20.

The requirements for Class 1 and 2 insulating rubber gloves are specified in Material Standards 7634.61 and 7634.62 respectively.

This material standard applies to the following Seattle City Light Stock Numbers:

Stock Number	Size	Length, in
012269	7	11
763359	8	11
012796	8 short finger	11
763360	9	11
763362	9-1/2	11
763364	10	11
763366	10-1/2	11
763368	11	11
013361	12	11
013258	09-1/2	14
013259	10-1/2	14

2. Application

The phase-to-ground voltage to which the rubber insulating gloves may be exposed shall be limited to the *maximum use voltage* (see detailed requirements) of the glove.

The gloves specified in this standard are only appropriate for use on systems rated 1000 V or less.

Refer to WAC 296-45 and ASTM F-496, Section 3 for more information.

Gloves with an overall length of 14 inches, Stock Numbers 013258 and 013259, are used exclusively by network protector crews.

3. Industry Standards

Gloves shall meet the requirements of the following industry standards:

ASTM D 120-08 - Standard Specification for Rubber Insulating Gloves

ASTM F 496-08 - Standard Specification for In-Service Care of Insulating Gloves and Sleeves

4. Detailed Requirements

Gloves shall have the following electrical ratings and attributes:

type	I, non-resistant to ozone
class	0
length	as specified in section 9
length tolerance, in	+0, -1/2
glove color (outside)	yellow
glove color (inside)	yellow
cuff design	straight
halogenation treatment	required, or approved equal treatment
class color	red
proof test	5,000 V ac (rms)
maximum use voltage	1,000 V ac (rms)

standards coordinator	*standards supervisor*	*unit director*
John Shipek	John Shipek	Darnell Cola

5. Marking

Each glove shall be marked according to the requirements of ASTM D-120, Section 7.

6. Testing

Gloves shall be tested according to the requirements of ASTM D-120 and F-496.

Test data that establishes compliance with the requirements of ASTM D-120 and ASTM F-496 shall be provided upon request.

7. Packaging

Gloves shall be packaged according to the requirements of ASTM D-120, Section 15, with the following clarification that the outside of each package shall be marked with Seattle City Light's Stock Number.

8. Issuance

PR

9. Approved Manufacturers

			Manufacturers and Catalog Numbers		
Stock No	Size	Length, in	Chance	Marigold Industrial	Salisbury
012269	7	11	PSC011Y7	-	E011Y/7
763359	8	11	PSC011Y8	-	E011Y/8
012796	8 short finger	11	-	1570118	-
763360	9	11	PSC011Y9	-	E011Y/9
763362	9-1/2	11	PSC011Y9H	-	E011Y/9H
763364	10	11	PSC011Y10	-	E011Y/10
763366	10-1/2	11	PSC011Y10H	-	E011Y/10H
763368	11	11	PSC011Y11	-	E011Y/11
013361	12	11	PSC011Y12	-	E011Y12
013258	9-1/2	14	-	-	E014Y/9H
013259	10-1/2	14	-	-	E014Y/10H

10. References

ASTM F 696-06: “Standard Specification for Leather Protectors for Rubber Insulating Gloves and Mittens;” ASTM

ASTM F 819-08: “Standard Terminology Relating to Electrical Protective Equipment for Workers;” ASTM

Chance product catalog; Chance (Hubbell Power Systems)

Chance website; www.hubbellpowersystems.com

The Lineman's and Cableman's Handbook; McGraw-Hill Professional; 9th edition

Salisbury product catalog; Salisbury

Salisbury by Honeywell website; www.whsalisbury

SCL 7634.20; “Gloves, Leather Protectors”; Material Standard

SCL 7634.61; “Gloves, Insulating, Rubber, Class 1”; Material Standard

SCL 7634.62; “Gloves, Insulating, Rubber, Class 2”; Material Standard

Shipek, John; SCL Standards Engineer; originator and subject matter expert for 7634.60 (john.shipek@seattle.gov)

Tawney, Everette; subject matter expert (everette.tawney@seattle.gov)

WAC 296-25505 (1); "Personal Protective Equipment"; *Washington Administrative Code*; Washington State

GLOVES, INSULATING, RUBBER, CLASS 1

1. Scope

This material standard covers the requirements for Class 1 electrical insulating rubber gloves.

The requirements for leather protector gloves, appropriate for use with Class 1 and 2 rubber gloves, are specified in Material Standard 7634.21.

The requirements for Class 0 and 2 insulating rubber gloves are specified in Material Standards 7634.60 and 7634.62 respectively.

This material standard applies to the following Seattle City Light Stock Numbers:

Stock Number	Size
763338	8
763339	8-1/2
763340	9
763342	9-1/2
763344	10
763346	10-1/2
763348	11

2. Application

In Washington State, insulating rubber gloves are only appropriate for use as a secondary layer of personal protection for the purpose of guarding against accidental contact with primary voltage.

The phase-to-ground voltage to which the rubber insulating gloves may be exposed shall be limited to the *maximum use voltage* (see detailed requirements) of the glove.

The gloves specified in this standard are only appropriate for use on Seattle City Light systems nominally rated 4 kV (line-to-line) or less.

Refer to WAC 296-45 and ASTM F-496, Section 3 for more information.

3. Industry Standards

Gloves shall meet the requirements of the following industry standards:

ASTM D 120-08 - Standard Specification for Rubber Insulating Gloves

ASTM F 496-08 - Standard Specification for In-Service Care of Insulating Gloves and Sleeves

4. Detailed Requirements

Gloves shall have the following electrical ratings and attributes:

type	I, non-resistant to ozone
class	1
length	14 inches
glove color (outside)	black
glove color (inside)	red
cuff design	straight
halogenation treatment	required, or approved equal treatment
class color	white
proof test	10,000 V ac (rms)
maximum use voltage	7,500 V ac (rms)

standards coordinator	*standards manager*	*unit director*
John Shipek	John Shipek	Pamela S. Johnson

5. Marking

Each glove shall be marked according to the requirements of ASTM D-120, Section 7.

6. Testing

Gloves shall be tested according to the requirements of ASTM D-120 and F-496.

Test data that establishes compliance with the requirements of ASTM D-120 and ASTM F-496 shall be provided upon request.

7. Packaging

Gloves shall be packaged according to the requirements of ASTM D-120, Section 15, with the following clarification that the outside of each package shall be marked with Seattle City Light's Stock Number.

8. Issuance

PR

9. Approved Manufacturer

Stock No	Size	Chance	Salisbury
763338	08	PSC114RB8	E114RB/8
763339	08-1/2	PSC114RB8H	E114RB/8H
763340	09	PSC114RB9	E114RB/9
763342	09-1/2	PSC114RB9H	E114RB/9H
763344	10	PSC114RB10	E114RB/10
763346	10-1/2	PSC114RB10H	E114RB/10H
763348	11	PSC114RB11	E114RB/11

10. References

7634.21; “Gloves, Leather Protectors;” Material Standard; SCL

7634.60; “Gloves, Insulating, Rubber, Class 0;” Material Standard; SCL

7634.62; “Gloves, Insulating, Rubber, Class 2;” Material Standard; SCL

ASTM F 696-06: “Standard Specification for Leather Protectors for Rubber Insulating Gloves and Mittens;” ASTM

ASTM F 819-08: “Standard Terminology Relating to Electrical Protective Equipment for Workers;” ASTM

Chance product catalog; Chance (Hubbell Power Systems)

Chance website; www.hubbellpowersystems.com

The Lineman's and Cableman's Handbook; McGraw-Hill Professional; 9th edition

Salisbury product catalog; Salisbury

Salisbury website; www.salisburybyhoneywell.com

Shipek, John; SCL Standards Engineer, subject matter expert and originator of 7634.61 (john.shipek@seattle.gov)

Tawney, Everette; subject matter expert (everette.tawney@seattle.gov)

WAC 296-25505 (1); "Personal Protective Equipment"; *Washington Administrative Code*; Washington State

GLOVES, INSULATING, RUBBER, CLASS 2

1. Scope

This material standard covers the requirements for Class 2 electrical insulating rubber gloves.

The requirements for leather protector gloves, appropriate for use with Class 1 and 2 rubber gloves, are specified in Material Standard 7634.21.

The requirements for Class 0 and 1 insulating rubber gloves are specified in Material Standards 7634.60 and 7634.61 respectively.

This material standard applies to the following Seattle City Light Stock Numbers:

Stock Number	Size
012924	8
012925	8-1/2
012926	9
012927	9-1/2
012928	10
012929	10-1/2
012930	11
012931	11-1/2
012932	12

2. Application

In Washington State, insulating rubber gloves are only appropriate for use as a secondary layer of personal protection for the purpose of guarding against accidental contact with primary voltage.

The phase-to-ground voltage to which the rubber insulating gloves may be exposed shall be limited to the *maximum use voltage* (see detailed requirements) of the glove.

The gloves specified in this standard are only appropriate for use on systems rated 26.4 kV (line-to-line) or less.

Refer to WAC 296-45 and ASTM F-496, Section 3 for more information.

3. Industry Standards

Gloves shall meet the requirements of the following industry standards:

ASTM D 120-08 - Standard Specification for Rubber Insulating Gloves

ASTM F 496-08 - Standard Specification for In-Service Care of Insulating Gloves and Sleeves

4. Detailed Requirements

Gloves shall have the following electrical ratings and attributes:

type	I, non-resistant to ozone
class	2
length	14 inches
glove color (outside)	black
glove color (inside)	red or yellow
cuff design	straight
halogenation treatment	required, or approved equal treatment
class color	yellow
proof test	20,000 V ac (rms)
maximum use voltage	17,000 V ac (rms)

standards coordinator	*standards manager*	*unit director*
John Shipek	John Shipek	Pamela S. Johnson

5. Marking

Each glove shall be marked according to the requirements of ASTM D-120, Section 7.

6. Testing

Gloves shall be tested according to the requirements of ASTM D-120 and F-496.

Test data that establishes compliance with the requirements of ASTM D-120 and ASTM F-496 shall be provided upon request.

7. Packaging

Gloves shall be packaged according to the requirements of ASTM D-120, Section 15.

8. Issuance

PR

9. Approved Manufacturer

		Salisbury		Chance	
Stock No	Size	Inside Red	Inside Yellow	Inside Red	Inside Yellow
012924	8	E214RB/8	E214YB/8	PSC214RB8	PSC214YB8
012925	8-1/2	E214RB/8H	E214YB/8H	PSC214RB8H	PSC214YB8H
012926	9	E214RB/9	E214YB/9	PSC214RB9	PSC214YB9
012927	9-1/2	E214RB/9H	E214YB/9H	PSC214RB9H	PSC214YB9H
012928	10	E214RB/10	E214YB/10	PSC214RB10	PSC214YB10
012929	10-1/2	E214RB/10H	E214YB/10H	PSC214RB10H	PSC214YB10H
012930	11	E214RB/11	E214YB/11	PSC214RB11	PSC214YB11
012931	11-1/2	E214RB/11H	E214YB/11H	PSC214RB11H	PSC214YB11H
012932	12	E214RB/12	E214YB/12	PSC214RB12	PSC214YB12

10. References

7634.21; “Gloves, Leather Protectors;” Material Standard; SCL

7634.60; “Gloves, Insulating, Rubber, Class 0;” Material Standard; SCL

7634.61; “Gloves, Insulating, Rubber, Class 1;” Material Standard; SCL

ASTM F 696-06: “Standard Specification for Leather Protectors for Rubber Insulating Gloves and Mittens;” ASTM

ASTM F 819-08: “Standard Terminology Relating to Electrical Protective Equipment for Workers;” ASTM

Chance product catalog; Chance (Hubbell Power Systems)

Chance website; www.hubbellpowersystems.com

The Lineman's and Cableman's Handbook; McGraw-Hill Professional; 9th edition

Salisbury product catalog; Salisbury

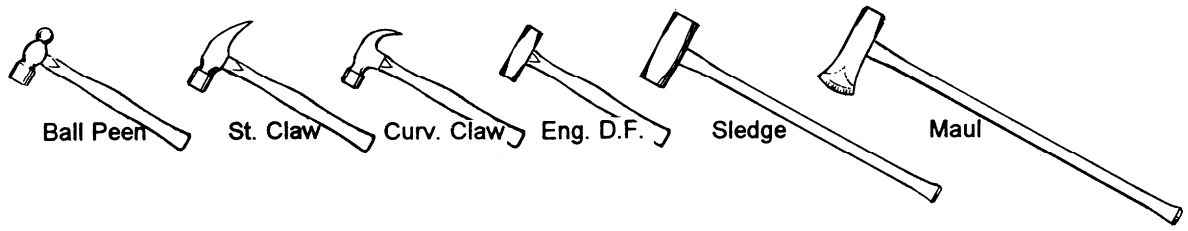
Salisbury website; www.salisburybyhoneywell.com

Shipek, John; SCL Standards Engineer, subject matter expert and originator of 7634.62 (john.shipek@seattle.gov)

Tawney, Everette; subject matter expert (everette.tawney@seattle.gov)

WAC 296-25505 (1); "Personal Protective Equipment"; *Washington Administrative Code*; Washington State

HAMMERS, HAND, FIBERGLASS HANDLE



Forged steel hammers shall be made in accordance with Federal Specification GGG-H-86

Hammer Handles shall be made of fiberglass.

Packaging shall be in accordance with the manufacturer's commercial practice to insure delivery without damage.

Marking. Shipping containers shall be legibly marked with the type and quantity of the items, the City Purchase Order number, the name and address of the manufacturer, and the address of the receiving warehouse.

Reference Specifications: Federal Specification GGG-H-86,
ANSI B173.1, B173.2, B173.3

Stock Unit: Each

Stock Number.	Hammer Type	Head Weight	Handle Length	Manufacturer and Part Number
763830	Ball Peen	16 oz	13"	Nupla 21-017 (M-16SG)
			12-3/4"	Stanley 54-316
			13-1/16"	Proto 1316PGD
763840	St. Claw	20 oz	14"	Nupla 19-021 (R20SG)
763842	St. Claw	22 oz	16"	Nupla 19-023 (R-22SG)
763845	Curv. Claw	20 oz	14"	Nupla 17-021 (C-20SG)
763845	Curv. Claw	16 oz	13-1/4"	Stanley 51-110
763850	Eng. D.F.	2 lb.	14"	Nupla 27-021 (BD-2SG)
763852	Eng. D.F.	3 lb.	14"	Nupla 27-035 (BD-3SG)
763860	Sledge	8 lb.	32"	Nupla 27-091 (BD-8SG)
			32"	Proto 1437G
			36"	Woodings Verona 769AF
763870	Sledge	12 lb.	32"	Nupla 27-121 (BD-12SG)
764435	Maul	8 lb.	36"	Nupla 22-082 (SM-8SG)
				Woodings-Verona 607AF

ORIGINATOR	STANDARDS COORDINATOR	STANDARDS SUPERVISOR	UNIT DIRECTOR
J Johnson	Charles L. Shaffer	John C. Skinner	Denis DeWitt

SEATTLE CITY LIGHT

MATERIAL STANDARD

STANDARD NUMBER: **7638.2**
PAGE: 1 of 1
DATE: August 7, 1963
REV: October 31, 1996

HANDLE, HICKORY, STRIKING TOOL
(Replacement)

Hickory Handles for replacement in striking tools, shall be made of fast growth, sound, straight grained hickory meeting the requirements of Federal Specification NN-H-0093. Handles covered by this specification are: pick.

Finish The handles shall be smoothly finished and may be flame treated or color stained, and shall be coated with a transparent lacquer that does not conceal the annual rings of growth or the grain of the wood. Painted handles are not acceptable.

Packaging shall be in accordance with the manufacturer's commercial practice to insure delivery without damage.

Marking: Shipping containers shall be legibly marked with the type and quantity of items, The City purchase order number, the name and address of the manufacturer, and the address of the receiving warehouse.

Reference Specification: NN-H-0093, latest revision

Stock Unit: Each

		Handle			
Stock No.	**Tool**	**Length, Inches**	**Type**	**Class**	**Grade**
763955	Railroad Pick	36	**V**	**1**	**AA**

ORIGINATOR	STANDARDS COORDINATOR	STANDARDS SUPERVISOR	UNIT DIRECTOR
Jim S. Horn	Charles L. Shaffer	John C. Skinner	Betty Robin

WOOD LADDERS, SINGLE AND EXTENSION, EXTRA HEAVY-DUTY

1. Scope

This standard covers the requirements for extra heavy-duty, wood, single and extension ladders and accessories.

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

Stock Number	Description, Ladder Type	Highest Standing Level	Wt, lb
013007	16-foot single	12 feet 6 inches	33
013008	18-foot single	14 feet 6 inches	42
013009	24-foot extension	17 feet 4 inches	55
013010	Slip-on ladder shoes, pair		-

2. Application

Wood ladders are used by operations personnel to access underground vaults and above ground structures. Highest standing levels may be found in the list above. Maximum intended load is 300 pounds.

Ladders are furnished with pivot shoes as standard. If slip-on shoes are required, request Stock Number 013010. Contact Standards for information on how to perform the retrofit.

3. Industry Standards

Wood ladders shall meet the applicable requirements of the following:

ANSI-ASC A14.1-2007 - American National Standard for Ladders - Wood Safety Requirements

Chapter 296-876 WAC - Ladders, Portable and Fixed

4. Construction

4.1 General

Ladder side rails shall be constructed of straight-grained Western Hemlock or a species equivalent in strength as determined by ANSI A14.1.

Ladder rungs shall be constructed of hickory or oak.

Ladder rungs shall be fully rodded with truss blocks.

Each ladder shall have at least three coats of a moisture-resistant, synthetic sealer; sealer shall be Sher-Wood Homoclad.

Each ladder shall be provided with a pair of Johnson #360810 pivot shoes installed.

4.2 Single Ladders

Single ladders shall be type IA, equating to a maximum intended load rating of 300 pounds.

Single ladder channels shall be parallel.

standards coordinator	*standards supervisor*	*unit director*
Kathy Tilley	John Shipek	Darnell Cola

4.3 Extension Ladders

Extension ladders shall be type IA, equating to a maximum intended load rating of 300 pounds.

Extension ladder channels shall be parallel.

Each extension ladder shall be provided with rope and pulley according to the requirements of ANSI A14.1, Section 6.3.3.10.

5. Tests and Test Reports

Data that establishes compliance with the requirements of ANSI A14.1, WAC, and this material standard shall be provided upon request.

6. Marking

Each wood ladder shall be marked according to the requirements of ANSI A14.1, Section 9.

7. Packaging

Wood ladders shall be packaged to prevent damage during shipping, handling, and storage.

8. Issuance

EA

9. Approved Manufacturers

Stock No.	Description	Michigan	Bauer
013007	16-foot single	Model 1560-16 with Goshen Stamping #360810 pivot shoes	Part #13116SCL
013008	18-foot single	Model 1560-18 with Goshen Stamping #360810 pivot shoes	Part #13118SCL
013009	24-foot extension	Model 1480-24 with Goshen Stamping #360810 pivot shoes	Part #12124SCL
013010	Slip-on ladder shoes, pair	Johnson #360210	–

10. References

7643.2 (canceled) “Ladders, Portable, Wood, Single and extension;” Material Standard, SCL

Shipek, John; SCL Standards Engineer, subject matter expert and originator of 7644.20 (john.shipek@seattle.gov)

Shoemaker, Bill; SCL subject matter expert for 7644.20 (bill.shoemaker@seattle.gov)

Mandrels, Proofing

1. Scope

This standard covers the requirements for rigid proofing mandrels. This standard applies to the following Seattle City Light (SCL) stock numbers.

Stock No.	Conduit Trade Size (in)
013294	3/4
013295	1
013296	1-1/4
013297	1-1/2
013298	2
013299	2-1/2
013300	3
013301	3-1/2
013302	4
013303	5
013304	6

2. Application

Rigid proofing mandrels are used to test for obstructions in an underground conduit run after trench backfill and/or conduit pour is complete.

The mandrel size should be at least as large as the largest cable pulling head (or grip) that could be used within that conduit to ensure cable can be pulled in successfully.

3. Construction

Proofing mandrels corresponding to conduit sizes up to and including 3-1/2 inches shall be constructed per Figure 3.1. A stainless steel 1/8-in aircraft cable shall be run through the center of the mandrel, looped at the ends, and secured with red Loctite compound and a flat washer.

Proofing mandrels corresponding to conduit sizes 4 inches and larger will be constructed per Figure 3.2. At each end of the mandrel, 1/2-in galvanized steel oval eye nuts shall be installed and secured with red Loctite compound to the 1/2-in galvanized rod via a lock washer and flat washer.

Acceptable dimensional mandrel length and diameter tolerance is +0% to -3%

Each mandrel shall be marked in a permanent legible fashion with the stock number and date of manufacture. Marking shall appear on the mandrel end face to prevent damage.

Figure 3.1. Mandrel with Stainless Steel Cable

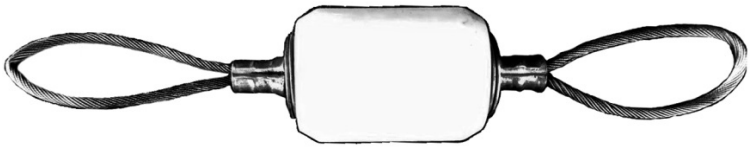


Figure 3.2. Mandrel

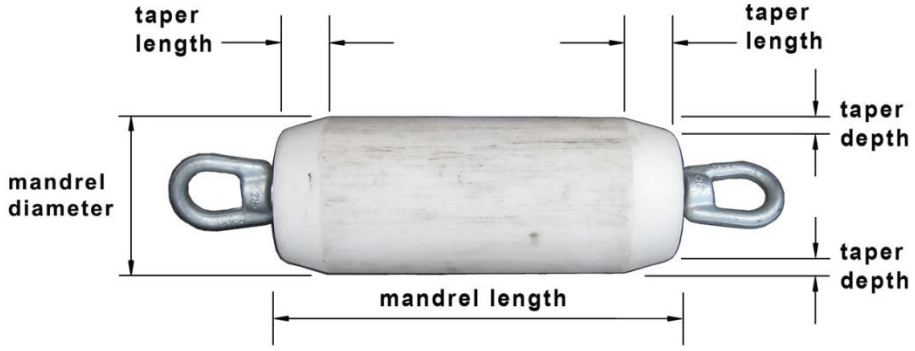


Table 3.1.Mandrel Dimensions

Stock No.	Conduit Trade Size (in)	Mandrel Diameter (in)	Mandrel Length (in)	Taper Length (in)	Taper Depth (in)	Material	Figure
013294	3/4	0.62	1.0	–	–	Delrin or nylon	3.1
013295	1	0.78	1.25	–	–	Delrin or nylon	3.1
013296	1-1/4	1.00	1.5	–	–	Delrin or nylon	3.1
013297	1-1/2	1.25	1.75	–	–	Delrin or nylon	3.1
013298	2	1.62	2.25	–	–	Delrin or nylon	3.1
013299	2-1/2	2.00	2.75	–	–	Delrin or nylon	3.1
013300	3	2.50	3.25	–	–	Delrin or nylon	3.1
013301	3-1/2	3.00	3.75	–	–	Delrin or nylon	3.1
013302	4	3.50	8.0	1.0	0.5	Delrin or nylon	3.2
013303	5	4.75	12.0	1.5	0.5	Delrin or nylon	3.2
013304	6	5.50	14.0	2.0	0.7	Delrin or nylon	3.2

4. Pre-Production Approval

The successful bidder shall submit a first prototype to SCL Standards for approval prior to the fabrication of the first production piece. The successful bidder shall submit a first production piece to SCL Standards for approval prior to the fabrication of the balance of the order.

5. Issuance

Stock Unit: EA

6. Approved Manufacturers

Bids may be solicited from any fabricator identified by Civil/Mechanical Engineering or Material Control as being capable.

7. References

SCL Construction Standard U2-11 / NDK-40; “Mandreling and Cleaning of Ducts and Conduits”

Hanson, Brett; SCL Standards Engineer, and subject matter expert and originator of 7645.40 (brett.hanson@seattle.gov)

Jerochim, Pete; SCL Electrical Inspector and subject matter expert of 7645.40 (pete.jerochim@seattle.gov)

Youngs, Rob; SCL Electrical Inspector and subject matter expert of 7645.40 (rob.youngs@seattle.gov)

REFLECTIVE LETTERS AND NUMBERS, PRESSURE-SENSITIVE, 2-7/8″ X 1-3/4″, AND PANEL

1. Scope

This material standard covers the requirements 2-7/8" x 1-3/4", pressure sensitive, reflective letters and numbers and flexible mounting panel.

2. Application

Pressure sensitive, reflective letters and numbers are used to mark a variety of equipment and material, including wood poles.

Pressure sensitive, reflective letters and numbers are appropriate for above and below ground applications.

Letters and numbers may be affixed to wood poles with the aid of flexible, horizontal panels, Stock Number 766300, which provide backing for up to eight characters.

3. Attributes

3.1 Letters and Numbers

Adhesive	acrylic
Grade	standard
Dimensions	
Character height, in	2-1/2
Backing height, in	2-7/8
Backing width, in	1-3/4
Color	
Character	yellow
Backing	black
Service life, years, min	7

3.2 Panel

Panel shall be designed and fabricated to be used with the letters and numbers specified in this material standard.

Material	Lexan
Orientation	horizontal
Dimensions	
Height, in	3-15/16
Width, in	17-3/4
Number of characters, max	8

Figure 3.2 Panel

4. Packaging

Pressure sensitive, reflective letters and numbers shall be packaged to prevent damage during shipping, inside storage, and casual handling prior to installation.

Pressure sensitive, reflective letters and numbers shall be packaged in individual character sets, in packs of 25.

standards coordinator	*standards manager*	*unit director*
John Shipek	John Shipek	Pam S. Johnson

4. Packaging, continued

Each package shall be marked with the following information:

- Manufacturer's name or symbol
- Manufacturer's catalog number
- Seattle City Light stock number
- Date of manufacture

5. Issuance

PK (25 per pack), letters and numbers

EA, panel

6. Approved Manufacturers

Stock Number	Character	Electromark Catalog Number
766310	0	REFL-YK-2.5-0
766311	1	REFL-YK-2.5-1
766312	2	REFL-YK-2.5-2
766313	3	REFL-YK-2.5-3
766314	4	REFL-YK-2.5-4
766315	5	REFL-YK-2.5-5
766316	6	REFL-YK-2.5-6
766317	7	REFL-YK-2.5-7
766318	8	REFL-YK-2.5-8
766319	9	REFL-YK-2.5-9
766328	A	REFL-YK-2.5-A
766332	B	REFL-YK-2.5-B
766329	C	REFL-YK-2.5-C
766335	D	REFL-YK-2.5-D
012997	E	REFL-YK-2.5-E
013074	F	REFL-YK-2.5-F
766320	H	REFL-YK-2.5-H
766334	K	REFL-YK-2.5-K
766321	M	REFL-YK-2.5-M
766322	N	REFL-YK-2.5-N
766323	P	REFL-YK-2.5-P
766324	S	REFL-YK-2.5-S
766333	T	REFL-YK-2.5-T
766330	U	REFL-YK-2.5-U
766325	V	REFL-YK-2.5-V
766326	W	REFL-YK-2.5-W
766331	FDR	REFL-YK-2.5-FDR
766327	- [*Dash*]	REFL-YK-2.5--
766300	panel	PAN-2.5-H8

7. References

Electromark Handbook, 4th Edition. Wolcott, NY; www.Electromark.com

Shipek, John; SCL Standards Engineer, subject matter expert and originator of 7650.07 (john.shipek@seattle.gov)

NUMBER TAGS, ALUMINUM, EMBOSSED, 7/8″ BY 1-5/8″ BAR CODE, AND HOLDER

1. Scope

This material standard covers the requirements of 7/8 by 1-5/8 inches, embossed aluminum number tags, custom sequential bar codes, and aluminum mounting holder.

This material standard applies to the following Seattle City Light Stock Numbers:

Stock Number	Description
013062	0
013063	1
013064	2
013065	3
013066	4
013067	5
013068	6
013069	7
013070	8
013071	9
013072	holder only
013073	assembled set

2. Application

Embossed aluminum number tags and custom sequential bar codes are primarily used to mark power and streetlight poles. They may also be used to mark other assets.

Embossed aluminum number tags and custom sequential bar codes are intended for above ground applications.

Embossed aluminum number tags and custom sequential bar codes are affixed to poles with the aid of vertical, aluminum holders, Stock Number 013072, which provide backing for up to seven numbers plus one bar code.

Individual number tags are available as separate stock items to repair damaged sets. Custom sequential bar codes are only available as components of assembled, sequential sets. If assembled sets are required, users must contact Material Control and provide a beginning and ending number sequence.

standards coordinator	*standards manager*	*unit director*
John Shipek	John Shipek	Pam S. Johnson

3. Attributes

3.1 Number Tags

Base material	aluminum, 1100-H14
Base material thickness, in	0.025 +/- .005
Dimensions	
character height, in	0.750 +/- .005
tag height, in	0.875 +/- .005
tag width, in	1.594 +/- .005
tag corner radius, in	0.062 +/- .005
Embossing	
height of raised character above base material, in	0.030 +/- .005
Color	
character	black
background	yellow

3.2 Bar Code

Base material	aluminum, anodized
Base material thickness, in	0.012 +/- .005
Dimensions	
tag height, in	0.875 +/- .005
tag width, in	1.600 +/- .005
tag corner radius, in	0.063 +/- .005
Color	
character	black
background	natural aluminum
Finish/coating	matte
Sequence integrity	type A (no missing labels)
Numbering Sequence	as specified on purchase order
Data characters	7
Symbology	code 39
Density, cpi	7.741
Wide to narrow ratio	3.0:1

3.3 Holder (only)

Holder shall be designed and fabricated to be used with the number tags and bar codes specified in this material standard.

Material	aluminum
Material thickness, in	0.024 +/- .005
Orientation	vertical
Dimensions	
height, in	10.245 +/- .005
width, in	1.62 +/- .030
Capacity (number of tags *excluding* bar code)	7

Holder shall be furnished with mounting slots and holes as pre-approved by Seattle City Light Standards.

3.4 Assembled Sets

An assembled set shall consist of seven numbers and one corresponding custom sequential bar code installed in one holder.

Assembled sets shall be composed of components meeting the requirements of this material standard.

The numbering sequence shall be as specified on the purchase order.

4. Packaging

Embossed aluminum number tags, holders, and assembled sets shall be packaged to prevent damage during shipping, inside storage, and casual handling prior to installation.

Each package shall be marked with the following information:

- Manufacturer's name or symbol
- Manufacturer's catalog number
- Seattle City Light stock number

5. Issuance

PK (25 per pack), number tags

EA, holder

Custom sequential bar codes are only available as a component of assembled, sequential sets.

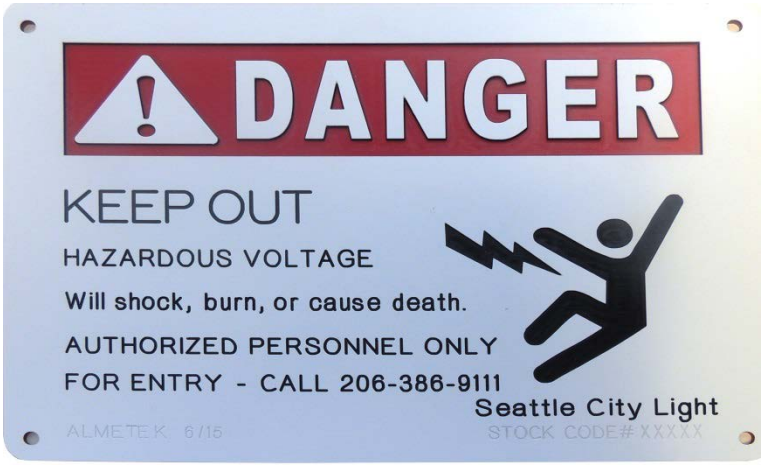
6. Approved Manufacturer

Stock Number	Character	Manufacturer's Part Number Almetek Industries, Inc.
013062	0	V5000
013063	1	V5001
013064	2	V5002
013065	3	V5003
013066	4	V5004
013067	5	V5005
013068	6	V5006
013069	7	V5007
013070	8	V5008
013071	9	V5009
none	bar code	Seattle City Light Pole, Drawing EX-35339
013072	holder only	TH-8A-SL
013073	assembled set	TH-8A-SL-SCL

7. References

Shipek, John; SCL Standards Engineer, subject matter expert and originator of 7650.13 (john.shipek@seattle.gov)

Signs, Danger Hazardous Voltage, 10 in x 14 in, Rigid



1. Scope

This standard covers the requirements for rigid “Danger Hazardous Voltage” signs.

This standard applies to Seattle City Light (SCL) Stock No. 013740.

2. Application

“Danger Hazardous Voltage” signs provide a visual aid in identifying potential hazards that may exist if a person were to come in contact with electrical equipment.

These signs are intended for use on the inside fence or on walls within a SCL substation. Signs may also be used in other situations where the same level of alert is warranted.

The term “danger” indicates a hazardous situation that, if not avoided, **will** result in death or serious injury. The use of this term is to be limited to the most extreme situations.

See SCL 7651.31 for rigid “Warning Hazardous Voltage” signs.

3. Industry Standards

Signs shall meet the applicable requirements of the following industry standards:

Occupational Safety and Health Administration (OSHA) 1910.145; Specifications for accident prevention signs and tags

American National Standards Institute (ANSI) Z535.1; Safety Colors

ANSI Z535.2; Environmental Facility and Safety Signs

ANSI Z535.3; Criteria for Safety Symbols

ANSI Z535.4; Product Safety Signs and Labels

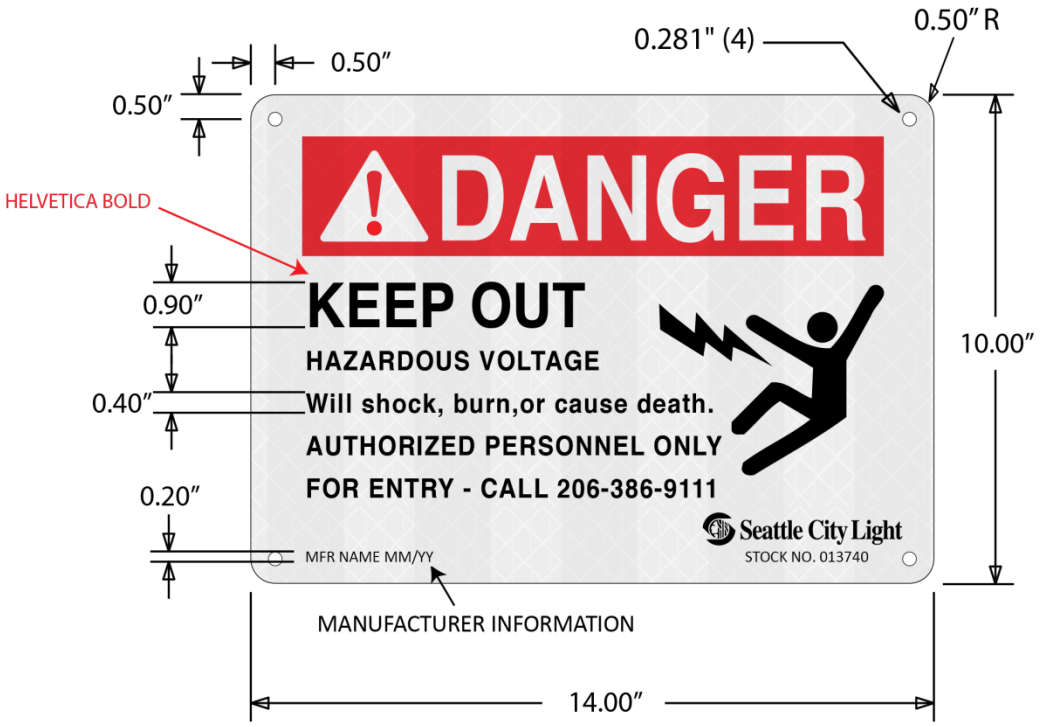
4. Requirements

Sign shall be fabricated according to Table 4 and Figure 4.

Table 4. Sign Requirements

Material	Aluminum
Dimensions (in)	10 x 14, with radiused corners and a 1/4-in hole (nominal) in each corner
Thickness (mils)	0.04
Coating	3M Series 3930 high intensity prismatic reflective sheeting; UV-inhibiting Sheeting strips applied in a vertical orientation
Text Colors	**Danger**: Safety White surrounded by Safety Red background **Exclamation point pictogram in triangle**: Safety Red surrounded by Safety White **Shocked person pictogram**: Safety Black **All other text**: Safety Black
Manufacturer and SCL Product Identification	**Manufacturer name or logo and the date of production** clearly marked along the bottom left edge of each sign **SCL stock number** clearly marked along the bottom right edge of each sign
Lettering	Helvetica Bold font
Layout	Per Figure 4

Figure 4. Example Sign Layout



5. Approval Process

Manufacturer must submit artwork and one representative physical sample for review by SCL Standards prior to being considered for approved manufacturer status. Artwork submission shall include manufacturer catalog number for SCL use in ordering product.

6. Approved Manufacturers

Manufacturer	Catalog No.
Almetek Industries	SIGN-14252 (Rev. B)
Designer Decal	DD-14252DAN-SCL
Electromark	–

7. Packaging

Each standard package shall be legibly marked with the following information:

- Manufacturer identification
- Product description
- Seattle City Light stock number
- Quantity contained (not to exceed 10)

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

- Manufacturer identification
- Product description
- Seattle City Light purchase order number
- Seattle City Light stock number

8. Issuance

Stock Unit: EA

9. References

SCL Material Standard 7651.31; “Signs, Warning Hazardous Voltage, 10 in x 14 in, Rigid”

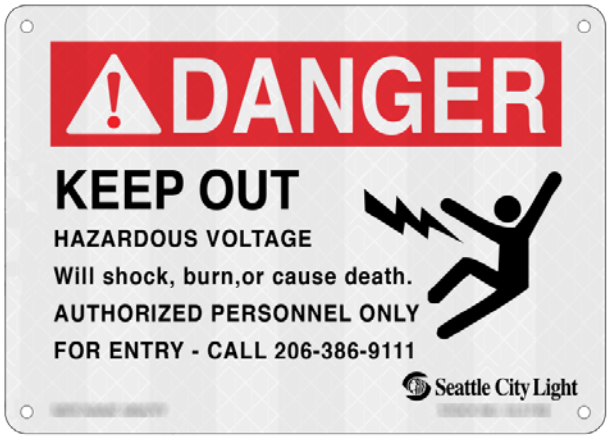
10. Sources

SCL Material Standard 7651.10 (canceled); “Sign, Danger High Voltage 7" x 10 ""

Tilley, Kathy; SCL Electrical Engineering Support Specialist, originator, and subject matter expert for 7651.19 (kathy.tilley@seattle.gov)

www.almetek.com

Signs, Danger Hazardous Voltage, 14 in x 20 in, Rigid



1. Scope

This standard covers the requirements for rigid “Danger Hazardous Voltage” signs.

This standard applies to Seattle City Light (SCL) Stock No. 765207.

2. Application

“Danger Hazardous Voltage” signs provide a visual aid in identifying potential hazards that may exist if a person were to come in contact with electrical equipment.

These signs are intended for use on transmission towers. Signs may also be used in other situations where the same level of alert is warranted.

The term “danger” indicates a hazardous situation that, if not avoided, **will** result in death or serious injury. The use of this term is to be limited to the most extreme situations.

3. Industry Standards

Signs shall meet the applicable requirements of the following industry standards:

Occupational Safety and Health Administration (OSHA) 1910.145; Specifications for accident prevention signs and tags

American National Standards Institute (ANSI) Z535.1; Safety Colors

ANSI Z535.2; Environmental Facility and Safety Signs

ANSI Z535.3; Criteria for Safety Symbols

ANSI Z535.4; Product Safety Signs and Labels

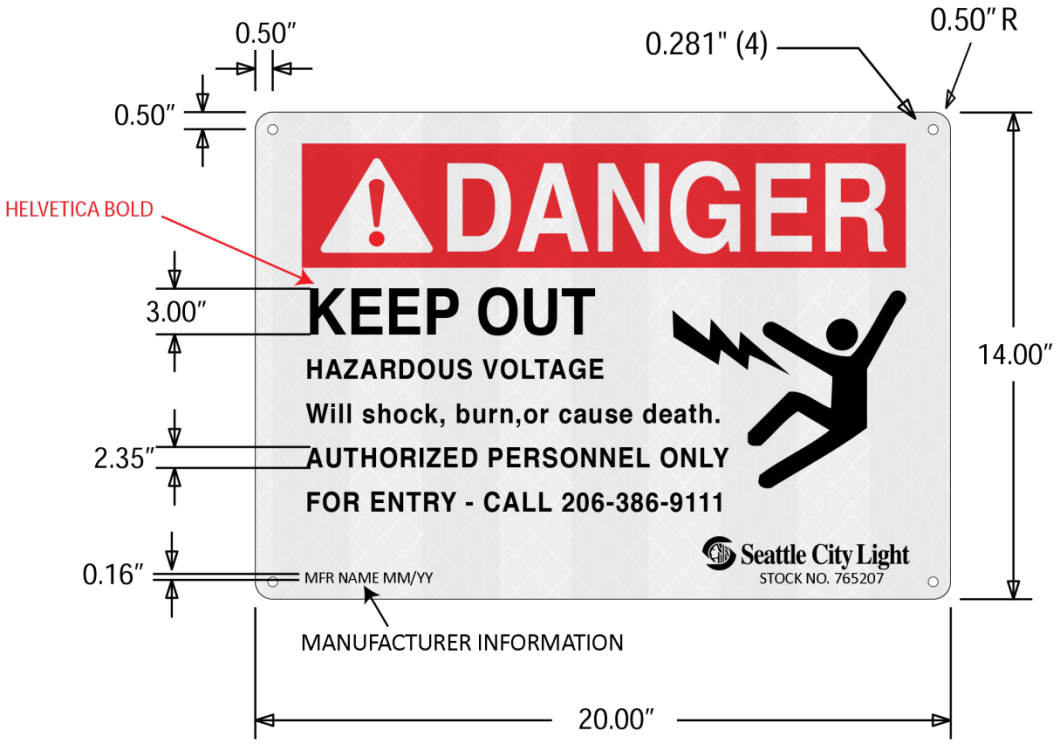
4. Requirements

Sign shall be fabricated according to Table 4 and Figure 4.

Table 4. Sign Requirements

Material	Aluminum
Dimensions (in)	14 x 20, with radiused corners and a 1/4-in hole (nominal) in each corner
Thickness (mils)	0.04
Coating	3M Series 3930 high intensity prismatic reflective sheeting; UV-inhibiting Sheeting strips shall be applied in a vertical orientation.
Text Colors	**Danger**: Safety White surrounded by Safety Red background **Exclamation point pictogram in triangle**: Safety Red surrounded by Safety White **Shocked person pictogram**: Safety Black **All other text**: Safety Black
Manufacturer and SCL Product Identification	**Manufacturer name or logo and the date of production** clearly marked along the bottom left edge of each sign **SCL stock number** clearly marked along the bottom right edge of each sign
Lettering	Helvetica Bold font
Layout	Per Figure 4

Figure 4. Example Sign Layout



5. Approval Process

Manufacturer must submit artwork and one representative physical sample for review by SCL Standards prior to being considered for approved manufacturer status. Artwork submission shall include manufacturer catalog number for SCL use in ordering product.

6. Approved Manufacturers

Manufacturer	Catalog No.
Almetek Industries	SIGN-14492
Designer Decal	DD-765207-SCL
Electromark	–

7. Packaging

Each standard package shall be legibly marked with the following information:

- Manufacturer identification
- Product description
- Seattle City Light stock number
- Quantity contained (not to exceed 10)

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

- Manufacturer identification
- Product description
- Seattle City Light purchase order number
- Seattle City Light stock number

8. Issuance

Stock Unit: EA

9. References

SCL Material Standard 7651.23; “Signs, Danger Hazardous Voltage, 7 in x 10 in, Rigid”

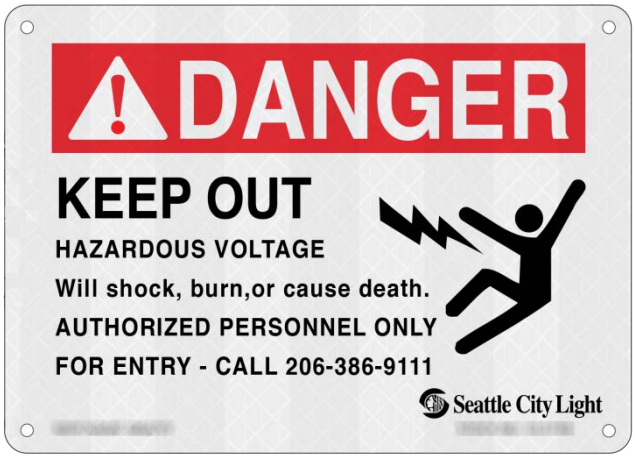
10. Sources

SCL Material Standard 7652.5 (canceled); “Sign, Danger High Voltage 14" x 20 ""

Tilley, Kathy; SCL Electrical Engineering Support Specialist, originator, and subject matter expert for 7651.21 (kathy.tilley@seattle.gov)

www.almetek.com

Signs, Danger Hazardous Voltage, 7 in x 10 in, Rigid



1. Scope

This standard covers the requirements for rigid “Danger Hazardous Voltage” signs.

This standard applies to Seattle City Light (SCL) Stock No. 765181.

2. Application

“Danger Hazardous Voltage” signs provide a visual aid in identifying potential hazards that may exist if a person were to come in contact with electrical equipment.

These signs are intended for use on the inside fence or on walls within a SCL substation. Signs may also be used in other situations where the same level of alert is warranted.

The term “danger” indicates a hazardous situation that, if not avoided, **will** result in death or serious injury. The use of this term is to be limited to the most extreme situations.

See SCL 7651.33 for rigid “Warning Hazardous Voltage” signs.

3. Industry Standards

Signs shall meet the applicable requirements of the following industry standards:

Occupational Safety and Health Administration (OSHA) 1910.145; Specifications for accident prevention signs and tags

American National Standards Institute (ANSI) Z535.1; Safety Colors

ANSI Z535.2; Environmental Facility and Safety Signs

ANSI Z535.3; Criteria for Safety Symbols

ANSI Z535.4; Product Safety Signs and Labels

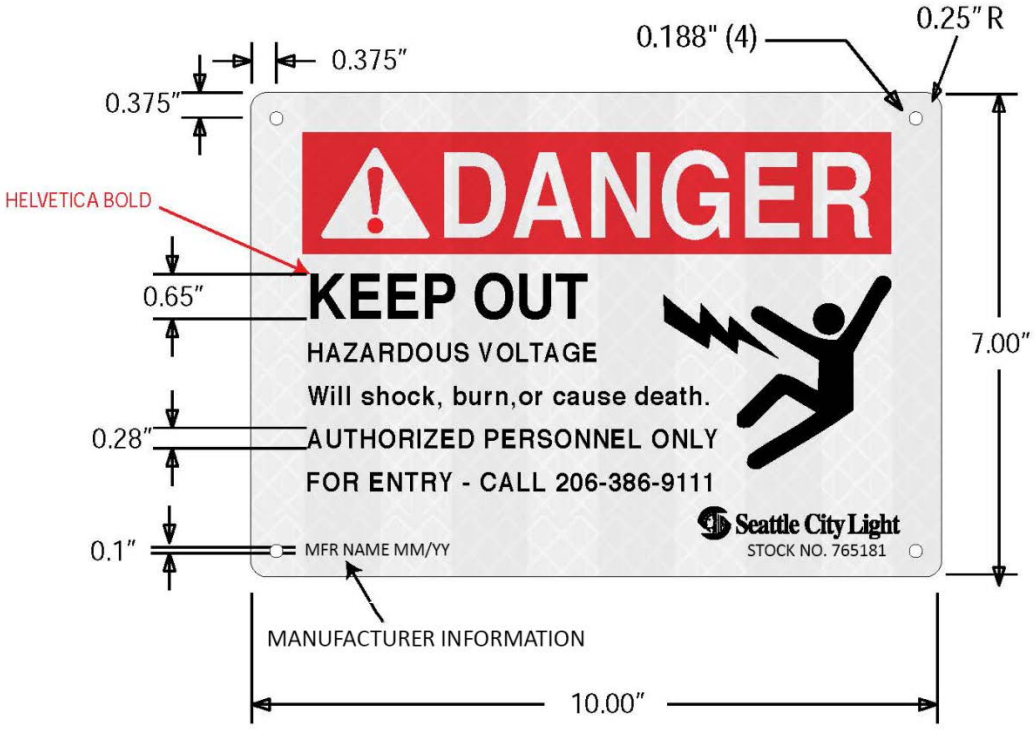
4. Requirements

Sign shall be fabricated according to Table 4 and Figure 4.

Table 4. Sign Requirements

Material	Aluminum
Dimensions (in)	7 x 10, with radiused corners and a 1/4-in hole (nominal) in each corner
Thickness (mils)	0.04
Coating	3M Series 3930 high intensity prismatic reflective sheeting; UV-inhibiting Sheeting strips shall be applied in a vertical orientation.
Text Colors	**Danger**: Safety White surrounded by Safety Red background **Exclamation point pictogram in triangle**: Safety Red surrounded by Safety White **Shocked person pictogram**: Safety Black **All other text**: Safety Black
Manufacturer and SCL Product Identification	**Manufacturer name or logo and the date of production** clearly marked along the bottom left edge of each sign **SCL stock number** clearly marked along the bottom right edge of each sign
Lettering	Helvetica Bold font
Layout	Per Figure 4

Figure 4. Example Sign Layout



5. Approval Process

Manufacturer must submit artwork and one representative physical sample for review by SCL Standards prior to being considered for approved manufacturer status. Artwork submission shall include manufacturer catalog number for SCL use in ordering product.

6. Approved Manufacturers

Manufacturer	Catalog No.
Almetek Industries	SIGN-14495
Designer Decal	DD-765181-SCL
Electromark	–

7. Packaging

Each standard package shall be legibly marked with the following information:

- Manufacturer identification
- Product description
- Seattle City Light stock number
- Quantity contained (not to exceed 10)

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

- Manufacturer identification
- Product description
- Seattle City Light purchase order number
- Seattle City Light stock number

8. Issuance

Stock Unit: EA

9. References

SCL Material Standard 7651.33; “Signs, Warning Hazardous Voltage, 7 in x 10 in, Rigid”

10. Sources

SCL Material Standard 7651.1 (canceled); “Sign, Danger High Voltage 7" x 10 ""

Tilley, Kathy; SCL Electrical Engineering Support Specialist, originator, and subject matter expert for 7651.23 (kathy.tilley@seattle.gov)

www.almetek.com

Sign, Equipment Transportation Agreement

1. Scope

This standard covers the material requirements for Equipment Transportation Agreement (ETA) signage.

2. Application

Specific signage is required when an ETA contract exists between a customer and Seattle City Light (SCL) for transformers or related equipment installed in a vault.

An ETA is a binding agreement typically established between SCL and a property owner as part of the electrical service initiation process. It dictates that in the event SCL equipment needs to be replaced or installed on site, it is the owner's responsibility to move such equipment in and out of the building.

ETA signage is not part of SCL stock. The customer is responsible for procuring signage per this standard.

3. General Requirements

Material	Phenolic resin sheet
Dimensions	12 in x 12 in square, ± 1/16 in
Color	
Sign	Red
Lettering	White
Lettering style and size	
Style	All caps, sans serif font, engraved
Size	Title text: 1-in high, nominal Body text: 1/2-in high, nominal
Thickness (in)	6 mils, nominal
Mounting	4 holes, 5/16-in diameter, ± 1/16-in, on corners

Figure 3. Text Sign Example

TRANSPORTATION AGREEMENT

AN EQUIPMENT TRANSPORTATION AGREEMENT

EXISTS FOR THIS VAULT. IF TRANSFORMER(S)

OR RELATED EQUIPMENT NEEDS TO BE MOVED

INTO OR OUT OF BUILDING, THE BUILDING

OWNER IS RESPONSIBLE FOR MOVING IT.

4. Suggested Manufacturer

Scott Machine Development Corporation, Walton, NY

5. Sources

Customer Electric Service Installation Process (CESIP) Section12.30; "Equipment Transportation Agreement Procedure," SCL Energy Delivery Operations, June 2008

Scott Machine Development Corporation; www.scottmachinecorp.com

Tilley, Kathy; SCL Electrical Engineering Support Specialist, originator of 7651.25 (kathy.tilley@seattle.gov)

Signs, Danger Hazardous Voltage, 7 in x 10 in, Adhesive

1. Scope

This standard covers the requirements for adhesive-backed decal “Danger Hazardous Voltage” signs.

This standard applies to Seattle City Light (SCL) Stock No. 765182.

2. Application

“Danger Hazardous Voltage” signs provide a visual aid in identifying potential hazards that may exist if a person were to come in contact with electrical equipment.

These signs are intended for use on the inside of switches, cabinets, transformers, or vault lids. Signs may also be used in other situations where the same level of alert is warranted.

The term “danger” indicates a hazardous situation that, if not avoided, **will** result in death or serious injury. The use of this term is to be limited to the most extreme situations.

See SCL 7651.35 for “Warning Hazardous Voltage” adhesive-backed decal signs.

3. Industry Standards

Signs shall meet the applicable requirements of the following industry standards:

Occupational Safety and Health Administration (OSHA) 1910.145; Specifications for accident prevention signs and tags

American National Standards Institute (ANSI) Z535.1; Safety Colors

ANSI Z535.2; Environmental Facility and Safety Signs

ANSI Z535.3; Criteria for Safety Symbols

ANSI Z535.4; Product Safety Signs and Labels

ANSI C2; NESC Handbook, Appendix B Safety Signs

ASTM D4956 Type IX; Standard Specification for retroreflective sheeting conforming to Type IX.

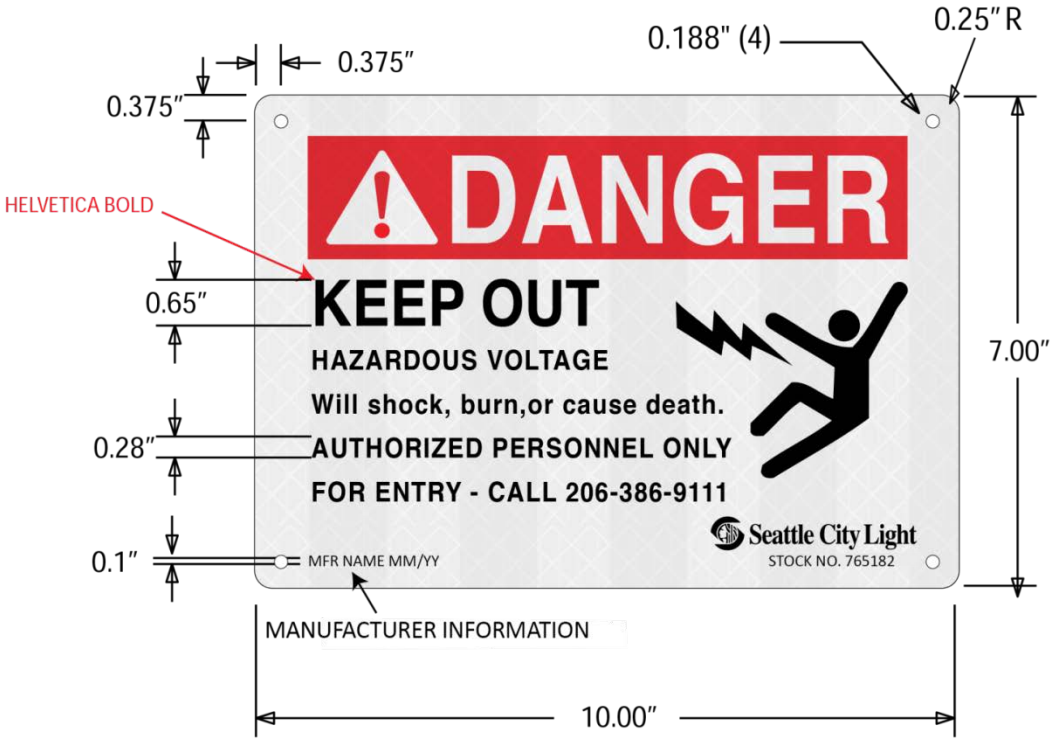
4. Requirements

Sign shall be fabricated according to Table 4 and Figure 4.

Table 4. Sign Requirements

Material	Suitable for application without requiring additional coats of adhesive or water to the application surface Minimum application temperature of -10°F Self-extinguishing
Coating	3M Series 3930 high intensity prismatic reflective sheeting; UV-inhibiting Sheeting strips applied in a vertical orientation Tedlar clear laminate
Adhesive	Clear, with silver underneath Pre-coated, pressure sensitive Shall have no staining effect on the decal material Mildew resistant Shall form a durable bond to clean, well-painted surfaces or unpainted corrosion-proof metals
Liner	Paper, back scored for easy removal Easy release-type; removable without tearing after storage for up to 4 hours at 180°F
Durability	Outdoor life of 6 years minimum, with vertical exterior exposure Resistant to 500 hours at 90% humidity Resistant to degradation by petroleum solvents and greases
Dimensions (in)	7 x 10
Text Colors	**Signal word panel**: Safety White letters on a transparent Safety Red background **Text copy**: Safety Black **Exclamation point pictogram in triangle**: Safety Red surrounded by Safety White **Electric shock symbol on body pictogram**: Safety Black **Shocked person pictogram**: Safety Black
Manufacturer and SCL Product Identification	**Manufacturer name or logo and the date of production** clearly marked along the bottom left edge of each decal **SCL stock number** clearly marked along the bottom right edge of each decal
Lettering	**Ink:** 3M 880N series or equivalent **Manufacturer and SCL identification**: In a style and size that is legible but that does not detract from the warning message **All other text**: Helvetica Bold font
Layout	Per Figure 4

Figure 4. Example Sign Layout



5. Approval Process

Manufacturer must submit artwork and one representative physical sample for review by SCL Standards prior to being considered for approved manufacturer status. Artwork submission shall include manufacturer's part number for SCL use in ordering product.

6. Approved Manufacturers

Manufacturer	Catalog No.
Almetek Industries	LABEL-14491
Designer Decal	DD-765182-SCL
Electromark	–

7. Packaging

Each standard package shall be legibly marked with the following information:

- Manufacturer identification
- Product description
- Seattle City Light stock number
- Quantity contained

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

- Manufacturer identification
- Product description
- Seattle City Light purchase order number
- Seattle City Light stock number

8. Issuance

Stock Unit: EA

9. References

SCL 7651.35; “Signs, Warning Hazardous Voltage, 7 in x 10 in, Adhesive”

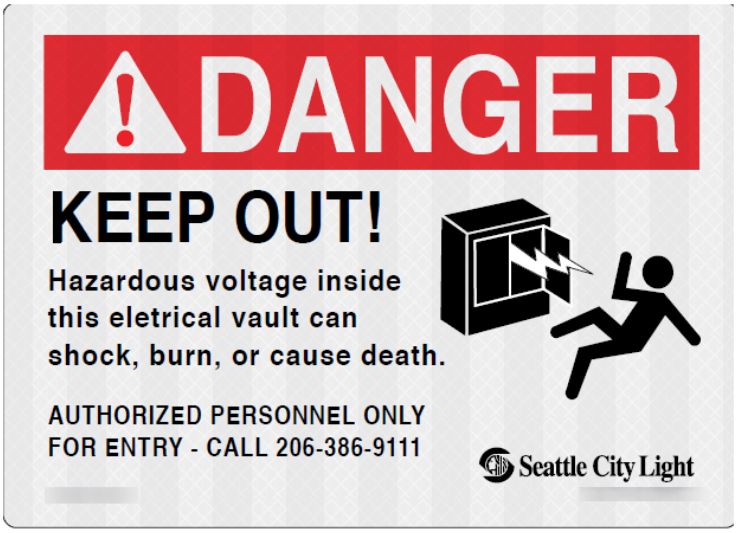
10. Sources

Tilley, Kathy; SCL Electrical Engineering Support Specialist, originator, and subject matter expert for 7651.27 (kathy.tilley@seattle.gov)

www.almetek.com

www.designerdecal.com

Signs, Danger Keep Out, 10 in x 14 in, Adhesive



1. Scope

This standard covers the requirements for adhesive-backed decal “Danger Keep Out Hazardous voltage inside” vault signs.

This standard applies to Seattle City Light (SCL) Stock No. 765209.

2. Application

“Danger Hazardous Voltage” signs provide a visual aid in identifying potential hazards that may exist if a person were to come in contact with electrical equipment.

These signs are intended for use specifically on, in, or around vaults. Signs may also be used in other situations where the same level of alert is warranted.

The term “danger” indicates a hazardous situation that, if not avoided, **will** result in death or serious injury. The use of this term is to be limited to the most extreme situations.

3. Industry Standards

Signs shall meet the applicable requirements of the following industry standards:

Occupational Safety and Health Administration (OSHA) 1910.145; Specifications for accident prevention signs and tags

American National Standards Institute (ANSI) Z535.1; Safety Colors

ANSI Z535.2; Environmental Facility and Safety Signs

ANSI Z535.3; Criteria for Safety Symbols

ANSI Z535.4; Product Safety Signs and Labels

ANSI C2; NESC Handbook, Appendix B Safety Signs

ASTM D4956 Type IX; Standard Specification for retroreflective sheeting conforming to Type IX.

4. Requirements

Sign shall be fabricated according to Table 4 and Figure 4.

Table 4. Sign Requirements

Material	Suitable for application without requiring additional coats of adhesive or water to the application surface Minimum application temperature of -10°F Self-extinguishing
Coating	3M Series 3930 high intensity prismatic reflective sheeting; UV-inhibiting Sheeting strips applied in a vertical orientation Tedlar clear laminate
Adhesive	Clear, with silver underneath Pre-coated, pressure sensitive Shall have no staining effect on the decal material Mildew resistant Shall form a durable bond to clean, well-painted surfaces or unpainted corrosion-proof metals
Liner	Paper, back scored for easy removal Easy release-type; removable without tearing after storage for up to 4 hours at 180°F
Durability	Outdoor life of 6 years minimum, with vertical exterior exposure Resistant to 500 hours at 90% humidity Resistant to degradation by petroleum solvents and greases
Dimensions (in)	10 x 14
Text Colors	**Signal word panel**: Safety White letters on a transparent Safety Red background **Text copy**: Safety Black **Exclamation point pictogram in triangle**: Safety Red surrounded by Safety White **Electric shock symbol on body pictogram**: Safety Black **Shocked person pictogram**: Safety Black
Manufacturer and SCL Product Identification	**Manufacturer name or logo and the date of production** clearly marked along the bottom left edge of each decal **SCL stock number** clearly marked along the bottom right edge of each decal
Lettering	**Ink:** 3M 880N series or equivalent **Manufacturer and SCL identification**: In a style and size that is legible but that does not detract from the warning message **All other text**: Helvetica Bold font
Layout	Per Figure 4

Figure 4. Example Sign Layout

5. Approval Process

Manufacturer must submit artwork and one representative physical sample for review by SCL Standards prior to being considered for approved manufacturer status. Artwork submission shall include manufacturer's part number for SCL use in ordering product.

6. Approved Manufacturers

Manufacturer	Catalog No.
Almetek Industries	LABEL-14605
Designer Decal	DD-765129-SCL
Electromark	–

7. Packaging

Each standard package shall be legibly marked with the following information:

- Manufacturer identification
- Product description
- Seattle City Light stock number
- Quantity contained

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

- Manufacturer identification
- Product description
- Seattle City Light purchase order number
- Seattle City Light stock number

8. Issuance

Stock Unit: EA

9. References

SCL 7651.27; "Signs, Danger Hazardous Voltage, 7 in x 10 in, Adhesive"

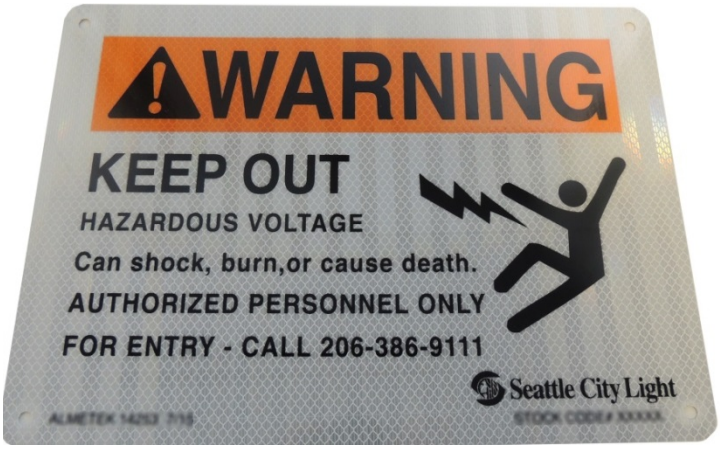
10. Sources

Tilley, Kathy; SCL Electrical Engineering Support Specialist, originator, and subject matter expert for 7651.29 (kathy.tilley@seattle.gov)

www.almetek.com

www.designerdecal.com

Signs, Warning Hazardous Voltage, 10 in x 14 in, Rigid



1. Scope

This standard covers the requirements for rigid "Warning Hazardous Voltage" signs.

This standard applies to Seattle City Light (SCL) Stock No. 013741.

2. Application

"Warning Hazardous Voltage" signs provide a visual aid in identifying potential hazards that may exist if a person were to come in contact with electrical equipment.

These signs are intended for use on the outside fence or exterior walls of an SCL substation. Signs may also be used in other situations where the same level of alert is warranted.

The term "warning" indicates a hazardous situation that, if not avoided, **could** result in death or serious injury.

See SCL 7651.19 for rigid "Danger Hazardous Voltage" signs.

3. Industry Standards

Signs shall meet the applicable requirements of the following industry standards:

Occupational Safety and Health Administration (OSHA) 1910.145; Specifications for accident prevention signs and tags

American National Standards Institute (ANSI) Z535.1; Safety Colors

ANSI Z535.2; Environmental Facility and Safety Signs

ANSI Z535.3; Criteria for Safety Symbols

ANSI Z535.4; Product Safety Signs and Labels

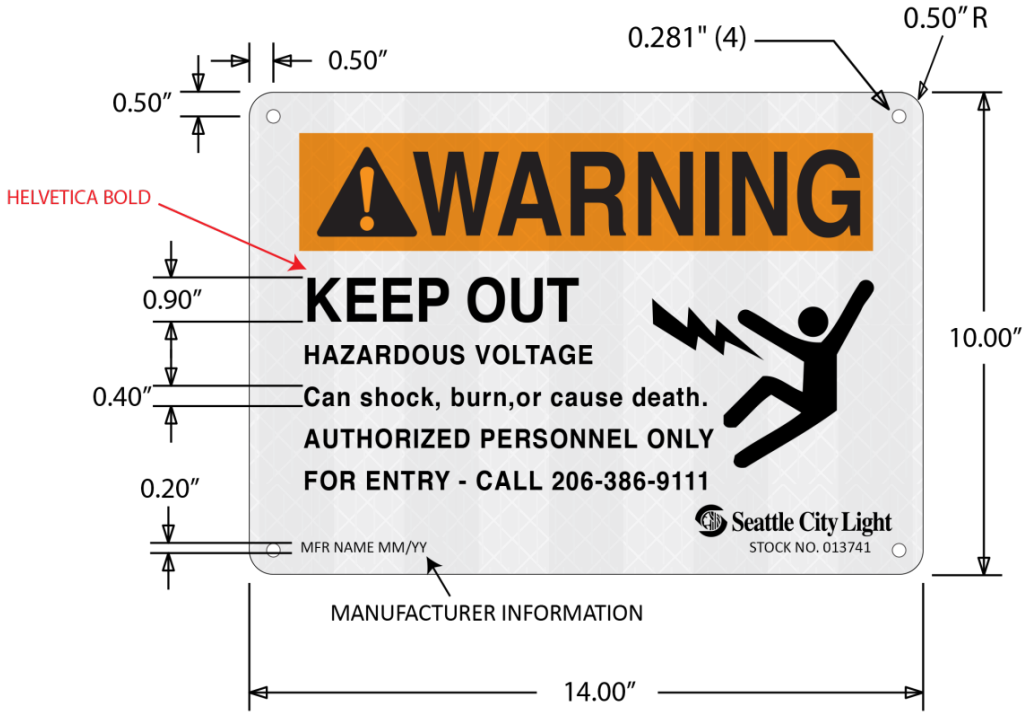
4. Requirements

Sign shall be fabricated according to Table 4 and Figure 4.

Table 4. Sign Requirements

Material	Aluminum
Dimensions (in)	10 x 14, with radiused corners and a 1/4-in (nominal) hole in each corner
Thickness (mils)	0.04
Coating	3M Series 3930 high intensity prismatic reflective sheeting; UV-inhibiting Sheeting strips applied in a vertical orientation
Text Colors	**Warning**: Safety White surrounded by Safety orange background **Exclamation point pictogram in triangle**: Safety orange surrounded by Safety Black. **Shocked person pictogram**: Safety Black **All other text**: Safety Black
Manufacturer and SCL Product Identification	**Manufacturer name or logo and the date of production** clearly marked along the bottom left edge of each sign **SCL stock number** clearly marked along the bottom right edge of each sign
Lettering	Helvetica Bold font
Layout	Per Figure 4

Figure 4. Example Sign Layout



5. Approval Process

Manufacturer must submit artwork and one representative physical sample for review by SCL Standards prior to being considered for approved manufacturer status. Artwork submission shall include manufacturer catalog number for SCL use in ordering product.

6. Approved Manufacturers

Manufacturer	Catalog No.
Almetek Industries	SIGN-14253 (Rev. B)
Designer Decal	DD-14253WAR-SCL
Electromark	–

7. Packaging

Each standard package shall be legibly marked with the following information:

- Manufacturer identification
- Product description
- Seattle City Light stock number
- Quantity contained (not to exceed 10)

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

- Manufacturer's identification
- Product description
- Seattle City Light purchase order number
- Seattle City Light stock number

8. Issuance

Stock Unit: EA

9. References

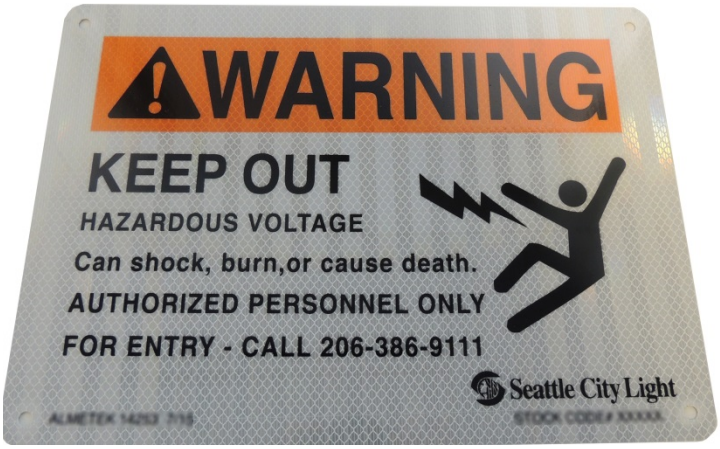
SCL Material Standard 7651.19; “Danger Hazardous Voltage, 10 in x 14 in, Rigid”

10. Sources

Tilley, Kathy; SCL Electrical Engineering Support Specialist, originator, and subject matter expert for 7651.31 (kathy.tilley@seattle.gov)

www.almetek.com

Signs, Warning Hazardous Voltage, 7 in x 10 in, Rigid



1. Scope

This standard covers the requirements for rigid “Warning Hazardous Voltage” signs.

This standard applies to Seattle City Light (SCL) Stock No. 013755.

2. Application

“Warning Hazardous Voltage” signs provide a visual aid in identifying potential hazards that may exist if a person were to come in contact with electrical equipment.

These signs are intended for use on the outside fence or exterior walls of an SCL substation or other electrical facility. Signs may also be used in other situations and facilities where the same level of alert is warranted.

The term “warning” indicates a hazardous situation that, if not avoided, **could** result in death or serious injury.

See SCL 7651.23 for rigid “Danger Hazardous Voltage” signs.

3. Industry Standards

Signs shall meet the applicable requirements of the following industry standards:

Occupational Safety and Health Administration (OSHA) 1910.145; Specifications for accident prevention signs and tags

American National Standards Institute (ANSI) Z535.1; Safety Colors

ANSI Z535.2; Environmental Facility and Safety Signs

ANSI Z535.3; Criteria for Safety Symbols

ANSI Z535.4; Product Safety Signs and Labels

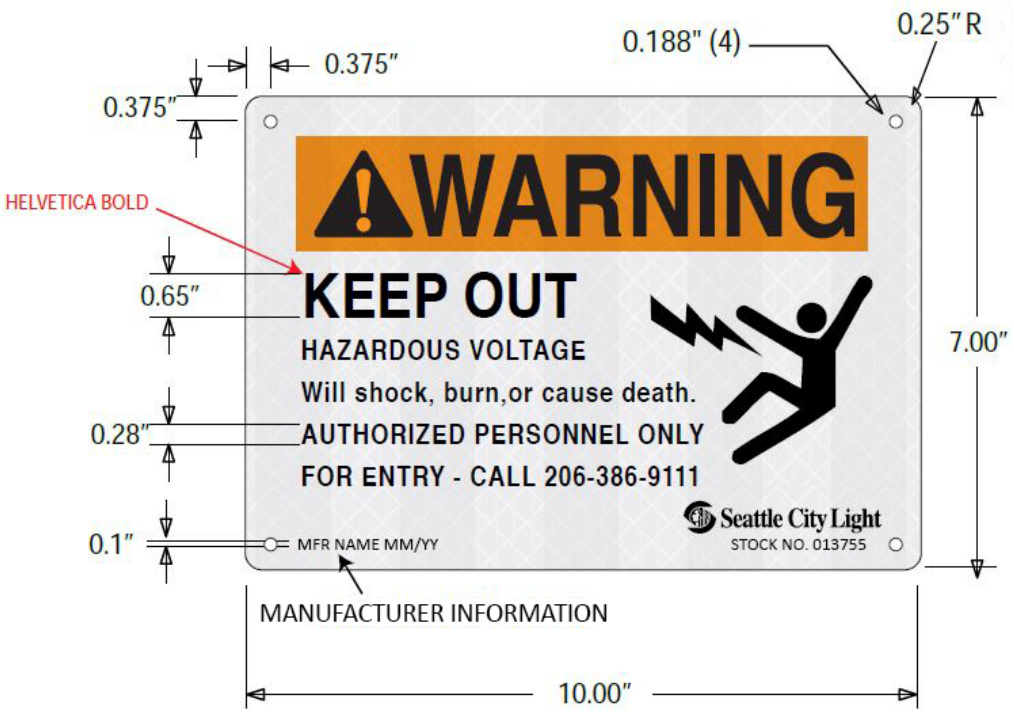
4. Requirements

Sign shall be fabricated according to Table 4 and Figure 4.

Table 4. Sign Requirements

Material	Aluminum
Dimensions (in)	7 x 10, with radiused corners and a 1/4-in (nominal) hole in each corner
Thickness (mils)	0.04
Coating	3M Series 3930 high intensity prismatic reflective sheeting; UV-inhibiting Sheeting strips applied in a vertical orientation
Text Colors	**Warning**: Safety White surrounded by Safety orange background **Exclamation point pictogram in triangle**: Safety orange surrounded by Safety Black. **Shocked person pictogram**: Safety Black **All other text**: Safety Black
Manufacturer and SCL Product Identification	**Manufacturer name or logo and the date of production** clearly marked along the bottom left edge of each sign **SCL stock number** clearly marked along the bottom right edge of each sign
Lettering	Helvetica Bold font
Layout	Per Figure 4

Figure 4. Example Sign Layout



5. Approval Process

Manufacturer must submit artwork and one representative physical sample for review by SCL Standards prior to being considered for approved manufacturer status. Artwork submission shall include manufacturer catalog number for SCL use in ordering product.

6. Approved Manufacturers

Manufacturer	Catalog No.
Almetek Industries	SIGN-14495
Designer Decal	DD-013755-SCL
Electromark	–

7. Packaging

Each standard package shall be legibly marked with the following information:

- Manufacturer identification
- Product description
- Seattle City Light stock number
- Quantity contained (not to exceed 10)

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

- Manufacturer identification
- Product description
- Seattle City Light purchase order number
- Seattle City Light stock number

8. Issuance

Stock Unit: EA

9. References

SCL Material Standard 7651.23; “Danger Hazardous Voltage, 7 in x 10 in, Rigid”

10. Sources

Tilley, Kathy; SCL Electrical Engineering Support Specialist, originator, and subject matter expert for 7651.33 (kathy.tilley@seattle.gov)

www.almetek.com

Signs, Warning Hazardous Voltage, 7 in x 10 in, Adhesive

1. Scope

This standard covers the requirements for adhesive-backed decal "Warning Hazardous Voltage" signs.

This standard applies to Seattle City Light (SCL) Stock No. 013754

2. Application

"Warning Hazardous Voltage" signs provide a visual aid in identifying potential hazards that may exist if a person were to come in contact with electrical equipment.

These signs are intended for use on the inside of switches, cabinets, transformers, or vault lids. Signs may also be used in other situations where the same level of alert is warranted.

The term "warning" indicates a hazardous situation that, if not avoided, ***could*** result in death or serious injury.

See SCL 7651.27 for "Danger Hazardous Voltage" adhesive-backed decal signs.

3. Industry Standards

Signs shall meet the applicable requirements of the following industry standards:

Occupational Safety and Health Administration (OSHA) 1910.145; Specifications for accident prevention signs and tags

American National Standards Institute (ANSI) Z535.1; Safety Colors

ANSI Z535.2; Environmental Facility and Safety Signs

ANSI Z535.3; Criteria for Safety Symbols

ANSI Z535.4; Product Safety Signs and Labels

ANSI C2; NESC Handbook, Appendix B Safety Signs

ASTM D4956 Type IX; Standard Specification for retroreflective sheeting conforming to Type IX.

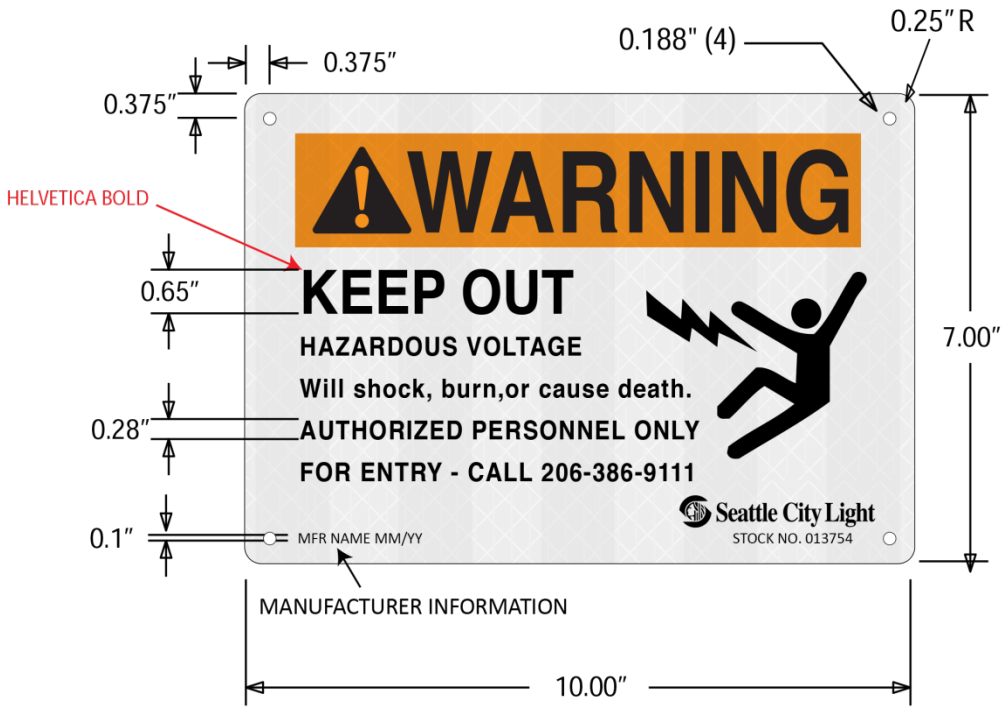
4. Requirements

Sign shall be fabricated according to Table 4 and Figure 4.

Table 4. Sign Requirements

Material	Suitable for application without requiring additional coats of adhesive or water on the label or application surface Minimum application temperature of -10°F Self-extinguishing
Coating	3M Series 3930 high intensity prismatic reflective sheeting; UV-inhibiting Sheeting strips applied in a vertical orientation Tedlar clear laminate
Adhesive	Clear, with silver underneath Pre-coated pressure sensitive Shall have no staining effect on the decal material Mildew resistant Shall form a durable bond to clean, well painted surfaces or unpainted corrosion-proof metals
Liner	Paper, back scored for easy removal Easy release-type, removable without tearing after storage for up to 4 hours at 180°F
Durability	Outdoor life of 6 years minimum, with vertical exterior exposure Resistant to 500 hours at 90% humidity Resistant to degradation by petroleum solvents and greases
Dimensions (in)	7 x 10
Text Colors	**Signal word panel**: Safety Black black letters on a transparent Safety Orange background **Text copy**: Safety Black **Exclamation point pictogram in triangle**: Safety Orange surrounded by Safety Black **Electric shock symbol on body pictogram**: Safety Black **Shocked person pictogram**: Safety Black
Manufacturer and SCL Product Identification	**Manufacturer name or logo and the date of production** clearly marked along the bottom left edge of each decal **SCL stock number** clearly marked along the bottom right edge of each decal
Lettering	**Ink:** 3M 880N series or equivalent **Manufacturer and SCL identification**: In a style and size that is legible but that does not detract from the warning message **All other text**: Helvetica Bold font
Layout	Per Figure 4

Figure 4. Example Sign Layout



5. Approval Process

Manufacturer must submit artwork and one representative physical sample for review by SCL Standards prior to being considered for approved manufacturer status. Artwork submission shall include manufacturer catalog number for SCL use in ordering product.

6. Approved Manufacturers

Manufacturer	Catalog No.
Almetek Industries	LABEL-14494
Designer Decal	DD-013754-SCL
Electromark	–

7. Packaging

Each standard package shall be legibly marked with the following information:

- Manufacturer identification
- Product description
- Seattle City Light stock number
- Quantity contained

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

- Manufacturer identification
- Product description
- Seattle City Light purchase order number
- Seattle City Light stock number

8. Issuance

Stock Unit: EA

9. References

SCL 7651.27; “Signs, Danger Hazardous Voltage, 7 in x 10 in, Adhesive”

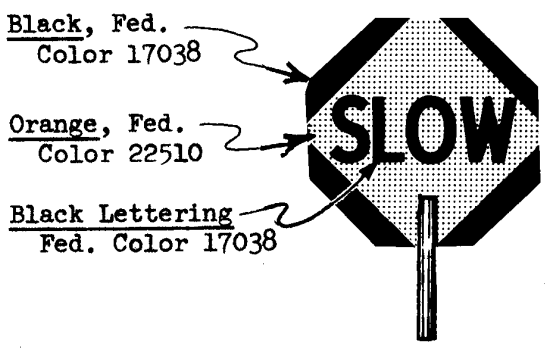
10. Sources

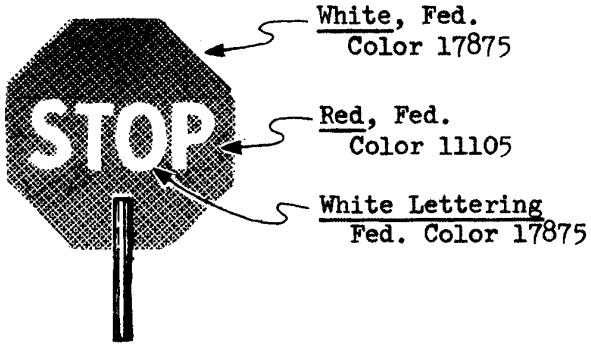
Tilley, Kathy; SCL Electrical Engineering Support Specialist, originator, and subject matter expert for 7651.35 (kathy.tilley@seattle.gov)

www.almetek.com

www.designerdecal.com

SIGN
TRAFFIC CONTROL





Traffic Control Signs shall be of the configuration shown and shall conform to Part 5 of ANSI D6.1, "Manual on Uniform Traffic Control Devices for Streets and Highways." Each sign shall be complete with a 2-inch diameter staff, 60 inches long, with a suitable coupler for connecting the sign and staff.

Letters. All letters shall be 6 inches high, Series C, per Bureau of Public Roads "Standard Alphabets for Highway Signs."

Fabrication. The signs shall be 24" to 26" in diameter and fabricated from ABS plastic, meeting the requirements of ASTM D1788 for Type 1, Grade 2 material. The 2-inch diameter, 24-inch long handle shall be securely attached to the sign body with bolts.

Colors. Colors of background, letters, and staff shall be air-drying enamel and shall conform to Federal Standard 595.

Reference Specifications: ANSI D6.1 (Part V); Bureau of Public Roads "Standard Alphabets for Highway Signs"; ASTM D1788; Federal Standard 595, latest revisions.

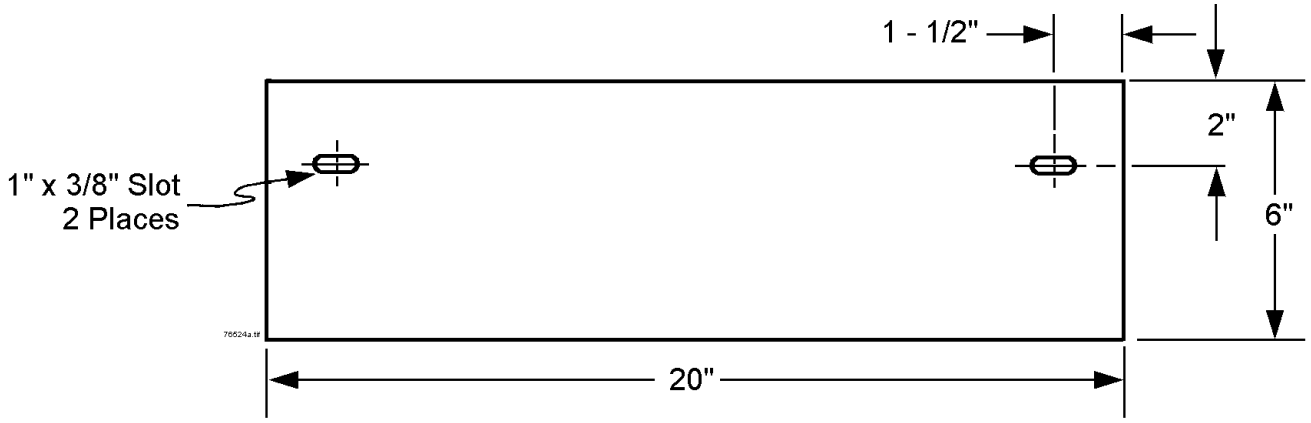
Stock Unit: Each

Approved Manufacturer: Safety Guide #02450

Stock Number: 765186

ORIGINATOR	STANDARDS COORDINATOR	STANDARDS SUPERVISOR	UNIT DIRECTOR
Jim S. Horn	Charles L. Shaffer	John C. Skinner	Betty Robin

SIGN
TOWER/CIRCUIT IDENTIFICATION
6” x 20”



Tower/Circuit identification signs shall be of the configuration shown.

Material. Signs shall be made from 6-inch by 20-inch blanks of .0508" 6061 alloy aluminum sheet. The sign shall have two slots, 1" x 3/8", located in the positions shown, for mounting. The holes shall be punched and all the edges deburred.

Lettering. See page 2 for lettering specifications.

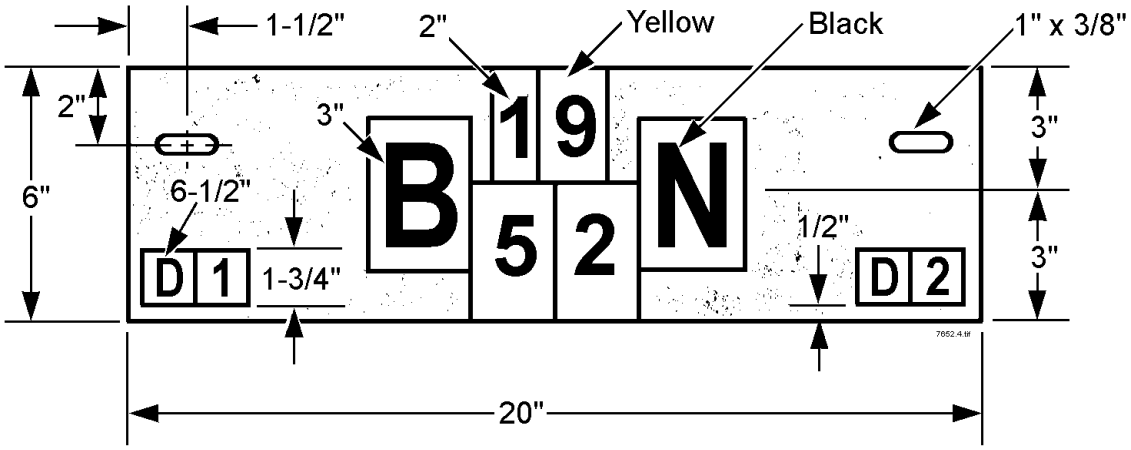
Finishing. See page 2 for finishing specifications.

Stock Number: 765210 (Includes only the aluminum sign. See page 2.)

Stock Unit: EA

ORIGINATOR	STANDARDS COORDINATOR	STANDARDS SUPERVISOR	UNIT DIRECTOR
Jim S. Horn	Charles L. Shaffer	John A. Skinner	Betty Robin

SIGN
TOWER/CIRCUIT IDENTIFICATION
6" x 20"



Tower/Circuit identification signs shall be of the configuration shown and shall meet the applicable requirements of the latest revisions to ANSI standard Z53.1, *Safety Color Code for Marking Physical Hazards.*

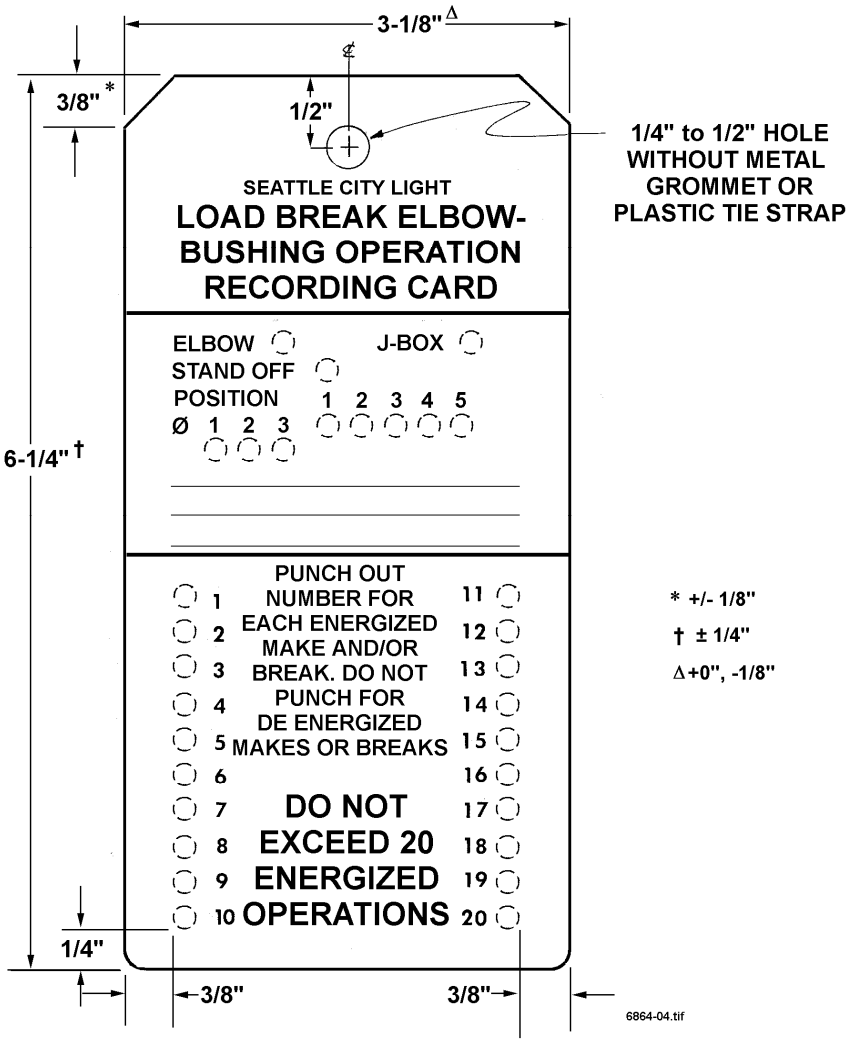
Lettering. Letters and numbers shall be black on a yellow background. They shall be fabricated from Minnesota Mining Company No. 3271 yellow *Scotchlite*® (or approved equal) and screened with No. 305 opaque black (or approved equal). The lettering and numbering shown on the example above are for illustration purposes only and are not necessarily representative of the actual sign. The size of the letters shall be as follows: 1-1/2" letters and numbers on 1-3/4"-high backing; 2" (numbers only) on 3" backing; and 3" (letters only) on 4" backing. Lettering is not part of Stock No. 765210, and is shown for example only.

Finishing. No finishing is needed other than installing the letters and numbers on the aluminum sign blank.

Reference Specification: ANSI Z53.1

Note: Lettering is shown only as an example of a typical installation. Letters and numbers are to be supplied by City Light crews, and are not part of Stock No. 765210.

RECORDING CARD



The recording card, of the configuration shown, shall be made of 15 mil (min.) plastic that shall withstand moisture, grease, and dirt. The surface shall be a matte finish that is easy to write on with ball-point pen or pencil. The background shall be yellow, and the lettering shall be black as shown. Camera ready artwork available from City Light Engineering Standards.

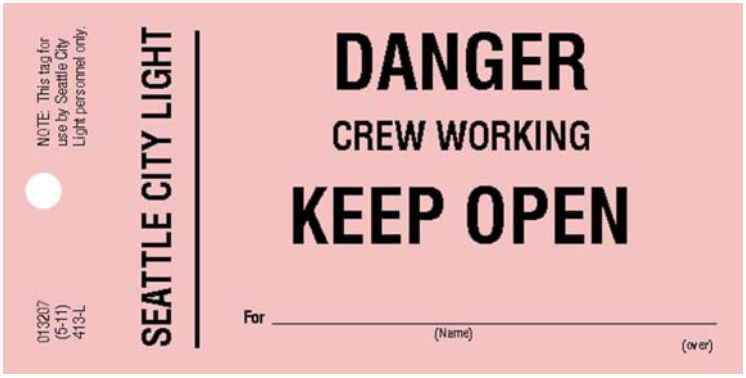
A perforated circle approximately 3/16" in diameter shall be located adjacent to the words or numbers as shown. The perforated circles shall be easily removed or punched out with an object similar to a pen or pencil.

The cards shall be packaged 25 per package. Reasonable variations are acceptable upon approval from City Light.

Stock Number: 686465 Stock Unit: EA

standards coordinator	*standards supervisor*	*unit director*
John Shipek	John Shipek	Pamela S. Johnson

OPERATIONS TAGS



1. Scope

This standard covers the requirements for operations tags.

This standard applies to the following Seattle City Light Stock Numbers:

Stock Number	Tag Label
013207	Danger Keep Open
013208	Abnormal Condition
013239	Station Warning Tag
013240	Recloser Off

2. Application

Operations tags are used by field personnel in the performance of switching and tagging procedures.

A complete description of how operations tags are used may be found in Seattle City Light's *Systems Operations Clearance Keep Open and Hold Open Procedures* book.

Note: Only solid-yellow Abnormal Condition tags are under the control of System Operations. Multi-colored Abnormal Condition Tags are in use at Seattle City Light but outside the control of System Operations. The use of these tags is the responsibility of the divisions for which their use is intended. Under no circumstances shall multi-colored tags be substituted for the solid-yellow tag.

Operations tags were once all manufactured in-house and assigned form numbers such as 413-L. As Seattle City Light's tags become standardized, references to these form numbers will gradually give way to Stock Numbers.

3. Requirements

3.1 General

Tags shall be fabricated from a material that can be reliably and durably written on in pencil or permanent ink marker.

Tags intended for outdoor application shall be water-proof and ultraviolet-light-resistant, suitable for long-term exposure.

The front, upper left corner of each tag shall contain the following information, arranged as typified in figure 3.2a:

- Seattle City Light's six-digit Stock Number
- (*mm-yy*) where *mm* = month of printing, *yy* = year of printing
- Seattle City Light's alphanumeric Form Number

Each tag shall be marked in an inconspicuous location with the manufacturer's name or symbol.

standards coordinator	*standards supervisor*	*unit director*
John Shipek	John Shipek	Darnell Cola

3. Requirements, continued

3.2 Danger Keep Open

Stock Number	013207
Text, layout and corners	according to Figures 3.2
Dimensions	
height, in	3-1/8, ± 1/16
width, in	6-1/4, ± 1/16
Punched hole, dia., in	7/16, + 1/16, -0; located as shown in Figures 3.2
Reinforced eyelet	none required

Attachment method	none required
Tag material	rigid PVC vinyl
Tag thickness, mils	15
Color	
background	florescent orange-red
printed font	black
City Light Form Number (historical reference only)	413-L
Application	outdoor

Figure 3.2a, front

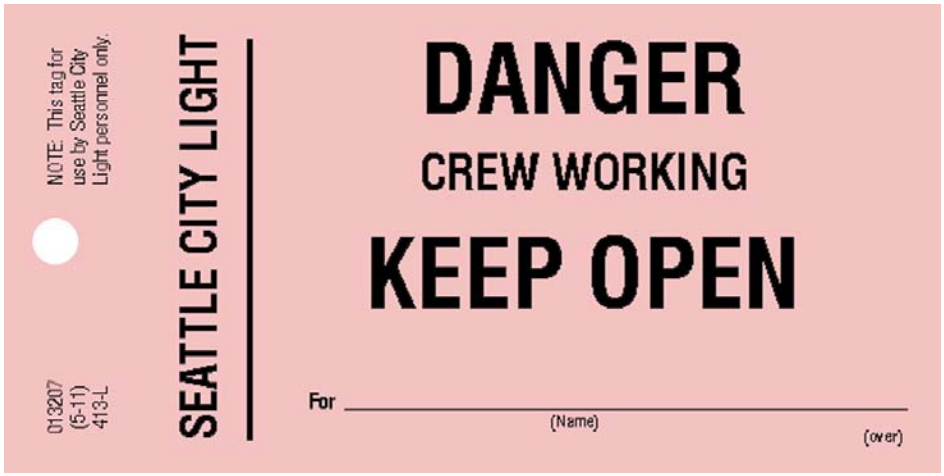
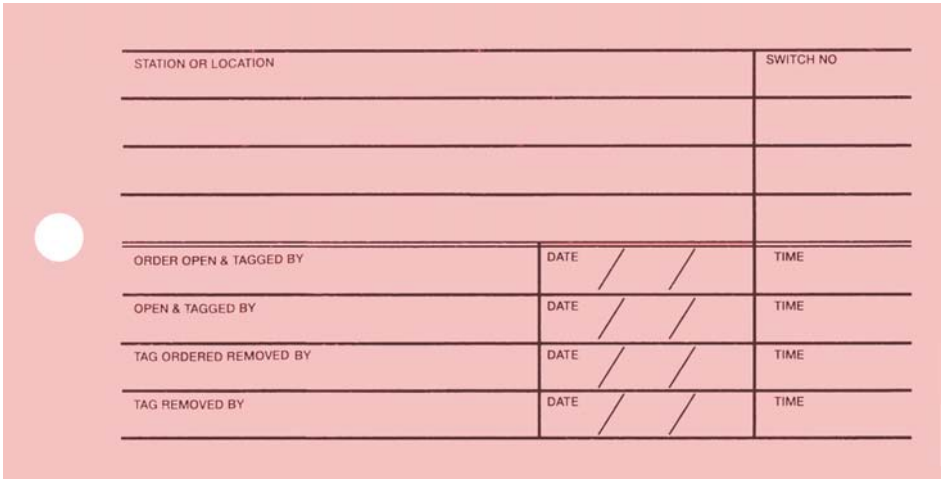


Figure 3.2b, back



note: color in figures does not represent the color requirements for the tag

3. Requirements, continued

3.3 Abnormal Condition

Stock Number	013208
Text, layout and corners	according to Figures 3.3
Dimensions	
height, in	3-1/8, ± 1/16
width, in	6-1/4, ± 1/16
Punched hole, dia., in	7/16, + 1/16, -0; located as shown in Figures 3.3
Reinforced eyelet	none required

Attachment method	none required
Tag material	rigid PVC vinyl
Tag thickness, mils	15
Color	
background	florescent yellow
printed font	black
City Light Form Number (historical reference only)	205-L
Application	outdoor

Figure 3.3a, front

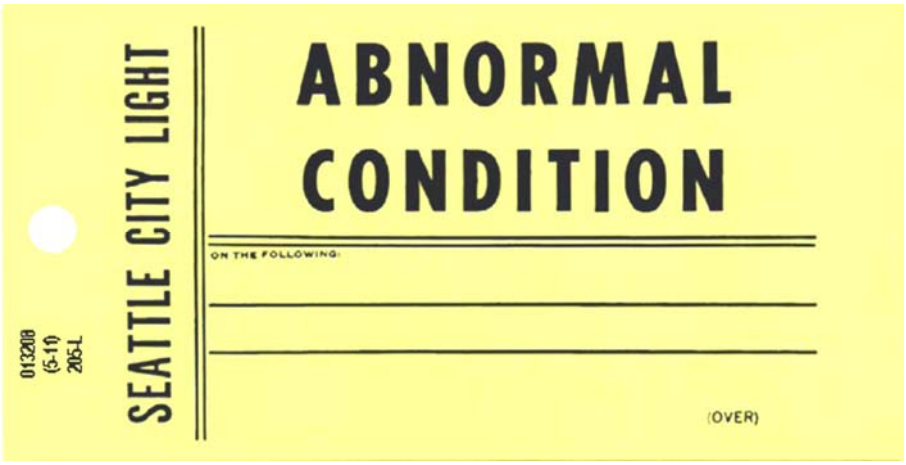
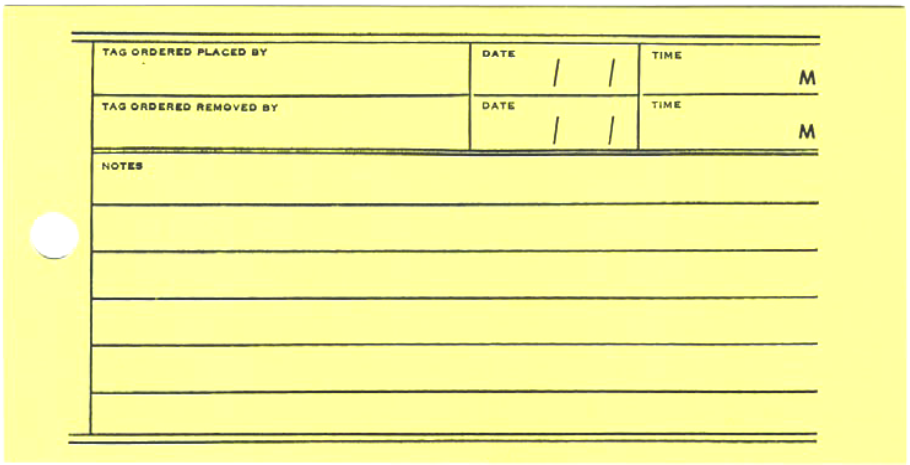


Figure 3.3b, back



note: color in figures does not represent the color requirements for the tag

3. Requirements, continued

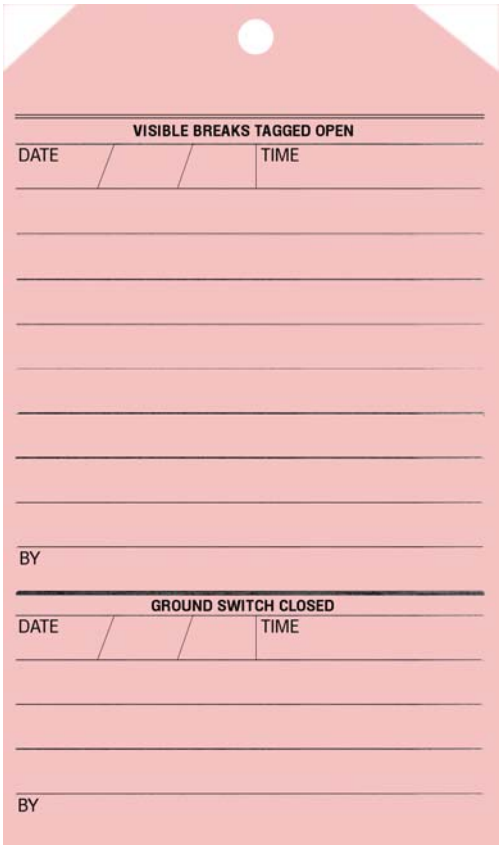
3.4 Station Warning Tag

Stock Number	013239
Text, layout and corners	according to Figures 3.4
Dimensions	
height, in	6-1/4, ± 1/16
width, in	3-1/8, ± 1/16
Punched hole, dia., in	7/16, + 1/16, -0; located as shown in Figures 3.4
Reinforced eyelet	none required

Attachment method	none required
Tag material	card stock
Tag thickness	
basis weight, lb	100
caliper, mil	15
Color	
background	florescent orange-red
printed font	black
City Light Form Number (historical reference only)	33-L
Application	indoors

Figure 3.4a, front

Figure 3.4b, back



note: color in figures does not represent the color requirements for the tag

3. Requirements, continued

3.5 Recloser Off

Stock Number	013240
Text, layout and corners	according to Figures 3.5
Dimensions	
height, in	6-1/4, ± 1/16
width, in	3-1/8, ± 1/16
Punched hole, dia., in	7/16, + 1/16, -0; located as shown in Figures 3.5
Reinforced eyelet	none required

Attachment method	none required
Tag material	rigid PVC vinyl
Tag thickness, mils	15
Color	
background	light blue
printed font	black
City Light Form Number (historical reference only)	649-L
Application	outdoor

Figure 3.5a, front

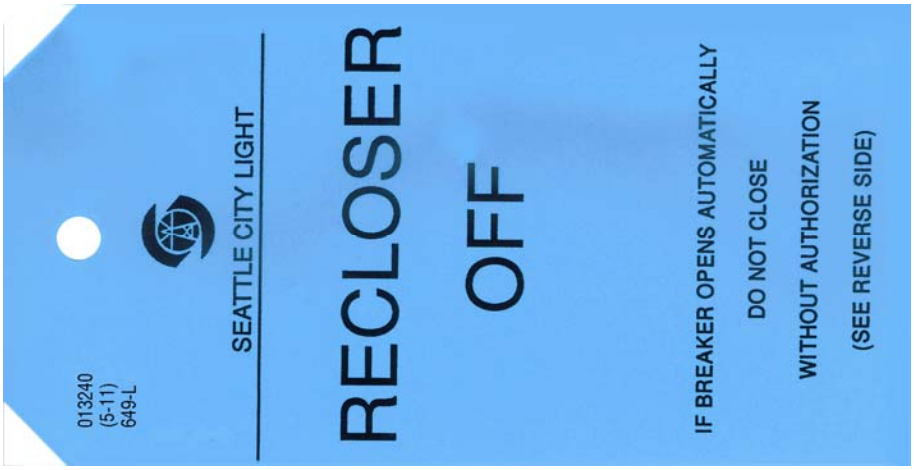
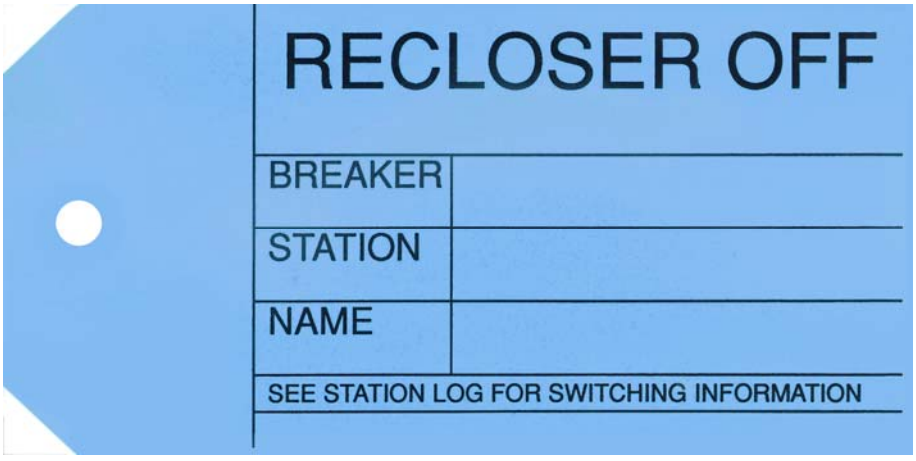


Figure 3.5b, back



note: color in figures does not represent the color requirements for the tag

4. Packaging

Tags shall be packaged to prevent damage during shipping, handling, and storage.

Tags shall be packaged in bundles of 50.

Each shipping container shall be marked with:

- Seattle City Light's Purchase Order Number
- Seattle City Light's Stock Number

5. Product Approval

Suppliers interested in having their tags approved for purchase by Seattle City Light must participate in a stepped approval process. Contact Standards for the details.

6. Issuance

EA

7. References

Designer Decal; www.designerdecal.com

Electromark; www.electromark.com

LEM Products, Inc.; www.lemproductsinc.com

SCL Form 205-L (9-10); "Abnormal Condition"; yellow tag

SCL Form 33-L (10-80); "Station Warning Tag"; red tag

SCL Form 413-L (1-97); "Danger Keep Open"; red tag

SCL Form 649-L (2-94); "Recloser Off"; blue tag

SCL; Seattle City Light, "Systems Operations Clearance Keep Open and Hold Open Procedures"; Revised October 2007

Shipek, John; SCL Standards Engineer, originator and subject matter expert for 7653.22; (john.shipek@seattle.gov)

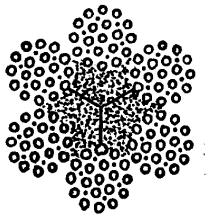
WAC 296-45-175; "Hazardous energy control (lockout/tagout) procedures"; Washington State code

WAC 296-45-335; "De-energizing lines and equipment for employee protection;" Washington State code

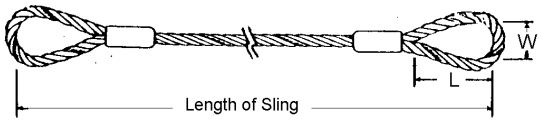
8. Approved Manufacturers

Stock Number	Tag Label	Form Number (historical only)	Manufacturers and Catalog Numbers		
			Designer Decal	Electromark	LEM Products, Inc.
013207	Danger Keep Open	413-L	#013207	Y2247890	FN13043
013208	Abnormal Condition	205-L	#013208	Y2251924	FN13044
013239	Station Warning Tag	33-L	#013239	Y2247871	FN13045
013240	Recloser Off	649-L	#013240	Y2251925	FN13046

SLINGS, WIRE ROPE



CROSS SECTION VIEW



Wire Rope Slings shall be made of wire rope conforming to the requirements of Federal Specification RR-W-410 and ANSI B3Q.9, except as modified herein.

Fabrication. The wire rope shall be Type 1, Class 2, Construction 4, 6 x 19 improved plow steel, with independent wire rope core (IWRC).

Lay. The wire rope shall have right regular lay.

Finish. The wire rope shall have an uncoated finish (bright).

Loop. The sling loops shall be formed by opening the end of the wire rope and laying it back so three strands pass around the loop in one direction and the other three strands, with the independent wire rope core, pass around the loop in the other direction (Flemish splice). The throat of the loop shall have all ends securely compressed under a steel sleeve. Under normal load conditions, the loop shall be free from "bird caging", evidenced by protrusion of the core.

Marking. The manufacturer's name or identifying mark shall be permanently impressed upon the sleeve or upon a permanently attached metal tag.

Approved Manufacturers: (1) B & J Equipment; (2) Broderick-Bascom; (3) West Pacific - WR; (4) N.W. Wire Rope; (5) West Coast - WR; (6) Pacific Industrial Supply.

Stock Number	Rope Diameter Inches	Dimensions Sling Length Ft.	Loop in Inches W	Loop in Inches L	Nominal Breaking Strength Lbs.	One Sling Max Work Load Stra. Pull - Lbs.	One Sling Max Work Load Choker Hitch - Lbs.
765420	3/8	2	3	6	13,000	2,450	1,900
765424	3/8	3	3	6	13,000	2,450	1,900
765428	3/8	4	3	6	13,000	2,450	1,900
765432	3/8	5	3	6	13,000	2,450	1,900
765434	3/8	6	3	6	13,000	2,450	1,900
765440	3/8	12	3	6	13,000	2,450	1,900
765454	1/2	3	4	8	23,000	4,300	3,400
765458	1/2	4	4	8	23,000	4,100	3,400
765462	1/2	5	4	8	23,000	4,100	3,400
765464	1/2	6	4	8	23,000	4,100	3,400
765470	1/2	12	6	12	23,000	4,100	3,400

ORIGINATOR	STANDARDS COORDINATOR	STANDARDS SUPERVISOR	UNIT DIRECTOR
Jim S. Horn	Charles L. Shaffer	John C. Skinner	Betty Robin

SLINGS, NYLON

1. Scope

This material standard covers the requirements for nylon slings, also known as synthetic webbing slings.

This material standard applies to the following Seattle City Light Stock Numbers:

Stock Number	Length, ft	Construction
765480	3	one-ply
765484	4	one-ply
765485	5	two-ply
765486	6	two-ply
765488	8	two-ply
765490	10	two-ply
765492	12	two-ply

2. Application

Slings are used to rig and hoist loads.

Before starting a job, sling users shall be trained in the selection, inspection, cautions to personnel, effects of the environment, and rigging practices cited in ANSI/ASME B30.9.

3. Industry Standards

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

ANSI/ASME B30.9-2010 – Slings, Safety Standard for Cableways, Cranes, Derricks, Hoists, Hooks, Jacks, and Slings

4. Requirements

4.1 Common

Webbing material	nylon
Webbing material color	yellow
Abrasion resistant webbing treatment	required
Webbing construction, tensile strength, minimum	9,800 lb/in of webbing width
Width, in	2
Length, ft	as cited in section 9 of this Standard
Type, per ANSI/ASME B30.9	IV (twisted-eye)
Class, per ANSI/ASME B30.9	7
Design factor	5 to 1
Eyes	leather or Cordura® brand reinforced
Wear indicator system	required

standards coordinator	*standards supervisor*	*unit director*
John Shipek	John Shipek	Pamela S. Johnson

4. Requirements, continued

4.2 One-Ply

Rated capacity, minimum

Vertical, lb	3,100
Basket, lb	6,200
Choker, lb	2,480

4.3 Two-Ply

Rated capacity, minimum

Vertical, lb	6,200
Basket, lb	12,400
Choker, lb	4,960

5. Marking

Each sling shall be marked according to the requirements of ANSI/ASME B30.9, Section 9-5.7. This information shall include, but not be limited to:

- Name or trademark of manufacturer
- Manufacturer's code or stock number
- Rated load for at least one hitch type and the angle upon which it is based
- Type of synthetic web material
- Number of legs, if more than one

In addition, each sling shall be marked with:

- "SEATTLE CITY LIGHT"
- Date of manufacture

Height of sling marking text shall be at least 3/16 inch.

Sling marking shall appear on a permanently attached tag made of leather or abrasion resistant polymer.

6. Testing

Test data that establishes compliance with the requirements of ANSI/ASME B30.9 shall be provided upon request.

7. Packaging

Slings shall be individually packaged to prevent damage during shipping, handling, and storage.

Each shipping container shall be marked with:

- Seattle City Light's Purchase Order Number
- Seattle City Light's Stock Number

8. Issuance

Stock Unit: EA

9. Approved Manufacturers

Stock Numbers	Length, ft	Construction	Manufacturers and Catalog Numbers			
			Lift-All	Lift-It	Olympic	Tuffy
765480	3	one-ply	EE1802NTT x 3' LONG	-	EE1-902-3 TYPE 4	EET-1-902-3
765484	4	one-ply	EE1802NTT x 4' LONG	EE1-902-4HT	EE1-902-4	EET-1-902-4
765485	5	two-ply	EE2802NTT x 5' LONG	EE2-902-5HT	EE2-902-5	EET-2-902-5
765486	6	two-ply	EE2802NTT x 6' LONG	EE2-902-6HT	EE2-902-6	EET-2-902-6
765488	8	two-ply	EE2802NTT x 8' LONG	EE2-902-8HT	EE2-902-8	EET-2-902-8
765490	10	two-ply	EE2802NTT x 10' LONG	EE2-902-10HT	EE2-902-10	EET-2-902-10
765492	12	two-ply	EE2802NTT x 12' LONG	EE2-902-12HT	EE2-902-12	EET-2-902-12

10. References

Part No. 1910, Standard No. 1910.184, Subpart N; "Part Title: Occupational Safety and Health Standards; Subpart Title: Materials Handling and Storage; Title: Slings"; Occupational Safety and Health Administration

Shipek, John; SCL Standards Engineer, subject matter expert and originator of 7654.80 (john.shipek@seattle.gov)

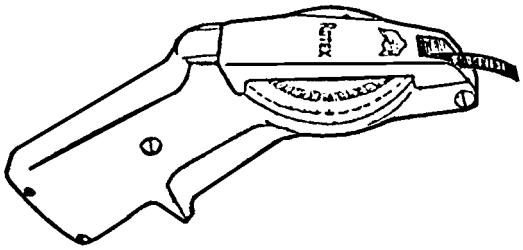
www.lift-all.com

www.lift-it.com

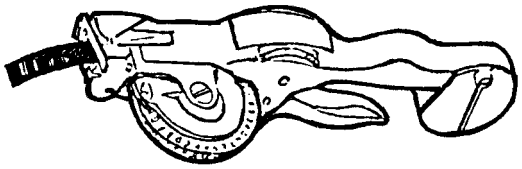
www.ospsling.com

www.tuffyweb.com

EMBOSSING TOOL, HAND



Plastic Embosser



Metal Embosser

Hand Embossing Tools shall be of the general configuration show, and shall be Type III, single line, hand portable, in accordance with Federal Specification 00-E-491. Embossing tools for metal tape shall be Type III, Class A, Style 2, with square cutoff. Embossing tools for plastic tape shall be Type III, Class B, Style 2, with square cutoff.

Tapes: Embossing tapes shall be 1/2-inch in width. Plastic tapes shall have a glossy finish, and shall meet the requirements of Federal Specification UU-T-94. Metallic tapes shall be stainless steel or aluminum without adhesive.

Packaging: Packaging shall be in accordance with the manufacturer's commercial practice to ensure safe delivery without damage.

Reference Specifications: Fed. 00-E-491, UU-T-94, latest revisions

Tool Stock Unit: EA
Tape Stock Unit: RL

EMBOSSING TOOL

Stock Number	Tape Type	Federal Tool Classification	Approved Manufacturers	
			Dymo	Rotex
765886	Plastic	Type III, Class B, Style 2	1540-00 1570-00	600-68
765887	Metal	Type III, Class A, Style 2	1011-05	–

TAPE

Stock Number	Color
723359	Black
723360	Yellow
723362	Red
723364	Gray

TAPE

Stock Number	Color
723365	Blue
723366	Green
723370	Stainless
723372	Aluminum

Approved Manufacturers of Tape: Dymo, General, Rotex

ORIGINATOR	STANDARDS COORDINATOR	STANDARDS SUPERVISOR	UNIT DIRECTOR
Jim S. Horn	Charles L. Shaffer	John C. Skinner	Betty Robin

FUNNELS, POLYETHYLENE, GENERAL PURPOSE

1. Scope

This material standard covers the requirements for general purpose plastic funnels.

This material standard applies to Seattle City Light the following Stock Numbers:

Stock No	Capacity, oz
013168	16
013169	32
013170	48

2. Application

For general purpose liquid channeling. May be used for petroleum products.

3. Requirements

Stock No	Material	Nominal Capacity, oz	Nominal Diameter, in	Nominal Height, in
013168	polyethylene	16	5.5	4.5
013169	polyethylene	32	7.5	7.0
013170	polyethylene	48	8.0	7.0

Funnels shall be professional grade and suitable for general purpose application in a utility environment.

Capacity indicates what volume the funnel will hold when the outlet is blocked.

4. Packaging

Funnels shall be packaged to prevent damage during shipping, handling, and storage.

Each shipping container shall be marked with:

- Seattle City Light's Purchase Order Number
- Seattle City Light's Stock Number

5. Issuance

EA

6. Approved Manufacturers

		Manufacturer and Catalog No		
Stock No	Capacity, oz	Plews Edelmann	Wilmar Corp.	Wirthco
013168	16	75-062	W4015	32831
013169	32	-	W4064	-
013170	48	75-064	W54275	-

7. References

Byrnes, Devyn; SCL Standards Student Intern, subject matter expert and originator of 7659.03 **(**devyn.byrnes@seattle.gov**)**

standards coordinator	*standards supervisor*	*unit director*
Devyn Byrnes	John Shipek	Pamela S. Johnson

DOT TYPE-II SAFETY CANS

1. Scope

This standard covers the requirements for Department of Transportation (DOT) type-II safety cans.

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

Stock Number	Capacity, gal
013413	2.5
013414	5.0

2. Application

Safety cans are used for over-the-road transport of gasoline and other flammable liquids.

3. Federal Regulations

Safety cans shall meet the applicable requirements of US Department of Transportation, Pipeline and Hazardous Materials Safety Administration, Hazardous Materials Regulations (HMR) CFR 49 Parts 100 to 185.

4. Requirements

Material	24-gauge premium coated steel
Color	Red
Body outer diameter, in	11-3/4
Body height, in	
2.5 gallon can	12
5.0 gallon can	17-1/2
Hose outer diameter, in	5/8
Hose length, in	9
Fusible link melt point, degrees F	165
Positive pressure relief actuation, range, psig	3 to 5

Safety cans shall have the following features:

- Full-fist rounded grip
- Positive-pressure-relief cap
- Spring-loaded, self-closing lid
- Long-life lid gasket
- Fusible link bracket
- Lead-free steel body and handle
- Flexible pour hose
- 24-gauge premium coated steel construction
- Durable, high-gloss powder paint finish
- Yellow banding with large ID zone
- Trilingual warning (English, Spanish, and French)
- Reinforced sidewalls
- Corrosion-resistant, stainless-steel flame arrester within the fill/pour spout
- Wide free-span opening lid
- Raised bottom construction
- Single hold-down bracket
- Heavy roll bars to protect mechanism

Safety cans shall be:

- DOT type-II compliant
- FM Global tested and approved
- Underwriters Laboratories listed

standards coordinator	*standards supervisor*	*unit director*
John Shipek	John Shipek	Darnell Cola

5. Marking

Each safety can shall be marked with:

- Manufacturer's name
- Capacity
- Applicable compliances, approvals, and listings

6. Packaging

Each safety can shall be packaged to prevent damage during shipping, handling, and storage.

Each shipping container shall be marked with:

- Seattle City Light purchase order number
- Seattle City Light purchase stock number

7. Issuance

EA

8. Approved Manufacturer

Stock Number	Capacity, gal	Justrite Catalog Number
013413	2.5	JUSTR 7325120, DOT compliant AccuFlow
013414	5.0	JUSTR 7350110, DOT compliant AccuFlow

9. References

Shipek, John; SCL Standards Engineer, originator of Material Standard 7659.09 (john.shipek@seattle.gov)

www.justritemfg.com

FLASHLIGHT, LED TYPE

1. Scope

This material standard covers the requirements for battery-powered, LED (light emitting diode) type flashlights.

This material standard applies to Seattle City Light Stock Number 013156.

2. Application

For general purpose, hand-held lighting needs.

Do not mix new and old batteries. Do not mix alkaline, standard (carbon-zinc), or rechargeable batteries.

Do not look directly into the beam of an LED type flashlight; the light is much brighter than that of traditional incandescent type flashlights and can cause eye damage.

3. Requirements

Light source	single, high performance LED
Light output	120 lumens, minimum
Efficiency	comparable to Cree XP-C technology or better
LED life	50,000 hours, minimum
Battery configuration	four AA Alkaline
Battery run time	4 hours, nominal

Flashlight shall be impact- and water-resistant.

Flashlight shall be professional grade, suitable for general purpose application in a utility environment.

4. Product Approval

Manufacturers and/or distributors interested in having their product approved for purchase by Seattle City Light must participate in the stepped processed summarized below. Contact Standards for the details.

- Submit evidence that product meets the requirements of this standard
- Provide one sample for evaluation

5. Packaging

Flashlight shall be packaged to prevent damage during shipping, handling, and storage.

Each shipping container shall be marked with:

- Seattle City Light's Purchase Order Number
- Seattle City Light's Stock Number

6. Issuance

EA

7. Approved Manufacturers

Ray-O-Vac RNF4AA-B 120 Lumens Roughneck

9. References

Shipek, John; SCL Standards Engineer, subject matter expert and originator of 7659.21 **(**john.shipek@seattle.gov**)**

www.rayovac.com

www.cree.com

standards coordinator	*standards manager*	*unit director*
John Shipek	John Shipek	Pamela S. Johnson

ALKALINE BATTERIES

1. Scope

This standard covers the requirements for alkaline batteries.

This standard applies to the following Seattle City Light Stock Numbers:

Stock Number	Size
760191	AAA
760190	AA
760192	C
760194	D
760189	9 volt transistor
760185	6 volt lantern

2. Application

Alkaline batteries are for powering flashlights and other small electronic devices.

Do not mix new and old batteries. Do not mix alkaline, standard (carbon-zinc), or rechargeable batteries in the same device.

To minimize power loss during storage, batteries should ideally be stored at a maximum temperature of 77° F (25° C). Refrigerated storage is neither necessary nor recommended.

Batteries should not be left in electronic devices past their expiration date.

3. Industry Standards

Batteries shall meet the applicable requirements of the following industry standards:

ANSI C18.1M Part 1; "Portable Primary Cells and Batteries with Aqueous Electrolyte - General and Specifications," American National Standards Institute, 01-Jan-2001

ANSI/NEMA C18.1M Part 2-2011; "For Portable Primary Cells and Batteries with Aqueous Electrolyte - Safety Standard," National Electrical Manufacturers Association, 2010

4. Requirements

4.1 General

Classification	alkaline
Temperature Range, degrees C	
Storage	-18 to 35
Operating	-18 to 54
Shelf life, years at 21 degrees C, 80% initial capacity, nominal	
1.5 V cells	7
9 V cells	5

Batteries shall meet Environmental Protection Agency (EPA) requirements for landfill disposal. No mercury-added formulation shall be used. Batteries shall not contain cadmium.

standards coordinator	*standards supervisor*	*unit director*
John Shipek	John Shipek	Darnell Cola

4. Requirements continued

4.2 Detailed Requirements

Table 4, Detailed Requirements

Stock Number	Cell Size	Designation		Normal Voltage (V)	Normal Weight (g)
		ANSI	IEC		
760191	AAA	24A	LR03	1.5	11.5
760190	AA	15A	LR6	1.5	23.0
760192	C	14A	LR14	1.5	66.2
760194	D	13A	LR20	1.5	148.0
760189	9 volt transistor	1604A	6LR61	9.0	45.6
760185	6 volt lantern	908A	-	6.0	665.0

5. Marking

Each cell shall be legibly marked with a battery expiration date.

6. Packaging

Batteries shall be packaged to prevent damage during shipping, handling, and storage.

Batteries shall be packaged in cardboard cartons in quantities up to 50 per carton.

Each shipping container shall be marked with Seattle City Light's Purchase Order Number.

7. Issuance

EA

8. Approved Manufacturers

8.1 Normal Situations

Table 8, Approved manufacturers for normal situations

Stock Number	Cell Size	Duracell Procell	Energizer Industrial	Rayovac Maximum
760191	AAA	PC2400	EN92	824
760190	AA	PC1500	EN91	815
760192	C	PC1400	EN93	814
760194	D	PC1300	EN95	813
760189	9 volt transistor	PC1604	EN22	A1604
760185	6 volt lantern	-	EN529	-

8.2 Emergency Situations

In situations deemed by Material Control as emergencies, the following exceptions are allowed:

- Duracell Coppertop (alkaline) may be substituted for the equivalent size Duracell Procell product.
- Energizer (alkaline) may be substituted for the equivalent size Energizer Industrial product.
- Rayovac (alkaline) may be substituted for the equivalent size Rayovac Maximum product.

In emergency situations, Seattle City Light packaging requirements may be waived.

9. References

Shipek, John; SCL Engineer, subject matter expert, and originator of 7660.24 (john.shipek@seattle.gov)

Rayovac: www.rayovac.com

Rayovac; Application Notes & Product Data Sheet, OEM 151 (R-3/99)

Energizer: www.data.energizer.com/

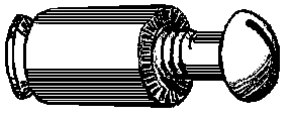
Energizer : Product Datasheet, Form No. EBC-1203J

Duracell: www.duracell.com

Duracell: Product Data Sheets, 6/08

IEC Standard for Primary Batteries, Part I: General (86-1) and Part II: Specification Sheets (86-2), 1982

ANCHORS – LIGHT-DUTY SCREW



1. **Light-Duty Screw Anchors** of the configuration shown are for masonry anchoring where holding requirements do not exceed the safe working loads listed in the table below.
2. **Material.** The anchor is composed of a hard zinc alloy, internally threaded cone, and a lead caulking sleeve.
3. **Thread Protection.** The bottom of the cone shall be closed to exclude dirt and dust from the threads.
4. **Caulking Tool.** One caulking tool shall be included in each box of anchors.
5. **Stock Unit:** EA

Stock No.	Screw Size, in.	Safe Load, lbs.	Drill Diameter, in.	Minimum Hole Depth, in.	Approved Manufacturers	
					MKT Fastening	Powers
780071	8-32	100	5/16	1/2	–	9205
780072	10-24	150	3/8	5/8	1405000	9210
780074	1/4-20	200	1/2	7/8	1407000	9220
780075	5/16-18	300	5/8	1	1408000	9225
780076	3/8-16	450	3/4	1-1/4	1409000	9230
780078	1/2-13	600	7/8	1-1/2	1411000	9240

STANDARDS COORDINATOR	STANDARDS SUPERVISOR	UNIT DIRECTOR

Bolts, Expansion Anchor, Stainless Steel

1. Scope

This standard covers the requirements for two types of stainless steel expansion anchor bolts.

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

Stock No.	Size (in) (Diameter x Length)	Type
780032	1/2 x 3-3/4	304
013666	1/2 x 4-1/2	304
780033	3/4 x 8	304
780147	5/8 x 4-3/4	304
780034	5/8 x 4-3/4	316
780141	1/2 x 3-3/4	316
780143	1/2 x 5-1/2	316
780145	5/8 x 6	316

2. Application

Table 2. Expansion Anchor Bolt Applications, All Types

SCL Standard	Material	Application	Environment	Seismically qualified?
7800.95 (this standard)	Stainless steel bolts with Type 304 stainless steel nuts and washers	Permanent	Wet	Yes
	Stainless steel bolts with Type 316 stainless steel nuts and washers	Permanent	Wet, corrosive/ saltwater conditions	Yes
7800.96	Carbon steel	Permanent	Dry, in-building	Yes
7800.97	Carbon steel	Light duty/ temporary	Dry, in-building	No

Expansion anchor bolt strength requirements depend on a variety of factors, including:

- Strength of concrete
- Bolt spacing
- Shear and tension
- Seismic

Please refer to the Hilti Kwik bolt TZ, Stainless Steel, 304 and 316 Expansion Anchor technical data sheet for additional information and contact SCL Civil Engineering for application-specific strength requirements.

3. Industry Standards

Expansion anchor bolts shall meet the applicable requirements of the following industry standards:

ACI 355.2; Qualification of Post-Installed Mechanical Anchors in Concrete

ANSI/ASME B18.2.1; Square, Hex, Heavy Hex, and Askew Head Bolts and Hex, Heavy Hex, Hex Flange, Lobed Head, and Lag Screws (Inch Series)

ANSI/ASME B18.21.1; Washers: Helical Spring-Lock, Tooth Lock, and Plain Washers (Inch Series)

ASTM F594; Standard Specification for Stainless Steel Nuts

ICC-ES AC 193; Acceptance Criteria for Mechanical Anchors in Concrete Elements

4. Requirements

Expansion anchor bolt, nut, and washer shall be provided to SCL pre-assembled.

Stainless steel expansion anchor nuts and washers are to be made from Type 304 or Type 316 stainless steel respectively.

Nuts shall meet the dimensional requirements of ASTM F594.

Washers shall meet the dimensional requirements of ANSI/ASME B18.21.1, Type A, plain.

Expansion sleeves (wedges) shall be made from Type 316 stainless steel.

Seismic qualification shall be tested in accordance with ACI 355.2 and ICC-ES AC 193.

Table 4. Dimension Requirements

Stock No.	Size (in) (Diameter x Length)
780032	1/2 x 3-3/4
013666	1/2 x 4-1/2
780033	3/4 x 8
780147	5/8 x 4-3/4
780034	5/8 x 4-3/4
780141	1/2 x 3-3/4
780143	1/2 x 5-1/2
780145	5/8 x 6

5. Marking

A red band near top of bolt differentiates this product from the light-duty Hilti Kwik Bolt 3.

Product and length identification shall be marked on all expansion anchor bolts.

A length identification mark shall be embossed into the impact section (dog point of the anchor. This mark shall be surrounded by four embossed notches identifying the anchor as a Hilti Kwik Bolt TZ.

6. Packaging

Each standard package shall be legibly marked with the following information:

- Manufacturer identification
- Product description
- Seattle City Light stock number
- Quantity contained

Quantity per box shall be as described in Section 8.

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

- Manufacturer identification
- Country of origin
- Product description
- Seattle City Light purchase order number

7. Issuance

Stock Unit: EA

8. Approved Manufacturer

Name: Hilti, Inc. (US)
Product Description: Kwik Bolt TZ

Stock No.	Size (in) (Diameter x Length)	Item Type	Item No.	Box Quantity
780032	1/2 x 3-3/4	TZ-SS304	387526	20
013666	1/2 x 4-1/2	TZ-SS304	387527	20
780033	3/4 x 8	TZ-SS304	387535	1
780147	5/8 x 4-3/4	TZ-SS304	387530	15
780034	5/8 x 4-3/4	TZ-SS316	411737	15
780141	1/2 x 3-3/4	TZ-SS316	411733	20
780143	1/2 x 5-1/2	TZ-SS316	411736	20
780145	5/8 x 6	TZ-SS316	411739	15

9. References

SCL Material Standard 7800.96; “Bolts, Expansion Anchor, Carbon Steel, Standard Duty”

SCL Material Standard 7800.97; “Bolts, Expansion Anchor, Carbon Steel, Light Duty”

10. Sources

Ng, Sharon; SCL Senior Civil Engineer and subject matter expert for 7800.95 (sharon.ng@seattle.gov)

Tilley, Kathy; SCL Electrical Engineering Support Specialist and originator of 7800.95 (kathy.tilley@seattle.gov)

www.hilti.com; Kwik Bolt TZ, Stainless Steel, 304 and 316 Expansion Anchor technical data sheet

Bolts, Expansion Anchor, Carbon Steel, Standard Duty

1. Scope

This standard covers the requirements for carbon steel expansion anchor bolts. This standard applies to the following Seattle City Light (SCL) stock numbers:

Stock No.	Size (in) (Diameter x Length)
780104	3/8 x 3
780105	3/8 x 3-3/4
780111	1/2 x 3-3/4
780113	1/2 x 5-1/2
780024	5/8 x 4-3/4
780115	5/8 x 6
780023	3/4 x 8

2. Application

Table 2. Expansion Anchor Bolt Applications, All Types

SCL Standard	Material	Application	Environment	Seismically qualified?
7800.95	Stainless steel bolts with Type 304 stainless steel nuts and washers	Permanent	Wet	Yes
	Stainless steel bolts with Type 316 stainless steel nuts and washers	Permanent	Wet, corrosive/ saltwater conditions	Yes
7800.96 (this standard)	Carbon steel	Permanent	Dry, in-building	Yes
7800.97	Carbon steel	Light duty/ temporary	Dry, in-building	No

Expansion anchor bolt strength requirements depend on a variety of factors, including:

- Strength of concrete
- Bolt spacing
- Shear and tension
- Seismic

Please refer to the Hilti Kwik bolt TZ, Carbon Steel, 304 and 316 Expansion Anchor technical data sheet for additional information and contact SCL Civil Engineering for application-specific strength requirements.

3. Industry Standards

Carbon steel expansion anchors shall meet the applicable requirements of the following industry standards:

ACI 355.2; Qualification of Post-Installed Mechanical Anchors in Concrete

ASTM A563, Standard Specification for Carbon and Alloy Steel Nuts

ASTM F844; Standard Specification for Washers, Steel, Plain (Flat), Unhardened for General Use

ASTM B633/A668M; Standard Specification for Steel Forgings, Carbon and Alloy for General Industrial Use

ICC-ES AC I93; Acceptance Criteria for Mechanical Anchors in Concrete Elements

4. Requirements

Expansion anchor bolt, nut, and washer shall be provided to SCL pre-assembled.

Carbon steel anchor components shall be plated in accordance with ASTM B633 to a minimum thickness of 5 µm.

Nuts shall conform to the requirements of ASTM A563, Grade A, Hex.

Washers shall meet the requirements of ASTM F844.

Expansion sleeves (wedges) shall be manufactured from type 316 stainless steel.

Seismic qualification shall be tested in accordance with ACI 355.2 and ICC-ES AC193.

Table 4. Dimension Requirements

Stock No.	Size (in) (Diameter x Length)
780104	3/8 x 3
780105	3/8 x 3-3/4
780111	1/2 x 3-3/4
780113	1/2 x 5-1/2
780024	5/8 x 4-3/4
780115	5/8 x 6
780023	3/4 x 8

5. Marking

A red band near top of bolt differentiates this product from the light-duty Hilti Kwik Bolt 3.

Product and length identification shall be marked on all expansion anchor bolts.

A length identification mark shall be embossed into the impact section (dog point of the anchor. This mark shall be surrounded by four embossed notches identifying the anchor as a Hilti Kwik Bolt TZ.

6. Packaging

Each standard package shall be legibly marked with the following information:

- Manufacturer identification
- Product description
- Seattle City Light stock number
- Quantity contained

Quantity per box shall be as described in Section 8.

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

- Manufacturer identification
- Country of origin
- Product description
- Seattle City Light purchase order number

7. Issuance

Stock Unit: EA

8. Approved Manufacturer

Name: Hilti, Inc. (US)
Product Description: Kwik Bolt TZ

Stock No.	Size (in) (Diameter x Length)	Item No.	Box Quantity
780104	3/8 x 3	387509	50
780105	3/8 x 3-3/4	387510	50
780111	1/2 x 3-3/4	387512	20
780113	1/2 x 5-1/2	387514	20
780024	5/8 x 4-3/4	387516	15
780115	5/8 x 6	387517	15
780023	3/4 x 8	387521	15

9. References

SCL Material Standard 7800.95; “Bolts, Expansion Anchor, Stainless Steel”

SCL Material Standard 7800.97; “Bolts, Expansion Anchor, Carbon Steel, Light Duty”

10. Sources

Ng, Sharon; SCL Senior Civil Engineer and subject matter expert for 7800.96 (sharon.ng@seattle.gov)

SCL Material Standard 7800.9 (canceled); “Anchor Bolts Light-Duty Stud Bolts”

Tilley, Kathy; SCL Electrical Engineering Support Specialist and originator of 7800.96 (kathy.tilley@seattle.gov)

www.hilti.com; Kwik Bolt TZ, Carbon Steel, 304 and 316 Expansion Anchor technical data sheet

Bolts, Expansion Anchor, Carbon Steel, Light Duty

1. Scope

This standard covers the requirements for carbon steel expansion anchors. This standard applies to the following Seattle City Light (SCL) stock numbers:

Stock No.	Size (in) (Diameter x Length)
780091	1/4 x 1-3/4
780092	1/4 x 2-1/4
780095	1/4 x 3-1/4
780103	3/8 x 2-1/4
780022	1/2 x 2-3/4

2. Application

Table 2. Expansion Anchor Bolt Applications, All Types

SCL Standard	Material	Application	Environment	Seismically qualified?
7800.95	Stainless steel bolts with Type 304 stainless steel nuts and washers	Permanent	Wet	Yes
	Stainless steel bolts with Type 316 stainless steel nuts and washers	Permanent	Wet, corrosive/ saltwater conditions	Yes
7800.96	Carbon steel	Permanent	Dry, in-building	Yes
7800.97 (this standard)	Carbon steel	Light duty/ temporary	Dry, in-building	No

Expansion anchor bolt strength requirements depend on a variety of factors, including:

- Strength of concrete
- Bolt spacing
- Shear and tension
- Seismic

Please refer to the Hilti Kwik Bolt 3, Carbon Steel Expansion Anchor technical data sheet for additional information and contact SCL Civil Engineering for application-specific strength requirements.

3. Industry Standards

Carbon steel expansion anchors shall meet the applicable requirements of the following industry standards:

ASTM B633-13; Standard Specification for Electrodeposited Coatings of Zinc on Iron and Steel

ASTM A563-15; Standard Specification for Carbon and Alloy Steel Nuts

ASTM F844-07a(2013); Standard Specification for Washers, Steel, Plain (Flat), Unhardened for General Use

4. Requirements

Expansion anchor bolt, nut, and washer shall be provided to SCL pre-assembled.

Carbon steel anchor components shall be plated in accordance with ASTM B633 to a minimum thickness of 5 µm.

Nuts shall conform to the requirements of ASTM A563, Grade A, Hex.

Washers shall meet the requirements of ASTM F844.

Expansion sleeves (wedges) shall be manufactured from Type 316 stainless steel.

Table 4. Dimension Requirements

Stock No.	Size (in) (Diameter x Length)
780091	1/4 x 1-3/4
780092	1/4 x 2-1/4
780095	1/4 x 3-1/4
780103	3/8 x 2-1/4
780022	1/2 x 2-3/4

5. Marking

Product and length identification shall be marked on all expansion anchor bolts.

A length identification mark shall be embossed into the impact section (dog point of the anchor. This mark shall be surrounded by four embossed notches identifying the anchor as a light-duty Hilti Kwik Bolt 3.

6. Packaging

Each standard package shall be legibly marked with the following information:

- Manufacturer identification
- Product description
- Seattle City Light stock number
- Quantity contained

Quantity per box shall be as described in Section 8.

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

- Manufacturer identification
- Country of origin
- Product description
- Seattle City Light purchase order number

7. Issuance

Stock Unit: EA

8. Approved Manufacturer

Name: Hilti, Inc. (US)
Product Description: Kwik Bolt 3

Stock No.	Size (in) (Diameter x Length)	Item No.	Box Quantity
780091	1/4 x 1-3/4	282502	100
780092	1/4 x 2-1/4	282503	100
780095	1/4 x 3-1/4	282504	100
780103	3/8 x 2-1/4	282505	50
780022	1/2 x 2-3/4	282509	25

9. References

SCL Material Standard 7800.95; “Bolts, Expansion Anchor Stainless Steel”

SCL Material Standard 7800.96; “Bolts, Expansion Anchor, Carbon Steel”

10. Sources

Ng, Sharon; SCL Senior Civil Engineer and subject matter expert for 7800.97 (sharon.ng@seattle.gov)

SCL Material Standard 7800.9 (canceled); “Anchor Bolts Light-Duty Stud Bolts”

Tilley, Kathy; SCL Electrical Engineering Support Specialist and originator of 7800.97 (kathy.tilley@seattle.gov)

www.hilti.com; Kwik Bolt 3 Expansion Anchor technical data sheet

ANCHOR, FLUSH-MOUNT, INTERNAL-THREADED

1. Scope

This material standard covers the requirements for stainless-steel flush-mount internal-threaded anchors.

This material standard applies to the following Seattle City Light Stock Numbers:

Stock No.	Dimension, in
012960	1/2 x 2
012386	5/8 x 2-9/16

2. Application

The anchors are use in concrete or masonry where protruding bolt anchors would pose a hazard.

The anchors allow for reusable applications such as for setting temporary pulling plates or blocks as well as mounting items on the wall that may later be used elsewhere.

The anchors are used for installing pulling plates in Network vaults.

3. Attributes

Anchors shall be of stainless steel material (chromium-nickel steel), meeting the requirement of American Iron and Steel Institute (AISI) grade 303 stainless steel specifications also designated as UNS S30300 (Unified Numbering System for Metals and Alloys).

Anchors shall have the following attributes:

Stock No.	Bolt Size, in		Allowable Working Load, 4000 psi concrete, lb	
	Internal Thread	Embedment and Anchor Length	Tension	Shear
012960	1/2	2	1840	2760
012386	5/8	2-9/16	2630	4510

4. Packaging

Anchors shall be packaged to prevent damage during shipping and storage.

Each package and carton shall be marked with:

- Seattle City Light's Stock Number
- Manufacturer's name or symbol
- Manufacturer's catalog number
- Thread diameter

5. Issuance

Stock Unit: EA

6. Approved Manufacturer

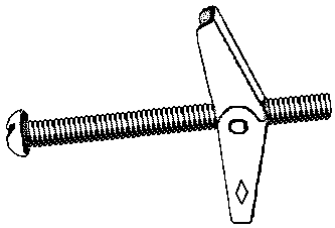
		Hilti HDI SS303			
		Package		Master Carton	
Stock No.	Thread Dia., in	Item No.	Qty.	Item No.	Qty.
012960	1/2	00336432	50	339619	300
012386	5/8	00336433	25	339620	100

7. References

Wang, Quan; SCL Standards Engineer; subject matter expert and originator of Material Standard 7801.10; quan.wang@seattle.gov

standards coordinator	*standards manager*	*unit director*
Quan Wang	John Shipek	Pamela S. Johnson

ANCHORS – SPRING TOGGLE BOLT



Spring Toggle Bolt Anchors of the configuration shown are for very light anchoring in hollow walls and horizontal surfaces.

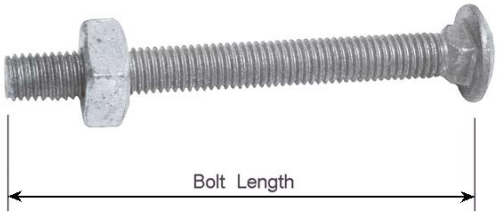
The anchors are composed of full-threaded, round-head bolts and spring-loaded toggle heads. The anchors shall be zinc or cadmium plated for protection against rust.

Stock Unit: EA

	Bolt Size, in.		Approved Manufacturers				
Stock No.	**Diameter**	**Length**	**ARRO**	**MKT Fastening**	**Nelson**	**Powers**	**Star**
780131	3/16	3	8015	8315	1433	4131	3010 30
780132	3/16	4	8020	8320	–	4141	3010 40
780136	1/4	3	8035	8335	1443	4231	3015 30
780137	1/4	4	8040	8340	1444	4241	3015 40
780146	3/8	3	8070	8370	1463	4431	3025 30
780148	3/8	5	8078	8378	1465	4451	3025 50

STANDARDS COORDINATOR	STANDARDS SUPERVISOR	UNIT DIRECTOR
Charles L. Shaffer	John C. Skinner	Gaedee Guy

CARRIAGE BOLT WITH NUT



1. Foreword

1.1 Scope

This material standard covers the requirements for zinc-coated carriage bolts, each provided with one square (or hex) nut.

1.2 Application

Carriage bolts and nuts are for general use.

1.3 Industry Standards

Carriage bolts and nuts shall meet the applicable requirements of the following industry standards:

ASME B18.5-1990 (R2003) - Round Head Bolts (Inch Series)
ASME B18.2.2-1987 (R1999) - Square and Hex Nuts (Inch Series)
ASME B18.12-2001 - Glossary of Terms for Mechanical Fasteners
ASTM A153/A153M-2004 - Standard Specification for Zinc Coating (Hot-Dip) on Iron and Steel Hardware
ASTM B695-2004 – Standard Specification for Coatings of Zinc Mechanically Deposited on Iron and Steel

2. Fabrication

2.1 Common Requirements – Bolts

	Requirements	Reference
Product Name	round head square neck bolt	ASME B18.12, Section 3.1.1.6.5
Material	steel	ASME B18.5, Section 2.8.1
Dimensions	per reference	ASME B18.5, Table 2
Minimum Thread Length	per reference	ASME B18.5, Section 2.6.2
Corrosion Protection	per reference	ASTM A153 or ASTM B695

2.2 Common Requirements - Nuts

Nuts shall be provided installed on bolts, one nut per bolt.

	Requirements	Reference
Product Name	square nut	ASME B18.12, Section 3.2.1.29
	hexagon nut	ASME B18.12, Section 3.2.1.14.
Material	steel	ASME B18.2.2, Table 1, General Note (f)
Dimensions	square nuts	ASME B18.2.2, Table 1
	hexagon nuts	ASME B18.2.2, Table 3
Corrosion Protection	per reference	ASTM A153 or ASTM B695

STANDARDS COORDINATOR	STANDARDS SUPERVISOR	UNIT DIRECTOR
John Shipek	John Barnett	Hardev Juj

2.3 Marking

Bolt heads shall bear the manufacturer's symbol or identification mark.

2.4 Detailed Requirements

Nominal Size, in.	Threads per in.	Minimum Thread Length, in.	Bolt Length, in.	Stock Number
1/4	20	3/4	1-1/2	780434
			2	780436
			2-1/2	780438
			3	780440
			3-1/2	780441
			4	780442
			4-1/2	780443
			5-1/2	780445
5/16	18	7/8	2-1/2	780468
			3-1/2	780471
3/8	16	1	1	780492
			1-1/2	780494
			2	780496
			2-1/2	780498
			3	780500
			3-1/2	780501
			4	780502
			4-1/2	780503
			5	780504
			5-1/2	780505
			6	780506
		1-1/4	6-1/2	780507
			8	780510
1/2	13	1-1/4	1-1/2	780524
			3	780530
			4-1/2	780533
			5	780534

3. Packaging

3.1 Quantity

Standard package quantity shall not exceed 100 per box.

3.2 Weight

Standard package weight shall not exceed 50 pounds.

3.3 Package Marking

Each standard package shall be legibly marked with the following information:

- Manufacturer's identification
- Product description
- Seattle City Light's Stock Number
- Quantity contained

3.4 Shipping Container

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

- Manufacturer's identification
- Country of origin
- Product description
- Seattle City Light's Purchase Order Number
- Seattle City Light's Stock Number

4. Shipping

Product shall be shipped to the address specified on the Purchase Order.

5. Issuance

Stock Unit: EA

6. Approved Manufacturers:

A. B. Chance (Hubbell Power Systems)
Hughes Brothers, Inc., Seward, NE
Joslyn Manufacturing
(MacLean Power Systems)
Kortick, Hayward, CA
Portland Bolt, Portland, OR

Seattle City Light Material Control personnel may identify and approve distributors, and hence manufacturers, for 5/16 and smaller hardware.

Carriage Bolts, High Strength

1. Scope

This standard covers the requirements for high strength, zinc-coated, steel carriage bolts.

Stock No.	Nominal Size (in)
013487	7/16 x 8-1/2

2. Application

High strength carriage bolts are used with overhead travelers for installation of overhead conductors.

An ASTM A449 steel carriage bolt is equivalent in strength to an SAE Grade 5 fastener.

Refer to SCL 7804.1 for general use carriage bolts.

3. Industry Standards

Carriage bolts shall meet the applicable requirements of the following industry standards:

ASME B18.12-2001 - Glossary of Terms for Mechanical Fasteners

ASME B18.5-1990 (R2003) - Round Head Bolts (Inch Series)

ASTM A449-1993 - Standard Specification for Quenched and Tempered Steel Bolts and Studs

ASTM B695-2004 - Standard Specification for Coatings of Zinc Mechanically Deposited on Iron and Steel

ASTM F1941/F1941A - Standard Specification for Electrodeposited Coatings on Threaded Fasteners

SAE J429 - Mechanical and Material Requirements for Externally Threaded Fasteners Specification

4. Fabrication

4.1 Common Requirements

Table 4.1. Fabrication Requirements

	Requirements	Reference
Product Name	Round Head Square Neck Bolt	ASME B18.12, Section 3.1.1.6.5
Material and Mechanical Properties	Type 1 or Type 2 Steel or Medium Carbon Steel (Grade 5)	ASTM A449 or SAE J429
Dimensions	Per Reference	ASME B18.5, Table 2
Threads	Standard Series UNC Class 2A	ASME B18.5, Section 2.5
Minimum Thread Length	Per Reference	ASME B18.5, Section 2.6.2
Corrosion Protection	Zinc-Coated (Fe/Zn 3AT)	ASTM A449, Section 5.1.3, ASTM B695, Class 50 or ASTM F1941

4.2 Marking

Carriage bolt heads shall be marked according to ASME B18.2.1, Section 2.8, ASTM A449 Section 15 or SAE J429.

Figure 4.2. Carriage Bolt Head Marking, Example

4.3 Detailed Requirements

Table 4.3. Detailed Requirements

Stock No.	Nominal Size (in)	Threads per in	Thread Length (in)	Bolt Length (in)
013487	7/16	14	5-1/2	8-1/2

5. Packaging

Standard package quantity shall not exceed 50 per box.

Each standard package shall be legibly marked with the following information:

- Manufacturer's identification
- Product description
- Seattle City Light's stock number
- Quantity contained.

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

- Manufacturer's identification
- Country of origin
- Product description
- Seattle City Light's purchase order number
- Seattle City Light's stock number.

6. Issuance

Stock Unit: EA

8. Approved Manufacturers

Seattle City Light Material Control personnel will identify and approve distributors, and hence manufacturers, for this group of stock numbers.

9. References

SCL Material Standard 7804.1; "Carriage Bolt With Nut," June 2006

Wang, Quan; SCL Standards Engineer, subject matter expert and originator of 7804.12 (quan.wang@seattle.gov)

Carriage Bolt Assembly

1. Scope

This standard covers the requirements for a carriage bolt assembly.

This standard applies to SCL Stock No. 013486.

2. Application

This assembly is used for rigging the traveler for installation of overhead conductors. Replacement parts may be obtained separately.

3. General Requirements

Each assembly shall consist of one high strength, steel carriage bolt, one wing nut, and one flat round washer.

Assembly components shall meet the requirements described in Table 3.

Table 3. Assembly Component Requirements

Description	Stock No.	Dimensions, nominal (in)	Reference
Carriage bolt, high-strength, steel	013487	7/16-14 x 8.5	SCL 7804.12
Wing nut	013488	7/16-14	SCL 7830.00
Flat washer, plain, Type A, narrow	013489	7/16	ANSI B18.22.1

4. Packaging

Bolt, washer, and nut sets shall be shipped assembled.

Standard package quantity shall not exceed 50 per box.

Each standard package shall be legibly marked with the following information:

- Manufacturer's identification
- Product description
- Seattle City Light's stock number
- Quantity contained

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

- Manufacturer's identification
- Country of origin
- Product description
- Seattle City Light's purchase order number
- Seattle City Light's stock number

5. Bid Submittal

Manufacturer shall include as part of the bid submittal all exceptions to this specification.

Suppliers shall indicate the manufacturer and country of origin of each lot of carriage bolts and wing nuts and provide the manufacturer's test or specification sheet indicating compliance with this specification.

6. Issuance

Stock Unit: EA

7. Approved Manufacturers

SCL Material Control personnel will identify and approve distributors, and hence manufacturers, for this set of stock numbers.

8. References

SCL Material Standard 7804.12; “Carriage Bolt, High Strength”

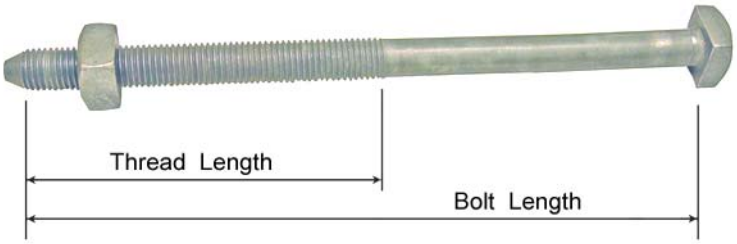
SCL Material Standard 7830.00; “Steel Wing Nut”

9. Sources

Wang, Quan; SCL Standards Engineer, subject matter expert and originator of 7804.60 (quan.wang@sattle.gov)

ANSI B18.22.1; Plain Washers, 1965 (R2003)

SQUARE HEAD MACHINE BOLT WITH SQUARE NUT



1. Foreword

1.1 Scope

This material standard covers the requirements for zinc-coated, square head, steel machine bolts, each provided with one square nut.

1.2 Application

Machine bolts and nuts are used in overhead line construction and where the applied load is primarily a tensile load.

Refer to IEEE C135.1, Table 10 for minimum tensile strength values.

1.3 Industry Standards

Machine bolts and nuts shall meet the applicable requirements of the following industry standards:

IEEE C135.1-1999 - Standard for Zinc-Coated Steel Bolts and Nuts for Overhead Line Construction

ASME B18.12-2001 - Glossary of Terms for Mechanical Fasteners

ASTM A153/A153M-2004 - Standard Specification for Zinc Coating (Hot-Dip) on Iron and Steel Hardware

2. Fabrication

2.1 Common Requirements – Bolts

	Requirements	Reference
Product Name	square head bolt	ASME B18.12, Section 3.1.1.39
Material	steel	IEEE C135.1, Section 3.1.
Dimensions	per reference	IEEE C135.1, Tables 1, 6, 7 & 9
Minimum Thread Length	product length 4 in. or greater	IEEE C135.1, Section 5.5.
	product length 4 in. or less	ASME B18.2.1, Table 1
Corrosion Protection	zinc-coated	IEEE C135.1, Section 8

Machine bolt threads shall be machine-rolled; cut threads are not acceptable. This requirement is a clarification to IEEE C135.1, Section 5.1.

2.2 Common Requirements – Nuts

	Requirements	Reference
Product Name	square nut	ASME B18.12, Section 3.2.1.29
Material	steel	IEEE C135.1, Section 3.2.
Dimensions	per reference	IEEE C135.1, Tables 4 & 8
Corrosion Protection	zinc-coated	IEEE C135.1, Section 8

Nuts shall be provided installed on bolts, one nut per bolt.

STANDARDS COORDINATOR	STANDARDS SUPERVISOR	UNIT DIRECTOR
John Shipek	John D. Skinner	Hardev Juj

2.3 Marking

Bolt heads shall bear the manufacturer's symbol or identification mark according to IEEE C135.1, Section 10.

2.4 Detailed Requirements

Nominal Size, in.	Thread per in.	Minimum Thread Length in.	Product Length in.	Stock Number
1/2	13	1-1/4	1-1/2	780794
			2	780796
			3	780800
		3	4-1/2	780803
			5	780804
			5-1/2	780805
			6	780806
			7	780808
		4	8	780810
			9	780812
			10	780814
		6	12	780815
			14	780816
			16	780817
			18	780818
5/8	11	1-1/2	2	780827
			2-1/2	780828
			3-1/2	780831
		3	5	780834
			6	780836
			7	780838
		4	8	780840
			10	780844
		6	12	780845
			14	780846
			16	780847
			18	780848
			20	780849
			22	780850
			24	781040
			30	781046

2.4 Detailed Requirements (continued)

Nominal Size, in.	Thread per in.	Minimum Thread Length in.	Product Length in.	Stock Number
3/4	10	6	12	780875
			14	780876
			16	780877
			18	780878
			20	780879
			22	780880
			24	781070
			26	781072
7/8	9	6	12	012636
			14	012637
			16	012638
			18	012639
			20	012640
			22	012643
			24	012641
			26	012642

3. Packaging

3.1 Quantity: Detailed Standard package quantity shall not exceed 100 per box.

3.2 Weight: Detailed Standard package weight shall not exceed 50 pounds.

3.3 Package Marking: Each standard package shall be legibly marked with the following information:

- Manufacturer's identification
- Product description
- Seattle City Light's Stock Number
- Quantity contained

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

- Manufacturer's identification
- Country of origin
- Product description
- Seattle City Light's Purchase Order Number
- Seattle City Light's Stock Number

4. Shipping

4.1 Shipping containers shall be delivered on open flatbed trucks suitable for side unloading by forklift.

4.2 Product shall be shipped to the address specified on the Purchase Order.

5. Issuance

Stock Unit: EA

6. Approved Manufacturers

A. B. Chance (Hubbell Power Systems)
Hughes Brothers, Inc., Seward NE
Joslyn Manufacturing (MacLean Power Systems)
Kortick, Hayward, CA
Portland Bolt, Portland, OR

Bolts, Galvanized, Double-Arming

1. Scope

This standard covers the requirements for galvanized bolts and nuts used to construct double arms. Double-arm bolts are commonly referred to as DA bolts.

This standard applies to the stock numbers cited in Section 8.

2. Application

Double-arm bolts are used to construct double wood crossarm installations where one crossarm is attached on each side of the pole.

3. Industry Standards

IEEE C135.80; "IEEE Standard for Fasteners for Overhead Line Construction"

ASME B18.2.1; "Square and Hex Bolts and Screws (Inch Series)"

ASME B18.2.2; "Square and Hex Nuts (Inch Series)"

ASTM A153/A153M; "Standard Specification for Zinc Coating (Hot-Dip) on Iron and Steel Hardware"

4. General Requirements, Bolts

4.1 Material

Bolts shall be made from hot-rolled steel produced by open-hearth, basic-oxygen, or electric-furnace process, and of a grade that is suitable to meet the requirements of IEEE C135.80.

4.2 Dimensions

Bolts shall have threads the full length of the bolt per ASME B18.2.1.

Diameter, length, and strength are shown in Table 4.2.

Table 4.2 Double-Arming Bolt Dimensions and Strength

Stock No.	Diameter (in)	Bolt Length (in)	Minimum Tensile Strength (lb)
560518	5/8	18	12,400
560520	5/8	20	12,400
560522	5/8	22	12,400
560524	5/8	24	12,400
560526	5/8	26	12,400
560528	5/8	28	12,400
560530	5/8	30	12,400
560532	3/4	32	18,350

4.3 Finish

Bolts shall be free from burrs, seams, laps, and irregular surfaces that affect serviceability.

Bolts shall be hot-dip galvanized as stated in ASTM A153/A153M.

4.4 Assembly

Each bolt shall be fitted with four nuts on the bolt. Nuts shall not be supplied loose within the packaging.

5. General Requirements, Nuts

5.1 Material

Nuts shall be made from hot-rolled steel produced by open-hearth, basic-oxygen, or electric-furnace process, and of a grade that is suitable to meet the requirements of IEEE C135.80.

5.2 Dimensions

Nuts shall be square or hexagonal in accordance with ASME B18.2.2. Nut sizes are shown in Table 5.2.

Table 5.2. Nut Sizes

Diameter (in)	Threads per inch
5/8	11
3/4	10

Nuts shall be tapped oversized in accordance with Table 8, IEEE C135.80.

5.3 Finish

Nuts shall be hot-dipped galvanized as stated in ASTM A153/A153M.

6. Packaging

Each standard package shall be legibly marked with the following information:

- Manufacturer's identification
- Product description
- Seattle City Light stock number
- Quantity contained

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

- Manufacturer's identification
- Country of origin
- Product description
- Seattle City Light purchase order number
- Seattle City Light stock number

7. Issuance

Stock Unit: EA

8. Approved Manufacturers

Stock No.	Bolt Length (in)	Hubbell	Joslyn	Cooper Power Systems
560518	18	8868	J8868	DF2D18
560520	20	8870	J8870	DF2D20
560522	22	8872	J8872	DF2D22
560524	24	8874	J8874	DF2D24
560526	26	8876	J8876	DF2D26
560528	28	8877	J8877	DF2D28
560530	30	8878	J8878	DF2D30
560532	32	889832	J8899	–

9. Sources

SCL Material Standard 5610.1 (canceled); “Bolts, Galvanized, Double-Arming”

Tilley, Kathy; Electrical Engineering Support Specialist and subject matter expert for 7807.32 (kathy.tilley@seattle.gov)

Wang, Quan; SCL Standards Engineer and subject matter expert for 7807.32 (quan.wang@seattle.gov)

Bolts, Galvanized, Oval Eye

1. Scope

This standard covers the requirements for oval eye bolts.

This standard applies to the Seattle City Light (SCL) stock numbers cited in Table 4.

2. Application

Oval eye bolts have many uses in overhead line construction such as securing clevises, links, and dead-end insulators.

3. Industry Standards

Oval eye bolts shall meet the applicable requirements of the following industry standard:

IEEE C135.80-2012; IEEE Standards for Fasteners for Overhead Line Construction

4. Requirements

Oval eye bolts and nuts shall meet the requirements listed in Table 4 and IEEE C135.80.

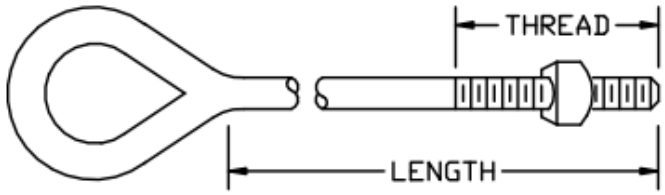
Oval eye bolts are supplied with a threaded end and one assembled square nut. Nuts shall not be supplied loose in the box.

Oval eye bolts and nuts shall be made of hot-rolled steel produced by open-hearth, basic oxygen, or electric furnance process.

Table 4. Requirements for Oval Eye Bolts

Stock No.	Diameter (in)	Length (in)	Tensile Strength (lb)	Thread Length (in)
561010	1/2	10	7700	4
561106	5/8	6	12,400	3
561108	5/8	8	12,400	4
561110	5/8	10	12,400	4
561112	5/8	12	12,400	6
561114	5/8	14	12,400	6
561116	5/8	16	12,400	6
561118	5/8	18	12,400	6
561120	5/8	20	12,400	6
561122	5/8	22	12,400	6
561210	3/4	10	18,300	6
561212	3/4	12	18,300	6
561214	3/4	14	18,300	6

Figure 4. Measurement for Oval Eye Bolts



5. Packaging

Each standard package shall be legibly marked with the following information:

- Manufacturer's identification
- Product description
- Seattle City Light stock number
- Quantity

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

- Manufacturer's identification
- Country of origin
- Product description
- Seattle City Light purchase order number
- Seattle City Light stock number

6. Issuance

Stock Unit: EA

7. Approved Manufacturers

The following are approved manufacturers:

- Hubbell Power Systems (formerly Chance)
- Kortig
- Cooper Power Systems (formerly McGraw-Edison)

8. Sources

SCL Material Standard 5610.1; "Bolts Galvanized, Oval Eye" (canceled)

Tilley, Kathy; SCL Electrical Engineering Support Specialist and subject matter expert for 7807.41 (kathy.tilley@sattle.gov)

Wang, Quan; SCL Standards Engineer and subject matter expert for 7807.41 (quan.wang@seattle.gov)

Eye Nuts

1. Scope

This standard covers the requirements for oval eye, thimble eye, and twin eye nuts.

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

Stock No.	Description	Min. Tensile Strength (lb)
565252	Oval eye nut	12,400
565254	Oval eye nut	18,350
565260	Thimble eye nut	18,350
565266	Twin eye nut	18,350

2. Application

Oval eye nuts are used for deadening, back-guying, and attaching pole head guys on the threaded end of a crossarm bolt.

Thimble eye (thimbleye) nuts, also known as strand eye nuts, are used to attach through bolts or the threaded end of a straight or angle eye bolt for straight-away guys.

Twin eye (twineye) nuts, also known as twin strand nuts, are used for head or stub guying of two strands of guy wire. The grooves are contoured to protect the guy wire strands.

3. Industry Standards

ASTM A153; Standard Specification for Zinc Coating (Hot-Dip) on Iron and Steel Hardware

IEEE Standard C135.80; Standard for Fasteners for Overhead Line Construction

4. Requirements

Eye nuts shall meet the requirements of IEEE C135.80 and Table 4.

Eye nuts shall:

- Be made of hot-rolled steel produced by open-hearth, basic oxygen, or electric furnance process.
- Be tapped after galvanizing.
- Have the minimum tensile strength of the bolts or anchor rods for which they are intended.
- Meet the minimum and maximum dimensions as detailed in IEEE C135.80.

Table 4. Dimensions

Stock No.	Figure	Diameter (in)	Threads per Inch
565252	4a	5/8	11
565254	4a	3/4	10
565260	4b	3/4	10
565266	4c	3/4	10

Figure 4a. Oval Eye Nut

Figure 4b. Thimble Eye (Strand Eye) Nut

Figure 4c. Twin Eye (Twin Strand) Nut

Each standard package shall be legibly marked with the following information:

- Manufacturer's identification
- Product description
- Seattle City Light stock number
- Quantity contained

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

- Manufacturer's identification
- Country of origin
- Product description
- Seattle City Light purchase order number
- Seattle City Light stock number

5. Issuance

Stock Unit: EA

6. Approved Manufacturers

Stock No.	Description	Hubbell Power Systems (formerly Chance)	MacLean Power Systems (formerly Joslyn)
565252	Oval eye nut	6502	J1092
565254	Oval eye nut	6503	J1093
565260	Thimble eye nut	6511	J6511
565266	Twin eye nut	6561	J6516

7. References

SCL Material Standard 5652.1; "Eye Nuts, Guy Cable Fittings" (canceled)

Wang, Quan; SCL Standards Engineer and subject matter expert for 7808.15 (quan.wang@seattle.gov)

Tilley, Kathy; SCL Electrical Engineering Support Specialist and originator of 7808.15 (kathy.tilley@seattle.gov)

Nuts, Clevis

1. Scope

This standard covers the material requirements for 5/8-in galvanized clevis nuts.

This standard applies to Seattle City Light (SCL) Stock No. 565280.

2. Application

Clevis nuts are used in guying and dead-ending applications. They connect guy wire, conductor, wire grips, or dead-ended bails to eye fittings of insulators, eye bolts, and pole eye plates.

3. Industry Standards

Clevis nuts shall meet the applicable requirements of the latest revision of the following industry standards:

IEEE C135.80; "IEEE Standard for Fasteners for Overhead Line Construction"

ASME B18.2.1; "Square and Hex Bolts and Nuts (Inch Series)"

ASTM A153/A153M; "Standard Specification for Zinc Coating (Hot-Dip) on Iron and Steel Hardware"

ASTM B633/A668M; "Standard Specification for Steel Forgings, Carbon and Alloy for General Industrial Use"

4. Requirements

Clevis nuts shall be made of hot-rolled steel that has been produced by open-hearth, basic oxygen, or electric-furnace process, or of malleable or ductile type ferrous castings.

All material shall be of grades and qualities suitable to meet the requirements of IEEE C135.80.

Clevis nuts shall be hot-dip galvanized as stated in ASTM A153/A153M.

Hole shall be tapped after galvanizing as stated in IEEE C135.80. See Figure 4.

Cotter key shall be stainless steel, humped-type.

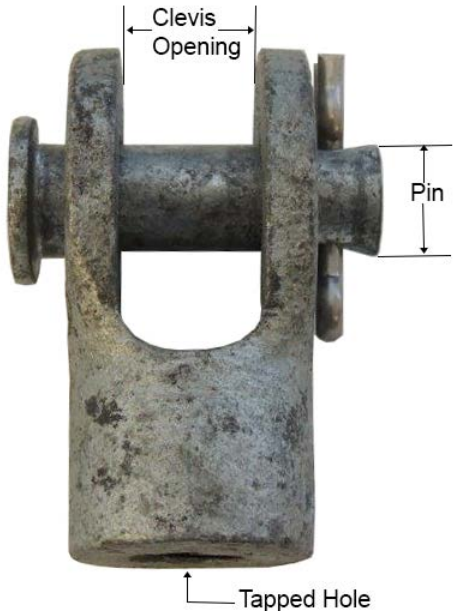
Clevis nut, pin, and cotter key shall be provided by manufacturer as an assembled unit.

Dimension and strength requirements are described in Table 4 and Figure 4.

Table 4. Dimension and Strength Requirements

Stock No.	Minimum Tensile Strength (lb)	Tapped Hole Diameter (in)	Pin Diameter (in)	Clevis Opening (in)
565280	12,400	5/8	5/8	3/4

Figure 4. Clevis Nut



5. Packaging

Each standard package shall be legibly marked with the following information:

- Manufacturer's identification
- Product description
- Seattle City Light stock number
- Quantity contained

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

- Manufacturer's identification
- Country of origin
- Product description
- Seattle City Light purchase order number

6. Issuance

Stock Unit: EA

7. Approved Manufacturers

Manufacturer	Catalog No.
MacLean Power Systems	CN5
Malleable Iron Fittings Co.	PA321

8. References

SCL Material Standard 5652.5; “Nuts, Clevis” (Canceled)

SCL Material Standard 7808.15; “Guy Cable Fitting Eye Nuts”

9. Sources

Wang, Quan; SCL Standards Engineer and subject matter expert for 7808.19 (quan.wang@seattle.gov)

Tilley, Kathy; SCL Electrical Engineering Support Specialist and originator of 7808.19 (kathy.tilley@seattle.gov)

BELLEVILLE SPRING WASHER BOLT ASSEMBLY KITS AND PARTS STAINLESS/ALUMINUM

1. General

This specification is for prepackaged Belleville spring washer bolt assembly kits and replacement parts. The kits will contain one bolt, one nut, two flat washers, and one Belleville spring washer. The assembly kits are used for making bolted copper and aluminum electrical connections. Replacement stainless steel parts shall be supplied separately.

2. Material

2.1 Stainless steel parts shall meet the latest requirements of ASTM F593 and F594 for the manufacturing and supply of stainless steel nut and cap screws. The bolt, nut, and flat washers shall be a Group I stainless steel alloy; i.e., 304, XM7. The Belleville spring washer shall be 17-7 PH Rockwell C 38/43 annealed and fully heat treated stainless steel; the flat deflection shall be 0.024 ± 10% with a flat load rating of 3,000 lbs. ± 10%.

2.2 Aluminum hex-head cap screws shall be 6061-T6 or 2024-T4 aluminum alloy. Aluminum finished hex-head nuts shall be 6061-T6 aluminum alloy.

3. Packaging

3.1 The bolt/nut/washer assembly kits shall be shipped as a complete assembly in individual packages containing all the parts for one complete assembly kit. The packaged kits shall be clearly marked with the SCL Stock Number and the contents of the kit; e.g., alloy, size of bolt, and manufacturer of Belleville washer.

3.2 Individual stainless steel parts may be shipped in boxes containing up to 100 units, with each box marked indicating the part and number of units in the box; e.g., 1/2" stainless steel split lock washers, quantity: 50, 6 digit SCL Stock Number.

4. Bid Submittal

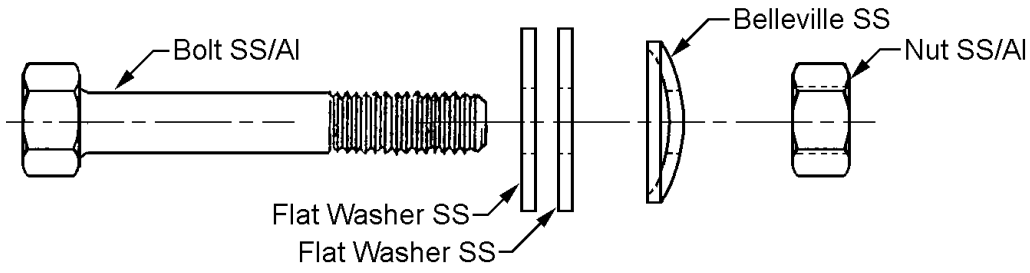
The manufacturer shall include as part of the bid submittal all exceptions to this specification. Suppliers shall indicate the actual manufacturer of each individual part or parts of the assembly kit with the manufacturer's test or specification sheet indicating compliance with this specification.

standards coordinator	*standards supervisor*	*unit director*
John Shipek	John Shipek	Darnell Cola

Description	Stock No.	Bolt, Inches	Nut, Inches	Flat Washer, Inches	Belleville Washer, Inches
Stainless Steel Bolt Kit	782042	1/2-13 UNC x 1-1/2 SS	1/2-13 UNC SS	0.515 x 1.5 0.125 thick SS	0.515 x 1.312 0.098 thick SS
	782040	1/2-13 UNC x 2 SS			
	782041	1/2-13 UNC x 2-1/2 SS			
Aluminum Bolt Kit	782050	1/2-13 UNC x 1-3/4 AL	1/2-13 UNC AL	0.515 x 1.5 0.125 thick SS	0.515 x 1.312 0.098 thick SS
	782051	1/2-13 UNC x 2 AL			
	782053	1/2-13 NC x 2-1/2 AL			
	782052	1/2-13 NC x 3-1/2 AL			
Belleville Washer SS	584133	For use with 1/2-inch bolts			0.515 x 1.312 0.098 thick SS
	788300	For use with 5/8-inch bolts			0.656 x 1.25 0.098 thick SS
Flat Washer SS	788030	For use with 1/2-inch bolts		0.515 x 1.5 0.125 thick SS	–
	788031	For use with 5/8-inch bolts		0.656 x 1.5 0.125 thick SS	–

Stock Unit: EA

Bolted Electrical Connection Assembly Kits with Belleville Spring Washers



Steel Nuts



1. Scope

This standard covers the requirements for zinc-coated steel, square and hex nuts.

2. Application

Square nuts are generally used in the overhead system. Hex nuts are used in the underground system, networks, substations, and in a variety of other applications.

The heavy hex nut is intended to be used with the cross-plate anchor (SCL Stock Number 562058).

3. Industry Standards

ASME B18.2.2-1987 (R1999) - Square and Hex Nuts (Inch Series)

ASME B18.12-2001 - Glossary of Terms for Mechanical Fasteners

ASTM A153/A153M-2004 - Standard Specification for Zinc Coating (Hot-Dip) on Iron and Steel Hardware

ASTM B695-2004 - Standard Specification for Coatings of Zinc Mechanically Deposited on Iron and Steel

ASTM A194 / A194M - 2012a - Standard Specification for Carbon and Alloy Steel Nuts for Bolts for High Pressure or High Temperature Service, or Both

ASTM A563-2007a - Standard Specification for Carbon and Alloy Steel Nuts

4. Product Requirements

4.1 Common Requirements – Hex Type

	Requirements	Reference
Product Name	Hexagon nut	ASME B18.12, Section 3.2.1.14
Material	Steel	ASME B18.2.2, Table 3, Note (e)
Dimensions	Per reference	ASME B18.2.2, Table 3
Threads	Standard series UNC Class 2B	ASME B18.2.2, Table 3, Note (d)
Corrosion Protection	Zinc-coated, per reference	ASTM A153 or ASTM B695

4.2 Common Requirements – Heavy Hex Type

Product Name	Hexagon nut	ASME B18.12, Section 3.2.1.14
Material	Steel	ASTM 563 (Grade DH), or ASTM 194 (Grade 2H)
Dimensions	Per reference	ASME B18.2.2, Table 9
Threads	Standard series UNC Class 2B	ASME B18.2.2, Table 9, Note (d)
Corrosion Protection	Zinc-coated, per reference	ASTM A153 or ASTM B695

4.3 Common Requirements – Square Type

	Requirements	Reference
Product Name	Square nut	ASME B18.12, Section 3.2.1.29
Material	Steel	ASME B18.2.2, Table 1, Note (f)
Dimensions	Per reference	ASME B18.2.2, Table 1
Threads	Standard series UNC Class 2B	ASME B18.2.2, Table 1, Note (e)
Corrosion Protection	Zinc-coated, per reference	ASTM A153 or ASTM B695

4.4 Detailed Requirements

		Stock Number by Type			
Nominal Size (in)	**Threads per in**	**Hex, zinc-coated**	**Hex, zinc-coated Hot Dipped Galvanized**	**Heavy Hex, zinc-coated Hot Dipped Galvanized**	**Square, zinc-coated Hot Dipped Galvanized**
1/4	20	782982	–	–	–
5/16	18	782983	–	–	–
3/8	16	782984	783114	–	–
7/16	14	012283	–	–	–
1/2	13	782986	783116	–	783076
5/8	11	010162	783118	–	783078
3/4	10	782989	783119	–	783079
7/8	9	–	–	–	012652
1	8	–	783121	013508	–

5. Packaging

Standard package quantity shall be as follows:

Nominal Size (in)	Quantity per Box
1/4, 5/16, 3/8	50 or 100
7/16, 1/2, 5/8	25 or 50
3/4, 7/8, 1	10, 20 or 25

Each standard package shall be legibly marked with the following information:

- Manufacturer's identification
- Product description
- Seattle City Light's stock number
- Quantity contained.

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

- Manufacturer's identification
- Country of origin
- Product description
- Seattle City Light's purchase order number
- Seattle City Light's stock number.

6. Shipping

Product shall be shipped to the address specified on the purchase order.

7. Issuance

Stock Unit: EA

8. Approved Manufacturers

A. B. Chance (Hubbell Power Systems)

Hughes Brothers, Inc., Seward, NE

Joslyn Manufacturing (MacLean Power Systems)

Kortick, Hayward, CA

Portland Bolt, Portland, OR

Seattle City Light Material Control personnel may identify and approve distributors, and hence manufacturers, for 5/16 inch and smaller hardware.

Steel Wing Nuts

1. Scope

This standard covers the requirements for zinc-coated steel wing nuts.

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

Stock No.	Size, Nominal (in)	Threads per in
013488	7/16	14

2 Application

Wing nuts are used with overhead travelers for installation of overhead conductors.

3 Industry Standards

Nuts shall meet the applicable requirements of the following industry standards:

ASME B1.1 - Unified Inch Screw Threads

ASME B18.6.9 - Wing Nuts (Inch Series)

ASME B18.12-2001 - Glossary of Terms for Mechanical Fasteners

ASTM A153/A153M-2004 - Standard Specification for Zinc Coating (Hot-Dip) on Iron and Steel Hardware

ASTM B695-2004 - Standard Specification for Coatings of Zinc Mechanically Deposited on Iron and Steel

ASTM F1941/F1941A - Standard Specification for Electrodeposited Coatings on Threaded Fasteners

4. Requirements

Table 4. Wing Nut Requirements

	Requirements	Reference
Product Name	Wing Nut	ASME B18.12, Section 3.2.1.14
Material	Steel	ASME B18.17, Section 2.5.1
Dimensions	Per reference	ASME B18.17, Type A, Light ASME B18.6.9, Type A, Light
Threads	Standard Series UNC	ASME B1.1, Class 2B
Corrosion Protection	Zinc-Coated, Per Reference	ASTM A153, ASTM B695 or ASTM F1941

5. Packaging

Standard package quantity shall not exceed 50 per box.

Each standard package shall be legibly marked with the following information:

- Manufacturer's identification
- Product description
- Seattle City Light's stock number
- Quantity contained.

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

- Manufacturer's identification
- Country of origin
- Product description
- Seattle City Light's purchase order number
- Seattle City Light's stock number.

6. Issuance

Stock Unit: EA

7. Approved Manufacturers

Seattle City Light Material Control personnel will identify and approve distributors, and hence manufacturers, for this group of stock numbers.

8. References

Wang, Quan, SCL Standards Engineer and originator of 7830.00
(quan.wang@seattle.gov)

SILICON BRONZE HEX NUT

1. Scope

This material standard covers the requirements for silicon bronze hex nuts.

2. Application

Silicon bronze hardware is used to make up electrical connections. Refer to Construction Guideline D14-4/NSV-20. Silicon bronze hardware is also used in situations where high-strength and corrosion-resistance is desired.

3. Industry Standards

Hex nuts shall meet the applicable requirements of the following industry standards:

ASME B18.2.2-1987 (R1999) - Square and Hex Nuts (Inch Series)

ASTM F467-1993 - Standard Specification for Nonferrous Nuts for General Use

ASME B18.12-2001 - Glossary of Terms for Mechanical Fasteners

4. Fabrication

4.1 Common Requirements

	Requirements	Reference
Product Name	hexagon nut	ASME B18.12, Section 3.2.1.14
Material	silicon bronze alloy 651	ASTM F467, Tables 1 and 2
Dimensions	per reference	ASME B18.2.2, Table 3
Threads	standard series UNC Class 2B	ASME B18.2.2, Table 3, General Note (d)

4.2 Marking

Nuts shall be marked according to ASTM F467, Section 17.1.

4.3 Detailed Requirements

Stock Number	Nominal Size, in	Threads per in
783321	1/4	20
783322	5/16	18
783323	3/8	16
783325	1/2	13
783326	5/8	11
783327	3/4	10

5. Packaging

Nuts shall be packaged 25, 50 or 100 per box.

Each standard package shall be legibly marked with the following information:

- Manufacturer's identification
- Product description
- Seattle City Light's Stock Number
- Quantity contained

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

- Manufacturer's identification
- Country of origin
- Product description
- Seattle City Light's Purchase Order Number
- Seattle City Light's Stock Number

6. Shipping

Product shall be shipped to the address specified on the Purchase Order.

7. Issuance

Stock Unit: EA

8. Approved Manufacturers

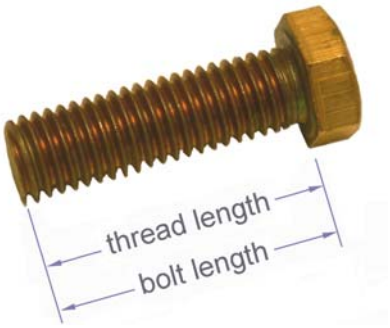
Seattle City Light Material Control personnel will identify and approve distributors, and hence manufacturers, for this group of Stock Numbers.

9. References

Shipek, John; SCL Standards Engineer, subject matter expert and originator of 7833.3 (john.shipek@seattle.gov)

STANDARDS COORDINATOR	STANDARDS SUPERVISOR	UNIT DIRECTOR
John Shipek	John Barnett	Richard Kent

SILCON BRONZE HEX HEAD CAP SCREW



1. Foreword

1.1 Scope

This material standard covers the requirements for silicon bronze, hex head, cap screws.

1.2 Application

Silicon bronze hardware is used to make up electrical connections. Refer to Construction Guideline D14-4/NSV-20. Silicon bronze hardware is also used in situations where high-strength and corrosion-resistance is desired.

Refer to ASTM F468, Table 2 for tensile strength values.

1.3 Industry Standards

Cap screws shall meet the applicable requirements of the following industry standards:

ASME B18.2.1-1996 - Square and Hex Bolts and Screws (Inch Series)

ASTM F468-03a - Standard Specification for Nonferrous Bolts, Hex Cap Screws, and Studs for General Use

ASME B18.12-2001 - Glossary of Terms for Mechanical Fasteners

2. Fabrication

2.1 Common Requirements

	Requirements	Reference
Product Name	hex cap screw	ASME B18.12, Section 3.1.2.7
Material	silicon bronze alloy 651	ASTM F468, Tables 1 and 2
Dimensions	per reference	ASME B18.2.1, Table 4
Threads	standard series UNC Class 2A	ASME B18.2.1, Table 4, Note (12)
Minimum Thread Length	per reference	ASME B18.2.1, Table 4, Note (9)

2.2 Marking

Cap screw heads shall be marked according to ASME B18.2.1, Section 2.8.

STANDARDS COORDINATOR	STANDARDS SUPERVISOR	UNIT DIRECTOR
John Shipek	John Barnett	Hardev Juj

2.3 Detailed Requirements

Nominal Size, in.	Threads per in.	Length, in.	Stock Number
1/4	20	3/4	784503
		1	784505
		1-1/4	784506
		2	784509
		2-1/2	784511
5/16	18	3/4	784523
		1	784525
		2	784529
		2-1/2	784531
		3	784533
3/8	16	3/4	784543
		1	784545
		1-1/4	784546
		1-1/2	784547
		1-3/4	784548
		2	784549
		2-1/4	784550
		2-1/2	784551
1/2	13	1	784585
		1-1/4	784586
		1-1/2	784587
		1-3/4	784588
		2	784589
		2-1/4	784590
		2-1/2	784591
		3	784593
		4	784595
5/8	11	1	784605
		1-1/2	784607
		2	784609
3/4	10	1-1/2	784627
		2	784629

3. Packaging

Cap screw standard packaging shall be as follows:

Nominal Size, in.	Length, in.	Quantity per Box
1/4	all	50 or 100
5/16, 3/8	all	25 or 50
1/2	all	25 or 50
5/8, 3/4	all	10, 20 or 25

Each standard package shall be legibly marked with the following information:

- Manufacturer's identification
- Product description
- Seattle City Light's Stock Number
- Quantity contained

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

- Manufacturer's identification
- Country of origin
- Product description
- Seattle City Light's Purchase Order Number
- Seattle City Light's Stock Number

4. Shipping

Product shall be shipped to the address specified on the Purchase Order.

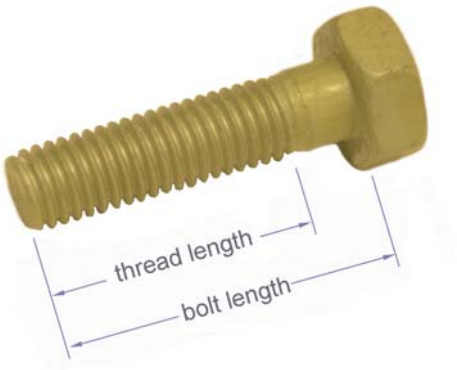
5. Issuance

Stock Unit: EA

6. Approved Manufacturers

Seattle City Light Material Control personnel will identify and approve distributors, and hence manufacturers, for this family of products.

ALUMINUM HEX HEAD CAP SCREW, HEAVY



1. Foreword

1.1 Scope

This material standard covers the requirements for aluminum, heavy hex cap screws.

1.2 Application

Aluminum hardware is used to make up bolted aluminum-to-aluminum and aluminum-to-copper electrical connections. Refer to Construction Guideline D14-4/NSV-20. This includes connections to integral web channel bus (IWCB) in the Network, transformer and bus terminals, and aluminum lugs in stations and elsewhere.

Aluminum fasteners are anodized and lubricated for corrosion resistance and to prevent galling and seizing.

Refer to ASTM F468, Table 2 for tensile strength values.

1.3 Industry Standards

Cap screws shall meet the applicable requirements of the following industry standards:

ASME B18.2.1-1996 - Square and Hex Bolts and Screws (Inch Series)

ASTM F468-03a - Standard Specification for Nonferrous Bolts, Hex Cap Screws, and Studs for General Use

ASME B18.12-2001 - Glossary of Terms for Mechanical Fasteners

2. Fabrication

2.1 Common Requirements

	Requirements	Reference
Product Name	heavy hex cap screw	ASME B18.12, Section 3.1.2
Material	aluminum alloy 2024-T4	ASTM F468, Tables 1 and 2
Dimensions	per reference	ASME B18.2.1, Table 6
Threads	standard series UNC Class 2A	ASME B18.2.1, Table 6, Note (12)
Minimum Thread Length	per reference	ASME B18.2.1, Table 6, Note (9)

Cap screws shall be anodized and coated with Aluminite 205.

STANDARDS COORDINATOR	STANDARDS SUPERVISOR	UNIT DIRECTOR
John Shipek	John Barnett	Hardev Juj

2.2 Marking

Cap screw heads shall be marked according to ASME B18.2.1, Section 2.8.

2.3 Detailed Requirements

Nominal Size, in.	Threads per in.	Length, in.	Stock Number
1/2	13	2	781809
5/8	11	1	781819
		2	781813
		2-1/2	781815
		3	781817

3. Packaging

Cap screw standard packaging shall be as follows:

Nominal Size, in.	Length, in.	Quantity per Box
1/2	all	50
5/8	all	25

Each standard package shall be legibly marked with the following information:

- Manufacturer's identification
- Product description
- Seattle City Light's Stock Number
- Quantity contained

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

- Manufacturer's identification
- Country of origin
- Product description
- Seattle City Light's Purchase Order Number
- Seattle City Light's Stock Number

4. Shipping

Product shall be shipped to the address specified on the Purchase Order.

5. Issuance

Stock Unit: EA

6. Approved Manufacturers

Seattle City Light Material Control personnel will identify and approve distributors, and hence manufacturers, for this group of Stock Numbers.

ALUMINUM HEX NUT, HEAVY

1. Foreword

1.1 Scope

This material standard covers the requirements for aluminum heavy hex nuts.

1.2 Application

Aluminum hardware is used to make up bolted aluminum-to-aluminum and aluminum-to-copper electrical connections. Refer to Construction Guideline D14-4/NSV-20. This includes connections to integral web channel bus (IWCB) in the Network, transformer and bus terminals, and aluminum lugs in stations, and elsewhere.

Aluminum fasteners are anodized and lubricated for corrosion resistance and to prevent galling and seizing.

1.3 Industry Standards

Hex nuts shall meet the applicable requirements of the following industry standards:

ASME B18.2.2-1987 (R1999) - Square and Hex Nuts (Inch Series)

ASTM F467-1993 - Standard Specification for Nonferrous Nuts for General Use

ASME B18.12-2001 - Glossary of Terms for Mechanical Fasteners

2. Fabrication

2.1 Common Requirements

	Requirements	Reference
Product Name	heavy hexagon nut	ASME B18.12, Section 3.2.1.14
Material	aluminum alloy 6262-T9	ASTM F467, Tables 1 and 2
Dimensions	per reference	ASME B18.2.2, Table 9
Threads	standard series UNC Class 2B	ASME B18.2.2, Table 9, General Note (d)

Nuts shall be anodized and coated with Aluminite 205.

STANDARDS COORDINATOR	STANDARDS SUPERVISOR	UNIT DIRECTOR
John Shipek	John Barnett	Hardev Juj

2.2 Marking

Nuts shall be marked according to ASTM F467, Section 17.1.

2.3 Detailed Requirements

Stock Number	Nominal Size, in.	Threads per in.
783558	1/2	13
783560	5/8	11

3. Packaging

Nuts shall be packaged 25, 50 or 100 per box.

Each standard package shall be legibly marked with the following information:

- Manufacturer's identification
- Product description
- Seattle City Light's Stock Number
- Quantity contained

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

- Manufacturer's identification
- Country of origin
- Product description
- Seattle City Light's Purchase Order Number
- Seattle City Light's Stock Number

4. Shipping

Product shall be shipped to the address specified on the Purchase Order.

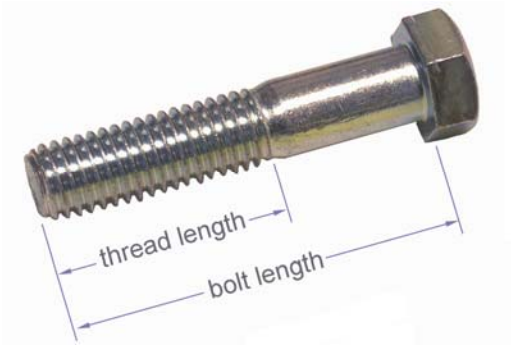
5. Issuance

Stock Unit: EA

6. Approved Manufacturers

Seattle City Light Material Control personnel will identify and approve distributors, and hence manufacturers, for this group of Stock Numbers.

STEEL HEX BOLT



1. Foreword

1.1 Scope

This material standard covers the requirements for steel hex bolts.

1.2 Application

Hex bolts are for general use.

1.3 Industry Standards

Hex bolts shall meet the applicable requirements of the following industry standards:

ASME B18.2.1-1996 - Square and Hex Bolts and Screws (Inch Series)

ASME B18.12-2001 - Glossary of Terms for Mechanical Fasteners

ASTM B633-98e1 - Standard Specification for Electrodeposited Coatings of Zinc on Iron and Steel

ASTM B695-2004 - Standard Specification for Coatings of Zinc Mechanically Deposited on Iron and Steel

2. Fabrication

2.1 Common Requirements

	Requirements	Reference
Product Name	hexagon head bolt	ASME B18.12, Section 3.1.1.17
Material	steel	ASME B18.2.1, Table 2, Note (15)
Dimensions	per reference	ASME B18.2.1, Table 2
Threads	standard series UNC Class 2A	ASME B18.2.1, Table 2, Note (13)
Minimum Thread Length	per reference	ASME B18.2.1, Table 2, Note (11)
Corrosion Protection	zinc-coated	ASTM B633 or ASTM B695

2.1 **Common Requirements**, continued

Hex bolt thread length shall be according to ASME B18.2.1, Table 2, Note (11).

Hex bolts shall be protected from corrosion according to ASTM B633 or ASTM B695.

2.2 Marking

Hex bolt heads shall be marked according to ASME B18.2.1, Section 2.8.

STANDARDS COORDINATOR	STANDARDS SUPERVISOR	UNIT DIRECTOR
John Shipek	John Barnett	Hardev Juj

2.3 Detailed Requirements

Nominal Size, in.	Threads per in.	Minimum Thread Length, in.	Product Length, in.	Stock Number
1/4	20	full	1/2	784701
			3/4	784703
		3/4	1	784705
			1-1/4	784706
			1-1/2	784707
			1-3/4	784708
			2	784709
			2-1/4	784710
			2-1/2	784711
			2-3/4	784712
			3	784713
			4	784717
5/16	18	full	1/2	784731
			3/4	784733
		7/8	1	784735
			1-1/4	784736
			1-1/2	784737
			1-3/4	784738
			2	784739
			2-1/4	784740
			2-1/2	784741
			2-3/4	784742
			3	784743
3/8	16	full	3/4	784763
			1	784765
		1	1-1/4	784766
			1-1/2	784767
			1-3/4	784768
			2	784769
			2-1/4	784770
			2-1/2	784771
			2-3/4	784772
			3	784773
			3-1/2	784775

2.3 Detailed Requirements, continued

Nominal Size, in.	Threads per in.	Minimum Thread Length, in.	Product Length, in.	Stock Number
7/16	14	full	1	784795
		1-1/8	1-1/4	784796
			1-1/2	784797
			2	784799
1/2	13	full	3/4	784823
			1	784825
			1-1/4	784826
		1-1/4	1-1/2	784827
			1-3/4	784828
			2	784829
			2-1/4	784830
			2-1/2	784831
			2-3/4	784832
			3	784833
			3-1/4	784834
			3-1/2	784835
			4	784837
			5	784841
5/8	11	full	1	784885
			1-1/4	784886
			1-1/2	784887
		1-1/2	1-3/4	784888
			2	784889
			2-1/4	784890
			2-1/2	784891
			2-3/4	784892
			3	784893
			3-1/2	784895
			4	784897
3/4	10	full	1-1/2	784917
			1-3/4	784918
		1-3/4	2	784919
			2-1/2	784921
			2-3/4	784922
			3	784923
			3-1/2	784925
			4	784927

3. Packaging

Bolt standard packaging shall be as follows:

Nominal Size, in.	Product Length, in.	Quantity per Box
1/4	all	50 or 100
5/16, 3/8	all	25 or 50
7/16, 1/2	all	25 or 50
5/8, 3/4	all	10, 20 or 25

Each standard package shall be legibly marked with the following information:

- Manufacturer's identification
- Product description
- Seattle City Light's Stock Number
- Quantity contained

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

- Manufacturer's identification
- Country of origin
- Product description
- Seattle City Light's Purchase Order Number
- Seattle City Light's Stock Number

4. Shipping

Product shall be shipped to the address specified on the Purchase Order.

5. Issuance

Stock Unit: EA

6. Approved Manufacturers

Seattle City Light Material Control personnel will identify and approve distributors, and hence manufacturers, for this group of Stock Numbers.

STEEL HEX HEAD CAP SCREW, HIGH STRENGTH

1. Foreword

1.1 Scope

This material standard covers the requirements for high strength, zinc-coated steel, hex head cap screws.

1.2 Application

High strength cap screws are for use on network protectors.

An ASTM A449 steel cap screw is equivalent in strength to an SAE Grade 5 fastener.

1.3 Industry Standards

Cap screws shall meet the applicable requirements of the following industry standards:

ASME B18.2.1-1996 - Square and Hex Bolts and Screws (Inch Series)

ASME B18.12-2001 - Glossary of Terms for Mechanical Fasteners

ASTM A449-1993 - Standard Specification for Quenched and Tempered Steel Bolts and Studs

ASTM B695-2004 - Standard Specification for Coatings of Zinc Mechanically Deposited on Iron and Steel

2. Fabrication

2.1 Common Requirements

	Requirements	Reference
Product Name	hex cap screw	ASME B18.12, Section 3.1.2.7
Material	type 1 or type 2 steel	ASTM A449
Dimensions	per reference	ASME B18.2.1, Table 4
Threads	standard series UNC Class 2A	ASME B18.2.1, Table 4, Note (12)
Minimum Thread Length	per reference	ASME B18.2.1, Table 4, Note (9)
Corrosion Protection	zinc-coated	ASTM A449, Section 5.1.3, and ASTM B695, Class 50

STANDARDS COORDINATOR	STANDARDS SUPERVISOR	UNIT DIRECTOR
John Shipek	John Barnett	Hardev Juj

2.2 Marking

Cap screw heads shall be marked according to ASME B18.2.1, Section 2.8 and ASTM A449, Section 15.

type marking

2.3 Detailed Requirements

Nominal Size, in.	Threads per in.	Product Length in.	Stock Number
1/2	13	1-1/4	011910
		1-1/2	011911
		1-3/4	011912

3. Packaging

Standard package quantity shall not exceed 50 per box.

Each standard package shall be legibly marked with the following information:

- Manufacturer's identification
- Product description
- Seattle City Light's Stock Number
- Quantity contained

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

- Manufacturer's identification
- Country of origin
- Product description
- Seattle City Light's Purchase Order Number
- Seattle City Light's Stock Number

4. Shipping

Product shall be shipped to the address specified on the Purchase Order.

5. Issuance

Stock Unit: EA

6. Approved Manufacturers

Seattle City Light Material Control personnel will identify and approve distributors, and hence manufacturers, for this group of Stock Numbers.

Lag Screws

1. Scope

This standard covers the requirements for zinc-coated, square head, gimlet-point and fetter-drive steel lag screws.

This standard applies to the Seattle City Light (SCL) stock numbers cited in Table 4.

2. Application

Lag screws are used in overhead line construction and where the applied load is primarily a tensile load.

Gimlet-point lag screws are generally twisted into wood members, while fetter-drive lag screws are generally installed with a hammer. See Figure 2.

Figure 2. Screw Types

Gimlet point

Fetter drive

3. Industry Standards

Lag screws shall meet the applicable requirements of the following industry standards:

IEEE C135.80-2012; Zinc-Coated Ferrous Lag Screws for Pole and Transmission Line Construction

ASME B18.2.1; Square and Hex Bolts and Screws (Inch Series)

ASME B18.12; Glossary of Terms for Mechanical Fasteners

ASTM A153/A153M; Standard Specification for Zinc Coating (Hot-Dip) on Iron and Steel Hardware

4. Requirements

All lag screws shall be square head.

Lag screw dimensions and strengths are shown in Table 4.

Table 4. Lag Screw Dimensions and Strengths

Stock No.	Diameter (in)	Length (in)	Tensile Strength, minimum (lb)	Type
785212	1/4	2	1500	Gimlet point
785213	1/4	2-1/2	1500	Gimlet point
785214	1/4	3	1500	Gimlet point
785216	1/4	4	1500	Gimlet point
785243	3/8	2-1/2	3500	Gimlet point
785244	3/8	3	3500	Gimlet point
785245	3/8	3-1/2	3500	Gimlet point
785246	3/8	4	3500	Fetter drive
785261	1/2	4	6500	Fetter drive
785265	1/2	6	6500	Fetter drive
013746	1/2	4	6500	Gimlet point

5. Packaging

Standard package quantity shall not exceed **100** per box.

Standard package weight shall not exceed **50** pounds.

Each standard package shall be legibly marked with the following information:

- Manufacturer's identification
- Product description
- Seattle City Light's stock number
- Quantity

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

- Manufacturer's identification
- Country of origin
- Product description
- Seattle City Light's purchase order number
- Seattle City Light's stock number

6. Issuance

Stock Unit: EA

7. Approved Manufacturers

A. B. Chance (Hubbell Power Systems)

Esco Fasteners

Joslyn Manufacturing (MacLean Power Systems)

Portland Bolt & Manufacturing Company

8. Sources

SCL Material Standard 7852.1; “Lag Screw” (canceled)

COPPER ALLOY WASHERS, PLAIN AND LOCK

plain

external tooth

split lock

1. Foreword

1.1 Scope

This material standard covers the requirements for copper alloy, plain, external tooth and helical spring (split) lock washers.

1.2 Application

Copper alloy washers are used in conjunction with silicon bronze cap screws and nuts to make up electrical connections. Refer to Construction Guideline D14-4/NSV-20. Silicon bronze hardware is also used in situations where high-strength and corrosion-resistance is desired.

1.3 Industry Standards

Washers shall meet the applicable requirements of the following industry standards:

ASME B18.21.1-1999 - Lock Washers (Inch Series)

ASME B18.22.1-1965 (R2003) - Plain Washers

ASME B18.12-2001 - Glossary of Terms for Mechanical Fasteners

ASTM B96-1993 - Standard Specification for Copper-Silicon Alloy Plate, Sheet, Strip, and Rolled Bar for General Purposes and Pressure Vessels

ASTM B99-2001 - Standard Specification for Copper-Silicon Alloy Wire for General Applications

ASTM B591-1993 - Standard Specification for Copper-Zinc-Tin Alloys Plate, Sheet, Strip, and Rolled Bar

2. Fabrication

2.1 Common Requirements – Plain Washers

	Requirements	Reference
Product Name	plain washer	ASME B18.12, Section 3.3.1.13
Material	copper alloy UNS No. C65100 (general name, silicon bronze)	ASTM B96, Table 1
Dimensions	per reference	ASME B18.22.1, Type B, Table 2, Regular

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2. Fabrication, continued

2.2 Common Requirements – External Tooth Lock Washers

	Requirements	Reference
Product Name	external tooth lock washer	ASME B18.12, Section 3.3.1.17
Material	copper alloy UNS No. C42500	ASTM B591, Tables 1, 2, and 4
Dimensions	per reference	ASME B18.21.1, Type A, Table 8

2.3 Common Requirements – Helical Spring (Split) Washers

	Requirements	Reference
Product Name	helical spring lock washer	ASME B18.12, Section 3.3.1.10
Material	copper alloy UNS No. C65100	ASTM B99, Tables 1 and 2
Dimensions	per reference	ASME B18.21.1 Table 1 (for Regular) or Table 2 (for Heavy)

2.4 Detailed Requirements

Nominal Size, in.	Stock Number		
	Plain	**External Tooth**	**Split Lock**
1/4	788022	788101	788121
5/16	788025	788102	788122
3/8	788024	788103	788123
1/2	788026	788104	788125
5/8	788027	788105	788126
3/4	788028	–	788127

3. Packaging

Standard package quantity shall not exceed 100 per box.

Each standard package shall be legibly marked with the following information:

- Manufacturer's identification
- Product description
- Seattle City Light's Stock Number
- Quantity contained

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

- Manufacturer's identification
- Country of origin
- Product description
- Seattle City Light's Purchase Order Number
- Seattle City Light's Stock Number

4. Shipping

Product shall be shipped to the address specified on the Purchase Order.

5. Issuance

Stock Unit: EA

6. Approved Manufacturers

Seattle City Light Material Control personnel will identify and approve distributors, and hence manufacturers, for this group of Stock Numbers.