HIGH VOLTAGE, XLPE INSULATED CABLE - GENERAL

1. Scope

This Material Standard covers the general requirements for 69-138 kV, cross-linked polyethylene (XLPE) insulated, single-conductor high voltage cable used for the distribution and transmission of electric energy.

Cable joint and termination requirements are outside the scope of this Material Standard.

Commission testing requirements of installed cable prior to energization are outside the scope of this Material Standard.

2. Application

Cable is intended for use on three-phase, 60 Hz, grounded, wye-connected systems.

3. Specific Requirements

Specific requirements shall be according to the detailed Material Standard and Purchase Order issued subsequent to competitive solicitations.

4. Industry Standards

Cable shall meet the requirements of the following industry standards as referenced in this and the detailed Material Standard:

AEIC CS9-2006 – Specification for Extruded Insulation Power Cables and Their Accessories Rated Above 46 kV Through 345 kVac

ASTM B3-01 – Standard Specification for Soft or Annealed Copper Wire

ASTM B8–04 – Standard Specification for Concentric-Lay-Stranded Copper Conductors, Hard, Medium-Hard, or Soft

ASTM B49-04 – Standard Specification for Copper Redraw Rod for Electrical Purposes

ICEA S-108-720-2004 – Standard for Extruded Insulation Power Cables Rated Above 46 Through 345 kV

NEMA WC 26-2000 (EEMAC 201-2000) – Binational Wire and Cable Packaging Standard

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. Seattle City Light detailed Material Standard
4. This Material Standard
5. AEIC CS9
6. ICEA S-108-720

6. Purchase Order Information

Purchase Order will state the following minimum information:

- Cable description
- Seattle City Light General Material Standard number including revision date
- Seattle City Light detailed Material Standard number including revision date
- Seattle City Light Stock Number
- Total order quantity
- Price
- Delivery date
- Quantity per reel

7. Alternative Proposals

Alternative proposals will be accepted according to the requirements of AEIC CS9, Section 1.4.2.

8. Construction and Ratings

8.1 General

Cable shall be suitable for underground ducts, conduit risers, and wet or dry locations.

The manufacturer shall be responsible for ensuring the compatibility of all components used to assemble the cable.

Cable shall be manufactured in a continuous triple-extrusion process. The conductor shield, insulation, and insulation shield layers shall be extruded over the core conductor in one continuous pass using true triple or triple tandem extruders.

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

8. Construction and Ratings

8.1 General, continued

Cable shall be capable of being safely handled and installed if not subjected to temperatures lower than minus 10° C in the preceding twenty four hours.

Completed cable assembly shall not contain lead.

In-plant repairs of the cable core are prohibited unless specifically agreed to by the purchaser.

Failure to meet any of the requirements of this and referenced standards shall be cause for rejection.

Cable shall be designed and constructed to operate at conductor temperatures according to the requirements of AEIC CS9, Section 1.9 and not exceeding those shown in Table 8.1.

Table 8.1

Insulation Material	Normal Operation	Emergency Overload	Short Circuit
XLPE	90° C	105° C	250° C

8.2 Conductor

Conductor shall meet the requirements of AEIC CS9, Section 2.1.

8.3 Conductor Shield

Conductor shield shall meet the requirements of AEIC CS9, Section 2.2.

Conductor shield shall be super smooth grade.

8.4 Insulation

Insulation shall meet the requirements of AEIC CS9, Section 2.3.

Insulation shall be with no mineral fillers crosslinked polyethylene (XLPE).

Insulation shall be super clean grade.

Approved insulation providers:

- Dow
- Borealis

Cable shall be dry cured. Steam curing is expressly prohibited.

8.5 Extruded Insulation Shield

Extruded insulation shield shall meet the requirements of AEIC CS9, Section 2.4.

Extruded insulation shield shall be conspicuously marked “semiconducting.”

Extruded insulation shield shall be bonded.

8.6 Metallic Shield/Sheath

Metallic shield/sheath shall meet the requirements of AEIC CS9, Section 2.5.

If the Detailed Material Standard requires the option of water blocking components for the metallic shield the following clarifications apply:

- The requirements of ICEA S-108-720, Section 6.5 shall apply.
- The water blocking type shall be water swellable tape.

8.7 Jacket (Non-Metallic Covering)

Jacket shall meet the requirements of AEIC CS9, Section 2.6.

Cable jacket or jacket laminate combination shall be free stripping from the fault handling layer.

8.8 Assembly and Identification

Cable shall be assembled and identified according to the requirements of AEIC CS9, Section 9.

9. Packaging

Cable shall be placed on reels according to the requirements of AEIC CS9, Section 10.0.

Reels shall be returnable steel.

Reels and their corresponding capacities shall be according to the requirements of NEMA WC 26.

Cable shall be dry when shipped.

Cable ends shall be sealed to prevent the entrance of moisture.

The inner end of the cable shall be brought to the outside of the reel flange and securely fastened.

The inner end shall not be brought out through the reel arbor.

The outer end shall be securely fastened to the inner side of the flange.

One cable per reel shall be provided with a cable eye.

Each reel shall be legibly marked with the following information:

- Manufacturer's identification
- Product description
- Reel identification number
- Shipping length of cable on reel
- Outer and inner end sequence length marking numbers
- Gross weight
- Tare weight
- Net weight
- Date of manufacture
- Reel identification according to NEMA WC-26, Section 5
- Seattle City Light's Purchase Order Number
- Seattle City Light's Stock Number

9. Packaging, continued

Reels shall be protected for shipment according to WC 26, Section 4, and Table 9.1 of this Material Standard.

Table 9.1

Plant Location	WC 26 Reel Covering
US	Level 2 (Weather Protector)
Canada	
Mexico	
All other	Level 6 (Export)

10. Testing and Test Methods

Testing and test methods shall be performed according to the requirements ICEA S-108-720, Part 9 and AEIC CS9, Section 2.7.

Cable insulation shall not be tested with high voltage DC.

11. Documentation

11.1 General

Documentation shall be in English and use customary inch-pound units.

Documentation shall utilize common industry terminology and well-understood abbreviations.

11.2 Bidder's Data

Bidder shall return the following technical information with their bids clearly indicating to which Stock Number it applies:

- Manufacturer's name
- Manufacturing plant location(s) (all possible)
- Basic cable description
- Information specified in ICEA S-108-720, Section 1.4
- Reel designation (RM or RMT) and class (1 or 2)
- Reel flange diameter
- Reel inside traverse and overall outside width
- Reel drum diameter
- Alternate packaging (if any, at supplier's option; this shall supplement standard packaging information, not replace it)
- Length per reel
- Reel gross, net, and tare weight
- Approximate weight per foot of cable
- Manufacturer's warranty
- All exceptions to Seattle City Light requirements with reference to the requirement to which exception is taken; indicate if no exceptions taken

11.2 Bidder's Data, continued

Bid information shall be presented in a clear and consolidated manner for ease of review.

11.3 Exceptions to Bidder's Data

The requirements of Section 11.2 may be waived provided the following conditions are met:

- Manufacturer has submitted the requested technical information by means of a formal bid within the previous twelve months.
- Requested information has not changed since the last submission.
- Manufacturer confirms in their bid that no exceptions are taken to Seattle City Light's requirements.

11.4 Certified (Production) Test Reports

For each shipment a certified production test report (CTR) shall be emailed to:

standards.scl@seattle.gov

Certified production test report shall include:

- A unique certified test report number
- Plant location
- Seattle City Light Purchase Order number
- Manufacturer's order number
- Shipping reel information or serial numbers and shipment footage
- All information listed under Bidder's Data
- Conductor metal, stranding type, class, stranding subtype, number of strands, temper, and lay
- Conductor shield manufacturer and compound number
- Extruded insulation shield manufacturer and compound number
- Metallic insulation shield dimensional information
- Results of the testing required under Section 10 of this Material Standard
- Cable core extruder line identification
- Jacket extruder line identification
- List of shipping reels in the sequential order in which they came off the core extruder
- The sequential order of the shipping reels in which they came off the jacket extruder
- Outside (top) and inside (bottom) jacket sequential footage numbers for each shipping reel

Certified production test report shall include a statement that all data in the report is true and complete.

Certified production test reports shall not contain information for more than one cable order or more than one Stock Number at a time.

11. Documentation

11.4 Certified (Production) Test Reports, continued

Supplier shall provide certified production test report according to Table 13.1 of this Material Standard.

11.5 Certified Qualification Test Reports

Cable shall meet the qualification test requirements of ICEA S-108-720, Part 10.

Upon request, supplier shall provide copies of ICEA certified qualification test reports.

11.6 Plant QA Processes

Upon request, supplier shall provide information describing their plant's quality assurance processes.

12. Cable Samples

For each shipment, manufacturer shall provide cable samples for Seattle City Light to evaluate for compliance according to Tables 12.1 and 13.1 of this Material Standard.

Cable samples shall be taken from the top of each shipping reel.

Each cable sample shall include at least one complete identification string and at least one sequential length marking number.

For each shipment, cable samples shall be express mailed to:

Seattle City Light
3613 – 4th Avenue South
Seattle, WA 98134
Attention: Quality Assurance

Each cable sample shall be marked at one end with corresponding:

- Manufacturer's Name
- Shipping Reel Number
- Reel Length
- CTR Number
- Seattle City Light Purchase Order Number
- Seattle City Light Stock Number

Table 12.1

Cable Type	Sample Requirements
1/C	One 2-foot sample per shipping reel

13. Product Evaluation

Seattle City Light Quality Assurance and Standards will evaluate the certified production test report and cable samples for compliance.

Following the internal evaluation, Seattle City Light Material Control will inform the supplier if cable shipment is in compliance, or not.

Seattle City Light Material Control will release reels for shipment and receive cable according to Table 13.1.

Table 13.1

Subject/Event	Action
Certified test reports	Email as soon as available
Cable samples	Express mail as soon as available
Release reels for shipment	Following verification of compliance by Seattle City Light
Receive cable	Following matching of reels with CTR and check for visible shipping damage

14. Plant Inspections

Upon request, supplier shall provide sufficient notice for Seattle City Light or Seattle City Light's representative to inspect the cable during any stage of manufacture or testing.

15. Shipping

Reels shall be shipped according to the requirements of AEIC CS9, Section 10.0.

16. Approved Manufacturers

Approved manufacturers are identified in the detailed Material Standard.

17. References

Cunningham, Bob; SCL Engineer, subject matter expert (bob.cunningham@seattle.gov)

IEC 60840; *Power Cables with Extruded Insulation and Their Accessories for Rated Voltages above 30 kV (Um = 36 kV) up to 150 kV (Um = 170 kV) - Test Methods and Requirements;* International Electrotechnical Commission; April 2004 (Edition 3)

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