

## 1. Scope

### 1.1 Description

This material standard covers the technical requirements for 600 volt general purpose, multi-conductor control cable. The cable shall consist of cross-linked polyethylene, ethylene propylene rubber or flame retardant ethylene propylene rubber insulated conductors wrapped with a separator tape and covered with a thermoplastic chlorinated polyethylene or low-smoke zero-halogen jacket.

### 1.2 Material ID Numbers

This material standard applies to the following District control cable Material ID Numbers:

MID	Control Cable
1000056	4/C No. 12 AWG cable
1000057	7/C No. 12 AWG cable
1000058	12/C No. 12 AWG cable
1000059	4/C No. 10 AWG cable
1000060	7/C No. 10 AWG cable
1000061	3/C No. 8 AWG cable
5001007	2/C No. 6 AWG cable

### 1.3 Service Environment and Operating Requirements

**1.3.1** The cable shall be suitable for indoor and outdoor use in wet or dry locations in conduit, cable trays, cable trench and direct burial.

**1.3.2** The cable shall be rated for continuous use at 90°C and suitable for a minimum installation temperature of -35°C.

### 1.4 Language

All information communicated to the District shall be in the English language and shall be in customary English units, i.e., feet, inches, pounds. Metric units and/or other languages are not acceptable.

## 2. Reference Standards

Reference is made in this material standard to the following standards, the latest editions, amendments, and supplements of which shall apply, unless otherwise stated in this document or in associated purchasing documents:

ASTM Standards As referenced

**ICEA S-73-532 (NEMA WC 57)** Standard for Control, Thermocouple Extension, and Instrumentation Cables

**ICEA S-95-658 (NEMA WC 70)** Standard for Nonshielded Power Cables Rated 2000 Volts or Less for the Distribution of

Electrical Energy

**IEEE Standard 383** IEEE Standard for Type Test of Class 1E Electric Cables, Field Splices, and Connections for Nuclear Power Generating Stations

**NEMA WC 26** Wire and Cable Packaging

### 3. Definition of Terms

The following definitions pertain to this material standard:

**ASTM** American Society for Testing and Materials

**ICEA** Insulated Cable Engineers Association

**IEEE** Institute of Electrical and Electronics Engineers

**NEMA** National Electrical Manufacturers Association

**CPE** Chlorinated polyethylene

**EPR** Ethylene propylene rubber

**F R-EP or FR-EPR** Flame retardant ethylene propylene rubber

**LSZH** Low-smoke-zero-halogen

### 4. Construction

#### 4.1 Conductors

Conductors shall be Class B or C concentric stranded, soft or annealed tinned copper in accordance with ASTM B-8 and B-33. Type XHHW-2 conductors are typical of the approved type.

#### 4.2 Insulation

Each conductor shall be insulated with FR-EPR or EPR meeting the flame test requirements of ICEA S-95-658. The average thickness shall be 25 mils for No. 16 AWG, 30 mils for Nos. 14 - 10 AWG, and 45 mils for Nos. 8 - 2 AWG. The minimum thickness at any point shall not be less than 90 percent of the specified average thickness.

#### 4.3 Circuit Identification

The insulation for conductors No. 10 AWG and smaller shall be color coded in accordance with ICEA S-73-532 Appendix E, E.3.1 Method 1, Table E-2 (see excerpt below, shown as Table 1). The insulation for conductors No. 8 AWG and larger shall be color coded in accordance with ICEA S-73-532 Appendix E., E3.3 Method 3, Table E-2, black insulation with white printing.

### 5. Testing

Individual conductors and completed cables shall be tested in accordance with all applicable requirements of ICEA S-73-532 and ICEA S-95-658. Cables shall be capable of passing the vertical tray flame test requirements of IEEE Standard 383.

## 6. Shipment and Reels

### 6.1 Packaging and Sealing

**6.1.1** Cable shall be supplied in one continuous length for each reel. Cable length per reel shall be as specified in Table 2, shown below.

**6.1.2** Each end of the cable shall be firmly and properly secured to the reel. Care shall be taken to prevent looseness of reeled cable. The cable end attached through the interior of the reel shall be fastened in such a manner that it remains attached as the cable is dispensed from the reel and does not interfere with other reels or waste cable.

**6.1.3** Watertight seals shall be applied to all cable ends to prevent entry of moisture during transit and outside storage. All reels shall have Level 2 protection over the outer layer of the cable in accordance with NEMA WC 26-2000, Section 4.1.

### 6.2 Reels

Unless otherwise stated on the Special Provision Sheet all reels shall:

- a. Be standard non-returnable wood conforming to NEMA WC 26.
- b. Be free of damaging protrusions such as nails, staples, etc.
- c. Have minimum drum diameters as specified in NEMA WC26.
- d. Have dimensions as shown below in Table 2.

Cable Size	Cable Length		Reel Dimensions	
	Footage per Reel	Tolerance	Max Flange Dia.	Max Inside Traverse
4/C No. 12 AWG cable	500'	-0% / +10%	30"	18"
7/C No. 12 AWG cable	1000'	-0% / +10%	30"	18"
12/C No. 12 AWG cable	1000'	-0% / +10%	36"	24"
4/C No. 10 AWG cable	1000'	-0% / +10%	30"	18"
7/C No. 10 AWG cable	1000'	-0% / +10%	30"	18"
3/C No. 8 AWG cable	500'	-0% / +10%	30"	18"
2/C No. 6 AWG cable	500'	-0% / +10%	30"	18"

### 6.3 Marking on Reels

The following cable information shall be permanently embossed on weatherproof tags permanently attached to the outside of each reel:

- a. District Purchase Order Number
- b. Manufacturer's name
- c. Date of manufacture
- d. Number and size of conductors, insulation type and voltage rating
- e. Type of cable jacket material
- f. Length of cable on reel (ft)
- g. Net weight, tare weight, gross weight (lb)

## 6.4 Shipping Data

The following information shall accompany each cable shipment:

- a. District Purchase Order and Release Number
- b. Cable type
- c. Total footage of cable shipped
- d. Number of reels shipped
- e. Footage per reel
- f. Gross weight per reel (lb)

## 7. Warranty

The vendor warrants that the cable furnished under this material standard shall be free from defects for a period of 1 year after energization or 18 months after shipment and agrees to replace any cable that is unsuitable for operation or fails in operation during this warranty period.

## 8. Bidding Proposal Requirements

**8.1** The bid proposal shall include a complete list of any and all proposed exceptions to the requirements of this material standard.

**8.2** The bid proposal shall include a statement of the vendor's warranty.

## 9. Evaluation of Bids

The following factors will be considered in the evaluation of bids and in subsequent bid awards:

- a. Base price
- b. Past experience with bidder
- c. Conditions of warranty
- d. Construction details
- e. Adherence to this material standard
- f. Delivery

## 10. General Bidding Conditions

The attached General Bidding Conditions are made a part of this material standard.