

**HOLLAND BOARD OF PUBLIC WORKS
ELECTRICAL EQUIPMENT
AND MATERIAL SPECIFICATION**

**SPECIFICATION FOR 1/0 AWG, 15KV, 2C, EPR-BASED INSULATION, CONCENTRIC NEUTRAL, POLYETHYLENE
JACKET, UNDERGROUND CABLE**

1. SCOPE

This specification covers the minimum requirements of the Holland Board of Public Works for two (2) conductor concentric-neutral Underground (URD) cables consisting of one high temperature EPR-Based elastomeric compound insulation (an aluminum conductor) and one copper concentric conductor applied helically overall, which is encapsulated in an insulating jacket.

2. APPLICABLE DOCUMENTS

- A. All cable purchased under this specification shall meet the requirements of this document and the most recent edition of:
1. Insulated Cable Engineers Association Standards Publication ICEA S-94-649.I
 2. Association of Edison Illuminating Companies (AEIC) CS8.
 3. National Electric Safety Code (NESC) Article 350. General, G.
- B. If this specification conflicts with any of the documents listed, the requirements of this specification shall apply.

3. GENERAL

- A. Characteristics of system on which cable is to be used.
1. Current - alternating.
 2. Frequency - 60 Hz.
 3. Normal operating voltage - 12470Y/7200 volt.
 4. Single or three-phase primary grounded, underground distribution, conductor... 2/C.
 5. Cable insulation level - 133%
 6. Description of installation - the cable shall be suitable for application in plastic duct, steel conduit, direct burial (trenched or plowed with or without select backfill), riser pipes and air exposed to weather and direct sunlight.

7. Conditions of installation - the cable shall be suitable for:

- a) Installation in wet or dry locations
- b) 40% fill in conduit, duct and riser pipes.

After installation, the cable will be exposed to earth ambient temperatures between 0 degrees celsius and 28 degrees celsius and shall be capable of being operated at maximum conductor temperatures listed below:

- 105 degrees celsius - Normal Operation
- 140 degrees celsius - Emergency Operation
- 250 degrees celsius - Short Circuit Operation

B. Description of Cable

- 1. Type of cable - 2/C concentric neutral primary cable.
- 2. Rated circuit voltage - 15 KV phase to phase.
- 3. Size of conductors - see "Material I.D. Listing", paragraph 4.
- 4. Insulation - see "Insulation", paragraph 7.
- 5. Jacket - see "Jacket", Paragraph 10.

4. MATERIAL I.D. LISTING

<u>Cable Size</u>	<u>No. of Conductor Strands</u>	<u>Inventory Number</u>
1/0	19	130001200

5. CONDUCTOR

Central stranded conductor shall be compressed concentric-lay Class B stranded H19 (hard drawn) Alloy 1350 Aluminum. The number of conductor strands shall be as shown in paragraph 4 of this specification.

6. CONDUCTOR SHIELD

The conductor shield shall be a stress control or semi conducting layer to reduce electrical stress and suppress energy transfer at the insulation interface. The minimum thickness of the conductor shield shall not be less than 12 mils at any point.

7. INSULATION

- A. The insulation shall be high temperature extruded thermo setting synthetic rubber resistant to discharge, ozone and heat.
- B. The nominal insulation thickness shall be 220 mils, with the minimum thickness being no less, than 210 mils at any point.
- C. The insulation shall meet all applicable requirements of AEIC CS8, Section D, and ICEA S-94-649.
- D. The completed cable shall be examined for gels, agglomerates, contaminants, and voids.
- E. The manufacturer shall specify the insulation resistance and be able to show conformance in complete cable.

8. INSULATION SHIELD

- A. The insulation shield shall be semi-conducting, free stripping and resistant to sunlight and weathering. The insulation shield shall serve as both an electrostatic shield and a protective covering and shall not be considered part of the insulation thickness.
- B. The minimum thickness shall be not less than 30 mils.

9. CONCENTRIC NEUTRAL CONDUCTOR

- A. The neutral conductor shall consist of bare copper wires. The wires shall be spirally wrapped and equally spaced in contact with the insulation shield. Lay of wires shall not be less than 6 or more than 10 times the diameter of the cable over the concentric neutral.
- B. **Size and Number of Wires.**

Concentric Neutral Wires

<u>Cable</u>	<u>(Number)</u>	<u>- (Size)</u>	<u>Application</u>
1/0	16	#14	1 and 3-phase

10. JACKET

- A. The jacket shall be extruded insulating linear low-density polyethylene material, which covers the concentric wires
- B. The jacket shall be free stripping.
- C. The thickness of the jacket shall be as per table 7-10 of ICEA S-94-649.
- D. There shall be three polyethylene red stripes (approximately 3/8 inch width) equally spaced around the circumference of the jacket.
- E. Cables with jackets shall be manufactured to minimize the jacket shrinkback.
- F. Cables with insulating jacket shall be subjected to the spark test requirement of ICEA S-94-649.
- G. There shall be no water between the insulation shield and the jacket

11. CABLE IDENTIFICATION

- A. The outer jacket surface of the cable shall be marked as specified under ICEA S-94-649 section 8.2.1.
- B. Beginning and ending footage shall be clearly printed on the outside of the shipping reel flange. The printing must be legible, durable and easily readable.
- C. Each reel shall consist of one continuous run of cable (no splices allowed.)

12. TESTING

A lot shall not be shipped (except when agreed to by the purchaser) unless all required tests have been completed and the results of the tests show compliance with all requirements of this and all referenced specifications.

- A. Production Sampling Tests - (data to be certified for each lot.)
 - Conductor Tests
 - Dimensional Analysis
 - Original Physical Properties
- B. Completed Cable Full Reel Tests - (data to be certified for each shipping reel)
 - Partial Discharge Test
 - AC Voltage Test
 - Insulation Resistance Test
- C. If requested by the purchaser at the time of inquiry, the manufacturer shall furnish the purchaser with certified copies of the results of all tests required by this and all referenced specifications.
- D. The manufacturer shall maintain production test record for all cables for a period

of not less than one year from the shipping date, and be able to correlate this date to each master length and shipping length.

13. PACKAGING AND SHIPPING

- A. Completed cable shall be shipped in 2500 foot lengths on non-returnable wood reels not to exceed 60 inches flange diameter, 30 inches traverse width with a minimum arbor hole of 2-3/4 inches. The tare of the reel shall be clearly printed on the outside of the shipping reel flange. (Or returnable reels as approved by purchasing).
- B. Reels shall be marked to show beginning footage, ending footage and total footage of cable on the reel. Ends of cable shall be sealed and secured such that they remain inside the reel flange to prevent damage.
- C. Shipping shall be in accordance with the purchase order requirements.
- D. With a durable label securely attached to the outside of a flange of the reel and plainly stating the destination, the BPW order number, date of manufacture, length of the cable on reel, number, size and type of conductors, cable configuration, thickness and type of insulation, voltage rating, gross tare and net weight, and shall show the identification.

14. BID QUOTATION REQUIREMENTS

The following information shall be included with the bid quotation:

- A. Manufacturer guarantee that all cable furnished under this specification is of first class material and workmanship throughout and meets all requirements of this specification. **Any variances shall be stated in writing with the bid.**
- B. Conductor type and number of strands.
- C. Conductor shield type and minimum average thickness.
- D. Insulation type and minimum average thickness.
- E. Insulation shield type and minimum average thickness.
- F. Number and size of concentric neutral wires.
- G. Reel size.
- H. Manufacturer shall provide complete, specific warranty data on specified cable upon submission of Bid.
- I. Delivery lead times, terms of sale, price, and price adjustment factors.

Engineer: _____
Caleb Harrison

Approved: _____
Mike Buikema