



1. APPLICATION

- A. 15 kV single conductor, insulated power cable is installed in conduits underground and exposed outside on riser poles in EWEB's 12.47 kV grounded wye electric distribution system.

2. REFERENCE STANDARDS

- A. The cable furnished shall meet all applicable provisions of the latest editions, revisions, and amendments of the following standards unless otherwise stated in this specification.
- 1) Association of Edison Illuminating Companies (AEIC) Cable Specification No. CS8, Specification for Extruded Dielectric Shielded Power Cables Rated 5 through 46 kV
 - 2) Insulated Cable Engineers Association (ICEA) publication ICEA S-94-649 Standard for Concentric Neutral Cables rated 5 through 46kV or publication ICEA S-97-682 Standard for Utility Shielded Power Cables rated 5 through 46kV, as appropriate.
 - 3) The following American Society for Testing Materials (ASTM) specifications:
 - a) ASTM B3: Specification for Soft or Annealed Copper Wire
 - b) ASTM B8: Specification for Concentric Lay Stranded Copper Conductors, Hard, Medium-hard, and Soft.
 - c) ASTM B230: Specification for Aluminum 1350-H19 Wire for Electrical Purposes

MATERIAL SPECIFICATION
EUGENE WATER & ELECTRIC BOARD

**JACKETED EPR INSULATED
POWER CABLE – 15kV**

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- d) ASTM B231: Specification for Concentric Lay Stranded Aluminum 1350 Conductors
- e) ASTM B609: Specification for Aluminum 1350 round wire. Annealed and Intermediate Tempers, for Electrical Purposes

3. PRODUCTS

A. General

- 1) Cable shall be suitable for use in wet or dry locations, in underground or exposed conduits, direct buried, or outdoor above ground exposed to sunlight.
- 2) Cable shall be rated for 90°C conductor temperature for continuous operation, 130°C for emergency overload conditions, and 250°C for short-circuit conditions. Emergency overloads are those overload conditions that are in existence for less than 100 hours per year.

B. Central Conductor

- 1) Conductor shall be copper or aluminum as specified in bid request.
- 2) Copper conductors shall be soft drawn and annealed in accordance with ASTM B3 and B8, compact stranding.
- 3) Aluminum conductors shall be stranded 1350 aluminum Class B compressed, H16 or H26 (3/4 hard), in accordance with ASTM B231. Before stranding, the aluminum wire shall meet the requirements of ASTM B230 or ASTM B609, as applicable.
- 4) The manufacturer's name and year of manufacture shall be embossed on the center strand of the conductor at intervals not to exceed 12 inches.

C. Conductor Shield

- 1) The conductor shield shall be an extruded layer of semi-conducting or non-conducting thermosetting material, thermally homogeneous with the insulation which meets the requirements of the referenced standards.
- 2) Minimum thickness at any point shall be in accordance with the referenced standards.
- 3) The conductor shield shall have an allowable operating temperature equal to, or higher than, that of the insulation. After application to the conductor, the shield shall comply with the referenced standards.

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- 4) The conductor shield shall be cylindrical, firmly bonded to overlying insulation with a smooth interface, easily removable from the underlying conductor and comply with the referenced standards.

D. Insulation

- 1) The insulation shall be a high-quality, heat, moisture, impact, deformation, and ozone resistant, flexible thermosetting ethylene propylene rubber, (EPR). The insulation shall comply with the referenced standards.
- 2) The thermal properties of the insulation shall be such as to maintain its critical electrical and physical qualities during the minimum 40-years of service life.
- 3) The nominal average thickness of insulation shall be 220 mils which is an insulation level of 133% for 15 kV systems. The minimum thickness at any point shall not be less than 210 mils, or greater than 250 mils.

E. Insulation Shields

- 1) Non Metallic Covering
 - a) A semi-conducting polymeric layer meeting the requirements of the referenced standards shall be extruded tightly over the insulation to serve as an electrostatic shield and protective covering. The shield compound shall be thermally homogenous with the insulating material.
 - b) The voids and protrusion limits on the semi-conducting shield shall be in accordance with the referenced standards.
 - c) The semi-conducting material shall be suitable for exposure to sunlight and other anticipated atmospheric conditions.
 - d) The thickness of the extruded insulation shield shall be in accordance with the referenced standards.
 - e) The shield shall be applied such that it can be easily removed without externally applied heat. Stripping tension values shall be within the range of 3-24 pounds.
 - f) The indentation of the shield into the insulation shield shall not exceed 15 mils at any point. The measurement shall be made on cable samples removed from the composite jacketed cable.

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- 2) Metal Component, when specified in bid request.
 - a) Bare copper tape shall be applied helically with a lap or corrugated longitudinally with a lap over the semi-conducting nonmetallic insulation shield.
 - b) Copper tape shall be at least 5 mils thick and shall have a minimum 10% overlap.
 - c) The contiguity of copper tape shall not be distorted or disrupted during normal cable bending.

F. Extrusion Process

- 1) The conductor shield, insulation, and nonmetallic insulation shield shall be applied in a triple or tandem triple extrusion process, or the conductor shield and insulation shall be extruded in a dual extrusion, and after a quality assurance check and exam, the insulation shield shall then applied.
- 2) The curing process during extrusion shall be nitrogen gas or steam.

G. Concentric Neutral. When specified in bid request.

- 1) A concentric neutral consisting of annealed copper wires in accordance with the referenced standards, shall be spirally wound and evenly spaced over and remain in contact with the underlying insulation shield. The conductor lay shall be 6-10 times the diameter of the cable, measured over the concentric wires.
- 2) The wires shall be uncoated.
- 3) The conductivity of the concentric neutral shall be full neutral for 1/0 AWG cables and one third neutral for all other cables unless specified otherwise in bid request.

H. Overall Outer Jacket

- 1) A non-conducting outer jacket shall be applied directly over the copper shield or concentric neutral.
- 2) The jacket material shall fill the interstice area leaving no voids. The jacket shall be free stripping.

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- 3) The jacket shall consist of a low density or linear low density HMW black polyethylene compound meeting the referenced standards.

I. Cable Identification

- 1) The outer jacket shall be durably marked at regular intervals not to exceed one foot throughout its length with the manufacturer's identification, type of insulation, insulation level, size of conductor, type of conductor, rated voltage, year of manufacture, lightning bolt per NESC Rule 350, and consecutive footage markings for the entire shipment. This information shall be indent printed or embossed on the surface of the cable jacket.

4. TESTS

A. Factory Tests: Electrical tests shall be conducted in accordance with the referenced standards.

- 1) Partial discharge test. Corona level tests shall be performed on cable wound on reels that are ready for shipment. Corona level test shall include an x, y recording (apparent discharge versus voltage) for each individual reel. The apparent discharge shall not exceed five (5) picocoulombs for all voltage levels. A copy of this test data shall be furnished with the certified test report.
- 2) AC voltage test. Each length of completed cable shall withstand, for 5 minutes, an alternating current test at 200volts/mil.
- 3) Certified copies of the results of all tests required by this material specification and all reference standards shall be provided.

B. EWEB Tests: Additional tests may be performed by EWEB or its designee, to determine quality and/or adherence to this material specification.

- 1) At the option of EWEB, a sample of each shipping reel of cable shall be submitted by the supplier for testing, before shipment of the cable. If EWEB elects to accept such samples prior to shipment, the supplier shall:
 - a) Indicate how the samples and reels will be marked for easy identification and matching by EWEB.
 - b) Permit EWEB, or its agent, to witness the sampling and to place its own identification marks on the samples and reels, if they wish.
 - c) Notify EWEB in writing, of the date when the sample will be cut from the reels, such notification to be received by EWEB at least ten days prior to the proposed date of sampling. EWEB will then

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notify the supplier within seven (7) days whether or not they intend to witness the sampling

- d) Ship the sample to EWEB or to an independent testing laboratory specified by EWEB.
- 2) EWEB will determine the acceptability of the product within 10 working days.
- 3) Cable that does not meet the requirements of this materials specification or pass the tests herein may be rejected.
- 4) Rejected orders will be returned to the supplier at the supplier's expense.

5. WARRANTY

- A. The manufacturer shall warrant that the cable will be free from defects in material, design, and workmanship for a minimum of forty (40) years.

6. PACKAGING AND DELIVERY

- A. Cable sizes greater than or equal to 350 KCMIL shall be on reels which have a maximum diameter of 72" and a maximum outside width of 48", with a 3" diameter steel bushed arbor hole, and shipped with axis horizontal. Standard cable length shall be a minimum of 2,000 feet and a maximum of 2,500 feet per reel. Specific required cut lengths that deviate from standard reel lengths shall be provided as requested by EWEB.
- B. Cable sizes less than 350 KCMIL shall be on reels which have a maximum diameter of 72" and a maximum outside width of 40", with a 3" diameter steel bushed arbor hold and shipped with axis horizontal. Standard cable length for each reel shall be minimum 2,500 feet and maximum 3,000 feet per reel. Specific required cut lengths that deviate from standard reel lengths shall be provided as requested by EWEB.
- C. In accordance with the latest revision of NEMA WC26 all reels shall have a Level 2 protective covering prior to being shipped to protect cable against physical damage.
- D. Cable ends shall be capped with water tight caps.
- E. Cable reels are to be shipped by open flatbed truck only.
- F. Cable reels shall meet or exceed the manufacturer's recommended minimum bending radius/ Each reel shall be legibly marked with the manufacturer's name, address, and

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reel number; the cable size, voltage class, weight (gross, tare, and net), and length; the beginning and ending sequential footage markings; and the purchase order number.

7. SUBMITTALS

A. Submit the information required in Exhibit A

8. EWEB STORES INFORMATION

A. This material specification shall be used to purchase the material with the following stock codes:

- 1) Shielded Cables:
 - 436-0000972 1/0 CU
 - 436-0000975 350 KCM CU
 - 436-0000976 500 KCM CU
 - 436-0000973 750 KCM CU

- 2) Concentric Neutral Cables:
 - 436-0000971 1/0 AL
 - 436-0000974 750 KCM CU
 - 436-0000977 750 KCM AL

9. MANUFACTURER'S PREQUALIFICATION

A. To be qualified as a considered supplier, the manufacturer shall meet at least one of the following requirements:

- 1) The manufacturer shall have successfully produced cables with the proposed EPR insulation for at least fifteen (15) years.
- 2) The manufacturer shall have successfully passed the ICEA Cable Core qualification tests per the referenced standards.

B. EWEB reserves the right to visit the cable plant before vendor qualification.

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EXHIBIT A

(Sheet 1 of 2)

**SPECIFIC INFORMATION REQUIRED WITH BID
JACKETED EPR INSULATED POWER CABLE-15 KV**

(Submit Separate Sheets for each Item)

Manufacturer's Name: _____

Brand Name: _____

Distributor's Name: _____

1. AMPACITY

- 3 cables in conduit 30" below grade
- 20°C Earth ambient temperature
- Earth thermal resistivity, RHO = 90
- 75% Load Factor

- a. Continuous at 90°C _____ A
- b. Continuous at 105°C _____ A
- c. Emergency at 140°C/time _____ A/hr
- d. Short circuit at 250°C/time _____ A/sec

2. CONDUCTOR

- a. Size _____
- b. Material (CU or AL) _____
- c. Number and size of strands _____
- d. Conductor Diameter _____ inches

3. CONDUCTOR SHIELD

- a. Manufacturer brand and type _____
- b. Thickness _____ inches

4. INSULATION

- a. Manufacturer brand and type _____
- b. Thickness _____ inches
- c. Diameter over insulation _____ inches
- d. Insulation losses @ rated voltage _____

<u>Temp</u>	<u>Cable Loading</u>	<u>SIC*</u>	<u>DF*</u>	<u>Loss (watts/foot)*</u>
20°C	_____ %	_____	_____	_____
30°C	_____ %	_____	_____	_____
50°C	_____ %	_____	_____	_____
90°C	_____ %	_____	_____	_____
105°C	_____ %	_____	_____	_____

*Values are to be guaranteed. Average values will not be acceptable.

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**SPECIFIC INFORMATION REQUIRED WITH BID
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(Submit Separate Sheets for each Item)

- 5. **INSULATION NON METALLIC SHIELD**
 - a. Manufacturer brand and type _____
 - b. Thickness _____ inches

- 6. **METALLIC SHIELD (when specified)**
 - a. Thickness _____ mils
 - b. Overlap _____ %

- 7. **CONCENTRIC NEUTRAL (when specified)**
 - a. Material (CU or AL) _____
 - b. 1/3 or full _____
 - c. Number and size of strands _____

- 8. **CABLE JACKET**
 - a. Manufacturer brand and type _____
 - b. Thickness _____ inches

- 9. **PULLING TENSION**
 - a. Recommended Pulling Method
(pulling eye or grip) _____
 - b. Maximum allowable 1 phase
pulling tension _____ lbs
 - c. Maximum allowable 3 phase
pulling tension _____ lbs

- 10. **OVERALL CABLE**
 - a. Weight _____ lbs/ft
 - b. Diameter over jacket _____ inches

11. **EXCEPTION(S) TO EWEB SPECIFICATION:**

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