

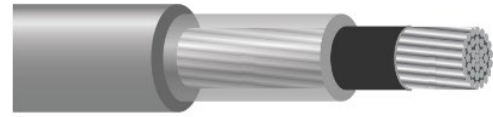


Equipment Specification

Document No.: 4350.063

Originating Department: Distribution Engineering

**Aluminum Conductor, ACSR/GA,
15 kV, Spacer Aerial, Three Layers**



1. Introduction

This is a general specification that covers the minimum requirements for 15 kV aluminum conductor ACSR/GA (spacer aerial) to be used in the distribution system in Puerto Rico. Further information will be provided by LUMA Energy at the time of order placement and will provide information on site specific conditions, quantity, and other requirements. This document includes the general electrical and mechanical characteristics of the material.

2. Special Requirements

- 2.1. Samples shall be furnished as requested by LUMA Energy. All documented testing required by applicable specifications and standards shall be submitted with product samples, including mechanical drawings, prior to approval. Vendors that have supplied this material to PREPA/LUMA on previous orders, will not have to furnish samples at bid opening. With the exception if any material or design changes were made to an approved product, vendor must re-submit sample to the Material Specification engineer for approval before shipping. The material will be received at the LUMA's general warehouse (011) at Palo Seco, Puerto Rico. Shipping will include transportation and unloading at the indicated warehouse.
- 2.2. Product shall be manufacture in accordance with the latest issue ASTM, NEMA, IEEE and ANSI specification. When conflicts occur between Purchaser's specifications and the ASTM, NEMA, IEEE, or ANSI specifications, the Purchaser's specification shall prevail. The product shall be furnished as described here in this specification or as amended by the purchase order. Any changes or updates to the Supplier's procedures, quality routines, and/or inspection layout shall be liable for all costs incurred for product that is refused/rejected.
- 2.3. Upon inspection of incoming material, the purchaser reserves the right to refuse product shipments and to determine the acceptability or rejection of product received. The Supplier shall be liable for all costs incurred for product that is refused/rejected.
- 2.4. Vendor shall submit two (2) quotes: one for conductor on steel reel and another for conductor on wood reel. See detail of reels in section 6.



Equipment Specification

Document No.: 4350.063

Originating Department: Distribution Engineering

Aluminum Conductor, ACSR/GA, 15 kV, Spacer Aerial, Three Layers

3. Quantity/Literature

Descriptive and technical literature must be supplied by vendor at time of bidding. This literature may include, but is not limited to details of material, drawings, documented testing, and instructions for use and installation. Failure to submit documents on time will cause bidder disqualification. For products described in this specification as requiring qualification, awards will be made only for such products that, prior to the time for opening of bids, had been tested and/or approved by LUMA. Evidence of PREPA's and/or LUMA Energy's approval of the equipment or material shall be supplied by vendor if requested by LUMA Energy.

4. Markings

- 4.1. Conductor reels shall be marked outside with LUMA Energy's purchase order, item number, description of wire & specification date, code name, net length & size, gross & tare weights, and manufacturer's name & lot/production number.
- 4.2. Packaging labels and tags shall be waterproof.

5. Equal or Approved Equal to

- 5.1. American Wire Group (for models see section 12, Table 1).
- 5.2. Southwire Company
- 5.3. Viakon

6. Packaging

- 6.1. All material and equipment shall be packaged and marked in such a way as to facilitate handling and protection from damage and that the receiving warehouse can readily identify it and send it, in one complete unit, to a field location without opening crates or boxes to sort items and/or parts.
- 6.2. Shall be shipped continuous in a non-returnable new reel containing (see section 12 table 1 for package quantity by cable type). Conductor won't be accepted by sections.
- 6.3. Reels shall be made of steel with a finishing consisting of a high-pressure hot phosphate wash and bonding agent, zinc chromate-iron oxide primer and final enamel coat to provide the necessary extra durability.
- 6.4. Reels shall have a minimum arbor hole diameter of 2.5 in (6.35 cm).
- 6.5. Each end of the cable shall be firmly and properly secured to reel.



Equipment Specification

Document No.: 4350.063

Originating Department: Distribution Engineering

**Aluminum Conductor, ACSR/GA, 15
kV, Spacer Aerial, Three Layers**

- 6.6. Reels shall be protected against damage in ordinary handling and shipping.
 - a. Manufacturer shall protect the upper layers with pieces of wood along the transverse section of reel for cable protection.
 - b. Manufacturer shall protect cable ends from water entrance or damage by means of an adequate seal.

6.7. Reels made of treated wood conforming with AWPA (U1 & T1-17), with a retention of 0.3 lbs/cu ft (4.81 kg/cu m) of pentachlorophenol or chromated-copper-arsenate (CCA) shall be accepted. Treatment material shall comply with AWPA P9.

6.8. Other types of reels will be evaluated by Luma Energy.

7. Number Per Package (Logistics)

Package: see section 12 table 1 for quantity/conductor type or as requested by LUMA.

8. Acceptance Criteria

- 8.1. Test required: certified by external laboratories.
- 8.2. Latest applicable codes, standards, and other regulations: ANSI/ASTM (B230, B231, B232, B498, D2656), AWPA (P9, U1, T1).
- 8.3. NEMA Standard Publication No. WC 26: Binational Wire and Cable Packaging Standard.

9. Description

- 9.1. This conductor is used for overhead distribution system.
- 9.2. Shall be rated at 15 kV and consist of a concentric lay stranded aluminum conductor as per ASTM B231 with a steel reinforced (ACSR) core, in accordance with ANSI/ASTM B232.
- 9.3. Material:
 - a. Aluminum alloy 1350 H19 round conductor wire conforming with ANSI/ASTM B230.
 - b. Zinc coated, class-A galvanized steel core wire conforming with ANSI/ASTM B498.
- 9.4. Insulation, three (3) layers, preferred by LUMA:
 - a. Shall have a conductor shield of extruded semiconductor polymer not less than 15 mils (0.38 mm) thickness. Not less than 20 mils (0.51 mm) for cables 556.5 MCM and above.
 - b. Shall have an inner layer of extruded semiconductor polymer with not less than 75 mils (1.9 mm) thickness. Not less than 80 mils (2.03 mm) for cable 795 MCM.



Equipment Specification

Document No.: 4350.063

Originating Department: Distribution Engineering

**Aluminum Conductor, ACSR/GA, 15
kV, Spacer Aerial, Three Layers**

- c. Shall have an outer layer of high-density track-resistant cross-linked polyethylene (TR-XLPE with not less than 75 mils (1.9 mm) thickness. Not less than 80 mils (2.03 mm) for cable 795 MCM.
 - d. Cross-link polyethylene shall be in accordance with ASTM D2656.
- 9.5. Insulation of two (2) layers could be accepted as a second option:
- a. Shall have an inner layer of extruded semiconductor polymer with not less than 75 mils (1.9 mm) thickness. Not less than 80 mils (2.03 mm) for cable 795 MCM.
 - b. Shall have an outer layer of high-density track-resistant cross-linked polyethylene (TR-XLPE with not less than 75 mils (1.9 mm) thickness. Not less than 80 mils (2.03 mm) for cable 795 MCM.
 - c. Cross-link polyethylene shall be in accordance with ASTM D2656.
- 9.6. For size, strands, diameters (OD), weight, and ultimate strength see section 12, Table 1.

10. Inspection

The acceptance of any material or equipment shall in no way relieve the vendor from his responsibility to meet all the requirements of this specification, and it would not prevent subsequent rejection if such materials were found later to be defective.

11. Warranty

The conductor shall be designed and manufactured to provide a minimum life expectancy of 40 years. Replacement costs associated with premature conductor failure due to inadequate design of faulty manufacturing is to be the responsibility of the Supplier. The manufacturer shall guarantee that each part of the finished conductor has been manufactured in accordance with requirements of the referenced specifications and standards and that the finished conductor complies with the same requirements. The supplier/manufacturer shall agree to replace any length of conductor for two years after date of delivery if defective material or workmanship is found during installation or if the conductor fails from normal use during its first year of service. In either case, the supplier/manufacture shall be given a reasonable opportunity to inspect such defect or failure. A technical report detailing the cause(s) of the defect and the corrective measures implemented to prevent recurrence shall be provided upon request of the purchaser.



Equipment Specification

Document No.: 4350.063

Originating Department: Distribution Engineering

**Aluminum Conductor, ACSR/GA, 15
kV, Spacer Aerial, Three Layers**

12. Table 1: Warehouse and Asset Suite Identification Number

Item	Warehouse Catalog #	Asset Suite #	Package	Minimum Ultimate Strength	Strands & Conductor OD	Approx. OD	Approx. Weight/1000 ft	Suggested Manufacturer & Model
2 AWG	042-82619	82619	5,000 ft (1,524 m) per reel	2,700 lbf (12.01 kN)	6 / 1 0.316" (8.03 mm)	0.646" (1.64 cm)	202 lbs (91.6 kg)	American Wire Group (TW15-3-ACSR-2-6/1)
3/0 AWG	042-00820	37633	5,000 ft (1,524 m) per reel	6,200 lbf (27.58 kN)	6 / 1 0.502" (12.75 mm)	0.832" (2.11 cm)	393 lbs (178.3 kg)	American Wire Group (TW15-3-ACSR-3/0-6/1)
4/0 AWG	042-82620	82620	2,500 ft (762 m) per reel	7,900 lbf (35.14 kN)	6/1 0.563" (14.3 mm)	0.893" (2.27 cm)	471 lbs (236.6 kg)	American Wire Group (TW15-3-ACSR-4/0-6/1)
266.8 MCM	042-82744	82744	2,500 ft (762 m) per reel	6,500 lbf (28.91 kN)	18/1 0.609" (15.47 mm)	0.939" (2.38 cm)	474 lbs (215.0 kg)	American Wire Group (TW15-3-ACSR-266.8-18/1)
336.4 MCM	042-00911	56723	2,500 ft (762 m) per reel	8,200 lbf (36.48 kN)	18 / 1 0.684" (17.37 mm)	1.014" (2.58 cm)	570 lbs (258.5 kg)	American Wire Group (TW15-3-ACSR-336.4-18/1)
556.5 MCM	042-00986	56730	2,500 ft (762 m) per reel	18,800 lbf (83.63 kN)	24 / 7 0.914" (23.22 mm)	1.254" (3.18 cm)	949 lbs (430.6 kg)	American Wire Group (TW15-3-ACSR-556.5-24/7)
795 MCM	042-83217	83217	2,500 ft (762 m) per reel	29,900 lbf (133 kN)	26 / 7 1.108" (28.14 mm)	1.468" (3.73 cm)	1350 lbs (612.3 kg)	American Wire Group (TW15-3-ACSR-795-26/7)

— End of Specification —



Equipment Specification

Document No.: 4350.063

Originating Department: Distribution Engineering

**Aluminum Conductor, ACSR/GA, 15
kV, Spacer Aerial, Three Layers**

Document History

Item	Version
042-82619	2
042-00820	8
042-82620	2
042-82744	2
042-00911	9
042-00986	2
042-83217	1

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Author Miguel J. Rios
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Handwritten signatures in blue ink over horizontal lines, corresponding to the Author, Reviewer, and Approver Manager roles.