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Document Title:

Fiberglass Crossarm-Dead End (5 ft. and 8 ft.) and Alley Arm (8 ft.)

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Management Approval (If apply)

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Related/Referenced Documents

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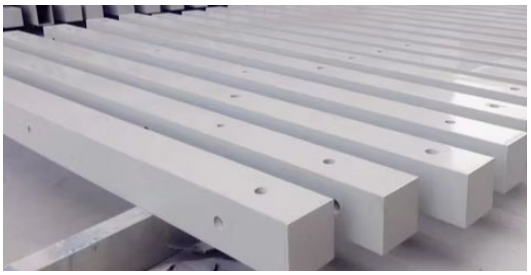
Version History

Version	Date	Revision
01	June 16, 2025	Initial Release. Items 008-82814, 008-82815, and 008-83421 were transferred from document 4350.155 and 4350.189 respectively. This document supersedes documents 4350.155 and 4350.189.

Item Version History

Warehouse Catalog #	Asset Suite #	Version	Date
008-82814	82814	6	06/16/2025
008-82815	82815	6	06/16/2025
008-83421	83421	3	06/16/2025



1. Introduction

This is a general specification that covers the minimum requirements for fiberglass crossarm dead end and fiberglass alley arm 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 characteristics of the equipment/material.

2. Special Requirements

Samples shall be furnished as requested by LUMA Energy. Vendors that have supplied this equipment/material to LUMA on previous orders, will not have to furnish samples at bid opening. The equipment/material will be received at LUMA's general warehouse (011) at Palo Seco, Puerto Rico. Shipping will include transportation and unloading at the indicated warehouse.

3. Literature

3.1. Descriptive and technical literature must be supplied by the vendor at time of bidding. This literature must include, but is not limited to, details of material, drawings, documented testing, and instructions for use and installation. The literature must be an official document from and certified by the manufacturer. **Failure to submit documents on time and duly certified by the manufacturer will cause bidder disqualification.**

3.2. If required by LUMA, final drawings and documentation shall be submitted by the vendor before the manufacturing and shipping process for approval.

4. Markings

4.1. Containers shall be marked outside with LUMA Energy's purchase order and item number.

4.2. Individual package(s) shall be clearly marked with manufacturer name and item information (part number, serial number, quantity, etc.).

4.3. Packaging labels and tags shall be waterproof.

5. Packaging

5.1. All equipment/material 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.

5.2. A list of all parts included in the container and/or package must be provided at the time of delivery so the receiving personnel can verify that everything requested is present, avoiding any delay in the receiving process.

6. Number Per Package (Logistics)

Each manufacturer should define the number of crossarm per package depending on the shipping on open platforms or closed trailers for delivery according to LUMA requirements or as requested by LUMA.

7. Acceptance Criteria

7.1. Test required: certified by external qualified laboratories.

7.2. Product shall be manufactured in accordance with the latest issue below (section 7.3). When conflicts occur between purchaser's specifications and the latest issue below, the purchaser's specification shall prevail.

7.3. Latest applicable codes, standards, and other regulations:

ASTM A153	Specification for Zinc Coating (Hot Dip) on Iron and Steel Hardware
ASTM A871	Standard Specification for High-Strength Low-Alloy Structural Steel Plate with Atmospheric Corrosion Resistance
ASTM D635	Standard Test Method for Rate of Burning and/or Extent and Time of Burning of Plastics in a Horizontal Position

ASTM 8019	Standard Test Methods for Determining the Full Section Flexural Modulus and Bending Strength of Fiber Reinforced Polymer Crossarms Assembled with Center Mount Brackets.
ASTM G154	Standard Practice for Operating Fluorescent Ultraviolet (UV) Light Apparatus for Exposure of Nonmetallic Materials
ASTM B85/B85M	Standard Specification for aluminum-alloy die castings.
ASTM D570	Standard Specification for Hot-Rolled Carbon Steel Sheet and Strip, Structural Quality
ASTM D2584	Standard Test Method for Ignition Loss of Cured Reinforced Resins
ASTM D3917	Standard Specification for Dimensional Tolerance of Thermosetting Glass-Reinforced Plastic Pultruded Shapes
ASTM D4385	Standard Practice for Classifying Visual Defects in Thermosetting Reinforced Plastic Pultruded Products
ASTM D578	Standard Specification for Glass Fiber Strands
ASTM D570	Standard Specification for Hot-Rolled Carbon Steel Sheet and Strip, Structural Quality
ANSI O5.3	Solid Sawn-Wood Crossarms and Braces - Specifications and Dimensions
ANSI B18.22.1	Type A Standard for washer dimensional requirements.
ASME B1.1	Unified Inch Screw Threads
UL 94	Classification and Flame-Retardant Plastic Materials
AWS D1.1	Structural Welding Code–Steel
RUS 1724e-151	Mechanical Loading on Distribution Crossarms
RUS 1724e-200	Design Manual for High Voltage Transmission Lines
ASCE-SEI-104	American Society of Civil Engineering
IEEE	Standard 4, and IEC 60060-1: Standard for High-Voltage Testing Techniques.

7.4. If any other standard different from the ones indicated in this document is used, the supplier must provide information showing compatibility with the required ones.

8. Description

8.1. The specifications are divided into two parts in the Technical Specifications and the Special Conditions. The **Technical Specifications** will include the material, design, crossarm uses in pole types, types of crossarm, force to be considerate, deflection, drawings, final approval before manufacture, labels and markings. The **Special Conditions** will include the crossarm color, mounting bracket, hardware, structural steel and accessories, protective coating, material to be considerate, failure to meet the specification and guarantee.

8.2. **Technical Specifications**

a. Material:

The fiberglass crossarm materials shall be composed of boron-free continuous glass fiber reinforcement by ASTM D578 and thermoset resin system. The fiberglass crossarm material shall be self-extinguishing.

b. Design:

1. The supplier is responsible for the design.
2. The bidder shall submit all the design parameters, either with the runs of the program he used for his analysis or other software to prove it. **Should they do not prove their design parameters, they will be automatically disqualified.**

c. Types of poles to be used fiberglass crossarm and fiberglass alley arm:

The fiberglass crossarm base will be used for galvanized steel dodecagonal, square prestressed concrete and fiber reinforce composites poles with heights from 35 ft. to 65 ft.

d. Types of fiberglass crossarm:

The fiberglass crossarm provides crucial support to balance the tension of conductors at corners, along angled sections, and in areas with switch installations:

1. 5 ft. Fiberglass Crossarm: (Dead End):

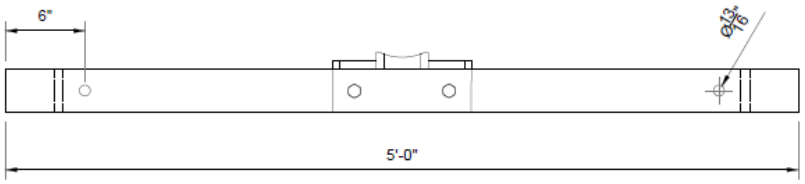
a. The fiberglass crossarm shall feature four 13/16" diameter holes with a bolt sleeve positioned inside each hole.

b. Looking at the fiberglass crossarm from above, the distance from each end to the nearest hole shall be 6" (see top view in figure below).

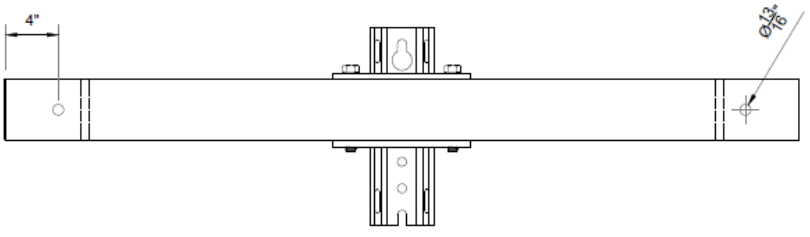
c. When viewed from the front, the distance from the end of the fiberglass crossarm to the nearest hole shall be 4" (see front view in figure below).

d. The fiberglass crossarm's cross-section should be at least 4-5/8" by 3-5/8", or as otherwise determined by design requirements.

e. A bracket shall be located at the center of the fiberglass crossarm. The base that is shown in the drawing is for illustrative purposes only. The designer will have the task of making the mounting according to the specifications requested here. (See 8.3 b).



TOP VIEW



FRONT VIEW

2. 8 ft. Fiberglass Crossarm: (Dead End):

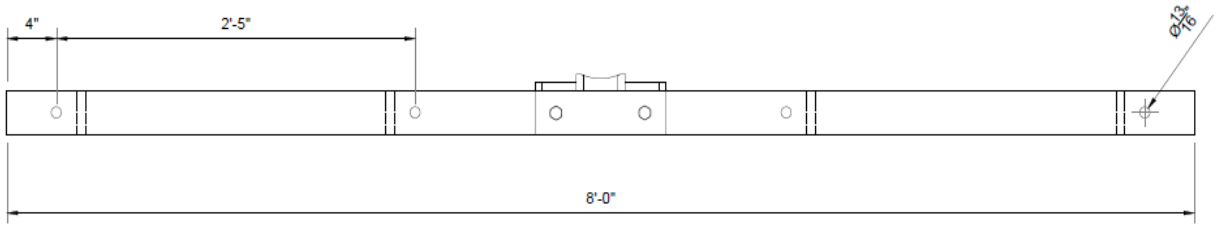
a. The fiberglass crossarm shall feature eight 13/16" diameter holes, with a bolt sleeve positioned inside each hole.

b. Viewed from above, the fiberglass crossarm has its first hole located 4” from each end. The second hole is located 2'-9” from the end of the fiberglass crossarm and is located 2'-5” from the first hole.

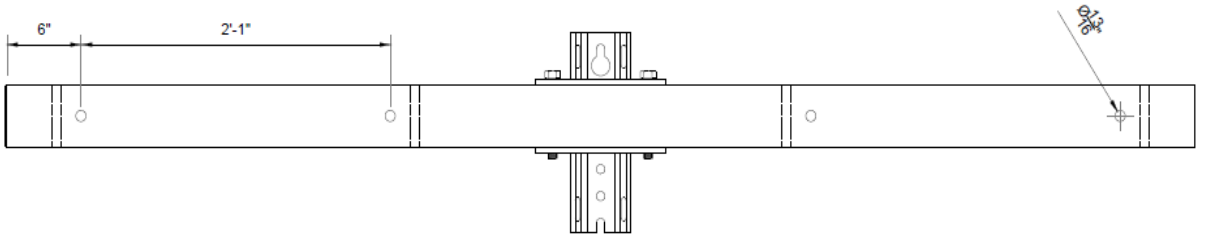
c. Viewed from the front, the first hole is 6” from each end of the fiberglass crossarm. The second hole is 2'-7” from the end of the fiberglass crossarm and is located 2'-1” from the first hole.

d. The fiberglass crossarm's cross-section should be at least 4-5/8” by 3-5/8”, or as otherwise determined by design requirements.

e. A bracket shall be located at the center of the fiberglass crossarm. The base that is shown in the drawing is for illustrative purposes only. The designer will have the task of making the mounting according to the specifications requested here. (See 8.3 b).



TOP VIEW



FRONT VIEW

3. 8 ft. Fiberglass Alley Arm:

a. The fiberglass alley arm is used to support overhead conductors when a displacement in the alignment of electrical power lines is required.

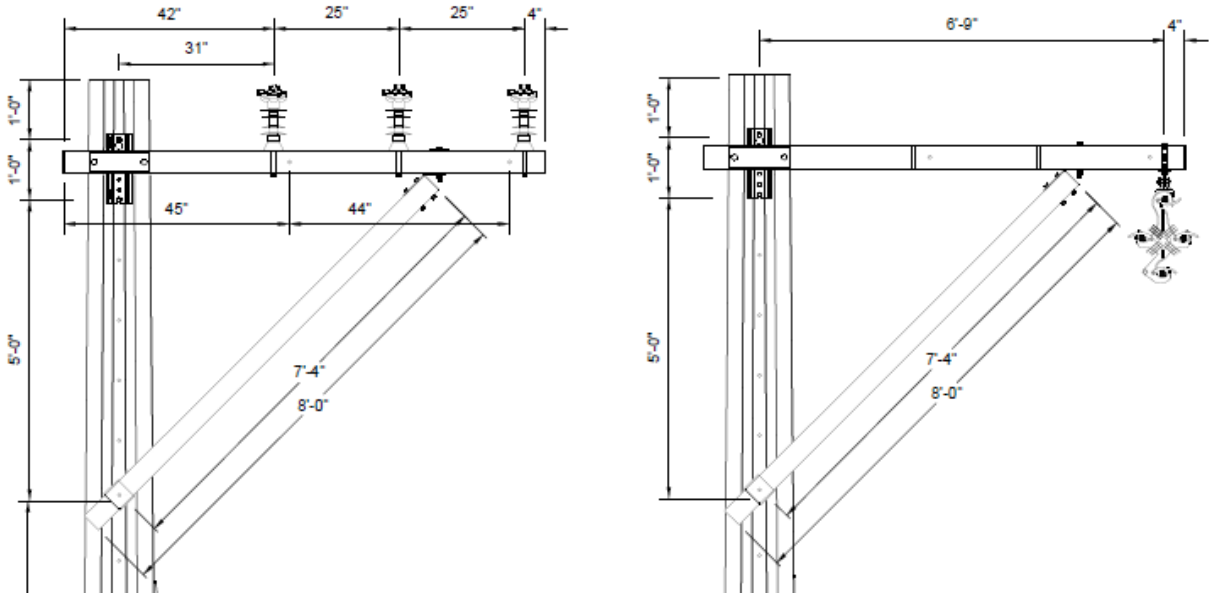
b. The fiberglass alley arm consists of one horizontal fiberglass beam with the support bracket located near one end and one diagonal fiberglass beam for reinforcement.

c. The horizontal beam comprises five 13/16" diameter holes and a bolt sleeve positioned inside each hole.

d. When viewed from the top, the distance from the end of the fiberglass alley arm crossarm (attached end) to the first hole shall be 42”. The second hole is located 25” away from the first hole. The third hole is located 25” away from the second hole and 4” away from the other end of the fiberglass alley arm (see figures below).

e. When viewed from the front, the distance from the end of the fiberglass alley arm (attached end) to the fourth hole shall be 45”. The fifth hole is located 44” away from the fourth hole (see figures below).

f. The fiberglass alley arm's cross-section should be at least 4-5/8” by 3-5/8”, or as otherwise determined by design requirements.



DIFFERENT CONFIGURATIONS

e. Forces to be considered:

1. Loading on crossarms is the sum of the following forces when applicable: conductor tensions, weight of conductors, and the force of the wind on conductors and the crossarm.

2. Unbalanced loading can occur when the tensions in the conductors that are attached "into" and "out from" the crossarm assembly are unequal because of:

    1. Change in conductor size or type.
    2. Different installation tensions.
    3. Unequal wind loading.
    4. Different ruling spans.

3. Longitudinal and Vertical Loads by fiberglass crossarm and Alley Arm:

    a. Longitudinal Load per wire:

        5. The Minimum Ultimate Force for the 5 ft fiberglass crossarm shall be 6,600 pounds: (2 wires) (3,300 pounds per wire).
        6. The Minimum Ultimate Force Capacity for the 8 ft fiberglass crossarm shall be 14,000 pounds: (4 wires) (3,500 per wire).

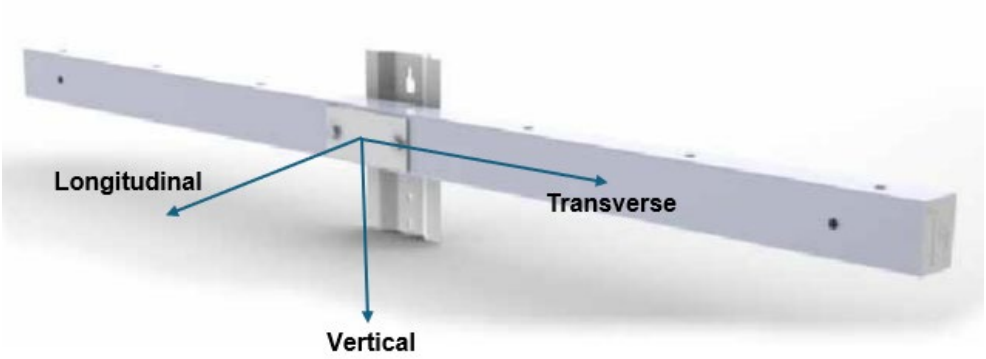
    b. Vertical Load per wire:

        The Minimum Ultimate Force Capacity for the Assembly must exceed 2,000 pounds.

    c. Alley Arm:

        1. The minimum Ultimate Force Capacity shall be 2,000 pounds per wire.
        2. Fiberglass members shall withstand a pin torque test with longitudinal load exceeding 700 pounds and transverse load exceeding 75 pounds without crushing the fiberglass beam as per RUS requirement.

d. Pattern of loads assumed:



f. Deflection:

The fiberglass crossarm shall not exhibit a deflection of greater than 3/4" vertical for both the standard and wing arm.

g. Drawings:

The bid proposal drawings shall include original documents with the following information:

1. The assembled pole showing all its components and their location.
2. General dimensions of all the structural components.
3. Weight for each fiberglass crossarm (galvanized with all accessories installed).
4. A bill of materials.
5. Details of all accessories including bolts, nuts, and washers to attach mounting bracket to the fiberglass beam, etc.

h. Final Approval before Manufacture:

1. Final design calculations shall be submitted before fabrication commences together with the shop drawing for LUMA approval.
2. After approval, one final set of drawings and design calculations in PDF format plus, a digital copy of drawings in AutoCAD 3D (DWG) shall be sent for our files.
3. All drawings shall include our purchase order number.

i. Labels and Markings:

1. Each fiberglass crossarm shall have waterproof and legible identification labels.
2. The labels shall be 4" x 2 ½" approx. in dimension, stamped with letters.
3. The labels shall contain the following minimum information:
   a. Owner's name
   b. Warehouse Number
   c. Country
   d. Fabrication Date: MM/YY
   e. Bach Number
   f. RFQ Number or PO Number
   g. Model
   h. Dimension (L x W x H)
   i. Weight
   j. Manufacture's Name

8.3. **Special Conditions**

a. Fiberglass crossarm Color:
   The fiberglass crossarm color shall be gray.
b. Mounting Bracket:
   1. The center mount bracket must be heavy duty type made of cast aluminum drilled and tapped.
   2. Mounting holes must be 13/16" in diameter with 8" and 12" center to center spacing or, alternatively, with 12" and 16" center to center spacing.
c. Hardware, Structural Steel and Accessories:
   1. Mounting bracket shall be made of 6061-T6 aluminum, hot-rolled steel, or welded structural steel.

2. All hardware, including mounting bracket, bolts, washers, and nuts shall be hot-dipped galvanized in accordance with ASTM A153. In addition, an open hole plug must be installed (included in this order).

d. Protective Coating:
   1. The fiberglass crossarm shall be treated with UV-resistant coating to protect against UV degradation.
   2. The fiberglass crossarm shall be tested for accelerated weathering and ultraviolet aging for 10,000 hours without any degradation of strength or modulus of elasticity (MOE), without deterioration of color, and shall show no visual evidence of exposed glass fibers or other reinforcements when tested in accordance with ASTM G154.
   3. UV coating shall have a minimum protective **life expectancy** of 40 years.

e. Material to be considered:
   1. Conductors, insulator, and clamp:
      a. 556.5 MCM Parakeet: Minimum Ultimate Strength (19,800 lbf), Strands & Diameters (24/7), Overall diameter (0.914 in.), and Weight/1000 ft (716.8 pounds).
      b. 266.8 MCM Partridge: Minimum Ultimate Strength (11,240 lbf), Strands & Diameters (26/7), Overall diameter (0.642 in.), and Weight/1000 ft (367.3 pounds).
      c. 3/0 AWG Pigeon: Minimum Ultimate Strength (6,620 lbf), Strands & Diameters (6/1), Overall diameter (0.502 in.), and Weight/1000 ft (230.8 pounds).
      d. Suspension Insulator: 25 kV, SML Composite, Distribution System, Minimum Specified Mechanical Load (SML): 15,000 lbf.
      e. Suspension Clamp: Minimum Ultimate Strength (25,000 lbf), Approx. Length (9.9 in), Approx. Weight (4.9 lbs).

8.4. Failure to Meet the Specification and Guarantee:

a. In the event that any equipment fails to comply with the warranties and requirements of these specifications within the period proposed or indicated, it shall be at the option of the LUMA representative to accept the material or reject it and instruct the manufacturer to proceed immediately to make such modifications or supply such new parts as may be necessary to bring it into compliance with the warranties and requirements.

b. All costs of supplying and installing new parts due to non-compliance of material with warranties and other specification requirements shall be the responsibility of the manufacturer.

9. Inspection

9.1. Upon inspection of incoming equipment/material, the purchaser reserves the right to refuse product shipments and to determine the acceptability or rejection of the product received. The supplier shall be liable for all costs incurred for a product that is rejected.

9.2. The acceptance of any equipment/material 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 equipment/materials were found later to be defective.

10. Proposal Information

10.1. Submitted proposals must include:

a. Technical information, drawings, and tests.

b. Table of Compliance completed by the bidder with reference (see Appendix 1).

11. Table 1: Warehouse and Asset Suite Identification Number

Warehouse Catalog #	Asset Suite #	Crossarm Type
008-82814	82814	5 ft Crossarm-**DE**
008-82815	82815	8 ft Crossarm-**DE**
008-83421	83421	8 ft Alley Arm

DE: DEADEND

—End of Specification —

Appendix

Appendix 1: Table of Compliance

Line	Description	Pass/Fail (P / F)	Comments
	Industry Standards		
1	The Proponent complies with the industry standards established in the specification document (ANSI, ASTM, See Section 7.3)		
	ASTM G154 / ASTM D578		
	UL 94		
	Literature		
2	Technical Information		
	Drawings		
	Descriptive and technical literature must be supplied by the vendor at time of bidding. This literature must include, but is not limited to, details of material, drawings, documented testing, and instructions for use and installation. The literature must be an official document from and certified by the manufacturer. **Failure to submit documents on time and duly certified by the manufacturer will cause bidder disqualification.**		
	Material		
3	ASTM D578 and thermoset resin system.		
	Design		
4	The bidder shall submit all the design parameters, either with the runs of the program he used for his analysis or other software to prove it. Should they do not prove their design parameters, they will be automatically disqualified.		
	Types of Crossarm		
4	**5 ft.-DE-**Crossarm shall feature four 13/16" diameter holes with a bolt sleeve positioned inside each hole. Looking at the crossarm from above, the distance from each end to the nearest hole shall be 6" (see top view in figure below). When viewed from the front, the distance from the end of the crossarm to the nearest hole shall be 4" (see front view in figure below). The crossarm's cross-section should be at least 4-5/8" by 3-5/8", or as otherwise determined by design requirements. A bracket shall be located at the center of the crossarm. The base that is shown in the drawing is for illustrative purposes only. The designer will have the task of making the mounting according to the specifications requested here. (See 8.3 b).		
	8-Ft-DE-Crossarm shall feature eight 13/16" diameter holes, with a bolt sleeve positioned inside each hole. Viewed from above, the crossarm has its first hole located 4" from each end. The second hole is located 2'-9" from the end of the crossarm and is located 2'-5" from the first hole. Viewed from the front, the first hole is 6" from each end of the crossarm. The second hole is 2'-7" from the end of the crossarm and is located 2'-1" from the first hole. The crossarm's cross-section should be at least 4-5/8" by 3-5/8", or as otherwise determined by design requirements. A bracket shall be located at the center of the crossarm. The base that is shown in the drawing is for illustrative purposes only. The designer will have the task of making the mounting according to the specifications requested here. (See 8.3 b).		
	8-Ft-AA- Alley arms are used to support overhead conductors when a displacement in the alignment of electrical power lines is required. The alley arm consists of one horizontal fiberglass beam with the support bracket located near one end and one diagonal fiberglass beam for reinforcement. The horizontal beam comprises five 13/16" diameter holes and a bolt sleeve positioned inside each hole. When viewed from the top, the distance from the end of the crossarm (attached end) to the first hole shall be 42". The second hole is located 25" away from the first hole. The third hole is located 25" away from the second hole and 4" away from the other end of the crossarm (see figures below). When viewed from the front, the distance from the end of the crossarm (attached end) to the fourth hole shall be 45". The fifth hole is located 44" away from the fourth hole (see figures below).		

Forces			
5	Longitudinal Loads: Longitudinal Load per wire: The Minimum Ultimate Force for the 5 ft fiberglass crossarm shall be 6,600 pounds: (2 wires) (3,300 pounds per wire). The Minimum Ultimate Force Capacity for the 8 ft fiberglass crossarm shall be 14,000 pounds: (4 wires) (3,500 per wire). Vertical Load per wire: The Minimum Ultimate Force Capacity for the Assembly must exceed 2,000 pounds. Alley Arm: The minimum Ultimate Force Capacity shall be 2,000 pounds per wire. Fiberglass members shall withstand a pin torque test with longitudinal load exceeding 700 pounds and transverse load exceeding 75 pounds without crushing the fiberglass beam as per RUS requirement.		
Deflection			
6	Crossarm shall not exhibit a deflection of greater than 3/4" vertical for both the standard and wing arm.		
Crossarm Color			
7	Gray		
Mounting Bracket			
8	The center must be heavy duty type made of cast aluminum drilled and tapped. Mounting holes at mounting plate must be 13/16 in. in diameter with 8 in. and 12 in. center to center spacing or, alternatively, with 12 in. and 16 in. center to center spacing.		
Hardware, Structural Steel and Accessories			
9	Mounting bracket shall be made of 6061-T6 aluminum, hot-rolled steel, or welded structural steel. All hardware, including mounting bracket, bolts, washers, and nuts shall be hot-dipped galvanized in accordance with ASTM A153 and shall have a finger-free fit.		
Protective Coating			
10	Shall be treated with UV-resistant coating to protect against UV degradation.		
	Shall be tested for accelerated weathering and ultraviolet aging for 10,000 hours without any degradation of strength or modulus of elasticity (MOE), without deterioration of color, and shall show no visual evidence of exposed glass fibers or other reinforcements when tested in accordance with ASTM G154.		
	UV coating shall have a minimum protective life expectancy of 40 years.		

NOTE: This table is only a checklist for reference. The compliance must be with the complete document. Filling out the table with "PASS" won't be accepted as a compliance without the technical information required to certify it.

4350.351 Fiberglass Crossarm (6-16-2025)

Final Audit Report 2025-06-16

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