



**Polymer Suspension Insulator
38, 115 & 230 kV**

Equipment Specification

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Author

Emmanuel E Rivera Cruz
Designer, Transmission & Substation Engineering


Signature and Date


Emmanuel E Rivera Cruz (Jun 2, 2022 09:38 EDT)

Reviewer 1

Rene Maldonado
Supervisor, Line Engineering Standards

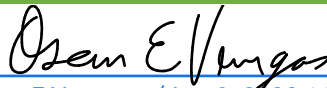
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Rene Maldonado (Jun 3, 2022 09:56 EDT)

Reviewer 2

Oscar Venegas
Lead Engineer, Trans

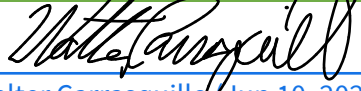
Signature and Date


Oscar E Venegas (Jun 9, 2022 11:40 EDT)

Approver

Walter Carrasquillo Alberty
Manager, T&S Standards and Materials

Signature and Date


Walter Carrasquillo (Jun 10, 2022 08:13 EDT)

Management Approval

Heriberto González
Section Manager, Standards

Signature and Date


Heriberto Gonzalez (Jun 10, 2022 09:40 EDT)

Darrel Wilvers
Director, Asset Management

Signature and Date

N/A

Version History

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00	Dec 28, 2021		Rene Maldonado	Heriberto Gonzalez	Walter Carrasquillo
01	May 13, 2022	General revision for final approval	Emmanuel E. Rivera	Rene Maldonado Oscar Venegas	Walter Carrasquillo



1. General

- 1.1. This specification describes the minimum requirements for the design, manufacturing, testing, and supply of silicone rubber composite insulators to be used in the transmission lines in Puerto Rico.
- 1.2. Further information will be provided by LUMA Energy at the time of order placement and will provide information on site conditions, quantity, and other requirements.

2. Specific Name

- 2.1. Polymer Suspension Insulator for Transmission System.

3. Basic Use

- 3.1. The suspension insulator is used for mechanical support and insulation on overhead transmission lines.

4. Special Requirements

- 4.1. Samples shall be furnished if requested by LUMA.
- 4.2. LUMA may require One (1) unit properly labeled for testing and analysis.
- 4.3. Descriptive and technical literature shall be supplied if requested by LUMA.
- 4.4. They shall be required to show evidence of LUMA's approval of the equipment if requested.

5. Marking

- 5.1. Each composite insulator shall bear a marking in accordance with ANSI Standards, identifying the following:
 - 5.1.1. Manufacturer's Name.
 - 5.1.2. Manufacturer's Catalog Number.
 - 5.1.3. Year of Manufacture.
 - 5.1.4. Specified Mechanical Load (S.M.L.).
- 5.2. The marking shall be legible and durable. The use of labels is not permitted.
- 5.3. Containers shall be marked outside with LUMA's purchase order number and code number.



6. Packaging / Labeling

- 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. Insulators shall be shipped in boxes or crates with units supported by end fittings. At least one intermediate support is required for 230 kV units.
- 6.3. Handling instructions shall be shipped inside each box or crate.
- 6.4. Corona rings shall be packaged and shipped on separate compartments of the crate or box containing the insulators. Drawings showing the installation procedure and correct position of the corona ring shall be shipped inside the crate or box.
- 6.5. Crates or boxes walls shall be protected against rodents.
- 6.6. Crates or boxes shall be lined to protect insulators from dirt and dust.
- 6.7. Packaging labels and tags shall be waterproof. Clear weatherproof containers are required for each insulator. The containers shall be removable by hand.

7. Equal or approved equal to:

- 7.1. As approved by LUMA.

8. Number per package:

- 8.1. As requested by LUMA.

9. Acceptance Criteria

- 9.1. Latest applicable codes, standards, and other regulations:
 - 9.1.1. ANSI C29.1 Test Methods for Electrical Power Insulators.
 - 9.1.2. ANSI C29.11 Standard for Composite Suspension Insulators for Overhead Transmission Lines Test.
 - 9.1.3. ANSI 987 IEEE Guide for Application of Composite Insulators.
 - 9.1.4. CSA 411 .4 Composite Suspension Insulators for Transmission Applications.
 - 9.1.5. IEC 61109 Composite Insulators for AC Overhead Lines with a Minimal Voltage Greater than 1,000 volts, Definitions, Test Methods, and Criteria.
 - 9.1.6. ASTM A153 Zinc Coating (Hot-Dip) on Iron and Steel Hardware.



10. Description

- 10.1. Temperature & Humidity: The equipment supplied shall be adequate for an operating temperature range of 5°C to 40°C (41 to 104 °F), with humidity up to 100%.
- 10.2. The composite suspension insulator design shall be long rod aerodynamic type design. The suspension insulator end fittings at the line end shall be terminated with an ANSI class-5 ball and at the grounded end with Y clevis.
- 10.3. The composite insulators shall have the parameters included on Table I.
- 10.4. The manufacturer's probable true values for the dry and wet low frequency flashover, and for the positive and negative critical impulse flashover shall include the corona ring effect, and shall be in the range specified by Table I.
- 10.5. If a corona ring is necessary, the manufacturer's probable true values for the dry and wet low frequency flashover and for the positive and negative critical impulse flashover shall include the corona ring effect, and shall be in the range specified by Table I.
- 10.6. LUMA requires corona rings for all 230 kV insulators.

10.7. Material

- 10.7.1. The complete composite insulator shall consist of a core, housing (includes sheath and shed), and metal end fittings.
- 10.7.2. The housing material shall be made of 100% silicone rubber prior to the addition of fillers.
- 10.7.3. The polymer sheath and weather sheds shall be made of a material resistant to ultraviolet (UV) radiation exposure.
- 10.7.4. Steel parts, except cotter pin, shall have the strength to withstand the load specified with the applicable safety factors.
- 10.7.5. The coating of steel parts shall be as follows:
 - 10.7.5.1. Galvanizing shall be made after complete fabrication in accordance with ASTM A153. The fabricated product after galvanizing shall be free and clear of acid drops, tear drop membrane, clean, attractive, and unscarred when received. Pieces having galvanizing which does not meet these requirements shall be rejected.
 - 10.7.5.2. The continuity of the coating application shall be in accordance with the test method described in ASTM A239 (six successive baths required).
- 10.7.6. The insulator shall be provided with high temperature vulcanized silicone rubber weathersheds, vulcanized or bonded to the fiberglass rod at intervals to provide optimum electrical performance. The strength of the silicone rubber to the rod interface shall be greater than the tearing strength of the silicone rubber.
- 10.7.7. No radial joints shall be made along the length of the sheath regardless of the distance between the end fittings. The sheath of pre-molded sheath with weather shed shall be extended inside the end fittings to protect the fiberglass core from moisture and to eliminate the possibility of discharge at joints.



10.7.8. The thickness of the sheath or weather shed covering over the rod shall not be less than $\frac{1}{8}$ ".

10.7.9. Cotter pin shall be made from cold drawn wire of bronze, brass, or stainless steel.

10.7.10. The reinforced fiberglass core shall consist of glass fibers in a resin matrix and shall be designed to withstand temperatures above 160° C without loss of its electrical and mechanical properties.

10.8. Tests

10.8.1. The composite insulators shall be tested in accordance with ANSI C29. 11, ANSI C2 9.1, CSA 411.1, and IEC 61109 standards.

10.8.2. Prototype tests shall be done on composite insulators of new designs in four (4) parts as described on section 7 of ANSI C29 .11. Each part may be performed independently on new test specimens. The test specimens shall pass the tests in each part in sequence. Prototype tests are to be performed for each class of insulator to verify the suitability of the prototype design, materials, and method of manufacture.

10.8.3. Certified reports of prototype tests performed on complete insulator of identical similar class by an independent Test Laboratory shall be submitted for review and acceptance by LUMA in line up of the actual prototype tests.

10.8.4. Type or Design tests shall be performed on composite insulators of new design, to verify those characteristics of a composite insulator which depend on its size and shape.

10.8.5. Certified reports of design or type tests, performed on complete insulator of identical design by an independent Test Laboratory, shall be submitted for review and acceptance by LUMA in lieu of the actual design or type tests.

10.8.6. The insulator, including all its hardware assembly, shall be tested in a suitable high voltage laboratory to demonstrate that the Corona Extinction Voltage (CEV) is greater than 1.2 times the maximum system operating voltage. If a corona ring is necessary, its surface shall be representative of actual LUMA field conditions.

10.8.7. The Manufacturer shall submit evidence of the Multi-Stress laboratory test reports as per IEC 61109 for the insulator rating specified in the purchase requisition.

10.8.8. The manufacturer shall submit evidence of dye penetration laboratory test reports as per CSA 411.4.

10.8.9. Quality conformance tests shall be performed at random on insulators selected from the lot to be supplied to LUMA.

10.8.10. Routine tests shall be performed on each insulator.

10.8.11. The Supplier shall provide certified copies of the factory tests results reports.



11. Inspection

11.1. 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 shall not prevent subsequent rejection if such material is found to be defective later.

12. Drawing



TABLE I

Polymer Suspension Insulators for Transmission System			
Parameters	System Voltage		
	38 kV	115 kV	230 kV
Min. Leakage Distance	46 In	125 In	220 In
Min. Dry Arc Distance	20 In	54 In	78 In
Dry Low Freq. Avg. Flashover	200 kV	535 kV	750 K kV
Wet Low Freq. Avg. Flashover	160 kV	440 kV	645 kV
Pos. Critical Imp. F. O.	350 kV	860 kV	1260 kV
Neg. Critical Imp. F. O.	-	880 kV	1310 kV
Nominal Length	24 In	65 In	90 In
SML Strength	25,000 Lbs	25,000 Lbs	25,000 Lbs
Warehouse Code Number	014-01967	014-01983	014-02007

— End of Specification —


4752.200 Polimer Suspension Insulator 38, 115 & 230 kV


Final Audit Report


2022-06-10


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