

TECHNICAL BULLETIN

TB-25-001

Title: Revised Three Phase Underground-Fed Transformer Bank Standards No. T-3-1 and T-5

Issue Date: 07/03/2025

Effective Date: 07/18/2025

Department: Distribution Standards and Materials


Addressed to:

Engineers, Designers, Consultants, Developers, Contractors, Master Electricians, Puerto Rico Electrical Contractors Association, Electrical Equipment Manufacturers, Electrical Engineers Institute, Electrical Engineers Society, Engineers and Surveyors Professional College, Master Electricians Professional College Directors, Managers, Supervisors, Inspectors, and the public

Approval:

| | |
|---|--|
| <p>Approved by:</p> <p><u>Ricardo Castro</u> Manager, Distribution Standards and Materials</p> | <p>Signature and Date:</p>  <p>07/03/2025</p> |
|---|--|

Management Approval:

| | |
|--|--|
| <p>Approved by:</p> <p><u>Reinaldo Baretty</u> Director, System Standards and Records</p> | <p>Signature and Date:</p>  <p>07/18/2025</p> |
|--|--|

This Bulletin annuls and replaces the following Bulletin(s): N/A

| Referenced Documents | | | |
|----------------------|---|---------|------------|
| Document Number | Title | Version | Date |
| 4301.053 | Standard no. T-3-1 - Three Phase Underground Fed Transformer Bank | 7 | 02/26/2024 |
| 4301.053 | Standard no. T-3-1 - Three Phase Underground-Fed Transformer Bank | 8 | 07/03/2025 |
| 4301.055 | Standard no. T-5 - Three Phase Underground Fed Transformer Bank with Metering Instrument Transformers | 11 | 02/26/2024 |
| 4301.055 | Standard no. T-5 - Three Phase Underground-Fed Transformer Bank with Metering Instrument Transformers | 12 | 07/03/2025 |

Table of Contents

| | |
|--|---|
| 1. Introduction | 3 |
| 2. Technical Norms or Provisions | 3 |
| 3. Appendixes | 4 |

1. Introduction

As the responsible entity, **LUMA Energy** establishes and updates the norms, standards, and regulations that guarantee the construction and installation of equipment in the transmission and distribution system. The regulations are adjusted according to the technological changes that affect our system through releases and technical bulletins. These documents provide immediate guidelines for the construction and installation of technical equipment.

The dynamic nature of the standard drawings demands continuous improvement to address the continually changing requirements related to safety, design, construction, and operational aspects of the electrical distribution standards. As a result, specific standards for the installation of a three-phase underground-fed transformer bank have been updated to align with the current best practices—and material efficiencies. An overview of the modifications made to these standards is included, along with the updated standards and their applicability.

2. Technical Norms or Provisions

The following standards have been revised:

- Standard no. T-3-1, *Three Phase Underground Fed Transformer Bank* (document no. 4301.053), dated February 26, 2024
- Standard no. T-5, *Three Phase Underground Fed Transformer Bank with Metering Instrument Transformer* (document no. 4301.055), dated February 26, 2024

Modifications were made in order to simplify the construction, maintaining compliance with current applicable industry codes and standards. Among the most significant ones are:

- Risers' ducts installation placement on a different side of the pole in both standards.
- Notes were updated to provide clarity for field implementation and inspection.
- Materials list names were conformed with the updated Distribution System Materials List (document no. 4300.018).

This document supersedes any previous version of standards no. T-3-1 and T-5 issued by LUMA prior to the effective date of this document.

3. **Appendixes**

- Standard no. T-3-1 (V8) – *Three Phase Underground-Fed Transformer Bank*
- Standard no. T-5 (V12) – *Three Phase Underground-Fed Transformer Bank with Metering Instrument Transformers*



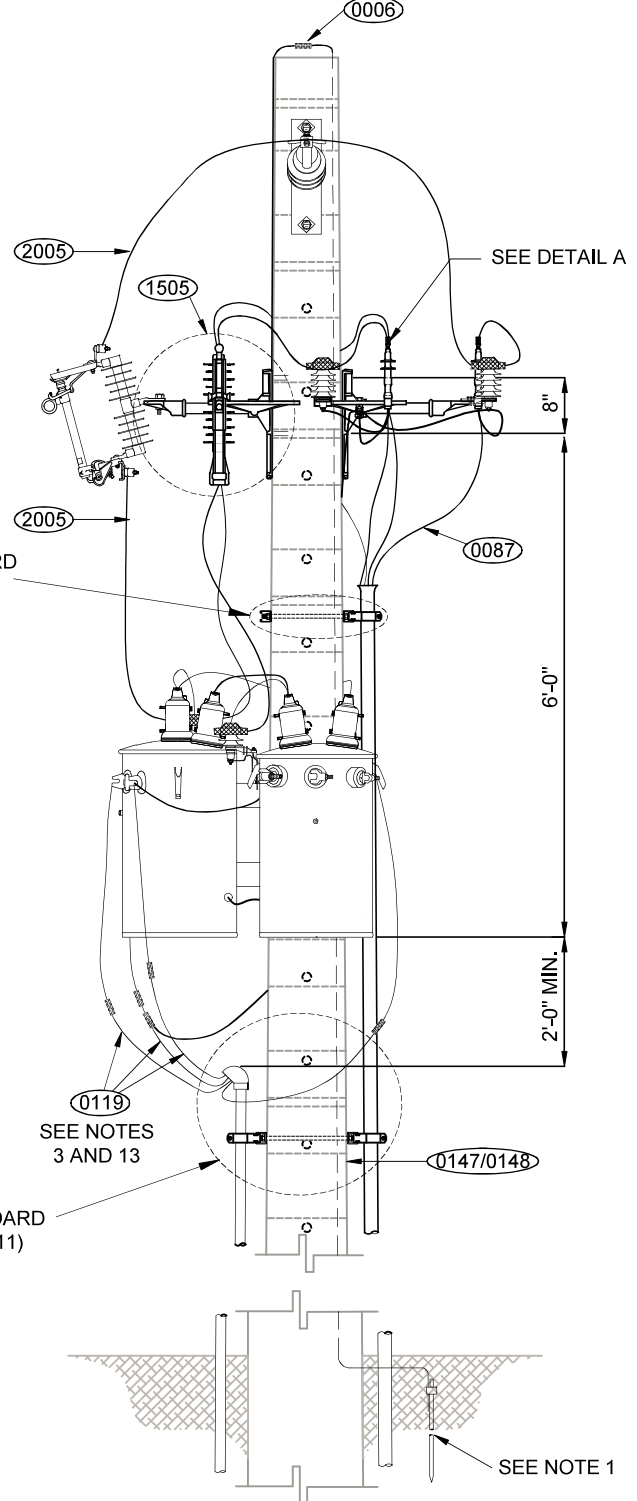
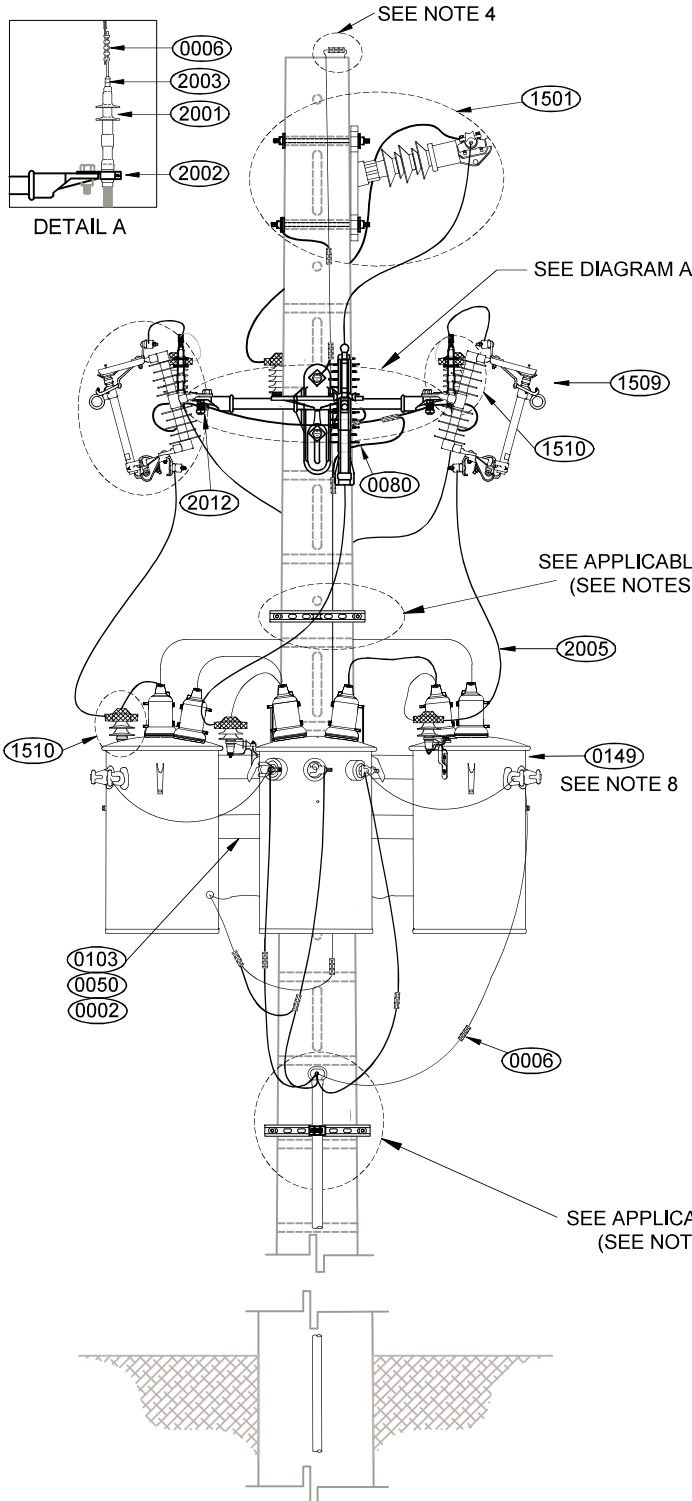
DISTRIBUTION ENGINEERING

OVERHEAD DISTRIBUTION STANDARDS

TITLE:

**THREE PHASE UNDERGROUND-FED TRANSFORMER BANK
MAXIMUM VOLTAGE: 13.2 KV**

| | | | |
|--------------|------------------------------|---------|-------------|
| STANDARD NO. | T-3-1 | VERSION | 8 |
| DOCUMENT NO. | 4301.053 | | |
| PAGE | 1 OF 3 | DATE | JUL 3, 2025 |
| SUBMITTED | LUIS R. SOTO LIC. 11658 | | |
| REVIEWED | IVETTE D. SANCHEZ LIC. 13837 | | |
| APPROVED | RICARDO CASTRO LIC. 12135 | | |
| DIGITIZED | EMILIO CUADRADO LIC. 3000 | | |
| | VICTOR R. FEBRES LIC. 3412 | | |





DISTRIBUTION ENGINEERING

OVERHEAD DISTRIBUTION STANDARDS

TITLE:

THREE PHASE UNDERGROUND-FED TRANSFORMER BANK
MAXIMUM VOLTAGE: 13.2 KV
NOTES

STANDARD NO. T-3-1 VERSION 8
 DOCUMENT NO. 4301.053
 PAGE 2 OF 3 DATE JUL 3, 2025
 SUBMITTED LUIS R. SOTO LIC. 11658
 REVIEWED IVETTE D. SANCHEZ LIC. 13837
 APPROVED RICARDO CASTRO LIC. 12135
 DIGITIZED EMILIO CUADRADO LIC. 3000
VICTOR R. FEBRES LIC. 3412

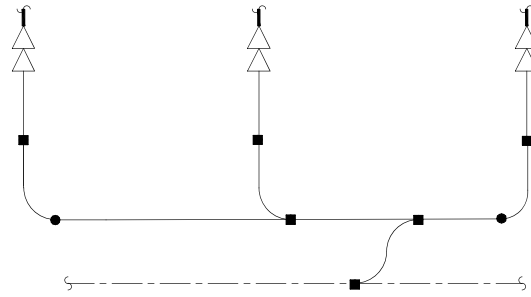







DIAGRAM A
BONDING CONNECTION - ONE LINE DIAGRAM

LEGEND:

-  CABLE TERMINATION
-  BRONZE MALE SERVICE POST CONNECTOR (ITEM 2012)
-  CONNECTOR (ITEM 0006)
-  ELECTRICAL COMPONENT GROUND TERMINAL
-  POLE GROUND CONDUCTOR

NOTES:

1. REFER TO ASSEMBLY NO. ASSY-1511 FOR POLE GROUND INSTALLATION. THE NEUTRAL CONDUCTOR SHALL BE EFFECTIVELY BONDED TO THE GROUNDING SYSTEM.
2. ALL MINIMUM VERTICAL CLEARANCES BETWEEN CONDUCTORS AT THE POLE ARE BASED UPON NESC RULE 235C.
3. TRIPLEX CABLE (ITEM 0119) SHALL BE PROPERLY RATED AND SIZED IN COMPLIANCE WITH THE NATIONAL ELECTRICAL CODE (NEC) REQUIREMENTS AND THE TRANSFORMER RATING (KVA).
4. REFER TO ASSEMBLY NO. ASSY-1512 FOR BONDING TO GROUND CONNECTION DETAILS.
5. STAINLESS STEEL MATERIAL SHALL BE USED WITHIN 1 MILE OF SALTWATER BODIES.
6. REFER TO ASSEMBLY NO. ASSY-1513 FOR AVIAN AND ANIMAL PROTECTION GUIDELINES.
7. MAXIMUM RECOMMENDED SPAN IS 150'-0" IN URBAN AREAS. FOR RURAL AREAS, THE SPAN DEPENDS ON SITE TOPOGRAPHY.
8. THE MAXIMUM SIZE OF THE TRANSFORMER ALLOWED IS 100 KVA, UNLESS IT IS BEING TRANSFERRED TO LUMA, WHERE THE LIMIT IS REDUCED TO 75 KVA.
9. REFER TO ASSEMBLY NO. ASSY-1510 FOR SURGE ARRESTER INSTALLATION DETAILS.
10. REFER TO STANDARD NO. URD-4 OR URD-4-A OF THE UNDERGROUND ELECTRICAL DISTRIBUTION SYSTEM MANUAL FOR INSTALLATION DETAILS AND MATERIALS OF THE PRIMARY AND SECONDARY RISERS SHOWN IN THIS STANDARD.
11. REFER TO ASSEMBLY NO ASSY-2501 OF THE UNDERGROUND ELECTRICAL DISTRIBUTION SYSTEM MANUAL FOR INSTALLATION DETAILS AND MATERIALS NECESSARY TO ATTACH THE PRIMARY AND SECONDARY RISERS SHOWN IN THIS STANDARD TO THE POLE.
12. REFER TO STANDARD NO. M-12-2 FOR TRANSFORMER CONNECTION DETAILS.
13. FOR THE SECONDARY BUSHINGS OF TRANSFORMERS, STRANDED COPPER CABLE TYPE XHHW-2 (ITEM 2005) WITH VOLTAGE RATING OF 600 V CAN BE USED INSTEAD OF TRIPLEX CABLE (ITEM 0119). THIS TYPE OF CABLE SHALL BE USED FOR 75 KVA AND 100 KVA TRANSFORMERS.



DISTRIBUTION ENGINEERING

OVERHEAD DISTRIBUTION STANDARDS

TITLE:

THREE PHASE UNDERGROUND-FED TRANSFORMER BANK
 MAXIMUM VOLTAGE: 13.2 KV
 BILL OF MATERIAL

STANDARD NO. T-3-1 VERSION 8
 DOCUMENT NO. 4301.053
 PAGE 3 OF 3 DATE JUL 3, 2025
 SUBMITTED LUIS R. SOTO LIC. 11658
 REVIEWED IVETTE D. SANCHEZ LIC. 13837
 APPROVED RICARDO CASTRO LIC. 12135
 DIGITIZED EMILIO CUADRADO LIC. 3000
VICTOR R. FEBRES LIC. 3412

MATERIALS

| NO. | GENERAL DESCRIPTION | WAREHOUSE ITEM | QTY. |
|-----------|---|----------------|--|
| 0002 | FLAT SQUARE WASHER | VARIES | 2 |
| 0006 | COMPRESSION SPLICES AND CONNECTORS | VARIES | AS REQ. |
| 0050 | DOUBLE ARMING BOLT | VARIES | 2 |
| 0080 | BARE COPPER CONDUCTOR | VARIES | AS REQ. |
| 0087 | 15 KV UNDERGROUND CABLE | VARIES | AS REQ. |
| 0103 | TRANSFORMER CLUSTER MOUNT | 002-13413 | 1 |
| 0119 | TRIPLEX CABLE | VARIES | AS REQ. |
| 0147/0148 | CONCRETE, METAL OR COMPOSITE POLE | VARIES | 1 |
| 0149 | POLE MOUNTED DISTRIBUTION TRANSFORMER | VARIES | 3 |
| 1501 | SIDE POST INSULATOR ASSEMBLY | ASSY-1501 | 1 FIGURE A |
| 1505 | FIBERGLASS STAND-OFF BRACKET ASSEMBLY | ASSY-1505 | 2 FIGURE C |
| 1509 | FUSE CUTOUT ASSEMBLY | ASSY-1509 | 3 |
| 1510 | SURGE ARRESTER ASSEMBLY | ASSY-1510 | 6 3-FIGURE A, 3-FIGURE B |
| 1511 | POLE GROUND ASSEMBLY | ASSY-1511 | 1 |
| 1512 | EQUIPMENT AND HARDWARE BONDING TO GROUND ASSEMBLY | ASSY-1512 | 6 1-FIGURE A, 3-FIGURE B, 1-FIGURE D, 1-FIGURE F |
| 1514 | PIN TYPE POLYMER INSULATOR ASSEMBLY | ASSY-1514 | 1 FIGURE A |
| 2001 | OUTDOOR CABLE TERMINATION STRESS CONE | VARIES | 3 |
| 2002 | CABLE AND STRESS CONE SUPPORT BRACKET | VARIES | 3 |
| 2003 | PIN TERMINAL CONNECTOR | VARIES | 3 |
| 2005 | STRANDED COPPER CABLE, 600 V, XHHW-2 | VARIES | AS REQ. |
| 2012 | BRONZE MALE SERVICE POST CONNECTOR | VARIES | 2 |



DISTRIBUTION ENGINEERING

OVERHEAD DISTRIBUTION STANDARDS

TITLE:
**THREE PHASE UNDERGROUND-FED TRANSFORMER BANK
 WITH METERING INSTRUMENT TRANSFORMERS**
 MAXIMUM VOLTAGE: 13.2 KV
 NOTES

STANDARD NO. T-5 VERSION 12
 DOCUMENT NO. 4301.055
 PAGE 2 OF 4 DATE JUL 3, 2025
 SUBMITTED LUIS R. SOTO LIC. 11658
 REVIEWED IVETTE D. SANCHEZ LIC. 13837
 APPROVED RICARDO CASTRO LIC. 12135
 DIGITIZED EMILIO CUADRADO LIC. 3000
VICTOR R. FEBRES LIC. 3412

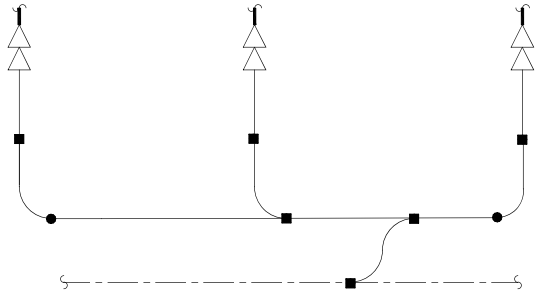


DIAGRAM A
 BONDING CONNECTION - ONE LINE DIAGRAM

LEGEND:

CABLE TERMINATION

CONNECTOR
 (ITEM 0006)

POLE GROUND
 CONDUCTOR

BRONZE MALE SERVICE
 POST CONNECTOR (ITEM
 2012)

ELECTRICAL
 COMPONENT
 GROUND TERMINAL

NOTES:

1. REFER TO ASSEMBLY NO. ASSY-1511 FOR POLE GROUND INSTALLATION. THE NEUTRAL CONDUCTOR SHALL BE EFFECTIVELY BONDED TO THE GROUNDING SYSTEM.
2. ALL MINIMUM VERTICAL CLEARANCES BETWEEN CONDUCTORS AT THE POLE ARE BASED UPON NESC RULE 235C.
3. TRIPLEX CABLE (ITEM 0119) SHALL BE PROPERLY RATED AND SIZED IN COMPLIANCE WITH THE NATIONAL ELECTRICAL CODE (NEC) REQUIREMENTS AND THE TRANSFORMER RATING (KVA).
4. REFER TO ASSEMBLY NO. ASSY-1512 FOR BONDING TO GROUND CONNECTION DETAILS.
5. STAINLESS STEEL MATERIAL SHALL BE USED WITHIN 1 MILE OF SALTWATER BODIE.
6. REFER TO ASSEMBLY NO. ASSY-1513 FOR AVIAN AND ANIMAL PROTECTION GUIDELINES.
7. MAXIMUM RECOMMENDED SPAN IS 150'-0" IN URBAN AREAS. FOR RURAL AREAS, THE SPAN DEPENDS ON SITE TOPOGRAPHY.
8. THE MAXIMUM SIZE OF THE TRANSFORMER ALLOWED IS 100 KVA.
9. REFER TO ASSEMBLY NO. ASSY-1510 FOR SURGE ARRESTER INSTALLATION DETAILS.
10. REFER TO STANDARD NO. URD-4 OR URD-4-A OF THE UNDERGROUND ELECTRICAL DISTRIBUTION SYSTEM MANUAL FOR INSTALLATION DETAILS AND MATERIALS OF THE PRIMARY AND SECONDARY RISERS SHOWN IN THIS STANDARD.
11. REFER TO ASSEMBLY NO ASSY-2501 OF THE UNDERGROUND ELECTRICAL DISTRIBUTION SYSTEM MANUAL FOR INSTALLATION DETAILS AND MATERIALS NECESSARY TO ATTACH THE PRIMARY AND SECONDARY RISERS SHOWN IN THIS STANDARD TO THE POLE.
12. THIS STANDARD IS ONLY FOR PRIVATE SUBSTATIONS.
13. FOR THE SECONDARY BUSHINGS OF TRANSFORMERS, STRANDED COPPER CABLE TYPE XHHW-2 (ITEM 2005) WITH VOLTAGE RATING OF 600 V CAN BE USED INSTEAD OF TRIPLEX CABLE (ITEM 0119). THIS TYPE OF CABLE SHALL BE USED FOR 75 KVA AND 100 KVA TRANSFORMERS.



DISTRIBUTION ENGINEERING

OVERHEAD DISTRIBUTION STANDARDS

| | |
|---|--|
| TITLE: THREE PHASE UNDERGROUND-FED TRANSFORMER BANK WITH METERING INSTRUMENT TRANSFORMERS MAXIMUM VOLTAGE: 13.2 KV BILL OF MATERIAL | STANDARD NO. <u>T-5</u> VERSION <u>12</u> |
| | DOCUMENT NO. <u>4301.055</u> |
| | PAGE <u>3 OF 4</u> DATE <u>JUL 3, 2025</u> |
| | SUBMITTED <u>LUIS R. SOTO LIC. 11658</u> |
| | REVIEWED <u>IVETTE D. SANCHEZ LIC. 13837</u> |
| APPROVED <u>RICARDO CASTRO LIC. 12135</u> | |
| DIGITIZED <u>EMILIO CUADRADO LIC. 3000</u> | |
| | <u>VICTOR R. FEBRES LIC. 3412</u> |

| MATERIALS | | | |
|-----------|---|----------------|--|
| NO. | GENERAL DESCRIPTION | WAREHOUSE ITEM | QTY. |
| 0002 | FLAT SQUARE WASHER | VARIES | 4 |
| | FLAT ROUND WASHER | VARIES | 32 |
| | SPLIT LOCK WASHER | VARIES | 16 |
| 0006 | COMPRESSION SPLICES AND CONNECTORS | VARIES | AS REQ. |
| 0050 | DOUBLE ARMING BOLT | VARIES | 4 |
| 0080 | BARE COPPER CONDUCTOR | VARIES | AS REQ. |
| 0087 | 15 KV UNDERGROUND CABLE | VARIES | AS REQ. |
| 0103 | TRANSFORMER CLUSTER MOUNT | 002-13413 | 1 |
| 0104 | CURRENT TRANSFORMER | VARIES | 2 |
| 0105 | VOLTAGE TRANSFORMER | VARIES | 2 |
| 0119 | TRIPLEX CABLE | VARIES | AS REQ. |
| 0145 | DOUBLE EYE TERMINAL CONNECTOR | VARIES | 8 |
| 0146 | INSTRUMENT TRANSFORMER SUPPORT | VARIES | 1 |
| 0147/0148 | CONCRETE, METAL OR COMPOSITE POLE | VARIES | 1 |
| 0149 | POLE MOUNTED DISTRIBUTION TRANSFORMER | VARIES | 3 |
| 0174 | GROUND / BOND WIRE CLAMP | VARIES | 1 |
| 1501 | SIDE POST INSULATOR ASSEMBLY | ASSY-1501 | 1 FIGURE A |
| 1505 | FIBERGLASS STAND-OFF BRACKET ASSEMBLY | ASSY-1505 | 2 FIGURE C |
| 1509 | FUSE CUTOUT ASSEMBLY | ASSY-1509 | 3 |
| 1510 | SURGE ARRESTER ASSEMBLY | ASSY-1510 | 6 3-FIGURE A, 3-FIGURE B |
| 1511 | POLE GROUND ASSEMBLY | ASSY-1511 | 1 |
| 1512 | EQUIPMENT AND HARDWARE BONDING TO GROUND ASSEMBLY | ASSY-1512 | 6 1-FIGURE A, 3-FIGURE B, 1-FIGURE D, 1-FIGURE F |



DISTRIBUTION ENGINEERING

OVERHEAD DISTRIBUTION STANDARDS

| | |
|--|--|
| TITLE: THREE PHASE UNDERGROUND-FED TRANSFORMER BANK WITH METERING INSTRUMENT TRANSFORMERS MAXIMUM VOLTAGE: 13.2 KV BILL OF MATERIAL | STANDARD NO. <u>T-5</u> VERSION <u>12</u> |
| | DOCUMENT NO. <u>4301.055</u> |
| | PAGE <u>4 OF 4</u> DATE <u>JUL 3, 2025</u> |
| | SUBMITTED <u>LUIS R. SOTO LIC. 11658</u> |
| | REVIEWED <u>IVETTE D. SANCHEZ LIC. 13837</u> |
| | APPROVED <u>RICARDO CASTRO LIC. 12135</u> |
| DIGITIZED <u>EMILIO CUADRADO LIC. 3000</u> | |
| | <u>VICTOR R. FEBRES LIC. 3412</u> |

| MATERIALS | | | |
|-----------|---------------------------------------|----------------|---------------|
| NO. | GENERAL DESCRIPTION | WAREHOUSE ITEM | QTY. |
| 1514 | PIN TYPE POLYMER INSULATOR ASSEMBLY | ASSY-1514 | 2 FIGURE A |
| 2001 | OUTDOOR CABLE TERMINATION STRESS CONE | VARIES | 3 |
| 2002 | CABLE AND STRESS CONE SUPPORT BRACKET | VARIES | 3 |
| 2003 | PIN TERMINAL CONNECTOR | VARIES | 3 |
| 2005 | STRANDED COPPER CABLE, 600 V, XHHW-2 | VARIES | AS REQ. |
| 2009 | HEXAGONAL NUT | 002-82038 | 16 |
| 2012 | BRONZE MALE SERVICE POST CONNECTOR | VARIES | 2 |
| 2048 | HEX HEAD BOLT | 038-83218 | 16 |









TB-25-001 Revised Three Phase Underground-Fed Transformer Bank Standards No. T-3-1 and T-5.docx

Final Audit Report

2025-07-18

| | |
|-----------------|--|
| Created: | 2025-07-03 |
| By: | Kary Gonzalez (kary.gonzalezmonzon@lumapr.com) |
| Status: | Signed |
| Transaction ID: | CBJCHBCAABAAL9y9Gy_TR76ji9I5Iqn_hPHwf_JT0WsY |

"TB-25-001 Revised Three Phase Underground-Fed Transformer Bank Standards No. T-3-1 and T-5.docx" History

-  Document created by Kary Gonzalez (kary.gonzalezmonzon@lumapr.com)
2025-07-03 - 1:53:01 PM GMT
-  Document emailed to Ricardo Castro (ricardo.castro@lumapr.com) for signature
2025-07-03 - 1:53:07 PM GMT
-  Email viewed by Ricardo Castro (ricardo.castro@lumapr.com)
2025-07-03 - 2:06:36 PM GMT
-  Document e-signed by Ricardo Castro (ricardo.castro@lumapr.com)
Signature Date: 2025-07-03 - 2:50:04 PM GMT - Time Source: server
-  Document emailed to Reinaldo Baretty (reinaldo.baretty@lumapr.com) for signature
2025-07-03 - 2:50:06 PM GMT
-  Email viewed by Reinaldo Baretty (reinaldo.baretty@lumapr.com)
2025-07-18 - 2:37:29 PM GMT
-  Document e-signed by Reinaldo Baretty (reinaldo.baretty@lumapr.com)
Signature Date: 2025-07-18 - 2:39:04 PM GMT - Time Source: server
-  Agreement completed.
2025-07-18 - 2:39:04 PM GMT