GUAM POWER AUTHORITY

Post Office Box 2977
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TRANSMISSION AND DISTRIBUTION SPECIFICATION

Specification No. E-007

FOR

POTENTIAL TRANSFORMER OUTDOOR TYPE

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1.0 SCOPE:

This specification covers Guam Power Authority's requirements for potential transformers used in station metering and relaying application at line operating voltages herein specified.

2.0 SERVICE CONDITIONS AND OPERATION:

The potential transformer and its accessories are intended for use in an average ambient temperature of 21-32 deg. C (70-90 deg. F) with corrosive, salt air environment, sustained wind strengths of 170 MPH, and subject to IBC seismic zone 4 conditions.

3.0 CONFORMANCE TO SPECIFICATION REQUIREMENTS:

The potential transformers shall meet the requirements of the following standards and specifications, including latest revisions with respect to material, design and tests.

3.1 Applicable Standards

INSTITUTE OF ELECTRICAL AND ELECTRONICS ENGINEERS (IEEE) / AMERICAN NATIONAL STANDARDS INSTITUTE, INC. (ANSI)

C57.13	Standard Requirements for Instrument Transformers
C57.168	Guide for Low-Frequency Dielectric Testing for Distribution, Power, and Regulating Transformers
C57.12.70	Standard for Standard Terminal Markings and Connections for Distribution and Power Transformers
IEEE 693	Recommended Practice for Seismic Design of Substations

NATIONAL ELECTRICAL MANUFACTURERS ASSOCIATION (NEMA)

HV 80036	Methods of Measurement of Radio Influence Voltage (RIV) of High Voltage Apparatus
CC1	Electric Power Connection for Substation

AMERICAN SOCIETY FOR TESTING AND MATERIALS (ASTM)

D3487	Standard Specification for Mineral Insulating Oil Used in Electrical Apparatus
D1535-14	Standard Practice for Specifying Color by the Munsell System

MILITARY SPECIFICATION

NFPC-MIL-DTL-53030	Primer Coating, Epoxy, Water Based, Lead and Chromate Free

3.2 Deviations and Non – Conformance Requirements

3.2.1 Deviations from this specification or changes in the material or design after the purchase order has been placed must be approved by the GPA Engineering Department and acknowledged by a Purchase Order Amendment issued by Guam Power Authority.

3.2.2 Units received with deviations or non-conformance that are not acknowledged as specified in Section 3.2.1, are subject to rejection. The Supplier of rejected units is responsible for any corrective action including but not limited to materials, labor and transportation necessary to dispose of, or make the units conform to this specification.

3.2.3 Notification of defects discovered before or after installation that are believed to be inherent to manufacturing problems or workmanship shall be made and forwarded to the Supplier. The description of the item, documentation of the problem and the described information, disposition and/or follow-up (as appropriate) that Guam Power Authority expects from the Supplier will be specified. The Supplier's response shall be made within thirty (30) days unless an extension is acknowledged and approved in writing by the GPA Manager of Engineering.

4.0 SUBMITTALS:

4.1 Shop drawings indicating details of construction and the outline of all connectors shall be submitted to GPA Engineering for review and approval.

Information required includes:

a. Mounting dimensions
b. Location of terminals
c. Polarity
d. Untanking clearance
e. Weights
f. Number of gallons of oil
g. Nameplate
h. Connection diagram

4.2 GPA shall be allowed two (2) weeks to review and approve drawings provided in Section 4.1 without affecting the shipping date. Delays in delivery due to drawings that are disapproved during this review period are the responsibility of the Supplier.

4.3 Drawings returned to the Supplier as approved shall be considered authorization to proceed with the work. The approval of GPA shall in no way abrogate the requirements of this specification.

4.4 Installation, Operation, and Maintenance Manuals shall be furnished which shall contain the description of components, parts and accessories, detailed installation instructions, complete instructions covering operation and maintenance of equipment, complete replacement parts list, typical ratio and phase angle curves for the ANSI meter burdens.

4.5 One (1) electronic soft file in Portable Document Format (PDF) and at least three (3) full sets of drawings and O&M manuals shall be provided at the time of delivery.

5.0 CERTIFIED LABORATORY TEST REPORTS:

Certified tests shall be conducted in accordance with IEEE/ANSI C57.13. Transformers shall undergo ratio and phase angle tests and shall be 10% above and below rated voltage at 60 Hz with IEEE burdens of W, X, Y, Z. Transformers shall receive applied potential and induced potential tests. The Supplier shall furnish two (2) hardcopies and one (1) electronic soft file in Portable Document Format (PDF) of the certified tests reports of all tests covered by this specification to the GPA Manager of Engineering within two (2) weeks prior to delivery.

6.0 RATINGS:

6.1 The potential transformer rating requirements are as follows:

System line to line voltage (kV)	34.5	115
BIL (kV)	200	550
Primary (V)	20, 125	69, 000
Secondary (V)	67.08/115	69/115
Ratio	300/175	1000/600
Number of Primary Bushings	1	1
Thermal Rating	1000 VA	6000 VA

6.2 The potential transformer shall provide 0.3% accuracy class when loaded with IEEE burdens of W, X, M and Y for 34.5 kV volt systems or 0.3% accuracy class when loaded with IEEE burdens of W, X, M, Y, Z and ZZ for 115 kV volt systems. When any or all of the secondaries are carrying any of the specified burdens, taped secondaries shall meet the specified accuracy requirements on all windings or taps.

6.3 Insulation Withstand

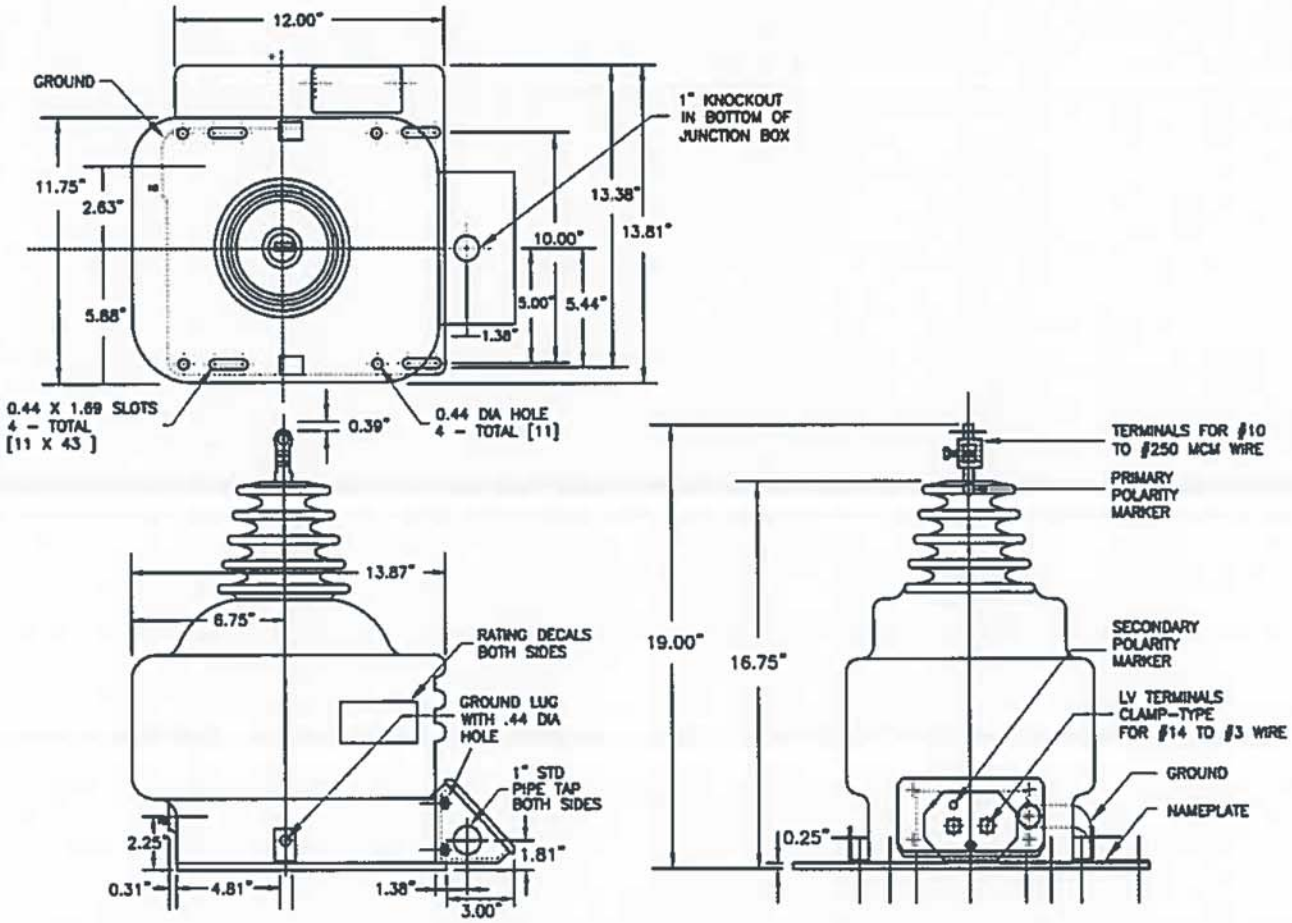
System line to line voltage (kV)	34.5	115
BIL (kV)	200	550
Low-frequency withstand, dry (kV)	70	230
Low-frequency withstand, wet (kV)	95	230
Chopped waves, crest (kV)	230	630
Chopped wave, minimum to flash (microseconds)	3	3

7.0 DESIGN AND CONSTRUCTION:

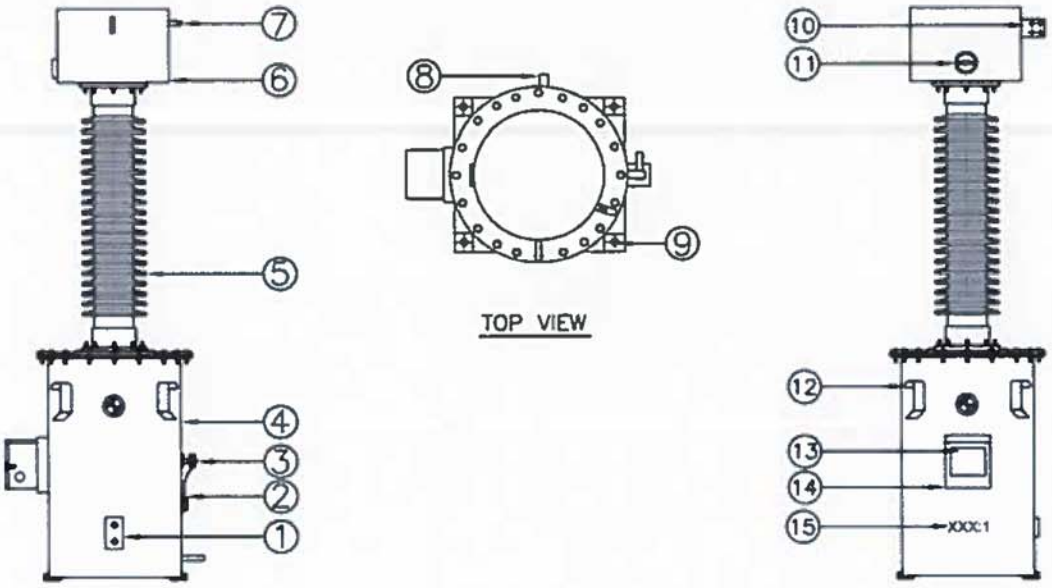
7.1 Construction

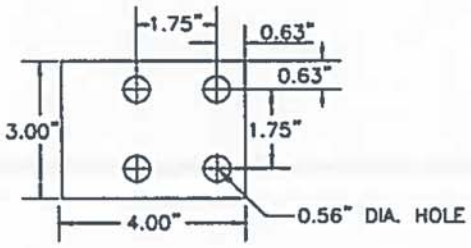
Transformers rated at 350 kV BIL and below shall have the core and coil assembly molded in polyurethane resin (black) or hydrophobic cycloaliphatic epoxy resin (grey) formulated for outdoor service. Transformers 550 kV BIL and above shall be oil filled. Transformers shall be provided with eyebolts, lugs or similar lifting provisions as well as any manufacturer recommended accessories and tools.

7.1.1 34.5 kV Class 200 kV BIL Potential Transformer

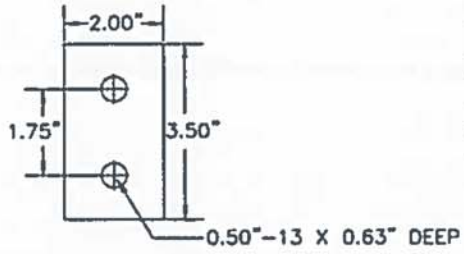


7.1.2 115 kV Class 550 kV BIL Potential Transformer





DETAIL VIEW OF HV TERMINAL



DETAIL VIEW OF GROUND PAD

NOTES:

1. NEMA 2– hole Ground Pad
2. Removable Ground Strap
3. HO Bushing
4. Welded Steel Tank
5. Porcelain Insulator,ANSI 70 Lt. Gray
6. Welded Steel Expansion Chamber
7. 3/4" National Pipe Thread (NPT) Vacuum Port and Pressure Relief Valve (PRV)
8. 1/2" Drain Valve
9. Mounting Foot
10. Primary 4 Hole NEMA Terminal Pad
11. Oil Level Indicator
12. Lifting Eyes
13. Stainless Steel Nameplate
14. Secondary Terminal Box with three 1.5" conduit hubs
15. Ratio Identification Stenciled on Tank

7.2 Windings

There shall be one primary voltage winding and two secondary voltage windings in each transformer. The secondary voltage winding (X1-X3) shall have a nominal rating of 115 Volts with a tap (X2) brought out to give a nominal (X2-X3) rating of 69 Volts for 115 kV line to line or 67.08 Volts for 34.5 kV line to line. The tertiary voltage winding (Y1-Y3) shall have a nominal rating of 115 Volts with a tap (Y2) brought out to give a nominal (Y2-Y3) rating of 69 or 67.08 Volts.

7.3 Terminals

7.3.1 Primary and secondary terminals shall be copper or high-conductivity copper alloy. They shall be provided with either a pad or stud mount drilled in accordance with the NEMA standard. Refer to section 7.1.1 for 34.5 kV Class and 7.1.2 for 115 kV Class.

7.3.2 Terminals shall also be provided with line terminal connectors to receive 2c500 MCM copper or aluminum cable and a ground clamp type terminal for a 4/0 copper ground wire.

7.3.3 Secondary Terminal Box

Secondary windings shall be terminated on terminal boards with corrosion resistant stud or screw type terminal connectors. The terminal boards shall be enclosed in a weatherproof terminal box which has a removable cover. The terminal box shall be provided with not less than two, tapped, 1-inch or 1 ½-inch conduit hubs, each located on a different side of the terminal box or one similar conduit hub which can be rotated to allow the conduit to enter from at least three directions. The conduit hubs shall not interfere with the removable cover or with the access to the terminal board.

7.4 Insulating Oil for 115 kV Potential Transformers

Any oil required for the transformer and bushing shall be the Manufacturer's standard or recommended type, with the exception of PCB or any other liquid that is prohibited or banned by the Environmental Protection Agency. Those shall not be acceptable.

7.5 Gauges and Valves

Gauges and valves shall be provided with an oil gauge marked to indicate the proper oil level and with valves for draining the tank completely and for sampling oil.

7.6 Nameplate

The transformer shall be provided with a permanent nameplate showing all of the required information, including voltage rating, ratio, BIL, weight, etc., plus a winding diagram showing all taps and connections.

7.7 Porcelain Color and Paint

All external porcelain shall be ANSI 70 light gray.

8.0 QUALITY ASSURANCE:

8.1 The manufacturer shall have a formal Quality Assurance Program. The manufacturer's Quality Assurance Manual shall consist of systematic procedures that provide confidence that the work is in accordance with the manufacture's standard design, codes and standards referenced above, and these specifications for controlling activities affecting quality, such as welding, heat treating, and nondestructive examination. Formal training of individuals performing the work shall be an element of the Quality Assurance Program. Inspections and audits shall be conducted to insure that the Quality Assurance Program is being followed.

8.1.1 The manufacturer's Quality Assurance Manual shall be available at GPA's request and shall include descriptive information and details of the program, including program organization, documentation requirements, and quality control procedures.

8.1.2 The Quality Assurance Program shall include testing procedures, acceptance criteria, repair methods and the quality control requirements of these specifications.

9.0 PACKING AND SHIPPING REQUIREMENTS:

9.1 Because of severe transportation conditions, the Supplier shall pay particular attention to the proper packaging and bracing of the apparatus to assure its safe arrival.

9.2 The Supplier shall prepare all materials and equipment for shipment in such a manner as to protect from damage in transit. All small parts and unit components shall be separately boxed or bundled to prevent galling due to rubbing of one part against another. Each item, box or bundle shall be plainly and individually identifiable for content according to item number, GPA P.O. Number, and Supplier's Identifying Number.

9.3 Complete itemized Bill of Lading, which clearly identifies and inventories each assembly, sub-assembly, carton, package, envelope, etc., shall be furnished and enclosed with each item or items at the time of shipment.

9.4 The transformers shall be shipped in crates containing not more than two units each.

10.0 STATEMENT OF COMPLIANCE:

The Supplier shall provide a signed statement verifying that the products being supplied fully comply with the specification stated herewith. Items not in full compliance with this specification will be identified with a description of the deficiency and any proposed substitutions must be approved by the Guam Power Authority Engineering Department, as described in Section 3.2.1.

11.0 WARRANTY:

The Supplier shall warrant the satisfactory and successful operation of the equipment furnished under this specification at the rating, under the conditions, and for the service specified. The Supplier shall further warrant this equipment against defects of design, material and workmanship. All workmanship and parts shall have a warranty of at least (1) year from the date of equipment's commissioning.