

NEWNAN UTILITIES TECHNICAL SPECIFICATION FOR THREE PHASE PAD MOUNTED TRANSFORMERS

1. SCOPE

- 1.1. This standard covers electrical characteristics and mechanical features of three phase, 60 Hz, mineral-oil filled, pad mounted, compartment type distribution transformers, with separable insulated high voltage connectors rated 2500 kVA and smaller, high voltage 12470/7200Y.
- 1.2. kilo-volt ampere (kVA) ratings are continuous and based on not exceeding either 65 degree C average winding temperature rise of a 30 degree C ambient. The temperature rise of the insulating oil shall not exceed 65 degree C over a 30 degree C ambient when measured near the top of the tank.
- 1.3. All characteristics, definitions and terminology, except as specifically covered in this specification, shall be in accordance with American National Standards Institute (ANSI). Using the latest revisions, the following standards apply to all designs.

C57.12.00, General requirements for liquid-immersed distribution, power and regulation transformers.

C57.12.26, Standards for pad mount compartmental-type transformers.

C57.12.28, Pad-mounted equipment enclosure integrity.

C57.12.70, Terminal Marking

C57.12.80, Terminology for power and distribution transformers.

C57.12.90, Test code for liquid-immersed distribution, power and regulation transformers and guide for short-circuit testing of distribution and power transformers.

C57.12.91, Transformer Loading Guide for mineral oil immersed pad-mounted distribution transformers less than 500 kVA.

C57.12.92, Transformer Loading Guide for mineral oil immersed pad-mounted distribution transformers greater than 501 kVA.

2. TRANSFORMER PARAMETERS

- 2.1. One of the considerations for purchase of distribution transformers will be total ownership cost. To be considered, bidders must supply the following transformer parameters for evaluation:
- 2.1.1. The guaranteed average winding loss (full load) in watts, at 85° C (65° rise over 20° ambient).
 - 2.1.2. The guaranteed core loss (excitation or no load) in watts, at 85° C (65° rise over 20° ambient).
- 2.2. All transformers shall be tested for no load and full load losses, and percent impedance. Certified test data shall be provided for each transformer shipped. Full losses shall be tested for at 65° C.
- 2.2.1. The actual core loss and total loss parameters of transformers received shall not exceed the quoted parameters by more than the following:
- 2.3. Each transformer individually shall not exceed the following percentages. Indemnification for transformers exceeding these tolerances shall be in accordance with 2.4.1 and 2.4.2 below.
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|-----------------------------------|-------|
| Core Loss (Excitation or No Load) | + 10% |
| Total Loss (Full Load Loss) | + 6% |
- 2.3.1. For orders of more than one unit the average of all units of that stock number shipped on any purchase order shall not exceed the quoted parameters. Indemnification for transformers exceeding these tolerances shall be in accordance with 2.4.1 and 2.4.2 below.
- 2.4. The indemnification of distribution transformers for loss parameters outside the tolerance levels established in Section 2.3 of this specification shall be assessable and initiated within two (2) years from the date of receipt of production loss test data. Indemnification shall be as follows:
- 2.4.1. Be returned to the manufacturer for replacement at the discretion of Newnan Utilities. Replacement shall be made, at no additional charge, within thirty (30) days after the expiration date of the current lead time once notification of rejection has been made by Newnan Utilities. All shipping, installation and de-installation costs incurred by Newnan Utilities a result of the nonconforming transformer shall be reimbursed by the seller.

2.4.2. If not returned for replacement, the transformer(s) may be subject to a loss penalty charged to the manufacturer. The loss penalty shall be based on the algebraic sum of the loss deviations for all units on the order. Lower than quoted losses may be used to offset higher than quoted losses, but no additional billing for lower total losses will be allowed.

3. PRODUCTION LOSS TEST DATA

- 3.1. A DRAFT REPORT SHOWING THE VALUES FOR NO LOAD LOSS 85° C (65° RISE OVER 20° AMBIENT) AND FULL LOAD LOSS 85° C (65° RISE OVER 20° AMBIENT) FOR EACH UNIT SUPPLIED UNDER THIS SPECIFICATION SHALL BE INCLUDED WITH EACH UNIT AT THE TIME OF SHIPMENT TO NEWNAN UTILITIES. WITHIN 30 DAYS OF THE DATE OF SHIPMENT, THE ACTUAL, CERTIFIED VALUES FOR NO LOAD LOSS AND FULL LOAD LOSS SHALL BE PROVIDED TO NEWNAN UTILITIES IF REQUESTED.
- 3.2. Accuracy of production loss test data is the responsibility of the manufacturer.

4. CONSTRUCTION

- 4.1. Cabinet constructions shall be as described in ANSI C57.12.26 sections 7.1.3 thru 7.1.14 and evaluated in accordance with test procedures and requirements of the design test method for cabinet security described in ANSI Standard C57.12.28 for pad mount equipment.
- 4.2. The equipment shall be designed to minimize areas where water and corrosive elements can accumulate.
- 4.3. Excessive welding and/or discontinuous or "skip" welds shall be avoided. Weld spatter shall be ground down to case level.
- 4.4. The transformer shall have a hinged compartment door and sill arrangement to provide access to the terminating compartment. Stainless steel (**alloy 304L**) hinges shall be provided. The stainless steel hinge pins shall be a minimum of 3/8" in diameter. The hinges shall be continuously welded to the tank and lid. The gauge of the hinges is to be the same as or greater than the gauge of the door. The doors are to be equipped with stops for latching in the open position and shall be designed for removal by lifting off when in the open position. Transformer(s) with hinged cabinet cover(s) are preferred.

- 4.5. The construction of the pad mount transformer shall comply with the tests and requirements for enclosure security as specified in ANSI standards C57.12.28. The pad mount compartmental type transformer shall consist of the transformer tank and high voltage and low voltage compartment.
- 4.6. The compartments shall be separated by a barrier of metal or other rigid material suitable to prevent access to the primary compartment. The transformer tank and compartments shall be assembled as an integral unit suitable for flush mounting on a flat rigid surface.
- 4.7. The high voltage and low voltage compartment shall be located side by side. When viewing from the front, the low voltage compartment shall be on the right.
- 4.8. In addition to the regular locking provisions, all access doors or hood shall be secured by a recessed, captive, pentahead bolt and padlock provisions.
- 4.9. Lifting inserts shall be of corrosion resistant material and so arranged to provide a suitable balance lift for the completely assembled unit. Lifting bolts shall be supplied with each unit.
- 4.10. The transformer(s) shall be of sealed tank construction of sufficient strength to withstand a pressure of 7 PSI without permanent distortion. In addition, the minimum tank withstand pressure shall be in accordance with ANSI standards, 15 PSIG. At the minimum tank withstand pressure, no oil leak shall be initiated and no component or bushing shall be expelled from the unit. If there is deformation, the unit shall remain tamper-proof and it shall be possible to open the compartment for access to the cable terminations.
- 4.11. Tanks without cooling fins are preferred. If required, cooling fins shall be designed so that no sharp points or edges exist on any part of the fins or where they attach to the tank. External corners and edges shall be rounded and smoothed. Cooling fins shall be arranged to minimize their protrusion from the tank.
- 4.12. The pad-mounted equipment shall meet the requirements for tamper resistance as set forth in ANSI C57.12.28.
- 4.13. Transformers shall be of the loop feed type with six (6) bushing wells and six (6) bushing inserts (10,000 ampere rated).
- 4.14. A durable metal nameplate made of stainless steel or anodized aluminum material and conforming to ANSI/IEEE C57.12.00 shall be affixed to each transformer and contain all essential data, year of manufacture, serial number, and clearly state insulating oil is NON-PCB.

- 4.15. Noise level shall not exceed ANSI standards for distribution class transformers.
- 4.16. Transformers shall be furnished with grounding lugs.
- 4.17. A self-actuating qualitrol pressure relief device and oil drain plug shall be provided.

5. Line Switches

- 5.1. An externally operable, internal, three-pole, 4-position, “t-blade” load break switch shall be provided on all loop feed transformers. The line switch shall be rated at 200 amp and BIL rating of primary voltage. Location of the line switch handle shall be in the high voltage compartment above the line bushing and hot stick operable with the cables in place

Switch positions of the 4-position switch shall be as follows:

12:00 position	A on;	B on;	Transformer on
3:00 position	A off;	B on;	Transformer on
6:00 position	A on;	B off;	Transformer on
9:00 position	A-3	feed thru	Transformer off

- 5.2. Approved manufactures of the 4-position line switch are listed below.
 Asea Brown Boveri (ABB)
 Copper 4-position switches
 Other manufactures of the 4-position load break switches shall be considered if they function in the same way.

6. HIGH VOLTAGE TERMINATIONS

- 6.1. High voltage terminal arrangements as shown in **Newnan Utilities Three Phase Pad Mount Drawing**. The high voltage bushings shall consist of bushing wells and 200-amp load break bushing inserts designed to mate with RTE, Elastimold, Chardon or equivalent. The high voltage bushing shall be covered with a dust cover, which shall remain on the high voltage bushing during handling and storage.
- 6.2. The transformer terminals shall be spaced and arranged so that the transformer compartment door and its tamper-resistant barriers do not violate or reduce the minimum spacing and clearances required. This requirement includes all compartment door positions from fully open to fully closed.

- 6.3. Bushing wells provided shall be in accordance with ANSI/IEEE Standards 383, or latest revision thereof. Minimum of (6) six parking stand positions are required.

7. HIGH VOLTAGE PROTECTIVE DEVICES

- 7.1. Bayonet-type fuse holder(s) for oil immersed, dual sensing expulsion fuses(s) shall be provided. The Bayonet device shall be rated to make or break full load current rating of the transformer. A high-voltage bushing, a non-conducting drip shield shall be provided. Fuses shall be included at time of order.
- 7.2. The circuit location of the primary fuse shall be shown in the nameplate schematic.
- 7.3. Fuse type in the draw out shall be dual sensing cartridge fuse (358C--) and coordinated with a partial range current limiting fuse. Both fuses shall be immersed in oil. Access to the partial range current limiting fuses shall be through the tank hand hole. Listing of approved fuse manufacturers are listed in preferred order.

Manufacturer	Type/Curve
Hi-tech	HTDS Type OS
Cooper (RTE)	ELSP
General Electric	T Series OSP

- 7.4. Fuse coordination between the partial range current limiting fuse and draw out fuse and the impedance of the transformer shall be done by the manufacture.
- 7.5. Fuse information of catalogue number for both fuses shall be stenciled inside the door in 1" high yellow letters. Fuse information shall be provided in the outline drawing provided with each transformer design.
- 7.6. Transformers shall have three (3) 10kVA under oil arrestors with positive disconnect device when specified on purchase order.

8. LOW VOLTAGE TERMINATIONS

- 8.1. The low voltage bushings shall be the spade type with a minimum of eight holes (8) per spade. The low voltage bushings shall be staggered. See **Newnan Utilities Three Phase Pad Mount Drawing**.

- 8.2. Secondary bushing spade support shall be furnished on transformers. Spade support method shall attach to the spade in an independent hole other than the cable connection holes. Spade support mounting shall be of insulating material with adjustable means to increase or decrease tension. Cross members of the spade supports shall be mounted off the cabinet wall and compartment separation barrier. Spade support components shall be designed to be easily removed and reassembled for assembly of cable to secondary spades.
- 8.3. The low voltage neutral (XO) shall be brought out on an insulated bushing and externally grounded by a removable grounding strap. The grounding strap shall be attached to the neutral bushing independent of any other holes in the spade that are intended as cable termination. The other end of the grounding strap shall be attached to the ground pad on the tank wall. One or more removable ground straps shall be suitably sized for the short circuit rating of the transformer, as defined in ANSI/IEEE C57.12.00, and shall be connected between the low voltage neutral terminal and the ground pad.
- 8.4. The low voltage neutral ground pad shall be independent of other ground pads provided in the low voltage compartment.
- 8.5. The low voltage lighting tap (X4) shall be brought out in an insulated bushing and externally grounded by a removable grounding strap. The grounding strap shall be attached to the tap bushing without occupying the holes in the spade that are intended for cable termination. The other end of the grounding strap shall be attached to the ground pad on the tank wall. One or more of the ground straps shall be suitably sized for the short circuit rating of the transformer, as defined in ANSI/IEEE C57.12.00, and shall be connected between the low voltage lighting tap and ground pad.
- 8.6. For wye-wye connected units, the high voltage neutral shall be connected to the low voltage neutral internally, with provisions for opening this connection for testing.
- 8.7. For wye connected high voltage and delta (with or without mid tap) low voltage, the primary neutral shall be floated internally and not accessible externally.

9. FINISH

- 9.1. The transformer shall have a corrosion resistant finish that shall meet or exceed ANSI C57.12.28 finishing requirements, latest revision. Top finish paint shall be of such quality as to resist rust, fading, etc., for a minimum 15-year (exposed to the elements) period. Color shall be Mussel 7GY, outdoor green.
- 9.2. A corrosion preventative undercoating shall be applied to all surfaces that are in contact with the pad and shall include the lower 4" of the tank or cabinet walls and base sill. Paint shall be of such quality as to resist rust, fading, etc., for a minimum 15-year (exposed to the elements) period. Color shall be Mussel 7GY, outdoor green.
- 9.3. All paint and/or coatings including topcoats, intermediate coats and primers shall be free of lead.
- 9.4. Units supplied according to this specification shall meet ANSI C57.12.28 (latest revision) requirements.

10. BID EVALUATION AND AWARD

- 10.1. All bids received will be evaluated and awarded on the basis of the total ownership cost. The total ownership cost shall be determined with the following formula:

$$TOC = PRICE + NL\ WATTS * 4.50 + LL\ WATTS * 1.575$$

Where: TOC = Total owning cost
 PRICE = Purchase price quoted
 NL WATTS = quoted no-load losses in watts
 LL WATTS = quoted load loss watts

For the determination of the award of business, Newnan Utilities will consider all bids within two and one half percent (2.5%) of the lowest TOC to be economically equivalent and will consider other factors such as lead times and purchase price in making the award.

- 10.2. A non-corrosive nameplate marked with an indelibly marking shall be installed under the voltage nameplate inside the low voltage compartment. The plate is to include the following information:

NO LOAD Losses FULL LOAD Losses and all losses shall be quoted in watts at 65 degrees C.

11. IMPEDANCE VOLTAGE

- 11.1. The percent impedance voltage, as measured on the rated voltage connection, shall be within the following limits:

Percent Impedance Voltage

kVA rating	Minimum	Maximum
112.5 - 300	1.20	5.00
500 - 2500	1.50	6.00

- 11.2. The percentage departure of testing impedance voltage on any tap from tested impedance voltage at rated voltage shall not be greater than the total tap voltage range expressed as a percentage of the rated voltage.

12. OPTIONAL ACCESSORIES , CONFIGURATIONS OR SPECIAL ORDERS

- 12.1. Four taps, two 2-1/2% taps above and two 2-1/2% taps below the rated voltage.

- 12.2. Radial Feed Design

Live or dead front radial feed design will only be used in special circumstances and each site will be unique, specifications will be put out at that time.

- 12.3. Internal Under Oil Arrestor (when specified)

Internal under oil arrestors shall be provided when specified on purchase order. Mounting location of the under oil arrestor shall be such not to contaminate the coils in an event of a mechanical failure. The arrestor shall be wired between the partial range fuse and the draw out or weak line fuse.

- 12.4. Nameplate shall show location of the arrestor in the schematic drawing, with the arrestor labeled as “oil immersed surge arrester”.

Stencil information inside the high voltage door shall include the stencil “UOA” in 2” red letters. Location of the stencil shall be below the fuse information.

13. NAMEPLATE INFORMATION

- 13.1. All transformer nameplates shall be made of stainless steel or anodized aluminum, conform in all respects to Nameplate A, as described in ANSI/IEEE C57.12.00 (latest revision), and indicate the following:
- 13.2. kVA, High voltage, and low voltage.
- 13.3. BIL rating of the high voltage winding (both high voltage BIL ratings on dual voltage transformers).
- 13.4. Transformer weight.
- 13.5. Month and year of manufacture.
- 13.6. Serial number.
- 13.7. Bar code in accordance with C57.12.35 (latest revision).
- 13.8. PCB Content

14. DIELECTRIC FLUID

- 14.1. The transformer dielectric fluid shall be certified by the transformer manufacturer as having a PCB content of less than two (2) ppm on a dry weight basis when tested in accordance with an EPA approved method. Transformer dielectric fluid shall meet Federal Regulation No. 40CFR 761, dated May 31, 1979, and subsequent revisions. Manufactures shall notify Newnan Utilities if any oil utilized should subsequently become classified as a hazardous material in the future.
- 14.2. All transformers shall have an approved durable label with medium blue background and white lettering describing the dielectric fluid as non-PCB and stating its maximum PCB concentration at the time of manufacture. The label shall be affixed adjacent to the nameplate.
- 14.3. The maximum PCB concentration shall also appear on the nameplate.

15. PAD MOUNTED TRANSFORMER SAFETY LABELS

- 15.1. No danger signs, warning signs or safety labels are permitted on the exterior surface of the transformer.
- 15.2. For pad mounted transformers, a NEMA 260 - "Mr. Ouch" danger label is required on the inside surface of the compartment door.

16. WARRANTY

- 16.1. Each transformer conforming to this material specification shall be unconditionally guaranteed against failure due to any cause, except misapplication or abuse, for a minimum of one (1) year from the date of installation or 18 months from the date of shipment, whichever occurs first. Any transformer that does not conform to this warranty shall, at buyer's option, be repaired or replaced by seller. Seller shall indemnify buyer for all costs incurred as a result of any such nonconformity.

17. SHIPPING

- 17.1. Transformers shall be shipped in open top trucks; single-tier freight trailers and be forklift unloadable from the side. Transformers shall be arranged and stacked in the truck or freight trailer to prevent damage during shipping.
- 17.2. Shipments of transformers shall be a single transformer to a pallet. Each transformer shall be secured (banding, bolting, or other suitable method) to a pallet to protect it from damage during shipping and handling. Pad mounted transformers shall use the anchor bolts for handling and lifting. All packaging or pallets used in shipping transformers shall have a minimum ground clearance of 2 inches, and to be capable of supporting transformers without damage. Minimum of 18" fork width will be provided.

18. DEVIATIONS TO SPECIFICATIONS

- 18.1. Manufactures quoting transformers to this specification shall indicate any areas where deviations are required by their design. The manufacture shall include sufficient information to allow Newnan Utilities to evaluate these deviations. This data shall be sent in letterform to Newnan Utilities at P.O. Box 578, Newnan, Ga. 30264. Attention Steve Smith Purchasing Agent or Jimmy Lee Electrical Distribution Supervisor or Randy Griffith Staking Technician.

19. CHANGES

- 19.1. Newnan Utilities reserves the right to change or modify its specifications at any time through addendum, letter or reissue. Newnan Utilities also reserves the right to specify, for individual orders, variations from our specifications to meet special needs of our customers.

20. BID DRAWING

20.1. Outline Drawing

20.2. Outline drawings shall be completed for all transformers. Information on these outline drawing shall include the following:

High Voltage bushing height and spacing.

Low Voltage bushing height and spacing.

Overall unit height, width and depth. (including fins or oil coolers)

Recommended pad size with cable opening.

Table of components.

Fuse rating for both types of fuses.

20.3. Outline Drawing shall be provided to the engineering department upon request along with complete nameplate drawing that includes all the information except serial number and date of manufacturing.