**CLAY ELECTRIC COOPERATIVE, INC.**

 **Keystone Heights, Florida 32656**

 **CEC Specification #15-84 DE R15**

 **3 Phase Padmounted Transformers**

 **12 470 GrdY/7200 x 24 940 GrdY/14 400**

 **75 - 3000 kVA**

**1.0 Scope**

 1.1 These specifications cover the electrical and mechanical features of three phase, 60 Hz. padmounted compartmental type, and distribution transformer with separable insulated high voltage connectors used on Clay Electric Cooperative, Inc. (CEC) electric distribution system. These units shall be designed for use on a 4 wire grounded Wye system.

 1.2 Transformers furnished under this specification shall comply with the latest revisions of RUS Specification U-5 and the American National Standards Institute (ANSI) standards as noted within this specification except where they conflict with CEC specifications, in which case CEC specifications shall take precedence.

**2.0 Ratings**

 2.1 High Voltage: 12 470 GrdY/7200 x 24 940 GrdY/14 400 or 24 940 GrdY/14 400

 2.2 Low Voltage: 208Y/120 or 480Y/277 or 2400/4160, See Bid Sheet for specific voltage.

 2.3 BIL: High Voltage - 125 kV

 2.4 Taps: None

**3.0 Test**

 3.1 Transformers shall have been tested in accordance with RUS specification U-5 and ANSI C57.12.26-1987 or latest revisions thereof.

 3.2 The core and coil design shall have passed short circuit criteria as per ANSI C57.12.00-1987 and C57.12.90-1987 or latest revisions thereof. Certification shall be provided in the form specified.

**4.0 Construction**

 4.1 The transformer shall be a padmounted compartmental type with a steel barrier between the high voltage and low voltage compartments.

 4.2 The transformer shall be of a sealed tank construction.

 4.3 The transformer shall meet the requirements for tamper resistance as set forth in ANSI C57.12.28-1988 and Guide 2.13, dated April 2, 1979, Western Underground Committee. In addition, the transformers shall be secured by a recessed captive pentahead bolt that complies with ANSI C57.12.21-1980, section 6.1.7. Provisions for installing an external locking device shall comply with ANSI C57.12.21-1980, section 6.1.6.

 4.4 A durable nameplate made of corrosion resistant material and conforming to section 5.12 and Table 9 of ANSI/IEEE C57.12.00-1987 shall be affixed to each transformer. The nameplate shall include a statement that the transformer contains less than 1 PPM of PCB's.

 4.5 Three bronze transformer tank connectors shall be provided - two on the highside and one on the lowside. These connectors shall have a 1/2"-13 stud and be capable of accommodating a range of grounding conductors from #6 through #1/0 shall be “vise” type. The connectors shall be Hubbell# GC207, Erico# CC207, or approved equal.

 4.6 The manufacturer's coating system shall meet or exceed the requirements specified in Sections 5.2 and 5.4 of ANSI C57.12.28-1988. Unless otherwise specified, the topcoat color for padmounted enclosures shall be Munsell 7GY3.29/1.5 padmount green.

 4.7 No warning labels shall be attached to the transformer by the manufacturer.

 4.8 The kVA size, high voltage and low voltage rating shall be painted on the outside of one door panel. Letter/numeral height shall be one inch and be centered on the door panel. The color of each letter/numeral shall be a color that will contrast with the color of the lid.

**5.0 High Voltage Terminations**

 5.1 The transformer shall be furnished with 25 kV Class 200 amp bushing wells for dead-front, loop feed application and shall be externally clamped and shall conform to ANSI C57.12.26-1987, Figure 6A.

 5.2 Refer to Section 6.4 for specific “Bushing Height Requirements” for the high voltage terminations.

 5.3 Transformers shall come with insert bushings installed and be one of the following: Cooper #LBI225, Elastimold #2701A4, or HPS #225BI.

**6.0 Low Voltage Terminations**

 6.1 The low voltage bushing on 75kVA -300kVA units shall be epoxy with a threaded stud that meets ANSI C57.12.26-1987, Figure 9D and shall be externally clamped.

 6.2 The low voltage bushings shall be epoxy with eight (8) hole NEMA spades on 500 through 1500 kVA, twelve (12) hole NEMA spades on 2000 through 3000kVA and shall be externally clamped.

 6.3 Bushing arrangements shall be as shown in ANSI C57.12.26-1987, Figures 7 and 8A. Refer to Section 6.4 for specific “Bushing Height Requirements” for the low voltage terminations.

6.4 A removable ground strap for the secondary neutral sized for the rating of the transformer shall be included.

 Bushing Height Requirements:

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| kVA Rating (3-Phase) | Bushing Height Nominal Dimension: C/L to Base Plane (Inches) |  |  |  |
|  | H1A | H2A | H3A | H1B | H2B | H3B | X0 | X1 | X2 | X3 |
| 750 - 3000 | 41 - 39 | 34 - 33 | 27 | 41 - 39 | 34-33 | 27 | 46 | 54 | 46 | 54 |
| 225 - 500 | 41 - 39 | 34 - 33 | 27 | 41 - 39 | 34-33 | 27 | 31 | 39 | 31 | 39 |
| 75 - 150 | 39 | 33 | 27 | 39 | 33 | 27 | 27 | 33 | 27 | 33 |

 6.5 A durable label made of corrosion resistant metal or a vinyl sticker shall be furnished and installed on the inside of the secondary voltage door indicating the actual primary and secondary bushing heights from centerline of bushing to base plane in inches.

 6.6 750 kVA and higher shall have insulated mechanical supports provided on the low-voltage terminal spades. The supports shall be mounted at the cable compartment top. The support will be at the outer end of the spade and shall not interfere with NEMA spaced holes. Support brackets shall not be bolted through the outer compartment walls.

**7.0 Switching and Fusing**

 7.1 Overcurrent protection for 75kVA – 500kVA units shall consist of three Bay-O-Net fuse holders, RTE Catalog #4000361C99M, General Electric or Westinghouse equivalent. The fuse cartridge and isolation link shall be installed with the fuse holder and shall conform to the following table:

 Transformer System Primary Voltage (kV) RTE

 Size (kVA) 7.2/12.5 kV 14.4/24.9 kV Isolation Link\*

 3 Phase Cat# Size Cat# Size Cat#

 75 124080-06 6 124080-05 2 1861A02

 150 124080-12 12 124080-06 6 1861A02

 225 124080-15 15 124080-08 8 1861A03

 300 124080-25 25 124080-12 12 1861A03

 500 124080-30 30 124080-15 15 1861A04

 \*Isolation link sized to coordinate with Bay-o-Net fuse at 7.2/12.5 kV.

 Kearney fuses are dual element: Cat #124080-\_\_

 7.2 Painted or stenciled letters (minimum 1/2", max. 1") high in a color contrasting with the tank shall be painted on the inside of the cover and read according to kVA size, the following:

 75 kVA: "for 12.5kV, use Kearney cartridge 124080-06"

 "for 24.9kV, use Kearney cartridge 124080-05"

 150 kVA: "for 12.5kV, use Kearney cartridge 124080-12"

 "for 24.9kV, use Kearney cartridge 124080-06"

 225 kVA: "for 12.5kV, use Kearney cartridge 124080-15"

 "for 24.9kV, use Kearney cartridge 124080-08"

 300 kVA: "for 12.5kV, use Kearney cartridge 124080-25"

 "for 24.9kV, use Kearney cartridge 124080-12"

 500 kVA: "for 12.5kV, use Kearney cartridge 124080-30"

 "for 24.9kV, use Kearney cartridge 124080-15"

 7.3 An oil-drip shield shall be installed beneath the Bay-O-Net fuse holder to prevent oil from dripping on a primary bushing. It shall be arranged such that it will not interfere with the switching operation of the unit.

 7.4 Overcurrent protection for 750kVA - 3000kVA units shall consist of internally mounted oil immersed weak link fuses.

**8.0 Pressure Relief**

 8.1 An automatic pressure relief device with hook stick ring shall be provided and comply with ANSI C57.12.26-1987, paragraph 7.5.2.

**9.0 Environmental Acceptability**

 9.1 The manufacturer must certify that the transformer will be environmentally acceptable and shall comply with all laws in effect as of the date of manufacturer pertaining to hazardous chemicals.

 9.2 The manufacturer shall certify that the transformer liquid insulation shall not contain Polychlorinated Biphenyl (PCB's) above one (1) Part Per Million (PPM).

**10.0 Liquid Insulation**

 10.1 Transformers shall be filled with new, unused Mineral Oil that shall meet the requirements of ASTM D 3487-81 [47].

 10.2 The manufacturer shall certify that the transformer liquid insulation shall not contain Polychlorinated Biphenyl (PCB's) above one (1) Part Per Million (PPM).

**11.0 Shipping**

 11.1 Lifting provisions shall be 5/8" - 11 threaded flush-mounted inserts of stainless steel and so arranged to provide a suitable, balanced lift for the completely assembled unit. Threaded (5/8" - 11) bolts, 2-1/2" long for lifting the transformer shall be inserted.

 11.2 In the event that the lifting provision specified in 11.1 does not provide a safety factor of 5 as defined in ANSI C57.12.26-1987, then the manufacturer shall provide permanently attached lifting provisions as specified in section 7.1.14 of ANSI C57.12.26-1987.

**12.0 Electronic Transformer File**

 12.1 All Transformers shall come with an Electronic Transformer File(.CSV) to be sent to the Purchasing & Stores Manager upon delivery.

12.2 Transformer File Layout for NISC:



|  |
| --- |
| **Special Notes:** |
| - CSV format is required |
| - Use Sheet2 to obtain the appropriate 3 character Manufacturer Code |
| - The fields with sample records are the MINIMUM requirement |
| - Hardcoded records are colored RED |
| **MANUFACTURER CODE** | **DESCRIPTION** | **MANUFACTURER CODE** | **DESCRIPTION** |
| ABC | A.B. CHANCE COMPANY | PAW | PAUWELS TRANSFORMERS |
| AB | AB | PT | PENNSYLVANIA TRANS |
| ABB | ABB | PS | POLE STAR |
| AC | ALLIS CHALMERS | PPI | POWER PARTNERS INC |
| B&B | B & B TRANSFORMERS | RET | RET |
| CFT | CENTRAL FLORIDA TRANS | ROB | ROBERTS TRANSFORMER |
| MOL | CENTRAL MOLONEY | RTE | RTE CORPORATION |
| CG | CG POWER SYSTEMS USA | SAM | SAM |
| CP | COOPER POWER | SAN | SANG |
| CTC | CTC | SNG | SANGAMO |
| DS | DELTA STAR | SC | SC |
| DOW | DOWZER | SCH | SCHLUMBERGER |
| EL | EL | SEL | SEL |
| ERM | ERMCO | SEN | SENSUS |
| FTI | FTI | SI | SI |
| GEN | GEN | SOL | SOLOMON CORPORATION |
| GE | GENERAL ELECTRIC | TRE | T&R ELECTRIC SUPPLY INC |
| HI | HI | TD | TD |
| IT | IT | ST | THE STANDARD TRANS. COMP |
| ITR | ITRON | TUR | TURNER |
| JEC | JIM'S ELECTRIC COMPANY | UK | UK |
| KUH | KUHLMAN | UUS | UNITED UTILITIES SUPPLY |
| L+G | LANDIS+GYR | VAN | VANTRAN |
| LMI | LINE MATERIAL INDUSTRIES | WAG | WAGNER |
| MAG | MAGNETIC ELECTRIC | WST | WEST |
| ME | McGRAW EDISON | WH | WESTING HOUSE |
| MCE | MID CENTRAL ELECTRIC INC |   |   |

 **DISTRIBUTION TRANSFORMERS SPECIAL PROVISIONS**

**1.0 Loss Evaluation Formula**

 1.1 Losses as shown on the bid form shall be quoted for each transformer bid. The levelized cost of losses and the levelized bid price shall be calculated and summed as shown on the bid form.

 1.2 Losses shall be average as defined by ANSI C57.12.00-1980. Load loss data shall be corrected to 85°C (65°C rise plus 20°C ambient). No load loss data shall be corrected to 20°C ambient.

 1.3 Each bidder is responsible for completing each column of the bid form including specifying losses and calculating the cost as shown.

**2.0 Test Data**

 2.1 All test data for losses shall be supplied at 85°C and shall be furnished on each unit shipped at the time of shipment. Data shall be sent to the attention of the Manager of Purchasing. Loss data shall include both no load and load. Load loss data shall be corrected to 85°C (65°C rise plus 20°C ambient). No load loss data shall be corrected to 20°C ambient.

 2.2 Certification of short circuit testing as specified shall have been furnished.

**3.0 Penalty Charge**

 3.1 Measured loss data furnished at the time of shipment shall be compared to quoted losses. Table 16 of ANSI C57.12.00-1980 shall be used as a guideline for acceptable loss variation except as noted below.

 3.2 On a multiple order, any individual unit which exceeds the ANSI tolerances will be rejected and returned to the manufacturer and the cost of that unit will be deducted from the amount due. If the average for all units of one design and one shipment exceeds the losses quoted but each unit meets ANSI tolerances, a penalty charge, calculated as specified herein, will be calculated and deducted from the amount due on the invoice.

 3.3 On an order of one unit, Table 16 of ANSI C57.12.00-1987 shall be used as a guideline for acceptable loss variation. If the unit exceeds ANSI tolerances, such unit shall be rejected and returned to the manufacturer.

 3.4 A penalty charge, as applicable, will be calculated as follows:

 Penalty Charge = ((average NLL supplied - NLL quoted)(Cost))+

 ((average LL supplied - LL quoted)(Cost))

 Carrying Charge

6

 CLAY ELECTRIC COOPERATIVE, INC

 TRANSFORMER BID FORM - COMMERCIAL

CEC BID NO: TRANSFORMER TYPE: [ ] CONV – DOUBLE BUSHING [ ] 3φ PAD

BID DATE: TRANSFORMER KVA:

BIDDER: HV RATING: [ ] DV [ ] 7.2 KV [ ] 14.4 KV [ ] 2400/4160Y

MANUFACTURER: LV RATING: [ ] 120/208 [ ] 120/240 [ ] 240/480 [ ] 277/480 [ ] 2400/4160Y

|  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| ITEM NO. | (C)KVA RATING | (D)BID PRICE | (E)NO LOAD LOSS, KW | (F)LOAD LOSS, KW | (G)LEVELIZED BID PRICE (D)X(0.213) | (H)LEVELIZEDNO LOAD LOSS(E) X(515.39) | (I)LEVELIZEDLOAD LOSS (F) X (33.73) | (J)LEVELIZED ANNUAL COST (G) +(H)+(I) | DELIVERY WEEKS |
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 \*LOAD LOSS SHALL INCLUDE BREAKER LOSSES FOR CSP UNITS

7

Revision Notes for CEC Specification #15-84 DE R14

 Date Revision # Sections Revised/Added

 06/06/90 4 2.2, 6.1, Special Provisions 1.2

 02/27/92 5 Specification Item 6.2

 02/27/92 5 Special Provision Item 2.1

 02/05/93 6 Transformer Bid Form

 12/09/94 7 Revised Sections 1.0, 2.3, 3.0, 4.3, 4.4, 4.6, 5.1, 6.2, 6.3, 7.1, 8.1, 8.2.

 Added Sections 4.7, 4.8, 9.0, 10.0 & 11.0.

 Revised Transformer Bid Form

 05/20/96 8 Specification Item 8.1

 9/18/08 9 Revised Transformer Bid Form

 (Tx Cost Factors)

 01/18/2012 10 Includes 500kVa – 3000kVA. Revisions to Section 5.0

 05/13/2014 11 Revision to Sec. 4.5 for “vise”

 type grounding lug.

 02/17/2015 12 Added 8.5 for secondary

 supports

04/22/2015 13 Revised Sections 6.1, 6.2, 7.2, 7.3, 8.1. Item 8.1 now to be 6.1, 8.5 to be 6.5

 Added Section 6.4 and 6.5: “Bushing Height Requirement” Table. Added 5.2. Clarified Section 6.3 and 6.6.

05/31/2018 14 Changed fusing cat# and iso link cat#.

03/22/2021 15 Added 2400/4160V as a secondary voltage.

4/12/2021 16 Added Electronic Transformer File Req.

 Section 12

8