

**OLUSTEE PUBLIC WORKS AUTHORITY  
OLUSTEE, OKLAHOMA**

**SPECIFICATION  
FOR  
34.5-12.47/4.16 kV, 2.5 MVA  
PAD MOUNT TRANSFORMER  
for the  
OLUSTEE SUBSTATION**

BID DATE: \_\_\_\_\_

BIDDER: \_\_\_\_\_

\_\_\_\_\_

PHONE: \_\_\_\_\_ FAX: \_\_\_\_\_

EMAIL: \_\_\_\_\_

**OLUSTEE PUBLIC WORKS AUTHORITY**  
**TRANSFORMER SPECIFICATIONS**  
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# NOTICE TO BIDDERS

## OLUSTEE PUBLIC WORKS AUTHORITY OLUSTEE SYSTEM IMPROVEMENTS

### PROJECT: 34.5-12.47/4.16 KV, 2.5 MVA PAD MOUNT TRANSFORMER by OLUSTEE PUBLIC WORKS AUTHORITY OLUSTEE, OKLAHOMA

*Notice is hereby given that Sealed Bid Proposals will be received by Ms. Kim Keller of Olustee Public Works Authority at 105 W 4th St, Olustee, Oklahoma 73560 until 5:00 PM CDST, Local Time, Thursday, May 11th, 2023, for one (1) 2.5 MVA, 34.5-12.47/4.16 kV Pad Mount Transformer with options for additional testing, spare parts, and installation.*

*The bid documents may be examined at the office of Oklahoma Municipal Power Authority (OMPA). Questions, requests for specifications and documents, or comments concerning the material specified should be directed to the Project Engineer, Alex Dobson, OMPA at 405-359-2512 or to [adobson@ompa.com](mailto:adobson@ompa.com).*

*Bids received after this time will not be accepted. Bids will be opened publicly and read aloud at 7:00 PM, CDST, Thursday, May 11th, 2023. Olustee Public Works Authority reserves the right to reject any or all bids, or to accept the bid deemed to be in the best interest of the Olustee Public Works Authority.*

**OLUSTEE PUBLIC WORKS AUTHORITY  
MS. KIM KELLER  
105 W 4<sup>th</sup> Street  
OLUSTEE, OKLAHOMA 73560**

**INDEPENDENT CONTRACTOR AGREEMENT**

*Comes now the City of Olustee acting through the Oklahoma Municipal Power Authority (OMPA) and \_\_\_\_\_ whose address is \_\_\_\_\_ (Contractor) this \_\_\_\_ day of \_\_\_\_\_, 20\_\_\_\_, and agree as follows:*

- 1. Contractor shall provide the product, service and/or equipment as described on Exhibit A in accordance with the terms and conditions herein.*
- 2. Contractor shall at all times perform as an independent Contractor, solely responsible for his work methods, supervision of any and all employees or assistants and for any and all taxes, insurance and the like related to his services. Contractor shall be solely responsible for the means, methods, techniques, sequences and procedures of construction, and for safety as required by laws and regulations. Contractor shall be responsible to see that the completed work complies accurately with this agreement.*
- 3. Work shall not be subcontracted without the written consent of OMPA.*
- 4. Unless otherwise specified, Contractor shall furnish and assume full responsibility for all materials, equipment, labor, transportation, construction equipment and machinery, tools, appliances, fuel, power, light, heat, telephone, water, sanitary facilities, temporary facilities and all other facilities and incidentals necessary for completion of the work.*
- 5. Unless specifically provided otherwise in writing in each case, all materials and equipment furnished for permanent installation in the work shall conform to applicable standard specifications and shall be new, unused, and undamaged when installed or otherwise incorporated in the work.*
- 6. Contractor shall furnish, for approval, full information concerning the materials or articles which are intended for incorporation into the work. Installation of materials or equipment without such approval shall be at Contractor's risk and be subject to subsequent rejection.*
- 7. Contractor shall continuously maintain adequate protection of the contract work, job site and materials from damage due to construction activities, the carelessness of other contractors, theft, burglary etc. until the completion and final acceptance of the work, or termination of the contract. No additional time will be granted for Contractor's failure to adequately protect the work, materials and job site. Contractor shall bear the risk of loss or damage until the entire contract is completed and the work is accepted by OMPA*

8. *Unless otherwise specified, Contractor shall give all notices and comply with all laws and regulations applicable to furnishing, and performance of the work.*
9. *Contractor shall be responsible for initiating, maintaining and supervising all safety precautions and programs in connection with the work. Contractor shall take all necessary precautions for the safety of, and shall provide the necessary protection to prevent damage, injury or loss to: all persons on the work site or who may be affected by the work; all the work and materials and equipment to be incorporated therein, whether in storage on or off the site; and other property at the site or adjacent thereto, including trees, shrubs, lawns, walks, pavements, roadways, structures, utilities and underground facilities not designated for removal, relocation or replacement in the course of construction.*
10. *Contractor shall comply with all applicable laws and regulations of any public body having jurisdiction for safety of persons or property or to protect them from damage, injury or loss; and shall erect and maintain all necessary safeguards for such safety and protection. Contractor shall notify owners of adjacent property and of underground facilities and utility owners when prosecution of the work may affect them, and shall cooperate with them in the protection, removal, relocation and replacement of their property. Contractor's duties and responsibilities for safety and for protection of the work shall continue until such time as all the work is completed and accepted by OMPA.*
11. *Contractor shall designate a qualified and experienced safety representative at the site whose duties and responsibilities shall be the prevention of accidents and the maintaining and supervising of safety precautions and programs.*
12. *Contractor shall be responsible for coordinating any exchange of material safety data sheets (MSDS) or other hazard communication information required to be made available to or exchanged between or among employers at the site in accordance with laws and regulations.*
13. *OMPA may advise the Contractor of any safety violations. It is Contractor's responsibility to make the necessary corrections. Failure to correct safety violations shall be grounds for an order from OMPA to cease further work and leave the job site until the condition is corrected.*
14. *OMPA shall not be responsible for any asbestos, PCB's, petroleum, hazardous waste or radioactive material brought to the site by Contractor or anyone else for whom Contractor is responsible.*
15. *Contractor shall purchase, maintain and provide proof to OMPA of such liability and other insurance which is acceptable to OMPA, is appropriate for the work being performed and furnished, and will provide protection from claims set forth below which may arise out of or result from Contractor's performance and furnishing of the work and Contractor's other obligations under the agreement, whether it is to be performed or furnished by Contractor or by anyone directly or indirectly employed by Contractor to perform or furnish any of the work or by anyone for whose acts may be liable.*
  - a. *Claims under worker's compensation disability benefits and other similar employee benefit acts, as required by law.*

- b. *Claims for damages because of bodily injury, occupational sickness or disease or death of Contractor's employees or of any other person, not less than \$1 million each occurrence.*
  - c. *Claims for damages insured by customary personal injury liability coverage which are sustained by any person as a result of an offense directly or indirectly related to the provision of the products, service or equipment described in Exhibit A, not less than \$1 million each occurrence.*
  - d. *Claims for damages other than to the work itself because of injury to or destruction of tangible property wherever located, not less than \$1 million each occurrence.*
  - e. *Claims for damages because of bodily injury or death of any person or property damage arising out of the ownership, maintenance or use of any motor vehicle, not less than \$1 million per person and \$1 million each occurrence, and property damage of \$1 million for each occurrence. A single limit of \$1 million for bodily injury and property damage is acceptable. This insurance may be in a policy or policies of insurance, primary and excess including the umbrella or catastrophe form.*
16. *In return for the services and/or equipment provided hereunder, Contractor shall bill and be paid in accordance with Exhibit B hereto.*
17. *Contractor warrants all equipment and materials furnished by it and all work performed by it under the contract against defective design (unless furnished by OMPA), materials and workmanship for a period of one year from and after final acceptance.*
18. *Contractor agrees to unconditionally indemnify, defend and hold OMPA and OMPA's officers, agents and employees harmless from any and all claims and damages of any kind or nature arising from any services, work or equipment provided by Contractor hereunder.*
19. *This agreement is made under and shall be construed according to the laws of the State of Oklahoma without reference to the jurisprudence of any other jurisdiction.*
20. *The parties to this agreement agree to execute and deliver all documents, provide all information or take or refrain from taking action as may be necessary or appropriate to achieve the purposes of this agreement.*
21. *This agreement may not be assigned by either party without the written permission of the other.*
22. *This agreement shall be binding upon and inure to the benefit of the parties hereto and their heirs, executors, administrators, successors, legal representatives and permitted assignees.*
23. *This agreement constitutes the entire agreement among the parties hereto pertaining to the subject matter hereof and supersedes all prior agreements and understandings pertaining thereto.*

24. *This agreement may be executed in multiple counterparts all of which together shall constitute but one binding agreement.*

SEAL

Olustee Public Works Authority

BY: \_\_\_\_\_

ATTEST: \_\_\_\_\_

TITLE: \_\_\_\_\_

DATE: \_\_\_\_\_

SEAL

Contractor

BY: \_\_\_\_\_

ATTEST: \_\_\_\_\_

TITLE: \_\_\_\_\_

DATE: \_\_\_\_\_

**BID AFFIDAVITS**

The following affidavits are to accompany the bid:

A. Non-Collusion Affidavit

STATE OF \_\_\_\_\_ )  
 ) SS  
COUNTY OF \_\_\_\_\_ )

\_\_\_\_\_, of lawful age, being first duly sworn, on oath says that (s)he is the agent authorized by the Bidder to submit the attached bid. Affiant further states that the Bidder has not been a party to any collusion among Bidders in restraint of freedom of competition by Agreement to bid at a fixed price or to refrain from bidding; or with any state official and owner's official or employee as to quantity, quality, or price in the prospective Contract, or any other terms of said prospective Contract; or in any discussions between Bidders and any official concerning exchange of money or other thing of value for special consideration in the letting of a Contract.

\_\_\_\_\_  
By: \_\_\_\_\_  
Title: \_\_\_\_\_

SEAL

Subscribed and sworn to before me this \_\_\_\_\_ day of \_\_\_\_\_, 20\_\_\_\_\_.

By: \_\_\_\_\_

Notary Public

SEAL

My Commission Expires:

\_\_\_\_\_

B. Business Relationships Affidavit

STATE OF \_\_\_\_\_ )  
 ) SS  
COUNTY OF \_\_\_\_\_ )

\_\_\_\_\_, of lawful age, being first duly sworn, on oath says that (s)he is the agent authorized by the Bidder to submit the attached bid. Affiant further states that the name of any partnership, joint venture, or other business relationship presently in effect or which existed within one (1) year prior to the date of this statement with the architect, engineer, or other party to the project is as follows:

\_\_\_\_\_  
\_\_\_\_\_

Affiant further states that any such business relationship presently in effect or which existed within one (1) year prior to the date of this statement between any officer or director of the bidding company and any officer or director of the architectural or engineering firm or other party to the project is as follows:

\_\_\_\_\_  
\_\_\_\_\_

Affiant further states that the names of all persons having any such business relationships and the positions they hold with their respective companies or firms are as follows:

\_\_\_\_\_  
\_\_\_\_\_

(If none of the business relationships herein above mentioned exist, affiant should so state.)

\_\_\_\_\_  
By: \_\_\_\_\_

SEAL

Title: \_\_\_\_\_

Subscribed and sworn to before me this \_\_\_\_\_ day of \_\_\_\_\_, 20\_\_\_\_\_.

By: \_\_\_\_\_

Notary Public

SEAL

My Commission Expires:

\_\_\_\_\_

**NON-DISCRIMINATION CERTIFICATE**

I, \_\_\_\_\_, do hereby certify that I am the  
\_\_\_\_\_ of the \_\_\_\_\_ Corporation.

I further certify that I have, this date, submitted a bid to \_\_\_\_\_  
pursuant to the solicitation for Bids for \_\_\_\_\_ dated  
\_\_\_\_\_, 20\_\_\_\_.

*I certify that if I am the successful Bidder on this project, I will not discriminate against anyone in employment or employment practices because of race, creed, color, sex, or national origin, and that I will comply with all federal and state laws and executive orders concerning the subject of non-discrimination.*

\_\_\_\_\_  
By: \_\_\_\_\_

SEAL

Title: \_\_\_\_\_

Subscribed and sworn to before me this \_\_\_\_\_ day of \_\_\_\_\_, 20\_\_\_\_.

By: \_\_\_\_\_

Notary Public

SEAL

My Commission Expires:

\_\_\_\_\_

## **BID BOND**

*The Bidder shall submit to the Owner a Bid Bond on the Form(s) as supplied by the Bidder's corporate surety licensed to do business in the State of Oklahoma for a sum, not less than five percent (5%) of the total amount of the Proposal or the Proposal is to be accompanied by a certified or cashiers' check of the like amount payable to the Owner.*

**MAINTENANCE BOND**

**DEFECT BOND**

**KNOW ALL MEN BY THESE PRESENTS:**

*That \_\_\_\_\_,  
as Principal, and \_\_\_\_\_, a corporation  
organized under the laws of the State of \_\_\_\_\_, and authorized to transact  
business in the State of Oklahoma, as Surety, are held and firmly bound unto Olustee Public  
Works Authority in the penal sum of*

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*Dollars (\$ \_\_\_\_\_), in lawful money of the United States of  
America, said sum being equal to One Hundred Percent (100%) of the Total Contract Amount,  
for the payment of which, well and truly to be made, we bind ourselves and each of us, our heirs,  
executors, administrators, trustees, successors, and assigns, jointly and severally, firmly by these  
presents.*

*The condition of this obligation is such that:*

***WHEREAS**, said Principal entered into a written contract with Olustee Public Works Authority,  
dated \_\_\_\_\_, 20\_\_\_\_, for \_\_\_\_\_ all in compliance with the  
plans and specifications therefore, made a part of said Contract and on file in the Office of the  
Olustee Public Works Authority.*

***NOW, THEREFORE**, if said Principal shall pay or cause to be paid to the Olustee Public Works  
Authority, all damage, loss, and expense which may result by reason of defective materials and/or  
workmanship in connection with said work, occurring within the warranty period, then this  
obligation shall be null and void, otherwise to be and remain in full force and effect.*

*It is further expressly agreed and understood by the parties hereto that no changes or alterations  
in said Contract and no deviations from the plan or mode of procedure herein fixed shall have the  
effect of releasing the Sureties, or any of them, from the obligations of this bond.*

***IN WITNESS WHEREOF**, the said Principal has caused these presents to be executed in  
its name and its corporate seal to be hereunto affixed by its duly authorized officers, and  
the said Surety has caused these presents to be executed in its name and its corporate seal*

*to be hereunto affixed by its attorney-in-fact, duly authorized so to do the day and year set forth below.*

Dated this \_\_\_\_\_ day of \_\_\_\_\_, 20 \_\_\_\_\_.

PRINCIPAL

\_\_\_\_\_

By: \_\_\_\_\_

Title: \_\_\_\_\_

SEAL

ATTEST: \_\_\_\_\_

SURETY

\_\_\_\_\_

By: \_\_\_\_\_

Name: \_\_\_\_\_

Title: \_\_\_\_\_

Date: \_\_\_\_\_

Attorney-in-Fact

Address: \_\_\_\_\_

City: \_\_\_\_\_

Telephone: \_\_\_\_\_

SEAL

**PERFORMANCE BOND**

**KNOW ALL MEN BY THESE PRESENTS**, that we \_\_\_\_\_ as Principal and, \_\_\_\_\_ with general offices in a corporation organized under the laws of the State of \_\_\_\_\_ and authorized to transact business in the State of Oklahoma, as Surety, are held and firmly bound unto the Olustee Public Works Authority, a body corporate and politic organized and existing under the laws of the State of Oklahoma, in the penal sum of \_\_\_\_\_

\_\_\_\_\_ Dollars \$ \_\_\_\_\_ ), lawful money of the United States, in payment of which sum well and truly to be made, the said Principal and Surety bind themselves, their successors and assigns, jointly and severally, firmly by these presents.

Signed, sealed and delivered this \_\_\_\_\_ day of \_\_\_\_\_, 20\_\_\_\_\_.

**WHEREAS**, said Principal has entered into a written contract with the Olustee Public Works Authority of the State of Oklahoma, dated this \_\_\_\_\_ day of \_\_\_\_\_, 20\_\_\_\_, \_\_\_\_\_ according to the plans and specifications attached to said contract, which includes the furnishing of all necessary tools, equipment, material and labor, a copy of which contract, together with all plans, specifications, and general conditions, is hereto attached and made a part hereof as if set out in full herein, and for the payment to the Olustee Public Works Authority, of all sums due, or which may become due, by the terms of the contract, as well as by reason of any violation thereof by the Principal herein, and for the payment of any and all judgments, costs of suits and actions brought against the Olustee Public Works Authority, or its officers, for any cause whatever arising from, or on account of, any injuries or damage to life or property, suffered or sustained by any person, or persons, firm or corporation, caused by the Principal herein, its agents, servants, or employees, in the construction of said work, or by, or in consequence of, any negligence, carelessness, or misconduct, in guarding or protecting the same, or from any improper or defective materials used in the construction of said work, or any act of omission of said Principal, or its agents, servants, or employees; and for the protection of the Olustee Public Works Authority against all suits, or claims for infringements, or patent rights or processes.

And the said Surety, for value received, hereby stipulates and agrees that no change, extension of time, alteration or addition to the terms of the contract or to the work to be performed thereunder or the specifications accompanying the same shall in any way affect its obligations on this bond, and it does hereby waive notice of any such change, extension of time, alteration or addition to the terms of the contract or to the work or to the specifications.

**NOW THEREFORE**, the condition of the foregoing obligation is such that is the said Principal shall well and truly perform all the covenants and conditions of the said contract on the part of the said Principal to be performed, then this obligation shall be void, otherwise to remain in full force and effect in law.

**IN TESTIMONY WHEREOF**, the said Principal has caused these presents to be executed in its name, and its corporate seal to be hereto affixed by its duly authorized officers, and the said Surety has caused these presents to be executed in its name, and its corporate seal to

*be hereunto affixed, by its attorney-in-fact, duly authorized thereunto so to do, the day and year first above written.*

\_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_

Contractor (Principal)

\_\_\_\_\_  
\_\_\_\_\_

Oklahoma Resident Agent

\_\_\_\_\_  
\_\_\_\_\_

By

\_\_\_\_\_  
Address

\_\_\_\_\_  
Surety Company

\_\_\_\_\_  
By \_\_\_\_\_  
Attorney-in-Fact

(Accompany this Bond with Attorney-in-Fact's Authority from the Company)

(Principal's Seal)

(Surety's Seal)

**STATUTORY BOND**

**KNOW ALL MEN BY THESE PRESENTS:** That ,as Principal, and \_\_\_\_\_ (Bonding Company), as Surety, a corporation of \_\_\_\_\_, whose principal office is located at \_\_\_\_\_, are firmly bound unto Olustee Public Works Authority as Oblige to fill the obligations of the Principal and the surety under the Contract to which reference is hereafter made, in the amount of \_\_\_\_\_ Dollars (\$ \_\_\_\_\_) for payment whereof Principal and Surety bind themselves, their heirs, executors, administrators, successors and assigns, jointly and severally, firmly by these presents:

**WHEREAS,** Principal has by written Proposal, dated \_\_\_\_\_, offered to enter into a Contract with Oblige for \_\_\_\_\_ pursuant to the terms and conditions set forth in the Contract Documents, dated \_\_\_\_\_, the Owner has issued a written Notice to Apparent Low Bidder dated \_\_\_\_\_, and

**WHEREAS,** this bond is given in compliance with Title 61, Oklahoma Statutes, Sections 1, and 2, as amended and supplemented,

**NOW, THEREFORE,** the condition of this obligation is such that if the Principal shall pay all indebtedness incurred for labor or material or rental of machinery or equipment furnished in the construction of said public building of in making said public improvement, and shall faithfully perform all provisions of the Contract on its part, and maintain the Oblige and the Oblige's property free and clear of all liens arising out of agreements for labor and material and pay all laborers, mechanics, and subcontractors and materialmen, and all persons who shall supply such person or persons or subcontractors or materialmen with provisions and supplies for the carrying on of such work and indemnify and save harmless the Oblige from all loss, cost or damage which it may suffer by reason of the failure to do any of the foregoing, then this obligation shall be null and void; otherwise, it shall remain in full force and effect. All persons who have furnished labor, materials or supplies for use in and about the work provided for in the Contract shall have a direct right of action under this bond, subject to the Oblige's priority.

Any suit under this bond shall be instituted before the expiration of seven (7) years from the date on which final payment under the Contract is due.

Signed and sealed this \_\_\_\_\_ day of \_\_\_\_\_, 20 \_\_\_\_\_.

\_\_\_\_\_  
Surety (Principal)  
By \_\_\_\_\_

\_\_\_\_\_  
Attorney-in-Fact (Title)  
(Surety's SEAL) (Principal's SEAL)

**EXHIBIT A  
TO  
INDEPENDENT CONTRACTOR AGREEMENT**

**Description of Services and/or Equipment**

**PROPOSAL**

TO: Olustee Public Works Authority  
105 W 4<sup>th</sup> Street Olustee, Oklahoma 73560

FOR: One (1) Three Phase, 2.5 MVA, 34.5-12.47/4.16 kV Outdoor Substation  
Pad Mount Transformer, per the attached Specifications.

BID: Bid proposals to be received by 5:00 PM, CDT, local time; Thursday, May  
11th, 2023.

SECURITY: (See Bid Bond attached)

*The undersigned, as Bidder, declares that he/she has carefully examined the Specifications attached hereto, and he/she proposed and agrees that if his/her proposal is accepted, he/she will contract with the Olustee Public Works Authority, to furnish and deliver all equipment called for by this proposal, it being understood and agreed that all terms and conditions of said specifications shall become a part of a contract awarded through the issuance of a purchase order and/or execution of certain contract documents by the Olustee Public Works Authority in accordance with statutes of the State of Oklahoma.*

TRANSFORMER PROPOSED IS: NEW UNIT: \_\_\_\_\_, REBUILT UNIT \_\_\_\_\_.

TRANSFORMER WILL BE DELIVERED: No later than \_\_\_\_\_

TRANSFORMER WILL BE ASSEMBLED AND TESTED: No Later Than \_\_\_\_\_

**BID AMOUNTS:**

PAD MOUNT TRANSFORMER \$ \_\_\_\_\_\*

**OTHER RECOMMENDED SPARE PARTS (List):**

Description Each	Quan	Price
_____	_____	_____
_____	_____	_____

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ON-SITE OFF LOADING, ASSEMBLY AND TESTING (OPTIONAL) \$ \_\_\_\_\_ \*

*\*Include only the indicated prices in the total stated below.*

TOTAL BID AMOUNT: \_\_\_\_\_  
(Numerical Bid Figures)

\_\_\_\_\_  
(Manufacturer Represented by Bidder)

\_\_\_\_\_  
(Total Bid Amount in Words)

BIDDER: \_\_\_\_\_  
(Name of Bidder)

\_\_\_\_\_  
(Business Address of Bidder)

\_\_\_\_\_  
(City) (State) (Zip Code)

\_\_\_\_\_  
Signature of Bidder of Authorized Representative

\_\_\_\_\_  
(Month) (Day) (Year)

## **EXCEPTIONS**

Exceptions that the Bidder takes to the attached specifications, and/or alternates shall be listed here. The Bidder shall also clearly indicate if there are no exceptions.

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## EQUIPMENT DATA

Mandatory equipment data and information is required of the Material man on the following technical list of items. Incomplete data will be sufficient cause to reject the Material man's proposal.

### **One (1) Three Phase, 2.5 MVA, 34.5-12.47/4.16 kV Delta – Grounded Wye Outdoor Substation Pad Mount Transformer, per the attached Specifications.**

1. Weight of transformer complete \_\_\_\_\_ lbs.  
Shipping weight \_\_\_\_\_ lbs.
2. Weight of core and coil assembly \_\_\_\_\_ lbs.
3. Weight of oil \_\_\_\_\_ lbs.
4. Gallons of oil required for this unit \_\_\_\_\_ gals.
5. Will all or part of insulating oil be shipped in this unit? \_\_\_\_\_ yes \_\_\_\_\_ no
6. Number of gallons shipped in transformer \_\_\_\_\_ gals.
7. If insulating oil is shipped in truck-tank-car:  
Number of hours before demurrage \_\_\_\_\_ hrs.  
Charge for demurrage \_\_\_\_\_  
Maximum size of truck-tank-car \_\_\_\_\_
8. If oil is being furnished by drum, are drums to be returned? \_\_\_\_\_ yes \_\_\_\_\_ no
9. Will the transformer unit be shipped by tractor-trailer? \_\_\_\_\_ yes \_\_\_\_\_ no  
(Note: Maximum loaded height without bushings must be less than 15 ft.)
10. Will the transformer unit be shipped with the following items installed?

Check the Units of Items not installed.

All Installed

- Radiators \_\_\_\_\_ lbs.
- H. V. Bushings \_\_\_\_\_ lbs.
- L. V. Bushings \_\_\_\_\_ lbs.
- H. V. Arresters \_\_\_\_\_ lbs.
- L. V. Arresters \_\_\_\_\_ lbs.
11. Shipping height \_\_\_\_\_ inches
12. Bushing Manufacturer \_\_\_\_\_
13. Bushing (Manufacturer and Model/Catalog Number):  
Low Voltage: \_\_\_\_\_  
High Voltage: \_\_\_\_\_
14. Source Arresters (Manufacturer and Model/Catalog Number):  
Low Voltage: \_\_\_\_\_  
High Voltage: \_\_\_\_\_  
H.V.: \_\_\_\_\_  
L.V.: \_\_\_\_\_
15. Number of Heat Exchangers (Radiators) \_\_\_\_\_
16. Number of Cooling Forced Air Fans \_\_\_\_\_
17. Guaranteed losses:  
No Load (@ 100% Rated Voltage): \_\_\_\_\_ kW  
Load (@ 55 Deg. C. Rise ONAN Rating with DETC and LTC on neutral): \_\_\_\_\_ kW  
Total: \_\_\_\_\_ kW
18. Transformer Impedances on 55 Deg. C. Rise ONAN@ 75 Deg. C. Rise:  
a. Base kVA \_\_\_\_\_ kVA  
b. Positive Sequence Z1= \_\_\_\_\_ %  
c. Zero Sequence Z0= \_\_\_\_\_ %  
d. Allowable impedance tolerance \_\_\_\_\_ %
19. Regulation:  
a. % Regulation at 100% P.F. \_\_\_\_\_ %  
b. % Regulation at 80% P.F. \_\_\_\_\_ %
20. Windings – Copper H.V.: \_\_\_\_\_  
L.V.: \_\_\_\_\_

25. Core/Winding Design: \_\_\_\_\_
- a. Form (Shell or Core) \_\_\_\_\_
  - b. Core Material \_\_\_\_\_
  - c. Winding Conductor Material \_\_\_\_\_
  - d. Winding Conductor Shape \_\_\_\_\_
  - e. Winding Insulation Material \_\_\_\_\_
26. Other information desired to be submitted by the Materialman with proposal:
- a. Dimensional Outline Drawings \_\_\_\_\_
  - b. Transformer Tank Base Dimensions \_\_\_\_\_ W x \_\_\_\_\_ L
  - c. Transformer Tank Height \_\_\_\_\_ H
  - d. NEMA Standard Performance Specification Sheet \_\_\_\_\_
  - e. Certification of PCB free oil \_\_\_\_\_
27. List of components to be assembled on site:
- \_\_\_\_\_
- \_\_\_\_\_
- \_\_\_\_\_
28. Manufacturer
- a. Manufacturer Name \_\_\_\_\_
  - b. Model or Type \_\_\_\_\_
  - c. Years similar type has been produced \_\_\_\_\_
  - d. Number of units this type and size produced \_\_\_\_\_
  - e. Manufacturing Plant Location \_\_\_\_\_
  - f. Number of years the type and sized produced at the plant location \_\_\_\_\_
29. Any exceptions taken to the Specifications? \_\_\_\_\_yes \_\_\_\_\_no  
 If so, please document clearly herein.  
 If not, then so state.
30. Oil Preservation System: \_\_\_\_\_yes \_\_\_\_\_no  
 Manufacturer. \_\_\_\_\_

\_\_\_\_\_  
 Bidder to Initial

**EXHIBIT B  
TO  
INDEPENDENT CONTRACTOR AGREEMENT**

**Description of Billing and Payment Procedures**

Olustee Public Works Authority hereby agrees to pay to the Contractor as full compensation for the complete performance of the Contract a sum of money equal to the Total Contract Amount: If said Amount is up to 90% of Total Contract Amount upon successful completion of delivering the transformer unit, and all related materials, oil, bushings, lightning arresters, accessories, etc. on site and being accepted by the Owner. The remaining 10% will be released upon final acceptance of all remaining work, goods, documentation or manuals, drawings, reproducible, etc. of the Contractor by the Owner whether or not the transformer is energized and placed into service prior to that time. The making or method of any payment to the Contractor under the Contract shall not relieve the Contractor of any obligations there under. The Contractor is obligated to complete the Contract in its entirety and to deliver to the Owner such completed construction and work, as is specified in the Contract. Until the Contract is fully performed by the Contractor, the Contractor shall be obligated to repair, replace, restore, or rebuild any fully or partially completed construction and work required to be provided under the Contract, which may not be in conformance with the Contract. Final payment does not relieve the Contractor of its Contract obligations with respect to Warranty and Performance, Defect, and Statutory Bonds, and those obligations shall remain in force for the period as provided in the Contract. Payment amounts will only be considered upon the Owner's receipt of a formal invoice from the Contractor

**SPECIFICATIONS – PART 1**  
**10/12/14 MVA, 69-12.47/4.16 kV PAD MOUNT TRANSFORMER**  
**WITH 5-STEP DETC**

**1**     **SCOPE**

This specification covers the furnishing of one (1) three-phase, three winding, 60 Hertz, outdoor Pad Mount Transformer. The Bidder shall design, construct, factory test, and deliver the transformer(s) to the location shown in the Proposal.

**2**     **APPLICATION**

The transformer(s) will be used in a step-down power delivery application connected to an effectively grounded neutral source to provide a 34.5 kV Delta - 12.47Y/4.16Y kV transformation. Normal service conditions will approximate those described in IEEE Std C57.12.00. Operation elevation (altitude) will not exceed 3,300 ft. AMSL. The transformer(s) will be loaded in accordance with ANSI C57.91.

**3**     **STANDARDS**

**3.1**    **General**

The transformer(s) shall be designed, constructed, rated and tested in accordance with the applicable industry standards, including those listed below, unless more stringent or additional requirements are specified herein, in which case these specifications shall take precedence. Standard revisions effective on or following the date of the Notice and Instructions to Bidders shall not apply.

**3.2**    **American National Standards Institute (ANSI)**

ANSI C2-2002, *National Electrical Safety Code* ANSI C57.12.10-1997, *American National Standard for Transformers 230 000 Volts and Below 833/958 Through 8333/10 417 kVA, Single-Phase, and 750/862 Through 60 000/80 000/100 000 kVA, Three-Phase without Load Tap Changing; and 3750/4687 through 60,000/80,000/100,000 kVA with Load Tap Changing Safety Requirements* ANSI C57.91-1995 (R2004), *IEEE Guide for Loading Mineral Oil-Immersed Transformers* ANSI C76.1, *Apparatus Bushings and Test Code for Apparatus Bushings*

**3.3**    **Institute of Electrical & Electronics Engineer (IEEE)**

IEEE Std 32-1972 (R1997), *IEEE Standard Requirements, Terminology and Test Procedures for Neutral Grounding Devices*

IEEE Std C37.90-1989 (R1994), *Relays and Relay Systems Associated with Electric Power Apparatus*

IEEE Std C37.90.9-2002, *IEEE Standard for Surge Withstand Capability (SWC) Tests for Relays*

IEEE Std C57.12.00-2000, *General Requirements for Liquid-Immersed Distribution, Power and Regulating Transformers*

IEEE Std C57.12.70-2000, *IEEE Standard for Terminal Markings and Connections for Distribution and Power Transformers*

IEEE Std C57.12.80-2002, *IEEE Standard Terminology for Power and Distribution Transformers*

IEEE Std C57.12.90-1999, *IEEE Standard Test Code for Liquid-Immersed Distribution, Power and Regulating Transformers and Guide for Short-Circuit Testing of Distribution and Power Transformers*

IEEE Std C57.19.00-1991 (R1997), *IEEE Standard General Requirements and Test Procedure for Outdoor Power Apparatus Bushings*

IEEE Std C57.19.01-2000, *IEEE Standard Performance Characteristics and Dimensions for Outdoor Apparatus Bushings (ANSI)*

IEEE Std C57.98-1993 (R1999), *Guide for Transformer Impulse Tests*

IEEE Std C57.123-2002, *IEEE Guide for Transformer Loss Measurement*

IEEE Std C57.131-1995, *IEEE Standard Requirements for Load Tap Changers*

IEEE Std C62.11-2005, *Standard for Metal-Oxide Surge Arresters for AC Power Circuits (>1kV)*

**3.4**    **National Electrical Manufacturers Association (NEMA)**

NEMA TR 1-2013 (R2019), *Transformers, Regulators and Reactors*

**3.5**    **National Fire Protection Association (NFPA)**

NFPA 70-2023 *National Electric Code 2023*

#### 4 **RATINGS AND REQUIREMENTS**

The transformer(s) shall be rated and meet the requirements as follows:

##### 4.1 **Capacity**

2500 kVA, @ 55°C Rise, Manufacture to determine, ONAN/ONAF/ONAF @ 65°C Rise, as measured by the average winding temperature rise by resistance.

##### 4.2 **Voltage**

HV = 34,500, LV = 12,470Y/4,160Y Volts, Three Phase

##### 4.3 **BIL**

HV = 150 kV, LV = 110 kV

##### 4.4 **Short-Circuit**

The transformer(s) shall meet the Acceptable Condition Requirements given in IEEE Std. 057.12.90. Short-circuit currents shall be limited only by the transformer impedance. The Owner reserves the right to include short-circuit testing of the transformer(s). The Owner will advise the Bidder at any time prior to completion of other testing if short-circuit testing is elected.

##### 4.5 **Impedance**

Standard for this size and type of transformer. The impedance shall not change more than 2% after short-circuit testing, if performed.

##### 4.6 **Audible Sound Level**

The transformer shall be designed and guaranteed to have an average sound level not exceeding the levels listed in NEMA TR1.

##### 4.7 **LTC (not used in this application)**

##### 4.8 **Auxiliary and Control Voltages**

- Cooling Fans (if required): 1 PH, 120 VAC
- Nitrogen cabinet (if required): 120 VAC heater, 125 VDC for alarm contacts.

##### 4.9 **Current Transformers (not used in this application)**

##### 4.10 **Pressure Type Relay (not used in this application)**

##### 4.11 **Surge Arresters (not used in this application, installed externally)**

##### 4.12 **Nitrogen System**

- If a sealed head space is not sufficient oil preservation, install a nitrogen preservation system consisting of a nitrogen pressure regulator, valves, gauges and association equipment to allow for the automatic regulation of headspace nitrogen pressure of 0.5 psi.

##### 4.13 **Additional (Optional) Tests**

The following selected additional, non-routine, tests shall be included:

- {X} Winding Insulation Resistance
- {X} Core Insulation Resistance
- {X} Insulation Power Factor
- {X } Control (Auxiliary) Cooling Losses: Measurement of losses associated with fans, pumps, coolers, heaters, LTC drive motor, lamps, and all other devices operated from the control cabinet.
- {X} Excitation: Single phase tests on the rated voltage connection of all phases of any winding with the terminals brought out and accessible for suitable connection.
- { } Zero-phase Sequence Impedance Voltage:
- { } Low-Frequency Dielectric (Auxiliary): Low-frequency dielectric tests on auxiliary devices, control, and current transformer circuits.
- {X} Dissolved Gases in Oil Analysis.
- {X} Sweep Frequency Response Analysis (SFRA)

##### 4.14 **Documentation Transmittal**

All documentation and reports, including Progress Reports, Approval Drawings, Final Instruction Manuals, Test Reports, Field Reports, Etc., shall be sent to:

Oklahoma Municipal Power Authority  
Alex Dobson  
PO Box 1960  
Edmond, OK 73083-1960

## **5 LOSS EVALUATION AND COSTS**

### **5.1 Evaluation**

The evaluated purchase price of the transformer will be the proposal price, plus the evaluated cost of no-load losses (at rated voltage and frequency), plus the evaluated cost of load losses (at rated voltage, frequency and 65° C ONAN loading), plus the evaluated cost of the total auxiliary equipment power requirements.

### **5.2 No-Load Loss Evaluation Cost**

No-load (core) losses will be evaluated at a capitalized cost of \$3,000 per Kw at 100% rated voltage with DETC on neutral.

### **5.3 Load Loss Evaluation Cost**

Load (winding) losses will be evaluated at a capitalized cost of \$2,500 per kW at the 55 Deg. C ONAN rated load with DETC and LTC on neutral.

### **5.4 Auxiliary Loss Evaluation Cost**

Auxiliary equipment power requirements will be evaluated at a capitalized cost of \$1,000 per kW at the total auxiliary equipment power requirements.

### **5.5 Guarantee and Price Adjustment**

The tested losses shall be guaranteed to be less than or equal to the losses stated in the proposal. The final selling price of the transformer(s) shall be reduced if the factory tested losses are not less than or equal to the guaranteed losses stated in the manufacturer's proposal. The price reduction will be the sum of the differences between the guaranteed and tested no-load, load and auxiliary losses multiplied by the respective evaluation costs specified herein.

## **6 CORE AND COIL ASSEMBLY**

### **6.1 Core**

The core assembly shall have laminations made of "Non-aging", cold rolled, grain oriented, highly permeable silicon alloy steel. The assembly shall be braced or bolted adequately to prevent displacement and distortion under all normal handling, including rail shipment, and operation under maximum short circuit conditions. All bolted connections shall have locking provisions.

### **6.2 Winding**

Windings rated 350 kV BIL and above shall be circular continuous wound disc construction. Windings rated less than 350 kV BIL shall be circular, disc or helical construction. Windings shall be copper with brazed or compression joints.

### **6.3 Insulation**

Insulation material shall be of the thermal upgraded type and completely compatible system similar and equal to Westinghouse Insuldur. The insulating material, varnishes and other associated compounds shall not contaminate the insulating oil nor shall these items be affected by the oil. Core bolt insulation material shall be of suitable for use at sustained high temperatures and temperature cycling.

## **7 H.V. DE-ENERGIZED (NO-LOAD) TAP CHANGER**

### **7.1 General**

The transformer(s) shall include an externally operated de-energized (no-load) tap changer conforming to the requirements of ANSI C57.12.10, Sec. 5.1.1.

### **7.2 Tap Ratings**

The tap changer shall provide five (5) full capacity taps at rated voltage, 2.5% above and below rated voltage and 5% above and below rated voltage.

## **8 LOAD TAP CHANGER (not used in this application)**

- 9**        **BUSHINGS**  
Construction shall be dead front high voltage bushing wells suitable for use with Elastimold elbows and provide feed through bushings in a V configuration of the HV connections. Dummy caps suitable for energized use shall be installed on the “out” feeds. Shipping caps shall be installed on the “in” feeds. Low voltage connections shall be 4 hole brass spade type bushings.
- 10**        **TRANSFORMER TANK**
- 10.1**      **General**  
The transformer tank shall be of welded plate construction and in accordance with ANSI C57.12.10, Sec. 5.8 and the requirements herein specified.
- 10.2**      **Design Pressures**  
The transformer tank shall be designed for full vacuum filling. When auxiliary compartments such as expansion tanks are not designed for vacuum filling, they shall be designated on the nameplate and suitable isolating valves provided. The positive design pressure shall be as required by the operation of the transformer and applicable standards (9.5 psi. minimum).
- 10.3**      **Operating Pressures**  
The main transformer tank and any attached compartment that is subjected to operating pressures shall be adequate to withstand, without permanent deformation, pressures 25% greater than the maximum operating pressures resulting from the system of oil preservation used. The maximum operating pressures, positive and negative, which the transformer tank is designed to withstand, shall be shown on the nameplate. The maximum positive operating pressure shall be 10 psi.
- 10.4**      **Manholes**  
One or more manholes shall be provided in the cover. The minimum dimension for round, oval or rectangular manholes shall be twenty inches (20”).
- 10.8**      **Tanking Guides**  
The transformer tank shall be provided with tanking guides and centering pins for centering the core and coil assembly.
- 10.9**      **Internal Bracing**  
The completed transformer assembly shall be provided with the necessary internal bracing of core and coils to withstand handling, rail shipment and operating stresses and forces.
- 10.10**     **Accessory Supports**  
All accessory supports shall be adequately supported to provide a stable assembly.
- 10.11**     **Base Centerline & Center-of-Gravity Marking**  
The tank shall be permanently and plainly marked on all four sides of the tank to show: 1. The centerline of the base, marked by a notch or bead on or near the edge of the base. 2. The shipping center of gravity. 3. The assembled and oil filled center of gravity.
- 10.12**     **Drain & Filter Valves**  
Drain and filling valves shall be brass ball valves and shall be provided as follows:
- 10.12.1**   **Drain Valve**  
A two-inch (2”) NPT brass ball drain valve with sampling device shall be located at the bottom of each oil filled compartment of the main tank. These valves shall provide complete drainage of the oil filled compartment. Internal baffles shall be provided to draw the oil from the bottom 1/4” of the tank bottom. Valve shall be accessible without opening the cabinet and shall have a locking mechanism.
- 10.12.2**   **Filling Valve**  
A one-inch (1”) minimum NPT filling brass ball valve with sampling device shall be located in the top of each oil filled compartment of the main tank.
- 10.12.3**   **Vacuum Connection**  
At the recommendation of the manufacturer, a three inch (3 In.) NPT vacuum connection shall be located in the top of each oil filled compartment and shall be accessible without opening the cabinet. This connection shall be separated sufficiently from the filling valve to prevent the entrance of splattered oil during filling.

#### **10.12.4 Plugs**

Each valve and connection shall be furnished with a square head, solid brass pipe plug in the open end.

#### **10.12.5 Sampling Devices**

Sampling devices shall be 3/8", located between the main valve seal and the end plug. This device shall have 5/16" x 32 male thread and be equipped with a hand removable cap.

#### **10.13 Surge Arrester Supports & Mountings (not used in this application)**

#### **10.14 Nameplate**

A nameplate shall be furnished in accordance with ANSI C57.12.10, Sec. 5.4.

#### **10.15 Finish**

The finish of the transformer(s) exterior, including control cabinet shall be ANSI No. 70, light gray. Radiators shall be painted ANSI No. 70, light gray or shall be hot dip galvanized after fabrication (HDGAF). The interior of all control cabinet, compartments and transformer tank shall be white (ANSI 70, light gray, is an acceptable alternate for the control cabinet). Paint shall be durable and suitable for the application; paint thickness shall be a minimum of 3 mils.

#### **10.16 Joints & Gaskets**

All gasketed joints shall have machined surfaces on both sides to assure even and effective pressure, avoid over stressing gaskets and maintain oil tightness of the joint under all operating conditions. Gasket retainers and metal-to-metal stops shall be provided, except that the use of special non-retainer gaskets (dumbbell type) will be acceptable for the LTC compartment. All gaskets in contact with oil-bearing surfaces shall be nitrile butadiene synthetic rubber, cork, in any form, is unacceptable as gasket material.

### **11 INSULATING OIL**

#### **11.1 General**

The transformer(s) shall be supplied with the necessary quantity of high quality, non-PCB insulating oil.

#### **11.2 Characteristics**

The insulating oil shall have high dielectric strength, low viscosity and freedom from inorganic acids, alkali and corrosive Sulphur. The oil shall meet the requirements of ASTM D-3487 and have the following characteristics as a minimum:

1. PRECIPITATION NUMBER: 0 (zero)
2. MOISTURE CONTENT: 35 PPM maximum (ASTM D-1533)
3. INTERFACIAL TENSION : 40 Dynes/cm<sup>2</sup> minimum (ASTM D-1971)
4. DIELECTRIC CONSTANT: 2.2
5. DIELECTRIC STRENGTH: 30,000V minimum (ASTM D-877)
6. POWER FACTOR: 0.05%, maximum, @ 60 Hz and 25°C (ASTM D-924)
7. OXIDATION LIFE: 100 Hours minimum (ASTM D-943)

### **12 OIL PRESERVATION SYSTEM**

#### **12.1 General**

An oil preservation system shall be furnished. The design of the transformer(s) shall be such as to permit energizing the transformers at a minimum oil temperature of -20°C. At this temperature, the oil level shall be above the low level marking and the alarm setting of the oil level gauge. A sealed tank oil preservation system is preferred; however, any one of the following types of oil preservation systems may be provided.

#### **12.2 Sealed Tank System**

Sealed tank systems shall be in accordance with ANSI C57.12.10, Sec. 5.7.1. Additionally, transformers of this tank design shall have a combustible gas sampling line brought down from the top gas space in the main tank, not from any other place, and terminated at a point approximately 5-feet above the transformer base.

### **12.3 Pressure-Vacuum Bleeder System**

Pressure-vacuum bleeder systems shall be in accordance with ANSI C57.12.10, Sec. 5.7.2. Additionally, transformers of this tank design shall have a combustible gas sampling line brought down from the top gas space in the main tank, not from any other place, and terminate at a point approximately 5-feet above the transformer base. Each system shall be equipped with a pressure/vacuum gauge and pressure/vacuum regulator set to operate at the maximum pressure/vacuum pressures indicated on the transformer nameplate. The regulator inlet air shall be passed through a renewable desiccate filter/dryer with moisture indicator prior to entering the transformer tank.

## **13 COOLING EQUIPMENT**

### **13.1 General**

Transformer cooling shall include convection circulated insulating oil, external air exchange radiators and, if specified, auxiliary forced air-cooling fans automatic controls and accessories.

### **13.2 Radiators**

The transformer radiators shall be fixed, welded, if practical. Removable radiators shall be furnished when necessary for shipment and other reasons. Removable radiator connections shall be made with bolted flange type oil tight fittings. Valves shall be provided so that individual radiators, or radiator banks if a common header is used, may be removed without lowering the oil level in the main transformer tank. Valves must be of a type which do not leak around their operating stems.

### **13.3 Fans & Fan Motors**

Forced air cooling fans shall be provided whenever specified by the transformer rating.

#### **13.3.1 Fan Construction**

Cooling fans shall be a slow speed, high volume type designed for quiet operation and shall have their rotating shafts in horizontal position. Fans shall be dynamically static balanced and operate without vibration. Fans shall be fully accessible and mounted so any one fan can be easily removed without disturbing the operation of other fans.

#### **13.3.2 Fan Motors**

All fan motors shall be totally enclosed, non-ventilated, with sealed, pre-lubricated ball bearings and rated for all-weather outdoor operation. All fan motors shall have a power factor of 0.8 or better. Each fan motor shall be provided with thermal overload devices.

#### **13.3.3 Fan Motor Wiring**

Wiring shall be provided to allow the fans to be mounted on either side of the radiator banks in order to reinforce prevailing winds. Each fan shall have a flexible cable connection to a ring type disconnect mounted on the motor housing.

### **13.4 Automatic Auxiliary Cooling Control**

Temperature sensing devices, wiring, circuit breaker protective devices, control relays, contactors and shall be provided to control the fan operation. Power source terminals, wiring, circuit breaker protective devices, control switches, control relays and contactors shall be mounted in the control cabinet. The controls shall include the following:

#### **13.4.1 Winding Temperature**

One dial type "hot-spot thermometers" indicating the hottest winding temperature. Each thermometer shall have two independent Form C contacts. One contact shall control the auxiliary cooling equipment if equipped. The second non-grounded Form C contact shall be available for future wiring to SCADA. Each contact shall be adjustable between 65°C and 110°C.

#### **13.4.2 Control Switches**

Control switch(es) shall allow the cooling fans to be turned off or either bank of fans selected as the lead or first on bank.

## **15 GROUNDING**

### **15.1 Core Grounding**

Core grounding shall be provided in accordance with IEEE Std C57.12.00, Sec. 6.7. The design shall also facilitate performing core grounding tests.

#### **15.1.1 Access**

The grounding strap or lead shall be easily accessible from cover mounted bushing (preferred) or either a manhole or handhole on the transformer cover providing access to an in tank connection. Removal of the manhole or handhole cover shall not require the removal or lowering of the oil level of sealed-tank and inert-gas pressure tank designs.

#### **15.1.2 Connection**

The grounding strap or flexible lead shall pass under the access cover above, not below, the oil level. The ground connection hardware shall be accessible without the removal or lowering of the oil level of sealed-tank and inert-gas pressure tank designs. The connection shall not be slotted for disconnection and shall have a captive bolt.

#### **15.1.3 Marking**

The location of the grounding strap or flexible lead shall be marked on the transformer cover and outline drawing.

#### **15.2 Tank Grounding**

Tank grounding provisions shall be provided as follows:

##### **15.2.1 Grounding Pads**

Tank grounding pads in Segments 1, 3 and inside the cabinet as well as other pads required to provide adequate grounding and support of the grounding system. All grounding pads shall be copper-faced steel pads, with a 0.015-inch minimum thickness copper facing, or stainless steel pads, without copper facing. Pads shall have 2-hole NEMA spacing and drilling. Thread protection consisting of a removable flanged cup of noncorrosive material suitable for press fitting into threaded openings shall be provided for each open drilling.

##### **15.2.2 Grounding Bus**

Grounding bus shall be extended the length of the cabinet and have provisions for grounding all cables, ground rods, neutral bushings, and dummy caps. The main grounding bus shall be not less than 2-inch x 1/4-inch copper bar securely fastened and including a minimum number of splices and joints. Splices and joints must utilize not less than two (2) connection bolts at each splice point.

### **16 TRANSFORMER ACCESSORIES**

#### **16.1 Hot Oil Temperature Gauge(s)**

One dial type hot oil thermometer shall be provided for each separate oil compartment containing heat producing components. Each thermometer shall have one isolated, non-grounded Form C contact. Contacts shall be adjustable between 65°C and 110°C.

#### **16.2 Oil Level Gauge**

One liquid level gauge shall be provided for each separate oil compartment. Liquid level gauges shall be mounted at oil level heights. Each gauge shall have an isolated, non-grounded Form C contact.

#### **16.3 Pressure-Relief Device**

The transformer(s) shall be provided with a self-reseating pressure-relief device on the cover of the main tank. Each device shall have a mechanical indicator visible when standing at the transformer base level. Each device shall have one isolated, non-grounded Form C contact.

#### **16.4 Touch-Up Paint**

Two pints cans of matching tank paint shall be furnished with each transformer for exterior paint touch-up.

#### **16.6 Other Standard Accessories**

All accessories and features normally provided shall be furnished.

### **17 FACTORY TESTING**

#### **17.1 Routine Tests**

The transformer(s) shall receive all routine tests specified by IEEE Std C57.12.00. These tests shall be performed in accordance with IEEE Std C57.12.90.

##### **17.1.1 Winding Resistance**

Resistance measurements of all windings on the rated voltage tap and at the tap extremes.

##### **17.1.2 Ratio**

Ratio tests on all HV tap positions.

- 17.1.3 Polarity and Phase Relation**  
Polarity and Phase Relation on the rated voltage connection.
- 17.1.4 No-Load Losses & Excitation Current**  
No-load Losses and Excitation Current at 100% and 110% of rated voltage at the rated power frequency on the rated voltage tap connection(s).
- 17.1.5 Impedance Voltage and Load Loss**  
Impedance voltage and load loss at rated current and rated frequency on the rated voltage connection, and at the tap extremes as well as the HV tap positions listed in IEEE Std C57.12.00Section 8.3.2.
- 18.1.6 Low-Frequency Dielectric Test**  
Low-frequency dielectric test on both the HV and LV windings.
- 18.1.7 Operation Test**  
All electrical and electro-mechanical devices such as fans, pumps, motors, LTC, etc. shall be operated both in auto and manual mode for proper sequence/staging and function.
- 18.1.8 Leak Test**  
The tank leak test shall be performed in accordance with the manufacturer's standard test procedures.
- 18.2 Additional (Other) Tests**  
The transformer(s) shall receive all other tests required by Section IV as described by IEEE Std C57.12.00. These tests shall be performed in accordance with IEEE Std C57.12.90.
- 18.2.1 Winding Insulation Resistance:**
- 18.2.2 Core Insulation Resistance:**
- 18.2.3 Insulation Power Factor**  
The insulation power-factor tests shall be performed in accordance with IEEE Std C57.12.90, Sec. 10.0. The results shall be in the Doble Engineering format.
- 18.2.4 Control (Auxiliary) Cooling Losses**  
Measurement of losses associated with fans, pumps, coolers, heaters, LTC drive motor, lamps, and all other devices operated from the control cabinet.
- 18.2.5 Excitation**  
Single phase tests on the rated voltage connection of all phases of any winding with the terminals brought out and accessible for suitable connection.
- 18.2.6 Zero-phase Sequence Impedance Voltage**
- 18.2.7 Low-Frequency Dielectric (Auxiliary)**  
Low-frequency dielectric tests on auxiliary devices, control, and current transformer circuits.
- 18.2.8 Dissolved Gases in Oil Analysis**
- 18.2.9 Sweep Frequency Response Analysis**
- 18.3 Test Report**  
All test results shall be consolidated into a test report for each transformer. Test reports shall identify the transformer and show pertinent test voltages, etc. as well as the result. Test reports shall be certified by a qualified test engineer.
- 18.4 Witness**  
The Owner and/or designated representative(s) shall have the right to examine the core and coil assembly prior to tanking and witness all tests. The Manufacturer shall advise the Owner not less than 15 working days in advance of the tanking of the core and coil assembly and factory test then coordinate with the Owner and/or designated representative(s) to assure arrival at the appropriate time.
- 18.5 Test Failure**

The Owner shall be notified immediately of any test failure. If desired by the Owner, disassembly, repair and retesting shall be delayed, for up to three working days, to allow examination by the Owner and/or designated representative(s).

**18.6 Shipping Release**

The Owner does not require approval of test results prior to shipment of transformers; however, the test results must meet all standards, specification requirements and guarantees.

**19 PROGRESS REPORT**

**19.1 Schedule**

The Manufacturer shall transmit monthly progress reports to the Owner. The progress reports shall identify the Owner's and Manufacturer's order numbers, serial number, contract date, approval drawing transmittal date(s), percentage completion of the design, core, coil, core and coil assembly, tank and assembly phases; proposed testing schedule date(s); and proposed shipping date. Additionally the Manufacturer shall promptly notify the Owner whenever any significant changes in the shipping schedule. Notification shall be made in writing and shall include all reasons and other pertinent data for the change.

**19.2 Design & Manufacturing Changes**

The manufacturer shall inform the Owner when quoting and before construction, of any major design or manufacturing changes to be made on this transformer which varies from an established design previously furnished.

**20 SHIPPING**

**20.1 General**

The transformer shall be shipped by truck if possible. The transformer shall be shipped assembled insofar as possible. The transformer; any detached auxiliary equipment and accessories; and spare parts shall be shipped at the same time to the specified shipping point(s). All items shall be adequately braced and in weatherproof packages, suitable for shipment and extended outdoor storage, shall be provided for all equipment.

**20.2 Bill of Material**

Two copies of the Bill of Material and Packing Lists for all shipments shall be sent to the Owner two weeks before date of shipment. An additional copy shall accompany the actual shipment. The bills of material shall give method of shipment and the equipment to be shipped on each truck/rail car.

**20.3 Identification & Tagging**

All equipment and separately shipped items shall be clearly identified with a securely fastened, weatherproof tag, labeled with Owner's order number, specification number (including revision number), equipment number (if any) and service. All shipping containers, packing lists, bills of material, correspondence, etc., shall be identified with the same above information. All boxes, shipping containers, crates, etc., shall have weatherproof packing list firmly attached to the exterior and a duplicate packing slip packed inside. This requirement shall also apply to any subcontractor(s) for all equipment and items drop shipped to the Owner directly by the subcontractor(s).

**20.4 Notification**

The Owner shall be notified of the expected ship date(s) two weeks in advance and shall be further advised of the actual shipping date, the method of shipment, carrier, car number, if any, and PRO number, if any. Notification shall also be made 24 hours before arrival. Notifications shall be made directly to the person designated by the Owner.

**20.5 Oil**

The transformer(s) shall be shipped completely filled with oil unless prohibited by shipping weight limitations. If the transformer cannot be shipped completely filled with oil, the transformer tank shall be shipped filled with nitrogen gas or dry air under pressure and the necessary quantity of insulating oil shipped via roadway tank trucks. If the insulating oil is shipped separately and the assembly is not supervised by a field service engineer and not performed by a field assembly crew, delivery times must be coordinated by the Bidder in cooperation and with the approval of the Owner. Not less than 48 hours shall be allowed for unloading. Demurrage charges on tank trucks arriving prior to the approved time shall be the responsibility of the Bidder.

**20.6 Rail Shipment Impact Recorder**

Transformer(s) shipped via rail car shall be shipped with a 30-day sealed two axis impact recorder attached to the tank or car. The Owner's personnel will remove recorder, review recorder chart, and return recorder to Manufacturer. The recorder must be operative for the entire transit time.

**20.7 Pressure-Vacuum Gauge**

A pressure-vacuum gauge shall be installed on the transformer main tank during shipment.

**20.8 Pre-Shipment Tests & Reports**

Just prior to shipment the manufacturer shall perform the following tests and provide the reports described to the Owner. One copy of the data shall be shipped with the transformer and one copy immediately sent to the Owner.

**20.8.1 Tank Pressure**

Read and record the tank pressure shown on the installed pressure-vacuum gauge as well as the ambient temperature.

**20.8.2 Dew Point**

Measure and record the transformer tank gas dew point and temperature.

**20.8.3 Core Ground Resistance Test**

The core ground resistance test shall measure the resistance between the core and the transformer ground with the core ground strap disconnected. The test shall be performed at the ground strap or flexible lead. The test procedure and instrument data shall be sent with the test results. The value of the core ground resistance shall be in keeping with good design practice; the minimum acceptable value shall be determined by the Manufacturer and recorded on the test report.

**20.9 Receiving**

Shipments will be received and unloaded only during the Owner's normal working hours (generally 9:00 A.M. through 4:00 P.M., Monday through Friday, excluding holidays) unless other specific arrangements are made prior to delivery. The Manufacturer shall be responsible for all demurrage charges for deliveries and unloaded during hours other than those listed above and wait times if unloading cannot be accomplished within the above time period and is deferred until the next period.

**20.10 Internal Inspection**

An internal inspection may be required prior to acceptance if internal damage is suspected or if any of the following conditions exist.

1. The rail shipment impact recorder fails to record the entire ride.
2. The rail shipment impact recorder shows that transformer was subjected to horizontal impacts above Zone 2.
3. Exterior damage, lose or broken bracing, etc., is observed.

The Owner will notify the Contractor if acceptance will not be given without an internal inspection. The Contractor shall provide the personnel and equipment needed for an internal inspection at no cost to the Owner. The inspection shall be performed by a qualified representative of the manufacturer. The Owner may elect to have a representative also make an internal inspection. Demurrage charges due to the resolution of possible damage shall be the responsibility of the Manufacturer.

**21 DELIVERY AND OFFLOADING**

**21.1 General**

The transformer and parts, accessories, and spare parts shall be delivered to the designated location and off loaded for assembly and/or storage. The parts, accessories, and spare parts may be redirected to a nearby secured storage area. Transformer shall be F.O.B. pad to;

Olustee Substation  
182030 North 2810 Road  
Olustee, Oklahoma 73529  
Intersection of N2810 Road (27<sup>th</sup> Street) and East 1820 Road (East Stephens County Road)  
GPS Coordinates: 34.376038, -97.981840  
Delivery Contact: Kim Keller @ #580-648-2288 / Alex Dobson @#405-359-2512

Contractor shall provide proper equipment for offloading and assembling transformer including installation of radiators, bushings, and any other required equipment. The contractor shall provide testing equipment to test the unit after full assembly is complete.

**21.2 Receiving**

Shipments will be received and unloaded only during the Owner's normal working hours (generally 9:00 A.M. through 4:00 P.M., Monday through Friday, excluding holidays) unless other specific arrangements are made prior to delivery. The Manufacturer shall be responsible for all demurrage charges for deliveries and unloaded during hours other than

those listed above and wait times if unloading cannot be accomplished within the above time period and is deferred until the next period.

**21.3 Bill of Material**

The Bill of Material and Packing Lists for all shipments shall be compared to the shipment received and any missing or damaged items or packaging shall be noted.

**21.4 Transformer**

Transformers to be delivered to the substation pad shall, following the on-car inspection and initial acceptance by the Owner, be offloaded to the transformer pad. Offloading may be by crane or jack-and-skid, or other approved methods. The transformer shall be placed with the orientation and in the exact position marked by the Owner, generally aligning with the high voltage and low voltage cables in the pad cutout section.

**21.5 Accessories and Parts**

Transformer accessories and parts removed for shipment shall be unloaded at the designated delivery location or a nearby secure storage location. If unloaded at the designated delivery location and stored outdoors any boxes, etc. using cardboard or other packaging which might deteriorate if exposed to the weather shall be suitably covered.

**21.6 Oil**

Oil for transformers which are gas filled for shipment will be scheduled for delivery by the assembly crew by contacting the Contractor. Oil shipments shall be accompanied by certified test reports stating the brand, type, and name of the oil as well as the pre-shipment tested characteristics, including dielectric strength and PCB content. Oil shall be delivered via roadway tank trucks to the designated location at a location suitable for connection to the processing equipment and at the designated date and time. Demurrage charges on tank trucks arriving prior to the approved time shall be the responsibility of the Bidder. Not less than forty-eight (48) hours time after arrival shall be allowed for unloading. The field assembly crew shall be permitted to connect their hoses and equipment directly to the delivery truck for unloading.

**21.7 Rail Shipment Impact Recorder**

Transformer(s) shipped via rail car shall have a visual inspection of the impact recorder data prior to acceptance by the Owner. Failure of the impact recorder to operate throughout the shipment period or impacts greater than that specified in the manufacturer's instructions may require an internal inspection.

**21.8 Delivery Tests & Reports**

Upon delivery and prior to offloading the Contractor shall make a thorough visual inspection of the transformer and accessories for damage or loss. The following tests shall also be performed and reports of the results provided to the Owner.

**21.8.1 Tank Pressure**

Read and record the tank pressure shown on the installed pressure-vacuum gauge as well as the ambient temperature. Compare the readings with the pre-shipment values to determine whether or not a loss of pressure may have occurred during shipment.

**21.8.2 Dew Point**

If a loss of pressure is suspected or possible, measure and record the transformer tank gas dew point and temperature. Compare to the manufacturer's acceptable limits.

**21.8.3 Core Ground Resistance Test**

The core ground resistance test shall measure the resistance between the core and the transformer ground with the core ground strap disconnected. The test shall be performed at the ground strap or flexible lead with an instrument and procedure similar to the pre-shipment test. Compare the reading with the pre-shipment value. The reading should be near the pre-shipment value and shall be in keeping with good practice. The minimum acceptable value shall be determined by the manufacturer and recorded on the test report.

**21.9 Acceptance**

The Contractor will be notified if the equipment is not accepted due to damage or suspected damage. The Contractor may return the transformer to the factory for inspection and repair or perform an on-site internal inspection to confirm the damage or assure that no damage is present. The inspection shall be performed by a qualified representative of the manufacturer. The Owner may elect to also have a representative participate in the internal inspection.

**22 APPROVAL DRAWINGS & DOCUMENTATION**

## **22.1 General**

The Manufacturer shall furnish engineering drawings, requested supporting data, materials lists, instruction manuals, etc., to allow a general review and approval of the design and provide instructions and drawings suitable to move, assemble, install, field test, operate, service and repair the transformer(s).

## **22.2 Approval Drawings**

Approval drawings shall be submitted in triplicate to the Owner or Owner's Engineer for review before manufacturing begins. Drawings and data shall be complete in all respects, not requiring additional drawings to understand the function and intent of what is being furnished, and shall have been thoroughly checked by the Manufacturer. The Owner will review the drawings and data for compliance with specifications, will mark them to showing questions, changes and corrections then will return one set to the Manufacturer. If required, the Manufacturer shall resubmit revised drawings and data with the revisions clearly indicated. The Owner's approval does not relieve the Manufacturer from any liability or responsibility for proper design, fabrication and compliance with these specifications. Drawings for approval shall include:

### **22.2.1 Nameplate**

The nameplate drawings shall show the nameplate to be provided.

### **22.2.2 Outline**

Scaled and dimensioned outline diagrams showing assembled and shipping views of the top and all four side elevations of the complete transformer, including shipping, major component and assembled weights and dimensions and centers of gravity, weight of heaviest component to handle during field assembly, device mounting locations; quantity of oil required to cover the core and coils, trip the low oil alarm and total; total and per stage auxiliary cooling power requirements; and other information normally included.

### **22.2.3 Internal Core and Coil Assembly Outline**

Scaled and dimensioned outline diagrams showing assembled views of the top and all four side elevations of the completed transformer core and coil assembly within the tank structure.

### **22.2.4 Materials List**

Materials list adequately identifying all significant features and devices. This list may be a part of the outline drawings. This list shall identify any items to be shipped not installed.

### **22.2.5 Control Schematics and Wiring Diagrams**

Control schematics showing all control and auxiliary power circuits and devices, wiring diagrams showing the general layout of all control and auxiliary power devices, their terminal arrangements and interconnecting wiring. Control schematics shall also show device voltage ratings, motor ratings including horsepower, voltage, starting and running currents, etc.

### **22.2.6 Current Transformer Information (Not used in this application)**

### **22.2.7 Bushing Information (Not used in this application)**

### **22.2.8 Other**

Other drawings normally furnished or appropriate.

## **22.3 Instruction Manual**

Four (4) Instruction Manuals for each transformer furnished. Each Instruction Manual shall include all final (as built certified) drawings and instructions covering the storage, handling, assembly, installation, field testing, operation, service and repair of the transformer and all devices and accessories provided shall be furnished as early as possible, but not later than two weeks prior to shipment from the factory. Additionally, one (1) Instruction Manual shall be shipped with each transformer. Indexing and space to insert the Certified Test Reports at a later date shall be provided. Instruction books shall be hardback, provide means of field binding additional information and include securely bound drawings or drawing pockets adequate to contain all drawings furnished. The instruction book shall include:

### **22.3.1 Index**

A detailed index listing each instruction manual and drawing by name and number.

### **22.3.2 Instructions**

Complete instructions for the storage, handling, assembly, installation, field testing, operation, service and repair of the transformer and all devices and accessories provided. Operating, test and service instructions and renewal parts information shall be included for all control, accessory and auxiliary devices, tap changer controls, fans, cooling

controls, pressure relays, pressure-relief devices, liquid-level devices, oil temperature thermometers, control relays, control switches, etc.

**22.3.3 Final Drawings**

These shall include as built revisions of all drawing furnished for approval and any other drawings normally furnished or necessary for the application.

**22.3.4 Renewal Parts List**

A renewal parts list including the necessary reference and ordering information for all replaceable devices provided.

**22.3.5 Spare Parts List**

A listing of all parts (gaskets, bushings, etc.) furnished as spare parts as well as ordering information and order reference numbers.

**22.4 Design Information**

Design information shall be included on the Final Certified Drawings. The fact that such design information may be included in the instruction and/or operating manuals does not relieve the Manufacturer from compliance with this requirement.

**22.5 Technical Requirements**

Drawings shall comply with ANSI Y14. Drawings and instructions shall be clear, legible and capable of legible reproduction. Drawings not larger than 24-inches by 36-inches and instruction 8.5 x 11-inches are preferred. Each drawing and Instruction Manual shall reference the Owner's purchase number(s), Manufacture's order number(s) and specific transformer(s) for which the drawing and Instruction Manual is intended. Standard drawings which cover a number of variations or a general class of equipment shall have each such drawing individually endorsed on the front (or back if space is not available on the front) to describe exactly which parts of the drawing apply to the equipment furnished.

**22.6 CAD Drawing Files**

CAD drawing files shall be furnished for all drawings not later than two weeks prior to shipment. The drawing files shall be Autodesk AutoCAD Windows, Version 2020 or later, drawing format (.DWG). All fonts, shape files, line types, hatch patterns, etc. used in the drawings, but not supplied with the AutoCAD software shall also be furnished. Files shall also be furnished in PDF format. PDF files shall be formatted to print to the original drawing dimensions.

**22.7 Letter of Transmittal**

A letter of transmittal shall accompany all transmittals. Each transmittal shall identify the Owner and Manufacturer's order information, purpose of the transmittal and any response requested and list of items furnished including number, name and quantity.

**22.8 Photographs**

The Manufacturer shall furnish high resolution digital photo files (JPG) of the core and coil assembly. The photographs shall be of each side and each end of the assembly prior to tanking and of the top of the unit after tanking but prior to installation of the cover.

**SPECIFICATIONS – PART 2**  
**OPTIONAL TESTING FOR PAD MOUNT TRANSFORMER**

**23      GENERAL**

The Bidder shall individually price the following optional factory testing. The Owner will elect which tests are to be included in the contract. The tests, if elected by the Owner, shall be as described by IEEE Std C57.12.00 and performed in accordance with IEEE Std C57.12.90.

**23.1    Lightning Impulse Test**

The lightning impulse test shall be performed in accordance with IEEE Std C57.12.90, Sec. 10.3, and include one reduced-full-wave, two front-of-wave, two chopped-wave and one full wave impulses.

**23.2    Short-Circuit Tests**

The Short-Circuit Tests shall be performed in accordance with IEEE Std C57.12.90, Sec. 12.

**23.3    The Average-Rise Temperature Test**

The average rise temperature test, shall be performed in accordance with IEEE Std C57.12.90, Sec. 11; however, temperature tests shall be made on only one unit when multiple units of the same rating and design are produced at the same time; furthermore, these tests shall be omitted when a record of a temperature test on a duplicate or essentially duplicate transformer is available and the Owner agrees. On units with auxiliary cooling equipment to provide multiple kVA ratings, these temperature tests shall be made on all nameplate ratings.

**23.4    Audible Sound Tests**

The Audible Sound Tests, if specified in Section IV, shall be performed in accordance with IEEE Std C57.12.90, Sec. 13.

**23.5    Test Report**

All test results shall be consolidated into a test report for each transformer. Test reports shall identify the transformer and show pertinent test voltages, etc. as well as the result. Test reports shall be certified by a qualified test engineer.

**23.6    Witness**

The Owner and/or designated representative(s) shall have the right to examine the core and coil assembly prior to tanking and witness all tests. The Manufacturer shall advise the Owner not less than 15 working days in advance of the tanking of the core and coil assembly and factory test then coordinate with the Owner and/or designated representative(s) to assure arrival at the appropriate time.

**23.7    Test Failure**

The Owner shall be notified immediately of any test failure. If desired by the Owner, disassembly, repair and retesting shall be delayed, for up to three working days, to allow examination by the Owner and/or designated representative(s).

**23.8    Shipping Release**

The Owner does not require approval of test results prior to shipment of transformers; however, the test results must meet all standards, specification requirements and guarantees.

**SPECIFICATIONS – PART 3**  
**OPTIONAL SPARE PARTS FOR PAD MOUNT TRANSFORMER**

**24      GENERAL**

The Bidder shall provide pricing for the below listed items. The Owner will select the items and quantities to be included in the contract.

**24.1      Gaskets**

Spare gaskets are for future use only, excess of those required for initial transformer assembly. A set of spare gaskets shall be one gasket for each gasketed location on the transformer which contains insulating oil. Gaskets shall be furnished in protective wrappers or bags plainly marked as to the use or identified with a part number which can be referenced in the Parts List to determine the use. Gasket sets shall be furnished with any required greases, adhesives, etc., which may be required for proper installation.

**24.2      Bushings**

Spare bushings shall be identical to the bushings provided with the transformer. Spare bushings, if purchased, shall be wood crated suitable for shipment and long term indoor storage. The center cavity of draw lead bushings shall be covered with removable plugs to prevent the entrance of insects, etc. Each bushing shall be plainly marked as to the use or identified with a part number that can be referenced to the transformer order and in the transformer Parts List to determine the use.

**24.3      LTC Overhaul Kit**

The LTC overhaul kit shall include all contacts, vacuum bottles, gaskets and other parts necessary to overhaul a worn LTC mechanism. Bidder shall include, as a part of the Proposal, a listing of the parts included in the overhaul kit. The kit, if purchased shall be provided in crates, boxes, etc., suitable for shipping and long-term indoor storage. Each container shall be plainly marked as to the use or identified with a part number that can be referenced in the Parts List to determine the use.

**24.4      Other Recommended Spare Parts**

The Bidder shall include, as a part of the Proposal, a listing of other spare parts recommended for stocking by the Owner for maintenance and repair. These items are to be listed and priced separately on a unit basis. Other parts recommended and purchased shall be provided in crates, boxes, etc., suitable for shipping and long-term indoor storage. Each container shall be plainly marked as to the use or identified with a part number that can be referenced in the Parts List to determine the use.

**SPECIFICATIONS – PART 4**  
**PAD MOUNT TRANSFORMER ASSEMBLY AND TESTING**

**25**     **SCOPE**

The Bidder shall completely assemble and test the transformer such that it is ready to be energized and placed into service with full warranty. The Bidder shall provide all necessary manpower, equipment, tools and power source(s) needed to supply power to the equipment and tools for this work. The manufacturer’s written instructions provided at the time of shipment shall be used for installation. The Bidder shall comply with the more stringent requirements of these specifications, the manufacturer’s written instructions, and IEEE Std C57.1995 “IEEE Guide for Installation of Liquid-Immersed Power Transformers”. The Owner shall be notified in the event of a conflict between the requirements. The Owner understands that the cleanliness and quality of workmanship during installation impact the life of the transformer; therefore, the Owner reserves the right to stop work or demand that equipment and/or personnel be replaced if, in the Owner’s opinion, the offending equipment and/or personnel are detrimental to the quality of work and long term life of the transformer.

**26**     **SCHEDULING**

The Contractor shall schedule this work in conformance with the overall project schedule provided elsewhere in this document. Bidder shall advise the Owner, at least two-weeks in advance, of the proposed transformer installation start date of the name(s) of the crew superintendent, proposed schedule, and a list of the equipment, with pertinent ratings, to be used for this work. The schedule, or separate procedure document, shall state the pertinent criteria to be used (maximum ambient humidity to open the tank, minimum winding temperature prior to oil filling, minimum pressure (vacuum) during oil filling, etc.). The Owner will coordinate the schedule with manufacturer and advise as to whether or not the schedule is approved. The Owner will also review the criteria and advise of approval or state if more stringent criteria required.

**27**     **LOG REPORT**

The Bidder shall maintain a contemporaneous log of personnel on duty, activities, test results, readings, and problems. This log shall be available for inspection by the Owner or Owner’s representative(s) at any time during the installation. A complete copy of the log shall be provided to the Owner at the conclusion of the installation and prior to departure of the superintendent. The Log shall include, at a minimum, the following information:

- Date and time personnel, by name, arrive and depart the crew.
- Visual Inspection results.
- Accessory inventory results
- Tank ground verification
- Initial test results (tank pressure, core temperature, internal gas dew point, core ground resistance, etc.)
- Assembly activities
- Pre-vacuum Pressure Leak Test results
- Pre-vacuum Core Ground Test results
- Pre-vacuum Ratio Test results
- Pre-vacuum Current Transformer Continuity and Insulation Resistance Test results
- Vacuum, oil temperature, and oil dielectric readings (at least every 15 minutes)
- Date and time of oil arrival and pertinent truck and batch data, as well as dielectric test results from each compartment.
- Total amount of oil installed
- All final transformer test results

The superintendent shall stipulate in the log any waiting times or other restrictions regarding energization and loading and certify that the transformer is ready for service with full warranty.

**28**     **EQUIPMENT**

The installation equipment shall have the following characteristics:

- Vacuum Pump – Two-stage, approximately 150 cfm, capable of 200 microns of Mercury (0.02 mm Hg) when blanked off.
- Filter Press – Minimum 5 micron (1 micron preferred), capable of processing NLT 10 gpm (range of 10 – 40 gpm acceptable), with new filters and extra filter sets.
- Cold Trap – Recommended, but not required.
- Vacuum Gauge – Capable of measurement 0 -20 mm Hg.
- Vacuum Pipes and Hoses – Minimum 3-inch diameter.
- Oil supply lines, fittings, valves, and connections.
- Test instruments (winding ratio, oil dielectric (ASTM D-1816 with 1 mm gap and ASTM D-877 up to 60 kV), moisture in oil, dew point (to NLT -60 Deg C), etc.)

- Other equipment and instruments as recommended by the manufacturer's instructions
- Safety equipment (air tester, confined space entry hoist, etc.)

All equipment shall be in good operating condition and expected to provide satisfactory service throughout this work. All oil handling equipment shall be free of excess moisture and contaminants and shall be completely PCB free. All oil handling equipment shall be flushed with clean oil prior to use.

**29**     **ASSEMBLY**

The Bidder shall assemble all accessories and devices to the transformer per Manufacturer's instructions. Caution shall be made to minimize the introduction of foreign materials, atmospheric air or moisture into the tank. Preparation shall be made to minimize the open tank time and dry air or Nitrogen, with a Dew Point of NGT -40 Deg F shall be used to keep the tank pressurized whenever the tank is opened. The tank shall not be opened anytime rain or high humidity is present or expected during the open time. Workers around a tank opening shall have removed all jewelry and other items which could fall into the tank, have no unneeded tools or hardware in the vicinity of the opening, tie off all tools to prevent falling into the tanks and account for all hardware following each step of the installation. The Contractor shall immediately report to the Owner and Engineer the nature and location of any foreign materials that were or may have been dropped into the tank.

**30**     **VACUUM TREATMENT AND OIL FILLING**

The Contractor shall schedule the oil delivery with the Owner and manufacturer's representative with sufficient time for ordering and delivery. Oil delivery truck demurrage due to miss-scheduling or delays by the Contractor shall be paid by the Contractor. The transformer manufacturer's written instructions and verbal instruction by the manufacturer's representative shall be followed. In the event of verbal instructions that deviate from the written instructions of deemed to be detrimental to the work shall be brought to the Owner's and Engineer's attention as soon as possible.

**31**     **PREPARATION FOR SERVICE**

The Contractor shall remove all vacuum filling piping and accessories, install pipe plugs in all valves and fittings, install remaining accessories, clean all bushings, clean the top and sides of the transformer, and perform other work as needed to prepare the transformer for energization and service.

**32**     **FINAL TEST AND ENERGIZING**

The Contractor shall perform all tests required for warranty coverage and, at a minimum, the following tests:

**32.1**    **Oil Dielectric**

Sample from bottom drain valve. *Should be 35 kV or higher using ASTM D-877 or 32kV using ASTM D-1816.*

**32.2**    **Oil Power Factor**

Sample from bottom drain valve. Should be NGT 0.05% @ 25 Deg C and NGT 0.3% @ 100 Deg C.

**32.3**    **Turns Ratio**

All phases, on all LTC taps with the DETC at Neutral and at all DETC taps with the LTC at Neutral. Should be within 0.05% of calculated values and match factory test values.

**32.4**    **Insulation Power Factor and Capacitance to Ground**

Make the following test with a suitable power factor bridge. Measure only the power factor and capacitance on winding connections. Be sure to record the temperature of the insulation as accurately as possible. The temperature corrected values should not exceed 0.5%.

- Two winding transformers:
  - HV to GRD with LV winding grounded (H-LG).
  - LV to GRD. With HV winding grounded (L-HG).
  - HV connected to LV to GRD (HL-G).
- Autotransformers with tertiary winding:
  - HV and LV to GRD with TV grounded (HL-TG).
  - Tertiary to GRD with HV and LV grounded (T-HLG).
  - All windings connected together to ground (HLT-G).
- Autotransformers without tertiary windings:
  - HV and LV to GRD (HL-G).

- Three winding transformers:  
HV to ground with LV and TV grounded (H-LTG).  
LV to ground with HV and TV grounded (L-HTG).  
TV to ground with HV and LV grounded (T-HLG).  
All windings connected together to ground (HLT-G).

*NOTE: Windings may be called by different names than those given above, but the above pattern should be used.*

The Contractor shall perform record and report all other manufacturer recommended tests to the Owner, including:

**32.5 Water in Oil Content**

Sample from bottom drain valve. Should be NGT 15 ppm using ASTM D1533.

**33 RELEASE**

Following completion of all work the Contractor shall provide the Log Report to the Owner and advise the Owner that the transformer installation is completed and ready for energization.