

FAYETTEVILLE PUBLIC WORKS COMMISSION

**SPECIFICATIONS AND BID DOCUMENTS FOR
230/66KV AUTOTRANSFORMER 134.4/179.2/224 MVA AT 65C**

ISSUED FOR BIDS

FAYETTEVILLE PUBLIC WORKS COMMISSION

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A 230/66KV AUTOTRANSFORMER 134.4/179.2/224 MVA AT 65C

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Issued

January 3, 2022

FAYETTEVILLE PUBLIC WORKS COMMISSION

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FAYETTEVILLE PUBLIC WORKS COMMISSION

NOTICE TO PROSPECTIVE BIDDERS

Pursuant to N.C.G.S 143-129, Sealed Proposals will be received by the Fayetteville Public Works ("PWC") Commission, Fayetteville, North Carolina until 2:00 p.m., Local Time, Thursday, January 27, 2022, at the Fayetteville Public Works Commission Administration Building, 955 Old Wilmington Rd., Fayetteville, North Carolina 28301, Outside by the Entrance Doors, at which time they will be publicly opened and read for the purchase of:

A 230/66KV AUTOTRANSFORMER 134.4/179.2/224 MVA AT 65C

Specifications and Proposal forms may be obtained from the PWC Procurement Department at, <https://www.faypwc.com/purchasing> and in the Fayetteville Public Works Commission's Procurement Department, 1st Floor, PWC Administration Building, 955 Old Wilmington Rd, Fayetteville, NC between the hours of 8:00 a.m. and 5:00 p.m., Monday through Friday.

Each Proposal shall be accompanied by cash, cashier's check, or certified check drawn on a bank insured by the Federal Deposit Insurance Corporation or Savings Association Insurance Fund. Checks shall be payable to the Fayetteville Public Works Commission, North Carolina, in an amount not less than five percent (5%) of the total bid as a guarantee that a Contract, if awarded, will be entered into. In lieu thereof, a Bid Bond which conforms to the provisions of G.S. 143-129 as amended by Chapter 1104 of the Public Laws of 1951 may be submitted by the Bidder.

Proposals must be enclosed in a sealed envelope and are to be marked "PROPOSAL FOR A **230/66KV AUTOTRANSFORMER 134.4/179.2/224 MVA AT 65C**, NOT TO BE OPENED UNTIL 2:00 P.M., LOCAL TIME, January 27, 2022". Bidders are to mail or deliver their Proposals as follows: Fayetteville Public Works Commission, 955 Old Wilmington Rd., Fayetteville, North Carolina Attention: Nikole Bohannon, Procurement Advisor.

All late Bids shall be returned unopened to the sender. Regardless of the bidder's chosen means of delivery, a bidder assumes responsibility for delivery to the advertised location by the advertised deadline. If the delivery service cannot deliver the bid to the proper location by the deadline, the bid must be rejected as untimely, and shall be returned unopened to the sender.

The PWC its rights to reject any or all bids and to waive all formalities concerning the bid, or award bid to the lowet, responsive, responsible Bidder or Bidders taking into consideration quality, performance, and the time specified in the Proposals for the performant of the contract..

FAYETTEVILLE PUBLIC WORKS COMMISSION
FAYETTEVILLE, NORTH CAROLINA

By Trent Ensley
Procurement Manager

Date: January 3, 2022

DEFINITIONS

Whenever in these "Instructions to Bidders", "Materialman's Proposal", "Technical Specifications", "Agreement", "Bond", etc., the following terms or pronouns in place of them are used, the intent and meaning shall be interpreted as follows:

Commission or Owner or PWC	Fayetteville Public Works Commission
General Manager	Elaina Ball or her authorized designee.
COO Electric Systems	Jonathan Rynne, PE, or his authorized designee.
Substation Manager	Joel Valley or his authorized designee.
Procurement Manager	Trent Ensley, or his authorized designee.
Engineering Manager	David Deschamps, PE, or his authorized designee.
Observer	An authorized representative of the Commission is assigned to make any or all necessary observations of work performed and equipment and/or apparatus furnished by the Materialman.
Bidder or Materialman	Any individual, firm, or corporation submitting a Proposal for the work contemplated, acting directly or through a duly authorized representative.
Materialman or Contractor	Party to the second part of the Contract, acting Directly or through a duly authorized representative.
Subcontractor	An individual, firm, or corporation who contracts with the Materialman to perform part of or all the latter's Contract.
Surety	The body, corporate or individual, approved by the Commission which is bound with and for the Materialman, who is primarily liable, and which engages to be responsible for his acceptable performance of the work for which he has contracted.
Form of Proposal	The approved prepared form on which the Bidder is to submit or has submitted his Proposal for the work contemplated.
Bid Deposit	To all bids there shall be attached cash, cashier's check, or certified check of the Bidder upon a bank authorized to do business in North Carolina, or in lieu thereof, a Bid Bond.
Plans	All Drawings or reproductions of Drawings pertaining to the constructions under the Contract.
Technical Specifications	The directions, provisions, and requirements contained herein pertaining to the method and manner of performing the work or to the quantities and qualities of material to be furnished under the Contract.

Contract or Agreement	The Sales of Goods Agreement covering the furnishing of equipment and/or apparatus and the performance of the work. The Contract shall include the "Materialman's Proposal", "Plans", "Technical Specifications", "Acknowledgements" and any other Contract Documents
Performance Bond	The approved form of security to be approved by the Commission furnished by the Materialman and his Surety as a guarantee of good faith on the part of the Materialman to execute the work in accordance with the terms of the Specifications and Contract.
Payment Bond	The approved form of security to be approved by the Commission furnished by the Materialman and his Surety as a guarantee for payment of all Subcontractors on the part of the Materialman in the execution of the work in accordance with the terms of the Specifications and Contract.
Work	The performance of the project is covered by the Specifications or the furnishing of labor, machinery, equipment, tools, or any other article or thing being purchased by the Commission.
Emergency	A temporary unforeseen occurrence or combination of circumstances that endangers life and property and calls for immediate action or remedy.
Work at Site of Project	Work to be performed, including work normally done on the location of the project.

The subheadings in these Specifications are intended for convenience or reference only and shall not be considered as having any bearing on the interpretations thereof.

INSTRUCTIONS TO BIDDERS

1.0 Proposals

- 1.1 Only those Proposals made in accordance with these instructions will be considered.
- 1.2 Proposals must be made on the Contractor's Proposal provided herein and must not be altered, erased, or interlined in any manner. The Contractor shall fill in the Contractor's Proposal as detailed in the instructions. The Bidder may retain one (1) copy, but the original, fully executed, must be inserted or be attached to the Specification and Bid Documents. In addition, one (1) additional copy of all executed forms and supporting information shall be submitted with the original.
- 1.3 Proposals must be enclosed in a sealed envelope, addressed to the attention of **Nikole Bohannon, Procurement Advisor**. The outside of the envelope must be marked as required in the "Notice to Prospective Bidders" and the Bidder's name, bid opening date and time must shown thereon. All Proposals must be made on the blank forms provided in the Contractor's Proposal.
- 1.4 Proposals shall include a Form of Exceptions utilizing forms provided which shall itemize each and every exception from the Technical Specifications. The Form of Exceptions shall state the section, subsection, and paragraph designations from the part of the Specifications to which exception is taken and explain in detail the nature of the exception. A copy of this Form of Exceptions is included in the Contractor's Proposal section. Exceptions will not necessarily eliminate a Bidder from consideration, even if bids without exceptions are received from others. The treatment of exceptions will be based entirely on the overall best interests of PWC.
- 1.5 Invoice shall list the appropriate state sales tax as a separate item.
- 1.6 The prices as quoted herein:
 - a. Are firm unless otherwise stated.
 - b. Do include the cost of delivery to the site at the Bidder's Risk.
- 1.7 Modifications to bids must be by removal of the Bidder's original bid and the submittal of a completely revised bid package in full compliance with the Plans, Technical Specifications, and Bid Documents. This is required prior to the time of opening bids. No oral or telephonic Proposals will be accepted.
- 1.8 The Materialman represents and acknowledges that it has reviewed, familiarized itself, and has a complete necessary understanding for any Work at Site of Project. Materialman further represents and acknowledges that it has examined the Technical Specifications for the work and the Contract Documents relative thereto, read all special provisions furnished prior to the opening of the bids, and satisfied himself relative to the work to be performed.

- 1.9 The materials will conform to the Technical Specifications sections attached hereto and made a part hereof.
- 1.10 Should the Bidder find discrepancies in or omissions from the Drawings or Contract Documents or should he be in doubt as to their meaning, he shall at once notify Trent Ensley with PWC, who will send written instructions to all Bidders. Neither PWC nor the Engineer will be responsible for any oral instructions. If Plans and Specifications are found to disagree after Contract is awarded, the PWC shall be the judge as to what was intended. The Successful Bidder is hereby made responsible for the furnishing of the necessary labor, tools and equipment reasonably inferred or evidently necessary for the proper execution and completion of the work; for any additional work involved in the correction of apparent errors or inconsistencies, and in executing the true intent and meaning of the Drawings and Specifications as interpreted by PWC and all such labor and equipment shall be provided at the Contractor's expense, and under no condition will any such labor and equipment be allowed as an extra.
- 1.11 After opening, bids may only be withdrawn in accordance with N.C.G.S. 143-129.1.

2.0 Payment

- 2.1 Payment by the Commission to the Successful Bidder shall be made in accordance with the milestone payment schedule as follows:
Milestone Payment Schedule:
10% upon approval of submitted drawings
30% upon receipt of copper and core steel at the factory
35% upon shipment of transformer to owner
20% after delivery to site, setting on pad, dressed, and tested
5% retainage up to 60 days after delivery
Milestone Percentages, less retainage, to build transformer and after it is demonstrated that the equipment meets the Specifications.
- 2.2 In accordance with N.C.G.S. 143-134.1, the Commission will retain five percent (5%) of the amount of each monthly periodic payment. The Commission, after fifty percent (50%) of the work has been completed, will consider waiving further retainage on the project upon the following conditions: (1) written consent of surety is received; (2) satisfactory progress is being made on the Project; and (3) prior to fifty percent (50%) completion, any nonconforming work identified in writing by the Engineer has been corrected by the Contractor and accepted by the Engineer. If retainage is discontinued or reduced, the Commission reserves the right to reinstate retainage up to the five percent (5%) level if the Contractor performs unsatisfactorily. Furthermore, the Commission reserves the right to continue to retain payment, even in the event the Contractor's work is satisfactory, in order to ensure a total of two and one-half percent (2.5%) retainage over the life of the project. The Commission reserves the right to withhold additional payments for unsatisfactory job progress, defective construction not remedied, disputed work, or third-party claims filed against the Commission or reasonable evidence that a third-party claim will be filed.

2.3 The address for submittal of all invoices is Fayetteville Public Works Commission, 955 Old Wilmington Road, Fayetteville, North Carolina 28301, Attention: Joel Valley.

3.0 Bid Security

- 3.1 Each Proposal shall be accompanied by a cash deposit, cashier's check, or certified check drawn on a bank or trust company insured by the Federal Deposit Insurance Corporation or Savings Association Insurance Fund, or a Bid Bond in an amount not less than five percent (5%) of the Proposal. Said deposit will be retained by the Commission as liquidated damages in the event of failure of the Successful Bidder to execute the Contract within ten (10) days after the award.
- 3.2 Bid Bond shall be conditioned that the Surety will, upon demand, forthwith make payment to the Obligee upon said Bond if the Bidder fails to execute the Contract in accordance with the Bid Bond and that upon failure to forthwith make payment, the Surety shall pay to the Obligee an amount equal to double the amount of said Bond.
- 3.3 Only one (1) Bid Bond is required, the amount of which shall be based on the total amount of the bid. The value for the Bid Bond shall be based on the Bid Schedule of the maximum total amount.

4.0 Bulletins and Addenda

Any bulletins or addenda to the Specifications issued during the time of bidding are to be considered covered in the Proposal, and in closing a Contract, they will become a part thereof. Receipt of addenda shall be acknowledged by the Bidder.

5.0 Delivery of Equipment

The base prices quoted for each power transformer shall include delivery of the transformer FOB Point of Delivery, Fayetteville, North Carolina.

The Transformer Final site placement for the transformer will be our POD1 Owen Road Substation. The address of the site is 2842 Cumberland Road, Fayetteville, North Carolina 28306. The delivery site will be located within the service territory of the Commission in and surrounding Fayetteville, North Carolina. The Commission shall provide reasonable roadworthy access to each final destination.

Delivery of all items of equipment shall be made to permit unloading between the hours of 9:00 a.m. and 3:00 p.m., Monday through Thursday, holidays excluded. The Materialman shall give no less than forty-eight (48) hours' notice of all deliveries.

Quoted prices for materials and equipment shall include shipment to the substation site. Each power transformer will be delivered by the Materialman complete with unloading and rigging onto a permanent concrete pad. Once the transformer is completely unloaded by the Materialman, the manufacturer and its labor or contractor, at the appropriate time, will assemble any parts removed for shipment. The Materialman will furnish the services of a Engineering Manager for the supervision of this reassembly as specified under the manufacturer's field service requirements.

Coordinated shipment shall be made to reduce storage by the Commission and to facilitate the accumulation of component parts. **Partial shipments at scattered times will not be acceptable.** In the event that delays occur, the Materialman shall be responsible for all shipping demurrage, unless such delays are caused solely by the Commission.

Receipt of "Approval Drawings" by the Materialman constitutes an authorization for manufacture only, predicated upon the Drawings and corrections found thereon. Tentative release for shipment is to be granted by either the Commission or the Commission's Engineer, based upon the following:

1. Twenty-one (21) consecutive days prior notification of transformer tests so the Commission may have a representative present for the witness of the tests.
2. Furnishing of the requested number of copies of the Final Drawings as called for in the Specifications.
3. Coordination of manufacturing and delivery with Commission's construction schedule as may be noted in these Specifications.
4. Thirty (30) days' notification of tentative shipping schedule and forty-eight (48) hours' notification prior to all deliveries.

6.0 Award of Contract

- 6.1 The Award of Contract will be made to the lowest, responsive, responsible Bidder as soon as practicable, taking into consideration quality, performance and the time specified in the proposals for the performance of the contract. The Commission reserves the right to reject any and all bids.
- 6.2 The Commission reserves the right to waive minor irregularities or minor errors in any Proposal if it appears to the Commission that such irregularities or errors were made through inadvertence. Any such irregularities or errors so waived must be corrected on the Proposal prior to its acceptance by the Commission.
- 6.3 In evaluating bids for award of the contract, the Commission will consider pricing submitted by the bidder and the following factors:
 1. Equipment delivery date.
 2. Adherence to the Plans and Technical Specifications.
 3. Suitability of materials and equipment.
 4. Firm prices.
 5. Additional extended warranty.
 6. Standardization of equipment.
 7. Long-range economy.
 8. History of prior delivery performance.
 9. No-Load and Load Loss Evaluation.
 10. Accessibility of Materialman's service facilities and personnel.
 11. History of prior equipment and service personnel performance.

- 6.4 The required deliveries are shown in the Proposal. Strict adherence to the quoted delivery schedule is expected. Special attention should be given to the stipulations for delivery outlined in the General Conditions section of this document. Furthermore, the Materialman shall match his scheduled deliveries to the schedule preferred by the Commission if noted in the Proposal section.
- 6.5 In the event that the Bidder proposes any change or deviation from the Engineer's Plans and Specifications, such Proposal changes or deviations must be submitted at the time bids are opened. The Commission reserves the right to reject any such proposed changes or deviations. All exceptions must be stated on the Form of Exceptions. Failure to submit a Form of Exceptions will imply strict adherence to the Plans and Specifications.
- 6.6 The Commission reserves the right to accept any schedule, the combination of schedules, or any portion of a schedule.

7.0 Performance Bond/Payment Bond

A Performance Bond/Payment Bond is not required for this project.

8.0 Examination of Conditions

Prior to the submission of the Proposal, the Bidder shall make and shall be deemed to have made a careful examination of the Plans and Technical Specifications on file with the Commission and with the Engineer, and all other matters that may affect the cost and the time of completion of the work.

9.0 Bids to be Retained

No bid may be withdrawn after the scheduled closing time for the receipt of bids for a period of ninety (90) days pending the execution of a Contract by the Successful Bidder. Should the Successful Bidder default and not execute a contract, then the Contract may be offered to the next lowest, responsive, responsible Bidder whose Proposal is evaluated as acceptable.

11.0 Materialman's Proposal Form

Those bids not received on PWC Materialman's Proposal Form contained herein will be considered non-responsive. The forms shall be filled out completely. Any omissions may cause the entire Proposal to be rejected.

12.0 Questions

Questions regarding this bid must be submitted in writing to the attention of Nikole Bohannon, Procurement Advisor at nikole.bohannon@faypwc.com no later than **5:00 p.m., January 14, 2022.**

Bidders are **prohibited** by contacting any PWC official, employee, or agent other than as listed above. Failure to comply with this provision will result in disqualification of the Bidder.

13.0 Additional Purchase Clause

The Commission reserves the right to purchase additional units as specified herein within a one year period of contract award, upon the agreement of both parties.

GENERAL CONDITIONS

1.0 Drawings and Specifications

1.1 Preliminary

1.1.1 Before proceeding with fabrication, the manufacturer shall submit for approval sufficient Drawings to demonstrate that all parts conform to the requirements and intent of these Specifications. The Drawings shall include four (4) copies each of Outline, Nameplate, Detail, Control, Elementary, and Control Wiring Drawings. All Drawings submitted shall be a minimum of a "D" (24" x 36") size print. Submittal of Drawings smaller than "D" size will be immediately returned stamped "not approved" and proper size Drawing will have to be submitted. All Drawings shall be dimensioned in feet and inches; metric measurements alone will not be acceptable. However, dual dimensioning in feet and inches and centimeters will be acceptable. Approval Drawings shall be submitted directly to the Commission, Fayetteville PWC, 955 Old Wilmington Road, Fayetteville, North Carolina 28301, and Attention: Joel C. Valley

1.1.2 The Outline Drawing shall show dimensions of equipment including bushings, radiators and cooling equipment, base, and all other important external features. These Drawings shall show weights, bushing catalog numbers, ampere ratings, and descriptions of top bushing terminals and arrangement of all external accessory devices, as well as the complete transformer rating.

1.1.3 Approval of Drawings shall not be held to relieve the Materialman of obligations to meet all requirements of the Specifications, of responsibility for correctness of the Drawings, or of responsibility to meet original shipping promise on basis of Commission's Engineer being allowed two weeks for approval.

1.1.4 Receipt of Approval Drawings by the Materialman constitutes authorization for manufacture only, based upon the corrections found thereon. The Commission's Engineer reserves the right to request resubmittal of Drawings as deemed appropriate prior to authorizing manufacture.

1.1.5 The Drawings and Technical Specifications are complementary, one to the other. That which is shown on the Drawings or called for in the Technical Specifications shall be as binding as if it were both called for and shown. The intention of the Drawings and Specifications is to include all labor, materials, transportation, equipment, and any and all other things necessary to do a complete job. In case of discrepancy or disagreement in the Contract Documents, the order of precedence shall be Contract, Technical Specifications, Large-Scale Detail Drawings, Small-Scale Drawings.

1.2 Final Drawings

Contingent upon Approval Drawing review and product manufacture, the Bidder shall issue final documentation for the transformer as follows:

1.2.1 One (1) complete set of all Drawings, revised to "as-built" status, released on paper media.

1.2.2 Two (2) complete sets of all Drawings, revised to "as-built" status, released on two (2) separate CD-ROMs, compatible with AutoCad, Release 2010.

- 1.2.3 Four (4) copies of applicable instruction books, including one (1) print each of all Drawings representing physical and electric details as furnished per paragraph 5.2.1.
- 1.2.4 Two (2) copies of certified test reports corresponding to functional performance measurements after final assembly.
- 1.2.5 All Drawings are to be certified correct and supplied within a reasonable length of time prior to shipment of the equipment. Each set of Drawings and documentation shall include the following information:
- 1.2.6 Outline and Assembly Drawings showing size and location of major components and all principal dimensions.
- 1.2.7 Control cabinet front view.
- 1.2.8 Details of bushing and bushing terminal connectors.
- 1.2.9 Diagram of bushing current transformers, connection, number of turns, polarity marking, ratios, and bushing orientation.
- 1.2.10 Current transformer performance characteristic curves and data for all relay accuracy CT's.
- 1.2.11 Details of control housing.
- 1.2.12 Panel connection diagram showing exact connection for all components furnished.
- 1.2.13 AC and DC elementary circuit diagrams for all relay and control equipment furnished.
- 1.2.14 Wiring control and schematic diagrams.
- 1.2.15 Instruction books, including LTC operations manual(s), if so equipped.
5.18 Renewal parts catalog.
- 1.2.16 Two (2) copies of certified test reports.

2.0 Clarifications and Detail Drawings

In cases where the nature of the work requires clarification by the PWC Engineer, such clarification shall be furnished by the PWC Engineer with reasonable promptness by means of written instructions or Detail Drawings, or both. Clarifications and Drawings shall be consistent with the intent of Contract Documents and shall become a part thereof.

3.0 Copies of Drawings and Specifications

PWC will furnish free of charge to the Materialman two (2) copies of Plans and Technical Specifications, whichever is applicable.

4.0 Ownership of Drawings and Specifications

All Drawings and Technical Specifications are instruments of service and remain the property of the Engineer whose name appears thereon. The use of these instruments on work other than this Contract without permission is prohibited. All copies of Drawings and Specifications other than Contract copies shall be returned to the Engineer upon request after completion of the work.

5.0 Royalties, Licenses, and Patents

It is the intention of the Commission that the work covered in these Contract Documents will not constitute in any way an infringement on any patent whatsoever.

The Materialman shall protect and save harmless the Commission against any suit on account of alleged or actual infringement. The Materialman shall pay all royalties and/or license fees required on account of patented articles or processes, whether or not the patent rights are evidenced hereinafter.

6.0 Uncorrected Faulty Work

Should a correction of faulty or damaged work be considered inadvisable or inexpedient by the Commission or the Engineer, the Commission shall be reimbursed by the Materialman for the same by a deduction in the Contract Price. This deduction shall be arrived at by a fair estimate of the probable cost of correction, approved by all parties.

7.0 Delays and Extension of Time

7.1 The time to be allowed for delivery shall be stated on the Materialman's Proposal bound with these Specifications. The Materialman, upon notice of Award of Contract, shall prepare a construction schedule based on the allowed time and submit such schedule to the Engineer for approval.

7.2 If Materialman is delayed at any time in the progress of the work by any act of negligence by the Commission or the Engineer or by any separate Materialman employed by the Commission or by changes ordered in the work, the time of completion shall be extended for such reasonable time as the Engineer may decide.

7.3 No extension of time for completion will be made for ordinary delays and accidents. Extensions may be granted for delays ordered by the Engineer if the request has been made in writing within forty-eight (48) hours after the order to cease work has been given.

8.0 Guarantee

The Materialman shall guarantee their materials and workmanship against defects due to faulty materials or faulty workmanship or negligence for a period of five (5) years following final acceptance of the material and equipment. Materialman shall make good any defective materials or workmanship and any damage resulting therefrom without cost to the Commission.

9.0 PCB Dielectrics

All oil-filled materials and equipment shall be certified in writing and by permanently affixed nameplates to have a non-detectable level of PCB dielectrics, i.e., less than 2 ppm, in compliance with Federal Register (44FR31514), May 31, 1979.

10.0 Assignments

The Materialman shall not assign any portion of this Contract nor Subcontract in its entirety except as fully explained in the Materialman's Proposal and accepted by the Commission. No funds or sums of money due or to become due to the Materialman under this Contract may be assigned.

11.0 Change in Plans and/or Specifications

The Commission, or the Engineer on behalf of the Commission, may make changes to Plans and/or Specifications after awarding of the Contract or while construction is in progress. The compensation for such changes shall be agreed upon in writing between the Materialman and the Commission prior to commencement of work involving the change. No payment shall be made to the Materialman for correcting work not in compliance with Specifications.

12.0 Insurance

The Materialman shall maintain Workmen's Compensation Insurance and Liability Insurance appropriate for the level of exposure involved in the Contract. The Materialman shall furnish certification of the appropriate insurance.

13.0 Special Conditions

13.1 Defective Materials, Equipment, and Workmanship

13.1.1

All materials and equipment furnished hereunder shall be subject to the inspection, tests, and approval of the Commission and the Materialman shall furnish all information required concerning the nature or source of any materials and equipment and provide adequate facilities for testing and inspecting the materials and equipment at the plant of the Materialman.

13.1.2 Basic Right of Rejection

The materials and equipment furnished hereunder shall become the property of the Commission when delivered at the point to which shipment is to be made, provided, however, that the Commission may reject any such materials and equipment that do not comply with the Specifications and warranties of the Materialman and manufacturers. Recognition and subsequent rejection of any defective materials and equipment may occur either before or after incorporation of such materials and equipment into the facilities, provided such rejection is made within 60-days of date of energization of the materials and equipment. Upon any such rejection, the Materialman shall replace the rejected materials and equipment with materials and equipment complying with the Technical Specifications and warranties, F.O.B. truck at suitable destination. The Commission shall return the rejected materials F.O.B. truck at the same destination.

The Uniform Commercial Code UCC § 2-601 and 2-602 will be the guideline for the "Perfect Tender Rules" for such terms as "rejection, acceptance, and inspection".

In the event of the failure of the Materialman to so replace rejected materials and equipment, the Commission may make such replacement and the cost and expense thereof shall be paid by and recoverable from the Materialman.

- 13.1.3 The transformer to be provided herein shall include a full five (5) year warranty on the complete transformer together with all parts. This warranty shall extend for five (5) years from the date of delivery.

14.0 **Equal Employment Opportunity**

During the performance of this Contract, the Materialman agrees as follows:

1. The Materialman will not discriminate against any employee or applicant for employment because of race, color, religion, sex, national origin, political affiliation or belief, age, or physical handicap. The Materialman will take affirmative action to insure that applicants are employed and that employees are treated during employment without regard to race, color, religion, sex, national origin, political affiliation or belief, age, or physical handicap. Such action shall include but not be limited to the following: employment, upgrading, demotion or transfer, recruitment or recruitment advertising, layoff or termination, rates of pay or other forms of compensation and selection for training, including apprenticeship. The Materialman agrees to post in conspicuous places available to employees and applicants for employment notices setting forth the provisions of the nondiscrimination clause.
2. The Materialman will, in all solicitations or advertisements for employees placed by or on behalf of the Materialman, state that all qualified applicants will receive consideration for employment without regard to race, color, religion, sex, national origin, political affiliation or belief, age, or physical handicap.

3. The Materialman will send to each labor union or representative of workers with which he has a collective bargaining agreement or other Contract or other understanding, a notice advising the labor union or workers' representative of the Materialman's commitments under the Equal Employment Opportunity Section of this Contract and shall post copies of the notice in conspicuous places available to employees and applicants for employment.
4. In the event of the Materialman's noncompliance with the nondiscrimination clauses of this Contract or with any of such rules, regulations, or orders, this Contract may be canceled, terminated, or suspended in whole or in part and the Materialman may be declared ineligible for further Commission contracts.
5. The Materialman will include the provisions of this section in every subcontract unless exempted by rules, regulations, or orders of PWC so that such provisions will be binding upon each Subcontractor.

15.0 Iran Divestment Act

As mandated by NCGS. 147-86.59(a), Materialman hereby certifies that it is not listed on the Final Divestment List created by the North Carolina State Treasurer pursuant to NCGS 147-86.58. Consultant further certifies that in accordance with NCGS 147-86.59(b) that it shall not utilize any sub-consultant found on the State Treasurer's Final Divestment List. Consultant certifies that the signatory to this Contract is authorized by the Materialman to make the foregoing statement.

16.0 The Materialman shall complete the attached Form of Exception which clearly states any deviance to Technical Specifications proposed by the Bidder. Failure to state any deviance in the Materialman's Proposal from the Technical Specifications assumes complete and total compliance with the requirements of the Technical Specifications.

17.0 Covid-19

As North Carolina and the nation continues to deal with the COVID 19 pandemic, we must all take necessary steps to ensure the health and safety of employees, coworkers, family, friends, associates and people that we come in contact with on a daily basis. At PWC we implemented measures including requiring our employees to conduct temperature and wellness checks, wear a face covering or mask, whenever possible, maintain proper social distancing (minimum of 6 feet) and take other actions such as washing their hands, using approved sanitizer and wiping down surfaces, especially commonly shared equipment or tools. This applies to employees working in our facilities, working in public or at field sites. For firms who are under contract with PWC or working under Contract, those firms are expected to comply with all OSHA/EPA guidelines, CDC recommendations including any applicable North Carolina Executive Orders regarding the performance of work under COVID 19 conditions. Examples of such guidance can be found at the following:

OSHA COVID-19 Overview

<https://www.osha.gov/SLTC/covid-19/>

OSHA COVID-19 – Control and Prevention / Construction Work

[https://www.osha.gov/SLTC/covid-19/construction.html#:~:text=Keep%20in%2Dperson%20meetings%20\(including,Fill%20hand%20sanitizer%20dispensers%20regularly](https://www.osha.gov/SLTC/covid-19/construction.html#:~:text=Keep%20in%2Dperson%20meetings%20(including,Fill%20hand%20sanitizer%20dispensers%20regularly)

<https://www.osha.gov/Publications/OSHA4000.pdf>

North Carolina COVID-19 Executive Orders

<https://www.nc.gov/covid-19/covid-19-executive-orders>

Center for Disease Control

<https://www.cdc.gov/coronavirus/2019-ncov/index.html>

Implementing Safety Practices for Critical Infrastructure Workers

<https://www.cdc.gov/coronavirus/2019-ncov/community/critical-workers/implementing-safety-practices.html>

Essential Staff- Do's & Dont's

https://www.cdc.gov/coronavirus/2019-ncov/downloads/Essential-Critical-Workers_Dos-and-Donts.pdf

NC Licensing Board for General Contractors

<https://www.nclbge.org/2020/07/02/board-buzz-summer/>

NC Association of General Contractors

<https://www.cagc.org/CAGC/SafetyHR/CAGC/Safety/SafelyHomeInitiative.aspx?hkey=e3439388-0c36-4755-91bd-4c8fc6d22a41>

NC Department of Health and Human Services

<https://covid19.ncdhhs.gov/>

Cumberland County Health Department

<https://www.co.cumberland.nc.us/departments/public-health-group/public-health>

Department of Homeland Security

<https://www.ready.gov/pandemic>

Cape Fear Valley- What to do if you have COVID symptoms

https://www.youtube.com/watch?time_continue=1&v=tD0D7Apa_vw&feature=emb_logo

FAYPWC COVID Response

<https://www.faypwc.com/covid-19-update/>

Small Business Administration

<https://www.sba.gov/page/coronavirus-covid-19-small-business-guidance-loan-resources>

As an additional step to ensure the health and safety of contractor employees and PWC employees, should a contractor's employee test positive for COVID 19 the contractor must immediately inform the PWC project manager/supervisor or their primary point of contact at PWC and the employee should be performing work at PWC facilities or field sites until medically cleared.

This is necessary so PWC can inform our employees, conduct or own method of contact tracing for our employees and take any measures necessary such as quarantining PWC employees who may have been in contact with the individual who tested positive. These actions are necessary to ensure the health and safety of all and to ensure that contract performance can be achieved under the conditions of this pandemic.

Contractor must provide a plan with their proposal that describes their plan for working under COVID-19 conditions. The plan should address the Contractor's approach to protect their employees, PWC employees, along with any other Contractor's working on PWC's locations. This may include the Contractor's approach towards employee use of PPE, such as face masks, sanitizing commonly shared tools or equipment, practicing social distancing as work conditions permit, and working within close proximity of others. The plan may also address any other actions that the Contractor will be taking, such as conducting daily temperature checks, conducting symptom checks and trackers, and any other actions the Contractor deems appropriate to protect the health and safety of their employees, PWC employees, and any other Contractor's working on PWC's locations.

17.0 Change of Contract Price

A. The Contract Price may only be changed by a Change Order. The value of any Work covered by a Change Order or of any Claim for an adjustment in the Contract Price shall be determined as follows:

1. Where the Work involved is covered by unit prices contained in these Contract Documents, by application of such unit prices to the quantities of the items involved; or
2. Where the Work involved is not covered by unit prices contained in these Contract Documents, by mutually agreed unit prices or lump sum (which may include an allowance for overhead and profit); or
3. Where the Work involved is not covered by unit prices contained in these Contract Documents and agreement to a unit price or lump sum is not reached, on the basis of the Cost of the Work plus a CONTRACTOR's fee for overhead and profit.

B. CONTRACTOR shall establish and maintain records in accordance with generally accepted accounting practices and submit in a form acceptable to OWNER an itemized cost breakdown together with supporting data. OWNER may audit CONTRACTOR's records related to such costs during normal business hours.

C. The CONTRACTOR's total fee for overhead and profit shall not exceed 15% of the value of the additional work.

D. No increase in Contract Price shall be granted for Inexcusable Delays, unless otherwise agreed to by OWNER.

**FAYETTEVILLE PUBLIC WORKS COMMISSION
FAYETTEVILLE, NORTH CAROLINA**

A 230/66KV AUTOTRANSFORMER 134.4/179.2/224 MVA AT 65C

MATERIALMAN'S PROPOSAL

TO: Fayetteville Public Works Commission, North Carolina (hereinafter the "Commission" or "PWC)

The undersigned (hereinafter called the "Materialman") hereby proposes to sell and deliver to the Commission, upon the terms and conditions herein stated, the materials and equipment (hereinafter called the "Material") specified in the following schedule or schedules attached hereto and by this reference made a part hereof (hereinafter called the "Schedules") in accordance with the Bid Schedule and:

1. **Technical Specifications for the Materials and Equipment for A 230/66KV AUTOTRANSFORMER 134.4/179.2/224 MVA AT 65C.**
2. Instructions to Bidders.
3. Manufacturer's Specifications both as set forth herein and in manufacturer's literature (two sets) attached hereto or furnished separately as provided for in the "Instructions to Bidders."
4. Legal negotiations after bids are opened.

The prices quoted herein:

1. Are firm unless otherwise stated.
2. Are FOB, substation transformer pad, at each substation site to be designated by the Commission and located within the Commission's service area in and surrounding Fayetteville, North Carolina.
3. The price shall include unloading, handling, rigging, and placement of each transformer on an existing cribbing or foundation at the site to be designated by the Commission.
4. The transformers shall be assembled and tested by the manufacture.
5. Shall not include any tax from which a municipality in North Carolina is exempt.
6. Show North Carolina sales tax as a separate item.
7. Include service of the Manufacturers' Field Service Engineer for the number of days stated in the Materialman's Proposal with additional days or reimbursement for unused days at the daily rate stated in the Proposal.

The Materialman further declares that he has examined the site of the work and informed himself fully regarding all conditions pertaining to the locations where the work is to be done, examined the Technical Specifications for the work and the Contract Documents relative thereto, read all special provisions furnished prior to the opening of the bids, and satisfied himself relative to the work to be performed.

The Materialman proposes and agrees that if the following schedule or schedules of this Proposal are accepted, he will contract with PWC, in the form of a Contract specified, to furnish all necessary materials and equipment, except materials and equipment specified to be furnished by the Commission, complete and in accordance with the Plans, Specifications, and Contract Documents, to the full and entire satisfaction of the Commission, with a definite understanding that no money will be allowed for extra work except as set forth in the General Conditions and Contract Documents, and as cited on Change Order Forms.

The following information is supplied regarding the materials and equipment on which this bid is based:

Manufacturer: _____

Type or Model: _____

Location or Manufacturing Facility: _____

Nearest Repair Facility: _____

Percent of Failure of last 100 power transformers at the factory testing: _____

Percent of Failure of last 100 power transformers after installed in field: _____

Other Utilities Purchasing Recent Units of Same Design: _____

MATERIALMAN'S PROPOSAL

SCHEDULE NO. 1

Description	Price (Payment)
One 230/66KV AUTOTRANSFORMER 134.4/179.2/224 MVA AT 65C, including specified five-(5) year warranty, all in accordance with the Specifications. Shipment to occur on or before June 30, 2024, to Point of Delivery #1 at 2842 Cumberland Road, Fayetteville, NC 28306, or agreed upon delivery date with the awarded bidder.	
Milestone Payment Schedule:	
10% upon approval of submitted of drawings	1 \$ _____
30% upon receipt of copper and core steel at the factory	2 \$ _____
35% upon shipment of transformer to owner	3 \$ _____
20% after delivery to site, setting on pad, dressed, and tested	4 \$ _____
5% retainage up to 60 days after delivery	5 \$ _____
NC Sales Tax 7%	\$ _____
Total Unit Cost	\$ _____

Notes:

MAXIMUM GUARANTEED LOSSES

SCHEDULES 1⁽¹⁾

Maximum guaranteed no-load kW losses, 100% voltage, 75°C, 120 MVA ⁽³⁾	_____ kW	_____ kW
Maximum guaranteed load kW losses, (not total losses) at 120 MVA ⁽³⁾	_____ kW	_____ kW
Maximum guaranteed Total kW losses, at 120MVA, 75°C ⁽³⁾	_____ kW	_____ kW
Auxiliary kW losses, first stage cooling	_____ kW	_____ kW
Auxiliary kW losses, second stage cooling	_____ kW	_____ kW
Impedance %		_____ %

(1) All transformers in all bid schedules shall conform to these losses.

(2) These levels will be considered in evaluating the bids.

(3) No-load and total losses are to be guaranteed per ANSI or IEEE standards.

	Delivery (Weeks)**	
	Bid Schedule No. 1	
Approval Drawings (Days)		
Final Drawings**		
Delivery**		

- The prices of Materials set forth herein do not include any sums which are or may be payable by the Materialman on account of County or North Carolina sales tax upon the sale, purchase, or use of the Materials hereunder. The amount thereof shall be added to the purchase price and paid by the Commission after the Materialman has ascertained the actual sales tax to be included.
- The Materials will conform to the “Technical Specifications for A 230/66KV AUTOTRANSFORMER 134.4/179.2/224MVA AT 65C” attached hereto and made a part hereof.

3. **The prices quoted in the Materialman's Proposal shall be firm unless otherwise stated in the Proposal.**
4. The prices quoted shall include delivery of the materials and equipment by truck or rail FOB, to Point of Delivery #1 at 2842 Cumberland Road, Fayetteville, NC 28306, as outlined in the Instructions to Bidders. Materialman shall be responsible for providing crane and rigging to off-load transformer from delivery truck onto pad.
5. The prices of the materials and equipment set forth herein shall include the cost of delivery to the site at the Materialman's risk. The time of delivery shall be as shown in this Proposal.

The time for delivery shall be extended for the period of any reasonable delay due exclusively to causes beyond the control and without fault of the Materialman, including acts of God, fires, floods, strikes, and delays in transportation.

Delivery of all items of equipment to the Commission's designated delivery point shall be made to permit unloading between the hours of 9:00 a.m. and 3:00 p.m., Monday through Thursday, holidays excluded.

6. Receipt of Approval Drawings by the Materialman constitutes an authorization for manufacture predicated upon the Drawings and corrections found thereon. After the return of Approval Drawings, release for shipment is to be granted by either the Commission or its Engineer based upon the manufacturer's compliance with the following:
 - a. Fourteen (14) consecutive days prior notification of tests so the Commission may have a representative present for the witnessing of the tests.
 - b. Furnishing of the requested number of copies of the Final Drawings as called for in the Specifications.
 - c. Coordination of manufacturing and delivery with the Commission's construction schedule as may be noted in these Specifications.
 - d. Thirty (30) days notification of tentative shipping schedule and forty-eight (48) hours' notification prior to all deliveries.
 - e. The base quotation shall include the services of a Manufacturer's Field Service Engineer for the time outlined below per unit. Extra days (or credit for days not used) shall be supplied at a daily rate as quoted below:

7. Title to the materials and equipment shall pass to the Commission upon delivery on the pad, to the point specified above, and subject to successful final field testing and acceptance by the Commission or the Engineer.
8. This Proposal is made pursuant to the provisions of the Notice and Instructions to Bidders and the Technical Specifications, and the Materialman agrees to the terms and conditions thereof.
9. The Materialman warrants the accuracy of all statements contained in the Bidder's qualifications, if any shall be submitted, and agrees that the Commission shall rely upon such accuracy as a condition of the Contract in the event that this Proposal is accepted.
10. The Materialman warrants that the materials will conform to the performance data and guarantees which are attached hereto and by this reference made a part hereof.
11. NON-COLLUSIVE BIDDING CERTIFICATION - By the submission of this bid, the Materialman certifies that:
 - a. The bid has been arrived at by the Materialman independently and has been submitted without collusion with any other Materialman or Subcontractor of materials or equipment of the type described in the Notice to Prospective Bidders or the Technical Specifications.
 - b. The contents of the bid have not been communicated by the Materialman or, to his best knowledge and belief, by any of his employees or agents to any person not an employee or agent of the Materialman or his Surety on any Bond furnished herewith and will not be communicated to any person prior to the official opening of the bid.
 - c. The undersigned further agrees that in case of failure on his part to execute said Contract within ten (10) consecutive calendar days after written notice has been given of the Award of Contract, the check, cash, or Bid Bond accompanying this bid and the monies payable thereon shall be paid into the funds of the Commission account set aside for this project as liquidated damages for such failure; otherwise, the check, cash, or Bid Bond accompanying the Proposal shall be returned to the Undersigned.
12. The Materialman shall complete the attached Form of Exception which clearly states any deviance to Specifications proposed by the Bidder. Failure to state any deviance in the Materialman's Proposal from the Specifications assumes complete and total compliance with the requirements of the Specifications.

1. If in submitting this Proposal, the Materialman has made any change in the Materialman's Proposal, the Materialman understands that the Commission may evaluate the effect of such change as it sees fit or may exclude the Proposal from consideration in determining the Award of the Contract.

Respectfully submitted this _____ day of _____, 2022.

Name of Firm

By _____

TITLE

Address of Bidder:

Manufacturer of Proposed
Equipment:

Place of Manufacture:

NORTH CAROLINA BID BOND

KNOW ALL MEN BY THESE PRESENT, THAT WE

as Principal, and _____ as Surety, who is duly licensed to act as Surety in North Carolina, are held and firmly bound unto the Fayetteville Public Works Commission, Fayetteville, North Carolina, as Obligee, in the penal sum of _____ DOLLARS (\$ _____) (5% Bid Bond), lawful money of the United States of America, for the payment of which, well and truly to be made, we bind ourselves, our heirs, executors, administrators, successors and assigns, jointly and severally, firmly by these present.

SIGNED, Sealed and dated this _____ day of _____, 2022.

WHEREAS, the said Principal is herewith submitting Proposal for

A 230/66KV AUTOTRANSFORMER 134.4/179.2/224 MVA AT 65C

and the Principal desires to file this Bid Bond in lieu of making the cash deposit as required by GS 143-129 amended in Chapter 1104 of the Public Laws of 1951;

NOW, THEREFORE, THE CONDITION OF THE ABOVE OBLIGATION is such that if the Principal shall be awarded the Contract for which the bid is submitted and shall execute the Contract and give Bond for the faithful performance thereof within ten (10) days after the award of same to the Principal, then this obligation shall be null and void; but if the Principal fails to so execute such Contract and give Bond as required by GS 143-129, as amended by Chapter 1104 of the Public Laws of 1951, the Surety shall, upon demand, forthwith pay to the Obligee the amount set forth in the first paragraph hereof, and upon failure to forthwith make such payment, the Surety shall pay the Obligee an amount equal to double the amount of this Bid Bond as set forth in the first paragraph herein. Power of Attorney from the Surety to its Attorney-in-Fact is attached hereto.

Principal

By _____ (SEAL)

Corporate Surety

By _____ (SEAL)

SALE OF GOODS AGREEMENT

This Sale of Goods Agreement (“Agreement”) is made by and between the City of Fayetteville (the “City”), by and through the Fayetteville Public Works Commission (“PWC”), a North Carolina public authority, and _____ [insert seller’s full legal name] (“Seller”), a _____ [identify the type of legal entity and State in which formation was accomplished] (each of PWC and Seller is a “Party” and both are collectively the “Parties”) as of the date of execution last written below (the “Effective Date”). The Parties agree as follows:

1. Sale of Goods. Seller shall sell to PWC and PWC shall purchase from Seller the following specifically manufactured good(s): [INSERT ONE SENTENCE OR MORE DESCRIBING THE GOOD(s) TO BE MANUFACTURED AND SCOPE OF WORK TO BE PERFORMED ANY DELIVERABLES TO BE RECEIVED BY PWC OR attach a scope of goods OR a quote/invoice “as Exhibit A attached hereto and incorporated herein by reference”] (the “Goods”). PWC may issue a purchase order for the Goods that specifies any additional applicable terms and conditions set forth for the purchase (a “Purchase Order”), but such Purchase Order is subject to the terms of this Agreement. In the event of a conflict between the provisions of this Agreement and the provisions of any Contract Documents or attachment or exhibit or Purchase Order made pursuant to this Agreement, the terms of this Agreement shall govern.

2. Contract Documents. “Contract Documents” means the following documents that were either made available to Seller by PWC during the bid solicitation process (including Drawings) or executed by the Parties, or both, which are all incorporated by reference herein:

- a. This Agreement
- b. Notice to Prospective Bidders
- c. Definitions
- d. Instructions to Bidders
- e. General Conditions
- f. Materialman’s Proposal
- g. Bid Bond
- h. Technical Specifications
- i. Purchase Order(s)
- j. Addenda

3. Delivery of Goods. Seller shall deliver the Goods [EITHER: “on or before _____” OR “as specified in the Contract Documents or an applicable Purchase Order issued by PWC” OR “as otherwise agreed in writing by the Parties”] (the “Delivery Date”). Timely delivery of the Goods is of the essence. If Seller fails to deliver the Goods on or before the Delivery Date, PWC may, without any liability to Seller, terminate this Agreement immediately by providing written notice to Seller. Unless otherwise specified in an applicable Purchase Order or the Contract Documents, excluding this Agreement, all Goods shall be delivered to PWC’s Warehouse at 955 Old Wilmington Road, Fayetteville, North Carolina 28301 (the “Delivery Point”) during PWC’s normal business hours. Delivery shall be made FOB Delivery Point.

4. Title and Risk of Loss. Title of the Goods passes to PWC upon delivery of the Goods to the Delivery Point. Seller bears all risk of loss or damage to the Goods until delivery of the Goods to the Delivery Point.

5. Packaging. Seller shall properly pack, mark, and ship the Goods as instructed by PWC and otherwise in accordance with applicable law and industry standards and shall provide PWC with all shipment documentation showing the quantity of pieces in shipment, the number of cartons or containers in shipment, Seller's name, the airway bill or bill of lading number, and the state of origin.

6. Inspection and Rejection of Nonconforming Goods. PWC has the right to inspect the Goods on or after the Delivery Date. PWC, at its sole option, may inspect all or a sample of the Goods, and may reject all or any portion of the Goods if it determines the Goods are nonconforming or defective. If PWC rejects any portion of the Goods, PWC has the right, effective upon written notice to Seller, to: (a) terminate this Agreement in its entirety and require Seller to remove the Goods in a commercially reasonable time period or pay the full cost and expense to have the rejected Goods returned to Seller; or (b) reject the Goods and require replacement of the rejected Goods at Seller's sole expense. If PWC requires replacement of the Goods, Seller shall, at its sole expense and in the lesser of ninety (90) days or the number of days between any applicable Purchase Order of PWC and the Delivery Date, replace the nonconforming Goods and pay for all related expenses, including, but not limited to, transportation charges for the return of the defective goods and the delivery of replacement Goods. Any inspection or other action by PWC under this section shall not reduce or otherwise affect Seller's obligations under this Agreement, including Seller's warranties, and PWC shall have the right to conduct further inspections after Seller has carried out its remedial actions.

7. Price. PWC shall purchase the Goods from Seller in the total amount of \$_____ ("Price"). The Price includes all packaging, transportation costs to the Delivery Location, insurance, fees, and applicable taxes, including, but not limited to, all sales, use, or excise taxes. No increase in the Price is effective, whether due to increased material, labor, transportation costs or otherwise, without the prior written consent of PWC.

8. Billing and Payment. Seller shall invoice PWC within thirty (30) days after the completion of the delivery of the Goods. PWC shall pay the undisputed portion of the invoice within forty-five (45) calendar days after PWC's receipt of the invoice. All payments from PWC to Seller shall be transferred electronically to Seller's designated financial institution, and Seller shall, prior to delivery of its invoice to PWC, supply the name of Seller's financial institution, routing number, and account number on the form available from PWC and provide to PWC a completed and signed IRS Form W-9. Seller has the right to impose a late payment charge of one percent (1%) per month for amounts unpaid by PWC by the date due.

9. Warranties. Seller warrants to PWC that for a period of twenty-four (24) months from the Delivery Date, all Goods will: (a) be free from any defects in workmanship, material and design; (b) conform to applicable specifications, drawings, designs, samples and other requirements set forth in the Contract Documents or as specified by PWC and agreed to by Seller; (c) be fit for their intended purpose and operate as intended; (d) be free and clear of all liens, security interests, or other encumbrances; and (e) not infringe or misappropriate any third party's patent or other intellectual property rights. These warranties survive any delivery, inspection, acceptance or payment of or for the Goods by PWC. These warranties are cumulative and in addition to any other warranty provided by law or equity. Any applicable statute of limitations runs from the date of PWC's discovery of the noncompliance of the Goods with the foregoing warranties. If PWC gives Seller notice of noncompliance with this Section 9, Seller shall, at its own cost and expense, within thirty (30) days replace or repair the defective or nonconforming Goods and pay for all related expenses, including, but not limited to,

transportation charges for the return of the defective or nonconforming goods to Seller and the delivery of repaired or replacement Goods to PWC.

10. Termination. Notwithstanding any other or additional remedies that may be provided under this Agreement, PWC may terminate this Agreement with immediate effect upon written notice to the Seller, either before or after the acceptance of the Goods, if: (a) Seller repudiates, or threatens to repudiate, any of its obligations under this Agreement; (b) Seller is in breach of, or threatens to breach, any representation, warranty, or covenant of Seller under this Agreement and either the breach cannot be cured or, if the breach can be cured, it is not cured by Seller within a commercially reasonable period of time under the circumstances, in no case exceeding seven (7) days following Seller's receipt of Notice of such breach; (c) Seller fails to, or threatens to fail to, timely deliver Goods conforming to the requirements of, and otherwise in accordance with, the terms and conditions of this Agreement; or (d) Seller becomes insolvent, files a petition for bankruptcy, or commences or has commenced against it proceedings relating to bankruptcy, receivership, reorganization, or assignment for the benefit of creditors. PWC shall be obligated to pay Seller only for work performed and reasonable expenses incurred until delivery of the notice of termination.

11. Insurance. During the term of this Agreement and for a period of three (3) years after the date of this Agreement, Seller shall, at its own expense, maintain and carry insurance in full force and effect that includes, but is not limited to, commercial general liability (including product liability) with limits no less than \$1,000,000 for each occurrence and \$3,000,000 in the aggregate and umbrella liability in a sum no less than \$5,000,000, which insurance shall be placed with insurance companies authorized to do business in the State of North Carolina and rated A minus VII or better by the current edition of Best's Key Rating Guide or otherwise approved in writing by PWC. Prior to delivering any Goods, Seller shall deliver to PWC certificates of insurance confirming each such coverage, and Seller shall direct its insurers to provide annually to PWC certificates confirming each such coverage during the coverage period. PWC shall be named as an additional insured in the insurance policy. Seller shall not reduce or allow the required insurance coverages to lapse without PWC's prior written approval. All policies for insurance must be endorsed to contain a provision giving PWC a thirty (30) calendar day prior written notice by certified mail of any cancellation of that policy or material reduction in coverage. Should a notice of cancellation be issued for non-payment of premiums or any part thereof, or should Seller fail to provide and maintain certificates as set forth herein, PWC shall have the right, but not the obligation, to pay such premium to the insurance company or to obtain such coverage and to deduct such payment from any sums that may be due or become due to Seller, or to seek reimbursement for said payments from Seller. Any such sums paid by PWC shall be due and payable immediately by Seller upon notice from PWC. The insurance provisions of this Agreement shall not be construed as a limitation on Seller's responsibilities and liabilities pursuant to the terms and conditions of this Agreement.

12. Indemnification. Seller shall indemnify, defend, and hold harmless PWC and its Commissioners, officers, employees, agents, and representatives (collectively, "Indemnitees") from and against all claims, actions, liabilities, damages, losses, costs, and expenses (including, without limitation, injury to or death of any persons and damage to property, economic and consequential damages and attorneys' fees) asserted by one or more third parties against one or more of the Indemnitees arising out of negligent or willful acts, violations of law, infringement of any patent, trademark, trade secret, copyright, or other intellectual property right of a third party, or omissions or breach of the obligations set forth in this Agreement by Seller or any of its employees, agents, representatives, and subcontractors. Seller's obligation to indemnify, defend, and hold harmless the Indemnitees shall survive the termination of this Agreement and

shall include the duty to pay for the reasonable attorney's fees and costs associated with defending the Indemnitee(s) by the legal counsel of each Indemnitee's choice.

13. Notices. Any notice which either Party is required or desires to give the other shall be deemed sufficiently given if, in writing, it is delivered personally, or sent by certified U.S. mail, return-receipt requested, postage prepaid, to the addresses listed hereinbelow, or such other address as either Party shall give to the other Party by written notice in accordance herewith. Any notice given herein by personal delivery shall be deemed delivered when received. Any properly addressed notice given herein by certified mail shall be deemed delivered on the third Business Day after the same is deposited in an official United States Post Office, postage prepaid, or if sooner upon the date when the return receipt therefor is signed, or refusal to accept the mailing by the addressee is noted thereon by the postal authorities.

To PWC:
Fayetteville Public Works Commission
Attn: Elaina L. Ball, CEO/General Manager
PO Box 1089
Fayetteville, NC 28302

To Seller:
[INSERT MAILING ADDRESS]

14. Compliance. Seller hereby acknowledges that "E-Verify" is the federal E-Verify program operated by the US Department of Homeland Security and other federal agencies which is used to verify the work authorization of newly hired employees pursuant to federal law and in accordance with Article 2, Chapter 64 of the North Carolina General Statutes. Seller further acknowledges that all employers, as defined by Article 2, Chapter 64 of the North Carolina General Statutes, must use E-Verify and after hiring an employee to work in the United States, shall verify the work authorization of the employee through E-Verify in accordance with NCGS §64-26(a). Seller hereby pledges, attests, and warrants through execution of this Agreement that Seller complies with the requirements of Article 2, Chapter 64 of the North Carolina General Statutes and further pledges, attests, and warrants that all subcontractors currently employed by or subsequently hired by Seller to provide services for PWC shall comply with all E-Verify requirements. Failure to comply with the above requirements shall be considered a breach of this Agreement. Seller hereby further acknowledges that the execution and delivery of this Agreement constitutes Seller's certification to PWC and to the North Carolina State Treasurer that, as of the Effective Date, Seller is not listed on (a) the Final Divestment List created and maintained by the North Carolina Department of State Treasurer pursuant to the Iran Divestment Act of 2015, Chapter 147, Article 6E of the General Statutes of North Carolina (the "Iran Divestment Act"); or (b) the list of companies that the North Carolina State Treasurer determines to be engaged in a boycott of Israel in accordance with Article 6G of Chapter 147 of the General Statutes of North Carolina. Seller represents and warrants to Commission that Seller, and all persons and entities owning (directly or indirectly) an ownership interest in it: (i) are not, and will not become, a person or entity with whom a party is restricted from doing business with under regulations of the Office of Foreign Asset Control ("OFAC") of the Department of the Treasury (including, but not limited to, those named on OFAC's Specially Designated and Blocked Persons list) or under any statute, executive order (including, but not limited to, the September 24, 2001, Executive Order 13224 Blocking Property and Prohibiting Transactions with Persons Who Commit, Threaten to Commit, or Support Terrorism), or other governmental action; and (ii) are not knowingly engaged in, and will not knowingly engage in, any dealings or transactions or be otherwise associated with such persons or entities described

in clause (i) above. Seller also shall at all times during the term of this Agreement comply with Executive Order 11246, including but not limited to the Equal Opportunity Clause requirements set forth in 41 C.F.R. § 60-1.4. Seller shall abide by the requirements of 41 CFR 60-300.5(a) and 60-741.5(a) prohibiting discrimination against qualified individuals on the basis of protected veteran status or disability and requiring affirmative action by covered prime contractors and subcontractors to employ and advance in employment qualified protected veterans and individuals with disabilities.

15. Cumulative Remedies. All rights and remedies provided in this Agreement are cumulative and not exclusive, and the exercise by either Party of any right or remedy does not preclude the exercise of any other rights or remedies that may now or subsequently be available at law or in equity.

16. Miscellaneous Provisions. Seller is and shall remain an independent contractor. Nothing contained in this Agreement shall be deemed or construed to create the relationship of principal and agent or of partnership or of joint venture or of any association whatsoever between the Parties. No breach or non-performance of any term of this Agreement shall be deemed to be waived by either Party unless said breach or non-performance is waived in writing and signed by the Parties. No waiver of any breach or non-performance under this Agreement shall be deemed to constitute a waiver of any subsequent breach or non-performance, and for any such breach or non-performance each Party shall be entitled to such remedies as provided by law. No consent or waiver by a Party shall be effective unless it is in writing and then only to the extent specifically stated. The invalidity, illegality, or un-enforceability of any portion or provision of this Agreement shall in no way affect the validity, legality, and/or enforceability of any other portion or provision of this Agreement. Any invalid, illegal, or unenforceable provision of this Agreement shall be deemed severed from this Agreement, and the balance of the Agreement shall be construed and enforced the same as if the Agreement had not contained any portion or provision which was invalid, illegal, or unenforceable; provided, however, severability shall not prevent this entire Agreement from being void in the event any portion or provision of this Agreement that is of the essence of this Agreement shall be void. This is the entire agreement of the Parties on the subject matter hereof, and all prior negotiations, representations, proposals, letters, agreements, understandings, or other communications between the Parties, whether written or oral, are hereby merged into the Agreement and superseded by this Agreement. This Agreement shall not be modified unless such modifications are evidenced in writing, signed by both Parties. Nothing herein shall be construed to give any right or benefits hereunder to anyone other than the Parties. This Agreement shall be governed by the laws of the State of North Carolina without the application of the laws of any other state. The exclusive venue for all mediations and litigation and any other legal proceedings regarding this Agreement shall be the State and Federal Courts serving Cumberland County, North Carolina, and Seller consents to personal jurisdiction in such courts. Seller irrevocably waives, to the fullest extent permitted by law, any objection that it may now or hereafter have to the laying of the venue of any such suit, action or proceeding in any such court serving Cumberland County or that any such suit, action or proceeding brought in any such court serving Cumberland County has been brought in an inconvenient forum. This Agreement may be executed in counterparts with the same effect as if the signatures to each counterpart were upon a single instrument, and all such counterparts together shall be deemed an original of this Agreement. For purposes of this Agreement, a facsimile copy or scanned copy or photocopy of a party's signature shall be sufficient to bind such party. This Agreement shall be subject to execution by electronic means in accordance with Article 40 of Chapter 66 of the North Carolina General Statutes. The titles of the paragraphs throughout this Agreement are for convenience only and the words contained therein shall in no way be held to explain,

modify, amplify, or aid in the interpretation, construction, or meaning of the provisions of this instrument.

17. Conflicts. Except with PWC's knowledge and prior written consent, the Seller shall not engage in any activity or accept any employment, interest or contribution that would reasonably appear to compromise the Seller's professional judgment with respect to the Goods. The Seller shall disclose to PWC any business or personal relationship with any Commissioner, officer, director, manager, or supervisor of PWC.

IN WITNESS WHEREOF, the Parties have executed this Agreement by their duly authorized representatives.

Fayetteville Public Works Commission

[INSERT SELLER'S FULL LEGAL NAME]

By: _____
Elaina L. Ball, CEO/General Manager

By: _____
_____, _____
(Printed Name) (Title)

Date: _____

Date: _____

This instrument has been preaudited in the manner required by the Local Government Budget and Fiscal Control Act (N.C. Gen. Stat. § 159-1 et seq.).

By: _____
Rhonda Haskins, Chief Financial Officer

Approved as to form:

James P. West, Chief Legal Officer

**SPECIFICATION AND BID DOCUMENTS
FOR A 134.4MVA AT 65-degree BASE AUTOTRANSFORMER
FOR THE 230 TO 66 KV POINT-OF-DELIVERY**

TECHNICAL SPECIFICATIONS

1. SCOPE

The work shall include furnishing all equipment and materials, as set forth in the Bid Schedule(s) and as specified herein.

This transformer will act as a step up and step down with a non-loaded tertiary winding and no LTC for a substation interconnecting to a transmission system.

2. GENERAL CONDITIONS

All materials and equipment shall be new. These Specifications describe the type, size, and characteristics of the various materials and equipment required to be furnished. Strict adherence to these general Specifications is required to facilitate review and consideration of the Proposal. Alternate proposals will be evaluated if deemed appropriate.

It is the intent of these Specifications that the transformer shall be complete and fully operable. Any details or materials not mentioned in the Specifications, but required for satisfactory operation, shall be furnished, and installed by the Materialman.

Station power available at the Owner's substation will be 120/240 volts, 60 Hz, single-phase. Control DC voltage at the substation will be 125 volts. The equipment on the transformers shall coordinate with these voltages, as appropriate.

The transformers shall be manufactured in the 24 countries to be considered in North America. (i.e., Canada, USA, Mexico)

3. SPECIAL CONDITIONS

3.1 Defective Materials, Equipment, and Workmanship

All materials and equipment furnished hereunder shall be subject to the inspection, tests, and approval of the Engineer and the Materialman shall furnish all information required concerning the nature or source of all materials and equipment, as well as provide adequate facilities for testing and inspecting the materials and equipment at the plant of the Materialman.

The materials and equipment furnished hereunder shall become the property of the Owner when the transformer is sitting on the pad fully assembled and certified ready for energization by a certified representative of the manufacturer, provided, however, that the Owner may reject any such materials and equipment which do not comply with the Specifications for materials and equipment and/or warranties of the Materialman and manufacturers. Recognition and subsequent rejection of any defective materials and equipment may occur either before or after incorporation of such materials and equipment into the facilities, provided such rejection is made within one year of date of delivery of the materials and equipment. Upon any such rejection, the Materialman shall replace the rejected materials and equipment with materials and equipment complying with the Specifications for materials and equipment and warranties. The Owner shall return the rejected materials via truck at the substation to the materialman. In the event of the failure of the Materialman to so replace rejected materials and equipment, the Owner may make such replacement and the cost and expense thereof shall be paid by and recoverable from the Materialman.

3.2 Miscellaneous

The Materialman shall hold harmless and indemnify the Owner, its agents, and employees, from any and all claims, suits, and proceedings for infringement of any patent or patents covering materials and equipment purchased hereunder. The Materialman shall defend any suit or proceeding brought against the Owner, its agents, or employees, based upon a claim that the materials and equipment or any part thereof constitute an infringement of any patent, or if the Materialman shall fail to defend such suit or proceeding, the Owner may do so, and the Materialman shall make reimbursement for the expense of such litigation. If the materials and equipment, or any part thereof, are held to constitute infringement and the use thereof is enjoined, the Materialman shall, at its own expense, either procure for the Owner the right to continue to use the materials and equipment, or such part thereof, or shall replace the materials and equipment, with non-infringing materials and equipment.

3.3 Standards

All equipment and materials covered by these Specifications and all tests applied thereto shall, unless otherwise stated herein, be in accordance with the applicable provisions of the latest editions of the Standards of the ASTM, ANSI, AEIC, AWS, NEMA, IEEE, and NESC. Where the term "Standards" is used in the specifications, it shall be understood to refer to the above standards.

3.4 Drawings

3.4.1 Preliminary

Before proceeding with fabrication, the manufacturer shall submit for approval to the Engineer sufficient Drawings to demonstrate that all parts conform to the requirements and intent of these Specifications. The Drawings shall include outline, control cabinet front view and layout, nameplate, applicable equipment nameplates, material list with manufacturer part numbers, and control schematics and wiring diagrams. Drawings shall be submitted electronically as AutoCAD ".dwg" drawings and in PDF format. Each drawing shall contain identifying information such as, but not limited to, customer and project name. Catalog cut sheets and details of instrument transformers, bushings, bushing terminal connectors, surge arresters, relays, and all accessories shall also be submitted for approval.

The Outline Drawing shall show dimensions of equipment, including bushings, bushing designations, radiators and cooling equipment, base, control cabinet, and all other important external features. Outline Drawings shall be to scale and include plan view and elevations from all four (4) sides. These Drawings shall show shipping weight, total weight, center of gravity, bushings, bushing catalog numbers and ampere ratings, description of top bushing terminals, and arrangement of all external accessory devices. Control schematic drawings shall clearly indicate power requirements for DC circuits and AC auxiliary power (amps/volts/watts).

Approval of Drawings shall not relieve the manufacturer of obligations to meet all requirements to the Specifications or of responsibility for correctness of the Drawings, or of responsibility to meet original shipping promise on the basis of customer being

allowed two (2) weeks for approval.

The Engineer may require additional submittals of Shop Drawings if, in the opinion of the Engineer, such is required due to the extent of changes required on the previous submittal(s). If an extension of time is required due to a protracted drawing approval process, the price will remain as quoted for the quoted delivery.

Receipt of Approval Drawings by the Materialman constitutes authorization for manufacture based upon the corrections found thereon.

No changes shall be made in the final Drawings from the approved Approval Drawings. Any proposed changes from the approved drawings must go through the approval drawing process again **with the changes clearly denoted**.

Following approval of drawings, the Materialman shall submit a complete set of "For Construction" drawings to the Engineer.

3.4.2 Final Drawings and Instruction Manuals

Materialman shall furnish five (5) hard copies of instruction manuals **prior to the shipment of the equipment**. One (1) copy shall be sent to the Engineer and the other four (4) copies shall be sent to the Owner. Each instruction manual shall include a digital medium (such as a USB drive) that contains entire contents of instruction manual in PDF format. Final drawings are to be certified as "As-Built" and shall be provided in AutoCAD format in addition to PDF format.

Instruction manuals are to include, as a minimum, each of the following:

- 3.4.2.1 Materialman's installation and maintenance instructions for transformer
- 3.4.2.2 Manufacturer manuals for components, fittings, valves, controls, and accessories
- 3.4.2.3 Outline and assembly drawings
- 3.4.2.4 Control cabinet front view and layout drawing(s)

- 3.4.2.5 Nameplate drawing(s)
- 3.4.2.6 Material list drawing
- 3.4.2.7 Schematic and wiring diagram drawings for all control and accessory items
- 3.4.2.8 Details of bushing and bushing terminal connectors
- 3.4.2.9 Diagram of bushing current transformers indicating connection, number of turns, polarity marking, ratio, accuracy class, and thermal rating factor
- 3.4.2.10 Catalog cut sheets for instrument transformers, surge arresters, relays, and all control accessories
- 3.4.2.11 Renewal parts catalog
- 3.4.2.12 Certified test report

4. SHIPPING OF POWER TRANSFORMER

Delivery shall be made on or before June 30, 2024.

The transformer shall be shipped to the substation site and installed on a concrete pad. **NOTE: Materialman shall be responsible for providing crane and rigging to off-load transformer from delivery truck onto pad.** Before shipment, power transformer shall be completely assembled to determine if all parts fit properly. Parts removed for shipment shall be marked to permit easy identification when reassembling.

Method of packing and loading shall be such as to protect all parts from dampness, corrosion, breakage, or vibration injury that might reasonably be encountered in transportation, storage, and handling. Release for shipment is to be granted based upon the manufacturer's compliance with the following:

- a. **Fourteen (14) days notification of tests shall be given so the Engineer may have a representative present for witness of the tests.**

- b. Furnishing of the required number of copies of the Final Drawings and Instruction Books as called for in the Specifications.**
- c. Thirty (30) days notification of tentative shipping schedule shall be given, and forty-eight (48) hours notification prior to delivery.**
- d. A three-direction impact recorder with GPS shall be installed to travel on the transformer for shipment and shall remain on the unit until it is unloaded unless the Materialman is relieved of this requirement by the Commission's Engineer. The impact recorder shall be read prior to unloading, at the rail siding prior to unloading if applicable, on the trailer prior to transportation to the site, and after arrival at the site.
- e. The transformer will be shipped dry. The bushings and oil will be added back to transformer once placed on the concrete pad.
- f. The transformer is shipped without oil, it shall be shipped with dry air-filled and equipped with proper pipe connections for checking and filling under vacuum. The oil shall be shipped by tanker with the unloading pump furnished. The unloading pump shall have been flushed free of undesirable contaminants by flushing with the same type oil provided for the transformer. The Materialman shall furnish all equipment, labor, and supervision required for filling, and the Materialman shall coordinate timing and arrangements. Materialman shall be responsible for proper cleanup of any oil spilt during the filling operation.
- g. Delivery shall be made to the substation site located at:
Point of Delivery #1 Fayetteville
2842 Cumberland Road
Fayetteville, NC 28306
Joel Valley, cell (910) 257-2198

5. MANUFACTURER'S FIELD REPRESENTATIVE(S)

The manufacturer shall provide, and include as a part of his Proposal, all the costs associated with furnishing the services of a Field Service Engineer as required for final assembly and acceptance testing. The duties of the Field Service Engineer shall include supervising installation of Materialman provided component parts removed for shipment, including but not limited to bushings, radiators, and surge arresters. The oil will be shipped separately and

transformer filled on site, Materialman shall also be responsible for supplying all labor and equipment needed to vacuum fill the transformer. He shall supervise installation of all control and auxiliary wiring. He shall perform field acceptance tests after assembly as called for in the "Tests" section (7.0) of this specification. It is preferred that the Materialman also furnish all the labor and equipment needed to perform the field assembly and testing work, but the owner can supply this if needed. The cost for Owner supplied labor and equipment will be considered in evaluation of the bids received. Field Service Engineer shall clean and repair any surfaces that were soiled, discolored, or otherwise damaged by abrasion since leaving the factory. Field Service Engineer shall certify when the transformer is ready to be energized.

6. TRANSFORMER

6.1 Type and Rating

The transformer shall be three-phase, 60 Hertz, suitable for outdoor service at an altitude less than one kilometer (3300 feet) above sea level. The windings shall be insulated and connected as follows:

Winding	Voltage (kV)	Connection	BIL (kV)
High Voltage	230/132.790	Wye	825
Low Voltage	66/38.106	Wye	350
Tertiary	13.8	Delta	110
H0X0	24.9	Ground	150

The high voltage shall be in phase with the low voltage and have a delta connected tertiary winding. Tertiary winding leads shall be brought to the exterior of the transformer for testing purposes not for load carrying. The transformer will be operated with the H0 and X0 bushings tied solidly to the copper ground. All windings shall be copper.

Transformer shall be oil-immersed for continuous self-cooled/forced air-cooled operation ONAN/ONAF/ONAF with two (2) stages of fan cooling and shall be furnished complete with oil. Fans shall be included with the transformer; operating voltage for fans shall be 240 volts, single-phase. Transformer ratings, when loaded in accordance with ANSI C57.91 (latest edition) "IEEE Guide for Loading Mineral-Oil-Immersed Transformers and Step-Voltage Regulators", shall be as follows:

Class	Rise (°C)	Rating (kVA)
ONAN	55/65	120,000/134,400
ONAF1	55/65	160,000/179,200
ONAF2	55/65	200,000/224,000

The tertiary "Y" copper winding capacity shall be approximately 1/3 of "H" and "X" windings MVA rating.

The transformers shall be capable of carrying rated current continuously at 5% above rated secondary voltage without exceeding an average winding temperature rise of 65°C above a 40°C maximum ambient and 30°C average ambient over 24 hours.

The transformer shall be 65°C construction where the winding temperature rise by resistance will not exceed 65°C; hottest-spot winding temperature rise will not exceed 80°C; suitable for loading in accordance with ANSI C57.91 (latest edition) "IEEE Guide for Loading Mineral-Oil-Immersed Transformers and Step-Voltage Regulators".

The transformer shall have five (5) full capacity, high voltage taps at rated kVA and shall be provided as follows:

HV Taps Rating (volts)
218,500
224,250
230,000
235,750
241,500

A weatherproof hand-operated tap changing mechanism shall be provided, suitable for de-energized operation, with one external handle that may be operated from the transformer base level and have provision for locking in any position. An external indicator shall clearly display the tap position.

Core shall be of cruciform, or circular, shape. Obround, oval, and elliptically shaped cores are not acceptable.

High voltage, low voltage, and tertiary windings (as applicable) shall use a continuous-disc or helical copper winding design exclusively. Pancake and layer (or "barrel") type windings are not acceptable.

The windings shall be properly braced and blocked so the coils will withstand short circuits forces caused by short circuits on the secondary terminals.

All windings shall be wound with copper conductors. On coils requiring multiple conductors per turn, allowance of multiple conductors per turn of rectangular magnet wire, to minimize losses and hot-spot temperatures and to produce a more compact winding with improved short-circuit performance. Continuously Transposed Copper CTC cable is not required in all multiple conductors turns.

Any variation on winding design shall be preapproved.

Photographs of high voltage and low voltage sides of core and coil assembly indicating blocking, bracing, and dressing out of leads shall be submitted for approval prior to tanking.

- 6.2 All transformer windings shall be copper with circular coil design and circular core and shall be suitably clamped and harnessed with mechanical means at the top and bottom to prevent shifting under short circuit conditions as specified in the standard IEEE C57.12.00 newest edition. The paper covered rectangular copper wire is to be oxygen-free copper rod and shall be extruded or drawn by a mold. Transformer winding leads shall be connected to porcelain apparatus bushings using cable connections or bare copper bars with flexible links.

All core steel shall be low loss grain oriented electrical steels that come from the following approved companies: AK Steel - USA, USS-POSCO USA, and ThyssenKrupp Steel – Germany. Transformer core and windings shall be suitably harnessed in the tank to prevent movement during faults, shipping or installation. The installed core and coil assembly shall receive a Vapor Phase drying process to minimize moisture content.

Bid proposal shall describe the type of core and winding construction, including clamping design.

6.3 Insulation

Solid insulation ASTM D1305-16, within the windings and clamping structure shall be of a suitable cellulosic or aramid material and shall comply with current applicable industry standards for dielectric integrity, short circuit, thermal requirements, loss of life, and emergency loading.

Solid insulation within the windings and clamping structure shall be of a high density Weidmann USA and/or ABB Pucaro transformer-board manufactured in accordance to ASTM D4063-99. Transformer-board will be produced using an electrical grade pulp specified by the transformer-board manufacturer. Transformer-board to be produced using unbleached softwood Weidmann USA Kraft pulp with key properties and testing methods clearly specified by the transformer-board manufacturer.

Conductors shall be insulated with Weidmann USA 12HCC or 22HCC Crepe paper or M-250 flat paper thermally stabilized using the INSULDUR™ system. Solid insulation paper used to insulate the conductor between layers in the coil shall be thermally upgraded Kraft paper as defined by IEEE C57.100 as Cellulose based paper which has been chemically modified to reduce the rate at which the paper decomposed. Values for nitrogen content of acceptable thermally upgraded papers shall be between 1 and 4 percent when measured in accordance with ASTM D-982. Paper is to be supplied by a paper manufacturer from the United States or Canada with a proven record of no less than 15 years supplying this material for this application to be oil-filled, transformer industry.

6.4 Case and Cover

Tank shall be designed and braced for full vacuum and suitable for filling with oil under a vacuum of 28 inches of mercury, in the field.

Lifting lugs on tank capable of lifting the entire transformer completely assembled, lifting eyes on cover, and provisions for jacking. Location of jack bosses shall be a minimum of thirteen inches (13") above the transformer base line and capable of supporting entire weight of transformer completely assembled.

Stainless steel Type 304 nameplate in accordance with ANSI Standards, located on the main tank near the control cabinet.

Stainless steel Type 304 diagram instruction plate shall be stainless steel. Turn progression and accuracy class of bushing current transformers shall be shown on nameplate.

Containing case shall not leak oil. Welded joints and seams shall be employed whenever practicable. No welds will be made on vertical corners of tank. Welds will not be greater than 2' from vertical edge of transformer.

Main transformer cover shall be welded. Gasketed joints for manhole covers, bushings, and other bolted attachments shall be sealed with a durable and reusable gasket material (ordinary cork or corkprene are not approved) and shall be designed so as to permit their being made oil tight in reassembly. Mechanical stops shall be provided to prevent crushing (controlled compression).

Transformer base design shall be suitable for skidding the transformer in a direction parallel to either centerline of the tank and shall be capable of supporting the transformer on two pier foundations. The bottom of the transformer tank shall not bear on the concrete pad in the finished installation. The bottom shall be primed and painted as described above. Flat bottom transformers shall be furnished with supporting spacer beams. The dimensions and locations of these beams shall be shown in the manufacturer's drawings.

All conduits provided on the exterior of the transformer case shall be rigid steel. A Flexible Metal Conduit (FMC) where external coating is non-conductive, and UV inhibited. The FMC can be used at gauges, devices, and existing and entering all control cabinets but shall not exceed 24-inches in continuous length. PVC or EMT is not acceptable.

All surfaces of case and covers, both exterior and interior, shall be thoroughly cleaned by means of shot-blasting or by any other equally effective method. Primer coats of exterior paint and exterior paint top coat shall comply with applicable standards for painting of substation transformers and meet the stipulations of the EEI finishing requirements.

The top of transformer main tank and top of LTC compartment (if applicable) shall have a non-skid surface.

The exterior surface of all mounting hardware shall be stainless steel bolts and washers with silicon bronze nuts. No exposed cadmium-plated or zinc chromate-plated parts will be allowed.

The transformer tank shall be furnished with supported 4" x 1/4" copper bus bars from the top of the tank to a location 12" above the base of the tank on both diagonal corners to connect high-and low-voltage surge arresters and the H0 and X0 neutral bushings. The copper shall be tinned at all connection points and the copper bar shall be painted with ANSI Gray 70 paint. Support points shall be at four feet maximum spacing from the tank base to the top surface. Arrester leads shall be 4/0 AWG copper or 1/4" x 2" copper bar minimum and the neutral bushing lead shall be 1000 MCM copper or equivalent minimum. All

leads shall be connected to the main 1/4" x 4" bars with NEMA 2-hole or 4-hole drilling. One (1) spare NEMA 4-hole drilling shall be provided on each copper bar for connection to station ground system.

6.5 Impedance

The percent impedance voltage at the self-cooled rating as measured on the rated voltage connection shall be in accordance with the latest revision of IEEE Std. C57.12.10 and tolerance shall be as specified in the latest revision of IEEE Std. C57.12.00. This transformer's impedance at the base rating 134.4MVA shall be approximately ten percent (10.08%) at 65°C.

6.6 Sound Level

The transformer shall be so designed that the average sound level will not exceed the values given in the latest revision of NEMA TR-1 when measured at the factory in accordance with the conditions outlined in the latest revision of IEEE Std. C57.12.90.

The sound level at the 120-MVA self-cooled rating shall not exceed 72 dBA when factory-tested in accordance with the procedure stated in NEMA TR1-9.04.

6.7 Bushings and Terminals

The transformer shall be provided with transformer-type bushings constructed of high strength wet-process porcelain and be clearly labeled externally. All bushings shall be light gray, ANSI No. 70, condenser type, and have provisions for power factor C1 testing port. High voltage bushings shall be oil-filled and dimensionally interchangeable between transformers and have corona mitigation, according to latest revisions of ANSI Standard C76. The high voltage bushings shall be draw lead type and the low voltage bushings shall be bottom connected.

Type of contaminated environment: Medium

Minimum creepage distance shall be based on type of contaminated environment stated above and as described in latest revision of IEEE Std C57.19.100.

Bushings shall be rated to meet or exceed electrical insulation characteristics given in the latest revision of Table 1 of IEEE Std C57.19.01.

Bushings shall be provided as follows:

Location	Voltage (kV)	Amperes	Connection
H1, H2, H3	230	1200	Bottom
X1, X2, X3	69	2000	Bottom
H0X0	24.9	1200	Bottom
Y (Tertiary)	15	1200	Bottom

The neutral and tertiary bushings shall be furnished with a NEMA 4-hole spade-type terminal for connection with 1000 MCM copper to the 1/4" x 4" copper neutral bus extending from the terminal to a tank ground pad for direct connection to the station ground system. Tertiary winding leads shall be brought to the exterior of the transformer for testing purposes not for load carrying.

All primary and secondary bushings shall be provided with copper-threaded studs sized in accordance with their respective current ratings. Each bushing stud shall be provided with a NEMA 4-hole flat spade terminal connector. High and low voltage terminal studs and flat spade terminal connectors shall have silver-plated contact surfaces.

The bushings shall be spaced to comply with, or exceed, minimum phase-to-phase and phase-to-ground external clearances between live parts in accordance with IEEE C57.12.10-newest edition.

Trench is not an acceptable bushing supplier.

6.8 Auxiliary Cooling

Cooling equipment shall be furnished in accordance with ANSI standards for transformer self-cooled and forced-cooled ratings of ONAN/ONAF/ONAF.

Galvanized cooling radiators shall be mounted independently of one another on the transformer and individually removable from the transformer tank. Radiators shall be designed and braced to withstand all vibration and operating forces.

Radiator mounting flanges on the transformer tank shall each be equipped with valves to permit the removal or replacement of an individual cooling radiator without loss of either oil or gas above oil in the transformer tank.

Auxiliary cooling equipment including USA manufactured radiators, USA manufactured fans, and pumps, shall be located on the side of the tank in either Segment 2 or Segment 3 as identified by IEEE C57.12.10. Placement of radiators shall not obstruct the operator's view of any indicating dial or gauge located within Segment 1 of the transformer.

All cooling radiators shall be hot dipped galvanized, manufactured in the USA by Menks or Trantech, and mounted either in Segment 2 or Segment 3 as identified by IEEE C57.12.10, and as described in subparagraph 8.4.1 of these Technical Specifications. Final location of the radiators on the tank wall shall be subject to the approval of the Commission or the Commission's Engineer.

Each cooling radiator shall be equipped with a fill valve at the top and a drain valve at the bottom of the unit. All cooling fans shall be equipped with automatic control to provide the operation of all cooling stages, based on the sensing of transformer winding temperature. Each fan shall be driven by an enclosed waterproof induction motor-rated 240 volts AC, single-phase, 60-Hertz. Each motor shall be equipped with thermal overload protection. Each fan shall be dynamically balanced for vibration-free operation.

All cooling fans (and/or pumps) shall be USA manufactured and utilize the Dynamic Rating E3-7200 transformer monitor to provide the operation of all cooling stages based on the sensing of transformer winding and oil temperatures. Each fan (and/or pump) shall be driven by an enclosed waterproof induction motor rated 240 volts AC, single phase, and 60-hertz. Each motor shall be equipped with thermal overload protection. Each fan (and/or pump) shall be dynamically balanced for vibration-free operation. All fan guards shall be stainless steel or hot dipped galvanized and shall meet OSHA safety standards.

Automatic control of all electrically powered cooling systems shall be accomplished by the closure of contacts within the transformer monitor. Recommendations for set points for turning cooling fans on and off, alarming, and tripping shall be supplied by the manufacturer.

The cooling systems shall provide a control switch for the transfer of cooling operation from automatic to manual control. All cooling system controls shall be enclosed in the transformer control cabinet, complete with all conduit and inner wiring to the fan. This function may be provided by the transformer monitoring system in lieu of a separate relay if so equipped.

6.9 Current Transformers

The power transformers shall be equipped with bushing type current transformers mounted inside the main case on terminals H1, H2, H3, H0X0, X1, X2, X3, and tertiary with leads brought to identified terminal shorting blocks in a control cabinet.

Bushing type current transformers shall have standard taps and be furnished in accordance with the latest revision of Table 5 of IEEE Std C57.12.10-newest edition as follows:

Location	Ampere Ratio	Quantity EA/ Bushing	Total	Revenue Metering Class	Relay Accuracy Class	Thermal Rating
H1, H2, H3	1200:5	2	6	0.3B-1.8	C800/400	2.0
X1, X2, X3	2000:5	2	6	0.3B-1.8	C800/400	2.0
H0X0	1200:5	1	1	0.3B-1.8	C400/200	2.0
Tertiary	1200:5	1	1	0.3B-1.8	C200/100	2.0

If the current transformers are mounted in a removable current transformer adapter, the current transformer shall be shipped in the main transformer mounted in the adapters. The current transformer secondary leads shall be permanently connected to the terminal blocks in the control cabinet. No splicing of secondary current transformer leads shall be required after delivery to the Owner. A CT metal diagram instruction plate shall be provided. Turns progression, accuracy class, and thermal rating factor of bushing current transformers shall be shown on the nameplate.

6.10 Surge Arresters

Surge arresters shall be transformer-mounted for the high and low voltage side on each phase. These shall be rated:

System Voltage, L-L (kV)	Ur, Duty Cycle (kV)	Uc, MCOV (kV)
230	180	144
69	72	57

Surge arresters shall be polymer housed, IEC line discharge class 3 (station class), light gray, ANSI No. 70. The surge arresters shall comply with the latest revision of ANSI Standard C62.11. Only metal

oxide arresters are acceptable.

The surge arresters shall be located with relation to one another and the bushings to comply with, or exceed, minimum phase-to-phase and phase-to-ground clearances between live parts in accordance with ANSI Std C57-12.00-newest edition Table 11.

Lightning Arrester Mounting. Tank mounted lightning arrester brackets shall be provided as follows: Three removable tank mounted brackets for mounting the specified station class arresters near each high voltage bushing. Three brackets for mounting the specified low side arresters near each low voltage bushing.

Support brackets, conductor, and connectors for the transformer grounding system. The copper shall be tinned at all connection points and the copper bar shall be paint with ANSI Gray 70 paint. The surge arresters shall be provided with 4-hole NEMA pad connectors to the bushing terminals. Ground conductors equivalent at minimum to 4/0 copper or 1/4" x 2" copper bus shall also be furnished and carried from the arrester bases to the transformer ground buses (looped configuration).

6.11 Control Cabinet

The control cabinet will be provided by Dynamic Ratings located in Sussex, Wisconsin. The manufacture will work all control cabinet approval drawings through Dynamic Ratings. Dynamic Ratings will provide a customized monitoring schematic to interface properly with the transformer manufactures control system drawings. A NEMA 4X, weatherproof, painted, and stainless-steel Type 304 control cabinet shall be furnished enclosing control circuits, signal circuits, protective relays, individual transformer alarm indicators, and a suitable 240/120-volt, 60 Hertz thermostatically controlled heater with double-pole terminal circuit breaker. All control conductors shall be tinned copper. All control wires into the control cabinet shall terminate on clearly marked and properly identified terminal blocks. All wires shall be identified by showing the others end it came from and the landing designation. A swing-out panel shall be provided to mount a DYNAMIC RATINGS E3-7200 transformer monitor user interface unit.

No tripping relays shall be mounted on a swinging panel. All tripping relays shall have covers.

The weatherproof control panel shall be centrally located near the

bottom of the tank at a location to be approved by the Owner or Dynamic Ratings. The Control Cabinet shall be shock and vibration isolated from main tank. The cabinet door shall be completely weatherproof and shall have a handle with a triple latching mechanism, hinged on the left side. Handle/latch mechanism shall be furnished with padlocking provisions. Bolted door covers will not be acceptable. Doors shall have provisions for blocking in the opened position. Breathers for the control cabinet shall be silica-gel type. The window shall be UV-protected safety glass.

A dead-front control panel in the control cabinet shall contain the necessary switches, circuit breakers, relays, indicating lamps, etc. Target relays or indicating lamps shall be visible through a tempered glass window in the front door of the cabinet.

The control cabinet heater shall be equipped with guards and thermostatically controlled so that the guard temperature cannot exceed 120°F. The 240-volt electric terminals of the heater shall also be covered.

All cabinets attached to the transformer shall be solidly grounded to the transformer case.

6.12 Transformer Monitoring System

A microprocessor-based transformer monitoring system shall be installed and programmed on the transformer. The monitor shall be factory programmed at Dynamic Ratings per the design and functionality of the transformer control system and shall be bench tested for proper I/O operation. Self-checking functions shall be included. Specific requirements are as follows:

Front-panel visualization. The transformer monitoring system shall be capable of displaying measured values, calculated values, I/O statuses, device status, and configuration parameters on a front-panel backlit, full graphical display with adjustable font. The display shall have a full numerical keypad, four quick access function keys and eight programmable "hot keys" to allow instant access to user favorite screens. The eight programmable keys shall be preconfigured as follows and a label shall be provided accordingly:

- 0- New Alarms
- 1- Active alarms
- 2- DGA
- 3- BHM
- 4- PDM

- 5- Harmonics
- 6- Temperature detail
- 7- Motor Currents

Functions provided. The transformer monitoring system shall monitor and report the following functions: top oil temperature, hot spot temperature on LV windings, load, transformer insulation aging, overload capability, transformer gas pressure, main tank liquid level, warnings and alarms with dry contact output, through fault current measuring, monitoring of fans, exercise and rotation of fans, event recording, and remote access of data.

Programming capability. The transformer monitoring system shall be capable of implementing a wide variety of logic and control functions using the tools available in the Programming Language. Logic shall have the ability to use math functions, comparison functions, and Boolean logic functions.

IRIG-B synchronized, time-stamped events. DNP3 or NTP synchronized, time-stamped events. The transformer monitoring system shall store up to one year (52 weeks) of events, with synchronized timestamps. An internal real-time clock shall be used for time stamping if a SCADA master time sync signal is not available.

Sequential Event Recorder. A chronological report shall be provided by the transformer monitoring system to help determine the order and cause of events and assist in troubleshooting. The last 52 weeks of events, alarms and analog values shall be recorded.

Metering. The transformer monitoring system shall include metering capabilities for real-time current, voltage, power, and energy quantities, as well as phase demand and peak demand current values, for all AC currents and voltage inputs.

Transformer Thermal Monitor. The system shall incorporate a transformer thermal monitor based on IEEE C57.91-newest edition. The model shall include a capability for entering known transformer thermal constants as well as default constants. Three (3) loss-of-insulation-life values shall be provided, including loss-of-life per day, total loss-of-life, and insulation aging factor. The monitor shall be able to provide predictive smart activated cooling.

DGA Monitor Integration: The Dynamic Ratings E3 transformer monitor shall be able to communicate to the Vaisala OPT100 DGA monitor through ethernet cabling or fiber ethernet, read and store all applicable gas values and alarms, display values and alarms on E3-7200 integrated web pages and provide the following analytics: Duvals triangles, Duvals Pentagons, IEEE ratio, Rogers Ratio, IEC Ratio, Dorenburg, IEEE key gas, IEEE condition, CO2/CO ratio, Method NEI, Method X1, X2, X3 dependent on DGA model. The transformer monitor shall also be able to consolidate and transmit the DGA data and alarms via user selectable protocols of either; Modbus, DNP3 or IEC61850 to the users SCADA RTU. The monitor shall also provide a bubble evolution alarm and moisture-in-paper analytic. **Materialmen will purchase the commissioning and testing services for Dynamic Ratings and Vaisala installed equipment. Along with onsite field training for PWC substation employees.**

Harmonics Analysis: The monitoring system should provide harmonic analysis with the following parameters: total fault count, maximum fault current, total harmonic distortion, and the ratio of even and odd harmonics.

Through-Fault Event Monitor. The system shall provide for the capability of reporting fault current level, duration of maximum 3 seconds or for 10 times rated current, and date/time for overcurrent events which exceed a preprogrammed threshold via the bushing CTs installed on the LV windings. Through-fault monitoring shall provide accumulated through-fault levels, a number of through-faults, total fault count, maximum fault current and the total consumed through-fault capacity of the transformer (based on the *IEEE Guide for Liquid-Immersed Transformer Through-Fault-Current Duration section 4.3.2 of the C57.109-newest edition*).

Event Record. The transformer monitoring system shall store up to 15 cycles of raw data with 16-sample/cycle resolution.

Voltage Inputs. Voltage inputs shall accept 0–150 Vac.

Current Inputs. Current inputs shall accept 0–10mA and utilize an intrinsically safe clamp on 1000:1 interfacing CT on bushing CT secondary.

Fiber-optic Ethernet communications port to communicate with the substation RTU via DNP3.

DNP3. The transformer monitoring system shall be capable of operating as a DNP3 Slave Level 2 either serial or LAN/WAN. All control points within the transformer monitor shall be available as DNP3 control points using latch on/latch off pulse on/pulse off, or trip/close control functions.

IEC 61850 Ethernet Communications. The device shall provide IEC 61850 compliant communications. The IEC 61850 capability shall include GOOSE messaging and defined logical node data points.

PC Software. The transformer monitor shall include compatibility with a PC software program for use in programming control settings and logic functions and retrieving event data. The PC software shall be supplied as part of the transformer monitor.

Operating Temperature. The transformer monitor shall have an operating temperature range of -40° to $+80^{\circ}\text{C}$ and a power supply input of applicable DC control voltage.

Specification Compliance. The transformer monitoring system front panel shall meet NEMA 12/IP54. The programmable automation controller shall be type tested to sections of C37.90, IEC 60255, IEC 60068, and IEC 61000 standards.

Warranty. The transformer monitoring system shall have a minimum 10-year warranty.

The transformer monitoring system shall be a combination of Dynamic Rating E3-7200 with Vaisala OPT100 or approved equal.

The Dynamic Rating E3-7200 monitor shall be wired in accordance with the Input/Output Schedule included in the Appendix. Materialmen will purchase the commissioning and testing services for Dynamic Ratings and Vaisala installed equipment. Along with onsite field training for PWC substation employees.

The transformer monitoring system above as supplied by Dynamic Ratings, Inc. shall include Dynamic Ratings 10yr Warranty package, to be purchased by the transformer manufacturer with the hardware and shall include following:

- Commissioning in the substation, within 10 years from date of shipment.
- Product warranty is 10 years from date of shipment from Dynamic Ratings.

- Ten-year labor warranty on all DR supplied equipment
- Free firmware updates for 10 years from shipment from Dynamic Ratings (date of warranty expiry is hard coded into the equipment by Dynamic Ratings at the time of shipment).
- Diagnostic support for any requirements during the first 10 years of product usage

6.13 Pressure Relief

A pressure relief valve with visual indication shall be provided on the transformer for the detection of an excessive positive increase in transformer tank pressure. The pressure relief alarm point contact shall be wired to the transformer monitor.

A transformer pressure relief device shall be provided to release at no more than 10 psi. Stainless steel or aluminum piping shall be provided to direct oil released through the pressure relief device to the base of the tank.

The pressure relief device shall be Qualitrol XPRD with alarm contacts and 8" stainless steel or aluminum discharge pipe or approved equal.

6.14 Winding Temperature Relay

A winding temperature relay shall be provided on the transformer for the detection of over-temperature. The relay shall have four (4) sets of contacts and be wired to the transformer monitor for remote alarm and remote initiation of a transformer lockout relay. Contacts supplied for alarms and initiation of lockout shall be dry and normally open.

The four-element winding temperature relay shall incorporate an indicating dial to display the winding temperature of the transformer.

The winding temperature device shall be Qualitrol or approved equal.

6.15 Oil Level Relay

An oil level relay shall be provided on the transformer for the detection of low oil. The relay shall have two (2) sets of contacts and be wired to the transformer monitor for remote alarm and remote initiation of a transformer lockout relay. Contacts supplied for alarms and initiation of lockout shall be dry and normally open.

The two-element liquid level relay shall incorporate an indicating dial to display the liquid level of the transformer.

The winding temperature device shall be Qualitrol or approved equal.

6.16 Windings, Oil, and Ambient Temperatures

Resistance temperature detectors (RTD) shall be provided for detection of hottest spot winding temperature, transformer main tank top oil temperature, and ambient temperature.

RTDs shall be three (3) wire style units. The outputs shall be wired to the transformer monitor RTD inputs for remote alarm, remote initiation of a transformer lockout relay, and control of fans.

6.17 Undervoltage Relays

Undervoltage relays shall be provided to monitor AC and DC circuits. Each stage of fans shall be individually monitored as well as DC trip circuit(s) on the load side of the breakers. Alarm contacts shall be supplied and wired out to inputs of the transformer monitor.

6.18 Conservator Oil Preservation System (COPS)

Oil preservation shall be by a conservator system, consisting of an externally mounted conservator (expansion) tank. A system of piping and valves for oil expansion from the main tank to the conservator including control and monitoring equipment required to safeguard and protect the equipment.

The oil level in the expansion tank shall be designed to maintain positive pressure on the main transformer tank including bushing pockets, turrets and/or adapters. The expansion tank shall be of sufficient capacity to operate through an ambient temperature range of -40°C to $+85^{\circ}\text{C}$ without causing the low-level alarm contacts at the lower limit and without exceeding the recommended full oil level at the upper limit. The conservator system shall be designed to prevent direct contact between the oil and the atmosphere. This shall be accomplished by means of an air cell used in the expansion tank, which shall vent air to the atmosphere through a dehydrating breather.

The air cell shall be nitrile rubber or equivalent material and shall not affect nor be affected by contact with hot oil. Neoprene rubber and similar materials are not acceptable. The dehydrating breather must be

located so that it can be conveniently accessed from the transformer pad and can be maintained without removing the transformer from service.

A low oil level gauge shall be mounted on the conservator tank and designed such that the rupture of the air cell shall not prevent the operation of the oil level indicator or cause the low oil level alarm to fail to operate. A section of removable pipe or stainless steel braided flexible hose and isolation valves shall be furnished between the transformer tank and conservator tank. All piping and valves shall be capable of withstanding a full vacuum.

The design of the conservatory system shall be such that thermal siphoning of oil between the transformer tank and the conservator shall not occur due to density changes.

The transformer shall be equipped with a Buchholz relay equipped with contacts for alarming and provisions for testing. A gas sampling valve (mounted within 70 inches of the base) shall be provided to pull gas samples from the gas relay. Provisions shall be made for the application of full vacuum or equalization of pressure/vacuum to the expansion tank when oil filling is required. Vent valves and piping located on the transformer cover shall be located to avoid tripping hazards and guarded to prevent damage.

6.19 Wiring

The primary insulation jacket of all wiring shall be 600-volt, 105° C, water, oil, and flame resistant. All power wiring shall be made with #12 AWG or larger stranded tinned copper wire. All current transformer leads are to be #12 AWG stranded tinned copper or larger in size. All voltage transformer wiring shall be made with #12 AWG or larger stranded tinned copper wire. All control wiring shall be flexible SIS type, minimum 41 stranded, and not smaller in size than 12 AWG tinned copper wire, with the exception that wiring to alarm auxiliary relays and indicating lights may be smaller in size. CT wiring shall be No. 10 AWG minimum and be terminated with insulated ring lugs.

All wire into the control cabinet shall be enclosed in conduit. All conductors into the control cabinet shall terminate on clearly marked and properly identified terminal blocks.

- a. Power wiring shall be sized in accordance with the National Electrical Code.

- b. All connections for wiring shall use silicon bronze, split-type lock washers.
- c. All wires shall be identified at each end with legible permanent labels.
- d. Wiring connections between fixed and hinged sections shall be SIS flexible type minimum 41-stranded wire.
- e. All terminal connections for conductor sizes #10 AWG in size and smaller shall be made with the non-insulated full-ring tongue, crimp-type lugs. Lugs shall be AMP, Inc. "Solistrand Diamond-Grip" or approved equivalent. Spade-type terminals or slip-on connectors are not acceptable.
- f. All terminal connections for conductor sizes #2 AWG through #8 AWG shall be made with Burndy HYLUG Type YAV-L, or approved equivalent.
- g. All terminal connections for conductor sizes larger than #2 AWG shall be made with a two-hole, long barrel, double-indent, crimp-type lugs: Burndy Hylug Type YA or approved equivalent. (Single-hole lugs may be used only where necessary.)
- h. Grommets shall be provided for all openings in metal barriers used for wiring.
- i. Uninsulated exposed conductor or terminal lug shall not extend beyond the sides of the terminal block or its insulating barriers.
- j. All leads for multi-ratio current transformers shall be wired to terminal blocks in the control cabinet. If junction boxes are required in the wiring between the current transformer and control cabinet, terminal blocks shall be used for wiring connections. In-line type disconnecting terminals such as American Petroleum Institute (API) No. 32488 or Burndy No. YZ10 will not be acceptable.
- k. Bushing current transformer grounds: jumpers must be from the sixth pole of the shorting terminal block on the manufacturer's side directly to the ground bar. Jumpers between shorting terminal blocks are not acceptable unless jumpers are strictly between terminal blocks grouped together. An example of a grouping would be H1-H2-H3.

- l. If accidental short-circuiting of certain wires can result in a malfunction of equipment, these wires shall not be terminated on adjacent terminal block points.
- m. No more than two wires per terminal point are permissible.
- n. All conduits mounted on the transformer shall be rigid steel unless otherwise specified.

6.20 Trip Contacts

Sudden pressure and transformer monitor trip contacts, as specified herein, shall be brought to a single terminal block for ease of customer connections. Transformer monitor relay health alarm, communication alarm, and any spare output contacts shall also be brought to the same or adjacent terminal block.

6.21 Terminal Blocks and Molded Case Circuit Breakers

All terminal points shall be furnished with screws.

Marathon 1500 STD series or equivalent terminal blocks shall be provided furnished with white marking strips for identification of terminal wires for all connections except current transformers and control power.

A minimum of 15-percent spare (but no less than 12 points) terminal points shall be provided in the control cabinet.

Marathon 1600 SC series terminal blocks shall be provided for current transformer leads with at least three shorting screws per terminal block. A separate short-circuit type terminal block shall be provided for each set of current transformer leads.

Marathon Catalog No. 1423123 power terminal blocks shall be provided for the landing of Owner's ac control power leads.

Marathon Catalog No. 1422123 power terminal block shall be provided for the landing of the Owner's dc voltage control power leads.

Molded case circuit breakers shall be used for interruption and protection of low voltage circuits.

6.22 Transformer Oil Inhibitor

All oil is to be Type II insulating transformer oil supplied shall have antioxidant oil inhibitor added. The manufacturer may supply 0.3% wt. DBPC or 0.3% wt. DBP inhibitor. Installation of inhibitor shall be in accordance with the newest edition of IEEE C57.106.

6.23 The Transformer Core Ground

The core ground strap is to be made accessible provided on cover, or tank sidewall near cover. Tests for core grounds are to be performed after tanking and just prior to leaving the factory using a 1000-volt Megger. Resistances measured are to be included in a certified test report and reported to the Engineer prior to shipment. Core ground pocket bushing with the protective cover shall be accessible from the ground.

- 6.24 Fall-Arrest System – provide DBI SALA 8516691 Portable Fall Arrest System and 8517565 Carrying/Storage bag. The manufacture will weld bare steel plate DBI SALA Model 8517412 and then paint to match transformer ANSI 70 Gray.

<http://www.aikencolon.com/dbi-sala-8516691-advanced-portable-fall-arrest-post-system#3>

7.0 TESTS

The transformer shall receive standard commercial tests in accordance with ANSI Standards. The Materialman shall furnish evidence of short circuit testing on similar units having the same basic ratings and designs. Short circuit tests shall comply with appropriate ANSI regulations.

The transformer shall receive standard ANSI impulse tests, including full-wave and chopped wave on each high-voltage line terminal and on each low-voltage line terminal. Copies of oscillograms and a formal report will be submitted as a record of the tests.

The transformer shall receive a Sweep Frequency Response Analysis (SFRA) during factory testing on the neutral taps. This test shall be repeated during site testing. Results shall be compared, and a report provided with an explanation for any differences in results.

Perform Partial Discharge testing making measurements per IEEE standards C57.12.00, Table 17 & C57.12.90, section 10.8 describe induced testing

requirements and procedures, by evaluation of partial discharge measurements as criteria for pass/fail.

In addition, to the Standard ANSI tests, the transformer shall be corona tested at the full induced-test voltage level. RIV testing: equipment and general method used will be in accordance with IEEE C57.12.90 Annex A. IEEE Transactions PAS 86 No. 12, December 1967, "Tests for Damaging Corona on Oil-Insulated Power Transformers". Second, the corona test shall be made after all other insulation tests are completed. The RIV readings shall not exceed one hundred (100) microvolts for the following test procedure:

The corona tests shall be made as follows: one with the cooling oil-circulation pumps shut down and one with all pumps running. Only one (1) corona test will be required where no pumps are required for cooling.

For each test, RIV readings at one hundred seventy percent (170%) of rated maximum voltage to the transformer terminal shall be recorded for at least five (5) seconds, after which the test voltage should be reduced to one hundred fifty percent (150%) of rated maximum voltage and held for one (1) hour. Should the corona RIV reading increase in the last twenty (20) minutes of the test, the test time shall be extended beyond one (1) hour to allow time for the RIV readings to stabilize or decrease. If the RIV readings continue to increase, the test shall be considered to indicate a transformer failure. A further investigation shall be made to determine the problem and to correct it.

Corona shall be monitored continuously throughout the test and recorded every five (5) minutes. This shall be made a part of the certified test reports. A frequency of 120 Hertz is recommended for each test.

All impedances between windings shall be shown on the test reports.

The Materialman may offer in his quotation deductions for substitution of manufacturers' standard tests in lieu of those specified. However, the basic quotation must include all tests specified.

The Engineer reserves the option of having a representative present to inspect the core and coils prior to tanking and to witness any or all tests.

Without limiting in any way any obligation of the Materialman under this agreement, the Materialman shall demonstrate to the satisfaction of the Engineer that the transformer proposed to be furnished under this Specification shall have sufficient mechanical strength to withstand without failure all fault currents. The Materialman shall demonstrate that the transformers meet this requirement by one of the following methods:

- a. Certified test data showing that a transformer with a core and coil in similar design and construction and similar with respect to MVA capacity, kV ratings, BIL, impedance, and voltage taps has been tested without failure for short-circuit strength. A description of the test code under which the transformer was tested for short-circuit strength will be provided by the Materialman to the Engineer.
- b. A history of successful experience with transformers of identical or similar ratings, design, and construction. The Materialman shall list all transformers in service with core and coils which are essentially identical in design, construction, and manufacture to the transformer covered by this specification, and provide information on the date of installation, location, and failures if any. Where such transformers have not been built or the cumulative service record is less than 20 transformer years, a list of transformers in service which represent the closest approximation to the transformer covered by this Specification shall be submitted. The information submitted shall be representative of the total experience of the manufacturer with the design of the transformer it proposes to furnish and include the dates of installation or shipping, the ratings of the transformers, and the failures and causes of failure if any have been experienced.
- c. The Materialman shall submit with his Proposal a complete listing of all full-size transformers of his manufacture of similar ratings which have been short-circuited tested. The list shall include all full-size units tested, whether they were developed tests or tests of customer units. Complete ratings shall be given of each unit and each shall be noted as to whether copper or aluminum windings were used for comparison with that winding material offered on this bid. In the case of units tested for or by the ultimate customer, an indication shall be given on each unit as to whether the test was successful or unsuccessful and, if tested more than once, each subsequent test shall be so listed and appropriate comments are given as to design changes made - if any.
- d. If the Materialman has no such test data available, he shall so state on the Proposal.

The transformer shall be tested for the following:

Factory Tests

The transformer shall receive at the factory those tests identified in IEEE Standard C57.12.00 latest revision section on "Routine Tests". All tests are to be performed at 60 hertz.

The transformer shall be designed and built to meet the short-circuit design requirements of IEEE C57.12.00 latest revision and the Short-circuit test code of IEEE C57.12.90 latest revision.

PWC shall be notified five (5) weeks in advance so that its representative can witness the following factory routine tests (FAT) without causing any delays in factory schedules when located in North America:

Performance Tests

- Winding resistance measurements
- The ratio on all taps
- Polarity and Phase relation tests
- No-load losses and excitation current at 100% and 110% rated voltage
- Impedance voltage and load loss
- Operation tests of all devices
- Control (auxiliary) and cooling consumption losses
- Zero-phase sequence impedance voltage and load loss
- Temperature rise
- Dissolved gas in oil analysis (before the start of all tests and after the completion of all tests)
- Audible sound level
- The transformer shall receive a full spectrum Sweep Frequency Response Analysis (SFRA) during factory testing on the neutral taps. This test shall be repeated during field testing. Results shall be compared, and a report provided with an explanation for any differences in results.

Dielectric Tests

- Winding insulation resistance
- Core insulation resistance
- Insulation power factor and capacitance
- Low-frequency test on auxiliary devices and control and current transformer circuits
- Lightning impulse
- Low-frequency
- Partial discharge tests

Mechanical Tests

- Pressure
- Leak (fully assembled, with radiators installed)

The certified test report shall include impedance values as follows: Z1%, X1/R1, Z0%, and X0/R0 (and specify MVA base of these values).

Field Tests/Checks

All tests as called for by the latest revision of ANSI/NETA Standard for Acceptance Testing Specifications for Electrical Power Equipment and Systems shall be performed. For reference, applicable portions of ANSI/NETA ATS-2009 have been included in Appendix 5.

In addition, a Sweep Frequency Response Analysis shall be performed. The technicians performing the tests will need to be NETA certified. This will need to be performed even if the manufacture has to hire a testing contractor.

Any tests listed that are not included in the bidder's proposal shall be so noted in the list of exceptions to the specifications.

In addition, the manufacturer shall provide certification for all design and other tests listed in Table 18 of ANSI C57.12.00 including verification that the design has passed Short Circuit Criteria per ANSI C57.12.00 and C57.12.90.

8. TRANSFORMER BID EVALUATION

Transformer bids shall be evaluated for "Equivalent First Cost of Ownership" utilizing initial cost and transformer losses. The formula is as follows:

$$\text{"Cost of Ownership"} = (\text{Unit Cost}^*) + (\text{Factor A} \times \text{No-Load Losses}) + (\text{Factor B} \times \text{Winding Losses}) + (\text{Factor C} \times \text{Auxiliary Losses})$$

*Including possible escalation if any.

The Cost of Losses will be evaluated using the following Factor amounts:

<u>Unit</u>	<u>Factor</u>	<u>ONAN Base Rating</u>	<u>-</u>
No-Load Loss	A	\$5,200 per kW	
Winding Loss	B	\$1,800 per kW	
Auxiliary Losses	C	\$1,000 per KW	

The No-Load and Winding Losses quoted by the Materialman are of the essence of the Contract. Should the Materialman fail to meet the quoted losses, the Owner shall have the right to deduct from and retain out of such monies which may be then due or which may become due and payable to the Materialman the sum equal to the difference in quoted loss values and the actual loss values as verified by the certified test reports provided after manufacture computed in dollars utilizing the No-Load Loss and Winding Loss values listed above as liquidated damages and not as a penalty. In no event shall the adjustment factor under this provision result in a net price increase to the Owner. If the amount due and to become due from the Owner to the Materialman is insufficient to pay in full any such liquidated damages, the Materialman shall pay to the Owner the amount necessary to affect such payment in full, provided, however, that the Owner shall promptly notify the Materialman in writing of the manner in which the amount retained, deducted, or claimed as liquidated damages were computed.

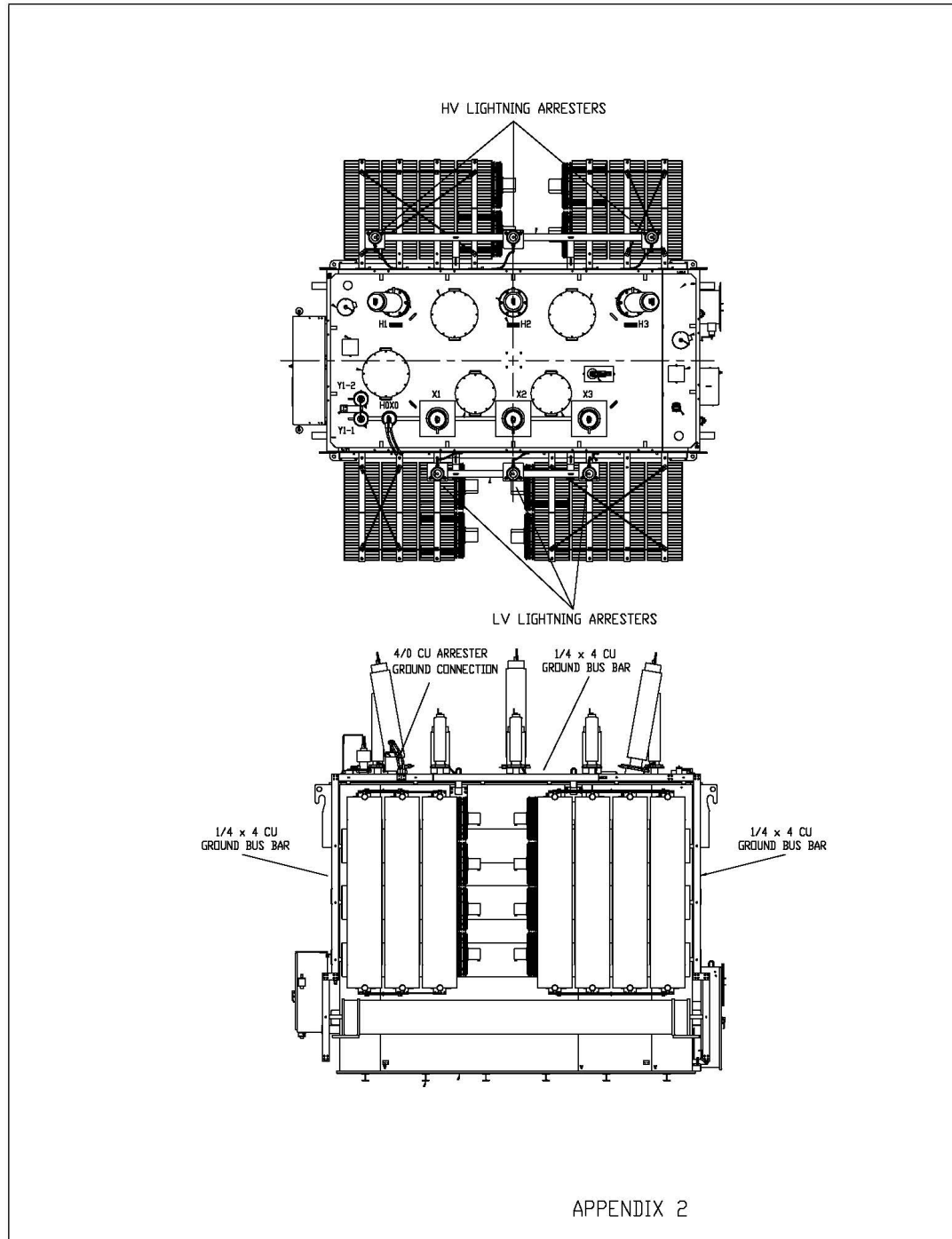
9. WARRANTY

The Materialman shall guarantee his materials and workmanship against defect due to faulty materials or faulty workmanship or negligence for a period as outlined below following final acceptance of the work. He shall make good such defective materials or workmanship and any damage resulting therefrom during the warranty period without any cost to the Owner.

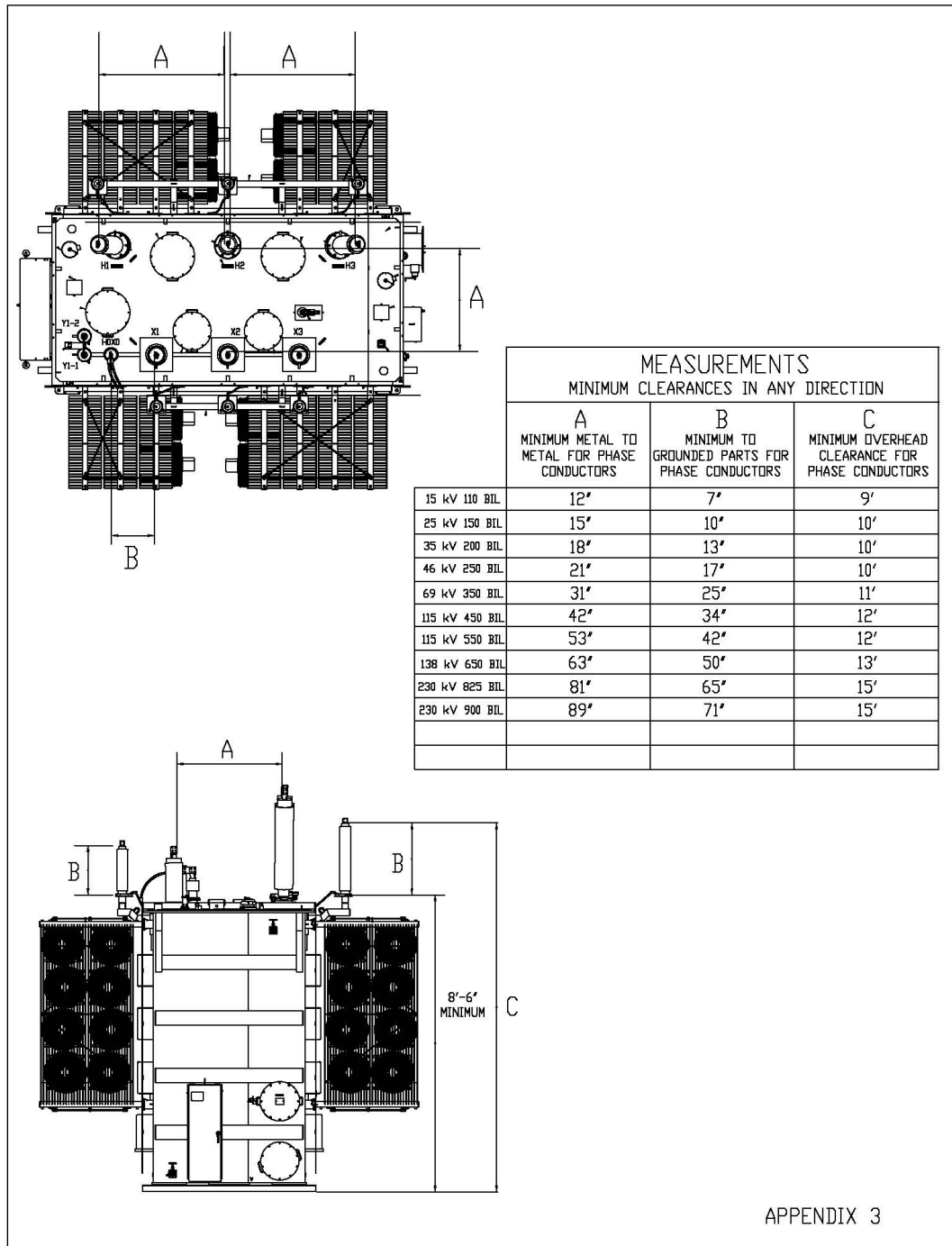
Each class of equipment shall carry a full five (5) year warranty against defects. Unless otherwise stated in previous specifications.

Materialmen will purchase the commissioning and testing services for Dynamic Ratings and Vaisala installed equipment. Along with onsite field training for PWC substation employees.

Appendix 2



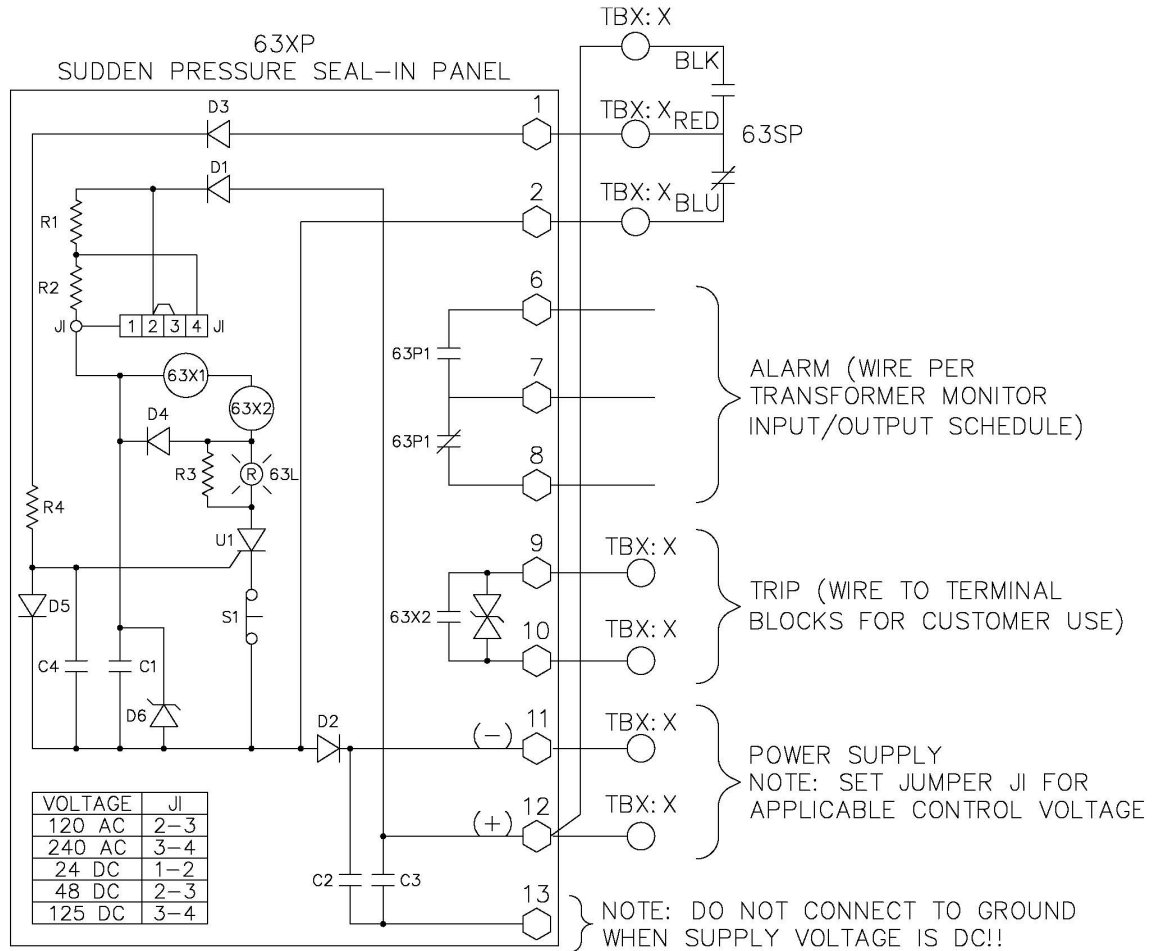
Appendix 3

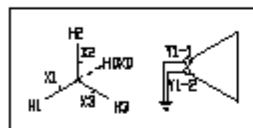
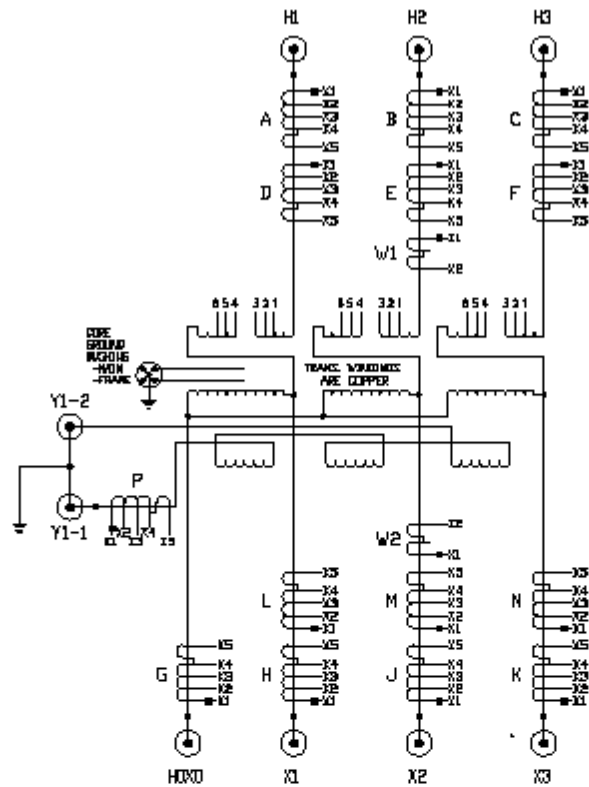


APPENDIX 3

Appendix 4

63XP Sudden Pressure Seal-in Circuit





CURRENT RATIO	CURRENT RATIO	CURRENT RATIO	SEC. TAP
50:5	100:5	800:5	X2-X3
100:5	200:5	400:5	X1-X2
150:5	300:5	1200:5	X1-X3
200:5	400:5	500:5	X4-X5
250:5	500:5	300:5	X3-X4
300:5	600:5	1100:5	X2-X4
400:5	800:5	1500:5	X1-X4
450:5	900:5	800:5	X3-X5
500:5	1000:5	1800:5	X2-X5
600:5	1200:5	2000:5	X1-X5

APPENDIX 1