INVITATION FOR BID

PWC2425077

THREE (3) CONTINUOUS RATED 67KV DELTA TO 13.09 Y/7.56KV WITH LTC RATED 24/35.8/44.8 MVA POWER TRANSFORMERS AT ONAN, ONAF, ONAF

Date of Issue: April 21, 2025
Date of Opening Date: May 8, 2025, 2:00 P.M.

Direct all inquiries concerning this IFB to:

Carla Wint
Procurement Advisor
procurement@faypwc.com

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Cumberland County
North Carolina

Bids are solicited and will be received at Fayetteville Public Works Commission, Administration Building, Procurement Department/Conference Room 107, 955 Old Wilmington Road, Fayetteville, NC 28301, until **2:00 p.m., EST Thursday, May 8, 2025**, for the **Three (3) Continuous Rated 67KV Delta To 13.09 Y/7.56KV With LTC RATED 24/35.8/44.8 MVA Power Transformers AT ONAN, ONAF, ONAF.**

The Commission is requesting firm quotations for three (3) continuous rated 67KV delta to 13.09 Y/7.56KV with LTC rated 24/35.8/44.8 MVA power transformers at ONAN, ONAF, OAF, as specified in this document, to support the operations of the Electric Support Services.

Enclosed are the Instructions to Bidders, Detailed Specifications, and Bid Pricing Form. Bidders must submit the completed Bid Pricing Form, References, Attachment B, Attachment C, MWDBE Affidavit A or B, MWDBE Affidavit E, and any required addendum acknowledgments. Submissions must be made using the provided forms or exact copies thereof, as specified in the bid documents.

Questions regarding this bid must be submitted in writing to the attention of **Carla Wint**, at procurement@faypwc.com no later than **5:00 p.m., EST Wednesday, April 30, 2025**, in order to be considered for a response.

Mailed bids must be addressed to **Carla Wint**, Procurement Advisor, Fayetteville Public Works Commission, 955 Old Wilmington Road, Fayetteville, North Carolina 28301. The outside of the envelope must be marked **IFB: PWC2425077 THREE (3) CONTINUOUS RATED 67KV DELTA TO 13.09 Y/7.56KV WITH LTC RATED 24/35.8/44.8 MVA POWER TRANSFORMERS AT ONAN, ONAF, ONAF** and shall indicate the name, and address of the bidder. Late bids will not be considered.

Fayetteville Public Works Commission reserves the right to reject any or all bids for any reason determined by PWC to be in its best interest, or to award the bid to the lowest responsible bidder or bidders, taking into consideration quality, performance, and the time specified in the bids for the performance of the contract.

FAYETTEVILLE PUBLIC WORKS COMMISSION
Nikole Bohannon
Procurement Manager

INSTRUCTIONS TO BIDDERS
FAYETTEVILLE PUBLIC WORKS COMMISSION
PWC2425077 THREE (3) CONTINUOUS RATED 67KV DELTA TO 13.09 Y/7.56KV WITH LTC RATED 24/35.8/44.8 MVA POWER TRANSFORMERS AT ONAN, ONAF, ONAF

SCOPE

PWC is seeking bids for the purchase of power transformers, with orders to be placed in 2025. The procurement includes the purchase of Three (5) 24/35.8/44.8 MVA power transformers, which must be shipped by the manufacturer on or before August 1, 2027. Bids should reflect firm pricing based on an order placed within sixty (60) days from the bid date.

Bids must cover all associated costs, including delivery, unloading, handling, rigging, and placement of the transformers onto PWC's foundation pad or piling at designated substation sites within PWC's service area, which includes Fayetteville, North Carolina, and surrounding areas. PWC will specify the exact delivery site for each transformer at least thirty (30) days prior to the scheduled delivery date. PWC will ensure roadworthy access to the designated delivery sites.

For evaluation purposes, bids that do not include complete oil-filling of the transformers in the base bid will have an additional $45,000 cost added to their evaluation.

Manufacturers may also submit an alternate bid of a LTC mechanism for vacuum switching, stating the guaranteed minimum number of maintenance-free LTC operations. Bids guaranteeing fewer than 500,000 operations before maintenance will be deemed unresponsive and disqualified from consideration.

OBJECTIVE OF THE REQUEST

It is the intent of this bid invitation to obtain pricing for **THREE (3) CONTINUOUS RATED 67KV DELTA TO 13.09 Y/7.56KV WITH LTC RATED 24/35.8/44.8 MVA POWER TRANSFORMERS AT ONAN, ONAF, ONAF** within the detailed specifications section of this Invitation for Bid (IFB). You are requested to submit your bid on the enclosed Bid Pricing Form.

IFB SCHEDULE

The following table shows the schedule of events to prepare your organization's response. The key deadlines and targeted dates for this process are as follows:

Action	Responsibility	Date/Time
Submit Written Questions	Bidders	Wednesday, April 30, 2025
Provide Response to Questions	PWC	Monday, May 5, 2025
Submit IFB	Bidders	Thursday, May 8, 2025
Target Commission Date	PWC	Wednesday, May 28, 2025
Target Council Date	PWC	Monday, June 9, 2025
Award /Sale of Goods Agreement	PWC	Wednesday, June 18, 2025
Preferred Delivery	Awarded Bidder	August 1, 2027

QUESTIONS

Written questions shall be e-mailed to procurement@faypwc.com by the date and time specified in the IFB schedule. Bidders will enter "IFB **PWC2425077** – Questions" as the subject of the email.

Questions received prior to the submission deadline date, the Procurement Advisor's response, and any additional information deemed necessary by PWC will be posted in the form of an addendum to the PWC website and shall become an Addendum to this IFB. No information, instruction, or advice provided orally or informally by any PWC personnel, whether made in response to a question or otherwise concerning this IFB, shall be considered authoritative or binding. Firms shall rely only on written material contained in an Addendum to this IFB.

Inquiries should be submitted no later than the date and time noted in the IFB schedule. Questions answered verbally will be followed up by written addenda as deemed necessary; oral interpretations shall have no effect.

MINORITY, WOMEN, AND DISADVANTAGED BUSINESS ENTERPRISE (MWDBE) PROGRAM / SMALL LOCAL SUPPLIER (SLS) PROGRAM

PWC is committed to promoting the utilization of Minority, Women, and Disadvantaged Businesses in PWC's geographical statistical area (GSA) by providing equal opportunity for participating in all aspects of PWC's contracting and procurement programs. The GSA consists of NCDOT division areas 3-8, and 10. PWC is also committed to promoting the utilization of small, local businesses in the Fayetteville Metropolitan Statistical Area (MSA) by increasing opportunities for those businesses to participate in PWC procurements. The MSA consists of Cumberland County, Hoke County, and Harnett County.

Bidders must report their efforts to engage MWDBEs, Historically Underutilized Businesses (HUBs), and Small Local Suppliers for each project, regardless of specific project requirements.

Bidders shall submit the MWDBE Affidavits A or B, & E provided within Attachment F with their bid submittal. The Affidavits shall be signed and notarized.

In accordance with PWC's MWDBE Program, the goal shall be to award four percent (**4%**) of the total contract dollars to MBE firms and four percent (**4%**) to WBE firms. A complete copy of PWC's MWDBE Program is available for inspection at PWC Procurement Department.

Bidders are encouraged to document good faith efforts and subcontractor utilization in the **MWDBE Affidavits C or D** at the time of bid submission, though it is not mandatory. If these efforts are not included, PWC's Program staff will contact the lowest responsive bidder to request documentation, which must be provided within **24 hours** or by the next business day.

The following is a list of the efforts that should be made by the prime service provider to encourage MWDBE participation. In order to receive credit for having made "good faith efforts", the prime service provider should document all actions taken to include the following:

1) Attending pre-bid meetings scheduled by the department;

2) Identifying selected specific items of the project which could be executed by a MWDBE;

3) Soliciting MWDBE service provider participation in a reasonable time before the proposals are due through advertisements in circulation media, trade publications, and minority-focused media;

4) Contacting local firms, firms owned by minorities or women, and associations or business development centers which disseminate information to local businesses and businesses owned by minorities or women in a timely manner to allow sufficient time for MWDBEs to respond;

5) Following up on initial solicitations of interest by contacting the MWDBE to determine whether the MWDBE was interested in performing specific items of the project;

6) Attempting to enter into joint venture or partnership arrangements with MWDBEs and provide interested MWDBEs with information about the requirements for the project;

7) Providing assistance to MWDBEs in the review of proposals and work to be done by sub-service providers;

8) Using available directories of certified MWDBEs and other available resources;

9) Ensuring that the proposer negotiated in good faith with the MWDBE and did not unjustifiably reject as unsatisfactory quotes prepared by any Minority, Women, or Disadvantaged Business Enterprise;

10) Making every effort to obtain Minority, Women, or Disadvantaged Business Enterprise participation that could reasonably be expected to produce a level of participation sufficient to meet the goals of PWC; and

11) Providing interested minority, women, and disadvantaged businesses with information relative to project requirements

REFERENCES

Bidders shall provide at least three (3) different references for which your company has supplied the exact model of equipment offered. PWC may contact these references to determine the commodity provided are substantially similar in scope to those requested in Attachment A and that the bidder's performance has been satisfactory. The information obtained shall be considered in the evaluation of the bid. If PWC is referenced, it cannot be counted towards your three (3) required references but may be included in addition to. Bidders are encouraged to provide at least three (3) references where your company has supplied equipment or services within the energy and power generation industry. PWC may contact these references to assess whether the bidder's performance was satisfactory and aligned with industry standards. The information obtained may be considered in the evaluation of the bid. If PWC is listed as a reference, it may be included as one of the three (3) optional references.

COMPANY NAME	CONTACT NAME	TELEPHONE NUMBER	EMAIL
Fayetteville Public Works Commission, if applicable			

VENDOR REGISTRATION VIA ISUPPLIER

1) All vendors interested in doing business with PWC must register as a vendor through the iSupplier Portal using the link below. The iSupplier self-service portal enables vendors to have real-time access to information regarding purchase orders, invoices, and payments through a secure environment. Attach a copy of your W9 to your online registration.

https://www.faypwc.com/isupplier-doing-business-with-pwc/

BID DEPOSIT

1) Each bid shall be accompanied by a 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 Fayetteville Public Works Commission, Fayetteville, 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 may be submitted by the bidder.

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 Agreement 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) 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.

SUBMISSION INSTRUCTIONS

1) Bids should be complete and carefully worded and should convey all the information requested in the IFB. Bids should be prepared simply and economically, providing a straightforward, concise description of the bidder's capabilities to satisfy the requirements of the IFB. Emphasis should be on completeness and clarity of content. If the bid includes any comment over and above the specific information requested in the IFB, the bidder should include this information as a separate appendix to its bid. Bids that include clarifications or modifications to any of the IFB's contractual requirements, or a bidder's standard terms and conditions, may be deemed non-responsive and not considered for award at PWC's discretion.

2) Unsolicited bid samples or descriptive literature will not be examined or tested, will not be used to determine responsiveness, and will not be deemed to vary any of the provisions of the IFB. Failure to comply with these requirements shall constitute sufficient cause to reject a bid without further consideration. PWC reserves the right to accept or reject any bid and to annul the bidding process and reject all bids at any time prior to award of a Sale of Goods Agreement, without thereby incurring any liability to the affected bidder or bidders or any obligation to inform the affected bidder or bidders the reasons for PWC's action.

3) Bids may be withdrawn by the bidder only in writing and if receipt of such withdrawal is acknowledged by PWC prior to the time for the bid submittal deadline identified in the Advertisement for Bidders (or such later date included in an Addendum). Written withdrawal requests shall be submitted on the bidder's letterhead and signed by an official of the bidder duly authorized to make such request. Any withdrawal request made after the bid submittal deadline shall be allowed only if the price bid was based upon a mistake that constituted a substantial error, provided the bid was submitted in good faith, and then only pursuant to the terms of N.C.G.S. § 143-129.1.

4) Bids must be submitted in an envelope clearly marked with "**IFB: PWC2425077 THREE (3) CONTINUOUS RATED 67KV DELTA TO 13.09 Y/7.56KV WITH LTC 24/35.8/44.8 MVA POWER TRANSFORMERS AT ONAN, ONAF, ONAF** along with the bidder's name and address. **Even if this envelope is placed inside a courier's envelope, the courier envelope itself must also be properly marked to ensure the bid can be identified without opening it.** This is critical for proper sorting and handling, as multiple bids are received daily for different Procurement Advisors. Any bid received without proper labeling on the courier envelope will be returned to the sender and will not be considered for award. All bids must be delivered to the Fayetteville Public Works Commission, Administration Building, Procurement Department, at 955 Old Wilmington Road, Fayetteville, NC 28301, by the specified deadline. Late bids will not be considered.

5) Bids will be examined promptly after the due date and an award will be made at the earliest possible date. Bids must be held firm for PWC for a period of sixty (60) days after the bid due date. A purchase order will be issued to the awarded bidder.

6) Bidders shall submit bids only on the Bid Pricing Forms provided herein, or exact copies thereof **(See Attachment B – Bid Pricing Form)**. Failure to provide full and complete Bid Pricing Forms using the form provided herein will result in a bid being deemed non-responsive.

7) All bids must be signed by an authorized official of the bidder. Bids may be rejected for any omission, alteration of form, additions not called for, conditional bid, or any irregularities of any kind.

8) Do not submit alternate bids unless specifically called for on the Bid Pricing Forms.

PRICING

1) All bidders are advised to include all costs incurred by the bidder in delivering the **THREE (3) CONTINUOUS RATED 67KV DELTA TO 13.09 Y/7.56KV WITH LTC RATED 24/35.8/44.8 MVA POWER TRANSFORMERS** in their bid submittal. The invoice submitted for payment shall not reflect any other costs (fuel surcharge, toll, shipping, etc.). PWC is not tax-exempt.

2) Bids for each transformer shall include the bidder's risk of delivery, unloading, handling, rigging, and placement of the transformer onto the PWC foundation pad or foundation piling at each site to a substation site located within the PWC's service area in and surrounding Fayetteville, North Carolina. PWC will designate the specific delivery site for each transformer at least thirty (30) days before the Manufacturer's scheduled delivery. PWC will provide reasonable roadworthy access to each site.

3) Price Adjustments: The Agreement shall contain a provision for price adjustment based on the U.S. Bureau of Labor Statistics, Producer Price Index by Industry: Electric Power and Specialty Transformer Manufacturing: Power and Distribution Transformers and shall provide, in part, that in the event of a change of +/- 5% prior to the purchase of the materials from the time of bidding, the price shall be adjusted accordingly. A website such as https://fred.stlouisfed.org/series/PCU3353113353111 shall be used to determine commodity values during the manufacturing process period.

EVALUATION AND AWARD

1) An award of a contract is subject to the approval by the Board of Commissioners of PWC and the Fayetteville, North Carolina City Council.

2) PWC reserves the right to inspect, at a reasonable time, the equipment, item, plant, or other facilities of a prospective Bidder prior to award, and during the Sale of Goods Agreement term, as PWC deems necessary to determine that such equipment, item, plant, or other facilities conform with the specifications/requirements and are adequate and suitable for the proper and effective performance of the Sale of Goods Agreement.

3) PWC reserves the right to request additional information from bidders to aid in the evaluation process. This information may include but is not limited to, financial statements, a reference list of contracts of similar size, etc.

4) In evaluating the bids for the award of the Sale of Goods Agreement, PWC will consider, in addition to the prices quoted in the Bid, and other potential criteria, the following factors:

a) Lead times.
b) Adherence to the plans and technical specifications.
c) Suitability of materials.
d) Firm prices.
e) Additional extended warranty.
f) Standardization of equipment.
g) Long-range economy.
h) History of prior delivery performance.
i) No-Load and Load Loss Evaluation.
j) Accessibility of service facilities and personnel.
k) History of prior equipment and service personnel performance.
l) Ability and practicality to inspect the equipment in person prior to shipment and witness any testing.

5) Bids submitted shall be evaluated for "Equivalent First Cost" utilizing initial cost, transformer losses, and the cost of financing over a twenty-year (20-year) evaluation of ownership. The formalization is as follows:

"Equivalent First Cost" = (Unit Cost*) + (No-Load Losses x A) + (Winding Losses x B)

*Including any, cost of insurance (1) if less than a five-year warranty is quoted.

For the purpose of evaluating transformer losses for award and determination of compliance after manufacturing and testing, the following will apply for no-load and winding losses:

No-load and winding losses:

No-load losses will be evaluated using the average of quoted losses at the LTC 1R position and the LTC average 15R and 16R positions. Winding losses will be evaluated using the quoted losses at LTC average 15R and 16R positions.

The Cost of Losses will be evaluated using the following kW charge:

	50MVA Base Rating
No-Load Loss (A)	$ 5,200 per kW
Winding Loss (B)	$ 1,800 per KwPWC

6) PWC reserves the right to change the no-load loss and winding loss charge values given above insofar as these values are used to evaluate bids. Such changes might be necessary to reflect changed conditions and are not expected to be more than ±20% of the values shown above. If bid's total cost evaluations are within five percent (5%) of each other at total cost of ownership PWC reserves the right to go back to lowest cost transformer as the awarded bidder. The no-load and winding losses quoted by the Bidder are of the essence of the Agreement. Accordingly, the Agreement shall provide that should the Bidder neglect, refuse, or fail to meet the quoted losses provided, the Purchase Price shall be reduced by 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. PWC shall have the right to deduct from and retain out of the portion of the monies then due and payable or which may become due and payable to the bidder such amount. In no event shall the adjustment factor under this provision result in a net price increase to PWC. If the funds due and to become due from PWC to the bidder is insufficient to pay in full any such amount, the bidder shall pay to the Commission the amount necessary to affect such payment in full upon demand therefore, provided, however, that PWC shall promptly notify the bidder in writing of the manner in which the amount retained, deducted, or claimed were computed.

7) PWC reserves the right to make a single award for all items or may award separate contracts to multiple bidders for various items to the lowest responsive, responsible bidder or bidders, taking into consideration product quality, performance to PWC, and conformity with the specifications in these bid documents. PWC may also consider, among other things, the Bidder's past performance conduct on other contracts, and other information as PWC deems necessary to assist in the evaluation of any bid.

8) The Sale of Goods Agreement will be awarded for a period of two (2) years to begin on or about June 18, 2025.

9) The successful bidder shall not assign, transfer, or convey any part of the agreement, including rights or obligations, to a third party without obtaining prior written approval from PWC. This includes the assignment of payments that may become due under the agreement.

Any unauthorized assignment may result in disqualification or termination of the agreement. Approved assignments do not relieve the successful bidder of their responsibilities under the terms of the agreement unless explicitly stated in writing by PWC.

10) The successful bidder must promptly notify PWC in writing of any legal actions, investigations, or issues arising during the agreement period that may impact their ability to perform their obligations under the agreement. Failure to provide timely notification may result in termination of the agreement. As outlined in Attachment C: Certification of Primary Participant Regarding Debarment, Suspension, and Other Responsibility Matters, the successful bidder must also certify that no such legal impediments exist at the time of bid submission. If circumstances change after submission or during the agreement period, the bidder is required to immediately inform PWC, providing full details of the situation.

DELIVERY AND PAYMENT

1) The three (3) transformer delivery locations will be located within the service territory of PWC or the surrounding area. PWC will provide reasonable roadworthy access to each destination.

2) Delivery to be made **F.O.B.** Public Works Commission **1097 Public Works Drive, Fayetteville NC, 28301.**

3) Deliveries shall be made between the hours of **9:00 a.m. and 3:00 p.m., Monday through Friday**, within the time frame specified on the Bid Pricing Form. The successful bidder must provide 48-hour notice of all deliveries.

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

5) Receipt of "Approval Drawings" by the successful bidder constitutes an authorization for manufacture only, predicated upon the drawings and corrections found thereon. Tentative release for shipment is to be granted by either PWC or PWC's engineer, based upon the following:

a) Twenty-one (21) consecutive days prior to notification of tests so that PWC may have a representative present to witness the tests.
b) Furnishing of the requested number of copies of the final drawings as called for in the Sale of Good Agreement.
c) Coordination of manufacturing and delivery with PWC's construction schedule as may be noted in the Sale of Good Agreement.
d) Thirty (30) days' notification of the tentative shipping schedule and 48 hours' notification prior to all deliveries.

6) Payment for equipment, material, supplies, etc. purchased pursuant to this bid shall be made by PWC in accordance with the milestone payment schedule as follows: a) 10% upon approval of submitted of drawings b) 30% upon receipt of copper and core steel at the factory c) 35% upon shipment of transformer to owner d) 20% after delivery to site, setting on pad, dressed, and tested 5% retainage up to 60 days after delivery e) Milestone Percentages, less retainage, to build transformer and after it is demonstrated that the equipment meets the technical specifications.

7) PWC will withhold five percent (5%) of each monthly payment as retainage. After fifty percent (50%) of the work is completed, PWC may consider waiving further retainage if the following conditions are met: (1) written consent is received from the surety; (2) satisfactory progress is being made on the project; and (3) any nonconforming work identified by the PWC engineer before fifty percent (50%) completion has been corrected by the Contractor and accepted by the PWC engineer. If retainage is reduced or waived, PWC reserves the right to reinstate retainage up to the five percent (5%) level if the Contractor's performance becomes unsatisfactory. Additionally, PWC may continue to withhold payment, even if the Contractor's work is satisfactory, to ensure a total retainage of two and one-half percent (2.5%) over the life of the project.

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

9) The Agreement shall contain a liquidated damages provision with respect to damages due to delays which provides in part that in the event that the successful Bidder fails to deliver the power transformers within the agreed-upon delivery schedule, liquidated damages shall be assessed as follows:

a) First 90 Days: For the first ninety (90) calendar days following the agreed-upon delivery date, liquidated damages in the amount of $500 per calendar day shall be imposed for each day the delivery is delayed.

b) Beyond 90 Days: Beginning on the ninety-first (91st) calendar day and continuing until the delivery of the power transformers, liquidated damages in the amount of $750 per calendar day shall be imposed for each day the delivery is delayed.

These liquidated damages are intended to compensate PWC for the losses and inconvenience caused by the delay and are not intended as a penalty. The successful Bidder agrees that these amounts are reasonable estimates of the actual damages PWC will incur in the event of such delays.

TRANSITION ASSISTANCE

1) If a PWC Sale of Goods Agreement results from this solicitation, and said Agreement is not renewed at the end of the then current term or is terminated prior to its expiration for any reason, at the option of PWC, Bidder shall provide transition assistance to PWC for up to six (6) months following termination or expiration of the Agreement to allow for the Services to continue without interruption or adverse effect, and to facilitate the orderly transfer of such Services to PWC or its designees. If PWC exercises this option, the Parties agree that such transition assistance shall be governed by the terms and conditions of the Agreement (notwithstanding this expiration or cancellation), except for those Agreement terms or conditions that do not reasonably apply to such transition assistance. PWC shall agree to pay the Bidder for any resources utilized in performing such transition assistance at the most current rates provided by the Bidder for performance of the Services or other resources utilized. Upon request of PWC, Bidder agrees to deliver an amendment to the Agreement in form and substance reasonably acceptable to the parties memorializing the extension of the term as contemplated above.

FAYETTEVILLE PUBLIC WORKS COMMISSION
THREE (3) CONTINUOUS RATED 67KV DELTA TO 13.09Y/7.56KV WITH LTC RATED 24/35.88/44.8 MVA POWER TRANSFORMERS AT ONAN, ONAF, ONAF

ATTACHMENT A: TECHNICAL SPECIFICATIONS

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FAYETTEVILLE PUBLIC WORKS COMMISSION
THREE (3) CONTINUOUS RATED 67KV DELTA TO 13.09Y/7.56KV WITH LTC RATED 24/35.88/44.8 MVA POWER TRANSFORMERS AT ONAN, ONAF, ONAF

TECHNICAL SPECIFICATIONS

1.0 Standards

1.1 All materials and equipment shall be new.

1.2 The Technical Specifications describe the type, size, and characteristics of the various materials and equipment required to be furnished. The Drawings indicate general arrangement, equipment location, and spacing.

1.3 Strict adherence to the Technical Specifications and Drawings is requested to facilitate checking and consideration of the Proposal.

1.4 The transformer manufacturer must have a USA-located repair facility to bid on this project.

1.5 Bid submittals shall include the following:

1.5.1 Catalog numbers, manufacturer, ratings, characteristics, types, sizes, etc., of all major removable materials and equipment included. A simple statement that all necessary materials and equipment will be provided is not satisfactory.

1.5.2 Performance data and evidence of short circuit testing for similar designs for the several items as outlined in the Detailed Specifications.

1.5.3 The Bidder shall state in its bid how the transformers will be shipped, namely, truck or rail; whether units shall be shipped oil-filled; or with gas pressure, and whether bushings will be installed or removed. The bushing shall be shipped upright.

1.5.4 Prices shall include the cost of delivery to the substation site and unloading onto the pad as per Instructions to Bidders.

1.5.5 These Technical Specifications are intended for the transformer to be complete and fully operable. Any details not mentioned in the Technical Specifications but required for satisfactory operation shall be furnished and installed by the awarded Bidder including top-off oil.

1.5.6 Station power available at the PWC's substation will be 120/240 volts, 60 Hz, single-phase. The control **DC** voltage at the substation sites will be **48 volts**. The equipment on the transformers shall coordinate with these voltages as appropriate.

1.6 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.

1.7 All equipment and materials covered by the Technical Specifications and all tests applied to it, unless otherwise stated herein, by the applicable provisions of the latest editions of the Standards of the ASTM, ANSI, AEIC, IEEE, NEMA, NESC, and OSHA.

Where the term "Standards" is used in the Technical Specifications it shall be understood to refer to the above Standards. The following is a reference list of applicable documents:

IEEE C37.90.1 Surge Withstand (SWC) Tests
IEEE C57.12.00 Standard General Requirements for Liquid Immersed Power Transformers
IEEE C57.12.10 Standard Safety Requirements for Power Transformers
IEEE C57.12.70 Standard Terminal Markings and Connections for Distribution and Power Transformers
IEEE C57.12.80 Standard Terminology for Power and Distribution Transformers
IEEE C57.12.90 Standard Test Code for Liquid Immersed Power Transformers
IEEE C57.19.00 General Requirements and Test Procedure for Outdoor Power Apparatus Bushings
IEEE C57.19.01 Performance Characteristics and Dimensions for Outdoor Apparatus Bushings
IEEE C57.91 Guide for Loading Oil-Immersed Power Transformers
IEEE C57.98 Guide for Transformer Impulse Tests
IEEE C57.116 IEEE Guide for Transformers Directly Connected to Generators
IEEE C57.131 Standard Requirements for Load Tap Changers
IEEE C57.163 IEEE Guide for Establishing Power Transformer Capability while under Geomagnetic Disturbances
IEEE 693 IEEE Recommended Practices for Seismic Design of Substations
Doble TDRB-291 Power Factor Test-Data Reference Book
Doble - Doble Transformer Oil Purchase Specification (TOPS)
EPRI 1015077 Guidance for Planned Replacement of Large Power Transformers at Nuclear Power Plants
NEMA TR1 Audible Sound Levels for Transformers
IEEE C57.32 Requiremen3ts, Terminology, and Test Procedure for Neutral Grounding Devices
IEC 60076-5 Power Transformer Ability to Withstand Short Circuit

2.0 Drawings

2.1 Preliminary

Before proceeding with fabrication, the manufacturer shall submit for approval sufficient Drawings to demonstrate that all parts conform to the requirements and intent of the Technical 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: Fayetteville PWC, 1094 Commission Drive, Fayetteville, North Carolina 28301, and Attention: Joel C. Valley.

The Outline Drawing shall show the dimensions of the 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.

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

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

2.2 Final Drawings

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

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

2.2.2 Two (2) complete sets of all Drawings, revised to "as-built" status, released on two (2) separate CD-ROMs, compatible with AutoCAD, Release 2021.

2.2.3 Four (4) copies of applicable instruction books, including one (1) print each of all Drawings representing physical and electric details as furnished per paragraph 3.2.1.

2.2.4 Two (2) copies of certified test reports corresponding to functional performance measurements after final assembly.

2.2.5 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:

2.2.6 Outline and Assembly Drawings showing size and location of major components and all principal dimensions.

2.2.7 Control cabinet front view.

2.2.8 Details of bushing and bushing terminal connectors.

2.2.9 Diagram of bushing current transformers, connection, number of turns, polarity marking, ratios, and bushing orientation.

2.2.10 Current transformer performance characteristic curves and data for all relay accuracy CTs.

2.2.11 Details of the control housing.

2.1.12 Panel connection diagram showing the exact connection for all components furnished.

2.2.13 AC and DC elementary circuit diagrams for all relay and control equipment furnished.

2.2.14 Wiring control and schematic diagrams.

2.2.15 Instruction books, including LTC operations manual(s), if so equipped.

2.2.16 Renewal parts catalog.

2.2.17 Two (2) copies of certified test reports.

3.0 Shipping of Transformer

3.1 Each transformer shall be shipped to a substation site to be specifically designated by PWC at least thirty (30) days before the Manufacturer's scheduled delivery date. The Manufacturer shall furnish an adequate capacity crane for unloading, handling, rigging, and placement of the transformer onto the PWC's foundation.

3.2 Before shipment, the 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. Assembly of any parts removed for shipment will be performed by the manufacturer’s field labor or a hired contractor by the manufacturer and to be under the supervision of the manufacturer's field service engineer.

3.3 Method of packing and loading shall ensure protection of all parts from dampness, corrosion, breakage, or vibration injury that might be encountered in transportation, storage, and handling.

3.4 Release for shipment is to be granted by either PWC or the PWC's Engineer based upon the manufacturer's compliance with the following:

Fourteen (14) consecutive days before notification of tests, so PWC may have a representative present to witness the tests.

3.5 Furnishing of the requisite number of copies of the Final Drawings as called for in the Specifications.

3.6 Thirty (30) days' notification of tentative shipping schedule and forty-eight (48) hours' notification before delivery.

3.7 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 Bidder is relieved of this requirement by PWC's Engineer. The impact recorder shall be read before unloading, at the rail siding before unloading if applicable, on the trailer before transportation to the site, and after arrival at the site.

3.8 Transformer may be shipped oil-filled with the low-voltage bushings installed unless otherwise stated at the time of bid. The Bidder shall state the method of shipment, and this shall be evaluated when awarding the Sale of Good Agreement. With the MVA size of this transformer PWC prefers that the transformer be shipped with no oil with the low-voltage bushings installed. The Bidder should prepare to send an oil tanker to fill the transformer once it arrives in Fayetteville, NC. Bidder must provide top-off oil for when adding radiators.

3.9 If the transformer is not shipped oil-filled, it shall be shipped 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 facility (pump) furnished. The unloading facility shall have been flushed free of undesirable contaminants by flushing with the same type of oil provided for the transformer. The Bidder shall furnish all equipment and supervision required for filling, and the Bidder shall coordinate timing and arrangements.

3.10 The type of shipment (oil-filled or dry-air-filled) shall be specified in the Bid.

4.0 Manufacturer's Field Representative

The manufacturer shall provide the services of a Field Service Engineer for a period of up to five (5) working days per unit. The duties of the Field Service Engineer shall be to supervise a contractor hired or provide field labor by the manufacturer of the transformer for the installation of parts removed for shipment, including but not limited to bushings,

radiators, surge arresters, and top-off oil. He shall supervise the installation of all control and auxiliary wiring of the contractor. Once re-assembled, the transformer will be completely field tested by the Field Service Engineer as may be noted in Section 10.0 of these Technical Specifications. Additional time required shall be performed at the per-day rate quoted in the Proposal. This same rate shall apply as a deduction for any days included in the base bid that are not used.

5.0 Transformer Specifications

5.1 Type and Rating

5.1.1 The transformer shall be three-phase, 60 Hertz, two-winding, suitable for outdoor service at an altitude less than one kilometer (3300 feet) above sea level.

5.1.2 High voltage shall be 67,000 volts DELTA at 350 kV BIL, and low voltage shall be 13,090/7,560 volts WYE, 110 kV BIL. The high voltage shall lead the low voltage by a 30° phase angle. The transformer will be operated with the neutral tied solidly to the ground. All windings shall be copper and circular in design; where the High Voltage (HV) windings are made of Strand wire copper suitable design, such as parallel winding for the Low Voltage side (LV).

5.1.3 The transformer shall be oil-immersed for continuous self-cooled/forced air-cooled operation ONAN/ONAF/ONAF with two (2) stages of cooling and shall be furnished complete with oil. Fans shall be included with the transformer. The operating voltage for fans shall be 240 volts, single phase.

5.1.4 Transformer ratings, when loaded following IEEE C57.92 (newest ed.) "Guide for Loading Oil-Immersed Distribution and Power Transformers," shall be as follows:

	Schedule No
55°C rise, ONAN	24,000 kVA
65°C rise, ONAN	26,880 kVA
55°C rise, ONAN/ONAF	31,920 kVA
65°C rise, ONAN/ONAF	35,840 kVA
55°C rise, ONAN/ONAF/ONAF	39,900 kVA
65°C rise, ONAN/ONAF/ONAF	44,800 kVA

5.1.5 The transformer shall be capable of carrying rated load continuously at five percent (5%) above rated secondary voltage without exceeding an average winding temperature rise of 55°C above a 40°C maximum ambient and 30°C average ambient over twenty-four (24) hours.

5.1.6 Kilovolt ampere ratings are continuous and 55/65°C construction where the winding temperature rise by resistance will not exceed 65°C; hottest-spot winding temperature rise will not exceed 80°C. The transformer shall be suitable for loading

following IEEE C57.92 (current edition) "Guide for Loading Oil-Immersed Distribution and Power Transformers."

5.1.7 The transformer shall be suitable for loading following the latest revision of NEMA "Guide for Loading Oil-Immersed Power Transformers with 65°C Average Winding Rise," Pub. No. TR98.

5.1.8 Operating Temperature: The transformer shall be capable of operating in a maximum ambient temperature range of +50 °C to -15 °C, with no reduction in capacity.

5.1.9 Seismic Requirements: Units shall be designed to operate in a seismic zone corresponding to a minimum of a Moderate Qualification Level (response spectrum 0.25 g) per IEEE 693.

5.1.10 Loading: No current carrying part or device, such as tap changers, internal lead assemblies, cables, terminal boards, bushings, current transformers, etc. shall limit the loading of the transformer to less than the capability of the core and coil. The temperature rises of any current carrying devices shall not exceed the temperature rise of the winding it is associated with.

5.1.11 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.

5.1.12 Transformer must be filled with new Type II Mineral Oil that meets ASTM D-3487-2016 a naphthenic oil. Inhibited oils are insulating oils, which have been supplemented with either 2,6 ditetiary-butyl phenol or 2,6 dietertiary-butyl-p-cresol or any other specified and acceptable oxidation inhibitor. If an additive other than 2,6 ditetiary-butyl phenol or 2,6 dietertiary-butyl-p-cresol is used, appropriate limit values for oxidation stability tests (those for Type II oils). Oils with any detectable amounts of passivator will be assessed using the oxidation stability limits for Type II oils.

5.2 High-Voltage Taps

5.2.1 The transformer shall have full-capacity, high-voltage taps at maximum rated kVA provided as follows:

70,600 Volts
68,800 Volts
67,000 Volts
65,200 Volts
63,400 Volts

5.2.2 A weatherproof, hand-operated, tap-changing mechanism shall be provided suitable for de-energized operation of the high-voltage taps, with an 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 which is set.

5.3 Low-Voltage

5.3.1 The transformer shall have a single-voltage secondary winding, grounded WYE, providing full capacity at maximum kVA:

5.4 Tank and Cover

5.4.1 To achieve uniformity and compliance with PWC's standard design for substation facilities, each transformer tank design shall observe the following criteria for location of external equipment and accessory hardware:

5.4.2 The control cabinet housing all low voltage wiring associated with current transformer secondary's, automatic fan control, alarms, LTC control, etc. shall be located on the side of the tank in Segment 1 as identified by IEEE C57.12.10.

5.4.3 The LTC compartment shall be located on the side of the tank in either Segment 2 as identified by IEEE C57.12.10 - (current edition).

5.4.4 The control cabinet and the LTC compartment must be positioned to provide any substation operator a clear and unobstructed view of the LTC position indicator while standing at the control cabinet operating panel.

5.4.5 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.

5.4.6 Final placement of the control cabinetry, LTC compartment, LTC position indicator, radiators, and all other external auxiliary equipment shall be subject to the approval of PWC. Relocation of these components will be required only as necessary to physically comply with PWC's standard facilities design for foundations, oil containment systems, and surrounding substation structures.

5.4.7 The tank shall be designed and braced for full vacuum and shall be suitable for filling with oil under a vacuum of twenty-eight inches (28") of mercury in the field.

5.4.8 The tank shall not leak oil. Welded joints and seams shall be employed wherever practicable. The tank must not have seams on the corners of the tank.

5.4.9 The 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 not approved) and shall be designed to permit their being made oil-tight in reassembly. Mechanical stops shall be provided to prevent crushing (controlled compression).

5.4.10 The transformer base shall be suitable for sliding the transformer in a direction parallel to either center line of the tank and shall be capable of supporting the transformer on two (2) pier foundations.

5.4.11 All surfaces of the case and covers, both exterior and interior, shall be thoroughly cleaned utilizing shot-blasting or any other equally effective method. At least three (3) coats of exterior paint are to be applied. The total paint thickness on the transformer tank and control box shall be 5 mils, minimum. The hot-dipped galvanized coatings shall be 2.16 mils. the minimum thickness on all transformer radiators.

5.4.12 The exterior surface of all bolts, nuts, and washers shall be primed and painted as above or such parts shall be stainless steel or galvanized. No exposed cadmium-plated or zinc chromate-plated parts will be allowed.

5.4.13 Paint shall be standard light gray, ANSI No. 70, and certified as lead-free.

5.4.14 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.

5.4.15 The transformer tank shall be furnished with support brackets to mount a grounding/neutral bus of 4" x 1/4" (minimum) copper. The copper shall be tinned at all connection points and the copper bar shall be painted with ANSI Gray 70 paint. The grounding bus shall be supplied by the manufacturer and designed for attachment to the Xo neutral bushing, the base of all surge arresters, and the tank ground pads (loop configuration). Support points shall be at four feet maximum spacing from the tank base to the top surface, on two (2) diagonal corners. (See the attached Drawing identified as Appendix 2 for a typical grounding layout.)

5.5 Impedance

The LTC transformer impedance at the base rating shall be nine percent (9%) at 75°C with ANSI or IEEE standard tolerances for 67,000 volts, 350 kV BIL.

5.6 Sound Level

5.6.1 The transformer will be designed so that the average sound level will be following the latest revision of NEMA TR-1.

5.6.2 The sound level at the 50MVA self-cooled rating shall not exceed 72 dBA when factory-tested following the procedure stated in NEMA TR1-9.04.

5.7 Bushings and Terminals

5.7.1 The transformer shall be provided with three (3) primary and four (4) secondary cover-type bushings constructed of high-strength, wet-process porcelain.

5.7.2 All high-voltage bushings shall be Lapp or ABB manufactured oil-filled and dimensionally interchangeable between circuit breakers and transformers according to the latest revisions of IEEE Standard. High-voltage bushings shall be rated 72.5 kV, 350 kV BIL, 1,200 amperes bottom connection C76, with C1 test ports. Low-voltage bushings shall be rated 27 kV, 150 kV BIL, **2,500** amperes bottom connection. All bushings shall be light gray, standard creepage. The High Voltage bushings shall be condenser-type and have provisions for power factor testing on C1.

5.7.3 Primary and secondary bushings shall be provided with copper thread studs sited following their respective current ratings. A connection suitable for flat spade connection with NEMA four-hole drilling shall be either built into the bushing or furnished as a separate item. High-voltage and low-voltage terminal studs and flat spade terminal connectors shall have silver-plated contact surfaces.

5.7.4 Secondary neutral bushing shall be provided with a connection for flat spade connections with NEMA four-hole drilling and connected to a 4" x 1/4" (minimum) copper bus extending from the terminal to a tank ground pad for direct connection to the station ground system. Refer to Appendix 2 for a typical grounding layout.

5.7.5 The bushings shall be spaced to comply with or exceed minimum phase-to-phase and phase-to-ground external clearances between live parts following IEEE and NESC Standards, and as per dimensions outlined in Appendix 3.

5.8 Auxiliary Cooling

5.8.1 Cooling equipment shall be furnished following ANSI or IEEE standards for transformer self-cooled and forced-cooled ratings of ONAN/ONAF/ONAF.

5.8.2 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. The final location of the radiators on the tank wall shall be subject to the approval of the Commission or the Commission's Staff.

5.8.3 Provisions shall be made for cooling radiators to 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. The Commission would like radiators mounted on separate support racks to elevate stress on the radiators.

5.8.4 Radiator mounting flanges on the transformer tank shall each be equipped with double flanged 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.

5.8.5 Each cooling radiator shall be equipped with a fill valve at the top and a drain valve at the bottom of the unit.

5.8.6 All cooling fans (and/or pumps) shall be USA manufactured and utilize the DR C54 transformer monitor to provide the operation of all cooling stages based on the sensing of transformer winding temperature. 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 and shall meet OSHA safety standards.

5.8.7 Automatic control of all electrically powered cooling systems shall be accomplished by the closure of contacts within a thermally operated winding temperature relay. The first set of contacts shall initiate the first stage of cooling. The second set of contacts shall initiate the second stage of cooling. A third set of contacts shall be wired to a control cabinet terminal block for use by the PWC for tripping.

5.8.8 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 fans.

5.9 Current Transformers (CT)

5.9.1 Provisions shall be made in the power transformer for installing bushing-type current transformers mounted inside the main case on terminals H1, H2, H3, X1, X2, X3, and X0 with leads brought to identified terminals in a control cabinet. Current transformers will be sourced from USA headquartered companies only and have copper windings. Terminal blocks shall have short-circuiting devices which will allow a continuous CT secondary circuit while CT tap positions are being changed. Each CT shall be connected to a separate six-point terminal block. Terminal designations shall comply with the attached drawings designated in Appendix 1.

5.9.2 Current transformers (CT) to be furnished on terminals shall be as follows:

a. Provide six (6) 1200/5 ampere, with standard BCT multi-ratio, 5 leads, C800 relaying accuracy current transformer, two (2) each on H1, H2, and H3 with taps for 100, 200, 300, 400, 500, 600, 800, 900, 1000, and 1200 to 5-ampere ratios.
b. Provide one (1) 1200/5 ampere, with standard C200 relaying accuracy current transformer in the neutral of the secondary (XO) with 5-ampere ratios.
c. Provide six (6) 3000/5 ampere RF 2.0, with standard BCT multi-ratio, 5 leads, C800 relaying accuracy current transformers, two (2) each on X1, X2, and X3 with taps for 300, 500, 800, 1000, 1200, 1500, 2000, 2200, 2500, and 3000 to 5-ampere ratios.

5.10 Control Cabinet

5.10.1 The control cabinet will be provided by Dynamic Ratings (DR) located in Sussex, Wisconsin. The manufacturer will work all control cabinet approval drawings through Dynamic Ratings. Dynamic Ratings will provide a customized monitoring schematic to interface properly with the transformer manufacturer control system drawings. A weatherproof painted stainless-steel control cabinet with a 3-point latch shall be furnished enclosing control circuits, signal circuits, protective relays, individual transformer alarm indicators, interior lighting, convenience outlet, and a suitable 240-volt, 60 Hertz, heater with double-pole thermal circuit breaker. All wire into the control cabinet shall have 600-volt, flame-resistant, moisture-proof insulation and shall be enclosed in metallic conduit. 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 other end they came from and the landing designation. A swing-out panel shall be provided to mount C54 a DYNAMIC RATINGS C54-ABCF-0-48 transformer monitor user interface unit. The Dynamic Ratings C54 control and monitoring hardware shall be mounted to the main control subpanel for integration of alarm/control I/O wiring.

5.10.2 A SEL 2725#NG4B with conformal coating 4-port Ethernet switch with one FX-LC fiber to be installed in the main cabinet and all Ethernet runs must go to this network switch.

5.10.3 Terminal blocks for CT leads shall be shorting- type and each CT shall be connected to a separate six-point terminal block. All the secondary leads of the current transformers shall be extended to shorting type terminal blocks (GE EB-27 or equivalent) in the control cabinet. CT wiring shall be No. 10 AWG minimum and be terminated with insulated ring lugs.

5.10.4 The weatherproof control panel shall be centrally located in Segment 1 per IEEE C57.12.10 near the bottom of the tank at a location to be approved by PWC.

The cabinet door shall be completely weatherproof and shall have a handle with a triple latching mechanism, hinged on the left side. The handle/latch mechanism shall be furnished with padlocking provisions. Bolted door covers will not be acceptable. A window shall be UV-protected safety glass.

5.10.5 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 UV-protected safety glass window in the front door of the cabinet.

5.10.6 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.

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

5.10.7 Conduit entrance provisions shall be provided in the bottom of the cabinet.

5.11 Wiring

5.11.1 All power wiring shall be made with #12 AWG stranded tinned copper wire or larger sized wire. The primary insulation jacket of all wiring shall be 600 volt, 105°C, water, oil, and flame resistant. Control wiring shall be 45 or 65 mil stranded cable and not smaller in size than #14 AWG tinned copper wire, with the exception of wiring to alarm auxiliary relays and indicating lights may be smaller in size. SIS control wire is recommended. All current transformer leads are to be #10 AWG-stranded tinned copper.

a. Power wiring shall be sized as required following the National Electrical Code.
b. All connections for wiring shall be made using silicon bronze, split-type lock-washers.
c. All wires shall be identified at each end with legible permanent labels. Wire identification shall show both placement and where it came from.
d. Wiring connections between fixed and hinged sections shall be a minimum of 41-stranded wire.
e. Seven-stranded control wire is not acceptable.
f. All terminal connections for conductor sizes #10 AWG in size and smaller shall be made with pre-insulated, full-ring tongue, crimp-type lugs. Lugs shall be AMP, Inc., "Pre-Insulated Diamond-Grip" (PIDG) with nylon or PVC sleeves or approved equivalent. Spade-type terminals or slip-on connectors are not acceptable.
g. All terminal connections for conductor sizes #2 AWG through #9 AWG shall be made with Burndy Insulug Type YAEV or approved equivalent.

h. All terminal connections for conductor sizes larger than #2 AWG shall be made with 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).

5.11.2 Grommets shall be provided for all openings in metal barriers used for wiring.

5.11.3 Un-insulated exposed conductor or terminal lug shall not extend beyond the sides of the terminal block or its insulating barriers.

5.11.4 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 the 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.

5.11.5 If accidental short-circuiting of certain wires can result in malfunction of equipment, these wires shall not be terminated on adjacent terminal block points.

5.11.6 Two (2) wires per terminal point maximum are permissible with the opposite lay of the terminal lug.

5.12 Terminal Blocks and Fuse-holders

5.12.1 Molded-type terminal blocks rated 600 volts and 30 amperes, for all external control connections shall be provided. Terminal blocks with self-contained pressure-type connectors are not acceptable.

5.12.2 Marathon 1600 DJ series of Buchanan or equivalent Type HD or XHD terminal blocks shall be provided furnished with white marking strips for identification of terminal wires for all connections except current transformers. The terminals shall be identified with legible permanent markings.

5.12.3 Marathon 1600 SC series terminal blocks or equivalent 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. A States terminal block is not an acceptable substitution.

5.12.4 One three-pole terminal block sized for #6 to #2/0 AWG wire for PWC's single-phase, three-wire, 120/240 volt; control power leads shall be furnished.

5.12.5 A minimum of fifteen percent (15%) spare (but not less than 12 points) terminal points shall be provided in the control cabinet. These terminal points shall be furnished with all screws and lock washers.

5.12.6 Circuit breakers shall be ABB or Square D Industrial series (non-residential) and Philips/Straight-slotted silicon bronze screws on each terminal, or approved equivalent.

5.13 Transformer Monitoring System and Alarms

A microprocessor-based transformer monitoring system shall be installed and programmed on the transformer. The monitor shall be factory programmed at Dynamic Ratings (DR) 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. The monitor model shall be a Dynamic Ratings C54-ABCF-0-48. 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 provide user configurable hot link buttons for rapid access to key user data. The display shall provide password protection for control and alarm settings.

Functions provided: The transformer monitoring system shall monitor and report the following functions: top oil temperature, hot spot temperature on HV and LV windings, load, transformer insulation aging, transformer gas pressure, main tank liquid level, warnings and alarms with dry contact output, monitoring of fans, fan exercise, LTC contact wear, LTC tap position, tap counter for total as well as individual tap counts, tap changer motor energy and LTC/Top Oil differential temperature with alarms, event recording, and remote access of data.

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.

DGA Monitor Integration: The Dynamic Ratings transformer monitor shall be able to communicate to the Vaisala OPT100 DGA monitor, read and store all applicable gas values and alarms, display values and alarms on its 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 user's SCADA RTU.

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. The PC software shall be supplied as part of the transformer monitor.

Embedded Web Pages: The transformer monitor shall have embedded web pages for configuration of hardware I/O, viewing of DGA and bushing diagnostics (where applicable), viewing of data, events, and alarms, downloading of event history and data log files, and ability to locally or remotely perform system updates via file upload.

Operating Temperature. The transformer monitor shall have an operating temperature range of – 40° to +70°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 C54 with Vaisala OPT100 or approved equal.

The Dynamic Rating C54 monitor shall be wired following 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.

5.13.2 The following alarms are to be wired to the DR C54 monitor:

a. Transformer Sudden Pressure (63FP)
b. Transformer Liquid Level - Main Tank (71Q)
c. Transformer Liquid Level - LTC (71 QLTC)

d. Transformer Pressure Relief (63PR)
e. Transformer Under-Voltage (auxiliary power) (27-1)
f. Transformer Fan Failure (49-88F)
g. Transformer Gas System - High Pressure (63G-HI)
h. Transformer Gas System - Low Pressure (63G-LO)
i. Transformer Gas System (63G)
j. LTC Raise Limit (16R)
k. LTC Lower Limit (16L)

5.14 Fault Pressure Relay

A fault pressure relay shall be provided and installed on the transformer and will be independently connected to the station "lock-out" relay. The fault pressure relay is to be provided with a pair of normally open, isolated contacts for tripping and alarms complete with all auxiliary relays necessary to make it capable of activating the substation protection scheme as well as alarming this condition. The fault pressure relay shall be complete with auxiliary hand reset and target relay similar to Qualitrol 909-300-01 or equal to General Electric Type HAA-16B. The sudden pressure relay shall be Qualitrol Series 900 or 910 with auxiliary relays as required. The fault pressure relay shall be located on the transformer to avoid false tripping during through-fault conditions. The fault pressure relay shall be located on the side of the transformer tank to permit testing without removing the unit from service. The relay shall be accessible from ground level.

5.15 Oil and Winding Temperature Measurement

5.15.1 Visual indication of transformer top oil temperature and winding temperature shall be provided by a DR C54 transformer monitoring system. The monitoring system shall be provided with a 100 Ohm platinum resistance temperature detector (RTD) and winding temperature current transformer per IEEE standards. The thermal sensing bulb and capillary tube, the RTD shall be installed in the thermal well located in the hottest oil near the top of the transformer tank. 100 Ohm platinum resistance temperature detectors (RTD) shall also be installed for the measurement of ambient and LTC tank temperatures.

5.15.2 The DR C54 transformer monitoring system shall provide a local display of the transformer top oil temperature and the simulated winding temperature. The top oil temperature display shall be capable of measuring and displaying a range of -50° to 200° Celsius. The winding temperature display shall be capable of measuring and displaying a range of 0° to 180° Celsius.

5.15.3 The DR C54 transformer monitoring system shall provide all relays necessary to automatically actuate first and second-stage auxiliary cooling, based upon measurement of the winding temperature.

5.15.4 The power supply for the DR C54 transformer monitoring system shall be configured for **48 VDC** input to maintain stability of the temperature data during ac power system disturbances.

5.15.5 The DR C54 transformer monitoring system shall be completely installed as an integral component of the power transformer.

5.15.6 Must provide a Dynamic Ratings C54 transformer monitor system with a 10-year warranty option.

5.16 Surge Arresters

5.16.1 Surge arresters shall be of the **station-class-type**, transformer-mounted for the high and low voltage side on each phase of the three-phase transformer.

The arresters rating shall be:

System Voltage	Conventional Arrester Rating	Metal Oxide MCOV Arrester Rating
67 kV, 350 kV BIL	60 kV	48 kV
13.09/7.56kV, 110 kV BIL	10 kV	8.4 kV

5.16.2 Metal oxide surge arresters are rated either in terms of maximum continuous operating voltage (MCOV) or by the conventional arrester rating that they replace. MCOV ratings are assumed here for metal oxide arresters. However, metal oxide arresters that are given conventional ratings may be furnished if the MCOV equivalent ratings are as specified here.

5.16.3 The surge arresters shall be located in relation to one another and the bushings to comply with or exceed, minimum phase-to-phase and phase-to-ground clearances between live parts following Appendix 3.

5.16.4 The surge arresters shall be provided with connections to the line-side bushing terminals with connections equivalent to double 750 KCMil copper minimum. Ground conductors equivalent at minimum to 4" x 1/4" copper bus shall also be furnished and carried to the transformer ground pads with loop configuration as shown in Drawing Appendix 2. The copper shall be tinned at all connection points and the copper bar shall be painted with ANSI Gray 70 paint.

5.16.5 The body of the surge arresters shall be wet-process porcelain, light gray, ANSI No. 70.

5.16.6 The surge arresters shall comply with IEEE Standard C62.1. Arrester spark-over* and discharge voltages shall not be greater than:

* Or equivalent ANSI or IEEE parameter for metal-oxide arresters.

5.17 Positive Pressure System

5.17.1 The transformer shall be equipped with a positive pressurizing system utilizing nitrogen gas to protect the transformer oil in the main tank from oxidation and moisture absorption. The system shall consist of a nitrogen gas supply (cylinder) complete with a supply pressure gauge, multi-stage pressure reduction assembly, and associated piping and valves to control the flow of gas to and from the tank. The system shall provide alarms for low gas supply, high tank pressure, and low tank pressure conditions. The nitrogen supply cylinder, supply pressure gauge, and multi-stage pressure reduction assembly shall be housed in a weatherproof enclosure.

5.17.2 The system shall maintain transformer tank pressure at 0.5 psi minimum and 5.0 psi maximum, with appropriate fill and bleed-off regulation. Gas system alarms shall actuate whenever pressure falls below 0.5 psi or rises above 5.5 psi or whenever supply pressure falls below 100 psi.

5.18 Transformer Oil Inhibitor

5.18.1 All oil is to be Type II insulating transformer mineral 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 version of IEEE C57.106.

5.18.2 Installation of inhibitor shall be in accordance with the newest version of IEEE C57.106.

5.18.3 All oil and inhibitor shall be furnished and installed by the manufacturer with associated PCB certification

5.19 Load Tap Changing for Transformer

5.19.1 The transformer to be furnished shall be provided with a Reinhausen Type RMV-II on-load tap changer unit equipment in addition to all provisions described heretofore all. Be reactive vacuum with all arcing during tap change occurs in a vacuum bottle. This requires a reactor for bridging taps during tap changer operation. The tap-changing equipment for the transformer must be capable of parallel operation with a second LTC-equipped transformer. Method of parallel operation to be in accordance with IEEE C57.15 standard circulating current method or as agreed to by the Owner.

5.19.2 The load tap changer equipment shall be furnished to provide the characteristics and features outlined herein. The equipment shall be designed to withstand full-voltage short-circuit conditions and to initiate and complete any desired tap change under full-voltage short-circuit conditions. The manufacturer, if it so desires, may submit an alternate Proposal for vacuum switching. The manufacturer will state in its Proposal the guaranteed minimum number of maintenance-free LTC operations of the unit. Units guaranteeing less than 500,000 operations before maintenance will be evaluated as unresponsive.

5.19.3 The load tap changing equipment covered by the Technical Specifications and all tests applied thereto shall conform to the latest standards of the IEEE, NEMA, NESC, and ANSI.

5.19.4 The LTC circuit and components shall be arranged so that with a constant voltage held on any high voltage rated kVA tap, the tap changer will operate to provide ± voltage regulation of the low-voltage transformer terminals in sixteen (16) 5/8% steps above and below rated voltage. For voltages above the rated position, the transformer will deliver rated kVA. For voltages below the rated position, the transformer will deliver at its terminals a current equal to the current at rated kVA and rated voltage.

5.19.5 The LTC taps may be located wherever necessary in the windings or circuits to produce the desired result. A series transformer may be used if necessary. However, the physical location of the load tap changing compartment must provide an unobstructed view of the LTC position indicator to any operator attending the main control compartment. The final location of the LTC compartment shall be subject to the approval of the Owner or the Owner's Engineer. Provision for manual operation with electrical interlock with drive motor must be used.

5.19.6 The main transformer tank shall include:

a. Series transformer (if required by design).
b. Preventive reactor.
c. Current transformer for the line-drop compensator. The primary current is determined by rating and design. Secondary current 0.2 amps.
d. Hot spot temperature indicator.

5.19.7 The separate oil-filled compartment shall include:

a. Tap the selector switch and contactor mechanism, with the reversing or transfer switch.
b. Mechanical stops at limits of switch movement.
c. LTC Compartment Breather will be a Qualitrol STB000 LTC Smart Transformer Dehydrating Breather.
d. Liquid-level gauge similar to gauge used on transformer tanks.
e. Drain and filling valve: one-inch (1") screw-end globe valve.

5.19.8 The separate air-filled compartment shall include:

a. Microprocessor control equipment, including:
    1. Voltage-level circuit adjustment
    2. Bandwidth circuit adjustment
    3. Time-delay circuit adjustment
    4. Line-drop compensator with resistance and reactance adjustment
    5. Reactance reversing switch
    6. Band-edge test lights and switch
    7. Potential circuit breaker
    8. Output-voltage test terminals

9. Potential supply input terminals and disconnect switch
10. Space for mounting individual parallel switches for parallel operation

b. Motor control equipment, including:
1. Drive motor 240 volts single phase to be supplied from the station power supply.
2. Provision for manual operation with electrical interlock with drive motor.
3. Automatic-manual switch with raise and lower.
4. Position indicator equipped with electrically resettable drag hands and with electrical limit switches. The position indicator shall be graduated for each step position (16L-N-16R), and shall be located for unobstructed visibility to any personnel attending the main control compartment of the transformer.
5. The electrical limit switches shall be interconnected to the motor control circuit for automatic cutoff at the end of the raise and lower tap range. The limit switch at either end of the range shall also provide one spare normally open contact for annunciation of end-of-range LTC position.
6. Neutral indicator LED lamp.
7. Motor drive power-supply switch with thermal breaker.
8. Operation counter.
9. Lamp with manual switch for compartment illumination.
10. Convenience outlet.
11. Strip heater.
12. Terminal blocks for customer connection.
13. Conduit entrance at the bottom of the compartment.
14. Current transformers for parallel operation.
15. Voltage control circuitry and circulating current protection for automatic parallel operation of two (2) units on the same substation bus. Circulating current CTs shall be provided in the line-drop compensator circuit to permit this and other similar units at this location to operate in parallel automatically with the minimum circulating current.
16. Necessary terminal blocks and wiring.

5.19.9 Remote LTC Control - The load tap changer shall be quoted including the installation of equipment for remote operation and indication by a supervisory system. The necessary contacts and/or devices shall be included to provide the following functions or indications:

a. Indication of maximum raise and lower positions as an alarm condition to the supervisory system.
b. Integrity control failure alarm (vacuum unit only).
c. Vacuum contact failure alarm (vacuum unit only).

d. Three-step automatic voltage reduction control with steps at three percent (3%), five percent (5%), and seven percent (7%), controlled by a supervisory system.
e. Remote position indicator for monitoring tap changer position in the substation control house. Tap Position sensing and indication shall be provided by Dynamic Ratings (D.R.) and shall consist of: SEN-0017 Tap Position Sensor with MD-III Kit for RMV-II LTC, MOD-0014 – Tap position Display Module (120VAC).

   The position of the shaft shall not be lost or reset each time power is applied. The remote indicator shall be analog, a digital monitor will be considered less responsive. The transmitter unit shall be installed and connected to the tap changer operating shaft

f. Provisions for the selection of local or remote operation of the tap changer motor circuit. The circuitry shall be designed so that the "remote" operating mode will override local automatic LTC operation and enable remote raise and lower commands as described below. Selection of the "local" mode at the LTC control will override any position selected at the remote location.
g. Provisions for the remote initiation of "raise" or "lower" commands to the LTC control. The circuitry shall be designed so as to allow remote raise and lower only when the LTC control is set for remote control.
h. Provisions for the connection of a remote indicator LED lamp to annunciate the position of the local/remote switch in the "remote" position through the SEL transformer monitor.
i. Provisions for the connection of a remote indicator LED lamp to annunciate the actuation of the LTC motor contactor pick-up for each tap change during remote operation through the DR C54 transformer monitor.

5.20 Special Control Requirement

5.20.1 Voltage regulation control of the LTC shall be provided, including voltage regulation and compensation module, LTC paralleling module, circulating overcurrent protection module, and overvoltage protection module. Modules shall be manufactured by Beckwith Electric Company and shall consist of:

M-2001D Tap Changer Control (w/Ethernet fiber ports) M-0115A Parallel Balance Module
M-0127 AC Current Relay
M-0169 Auxiliary CT
M-0329 Backup Relay

Tap Position sensing and indication shall be provided by Dynamic Ratings and shall consist of: SEN-0017 Tap Position Sensor with MD-III Kit for RMV-II LTC MOD-0014 – Tap position Display Module (120VAC)

5.20.2 The manufacturer must clearly indicate on the Form of Exceptions any substitutions to the Beckwith equipment. Should the manufacturer elect to substitute alternate controls, one (1) spare of each substitute module must be included in the base bid.

5.20.3 The control panel shall be of unit construction to allow its removal from the LTC control cabinet by disconnecting polarized disconnect jack plugs.

5.20.4 The voltage regulating relay shall be capable of no-load voltage settings between 100 and 135 volts inclusive, having a ratio of 120-to-1 potential transformer secondary on a phase-to-neutral basis.

5.20.5 The bandwidth adjustment shall be capable of holding a regulated voltage bandwidth from plus or minus 1.5 volts to plus or minus 3 volts. A bandwidth indicating meter shall be furnished which provides an indication as to whether the input panel voltage is within the bandwidth.

5.20.6 Line-drop compensation shall have a minimum of 0-24 volts each for resistance and reactance. Test terminals for load and voltage shall be located for convenient testing. The time delay relay shall be capable of settings between ten (10) and ninety (90) seconds inclusive. All leads to the control shall be either color-coded or labeled for easy identification.

5.20.7 The control shall be equipped with an accessory that limits the maximum voltage or minimum voltage output. This accessory shall be adjustable from 120 to 135 volts maximum and 105 to 120 volts minimum.

5.20.8 All control modules shall have DNP 3.0 protocol and fiber optic ports.

5.21 Current Transformers

The current transformer ratio for line-drop compensation shall be noted in the proposal.

5.22 Potential Transformers

Sensing voltage for the LTC control panel will be supplied by an Owner-furnished externally mounted potential transformer having a line-to-neutral voltage ratio of 60:1. The bidder will provide terminal block provision for the two-wire external leads from external PT to be landed for sensing voltage.

6.0 Additional Features

The transformer shall include but is not limited to the following mechanical and electrical features:

6.1 Two (2) NEMA 2-hole ground pads per IEEE C57.12-17.99 or the latest version for connectors for 4/0 through 750 KCM stranded copper conductors.

6.2 Main transformer core ground shall be accessible from ground level.

6.3 6-inch dial face liquid-level gauge with alarm and trip contacts and liquid temperature indicator, compatible with the DR C54.

6.4 Qualitrol 104 SCADA Capillary Based oil liquid temperature indicator model, compatible with the DR C54.

6.5 Pressure vacuum gauge and bleeder devices such as Qualitrol 070 Series with sampling and purging valve. The gauge shall be mounted at eye level.

6.6 Qualitrol XPRD pressure relief device for the main tank and the LTC Compartment with alarm contacts and 8” Stainless Steel discharge pipe, compatible with the DR C54.

6.7 Upper valve for filter-press connection and a filling connection, both one inch (1").

6.8 Lower valve for combination filter-press connection, two-inch (2"), with 3/8" oil drain and sampling device and vacuum fittings.

6.9 Pressure Vacuum Bleeder

6.10 Manhole (eighteen inches (18") diameter minimum) and, if required, one or more hand holes (eight inches (8") diameter minimum).

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

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

6.13 The metal diagram instruction plate shall be stainless steel. Turn progression and accuracy class of bushing current transformers shall be shown on the nameplate.

6.14 Lightning Arrester Mounting. Tank-mounted lightning arrester brackets shall be provided as follows: Three (3) removable tank-mounted brackets for

mounting the specified station class arresters near each high-voltage bushing. Three (3) brackets for mounting the specified low-side arresters near each low voltage bushing.

6.15 Support brackets, conductor, and connectors for the transformer grounding system, as outlined in paragraph 6.16.4 and as shown in Drawing Appendix 2.

6.16 Under-Voltage relay for all phases of cooling power.

6.17 All valves shall have silicone rubber (or better) packing to prevent leaking.

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

6.19 Insulating oil with associated PCB certification and nameplate, per General Conditions.

6.20 Forced-air cooling fans shall be single phase, 60 Hertz, 240 volts with stainless steel OSHA guards.

6.21 Three (3) 1200:5 multi-ratio current transformers of C800 relaying accuracy on each high-voltage phase bushing with leads brought down to shorting terminal blocks in the control cabinet.

6.22 One (1) 1200:5 current transformer of C400 relaying accuracy on the neutral low-side bushing, with leads brought down to shorting terminal blocks in the control cabinet.

6.23 Six (6) 3000:5 multi-ratio current transformers of C800 relay accuracy with an RF of 2.0 on each low-voltage phase bushing with leads brought down to shorting terminal blocks in the control cabinet.

6.24 Fault pressure relay with leads and auxiliary relays as specified.

6.25 All alarm contacts shall be suitable for 48V DC with separate wiring from all terminals of each device to a terminal block located in the transformer control cabinet and shall be compatible with the DR C54. All control wiring and CT terminals to be equipped with non-magnetic split-type lock washers and ring-type compression lugs. All current transformer leads are to be #10 or larger and terminated on separate six-point shorting-type terminal blocks in the control cabinet.

6.26 Each cooler (removable radiator) shall be provided with drain and vent plugs connected at the top and bottom and valves for detachable radiators, coolers, and/or pumps.

6.27 All equipment required for positive pressure gas regulation system, including alarms.

6.28 Tap changer instruction nameplate, stainless steel.

6.29 Core ground pocket bushing with protective cover shall be accessible from the top of the tank cover.

6.30 Install Vaisala Model OPT100-OPTIMUS A1A3N0N0N0B1N0N0N1A0 DGA gas monitor wired to transformer control cabinet connected to a DR C54 using DNP. A CAT6 Ethernet cable between the Vaisala OPT100 and to the main control cabinet. Mounting to include isolating valves and galvanized materials are not permitted. The OPT100 hardware and field commissioning of OPT100 shall be purchased as a complete package from Dynamic Ratings to facilitate the integration of the OPT100 and Dynamic Ratings C54 monitor during the commissioning process. The Vaisala shall come with a 5-year warranty option.

6.31 Fall-Arrest System – provide DBI SALA 8516691 Portable Fall Arrest System and 8517565 Carrying/Storage bag. 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

7.1 Transformer shall receive standard commercial tests in accordance with ANSI/IEEE Standards.

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

7.3 Transformer shall receive a Sweep Frequency Response Analysis (SFRA) during factory testing on the neutral taps. Frequency of 15, 30, 45, 60, 145, 230, 315, and 400 Hertz shall be used. This test shall be repeated during site testing. Results shall be compared, and a report provided with an explanation for any differences in results.

7.4 The loss measurement system used to measure losses shall state in the test report the measurement error traceable to the National Bureau of Standards (NBS) by means of a procedure described in NBS Technical Note 1204 or an approved equivalent procedure. This shall be applicable to the test system used to measure both the no-load and load losses for the transformers specified herein. The approach outlined in NBS Technical Note 1204 or an approved equivalent

procedure shall be used to ensure the traceability of measurements. The measurement error determined through the procedure outlined in Technical Note 1204 or an equivalent procedure will be added to the measured losses determined during the test prior to determining if the loss guarantee has been met. Should the Bidder (manufacturer) be unable to comply with this provision, it shall clearly so stated in the section entitled "Form of Exceptions".

7.5 All transformer losses, including auxiliary losses, shall be shown on the test reports.

7.6 In addition to the standard ANSI/IEEE tests, PWC shall select one of the following corona tests:

a. First, the transformers shall be corona-tested at the full induced test-voltage level. Equipment and general method used will be in accordance with IEEE Transformer Committee Report: IEEE Transactions PAS 86 No. 12, December 1967, "Tests for Damaging Corona on Oil-Insulated Power Transformers."

b. 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:

c. 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.

d. 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. Further investigation shall be made to determine the problem and to correct it.

e. 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.

7.7 The Bidder shall clearly state any exceptions of lack of capability to perform either of the above corona tests.

7.8 Insulation power factor tests shall be made and shall be one percent (1%) or less corrected to 20°C by the IEEE temperature correction curve.

7.9 Prior to shipment, the assembled transformer shall be liquid-filled and pressure-tested for at least eight (8) hours at the maximum operating pressure to detect the presence of leaks.

7.10 The transformer sound level shall be tested in accordance with NEMA 0TRI-9.04, "Audible Sound Level Tests."

7.11 No transformer will be accepted for shipment until approved by PWC or the PWC's Engineer.

7.12 PWC reserves the option of having a representative witness any or all tests.

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

7.14 The manufacturer's field engineer or hired testing firm shall perform a series of tests on the transformer after installation at the substation. These tests shall include Sweep Frequency Response Analysis, transformer turns ratio tests for all tap positions, insulation Megger tests, current transformer checks (polarity, turns ratio, and connections), and oil tests as follows: specific gravity, dielectric, moisture content, acidity, interfacial tension, and PCB content. The manufacturer shall provide a complete dissolved gas in oil analysis on the oil installed in the transformer after final assembly. Directions for the collection of the samples and the recording of the temperature of oil at the time of collection and shipping containers shall come with the bombs. The manufacturer shall conduct a complete DGA on each sample and send the results to PWC engineer or designated person. Each Sample shall be tested for specific gravity, moisture content, acidity, and interfacial tension.

7.15 The manufacturer's field engineer shall approve energizing the transformer, and a manufacturer's representative shall be on site to observe the entire energization process.

7.16 The transformer core ground strap is to be made accessible from the top of the tank cover so that it may be removed when making the core ground tests. Tests for core grounds are to be performed after tanking and just before 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. The Bidder may offer in its quotation deductions for substitution of manufacturers' standard tests in lieu of those specified. However, the basic quotation must include all tests specified.

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

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

7.18.1 Certified test data showing that a transformer with a core and coil identical in design and construction and identical or similar concerning kVA capacity, kV ratings, BIL, losses, 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 Bidder to PWC.

7.18.2 A history of successful experience with transformers of identical or similar ratings, design, and construction. The Bidder shall list all transformers in service with core and coils that 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 twenty (20) transformer years, a list of transformers in service that 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 shall include the dates of installation or shipping, the ratings of the transformers, and the failures and causes of failure if any have been experienced.

7.18.3 The Bidder shall submit with its Proposal a complete listing of all full-size transformers of its manufacture, in ratings 12,000 through 50,000 kVA, which have been short-circuit tested. The list shall include all full-size units tested, whether they were development 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 addition, if an OLTC was installed.

7.18.4 In the case of units tested for or by the ultimate customer, 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 given as to design changes made, if any.

7.19 If the Bidder cannot furnish such test data, it shall so state on the Proposal.

8.0 Guarantees

Included with the transformer data to be submitted by the Bidder with its Proposal shall be the following:

8.1 Efficiencies at 1/4, 1/2, 3/4, and full load at unity power factor and 75°C.

8.2 No-load loss in watts. (Include losses at 1-raise and the average of 15-raise and 16-raise)

8.3 Total full-load loss in watts at each rating and temperature rise, plus auxiliary losses (shown separately), at:

Schedule No. 1

_____Watts @ 55°C ONAN 50,000KVA
_____Watts @ 65°C ONAN 56,000 KVA
_____Watts @ 55°C ONAN/ONAF 66,667 KVA
_____Watts @ 65°C ONAN/ONAF74,667 KVA
_____Watts @ 55°C ONAN/ONAF/ ONAF 83,333 KVA
_____Watts @ 65°C ONAN/ONAF/ ONAF 93,333 KVA

Include losses at 1-raise and the average of 15-raise and 16-raise

8.4 Full-load regulation at one hundred percent (100%) and eighty percent (80%) power factor.

8.5 Exciting current at the rated frequency in the percentage of the rated voltage and rated kVA.

8.6 Cooling fans and pumps, H.P. rating, and voltage.

8.7 Net weight of transformer, including insulating oil.

8.8 Shipping weight of the transformer.

8.9 Gallons of oil are required per transformer.

8.10 Limiting Dimensions of the transformer.

8.11 Copies of the transformer test reports shall be furnished to PWC at the time the transformers are shipped.

8.12 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.

8.13 The Bidder 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. Bidder shall make good any defective materials or workmanship and any damage resulting therefrom without cost to PWC.

9.0 Transformer Accessories

The following accessories shall be installed in the location as specified in IEEE C57.12.10.

- The transformer shall be equipped with a weatherproof, hand-operated, tap changing mechanism suitable for de-energized operation of the high voltage taps.
- Removable without breaking tank seal dial-type winding temperature indicator with resettable drag hand and adjustable alarm and trip contacts.
- Removable dial-type liquid oil thermometer indicator with resettable drag hand and adjustable alarm and trip contacts.
- Removable dial type magnetic liquid level gage with alarm contacts.
- Cover-mounted mechanical pressure relief device with automatic resealing-resetting operation alarm contacts and mechanical signal for indication of device operation.
- Thermal plate for remote winding temperature and liquid temperature gages.
- Thermal current transformer located on the X2 bushing for winding temperature indicator.
- A diagrammatic nameplate per IEEE C57.12.00 which shall have a bar code giving the size, manufacturer's identification number, and serial number.
- Base designed for rolling, provision for pulling in directions of center lines of each segment.
- Lifting lugs for lifting the complete transformer.
- Jacking facilities at four corners of the base.
- Lifting eyes for cover only.
- Facilities for lifting core and coil assembly from tank.

- Two ground pads with tapped NEMA two-hole drilling for tank grounding located on diagonally opposite corners.
- Two manholes in the cover.
- The transformer core shall be grounded to the transformer tank. To facilitate testing of the core clamp insulation, the core ground shall be accessible through a 1.2 KV bushing located in a terminal box on the top of the tank cover or accessible from the ground.
- (3) Upper valve, 2" globe type.
- (2) Lower valve, 2" globe type.
- Main tank drain valve, 2" globe type with plug.
- Pressure vacuum bleeder for monitoring units shipped dry air.
- All gaskets shall be reusable nitrile rubber with means provided for controlled compression.
- The installed transformer shall be filled with ASTM Type II insulating transformer oil with an inhibitor per IEEE C57.106. All oil and inhibitors shall be furnished and installed by the manufacturer.
- A Sudden Pressure Relay a Qualitrol 900 oil fault pressure relay located at eye level flange connected on the side of the transformer tank to allow testing without having to take the unit out of service and the output shall be interconnected to the station "Lock-out relay". Seal in relay (QUALITROL 909-300) for latching alarm or trip signal is required.
- A SEL 2725#NG4B with conformal coating 4-port Ethernet switch with one FX-LC fiber to be installed in the main cabinet and all Ethernet runs must go to this network switch.
- Install Vaisala Model OPT100-OPTIMUS A1A3N0N0N0B1N0N0N1A0 DGA gas monitor wired to transformer control cabinet connected to a DR C54 using DNP. Mounting to include isolating valves and galvanized materials is not permitted. A CAT6 Ethernet cable between the Vaisala OPT100 and the main control cabinet. Materialmen must purchase the field commissioning of the OPT100.

10.0 Transformer Control Cabinet and Wiring

The control cabinet shall be a NEMA 3R and suitable for outdoor use and shall be integrally mounted to the transformer tank and contain all control circuits, auxiliary relays, and terminal Boards as required to provide a single interface location for all PWC field wiring to the transformer. The door hinge pins shall be stainless steel with a three-point latching system. All factory-installed wiring shall be 600 volts and 105° C with stranded, tinned copper conductor. Control and alarm circuits and

power circuits shall be #14 AWG and CT circuits shall be #12 AWG. All conductors shall be identified at point of termination and all wiring on the exterior shall be routed in galvanized electrical steel conduit fastened to tank using approved fittings. The control cabinet shall contain a thermostatically controlled heater of sufficient size to prevent condensation. The cabinet shall contain a duplex receptacle and interior light and be wired for 120/240 VAC, single-phase, 3-wire service. The bottom plate of the cabinet shall have a minimum clearance to the base of the transformer of sixteen inches (16”) with a field drillable removable bottom plate.

11.0 Transformer Tank and Oil Preservation

The sealed steel tank shall be formed and fabricated with a welded cover supplied with an inorganic gasket permanently located between the cover and the tank flange to prevent the entrance of weld splatter during welding. All welds shall meet or exceed the requirements of the American Welding Standards (AWS). The tank shall be designed and braced for full vacuum and shall be suitable for filling with oil under a vacuum. To maintain a positive pressure, the tank shall be an **Automatic Gas-Control Design** to maintain an atmosphere of dry nitrogen under a slight pressure between the top oil and the cover.

The gas control shall have a pressure gauge, nitrogen low-pressure alarm switch, gas cylinder, regulator, and all associated control equipment.

Removable radiators mounted on the transformer shall be provided. A shutoff valve shall be furnished at each radiator connection for isolating individual radiators with a double flanged valve. A drain connection and a filling connection shall be supplied on each individual radiator.

Cooling fans shall be single phase, 60 hertz, and 240 volts with standard stainless-steel guards to meet OSHA safety requirements. Fan blades shall be carefully balanced to keep sound levels to a minimum. Fans shall be furnished with watertight connections and have motors that are totally enclosed and non-ventilated with automatic reset thermal protectors.

12.0 Transformer Winding and Core Construction

All transformer windings shall be copper with a 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 latest revision. The paper-covered rectangular copper wire is to be an 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, or ThyssenKrupp Steel. 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.

The bid proposal shall describe the type of core and winding construction, including clamping design. Windings are to be copper in a circular coil, other designs, including rectangular core and coil design, will not be considered.

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 with IEC 60641-3 B.3.1.A.

Solid insulation within the windings and clamping structure shall be of a suitable cellulosic high-density transformer board supplied by a manufacturer with a proven history (15 or more years' experience supported by technical development and testing) and shall comply with current applicable industry standards for dielectric integrity, short circuit, thermal requirements, loss of life, and emergency loading.

The 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.

The transformer is to be manufactured using only Weidmann USA and/or ABB Pucaro Transformer-board for solid, non-paper insulation components.

12.1 Core

The core of the power transformer shall not become saturated under any of the operating conditions described in paragraph 4.1.6.1 of C57.12.00-2015 or with 105% voltage at the secondary side and rated maximum MVA with 0.8 power factor or with 115% voltage on the primary side and no load. In addition, the flux density shall not exceed 1.67 Tesla at 100% rated voltage, and no-load conditions. The manufacturer shall be ready to demonstrate per calculation that the core will not be saturated under these conditions. Saturation flux density shall be taken from the core material supplier's data sheet.

Core Lamination Burrs: The maximum allowed burrs on the edge and end cuts is 0.008 inches or 0.02 mm.

Core and Frame Ground System: The transformer core shall be grounded to the transformer tank. To facilitate testing of the core clamp insulation, the core ground shall be accessible through at least 1.2 KV bushing located in a terminal box on the top of the tank cover. Each core, clamping frame (when applicable), auxiliary core ground lead(s) shall be individually grounded through-separate bushings for external testing and grounding. The bushing(s) shall be mounted on the transformer cover or tank wall in a weatherproof box. The box shall be located within 12 inches from a manhole/hand hole opening. Each bushing shall be permanently labeled (metallic nameplate affixed with screws or rivets) inside the box and the box cover shall also be labeled. Removable straps shall be provided in the box to connect the bushing(s) to ground.

Core Joint Gaps: Gaps in the core along the magnetic flux line at the joints shall be less than 1/8 inch or the manufacturer's shop standard, whichever is less.

Core Joints: A mitered step-lap type core with a minimum of five steps per book shall be used.

Core Coatings: Epoxies or other bonding materials shall not be applied to the top yoke laminations.

Core thru Bolts: Metallic core thru bolts is not permitted in the main or auxiliary cores without the PWC's written approval.

12.2 Coils

The Coils 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 latest revision.

Transpositions: Each individual CTC strand shall be fully transposed at least one time per turn.

Crossovers: Crossovers performed using two spans, whereby the crossover runs across a key spacer (axial spacer) support column, are prohibited.

12.3 Connections

Windings and Leads: All connections shall be brazed or crimped. Brazed CTC connections within a winding are not permitted. All connections, including tap exits, shall be on the outside turn and shall be strand-to-strand.

Bushings and Tap Changers: Bolted connections shall be made with a minimum of four bolts.

Cable Supports: The use of cotton tape, string or plastic ties is not preferred for cable support. DETC cables or leads shall contain spacers between them when supported as a group.

Lead Supports: Lead supports shall be supported from the active part. In no case shall lead supports, either permanent or temporary, be supported from the tank bottom.

Winding Sizing: The windings shall be individually compressed prior to the final clamping. The maximum allowed tolerance during sizing of each winding is a factor of the target tolerance and the minimum key spacer thickness used in each winding. The target sizing range is +2, -0 mm. If the winding is greater than 2mm and the removal of one key spacer places the coil greater than the zero minimum, the remainder will be applied to the block assembly. The target adjustment for block assembly is also +2, -0 mm. It is preferred that isostatic pressure be applied to the windings during processing.

Final Clamping Pressure (Disc or Helical): Windings shall be compressed and clamped by one of the following methods.

a) Overpressure: Windings shall be compressed to a minimum final pressure of 6.9 N/mm2 or 1000 psi on the radial spacers before the removal of jacks.

b) Normal Pressure and Suspension: Windings shall be compressed to a minimum final pressure of 5 N/mm2 or 725 psi on the radial spacers before the removal of jacks. After application of final clamping pressure and before tanking, the active part shall be suspended by the top frame for 1 hour without any other support. After which, the final clamping pressure shall be re-verified. If more than 15% of the final clamping pressure has been lost, reapply the final clamping pressure, make necessary adjustments, and repeat suspension from the crane for an additional hour and reverify. This process shall be repeated until the final clamping pressure remains within 15% of the final pressure. The final results of this verification process shall be documented in the test report including the residual pressure found and the amount of additional material added.

Clamping Rings: Clamping rings shall be made of non-metallic material. Split clamping rings are not allowed for transformers rated 7.5 MVA and above. There shall be no reduction in the thickness of the top clamping ring in the core window. There shall be no support to the top yoke.

The installed core and coil assembly shall receive a Vapor Phase drying process to minimize moisture content.

Transformer core and windings shall be suitably harnessed in the tank to prevent movement during faults, shipping, or installation.

There shall be facilities for lifting core and coil assembly from the tank.

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

Although it is not tested, all windings shall be capable of withstanding, without damage, the mechanical and thermal stresses of short circuit conditions listed in the standards.

Windings shall be designed for free buckling unsupported span.

Short Circuit Withstand: Only the transformer impedance shall be used to determine the maximum short circuit current.

Short Circuit Calculations: Short circuit calculations must be made using finite element analysis. In the calculation of short circuit forces, a pre-fault voltage of 110% shall be used. The calculation of single line-to-ground system faults shall use X0/X1 ratio of 2.0. The resulting short circuit stresses shall not exceed IEC 60076-5 Annex A material strength or structural limitation.

The Manufacturer shall provide all design information to PWC to perform a design review prior to the manufacturing of major components.

Angular Displacement: The nominal angular displacement between windings for three (3) phase transformers shall be specified in the PRS.

Varistors: The use of zinc oxide varistors to control voltages on tapped winding sections is not preferred. The use of varistors shall be clearly stated in the proposal. If the need for varistors is identified during the final design, the Purchaser requires approval. If approved, the zinc oxide varistors shall be designed for use under oil in a power transformer and shall be shown on the transformer nameplate.

Transient Analysis: The design must be analyzed for all voltage conditions including lightning impulse, switching impulse, and power frequency voltages. The insulation design margins for all dielectrics withstand and creepage shall be 20 percent minimum based on Weidmann Partial Discharge Inception Curves for degassed oil and the applicable Weidmann Creep Stress Curve respectively (demonstrated during design review). Transformers with high voltage rated 138 kV and above must be fully analyzed using transient voltage calculation programs that contain both capacitance and inductance in the matrix. The programs must be capable of accurately representing the distribution of the transient voltages in all windings including induced voltages in adjacent windings.

Impulse Ratio Factor: For transformers with HV rated 138 kV and above, the maximum acceptable ratio between full wave impulse and power frequency for the design of insulation gaps shall be 2.5.

Switching Impulse Ratio: For transformers with HV rated 138 kV and above, the maximum acceptable ratio between switching impulse and power frequency for the design of insulation gaps shall be 1.8.

Field Plots: Field plots shall be provided to the purchaser during the design review for transformers with a high voltage winding of 230 kV and above. Field plots shall include key stress points (e.g., corners, shields, etc.) and creep stress.

13.0 Transformer Paper Insulation for Conductor Insulation

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 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 (1-4%) 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 fifteen (15) years of supplying this material for this application to be oil-filled, transformer industry.

The paper-covered rectangular copper wire is to be an oxygen-free copper rod and shall be extruded or drawn by a mold. Paper used for winding and lead insulation shall be thermally upgraded crepe paper

Conductor Insulation: Enameled or varnished insulation is acceptable in CTC cable only. Other applications of enameled or varnished insulation must be noted in the proposal and subject to purchaser approval. Enamel or Varnished Conductor: The enamel or epoxy bonding material of a conductor must retain 50% of its physical characteristics at 125°C after curing.

Material Density: Barriers and spacers must be made from high-density (1.1gm/cc minimum) pre-compressed pressboard. The only exception is formed parts which must be made from formable grades having minimum densities of 0.95 gm/cc.

Corrugated Materials: The use of corrugated insulation material is not allowed inside the winding.

14.0 Final 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 two (2) weeks in advance so that its representative can witness the following factory routine tests without causing any delays in factory schedules:

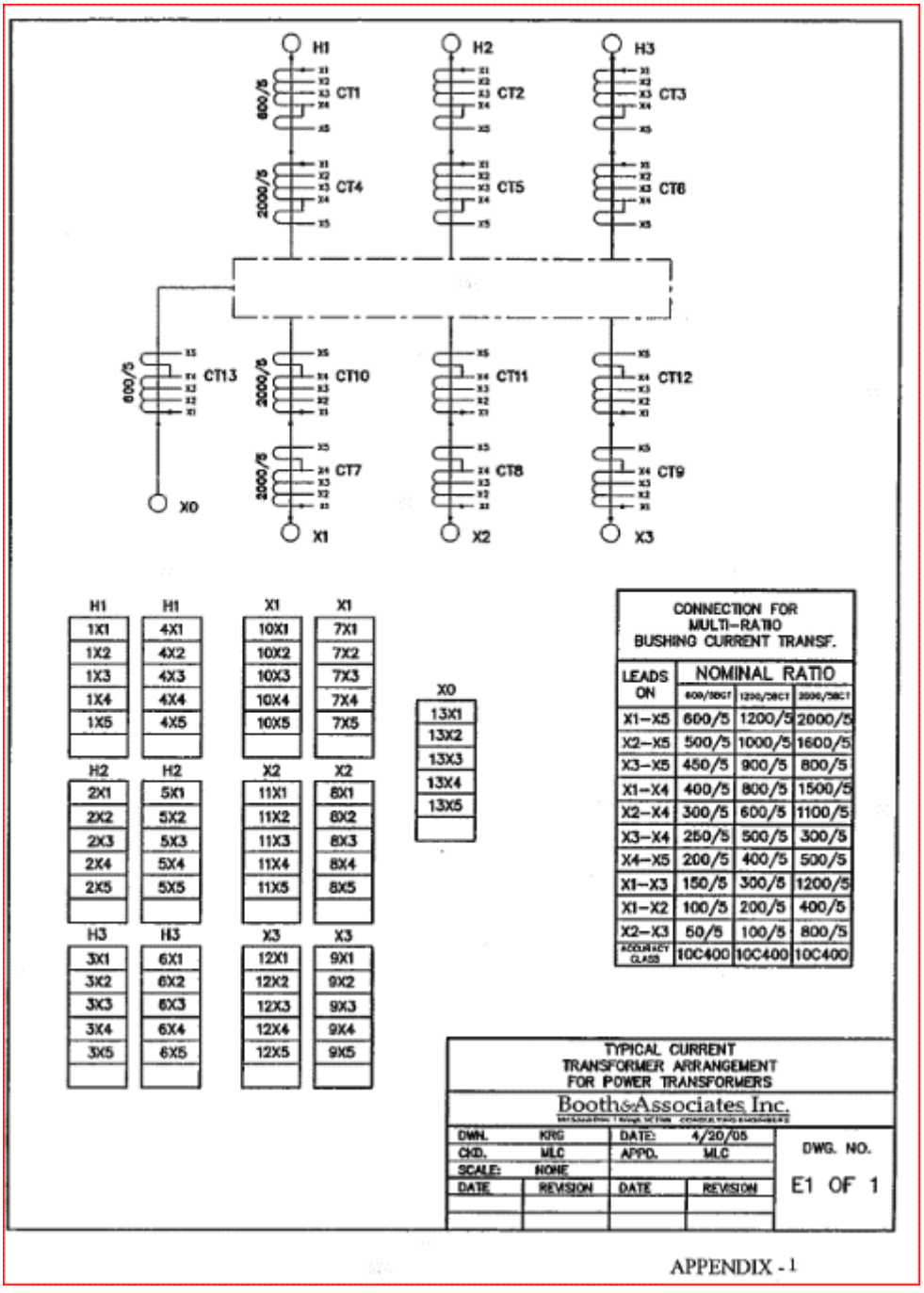
Preliminary Tests
• Ratio, Polarity, and phase relationship
• Winding capacitance and Insulation dissipation factors
• CT polarity check and Hi-Pot in cover assembly
• Winding and core insulation resistance

Field Tests
• Oil test -PCB
• Particle count
• Moisture content
• Gas in oil analysis before final tests
• Total gas content
• IEEE 1816 Dielectric breakdown- BS-5874@1.0mm Gap
• Core insulation resistance
• Winding insulation resistance
• Winding capacitance and Insulation Dissipation Factors - Insulation P. F. = 0.4% (ANSI)
• Resistances per phase in ohms at 75°C.
• No load loss and exciting current after demagnetization -Repeat after impulse tests
• Operational test on LTC at 110% of operating voltage at No Load-Chart required
• Lightning Impulse
• Applied Potential- HV and LV for 1 minute
• Induced Potential
• Gas in oil analysis -two samples
• Load Loss and Impedance
• Operational test on LTC at maximum current of maximum rating with Chart
• Winding capacitance and Insulation Power Factors - Doble- <0.4%
• Power Factor (Doble) excitation at 1L, N, 1R-+ 16R
• Measure losses of fans

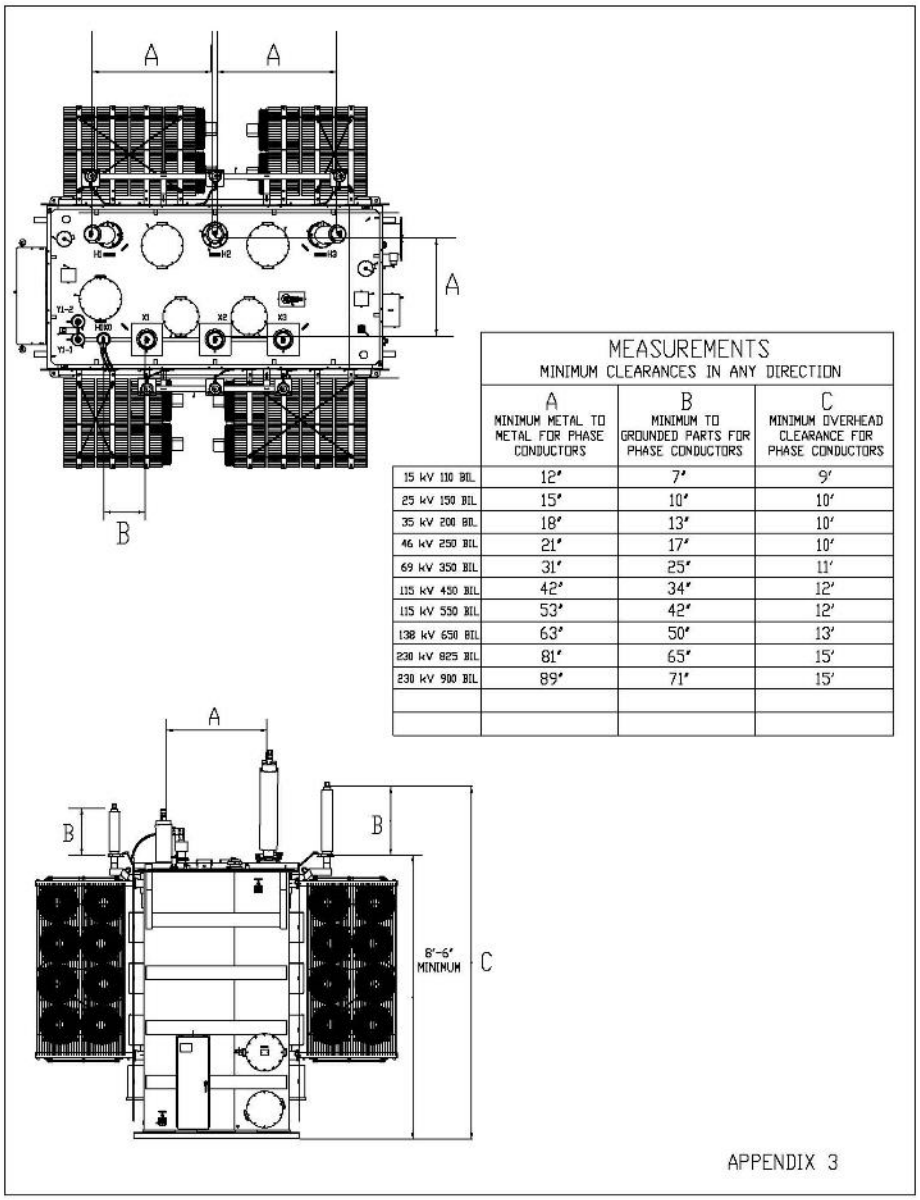
• Sweep Frequency Response Analysis (SFRA) during factory testing on the neutral taps. Frequency of 15, 30, 45, 60, 145, 230, 315, and 400 Hertz shall be used.

The Sweep Frequency Response Analysis (SFRA) shall be repeated during site testing. Results shall be compared, and a report provided with explanation for any differences in results.

Appendix 1- Typical Current Transformer Arrangement for Power Transformers



Appendix
2- Power Transformer Neutral Support Bracket Detail



DGA Specification

1. The online DGA must at a minimum measure the following parameters in the transformer oil

- Hydrogen

- Methane (CH_4)
- Ethane ($C2H_6$)
- Ethylene ($C2H_4$)
- Acetylene (C_2H_2)
- Carbon monoxide (CO)
- Carbon dioxide (CO_2)
- Moisture

2. Construction of the DGA is such that no plastic components are in contact with transformer oil.

3. All measurement components must be hermetically sealed to prevent leakage of transformer oil or gases. Oil Temperature Range: -40 to +120 °C

4. Measured DGA gases must not be vented to the atmosphere.

5. The online DGA shall not require any regular factory calibration or consumable gasses during its service lifetime.

6. The online DGA must have an autocalibration capability which must be made without use of any calibration gases or other consumables.

7. Measurement cycle shall not take longer than 2 hours in regular operations.

8. The measurement system of carbon gases must be optical and based on Non-Dispersive infrared (NDIR) technology.

9. The receiver of NDIR measurement system must not contain any mechanical parts such as microphones or mechanical chopper wheels or rotating filters.

10. NDIR measurement system must have ability to define its maximum IR transmission and compensate for any decrease in light source intensity.

11. No external pumps shall be needed to ensure flow of oil into the DGA.

12. Gases shall be extracted from the transformer oil using vacuum extraction method.

13. Use of membranes for gas separation from oil shall not be acceptable.

14. The online DGA must have integrated data logging capability for data storage up to 10 years. The on-line monitoring system shall be able to provide alarms based on single index increments.

15. The online system can be connected to SCADA using known protocols such as Modbus, DNP3 or IEC61850. It must support RS232, RS485, fiber-optic serial, fiber-optic ethernet, 4G, Ethernet carriers and include 3 x LED Indicators (Power, Service, Alarm) and Alarm relay contacts.

    The on-line monitoring system shall be able to:

    - Provide PD output in a single line energy trend which can be trended together with Load, H2 production and all relevant indexes for diagnostic correlations.

    - Initiate a DGA sample based on PD readings

16. Installation should be able to be performed without an outage if required.

17. With regards to specific Dissolved Gas Analysis, the monitoring system shall have a user interface which provides the following Dissolved Gas Analysis:

    • DGA Graph Trending
    • DGA Instantaneous Values
    • DGA Scheduling
    • DGA Online Monitor Alarm Management
    • Cross Data Trending
    • Data Export to User device

18. The supplier shall be capable of providing a team of transformer experts to support and enhance the customer experience providing monitor support and technical transformer service. Costs for these services will be agreed with the customer in advance based on a per project or transformer basis.

19. The supplier should also be able to support OEM Design for specification review and acceptance tests and provide training across all aspects of transformer operational life.

20. The online DGA enclosure must be rated to IP66. Enclosure to be constructed of 304 SS stainless steel that is white powder coated.

    - The enclosure shall be further protected with a rain shield lip covering swing door.

21. A factory calibration test-report for the online DGA must be included during the delivery.

22. The unit shall be capable to tolerate vacuum and overpressure.

23. The DGA must have an automatic recovery after power outage without any user intervention

24. Sensor Specifications

For Hydrogen

Measurement range (in oil)	:	5 to 5000 ppm
Accuracy (in oil temp. range -20 ... +60 °C)	:	15%of reading or 25 ppm (whichever is greater)
Repeatability	:	10% of reading or 15 ppm (whichever is greater)
Typical long-term stability	:	3 %of reading / year
Cross Sensitivity to Other gases	:	< 2 %(CO2, C2H2, C2H4, CO)
Sensor	:	Catalytic Solid-State Sensor

For Methane (CH4)

Measurement Range	:	20 - 50 000 ppm
Accuracy	:	10 ppm or 10 % of reading
Repeatability	:	10 ppm or 5 % of reading

For Ethane (C2H6)

Measurement Range	:	0 - 10 000 ppm
Accuracy	:	10 ppm or 10 % of reading
Repeatability	:	10 ppm or 5 % of the average of 5 reading

For Ethylene (C2H4)

Measurement Range	:	5 - 90 000 ppm
Accuracy	:	10 ppm or 10 % of reading
Repeatability	:	10 ppm or 5 % of reading

For Acetylene (C2H2)

Measurement Range	:	2 - 5 000 ppm
Accuracy	:	2 ppm or 5 % of reading
Repeatability	:	1 ppm or 10 % of reading

For Carbon monoxide (CO)

Measurement Range	:	25 - 20 000 ppm
Accuracy	:	10 ppm or 10 % of reading
Repeatability	:	10 ppm or 5 % of reading

For Carbon dioxide (CO2)

Measurement Range	:	0 ... 10 000 ppm
Accuracy	:	10 ppm or 10 % of reading
Repeatability	:	10 ppm or 5 % of reading

For Moisture

Measurement Range	:	5 to 95 %RS / Water Activity 0 to 1/ non-condensing
Accuracy (including non-linearity, hysteresis and repeatability)	:	±2 ppm or ±10% of reading
Sensor	:	Capacitive Polymer
Calibration	:	Lowest calibration point <2%RH Certificate supplied.

25. The online DGA must be able to operate in the following environment

Operating humidity range	:	5 to 95%RH, non-condensing
Operating Temperature Range	:	-40 to +55 °C

Manufacturer's test report for Ingress Protection reports must be submitted with the proposal.

26. The online DGA must have the following communications output options

- RS485 which support Modbus RTU and DNP3 ethernet
- TCP/IP which supports Modbus TCP/IP, DNP3, and HTTP
- include 3 x LED Indicators (Power, Service, Alarm) and Alarm relay contacts
- support RS232, RS485, Fiber optic, Fiber-optic Ethernet, 4G cellular, Ethernet carriers

27. No additional software than a Browser shall be required for commissioning and data interpretation. All advanced diagnostic charts (Duval's Triangle, Bushing Polar Plot, Trends…) should be visible without installing any desktop software or server, but just using a Browser (IE10, Chrome, Firefox). The Overall Dashboard must display in one single page the gas levels, temperatures (top oil, environmental, tap changer and LTC differential if equipped), and load values.

28. The Web browser-based user interface shall contain the following information from the DGA

- All measured parameters in graph format
- All measured parameters in tabular format showing most recent measured values, 1-day average values, 1-day rate of change and 30 days rate of changes

29. The user must be able to download this data in comma separated values (.csv) format directly from the web browser

30. The user must be able to start and stop the measurement of the online DGA using the web browser interface.

31. The user must be able to configure the relays directly from the web browser.

32. Declaration of Conformity or Certificate for EMC & safety type tests according to IEC standards must be provided.

33. Operating power of the unit shall be 60 hertz singe-phase 120-240 AC voltage. Other operating voltages allowed is 48-volt DC.

ATTACHMENT B: BID PRICING FORM

Bidder Information:

Name of Company _____

Address _____

Phone Number _____

Email Address _____

NAICS _____

Is the company an N.C. Certified HUB or DBE _____

Printed Name _____

Title _____

Signature _____

Date _____

Bidders shall submit bids only on the Bid Pricing Forms provided herein, or exact copies thereof. Each bidder must sign the Bid Pricing Form and provide the manufacturer's name, lead time, and item number for each line item. Failure to provide a full and complete Bid Pricing Form, including the required signature, manufacturer's name, lead time, and item number, will result in the bid being deemed non-responsive, as PWC will not have the necessary information to properly evaluate the bids.

Furnish And Deliver:

Item #	QTY.	UOM	DESCRIPTION	UNIT PRICE
1	3	E.A.	Continuous Rated 67kv Delta To 13.09 Y/7.56kv With LTC 24/35.8/44.8 MVA Power Transformers At ONAN, ONAF, ONAF Manufacturer: _____ Part Number: _____ Lead Time: _____	$

TOTAL EXTENDED PRICE: $ _____

MAXIMUM GUARANTEED LOSSES

SCHEDULES 1[(l)]

	LTC 1R Pos		LTC[(2)] Avg. 15R & 16R Pos.
Maximum guaranteed no-load kW losses, 100% voltage, 75°C, 50 MVA(3)		kW	kW
Maximum guaranteed load kW losses, (not total losses) at 50 MVA(3)		Kw	kW
Maximum guaranteed Total kW losses, at 50 MVA, 75°C(3)		kW	kW
Auxiliary kW losses, first stage cooling		kW	kW
Auxiliary kW losses, second stage cooling		kW	kW
Impedance %			%

MAXIMUM GUARANTEED PCB DIELECTRIC LEVEL (1)

Measured at the factory prior to oil filling of the transformer _____ PPM

Measured at the site after oil filling of the transformer _____ PPM

(1) All transformers in all bid schedules shall conform to these losses and values.
(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** _____

Final Drawings** _____

Delivery**

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:

Item	No. of Days Per Unit	Daily Rate*
LTC Power Transformer		
	kW	kW

*Adjustment for exceeding five (5) days or credit for less than three (3) days.

Bid Deposit. Use this space for attaching the check, if applicable:

FORM OF EXCEPTIONS
FAYETTEVILLE PUBLIC WORKS COMMISSION
THREE (3) CONTINUOUS RATED 67KV DELTA TO 13.09 Y/7.56KV WITH
LTC RATED 24/35.8/44.8 MVA POWER TRANSFORMERS AT ONAN, ONAF, ONAF

BIDDER: _____

MANUFACTURER: _____

INSTRUCTIONS: The following is a list of exceptions to the Sale of Good Agreement and/or Technical Specifications pertaining to the furnishing of the subject materials. Bidders shall identify each exception by page and paragraph number on this form. The omission of exceptions implies complete compliance with the Plans and Sale of Good Agreement.

BID DOCUMENT or TECHNICAL SPECIFICATIONS

PAGE NO. AND PARAGRAPH	EXCEPTION/VARIATION

1) If, in submitting this bid, the bidder has made any exceptions to bid documents, the bidder understands that PWC will evaluate the effect of such exceptions in determining the award of the agreement.

Respectfully submitted this _____ day of _____, 2025.

_____
Name of Bidder

By _____

_____
TITLE

Address of Bidder:

_____

_____

_____

Manufacturer of Proposed Equipment:

_____

Place city and country of Manufacturer Facility:

_____

BID BOND

This is a Bid Bond that is subject to the provisions of Article 3 of Chapter 44A of the North Carolina General statutes.

This Bond is executed on _____ , 20 _____ .

The name of the PRINCIPAL is _____ (1)

_____ (2)

The name of the SURETY is _____

_____

Fayetteville Public Works Commission, Fayetteville, North Carolina is the OWNER

The amount of the Bond is _____

_____ (Dollars) ($ _____)

KNOW BY ALL MEN BY THESE PRESENTS, the Principal and Surety above named are hereby held and firmly bound unto the above named OWNER hereinafter called the OWNER in the penal sum of the amount stated above in lawful money of the United States, for the payment of which, well and truly to be made, we hereby jointly and severally bind ourselves, our heirs, executors, administrators, successors and assigns.

The condition of the above obligation is such that whereas the Principal has submitted to the OWNER a certain Bid, attached hereto and hereby made a part hereof to enter into a Contract in writing, for the purchase of:

THREE (3) CONTINUOUS RATED 67KV DELTA TO 13.09 Y/7.56KV WITH LTC RATED 24/35.8/44.8 MVA POWER TRANSFORMERS AT ONAN, ONAF, ONAF

NOW, THEREFORE

(a) If said Bid shall be rejected, or in the alternate,

(b) If said Bid shall be accepted and the Principal shall execute and deliver a Contract in the Form of Contract attached hereto (properly completed in accordance with said Bid) and shall furnish a bond for his faithful performance of said Contract, and for the payment of all persons performing labor or furnishing materials in connection therewith, and shall in all other respects perform the agreement created by the acceptance of said Bid, then this obligation shall be void, otherwise the same shall remain in force and effect; it being expressly understood and agreed that the liability of the Surety for any and all claims hereunder shall, in no event, exceed the penal amount of this obligation as herein stated.

The Surety, for value received, hereby stipulates and agrees that the obligations of said Surety and its Bond shall be in no way impaired or affected by any extension of the time within which the Owner may accept such Bid; and said Surety does hereby waive notice of any such extension.

IN WITNESS WHEREOF, the Principal and the Surety have hereunto set their hands and seals, and such of them as are corporations have caused their corporate seals to be hereto affixed and these presents to be signed by their proper officers, the day and year first set forth above.

ATTEST:

(Principal Secretary) (SEAL)	Principal
	BY: (3)
	(Address)
Witness as to Principal	Surety
(Address)	(Address)

ATTEST:

N.C. Resident Agent
(SEAL)

Witness as to Surety

(Address)

(1) Correct name of Contractor
(2) A Corporation, a Partnership or an Individual, as the case may be
(3) If Contractor is a Partnership, all partners should execute Bond

ATTACHMENT C: CERTIFICATION OF PRIMARY PARTICIPANT REGARDING DEBARMENT, SUSPENSION AND OTHER RESPONSIBILITY MATTERS

The Primary Participant, _____ (major third party contractor), certifies to the best of its knowledge and belief, that it and its principals:

1. Are not presently debarred, suspended, proposed for debarment, declared ineligible, or voluntarily excluded from covered transactions by any Federal department or agency;

2. Have not within a three-year period preceding this proposal been convicted of or had a civil judgment rendered against them for commission of fraud or a criminal offense in connection with obtaining, attempting to obtain, or performing a public (Federal, State or local) transaction or contract under a public transaction; violation of Federal or State antitrust statutes or commission of embezzlement, theft, forgery, bribery, falsification or destruction or records, making false statements, or receiving stolen property;

3. Are not presently indicted for or otherwise criminally or civilly charged by a governmental entity (Federal, State or local) with commission of any of the offenses enumerated in paragraph (2) of this certification; and

4. Have not within a three-year period preceding this application/proposal had one or more public transactions (Federal, State or local) terminated for cause or default.

(If the primary participant is unable to certify to any of the statements in this certification, the participant shall attach an explanation to this certification.)

THE PRIMARY PARTICIPANT _____ CERTIFIES OR AFFIRMS THE TRUTHFULNESS AND ACCURACY OF THE CONTENTS OF THE STATEMENTS SUBMITTED ON OR WITH THIS CERTIFICATION AND UNDERSTANDS THAT THE PROVISIONS OF 31 U.S.C. SECTIONS 3801 ET. SEQ. ARE APPLICABLE THERETO.

_____	_____
Signature	Title
_____	_____
Printed Name	Date

PWC At a Glance

PWC
Fayetteville's
HOMETOWN UTILITY

Customers

- In operation since 1905 (116 years)
- Provide Electric, Water and Wastewater Services
- Total Customers: 119,380
- Number of Services: 273,794
  - Electric: 82,304
  - Water: 90,430
  - Wastewater: 89,913
- Customers with 2+ services: 75%
- Annual Customer Turnover: 20-25%

Customer Service

- Annual Customer Contacts: 433,794
- Average Monthly Calls: 31,452
- Annual Bills Generated: 1.4 Million
- Customer Incentive Programs: 13
- Annual Water Leak Notifications: 21,850

Employees

- Number of Employees: 651
- Average Tenure of Employees: 10.37 years
- Average Age: 44.59
- Annual Turnover: 6.0%*
- Annual Hours Worked: 1.2 Million

*non retirement

Facilities

- Butler-Warner Generation Plant (268 MW)
- PO Hoffer Water Treatment Facility (39.5 MGD)
- Glenville Lake Water Treatment Facility (18.0 MGD)
- Cross Creek Water Reclamation Facility (25 MGD)
- Electric Service Area: 147 Sq. Miles
- Water Service Area: 163 Sq. Miles
- Wastwater Service Area: 142 Sq. Miles

Electric Operations

- Purchase Wholesale Power from Duke Energy
- Only NC municipal system to own/operate a generation plant (Dispatched for use by Duke Energy)
- Generation Capacity: 268 MW
- Annual MWH Sold: 1.9 Million
- System Peak: 499 MW (Feb. 9, 2015)
- Reliability Rate: 99.9906%
- Electric Distribution Substations: 32
- Distribution Lines: 1,351 miles
- Transmission Lines: 142 miles
- Streetlights/Area Lights: 37,441

Water/Wastewater Operations

- Population Served: 225,000
- Drinking Water Treated: 11.2 Billion Gallons/Year
- 100% Complaint for all EPA Drinking Water Standards
- Daily Water Treatment Capacity: 57.5 Million Gallons
- Daily Wastewater Treatment Capacity: 46 Million Gallons
- Water/Wastewater Infrastructure: 2,700 miles
- Hydrants: 8,300
- Sanitary Sewer Lift Stations: 82

Financial

- Annual Operating Budget: $405.2 Million
- Total Assets: $1.44 Billion
- Bond Rating: Aa2 (Moody's), AA (Standard and Poor), AA (Fitch)
- Annual Local Purchases: $25 Million
- Operations & Maintenance Expenses per
- Customer: $432 ($556 National Median)
- Annual Contributions to City of Fayetteville in Lieu of Taxes: $11.4 Million
- Annual Streetlight Services: $3.9 Million
- Annual Economic Development: $1.2 Million (thru 2021)

Attachment E

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 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"). In consideration of the mutual covenants and agreements contained herein, and other good and valuable consideration, the receipt and sufficiency of which is hereby acknowledged, The Parties agree as follows:

1. Sale of Goods. Seller shall sell to PWC and PWC shall purchase from Seller the following [Identify the goods specifically] (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, attachment, exhibit or Purchase Order made pursuant to this Agreement, the terms of this Agreement shall govern.

2. Contract Documents. "Contract Documents" means, collectively, 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.

Provider shall comply with all of the following requirements so that PWC may recover the full amount of sales and use tax under North Carolina law permitted under the law:

a. Furnish PWC documentary evidence showing the material used, sales tax paid, and County paid (County of sale). The documentary evidence shall include Provider's certified statement showing total purchases of materials from each separate vendor and total sales taxes charged to PWC and paid by Provider. The documentary evidence shall also include Provider's certified statement as to the amount paid by PWC for sales tax on the Goods. A certified form is required even if no sales tax was paid for the pay request period. Materials used from Provider's warehouse stock shall be shown in a

certified statement at warehouse stock prices and amount of County of Use Tax charged to PWC and paid by Provider;

b. Provider shall furnish to PWC invoices or copies of invoices for all materials purchased for said work within pay request period, and such invoices shall state the amount of North Carolina Sales Tax, if any, paid for the Goods. Provider shall also furnish to PWC invoices identifying the amount paid for the sales and use tax on Services that are subject to such taxation under North Carolina law; and

c. Provider shall not include any tax paid on supplies, tools, and equipment that Provider uses to perform its obligations under this Agreement.

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: Timothy Bryant, 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 as of the Effective Date.

Fayetteville Public Works Commission	[INSERT SELLER'S FULL LEGAL NAME]
By: _____	By: _____
Timothy Bryant, CEO/General Manager	_____, _____
	(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:

_____
Legal Dept.

Attachment F

FAYETTEVILLE PUBLIC WORKS COMMISSION'S

MWDBE COMPLIANCE PROVISIONS

APPLICATION:

The requirements of Fayetteville Public Works Commission (PWC) Minority, Women, and Disadvantaged Business Enterprise (MWDBE) Program for participation specific contracts are hereby made part of the Contract Documents. Copies of the Program may be obtained from:

Fayetteville Public Works Commission
Economic Inclusion Programs
P.O. Box 1089
Fayetteville, North Carolina 28302
Phone (910) 223-4016 Fax (910) 483-1429
E-mail: EIProgram@faypwc.com

NCDOT DBE Directory: www.ebs.nc.gov/VendorDirectory
HUB Directory: https://ncadmin.nc.gov/businesses/hub

MWDBE Compliance Requirements:

1. The Bidder shall provide, with their Bid Form, at the time bids are due, the documents set forth below, properly executed. Returning executed copies indicates and establishes that the Bidder understands and agrees to any incorporated MWDBE contract provisions.

2. All Bidders must provide with their Bid Form, at the time bids are due, a properly completed and executed copy of **either:**

   - Affidavit A – Listing of Good-Faith Efforts **OR**
   - *Affidavit B – Intent to Self-Perform with Own Workforce.

   *Affidavit B should **only** be used if the Contractor will perform **ALL Elements** of the Work on this project with their own forces **AND** will complete **ALL Elements** of this project **WITHOUT** the use of subcontractors, material suppliers, or providers of professional services.

3. Upon being identified as the apparent lowest responsive, responsible Bidder, a Bidder shall, within twenty-four (24) hours of PWC's notification provide a properly completed and executed copy of **either:**

   - Affidavit C – Percentage of MWDBE Participation **OR**
   - Affidavit D – Good-Faith Efforts.

4. All Bidders must provide with their Bid Form, at the time bids are due, a properly completed and executed copy of Affidavit E- Identification of MWDBE/Local Participation Form

All written statements, certifications, or intentions made by the Bidder shall become a part of the agreement between the Contractor and Fayetteville Public Works Commission for performance of this contract.

SUBCONTRACTOR PAYMENT REQUIREMENTS:

North Carolina General Statutes 143-134.1 (N.C.G.S.) states that the percentage of retainage on payments made by the prime contractor to the subcontractor shall not exceed the percentage of retainage on payments made by the Fayetteville Public Works Commission to the prime contractor. Failure to comply with this provision shall be considered a breach of the contract, and the contract may be terminated in accordance with the termination provisions of the contract.

The Contractor shall provide an itemized statement of payments to each MWDBE subcontractor before final payment is processed.

The Contractor shall provide an itemized statement of payments to each NON-MWDBE subcontractor before final payment is processed.

_____
Contractor

_____
Signature

_____, _____
Printed Name Title

_____
Date

Affidavit A: Listing of the Good Faith Efforts

Affidavit of _____
(Name of Bidder)

I have made a good faith effort to comply under the following areas checked:

Total Available GFE Points: ***155***		*Minimum Number GFE Points* ***Required*****:** ***50***
Points		
	10	Contacting minority businesses that reasonably could have been expected to submit a quote and that were known to the contractor or available on State or local government-maintained lists at least 10 days before the bid or proposal date and notifying them of the nature and scope of the work to be performed.
	10	Making the construction plans, specifications and requirements available for review by prospective minority businesses or providing these documents to them at least 10 days before the bid or proposals are due.
	15	Breaking down or combining elements of work into economically feasible units to facilitate minority participation.
	10	Working with minority trade, community, or contractor organizations identified by the Office for Historically Underutilized Businesses and included in the bid documents that provide assistance in recruitment of minority businesses.
	10	Attending any pre-bid meetings scheduled by the public owner.
	20	Providing assistance in getting required bonding or insurance or providing alternatives to bonding or insurance for subcontractors.
	15	Negotiating in good faith with interested minority businesses and not rejecting them as unqualified without sound reasons based on their capabilities. Any rejection of a minority business based on lack of qualification should have the reasons documented in writing.
	25	Providing assistance to an otherwise qualified minority business in need of equipment, loan capital, lines of credit, or joint pay agreements to secure loans, supplies, or letters of credit, including waiving credit that is ordinarily required. Assisting minority businesses in obtaining the same unit pricing with the bidder's suppliers in order to help minority businesses in establishing credit.
	20	Negotiating joint venture and partnership arrangements with minority businesses in order to increase opportunities for minority business participation on a public construction or repair project when possible.
	20	Providing quick pay agreements and policies to enable minority contractors and suppliers to meet cash-flow demands.
Total GFE Points (Claimed by Bidder):		***Total GFE Points (Assessed by PWC):***

In accordance with NCGS 143-128.2(d) the undersigned will enter into a formal agreement with the firms listed in the Identification of Small Disadvantaged Business Participation schedule conditional upon execution of a contract with the Owner. Failure to abide by any applicable statutory provision may constitute a breach of the contract. The undersigned hereby certifies that he or she has read the terms of the MWDBE business commitment and is authorized to bind the Bidder to the commitment herein set forth.

Date:_____Name of Authorized Officer: _____

SEAL

State of _____, County of _____

Subscribed and sworn to before me this _____day of 20___

Notary Public _____

My commission expires _____

Last Revised September 24, 2024

Affidavit B: Intent to Perform Contract with Own Workforce

Affidavit of _____
(Name of Bidder)

I hereby certify that it is our intent to perform 100% of the work required for contract:

_____
(Name of Project)

In making this certification, the Bidder states that the Bidder does not customarily subcontract elements of this type project, and normally performs and has the capability to perform and will perform **all elements of the work** on this project with his/her own current workforces; and will complete all elements of this project **without** the use of subcontractors, material suppliers, or providers of professional services.

The Bidder agrees to provide any additional information or documentation requested by the Owner in support of the above statement.

The undersigned hereby certifies that he or she has read this certification and is authorized to bind the Bidder to the commitments herein contained.

Date:_____Name of Authorized Officer: _____

SEAL

State of _____, County of _____

Subscribed and sworn to before me this _____day of 20___

Notary Public _____

My commission expires _____

Affidavit C: Percentage of MWDBE Participation

Affidavit of _____
(Name of Bidder)

I hereby certify that on contract: _____
(Name of Project)

$_____
(Dollar Amount of Total Bid)

I will expend a minimum of _____% of the total dollar amount of the contract with Minority, Women, and Disadvantaged Business Enterprises (MWDBE). MWDBEs will be employed as subcontractors, vendors, or providers of professional services. Such work will be subcontracted to the following firms listed below.

Name, Address, & Phone No.	EIN	*MWDBE Category	NAICS	Dollar Value	% of Contract

*MWDBE categories: Black-African Americans (B), Hispanic-Americans (H), Asian- Americans (A), Native-Americans (I), Women (F), Socially/Economically Disadvantaged (D)

Pursuant to NCGS 143-128.2(d), the undersigned will enter into a formal agreement with MWDBEs for work listed in this schedule conditional upon execution of a contract with the Owner. Failure to fulfill this commitment may constitute a breach of the contract.

The undersigned hereby certifies that he or she has read the terms of this commitment and is authorized to bind the Bidder to the commitment herein set forth.

Date:_____Name of Authorized Officer: _____

SEAL

State of _____, County of _____

Subscribed and sworn to before me this _____day of 20___

Notary Public _____

My commission expires _____

Affidavit D: Good Faith Efforts

If Owner determines using reasonable discretion that Affidavit C is insufficient, Bidder agrees to provide the following information regarding any good-faith efforts.

Name, Address, & Phone No.	**EIN**	***MWDBE Category**	**NAICS**	**Dollar Value**

*MWDBE categories: Black-African Americans (B), Hispanic-Americans (H), Asian- Americans (A), Native-Americans (I), Women (F), Socially/Economically Disadvantaged (D)

Bidder may be requested to provide documentation of the Bidder's good-faith efforts. Examples of documentation may include the following:

a. Copies of solicitations for quotes to MWDBEs. Each solicitation may include a specific description of the work to be subcontracted, location where bid documents can be reviewed, representative of the Prime Bidder to contact, and location, date and time when quotes must be received.
b. Copies of quotes or responses received from each firm responding to the solicitation.
c. A telephone log of follow-up calls to each firm sent a solicitation.
d. For subcontracts where a MWDBE is not considered the lowest responsible sub- bidder, copies of quotes received from all firms submitting quotes for that particular subcontract.
e. Documentation of any contacts or correspondence to MWDBE, community or contractor organizations in an attempt to meet the goal.
f. Copy of pre-bid roster.
g. Letter documenting efforts to provide assistance in obtaining required bonding or insurance for MWDBEs.
h. Letter detailing reasons for rejection of a MWDBE due to lack of qualification.
i. Letter documenting proposed assistance offered to MWDBEs in need of equipment, loan capital, lines of credit, or joint pay agreements to secure loans, supplies, or letter of credit, including waiving credit that is ordinarily required.

Failure to provide the documentation as listed in these provisions may result in rejection of the bid and award to the next lowest responsible and responsive Bidder.

Date:_____Name of Authorized Officer: _____

SEAL

State of _____, County of _____

Subscribed and sworn to before me this _____day of 20___

Notary Public _____

My commission expires _____

Affidavit E: Identification of MWDBE/Local Participation

_____
(Name of Bidder)

I hereby certify that on contract: _____
(Name of Project)

We will use the following Minority, Women, and Disadvantaged Business Enterprises (MWDBE), and Local (Cumberland, Hoke, Harnett County) as construction subcontractors, vendors, suppliers, or providers of professional services.

Name, Address, & Phone No.	**EIN**	***MWDBE Category / **Local**	**NAICS**	**Dollar Value**

*MWDBE categories: Black-African Americans (B), Hispanic-Americans (H), Asian- Americans (A), Native-Americans (I), Women (F), Socially/Economically Disadvantaged (D)

**Local: Fayetteville Metropolitan Statistical Area (MSA) comprising of Cumberland County, Hoke County, and Harnett County. PWC is requesting this information for reporting purposes only, and use of local entities will not be considered for compliance with the requirements of the MWDBE Program.

The total value of MWDBE/local business contracting will be $_____

Date:_____Name of Authorized Officer: _____

SEAL

State of _____, County of _____
Subscribed and sworn to before me this _____day of 20___
Notary Public _____
My commission expires _____

FAYETTEVILLE PUBLIC WORKS COMMISSION
MWDBE ADD / CHANGE FORM

If a MWDBE subcontractor fails to complete work under the subcontract for any reason, the recipient must require the prime contractor to employ the good faith efforts set forth in the MWDBE Program if soliciting a replacement or additional subcontractor.

For MWDBE Change Request, please provide all information below:

Prime Contractor: _____

Subcontracted Work: _____

Previous Subcontractor: _____

Reason this for change request:

_____

New Subcontractor: _____

EIN:_____

MWDBE Category: _____

To Add MWDBE Subcontractor/Subcontracted work:

If this is a new trade being subcontracted or a subcontractor that was not documented in the original Project Bid Information submittal, then good faith efforts to solicit a MWDBE must be documented, as the original MWDBE instructions indicate. Please provide all good faith efforts below showing all the MWDBE firms contacted to perform this work along with any additional good faith efforts or evidence that there are not reasonably available firms in the work area. PWC's MWDBE Program requires that good faith efforts are to be carried out to the fullest extent practicable. If solicitations were not carried out due to being impracticable, please attach this explanation to this form.

Name, Address, & Contact Information	EIN	MBE or WBE and Certifying agency	How was this firm contacted (email, letter, or Phone) and what was the result of the solicitation? *

*Must submit copies of emails or letters. If phone calls were made this sheet can serve as documentation of calls

Date:_____Name of Authorized Officer: _____

SEAL

State of _____, County of _____

Subscribed and sworn to before me this _____day of 20___

Notary Public _____

My commission expires _____

Last Revised September 24, 2024

Attachment G

SMALL LOCAL SUPPLIER / MWDBE SUBCONTRACTOR DISCLOSURE FORM

Contractor: _____
Address & Phone: _____
Project: _____
Name: _____
Pay Application # _____

Please complete the below form by providing the necessary information for the payments made to each subcontractor, vendor, or supplier for the work associated with the identified pay application. This form must be fully completed and attached to each pay application.

Firm Name, Address, and Contact Information	Payment Amount	Type of Work/Commodity (Include NAICS Code)

_____
Signature

_____, _____
Printed Name Title

_____
Date

ATTACHMENT H: BID SUBMITTAL CHECKLIST

To ensure your bid is considered for evaluation and potential award, the following forms and required information must be submitted in full. Each item on this checklist must be completed and provided with your bid response. Failure to submit any required documentation or information may result in disqualification. Please carefully review the checklist to confirm all required materials are included before submitting your bid.

- ☐ 1. Properly Marked Sealed Bid (Submission Instructions paragraph 4)
- ☐ 2. References (provided on page 6)
- ☐ 3. Attachment B Bid Pricing Form (provided)
- ☐ 4. Attachment B Schedule No. 1 (provided)
- ☐ 5. Attachment B Maximum Guaranteed Losses (provided)
- ☐ 6. Attachment B Form of Exceptions (provided and signed)
- ☐ 7. Attachment B Bid Bond (provided and notarized)
- ☐ 8. Attachment C (completed and signed) or Explanation (provided)
- ☐ 9. MWDBE Affidavit A or Affidavit B (completed and notarized)
- ☐ 10. MWDBE Affidavit E (completed and notarized)
- ☐ 11. Addendum 1, if applicable (acknowledged and signed)
- ☐ 12. Addendum 2, if applicable (acknowledged and signed)
- ☐ 13. Addendum 3, if applicable (acknowledged and signed)
- ☐ 14. Addendum 4, if applicable (acknowledged and signed)